KATZIE FIRST NATION COMMUNITY FOREST

FOREST BUSINESS REPORT

Prepared for:
Infinity-Pacific Stewardship Group
Maple Ridge, BC

Prepared by:
Nicola Bakker
February 2009
FRST 497 – 2 credits

EXECUTIVE SUMMARY

This business report examines the financial aspects and management alternatives for the Katzie Community Forest (KCF) during a 5-year startup period. A spreadsheet model (Coastal Forest Products Model) was developed and used to calculate the predicted financial outcomes of the KCF. It encompasses timber harvesting, non-timber forest products (NTFPs), and ecosystem services. This report discusses the KCF financial report and explains the model used to help develop the report.

The Katzie First Nation is located in the Lower Mainland with traditional territory extending from Northern Pitt Lake to White Rock and Richmond (Katzie 2002). A community forest agreement has been proposed on the Blue Mountain Area near Maple Ridge, BC. This will be the Katzie Community Forest. This will be managed for the following five values:
1. timber harvesting
2. education
3. First Nation garden
4. recreation
5. non-timber forest products (Friesen 2008).

The Katzie Community Forest will also be managed to provide opportunities to the Katzie people and foster development in the community.

A copy of the model is included with this report. The model calculates the production, revenues, and management costs of timber, mushrooms, berries, syrup, floral greens, recreation, and ecosystem services. The Katzie Community Forest's primary focus will be the management of timber, recreational trails, and day-use areas. Other products, whose harvest are included in the analysis, are chanterelle mushrooms, raspberries and huckleberries, bigleaf maple syrup, and salal boughs.

The net revenues after taxes for the first five years of KCF operation are shown in Table 1. The sum of these five years is $145,073.18. The first year is a net loss because of large infrastructure development and start up costs. This loss will likely be spread out over a greater period of time. Net revenues increase over time due to increasing timber prices and increasing non-timber forest product harvests. The following report includes detail of the forest products included in the model, calculations done, and results for the Katzie Community Forest.

Table 1. 5 year net revenue after taxes for the Katzie Community Forest

	Year 1	Year 2	Year 3	Year 4	Year 5
Net Revenue	-$51,580.93	$27,730.33	$35,337.03	$52,792.36	$80,794.38

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

Abbreviations	Description
AAC	annual allowable cut
BCTS	British Columbia Timber Sales
KCF	Katzie Community Forest
FRPA	Forest and Range Practices Act
NTFP	Non-Timber Forest Product
TIPSY	Table Interpolation Program for Stand Yields
Amabilis fir	*Abies amabilis*
Bigleaf maple	*Acer macrophyllum*
Black morels	*Morchella elata*
Blueberries	*Vaccinium* spp.
Devil's club	*Oplopanax horridus*
Douglas-fir	*Pseudotsuga menziesii*
Excel	Microsoft Excel 2003
Golden chanterelles	*Cantharellus formosus*
Mountain hemlock	*Tsuga mertensiana*
Oyster mushrooms	*Pleurotus* spp.
Pine mushrooms	*Tricholoma magnivelare*
Raspberries	*Rubus* spp.
Salal	*Gaultheria shallon*
Shiitake mushrooms	*Lentinus edodes*
Sword fern	*Polystichum munitum*
Western hemlock	*Tsuga heterophylla*
Western redcedar	*Thuja plicata*
Western yew	*Taxus brevifolia*

I. INTRODUCTION

1.1 BACKGROUND

The Katzie First Nation is comprised of approximately 460 members who live on the Reservations and throughout the Lower Mainland. There are five reservation areas located in Pitt Meadows, Langley, Barnston Island, Coquitlam, and Maple Ridge. Their traditional territory extends from the Northern edge of Pitt Lake Watershed to White Rock and Richmond (Figure 1). (Katzie 2002)

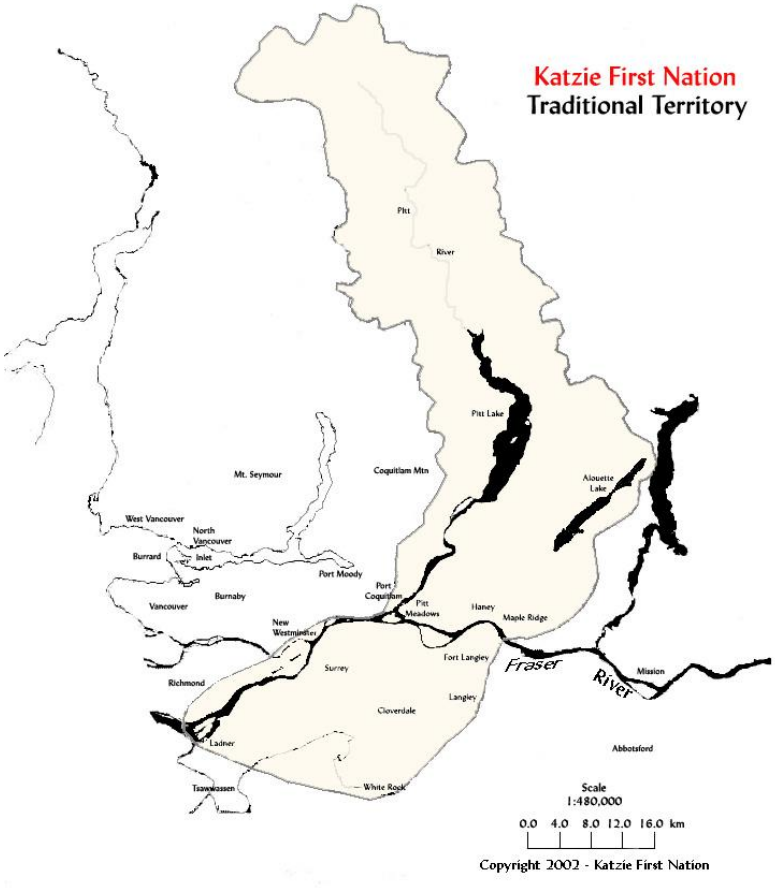

Figure 1: Katzie First Nation Traditional Territory (Katzie 2002)

The community forest will be managed for the following five values:
1. Harvesting
2. Education
3. First Nation Garden
4. Recreation
5. NTFPs (Friesen 2008)

This business report incorporates all five values into the management of the forest. Figure 2 is a map of the proposed community forest area.

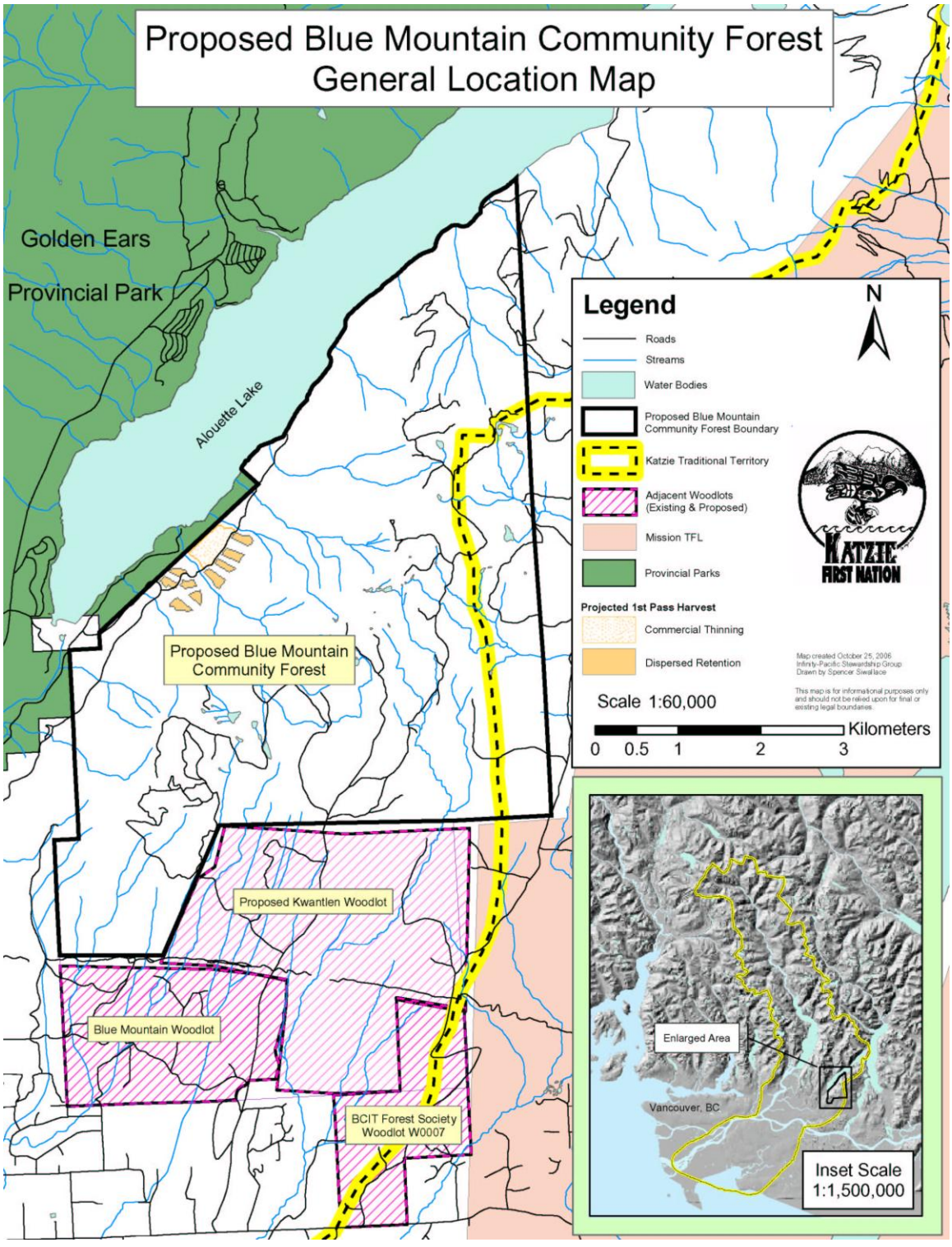

Figure 2: Proposed Blue Mountain Community Forest Area (Infinity-Pacific 2006)

A strong connection to the land is an integral part of Katzie culture. The Katzie desire a community forest to help renew their connection with the land since separation due to colonization occurred. A community forest will allow them to manage both traditional

resources (medicinal plants) and commercial resources (timber). It will also allow the Katzie to establish a presence on the land. The community forest will have cultural, economic, and educational benefits to the Katzie First Nation. This involvement in the land and resources will help the Katzie in their treaty negotiations. (Friesen 2008)

1.2 COASTAL FOREST PRODUCTS MODEL

Excel was used to develop a basic model to estimate forest revenues for a five-year start up period. The model was designed for a coastal or transitional forest in British Columbia. Eight resources have been included in the model:

1. timber
2. mushrooms: chanterelles, morels, pine mushrooms, and domestic
3. berries: raspberries, huckleberries, salal berries
4. syrup: bigleaf maple
5. floral greens: salal, sword fern, western redcedar
6. recreation: campground, trails, day-use areas
7. medicinals: pacific yew, western redcedar, devil's club
8. ecosystem services: carbon credits, biodiversity credits

1.2.1 Inputs

In the model, the user can input the management goals for each resource. Timber is managed by AAC volume. Silvicultural practices can be incorporated as a percent of harvested area. Non-timber forest products are managed by area. Recreation includes a campground, trails, and day-use areas. The campground and day use areas are managed by number of sites. Trails are managed by kilometer. Other inputs include wages, forest area, stand density, stumpage (optional), and log prices (optional).

There is variability between contracts for ecosystem services. Carbon credits are sold in tonnes of Carbon Dioxide equivalents. These can be calculated using carbon-modeling programs. Biodiversity credits are generally managed in hectares of preserved habitat.

Table 2 on the following two pages shows the input values for the Katzie Community Forest. All calculations and results in this report have been found from these inputs.

Table 2: Katzie Community Forest inputs (page 1 of 2)

Wages	Recreation Services employees	$20.00/hr	
	NTFP harvesters and processors	$15.00/hr	
	Fellers	$85.00/hr	
Non-timber forest products	Recreation: Campground	Number of Sites	0
		Days Open	0
	Recreation: Day-use	Trails to build	5 km
		Trails to Deactivate	20 km
		Existing Trails	50 km
		Recreation sites	10
	Mushrooms	Chanterelles	2 ha
		Morels	0 ha
		Pine	0 ha
		Domestic	0 ha
	Berries	Rubus spp	2 ha
		Vaccinium spp	0 ha
		Gaultheria spp	0 ha
	Bigleaf Maple Syrup	Bigleaf Maples	1 ha
	Floral Greens	Salal	1 ha
		Western Redcedar	0 ha
		Sword Fern	0 ha
	Medicinal	Western Redcedar	0 ha
		Pacific Yew	0 ha
		Devil's Club	0 ha
	Market		Unknown

Table 2: Katzie Community Forest inputs (page 2 of 2)

Timber	Annual Allowable Cut	13890 m^3		
	Average volume/ha	700 m^3/ha		
	Tax rate	20%		
	Harvesting		Proportion	Cost
		Ground Harvesting	100%	\$25 /m^3
		Cable Harvesting	0%	\$38 /m^3
		Heli Harvesting	0%	\$55 /m^3
	Silviculture		Proportion	Cost
		Planting	100%	\$1300 /ha
		Thinning	0%	\$3300 /ha
		Fertilizing	0%	\$1200 /ha
		Brushing	25%	\$2500 /ha
	Log prices	Year 1	\$76.00/m^3	
		Year 2	\$77.00/m^3	
		Year 3	\$78.00/m^3	
		Year 4	\$80.00/m^3	
		Year 5	\$83.00/m^3	
	Stumpage	Rate	\$16.00/m^3	
Ecosystem Services	Carbon	sequestered annually	0 tCO2e	
	Biodiversity	habitat protected	0 ha	
		contract length	0 yrs	

1.2.2 Calculations

In the model, there are three major calculations done for each resource: production, cost, and revenue. Timber production is the AAC. Costs are not included in ecosystem services.

Production of non-timber forest products was found per unit area for each species from peer-reviewed literature, government publications, and other sources. These unit values are combined with the management objectives (inputs) to calculate a potential production (amount of product grown). This potential production was then modified for each year to give predicted production, or harvest. Harvest of NTFPs is modeled to increase over time. This reflects an increase in infrastructure and processing capacity over time. Most products are at 100% capacity after a five-year development period. It should also be noted that there is extremely variable production with most NTFPs, such as mushrooms and berries (Ehlers 2007, Gamiet et al. 1998, Heiligmann 2002, Lesosky 2008). Conservative averages were chosen in these cases.

Costs are calculated based on the amount of product harvested. Fixed costs, such as maintenance equipment, are also included. The unit values of the costs were obtained from peer-reviewed literature and sales firms (Gamiet et al. 1998, Gamiet et al. unknown, Huyler 2000, Lynch and McLain 2003, Stech 2008, National Park Service 2004, Mycosource 2006). The predicted production numbers are used to find production costs. Most costs have been grouped into four categories: setting up, harvesting, processing, and equipment. Setting up includes the development of infrastructure such as trails, mushroom logs, or shelters. Harvesting includes the labour to collect the product or fees. Processing includes the labour for processing the product or maintaining recreation areas. Equipment includes the cost of tools required for setup, harvest, and processing. It should be noted that there is variability with costs.

Revenue is calculated based on harvest. The user may select either of three different markets for products: retail, wholesale, or unknown. Retail has higher selling prices; wholesale has lower selling prices. An average selling price is selected if the market is not known. Selling prices were obtained from peer-reviewed literature, sales firms, and interviews (Ihalainen et al. 2003, Lesosky 2008, Tedder and Mitchell 2003). The cost of a salesperson or and transport to a market has not been included if retail is selected. It should also be noted that prices are extremely variable for products such as wild mushrooms (Lesosky 2008). Conservative averages were taken in these cases.

1.2.3 Outputs

The output is net revenue for a five-year period. This includes all calculated costs and revenues. Taxes may be applied at a rate selected by the user. All outputs from the KCF can be found in Section IV: Financial Analysis.

1.3 PURPOSE

The purpose of this business report is to examine the costs and revenues of forest product production, especially NTFPs, over 5 years in the KCF. The input values were attained from current management objectives from Infinity-Pacific. The costs of logging were estimated based on current rates and average terrain conditions. The values of non-timber forest products will be analyzed using the model described above. The net revenue including all forest products will be calculated over time.

In addition to the financial report, the purpose of this report is to describe the Coastal Forest Products Model developed to aid financial analysis. Other applications and improvements of this model will be suggested.

1.3.1 Product Description

The community forest will be providing timber and non-timber forest products to the community, including mushrooms, berries, floral greens, and recreation. Using this model, the KCF is responsible for all costs and directly receives all revenues from NTFPs. A possible alternative would be to issue permits for public harvesting of NTFPs. This alternative is not studied in this report.

The following products will be managed for in the KCF:

- **Timber:** saw logs, peeler logs, house logs, poles, and pulp wood
- **Recreation:** multi-use trails and day-use areas
- **Mushrooms:** chanterelles
- **Berries**: huckleberries (*Vaccinium* spp) and raspberries (*Rubus* spp)
- **Floral greens:** salal

These products will be made available to local retail or wholesale markets. They may be sold as either value-added (dried, frozen, jams, etc) or fresh products.

1.3.2 Company Goals

The KCF will recover initial investments and capital costs to become a profitable business. This profit will be returned to the community to help increase the opportunities available to the Katzie people. The KCF strives to enhance the services provided by the community forest to the people, including timber, recreation, non-timber forest products, education and employment. Employing First Nations members will increase involvement, environmental responsibility, education, and provide income opportunities to the community. The KCF will strive to foster cultural opportunities, knowledge and development for the Katzie First Nation.

The KCF has a vision to foster community development while sustainably managing forest land for timber, NTFPs and cultural values. The KCF values a forest legacy through which the community may learn about forests and the environment. Education and culture will be fostered through the management of a First Nations Garden.

Sustainable management of timber and non-timber forest products is highly valued. Recreation is a key value in the community forest and will be managed to benefit the Katzie people and the surrounding communities.

1.4 INDUSTRY OVERVIEW

1.4.1 General Industry Description

Due to the large array of products available from the community forest, the KCF will be involved in many different industries, including wood products, wild food, floral greens, and recreation. This diversity will give the KCF stability in potentially adverse and unstable market conditions. The wood products industry is currently weak; mill closures can be seen around the province. There are increasing public pressures to manage the land for resources other than timber. The wild food industry, similar to the organic food industry, is growing. In the Vancouver region, this growth is especially noticeable, as people are becoming more concerned about where their food comes from. The floral greens industry is significant on Vancouver Island and along the coast of British Columbia. The KCF has the natural resources available to be part of this industry. Currently, there is almost no wild medicinal plant industry in British Columbia. Medicinal plants would be managed for the benefit of the traditional knowledge and practices of the Katzie First Nation. As the population of Vancouver grows, so does the potential ecotourism and recreation opportunities in the surrounding area. The community forest is located within a one-hour drive of the city of Vancouver, making it accessible to a very large market.

1.4.2 General Market Description

The community forest is fortunate to be geographically located close to the Greater Vancouver Regional District (GVRD), a large population and market center. There is a large population, over 2.2 million people in the GVRD, which could provide a large market for all of the non-timber forest products the KCF will have to offer. Farmers markets, florists, and local distributors are some major potential customers.

In addition to the local markets, there are large overseas markets. There are some overseas sales of mushrooms to Japan. A problem with these fresh exports is that they frequently spoil or become infested by the time they reach Japan, so they do not receive a high price (Gamiet et al unknown). Salal is frequently exported to Asia and Europe (Draffan 2006).

The timber resources will be available to several markets. The community forest should focus on local markets such as local sawmills, log home builders and craftsmen. An option is developing a sawmill run by the Katzie First Nation.

1.4.3 Competition

The current competition supplies fresh produce to local markets and processed products to overseas markets. In the local markets, the competition includes other harvesters and

buyers in the area. There are a large number of these from the Pemberton area and Vancouver Island. Global competition with these products exists from other countries in both Europe and Asia. Quality is a limiting factor for exports, especially mushrooms.

Timber experiences global competition from countries such as the Philippines, China and Brazil. However, the largest current problem in the timber market is a significantly reduced demand from Canada's largest buyer, the United States.

1.5 FUNDING

Initial funding for the KCF will come from three sources: British Columbia Timber Sales (BCTS), the Forest and Range Agreement (FRA), and First Nations Forestry Program (FNFP) grants. BCTS will fund some of the initial costs of the KCF. In return, BCTS will use the KCF as a model forest to help establish timber pricing. The KCF will repay the initial funding as it becomes a successful business.

An additional possible source is through Aboriginal Small Business Initiatives. If the KCF has a certain proportion of First Nations members involved in the business, it is eligible for funding from sources such as the First Citizens Fund or Aboriginal Business Canada.

II. OPERATING PLAN

2.1 NON-TIMBER FOREST PRODUCT (NTFP) ACCESS REGULATION

To manage NTFPs on the land, the KCF will need to regulate public access to the NTFPs. Several different methods of NTFP regulation have been studied. The best method would be permitting, used in combination with harvest prohibitions and physical barriers (Lynch and McLain 2003). Access regulation is a large problem on the KCF because of large public pressures. People from nearby urban centers can be destructive to infrastructure, damage sensitive areas, and leave refuse on the forest land.

2.1.1 Permits

Public permits will be the preferred method of regulation. They will be used in combination with harvest prohibitions and physical barriers. Permits give non-exclusive access to a limited number of harvesters (Lynch and McLain 2003). Permits best suit the community forest because they may allow for revenue generation while allowing the public access to the resources for personal use.

2.1.2 Harvest Prohibitions

Harvest prohibitions restrict harvesting of a resource. Harvesting may be restricted in a sensitive or historically over-exploited area. Harvest prohibitions may also restrict commercial harvesting while allowing recreational harvesting. Certain areas may be restricted from public access and reserved for Katzie people. Harvest prohibitions can be used with other systems of regulations (leases and permits) to protect certain areas.

2.1.3 Physical Barriers

Physical barriers may be used to aid harvest regulation (permits) and harvest prohibitions. Examples of physical barriers include locked gates, road closures and ditching. Barriers can also be used to monitor and control access to parts of the forest. This can allow people to access forest resources at a price. Physical barriers can help control hours of access, number of people, and user-groups on the land. Some problems with physical barriers include vandalism, cost, ineffective control, and difficult access when access is required (emergencies etc). (Lynch and McLain 2003)

2.2 ANTICIPATED PRODUCTION SCHEDULE

In the first three to four years, the KCF will only produce and manage for timber. This will allow infrastructure to be built and agreements to be made with existing user-groups. When agreements have been made and the required infrastructure is available, NTFPs will be harvested. This harvesting and management will increase over time as more experience is gained and the KCF develops contacts in the market. Ultimately, the KCF will harvest timber, NTFPs and issue permits to the public for NTFP harvesting and recreation.

The model does not allow for this long delay before producing NTFPs because it is a short-term model (5-years). When the model was used, it was assumed that a small number of NTFPs would be harvested in the first year and will increase in time. Only years when NTFPs were modeled.

2.2.1 Required Construction

Several facilities must be constructed at the KCF before full operations can occur. These will be primarily for recreation. Some existing trails will require deactivation, while others will require maintenance. A few trails may be constructed. Signs will be installed along the trails and at access points from roads. Day-use sites will be constructed along trails and at trail access points. Processing facilities for NTFPs will also require construction. These include drying racks for mushrooms, a "sugar-shack" for reducing syrup, and possibly areas for processing berries into jams or juices. An office space will be required for completing the administrative duties of the community forest. Construction is modeled to occur in the first year of operation. Although this will more likely span a greater period of time, the costs will be similar.

2.2.2 Product Development

Figure 3 shows how NTFP production was modeled to increase over the first 5 years in the Coastal Forest Products model. This growth reflects the increased capacity and infrastructure of the community forest. It also includes an increase in demand as the products become more widely known and connections with buyers are established.

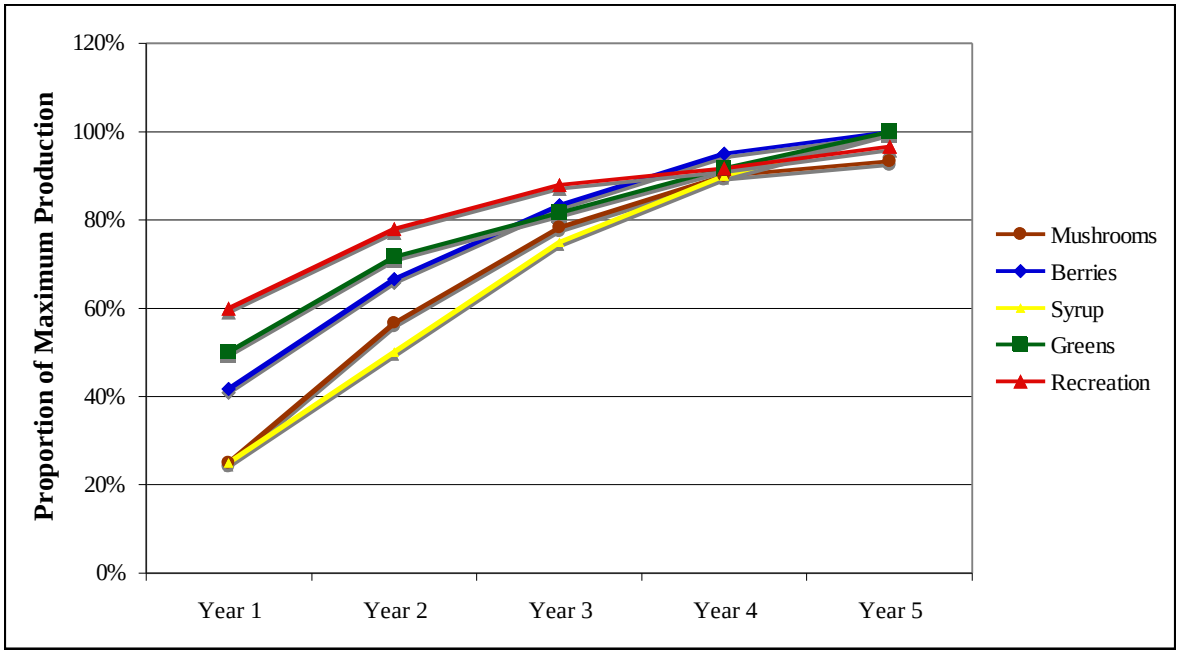

Figure 3: Proportion of maximum production over time

Table 3 shows the estimated production of forest products over time. This includes the production increase as described above. These are the numbers used to calculate costs and revenues of each product.

Table 3: Resource production over time

	Year 1	Year 2	Year 3	Year 4	Year 5
Timber (m3)	13890	13890	13890	13890	13890
Mushrooms (kg)	5	7	8.5	9	10
Berries (kg)	5	7.5	9	10	10
Syrup (L)	6.5	13	19.5	23.4	26
Floral Greens (bunches)	50	70	80	90	100
Recreation (user-days)	715	1136	1458	1644	1772

III. PRODUCTS

3.1 TIMBER

Timber harvest volumes for the KCF were taken from the Forest and Range Agreement and Community Forest Agreement. Species harvested include douglas-fir, western redcedar, western hemlock, amabilis fir, yellow cedar, grand fir, white pine, and mountain hemlock. The timber products produced will include saw logs, peeler logs, house logs, poles, and pulp wood. Table 4 summarizes the timber production, costs and revenues over a 5-year period.

Table 4: Timber production, costs, and revenues for 5 years

	Production (m3)	Revenue ($)	Cost ($)	Net Revenue ($)
Year 1	13890	1,055,640.00	-1,024,387.50	31,252.50
Year 2	13890	1,069,530.00	-1,032,284.96	37,245.04
Year 3	13890	1,083,420.00	-1,040,224.08	43,195.92
Year 4	13890	1,111,200.00	-1,048,205.30	62,994.70
Year 5	13890	1,152,870.00	-1,056,229.02	96,640.98
			5-year sum:	$271,329.14

3.1.1 Costs

The costs included in this analysis were road building, harvesting, stumpage and silviculture. Harvesting costs were divided into ground-based, cable system and helicopter logging because of the large cost difference between methods. These costs were increased 1% annually to represent inflation. Road building costs were only applied to the volume that was harvested conventionally and by cable systems (not helicopter). Stumpage values were obtained for March 2008 and averaged for amabilis fir, hemlock and douglas-fir (Stetch 2008). Silviculture costs were found using TIPSY and from personal interviews. Silviculture costs included in the model are reforesting, fertilizing, thinning and brushing. The KCF will plant 100% of the harvested area and brush 25% of the planted area. It should be noted that the costs of employing a forester or management team has not been included in this analysis. Table 2 lists the combined costs per year.

3.1.2 Employment

There will be employment generated from timber harvesting. Direct employment includes a professional forester, layout and cruising crews, road building contractors, logging contractors, reforestation contractors and surveyors.

3.1.3 Revenue

Timber revenues were generated based on the amount harvested and the log price. Log prices were found from the Ministry of Forests Revenue Branch, but may be modified by the user to keep the spreadsheet current and relevant to the market situation

3.2 MUSHROOMS

The CKF will manage for one wild mushroom species. The wild mushroom species will be chanterelles. Other species included in the model are pine mushrooms and morels. The model also includes the option of domestic mushrooms. The domestic mushroom species could be shiitake, oyster mushrooms or other domestic mushrooms species for which spawn is available. If domestic mushrooms are included in the management, additional costs of setting up and inoculating the mushroom logs will automatically be included in the model. Table 5 shows a summary of the production, costs and revenues over the modeled 5-year period.

Table 5: Mushroom production, costs, and revenues for 5 years

	Production (kg)	Revenue ($)	Cost ($)	Net Revenue ($)
Year 1	5	142.50	-161.25	-18.75
Year 2	7	199.50	-225.75	-26.25
Year 3	8.5	242.25	-274.13	-31.88
Year 4	9	256.50	-290.25	-33.75
Year 5	10	285.00	-322.50	-37.50
			5-year sum:	-148.13

3.2.1 Costs

In the model there are three phases of mushroom management during which costs are incurred: setting up, harvesting, and processing. There will be no set up costs for wild mushroom management. The KCF will only incur costs from harvesting and processing chanterelles. Harvesting and processing will cost $15/hour, so total costs will depend on the amount harvested.

In the model, the setup costs for domestic mushrooms include log preparation (felling, positioning and drilling) and spawn purchase. Felling will cost $85/hour and the remaining labour will be $15/hour. Spawn will cost $510 for 10,000 plugs, purchased from an online wholesaler (Mycosource 2006). The predicted total costs for managing and harvesting mushrooms are shown in Table 3.

3.2.2 Employment

Employment from mushrooms will be primarily seasonal. Harvesting and processing will only occur while mushrooms are being produced (late summer and autumn). Additional employees may be needed to sell processed or fresh mushrooms to local markets and retailers.

Pickers and processors will be paid $15/hour. This is a reasonable rate that guarantees a steady income level for harvesters. Bonuses may be paid to harvesters on particularly productive days.

3.2.3 Revenue

Revenue from mushrooms will occur annually during the harvesting season. The predictions made in this report may vary from actual harvest levels and revenue due to annual variability in production and price. Conservative numbers have been chosen for both production and prices. The price received per kilogram of mushrooms will vary by market and year. The predicted total revenue from mushrooms is shown in Table 3. Average values from many sources ranging from retailers to scientific papers were used.

3.3 BERRIES

The model includes several different species of berries in the genus' *Vaccinium* (huckleberries) and *Rubus* (raspberries), as well as salal berries (*Gaultheria shallon).* The KCF will manage for huckleberries and raspberries. Table 6 shows a summary of the production, costs and revenues for berries on the KCF for a 5-year period.

Table 6: Berry production, costs, and revenues for 5 years

	Production (kg)	Revenue ($)	Cost ($)	Net Revenue ($)
Year 1	5	32.50	-33.75	-1.25
Year 2	7.5	48.75	-50.63	-1.88
Year 3	9	58.50	-60.75	-2.25
Year 4	10	65.00	-67.50	-2.50
Year 5	10	65.00	-67.50	-2.50
			5-year sum:	-$10.38

3.3.1 Costs

In the model, harvesting and processing costs will be the only costs included in berry management. The KCF will both harvest and process berries. Both of these activities will pay employees $15/hour. The amount of time spent harvesting and processing berries will depend on the quantity harvested, which varies by species, year, and capacity. Table 4 shows the predicted annual berry management costs.

Although not included in this analysis, additional costs could be incurred in the future if more processing facilities are added. These processing facilities may be for the production of jams, juices or alcoholic beverages. This would be a good value-added alternative if there were large quantities of berries harvested.

3.3.2 Employment

Employment from berries will be seasonal (summer and early autumn). Harvesting and processing will only occur while berries are being produced. Employees may be needed

to sell processed or fresh berries to local markets and retailers; a cost not included in the model.

3.3.3 Revenue

The selling price selected for the KCF was for an unknown market: $6.50/kg. This is an average of wholesale ($5.00/kg) and retail ($8.00/kg) prices. An increased harvest was predicted over time to account for increased infrastructure, harvesting and processing capacity. Selling value-added products with simple marketing could greatly increase revenues.

3.4 BIGLEAF MAPLE SYRUP

Bigleaf maple syrup is a product that is growing in popularity on the West Coast. It is similar to sugar maple syrup, but requires more boiling and reduction to reach the same sweetness levels. Bigleaf maple sap must be boiled to about 1/50th of its original volume to become syrup (Heiligmann 2002). KCF will manage for a small area of bigleaf maples for syrup production. A summary of the syrup production, costs and revenues can be found in table 7.

Table 7: Maple syrup production, costs and revenues for 5 years

	Production (L)	Revenue ($)	Cost ($)	Net Revenue ($)
Year 1	6.5	585.00	-5,380.10	-4,795.10
Year 2	13	1,170.00	-255.00	915.00
Year 3	19.5	1,755.00	-382.50	1,372.50
Year 4	23.4	2,106.00	-459.00	1,647.00
Year 5	26	2,340.00	-510.00	1,830.00
			5-year sum	$969.40

3.4.1 Costs

Setting up taps, harvesting, and processing bigleaf maple sap will incur costs. Most equipment costs will occur in the first year. Maintenance, cleaning and repair costs will occur in successive years. Taps and sap collection bags will be installed, monitored and collected. Finally the sap will be filtered, boiled down and bottled. To reduce energy costs in the boiling process, waste wood will be used from timber harvesting. Labour in all phases will be $15/hour. There is the possibility to increase the labour wages if specialized labour is needed. Another cost will be $5,000 for the construction of a small shelter ("sugar-shack") with facilities to boil down sap into syrup.

3.4.2 Employment

Bigleaf maple syrup will require a significant amount of seasonal labour (late winter/early spring). Fortunately, the jobs that will be created by bigleaf maple syrup equipment setup, harvest and process will not overlap with other seasonal jobs such as mushroom and berry harvesting. Employees will need to set up and monitor taps, and

empty sap collection bags. Several hours of supervision will be required for the boiling down of sap into syrup. The sales of bigleaf maple syrup could be combined with other products such as mushrooms and berries.

3.4.3 Revenues

Bigleaf maple syrup is becoming a valuable specialized product in southern BC. An average price for this product is $60/litre (BC Agroforestry 2005). Small quantities should be bottled for sale in retail markets.

3.5 FLORAL GREENS

The model includes species commonly used as floral greenery: salal, western redcedar boughs, and sword fern. The KCF will initially manage for 1ha of salal floristry greens production. A summary of the production, costs and revenues of this are summarized in table 8.

Table 8: Floral green production, costs, and revenue for 5 years

	Production (bunches)	Revenue ($)	Cost ($)	Net Revenue ($)
Year 1	50	175.00	-725.00	-550.00
Year 2	70	245.00	-1,015.00	-770.00
Year 3	80	280.00	-1,160.00	-880.00
Year 4	90	315.00	-1,305.00	-990.00
Year 5	100	350.00	-1,450.00	-1,100.00
			5-year sum:	-$4,290.00

3.5.1 Costs

The model includes three costs for floral greens: harvesting, processing, and equipment. The primary cost for floral green management will be labour ($15/hr) for harvesting. The equipment cost will be small to cover some harvesting tools such as cutting instruments and boxes.

3.5.2 Employment

The harvesting of floral greens will generate seasonal employment. Pickers will complete the harvesting. The same employees can accomplish processing and packaging. A salesman or driver may be required, but was not included in the costs, to transport the floral greens to nearby urban centers for sale.

3.5.3 Revenues

Seasonal demand for floral greens, such as western redcedar boughs, can create a price of $20/bunch, depending on the size and quality of the bunch (Bloomsbythebox 2007). This price assumes good quality boughs in a 0.5 kg bunch. There will be seasonal variability

of prices and price fluctuations based on supply and demand (Draffan 2006). In the analysis, average prices were used to calculate the revenue from floral greens.

3.6 RECREATION

Recreation services included in the model are a campground, trails, and day-use areas. These products have the potential to generate long-term revenue and increase community involvement. The KCF will focus on trails and day-use areas to enhance the trails. There are many existing trails on the forest area that are used by walkers, mountain-bikers, and horseback riders. Regulation of user-groups and the division of trails must be established before the KCF can effectively manage this resource. Some trails will require deactivation, others require maintenance, and some need to be built. Signs will be installed along the trails. Basic day-use areas with facilities such as a picnic table and garbage can will be installed along the trails. Day use areas will also be set up at key access points, such as parking lots, that include an outhouse in addition to the basic facilities. The KCF will not have a campground. Table 9 shows a summary of the estimated use, costs, and production for recreation services on the KCF.

Table 9: Recreation use, costs, and revenues for 5 years

	User-days	Revenue ($)	Cost ($)	Net Revenue ($)
Year 1	714.5	7,145.00	-84,613.33	-77,468.33
Year 2	1136.1	11,361.00	-14,060.00	-2,699.00
Year 3	1457.7	14,577.00	-14,060.00	517.00
Year 4	1643.5	16,435.00	-14,060.00	2,375.00
Year 5	1772.2	17,722.00	-14,060.00	3,662.00
				-$73,613.33

3.6.1 Costs

An extensive cost analysis for constructing a campground is included in the model. This includes land-clearing costs, facilities and installation, staffing and equipment costs. Staffing and maintenance costs are incurred annually, but facility construction and land clearing costs are only incurred in the first year. These are not included for the KCF.

There are approximately 50km of existing trails on the KCF that require maintenance. Approximately 20 km of trail will be deactivated and 5 km of trail will be built. This was modeled to occur in the first year. Maintenance costs will be incurred along all existing and constructed trails. In addition the cost of replacing one sign per year was included in maintenance. The main cost for trail construction, maintenance and deactivation will be labour.

Day-use areas have construction costs that include labour and equipment. Equipment includes an outhouse and picnic table at each site. Maintenance and cleanup will occur once a week. An additional cost of one sign per year is included. Cost may vary from the estimates. An outhouse in included for all sites, which may be unnecessary. Also,

there will be additional transport and labour costs for day-use sites that are not readily accessible by road.

3.6.2 Employment

There will be seasonal and part-time employment generated by recreation. Seasonal employment will be required for collecting user-fees and maintaining the day-use areas. Part-time employment will be generated from constructing day-use sites and trails.

3.6.3 Revenues

Revenue will be generated from the campground, trails and day-use areas. A user-fee of $10/day/person will be implemented on trails and day-use areas. As the recreation facilities become better developed and well known, use will increase. Also, revenue will increase as more people become accustomed to paying for recreation facilities. An alternative system may include annual passes for frequent users.

3.7 MEDICINAL PLANTS

Three important medicinal plants that are included in the model are western redcedar (essential oil), pacific yew (taxol), and devil's club (an astringent). There are a large variety of species in the community forest that were traditionally used by First Nations as medicines. The KCF will not manage medicinal plants commercially. Some Katzie people may harvest for there own use, but there was no economic analysis done on medicinal plants for the KCF.

The model includes costs for harvesting, processing and some basic equipment. Harvesting these resources may create limited seasonal employment. Revenue is also marginal because the markets are underdeveloped.

3.8 ECOSYSTEM SERVICES

Ecosystem services include carbon credits and biodiversity preservation credits. The model allows for the management of both. Carbon credits are measured in tons of carbon dioxide equivalent (tCO_2e). Total ecosystem carbon sequestration can be calculated using the CFS-CBM3 carbon budget model of the Canadian Forest Service or other available models. Carbon credits will not be managed for in the KCF. Biodiversity preservation is measured in hectares of habitat preserved. Although the KCF has some unique habitat, it will not be managed for biodiversity credits. Ecosystem services were not included in the economic analysis of the KCF.

3.8.1 Costs

Carbon credits and biodiversity preservation credits may have legal fees and other costs incurred by creating a legal agreement. The model includes a rough cost estimate of $2500 per year for carbon credits. A one-time cost of $2500 is included in the first year of the model for negotiating a biodiversity credit contract in the model.

3.8.2 Employment

Ecosystem services will generate very little employment. There may be a part-time administrative position to organize the agreements.

3.8.3 Revenue

In the model, ecosystem services can generate substantial revenue. Carbon credits currently sell for $2.10 per CO2e on the Chicago Climate Exchange (CCE 2009). The model uses equal payments for carbon credits each year at the negotiated price. Biodiversity preservation credits vary greatly in price and contract length. The model includes an equal annual payment.

IV. FINANCIAL SUMMARY

4.1 NET PRESENT VALUE

Table 10 shows the net present value and the net revenue for the first 5 years of operation, discounted at 7%. These values include net revenue after taxes from non-traditional forest products and timber products. This demonstrates that despite significant startup costs, KCF can be a financially viable business in a short period.

Table 10: Net revenue after tax and NPV for 5 years

	Year 1	Year 2	Year 3	Year 4	Year 5	NPV
Net Revenue	-$51,580.93	$27,730.33	$35,337.03	$52,792.36	$80,794.38	$102,740.13

4.2 CUMULATIVE NET REVENUE

Figure 4 shows the cumulative net revenue before taxes by resource. Timber and bigleaf maple syrup create a profit for the first five years of operation. Mushrooms, berries, floral greens and recreation are costs for the first 5 years of operation. Table 11 is the data for figure 4.

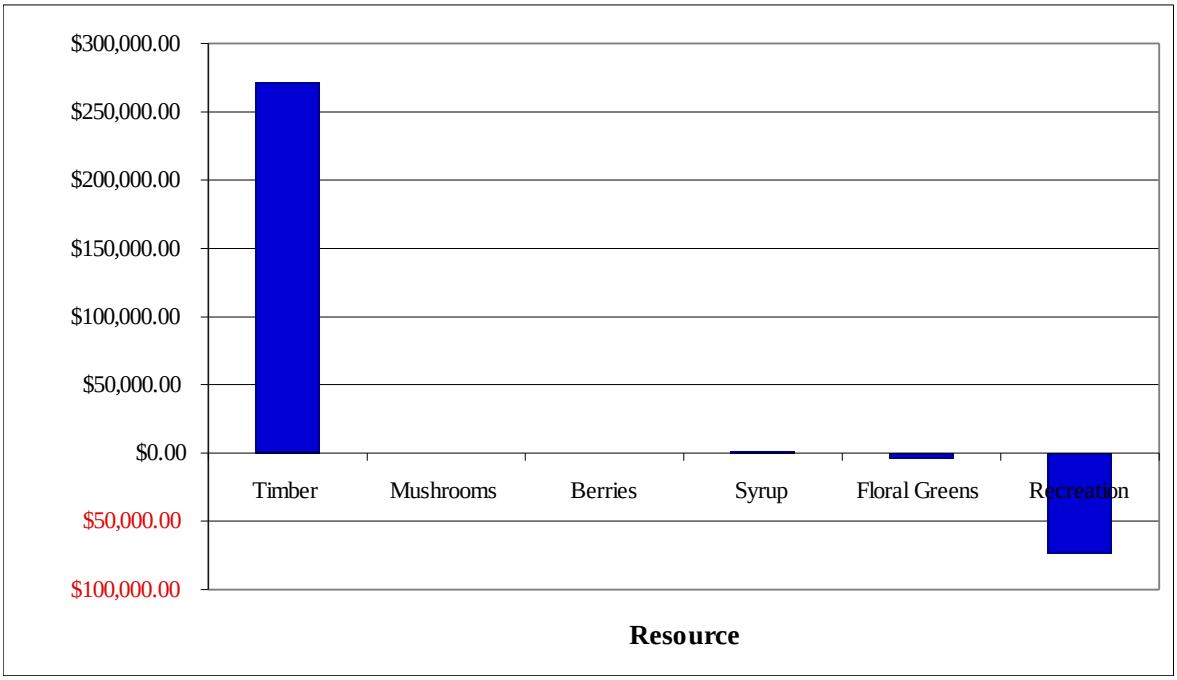

Figure 4: Cumulative net revenue before taxes for 5 years by resource

Table 11: Cumulative net revenue before taxes for 5 years by resource

	Timber	Mushrooms	Berries	Syrup	Floral Greens	Recreation
Net Revenue	$271,329.14	-148.13	-10.38	$969.40	-$4,290.00	-$73,613.33

4.3 NET REVENUE OVER TIME

Figure 5 shows the net revenue of all resources combined over the modeled 5 year period. Net revenue increases over time due to increasing timber prices and increased production of NTFPs. Net Revenue is negative in the first year because of development costs occurring in the first year.

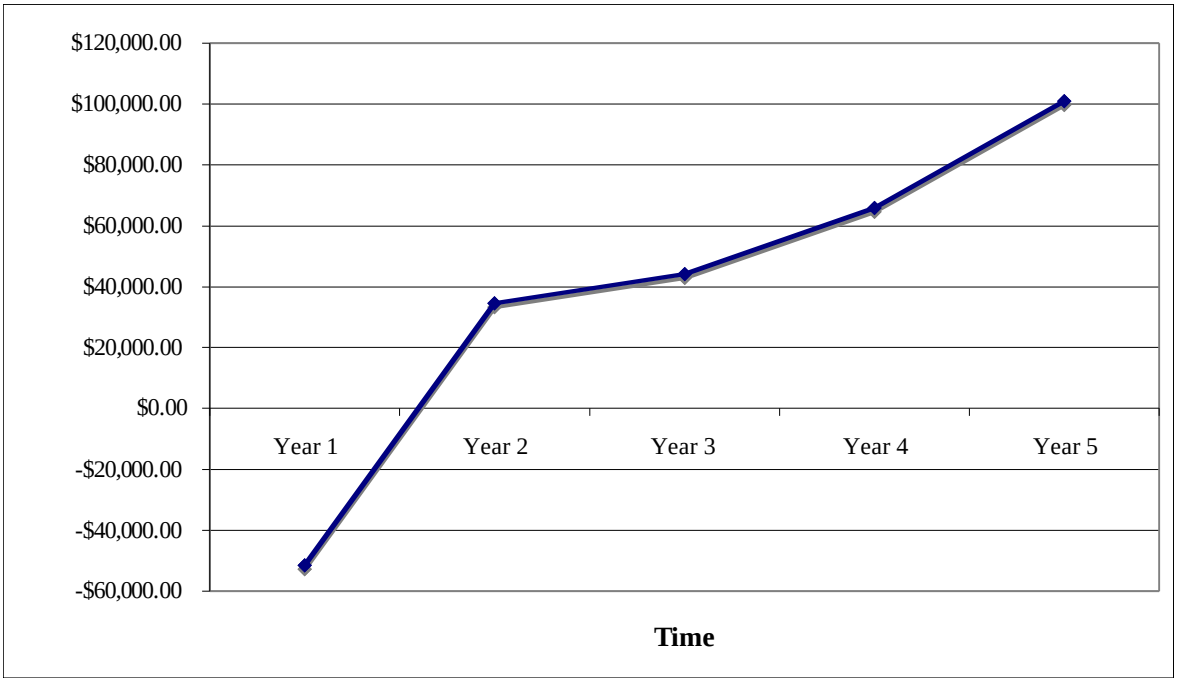

Figure 5: Net revenue before tax of combined resources over time

Table 12 shows the exact values from the model over time. It can be expected that net revenues will continue to increase provided there is a steady lumber market and harvest of NTFPs continues to increase.

Table 12: Net revenue before tax of combined resources over time

	Year 1	Year 2	Year 3	Year 4	Year 5
Net Revenue	-$45,145.93	$34,662.92	$44,171.29	$65,990.45	$100,992.98

Figure 6 shows the annual net revenue for each resource. The trend of increasing revenue can be seen for timber, syrup and recreation. Recreation has very high startup costs because of trail and day-use site construction. The trend of increasing revenues from

recreation suggests that this may be profitable as a long-term resource. Table 11 gives better detail of net revenues for each product.

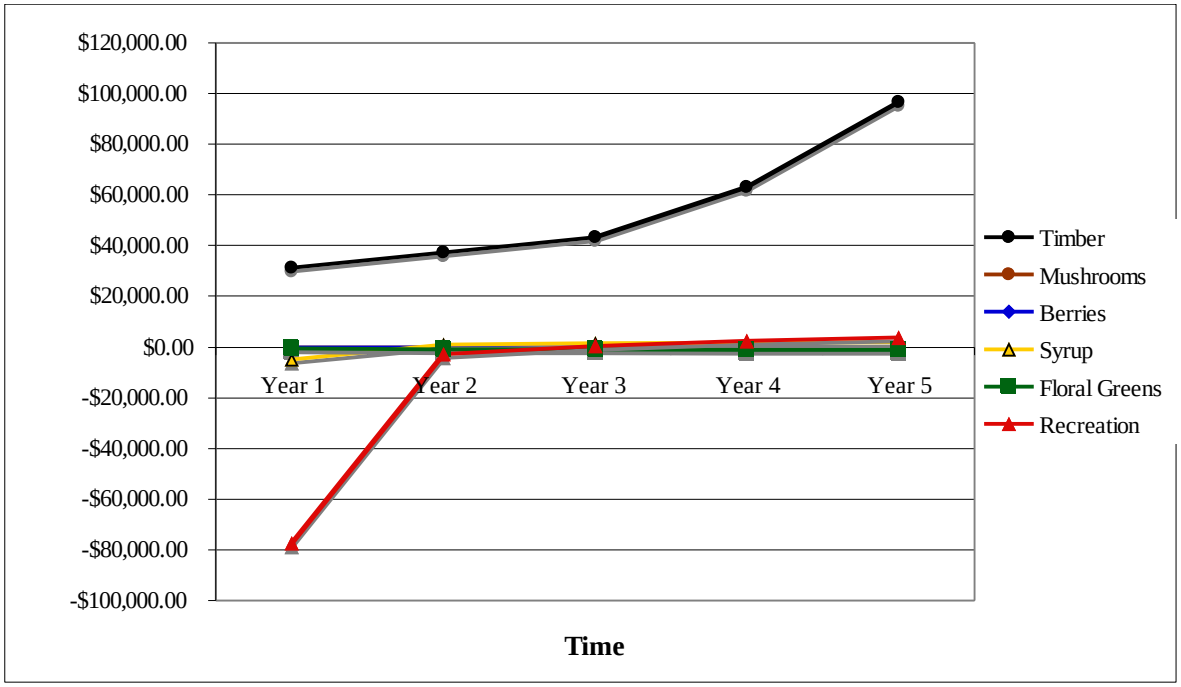

Figure 6: Annual net revenue before taxes by product

Table 13 shows the exact values of net revenue before taxes from the model. It is clear that some resources do not generate revenue over time. This is most likely due to a combination of high wages and low prices. Although these products may create minimal revenue, their management creates jobs, can involve the community, and adds diversity to the products available from KCF.

Table 13: Annual net revenue before taxes by product

	Year 1	Year 2	Year 3	Year 4	Year 5
Timber	$31,252.50	$37,245.04	$43,195.92	$62,994.70	$96,640.98
Mushrooms	-$18.75	-$26.25	-$31.88	-$33.75	-$37.50
Berries	-$1.25	-$1.88	-$2.25	-$2.50	-$2.50
Syrup	-$4,795.10	$915.00	$1,372.50	$1,647.00	$1,830.00
Floral Greens	-$550.00	-$770.00	-$880.00	-$990.00	-$1,100.00
Recreation	-$77,468.33	-$2,699.00	$517.00	$2,375.00	$3,662.00

4.4 PRODUCT REVENUES AND COSTS

Table 14 shows the gross revenue of each product by year. Timber generates the greatest gross revenue for the KCF in the first 5 years of operation. All other products have increasing revenue over time.

Table 14: Product gross revenue by year

	Year 1	Year 2	Year 3	Year 4	Year 5
Timber	$1,055,640.00	$1,069,530.00	$1,083,420.00	$1,111,200.00	$1,152,870.00
Mushrooms	$142.50	$199.50	$242.25	$256.50	$285.00
Berries	$32.50	$48.75	$58.50	$65.00	$65.00
Syrup	$585.00	$1,170.00	$1,755.00	$2,106.00	$2,340.00
Floral Greens	$175.00	$245.00	$280.00	$315.00	$350.00
Recreation	$7,145.00	$11,361.00	$14,577.00	$16,435.00	$17,722.00

Table 15 shows the total cost of producing each product by year. Timber is the most costly to produce. Recreation has very high costs in year one due to the development of recreation sites. All other resources have increasing costs as production increases over time.

Table 15: Product total costs by year

	Year 1	Year 2	Year 3	Year 4	Year 5
Timber	-$1,024,387.50	-$1,032,284.96	-$1,040,224.08	-$1,048,205.30	-$1,056,229.02
Mushrooms	-$161.25	-$225.75	-$274.13	-$290.25	-$322.50
Berries	-$33.75	-$50.63	-$60.75	-$67.50	-$67.50
Syrup	-$5,380.10	-$255.00	-$382.50	-$459.00	-$510.00
Floral Greens	-$725.00	-$1,015.00	-$1,160.00	-$1,305.00	-$1,450.00
Recreation	-$84,613.33	-$14,060.00	-$14,060.00	-$14,060.00	-$14,060.00

V. FUTURE WORK

The spreadsheet model could be further developed for more accurate use in a greater diversity of applications. It could be made applicable to other climates in BC, not just coastal ecosystems. Modifications could be made to accommodate any existing infrastructure. In addition, prices will need updating. This will make the model more complex in its current format. Additional development in the layout of the spreadsheet and user interface will keep the model easy to use.

The model could be made applicable to other ecosystems by diversifying and increasing the available products. This includes new tree species and logging costs. Different species of mushrooms, floral greens, and medicinal plants could be added. Products such as birch syrup could be produced in the interior of British Columbia where bigleaf maple does not grow.

Certain products, such as recreation, could be modified to include existing infrastructure. A campground may exist that requires new picnic tables and gravel, but is otherwise equipped. The model currently does not include such a situation. The original model was altered to include existing trails. This modification was required specifically for KCF, but is applicable to many other community areas.

The economy is dynamic; prices used in the model will change. This will affect both costs and revenues in the model. Some prices will be accurate for years, while others will change very quickly. Lumber prices and stumpage are inputs because they vary greatly with location and time. Eventually, all prices will need to be changed.

All of the above changes will benefit the accuracy of the output. However, the modifications will make the model significantly more complicated to use. If the above changes are made, the model will require a new user interface for data entry and results viewing. The use of Microsoft Visual Basic in combination with Excel could help simplify the user interface.

Community forests and woodlots are growing in number in British Columbia. This basic model can help estimate some business expenses for both timber and NTFPs in these licenses. There is further development that could be done on the model. However, it was useful for doing a financial analysis of the KCF. The KCF needs to receive its Community Forest Agreement before it begins to produce forest products and manage the land. After this, the results from the model may be compared to the actual costs and revenues of the KCF.

REFERENCES

Bakker, N., Chewter, M., Wells, G., Whiting, E. 2008. Financial report for the Cascade Lower Canyon Community Forest Corporation. FRST 424 course work.

Bloomsbythebox. 2007. Western Cedar Bough Tips. Accessed March 25, 2008. www.bloomsbythebox.com

British Columbia Agroforestry Development Initiative. 2005. Tapping bigleaf maple demonstration shows positive results. Accessed March 12, 2008. http://www.woodlot.bc.ca/agroforestry/pdf/Tapping-Big-Leaf-Maple-final-report.pdf

Canada/BC Business Services Society. 2003. Business Services for Aboriginal Entrepreneurs in BC and Canada website. Accessed April 6, 2008. http://www.firstbusiness.ca/home.htm

Chicago Climate Exchange (CCE). 2009. Carbon Financial Instruments – January 2009. Accessed February 3, 2009 at http://www.chicagoclimatex.com/market/data/monthly.jsf

Draffan G. 2006. Report on the floral greens industry. Accessed March 15, 2008. http://www.endgame.org/floral.pdf

Ehlers, T. 2007. Chanterelle mushroom habitat modeling and inventory. Project Number Y071163/Y082163. Executive Summary. Accessed March 4, 2008. http://www.for.gov.bc.ca/hfd/library/FIA/2007/FSP_Y071163.pdf

Friesen, C.D. 2008. Katzie Values. Personal correspondence.

Gamiet, S., Ridenour, H., Philpot, F. 1998. An overview of pine mushrooms in the Skeena-Bulkey region. Accessed March 8, 2008. http://northwestinstitute.ca/downloads/mushroom_report_98.pdf

Gamiet, S., Berch, S.M., Kroeger, P., Roberts, C., Winder, R., MacKinnon, A. Unknown. Non-timber forest products of British Columbia website. Accessed March 12, 2008. http://bcmushrooms.forrex.org/ntfp

Green, R.N. and Klinka, K. 1994. A field guide for site identification and interpretation for the Vancouver Forest Region. Land Management Handbook Number 28. Ministry of Forests Research Program. Victoria, BC.

Heiligmann, R.B. 2002. Hobby maple syrup production. Ohio State University Fact Sheet. School of Natural Resources. F-36-02. Accessed March 17, 2008. http://ohioline.osu.edu/for-fact/pdf/0036.pdf

Huyler, N.K. 2000. Cost of maple sap production for various size tubing operations. Res. Pap. NE-712. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northeastern Research Station. Accessed March 12, 2008. http://www.fs.fed.us/ne/newtown_square/publications/research_papers/pdfs/2000/rpne712.pdf

Ihalainen, M., Salo, K., Pukkala, T. 2003. Empirical prediction models for *Vaccinium myrtillus* and *V. vitis – idaea* berry yields in Northern Karelia, Finland. Silva Fennica 37(1): 95-108. Accessed March 12, 2008. http://www.metla.fi/silvafennica/full/sf37/sf371095.pdf

Infinity-Pacific Stewardship Group. 2008. Personal interview with Friesen, C.D.

Lesosky, J. 2008. Wild mushroom values. Personal correspondence.

Lynch, K.A. and McLain, R.J. 2003. Access, labour, and wild floral greens management in Western Washington's forests. General Technical Report PNW-GTR-585. Accessed March 25, 2008. http://www.fs.fed.us/pnw/pubs/gtr585.pdf

McIntosh, R.A., Alexander, M.L., Bebb, D.C., Ridley-Thomas, C., Perrin, D., Simons, T.A. 1997. Financial state of the forest industry and delivered wood cost drivers: IV Increases in BC delivered wood costs: 1992 – 1996. Accessed April 4, 2008. http://www.for.gov.bc.ca/het/costs/fin-5.htm

Ministry of Forests and Range. Southern Interior Forest Region mushroom picking website. Accessed March 8, 2008. http://www.for.gov.bc.ca/rsi/publicuse/MushroomPicking.htm

Mycosource. 2006. Spawn for logs or stumps. Accessed February 3, 2009. http://www.mycosource.com/spawn.htm

Research Branch, BC Ministry of Forests and RamSoft Systems Ltd. 2005. Table Interpolation Program for Stand Yeilds (TIPSY) Version 3.2b. Available at: http://www.for.gov.bc.ca/hre/software/

Ruth, R.H., Underwood, J.C., Smith, C.E., Yang, H.Y. 1972. Maple syrup productions from bigleaf maple. U.S. Department of Agriculture, Forest Service, Pacific North West Forest and Range Experiment Station. Research Note PNW-181. Accessed March 12, 2008. http://www.fs.fed.us/pnw/pubs/rn181.pdf

Stech, Murray. 2008. Coast Average Stumpage Rate Schedule. Ministry of Forests and Range Revenue Branch. Memorandum. File 21740-01. Accessed April 4, 2008. http://www.for.gov.bc.ca/hva/timberp/coastaverage_Mar08.pdf

Tedder, S. and Mitchell, D. 2003. The commercial harvest of edible wild mushrooms in British Columbia, Canada. Accessed March 12, 2008. http://www.fao.org/DOCREP/ARTICLE/WFC/XII/0379-B1.HTM

National Park Service. 2004. High Bridge Ranger Station Historic District management plan: estimated costs for implementation, as a function of five year objectives. U.S. Department of the Interior, Lake Chelan National Recreation Area, Washington. Accessed March 27, 2008. http://www.nps.gov/archive/noca/Highbridgemgt/secc.htm

Welwood, D. 2004. Non-Timber Forest Products. A presentation for the Haida Gwaii/Queen Charlotte LUP Community Planning Forum. Meeting #11. Accessed March 17, 2008. http://ilmbwww.gov.bc.ca/lup/lrmp/coast/qci/docs/NTFP_Presentation_LUP.pdf

Wiensczyk, A.M. and Berch, S.M. 2001. Ecological description and classification of some pine mushroom habitat in British Columbia. BC Journal of Ecosystems and Management. Vol. 1 Number 2.

Wiita, A.L. and Wurtz, T.L. 2005. The morel mushroom industry in Alaska: current status and potential. Accessed March 12, 2008. http://www.iser.uaa.alaska.edu/Publications/morel_final.pdf

GLOSSARY

Biodiversity: the diversity of plants, animals and other living organisms in all their forms and levels of organization. Includes the diversity of genes, species and ecosystems as well as the evolutionary and functional processes that link them

Carbon Budget Model (CBM-CFS2): a landscape-level forest carbon accounting framework that simulates carbon dynamics of above-ground and below-ground forest biomass, soil and dead organic matter over time.

Ecosystem services: processes and functions provided by natural ecosystems that sustain life and are critical to human welfare. Includes carbon sequestration and biodiversity preservation.

Net revenue: the total income minus the costs of a product or service.

Net Present Value (NPV): the difference between the future stream of revenues and of costs converted into equivalent values today

Non-Timber Forest Product (NTFP): a forest product used by humans, of plant or fungal origin, other than timber and wood products. Includes mushrooms, berries, medicinal plants and floral greenery.

Spawn: a media, such as sawdust or wooden dowels, containing fungal mycelium, which is used to inoculate fungus into a new media, such as logs, for the production of mushrooms.

Table Interpolation Program for Stand Yields (TIPSY): a table interpolation program for managed stands developed by the B.C. Ministry of Forests and Range. Used to establish stand yield curves representing thinning and fertilization treatments.

Total ecosystem carbon: the sum of carbon sequestered from all biological sources in an ecosystem, including biomass and dead organic matter. Used to determine the net amount of carbon sequestered in an ecosystem, and thus available to sell as carbon credits.

Glossary from Bakker et al 2008