United States
Department of
Agriculture

Forest Service

Pacific Northwest
Research Station

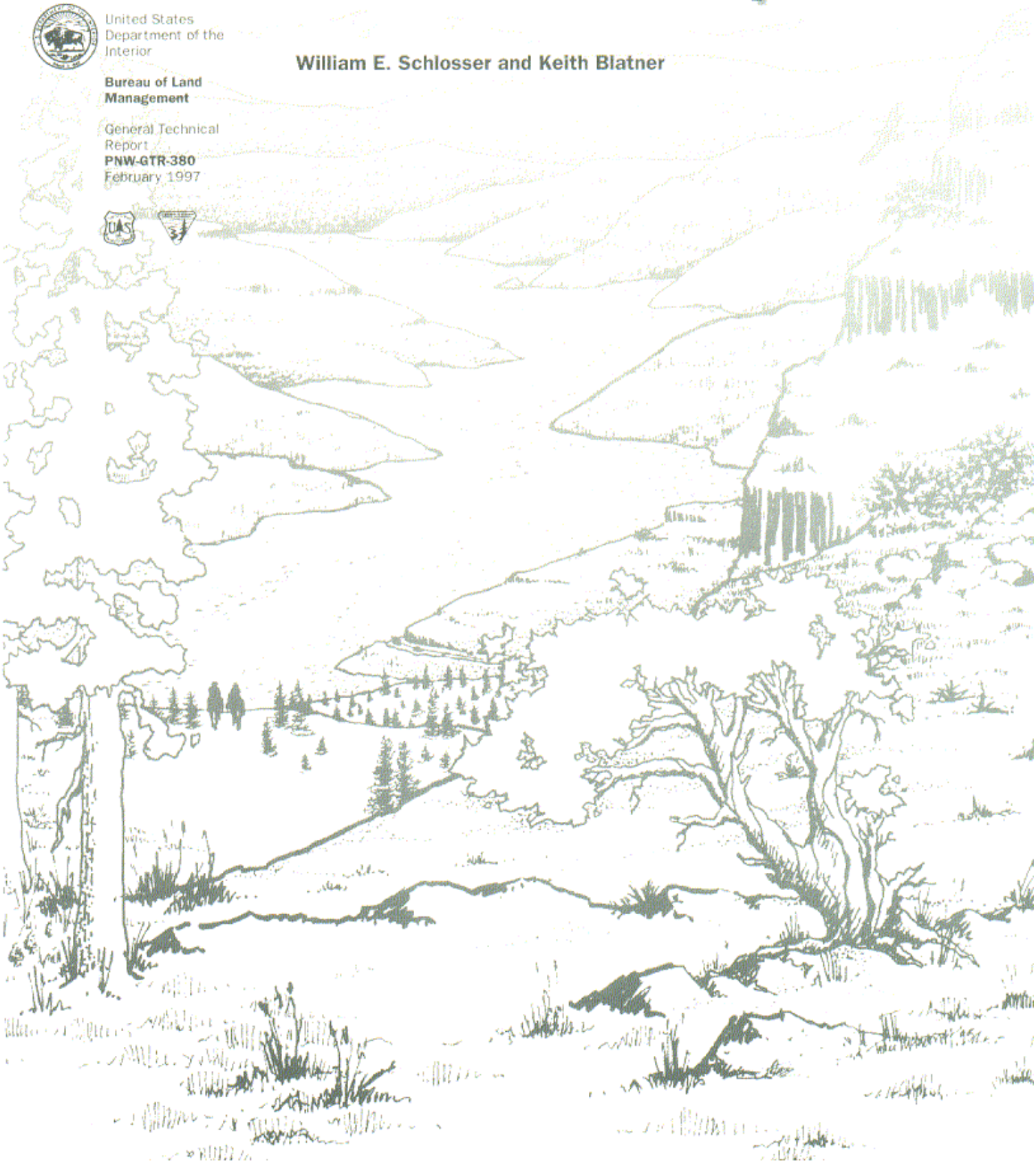
United States
Department of the
Interior

**Bureau of Land
Management**

General Technical
Report
PNW-GTR-380
February 1997

Special Forest Products: An East-Side Perspective

William E. Schlosser and Keith Blatner



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William E. Schlosser and Keith A. Blatner

Interior Columbia Basin Ecosystem Management Project: Scientific Assessment

Thomas M. Quigley, Editor

U.S. Department of Agriculture
Forest Service
Pacific Northwest Research Station
Portland, Oregon
General Technical Report PNW-GTR-380
February 1997

Abstract

Schlosser, William E.; Blatner, Keith A. 1997. Special forest products an east-side perspective Gen Tech Rep PNW-GTR-380 Portland, OR US Department of Agriculture, Forest Service, Pacific Northwest Research Station 27 p (Quigley, Thomas M , ed , The Interior Columbia Basin Ecosystem Management Project scientific assessment)

The special forest products industry has gained increasing attention, as timber harvest levels in the Pacific Northwest have declined, and has been heralded, at least by some, as a partial solution to the employment problems common throughout the rural areas of Washington, Oregon, Idaho, and Montana To date, relatively little work has been published on those portions of the industry located east of the Cascade Range Yet the east side produced about 48 percent of the total wild edible mushroom harvest (about 1 9 million pounds worth $118 million) during 1992 The region also accounts for all of the baby's breath harvested in the Pacific Northwest and has the potential to produce large quantities of other floral products It also seems to have the potential to become an important producer of other edibles and medicinal products, however, relatively little is known about this segment of the industry The following report provides overview of the special forest products industry east of the Cascade Range and evaluates its potential for expansion

Keywords Special forest products, wild edible mushrooms, floral greens, Christmas greens, economics, marketing

Preface

The Interior Columbia Basin Ecosystem Management Project was initiated by the Forest Service and the Bureau of Land Management to respond to several critical issues including, but not limited to, forest and rangeland health, anadromous fish concerns, terrestrial species viability concerns, and the recent decline in traditional commodity flows. The charter given to the project was to develop a scientifically sound, ecosystem-based strategy for managing the lands of the interior Columbia River basin administered by the Forest Service and the Bureau of Land Management. The Science Integration Team was organized to develop a framework for ecosystem management, and assessment of the socioeconomic and biophysical systems in the basin, and an evaluation of alternative management strategies. This paper is one in a series of papers developed as background material for the framework, assessment, or evaluation of alternatives. It provides more detail than was possible to disclose directly in the primary documents.

The Science Integration Team, although organized functionally, worked hard at integrating the approaches, analyses, and conclusions. It is the collective effort of team members that provides depth and understanding to the work of the project. The Science Integration Team leadership included deputy team leaders Russel Graham and Sylvia Arbelbide; landscape ecology—Wendel Hann, Paul Hessburg, and Mark Jensen; aquatic—Jim Sedell, Kris Lee, Danny Lee, Jack Williams, Lynn Decker; economic—Richard Haynes, Amy Home, and Nick Reyna; social science—Jim Burchfield, Steve McCool, and Jon Bumstead; terrestrial—Bruce Marcot, Kurt Nelson, John Lehmkuhl, Richard Holthausen, and Randy Hickenbottom; spatial analysis—Becky Gravenmier, John Steffenson, and Andy Wilson.

Thomas M. Quigley
Editor

United States Department of Agriculture

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Interior Columbia Basin Ecosystem Management Project

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Introduction

The special forest products industry has gained increasing attention, as timber harvest levels in the Pacific Northwest have declined, and has even been heralded, by some, as a partial solution to the employment problems in western Oregon and western Washington resulting from the spotted owl-ancient forest controversy Others point to the special forest products industry as a way to diversify the rural economies of eastern Washington, eastern Oregon, Idaho, and Montana

To fully understand the existing east-side special forest products industry, underlying resource-availability issues, and its future potential, however, one must first understand the overall industry Currently, most of the physical processing facilities are concentrated west of the Cascade Range These companies are often larger and better established than their east-side counterparts and often have provided access to distribution channels for products produced by east-side processors Some east-side businesses are marketing a larger proportion or all of their products, but west-side firms still play a key role in the marketing of products harvested east of the Cascade Range It is estimated that it will be at least a decade before individual east-side special forest products businesses will begin to approach the economic maturity of their west-side counterparts The west-side industry, however, will likely continue to dominate most aspects of the industry, with some notable exceptions (for example, wild edible mushrooms, baby's breath, and possibly beargrass) [1]

The special forest products industry is based on the harvest, processing, and marketing of plants and plant parts commonly found growing in the understory of the temperate forest zone common to the Pacific Northwest Major industry segments include (1) floral greens, (2) Christmas greens, (3) wild edible mushrooms, (4) wild edible berries, and (5) wild plants used for medicinal products (for example, Pacific yew, arnica, and abies oil)

[1] Common and scientific names of species are mentioned in the appendix

Schlosser and others (1991) conducted the first formal study of the floral and Christmas greens segments They estimated that these two segments generated about $128 5 million in product sales at the wholesale level during 1989, primarily in western Washington, western Oregon, and southwestern British Columbia Processors located in this area purchased $38 0 million worth of floral greens and $9 6 million worth of boughs from an estimated 10 000 harvesters during 1989

In a separate study, Schlosser and Blatner (1995) estimated that the wild edible mushroom industry in Washington, Oregon, and Idaho paid about $20 3 million for the acquisition of 3 94 million pounds of wild edible mushrooms during 1992 and provided income opportunities for an estimated 10,400 harvesters in the three-state region They estimated the wild edible mushroom segment generated $41 1 million in product sales at the wholesale level during 1992 About 29 percent of this total value, $118 million, was generated from businesses located east of the Cascade Range The east side produced about 48 percent of the total mushroom harvest during 1992, accounting for about 1 9 million pounds of wild edible mushrooms

Relatively little is known about the value of raw product received by the landowner, the value paid to harvesters, number of persons employed, or channels of distribution for the edibles and medlcinals segments, with the exception of the use of Pacific yew in the production of taxol

Other plant species used by these industry segments include huckleberries, blackberries, elderberries, quinine conk, cascara bark, wild ginger, various other roots, herbs, and other similar products Anecdotal evidence suggests that the harvest, processing, and sale of wild edible berries in the form of specialty jams and jellies has expanded rapidly throughout the Pacific Northwest and is becoming an increasingly important component of the economy of some rural communities

Pacific yew currently has only one use and one manufacturer Yew bark is used in the development of taxol, a cancer treatment processed by

Bristol-Meyer-Squib [2] Yew trees are felled, the bark removed and purchased by Hauser Northwest, Inc The harvest phase is highly labor-intensive, requiring several crews to strip the bark On delivery to the mill, it is chipped, dried, and shipped to Hauser Northwest's central processing plant in Boulder, Colorado

About 1,500 individuals participated in the harvest of Pacific yew in Washington, Oregon, Idaho, and western Montana, processing about 1 6 million dry pounds of bark in 1992 [3] The harvest volume of yew bark during 1993-96 decreased, due to the recent semisynthesis of taxol

As many observers have commented, the special forest products industry provides badly needed jobs in many communities of the region The best paying jobs, and those most likely to provide value-added employment to the regional economy, however, he in the processing and marketing of special forest products, not in the harvesting phase Unfortunately, the types of jobs provided by the harvest of special forest products are frequently low-paying, seasonal, and offer no medical or retirement benefits and no long-term security In fact, the special forest products industry is not a panacea for solving the employment problems of rural areas, instead, it is but one piece of a larger mosaic of rural development options

Industry Structure

Harvesters are generally independent, self-employed individuals with the latitude to secure harvest lease agreements with multiple landowners and to sell products to multiple businesses on a competitive basis Both full- and part time harvesters are common Full-time harvesters work almost year-round harvesting various products Harvest rights are secured by harvesters in the form of formal harvest lease agreements or through harvest permits A few processors own a portion of the land that provides their raw material supply (Schlosser and others 1991)

Processing sheds are businesses that purchase special forest products from harvesters, process plant materials, and sell processed products to brokers, or in some cases directly to retailers Interindustry trade of plant materials is not uncommon Some businesses are horizontally integrated with sheds located in diverse areas, frequently through franchise agreements Interindustry trade also occurs among businesses to obtain needed quantities or to facilitate the marketing of specific products

A core of full-time, nearly year-round employees is often hired to process products Temporary, full-time employees also are hired during October, November, and early December to process the high volume of evergreen boughs and other seasonal materials

Harvesters often shift from product to product, harvesting Christmas greens in late fall and early winter, wild edible mushrooms and other edibles in spring and fall, and floral greens during all but the spring growing season Many harvesters, however, do not depend on this industry for 100 percent of their annual income In the 1989 survey of special forest products processors (Schlosser and others 1991), respondents indicated that about 51 percent of the harvesters received only part time income through this industry This multiple-segment characteristic of the special forest products labor force was further confirmed during a more recent survey of the wild edible mushroom industry (Schlosser and Blatner 1995)

Although many part-time harvesters provide products only for a specific segment of the industry, some harvest products on a part-time basis for multiple industry segments Most full-time harvesters work in multiple industry segments Conversely, many harvesters tend to specialize in one or two segments of the industry by "following the harvest" as the season progresses

Processing sheds also participate in multiple segments About 42 percent of the wild edible mushroom processors also process other special

[2] The use of trade or firm names in this publication is for reader information and does not imply endorsement by the U S Department of Agriculture of any product or service

[3] Danly G 1993 Telephone conversation April 27 1993 [Orofino ID Hauser Northwest Inc] On file with Schlosser William E Michigan State University Extension Courthouse Annex 12 North Third St L Anse Ml 49946 1085

forest products, especially floral greens and other edibles Most floral greens processors also purchase and market Christmas greens (Schlosser and others 1991)

Major Plant Materials Currently Used

Diverse conditions are required to produce the various characteristics demanded by the various markets for special forest products Market prices for these products reflect distinctions in product quality or grade Product quality or grade is governed, in turn, by the forest conditions under which the plant materials grew Although the management of forest ecosystems for the production of special forest products concurrently with other more traditional products is under study, management prescriptions, including preservation, directly impact (positively and negatively depending on the product) the quantity and quality of special forest products available for harvest

Floral greens—The evaluation of the east-side floral greens industry is aided by evaluating the structure and characteristics of west-side floral greens processors Plants possessing deep green color and long-lasting evergreen properties are commonly used by the floral industry to accent and complement floral arrangements Many forest plants common to the Pacific Northwest have these charactenstics

Salal with its deep green leathery leaves and light green to red stem is used as background material by the floral industry Evergreen huckleberry and dwarf Oregongrape have fine featured evergreen leaves that are highly valued as accent products Both western sword-fern and deer-fern remain highly flexible in the arrangement process

Harvested plants are marketed in various forms For example, both evergreen huckleberry and salal are harvested in two forms, regular and short bunches (called tips or Johnny bunches) Both forms are used in a similar manner, however, the Johnny bunches provide slightly different, fine-featured leaves for the arrangement process Evergreen huckleberry is harvested in third form —"red-huck " The different trade names reflect differences in plant form and coloring important to the floral trade The standand form of this plant with its wide-spreading branches is referred to as huck-sprays Both sprays and tips are grown under a protective forest canopy producing deep green leaves Open-grown plants form dense clumps with long, straight shoots which turn deep red in the direct sunlight (red-huck) All forms are used singly or in small groups, as backdrops and filler to the main floral arrangements

Some deciduous plants such as Scotch broom, are used in the diverse floral greens market as well Scotch broom is used in floral arrangements where its deep color forms a backdrop for lighter plants Beargrass is used in three forms (1) fresh, (2) preserved and (3) dried and sold primarily to floral retailers in the Eastern United States and Europe Many species of moss are harvested for the production of moss baskets used for potting live and aitificial plants Other plant species are harvested annually, many on an experimental basis or for unique market niches

Floral greens processors typically procure plant materials up to an average of 300 miles from the business headquarters A few businesses even purchase plant materials from distances up to 1,000 miles away Extended purchase and trans port distances, however generally are associated with the annual harvest of baby's breath, a noxious weed naturalized in the arid rangelands east of the Cascade Range (Schlosser and others 1991)

Access to floral greens is typically procured via leases or permits, which allow harvesters to collect one or more plant products from a given area over a period of time Moral greens leases generally are secured by independent harvesters During 1989, only 45 percent of floral greens processors leased harvest rights directly from forest land owners accounting for 44 percent of total product value at the wholesale level Leases for the special forest products businesses that leased harvest rights averaged 11,750 acres per firm during 1989 (Schlosser and others 1991)

Salal products, including the standard spray form and Johnny bunches, accounted for a total of $13 1 million paid to the harvesters of the product during 1989 (table 1) Beargrass accounted for $115 million worth of product-acquisition expense Evergreen huckleberry raw materials

Table 1—Floral greens and related harvest values during 1989 from western Washington, western Oregon, and southwestern British Columbia

Species	Volume	Unit	Value
			1989 dollars
Dwarf Oregongrape	99,141	Bunch	59,485
Scotch-broom	345,698	Bunch	138,279
Salal	8,490,100	Bunch	7,641,090
Salaltips	10,878,589	Bunch	5,439,294
Sword-fern	2,463,092	Bunch	1527,117
Evergreen huckleberry	2,278,454	Bunch	1,480,995
Evergreen huckleberry (tips)	289,521	Bunch	107,123
Red-evergreen huckleberry (red-huck)	173,692	Bunch	112,900
Beargrass	12,781,823	Bunch	11,503,641
Moss	158,510	50 1b/sack	2,060,628
Total			30,070,552

Note Evergreen huckleberry, evergreen huckleberry tips and red-evergreen huckleberry (red-huck) all refer to *Vaccinium ovatum* The different common (trade) names reflect differences in the size of the product and plant coloring which are important in the floral greens trade Evergreen huckleberry refers to sprays ranging in length from 24 to 30 inches Evergreen huckleberry tips range in size from 18 to 20 inches Red evergreen huckleberry refers to the red tips (18 to 28 inches in length) associated with *Vaccinium ovatum* grown in direct sunlight All of these products are used and marketed in different ways

cost processors about $17 million during 1989 Western sword-fern accounted for about $15 million of revenue to the harvesters of the raw materials (table 1)

Floral greens processors ship plant products to various distribution channels including floral brokers, wholesalers, retailers, and other processors Typically, floral greens processors store products in waxed boxes in a cool, humid location until sufficient volume is present to ship a tractor trailer load Storage in this manner is typically no more than a few days in duration At other times, multiple shipments may leave the processor daily (Savage 1995) In other circumstances, shipments may be completed by combining production from multiple sheds

Of the products marketed to floral retailers in 1989, 17 percent was distributed locally by the businesses, 28 percent was exported, and 52 percent was marketed to the rest of the United States by value The Pacific Rim received 4 percent of this value, whereas Europe received an estimated 24 percent (Schlosser and others 1991)

Christmas greens—Evergreen boughs are used during the Christmas season for manufacturing wreaths, door charms, garlands, and swags Commonly used evergreen tree boughs include those from noble fir, Douglas-fir, western redcedar, western white pine, subalpine fir, lodgepole pine, western juniper, Pacific silver fir, and incense-cedar These species are distinguished from many of the other species in the region due primarily to their tendency to retain their needles for prolonged periods after harvest

Evergreen boughs are harvested almost exclusively during fall and winter for use in Christmas decorations Although noble fir is the preferred species for wreaths, door charms, and swags, many other species also are used Western redcedar is used in the manufacture of garland chains (a noncircular, wreathlike product), and as additions to wreaths and charms Douglas-fir provides inexpensive material for lower valued wreaths, charms, and swags Western white pine is a moderately valued product which is used to accentuate other bough products The remaining

Table 2—Major Christmas greens and related harvest values for 1989

Species	Volume	Units	Value
			1989 dollars
Subalpine fir	900	Tons	575,840
Noble fir	9,310	Tons	6,703,116
Western juniper	283	Tons	141,705
Incense-cedar	176	Tons	133,242
Lodgepole pine	272	Tons	97,856
Western white pine	995	Tons	457,503
Douglas-fir	1,317	Tons	263,393
Western redcedar	2,375	Tons	1,092,385
Other boughs	NA	Tons	59,242
Cones	7,230,871	Number	253,080
Holly	1,908,861	Pounds	2,672 405
Total			12 449 767

NA = not available

species generally are used in combination with other materials for seasonal decorations Other products commonly harvested for use in the production of greens include the cones of various species and holly

The desired qualities of evergreen boughs are found almost exclusively on young trees often categorized as saplings to pole-size timber The boughs found on mature and old-growth trees are rarely used due to their woody appearance and poor product quality

Schlosser and others (1991) estimated that $ 12 4 million worth of boughs and other Christmas greens were harvested from the region during 1989 The most important Christmas greens in terms of volume and value purchased were noble fir, western redcedar, and holly (table 2)

Wild edible mushrooms—Many wild edible mushrooms[4] are found in Pacific Northwest forests from northern California, Oregon, Washington, and into the northern Rockies of Idaho and Montana ()! the wild edible mushrooms found throughout the region, about 25 to 30 species are harvested on a commercial basis, however, only a few species are harvested for resale on a large commercial scale The lour most important species in tains of overall quantity harvested and total market value are morels, chanterelles, matsutake and boletes

Because mushrooms hint at different times of the year, buyers often travel hundreds of miles to acquire needed supplies of specific species Harvest begins during late winter-early spring in northern California and continues through spring and early summer in Washington, Oregon, Idaho, Montana, and into western Canada and Alaska The mushroom harvest usually is suspended during the hot summer months, because few species fruit during this period Harvest resumes in fall in about reverse order The spring harvest, however, is far more important than the fall harvest east of the Cascade Range

Mushrooms are either cleaned and marketed fresh to distributors in the United States, Asia, and Europe, or dehydrated for later sale During the harvest season, the highest quality mushrooms are harvested and an freighted the next morning for immediate consumption in fine restaurants

[4] For purposes of this discussion wild edible mushrooms are those fungal species hereinafter called mushrooms that are native to the temperate forest zone of the Pacific Northwest

around the world or for sale through other outlets (Schlosser and Blatner 1995) The timing of shipments is critical to the fresh market, as mushrooms are bought and sold on a weight basis Fresh mushrooms can lose an estimated 10 percent of their weight per day due to dehydration Lower quality mushrooms and excess supplies of high-quality mushrooms are dehydrated and stored for later sale when the species are no longer "in-season" and prices are elevated

Each mushroom species has unique characteristics, or a cultural significance, that influence marketing efforts Processors frequently use brokers to market their products in Asia, Europe, and the United States

Of the total pounds harvested during 1992, about 48 percent of these mushrooms, 1 9 million pounds, were harvested from eastern Washington, eastern Oregon, and Idaho East-side processors paid about $9 9 million to harvesters for all mushrooms purchased during 1992 The wholesale value of the east-side industry was estimated at $118 million during 1992 (Schlosser and Blatner 1995)

Morels—During 1992, about 1 3 million pounds of morels were harvested from Pacific Northwest forests with an estimated value of $5 2 million

Table 3—Major wild edible mushrooms and related harvest values for 1992 in Washington, Oregon, and Idaho

Species	Volume	Value
	Pounds 1992	*dollars*
Boletus species	481660	2 290 599
Chanterelle	1 135 175	3 664 261
Coral tooth	1488	5 761
Spreading hedgehog	42 993	122 438
Puffballs	2 209	3 648
Morels	1 325 827	5 222 237
Oregon black **truffle** (black *picoa)*	5 951	456 013
Cauliflower	7 779	22 070
Matsutakc	824 647	7 955 687
Truffle spp	7 441	235 533
Others	100 084	288 833
Total	3 935 254	20 267 080

paid to the harvesters of the product (table 3) Most morels, 96 percent, were harvested east of the Cascade Range However, east-side mushroom processors handled only 876,500 pounds of morels, whereas west-side and out-of-region processors purchased the remaining 449,300 pounds East-side processors paid about $3 3 million to morel harvesters during 1992 The discrepancy between the 1 27 million pounds of morels harvested and the 876,000 pounds processed on the east side reflects the competitiveness of west-side processors as they extend their procurement efforts to surrounding areas

Mushroom businesses indicated that 42 percent of their morels were sold in the Western United States, with some of this volume being resold to marketing agents for resale The region's mushroom processors sold about 15 percent of their morels to buyers in the Eastern United States About 20 percent of the morel harvest was sold directly by processors to Japan, with a roughly equal amount (20 percent) exported to European markets (Schlosser and Blatner 1995)

Chanterelles—The chanterelle harvest during 1992 totaled just over 1 1 million pounds for an estimated value of $3 7 million paid to harvesters (table 3) Only 5 percent of the total chanterelle harvest was supplied from east-side forests East-side processors, however, paid harvesters about $1 2 million for 327,000 pounds of chanterelles East-side mushroom processors competed on the west-side market for chanterelle procurement for about 270,000 pounds of chanterelles

About 30 percent of the total chanterelle harvest was sold in the Western United States Again, some portion of this volume was resold regionally and internationally through brokers Europe was the final destination for about 46 percent of the chanterelle harvest France received most of the chanterelles, at 24 percent of the total, however, Germany, the Netherlands, and other European markets received significant quantities (Schlosser and Blatner 1995)

Matsutake—Matsutake are a highly valued mushroom in the oriental market Also called the pine mushroom, the matsutake is similar to an oriental mushroom that was over-harvested in Asia and is now considered rare by many About 825,000 pounds of matsutake were harvested during 1992 with a total value of $7 96 million

paid to harvesters (table 3) About 25 percent (203,000 pounds) of the matsutake harvest came from east-side forests during 1992 East-side businesses processed about 28 percent of the total matsutake harvest, paying harvesters an estimated total of $3.5 million

Japan directly received most (70 percent) of the 1992 matsutake harvest exported by the region's mushroom processors Most of the remaining amount of the harvest (21 percent) was sold to the Canadian market It is speculated that most of the matsutake purchased in the United States by Canadian businesses were re-exported to Japan to fulfill contractual obligations for this mushroom in that market (Schlosser and Blatner 1995)

Boletes—The bolete harvest totaled about 482,000 pounds during 1992, with an estimated value of $2 3 million paid to harvesters (table 3) Most (72 percent) of the boletes harvested in the region came from east-side forests East-side processors, however, generally were not active in west-side procurement of boletes, processing about 73 percent of the total bolete harvest East-side businesses paid about $1 5 million to purchase boletes from harvesters during 1992

About 15 percent of all boletes marketed by the regional mushroom processors were sold in Eastern U S markets and 27 percent in Western US markets Asia received about 12 percent of the exports from this group Europe purchased about 46 percent of the 1992 harvest France was the largest single importer (Schlosser and Blatner 1995)

Large quantities of wild edible mushrooms also are harvested for personal consumption by recreational pickers throughout the region Recreational pickers are an important consideration in the management of this resource, because there are many recreational pickers in direct competition with commercial pickers for the resource

Employment by Segment

Given the high degree of cross-sector employment within the special forest products industry, it is difficult to estimate the total number of individuals involved in the harvest of products on an industrywide basis Research provides estimates of several individuals involved in the harvesting of floral and Christmas greens, wild edible mushrooms and Pacific yew One must recognize, however that some harvesters may be represented more than once when attempting to estimate total employment.

Floral and Christmas greens—Floral greens has traditionally been the backbone of the over all industry, providing stability to the other segments through a nearly year-round presence in western Washington and western Oregon During 1989, the floral greens segment paid an estimated $38 0 million to about 5 420 harvesters of native plants and plant parts (Schlosser and others 1991), located almost exclusively in western Washington, western Oregon md southwestern British Columbia To date no reliable estimates of the number of floral greens harvesters working on the east side exists, although ongoing research by Schlosser and Blatner should answer this question

During the winter months, when snowfall has covered the crop or made roads impassable, many of the products are not harvested This problem is partly mitigated by the comparatively mild winters experienced on the Pacific Coast of Washington and Oregon Snow is a significant factor, however, east of the Cascade Range and will influence the prices paid for species that are only harvested in this area During the growth period, the plant tips are fragile and do not react well to harvest, transportation, or storage As a result, this segment of the industry closes down during the spring growing season

Processing sheds paid over $9 6 million to the harvesters during 1989 Boughs were harvested during the roughly 70 day harvest period, starting in October and running through early December (Schlosser and others 1991) Again, these values do not reflect any employment by east-side Christmas ornament processors

Many of the businesses that process Christmas greens also are involved in the floral greens industry, thus several individuals are involved in both the harvest and processing of floral greens and evergreen boughs One advantage to this arrangement is the facilities and personnel necessary to support one segment are often sufficient to support the other.

Employment data for the floral and Christmas greens segments of the industry indicate that about 10,300 individuals participated in harvest and processing This included about 2,670 full time and 2,750 part-time harvesters Processors employed about 700 individuals full-time, year-round during 1989, about 4,180 individuals were hired as full-time seasonal employees (Schlosser and others 1991)

Wild edible mushrooms—The wild edible mushroom segment is smaller than the combined floral and Christmas greens segments of the industry About 10,400 individuals participated in the 1992 wild edible mushroom harvest on a seasonal basis over the three-state area The wild edible mushroom segment employs about 520 individuals in the three-state area for the processing of mushrooms (Schlosser and Blatner 1995)

Although many wild edible mushroom businesses are open year-round, the average mushroom business was open for 170 days (about 5 6 months) during 1992 (Schlosser and Blatner 1995) East-side businesses were open slightly fewer days on the average at 155 days (5 months) each

Mushroom processors indicated that about 35 percent of the wild edible mushroom harvesters sold mushrooms for primary income, whereas the remaining 65 percent sold mushrooms for supplemental income during the harvest period (Schlosser and Blatner 1995) It was estimated that about 17 percent of the mushroom harvesters also harvest other special forest products Mushroom harvesters, however, tend to be associated with other industries as well About 13 percent of the mushroom harvesters were also employed in the logging industry, with about 6 percent also employed by the commercial fishing industry About 4 percent of the harvesters were employed by the Christmas tree industry, with another 6 percent employed in fighting wildfires and prescribed burning An additional 10 percent of the harvesters were students (college and high school) About 14 percent of the mushroom harvesters also received welfare, and 13 percent received unemployment compensation (Schlosser and Blatner 1995)

Estimated Contribution to the Regional Economy During 1993

Frequently asked questions about the special forest products industry by economic development experts, policy analysts, and land managers include How much has the industry grown since the 1989 survey? What is the economic growth potential of the special forest products industry? and How important is the industry on the east side? Unfortunately, none of these questions are easily answered

Schlosser and others (1991) estimated that the floral and Christmas greens segments generated $128.5 million in product sales at the wholesale level during 1989, primarily in western Washington, western Oregon, and southeastern British Columbia Processors located in this area purchased $38 million worth of floral greens and $9 6 million worth of boughs from harvesters during 1989

Schlosser and Blatner (1995) estimated that wild edible mushrooms generated about $41 1 million in product sales at the wholesale level during 1992 Wild edible mushroom processors in Washington, Oregon, and Idaho paid about $20 4 million for the acquisition of 3 94 million pounds of wild edible mushrooms during 1992 About $11.8 million of this value was generated by east-side businesses (1 9 million pounds)

The 1992 survey of the wild edible mushroom industry (Schlosser and Blatner 1995) included processors throughout Washington, Oregon, and Idaho In addition, processors located outside the three-state area were surveyed relative to the volume of mushrooms harvested in the study region

Information on subsequent surveys of these industries has not been completed to date, and, since both studies were the first of their kind, no historical trend information exists relative to the growth of the industry Estimating the total size of the industry and its impact on the regional economy is further confounded by the fact that the original survey of the floral and Christmas greens segments of the industry only considered processors with businesses based in western Washington, western Oregon, and southwestern

British Columbia (Schlosser and others 1991) The study area considered represented the largest concentration of floral and Christmas greens processors at that time and represented a logical first effort Over the past few years, however, expansion of the special forest products industry east of the Cascade Range indicates a need for a larger regional perspective when estimating the overall size of the industry

Further, the past 4 years have witnessed the development and marketing of new products, the opening of many new businesses, and the closure of other long-standing companies In short, the industry remains highly dynamic in character, making growth projections difficult

Given these data limitations, it seems likely that the floral and Christmas greens segments of the industry have either just been keeping up with inflation or have been expanding at a rate of up to 3 percent per year in real terms (3 percent in excess of inflation) The average inflation rate since the 1989 survey has been about 3 percent The 3-percent growth rate assumes that the industry has grown at about the same rate or slightly faster than that of the overall U S economy

Given these assumptions, we believe the floral and Christmas greens segments would have contributed between $146 0 and $163 8 million dollars in real terms during 1993, primarily to the regional economy of western Washington, western Oregon, and southwestern British Columbia Anecdotal evidence suggests, however, that the floral greens segment may have grown at a slower rate due to depressed international markets, whereas the Christmas greens segment has experienced increased product prices and volume The much smaller floral and Christmas greens segments located east of the Cascade Range may have accounted for an additional $5 to $10 million in product sales at the wholesale level during the same year

The wild edible mushroom industry also has continued to undergo changes since the 1992 survey was conducted (Schlosser and Blatner 1995) Based on the results of the 1992 survey, it is estimated that the wild edible mushroom industry contributed $26 8 million to economies of western Washington and western Oregon, and $11.8 million to the economies of eastern Washington, eastern Oregon, and Idaho in product sales at the wholesale level Assuming the same range of growth rates (0-3 percent), the wild edible mushroom industry probably increased from $41 1 million in 1992 to between $42 5 and $43 7 million in Washington, Oregon, and Idaho during 1993

Any estimate of the contribution of the other edibles and medicinals segment of the special forest product industry represents no more than an "educated guess" based on anecdotal evidence However, given the increasing production of specialty jams and jellies by firms located throughout Washington, Oregon, Idaho, and Montana, and the relatively high value of the products produced and the many other specialty products produced by businesses in this sector of the industry, it seems likely that this little-known segment may have contributed an additional $2 to $10 million to the economies of the four-state area In addition, many of the specialty jam and jelly processors also seem to be located east of the Cascade Range

Summing these values suggests that the special forest products industry contributed between $195.5 and $227.5 million in product sales at the wholesale level to the region's economy during 1993 Most of this estimated value was earned by firms located west of the Cascade Range It is important to note, however, that much of the income earned occurs in the rural communities of the region, many of which have been severely impacted by recent reductions in timber harvest levels The contribution of these dollars to the rural economy of the region are particularly noteworthy when one considers that these dollars turn over 1 5 to 2 0 times before leaving these same communities There is also tremendous potential for the expansion of this sector in the inland empire

Potential Products Marketed From East-Side Forests

Although most of the special forest products industry is based west of the Cascade Range in Washington and Oregon (in terms of value, volume, and the number of established processors), a significant amount of product is supplied from east-side ecosystems As businesses become more competitive in this region, certain unique

product markets will be developed by east-side businesses In the short term, expansion of the east-side industry will likely be in areas with strong product markets primarily defined by existing west-side businesses The long-term growth of the east-side industry, however, will likely be through new products unique to this region

Floral greens—Floral greens species with the greatest potential for initial development in this region are those species common to both regions Initially these products will include bear grass, Pachistima, western sword-fern, baby's breath, and two Oregongrape species

Beargrass—Beargrass is the most widely harvested floral greens species in the region It is harvested from cool and moist forest habitat types across the Pacific Northwest, generally from higher elevations Although a significant volume of beargrass is harvested from the east side, most beargrass is processed west of the Cascade Range for final sale A handful of existing east-side businesses process and market this product

Pachistima—Pachistima, also called Oregon box-wood, is a floral greens species found throughout eastern Washington, eastern Oregon, and northern Idaho It is marketed in various forms including fresh product, dyed, or preserved[5] and dyed Although it has a striking resemblance to evergreen huckleberry sprays, Pachistima has been used only minimally as a substitute for this species in its nondyed form The limited amount of substitution probably stems from two factors (1) buyers and retailers are familiar with handling evergreen huckleberry but have less experience with Pachistima, and (2) supplies of evergreen huckleberry are sufficient to meet current demand

Western sword-fern—Although the quantity of western sword-fern harvested west of the Cascade Range is low compared to other products, it does represent a significant volume and value for some businesses Little western sword-fern is currently harvested from east-side forests If certain events occur in the future, however, east-side processors would have the opportunity to enter this otherwise limited market Potential future which would create the opportunity for an east-side entry into this market include (1) increased land use restrictions on the west side limiting the harvest of western sword-fern with no accompanying east-side restrictions, or (2) increased demand for western sword-fern at a time when selected east-side processors are positioned to take advantage of the market, or (3) both scenarios occurring at about the same time

Oregongrape species—Dwarf Oregongrape accounts for a small, but significant, annual harvest in the floral greens industry Although dwarf Oregongrape does not commonly grow east of the Cascade Range, two related species do grow on the east side tall Oregongrape and creeping Oregongrape Neither species is currently harvested on a large commercial level, however, both sport the hollylike leaflets of their dwarf Oregongrape cousin and are logical substitutes There are morphological differences in the species such as color, length, and rigidity, but these characteristics may provide unique marketing traits as opposed to product deficiencies Marketing efforts focusing on the minor differences among the three *Berberis* species may be able to capitalize on a niche market

Special range plants—Special range plants include various plants and plant parts collected from the arid and semiarid rangelands of the east side Like the special forest products discussed above, these plants and plant parts are commonly used in the floral industry

Baby's breath is a noxious weed of Euro-Asian origin that has naturalized across much of the east side and portions of the interior United States (Darwent and Coupland 1966) The vegetative growth of this plant is harvested by the floral greens industry of the Pacific Northwest During the 1989 survey of floral greens processors (Schlosser and others 1991), it was determined that west-side processors purchased about $5 0 million worth of baby's breath from harvesters A significant amount of this product is

[5] Products that are preserved have their stem bases placed in preservative chemicals such as glycerin that slows the deterioration process and increases leaf retention to branches Sometimes dyes are placed in the preserve chemical to color the plant material

preserved with glycerin and dyed for use in floral arrangements Because a significant amount of this product is processed on the east side, we believe that this value substantially underestimates the total size of this product line

Other special range products include perennial pepperweed, clasping (annual) pepperweed, black henbane, Indian ricegrass, arrowleaf balsamroot, and many other lesser known products Many of these special range products are marketed as dried plant as opposed to preserved There has been no research on special range products in this region As the floral greens processors continue to expand on the east side, further research will be needed

Christmas greens—The boughs of many evergreen tree species common in the Pacific Northwest have been used for several decades in the making of wreaths, swags, and charms The best boughs come from trees with the ability to retain their needles for extended periods after they have been severed from the tree

Except for noble fir, western juniper, and incense-cedar, every species of tree used as Christmas greens is found on the east side Subalpine fir is a common substitute for noble fir in the wreath-making process in this region Other suitable species also are available on the east side for harvest with little to no difference in quality

Wild edible mushrooms—The mushroom segment of the industry currently operates throughout the east side The most widely harvested and marketed mushroom species in this region is the morel Also harvested from this region are matsutake, boletus, cauliflower mushroom, black picoa, and spreading hedgehog Other species are harvested on a recreational or smaller commercial scale (Schlosser and Blatner 1995)

Businesses locating mushroom processing facilities on the east side will likely process mushrooms from throughout the Pacific Northwest Processing mushrooms involves many steps, including training a reliable workforce, identifying species, harvesting, cleaning, sorting, grading, and either packaging and shipping for fresh delivery (usually by air freight) or dehydrating or freezing, packaging, and storage for later sale Difficulties in the marketing phase should not be underestimated Many mushroom producers in the Pacific Northwest choose to sell their products to mushroom brokers as opposed to finding markets in the United States, Europe, and Asia (Schlosser and Blatner 1995)

Other edibles and medicinals—Other edibles and medicinals include various berry species commonly collected in this region dwarf huckleberry, blue huckleberry, big huckleberry, dwarf bilberry, western huckleberry, early blueberry, grouse whortleberry, Saskatoon serviceberry, and elderberries Medicinals include quinine conk, cascara bark, roots, herbs, and other similar products

Probably the best-known product of this segment on the east side is the edible huckleberry The edible huckleberry season is highly variable, similar to the mushroom harvest, beginning by midsummer and dwindling by late fall There are countless other plant materials harvested in limited quantities for sale in the region's health food and natural medicine stores

Managing Special Forest Products From an Ecosystem Perspective

An ecosystem-management perspective provides unique opportunities for combining the production of special forest products and other traditional forest uses Many of the plants used in the floral greens industry thrive in the forest environments created by past management activities that retained an overstory tree canopy These and other management prescriptions are encompassed within ecosystem management and are complementary to various other forest outputs (nontimber) within the region including recreation, wildlife, aesthetics, water quality, and special forest products

Historically, the special forest products industry has been described as having a "hunter-gatherer" mentality, with notable exceptions But as this industry has expanded the need for astute management of the resource has become more critical More intensive management, in turn, requires a formal assessment of plant growth and regrowth potential to support this economically important industry As forest management moves into ecosystem-based techniques, the need for management prescriptions that reflect specific plant

responses is accentuated for various reasons. These reasons include ecosystem viability, commercial usage, and unknown biological opportunities.

The quantity and quality of special forest products on many forest sites is tied directly to the forest habitat type and the potential of that plant community to produce desired plant species. Forest habitat types have been defined in this region by Cooper and others (1991) and other experts. Additionally, much of the federally owned and managed forest lands in the region have been categorized by habitat type and other information, providing a unique source of information for managers interested in special forest products.

The first step in ecosystem management for special forest products in the region is to identify the habitat type of the site. This allows the land manager to not only characterize the potential of the ecosystem to produce climax plant communities but also (identify possible) successional pathways. Many plant species, such as Pachistima, are present only during the early and mid-successional development of certain habitat types. Thus, a management plan involving the use of Pachistima would involve management that creates forest conditions at or near mid-successional status.

The evaluation proceeds by analyzing the understory plants capable of growing and thriving on the site. This is accomplished by mapping out ecosystem development along successional pathways. It may involve recognizing certain plant species as present only during early successional stages of development, such as those species growing after significant site disturbances (for example fire or clearcutting). It also may involve identifying certain species as growing only in climax plant communities. The identification will depend greatly on the specific plant community and the biological characteristics of the ecosystem.

To illustrate, on the western hemlock-queen's cup beadlily habitat type-beargrass phase, beargrass is present in all stages of forest succession shortly after site disturbances, during mid-successional development, and in successionally advanced climax plant communities. Product quality, however, is maximized during the latter stages of mid-successional development and in the climax plant community. A forest land manager interested in managing this site for special forest products would be wise to maintain forest conditions at or near the preferred phases.

Forest Succession and Special Forest Products

Forest land managers are familiar with the management of forest lands and the impact of different management prescriptions on tree growth and tree regeneration. Many managers are also familiar with controlling understory vegetation. What is less well known is how to manage a forest site for special forest products, while manipulating site conditions to enhance the production of more traditional forest products or from a broader ecosystem perspective. An assessment of floral greens potential on forest lands west of the Cascade Range in Washington and Oregon was completed by Schlosser and others (1992). The following discussion is an initial evaluation of the potential of managing forest lands for selected special forest products east of the Cascade Range in eastern Washington, eastern Oregon, northern Idaho, and western Montana.

Beargrass—Although beargrass occurs across many forest habitat types in the region, quality products need specific site conditions to be harvestable and profitable. High-quality beargrass is deep green and has wide, firm blades longer than 28 inches. Browned tips and a yellowish tint to the blades indicate poor and unacceptable product quality.

Beargrass occurs on three habitat types within the Douglas-fir series (table 4); however, its shortened length and commonly yellowed appearance makes commercial harvest of this species unlikely or sporadic within this series. Beargrass occurs abundantly across the grand fir series, subalpine fir series, and the mountain hemlock series (table 4) with exceptionally high quality and normally profitable harvest. The highest occurrence of beargrass is represented where beargrass, fool's huckleberry, and twinflower are the indicators of the understory climax plant community. On these sites, beargrass occurs on between 75 and 100 percent of the sites with coverage values between 28 and 51 percent (table 4). The cooler and wetter sites represented in the western redcedar and

western hemlock series do support beargrass populations, but generally not at acceptable harvest levels with the exception of the western hemlock-fool's huckleberry series On this latter site, beargrass occurs on nearly every site and occupies about 70 percent coverage (table 4)

Although beargrass has the potential of occurring on many sites within this region, forest management practices will greatly influence its quality for commercial usage Beargrass is not normally harvested from stands after a clearcut or a seed tree harvest until forest conditions have created a closed forest canopy for a prolonged period When managed as a three-entry system, the shelterwood regeneration technique can be operated with beargrass harvest after the first harvest entry but not after the second or third entries Beargrass harvest potential is strongly influenced by overstory forest conditions Three general site characteristics are associated with the production of high-quality beargrass (1) diffused sunlight through an elevated forest canopy, (2) limited soil compaction, and (3) sites exhibiting a conservation of site moisture (that is, north- and east-facing slopes, and appropriately sized openings in the overstory to allow adequate infiltration of snowfall)

It is generally accepted that the harvest of beargrass, and most other floral greens species, is eliminated for many years after a regeneration harvest of trees on the site When a commercial thinning or other type of intermediate stand practice is conducted, however, floral greens harvest can begin after 3 to 7 years of regrowth This period will fluctuate depending on the site and the application of specific ecosystem-management practices

Pachistima—Pachistima sprays generally are characterized by wide spreading branches, many leaves scattered evenly up the spray, and fine features charactenstic of a healthy plant Harvested sprays are generally between 26 and 30 inches in length with a small proportion shorter

Pachistima sprays generally are harvested from forests of mid-successional status On many sites, Pachistima will be present in early successional stands, but the product generally requires an overstory canopy to develop usable products Unlike beargrass, Pachistima does not generally require an elevated forest canopy to develop salable products, thus commercial harvest generally can begin after site disturbances sooner than beargrass harvest Additionally, Pachistima harvest is less affected by intermediate stand practices such as thinning and pruning On certain sites, this plant will be present on advanced forest communities, but occurrence generally is reduced due to increased shading and competition factors

Pachistima has a wide ecological range occurring on the semimesic habitat types of the Douglas-fir series through all of the wetter and cooler forest series On the drier sites, commercial harvest of this species generally will occur on the Douglas-fir/dwarf huckleberry habitat type where it is found on about 50 percent of these sites with a coverage of about 32 percent where it is found (table 4) As available moisture increases through the grand fir series, Pachistima has constancy values between 10 and 40 percent with coverage values ranging from only a trace to almost 40 percent (table 4) Commercial harvest on the grand fir series should be limited to those sites where both constancy and coverage values exceed 30 percent Across the subalpine fir, mountain hemlock, western redcedar and western hemlock series, Pachistima occurs sporadically on many sites, but coverage values are unacceptably low It may be harvestable on certain sites, but management efforts will be limited on these harsher sites The greatest potential for Pachistima harvest will be found on Douglas-fir and grand fir habitat types

Forest management activities also affect commercial Pachistima harvest, however, the effect will be less than most other floral greens species Major stand disturbances, such as a stand replacement (for example, clearcut, seedtree, and shelterwood regeneration techniques), will generally preclude commercial Pachistima harvest for a period dependent on the time necessary to create an overstory canopy Intermediate stand practices such as thinning, salvage, and sanitation harvests, however, will result in only brief delays in harvest ranging from 1 to 5 years depending on the degree of change created in the affected environments

Western sword-fern—Western sword-fern is marketed around the world as a fresh product for use in floral arrangements Long fronds with deep green color an desired commodities on the

Table 4—Selected special forest products occurence across selected forest habitat types in northern Idaho

Forest habitat types	Floral greens: Bear-grass	Pachis-tima	Western sword-fern	Oregon-grape	Christmas greens: Subalpine fir	Douglas-fir	Western redcedar	Western white pine	Edible berries: Dwarf huckleberry	Blue/globe huckleberry	Dwarf billberry	Grouse whortleberry
	Values [a]											
Ponderosa pine series:												
Bluebunch wheatgrass	-( )	-( )	-( )	-(T)	-( )	1 (T)	-( )	-( )	-( )	-( )	-( )	-( )
Idaho fescue	-( )	-( )	-( )	-( )	-( )	1 (T)	-( )	-( )	-( )	-( )	-( )	-( )
Common snowberry	-( )	-( )	1 (T)	4 (15)	-( )	1 (T)	-( )	-( )	1 (3)	-( )	-( )	-( )
Ninebark	-( )	-( )	3 (T)	6 (3)	-( )	(-)	-( )	-( )	4 (T)	-( )	-( )	-( )
Douglas-fir series :												
Bluebunch wheatgrass	-( )	-( )	-( )	-( )	-( )	10 (15)	-( )	-( )	-( )	-( )	-( )	-( )
Idaho fescue	-( )	-( )	-( )	5 (T)	-( )	10 (20)	-( )	-( )	-( )	-( )	-( )	-( )
Pinegrass	2 (15)	2 (T)	-( )	8 (2)	-( )	10 (54)	-( )	-( )	-( )	-( )	-( )	-( )
Shiny-leaf spiraca	-( )	-( )	-( )	1 (T)	-( )	10 (40)	-( )	-( )	-( )	-( )	-( )	-( )
Common snowberry	-( )	1 (T)	-( )	4 (7)	-( )	10 (57)	-( )	-( )	-( )	-( )	-( )	-( )
Ninebark	1 (19)	1 (1)	-( )	5 (4)	-( )	10 (51)	-( )	-( )	- ( )	1 (2)	- ( )	- ( )
Grand fir series :												
Shiny-leaf spiraca	2 (T)	1 (38)	1 (T)	6 (2)	-( )	10 (31)	- ( )	1 (T)	- ( )	5 (1)	- ( )	- ( )
Nninebark	1 (2)	4 (17)	1 (T)	6 (4)	-( )	9 (53)	- ( )	3 (3)	- ( )	4 (3)	- ( )	- ( )
Beargrass	10 (40)	2 (4)	- ( )	6 (1)	6 (5)	9 (18)	- ( )	1 (1)	- ( )	10 (37)	- ( )	5 (28)
Twinflower	9 (28)	4 (5)	- ( )	4 (T)	4 (6)	9 (38)	- ( )	1 (T)	- ( )	9 (43)	- ( )	3 (T)
Queen cup beadlily	2 (2)	2 (12)	4 (T)	5 (2)	1 (1)	9 (26)	1 (2)	3 (7)	1 (15)	7 (10)	- ( )	1 (15)
Wild ginger	4 (T)	4 (7)	3 (8)	2 (1)	1 (2)	9 (40)	2 (T)	2 (7)	- ( )	6 (9)	- ( )	- ( )
Arrowleaf	4 (2)	3 (T)	2 (T)	- ( )	3 (2)	2 (8)	- ( )	- ( )	- ( )	8 (22)	- ( )	- ( )
Subalpine fir series :												
Smooth woodrush	5 (T)	- ( )	- ( )	- ( )	10 (48)	- ( )	- ( )	- ( )	- ( )	3 (9)	- ( )	5 (18)
Beargrass	10 (51)	2 (7)	- ( )	1 (T)	10 (37)	7 (24)	- ( )	2 (8)	1 (15)	10 (45)	- ( )	6 (1)
Fool's huckleberry	8 (48)	2 (3)	- ( )	- ( )	10 (60)	2 (T)	- ( )	2 (15)	- ( )	10 (36)	- ( )	5 (T)
Queen cup beadlily	- ( )	3 (T)	- ( )	- ( )	10 (54)	7 (8)	- ( )	- ( )	- ( )	10 (25)	- ( )	3 (T)
Twisted-stalk	7 (5)	1 (T)	1 (T)	- ( )	10 (26)	2 (10)	1 (T)	- ( )	1 (T)	9 (8)	- ( )	4 (13)

Table 4—Selected special forest products occurence across selected forest habitat types in northern Idaho (continued)

Forest habitat types	Floral greens				Christmas greens				Edible berries			
	Bear-grass	Pachis-tima	Western sword-fern	Oregon-grape	Subalpine fir	Douglas -fir	Western redcedar	Western white pine	Dwarf huckleberry	Blue/globe huckleberry	Dwarf billberry	Grouse whortleberry
	Values [a]											
Mountain hemlock series :												
Bluejoint reedgrass	7 (10)	- ( )	- ( )	- ( )	10 (23)	3 (19)	- ( )	- ( )	3 (T)	7 (10)	2 (T)	8 (3)
Beargrass	10 (51)	- ( )	- ( )	- ( )	10 (33)	- ( )	- ( )	1 (T)	- ( )	8 (17)	1 (15)	9 (25)
Fool's huckleberry	10 (29)	- ( )	- ( )	- ( )	10 (33)	- ( )	- ( )	1 (2)	- ( )	8 (29)	1 (15)	9 (15)
Queen cup headlily	10 (46)	5 (5)	1 (T)	- ( )	7 (13)	7 (8)	1 (T)	6 (7)	- ( )	9 (46)	- ( )	2 (T)
Twisted-stalk	7 (T)	- ( )	- ( )	- ( )	10 (51)	- ( )	- ( )	- ( )	- ( )	10 (21)	- ( )	7 (2)
Western redcedar series :												
Queen cup beadliliy	2 (2)	4 (7)	4 (2)	4 (2)	1 (T)	8 (21)	10 (43)	4 (7)	1 (2)	6 (7)	+ (T)	- ( )
Wild ginger	3 (2)	3 (3)	5 (1)	1 (3)	1 (8)	6 (23)	10 (50)	3 (5)	(-2)	7 (3)	- ( )	- ( )
Oak-fern	2 (T)	5 (2)	7 (3)	1 (T)	2 (6)	2 (5)	10 (75)	4 (4)	- ( )	9 (13)	- ( )	- ( )
Maidenhair fern	+ (T)	- ( )	9 (13)	+ (T)	- ( )	3 (12)	10 (60)	3 (7)	- ( )	7 (T)	- ( )	- ( )
Ladyfern	- ( )	1 (T)	8 (3)	1 (T)	- ( )	2 (T)	10 (60)	2 (2)	- ( )	4 (1)	- ( )	- ( )
Devil's club	1 (T)	3 (T)	4 (2)	- ( )	1 (2)	- ( )	9 (59)	4 (3)	- ( )	5 (7)	- ( )	- ( )
Western hemlock series :												
Fool's huckleberry	10 (70)	- ( )	- ( )	- ( )	10 (46)	- ( )	- ( )	- ( )	- ( )	10 (18)	3 (T)	- ( )
Queen cup beadlily	4 (T)	7 (5)	2 (T)	2 (T)	2 (27)	5 (28)	9 (37)	6 (9)	+ (T)	9 (7)	+ (T)	1 (2)
Wild ginger	2 (T)	7 (4)	4 (1)	3 (1)	1 (T)	5 (21)	5 (36)	6 (10)	- ( )	7 (2)	+ (3)	- ( )
Oak-fern	3 (T)	7 (5)	2 (1)	+ (T)	2 (5)	2 (3)	6 (48)	7 (8)	1 (T)	9 (7)	+ (T)	+ (T)

[a] Numbers presented are constancy values followed by coverage values in parentheses ( ).

- Code to constancy values :

T = trace 9<%)

+ = 0.5% 2 = 15-25% 4 = 35-45% 6 = 55-65% 10 = 95-100%

1 = 5-15% 3 = 25-35% 5 = 45-55% 7 65-75% - = 0%

- Code to coverage values ( ) :

Numbers represented average percentage of canopy coverage ont eh plots where the species occurred :

- Table adapted from Copper and others (1991).

world floral market Fronds in excess of 30 inches are desired with no discoloration or breaks in the frond Mature annual growth without reproductive spores is harvested from this plant at the base, leaving older and damaged fronds in the woods Harvest is possible annually from communities supporting this product

Western sword-fern is found only on the more mesic forest habitat types of advanced forest communities where highly filtered sunlight results from elevated tree canopies Although represented on several grand fir habitats (table 4), commercial harvest there is unlikely Commercial harvest of this species will have the greatest success on the western redcedar series where it is represented on as many as 95 percent of the sites with up to 13 percent coverage (table 4) This seemingly low coverage value traditionally represents acceptable harvest levels of this species because of the overlapping nature of the fronds (Schlosser and others 1992)

Forest management activities significantly affect the harvestability of this plant species Western sword-fern, as well as other fern species (for example, deer fern), requires a dense overstory tree canopy elevated well above the fern to produces the characteristics desired by the industry Additionally, elevated soil moisture with moderate to slow subsurface water movement produces western sword-fern of exceptional quality Such sites normally are found in conjunction with north and east slopes, in steep river valleys, and near midslope springs Even intermediate stand practices will influence product quality when the amount of sunlight reaching the forest floor is increased These effects will be reduced on north- and east-facing sites, but a nominal harvest delay of 5 to 10 years should be expected when removing portions of the overstory canopy

Oregongrape species—Tall Oregongrape and creeping Oregongrape are east-side relatives of dwarf Oregongrape with future market potential The edible berry of this species also makes a jelly similar in taste to grape, and the roots have been used by Native Americans for dye and medicinal purposes (Patterson and others 1985)

Much ecological data have been collected for creeping Oregongrape (Cooper and others 1991), whereas little ecological data have been collected for tall Oregongrape The latter species, however, tend to occur on more mesic sites than does creeping Oregongrape (Patterson and others 1985) Both Oregongrape species tend to occur on the more and forest habitat types including the ponderosa pine series, Douglas-fir series, and into the grand fir series Their representation in the wetter and cooler series is limited and not generally commercially harvestable Across the Douglas-fir and grand fir series, creeping Oregongrape will be found commercially on 50 to 100 percent of the sites, with coverage values between a trace and 7 percent Although these coverage values are low, they do signify commercially harvestable levels

Oregongrape species can be harvested from stands relatively soon after major stand disturbances including clearcut, seedtree, and shelterwood regeneration techniques This species regenerates readily from rhizomes, even after fire, to preharvest levels within 5 to 10 years (Patterson and others 1985)

Christmas greens—East of the Cascade Range, there are a handful of species that have been marketed and used for this industry (table 4) High-quality bough products are harvested from trees of sapling to pole-timber size Short annual branch growth, with deep color and abundance of retained live needles, is desired in the construction of wreaths and other Christmas ornamental products Unfortunately, boughs are not generally cut off the tree at the bole Instead, branches are severed at a point where usable material is maximized with respect to the price paid per pound for the boughs Although many land managers would like a bough harvest to accomplish a pruning of the forest, additional work needs to be completed to accomplish the pruning activity Many land managers have successfully merged these two activities through creative pruning-bough contracts

The bough harvest begins shortly after the first sustained frost of the fall and ends by early December Generally, boughs are harvested from trees by using pole clippers extended to 20, 30, and even 40 feet above the cutter Cut boughs are collected and baled into 30- to 50-pound bales and loaded onto a truck or trailer Once delivered

to the processing facility, the individual boughs are processed by cutting the usable tips (4 to 8 inches) from the woody branches The stems are discarded, and the usable material is processed into the final product

The logical time to harvest evergreen boughs is when completing a thinning or pruning of the stand Most sites will yield multiple commercial bough harvests

Edible berries—The berry species commonly collected in this region include dwarf huckleberry, blue huckleberry, big huckleberry, dwarf bilberry, western huckleberry, early blueberry, grouse whortleberry, and Saskatoon serviceberry

The most popular species being harvested and processed in the region are the huckleberry species, particularly blue huckleberry and big huckleberry The berry harvest occurs in midsummer through fall depending on elevation, seasonal moisture, and temperature fluctuations Unlike the floral greens species discussed earlier, edible berries rely on either direct or slightly filtered sunlight to grow and thrive Forest managers have long realized that forest habitat types suited to huckleberry species (table 4) need immediate tree regeneration to prevent occupation for prolonged periods with huckleberries Many berry harvesters see this issue from the opposite viewpoint, recognizing that tree regeneration ultimately reduces the berry harvest Additionally, many forest land managers see potential conflicts between berry harvesters and bears that traditionally spend prolonged periods in these areas relying on the berries for a large portion of their seasonal diet This is particularly true in the extreme northern part of the region where grizzly bears *(Ursus hombihs)* may be encountered

Blue huckleberry and big huckleberry are considered ecological equivalents in northern Idaho (Patterson and others 1985) The two species occur in commercially viable densities across much of the grand fir series, subalpine series, mountain hemlock senes, western redcedar senes, and the western hemlock senes (table 4) The greatest densities occur on the first three mentioned forest senes where 80 to 100 percent occurrence is common and 25 to 46 percent coverage is attained (table 4) It is on these sites that commercial harvests of edible berries will be the most concentrated

Unlike the huckleberry species, Saskatoon serviceberry is found on drier sites including the ponderosa pine series Douglas-fir series, and into the grand fir series (table 4) Little is known about the management needed to improve Saskatoon serviceberry populations

The harvest of edible berry species has few negative effects to forest ecosystem management Berries can be harvested from the same plant annually, because the h n \ ester does not destroy the plant or its ability to pioduce bernes annually

Wild edible mushrooms—Little is currently known about the ecology and management of wild edible mushroom species in the region Morels are the most widely hai vested east-side mushroom species Morels are commonly harvested from this region in spimg and early summer Generally, morels are found on forest sites during the first several yeais after they have been harvested or burned Motel production drops off sharply after tree regeneration forms a canopy over the site

Other mushroom species commercially harvested from the region include boletes, chanterelles, matsutake, spreading hedgehog, and cauliflower mushroom Although each of these species is associated with matuit forest communities, the need for further research in the region is clearly indicated

Site-Specific Example

To fully understand the usefulness of the aforementioned information in the production of special forest products in an ecosystem management perspective, consider the following example The site has been descubed by Cooper and others (1991) as the grand fn twinflower habitat type This habitat type is common across northern and central Idaho, with similar habitat types described in northeastern Washington, western Montana, and northeastern Oregon (Cooper and others 1991) The normal elevation range is from 2,200 to 5,300 feet on protected and gentle slopes

Dominant successional tree species include Douglas-fir, ponderosa pine, lodgepole pine, Engelmann spruce and western larch (Cooper and others 1991) This plant community exhibits a high degree of biological diversity, supporting 7 to 8 conifer species, 18 shrub species, and up to 23 perennial forb species in all but late-successional stands (Cooper and others 1991)

The beargrass phase of the grand fir-twinflower habitat type normally lies above 4,900 feet, with southerly aspects The understory is dominated by beargrass with a layer of blue huckleberry superimposed above it Major serai tree species include Douglas-fir and lodgepole pine (Cooper and others 1991)

Early successional management on these sites might concentrate on the harvest of huckleberries and various mushroom species The harvest of the hucklebernes will be on sites exhibiting a competitive advantage for the true huckleberry species Site preparation and presence of appropriate fungal mycelium will greatly influence the production of mushroom species including morels (Molina and others 1993)

Mid-successional stands of this habitat type generally will continue to produce huckleberries, however, the quantity will tend to decrease as canopy shading increases over the shrub layer Beargrass populations during this stage of forest development will increase greatly The color, length, and overall quality of the individual blades should achieve acceptable product quality with constancy approaching 90 percent and coverage near 30 percent (table 4)

Stands exhibiting late-successional characteristics and climax habitat type populations will be uniquely suited to the production of beargrass Although product quantity will decrease slightly in heavily shaded communities, product quality will become excellent Due to the increased amount of shading provided by the overstory of mature trees, beargrass blades become thicker, darker, and grow to an extended blade length The harvest of beargrass on the grand fir-twinflower habitat type, beargrass phase, during the late-successional stands will exceed the production of quality beargrass product on most other sites

Expansion Pathways and Economic Contributions of an Expanded East-Side Industry

The east side has experienced increased attention from the traditionally west-side based special forest products industry over the past decade This increased interest is due, in part, to the decreased availability of raw products west of the Cascade Range in Washington and Oregon coupled with the normal entrepreneurial desire for business expansion

The east side boasts a comparatively untapped resource base Although commercial harvest has been carried out for over a decade in this region, readily accessible product supplies exist for most species

Although product supplies are available, a mobile and trained workforce is less accessible Traditional forest-based employment in the region involves limited travel, generally based within 75 miles of harvest locations For special forest products harvesters to be similarly employed, they will need to be involved in the harvest of products for multiple segments of the industry The comparatively high unemployment figures for parts of the region suggest that an available workforce could be mobilized as the industry expands Unfortunately, the jobs tend to be lower paying and even more seasonal than the timber harvesting jobs they hope to replace

Although business expenses may be slightly decreased in this region due to lower costs of overhead and facilities, higher transportation costs can be expected to move products to final markets in many cases One method for industry expansion into this region will be through franchises with established businesses from western Washington and western Oregon, these firms have established markets, contracts, and access to needed capital Many businesses, however, will be built by sole proprietors or small family units with an innate business sense and a lot of hard work

New business combinations—The new business owner establishing a processing facility on the east side will face an interesting set of opportunities and decisions To begin with, new businesses

will have to decide which segment(s) of the industry it should concentrate on. Obviously, markets and entrepreneurial preference will be a major factor in answering this question.

The floral greens segment of the industry boasts one of the longest harvest seasons for the east side. Although plants used as floral greens can be harvested throughout the year, winter and spring pose problems. Many products are not harvestable during winter months when snowfall completely covers the plants or makes roads impassable; this may preclude harvest for 3 or more months each year. During the spring growing season, plant tips are fragile and do not react well to harvest, transportation, or storage (Schlosser and others 1992).

The Christmas greens segment of the industry will hold many opportunities in this region. First, there is a readily available supply of evergreen boughs in the region. Second, the labor force in the region during late fall and early winter should be amenable to this type of labor. And finally, access to product markets is not hindered as in some other segments of this industry.

Most product markets for Christmas greens are found within the United States. Although many are located in California, others exist in Colorado, Texas, and other population centers along the eastern seaboard; thus, access to westside seaports and international airports is not critical. Trucking routes and medium-sized airports will most likely be the primary source of infrastructure linkages to final markets.

The harvest of evergreen boughs and manufacture of wreaths and similar products begins after the first sustained fall frost and ends in December, depending on product orders. Eastside businesses, especially those located at higher elevations, will be able to begin harvest about 2 to 3 weeks earlier than their west-side counterparts because of earlier frosts encountered in the region. The earlier starting time could be an important competitive edge to companies located on the east side.

A significant amount of the wild edible mushroom industry is already located east of the Cascade Range. As businesses grow, horizontally integrate, and venture into other product markets, the importance of the mushroom harvest will be amplified in the region. Initially, it is doubtful that the volume of mushrooms harvested from the region will increase. Instead, it could be speculated that the volume of mushrooms being harvested from the region but shipped to the west side for processing will decrease. This decrease will result from the increased purchasing power by east-side companies, competing on price, location, and a reduction in harvester time commitments. Initially, morels and boletes will be the most predominant species harvested, with other species "brought on line" as marketing efforts expand.

Harvest seasons for other edibles and medicinals differ greatly, depending on the specific products harvested. Unfortunately, mushrooms and edible berry products are marketed through different distribution channels, and marketing both products could substantially increase overhead costs. Also, if berries are processed into specialty jams and jellies, the company would incur additional costs for processing equipment, licenses, and the need for specialized knowledge concerning the production of jams and jellies. Significant opportunities will exist for businesses interested in this segment of the industry.

Although integration of multiple segments into one business is not necessary, it may be beneficial to rural economies looking for sustainable natural resource business that provides full-year (or nearly so) employment. The labor force needed for this industry has been mobilized for the Pacific yew bark harvest, the wild berry harvest and the wild edible mushroom harvest. Additionally, smaller companies starting businesses in this region have experienced success in evergreen harvest and floral greens harvest.

Horizontal integration is common in the industry. It is unlikely, however, that a new business locating on the east side would open a fully integrated operation initially due to specific needs such as capital, developing a trained workforce, establishing needed market linkages, and other factors. It is probable that businesses will begin with one or two product lines, then add related product lines that can be marketed through existing or similar distribution channels. For instance, a beargrass processor might add

Pachistima, western sword-fern, and Oregongrape during expansion efforts But, the addition of wild edible mushroom processing would require significant time and capital to develop markets and processing techniques

Industry structure—The special forest products industry reflects a common structure across all segments of production In every case, the industry relies on landowners and managers to make these noncultivated products available for harvest Sometimes this harvest is the result of specific management practices intended to improve the quality or quantity of products from the site More frequently, the harvest is simply a positive externality

The products are collected by several harvesters that are generally independent contractors securing their own leases and harvest permits Occasionally, these harvesters are employees of the processors, but this has not been common in the past Within the wild edible mushroom and berry segments, it is common to find buyers that purchase the product from the harvesters in remote areas to provide the value-added service of species sorting and delivery to processing facilities This service is not common in the other segments of the industry

Processors sort, clean, bunch, package, dehydrate, preserve, or otherwise prepare the products for wholesale markets These businesses add as much or more value to the product as the harvester Business owners usually have a processing facility, transportation services, employees for the actual processing, and marketing personnel In some cases, the processor uses the services of a marketing agent to find buyers around the world for their clients' products Others involved in the marketing and transportation of these products include freight forwarders for international links, foreign marketers, retail outlets, and the consumer

Current and Potential Contributions to the East-Side Economy

Floral greens and Christmas greens—There is currently no published information on the size of the floral and Christmas greens industry east of the Cascade Range It has been estimated, however, that revenues for this industry might have been between $5 and $10 million during 1993 in total product sales at the wholesale level Extrapolation from the west-side industry provides some insights into the future of this industry east of the Cascade Range

The average floral and Christmas greens processor in western Oregon, western Washington, and southwestern British Columbia employed 12 full-time, year-round employees with an additional 71 part-time, seasonal employees, on average Businesses purchased materials from an average of about 50 full-time, year-round harvesters, and 50 part-time, seasonal harvesters during 1989 An average of $397,000 in wages and benefits were paid to these individuals during the same year The cost of purchasing materials during 1989 averaged about $795,000 per business Hence, the direct contnbution to the regional economy by the average floral and Christmas greens business in western Oregon, western Washington, and southwestern British Columbia during 1989 was about $1 53 million (Schlosser and others 1991)

Although it is impossible to predict if and how long it will take for new companies locating in this region to reach this size, the highly competitive nature of the industry suggests that contributions of this magnitude to the regional economy are possible within the first decade of operation This view is based on the belief that the industry has continued to expand since the Schlosser and others (1991) study was completed

Additionally, the differences in products and land ownership characteristics east of the Cascade Range will influence this evolving industry For example special range products, although marketed through similar channels, will have a significant impact on the evolution of new businesses In addition, the various plant products and largely untapped resources available to east-side processors will result in limited competition for specific plant species, at least in the early stages of industry development

Wild edible mushrooms—Mushroom processors in Idaho, eastern Oregon, and eastern Washington processed an average of 207,000 pounds of mushrooms per business during 1992, employed about 5 6 individuals to process mushrooms, with an average of 112 2 harvesters per business

supplying the raw materials to these facilities East-side processors employed about 2 0 individuals per business with an average of 162 7 harvesters completing the mushroom harvest during 1992 (Schlosser and Blatner 1995)

The typical east-side processor was open 136 days (4 5 months) during 1992 and purchased 45,000 pounds of mushrooms from harvesters The average facility spent about $39,000 to employ facility personnel during 1992 The combined payroll and product acquisition costs for east-side businesses totaled about $1 1 million per business Adding in overhead, advertising, and profit, each east side mushroom processor contnbuted about $13 million to the gross state product for a total contribution of about $118 million during 1992 (Schlosser and Blatner 1995)

Although it would be tempting to assume that each new mushroom processor in the region would add $1 3 million to the "lucky" local economy, the reality of the addition of a new processor would be significantly less The average wild edible mushroom business represented on the east side has been in operation for up to a decade and even more in some situations The more likely impact of a new processor would be that of the average Idaho processor, a state that lags behind the rest of the region in terms of individual business development and in years of operation The average Idaho processor adds about $328,000 to the local economy and employs about 1 5 facility personnel with an additional 47 5 harvesters (Schlosser and Blatner 1995)

Although expansion of the mushroom industry is likely, it is impossible to estimate the potential number of businesses the resource could support To date, no assessment of the resource base for mushrooms on either the west or the east side has been completed Further research is needed to answer this question

A Rural Development Tool

Based on the above discussion, a community with a floral greens, Chnstmas greens, or wild edible mushrooms processing facility will benefit significantly, directly and indirectly Direct benefits include the increased employment to between 50 to 125 individuals and a direct contribution to the regional economy of $325,000 to $1 5 million per business In most situations, this industry creates new revenues for a rural economy

It is useful to contrast these economic impacts against those created by the traditional timber harvesting and lumber manufacturing industries The average north Idaho sawmill processed about 20 million board feet of logs during 1990, employed an average of 177 people in all phases of production (logging forestry, processing, residue, secondary, and other misc), and contributed an estimated $5 1 million in wages to the local economy [6] The total direct contnbution to the regional economy is much larger The special forest products industry compares rather well in terms of average number of individuals employed at 125 But in terms of the direct economic contribution to the local economy, the average floral and Chnstmas greens or wild edible mushroom processor pales in contrast This comparison further highlights tht discrepancy between the traditionally higher paying jobs with benefits of the timber industry and the lower paying and seasonal jobs of the special forest products industry

Conversely, the indirect benefits of the special forest products industry to the rural and urban communities of this region are many First, social costs for unemployment and welfare are decreased when these individuals are employed through harvesting jobs Second any increase in local employment contributes to local business stability and growth due to the increased dollars circulated in the community and an increased tax base

Finally, although less tangible, there is a large benefit derived from increased employment levels through a business venture of this type within a community Many logging and mining jobs are supposed to be "replaced" by high-tech jobs requiring additional training This theoretical replacement does not consider the rugged individualism of many in the logging and mining sector

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who value being free from indoor work settings and close supervision (Carroll and Lee 1990, Lee and others 1991) Special forest products harvesting will allow those individuals with a strong work ethic to be self-employed, productive members of society

Potential Factors Limiting Expansion

Although the industry has tremendous growth potential, the rate and extent of future expansion will be governed by various institutional factors, future market development efforts, and the limitations of supporting ecosystems Potential institutional barriers to expansion of the industry include laws and regulations governing the harvest, transport and sale of special forest products, and other factors such as the reluctancy of the banking community to finance new businesses, particularly in a unique and frequently poorly understood industry

Market development activities are cntical to the expansion of the industry New products are constantly being promoted by industry leaders to increase the volume and variety of floral and Christmas greens and wild edible mushrooms sold in various markets Similarly, there is a continuing need for market development efforts for existing products in both domestic and international markets

Finally, there is a strong need to develop a more complete understanding of the role of these plants in various ecosystems and the sustainabihty of harvest Failure to develop a more complete understanding of the role of these plants in the ecosystem may lead to over harvesting and a correspondingly needless future downsizing of the industry

Institutional Barriers

From an economic development and a policy perspective, there is a need to develop a cost-effective and meaningful system for the administration of special forest products permit systems and leases Substantial progress in this area has been made over the past year as agencies have attempted to craft regionwide regulations and policies governing the administration of the harvest and sale of these products, particularly in the Pacific Northwest Region Inconsistencies between district policies under the old regulations as well as the number of permits required from different district offices frequently made the harvest and transport of special forest products from the forest to the processor impossible or impractical Current efforts underway have the potential to overcome many of these problems, however, further work remains

One example is the tendency to treat the east-side industry exactly the same as the west-side industry by assuming uniformity in products and product pnces across the four-state region in setting harvest fees Product pnces received by harvesters located on the east side often differ significantly from those received by their west-side counterparts because of product differences, frequently higher transport costs, and the less developed nature of the east-side industry Hence, setting of east-side harvesting fees based on west-side prices may force the harvester to misrepresent his harvesting activities

In other cases, industry growth is being hindered by the unwillingness, of some east-side National Forest Districts to offer harvest permits, due in part to budget reductions within the agency Some existing state laws also are impractical relative to the harvest and transport of special forest products, for example, in Montana the sale of wild edible mushrooms is illegal under older state laws

The growth of the special forest products industry is further hindered by a lack of investment capital Over the past few years, small businesses of all types within the economy have experienced difficulty in obtaining needed capital for short-term operations and long-term investment needs This problem is more pronounced in the special forest products industry The industry's small entrepreneurial nature, centered around the harvesting and processing of unique products, combined with its seasonal nature and the negative image created by the media relative to the harvest of selected products, has significantly increased the difficulty of acquiring needed capital

Market Development

Market development activities are at the heart of this industry. In fact, if it were not for the market development activities of many of the current industry leaders, it would not have achieved its current size or diverse nature. Further, the growth of this industry has occurred almost solely on its own initiative, with little or no assistance from the research community, various state departments of agriculture and commerce, or the Federal Government. In contrast to more traditional sectors of the economy, the special forest products industry has been somewhat overlooked or discounted as unimportant or viewed from the negative perspective as an "industry based on theft" and thus undeserving of the types of assistance commonly provided other industries in the Pacific Northwest.

This lack of support for the industry has significantly hindered its ability to expand in domestic and particularly in international markets. Although some progress has been made in this area over the past few years, the industry remains poorly understood by many people within state and Federal Government, and only limited funds have been provided to aid in the expansion of this sector of the economy.

Need for an Ecosystem Management Perspective

A more complete understanding of the role of these plants in the ecosystem and their potential for management is critical to the industry if we are going to progress from the present exploitative stage of industry development. If the principles of ecosystem management are going to be followed in the future management of public lands, then considerable research will be required. At present, we have only a limited understanding of the potential to manage forest ecosystems for the production of special forest products and other forest outputs. Management systems, suitable harvest levels, yield functions, sustainability, the long-term impact of the sustained harvesting of special forest products and many other relations will become increasingly important as the industry expands.

Conclusions

The special forest products industry of the Pacific Northwest already contributes hundreds of millions of dollars annually to the regional economy. Initial economic and marketing studies of the floral and Christmas greens and wild edible mushrooms have been completed. As many businesses have already proven, the east side holds the potential of seemingly limitless opportunities for the rural entrepreneur operating in this dynamic industry. It can be further argued that a significant amount of the growth in this industry is likely to occur on the east side due to its vast resource and employment base.

The first assessment *o(* the floral greens resource base for both the weM (Schlosser and others 1992) and the east side has been finished. Preliminary studies of the ecology and management of the resource base underKing the wild edible mushroom industry are ongoing by various researchers. Unfortunately, little of this research is focused on east-side forest ecos) stems.

Many planners and economic development experts believe the special forest products industry has the potential to expand over the next decade. Expansion of this industry may provide badly needed jobs in many of the rural economies of the Pacific Northwest, but the jobs created will be lower paying, with feu if any benefits.

Developing new, and expanding existing product markets in the industry implies that adequate wild resources are and will continue to be available in the future. Although this may be true for some species, many concerns have already been raised about others, particularly among various mushrooms species. To effectively manage the underlying resource base o! this industry, it is critical to undertake new research efforts to develop a more thorough undei standing of this growing industry including its markets, management of the resource base, and the role of these plants in the ecosystem. It is also uitical that we develop a more comprehensive knowledge of the types of jobs created by this industry and their impact on communities.

Product availability and quality are strongly influenced by the type of ecosystem management practices employed in a given area. In general, the joint production of floral greens and traditional forest products is more compatible with intermediate stand practices, uneven-age management, and other partial-cutting approaches as opposed to clearcut, seed-tree, and shelterwood regeneration techniques. There are, however, specific floral greens plants that thrive under the environment created by the latter silvicultural systems. The harvest of boughs also is compatible with the growing of many tree species for commodity production.

The successful joint production of special forest products and other forest products depends greatly on three factors: (1) the availability of desired plant species in the environmental gradient (habitat type), (2) the manipulation of site conditions to favor selected species, and (3) astute management of the harvest of the selected species to ensure long-term sustainability.

New ways of handling nontimber resources and more open communication between those who manage and harvest these resources are needed to maintain the quality and sustainability of both the human and ecological communities involved. Existing research-management issues are highly complex and are not easily addressed. All of the interested parties must work together in an open and frequently interdisciplinary manner if viable approaches to management of forests for the joint production of special forest products and other outputs are to be achieved.

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Appendix

Common and Scientific Names of Species Mentioned

Common name	Scientific name
Arnica	*Arnica latifolia* Bong.
Arrowleaf balsamroot	*Balsamorhiza sagittata* (Pursh) Nutt.
Baby's breath	*Gypsophila paniculata* L.
Beargrass	*Xeropyllum tenax* (Pursh) Nutt.
Big huckleberry	*Vaccinium membranaceum* Dougl.
Blackberries	*Rubus* spp. L.
Black henbane	*Hyoscyamus niger* L.
Blue huckleberry	*Vaccinium globulare* Rydb.
Boletes	*Boletus* spp. Fr.
Boletus	*Boletus* spp. Dill ex Fr.
Cascara	*Rhamnus purshiana* DC.
Cauliflower mushroom	*Sparassis crispa* Wiilf.: Fr.
Chanterelles	*Cantharellus* spp. Adans. ex. Fr.
Clasping (annual) pepperweed	*Lepidium perfoliatum* L.
Coral tooth	*Hericium abietis* (Weir ex Hubert) K. Harrison
Creeping Oregongrape	*Berberis repens* Lindl.
Deer-fern	*Blechnum spicant* (L.) Roth
Douglas-fir	*Pseudotsuga menziesii* (Mirb.) Franco
Dwarf bilberry	*Vaccinium myrtillus* L.
Dwarf huckleberry	*Vaccinium caespitosum* Michx.
Dwarf Oregongrape (Oregongrape)	*Berberis nervosa* Pursh
Early blueberry	*Vaccinium ovalifolium* Smith
Elderberries	*Sambucus* spp. L.
Engelmann spruce	*Picea engelmannii* Parry ex Engelm.
Evergreen huckleberry	*Vaccinium ovatum* Pursh
Fool's huckleberry	*Menziesia ferruginea* Smith
Grand fir	*Abies grandis* (Dougl. ex D. Don) Lindl.
Grouse whortleberry	*Vaccinium scoparium* Leiberg
Holly	*Ilex* spp L.
Huckleberries	*Vaccinium* spp. L.
Incense-cedar	*Libocedrus decurrens* Torr.
Indian ricegrass	*Oryzopsis hymenoides* (R. & S.) Ricker

Common name	Scientific name
Lodgepole pine	*Pinus contorta* Dougl. ex Loud.
Matsutake	*Tricholoma* spp. (Fr.) Kummer
Matsutake	*Tricholoma matutake* (Itod Imai) Sing.
Morels	*Morchella* spp. Dill, ex Fr.
Mountain hemlock	*Tsuga mertensiana* (Bong.) Carr.
Noble fir	*Abies procera* Rehd.
Oregon black truffle (black *picoa)*	*Picoa carthusiana* Tulasne & Tulasne
Pachistima (Oregon box-wood)	*Pachistima myrsinites* (Pursh) Raf.
Pacific silver fir	*Abies amabilis* Dougl. ex Forbes
Pacific yew	*Taxus brevifolia* Nutt.
Perennial pepperweed	*Lepidium latifolium* L.
Ponderosa pine	*Pinus ponderosa* Dougl. ex Laws.
Puffballs	*Lycoperdon* spp. Pers. and *Calvatia* spp. Fr.
Queen's cup beadlily	*Clintonia uniflora* (Schult) Kunth
Quinine conk	*Fomitopsis officinalis* (Vill.: Fr.) Bond et Sing *[Fomes officinalis* (Vill.: Fr.) Faull]
Saskatoon serviceberry	*Amelanchier alnifolia* Nutt.
Salal	*Gaultheria shallon* Pursh
Scotch broom	*Cytisus scoparius* (L.) Link
Spreading hedgehog	*Hydnum repandum* L.: Fr.
Subalpine fir	*Abies lasiocarpa* (Hook.) Nutt.
Tall Oregongrape	*Berberis aquifolium* Pursh
Truffle	*Tuber* spp. Mich, ex Fr.
Twinflower	*Linneae borealis* L.
Western hemlock	*Tsuga heterophyla* (Raf.) Sarg.
Western huckleberry	*Vaccinium occidental* L
Western juniper	*Juniperous scopulorum* (Hook.) Nutt.
Western larch	*Larix occidentalis* Nutt.
Western redcedar	*Thuja plicata* Donn ex D Don
Western sword-fern	*Polystichum munitum* (Kaulf.) Presl.
Western white pine	*Pinus monticola* Dougl. ex D. Don
Wild ginger	*Asarum caudatum* Lindl.

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Schlosser, William E.; Blatner, Keith A. 1997. Special forest products: an east-side perspective. Gen. Tech. Rep. PNW-GTR-380. Portland, OR: U S Department of Agriculture, Forest Service, Pacific Northwest Research Station 27 p. (Quigley, Thomas M, ed.; The Interior Columbia Basin Ecosystem Management Project: scientific assessment).

The special forest products industry has gained increasing attention, as timber harvest levels in the Pacific Northwest have declined, and has been heralded, at least by some, as a partial solution to the employment problems common throughout the rural areas of Washington. Oregon, Idaho, and Montana. To date, relatively little work has been published on those portions of the industry located east of the Cascade Range. Yet the east side produced about 48 percent of the total wild edible mushroom harvest (about 1.9 million pounds worth $1 1.8 million) during 1992. The region also accounts for all of the baby's breath harvested in the Pacific Northwest and has the potential to produce large quantities of other floral products. It also seems to have the potential to become an important producer of other edibles and medicinal products; however, relatively little is known about this segment of the industry. The following report provides overview of the special forest products industry east of the Cascade Range and evaluates its potential for expansion.

Keywords: Special forest products, wild edible mushrooms, floral greens, Christmas greens, economics, marketing.

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