# CHAPTER 5

# A Case Study Analysis of Different Management Approaches

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## 5. A Case Study Analysis of Different Management Approaches

Commercial collection of medicinal plants from public forests is, for the most part, unregulated and unmanaged. Very little information exists regarding the amount or value of the material collected. Though some local units of the U.S. Forest Service are trying to manage for these and other non-timber forest products, in general these products have not been included in management plans or activities. Further, a common perception among many professionals involved with non-timber forest products is that management approaches vary tremendously across national forests and federal agencies. To improve management of public forests for medicinal plants may require a fundamental shift of how federal agencies deal with these products. But, before making changes in the overall management strategies, a better understanding is needed of how different units manage for medicinal plant products. This would allow for inclusion of successful methods in recommended management schemes.

Whereas previous research (TRAFFIC 1999) focused on identifying the species with medicinal value and reviewing the markets for these products, this study examines the medicinal plant products, the markets in specific geographic areas, and programs to manage for these products. These products were selected for examination because of their high market value and the fact that the study areas are major sources of these products. This chapter utilizes a case study approach to examine four forest areas and the programs and policies of two federal agencies that oversee how medicinal plants are managed in those forests. It builds on previous chapters, providing further insight into priority medicinal plant species in selected areas. The chapter also examines how government agencies and non-governmental organizations are addressing these resources. Finally, the chapter provides strategies and recommendations for a conservation program geared to medicinal plants.

### 5.1 Background

A key component of the management of forest resources for medicinal plants is that they be recognized and managed as renewable natural resources. Though previous research started to identify the vast number of medicinal plants on the market, very little work has been done to extend that knowledge to understand the volume and value of the products being collected. Further, there has been no assessment of how either federal agencies or non-governmental organizations approach NTFPs in forest management and if they included medicinal plants. In addition, there is a general lack of understanding of the policies and procedures that guide how public forests are managed for these products.

Because there is vast number of medicinal plants on the market, it is essential to focus conservation efforts on a set of priority species. In an earlier report, TRAFFIC, North America (1999) identified more than 175 native species with medicinal values and markets. The ecological vulnerability of these many species varies tremendous. Some medicinal plants, such as *Hypericum spp.* (St. John's wort), are considered noxious weeds, and have little significance for conservation purposes. On the other hand, the conservation status of other medicinal plants, such as *Panax quinquefolius* (American ginseng) and *Hydrastis canadensis* (goldenseal), is precarious. From a market perspective it may be important to focus on specific medicinal plants that are in high demand and have limited populations.

Unfortunately, the amount of information concerning the medicinal plants and their markets is severely lacking. Very little information has been compiled on the volumes or values of most medicinal plants. Much of the knowledge may be proprietary, and difficult to obtain. The markets are changing so rapidly that only those people who are involved on a daily basis have a feel for the market conditions. The general sense, however, is that demand for medicinal plants is increasing tremendously. In 1998, it was reported that demand for many medicinal plants was growing in excess of 100 percent annually (Brevoort 1998). But in the following year, dealers apparently could not sell some of their products to cover costs due to a surplus of medicinal plant products on the market.

A general perception among many forest managers who were involved in a survey the results of which are reported in chapter three, is that there is tremendous variation and a lack of continuity in how national forests approach non-timber forest products management. Interviews with Forest Service managers indicate that management strategies are inconsistent across districts, forests, and regions. These dissimilarities could reflect ecological, market or administrative differences, but no review has been done to determine how federal agencies manage for these products. The activities and experiences of local units may provide opportunities to improve overall management direction, as well as management on specific locations.

Non-governmental organizations (NGOs) can have tremendous influence on the management of public forests. Over the last two decades there has been a proliferation of natural resource management and conservation oriented NGOs. Many of these groups are focused on issues such as timber harvesting, the roadless initiative, watershed protection, and ecosystem preservation. Many of these organizations work well with the public and may provide opportunities to reach out to medicinal plant stakeholders. Identifying these groups and understanding how they operate is important in developing strategies to fully embrace the community of medicinal plant stakeholders.

Forest managers in federal agencies are provided direction through a series of polices and procedures, which are well developed for the more traditional natural resources, such as timber. The directives that guide how the Forest Service units manage natural resources are found in either the Forest Service Manual or the Forest Service Handbook (USDA Forest Service 2000). The Manual provides legal authorities and general policies, while the Handbook is the source of specialized guidance and instruction on how to carry out the directives. The Bureau of Land Management in Oregon has published its policies and procedures for “special forest products” in a comprehensive handbook (USDI BLM 1996). An examination of these procedures is warranted to determine potential constraints to improving management for medicinal plants. In addition, agency efforts may be improved by considering how the other agency deals with these products.

Based on this review, there is a need to examine how different management units deal with non-timber forest products, in general, and medicinal plants particularly. There is need to identify the medicinal plants that are collected from each area selected for this study, and to improve the knowledge about the markets for these products. Examining the approach taken in different locations by different agencies may reveal elements that could serve to improve overall management. With the growing importance of public involvement it is crucial that the analysis

consider the potential capacity of non-governmental organizations to partner in conservation efforts. Finally, the policies and procedures need to be examined to identify possible constraints to management.

## 5.2 Research Approach

This analysis is intended to identify components of current management approaches that could lead to the overall improvement of management strategies for medicinal plants. Several elements (the plants, programs, policies and procedures) need to be examined to find ways to improve our understanding of the issues that affect management approaches. The crosscutting geographic focus of this study provides opportunities to learn from other locations what may benefit local situations. Discussions with local resource people were fundamental to the approach used in this study.

### 5.2.1 Goal and Objectives

The overall goal of this chapter is to recommend strategies to improve management for non-timber forest products. Recommendations are based on an examination of the approaches used by two federal agencies covering four public forests in different geographic locations. To achieve the goal, the study had three objectives:

1. Identify medicinal plant species that are collected from the four areas and ascertain their levels of collection, cultural and socioeconomic significance to local collectors, trade volumes, market value, and availability at the local, national and international level;

2. Identify relevant government and non-government agencies and organizations and assess their strengths, weaknesses, and opportunities to collaborate with these groups; and

3. Examine and assess U.S. Forest Service and Bureau of Land Management policies, procedures and available resources for monitoring and managing medicinal plants exploited from areas selected for study; make recommendations regarding how procedural strengths might be replicated and weaknesses eliminated to improve the conservation of medicinal plants.

### 5.2.2 Sample Frame and Study Areas

The primary method to obtain the needed information will be individual (e.g., resource professionals, stakeholders, industry experts) and organizational documents and reports. Within the locales selected for this study, certain individuals and groups were targeted to obtain the information needed to fulfill the objectives. These groups included U.S. Forest Service and Bureau of Land Management staff, industry experts, professionals in non-governmental organizations, stakeholders, and natural resource management experts in universities. After starting with a core group of local experts, the snowball method (Malhotra 1996)was used to identify and locate additional resource people.

This study focused on geographic areas representing three eco-regions (Ricketts et al. 1999). Two of these eco-regions (Appalachian/BlueRidge and Klamath-Siskiyou) were selected because of their biological diversity. These two regions are considered global centers of biodiversity (Wallace 1983, Ricketts et al. 1999), and major sources of medicinal plants. The forests of the Appalachian/Blue Ridge eco-region are considered some of the richest temperate hardwood forests in the world (Ricketts et al. 1999). The western study site was located in the Pacific Northwest, in the Klamath-Siskiyou eco-region. The Arkansas location, which embraces the Ozark Mountain eco-region, was included because it is a transition zone that incorporates the central U.S. mixed hardwood forest region, which is another region known for producing forest-harvested medicinal plants.

Both eastern examples are located in the U.S. Forest Service Region 8 (Southern region). The Pisgah National Forest is located in western North Carolina (Figure 5.1) and covers more than 500,000 acres. Immediately south of the Pisgah National Forest is the Nantahala National Forest, which adds another 500,000 acres to the study area. These two National Forests are managed as one unit. The Ozark-St. Francis National Forest (Figure 5.2) covers more than 1 million acres.

The western sites are similar ecologically, but managed by different agencies. Both, the Applegate Ranger District of the Rogue River National Forest and the Medford District of the Bureau of Land Management are located in southern Oregon (Figure 5.3). The Applegate Ranger District covers more than 219,000 acres, of which approximately one-quarter are in Northern California. The Medford District, the neighbor to the Applegate Ranger District, covers more than 850,000 acres.

These four locations were selected for several reasons. First, they represent eco-regions of particular importance for biological diversity (Ricketts et al. 1999). The forests of North Carolina and southern Oregon have been identified as especially important for conservation. A second reason for selecting these locations was that it would allow for comparison between eastern and western United States. Further, selecting sites in western United States allowed for examination of how another federal agency (Bureau of Land Management) approaches the management of non-timber forest products. These cross-regional and agency examinations may provide valuable insight that could lead to improving management of public forests for non-timber forest products. One limitation of the sample was that analysis was confined to specific geographic locations, and people outside of the study areas may have been able to provide additional information.

### 5.2.3 Methods

Given the explorative nature of this research, a case study approach was most appropriate. Merriam (1988, p. 21) defined a case study as “an intensive, holistic description and analysis of a single” location. According to Merriam (1998, p. 27) the most important characteristic of case study research is “delimiting the object of the study.” The object of the current study is to improve the understanding of how management units in different locations and agencies include medicinal plants in forest management.

Hence, the general research approach was based on case studies using snowball sampling; methods that are well accepted for this type analysis (Babbie 1995, Leedy 1997, Merriam 1998,

Miles and Huberman 1994, Malhotra 1996). These methods have been used in a number of studies focused on non-timber forest products. Greene et al. (2000) combined a case study with snowball sampling to examine the marketing and management of non-timber forest products in southwest Virginia. Richards (1997) used snowball sampling to study Native American collection and use of forest-harvested mushrooms. Finally, Ruiz Perez and Byron (1999) introduced a case study approach to examine non-timber forest products issues in different locations.

Using in-depth, semi-structured interviews with local resource people, pertinent information was collected concerning the three study objectives. Starting with a core group of experts and stakeholders, the study used a "snowball" approach to identify and target additional resource people who could provide insight into the local market and management situation. Initial contact with key resource people was made using the telephone. Subsequent contact was made in-person to facilitate further discussion. When necessary follow-up telephone conversations were undertaken to explore issues and to seek clarification.

The study also incorporated examination of related literature concerning management and marketing of medicinal plants. Current and relevant documentation was collected, examined and summarized. Documentation reviewed for this study included internal memorandums, policy directives, company price and product catalogs, as well as studies on non-timber forest products. The study focused on information that was readily available to decision makers. By working with local resource people, the methods ensured that recommendations would focus on issues that were important to the local situations.

### 5.2.4 Limitations

Several factors limit the ability to examine the markets and management of public forests for medicinal plants. To truly understand the market trends for medicinal plants would require multiple year analysis. Because plant populations are not limited to political boundaries, an examination limited to public forests may not truly reflect the market conditions. Further, reporting the volumes and values of medicinal plants may not reflect that which is collected from public forests. A breakdown of the amount of medicinal plant products collected from public and private lands has not been undertaken. In addition, the severe lack of information concerning management for medicinal plants limits any analysis.

This study is only able to provide a static analysis of the current situation -- a "snap shot" of the local situation concerning management of medicinal plants. Because of its very nature, the study cannot analyze market and conservation trends. To overcome this limitation would require additional studies, monitoring and tracking local activities over several seasons.

The geographic focus of the study was, initially, a limitation. Analysis of the Applegate Ranger District was restrictive, covering only portions of the Applegate watershed. Also, the original focus on just the Pisgah National Forest did not include activities on neighboring National Forests in the same state. Expansion of the geographic focus beyond district and national forest borders provides a more useful analysis of the current situation regarding medicinal plants.

The general lack of information is another inherent problem in case study analyses of management of medicinal plants. These resources have not been recognized as such; therefore little management information is available. Market information and knowledge is lacking as well. This lack of information reflects a lack of the concern for these natural resources over the last decade.

## 5.3 Findings

This next section presents the findings of this study regarding the three objectives. It first summarizes the situation in the four areas concerning medicinal plants. This includes development of a priority list of species for North Carolina and Oregon. No priority list is developed for the Ozark forests of Arkansas because of the lack of information concerning the medicinal plant species of that are collected from those forests. A review of the government programs and practices, relative to medicinal plant management in the study areas, is followed by an examination of the non-governmental organizations that are active in each area. Finally the section reviews that policies and procedures that guide how the Forest Service and Bureau of Land Management deal with medicinal plant management.

### 5.3.1 Medicinal Plants

Each selected study area represents a unique ecological and economic region. This section presents both historical trends and up-to-date market information about the three study areas. It demonstrates the diversity of products that are available in each area. It also demonstrates that many of the products harvested in the eastern forests find their way into western markets.

**Pisgah National Forest, North Carolina:** The Pisgah National Forest, located in Western North Carolina, covers more than 505,000 acres. It is located in one of the most diverse ecoregions (the Appalachian/Blue Ridge Forests) in the United States. More tree species are native to southern Appalachia than to any other northern temperate region in the world (Southern Appalachian Man and the Biosphere 1996). More than 150 tree species can be found in the region (Ricketts et al. 1999). No other region in North America hosts so much living diversity as Appalachia (Constantz 1994).

More than 30 species of medicinal non-timber forest products are collected from the national forests of the Southern Appalachia (Table 5.1). The National Forests of North Carolina (NFNC) has selected four medicinal plant species as priority for conservation efforts under the recently initiated program (USDA Forest Service 1999a). The priority species selected by the NFNC are: *Actaea racemosa* (black cohosh), *Panax quinquefolius* (American ginseng), *Sanguinaria canadensis* (bloodroot), and *Trillium erectum* (bethroot). Industry representatives concur on three of these species, and also recommend an additional priority species: *Chamaelirium luteum* (false unicorn) (Fletcher and Hayes 2000). This study combines NFNC and industry priorities, giving a list of five crucial medicinal species for the forests of North Carolina (Table 5.2).

The availability of market information for these priority species is truly lacking. For example, the only information available for bethroot and false unicorn are brief descriptions of their distribution and usage. No price or quantity data are available for either of these medicinal

plants. Though providing medically reliable information on these species is well beyond the scope to this project, it is helpful to know the most popular uses for these plants. While the roots of bethroot were traditionally used to aid in child birthing, the rhizome of false unicorn is used for menopausal problems (Foster and Duke 2000).

Black cohosh is native to hardwood forests of the Eastern United States. In bloom from later June through July, its distinctive white flowers are evident in rich cove forests. The roots of black cohosh are used for menstrual cramps and mild pain. Over the last few years, the market for this important medicinal herb has experienced drastic changes. From 1996 to 1997, the price that Wilcox Natural Products in Boone, North Carolina was paying for black cohosh increased 25 percent, from $1.00 to $1.25 per pound. In 1999 another firm, Bell's Botanicals and Trading Company was willing to pay $3.00 per pound for black cohosh. During this period, the market for black cohosh grew drastically. The estimated growth in the mass market for black cohosh, for the 52-week period ending July 12, 1998, was approximately 500 percent (Brevoort 1998). The following year, there was an overabundance of black cohosh on the market and collectors could not sell it.

Bloodroot is an effective medicinal herb in combating dental problems. It prevents bacteria from sticking to newly formed plaque and reduces inflammation (Sterling 1999). The price for bloodroot increased more than fifty percent over the three years from 1996 through 1999. In 1996, Wilcox Natural Products was paying approximately $4.00 per pound for bloodroot (Wilcox Natural Products 1996). The following year, the price that this firm was willing to pay for bloodroot increased to $6.25 per pound. In the fall of 1999, the latest year for which prices are available, Wilcox was paying $6.00 per pound for bloodroot. Though no data are available to confirm how much bloodroot is traded each year, industry representatives who preferred to remain anonymous estimated that the demand might exceed 25,000 pounds in 2000.

More is know about the markets for ginseng than any of the other priority species. One of the reasons for this is that the U.S. Fish and Wildlife Service has been tracking this product for the last 20 years, as part of its commitment to the Convention on International Trade in Endangered Species (CITES). No other NTFP has received as much attention. The average annual harvest of wild ginseng reported in North Carolina is approximately 6,700 pounds. This represents approximately 6.2 percent of the average national annual harvest of wild ginseng. There has been a definite increasing trend in the collection of ginseng over the last 20 years (Figure 5.4). In 1978, the first year that data is available, approximately 3100 pounds of forest-harvested ginseng was reported. In 1996, more than 10,000 pounds were reported. For that period (1978-1996) the volume of reported forest-harvested ginseng increased approximately 300 percent.

Since 1996, reported production of forest-harvested ginseng has been declining. From 1996 to 1997, reported harvest declined more than 16 percent. The following year (1997-1998), reported harvest volume declined almost 30 percent. Over the three years (1996-98), the total reported harvest of wild ginseng from North Carolina decreased approximately 41 percent. This could be due to two factors: a decline in demand, or a decline in supply. All indications suggest increasing demand for ginseng and other medicinal plants. A decrease in supply would suggest that it is more difficult to find ginseng. Another possibility is that another product is being substituted for the forest-harvested ginseng. This substitution effect could come from an increased production of

cultivated ginseng. Forest-harvested ginseng is preferred for its visual attributes, which are not evident in cultivated ginseng.

Until recently two firms purchased the majority of medicinal plants collected from the forests of North Carolina. Wilcox Natural Products, based in Boone, North Carolina, was a family owned operation that was established around the turn of the 20th century. Wilcox was a wholesale purchaser of medicinal plant material from collectors throughout the region. In the early 1990s, an international corporation bought Wilcox, and in the spring of 2000 shut down local operations. According to industry representatives, the firm is still buying medicinal plant products collected from the immediate area, but not in the quantity of the past.

The other major buyer of wild-harvested medicinal plants is the firm Gaia Herbs based in Brevard, North Carolina. Gaia purchases forest-harvested, as well as cultivated medicinal plant materials. It sells bulk herbs, but also processes the raw material into liquid extracts. From the 1998 price list, more than 25 medicinal plant species are identified that are collected from local forests (Gaia Herbs 1998). These include, but are not limited to, *Sanguinaria canadensis* (bloodroot), *Caulophyllum thalictroides* (blue cohosh), *Hydrastis canadensis* (goldenseal), *Sassafras officinalis* (sassafras), *Xanthorrhiza simplicissima* (yellow root), and *Podophyllum peltatum* (mayapple).

**Ozark Highlands, Arkansas:** The Ozark Highlands of Arkansas are a favored vacation spot for people throughout the midwest and south (Figure 5.5). "Wild crafters," those who collect medicinal plant products from the forests, come to this area because of its diverse ecological and cultural environment. Ginseng collectors from other states plan their vacations to this region during the ginseng collection season.

According to the Ozark-Ouachita Highlands Assessment, the National Forests account for more than 4 million acres, or about 10 percent of the area. Established in 1908, the Ozark-St. Francis National Forest, covers approximately 1.16 million acres, of which about 98 percent is classified Highlands. Approximately 23 percent of the land base, in counties that encompass the Ozark National Forest, is under Federal ownership. In some rural counties of Arkansas, the Forest Service is responsible for more than 35 percent of the land.

Most of the forest-harvested ginseng comes from Northwest Arkansas, and those counties that encompass the Ozark-St. Francis national forest (Figure 5.6). All but one of the top ten producing counties is located in northwest Arkansas. The top five ranked counties (Newton, Van Buren, Madison, Searcy, and Stone) contain more than 370,000 acres of national forestland. This represents approximately 16 percent of the total land base in those counties. According to Minton (1996) these five counties produced almost 70 percent of the total volume of ginseng harvested from the Ozark Highlands in 1995.

Since 1979, the Arkansas state-monitoring program for ginseng has reported approximately 57,000 pounds of forest-harvested ginseng to the U.S. Fish and Wildlife Service. Thus Arkansas accounts for approximately 2.6 percent of the forest harvested ginseng reported to the Fish and Wildlife Service over the past two decades. There has been a gradual decline (Figure 5.7) in

forest-harvested ginseng reported to the U.S. Fish and Wildlife Service through the state-monitoring program. This recent decline mimics the decline seen in North Carolina (Figure 5.4).

In 1996, the national forests in the Ozark Highlands generated approximately $13,500 from the sale of permits to collect ginseng (USDA Forest Service 1999). In that year, over 300 permits were issued for the collection of 906 pounds. According to the Ozark-Ouachita Assessment, the wholesale price for forest-harvested ginseng in 1996 was approximately $500 per pound (USDA Forest Service 1999). The wholesale value of the ginseng for which permits were issued in 1996 was therefore approximately $453,000. This suggests that the national forests received less than 3 percent of the market value from the sale of ginseng. Even if the wholesale price for ginseng was actually only $250 per pound, the value of the ginseng harvested from the national forests in Arkansas would still exceed $226,500. This still represents less than 6 percent of the market value.

The trade and use of ginseng in Arkansas has a long history and a widespread geographic impact. One collector, living in Madison county, surrounded by the Ozark-St. Francis National Forest, learned how to collect ginseng from his father, who learned from his father how to collect and manage ginseng from the local woods (Minton 1996). Madison County is one of the major producers of forest-harvested ginseng. The tradition of collecting has been with the people of this area for generations.

According to Minton (1996), a local dealer in Madison County has been buying and selling roots for more than 30 years. The Arkansas-based dealer has seen the number of local buyers decline by more than 75 percent, over the last 30 years. Collectors come from as far south as Mena, Arkansas to sell their ginseng. In 1995, this dealer reportedly paid out more than $300,000 for ginseng (Minton 1996).

One of the largest regional dealers of medicinal plants is located in Southern Missouri, just over the border. Schofield Roots and Herbs, in Theodosia, Missouri has been in the business for decades (Minton 1996). Over the years this firm has developed a network of more than 400 collectors in Arkansas. During the season, the Schofield representative travels throughout the Ozark Highlands buying ginseng and other medicinal plant products, from Fort Smith to Mountain View. The 1997 price list for Schofield Roots and Herbs has more than 70 products, representing more than 60 plant species (Schofield Roots and Herbs 1997). Many of the species are found in the Ozark Highlands. All of the priority species identified by the National Forests of North Carolina appear on Schofield's price list (e.g., bethroot, black cohosh, bloodroot, and ginseng). In 1997, Schofield was paying $1.00 for a pound of bethroot, and $1.25 per pound of black cohosh.

**Applegate Watershed, Oregon:** Parts of Southern Oregon have evolved into a Mecca for medicinal plant enthusiasts. According to Chris Hobbs, an herbalist and a board member of the United Plant Savers, Williams, Oregon, the next watershed west of the Applegate has become a center of attention for herbalists (Kettler 2000). One reason for this evolution is the high diversity of plants that are collected from the forests. Borsting (1998) identified more than 45 non-timber forest products common to Southwest Oregon (Appendix 5.1). At least 35 of these are used for medicinal purposes. Industry representatives consider seven of these as a priority for

conservation efforts. At the same time, the environment is conducive to cultivating many of the medicinal plants in demand. Over the last 20 years, the area has experienced a steady growth in the number of companies dealing with medicinal plants.

The Pacific Northwest Herb Directory provides a networking forum for firms throughout the region (Thie and Eaton 1997). The Directory covers five western states (Alaska, Washington, Oregon, Idaho, western Montana) and British Columbia. More than 180 businesses and resource people are identified. More than one-third of these are located in Oregon, and, approximately 25 percent of these are located in the area surrounding the Applegate watershed. There are three major market players in the area. Two of these firms wholesale bulk quantities of medicinal plants. The third adds value through secondary processing.

One of the most prominent herbal companies is Herb Pharm, a family-owned business located in Williams, Oregon, and founded in 1978. Herb Pharm grows organic herbs locally and purchases wild-crafted medicinal plants from collectors around the world (Herb Pharm 2000). The company processes raw materials into liquid extracts that it then sells through retail outlets. Its product line includes more than 175 single species extracts. Some of the species used for these products are found in Eastern United States. More than 30 of the products offered are made from medicinal plants from the Pacific Northwest.

Herb Pharm has a strong environmental ethic. One of the company's founders and the company's director of research are on the board of the United Plant Savers. This not-for-profit organization is dedicated to the conservation of native medicinal plants. The principal buyer for Herb Pharm claims a genuine concern for conservation and indicates that he works with collectors to ensure best management practices. He identifies 7 of the species listed on the company's product line as priority for conservation efforts (Table 5.3). The Herb Pharm buyer recommends special attention be given to lomatium in the west and to false unicorn in the east.

Wild Botanicals, a mid-sized wholesaler in Murphy, Oregon sells certified organically grown herbs, as well as forest-harvested materials. The company's product line includes more than 90 species, of which more than 68 percent are wild-harvested (Wild Botanicals 1999). At least four of the species (i.e., black cohosh, bloodroot, false unicorn, ginseng) offered by Wild Botanicals are found in Eastern United States. Five western priority species (i.e., lomatium, Oregon grape, valerian, yarrow, and yerba santa) appear on Wild Botanical's price list. Prices for these products vary throughout the year. For example, the price that Wild Botanical is willing to pay for yerba santa varies from $5.00 to $9.00 per pound, depending on the season. Fresh, spring-gathered material is cheaper than dried material in other times of the year. Wild Botanical provides price quotes for quantities in excess of 100 pounds, suggesting that the company deals in large quantities.

One of the largest wholesalers of medicinal herbs in Western United States is located in Grand Junction, Oregon. Northwest Botanicals has developed a network of more than 120 firms that wholesale herbal products (Miller 2000). Approximately 45 percent of these are international firms that import and export herbal products. Another forty percent of the network deals in small quantities, with a minimum volume of 500 pounds. More than 20 firms have a minimum volume order of 5,000 pounds.

A 1998 price list (Appendix 5.2) of herbs and spices offered by Northwest Botanicals (Miller 1998) lists more than 100 medicinal plant products. Northwest quotes prices for volumes from 1 pound to more than 1 ton. Both wholesale and retail prices are provided. Seven of the priority species, for the east and west, are listed. For example, prices are listed for ginseng and black cohosh, two priority species from Eastern United States. Prices also are listed for Oregon grape, pipsissewa, valerian, yarrow, and yerba santa.

This section focused on markets for medicinal plant products in the study areas. It demonstrated that the amount of information varies between study areas. From this analysis it should be clear that North Carolina and Oregon are major producers of medicinal plants. Compared to the other areas, Arkansas is not as productive. The next section focuses on the programs and practices of the two major federal agencies in the study areas. While the Forest Service is active in three locations, the Bureau of Land Management activities are limited to Oregon.

### 5.3.2 Government Programs and Practices

There is ample information available to examine the federal programs and practices on the three National Forests and in one BLM district regarding non-timber forest products and medicinal plants. Though the primary focus of this study is medicinal plant conservation, program information is presented concerning all non-timber forest products. There are two reasons for this expanded coverage. First, the amount of activity specifically concerning medicinal plants is lacking in all of the areas. Second, approaches and strategies for medicinal plants can be improved tremendously with a better understanding of how the agencies have dealt with the other products.

Region 8 (Southern Region) of the Forest Service undertook a cursory regional assessment of NTFP collecting on national forests in 1993. This provides important insight into the activities in general throughout the Southeastern region. At that time, the primary medicinal products collected from the national forests were ginseng, bloodroot, yellowroot, goldenseal, coneflower, and saw palmetto. Four of these are found on the National Forests of North Carolina. Several Region 8 managers had expressed concern about the ill effects of over-harvesting. The National Forests of North Carolina responded that it was using biological evaluations and tagging individual plants to monitor collection. The regional survey recommended in-service training for local unit leaders, uniform guidelines for permits and collection, fees that reflect fair market value, and increased support for law enforcement (Hyatt 1993).

**National Forests of North Carolina:** Over the last 9 years, the NFNC has undertaken several studies to determine the effect of harvesting on various species. The NFNC have issued thousands of permits for the collection of numerous NTFPs. In 1999, the NFNC initiated a comprehensive effort to improve the management of the forests for non-timber forest products. And in 2000, the NFNC considered putting a moratorium on all ginseng collection, but initiated instead a program to mark and monitor ginseng collection.

In 1991, the National Forests of North Carolina initiated a log moss removal study to better understand the dynamics of harvesting (Kauffman and Lea 1997). For the 6 years prior to the

study there had been a growing concern locally within the Forest Service that moss harvesting was not sustainable, and that the local units lacked the knowledge to make sound management decisions. The study estimated that for the previous 6 years, permits had been issued for more than 30 tons of moss. In 1996 alone, permits were issued for more than 18 tons of moss. Requests from moss dealers had come from as far away as Georgia and Kentucky. The study (Kauffman and Lea 1997) examined 4-5 harvest methods, and while lacking the statistical rigor needed to provide credibility, it did provide valuable anecdotal evidence to support management decisions. The study concluded that collectors could provide some answers to appropriate harvesting techniques.

In 1997, the Wayah District of the Nantahala National Forest in North Carolina examined alternative moss management options (USDA Forest Service 1997). The analysis identified areas on the District where moss collection is restricted. These included wilderness areas (5,750 acres), special interest areas (414 acres), riparian areas (9,480 acres), and designated old-growth areas (14,167 acres). In addition, another 14,500 acres of old-growth were designated on the District from which moss collection would be restricted. The total acreage identified on the Wayah District from which moss collection would be restricted was approximately 50,000 acres, representing almost 37% of the total land area. Two years later the district offered a sale of moss (USDA Forest Service 1999c).

Two alternative strategies were considered. The first alternative, which was the existing process, permitted moss collection only from regeneration areas. The second alternative would establish ten zones within the district. Collecting would rotate through these zones. Collection would be allowed for ten years before moving to the next zone. In this way collection would be restricted from any one zone for 90 years. In addition, under the second alternative, collection would be restricted to areas below 4,200 feet in elevation to avoid collection of particularly sensitive species. Under the second alternative, collectors would be required to leave three one foot patches of moss on each log (USDA Forest Service 1997).

In 1999, the National Forests of North Carolina (NFNC) initiated a comprehensive analysis of significant non-timber forest products harvested from public forests. The program of work for this effort identifies five critical issues that affect management of NTFPs in southern Appalachia. First, large volumes of NTFPs are collected from southern Appalachian forests; from 1988 through 1992, more than 1300 permits were issued in North Carolina for the collection of more than 50 species of NTFPs. Second, there is growing concern among forest managers in North Carolina that harvest levels are not sustainable. Several studies have documented slow recovery rates from collection. Third, insufficient monitoring is being done on collectors' compliance with regulations, and on the rate of recovery from this collection. A fourth issue is the limited and inconsistent standards and guidelines in forest plans concerning NTFP management. Finally, the program of work identifies inconsistencies in the NTFP programs (or lack thereof) between forests as a serious issue that affects overall management (USDA Forest Service 1999a).

The NFNC program is geared to improving the understanding of the ecological, social and economic impact of harvesting non-timber forest products in Southern Appalachia (USDA Forest Service 1999a). The program is designed to provide inventories, define and track market trends, and identify and assess potential strategies to conserve the resource. It incorporates five

major focal areas: product supply and demand, resource productivity, management practices, socio-economic needs, and education. The program will address current and projected demand for NTFPs from Southern Appalachia. Through habitat models, the program is assessing supply and productivity of priority species to help determine recovery rates and monitoring protocol. The program also is examining and evaluating management policies to recommend ways to make them more consistent within and across national forests. The program is also describing social, cultural and demographic characteristics of NTFP stakeholders (collectors, dealers, distributors). Finally, the North Carolina program will produce educational tools relative to NTFP management.

The program identifies more than 45 NTFPs (Appendix 5.3), the collection of which is managed through a free or fee-use permit system (USDA Forest Service 1999a). The program will focus on nine priority products of the 45 identified. More than 30 medicinal plants are identified, of which four species are recognized as a priority for the North Carolina program.

In 2000, as part of the comprehensive study on NTFPs, the NFNC summarized the permit activities for each of eight ranger districts for the period of 1997 through 1999, including the number of permits issued and the allowable volume for 21 species and one general category of medicinal plants. Approximately 43 percent (9 species) of the 21 species were collected during only one year. Another 23.8 percent (5 species) were collected in only two of the three years. Permits were issued for six species (28.6 percent) every year.

Over the last three years the overall number of permits issued for the collection of medicinal plants has decreased by approximately 22 percent. The Highlands district has experienced more than a 50 percent decrease in the number of permits. Three districts (Toecane, Tusquite, and Wayah) each have had more than a 35 percent decrease in the number of permits. The French Broad and the Grandfather Districts have had an increase in the number of permits. Since 1997, the number of permits issued for collection of medicinal plants on the French Broad Ranger District has more than doubled.

The total volume, by weight, of permitted collection has decreased as well, but not substantially. Since 1997, the volume of medicinal plants that was permitted decreased approximately 3 percent. The Pisgah Ranger District experienced the greatest decline in volume. Since 1997, the volume of permitted collection on the Pisgah Ranger District has decreased almost 96 percent. Over the same period, three districts (Cheoah, Highlands, and Wayah) each have realized more than a fifty percent decrease in the volume of permitted collection. After a fifty-three percent increase in volume from 1997 to 1998, the volume of permitted collection in 1999 from the Toecane Ranger District decreased approximately 26 percent from the first year. Over the same period, the Tusquite Ranger District realized an increase of more than 2500 percent.

Though there has been an overall decrease in the number of permits, as well as the volume of permitted collection, the volume per permit has increased over the last three years. In 1997, the average volume of permitted collection for each permit was approximately 39 pounds. The next year, this figure climbed to approximately 41 pounds. And in 1999, the average volume for each permit was more than 49 pounds. This represents an overall increase of approximately more than

25 percent per permit. This suggests that fewer people are collecting, but they are collecting more volume.

The total number of permits issued during the three years from each district is revealing. Almost 1500 permits for the collection of medicinal plants were issued over three years from eight districts. Approximately 33 percent of the total number of permits issued for medicinal plant collection was from the Wayah district (479 permits). The Highlands district (276 permits) represented the next largest number of permits issued, but only captured approximately 18 percent of the total issuances. The Pisgah, Grandfather, and Tusquite Ranger Districts each issued less than 100 permits for medicinal plant collection over the three years.

Over three years (1997-1999), permits were issued for the collection of more than 63,000 pounds of medicinal plants. Approximately 88 percent of this material was generated from two districts. Over the three years, the Toecane Ranger District permitted collection of approximately 39,000 pounds, while the French Broad district issued permits for approximately 17,600 pounds of medicinal plants. The remaining 12 percent of the total volume was shared between six ranger districts. The smallest volume of permitted collection was from the Highlands Ranger District.

The volume per permit from each district shows tremendous variation. At one extreme, the volume per permit for the Toecane Ranger District exceeded 230 pounds per permit. Conversely, the Highlands and Wayah district each had a volume per permit ratio of approximately one pound per permit. The French Broad and the Grandfather Districts had volume per permit ratios of 87 and 29, respectively.

Of the six species for which permits were issued every year, only one species was permitted every year from every district: *Panax quinquefolius* (American ginseng). Over the three years, the number of permits issued declined from 490 to 355. The volume declined as well, from 514 to 292 pounds. Two districts (Highlands and Wayah) issued almost sixty percent of the permits and volume. The Cheoah and French Broad Districts issued 10 and 12 percent of the total permits, respectively.

The issuance of permits for the other five species varied from year to year. For example, two Ranger Districts (Grandfather and Toecane) issued permits for *Actaea racemosa* (black cohosh) every year. The Cheoah Ranger District issued permits for Black cohosh in 1998 and 1999. The French Broad district issued permits in 1997 and then again in 1999. Approximately 51 percent of the permits and 75 percent of the volume of Black cohosh were from the Toecane Ranger District. While the Grandfather Ranger District issued approximately 22 percent of the permits, this district only accounted for 5 percent of the volume. The remaining 28 percent of the permits were issued from the Cheoah, French Broad, and Pisgah Ranger Districts. The other districts did not issue any permits for black cohosh at all during the three year study period.

The issuance of permits for *Sanguinaria canadensis* (bloodroot) occurred every year from the Cheoah and Toecane Ranger District. The French Broad issued permits for bloodroot in 1997 and again in 1999. While the Grandfather district issued permits in 1998 and 1999, the Pisgah district only issued permits in 1997. The Toecane issued 30 percent of the permits, which

accounted for 39 percent of the volume. The Cheoah and French Broad each issued 27 percent of the permits. These accounted for 13 and 44 percent of the volume, respectively.

Permits for the collection of *Trillium erectum* (bethroot*)* were issued in each of the three years, as well. In 1997 permits were issued from the French Broad and Pisgah Ranger District, while in 1998 only the Toecane Ranger District issued permits for collection of bethroot. In 1999, the French Broad and the Toecane Ranger Districts again issued permits for collection of bethroot. The French Broad District issued approximately 59 percent of the permits, and 69 percent of the volume. The Toecane issued 29 percent of the permits, which accounted for 27 percent of the volume.

The Toecane Ranger District issued permits for *Podophyllum peltatum* (mayapple) and *Hamamelis virginiana* (witch hazel) in each of the three years. The French Broad District issued permits for these species in 1997 and again in 1999. No other districts issued permits for these species in multiple years. The Grandfather and Pisgah Districts issued permits for witch hazel in 1997, but not in subsequent years. The Toecane District accounted for 82 percent of the permits for witch hazel and 53 percent of the permits for mayapple. This district generated 93 percent and 52 percent of the volume of these species, respectively. The French Broad district issued 47 percent of the permits for mayapple, which accounted for 48 percent of the volume. On the other hand, this district only issued 7 percent of the permits for witch hazel, which was about 3 percent of the volume.

**Ozark-St. Francis National Forests:** In 1991, the Ozark-St. Francis National Forest raised concerns that no efforts were being made to ensure the long-term viability of ginseng (Leeds and Leeds 1991). Recommendations were made to improve the planting of ginseng. A cost share program to encourage planting also was recommended. One ounce of seed would be handed out with each permit issued to collectors. The estimated cost of ginseng seed in 1990 was approximately $80 per pound. Further recommendations were made to use Knutson-Vandenberg (K-V) funds to enhance ginseng populations.

Around that same period, the Ozark-St. Francis National Forest developed and implemented a medicinal plant survey. The survey form (Appendix 5.4) identified more than 80 species with medicinal value found on the Forest. The survey was designed to locate the plant occurrence to the county, compartment and stand in which it was found. A short list of priority species was identified: *Aristolochia spp.* (Virginia snakeroot), *Asimina triloba* (pawpaw), *Echinacea spp.* (purple coneflower), *Hydrastis canadensis* (goldenseal), *Panax quinquefolius* (American ginseng), *Polygata senega* (milkwort), *Sanguinaria canadensis* (bloodroot), *Spigelia maritandica* (Indian pink), and *Veronicastrum virginieu* (black root).

The number of permits issued by the Ozark-St. Francis National Forest from 1981 through 1991 increased (Table 5.4). During this period, there was a general increase in the number of permits issued. From 1981 through 1991, the National Forest realized a 137 percent increase in the number of permits for collection of ginseng. The number of permits reached a maximum in 1989 (377 permits), which represented a 214 percent increase from 1981. After 1989, the number of permits began declining.

The number of permits issued, in 1991, for collection of ginseng by each district on the Ozarks-St. Francis National Forest has been summarized (Table 5.5). Four districts issued more than 90 percent of the permits. The Buffalo district issued the majority of permits during that year. Almost 25 percent of the permits were issued from the Pleasant Hill district. In 1991, the Magazine district issued no permits for collection of ginseng. No permits were issued on the St. Francis after 1991 because ginseng was listed as a sensitive species in 1992.

In 1995, the Ozark-St. Francis National Forest established a ginseng task force to analyze the management situation and to make recommendations on appropriate policy and actions (Minehart 1995). The task force was an interdisciplinary team representing law enforcement, research, wildlife biology, and timber sales. The objectives of the task force were to develop a sustained-yield management strategy for ginseng and to prevent ginseng populations from declining to the point that the species would be listed under the Endangered Species Act.

The Ozark task force's analysis portrayed a situation of increasing market demand for ginseng with a decreasing collection on neighboring national forests. This presented a condition on the Ozark-St. Francis National Forest of greater than ever pressure on ginseng populations. The analysis identified that in one year (1994), 577 permits for the collection of ginseng were issued from five Ranger Districts. The Buffalo Ranger District issued more than 38 percent (222) of the permits. The Pleasant Hill Ranger District issued approximately 19 percent of the permits. The Boston Mountain and Bayou Ranger Districts each issued 15 percent of the permits. The Sylamore Ranger District issued approximately 14 percent (78) of the permits in 1994. No permits were issued from the Magazine or the St. Francis Districts.

The task force identified several factors that inhibit sustainable management of ginseng. Permits are issued without any National Environmental Protection Act (NEPA) process. Population inventories are inadequate and there is insufficient funding to allow for proper management. The task force projected that adequate funding was not likely to occur.

The Ozark task force recommended 4 alternative strategies (Minehart 1995). The first was to continue the existing approach. They concluded that the major advantages to this strategy would be to minimize conflict with collectors and to provide more time to evaluate the situation. The second alternative was to permanently discontinue issuing permits for the collection of ginseng. The task force concluded that this strategy would prevent any further decline in ginseng populations. The third alternative proposed by the task force was to place a 5-year moratorium on ginseng collection. This would reduce the pressure and would allow for populations to increase. The greatest disadvantage of this approach was the lose of credibility and the creation of conflict with collectors. The fourth alternative proposed by the task force was to provide District Rangers with adequate support to manage the resource. This support would include restricting the collection season, using K-V funds to buy seeds for replanting, designating specific collection areas, rotating collection areas to give populations time to recuperate from harvest pressures, and to limit the number of permits issued each year. Unfortunately, increased support for this kind of activity has not been forthcoming.

The Forest Supervisor selected and endorsed the last alternative (Key 1995). He encouraged developing management strategies that would ensure the sustainable management of ginseng.

The Forest Supervisor also recommended that the management of ginseng be analyzed in the revision process of the forest plan.

In 1997, the Forest Leadership Team of the Ozark-St. Francis National Forest met to discuss ginseng management. The team recommended several actions that would improve management efforts (Bollman 1997). They recommended that the forest continue with designated collection zones, and that certain zones be idle for at least 5 years. They further recommended that the season be reduced by two weeks, and that it be consistent across the Forest. The recommendation was made to reduce the minimum volume per permit from 3 pounds to 1 pound, which would reduce the charge levied to collectors. The Team also recommended that measures be implemented to restore and improve ginseng habitat, and to develop a monitoring and evaluation program. The Leadership Team identified the need to involve many partners in the efforts to improve ginseng management. Further, they suggested the continued gathering of information from collectors and the use of a standardized windshield tag to identify the vehicles of collectors.

In 1997, the Ozark-St. Francis National Forest published a brief history and a policy for the harvesting ginseng (Leeds 1997; USDA Forest Service 1997a; USDA Forest Service 1997b). It reiterated much of the findings and recommendations from previous studies. In 1997, the collection season would run from 15 September through 31 December. Permits would go on sale starting 2 September. The cost of permits would be $15 per green pound, with a minimum of 1 pound per permit. No permits would be issued on the Magazine district or the St. Francis National Forest. Only one person would be allowed for each permit. A windshield tag, to be displayed while collecting, would be issued with each permit. A small amount of seed, and planting instructions, would be distributed with of each permit.

The policy for ginseng was revised again in 1998 (USDA Forest Service 1998). The collection season for ginseng was modified to run from 1 September through 1 December – another two weeks shorter that the 1997 season.. No permits were to be sold to people under the age of 16. Any ginseng collected by youths under this age would be counted toward the adult's permits. Individuals could only purchase a permit for one zone per district, but districts could sell permits for another district. And an individual could purchase permits for more than one district. Collection was restricted to plants that had 3 leaves or more. Further, collectors were instructed to plant ginseng seed in areas where they collected. A colored windshield tag was issued with each permit, and it was the responsibility of the collectors to display this in their automobile while collecting. In 1998, the Pleasant Hill Ranger District was divided into five collection zones, one of which was closed to collection in this year (Appendix 5.5).

In 2000, the policy for ginseng management shifted dramatically. The Forest Service banned all collection of ginseng from the Ozark-St. Francis National Forest for a period of 5 years (Hayworth 2000). After 5 years of evaluation and monitoring, the Forest Service reached the conclusion that the best course of action was a complete moratorium on ginseng collection. The decision to close collection on the National Forest was driven by a growing concern that ginseng populations were declining. The major concern was that the population would continue to decline to the point where the species would be placed on the endangered species list. Should this happen, the restriction on ginseng collection would be more extreme than current actions.

**Applegate Ranger District, Rogue River National Forest:** The Applegate Ranger District of the Rogue River National Forest has not had an active program of issuing permits for the collection of non-timber forest products. In 1997, the District issued 127 permits for non-timber forest products (Mitchell 2000). No permits were issued for the collection of medicinal plants. The majority (54%) of the permits issued in 1997 were for fuelwood collection. Almost a quarter of the permits were for individual sawlogs. In 1997, only 7 permits for mushroom collection were recorded.

The 1998 records for permits to collect non-timber forest products are incomplete (Mitchell 2000). In that year, records for only 60 permits are available. Of those, no permits were issued for medicinal plants. No records are available to indicate that permits were issued for mushroom collection. The majority (62%) of the permits were issued for individual sawlogs. Approximately 18 percent of the permits were issued for burls. Only eight (13%) permits were issued for fuelwood.

**Medford District, Bureau of Land Management:** The Bureau of Land Management has been aggressively addressing non-timber forest products since the early 1990s. In 1991, BLM managers of Oregon and Washington convened to identify major issues that limited the agency's management of NTFPs. The group identified and developed a set of recommendations and procedures for 5 issues that needed to be addressed (USDI BLM 1993). The first of five recommendations was to develop a section specifically for non-timber forest products in the resource manual procedures and get NTFPs out from under the timber management program. The second recommendation resulted in the publishing of the Special Forest Products Procedures Series Handbook in 1996 (USDI BLM 1996). The third recommendation was to provide management and budgetary support to adequately manage for NTFPs within the context of ecosystem management. The fourth recommendation was to complete the inventory of priority species and to develop a monitoring system to evaluate the impact of harvesting. The final recommendation from the task force was to enhance public education and outreach, and to develop partnerships.

The Medford District of the BLM has an active non-timber forest products program. The products are fully integrated into management plans and site prescriptions. In some areas, the management for NTFPs is a major objective. But, they do not receive many requests for medicinal plants. This is corroborated by the revenue statistics, presented below. Some of the products purchased from BLM land include *Eriodictyon californicum* (yerba santa), *Usnea spp.* (usnea), *Hypericum spp.* (St. John's wort), and *Aralia spp.* (spikenard).

The BLM permit system incorporates load tags to track and monitor collection. Each load tag is in three parts. One part stays with the ranger when the permit is issued. One part is mailed back to the ranger. The third section remains with the load. According to the BLM District Ranger, approximately 800 permits are issued each year. Most of these are for firewood. In some areas, the BLM and Forest Service issue joint permits, especially for mushroom collection.

In 1999, the cash sales of non-timber forest products from BLM lands in Oregon and Washington exceeded $125,000 (Appendix 5.6). The Medford District in Oregon generated $44,180 in revenues from non-timber forest products in 1999. Twenty-three contracts were

issued for edible and medicinal products, the value of which accounted for less than 0.4 percent of the total revenues from non-timber products. The collection of more than 10,000 pounds of medicinal products was reported in 1999. The total value received from the sale of these products was approximately $450, which translates into less than $0.05 per pound. Specialty wood products accounted for the largest proportion (approximately 30%) of the revenue generated from NTFPs. The revenues from floral and greenery products exceeded $35,000, approximately 29 percent of the total. The BLM received more than $20,000 from the sale of conifer boughs.

In 1999, the sale of edible and medicinal products generated less than 1 percent of the total revenues from non-timber forest products on the Medford District. The total value received for these plant products was forty dollars. This was approximately 1,400 pounds, which translates into a value per pound ratio of approximately $0.03. In comparison, the Medford District received revenues of approximately $4.60 per pound for mushrooms, $4.41 per Christmas tree, and $1.36 for each bushel of seed or seed cones.

### 5.3.3 Non-Governmental Organizations

This section focuses on the prominent non-governmental (NGOs) activities in each of the target areas. It identifies the NGOs in each area that have potential to work on conservation of medicinal plants. It then examines the constraints and opportunities of each of the groups. In each area there are groups that have experience and programs that could support medicinal plant conservation. There seems to be more relevant NGOs in the west, which may be due in part to the environmental turmoil that has plagued that region over the last ten years. Also, the President's Northwest Forest Plan initiated in the early 1990s provided resources for establishment of non-governmental organizations.

**Western North Carolina:** Most of the non-governmental organizations in North Carolina that focus on forestry on public lands are focused on the popular regional issues including roadless area management, timber harvesting, watershed protection, and wildlife issues. Only one is identified that targets medicinal plant conservation and economic development. The Southern Appalachian Forest Coalition (SAFC) located in Asheville North Carolina is a non-profit alliance of 17 member groups (Southern Appalachian Forest Coalition 1998). The Coalition is dedicated to reforming public land management policies and practices, providing useful information to its constituents, and to strengthening the capacity of member organizations to better affect improved public land management.

Because SAFC and other groups are focused on the preservation, not the conservation of natural resources, alignment with these groups would not be productive for the active management and conservation of medicinal plants. They would not likely embrace collection of medicinal plants by local rural harvesters. Certainly if a connection were made with big pharmaceutical companies, many of these groups would actively oppose any utilization efforts.

There is one group that is taking a leadership role in medicinal plant conservation. Yellow Creek Botanical Institute (YCBI) based in Graham County, North Carolina is focused on the research and development of native plants – including medicinal and edible plants -- as new and alternative crops (Yellow Creek 2000). The Institute has the advantage of being located in an

ecologically diverse area with an abundance of medicinal and edible plants. It has a good working relationship with the Forest Service, and collaborates with the public agency on germplasm preservation. YCBI is developing protocols for the propagation and cultivation of medicinal and edible plants. Also, it is working to develop sustainable production systems for these new crops, and ethnobotanical studies for medicinal plant collection.

Though Yellow Creek Botanical Institute is a relatively young organization, it is well aligned with the principals of medicinal plant conservation. It is dedicated to working with local collectors on ways to better manage the forest resources for medicinal plants. It recognizes that economic development of the people involved in medicinal plant collection is dependent on the ecological sustainability of the forest resources. The Institute has great potential to partner with similarly aligned organizations for the conservation of medicinal plants.

**Ozark Highlands:** The amount of NGO activity in the Ozark Highlands is significantly less than in the other areas. Nonetheless, environmental groups that advocate 'no-cut and no-use' of forest resources are fully represented. The main focus of community development and natural resource NGOs in the Ozark Highlands is alternative and sustainable agriculture. At least one group is working on forest management, particularly improved utilization of small diameter, marginal quality wood products.

The Newton County Resource Council, based in the heart of the Ozark Highlands is working with local loggers and sawmills to improve management and marketing of local forest products (Knox 2000). The Council organizes trainings and workshops on alternative management practices. It is working to install small-scale kiln drying facilities to improve local sawmill operations. The Council also is developing a web-site to help in the marketing of locally produced lumber.

Perhaps the greatest potential for medicinal plant conservation in the Ozark Highlands is with the Shirley Community Development Corporation (SCDC). The SCDC was established in 1988 to plan and initiate economic development programs through education, skills development and training and service projects. The Corporation undertakes projects to research and demonstrate the skills and techniques needed to produce and market specialty agricultural products (Shirley Community Development Corp. 2000). The major focus of the SCDC is the production and marketing of shiitake mushrooms. The SCDC offers workshops, production supplies, and marketing assistance to interested entrepreneurs. The organization is expanding its efforts to include garden bricks, stepping stones, production of culinary herbs in raised beds, and small-scale greenhouses.

Though no groups are focused specifically on medicinal plant conservation, there is potential to work with local organizations to develop this area. There may be NGOs involved in sustainable agricultural activities that are peripheral to medicinal plant conservation, but they are not readily identifiable. The SCDC has the most appropriate focus, though conservation efforts would need to embrace development of the market potential for these products. Any efforts to develop medicinal plant conservation will need to adapt to on-going programs.

**Southern Oregon:** Non-governmental organizations in Southern Oregon have been working together on the issue of conservation of non-timber forest products for more than 5 years (Carnival 1998). Collaborative groups that include collectors, industry, conservation groups, and public agencies are established and working in some areas. Groups within and outside the immediate area are working on the issue of improving the management of forests for non-timber forest products, or related concerns. There are many opportunities for increased collaboration on medicinal plant conservation.

The Rogue Institute for Ecology and Economy (RIEE) was one of the pioneers behind much of the early work on non-timber forest products. However, RIEE has not maintained its program on non-timber forest products, and does not anticipate working on that issue in the future. It is dedicated to sustaining ecosystems, jobs, and the communities. RIEE promotes community involvement, sustainable forestry, and collaboration. It combines a focus on harvest practices with the end use and markets to sustain jobs and the environment. This non-governmental organization is a Smartwood Certifier of forest management practices on private lands. One of the NGO's more active programs is ecosystem management technician training.

One of the more prominent publications of the RIEE is a guide to harvesting NTFPs (Borsting, Vance and Pilz 1999). This effort provided information about collection and use of more than 25 species. The harvest guidelines advocate having a sound knowledge of the use, markets, ecology and botany of the species. The guidelines recommend technical proficiency in collection techniques, as well as awareness of the impacts of harvesting. The guide covered five of the priority western medicinal plants: yarrow, Oregon grape, pipsissewa, yerba santa, valerian.

The RIEE also published other NTFP documents. The "Special Forest Products Inventory, Ecosystem Assessment Guide" (RIEE 1995) provides a method to assess the vigor, health, cover conditions, soils and species of ecosystems. The "Beargrass Harvest Impact Study" (RIEE 1998) developed a research protocol for assessing the impact of harvesting this floral product. The report provided sustainable harvest guidelines for beargrass and discussed efforts to improve market knowledge, and to transfer lessons learned to practitioners.

One of the lasting accomplishments of the RIEE is the Collaborative Learning Circle (CLC). This group of local and regional NGOs convenes monthly to discuss natural resource issues. It works to educate members through peer raining workshops, and to develop alliances that work collaboratively on critical issues. The CLC has worked with mushroom collectors as well other NTFP collectors. It is well aligned with the National Network of Forest Practitioners. The CLC appears more aligned with radical environmental groups.

The Applegate Partnership (AP) is another lasting outcome of the effort of the Rogue Institute. The Partnership was established in 1992 to focus on improving the management of public forests in the Applegate Watershed. The AP supports management of lands to sustain natural resources. It has become a model of successful collaboration of private industry, conservation and natural resource management groups, and public forest management agencies. One of the AP leaders expressed that; environmental groups neither collaborate nor cooperate in the partnership. The local environmental groups have refused to participate and are often antagonistic toward the

partnership. Nonetheless, the AP is an excellent model of how many different factions can work together to find approaches to common natural resource problems.

The Applegate Watershed Council (AWC) is the implementing arm of the Applegate Partnership (Applegate Watershed Council 2000). The AWC has a small but effective staff, with expertise in geology, hydrology, wildlife, and biochemistry. Its primary focus is the riparian zones of private forestland. AWC works to restore and sustain the health and functioning of watersheds. The NGO's activities include ecosystem monitoring and assessment, conservation strategies, and habitat protection. Its fundamental strengths are the skills and technical expertise it can call upon to address critical issues. Like most small NGOs, the most critical constraint that AWC faces is financial support and the participation of its Board of Directors.

North of the Applegate Watershed is the Jefferson Center. This NGO is modeled after the Highlander Center of Eastern Tennessee (Jefferson Center 1999). Its primary focus is social justice for marginalized workers. It fights for social change to improve the conditions of the rural poor. The Jefferson Center has worked extensively with local collectors and has a good working relationship with many of them. The Center is very much process-oriented: *how* a community develops is just as important as *how much* it develops. The group is well aligned with the National Network of Forest Practitioners.

There are several resource groups just outside the immediate area that could provide valuable expertise. These groups have a great deal of experience with finding ways to manage forests for non-timber products. The Watershed Research and Training Center (WRTC), based in Hayfork, California, has done some of the premier work on NTFPs. The WRTC organizes workshops and public forums and develops networks to enhance communications between community members (Carnival 1998). Through this collaborative effort, research questions are defined for WRTC to address.

A prime example of this process is WRTC's collaboration with the Collaborative Learning Circle, discussed above. These groups organized a study tour focused on NTFP management issues. They explored critical issues through dynamic discussions with public agencies, private companies, and environmental and conservation groups. Through this process, three priority issued emerged that would drive WRTC's research and development. These were: 1) monitoring environmental impact, 2) development and dissemination of information, and 3) sustainability of the resource base (Everett and Borsting 1997).

The WRTC has collaborated with the U.S. Forest Service on a number of projects. Of particular interest is a guide to the NTFPs of an adaptive management area that includes two national forests in California (Everett 1997). The guide summarizes important ecological information on key NTFPs. It focuses on three groupings: 1) species that are the least sensitive to harvesting, 2) species that are moderately sensitive, and 3) species that are sensitive to harvesting. The guide classifies the priority species yarrow as least sensitive. Yerba santa is classified in the second group. And Oregon grape is considered very sensitive to harvesting.

A second group in Northern California that could be a useful resource for medicinal plant conservation in Southern Oregon is Trinity Alps. This group was formed in the mid 1990s as a

formal cooperative of growers and collectors of medicinal plants. In markets organically grown and ethically collected medicinal plants. Trinity Alps has published standards and guidelines for the sustainable harvest of non-timber forest products (Klein and Johnson 1997). Its harvest guidelines address exotic species that are least sensitive to collection, and native species that are extremely sensitive. The guidelines recommend techniques and etiquette for harvesting on public and private lands. Trinity Alps also organizes workshops on plants for restoration and medicine. During these forums, resource speakers address propagation, collection, and habitat restoration with native plants.

### 5.3.4 Policy and Procedures of the Management Agencies

This section explains and compares the non-timber forest product policies and procedures that guide the National Forest and Bureau of Land Management. Since 1991, the Forest Service has issued more than nine directives that impact non-timber forest products. This section tracks the Forest Service directives issued at the various management levels to provide an understanding of the evolving policies. It reviews the national, regional, and forest-level directives that affect how each National Forest approaches NTFPs. The Bureau of Land Management policies and procedures are similarly examined.

**U.S.D.A. Forest Service:** The current US Forest Service policies and directives governing non-timber forest products are found in two primary documents: the Forest Service Manual (FSM) and Forest Service Handbook (FSH) (USDA Forest Service 2000). The FSM contains the legal authorities, objectives, policies, responsibilities, instructions, and guidance for the agency. It houses more significant policy and standards governing the Forest Service programs than the FSH. On the other hand, the FSH is the principle source for specialized guidance and instruction on how the Forest Service is to carry out directives issued in the FSM. These documents, as well as any amendments, are stored and issued electronically.

A computerized search of these documents reveals that since 1991, three service-wide issuances from the national office have been entered into the FSM. Only two amendments to the FSH are identified during that same period. Since 1994, four regional issuances from Region 8 have been entered into the Forest Service Directive System (FSDS) concerning NTFPs. No region-wide issuances have been entered for Region 6, which covers the Rogue River National Forest. Two of the three national forests of interest (Ozark-St. Francis, Pisgah/Nantahala) have entered field issuances into the FSDS since 1989. The following discussion on the Forest Service directives first summarizes the national direction, then the direction from the region 8 office and finally direction from the two forests.

**National Direction:** Section 2467 of Amendment 2400-91-9 of the FSM (USDA Forest Service 1991) establishes the authority for the sale of other forest products from national forests. The explicit objective as detailed in Section 2467 is “to sell other forest products where it will serve local needs and meet land management objectives” (USDA Forest Service 1991, section 2467.02). The stated policy is to “use management measures that perpetuate or increase production of miscellaneous forest products” (section 2467.02) This shall be done “within applicable objectives, standards and guidelines of the forest plan” (section 2467.02). Section 2467.03 directs the Forest Service to “recover fair market value of such products when it is

practical to do so." Further, section 2467.04 directs the Regional Forester to develop valuation and sale procedures, including conditions of sale for tree sap and other forest products. Finally, section 2467 sets the conditions of use for miscellaneous forest products as those set forth in FSH 2409.18 section 87.

Amendment 2400-95-2 of the FSM places additional responsibility onto the Forest Supervisors to operate sales efficiently. With reference to non-timber forest products, Section 2431.04b directs the Forest Supervisor to "coordinate fire wood sales with the Bureau of Land Management or other Federal or State agencies in the local area" (USDA Forest Service 1995).

Amendment 2400-99-2 of the FSM delegated the authority to sell and dispose of national forest timber and forest products (USDA Forest Service 1999d), including special forest products. The Regional Forester has the authority to transact sales of NTFPs up to a maximum amount of $100,000. The Regional Forester then delegates the maximum sale amount for which Forest Supervisors have authority. The delegated amount "may be increased to $500 by the Regional Forester in times of emergencies." Likewise, Forest Supervisors may authorize District Rangers to conduct sales to a maximum of $500. At the national level, the Director of Forest Management has authority to approve sales exceeding the Regional Forester's limit.

Perhaps the most comprehensive coverage of NTFP management is Amendment No. 2409.18-91-3 (USDA Forest Service 1991a) of the FSH. Chapter 80 of this amendment deals with uses of timber other than commercial sales. Within this chapter are sections on free use for firewood and other products, as well as directives on the sale of other forest products. Section 82 of FSH Amendment No. 2409.18-91-3 addresses free use of forest products, particularly firewood, but also "other products." According to this section, firewood is normally sold for personal use at rates provided in FSM 2431.31c. This section of the FSM requires a minimum charge of $10 per permit for firewood and other forest products, except Christmas trees. The minimum sale for Christmas trees is $2.

The sale of other forest products is addressed in Section 87 of FSH Amendment No. 2409.18-91-3 (USDA Forest Service 1991a). Subsection 87.2 provides guidance on management of naval stores. This section directs the Forest Service to use only trees selected for timber harvest and only in stands selected for regeneration. The basic principle outlined in Section 87.2 concerning naval stores is that they provide byproducts to the primary objective of sawtimber. Contracts for extraction of naval stores should provide for methods that minimize damage and loss of other timber products. Forest supervisors are directed to submit annually a list to the Regional Forester showing proposed naval store sales and appraisal data. Approval of this authorizes the line officer to proceed with advertisement of the sale. Section 87 identifies that extraction of naval stores can increase the fire hazard, and directs the agency to treat stands with prescribed burns before a sale. This reduces the fire risk and increases the ease with which bidders can set up operations.

Subsection 87.3 of FSH Amendment No. 2409.18-91-3 provides direction on pine distillate wood. This section directs forest officers to sell pitchy stumps and top wood that are left behind after the harvesting of longleaf and other pines. This material may be sold by the ton, acre, cord or cubic foot.

Procedures for the selling of Christmas trees and boughs are dealt with in Subsection 87.4 of FSH Amendment No. 2409.18-91-3. All sales of Christmas trees and boughs must be cut in accordance with silvicultural prescriptions that are established prior to the sale. Sales are to be designed for maximum improvement to the stand. When possible, the Forest Service is directed to manage areas exclusively for Christmas trees.

Chapter 80 of FSH Amendment No. 2409.18-91-3 also addresses tropical forest products. Subsection 87.6 regulates sale of minor forest products within the Caribbean National Forest, include vines, tree fruits, seeds and cuttings, palm leaves and leaf sheaths, grass and straw, bark, bromeliads and fungi and sphagnum moss (USDA Forest Service 1991a). This subsection also provides direction for foraging and charcoal production.

A list of saleable products is provided in Subsection 87.71 of FSH Amendment 2409.18-91-3 (USDA Forest Service 1991a). More than 20 products are identified, including edible, floral, decorative, and medicinal products. The basic direction that guides the overall extraction of these products is to make sure that collection on national forests complies with state and federal laws for the protection of plant and animal materials.

FSH Amendment No. 2409.18-99-10, issued in April of 1999, reassigns section 53.5 as Forest Products Removal Permit and Cash Receipt, Form FS-2400-1 (USDA Forest Service 1999e). This amendment provides additional direction for the use of the permit form FS-2400-1. Exhibit 1 of Amendment No. 2409.18-99-10 presents the type of contracts and permits needed for the different transactions. Form FS-2400-1 is appropriate in situations where there is a charge for non-timber forest products. For non-convertible forest products with low value sales, the appropriate form is FS-2400-4.

**Regional Direction:** The regional policy on the sale of non-timber forest products was updated in 1994 (USDA Forest Service 1994). Section 2467 of the supplement (No. 2400-94-3) deals specifically with the sale of other forest products. The stated objective of this Section is to “sell special forest products in a cost efficient manner and at fair market value.” This objective will be accomplished while “meeting forest land and resource management plan objectives.”

The policy regarding NTFPs, as stated in the R8 supplement, embraces sustainable harvests based on annual work plans, with maximum cost efficiency with positive public benefits (USDA Forest Service 1994). Specifically, the Supplement directs the Forest Service to use methods that will “perpetuate or increase production of special forest products” (Subsection 2467.03). This shall be done in agreement with the objectives of the forest plan and within the principles of ecosystem management. Sales of non-timber forest products are to be scheduled and implemented based on annual work plans and budgets. The policy states that the long-term benefits from the sale of non-timber forest products shall exceed the costs of implementing the program. Further, the Forest Service shall use economic analysis to document the net public benefit from NTFP sales. The 1994 policy directs the Forest Service to use competitive bidding in situations where sufficient competition exists.

The responsibilities for the Regional Forester and Forest Supervisors concerning NTFP management are assigned in the R8 supplement to the FSM (USDA Forest Service 1994). According to the supplement, the Regional Forester is responsible for developing procedures to determine the value of products and facilitate the sale of products. Also, the Regional Forester is responsible to quality control and program oversight. Forest Supervisors are to develop and update the value and rate schedules for all non-timber forest products. It is the responsibility of the Forest Supervisors to develop National Environmental Protection Act (NEPA) documentation, including biological evaluations. Further, the supplement directs the Forest Supervisors to provide for the administration and monitoring to ensure that management objectives are meant, and that the terms of the permits are fulfilled. In addition, Forest Supervisors are to establish criteria and standards for the issuance of permits for research purposes.

The R8 Supplement No. 2400-94-3 also sets the conditions for the sales of NTFPs (USDA Forest Service 1994). Section 2467.1 of the supplement directs that the cost of fee permits be based on "fair market value of the products." Free-use permits are to be issued only when there is no competition and when collection is for personal purposes. This section directs the Forest Service in Region 8 to "establish fair market value through several methods, including appraisal schedules developed by the Forest Supervisors, transaction evidence, a residual value process, or constructed cost procedures (USDA Forest Service 1994, Section 2467.1). Finally, the section directs the Forest Service to "use a minimum of 20 percent of wholesale market value of the products as a starting point" to establish the appraised product value.

The R8 Supplement No. 2400-96-2 to the FSM redelegates authority to sell and dispose of non-timber forest products (USDA Forest Service 1996). Section 2404.24 directs authority for the sale of NTFPs to the Unit Leader for Forest Products and the Forester in the Forest Product Unit. These individuals are delegated to act for the Regional Forester in the sale of NTFPs in Region 8.

Two regional supplements to the FSH concerning NTFPs have been issued in Region 8 (Southern Region). Both were directed at the Timber Sale Preparation Handbook. The first was issued in 1994 and dealt with the correct form to use for fuelwood sales (USDA Forest Service 1994). Subsection 53.4 of R8 Supplement No. 2409.18-94-3 directs the Forest Service in Region 8 to use Form FS-2400-4 for the sale of fuelwood. This form is used as the permit for collection, as well as a summary of value and volume of the product removed from the national forests. Subsection 53.4 paragraph 3 of this supplement specifies that Form FS-2400-4a may be used "to sell Christmas Trees and other special forest products such as moss or pine cones."

In 1995, R8 Supplement No. 2409.18-95-1 was issued to modify the Timber Sale Preparation Handbook (USDA Forest Service 1995a). This supplement authorized procedures for the sale of naval stores in the region and provides a list of products that are saleable from the national forests. The procedures for the sale of naval stores include direction on marking and tallying specific trees, appraising their value, and administering sales.

Subsection 87.71 of R8 Supplement No. 2409.18-95-1 deals specifically with medicinal plants and roots, focusing particularly on ginseng. The subsection directs the Forest Service to cooperate with state programs and to work within the regulations of the U.S. Fish and Wildlife

Service. The latter agency controls the export of ginseng from states with an approved management program. The Forest Service is directed to "develop ginseng management policies that reflect the forest plan objectives, biological evaluations, and locally appraised values." According to the supplement, the appropriate permit for the collection of ginseng is FS-2400-4. The subsection further directs the Forest Service to "provide specific harvesting requirements on the permit, including verification of amounts harvested."

**National Forest Direction:** Both the Ozark-St. Francis and the National Forests of North Carolina have entered field issuances into the FSDS concerning NTFP management. In 1989, the National Forests of North Carolina issued Supplement 133 to Chapter 2430 (Commercial Timber Sales) of the Timber Management Handbook (USDA Forest Service 1989). The objective of this supplement is to "establish procedures for the management of the personal use firewood program" (2430.2) The stated policy is to "sell all personal use firewood in unadvertised sales." Management of the firewood program is to be an "integral part of the District's" workload. The policy directs that "funding for the program be included in the annual budget allocations." Subsection 2431.46 of Supplement 133 provides detailed procedures for the disposal of firewood, including the setting of standard rates for permits, establishing the period for which permits are active, and identifying trees that are prohibited or reserved from the fuelwood program.

The policy for the sale of "other forest products" from the National Forests of North Carolina is addressed in Section 2467 of Supplement 133 (USDA Forest Service 1989). The section directs the District Rangers to check local prices on non-timber forest products. The Forest Supervisor's office is directed to summarize and publish standard prices for all forest products.

In 1996 the National Forests of North Carolina issued supplement 96-1 to Forest Service Manual (USDA Forest Service 1996a). This supplement delegated authority for the sale of forest products, including "special forest products." Each ranger district, except for the Croatan District, is authorized to administer sales not to exceed value of $2,000 and a volume of 400 MCF. The Croatan Ranger District is authorized to administer sales of pine straw up to a value of $10,000.

The National Forests in North Carolina (NFNC) Supplement No. 2409.18-99-1, which does not appear in the online Forest Service Directive System, revises the Forest policy for the sale of non-timber forest products, as well as the list of products available for sale (USDA Forest Service 1999b). Specific guidelines are provided for ginseng, Fraser fir cones, pine straw, and log moss. The supplement provides a reference table with the accepted unit of measure, price per measure and minimum permit for 20 products that are collected from the National Forests of North Carolina. Also, it provides an extensive list of 40 medicinal herbs that are found on the National Forests.

The NFNC Supplement No. 2409.18-99-1 for ginseng directs the Forest Service to cooperate with the North Carolina state program, as well as the Fish and Wildlife Service. It further directs that management policies for ginseng reflect objectives of the Forest Plan. Forest managers are directed to use permit form FS-2400-4 for collection of ginseng. The supplement establishes the permit season as September 1 through December 31. The NFNC policy as stated in the

supplement is that anyone who is issued a permit for ginseng is required to plant mature seeds from nearby plants. The supplement restricts collection of ginseng to plants that are larger than 3-prongs.

The directives for Fraser fir cones, pine straw, and log moss are less developed (USDA Forest Service 1999b). Permits for cone collection will be issued as requests are submitted, and will only be sold during the last two weeks of August. The supplement directs responsibility for determining harvest levels to the administering unit, which will base the decision on cone maturity. The price for permits is to be determined every year. The supplement directs District Rangers on the Croatan National Forest to determine where pine straw is to be harvested, and to sell it by the acre. District Rangers on the Nantahala and Pisgah National Forests are directed to designate where log moss shall be harvested. The supplement provides no direction for the collection season for pine straw, but it does indicate that permits for log moss collection will be issued for the period of 1 July through 31 March.

The Ozark Supplement 2400-93-2, issued by the Ozark-St. Francis National Forest, clarifies the authority for the Forest Supervisor and District Rangers concerning the maximum volume and value of NTFP sales (USDA Forest Service 1993). District Rangers are authorized to administer the sale of NTFPs, not to exceed $2,000 in value. No volume level is identified for the sale of NTFPs.

In January of 2000, the Ozark Supplement No. 2400-00-1 was issued to enhance Title 2400 (Timber Management) of the FSM (USDA Forest Service 2000a). The objective of this supplement was “to establish a uniform forest-wide personal use firewood program.” The policy that guides the firewood program is two-fold (Subsection 2430.3). First, “free personal use of firewood is limited to bonafide emergencies.” Under this policy, the only situation in which firewood will be given away is if it is to the benefit of the government. The second condition of the firewood policy restricts the provision of wood that has been treated with herbicide. Free use of such wood may be provided “upon specific application from individual users.” The supplement provides direction on the standard rates for the sale of firewood, the maximum allowable volume for each permit, as well as the period that permits are active.

**U.S.D.I. Bureau of Land Management:** In 1996, the Bureau of Land Management (BLM) published a handbook on special forest products (USDI BLM 1996). This document provides guidance for the management of non-timber forest products on BLM administered lands in Oregon and Washington. The handbook addresses and identifies who is responsible for the “special forest products” program. It discusses the legal requirements for NTFP contracts or permits, as well as current federal regulations, state laws and BLM manual directives that affect management of NTFP resources. The document covers NEPA requirements, including screening for compliance, categorical exclusions, and available options. The handbook provides BLM managers with administrative procedures for preparing contracts and permits, as well as the requirements for the use of different contracts and free use forms. Information is provided for the major products that are collected from BLM lands in the two states.

The BLM handbook defines “special forest products” as “vegetative material that includes such items as grasses, seeds, roots, bark, berries, mosses, ferns, edible mushrooms, tree seedlings,

transplants, poles, and firewood" (USDI BLM 1996. p. 1). The management of these products is recognized as important for ecosystem management. The handbook directs BLM managers to consider non-timber forest products when gathering field information and analyzing management alternatives.

BLM District Managers have overall responsibility for the NTFP program. This includes authority to issue permits and contracts, collect revenues from the sale of products, and to assign specific staff to implement and monitor the program. The handbook identifies the minimum qualifications required for the major positions needed for the program. These include a Public Contact Representative, a Resource Support Technician, Law Enforcement Officers, and a Special Forest Products Manager. The Special Forest Products Manager should be knowledgeable of the environmental issues and laws, the current management plans, NEPA requirements, as well as BLM rules and regulations as they relate to NTFPs. In addition these managers must understand cruising, scaling, and appraisals methods as well as procedures for dealing with trespassing and other criminal acts.

The handbook identifies areas on BLM land where collection of NTFPs may be restricted. These include areas that may contain threatened and endangered species, special habitats (rocky outcrops, wetlands, riparian reserves), and research natural areas. Collection of NTFPs also is prohibited in areas of critical environmental concerns, designated wild and scenic rivers, and wilderness areas. Further restrictions are placed on collection from outstanding natural areas and recreation sites. Areas covered by treaties with Native Americans may be restricted from collection of NTFPs. In addition, collection may be restricted from areas identified as late-successional reserves or connectivity/diversity blocks.

The handbook identifies areas where forest management activities are planned as the preferred location for collection NTFPs, including reforestation projects and timber sale units. Two criteria must be fulfilled to allow the harvesting of NTFPs from these areas: 1) the harvest of NTFPs that are not measured in board feet is permitted until the contract for the planned activity is committed, and, 2) the harvest of NTFPs that are measured in board feet is permitted until the volume measurement for the planned activity begins. Once volume measurements have been initiated, sales of NTFPs will no longer be permitted.

Chapter five of the handbook deals with the legal requirements for NTFP contracts and permits. The collection, for non-commercial use, of reasonable amounts of common renewable resources such as flowers, berries, nuts, seeds, cones and leaves is allowed free of charge. The handbook identifies the "reasonable amount" of specific non-timber forest products for which personal free use collection is allowed (Table 5.6).

The Special Forest Products Handbook provides detailed procedures for the preparation and administration of contracts and permits for the collection of NTFPs (USDI BLM 1996). It directs BLM managers to be specific in designating which products (i.e., morel mushrooms) are harvestable. Managers also are directed to allocate specific collection areas with a legal description, maps, paint (on material to be removed), boundary posters or signs, roadside signs, and road numbers.

BLM managers also are provided procedures for estimating allowable quantities and prices for NTFPs. To ensure that fair market value is charged, the volume of poles, posts, and firewood should be estimated in board feet. For products that are not measured in board feet, or can not be converted to board feet, BLM managers must determine the best method to measure volume. BLM managers are directed to sell NTFPs at the "highest value to the government" (USDI BLM 1996). Prices established at the district level should reflect the pre-harvest fair market value, or 10 percent of the wholesale value. Further, BLM managers are directed to coordinate any changes in pricing with other BLM offices and the USFS.

The requirements for the use of different contracts and free use forms are presented in the handbook (USDI BLM 1996). There are three sale and two free use forms from which to choose depending on the product and transaction type. The most common for NTFPs is for negotiated cash sales that do not exceed $2,500. This form is selected when harvesting is not likely to negatively impact the environment. The contract for "cash sale of vegetative resources" is used for materials that cannot be measured in board feet. Another form is used specifically for non-commercial cash sale of Christmas trees. One free use permit deals with specifically with firewood, while the other is a general permit for vegetative of mineral resources.

The Special Forest Products Handbook provides minimum standards for various important products. BLM managers are directed to allow the harvest and removal of NTFPs only from previously approved areas (USDI BLM 1996). Also, they are instructed to review local management plans prior to issuing contracts or permits. Specific products addressed in the handbook include pacific yew, hardwood, and firewood. Special emphasis is provided for NTFPs measured in board feet, including arrow bolts, chip logs, cull peelers, corral poles, house logs, poles, posts, puddle sticks, shake bolts, and split rails. Product information also is provided for NTFPs not measured in board feet: beargrass, boughs, burls, cascara bark, Christmas trees, cones, greenery (sword fern, bracken fern, huckleberry, salal, manzanita, Oregon grape), moss and lichen, mushrooms, prince's pine, quinine conk, and transplants.

The handbook provides BLM managers with examples of the different types of contracts, permits, and tags that are used in the program. It reviews selected federal and state laws and regulations and NEPA requirements. The handbook identifies 14 products for which special provisions are required. It offers some information in 5 different languages. The handbook provides specific procedures for estimating quantities of floral greenery, contract stipulations and yield tables for Pacific yew bark.

### 5.4 Discussion

This section identifies and discusses the major issues that could affect a medicinal plant conservation program. It focuses on the three major focal areas covered by this study: the plants, the programs (government and non-government) and the policies. The discussion includes remarks on the gaps in information and knowledge that could affect management for medicinal plants. None of the issues are insurmountable, but each could impede success of a program to improve the management of public forests for medicinal plants. Understanding and addressing these issues could aid in developing appropriate interventions to improve management practices.

### 5.4.1 Medicinal Plants

Each National Forest has its unique blend of plants biota that is favored for medicinal purposes. The Pisgah may have the highest diversity of plants and, perhaps the highest demand on the resources for these products. But the Applegate Watershed is the resource base for many western medicinal plants, and the hub of a thriving industry. The Ozark Highlands is unique in its own way. All of these locations embrace a counter-culture that is attracted to medicinal plant collection and use. Unfortunately, the lack of social, economic, market and cultural information on these products impedes efforts to sustainably manage medicinal plants.

In general there is a lack of information regarding most aspects of medicinal plants. For many of the plants all that is known is basic biology, taxonomy and habitat preferences. One may know in what forest habitat to look for the plants, and how to identify them once found. But the lack of knowledge on the ecology and reproductive biology seriously impedes the ability to regenerate and maintain these resources. Basic silvicutural treatments are lacking that consider and incorporate the plants that are harvested for medicinal purposes. Just as critical is the lack of knowledge concerning the levels of harvest that will sustain the resource base. This threshold information is essential to develop and implement plans for sustainable forest management. Also, the ecological impact of medicinal plant collection on associated members in the ecosystem is not well defined.

The previous section demonstrates how little is known about the markets and economics of these important products. The channels through which medicinal products flow from the forest to the consumer, have not been defined, evaluated or assessed. Basic information concerning supply and demand for medicinal plants has not been compiled. Neither the volume, nor the value of these products have been consistently defined or tracked. The economic impact to the local collectors and traders of medicinal plants has not been evaluated nor monitored. The general sense among many forest policy decisions makers is that the economic impact from non-timber forest products, including medicinal plants, is inconsequential.

However, using ginseng as an example, there must be a positive economic impact to rural communities that collect and market medicinal plants. The wholesale value of the average annual national harvest of forest grown ginseng exceeds $25 million. The forests of Arkansas and North Carolina account for 2.6 percent and 6.2 percent of the total, respectively. Five counties in the Ozark Highlands, where the unemployment rate exceeds the national average, account for the majority of the $650,000 that is generated through the ginseng trade each year. Unfortunately, more thorough data on the economic impact of ginseng collection and trade to rural communities has not been reported. The economic impact of the other medicinal plants is even much less known.

Though data sited above suggest that complete economic studies of medicinal plants would be valuable, such studies would necessarily have to extend well beyond the geographic limitations of this analysis. The Applegate Ranger District of the Rogue River National Forest provides a small fraction of the medicinal plants that are absorbed into the market. This analysis of specific collection regions could not begin to capture the importance of medicinal plants on the neighboring towns within the Applegate watershed. Likewise, one of the major buyers of

medicinal plants from the Ozark Highlands is located beyond the border of Arkansas and thus beyond the geographic focus of this study.

To capture a true understanding of the markets, one would have to focus beyond the geographic borders defined by Districts or National Forests. Such as study would need to include market borders that extend regionally, nationally and internationally. Interviews with industry experts showed that though these products may be harvested locally, they may have national and international markets. Thus, to truly understand the economic impact of medicinal plant collection from the Applegate Watershed, the Pisgah National Forest, or the Ozark St. Francis National Forest, one would need to examine the international markets for the products that originate in these locations. Defining and monitoring these markets would require more resources and commitments.

Market conditions can encourage or discourage collection. As prices increase, more collectors will be searching the forests for these products. Again, ginseng is a good example. As the price for ginseng has escalated, the number of collectors has increased as well. With some products, the markets are easily flooded. When over-supply becomes a problem, prices decline. On the positive side, as prices decline, collection should also decline. But this presents a problem for the person, or firm, who has inventories of raw material that cannot be sold at cost. This has happened recently with black cohosh; over-supply of this medicinal herb has driven prices below the costs. These fluctuations make it difficult to convince collectors to move into cultivation. Information concerning market conditions could help to assuage some of the risk associated with moving from collection to cultivation. At the same time, the information could alert decision makers to changes in market trends that could be a signal of environmental problems. For example, significant decline in forest-harvested ginseng during a period when market demand for this product is increasing could warn of over harvesting.

The social and cultural importance of these products to the people who collect, trade and use them is even more difficult to document. The culture that embraces medicinal plants is particularly special. Many collectors and users find a spiritual connection with medicinal plants. The earliest European settlers learned from the Native Americans what could and could not be used for medicinal purposes. They learned how, what and where to collect. Many of the techniques and ethos of collecting medicinal plants were transferred to progeny, and progeny's progeny.

But this culture is changing rapidly. As more folks have begun collecting medicinal plants, the harvesting practices have changed. These changes may have deleterious effects on the resource. Also, with these changes, there is potential to lose traditional practices, techniques, and knowledge. The socio-economic makeup of the market is changing at all levels. New ethnic groups are entering the community. New firms are being established. Old family firms are being bought out and liquidated. Social and cultural changes pose serious challenges to managing for these products. Understanding and respecting cultural and social differences requires special attention and care. Building trust and community, which may take years, is particularly difficult when the market players change so rapidly.

Until medicinal plants are recognized as a natural resource, and managed as such, the conservation of these resources will be inadequate. These important components to the natural forest ecosystem play a critical role in the social, cultural, and economic make up of rural communities. Understanding the markets for these products is as essential as understanding the markets for any other natural resource that is extracted from public forests. Determining sustainable harvests levels and developing appropriate management strategies will remain elusive goals without a long-term commitment to monitor and track the markets.

### 5.4.2 Government programs

There are significant differences among the national forests, as well as between management agencies. In general, the Bureau of Land Management (BLM) has a more organized and clear program to manage for non-timber forest products than the U.S. Forest Service. The BLM has integrated NTFPs into forest management strategies, such that they are considered in silvicultural prescriptions and management decisions. The Forest Service, on the other hand, has a more ad hoc approach to dealing with these resources. In the west, the Forest Service collaborates closely with the BLM, and may benefit greatly from the efforts of this sister agency. The Forest Service in eastern United States appears to have a more active program where it has issued more permits, policy directives, and studies.

Within the Forest Service, the eastern national forests can provide valuable insight into various approaches to managing for medicinal plants. The programs and activities of the national forests in eastern United States are much better documented than the western counterparts. The tracking and monitoring of permits for collection of non-timber forest product, including medicinal plants, is more detailed in the eastern forests. These forests seem to have more experience with medicinal plants, especially ginseng. Of course, this important medicinal plant is not found in the forests of Oregon. But a similar example of such an important medicinal plant is not revealed in the documentation concerning collection from the western forest. The type of analysis that the National Forests of North Carolina are undertaking is a good model that would benefit the other forests.

Regional differences could be a reflection of the amount of requests to collect medicinal plants. Based on the number of permits issued, the forests of southeastern United States are under significantly more pressure for medicinal plants than their counterpart in the west. For example, the Pisgah National Forest is located in the ecological center for a great many medicinal plants. These public forests are the source of many popular medicinal plants. Though southern Oregon is a hub of the medicinal plant industry for the western United States, most activities may occur in districts other than the Applegate Ranger District. For this reason, expanding the focus of medicinal plant conservation efforts to include the entire watershed would be worthwhile.

The eastern national forests also differ in their programs. Whereas the program of the National Forests of North Carolina includes many medicinal plant species, the program in Arkansas focuses primarily on ginseng. This difference could reflect ecological, administrative, or market dissimilarity. The biodiversity of the Ozark Highland forests may be such that only ginseng is available in quantities that make it viable to collect. On the other, the reporting of the Arkansas program could be more relaxed than that of the North Carolina program. Or the markets in the

two areas could be significantly different. But the evidence does not suggest major differences in the markets for medicinal plants. Whereas the Pisgah area is an ecological center for medicinal plants, the Ozark Highlands seem to be even more of an ecological perimeter for some medicinal plants. Thus there may be lessons to be learned from the experience that the NTNC has had with permits. Much could be learned to improve management if programs across national forests were consistent and comparable.

The National Forests of eastern United States have undertaken several research studies to better understand management issues regarding non-timber forest products. Though these studies did not directly address medicinal plants, their design and reliability have direct ramifications on future progress. The credibility of these studies could be tremendously improved through better design: replication, controls, and increased time allotment.

Very little analysis has been done of the permits to collect medicinal plants, or other non-timber forest products. The recent initiative of the National Forests of North Carolina (NFNC) to analyze and summarize the permit activity on the forests provides valuable information concerning the Districts and species that are under the most pressure (USDA Forest Service 1999a). This knowledge aids in setting priorities and allocating scarce resources to maximize benefits. Other National Forests may not have as much activity as the NFNC, but they would benefit greatly from this kind of analysis.

Whereas the BLM appears to have a clear strategy on how to manage non-timber forest products, including medicinal plants, the Forest Service seems to lack a cohesive approach to managing these resources. BLM managers have integrated non-timber forest products into management strategies. The Forest Service, on the other hand, lacks clearly defined and articulated goals and objectives for non-timber forest products.

### 5.4.3 Non-Governmental Programs

The lack of non-governmental organizations that are focused on medicinal plant conservation will impede public involvement in that aspect of managing public forests for these NTFPs. Very few non-governmental organizations (NGOs) in the areas of interest are focused specifically on medicinal plant conservation. Most are concentrating on more broad forestry and forest management issues, such as watershed management, roadless areas, and timber extraction. Of course the conventional natural resource conservation and environmental groups are working in these regions. The Natural Heritage Program and native plant conservation efforts are active in all of them. The Nature Conservancy, Sierra Club, and other prominent national NGOs have a presence within each state and in the local areas. These groups have their specific focus (e.g., forest preservation, no extraction of forest resources, and native plant conservation), which may or may not embrace management for medicinal plants.

But beyond these commonalities, each area has specific NGOs whose experience and expertise could improve efforts in other localities. For example, the Jefferson Center (Oregon) is based on the experience of the Highlander Center in Tennessee. The real opportunity for advancement in the conservation of medicinal plants is the cross-fertilization of ideas, approaches, and strategies from other regions. This transfer of knowledge between communities can have tremendous

positive impact on conservation efforts. There are some good NGO programs, and elements thereof, that could be shared between regions to improve conservation efforts. Specific examples are presented in section 5.4 of this report.

In general, there are more NGOs working on forestry issues in the west. This could be due to recent environmental turmoil in the region. Over the last decade, the Pacific Northwest has been the center of tremendous changes in forestry and forest management. The development and implementation of the Northwest Forest Plan created controversy and opportunities for NGO activities. The reduction in timber harvest from public forests increased the pressure on these resources for other products and services. Relative to other issues, management for non-timber forest products has been secondary. In general, NGO programs are focused on forestry issues that are peripheral to medicinal plant conservation. There is potential to fit medicinal plant conservation efforts into current NGO programs (e.g., watershed management and alternative forest products) but this would require creative efforts to mold new initiatives into on-going activities.

The western region has several good models that could prove useful in promoting medicinal plant conservation. The Applegate Partnership (Oregon) of conservation groups, industry, and public agencies are addressing watershed management issues and could embrace medicinal plant conservation. The Jefferson Center, which works for social justice for collectors, provides an exceptional forum for organizing and educating collectors. The Rogue Institute's effort to promote alternative and certified forest products has potential to include medicinal plants. The Institute could be the forum to facilitate evolution and implementation of the principals and criteria needed for NTFPs to be incorporated into Forest Stewardship Council (FSC) certification standards. These types of organizations should be nurtured in other regions, to encourage community participation.

Some Oregon NGOs have ample experience with non-timber forest products, which could be transferred to focus on medicinal plants. In particular, the Rogue Institute was one of the early champions for non-timber forest products. It was the driving force behind much of the early work on this issue. Unfortunately, the people involved in that effort are no longer with the Institute, and the organization has not continued the commitment to these products. Without a champion and a long-term institutional commitment to medicinal plant conservation, efforts will flounder.

The situation in the east is significantly different. Only one NGO in North Carolina is focused on medicinal plant conservation: the Yellow Creek Botanical Institute. The Institute has access to prime medicinal plant habitat on which conservation efforts could be focused. Though it is relatively young, this NGO has developed a good relationship with the Forest Service, and other institutions throughout the region. These organizations are working together to develop a cohesive program on medicinal plants. The predominant focus of most NGOs in the Ozark Highlands is sustainable agriculture. Though this focus could support medicinal plant conservation, any efforts would have to be designed to meet current on-going program requirements.

There are opportunities to develop regional and national collaborative arrangements. Perhaps the greatest potential collaborator is TRAFFIC North America (World Wildlife Fund). This group has a particular interest in these areas, from a biodiversity conservation perspective. An additional potential collaborator is the United Plant Savers, a non-profit organization with a mission to conserve and restore native medicinal plants of the United States and Canada. The group has gardens and plantings in Southern Oregon, but no field conservation programs in any of the areas.

### 5.4.4 Policies and Procedures

The lack of a comprehensive and well-organized document to guides management decisions is severely limiting the Forest Service's efforts to manage for medicinal plants. The two agencies differ in their policies and procedures concerning management of non-timber forest products, including medicinal plants. The BLM is more advanced and organized in its approach to management for these products. The BLM is more advanced in its presentation of policies and procedures dealing with non-timber forest products, in general. The BLM offices in the states of Washington and Oregon published a compilation of the directives that guide how the agency manages NTFPs. The BLM documentation deals with who is responsible for administering a NTFP program, contracting procedures, legal requirements, as well as product information. BLM managers are provided guidelines for personal use collection and procedures for estimating the values and volumes of material collected. This clearly organized and straightforward document is a model that could help to alleviate some of the inconsistencies found in how Forest Service units approach non-timber forest products.

The policies and procedures that guide how the Forest Service manages for these products is mixed in with the policies concerning timber. Unlike other natural resources, including minerals, water, and wildlife, the policies and procedures for managing national forests medicinal plants are buried among policies for timber. To compile the directives that guide how our national forests are managed for medicinal plants requires searching for several terms: other forest products, miscellaneous forest products, special forest products, and forest botanicals. Then each section must be examined to determine how, or if, it addresses medicinal plants. This provides tremendous opportunities to increase inconsistencies between how Forest Service units interpret policies and procedures.

In 1991, the Forest Service published a list of saleable products that included medicinal plants. Unfortunately, detailed policies and procedures are not established for most products. Perhaps the most comprehensive policies are for firewood. In 1989, Forest Service units were provided with procedures to deal with firewood. Policies and procedures to manage for fuelwood are now well established. The management policies and procedures for naval stores also are well detailed. Forest Service units are directed to propose sale areas and undertake appraisals for pine distillates. Line officers are authorized to advertise sales of these and other non-timber products. In 1995, units in Region 8 were directed to develop management policies for ginseng. The management of the medicinal plant resources would improve significantly if there were detailed federal policies and procedures that dealt specifically with these resources.

The direction provided from the national level of the Forest Service is extensive, but broad. Forest Service units are directed from the national level to prescribe management actions that will enhance production of other (non-timber, miscellaneous, special) forest products, especially pine distillates. Less direction is provided from regional level, but Forest Service units in Region 8 are provided much more regional direction than units in Region 6. In 1994, Forest Service units in Region 8 were directed to use methods that would sustain the non-timber resources and to use the principles of ecosystem management in dealing with these products. Further, the region dictated a clear policy to use economic analysis in management of non-timber resources.

From the national level, Forest Service units are directed to update, annually, the rate schedules that guide the amount charged for collection permits. Forest Service units in Region 8 are directed to use a minimum of 20 percent of the wholesale market value in determining the price for permits (USDA Forest Service 1994). But, this amount differs, substantially from the 10 percent of fair market value hat is generally used to guide prices. Local units have been directed to check local prices for NTFPs in developing pricing strategies for permits.

Legislation in the Appropriations Act 2000 (H.R. 2466 1999) directs the Forest Service to begin recovering fair market value for NTFPs, and to develop systems to manage for the long-term sustainability of these products. But current policies and procedures already direct the Forest Service to do this. Under previously issued policies, Forest Service units are directed to 'recover fair market value' for the extraction of medicinal plants, as well as other non-timber products. Although no specific protocols or procedures are specified, previous policies have directed the Forest Service units to develop systems to value non-timber products, and to proceed with advertising the sale of these products. Units are to use appropriate silvicultural and management measures to ensure the long-term sustainability of these resources. Previous directives mandated that management activities for these products meet the objectives of the forest plans, and be economically efficient.

The new legislation therefore seems redundant. If current national, regional and forest-wide directives already instruct Forest Service units to manage for non-timber forest products, why is special legislation needed? The new legislation does not guarantee the financial support that is needed to manage medicinal plants or other non-timber forest product. But it will bring additional attention to the issue.

The management for medicinal plants on Forest Service lands could improve tremendously if the procedure and policies were compiled and published in a simple document. Also, management in the Western National Forest could benefit from the directives issued in the Southeast region. The basic direction needed to manage the national forests for non-timber forest products already exists. Efforts should focus on elaborating policies and procedures to manage for medicinal plants.

Based on the findings of this study the next section presents strategies and recommendations that could help to improve management for non-timber forest products. To achieve this goal required examining the body of knowledge regarding medicinal plant collection and markets in the target areas. The examination of the programs of government agencies and non-governmental organizations to manage for the products revealed opportunities for improvement. Finally, the

review of the management policies and procedures suggest that sufficient guidance exists but is not readily accessible.

## 5.5 Strategies and Recommendations

To improve the federal management of medicinal plants will require a fundamental shift in how these valuable commodities are viewed. To convince policy-makers and consumers alike to make this shift will require concrete data and proactive sharing of information among stakeholders. From this research several steps could help this process:

1. Initiate and conduct socio-economic strategic market research on the medicinal plants industry and share this with stakeholders.

2. Compile, publish and make available the knowledge on medicinal plant resources, including the policies and procedures that affect their management, the bio-physical and ecological information that is needed to understand the implications of harvesting, and the agricultural and silvicultural systems needed to ensure sustainable production.

3. Seek, encourage and facilitate collaboration among all stakeholders, including collectors, marketers, consumers, governmental and non-governmental organizations, policy-makers, and forest managers who are involved in the medicinal plant industry.

4. Based on the research results, encourage federal policy makers to group medicinal plants and relevant policies under a single sub-heading within the non-timber forest products heading, and provide sufficient support for government agencies to adequately manage these natural resources.

Activities should be governed by an overarching goal to conserve medicinal plants and improve national forest management. The proposed approach is designed to ensure the sustained availability of medicinal plants for the benefit of the people and communities who collect, trade, and use these products, without detrimental impact on the integrity of the ecosystem from which they originate. The program would draw from a blending of rural conventional wisdom with reproducible scientific investigation.

The studies and analysis of the field activities should employ standard scientific procedures wherever possible. The industry is riddled with hearsay - and though much of the anecdotal evidence is worthwhile, it should be verified by long-term, controlled experiments. Likewise, market research should seek actual wholesale price lists, for example, rather than promoting further "guessing" when pricing harvesting permits. This market research should consider not just the prices of large wholesalers, but the purchase prices available to local collectors.

The scientific horizon needs to be expanded beyond the bio-physical research that has been the foundation of the medicinal plant knowledge base. The scientific examination of natural resource issues needs to embrace more socio-cultural aspects. The social science methods combined with market research techniques provides valuable insights into socio-economic aspects of

management issues. This knowledge can help improve the understanding of peoples' attitudes and perceptions toward management. It can also improve the cultural understanding.

The next sections discuss how these objectives might be carried out. Certainly successful implementation of these objectives will require multi-year investment significantly greater than current commitments.

### 5.5.1 Socio-Economic Market Research

There is a general lack of market research on medicinal plants. While a comprehensive socio-economic study of this booming field could be costly, a strategic market analysis could provide guidelines for policy makers and permit granters. For example, rather than study the 30 to 50 species categorized by various forests as medicinal, analysis could focus on five or ten top sellers. For example, research focused on black cohosh, bloodroot, false unicorn, ginseng, Oregon grape, pipsissewa and yerba santa could demonstrate the importance of valuing these resources appropriately. Likewise, rather than surveying only local- and national-level medicinal plant market players, strategic market research would extend to international markets.

Market research results should be compiled and shared with all stakeholders. Ideally, market research updates would be provided to the local forest managers regularly, timed to coincide with the individual harvesting seasons of the most highly valued medicinal species. Market research reports would be made available through various media, including web-based, printed materials, video and radio. Revenues gained from market-driven permit pricing could potentially support this market research and perhaps even improve conservation efforts.

### 5.5.2 Compile and Publish Existing Knowledge

The wide range of industry stakeholders can already provide an abundance of information on medicinal plants. By surveying collectors, herbal medicine sellers, consumers, and local forest managers, one could compile information useful to all the stakeholders. The resulting literature should examine all aspects of medicinal plants, including their growth patterns, sustainable harvesting, on-farm and in-forest planting, market value, and medicinal uses. The compiling of data should be managed proactively, through the stakeholder groups discussed below. This knowledge should be shared through a number of media, including web-based, video, newsletters, fact sheets, and policy documents. Three bodies of knowledge should be developed into appropriate documents.

First, resources should be directed at gathering, organizing, publishing and distributing the policies, directives, and procedures that impact management of federal forests for medicinal plants. This information is essential to improving management practices. It could improve the awareness of forest managers at all levels. The forest managers who make strategic and operational decisions would benefit greatly from ready access to this information.

Second, efforts should be directed at creating and delivering educational materials to collectors, forest managers, and consumers. Collectors and forest managers would benefit from educational material on sustainable management practices, conservation techniques, or marketing techniques.

Additional product market information would be useful to all three groups. Consumers would benefit from knowing that medicinal plants are being harvested, sustainably, from the national forests. Some consumers might be inclined to support programs to sustainably manage for non-timber forest products.

Third, efforts should focus on building the awareness of policy makers concerning medicinal plant management. Appropriate documents should be developed and shared to the build awareness of state and federal policy makers of the importance of supporting management of medicinal plants. Additional efforts could be focused on developing the awareness of executives of pharmaceutical companies of the need to support conservation efforts.

### 5.5.3 Facilitate Collaboration

The problem of managing medicinal plant resources on public forestlands encompasses multiple issues and impacts multiple stakeholders. Only by working together can the stakeholders find sustainable solutions forest management issues. Collaboration with a diverse research community in the areas of rural economics, market research, silviculture, and non-traditional agriculture is warranted and would be most beneficial. By involving as many groups of stakeholders as possible, the conservation program would be taking proactive steps to remain transparent and focused on results-oriented activities. Such a program would value the process and the people involved as much as the end result, thereby fostering trust among all stakeholders.

This chapter has provided several examples of stakeholder groups already in place that could provide an excellent place to initiate collaboration. Regional and national groups have the ability to affect more widespread change. They provide access to a broader range of decision makers and change agents. TRAFFIC, North America is already involved with a network of experts working in the area of medicinal plant conservation. The network, which is a web-based list-server, is organized and facilitated by the U.S. Fish and Wildlife Service. A partnership with this group could prove beneficial to further expansion and development of the network. The network could serve to review protocols and policy recommendations.

Other strategic partnerships should be pursued at the national, forest, and local levels. On the national level, Forest Service partnerships with the United Plant Savers (UpS) and the National Network of Forest Practitioners (NNFP) should be explored. The UpS is committed to medicinal plant conservation. They have an international network of practitioners and experts with an overwhelming amount of knowledge on collection, production, and use of medicinal plants. On the other hand, the NNFP focuses on sustainable forest management with local people. A partnership with these groups could form the basis for a strong comprehensive program.

There are opportunities for strategic partnerships with both private and public organizations. A special effort is needed to build collaboration with the U.S. Forest Service and BLM. These agencies are responsible for stewardship of the public forests. Working with and supporting the efforts of the local units of these agencies would benefit medicinal plant management. The Applegate Partnership is active in developing sustainable forest management in the Applegate Watershed. Energy should be focused on becoming integrated into the Applegate Partnership and expand the group’s focus to include medicinal plants.

There are several opportunities for strategic partnerships at the local level. First, the Yellow Creek Botanical Institute has potential as a partner in North Carolina. The Jefferson Center and Roque Institute for Ecology and Economy have potential in southern Oregon. These organizations offer the strength of local knowledge and understanding of the local environment. They are dedicated to medicinal plant conservation, rural economic development and social justice for forest laborers. These are all elements for sustainable management of medicinal plant resources.

As discussed earlier, Forest Service managers, policy makers, plant collectors, marketers, consumers, and other stakeholders already possess enormous expertise on medicinal plants. Focus groups should be employed to test standard marketing techniques to distribute information, including public announcements, newsletters, instructional pamphlets, media releases, and Internet websites and list-serverers.

Collaborative sessions would provide the opportunity to build bridges among different communities: policy makers, scientists, conservationists, herbal medicine consumers and marketers, rural harvesters, and so on. Once these bridges are built, these stakeholder groups could host symposia for sharing expertise and communicating field experience to relevant policy makers. Silvicultural research results could be passed quickly to rural planters and harvesters during workshops open to the public; in turn, harvesters could recommend methods passed down to them by their ancestors. Such dialogues would also help policy makers to grasp the social and cultural importance of medicinal plants to certain rural areas.

Collaborative findings from one local focus group could be communicated to other stakeholders through appropriate media, including radio, print, video, and the internet. Nationwide forest management programs might then be able to meet or exceed national mandates in an informed manner, even if individual forest programs were not big enough or well enough established to host their own stakeholder groups.

Special effort should be made to engage medicinal plant consumers in the dialogue. This could be done through point-of-purchase displays in health food and herbal medicine stores. Consumers who understood the need to conserve medicinal plant resources might then begin to support companies who promote sustainable harvesting. Similarly, if wholesale buyers participate in these focus groups, they could keep harvesters and permit sellers alike aware of which products are in highest demand and how they should be harvested for maximum value. This would build the sales capacity of the local collectors. In turn, wholesalers might learn the ecological importance of medicinal plants to a forest ecosystem and begin to promote sustainable harvesting.

### 5.5.4 Policy and Support

Armed with research results, and organized to represent the array of stakeholders, a medicinal plant group could be formed to focus resources on encouraging federal policy makers to categorize medicinal plants and relevant policies under a single heading. The group should work to build the awareness of policy-makers of the need to manage for medicinal plants. They need

to be recognized in federal policies and directives as a natural resource, the management of which requires sufficient resources. Special efforts should be directed at securing Congressional funding for the U.S. Forest Service and BLM to manage these resources.

By assigning medicinal plants a separate management objective forest managers may begin to recognize the significant and rapidly increasing value of these resources. Under current policies, medicinal plants are easily lost when mixed with better known non-timber forest products such as pine straw and sap. But whether policy makers acknowledge their importance or not, it appears that medicinal plant demand will continue to rise. If policy makers do not begin to recognize this demand, they may respond inappropriately. For example, stopping all ginseng harvesting could lead to higher prices per pound and poaching. On the other hand, failure to regulate harvesting at all could deplete populations and put ginseng on the endangered list.

### 5.5.5 Target Audience

The target audience for the above collaborative information and research results is enormous, but may be grouped into several categories: collectors, wholesale buyers, consumers or "end-users," local and national decision makers, and the research community.

Collectors should be targeted both to build their capacity and to improve their understanding of the need to conserve and manage forests sustainably. These folks are directly connected to the resource and how it is managed. They are likely to have a pretty accurate knowledge of where the plants thrive and where populations are on the decline. It is of utmost importance that this group understands the long-term impact of collecting. Awareness building stands to build a conservation ethic among this group closed to the medicinal plant sources.

The second and third groups both purchase medicinal plants, though on different scales. Wholesalers know the value of the medicinal plant market and should be convinced to promote sustainable harvesting, if only for their own self-preservation. Herbal medicine and food consumers tend to already have a concern for the environment. But many are likely unaware of harvesting practices and the need to conserve. If national programs could target this huge audience, this community could be mobilized to consume conscientiously and perhaps even to support conservation efforts with volunteer time and financial contributions. This could further drive wholesalers and retailers to support community and national conservation efforts.

### 5.5.6 Conclusion

The locations examined have medicinal plants that are unique and valuable. In North Carolina, more than 30 species have been identified with current market value. Four of these are considered priorities for species conservation. In Southern Oregon, at least 35 species have medicinal purposes and market value. Of these, seven are identified as crucial for conservation. Less is known about the medicinal species in Arkansas, but evidence suggests a thriving industry with at least 20 important species.

Even a cursory glance at permit data and wholesale prices suggest that forest managers are undercharging for medicinal plants, perhaps as much as two- to four-fold. If managers had up-to-

date market information at their fingertips, they would be better equipped to value permits. On a larger scale, until policy makers can access information, not just the biophysical and ecological, but also the social, cultural, and economic, decisions designed to promote sustainable forest management will be misguided.

Federal agencies and NGOs need to work together to improve the management of medicinal plants. There are a few notable groups with experience in peripheral forest products whose expertise should not go untapped. By facilitating partnerships among all levels of medicinal plant collectors, buyers, and sellers, the entire community of stakeholders stands to gain now and in generations to come.

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## 5.7 Tables

**Table 5.1 Medicinal plants sold in the Southern Appalachians[1,2].**

| Common Name | Scientific Name | Priority |
|---|---|---|
| Yarrow | *Achillea millefolium* | |
| Black cohosh | *Actaea racemosa* | * |
| Maidenhair fern | *Adiantum peltatum* | |
| Star grass | *Aletris farinosa* | |
| Mountain angelica | *Angelica triquinata* | |
| Wild sarsparilla | *Aralia nudicaulis* | |
| Spikenard | *Aralia racemosa* | |
| Wild ginger | *Asarum canadensis* | |
| Butterfly weed | *Asclepias tuberosa* | |
| Wild indigo | *Baptisia tinctoria* | |
| Blue cohosh | *Caulophyllum thalictroides* | |
| Pipsissewa | *Chimaphila umbellata* | |
| Stone root | *Collinsonia canadensis* | |
| Hawthorn | *Crategus spp.* | |
| Wild yam | *Dioscorea villosa* | |
| Striped gentian | *Gentiana villosa* | |
| Witch hazel | *Hamamelis virginiana* | |
| Wood nettle | *Laportea canadensis* | |
| Indian tobacco | *Lobelia inflata* | |
| Partridge berry | *Mitchella repens* | |
| American ginseng | *Panax quinquefolius* | * |
| Broad-leaved plantain | *Plantago rugelii* | |
| Mayapple | *Podophyllum peltatum* | |
| Bowman's toot | *Porteranthus trifoliatus* | |
| Red raspberry | *Rubus idaeus* | |
| Elderberry | *Sambucus canadensis* | |
| Bloodroot | *Sanguinaria canadensis* | * |
| Sassafras | *Sassafras albidium* | |
| Maddog skullcap | *Scutellaria integrifolia* | |
| Goldenrod | *Solidago spp.* | |
| Red clover | *Trifolium pratense* | |
| Bethroot | *Trillium erectum* | * |
| Slippery elm | *Ulmus rubra* | |
| Yellowroot | *Xanthoriza simplicissima* | |

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[1] Priority species for conservation are noted with an asterisk (*).
[2] Source: USDA Forest Service 1999a

**Table 5.2 Medicinal plant species considered priority for conservation in North Carolina.[3]**

| Common Name | Scientific Name |
|---|---|
| Black cohosh | *Actaea racemosa* |
| American ginseng | *Panax quinquefolius* |
| Bloodroot | *Sanguinaria Canadensis* |
| Bethroot | *Trillium erectum* |
| False unicorn | *Chamaelirium luteum* |

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**Table 5.3 Medicinal plant species considered a priority for conservation in Southern Oregon.[4]**

| Common Name | Scientific Name | Collecting |
|---|---|---|
| California poppy | *Eschscholzia californica* | Root and all |
| Lomatium | *Lomatium dissectum* | Roots, late spring to fall |
| Oregon grape | *Mahonia aquifolia* | Roots and lower yellow stems |
| Pipsissewa | *Chimaphila umbellate* | Arial parts, spring through fall |
| Valerian | *Valeriana dioica* | Roots in late summer |
| Yarrow | *Achillea millefolium* | All parts |
| Yerba santa | *Eriodictyon californicum* | Foliage in spring and summer |

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[3] Based on U.S. Forest Service documents and interviews with industry experts.
[4] Based on interviews with resource management and industry experts.

**Table 5.4 Ginseng collection permits issued annually on the Ozark-St. Francis National Forest, for a ten-year period ending in 1991.[5]**

| Year | Number of Permits |
|---|---|
| 1981 | 120 |
| 1982 | 211 |
| 1983 | 130 |
| 1984 | 214 |
| 1985 | 254 |
| 1986 | 217 |
| 1987 | 200 |
| 1988 | 240 |
| 1989 | 377 |
| 1990 | 318 |
| 1991 | 285 |

(Back to text)

**Table 5.5 Ginseng permits issued on the Ozark-St. Francis National Forests during 1991 by district.[6]**

| District | # Permits | Percent Share |
|---|---|---|
| Sylamore | 45 | 13.6 |
| Buffalo | 132 | 39.9 |
| Bayou | 17 | 5.1 |
| Pleasant Hill | 82 | 24.8 |
| Boston Mountain | 49 | 14.8 |
| Magazine | 0 | 0.0 |
| St. Francis | 6 | 1.8 |
| Total | 331 | 100.0 |

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[5] Source: USDA Forest Service 1997n
[6] Source: USDA Forest Service 1997b

**Table 5.6 Non-timber forest products for which personal free use collection is permitted from BLM land in Oregon and Washington.[7]**

| Non-Timber Forest Product | Unit of Measure | Reasonable Amount (Per person per year) | |
|---|---|---|---|
| | | Oregon | Washington |
| Beargrass | Pounds | 25 | 5 |
| Berries | Gallons | 5/species | 5/species |
| Boughs, All Conifer Species | Pounds | 25 | 5 |
| Cones, Ornamental | Bushels | 2 | 2 |
| Greenery, All Types | Pounds | 25 | 5 |
| Moss | Pounds | 25 | 5 |
| Mushrooms | Gallons | 5/species | 5/species |

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[7] Source: USDI Bureau of Land Management 1996

## 5.8 Figures

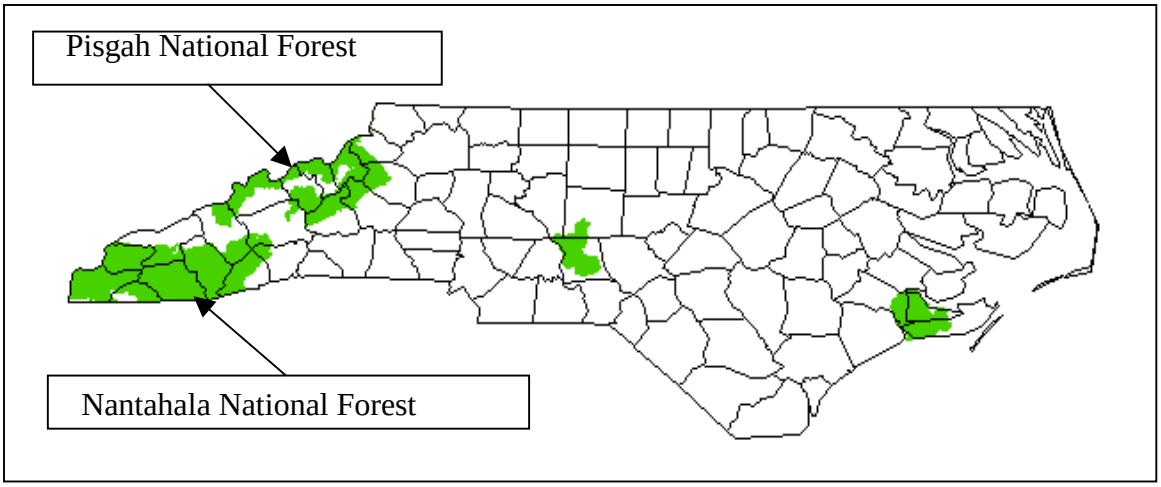


**Figure 5.1 General location of the Pisgah and Nantahala National Forests of North Carolina.**[89]

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[8] Shaded areas not designated by arrows are national forests that were not included in this case study.

[9] Adapted from USDA Forest Service 1984

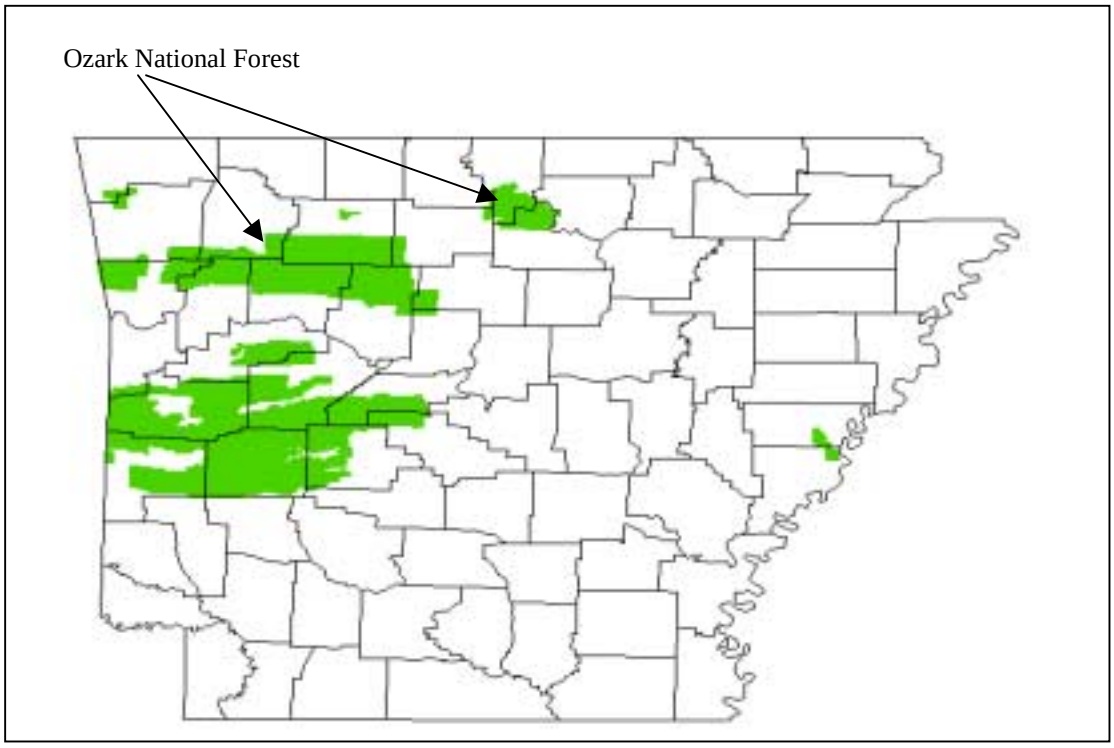


**Figure 5.2 General location, designated by the arrows, of the Ozark National Forest in Arkansas.[10][11]**

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[10] Shaded areas not designated by arrows are national forests that were not included in this case study.

[11] Adapted from USDA Forest Service 1984

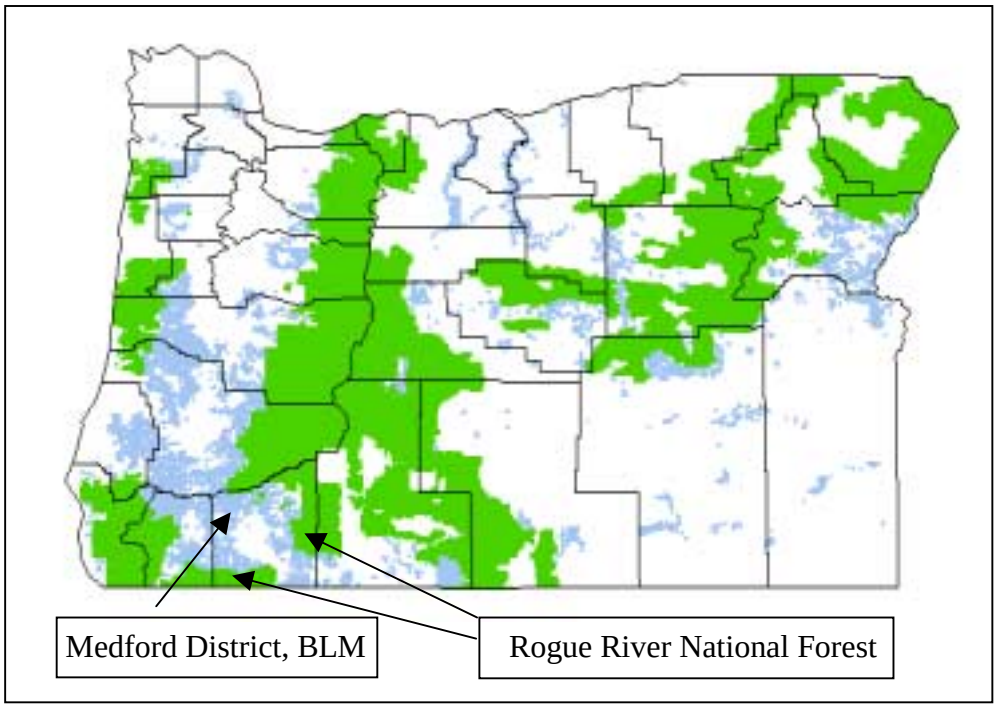


**Figure 5.3 The general location, identified by the arrows, of the Oregon based study areas.[12][13]**

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[12] Dark shaded areas are Bureau of Land Management lands, while light shaded areas are U.S. Forest Service national forests. Arrows delineate the general area of the two study locations.
[13] Adapted from USDA Forest Service 2000b

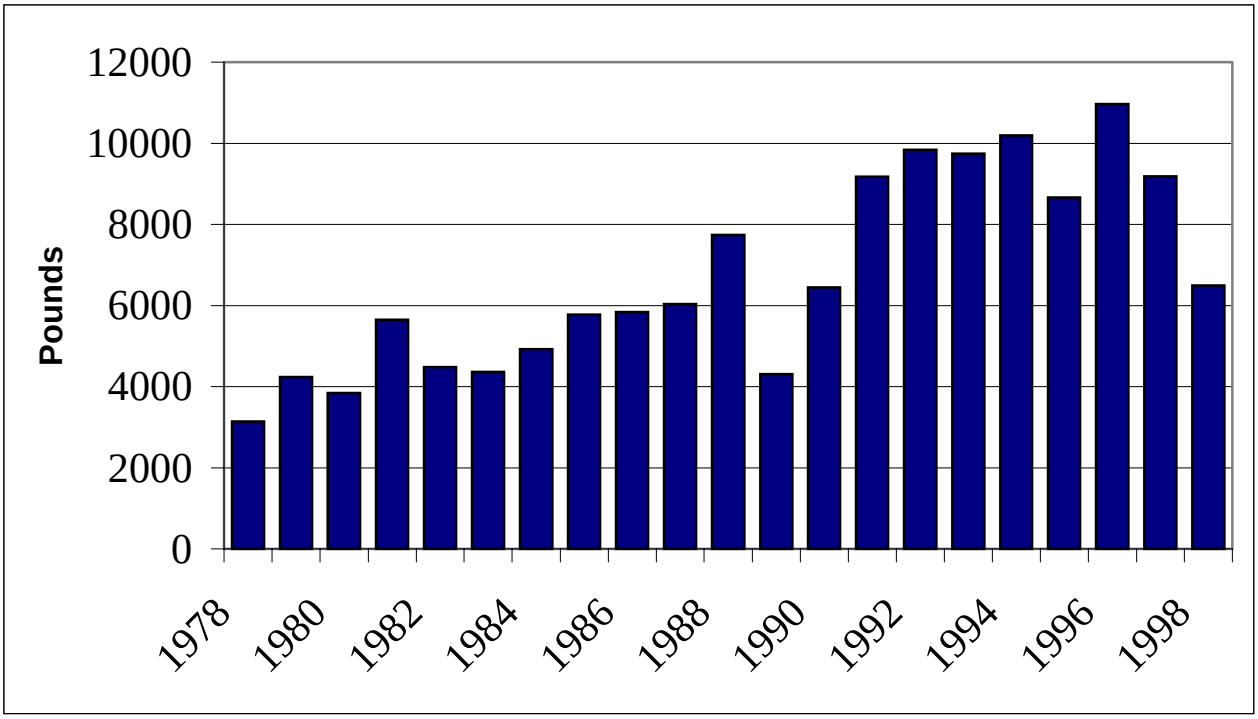


**Figure 5.4 Dry weight volume of forest-harvested ginseng in North Carolina as reported to the U.S. Fish and Wildlife Service.[14]**

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[14] Source: USDA Foreign Agriculture Service 1998


**Figure 5.5 Ozark-Ouachita Highlands Assessment area and the area from which visitors are drawn to this region.**[15]

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[15] Source: USDA Forest Service 1999

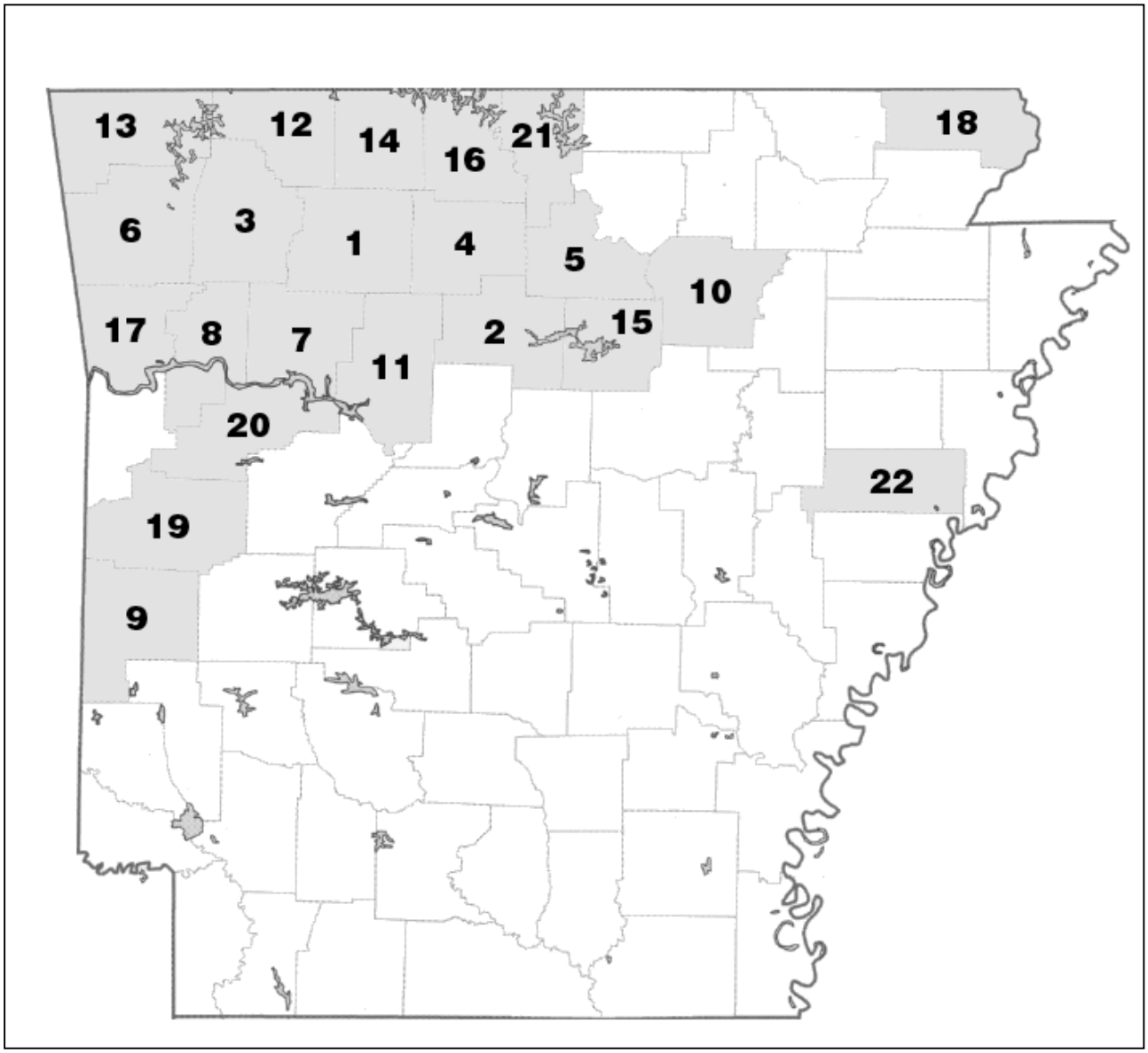


**Figure 5.6 Counties in Arkansas that produce forest-harvested ginseng.**[16][17]

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[16] Note: Numbers designate the rank order of the volume collected from each county
[17] Source: Minton, 1996

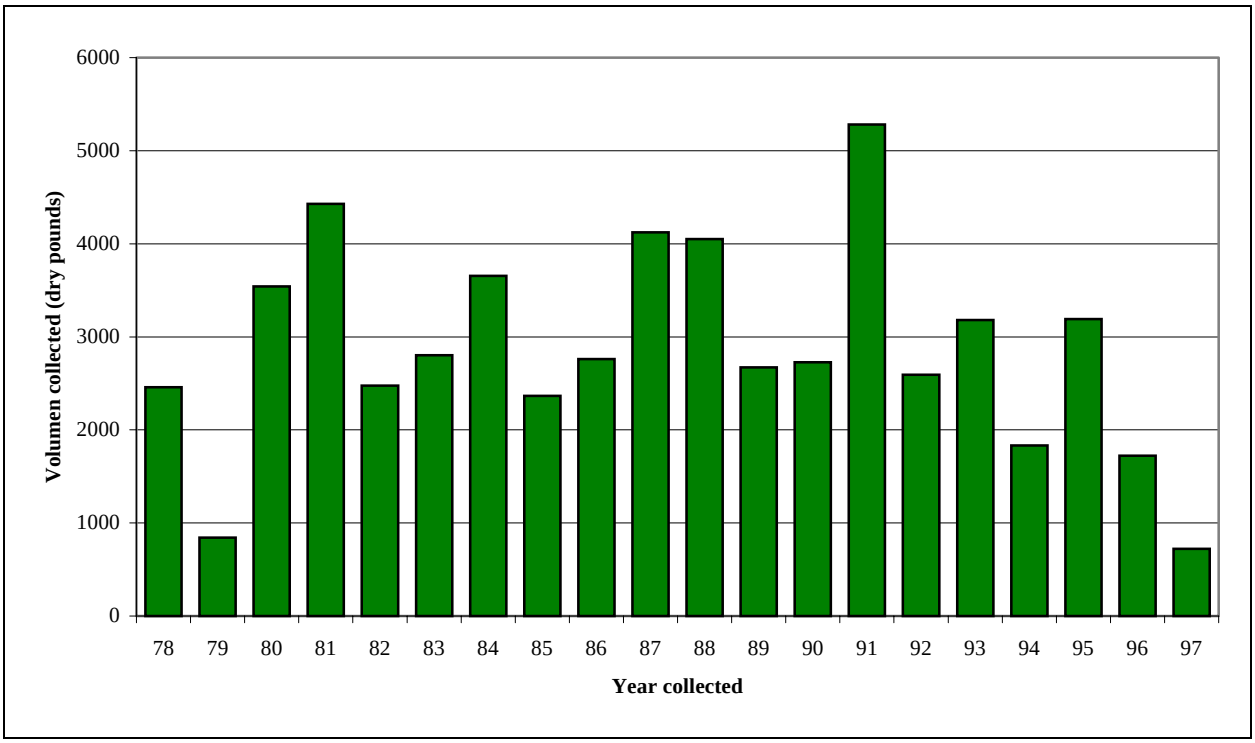


**Figure 5.7 Forest-harvested ginseng in Arkansas reported to the U.S. Fish and Wildlife Service, by the Arkansas state monitoring program.[18]**

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[18] Source: USDA Foreign Agriculture Service 1998

## 5.9 Appendices

### Appendix 5.1 Common Non-Timber Forest Products in Southern Oregon.[19]

| Common Name | Species Name | Part Harvested | Use |
|---|---|---|---|
| Yarrow | *Achillea millefolium* | leaves, stems, flowers, roots | medicinal; decorative |
| Alder (red) | *Alnus rubra* | leaves, bark | medicinal |
| Pearly Everlasting | *Anaphalis margaritacea* | herb in flower | floral |
| Angelica | *Angelica spp.* | root | medicinal |
| Spikenard | *Aralia californica* | root; also berries and leaves | medicinal |
| Manzanita | *Arctostaphylos spp.* | leaves | floral |
| Kinikinnick | *Arctostaphylos uva-ursi* | leaves, stems, flowers berries | medicinal |
| Arnica | *Arnica cordifolia, latifolia* | flowers, root | medicinal |
| Mugwort | *Artemisia douglasiana* | leaves | medicinal |
| Wild Ginger | *Asarum caudatum* | entire plant; leaves most flavorful | medicinal |
| Oregon Grape | *Berberis aquifolium* | roots, stems, leaves | medicinal (root bark) edible |
| Dwarf Oregon Grape | *Berberis nervosa* | roots, stems, leaves | medicinal |
| Incense Cedar | *Calocedrus decurrens* | boughs | floral |
| Mt. Mahogany | *Cercocarpus sp.* | bark | medicinal |
| Pipsissewa | *Chimaphila umbellata* | whole plant | medicinal |
| Amole lily | *Chlorogalum pomeridianum* | bulbs | medicinal |
| Port Orford Cedar | *Cupressus lawsoniana* | boughs | floral |
| Wild Carrot/ Queen Anne's Lace | *Daucus carota* | dried roots, ripe seeds | medicinal |

[19] Source: Borsting 1998

**Appendix 5.1 (Continued)**

| Common Name | Species Name | Part Harvested | Use |
|---|---|---|---|
| Trillium | *Trillium spp.: trillium ovatum* | leaves, roots | medicinal |
| California bay | *Umbellularia californica* | leaves | medicinal |
| Usnea/old man's beard | *Usnea spp.* | whole plant | medicinal |
| Huckleberry | *Vaccinium spp.* | leaves, branches, fruit | floral/edible |
| Valerian | *Valeriana spp.* | roots | medicinal |
| Boughs | *various spp.* | branches, leaves | floral |
| False hellebore | *Veratrum viride* | roots, leaves | medicinal |
| Mullein | *Verbascum thapsus* | leaves, flower | medicinal |
| Blue Vervain | *Verbena lasiostachys* | whole aerial plant | medicinal |
| Bear Grass | *Xerophyllum tenax* | leaves | floral |

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**Appendix 5.2 Price list for common herbs and spices on the market from Northwest Botanicals, Oregon.[20]**

| HERB/SPICE | 2 TON | 500 LB. | 100 LB. | 1 LB. | RETAIL | |
|---|---|---|---|---|---|---|
| | | | | | $/LB. | $/OZ. |
| Alfalfa (*Medicago sativa*) | 0.16 | 0.80 | 1.60 | 2.55 | 8.00 | 0.50 |
| *Angelica (*Angelica atropurpurea*) | 2.40 | 4.80 | 5.60 | 6.25 | 13.60 | 0.85 |
| Anise (*Pimpinella anisum*) | 0.90 | 1.80 | 2.40 | 2.95 | 9.60 | 0.60 |
| Basil (*Ocimum basilicum*) | 1.60 | 2.50 | 2.80 | 3.50 | 8.00 | 0.50 |
| *Bay (*Umbellularia californica*) | 1.50 | 2.40 | 2.90 | 3.50 | 15.20 | 0.95 |
| *Bergamot (*Monarda fistulosa*) | 1.20 | 2.00 | 2.80 | 4.00 | 14.40 | 0.90 |
| *Blackberry (*Rubus fruiticosus*) | 0.60 | 1.60 | 1.85 | 2.50 | 12.80 | 0.80 |
| *Black Cohosh (*Cimicifugo racemosa*) | 1.20 | 2.80 | 4.00 | 6.30 | 10.40 | 0.65 |
| *Blessed Thistle (*Cnicus benedictus*) | 1.10 | 1.85 | 2.30 | 3.35 | 16.00 | 1.00 |
| *Blue Cohosh (*Caulophyllum thalicatroides*) | 1.00 | 2.50 | 3.75 | 8.00 | 12.80 | 0.80 |
| *Borage (*Borago officinalis*) | 3.20 | 4.00 | 4.60 | 8.00 | 19.20 | 1.20 |
| *Burdock (*Borago officinalis*) | 1.40 | 1.85 | 2.40 | 4.80 | 13.60 | 0.85 |
| *Calamus (*Acorus calamus*) | 0.90 | 1.60 | 2.20 | 4.40 | 14.40 | 0.90 |
| Caraway (*Carum carvi*) | 0.95 | 1.20 | 1.60 | 2.20 | 12.80 | 0.80 |
| *Cascara segrada (*Cascara segrada*) | 1.25 | 1.40 | 2.00 | 4.05 | 22.40 | 1.40 |
| *Catnip (*Nepeta catara*) | 0.85 | 1.40 | 1.90 | 3.55 | 11.20 | 0.70 |
| Chamomile (*Anthemis nobilis*) | 3.50 | 3.70 | 4.00 | 4.55 | 12.80 | 0.80 |
| *Chapparal (*Larrea mexicana*) | 0.90 | 1.70 | 2.20 | 3.35 | 14.40 | 0.90 |
| Chervil (*Anthiscus cerfoloum*) | 3.40 | 4.80 | 5.30 | 6.80 | 16.00 | 1.00 |
| *Chickweed (*Stellaria media*) | 1.80 | 2.50 | 3.20 | 4.50 | 13.60 | 0.85 |
| *Chicory (*Cichorium intybus*) | 0.90 | 1.40 | 1.90 | 2.80 | 10.40 | 0.65 |
| *Coltsfoot (*Tussilago farafara*) | 0.80 | 1.20 | 1.80 | 2.75 | 22.40 | 1.40 |
| Comfrey (*Symphytum officinale*) | 1.80 | 2.60 | 4.20 | 7.20 | 28.80 | 1.80 |
| Coriander (*Coriandrum sativum*) | 0.65 | 0.90 | 1.40 | 2.25 | 12.00 | 0.75 |
| Cumin (*Cuminum cyminum*) | 1.25 | 1.80 | 2.20 | 2.75 | 25.60 | 1.60 |
| *Dandelion (*Taraxacum officinale*) | 2.70 | 3.20 | 4.00 | 5.25 | 16.00 | 1.00 |
| *Devil's Club (*Oplopanax horridum*) | 1.80 | 2.20 | 2.60 | 3.00 | 25.60 | 1.60 |
| Dill (*Anethum graveolens*) | 1.00 | 1.80 | 2.40 | 4.00 | 12.80 | 0.80 |
| *Desert Tea (*Ephedra nevadensis*) | 1.10 | 1.90 | 2.20 | 3.50 | 28.80 | 1.80 |
| *Echinacea (*Echinacea angustifolia*) | 9.00 | 16.00 | 19.50 | 26.35 | 56.00 | 3.50 |
| *Elder (*Sambucus nigra*) | 2.40 | 3.20 | 4.30 | 8.95 | 22.40 | 1.40 |
| *Eucalyptus (*Eucalyptus globulus*) | 0.95 | 1.40 | 2.00 | 3.90 | 32.00 | 2.00 |
| Fennel (*Foeniculum vulgare*) | 0.85 | 1.40 | 1.85 | 2.55 | 12.80 | 0.80 |
| Garlic (*Allium sativum*) | 1.20 | 1.85 | 2.20 | 3.85 | 19.20 | 1.20 |
| Ginger (*Zingiber officinale*) | 0.85 | 1.35 | 1.85 | 3.25 | 13.60 | 0.85 |
| *Ginseng (*Panax quinquefolium*) | 180.00 | 220.00 | 270.00 | 340.00 | 1440.00 | 90.00 |
| *Goldenseal (*Hydrastis canadensis*) | 24.00 | 32.00 | 40.00 | 69.50 | 128.00 | 8.00 |
| Hop (*Humulus lupulus*) | 0.85 | 1.60 | 2.20 | 4.75 | 12.80 | 0.80 |

[20] Source: Miller 1998

## Appendix 5.2 (Continued)

| | | | | | | |
|---|---|---|---|---|---|---|
| *Horehound (*Marrubium vulgare*) | 0.80 | 1.45 | 1.80 | 2.40 | 14.40 | 0.90 |
| *Horsetail (*Equisetum arvensa*) | 0.75 | 1.20 | 1.55 | 1.85 | 16.00 | 1.00 |
| Hyssop (*Hyssopus officinalis*) | 0.65 | 1.05 | 1.80 | 3.55 | 12.80 | 0.80 |
| *Kelp (*Fucus versiculosus*) | 0.60 | 0.85 | 1.05 | 2.20 | 9.60 | 0.60 |
| *Kinikinnick (*Arctostaphylos uva-ursi*) | 0.75 | 1.00 | 1.60 | 2.35 | 14.40 | 0.90 |
| Lavendar (*Lavandula officinalis*) | 3.50 | 4.50 | 5.00 | 9.50 | 24.00 | 1.50 |
| Lemon Balm (*Melissa officinalis*) | 1.80 | 2.40 | 2.85 | 4.95 | 13.60 | 0.85 |
| Lemon Verbena (*Lippia citriodora*) | 2.20 | 3.20 | 3.65 | 4.80 | 19.20 | 1.20 |
| *Licorice (*Glycyrrhiza glabra*) | 0.80 | 1.60 | 1.90 | 4.05 | 16.00 | 1.00 |
| *Lobelia (*Lobelia inflata*) | 2.20 | 2.50 | 2.90 | 4.40 | 19.20 | 1.20 |
| *Lovage (*Levisticum officinale*) | 1.45 | 2.00 | 2.80 | 5.20 | 14.40 | 0.90 |
| *Mandrake (*Podophyllum peltatum*) | 0.95 | 1.65 | 2.00 | 3.80 | 24.00 | 1.50 |
| Marigold (*Calendula officinalis*) | 0.40 | 0.90 | 1.40 | 2.45 | 11.20 | 0.70 |
| Marjoram (*Origanum majorana*) | 0.85 | 1.45 | 1.80 | 2.50 | 9.60 | 0.60 |
| *Marshmallow (*Althea officinalis*) | 2.20 | 2.80 | 3.20 | 4.60 | 25.60 | 1.60 |
| *Mistletoe (*Phoradendron flavenscens*) | 0.55 | 0.95 | 1.60 | 3.50 | 12.80 | 0.80 |
| *Mugwort (*Artemisia vulgaris*) | 1.00 | 1.60 | 2.20 | 3.65 | 14.40 | 0.90 |
| *Mullein (*Verbascum thapsus*) | 0.85 | 1.20 | 1.80 | 3.85 | 10.40 | 0.65 |
| Nettle (*Urtica urens*) | 1.10 | 1.80 | 2.40 | 4.20 | 9.60 | 0.60 |
| Oatstraw (*Avena sativa*) | 0.32 | 0.90 | 1.20 | 2.80 | 8.00 | 0.50 |
| Onion (*Allium cepa*) | 0.85 | 1.40 | 1.80 | 3.40 | 9.60 | 0.60 |
| Oregano (*Origanum vulgare*) | 0.80 | 1.60 | 1.90 | 3.75 | 14.40 | 0.90 |
| *Oregon Grape (*Berberis aquifolium*) | 2.00 | 2.80 | 3.50 | 4.80 | 16.00 | 1.00 |
| Parsley (*Petroselinum crispum*) | 2.00 | 2.65 | 2.90 | 4.80 | 13.60 | 0.85 |
| Passion Flower (*Passiflora caerulea*) | 0.85 | 1.60 | 1.95 | 5.25 | 12.80 | 0.80 |
| *Pennyroyal (*Mentha pulegium*) | 0.95 | 1.90 | 2.40 | 3.95 | 10.40 | 0.65 |
| Peppermint (*Mentha piperita*) | 1.20 | 1.80 | 2.40 | 2.75 | 16.00 | 1.00 |
| *Pippissawa (*Chimaphila umbellata*) | 2.20 | 2.65 | 3.40 | 5.45 | 24.00 | 1.50 |
| *Plantain (*Plantago major*) | 0.80 | 1.25 | 1.70 | 4.00 | 9.60 | 0.60 |
| *Poke (*Phytolacca americana*) | 1.40 | 2.00 | 2.60 | 3.20 | 8.00 | 0.50 |
| *Queen-of-the-Meadow (*Eupatorium purpureum*) | 1.90 | 2.40 | 2.65 | 4.80 | 24.00 | 1.50 |
| Raspberry (*Rubus idaeus*) | 0.85 | 1.30 | 1.60 | 3.35 | 14.40 | 0.90 |
| Red Clover (*Trifolium pratense*) | 2.00 | 3.50 | 4.80 | 8.95 | 16.00 | 1.00 |
| *Rosehip (*Rosa canina*) | 0.45 | 0.90 | 1.40 | 2.95 | 8.00 | 0.50 |
| Rosemary (*Rosemarinus officinalis*) | 0.45 | 0.90 | 1.35 | 2.30 | 8.00 | 0.50 |
| Rue (*Ruta graveolens*) | 1.60 | 2.60 | 2.90 | 3.80 | 24.00 | 1.50 |
| Sage (*Salvia officinalis*) | 0.95 | 1.40 | 1.85 | 3.70 | 12.80 | 0.80 |
| *St. John's Wort (*Hypericum perforatum*) | 0.90 | 1.80 | 2.45 | 4.95 | 16.00 | 1.00 |
| *Sarsapariila (*Smilax regelii*) | 0.95 | 2.00 | 2.60 | 4.60 | 14.40 | 0.90 |
| *Sassafras (*Sassafrass albidum*) | 2.60 | 3.50 | 4.20 | 10.95 | 19.20 | 1.20 |
| Savory (*Satureia hortensis*) | 1.20 | 1.90 | 2.20 | 3.10 | 9.60 | 0.60 |
| *Scullcap (*Scutellaria hortensis*) | 3.50 | 4.50 | 6.00 | 9.50 | 17.60 | 1.10 |
| *Shepherd's Purse (*Capsella bursa-pastoris*) | 0.90 | 1.20 | 1.80 | 3.60 | 11.20 | 0.70 |
| *Slippery Elm (*Ulmus rubra*) | 3.20 | 4.00 | 4.80 | 9.40 | 8.00 | 0.50 |
| Spearmint (*Mentha viridis*) | 0.95 | 1.40 | 1.80 | 2.55 | 14.40 | 0.90 |
| Strawberry (*Fragaria vesca*) | 0.85 | 1.25 | 1.65 | 4.50 | 12.80 | 0.80 |
| *Tansy (*Tanacetum vulgaris*) | 0.85 | 1.00 | 1.65 | 3.20 | 8.00 | 0.50 |
| Tarrigon (*Artemesia dracunculus*) | 4.80 | 6.00 | 8.00 | 12.95 | 32.00 | 2.00 |

**Appendix 5.2 (Continued)**

| | | | | | | |
|---|---|---|---|---|---|---|
| Thyme (*Thymus vulgare*) | 1.60 | 2.20 | 2.90 | 3.90 | 16.00 | 1.00 |
| *Valerian (*Valeriana officinalis*) | 0.85 | 1.20 | 2.00 | 5.25 | 14.40 | 0.90 |
| *Vervain (*Verbena hastatin*) | 0.85 | 1.40 | 1.90 | 3.20 | 16.00 | 1.00 |
| *Walnut (*Juglans nigra*) | 0.15 | 0.40 | 0.80 | 1.80 | 9.60 | 0.60 |
| *White Oak (*Quercus alba*) | 0.40 | 0.95 | 1.40 | 2.60 | 14.40 | 0.90 |
| *Wild Cherry (*Prunus serotina*) | 0.80 | 1.35 | 1.70 | 3.85 | 22.40 | 1.40 |
| *Wild Lettuce (*Lactuca scariola*) | 0.80 | 1.60 | 1.90 | 2.80 | 12.80 | 0.80 |
| *Wintergreen (*Gaultheria procumbens*) | 1.20 | 1.90 | 2.40 | 4.25 | 22.40 | 1.40 |
| *Witch Hazel (*Hamamelis virginiana*) | 1.40 | 2.20 | 2.80 | 4.60 | 12.80 | 0.80 |
| *Woodruff (*Asperula odorata*) | 1.00 | 1.80 | 2.40 | 4.20 | 12.80 | 0.80 |
| *Wormwood (*Artemisia absinthium*) | 0.85 | 1.40 | 1.90 | 4.65 | 12.80 | 0.80 |
| *Yarrow (*Archillea millefolium*) | 0.65 | 1.00 | 1.40 | 2.30 | 16.00 | 1.00 |
| *Yellow Dock (*Rumex crispus*) | 0.90 | 1.70 | 2.20 | 3.45 | 11.20 | 0.70 |
| *Yerma Mate' (*Ilex paraguaiensis*) | 0.60 | 0.95 | 1.40 | 3.35 | 14.40 | 0.90 |
| *Yerba Santa (*Eriodictyon californicum*) | 0.95 | 1.80 | 2.40 | 3.90 | 16.00 | 1.00 |
| | | | | | | |

**Foraged or has good forage potential*

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**Appendix 5.3 Forest botanical products sold in southern Appalachia. Priority conservation species are noted with an astericks (*).[21]**

| Product | Common Name | Scientific Name | Priority |
|---|---|---|---|
| Medicinals | Yarrow | *Achillea millefolium* | |
| | Black cohosh | *Actaea racemosa* | * |
| | Maidenhair fern | *Adiantum peltatum* | |
| | Star grass | *Aletris farinosa* | |
| | Mountain angelica | *Angelica triquinata* | |
| | Wild sarsparilla | *Aralia nudicaulis* | |
| | Wild ginger | *Asarum canadensis* | |
| | Butterfly weed | *Asclepias tuberosa* | |
| | Wild indigo | *Baptisia tinctoria* | |
| | Blue cohosh | *Caulophyllum thalictroides* | |
| | Pipsissewa | *Chimaphila umbellata* | |
| | Stone root | *Collinsonia canadensis* | |
| | Hawthorn | *Crategus spp.* | |
| | Wild yam | *Dioscorea villosa* | |
| | Striped gentian | *Gentiana villosa* | |
| | Witch hazel | *Hamamelis virginiana* | |
| | Wood nettle | *Laportea canadensis* | |
| | Indian tobacco | *Lobelia inflata* | |
| | Partridge berry | *Mitchella repens* | |
| | American ginseng | *Panax quinquefolius* | * |
| | Broad-leaved plantain | *Plantago rugelii* | |
| | Mayapple | *Podophyllum peltatum* | |
| | Red raspberry | *Rubus idaeus* | |
| | Elderberry | *Sambucus canadensis* | |
| | Bloodroot | *Sanguinaria canadensis* | * |
| | Sassafras | *Sassafras albidium* | |
| | Maddog skullcap | *Scutellaria integrifolia* | |
| | Goldenrod | *Solidago spp.* | |
| | Red Clover | *Trifolium pratense* | |
| | Bethroot | *Trillium erectum* | * |
| | Slippery elm | *Ulmus rubra* | |
| | Yellowroot | *Xanthoriza simplicissima* | |
| Edibles | Ramps | *Allium tricoccum, Allium burdickii* | * |
| Floral plants | Smokevine | *Aristolochia macrophylla* | |
| | Bittersweet | *Celastrus scandens* | |
| | Galax | *Galax urceolata* | * |
| | Log mosses | *Hypnum spp, Thuidium spp* | * |
| | Laurel leaves | *Kalmia latifolia* | |
| | Ground-Pine | *Lycopdium obscurum* | |

[21] Source: USDA Forest Service 2000

| Product | Common Name | Scientific Name | Priority |
|---|---|---|---|
| | Christmas ferns | *Polystichum acrostichoides* | |
| | Grapevine | *Vitis spp.* | |
| Ornamentals | Fraser fir | *Abies fraseri* | * |
| | Mountain laurel | *Kalmia latifolia* | * |
| | Doghobble | *Leucothoe fontansiana* | |
| | Rhododendron | *Rhododendron spp.* | |
| | Hemlock | *Tsuga canadensis* | |

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**Appendix 5.4 Medicinal plant survey form for use on the Ozark National Forest.**[22]

## MEDICINAL PLANT SURVEY

COUNTY: _____ COMPARTMENT: _____ STAND: _____
DATE: SLOPE: ASPECT:
TRANSECT LENGTH: _____ TRANSECT WIDTH: _____ LOCATION: _____

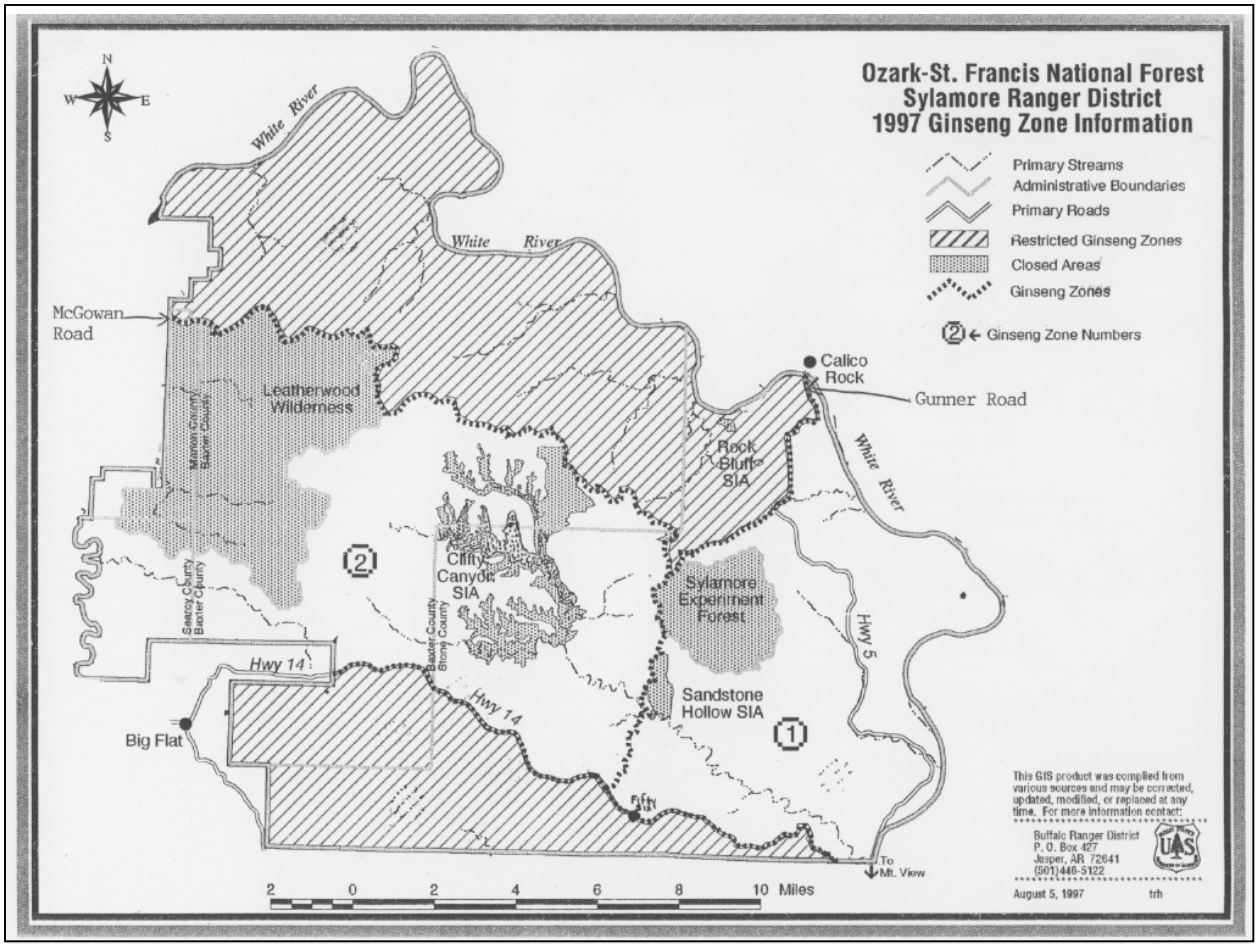
| SCIENTIFIC NAME | COMMON NAME | COUNT | SCIENTIFIC NAME | COMMON NAME | COUNT |
|---|---|---|---|---|---|
| *Achillea millefolium* | Yarrow | | *Lobelia inflata* | Lobelia | |
| *Acorus americanus* | Sweet Flag | | *Lycopus virginicus* | Bugleweed | |
| *Adientum spp.* | Maidenhair Fern | | *Mithchella repens* | Partridge Berry | |
| *Aletris faranosa* | Yellow Star Grass | | *Monarda spp.* | Bergamot | |
| *Allium spp.* | Wild Garlic | | *Myrica cerifera* | Wax Myrtle | |
| *Apios americana* | Groundnut | | *Oxalis spp.* | Oxalis | |
| *Apocynum cannabinum* | Dogbane | | *Panax quinquefolius* | Ginseng | |
| *Aralia spinosa* | Hercules Club | | *Passiflora incarnata* | Maypop | |
| *Aralia racemosa* | Spikenard | | *Penthorum sedoides* | Ditch Stonecrop | |
| *Arctium spp.* | Burdock | | *Plantago spp.* | Plantain | |
| *Arisaema triphyllum* | Jack in the Pulpit | | *Podophyllum peltatum* | Mayapple | |
| *Aristolochia spp.* | Virginia Snakeroot | | *Polygonum spp.* | Smartweed | |
| *Asarum canadense* | Wild Ginger | | *Polygonatum biflorum* | Solomon Seal | |
| *Asclepias tuberosa* | Butterfly Weed | | *Polygala senega* | Milkwort | |
| *Asimina triloba* | Pawpaw | | *Phytolacca spp.* | Poke | |
| *Capsella bursa-pastoris* | Shepard's Purse | | *Prunus spp.* | Peach or Plum | |
| *Caulophyllum thalictrodes* | Blue Cohosh | | *Prunus serotina* | Wild Cherry | |
| *Ceanthus americanus* | New Jersey Tea | | *Prunella vulgaris* | Heal All | |
| *Chelone glabra* | White Turtlehead | | *Quercus alba* | White Oak | |
| *Chionathus virginicus* | Fringetree | | *Rhus glabra* | Smooth Sumac | |
| *Cichorium intybus* | Chickory | | *Rubus spp.* | Blackberry | |
| *Cimicifuga racemosa* | Black Cohosh | | *Rumex crispus* | Dock | |
| *Cunila origanoides* | Dittany | | *Rumex acetosella* | Sheep Sorrel | |
| *Cypripedium spp.* | Lady Slipper | | *Salix spp.* | Willow spp. | |
| *Dioscorea quaternata* | Wild Yam | | *Sanguinaria canadensis* | Blood root | |
| *Echinacea spp.* | Coneflower | | *Sambucus canadensis* | Elderberry | |
| *Eupatorium perfoliatum* | Boneset | | *Scrophularia marilandi* | Figwort | |
| *Eupatorium puperea* | Joe Pye Weed | | *Scutellaria spp.* | Scullcap | |
| *Galium aparine* | Cleavers | | *Solidago spp.* | Goldenrod | |
| *Geranium maculatum* | Cranesbill | | *Spigelia marilandica* | Indian Pink | |
| *Hammamelis spp.* | Witch Hazel | | *Stillingia sylvatica* | Queen's Delight | |
| *Hepatica spp.* | Hepatica | | *Tanacetum parthenium* | Tansy | |
| *Heuchera spp.* | Alumroot | | *Taraxcum officinale* | Dandelion | |
| *Hydrangea arborescens* | Wild Hydrangea | | *Teucrium canadense* | Wood Sage' | |
| *Hydrastis canadensis* | Goldenseal | | *Trillium erectum* | Purple Trillium | |
| *Hypericum spp.* | St. John's Wort | | *Trifolium pratense* | Red Clover | |
| *Iris virginica* | Blue Flag | | *Ulmus rubra* | Slippery Elm | |
| *Impatiens capensis* | Jewelweed | | *Verbascum thapsus* | Mullein | |
| *Juglans nigra* | Black Walnut | | *Verbena hastata* | Amer. Vervain | |
| *Lactuca spp.* | Wild Lettuce | | *Veronicastrum virginicu* | Black Root | |
| *Leonurus cardiaca* | Motherwort | | *Viburnum spp.* | Blackhaw | |
| *Lindera benzoin* | Spicebush | | *Zanthoxylum spp.* | Toothache Tree | |

Surveyed By: _____

SHADED INDICATES SHORT SURVEY SPECIES

[22] Source: Leeds 1997

**Appendix 5.5 Map of management zones for ginseng on the Sylamore Ranger District, Ozark-St. Francis National Forest.**[23]

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[23] Source: Leeds 1997

## Appendix 5.6 Summary of 1999 non-timber forest products sales from Bureau of Land Management lands in Oregon and Washington.[24]

| PRODUCT | AMOUNT | UNIT OF MEASURE | NO. OF CONTRACTS | VALUE RECEIVED | MAINTENANCE FEES COLLECTED |
|---|---|---|---|---|---|
| Boughs - Coniferous | 811,910.0 | Pounds | 242 | $20,847.20 | $819.03 |
| Burls & Miscellaneous | 81,950.7 | Pounds | 34 | $8,259.00 | $100.92 |
| Christmas Trees | 832.0 | Number | 33 | $3,559.25 | $11.00 |
| Edibles & Medicinals | 10,989.0 | Pounds | 23 | $448.30 | $42.84 |
| Feed & Forage | 0.0 | Tons | 0 | $0.00 | $0.00 |
| Floral & Greenery | 726,376.5 | Pounds | 1,279 | $35,647.05 | $3,311.03 |
| Mosses - Bryophytes | 95,849.0 | Pounds | 94 | $2,859.00 | $289.98 |
| Mushrooms - Fungi | 49,145.5 | Pounds | 664 | $13,114.61 | $1,166.18 |
| Ornamentals | 100.0 | Number | 1 | $25.00 | $2.00 |
| Seed & Seed Cones | 1,472.5 | Bushels | 8 | $552.50 | $28.00 |
| Transplants | 17,410.0 | Number | 60 | $3,366.38 | $324.95 |
| Wood Products - SFP | 919,593.6 | Cubic feet | 1,979 | $37,989.81 | $2,886.88 |
| Wood Products - Sawtimber (Not SFP) | 139,276.8 | Cubic feet | 233 | $209,228.92 | $5,206.41 |
| **Current Totals - SFP Only** | | | **4,417** | **$126,668.10** | **$8,982.81** |
| **Current Totals - All Products** | | | **4,650** | **$335,897.02** | **$14,189.22** |

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[24] Source: USDI Bureau of Land Management 1999