Special Forest Products

Biodiversity Meets the Marketplace

"For nought so vile upon
the earth doth live,
But to the earth some
special good doth give."

William Shakespeare

Carving by a medicine man of Pacific northwest tribal ancestry in which he depicts the “true nature of the devil’s club” (*Oplopanax horridum*) a spider positioned in its roots above flowing water. Devil’s club grows in moist forested areas in the Pacific Northwest into Canada and Alaska and has great spiritual and medical importance to coastal aboriginal peoples who use different parts of the plant for a variety of purposes.

“…the spider woman who makes no web to catch things. She defends her house, above underground springs against unwanted visitors. If you should go to visit her, sit and talk with her for a while, then she will not shut up once she begins talking back. She is shy, yet has a lot to say if you will listen.”

David Forlines, medicine man

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Nan C. Vance, Editor
Supervisory Plant Physiologist and Team Leader
Biology and Culture of Forest Plants
PNW Research Station
Corvallis, OR 97331

Jane Thomas, Editor
Publications
College of Forestry
Oregon State University
Corvallis, OR 97331

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Abstract

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Although North American forests traditionally have been viewed as a source of wood and paper, a variety of profitable products are being discovered that come not only from trees, but from nonwoody plants, lichens, fungi, algae, and microorganisms. The northern temperate forests' abundant biotic resources are being transformed into medicinals, botanicals, decoratives, natural foods, and a host of other novel and useful products. These products are referred to as secondary, specialty, special, or nontimber forest products. Consumer forces, social climate, expanding global markets, and an increase in entrepreneurialism are contributing to a new interest in developing these products as a viable economic option. Species diversity, a biological attribute that contributes to the ecological stability of forests, takes on an economic value to those sourcing or "biodiversity prospecting" for natural products. Consideration should be given to how this diversity might contribute to stabilizing economies, particularly of communities that have a vital relationship with forests. A totally integrated model of ecosystem management or of sustainable forestry would include this kind of interaction.

The Sustainable Forestry Partnership and the College of Forestry at Oregon State University along with the Pacific Northwest Research Station, and funded in part by the John D. and Catherine T. MacArthur Foundation, presented a seminar series at Oregon State University, Corvallis, Oregon, in the fall of 1995. The intent of the seminar series, "Special Forest Products—Biodiversity Meets the Marketplace," was to stimulate new and continuing dialogue concerning future sustainability of forest resources as they evolve along with other societal and economic trends into the 21st century. This proceedings is an outcome of the seminars given by 11 experts who, with first-hand knowledge, offered new creative approaches for developing, managing, and conserving nontimber forest resources.

Keywords: Special forest products, nontimber forest products, biodiversity, medicinal plants, CITES, sustainable forestry, forest communities, forest management, American Indians, forest plants, mushrooms.

Nan C. Vance

Acknowledgements

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Contents

The Challenge of Increasing Human Demands on Natural Systems

Nan C. Vance
USDA Forest Service
PNW Research Station
Forestry Sciences Laboratory
3200 Jefferson Way
Corvallis, OR 97331

North American forests traditionally and almost exclusively have been viewed within the marketplace as a source of wood and paper products. But the marketplace is changing; consumer forces, social climate, expanding global markets, and an increase in entrepreneurism are contributing to a new interest in developing other forest resources as viable economic options. A variety of profitable products are being discovered that come not only from trees, but from nonwoody plants, lichens, fungi, algae, and even microorganisms.

The northern temperate forests' abundant biotic resources are being transformed into medicinals, botanicals, decoratives, natural foods, and a host of other novel and useful products. These products are referred to as secondary, specialty, special, or nontimber forest products—names that indicate wood or timber have been the norm and all other products coming out of the forest are unusual. Ironically, the dominant use of forests for wood and paper commodities is relatively recent in human history. The practice of using forest resources to meet a variety of human needs and activities has been around for a very long time. These uses, however, were not part of the evolution into a major industry that dominated and defined the science and practice of forestry.

Species diversity, comprising a vast number and combination of genes, is the source of a wide variety of natural products. The economic importance of biodiversity in medicinal product development is that it affords a greater possibility of finding unique gene products. In fact, to the phytopharmaceutical industry, the exploration of tropical and temperate rain forests for unique and potentially useful genomes is considered "biodiversity prospecting." The economic importance of species richness, i.e., biodiversity, is well known in the field of natural products medicines; but in forestry, biodiversity's ecological value has been far more understood and accepted than its economic value. Now, with the broadening commercial potential of a greater number of forest species, managing for biodiversity as a sound investment strategy may be more widely considered. How biodiversity can accommodate a range of economic, social, and environmental benefits, however, is an issue that needs more analysis and debate before any conclusions can be drawn.

The unique qualities of organisms arose from their evolutionary response to the varying demands of climate and topography. It is in their collective adaptation to their respective environments that the form and function of a particular ecosystem may be defined. Using ecosystems properly requires that

this dynamic interaction of a variety of organisms with each other and their surroundings be understood and weighed carefully. Interestingly, the ecosystem approach to managing forested landscapes may have gained acceptance at the very time economic diversification would require a systems approach for managing not only biological diversity but diversity in resource use as well.

Species diversity is a biological attribute that contributes to the ecological stability of forests, but consideration should be given to how it might also stabilize economies, particularly of communities that have a vital relationship with forests. A totally integrated model of ecosystem management or of sustainable forestry would include this kind of interaction, recognizing that humankind has had a virtually unbroken relationship with wild plants and animals throughout history. American Indians are a clear, but often overlooked, reminder of that historical model.

Harvesting from the wild for commercial or personal purposes is widespread and in many areas a multigenerational tradition in North American folk culture. Although it may be commonplace in rural communities, the contribution of these small commercial activities to the United States, much less global, economy has received little attention. But interest in wildcrafting for a variety of forest products has increased rapidly in just a few years. The end-user may be interested because a product is "natural" or environmentally friendly, and the harvester or landowner, because of the independence it is perceived to bring. The expanding marketplace is transforming this economic landscape of small, entrepreneurial enterprises into more capitalized ventures where large volumes of raw material are transported long distances for processing and sales. What the consequences of these inroads into the smaller, local commercial trade and communities will be, is unknown.

As commercial trade in these forest products increases in scope and complexity, so do the issues. Several revolve around accessibility and are subject to different implications and conflicting interpretations. Nontimber resources may be renewable or sustainable, but they are limited, provoking competition for access. On public lands, legal access is attained by contractual agreements and permitting. But competitively awarded contracts may favor high volume and low overhead at the expense of stewardship, and permits are often perceived to be issued arbitrarily. Regulatory denial of access to local, customary harvesters who are likely to have a vested interest in sustainability, versus harvesters brought in by a distant contractor, can be contentious. Access, as with other issues, is subject to cultural as well as legal interpretation. Collecting species traditionally important in the cultures of American Indians is a sovereign rights issue manifested in the rising number of treaty rights violations being adjudicated in the courts. Information acquired by researchers, developers, and policymakers and decisionmakers may be an access issue of rights to intellectual property.

In this proceedings, experts with first-hand knowledge and often deep, personal involvement explore these and other issues. The issues do not lend themselves to easy solutions. Nevertheless, in an era when ecosystem-based management and sustainable forestry concepts are being tested, it is important that these forest resource issues be confronted and understood.

The Seminar Series and Speakers

In 1995, the newly formed Sustainable Forestry Partnership at Oregon State University was ready to support an examination of emerging issues in forest resource sustainability. To meet that goal and launch their sponsorship of seminars and colloquia, no topic seemed more appropriate and intriguing than special forest products. Nowhere was this topic more relevant and immediate than in the Pacific Northwest. Oregon State University offered an ideal center for the experts and the experienced to bring before students and the public the range of viewpoints, knowledge, and understanding presented here. It was through the collaboration of the Sustainable Forestry Partnership with the College of Forestry and the Pacific Northwest Research Station, and funded in part by the John D. and Catherine T. MacArthur Foundation, that the seminar series was presented in the fall of 1995. The intent of the seminar series, "Special Forest Products—Biodiversity Meets the Marketplace," was to stimulate new and continuing dialogue about the future sustainability of forest resources as they evolve along with society into the next century.

Among the information presented by the 11 invited speakers were singular insights and new, creative approaches for developing, managing, and conserving these resources. As each viewpoint is considered, it isn't until the last speaker is heard, or the last paper read, that the full social, economic, and ecological ramifications of exploiting species diversity in forests can be fully understood.

Catherine M. Mater, a principal and vice president with Mater Engineering Ltd. in Corvallis, Oregon, opened the seminar series by introducing the widening economic choices in forest products and the diverse markets and consumer forces that shape these economies. Ms. Mater has been consulted extensively for her unique expertise in identifying marketing opportunities and developing marketing strategies for domestic and international trade in special forest products. Ms. Mater, drawing from her own studies and interviews, suggested that income opportunities are limited, in part, by limited knowledge, regulatory constraints and issues related to operations, and the challenge for communities, industry, and resource managers is in addressing these concerns.

One of the largest markets and industries emerging from special forest products is the multibillion dollar medicinal-herbal market. Steven Foster, author, photographer, editor, and expert in medicinal and aromatic plants, draws on more than 21 years of experience in economic botany in his discussion of medicinal plants from the wild and how they are being harvested, marketed, and grown in cultivation. Mr. Foster focuses on important North American plants, sharing his expertise on many species native to U.S. forests including Echinacea, reputed to be the most widely used botanical in the United States.

Keith A. Blatner is a leading authority on regional markets in floral greens, boughs, and mushrooms and co-author of several seminal articles on special forest products in the northwestern United States. Associate professor in the Department of Natural Resource Sciences at Washington State University, Dr. Blatner describes how the regional economy and markets in floral greens and edible mushrooms are evolving, and adds an international perspective by relating his impressions from a recent trip to Russia.

The entrepreneur in special forest products is represented by James R. Freed, an extension professor in forest marketing at Washington State University and consultant to the USDA Forest Service on the Olympic National Forest, with more than 20 years' experience in marketing forest-based products. Mr. Freed, whose focus is land management, new markets, value-added strategies, and information-sharing systems, points out the rapid changes in forest-based communities and the constraints and opportunities for new kinds of economic development. Sharing the discussion with Jim Freed is John R. Davis, special forest products coordinator at the Zigzag Ranger District, Mount Hood National Forest. Mr. Davis describes what it is like to manage a busy urban forest for a variety of forest products ranging from mushrooms to Christmas tree boughs. Mr. Davis has 20 years of experience in forestry, silviculture, and forest ecology and has spent 10 years as a specialist in special forest products, writing silvicultural prescriptions to optimize the management of multiple forest plant resources. Based on his experience, Mr. Davis describes ways forest managers can integrate this kind of multiple resource management into a cohesive forest management strategy.

In posing the question "Where are the pickers?" social anthropologist Thomas Love suggests that the shifting paradigm in forestry is real and that academia is not leading the shift. Dr. Love and graduate student Eric Jones illustrate the emergence of special forest products' legitimacy in competing uses of forests with their experience and research in mushroom harvesting in the Pacific Northwest. Dr. Love has applied his professional experience in anthropology and cultural ecology and his interest in tropical and temperate forests to examine the effects of global processes on local communities. A Fulbright scholarship led Dr. Love, currently associate professor in the Department of Sociology and Anthropology at Linfield College in Oregon, into special forest products 8 years ago.

Lynn Jungwirth, executive director of the Watershed Research and Training Center in Hayfork, California, and Beverly A. Brown, author and coordinator of the Jefferson Center for Education and Research in Grants Pass, Oregon, strongly argue that academia and policymakers are out of touch with the dynamics of timber-based communities facing change. Both are leaders in promoting community-based strategies for solving forest resource problems. Mrs. Jungwirth describes the problems facing such a community and how it strives to survive when it has been cut off from its major source of income. Ms. Brown focuses on co-management schemes addressing multicultural conflicts. Both speakers suggest that there are novel opportunities for creating new models for using and maintaining forests, and that most of the innovation is coming from those in communities who face the problems daily.

Another voice seldom heard in the old paradigm is that of indigenous people. In that paradigm, American Indians were inconsequential to shaping forest and prairie ecosystems. But these people have a long history of knowledge of, and a utilitarian as well as spiritual intimacy with, their natural surroundings. They were far more active in influencing the productivity of the landscape than has been generally acknowledged by scholars, scientists, or practitioners of forest management. Dennis Martinez is a board member and policy chair of the Society for Ecological Restoration, Takelma Inter-tribal Project member, and activist and advocate for indigenous people's rights to resources. Mr. Martinez introduces a model of indigenous people's involvement in sustainable harvest issues and land-stewardship practices, and suggests that an optimal model of management is co-management using and integrating the approaches and ethics that were sustainable for American Indians for thousands of years.

Anthropologist Jason W. Clay has focused much of his research on international models of conservation and product-led community development, and presents them here as instructive and relevant to the United States. Dr. Clay is executive director of Rights & Resources and senior fellow at the World Wildlife Fund (WWF), and the author of 6 books and more than 200 articles on human and resource rights, indigenous peoples, peasant agriculture, and the relations between world systems and local production, nutrition, and development. Dr. Clay also founded Cultural Survival Enterprises and directed its efforts to generate income for forest residents in North, Central, and South America, Africa, and Asia by marketing their nontimber products in North America and Europe. Dr. Clay presents many of his experiences from "in the field" to develop the theme of stakeholder communities in forested lands involved in using co-management schemes to monitor resources, reduce illegal harvest, address multicultural conflicts, and achieve equitable access to forest resources.

Chris Robbins, an analyst with TRAFFIC USA, a joint network of WWF and the World Conservation Union (IUCN) in Washington, DC, describes the global consequences of increasing international trade in plants and animals, and the role of the international community in controlling illegal trade by using the Convention of International Trade in Endangered Species of Wild Fauna and Flora (CITES) as its most comprehensive tool. Mr. Robbins uses trade in medicinal plants and animals to describe the issues that should be addressed to protect species viability and sustainability and recommends steps the international community should take for maintaining biodiversity into the future.

Devil's Club—medicinal plant of Pacific Northwest tribes

Consumer trends, market opportunities, and new approaches to sustainable development of special forest products

Catherine M. Mater
Vice President, Mater Engineering Ltd.
101 SW Western Blvd.
Corvallis, OR 97333

It is always a pleasure to talk about one of my favorite subjects—how an engineer in the wood-products industry comes full circle, talking not just about the wood-products industry, but the forest-products industry. We need to begin grappling with the issues involved with the whole concept of sustainable forest management practices and special forest products—what the problems are, the perceptions, the misperceptions, and the practices we should look at. I want to challenge you to think outside the bounds of a single perspective.

It's not just about being a part of a company's extraction process, thinking you have to live within the parameters of what a logging or harvesting company thinks about. Rather, it's about understanding the connections between the resource base, the producers, the wholesalers, the resellers, and the end users; and further, understanding how to affect decisionmaking up and down the line in terms of sustainable resource management as well as sustainable economic development. In a nutshell, that's what this is all about.

With a world economy and a limited world resource base, we need to learn to maximize the resources available for use—not just working and thinking as in the past about how to sustain and use our traditional resources, but looking well beyond that to find solutions that help many different cultures, local economies, and local ecosystems. Let me tell you what I see happening now within the United States and in many other parts of the world.

The Resource and Manufacturing Mandates (see box next page) were assembled in 1994, but I just returned from consulting with the World Resources Institute, and these same mandates are still clearly important. They are on the radar screens of many countries throughout the world. There are correlations between the wood products side of the equation and the nonwood products, or special forest products, side that begin to make sense. Clearly a mandate from communities up to the Federal Government is to move from thinking about commodities to value-added products. But the challenge is to move from value-added to finished products. In other words, resources should bring maximum benefits for the whole community—for those who have taken stewardship of those resources—rather than being shipped off to where somebody else gains the value and the economic base.

Using material waste to make products generates profits and benefits civilizations and people. But not only can we take biomass and waste stream conversion to finished products, we can also employ unused and under-

Resource and Manufacturing Mandates (Mater 1994)

Manufacturing:

- Move from value-added to finished product (ready for consumer use).
- Convert biomass and "waste" stream to finished product.
- Employ unused and/or underutilized species in product development (and new technologies).
- Develop Vertically-Integrated Products (VIP).

Resources:

- Manage fully forest ecosystems (sustainable resources and development).
- Pay attention to non-wood-based products from the forest (special forest products).
- Move to value-added product development for special forest products.

utilized species and work on product development. A corollary to that goal is the use of new technologies. I'll show you some examples we have found not only on the special forest products side, but also some cases where we were able to readapt that technology for the wood-based side—what I call vertically integrated product development. Resources and products would now be managed not just to provide the consumer with a product, but rather to provide a solution that may have multiple products integrated within it for the consumer's benefit. Learning how to put it all together is difficult.

"Full forest ecosystem management, sustainable resources, and development" — these are clearly the mandates, not only in the United States, but also in many other countries. This is tough for people trained to think only about managing trees. Many other products managed with those trees are not only equal, but in many cases *more* valuable on an annual cash-flow basis than the trees or wood.

It's interesting the misperceptions, [the] differing opinions. Most people think special forest products—floral greens, that sort of thing—are pretty small stuff. But documented values are very conservative. Only a fraction of the resources from public and private forest lands are reported. What is reported gives some indication of increases in demand. Although quantities sold fluctuate from year to year, the record of receipts to the Bureau of Land Management (BLM) in Oregon and Washington show remarkable increases in sales between 1993 and 1995 for several key products. Bough sales increased 143 percent from about 0.51 million pounds in 1993 to more than 1.24 million pounds in 1995. Moss sales increased almost 660 percent from 27,000 pounds in 1993 to 205,000 pounds in 1995. For evergreens, like salal (*Gaultheria shallon*) and oregongrape (*Berberis nervosa*), sales increased

Salal

from 16,000 pounds in 1993 to 89,000 pounds in 1995. Beargrass (*Xerophyllum tenax*) sales increased from 0.656 million bunches in 1993 to approximately 1 million bunches in 1995.

Other countries understand the economic value of these products we think of as brush and scrub in the forest—they are the ones capturing the value and extracting that value from our forest systems. And it's happening right under our noses. Beargrass is such an important product in the floral industry [that] the Netherlands, a global leader in the industry, imported whole plants for cultivation in their country.

In Montana, devil's club (*Oplopanax horridum*) is the albatross of the loggers' existence. It is a nasty plant. But folks in Montana wanted to know whether something could be done with devil's club, and we found out about some new research on extracting an insulin substitute for diabetics from the dried plants. Similarly, Russian wood-products specialists have extracted an interesting oil called roprene from Siberian fir (*Abies sibirica*) needles that may turn out to be the newest prescription for arthritis.

I see these important special oils and extracts as "quality-of-life issues." If not cancer or heart conditions or HIV, they may be effective for Alzheimer's disease, arthritis, hearing loss, sight loss—conditions that affect the overall quality of life for many people in the world.

Kudzu (*Pueraria lobata*), an introduced plant gone wild, grows in the South and Hawaii and sucks the life out of everything. But scientists did research on kudzu, and brought golden Siberian hamsters to drink its extract. Golden Siberian hamsters will drink alcohol over water any day. They love it—they have a serious alcohol problem. Treatment with kudzu extract reduced their alcoholism rate by 90 percent. So again we take a basic weed, a scourge of the earth, and reverse the equation to ask whether this weed may hold unusual opportunities. (I still think there must be something in tar weed, but I haven't found out what it is yet.)

Certainly we're seeing significant changes, even with traditional treatments. I can tell you from being on the Foundation for Medical Excellence and on the Board of Medical Examiners, there are direct applications of traditional medicines that include substituting valerian (*Valeriana* spp.) root extracts for prescription drugs such as Valium. There are big opportunities in these areas.

Hemp (*Cannabis* spp.) is an interesting product, though not for the reason you think! I'm talking about nonnarcotic hemp, the stalk and the head, whose fibers can be very effective in composite board manufacturing. Hemp has about 400 percent the strength factor of many of the wood fibers we currently use. But interestingly enough, researchers in California have found that a component of the residual biomass is an excellent dietary product for aiding fat cell breakdown. So, again, there are interesting applications.

Echinacea is widely utilized in homeopathic or naturopathic treatment. It is one of the big botanicals used throughout the world and is being examined through new research. In California, the plant is being used as an

enhancement to the immune system of race horses. As another example, right here in Corvallis, Oregon, a new beer beverage containing ginseng is being developed. So there are lots of unusual opportunities for using plants from forest systems throughout the United States and the world.

I would pay attention to natural product sales. With many of the non-wood-based products coming out of forests in the United States, we see new direct processing facilities servicing many of these natural product industries. Table 1 shows the increase in growth overall, a growth rate of nearly 23 percent in the

TABLE 1. Natural product retail sales and increases in 1993 and 1994

	1993		1994	
	Sales (billion $)	Increase (%)	Sales (billion $)	Increase (%)
Natural/Health Food Stores	4.21	17.0	5.09	21.0
Health Food Chains	0.82	23.0	1.01	23.0
Mass Market	1.17	14.0	1.45	24.0
Total Sales	6.20	18.0	7.55	22.7

United States. Knowing where people are buying these products affects the ability to penetrate markets. The biggest increases are in mass markets and health food chains. We are talking billions of dollars here. In 1992, sales were about $922 million. By 1994, they were over $7 billion.

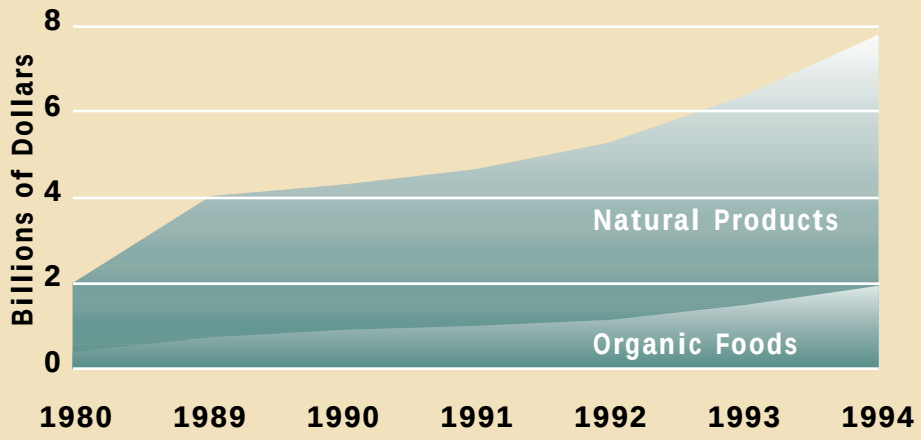
In the United States, nonconventional botanicals and medicinals are less likely to be purchased over the counter than in many other countries where using these products is standard practice (Table 2). The worldwide rate of growth for herbal medicine outstripped the average growth of over-the-counter medicine sales between 1986 and 1990.

TABLE 2. Value and growth of leading markets for herbal medications (1992 Sales)

Country	Value (million $)	Growth (%)
Canada	84	+5
France	144	+10
Germany	1,800	+6
Great Britain	120	+6
United States	970	+13-15

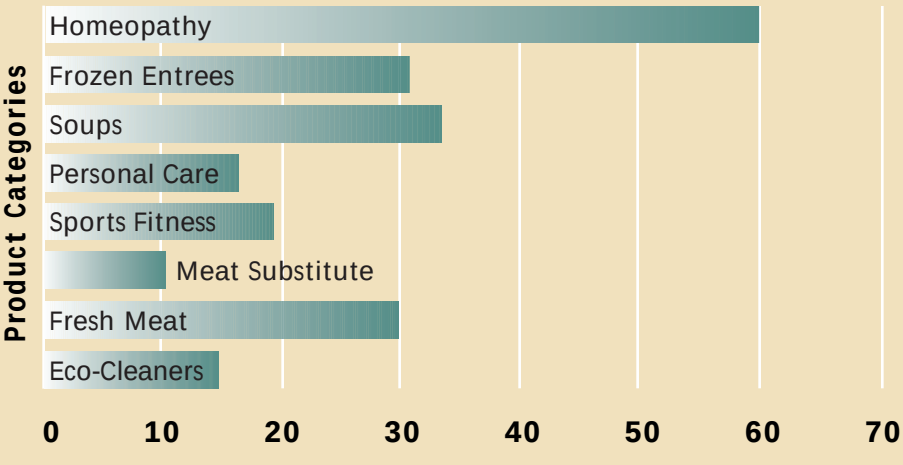
Going back to misperceptions, when most people hear "natural health products" they say, "Oh, yes, organic foods." But there are differences between natural health foods and organic foods in terms of acceptance on U.S. and worldwide markets. Natural product sales in 1994 were about $7.5 billion, whereas organic food sales totaled only $2.3 billion about 3 percent of the total food sales (Figure 1).

FIGURE 1. Sales histories in organic foods and natural products from 1980 through 1994.



Growth in natural products corresponds with alternative health care. A survey of retailers conducted by Natural Food Merchandiser indicates that homeopathic products are growing faster than personal care products, sports fitness, fresh meats, and eco-labeled cleaners (Figure 2).

FIGURE 2. Percent of retailers in 1994 who rated product sales growth as high.



Dr. David Eisenberg, a medical researcher at Harvard University, was so taken with this transition by American patients to using unconventional forms of treatment, that he conducted a study evaluating conventional versus nonconventional medical treatments used by Americans across the country. In his report in

the 1993 New England Journal of Medicine, he concluded that about 67 percent of those surveyed used nonconventional medicinals for illnesses, including valerian root for stress relief, dandelion (*Taraxacum officinale*) root for weight reduction, and all kinds of nonconventional botanical treatments for illness. More than 33 percent of the respondents reported that they not only used these products, but saw providers of nonconventional medical treatment for illness.

Research on herbs, botanicals, and traditional medicine

published by the New England Journal of Medicine, and based on a 1990 survey of Americans across the United States:

- 1 in 3 Americans reported using at least one alternative medical therapy to treat serious or bothersome medical problems;
- A majority used alternative therapies for chronic rather than life-threatening medical conditions.
- Alternative therapies for cancer and HIV accounted for less than 3 percent.
- Americans made 425 million visits to providers of alternative medicine in 1990, exceeding the 338 million visits to primary care physicians during that same year.
- Out-of-pocket expenses for alternative medicine were $10.3 billion, compared to $12.8 billion for all hospitalizations in the United States during that year.

Last year Dr. Eisenberg set up the first center for alternative medicine at Harvard Medical Research Institute. This and other centers of alternative medicine are conducting clinical trials on herbal medicines found in forests and used throughout the world. This research is being supported by the Office of Alternative Medicine established in 1991 by the National Institutes of Health (NIH).

For the floral industry, I'm going to give some examples of market demand from cases I have worked with in the United States. One example is the silk tree market (Table 3). The term "permanent" in this case means "preserved"

TABLE 3. 1992 sales of products in the silk tree floral industry and their approximate percentage increase over 1991 sales.

Category	1992 Sales (million $)	Increase (%)
Permanent Trees	112.4	65
Permanent Foliage	108.9	62
Containers, Ribbon, and Accessories	1,619.0	66

either by submersion or a systemic process of preserving to give a permanent natural product. So when we say "permanent trees," we don't mean Christmas trees, but those real-life trees with silk leaves that are now sold throughout the world. It's the real wood and bark from the tops of trees that are usually left in the forest, converted into permanent trees and foliage. Again, growth rates show tremendous possibilities. Key market areas within the United States are the Midwest (23 percent), the Southwest (17 percent), and the South (16 percent), with Canada at 6 percent and offshore markets, 16 percent.

Xeriscaping refers to using plants from natural areas that require less water and less maintenance. Look at salal, for example, and sword fern (*Polystichum munitum*) that grow in the Pacific Northwest. In conducting research for the Willamette National Forest in 1992, the first such special forest products study in the United States, we interviewed nurseries across the Pacific Northwest to find out the demand for those kinds of plants.

Xeriscape

Adapted from the term "Xeric," meaning "of or adapted to a dry environment."

- Xeriscape was created in Colorado in 1978. Today, more than 40 States have initiated statewide xeriscape projects. In 1991, Florida enacted the Nation's first statewide xeriscape law.

Why xeriscape?

- 50 percent decrease in yard maintenance costs.
- Elimination of weak, unadapted plants.
- More efficient watering techniques.
- Result: Native plants are "hot" products.

We found the demand was so great that some nurseries had a 2- to 3-year lead time for providing customers with plants from our forests—salal, sword fern, evergreen huckleberry (*Vaccinium ovatum*), Oregon grape.

Across the United States, the demand for native species for natural landscaping is creating a unique market opportunity. This demand also affords unusual opportunities for managing those forest resources.

Had you asked me about special forest products 4 or 5 years ago, I would have said there was nothing to consider—I was accustomed to dealing in large dollars in the wood-products industry, and that would have been the end of the conversation.

But with the coming of the spotted owl crisis, the U.S. Forest Service asked us to evaluate, within a 50-mile radius of Sweet Home, Oregon, other opportunities in the Willamette National Forest for this very devastated timber-impacted community, which was basically shut down because of the limitations due to the spotted owl (Mater Engineering 1992).

When we got that contract, I assumed this was going to be a slam dunk. I would be in and out with nothing to report. But that was the project that made me look not just at the wood-products industry, but at the forest-products industry, and it did so for these reasons.

We looked at whether there were substantial markets for the processing of special forest products. In this case we started with 40 forest species and brought the list down to 4 fresh species sold in the international floral markets—salal, huckleberry, sword fern, and beargrass. My original perception was that this was an extremely small business; we would not have to mess with this very much.

In fact, our research showed that the estimated worldwide sales during 1991 for those species was approximately $72 million. The average domestic monthly sales increase during that period was 3 percent for salal, 18 percent for huckleberry, 28 percent for sword fern, and 19 percent for beargrass. Earlier I talked about beargrass having been extracted from our forest systems and now growing in plantations elsewhere in the world. When we're talking about $72 million for just these species, then I can tell a landowner in a wood-based forest products industry about agroforestry management practices. You would be surprised to know some of the big companies that are engaged in both the wood-based and non-wood-based side of the equation.

Can the processing of special forest products create jobs in a rural area? This is a big issue in terms of impact on community-based economies. It is an important consideration not only in the United States, but in many other parts of the world. The perception is that processing of special forest products supports only jobs at below minimum wage for transient populations. Future speakers in this series will be talking about just those people and their jobs and wages. In our research and primary interviews with buyers, we found there is a much larger market for these products than there are people to satisfy it—just the opposite of our expectations.

Examples of floral products

The Sweet Home project was a very small project based on conservative equations and valuations. For that project we recommended a processing plant that would employ 14 full-time and 2 seasonal workers at family wages, a base rate of $8.50 an hour plus a 30-percent multiplier on the base rate. There would also be 114 foraging positions annually, with annual incomes up to $24,000 or more, depending on the picker's experience. This is quite different from what most people understand those opportunities to be.

Can the processing of special forest products be an income-generating business? In other words, can it be bankable? Does it make good business sense? My perception, like most people's, was that these operations tend to be ma-and-pa operations, and indeed they do. But they don't need to be, which is the point we're trying to make, though it is difficult to overcome the mindset of those involved in the special forest products industry.

Using very conservative values, we predicted that the processing plant outside Sweet Home could be making about $2.3 million in annual sales, a $94,000 before-tax profit, a 21-percent return on investment. Again, these are very conservative estimates.

For the SFP processing plant in Sweet Home, we recommended annual harvest levels be only 2.5 percent of estimated annual volume available in study area. A 2-year harvesting rotation program was recommended to ensure sustainable volumes, protect surrounding species, and produce marketable product characteristics.

And this is the killer in many cases; the Forest Service has no idea how much is really leaving their forests. But with this one processing plant, the Forest Service could be garnering $80,000 in annual permit fees based on their current fee structure.

The big question is not only whether the industry is sustainable from an economic standpoint, but whether the resource itself can be sustained. Do we have good science on the harvesting and regenerative sustainability of those species? Is the ecosystem sustainable? For the species we looked at, the answer seemed to be yes. We asked the question: "Can foraging special forest products be an environmentally sound practice?" There is a perception that lands will be "picked clean," reducing the sustainability of special forest products and damaging other surrounding species.

We also recommended appropriate harvest rotations that would preserve these species for future generations. With salal, scientists at Oregon State University found that harvesting the plant correctly would actually increase its growth. Now, that's a funny story because I went full circle. I looked across the United States for someone studying regeneration of salal for market value generation, and nobody was doing it. And finally somebody said, "Well, why don't you look in your own backyard? Maybe OSU is doing some research." Sure enough, they were. The College of Forestry had salal plots already set up. And why were they looking at salal growth and regeneration? They were looking for ways to kill it. This was an interesting circle, seeing whether there might be trade-offs in appropriate forest management for products outside the traditional wood-based industry.

People planning to move into project development need to make sure there is good science and good methodology behind the research they are looking at. One approach for project development, which I have used in eight different States and two Canadian Provinces, provides a task-oriented basis for looking at methodologies for research. The plan suggests verifying location, use, and product potential of the species being looked at, as well as evaluating market potential.

No research begins to document market potential. The only way to get reliable information is to make that primary connection to interview people in the business, to go out into the industry or the field and work with those people. From a banking standpoint, good investment is necessary for anyone moving into this arena. Many public and private investors—some corporate and many private—are providing dollars to make these projects happen.

Setting up a special forest products project—Tasks:

1. Verify species, location, and use, and determine product potential.
2. Evaluate market opportunities.
3. Evaluate appropriate harvest methods, management policies, environmental considerations, and administrative issues associated with harvesting.
4. Evaluate cashflow needed for establishment of a processing facility.
5. Identify potential investors and funding levels needed for establishment of pilot processing plant.
6. Develop action plan for project implementation.
7. Identify areas of value-added potential for targeted species.
8. Identify areas where follow-up research is needed.

Last year, I was involved in an unusual project, the first of its kind in Canada. It was a joint contract between Weyerhaeuser of Canada and the Canadian Forest Service, encompassing all the timber-licensed holding areas in Saskatchewan (Mater Engineering 1993d). Weyerhaeuser initiated this study, looking at the non-wood-based species used by native people in communities in timber-licensed areas who actually live off many of those resources. Almost all the wood Weyerhaeuser takes is of small diameter, so it's used for pulp and paper. Yet they were ruining other species without any consideration for the lives they were affecting.

They initiated this study on non-wood-species in order to establish better connections before harvesting, so people in the communities could have access to those resources. As a part of that project, I divided the species into three categories.

The first included species with immediate market potential that appeared to be abundant in the study area—that is, species with immediate market demand and good volume. The second category was species with market potential, but unknown volume. That was a red flag to me. Without good science, it's impossible to know the volume capability of a species; it has to be in a different category even though it has market potential. The third category was species with aesthetic or botanical characteristics that needed evaluation as new products.

Category One Species:
Species that appear to be in abundance in the study area and holding immediate market potential

Category Two Species:
Species that appear to hold market potential but lack volume verification in the field

Category Three Species:
Species that hold aesthetic and/or botanical characteristics that suggest evaluation for new product development to service domestic and offshore markets

There was a surprise product for us in Saskatchewan. We were fascinated by the Saskatchewan pitcher plant (*Sarracenia purpurea*). In the United States, *Sarracenia leucophylla* is a lovely elongated white plant with green veins running through it. It is dried and used extensively in the international floral industry. It has been overharvested, especially in the South.

We were intrigued with *Sarracenia purpurea* in Canada because it was on the endangered species list. I was also interested in the way it looked. It had the same configuration as the southern plants except that it was green with red veins. We wondered whether there were endangered species that could be regenerated in native soils, reintroduced into natural forest systems, and hold market potential for people in local communities. We contacted Knud Nielsen, one of the largest international floral wholesalers in the world, about *Sarracenia purpurea*. We asked whether this plant, if dried correctly, would be of interest as a substitute for the southern *Sarracenia*. Nielsen was just buying land to increase *Sarracenia* yields by 25 to 30 percent. He was intrigued with the Canadian plants; if cultivation and processing could be done correctly, his company would be interested in a first-year purchase of 500,000 stems, with increases to a million stems annually.

So now we are examining the possibility of reintroducing an endangered species to natural forest systems. At the same time, this creates an opportunity to establish new business developments. This is an interesting twist on sustainable resources and sustainable development. These are the kinds of creative options we are continually looking for.

Weyerhaeuser and the Canadian Forest Service in Saskatchewan were interested in using forest biomass, in this case balsam fir (*Abies balsamea*) and jack pine (*Pinus banksiana*) needles, for extracting oil. We also looked at tamarack (*Larix laricina*) and white spruce (*Picea glauca*) and black spruce (*Picea mariana*).

Oils/Extractions from Saskatchewan species

- Best opportunities involve balsam fir and jack pine for oil extracts from needles, and sap or resin extracts from tree.
- Estimated biomass (needle) volume in study area is projected to be 500,000 cubic meters annually, or approximately 320,000 pounds of oil extract per month.
- Oil grade tests are currently being conducted to determine quality of oil extracted from species in study area. Results still pending.
- Product possibilities are in the fragrance, perfume, soap, and shampoo industries.
- Further technical and market research is planned on oils extracted from tamarack and white and black spruce.

Research in Canada suggested that the fragrance and perfume industries require a very high absolute grade of oil. We found out that the quality of oil extracted varies. It is a very fickle industry. Nonetheless, there is enough

biomass to yield approximately 320,000 pounds of oil per month. They're on their third oil extraction operation in this region now.

One thing I try to do is let people I'm working with know, based on the research and interviews we conduct, how much they are losing according to what buyers would be willing to pay for products right now. In the Saskatchewan case, well over, US$1.5 million of immediate income was lost because no one knew how to use the resources they had available.

Minor products in Saskatchewan were far from equilibrium in terms of supply and demand (Table 4). The best product opportunities for Saskatchewan species have immediate income opportunity of more than US$1.5 million based on the baseline interviews conducted. Annual usage of peat and sheet moss was 330,000 pounds, but the immediate additional demand was another 181,000 pounds, which translated into a current lost income of about $223,000. For branches with no foliage, there was an unfilled demand of 1.4 million branches, with an income loss of $224,000, and for preserved branches with foliage, a 455,000 branch demand and an income loss of $414,000. Buyers also would have bought 41,600 tree tops (poles only) for $52,000.

TABLE 4. Product opportunities for Saskatchewan species based on usage, demand, and potential income in U.S. dollars.

Product	Sales Unit	Annual Usage (1000's)	Additional Demand (1000's)	Potential Additional Income (1000's $)
Mosses	Pounds	330.2	181.0	222.65
Branches (no foliage)	Branches	2,400.0	1,400.0	224.00
Branches (w/foliage)	Branches	617.4	455.0	413.64
Tree Tops (poles only)	Tops	280.1	41.6	52.00
Ground Pine	Pounds	4,641.5	530.0	662.50
Birch Bark Flats	Sq. Ft.	unknown	62,000[1]	unknown

1Plus an additional 2,776 cases of bark

The little ground pine, *Lycopodium*, has a surprising demand in the European markets. The unfilled demand for over 530,000 pounds could have brought in almost $663,000. And Hong Kong would have bought 62,000 square feet of birch bark flats (flattened birch bark cut into 2 by 2's and used in the international floral industry for basketmaking) (Table 4).

We also completed a process evaluation in 1993 in Missouri (Mater Engineering 1993b). Decorative wood is often put into the special forest products arena; also seeds and cones, which are often seen as decorative as well. Yet when they're viewed as "decorative," they tend to have the lowest value. So we reverse that—view seeds and cones as part of the landscape ornamentals industry, and profits are maximized, up to 2,000 percent in some cases.

TABLE 5. Approximate annual demand for forest products, Missouri, 1993

Species	Demand (lbs.)	Projected Increase (%)
Witch hazel	>110,000	10
Purple cone flower	65,000	10-15
Black walnut hulls	>200,000	10-15
Ginseng	230,000	+15
Goldenseal	275,000	+20
May apple (Mandrake)	220,000	+10
Slippery Elm	200,000	15

There are many marketable species native to the forest systems in Missouri. For witch hazel (*Hamamelis virginiana*), interviews suggest an annual demand of more than 110,000 pounds, with projected annual increases of about 10 percent (Table 5). Purple cone flower (*Echinacea)* demand is 65,000 pounds with a projected increase of 10 to 15 percent.

For black walnut (*Juglans nigra*), we were working with the largest black walnut producer in North America. The black walnuts in Ben and Jerry's ice cream are probably produced by this company. But the company was having a problem. They knew what to do with the shells; they were breaking them up, milling them, and putting them into adhesives, paint abrasives, and all kinds of products.

But the hulls were presenting a big biomass problem. There were so many hulls the biomass was filling lands outside their own timber operations. So they asked us whether there was a market for the hulls. We had to go to Europe to track this down, but we found that the international cosmetic industry was looking for dried, milled black walnut hulls. Why? Not for facial scrubs, but for self-tanning cosmetics. It is big business—200,000 pounds annually. Here, again, is a way to convert a problem into a market opportunity.

This company not only produces high-grade walnuts, they use their shells in a variety of products. They sell tree prunings to people who produce walnut furniture, and they now dry the hulls and sell them to the international cosmetics industry. These are great value-added opportunities.

Waste Conversion

- Forest biomass: needles, leaves, limbs, and bark (oils, resins, saps used in multiple high-value cosmetic/pharmaceutical products worldwide).
- Full-tree utilization (similar to the artificial tree industry) uses tree tops (6-10 feet) of multiple species. Demand in the United States growing 15 to 25 percent annually.
- By-product development of black walnut for nuts (food), shells (abrasive), hulls (tanning agent), and limbs/twigs (furniture).

We recently finished a project for the Minarets Ranger District in the Sierra National Forest, in the foothills of the Sierra Nevada Range (Mater Engineering 1993c). Here the artificial tree trunk industry is a surprisingly big business.

Tree species for North Fork Product Development

Western redbud (*Cercis occidentalis*)	Twigs and branches, flowering branch (floral), landscape ornamental, foods
California juniper (*Juniperus californica*)	Preserved boughs (floral), foods
Dogwood (*Cornus nuttallii*)	Flowering branch (floral), landscape ornamental, foods
Birch (black) (*Betula nigra*)	Artificial tree tops, twigs and branches
Chinquapin (*Castanopsis chrysophylla*)	Solid wood products

In another evaluation on the West Coast, we asked wood product producers whether they understood the process of certified wood that is, wood certified to have come from sustainably managed forest systems and whether they would be willing to pay premiums on certified wood from under-utilized hardwoods. Chinquapin, black oak (*Quercus kelloggii*), Pacific madrone (*Arbutus menziesii*), and tanoak (*Lithocarpus* spp.) were the four we mentioned. Surprisingly, manufacturers in the three-State area were willing to pay a premium in the range of 10 to 15 percent for these species.

We also looked at the demand for artificial trees while working in Minnesota (Mater Engineering 1993a). When birch trees are harvested, usually the top 6 or 8 feet of a birch is left in the forest. But California buyers producing artificial trees had a huge demand for these treetops. One California buyer said they were purchasing 72,000 birch tops every 3 weeks and could have sold three times that volume if they had it. One West Coast distributor said he could increase his sales tenfold and still not meet the demand for these treetops, which are sold through mass merchandising operations such as Costco.

Midwest artificial treetop producers said they considered manzanita (*Arctostaphylos* spp.) one of the most exotic shrubs they have ever seen—they couldn't get their hands on enough of it. Yet California producers were burning the stuff, throwing it away, pushing it aside. So, it's a question of looking beyond your own backyard to the market potential for species you consider junk. If somebody else considers them exotic, you can move them into the product arena.

Transplant

You wouldn't think there would be a market for stinging nettle (*Urtica dioica*). Stinging nettle has purported health benefits; I use the term "purported" because no recent clinical trials have substantiated traditional medicine findings, at least in the United States. Nonetheless, we can argue all the way to the bank, because nettles are used in several higher end products, such as herbal teas and hair conditioners. Clairol alone purchases over 50 tons of stinging nettle for their hair conditioning products.

The traditional medical market is now looking seriously at other products. Valerian root is used as a muscle relaxant and sleep aid. As of 1993, 150 tons were used domestically, 1,000 tons globally. Wild licorice (*Glycyrrhiza lepidota*) is used in teas, cough syrups, and toothpaste. It may become a valuable substitute for artificial sweeteners. In many places, especially California, people collect yarrow (*Achillea millefolium*). They sell not only to the fresh floral industry, but to the herbal tea industry, which is big business domestically and internationally. Most people would not expect opportunities for marketing dandelion, but they exist, especially for use in weight reduction teas. Anything to do with product areas such as weight reduction or stress relief, those are the things we look at for market opportunity.

Just as we look at value-added opportunities on the wood-based side of the equation, so we want to look at those for special forest products. I will use salal as a classic example once again in the Pacific Northwest. We did some projections for forage costs and sales prices and the profit/loss conditions for providing a buyer with fresh product. We also looked at whether preserving the foliage would make a difference. There was a significant difference in profit potential if salal was systemically preserved (Table 6). It was environmentally benign; it could be preserved in the field to reduce waste. Instead of losing 25 percent of the fresh-cut salal before it reached the processing plant, it could be preserved in the field, capturing a significantly higher profit than for a nonpreserved piece. In other words, 40 percent less volume from the forest, if preserved, would yield the same net profit the fresh product had.

TABLE 6. Price comparison between fresh and preserved evergreen (salal or mountain grape) sales for one West Coast processor (1992 values).

	Evergreens	
	Fresh	Preserved
Projected annual sales (bunches)[1]	118,000	96,000
Raw product costs[2] (dollars)	94,400	76,800
Annual sales (dollars)	177,000	288,000
Profit (dollars)	82,600	211,200

[1]Sales value from wholesale to retail = $6.00/bunch

[2]Fixed costs = $0.80/bunch

So, again, looking at those value-added opportunities does make a difference. I would like to point out what is happening not only domestically but internationally. Last year I was looking at wood-based and other forest products in the Philippines. Coconut is a big forest product, both the wood and the coconut itself. But the husks were creating significant biomass problems in the forest, rather like the walnut hulls in Missouri. An ingenious engineer from Germany looked at the husk and fibers within that husk; he figured that if he could develop a piece of equipment to pull the fiber out, he could use it to manufacture products. And that's what he did—products such as rope fiber, matting for the nursery industry, and brushes. The problem was, though, that as they were producing these mats and ropes, they were also creating a fine dust that went into a huge pile. It's called coir, and it was a real environmental problem.

With more research, they found that this coir could be converted into "coco soil," an effective substitute for peat moss. It has higher mineral content and moisture retention value than the traditional peat moss used by the nursery industry here, and it is just hitting the U.S. markets. This is a very creative example of what can come from looking at natural resource problems in terms of market-generation capability.

The same engineer noticed people utilizing a scrub species, ipil-ipil (*Leucaena leucocephala*). He realized that this wood could be used as a substrate with veneer slices and trim ends for antique replication furniture to be sold in Europe, where there is real demand for such products. He now has three plants in Manila, employing over 50 people, in this growing line of furniture manufacturing.

We even looked at clothing. Esprit came out last year with a whole line of clothing, tencel clothes, made from wood fiber; the wood is from sustainably managed forests. The buttons they use are from tagua nuts from rainforest trees.

Many Indian tribes have developed products outside of wood-based resources. The Ojibwa tribe in Minnesota is a classic example; they have a rather large company called Lady Slipper Design selling birch bark flats in high-end catalog markets. Bloomingdale's has just picked up a full line of their products, as have Nordstroms and Saks Fifth Avenue, and they are selling these products at very high profit margins.

You can see a variety of applications based on forest resources. Ice bowls, punch bowls, and ice cubes are forest products selling in California. In another use of what most people see as garbage, branches were turned into a high-value product, a floral branch console. It is made of mountain laurel (*Kalmia latifolia*) and being sold for over $1,100; the rustic twig mirror is being sold for $395. Bloomingdale's 1993 catalog had a whole line of furniture made from twigs from Douglas-fir (*Pseudotsuga menzeisii*) cuttings. An ad says, "Outfit your home with the rustic appeal of these log director's chairs made from Douglas-fir limbs. These traditional director's chairs create a natural setting indoors. They're also great outdoors. Just remember keep them out of the rain." And they are offered for only $250.

So, again, it's all about thinking differently maybe even reversing the equation by starting with what you're throwing away. This is what special forest products is all about. This colloquium should suggest even more opportunities so you won't think traditionally anymore. There's enough out there, both in capability and opportunity, not only to sustain the resource, but to sustain economic development.

AUDIENCE: What is worth more in an old growth stand—the special forest products, mushrooms, and so on, or the wood itself?

MS. MATER: Truthfully, I can't answer that question. The next generation of research needs to look not only at one point in time, but at income based on cash flow versus income over time. This should show some interesting comparisons in terms of income generation.

Ultimately, that may lead to an entirely different view of agroforestry techniques. So it's never an either/or proposition it's choosing end products and understanding the dynamics on an annual basis and over time—which will lead to different levels of ecosystem management in the forests. Hopefully within the next year or so we'll be able to put those dollar values together to really show what we're talking about.

AUDIENCE: Do you do any networking with high school teachers training young people in smaller Oregon communities? These young people don't see job opportunities in their communities, though they might like to stay there. Perhaps with sufficient training they might turn to something like this and generate new local industries.

MS. MATER: Always. Wherever we can, not just in the United States but throughout the world. Sustainable forestry programs need to be included in traditional academic fields, not just at the university level, but all the way down. Many within academia don't even know the right questions to ask. They don't know these opportunities and this way of thinking are out there.

AUDIENCE: How do you minimize impacts of harvesting, and how do you regulate it within management practices?

MS. MATER: Those are good, tough questions. Part of the answer involves getting people to recognize other business opportunities within the industry. People wildcrafting some species may only wildcraft one or two of them. Someone wildcrafting salal may want nothing to do with harvesting sword fern or huckleberry or oregongrape root. Traditionally, workers have been transient, and the nature of the work is seasonal or part-time.

Yet the demand is there, with buyers saying "Hey, we need this volume consistently, and it has to be this grade and on time," and all the traditional requirements of business. So part of the answer is helping this industry make the transition to full-time, family-wage jobs, focusing resource management to take advantage of market demand.

For example, if salal is harvested correctly, volume can regenerate to larger volumes than the index volume cut by harvesting on a rotational basis. That way quality control is more in check and people have consistent access to meet year-round market demand.

Those kinds of management questions link up with the regulatory and the permit fee structure side, so managers understand who is out there, where they are, and what they are extracting from the forest systems. This is part of the answer—getting into the business end, the processing and manufacturing of special forest products.

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Chapter 2

Medicinal plant development in the United States

Steven Foster
Associate Editor, Herbalgram
Author, Photographer
PO Box 1343
Fayetteville, AR 72702

We're really at a remarkable stage in medicinal plant development. When we think of herbs generally we think of parsley, sage, rosemary, and thyme, and the common culinary herbs that have come to us from the Mediterranean region. But when we think about herbs, we should think about all types of plants. We have to broaden the definition beyond parsley, sage, rosemary, and thyme, beyond herbaceous plants, and look at the potential medicinal value of virtually everything out there in our fields and forests.

I have a friend who went to India several years ago and there he met an apprentice of an *Ayurveda* physician. *Ayurveda* is the traditional medical system of India, which is at least 5,000 years old. The apprentice had just finished his final exam, and for his test, his teacher instructed him to go into the surrounding hills and fields and find any plants without medicinal uses. He roamed the hillsides and mountains for 3 or 4 days and finally came back with his head hung low and said, "Master, I've failed. I couldn't find any plants without medicinal uses." His teacher reared back in laughter and said he passed the test.

Botanists estimate that there are probably somewhere in the neighborhood of a quarter of a million flowering plants. Jim Duke, recently retired USDA botanist, put together a data base and identified 80,000 plants that can be documented as being used for medicinal purposes on a worldwide basis.

The World Health Organization estimates that as much as 80 percent of the world's population relies on traditional forms of medicine, chiefly herbal medicine. A number of countries have developed medicinal plants as an important part of public health care.

China is probably the best example. Approximately 500 species are source plants of official drugs in the Chinese pharmacopoeia. There are an additional 5,000 species used as traditional medicines, folk medicines, or local medicines by ethnic groups in various parts of China.

Attention turned to China's use of herbal medicine in public health care as interest in medicinal plants catapulted on a worldwide basis starting in the early 1960's. Here in North America, excluding Mexico, we have around 21,757 species of vascular plants, and of those, approximately 2,147 have been used for medicinal purposes, at least in a traditional context. About 25 percent of prescription drugs sold in the United States contain at least one ingredient derived from a flowering plant. This figure has not changed by one percent since 1959, even though few new drugs have come to us in the United States from plants.

If we look at other industrialized countries, in Japan 80 percent of physicians have prescribed a traditional medicine in the past year, mostly traditional Chinese medicine formulas. Approximately 200 traditional Chinese formulas are officially recognized by the Japanese Government. Similarly, in Germany, where plant herbal medicine—phytomedicine—is fairly highly developed, approximately 80 percent of physicians prescribe these medicines. As of 1993, medical students were required to take a certain number of hours in phytomedicine, and a section on this subject is now a part of the licensing exam.

The development of medicinal plants has not necessarily followed a linear scientific evolution, especially in the United States. Various socio-economic factors during the last few decades have limited medicinal plant research in this country, whereas in Germany it has continued over the decades.

Devil's Club

So when herbs started becoming popular again in the late 1960's and early 1970's, and we began to see capsulated products and herbal teas first appear on the American market, they sat in a kind of a gray zone—a regulatory purgatory, if you will. They resided in the market niche of health and natural food stores, where they have remained for about 25 years.

Now, during that time period, interest in herbs and in "alternative" or "complementary" health care has also exploded. In 1994, the Dietary Supplement Health and Education Act of 1994, or DSHEA, was passed—a landmark event in the industry. This legislation was the first to put herb products in a clearly defined regulatory category of dietary supplements, along with a number of other dietary supplements including vitamins, minerals, and amino acids.

Before the act, the FDA attempted to regulate herb products in various ways. If there was a blatant health claim, a product could be considered a mislabeled drug, for example. The mechanism the FDA most frequently used to regulate herb products was to treat them as food additives, based on food additive laws developed in the mid-1950's.

Herbs used in the context of dietary supplement products for improving health are no longer treated as food additives. The legislation also allows for various labeling changes. For example, a structure function claim can be placed on a label. What that means, basically, is that the manufacturer can state how the product may affect the structure and function of the body as long as the claim is truthful, not misleading, and is backed by scientific evidence.

A structure function claim might be that garlic has been shown by numerous scientific studies to lower levels of serum cholesterol. You couldn't say that garlic lowers cholesterol and thereby reduces the risk of heart disease, because this would be a drug claim, which is not allowed in the legislation.

The product must also have a disclaimer that says the claim has not been evaluated or endorsed by the Food and Drug Administration, or something to that effect. Third-party literature, if balanced scientific information, can be used in conjunction with the sale of products. Basically, this legislation takes herb products from a niche market, the health and natural food market, and moves them into the mass market.

In 1995, we saw herbal dietary supplements jump from a health and natural food market to chain pharmacies and other mass market outlets. This shift creates a whole new set of opportunities and challenges in medicinal plant development. Number one is scientific verification of claims. Another is the supply problem. We also have a conservation problem in terms of genetic erosion and genetic diversity of some medicinal plant resources.

Goldenseal (*Hydrastis canadensis*), a member of the buttercup family, has long been a popular folk remedy in the United States. It was first mentioned in a seminal work on American medicinal plants, Benjamin Smith Barton's "Essays Towards the *Materia Medica* of the United States," first published in 1798. The majority of the 140 American indigenous species currently used in world commercial markets are mentioned in this work; the vast majority of these species are in the eastern deciduous forests.

The development of pharmacology as an academic discipline in the United States in the early 19th century spurred interest in the development of an American materia medica. The vast majority of medicinal plants we utilize to this day were known then. In terms of research purposes, about 2,000 species are documented as medicinal plants, but another 18,000 species have received little or no chemical or biological screening.

One of the interesting things about goldenseal is that its popularity is not the result of any current or even recent scientific research. The latest good scientific review article on its pharmacology was published in the 1950's, and the author notes the paucity of new studies in the previous 40 years.

This plant has been catapulted to popularity mainly by word of mouth. It is used by many people for cold and sometimes flu symptoms. Historically, its official pharmacopoeial use was as an astringent and tonic for inflamed mucous membranes. It contains a number of alkaloids, including hydrastine and berberine. Berberine is the alkaloid responsible for the bright yellow color in the root—it's the same compound that gives the inner bark of oregongrape (*Berberis* spp.) root its bright yellow color. It is amazing that the plant is so popular yet there's been so little research done on it.

One interesting use that evolved in the past few years literally arose out of fiction. A word-of-mouth notion is that goldenseal root will somehow mask drugs in urinalysis. This belief evolved out of a novel, "Stringtown on the

Pike," written by pharmacist John Uri Lloyd and published in 1900. In this mystery, a man is accused of murdering his uncle. Expert chemical testimony is introduced into the trial. The chemist, using a then infallible color reagent test for strychnine, discovers strychnine in the stomach of the deceased. Later in the story, the heroine, a chemistry student, points out that every morning the deceased drank bitters made from goldenseal, blood root, and other ingredients. As it turned out, the mixture of those plant materials and their alkaloids produced the same color reaction as strychnine in this "infallible" test. This story led to the notion that goldenseal somehow affects drug test results. Every decade or so, veterinary literature includes a paper reporting that a racehorse owner has attempted to mask the use of morphine in his horses by giving them goldenseal root.

There is no evidence that goldenseal will, in fact, change the results of a urinalysis. Dr. Varro Tyler at Purdue suggests that it may be as likely to produce a false positive as a false negative. Given its widespread use, however, some urinalysis labs are now testing for the presence of hydrastine in urine samples.

I estimate that about 100 tons of goldenseal root are used in the market each year. Most of it is harvested from wild habitats in the eastern deciduous forest. This intense harvest has brought tremendous pressures on wild populations, to the point that the plant has become scarce. With this high demand and scarcity of supply, the price has gone up and will probably reach somewhere in the neighborhood of $40 a pound by the end of 1995.

This scarcity points to a need for cultivated supplies of goldenseal, such as the cultivation operation in Iowa, where a number of ginseng growers are beginning to put goldenseal into their production systems as the price of goldenseal has now risen slightly above that of cultivated ginseng.

Speaking of ginseng, ginseng is a good tonic. The genus *Panax* has two species in commerce—*Panax ginseng*, Asian ginseng, the source of Korean or Chinese ginseng, and *Panax quinquefolius*, American ginseng.

Between 95 and 97 percent of the $50 million American ginseng crop goes to the Hong Kong market, where it's distributed to international markets, primarily Asian. The largest growing area is Marathon County, Wisconsin, where 90 percent of the cultivated American ginseng comes from. Approximately 80,000 pounds of wild *Panax quinquefolius* are also harvested each year.

The price for wild ginseng is around $500 a pound. Cultivated ginseng fluctuates depending on market conditions, but it has been around $20 a pound in recent months. One of the reasons for the fluctuation in ginseng pricing is that at some point in the early 1980's, the Chinese obtained a supply of American ginseng seed, and they have been growing it commercially. There are probably 800 hectares of American ginseng now growing in China. It's been hitting the Hong Kong market for the past 3 or 4 years now and selling at $6 to $8 a pound, a price far below American-grown American ginseng. This has thrown the U.S. ginseng market into a tailspin, and ginseng growers are looking for alternative cash crops.

Ginseng grows from rhizomes or fleshy underground stems. Each year as the plant dies back, it leaves a scar on the rhizome. By counting the scars, the age of the ginseng root can be determined. Typically, ginseng is not considered of commercial value until it's 4 or 5 years old. There's a rational scientific basis for this. The biologically active compounds are saponins known as ginsenosides. They develop in the root between the fourth and fifth year of growth, when a dramatic upswing in the ginsenoside content occurs.

A new word for ginseng's biological activity has emerged in the literature in the last couple of decades "adaptogenic." Basically, an adaptogen must be innocuous—that is, nontoxic—and return the body to normal function, regardless of the disease condition.

Steven Foster

Cascara Sagrada

There's been a tremendous amount of research done on Asian ginseng—for example, in Beijing at the Institute of Medicinal Plant Development, or IMPLAD. Very little scientific work has been done on American ginseng in terms of its chemistry, pharmacology, and clinical applications. Most of the studies are reported in Chinese and Japanese as well as German scientific periodicals.

In a traditional Chinese medicine context, ginseng is a very specific term. "Seng" refers to any fleshy root stock used as a tonic. There are about 60 seng- producing plants, but only one ginseng.

A plant that has been called ginseng in the American market, sold under the name Siberian ginseng or *Eleutherococcus senticosus*, is a far eastern member of the *Araliaceae*, the ginseng family. Siberian ginseng was catapulted into scientific interest in the late 1950's and early 1960's as the result of Russian efforts to find a substitute for ginseng. They started doing intensive biological and clinical screening of indigenous members of the ginseng family, and this is the one they hit upon for commercial development.

Eleutherococcus is a shrub that can be 6 to 9 feet tall, and it produces a woody root rather than a fleshy root. The bark of the root has traditionally been used; generally, what is seen in the marketplace is the whole root itself or the stems of the plant. Ginseng, as I mentioned, has to be at least 4 to 5 years old before it's harvested. Because it's the root that's used, a plant is killed when it is extracted. The bottom line with the Siberian ginseng is can you call something ginseng that's harvested with a chain saw?

Worldwide, there are about 500 species in the ginseng family. A number of species in the United States have not been researched but should be. A good example is *Oplopanax horridum*, or devil's club. Another ginseng family

Pacific Yew

member is *Aralia californica*, also called California spikenard, which ranges into southern Oregon and has had little research. *Aralia nudicaulis*, one of the dominant understory species in New England, was the subject of a commercial wild sarsaparilla trade in the 19th century. I don't know of any studies looking at its chemistry or potential biological activity.

Witch hazel (*Hamamelis virginiana*) is one of the few American medicinal plants that is available in virtually every pharmacy. In the form of an over-the-counter drug, it has been grandfathered over the decades or centuries as a rubefacient and astringent for the skin. Widely used in Europe in hemorrhoid preparations, it is not as widely used in the United States.

Like *Panax*, the genus *Hamamelis* shows a disjunct distribution pattern in eastern and western North America and East Asia. There are two North American species of *Panax* and about five or six East Asian species. Similarly, there are two North American species of witch hazel and five to seven East Asian species. This pattern of disjunctions involves about 150 genera of plants, many of them important medicinal plant groups on one continent or another. Similar uses by American Indian and East Asian populations would suggest the probability of a scientific basis behind those uses. Witch hazel, for example, is also used as an astringent in Asia.

Another species, *Hamamelis vernalis*, or vernal witch hazel, which is endemic to the Ozark plateau, has spread from there as well. It also has the horticultural virtue of blooming in Arkansas in the last week of December through the first week of January, effectively ensuring that something is in bloom every month of the year.

But it points to another problem in botanical supplies, and that's the problem of species identity. If you look at a product label or the literature, *Hamamelis virginiana* is always the species listed, but *Hamamelis vernalis* is also harvested commercially yet it is not reflected in any labeling or commercial supply. In addition, the United States imports red cultivars of Japanese witch hazel as garden subjects. A red form of the vernal witch hazel (*Hamamelis vernalis* form *carnea*) occurs in a couple of counties in Missouri and would be an excellent subject to develop as a secondary forest product for similar ornamental use.

I notice that dozens of sweet gum trees (*Liquidambar styraciflua*) are turning beautiful colors on campus now. The gum of sweet gum is a resin used in tincture benzoin, which is available at most pharmacies. One of the herb products that has become popular in the United States is tea tree oil from Australian *Melaleuca* species that are relatives of Eucalyptus. Oil from the leaf of the American sweet gum contains relatively high levels of the same terpene supposedly responsible for the biological activity of the tea tree oil, and yet

there's only been one paper on its chemistry and no work on its biological activity. This would be another good target for research, with sufficient biomass right here on campus.

Slippery elm (*Ulmus rubra*) is an over-the-counter drug, approved as a demulcent soothing for sore throats.

Cascara sagrada or buckthorn (*Rhamnus purshiana*), one of the few commercially developed indigenous medicinal plants of the Pacific Northwest, was developed as the result of a historical mistake. An article that appeared in an 1890's issue of a Parke-Davis publication called "New Drugs" included reports of using a cascara bark as a laxative. As a result of this publication, cascara from American buckthorn was developed commercially and supplanted European buckthorn bark as a stimulating laxative. That use continues to this day.

A model for how plant-based medicines are developed in the United States can be found in the Pacific Northwest's Pacific yew (*Taxus brevifolia*). Pacific yew was found to contain a compound that could be used effectively against certain cancers. The compound identified by scientists as taxol, and subsequently marketed by Bristol-Meyers Squibb Company (BMS) as Taxol,® is now approved for treating refractory ovarian cancer as well as a form of breast cancer. In the next decade, we'll probably see Taxol® approved for chemotherapeutic use in a wide range of cancer types, especially hard cell cancer types that have been difficult to treat with chemotherapy in the past.

Taxol was developed as a result of the National Cancer Institute (NCI) screening program that first came into existence in the early 1960's. The taxane identified as taxol, now called paclitaxel, was isolated in 1969 and structurally elucidated in 1971. By 1977, it became of interest to NCI. There was evidence of good biological activity, but many other compounds have shown positive results in similar testing systems. Then, in 1979, researchers at the Albert Einstein Institute in New York discovered a unique pharmacological mechanism for taxol to work against cancer.

In 1980, Federal funding for NCI's plant screening program was cut, but there was still interest in taxol, and it went into preclinical studies in 1983. Because it showed promising effects against cancer cells by the late 1980's, it was entered into Phase II clinical trials and tested on hundreds of patients. As success started occurring in a number of clinical trials, the supply on hand was insufficient to continue needed studies. To increase the supply needed for clinical trials, NCI developed a program that led to a Cooperative Research and Development Agreement (CRADA) with BMS and cooperative agreements with Federal land management agencies to facilitate harvest of bark from Pacific yew on public lands in the Pacific Northwest. To guard against similar shortages in developing clinical research, NCI instituted a new program to secure supplies of other natural compounds from raw materials before new compounds actually reached large-scale clinical trials.

Another plant product that was indirectly a result of NCI's screening program is the mayapple (*Podophyllum peltatum*). Two drugs also sold by BMS have

been developed from this plant, semi-synthetic compounds from podophyllotoxin, which is also derived from the Himalayan mayapple (*Podophyllum emodi*). Most of the commercial supply of podophyllotoxin, which is used as the starting material, comes from the Himalayan mayapple.

Black cohosh (*Cimicifuga racemosa*) is an example of an American medicinal plant that is more widely used in Europe than in the United States. There are a number of good clinical trials on the use of black cohosh in the treatment of symptoms associated with menopause, and it is prescribed by gynecologists.

Blue cohosh (*Caulophyllum thalictroides*), which is not related to black cohosh, also comes from the eastern deciduous forest and was widely used to induce contractions in labor during childbirth. A related eastern Asiatic species, *Caulophyllum robustum*, occurs in Japan and Korea, where it was used for similar purposes in traditional cultures. It hasn't been well researched in the United States. *Mitchella repens*, also known as squaw vine, is another American medicinal plant that's been used for symptoms associated with menstrual problems.

Lady's slippers, orchids of the now protected genus *Cypripedium*, were also used to treat menstrual problems. The showy pink lady's slipper (*Cypripedium acaule*) is now rare in eastern deciduous forests. During the 19th century, the root was widely harvested for medicinal purposes. It was known as American valerian and was generally used for sedative purposes as well as for female-related diseases. Large populations were extirpated from the forests and have never come back.

Growing up in Maine, as I did, we think of this plant as a relatively rare orchid, whereas 150 years ago it was undoubtedly much more common than it is today. Asa Gray, widely known as the father of American botany, described forests blanketed with pink lady's slipper in the East. The plant has simply been removed, and it is a good example of the need to protect genetic diversity and to work out population dynamics and reproduction biology before plants are extracted from the wild.

Chinese licorice (*Glycyrrhiza uralensis*) and European licorice (*Glycyrrhiza glabra*) are also used in commercial markets. In North America, a fairly widely distributed species, *Glycyrrhiza lepidota*, has been the subject of little research. There have been several reported chemical studies, but no pharmacological studies on this plant, which should be looked at for possible development.

Licorice, which is used for gastric ulcers, is a good example of the value of the German regulatory system. The Germans have monographs on about 300 different medicinal plants, with information such as acceptable indications, dosage, dosage forms, contraindications, side effects, and interactions with other drugs. Licorice has interactions with other drugs as well as possible side effects. Use is limited to a 6-week period, because it can cause sodium retention and potassium loss. Licorice is contraindicated if a patient is using digitalis glycosides, because glycyrrhizin, the primary biologically active component in licorice root, can double the effect of the digitalis glycosides.

Lobelia (*Lobelia inflata*) contains about 14 alkaloids including lobeline and lobeline sulfate. Lobeline is similar in structure and pharmacological activity to nicotine, so it's used as a replacement for nicotine. Although it's still widely used in other parts of the world, the FDA removed it from over-the-counter drug status in the United States last year on the grounds of no data to support its efficacy. *Lobelia inflata* grows from Georgia to Maine and west through the Ohio River Valley into the central plains. There are a number of other *Lobelia* species in North America that could be researched and haven't been.

Skullcap has traditionally been used as a mild sedative and a sleep aid. Virtually all of the studies in the literature refer to *Scutellaria baicalensis*, which is a Chinese species, the root of which produces a drug called "huang-qin." There are a number of studies that show antispasmodic and sedative action for flavonoids and other components of the roots of this particular plant. When we look at product labels or medicinal plant books, however, all refer to another species, *Scutellaria lateriflora*, which is the first species mentioned in the literature. Once again, it's a case of what Jim Duke calls bibliographical echo.

Scutellaria lateriflora is actually quite rare in the commercial supply, even though products are labeled as such. There is one commercial grower of skullcap in the Pacific Northwest, Trout Lake Farm in Trout Lake, Washington, that has bona fide *Scutellaria lateriflora* material. Here again our American species have not been researched.

The saw palmetto (*Serenoa repens*), a member of the palm family, occurs from South Carolina and Georgia into Florida. The fruits are used for benign prostatic hyperplasia (BPH), a form of prostate inflammation that affects many men over the age of 50. It's a registered drug for the treatment of BPH in Italy, France, and Germany, but not in the United States, where it is widely available in dietary supplement products. There are probably a dozen or so well-designed clinical studies on the efficacy and safety of this plant and the treatment of the BPH.

The North American forms of stinging nettle (*Urtica dioica*) occur throughout the continent. Recently, the root has been used for the treatment of BPH, and there are a number of European clinical studies to support that use.

American passion flower (*Passiflora incarnata*) is used as a sedative, mild nerve tonic, and sleep aid. There is an interesting and little known cultural aspect related to the German monograph on passion flower, which requires specific alkaloids to be at a very low level. Just a few parts per million of the specific alkaloids were used in the Nazi truth serum. There are some who think that the small level specified in the passion flower monograph is somehow related to Germany's past.

Wild indigo (*Babtisia tinctoria*) is common in the southeastern United States, extending to western Tennessee. It is one plant that's been researched as an immunostimulant, a nonspecific stimulant to the immune system. It is registered as a drug in Germany, but is unavailable in the United States.

One of my favorite plant groups is *Echinacea*, or purple coneflower, the plant group the Plains Indians used for medicinal purposes more than any other

plant. There are nine North American species of *Echinacea*. Three are commonly traded on commercial herb markets *Echinacea angustifolia*, *Echinacea pallida*, and *Echinacea purpurea*, which is our common garden perennial, purple coneflower.

Echinacea emerged as a drug in 1895 when the first product came out in the United States. From the late 1890's through the 1920's, this plant was the most widely prescribed American medicinal plant in the United States. Before the days of antibiotics, physicians used it for extremely difficult conditions such as diphtheria, tuberculosis, various cancer forms, and gangrene. *Echinacea* was mostly supplanted by sulfa drugs in the 1920's and thirties, and by penicillin in the 1940's. Use continued in Germany, however, but by the 1930's there were supply shortages, and Germans came to the United States looking for germplasm. They came looking for *Echinacea angustifolia*, and bought purported *Echinacea angustifolia* seeds. *Echinacea purpurea* plants arose from those "*Echinacea angustifolia*" seeds. As a result, over the last 50 years the vast majority of pharmacological and clinical studies on *Echinacea* have been done in Germany and have involved *Echinacea purpurea*. If you look at English language literature, however, most works will list *Echinacea angustifolia* as the "best" *Echinacea*.

Most of the supply still comes from the wild, and recently the price has shot up to around $30 a pound for wild harvested material. New groups of people are harvesting it instead of the traditional harvesters. Besides decreasing wild populations, this has caused new problems. Traditionally, diggers dug the roots from rangelands. They had permission from farmers to do so, and they would fill in the holes when they got through digging the roots. This year people have been blindly digging and not filling in the holes, causing cattle to break their legs, angering ranchers. Some people have become territorial and brought firearms to protect their *Echinacea* digging territory.

The solution: cultivation. *Echinacea* purpurea has a wider distribution in the eastern deciduous forest than any other *Echinacea* species, and the entire world supply is now cultivated. Trout Lake Farm in Trout Lake, Washington, is one of two U.S. growing operations for this species that I know about.

Echinacea purpurea has been grown as a horticultural plant in Europe for close to 300 years. Most of our cultivars in American horticulture have come back to us from Europe and have been selected for spreading, daisy-like petals instead of the typical drooping petals, because German or European gardeners thought the strongly reflexed petals represented diseased plants. Hence, we have daisy-like purple flowers in our gardens.

All *Echinacea* species are tap rooted. For many years, the *Echinacea purpurea* root that appeared in cut and sifted form on herb markets looked just like the roots of other *Echinacea* species. In 1987, I was doing some collections for the University of Munich when I heard of an adulteration problem in *Echinacea purpurea* roots sold here in the United States. So I sent a specimen of the alleged adulterant and asked if it was appearing on the German market. The research group in Munich had just published the discovery of four new sesquiterpenes in *Echinacea purpurea* root. They had worked with commercial

plant material without a voucher specimen to get those test results. Lo and behold, they had just described four new sesquiterpenes from a plant called *Parthenium integrifolium*, whose root, when cut and sifted, has an uncanny resemblance to *Echinacea* root. It had been such a widespread adulterant for so many decades that it was included in most reference samples of *Echinacea purpurea* root.

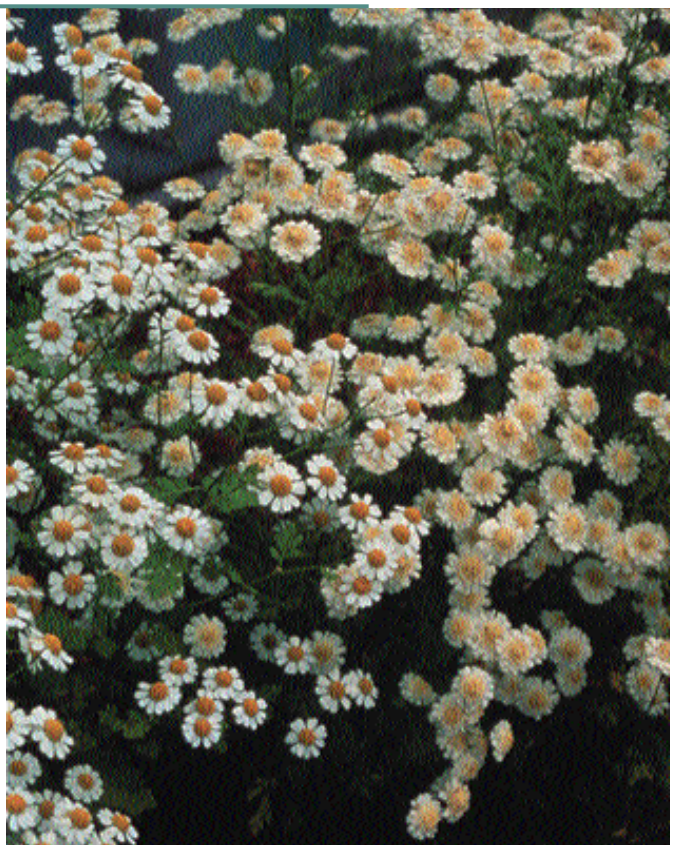
This adulteration puts in question any research on *Echinacea* published prior to 1988, when chemical studies were done on vouchered botanical specimens. A chemical study without a vouchered botanical specimen raises questions as to the origin and identity of the plant material used. Therefore, it is important to have a voucher specimen. It is also very important in this medicinal plant research area to make the research effort as multidisciplinary as possible. There is no one specialist no botanist or ethnobotanist, taxonomist, pharmacologist, or isolation chemist and no one academic specialty that can cover the broad range of disciplines necessary for developing commercially viable medicinal plant products.

Other species of *Echinacea* involved in the trade are *Echinacea pallida*, which occurs in the Midwest, *Echinacea paradoxa*, endemic to the Ozarks plateau in 5 Arkansas counties and 17 Missouri counties, and *Echinacea simulata*, which is endemic to north-central Arkansas and south-central Missouri in the Ozarks. It is also involved in the commercial supply as "Kansas snake root." I've been able to identify five species of *Echinacea* in the Kansas snake root supply. *Echinacea tennesseansis* was one of the first federally listed endangered species. It occurs in six populations in central Tennessee. There are about 200,000 individual plants in those populations.

Oregon grape

We often hear of the need for saving tropical rain forests. We hear the rallying cry of needing rain forests for their potential to supply new drugs to treat cancer or cure AIDS. Rarely does that cry translate into actual research on endangered species and their potential economic value.

Echinacea tennesseansis was obviously used in the 19th century because it's listed in Gatinger's "Medicinal Plants of Tennessee," published in 1895. It has been the subject of only one chemical study. We know its chemistry is nearly identical to E*chinacea angustifolia*. It has also been the subject of a successful recovery plan. Cultivation and reproductive biology requirements are now known and the plant is easily cultivated. If it were grown on a commercial scale and biologically tested, it would show that an endangered species is actually being researched for potential medicinal value. In the same category is *Echinacea laevigata*, an Appalachian species known from about 22 populations with about 6,000 individuals. These populations have never been researched chemically or pharmacologically.



Steven Foster

Feverfew

The cranberry (*Vaccinium macrocarpon*) has long been considered a urinary antiseptic. It was thought to have possible antibacterial activity in the urine, but it is now known that the mechanism is an antiadhesion effect that prevents *E. coli* or other bacteria from adhering to the bladder walls.

Butterfly weed (*Asclepias tuberos*), is also known as pleurisy root, a plant that was traditionally used for lung inflammations but has not been the subject of any new research.

St. John's-wort (*Hypericum perforatum*) is known in California and Oregon as Klamath weed. Historically, St. John's-wort has been listed in literature as a sedative, but now it's considered an antidepressant and is widely prescribed in Europe. There are about 18 well designed, randomized, placebo-controlled clinical trials that show the efficacy and safety of St. John's-wort extracts used over a period of several months in the treatment of depression without the side effects of traditionally prescribed drugs. The plant is cultivated in Europe. A commercial cultivation operation out of Cologne, Germany, uses the flowering tops. The plant has been one of the more rampant invasive aliens in the Pacific Northwest. The genetic material in the Northwest, apparently, is particularly aggressive.

If we look at the flora of North America, we see that one of the most rapidly changing elements is invasive aliens. In some parts of the country, the flora consists of nearly 30 percent alien species, many of which cause real economic and ecological harm, such as the Klamath weed has caused here in the Pacific Northwest. Perhaps one way of controlling these plant materials is by finding a way to use them.

Commercial interest in bloodroot (*Sanguinaria canadensis*) has arisen as a result of a single-user demand. One company uses a *Sanguinaria* alkaloid extracted from the root as an antiplaque agent in a dental product. This demand for the root has increased the harvest of the root in the eastern deciduous forest, and also resulted in a number of interesting studies.

Generally, roots are harvested when the plant is dormant, either in the spring or in the fall, when the alkaloid is considered to have its strongest effect. However, studies show that the concentration of the alkaloid *Sanguinaria* is actually highest when the plant is at its full vegetative stage. This type of study should be done for every plant that is brought into commercial use.

Ginkgo is an American plant by virtue of the fact that it occurred here 70 million years ago. *Ginkgo biloba* leaf extracts are the best-selling phytomedicines

Steven Foster

Red clover

in the European market, bringing in over $500 million to Germany and France. The leaf products are used for peripheral vascular circulatory problems, which create a number of disease conditions especially in elderly populations, and as an antagonist to a platelet activating factor. A German company has its tree-growing and leaf-production operation on a 1,900-acre farm. Cotton-picking machines are used to beat off the leaves, which go into the drying shed.

Red clover (*Trifolium pratense*) contains a flavonoid, genistein, which may inhibit cancer growth by blocking estrogen receptors (Brill 1994). Red clover tops have traditionally been used in folk cancer cures, and some rational basis behind that use may be shown in the future.

Dandelion (*Taraxacum officinale*) is used in the European market as a diuretic and also to stimulate bile flow. Dandelion is grown for commercial production at Trout Lake Farm. Most of this material goes to Europe.

Feverfew (*Tanacetum parthenium*) is a good example of biological diversity within a single taxon. Clinical trials show that it mitigates some symptoms associated with migraine headaches, and it has been approved in Canada for this purpose. *Tanacetum parthenium* has at least four known chemo types, each with different sesquiterpenes. The compound shown to have antimigraine activity is parthenolide, which occurs in only one of the four chemo types. It is very important for commercial development, therefore, to select the right germplasm for the medicinal plant product; otherwise, the product could end up being ineffective.

Ephedra is an example of how a product might be misused in the market. Ephedrine and pseudoephedrine, two alkaloids in the plant, are approved as bronchodilators for use in over-the-counter decongestant products. These alkaloids are also central nervous system stimulants, and they have found their way into a number of weight-loss products under the guise of the Chinese name for *Ephedra*, ma-huang, which has caused regulatory problems for the industry as well as concerns for FDA. Ephedrine and pseudoephedrine are imported as natural compounds from East Asia or developed synthetically. There are also 12 species of *Ephedra* in American deserts, most of which haven't been researched at all for their chemistry or pharmacology.

AUDIENCE: Is there any clearinghouse on how someone can start a small commercial growing operation of a botanical product, and how or where to market it?

MR. FOSTER: There are a number of organizations: There's the International Herb Association located in Mundelein, Illinois, just outside of Chicago. They do an annual herb symposium, and that's always a good place to get information. The American Botanical Council in Austin, Texas, supplies general scientific information on medicinal plants and medicinal plant utilization, though not market information as such. Also, the Herb Research Foundation in Boulder, Colorado, produces quite a bit of information.

AUDIENCE: Would they have any potential market source—you mentioned markets in Europe, but specific names of companies that buy?

MR. FOSTER: You're probably not going to find that from any one source. Generally I think the best thing is to research it by looking at trade magazines such as "Health Foods Business," "Natural Foods Merchandiser," or "Whole Foods" and their annual directory issues and scan their ads to see what people are selling. Then you can contact the companies directly.

The difficulty is for the start-up grower, it's kind of a catch-22. Buyers want to have products in hand before they'll let out a contract, and bankers want to have a contract before they'll let out money to a grower. You almost have to have a proven track record to get started in a large-scale commercial market unless you have a personal contact and a lot of capital.

AUDIENCE: What about cultivation techniques? For some of the Oregon crops you can see fairly nontraditional types of cultivation, digging and so on. Is there any information available on that?

MR. FOSTER: There is some information available. One of the best places to look is older USDA publications on medicinal plant production. There's one publication, USDA Farmer's Bulletin No. 633, Drug Plants Under Cultivation the last edition came out in the early sixties, I believe. The small-scale agriculture program at USDA has information on specialty products, too, and they have a newsletter.

There's also an international training program in aromatic and medicinal plants at Purdue University every year. They've held it twice, every other year, but I think they'll go to an annual basis. That's an excellent 2-week education program for a broad-based knowledge of medicinal plant production.

AUDIENCE: One of the big price differentials is between cultivated and wild ginseng plants. Is there that much difference in the active material?

MR. FOSTER: It is a matter of market perception more than anything else. There is quite a big difference in the roots, too. If ginseng buyers look at the roots side by side, it's very easy to tell which is the cultivated ginseng and which is the wild ginseng. The wild is considered to have higher value. There was actually a study published earlier this year or late last year that showed some chemical differences between wild and cultivated ginseng.

Wild Asian ginseng is extremely rare, and about 3 kilos of the wild Asian ginseng enter the Hong Kong market every year. Some of the material that's perceived as really high quality has sold for prices as high as $3,000 a gram. So a single root can sell for $100,000.

AUDIENCE: How about semi-wild cultivation?

MR. FOSTER: Woods-grown ginseng is another production system, and generally the roots turn out to have the appearance of wild ginseng rather than cultivated ginseng, and can be sold at a similarly high price.

AUDIENCE: Can *Echinacea angustifolia* and *Echinacea purpurea* be used interchangeably?

MR. FOSTER: I believe the answer is yes. And if we transform the question into what is the best species of *Echinacea*, my opinion is *Echinacea purpurea*, based on the fact that the majority of pharmacological and clinical studies have involved *Echinacea purpurea*. If you put *Echinacea purpurea* and *angustifolia* side by side in a test called the Carbon Clearance Test, *Echinacea purpurea* comes out slightly ahead. This test measures the rate that carbon particles are eliminated from the blood, so it measures phagocytosis which is kind of a crude measurement of the immuno-stimulant effect. The trump card for me is that the entire world supply of *Echinacea purpurea* is cultivated rather than from wild harvest.

AUDIENCE: Is there any way you can monitor wild populations to prevent overharvesting?

MR. FOSTER: The answer to that, I think, is best summed up by Dr. Ronald McGregor at the University of Kansas, who's a botanical expert on *Echinacea*—the problem with *Echinacea*, or plant conservation in general, is that plants don't have cute, little brown eyes and soft fur, so nobody pays attention to them.

What I would like to see for some of the more expensive or heavily pressured wild medicinal plants is a system similar to what we have for licensing the hunting of animals. You are issued a license that allows you to dig the plant materials. There is a specific season, and once you've taken your harvest, you have it tagged by an official from Fish and Wildlife or some agency so the long-term impact on the population can be determined.

What is not known is far greater than what is known. *Echinacea* diggers will tell you that, once they dig the root, a new plant will sprout up from that 6 or 8 inches away. Who knows what the truth is? With goldenseal, for example, the question is if you leave little pieces of rhizome in the ground 3 or 4 inches away from the plant, does a new plant sprout out from that?

AUDIENCE: How would you characterize the FDA's regulatory effect on medicinal plants?

MR. FOSTER: Well, in the past it's been difficult to gauge. The new legislation, the Dietary Supplement Health and Education Act of 1994, provides clear regulatory parameters for herb products used in the form of dietary supplements. So there's a much better regulatory environment than a year ago.

AUDIENCE: You don't see it being restrictive to new developments or alternative uses or anything like that?

MR. FOSTER: No. I think it opens it up more. You know, ideally, what I would like to see is a regulatory mechanism similar to Germany's where the plant materials are labeled as drugs, including uses, side effects, contraindications, dosage information where there is a reasonable certainty of safety and efficacy based on historic use of the plant coupled with scientific backing.

Special forest product markets in the Pacific Northwest with global implications

Keith A. Blatner
Associate Professor
Department of Natural Resource Sciences
Washington State University
Pullman, WA 99164-6410

I would like to first give credit to my colleague who has worked with me on many of these projects. Bill Schlosser was my former graduate student at the University of Idaho. He is now at Michigan State University and shortly will be a USAID employee in Khabarovsk in the Russian Far East. He and I researched special forest products together for about 6 or 7 years.

In the course of today's presentation, I'm going to focus primarily on products from the Pacific Northwest—major products, their markets, and economic contribution. However, I'm going to digress at various times to show the international flavor of this market.

There is a growing industry on the eastside of the Cascades, where I work. In fact, many of the products that are harvested on the eastside currently are marketed and processed through westside processors, a phenomenon that is slowly changing. There are large international markets for a variety of products.

The special forest products industry consists of several specialized industries. The floral greens industry uses wild-harvested evergreen plant materials in floral arrangements. Typically, these plants are flexible and have long-lasting properties so they can be used in fresh or dried arrangements, often as background material. Moss is used as covering for the base of arrangements, or in pots or baskets. Christmas ornamentals are bough products, primarily cones, that are used in Christmas wreaths, swags, and door charms. During the rest of the year, some are used in the form of casket drapes and other decorative pieces. Another specialty is edibles. Wild edible mushrooms are probably the most commercially important edible product. Unlike other species we produce horticulturally or agriculturally, we do not have the ability to propagate these species, so they must be harvested from the wild. Familiar mushrooms include morels (*Morchella* spp.), matsutake (*Tricholoma magnivelare*), and boletes (*Boletus* spp.). Another type of edible product is huckleberries. Herbal and medicinal plant products make up yet another important specialized industry. I will talk about these later.

FLORAL GREENS

First I will refer to the table we compiled for 1989 westside harvest values (Table 1). Bill and I are currently in the throes of finishing a re-survey of the industry for the 1994 business year. We haven't compiled all the data yet, so I'm going to use the 1989 data, and toward the end of the talk I will discuss how much I think the industry has grown.

Hand of beargrass; Elk City, ID

This example will give you an idea of the importance of plants in one application, floral use. In 1989, the amount paid to harvesters for beargrass (*Xerophyllum tenax*) was $11.5 million. Today purchasers are buying beargrass coming out of northern Idaho and northeast Washington as well.

Baby's breath (*Gypsophila paniculata*) was an industry worth about $5 million in 1989. When we did this survey, we did not survey any eastside firms. So these figures are only for baby's breath that moved through westside processors. Baby's breath is a plant of Eurasian origin, from around the Caspian Sea, which was planted by settlers as an adornment to cemeteries and similar places. It went wild and became a fertile plant. It's classed as a noxious weed, but it has developed a substantial market in the floral industry.

Moss has recently attracted quite a bit of research interest and environmental concern. It is used heavily in the production of moss baskets, and is widely exported to European floral markets.

Evergreen huckleberry (*Vaccinium ovatum*) had a value of $1.7 million for its use in floral arrangements. This does not include the value of any fruit products that are derived from the berries themselves. Mountain boxwood (*Pachistima myrsinites*) may be used as a substitute for huckleberry in floral arrangements.

East of the mountains, we have already highlighted baby's breath. Sword fern (*Polystichum munitum*) had a value of about $1.5 million. Sword fern does occur east of the Cascades, and there is a relatively untapped supply of it. Dwarf oregongrape (*Berberis nervosa*) is another product used for floral greens. Two oregongrape species occurring in Idaho, with slightly different characteristics, would make logical substitutes for their westside cousin.

CHRISTMAS ORNAMENTALS AND EVERGREEN BOUGHS

Christmas ornamentals (Table 1) consist of a variety of species and subjects: cedar and noble fir boughs, cones, holly, and so on. Christmas greens represent substantial economic value, with noble fir (*Abies procera*) at $6.7 million and western redcedar (*Thuja plicata*) at $1.1 million in 1989. Subalpine fir (*Abies lasiocarpa*), western white pine (*Pinus monticola*), and Douglas-fir (*Pseudotsuga menziesii*) are Christmas ornamental products of lesser commercial value.

The northern Rockies do not have noble fir. There is some subalpine fir readily available, which makes a good substitute for noble. There is also western redcedar, which actually has fewer disease problems in the inland west than it does on the westside. One disease is a red fungus that grows on the underside of the needles, making these products unmarketable. The drier climate on the eastside makes this less of a problem.

Table 1. Special forest product plant species and related harvest numbers for 1989. (Adapted from Schlosser, et al. 1991.)

Common name	Scientific Name	Volume	Unit	Value/ Unit	Total Value
Floral greens					
Beargrass	*Xerophyllum tenax*	12,781,823	Bunch	$0.90	$11,503,641
Salal	*Gaultheria shallon*	8,490,100	Bunch	$0.90	$7,641,090
Salal Tips	*Gaultheria shallon*	10,878,589	Bunch	$0.50	$5,439,294
Baby's Breath	*Gypsophila paniculata*	3,358,154	Bunch	$1.50	$5,037,230
Moss	Many species	158,510	Sack*	$13.00	$2,060,628
Evergreen Huckleberry	*Vaccinium ovatum*	2,741,667	Bunch	$0.62	$1,701,017
Sword Fern	*Polystichum munitum*	2,463,092	Bunch	$0.62	$1,527,117
Scotch Broom	*Cytisus scoparius*	345,698	Bunch	$0.40	$138,279
Dwarf oregongrape	*Berberis nervosa*	99,141	Bunch	$0.60	$59,485
Total					$35,107,781
Christmas and Evergreen Boughs					
Noble Fir	*Abies procera*	9,310	Tons	$720.00	$6,703,116
Western Redcedar	*Thuja plicata*	2,375	Tons	$460.00	$1,092,385
Subalpine Fir	*Abies lasiocarpa*	900	Tons	$640.00	$575,840
Western White Pine	*Pinus monticola*	995	Tons	$460.00	$457,503
Douglas-fir	*Pseudotsuga menziesii*	1,317	Tons	$200.00	$263,393
Western Juniper	*Juniperus scopulorum*	283	Tons	$500.00	$141,705
Incense Cedar	*Libocedrus decurrens*	176	Tons	$760.00	$133,719
Lodgepole Pine	*Pinus contorta*	272	Tons	$360.00	$97,856
Cones	Many species	7,230,871	Number	$0.04	$253,081
Holly	*Ilex* spp.	1,908,861	Pounds	$1.40	$2,672,405
Other Boughs	N/A**	N/A	N/A	N/A	$59,242
Other Products	N/A**	N/A	N/A	N/A	$113,301
Total					$12,563,546
Total Value of Product Purchases					**$47,671,328**

** One sack of moss weighs approximately 50 pounds*
*** Due to confidentiality, many products which have only a few producers have been grouped into Other Boughs and Other Products.*

Douglas-fir, western white pine, lodgepole pine (*Pinus contorta*), and western juniper (*Juniperus scopulorum*) work well in this market. One might argue, "It's a long way from the eastside to the coast where most of the established industry is. Why would anybody bother to look for products on the eastside?"

Well, we have one little advantage many might not appreciate—it gets cold in the northern Rockies. For these products to be salable, the needles need a prolonged period of frost so they will not drop off shortly after harvest. On average, the northern Rockies tend to freeze earlier or for longer periods than even the higher elevations in the Cascades. Certainly in terms of accessible areas, they have an advantage.

In northern Idaho and northeast Washington we can start harvesting subalpine fir, western redcedar, and western white pine ahead of our westside competitors. Some eastside production facilities are starting in this area, but right now most of it is trans-shipment; we harvest it and move it to the westside for processing. We can put it in a refrigeration truck, run it across the basin, and have it available to the processing sheds on the westside ahead of the westside competition. That allows us to prepare for the market and use our existing production facilities longer.

Pine cones are another part of the Christmas ornamentals market. Most of the cones come from the eastside. Western white pine is one source, with ponderosa pine (*Pinus ponderosa*) cones being the most prominent ones used in floral arrangements. Holly is another familiar plant; in 1989 it was worth about $2.7 million.

Looking at overall markets for the floral and Christmas greens industries together, we find that the United States is by far the dominant market at 52 percent. However, Europe is a very large market at nearly 25 percent. We are looking primarily at floral products moving into the European market, not Christmas ornamentals. On the florals, we have some unique products. There are also limited amounts going to the Pacific Rim and other areas. Christmas ornamentals are a big factor in Europe, but they already have an ample supply of their own.

If we look at the data we collected in 1989, we see about $128,500,000 in product sales, 10,000 people employed part- or full-time, and about 675,000 acres in production west of the Cascades. Breaking it out by product, wages, and overhead, we see that about $48 million was paid to the harvesters for raw products (Table 1). A certain amount of that trickles back to the landowner. Wages are paid to people who are employed in the processing facilities, making moss baskets, wreaths, and so on. Based on the assumption of a profit margin of about 7.5 percent, overall profit was about $9 million.

EDIBLE MUSHROOMS

Let's turn to mushrooms (Table 2). In this case, the study I'm going to summarize covered Washington, Oregon, and Idaho and did not suffer from the eastside/westside problems that the initial study did. There are two numbers presented in the table for each State: harvested and processed. "Harvested" refers to where the company recorded that the product was harvested. "Processed" refers to where the mushrooms were processed.

Because the industry follows the harvest, a Washington firm does not process only Washington mushrooms. That would substantially reduce the harvest period and the range of products that could be used. It would also be limiting because a poor crop of morels in one year would more severely affect businesses with a small procurement area, whereas it might be a good year in Oregon and a bad year in Washington.

Table 2. Estimated volume (pounds) of wild edible mushrooms, in pounds, harvested and processed by State and species. (Adapted from Schlosser and Blatner 1995.)

	Washington		Oregon		Idaho		Out-of-region
Species	Harvested	Processed	Harvested	Processed	Harvested	Processed	Processed
Morels	78,702	113,225	902,581	1,056,102	344,545	143,500	13,000
Chanterelle	553,634	369,951	581,540	695,223			70,000
Matsutake	274,657	268,879	450,886	440,163	99,104	16,000	99,605
Boletes	63,992	89,377	369,950	380,933	47,717	8,050	3,300
True truffles	414	383	6,013	6,483	1,014	575	
Oregon black truffle	632		4,178	4,951	1,141	1,000	
Cauliflower	2,707	3,334	3,917	3,695	1,155	500	250
Coral tooth	278	311	1,210	1,177			
Puffballs	1,297	496	912	1,714			
Spreading hedgehog	5,803	3,634	36,190	38,740	1,001	500	120
Other species	3,227	2,545	96,857	97,538			
Total	**985,343**	**852,135**	**2,454,234**	**2,726,719**	**495,677**	**170,125**	**186,275**

NOTE: Out-of-region refers to processors located outside of Washington, Oregon, and Idaho who purchase wild edible mushrooms from within the three States.

Another reason we distinguished between harvest and processing sites was that Washington processors were concerned about Oregon processors coming up north and buying Washington mushrooms, so the jobs would primarily be in Oregon. There were some efforts to implement a bill restricting that type of activity, or at least to tax Oregonians for their entrepreneurial efforts in

Washington. So we collected information for both harvesting and processing.

The out-of-region information refers to products that were purchased by companies outside the three-State area. That means Canada and California, in particular, with a little bit of Montana and occasionally Colorado and some other States thrown in.

Morels are widespread. They occur both in forests and after burns. Probably the most common area for procurement is in a recent burn. Morels can be found outside of Valdavalsa in the Russian Far East and elsewhere—same genus, same species, so we are not unique in this market.

Packaged dehydrated morels travel from Alaska to the Russian Far East and back to Pullman and who knows where before landing in an Alaska grocery store. They are very durable in this form, and they are also very expensive. A half-ounce container costs $5.83. So morels are not a low-value product.

Perfect morel

Chanterelles (*Cantharellus* spp.) are another popular mushroom. Washington and Oregon each harvest more than half a million pounds. There are probably a few chanterelles in Idaho, but certainly not in commercial quantities. There are various chanterelles, in different colors, and so on.

Matsutake is the mushroom that gets a lot of attention because of its high value. The average price paid to the processor in 1992 was about $16 a pound. That compares with an average of about $4 a pound for morels. For a high-value matsutake the type that commands $100 a pound in Tokyo you want a small button matsutake where the veil is not broken. It has to be absolutely perfect, with no worm marks and nothing else affecting it. Any mushroom of good quality but less than perfect will not command $100 a pound; however, matsutake that are past their prime, such as those with broken veils, are still very tasty. Harvesting levels were about a quarter million pounds in Washington, almost half a million pounds in Oregon, and nearly 100,000 pounds in Idaho.

Boletes are the fourth big mushroom product. There were about 64,000 pounds harvested in Washington, 370,000 pounds in Oregon, and 48,000 pounds in Idaho. Like other mushrooms, boletes are graded by quality. A perfect specimen would receive a Grade 1. Small imperfections such as a small line across the top would make them Grade 2, and so on.

Chanterelles

There are many other mushroom species harvested in relatively modest amounts. About 25 to 30 species were harvested in the Pacific Northwest on a commercial basis, many of them only in local areas—about 15,000 pounds for Washington, 150,000 for Oregon, and 5,000 for Idaho.

Some are very high-value species. The Oregon truffle (*Tuber gibossum*) had an average price paid to the harvester of about $77 a pound in 1992. However, a good day may mean harvesting only a few ounces—you are not going to make a fortune harvesting Oregon truffles. You may have a good day and come in with a couple of pounds, but you certainly cannot do it day in and day out. Other species may be oyster mushrooms (*Pleurotus* spp.) or puffballs (*Lycoperdon* and *Clavatia* spp.), such as those we have all seen in lawns and pastures, which grow throughout much of the world. There is a laundry list of species that fall into this category.

In the region, the total value paid to harvesters in 1992 was about $20.1 million—$6.2 million in Washington, $11.3 million in Oregon, $1.4 million in Idaho, and about $1.2 million paid outside the region. The mushroom industry's contribution to the regional economy was about $41 million—about $12 million in Washington, $25 million in Oregon, $1.7 million in Idaho, and $2.5 million out of the region.

OTHER EDIBLES, HERBALS, AND MEDICINALS

Other edibles, herbals, and medicinals are interesting products for which there is little market information in the Pacific Northwest. Where are edibles and medicinals being marketed? We find them very popular in Portland, in health food and apothecary stores and stores that specialize in trendy niche markets. We do not just find them on the West Coast. They are in Bozeman, or the medicinal store in West Yellowstone.

Wild edible huckleberries are a big industry on the eastside, and largely undocumented. Huckleberries are found in candies marketed widely. Various syrups, jellies, jams, and preserves are marketed as well.

Medicinals and herbal plants are another important type of forest product popular with herbalists and naturopathic healers. I will mention just a few. One familiar product comes from the bark of cascara (*Rhamnus purshiana*), a major component in laxatives. Quinine conk (*Fomitopsis officinalis*) was used in the treatment of malaria in World War II. Panax ginseng is harvested out of the Appalachians and in other parts of the eastern United States. Although it can be commercially cultivated, the wild plant commands a much higher

price. As the plant has grown increasingly rare, the price has escalated to more than $500 per pound.

We've all seen advertisements for ginseng. Two species that grow in the West in the same family as Panax ginseng (*Araliaceae*) are California spikenard (*Aralia californica*) and devil's club (*Oplopanax horridum*). Both are of medicinal use to Native Americans. Another interesting plant is St. John's-wort (*Hypericum perforatum*). This is a noxious weed on rangelands east of the Cascades. It is poisonous to cattle—ranchers hate it. However, it has a variety of medicinal uses. The flowers and so on can be made into an oil. Leaves can be used in the production of teas. It is used as an astringent, an expectorant, a treatment for menstrual cramps—a whole variety of uses. Arnica is found in high elevation country. It is used both internally and externally, made into a salve for treatment of various sores, and so on. It may also be used for intestinal problems.

Mushroom buying station

I traveled to Russia recently and found knowledge and use of wild edible and medicinal plants to be widespread. In a little village called Trotski outside of Khabarovsk, fiddlehead ferns are a major food product. Also common in the Russian Far East is what they call "chaga" (*Inonotus obliquus*), a polypore fungus that affects aging birch and is commonly found in northern Idaho, parts of Canada, and parts of northern Michigan. It's used by naturopaths in the treatment of stomach problems, particularly ulcers.

Schisandra chinensis was a classified secret in the Russian cosmonaut program. It acts as a natural speed. But it's not a restricted plant; it can be purchased through various plant catalogs here in the United States.

Siberian ginseng (*Eleutherococcus senticosus*) is also available as a medicinal product in Russia, where it is cut into little pieces, dried, and made into tea. Research from Russia suggests that it will raise blood pressure for people suffering from low blood pressure, or lower it for people with high blood pressure. Some medicinal flavored elixirs—brandies, vodkas, and so on—are made from grasses and herbs. As one example, ginseng-flavored vodka contains Siberian ginseng.

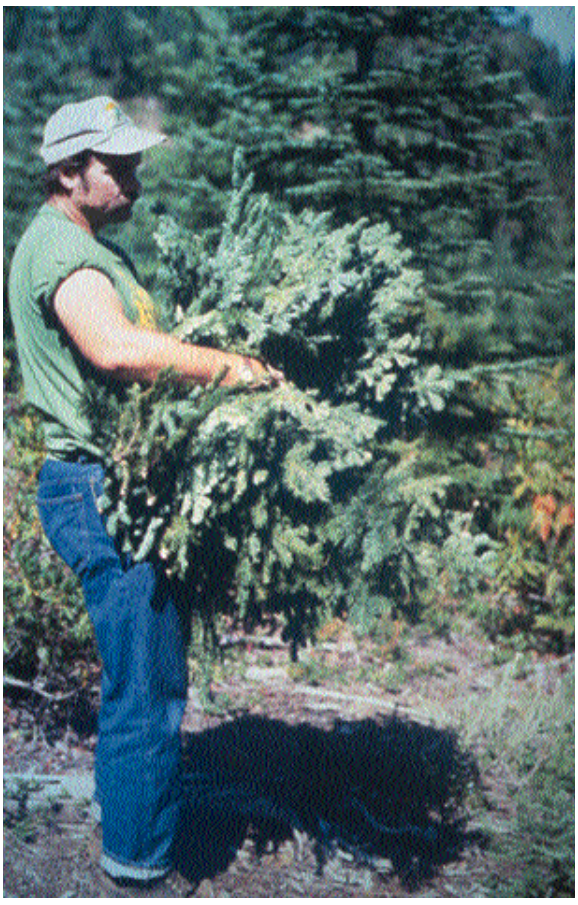
Worldwide interest in these products is substantial. If you are a Web surfer, type in "medicinals" on the Web and run a general search. I guarantee you will get thousands of hits in a blink of an eye. You will find naturopathic journals, advertisements for products, and so on. If you use more detailed searches, you can really focus in on medicinal products and medicinal product research. There are departments of chemistry and associated university departments around the world that focus on documenting the medicinal properties of compounds found in medicinal plants.

ECONOMIC AND OTHER ASPECTS

We examined the economic value of special forest products and estimated the size of the industry for 1992. We combined floral greens, Christmas ornamentals, and wild edible mushrooms, and we added them up assuming a 6 percent annual growth factor to account for inflation and expansion of the industry. We came up with $150 million.

This figure does not include other edibles or medicinals. It does not include the eastside other than baby's breath, and the industry has had time to grow since then. How big is it really? I don't know. It certainly is bigger than this. It might be $200 million, but it's probably more like $250 million or $300 million. It is really hard to pin down because processors are constantly entering and leaving the business. It's a very entrepreneurial type of activity.

The ad hoc evidence from national forest leases and permits and activities on industrial and other lands in the region shows a dramatic growth in the procurement of these materials in recent years. Special forest products are a growing and important industry, providing at least seasonal employment for many people in places like Elk City, Idaho, or Packwood, Washington—people who would prefer to live a different life-style and do not really want to live in Portland or Seattle. The industry has a lot of advantages for rural communities located near the resources.



Noble fir bough harvest

This work is often combined with other seasonal jobs. It is not uncommon for somebody to pick "brush" (slang for floral greens), harvest Christmas ornamentals, pick mushrooms, and maybe work in fishing or logging part of the year. Also, when we looked at the data for mushroom pickers, we found that about 25 percent of the people were on some form of assistance, either unemployment or welfare.

We see a large fraction of mushroom harvesting being done by recent migrants from Southeast Asia. This kind of job requires very little education or formal training, but it takes a willingness to work, because it is not easy labor. It's basically stooping labor.

Another consideration of special forest products use is recreational harvesting. Mycological societies throughout Washington, Oregon, Idaho, and Montana go on regular spring and fall forays. They might find some matsutake and have a very nice dinner that night, but they're not interested only in edible species. These people are very active, politically astute, and very interested in their resource. Many other nonmarket values associated with these products have not yet been extensively researched in this country.

Beargrass

Finally, if land managers do not start recognizing the commercial and the noncommercial importance of special products, we are going to have major problems. We have already had the first case of an appeal concerning a mushroom harvesting permit on the Flathead National Forest in Montana. There are likely to be more.

I'm concerned that if we do not recognize the importance of recreational development in this arena, along with commercial, community, and economic development, we're going to have problems similar to the ones we have had with timber.

We have the opportunity to avoid that kind of conflict if we can start now to develop positive relationships with all interested parties—professional businessmen, harvesters, amateur mycologists, and whoever else has an interest in these plant materials. Now is the time to work proactively with these groups.

AUDIENCE: I was wondering if harvesting only unblemished plants selects against insect and disease resistance.

MR. BLATNER: With respect to mushrooms, we don't harvest only the most insect resistant. It's a function of the time I go through the stand. I won't be looking for the Grade 1 *Boletus* or matsutake every day, because that would not provide enough volume.

What I might do is select a *Boletus* "button," and also a mushroom that is a Grade 3. It may be heavy, and a little buggy, but it will pay its way out of the woods, and I just keep filling my basket as I go along. At the end of the day, I may have a mix. I could have Grade 1, Grade 2, Grade 3 boletes, or maybe one of six grades of matsutake. I pick a range of products all day long. I do not discriminate solely on the highest value species. Boletes that are large with huge umbrella caps may look very nice, but they are worthless—they are full of bugs. They are also shedding spore and providing stock for re-establishment. I will not take the mycelia that are under the soil.

How much mushroom harvesting we can sustain is subject to debate. At some point we may overharvest them—there is controversy in the mycological literature.

AUDIENCE: I know that in Humboldt County, a Native American tribe was having a lot of difficulty because people were going on their lands and collecting mushrooms and raking the area. It was destroying the mycelia, and mushrooms would not come back the next year. I am wondering if you have seen that problem in other areas.

MR. BLATNER: Raking is most commonly associated with the truffles because they grow below ground, and so people use a rake to try to get them out. It is somewhat destructive. This can be very serious in certain places, but over all, in my experience, it has not been that big a problem.

AUDIENCE: Do you have any evidence that the money generated by these crops actually stays in the rural communities?

MR. BLATNER: As we showed with mushrooms, and it's about the same for floral greens and Christmas ornamentals, about 50 percent goes into product acquisition—that is, to typically rural people harvesting the product. Most of the processing facilities are also located in rural areas. You will find the largest eastside processor for wild edible mushrooms in LaGrande, Oregon, a nice, small community, a very pleasant community, in a largely rural setting.

Noble fir boughs

Now, the flipside of that is that these industries do not pull a lot of money into the community. You don't buy a lot of equipment to process mushrooms—a car or a pickup truck, a plastic basket, maybe a knife, and you head out to the field. And maybe you already have the knife. It is a very simple industry that has its pluses and minuses. It's not very capital intensive, so individuals can start businesses fairly easily, but it's not without its risks.

AUDIENCE: Were you able to break down where these products are coming from in terms of land ownership? And if they're coming off public lands, do you keep track of that?

MR. BLATNER: In the past, we have not specifically looked at source of supply. We have asked some very general questions about public and private land and leases. There are limits to the extent that we can get information.

I find that the industry is based on a lot of trust. An individual comes into a processing facility, and he says, "I'm broke. I need 50 bucks to buy some gas and some groceries—you know I'm good for it." A lot of processors have a personal relationship with many of the people they work with. They will hand the individual 50 bucks on a handshake. So a lot of processors can tell you every person they have bought from regularly in the last 5 years. With a little bit of effort they can guess how many pounds each individual brought in, and probably tell you where the bulk of their harvesting activities were. That data is suspect from a research standpoint because it is basically anecdotal. So I haven't put a lot of emphasis in collecting it. But I happen to believe the processor has pretty good insights.

AUDIENCE: I think your numbers underestimate the true value of these products because this is a cash-and-barter economy, and difficult to report.

MR. BLATNER: That is a common hypothesis, and I don't disagree with you too strongly on it. However, I think that was more true 5 or 10 years ago than it is today. The States and the IRS have clamped down considerably on reporting. Historically, it was very common for someone to walk into a buying shed and be paid in cash or by check totally off the books. That aspect of the industry is disappearing very quickly. Most people picking floral greens and bough products have established businesses and operate legitimately.

Management opportunities and constraints: State and Federal land management perspectives

James R. Freed (Jim)
Extension Professor, Forest Marketing
Washington State University
Olympic National Forest
1835 Black Lake Blvd.
Olympia, WA 98512

John R. Davis
Special Forest Products Coordinator
USDA Forest Service
Zigzag Ranger District
Mt. Hood National Forest
Zigzag, OR 97049

MR. FREED: I'd like to address some of the issues small communities are facing through community and economic development, as well as some of the questions bothering local people, who may not even know where nontimber products go. Hopefully my comments will dovetail with what John Davis is going to say.

Because of my background, a lot of my efforts have been in marketing. I look at access to land and to markets. Most recently, I've started working with individuals and communities on value-added products.

I've been working in the special forest products arena since 1974. A lot of these products go through Mason County, south of the Olympics in Washington. Pickers and people here are typical for the industry. Until 1989, very few people cared about special forest products, and people harvesting plant resources for these products often didn't even need permission from landowners.

These plant species were pretty much considered weeds. And we at research institutions worked on getting rid of weeds. There is much more information on killing than on managing these particular species.

In about 1989, there was a change in the way forests were managed. That changed how these raw materials were viewed by the pickers, by the local value-added industries, by local economic development organizations, by public decisionmakers, and by the land managers themselves. Something once called a weed is now something very valuable.

That change happened literally overnight. It turned a lot of people on the edge of society into criminals, because where they had harvested the product for years and years, they now needed permits. Salal (*Gaultheria shallon*), a product that's used for floral greenery, is an example. People used to just come and get rid of plants like salal, evergreen huckleberry (*Vaccinium ovatum*), and sword fern (*Polystichum munitum*). A typical lease was 25 cents

Salal harvester

an acre. I worked with people who leased 26 sections and could take whatever they wanted for a year. Suddenly there were rules and regulations and competition. Now they needed permits. They were sharing their sites with other people.

So for the harvester, the new practices of the land managers and the industry led to some real conflicts. The harvesters also started looking at where their products were going. There were quality concerns because of worldwide competition, not just from other local producers, but from the rest of the Pacific Northwest, the United States, and the world. Market fluctuations became a concern. Why did one mushroom species go from 80 cents a pound to $18 a pound this year? Or why did another species go the other way, from $200 to 75 cents a pound? Things happening in Polish or Chinese forests now affected prices here, but the harvesters didn't know that. Before, they didn't care—now they had to be aware of world markets.

What we're looking at, economically, is community development more than economic development. When I work with economic development people, they talk about putting in big buildings and finding businesses to hire 100 displaced timber workers or maybe displaced shellfish and seafood people on the Olympic Peninsula. How can we put 500 timber workers into the special forest products industry?

Bales of sword fern

We can't. It's very large, but this is a cottage industry. It is a $178 million industry in Washington and Oregon, on a wholesale level. However, it is made up of many, many individuals who operate home-based businesses. Many of these people have tried to avoid society for years, and I think they are pretty typical of the forestry industry.

Most foresters didn't take the job because they wanted to talk to people. They took it because they could talk to trees, and trees don't talk back. But now these foresters have to deal with 15,000 people wanting mushroom permits. That's a whole different world.

Well, the same thing is true for the harvesters. These people picked to supplement their income. They didn't make $100 a day, and it was all cash based. If I asked them to, a typical company would write a check to "Number 10" instead of to me, Jim Freed. I'd take it down to Bob's Bar and Grill and get my check cashed at the same time I bought my chicken and joes. All I had to do was write "Number 10" on the back, Bob charged me

Flowering beargrass

two bucks, life was good, and I went on. That's how the system was, very community-based, very self-supportive and trusting. Everybody knew each other. Everybody looked the same, all European heritage.

That also changed in 1989. All of a sudden land managers saw the potential for world markets and wanted more money. New United States citizens started seeing this as a chance because of the low capital investment. It doesn't take a lot of money to get into this business—a car with the backseat out and the trunk lid off, a box knife or a ring knife, a good supply of rubber bands and they were ready to make $50 a day.

People of every nationality were now in the woods. That put a lot of pressure on traditional harvesters. The people who had worked three and four generations harvesting on Weyerhaeuser, Simpson, Washington Department of Natural Resources (WDNR), or U.S. Forest Service land were now being pushed out because they weren't aggressive about getting permits. Their traditional harvesting sites were not traditional anymore. They were run out because they didn't have the money to pay the cash up front.

So change occurred on that level, but also the harvesters changed from timber industry people supplementing their income to people from a wide variety of ethnic backgrounds using this as their entire income.

The other area that has changed at the community level is the community's interest in starting these businesses—actually supporting and helping people get into the business. We've seen a lot of success in using cooperatives. Individuals alone have very little power to access big markets or to encourage buyers to come into the area.

In the Pacific Northwest, one problem is that buyers are located typically near Shelton, near the big processing facilities in the Shelton and Olympia area. They can't afford to put these expensive plants all over the place and have them empty 9 months of the year, so the pickers have to travel all over to bring the raw material back.

What I'm doing with communities now is looking at how they can develop a raw material supply that the Shelton people will pick up or that they can send up. Is there something as simple as a container? For $1,500 you can buy a used refrigeration truck that will easily store $2,000 worth of product. Fill that container, and Continental Cascade or Mill Crest or Mill Creek Ironwood will come pick it up and pay a premium. So we've been suggesting that these communities should look at smaller structures people can all chip in to, instead of building big facilities. Some of our land managers are even looking at converting old Christmas tree or tree stock refrigeration storage into this.

So we are looking at the local communities and saying, "How can we help a lot of small businesses get the skills to harvest sustainably?" That's the critical issue, because there's a valid concern by people who watch the forest that we could overharvest these products.

One of my education projects is teaching people not just how to make and market a wreath or a basket, but how to identify the plants. One problem is that there are no schools in the United States that teach how to manage, market, or manufacture these products. Even identifying the 170-some plants that can be used for herbal and edible and medicinal uses would be a start. I was trained to be a forester, and we spent 2 whole days on other things besides timber. That supposedly gave us all the background we needed to deal with multiple use.

Yet when we talk about products, sometimes we don't even know the relationships between the various plants in the communities they grow in. Where do they grow? What kind of volume can they produce? How intensively should they be managed?

What should we do? We can begin training forest land managers. We can also train harvesters, teaching them how to harvest sustainably and helping them find the markets. However, some of the greatest entrepreneurs in the world are the pickers we work with.

The most important thing I can say is that these communities are beginning to see special forest products as being valuable. The research institutions are starting to look at forest products as important. Our wildlife people, the land managers, everybody is starting to say these are important products. They're important to communities, because they help absorb some of the shock caused by changes in the timber industry.

We know the products and where they can be marketed. People can manufacture them in home-based businesses and access markets individually or through cooperatives. Local people can offer land managers new skills in stewardship activities.

This is not a new industry. The first company formally selling Pacific Northwest products started in 1938. All of these products had been managed by Native Americans, and the first European settlers used many of the same products. So we're building on history. However, most land managers and community development people see this as starting within the last 4 or 5 years.

The industry is entrepreneurial. It's small companies and individual people who need to learn to manage these products successfully. For a lot of people, if they can earn enough to sustain their life-styles and live in Forks, Washington, instead of moving to the city to be computer key punch operators, they're happy, even if it isn't what some people consider "a living." We need to remember that when we deal with the harvesters. We cannot superimpose our ideas of what they need to make.

I deal with a lot of things, everything from teaching people how to manage the land to plant identification, marketing, and working with small groups. The farm and forestry associations and a lot of governmental groups are only beginning to realize that the economic development side really shows itself as community development.

In Washington and Oregon we're extremely lucky—it's a real strength of communities—that Native American people are included, because the First People's issues are going to be critical. There is an enormous market for Native American products. When I bring people here from Taiwan, Japan, China, Korea, Germany, France, and England, they want to see how the Native Americans used these products. But accompanying a tremendous market potential are some important Native American issues.

Community development at the local level involves individuals and usually families, often family-owned businesses. I realize it's a very broad scope.

AUDIENCE: Mason County on the Olympic Peninsula has a long history connected with the special forest products industry. Does that hold true in other parts of the region? Are there hot spots of industry and cold spots where there's not much going on?

MR. FREED: The answer is yes, in both Washington and Oregon. Two weeks ago I spent a whole week on the eastside from Newport, Washington, and the Okanogan Forest down to Wenatchee. They didn't think they had any special forest products because they didn't have floral greenery, which is the main driving force. But they told me what they had, and I started explaining different markets to them.

There are cold spots because people haven't thought of the plants on the forest floor, or even on the range, as having value. And yet some of our best medicinal plants may come from these areas.

AUDIENCE: You said there are three or four generations of people interested in special forest products in some communities. Is that true for most places?

MR. DAVIS: It's a regional thing across the country. You find folk crafts—making wooden cradles, weaving baskets, a wide variety of things. It's been going on for centuries, but it's not well recognized.

Beargrass harvest

MR. FREED: There are two sides to the question of special forest products. One is the commercial—manufacturing, selling it to somebody in Hong Kong or to an ethnic clientele in Portland. The other side is the recreational or personal use. More people harvest forest products for personal use than commercially. There is a long history of personal use and barter of these products. People have lived off these products as long as anyone has lived in these areas including Native Americans, who have lived on the Olympic Peninsula for 12,000 years, and the early European settlers. There is a long tradition of very local, small, almost farmer-type markets: roadside markets, direct marketing for products like huckleberries. Direct marketing has been all over the Pacific Northwest—there isn't a community where someone hasn't harvested something and sold it locally.

What's different now is that the whole world is interested in products from these places. The Olympic Peninsula, because of its wholesale markets, has been there for years. Our problem in the Olympic Peninsula is the wholesale mentality. It's like selling round logs to Japan. The mindset says to sell—get big in the wholesale business. Some of the consultants just want to see more wholesale.

But people can make more money by picking mushrooms and selling them directly to restaurants or by setting up a stand at a farmers' market than by getting $1.50 or $2 a pound from a buyer for chanterelles (*Cantharellus* spp.). I go to little markets alongside the road and pay $4 for a pound of mushrooms. To them it's "Wow, I just tripled what I would have been paid."

I train people to look at those small markets, because every community can access a Fred Meyer. One of the best places is Wal-Mart, if you're making crafts, baskets, wooden birdhouses, whatever. If you have a Wal-Mart in your community, you have the world as a market. Local managers get a commission for finding products, especially if they're American-made. If they're traditional, that's even better.

But there are also the small markets. The Olympic Peninsula has a good wholesale market, but the retail market can be worldwide. Take jams and jellies. There isn't a community in Washington or Oregon I've been in that isn't a hot retail market.

MR. DAVIS: Yes, and then there's the restaurant market throughout the Northwest. If you can set up delivery, you can sell forest edibles to up-scale gourmet restaurants.

MR. FREED: At the community level, people can find a local retail market. When I came to Mason County, 17,000 people were there in the summer. Now, the summer population is 142,000 people, and the resident population is 46 - 49,000, depending on who they count. Most of those new people don't even know what grows in the forest, but they have the disposable income to buy fresh mushrooms. You can buy organic lettuce at the farmers market, but you can't buy wild chanterelles. (I'm working with people to set up door-to-door sales—you know, the Schwan Ice Cream delivery mind set.) If you want people to make a lot of money without pressuring forest resources, try retail sales—it takes 16 to 25 times as much product at the wholesale level as it does selling retail to bring in the same money.

You put more work in, but you get more money in return, whether it's mushrooms or making baskets. I have people making wooden bowls that sell for $600 a piece. Native American baskets can be $1,800 to $3,000 if they're made by a Native American using beargrass and natural dyes or cedar bark. Even something as simple as walking sticks, made from an alder waste product the company got a permit to harvest and sold 1,800 for $50 apiece this year.

AUDIENCE: And I sell them for 10 cents each as aluminum puddling sticks.

MR. FREED: Yes, the tourism market is the other side for value added—the local thing is the tourism market. Everybody forgets that one. There is a tremendous potential for value added in the crafts market. I have birch bark

that's been carved in the form of roses, spruce cones, and a pine fungus. They were really excited to get $2.50 apiece for these products. I asked how many they could make—they can be sold at the Saturday Market for who knows what? So we're helping people understand the local retail market versus the world market and some of the ethnic markets.

MR. DAVIS: I deal with the land management end. When you go in to get a permit or try to harvest something, I'm the person you deal with.

Let me tell you a couple of things first, because if I don't, you'll probably take things the wrong way. I have some very strong biases about this subject. I am, by training and inclination, a "timber beast." I'm also a silviculturist, and I approach the issues from a silviculture standpoint.

Jim's right. There's almost no forestry school in the country that teaches what I'm going to talk about. What I learned 20 years ago in silviculture, though, holds true whether I'm growing white pine (*Pinus monticola*), Douglas-fir (*Pseudotsuga menziesii*), or prince's-pine (*Chimaphila umbellata*). The principles are basically the same. A good basic ecology background will get you a long way in this area we call special or specialty forest products. So keep those things in mind.

I'm not an expert, but I've been doing this for about 10 years now. Jim is more knowledgeable than I am about certain aspects, but on some things I'm more knowledgeable than he is. And there are harvesters who know more than I do.

Until about 1986 or '87, the way special forest products were handled on the Zigzag Ranger District on the Mt. Hood National Forest was that you walked in, you requested to collect something, and boom, you went to get it. No permit, no oversight. Nothing.

Most landowners really didn't care. There was no demand for these products. There was no value ascribed to them. But if you look at the historical perspective not only the Native Americans but the early loggers and fishermen people often augmented their income or their larder by harvesting what we now call special forest products.

For purposes of this discussion, we are talking about products that are not delivered to a saw mill, a pulp mill, or a plywood plant. They include things like berry posts. Berry farmers want cedar posts, which are long lasting, and hop farmers want hop poles. Those are specialty products.

Pepsi is a high-value product. Pepsi has a flavoring from a plant called prince's-pine, which has commercial value. We still don't know what is paid for it, where it's going, who's harvesting it, or how much is being harvested.

In my native State of Minnesota, wild rice can only be harvested by Native Americans. They are trying to grow it in an agricultural setting, but it's restricted. You and I can't harvest it, but a Native American could. We have to buy it for $16 a pound.

This raises some interesting conundrums from a management standpoint. Historically, we've been interested in timber because that's what people wanted. They wanted houses. They wanted shelter. We didn't worry about the other things.

Most of you have harvested huckleberries and mushrooms, cut firewood, picked wildflowers, and cut Christmas trees and boughs. Guess what, folks. You've been harvesting special forest products and you probably never got a permit. If you talk to long-term people in this business, particularly the "shroomers," the people who harvest mushrooms, you'll find that harvesting special products is often done secretly, illicitly, and flat-out illegally. It is still being done that way because in the past nobody really cared. Well, in the last 8 or 10 years, we have begun to really care.

Coupled with the increasing demand for products and concern by managers, there has been an explosion in people harvesting. Now I work in the Mt. Hood National Forest, 45 miles from Portland. There are a million and a half people within an hour's drive, and I think I see every one of them.

Those people must be calling their relatives across the world and telling them, "Come on over and pick." We see Japanese people who don't speak a word of English harvesting matsutake mushrooms (*Tricholoma magnivelare*). We see Germans, French, Italians, Estonians, Czechs, Slovaks, Ukrainians, Russians, Latvians, Finns, Lithuanians, Cambodians, Hmongs, Ming, Vietnamese, and Thai. You name the country or ethnic group, I've seen them all, and they are all looking for the same thing.

However, they don't all come with the same skills. Often nobody explains what the regulations are, or what is expected of them. They don't have the level of knowledge you or I might have. In fact, most of you probably do not know what we commonly ask on a permit.

Incidentally, how many are mushroomers in here? Did you get permits? The State of Oregon now requires written landowner permission for all forest products going down a highway, and that includes anything more than a gallon of mushrooms.

AUDIENCE: A gallon or less. For florals it's 12 cubic feet and wood products like firewood, 27 cubic feet—which is a pickup.

AUDIENCE: And the State police will stop you. That's why so many people are getting permits this year.

MR. DAVIS: You need documentation—written permission with the landowner's name and address on it. For most products, that hasn't been required before.

AUDIENCE: But what if I own the land?

MR. DAVIS: You have to prove to the State police that it's your land.

MR. FREED: Legally, you can write yourself a permit, but only if you are the landowner or you have permission from the landowner.

AUDIENCE: The added emphasis on requiring documentation affects mushroom sales because buyers won't buy the product from the picker without it.

MR. DAVIS: That's a significant change from 8 years ago. We used to require Christmas tree permits, Christmas tree tags, and firewood tags and that was pretty much it.

MR. FREED: Five Christmas trees. If you have five Christmas trees on board, you better have something in writing.

MR. DAVIS: Quite frankly, my interest is not in the legalities of permitting. My interest is the actual management of these products. We as land managers have made very little attempt to manage these resources. We've managed Christmas trees and a few other things. We've even put some of them into an agricultural or horticultural setting.

Most of what we're harvesting today is being harvested because of something someone did in the past. They burned a unit, they clear-cut it, whatever. We are living off the interest of that activity. But for most of these products, we're not only living off the interest, we're living off the principal. We have not made serious attempts to build the principal back up.

That is where my focus on special products is going, because I'm encouraging people to follow a simple rule. "Allemans rätten" is Swedish for "every man's right." In Scandinavia, particularly in Sweden and Finland, they have this concept of "every man's right." You are allowed as an individual to enter private property. You can camp on it, you can pick mushrooms, you can pick berries, as long as you do not damage the property.

This is an ethic. One of the things some of us in land management are trying to encourage is developing an ethic—developing not only the resource but good resource ethics in people.

I'll give you an example. I have an area of about 3,000 to 4,000 acres, and it's very popular for matsutake mushrooms. The matsutake are highly prized by the Japanese in this country and in Japan. On this particular piece of ground, the Portland Japanese community has been harvesting matsutake for about 80 years.

It is such a tight little community and such a heritage that these individuals literally pass it on from generation to generation. I have talked to people who have harvested the same little plot of ground for three and four generations. They are very protective of it. They're so protective they don't always pass it on to the succeeding generation because they don't feel the family is worthy of the honor of picking in the father's or grandfather's spot.

Well, when other folks found out matsutake were selling for $100 to $250 a pound, everybody got excited. And on this 3,000- to 4,000-acre area, we were seeing a thousand people every day. We saw that for 4 weeks straight.

AUDIENCE: Now that the industry is growing bigger than the traditional family business, what are the ecological implications?

MR. DAVIS: That was one of our concerns. The perception is that this is a unified industry. Actually, this is a whole bunch of little mom-and-pops taking advantage of opportunities. It doesn't make any difference whether it's beargrass or mushrooms or teepee poles or cedar. You're not talking about Fred Meyer or Safeway or Seven-Eleven businesses.

You're talking about a family unit—say a Southeast Asian community group. It might be Hmong or Ming or Vietnamese or Laotian parents, kids, grandparents, aunts and uncles, maybe 8 or 10 people. Some of the European groups do the same thing, not necessarily for commercial purposes. A lot of the people don't speak English. The different ethnic groups do not necessarily talk to each other.

It wasn't so much that there were a thousand people out there, but this particular area is a designated Wild and Scenic River. It's a geologic special interest area. It has a unique assemblage of plants, because it's a 200-year-old mud flow. We were selling ground moss off of it. We were issuing and selling personal and commercial-use mushroom permits. We were selling permits for medicinal plants and a variety of other things.

Some of these new mushroom harvesters were just pulling the moss away. The Japanese community went ballistic, and quite rightly so. There were a thousand people a day with no regard for proper harvesting techniques.

There are individuals out there who don't know what they're doing and nobody has told them what to do. We weren't taught about these things in school. Few people can explain the proper way to harvest a product. We in the government have the tendency to overregulate, to write more rules, and that doesn't work.

AUDIENCE: Is there any sort of monitoring going on?

AUDIENCE: Very little. For example, cascara is a laxative, a Northwest product from the bark of the buckthorn tree (*Rhamnus purshiana*), that's been harvested for many years. BLM managers may write specifications on permits such as minimum tree diameter. They specify a particular area, and they go out with the permittee. So in that instance, there is some control over who is harvesting and how they harvest. But there is no formal monitoring of harvest consequences.

MR. DAVIS: That's in all permits, generally speaking. A contract is a little easier to deal with if it goes to court.

AUDIENCE: When you deal with large amounts of product and large acreage, it makes more sense to use a contract. For small amounts and small land sizes, perhaps a permit is more useful.

AUDIENCE: From a harvester's point of view, one of the more important things about a contract is exclusive rights.

MR. DAVIS: That is a big issue. In the Forest Service, we will not put a timber sale on top of another timber sale, or even on the same road.

With special products, there are a multitude of products that can be harvested from a piece of ground. If I issue someone a permit for a particular product, they have the exclusive rights to that product, but not to the other products in that area. I tell a harvester, "I'm issuing you a permit for this area for these products to this quantity, and I will not put another permit of that product on top of yours, but I may allow somebody to come and harvest a different product."

The tendency in the past was to take everything from a given quarter of an acre, with no management. Now, I can issue a multiple-product contract.

In ecosystem management, which is where I see special products having a strong push because of the need to keep track of more ecosystem components, these vast areas with all products harvested are going to be out.

I want to spread the opportunity to as many people as possible, because if one person has exclusive rights, 20 other people can't harvest there. That doesn't help community development.

MR. FREED: I just want to support the last thing John said. To manage sustainable communities and sustainable ecosystems, land managers and the timber industry have to learn how this fits in. It's not an either/or situation. Timber managers, as well as forestry schools, often regarded this as an either/or; either they raise special forest products on the site, or they raise timber.

What we're seeing is that products change through the stages of a timber cycle. Land managers are starting to ask: What can be harvested between clearcutting and year 15? How can we enhance those products? If we extend that time from year 15 to year 40 by pruning, thinning, and fertilization, what effect will that have on the timber? We're beginning to see a sustainable alternative to the clearcut option.

MR. DAVIS: One of the things we're talking about is dealing with huckleberries on a landscape basis by having smaller permanent fields that are always there, and also having a whole series of transitory fields that move over the landscape.

The Northwest Forest Plan talks a lot about late successional reserves—stands 80 years [old] and older. This raises some real concerns because a lot of these products, such as huckleberries, are highly dependent upon early to mid-seral stands. That doesn't mean we don't have them in late seral, but they are far less abundant. Now, the tendency over the last 30 years has been to carve the landscape into various land allocations: wilderness, wild and scenic rivers, and so on. So, instead of being able to do this on a landscape area, we're actually dealing with very, very small pieces of ground. It makes this kind of management very difficult.

MR. FREED: These buyers, these harvesters, watch a site. When quality drops to a certain level, they move away. They'll harvest somewhere else. Land managers call me and say, "Nobody came to pick beargrass (*Xerophyllum tenax*) this year. What was going on?" Harvesters look at the whole region,

not just one ranger district. They look at what's happening in Northern California, Washington, Oregon, British Columbia, Saskatchewan, and they harvest all over.

MR. DAVIS: Or the price drops or goes up. They're very price-conscious. What we're talking about is basically transitional development. You may harvest out of a clearcut here for 15 years, but down the road I put a clearcut over there so the harvest moves.

AUDIENCE: Are assessments associated with these sales? And are they put out to public bid?

MR. FREED: Yes. Public and private land managers, ecologists, and community associations help us. For example, the wildlife people know what the wildlife harvest is, and grazing studies—for example, exclusionary studies—can show what happens under certain conditions.

Special forest product harvesting has to meet the same criteria as timber sales including Environmental Assessments. The biggest difference is that we're not talking about mechanized harvest. It can be virtually invisible. I could harvest the floral products from your front yard and you wouldn't know I'd been there.

AUDIENCE: One of the ironies is that most of our biological knowledge of these species comes from studying how to get rid of them; salal, beargrass, vine maple (*Acer circinatum*). The interest in their biology was in finding ways to get them out of the way of the single timber species of commercial importance. I say "irony" because once we attach economic value to something, and particularly as the value goes up, we finally start worrying about conservation. Ginseng is a good example. The value of ginseng goes up as it becomes more scarce, which drives people to look for it more—perhaps to the edge of extinction.

MR. FREED: I'm an outsider. It's fun to work with the Forest Service and with BLM and WDNR and the parks people. We don't always think about State parks, but those people are asking the same questions they have things that can be harvested on a recreational basis. It doesn't sound like much, but each person can take a gallon of mushrooms. If 15,000 people get personal use permits from one ranger district, that's quite an impact.

MR. DAVIS: Actually, from what the land managers in the Forest Service hear from harvesters, we probably could harvest at higher levels. Harvesters would argue that we put too many restrictions in terms of quantity.

There are a couple of interesting questions in terms of the National Environmental Policy Act (NEPA). The Willamette and Siuslaw National Forests have prepared Environmental Assessments on special forest products. At Mt. Hood National Forest, we have special forest products recognized in our forest plan, and I do a categorical exclusion every year for the program, so we do have input.

We also have to deal with Native Americans. There's a possibility that treaty rights may overshadow personal use and commercial use. If push comes to shove, treaty rights supercede other rights to harvest on ceded lands or on traditional and customary use lands.

Now, at Mt. Hood, the whole eastside is ceded and the westside is traditional customary use. If somebody from Warm Springs Reservation says, "I want all the huckleberries on the Mt. Hood National Forest for cultural use," my forest supervisor has the legal responsibility to say, "There will be no harvest of huckleberries on the Mt. Hood National Forest until the Warm Springs people are satisfied."

MR. FREED: The same thing holds true on the Olympic Peninsula.

MR. DAVIS: It depends on the Indian tribe and on the treaty. That's an issue that hasn't raised its head yet. We hope it won't get to the level the salmon got to. We're working with the tribes to address their needs and still accommodate everybody else.

AUDIENCE: What level of contention do you expect on special forest products, and when might it peak?

MR. DAVIS: I don't think it's ever going to peak, because as long as you have people competing for resources, there will be contention.

AUDIENCE: You don't think public land managers can set up a system that will satisfy people?

MR. DAVIS: The only situation I know that is evidently working is on the Gifford Pinchot National Forest in the Mt. Adams Ranger District. Since about 1983 there's been a handshake agreement between the Mt. Adams Ranger District and the Yakama Nation for a set-aside for the harvest of huckleberries by the Yakamas. There are no legal documents—it's totally on a handshake. Because it's got 60 years of use behind it, it would probably be upheld in the court. I would hope so.

Warm Springs has a huckleberry festival every year that's very important to them. They look for huckleberries in the summer, and when they get ripe ones, they have the festival. They have requested for many years that we either designate an area on the Mt. Hood where only they can harvest, or we say there will be no huckleberry harvest until after the festival. Now, that's a decision that I can't make because we're talking about a government-to-government relationship.

When the matsutake prices went through the roof, the Japanese complained about the commercial harvesters and the Southeast Asians. Everybody was kicking over everybody else's mushrooms because they didn't know what they were. I don't want to see that kind of contention. I want to see cooperation and ethics so that everybody has an opportunity.

AUDIENCE: You noted the large number of transient harvesters going to hot spots, yet you're working on community development and establishing local businesses. How do you think managers can balance the two?

MR. FREED: As land managers, universities, and others start looking at managing these products, we are going to see better management. I have already seen it on the nonindustrial private forest lands. People managing small forest projects see developing their sites for mushrooms as an exciting possibility. I see a lot of small-forest landowners having specialty contracts with the retail side.

I'm working with companies that want to develop small specialty mushroom sites for tourism, where they can lead guided tours that charge people outrageous amounts of money—it matches what's happening in Japan. We don't have any big mushroom festivals in the United States that I know of, and yet Japan has many of them.

Sites are going to be fragmented. I see this already on the public side, where you have recreational, wholesale, and local retail. So you have a big commercial concern or you can issue a long-term contract.

AUDIENCE: You're talking about dividing up different pieces of land for different purposes?

MR. FREED: The big commercial companies are getting into stewardship and long-term agreements, because they have something the small company doesn't have—the capital to get the permits.

MR. DAVIS: In some situations you do not want a small commercial company, or you don't want the transitory or personal workers. At a ski area, a permittee has the right to use the area as a ski area. However, the runs aren't used 6 to 9 months of the year. Historically, at least through the Forest Service, the pattern has been to throw grass on it—nonnative grass, I might add.

A lot of these sites are at elevations that could grow mushrooms or huckleberries, for example. Why not landscape the area and put in hiking trails that would also allow access to mushrooms? One of the issues on the Mt. Hood is rehabilitating the blister rust infected whitebark pine (*Pinus albicaulis*), which has been the source of pine nuts, an important tribal food. All of these things are opportunities, but I wouldn't necessarily put mom and pop out there to do these things.

MR. FREED: Another area where we'll be seeing agreements is with cooperatives or larger companies where you don't want many people. Then land managers know who's out there, and they can ask anyone else to leave. However, policing is a major issue. How do you know who's who? In some areas you can lock up roads. Where the infrastructure is set up to handle people, those sites can be set aside for recreational use and high numbers of people.

AUDIENCE: It sounds like you're saying managers are moving away from general permits toward accountability in harvesting an area.

MR. DAVIS: The Northwest Forest Plan lays out certain expectations on various land allocations. There are certain products that are specific and unique to riparian reserves. I'm not likely to let a transitory crew in there without a very stringent permit or a contract.

AUDIENCE: I hope you'll at least set aside some areas for personal use.

MR. DAVIS: On the Zigzag Ranger District, we have designated our Old Maid Flats area as a personal use mushroom harvest area—no commercial harvesting. As other products develop, we may set aside similar areas for them.

MR. FREED: Biological societies, the native plants societies—they're all interested in the forest being managed for the public, in making sure we have recreational uses. The State park system in Washington had cleared all the brush out. Now they're allowing brush to grow back for the berries because they realize the people want them.

MR. DAVIS: You have to realize, though, that different places do different things. Different ranger stations, different forests have different policies. A lot depends on their staff's knowledge, time, interest, and especially, funds.

If you've got somebody who really gets into this, they'll separate the different groups and work with each group so everybody understands the rules of the game. People less interested, or with less support, are not going to do that. That's a real problem.

MR. FREED: You own these public lands. If you harvest or manage, make sure your voice is heard. Right now there are a lot of questions about how these lands will be managed for special forest products.

As an outsider with the Forest Service, I'm working on where the monies generated by special forest products go. Currently, they go back to the general fund in Washington, DC. We're trying to turn some of that money toward research, improvements, and local monitoring. It is not impossible, but it's going to take a little work.

Become involved. Public land managers either say they have thousands of people interested, or they don't think they have anything of value. There isn't a ranger district in Oregon or Washington, or a BLM district or a State or Federal park, where special forest products aren't harvested. Even though there may not be permits, it's happening.

So make sure your voices are heard at all levels. Offer to do some monitoring. Find out what's out there, because that's critical. There's no money for plant surveys. If you're looking for a student internship, or if you're a harvester looking for access to a piece of property, do some monitoring.

MR. DAVIS: I have the Mycological Society doing mushroom surveys—they learn and I get information.

Most professionals in the Forest Service don't have a clue about who I deal with on a daily basis. They have no concept of what backgrounds these folks come from, because they're used to dealing with the large recreational groups, the timber companies, the more traditional publics.

The decisionmakers rarely see the little mom-and-pop mushroom harvester or beargrass harvester who walks in the door. Most of the recreating public picking mushrooms or huckleberries never talk to the people who make the monetary and management decisions.
I tell both my personal and commercial harvesters, "You guys are being shut out of the woods because people making decisions don't have the information they need. They don't know who you are. They don't have a quarter of the information they need to keep you in the woods." I don't mention this to scare people, but access to public and private lands is a major issue. Landowners and managers are increasingly closing lands because of garbage, theft, liability, and other issues.

Harvesters of special products, whether they harvest for personal or commercial use, have a responsibility to make themselves known to the landowners and managers and to make their concerns and interests heard. My experience suggests that with good planning, special products development, management, and harvest are not necessarily at odds with other resource objectives.

To conclude this discussion, I leave you with the following four points:

1. To establish and maintain a supply of a variety of special products for all potential users and also to address American Indian treaty rights will take planning, foresight, and change in thinking by land managers, harvesters, buyers, and the general public. All must change their ideas, attitudes, and perceptions.

2. Harvesters and buyers will need to establish high standards and ethics regarding the harvest, sale, and even management of special products. They will need to become more open in passing on their knowledge and expertise to land managers and other harvesters and buyers to help ensure not only sustainability of resources but also access to those resources.

3. The development, management, and sustainability of many products will require active forest management, integrated with the broader forest management plan, that will probably include a full array of silvicultural treatments to develop and maintain suitable site conditions.

4. Finally, developing special products and management strategies takes time. Although we may have enough of these products today, are we doing enough to maintain or increase quantity and quality for the future? For many products, it can take one to two decades for the plant or organism to produce fruit, grow large enough to meet size requirements, or to create the ecological conditions necessary for establishment and growth. This is a long-term process requiring a long-term commitment from land managers, harvesters, and everyone else interested in these resources.

Grounds for argument: local understandings, science, and global processes in special forest products harvesting

Thomas Love
Associate Professor
Department of Sociology and Anthropology
Linfield College
McMinnville, OR 97128

Eric Jones
Department of Anthropology
University of Massachusetts
Amherst, MA 01003-4805

INTRODUCTION: WHERE ARE THE PICKERS?

In the Pacific Northwest and elsewhere, growing concerns about human impacts on forests and other natural systems, the possibilities for sustainable development of local communities, and the tradeoffs involved in tighter linkages with global market forces have come together in exciting ways in the special forest products (SFP) arena. This seminar series comes at an important time in the development of thinking about these issues.

Since other social scientists in this seminar series (economists Mater and Blatner, and fellow anthropologist Clay) have focused almost exclusively on economic and business aspects, in this paper we have chosen to range more widely than we might have liked. Consequently, we take as our task here to sandwich the ways we typically discuss these issues, both by contextualizing (what are the larger institutional and global contexts in which SFP harvesting occurs?) and by grounding the discussion (what is harvesting actually like as an activity?).

I have had the privilege of carrying out research on SFP harvesters over the past 6 years in Peru with Brazil nut harvesters[1] and in the Pacific Northwest with brush and mushroom pickers. The road has been filled with many surprises and perplexing features, some of which I want to share with you this afternoon. In both cases harvesters work long, hard hours, they are economically and/or socially marginalized, their rights to nontimber forest resources are threatened, and the forest itself is under assault from agricultural, mining, logging, and other interests in the name of "development."

In Washington, in the Olympic Peninsula (WA) Man and the Biosphere Project (MAB), we set out with a relatively modest goal: to develop a socioeconomic profile of who was harvesting edible wild mushrooms in the Biosphere Reserve. The mycoflora here is exceptionally diverse because of the large amount of downed woody material, high humidity, and incredible microclimatic diversity of the Peninsula. We have found three types of harvesters: commercial, recreational, and subsistence, representing four

principal ethnic categories: Cambodian (and other Southeast Asian), Hispanic, Native American, and Caucasian (or Euro-American). Picking is almost entirely confined to the fall season and focuses on chanterelles (*Cantharellus* spp.), along with matsutakes (*Tricholoma magnivelare*), boletes (*Boletus* spp.), and several other species. Since the harvest is seasonal, all pickers must rely on other sources of income to sustain their households through the rest of the year. Each ethnic group has devised a strategy, a seasonal round as it were, though there is much individual variation within the ethnic categories. We describe more fully the social organization of this harvesting later in the paper.

This paper starts with a deceptively simple question: where are the pickers? This question calls for more than just fieldwork; it is useful to turn the gaze on ourselves for a moment. Why is it that we almost never see SFP harvesters themselves at SFP workshops, seminars, etc.? Why do the policy and research communities know so little about the people doing the actual harvesting work? Social scientists working in SFP harvesting and ethnobotany in both temperate and tropical ecosystems report that local harvesters typically have an intimate knowledge of flora and species relationships. So why aren't the often sophisticated understandings and concerns of harvesters taken seriously in the formulation of SFP policies? Given how commonplace harvesting of a wide array of forest resources is among peoples around the world, why is it so new and surprising to think that many people in our region make a living by harvesting forest resources other than trees? Or to turn this around, why has one necessary but destructive use of our forestlands—large-scale logging—assumed such primacy in our thinking, to the exclusion of other ways to use forest resources?

WHAT HAS ANTHROPOLOGY GOT TO DO WITH IT?

While interest in other peoples' customs and strange ways is as old as humanity itself, the attempt to systematically order all this information is quite recent, only a hundred years old or so, and until very recently largely confined to Europe and North America. Anthropology, especially cultural anthropology, is concerned with the nature of culture—shared mental states (attitudes, values, beliefs, etc.)—and how these cultural patterns are distributed among humanity.

We now realize that this task of organizing different peoples' worldviews, customs, and practices cannot be separated from the western Enlightenment rationalist worldview of the 500-year-old Euro-American expansion and domination of the modern world system (Wolf 1982). As the French anthropologist Levi Strauss put it, anthropology is bourgeois Europe "scratching itself on the head," wondering who all these other people were that they encountered in their expansion over the globe.

Anthropology constitutes a principal point in which Others' understandings enter Enlightenment rationalist discourse, or what we may call the scientific worldview that dominates western culture. Anthropology serves as an especially visible arena in which to see these contending worldviews ("discourses") play out. All victors rewrite history in their own light and attempt to subordinate other cultures' understandings ("local narratives or discourses") to their dominant one ("the grand narrative of scientific

discourse"). (Think back to Foster's presentation and the ways "ethnobotany" transforms folkloric and Native American herbal knowledge into scientific knowledge.) In addition to providing an opening for local understandings to enter the discussion, anthropology also provides an arena in which the dominance of local by grand worldviews has been more easily contested. This is because anthropology is also about valuing other cultures, other ways of knowing, other ways of being human.

Oddly, then, anthropologists operate as culture brokers, mediating among dissimilar worldviews, translating other cultures' understandings. This is an awkward position, since in many ways it would be far better to have the "others" themselves expressing their viewpoints. But they usually don't, or more typically can't, for reasons of power or language (so anthropologists continue to have a niche in the job market!). Anthropologists typically find themselves in the middle, between cultures, and have learned to incorporate some level of reflexivity into their work. Or, more simply, they have learned to expose their biases through turning the focus on themselves.

GLOBAL PROCESSES AND LOCAL EFFECTS

Before launching into an interim report on the very interesting findings in our current MAB research, we must briefly assess the forces operating at a global level that impinge on Olympic Peninsula harvesters, for the contending discourses noted above are necessarily linked to political economic arrangements that underlie and support them.

In addition to mediating between cultures, anthropology—borrowing from a much broader social science tradition involving many disciplines—focuses attention on the nature of the modern world system and how large-scale forces affect everyday lives. After all, behind such abstractions as "SFP harvesters" or "hegemonic worldviews" are real living, breathing human beings. Our task is to make linkages among macro- and micro-level processes and their effects on real peoples' lives.

Harvesters

World system theory argues fundamentally that the modern world system, with its origins in European expansion overseas beginning around 1500, is different from all preceding large political-economic systems. In all previous systems, the scale of political organization matched the scale of economic organization; in other words, economies were command economies of some sort. The functioning of the economy of the modern world system, in contrast, must lie outside the control of a single political entity (Wallerstein 1979). Capital must be able to freely roam the Earth searching for profit. A great global division of labor has been created, linking yet pitting core and periphery.

Startling advances in all areas of material functioning have resulted, from transportation and communication to food production and energy consumption. But these advances, nice as they are, come at some cost in social upheaval, as labor is shunted around to be combined with capital and resources in a factory system. The growth in the world economy has been accompanied by—or for some analysts has required—the dislocation from their land of small-scale societies of food foragers, horticulturists, or pastoralists. Witness the opening up of the vast grasslands of the American midwest, which required the great Indian wars of the last century to remove and relocate the Native peoples living there.

As noted above, anthropology crystallized as an intellectual tradition or, better, quasi-scientific discourse, around Europeans' and North Americans' attempts to make sense of, control, and if necessary remove the various peoples they encountered in their global expansion. Of course, dislocation of conquered peoples by expanding states or empires is hardly a European or American invention. However, the special nature of the modern world system—relatively unfettered accumulation, reliance on wage labor, finance capital seeking maximum returns on investment, political apparati in place to stabilize and facilitate that accumulation—makes the dislocation both more widespread and more profound.[2]

Nash (1994), however, argues that it is not only in the periphery of the modern world system that such dislocations are taking place. They are also occurring in the interstices of the core of this modern world system. In the current economic restructuring and flight of capital offshore, factories close or move and employment opportunities become increasingly precarious and volatile. In the timber industry, for example, reorganization and automation have had profound effects, especially on small mill towns, throughout our region.

SFP harvesting must be located within these wider processes. Such activity represents both marginal people thrown onto a subsistence base, in whole or in part, and an opportunity created by that same system to broaden occupational niches. Ironically, these hidden forest workers are more closely tied to global markets than most other sectors in the Pacific Northwest economy, given how predominantly the wild mushroom industry is tied to export markets in Japan and western Europe.

UNDERSTANDING THE CURRENT CRISIS

It is fundamental, therefore, that we locate SFP issues in these larger contexts—not only political and economic, but also social, cultural, and historical—in which they occur. In this section we focus on 1) the institutional crisis in which both public forest-managing agencies and, to a certain extent, corporate timber companies find themselves, and 2) the even larger cultural crisis of our North Atlantic civilization.

Richard White (1992) notes that "Gradually, over the last 30 years, what might be called the master narrative of the national forests has changed. In the original story there was once a vast and bountiful nature. Americans exploited this bounty to build a civilization, but abundance bred waste and carelessness. Far-sighted men, recognizing that the resources were not

unlimited, wisely saved a remnant of the original abundance by withdrawing it from the public domain. Carefully nurtured, these lands have yielded profusely as skilled managers have made sure that what is taken is replenished. [He notes that] recent studies of the national forests have not been kind to this narrative."

Given the resource destruction occurring around the turn of the century, there were good reasons why this consensus chartering the public forestlands system was constructed. The paradigm shift in the U.S. Forest Service from this earlier "custodial" approach to the post-World War II "conspiracy of optimism" involved in the multiple-use paradigm has been well documented (Hirt 1994). But as the 20th century closes, the multiple-use consensus is under attack from several directions. White (1992) and Martinez (in this series) argue that Native Americans' understandings and practices, only sometimes coded legally in treaty rights, have virtually never been taken into account. From another angle, Wayne Hage (1994) challenges the legal authority of Federal agencies to manage their lands in the first place, by arguing that public lands of the west are in fact a "split estate"—prior private rights of early white settlers exist legally and in practice. Recent acrimony over ancient forests, centered in the Pacific Northwest, clearly contests the privileging of certain narrow interests over larger public values (Norse 1990). Other criticisms of this paradigm come even from employees within Federal agencies, most notably the U.S. Forest Service (Brown and Harris 1992). As social scientists within forestry circles have been arguing, alternative values are demanding recognition and crashing in on the forestry profession and management agencies (Clark et al. 1993).

What underlies this volley of new claims on public forestlands is the growing public suspicion that multiple-use rhetoric disguises industry predominance in the management policies and practices on public forestlands. "For, whatever else they were, national forests were an exercise in power. The changes in the land marked the changes in power [referring to pushing Indians off public forestlands]" (White 1992).

This current legitimacy crisis of public agencies (USFS, BLM, etc., and other timberland managers) is, in turn, located in a broader paradigmatic shift, or discursive break, thought to be currently underway in our civilization. West (1993), for example, notes that the present crisis "is primarily rooted in the modernist promotion of what Lewis Mumford called 'the myth of the machine.' This myth is not simply an isolated aesthetic ideology but rather a pervasive sociocultural phenomenon that promotes expert scientific knowledge and elaborate bureaucratic structures that facilitate the five P's power, productivity for profit, political control, and publicity." Many scholars argue that our civilization is now entering a "post-modern" phase, characterized fundamentally by widespread lack of belief in any such overarching, generalizing stories about why the world is like it is.[3]

The consensus described by West was crafted in the Cold War struggle between superpowers. It privileged a technocratic scientific discourse of rational experts and spawned an entire university research establishment tied to it in many ways. It came at the expense or exclusion of alternative or local knowledge, not only internationally but also within our own country.

Minority understandings were subordinated, or silenced, in the "war effort" of the whole national modernist project … much as Japanese Americans were silenced and shipped off to remote camps in the name of defeating fascism during World War II. Such alternative understandings of the situation, their values, their version of events, their narrative, weren't necessarily destroyed, but rather subordinated to a larger, hegemonic discourse.

Dynamic forest floor

When the conditions underlying or propping up a particular dominant worldview change, the worldview itself must change. A "discursive break," or a space, is opened in which subordinate or alternative narratives, or understandings, can emerge into public conversation.[4] With the fall of the Soviet Union and the end of the Cold War, we now appear to be at such a point in our civilization; a deep sense that "something is changing" pervades all aspects of our lives.

Many things are in flux right now, as we are between convincing narratives about how the world works, between paradigms or what Shumway (1991) has called "guiding fictions." What exactly we call them doesn't much matter rather, we should grasp the idea that some convincing worldview must necessarily emerge for any society to hang together and work for its members.[5]

SPECIAL FOREST PRODUCTS: CONFLICTING WORLDVIEWS

So why have these alternative claims to proper use of forestlands emerged into public discourse now? As the larger civilizational worldview in which they are nested changes, the legitimacy of narratives (such as the one described by White), of practices (such as massive clearcutting of our forests), and of institutions based on them (such as the U.S. Forest Service) is now more contested and open to question.

It is in this milieu of many sectors claiming recognition for their uses of forestlands that SFP practices have emerged and come into public view. And it is in this context that the forestry research and policy community is belatedly coming to recognize that a whole lot of SFP harvesting has been going on in our region for quite some time.

The legitimacy crisis I described above is also being felt by academics in the forest research community, most of whom remain wedded to scientific positivism and the multiple-use forestry paradigm described by White (McEvoy 1992). Without romanticizing or privileging them, we are coming to understand that pickers and buyers—those most engaged in SFP activity—know more about SFP than most of us in the research community.[6]

Our basic argument today is this: we cannot understand or develop comprehensive policy on SFP without the direct participation of harvesters in the reconfiguration of forest policy and without taking into account their understandings and practices. Let me be clear: to advocate this is not to be

Pickup load of morels for sale

anti-science or to engage in some romantic advocacy. Without harvesters' participation we will have poorer science, poorer management models, and unenforceable policy. But we have an opportunity now, at this historical juncture, to change the way we do research and formulate policy, to engage all users of our forestlands, and to truly move toward cooperative management of forest ecosystems.

Now to be fair, part of the reason SFP harvesters' understandings and practices have been absent from these discussions is the difficulty of finding and engaging them. Mushrooming and other SFP collecting takes place in relative obscurity and remoteness deep in the forests and mountains of our region, and some harvesters are trying to lie low and keep the activity hidden for legal, tax, and other reasons. Also, secrecy is a necessary strategy for defending access to the resource, whether such access is formally legal or not.

But while policymakers with mandates to generate revenue from forest activities conveniently envision fantastic wealth earned in a black market economy, we encounter SFP harvesters driving aging vehicles, living in trailers or very basic housing (if not out of their cars), and wearing worn out clothes. (Have you ever worn sneakers with holes in the soles while carrying heavy buckets of wet mushrooms on steeply pitched slopes?) Buyers' homes are not palaces painted with gold, either. A few have moderate two-bedroom ranch homes, but everyone is living quite basically in economically depressed areas.

Cambodians are frequently seen driving newer vehicles, such as nice 4X4 pickups. But this is yet another example of the well known migrant strategy of extended families investing together in reliable transportation, rather than in shelter. Most Cambodians we have encountered live in low-income apartments or trailer courts. There are advantages to appearing successful in public as well. People who are perceived to have wealth are perceived to have power and are less likely to be taken advantage of. Also, it casts an image of "we're the real mushroom pickers," impressing other harvesters as well as buyers.

The downside is that Cambodians are outsiders who are carving a successful economic niche and displacing local traditions. They are a magnet for rumor mongering, which is a subtle but powerful form of social control. Negative images of "Asians" (Cambodians and other Southeast Asians) abound among the pickers we encounter, especially among Caucasians. Despite their frequent claims of not being prejudiced, there is clearly an anti-immigrant undercurrent present.

Buyers often report that local harvesters are "not as good" as the Cambodians. From an economic standpoint this may be true, but it ignores other motivations Caucasians or others may have for harvesting. Frequently we are told by whites that their main purpose for picking mushrooms is that it gives them an excuse to be out in the woods. The possibility of making money makes it even more exciting, plus every mushroomer dreams of turning the

corner and hitting the mother lode. One picker told us, for example, "Sometimes I come into a patch and I can't see where it ends, my heart starts racing and I let out a whoop. If they're big I yell 'walruses' so my partner will get a good laugh and feel the same excitement."

The crucial point is that local cultural attitudes and values are too easily overlooked or ignored. SFP harvesters are all too often regarded as "problems" to be managed rather than as actors in their own right.

It is interesting in this context to note the lack of a public mushroom harvester identity. Throughout the Olympic Peninsula, stores and taverns have signs saying "Hunters Welcome," but nowhere do we see "Mushroom Gatherers Welcome." Signs frequently adorn homes with "This family supported by timber dollars" or "This family supports timber workers," but nowhere do we see "This family is supported by SFP dollars" or "This family supports SFP workers," despite the fact that, as Keith Blatner (earlier in this seminar series) and others have shown, it is a multimillion dollar industry and employs thousands of people.

This lack of social identity raises numerous questions we are only beginning to understand in our fieldwork. In the recent years of timber/environmental battles that have raged on the Olympic Peninsula, the consequence has been a much reduced timber harvest and timber employment. However, given the long history of timber identity on the Peninsula, many former workers still describe themselves as loggers, and boys wear Logger World suspenders, trying to be optimistic about their future in timber. The reality, of course, is that along with a decrease in timber harvesting, automation is reducing employment. Many, it seems, are supplementing their incomes with SFP, but SFP gathering does not call to mind the powerful masculine image of logging and hunting; you don't hear talk about the "big mushroom fallers" or brushpickers of yesteryear. Except in the case of perhaps a very few dedicated individuals, SFP harvesting pays far less and is much more labor intensive than logging. In this atmosphere, if you were an oldtimer getting out in the woods to pick mushrooms, you wouldn't want to call yourself a mushroom picker.

As I was saying, one of the difficulties of research on SFP harvesting is that it's hard to find the harvesters. Even when you do encounter them, usually at buying stations, they often show an initial reluctance to open up. Many harvesters definitely resist SFP research if they know it has to do with regulation. Several times we have heard people mutter, "Oh no, another research project."

We recently came across a situation in which mushroom research plots were set up right in the middle of one of the best picking grounds in the area, and a large buffer area around them was closed off to harvesting. At least eight local pickers have told us they were so upset at being imposed on without being consulted that they have gone into the plots and picked mushrooms. Their activity, however illegal, irrational, or irresponsible, must be seen as part of an "everyday resistance" (Scott 1985) of the implicit arrogance of the scientific research paradigm, the dominant worldview of the powerful institutions of society I discussed above.

Recently the USFS Soleduc Ranger District has started issuing $120 season permits for commercial mushroom harvesting. This continues a process of fulfilling their mandate and managerial duties. It follows the Western scientific pattern of isolating from complex ecosystem processes specific, individual parts to be monitored and regulated. The commercialization of mushrooms prompted local managers to implement policy, as they did with hunting, fishing, etc. But in the process they disregarded local tradition; as a result many of Forks' schoolkids, elderly, and housewives were turned into outlaws. People there are adamant about resisting the permit process; they refuse to buy or can't afford permits, but continue to harvest their patches. The stepped-up monitoring and regulating has the unfortunate and perhaps unintended effect of criminalizing culturally and economically valuable activities.

Harvesters well understand that research and regulation go hand in hand. Even if permits are free, there is still a sense of losing control. All this is part of a deeper suspicion, we believe, of academics, especially "scientists," in producing information. Harvesters understand that information is not neutral and objective. However unfortunate, this sort of anti-intellectualism is based on a realization that knowledge and power have gone together and have rarely benefited them.

Scientific research is basically about control. Access to wild resources connotes a certain freedom from control; indeed, the "wild" nature of special forest products refers precisely to their being "unsubdued" or "out of control." That's also part of the allure about this activity; it seems to point back to a frontier narrative we once shared and still tell about, a closeness to a raw and untamed land. But why can't SFP practices point forward to a new narrative of sustainability?

Yet, however difficult the research, very real problems result when local understandings are dismissed or not taken into account. This is particularly true in the SFP arena, where harvesters are in some ways ahead of the research community in understanding the biology and ecology of the plants, along with the organization of picking, grading, preparing, and marketing them.

So for a variety of reasons, the lack of engagement of SFP harvesters and buyers with the forest research and policy communities has meant that harvesters' views are not feeding into the formulation of SFP policy. Consequently, SFP policies are being developed that are not only out of step with harvesters' practices and understandings, but are also unenforceable.

THE MAB SFP PROJECT

The Man and the Biosphere Special Forest Products (MAB SFP) project is focused on chanterelle mushroom harvesting in the Olympic Biosphere Reserve of northwest Washington. It is one of a handful of research projects designed to be interdisciplinary from the outset to the final reporting of research results. We are trying something seldom attempted—to discern the intricate workings of a big activity across biological, socioeconomic, and managerial disciplines. The project is policy-relevant, designed to yield information to resource managers, public and private, around the Peninsula.

We are mandated and have tried to be as public and inclusive as possible. Some preliminary comparative work has been started in the Southern Appalachian Biosphere Reserve, but much more work will be needed there.

Mushroom plot posting

As we noted earlier, there are three "types" of harvesting of edible wild mushrooms: commercial, recreational, and subsistence. Each of these is a "tradition" worth knowing, that is, a set of practices handed down from generation to generation, with a history. Our task has been to describe these traditions by creating a social profile of each.[7]

It is very important to realize that there is no single portrait of a mushroom picker, even within each of the three categories of commercial, recreational, and subsistence use. On the northwest side of the Peninsula (Forks area), for example, there is a long tradition among local Caucasians of going out to gather wild foods as a subsistence strategy, whereas on the southeast side (Shelton area) such a local culture of wild gathering is much less evident. Though mushrooms are present on the dry rainshadow northeast side of the Peninsula (Quilcene), there appears to be less harvesting of all sorts, although recreational picking appears to be relatively more important. On the southwest side (Quinalt area) there is a mix of ethnic groups and commercial activity that is still unclear.

What follows is a preliminary report, given that we are still in the middle of fieldwork and many patterns are not yet clear.

A) Commercial Harvesters

Why has commercial mushroom harvesting intensified so in the last decade? Implicit in our argument is that this increase has to do with national and even global economic restructuring, further analysis of which is beyond the scope of this paper.

While commercial harvesting of SFP, in this case chanterelle mushrooms, appears on the surface to be a relatively uniform activity, in fact we see two different movements: a phase in the maintenance or upward mobility of recently arrived immigrant groups—Southeast Asians (since the late 1970's) and Hispanics (since the late 1980's)—and downward mobility for local Caucasians thrown onto a "subsistence" base in declining mill towns.

Ethnicity plays a very important role in SFP harvesting on the Olympic Peninsula. For example, it appears that among all ethnic categories, it is largely Caucasians (and perhaps some Native Americans) who frame their plight in ethnic terms. Split labor market theory[8] would predict that those experiencing downward socioeconomic mobility, or who face the threat of it, should be the most active in defending their rights and privileges. An anti-immigrant, quasi-racist rhetoric could be a useful weapon. In contrast, Cambodians and Hispanics collecting SFP on the Olympic Peninsula are not downwardly mobile, and they seem less overt and, oddly enough, less "ethnic" about their claims to resources.

It appears that very few of the people harvesting mushrooms on the Olympic Peninsula come with a strong cultural tradition of mushrooming. All are operating in the relatively unregulated atmosphere in which mushrooming takes place; as immigrants with weaker language and cultural skills, Cambodians and Hispanics are particularly attracted to the unregulated nature of this business. You don't have to speak English or deal with foreign customs in order to make a living. With acculturation, later generations of Cambodians and Hispanics will probably drift out of this sector.

Ethnic strategies differ somewhat between and within categories:

1) Southeast Asian (Cambodian) - Several categories of Southeast Asians, including Cambodians (majority group plus a Muslim minority group), Vietnamese, Laotians, and some others, have been involved in SFP—particularly mushroom collecting—since the late 1970's. Their dominant position in regional commercial mushrooming seems connected to their arrival in the United States at about the time the mushroom industry began to take off.

Cambodians seem to specialize within mushrooming, according to both Cambodian and non-Cambodian sources. In Crescent, Oregon, R. McLain (pers. comm.) found that Cambodian groups divided the work into recognized roles: someone to scout out the location of matsutakes, someone to pick, someone to cook, someone to track market prices and sell the pooled mushrooms. Separate receipts were kept for each person's contribution of picked mushrooms, and people serving the group in these special roles were paid. This sort of organization seems distinctive to the Cambodians, and represents a group adaptation quite unlike that found in other ethnic groups.

Oddly enough, as the most entrepreneurial of commercial pickers, Cambodians more closely embody the "American" work ideal than any of the other groups.

2) Hispanic - Growing Hispanic involvement in SFP harvesting cannot be understood apart from the economic and political crises in Mexico and Central America that send increasing numbers of people northward. SFP represent another commodity in a menu of commodities for Hispanics harvesting in the western States. For example, along with R. Hansis (pers. comm.), we have discovered that some Hispanics will abruptly depart from picking huckleberries or harvesting brush to work in the apple and pear orchards of Yakima and Hood River, despite the fact that the wild products are still in fine, harvestable condition. They shift like this to preserve their seniority in economic niches they have long dominated.

Hispanics on the Olympic Peninsula are recently arrived (they have been involved only since the late 1980's), and they are internally divided into various sub-categories, including: country of origin (Guatemalans perceive themselves as very different from most Mexicans, for example), class/occupation (those who reside more or less permanently on the Peninsula vs. those who move in seasonally, typically in the fall to work Christmas trees), or subethnicity (many Mexicans pride themselves on Indian heritage; others emphasize mestizo traits).

In any case, mushroom harvesting for Hispanics is opportunistic and ancillary to "brush" picking (salal (*Gaultheria shallon*), huckleberry (*Vaccinium* spp.), and other floral greens). Since brush can be harvested almost year round, Hispanics in SFP devote their energies to it. Mushrooms are too ephemeral, seasonal, and volatile in price to be counted on as an income source. There may be other constraints as well, however; brush sheds hiring teams of workers may not want their workers picking mushrooms, since that would divert attention from the products needed by the business. In at least one case, it appears that Mexicans are clearly told not to pick mushrooms, and that if they get caught they will be dismissed. However, a larger brush shed told us they know their pickers go after mushrooms, but they don't care since it is more important that their subleasers form a commitment to the sections the shed has leased from a local timber company. Such commitment to their lease areas results in a quasi-stewardship system. Subsidized by mushroom income, the shed's brush pickers can afford to stay on.

3) Native Americans - So far, we are finding little evidence of Native American involvement in Olympic Peninsula mushrooming. This is rather surprising, since some groups (e.g., Quinalts) have a relatively secure, if fragmented, resource base that allows tribal members to exclude competitors and harvest SFP. Native Americans, like Caucasians, operate as individuals when it comes to mushrooming.

Various ethnographies of Olympic Peninsula native groups (summarized in Suttles (1987)) make no mention of use of mushrooms by any of the Olympic Peninsula groups—Makah, Southwest Coastal Salish (including Quinalt), Quileute, Central Coast Salish, or Southern Coast Salish (Puget Sound area). Since gathering was done traditionally by women, and women's activities have typically been underreported and marginalized, it could very well be that there was or is a tradition of women's gathering of mushrooms for subsistence, medicinal, and/or shamanic use. Native Americans have a long experience of being objectified by anthropologists and others and are especially reluctant to divulge intellectual property information.

There is growing tension between Native Americans and others over access to SFP on tribal lands. Because reservation lands were allotted earlier this century, reservations are a patchwork quilt of different and multiple owners. Consequently, enforcing SFP picking regulations is very difficult. For example, with such fragmentation and a permeable reservation boundary, it has been easier for the Quinalt Tribe simply to prohibit SFP collecting by nontribal members anywhere on the reservation than to establish and enforce a permit system allowing SFP harvesting on some sections.

4) Caucasians (Euro-Americans) - Wild mushroom harvesting by whites is several generations deep, especially on the northwest side of the Peninsula. In some cases, mushrooms are a subsistence item, an important part of the pantry. In other cases, harvesting is a hand-me-down tradition from father to daughter to brother and so on. Within this tradition there are practical benefits to the community, such as giving teenage boys a constructive activity and promoting their appreciation of the local environment, or giving retired loggers a continued link to the woods they love. It has partially to do with how nature is perceived; for a hiker or recreational picker, the forest is a place

to visit; for a logger or comercial mushroom picker, the woods are where they live—a place for giving, taking, and nurturing.

It is unclear how much of Caucasians' SFP orientation is a result of borrowing from nearby Native Americans, a legacy of gathering traditions from the Ozarks and southern Appalachians where many whites originated (with possible ties to Native traditions there), or an independent invention to buffer the seasonality of logging and mill employment. In any case, many Caucasians involved in commercial mushrooming on the Peninsula are suffering downward mobility, often related to the shrinking of employment opportunities in logging, millwork, and related occupations.

Caucasians have been in the business the longest, and have the best knowledge of local patches. They defend "their" patches, even though many are on public or timber company land. They resent outsiders of any sort disturbing their "traditional" activities—whether other ethnic groups getting involved in commercial harvesting, or regulators telling them where they can or can't pick. The ethic of independence, freedom, and defiance of authority is strongest here.

5) Other: There have been or are Russians, Japanese, and others engaged from time to time in SFP collecting on the Olympic Peninsula.

B) Recreational Harvesters

Urban recreational mushroom pickers are now being surveyed. Preliminary indications suggest that only some are organized into mycological associations and mushroom clubs. Recreational picking on the Olympic Peninsula seems to be declining, according to our preliminary discussions, because of the increasing maze of regulations and increasing competition from commercial pickers. Many people say that because it's so hard to find mushrooms in such a wet, dense forested area, they'd rather pick in the Cascades or east of the mountains.

Adopting the environmentalist rhetoric of fighting "overharvesting" of mushrooms, some recreational pickers have been instrumental in pushing for a series of laws and regulatory machinery to monitor and control commercial harvesting. Whether intentional or not, underlying this rhetoric and these policies is a certain attack on the class base of commercial pickers, threatening their livelihood. This is especially odd since studies show (e.g., Norvelle 1990), and commercial harvesters constantly claim, that there isn't an overharvesting problem. Nevertheless, it remains unclear what the long-term effects of intensive harvesting may be. Also, what constitutes "overharvesting" is both a perceptual and a research question. Recreational pickers, especially those organized into mycological societies, act as amateur scientists and tend to buy into the dominant scientific, rationalist worldview discussed above.[9]

C) Subsistence Harvesters

This is an undertheorized category. By subsistence we refer to those harvesters who "need" to incorporate some part of what they pick into their household subsistence strategy through direct consumption of what is picked. Most harvesters falling into the other two categories will keep some

mushrooms for personal consumption, but it seems largely in the local Caucasian category in the Forks area that people commonly pick for household consumption. Surprisingly, preliminary information suggests that few Native Americans on the Peninsula pick mushrooms for household consumption.

CONCLUSIONS

Along with policymakers, researchers and scientists need to draw SFP harvesters into ongoing, sustained conversations about management issues. SFP harvesters are co-actors in the regional drama playing out before our eyes. In the absence of good information, we in the research and policy communities have made them into whatever we need them to be—exploited workers, noble forest-dwellers, clever entrepreneurs, or bandits. We must be more sensitive to specific socioeconomic patterns—all SFP harvesters and harvesting are not the same (e.g., Forks vs. Shelton). It should be noted that, as co-actors in this drama, they in turn make us into whatever they need us to be.

From an economic standpoint, it is fundamental for policymakers to understand who the harvesters are. Though stories of wealth and violence may be an excuse or concern that initiates and drives policy, the industry may be fragile in light of the global mushroom industry. If local regulations become too restrictive, many commercial pickers dependent on an economic niche will leave the region and become either circuit pickers or commuter pickers. Buyers complain that they go through periods with mushrooms but no pickers. Thus in nonpeak times, local part-timers may be the only ones to pick up the slack when the pros are chasing hot spots or less regulated areas, or (like many Hispanics) are away harvesting other commodities. The important point is that not only are many mushroom pickers quite able and willing to be mobile, but so is the industry. Companies and buyers usually talk prices every day, and if a company can buy cheaper mushrooms of the same or better quality elsewhere, that is where they shift their emphasis.

This raises important questions about what kind of mushroom industry would provide the most benefit and be most stable for regional economies. One possibility being tried is promoting local stewardship over the resources and keeping the product within the Olympic Peninsula until it can be processed and value added. (Jim Freed discussed some of these possibilities last week.) Such a system would be much less susceptible to the roller coaster, cutthroat world of the global fresh market, which pits harvesters in economies with a lower standard of living (eastern Europe, Russian Far East, Chile, India, etc.) against harvesters in the Pacific Northwest. The long-lived and flourishing floral greens industry has cut down on bulk shipping and started processing raw ingredients into value added products, which are then put on the market. Evidence is emerging that the wild mushroom industry is following the same pattern, from drying and packaging to preparation of pastes and powders.

SFP harvesters on the Olympic Peninsula speak ambivalently about widespread clearcutting, on both public and private forestland, as the biggest threat to their resource base. On the one hand, pickers, especially Caucasians, do not question the right of timber companies to do what they

want with their own trees (hegemonic discourse). Yet when their favorite stand is cut, they see their favorite patches destroyed, at least for the next 15-40 years. The proportion of forestland on the Peninsula with stands 40-60 years old is increasing, so the longer-run prospects for chanterelle mushrooming appear to be good. The question is whether pickers will have access to these new areas coming into production.

The implications for land management are enormous and difficult. New models of local stewardship that reap the advantages but avoid the problems of the commons are clearly needed (McCay and Acheson 1987). In other cultures with long traditions of local land stewardship, self-interested invasion of the commons is kept in check through social controls and ties. SFP harvesters represent groups of people intimately working in the forest extracting renewable resources, whose social networks might effectively control resource erosion and thievery. Bringing them into the policy conversation is essential to improve practices and promote community sustainability.

We have a special moment in history to influence the nature of the new consensus that will certainly emerge out of the current contested period. This task is inherently interdisciplinary and political. Consideration of the value of SFP and SFP harvesters must be built into the curricula of forestry schools as we train a new generation of foresters, who must be sensitive to and knowledgeable about both the larger contexts and the range of local uses of the forest.

ACKNOWLEDGMENTS

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ENDNOTES

[1] My work with Brazil nut collectors in Peru has been with a local conservation group (Asociación de Conservación para la Selva Sur) and an international affiliate (Friends of the Peruvian Rainforest), on which I serve as a board member (Love 1989, Ricalde 1993). ("I" throughout refers to Love, who delivered the talk.) Co-author Eric Jones has done important ethnographic fieldwork on wild mushrooming both on the Olympic Peninsula and in the Oregon Cascades.

[2] This is hardly the place to embark on a social history of the modern world system and the place of scientific ways of knowing in it. Wolf (1982) is a good place to begin and to find further references.

[3] For many postmodernists, the modern rationalist worldview is an especially generalizing metanarrative, but is simply one of a variety of ways, or epistemologies, by which humans make assertions or truth claims about phenomena. Bases for such assertions vary in different cultures, ranging from empiricist or logico-deductive to authority, intuition, or revelation. That we privilege science (empirical and logico-deductive ways of knowing) in our "western" tradition has to do with politics, not truthfulness in this view. Best and Wellner (1991) review currents in post-modern thought.

[4] In this sense, there is nothing "post" about postmodernism: rather it is the latest or current version of anti-modernism, which has cropped up at every discursive break of the last few centuries. (I am grateful to Henry Rutz, Hamilton College, for this insight.)

[5] Eventually a new consensus is reached, though careerists in the cottage industry of postmodernism mimic their modernist counterparts such as Fukuyama in advancing the idea that history, at least "ordinary" history, has stopped, in a sense; that postindustrial, electronic society is in a new, permanent postmodern phase of development (Callinicos 1990).

[6] Additionally, science as we practice it has been influenced by the mycophobia of Anglo culture, so that mushrooming in particular has not been recognized either as a worthwhile activity or as an activity much worth knowing about (Arora 1990).

[7] A parallel concern is why some of these alternative understandings and uses of forest resources are called "traditional," while others aren't. To be labeled "traditional" becomes a valuable asset in defending rights to resources, one of which many Native American groups are rightly masters. But why, for example, is current commercial harvesting of mushrooms by Hispanics and Southeast Asians not "traditional?" How have these different "traditions" been constructed? Who uses the terms "local" and/or "traditional" to describe these people? They themselves do, as a weapon in defense of a way of life; recreational pickers also do, to distinguish them from educated, urban types like themselves. Identities are both constructed and imposed.

[8] In SFP we see the operation of a split labor market (Bonacich 1972). In a perfectly competitive market there would be no barriers to entry in any occupation, and wages would reflect the danger or difficulty of the work. The most difficult and dangerous occupations should be the highest paid, so as to attract workers to them. The split labor market model holds that higher wage workers are better organized and create barriers to entry to protect benefits and better working conditions from these market forces. Difficult, dirty work typically is performed by minorities, who are distinguished by ethnic identifiers with which they come to identify.

[9] McLain (pers. comm.) has noted that recreational pickers go on "forays," which originally connoted going out into enemy territory to pillage or take. While mushroom forays are not so violent, the term captures very well the estrangement from and longing for connection with nature that urbanites' recreational picking of mushrooms provides. Our point here is not to side with one or the other, but to expose the class nature of the two camps and the ironic contradiction (for some) of hard-working immigrants pulling themselves up by the bootstraps vs. anti-immigrant rhetoric. Many non-SFP-harvester Caucasians in the Shelton area object to raids that expel undocumented Hispanic workers, without payment of wages for work performed. Such crackdowns regularly take place during the fall.

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Special forest products in a forest community strategy and co-management schemes addressing multicultural conflicts

Lynn Jungwirth
Executive Director
Watershed Research and Training Center
Hayfork, CA 96401

Beverly A. Brown
Coordinator
Jefferson Center for Educational Research
Rogue Community College
3345 Redwood Highway
Grants Pass, OR 97527

MS. JUNGWIRTH: I probably need to let you know what the Watershed Center in northern California has done in the last 3 years. We're trying to figure out what you do when you don't do timber anymore, and that's all you had. So we're not unlike a lot of towns in Oregon.

One thing we've done is to start a community program to train local people to use Geographic Information Systems (GIS). Not only does the Forest Service need GIS, but also the county, the sheriff's department, and the fire departments need it. Everybody wants it, and they're willing to pay. It's been a very good program for us. We also started an ecosystem management training program and programs dealing with special forest products and value-added manufacturing of hardwoods and softwoods.

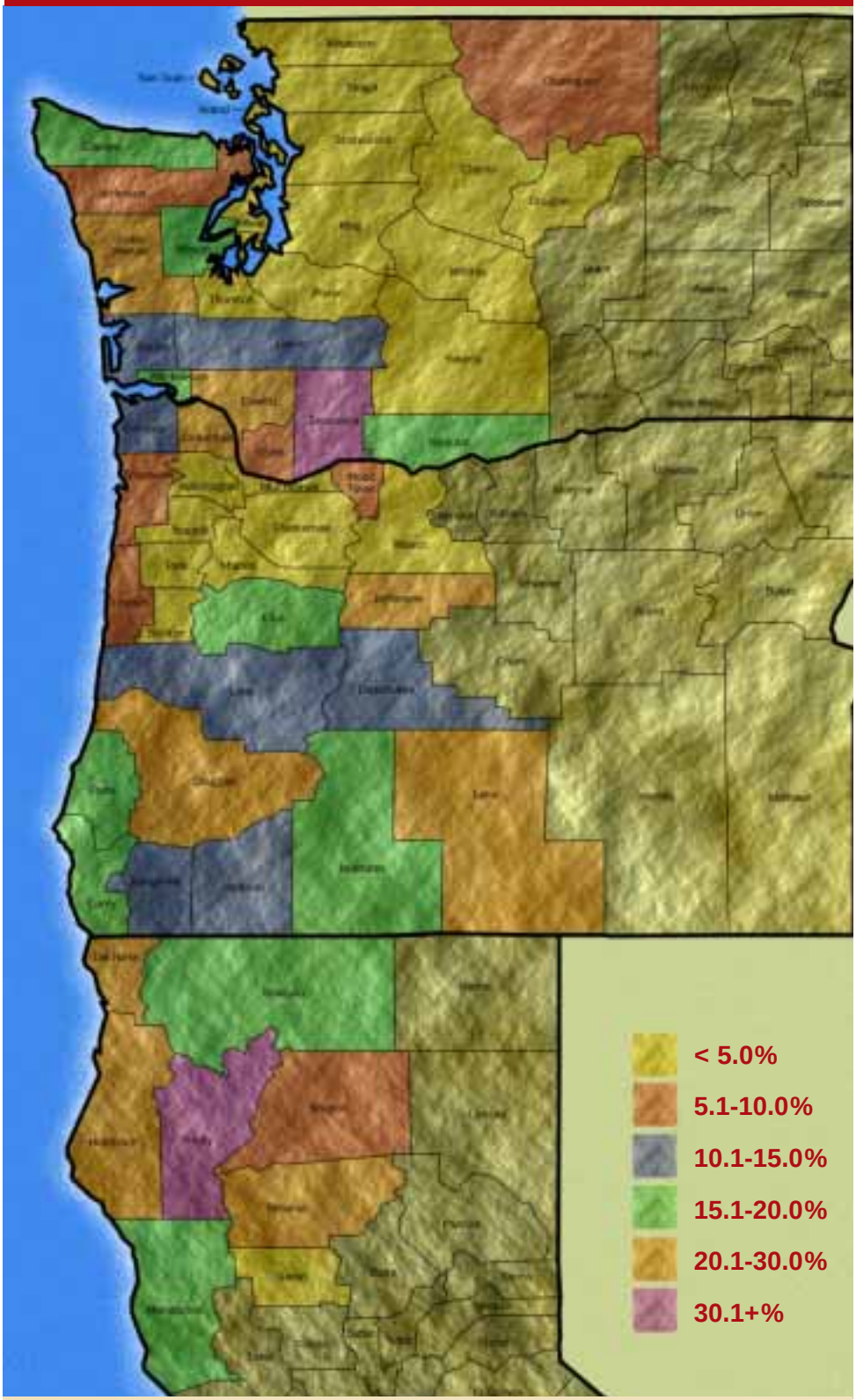
So, we're kind of like the frog in buttermilk: two frogs fell into buttermilk and started treading water, trying to keep their heads up. One of them finally said, "Well, I'm going to give up and drown." The other kept going, and pretty soon he made butter. The butter rose to the top, and he sat on it and jumped out.

That's where my town is—we're the frogs in the buttermilk. So we keep getting recognized for being innovative. We wouldn't be innovative if we had any choice, but we don't.

I wanted to give you a sense of my community because my presentation deals with communities of place, special forest products, ecosystem management, community development.

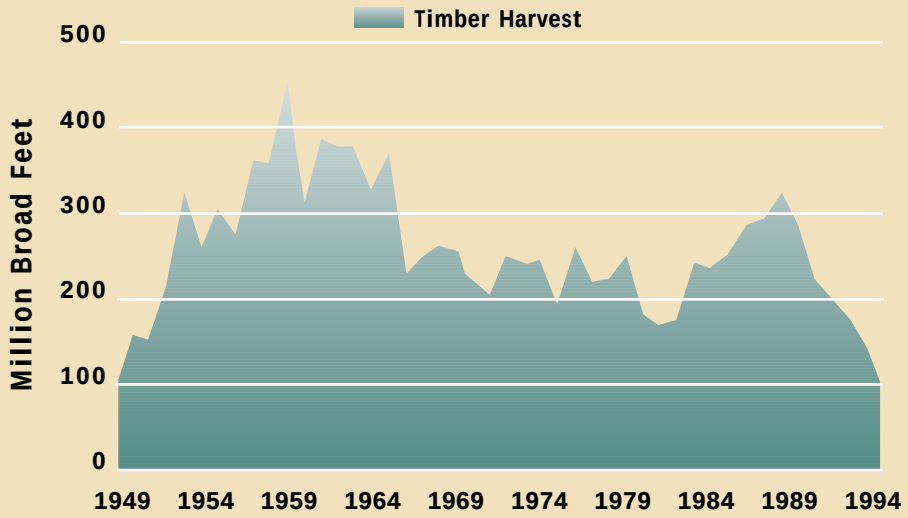
Beverly can talk about those other pieces of the puzzle that need to fit into communities of place, but I'm going to focus on communities of place. My place is Trinity County, with over 30 percent timber industry employment at the time the famous FEMAT team did its wonderful social assessment based on statistics from 1985 through 1989 (Figure 1). The other county with timber industry employment that high was Skamania County, in southwest Washington. That helps explain why we're so motivated.

FIGURE 1: Timber industry employment as a percentage of total wage and salary employment by owl-impact counties, 1985-89.



I want to show what happens when you suddenly switch to ecosystem management. This is timber harvest in Trinity County from 1949 to 1994 (Figure 2). As you can see, by 1994 Trinity County was down to 1949 levels. So when we think about special forest products, it's because we can't think about timber anymore. With special forest products, we should try to learn from what happened to timber and hope that policy for special forest products won't be based on those models.

FIGURE 2: Amount of timber harvested in Trinity County from 1949 to 1994.



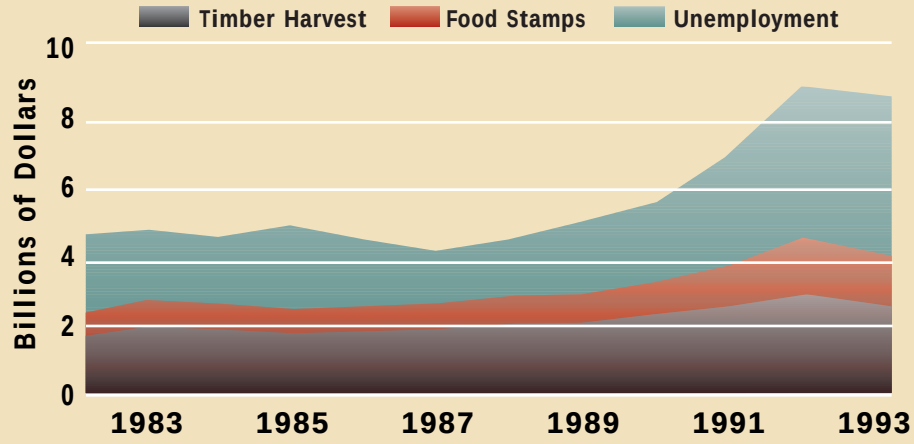
Data source: California State Board of Equalization (California Franchaise Board).

Graphing Aid to Families with Dependent Children (AFDC), food stamps, and unemployment can show what ecosystem management on the social level looks like (Figure 3). After the Dwyer decision in 1991, unemployment went up. We are now paying nearly twice as much in our county for unemployment, food stamps, and AFDC. That's the famous American safety net. I don't make fun of it anymore. I don't know what we would have done without it.

The Sustained Yield Acts of 1944 and 1976 were in part attempts to help stabilize communities by creating a sustained, predictable timber output. No one knew what would happen to the timber industry after the 1982 recession, but while the timber harvest in Trinity County went up, our AFDC rate was going up as well. Clearly, the timber harvest and the well-being of my community were disconnected.

Figure 4 shows what happens when the Government thinks it can do sustainable harvest. Look at the fluctuations in volumes between the public and private sector. Guess which lands were under a sustained yield mandate? That's right the public lands. So this mandate actually exacerbated the market problems.

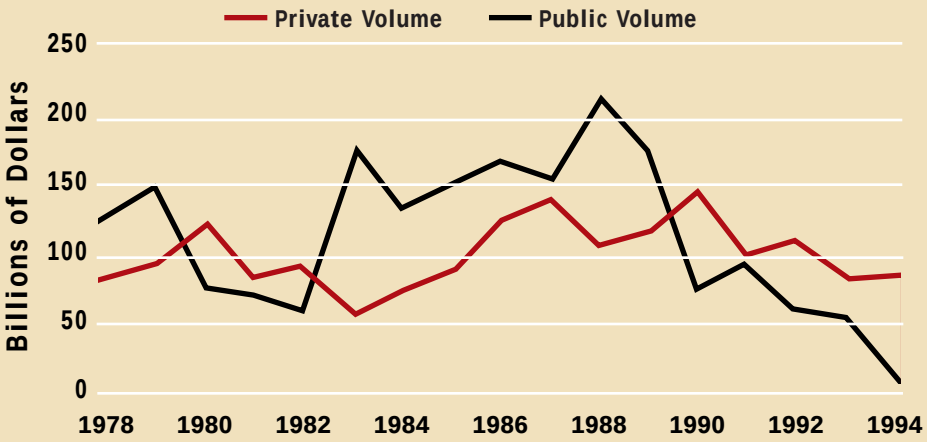
Figure 3: AFDC, food stamp, and unemployment payments in Trinity County



Data source: Bureau of Economic Analysis.

The other thing that we noticed is that 83 percent of the land in Trinity County is in the Shasta-Trinity National Forest. Of the 17 percent remaining, 12 percent is in the hands of private, absentee, industrial landlords. Privately owned land is only 5 percent of the land base. So we are in the hands of absentee landlords, whether it's public or private lands.

Figure 4: Amount of timber cut on private vs. public land in Trinity County.

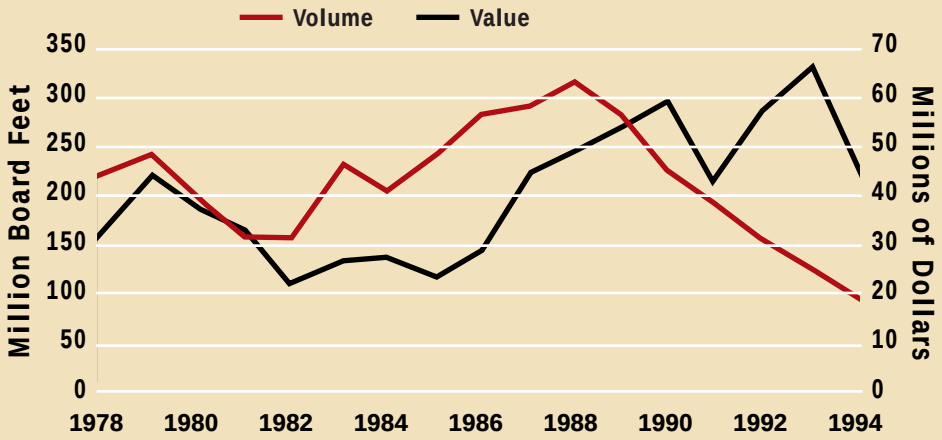


Data source: California State Board of Equalization (California Franchaise Board).

Since we wanted to see the social impact of the change to ecosystem management, we decided to look at the timber industry in our area. And this is what was happening as timber volume went down, value went up (Figure 5). Somebody made a hell of a lot of money, and it wasn't us.

So as we think about special forest products, we're interested in a principle of forestry that says forestry is an instrument of community development and ecosystem health.

Figure 5: Volume vs. value of timber cut in Trinity County.



Data source: California State Board of Equalization (California Franchaise Board).

Let me tell you what we've been doing about special forest products. About 5 years ago we started looking at other products besides timber, because anyone had to be an idiot not to see this coming. We started looking at where the markets were, and we were pretty intimidated by the globalization of the markets. They're sophisticated markets.

But people started harvesting things like prince's-pine (*Chimaphila umbellata*), yarrow (*Achillea millefolium*), mullein (*Verbascum thapsus*), mugwort (*Artemesia douglasiana*), and pine cones and boughs. It was clear that the Forest Service was going to set up regulations for harvesting those products, and that there was no information to help them determine what those regulations should be.

So we predicted that they would set up a permitting process where people paid X dollars for a permit. If too many people ended up with permits, they could raise the cost of the permit, or narrow the window of harvest.

That would be a real problem. The only reason we were gathering these products was because this was one of the few options we had left. Most of the gatherers were not getting Forest Service permits. So we were going to have to decide whether to be outlaws. Now, we tend to be law-abiding people, but when push comes to shove, we're willing to bend the rules a little.

So at the Watershed Center we went to the Forest Service and said, "Hey, how about a partnership, so we can help decide on the rules for harvesting sustainably. We don't want these products to run out. We don't want to end up with something like the Dwyer decision that shuts everything down overnight because we've pushed it too far. How about working with us?" So we began the partnership.

The interesting thing about harvesting special forest products is that we chase these products across the landscape. We look at trees as a 180-year or 100-year rotation, depending on the species, but for these products we ask, "What

are the annual crops? What are the perennials? What takes 5 years for harvest? What can be harvested in 10 years?" We look at the landscape entirely differently.

Well, that means someone has to know what's happening in terms of ecosystem management. We're trying to figure out the management regime for 20 species on a single piece of land. The books we read don't tell us that. Nobody knows that. So we thought, "We're in a fix because we can either shut down until somebody figures it out, or we can enter a partnership to help figure it out ourselves." So we did that.

We started with species no one is worried about. We have yarrow all over the burned areas. We have mullein all over the clearcuts. We have Klamath weed (*Hypericum perforatum*) they were paying people to pull it out. We began doing mapping and inventory. We talked people into getting permits, laying out plots, and monitoring to see what's happening to those harvest rates. But as the Forest Service does its research and makes decisions on regulations, we find that the people making the decisions are not necessarily getting information from the real world.

In my area, the most valuable special forest products are medicinals. Our climate is high and dry, and we grow incredibly potent medicinals. They're very good. The people with the best knowledge about medicinals are the indigenous people. There is a lot of expertise out there. But when we call a meeting on special forest products and herbals and medicinals, they don't show up.

So we set up a field trip. We bring in the experts and the local folks—the couple of them brave enough to do this—and take a van out to the watershed. We talk about what's out there.

I cannot tell you how many times we'll have a discussion and some expert makes a statement about where something grows the best: "Well, prince's-pine is usually found at this elevation, at this slope and aspect, under this kind of cover." And everybody says, "Yeah."

Then we talk about how people are harvesting it, and someone will say something like, "Well, you should be cutting it off. You shouldn't be pulling it out by the roots." And then we'll have more discussion and go back to town. And 2 days later Juanita, who went on the trip out of politeness, says, "You know that prince's-pine, I should take you up to those old clearcuts. It really grows well there."

"Juanita, why didn't you tell them that?" She says, "They didn't ask." They didn't ask.

I've got a Hoopa Indian friend, Sherlette, who knows everything the Hoopas know about medicinals and other plants we call special forest products. We were at a workshop where somebody was talking about propagating prince's-pine. They were going to propagate some in their greenhouse, but they didn't know whether it had been done before.

Next time I saw Sherlette, she said, "I know they can do it because I grow it around the house. I've done it for years."

"Sherlette, why didn't you tell them that?"

"They didn't ask."

We have a short time to get this figured out, because there is tremendous pressure on this resource, not just from local Anglos out of work, but from a lot of other people who are also out of work. We cannot wait for university scientists to figure this out. We have to be partners. We have to get this knowledge to the table, and do it in a way that will protect the resource.

I'm thrilled that the university is having these seminars, because you need to help us figure this out. And that means working with us in our communities to help us use our knowledge to avoid mucking up these ecosystems, and helping us make a living and stay in place on the landscape. We do not want to be outlaws. Scientists, let us participate in your research. Policymakers, ask us to help develop policies so we can make laws we can live by.

MS. BROWN: In an institution like OSU, you're being trained to work within a competitive academic discipline. That's very important, but it doesn't necessarily work in a community with very different goals. This is not a criticism. It's reality. I know it's tough to bring participatory research to the community while also meeting the demands you've been trained for.

I'm Beverly Brown, and I grew up in Redding, California, back when it was high, dry country with a low population. I live in Grants Pass now, and someplace in between I ended up at the Highlander Center in upper east Tennessee. I'd worked quite a bit in rural areas to see what local people could do to improve their communities, with an emphasis on social and workforce issues.

But I'd been frustrated. In the Cave Junction area, where we have a $6 billion cobalt deposit that people in South Africa would like to mine, some of the educated anti-mine activists wanted to work on a strictly legislative strategy. Those legal-based strategies can be very good. That's the model we've used most in Oregon: organize together, round up expertise, hire the lawyers, go to the legislature, go to the courts.

Some of us would like to pursue these problems as community issues as well. We'd like the right to know that the mining corporations are in the neighborhood (it took us a year to find out)—the right to know that the Bureau of Mines had spent $2 million setting up a processing plant outside Salem to test extraction processes for southern Oregon ores—we had no idea about that, either.

But how do we get the community involved? How do we have access to strategies where only the legal experts hold the issues?

Discussion at Non-timber Forest Products Workshop, Willow Creek, California. Seated left to right: Lynn Jungwirth; Julie Nelson, botanist, Trinity National Forest, U.S. Department of Agriculture Forest Service; John McCrae, botanist, Six Rivers National Forest, U.S. Department of Agriculture Forest Service; Bede Smith; Denise Smith, Christina Johnson, Trinity Alps Botanicals; Sherlette Colgrove, Hoopa Tribe; Beverly Brown.

At the Highlander Center, the central premise of community involvement is to go straight to the people being impacted—"What do you know?" Get together a circle of people in a small enough group that people can talk to each other face to face. Find out what everyone knows.

The basic idea is to get people from several areas who are directly affected into one place. And it is true that unless we ask in a situation where it's safe for working people to answer, they aren't going to participate. Most public meetings are not safe for working people. Their employers are in the audience whether they are in the room or not. Being able to make a living is crucial to staying in the rural areas where we grew up. We want to stay and so do our friends and neighbors.

If you want to find out what people think, don't have a public hearing. Have a public hearing for the organizers who are willing to speak up in public. But if you want to know what's going on in the working people's community, talk in somebody's kitchen.

At Highlander, people are brought together and asked to share their experiences with a common problem and their analysis of how to organize. If they then change things in their community, that's their business. But one quickly discovers, bring people together who are interested in changing things in their community, and, by golly, they'll do it.

I wanted to bring that back to my area: listening to who wasn't being heard. Looking for the multicultural issues because we're becoming a multicultural community all over this continent. Looking for issues that were structural to the economy. There's no question that forest issues are structural to our economy up and down the West Coast.

A group of us worked long and hard to create the Jefferson Center. The name is from "the state of Jefferson." We wanted to have a name that implied both the land and the people. The "state of Jefferson" is between Eugene and Redding. It's a piece of mountainous country that the railroad doesn't go through because it's too tough, and that California and Oregon don't pay attention to because it's too tough. We're a fractious people—a lot of folks call us a bunch of hillbillies or "goddamn rednecks." And we know a lot. We know a lot and we're important.

My book, *In Timber Country*, is a set of interviews from a white working-class community in the "state of Jefferson," mostly around the Rogue Valley region. The method was very much like those used at Highlander, asking people to analyze the changes taking place in their communities.

Selling huckleberries at farmers market

In the interviews, special forest products came up a lot. "We used to get mushrooms over there. But now there are houses worth $200,000, and someone will shoot you if you go there." "We used to hunt deer over here. But we can't go there anymore." "We used to fish up Thompson Creek, but they put barbwire on it." "We used to get blackberries for making all kinds of things, but you can't go there anymore because there's a new house with a no trespassing sign." And contrary to the old-fashioned no trespassing signs, which were a form of legal protection in case anyone got hurt, the new signs really meant "no trespassing." Those kinds of stories came up as a constant theme.

The other thing that came up in the interviews was how much the Latino community was involved not only in tree planting—they do about 90 percent of tree planting; very important work in our community—but also in special forest products harvesting. Also how important the Southeast Asian community is in our region, traveling with the mushroom harvest, especially matsutake (*Tricholoma magnivelare*). The Native community is also important, both the landed and the unlanded Native community. Native people share many of the same problems as Latinos and Southeast Asians.

The Jefferson Center is working in coalition with four major cultures. In fact, five—Weed, California, has an African-American and Anglo-American community. With special forest products right now we have four main cultural groups Southeast Asian, Latino, Native, and European-American. We have Native communities who may have lived here thousands of generations, and sometimes, seven, eight, nine generations for the Anglo community. They know a lot about the woods. They have ties to the community and the forest.

But community is complicated in the way ecosystems are complicated, more complicated than we can readily understand. You can't say anything romantic like "communities are stable and homogeneous over time." They aren't. They're many different communities smashed together and fighting amongst themselves—ourselves.

Nonetheless, there is something about a community of place, where people know each other, where they have ties. There's still a core of continuity, even though people come and go, and that's important.

But there are also communities that migrate—the Latino community and the Southeast Asian community, in particular. And in the Native American fire community, a lot of fire crews move with the fires. Local people think of these folks as newcomers. Well, Latinos have been in the woods for a long time, 20 or 30 years or even longer.

Southeast Asians may have harvested mushrooms here for only 7 or 10 years, but I was talking with Ronnie Yimsut, who is a native Cambodian and the Asian-Pacific Islander liaison at Bend/Fort Rock Ranger District. On his own time he also works with issues that affect Southeast Asian mushroom harvesters. At a conference, someone said, "This is great. You Southeast Asians learned all the Pacific Northwest mushroom cycles in the last 8 or 10 years."

Ronnie paused, then said, "We already knew." Cambodians have been harvesting similar species in Southeast Asia for thousands of years.

The Pacific Northwest receives rural migrations from rural places around the world. The Latino tree-planting crews are mostly displaced rural people from Mexico and Central America. The Cambodians and the Laotians are displaced rural people forced by war from the countries of their ancestors. For the most part, they have to live in U.S. cities now; discrimination makes settlement in rural forest regions difficult or impossible. Cambodians who try to live in Bend get harassed. Latinos have similar problems, as do Native people off reservation lands.

Between the in-place and migrant workers, a lot of people have a big stake in the woods. Many migrants of all ethnicities are involved in the commercial harvest of special forest products. For Southeast Asians, beargrass (*Xerophyllum tenax*) and matsutakes have been primary. Latinos are getting more and more involved. As tree-planting contracts and farm work decrease, Latino workers gather huckleberries (*Vaccinium* spp.), beargrass, and other nontimber forest products. Beargrass used to be used almost exclusively by Native Americans. Of course, Anglos have been using huckleberries and other species noncommercially since early settlement. So there's a gradual change in who's using which forest products. This is a big issue across a very large landscape, and we have to look at it from a panoramic perspective.

For instance, the Latinos who are harvesting mushrooms may also be tree planters. The technical workers doing vegetative surveys used to be tree planters. Loggers harvest special forest products off-season or if they lose their logging jobs. Tree planters may also do logging. People mix and match income strategies, perhaps involving themselves in two or three types of forest

work during the year. So when you're looking at the big picture, you can't look at just special forest products and who harvests them. You have to look at the whole cycle and status of woods work. How many activities take place on a piece of land?

I am going to assume that this element is missing in ecosystem management. So how do we get it in there? What happens if you take one community of place and say, "Okay. You're the primary group here. Let's have the local community do co-management, with preference for permits." An in-place group is probably Anglo, maybe Native. So guess what happens the next time Latino or Southeast Asian gatherers travel to that community? We already hear plenty of local opinions in southern Oregon: "Those damn Southeast Asians are taking our mushrooms," and "They are filthy people who don't know how to do anything and won't talk to us."

You know the stereotypes middle-class white people have against the poor white people who gather twigs for the floral trade—poor white trash or, more typically in our area, "rednecks." So there's a question of who's going to be considered good enough to be in the woods and under what terms.

Between these two groups of people—local and migrant communities—there is a good pool of knowledge. Specialized knowledge of regions from people who migrate; detailed knowledge of the landscape from people who are "in-place." Unfortunately, policies put management issues in rigid categories, in isolation from one another.

If we continue to look at forest worker issues as "us and them," we're going to end up with more race wars, but this time, out in the woods. We can easily re-create the problems of the inner cities in the forest. Unfortunately, we're already headed in that direction. Southeast Asians have been shot in the back while mushroom gathering. Latinos have been beaten up or shot at or had knives pulled on them. Poor whites are told to "Get the hell off this property" and the landowner sends the dogs after them. Natives know the tensions between white and Native communities.

We can't afford it. The forests can't afford it. If people are locked out, they will become outlaws. And this is true globally. If poor people can't continue legally gathering the products they've customarily harvested, they will enter illegally. Changing access rights makes people illegal when they continue the activities they have been doing for decades.

If we want ecosystem management, we've got to do it as an integrated unit. In terms of the workforce, that includes the tree planters, the technical workers, the special forest products people, the timber people. I don't look at special forest products by themselves. But how do we get these people involved? What does one say when one's employer is the audience? What are the harvesters, the loggers, the tree planters, and the technical workers going to say when an industry is their employer? Not a hell of a lot. So you're not going to get ecosystem management, because they aren't going to be contributing their large store of knowledge. So in some ways, co-management is almost necessary if you believe that the health of the community, as well as the health of the forest, is important. But how do we do that?

An alternative is a lease or some other kind of business agreement that will be in the hands of large industry—for instance, barter arrangements or the goods-for- services arrangements that industry is promoting as an "industry stewardship contract." These industry proposals don't have much to do with stewardship at all; they have to do with corporations having control over a piece of land. These are lobbied at a national level.

The problem is the danger of creating property rights of access. Property rights on national forest lands are a real problem between everybody's stewardship community activist proposals and industry proposals that are long term.

I think we can include both the in-place communities and the communities who come through every year. We need to have people sit down and talk in a council where they as a workforce help co-manage a piece of ground. We need to create situations where property rights are not possessed, because with different groups using the same piece of ground, no one group can claim sole possession.

This is very different from current policies, but it's a possibility. It's done elsewhere, especially internationally. We have to find ways to get people to the table and to have chairs there when they arrive. For instance, Cambodian refugees from the Khmer Rouge don't want to talk to anybody in authority. They know what that means—meetings to them were public executions. Cambodians don't want to be involved in public meetings, or to be seen at all. It is sobering.

Recent Latino immigrants have been dealing with a patronage system in Mexico a political system that's very different from ours. People are cautious about joining a civic conversation, and they have a long history of discrimination in the United States, especially in the fields and forests.

The poor Anglo community knows what it's like to speak up and get fired. I've been involved in meetings where people were later told that if they went to any more meetings, they would lose their jobs.

So let's not be naive. We've got to create a situation where all the parts of the forest workforce have the freedom to speak. That freedom does not exist now, and you, as researchers and concerned citizens, will not get the information you need to accomplish good forest management.

We need to create some kind of management system that allows us, through face-to-face talk, to create community well-being for all of us. Rural Pacific Northwest communities will cease to be exclusively Anglo or even Native. We already have a global workforce in our forests. So we have to talk to each other.

And that's where the Jefferson Center and the ideas of Highlander come in. We had a workshop recently with 31 people, Cambodian, Chinese American, Native American, Latino, and Anglo. We had technical workers, tree planters, folks in special forest products. We had researchers.

We had four primary languages and conducted the workshop in Spanish and English. It's slow and expensive to do it that way, but miraculous things can happen. Afterwards, people were saying, "We've never been to a meeting before where we lived together as brothers." People quickly saw the connections as they listened to each other's stories. People contributed information to construct a timeline, a history, for tree planting, for special forest products (mushrooms in particular), for technical work.

Norman Uphoff has recently written a book called *Learning from Gal Oya*, about Sri Lanka co-management systems and irrigation, working with the bureaucratic system. Not *against* the bureaucratic system but *with* people's irrigation collaborations from the bottom up. Uphoff concluded that making any of these systems work takes *ideas* and *ideals* and, most of all, *friendships* people knowing the land and people knowing one another. Those structures carry the whole thing.

To close, Aristotle said a long time ago that justice and friendship are about the same thing, and they occur in about the same proportion. To work effectively with special forest products management, we need to listen to harvesters as well as scientists. But to work with harvesters, we must create situations in which people can reach across great cultural gulfs to speak to one another. It is the work of the Jefferson Center to help create that bridge, and to encourage the face-to-face trust that can make ecosystems collaboration a reality.

AUDIENCE: How does the Forest Service reach out to the public? The Forest Service seems to prefer a public forum, but people won't say anything there. So what kind of a forum do you recommend?

MS. JUNGWIRTH: In my community, the kind of forum that works is one-on-one where a Forest Service field worker talks to people out on the ground. Unfortunately, those people are usually forest technicians, not people asked to the table when biologists and managers make decisions. This kind of split-level interaction leads to a great deal of frustration within the Forest Service because on-the-ground reality just doesn't get into the mix.

When you establish those relationships, as our organization tries to do, you can entice people to workshops. They still don't talk much, but at least they're there. After awhile, relationships develop.

The Forest Service does not currently have the money or the staff to do this. It is not recognized as being important enough, and it's not what they're trained to do in forestry school.

AUDIENCE: How do you get people to come to a forum?

MS. JUNGWIRTH: Chili.

MS. BROWN: Yes, chili. Transportation. People who work in the woods can't afford time to go to meetings unless you pay for transportation, food, and lodging. Even then they can't necessarily afford it. In one case, a supervisor paid 1 day for work lost so a worker could come to a meeting because the supervisor thought it was important.

The Jefferson Center, as a private nonprofit organization, brings people together to work with various community leaders. It's difficult. We spend a lot of time on the phone.

On a more official level, in your research or in the Forest Service, some of the ways to make bridges are simple. You need to have someone who speaks the language, who knows the culture, and who cares. You need to build personal relationships. If your people are all English speakers, send someone along who can tell people in their own language whether you, as a researcher, are safe to talk to. Your good intentions may cause marginalized people a great deal of trouble.

The other thing you need to do is bring the knowledge back. Bring it back to people. Don't get a Ph.D., take it, and become famous. Bring it back. If you do that, you'll build trust and community. If you don't do it, it just tears communities apart. Our communities are already in enough pieces. They've lost a lot of their internal structure. Down in southwest Oregon we're all at each other's necks, and I mean the Anglo community in this case. It's not worth it. You need to get those trust-building conversations back in.

MS. JUNGWIRTH: I think the social aspect is the most important piece right now—how you work with people, how you work with groups, how you make decisions, and how you respect the local knowledge.

A lot of land managers end up tied because of that. Local people often know simple solutions but just weren't asked. In one restoration project, they spent a long time doing the engineering and the design work. Then they went down to the coffee shop, and one of the locals asked what they were going to do.

"Well, we're going to put in this in-stream structure."

And he asked, "Well, what about that 'blue goo'?"

"What blue goo?" So then he told them about this blue clay and what it would do to their machinery and their design. And on the back of a napkin he helped them redesign the project, and things went well. But most of our land managers don't seem to have that kind of respect for local knowledge.

MS. BROWN: The depth of in-place knowledge is very important. It's also very important that migrant workers bring in their technical knowledge. But we need to have the in-place communities as the primary participants, because that's where the projects are grounded.

We do need technical knowledge from the university. But we need it in interaction with local and migrant workers. The university can provide perspectives we don't get at the community level. We need help making those connections. In Sri Lanka they've successfully created co-management schemes that could in part be applicable to us here. In fact, it's inspiring. But it has to be done within the context of the on-the-ground working community.

MS. JUNGWIRTH: In fact, we're rethinking the whole idea that the Forest Service should be the stewards of the land. Maybe we should be the stewards. We've seen too many migrant workers and I'm not talking about tree planters. I'm talking about biologists and planners and decisionmakers and rangers who stay for 3 or 4 years and then disappear. We want the landscape to be taken care of. We want it to sustain us over a long period of time. I'm not sure we can get that with the kind of interaction the Federal land managers have with the land.

So maybe we're talking about a community management model. Not local control, but where the national interest provides the umbrella. You have some national goals, but you allow them to be worked out at the local level.

AUDIENCE: National forest lands are public lands, owned by taxpayers throughout the country. How does the local community serve itself and at the same time serve the interest of all the people with a vested interest in the land? How do you deal with that?

MS. BROWN: I think that's a very important question. Any system I would feel happy about would have to consider both aspects. Of course, we may have to change the ways in which national rules and regulations are administered in the field.

This would be impossible if we started dividing up the land into stewardship contracts that become a kind of property. For instance, grazing leases have become a kind of property. Once we follow that example, it will be a mess. If we start down that road, will there still be public access to public land? My guess is that eventually, there won't be. But with a co-management system there are ways to keep the conversation going and avoid creating property rights for single individuals, companies, or other business entities.

AUDIENCE: I think the single most important product our forests provide is water. Over the next 20 to 25 years, their need to deliver pure, clean, plentiful water is going to completely change the discussion of how to manage these lands. What do you think about the Watershed Council, which involves biologists, the agencies, and the landowners and workers? What experience have you had with that?

MS. JUNGWIRTH: California has been trying to figure this out with bioregion groups and various watershed councils. It looks good except that the workers are never at the table. There are always those "empty chairs." People cut deals and the worker position isn't represented. I think these councils are going in the right direction, and I hope they work out. But if we don't broaden that vision, it's not going to be very useful.

MS. BROWN: I agree that we need to create a meeting structure that bridges the styles used by workers and middle-class people. Working people mostly use narrative stories to show examples. That drives the middle-class participants crazy. Middle-class people talk in theories and generalized examples. That drives the working people crazy. The differences between the languages of narrative and abstraction are as great as between Spanish and English. People in forestry school should think about this as they seek public input.

A few people are bridge people, though. And those bridge people need to help us find the way across these class and cultural differences.

AUDIENCE: How can we address the concept of more local involvement and control while dealing with the social pressures of population centers elsewhere that also want control?

MS. JUNGWIRTH: It's a tough one. In the long run, both groups have to be involved. In a perfect universe, everyone would have a place to live and none of us would get displaced. We don't live in that kind of world. Nonetheless, we need to take advantage of knowledge of local and in-place systems, and whether people want to let the other folks in. One thing that was clear after we looked at the four different cultures is that the migrant and technical crews have a tremendous amount of expertise in mushrooms and tree planting that could be very useful to the in-place communities. What's the balance? When everyone migrates, that's not a good balance. We've just got to adjust the balance so there are some rights.

MS. BROWN: We've been trying to find people who have set up co-management systems that involve migrating and in-place communities. There are a few in Africa and in a few other places. Even those usually involve only two groups. But for the moment, we're trying to do something no one's ever done.

That's exciting, not discouraging. It's wonderful to have this opportunity. We've got to come up with something. We can't afford a war in the woods like we've had in the cities.

AUDIENCE: I think there's a political shift in Oregon to an urban-based, non-resource-based population whose view of the forest is recreation, especially on public lands. And they don't want them touched. How do you deal with that?

MS. JUNGWIRTH: You mean the ol' urban amenities. There are urban people who want to hike in the Sierras, and they don't want anything changed. There are also some academics who suggest that things can remain natural and be pure forever. If that's the message sold to America, then we'll die out and those towns will disappear. There are other systems in the world willing to do that. The Seventh American Forest Congress is coming up, and people are going to have to talk about these issues.

MS. BROWN: There's a piece of controversy embedded here. The folks driving a lot of those sentiments in our area came from urban areas and they don't talk to the working-class people. They don't know what's going on with Native or long- term Anglo people in the woods.

So what you have, again, is a social problem. Who talks to who? If you moved from the city and you're a middle-class, represented-class person, that's the circle you stay in. You create organizations that appeal to groups of people similar to yourself. The big environmental group in our area is in Ashland, the upscale town. It is not in Grants Pass, which is still predominantly working class. It moved from Grants Pass a long time ago.

So there are exclusive circles of conversation, friendships, networks, ties. It's a social phenomenon. Middle-class networks do not include people who are workers or Latino or Southeast Asian or Native American, and vice-versa. So there's a problem in the rural area about who is talking to who.

I've been told in the last year by someone who was supposedly very knowledgeable, "Well, the Latino folks are just there for a job. They don't care about the woods." One Latino in our Jefferson Center workshop worked planting trees. Planting trees is hard work you're away from home, and sometimes you sleep on the ground. And if you're a Latino, sometimes you don't eat too well. Yet this guy talked about how wonderful it was to plant trees, and how good he feels "to give life to the forest, because the forest gives life to all of us."

MS. JUNGWIRTH: So should we chase him off the mountain? If the people in my town who objected to Latinos taking jobs would listen to that, they would not want to chase him off the mountain. And if the urban people could hear him talk, they wouldn't want to chase him off the mountain either.

AUDIENCE: In your work, are you organizing and collecting information on special forest products or forest issues?

MS. JUNGWIRTH: We have a couple of projects going. We're taking inventory and assessing tree species that have markets for special forest products. We're also working with the Hoopas to document some of their knowledge. That ancient knowledge is just about to disappear because the traditional Indians are not passing the information on to what they call the urban Indians. Before, the Native Americans would say, "I'm not sharing that knowledge. You'll just exploit it. I won't have any control over it." Now, for some reason, they're willing to share that knowledge with like-minded souls outside of their culture, because they're afraid it will be gone forever. So we're helping them get that knowledge documented and transferred.

MS. BROWN: Of course, people want jobs. But if people have a choice between a job that trashes the woods and one that gives them a long-term interest in the forest, chances are they'll protect the woods. At a recent workshop, we had some wonderful stories about small tree-planting stewardship contracts. Tree-planters far preferred a 3-year tree-stewardship contract over plant-and-run methods.

Hands down, there's no question about what people want. The first five things they listed as workshop themes were cooperation, communication, community, control over work, and to be seen and heard. None of those call for making the highest possible profits.

AUDIENCE: So how do you, as a policy person, deal with the "economic steamroller"? I work for the O&C (Oregon and California Railroad) Lands, and the steamroller we've got is that ecosystem management equals less wood, which equals less money for the counties. We need to make up that money. One way is through special forest products: mushrooms, ferns, etc. So where does that fit in with creating a social system, while we still make enough money from special forest products to give back to the O&C counties and keep people happy?

MS. BROWN: The timber industry is currently lobbying in Washington for industry-controlled stewardships, which they claim can make more money. And if we don't start producing something off the O&C lands, they may be turned over to the State. So we need to create viable markets and community-involved management for special forest products. The value is there.

MS. JUNGWIRTH: We've got the same kind of problem in Trinity County because we were used to working off of the Federal Reserve. So we took our statistics to the county supervisors to discuss the difference between the money that went into the county coffers for schools and roads from the Federal Reserve, and what happened when you disinvested in your community by letting industry take all of the capital out of it. Do we want this unsustainable basis for schools and roads, going up and down with the market, or do we want a sustainable long-term reinvestment strategy for our communities, where the community tax base and economic activity can support the town?

The large industrial model basically turned our county into a colony. Option 9 came down and said let's reinvest in these counties and revitalize them. Well, guess what? We didn't have sewer systems needed for loans. We didn't have water systems. We didn't have industrial parks. We still don't have them. We still can't afford them. So that's the argument that I think you can make.

MS. BROWN: The moment you get a firm voice from the rural working people opposing a corporate monopoly in rural America, all hell breaks loose. And it is dangerous for working people because industry is very powerful. On the other hand, a collective voice from working people is dramatic because industry assumes the community will stay quiet, and vote conservative if they vote at all. Only 30 percent of dislocated timber workers are registered to vote—that tells you how powerful people feel.

We desperately need an independent community voice, because the environmentalists are willing to make arrangements with industry and ignore rural community efforts. They're talking up there and we're living down here. So that doesn't solve things either. We need community involvement about infrastructure, about recapitalization, reinvestment. There's no other way.

AUDIENCE: Are you working with other groups to change national laws about how national forests operate?

MS. JUNGWIRTH: There's a group called the National Network of Forest Practitioners. We're trying to address that network. We're trying to work with the Seventh American Forest Congress. We're trying to work with the Northwest Economic Adjustment and Ecosystem Jobs in the Woods Program to show people that retraining the worker while keeping the old structure won't help communities—those structures have to change.

MS. BROWN: In our area, we're still small, we're new, we're still trying to get people into the conversation. By having multiethnic, multilanguage forest worker gatherings where folks can see each other face to face, we're starting to bring that knowledge together to see how the issues interact and relate and discover how they affect each other. Our sole purpose right now is looking at workforce issues and getting folks face to face.

MS. JUNGWIRTH: One of the biggest problems is Province-level teams formed under the spotted owl management FEIS Record of Decision (USDA and USDI 1994). They enter the Interagency Executive Council and make decisions about where to put money in the resources.

When they started organizing those 2 years ago, my county said, "All these top-level executives and resource managers are going to make decisions. Where is their counterpart in forest sociology and economy?" They still don't have anyone. It's that kind of utter disrespect for any science besides biology that keeps the others from getting equal weight. At the local level, working with land management, you need somebody credible at that table. Not me. I'm local. I have no credibility when I talk about the social and economic ramifications of their decisionmaking.

MS. BROWN: Someone like that would make a lot of difference. In all the social assessments I've seen, the best work is mostly concerned with people in timber, because that's what people know the most about. But on nontimber issues, there's hardly been anything done.

Luckily, some of us working people were trying to find out more. And I'm very glad there's a little bit of work starting on special forest products especially by researchers in Washington State. We need economics from a community perspective, not just the utility maximization dogma.

AUDIENCE: This is a national and international issue. But we have a third-world dimension in this country, a subsistence economy that occurs throughout the United States. It can be characterized regionally, and not necessarily just where there's a large public land base. Even where there's a lot of private timber ownership, cultures are in a subsistence mode, and those cultures are changing.

For example, in the Mississippi Delta, people have fished the local streams and made a consistent living. They used cane poles. But now that the lands are being bought for investment or second homes and the no trespassing signs are serious, these people no longer have access to water and fish. There are all sorts of stories nationally, but they're not getting out to Congress and the people in power in Washington. They're overlooked by the press. The press is a mighty powerful tool.

MS. BROWN: Well, a big problem is that if I'm the mill owner and Lynn is the mill worker being laid off, and I'm sitting here and a reporter sticks a microphone in her face, I can tell you what she's going to say. However, if the reporters would talk with people when they're not vulnerable, they'd get a much more complicated story. So the press is in an awkward position.

AUDIENCE: In Mexico, it's different. The only way to talk with those people, when I was working in Mexico, was to work with them and build some trust. That's the only way—trust—to start talking with them.

MS. BROWN: It takes time, but we have to start. We have a group of people in conversations now, 18-year-olds up to 60-year-olds.

AUDIENCE: I wondered how you're able to do the work you're doing. I understand the motivation, but financially?

MS. BROWN: I work three-quarter time as a secretary at a community college. It provides me with health insurance. The Jefferson Center raises money from foundations who are interested in environmental justice work. Lynn's a zealot, I'm a zealot. We spend a lot of our own time, our own money. And it's hard.

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American Indian cultural models for sustaining biodiversity

Dennis Martinez
Takelma Inter-Tribal Project
Restoration Consultant
785 Barton Rd.
Glendale, OR 97442

Just to give you my own background, my grandpa's bones and grandma's bones on my mother's side are in the San Joaquin Valley, and on my dad's side they're in northern Mexico—Sonora, Mexico.

My tribal background is O'odham on my dad's side—Sonora, Mexico—and I'm adopted by the Crow tribe, Whistling Water Clan Pretty Weasel family. My Crow name is De'k Sash 'M' Gosh, which means First Eagle.

What I want to talk about is something like when a person is living in two worlds, two worlds that are just now beginning to come a little bit together. These two worlds are very different.

I always have to have the caveat that I don't speak for any other Indian but myself. That's standard stuff. There are a lot of different kinds of Indians in the world. I do work with a lot of traditional people, a lot of elders, and I work in northern Mexico, in the United States, and in Canada.

You're going to read books talking about Indian people being in North America or South America 10,000 to 12,000 years, maybe 30,000 if the scientist is really brave. But there's a site in Mexico that may be much older.

You have heard of the Bering Strait theory. It's only a theory. If you search the literature, you will not find a single article that confirms the theory. What has been done is that one scientist after another has copied this idea.

You've heard of the megafauna extinctions. There's utterly no evidence for it, yet we hear over and over that Indian people exterminated the megafauna in North America. I can go on and on and on. The books you read don't reflect indigenous history at all.

So what we're going to have to do is start in the beginning and try to give you a traditional point of view. You're not going to find it in a book. There's no book out there and there are very few articles that tell you how to go from the past, which is the collective heritage of everyone in this room, to the present in solving problems using both science and traditional environmental knowledge.

In fact, what I'm going to talk about is trying to integrate traditional knowledge into modern science. I'm not putting Western science down. It has a very useful role, but from the traditional point of view, we feel it has a limited role. I will talk about why we need to try and integrate or form a synthesis of Western ecological sciences and traditional environmental knowledge.

There are around 300 million indigenous people on this globe of 6+ billion people. Those 300 million people are right now experiencing the worst genocide in the 500 years since the European voyages of discovery. The last 30 years, for example, have been utterly devastating to indigenous peoples in Mexico, also in North America, particularly in Canada for the last 20 years, in Amazonia, or in Siberia under communism, and it is no better now since the government's changed.

We're experiencing a global assault that's unparalleled in world history an assault on our cultures as indigenous people, just as biological diversity is experiencing an assault of a magnitude many times that of natural geological or climatic events.

Tribal and Forest Service representatives looking at deergrass management in Stanislaus National Forest

What I'm going to tell you is that biological diversity and cultural diversity are linked. You cannot have one without the other. That is a very important concept to grasp. Zah Naveh, an Israeli restoration ecologist, has proposed that we call cultural diversity and biological diversity 'ecodiversity' because that's very broad. It encompasses both culture and biology.

There's a tendency to think of nature as pristine. I think people are beginning to realize that there are very few places on this globe that one could adequately describe as pristine. The anthropogenic landscape has been around for not just tens of thousands of years, but hundreds of thousands of years.

We're going to have to reorder the way we look at the world a little bit. If we as scientists view preserving wilderness or biodiversity as worthy of study only when the area has no native or any other peoples, then I think we're dangerously on the wrong track. If you take the native peoples out of their own habitat—the forest, the desert, the tundra or wherever—I think 9 times out of 10, the ecosystems start to unravel. This instability comes about because people have learned, as native people did here in North America for eons of time, to live in a relationship culturally and spiritually with the plants and animals in the natural world.

David Brower once said that if you took the whole time that life has been on this globe and you compressed it to 24 hours, the last 400 or 500 years of industrial civilization would last 1/40th of a second. So I'm trying to give you a very, very important time perspective.

People who lived in a place for generations—tens to hundreds of thousands of years—needed to have their act together in order to survive. They needed to know how to use the land, and how to use the land sustainably. This is not a function of just one population in any one generation.

Pictograph – "She who watches"

If you've ever been to a State or county park and tried to find a stick of firewood—after 20 or 25 years, you can't find one. You've got to take a rock on a rope and throw it over a limb to pull it down. I've done that before. People can exhaust the resources of a place in 20 to 25 years in this culture. We can do that in a few years with mushroom hunting, for example.

There had to have been a way for people to have lived sustainably, because these populations, smaller than we have at present, were here for a very long time. People could have exhausted a resource in any given generation very easily, had they not had a fundamental restraint and a fundamental notion of reciprocity—what to give back to that system. Without that restraint, one Indian with one club could have wiped out the Bering Strait cormorant, or the great auk, both of which later became extinct.

We're attempting to resist the homogenization process that's occurring globally through both species lost and cultures lost, because when we lose the last indigenous culture—which might be your own heritage dating back at least a half a million years in co-evolutionary time—this world is going to be a much poorer place.

It isn't just a matter of looking back and saying, "Those people knew how to live sustainably on the land." And when I say that, I'm not talking about the romantic noble savage. Let's be clear on this—the noble savage is a European invention. That was a part of the 18th century European identity crisis politically. They hoped the Hottentots of South Africa or the Iroquois of New York or Ontario represented what people could be if they didn't have the evils of civilization. That's what that was all about. It's not an Indian concept in the least, and it's not an issue for us. There were bad people, there were good people—just like today. But there was a cultural way of making things work out more harmoniously than people are apparently able to do today. There was a cultural way of working with natural processes that, by and large, worked sustainably over a very long time period.

Even with a renewed interest in Native ideas, the modern tendency is to look upon North America as a place that was sparsely inhabited. There is a famous papal doctrine called the Tierra Nullis. In this Papal Bull, a justification put forth by the Spanish, Portuguese, and Catholic church for taking this land was that nobody was doing anything to the land. It was virtually uninhabited. There was "nullis" or "nothing. "

Granted, there were a few "primitive savages." However, as you'll read in your modern anthropology textbooks, they really had no impact on the land. The

land had an impact on them. People were, as one British philosopher said, "living short, nasty brutish lives," dying at very young ages.

In our stories, just like in the Bible, there are stories of people living 400 and 500 years. There are stories of large animals, which we've only read about in books, living among Indian people and human giants 8 feet tall.

I just came from a meeting in Boulder, Colorado, sponsored by the American Indian Science and Engineering Society and hosted by Professor Vine Deloria of the University of Colorado in Boulder. It was 2 days of no notes, no audio, no tape recorders, just 2 days of oral presentations by elders from every corner of North America from Guatemala to Canada and from coast to coast telling their stories of origins and migrations of the people.

We sat on the edges of our seats afraid to breathe. Yet these elders knew only so much. The people that didn't come knew even more. In the Ojibwa longhouse, it takes 7 days to tell the story of creation. Seven days just for that one story. The story of when a planet came close to the earth, when the poles changed overnight and the ice formed instantly. This is part of our traditions.

The knowledge at Boulder was absolutely stunning in its scope and depth. And yet most people in the environmental movement and the scientific community have ignored this tremendous potential for direction, for finding the way to reintegrate the modern separation of ecology, economics, ethics, spirituality: a holistic model. Again, not a romanticization of the past, but a practical formula for how to live and how to live with each other and how to live sustainably on the earth.

This was an incredibly inhabited place—1 million people alone at the mouth of the Columbia River. The idea that this was Tierra Nullis, that people really weren't doing anything and making an impact on the land, is simply not true.

When I say "management," that does not exclude the spiritual part. For many of us Indians today, spirituality is a touchstone of identity. The problem we wrestle with is identity. What does it mean, for example, to be an Indian person today, in 1995, in North America at Oregon State University?

Sometimes, it's almost as if we're living in two worlds. If there's anything we can tell our children as Indians, it's that we have an incredible heritage. If there's anything we can tell our professors and our fellow students and friends in the environmental movement, it's that we have something to offer today, not yesterday, that is relevant to the problems that they're wrestling with.

In the old days we didn't have any big buildings, and we didn't have a lot of paved streets. Every place around here was well known, etched in memory since childhood. We knew the territorial boundaries by heart. We knew everything about our neighborhood, and we knew all the songs for the trails and the springs.

When the forest is clearcut, the way it is now in Borneo or in Southeast Asia, it's like after Hiroshima or Nagasaki. It's gone, the neighborhood, the

memory the place is unrecognizable. If the old people were to come back now to any forest system in the Pacific Northwest, they wouldn't recognize it, it's so completely different. That's what a lot of people call "natural." It really is a gigantic experiment in secondary succession, the end result of which is unknown.

If the elders were to come back now from the spirit world, they would look around and say, "There's nobody taking care of this place." You see, when they cut the forest down in Borneo, that was home. Now it's gone. Everything is gone—sustenance, livelihood, spirituality, the places where ancestors were buried. No identity, no remembrance—obliteration. That's what genocide is about. Now we're stuck in this modern world wondering who we are, where we belong, how to keep our self-esteem.

For Indian people who follow their traditions, the world is highly ordered. There's a sacred geography that constitutes their universe or world. And of all of the stories of creation and migrations, each different story is respected. It was that people's way of trying to understand how all this came about. Many of the stories we heard in Boulder conform to science. Some do not. But these are all very old stories.

Scientific fashions have a much, much shorter life span. I remember when it was good science to take logs out of rivers. I remember when they awarded the Nobel Prize in chemistry to the creators of DDT and so on. I remember when good science justified extensive clearcuts. Is this where we want to put our faith as indigenous people? I think not.

All of us—indigenous and nonindigenous—share the same watershed, live in the same cities, are subject to the same decisionmaking processes by our resource management agencies. We need each other. We need to be able to work together. To work together means that we want equal input into whatever environmental discussions affect us.

I work with the United Nations Biodiversity Convention that has been going on in Jakarta, Indonesia. I'm working with a global network. I'm the North American coordinator for the Meeting of Traditional Indigenous People, which is taking place on each continent and in the Pacific region. Elders from Mexico, Guatemala, Canada, and the United States are telling the United Nations their stories as traditional people, and how they value biological diversity.

Chalachortus-Roots of this prairie species nourished plains Indians

The whole discussion on biological diversity at the UN convention is dominated by the United States and the UK. Northern economists are now attempting to subsume all externalities into a new neoclassical economic paradigm. In terms of the Western point of view, this is certainly a step in the right direction, at least in the attempt to calculate the true costs of environmental degradation. But it has virtually nothing to do with the values of indigenous peoples. Everything in the indigenous philosophy has intrinsic worth, cannot be commodified, has a right to live in and of itself even if there's no economic value. We now live in a world

where a commodity without an economic value becomes an "invisible resource."

N. Paiute water bottle starts

That poses a dilemma. A lot of tribal people simply do not want to see any important cultural plant or animal made into a commodity. There are elders who would rather see the last species die out than let white people commercialize them. Believe me, there are some real strong feelings about this.

Now there's a lot of gray here, too. In any given tribe, you're going to have a variety of opinions about what and how much to harvest. One of our problems is that on most reservations and reserves, we don't have any standardized way to reach a consensus on harvesting and commercialization of any given organism.

So the tendency of the elders, then, is to hold back, to hang onto this information. It may not even be shared with the children, if they are perceived as not ready to take responsibility for the respect and the constant attention the information commands. It entails responsibility. This education requires proper spiritual process and authority. Our way is a lot slower and more painstaking to go slowly up, step by step, guided by those who know more than we do. The old way of slow initiation into the mysteries of knowledge is a very personal endeavor.

A fundamental difference between Western education and indigenous education is that knowledge is accessible to everyone in indigenous communities and they acquire it in their own way, guided by tradition, the oral tradition and the elders living today.

I use a root called ikmish, osha, and a lot of other names—bearroot on the plains, angelico among the Pomo, etc. When my mouth gets dry on the road, the way it's doing now because I've been talking a long time, I chew it. During the Spanish influenza of World War I, the Paiute Indians of Nevada would make tea from this root (which I do every day), and scientists noticed that they were remarkably free of the flu.

But do we want every Tom, Dick, and Harry going to the mountains to commercialize this? No, we don't. We want access to traditional gathering places for this root. We don't want to ask the Forest Service or Bureau of Land Management (BLM) for a permit. Indians are a special case—we're not newcomers. We have a long-term special relationship with the land.

Multiple use refuses to recognize this. It's a problem when you go for co-management, which is one area I work in. We want equal input into decisions affecting ceded ancestral lands.

There are areas in which we don't want our plants harvested or commercialized. Other plants, however, may provide an economic base. Among tribal elders, opinions will vary.

In some places, like the area around the Six Rivers National Forest in northern California, the Forest Service and BLM are working to encourage tribes to make their own decisions. If the tribes can work it out amongst themselves, they'll decide what's off limits to commercial harvesters and what people are going to use for their own spiritual and material needs.

One of the really sad things about the work I do with traditional communities is that the elders cannot find the plants and animals necessary to keep the culture going for good diet and nutrition, for ceremonies, for baskets. They can't find a straight basket shoot. The average basketmaker in the California Basket Weaver's Association travels 3 to 8 hours every weekend to locate a patch of suitable twigs from hazelnut (*Corylus cornuta* var. *californica*) or redbud (*Cercis occidentalis*) or gray willow (*Salix bebbiana*) to make a basket.

If you can't make a basket, you can't teach your children how to make a basket. If you work Monday through Friday and spend half of every weekend trying to find basket material, there's no time left over to teach your children how to make a basket. On top of that, if you're worried about herbicide spray, you're afraid to let those children run the basket material through their teeth to take the strands apart, because you don't know if an area has been sprayed or not.

The motifs that go into the basket designs are the cultural reminders of our own responsibilities to each other and to the environment. Those symbols become agents of the cultural revitalization so desperately needed now. When the baskets no longer can be made in northern California, it will be a sad day for Indian people there, because the culture is going to die.

That's how closely we're related to the land. Not just to any land, but the land that's healthy. Fire rejuvenates basket lands. In the second year after a fire, straight shoots come up. At any museum, you'll see long spaces between the nodes because of fire: periodic, light, cool forest underburns. Go out in the woods today and they're all knotty and twisted, short spaces between nodes.

When I was a kid in the Sierra Nevada Mountains near the San Joaquin Valley, we lived on deer and salmon. We had a smoke house. The salmon disappeared in '49 when they put the Friant dam on the San Joaquin River the Central Valley Irrigation Project. That whole way of life ended.

Brush fields began to close up after clearcut logging and slash fires in the Sierras. And when that happened, the deer had no palatable browse. The nutrition in the old leaves of the buck brush were worthless, and we would find deer dead with their bellies full of old brush leaves. Sometimes the does would never fawn, and the bucks were no larger than a big dog and didn't grow horns.

Redbud—Traditional pruning practices are carried on today by California tribal members

You can't subsist in that kind of a situation. Therefore, you have to get a job. You become wage-dependent and your independence ends. And when your independence ends, your culture dies. It's economic things we're talking about: viable, multiple subsistence strategies in a healthy environment, and this is a global phenomenon. It's going on as I talk.

A lot of our own Indian people have begun to separate spiritual from practical care giving. The elders say, "You take care of the plants and animals, and the plants and animals will take care of you." Once you make that split between your practical life and your spiritual life, you're on the road to major assimilation, and what was formerly a spiritual way becomes a religion.

While we are truly citizens of the universe, we are also citizens of a place, a specific local place. So then we have the question, how do we address ecological degradation? Because cultural degradation is tied directly to it. Believe me, the situation I've been outlining for indigenous peoples applies to everyone. As the plains Indian leaders predicted in the 19th century, "Someday they're going to treat all you people, you white people, just like they treat us. You all are going to become Indians." And, in fact, their prophecies have come true, more or less.

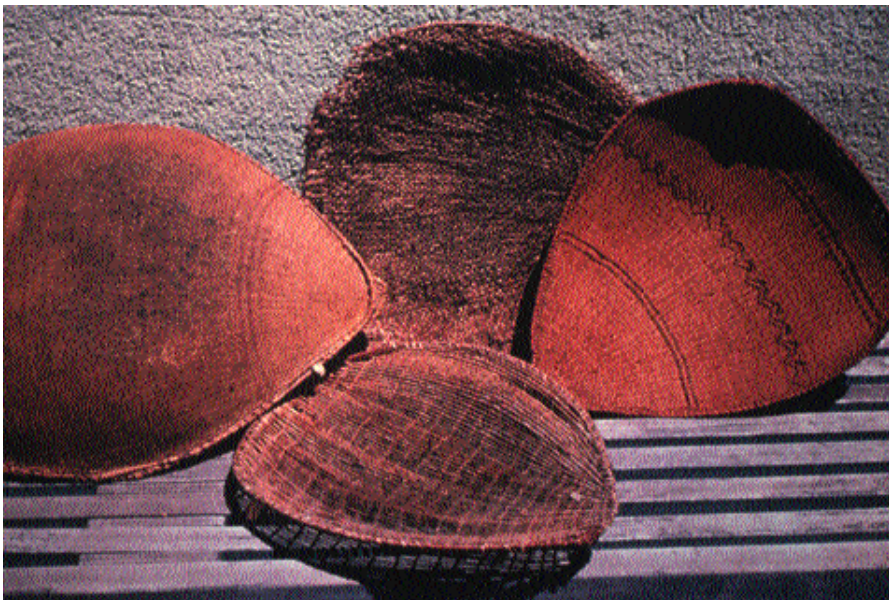
That's where we've got a lot of common ground, and that's where we can learn from one another and help one another in addressing issues of ecological degradation. If we're going to talk seriously about special forest products in this climate and with this kind of ecological degradation, we're going to have to tie ecological restoration to harvesting.

There is, I believe, no other way to do this. We can't just harvest without giving back. That's the advantage of this indigenous model that I've outlined to you. It's holistic. It's unfragmented. It integrates ecology and economy, and that doesn't just mean subsuming externalities to ascertain true costs of products.

It means a relationship with the plants and animals that is almost completely missing in modern society. We don't thank the plants and animals anymore. Even Indian people have stopped thanking them. Recognizing their contribution, as individual plants and animals, to our sustenance and livelihood—this is extremely important because there's a reciprocal relationship.

Willow

For Western peoples, one way to give back is to acknowledge the interdependency of all life and think about restoring the land. When you harvest, every harvesting move needs to further either conservation or restoration.



N. Paiute winnowers

To give you one example, when Indian women used to burn the gray willow—or prune it as they do now because fires are illegal—they opened up that gray willow like a vase, and the wind came into the gray willow and the birds came into the gray willow and ate the larvae that used to burrow into the centers of the stems used in baskets, which weakened the basket stem. The wind started to move those stems, strengthening them. The sunlight reached the area around the willow that formerly was shaded. The bird could now see all the larvae, pick them off. Willows sprout from the crown and from the roots. So you have all sorts of possibilities enhanced by that pruning and that burning—high-protein forage for deer who love willow, and so on.

When you pruned, when you burned, you also enhanced the living situation, the quality of habitat for your relations in the family of life, and that's the relationship I'm talking about. We have a family. It's neither anthropogenic nor ecocentric. That's a false dichotomy, which is typical of Western thinking. I had to coin a word "kincentric." The English language itself is a problem because it has no words to describe relationships, socially or ecologically, of any consequence.

We're going to have to compound words, reorder syllables in order to come up with something like "kincentric" that expresses the fact that the family is the center of our life, and that we're all equal in it, horizontally equal. There's no hierarchy. Even the smallest species deserves special attention if we're losing it.

Most of our special forest products come from the herbaceous understory of the forest or riparian zone, or come from prairie plants in large openings or from desert plants. Most of our culturally important plants, most of our medicinal plants and our potential special forest products, come from openings that are also quality wildlife habitat.

What's good for cultural survival is also good for forest health, and what's good for forest health is also good for cultural survival. David Perry, an ecologist at Oregon State University, describes these as "key linkages" in ecosystem stability. The bunchgrass forb community between the trees that's enhanced by fire is a key place where mutualism takes place between soil, mycorrhizal fungi, and other plants in the bunchgrass forb community.

We're going to have to look really closely at the soil. The bunchgrass forb community is a keystone community. If it goes, lots of other species are going to go. Moreover, indigenous managers are also keystone species, and when they have gone, lots of other things have gone, too.

So if we're serious about special forest products, if we're serious about affirming the validity of indigenous cultural survival, and if we're serious about economic diversification, then we're going to have to look between the trees. In an economic scenario that involves thinning of smaller trees—pole-size trees, saplings, and seedlings—and using fire, we are going to have to learn how to restore the quality of those plant communities that used to exist extensively between the trees.

Part of restoration is trying to get back all the specialist species that have disappeared. We've got too high a proportion of generalist species. I'm a contract vegetation surveyor and grass seed collector, and I see slope after slope, aspect after aspect, of generalist species where conservative species should be—I've seen poison oak where I should find trillium, and so on and so on, over and over. It's almost depressing.

Species distributions and species richness have been severely impacted by fire suppression, by shading out, by the ecological destabilization caused by industrial forest practices, by overgrazing, and on and on.

Restoration is a way to reverse that degradation, to get forest health slowly back through multiple thinning re-entries and little fires started first in the spring and then later, when the fuel load is down, by going to the traditional seasonality, which is late summer and early fall.

If we want to talk about a natural fire regime in the Pacific Northwest—especially eastside Cascades, the Klamath area, Sierras, the Coast Range and to some degree the westside—we're going to have to include Indian burning as part of the natural fire regime. Unless we more or less match the seasonality, the intensity, the frequency and duration of Indian fires, we're not going to trigger the genetic memory resulting from coevolution that's going to produce optimum plant responses from the burns.

Indigenous knowledge is essential to how we define "natural" in this situation, especially with regard to fire. Most of our special forest products are adapted to periodic, low-intensity, fairly frequent fires. So along with our education about the uses and marketing of special forest products, we need a lot more education about how much to harvest, and how to harvest to stimulate natural rejuvenation processes. Indian women used to dig the *Brodiaea* and *Calochortus* and yampahs and many other "Indian potatoes." These plants have corms with sterile offsets, and it wasn't until the women moved the corm that the young cormlets were released and could grow. To this day, the women bend down and put those right side up so they'll grow straight up.

That's caregiving. That's giving back as you're taking. Those competent Indian women were contemptuously called diggers. Unbeknownst to the Anglos and Spanish alike, they were doing something that was making the system work, and they had been doing that for tens of thousands of years.

When BLM put a fence around Indian potatoes in Eastern Oregon, they started to disappear. When Fish and Game in the thirties wanted to stop the California Indians at Bolinas Lagoon from harvesting clams, it was the same idea. The clams needed to be shaken up, moved around to establish a new niche to grow. The clams began to disappear. That's traditional environmental knowledge. There are many examples like these.

I've heard Shoshone elders talk about little organisms that live in the snowpack that have to do with the utilization of snowpack water in the soil. Has anyone ever heard of those? Or the Kogi in Santa Marta, Colombia, who talk about bacteria that live in the gold veins in the earth when you tap into the gold veins and take that gold out, you're hurting the Mother Earth. No science can tell us that.

How did the Sioux Indians know that a dung beetle always points its antenna toward the nearest bison herd? Think how long it must have taken people to realize that or was it so long? You see, we believe that no knowledge is ever really lost. Sometimes it can be accessed by spiritual means. The Tule River Tribe in the Southern Sierras brought back 32 songs as well as the bear dance from vision quests several years ago.

Grant Pilgrim, Agnes Baker Pilgrim's husband, was here last year and we were talking together, singing together. His dad was murdered when he was 5 years old. When he got to be a teenager, he began to sing his dad's songs. No one had ever shared those songs with him, but people who knew his dad remembered those songs.

This world is incredible. The spirituality behind the material phenomenon that we see is simply breathtaking. It's been ignored, and it's been ignored to our peril. You can't just take a little bit and expect to survive.

A lot of people have a hard time with loose ends. But we're not going to get through this ecological crisis until we learn to live with loose ends. That's part of the creative process.

We can't rely on the Government. There have been 385 treaties broken. Land was promised as long as the grass would grow and the waters would flow. You can't put your faith in the U.S. Government to protect even the forest reserves, because when times get hard, those reserve lines, just like the reservation lines, are going to change. That's the historical track record.

It's going to take your own efforts to go to your own watershed, in your own place, and resolve to take care of it. Take personal responsibility. Our ceremonies are our ways of taking personal responsibility for restoring the Earth spiritually every year to renew the Earth because we use it up.

Do you think you can go on and on, decade after decade, taking and taking and taking and not expect something bad to happen? It's impossible. It's a complete violation of Natural Law. That's why the personal responsibility for the products you use, whether special or not, is absolutely essential to their survival and your survival.

AUDIENCE: You speak of the need for partnerships. How can that be achieved on a sufficient scale?

MR. MARTINEZ: I think that in any kind of change, only a few people typically lead the way. Indian people are more important than their numbers would indicate. If a few good scientists, a few creative people in science and in other social fields, would take notice of the ecological contributions of native peoples, as the founding fathers of the United States noticed the democratic political system of the Iroquois League, it would make a difference.

We're not really attempting to convert everyone. What we're trying to do is reach the right people so we can survive, you can survive, and the land can survive, at least for humans and many of our threatened animal and plant relatives, because in the end the Earth will heal herself. But her time frame is vastly different from ours.

AUDIENCE: I would appreciate your comments on the role or impact nonindigenous species have on the native flora.

MR. MARTINEZ: Well, if you're talking about temperate systems, I think we have a chance to resist most exotic invaders by having stable ecosystems. Stability really is the key to biodiversity, not the other way around. When I grew up in the Sierra foothills, if the rains came early, we had mostly grass, and if the rains came late, we had mostly forbs on the range. You had that kind of annual diversity, but it was highly unstable.

Close up of a N. Paiute coil willow

What characteristics allow star thistle to take advantage of destabilized systems? To change the emphasis, what species do we need to keep or restore to the system to resist invasion, or to encourage stability within the system?

The concept of seral succession is highly misleading. It's misleading because it assumes discrete breaks within vegetation development when in fact, except for conifers and most grasses, most species have been there from the beginning, shrubs and forbs in particular. So we need to manipulate the vegetation to restore or maintain species that perform the greatest role in resisting invasions by brush, woody plant, generalist native,

and exotic species. In that way we'll be able to weather the period before we learn exactly what kind of fire regimen is needed, because in most ecosystems we are writing our own book as we go.

They stopped burning by Indians. The latest Indian burning in Northern California and Southern Oregon was in the 1940's. When Henry Lewis did his 1973 study of the patterns of Indian burning in California, there were people living who remembered why they burned. Now their children, who are in their 60's and 70's, remember burning, but they don't remember the control techniques or the objectives. So we may have lost that knowledge.

At Three Fires Walpole Island Reserve (Ojibway, Potawattomi, Ottawa), they never stopped burning. Ontario's 70 endangered species are found in quantity in 2,200 hectares on Walpole Island. This is amazing to botanists, who come there from all over the world to see what a "pristine" landscape can be like. But the people are part of that "pristine" quality. They're still performing their role in the ecosystem, so the biodiversity is incredibly high. It's the only place in Ontario where you can find biodiversity that high.

Remember that Indian burning was rotational, as slash and burn Mayan burning is rotational. That's traditional. When tropical systems go away from the rotational nature of the burning, they become destabilized culturally. Economically, people have no hope without burning as much as they can for money to keep their kids from starving. It's coming down to that in most of the world.

Where the traditions are intact and they're based on multiple subsistence strategies, they're able to burn in such a way that little is disturbed at one time. That retains the stability of the system. The harvesting methods themselves may rejuvenate: through stress disturbing the key plants, or by selective harvesting of animals, for example.

Here in the Willamette Valley, the Calapooia used to burn a 50-mile circle. That burn line would go in toward the center. When it got in real close, they'd let the best animals out, and that way they kept the herd strong.

Indian people outplanted, they transplanted, they did root cuttings, they did leaf cuttings. A good part of Amazonia in Kayapo country is a function of outplanting because people always have the "drugstore" and the "supermarket" on their trips around their territory. Oak trees were the same in the Willamette Valley, planted out by Indians, not just jays. Jays participated, so did squirrels, but Indians planted, too. It's that kind of engagement that we're talking about here.

AUDIENCE: How do you acquire traditional knowledge and who is qualified to get it? Does contact with tribal people require that you be a social scientist or anthropologist?

MR. MARTINEZ: In areas where there are tribal people with traditions intact—not Oregon except Warm Springs north—you need to go to the literature or find an Indian go-between who has respect in the community and can talk to elders.

It is difficult for us, for Indian people, to get information from traditional elders in many cases because of lack of trust. The fact is, I know elders in Northern California—I know one who says she has a cure for diabetes and AIDS. I believe her when she says that. She's afraid of commercialization. So she's holding onto that and sharing it with a few students. She's about to retire.

In the traditional knowledge council I work on, we have a "Cherished Elders" program and we just decided to pay elders $4,000 or $5,000, the same as major professors, for talking. We're going to go to their own locality with youth and adults, and we're going to start sharing that knowledge within that group. That knowledge then goes to Indian schools, native curriculum development. From there the theory is that it will go out—what can be shared with the elder's permission goes out beyond.

What's happening now is the non-Indians are defining Indian culture for Indians and everyone else, and we're trying to head that process off. We want Indian students to benefit first from that knowledge, because they need it in the worst way. The suicide rate is incredible in Indian youth communities.

From there it can get absorbed into the mainstream. I work not as a traditional person with a lot of knowledge. I don't have very much knowledge if I compare myself with elders that I know. I'm an interpreter or translator. I'm making you aware of the possibilities, I'm outlining a conceptual schemata that you can plug into that integrates all of these things.

It's going to be up to you to find a way. The library in this case is the best way to start—anthropology and ethnography. However, everything tribal people have told anthropologists is not necessarily true. Anthropologists were often deliberately misled.

You have to ferret out the good material, but don't go knocking on elders' doors. You'll get nothing but a door slammed in your face. They won't talk to you unless your heart is pure.

*Redbud coils – redbud (*Cercis occidentails*) is burned or pruned*

Business and biodiversity—rainforest marketing and beyond

Jason W. Clay
Executive Director
Rights and Resources
2253 North Upton St.
Arlington, VA 22207

I got out of human rights and into the business side of lesser known nontimber forest products because I was tired of counting bodies in parts of the world where there were longstanding fights over natural resources. I decided that to get ahead of the game, we had to find ways for local peoples to generate income to hire their own lawyers to protect their own resource bases—that way we might be able to prevent encroachments and prevent shooting wars from taking place in the first place.

Now, this comes from a realization that conservation or, rather, environmental problems are people problems, not biological problems. Trees aren't cutting themselves around the world, streams aren't polluting themselves, solid waste isn't creating itself. We're creating them. We're creating all these problems, and now we have to figure out ways to solve them.

Now, lest I sound like a pro-Reaganomics person, I don't believe that markets are the only solution, but I think almost every solution has to have some foot in the marketplace. We have to figure out ways to use market forces, to harness market forces to generate income and conserve resources. It all comes down to that word that's so hard to define—"sustainability"—which I want to talk about today.

We've had more and more papers, more and more research projects, more and more studies, that indicate that forests are valuable, at least in theory. The problem is you can't eat theoretical value. We have to figure out how to prove that value and how to turn it into money in people's bank accounts in ways that don't destroy that resource base for those people and future generations. Real markets don't react the same way as theoretical markets, as paper markets.

So what is rainforest marketing all about? I started the concept of using products from the rainforest, harvested by local people, as a way to generate income for those people to protect their land rights, to fund sustainable use of resources, to invest in value-added processing, and to generate connections between consumers in the North and producers in the South. And by this I mean the northern industrialized countries versus the southern less-developed countries.

I wanted to use the power of commodities markets to actually change those markets, instead of taking the approach of fair traders. The fair trade movement tries to help a community add value to its own product and sell it into a dedicated market in Europe or the United States. My approach was different. I tried to figure out mechanisms that would help generate larger

sums of money to invest in sustainable development by taxing the sale of natural resource based products, or generating revenues across the board on commodities. This approach would generate money that would actually change an entire market structure rather than changing one village at a time. Consumers would not be given a choice about whether to pay the premium. Increasing the cost of raw materials, even by doubling the price to the producer, should not affect consumer prices by 5 percent; in fact, it was usually less than 1 percent.

Brazil nuts

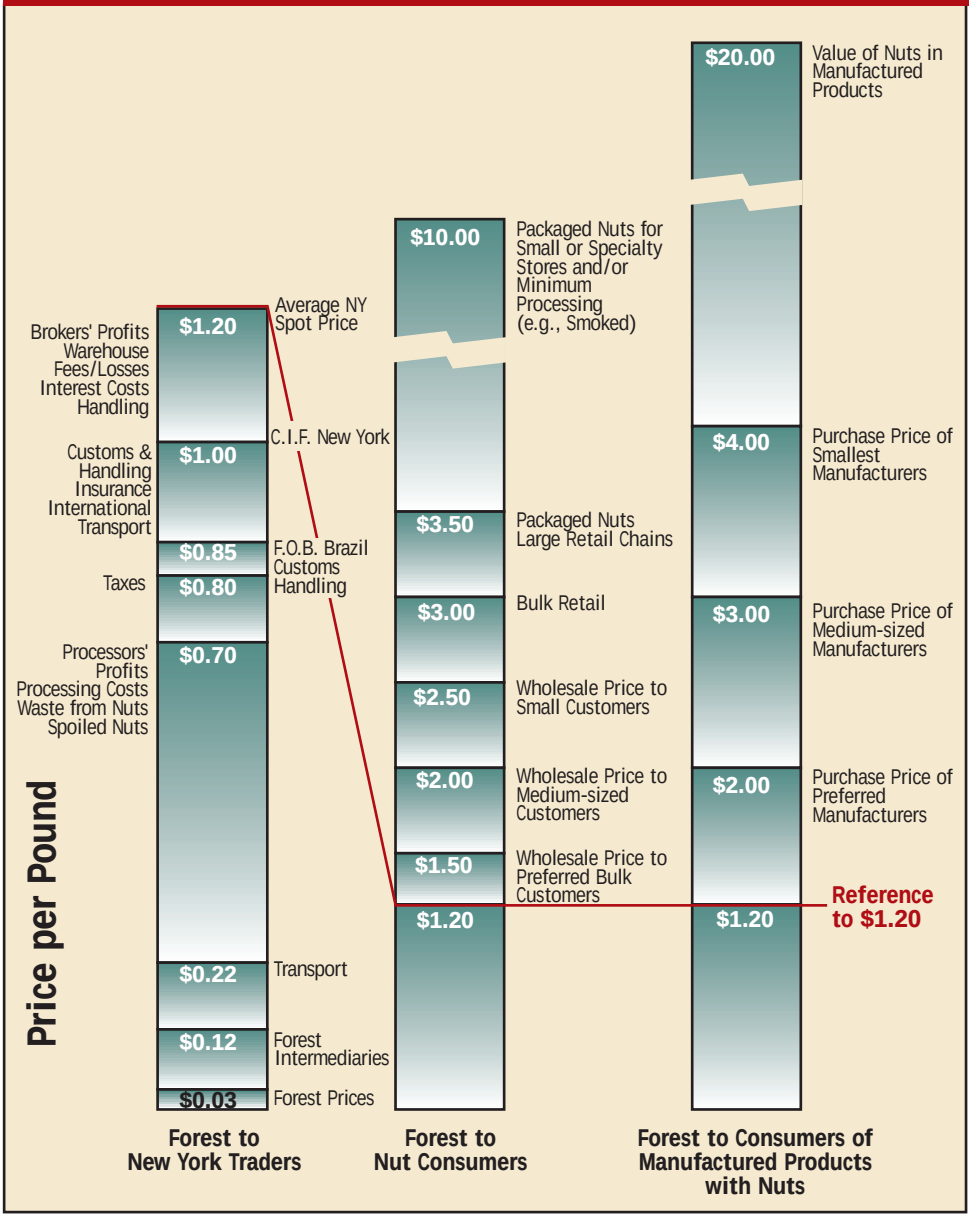
This isn't really business as usual. The companies I was working with all agreed to pay a premium of at least 5 percent on the CIF U.S. price of the raw materials they were buying. They also all agreed to donate a percentage of their profits back to the producers who were sourcing their raw materials.

This was not a difficult issue for these companies because producers receive such a tiny share of the value that's added to their product as it moves through a marketing system. Now, it's hard to believe just how tiny that share is until you actually see it on paper. The average producer price of raw materials around the world, whether in forests or in commodities, is around 2 to 3 percent of the final product price. That's how much they get of the New York City price of their product. What that means is that if you bought a box of corn flakes that cost $4 and it didn't have any corn in it, you would still pay $3.96 for it. The other 4 cents is what the producer of the corn got.

Brazil nuts are an example of how value is added to a product (Figure 1). The people in the forest who harvest Brazil nuts get 3 cents a pound when they sell them. The "value" is added as the product moves through the marketing system. We did an exercise to figure out an appropriate tax to put on the consumers of these products that would have a significant impact on poor producers. It turns out that a 5 percent environmental premium on the U.S. CIF price of Brazil nuts is 160 percent more than producers receive when they harvest their crop. So, by getting Ben and Jerry's, The Body Shop, and 50 other companies to buy these nuts, we generated a stream of income that increased the revenue to producers by one-and-a-half times.

We launched the program by purchasing commercially sourced nuts, because there were no nuts being processed by local communities that could be sold to a company like Ben and Jerry's. In about 2 years, we were able to fund the factory, bring products on line, and generate about 200 metric tons of Brazil nuts a year from our sources in addition to another 200 from commercial sources. The environmental premiums and profit sharing agreements generated income of about $400,000 a year, enough for significant investment in such programs as land rights and value-added processing.

FIGURE 1. Value added to Brazil nuts.



The value that's added to products isn't limited to nontimber products. In an Indian area in Central Brazil, the Xikrin area, the Indians are paid $6 per cubic meter for the mahogany (*Swietenia* spp.) on their reservation, while white farmers are paid $20 per cubic meter. At the saw mill, the value of the mahogany log is $100 per cubic meter. When it leaves the mill as sawn lumber (after 50-80 percent waste), it's worth $750 per cubic meter. When it's dried and sold at the port FOB Brazil, it's $1,500 per cubic meter. When it arrives in London and is warehoused and sold at wholesale levels, it's $3,000 per cubic meter.

Doing these value-chain analyses gives a sense of where one might enter a market more effectively to be an agent for change. With rainforest marketing, we wanted to focus on what was available in the marketplace. We didn't want to develop new products. To bring new products into the U.S. market takes up to 5 years for foods, maybe 10 years for personal care items, and up

to 20 years for pharmaceuticals because of all the testing and FDA requirements. We wanted to start with things we could move more quickly.

In 1989-90, the first year of operation, I brought out 1,500 possible products from the Brazilian Amazon alone, and over the first 3 years we brought out 3,500 different products from 4 different continents. I didn't go into the forest and collect them. I bought them in local markets throughout the various regions.

We showed these products to about 300 companies that had expressed interest in the program. After the initial screenings, we came up with 50 products that excited these companies—50 raw materials that were already on the market. I didn't go into communities and buy them.

Once we had identified the 50 most likely products, we went to the botanists, because these were all plant products, and asked, "Of these 50 products, which do we know without any further research cannot be harvested sustainably or are already being harvested at unsustainable rates?" Even if we'd had the money, we could not afford to waste it on research on sustainability when maybe only 30 products would ever come to market. We eliminated 7 of the 50 right off the bat. At that point, we asked the botanists to look into each of the remaining 43 products, and we began to look at communities that might have these products for sale. That is how our project proceeded.

We wanted the companies to do all the R&D [research and development] and pay for that up front. It wasn't a viable thing for us to do. We wanted the companies to get involved and express an interest before we moved ahead with any marketing. We wanted to start with products on a step-by-step basis. In the short term, we were concerned about product quality and making finished products that somebody would actually buy. We figured we could add value to the products locally over time. In the meantime, we could ensure they were produced sustainably. Even in the short term, we could increase profits to local producers, and we could increase overall income from a given amount of product over time. These were the goals of the project. We had to start quickly, because once local people got involved, they wanted to see an immediate effect on their income.

After about 4 years, we accounted for about 12 percent of the Brazil nuts sold in the U.S. market. We were, in addition, buying and selling, in quantity, about 14 other products ranging from Zambian honey and beeswax to fried banana chips from the Philippines, cinnamon and vanilla from Indonesia, and various fruits from Brazil and the Amazon. By the end of that first 4 years, 50 companies came out with about 200 different finished consumer products. Another 150 companies were either in stages of product development or looking at what kinds of products they might want to produce.

In 1993, we had a total trade of about $3.5 million in these 14 products, which generated $100 million in retail sales in the United States. Based on the 5 percent premium we charged each of the manufacturers and the profit-sharing agreements they entered into, that $3.5 million translated into another $300,000 returned to those producers in addition to the outright sale of commodities, so the project was generating significant income.

Local marketplace in South America

Local communities spent the money generated through these commodities sales and through the environmental premiums and profit sharings on a number of things. They spent it on consumer purchases. They spent it on hiring lawyers to defend and define resource rights, particularly property rights such as genetic rights, timber rights, and subsoil rights. A lot of these rights are ambiguous in many countries. In many countries we worked in, people could own the land but not the trees on it. Somebody could be sold a concession to cut the trees without any idea of what that would do to the land. We wanted to help local groups clarify some of these issues by taking test cases to court.

Groups also spent their previous revenues on developing business plans for new companies and for developing businesses that actually had a positive environmental impact. So, for example, over a period of 3 or 4 years, we undertook research on the heart of palm industry in Brazil. We found that none of the heart of palm being sold in Brazil or exported was being harvested sustainably. We worked with botanists to develop a very simple and ingenious system for sustainable harvest of heart of palm. If you only harvest a tree greater than a certain diameter, you will always be able to harvest sustainably. It's kind of like clamming in New England. If you can drop the clam through a little ring, you can't harvest the clam because it's not big enough yet. This is the same kind of thing.

We incorporated the cost of sustainably harvesting heart of palm into a business plan for a heart of palm canning business. We've now got a group in Brazil suing the Government on behalf of all Brazilians to shut down all the heart of palm industries that are not sustainable, making a case that only heart of palm harvested sustainably should be sold.

These rainforest marketing efforts exposed about 100 million consumers to the products themselves. There were about 1,000 finished products on the program. This approach allowed us to reach a lot of consumers and a lot of companies. What's more, for the whole time we ran this project, we didn't spend any money on advertising.

We also spent no money on convincing companies to do business with us or to buy rainforest products. All of the 200 companies involved with the project read about it in the newspaper and wanted to get involved. We used the press to do our advertising for us. Researchers have shown that it's six or seven times more effective to be written about than to take out an advertisement.

I want to talk, now, about the specific projects we supported, and then I want to summarize some of the lessons we learned from our work. I think our work has implications for the Pacific Northwest, where people are looking for ways to generate income and employment from a combination of timber and nontimber products while pursuing conservation objectives.

One project involved a group of Indians in Brazil called the Xikrin. The Xikrin number about 350 people with a reservation of about 450,000 hectares. They wanted to set up a system of sustainable timber management on about 50,000 hectares, or 12 percent of the total area they own.

What they proposed to do, and they've worked it out with botanists, is harvest from about 1,000 hectares a year. They've identified the trees to be cut—only trees that are 70 centimeters diameter at breast height or more. There are 13 species they'll be harvesting. They've used a global positioning system (GPS) to identify the individual trees for the first 2 years of cuts. They've also used topographical maps to determine where to create the best trails for bringing logs out while causing the least environmental damage.

On the first 1,000 hectares they mapped, they found about 35,000 cubic meters of timber in these 13 species. About 12 percent was mahogany and about 10 percent cedar (*Cedrela* spp.). These are the two most viable commercial species on their land. The others were lesser-known species: some would have external markets, but most would be sold within Brazil. The Xikrin developed an environmental management plan. We are now helping them develop a business plan that will allow the most benefit from the sale of timber while incurring the least risk to the tribe itself.

What we've come up with is the following: We have helped the Xikrin find a commercial saw mill in Brazil that is harvesting tropical timber elsewhere in the country and is in the process of being certified. We have proposed that they come into the Xikrin area to undertake the extraction, saw mill, kiln, and value-added operations (e.g., furniture blanks and parquet), because that's their business. They know how to do it. They will not make the kinds of mistakes in the short term that might be made if the project were managed by the Xikrin, who have never run a business or used machinery and don't speak the national language, don't have bank accounts, and have never balanced a checkbook.

Jason Clay on a pile of brazil nuts

We've also been able to bring in an investor who will invest in this project and help the saw mill expand its operations on the condition that only certified trees are cut. As that debt investment is repaid, equity will accrue to the Xikrin in the saw mill operation. The exact percentage has to be negotiated. When the initial investment in the saw mill company is paid off, the Xikrin will own part of the company.

Now, in addition to capturing some of the value added by having an equity position in the company processing the timber, we've also contacted a U.S.-based company that sells lawn furniture and is interested in shifting its sources of tropical timber from Indonesia to other certified sources. They need about 3,000 cubic meters a year for the furniture they sell, and between mahogany and cedar and some of the other tropical hardwoods, the Xikrin could easily supply the amount needed.

However, this introduces another level of complexity. Although the Xikrin would get more money from this arrangement, the U.S. company wants to buy finished furniture directly from Brazil, rather than furniture made in the United States, so we would have to bring a furniture manufacturer into the deal. Figuring out how to protect the Xikrin from some of these complexities and risks, while bringing maximum benefits, has been the real issue.

In other cases, our projects have focused on local markets. We worked with a group of Huichol Indians in Mexico who had traditionally sold logs to Mexican timber companies to supplement their corn and beans subsistence farming. The Huichol received about $1 per log. We helped them develop a system of processing logs into lumber, which they dried using solar-powered kilns. The Huichol craftsmen then made the lumber into school desks and benches and other items that were sold on local markets to counties and states in that part of Mexico. In the end, the Huichol were bringing in about $300 per log plus gaining considerable employment in an area with lots of unemployment.

Another program involves an area in Colombia where there had been extensive environmental degradation and where indigenous organizations had regained lands they'd lost 50 or 60 years ago. Our project helped set up for-profit nurseries selling seedlings for food and cash crops to local people, both Indians and non-Indians. That project has proven to be very successful.

In each instance, we've had to undertake inventories and assess the local community's natural resources, financial resources, and skills and capacities to run projects. Assessing and keeping these three resources in balance—the environmental, the financial, and the social—has been a real trick, and working with a number of players has often been very challenging. However, as we work through the problems, each of the projects becomes rewarding in the end.

A lot of these groups were already producing and selling goods to local, national, and even international markets. In these instances, the assistance we provided involved quality control and generating a consistent product. We provided bee keepers in Zambia with technical assistance on keeping smoke flavor out of the honey, because they were using fire to drive the killer bees from the hive as they took the honey out. We used a process that allowed them to generate about 40 percent more income by producing a higher-quality honey for the gourmet market. It wasn't just an industrial or a "socially-responsible" honey at that point.

Most of these communities haven't had the financial skills necessary to run a business. They don't necessarily need computers and spreadsheets, but someone needs to help them to do problem-solving exercises—how to solve

problems as they come up, how to solve them in the abstract before it's a life and death situation.

Tapping latex

One financial technique we've used is to go through communities or larger co-ops, rather than through individual loans to individual producers. Our goal is to work through groups large enough to have some economic clout, either regionally within their country, or at an export level.

We are now attempting to finance things like employee stock ownership plans (ESOP), which are businesses where workers own all or part of the company. Instead of only helping nut gatherers or making nut-shelling factory owners wealthier, we are developing ways to help nut shellers organize themselves and buy out half the equity in the factory so they own some of the value they add to the nuts. They get not only a wage, but also some of the factory's profits. These are some of the approaches that can be used.

Now, what are the lessons learned? I've spelled out 20 of these lessons in a book titled "Generating Income and Conserving Resources: 20 Lessons from the Field" (Figure 2). I will highlight some of these here.

First of all, it's pretty much impossible to have any kind of sustainable development or equitable distribution of revenues unless there are clear land and resource rights—unless it's clear who has access, who regulates access, etc. Without clearly defined structures, people are not going to make the investments required for sustainable production. And sustainability costs money! It costs time, and it costs capital as well.

It's important to work out land and resource rights right up front, because without that, nothing else makes much sense. You're not going to plant a tree if you don't know whether you're going to own it in 5 years. You're not going to harvest sustainably if you assume that somebody else is coming after you to harvest unsustainably. These kinds of issues are especially problematic in third-world countries, but I don't think they're dissimilar to problems involved with wild-crafting in the Northwest.

Another lesson is the need for community resource inventories—collecting information on a whole gamut of things from natural resources to finance to the human resource base. What is a community capable of? What have they done in the past? What are they doing now? What are they interested in doing in the future?

Learn from the past. Around the turn of the century, for example, Brazil was exporting about 45 wild vegetable oils harvested from the Amazon. With the advent of electricity, the markets for oils to make candles were wiped out; the increased availability of corn and soybean oil for cooking knocked out a lot of other oils. By the late 1980's, only three or four oils were being exported directly from the Amazon.

FIGURE 2. Generating Income and Conserving Resources: Twenty Lessons

1. View land and resource rights as essential to both income generation and conservation.
2. Undertake a community resource inventory.
3. Start with products that are already being produced and that have markets.
4. Capture the value that is added as the product travels through the market system.
5. Improve the harvesting techniques of existing products.
6. Reduce post-harvest losses.
7. Increase the competitiveness of a community's existing products in the market.
8. Keep the strategy simple.
9. Diversify production and reduce dependence on a single product.
10. Diversify markets for raw and processed forest products.
11. Add value locally.
12. Identify and use appropriate production and processing technology.
13. Use your business to buy manufactured products in bulk for the community.
14. Know what you are selling. Establish standards for each product.
15. Bring other players on board, as there is strength in numbers.
16. Make a decent profit, not a killing.
17. Don't create or reinforce patron-client relationships.
18. Create solutions that are equal to the problems.
19. Require community investments and, when outside finance is needed, use loans not grants.
20. Establish ecological marketing systems. They can make production sustainable, and international "green" markets are for the protection of ecosystems, not people who live in them.

So we said, "Wait a minute. There's a growing interest in natural vegetable oils, in oils that could be certified organic or produced without chemicals. Why don't we look at the historical records to determine strategies for old oil products that might have new markets?" In doing that, we brought three or four oils back onto the market, mostly for personal care products—shampoos, conditioners, body lotions, etc.

As I said before, however, start with products currently on the market. There isn't time for long and costly start-up testing—it just doesn't make sense.

Besides, so much can be done with the products already being sold that will both generate income and produce them more sustainably.

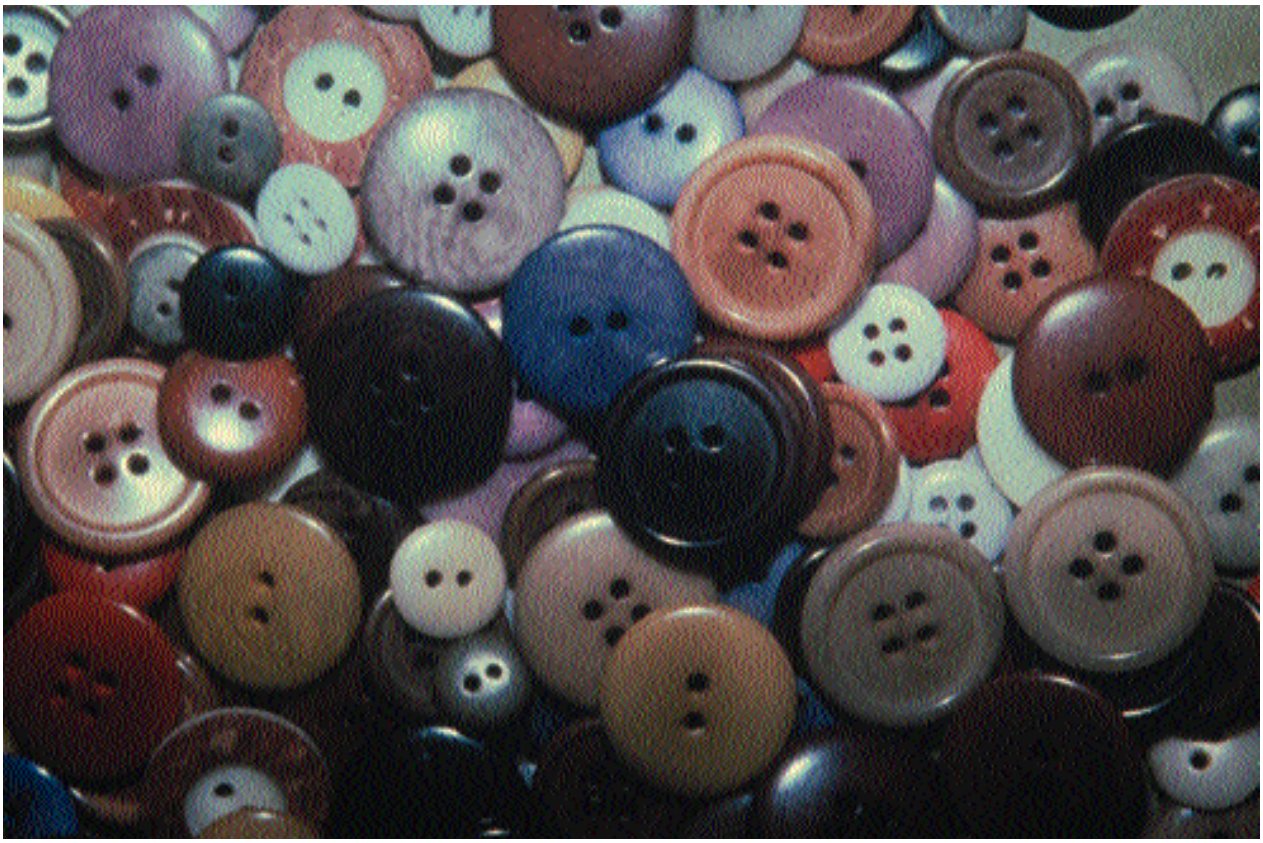
Improve the harvesting techniques (see Figure 3). In Brazil, we found it was very easy to earn 25 to 50 percent more by changing the way people harvested products. Part was an actual increase in production, part was an increase in quality of the product harvested, and part was reducing the environmental impact of harvesting so there was more to harvest next year and people didn't have to go further afield—in fact, they began to harvest sustainably. Improving harvesting techniques had a noticeable impact on income.

In that same vein, reduce post-harvest losses. People harvesting secondary nontimber forest products lose anywhere from 15 to 30 or 40 percent of their products. For fruits, the loss may be much more than that. There are always ways to improve storage, handling, and income from these products. Efforts can be focused on transport, on warehousing, on eliminating pests, or on processing.

FIGURE 3. Potential economic returns from activities discussed in this section (Clay 1996)

Potential returns to producers are summarized in this box. However, these are only estimates. Actual returns to any given producer for any given activity will vary tremendously. If producers are not careful, activities can even have net costs rather than income. There are risks and costs associated with each activity, although some are riskier than others. This information is intended to illustrate possibilities associated with specific activities and to show relative potentials of different activities.

Activity	Economic Impact
• Improve harvesting techniques	Increase income by 10% or more
• Increase harvest efficiency in the forest	Increase income 5 to 10%
• Reduce post-harvest losses through:	
Improving forest storage and/or transport	Reduce losses by 5% or more
Improving local warehouses/storage	Reduce losses by up to 25% or more
Improving or beginning to transport to processing plants	Reduce losses by up to 35%
• Improve transport through:	
Volume shipping	Reduce costs by 10% or more
Backhauling	Reduce costs by up to 50%
Processing product to reduce water and waste matter	Reduce costs by up to 70%
• Hold product and sell in off-season	Increase gross income up to 200%
• Add value locally through processing	Increase gross income up to 500%
• Obtain better pricing information	Increase income by 10% or more
• Improve credit terms	Reduce credit costs by up to 75%
• Capture "green" premiums in Northern markets	Increase income 10% or more
• Negotiate income-sharing agreements with manufactures	Increase income 10% or more
• Purchase consumer goods in bulk	Reduce costs up to 50%
• Transport consumer goods in bulk	Reduce costs up to 10% or more



Tagua buttons

Capture value added as products move through the marketing system. Find out who's doing what with each product and where the value is being added. Find out where the risks are being taken, what kind of investment needs to be made each time the product changes hands or is transformed. Get a better idea of where you can enter that system without incurring a lot of risk.

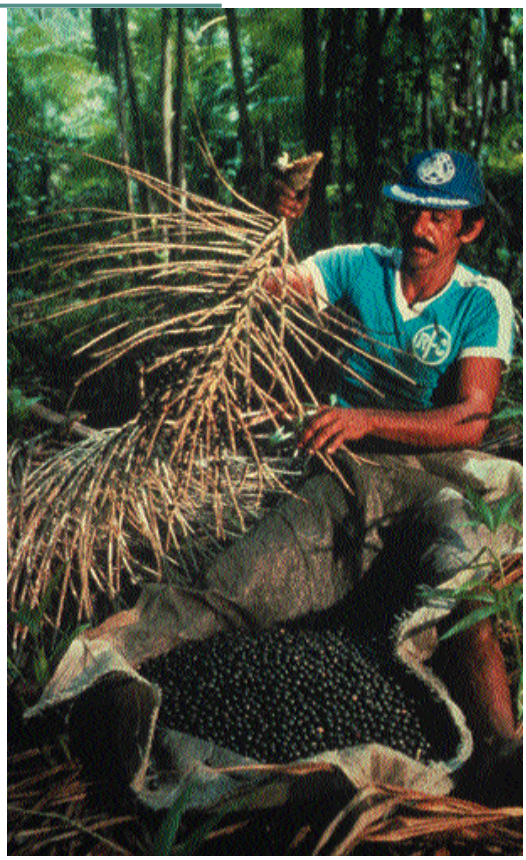
Increase the competitiveness of a community's products. A lot of communities produce only a small amount of product, maybe 2,000 pounds of shelled Brazil nuts, so they sell those 2,000 pounds of nuts as an undifferentiated lot. In fact, in the international market Brazil nuts have seven different classifications. If the nuts are divided up, communities might average $1.40 a pound for the differentiated nuts, whereas when the nuts are all lumped together they'll bring only $1.00 to $1.10 a pound. This is just an example.

It's worth the effort to raise the product's value by sorting it into categories the market wants. Every commodity has classifications. Cashew nuts have 32 different classifications. Fruits are sold by sugar content—the brick content. Every product has some kind of quality screen buyers use to determine price.

Keep the strategy simple. Complex strategies have a way of getting dicey and blowing up in your face. Do one thing at a time. Make one or two changes or have a controlled experiment with one group of people doing one thing and another group doing another to see which works better. But don't try to do too many things at once.

For example, we financed a Brazil nut factory. The next year the same group of people wanted to use their equity in the Brazil nut factory to finance a rubber factory. The Brazil nut factory wasn't profitable yet, and it was having major management problems. It didn't make sense to add a whole new level of management problems on top of that. So we nixed the idea. You have to keep things simple.

That being said, diversifying production and reducing dependence on a single product is very important. But that can be done in different ways. Take a product you're already selling, like Brazil nuts. You can sell it not just to the food industry, but also to the personal care products industry as expressed oil. You can take the flour that's left after making the oil—flour that is 40 to 50 percent protein by weight—and sell it to companies that make bread and pasta for school lunch programs. It's an incredibly nutritious food. Selling the oil pays for the cost of the nuts. The by-product can have a tremendous impact locally.



Harvesting palm fruits

Take something being thrown away as by-product and develop it into a marketable product. Brazil produces about 35 percent of the world's cashew nuts and throws away 100,000 metric tons of cashew fruit every year. This fruit, which is mostly organic, could provide an incredible amount of nutrition for a nutrition-starved country. It could also be exported, now that the United States has changed its regulations and organic foods actually have to be all organic. So cashew fruit juice could be a substitute for white grape juice. It has tremendous market potential.

Put cashew on any product in the United States and you can sell it for more than that product sells by itself. People go nuts over cashews. So think about production and marketing strategies this way. Also, while you're at it, put a few beehives in those cashew trees so you can sell honey and increase the productivity of the trees as well. From a marketing point of view, cashew honey has incredible cachét.

Diversify markets for raw and processed forest products. If the products are normally sold in only one or two ways, as Brazil nuts were (mixed nuts or in-shell nuts during the holidays), think of other ways they can be used; we sold Brazil nuts for Ben and Jerry's ice cream. Create new demands that buoy the price.

Add value locally. This is the mantra everybody around the world has heard. I say this with some trepidation. Some projects have generated five-fold income increases, but a lot of local projects don't make sense economically. That's why you need business plans when you're thinking about these projects. In many cases it simply does not make sense to saw timber or process rattan in Indonesia. Politically it's important, but economically it's a loser, because it uses up the resource base faster than more efficient saw mills elsewhere.

So look at each potential venture very carefully. If you can add value, do so. But don't try to do it at all costs, because adding value is very complicated and often requires financial and management skills communities and co-ops don't have. In short, adding value can be a disaster if you're not careful.

Identify and use appropriate production and processing technology. When outsiders try to start income-generation projects, they often bring in very expensive equipment that 1) doesn't work very well in those conditions; 2) isn't necessarily the best equipment for the job, and 3) can't be repaired except at great expense. There may be better ways to go.

So take a cautious approach. Maybe borrow technology that hasn't been applied to what you're doing. We found, for example, when we started the Brazil nut factory that we could spend $25,000 on a nitrogen-flushing, vacuum-packing machine that would pack 20-kilo boxes of Brazil nuts, flush them with gas, and seal them tight. The boxes had a shelf life of more than a year when kept at 50 degrees or less.

However, for 25 cents a box, we could buy little oxygen-absorbing packets from Mitsubishi and use a $500 heat sealer to seal the bags. The oxygen absorber sucked the oxygen out, creating a vacuum. We used this system until the project was economically viable. After the second year we bought the larger machine because our volume increased. Think about technology before you buy. It doesn't always make sense. I realize that a lot of these ideas are very basic, but sometimes they need to be underscored.

Most communities doing income-generation projects want money to purchase consumer goods. One way to get more purchasing power is to buy in bulk and "backhaul" use the transportation that took your products out to bring other products in, and sell them to your people at lower cost than they could buy from merchants. If you can cut costs on purchases, you don't need as much income. Keep production and consumption connected. It's useful to think about it that way. If you've got a depot where people bring in products to sell to you, sell them something you can buy in bulk for less than they can buy it elsewhere.

Charcoal kilns

One thing that keeps people in debt, particularly in third-world forest areas, is selling production in advance of harvest. However, even when they sell products at the time of the harvest, they only get about 50 percent of the value the products would get in the local market. The reverse is that when they buy consumer goods—kerosene, sugar, salt—they're paying, in the Brazilian Amazon at least, up to 10 times more than they would if they bought in a city 50 miles down the road.

These kinds of debt peonage systems need to be addressed. Groups focusing on production and income generation need to focus on the consumption needs of these populations as well, because a lot can be done there that won't add costs. Isn't it more efficient use of a truck if it's full going out and coming back?

Know what you're selling. As far as local communities are concerned, they're selling fiddlehead ferns or Brazil nuts or mushrooms or something else. But buyers want a chemical analysis, a spec sheet; they want to know the standard deviations for a particular product, and variations during the time of year they're buying the product. In sum, buyers need to know whether a product is acceptable or falls outside of an acceptable range—whether they can legitimately reject a product for quality reasons. If you can't provide that information, they're not going to want to buy from you. They need that information to protect their own products and business.

With weird products no one has ever heard of, it gets even more complicated. Buyers really need basic information. They need to know scientific names, local names, history of use, health and safety tests that have been done, who the experts are on the product. It's often very hard for an individual community to come up with this information, but groups of communities can work together not only to get the information but to spread the cost among themselves. This can be very fruitful cooperation for universities, non-governmental organizations (NGO's), and local people trying to sell things.

As residents of the Pacific Northwest look into nontraditional forest cash crops, this kind of information will have to be found before new products can be brought onto the market. Probably a lot of historical research has already been done on many products with market potential. The challenge is to pull it all together.

In Brazil, for example, we found huge amounts of data in the archives of the botanical gardens and research institutes from the last 50 or 100 years; we found that this information allowed us to sell products in the United States, either because the research had been done or we could document that sales to the United States had already taken place. But this information, gathered before the computer age, had been lost. It was just sitting on shelves and nobody knew it was there. You need to gather this kind of information. Without it, you won't sell products. It's as simple as that.

Strength in numbers. One community, one producer, can produce only so much. A single community's production often is not enough to interest a buyer. We need to figure out ways to bring communities under a single marketing arm. A State can do that, like the State of Oregon, through a computer-based offering/trading system.

One example illustrates the issue of strength in numbers. When we first started the rainforest marketing program, we financed a Brazil nut shelling factory. We were really excited; we were going to have 80 tons of Brazil nuts a year. To sell these nuts, we had a meeting with M&M/Mars. We hoped they'd use Brazil nuts for one of their products, maybe a rainforest Snickers. We said, "We've got 80 tons coming next year," and they looked at us and said, "We use 80 tons of peanuts in 8 hours when we make Snickers."

You've got to get the scale into sync here, the supply and demand. One way to do that is to include 5 or 6 or 10 or 50 factories in a marketing scheme. They can do separate billing, they can do things individually, and they still have control. But they can market their products in larger lots.

Another reason we sourced products commercially was so a company working with a local community wouldn't be limited by the community's production. For example, if a company had a best-selling product, we could supply it from the commercial market and they would pay an environmental premium and do profit sharing even on the commercially sourced plants. They'd be able to make and sell as much as they could, which was very important from their point of view. They didn't want to develop a product and then be shut off with no more products 2 weeks before Christmas. That wouldn't be viable from their point of view, no matter how politically correct the cause.

Make a decent profit, not a killing. It's better to make a 20 percent profit for 100 years than 100 percent profit for 2. It's better to sell 100 million pounds of something at a 5 or 10 or 20 percent profit rate than 1,000 pounds at 100 percent profit. Begin to think about these things.

One reason the natural resources on this planet are being degraded is because people want to make a killing. They want to make all their money now. That's true in a lot of local communities as well, including indigenous communities. Indigenous communities do not always manage resources more sustainably than anybody else. They may have done so traditionally, but there are new pressures—population, wants that become needs, reduced or impoverished resource bases, etc. So we have to be careful that harvest levels are sustainable. This is the only way businesses can be sustainable over time.

Decide what you are trying to build. Sustainable businesses are based not just on environmental issues, but on how business is done. Can community members make a living? Are equity issues being addressed appropriately? Are relationships being created that will last a long time?

Don't create or reinforce patron-client relationships. One thing people do as they get involved in market activities is try to monopolize business relationships, either within their own companies or with suppliers or clients. Monopolies have caused lots of problems in the way business is done. Try to break out of that mold rather than creating new problems.

The solutions must be equal to the problems. We can't have a lot of little Band-Aids if we need a tourniquet. Plan at a larger level. Plan strategically from a zoning point of view, from a use point of view, from a marketing point of view. See where you can have the biggest impact on income and conservation and focus your efforts there. The appropriateness of the strategy will depend on the initial inventories you did, not just for a single community but for many communities or even the region.

Finally, the work I've done on international and particularly green markets indicates that there is interest in the environment. Consumer interest is not in people. Your one-two punch has to be about how many trees you're saving, how many forests you're saving, how much reef you're saving, how many species you're saving, etc.

Rainforest logging

You can educate consumers about the importance of people in the sustainability process, but don't start with how many dollars you're generating for local people, because consumers see that as a transfer of their wealth to somebody else. This is not going to work as a marketing strategy. So try to come up with solutions tempered with that reality.

Another important lesson is to look for policy issues that can help create more sustainable uses of resources. Many people interested in forests or in grassroot and income-generation development don't look at the impact and potential of policies in a positive way.

For example, we came across a situation in Brazil where a state was taxing Brazil nuts that were shelled where value had been added and employment and income had been generated. They taxed shelled nuts at 12 percent and allowed unshelled nuts to leave the state with no tax.

We got them to reverse this policy. With the help of economists from the state university, we showed them that instead of having an $800,000 a year industry selling unshelled nuts, they could generate more than $6 million by shelling and adding the value locally. The $6 million would have a multiplier effect on the economy far greater than the 12 percent tax they were currently collecting. Those kinds of analyses need to accompany any strategy. It's very important to look at gains that can be made through policy changes.

Also, if we're really interested in policy issues we should examine them on a global basis. We need to look at how the General Agreement on Tariffs and Trade (GATT) and the World Trade Organization (WTO) affect sustainability in general and certification guidelines in particular.

GATT and WTO are not written in stone. They are based, to a great extent, on precedents. If there's a political will, GATT and WTO can be changed. So we need consumer and producer education to create the will to put environmental value-added premiums (you can't say taxes these days) or certification guidelines into the GATT/WTO framework.

Finally, we need to take a hard look at the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). For 5 years, I've been trying to figure how local communities in rainforest areas can propagate orchids by using the rainforest as a greenhouse; they could generate tremendous amounts of income from the sale of cut flowers, live plants, and

Replanting in the tropics

essential oils. You could sell $20 orchids in Woolworth's and they would become the African violet of the next century. You could also cut orchids (they last 30 days) or press fragrant orchid blooms into essential oils for the perfume industry. Until the end of the 19th century, orchids were some of the main sources of essential oils for perfumes.

All of those things are possible, but under CITES, it's very difficult to trade in endangered species, even if they're hand propagated and produced in a monoculture or a factory situation. One orchid pod can produce 100,000 seedlings. They can be grown on agar and bananas—bananas that are thrown away in many countries like Costa Rica. This kind of project would make tremendous sense in many areas. However, until CITES is a little more flexible in the sale and commerce of orchids, you can't do these things. Now, I'm not saying CITES is bad. I'm just saying we need to look at ways to change it in certain limited instances.

AUDIENCE: You said that too high a price decreases sustainability? The logic seems backwards. A high price will control the supply or the demand of a particular item.

MR. CLAY: What we've found is that there is a middle ground for sustainability. If the price is lower than that, production isn't sustainable because people degrade the resource because they need to sell so much to make a living. The buffalo was a good example. Or if the price is too low, they will convert the resource, say a forest, to something totally different, which is what's happened with a lot of rainforests, prairies, and wetlands.

On the other end, if the price of a product is too high, people will find every one of those valuable items to sell; they will destroy the resource base without a second thought. This is the case with alligator hides, elephant tusks, and rhino horns. You could argue that high prices create a desire for sustainable production, but everybody is competing with everybody else to produce and sell as much as possible. This is particularly true in commons, where one's investment in a future crop doesn't translate to increased income because somebody else may come behind you and harvest what you've left behind.

Now, in commodities, you might find a difference. With a commodity that's produced in an agricultural system, you might actually get more sustainability as you go up the value scale, although I think that's arguable, too. But certainly from an ecosystem point of view you wouldn't get a more sustainable system. You would get more monoculture.

AUDIENCE: What about a situation that's not a commons? Where you have some control, so people harvesting wild products and funneling them to the world market to get the most for their dollar don't have to worry about this "gold rush"?

MR. CLAY: Unfortunately, it does become a gold rush because of the money. Furthermore, even when resources are privately held, producers in one country compete with those in others.

THE AUDIENCE: Would enforcement of boundaries help?

MR. CLAY: Enforcement is very difficult. This is a digression, but from a political economy point of view, everything we've done for the last century has undermined local institutions because States have usurped more and more power. As States have done that, indigenous people and local communities have basically seen their power and their influence eroded; often, now, indigenous people can't even control their own members on communal resource bases to prevent this kind of overexploitation. This is happening all over the place.

That doesn't mean it has to happen everywhere. There are some cultures where the social control systems still work. But, by and large, these systems have been eroded over a long time. Even teaching local groups in national languages through the education system often doesn't foster the language skills people need to manage their resources over a long period. That knowledge is not valued by the young and is not passed on. It is gone.

AUDIENCE: I just wanted to understand your comment on commodities. I'm assuming that if a reverse occurs on a commodity, it is because you hold control of the universe of that commodity? In other words, nobody else is competing against you on that commodity?

MR. CLAY: With regard to the commodity issue, what you'd find is more and more efficient production, which means a cheaper price. You're beating labor down and you're not valuing anything in the natural world except the commodity you're producing, so you're going to the cheapest place to produce it. Fairly quickly, supply would increase relative to demand, and the price would go down. For example, when sugar and spices were first introduced in Europe, they were exorbitantly priced. Today, because of widespread production, they are relatively cheap.

I still think that even with a commodity you'd get more soybeans, more corn, and more wheat, and drive prices down. And, in the process, you would totally destroy the ecosystem where that commodity is being produced.

AUDIENCE: That's the correlation I've seen. If you charge the higher price for the commodity, the only way it can be sustainable without a roofing mechanism of the buyer going to the lowest price is to have control of the universe of that commodity.

MR. CLAY: I think that's true. Since nobody has control over the universe, even in Cargil or Continental, the price of commodities always goes down. So you never get a higher price in the end, even though they may start out at high

prices. In fact, a lot of these exotic rainforest products are going to end up being grown on somebody's plantation if they really become valuable, and the price is going to come down. That's what happened with rubber, and now people are experimenting with Brazil nuts grown in plantations. It's happening all over the place.

AUDIENCE: Many third-world people live in areas that are degraded I'm thinking of the African bush in particular. What potential do you see for them in developing sustainable products?

MR. CLAY: I think the real challenge for conservation is in the occupied areas of the world, not the hot spots the MacArther Foundation and others have identified as places to save because of their biological diversity. There's pretty good evidence that most biodiversity exists where people live and use resources, not in remnant forests or isolated mountain valleys where nobody lives.

The challenge is to figure out how to live in the bush, jungle, savanna, or even in cleared or partially cleared agricultural areas and maintain biodiversity and ecosystem function. But the greatest challenge is in the latter areas. If production in those areas is to be sustainable, somebody's got to pay for it.

Our whole production system, where producers compete with each other, means that if I want to produce something sustainably and sell it in the marketplace, I'm basically cutting my own throat. I'm absorbing the costs myself, and the real polluter—the consumer—is not paying them.

One way to turn this system around is through an environmental tax or a value-added tax at the point of export. For every bushel of corn, every bushel of soy beans, every board foot of timber, every single product that moves across boundaries—and this is WTO- and GATT-friendly, too, because you're not discriminating—everybody would pay a 5 percent tax right at the border.

We could create superfunds for sustainable development, for investing in sustainable development. There are a lot of certification programs out there. If, as a producer, you can show that you produced your mahogany along the lines of the Forest Stewardship Council (FSC), or your sesame in Nicaragua is certified as organic by a third party, then you get a share of the 5 percent tax; you incurred the costs so you deserve it.

Packing nuts

If you are not certified, but would like to convert your operation to more sustainable production, some of that fund could be invested in helping you make the conversion. For the most part, however, the fund may be paid out to clean up mistakes, to maintain ecosystem services, because consumption is leading to an overuse of the natural resource base.

Consumers have to pay the true cost of the commodities they use, and this means a higher price for those commodities. Environmental externalities (e.g., erosion, fertility declines, pollution from chemicals) need to be included in the price. That price has to convert the costs of cleaning up the problems. The cost shouldn't be a generalized tax on governments. The people using the commodities should pay the costs.

Now, how does this affect consumer prices? Take a can of Coca-Cola that sells for 60 cents to $1 a can. There's 4 cents worth of raw materials in the Coke you drink from that can. If you put a 5 percent tax on all of those, that's going to be an increase of two-tenths of 1 cent in the consumer price of a can of Coke. Remember my example of the box of corn flakes. There's 4 cents of corn in a $4 box of corn flakes. A 5 percent tax would be a 0.2 cent increase in the price of a box of corn flakes. With companies reducing RTE (ready-to-eat) cereal prices by 25 percent, we know the margin is there.

AUDIENCE: That's not true when you get into wood products. Consumers would really feel a price increase on that FOB on a per board foot basis.

MR. CLAY: There's pretty good evidence, actually, that a 5 percent tax at an FOB level is not going to distort the global economy. Now, there may be specific commodities where that would happen, but it's not going to be timber across the board. It might happen with low-value timbers, perhaps not high-value ones. But maybe we should tax the latter at higher rates. Maybe we want to treat those as potentially nonrenewable, or as resources being used beyond renewability at this point. Remember, the Indian is paid $6 per cubic meter for mahogany that fetches $3,000 in London. Don't tell me there's no room for a 5 percent environmental premium ($75) on the FOB price in Brazil. This is something we need to think about.

Now, let's look at the 10 largest commodities in the United States this is, again, an example from beyond rainforests or forests in general. But a 5 percent tax on the 10 agricultural commodities that are traded most in the world could generate $10 to $12 billion a year. That's more than the World Bank or all the bilateral agencies or regional multilateral banks together are spending on any development (not just sustainable). For sugar consumption in the United States alone, we could generate a billion dollars per year. Now through U.S. AID, the United States currently spends about $200 million a year on its international environmental programs.

This is a potential change. But it would come out of consumers' pockets, so there should be an offset in income tax to balance it; otherwise consumers would pay more in taxes.

In fact, flooding in the Missouri and Mississippi Rivers, which cost $20 billion a few years ago, could be paid for out of this fund. It wouldn't be a general Government expense, because most of that flooding was caused by corn and soybean production.

AUDIENCE: Your narrowing the number of products to 50 sounded like a snap of the fingers to determine sustainability.

MR. CLAY: No. That was before we started the trade. We showed companies what was available, and they made the decision about what interested them. In the end, it didn't matter how much we wanted to sell something. What mattered was how much someone wanted to buy it.

With regard to sustainability, we hired people to examine existing research to determine whether we should get involved with a product, and if we did, what the main issues might be.

In each of the projects where we did trade, we had ongoing environmental monitoring. This wasn't just a toggle switch that said "yes" or "no." Monitoring is an ongoing process.

I'm setting up the Fund for Sustainable Enterprises. This fund will require baseline environmental, social, and economic data before any investment is made in a project. After a project is funded, we monitor it as long as our money is invested.

AUDIENCE: When you link people to the world economy, there must be some risks involved. Are you hoping the payoff is ultimately greater economic stability?

MR. CLAY: Remember one of the lessons: Start with what's on the market. We didn't actually go into any community that wasn't already producing for the market. So we're not exposing them to more risk than they already have. Now, of course, that's not totally true. If you become dependent on a higher price and that price fluctuates, there is some risk. But the issue is really one of rising expectations, not whether to produce for markets.

We're not dragging people kicking and screaming into the market economy. Very few people in the world are not somehow in the market economy. However, they may be bartering, they may be buying, they may be getting screwed, like the Mexican coffee producers who sell their coffee 6 months before harvest at 15 percent interest per month. By the time they harvest the coffee, they get 10 percent of the value. Is our program more risky than that? It's not!

AUDIENCE: In most places you've worked, have the local, regional, and national governments been supportive, or have they worked against you? What kind of relationship have you had?

MR. CLAY: Well, coming from the human rights movement where I've been kicked out by governments, I tend to stay away from them. My sense is that governments can only make things hard.

Now, there was that one exception where we lobbied successfully to change the tax structure on shelled and unshelled Brazil nuts. But, for the most part, we didn't want government assistance. We didn't want anything to do with governments. We wanted this to be outside of governments. That being said, we didn't really have any problems from governments, either.

AUDIENCE: What about from the standpoint of landowner rights and the resource?

MR. CLAY: That's for local communities to get involved with, not us. Our support allows them to enter into that debate on a more level playing field. They can afford to hire lawyers. They can bring in experts often more experts than the government has.

THE AUDIENCE: In the case of Brazil nuts, where you have the longest experience, what specific structures are in place to prevent the movement toward plantation-grown nuts?

MR. CLAY: What structures are in place? Only nature. Brazil nuts don't do well (yet) in plantations. Now, by grafting Brazil nuts, you can get production within 8 years. By putting Brazil nuts in a 10- by 12-meter grid or 10- by 10-meter grid, which is what the plantations are experimenting with, you could get huge theoretical production on small areas, so collection and transportation costs would go way down. The product quality goes way up because the nuts don't sit on the forest floor until somebody picks them up.

So there are advantages, but Brazil nut trees need to be pollinated, and the bugs don't like to fly out in the open air because they get eaten by birds. They haven't found a way around the pollination issue yet, but it's inevitable that they will.

AUDIENCE: Wouldn't that cut the long-term effectiveness of efforts for sustainable forest harvesting?

MR. CLAY: No. It means that Brazil nuts are only part of the strategy, and the strategy has to be flexible. You've got to look for the second product before the first one's gone. You can't just focus on one product.

Our economic analysis is that if collectors in forests used enrichment planting to double the number of Brazil nut trees to four trees per hectare, and if they added value themselves through local shelling associations, they could compete with plantations. They couldn't at current tree density levels, but they could if they did those other things.

So there are ways around this problem. You can be competitive in a way that's a lot more viable than the rubber tapping in Brazil. Brazilian rubber tappers have been tapping since the 1880's, even though almost all of the world's rubber is produced in Malaysia. They can still compete because they're closer to their own market, etc.

AUDIENCE: What recommendation would you make for our regional situation, where we have numerous products on government lands? We have problems with sustainable development of specific resources and with access.

Plant extract for natural red dye

MR. CLAY: The two are very much related, but they're separate issues. My sense is the sustainability issues are more empirical, and you need to get some data on harvest rates. How many different kinds of mushrooms are going out of the forests that people don't even know about? What's the effect of harvesting on fiddlehead ferns? What's the impact of boughs being harvested for wreaths?

There are all kinds of things going on. We don't know what the impact is. We know it's bad in some places, but we don't know over all. Maybe some of the money from permits could be put toward research on sustainability. It's an investment in the future.

The access issue is extremely complicated, as all of you know. Access needs to be regulated, but no more than for timber products. The economics of access should be carefully thought through, but again, no more than for timber products. The real question is whether sustainable harvesting can ever be accomplished through 1-year permits on one-cut timber concessions. I doubt it.

Another issue is that when individuals' lives depend on knowing where something grows, they're not going to tell you where it is, so it's very hard to monitor whether it's being harvested sustainably. The wildcrafters associations have had a hard time coming up with sustainability guidelines that could be monitored by a third party.

Again, I'm not totally in favor of third-party monitoring. It can be disempowering. It seems good at the outset because it provides a screening process everybody can be evaluated against. But it basically doesn't involve the producer enough to encourage sustainable production in the long term. You need to get communities involved in their own monitoring with outside verification, but as a partnership rather than an adversarial relationship.

AUDIENCE: Will cultivation have a large impact?

MR. CLAY: That's the trend for all these products. If they become big in the market, cultivation is just a question of time. Paper pulp may be headed that way—eucalyptus plantations in the tropics.

I grew up in Missouri collecting morel mushrooms. Nobody thought they'd ever be cultivated. Now we're just years away from commercial production. They've already developed the technology.

AUDIENCE: What about third-party verification for organic products?

MR. CLAY: Well, that raises another issue that's extremely troublesome and important. A lot of the organic certification around the world is owned by whoever pays for it, not by the producer. That is absolutely atrocious.

An example is organic cinnamon coming into Oregon. An Oregon-based company owns the certification on organic cinnamon in Indonesia because it paid for it. The producers can't sell organic cinnamon to anybody else. That's the kind of monopoly we should be trying to break, not to create.

AUDIENCE: Are there any studies on whether communal management leads to sustainability?

MR. CLAY: About 10 years ago I proposed to the U.S. Man and the Biosphere Program that they finance a study on sustainability in communal versus individual ownership of seven ecosystems types. Since Garrett Harden's writings, there is a notion that communal access will lead to resource degradation. This idea is based on European sheep farming, but on faulty interpretation of data. Wealthy individuals destroyed the commons even as they pushed poor people off their lands. It's not clear that the theory is any more accurate for other areas.

There are a lot of factors we need to look at. There is a very strong case for communal management of a number of resources. If not, what are we going to do about oceans and air? If we can't develop communal management systems, we'll all be up a creek. In fact, a global approach to managing the Earth's finite natural resources may be the most sensible approach of all.

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Wildlife and plant trade and the role of CITES: challenges for the 21st century

Chris Robbins
TRAFFIC USA
World Wildlife Fund
1250 Twenty-fourth St., NW
Washington, DC 20037

I would like to thank members of the colloquium for inviting me here to speak about the commercialization of wildlife and wildlife products at the global level. A discussion on wild harvested or special forest products would not be complete without addressing the role of commercialization in trade. To put this in context, I'd like to give you an overview of the global trade in wildlife (flora and fauna) and a brief summary of the principal instruments through which commercial trade in wildlife is monitored and controlled. I'd like to then examine a particularly complex and challenging issue facing the conservation community today—the medicinal trade of wildlife, and especially medicinal plants.

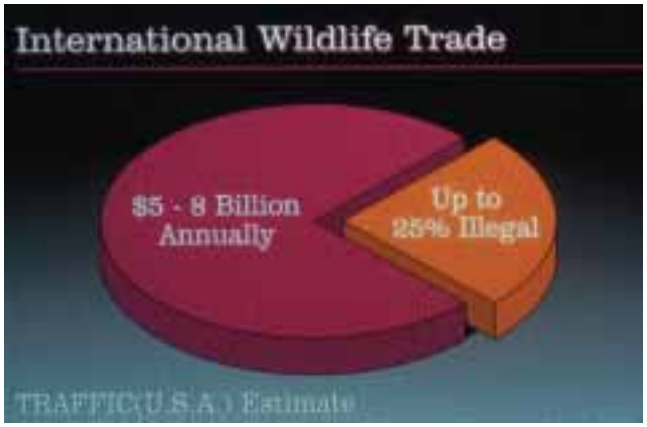
We're all aware of the continued threats and challenges facing conservation of biodiversity as we head into the 21st century. Habitat loss as the result of human encroachment, agricultural expansion, and development is the single greatest threat to biodiversity today.

While habitat loss continues to threaten some of the world's rare species and most fragile ecosystems, the unchecked, unsustainable, and illegal exploitation of flora and fauna for international trade is more insidious in nature, and it can be just as devastating in wiping out entire animal and plant populations. In fact, as habitat is converted or lost, access to and contact with commercially important species increases.

WILDLIFE UTILIZATION AND TRADE

International wildlife trade

The huge and lucrative global trade in wildlife and wildlife products, which is estimated to be between $5 and $8 billion a year excluding fisheries and timber products, is fueled by an insatiable appetite for exotic and rare species in countries like the United States, Japan, China, and in Europe, and this trade shows little sign of waning in the near future. In fact, we could raise this figure to $10 billion, since we've recently learned that China is a tremendous consumer of wildlife and wildlife products. In addition, the United States is one of the leading wildlife trading nations, officially importing and exporting over $1 billion a year in wildlife.



Although there is no foolproof way of measuring the level of illegal trade, the illegal

global wildlife trading continues unabated and may account for as much as $2 to $3 billion a year. Unfortunately, many countries are simply overwhelmed by the size of the wildlife trade and do not have the financial capability or resources—including wildlife inspectors, equipment, training, or technical expertise—to physically and effectively inspect every incoming and outgoing shipment.

Even in the United States, where the illegal trade of wildlife is estimated to be between $100 million and $250 million annually, underequipped wildlife inspectors cannot cover all the channels through which wildlife shipments pass because of lack of resources and staff. With fewer than 5 percent of all shipments in and out of the United States being physically inspected, the vast majority of wildlife imports and exports go completely unchecked, which increases the likelihood of smuggling.

Now, I'd like to emphasize that not all wildlife trade is unsustainable or illegal. People who depend on wild animals and plants for their main source of food, timber, medicine, and other products are often sensitive to harvest limitations. The revenue generated by the sustainable harvesting and sale of wildlife can provide an important source of income for local people, which in turn can translate into greater awareness of the benefits derived from the sustainable use of wildlife. It can also foster locally supported efforts to protect wildlife from illegal hunting and commercialization. In some countries, a portion of proceeds from commercial wildlife sales is reinvested for locally or regionally based management programs or natural resource cooperatives.

In Zimbabwe, for example, we've seen the development of a program called CAMPFIRE, which stands for Communal Areas Management Programs For Indigenous Resources. CAMPFIRE is designed to give rural communities and designated districts greater decisionmaking power over exploitation and management of natural resources on communal land. CAMPFIRE empowers rural districts to develop their own programs of wildlife utilization and management while giving these communities the sole responsibility of dealing with animal control, law enforcement, and protection of the resource.

Some countries have taken measures to protect their wildlife from overexploitation and unsustainable trade by setting up captive breeding facilities, management programs, and implementing export controls. In Africa, for example, quotas limit the number of noncommercial exports of leopard (*Panthera pardus*) trophies and skins. The trade in leopard products was banned in the mid 1970's due to excessive hunting for export to the commercial fur market throughout much of the leopard's range.

However, the international community also recognized that the killing of leopards to protect livestock and property was periodically necessary, particularly where the leopard was not endangered. Killing individual animals that were destroying property could reduce human-leopard conflict and indirectly enhance long-term survival of the species.

Consequently, the international community through the Convention of International Trade in Endangered Species of Wild Fauna and Flora (CITES), agreed in the early 1980's to begin allowing certain African nations to export leopard hunting trophies and skins. Today, 12 African countries are allowed

to export from 50 to 500 trophies and skins annually as long as these products are solely for noncommercial purposes.

THE CONVENTION ON INTERNATIONAL TRADE IN ENDANGERED SPECIES OF FAUNA AND FLORA (CITES)

Keeping wildlife exploitation and trade in check continues to be a major challenge for the international conservation community. Many countries do not have the infrastructure for wildlife protection, lack adequate legislation, and often have too few resources to enforce existing wildlife trade laws.

Without a doubt, CITES is the single most important global tool in controlling detrimental wildlife trade. The convention came into effect in 1975 and includes 130 member nations who, upon becoming members of CITES, are obliged to monitor and regulate international trade in wildlife and wildlife products and take actions if species are adversely impacted by trade.

CITES-party nations convene every 2 to 2-1/2 years at a conference of parties (known as a COP) to discuss CITES' performance and make changes to three appendices of species protected or regulated under the convention. They also address other policy issues. At the latest COP, held a year ago this month in Ft. Lauderdale, Florida, the 119 parties in attendance voted on several contentious issues ranging from opening up the commercial trade in minke whale (*Balaenoptera acutorostrata*) to listing the red-knee tarantula (*Brachypelma* spp.), an endemic Mexican and Central American tarantula popular in the pet trade.

About 25 full-time staff at the Geneva-based CITES Secretariat monitor the implementation of the treaty and its violations, administer field-based scientific studies for commercially traded species, identify problems and challenges facing CITES implementation and enforcement, and organize official CITES events such as the biennial conference of parties. The CITES Secretariat's operational costs are paid for primarily through annual contributions from member parties. A party is asked to make a payment to CITES Secretariat's trust fund based on the United Nations contribution scale, which prorates contributions according to a country's economic standing. The United States, for example, contributes substantially to this trust fund and accounts for approximately 25 percent of the Secretariat's budget, whereas poor countries like Vietnam and Zaire contribute a much smaller share, equal to less than 2 percent of the total CITES budget.

In recent years, many countries have failed to make their annual contributions to the CITES trust fund, which has left the Secretariat underfunded and has undermined it's ability to assist countries in regulating their wildlife trade.

The lack of funding from parties has been partially offset by financial and technical support from nongovernmental organizations, otherwise known as NGO's. Although NGO's cannot vote on issues raised at CITES meetings, where only CITES parties have the right to officially vote, qualified institutions have been allowed to participate in the CITES process over the years.

Historically, NGO's have played an instrumental role in assisting with the implementation and enforcement of CITES, especially in carrying out investigations, seminars and public awareness campaigns aimed at promoting sustainable legal trade, and curtailing illegal wildlife trade.

Role of Nongovernmental Organizations—TRAFFIC

The TRAFFIC network, a joint program of the World Wildlife Fund and The World Conservation Union (IUCN), monitors trade in wild plants and animals through a network of offices worldwide; it is mainly a research-oriented NGO whose primary purpose is to provide objective assessments on wildlife commercialization and trade.

Moss exports from U.S. in 1995 exceeded $14 million in value.

The TRAFFIC network with 17 offices assists the CITES Secretariat with wildlife trade monitoring by conducting field and market-based research to determine the levels and types of trade developing. TRAFFIC also develops public outreach and educational programs, providing tips and information on the illegal wildlife trade for law enforcement in various countries and the CITES Secretariat, and advises countries on CITES implementation including promoting CITES to parties that are not yet members to CITES.

How Does CITES Work?

The convention supports levels of protection for species, depending on their biological status and the degrees to which they are affected by trade. The CITES Appendix I lists species in danger of extinction and likely to be impacted by trade, such as the snow leopard. Species listed in Appendix I are generally listed as prohibited from international commerce.

Under exceptional circumstances, listed species can be traded among CITES parties for scientific, educational, and noncommercial sport hunting purposes. For example, the United States Government strictly regulates imports of the highly endangered giant panda (*Ailuropoda melanoleuca*), which is listed as endangered under the U.S. Endangered Species Act and also in CITES Appendix I. There are fewer than 1,000 giant pandas remaining in the wild in China. To date, a few U.S. zoological institutions have been permitted to import giant pandas as short-term loans for noncommercial purposes, including exhibition and scientific research on panda breeding behavior, diet, mating ability, and fertility. All funds generated through panda exhibitions in the United States are closely monitored by the United States and must be applied to conservation and captive breeding activities in China.

Of the approximately 700 species listed in Appendix I, about 75 percent are animals, including some of the world's most endangered megafauna such as the tiger (*Panthera tigris*) and rhinoceroses (*Rhinocerotidae* spp.). Parts and derivatives of tiger and rhino are highly valued in traditional Chinese

Calypso orchid

medicine. And tiger and rhino populations are dangerously low because of continued poaching and illegal trade in body parts on the lucrative black market. Among many other Appendix I species are African (*Loxodonta africana*) and Asian (*Elephas maximus*) elephants, all the great apes, sea turtles, whales, birds of prey, orchids, and cacti.

The 25,000-plus species listed in the CITES Appendix II are potentially threatened by trade, but they aren't as endangered as those in Appendix I. However, species listed in Appendix II are likely to become increasingly threatened if the trade is not controlled and monitored. As a safety net, an Appendix II listing is also used for species that are not necessarily threatened by trade but which closely resemble other species in the CITES appendices. An entire genus, family, or order may be listed if most members of the group are threatened, and it's difficult to distinguish between threatened and nonthreatened taxa. This helps customs and wildlife inspectors because all shipments containing look-alike species must be accompanied by appropriate documentation.

Now, in contrast to Appendix I, most of the species listed in Appendix II are plants, primarily because this appendix includes the orchid and the cactus families, which account for more than 80 percent of all Appendix II plants.

The lady slipper orchid (*Cypripedium* spp.), a native North American plant exported for the florist and medicinal trade, is just one of many thousands of orchids listed in Appendix II. Commercial trade in Appendix II species is allowed, but export permits from the country of origin or a re-export certificate from the country of export is required.

Now, upon joining CITES, each country is required to designate one or more governmental departments as its management authority to oversee issuance of import-export permits and compile annual trade reports for submission to the CITES Secretariat. A designated scientific authority provides the scientific expertise on which wildlife import-export approvals are based. In the United States, the designated management of the scientific authorities is housed within the U.S. Fish and Wildlife Service.

Finally, I'd like to mention Appendix III, which is an optional list available to any country that wishes to protect a native species that might be threatened by trade. Listing a species in Appendix III doesn't require the approval of parties themselves, but it does enlist the help of CITES members in enforcing national wildlife laws.

For example, Costa Rica has recently listed big-leaf mahogany (*Swietenia macrophylla*) in Appendix III. Big-leaf mahogany is a heavily traded neotropical timber species that has been at the center of a contentious debate over whether CITES should regulate the timber trade. While some major importing countries have supported an Appendix II listing of big-leaf mahogany, most exporting nations have opposed such a listing for obvious reasons. Costa Rica's Appendix III listing of big leaf mahogany not only

allows Costa Rica to regulate exports, but it also requires other nations exporting big-leaf mahogany to certify that the species has been exported from a particular country.

WILDLIFE MEDICINAL TRADE

CITES has been a cornerstone of global species conservation for the last 20 years and has helped curb unsustainable trade in many threatened species. However, the convention is confronted with new wildlife trade issues and conservation challenges that raise serious questions about its future role and effectiveness in protecting biodiversity.

A particularly complex trade issue facing CITES and the conservation community is the enormous and lucrative medicinal trade in wild fauna and flora. There are serious questions about the ability of CITES or any regulatory mechanisms to effectively monitor and regulate this trade. The wildlife medicinal trade is composed of animals and plants and their parts and derivatives that are valued for therapeutic effects.

The trade in medicinal plants and animals, especially in parts of Asia, is entrenched in hundreds or thousands of years of historical and cultural use. And today, medicinal plants and animals play an increasingly active and integrated role in both traditional and modern systems of health care. In 1985, for example, the World Health Organization (WHO), estimated that as many as 80 percent of the world's more than 4 billion human inhabitants relied primarily on animal- and plant-based medicines.

However, traditional and subsistence use of medicines through animals and plants has really become very commercialized in recent years. The growth of the industry in the last two decades has been enormous, with new herbal products entering the market regularly. In China, for example, the practice of traditional medicine began 4,000 years ago. Practitioners continue to prescribe health treatments that use raw animal and plant matter through the thousands of local medicinal shops and traditional pharmacies in Asia and Asian communities worldwide.

But traditional medicines, particularly traditional Chinese medicines (TCM's), have taken on a new dimension. The TCM industry has expanded to include a multi-billion dollar manufacturing business selling packaged over-the-counter patented medicinal products within and outside China. The Chinese medicinal industry's tremendous growth is in step with China's economic boom, and trade in these medicinal products has skyrocketed. Unfortunately, however, these products continue to use, or claim to use, ingredients that include or are comprised of endangered and threatened species.

The commercial trade in wildlife medicinals is a cause for concern because it affects animal and plant populations as well as the indigenous people who rely on locally obtained medicinals for their own basic needs. For example, the sharp decline in rhino and tiger populations as a result of poaching for their body parts used in traditional Chinese medicines is probably the most sobering example of the impact of this continued illegal and unsustainable use of wildlife. Rhino horn, skin, urine, and teeth are prescribed for a

number of ailments. However, as a direct result of this trade, fewer than 11,000 rhinos survive in the wild today. The black rhino, of which there are fewer than 2,000 remaining in the wild, has been the hardest hit. To put things in perspective, there's been a 95 percent decrease in black rhino populations since 1970.

Now, nearly every part of the tiger's body hair, skin, testes, tail, stomach, nose, whiskers, and bones holds some medicinal value in treating a litany of ailments. The number of wild tigers has decreased from an estimated 100,000 at the turn of the century to fewer than 6,000 individuals today.

I'd like to emphasize that tigers and rhinos are not the only threatened species whose body parts and by-products are used for traditional medicines and foods. Thousands of other species of animals and plants are used in traditional Chinese medicines—bones from leopard, musk glands from musk deer (*Moschus* spp.), saiga antelope (*Saiga tatarica*) horn, genitalia from seals (*Otaria* spp.), scales from the anteater-like animals known as pangolins (*Manis* spp.), salts derived from bear (*Ursidae* spp.) gallbladders, and roots of orchids and ginseng. These are all species whose continued exploitation for use in Chinese pharmacopoeia is an increasing conservation concern. Now, I really don't want to single out or criticize traditional Chinese medicine. Rather, I want to highlight how the deeply rooted traditional use of wildlife in many cultures, coupled with a growing market for wildlife medicinals, is a serious threat to biodiversity. Simple economics dictates the efforts poachers and smugglers will undertake to cash in on species that fetch high prices on the international black market. Despite a CITES ban on commercial trade in rhino and tiger, illegal trade continues.

MEDICINAL PLANTS—CONCERNS FOR SUSTAINABLE USE AND CONSERVATION

I have focused on the use of well known megafauna in traditional Chinese medicine, but I would like to emphasize that rhinos, tigers, and bears are not the only medicinally exploited species of conservation concern. Plants are more heavily used in medicinal products than animals, although their conservation needs are frequently overlooked. People rely more on medicinal plants than on any other medicinal treatment worldwide. To escape the cost of importing increasingly expensive Western medicines, developing countries are turning to locally available medicinal plants in providing primary healthcare to a greater number of their people. As people in developing countries move from rural areas to cities, they bring their culture and traditions with them, including reliance on locally used medicinal plants.

In addition, people in developed countries are becoming increasingly disenchanted with the costs of modern medicine, leading to an explosive interest in alternative means of self-medication, including herbs and phytomedicines, which are derived from plant extracts. I'm willing to bet that 8 out of 10 people in this room have purchased some herb or herbal products for either medicinal or cosmetic use and probably haven't given a thought to conservation implications.

Expanding markets and the demand for medicinal plants raise serious questions concerning the sustainable use and conservation of wild plants. In the United States alone, the herbal products industry is growing at an estimated 15 to 20 percent a year. For example, a number of native North American plants that are not well monitored in the wild are exploited for their roots, rhizomes, and other parts. Some native plant taxa have declined in numbers because of the medicinal trade (Foster and Duke 1990).

Goldenseal (*Hydrastis canadensis*), a herbaceous perennial occurring in Eastern deciduous forests, is extensively and intensively collected for its root, which is sold to North American wholesale and retail outlets and exported to foreign countries. In Canada alone there are about 40 over-the-counter drugs containing goldenseal or its active ingredients. Goldenseal's market value has soared in recent years, which makes it an especially lucrative forest product among diggers and dealers. Goldenseal's wholesale value is surpassed by only a few other native North American plants, including wild American ginseng (*Panax quinquefolius*), that helps supply the world market in ginseng.

The problem with goldenseal is that no mechanism exists for monitoring collection and trade. Unlike American ginseng, which is listed on CITES Appendix II and must meet certain biological and management criteria before any export is approved, goldenseal is not subject to any trade monitoring or controls. Anecdotal information from harvesters and rising wholesale prices suggest that this species is becoming increasingly difficult to locate in the wild. Although propagation techniques have been established, it is not yet propagated in sufficient quantities to supply the commercial trade. The heavy collection and lack of commercially available propagated sources raise concerns about the sustainability of goldenseal collection and trade, the need for improved monitoring of the species in trade, and alternative means of production such as cultivation.

Insufficient Information on Medicinal Plant Use and Trade

Industrial development and water pollution, farming, livestock, clearance of land for timber production, and collection of timber and firewood are probably the greatest threats to plant life. Until recently, plants have been neglected in the conservation sense; compared to their animal counterparts, they have received little attention and publicity, even though the threats are just as immediate.

Because plants are undermonitored, under-researched, and poorly regulated, we know much less about the medicinal plant trade and the status of plants traded than we know about the highly publicized trade of most megafauna such as rhino and tiger. For example, there is little information on medicinal plant user groups—who's using medicinal plants, which species they're using, and how much they use. Furthermore, we know very little about the impacts of harvests on wild populations and the implications of commercialization and international trade on subsistence or traditional use. Also, we know little about the biological status of commercially exploited plants and on-the-ground conservation efforts, including cultivation and management of medicinal plants.

The conservation community needs a better understanding of the scope and dynamics of the medicinal plant trade in order to address its impacts on wild plant populations and avert the disasters that have occurred with rhino, tiger, and the African elephant. However, many gaps in knowledge will not easily be filled. One reason why is that pharmaceutical and herbal companies scouring the Earth's surface for plants containing promising bioactive compounds are extremely proprietary about their work; they usually will not volunteer information on the collection of plants and plant material and often will not divulge species they're collecting, their location, or the numbers of plant specimens collected for trade. Few laws require that they do so.

Another informational gap exists with respect to species-specific information on plants and international trade. Currently, there are no standardized trade categories for medicinal plants or animals. Most Asian custom records are not species-specific for plants. Rather, they lump all species of medicinal plants into one nonspecific category. Another example is the Standard International Trade Classification System, which groups fresh herbs and dried medicinal plants under one broad category. General trends in medicinal plant consumption can be deduced under this trade classification category, but the system doesn't differentiate between medicinal plant taxa.

This system wasn't intended as a tool for conservation, but as a universal system for customs to report processed goods. However, the lack of information on traded plants demonstrates the need for a system that records and monitors the trade at the species level, so that detailed information on the volume of traded species can be used in the development of management strategies for sustainable harvests and use (Marshall 1995).

Problems Facing CITES and the Medicinal Plant Trade

For now, the only tool that provides species-specific information on international trade in medicinal plants is CITES. Even CITES, however, does not have a complete handle on the voluminous medicinal plant trade. Although species may be protected by CITES, the parties have recognized the significant burden and questionable conservation benefit of trying to track the trade of all wildlife and product derivatives, especially those not readily recognizable.

Trade monitoring is most useful for primary products such as raw material because it provides a direct means of assessing the effects of trade on wild populations. Tracking the trade end-product derivatives provides fewer tangible conservation benefits, although it may provide a means of ensuring the legality of products entering commerce.

CITES has specifically exempted certain plant products and derivatives from international trade and controls. For example, at the 1994 conference of parties in Ft. Lauderdale, the parties accepted an Indian proposal to list Himalayan yew (*Taxus wallichiana*) in Appendix II of CITES. Yew is harvested for a compound used in the anticancer drug taxol. Increased habitat disturbance, illegal trade, and overcollection of bark and leaves of the Himalayan yew prompted the CITES action. However, the parties decided that chemical derivatives of Himalayan yew fall under the CITES definition of

nonreadily recognizable parts or derivatives, and these qualified for exemption from CITES controls.

Administratively, this exemption simplifies implementation of the Himalayan yew listing on CITES. However, most specimens of Himalayan yew probably enter trade as semi-processed or processed chemical derivatives, so the tracking system captures only a small portion of the actual trade. Accurate trade data are needed to assess the level of exploitation and protection needed for CITES-listed species. Furthermore, as long as Indian manufacturers can process Himalayan yew into chemical derivatives, collection and trade of the species will continue outside the scope of CITES. This is clearly an evolving issue for CITES that will need to be resolved in the coming years.

Lady slipper orchid

A second problem with regulating medicinal plants for CITES is the widespread unawareness of medicinal plant listings covered by the convention (Marshall 1995). Historically, most plants have been traded for the horticultural and florist markets. Some of these same plants, however, are also valued as medicinals. For example, all orchids are regulated under CITES Appendix II, although some endangered species and genera are protected by Appendix I. Most orchids are collected for the horticultural trade. However, some European countries discovered a few years ago that large quantities of powdered orchids were being traded to make a drink called Salep, favored by Turkish and Greek populations. This elusive trade went undetected by CITES for years. The material is located in small packages that can be purchased throughout Europe and the United States. It's very difficult to identify derivatives of this nature in international trade, which raises conservation concerns that the bulk of the trade is in these kinds of products.

In one comprehensive survey of CITES-listed plants imported for medicinal consumption into Germany, which is one of the largest importers of medicinal plants, 35 CITES-listed medicinal plant taxa were identified. Only none of these were listed by CITES. These represent only a tiny fraction of the total number of CITES medicinal plants that need more protection under the convention, and there are probably hundreds of CITES-listed plants traded for their medicinal value that are not being recorded in CITES statistics because so little is known about them. To get a better handle on this problem, CITES will clearly need to identify which taxa listed in the appendices are collected and traded solely for medicinal use.

Developing a strategy to enhance monitoring and regulation of the trade in medicinal plants means that CITES needs to resolve another problem, this is the physical identification of individual species in commerce. Medicinal plants and herbs enter international trade in a variety of indistinguishable forms, so it's nearly impossible to identify and monitor them. It's almost impossible for wildlife inspectors to single out these products and record them in trade. Medicinal plants are traded in a number of forms including as roots, bark, powder, extract, or semi-processed and finished plant-based medicines. Identifying the medicinal plants based on their appearance is not possible. You need the plants. Animal parts and derivatives are also difficult to distinguish by species or even taxonomic group. For example, gallbladders reported to be from bear species have been chemically analyzed and determined to be from domestic pigs (Espinoza, Shafer and Hagey 1995).

Besides problems with identifying hundreds if not thousands of parts and derivatives, there are cultural issues to be addressed. Traditional medicine practitioners and users have relied on medicinal plants and animals for centuries, and laws alone will not alter their reliance and dependability on these products. Governments and nongovernmental organizations are beginning to work with the traditional medicine community, particularly the Chinese community, to reduce the illegal trade in endangered and protected species. They're also trying to promote appropriate substitutions for products from rare and endangered species and prevent the unsustainable trade in dozens of other medicinally exploited animals and plants. World Wildlife Fund and TRAFFIC have recently undertaken a project to reduce the trade and use of endangered species in traditional medicines manufactured in China by working with the manufacturers and practitioners in law enforcement as well as monitoring the markets.

CONCLUSIONS

Despite difficulties of regulating a market as large and complex as the medicinal market, CITES is currently the only tool through which parties can protect species exploited for that market. However, international regulation is not enough to ensure the viability and sustainability of heavily exploited species. We need action on several other fronts, in addition to artificial propagation or captive breeding of endangered species; consumer advocacy and industry awareness are also crucial. Conscientious consumers may only wish to purchase herbal or plant-based products containing propagated or sustainably harvested plant material. Likewise, industries may improve their image and sales by marketing herbs and extracts that have been sustainably collected or artificially propagated.

Perhaps the single most important step in controlling the trade in medicinals, particularly plants, is the need for more information on the trade in general, including its mechanics, its demands and trends, and the volumes of species traded. Our first and foremost goal should be to minimize the impact of exploitation on wild plant populations by developing a viable and ultimately realistic plan for the conservation of medicinal plants in the 21st century.

Five key issues that need to be addressed :

1. Market Dynamics and Structure
The demand for medicinal plants and plant-based medicines is undoubtedly growing. However, basic yet essential information on the trade is seriously lacking. Furthermore, the secretive and proprietary nature of plant collecting for manufacturing these products seriously hinders efforts to prevent overexploitation.

2. Trade Monitoring
The problems CITES faces in implementing medicinal plant listings include the lack of reliable information on the portion of CITES-listed plants used as medicines. Furthermore, it is extremely difficult to identify traded medicinal plants based on physical characteristics. A better trade control regimen, ensuring that the trade information most useful for conservation purposes is collected, perhaps through CITES or The Convention on Biological Diversity, must be a priority.

3. Information, Exchange, and Dissemination
The exchange and dissemination of information on the medicinal plant trade should be encouraged. The IUCN medicinal plant specialist group, recently created to deal with this issue and to monitor and address the medicinal plant trade, is working with the CITES Secretariat to prepare a list of medicinal plants that are of high conservation priority. This group, which is also collecting additional information on plant taxa traded for medicinal purposes, will recommend action to the CITES Secretariat for improving implementation of poorly monitored CITES plants. TRAFFIC is also developing a strategy of its own to address this complex trade. In addition, we are looking for culturally and medicinally appropriate ways to reduce the demand for these species to a sustainable and acceptable level.

4. Education and Cultural Differences
Medicinal plants are steeped in tradition and have served as the basis for health care in some cultures for thousands of years. However, the overexploitation of some of these plants not only threatens wild populations, but also the very foundation on which cultural reliance on plants is based.

5. Consumer Awareness
Finally, consumers can have a significant impact on the conservation of medicinal plants. Because of the lack of monitoring, consumers cannot be certain the medicinal plant products they purchase have been harvested sustainably or from cultivated sources. Consumers should become more proactive in concern for the sustainability of the medicinal plants and herbs they purchase. If consumers hesitate to buy medicinal plant products because of concerns about the sustainability of wild plant resources, industry may make more of an effort to obtain plant material from cultivated stock or sustainably harvested plants.

I would like to leave you with some parting thoughts. As someone who monitors trends in wildlife utilization in trade, I've focused on the commercialization and utilization of wildlife and on how the unchecked exploitation of medicinal plants has raised questions about sustainable use and future conservation. I've also described a useful regulatory tool, CITES, which has undoubtedly reduced the detrimental trade in threatened wild fauna and flora. Although biodiversity conservation benefits from CITES, the long-term conservation and sustainable use of species depends on much more than regulation. It ultimately depends on the will of societies worldwide to make it happen.

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