Chapter 11—Mushrooms

Description of the Product and Its Uses

The mushroom plant is composed of mycelium, a network of living fibers so small as to be invisible to the naked eye. Mushrooms are fungi. More specifically, they are saprophytes, which means that they live on dead and decaying material. Mushrooms convert decaying matter into their own food. When climatic conditions (temperature, light, moisture, and food supply) are right, the mycelia form small buds that grow into the fruits we know as mushrooms. The mushrooms, in turn, form spores that are spread by wind to other decaying matter. These spores then germinate to form new mycelium to repeat the life cycle.

The major commercial use of mushrooms is for food. Many species are inedible or poisonous, however, so the ability to identify these is critical to harvesting and cultivation. In addition to food, mushrooms are being developed for other uses. For example, the shiitake has been used in the biopulping process, and research has been conducted on ways of using fungal strains to reduce some of the toxic materials in municipal dumps. Some have use as dyes for textiles, and others are being used in medical research (table 11–1).

Table 11–1. Forest mushrooms with commercial uses

Agaricus	Lactarius	Polyporus
Armillaria	Lepiota	Puffballs
Boletas	Lions mane	Rozites
Chanterelles	Lyophyllum	Russula
Clavaria	Matsutake	Shiitake
Craterellus	Morels	Sparassis
Fistulina	Oregon white truffles	Sweet tooth
Hedgehog	Pleurotus	Verpa

Market and Competition Considerations

Forest-Harvested Mushrooms

In the early 1980's, a commercial market for wild edible mushrooms began developing in the Pacific Northwest when a few enterprising harvesters began exporting chanterelles to European canneries at the same time that a depressed timber industry had many rural people eager to supplement their incomes. The volume of wild mushrooms picked and sold increased dramatically, with annual volumes of up to 7 million pounds being blanched, chilled, packed in brine in large containers, and flown to Europe for canning.

Although numerous mushroom species are commonly collected, the most important wild ones from a commercial standpoint are the chanterelle (*Cantharellus cibarius*), morel (*Morchella conica*, or "blacks," and *Morchella esculenta*, or "yellows"), matsutake (*Armillaria ponderosa*, or "pine mushroom," and *Tricholoma matsutake*), boletus (*Boletus edulis*), and hedgehog (*Dentinum repandum*, or sweet tooth). Additional wild varieties that are harvested on a recreational basis include the meadow mushroom (*Agaricus campestris*), the fried chicken mushroom (*Lyophyllum multiceps*) (so called for its flavor when cooked), the orange delight, the shaggy mane (*Caprinus commatus*), the chicken of the woods (*Laetiporus (Polyporus) sulphurCus*), the gem-studded puffball, and the cone-shaped morel (*Morchella augusticeps*). The Northwest Wild Mushrooms Association listed 41varieties of wild mushrooms as safe for fresh market sales in 1984.

Chanterelle

The most important wild mushroom has been the chanterelle (the common golden or yellow chanterelle). In a good year, an estimated 4 million pounds of chanterelles are marketed from Oregon and Washington. Roughly one-eighth are marketed fresh. The rest are canned. The price to the picker averages $1 per pound for cannery grade and $1.50 per pound for fresh. The average wholesale price was $3 per pound for cannery grade and $4 per pound for fresh shipments in 1991.

Morels

Blacks and yellows are commonly marketed. In a good year, the Oregon harvest may be 500,000 pounds, 80 percent of which are dried prior to sale. The price to the picker averages $3 per pound. The sale price leaving the State averages $6 per pound fresh weight.

Matsutake

The estimated annual harvest of matsutake from Oregon and Washington is 35,000 pounds. This contrasts with a Canadian harvest of 250,000 pounds. The price to the picker varies widely, depending on the grade, but averages $6 per pound.

Boletus

The "king" is one of the most sought-after wild mushrooms, but unfortunately marketing it becomes a race with the fly larvae that invade the base of the stem and quickly destroy the mushroom. Several other species of boletus are marketed occasionally.

Hedgehog

This mushroom is a relative newcomer but is now generally available in season.

Until recently, both public and private forest landowners in Washington and Oregon usually ignored wild mushroom harvesting on their lands. The emergence of the commercial mushroom picking industry has attracted the attention of forest landowners. The Forest Service has implemented fee systems for selling wild mushrooms to commercial harvesters. Several systems are either in the developmental stage or have been implemented. Some timber companies allow mushroom harvesting on their land without fees, while others try to discourage trespassing and mushroom theft.

Russell (1990) has written one of the few papers on production, marketing, and regulation considerations of wild mushrooms. Domestic, fresh, forest-harvested mushroom markets are expanding steadily. Restaurants, health food stores, a few large grocery companies, farmers' markets, and other outlets are selling forest mushrooms in season. Harvest figures are difficult to obtain because regulatory laws and crop statistics, until recently, were nonexistent. The first annual wild mushroom report, prepared by the Washington State Department of Agriculture and the Washington Agricultural Statistics Service, has begun to track production, however. In Oregon, the sale of domestic and wild mushrooms is one of the fastest growing produce industries in the State. The total annual value of wild mushrooms exported from Oregon normally exceeds $6 million, mostly in sales to Germany.

In 1989, 20 licensed buyers and 4 licensed processors (dealers) in Washington reported buying 257,700 pounds (130 tons) of wild mushrooms with a wholesale value of $652,247, or $2.53 per pound. The bulk of these mushrooms came from two counties, and 97 percent of the crop was chanterelles. The next most popular species was boletus, with 4,060 pounds harvested for an average price of $5.99 per pound. The most valuable species was matsutake, with 2,600 pounds harvested with an average price of $13.99 per pound.

Picking and selling wild edible mushrooms provides supplemental seasonal income for many. It is estimated that Washington has from 700 to 900 commercial mushroom pickers whose earnings range from a few dollars to $3,000 – $5,000 in a good season.

The State of Washington passed a Wild Mushroom Harvesting Act in 1988 that requires an annual license for persons who buy and process wild mushrooms for market. It is the only State or province in North America known to have a law for commercial harvesting of wild mushrooms. Buyer and dealer licenses are $75 and $375, respectively. Pickers are exempt. The buyers must send a monthly form to the State Department of Agriculture that includes (a) site of purchase (b) amount by weight of each species obtained (c) approximate location of harvest site (d) date of purchase (e) price paid to harvester and (f) name, address, and license number of dealer to whom the mushrooms are sold. The State intends to publish annual harvest totals as well as a description of where processed wild mushrooms are being sent.

In Europe, there is much more interest in the wild mushroom than in the United States. For example, millions of pounds of mushrooms are shipped to Germany from the United States.

There has been a big increase in competition among dealers of forest-harvested mushrooms in the past few years. For one reason, Japanese companies are now represented in the Northwest. It is believed that the Japanese already control the matsutake market. The Japanese have been known to bid higher for this mushroom than the current market price in Japan in order to corner the U.S. market, and gamble that by the time the mushroom arrives in Japan, the price would be higher there and they would make a profit. It should be noted that American dealers are not permitted to sell directly to the Japanese consumer, only to Japanese dealers.

Cultivated Mushrooms

Cultivated mushrooms are a promising new industry, with many new businesses developing every year. The more popular cultivated varieties are the shiitake, chanterelle, oyster, and enoki. Work is progressing on the cultivation of matsutake as well.

There are as many methods of cultivation as there are varieties of mushrooms. Each has its particular requirements. Because these are so varied, this section will briefly summarize cultivation of the shiitake since interest in its production in private forest lands has been quite high and it now has the greatest potential in terms of both indoor and outdoor cultivation. It can be cultivated in virtually every part of the country and in both small and large operations.

Mushroom cultivation is an excellent method of increasing the profitability of a forest with little disruption of the existing ecosystem. For example, firewood or pulpwood may sell for $30 to $40 per cord. The same wood-producing shiitake might be worth $500.

Shiitake

The shiitake (*Lentinula (Lentinus) edodes*) has been popular for centuries in Japan, where it is known as the forest mushroom and originally grew wild on the shii tree (closely related to the oak). It has been prized for its flavor and use in folk medicine. The Japanese slowly learned how to cultivate it, and Japan currently produces over 90 percent of the world's shiitake. But in the last 20 years, hundreds of shiitake growers have begun cultivating the mushroom in the United States as well.

Since the 1940's, worldwide demand for shiitake mushrooms has placed its market volume second only to that of the common white mushroom (*Agaricus brunnescens*). The texture of shiitake is more chewy, and the odor more aromatic, with a pleasant garliclike flavor. It tastes good either fresh or rehydrated from dried mushrooms, and is a dietary source of protein, vitamin D, B vitamins, and minerals. Markets for fresh and dried shiitake already exist in the United States, particularly in large cities where the bulk of the sales go to oriental restaurants and oriental, gourmet, and health food stores.

Of all the cultivated mushrooms, the shiitake has seen the greatest growth in the last decade in terms of both indoor and outdoor cultivation. Its market potential is great because of its unusually high nutrition value and the fact that it can be cultivated in virtually every part of the country in both small and large operations.

The first step in growing shiitake, as well as any other mushroom, is selecting the growing medium. Although a wide variety of media are reportedly used (including hay and rice), the most popular method is to use wood as a medium. A wide range of trees can be used, but there is general agreement that oaks work well, particularly white oak. Logs are cut from living, decay-free trees during the dormant season when the wood contains the maximum amount of stored carbohydrates. The diameter of logs should be from 3 to 6 inches. The bark layer should remain intact. Raising shiitakes allows use of wood that would otherwise be unmarketable, and wood cut to thin overgrown woodlots. In States such as Texas, such overgrown hardwoods cover millions of acres in the State, providing an unlimited resource for shiitake production.

Inoculation is the placement of spawn into the logs so that the shiitake fungus can begin to grow. This should be done within 2 weeks of harvesting the logs. Spawn comes either as wooden plugs made from hardwood dowels or as sawdust. There are several inoculation techniques, but most commonly holes are strategically placed around the log and the holes are filled with the spawn plugs.

The first "fruiting" will normally occur between 6 and 18 months after inoculation. During this incubation period it is critical to monitor and maintain the environmental conditions, including moisture, light, and temperature.

Successful mushroom marketing involves direct marketing to grocery chains, restaurants, health food stores, and retail sales to consumers. The article by Green (1988) is useful in analyzing potential markets during the early planning stages of a new production. Once a sufficient number of growers are active, a marketing cooperative is generally beneficial to consolidate some production, grading, and packaging activities at a central location. Via a co-op, sales can be made to larger volume users such as large grocery chains and to larger food processors and restaurant chains. Wholesale prices in 1990 were anywhere from $3.50 to $10 per pound in the Southeast, with retail prices between $9 and $12 a pound in cities.

Matsutake

This native American mushroom has great potential, since Japanese have paid over $100 a pound for it.

Chanterelle

Sales are estimated at 10 million pounds a year worldwide and are a big factor for rural development.

Distribution and Packaging

All types of mushrooms are at their best when not subjected to long storage. Harvesting, shipping, and marketing should be accomplished as quickly as possible. Even under the best conditions, mushrooms do not keep fresh more than 1 week after harvest. Immediate cooling is essential for prolonged shelf life. Most shippers refrigerate after packing. A few use vacuum cooling.

For short periods of time, mushrooms can be stored at 34°F with relative humidity at 90°F. Shiitake and enoki will keep for about 2 weeks at 34° to 36°F .

To meet most consumer needs, mushrooms are packaged in 8-, 10-, 12-, and 16-ounce packages. A 4-ounce bag size may be needed in farmers' markets to sell to first-time buyers. The 8-ounce package is generally most popular. Mushroom boxes must be vented so that air can circulate. Since mushrooms give off heat, venting helps minimize spoilage. The average price for a custom-designed box is 50 to 75 cents.

Most growers sell their products to two sources: direct to roadside or farmers' markets or to shipping point firms, which include cooperatives, brokers, or other grower-packers. From grower-packers, the product is marketed for export or sold to direct sale, wholesale, or retail markets, which, in turn, market directly to the public

or to other consumers such as food processors or restaurants.

Mushrooms of lower quality or freshness can be dried, packaged, and sold in the retail and restaurant markets. A tremendous quantity of mushrooms is used in the processed food industry in the dry form where visual quality is not as important.

Equipment Needs, Costs, and Suppliers

Forest Harvesting

One advantage of mushroom picking is that a picker with a car and reasonable woods lore can become an independent business person. However, it may be cause for concern if pickers are not thoroughly acquainted with each species they are collecting. The influx of Southeast Asians into Washington has brought an increase in the picker work force, since similar mushrooms were available in the homelands of these individuals. It is possible to pick and sell mushrooms to buyers without being fluent in English. The greatest majority of pickers are nomadic, following the seasons and the rain.

The buyers are not hard to find. There are buying stations scattered around the region, sometimes several, and word gets around. Some of the buyers are from the local area but many of these people are nomadic, too. It takes a lot of experience to be a good buyer—not only must the buyers be able to identify the mushroom, but they must be able to recognize quality and they must be skillful with people. A sample information sheet for mushroom pickers is included in the appendix.

Commercial Production

In addition to the space in which to grow the shiitake (outdoors or indoors), the basic requirements for cultivation include logs or other growing media, mushroom spawn, and various miscellaneous tools and supplies such as drills for coring the wood. A general estimate of these fixed start-up costs, based on the inoculation of 500 logs, is slightly more than $500.

There are many firms that supply mushroom spawn, tools, and information to both professional and hobbyist cultivators (see section on suppliers, buyers, and producers). Regional suppliers can usually be located through local associations and extension offices.

The basic strategy in mushroom farming is to introduce the fungus of choice into a suitable substrate while excluding other fungi that would compete for the same space. Fungus growth can be divided into two stages: a vegetative stage and a fruiting (reproductive) stage when the mushrooms are produced. The basic steps for growing shiitake are (1) obtaining logs and spawn (2) inoculating (3) laying (4) raising and (5) harvesting and marketing. The appendix lists sources of growing information. It should be noted that different strains of shiitake can have very different characteristics, and it may be necessary to try a few to find the strain that works best in a given situation. In addition, some buyers (the Japanese, for example) are very particular about which strains they want.

Resource Conservation Considerations

Potential for Overharvesting Wild Mushrooms

It is not yet known whether picking affects the productivity of future generations of mushrooms. Indications are that the answer depends on the weather. But the intensity of harvesting wild edible mushrooms has reached the point of valid concern about possible degradation of the resource itself.

European forests have recently experienced declining wild mushroom crops after decades of heavy harvesting, and the rising popularity of the wild mushrooms of North America stems in part from this diminished European supply. However, it has been pointed out that the declining European mushroom harvest may be just part of the larger overall deterioration of these forests, caused largely by air pollution (Denison and Donaghue, 1988).

Tours and examinations of recently burned areas of the Malheur National Forest (July 1991), where commercial morel collecting had occurred, revealed that even in a heavily picked area, sufficient morels were in place to produce spores to disperse the species. While it was not possible to evaluate the vigor of the subterranean mycelium that produces the morels, there was no reason to believe that the picking had damaged it. There was, however, a concern that the encampments of pickers in random camps with no sanitary or other facilities had a definite detrimental impact on the area. It has been recommended that some rare mushrooms, such as black chanterelles, should not be harvested anywhere in the Pacific Northwest until it has been determined what level of harvest provides for sustained yield.

Needed Regulation in Harvest Methods

There is not yet even a definite answer to the question of whether it is better to harvest a mushroom by cutting it off at the stem or by pulling it out. Further guidelines are needed on harvest methods. The way in which harvesting is done will also affect a forest's ecology over the

long run. Commercial picking operators generally make a clean sweep of timber stands. Some use rakes to disturb the duff, a method which should certainly be discouraged. For example, large crews have been observed using rakes to dig up the turf and duff sometimes over a foot deep to find matsutake mushrooms. This digging certainly changes the forest ecology. There seems to be an emerging consensus that Federal and State laws should prohibit disturbing the duff or not replacing it, or digging deeper than 2 inches. Of course, it would not be easy to enforce such a law.

An additional area for regulations regards the size of mushrooms that could be picked. Many feel that small chanterelles (less than 1 inch cap) should not be picked. The reason is that most restaurants do not want them and they are not regarded as a quality product. Picking the little ones means they do not throw their spores. Also, leaving them for even a few weeks can make a big difference in size.

Forest Management Practices

The single most destructive forest practice from the point of view of those in the wild mushroom business is timber clearcutting. Some individuals maintain that once an area is clearcut, mushrooms will not be found for about 15 years. Some crops in certain localities have been reduced substantially because of clearcutting. The mushroom industry feels that a study needs to be done to assess whether it might not be true that more money can be attributed to nonforest products from multispecies forests than can be obtained from the trees alone. The tree can only be harvested once in 60 years. Products like the mushroom can be harvested frequently. In addition, pickers do not need heavy machinery.

Conflicts Between User Groups

There are currently no mushroom harvest restrictions in Washington or Oregon, and increasing conflict and competition is occurring between recreational and commercial pickers, with commercial pickers harvesting during the week and tending to clean out recreational pickers' favorite patches by the weekend. Some recreational pickers reportedly have been ordered away from certain areas or otherwise confronted or intimidated by commercial pickers. Resource harvests may need to be rotated to allow light harvest (recreational), commercial harvest, and recovery years.

Denison and Donaghue (1988) have described the question of harvesting from public forests from the viewpoint of the pickers, brokers, and landowners (generally the taxpaying public or shareholders of large companies) involved in the mushroom question. This paper points out that although the economic need of the picker and broker may be great, the economic need of the forest landowner is perhaps greater, since maintenance of the forests requires a continuing annual investment.

Leasing Picking Rights

The national and State forests have been trying different leasing and permitting systems to deal with wild mushrooms pickers. One may sell 3-day and 30-day commercial harvesting permits and allow free personal use permits with a limit of 5 gallons. Mushroom buyers using Federal land as a purchasing station may be required to have a $100 annual permit and to only purchase mushrooms from pickers who have valid Federal harvesting permits. Another system may allow up to two annual permits for family or personal use for 50 pounds of mushrooms, or a 3-day commercial permit to allow harvest of 100 pounds at an appraised price. The Washington Department of Natural Resources leases land to individuals or leaseholders at a bid price. Other agencies with responsibility for wildlife or parks usually allow recreational picking but not commercial harvesting.

In the opinion of mushroom pickers, the Forest Service's system of "leases to pick" is detrimental to the industry. The approach has been to look at mushrooms as a forest product just like timber. However, the mushroom supply cannot be measured. And while rain, snow, heat, and cold do not hurt timber, sudden weather shifts can devastate a mushroom crop. In the worst case, after a dealer has a lease, he or she could find nothing to harvest. The only ones who will take this risk in bidding for leases to pick are companies with lots of money. A better arrangement, in the opinion of pickers, would be to charge according to how many pounds of mushrooms are harvested.

The picker also becomes responsible for forest dangers. If a forest fire results from someone's carelessness, the picker has to pay for the forest fire. There is virtually no small company that could survive such a fire. This policy has encouraged some companies to create bogus companies to protect their assets. Here again, in the opinion of some mushroom pickers, a bonding company should be used instead.

Licensing

The State of Washington requires licenses rather than leases. This licensing process requires dealers to fill out records telling the amount harvested and the county where the harvesting occurs. However, this system is prone to error because there is no guarantee that the county where the picker harvested the mushroom is the same county where the mushrooms were sold to the dealer. Dealers also fear that if word gets out about mushroom areas, European companies will descend on

these areas, bringing their own people and bidding prices way up, even taking the whole crop. The market in Europe is so much stronger that this is viewed as a real possibility. European mushroom dealers also have all the needed infrastructure already in place, and their governments will loan them money to expand.

The alternative would be to keep such statistics completely confidential and thereby ensure the cooperation of the dealers and pickers.

Dealers also do not want to be slowed down with a lot of paperwork because the product must be moved so fast. Each year's weather is so different, too, that it makes it very difficult to draw conclusions from annual sales data.

There would also be resistance among dealers to tracking sales, since dealers want to protect the identities of their buyers.

Public Health Concerns

In the State of Washington, mycologists and others have expressed concern that poisonous mushrooms could accidentally slip into the market because the State has no regulations or inspections of mushrooms sold to the public. Pickers are not certified in any way, although various guides have been published to identify poisonous mushrooms (Puget Sound Mycological Society, 1972). In contrast, French mushroom markets are closely regulated by certified mushroom inspectors, and access to the market is carefully controlled. Sellers must live within the local area serviced by the market, which is only open July 1 to November 15. It has been recommended that sales of any and all food and drug resources from the national forests be made only to brokers or processors who are properly licensed, and that these processors should only employ harvesters holding current valid health cards.

Profile

Sharon Krogmeier of K.P. Spring Oak in West Point, Iowa, attended a shiitake-growing seminar about 6 years ago and became interested in growing mushrooms. While she and her husband do not own their own woodlands, her sister's family does, and she knew she could get a dependable and free supply of white, red, and black oak logs.

The Krogmeiers started out with 200 logs and relatively little investment. They ordered their spawn through the Geode Shiitake Mushroom Producer's Association, which was formed in January 1991 because of the growing interest in Iowa in mushroom cultivation. The Krogmeiers' initial supply of wood was free, they already had a garage in which to store the logs and to force the fruit, and the family could supply all the needed labor. First-year harvests were so satisfying that they quickly increased in production to their current 3,000-log operation.

Presently, they cut about 600 to 700 logs a year, which are inoculated soon after being cut, left to sit for about 6 months outside, and then brought into a 12- by 24-foot garage where they are soaked in water for about 24 hours and then placed in a controlled environment (temperature around 80°F and humidity around 85 percent) where the mushrooms rapidly emerge. This size of an operation requires 15 to 20 hours a week in labor from one person and allows a net profit of $10,000 to $12,000 in a good year. This is a good source of supplemental income. Sharon Krogmeier also runs a child care center and her husband is a heating and plumbing contractor.

The mushrooms are harvested and sold through the Geode Shiitake Mushroom Producers Association. Between one-quarter pound and one-half pound of mushrooms can be obtained from each log. The association can sell virtually any amount that is grown, providing it is of good quality. Most of the mushrooms are sold to food processing companies. Currently, the association sells the shiitake mushrooms for about $6 a pound, withholds 20 percent ($1.20) for association costs, and pays producers the remaining $4.80 per pound. The markets have stayed very strong.

Having the association do the marketing for the producers has been a big help to the shiitake mushroom producers in the State. Some producers are planning for 10,000-log operations and larger. There are also many with relatively small (300-log) operations. Many producers are using vacant pole buildings, which they insulate and heat. In general, buildings can house two logs per square foot.

Many shiitake producers use limbs that are too small for loggers or they purchase wood by the cord. The logs must be "live wood," cut during the dormant season between fall and spring, and disease-free. The logs will last 3 to 5 years after they are inoculated and they are inoculated only once. Every 3 months or so after fruiting, they are resoaked and then put back into production. In the last few years, the Krogmeiers have begun buying some of their logs at about $0.80 to $1.00 a log. They plan to maintain a 3,000-log operation.

Considerations for a Rural Development Strategy

One useful role for rural development interests would be to free restaurants from the stigma of serving a well-recognized wild mushroom. The ordinary Mom and Pop

restaurant in a rural area thinks it is not allowed to serve chanterelles, for example, because they are "foreign substances," for instance, not purchased from a licensed grocery dealer. Most are scared that they will be fined. But in Seattle restaurants, wild edibles are sold all the time. Getting this attitude changed would be a way to support the local economy with a forest product, since local pickers could then sell direct to local restaurants. The local restaurants could improve their specialty reputations with delicious native foods that would cost the consumer about one-fourth the price of what they would pay in a big city. There would still be a need for some system to ensure safety, however.

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Shiitake Mushroom Marketing Guide, Forest Resource Center, Route 2, Box 156 A, Lanesboro, MN 55959.

Shiitake Mushrooms. 1989. The proceedings of a national symposium and trade show (Table of Contents, May 3–5, 1989, St. Paul, MN). Available from Center for Alternative Plant and Animal Products, St. Paul, MN, $20.

Shiitake News. Forest Resource Center, Lanesboro, MN 55959.

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Yoo, B.W. 1976. How to grow oak tree mushroom shiitake. Dr. Yoo Farm, College Park, MD 20740. 21 p.

Resources

Keith Blatner, Economist, Washington State University, Pullman, WA 99164. 509–335–2811.

Dr. Harold Burdsall or Tom Volk, USDA Forest Service, Forest Products Laboratory, One Gifford Pinchot Drive, Madison, WI 53705. 608–231–9234.

Milo Burnham, Cooperative Extension Service, Box 5446, Mississippi State University, Mississippi State, MS 39762. 601–325–3036.

Bill Denison, Northwest Mycological Consultants, 702 Northwest Fourth Street, Corvallis, OR 97330. 503–754–3451.

The Forest Resource Center has compiled and published the Shiitake Mushroom Marketing Guide for Growers to help growers effectively market their produce. The Center also publishes the Shiitake News to exchange ideas and update growers on new developments that affect the industry. Forest Resource Center, Route 2, Box 156A, Lanesboro, MN 55949. 507–467–2437.

Fungi Perfecti, P.O. Box 7634, Olympia, WA 98507. 206–426–9292. Paul and Cruz Stamets. Promotes cultivation of high-quality gourmet mushrooms. The Stamets are currently growing Ganoderma lucidum, a medicinal wood-rotting fungus prized by oriental people. Have also worked with oyster mushrooms, shiitake, morels, and others. Fine scientists.

Geode Shiitake Producers Association, 4809 Avenue O, Fort Madison, IA 52627. 319–372–1692.

Anthony Hankins, Extension Specialist, Alternative Agriculture, Box 540, Virginia State University, Petersburg, VA 23803. 804–524–5961.

Dr. James Kimbrough, Plant Pathology Department, P.O. Box 110680, University of Florida, Gainesville, FL 32611. 904–392–2158.

Dr. Ralph Kurtzman, 573 Harbor Way, Richmond, CA 94801. 415–233–0555.

Pacific Forestry Centre, brochures on Harvesting Edible Wild Mushrooms in British Columbia and Mushrooms in Forestry, 506 West Burnside Road, Victoria, BC V8Z 1M5. 604–363–0600.

John H.D. Rodwell, 3373 Ocean Drive, Channel Islands Harbor, Oxnard, CA 93035. 805–985–1017.

Dr. Dan Royce, Associate Professor of Plant Pathology, 211 Buckhout Laboratory, Pennsylvania State University, University Park, PA 16802. 814–865–7322.

Society for Economic Botany, Dr. George Constantine, College of Pharmacy, Oregon State University, Corvallis, OR 97330.

The Texas Forest Service has assembled a 75-page packet of information on growing shiitake mushrooms, sources of spawn and equipment, management procedures, and economic and marketing ideas. The cost of this packet is $4; checks should be made payable to the Texas Forest Service and sent to the Forest Products Laboratory, Highway 59S, P.O. Box 310, Lufkin, TX 75901. Phone 409–639–8180.

Associations

America Mushroom Institute, 907 East Baltimore Pike, Kennett Square, PA 19348. 215–388–7806.

The Canadian Wild Mushroom Association, P.O. Box 80794, Burnaby, BC V5H 3Y1.

Forest Resource Center, Route 2, Box 156A, Lanesboro, MN 55949. 507–467–2437. Jerome Deden, Executive Director.

North American Mycological Association, 3556 Oakwood, Ann Arbor, MI 48194. Ann Bornstein, Membership Secretary.

Suppliers, Buyers, and Producers

Allied Mushroom Products Company, P.O. Box 490, Tonitown, AR 72770. 501–361–5938.

American Type Culture Collection, 12301 Parklawn Drive, Rockville, MD 20852.

Carolina Agro-Tech Corporation, Route 5, Box 84E, Henderson, NC 27536. 919–438–2674.

Cascade Mushroom Company, Matt and Ellen Briggs, 530 Northwest 112th Avenue, Portland, OR 97229. 503–644–0962.

Dr. Yoo Farm, Box 290, College Park, MD 20740.

Elix Corporation, Route 1, Box 133-1A, Arvonia, VA 23004.

Far West Fungi, Box 1333, Goleta, CA 93116.

Farlow Reference Library and Herbarium of Cryptogamic Botany, 20 Divinity Avenue, Harvard University, Cambridge, MA 02138.

Field and Forest Products Inc., N3296 Kozuzek Road, Peshtigo, WI 54157.

Four Seasons Distributors, Box 17563M, Portland, OR 97217.

Fungi Perfecti, Box 7634, Olympia, WA 98507. 206–426–9292.

Don and Bonnie Grandorff, 31465 Berlin Road, Lebanon, OR 97355. 503–451–2536.

H-S Farming Company, P.O. Box 724, Heraldsburg, CA 95448. 707–838–4570.

The Kinoko Company, Box 6425, Oakland, CA 94621.

Kurtzman's Mushroom Specialties, 815 Harbor Way, No. 12, Richmond, CA 94804.

Madam Mushroom, Coast Mt. Res., P.O. Box 217, Satsop, WA 98583. 206–482–2722.

Mushroom Technology Corporation, Box 2612, Naperville, IL 60565.

Mushroompeople, P.O. Box 159, Inverness, CA 94937. 415–663–8504.

Nature's Bounty, Norm Weir, P.O. Box 53, Harrisburg, OR 97446. 503–995–8292.

Northwest Mycological Consultants, Dept. M, 702 Northwest Fourth Street, Corvallis, OR 97330.

Pacific Mushrooms Inc., John Barnes, 2608 Roosevelt Boulevard, Eugene, OR 97402. 503–688–5645.

Pennsylvania State University, 2111 Buckhout Laboratory, University Park, MD 16802.

Rainforest Mushroom Spawn, International Division, P.O. Box 1793, Gibsons, BC V0N1V0, CANADA.

Sohn's Oak Forest Mushrooms, Box 20, Westfield, WI 53964.

Table Mountain Mushrooms, John Donaghue, 1810 Northeast Seavy, Corvallis, OR 97330. 503–745–5886.

Tucker's Evergreens, Roy Tucker and Jerry Eastbourne, 4902 Highway 20, Sweet Home, OR 97386. 503–367–5625. (They deal in everything from mushrooms to Oregon grape root and cascara bark.)

Western Olympic Mushroom Corporation, 21067 Bucoda Highway, SE, Centralia, WA 98513. 206–278–3441.

Picking Edible Mushrooms in the National Forest

To pick edible mushrooms for resale in the National Forests, you must obtain a forest product collection permit, (such as the permit distributed by the Umatilla National Forest) (UMA MPP–1). You can obtain these permits at the local U.S. Department of Agriculture, Forest Service office. Although rates are subject to change, the following permits and rates can be issued: 3 day—$10; ,7 day—$20; seasonal or annual—$150. Note: This permit is not authorization for you to camp in established national forest campgrounds.

To obtain an edible mushroom picking permit, you must agree to the following general conditions:

1. Mushrooms for resale are collected only from the National Forest lands indicated on the permit and only on the dates indicated on the permit.

2 Permits must be kept with the permittee at all times when collecting, transporting, or selling edible mushrooms.

3. Permits cannot be transferred or used by others.

4. Payment for permit cannot be refunded. The permit expires on the indicated date regardless if mushrooms are collected.

5 Members of Congress or the resident Commissioner will not be admitted to any share or part of this permit or to any benefit that may arise from it, unless it is made with a corporation for its general benefit (18 USC 431,433).

6 The USDA Forest Service reserves the right to revoke this permit for noncompliance of permit conditions.

7. The permittee and those accompanying the permittee shall indemnify and hold the USDA Forest Service harmless from any claims, loss, cost, injury, expenses, attorneys' fees, damages, or liability caused by or arising from the exercise of this permit.

After you have obtained your mushroom permit, the following information will help you have a pleasant and safe visit during your stay in the National Forest.

Camping

Large groups must have a free industrial camping permit. Small groups are welcome to camp in any dispersed camping area. Camping within developed recreation sites for nonrecreation purposes (commercial mushroom pickers and buyers) is prohibited. All developed campgrounds have a 14-day-stay limit. We have no trash removal facilities, so when you leave the campground, take your trash with you.

Road and Area Closures

A free map showing the road and area closure locations throughout the forest can be obtained at the local Forest Service office.

Wilderness Areas

Several wilderness areas exist within the forest. Commercial picking of mushrooms is not allowed in these areas as it is in violation of the Wilderness Act of 1964. For more information on wilderness areas, contact the local Forest Service office.

Fire Danger

Campfires or warming fires are allowed in the forest unless you are directed otherwise by forest officials. A responsible person must attend open fires at all times. Completely extinguish fires before leaving the area.

General

Many forest roads are narrow and winding with limited visibility. Please drive safely and at speeds appropriate to road conditions.

Do not park vehicles in front of gates on forest roads. These roads are used by emergency vehicles for fire suppression. If a vehicle is parked in such a manner that it impedes emergency traffic, the vehicle will be removed at the owner's expense.

Salvage of timber from previously burned areas will be taking place in prime mushroom picking locations. Exercise caution when collecting mushrooms in any areas where logging activities are occurring.

The Forest Service does not have any information on mushrooms or their locations. For more information on mushroom species that are safe, edible, and choice, contact the County Extension Office.

If you have questions or need to report an incident, please contact the local Forest Service office.