# SPORE PRINTS

**BULLETIN OF THE PUGET SOUND MYCOLOGICAL SOCIETY**
Number 404 September 2004


## 2004 WILD MUSHROOM EXHIBIT — Ron Post

Browsing through past issues of *Spore Prints*, I am astounded to realize that many of our October exhibits have been staffed by more than 100 people. That's a lot of mushrooms.

**We need you to sign up now** to help at least a few hours at the 41st PSMS annual exhibit, especially as member participation has waned a bit in the past few years. The sign-up sheets will be out at the September meeting, or you can call one of the committee chairs listed elsewhere in this newsletter.

We now bring in a nationally known speaker for each show, and the "Matchmaker" CD and our slide collection should be available on computer at an "interactive" table during the entire exhibit. Your attendance and donation of time will be well rewarded, whether you get to know other members in the hospitality lounge or learn more about mushrooms in the exhibit area. Remember, it's October 16–17 at Sand Point/Magnuson Park. We've cut the hours this year (see below).

All of us owe a real debt of gratitude to our recent exhibit chairs for keeping things very well organized. Now, a few items you might want to know about.

**The show poster for this year** will be available at the September and October meetings. Please pick up at least 5 of them and distribute them to walls and posting areas in your neighborhood, or better yet, in the window of a local business with high foot traffic. If you want more posters or can't make the meeting, call Ron at (206) 527-2996 or Tony at (206) 933-8357. We will try to have a small PDF version available to download from the Web.

Dr. Tom Volk is our guest speaker, and Taylor Lockwood also plans to sell his goodies again during the exhibit. Please make both of these experts feel welcome.

**Collection of specimens** will once again be organized by charter member Russ Kurtz. Patrice Benson is again coordinating the **cooking demonstration**. I want to thank our excellent identifiers ahead of time for once again doing the painstaking task of putting names on all those mushrooms!

The exhibit hours have been shortened! **Saturday hours are noon to just 7 PM** and **Sunday hours are 10 AM until 5 PM.** We lopped off an hour from the end of each day to make it easier on everyone. The same procedure as always will be used for disposing of specimens at the exhibit's 5 PM closing on Sunday.

We'll have fewer **artist items** on sale this year, since we (the exhibit co-chairs) didn't have much expertise (or interest) in that part of the exhibit. If you have something to sell, contact Marian Maxwell or Marilyn Droege.

**Microscopes** will be on hand at the show for members and the public. These will be placed near the identification table. If you have been trained in their use, feel free to make slide mounts and demonstrate something for one or two members of the public at a time. This should only take you a few minutes, so we don't expect any lines to form at the scopes. If the weather cooperates, you will find abundant species labeled "for microscopy" in the tray preparation area. Please, no groups of people in either the preparation area or the microscope area.

An important note: Keep doors closed that are marked "PSMS members only." Have fun. A list of committee chairs and their phone numbers is provided below. My number is (206) 527-2996 and Tony's is (206) 933-8357.

## COMMITTEE CHAIRS

| | |
|---|---|
| ARTS AND CRAFTS | Marilyn Droege, (206) 634-0394<br>Marian Maxwell, (425) 235-8557 |
| BOOK SALES | Trina Litchendorf, (206) 923-2883 |
| COOKING & TASTING | Patrice Benson, (206) 722-0691 |
| CONSTRUCTION | Don Lennebacker, (425) 742-3163 |
| DUFF/MOSS COLLECTION | Lynne Elwell, (425) 885-5580 |
| EXHIBIT CO-CHAIRS | Ron Post, (206) 527-2996<br>Tony Tschanz, (206) 933-8357 |
| FEEL & SMELL | Dennis Krabbenhoft, (253) 752-7202 |
| HOSPITALITY | |
| IDENTIFICATION | Brian Luther, (206) 522-1051 |
| KID'S TABLE | Joshua Birkebak, (206) 767-3581 |
| MEMBERSHIP | Bernice Velategui, (206) 232-0845 |
| MUSHROOM COLLECTION | Russ Kurtz, (206) 784-3382 |
| PSMS OFFICE (for latest info) | (206) 522-6031 |
| TICKET SALES | Elizabeth Lisaius, (206) 433-0193 |
| TRAFFIC CONTROL | |
| TRAY ARRANGEMENT | Marian Maxwell, (425) 235-8557 |

## TRAILSFEST 04 PICTURES

*Frank & Meredith Radella staffing the PSMS booth*

Ron Post

# Spore Prints

is published monthly, September through June by the

**PUGET SOUND MYCOLOGICAL SOCIETY**

Center for Urban Horticulture, Box 354115
University of Washington, Seattle, Washington 98195
(206) 522-6031 http://www.psms.org
*User name: Password:*

| | |
|---|---|
| OFFICERS: | Ron Post, President<br>Patrice Benson, Vice President<br>John Goldman, Treasurer<br>Ramona Owen, Secretary |
| TRUSTEES: | Alissa Allen, Steve Bigelow, Colleen Compton, Lynne Elwell, David Hunt, Dennis Oliver, Pacita Roberts, Tony Tschanz, Bret Vielbig, Daniel Winkler, Karin Mendell (Immed. Past Pres.) |
| ALTERNATES: | Marilyn Droege, Karin Tolgu |
| SCI. ADVISOR: | Dr. Joseph F. Ammirati |
| EDITOR: | Agnes A. Sieger, 271 Harmony Lane, Port Angeles, WA 98362<br>sieger@att.net |

Annual dues $25; full-time students $15


## CALENDAR

| | |
|---|---|
| Sept. 14 | Membership Meeting, 7:30 PM, CUH |
| Sept. 18 | Seattle Tilth Organic Harvest Fair<br>Possible field trip; check PSMS Website. |
| Sept. 20 | PSMS Board Meeting, 7:30 PM, CUH |
| Sept. 21 | *Spore Prints* Deadline |
| Sept. 25 | Field Trip, Circle 8 Ranch |
| Oct. 2 | Field Trip, Big Four Picnic Shelter |
| Oct. 9 | Field Trip, Chatter Creek |
| Oct. 12 | Membership Meeting, 7:30 PM, CUH |
| Oct. 16–17 | 41st Annual Wild Mushroom Exhibit, Sand Point |

## BOARD NEWS — Ramona Owen

The focus of the first Board meeting of Fall 2004 was our Fall Exhibit and catching up on PSMS business that transpired in the spring and over the summer. Treasurer John Goldman noted that we have some large expenses coming up, such as our annual wild mushroom exhibit and printing of the new roster. Our poster this year is based on a mushroom print that was used by Dr. Stuntz in his teaching days. Expect great T-shirts and hats again this year. Beginners classes have been organized. Committees for the Exhibit are set (please volunteer to help out). Field trips and forays are in the planning stages. There is some question about the viability of our July picnic; attendance may be better on another date. Our PSMS Website design is being worked on by Molly Bernstein and Steve Bigelow. The Board needs an interim secretary starting in September. We also need a librarian. The Board voted to purchase a laptop which will be used in the office and also on field trips to run MatchMaker.

## MEMBERSHIP MEETING

Tuesday, September 14, at 7:30 PM at the Center for Urban Horticulture, 3501 NE 41st Street, Seattle

First comes a call to arms to enlist volunteers for the 41st Annual Wild Mushroom Exhibit, followed by the unveiling of the exhibit poster. Then comes a presentation on the Shadow Lake Bog Project, with photos and the latest update of accomplishments by the "Bog People."

If your last name begins with A–L, please bring a treat to share after the presentation. Please think about great spots to put up posters which will be available for pick up after the meeting.

## 2004 NAMA FORAY, ASHEVILLE, N.C. — Ron Post

A first-ever joint foray with NAMA and the Mycological Society of America took place on the campus of the University of North Carolina-Asheville in mid-July. It was my second NAMA event, and it turned out to be worth traveling across the country.

Another nearby happening also took place around the same time: a "mycoblitz" in Tennessee, part of the All Taxa Biodiversity Inventory. In all, about 350 people interested in mushrooms were buzzing around the Southern Appalachians.

The specimen tables kept everyone occupied right up until the last day's final minutes.

A few weeks of intermittent rain had produced lots of specimens in the Smoky Mountains. It seemed the higher we went, the more mushrooms there were. At least 25 species of *Amanita* came in, and lots of interesting polypores, tooth fungi, and Russulaceae. The understory in those broadleaf woods included rhododendron, and increasingly as we hiked upwards, we saw pines and hemlock. Ah, familiarity!

I enjoyed sharing dinner one evening, on a night we were served two kinds of beer with our meal, with Ben and Ruth Woo and Brandon Matheny. Our conversation ended only when the beer ran out.

I took the opportunity to thank Gary Lincoff for such an enjoyable series of talks at our exhibit last year, and I met Tom Volk, who will be this year's speaker. Both men gave highly interesting talks during the foray.

At one of the evening socials, a female graduate student of Dr. Volk's called me an "old geezer" when I refused to dance with her. Well, she wasn't even a good dancer! And I was enjoying the assortment of microbrews provided by generous NAMA members.

I'll always remember the talks I had with longtime NAMA member Walt Sturgeon and his friends. Walt gave a talk on Eastern mushrooms. It was so well attended that many listeners had to stand, lining the walls of the lecture room. I had the chance to meet and talk with Larry Evans of the Western Montana club and Britt Bunyard, currently the editor of *Mycophile*.

Young geezers Ben Woo, Maggie Rogers, and Judy Roger helped me find interesting specimens to look at under the microscope, and a variety of "old geezer" types shared their knowledge of native and invasive plants in that part of the country. On the last night of the foray I attended an auction (following Dr. Orson Miller's fantastic lecture), and I picked up a subscription to *Mushroom: The Journal* for a song (we'll give it away at the PSMS exhibit next month).

## GIANT MUSHROOM BAFFLES EXPERTS

BRAZZAVILLE, 27 May 2004 (Reuters) - A giant three-tiered mushroom which measures a meter across and was found in the tropical forests of the Republic of Congo has left experts in the capital Brazzaville scratching their heads.

"It's the first time we've ever seen a mushroom like this, so it's difficult for us to classify. But we are going to determine what it is scientifically," Pierre Botaba, head of Congo's veterinary and zoology center, told reporters on Thursday.

The giant fungi stands 45 centimeters (18 inches) high and has three tiered caps on top of a broad stem. The bottom cap measures 1 m across, the second one 60 cm, and the top one 24 cm, Botaba said.

The bizarre-looking mushroom was found in the village of Mvoula about 38 miles from Brazzaville and transported carefully to the capital by the local chief.

## FALL FIELD TRIPS

**Cathy Lennebacker**

Attention fun lovers! Summer is winding down. It's time for cool days, crisp nights, and mushrooms. The club has planned several field trips, most with camping opportunities. Field trips are a good opportunity to make friends, learn from an identifier, and have a potluck supper.

Each field trip has been planned for a time and location supposed to be good picking, weather willing. There will be a host at the meeting place at 9 AM on Saturday. He or she should be able to point you in the right direction to start looking. Advice is free and worth every penny. Be sure to bring a compass, whistle, watch, bag lunch, and something for the potluck if you plan on staying.

Once again we are looking for field trip hosts. Please call Cathy Lennebacker at (425) 742-3163 to volunteer. I will train you, hold your hand, and help you in any way I can, so don't be afraid to give this a try. The club pays for everything but your time.

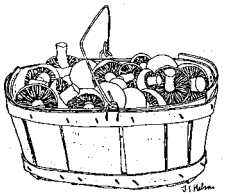
**September 18** **TBA**

If this rain keeps up, we will have a nearby chanterelle outing. Check the PSMS Website and monthly meeting announcements.

**September 25** **Circle 8 Ranch**
(elev. 2000 ft, 75 miles east of Seattle)

We can camp at Circle 8 Saturday, September 25, for the following charges: $15 for tents, $17 for electricity and water, and $19 for full hookups. Please pay the field trip host on site if you decide to stay overnight. There is a cabin you could rent for $30 if you so desire. You would still need your own sleeping bag.

Driving Directions: Go east on I-90 over Snoqualmie Pass. Continue 20 miles and take exit #74, the "West Nelson" exit, from I-90. Go to the right. After ±2 miles you will see a sign to the Circle 8 ranch. You will see two interlocking squares (the square dance symbol). The Circle 8 Ranch is on your right. There is a usage fee of $2 per person.



**October 2** **Big Four Picnic Shelter**
(elev. 1700 ft, 60 miles north of Seattle)

The Big Four picnic shelter is 4 miles west of Barlow Pass, just past milepost 25 on the Mountain Loop Highway. The picnic area is the start of an easy 2.0 mile trail to the Big Four Ice Caves. A Trailhead Pass is required. A one day pass can be purchased at the Verlot Ranger Station for $5 on the way up. If you are 62 or older you are eligible for the best deal around: with a photo ID and $10, you can get a lifetime pass which works as a trailhead pass, gets you free entry into National Parks and campsites, and is good for a half price discount at Forest Service campgrounds. Washington State still collects full price at the State Parks.

Driving Directions: From Seattle take I-5 north to Exit 194. Follow Highway 2 east for 2.3 miles; stay in the left lane and go to Lake Stevens Highway, 204 East. In 2.2 miles turn left (north) on Highway 9 to Lake Stevens, in 1.7 miles take a right (east) on Highway 92 to Granite Falls, and in 8.4 miles turn left (north) to the Mountain Loop Highway. Follow the Loop Highway to the Verlot Visitors Center and then travel 14.5 miles farther. Trailhead parking and the picnic area are on the right.

**October 9** **Chatter Creek**
(elev. 2400 ft, 150 miles east of Seattle)

Chatter Creek Campground is 16.1 miles up Icicle Creek Road out of Leavenworth. This is a reserved group camp with a shelter. Check in with the campground manager. Friday check-in time is 2 PM. Overnight camping Friday and Saturday nights will be paid by PSMS.

Driving directions: Take Hwy. 2 over Stevens Pass and proceed 34 miles. (You can also take I-90 over Snoqualmie Pass to exit #85, go over Swauk Pass to Hwy. 2, and proceed left for 6 miles.) Icicle Creek Road is on the north edge of town.

**October 23** **Crystal Springs**

**October 30** **PSMS/The Mountaineers Joint Field Trip, New Castle Park, Bellevue**

**November 6** **Twanoh State Park**

**November 13** **Deception Pass State Park**

**November 20** **Seward Park, Seattle**

## SEATTLE TILTH ORGANIC HARVEST FAIR

**Emily Routledge**

Save the date of Saturday, September 18, 2004, for the annual Organic Harvest Fair, sponsored by Seattle Tilth, at the Good Shepherd Center in Wallingford. This is the third year that PSMS will be exhibiting at this event, and volunteers are needed to staff our educational display booth. In addition to being a terrific opportunity to promote our upcoming fall show, it's a fun and festive event for ecologically minded folks. The fair hours are 10 AM to 4 PM, with assistance especially needed in booth setup and breakdown. For details, contact Emily Routledge at (206) 355-5221 or emilyroo@hotmail. com.

## BREITENBUSH MUSHROOM CONFERENCE

The 21st Annual Breitenbush Mushroom Conference will be held October 21–24, 2004, at Breitenbush Hot Springs near Detroit, Oregon. For more information or to register, visit www. breitenbush.com or phone (503) 854-3314.

## BOG BLOG

**Leesa Wright and the Shadow Lake Bog Team**

Greetings from the Bog People! Who, you ask, are the Bog People? We are a group of volunteers, including some members of PSMS, who since September 2003 have been conducting an ongoing weekly survey of the macrofungi (mushrooms and their relatives) at Shadow Lake Bog near Renton in King County, Washington. Our goal is threefold: (1) to generate a comprehensive species list of the macrofungi present in a defined set of study areas, (2) to assemble and preserve voucher-specimens of each species, together with extensive, descriptive notes, and (3) to construct a Website concerning the macrofungi of the bog.

This is the first installation of periodic "bog blogs" about our study. In the months to come, please look to the Bog Blog column in your copy of *Spore Prints* for updates to our ever-rising species count, for shout-outs for volunteers, and for fascinating descriptions of "bog fungi of the month." In the meantime check out our link on the Shadow Lake Bog Website at http://www.shadowhabitat.org/fungi-about.html.

**Shadow Lake Bog**

Shadow Lake Bog is located southeast of the city of Renton and is one of the last remaining Sphagnum bogs (also known as peat bogs or peatlands) in King County. As the last period of glaciation, known as the Pleistocene, was coming to an end approximately 13,000 years ago, the receding glacier that covered the Puget Sound region left behind several heavy pieces of ice, compressing and carving out the landscape beneath them. Shadow Lake formed in one of these glacial depressions. All water flowing to the lake comes from direct rainfall, springs, and the runoff from the surrounding uplands. With no outlet, the water seeped into the surrounding land, creating the ideal environment for Sphagnum moss. The moss flourished, creating a bog.

Plants that thrive in an acidic environment like a Sphagnum bog dominate the landscape around the lake. The bog cranberry (*Vaccinium oxycoccos*) is one of these plants. Native Americans harvested this tart, colorful fruit when they came to the Cedar River for the salmon runs. As the centuries passed, the layers of slowly decaying wood and moss built up, creating the beautiful, rolling green landscape of Shadow Lake Bog. The peat bog on the south and southwest banks of the lake rises into upland forest, wooded with large, old trees. Within these trees, a low-lying area receives the water draining from the forest, forming the headwaters of Jenkins Creek. Jenkins Creek is a major tributary to Soos Creek, a salmon-spawning stream.



*Shadow Lake Bog*

In 1995, Max and Erin Prinsen purchased an 18-acre parcel near Shadow Lake in an attempt to prevent further destruction of this rare, 65-foot deep peat bog. Understanding the developmental pressures that were crowding the area, they resolved that this unique environment had to be preserved. The Prinsens also recognized the opportunity for this property to serve as an educational experience and an example to other landowners of how to protect our environment and open spaces. They founded SHADOW (Save Habitat And Diversity Of Wetlands), a 501(c)(3) organization (http://www.shadowhabitat.org/). SHADOW seeks to acquire more bog land to preserve. Recent land acquisitions at Shadow Lake now bring the protected area to approximately 50 acres.

On the outer edge of the bog, on the land that the Prinsens purchased, was a fill area that had been used as a dump. Items dumped there included refrigerators, ovens, and cars. With help from the Rainier Audubon Society, King County, King Conservation District, and other volunteers, the Prinsens cleaned up the dump, removing 110 yards of material to a certified site. Then they began an ongoing process of removing invasive plant species and replanting the area with native plants. An amphibian pond was also created as part of the restoration project. From this area, a path leads a 600-foot-long boardwalk into the peat bog, so that visitors can see the bog without trampling its delicate beauty. At the other side of the rehabilitated area, a staircase rises to a viewing tower that overlooks the amphibian pond, and a skywalk connects the viewing tower to an education room called the Richter Interpretive Center. Shadow Lake Bog is recognized by the King County Council as a significant wetland and wildlife habitat for Southeast King County.

**Some Background on Sphagnum Bogs**

The Sphagnum-dominated peat bogs of western Washington represent a unique and increasingly rare wetland type. It has been estimated (Rigg, 1958) that, on an average, it takes about 41 years to accumulate 1 inch (2.5 cm) of peat. This suggests that Sphagnum-dominated peat bogs may be among the most ancient living ecosystems in western Washington (some bogs being more than 10,000 years old). The biological and chemical characteristics of Sphagnum-dominated peat bogs are unique and, owing to the slow rate of peat accumulation, are essentially irreplaceable once lost.

Peat bogs are waterlogged, acidic, and nutrient and oxygen poor. These conditions cause decomposition rates to be unusually low and, in turn, result in the accumulation of partially decomposed organic matter (Rigg, 1958). Only about the first two feet of Sphagnum (the acrotelm), contains any oxygen; below this point there is virtually no decomposition. Sphagnum moss helps facilitate these conditions by releasing hydrogen ions in exchange for cations such as $K^+$, $Na^+$, $Ca^{++}$, and $Mg^{++}$ (Gorham, 1967). By taking these nutrients out of solution and acidifying its surroundings, Sphagnum creates an inhospitable environment for many competing vascular plants and microbes. In addition, most Sphagnum species produce a microbial inhibitor called sphagnol, further inhibiting the growth of bacteria and fungi normally responsible for decomposition in an ecosystem (Clymo and Hayward, 1982).

These conditions favor the establishment of uniquely adapted plants and microbes that are rare in other environments. With the

exception of George C. Rigg's seminal work on Sphagnum-dominated peat bogs (Peat Resources of Washington, 1958) and vegetation communities identified by Kunze (1994), most of the information about these unique wetlands was produced not by university or government researchers, but as part of private development proposals and has remained largely unpublished.

Between 1930, when Rigg documented Sphagnum bogs in Washington, and 1990, the acreage of Sphagnum-dominated peat bogs in King County had decreased by 71% (Kulzer *et al.*, 2001). In order to address this, the King County Department of Natural Resources embarked in 2001 on a two-phase project to produce a comprehensive paper entitled "Characteristics of the low-elevation Sphagnum-dominated peatlands of western Washington: a community profile." The bulk of the funding for the profile was in the form of a grant from the Environmental Protection Agency.

The main goal of King County's community profile is to synthesize the mostly unpublished information on local peatlands into an open resource that would aid wetland scientists, researchers, and regulators in the understanding and conservation of these unique ecosystems. Phase 1 of the community profile included information compiled on the physical, chemical, and vegetation properties of Sphagnum-dominated peatlands and is available at http://dnr.metrokc.gov/wlr/dss/sphagnum-bogs.htm. Phase 2 of the profile will cover hydrology and the invertebrate and vertebrate wildlife of these ecosystems.

Finally, the profile identifies critical areas of research that the authors feel need to be addressed in future studies of Sphagnum-dominated wetlands. Fungi are not presently listed as one of these critical research areas. In fact, fungi in bog environments have scarcely been studied in the United States despite their ecological importance as decomposers and as mycorrhizal and endophytic symbionts of plants. This unfortunate omission is compounded by the fact that bacteria, the other main decomposing organisms, are even more sensitive to the acidic conditions found in Sphagnum bogs than are fungi. In one study, water from the undisturbed peatland showed bacterial counts an order of magnitude lower than the non-peat-forming wetland sampled (Kulzer *et al.*, 2001).

**Why We're Interested**

We find it troubling that, in an ecosystem defined largely by its inordinately slow decomposition rates and limited nutrient availability, the very organisms whose ecological niches happen to be decomposition and nutrient cycling, among other things, are given not even cursory consideration in seemingly comprehensive community-level research models.

Even now, with a growing body of knowledge that firmly supports the integral and varied roles fungi play in virtually all ecosystems, they remain, as they have been historically, overlooked. The lack of trained mycologists (especially taxonomists), coupled with a very basic misunderstanding of fungi on an organismal level, may contribute to the problem. Perhaps because many fungal species are plant pathogens, or because they are non-motile, historically fungi have incorrectly been placed under the purview of botanists. In fact, studies that look at the evolutionary development and history of organisms (cladistics) suggest that fungi are more closely related to animals than to plants. It seems unlikely, however, that zoologists will begin studying fungi in earnest any time soon. This leaves open the question of who will pursue the study of this important kingdom of organisms. Finally, like most initial attempts at understanding systems models, an oversimplification of how ecosystems function, especially in regard to how discreet organisms interact with one another, has yielded very few *in situ* studies on fungi in nonagricultural environments.

We hope that the data we collect and the subsequent resources that we will produce from these data will be useful in general to those studying wetland ecology in our area, and in specific to the mycological community interested in wetland macrofungi or fungi in other limiting environments.

This first phase of our project is a survey to establish species diversity. As we near the one-year anniversary of our study, our plans are to continue our weekly collection outings and our Monday night taxonomy labs with Joe Ammirati, Professor of Mycology at the University of Washington, until we reach a plateau of species richness. Currently we have 340 collections, 53 unique genera, and 113 unique species. After we have reached a plateau in the number of distinct species, we will shift our focus to collecting phenological data such as the seasonality and proliferation of species.

**References**


Clymo, R.S. and P.M. Hayward. 1982. The Ecology of Sphagnum. Chapter 8, In: *Bryophyte Ecology*. A.J.E. Smith (ed.). Chapman and Hill, New York, NY.

Gorham, E. 1967. Some chemical aspects of wetland ecology. *Annual Muskeg Research Conference Proceedings 12*: 20–38.

Kulzer, L. *et al*. 2001. Characteristics of the low-elevation Sphagnum-dominated peatlands of western Washington: a community profile. King County Department of Natural Resources, Seattle, WA.

Kunze, L.M. 1994. Preliminary classification of native, low-elevation, freshwater wetland vegetation in western Washington. Natural Heritage Program, Washington State Department of Natural Resources, Olympia, WA.

Rigg, G.B. 1958. Peat Resources of Washington. Division of Mines and Geology, Bulletin No. 44, State of Washington.


## GPS - WHAT IS IT?

**Chris Hardwick**

*Spores Afield*, Colorado Myco. Soc., April 2004

Have you ever been lost in the woods or can't remember where you found those mushrooms last year? Then you need a GPS! Scott Frank introduced me to GPS during a foray two years ago, and I decided then and there that I needed one. I had run across some great matsutake and chanterelles the year before, and I couldn't remember where I needed to go to find them!

You might be asking yourself, "What is GPS?" GPS stands for "Global Positioning System." The system consists of 24 military satellites that hover in space above the earth, their ground stations, and a receiver. The entire system is run by the government (paid for with your tax dollars) and costs over 6 billion dollars.

The only thing you need to purchase to utilize this multibillion-dollar system is a receiver (often called a GPS) that is about the size of a cell phone. Entry-level models can be bought for less than $100. The best part is that, unlike a cell phone, there are no monthly fees.

The GPS system gives every square foot of the planet a unique address. With a receiver (GPS), you can map your location as you move, backtrack your exact path, and mark "waypoints" or locations anywhere on the planet for future reference. For example, I found an edible mushroom, *Coprinus micaceus*, in abundance at North latitude 39.77434º, West longitude 105.10002º. If

you had a GPS you could simply plug in these numbers and it would show you exactly on the map where this location is and would lead you right to it. (Some GPS units are accurate to within three meters!) GPS data is a great way to keep a record of all of your favorite spots. A GPS will also give exact elevations, which is valuable information when you want to find a particular species of mushroom that grows only at a certain elevations.

I purchased a Garmin e-trex Legend (retail is about $149), and it has a button on the front of the GPS that, when pushed, puts down a "flag" on the map at the point where you are standing. The GPS will automatically give the flag a number or you can give it a name. I like to give all my waypoints specific names to indicate what is located there (like Boletes, etc.). This particular model also has the option of downloading maps from your computer. For an additional cost, you can purchase topographical maps, road maps, point-of-interest maps, marine maps, etc., and load them into your GPS. (Some basic GPS models don't have this option.) You can also upload all your waypoints to your computer and see them on a map in full screen view. There are a lot of other functions on my GPS that I have yet to tap into.

Don't be fooled by all this technology though; you can still get lost with a GPS! I've found that the screen is so small that it takes time to navigate to a waypoint unless you are within a few miles of it. Also, the signal strength to the satellites is weak. If you walk under trees or into a building, the signal gets cut off (it works through glass and in cars though). Start-up is slow, and you have to be out in the open or in a car since you have to communicate with at least three satellites to get your location. I've also found that you should have a good topographical map in addition to a GPS. And most of all, bring extra batteries!

## FUNGAL FARMERS — Susan Goldhor

*Bulletin*, Boston Mycological Club, June 2004

Animal-fungal interactions range from totally focused monoculture to casual spore-sowing. But no one doubts that colonial insects are the most advanced fungal farmers. Of course, they've had the longest time in which to evolve their techniques. Humans have been farming for 10,000 years or thereabouts; termites have been farming fungi for 30 to 50 million years. The termites themselves have been around much longer—over 200 million years.

Like almost all animals that eat plants, termites can't digest either the lignin of the woody plants or the cellulose from which they derive most of their calories. Instead, most termites utilize their guts as fermentation chambers in which they culture a variety of microbes that can produce cellulases and limit themselves to eating wood that is rotten and thus already contains lignin-digesting organisms. This is actually a pretty simple approach, and replacing it with the complexities of farming was risky.

Experts think that fungal farming by termites evolved only once, in Africa (like everything else), followed by several waves of emigration to Asia. Else Vellinga, a Dutch mycologist working on *Lepiota* at U.C. Berkeley, contributed an excellent paper on termites and fungi to the May/June 2004 issue of *The Mycophile*, and the following is taken from that.

The Macrotermitinae, the only termite family relying on fungi, provide an Old World parallel to the New World leucocoprinoid fungi-cultivating leaf-cutter ants and their relatives. One difference, however, is that at least some of the Macrotermitinae deserve their name by virtue of their growing the world's largest mushroom: the aptly named *Termitomyces titanicus*. This fruiting body, which can have a cap over three feet wide, starts out from inside the nest, sending out a long stem with a point on the end to penetrate the nest wall. This odd morphology is also found in many of the smaller *Termitomyces* species. (There are only about 40 species of *Termitomyces*, but there are about 330 fungus-growing termites.) Another difference between the termites and the ants is that the big *Termitomyces* are sought-after delicacies. Given the tendency of termites to eat our homes, it gives me pleasure to contemplate eating a piece of their home; turnabout being fair play and all of that. The relation of these termites to their chosen fungal partners is an obligate mutualism; neither can survive without the other, which is pretty much what we'd expect after a 50-million-year-long marriage. What is most fascinating about the termite-fungal relationship is the variety of ways that the termites have found to utilize their crop.

The fungi are grown on combs, special structures made by the termites. The termites eat fresh plant material that passes quickly through the intestinal canal without much decomposition, and that material is molded together to form a substrate for the fungi. On the combs, the fungi form white blobs (in jargon they are called myco-têtes, which is French for fungal heads) containing asexual spores, and the termites eat this part of the fungus. Different termite species use the fungi and the comb in different ways: some eat the fungus for food, others only for their enzymes. In some cases, only the lignin-degrading enzymes are used; in other cases, so are the enzymes that decompose cellulose. It is nature at its best; for everything a solution, and no two systems exactly the same.

The fungus combs serve not only as food but also as regulators to keep constant the temperature and humidity in the termite nests or heaps, thereby providing a stable environment for the eggs and developing larvae. The termites ward off (fungal) parasites from their combs with specific fungicides in their saliva.

Some species of the fungus never produce fruiting bodies. Before the winged termites set out on their flight to form a new colony, either the females or the males, depending on the species, first eat spores from the white blobs and later excrete a bolus to inoculate the combs in the new nest. However, most of the species of fungal symbionts do produce fruiting bodies, and these appear outside the nest at just the right time. When a new nest has been constructed but is still fungus-free, workers leave the new nest and gather the spores with which they will inoculate the combs.

## HELPING THE ECOSYSTEM THROUGH MUSHROOM CULTIVATION — Paul Stamets,

*Mycolog*, Humboldt Bay Myco. Soc., No. 217, May 2004

Mushroom growing isn't just a rapidly expanding agribusiness; it is also a significant tool for the restoration, replenishment, and remediation of Earth's overburdened ecosphere. With the increasing concern about the depletion of resources, loss of habitat, and release of toxic substances into the environment, it is encouraging to find that the cultivation of mushrooms can help to tip the scales in Nature's favor, thereby benefiting all the inhabitants of Planet Earth. From a piece of tissue the size of one tenth of your little fingernail, what is called a clone, cells can be grown exponentially into millions of pounds of mushrooms in as little as several months. More than 10% of the growing medium or substrate (straw, sawdust, compost, most agricultural and forest debris) can

be converted into a protein- and vitamin-rich food. Not only are these mushrooms nutritious, they have demonstrated abilities in enhancing the human immune system, and they produce a slew of natural antibiotics. Yet it is the residual mycelium in that substrate that holds the greatest potential for ecological rehabilitation.

Mycelia can serve as unparalleled biological filters. By producing extracellular enzymes and acids, they break down recalcitrant molecules such as lignin and cellulose, the two primary components of woody plants. By circumstance, these same enzymes are superb at breaking apart hydrocarbons, the base structure common to oils, petroleum products, pesticides, PCBs (polychlorinated biphenyls), and many other pollutants.

Several years ago, I began a series of experiments in association with Battelle Laboratories, a nonprofit foundation, whose mission is to use science to improve environmental health. The focus of the research was the application of fungi in the area of bioremediation.

The first significant study showed that a strain of Oyster mushrooms could break down heavy oil. A trial project at a vehicle storage center controlled by the Washington State Department of Transportation (WSDOT) enlisted the techniques from several, competing bioremediation groups. The soil was blackened with oil and reeked of aromatic hydrocarbons. One berm of soil approximately 8 feet × 30 feet × 3 feet high was inoculated with mushroom spawn while other technicians employed a variety of methods, ranging from bacteria to chemical agents.

After four weeks, the tarps were pulled from each test pile. The first piles employing the other techniques were unremarkable. Then the tarp was pulled from our inoculated pile, revealing that the hydrocarbon-laden pile was bursting with mushrooms! Oyster mushrooms up to 12 inches in diameter had formed across the pile. Analyses showed that more than 95% of many of the polycyclic aromatic hydrocarbons were destroyed or reduced to nontoxic components, and the mushrooms were also free of any petroleum products.

After eight weeks, the mushrooms had rotted away, and then came another startling revelation. As the mushrooms rotted, flies were attracted ("fungus gnats" commonly seek out mushrooms and spread the spores to other habitats). The flies became a magnet for other insects, which in turn brought in birds.

Apparently the birds brought in seeds, and this particular pile had become an oasis, the only pile teeming with life! We think we have found what is called a "keystone" organism, one that facilitates a cascade of other biological processes that contribute to habitat remediation.

In this series of experiments our group made two other significant discoveries. One involved a mushroom from the old growth forest that produced an army of crystalline entities advancing in front of the growing mycelium, disintegrating when they encountered *E. coli*, sending a chemical signal back to the mother mycelium that, in turn, generated what appears to be a customized macrocrystal which attracted the motile bacteria by the thousands, summarily stunning them.

The advancing mycelium then consumed the *E. coli*, effectively eliminating them from the environment. The other discovery, which I am not fully privy to, involves the use of one of my strains in the destruction of biological and chemical warfare agents. The research is currently classified by the Defense Department, as one mushroom species has been found to break down VX, the potent nerve gas agent Saddam Hussein was accused of loading into warheads of missiles during the Gulf War. This discovery is significant, as VX is very difficult to destroy.

We believe that buffer zones around streams work primarily because of the mycelium resident in the first few inches of soil. Buffers with multicanopied trees and shrubs combined with grasses, and the debris fallout they provide, afford a mycologically rich zone, filtering out runoff from adjacent farms, highways, and suburban zones. The mycologically rich riparian zones are cooler, attract insects which lay larvae (grub for fish), and then foster bird life. Once the riparian zones achieve a plateau of complexity, they become self-sustaining.

Mycofiltration is a natural fit to John Todd's "Living Machine" use of estuary ecosystems to break down toxic wastes. The marriage of upland use of mushroom mycelium with estuary environments could solve in the short term some of the greatest challenges threatening our ecosystem, and truly give meaning to the word "sustainability." There is work under way unifying these two friendly technologies in the creation of a new paradigm for the 21st century. However, we need help.

Our current capacity to produce and, more recently, monitor and detect toxins spilled into the environment has not gone hand in hand with an increase in our capacity to adequately clean these up. Oil spills, *E. coli* contamination of our waters, and other contaminants are very real risks of our own creation that we have not developed solutions for. It seems, however, that nature herself may be providing us with the tools and processes to regenerate toxic sites for all her creatures.

## THE BLACK FOOT MOREL — Dr. Carol Carter

*MushRumors*, Ore. Myco. Soc., July–August 2004

For the past few years I have been analyzing the DNA of morels sent to me from all over North America in order to try to sort out the various *Morchella* species. Recently OMS member Dolores Schneider sent me some specimens that she found in the east side of the Mt. Hood Wilderness Area. At first she thought her coal-black morels were just covered with dirt, but when she tried to clean them she realized that they were naturally black, from head to toe. She had never seen any morels of this type before, so she sent them to me for analysis. It turns out that Dolores's morels are one of the rarest types that I have found. My collaborator, Michael Kuo (http://www.bluewillowpages.com/mushroomexpert/), calls this species the Black Foot Morel. I call it #8 (I have 14 genetically distinct morel taxa so far, and I just assign them boring numbers), but if I had to name it, I'd call it The Panther! Some people might call it *Morchella atrotomentosa* or the Burnsite Morel (Re: McKnight and McKnight 1987, *A Field Guide to the Mushrooms of North America)*, but the descriptions as given in McKnight and McKnight for *M. atrotomentosa* and elsewhere really do not fit our Black Foot.

The Black Foot is characterized by a beautiful, velvety, black/brown stalk and a striking, all black cap. Young specimens are lighter, and their stalks show only a smudgy, transparent black veil. In sectional view, a well hydrated, mature specimen shows a cap that is black or deep gray all the way through to the light-colored lining of the hollow inner chamber.

So far I have confirmed—by DNA analysis—the Black Foot's occurrence in Montana, Colorado, Oregon, and the Yukon. Michael Kuo says it is very likely more widespread than that, because a number of people have described this kind of morel

*(cont.)*
through postings on the discussion board associated with the MushroomExpert.com Website. We don't know if it is always associated with burns or not. For a lovely, color picture of the Black Foot go to http://www.bluewillowpages.com/mushroomexpert/morels/mdcp_legend.html#08.

## OYSTERS MORCHELLA

*Wild Mushroom Cookery*, Oregon Mycological Society, 1987

This one calls for shouts of "Chef! Chef!"

3 or 4 dried morels
dry sherry
2 or 3 TBs butter
1 or 2 shallots, finely chopped
1/4 teaspoon finely chopped garlic
1/2 dozen fresh oysters, shucked, bottom shell reserved
6 TBs heavy cream
Grated Parmesan cheese

Barely cover morels with a mixture of half sherry and half warm water. Soak morels until reconstituted, adding more liquid if necessary.

Reserve liquid; mince morels. Over low heat, gently sauté morels briefly in butter with shallots and garlic. Add remainder of soaking liquid and reduce.

Place one rounded teaspoon of the morel mixture in each of the six oyster shells; top each with an oyster. Place shells on a baking sheet. Pour 1 TBs of cream over each oyster and sprinkle with Parmesan.

Broil just until the edges of the oysters curl. Serve immediately.


We are sad to report that PSMS member **Gloria Jean Barber**, creator of McGee, MS passed away May 24, 2004. She will be sorely missed.



**Puget Sound Mycological Society**
Center for Urban Horticulture
Box 354115, University of Washington
Seattle, Washington 98195

RETURN SERVICE REQUESTED

Non-Profit Org.
U.S. POSTAGE
**PAID**
SEATTLE, WA
PERMIT NO. 6545