EXPANDING FOREST MANAGEMENT TO INCLUDE MANAGEMENT OF NONTIMBER FOREST RESOURCES

James L. Chamberlain[1]

Abstract—The central hardwood forests of the United States are the source of many nontimber forest products (NTFPs), most of which originate from the understory flora. The collection, trade, and use of these products have been integral to rural economies since Europeans settled this country. Over the last decade, market demand for NTFPs and interest in managing forests for them have grown tremendously. Increased collection has led to concern about the ecological sustainability of the forest resources from which these products are harvested. The health and functioning of forest ecosystems and associated rural communities depend on sustainable management of NTFP resources. And yet, the science of managing the forests for these products is not well developed. Sustainability and the full range of benefits most likely will not be realized unless scientific management of forest resources includes scientific management of NTFPs. Understanding the extent that NTFPs occur in forests and the breadth of the markets for these products is crucial to improving scientific management. To maintain and enhance the long-term socio-economic benefits that rural collectors and processors realize from NTFPs depends on shifting the forest management paradigm to include nontimber forest resources.

INTRODUCTION

Forest management has evolved over time to reflect changes in society. "People now wish to use their forests for all sorts of purposes and forest management reflects this change" (Davis and Johnson 1987). In their seminal text these authors point out that "forest management is now directed at helping people achieve whatever goals they have for their forests." It entails meeting the objectives of landowners and society through manipulations of forest resources. Managing forests for nontimber goals is considered a major objective of private forest landowners who are interested in joint production of timber and other forest amenities (Amacher and others 2004). Legislation now mandates that national forests be managed for multiple uses.

In the early 1990s, the paradigm that guides forest management began a slow and unsure shift to include the floral and fungal botanical species that are gathered for personal and commercial uses. Market forces, such as bumper crops of forest mushrooms, increased availability of low-paid migrant workers, and shifts in public policy have fostered an atmosphere that encourages consideration of forest resources harvested for products other than timber in management planning and implementation. As a result, interest in and concern for nontimber forest products (NTFPs) that are harvested for commercial purposes increased tremendously.

In North America, international trade in forest botanicals other than timber dates to the early 1700s, when sassafras, ginseng, and other forest plants were regularly exported along with timber and other natural resources. Since those early days, the harvesting of nontimber forest resources has supported a dynamic and valuable socio-economic market. In the late 1890s, timber and water resources were recognized as essential resources that required active management and became the foundation for the multiple-use forest management paradigm. Over the last 100 years, that paradigm has expanded to include a multitude of resources, issues, and factors.

NTFPs have yet to be fully incorporated into the multiple-use forest management paradigm. They are slowly being recognized as natural resources that require active management for sustainability. Chamberlain (2000) identified three major areas of consideration that must be addressed to integrate

[1] Forest Products Technologist, USDA Forest Service, Southern Research Station, Blacksburg, VA 24060.

NTFPs into the multiple-use forest management paradigm. The ecological, social, and economic issues that affect how nontimber forest resources are managed require expansion of knowledge and new ways of examining forest management. More research, development, and support of practices and policies are needed.

FOREST MANAGEMENT PARADIGM

The paradigm that guides management of public forests has evolved to include a multitude of diverse resources and issues. The Organic Administration Act of 1897 (U.S. Code 30 Stat. 35) initiated management of the national forests and became the foundation for the paradigm that guides how forests are managed. The Act directed that forests be established to improve and protect the resources to secure water and to furnish a continuous supply of timber (U.S. Code 30 Stat. 35).

More than 60 years after the Organic Act, the Multiple-Use Sustained Yield Act (MUSYA 1960) expanded the national forest management paradigm. It authorized and directed the Secretary of Agriculture to manage the national forests to ensure the multiple-use and sustained yield of the renewable surface resources of the forests. MUSYA defined the purposes for which national forests would be managed as "outdoor recreation, range, timber, watershed, and wildlife and fish" (MUSYA 1960). The Act reinforced the traditional understanding that national forest priorities regarding wildlife would reflect State priorities, placing heavy emphasis on game management (Fedkiw n.d.). In the early 1960s and again in 1975, the paradigm expanded to include wilderness (Wilderness Act of 1964, Eastern Wilderness Act of 1975). Minerals were integrated into the management paradigm in the 1920s and again in 1970 (Mineral Leasing Act of 1920, Mining and Minerals Policy Act of 1970). By the end of the 1970s the paradigm by which forests were managed had expanded to include a variety of uses, resources, and services.

Protection of endangered species, participatory planning, and seeking public opinion were included in the forest management paradigm in the early 1970s. The Endangered Species Act (1973) focused management on threatened and endangered species and the habitats in which they are found (U.S. Environmental Protection Agency 2005). The Forest and Rangeland Renewable Resources Planning Act (RPA) of 1974 institutionalized land and resource management planning in the Forest Service (RPA 1974). The RPA legislation directs that forest management plans address recreation and wilderness, range, timber, watershed, and fish and wildlife. The National Forest Management Act (1976) amended the RPA to prevent abuses from timber harvesting (Shands and Healy 1977) and ensure equal consideration for all renewable forest resources.

The paradigm used to manage national forest lands has evolved over the years to become complex and comprehensive. More than 80 laws affect how national forests are managed (Floyd 1999). The multiple-use model is a global icon, and the basis for other more progressive paradigms (e.g., ecosystem management and sustainable forest management). The laws that regulate public forests may not be fully reflected in private forest management, yet the models that guide management of public and private forests are similar. In general, neither approach fully includes management of nontimber forest resources.

NONTIMBER FOREST PRODUCTS

A variety of 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. National legislation uses the phrase "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). A more common and widespread term is "nontimber forest products." Whatever the term used to describe these products, they are all based on plants or fungi or other flora materials. Wildlife or other fauna are not generally included in the definition.

NTFPs are plants, parts of plants, fungi, and other biological material harvested from within and on the edges of natural, manipulated, or disturbed forests. They include fungi, moss, lichen, herbs, vines,

shrubs, and trees. Plant parts harvested include roots, tubers, leaves, bark, twigs and branches, fruit, sap and resin, as well as wood (Chamberlain and others 1998). These are commonly classified into four major categories: culinary products, specialty wood-based products, floral and decorative products, and medicinal products and dietary supplements. A newly emerging category of NTFPs used in the landscape industry includes items such as pine straw and live native plants collected from the wild. Chamberlain and Predny (2005) present a comprehensive list of products gathered from the forests of Southern United States. They identify more than 100 NTFPs, the majority of which are harvested for medicinal purposes. Plants used for floral and decorative uses are also well represented.

Forest plants collected for culinary uses include mushrooms, fruits, ferns, greens, roots, and tubers. In the central hardwood region, food festivals are organized around the emergence of wild onions (Allium tricoccum), known regionally as ramps. Maple syrup festivals, such as those in the Mt. Rogers area of Virginia, are common in communities at higher elevations and further north. Fiddleheads (the young, tightly coiled fronds of the fern Matteuccia struthiopteris), dandelion (Taraxacum spp.) greens, and poke salat (Phytolacca decandra) are eaten in the spring as well. Nuts and berries—including black walnuts (Juglans nigra), muscadine grapes (Vitis rotundifolia), blueberries (Vaccinium spp.), raspberries and blackberries (Rubus spp.), and persimmons (Diospyros virginiana)—are gathered, consumed, and sold throughout the Southeastern United States.

Specialty wood-based NTFPs are produced from trees or parts of trees, excluding products made from cut timber. Some important wood-based NTFPs made from trees in the central hardwood region include sassafras (Sassafras albidum) stems for walking sticks, willow (Salix spp.) branches for furniture, and white oak (Quercus spp.) splits for baskets. Products made from vines, such as smokevine (Aristolochia macrophylla) and grapevine (Vitis spp.), are included in this category. The number of species that could be used in production of crafts is limited only by the imagination of crafters and market acceptance.

Many forest plants are harvested and used in the floral industry as complements to flower arrangements. The leaves of galax (Galax urceolata), an evergreen herbaceous perennial, are exported to Europe for background foliage. Sprigs and long lengths of grapevine and smokevine also may be used as complements or backdrops in floral arrangements. Several species of moss and lichen are harvested from Appalachian forests for the European floral industry.

Forest plants also are harvested and used for their therapeutic value and 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 southern 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. More than 80 percent of the forest-harvested ginseng comes from Virginia, Kentucky, Tennessee, and North Carolina. The central hardwood region is the principal source of many medicinal plants, including black cohosh (Actaea racemosa), American ginseng (Panax quinquefolius), and bloodroot (Sanguinaria canadensis).

NTFP Enterprises

The NTFP industry is made up of a diverse collection of enterprises. In general, enterprises involved in NTFPs may collect, buy, sell, process, or work with these products to produce goods and services. In this diverse industry, an enterprise may be an individual who collects and sells raw materials with little or no processing, such as ramp harvester; a family farm or small business that produces wreaths or other value-added products; or a formal corporation that employs many people. These NTFP enterprises include a vast array of firms, from individual entrepreneurs to multi-employee organizations, from the point where the NTFPs is collected to the point of final consumption. The fundamental thread that binds these organizations is the use of nontimber forest resource.

The USDA Forest Service, Southern Research Station work unit based in Blacksburg, VA (with support from the USDA Forest Service, Forest Inventory and Analysis (FIA) unit in Knoxville, TN) is working to define the NTFP industry in the southern region of the United States. An enterprise distribution map based on the perceptions of county extension agents reveals the concentration of NTFP enterprises (fig. 1). The distribution of these enterprises appears to be concentrated along the Appalachian Mountain chain and in the central hardwood forest region (Chamberlain and Predny 2003).

Markets and Market Dynamics

Though no formal estimates have been made of the total value of the NTFP markets in this region, available data illustrate the economic importance of some individual products. For example, in 1995 the United States exported moss and lichen, much of which was from southern forests, valued at more than $14 million (Goldberg 1996). In 1997, one company in southwest Virginia specializing in pine roping had sales in excess of $1.5 million (Hauslohner 1997). Several volunteer fire departments in western North Carolina generate from 30 to 90 percent of their budgets from annual ramp festivals. Based on 2001 prices, this author estimates that the average wholesale value of forest-harvested ginseng in a four-State region of Appalachia exceeds $18.5 million. Certainly, the aggregate value of NTFPs to the southern economy far exceeds these examples.

In the early 1990s, a series of major factors helped spark an increased interest in NTFPs. Bumper crops of edible mushrooms appeared on many national forests in Oregon and Washington (Freed 1994) as a result of major forest fires. Market studies of NTFPs revealed potential economic development opportunities (Mater Engineering 1992, 1993, 1994).

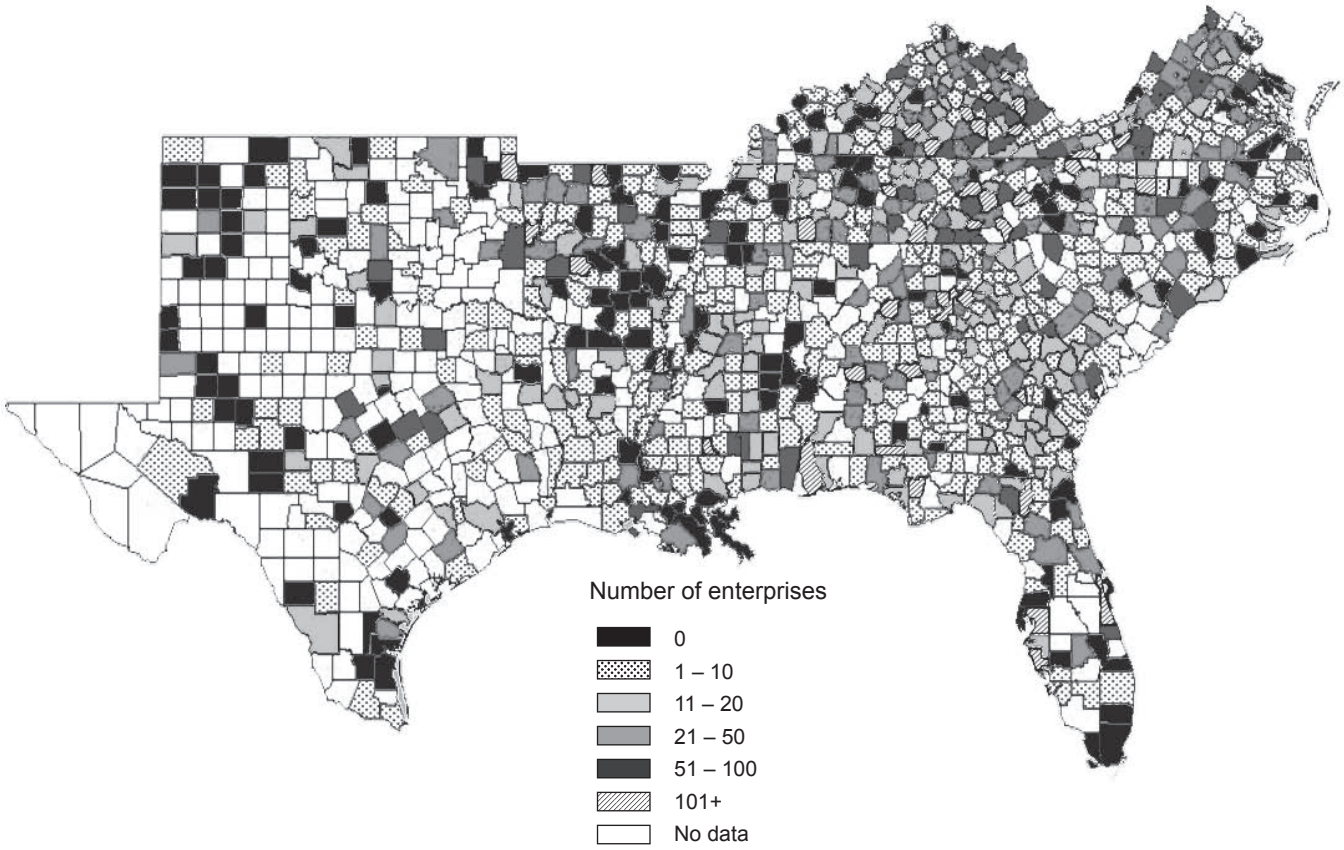

Figure 1—Perceived distribution of NTFP enterprises in the Southern United States.

The findings of medical research also helped to increase market demand for nontimber 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). Europe and Asia represented more than 80 percent of the global trade at that time. 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).

In the late 1990s, the mass-market segment for herbal medicinal products, approximately 17 percent of the U.S. market, grew at an annualized rate of over 100 percent (Brevoort 1998). Exports of forest-harvested ginseng grew more than 300 percent from 1993 through 1996 (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 (Hypericum perforatum) and black cohosh, for the 52-week period ending July 12, 1998, was approximately 2,800 percent and 500 percent, respectively (Brevoort 1998).

Over the last 2 decades market factors have continued to change. Overall demand for NTFPs in all market segments has increased. The USDA Forest Service issued a national strategy regarding special forest products (USDA 2001). Legislation has been enacted to develop and strengthen management efforts within the national forest system (H.R. 2466 1999). The U.S. Food and Drug Administration issued several findings that affected the market for herbal remedies (e.g., Hormone Replacement Therapy). Recent medical research has raised health and safety concerns. The 2005 findings by the U.S. Fish and Wildlife Service regarding the export of wild-harvested ginseng will have direct and lasting impacts on the medicinal plant industry (U.S. Fish and Wildlife Service 2005).

INTEGRATING NTFPS INTO FOREST MANAGEMENT PARADIGM

NTFPs will be integrated into forest management when decision makers are fully convinced of the social, economic and ecological effects of not managing for them.

Ecological issues—There is increasing awareness that for all parts of the forest ecosystem to be sustainable, the resources from which NTFPs originate must be recognized as renewable resources and integrated into forest management. Scientific management and sustainable collection methods must be practiced. Unfortunately, the ecological knowledge needed to achieve these is generally lacking. The consequences of not fully understanding the impact of unmanaged harvesting of NTFPs 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.

For most NTFP species, ecological data is needed to determine sustainable harvest rates, develop growth and yield models, and craft inventory and monitoring protocols. Most basic information concerning product supply is lacking, and this affects the possibilities for sound inventory and monitoring (Reams and others 2004). Baseline information about 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 diversity of the plants and plant parts complicate management efforts. Reproduction rates and methods need to be determined for most NTFP species.

Economic issues—The people of the central hardwood region have enjoyed tremendous economic benefits from the harvesting of NTFP species. Families have depended on 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 NTFPs. Income from NTFPs becomes more important to local harvesters as economic downturns occur.

Local, regional, national, and international businesses depend on sustainable supplies of NTFPs. 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 NTFP industry has not been fully estimated, that which has been discovered indicates a large, vibrant, complex economy. The NTFP economy may be in jeopardy without more active management of the forest resources. Lack of management of the NTFP 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 NTFP 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. Full strategic market assessments are needed for each segment (i.e, edibles, floral, medicinal, crafts, and live-plants) of the industry, to help in setting conservation priorities.

Social issues—Some Appalachian harvesters of European descent can trace their relationship with American ginseng, and other NTFPs, to contact between their ancestors and native Cherokee tribes. Other harvesters do not have historical ties to NTFPs, 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 NTFP resources could lead to increased tension, distrust, and increased difficulty in enforcing policies. Integration of social issues 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 NTFPs will help to identify obstacles that could limit conservation efforts.

An expansion of the forest management paradigm to include NTFPs will impact people who 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 NTFPs 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 NTFP community in shifting the multiple-use forest management paradigm to include nontimber forest resources.

CONCLUSIONS

The multiple-use forest management paradigm appears to be shifting, albeit slowly, to include forest botanical species harvested for nontimber values. Market forces are causing an expansion of forest management to incorporate products that have been gathered for hundreds of years. The lack of knowledge concerning economic, ecological, and social factors inhibits efforts to have these products better integrated into management planning and implementation. Efforts are underway to improve the situation, but much more work is needed before these resources are truly part of the overall paradigm.

Academic and government research and management agencies (e.g., the National Forests of North Carolina, North Carolina State University, and the USDA Forest Service, Southern Research Station) are working closely to fully understand the ecological ramifications of not managing the NTFP resources. The USDA Forest Service Southern Research Station and FIA have initiated an assessment to define the NTFP industry in the southern region. As no sample frames exist to contact market players, the study is building the foundation for more comprehensive assessments. Results indicate the concentration of NTFP enterprises throughout the region and are helping to focus research and development.

To fully incorporate nontimber forest resources and associated products into the multiple-use management paradigm will require greater evidence of their value and of the implications and ramifications of not managing for their conservation.

ACKNOWLEDGMENTS

The author would like to express his sincere appreciation to the members of SRS-4702 for their review, comments, and suggestions on this manuscript. In addition, the author expresses his appreciation to SRS-4801 (Forest Inventory and Analysis) for its insight and support for NTFP research.

LITERATURE CITED

Amacher, G.S.; Conway, M.C.; Sullivan, J. 2004. Nonindustrial forest landowner research: a synthesis and new directions. In: Rauscher, H.M.; Johnsen, K., eds. Southern forest science: past, present and future. Gen. Tech. Rep. SRS—75. Asheville, NC: U.S. Department of Agriculture Forest Service, Southern Research Station: 241-251.

Brevoort, P. 1998. The booming U.S. botanical market: a new overview. Herbalgram. 4: 33-45.

Chamberlain, J.L. 2000. The management of national forests of Eastern United States for non-timber forest products. Blacksburg, VA: Virginia Polytechnic Institute and State University. 279 p. Ph.D. dissertation.

Chamberlain, J.; Bush, R.; Hammett, H.L. 1998. Non-timber forest products: the other forest products. Forest Products Journal. 48(10): 2-12.

Chamberlain, J.L.; Predny, M. 2003. Non-timber forest products enterprises in the South: perceived distribution and implications for sustainable forest management. Proceedingsof the first national symposium on sustainable natural resource-based alternative enterprises for private landowners. Mississippi State, MS: Mississippi State University: 48-63.

Chamberlain, J.; Predny, M. 2005. Non-timber forest products. Encyclopedia of Southern Appalachian Forest Ecosystems. Rauscher, Michael, ed. U.S. Department of Agriculture Forest Service, Southern Research Station. http://www.forestencyclopedia.net. [Date accessed: September 1, 2005].

Davis, Lawrence S.; Johnson, K.N. 1987. Forest management. 2nd ed. New York: McGraw-Hill, Inc. 790 p.

Eastern Wilderness Act of 1975. 16 U.S.C. 1132, 88 Stat. 2096 p.

Eisenberg, D.M.; Kessler, R.C.; Foster, C. [and others]. 1993. Unconventional medicine in the United States. New England Journal of Medicine. 328(4): 246-252.

Farnsworth, N.R.; Morris, R.W. 1976. Higher plants – the sleeping giant of drug development. American Journal of Pharmaceutical Education. 148: 46-52.

Fedkiw, J. n.d. Managing multiple uses on national forests, 1905 to 1995: a 90-year learning experience and it isn't finished yet. FS—628. Washinton, DC: U.S. Department of Agriculture Forest Service. [Not paged].

Floyd, D.W., ed. 1999. Forest of discord: options for governing our national forests and Federal public lands. Bethesda, MD: Society of American Foresters. 84 p.

Freed, J. 1994. Special forest products: past, present, future. In: Schnepf, C., ed. Dances with an elephant. Proceedings of the conference, The Business and Science of Special Forest Products. Portland, OR: Western Forestry and Conservation Association: 1-11.

Genetic Engineering News. 1997. Germany moves to the forefront of the European herbal medicine industry. 17(8): 14.

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

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

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

Krochmal, A.; Walters, R.S.; Doughty, R.M. 1969. A guide to medicinal plants of Appalachia. Res. Pap. NE—138. Upper Darby, PA: U.S. Department of Agriculture Forest Service, Northeastern Forest Experiment Station. 291 p.

Le Bars, P.L.; Katz, M.M.; Berman,N. [and others]. 1997. A placebo-controlled, double-blind randomized trial of an extract of Gingko biloba for dementia. Journal of American Medical Association. 278(16): 1327-1332.

Mater Engineering, Ltd. 1992. Analysis and development of a conceptual business plan for establishing a special forest products processing plant. Sweet Home, OR: Rep. to the U.S. Department of Agriculture Forest Service, Region 6. 233 p. + Appendices.

Mater Engineering, Ltd. 1993. Special forest products market analysis. Project No.3017. Weyerhauser Canada, Ltd.: Rep. to Saskatchewan Timberlands Division, Prince Albert, Saskatchewan. 94 p. + Appendices.

Mater Engineering, Ltd. 1994. Minnesota special forest products: a market study. St. Paul, MN: Rep. to the Minnesota Department of Natural Resources. 200 p. + Appendices.

Mineral Leasing Act of 1920. 41 Stat. 437 p.

Mining and Minerals Policy Act of 1970. 84 Stat. 1876 p.

MUSYA, 1960. U.S. Code 74 Stat. 215. Multiple Use and Sustained Yield Act of 1960. 74 United States Statutes at Large. 215 p.

NFMA, 1976. U.S. Code 90 Stat. 2949. National Forest Management Act of 1976. 90 United States Statutes at Large. 2949 p.

RPA, 1974. U.S. Code 86 Stat. 476. Forest and Rangeland Renewable Resources Planning Act (RPA) of 1974. 86 United States Statutes at Large. 476 p.

Reams, G.A.; Clark, N.A.; Chamberlain, J.L. 2004. Monitoring the sustainability of the southern forest. Southern forest science: past, present, and future. Gen. Tech. Rep. SRS—75.Asheville, NC: U.S. Department of Agriculture Forest Service, Southern Research Station: . 179-188.

Shands, W.E.; Healy, R.G. 1977. The lands nobody wanted. A Conservation Foundation Rep. Washington, DC: Conservation Foundation. 282 p.

Stix, G. 1998. Plant matters. Scientific American. 278(2): 301.

U.S. Code 30 Stat. 35. 1897. Organic Administration Act of 1897. United States Statutes at Large. 35 p.

U.S. Department of Agriculture. 1999. U.S. agricultural exports. Washington, DC: U. S. Department of Agriculture. October 28.

U.S. Department of Agriculture. 2001. National strategy for special forest products. Washington, DC: U.S. Department of Agriculture Forest Service. 8 p.

U.S. Environmental Protection Agency. 2005. Summary of Endangered Species Act. http://www.epa.gov/region5/defs/html/esa.htm [Date accessed: August 15, 2005].

U.S. Fish and Wildlife Service. 2005. Findings on the export of wild American ginseng. Memorandum from Chief, Division of Scientific Authority, to Chief, Division of Management Authority. 16 p.

Wilderness Act of 1964. 16 U.S.C. 1131-1136, 78 Stat. 890.

World Wildlife Fund. 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. Washington, DC: Unpublished report to the National Fish and Wildlife Foundation. World Wildlife Fund, TRAFFIC North America. 21 p. + Appendices.