The Relationship between Nontimber Forest Product Management and Biodiversity in the United States

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Abstract
Nontimber forest products (NTFP) in the United States are harvested for commercial and noncommercial purposes and include thousands of wild or semi-wild species or parts of species used for medicines, foods, decorations, fragrances, containers, dyes, fuel, shelter, art, ceremonial purposes, and more. Despite the known and substantial economic value of a few individual NTFPs, and the unknown, but likely high economic value of NTFPs in aggregate, historically managers have not included them as important factors in forest management. Not only do NTFPs comprise a significant part of the biological diversity of forest ecosystems, but given the lack of formal NTFP research, the many people who harvest NTFPs part or fulltime have the most knowledge about them. Consequently, efforts to conserve biodiversity are unlikely to succeed unless knowledge about NTFPs, and the effects on them of various forest management activities such as timber removal, grazing, prescribed burning, and NTFP harvesting practices, becomes an integral part of forest management. This research project attempts to address these issues through achieving two objectives: 1) to advance understanding of the role and impact of NTFP management in forest ecosystem sustainability and biodiversity; and 2) to support the ability of U.S. forest managers to assess NTFP sustainability. We developed five interrelated components to meet these objectives. The first component is an online species database expanded from 857 to 1,343 entries. The database serves as an initial tool for identifying NTFP species that currently or formerly existed in their region and that can potentially be incorporated into planning for biodiversity conservation, forest restoration, cultural use patterns, and sustainable economic development. The second component is an online bibliographic database expanded from 1,468 to over 2,600 entries. The database aids in identifying NTFP references of books, journals, and gray literature. A large portion of the entries are annotated. The academic publications included in the database are drawn more heavily from the international NTFP arena, which is where the majority of NTFP research has been done thus far. The third component is a national survey of Forest Service Ranger District employees and state forest managers for the purpose of examining NTFP management in relation to biodiversity. The surveys include several questions specifically addressing inventory and monitoring activities. The fourth component is ethnographic fieldwork throughout the lower 48 United States that entailed driving over 37,000 miles to meet harvesters and other stakeholders in their communities. The fieldwork included formal and informal interviews and participant observation with hundreds of NTFP harvesters and other stakeholders including land managers, scientists, Native Americans, commercial businesses, and environmental groups. The fifth component is a series of four all-day multi-stakeholder workshops and a three-day retreat of the seven member project team held to discuss the possibilities for inventory and monitoring programs involving NTFP harvesters. The results of these meetings including rationale, harvester incentives, barriers, case studies, recommendations, and steps for creating participatory inventory and monitoring programs are incorporated into a companion document to this report.

Companion Documents: *Nontimber Forest Product Inventorying and Monitoring in the United States: Rationale and Recommendations for a Participatory Approach* and *Workshop Guide and Proceedings: Harvester Involvement in Inventory and Monitoring of Nontimber Forest Products*. Available online at: www.ifcae.org/projects/ncssf1

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INTRODUCTION

In June 2002, the National Commission on Science for Sustainable Forestry (NCSSF) awarded the Institute for Culture and Ecology (IFCAE) an 18-month grant to assess the relationship between forest management practices, nontimber forest products (NTFP) and biodiversity in the United States. This report provides a synthesis of findings from the study.

Defining NTFPs

Nontimber Forest Product (NTFP) is not an ecological category, but rather a political economic grouping used for the purpose of highlighting forest products other than industrial timber products. Thus, NTFPs are defined by what they are not (industrial timber), rather than by what they are. They include species and parts of species gathered for noncommercial or commercial purposes. For this study we define nontimber forest products (also referred to as special forest products and nonwood forest products) by six broad categories: 1) foods, such as wild edible mushrooms, fruits, and nuts; 2) medicinal plants and fungi; 3) floral greenery and horticultural stocks; 4) fiber and dye plants, lichens, and fungi; and 5) oils, resins, and other extracts from plants, lichens, and fungi, and 6) fuelwood and small diameter wood used for poles, posts, and carvings. This sixth category is included to more accurately reflect current federal forest categories and regulatory practices. Included in this definition are all plant organisms and their parts harvested from forests, tree plantations, and other tree environments (e.g., urban parks). Fruit products from domesticated orchards are not included except for fruits collected from domesticated fruit trees that have become naturalized in the wild. Turpentine, maple syrup, and other saps and resins are included where they are part of forest ecosystems. In addition, although we acknowledge that forests provide many other 'non-timber' values, such as fish, wildlife, recreation and ecosystem services, we limited the study to botanical and fungal species with the exception of honey produced from forest flora.

Rationale and Theory

Nontimber forest products have been recognized internationally as an important element in sustainable forestry. In 1992, delegates to the United Nations Conference on Environment and Development, known as the Rio Earth Summit, identified sustainable forest management as a key element in sustainable economic development. Agenda 21, which emerged from this conference, set out nonbinding guidelines for sustainable forest management with specific inclusion of nontimber forest products. In addition, over 150 countries signed the Convention on Biological Diversity (CBD), which addresses not only the conservation of biological diversity and the ecosystems where it occurs, but also how to ensure its sustainable use. The inclusion of this concern for sustainable use increased attention to nontimber forest products.

To demonstrate the links between NTFPs and biodiversity a major part of this study consisted of ethnographic fieldwork with harvesters, the people who are collecting NTFPs for subsistence, cash, trade, education, recreation, and healing and/or spiritual endeavors. To frame our research questions and refine our methods, we drew upon three intersecting theoretical frameworks commonly used by social scientists to explore human-environment interactions: traditional ecological knowledge theory, common property theory, and political ecology.

NTFPs are a subset of biological diversity, actively sought and collected for particular purposes with utility to human society (Wong 2000: 3). Throughout the world people living in forests often have extensive knowledge about and sometimes use nearly every plant in their area, whether it be for food, medicine, building materials or for cultural or spiritual practices. For example, Moerman (1998) documents the vast knowledge of native North American societies (in total 44,691 different uses of 4,029 plants in 291 different societies) in his volume, *Native American Ethnobotany*. Such knowledge is sometimes called Traditional Ecological Knowledge (TEK).

A significant amount of scientific research illustrates the valuable role traditional, local, and indigenous knowledge can play in promoting the sustainable management of biological diversity and the maintenance of ecosystems services (e.g. Freeman & Carbyn, 1988; Gadgil et al., 1993). Integrating traditional, local, and indigenous knowledge into conservation efforts has been recognized as critical for promoting sustainable forestry. A variety of international agreements reflect this growing awareness. For example, within the CBD, Article 8(j) focuses on respecting, preserving and maintaining knowledge, innovations and practices of indigenous and local communities embodying traditional lifestyles relevant for the conservation and sustainable use of biological diversity (SCBC, 2001a: 120-125).

Tenure, or the rules that societies use to govern who has access to what natural resources and under what conditions, also influences the extent to which resource users have incentives to harvest sustainably. Garret Hardin theorized in "The Tragedy of the Commons" (1968) that users dependent on commonly shared lands are locked into a system that compels them to increase their resource consumption without limit, inevitably leading to environmental degradation of the resources they depend on unless regulated by external authorities (e.g., government, privatization). Although tragedies have undoubtedly occurred, it is important to recognize that people have self-organized to manage common-pool resources for thousands of years, often devising long-term, sustainable institutions for governing these resources (Ostrom et al. 2003). Scholarly work continues to document how contemporary small and large cultural groups continue to successfully manage common property (e.g., Acheson 1988; Berkes 1999; McCay 1996). Ethnographic research with harvesters of wild mushrooms shows that such actions can be found in isolated individuals and small informal networks sharing common resources even on open-access systems[1]. Harvesters expressed concern about resource well-being (e.g., over-harvesting), had informal rules between harvesters to discourage overharvesting, and independently experimented with sustainable harvest techniques and resource productivity (Jones 2002). While our current research did not explicitly test for harvest activities on commonly shared resources, common pool theory further advances the rationale and approach for looking closely at the attitudes, behaviors, and knowledge of NTFP harvesters in relation to forest management.

Ecological knowledge and tenure together constitute key elements influencing human capacity and incentives to conserve biodiversity. Equally important, however, are the ways in which cultural, political, economic, and ecological systems are connected. Political ecology, an analytical framework developed for the purposes of examining these interconnections, posits that to understand resource use, management, and conservation issues, researchers must also investigate their political underpinnings. This approach encourages interdisciplinary thinking and moves beyond the simplistic dualistic analyses that have often characterized natural resource debates (e.g. owls vs. jobs). In using a political ecology framework in the nontimber forest products context, we are compelled to look not only at what species are gathered and the immediate ecological impact, but also factors such as why people harvest NTFPs and the ways in which harvesters contribute or don't contribute to policy and management. Such an approach calls for examining political, cultural forces operating across scales, from the local level to the global, and for a more holistic understanding of resource use patterns (Jones and Lynch 2002). In this way, we begin to understand the complexity behind human/nature relationships, and are thus better able to develop both ecologically sound and socially equitable policies and programs.

Using a political ecology approach also required us to examine and incorporate the perspectives of forest managers and other stakeholders. We thus supplemented the ethnographic work on harvesters with field visits and email surveys with USFS and state forestry employees, holding multi-stakeholder workshops, and corresponding with a variety of stakeholders by phone and email. The use of multiple methods to gather data from various categories of NTFP stakeholders enabled us to document a range of perspectives on the effects of NTFP management on biodiversity. A detailed description of these components is provided below.

[1] Though access on private and public lands is increasingly regulated, NTFP harvesting has generally evolved on what is in effect a defacto open access system, meaning NTFP harvesting was largely overlooked on regulated lands.

Project Overview

This study had two primary objectives: 1) to synthesize data regarding the impact of nontimber forest products management on forest ecosystem sustainability and biodiversity; and 2) to directly support the ability of U.S. forest managers to assess nontimber forest product sustainability. To achieve the project objectives we developed five interrelated components that allowed us to gain input from harvesters, managers, and various other stakeholders (Table 1). We relied on a wide array of methods, including: literature reviews, written surveys, semi-structured interviews, participant observation, and workshops with focus group discussions. This multi-method approach permitted us to triangulate and verify data obtained in the different components. Details about our research methods are included below in the component results.

Table 1. Project Components

Component	Description
Component 1	Expand the U.S. NTFP species database (Appendix 1)
Component 2	Expand the U.S. NTFP bibliographic database (Appendix 2)
Component 3	Survey state and federal forest managers to assess management of NTFPs and biodiversity
Component 4	Conduct anthropological fieldwork in eight ecoregions throughout the U.S. to synthesize NTFP harvester knowledge about management and biodiversity
Component 5	Facilitate four regional workshops that bring together stakeholders to discuss NTFP harvester involvement in biological inventory and monitoring.

Research Sites

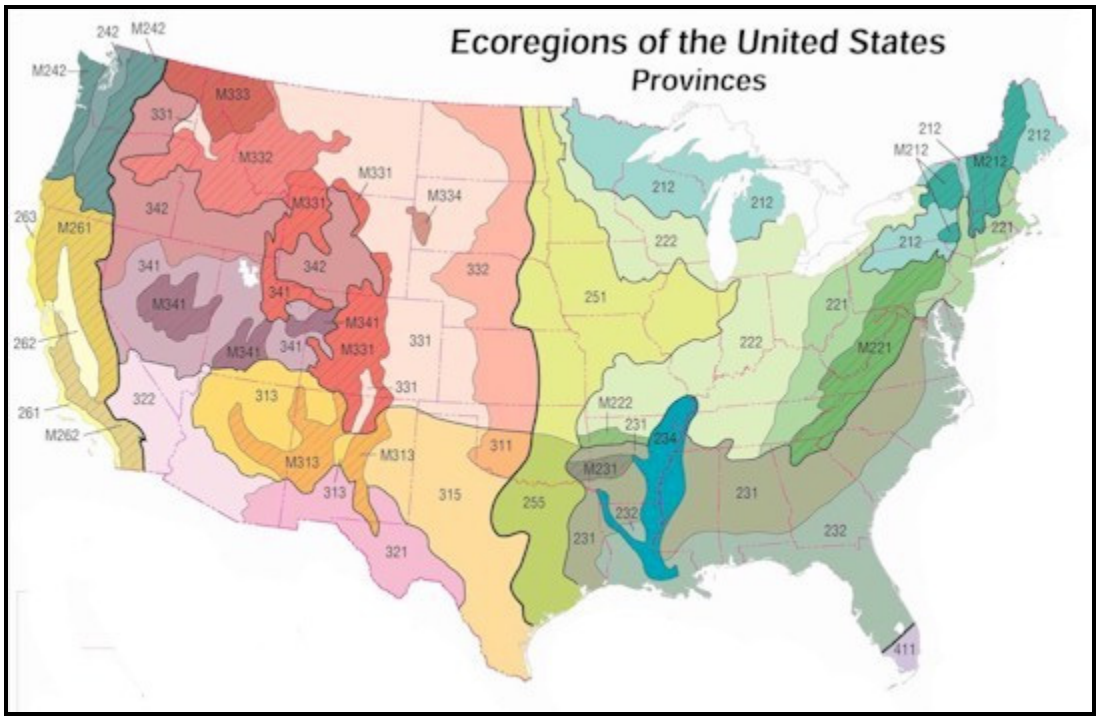
NCSSF required that we use ecoregion provinces to define research areas for this study (Table 2 and Figure 1).[2] We chose eight provinces across four areas of the United States as general boundaries for the fieldwork components. We selected these provinces to capture as much geographic, cultural and ecological diversity as possible, as well as to include areas where scientists and managers knew little about gathering traditions. This approach gave us the ability to test our hypothesis that NTFP gathering is a widespread activity throughout the United States. In the course of fieldwork, we expanded the geographic scope to include the Ozarks and the Appalachian highlands.

Table 2. Research Sites

Area	Ecosystem Provinces
West (Rocky Mtns.)	**M313** AZ-NM Mountain Semi-desert – Open Woodland – Coniferous Forest– Alpine Meadow **M331** Southern Rocky Mountain Steppe – Open Woodland – Coniferous Forest – Alpine Meadow
Southeast	**231** Southeastern Mixed Forest Province **232** Outer Coastal Plain Mixed Forest Province
Northeast and Great Lakes	**212** Laurentian Mixed Forest Province **221** Eastern Broadleaf Forest (Oceanic) Province
Pacific Coast	**M242** Cascade Mixed Forest – Coniferous Forest – Alpine Meadow Province **M261** Sierran Steppe – Mixed Forest – Coniferous Forest – Alpine Meadow Province

[2] Forest Service scientist Robert Bailey developed the ecoregions and agency adopted them in 1993 for use in ecosystem management. For more information, see www.fs.fed.us/land/ecosysmgmt/ecoreg1_home.html

Figure 1. Ecoregions of the United States. Provinces.



The following sections provide a synthesis of the results for all five components of this study. For component 1 and 2, expansion of the bibliographic and species databases, the significance of the work is only briefly described here. We provide additional details on those two components in two appendices. The discussions of components 1 and 2 are followed by descriptions of the results for component 3, the federal and state surveys, and component 4, the ethnographic fieldwork. For component 5, the regional workshops, a short summary is provided for context in understanding this study and the reader is directed to the companion report for a more in-depth discussion. Results from all five components inform the discussion sections of both reports.

COMPONENT 1 FINDINGS:

Expansion of NTFP Species Database (Appendix 1)

The U.S. Nontimber Forest Product species database contains 1,343 currently or formerly harvested commercial species for the states and territories[3] and is available free of charge to the public online at www.ifcae.org/ntfp/. While some of the species in the database, such as aspen trees (*Populus tremuloides*) for transplants, are harvested as whole organisms, many species have multiple parts used for a multitude of products. For example, the flowers, roots, seeds, stems, and leaves of wild bergamot (*Monarda fistulosa*) are used to make various decorative, food, and medicinal products. Although we don't know exactly how many of the 1,343 species listed in the database are still commercially used, evidence from our ethnographic fieldwork suggests it is high. Our research was not designed to develop a catalog of all the species the harvesters we interviewed gathered. Nonetheless, over the course of our fieldwork, harvesters mentioned

[3] The criteria for what is a nontimber forest product and hence what is listed in the database is loosely defined as species that occur in forest ecosystems, or are dependent on forests or trees in other settings. Many species such as those in the family *Cactaceae* may not technically be forest or tree species but are included since they share similar political, economic, and cultural factors in terms of biodiversity and conservation.

hundreds of species with commercial linkages. Regardless of the exact number of NTFP species still commercially used, the size of the database clearly indicates that people have been able to find value in a tremendous diversity of NTFPs.

COMPONENT 2 FINDINGS:

Expansion of NTFP Bibliographic Database (Appendix 2)

The U.S. Nontimber Forest product bibliographic database contains over 2,800 references and is available free of charge to the public online at www.ifcae.org/ntfp/. The number of references available for incorporation into the database indicates that awareness of NTFPs among researchers in the last decade has grown. Part of this recent attention stems from the increased awareness of biological diversity issues, especially in tropical forests. For example, a number of studies included in our database expansion examine how NTFPs (e.g., rattan, brazil nuts, botanicals) could be a development tool for market-oriented forest conservation. Only a few scholarly publications exist on NTFP uses in the U.S. outside of descriptions of subsistence use by anthropologists. Other countries with temperate forests (e.g., Russia and Finland) have done extensive research on NTFPs, but much of this literature remains untranslated. In addition to scholarly references, we also added an extensive number of publications from the gray literature (e.g., catalogs, newsletters, websites) to the database. The existence of this gray literature suggests that contemporary commercial and noncommercial use of NTFPs is widespread, albeit still largely invisible to formal science.

COMPONENT 3 FINDINGS:

Results from a Survey of US Forest Service Districts and State Foresters

Three major questions underlie this component of the study: 1) How widespread is NTFP harvesting on National Forests and state forests in the United States; 2) To what extent have public forest management agencies already taken steps to ensure that NTFP harvest levels are compatible with biodiversity conservation; 3) Since NTFPs themselves constitute a reservoir of biodiversity, to what extent do national forest and state forest managers analyze the effects of other forest management activities, such as timber harvesting, grazing, mining, and recreation, on NTFPs? To answer these questions, we conducted written surveys of USFS employees and state foresters about their NTFP programs. The surveys had three main objectives:

- To identify the extent of NTFP harvesting activities on National Forests and state forests in the United States;
- To identify gaps within the U.S. Forest Service and state forestry agencies with respect to their capacity to manage NTFPs;
- To gather information about the use of NTFP inventory and monitoring efforts, as well as barriers to and opportunities for effective NTFP inventory and monitoring, by the U.S. Forest Service and state forestry agencies.

We asked survey respondents to provide information on seven aspects of their NTFP programs:

- Important NTFP products harvested from the lands they manage
- Incorporation of NTFPs in resource management planning
- NTFP inventory and monitoring efforts
- Effects of NTFP management on biodiversity
- Barriers to implementing NTFP inventory and monitoring
- Contribution harvesters make to NTFP management
- Barriers to or advantages of using harvesters to do inventory and monitoring

We conducted the surveys in spring and summer of 2003. We distributed the Forest Service survey (Appendix 3) through the agency's internal email system to all Forest Service Ranger Districts in the continental United States and Alaska. We received responses for 218 of 531 ranger districts, a district response rate of 41 percent. These districts were distributed across 81 national forests. In addition, staff from three national forest Supervisors Offices (George Washington-Jefferson, Modoc, and Nez Perce) did not provide district breakdowns in their answers. Including the responses from these three forests with the 81 national forests from which we had at least one district response, 84 national forests, or 77 percent of national forests, participated in the survey.

We also emailed a survey (Appendix 4) with questions similar to those for the U.S. Forest Service to the state forester representatives listed on the National Association of State Foresters website for all 50 states. We received responses from 34 states, a response rate of 68%. A detailed analysis of the Forest Service survey, including regional level analyses, is scheduled for publication in fall 2005 as a General Technical Report under the auspices of the USDA-FS Pacific Northwest Research Station.

Limited financial resources did not permit us to conduct a sample survey of non-responding ranger districts or state forestry departments to determine how their programs differed from responding districts or state forestry departments. Our conclusions thus apply only to those districts and state forests that responded to the survey and cannot be generalized to all districts or state forestry departments across the country.

NTFP Products and Species

During the past decade, scientists have published a number of studies focused on NTFP harvesting and management in the United States (Schlosser et al. 1991; Emery 1998; Hosford et al. 1998; Love et al. 1998; Chamberlain et al. 2002; Jones et al. 2002). However, most of these studies are limited in their spatial coverage, often encompassing only a portion of a state, or at most a region or two. We were thus interested in clarifying the extent to which NTFP harvesting is taking place on public forests throughout the United States.[4] Specifically, we wished to answer the question of whether NTFP harvesting is an activity limited primarily to certain regions, such as the Pacific Northwest and the Southeast, or whether it occurs throughout the country and thus requires scientific investigation at a national scale.

The survey data demonstrate that NTFP harvesting takes place on national forests across the United States, rather than being limited to national forests located in one or two regions. Figure 2 depicts the percentage of reporting national forests for which at least one respondent mentioned various types of NTFPs among the five most important NTFPs. Firewood, posts and poles, and Christmas trees figured on the lists of the five most important NTFPs on fifty percent or more of the reporting national forests. Transplants, boughs, and wild mushrooms appeared as important products on between one-third to one-half of the reporting national forests. All of the remaining product categories were listed as among the most important NTFPs by less than one-third of national forests.

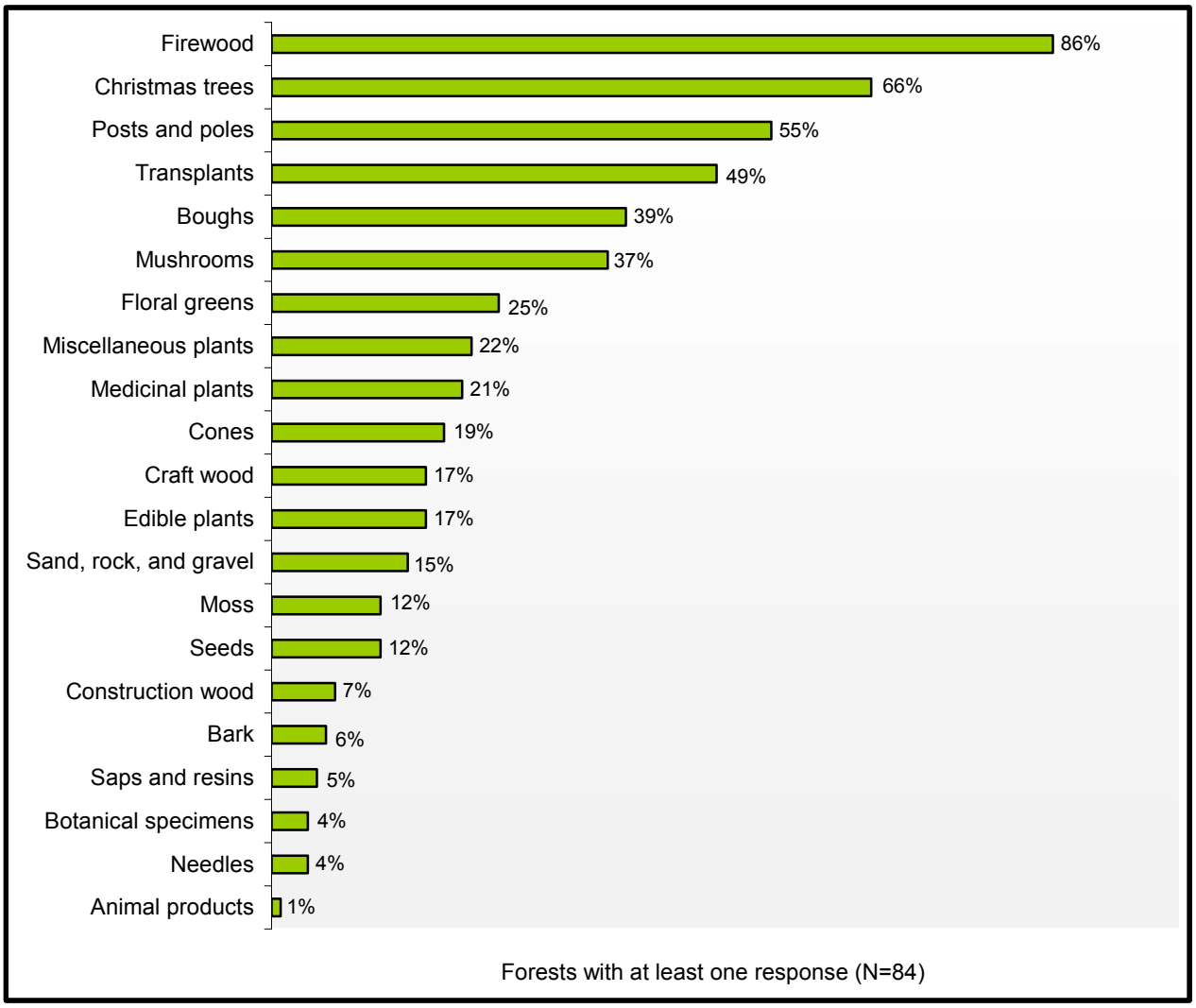
Twenty-eight, or 82% of the state foresters, listed at least one important NTFP product harvested off state forestlands.[5] Sixteen, or 47% of the state survey respondents, mentioned four or more important NTFP products. Of the state foresters who listed no NTFP products harvested on state lands, one was from West Virginia, which prohibits the harvesting of all NTFPs on state forests. Another respondent was from Arizona, which doesn't issue contracts or permits for NTFPs because commercial harvesters wanting to

[4] The surveys measure only the extent to which state foresters and National Forest employees are aware of NTFP harvesting taking place on the lands they administer. In practice, our fieldwork and similar work by Emery (1998) in Michigan's Upper Peninsula strongly suggest that many forest managers are unaware of the actual extent of NTFP harvesting taking place on the lands they manage.

[5] Oklahoma does not have any state forestlands and thus was not included in the analysis.

harvest on state forestlands "do not exist." A third was from Texas, where the respondent noted that there is no interest for harvesting NTFPs on state forests. It is unclear whether no NTFP harvesting occurs on state lands in these states, or whether harvesting occurs, but is not visible to the state forest agencies.

Figure 2 – Nontimber Forest Products Harvested on National Forests



Forest Service survey respondents listed 132 NTFPs, while state foresters mentioned 64 NTFPs. As indicated in Appendix 5 and 6, harvesting activities on National Forests and state forests encompass many types of NTFPs, ranging from firewood to floral greens to medicinal plants. The number of species encompassed by the Forest Service and state forester product lists is impossible to calculate since most respondents did not provide scientific names and used generic terms, such as moss, floral greens, or bark, that potentially include many species.[6] Additionally, respondents were only asked to list five of the most significant NTFPs, rather than all NTFPs harvested on their districts or state forests. The number of products harvested likely is considerably higher than the 132 products mentioned in our survey for national forests and 64 products listed for state forests. In a study of NTFP harvesting on the Hiawatha National Forest, Emery (1998:58) found that Forest Service employees could list only 6 NTFP products that people harvested on the forest. In contrast, the harvesters she interviewed named 138 NTFPs derived from 100 different species (Emery 1998:58). In the course of our fieldwork we visited 65 different Forest Service offices (including

[6] Both product and species data are important, as multiple products can be derived from one species.

Ranger Districts, Forest Supervisor Offices, and Regional Offices). We noted a similar lack of knowledge among Forest Service staff at all levels with respect to the number and kinds of NTFPs harvested on the lands they administered.

Forest Managers' Sources of Knowledge about NTFPs

During the late 1990s and early 2000s, the Forest Service and the Institute for Culture and Ecology collaborated in the development of two texts and a website on NTFP management. We included questions on the survey to determine if forest managers had used or were familiar with these three resources, all of which were national in scope. Inventory and monitoring is another mechanism for managers and policymakers to obtain information regarding the status of biodiversity conservation in general and NTFP species specifically. Therefore, we included a question that asked managers whether their administrative units conducted NTFP inventory and monitoring, and if so, asked them to describe those efforts. Finally, we included a question to find out whether managers included input from harvesters, the people most likely to have a detailed knowledge of specific NTFPS, when designing their NTFP programs and activities. The results are discussed below.

Familiarity with Selected Resources on NTFP Management and Policy

During the 1990s, the Forest Service developed and circulated a draft strategy for NTFPs, a document that the agency eventually published in 2001 under the title," National strategy for special forest products" (USDA-FS 2001). The developers of the strategy envisioned the document as a guiding framework for the agency's NTFP management program (USDA-FS 2001: v). The authors also viewed the strategy as a potential resource for state, tribal, and private forest managers (USDA-FS 2001:v). Respondents from 43 percent of the reporting national forests had read the strategy (Table 3). The strategy has also received only limited use by state foresters, as only 21% of the state survey respondents had read the document.

We asked respondents if they had read the two texts, "Nontimber forest products in the United States" (Jones and others 2002) and "Non-timber forest products: medicinal herbs, fungi, edible fruit and nuts, and other natural products from the forest" (Emery and McLain 2001). Both texts emerged from a multi-organizational, multi-year national assessment funded in part by the Forest Service and involving twelve authors employed by the Forest Service at the time of publication. Respondents from fewer than 20 percent of the reporting national forests had read either book (Table 3), while 26 percent of the state foresters had read one of the texts and 15 percent had read the other text.

Table 3. National and State Forest Manager Familiarity with NTFP Documents

	USFS [a] (n=84)	**State Forestry** (n=34)
Read National NTFP Strategy Document	43%	21%
Read Journal of Sustainable Forestry Special Issue on NTFPs	19% [b]	15% [c]
Read "NTFPs in the United States"	16%	26%
Visited IFCAE's NTFP Website	25%	12%

[a] National forest with at least one response [b] 2 missing values [c] 1 missing value

We included a question on another product of the national assessment effort noted above, the website, "Nontimber forest products: United States" (www.ifcae.org/ntfp/). This website was also developed by the Institute for Culture and Ecology in partnership with the Forest Service. Created in 1999, the website contains a national NTFP species database and an NTFP bibliographic database including all records from the Forest Service publication, "Conservation and development of nontimber forest products in the Pacific Northwest: an annotated bibliography" (von Hagen and others 1996). Respondents from 25 percent of the

reporting national forests stated that they had visited the website (Table 3). Only 12 percent of the state foresters indicated that they had visited the NTFP website.

As indicated above, respondents from many of the reporting national forests and state forestry departments had not read either of the only two texts presently available that provide national overviews of a broad range of non-timber forest products management and policy concerns in the United States. Likewise, respondents from very few of the reporting national forests and state forestry departments had visited the NTFP website.

Knowledge from NTFP Inventory and Monitoring

Forest inventory and monitoring data is a necessary part of the foundation of scientific knowledge for informing sustainable forest management. Inventorying is the process of quantifying single or multiple species in an area whereas monitoring is the process of observation over time to detect changes (Kerns et al. 2002: 238). We thus asked survey respondents to describe the kinds of NTFP inventory and monitoring taking place on their National Forest or state forest. This information served as an indicator of the extent to which forest managers have access to locally relevant scientific data for NTFP management.

Respondents on 36% of the National Forests reported that NTFP inventories take place on their forests (Table 4). NTFP monitoring, however, occurred on 60% of the National Forests. Only 9% of the state foresters conducted NTFP inventories, while 29% monitored NTFP harvesting activities (Table 4).

Given the lack of knowledge expressed about NTFPs during our visits to Forest Service personnel, we were surprised that the percentage of National Forests engaged in NTFP inventory and monitoring was so high. Written comments included with the surveys helped clarify this seeming contradiction. The comments suggested that much of the inventory activity for NTFPs on National Forests consisted of informal field checks of an area before employees issued a permit, lease, or contract for products in an area. Similarly, most NTFP monitoring consisted of permit compliance checks (i.e. field visits to see if harvesters had obtained permission from the agency to remove products from a specified site) or informal visual checks of harvested areas during or after the harvesters have gathered the products. State survey respondents did not provide enough details for us to draw any conclusions about the nature of their NTFP inventory programs. However, six of the ten state forest respondents who indicated the existence of NTFP monitoring programs noted that monitoring consisted of either visual exams or informal checks of harvest areas as part of conservation officers' regular duties. The remaining four respondents did not provide details regarding the informal or scientific nature of their monitoring programs.

Table 4. NTFP Inventory and Monitoring on National and State Forests

	USFS [a] (n=84: 1 missing value)	**State Forestry** (n=34: 5 missing values)
Inventory NTFPs	36	9
Monitor NTFPs	60	29

[a] National forest with at least one response

Use of Harvester Knowledge for NTFP Management

Ethnographic studies of contemporary NTFP harvesters indicate that many are very knowledgeable about the ecological characteristics of the resources they harvest, and the ecological conditions of their harvesting sites (Emery 1998; Jones 2002; McLain 2002; Richards 1997). These studies also reveal that forest managers either don't include, or discount the importance of including harvesters, in forest management and planning. In order to assess the degree to which these site-specific findings apply to other areas of the country, we asked survey respondents to indicate whether harvesters contributed to NTFP management on their forests.

Respondents on 56% of the National Forests stated that harvesters contributed to NTFP management in their area (Table 5). The percentage was lower among state foresters, only 24% of whom noted that harvesters contributed to NTFP management on the lands they administer (Table 5).

Table 5. Harvesters Contribute Knowledge to National and State Forest NTFP Management

	USFS [a] (n=84: 1 missing value)	State Forestry (n=34: 5 missing values)
Harvesters Contribute Knowledge	56	24

[a] National forest with at least one response

NTFPs in Resource Management Planning

The literature on NTFP management in the United States indicates that NTFPs are often not included, or are addressed only superficially, in natural resource management planning (Chamberlain et al. 2002; Emery 1998; Antypas et al. 2002). Yet, the U.S. Forest Service is implicitly mandated under a variety of statutes, including the National Environmental Policy Act and the National Forest Management Act, to include discussions of commercial and non-commercial NTFPs in forest planning documents. These documents include, among others, Forest Plans (also referred to as Land and Resource Management Plans), Environmental Impact Statements, Environmental Assessments, and a host of other large and small-scale planning documents, such as Watershed Analyses, Social Impact Assessments, Landscape Analyses, and Biological Assessments. We included several questions on the surveys about the inclusion of NTFPs in commonly used planning documents. We also incorporated a question about the existence of NTFP-specific documents to assess the extent to which National Forests and state forests treat NTFPs with the same degree of consideration as they do other resources.

Forest plans constitute the key documents guiding management decisions on national forests. Respondents on 87 percent of the reporting national forests indicated that their forest plan included discussion of NTFPs (Figure 3). Respondents on 67 percent of the reporting national forests stated that their forest included NTFPs in environmental assessments (EA).[7] Respondents from only 39 percent of the reporting national forests, however, indicated that their forest included NTFPs in environmental impact statements. Environmental Impact Statements are typically very extensive documents involving months, and sometimes years, of analysis.

Some possible explanations for why many of the reporting National Forests don't include analyses of NTFPs in Environmental Impact Statements and Environmental Assessments include the following:

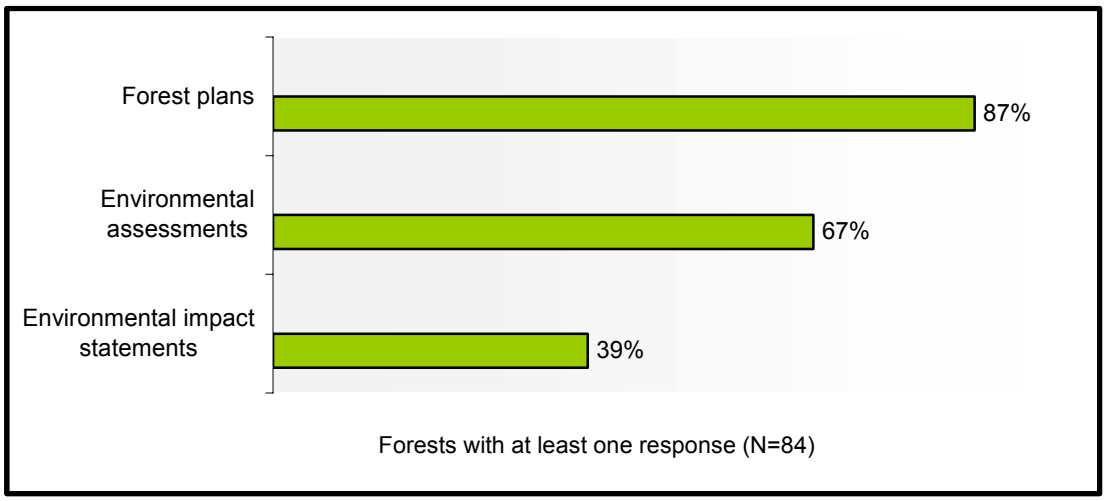
- NTFP harvesting may be very limited in scale and scope in some areas,
- Some National Forests lack information about the presence of NTFPs or NTFP harvesting activities within their boundaries, and
- National Forests may use a public scoping and comment process that NTFP harvesters either can't or won't participate in (McLain 2002).

Given the lack of agency attention to NTFPs that we encountered during our fieldwork, we were surprised that nearly all of the participating National Forests reported including NTFPs in their Forest Plans, and equally surprised that the rate of inclusion of NTFPs in Environmental Assessments was so high. This

[7] Federal agencies conduct environmental assessments to determine if the potential social and ecological impacts of a site-specific management activity (e.g., logging, thinning, controlled burning, campground construction) warrant detailed examination through the development of an environmental impact statement (EIS).

seeming discrepancy is likely explained by the range of interpretations possible for the term "include NTFPs in planning documents." Chamberlain et al. (2002) analyzed the amount of text devoted to nontimber forest products (i.e. SFPs) in Forest Plans in Regions 8 and 9. They concluded that "the attention afforded to NTFPs is minimal" (p.11) and that "no plan provided comprehensive coverage similar to that of other natural resources" (p.12). It is likely that Chamberlain's findings hold true for most National Forests.

Figure 3. USFS Forest Planning Documents Including NTFPs



Respondents on forty-two percent of reporting national forests indicated that their forest or district had prepared planning documents focused specifically on NTFPs. Survey respondents listed a wide spectrum of NTFP planning documents, ranging from site-specific biological and environmental assessments to forest-wide NTFP policies and monitoring plans (Table 6).

National forests with NTFP-specific documents often have highly visible NTFP activity. For example, the Tongass National Forest developed a comprehensive Forest-wide NTFP policy in order to ensure adequate supplies of NTFPs for subsistence harvesters in the area. Similarly, several National Forests in western Oregon developed environmental assessments for NTFPs during the 1990s when demand for NTFPs, such as matsutake mushrooms, increased dramatically.

Table 6. Types of NTFP-Specific USFS Planning Documents

Types of planning documents	
Biological evaluations	Forest-wide interim SFP policy
Budget plan	NEPA documents (unspecified)
Categorical exclusions	Product plans (firewood, Christmas trees, boughs, post and poles, log moss)
Decision memos	Post-fire harvest plan for mushrooms
Environmental analyses (decorative stone, sugar tapping,	Management situation analysis
Environmental assessments	Viability analysis
Fuel treatment/fire plan	Vegetation management analysis
Forest monitoring plan	

We also asked state foresters to provide information about whether they include NTFPs in planning documents. Since each state has its own legal mandates for planning documents, it is difficult to develop a list of documents that are applicable to all states. State foresters listed three kinds of forest planning documents that included NTFPs: forest-level management plans, statewide forest management plans, and

forest inventories. For all categories of documents, fewer than 20% of the state foresters reported including NTFPs.

NTFP Management Impacts on Biodiversity

A major focus of our study was to identify the effects of NTFP management on biodiversity. To accomplish this objective, we sought the answers to two broad questions: 1) How do NTFP management practices affect biodiversity?; and 2) How do forest management practices in general affect NTFPs? To answer these questions on a national scale, we included several survey questions aimed at identifying and assessing possible links between NTFP management and forest biodiversity. These included questions about non-regulatory NTFP management activities and on-going efforts to monitor the ecological impacts of NTFP management.

Non-Regulatory NTFP Management Activities

Our ethnographic fieldwork and previous studies of NTFP management in the United States indicate that most federal and state NTFP management focuses on regulation, rather than on investments in NTFP habitat or productivity enhancement (Emery 1998; McLain 2000). We thus asked survey respondents to indicate the kinds of non-regulatory NTFP management activities taking place within their forest boundaries. As indicated in Table 7, respondents on 20% of the participating National Forests indicated that non-regulatory NTFP management takes place on the forests they administer. The percentage (22%) of state forest respondents who mentioned non-regulatory NTFP activities was comparable (Table 7).

Table 7. NTFP Management Activities on State and National Forests

	USFS[a] (n=84)	State Forestry (n=34)
Non-regulatory NTFP Management	20	22[c]
Monitoring of Ecological Impacts of NTFP Management	53[b]	12[d]

[a] National forest with at least one response [b]Includes 2 missing values [c]Includes 1 missing value [d]Includes 11 missing values

Of the 12 National Forests engaged in active NTFP management, the kinds of activities noted included burning, fire suppression, fuel reduction activities, thinning, tree removals, and unspecified enhancement activities (Figure 4). Burning, for such purposes as enhancing berry fields and basketry material production, was by far the most commonly used active NTFP management practice. Several respondents noted that NTFP enhancement was a side product of wildlife habitat and fire hazard reduction activities rather than a management objective in itself.

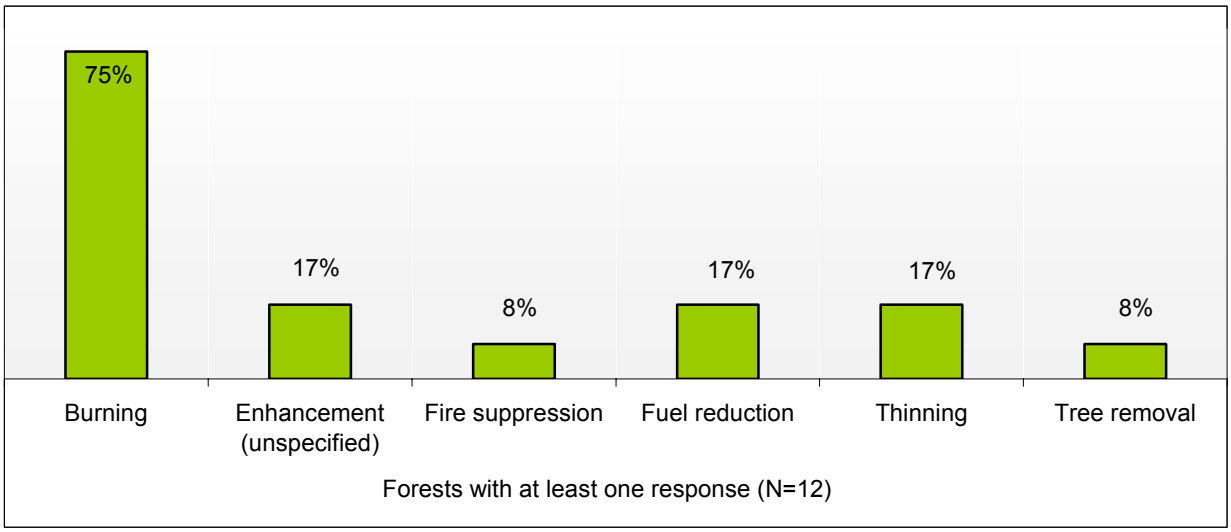
Only four state foresters indicated that they have undertaken non-regulatory management activities to enhance NTFP production. The four examples included: prescribed burning for blueberry production (Michigan), clearing small patches of forest for shrubbery enhancement (North Carolina), eliminating the hardwood understory in areas used for pine straw production (South Carolina), and prescribed burns as part of timber management practices with the secondary goal of enhancing a variety of NTFP species (Wisconsin).

Ecological Monitoring Efforts and Monitoring Results

To determine the extent to which forest managers invest time and resources in assessing the impacts of NTFP harvesting on biodiversity, we asked survey respondents whether their administrative units conduct ecological monitoring to determine the effects of NTFP management activities on biodiversity (Table 7

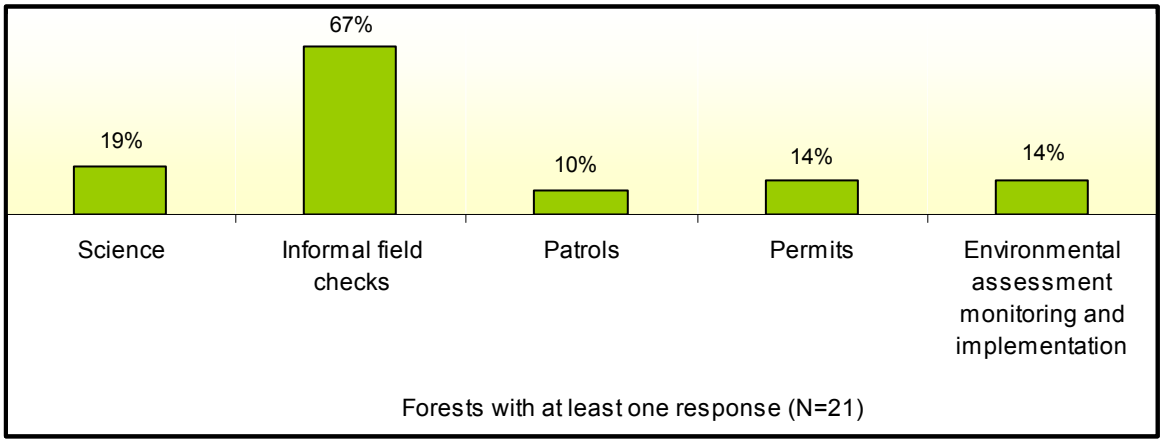
above).[8] Respondents from slightly more than half (53%) of the reporting National Forests indicated that ecological monitoring of NTFPs takes place on their forest. Forty-eight percent of the respondents from National Forests doing ecological monitoring provided no details about the kinds of things they monitored. For the 23 National Forests for which respondents provided ecological monitoring details, 65% focused their ecological monitoring on unspecified types of ecological impacts of NTFP management. The remaining 44% focused their ecological monitoring on the impacts of NTFP management on NTFPs themselves. Only four states (12%) reported doing ecological impact monitoring for their NTFP management activities.

Figure 4. Types of Non-regulatory NTFP Management Activities on National Forests



As with the NTFP inventory and monitoring question discussed above, the respondents interpreted the term "ecological monitoring" to include a range of activities ranging from informal checks of harvest areas, general site inspections, and permit tracking to scientific field plots and surveys. Informal field checks constituted the major method used by the national forests to monitor ecological impacts of NTFP management (see Figure 5).

Figure 5. Methods of Ecological Impact Monitoring on National Forests

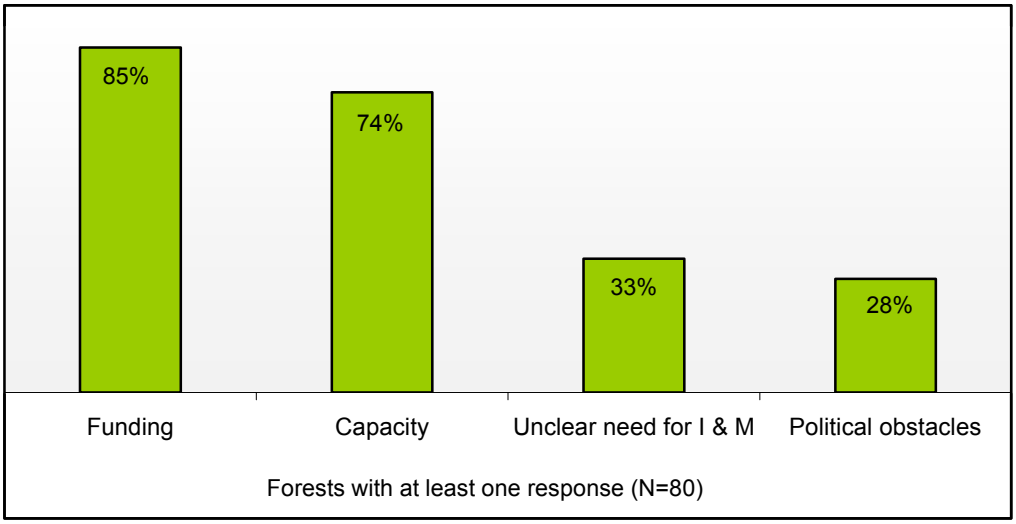


[8] The specific questions were: Are ecological impacts of district regulatory and non-regulatory SFP management activities monitored? Are ecological impacts of regulatory and non-regulatory NTFP management activities monitored on your state forests)?

Manager Perceptions of Barriers to NTFP Inventory and Monitoring

Survey respondents mentioned a variety of barriers to implementing NTFP inventory and monitoring, ranging from lack of funding to limited commercial demand for NTFPs to the low prioritization of such efforts within the agencies (Appendix 10). These barriers fell into four broad categories: lack of funding, lack of internal capacity; lack of political will within the agency; and limited or no perceived need due to either an abundant supply of NTFPs or a small number of harvesters relative to supply. The most commonly cited barrier to NTFP inventory and monitoring was lack of funding, which respondents from 85 percent of the reporting national forests listed (Figure 6). The second biggest barrier for the Forest Service was lack of staff, which respondents from 74 percent of the reporting forests mentioned. Both of these fall into the category of internal capacity. Twenty-five percent of the state forester survey respondents mentioned institutional capacity types of barriers, such as lack of agency knowledge and logistical difficulties, 14% listed lack of agency support, and 14% perceived no need for inventory and monitoring

Figure 6. Barriers to inventory and monitoring NTFPs



Manager Perspectives on Involving Harvesters in Inventory and Monitoring

One of our key research objectives was to assess the feasibility of developing participatory multi-stakeholder NTFP inventory and monitoring programs. We thus asked managers to provide their perspective on whether or not it would be useful or possible to involve harvesters in NTFP inventory and monitoring on their forest. As indicated in Table 8, respondents from the majority of reporting National Forests stated that it would be desirable to involve harvesters in inventorying (58%) and monitoring (54%).

Table 8. National and State Forest Manager Views on Harvester Participation

	USFS[a] (n=84)	State Forestry (n=34)
Support Harvester Involvement in Inventorying*	58	48[b]
Support Harvester Involvement in Monitoring*	54	46[c]
Agency-Harvester Collaborations**	38	29[d]

[a] National forest with at least one response [b]Includes 5 missing values [c] Includes 6 missing values [d] includes 3 missing values

As the following quotes indicate, managers who supported harvester involvement emphasized the knowledge that harvesters have to offer, as well as the fact that harvesters are already out on the ground, as reasons for encouraging their participation:

> They could easily describe locations where they are harvesting and make sure it [harvesting] is done in a sustainable manner. They could also inform the FS on situations where over-harvesting by other gatherers is happening. (FS)

> Commercial harvesters have knowledge of what species and products are available in the district and the amounts available. This information is valuable for inventorying products. They can provide valuable information on the effectiveness of harvest amounts and methods of promoting long-term viability of species. (FS)

> Native seed collectors are knowledgeable and do provide appropriate inventory and monitoring of the species they collect. (FS)

> Harvesters are the only people who have the means to maintain awareness of location and condition. (State)

Several Forest Service respondents, such as the two employees quoted below, offered examples of how harvesters are already involved in NTFP inventory and monitoring, as well as other aspects of NTFP management:

> A local non-profit group....has a very strong working relationship with SFP harvesters. In conversations with this group, they encourage the active participation of harvesters in the monitoring of SFP populations. (FS)

> Sassafras harvesters are able to track supply in areas. Fuel wood harvesters already help clean up timber sale areas and reduce fuel hazards. (FS)

However, a significant number of respondents expressed reservations about involving harvesters in inventory and monitoring. Concerns about the feasibility of participatory inventory and monitoring focused on four key issues:

- Whether harvesters have the skills to do such work,
- Concerns about harvesters producing biased results,
- Questions about whether harvesters have sufficient incentive, trust, or motivation to participate in such programs, and
- Reservations about the Forest Service's ability and political will to design and implement NTFP inventory and monitoring programs.

The quotes by Forest Service employees and state foresters in Figure 7 illustrate these concerns.

Figure 7. Forest Managers' Reservations about Harvester Involvement

Concerns about Harvesters' Abilities
Commercial harvesters in this area typically do not have the means or the knowledge to conduct proper inventories. They could contribute to monitoring by providing accurate collection data. (FS)
[Data] needs to be collected in a scientifically useful manner. They could provide input and information to the design team and therefore contribute, but I don't see them collecting data. (FS)

Concerns about Harvester Bias
Commercial harvesters would only be of limited value in inventorying since they tend to focus on the best areas with the highest value product. Harvesters also are reluctant to share any information about areas where they traditionally harvest products. Monitoring would be biased as the harvesters have difficulty identifying areas where their operations could be having an adverse effect. (FS)
The people requesting the product can be biased in the information provided. If the demand, value, need is demonstrated, then the state needs to develop the survey standards and manage the data. (State)
Lack of Trust and Incentives for Harvesters
The limited availability [of product] has reduced the interest expressed by contractors to provide inventory and monitoring information. (FS)
It is doubtful that they would because collectors tend to be secretive of their source locations due to competition, especially with regards to ginseng. (FS)
Medicinal plant harvesters are secretive about locations and would not publicize it. (State)
(cont.) **Lack of Capacity within the Forest Service**
Information is welcome, but we first need to develop a system to make such information useful (FS).
No inventory protocols exist, and no personnel to develop them. The only commercial SFP permits issued are for boughs. It would take some additional involvement to coordinate with permittees. With no support or money, it does not happen now. There is an opportunity to increase the SFP program, both for personal use and commercial use on the forest, but it has not been funded (FS).

Respondents from 38% of the National Forests and 29% of the state foresters indicated that harvesters already collaborate with them in NTFP management. We did not ask for further details on the nature of these collaborations. However, the comments listed below from US Forest Service respondents indicate that, at a minimum, collaboration consists of harvesters informing forest employees about resource conditions, quantities gathered, and unpermitted harvesting.

> Commercial harvesters often provide information as to progress of harvesting activities and conditions (FS).
>
> Commercial harvesters of SFPs help [increase] Forest Service awareness of commercially desired products and their locations (FS).
>
> Most of the recent inventory [data] comes from harvesters (FS).
>
> They could help and do where there is over gathering and poaching (FS).
>
> They provide feedback on availability and conditions (FS).

As noted earlier in this section, some harvesters also assist Forest Service employees in inventory and monitoring efforts.

Summary

The surveys demonstrate that NTFP harvesting is a nation-wide phenomenon that takes place on many National Forests and state forests. Not only is NTFP harvesting widespread but, even using a conservative estimate, the range of NTFP products and species harvested encompasses hundreds of different kinds of biological organisms, as well as a few non-biological products, such as rocks and minerals. Therefore, to ignore NTFPs in forest management is to ignore important components of biodiversity. Furthermore, efforts to conserve biodiversity are unlikely to succeed unless knowledge about these species, products, and the effects on them of various forest management activities, including but not limited to NTFP harvesting practices, becomes an integral part of forest management.

Unfortunately, the survey results also show that many of the reporting National Forests and state forestry departments pay limited attention to the impacts of other forest management activities on NTFPs, as well as the impacts of NTFP management on forest biodiversity. Many of the responding forest managers are unfamiliar with key NTFP policy documents and web resources. NTFPs are not included or are inadequately addressed in many forest planning processes. Few of the reporting National Forests or state forests make use of scientific inventory and monitoring procedures for gathering data about NTFPs. Moreover, managers on many of the reporting National Forests and state forests do not incorporate harvester knowledge into NTFP management and planning. Thus, NTFP management on many state and national forests is taking place in the absence of significant input from the very stakeholders most likely to have detailed knowledge about NTFPs. In short, many forest managers are either unaware of or are not using resources and tools that are available for learning more about NTFPs and the effects of NTFP management on biodiversity.

National Forest managers and state foresters are struggling with how to incorporate NTFPs into their forest planning processes in an era of declining budgets and decreases in staffing levels. Indeed, survey respondents identified lack of funding and personnel as the two major internal barriers to NTFP inventory and monitoring. However, many respondents indicated that agency-harvester collaborations could be used to develop and expand NTFP inventory and monitoring programs. For such programs to work, the designers would need to develop inventory and monitoring systems that simultaneously addressed the needs of harvesters (e.g. location information safeguards and access guarantees) and the needs of forest management agencies (e.g. data quality control). Effective collaborative NTFP inventory and monitoring systems would also require the development of suitable training materials for both harvesters and forest managers, as well as a long-term commitment on the part of upper level agency administrators to invest in such systems. In the course of our ethnographic fieldwork and a supplemental literature review, we identified a range of collaborative inventory and monitoring projects that can serve as models for developing a nation-wide network of NTFP inventory and monitoring projects aimed at supporting the biodiversity conservation objectives of the Montreal Process' sustainable forest management agenda.

COMPONENT 4 FINDINGS:

Ethnographic Fieldwork with Harvesters

We supplemented the forest manager surveys with a year of ethnographic research on NTFP harvesters in the eight Bailey's ecoregions covered by this study. Ethnographic fieldwork is the foundation of cultural anthropological research and typically involves in-depth research in a community over a long period of time in order to collect data that describe a culture (Bernard 1994:16). The federal government has a long history of using ethnography to "gain better understanding of the sociocultural life of a group whose beliefs and behavior were important to a federal program" (GAO 2003:3). We included an ethnographic component in this research because ethnography has a good track record as a method for studying populations, such as many NTFP harvesters, who are marginalized or invisible in natural resource management and policy

making (Emery 1998; McLain 2002). This section presents findings from the ethnographic research component. It includes a discussion of the different types of harvesters we identified, how their local knowledge could be beneficial to forest managers and policy makers, and their perspectives on the impacts of both harvesting and other forest management practices on NTFP species and biodiversity in general.

The ethnographic component of our study had two main objectives: 1) to gain insight into NTFP harvesting practices; and 2) to learn about changes harvesters had observed in their harvesting areas, either due to their own harvesting practices and/or due to forest management activities in general. By developing a better understanding of under-utilized harvester knowledge we hoped to expand the base of information from which managers and policy makers draw to make decisions. In order to achieve our objectives we needed to find harvesters where they live and work, visiting their communities and the areas where they harvest. We chose to do exploratory level research across the country, characterized by short visits in many communities, rather than conducting a much smaller number of in-depth local visits. We chose this option partly because basic information about the sociocultural aspects of NTFP harvesters across the U.S. is lacking, and we wanted to find out to what extent harvesters are present in various parts of the country and to learn about their relationships to NTFPs. Second, by making national-level data available, we improve the capacity of managers to understand the regional and national context of future local research on NTFPs and NTFP harvesters.

Methods

Based on past research experiences with harvesters, we knew that an ethnographic approach using interviews and participant observation was likely the most suitable approach for finding, engaging, and learning about harvesters. Given the dispersed settlement and forest use patterns of harvesters in many areas, we used a snowball sampling approach to find harvesters. Snowball sampling is defined as identifying one or more key individuals and then asking them to identify others who would be appropriate to contact for the study (Bernard 2000:97). We identified harvesters with assistance from our regional liaisons Marla Emery, Sarah Workman, and Tom Love, land managers and other advisors, buying station operators, and harvesters we already knew or met as we progressed across the country. Since we used a selective, rather than random sampling design, we cannot generalize our findings to the entire harvester population. Nonetheless, the data we collected is an important first step toward improving understandings of who harvests NTFPs, the complex cultural and ecological systems in which harvesters are embedded, and areas for more in-depth study.

In the twelve months we spent doing ethnographic fieldwork, we drove 37,000 miles crossing 39 states. Most of the time we traveled on rural roads and highways. After identifying harvesters in each of the study's eight ecoregions we conducted semi-structured, open-ended formal and informal interviews to learn about their background, experience harvesting, and observations they have made regarding harvesting impacts to biodiversity. We also asked if they would be interested in participating in inventory and monitoring efforts and to discuss potential incentives for, and barriers to, their participation.

Formal Interviews

We taped the formal interviews, which varied in length from half an hour to several hours. We conducted 143 formal interviews,[9] (Table 9). The semi-structured nature of the interviews allowed us to gather comparable data on key topics for each interviewee, while the open-ended questions gave interviewees the flexibility to introduce useful information that fell outside of our question set. Our only selection criteria for including or rejecting harvesters for participation in the formal interviews was that they be experienced harvesters. We defined an experienced harvester as anyone who had at least five years of experience. Although we focused on interviewing harvesters who gathered entirely or primarily on lands managed by the U.S. Forest Service and state forest departments, we also interviewed harvesters with access to private lands.

[9] Workman contributed three and Emery contributed six.

Table 9. Interviews by Ecoregion

Area	Total
West (Rocky Mtn. States)	40
Southeast	45
Northeast and Great Lakes	37
Pacific Coast	21
Total	**143**

Although we included many kinds of harvesters in our sample, we opted to forego interviewing the following categories of harvesters for the reasons cited below:

- Formally trained scientific harvesters since they are well known to land managers as well as being visible through their publications (See typology discussion below);
- Recreational harvesters with formal clubs since their activities are also generally visible through newsletters and related materials, though in retrospect interviews would probably clarify many unknowns about these types of harvesters;
- Migrant harvesters due to the tension over undocumented workers, and the lack of time for us to establish the trust needed to gain access to such harvesters.

While we invited and had some participation in our workshops we did not interview members of Native American tribes primarily because of the time it would take. The geographic scope of this study encompassed hundreds of tribes, each of which has its own traditions and relationships to the plants tribal members gather. The time frame was also too short to permit us to establish relationships with tribal governments and to and learn about those traditions they might be willing to share with outsiders. Furthermore, numerous ethnobotanical studies already provide some insight into the vast ecological knowledge of Native American peoples (Moerman, 1998). Finally, we wanted to expand awareness that gathering in the United States is a widespread practice that people from many cultural traditions have engaged in and continue to engage in on a regular basis.

Informal Interviews

In addition to the formal, semi-structured interviews, we conducted hundreds of informal interviews with a variety of NTFP stakeholders. Though untaped and unstructured by our formal interview guide, these interviews addressed some of the same questions and are captured in fieldnotes. As we moved into a new region, informal interviews helped orient us to regional issues and concerns regarding biodiversity conservation, forest management and NTFPs. Information from the informal interviews helped with networking and provided a means for us to verify and confirm formal interview findings.
Prior to conducting formal and informal interviews or asking questions of relevance to the research project, we introduced ourselves as researchers and explained the nature of the study. Before recording interviewees on tape or taking their photographs we received oral consent from participants. In keeping with standard ethnographic practice, we have presented all interview data anonymously. We also provided an opportunity for formal interviewees to review the ethnographic portion of this document for comment.

Participant Observation

As a complement to the interviews, we relied on participant observation to develop a greater understanding of the relationships between NTFP conservation of biodiversity and forest management. Participant observation is exactly what it implies—the researcher participates in and observes the lives and activities of the people they are studying. It entails "establishing rapport in a new community; learning to act so that

people go about their business as usual when you show up" (Bernard 2000:137). We spent approximately 160 hours observing such things as people at work and in their homes, the forests where they harvest, and demonstrations of problems people encounter while harvesting. Whenever possible we visited key nodes of harvester interaction, such as buying stations, storage and processing facilities, and the front desks of management offices. Our interactions with harvesters sometimes extended beyond initial contacts, including maintaining regular contact by phone, email, and additional visits. The benefits of participant observation are many. First, by 'hanging out' with local residents, walking in the forests with them, and going to the Ranger District offices where they obtain permits, we gained first-hand experience of the issues shared in the interviews. Second, we greatly expanded and contextualized the information harvesters shared in surveys and interviews. Third, participant observation provided a mechanism for us to verify and triangulate the data gathered though interviews and surveys. This ground-truthing was also important for clarifying comments harvesters made during interviews. In addition to formal participant observation we also spent hundreds of hours doing general observation research. General observation includes browsing herbal store shelves for wild-crafted NTFP ingredients, visiting forests to look for signs of NTFP management and NTFP species, and photographing NTFPs in various settings.

Who are NTFP harvesters?

We use the terms 'harvester' and "harvesting" in this report, but as we learned while traveling across the country, a variety of other local expressions exist to describe NTFP collection and collectors. Some of these terms and the NTFPs they are commonly associated with include *digging* medicinal roots, *pulling* moss, *gathering* nuts, *picking* berries and mushrooms, *tapping* maple syrup or turpentine, *rossing* slippery elm, *foraging* for wild foods, *wildcrafting* herbs, *stripping* or *peeling* bark, and *collecting* wildflowers and seeds. Additionally, an endless multitude of local slang expressions, such as *sanger*, *shroomin'*, *truffling*, *scrapper*, and *booneycrasher*, exist to describe harvesting and harvesters.

While some harvesters specialize in gathering a single species, we found that most people harvest more than one species. Only six people within our sample collected one species exclusively. 72 indicated they picked more than 25. While we did not seek to compile a complete list of products harvested by every harvester, we did ask interviewees to name some of the NTFPs they commonly harvested. Collectively, the harvesters we talked with mentioned over 473 NTFPs (Appendix 8). This number represents only a portion of what harvesters in our sample remove from the wild and are knowledgeable about. Furthermore, the large number of species being gathered is further evidence of the biological diversity that NTFPs represent.

Motivations underlying harvesting are often diverse (Table 10). Previous research has identified seven distinct, but often overlapping, categories of harvesters (Jones and Lynch 2002). These include people harvesting for subsistence, market exchange, recreation, spiritual purposes, healing, the development of formal scientific knowledge and the development of informal scientific knowledge. We added a new category to the typology – education – to refer to educators and students who harvest NTFPs in the course of teaching and learning.

Since most harvesters gather for multiple reasons, the purpose of this typology is not to pigeon-hole harvesters into any single category. Rather, it demonstrates the range of motivations that can underlie NTFP harvesting which potentially have implications for sustainable management. Our interviews included harvesters from all categories except formal scientific harvesters, recreational clubs that organize group forays, and educators or students harvesting in the framework of a formal science program.

Table 10. Typology of Nontimber Forest Product Harvesters

Type	Description
Subsistence	Noncommercial harvesting for food, shelter, clothes, or other necessities of life.
Commercial	Harvesting to exchange or trade for any form of payment, especially cash.
Recreation	Harvesting for pleasure or exercise, typically small quantities. Includes formal clubs.
Spiritual	Harvesting as a spiritual practice and/or viewing plants and harvesting locations as sacred.
Healing	Harvesting for the purpose of curing illness and maintaining health.
Formal Scientific	Harvesting or setting aside NTFP resource areas for activities based on the scientific method.
Informal Scientific	All forms of systematic inquiry about NTFPs beyond the scientific method.
Education	Harvesting in conjunction with teaching and learning, often in the form of outdoor courses.

One division that runs through the typology that has clear ramifications for sustainable management is commercial and noncommercial harvesting. For example, individual commercial harvesters may take larger quantities than individual noncommercial harvesters, but collectively noncommercial harvesters might remove larger quantities if their population outnumbers commercial harvesters. All categories in the typology except commercial harvesters are noncommercial harvesters, though they may also gather commercially at times. Our definition for commercial harvester included anyone acquiring any income from selling or trading NTFPs they have harvested. Thus, an educator who charges for a workshop would be considered to be commercially motivated. Within our formal interview sample, 29 harvesters fit exclusively into the commercial category, 25 could be described as noncommercial, and 89 did both commercial and noncommercial harvesting. We interviewed 31 people who provided formal instruction on harvesting NTFPs through courses, workshops, and other forms of training.

NTFP research shows that harvesters in the United States are diverse in terms of gender, age, ethnicity, class and cultural identity (Emery 1998; Richards and Creasey 1996; Hanson 1996; Jones and Lynch 2002). Although research on the social aspects of NTFPs is still in an exploratory stage, studies thus far indicate that harvester demographics vary considerably across specific NTFP sectors. For example, the floral greens sector in western Washington has a large Latino harvester population (Lynch and McLain 2003), while wild mushroom harvesting in southwestern Oregon and northern California has a large population of pickers of southeast Asia origins (Richards and Creasey 1996).

Variables such as gender, age, ethnicity, class, and cultural identity, as well as harvester motivations for gathering NTFPs, can influence how they interact with the resources they harvest. For example, many healers often go collect NTFPs when they need to make medicine, whereas a commercial collector may be out in the woods every day during the harvesting season. Some elderly harvesters prefer to harvest near their cars whereas younger people may go off-trail for miles. Myths, stories, and personal experiences of cultural groups can influence attitudes and behaviors in the forest. For example, in previous ethnographic research by Jones, both women and a few older Asian-Americans who lived in southeast Asia during the Vietnam war, expressed fears about meeting strangers in the woods and so preferred to harvest in groups.

We conducted formal interviews with a total of 60 women and 83 men (Table 11). Ages ranged from 25 to 88 with the average being 52 (missing values = 17). Educational backgrounds ranged broadly, from interviewees without literacy skills to several people with graduate degrees. Several interviewees had completed programs in herbal colleges, where they had learned to harvest medicinal plants and prepare medicines. However, most people in our sample learned to harvest through family, friends, or were self-taught.

Table 11. Sex of Interview Participants

Region	Women	Men
Western – M313, M331	18	22
Southeast – 231, 232	16	29
Northeast – 212, 221	18	19
Pacific Coast – M242, M261	8	13
Total	**60**	**83**

In some areas, forest managers take into account harvester diversity when developing NTFP policy and regulations. For example, many Forest Service districts distinguish between commercial and noncommercial use, regulating each differently. However, our research and previous studies of NTFP policy and management (Alexander et al. 2002; Carroll 2003 et al.; McLain 2000), suggest that this simple dichotomy does not adequately capture the diversity of harvesters' motivations and thus produces hardships for many harvesters. For example, it is common for some harvesters gathering mushrooms for their own use to collect more than the small amount per day allowed under the Forest Service's personal use permits in order to dry and store the mushrooms for the winter or for several seasons. Staying within the limits of the personal use permit requires such pickers to increase the number of their gathering trips. This increases both the time and the costs for them to harvest the quantities they need. Some of the types of hardships that can occur when policies are unable to differentiate between different types of forest use are revealed in the following quotes from interviewees:

> *Harvester*: As an independent educator, working with the Forest Service is needlessly impractical, so I've abandoned it. For instance, if I wanted to offer a one time event on their land they would require me to pay a base fee, a per person fee, limit me to 12 persons—11 students plus the instructor—no matter the habitat, require me to purchase special outfitters insurance, and join—pay annual fees to—an outfitters association. All that just to take students on a three hour educational hike in the woods. I would have had to double my fees to something no one could afford. They don't differentiate between a single ethnobotanical hike along an established trail, and an outfitter who makes his sole living catering high risk rock climbing expeditions on their land.

> *Harvester:* I teach classes all over the state [Colorado] and Wyoming so I would have to get a permit from that national forest and this national forest and one up in Wyoming. It is expensive so I will take that class out one time and take the risk that I am not going to be caught. I have never been caught because I hardly ever do it. A guy like me just doing a part-time business has to feel like I am doing something illegal because I don't want to spend hundreds of dollars on permits.

Although NTFP industries are more visible and developed in some regions of the United States, such as the Pacific Northwest, in 12 months of field work encompassing hundreds of unincorporated communities, small towns and cities in 39 states, we easily encountered harvesters everywhere we went. Nearly everyone we spoke with harvested something from the forest or at least knew somebody personally who did. Even in urban areas we discovered people who harvested from urban trees and associated vegetation.

Despite the apparent ubiquity of harvesting, many harvesters in our study observed that they are overlooked or ignored by forest managers. The frustration and anger that some harvesters have toward forest managers is revealed in the quotes below.

> *Harvester:* Amongst the pickers, here is how it goes: Scientists don't know a damn thing, right? Managers don't give a shit and rip you off. Sociologists ain't worth a shit. They are useless so you are in the useless category here. I have heard it all and the managers

> have heard all of this so you have got this mess that nobody trusts anybody and nobody has any confidence in anybody.
>
> *Harvester:* I don't really think it [harvesting] is on the radar screen. So far they have all been trained to promote the timber and I don't think they really know how to even be concerned.
>
> *Harvester:* I feel like I sometimes have to kiss ass with them. Instead of a mutual agreement it feels like I go way out of my way to work with these people and they do nothing to approach me.
>
> *Harvester:* Well, you might as well work with a stick. [laughs]. They told me that us old people don't know nothing, but we know more about that then "the book". They just go by the book. Whoever wrote that book must have been crazy.

Most harvesters were passionate about their livelihoods and said that they would welcome the opportunity to work with managers. For example, when asked if he knew of any harvesters working with forest scientists or managers, one harvester responded:

> *Harvester:* I don't. They've never asked me here. They've never asked anybody. I would gladly point them in the right direction. We'd be glad to work with any of them if they'd give us a chance.

A number of harvesters point to greater collaboration between harvesters and managers as a necessary direction to improve NTFP management and information. For example:

> *Harvester:* I think the first thing we need to do is change the mentality of the managers. They need to get out of this mentality where they think of one person, one contract—the old log company type. They need to get into the idea that they have to involve as many folks as possible in order to accomplish the task that they have in front of them. I think they need to look at ways of making the work attractive to people in areas of our economically depressed [area]. I think it's the perfect opportunity for the Forest Service to change that around and I don't see that happening. Certainly with the work that they have I think that's the only way that's going to be accomplished. What I think it'll do is...not only meet the need that's there....but certainly I think it will address the forest conditions we have known.
>
> *Harvester:* Somehow, I feel it's got to be collaboration. I don't think one herbalist could go there like, "well you know I'll help you harvest all that mistletoe off those trees." I could probably go and get a bag full. I think it would be really trying to get everybody together and in a small part I think we've just started doing that here.

Learning the Ground: Harvesting Frequency Patterns and Ecological Knowledge Development

One of the essential elements of Traditional Ecological Knowledge (TEK) is repeated observations and experience with a place (Huntington 2000). Thus, we wanted to evaluate the degree to which that fundamental element of TEK occurred with NTFP harvesters. All harvesters but one group of seed harvesters indicated that they returned to areas where they had previously harvested. For some harvesters, the process of making regular visits to harvesting sites allows them to develop intimate connections with the environment in which they work and engenders or strengthens a stewardship attitude. At a minimum such visits are an opportunity for harvesters to observe and experience the rhythms of the ecosystem and changes in specific areas over time. The following quotes provide a sense of the relationship between having frequent access to harvesting sites and developing knowledge about the site's ecology:

> *Harvester*: That's one of the things I tell people about wildcrafting. It's like, well you go and you may be able to pick depending on how the stand is doing but more than anything you're monitoring that spot…it's like your own little area in the woods that you check on. I don't think that the Forest Service, that they have that kind of intimate relationship with any of the forest. They don't actually go and spend time with it...that way.
>
> *Harvester:* We interact fairly intimately with a piece of land and what is growing on it. If you spend a week bent over in a draw picking seed you know what is growing next to it, you know what is growing on the slope, you know what is growing in the boulders, you know what is growing in the sand...and if you go back there year after year you can fairly quickly see the changes that are taking place because you have got that intimate baseline with which you can compare changes.
>
> *Harvester*: You go every day and if the weather gets too tough you make a short day out of it...it isn't just something anybody else in the street can go out there and do because there are certain products that might only have a thirty day window in the year for top quality...there is an optimum time there, certain state of maturity.
>
> *Harvester*: Some of us are out there quite often in areas and we have somewhat extensive knowledge of what's going on – the conditions, quantity, quality of different products, and I think that's valuable – that can be a valuable tool to researchers, land managers, maybe not to log, or not to thin until after a certain season.

The frequency with which harvesters visit their patches, as well as the distribution of their visits over time, influences the kinds of ecological knowledge development opportunities available to harvesters. For example, depending on climatic conditions, mushroom patches may produce several major flushes in a season. Harvesters who stay in an area for the length of an entire fruiting season will have a better opportunity to see how small variations in rainfall, temperature, slope aspect, and other variables affect mushroom production over the length of the season than harvesters who limit their time to one or two flushes toward the beginning of the season. Likewise the longer-term harvesters will be more likely to develop a better understanding of the kinds of ecological indicators that signal the emergence of the next flush, which in the case of a mushroom like the morel (Morchella spp.) may consist of a different species of morels. The following quote illustrates how repeated visits to the same spots year after year can lead to the development of site-specific ecological knowledge:

> *Harvester:* You end up doing that [making observations] particularly if you go to the same place year after year. I have been harvesting off the same hillside for fifteen, almost twenty years. I have taken almost four hundred students to the same hillside to harvest and they replant seed. I am watching the effects that we have. Last year there wasn't very much snow, and I have watched the plant yield increase.

Many NTFPs have definite seasons when they can be harvested, which in turn affect how often harvests take place. Harvesters that specialize in harvesting one species might only go out in the woods one season a year, and depending on the species, perhaps only once in a season. For example, several medicinal root harvesters indicated they could gather all that they needed for their family and friends in a single annual trip.

Though most of the harvesters we interviewed typically go back to known areas year after year, if they only go to the harvest site once a year, their knowledge would be limited to understanding changes taking place from year to year, rather than changes taking place within seasons. Most harvesters in our sample gathered multiple species from multiple places, returning regularly to the areas to harvest them. A few used a rotational schedule and only visited specific harvest sites once every two or three years, a method they felt helped assure they would not inadvertently overharvest. As indicated in the quote below, harvesters also

acquire knowledge about the conditions that indicate that the species they harvest are approaching harvest time:

> *Harvester*: ...summer to fall is mostly when I go and I try to go once a week...but it's just because I go out at least once a week out into the woods anyway just to see what is happening...so that way you can keep an eye on it.

Interviews with harvesters and buyers suggest that market risks associated with increased extraction levels can also affect how often harvesters enter the woods. For example, several seed buyers in the western region indicated that they refused to buy from harvesters who brought them immature seed. Immature seeds have a lower germination rate, and thus buyers who purchase and re-sell immature product risk acquiring a poor reputation among their customers. Buyer demand for more mature seeds encourages harvesters to wait later in the season before harvesting. In addition, many harvesters in our sample stated that they are sensitive to the potential negative effects that unsustainable harvesting practices could have on their livelihoods. Thus, as illustrated in the following quotes, a harvester may go out in the woods to see how a patch is doing, but may refrain from harvesting it if s/he perceives that doing so would be harmful:

> *Harvester*: I never travel without a flower press in my car...you never know when you are going to find something. I was picking and the trooper came along and asked me what I was doing and I told him and he said, "Lady, you just pick all you want to." Of course I wasn't going to deplete it. I wasn't going to pick everything that was there. When I do harvest I am always very careful not to harvest very much if there is only a little bit of it there. I want it to have the opportunity to seed and be there again next year.

> *Harvester*: We go back but don't necessarily harvest there...but look and see what it looks like this year as opposed to what it looked like last year, and if it looks like the plants are not doing as well we go find some place else to harvest, or they are doing really well then we harvest there.

Harvester Relationships with Landowners

The different land ownerships harvesters gather on and relationships with those landowners can be factors in sustainable NTFP management. For example, different landowners often have different sets of rules about access and product removal. For example, National Parks typically don't allow harvesting of NTFPs as a ecological conservation strategy, but they may share a boundary with a landownership like a National Forest that allows harvesting. If the border is porous, harvesters may intentionally or unintentionally harvest in areas where managers do not want them, potentially affecting the ecology in adverse ways.

Harvesters in our study gathered products on lands held under a variety of ownerships and management regimes, including public lands such as National Forests, Bureau of Land Management holdings, U.S. Fish and Wildlife holdings, military lands, National Parks, state forests, and probably most other publicly held forested lands, such as municipal and county forests. Some of the harvesters we talked with harvested on Native American reservations and on off-reservation reserved lands. Others harvested products on small privately held parcels, sometimes their own, and on corporately owned lands, generally large tree plantations owned by timber and energy companies. Harvesters worked on large private and public forests with tens of thousands of acres; they also gathered on small individual holdings less than an acre in size.

We encountered several examples of ownership patterns shaping harvester behavior. For example, in areas where private land ownership dominates, harvesters, such as the pine straw raker quoted below, may stitch together harvest agreements with multiple owners:

> *Harvester*: It's private owned land...just private owner farmers, mostly local farmers...Most you go in and lease...some of the owners want so much a bale. We can get a lot of ten acre plots....and that's why we can do our thing every six months or so because we don't have to go right back , because we got so many little spots that we can continue to go along. Sometimes it be a year before we get back…most of the landowners I've been dealing with for a while trust me.

Difficulties in identifying boundaries between ownerships can undermine management policies aimed at controlling where harvesters gather. This is especially true in western forests where distinguishing ownership boundaries over vast forested acreages can be difficult and in eastern national or state forests which tend to be fragmented by private in-holdings. In the southern states, some Forest Service managers indicated a reluctance to issue permits because they would have a difficult time enforcing them in light of such fragmented ownership. Even if boundaries are fenced, someone living adjacent to a national forest can easily slip into the forest and remove products if they do not wish to comply with permit regulations. How common movement back and forth between private and National Forest lands is unclear to us, but in previous research studies as well as this one, harvesters, such as those quoted below, frequently mention the difficulties of establishing one's location on the ground:

> *Harvester*: You know, it is interesting because up in the mountains the way the land is, it is all like mining claims so you just never know whose land you are on.

> *Harvester:* Why bother [getting a permit], I'm going to be illegal anyway because the boundaries aren't well marked.

The relationship harvesters have with land owners can affect where they go. Harvesters on both private and public lands expressed a range of positive and negative views about their relationships with private and public landowners. For example, one seed collector described his relationship with local forest managers in favorable terms:

> *Harvester:* I was the first in all of the surrounding National Forests that went in and asked for permits. They didn't know what to do with me. They never knew what to charge me. They were fairly reasonable though. I talked to them, gave them information and they came back with an offer and I'd go "yikes" and then we would debate the issue, and they would say, "okay," and we'd come to an agreement, and they would make me a permit, and I would go start collecting. Once they understood what I was doing they were okay about it...they were pretty decent to work with actually.

> *Harvester:* They were fine. They've been fine with everything I've wanted to get so far. They just charge me like, you know, ten cents per pound for a permit. It's actually quite a bit, I get it cheaper than that from private landowners. But they were fine.

However, it appears that both private and public land managers and law enforcement are increasingly discouraging harvesters from coming on their lands. For private property, access limitations are increasingly being enforced by absentee landowners on lands that local people formerly had informal agreements with previous property owners to hunt and harvest on. Several harvesters commented that they feel unwelcome on public land as well:

> *Harvester*: I don't believe you're supposed to get anything out there, unless you get a permit for it, and you can't get a permit for anything because they don't want to mess with it. They used to give out firewood permits...They used to sell ginseng permits. They don't do that anymore. Just mainly because they say that there's no study out there to tell them

> if it's good or not. That's their excuse but their excuse is they just don't have the people to do it and they don't want to.

One harvester we talked with described numerous negative encounters with Forest Service law enforcement such as intimidation, invasion of privacy, and roadblocks. In the following quote he identified lack of respect as the root of the problem:

> *Harvester*: There is absolutely no respect for them here or anywhere anymore and all it would take is for them to quit feeling like they deserve respect and earn it. You don't just come waltzing into my camp...you say, "do you mind if I come in and talk with you for a minute?" This is my home and I have certain rights...

Linking Local Knowledge to Scientific Knowledge Production

A key reason for exploring the potential for integrating harvesters into scientific studies of NTFPs on forestlands is that few managers can afford the time or expense to make regular visits into the woods to the degree that harvesters do, much less to gather information about specific NTFPs in those forests. This gap in knowledge among forest managers is described by a harvester as follows:

> *Harvester*: I haven't had much interaction with them [the Forest Service] and what interaction I have had it seems like they don't, they certainly don't, know as much about mushrooms that are available here as I do….a couple times I would try to call up on a Saturday morning and say, "are there any mushrooms up there?"… and you know the park rangers that I've talked to really don't know if there are or not. I would have them look out the window, because when they do come up in Arizona they come up everywhere…they're just everywhere…and they're easy to see, so I can sort of train this person to spot them over the phone… that's been the general experience I've had with the people I've spoken with. They don't really have any idea that there's this resource out there.

In previous fieldwork by Jones (2002) harvesters have provided descriptions of NTFPs that suggest they are aware of variability in species that scientists are unaware of, or have not fully documented. We thought that asking harvesters in this study to describe differences within species they harvested might yield responses that could be used to assess the depth of their ecological knowledge. Although we did not get much information about species variability when we asked this question, harvesters offered a range of comments that revealed the scope and depth of observation and analysis many harvesters engaged in during the course of harvesting NTFPs. For example, here is how one Colorado harvester talked about variation within chokecherries:

> *Harvester*: Well, chokecherries, there's about twenty-seven different varieties of subspecies. Some grow long panicles with a lot of berries. Some grow short panicles with very few berries. Some grow panicles along the branch. Some just grow panicles at the end of the branch. So you never know what kind of tree you're going to get into. And they grow together; it doesn't matter.

General observations about changes in the species or habitat, such as the observations quoted below, constituted a more common harvester response.

> *Harvester:* You know I've been noticing arnica in the last few years hasn't been that great, not really flowering as much. A lot of leaves are out but it just doesn't seem to be flowering at all. And then there was a couple of years where it was just all over the place. And those type of years I'd go out and I'd gather that.

> *Harvester:* I go back to the same trees, the same places, so I can tell the health of what's going on. I'm always amazed to find what goes on with populations. Now I can see over years how drought affects these trees, how it affects these plants...how the cows affect the herbs or not.

> *Harvester:* It has been eight or nine or maybe ten years now [since logging], and I am seeing a definite tapering out with the production, and these are just tiny little spots but I know them really well. I used to get twenty or thirty boletes...I am absolutely certain it has nothing to do with picking them. I think it has to do with the Oregon grape, salal...grasses coming in and crowding them out.

In addition to making, and sometimes recording, empirical observations, some harvesters also engage in various forms of systematic or semi-systematic experimentation (Jones 2002). Such experimentation often has the explicit goal of improving productivity or improving the experimenter's understanding of ecological relationships. The following quotes from our research provide a sense for the experimentation activities harvesters undertake:

> *Harvester*: Like that big patch of moss there. We just gather it out of the center of that and we leave three or four inches all over the rim and so you can come back in three years and harvest it again. Moss...once you leave an open spot in the center, it tries to cover it back up. I actually did some experimenting myself on how fast it grew and everything. What I'd do, one year when I first started this, is I went out there and I found a patch of moss growing and I drove pegs around it, all the way around it. And I'd go back every year and I'd check it and measure it and see how much it'd grow. Most of them will grow at least an inch a year all the way around. Some of it will grow more. It depends on the area, humidity, soils.

> *Harvester:* I don't remember who told me for sure but I heard it a lot, that you can't pull morels out of the ground, you better cut them, because of if you pull them they'll never come back....So I'd just pull on this side of the camp [motions left] and cut on this side of the camp [motions right]....I got twelve picks on each side and I could see absolutely no difference.

Harvesting Impacts to NTFPs

With few biological or ecological studies on the effects of harvesting NTFPs, the best sources of information are harvesters themselves. While our objective was not to assess harvesting impacts, our data shows some ways in which sociocultural research can be of value for providing greater understanding of such impacts. For example, some harvesters remove part or all of the upper vegetation on medicinal root plants, such as ginseng, so that other harvesters will be unable to locate the plant. Harvesters also remove identifying parts from plants too young to be harvested or older plants discovered out of harvesting season. The impacts of this strategy of 'hiding' the roots is not known. Some harvesters believe it reduces root growth, but from the harvester's perspective, a plant producing smaller roots is more desirable than having the plant discovered and dug too young (or by someone else). One harvester compared this strategy to the effects of deer browsing, believing that such browsing helped hide ginseng from other harvesters and thus protecting it.

> *Harvester*: I think the deer is helping the wild population of ginseng because they'll eat the leaves off of it. You can't find it if it ain't got the leaves on it unless you really know what it looks like. I've found stalks that didn't have berry pod or leaves on it because I knew what it looked like...When I find young patches out in the woods, I'll go and break them off, just so someone else don't go and dig them.

Harvesters often make observations, such as the following from two commercial harvesters, about the picking practices of others that they observe.

> *Harvester*: No, no chokecherries is the exact opposite, you want to strip the tree out and not leave a berry hanging. Because if you only pick half the tree then the rest of the tree gets riper and riper and then goes to seed and then falls off or whatever. The next year it comes in it'll do the same thing. The berries that you picked last year will ripen faster than the berries that you didn't pick. So you'll have a tree with ripe berries and with stuff that ain't ripe. So when you pick a chokecherry tree you've got to strip the whole thing out you don't want to leave any berries hanging.

> *Harvester:* It's just that there's some that they use sticks, and they use knives and different stuff, and they do, we call it roto-tilling. They go in and anything on the forest floor that might be a mushroom, a little hump, they pull it back and disturb it and look at it, and then never cover it up. Well, the first time they do that it's not detrimental, but by the fifth or sixth time that they've done this, you have the needles fluffed up a foot and half over the mineral soil.

Some managers expressed concern over the impact of seed harvesting for future reproductive and regeneration success of the gathered species. With the current lack of monitoring data, we asked some harvesters to explain their seed harvesting methods and how they might affect the plants. We learned that seed collection varies depending on the plant, but often tennis rackets are used to beat seeds from bushes. The use of seed collecting machines is not allowed on Forest Service lands because managers believe that they damage the plants. Some harvesters use machines on private lands. However, most seed harvesting is done by hand. Some harvesters speculated that they stimulate growth by spreading seed around. All seed collectors we talked with, including the harvester quoted below, indicated they always leave seed behind.

> *Harvester*: People worry about "oh, you are going to take all the seed." Well, first of all, collectors only harvest when it is a bumper year and in a patch where there is a lot of really good seed. Secondly seed collectors are sloppy. Just the nature of collecting, you spill a lot. Like I said, seeds are flying everywhere, even if you are collecting by hand they are going to fall and get buried by your feet.

Forest Management Impacts to NTFPs

The attention of land managers, conservationists, the media, and other stakeholders is often focused on the potential negative consequences of NTFP harvesting on biodiversity, while they ignore the bigger picture and effects of forest management on NTFPs. Few scientific studies document the impacts that NTFP extraction has on forest ecosystems, or the sociocultural and ecological impacts of other forest industries and activities on NTFPs. The harvesters we interviewed expressed considerable concern about the impact of forest management practices on the nontimber forest product species they gathered. While some harvesters mentioned positive effects, the vast majority of interviewees described negative impacts to NTFPs from activities such as mining, grazing, logging and associated activities such as herbicide spraying (Table 12). In the following section we discuss some of these impacts in greater detail, using the voices of harvesters to help illustrate their concerns about the impacts of other forest management activities on NTFPs.

Table 12. Forest Management Impacts to NTFPs Reported by Harvesters

Forest Management Type
Development (new housing, golf courses, subdividing large acreage)
Road construction (forest and nonforest)
Timber Removal
Fire Management (use of fire retardants, prescribed burns, fire control)
Herbicides
Pesticides
Grazing Animals
Recreation (trail construction, ski runs, campgrounds, parking lots)
Mining (mountain top removal for coal, open pit mines)
Power Line Corridor Creation and Maintenance
Snow Removal (salting road)

Spraying Herbicides

Many public and private forestlands are sprayed with herbicides to control invasive weeds and to prevent herbaceous vegetation from interfering with young tree growth. These sprays often have a negative effect on both nonnative and native species. We looked for national statistics on how much spraying takes place overall on American forests, but such data appear to be unavailable. However, some Forest Service documents provide spraying statistics for lands administered by the Forest Service. For example, a draft environmental impact statement for the Helena National Forest's noxious weed control project indicates that their preferred option is to spray 5,800 acres with herbicides over a 12-year period (Helena EIS 2003). Such a program costs hundreds of thousands of dollars. The document does not directly discuss the potential effects of spraying on nontimber forest products, harvester livelihoods, or forest users' health. This is a pattern reported by harvesters in other regions, many of whom indicated that local forest managers were unaware of the negative impacts of spraying on their livelihoods. A few examples of comments we received from harvesters about the effects of spraying on forest biodiversity are provided below:

> *Harvester*: Spraying is probably the number one thing [concern]. As far as when the fire happened, they sprayed all kinds of stuff there so people who wanted to harvest up their medicine couldn't…. if you need your medicine you're going to go harvest your medicine, and if somebody has sprayed it and you can't use it, now its totally going to affect your life….Right now they are going to start spraying on the Klamath again…herbicide spraying. It's just a giant, huge issue, not just for all harvesters, but forest workers and just people in the community.

> *Harvester*: A few years ago when they sprayed the County Road… it wiped out a lot of gooseberry bushes down there on that road. And the magnesium they're using on county roads now days too, raise heck with berries along the roads. They're just spraying for weeds, but the weeds flourish and everything else dies.

> *Harvester*: …they are doing a lot of logging and then after they log they come in and plant a type of pine and then they will spray the whole forest with an herbicide to kill off any other hardwoods that are coming up so there won't be any competition for the pines.

> Again you are killing, even though they are replanting the forest, these herbicides that they are spraying will prevent those native plants that were growing there from coming up.
>
> *Harvester*: Now they are using a lot of herbicides to spray power lines and areas like that, see and it just makes it bad. I am definitely against that...To them it is no good, to me that [area] is a gold mine....I was watching and they got my willows. They went in and sprayed and cut 'em down and I would have got every one of them in a matter of a day or two. I would have had them cleaned out.

Spraying Pesticides

Parts of many public and private forestlands are also sprayed with pesticides. The pesticides are primarily used to control insects that can damage trees but their use decreases biodiversity and harms beneficial insects in the ecosystems as well. In terms of nontimber forest products, harvester concerns about the use of pesticides range from the unknown consequences to their health when picking in areas that have been sprayed to how changes to the ecology might affect the quality or marketability of the products they harvest. For example, many consumers assume that wild foods are organic, and thus are willing to pay a higher price for such products. However, as consumers become more aware of the extent to which national forests rely upon pesticides, demand for wild foods among people who purchase organic foods, may drop. Some harvesters we interviewed stated that their markets are such that once they learn about the presence or history of spraying in an area, that area becomes unharvestable for them. For example, one harvester who gathers medicines for his herbal business indicated he had to stop gathering wild herbs because of the contamination from pesticides. In describing the program he stated:

> *Harvester*: There is incredible infestation of mosquitoes and body gnats....trucks come around at three o'clock in the morning and spray pesticide out of the back of trucks. That is part of what they call their abatement program. All of this is caught up in the foliage so when you harvest herbs that is where you end up with a lot of that stuff. I used to be so excited about coming here and wildcrafting and harvest so much stuff (Int.076.327).

Timber Removal

Timber extraction has long dominated U.S. forest management but an extensive array of archaeological and ethnographic monographs and related research demonstrates that NTFPs have also been an important part of forest history in America (e.g., Emery 2002; Moerman 1998; Sturtevant 1978). Research examining the relationship between timber management and nontimber forest products, however, is limited at best. Some contemporary NTFP harvesters are very concerned about this relationship, as illustrated by the following quote:

> *Harvester*: I just think at some point it's got to be recognized, the value [of medicinal herbs] ....I'm not opposed to logging, I'm a wood worker. So I'm not anti [logging], but I don't want someone to come in and say you're going to yank out ten thousand bucks worth of trees out of this area when you've got sixty thousand bucks worth of herbs...that grow underneath there....You know, this is where I come to gather my herbs. I don't want to come up here and [find] they're gone. This is how I stay alive. I've had such really bad health problems at different times that I know that the tincture is what really did the saving. So for me it's really pertinent for my health.

Many harvesters reporting that timber removal operations have substantially affected the NTFPs they harvest. The following quotes from harvester interviews provide a few of the many examples:

> *Harvester*: I've lost a lot of ground because they clearcut it and it just wipes it out....A lot of my good seng [ginseng] ground has been taken away when they go in and clearcut it....There is just a big spot in the middle of the woods now and they had the biggest hollow of ginseng...It will take fifty years before anybody can find seng back in there again. They are doing it everywhere though. Where I used to dig goldenseal and ginseng, they wiped the whole side of that hill out too. Seems like the big timber only grows where the ginseng is because that is where they wipe it out. I see that every year. I go back to places I was at three or four years before that and there ain't nothing there. There aren't many people in the woods now because there ain't nothing there. It is gone.

> *Harvester*: Well logging does [affect me]. Once they log it off it tears the moss all up and it's useless. They can go into places and if they log it off, you know them skidders and logs, they just tear the moss all to pieces. And plus, it opens the canopy to the sun and the sun kills the moss all out.

> *Harvester*: Terrible. Terrible. These clearcuts. There ain't nothing that grows back, but sprouts…You can't walk through 'em. I mean the deer can get in there and hide, but they can't eat none. Ain't no acorns in there. I can show you a clearcut that used to be beaucoup [Fr. much; slang – great in quantity] of goldenseal. It is not there. I can show you where they logged, right down here. There is no goldenseal, it is just scattered, one here, one there. They logged it, don't have enough shade to...you know its gotta have some shade.

Grazing

In 1997 grazing took place on about 30% of forested lands in the lower 48 states (ERS 2003). A large amount of the land used for grazing is covered by arid temperate forests, such as those in the western ecoregions of this study (M313, M331). In many regions of the world grazing has reduced the density, biomass, and biodiversity of plant and animal species (Kauffman and Pyke 2001). Harvesters suggest that a similar phenomenon is linked to grazing in the U.S.:

> *Harvester*: Just cows trampling and shitting on everything and trampling on what they don't eat. Everything west of the Mississippi River is pretty much eaten by cows. So when a forester says something about harvesting it just sends me up a wall. They worry about me taking a few plants when they have got these animals just eating everything.

> *Harvester*: The guy driving down the road is shaking his fist at you because you have been picking beautiful flowers oblivious to the fact that a whole flock of sheep just went though and picked about a million and a half an hour for the last three weeks. There are those funny contrasts: that we have had to get permits to collect something on one side of the hill where a federally subsidized airplane is spraying it out on the other side of the hill.

Wildlife Management

A number of harvesters expressed concerns about the negative impacts of wildlife management on NTFPs. Ungulates such as white tail deer can profoundly alter ecological communities and have negative and often dramatic consequences on forest biodiversity, including eliminating herb populations (Rooney and Waller 2001; Rooney and Gross 2003). For example, conservation measures to protect wild turkey and deer combined with a lack of predators, have contributed to a tremendous population expansion of these two species in the eastern United States. Wild turkeys can consume over 600 different species of plants and animals (Dickson 1992). Several harvesters described turkeys leaving vast areas of the forest floor nearly sterile as they scrape it for food. As one harvester stated:

> *Harvester*: We have an overpopulation of turkey. They will rake everything out, it looks like a ground tornado hit. And there is a massive overpopulation of deer. For folks who do sow ginseng seeds, they are lucky to ever see anything green, the deer and turkey just eat it up.

In addition to the direct effects of wildlife browsing on some NTFPs, harvesters also noted that wildlife management has indirectly affected their ability to harvest products because many traditional gathering areas have been converted into private hunting preserves. The closure of private lands to NTFP harvesting for wildlife management purposes is a national trend, but is particularly prevalent on private lands in the eastern United States. For some private timberland owners, leasing their land to hunting clubs provides extra income while they wait for their timber to mature. However, as a woman harvester in the Appalachian region notes, landowners obtain this benefit at the expense of local NTFP harvesters:

> *Harvester*: Land that is closed for hunt clubs, so access is for hunters exclusively. That has a huge impact. Lots of land has been closed off in the past 5-10 years for hunting and it has impacted us all. It is a management problem.

Development

In rural areas where housing development for second homes is occurring, the conflict over access to traditional gathering areas is particularly notable. The closing off of what long term residents have historically considered accessible lands through property right enforcement on the part of second home owners has affected harvesters' access to NTFP resources. A family in Maine, which buys mushrooms from harvesters picking in areas experiencing rapid development, noted how second home ownership has affected them:

> *Harvester 1*: When you go to pick your patch and there's a brand new half-million dollar house sitting on it, it's awful, it's terrible...
> *Harvester 2*: ...or the people from away won't let them pick in the front yard
> *Harvester 1*: …They say, "this is a private property, you best leave."

Harvesters we interviewed across the country reported losses of NTFP habitat due to development projects, such as new housing subdivisions and golf courses. One family we visited in east Texas had owned a home for 20 years in a small forest area just outside the city limits. They gathered a multitude of plants for medicine, food, and walking sticks. As the city grew in size, city planners decided to build a freeway through the family's harvesting area. Ultimately the loss of that area forced the family to relocate. According to the family member we interviewed, the environmental assessment for the road did not address the impacts of the freeway on their commercial and subsistence activities.

Nearly every day we spent on the road for this project, we observed some form of development taking place. Typically development sites included piles of debris in which we could identify nontimber forest products. For example, on a stretch of new highway under construction in northeast Florida we observed thousands of palm trees that had been pushed over by bulldozers. One harvester we met sells these kinds of palms as transplants for thousands of dollars. This loss of habitat and products is illustrated in the words of the following harvester:

> *Harvester*: I find when I am driving down the road if I see a field, like in the fall I get evening primrose seeds. If I see a field with evening primrose seeds in it, I know I had better stop and get them now because tomorrow they will be plowed down. It is constantly staying ahead of the bulldozer. It is the big challenge. Harvesting is not what hurts plants, it is all the developers and people who are looking for something other than just plants for growth.

Harvester: Well, the changes for us have been loss of habitat from expansion, growth, development. Some of our favorite areas that were close to town here are now housing developments, you know places where we used to go for herb walks. In terms of man-caused, that is probably the most I have seen. The past two years we have had major drops [in plant populations]. I am seeing definite changes in the plants for that. Definitely going to seed a lot.

Harvester: Of course any development is the obvious thing [impacting], your root habitat. That I suspect had more to do with the reduction of wild ginseng population than over harvesting by foragers or wild crafters. It is not to say that it can't be over harvested by people who don't have a long-term approach but yes, cutting down a forest can certainly do that...

Harvester: Development pressure is a big thing here. There are few spots, I guess it would be like northwest of Duncannon on the other side of the Juniata River where the development pressure is getting to be more and more. There are some rare plants over there that I have been keeping an eye on and they are tricky to transplant so I haven't wanted to move too many. I have collected some seeds and brought them over here and had limited success with that. That is something I keep an eye out for if I see the bulldozers coming, when they are there, when the places are staked out I guess I am less cautious about what I pick up and move. I would say [I've lost] every place where I picked in the County in the eighties. There is nothing left there.

Harvester: It's one of those things where you worry about it [habitat and supply], because it's like we're losing more and more to development. I'm really glad people love the UP but I wish they'd retire at home. They like the woods so much that pretty much there won't be any woods left because they're all moving up here.

As was the case with the person we met harvesting palms in Florida, many harvesters brought up the idea of salvage harvesting. The idea is that before an area is converted to housing, logged, or before a road is built or a particular area open to grazing, the property owner or manager should let the harvesters salvage the NTFP species that will be destroyed during construction or use conversion. This idea is expressed in the following quotes:

Harvester: Going in and harvesting before the habitat is destroyed...with housing developments, timber...I think that would be a good way to go. It would be hard because you would be taking more than you would usually take…That would be hard for the wild-crafter in general to go in and rape and pillage, which it would be, but if you look at what's going to happen. Like down the road here, it's going to be clearcut. So, you would go in and take the whole patch and the idea there would also be to transplant. I think that would be a really good idea. To go in and harvest and you could use it for medicine [and] then to relocate those plants [that you don't need]. And grants to do that would give the timber companies good PR.

We [harvesters] are not doing crap. It [the problem] is habitat depletion. We wanted to go in before....it is going anyway. Talk to a logging company...you are going to cut all this virgin forest, let us go in. They are running an interstate through Georgia and you are going to get a limited number of things....they are just not going to let you in.

Summary

Using a combination of formal and informal interviews and participant observation we met with hundreds of people who harvest NTFPs across the United States. Findings reaffirm survey results showing that NTFP harvesting is a nation-wide phenomenon on public lands. They also indicated that harvesting takes place on private land ownerships in many parts of the country. The ethnographic results show that a wide range of NTFPs representing hundreds of organisms are being removed from forests. These findings suggest a critical need for forest managers to better understand the relationship between nontimber forest products and biodiversity if they are going to develop effective measures for protecting biological diversity and promoting sustainable forestry.

Harvesters have many different motivations for harvesting and are diverse in terms of age, class, ethnicity, and gender. Different types of harvesters and motivations can translate into different kinds of interactions, needs, and attitudes toward NTFP resources. Managers need to move beyond simple differentiation between commercial and noncommercial uses and consider the full range of harvester diversity in their planning.

Harvesters have insights and knowledge about NTFPs that guide their decision-making and which could also inform forest management. They have understandings about harvest techniques, quantities harvested, and other harvesters' activities, but they also have ecological knowledge about optimal habitats for certain species and observations about changes they see occurring in the ecosystems in which they harvest. Many harvesters have intimate connections with their harvesting sites and strong beliefs about stewardship. Some conduct experiments to see whether it is possible to affect productivity of the species they harvest. However, the extent to which harvesters have opportunities to develop ecological knowledge varies depending on the frequency with which they visit an area. Thus, how landowners regulate access can affect the degree to which harvesters have the opportunity to develop ecological knowledge.

When managers and other stakeholders talk about NTFPs the discussion often centers around fears about unsustainable harvests. Much less commonly discussed are the effects of forest management practices on NTFPs and, consequently, biodiversity. Harvesters, however, described a multitude of forest management practices with negative impacts on NTFPs they gathered. These practices included logging, grazing, the spraying of herbicides and pesticides, the encouragement of high wildlife populations that over-browse understory vegetation, and loss of habitat from development. Even when NTFPs could be salvaged before being destroyed by these other activities, programs that allow harvesters to do so are nonexistent. The lack of such programs and general disregard of NTFPs by forest managers helps explain why some harvesters feel overlooked or ignored, even when they do make efforts to interact with managers.

Our intention is not to romanticize NTFP harvester knowledge or paint harvesters as the victims of forest management. Rather, our hope is that forest managers and policy makers will take more notice of a large group of stakeholders who can serve as allies and participants in developing better understandings of sustainable forestry and biodiversity conservation. In the next section we discuss one approach for how this can begin to happen.

COMPONENT 5 FINDINGS:

Regional Workshops Examining Harvester Involvement in Inventory and Monitoring

As a part of this study we held four regional workshops which brought together land managers, policy makers, research scientists, harvesters, buyers and other NTFP stakeholders to explore how harvesters might be included in biological inventory and monitoring efforts. The workshops were held in Denver, Atlanta, Pittsburgh and Portland. Following these a team retreat took place in Silver Falls State Park in Oregon to synthesize the results. The methods used to organize the workshops and the content of the workshops are

documented in our companion report, *Workshop Guide and Proceedings: Harvester Involvement in Inventory and Monitoring of Nontimber Forest Products* (Lynch et al. 2004). In addition, workshop results are further analyzed and discussed in the second companion report, *Nontimber Forest Product Inventorying and Monitoring in the United States: Rationale and Recommendations for a Participatory Approach* (Lynch 2004).

Through the discussions at the workshops and retreat, we found that harvester involvement in inventory and monitoring is a viable and prudent idea and that most stakeholders supported the idea. A key benefit of an inventory and monitoring approach that involves harvesters is that it can provide forest managers and policymakers with the data needed to develop and maintain sustainable NTFP management programs in an era of declining forest management budgets and staffing levels. Survey results indicated that many managers support the idea and some indicated that they have collaborated with harvesters in various activities. As the results from our ethnographic component demonstrate, harvesters spend regular time in forests and already have ecological knowledge, insights about what factors affect the species they harvest, and a desire to understand sustainable harvesting. They identified various incentives for their participation and many expressed an interest in volunteering or being paid to collect data. Furthermore, as case studies and other literature presented in the report attest to, participatory inventory and monitoring is being successfully implemented in domestic and international programs. The Component 5 workshops provided feedback from a diverse set of stakeholders on barriers and strategies for implementation. The report provides a synthesis of the findings and a set of recommendations for moving forward with participatory inventory and monitoring programs involving NTFP harvesters.

DISCUSSION:

Implications for Biodiversity Conservation

The history of forest management is largely the story of how governments and private companies have acquired and maintained control over forested areas for the purposes of expanding and assuring continual supplies of timber and other wood products. Forest history accounts, which could perhaps more properly be labeled timber history accounts, emphasize the military value of timber resources to political rulers and economic value to governments and private companies over the centuries. What is less clear, however, is why forest managers have placed so little importance on exerting control and assuring supplies over the wide array of NTFPs that forest users have gathered for millennia. Lack of economic value of NTFPs is an insufficient explanation: turpentine production in the southeast in the early 20th century generated substantial revenue alongside timber (Gerrell 1999). Today, the multi-million dollar pine straw industry in southern states allows pine tree plantation managers to obtain annual profits from their land while waiting for the timber to mature (UGA 2002; Zwolinski 1998).[10] Yet, despite the known and substantial economic value of a few individual NTFPs, and the unknown, but likely high economic value of NTFPs in aggregate, historically managers have not included them in forest management. Also unknown is what economic and ecological values forest managers have lost by focusing primarily on timber management, often at the cultural expense of an array of NTFPs. Though there is management interest in developing alternative silvicultural systems and new forest practices that embrace multiple values including biodiversity (Kerns et al. 2003), economists Alexander and Fight point out that although promising, few examples exist of joint management that produces an optimal mix of timber and nontimber products (2003).

A number of factors have converged in recent years to bring NTFPs into forest policy debates thus placing them at a critical juncture in forest management. First, the Forest Service and other federal land management agencies have adopted an ecosystem management approach that promotes the need for understanding the ecological and social relationships in forest ecosystems. Second, even though the U.S. government has

[10] Pinestraw is used for decorative landscaping and mulch.

refrained from signing the Convention on Biological Diversity, many forest stakeholders in the U.S., including the U.S. Forest Service, are actively working on implementing criterion and indicators emerging from the Montreal Process that followed on the heels of the drafting of the Convention on Biological Diversity. Third, in 2000, the U.S. Congress passed a law, commonly referred to as Section 339 (HR3194 1999), requiring the U.S. Forest Service to pay explicit attention to the harvest of botanical products within the national forest system.[11]

Given the results of our study it is uncertain how Congress expects the Forest Service to implement its ecosystem management mandate, fulfill its responsibilities with respect to the Montreal Process criterion and indicators, or implement Section 339. As the survey results presented earlier in this report indicate, many National Forest and state forest managers pay limited attention to NTFPs. Specifically, the surveys identified the following weaknesses in the capacity of the U.S. Forest Service and state forestry departments to manage forests for biodiversity conservation, of which NTFPs are an important element:

- NTFPs are not included or are inadequately addressed in many forest planning processes;
- Few of the responding forest managers conduct NTFP inventories and the methods used to conduct monitoring are often inadequate;
- Few of the reporting forest managers incorporate harvester knowledge into NTFP management and planning;
- Many of the responding forest managers are unfamiliar with elected documents and resources on NTFPs;

In addition, our informal visits with 65 Forest Service offices ranging including Ranger Districts, Forest Supervisor Offices, and Regional Offices, indicated that most forest management personnel have little knowledge about or interest in NTFPs on the lands they administer. A major barrier is the lack of training and experience with NTFPs. Not only do managers lack the training to recognize and administer NTFPs, but also Forest Service managers repeatedly told us that the system for tracking information on NTFPs (the Timber Inventory Management System) is inadequate and cumbersome.

Ignoring NTFPs is no longer a sensible option, nor is it necessary, for several reasons. First, our data indicate that the number of species harvested, commercially or non-commercially, on national and state forests is very likely in the hundreds, if not thousands. Together, the harvesters and managers in this study listed a combined total of 657 NTFPs, a number that likely represents hundreds of species.[12] The updated NTFP species database lists over 1,300 species as currently or previously commercially harvested in U.S. ecosystems. These findings suggest that NTFP species may comprise a significant part of the botanical diversity of forest ecosystems. Consequently, efforts to conserve biodiversity are unlikely to succeed unless knowledge about these species, products, and the effects on them of various forest management activities, including but not limited to NTFP harvesting practices, becomes an integral part of forest management.

Second, our data also indicate that NTFP harvesting continues to take place throughout the United States, and is an important forest use among people coming from a variety of cultural traditions. While many people's reliance on and use of NTFPs has diminished through time, harvesting has persisted as a commercial and noncommercial activity into contemporary times. That we easily found harvesters all along our 37,000-mile journey further suggests that the number of NTFP harvesters active today is still significant. NTFP harvesting has deep roots in most cultural traditions, and history suggests that even if forest managers prohibit harvesting and increase enforcement on public forests, harvesting is more likely to go underground than to stop.

[11] The Forest Service has not yet released the Code of Federal Regulations explaining how they will implement the law.
[12] Since we didn't ask harvesters and managers to provide exhaustive lists of the products or species they harvest or manage, 650 products represents the minimum number of products that are harvested, excluding some redundancy in responses.

Third, although many of the traditional practices and knowledge systems around NTFPs have become fragmented or lost, harvesters with extensive knowledge about the plants and their habitat are still out working in the nation's forests. Our findings demonstrate that harvesters often return to the same areas to harvest year after year, facilitating the development of detailed understandings of, and human relationships with, specific forest ecosystems. Harvesters develop such relationships in forest ecosystems located on lands held under a variety of private and public land ownerships. Traditional ecological knowledge and related theory suggests that cultural groups with long-term intimate connections with specific places can develop understandings of their local ecology equal to scientific ecological understandings (Anderson 1996; Becker and Ghimire 2003; Johnson 1992). Given the potential of local ecological knowledge to inform sustainable forest management, it would be wise to promote policies and management environments in which such knowledge can flourish. The importance of harvesters as a source of ecological knowledge is made all the more important by the lack of scientific research evaluating the impacts of both forest management practices and harvesters on NTFPs.

This study shows that nearly all experienced harvesters make detailed observations about the ecological as well as sociocultural environments of NTFPs. These observations guide their harvesting decisions and could be useful to sustainable forestry management. Empirical data from harvesters could be integrated with science to develop ecological theories and hypotheses for testing. Such data could also provide forest managers with a better understanding of the social and ecological needs for managing forests in ways that conserve biodiversity. The following list based on the data presented in the survey and ethnographic component descriptions in this report provides specific examples of areas in which harvesters could contribute and, in some cases, already do contribute, toward biodiversity conservation:

- Identification of optimal habitat and inventories
- Observations on unusual ecological change, species diversity and competition effects
- Monitoring patches or plots for effects of different harvest techniques and other data
- Keeping log books on quantities harvested, sold, and purchaser prices
- Sharing scientific findings and management decisions with other harvesters
- Reporting trespassing, vandalism, and theft

Harvester knowledge alone can't serve as the basis for management and policy decisions. However, it is possible to develop bridges linking informal harvester knowledge and formal scientific knowledge so that stakeholders accept and view harvester knowledge as legitimate. In a companion report we provide a detailed rationale and recommendations for how to involve harvesters in inventory and monitoring programs. We show that participatory approaches are not without precedent, as evidenced by participatory data gathering and analysis programs in commercial fisheries or in the many citizen science programs throughout the country (e.g., Environmental Protection Agency's water monitoring program). Furthermore, we argue that participatory programs must provide clear benefits for harvesters and consider the consequences of possibly privileging some harvesters over others.

The future of nontimber forest products is uncertain. Without broad stakeholder cooperation, forest managers may continue to emphasize management focused on a few species rather than on conserving biodiversity. NTFPs may simply be too much of a burden for the current forest management system. For example, active management done properly on public lands would require NEPA scoping processes and other costly measures. Consequently, managers may thus choose to discourage harvesting rather than actively manage for NTFPs.

Unfortunately, forest mangers currently are more likely to obtain their information about NTFPs and NTFP harvesters from the media's inaccurate and stereotyped portrayals of NTFP industries than they are from reliable scientific publications. For example, numerous managers and other people we met along the trail

have the image that mushroom harvesters in the west are prone to violence and that frequent murders occur over access to mushroom patches. While some aspects of the wild mushroom harvesting arena can resemble the anything-goes spirit of the 19th century western United States, mushroom harvesting is hardly the lawless bastion of violence commonly portrayed in the media. We also frequently heard from noncommercial harvesters, tribes, managers and others that commercial harvesters are ruining the resource, despite typically lacking scientific evidence to support such accusations. We do not doubt that some species are being overharvested or are at risk, but unsustainable extraction runs contrary to the attitudes expressed by the commercial harvesters in this study, as well as most other harvesters we have studied during 10 years of ethnographic research. Ironically, whatever damage harvesters may be doing pales in comparison to the loss of NTFPs and impacts to harvester livelihoods caused by logging, grazing, spraying herbicides and pesticides, mountain top removal for coal, power line maintenance, and a multitude of development projects including subdivisions, gold courses, ski runs and parking lots.

Nontimber forest products in the United States generally seem invisible, insignificant, misunderstood, or at least missing from the discussions of people debating the future of forestry. For example, the widely read scientist, John Terborgh, implied in a recent scientific journal that nontimber forest products are insignificant to large numbers of North Americans (2000). Likewise, many Forest Service managers across the country told us that no harvesting takes place in their area, but when we asked community members we would inevitably find people who told us they harvest NTFPs regularly. Given the lack of research that has been done on NTFP management, procurement, and markets, it hardly seems surprising that researchers and managers do not see harvesters. For upper-level managers and policy makers a major part of the invisibility of harvesters is that lower-level managers often do not track harvesters, especially if they are noncommercial harvesters gathering small amounts for personal use. A complicating factor in forest managers' lack of knowledge of harvesters is the desire on the part of many harvesters to remain invisible. For reasons that may not be fully understood, such as supporting ecological stewardship behavior, it may be important to protect harvester anonymity. If harvesters remain invisible, the challenge lies in determining which management decisions are likely to have negative impacts on them.

As ecosystem management and biodiversity conservation continue to be management priorities, managers have an opportunity to assess the value NTFPs and see how they can bring both biodiversity enhancement and socioeconomic diversification. To this end we provide an initial set of recommendations to be discussed, refined, and hopefully implemented with broad stakeholder support.

RECOMMENDATIONS

1. Acquire Basic Understanding of NTFPs

- Agencies need to create permanent NTFP management and research staff positions along with providing training and materials;
- Research is needed to develop basic ecological, economic, and sociocultural understandings of NTFPs including but not limited to a) the impacts of forest management practices on NTFP biodiversity, b) the role of NTFPs in commercial and noncommercial cultural traditions, and formal and informal economies, and c) economic evaluation of NTFPs and biological diversity relative to other management activities and forest uses;
- Broaden NEPA scoping processes so that they are capable of identifying NTFP stakeholders and their needs, including such practices as meeting personally with harvesters, buyers, and tribes in their communities.

2. Build mutually beneficial working relationships between NTFP Stakeholders

- Actively seek the participation of harvesters in collecting social and ecological data about NTFPs;
- Support pilot programs to examine the viability of NTFP harvester and product certification;
- Increase collaborations with non-agency organizations in areas of research, education, and management programs.

3. Actively Manage for NTFPs

- Initiate pro-active NTFP management as a tool to help meet forest conservation goals, such as restoring native forest biodiversity, reducing catastrophic wildfire risks, and having resource extraction dependent on the maintenance of biodiversity;
- Public land managers should publicize NTFP availability and harvesting opportunities for sustainably harvestable NTFPs;
- Require and advertise NTFP salvage opportunities before habitat destruction.

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APPENDIX 1

NTFP Species Database Expansion Details

www.ifcae.org/ntfp/

by David Pilz

The Institute for Culture and Ecology (IFCAE) maintains a free, Internet-based database of commercially harvested nontimber forest product species. Formerly called the NTFP Product Database, the renamed NTFP Species Database documents the extensive forest biodiversity represented by NTFPs throughout the United States and territories. The database is a tool that will increase biodiversity by recognizing the value of, and managing for, a greater number of species than is currently occurring. Land managers can use the database to help identify regional NTFP species that can be incorporated into planning for biodiversity conservation, forest restoration, and sustainable economic development. The database does not provide users with information about harvest sustainability. Because it includes threatened or endangered species (in all or part of their ranges), we provide links to other databases in numerous places encouraging users to do additional research on biological and cultural issues.

Summary of Changes

With funding from the National Commission on Science for Sustainable Forestry, David Pilz, an independent mycological consultant, added 490 new species to the database bringing the total to 1,343. Entries included edible and medicinal fungal species, commonly used decorative fungal species, all the lichen species, and additional vascular plants, mosses, liverworts, and ferns known to be currently or formerly commercially harvested in the United States. Information to existing entries was added or altered where relevant new information emerged or where errors existed with the old data. As a result of the new work, the database is less geographically biased, and includes perhaps 95% (to the level of genus) of the most important NTFP organisms in the mainland United States.

Criteria for species additions

- Included species known to be commercially harvested in the U.S., currently or formerly.
- Included exotics, noxious weeds, endangered, and over-harvested species.
- Included plants that likely grow in wetlands within or immediately adjacent to woodlands (such as common marshmallow, *Iris virginica*), but not meadow wetland plants (such as camas, *Camassia quamash*).
- Excluded animals, minerals, specialty wood products, firewood, transplants for the nursery trade, and illicit plants.
- Excluded the seeds of almost all trees and vascular plants since almost all are collected for the native plants trade and reforestation.
- Excluded plants that Native Americans used if no evidence of commercial (sale for money) harvest existed.
- Excluded exotic species if their only known commercial harvest is outside the US.
- Excluded plants primarily of the desert (such as California brittlebrush, *Encelia californica*), but left prior entries in the database (such as ocotillo, *Encelia farinose*).
- Excluded plants that require full sunlight or disturbed soils, and therefore do not occur naturally in undisturbed forests with at least a partial canopy. The researcher used his best judgment for plants on the borderline.
- Entered only the genus and a few prominent species when a genus had a large number of NTFP species, all of which are used for the same products (such as *Rosa* species).

Search Variable Exclusions

After careful evaluation we opted not to add NVCS vegetation classification codes to the database and instead concentrated on identifying missing species. Since most species in the NTFP database typically grow in a variety of vegetation types, it is more efficient for users to use the Natureserve database (http://www.natureserve.org/explorer/)

directly with a genus species entry taken from the NTFP database. Additionally, we have recently learned that lower level vegetation association data in the Natureserve database is still at a preliminary stage of collection. Therefore, having the NVCS codes in the NTFP database could have mislead users as to the utility of the search variable. However, the Natureserve database will be an increasingly valuable source of information on vegetation associations and other data useful for NTFP management so links are provided between the databases. We also decided not to enter USDA Plants Database symbols as a search variable in the NTFP Species Database, concluding it is more efficient for users to consult the USDA Plants Database website directly for additional information.

Future Needs

- Additional research is needed for species occurring in Hawaii, Guam, and American Samoa and for vascular plants used for weaving and dyeing.
- Add missing species used for transplants or wildlings for the nursery trade to the database.
- The full database can be viewed online or printed. It needs to be reprogrammed to allow researchers to download a complete tab delimited file that can be opened as a spreadsheet.
- Add several more "Product Uses" search variables, such as insecticides or insect repellants, industrial extracts, essential oils and resins, soaps and skin products, dyes, and basketry materials. Add more "Parts Used" search variables, such as bulbs, seed pods, nuts, spores, and transplants. Include an option to search publication abstracts in the bibliographic database search engine.

APPENDIX 2

NTFP Bibliographic Database Expansion Details

www.ifcae.org/ntfp/

The Institute for Culture and Ecology (IFCAE) maintains a free, Internet-based bibliographic database of English language references relevant to nontimber forest products. With funding from the National Commission on Science for Sustainable Forestry, IFCAE researchers (Kate Lyman, Lynn Schneider, Eric Jones) have added 1,349 new references bringing the total to 2,817. IFCAE will continue to maintain, add, and annotate references. Additionally, a website link is provided that allows interested authors to apply to write missing annotations for the database.

Most of the records in the database deal with nontimber forest product policy, management, conservation, ecology and culture. Three hundred new records address biodiversity and management issues specifically. We avoided adding biological studies of specific species without an explicit connection to NTFPs. The database includes both international and domestic material as well as gray literature sources available to the public, such as pamphlets, magazines, and newsletters. We generally did not include newspaper articles except for a few substantive, in-depth reports. The database allows for Boolean searches by author, title, date, keywords, publisher, and medium. Approximately fifty-percent of the references are annotated, providing users an initial opportunity to gauge the value of the article for their needs.

Most references specific to nontimber forest products are international in focus. A significant body of literature is relevant to NTFP management in the U.S., but only a small percentage of scholarly work uses NTFPs as an organizing concept in the U.S. context. For example, the database includes Daniel Moerman's comprehensive monograph, Native American Ethnobotany (1998), which provides in-depth references to plant uses of Native Americans. Although the monograph doesn't discuss species in a contemporary NTFP context, it nonetheless provides information that managers or scientists could use to examine forest management practices and policy that affect contemporary uses of the plants by Native Americans and others groups.

Future Needs

- Refinement and long-term maintenance of the database would best be served by housing it at a U.S. forestry school with access to a designated professional librarian and annotator.
- Locate publications in foreign languages, translate them to English, and add them to the database.

APPENDIX 3

Survey of US Forest Service District Level Special Forest Products Regulations and Management

This national survey represents the 2nd phase of a longitudinal study by the Institute for Culture and Ecology to examine changes in federal Special Forest Product (SFP) policy and management over the last several years. You or a colleague may have participated in the first phase of this survey which was distributed in January 2000 to all districts. This data informed several products including policy sections in our recent book (listed at end). A summary of the 1st survey results is attached and the complete analysis of both survey phases will be available in December 2003. Please take a few moments to complete this 2nd survey phase, regardless of whether or not you participated in the first phase. Funding for this research is provided by the National Commission on Science for Sustainable Forestry (www.ncssf.org). We greatly appreciate your assistance.

Instructions: You may complete this form electronically by highlighting the underscore lines and then typing in your answer. Alternatively, you may print, fill out, and mail this survey to the Institute for Culture and Ecology, PO Box 6688, Portland, OR 97228-6688. If you have questions, contact Eric Jones at etjones@ifcae.org. Feel free to add any additional comments, clarifications, or documents, and use additional paper if needed. ***Important:*** Do not leave any questions blank. If a question doesn't apply please put n/a for not applicable.

Date: _____
Your Name: _____
Position: _____
District: _____
Forest: _____
Email: _____
Phone: _____

1. Is there a uniform SFP policy for your:
District? Yes___ No___, Forest? Yes___ No___, Region? Yes___ No___

2. Is there a designated SFP coordinator for your:
District? Yes___ No___, Forest? Yes___ No___, Region? Yes___ No___

3. Did your district issue more or fewer permits for SFP removal in 2002 than in it did in 1999? More___ Fewer___

4. Is there a SFP law enforcement program on your district? Yes___ No___ Forest? Yes___ No___

5. Which of your district and forest planning and data gathering processes include SFPs? (please mark all that apply)

__ Forest Plans __ Watershed Analyses
__ Environmental Assessments __ Landscape Analyses
__ Environmental Impact Statements __ Other (list) _____
__ Social Impact Assessments _____

6. Does your district have any planning or analysis documents that focus specifically on SFPs? Yes___ No___
(If yes, please list) _____

7. Are SFPs inventoried on your district? Yes___ No___
(If yes, list species, methods, and the category/title of person who does the work e.g., FS botanist, contractor, volunteer)
_____
_____

8. Are SFPs monitored on your district? Yes___ No___
(If yes, list species, methods, and the category/title of person who does the work e.g., FS botanist, contractor, volunteer)
_____
_____

9. Product, Regulatory Mechanism, and Fee Table. ***Instructions:***
a) In order of importance (1 – 5), list the five most significant SFPs on your district in the top column;

b) Place a "**Y**" in each cell row to indicate if you use the regulatory mechanism listed in the left column;
c) Add a "**F**" in each cell to indicate if there is a fee.

	Product 1.	Product 2.	Product 3.	Product 4.	Product 5.
Commercial Use Permits					
Personal Use Permits					
Sales Contracts					
Leases					
Stewardship Contracts					
Buying Permits					
Transportation Permits					
Industrial Camping Permits					
Other? (specify type)					

10. List any SFP non-regulatory management activities (e.g., fire prescription for berry production) on your district.
_____
_____

11. Are ecological impacts of district regulatory and non-regulatory SFP management activities monitored? Yes___ No___
(If yes, list activities, methods, and who does the work e.g., FS botanist, contractor, volunteer. If no, skip to question 13)
_____
_____

12. If monitoring the ecological impacts of SFP management activities occurs on your district, does your data show:
a. positive effects on biodiversity Yes___ No___ Undetermined ___
b. negative effects on biodiversity Yes___ No___ Undetermined ___
c. List supporting documents _____
_____
_____

13. What barriers exist to inventorying and monitoring SFPs on your district? _____
_____
_____

14. Do SFP harvesters on your district contribute knowledge about SFPs that helps management? Yes___ No___

15. Are Forest Service personnel on your district collaborating with SFP harvesters on any projects? Yes___ No___

16. Could commercial harvesters contribute to inventorying district SFPs? Yes___ No___ Monitoring? Yes___ No___
(Why or why not?) _____
_____

17. What barriers exist to increasing commercial harvesting of SFPs on your district? _____
_____
_____

18. Have you read any part of the following publications before receiving this survey?
a. USDA Forest Service's *National Strategy for Special Forest Products*. FS-713. 2001. Yes___ No___
b. *Nontimber Forest Products in the United States* by Jones, McLain and Weigand. 2002. Yes___ No___
c. *Non-Timber Forest Products* by Emery and McLain. 2001. Yes___ No___
d. Have you used the U.S. Non Timber Forest Products website at www.ifcae.org/ntfp/ Yes___ No___

APPENDIX 4

Survey of State Non Timber Forest Product Regulations and Management

This survey is part of a national study of state policy and management of nontimber forest product harvesting in the United States by the Institute for Culture and Ecology. Nontimber forest products include such things as medicinal plants, mushrooms, berries, seeds, transplants, and floral decorations such as ferns, boughs, and moss. The survey takes about 15 minutes to complete and your participation will be greatly appreciated. Results will be made available in December 2003. Funding for this study is provided by the National Commission on Science for Sustainable Forestry (www.ncssf.org).

Instructions: Please print, fill out, and mail this survey to the Institute for Culture and Ecology, PO Box 6688, Portland, OR 97228-6688 by May 1, 2003. If you have questions, contact Eric Jones at etjones@ifcae.org. Feel free to add any additional comments, clarifications, or documents, and use additional paper if needed. ***Important:*** Do not leave any questions blank. If a question doesn't apply please put n/a for not applicable.

Date: _____
Your Name: _____
Position: _____
Office Location: _____
Email: _____
Phone: _____

1. Is there a uniform NTFP policy for your state forests? Yes___ No___

2. Is there a designated NTFP coordinator for your state forests? Yes___ No___

3. List the five most significant NTFPs on your state forests
_____
_____
_____
_____
_____

4. List the ways in which you regulate access to NTFPs (e.g., permits, leases, contracts, other).
_____
_____
_____

5. Is there a NTFP state forestry law enforcement program? Yes___ No___ If no, who handles the law enforcement?
_____
_____
_____

6. List any state forest planning and data gathering processes that include NTFPs:
_____
_____
_____

7. Are NTFPs inventoried on your state forests? Yes___ No___
(If yes, list species, methods, and the category/title of person who does the work e.g., botanist, contractor, volunteer)
_____
_____
_____

8. Are NTFPs monitored on your state forests? Yes___ No___
(If yes, list species, methods, and the category/title of person who does the work e.g., botanist, contractor, volunteer)
_____
_____
_____

9. List any NTFP non-regulatory management activities (e.g., fire prescription for berry production) on state forests:

_____
_____
_____

10. Are ecological impacts of regulatory and non-regulatory NTFP management activities monitored on state forests?
Yes___ No___ (If yes, list activities, methods, and who does it e.g., botanist, contractor, volunteer. If no, skip to Q 13).

_____
_____
_____

11. If monitoring the ecological impacts of NTFP management activities occurs on your state forests does your data show:
a. positive effects on biodiversity Yes___ No___ Undetermined ___
b. negative effects on biodiversity Yes___ No___ Undetermined ___
c. List supporting documents _____

_____
_____
_____
_____

12. What barriers exist to inventorying and monitoring NTFPs on state forests? _____

_____
_____
_____

13. Do NTFP harvesters on state forests contribute knowledge about NTFP that helps management? Yes___ No___

14. Are state forest personnel collaborating with NTFP harvesters on any projects? Yes___ No___

15. Could commercial harvesters contribute to inventorying state forest NTFPs? Yes___ No___ Monitoring? Yes__ No__
(Why or why not?) _____

_____
_____
_____
_____

16. What barriers exist to increasing commercial harvesting of NTFPs on state forests? _____

_____
_____
_____
_____

17. Have you read any part of the following publications before receiving this survey?
a. USDA Forest Service's *National Strategy for Special Forest Products*. FS-713. 2001. Yes___ No___
b. *Nontimber Forest Products in the United States* by Jones, McLain and Weigand. 2002. Yes___ No___
c. *Non-Timber Forest Products* by Emery and McLain. 2001. Yes___ No___
d. Have you used the U.S. Non Timber Forest Products website at www.ifcae.org/ntfp/ Yes___ No___

APPENDIX 5
NTFPs Listed on Forest Service Surveys

Agave
Bark
Bark – birch
Bark – cedar
Basketry material
Bean sticks
Beargrass
Berries
Berries – huckleberries
Berries – saw palmetto
Botanical specimens
Botany permits
Boughs
Boughs – balsam
Boughs – Christmas
Boughs – conifer
Boughs – green
Brown ash
Burls
Chaparral
Christmas trees
Cohosh
Cohosh – black
Cones
Cones – acorn
Cones – conifer
Cones – dry
Cones – Frazier fir
Cones – pine
Cones – sugar pine
Cuttings
Fatwood
Ferns
Fiber
Firewood
Firewood – oak, religious
Floral greenery
Floral products
Fronds – palm
Galax
Galax leaves
Ginseng
Goldenseal
Grapevine
Gravel
Green alder
Hay
Herbs
Juniper products
Ladybugs
Latillas
Leeks
Lycopodium
Lyonia ferruginea
Manzanita
Maple taps
Medicinal plants
Minerals
Mistletoe
Moss
Moss – Deer
Moss – Log
Moss – sheet
Moss – wood
Mountain laurel – cuttings
Mountain laurel – sticks
Mushrooms
Native American materials
Nuts – acorns
Nuts – pinyon
Ocotillo
Ornamentals
Palmetto fronds
Pine products
Pine straw
Plants – miscellaneous
Poles – bean
Poles – ceremonial firewood
Poles – tepee
Posts – Cedar
Posts – fence
Posts – locust
Posts and poles
Princess pine
Ramps
Rhododendron – sticks
Rock
Rock – decorative
Rock – landscape
Root wads
Salal
Sand
Sassafras
Scientific study collections
Seed
Seed – fescue
Seed – native plants
Seed – wildflower
Seedlings – Frazier fir
Shrubs
Sotol
Stays – fence
Stumps – cedar
Timber – sawlogs
Transplants – evergreen
Transplants
Transplants – aspen
Transplants – lodgepole pine
Transplants – rhododendron
Transplants – sagebrush
Trees
Trees – bonsai
Turkey oak tips
Twigs
Twigs – birch
Vigas
Vines
Walking sticks – aspen
Wildflowers
Wildings
Willows
Wood – carving logs
Wood – cedar
Wood – construction
Wood – craft
Wood – decorative
Wood – house logs
Wood – salvage
Wood – small sales
Wood – sticks
Wood – stumps
Yucca

APPENDIX 6
NTFPs Listed on State Forest Surveys

Bark – Birch
Basket weaving material
Beargrass
Berries
Boughs
Boughs – Balsam
Boughs – Floral
Boughs – Mountain laurel
Boughs – Pine
Christmas trees
Cones
Cones – Pine
Cones – Pitch pine
Craft products
Evergreen huckleberry
Fern
Fern – Fiddlehead
Firewood
Fish
Floral decorations
Floral greens
Foliage
Foliage – Mountain laurel
Foliage – Rhododendron
Fruits
Game (small)
Ginseng
Goldenseal
Grapevine
Holly
Huckleberries
Lycopodia
Medicinal plants
Moss
Moss – Sphagnum
Mushrooms
Mushrooms – Chanterelles
Needles – Pine
Nuts – Hazelnut
Nuts – Pinyon
Pine straw
Pine straw – Longleaf pine
Posts and poles
Recreation
Rocks
Salal
Sap – Birch
Sap – Maple
Seed
Seed – Loblolly pine
Seed – Longleaf pine
Seed – Pine
Seed – Slash pine
Seed – Tree
Seed – Wild plum
Seedlings – Trees
Stone
Transplants
Transplants – Trees
Tree tops – Spruce
Turpentine
Vines
Wildflowers
Willow – Diamond
Witchhazel

APPENDIX 7:

List of Formal Interviews

Interview	Nontimber Forest Product Harvested	State	Date
INT-001	Medicinals	CO	09/04/02
INT-002	Medicinals	CO	09/12/02
INT-003	Wild foods, medicinals	CO	09/15/02
INT-004	Medicinals, wild foods	CO	09/17/02
INT-005	Medicinals	CO	09/18/02
INT-006	Medicinals	CO	09/18/02
INT-007	Medicinals, wild foods	CO	09/19/02
INT-008	Wild foods (berries) for jams	CO	09/20/02
INT-009	Wild foods, medicinals, seeds	CO	09/21/02
INT-010	Wild native seeds	CO	09/22/02
INT-011	Teepee poles, wild foods, medicinals	CO	09/23/02
INT-012	Wild foods, medicinals	CO	09/23/02
INT-013	Medicinals	CO	09/24/02
INT-014	Medicinals	WY	09/26/02
INT-015	Medicinals	WY	09/26/02
INT-016	Medicinals	WY	09/26/02
INT-017*	Wild seed	WY	09/27/02
INT-018	Wild seed	WY	09/27/02
INT-019	Wild seed	WY	09/27/02
INT-020	Wild seed	WY	09/28/02
INT-021	Wild foods (berries) for wine	WY	09/28/02
INT-022	Wild seed	UT	10/03/02
INT-023	Wild seed	UT	10/03/02
INT-024	Wildflower honey	CO	10/04/02
INT-025	Fuelwood (for community heating, cooking)	NM	10/09/02
INT-026	Wild food (chokecherries)	NM	10/10/02
INT-027	Dye plants	NM	10/11/02
INT-028	Wild seed	CO	10/21/02
INT-029	Transplants	CO	10/21/02
INT-030	Wild seed (pine cones for seed)	CO	10/21/02
INT-031	Juniper wood for carving	NM	10/22/02
INT-032	Clay for pottery	NM	10/22/02
INT-033	Medicinals	NM	10/24/02
INT-034	Medicinals	NM	10/24/02
INT-035	Medicinals	NM	10/24/02
INT-036	Wild foods (Pinon nuts)	NM	10/24/02
INT-037	Wild seed (Pine cones for reforestation)	AZ	10/25/02
INT-038	Medicinals	NM	10/26/02
INT-039	Medicinals	AZ	11/5/02
INT-040	Wild foods (mushrooms)	AZ	11/6/02
INT-041	Wild foods, medicinals, arts & crafts materials	TX	11/12/02
INT-042	Wild foods, medicinals, arts & crafts materials	TX	11/12/02
INT-043	Wild foods	TX	11/13/02
INT-044	Moss	AR	11/13/02
INT-045	Medicinals	AR	11/13/02
INT-046	Medicinals	AR	11/14/02
INT-047	Arts & crafts materials	AR	11/15/02
INT-048	Wild foods (berries and fruits) for jams	LA	11/16/02
INT-049	Wild foods, medicinals	LA	11/16/02
INT-050*	Wild foods, medicinals	LA	11/19/02

INT-051	Wild foods, medicinals	LA	11/19/02
INT-052	Wild foods, medicinals	LA	11/19/02
INT-053*	Tupelo and other wood for carving	LA	11/19/02
INT-054	Wild foods, medicinals	LA	11/19/02
INT-055	Wild foods, medicinals, wood	LA	11/19/02
INT-056	Grape vines and others for arts & crafts	MS	11/27/02
INT-057	Wild foods (pine nuts, etc.), medicinals	MO	12/01/02
INT-058	Wild foods (pine nuts, etc.), medicinals	MO	12/01/02
INT-059	Medicinals	MO	12/01/02
INT-060	Medicinals	MO	12/01/02
INT-061	Wood for canes, walking sticks	AR	12/02/02
INT-062	Wood for canes, walking sticks, carvings, fiddles	AR	12/02/02
INT-063	Wild foods, medicinals, plants for rope, baskets	MS	12/03/02
INT-064	Wild foods, medicinals	MS	12/05/02
INT-065	Longleaf Pine seed	AL	12/06/02
INT-066	Wild flowers	AL	12/07/02
INT-067	Medicinals	AL	12/09/02
INT-068	Medicinals	AL	12/09/02
INT-069	Variety of plants, pine needles for baskets	FL	01/15/03
INT-070	Medicinals	FL	01/16/03
INT-071	Medicinals (saw palmetto, roots, herbs)	FL	01/23/03
INT-072	Medicinals (saw palmetto, roots, herbs)	FL	01/23/03
INT-073	Medicinals, moss	FL	01/27/03
INT-074	Pine straw	GA	01/31/03
INT-075	Turpentine, medicinals	GA	02/01/03
INT-076	Medicinals	SC	02/04/03
INT-077	Medicinals	NC	02/07/03
INT-078	Wild foods	VA	02/14/03
INT-079	Wild foods (ramps)	TN	03/04/03
INT-080	Medicinals	TN	03/04/03
INT-081	Medicinals (ginseng, bloodroot)	NC	03/05/03
INT-082	Moss, medicinals (ginseng)	NC	03/05/03
INT-083	Medicinals (ginseng)	NC	03/06/03
INT-084	Wild foods (mushrooms)	NC	03/12/03
INT-085	Medicinals	KY	03/14/03
INT-086	Medicinals, moss	VA	03/15/03
INT-087	Wild foods, medicinals	KY	03/16/03
INT-088	Medicinals (ginseng)	KY	03/18/03
INT-089	Medicinals, wild foods	OH	03/20/03
INT-090	Medicinals (black cohosh)	OH	03/21/03
INT-091	Seeds (for nursery stock)	OH	03/21/03
INT-092	Wild foods	OH	03/21/03
INT-093	Moss & variety of plants for floral greens	WV	03/22/03
INT-094	Medicinals, wild foods	VA	03/24/03
INT-095	Wild foods, medicinals	WV	03/27/03
INT-096	Medicinals, wild foods, moss	WV	03/28/03
INT-097	Medicinals (ginseng, yellowroot, cohosh)	WV	03/28/03
INT-098	Medicinals (ginseng, cohosh, yellowroot)	WV	03/31/03
INT-099	Medicinals (roots, herbs, barks)	PA	04/07/03
INT-100	Medicinals, wild foods	PA	04/9/03
INT-101	Medicinals (herbs)	NJ	04/10/03
INT-102	Wild foods	NY	04/14/03
INT-103	Wild foods (mushrooms, fiddleheads, ramps)	ME	04/18/03
INT-104	Wild foods, medicinals	ME	04/18/03
INT-105	Medicinals	VT	04/21/03

INT-106	Basket-making materials, medicines, foods	VT	04/24/03
INT-107	Medicinals (mushrooms, herbs)	VT	04/24/03
INT-108	Medicinals (herbs, roots, barks)	VT	04/24/03
INT-109	Wild foods (mushrooms, ramps), medicinals	MI	05/04/03
INT-110	Wild foods, medicines, basket and art materials	MI	05/05/03
INT-111	Wild foods (fiddleheads, ramps, mushrooms)	MI	05/06/03
INT-112	Wild foods (fiddleheads, ramps, mushrooms)	MI	05/06/03
INT-113	Medicinals (princess pine)	WI	05/08/03
INT-114	Wild foods (various mushroom sp.)	OR	06/01/03
INT-115	Wild foods (matsutake mushrooms)	OR	06/02/03
INT-116	Floral greens, medicinals, wild foods	OR	06/04/03
INT-117	Medicinals	OR	06/02/03
INT-118	Medicinals, wild foods	OR	06/05/03
INT-119	Medicinals	OR	06/05/03
INT-120	Medicinals	CA	06/07/03
INT-121	Medicinals	CA	06/07/03
INT-122	Medicinals, wild foods	CA	06/08/03
INT-123	Wild seeds (redwood and other natives)	CA	06/10/03
INT-124	Wild foods (mushrooms)	CA	06/10/03
INT-125	Mushrooms for dyes	CA	06/11/03
INT-126	Wild foods, medicines	CA	06/12/03
INT-127	Wild foods (mushrooms)	CA	06/13/03
INT-128	Plants for soaps, sachets	CA	06/13/03
INT-129	Medicinals	CA	06/16/03
INT-130+	Medicinals	CA	06/18/03
INT-131	Medicinals, wild foods, basket making materials	OR	06/21/03
INT-132	Mushrooms, floral greens	OR	08/15/03
INT-133	Wild foods	OR	09/06/03
INT-134	Boughs, wild foods (mushrooms, berries), cones	WA	10/06/03
INT-135#	Sweetgrass (for baskets)	NY	06/19/03
INT-136#	Wildflowers (whole plants)	VT	06/26/03
INT-137#	Medicinals, wild foods	VT	06/26/03
INT-138#	Wild foods	VT	07/02/03
INT-139#	Medicinals	NY	06/30/03
INT-140#	Wild foods, medicinals	NY	06/23/03
INT-141##	Wood (for woodworking), stones	GA	03/13/03
INT-142##	Pine straw	SC	03/15/03
INT-143##	Medicinals	GA	03/18/03

* Focus group discussion

** These five interviews are officially within the southeastern region, following Bailey's ecoregions.

+ Not taped at request of participant

Interview conducted by Marla Emery, regional liaison for the NE
Interview conducted by Sarah Workman, regional liaison for the SE

APPENDIX 8

NTFPs Named by Harvesters Interviewed

The following list of 473 items represents the nontimber forest products harvesters reported removing from the wild. Our study did not attempt to create an ethnobotanical catalog but we did want to get a sense for which NTFPs people gathered. Harvesters would typically name a few of the most common products they gathered and then we would move onto the next question. Thus this list represents only a fraction of the NTFPs gathered by the interviewees collectively. The list includes natives and invasive species, as well as domesticated plants that have become naturalized in the wild.

Sometimes harvesters used scientific species names and sometimes they used common names, some of which may be very local language. Thus there is some redundancy in the following list, i.e., not every item listed is distinct. For example, one harvester reported saskatoon and juneberry, both of which are commonly used to describe *Amelanchier alnifolia*. However, juneberry is also used to describe *Amelanchier canadensis*. Redundancies may also have occurred if a harvester reported a global category, such as "early greens," and also reported specific species or products that fall within the category, such as dandelion. Despite these redundancies the list serves to provide an overall sense of the extensive diversity of NTFPs that harvesters collect and are knowledgeable about.

acorn
Agaricus
air leaf balsima
alfalfa
amaranth leaf
Ambrosia sp.
American Feverfew
American sarsaparilla
apple mint
arnica
ash bark
asparagus
aspen transplant
aspen bolete
autumn olive
balsam fir tip
balsam root
basin big sage brush
bass wood honey
basswood
bay laurel
bay leaf
bayberry
beach grass
bear grass
bearded moss
bed straw
bee balm
beef steak
betony
bilberry
birch bark
birch branch
bitterbrush
bitterweed
acorns
Agaricus
air leaf balsima
alfalfa
amaranth leaf
Ambrosia sp.
American sarsaparilla
apple mint
arnica
ash bark
asparagus
aspen transplant
aspen bolete
autumn olive
balsam fir tip
balsam root
basin big sage brush
basswood
bass wood honey
bay laurel
blackberry
blackberry leaf
black cohosh
black cottonwood
black mulberry
black nightshade
black oak
black raspberries
black sagebrush
black trumpet
black walnut
black sage
black-eyed grass
bladder wort
bloodroot
blue cohosh
blue elderberry
blue skull cap
blue spruce cone
blueberry
boletes
boneset
borage
Boston poplar
bottle brush
bristlecone pine transplant
buck brush
burdock root
button snake root
California poppy
Calvatia gigantea
camphor vine
Canada snake root
Carolina jasmine
castle bally clover
catnip
cattail corn
cattail root
cattail shoot
cauliflower
cauliflower mushroom
cedar bark
cedar bough
chaga mushroom
chamomile
chanterelle mushroom
chaparro
chaparral
cherry bark
chicken of the woods
chickweed
chokecherry
Christmas trees
clay
cleavers
clematis
Cliff rose
clover
clover flower
colts foot
comfrey
common evening primrose
conch
coon grape
coppertop
coral mushroom
coral root
cork bark
cornflower
cotton root bark
cow parsnip
cranberry
cranes bill
creosote bush
crest
crooked wood
crows foot
culvers root
curly cup
curly dock
cypress
cypress ball
cypress knees
dandelion green
dandelion root
day lilies
dead man's foot
dead straw
deer tongue
desert willow
dewberry
docks
dogbane
dogwood
Douglas fir
Douglas fir cone
dragon wood
driftwood
dudzu
Dutchman's pipe
early greens
east desert pinyon
echinacea root
echinacea seed
elder branch
elder flower
elderberry
elderberry blossom
elephant tree
Engelmann spruce cone
Englewood spruce
transplant
eucalyptus
European beach grass
evening primrose roots
evergreen huckleberry
eye bright
false hellebore root
false Solomon seal
fennel
fiddlehead fern
firewood
flata
milk weed flower bud

forbs
fruits
Ganaderma sugay
gardener salt bush
geranium
giant puffballs
ginseng leaves
ginseng root
ginseng seed
gold thread
golden current
goldenrod
goldenseal
goose grass
goose tongue
grandfather's beard
grapevine
grease wood
green briar sprout
green gentian
Grindelia
ground cherry
gum weed
hawthorn berry
hazel nuts
healing herbs
heart leaf
hedgehog
hen of the wood
hickory nut
hickory sprout
Himalaya blackberry
Hindu wood
honey mushroom
honeysuckle
hops
horehound
horsetail
huckleberry
huckleberry root
hunter's hearts
incense cedar
Indian lettuce
Indian paint brush
Indian pipe
Indian turnip
indigo root
iris
ivy
Jack in the pulpit
jewel weed
juneberry
juniper berry
Kansas snakeroot
king bolete
kinnikinnick
knot mahogany
kudzu leaf
Lactarius
lady slipper
lamb's quarter
Larch cranberry
latillas
leek
lemon balm
lemon verbena
lichen
licorice
life everlasting
lilac blossom
limber pine cones
lobelia
lodgepole pine
log moss
long leaf pine seed
low sage brush
Lycopodium
Mahonia
maitake mushroom
manzanita
maple
maple limb
marigold
masutake
may apple
mayhaw
maypop
mealy grass
milk thistle flower
milkweed
miner's lettuce
mint
Mississippi black willow
Missouri snake root
Missouri top
mistletoe
mood moss
morel
moss
mountain maple
mountain tea
mugwort
mulberry
mullein
mullein seed
muscadine
mustard green
mutton grass
nettles
New Jersey tea root
oak leaf
ocotillo
oregano
Oregon grape
Oregon grape root
Osha
oyster mushroom
paleo mint
parasol
Parsnip
passion flower
pawpaw
peach tree leaves
penstemon
peppermint
pine cones
pine nuts
pine needles
pine straw
pine tree heart wood
pineapple sage
pinyon nut
pippsissewa
pitcher plant
plantain
poke berry
poke root
poke salet
pollen
ponderosa pine cone
ponderosa pine transplant
poplar
Port Orford cedar
possum grape
primrose root
princess pine
puffball mushroom
pussy willows
queen bolete
queen of the meadow
quince
rabbit brush
rabbit tobacco
ramps
raspberry
raspberry leaf
red cedar
red clover flower
red elderberry
red huckleberry
red oak
red raspberry
red root
red straw
red willow
redwood seed
reindeer moss
Rhizopogon
rhododendron
rhubarb
rock moss
rose hip
rosemary
rue
sagebrush
salal
salal berry
salt bush
sassafras
sassafras bark
sassafras branch
sassafras leaf
sassafras root
Saskatoon berry
sasspatoon berry
saw palmetto berry
saw palmetto frond
Scleroderma
scotch broom
sedge
serviceberry
shaggy mane
sheep sorrel
sheet moss
shell fungus
skull cap
skunk brush
skunk cabbage
slippery elm
small leaf myrtle
small willow herb
smooth chanterelles
snakeweed
snowberry
solomon seal root
spearmint
spotted horse
spray rose
spring cress
spruce cone
St. John's wort
staghorn sumac
star grass
star root
stone root
strawberries
sugarplums
sumac
sumac tree bark
sunflower
sweet bays
sweet goldenrod
sweet grass
sweet gum
sweet Sicily
sweetgrass
tan oak mushroom
tansy
teepee poles
thimble berries
thistle
toad flax
triden salt bush
Trillium
trout lily
trout lily root
truffle
tupelo
turkey tails
turpentine
usnea
uva ursi
Virginia snake root
valerian edulis
valerian root
verbena
vigas
vine melon
violet leaf
violets
Virginia snake root
walnut
watercress
weeds
western coltsfoot
western red cedar
Western red cedar bough
white fir cones
white mulberry
white oak
white oak acorn
white sage
Wyoming big sage brush
wild apple
wild black currant
wild bergamot
wild cherry
wild cherry bark
wild fig
wild carrot
wild geranium
wild ginger
wild gooseberry
wild grape
wild hydrangea
wild indigo
wild Iris
wild lettuce
wild loblolly seed
wild mustard
wild olives
wild onion
wild parsnips
wild passion fruit
wild persimmon
wild purslane
wild plums
wild slash seed
wild strawberry
wild strawberry root
wild thyme
wild tomatillo
wild violets
wild yam
Witch Hazel leaves