Non-timber Forest Products: Local Livelihoods and Integrated Forest Management

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NTFP: AN EVOLVING CONCEPT

In October of 1999 a conference was held in Kenora, Ontario, Canada, to explore the non-timber forest products (NTFPs) of boreal and cold temperate forests. Up to this time, the concept of NTFP, was one that had been developed largely for tropical and subtropical forests. An extensive body of literature exists on a wide range of topics for the NTFPs of tropical and subtropical forests. The Food and Agriculture Organization of the United Nations was one of the first agencies to promote NTFPs through their program on non-wood forest products (NWFP) (http://www.fao.org/forestry/FOP/FOPW/NWFP/nwfp-e.stm). Over the past 10 years, numerous other international agencies such as the World Bank, Canadian International Development Agency (CIDA) (http://www.worldbank.org), International Development Research Centre (IDRC) (http://www.idrc.ca), Center for International Forestry Research (CIFOR) (http://www.cifor.cgiar.org), International Union for the Conservation of Nature (IUCN) (http://www.iucn.org), and the Biodiversity Support Program (BSP) (http://www.bsponline.org), among others, have incorporated the concept of NTFP into their programming. The 1980s and the 1990s also led to an explosion in the research of and writing about NTFP from an international perspective. A quick scan of FAO reports and the bibliography of NTFP literature, both of which can be found on the FAO-NWFP Web site reveals the growth of international interest in the topic of NTFP for tropical and subtropical forests. While the main focus for NTFP has been the tropical and subtropical regions of the world, there has also been a parallel, albeit smaller, growth of interest in the NTFPs of boreal and cold temperate forests.

Although the widespread economic interest in the NTFPs of boreal and cold temperate forests may be new, a large amount of research in other fields of knowledge predate the concept of NTFP and apply to NTFP issues. While it is difficult to divide this literature into discrete categories, we suggest that the following seven categories roughly cover the main literature in which the NTFP concept has emerged.

1. Ethnographic Studies

The ethnographic record provides a rich set of historical and contemporary information on the collection and gathering of plants, animals, insects, minerals, and other biological organisms that people have used to maintain a livelihood in the boreal and cold temperate forest regions. Many ethnographies also include detailed information on the role of such biological organisms in the processes of nutrition, manufacturing, trade, rituals, ceremonies, and healing. Some ethnographies also provide information on the ways by which peoples of the boreal and cold temperate forest regions steward individual species and their local environments. Finally, many ethnographic studies have discussed the market structures through which NTFPs are traded and the sociological dimensions of harvesters and marketing cooperatives. Many contemporary journals contain discussions of cultural and social processes critical to a fuller understanding of NTFPs.

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2. Traditional Ecological Knowledge (TEK)

Traditional Ecological Knowledge is a broad term that can be used to capture diverse sets of interests including: people's perception, ordering, and naming of the environment and its components ("new ethnography"); people's understanding of individual components of the environment (ethnobiology, ethnoforestry (http://www .inef.org), ethnobotany, ethnozoology, ethnopedology, etc.); and people's understanding of the relationship among the components of the environment and related stewardship practices (ethnoecology) (Berkes 1999, and in this volume; Berkes and Davidson-Hunt, in this volume; Turner 1995, and in this volume). Although this area of study has usually focused on "local peoples" in relation to components of the environment, it has also looked at biochemistry to ascertain the nutritional status of species that people consume (Kuhnlein *et al.* 1982) and the medicinal properties of species that people use for healing (Marles *et al.* 1999, and in this volume; Turner and Hebda 1990). Many examples of this type of research relevant to the renewed interest in NTFP can be found in the *Journal of Ethnobiology* (http://www.ethnobiology.org) and in a recent issue of *Ecological Applications* (http://www.esa.sdsc.edu/esapubs/Applications_main.htm) devoted to the theme of TEK (*Ecological Applications*. 10(5).

3. Economic Botany

Economic botany is interested in the use of plant species by human communities since the late 1800s. The *Journal of Economic Botany* (http://www.econbot.org) provides an extensive source of information on specific plants that have been used in the past or have commercial potential.

4. Forest Management and Policy

Forest management has largely been associated with the management of timber resources. However, a recognition of the importance of NTFPs can be found as far back as the late 1800s when the British colonial government of India included minor forest products in its forest management plans. The inclusion of NTFPs in forest management policy in North America is perceived as novel; however, this is due to a lack of knowledge about the history of minor forest product policy and management in the temperate forests of northern India, and other European countries. Ideas on how NTFP can be included in forest policy and management are starting to show up in forestry journals such as the *Forestry Chronicle* (http://www.cif-ifc.org/chron.html) and the *Journal of Forestry* (http://www.safnet.org).

5. Biology and Ecology of Forests

The biology and ecology of forests have largely focused on the timber species found in the forest. However, forest research has recently begun to focus on the trees, shrubs, herbs, fungi, animals, insects, and the physical characteristics of forests and the interactions between the components. As the focus on the biology of forest organisms has broadened, and an ecological approach to the inventory of forested lands has begun, this area of research has started to generate information that is directly relevant to our understanding of NTFPs. Journals such as *Conservation Ecology* (http://www.consecol.org/Journal) and *Ecological Applications*, along with the forestry journals previously mentioned, are starting to carry research that has direct implications for our understanding of the biology and ecology of NTFPs.

6. Forest Products Research

An extensive set of literature has examined the chemical constituents of tree, shrub, and herb species for use in commercial applications. This extends back to some of the early work on latexes, saps, resins, and oils as well as more recent work on the pharmacological properties of medicinal plants. This type of work is being reported in journals such as the *Journal of Ethnopharmacology* (http://www.ethnopharmacology.org) and is carried out at research centers such as the Natural Resources Research Institute in Duluth, Minnesota, USA (http://www.nrri.umn.edu).

7. Business Organization and Marketing

The success of NTFP businesses is often related to the structure of the organization and the ability to plan marketing strategies. This area has remained relatively unexplored, but it does draw on previous work on harvesters' cooperatives, market structure of other small-scale forest products (i.e., rubber in the tropics), fair trade, and marketing of other natural products. This type of work is being reported in many of the aforementioned journals, but much of the work has been done by private research or economic development organizations such as The Taiga Institute (http://www.taigainstitute.org).

In the 1980s and 1990s, many of these diverse strands of interest began to be drawn together under the umbrella term of NTFP. One of the earliest inventories of NTFPs for boreal and cold temperate forest was that undertaken by Christine and Robert Prescott-Allen in 1986 (Prescott-Allen and Prescott-Allen 1986). They undertook an extensive examination of "wild" species in relation to the North American economy. By the 1990s, many reports were emerging that examined the commercial harvest of a number of different forest species. They were largely based upon the mushroom, bough, and berry harvesting of the Pacific Northwest rainforest. Much of this work has been recently compiled in an annotated bibliography put out by the Pacific Northwest Research Station of the USDA Forest Service (von Hagen *et al.* 1996). In Canada, a similar interest in NTFPs arose in British Columbia due to the harvest of mushrooms and boughs from B.C.'s public forests. This led to an overview of the NTFPs harvested from B.C. forests in 1995 (De Geus 1995). In this report it was estimated that over 200 different botanical species are actively harvested from B.C. forests. A similar report was also recently released for Ontario which again identifies the range of species harvested from Ontario's public forests (Mohammed 1999, and in this volume). Marla Emery (Emery 1998, and in this volume), of the USDA Forest Service, also undertook a detailed study of NTFP harvesting by households in the Upper Peninsula of Michigan. In Europe, a similar interest was emerging for boreal and cold temperate forests and which was summarized in a report issued by the European Forest Institute in 1998 (Lund *et al.* 1998). Along with these broad overview reports, numerous other reports were being released that detailed work on specific NTFPs, such as the Ambio Special Report #9 on chanterelle mushroom harvesting in the Pacific Northwest (Liegel *et al.* 1998).

As forest managers were trying to catch up with what people were harvesting from public forests, the impacts of harvesting on forest ecology and the potential benefits of harvesting, NTFP harvesters and businesses were harvesting, processing, and exporting NTFPs. Many agencies were also promoting NTFPs as a tool for economic development in regionally depressed forest community economies or as a means to reconcile biodiversity conservation and economic development. One agency that has been actively exploring the commercial potential of NTFPs for forest communities is the Model Forest Program, funded in part by the Canadian Forest Service. Such reports have been prepared by the Prince Albert Model Forest in Saskatchewan (Mater Engineering 1993); the Manitoba Model Forest (Mark Mitchell and Associates 1995); the Lake Abitibi Model Forest in northeastern Ontario (Arborvitae Environmental Services Ltd. 1997); and the Western Newfoundland Model Forest (Freeman 1995). These reports provide an important source of information on NTFPs across the western and eastern boreal forests in Canada. Numerous other studies have also reported on the commercial potential of NTFPs from other cold temperate and boreal forest regions: Minnesota (Mater Engineering, Ltd. 1994); the North Shore of Lake Superior (D.C. Brubacher and Associates 1998); British Columbia (Wills and Lipsey 1999); and north central Ontario (Duchesne 1995). Other reports have attempted to provide basic NTFP business organization and marketing information (Freed 1995, 1996; Thomas and Schumann 1993); impact of harvesting (Robbins 1998, Wood Sheldon *et al.* 1997); the relationship between NTFP harvesting and biodiversity conservation (Vance and Thomas 1997); and national or regional "guesstimates" of the value of NTFP harvesting (Duchesne *et al.* 2000, and in this volume; Schlosser and Blatner 1995; Schlosser *et al.* 1995). Best current guesstimates for NTFP commercial value are $241 million for Canada (Duchesne *et al.* 2000) and $200 million for the Pacific Northwest (Schlosser *et al.* 1991, 1995). Value estimates for NTFPs are beset by a

number of difficulties and thus our use of the term guesstimate.[4] By the mid-1990s it was apparent that the concept of NTFP was being used to describe a set of forest harvesting activities in boreal and cold temperate forests that, as Marla Emery (1998) described it, were previously "invisible."

NTFPs did not just begin to be harvested, marketed, and studied in the 1980s and 1990s in the boreal and cold temperate forest regions. In fact, as we noted previously, there was a lot of research being undertaken over the past couple of hundred years on NTFPs within discrete academic and research domains. An exploration of this research demonstrates that people have always held a diverse set of values in relation to the forest and actively harvested a variety of organisms for commercial and domestic purposes. Unfortunately, those values have not always been recognized or respected in the process of forest management. However, as the concepts of ecosystem management and integrated forest management became more accepted, forest management agencies in both the United States and Canada were required to consider a broader range of values for forest management. The NTFP concept appeared to coalesce a diverse set of interests in an attempt to reveal those "invisible" values and include them within an integrated forest management approach. This brought together an unlikely set of characters. Forest managers were inviting anthropologists, ethnobotanists, botanists, mushroom harvesters, berry harvesters, medicinal plant harvesters, chemists, economists, and various other researchers and harvesters to workshops and conferences. The concept of NTFP became an exciting area within which to work because traditional academic boundaries and the boundaries between research, practice, business, and management became blurred. Harvesters and NTFP business people often knew the biology, ecology, and marketing of specific forest species better than research scientists. Chemists knew that some plants in the boreal forest had constituents of commercial value. Forest managers did not always have a clear sense of the importance of commercial and/or non-commercial harvesting activities for the livelihoods of Aboriginal and other peoples. However, this set of people rarely have the chance to exchange ideas on more than a regional basis or across the divide between academics, managers, and harvesters. This was the intent of the conference held in Kenora during October 1-4, 1999. We wanted to bring together a non-traditional mix of researchers, forest managers, NTFP harvesters, Aboriginal peoples, business people, marketers, and anyone else interested in NTFPs, local livelihoods, and integrated forest management. The papers that follow in this volume reflect the breadth of interest that the concept of NTFP can bring together. This leads us to consider a definition of NTFP and the type of themes currently included in the concept of NTFP.

[4] *Suffice it to say that there are two main problems that beset attempts at valuation of NTFPs. (1) Quantity of harvest: Some commercial NTFPs do have market prices but it is difficult to estimate the size of the harvest because the quantity bought and sold is not tracked through official markets. NTFPs that are not used commercially are not tracked through any measure of household consumption; (2) Market price: Some NTFPs used for household consumption are not bought and sold in a commercial market; therefore an imputed price must be determined. Furthermore, many people who harvest NTFPs for spiritual, pleasure, or other non-market values would not agree that the market price represents the value of their harvesting activities. The quantity question can be overcome through detailed household studies on a regional basis, for example, Emery (1998), Godoy and Bawa (1993), Godoy* et al. *(1993, 2000), Schlosser* et al. *(1991). The question of market or imputed value is a more difficult problem. See Jenne H. De Beer and Melanie J. McDermott (1996) for a thorough examination of this problem.*

PROBLEMS OF DEFINITION

NTFP has proved to be difficult to define due to some of the blurred boundaries between timber and non-timber products as well as the underlying difficulty in defining a forest. Most attempts at definition deal with three specific problems: (1) Scale of Industry, (2) Goods and/or Services and, (3) Origin of Product.

(1) Scale of Industry

The broadest definition of NTFP would include all biological materials harvested from forests for human use. The distinction between timber and non-timber has been

used in an effort to distinguish between different scales of enterprises that are harvesting biological materials from forests (De Beer and McDermott 1996). As Duchesne *et al.* (2000) report, the NTFP industry is only 0.4 percent (241 M) of the size of the timber industry (58.7 B) in Canada. Non-timber forest products are usually harvested by individual harvesters, households, or small cooperatives. Buying, processing, marketing, and exporting are usually undertaken by small firms (i.e., <$1 million gross sales/year) versus large multinationals. This is one of the greatest sources of confusion because the use of trees for the small-scale production of crafts, log houses, and/or domestic consumption is often included in the concept of NTFP.

(2) Goods and/or Services?

Another question to consider is whether NTFPs include only products (i.e., goods) or both products and services (i.e., non-market values). Lund *et al.* (1998) provided a detailed discussion on this point and chose in the end to use the term non-wood forest resources, thereby including all products, services, personal use values, aesthetic values, tourism values, and other values of forest lands, but excluding all wood products. In another example, the concept of NTFP has been broken into two product categories: (1) Special Forest Products, which are derived from trees and are regulated; and (2) Botanical Forest Products, which are not derived from trees and remain unregulated (De Geus 1995). At this point, there is no clear agreement on whether NTFPs should be narrowly defined as only products or more broadly referred to as resources.

(3) Origin of Product

Another question that has been raised is whether non-timber forest products are only those biological resources that originate from within natural forests. This raises a whole different set of questions as to how a natural forest is defined and whether the concept of NTFP should be tied to such a definition. Intractable and thorny questions arise such as whether a chanterelle harvested from a planted jack pine plantation is excluded while a chanterelle harvested from a natural regeneration, post-fire jack pine stand is included? Are Ericaceous species (e.g., *Vaccinium* sp.) harvested after mechanical disturbance excluded while all *Vaccinium* sp. harvested following a fire disturbance or from a mature forest included? Are species from managed "wildlands" included while the same species from managed tree plantations excluded? Ultimately, we suggest, that these distinctions will not prove viable as a means of forest classification and will create more problems than solutions for a definition of NTFP. The concept of NTFP has been left purposely broad so that all biological species gathered from a variety of ecosystems have been included while those grown as agricultural crops have been excluded.

As can be seen, there is probably no agreed upon definition for NTFP at this time. We have tended to support a loose definition of NTFP due to the evolving nature of the concept and the potential to bring together a diverse set of interests and experiences to the idea of integrated forest management. Our preferred term, at this time, would be non-timber forest resources, recognizing that the scale of harvesting activity is an important consideration while including a diverse set of interests and values in forest management. However, as pointed out above, the concept of NTFP has become well established and has been able to integrate the diverse set of values and interests necessary to move toward integrated forest management. In essence, the concept of NTFP refers to a consideration of the interests, values, and activities of people who have largely been excluded from forestry research, planning, and management. In sum, **we would suggest a broad definition of NTFPs as those biological organisms, excluding timber, valued by humans for both consumptive and non-consumptive purposes found in various forms of forested landscapes.** In the future, as we move toward integrated forest management and the diverse set of interests, values, and activities are integrated into forest management planning, it may be possible to move toward a holistic vision of forested landscapes and abandon the current emphasis on NTFPs. At this point, however, we still see more prospects in the integrating ability of the NTFP concept than in other concepts that have attempted to move toward integrated forest management.

THE RANGE OF NTFPS

Gina Mohammed (1998:2; and in this volume) provided a set of NTFP categories that give a useful overview of the types of products that can be included in the concept of NTFP. This set of categories, and the types of products they include, is replicated below. We have added one category to maintain consistency: non-consumptive products. In all categories, the use of the product may be commercial or it may be for personal consumption, aesthetic, or other non-market values as suggested in our final category.

Food Products
- Berries
- Beverages
- Essential oils
- Flavoring agents
- Herbs and spices
- Honey
- Maple/birch saps - syrups, sugars, taffy, butters
- Mushrooms
- Nuts
- Seeds
- Teas
- Vegetables

Materials and Manufacturing Products
- Adhesives
- Alcohol
- Candles
- Cloth
- Essential oils
- Fragrances
- Incense
- Lignosulfonates
- Resins
- Specialty wood products
- Stuffing material
- Thread and rope
- Turpentine

Health and Personal Care Products
- Aromatherapy oils
- Cosmetics
- Drugs
- Essential oils
- Herbal health products
- Nutraceuticals
- Perfumes and fragrances
- Pet care products
- Shampoos
- Soaps

Decorative and Aesthetic Products
- Christmas trees
- Cone crafts
- Bark crafts
- Wood crafts
- Carvings
- Floral arrangements
- Wreaths, garlands, swags
- Natural dyes

Environmental Products
- Biofuels
- Biopesticides
- Recycled products

Landscape and Garden Products
- Landscape trees
- Shrubs
- Wildflowers
- Grasses
- Mulches
- Soil amendments

Non-consumptive NTFPs
- Natural and cultural heritage tourism and education
- Biodiversity conservation
- Healing ceremonies
- Recreation
- Water quality

TOPICAL ISSUES OF NTFP

While NTFP incorporates a diversity of interests, values, and activities, we identified three current issues that appeared to be important at this time and that we incorporated into the conference. These three issues were: (1) NTFP and economic development, (2) the biology and ecology of NTFP, and, (3) NTFP markets and enterprises.

(1) NTFP and Economic Development

NTFPs are often cited as providing the potential for economic development in areas where the forest industry is in decline or the number of jobs provided by the forest industry is shrinking due to technological shifts (Clapp 1998). NTFPs, along with ecotourism, are also often promoted as a means to reconcile economic development with biodiversity conservation (Vance and Thomas 1997). However, we need to be careful of the potential that NTFPs offer

forest communities for economic development. Ricardo Godoy's detailed studies of NTFP harvesting in the tropics demonstrated that the value of NTFP harvests is not always sufficient to offset the loss of income from timber harvesting (Godoy and Bawa 1993; Godoy *et al.* 1993, 2000). Although Godoy does not suggest that timber harvesting is the only option for forest communities, he does say that offering NTFP enterprises and/or ecotourism will not necessarily provide enough benefits to forest communities to offset the losses from giving up timber harvesting. He suggests that communities will also need to receive monetary compensation for the loss of timber harvesting benefits. It is clear that NTFPs are not a replacement for a timber industry.

While some NTFPs do emerge to become large industries, the role that NTFPs seem to play more often in economic development is that they provide supplemental income for regions that are experiencing declining levels of employment (Emery 1998, McClain *et al.* 1998). The people who benefit from the harvest of timber are not always the same as those who benefit from the harvest of NTFPs. In some cases, people who live in areas where the employment provided by the forest industry has declined and who don't want to leave an area to which they are attached explore NTFPs as a way to supplement their income. In other cases, people who have not been able to obtain access to forest industry employment harvest NTFPs as a way to supplement small incomes. NTFPs are often marginal forest resources but are extremely important sources of income for the people who harvest them. In some cases it may be possible to foment the emergence of harvester cooperatives and local processing facilities (i.e., value-added enterprises) as a means of economic development. In this case, certification becomes an important consideration for NTFP enterprises (see Patrick Mallet, this volume). However, the absence of such infrastructure and/or formal organizations does not mean that NTFP harvesting is not playing a significant role in terms of local economies and livelihoods (see Alexander, Chapeskie, Greet, this volume).

Other people would not see NTFPs as a tool for economic development but would see them as critical to their way of life. For instance, many First Nations people in Canada may not see much potential economic benefit from NTFPs but do see the ability to harvest medicines, berries, barks, and other things from the forest as integral to their way of life. Medicines are important for healing processes; some barks and plant species are integral to healing ceremonies while the ability to gather together in berry harvesting camps is necessary for the maintenance of a collective identity. While economic development is an important consideration of NTFP, we should remember that commercial utilization is not the only activity that gives value to NTFP.

A key purpose of this conference was to explore the commercial potential of NTFPs and the different perspectives of First Nation and other harvesters toward commercialization.

(2) The Biology and Ecology of NTFPs

NTFPs are often considered to be the black box of integrated forest management. While we have reams of data on the growth and yield of many tree species, we know very little about the ecology and biology of shrubs, herbs, and fungi that are found in forest ecosytems. The biology of NTFPs would include such questions as what factors control their distribution and their establishment, what physiological and morphological aspects control their usefulness and/or potency as NTFPs, as well as how these factors control the sustainability of their harvest.

The ecology of NTFPs focuses on where NTFPs occur within forested landscapes in space and time. We have found that many NTFP harvesters have a greater sense of the ecology of NTFPs then do many research scientists. This is an area where the active collaboration between research scientists and harvesters may reap great dividends. As forest inventory science has begun to move away from timber-based inventory systems toward systems of ecological land classification, which include shrub and herb species, it has become possible to use this research to understand the ecology of NTFPs. There are two important issues

regarding the location of NTFPs in space and time: (1) not all NTFPs occur in mature forests as is often assumed, and (2) while many NTFP species occur across a great range of forest types, they are often more abundant in some types than others. By understanding the ecology of NTFPs, we may actually be able to influence the abundance of NTFPs within the forest landscape through a variety of different management techniques. For instance, it may be possible to undertake prescribed burns of logging residue in such a way as to stimulate berry production on certain soil types. From a spatial point of view, we may be able to recognize especially rich mature forest habitats for specific NTFPs and ensure that they are not completely cut out. From a temporal point of view, we may be able to identify early post-disturbance vegetative communities that provide specific NTFPs and ensure that they are not sprayed with herbicides. It is possible to use the ecological processes to change the spatial and temporal distribution of NTFPs for the benefit of local economies and livelihoods—something that Aboriginal peoples of boreal and cold temperate forests have known and practiced for a long time (Berkes 1999, Johnson 1994, Lewis and Ferguson 1988, Turner 1999).

Similar statements can be made about the physiological, morphological, and anatomical aspects of NTFPs. There has been little work in the northern forest directly related to the underlying plant biology of NTFP production. However, there is much information on plant growth and development in general that is very relevant to NTFPs and their sustainability. As harvesters often know more about the ecology of NTFPs, the same can be said about harvesters' knowledge about NTFP biology. NTFP harvesters often know much about the limits of harvest as they relate to the potential for future production. Collaboration among scientists and harvesters offers many productive opportunities for increasing our understanding of the biology of NTFP and their sustainable harvest.

As previously noted, NTFPs are often considered to be marginal resources. Therefore, except for those NTFPs that have unusually high market value, it is unlikely that large research programs will be established to examine their biology and ecology. Fortunately, a lot of research undertaken for the broader purposes of forest biology and ecology may be amenable to answering critical questions about NTFPs. For instance, the ecological land classification of Ontario has made it possible to estimate, with a probability of error, whether an NTFP will occur in a particular forest type at a given age. It has also become possible to identify where an NTFP may occur across the landscape. In other words, an inventory system undertaken for forest land management can be used for rapid NTFP inventory and assessment without the need for an extensive biometric survey of NTFP. There is also the potential for close collaboration between harvesters and scientists in this regard. Many harvesters know with great intimacy the type of habitat preferred by certain NTFPs so that NTFP habitat profiles can be constructed for a given NTFP. This habitat profile can then be matched against ecological land classification profiles to determine where the NTFPs may occur across the landscape. Given that it is unlikely that much primary research will be done on NTFPs, these types of collaboration for mutual benefit allow for exciting new paradigms of biological and ecological research to emerge.

Exploring the current state of the biological and ecological knowledge of NTFPs was also a key purpose of this conference as well as examining the potential for collaboration between researchers, harvesters, and entrepreneurs (see Flaster; Marles; Turner; Huang and Barl; Duchesne *et al.*; Nauertz and Zasada, in this volume).

(3) NTFP Markets and Enterprises

In a study by D.C. Brubacher and Associates (1998), it was found that one of the dominant market structures for NTFP consisted of many harvesters selling to regional buyers, who in turn sell to centralized processors and exporters. They found very few examples in which the processing and marketing of NTFPs were handled by local enterprises. One of the conclusions reached by the authors was that the market structure was a reflection of the "patchy" nature of many NTFPs. The boreal forest is noted for the cyclical nature of biological species across time and their uneven

distribution in space. A mushroom harvest may be excellent one year and non-existent the next; the harvest may be excellent in one region and non-existent in another. Harvesters, buyers, and processors of these types of resources tend to be mobile or able to switch their harvesting effort from one resource to another in different years. This makes it difficult to build a processing facility or establish exporting enterprises, both of which require a consistency of harvest from year to year: a finding that is well known to those who have worked with the marketing of agricultural products. In light of this ecological characteristic of many NTFPs, harvesters and regional buyers tend to have little capital investment in their harvesting activities. In addition, NTFP processors and exporters, by necessity, acquire NTFPs from a large catchment area. If mushrooms are good in Newfoundland one year, they will buy from there; if good in B.C. then they will buy from there. The patchy nature of many NTFP resources requires that harvesters, processors, and brokers not be attached to a particular region so that they can obtain a livelihood or meet the demands of their markets. D.C. Brubacher and Associates (1998) found that the ability to provide, or access, a consistent supply of an NTFP was often the limiting factor for NTFP enterprises.

NTFPs in boreal and cold temperate forest are often patchy; however, not all NTFPs are as patchy as others. For instance, wild rice/manomin (*Zizania* sp.) has been able to support local harvesting cooperatives with their own processing and exporting enterprises in many boreal forest regions. An example of this was provided at the conference in a presentation and display by Kagiwiosa-Manomin of northwestern Ontario (http://www.manomin.on.ca). While the yields may vary from year to year, they do not have the same dramatic swings as is evident for some fungus and berry species. The surplus from some years can also be easily stockpiled for years in which the harvest is not abundant. Other NTFP products that exhibit this profile are the maple and birch syrups (*Acer* sp., *Betula* sp.), boughs, essential oils, and resins. NTFPs with this ecological profile may be able to provide consistent yields and/or storage characteristics to support non-mobile harvesting, processing, and marketing enterprises along with the inversion of capital. For this type of NTFP, processing and marketing often become the limiting factor as demand may exceed supply.

Based on the presentations made by NTFP businesses, such as Frontier Natural Products Cooperative (http://www.frontierherb.com) and Winter Woods (http://www.winterwoods.com), it is apparent that more attention should be given to the relationship between the biology/ecology of NTFPs and the appropriate form of organizational structure to ensure successful NTFP enterprises (see Letchworth, Cameron, Krantz, and Polson, in this volume). NTFPs characterized by widely fluctuating yields from year to year require an organizational structure that follows one of two strategies: (1) mobility, the ability to move to areas of abundant harvest or purchase from a large catchment area, or (2) diversity, the ability to switch harvest effort from one product to another depending upon the year. In the former, there is an emphasis not to sink capital into a regional center. Processing and marketing are carried out from a more centralized location that can draw upon harvesting and brokering operations that span the great northern forest. Access to markets and transportation networks require that the processing occurs near the market as opposed to a regional center. This provides a successful model of an NTFP enterprise, but it does not offer many possibilities for regional value-added enterprises although it can support smaller harvesting and brokering operations located in northern forest communities. The diversity strategy requires that the enterprise invest in intellectual capital because it will need to have a broad knowledge of the ecology and markets of many different NTFPs. This model offers more possibilities for regional economic development although the type of enterprises that result will probably be small family businesses that support a network of harvesting as opposed to large processing facilities. The model that offers the most potential for regional economic development are those NTFPs that can be harvested from year to year within a region at levels that can sustain a buying, processing, and marketing capacity. In all cases, the ability to transform the raw product into something with enhanced storage properties is needed to smooth out the effect of cyclical NTFP yields and offer their customers the same quantity and variety of products from year to year. The conference provided an opportunity for researchers, harvesters, processors,

and marketers to understand the linkage between the biology, ecology, and marketing of NTFP.

Finally, the conference also explored some new ways in which NTFPs are being used to support people's livelihoods in the northern forest. In Canada there is an increasing market for natural and cultural heritage tourism. For example, whale watching on the north shore of the St. Lawrence River in Quebec has grown to a $1 million per year industry, and visits to Canada's National Parks Network have been increasing at the rate of 4 percent per year. Brokenhead First Nation in Manitoba described how they have created a small business called the Brokenhead Ojibway Historic Village (BOHV) (http://www.manitobamodelforest.net), which takes people on excursions to view the natural and cultural heritage of a region. BOHV and the Mi'gMag Aboriginal Heritage Garden, located in Eel River First Nation, New Brunswick, also described how they have created infrastructure, such as teaching centers or botanical gardens, which offer workshops and interpretive tours so that people can learn about the northern forest and how to turn plants into things such as medicines and crafts. Other participants, such as Eel Ground First Nation in New Brunswick, stressed that NTFPs are not just inputs to production processes or only the potential base of many permutations of ecotourism enterprises, but also an integral part of a way of life and other personal use values for which the term product does not comfortably apply.

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