

NON-TIMBER FOREST PRODUCTS IN SUSTAINABLE FOREST MANAGEMENT

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Abstract--The forests of Southern United States are the source of many non-timber forest products (NTFPs). The collection, trade and use of these products have been important to rural economies since Europeans settled in this country. At the same time the plants from which these products originate are crucial to healthy ecosystems. Over the last decade, the market demand and the interest in managing forests for NTFPs has grown tremendously, which has generated concern for the ecological sustainability of forest resources from which they are produced. The health and functioning of the forest ecosystems and the associated rural communities depend on the sustainable management of the NTFP resources. And yet, the scientific knowledge of these products is not well developed. Sustainability and the full range of benefits cannot be realized unless non-timber forest products are included in the scientific management of the forest resources. We examine the status of forest management for non-timber products and discuss issues critical to sustainable management for these products.

INTRODUCTION

Southern forests produce more than timber, wildlife and water. They are a vast storehouse for non-timber forest products; the diversity of which complicates development of appropriate management policies and practices. These products have enormous social, economic and ecological value to the residents, communities and forests. Yet, they are not adequately recognized as natural resources, nor managed as such.

Sustainable forest management is built on the principle that forest management will meet current societal needs without prejudice to future generations, or the forests' abilities to rejuvenate and maintain existing stature. This concept embraces three fundamental standards: 1) forest management is socially acceptable and equitable, 2) the impact is ecologically benign, and; 3) the economic impact to local communities is positive. The Montreal Process, an international agreement for sustainable management of temperate forests, provides national level criteria and indicators to assess efforts to fulfill these three principles.

In general, forest management for non-timber products fails to meet the criteria and indicators for sustainable forest management. But, efforts to manage the national forests for NTFPs are developing and well ahead of management efforts on private lands. Recent policy developments could force public forest management agencies to address non-timber forest products. Yet, many critical issues impede further progress to implement and embrace the criteria and indicators for sustainable forest management.

NON-TIMBER FOREST PRODUCTS

Various terms (e.g., non-traditional, secondary, minor, non-wood, and special or specialty) have been used to describe products that come from the forests that are not timber-based. Recent legislation uses the term "Forest Botanical Products" to describe these products (H.R. 2466 1999). The USDA, Forest

Service defines them as special forest products (USDA Forest Service 2001). But, a more common and widespread term is "non-timber forest products."

Non-timber forest products (NTFPs) are plants; parts of plants, fungi, and other biological material harvested from within and on the edges of natural, manipulated or disturbed forests. NTFPs include fungi, moss, lichen, herbs, vines, shrubs, or trees. Plant parts harvested include the roots, tubers, leaves, bark, twigs and branches, fruit, sap and resin, as well as the wood (Chamberlain and others 1998). These products are currently classified into four major product categories: culinary, wood-based, floral and decorative, and medicinal and dietary supplements. Culinary non-timber products include mushrooms, fruits, ferns, and perhaps most important, *Allium tricoccum* (Ramps, wild onions).

Wood-based NTFPs are produced from trees or parts of trees, but not timber-sized trees. Some of the more important wood-based NTFPs include *Sassafras albidum* (sassafras) stems for walking sticks, *Salix spp.* (willow) branches for furniture, and *Taxodium distichum* (Baldcypress) knees for carving.

Many forest species are harvested and used in the floral industry as compliments to flower arrangements. The leaves of *Galax urceolata* (Galax), and evergreen herbaceous perennial, are collected and exported to Europe for background foliage. *Lyonia ferrugenia* (crooked-wood) from the forests of Florida is used to compliment dry flower arrangements. *Vitis spp.* (grapevine), collected throughout the region is crafted into wreaths, baskets and other sundry items. Several species of moss are harvested from Appalachian forests for the European floral industry.

The number of plants from the southern forests with medicinal value exceeds 125 (Krochmal and others 1969, TRAFFIC 1999). Of these, approximately 50 are commonly harvested and purchased by herb dealers. More than 90 percent of the forest-harvested ginseng comes from Virginia, Kentucky, Tennessee and North Carolina. During a twenty-year period (1978-1998), the average annual harvest from these southern states was approximately 53,000 pounds.

Many non-timber forest products are found only in southern United States. The longleaf-slash pine forest ecosystem that borders the Atlantic and Gulf coasts from South Carolina to Texas (USDA Forest Service 1984) is the source of many economically important products, including pine straw and naval stores. Baldcypress knees, harvested for woodcarving, are found in the swamps of the coastal plains (Harlow and others. 1991). The pine forests of Florida are the primary world source of *Serenoa repens* (saw palmetto), and popular medicinal plant. The Appalachian hardwood region is the principal source of the many medicinal plants, including *Actaea racemosa* (Black cohosh), *Panax quinquefolium* (American ginseng), and *Sanguinaria canadensis* (Blood root). Forests from the coast to the mountaintops are reservoirs of medicinal, edible, and floral products.

Though no formal estimates have been made of the total value of the NTFP markets in this region, available data illustrates the economic importance of some products. For example, in 1995, the U.S. exported moss and lichen, much of which was from southern forests, valued at more than \$14 million (Goldberg 1996). In 1996, collectors of the fruit of *Juglans nigra* (black walnut) were paid more than \$2.5 million (Jim Jones, personal communications). One company, specializing in pine roping, in southwest Virginia had sales in excess of \$1.5 million in 1997 (Hauslohner 1997). A volunteer fire department in western North Carolina generates approximately 35 percent of its budget

from its annual ramp supper. In 1999, the retail sales of saw palmetto exceeded \$45 million, representing a 34 percent increase over the previous year (Blumenthal 2000). Based on 2001 prices, we estimate the average wholesale value of forest-harvested ginseng to collectors in a four state region exceeds \$18.5 million. Certainly, the aggregate value of non-timber forest products to the southern economy far exceeds these examples.

MANAGING FOR NON-TIMBER FOREST PRODUCTS

NTFPs and National Forest Management

Although, NTFPs have significant economic value, they are not explicitly recognized in legislation as natural resources to be included in multiple-use management. In the 1980s, when the first national forest management plans were developed, management for non-timber products did not emerge as an issue of public concern. Even though there was no explicit mandate for management of these products, nor were they identified as a public issue, seven out of thirty-two (approximately 22 percent) national forest plans of eastern United States addressed NTFPs to some extent. The only forest plan in the southern United States to include NTFPs is the one for the National Forests of Florida (Florida NF LRMP 1985).

Only two of the revised forest plans address management of NTFPs. The National Forests of Florida now have forest-wide standards and guidelines for special forest products and designate the District Rangers as the responsible party for establishing appropriate restrictions on the collection of seventeen recognized special forest products (Florida NF LRMP 1999). The 1998, draft revised forest plan for the Croatan National Forests provides forest-wide management direction concerning production of pine straw (Croatan NF LRMP, Draft 1998). It recognizes the need for habitat manipulation to ensure sustainable production of pines straw, and provides prescriptions for fertilizer application and prescribed burning to maintain site productivity.

Currently, seven national forests in southern United States are revising their management plans. Non-timber forest products have not emerged as a management issue on any of these national forests. As the revision process is still underway this situation may change.

Two other national forests have taken action to manage for NTFPs, even though these products are not addressed in their existing plans. Over the last decade, the National Forests of North Carolina have undertaken several studies to determine the effect of harvesting on key species. From 1988 through 1992, the North Carolina National Forests' issued approximately 1,300 permits for NTFP collection. In 1999, the North Carolina forests initiated a comprehensive program to improve the understanding of the ecological, social and economic impact of NTFP activities on their southern Appalachian forests (USDA Forest Service 1999). It is designed to provide inventories, define and track market trends, and identify and assess potential strategies to conserve the resource. 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 ways to make management policies more consistent within and across national forests.

In 1991, the management team of the Ozark-St. Francis National Forest raised concern about the long-term sustainability of ginseng (Leeds and Leeds 1991). By 1995, a ginseng task force had identified several factors that inhibited sustainable management for ginseng, including the lack of National Environmental Protection Act analysis and documentation, inadequate inventories, and insufficient funding for management programs. Over the next

5 years, the Ozark-St. Francis management team implemented several practices to improve management. But, in 2000 the policy toward ginseng shifted dramatically, when the management team reached the conclusion that the best course of action was a complete, 5-year, moratorium on ginseng collection (Hayworth 2000). This action will eliminate legal collection, and shift pressure from the national forests onto private forestland.

NTFPs and Private Forest Management

Sustainable management for non-timber forest products is desperately needed on private forestlands, which cover more than 90 percent of southern forests. Management for these products on private forestlands lags significantly behind activities on national forests. There are few examples of private landowners incorporating NTFPs into forest management activities. A few progressive extension agents and small local non-governmental organizations are promoting the cultivation of NTFPs on private forestlands. But, the real challenge is for widespread integration of NTFPs into forest management on private lands. The greatest need is to make sustainable NTFPs management economically and socially attractive for private landowners, and to provide these landowners science-based knowledge on NTFPs.

Though the non-industrial private forest (NIPF) landowners control almost 70 percent of the southern forests, they are less likely to integrate NTFPs into forest management. Because many NIPF landholdings lack any management plans, and are typically smaller than industrial holdings, the economic feasibility of managing for NTFPs is drastically reduced. Further, the objectives of NIPF owners may not be conducive to including NTFPs. Perhaps the greatest risk to NTFP sustainability on private non-industrial forestlands is habitat fragmentation and loss due to housing development. To reduce this will require local policy initiatives.

POLICY DEVELOPMENTS THAT AFFECT NTFP MANAGEMENT

Two recent policy initiatives could have significant impact on how public forests manage for NTFPs. In February of 1999, the U.S. Congressional Subcommittee on Forestry and Public Land Management convened a hearing to explore opportunities and constraints to increase harvesting of non-timber forest products on national forest land. By the end of that year, national legislation had passed to establish a pilot program to manage non-timber forest products (H.R. 2466 1999, section 339). The Bill directs that appraisal methods and bidding procedures be established that guarantee that collection fees reflect fair market value. It requires that collection fees include all costs associated with administering a program, including any environmental or biological assessments. In addition, the Bill requires the Secretary of Agriculture to determine sustainable harvest methods and levels, and to establish procedures for monitoring and revising harvest levels.

The Forest Service recently issued the "National Strategy for Special Forest Products" (USDA Forest Service 2001) to guide the agency in managing NTFP resources. The strategy recognizes a need to have clear, comprehensive and fair policies toward non-timber forest products. It sets forth principles and priority areas to provide a basis for a plan of action to address the issue of managing for NTFPs. To direct management efforts, the strategy established five goals: 1) ensure availability of NTFPs within ecosystem limits; 2) integrate NTFPs into forest management; 3) have consistent and affective policies and plans; 4) inventory and monitoring of resources; and, 5) collaborate with stakeholders.

NTFPs AND THE MONTREAL PROCESS

Just as the two policy initiatives encourage sustainable forest management, international agreements provide additional support for improved management. The Montreal Process reflects an ecosystem approach to sustainable forest management. Of the seven criteria defined in the Process, only three directly target non-timber forest products (Montreal Process 2000). But, they address a range of issues that are needed to obtain the goal of sustainable forest management for NTFPs. Forest management activities must "maintain the productive capacity of forest ecosystems" (Criteria 2). Acceptable forest management practices "sustain and enhance the long-term multiple socio-economic benefits to meet the needs of society" (Criteria 6). And the "legal, institutional, and economic frameworks" are established for the conservation and sustainable management of non-timber forest products (Criteria 7).

The Montreal Process defines 10 formal indicators to measure achievement of these criteria. The annual removal of NTFPs relative to the level determined to be sustainable is the indicator for maintaining productive capacity of the forest ecosystem. Five indicators demonstrate long-term multiple economic benefits for society, and include measuring the trends in value and volume of NTFP harvests, presenting evidence of the relative value to Gross Domestic Product, the extent that supply meets demand, the contribution to overall employment, and the wage and injury rates relative to the workforce. Five indicators provide evidence that the legal, institutional and economic frameworks are established and functioning. A prime indicator of this is the provision provide for periodic forest-related planning, assessments, and policy reviews and coordination with relevant sectors. Other indicators address the availability of reliable and current data to measure, monitor, and report on the indicators associated with the criteria. Indicators extend to international cooperation and collaboration, as well as the integration of environmental and social costs and benefits into a national environmental accounting system. These criteria and indicators provide an internationally acceptable structure to assess management efforts.

ISSUES THAT IMPEDE SUSTAINABLE MANAGEMENT FOR NTFPS

The criteria and indicators provide guidance in determining issues that need to be addressed to achieve sustainable NTFP management. The model for sustainable forest management is based on three fundamental principles. First, management activities are to respect social and cultural needs, be equitable and fair. Second, the ecological impact of management should be benign, if not positive, toward the long-term sustainability of the biological diversity, and the balance of relationships within forest ecosystems. Finally, the economic impact to rural communities should remain equal or improve, and show signs of continued and sustainable positive growth. To achieve these three pillars will require institutional changes that encourage development of a dynamic collaborative process to manage for these socially, ecologically, and economically significant products.

Social and Cultural Factors to Address

Sustainable forest management is considerate of the needs, rights, and traditions of NTFP collectors. They are under-represented stakeholders in the forest management planning process, not organized, nor represented by any advocacy group. They may be apprehensive of getting involved in government activities, not wanting others to know how much is collected or from where the material was collected. But, management activities need to consider and respect traditional gathering patterns and practices. At the same time, many collectors have a long history and strong cultural ties with non-timber forest products. Many can trace their heritage and relationship with non-timber forest products back several generations, to the first contact with

Native Americans. This traditional ecological knowledge is critical in understanding the fundamentals of NTFP management.

Collector's knowledge is critical in developing and implementing sustainable forest management practices. Management decisions can drastically affect these people's livelihoods and their spiritual well being. For some collectors, the income gained from the sale of NTFPs is a major portion of their annual income. Certainly, for many collectors, the income from NTFPs is "extra money" and an important component to the overall household budget. A moratorium on collection of NTFPs, or an increase in permit costs 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. Sustainable management strategies will require understanding and respect of these peoples' views and uses of the NTFP resource.

Ecological Factors to Consider

The ecological issues, if not addressed, could result in long-term, and perhaps permanent decline in biological diversity. If they are not comprehensively examined, assessed, and dealt with, future management strategies may be more inclined toward strict protection of the NTFP resources, as opposed to conservation or utilization. Already there is evidence that suggests an inclination toward a preservation strategy. But, a status quo management strategy could lead to long-term, irreversible negative impact on the southern forests. Under current management strategies, NTFP populations may decline to such low levels to initiate the statutes of the Endangered Species Act. Forest management agencies would be required to initiate a protection strategy that would make collection illegal. Therefore, to manage for conservation and utilization, the status of NTFP populations cannot drop below that critical level.

Unfortunately, the science-based knowledge does not exist to ensure that harvest levels won't reach these levels. The current state of the scientific knowledge cannot adequately determine sustainable harvest levels. Research is needed to examine and determine the effects of harvesting on local plant populations, as well as the impact on associated forest ecosystems. Basic knowledge of the population dynamics of most NTFPs is required. Further, base line inventory data, as well as regular monitoring of populations are essential in developing sustainable forest management strategies. Current supplies, as well as regeneration rates are key elements in determining sustainable harvest levels. Management decisions will continue to be based on incomplete, and perhaps inaccurate information until the science has been done to answer the most fundamental questions. Sustainable forest management will remain elusive until knowledge concerning NTFPs is developed where it can support management decisions.

Economic and Market Factors that Impact NTFP Management

Unlike timber, the economic value of non-timber forest products is not well defined nor understood. For the most part, the NTFP economy remains an enigma. Currently, the volumes and/or values of NTFPs do not get documented until they reach regional or national markets. Though the overall value of some sectors (e.g., herbal medicinal) is documented, little is known of the economic and market value of forest-harvested products compared to cultivated products. Economic and market data is essential in determining fair market value, as well as setting fair and equitable rates for collection permits. Though demand figures for some products (e.g., ginseng) may be available, in general very little is known about the demand for most products. Knowledge of the value of NTFPs to rural communities and households is lacking, and yet

this information is needed to influence policies for sustainable forest management. Policy and decision makers need to be aware of the economic importance of NTFPs to rural communities. Further, accurate and reliable data on the supply and demand for non-timber forest products is essential to determine sustainable economic harvest levels.

INSTITUTIONAL FACTORS TO OVERCOME

To address the issues that affect the basic principles of sustainable forest management will require eliminating institutional deficiencies. Three major institutional weaknesses have potential to thwart sustainable forest management efforts. First, in general, current staff levels and expertise are inadequate to deal with non-timber forest products. Over the last decade, staff levels in the Forest Service have decreased, while the pressure to "do more" has increased. Putting demands on existing staff, to take on more responsibilities to manage for these products is unrealistic. This would be further exacerbated by an attitude among many forest managers that NTFPs are "a thorn" which they would be happy to see "go away." Even if staff were willing to manage for these products, the skills and expertise needed to do so are neither readily available nor adequately developed. Existing staff needs training in a multitude of areas, including NTFP silviculture, monitoring protocols, and inventory methods. Or, new staff with the required skills needs to be secured. Unfortunately, in the current economic environment hiring new staff is highly unlikely. Major efforts, therefore, are needed to improve the attitudes of forest managers that NTFPs are natural resources that require management, and to provide these people with the skills and training needed undertake this new demand on their time.

The second, and perhaps the greatest, institutional impediment to sustainable management of NTFPs is that the biological materials from which these products originate are not recognized nor treated as other natural resources. National legislation that guides the management of natural resources on national forests cover a multitude of resources, including water, fish and wildlife, recreation, timber, and minerals. The legislation provides unequivocal language directing management agencies to address these resources. Though, non-timber forest products may be implied in some laws, particularly in the National Forest Management Act (1976) and in the Multiple Use Sustained Yield Act (1960), there is no explicit law requiring national forests to manage for NTFPs. Further, there are no directives for the agencies to address these products on state and private forestlands. This lack of an explicit mandate allows for interpretation of policies that is not encouraging for sustainable management of these resources.

The lack of a clear mandate relegates NTFP activities to other administrative units, which are already overwhelmed by their primary responsibility. For example, in the Forest Service, NTFP activities fall within the timber management unit. The drastic reduction in timber harvests, and subsequent budget cuts, greatly hamper the ability of this unit to manage for NTFPs. Until NTFPs are fully recognized as natural resources, and the agencies and administrative units are provided sufficient authorizing language and support, "more important" issues will dominate management activities.

Even with authorizing language, agencies will find it difficult to manage for non-timber forest products, unless that authority is accompanied by new and more fiscal support. The third major institutional impediment is the severe lack of funding to support sustainable forest management activities. Over the last decade revenues, as well as appropriations to support forest management on public lands have declined drastically. It is extremely difficult for

forest management agencies to do what is currently required, let alone do more (i.e., increase management of NTFPs), with existing funding levels. Unfortunately, in the present economic environment, there is little potential for new funding, unless the people who are in positions to allocate scarce resources are made aware of the economic, ecological, and social value of these products. Sufficient funds will not be available for sustainable management of NTFP resources until the full importance of these products to household, community, and regional economies are recognized and acknowledged.

SUMMARY

Sustainable management of the NTFP resources is important, and the Forest Service is increasing its efforts to manage them. Unfortunately, institutional barriers hamper the agency's efforts to address the related social, economic and ecological issues. Significant increases in designated funds, as well as staff training and technical support are needed. In addition, private forestland owners would benefit tremendously from science-based information and knowledge on NTFPs. Management efforts would benefit from having a designated administrative "home" for non-timber forest products, similar to that which is found for other natural resources. A collaborative effort between Region 8 (National Forest System, State & Private Forestry) and the Southern Research Station to create a center for NTFPs, similar to the Center for Aquatic Technology Transfer, would provide the research and technical support that public and private forest managers need to improve management activities. With these changes, management agencies will be better equipped to address the sustainability issues.

Sustainable management for non-timber forest products requires consideration of three types of issues (ecological, economic, and social). The potential ecological impact of over-harvesting under current management strategies could be devastating for entire NTFP populations. The biological material, harvested for NTFPs, is a critical part in the functioning of healthy forest ecosystems. Unfortunately, current scientific knowledge cannot adequately determine if harvest levels and practices have long-term ecological impact on the NTFP resources. To rectify this will require new and additional funds to support targeted, basic and applied, ecological research and technology transfer. The collection and trade of these products is crucial to the economic well being of rural people and communities. Hence, the loss of access to gathering areas, or a significant decline in plant populations could have tremendous economic impact to the collectors and associated businesses. Knowledge from research about the economic impact of NTFP activities is needed to influence policies to support the sustainable management of the region's forests. Finally, as many place recreational importance on gathering NTFPs, the social value gained from harvesting NTFPs is vital to local communities and need to be understood. The wealth of traditional ecological knowledge could offer valuable insight into improving management. This valuable opportunity may be threatened if collection is banned or if it is no longer feasible due to species loss. To achieve sustainable forest management of NTFPs will require a concerted effort to address all of these issues.

REFERENCES

Blumenthal, M. 2000. Saw Palmetto Gets Strong Public Boost: USP publishes monograph and *Consumer Reports* Gives Thumbs Up, Recognizing Benefits for BPH. *HerbalGram* 50:32-37.

Chamberlain, J., R. Bush, and A.L. Hammett. 1998. "Non-Timber Forest Products: The Other Forest Products." *Forest Products Journal*. 48(10):2-12.

Croatan NF LRMP. 1998. Land and Resource Management Plan for the Croatan National Forest. U.S. Department of Agriculture, Forest Service. Southern Region, Atlanta, GA. 150 pp. + Appendices. Draft.

Florida NF LRMP. 1985. Land and Resource Management Plan: National Forests in Florida. U.S. Department of Agriculture, Forest Service, Southern Region. Atlanta, GA. 100 pp. + Appendices.

Florida NF LRMP. 1999. Revised Land and Resource Management Plan for National Forests in Florida. USDA, Forest Service, Tallahassee, FL. February. 100 pp.

Goldberg, C. 1996. From necessity, new forest industry rises. National Report Section, New York Times, Sunday March 24. p. 1.

Harlow, W.M., E.S. Harrar, J.W. Hardin, and F.M. White. 1991. The Textbook of Dendrology. McGraw-Hill Series in Forest Resources. 7th edition. McGraw-Hill, Inc. New York. 501 pp.

Hauslohner, A.W. 1997. Couple builds green empire with pine-roping outfit. Metro Edition, Roanoke Times, December 6. p. A1.

Hayworth, C. 2000. Biologists hope harvesting ban will save Ginseng. *Arkansas Democrat Gazette*. Section B, Monday, June 26. p. 1.

H.R. 2466. 1999. Department of the Interior and Related Agencies Appropriations Act, 2000, U.S. House of Representatives Bill, sent to the President October 1999.

Jones, Jim. 1998. Personal communication. Vice President, Hammons Products Company, Stockton, Missouri.

Krochmal, A., R.S. Walters, and R.M. Doughty. 1969. A Guide to Medicinal Plants of Appalachia. USDA, Forest Service Research Paper NE-138. Northeastern Forest Experiment Station, Upper Darby, PA. 291 pp.

Leeds, G. and L. Leeds. 1991. New Perspective: Memorandum to the District Ranger. USDA, Forest Service, Ozark-St. Francis National Forest. Russellville, AR. 3 pp.

Montreal Process. 2001. "Criteria and Indicators for the Conservation and Sustainable Management of Temperate and Boreal Forests." Technical Notes. April. <http://www.tbs-sct.gc.ca/rma/eppi-ibdrp/result/docs/CR61.htm> September 21, 2001

Multiple Use Sustained Yield Act (MUSYA). 1960. U.S. Code 74 United States Statute at Large 215.

National Forest Management Act (NFMA). 1976. U.S. Code 90 United States Statute at Large 2949.

TRAFFIC North America. 1999. "Medicine from U.S. Wildlands: An Assessment of Native Plant Species Harvested in the United States for Medicinal Use and Trade and Evaluation of the Conservation and Management Implications. Unpublished report to the National Fish and Wildlife Foundation. World Wildlife Fund, Washington, DC. 21 pp. + Appendices.

USDA Forest Service. 1984. Regional Guide for the Southern Region. Southern Region. Atlanta, Georgia. 100 pp. + Appendices.

_____. 1999. Forest Botanical Products: Maintaining Sustainability and Responding to Socio-economic needs in the Southern Appalachia. A Program of Work. National Forests of North Carolina, Asheville, NC.

_____. 2001. National Strategy for Special Forest Products. U.S. Department of Agriculture, Forest Service, Washington, DC. 8 pp.