

Conserving the Appalachian Medicinal Plant Industry

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ABSTRACT – An industry based on plants that flourish in the mountains of Appalachia is at a critical crossroads. The medicinal plant industry has relied on the conservation of Appalachian forest resources for more than 300 years. There is growing and widespread concern that many of the species, on which this vibrant and substantial industry depends, are being depleted and becoming rare and endangered. The Appalachian forests, which are some of the most productive temperate hardwood forests in the world, are the principal source of more than 50 medicinal plant species that are common to the market. Residents of Appalachia have relied on the forests for their livelihood for generations. Today, medicinal plant harvesters of the region are under-represented in deciding how the forests are managed. Business owners, new harvesters, consumers, and forest managers all have a stake in the conservation of the industry. To conserve this industry will require concerted effort to identify and communicate the implications and ramifications concerning ecological, economic and social issues, and to build programs that embrace these three pillars of sustainability. The abundance of medicinal plants that share similar forest habitats and the rich ecological diversity will require holistic conservation approaches. Collaboration and cooperation of all affected people is essential for the conservation of this important industry. As private forest lands, have traditionally received less management attention, the greatest potential for conservation may be on these holdings.

INTRODUCTION

When Gifford Pinchot (Father of Forestry) talked about conservation of our forests, more than 120 years ago, he spoke of “the greatest good for the greatest number.” Today, we often talk about conserving plants and animals, to make sure they are around 100 years from now. We talk about conserving species because they are being over-harvested. We talk about conserving species because their habitat is being depleted. We talk about conserving them because they are becoming endangered. Let us now talk about conserving an industry; because the plants on which it is based are being over-harvested; because the habitats that provide the plants are being converted; because the people, and their way of life, who depend on this industry will be permanently affected if we don’t.

Three major areas of consideration are critical to get medicinal plants integrated into the management of public, non-industrial or industrial forestlands. To have medicinal plants adequately included into forest management will require an increased understanding and comprehension of the ecological, economic, and social consequences of not managing the resources from whence they originate. These areas of concern are often referred to as the pillars of sustainability (Chamberlain 2000; Chamberlain and others 2001). They embrace the majority of issues that affect

management. Medicinal plants will be integrated into forest management when the people who are deciding how to manage forests are fully convinced of the ramifications of not managing for them (Figure 1).

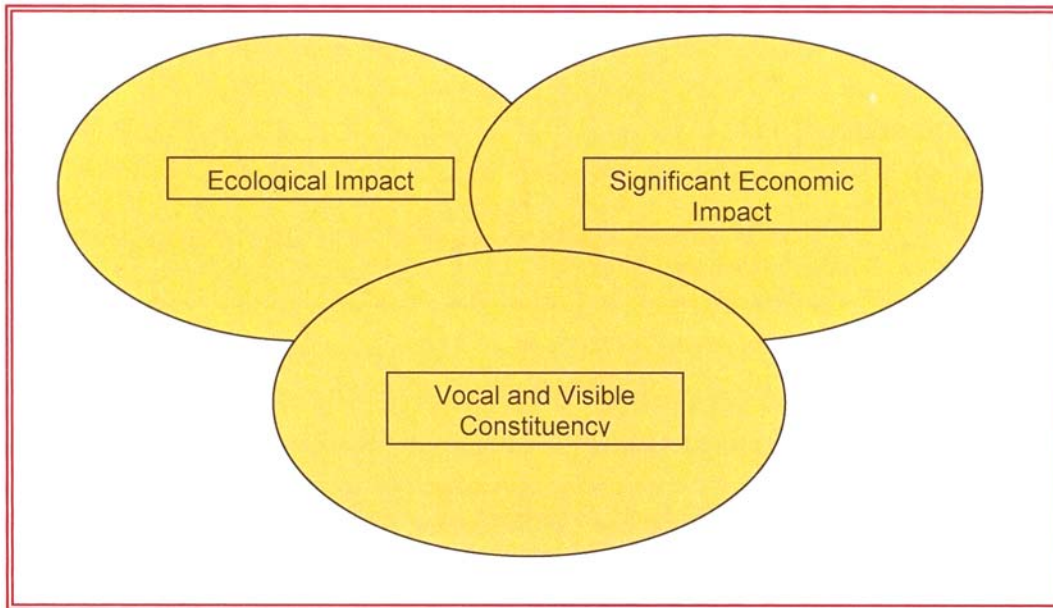


Figure 1. Factors critical to getting medicinal plants integrated into forest management.

Ecological issues-- There is increasing awareness that for all parts of the forest ecosystem to be sustainable, the resources from which medicinal forest products originate must be recognized as renewable resources and integrated into forest management. Scientific management and sustainable collection methods must be practiced, yet the ecological knowledge needed to achieve these is generally lacking. The ramifications of not fully understanding the impact of unmanaged harvesting of herbal medicinal products could be the decline of plant populations. Planning for the impact of harvesting will be challenging without a solid understanding of the life-cycles of the forest botanicals.

Ecological data is needed for most medicinal plant species to determine sustainable harvest rates, develop growth and yield models and craft inventory and monitoring protocols. Most basic information concerning product supply is lacking, which affects the promise for sound inventory and monitoring (Reams and others 2004). The lack of baseline information concerning the plants' ecological distribution, abundance, condition and rates of change are fundamental knowledge needed for management. In general there is a lack of knowledge about the biology and ecology of the flora from which these products originate. The sheer diversity of the plants and plant parts complicate management efforts.

Economic issues-- The people of the Appalachian region have enjoyed tremendous economic benefits from harvesting of medicinal plant species. Families have been depending on the income from the sale of medicinal, floral, and edible plants from the forests of Appalachia since their ancestors moved to this region. Today, local residents still rely on income from the sale of medicinal plants, and this reliance becomes more important to local harvesters as economic downturns occur.

Local, regional, national and international businesses depend on sustainable supply of medicinal forest products. The scale of the economy that depends on these natural resources is global, as a significant portion of the annual harvest is exported to European and Asian markets. Although the value of the medicinal plant industry has not been

fully estimated, that which has been discovered indicates a large, energetic, complex economy. The economy based on medicinal plants may be in jeopardy without more active management of the forest resources. Lack of management of the medicinal plant resources could lead to loss of plant populations, reduced access for the harvester, decline in revenues at all market levels, and loss of market share.

More quantitative analysis is needed to demonstrate the economic value of the medicinal plant industry. The value-additions at each level of the market need to be determined and tracked to provide valuable trends analysis. Studies of possible opportunities for local value-added initiatives are needed to find ways to conserve economic benefits. A full strategic market assessment is needed to help in setting conservation priorities.

Social issues-- The cultural ties to medicinal forest products within people of European descent can be tracked to the earliest contact between European immigrants and native people. Some Appalachian harvesters can trace their relationship with American ginseng, and other medicinals, to their ancestors contact with the native Cherokee tribes. Other harvesters do not have the historical ties to medicinal forest products, but started collecting out of necessity or interest in nature. 'Traditional ecological knowledge' of long-time Appalachian harvesters could help to educate newer harvesters and forest managers on ethical practices.

Neglecting the social issues in management of medicinal forest resources could lead to increased tension, distrust, and increased difficulty in enforcing policies. For social issues to be integrated into forest management will require describing, defining, and estimating demographics that define the people involved at all market levels. Understanding their attitudes, perceptions and beliefs regarding management of natural resources for medicinal forest products, will help to identify obstacles that could limit conservation efforts.

An expansion of forest management, on private or public lands, to include medicinal plants will impact a group of people that may be on the margins of the economy, depending heavily on collection of these plant materials and typically not included in policy dialogue. Changes in forest policies and practices regarding medicinal plants can significantly impact these peoples' lives, as they have few income opportunities. Active, transparent, sincere, and engaging dialogue is needed to ensure the full participation of the medicinal plant community in shifting the multiple-use forest management paradigm to include non-timber forest resources.

MEDICINAL FOREST PRODUCTS

Forest harvested plants used for their therapeutic value are marketed either as medicines or as herbal remedies. According to Farnsworth and Morris (1976), 25 percent of all prescriptions dispensed in the United States contain active ingredients extracted from higher order plants. The number of plant species harvested from Appalachian forests with medicinal value exceeds 125 (Krochmal and others 1969, World Wildlife Fund 1999). Of these, approximately 50 are commonly harvested and purchased by herb dealers. The Appalachian hardwood region is the principal source of many medicinal plants, including black cohosh (*Actaea racemosa*), American ginseng (*Panax quinquefolius*), and bloodroot (*Sanguinaria canadensis*). More than 80 percent of the forest-harvested ginseng comes from Virginia, Kentucky, Tennessee and North Carolina, which may be indicative of concentration of harvest activities for other medicinal plants.

The findings of medical research also helped to increase market demand for wild-harvested medicinal forest products (Eisenberg, and others 1993, Le Bars, and others 1997, Stix 1998). The 1996 estimated value of the global markets for herbal medicines was approximately \$14 billion (Genetic Engineering News 1997), of which Europe and Asia represented more than eighty-percent of the global trade. In 1998, the total retail market for medicinal herbs in

the United States was estimated at \$3.97 billion, more than double the estimate for North America in 1996 (Brevoort 1998, Genetic Engineering News 1997).

During that period, the mass-market segment for herbal medicinal products, approximately 17% of the U.S. market, grew at an annualized rate of over 100 percent (Brevoort 1998). Exports of forest-harvested ginseng from 1993 through 1996 grew more than 300 percent (USDA 1999). Although exports of forest-harvested ginseng decreased in 1997 and 1998, demand for other species increased (USDA 1999). For example, the estimated growth in the mass market for St. John's wort and black cohosh, for the 52-week period ending July 12, 1998, was approximately 2,800 percent and 500 percent, respectively (Brevoort 1998).

Ginseng – More is known about American ginseng (*Panax quinquefolia*) than any other medicinal plant because for the last 30 years the international trade of this medicinal plant has been regulated by the Convention of International Trade of Endangered Species (CITES). The collection and sales of ginseng roots have been a vital element of the Appalachia economy since the late 1700s, yet there have been no efforts to manage this natural resource. At one time, the plant was probably very common in its native habitat. Over the years, populations have declined due to unmanaged harvesting and changes in habitat. In 2005, actions by the U.S. Fish and Wildlife Service, the federal agency responsible for carrying out CITES regulations, placed greater restrictions on the export of American ginseng (U.S. Fish and Wildlife Service 2005). These actions and continued lack of efforts to manage forests for this important species could have tremendous negative impact on the industry and the people who have come to depend on medicinal plants for their livelihood.

Black cohosh – Since the U.S.D.A. Food and Drug Administration took actions to restrict Hormone Replacement Therapy (HRT), market demand for black cohosh has been on the increase (Dog and others 2003). When consumers became aware that cohosh was effective for menopausal symptoms, retail sales sky-rocketed. The wholesale price increased, as well, making it attractive for harvesters to dig more root. Soon, there was a glut of raw materials and the price crashed. Over the last few years, demand rebounded. As most black cohosh is harvested from the wild, concern for the sustainability of this forest resource has increased as well. Recently, a small group of concerned institutions, including the U.S. Forest Service, U.S. Fish and Wildlife Service and the Garden Club of America, have initiated long-term studies to examine the impact harvesting has on populations of this medicinal plant. A goal of the initiative is to determine sustainable harvest levels for black cohosh. More efforts like this are needed to save the industry.

Goldenseal – In almost every state where goldenseal (*Hydrastis canadensis*) is considered native, the conservation status is described as endangered, threatened, vulnerable, fairly rare, historic, or 'of special concern.' Since 1997, export trade of goldenseal has been regulated by CITES. The actual demand for goldenseal is not clear, but recent analysis by the American Herbal Product Association shows a decline over the last several years, with an increase of cultivated root supplying the market (AHPA 2003). Except for what is required by CITES, there are no efforts to inventory or monitor this medicinal plant. To conserve this, and other medicinal plants, will require more accurate assessment of the amount of raw materials harvested from the wild to meet market demand.

Associated Plants – Even a cursory examination of the range and habitats of the three species discussed will reveal that they share a lot in common. At one time, all were found from Canada south to Georgia. Today, their occurrences are shrinking throughout this native range. A review of their conservation status according to NatureServe (<http://www.natureserve.org/explorem>) indicates that where these species can be found is shrinking rapidly toward

the center of their respective ranges. Plant populations in marginal forest ecosystems have declined below a level that raise concerns for their conservation. Some medicinal species are considered extirpated in states on the perimeters of the range.

The medicinal plants, used as examples, do not live in isolation! There is a virtual cornucopia of plants that share the same habitats (Table 1). For example, bloodroot, mayapple, trillium, jack-in-the-pulpit are found in association with the medicinal species discussed above. Many of the associated plants also are harvested for medicinal values. When wild-harvesting from a healthy forest, one should expect to see many other species that are desired by the medicinal plant industry. The conservation of the medicinal plant industry will require focusing efforts on a multitude of species and taking a wholistic view toward conservation.

■ Understory herbs	■ Overstory tree species
■ Ginseng	■ Sugar maple
■ Black cohosh	■ American beech
■ Bloodroot	■ Red oak
■ Mayapple	■ Yellow birch
■ Trillium	■ Silver maple
■ Jack-in-the-pulpit	■ American basswood
■ Wild ginger	■ Black walnut
■ Trout lily	■ Butternut
■ Wild geranium	■ Hackberry
■ Hepatica	■ Red and black ash

Table 1. Forest plants associated with goldenseal and other medicinal plants.

FROM WHERE DO THESE PRODUCTS ORIGINATE?

In the mid 1700s, the Canadian sources for ginseng had been over-harvested and collection was heading south. By 1800, much of the Appalachian region had been settled, and many folks were collecting ginseng and other medicinal plants for personal use and for sale. The early settlers learned from the Native Americans that the forests of Appalachia were rich storehouses of medicinal plants. The forests of Appalachia have been, and continue to be, a source for the medicinal plant industry. This region is unique in its diversity of plants and culture.

The region, as defined by the Appalachian Regional Commission (ARC) includes land in 13 eastern states. It stretches from the Catskills of New York, south through the hardwood forests of Pennsylvania and ending in northern Alabama and Mississippi. The western border runs through middle Ohio, Kentucky and Tennessee. According to the ARC, the region encompasses all of western Pennsylvania and into southern New York. To the east, the region covers the Blue Ridge Mountain range into the Piedmont and terminates in north Georgia.

The forest landownership patterns of Appalachia clearly suggest that non-public forests are potentially the largest sources of medicinal plants. More than 86 percent of the forest lands in eastern United States are in private, industrial and non-industrial, ownership. Approximately 70 percent of all forest holdings are in non-industrial ownership. Federal, state and other public ownership, accounts for just about 12 percent of the forest lands. Of this, less than 7 percent is in national forests. Clearly, the largest source of medicinal plants may be non-public forest lands, although where the raw materials are being harvested from has not been determined.

The ecoregions that define Appalachia are known for their diversity of plants and animals. The diversity of some forests of Appalachia has been compared to the tropical rainforest. The number of plant species is outstanding. These are some of the most productive hardwood forests in the world. They have been the source of high valued hardwood timber for almost 400 years. During that time, these forests have also supplied the world with a tremendous diversity and quantity of high valued medicinal plants, as well.

Clearly American ginseng has many companion plants that share the same forests and markets. Ginseng is the 'prow of the ship' that drives the medicinal plant industry. Much of the consumers' awareness of herbal medicines is based on the association with ginseng. The harvest of ginseng is concentrated in 5 Appalachian states. More than 80 percent of the wild harvested ginseng is collected from West Virginia, Kentucky, Tennessee, Virginia and North Carolina. Assuming that medicinal plant harvesters are collecting more than ginseng, this sub-region is the source of the majority of herbal medicinal products from temperate hardwood forests.

Available records provide an indication of harvest concentration to the county level (Figure 2). Using data from the USDA Forest Service, USDI Fish and Wildlife Service and US Department of Commerce it is possible to estimate harvest levels of wild ginseng by county. The greatest concentration appears to be western Kentucky and southern West Virginia. These findings are supported by research from the Forest Service unit in Blacksburg that presents the perceived distribution of medicinal plant enterprises (Figure 3). The portrait created by these findings provides a basis to concentrate conservation efforts.

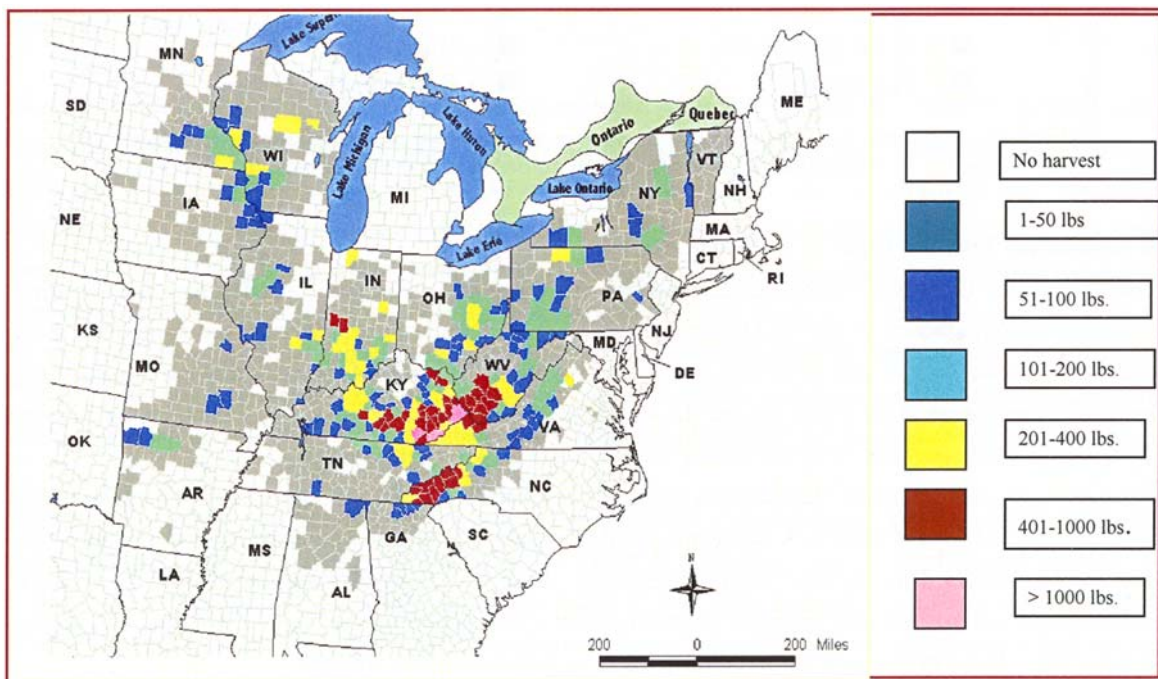


Figure 2. Harvest of wild American ginseng by county averaged for 1999 and 2000. (Adapted from Kauffman 2003)

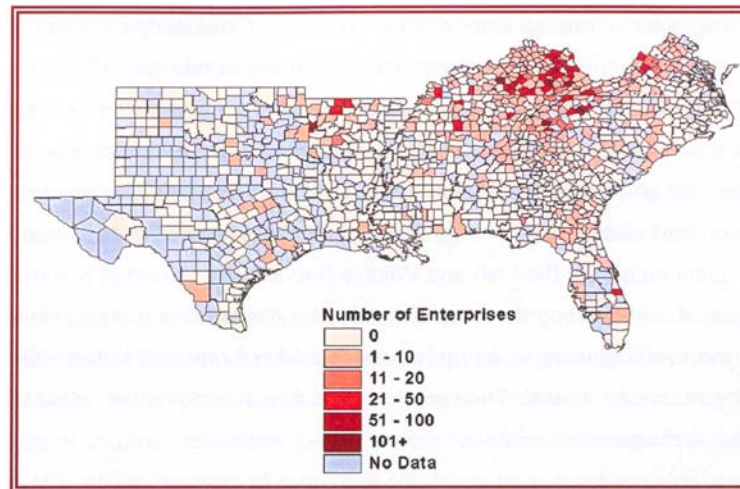


Figure 3. Perceived concentration of enterprises that deal with medicinal plants in southern United States.

Knowing where the medicinal plants originate, that feed the industry, is critical. Understanding where they go is just as important. The markets for medicinal plants from Appalachia are global; consumers in countries world-wide are buying herbal remedies made from plant harvested in Appalachia. European countries, particularly Germany, demand more than 40 percent of the global harvest of herbal medicines, while Asian countries consume about 30 percent of the market (Genetic Engineering News 1997). The USA and other North American countries make up just about ¼ of the market demand. Understanding the global implications and ramification is essential to conserve the industry.

HOW VALUABLE IS THIS INDUSTRY?

A general perception among many foresters and forest managers is that the economic value of medicinal plant industry is insignificant. But available evidence suggests a vibrant and multi-billion dollar industry. In 2000, the herbal medicine market in the U.S. was estimated at \$5 billion, representing a 25 percent increase over the previous two years (Brevoort 1998). The following year, retail sales of black cohosh were estimated at \$6.2 million (Blumenthal 1999). Around that same time, the annual wholesale value of wild ginseng was around \$25 million. These figures represent the 'tip of the iceberg' that defines the industry. Clearly the aggregate of all medicinal plant trade would dwarf these numbers.

The previous examples are evidence of the magnitude of the industry, but they do not demonstrate the dynamics of the market. An analysis of the trends provide insight into what the markets are doing, where they are going and what can be expected. Some evidence suggests that demand for some products is increasing, while other evidence suggests demand is decreasing. In one year, ending in the middle of 1998, retail sales of Black cohosh increased about 500 percent (Blumenthal 1999). In 2001, demand for this plant increased about 2 percent, while demand for many medicinal plants was decreasing. Conservation of the industry will require a clear understanding of the market dynamics that illustrate the directions the market is moving.

Understanding the amount of raw materials that are harvested from the wild is essential to conserving the industry. Without an accurate estimation of the demand for all wild-harvested medicinal plants from Appalachia determining sustainable harvest levels is difficult. Very little information is available, but that which is gives us valuable insight. Evidence suggests that demand for Black cohosh roots has increased from 183,000 pounds in 1999 to more than 500,000 in 2002 (Predny and Chamberlain 2005). Likewise, in 2000 approximately 250,000 pounds of goldenseal

was demanded, representing a 15% increase since 1931 (Predny and Chamberlain 2005a). The problem with this latter figure is that the time frame is so long that inferences concerning trends are difficult. Our understanding of the market dynamics would be much improved with annual data of market activities over the last 10-20 years.

The need for accurate and reliable data can not be stressed enough. A comparison of data for wild-harvested ginseng and the export of wild ginseng reveal a 100 percent discrepancy between the two sources of information. The estimated value of exported wild ginseng, using Department of Commerce data, was about \$59 million in 2001. Wild-harvested ginseng, using data from the Fish and Wildlife Service was valued at \$28 million that same year (Figure 4). In 2001, the amount of wild ginseng that was reported as exported was almost twice as much as the amount of wild-harvested. Either more wild ginseng is being harvested and not reported to the Fish and Wildlife Service, or cultivated ginseng is being marketed at wild. The reality is probably a combination; more wild is harvested than reported and some cultivated is marketed as wild.

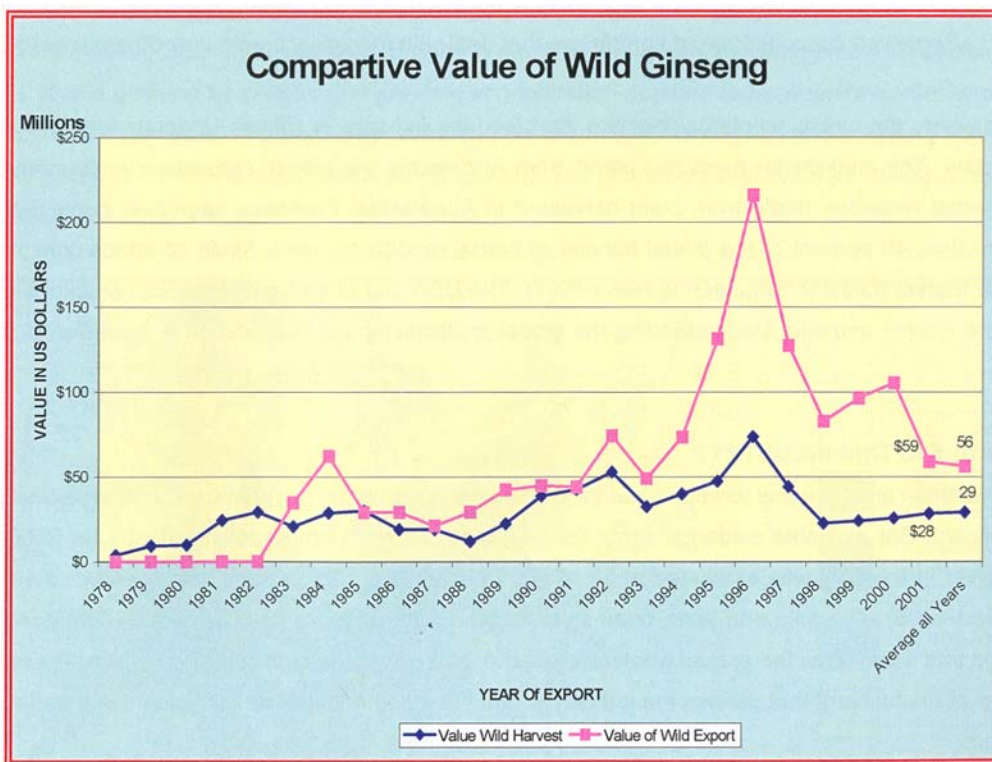


Figure 4. Comparative value of wild-harvested and wild-exported ginseng, based on data from U.S. Fish and Wildlife Service and the U.S. Department of Commerce.

WHO IS INVOLVED?

The people of Appalachia have been relying on their forests for livelihood for generations. Though timber may have been the dominant industry, it was certainly not the only forest based industry. Loggers, hunters and woodsmen regularly gathered products from the forests. Many families who were not in the ‘timbering’ business collected medicinal plants for sale and consumption. Many collectors can trace their heritage with medicinal plants back several generations. Traditional ecological knowledge that collectors have gained and shared through generations is critical in understanding the fundamentals of NTFP management.

Medicinal plant harvesters are under-represented stakeholders in forest management. In general, they are not organized, nor adequately represented by advocacy groups. They have no unified voice to represent their views,

concerns, and suggestions. Often collectors may be apprehensive of getting involved in government activities, not wanting others to know how much or from where the raw materials are collected. Often there is a perception that the government will 'shut-down' collection and trade of medicinal plants. Medicinal plant harvesters would rather be left to their own than to interact with outsiders who might put greater restrictions on collection activities. But, conservation strategies and management activities must actively reach out to local collectors. To conserve the medicinal plant industry it is essential that harvesters are included in dialogue, diagnostics and decisions.

Forest management decisions can drastically affect collectors' livelihoods and their spiritual well being. For some collectors, the income gained from the sale of medicinal herbs is a major portion of their annual income. Certainly, for many collectors, the income is "extra money" and an important component to the overall household budget. When there was no other source of income, collectors' predecessors relied on the sale of medicinal plants for their cash needs. Today, collectors still rely on the sale of medicinal plants as an economic 'safety-net.' Greater restrictions on collection of medicinal plants could have significant impact on the collectors' lives. Special efforts are needed to identify the collectors and to get their collaboration on improving forest management to conserve medicinal plants. Conservation strategies will require understanding and respect for these peoples' views and uses of the medicinal plant resources.

There is a general belief that as demand for medicinal plants has been increasing the number of collectors also has been increasing. New collectors are attracted by reports of sky-rocketing prices, as well as a decline in job opportunities. News of increasing prices for medicinal plants, increasing demand for finished products, and perceived ease of collection draw folks with a penchant for wild-harvesting. Wild-harvesting may appeal to people living on the 'edge of society' who do not want to 'conform' to more conventional 'ways-of-life.' Often in discussions among scientists and other stakeholders, the concern is voiced that this 'new-generation' of harvesters lacks the skills and ethics to conserve the medicinal plants. Whether this is true, or not, these folks need to be included in efforts to conserve the medicinal plant industry.

The enterprises and people who work between the harvesters and final consumers should have a vested interest in the conservation of the medicinal plant industry. These enterprises can not exist without a sustainable source of raw materials. They depend on customers who believe that the products are effective, safe and healthy. The livelihood of medicinal plant enterprises along the value chain relies on having secure sources of materials and devoted consumers of the products. Efforts to conserve the industry demand involvement of these 'middle-organizations.'

The final consumers are essential partners in efforts to conserve the medicinal plant industry. Without these folks purchasing product, the industry will not last. With every purchase, these people make decisions regarding the products' efficacy and effectiveness. Folks who consumer herbal medicines are perceived to be more concerned about the environment and the impact that their purchasing behavior has on natural resources. If this perception is true, then herbal medicine consumers should be concerned about the conservation of medicinal plants. Knowing that the product that they purchase comes from sustainably managed forests may influence consumers' decisions. Consumers of forest-harvested medicinal plants may be willing to remit a premium price for products that originate from conservation managed forests.

EXPANSION OF FOREST MANAGEMENT

The forestry profession has more than 100 years of data on managing forest resources for timber. Foresters know how to grow trees! The population biology of trees is fairly well understood. Growth and yield models, inventory, and monitoring protocols for trees are well developed and in place. The depth of knowledge on wildlife management is not as great, but significant advances have been made in this area. The knowledge of how to manage for many game species is readily understood and available. The value of managing forests for hunting and fishing is clearly recognized. The science of managing forests for other resources, such as water, recreation, and wilderness, has also received considerable attention. The management of recreational opportunities is well understood, and is a recognized objective in multiple-use management plans. In contrast, the body of knowledge on managing for medicinal plants is fledgling and seriously inadequate.

Little information is available on managing the forests' ground cover, herbaceous plants, shrubs or trees for medicinal products. In many cases, not much more is known than the botanical and ecological descriptions of the plants and their environments. Anecdotal evidence can be found for species that have had an important role in American folk history. Some of the more popular forest herbs (e.g., ginseng and goldenseal) have been the focus of scientific research. Few, if any, silvicultural prescriptions for natural forests consider medicinal products. In general there is a paucity of information on all aspects of medicinal plant management. Much more work is needed to develop a comprehensive body of knowledge on how to manage for medicinal plants; just as other forest resources are managed.

The biological and ecological knowledge needed to make sound management decisions concerning medicinal plants are lacking. For many of the plants little is known about their ecological requirements. Certainly, very little is known about the relationships with associated flora and fauna. For many products, the response to collection and the rate at which these resources respond to collection must be determined to manage the resource sustainably. Further, the reproductive biology of many medicinal plants is not clearly defined. Many forest managers may know that certain species exist within the forests, and skilled managers could find populations of these plants. But no inventories have been done, nor do the protocols exist to allow managers to inventory and monitor populations. The lack of knowledge about the markets for medicinal plants is just as wanting as the knowledge about silvicultural management. And yet, management decisions are being made that could seriously impact use of this resource.

The need to include medicinal plants in forest management plans is urgent. Fewer than 25 percent of the management plans for national forests of eastern United States address these resources. Surely the coverage in management plans for industrial forest lands is even less. As the majority of non-industrial private forest lands have no written management plans, the need to get medicinal plants included in this sector is even greater. Clearly there is an urgent need to educate foresters of the importance of including medicinal plants in management planning for all forest lands.

WHAT WILL IT TAKE TO CONSERVE THE INDUSTRY?

The conservation of the medicinal plant industry will take a concerted effort in three areas. The plants need to be recognized and accepted as natural resources that require management similar to other forest resources. The ecological impact of harvesting medicinal plants must be clearly documented, explained and articulated. Once this has been done, efforts can be made to develop and implement adaptive management practices. Although, scientific knowledge about managing forest resources for medicinal plants may be lacking, actions can be taken to improve conservation efforts before ecological research results can fill the many knowledge gaps.

The harvesting of medicinal plants provides tremendous economic benefits to people and communities worldwide. From the local harvester, to distant manufacturers and retailers, the medicinal plant industry has significant economic impacts. In general these are not well documented, nor adequately considered when defining the value of

the forest industry. The value to local economies, in particular, needs to be accurately estimated and integrated into forest management decisions. Medicinal plant conservation efforts must elucidate and demonstrate the tremendous value of medicinal forest resources.

The conservation of the medicinal plant industry will take a committed effort by the people who are directly, and indirectly involved. People along the entire value chain have an interest in making sure that the industry is conserved for future generations. The harvesters rely on collection of medicinal plants to maintain daily sustenance. The existence of medicinal plant enterprises depends on having the raw materials and the final consumers. Foresters and forest managers, though not directly involved in the medicinal plant markets, need knowledge and support to ensure that forests can supply the raw materials. The clients of foresters working with non-industrial landowners would greatly benefit from more guidance on alternative uses of their forest resources. Successful conservation strategies call for the cooperation and collaboration of all stakeholders

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Appalachian Opportunities

Medicinal and Aromatic Plants

Producing, Using, and Marketing Herbs and Non-Timber Forest Products

Proceedings

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