Future Forest Products and Fibre Use Backgrounder:

Non-Timber Forest Resources

Overview

Prepared for:
Omineca Beetle Action Coalition

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About this Project

The Mountain Pine Beetle infestation has had, and will continue to have, an impact on the timber supply and forest sector in northern British Columbia. The forest industry is the largest employer and economic catalyst in the Omineca Beetle Action Coalition (OBAC) area. Thus a reaction to, and innovation of, the current forest economy is necessary, complete with a diverse set of products and utilisation of resources.

In the OBAC's *Future Forest and Fibre Use Strategy*, a number of forests products already in production in the area are identified. These include:

- lumber;
- panels (veneer, plywood, particle board);
- posts and poles;
- finger-jointed lumber;
- chips;
- log homes;
- pulp and paper;
- pellets from sawmill residue; and
- power cogeneration plants.

A number of prospective options for future forest and fibre use are also identified and available for future reference, including:

- bio-energy;
- fuel pellets; and
- high value products (such as wood composite board for prefabricated construction).

This guide, however, seeks to identify alternative options to future forest and fibre use, particularly in the non-timber forest products sector. The aim is to build upon and supplement larger scale operational possibilities and industries, as outlined in OBAC's *Future Forest and Fibre Use Strategy*.

As a guide, this work seeks to provide insight to, and definition of, lesser known forest products and resources, by using existing literature and informational links for future reference.

Non-timber forest products are practical for small-scale operations, are compatible with conservation, can be ecologically sound, and can compliment mainstream forest harvest industries. Niche market products and small-scale forestry operations could play a larger role in the future of northern British Columbia's forestry economy, with many small operations cumulatively capturing a larger part of the market.

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Availability

Copies of this report are accessible through the Omineca Beetle Action Coalition and the Community Development Institute website (http://www.unbc.ca/cdi).

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1. Introduction

Forests have long provided a range of services and diverse products that contribute to the livelihood of economies, communities, and industries. The spectrum of non-timber uses of forest resources has come to be known as 'non-timber forest products'. These include botanical and mycological resources, and exclude conventional timber products (such as lumber, pulp, shakes, or firewood). Some definitions have come to include forest animals, although they are not generally considered part of non-timber forest products.

The Ministry of Forests and Range, in their overview of non-timber forest products describes the industry as a rapidly growing sector that contributes to the economic diversification of the province. In 1997, the Ministry of Forests and Range estimates valued the sector at $600 million per year, with over 30,000 British Columbia residents earning income from this sector.

Carla Burton lists 21 commercial locally grown products currently for sale in the area (including food, herbs, crafts, and decorative products). Also noted, are 31 commercial and locally available products which are for sale in Prince George stores, but are imported from other areas. This implies that there is a significant opportunity for growth and innovation in the non-timber forest resources sector of the Omineca Beetle Action Coalition's (OBAC) region.

Most non-timber forest products are harvested from relatively isolated public Crown lands. There are also independent small-scale harvesters who may or may not claim their earnings. As a result, regulation and data collection of non-timber forest products has proved to be difficult. Of concern to harvesters, recreation users, First Nations, and others are forest access and land use opportunities. In the Center for Non-Timber Resources at Royal Roads University's *A Regional Profile of Non-Timber Forest Products Being Harvested from the Cariboo-Chilcotin, British Columbia Area*, First Nations in the Cariboo-Chilcotin area expressed concerns around four themes, including:

- impacts of other resource uses and activities on traditional foods and medicines;
- commercialization of traditional foods and medicines, and the intellectual rights to First Nations traditional knowledge;
- harvest levels and techniques of non-timber forest resources; and
- a lack of information and support for First Nations governments to manage and develop sustainable non-timber forest product based businesses.

The harvesting, commercialization, and benefits derived from non-timber forest resources cross many aspects of forestry, policy, economics, community, ecological management, history, culture, and politics. Many studies have looked into the future of non-timber forestry, as it is likely to be a key component in the future of forestry and agriculture.

Northern British Columbia and the OBAC region could differentiate themselves from other lumber producing areas through increased diversification of the forest sector, particularly in terms of non-timber forest products. This guide will provide a brief outline

of available non-timber forest products and opportunities associated with each type of product, and how to implement the system or enter the market. Also included are links of interest, information on opportunities for capital funding [where applicable], best practise techniques, and industry articles analysing the non-timber forest products sector. Please note that since these links take readers to external websites, managed by other parties, we cannot vouch for their quality, accuracy, or reliability.

2. Agroforestry

What is agroforestry?

Agroforestry is a land management approach combined with agriculture industries, and is defined by the production systems employed. It is the practice of growing trees in combination with perennial and annual food crops or livestock. The BC Woodlot Association has extensive information on agroforestry practises specific to British Columbia's climate and ecology. Their publications, most notably the document *A Guide to Agroforestry in BC* has served as a basis for this section. There are four types of agroforestry typically identified, including:

- alley cropping;
- integrated riparian management and timber belts;
- forest farming; and
- silvopasture.

Benefits of agroforestry:

Agroforestry practises have many benefits associated with their implementation, such as productivity benefits, economic benefits, and environmental benefits. The Small Woodlands Program of BC notes numerous benefits, including:

Productivity benefits:

- combinations of trees and shrubs with agriculture can improve the use of available soil, resources, and light; and
- when used in addition to nutrient cycling, there are further ecological and soil productivity gains.

Economic benefit:

- short-term cash flow and extra income while awaiting long-term crops;
- diversification of crops and labour, reducing dependence on single commodities;
- more income and community jobs per hectare of land; and
- diversification and strengthening of agricultural and forest production.

Environmental benefits:

- trees and shrubs that provide biodiversity, wildlife habitat, green space; and
- tree and shrub buffers that can intercept groundwater and surface water; reduce the impacts of flooding, wind,and erosion; and decrease odours.

How do you integrate agroforestry practises?

Add a complimentary, additional forest or agricultural crop component to current land management systems for environmental and economic benefits.

2.1 Alley Cropping

What is alley cropping?

Alley cropping systems, also known as 'sun systems', are managed intercropping systems that grow harvestable crops between trees and require full sun exposure. Various berries, forages, vegetables, or grains are usually planted between rows of trees or shrubs, which are spaced strategically to allow sun between the rows. Crops that can be produced in full sun exposure include:

- horticultural plants, such as tomatoes, peas, potatoes, or carrots;
- forages and grains;
- tree fruit crops, such as plums and nuts;
- Christmas trees;
- shrubs, such as berries; and
- trees for lumber, high value hardwoods, and wood fibre.

An alley cropping agroforest system is best developed when the desired plants for enhancement require sun, or when the current tree density does not produce enough shade for other crops. As the sun system grows and the trees expand, they can either be pruned to maintain the alley cropping method, or can eventually become larger and develop into a 'shade system'.

Benefits of alley cropping:

The diversity of crops can have a favourable effect on soil chemical composition, microbiological activities, and yield. The integration of larger more densely rooted trees and shrubs also protects against soil erosion and has been shown to have a minimizing effect on weeds.

Many of the intercropping systems developed in eastern Canada and the US grow high-value trees (e.g. black walnut, cherry, birch, or beech) with other crops on agricultural fields. These systems are managed intensively and produce crops for profit during the years needed for the crops to mature.

How do you integrate alley cropping practises?

By adding horticultural crops to actively managed woodlots, or by adding well spaced tree crops to traditional agricultural practises, additional value can be extracted from existing farms. The multiple crop system must be actively managed and maintained. The design should be established by an experienced or accredited agriculturalist. Systems often utilise fast growing trees such as poplar or birch at first in order to establish quickly and derive benefits. Slower growing species can be planted concurrently for future harvest benefits.

2.2 Integrated Riparian Management and Timber Belting

What are integrated riparian management and timber belting?

Integrated riparian management is the practice of actively managing forests and shrubs in areas bordering lakes, streams, rivers, wetlands, farms, and agricultural lands. Integrated riparian management systems are used to enhance and protect aquatic and riparian resources, as well as to generate income from timber and non-timber forest products. Shelterbelts, timber belts, windbreaks, fence line plantings, and hedgerows work in a similar manner. They are designed for both shelter and the opportunity for woody plant harvest, as well as non-timber forest production. Trees and shrubs have long been used for protection, to reduce soil and water erosion, and are often integrated with other managed agroforestry techniques.

Benefits of integrated riparian management and timber belting:

Timber belts and integrated riparian management systems can employ a wide variety of tree and shrub species with specific plantings tailored to suit the growing conditions and production opportunities. Riparian and shelterbelt agroforestry plantings also produce forest products in addition to their conservation value and environmental benefits. These practices may also be employed to utilise a number of other environmental services, including:

- odour, dust, and noise reduction;
- waste water and manure management;
- green space and visual aesthetics;
- enhancement or maintenance of wildlife habitat; and
- crops from harvestable, multi-use shelter plants.

How do you pursue integrated riparian management and timber belting practises?

Integrated riparian management and timber belts generally provide a complementary agroforestry service to existing farms. A mismanaged riparian buffer system can result in the potential loss of economic opportunities or degraded areas (Brigham n.d.), so consultation with planning professionals or practitioners should be explored. Small-scale implementation of tree and shrub boundaries utilising natural or existing plants can easily supplement commercial or private purposes as long as they are actively managed for desired results.

Many cities across Canada, such as St. Catherine's Ontario, have been involved with the Greenbelt Movement and urban buffer systems. These systems allow the utilisation of natural plants for boundary and pollution absorption purposes.

2.3 Forest Farming

What is forest farming?

Forest farming is the "integrated cultivation of actively managed timber and non-timber forest products within shaded forest understory" (Small Woodlands Program of BC 2001). Forest farming does not refer to the harvesting of wild non-timber forest products, but rather purposefully introduced commercial crops into woodland areas.

A distinction is often made between a 'shade agroforest' and 'forest farming'. A shade agroforest tends to refer to less intensive, more extensive, and lower yielding production, while 'forest farming' refers to more intensive and cultivated understory crop production. Both can be classified as a 'shade system'.

Due to the nature of forest farming, shade systems are well suited to shade-tolerant crops, and potentially even the management and cultivation of traditionally 'wild' crops under a closed tree canopy. It is usually established in existing woodlands. According to the BC Woodlot Associations' *A Guide to Agroforestry in BC*, the vast forests of northern BC are well suited to forest farming and provide the necessary space for larger scale, seasonal crops. Successful forest farming operations in BC produce:

- mushrooms;
- maple and birch syrup;
- native plants used for landscaping and floral greenery;
- medicinal and pharmaceutical products (e.g. ginseng, goldenseal, and St. John's Wort);
- vegetable and fruit products (e.g. wild berries); and
- craft products (e.g. cones, twigs, and moss).

Benefits of forest farming:

Shade provision, reduction of water loss from evaporation, retention of soil moisture, and the non-destructive, lower maintenance nature of forest farming make it ideal for existing farms and woodlots. The forage food can also act as living mulch for trees and more intensive crops. Forest farming is suited to be placed in existing farms in BC or in underutilized forest patches immediately.

How do you integrate forest farming practises?

Forest farms are either created using existing forests and planning horticultural activities around the landscape, or by planting a sun system in order to develop a sufficient canopy for harvestable shade tolerant crops. The addition of forest farming techniques to existing agricultural operations is generally straight forward, but it does require basic agricultural knowledge and access to woodland.

2.4 Silvopasture

What is silvopasture?

Silvopasture combines livestock grazing with tree crop management in either a natural forest or pasture setting. Cattle, sheep and goats have all been incorporated into silvopasture systems in BC. Silvopasture systems may be located within a private farm or woodlot, or be special collaborative arrangements between forest licensees and livestock producers on Crown land (such as using sheep or cattle as a vegetation management tool). Crops and products that silvopasture systems yield include:

- meat and dairy goods;
- forage and hay;
- soft and hardwood lumber products; and
- nuts, fruits, and berries.

Benefits of silvopasture:

'Livestock in the forest'

The integration of animals into the system can increase the production and growth of cone trees, while providing protection for livestock. Livestock grazing on groundcover reduces competition for moisture between the trees and other vegetation, so tree yields often increase. The combination is environmentally sound and generates revenue, particularly if the silvopasture consists of high-value or special purpose trees.

'Trees in the pasture'

Adding tree farming into existing grazing operations is called a tree pasture system. These can be successful for two reasons. First, agricultural soils are usually deeper and more fertile than forest soils and produce more crop options for pasture trees. Second, the right choice of tree crop allows for the development of a livestock operation while maintaining an investment in [specialty] timber.

How do you integrate silvopasture practises?

Kootenay Tree Farms Ltd., in partnership with BC Hydro, the BC Ministry of Forests and Range, and local ranchers, began integrating low intensity grazing onto their lots. This pairing benefited both industries. To create silvopasture operations, liaising with forested land owners or existing farmers and finding an appropriate business match is the most viable option. Using unaltered woodland for cattle grazing is common in the OBAC region, although integrating this method with the production of high-value trees or other crops is less common.

3. Energy Production

What is energy production?

In terms of non-timber forest products, energy production can refer to any extractable unit of energy. Forests have a number of harvestable energies. The Omineca Beetle Action Coalition's *Alternative Energy Strategy* outlines non-timber, forest-based power producing technologies that could be employed in the OBAC region. These include:

- run-of-river (micro hydro) electricity (from forest streams and rivers);
- geothermal energy (under forest lands);
- wind power (energy harvested from ridge tops and open plains);
- solar photovoltaic and solar thermal energy (from atop forest areas); and
- biomass energies.

These technologies can be implemented on a large or small-scale, can be tied into existing or independent grids, and can be self-sufficient or reduce consumption of conventional energy methods.

Benefits of energy production:

Energy production can be used by small and large-scale producers, businesses, and homes. There are a number of benefits associated with non-timber energy production. These include:

- low emissions and pollution [if any];
- the utilization of sustainable renewable resources;
- the potential for long-term cost savings (particularly if fossil fuel prices increase).

How do you become involved in energy production?

Becoming an independent power producer, on or off of the BC Hydro grid lines, requires substantial investment. The required investment varies depending on the size and type of operation. Anastasia Ledwon, a Telkwa resident, has a full scale off the grid system including solar panels, a wind tower, a backup generator, 12 golf cart batteries, and an inverter. The system cost an estimated $30,000, and at the time was less expensive than bringing in hydro grid lines. Graig Pearen, a Prince George area resident, has wind energy capturing capabilities that supplement his BC Hydro use. Alternative energy websites are excellent resources for technology and investment ideas.

3.1 Biomass Energy

What is biomass energy?

Biomass energy refers to the energy available in non-fossil, live or recently living organic material. Biomass energy can be harvested from plants, animals, insects, and waste; and can be developed into a variety of gaseous, liquid, and solid products. Due to the size of the available wood fibre basket, the feasibility of utilising biomass from Mountain Pine Beetle kill salvaged wood and waste fibre sources in the OBAC area has been under investigation. Biomass technologies and product developments have been incorporated in the Ministry of Energy, Mines, and Petroleum Resources *BC Bioenergy Strategy* and the OBAC's *Alternative Energy Strategy*. While there are many potential bioenergy products which could be derived from beetle kill wood and wood waste from increased harvest, some of the more common products and uses include:

- biofuels, including biodiesel;
- cogeneration plants;
- ethanol;
- methanol (conceptual);
- pellets (exported to Europe) and cellulingnin briquettes (popular in Brazil); and
- synthetic natural gas.

Benefits of biomass energy:

The bioenergies market is growing worldwide, so there is tremendous opportunity for biomass development, investment, and expansion. According to BC Hydro, over 6.1 million dry tonnes of wood residue are generated annually in the mainland region of British Columbia. Of this residue, 74% of the total is consumed in pulp mill boilers, cogeneration plants (plants which produce both electricity and heat by controlled burning of wood residue), power plants, and other facilities. By using the additional wood residue, an additional 200 MW of power would be made available.

There can be environmental benefits from biomass use; the most noted being less reliance on petroleum products. While there are benefits to using waste wood, logging results in the loss of other valuable services, including other non-timber forest products, environmental services (such as carbon sequestration), and wildlife habitat. Completely removing all woody debris from an existing cut block can cause further problems.

How do you become involved in biomass energy production?

Biomass energy extraction tends to be large-scale and intensive, and a thorough, professional analysis should be conducted prior to any investment or fibre harvesting. OBAC's *Future Forest and Fibre Use Strategy* and the Bioenergy Conference website contain information on biomass industries and should be consulted for information on opportunities in the OBAC area.

4. Birch Products

What are birch products?

Birch (aka white birch or paper birch) timber and bark can be shaped with warm water to create a variety of goods. Traditional uses for birch include: baskets, cradles, canoes, wrapping and storing food, roofing pit houses, moose calls, toboggans, wood eating utensils and dishes, sap, medicine for colds, buckets, treatment for skin problems of various rashes, skin sores, and burns, and a cure for dysentery. Commercial uses of birch include:

- pulp;
- veneer logs;
- paneling;
- tongue depressors;
- cheese boxes;
- firewood and biomass feedstock; and
- furniture.

Commercial food and medicinal products can also be made from parts of the birch tree. Some listed in the *Buy BCwild: 2007/08 BC Directory of Buyers and Sellers of Non-Timber Forest Products* include:

- birch sap drinks (e.g. birch beer or birch syrup);
- value-added products (e.g. toffee, toppings, marinades, vinegar, and sauce);
- oils from bark for cosmetics, salves, and medicinal preparations;
- disposable wooden cutlery;
- chemicals (e.g. Xylitol) that are used as sweeteners; and
- Birch Catkins that is used for medicinal purposes and as a survival edible.

Benefits of birch products:

Birch is a fast growing hardwood. According to the City of Quesnel, the yearly net economic potential of each tree is estimated to be up to $189. Producers in the Quesnel area sell their syrup products from $13.50 / 250 ml. to $25.00 / 250 ml. Birch requires 80 to 120 litres of sap for every litre of syrup (2 to 3 times more sap than maple) and has specialty niche market status, deriving a reasonable market value for its products.

How do you become involved in the commercial birch industry?

There are many value-added opportunities for new and existing commercial birch products. The Community Futures Development Corporation (CFDC) of the Northern Cariboo sites 55 business owners who use birch in their end product. Their website should be consulted as an industry point of reference.

5. Botanical Products

What are botanical products?

Botanical products are plants or plant extracts used for therapeutic or cosmetic purposes. Harvesting regulations of botanical products, pursuant to the *Forest Act*, fall under the authority of the Lieutenant-Governor-in-Council, the Minister of Forests, or a regional or district manager.

A variety of products can be based on, or have additives of, natural botanical origin. Burton compiled the following chart of botanical ingredients for sale in a Prince George health store. These products, which are available for harvest in the OBAC region, are imported, and therefore suggest a gap between harvesters and retailers.

- bilberries;
- birch leaf;
- blueberry leaf;
- cranesbill;
- coltsfoot leaves;
- elder flower;
- elderberries;
- goldenrod;
- horsetail;
- hawthorn berries;
- juniper berries;
- nettle leaf;
- rosemary;
- raspberry leaf;
- rose hips;
- speedwell;
- strawberry leaves;
- uva-ursi;
- valerian root;
- white willow bark;
- wormwood;
- yarrow;
- alfalfa leaf;
- burdock root;
- dandelion root;
- eyebright;
- mullein;
- plantain leaf;
- red clover; and
- St. John's wort.

Benefits of botanical products:

Botanical products are beneficial because they utilise existing forest resources, generally on small levels. The botanical harvesting and sales sector is characterized by many small or home-based businesses. With the exception of certain products (such as wild rose or chamomile), annual harvest levels tend to be minimal between 1-10 kg.

How do you become involved in the botanical product industry?

There are opportunities to develop this sector into a broad, diverse set of businesses that utilize naturally occurring botanical resources for income and revenue generation. The most commercial botanical product sectors include botanical beauty products and herbal health products. These topics will be explored in further detail in sections 5.1 and 5.2.

5.1 Beauty Products

What are botanical beauty products?

Botanical extracts and wild flowering plants can be used as a basis or additives for beauty and grooming products. As consumer interest in ecologically friendly products and processing increases, more attention has been paid to natural beauty products. Current commercial botanical beauty products produced in BC include:

- salves, sunscreen, and lotions;
- massage oils;
- facial scrubs;
- essential oils for perfume;
- moisturizers;
- lip balms;
- mosquito repellent;
- after bite stick; and
- wild nettle, raspberry, yarrow, rose, and oatmeal soaps.

In a recent report commissioned for the Royal Roads Center for Non-Timber Resources' *A Regional Profile of Commercial Harvesting of Non-Timber Forest Products in the Prince George, British Columbia Area*, common and widely available plants used in botanical beauty product production include: rose leaves and rose petals (*Rosa*), chickweed (*Stellaria media*), and clover (*Trifolium*).

Benefits of botanical beauty products:

Wild botanical plants are an existing forest resource. The natural beauty and grooming industry is growing, and internet sales allow greater access to buyers of naturally sourced products. Harvesting of rarer plant varieties and the use of traditional weed or pest plants means a long-term supply for future use in value-added products.

How do you become involved in the botanical beauty product industry?

The *Buy BCwild: 2007/08 BC Directory of Buyers and Sellers of Non-Timber Forest Products* directory lists existing commercial non-timber beauty products. By researching daily use products and consumer preferences, and by taking advantage of the availability of naturally growing substances in BC, small-scale seasonal harvesting and sales can become a successful venture.

5.2 Herbal Health Products

What are herbal health products?

Herbal health products are derived from natural sources. The herbal health market has expanded as concerns about long-term health and attention to traditional medicines have increased. Naturally based pharmaceuticals and treatments can be alternatives to, or compliments of, western medicines. Herbal health products can be derived from roots, stems, flowers, or plant leaves, and are frequently sold in liquid extracts, capsules, tablets, or teas. Examples of herbal plants with medicinal values are:

- hawthorn flower, leaf, and berry (heart tonic, popular in China);
- arnica (pain reliever, natural herbal health products);
- cottonwood bud (pain relieving, anti-inflammatory, and skin healing properties);
- St. Johns wort (treatment for depression);
- elderberry, horsetail, nettle (tinctures);
- chickweed (emollient, burn and skin soothing);
- devil's club (antifungal, antiviral);
- choke cherry (cough suppressant, heart and worm medication);
- dandelion (digestive aid, liver stimulant, detoxifier);
- birch catkins (tuberculosis remedy, skin soothers, may suppress tumours);
- arrowleaf balsamroot (expectorant, immunosuppressant, topic anaesthetic); and
- yarrow (skin swelling, cuts, fevers, and bleeding wounds).

Benefits of herbal health products:

Herbal health products are readily available non-timber forest resources and many have long histories of use. Aboriginal traditional knowledge, Chinese medicine, and other homeopathic treatments are examples of long standing herbal health knowledge.

A tourist market exists for instruction and guided tours of botanical health products in the OBAC region. Jean Christison, an herbalist from Smithers, gives tours and trips on the gathering, identification, and preparation of herbal medicines.

How do you become involved in the herbal health product industry?

The harvesting of herbal health products requires knowledge not only of the plant to be harvested and its medicinal value, but also of the topographical features of the area and similar looking plants. Those interested are advised to seek well known plants, consult a professional herbalist, or take a course of study before proceeding with any commercial business plans or administration of herbal health botanical products. This assists in the avoidance of poisoning, health risks, or conflict with other medications.

6. Crafts and Wild Flowers

What are crafts and wild flowers?

Crafts and wild flowers are [non-cultivated] products that are either processed into crafts or packaged for retail sale. Commercial craft and wild flower use tends to be small-scale and for aesthetic purposes.

An important aspect of wild craft materials is timber, usually from fallen trees or small shrubs. Some wood-based craft products for sale in the OBAC region identified by Burton include:

- small boxes;
- picture frames;
- tool handles; and
- trinkets.

Wild flowers, which are only seasonably available can be harvested and used for:

- decorative arrangements;
- bouquets for weddings;
- potpourri; and
- seed sales and distribution.

Benefits of crafts and wild flowers:

Craft materials and wild flowers are generally area specific, so the plants and flowers of one region may be of novelty value to another distant place. This can also be true for natural craft and flower products desired by urban areas. Niche market products can be of considerable novelty value. For instance seed paper (dried seeds flattened to create paper) used in product packaging can be dissolved in water after use, and will return to its original seed form.

How do you become involved in the crafts and wild flowers industry?

Successful entrance into the niche-based craft and wild flower market is more reliant on securing a broad and sustainable customer base than finding the common material necessary for production or sale. Due to the ease and availability of many craft materials and wild flowers, those seeking these resources often harvest for themselves. Harvesting is generally unregulated and rarely monitored. Local flower stores, farmers' markets, and tourist shops may be useful links to develop a customer base for harvested craft and wild flower products.

7. Eco-services

What are eco-services?

Eco-services are services that the forests provide without harvesting, cultivation, or extraction. They allow for necessary natural processes and revitalization to occur. Costanza *et al.* highlights examples of eco-services, including:

- gas regulation (in particular a balance between carbon and oxygen);
- climate regulation (temperature and precipitation);
- soil formation and erosion control;
- waste treatment;
- recreation and tourism;
- cultural practises;
- biodiversity (genetic resource for medicine, pesticide, and other remedies); and
- habitat (refuge for local and migratory animals and birds).

Benefits of eco-services:

Eco-services often act as a public good, as they provide a service that can be enjoyed by everyone. Ecological services are difficult to charge for or assign a monetary value to because of this trait. The value placed on these services varies, as does the premium individuals are willing to pay. Some of the direct and indirect benefits from ecological services include:

- improved individual health and potentially less money spent on health care;
- sustainability of consumptive goods for individuals and businesses;
- long-term availability of natural resources (such as water, plants, and animals).

How do you become involved in the eco-services industry?

Since the large-scale implementation of ecological conservation efforts is dependant on a large number of individuals, usually with government or monetary incentive, many ecological services are not suitable for commercialisation. Some services, however, are easy to valuate and could be sold for profit.

Tolls at parks, carbon credits, and payment from urban centers to rural resource holders are some examples of value systems for eco-services. For instance, in 1997, Costa Rica pioneered an approach that paid landowners for the ecological services they produced. Such a system has not been attempted in a Canadian context. Carbon credits however, are already in wide use in the UK. Those more suited to commercialisation in Canada include carbon sequestration and eco-tourism. These will be explored in further detail in sections 7.1 and 7.2.

7.1 Carbon Sequestration

What is carbon sequestration?

Carbon absorption is a natural service provided by forests and intact natural ecosystems (e.g. wetland, bogs, etc.). This absorption is commonly referred to as sequestration, with the object holding the carbon known as a 'carbon sink'. The Organization for Economic Co-operation and Development (OECD) defines carbon sequestration (or carbon sinks) as "a biochemical process by which atmospheric carbon is absorbed by living organisms, including trees, soil micro-organisms, and crops, and involving the storage of carbon in soils, with the potential to reduce atmospheric carbon dioxide levels" (OECD http://stats.oecd.org/glossary/detail.asp?ID=286).

Carbon sequestration is often linked to the mitigation of climate change and the movement to reduce personal and industrial carbon emissions.

Benefits of carbon sequestration:

The need to reduce carbon or 'off-set' emissions has led to the development of a carbon trading system. In North America, there are voluntary cap-and-trade systems: the Chicago Climate Exchange and the [new] Montreal Climate Exchange. These exchanges create a mechanism which facilitates the exchange of environmental protection for monetary value.

Compensation for carbon sequestration services provides a unique opportunity for countries, such as Canada, with vast quantities of natural resources, to benefit fiscally from their conservation efforts. Trees for example, remove carbon dioxide from the atmosphere naturally during their growth and reproductive processes.

How do you become involved in the carbon sequestration market?

The Montreal Climate Exchange (created in partnership with the Chicago Exchange) is relatively new, so the actual potential for land owners to benefits from the exchange is still unknown. Trading and opportunity for monetary gain is available however, for those savvy enough to trade in the derivative-based Montreal climate market.

Since deforestation from logging, agriculture, and development is believed to be responsible for up to 20% of global carbon emissions, economic opportunities for 'green' logging, agroforestry, and conservation could become more widespread. Review of the Kyoto protocol (which sets the standards for carbon trading), as well as contact with industrial conglomerates that may need to purchase off-sets, should be established in order to determine the possibilities for carbon sequestration operations.

7.2 Eco-tourism

What is eco-tourism?

Eco-tourism is based on natural experience, and includes elements of community-based tourism, as well as sustainable travel and activities. According to the *International Ecotourism Society* eco-tourism should include the following of characteristics:

- minimized impact;
- building environmental and cultural awareness;
- providing positive experiences for visitors and hosts;
- direct financial benefits for conservation;
- financial benefits and empowerment for local people; and
- raising sensitivity to the host countries' political, environmental, and social climate.

Benefits of eco-tourism:

Fiscal benefits associated with eco-tourism tend to be allocated to the local community, which can be a part of local economic development or community improvement. According to the *International Ecotourism Society* in 2004, eco-tourism was growing globally at 3 times the rate of the general tourism industry.

How do you become involved in the eco-tourism industry?

Since eco-tourism is a large industry, there are a number of opportunities for new businesses. Some examples of eco-tourism operations include:

- [rain]forest hiking;
- kayaking and canoeing;
- bear, bird, and other wildlife watching;
- ocean and mountain tours;
- mushroom safaris; and
- wilderness lodging.

Eco-tourism is subject to market and resource fluctuations. Existing lodges, hotels, and other accommodation businesses can add an eco-tourist element to their operation by changing to environmentally sensitive practises, or collaborating with guiding, travel, and holiday operations that promote conservation / low impact travel.

8. Traditional Ecological Knowledge

What is traditional ecological knowledge?

Traditional Ecological Knowledge (TEK) is a way of understanding how one relates to and uses physical aspects of the land. TEK is generally associated with First Nations populations in a historical context; however, any society may have TEK. In order to protect and preserve the value of TEK a classification is needed. UNESCO has established the following traits:

- "Locally bound, indigenous to a specific area;
- Non-formal knowledge;
- Orally transmitted, and generally not documented;
- Dynamic and adaptive;
- Holistic in nature; and
- Closely related to survival and subsistence for many people worldwide" (http://www.unesco.org/most/bpindi.htm).

First Nations TEK is generally passed along in a different way than western learning. It is often done in a multidimensional way through hands on learning; lessons through error and stories; and an interweaving of botany, identification, practises, and spirituality.

Benefits of traditional ecological knowledge:

Traditional ecological knowledge is extremely useful and relevant to current resource industries and communities and can be applied in a number of ways. According to Canada's *International Development Research Centre*, traditional knowledge can be beneficial for:

- new biological and ecological insights;
- resource management;
- protected areas and for conservation education;
- development planning; and
- environmental assessment.

How do you access and apply traditional ecological knowledge?

Traditional knowledge is increasingly being used as a tool for development in both top down and grassroots approaches. Environmental scientists, climatologists, and policy developers often utilise First Nation's traditional expertise. The procurement of this knowledge can be of issue, often taken without permission or used in a manner other than originally intended. First Nations' losses can come in the form of lost market opportunity, exploitation, or land degradation.

9. Wild Greenery and Christmas Trees

What are wild greenery and Christmas trees?

Wild greenery and Christmas trees are abundant non-timber forest products available across BC. Wild greenery refers to any non-flowering product used for decorative purposes or commercial sale. Such products are usually wild plants, although some may be specifically grown via agroforestry. In the OBAC region, local florists and wild greenery users tend to import their greenery due to quality and consistency issues from local harvesters. Examples of wild greenery products include:

- salal (used around roses);
- green mosses;
- ferns;
- cattails; and
- tree branches for wreathes, boughs, and garlands.

Christmas trees, or trees used for seasonal festive purposes, can be harvested for personal use by obtaining a Christmas tree permit from the Ministry of Forests and Range's regional managers. Commercial Christmas tree operations are usually harvested from private lands or tree farms, with about 20% harvested from Crown lands. A variety of Christmas trees are farmed in BC including:

- fir (e.g. douglas, grand, noble, and concolor);
- pine (e.g. scotch and white pine); and
- spruce.

Benefits of wild greenery and Christmas trees:

Wild greens are a lucrative crop in BC, with Royal Roads estimates ranging from $27 to $65 million per year from 1995-2004. The Centre for Non-Timber Resources notes that salal alone can generate from $35 to $50 million per year in BC. Christmas trees and greenery are widely available in the Omineca region. Their long harvesting season makes them desirable crops.

How do you become involved in the wild greenery and Christmas trees industry?

The wild greenery market in the OBAC region is underdeveloped, with local buyers purchasing elsewhere due to concerns about the quality and consistency of supply. Since it is an unregulated industry, market entrance involves securing buyers products and providing product consistency. Christmas trees, which are heavily regulated, require access to private land, Crown harvesting licenses, power line right-of-way trees, or the development of a tree farm. Christmas tree farms, however, qualify for agroforestry funding through the *Agroforestry Industry Development Initiative* and can be marketable on a larger scale to non fir-tree producing countries, such as Mexico.

10. Honey and Honey Products

What are honey and honey products?

Honey is a well developed commercial industry. While honey is usually cultivated through actively managed hives and beekeeping, it is a natural forest resource, and thus can be considered a non-timber forest product. Honey production is well suited to both small-scale and large-scale commercial operations. Honey can be consumed alone as a sweetener, in combination with other wild edibles, or as an additive in products. Some commercial honey products include:

- mead (honey wine);
- honey and mead jellies;
- bee pollen and royal jelly (health product use);
- soaps, personal grooming, and cosmetic products;
- bee hive tourism;
- bee venom;
- smoke wood flavourers; and
- pollination services.

Benefits of honey and honey products:

Honey is successfully cultivated across northern BC. According to the Canadian Honey Council hives that are wintered indoors [similar to some Quebec operations] can experience lower mortality rates and greater honey bee survival. The value-added nature of many honey products and services, combined with advances in beekeeping methods and consumer demand for 'healthier' natural foods, contributes to the lucrative aspect of this industry in the OBAC region. Honey and honey products have a long history of successful sales in BC worth an estimated $160 million per year in bee services, and $8 million in product sales.

How do you become involved in the commercial honey and honey products industry?

Due to the well developed nature of the honey and beekeeping industry, as well as the intensiveness of honey production, market entrance can be more capital intensive and regulatory than other non-timber forest products. Wild honey collection (from wild nests) requires the knowledge of an experienced expert. Commercial hives require specialised equipment and queen bees. It would be advisable to contact the Ministry of Agriculture and Lands for registration and regulation information, as well as one or more of the regional beekeeping and honey associations for information on business development, funding, and best practises.

11.1 Wild Fruits and Berries

What are wild fruits and berries?

Wild fruits and berries are an abundant forest resource. The Ministry of Forests and Range estimates that thirty-five species of berry and wild fruit are used in BC. Burton notes seven species that are commercially harvested in the Omineca region. These include:

- wild strawberries;
- saskatoon berries;
- raspberries;
- blueberries;
- huckleberries;
- high-bush cranberries; and
- oregon grape.

Additional wild fruits and berries that are harvested on a smaller scale include: crab-apples, wild rose hips, elderberries, and soap berries.

Benefits of wild fruits and berries:

Wild fruits and berries can be consumed raw (with the exception of elderberries) or processed into baked goods and preserve products, making them a potential year round commercial product. These products include:

- jams and jellies;
- wines and vinegars;
- pies, cakes, and fillers;
- whole frozen fruits;
- syrups and salad dressings; and
- canned or jarred whole fruits.

How do you become involved in the wild fruits and berries industry?

Numerous studies reviewed by the Ministry of Forests and Range have shown that there is potential for economic development within the wild foods market. The challenge for wild fruits and berries proprietors is accessing information regarding product supply and inventory, such as harvesting locations and product marketability. Interested parties should consult local farmers' markets, craft and bakes sales, seller guides and associations, the Ministry of Agriculture and Lands, and the Ministry of Forests and Range for funding opportunities and market profiles before investing time or resources. The Ministry of Health should also be contacted for 'food safe' processing and sales regulations.

11. 2 Wild Vegetables and Seasonings

What are wild vegetables and seasonings?

Wild vegetables and seasonings provide value as edible vegetables, herbal seasonings, flavourings, and culinary stimuli for personal and commercial consumption. Many are considered speciality items due to their rarity. Some commercial wild forest vegetables and herbs include:

- tree tips (jellies);
- cattails (fresh or canned heads, root stems, and flour);
- fiddle heads (fresh, frozen, or canned);
- daisy capers;
- dandelions (fresh as a salad green, dried root, and leaves for herbal use);
- salmonberry (shoots);
- teas (made from a variety of leaves and shrubs, including Labrador Tea), and
- fireweed (cooked, raw in salad, and as an additive in honey).

In addition to commercial sales, a number of wild non-flowering edibles exist in BC and are utilised for personal consumption. These include:

- chickweed (salad green);
- stinging nettle (cooked like spinach);
- mountain potato (bulb);
- rhubarb (stalks only);
- thistle; and
- nodding onion.

Benefits of wild vegetables and seasonings:

Some plants, as noted by the BC Ministry of Forests and Range, can be beneficial additives or substitute products (such as biscuit-root, camas root, and cattail roots, which work as a wheat substitutes). Other products may have specialty 'niche' market status (such as salmonberry shoots that are popular in the Vancouver and Eastern Canadian market). The uniqueness of wild vegetables and seasonings increases their economic value.

How do you become involved in the wild vegetables and seasonings industry?

It is important to thoroughly research plants for harvest, as vast differences in plant edibility and safety can only be distinguished by slight variations in flora appearance. Poisoning is possible. Studying regional books on edible plants species and speciality food distributors is the most effective method to identify and develop marketable products. The Ministry of Health should also be contacted for 'food safe' processing and sales regulations.

11. 3 Wild Mushrooms

What are wild mushrooms?

Wild mushroom harvesting involves trained mushroom pickers who seasonally identify and harvest edible fungi, usually from public or Crown forests. In terms of commercial activities, pine, morel and chanterelles mushrooms have the highest value and are widely harvested. Many of wild mushrooms are exported. For example, morels are popular in France and Italy, and chanterelles are popular in Germany. Pine mushrooms (which are similar to the Japanese matsutake mushroom) are popular in Japan. Other mushrooms identified for commercial harvest in northern BC include:

- brain mushrooms (Gyromitra Esculenta);
- giant western puffballs (Calvatia Booniana)
- boletes (Boletus edulis);
- oyster mushrooms (Pleurotus Ostereatus);
- honey mushrooms (Armillaria Ostoyae);
- slippery jacks (Suillis Tomentosus);
- shaggy manes (Coprinus Comatus); and
- birch boletes (Leccinum spp) (Powell 2005).

Wild mushrooms produce an immediate commercial product, but there are also opportunities for value-added mushroom products. These include:

- wild mushroom spreads and pâtés;
- dressings and marinades;
- soups and [morel] bisques; and
- meat alternative products due to their meaty texture.

Benefits of wild mushrooms:

Wild mushrooms are a lucrative industry. The Center for Non-Timber Resources at Royal Roads University estimates that from 1995 to 2004, wild mushrooms sales ranged between $10 and $42 million per year.

How do you become involved in the wild mushroom industry?

Wild mushroom harvesting requires knowledge of mushroom species in order to avoid poisoning, as well as location sites and sustainable harvesting techniques. Local or seasonal pickers should be consulted. Pine mushrooms, which are generally associated with older pine, douglas-fir, or hemlock, may be difficult to locate due to the Mountain Pine Beetle's attack on older stands. Morels, however, are harvestable in the mid-spring and are often abundant in previous fire sites.

13. Sustainable Landscaping

What is sustainable landscaping?

Sustainable landscaping is the practise of using local plant species for cultured landscapes (such as yard and community spaces) along with less consumptive methods of maintenance, pest elimination, and care. The revitalised practise of using local plants and sustainable techniques stems from environmental concerns about pesticides and fertilisers. These practises consume natural resources and can pollute surrounding ecosystems.

Benefits of sustainable landscaping:

Sustainable landscaping practises have numerous financial, ecological, and aesthetic benefits. These include:

- reduced air, noise, and water pollution;
- less erosion and washout;
- increased biodiversity;
- less maintenance and consumption of natural resources;
- low cost;
- aesthetic appeal; and
- a sense of place affiliated with regional plant species.

The implementation of sustainable landscaping requires a source of live plants, seeds, and technical information. This creates an opportunity for rural areas to market locally harvested plants to urban areas where access to open woodland and biodiversity may be more limited. Some commercial sustainable landscaping products include:

- plants used in restoration projects or nature-scaping;
- green roof and living wall plants;
- ground cover plants, and wild flower seeds; and
- sustainable landscape planning.

How do you become involved in sustainable landscaping practises and industry?

UNBC, the City of Prince George and other partners entered into the *Northern Sustainable Landscaping Initiative.* This is a five year research program that explores landscaping options which can withstand road salt and cold winter temperatures, and does not require extensive watering or pesticides. Reviewing the City of Prince George project reports will be useful for determining which sustainable landscaping plants and techniques are best suited to a northern climate. The collection and addition of local wild or low maintenance plants in a turf test-patch is a simple introduction to sustainable landscaping practises.