Burns Lake Community Forest

Forest Management Program
2015-2017

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1. INTRODUCTION

1.1 OBJECTIVE

The objective of this document is to provide an overview of the Forest Management Program currently being implemented on the Burns Lake Community Forest (BLCF) and to provide opportunity for review and discussion of the program by FLNRO.

In Management Plan 3 (MP3) the BLCF committed to an extensive forest management program to be completed by early 2017. The following section was included in MP3 and provides an overview of the forest management program. Details on the program projects follow.

The forest management program is a work in progress and is subject to change as new information/input becomes available.

1.2 OVERVIEW

In July 2015, the Community Forest Board of Directors began to explore forest management options to shift management of the Community Forest "Beyond the Beetle". The key challenges identified were the declining revenue forecast as sawlog shelf-life ends, the current timber supply shortfall in the mid-term, and lack of suitable data, tools and area-based operating philosophy to create and implement a Mountain Pine Beetle (MPB) mitigation plan.

In August 2015, the Board of Directors approved funding for an extensive forest management program to address revenue concerns and mitigating the mid-term timber supply shortfall, all resulting from the MPB attack. The following outlines the forest management activities that will be undertaken.

First we will improve the basic resource data, which includes the acquisition of new forest inventory products including, new FLNRO funded forest cover inventory, BLCF LiDAR imagery, and BLCF sub-unit Pl inventory sampling.

We will review the basic silviculture program and determine how new objectives for both the basic and intensive silviculture program can help mitigate the mid-term timber supply.

We have identified issues with the timber supply netdown process, potentially some forest cover constraints, non-timber objectives and modelling assumptions that may be artificially constraining parts of the landbase. These will be explored further.

A significant environmental program has been included in the forest management program. Biodiversity will be conserved by providing a combination of protection and management to sustain ecological integrity across the landscape. The objectives for environmental management on the Community Forest are to:

- Model (using latest inventory information) species and habitats of concern (including rare) to identify high ecological resource values and prioritize conservation in these areas.
- Assess current and potential management strategies with regards to ecological resource values.
- Propose amendments to land use or Government Regulations where required for Government's consideration.
- Maximize potential ecological value of constraints (and integrate overlapping objectives).
- Examine restoration or enhancement opportunities to meet biodiversity objectives.

Due to the limited amount of time to salvage the remaining Pl stands, an economic model will be created and used to help make decisions on which stands should be harvested as the shelf-life and market place changes.

Finally, this information will be used in a Forest Estate Model to develop a MPB mitigation plan and ultimately be included in a revision of MP3 and potentially changes to the Forest Stewardship Plan (FSP).

Work on the forest management program is now well underway and several projects are complete. The new information is providing needed answers and helping reduce uncertainty of what is happening on the landbase. This is critical as we plan the transition into the mid-term.

2. RESOURCE INVENTORIES

2.1 DATA EXCHANGE AGREEMENT

As an area-based tenure holder, we are interested in moving towards co-maintaining all resource inventory data with FLNRO. We currently have a data exchange agreement (dated August 28, 2015) in place with the Forest Analysis and Inventory Branch for orthophotos and stereo imagery and are working on establishing a more detailed data exchange agreement with FLNRO. We are also developing a working agreement on how we can support each parties different inventory initiatives.

2.2 FOREST INVENTORY

FLNRO is currently completing a new Vegetation Resource Inventory (VRI) for the Lakes TSA, including the Community Forest. This inventory classification includes new stand structure attributes and information on the MPB attacked areas. We look forward to using this inventory information in our operations once it is publicly released.

2.3 MIXED SPECIES SUB-UNIT INVENTORY

In the fall of 2015, we undertook the Mixed Species Sub-unit inventory to answer the question, is there enough total volume in the BLCF to develop a new salvage program that focuses on partial cutting Pl from mixed-species stands?

The area we sampled was in the productive land base, Lodgepole pine (Pl) or Spruce (Sx) leading, Pl components 30-70% based on VRI estimated net merchantable volume, Pl volume > 75 m^3/ha and age class 5+. This resulted in a population of 10,031 ha. Information was gathered on the tree and understory attributes. The inventory was completed using two-phase sampling.

- Phase one - photo interpretation of tree and stand attributes from approximately 400 sample points located on a grid throughout the target population.
- Phase two - ground sampling at 37 of the sample points located on the grid. Ground sample plots were a modified VRI 5-point prism plot cluster.

This information is being used in conjunction with known information on the Pl stands currently being salvaged to:

- Estimate the amount of dead Pl still remaining on the Community Forest.
- To rationalize an increase in the salvage program.
- Specifically, to provide the data to support the expansion of the salvage program into mixed stands using partial cutting and understory protection regimes.

Further analysis is underway on this data to help define the understory protection program opportunities. We are also exploring using LiDAR data to define and stratify types for harvest planning.

2.4 LIDAR

LiDAR and related imagery was flown for the Community Forest in Fall 2015 and the data was processed using Fusion[1]. The data collected includes:

- A series of LiDAR product tiles (1 m contours, digital elevation model, canopy height model, bare earth model).
- 4 colour band imagery including infrared (IR).
- Digital orthophotos.
- Stereo digital images.

The LiDAR data can be used for various aspects of forest management and the Community Forest is exploring using LiDAR data to:

- Improve visual quality mapping.

[1] Fusion is a Lidar analysis software tool developed by the Silviculture and Forest Models Team, Research Branch of the US Forest Service.

- Upgrade the current PEM mapping.
- Map understory for the mixed species inventory.
- Improve stream break and classification mapping.
- Identify potential ecosystem restoration areas.
- Improve the VRI inventory information (height, stocking, and polygon boundaries).
- Assist in road and cutblock layout.
- Improve estimates of species composition and live/dead.

2.5 PEM

PEM is a computer modeling approach to ecosystem mapping where existing knowledge of ecosystem attributes and relationships is used with existing geographical data sources and expert knowledge to predict ecosystem representation in the landscape.

Use of the PEM is a key component in our forest management program for forestry, silviculture, and wildlife/biodiversity planning.

The Burns Lake PEM is comprised of 7,038 ha from the 2007 Lakes PEM[2] and 85,260 ha from 2009 BLCF PEM[3]. The two PEMs were combined into a single composite product.

Concern has been expressed that the BLCF PEM is possibly too generic and that LiDAR could be used to improve the resolution. We will explore using LiDAR to improving stream classification and wetland information.

2.6 SCENIC AREAS

Much of Community Forest is visible from Highways 16 and 35 and from the large lakes on or adjacent to the BLCF. Visual Quality Objectives (VQOs) were set for the entire Community Forest area in the land use plans.

In 2012/13, the FLNRO consulted the public with regard to interest in revisiting land use objectives to possibly mitigate timber supply impacts of the MPB epidemic. In the case of the Lakes LRMP, the ministry concluded that there was a degree of public support to re-visit VQO's and their impact on timber supply.

The history of BLCF, almost from its inception in 2000, was dealing with the MPB attack; initially efforts to control MPB and since 2008 on salvaging the dead Pine. As a result, because of the VQO designations and lower proportion of pine in many of the VQOs almost no harvesting has

[2] Timberline Natural Resources Group. 2007. Predictive Ecosystem Mapping in the Lakes Timber Supply Area - Final Report

3 Timberline Natural Resources Group. 2009. Predictive Ecosystem Mapping of Burns Lake Community Forest

taken place in the most constrained VQOs. This has resulted in a situation, where a very large proportion of the remaining mature timber on the Community Forest is within constrained VQOs.

The last 2 timber supply analysis show a significant pinch point approaching as the forest cover constraints, and various netdowns constrain the availability of mature timber. We expect the current analysis to show a similar result.

In order to try and mitigate the timber supply shortfall and help community stability through ensuring forestry jobs, we want to review the current VQO classification and objectives and determine if there is some areas and conditions in which we might access some of the visual areas in order to help us through the timber supply pinch point.

We will explore:

- Maintaining the current visual landscape unit mapping over all of the Community Forest (no new mapping).
- Using viewability analysis along the Highway 16 corridor to update the changes in roadside vegetation and determine if it might help screening some areas.
- Defining most highly visible R polygons.
- Developing a summary of the status of each VQO polygon as to total area, amount of deciduous, OGMA, environmental or other constraints already in place or that could be included and determine the area and volume of timber constrained.
- Using new VRI, PEM, and Lidar to classify the remaining VQO polygons as to their suitability for small patch cut blocks or partial cutting regimes.
- Modeling the timber supply impact of potential volume that could be removed by small patch cuts and partial cutting.
- Developing some draft proposals including cutblocks for public review and which may provide the basis to consider revising VQO's on the Community Forest.

2.7 STREAM CLASSIFICATION

Stream classification mapping for the Community Forest is being improved and the revised mapping will be included as a component of the forest estate model. LiDAR was used initially to identify stream breaks and provide preliminary stream classification mapping. Preliminary classification will be revised based on current field classifications available from previous fieldwork on the Community Forest. This is an ongoing, multi-year project and the stream classifications will be continued to be revised based on additional field sampling.

3. SILVICULTURE

3.1 KEY MANAGEMENT CONSIDERATIONS FOR THE SILVICULTURE PROGRAM

Given the forest management environment facing the Community Forest "Beyond the Beetle" and local expectations of the Community Forest, the silviculture program may be different than on other adjacent management units. The following should be considered:

- BLCF are market loggers and have no associated milling capacity, therefore basic silviculture regimes should be flexible and able to meet future wood requirements (as best as they can be defined).
- The goal of mitigating or improving the mid-term timber supply forecast should be the focus of basic silviculture regimes and intensive silviculture programs.
- The silviculture program should incorporate community values at the stand level.
- Certification may require modifications to silviculture regimes to meet specific certification requirements or indicators.
- The silviculture program should also help minimize the susceptibility of the forest to future forest health infestations and address considerations for climate change.
- At times, the intensive silviculture program may be adapted to use Government short-term job creation funding, which may have its own stand priorities that are different than the timber supply focused community forest goals. This is acceptable since we also have an objective for local job creation.
- Silviculture programs should incorporate site-limiting factors into decision-making processes, be cost effective, meet Ministry approval, and limit the Community Forest's financial and legal liabilities.

3.2 BASIC SILVICULTURE PROGRAM REVIEW - SILVICULTURE REGIMES FOR FUTURE STANDS (POST 2015 HARVESTING)

Basic silviculture will play an important part in mitigating the forecasted timber supply short falls; ensuring that the regenerated stands are fully-stocked and available for harvest as soon as possible. A review of the silviculture program is planned to ensure that it meets the key management considerations for the silviculture program. This will include:

- Determining the objectives as market loggers for the types of forests that should be grown.
- Collating the current FSP silviculture information.
- Meeting with local practitioners.
- Reviewing current silviculture practices.
- Undertaking a series of species, density, and ingress sensitivity analyses using a series of TASS runs to determine the sensitivity of achieving product goals to changes in species, density, and ingress.

The silviculture regimes will also be examined for opportunities to establish stands resilient to climate change and to reduce the forest susceptibility to future forest health pest and disease attacks.

These practices and analyses will be collated into site series based Silviculture Regimes for all post 2015 harvesting basic silviculture. These basic Silviculture Regimes can be modified on a site-specific basis to reflect wildlife habitat requirements and potentially to incorporate Aboriginal botanical products or other resource values.

It is possible that the FSP may require amendments, depending upon the results of the silviculture review and analysis.

3.3 USE OF UNDERSTORY PROTECTION OF SECONDARY STAND STRUCTURE

Discussions with FLNRO silviculture staff and researchers have indicated that silviculture systems based upon protection of secondary stand structure (Understory Protection) may play a significant role in addressing the salvage of MPB damaged timber and may help in mitigating the timber supply. Protection of existing naturally occurring understory could provide opportunities to shorten the green-up period, address some wildlife habitat issues, provide cover in VQO areas, address water quality issues, reduce forest susceptibility to future forest health pest and disease outbreaks, and help community fire prevention efforts. The technical challenge is to know which areas are most suitable for understory protection.

The silviculture liability issue is key to the success of the understory protection program. This is a costly program and indications are it will be close to break-even, without incurring basic silviculture costs. As a result, the overstory being removed must have a suitable (economic) number of salvageable dead and green stems and the stand must be considered free growing at completion of harvesting. Close supervision and very strict adherence to the prescription is mandatory.

Three situations[4] are foreseen:

1. Understory not suitable, stand is too impacted by blowdown, Pl>50%; an appropriate prescription would be to clearcut and regenerate.
2. Understory suitable, but small, overstory mixed Pl and other conifer; prescription would be understory protection, removal of only dead Pl in order to increase size and quantity of understory. This stand can be considered a natural shelterwood[5] requiring a

[4] Secondary Structure, an Operational Perspective, Ken Hodges RPF and Silvicultural Approaches to Managing MPB Damaged Stands: Regeneration and Mid-Term Timber Supply. Dave Coates.

[5] The Shelterwood system is defined as a silvicultural system in which mature trees are removed in a series of cuts to achieve a new even-aged stand under the shelter of remaining trees. Regeneration may be planted, or natural regeneration from seed or pre-established advance regeneration from the pre-harvest stand.

Regeneration Cut; a cutting, which may be the first cutting in some unmanaged stands, to provide growing space for establishing regeneration while maintaining shelter for developing seedlings. Trees chosen to be retained after this cut should be vigorous and windfirm.

3. Understory very good, protect understory and remove all overstory Pl and Sx. This stand can also be considered a natural shelterwood, but in this case, because acceptable advance regeneration is already present, the main stand treatment necessary to regenerate the site is to carefully harvest the mature overstory and allow the growth of released understory trees.

Training will be required for silviculture staff to select suitable stands and determine overstory removal levels.

There are a number of risks associated with the understory protection system, including:

- Lack of experienced forestry staff, loggers, and supervisors
- Risk of blowdown.
- Risk of overwhelming damage to understory and residual overstory.
- Not ensuring free growing status prior to harvesting.
- Overzealous overstory removal.

There are a significant number of stands that could possibly be treated under this program, if all issues outlined above are satisfactorily addressed.

3.4 INTENSIVE SILVICULTURE PROGRAM COMPONENTS

Intensive, incremental, and enhanced are all words that are used to describe silviculture activities that are additional to Basic Silviculture. Minimal intensive silviculture has been implemented on the Community Forest to date.

An important part of any intensive silviculture program, and particularly important for the Community Forest, is to ensure that the treatments are “given credit” in the AAC determination process. Ensuring a return (timber supply/employment) on the intensive silviculture investment can help both mid- and long-term timber supply forecasts and help forest managers rationalize further investments in the forest.

In the new forest management program, Forest Estate Modelling will be used to determine the type and amount of intensive silviculture activities that will have the biggest impact on addressing the mid-term timber supply shortfall. Inputs for this type of analysis are Managed Stand Yield Tables (MSYTs) that reflect the growth & yield contribution of the intensive silviculture activity undertaken. MSYTS are used to forecast the volumes and attributes of timber available in post-harvested regenerated stands.

Stand types to be considered will include:

- **Stands Harvested from 1970 to 2015 -** Having detailed knowledge of the current status of all logged and regenerated stands on the Community Forest is an important part of an area-based philosophy. Stands that were harvested from 1970 to 2015 will be examined to determine their suitability for further treatments that may help mitigate the timber supply forecast. We will also need to find a method to quantify the MPB impact on stocking levels in these stands. During forest estate modelling we will ensure that all previous silviculture investments are "given credit for" and incorporated into the timber supply model.
- **Naturally Occurring Age Class 3 & 4 Stands -** Opportunities will be explored in naturally occurring stands to determine their suitability for further treatments that may help to mitigate the forecasted timber supply shortfall. Key considerations are the suitability of the treatments to increase volume available in the mid-term and allow access to highly valuable timber constrained by VQOs and other resource values.

4. FIRE

Fire protection awareness and preparedness will be reflected in all forest activities carried out during the fire season. Strategies will be implemented that minimize the buildup of harvest debris. Harvesting close to the Village will be primarily during September-November to reduce debris in this area during the wildfire season.

The BC Wildfire Service supports the FireSmart Canada program for communities across the Province. The program provides practical tools and information for use by interface residences, local government, land use planners, firefighters, and industries to reduce the impact of wildfire. We will provide financial and in-kind support to local organizations and First Nations to support the implementation of this program for the Community Forest and surrounding area to reduce the risk of wildfire.

5. DECIDUOUS

As part of the new forest management program, there is a goal to incorporate the management of deciduous forest stands more inclusively with management of the Community Forest. This will start by incorporating the deciduous stands in the timber harvesting landbase (THLB) in the next timber supply analysis. We will then explore the use of these stands to meet timber, wildlife/biodiversity values, and/or VQO objectives.

6. ENVIRONMENTAL

6.1 OVERVIEW

The recent MPB outbreak has highlighted the importance of disturbance and post-disturbance management in our forests. Contemporary ecological management recognizes that certain disturbances are inevitable and that natural disturbances are an integral part of ecosystem function. It follows then, that increased management emphasis be placed on strategic post-disturbance interventions to minimize negative biodiversity and economic impacts.

With the MPB infestation salvage harvesting nearing its conclusion, now is the appropriate time to update affected inventories and environmental management regimes. The MPB has generated new management questions and elevated the importance of some pre-existing questions.

The forest management program approved by the Board of Directors included significant funding for environmental programs. The main objectives for environmental management on the Community Forest are to:

- Model (using latest inventory information) species and habitats to identify high ecological resource values and prioritize conservation in these areas.
- Assess current management strategies with regards to ecological resource values.
- Propose amendments to maximize potential ecological value of constraints (and integrate overlapping objectives).
- Examine restoration or enhancement opportunities to meet biodiversity objectives.

The following sections detail our plans in each of the environmental components.

6.2 RARE AND SENSITIVE ECOSYSTEMS

Rare (Provincially-listed) and sensitive ecosystems are important components of biodiversity and 26 at-risk ecosystems are currently listed by the Province in subzones occurring on the Community Forest.

Inventory information[6] will be used to identify areas that may support rare ecosystems on the landbase. Particular emphasis will be placed on the forested ecosystems as they are most likely to be effected by forestry operations (Table 1).

[6] Generally, forest cover maps, PEM maps, habitat models and appropriate literature.

Table 1 – At-risk ecosystems potentially occurring in the BLCF.

Scientific Name	English Name	BC List	BEC/Site Series
Picea engelmannii x glauca / Spiraea douglasii - Rosa acicularis	hybrid white spruce / hardhack - prickly rose	Blue	SBSdw3/06
Pinus contorta / *Juniperus communis* / *Oryzopsis asperifolia*	lodgepole pine / common juniper / rough-leaved ricegrass	Blue	SBSdk/02
Pinus contorta - *Picea mariana* / *Pleurozium schreberi*	lodgepole pine - black spruce / red-stemmed feathermoss	Blue	SBSdw3/05
Populus spp. (*balsamifera*, *trichocarpa*) - *Picea* spp. / *Cornus stolonifera*	(balsam poplar, black cottonwood) - spruces / red-osier dogwood	Red	SBSdk/08
Pseudotsuga menziesii - *Pinus contorta* / *Cladonia spp.*	Douglas-fir - lodgepole pine / clad lichens	Blue	SBSdw3/02
Pseudotsuga menziesii / *Pleurozium schreberi* - *Hylocomium splendens*	Douglas-fir / red-stemmed feathermoss - step moss	Blue	SBSdk/04

In the era Beyond the Beetle:

- Consideration will be given to recruitment opportunities to Pl-dominated rare ecosystems.
- Inventory information will be used to identify and manage rare ecosystems on the landbase.
- Inventory information will be used to identify sensitive ecosystems, which include old-growth forests, wetlands, grasslands and rock outcrops.
- OGMAs will be reviewed to determine their suitability to meet the requirements for rare and sensitive ecosystems.

6.3 RARE PLANTS

Rare plants are important components of biodiversity and seven species are currently listed by the province in subzones occurring on the Community Forest (Table 2).

Inventory information will be used to identify areas where rare plant populations may exist. Due to the specific environmental conditions required to support rare plants, the actual occurrence of rare plant species can only be determined with ground surveys. However predictive mapping is a valuable tool to help conserve rare plant populations and habitat.

Table 2 – Rare plants potentially occurring in the BLCF

Scientific Name	English Name	BC List	BEC/Habitat
Lloydia serotina var. flava	alp lily	Blue	ESSFmc
Carex backii	Back's sedge	Blue	SBSdk
Melica spectabilis	purple oniongrass	Blue	SBSdk
Plagiobothrys cognatus	sleeping popcornflower	Blue	SBSdk
Pinus albicaulis	whitebark pine	Blue	ESSFmc; SBSmc
Meesia longiseta		Blue	ESSF; SBS
Splachnum vasculosum		Blue	SBS

6.4 WILDLIFE RESOURCES

We intend to improve management strategies for species within our operating area that are potentially adversely affected by forestry related activities. Government direction, especially the Identified Wildlife Management Strategy (IWMS), provides some guidance for forest

management of a minority of species; however, most species at risk are not included in the present list of species in the IWMS.

Other species have been identified as having specific management requirements through the LRMP, SRMPs, *Forest and Range Practices Act* Section 7 Orders, or as Regionally Important Wildlife by the Ministry of Environment. Some of these species are species at risk; others are not at risk but require management for social and/or economic reasons.

Species at risk (provincially red/blue-listed and federally COSEWIC[7]/SARA[8]-listed species), commercial management species (primarily for hunting or fishing purposes), and regionally important species together comprise the species of management concern.

Table 3 – Wildlife species of management concern

Scientific Name	English Name	BC List (CF Priority)	SARA-COSEWIC	Management Concern
Botaurus lentiginosus	American Bittern	Blue (2)		
Ursus americanus	American Black Bear	Yellow (6)	NAR (1999)	Regionally Significant
Martes americana	American Marten	Yellow (2)		Regionally Significant
Hirundo rustica	Barn Swallow	Blue (2)	T (May 2011)	
Cypseloides niger	Black Swift	Blue (2)	E (May 2015)	
Certhia americana	Brown Creeper	Yellow (1)		Regionally Significant
Rangifer tarandus pop. 15	Caribou (northern mountain population)	Blue (2)	1-E/SC (May 2014)	Identified Wildlife
Chordeiles minor	Common Nighthawk	Yellow (2)	1-T (Apr 2007)	
Pekania pennanti	Fisher	Blue (2)		Identified Wildlife
Ursus arctos	Grizzly Bear	Blue (2)	SC (May 2002)	Identified Wildlife
Histrionicus histrionicus	Harlequin Duck	Yellow (1)		Regionally Significant
Myotis lucifugus	Little Brown Myotis	Yellow (5)	1-E (Nov 2013)	
Alces americanus	Moose	Yellow (5)		Ungulate
Oreamnos americanus	Mountain Goat	Blue (1)		Regionally Significant Ungulate
Odocoileus hemionus	Mule Deer	Yellow (6)		Ungulate
Accipiter gentilis	Northern Goshawk	Yellow (3)		Regionally Significant
Myotis evotis	Long-eared Myotis	Yellow (2)		Regionally Significant
Pristiloma arcticum	Northern Tightcoil	Blue (4)		
Contopus cooperi	Olive-sided Flycatcher	Blue (2)	1-T (Nov 2007)	
Falco peregrinus anatum	Peregrine Falcon, *anatum* subspecies	Red (2)	1-SC (Apr 2007)	
Dryocopus pileatus	Pileated Woodpecker	Yellow (4)		Regionally Significant
Acroloxus coloradensis	Rocky Mountain Capshell	Blue (2)	NAR (Nov 2001)	
Euphagus carolinus	Rusty Blackbird	Blue (2)	1-SC (Apr 2006)	
Grus canadensis	Sandhill Crane	Yellow (5)	NAR (May 1979)	Identified Wildlife
Tympanuchus phasianellus columbianus	Sharp-tailed Grouse, *columbianus* subspecies	Blue (2)		Identified Wildlife
Asio flammeus	Short-eared Owl	Blue (2)	1-SC (Mar 2008)	Identified Wildlife
Lasionycteris noctivagans	Silver-haired Bat	Yellow (2)		Regionally Significant
Anaxyrus boreas	Western Toad	Blue (2)	1-SC (Nov 2012)	
Gulo gulo luscus	Wolverine, *luscus* subspecies	Blue (2)	SC (May 2014)	Identified Wildlife
Aix sponsa	Wood Duck	Yellow (1)		Regionally Significant

[7] Committee on the status of Endangered Wildlife in Canada.
[8] Species at Risk Act.

Conservation strategies aim to maintain the mix of landscape conditions necessary to sustain all species. Management tools include protected areas and OGMAs, wildlife habitat areas and ungulate winter ranges, wildlife tree patches, and landscape seral-stage targets.

Identification and modelling of representative species and habitats can be used to examine the results of different management options on a more inclusive set of biodiversity indicators. We are currently working on species and habitat modelling. Additional indicators will be added to the modelling to include regionally important and rare species (songbirds, furbearers, small mammals, woodpeckers, valued plants and some rare plant communities).

Moose winter, summer and calving habitat will be identified to enable management strategies to recover habitat and populations in the shortest time frame. Additional wildlife and habitat models will be run over the PEM/VRI/LiDAR mapping to identify areas with the highest potential resource values in for the future era “Beyond the Beetle”.

A review of the management provisions recommended in each relevant species/community account will be reviewed and opportunities identified to integrate overlapping objectives. Wildlife features (including WTP, snags, CWD accumulations) will also be identified to increase the habitat value for indicator species.

6.5 HYDROLOGY AND AQUATIC RESOURCES

Forests play a key role in sustaining BCs water supplies. Loss of forest cover allows more precipitation to reach the ground, reduces evaporative losses, increases soil moisture, and when forest cover loss is extensive results in more water leaving the watershed.

Forest management strategies should lead to preservation of hydrological flows, mitigation of extreme hydrological events, retention of soils and sediments, support productivity and biodiversity, as well as maintenance and purification of water supply.

Within our Community Forest watersheds provide many values:

- Many tributaries of streams and other feeder streams to lakes support fish populations.
- The streams, wetlands, and lake support resident fish species including rainbow trout, char, and others.
- Fishing of both migratory and non-migratory species is an important recreation and tourism feature of the region.
- The area also supports First Nations food fisheries.

Aquatic resources include fisheries and other resources associated with the lakes, streams, and wetlands. The Community Forest encompasses Burns, Decker, Tchesinkut, and Fish Lakes, includes the Endako River, and many smaller streams and lakes.

Fisheries are not the only values associated with riparian areas. For example, wetlands provide important habitat for some species of big game (i.e. moose) and many species of birds, small mammals, amphibians, and insects.

We will explore using the new VRI and LiDAR data to produce improved stream classification mapping.

We will also be exploring:

- The selection of silviculture treatments and equipment to minimize ground disturbance within riparian areas in order to minimize introduction of non-native plant species and to maintain natural water movement.
- Maintaining and/or recruiting natural levels of coarse woody debris (CWD) within the riparian areas. CWD has additional value in riparian areas as habitat for a number of wildlife and plant species.
- Leaving all dead wildlife trees within riparian areas, that do not pose a risk to worker safety, to provide future instream large woody debris (LWD). If low value wildlife trees and danger trees have to be felled for worker safety reasons, then these stems should be retained on site as CWD.
- Incorporating these prescriptions into the silviculture regimes, and perhaps ultimately into the FSP.

6.6 LANDSCAPE-LEVEL BIODIVERSITY

OGMAs are identified primarily for the purposes of retaining or restoring the ecological attributes associated with old forest and maintaining areas that are subject to natural forest succession. They may also contribute to the retention of other features important for biodiversity or other values. OGMAs function to provide reserves for old-growth forest-dependent species across the landscape. The areas were selected to meet old seral criteria over time, while minimizing impacts on timber supply.

The goal of the old-growth forest objective is to manage for the retention of areas that are appropriately sized, contain, or can recruit specific structural old-growth forest attributes, and represent the range of ecosystem types found across the Community Forest planning area. It is important to note that where other objectives overlap with OGMAs, those objectives continue to apply.

The Ecora 2015 timber analysis report forecasts future age class distributions as the timber

supply models incorporate the multitude of constraints and assumptions detailed in the data packages. The forecast shows that in 100 years, the forest is split into two distinctly different parts:

- A younger forest with reasonably similar areas of ages 1 to 100 years;
- A second significantly older, spike of age 160 year + stands.

The analysis carries the projection to 250 years into the future and now the split in the forest is even more defined; a young forest up to about 80 years old, and a very large part of the THLB and non-THLB in age class 9 stands. This age class distribution of the forest does not reflect the age class of the initial natural forest. The artificially protected older forest is ecologically at much higher risk of loss to disturbance such as MPB, blowdown, bark beetles or fire. If the older forest was to suffer from such a catastrophic event, there are no stands in either the THLB or non-THLB that that are suitable for old forest recruitment for another 80 years.

Managing for old-growth forests is a critical component of implementing measures to conserve ecosystems and species biodiversity because it is difficult to reproduce once lost. We will:

- Develop a recruitment strategy to replace OGMAs where old functions have been compromised by the MPB infestation.
- Examine alternatives to the current OGMA strategy, ensuring no net loss of OGMA area.
- Maintain a range of forest seral stage by Biogeoclimatic zone within each landscape unit.

6.7 LANDSCAPE CONNECTIVITY

The FSP shows that the Lakes North Sustainable Resource Management Plan (LNSRMP) has an objective to maintain habitat connectivity within the landscape connectivity matrix shown on LNSRMP Map 3. It also shows that the harvesting deferral of January 29, 2009 has now expired.

The Lakes South Sustainable Resource Management Plan (LSSRMP) objective is to maintain a managed forest setting, landscape corridor (LSSRMP Map 3) dominated by mature tree cover and containing most of the structure and function associated with old forest by a) providing habitat connectivity within the landscape and b) permitting movement and dispersal of plant and animal species.

We propose to include a review of the landscape connectivity, along with the other environmental components discussed in this section, and incorporate landscape connectivity as an important component of the overall environmental-biodiversity planning. The key concern outlined in the LNSRMP of avoiding harvesting in rare and/or endangered plant communities will be addressed.

6.8 LAND USE PLAN CONSTRAINTS

The Lakes TSA, Lakes North SRMP, and Lakes South SRMP overlap the BLCF area and include 15 Landscape Units (LUs). The BLCF is only a small subset of the area including portions of 5 LUs. These larger scale plans outline approximately 14 land use objectives, requirements, strategies and spatial constraints on the landbase.

Spatial boundaries of these constraints do not coincide with the BLCF boundaries and some management constraints (eg. moose, old growth) are disproportionately higher compared to surrounding lands. FRPA identifies options to re-apportion land use impacts between operators and operating areas (FRPA Section 9: Proportional objectives). Fair apportioning of constraints is particularly important to enable long term planning within area based tenures like the BLCF.

Options to reapportion constraints to best meet Land Use Plan objectives will be identified using new inventory data and updated modelling. The intent is to balance the timber, biodiversity, and wildlife values within the Community Forest. The impacts or benefits of different options, compared to the current base case, can be quantified during Timber Supply Analyses.

Some options which will be considered include:

- Adjusting the size and boundaries of management zones (eg. moose winter range, OGMA amendments, maximize overlap).
- Connectivity corridors expired in 2016 and the Community Forest will participate in government discussions about future management.
- Altering prescriptions to meet objectives (eg. age class representation, reducing forest cover requirements).
- Assessing the status of resources outside the BLCF (eg. contributions of protected areas, units that cross BLCF boundary).
- Proposing new silviculture treatments to enhance resource values (eg. small patch and partial cutting, deadfall removal).
- Expand protection in key high conservation value riparian habitats while relaxing constraints in lower value areas (eg. apply new stream class, obtain FSC certification, capture rare ecosystems).

6.9 WILDLIFE FOREST COVER CONSTRAINTS

The current landbase netdown and forest cover constraints will be examined in light of the MPB attack to determine their current and future suitability to meet FRPA objectives for Species at Risk (Grizzly Bear), Regionally Important Wildlife (Moose), and Ungulate Winter Range (Moose and Deer).

Analysis of new inventory data (PEM/VRI/LiDAR) will be used to determine if the current netdowns and constraints are meeting the biodiversity and wildlife habitat objectives developed and implemented prior to the extensive beetle kill.

6.10 WILDLIFE FEATURES

Knowing the locations of priority ecological communities and species present in a Community Forest can help managers implement both coarse- and fine-filter strategies.

6.10.1 Coarse Woody Debris

CWD management is particularly important because of its impact on productivity: forest productivity in terms of soil-function and tree growth, and ecosystem productivity in terms of habitat. CWD is one of the major inputs of organic matter to forest soils and is critical for soil function, structure, and productivity.

We will explore considering and planning for CWD prior to conducting harvesting operations.

6.10.2 Wildlife Tree Retention

The goal of retaining wildlife trees is to promote healthy functioning ecosystems that provide wildlife habitat elements at the forest stand level. This will be promoted by maintaining forest stand structural attributes of natural forests, within managed stands, through wildlife tree retention areas.

We will explore the management options for the various wildlife features and may consider revisions to the FSP.

6.11 ECOSYSTEM RESTORATION FUNDING

The ecosystems in the Community Forest have been heavily impacted by the MPB attack and restoration of these ecosystems is necessary to maintain the timber supply.

FLNRO is currently developing the Forest Enhancement Program that should be operational is fiscal year 2016/2017. This program will undertake salvage harvesting of dead timber, wildfire risk reductions and fuel management operations, and will enhance reforestation efforts and wildlife habitat restoration of stands severely impacted by wildfires and MPB.

The increased investment (in reforestation) will restore and enhance wildlife habitat that has been disturbed by the MPB infestation and the accompanying large-scale salvage harvesting that occurred.

We will explore using funding from the Forest Enhancement Program to implement ecosystem restoration in the areas impacted by the MPB. Requirements for timber, wildlife and vegetation and non-timber resources will be considered in the implementation of ecosystem restoration.

High priority sites will be identified for potential enhancement or restoration projects using metrics which calculate the maximum social and ecological benefits or to make up localized ecological deficits.

7. CREATION AND SALE OF CARBON OFFSETS

Carbon offset creation can change the way many people, businesses, and communities value and manage the forest resources.

In April 2015, the Province of BC signed an Atmospheric Benefits Sharing Agreement with the Cheakamus Community Forest that enables the creation and sale of carbon offsets through improved forest management. BLCF believe that it may be possible to build a carbon management strategy that aligns with the timber harvesting, silviculture and environmental programs, which can diversify the Community Forest's revenue streams and meet broader social goals.

As part of the forest management program, the BLCF will be investigating ways to:

- Obtain an Atmospheric Benefits Sharing Agreement.
- Develop an inventory of potential carbon pools.
- Identify the types and cost-benefit of potential improved forest management activities including conservation, reforestation, avoided deforestation, increased utilization, ecosystem restoration, and longer lasting products.

This project is still in the preliminary development stage.

8. ECONOMIC MODEL

8.1 OVERVIEW

We will undertake an economic model project in early 2016 with the goal to build the analytical forest-level tools to:

- Explore an expansion of the Pl salvage program.
- Explore the economics of an understory protection program.
- Understand shelf-life of the various fibre baskets.
- Explore the utilization and sales of pulp logs.
- Understand the cost structures and delivered wood costs.

This will be accomplished by:

1. Using Patchworks as the analytical forest-level tool to integrate all information. This will provide the ability to include the spatial elements of realistically harvesting this fibre and allow us to test the impacts of different options on the mid- and long-term financials and timber supply.
2. Developing a delivered log cost model. This may include variable costs for road construction, hauling, logging, and silviculture, as well as fixed costs for development, administration, and stumpage.
3. Developing a fibre value model that may include:

a. The log/fibre and understory information collected in the new inventory.
b. A shelf-life model to predict the change in value over time of the different log/fibre grades in the target stands.
c. Log prices and market scenarios.

8.2 EXAMINE OPTIONS TO REDUCE SILVICULTURE COSTS IN LOW VOLUME PL SALVAGE

A subset project of the economic modeling will examine options to reduce silviculture costs in low volume Pl salvage stands. This project is a key step in the implementation of the understory protection program.

The biggest challenge in partial cutting is the increased cost of extracting the fibre. Logging costs are always higher than clearcutting, which can make this harvesting system uneconomical in many stands. Another important cost component is the requirement to meet free growing obligations, which in many stands will make them uneconomical to salvage.

The goal of this project is to assess the impact of silviculture obligation costs on the ability to economically use partial cutting in a secondary phase salvage program. This analysis would focus on a matrix of stand and understory conditions representing the spectrum across the target stand types.

The intent of the analysis is to determine the extent to which silviculture costs, under current legislation, would impair the ability to implement a secondary phase of savage.

9. EXAMINE OPTIONS TO IMPROVE MARKET OPPORTUNITIES

The goal of this project is to examine short- and mid-term opportunities for the four fibre baskets on the Community Forest; dead Pl sawlogs, green sawlogs, pulp logs, and bioenergy fibre.

This project is well underway and has produced some opportunities including a potential market for pulp logs.

10. FOREST ESTATE MODEL

A forest estate model will be developed for the Community Forest and will incorporate the new forest cover inventory, new information on Pl volumes, PEM, economic model, silviculture program components, and environmental data.

The use of the forest estate model, Patchworks is central to the new forest management program. Patchworks is well-suited to addressing the issues facing the BLCF and with the economic model it should provide superior results.

This analysis will systematically explore the costs of the various netdowns, forest cover constraints, and assumptions. Changes to the THLB and inoperable definitions will also be explored. All analyses will have the goal of getting the best environmental value with the lowest impact on the mid-term timber supply shortfall.

The results of this analysis will include a Data Package which details all the data and a Timber Supply Analysis Report with the various scenarios and sensitivity analyses.

11. MPB MITIGATION PLAN

Once all the new data is collected and analyzed, it will be available for incorporation into the timber supply model. Various scenarios will be run to examine opportunities, as well as consequences of various assumptions.

This will lead to the development of a MPB Mitigation Plan[9], which is envisioned as:

- Detailing all of the improvements in the data;
- Providing up-to-date landbase summaries;
- Detailing proposed changes to forest management practices;
- Detailing proposed changes to future silviculture regimes;
- Proposing intensive silviculture practices;
- Detailing results of economic studies and resulting strategies;
- Proposing changes to environmental protection practices;
- Revising the timber supply forecast and spatial harvest plan;
- Communication to agencies and training to staff and contractors.

11.1 UPDATE MANAGEMENT PLAN

Once the Mitigation Plan is approved by the Board of Directors and discussed with FLNRO, the BLCF Management Plan will be amended and submitted.

[9] Due to confidential nature of some of the economic data, some sections may not be publically available.