



# **BARLEY COMMUNITY FOREST MANAGEMENT PLAN #2**

Community Forest Agreement K3S

**Barkley Community Forest Limited Partnership**

**August 12, 2024**

## Signatory Page

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**Licence: Community Forest Agreement K3S**

**Licensee: Barkley Community Forest Limited Partnership**

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Acronyms

AAC	Annual Allowable Cut
BC	British Columbia
BCF	Barkley Community Forest
BCFC	Barkley Community Forest Corporation
BEC	Biogeoclimatic Ecosystem Classification
CFA	Community Forest Agreement
CHR	Cultural Heritage Resource
CMT	Culturally Modified Tree
CWS	Community Watershed
DBH	Diameter at Breast Height
EFZ	Enhanced Forestry Zones
FDU	Forest Development Unit
FLNRORD	Forest Lands Natural Resource Operation and Rural Development
FMLB	Forest Management Land Base
FPPR	Forest Planning and Practices Regulation
FRPA	Forest and Range Practices Act
GAR	Government Action Regulation
GIS	Geographical Information System
HLP	Higher Level Plan
LU	Landscape Unit
NAR	Net Area to be Reforested
NDT	Natural Disturbance Type
NHLB	Non-Harvestable Land Base
OGMA	Old Growth Management Area
RMZ	Resource Management Zone
ROA	Reasonable Opportunity Agreement
RPF	Registered Professional Forester
SI	Site Index
SIRD	South Island Resource District
THLB	Timber Harvesting Land Base
TSA	Timber Supply Area
UWR	Ungulate Winter Range
VILUP	Vancouver Island Land Use Plan
VLI	Visual Landscape Inventory
VQO	Visual Quality Objective
VRI	Vegetation Resource Inventory
WHA	Wildlife Habitat Area

# 1 Introduction

The Barkley Community Forest encompasses 6,567 ha between the shores of Barkley Sound in the southwest to Draw Lake in the northeast. It includes Mt. Ozzard and much of the Maggie Lake watershed (Figure 1 – Barkley Community Forest Overview Map). These lands are part of the traditional territory of the Toquaht and Ucluelet First Nations, who have been stewards of this land since time immemorial. The community forest is an important step towards reinforcing this historical link to the land and towards building partnerships between communities.

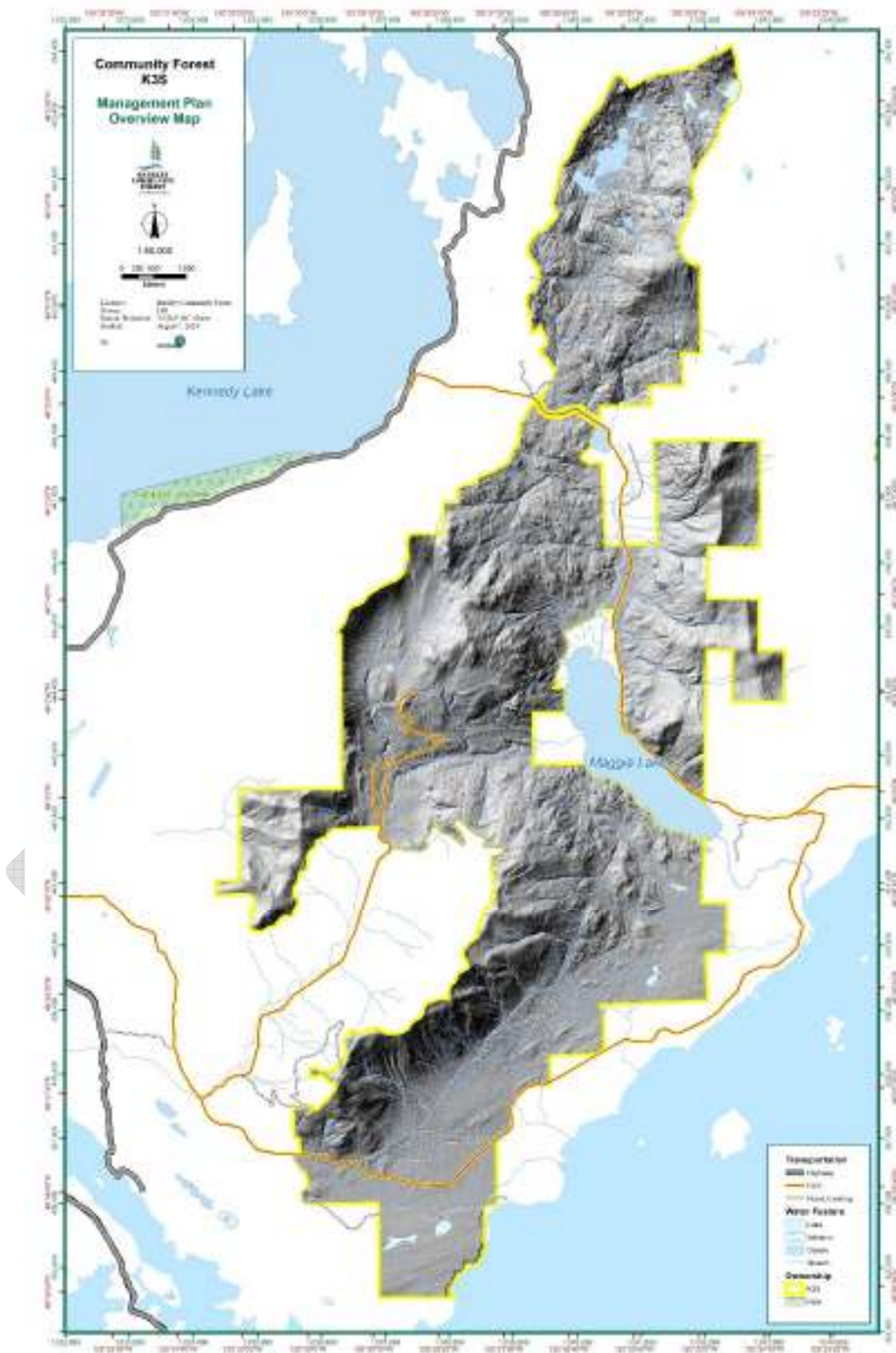
The Barkley Community Forest Agreement (CFA) was awarded in 2014 to the Barkley Community Forest Corporation, which is owned in equal partnership by the District of Ucluelet and the Toquaht Nation. Each partner appoints three members to a board of directors that oversees the management and operation of the community forest.

This management plan, which replaces the original plan that was prepared in 2014 as part of the CFA application, outlines the principles which guide the management of the community forest and explains how the BCFC will report to the community. It contains or describes the inventory information for the various resources within the community forest and the objectives for the management of these resources. These inventories and objectives are the primary inputs to the timber supply analysis which determines the sustainable rate of harvest, also known as the annual allowable cut (AAC), proposed within this plan.

## 2 Guiding Principles

1. Sustained ecosystem function, diversity and complexity are the foundation of the social and economic benefits provided by the community forest.
2. Local indigenous knowledge, cultures, and traditional practices are integral to the proper management of the community forest.
3. All persons with an interest or involvement in the management, use or operation of the community forest will be treated with respect.
4. Forest management decisions are made to ensure the long-term economic viability of the community forest business.

Figure 1. Barkley Community Forest Overview Map



## 3 Annual Reporting

### 3.1 OPEN HOUSE

Each year the BCFC will hold a public open house and present information on activities and achievements related to:

- The provincial community forest agreement program objectives.
- The BCF guiding principles.
- The BCF objectives and annual goals.

The open house will also be an opportunity for the public to pose questions and provide feedback to the BCFC board and managers. This public open house will be in addition to the reporting of activities required under the S.86 of the Forest Planning and Practices Regulation (FPPR).

### 3.2 FOREST OPERATIONS MAP

Consistent with S.15.1 of the *Forest Planning and Practices Act*, all proposed roads and blocks within the BCF will be advertised for public review and comment and shared through the Forest Operations Map (FOM) online portal. All comments received will be reviewed and addressed in the submission of new road or cutting permit applications to the Ministry of Forests.

Notices of new FOMs will be advertised in the local paper and on the Barkley Community Forest website ([www.barkleyforest.ca](http://www.barkleyforest.ca)).

## 4 Management Objectives

### 4.1 BROAD SOCIAL, ECONOMIC AND ECOLOGICAL MANAGEMENT GOALS

1. To establish and maintain a healthy and productive forest that provides economic, social, cultural and environmental benefits to both current and future generations.
2. To realize the potential of the forest land to host a diversity of viable economic activities with an emphasis on local employment and value-added opportunities.
3. To administer the community forest in a business-like manner to ensure financial viability and generate a fair rate of return on investment.
4. To encourage and advance a sustainable and profitable non-timber harvest sector.
5. To undertake progressive forest management practices.
6. To restore degraded forest lands to contribute ecological and economic benefits.
7. To provide the local communities with long term access to the forest.
8. To promote partnerships between aboriginal and non-aboriginal people where all people and their values and priorities are respected.
9. To conduct management in an open and honest manner with respectful consideration of varying community perspectives.
10. To ensure workers are treated with respect and all operations are conducted in a safe manner.

## 4.2 RESOURCE MANAGEMENT OBJECTIVES

The provincial management objectives for forest resource values are contained within the Forest Planning and Practices Regulation (FPPR). These objectives align with the guiding principles of the BCFC as they relate to forest stewardship. The BCFC has developed more detailed objectives for the management of landscape level biodiversity which incorporate the recommendations of the 2020 old growth strategic review “A New Future for Old Forests”. These can be found in Section 6 of this plan.

Operational results, strategies and practices for meeting these objectives, which meet or exceed provincial targets and legal requirements, are detailed in the BCFC’s Forest Stewardship Plan (FSP).

The timber supply analysis report in Appendix 2 details how the management objectives and operational results and strategies are incorporated into the modelling process to calculate a sustainable rate of harvest. This analysis is an integral part of this management plan and readers are encouraged to review it.

## 5 Resource Inventories

Inventory information for the multiple resources encompassed by the BCF is integral to the successful management of the BCF. This section of the management plan describes the best resource inventory information currently available to the BCFC and how this data is accessed and managed.

How this information is incorporated into the timber supply analysis (TSA), which is used to determine a sustainable AAC, is discussed in detail in the timber supply analysis report in Appendix 2.

Where applicable, the source, quality and opportunities for improvement of the respective inventories is discussed. The BCFC is committed to continually improving the quality and breadth of inventory information available to support management decisions.

### 5.1 WATER

The stream, lake and wetland inventories are made up of a combination of detailed field traverse and classification, historic TFL 44 data, and a LiDAR derived stream layer. All water/watercourse inventory data is stored in a mapping geodatabase and is updated whenever new information is received – typically through field verification of the LiDAR derived stream layer.

Where stream classification information is available, the applicable riparian reserve and management zone layers are also stored in the BCF geodatabase. Where stream classifications have not been confirmed, default classifications and net-down areas are used.

A small portion of the Mercantile Creek Community Watershed is located within the BCF.

Streams, lakes, wetlands and the community watershed are shown on the map in Appendix 1.

### 5.2 ECOSYSTEM CLASSIFICATION

Provincial Terrestrial Ecosystem Mapping (TEM) data is maintained by the Ministry of Forests and is publicly available through the BC Geographic Warehouse. This data contains the projected area by site series for each biogeoclimatic subzone and, in some cases, information on other forest structural attributes. The BCFC has used this data to perform landscape level ecosystem representation analysis.



Detailed site level ecosystem classification to determine appropriate silviculture systems, including regeneration strategies, is performed for each harvest area and this data is stored in the BCF geodatabase.

Information on Red and Blue listed plants, animals and ecosystems is administered by the Conservation Data Center and is also publicly available. Red listed species or ecosystems are ones at risk of being extirpated, endangered or threatened. Blue listed species or ecosystems are ones of special concern. There are currently no documented occurrences of red or blue listed ecosystems in the CF.

### 5.3 WILDLIFE

A number of wildlife species are known to inhabit the BCF but complete habitat or population inventories are not available for most of them. Site level surveys are conducted where during the development planning process with results incorporated into block specific management prescriptions. Habitat information collected through this process (e.g. the location of bear dens, eagle nests etc.) is stored in the geodatabase for the BCF and shared with the provincial government when required or requested.

In 2020 the Ministry of Environment completed a low-level aerial survey and classification of Marbled Murrelet (MAMU) habitat in BC to support the Implementation Plan for the Recovery of Marbled Murrelet. The BCFC has committed to maintaining all suitable MAMU habitat within the BCF and supports the establishment of new wildlife habitat areas (WHA) to meet the spatial reserve requirements of the provincial notice and order, which make up the provincial implementation plan.

Identified MAMU habitat is shown on the map in Appendix 1.

### 5.4 SOILS AND TERRAIN

Terrain stability class mapping was previously available through the BC Geographic Warehouse but is no longer published or publicly available. Historic terrain stability class is stored within the BCF geodatabase. LiDAR data acquired by the BCFC in 2018 contains detailed slope information and is used to determine operability for timber harvesting.

A landslide inventory for the Draw Creek, Maggie River and Twin Rivers watersheds was recently completed by the Toquaht Nation. This data is also stored in the BCF geodatabase and will be used in future operational planning for restoration and development projects.

Detailed soil and slope stability information is also collected at the site level during operational planning. This information is stored on the BCF electronic database and, if spatial products are produced, in the BCF geodatabase.

### 5.5 ROADS

The road and access inventory are derived from the provincial road tenure database and through the mapping of historic (deactivated and overgrown) roads from LiDAR data. The LiDAR hill shade and slope layers quite clearly illustrate old road locations which are then interpreted and added to the 'transportation' layer in the BCF geodatabase. Road area is then netted out of the operable land base based on size, usage and age.

## 5.6 CULTURAL HERITAGE

The BCF contains several areas of significant cultural heritage resources. These areas remain confidential and are not shown on the management plan map. Management of cultural heritage resources is guided by the recommendations of the Toquaht and Ucluelet First Nations as well as the Heritage Conservation Act and, where required, the work of professional archaeologists.

## 5.7 RECREATION

Other than the trail to the Vets surf break, which is captured in the road inventory, there are currently no known recreation trails within the BCF. The BCFC is actively working with the Ucluelet Mountain Bike Association (UMBA) to plan and construct new trails within the BCF. These trail locations will be maintained in the BCF geodatabase.

## 5.8 VISUAL LANDSCAPE

The visual landscape inventory for the BCF is maintained by the BC Ministry of Forests and is publicly available through the BC Geographic Warehouse. Visual quality objectives (VQO) for a number of areas within the BCF were established through the Government Actions Regulation in 2005 and amended in 2011. The established VQOs are shown on the management plan map in Appendix 1.

## 5.9 TIMBER

The timber inventory is maintained by the BC Ministry of Forests Forest Inventory Branch. The vegetation resource inventory (VRI) data used in the timber supply analysis for this management plan was created in 2014 and projected to 2020. The timber supply analysis will project this data a further four years to 2024.

Timber inventory polygons have been updated to capture recent harvesting and the forest cover information for these areas is derived from recent silviculture surveys or, in the case of very recent blocks, planting information. The timber type polygons used in the timber supply analysis for this management plan are shown and labelled on the map in Appendix 1.

# 6 Biodiversity and Old Forest Management

Biodiversity is the diversity of plants, animals and other living organisms in all their forms and levels of organization, and includes the diversity of genes, species and ecosystems, as well as the evolutionary and functional processes that link them<sup>1</sup>.

In keeping with the BCFC's first guiding principle, that forest resources are managed in a way that ensures sustained ecosystem function and diversity and with the province's intention to implement all of the recommendations of the 2020 old growth strategic review titled "A New Future for Old Forests", this management plan specifically addresses the conservation of biodiversity and the management of old forests within the BCF.

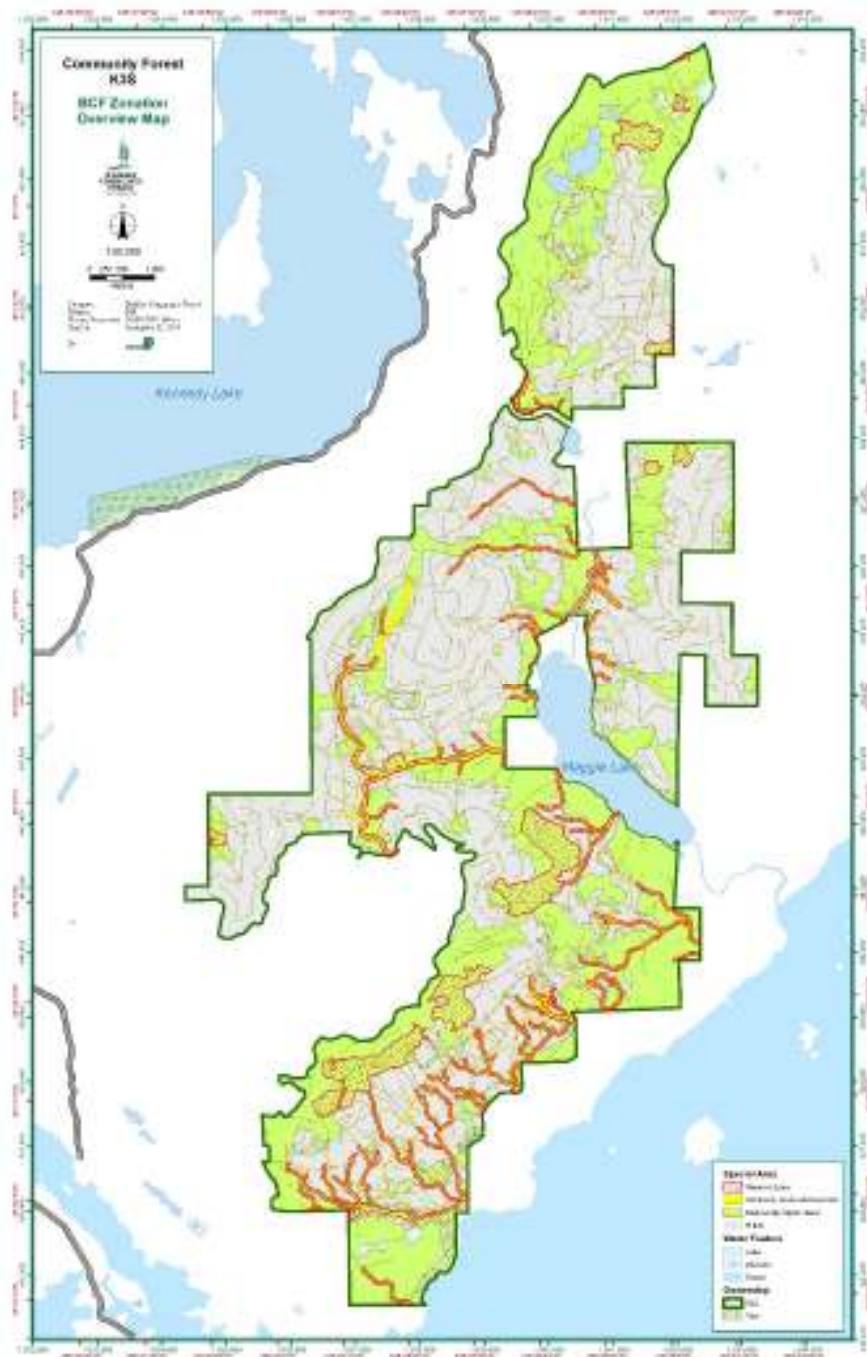
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<sup>1</sup>BC Ministry of Environment, Biodiversity Guidebook, 1995.

### 6.1 ZONATION

To achieve the biodiversity management objectives, the community forest land base has been divided into three zones - a Reserve Zone, Biodiversity Management Zone, and Timber Management Zone. Each zone contributes to both the coarse filter strategy, which broadly equates to maintaining representative habitat and seral stages for a range of species known and unknown, and a fine filter strategy where specific species or habitat features are managed.

Figure 2: Management Zones Overview Map



### 6.1.1 RESERVE ZONE

The Reserve Zone consists of statutory reserves such as Wildlife Habitat Areas (WHA), Wildlife Tree Retention Areas (WTRA), and Riparian Reserve Zones (RRZ). No harvesting is permitted from these areas and they are 100% removed from the timber supply analysis. These legally established reserves make up part of both the fine and coarse filter strategies.

The Reserve Zone currently makes up 1,154 ha or 17.5% of the community forest. Amendments to this zone will be made as specific species, habitat features or sensitive areas are identified through detailed fieldwork or improved inventory information and new WTRA is established by the BCFC. Changes may also be made by the province through the establishment of new WHA, OGMA or other statutory reserves.

- Additional riparian reserve zones will be established as additional detailed stream assessments and classification is completed. A net down for riparian reserve and management zones on unclassified streams has been included in the timber supply analysis.
- Additional WHAs will be established for Marbled Murrelet. All Marbled Murrelet habitat has been excluded from the timber supply analysis and is currently contained within the Biodiversity Management Zone.
- As required under the *Forest Planning and Practices Regulation*, additional WTRA will be established concurrent with site level harvest planning to capture unique or sensitive ecosystems and wildlife habitat features that are identified during fieldwork. These areas will become part of the Reserve Zone. An aspatial net down of 7% has been applied to all polygons to account for the establishment of stand level WTRA.

### 6.1.2 BIODIVERSITY MANAGEMENT ZONE

The Biodiversity Management Zone (BMZ) is designed to retain and recruit representative old forest ecosystems and to provide connectivity between them. Together with portions of the Reserve Zone, it provides habitat for the range of plant and animal species within the community forest and represents the coarse filter approach to biodiversity management. The BMZ is integral to meeting the biodiversity management objectives for the BCF which are discussed in detail in section 6.2.

The BMZ is 2,720 ha in total and represents 41% of the community forest area. It encompasses the majority of the 1,154 ha of the reserve zone as well as areas otherwise excluded from the timber supply analysis because they were considered to be non-merchantable, have low stocking, or be inoperable terrain.

An additional 964 ha that were considered available for harvest in the previous management plan are included in the BMZ to provide connectivity and ecosystem representation. This additional 964 ha equates to 35% of the BMZ and 15% of the community forest as a whole.

The BMZ is shown in Figure 2 and on the MP map in Appendix 1 and is 100% removed from the timber supply analysis. However, provided the biodiversity management objectives continue to be met, some harvesting is expected to take place in this zone. This might include thinning of second growth stands to recruit old forest structure, harvest of windthrow or damaged timber (recognizing these trees also have ecological value), or small to medium sized blocks with retention of stand structural attributes.

The boundaries of this zone may change as better inventory information is collected and second growth stands mature. Stand succession and ecosystem processes are dynamic and our understanding of them is incomplete, it is thus important that flexibility is incorporated into management strategies.

### 6.1.3 TIMBER MANAGEMENT ZONE

The Timber Management Zone is the remainder of the community forest after the delineation of the Reserve and Biodiversity Management zones. It is also referred to as the timber harvesting land base (THLB). The primary objective in this zone, subject to the requirements of the BCF Forest Stewardship Plan and the operational requirements of the *Forest Planning and Practices Regulation*, is the growing and harvesting of timber.

That said, this zone will also contribute to landscape level biodiversity by providing habitat for early and mid-seral plant and wildlife species.

## 6.2 BIODIVERSITY MANAGEMENT OBJECTIVES

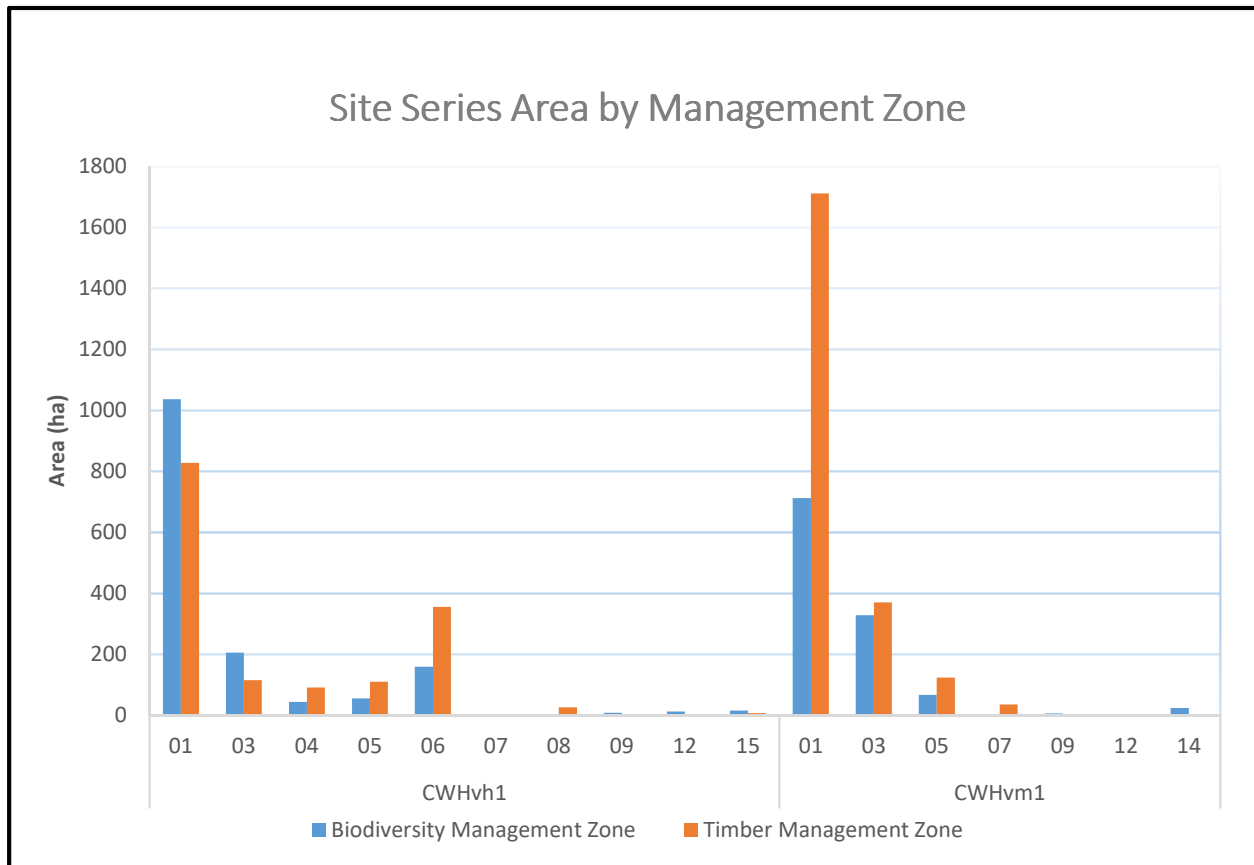
1. Maintain or recruit representation of all ecosystems within the community forest in an old growth condition.
2. Retain all rare ecosystems and habitat for threatened or endangered species.
3. Maintain connectivity between representative ecosystems within the BCF.
4. Maintain a minimum of 25% of the community forest as old forest.
5. Maintain old forest stand structural attributes when harvesting in the Biodiversity Management Zone.

### 6.2.1 ECOSYSTEM REPRESENTATION

There are two biogeoclimatic (BEC) subzones within the Barkley Community Forest, the Coastal Western Hemlock Very Wet Hypermaritime zone (CWHvh) and the Very Wet Maritime zone (CWHvm). Each of these subzones contains a range of Site Series defined by their relative soil moisture and nutrient regimes. Distribution of these site series within each subzone is available from the provincial Terrestrial Ecosystem Mapping (TEM) data layer.

The Biodiversity Management Zone (BMZ), which encompasses the Reserve Zone, and makes up 41% of the community forest land base, is intended to maintain or recruit representative ecosystems in a mature seral (old forest) condition.

Figure 3. Site Series Area by Management Zone



As illustrated in Figure 2, the majority of the BCF is made of up zonal sites with an average soil nutrient and moisture regime.

Figure 4. CWHvh1 BMZ Site Series Representation

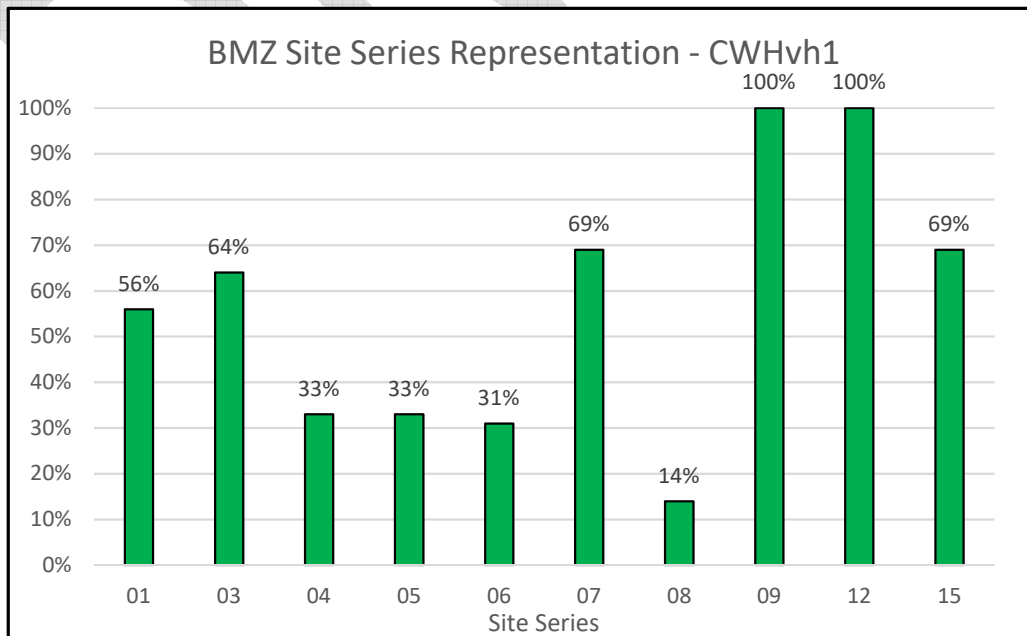
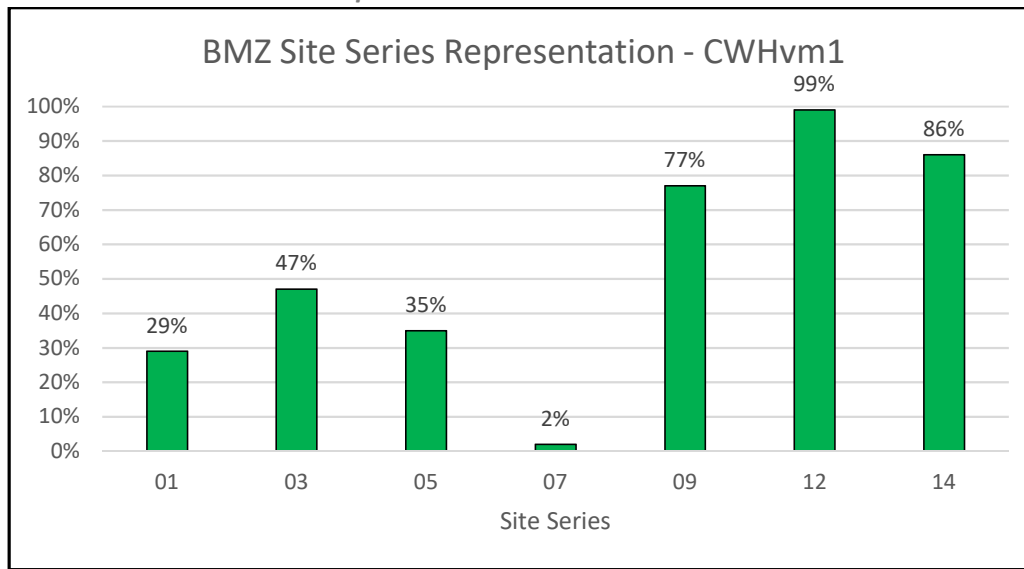


Figure 5. CWHvm1 BMZ Site Series Representation



Thirty percent ecosystem representation is widely considered the threshold to avoid a high risk of biodiversity loss. With the exception of the CWHvh1 08, CWHvm1 01 and 07, the BMZ encompasses at least 30% of the range of site series within the Barkley Community Forest. However, this analysis does not include the spatial reductions for riparian management outside of the BMZ or aspatial reductions for operability (10%) or new WTRA (7%) establishment. When these areas are designated, a minimum of 30% representation will be achieved for each site series within the community forest.

#### 6.2.2 RARE SPECIES, ECOSYSTEMS AND HABITAT

There are currently no known red or blue listed ecosystems within the community forest. The provision for the establishment of a further 7% of the community forest as wildlife tree retention areas (WTRA) is included in the timber supply analysis to allow for protection of these areas if they are identified during fieldwork. Larger areas may also precipitate changes to the BMZ to ensure connectivity and interior forest habitat are maintained if necessary.

The only red listed (endangered) species known to inhabit the community forest is Marbled Murrelet (MAMU). All identified MAMU habitat is contained within the BMZ and is expected to be established as legal WHA, which would then move that area into the Reserve Zone.

#### 6.2.3 CONNECTIVITY

The BMZ was established using the old forest stands as anchors with meaningful corridors that will provide some interior forest habitat established between them. In addition, connectivity between upper and lower slopes was considered. Riparian corridors will further add to the connectivity and distribution of old forest.

#### 6.2.4 OLD FOREST REPRESENTATION

For the purposes of this management plan, stands over 120 years of age (age class 7+) are considered old forest. Approximately 2,223 ha or 34% of the community forest land base is currently composed of stands considered to be old forest. These stands are all within the BMZ.

Within the timber management zone, which is also referred to as the timber harvesting land base, approximately 97% of the stands are less than 60 years old due to the rapid rate of first pass harvesting. These stands are well stocked and growing quickly but have a relatively low merchantable volume and value. In order to allow these stands to continue to grow, the minimum harvest age has been set to 90% of culmination – the age at which growth starts to slow down. When harvested, these stands will have a higher volume and value per hectare with less waste.

All of the old forest is contained within the BMZ but in order to manage the transition to second growth harvesting, a portion of these stands will be eligible for harvesting over the next 35 years provided the amount of old forest does not drop below 25% of the community forest area.

By allowing the second growth stands to reach maturity, this strategy will see the long run sustainable harvest from the timber harvesting zone increase from 12,600 m<sup>3</sup>/year to 19,645 m<sup>3</sup>/year and the overall old forest representation increase from 34% to 58% of the community forest area. Of this 58%, 41% is within the BMZ and the remaining 17% is made up of wildlife tree retention areas and inoperable terrain. This additional 17% will be defined spatially as detailed harvest planning takes place.

#### 6.2.5 HARVESTING IN THE BIODIVERSITY MANAGEMENT ZONE

Any harvesting in the BMZ will be designed to maintain stand structural attributes. This will be achieved through patch cut silviculture systems that create openings less than 1.0 ha or through a combination of in-block dispersed or patch retention.

## 7 Proposed Annual Allowable Cut

The proposed allowable annual cut for the Barkley Community forest is:

**12,600 m<sup>3</sup>/year**

The Barkley Community Forest Corporation board of directors and management staff have carefully considered several timber supply model scenarios and sensitivity analyses and determined that this rate of harvest meets the objectives of the community forest by:

- Incorporating the best available inventory information.
- Accurately reflecting good operational forest harvesting practices.
- Allowing for the recruitment of old forest representation across the range of ecosystems within the community forest.
- Providing or recruiting old forest connectivity.
- Allowing immature second growth stands to reach at least 90% of culmination age and thereby:
  - Increasing the volume and value at harvest.
  - Increasing the projected long run sustainable harvest to 19,645 m<sup>3</sup>/year.
- Balancing economic and ecological objectives by allowing some old forest harvesting during the transition to a complete second growth harvest profile.
- Providing flexibility to incorporate new inventory information to operational planning and prescriptions.

The data sources, model description, land base summary, spatial netdowns, and analysis results are contained in the timber supply analysis in Appendix 2.



## 8 Appendix 1: Management Plan Map

DRAFT

**Community Forest  
K3S  
Management Plan  
Map**



Licensee: Barkley Community Forest  
 District: 003  
 Design Project: NAD 83 BC Atlas  
 Date: August 12, 2024  
 By: econ

- Transportation**
- Highway
  - FSR
  - Road, Existing
  - Road, Traversed
  - Road, Temp.
  - Road, Overgrown
  - Road, React.
  - Road, Deact.
  - Road, Proposed
  - Trail, Existing
  - Trail, Traversed
  - Trail, Temp.
  - Rec. Trail, Non-Legal
  - Grade
  - Rec. Trail, Legal

- Line**
- Bluff
  - Hydroline
  - Waterline
  - Gasline
  - Forest Cover

- Watercourse**
- Unclassified
  - S1
  - S2
  - S3
  - S4
  - S5
  - S6
  - NCD
  - FSZ

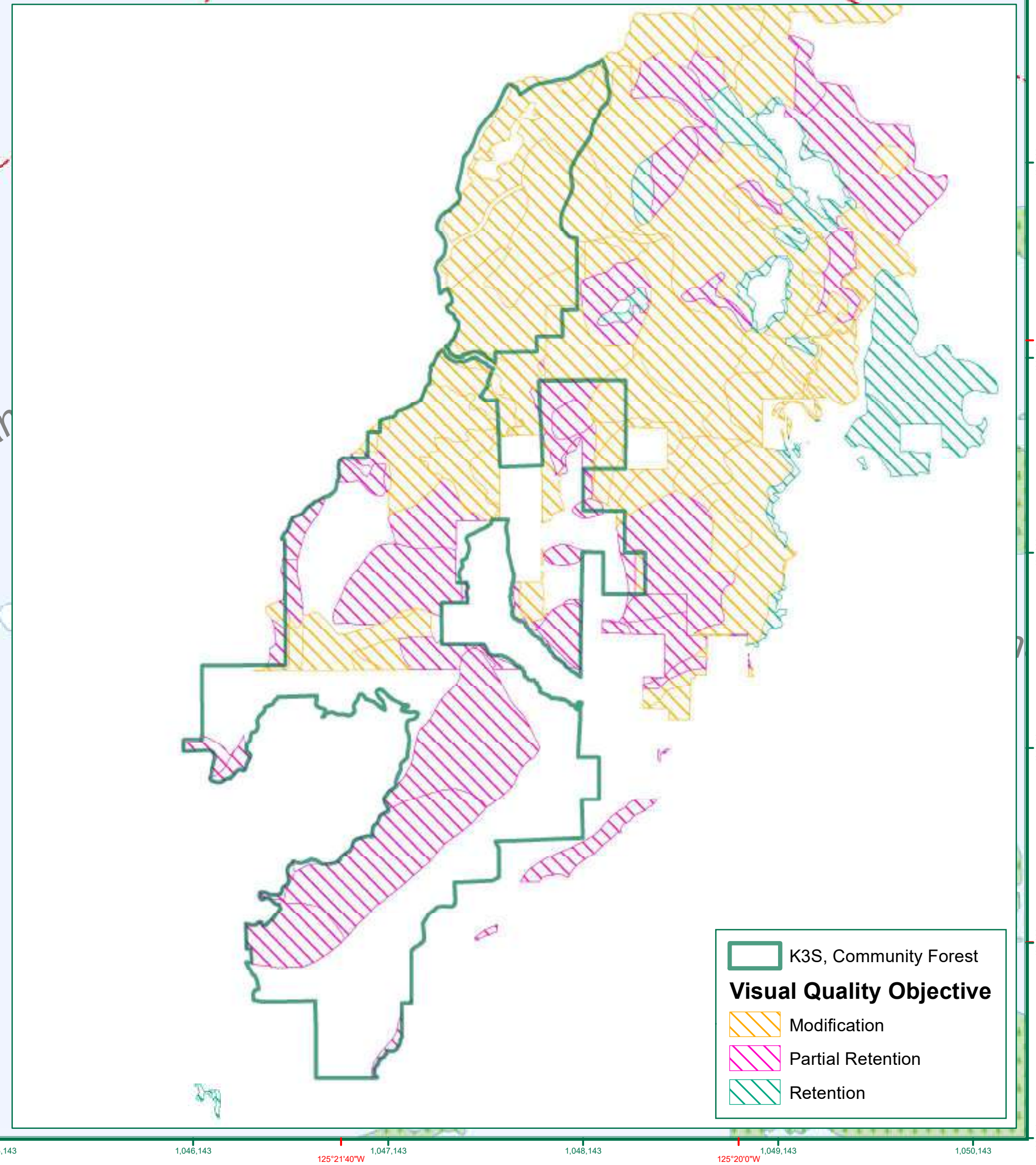
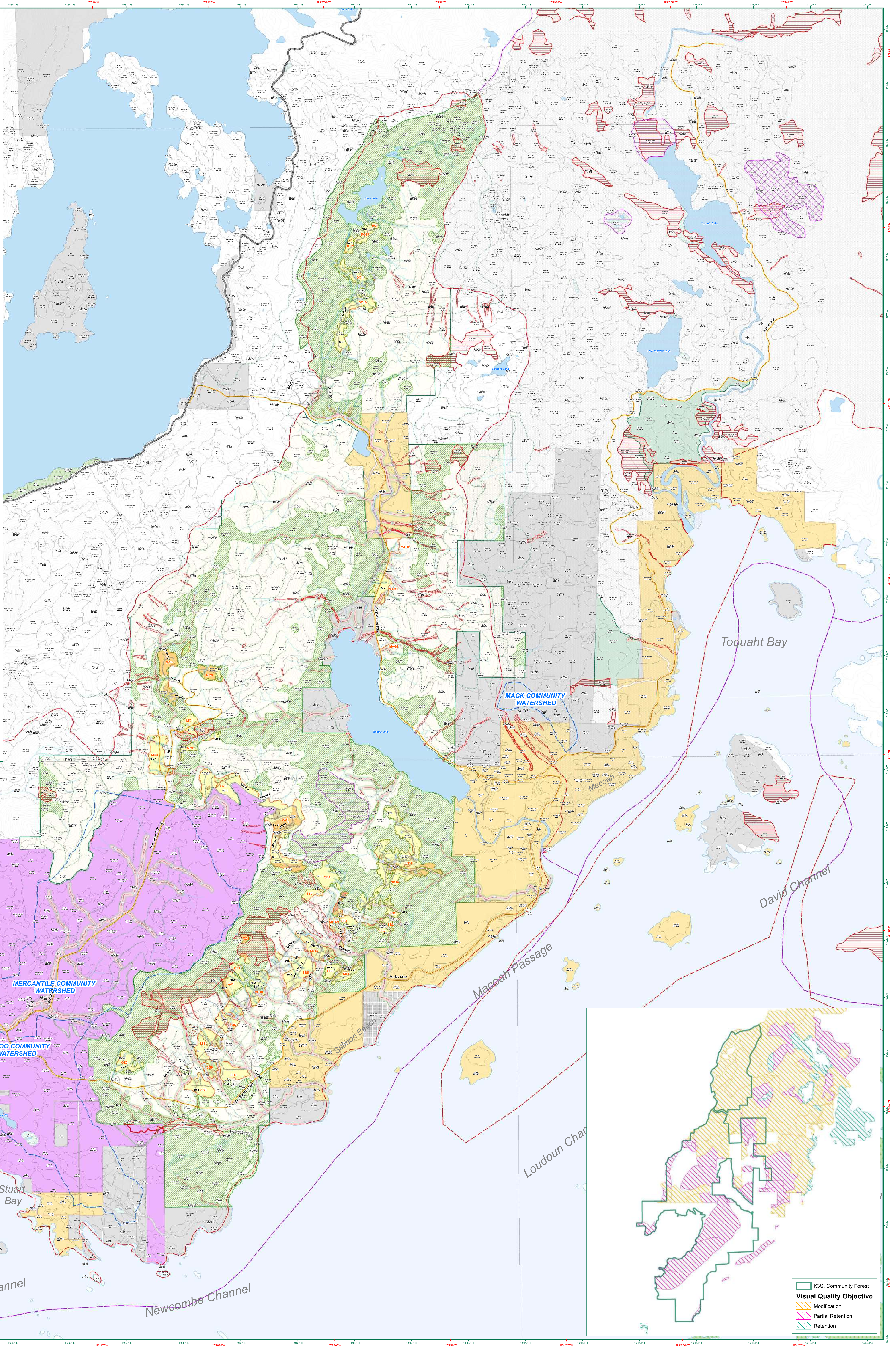
- Water Feature**
- Lake
  - Wetland
  - Ocean
  - Riparian Management Zone
  - Riparian Reserve Zone

- Standard Unit**
- SU-1, A
  - SU-2, B
  - SU-3, C
  - SU-4, D
  - PAS
  - NPR
  - TLA
  - WTRA
  - Block

- Special Area**
- Wildlife Habitat Area
  - Ungulate Winter Range
  - OGMA, Legal
  - MAMU Habitat
  - Community Watershed
  - Slide
  - Landscape Unit
  - VILUP EFZ
  - VILUP GMZ
  - Biodiversity Management Zone

- Ownership**
- K3S, Community Forest
  - Woodlot W1903
  - Private Land
  - Park

- Treaty Settlement Lands**
- Toquaht Nation
  - Ucluelet First Nation



- Visual Quality Objective**
- Retention
  - Partial Retention
  - Modification

## **9 Appendix 2: Timber Supply Analysis Report**

DRAFT

# Barkley Community Forest, Timber Supply Analysis

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## Management Scenario and Data Package

V 1.1

June 28, 2024

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## **1 Introduction**

This project investigated the timber supply for the Barkley Community Forest (BCF), on western Vancouver Island. This report presents the proposed management scenario for the BCF.

The analysis generally followed the methodology and analysis assumptions of the most recent Arrowsmith TSA Timber Supply Review, with some modifications as per the actual practices and plans in the BCF.

This report details the data inputs and assumptions used for the project. The land base data was updated for depletions and the analysis assumptions were updated when required considering the most recent legal orders and regulatory requirements.

The maximum sustainable even flow is the highest even flow harvest level that can sustain a stable growing stock. In this analysis the maximum sustainable even flow was established first. After this, the short-term harvest was elevated, if possible, without compromising the long-term sustainability of the harvest forecast. Possible increases to the long-term harvest level (LTHL) were tested as well. The transitions to lower or higher harvest levels were not allowed to exceed 10% per decade .

## 2. Study Area

The Barkley Community Forest is located near Ucluelet, on the west coast of Vancouver Island (Figure 1). It is 6,567 ha in size and is entirely within the Coastal Western Hemlock (CWH) BEC zone. It is within the South Island Forest District and the Arrowsmith TSA.

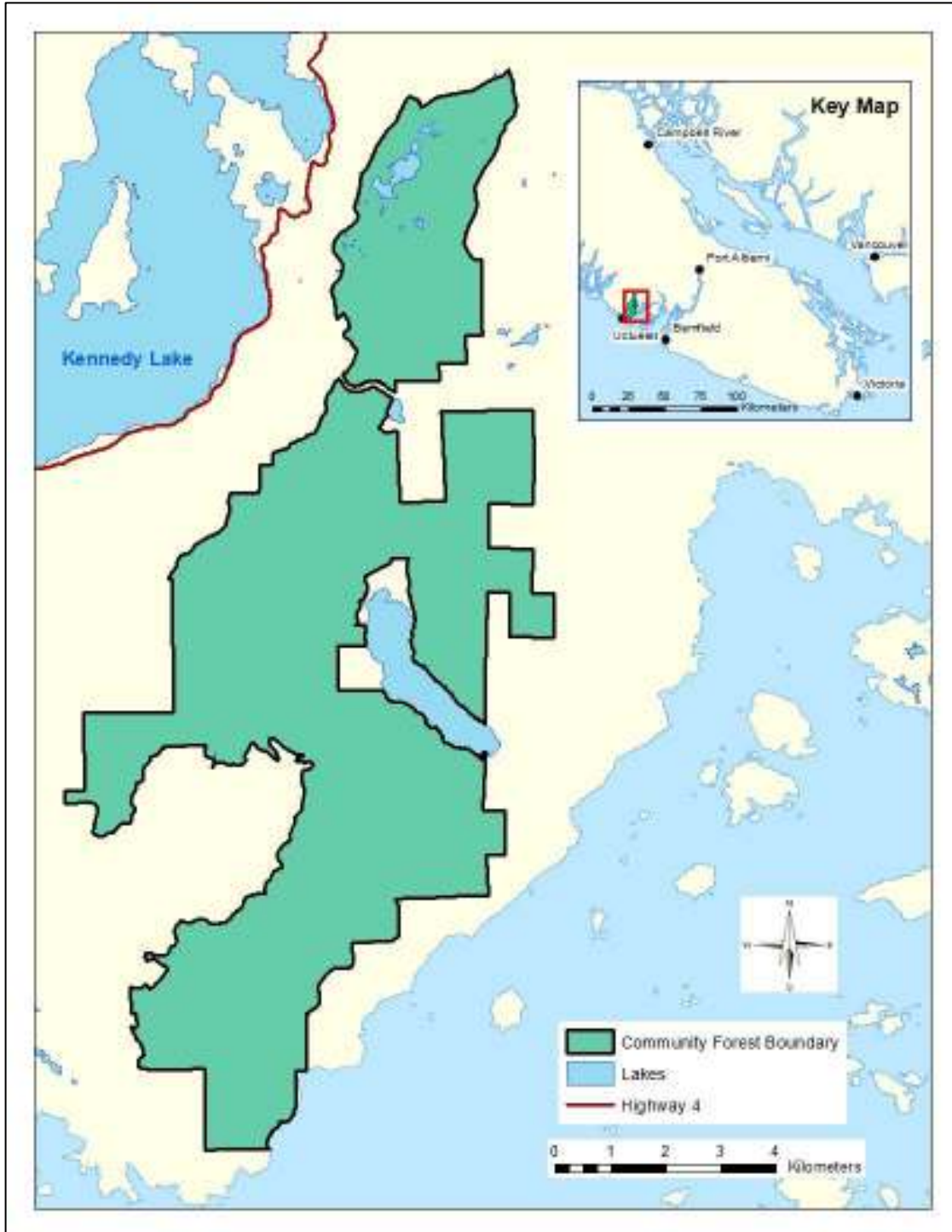


Figure 1: Barkley Community Forest



### 3 Data Sources

The data for this project was either provided by Erik Holbek or downloaded from the BC Geographic Warehouse (BCGW). All data used in the analysis is listed in Table 1.

**Table 1: Data Sources**

Layer Name	Description	Source	Original Name(s)	Date received	Vintage
vri_2022	Forest inventory, projected to 2022	BCGW	WHSE_FOREST_VEGETATION.VEG_COMP_LYR_R1_POLY	7-June-23	2023
bec	Biogeoclimatic Ecosystem Classification, version 12	BCGW	WHSE_FOREST_VEGETATION_BEC_BIOGEOCLIMATIC_POLY	7-Aug-23	2021
biodiv2	Biodiversity Management Zone	BCF	Biodiversity_Mgmt_Zone_V2.shp	14-Mar-24	2024
block	Recent harvest	BCF	Block.shp	17-Nov-23	2023
cons_cutblk	Consolidated Cutblocks	BCGW	WHSE_FOREST_VEGETATION.VEG_CONSOLIDATED_CUT_BLOCKS_SP	10-Oct-23	2023
Enh	VILUP enhanced zone	BCGW	WHSE_LAND_USE_PLANNING.RMP_PLAN_LEGAL_POLY_SVW	5-May-21	2009
K3S_bdy	Community Forest boundary	BCGW	WHSE_FOREST_TENURE.FTEN_MANAGED_LICENCE_POLY_SVW	11-Oct-23	2023
LU	Landscape Units	BCGW	WHSE_LAND_USE_PLANNING.RMP_LANDSCAPE_UNIT_SVW	4-May-21	2021
MAMU	Marbled Murrelet reserves	BCF	Mamu.shp	17-Nov-23	2023
ogma_nl	Non-legal OGMA	BCGW	WHSE_LAND_USE_PLANNING_RMP_OGMA_NON_LEGAL_CURRENT_SVW	10-Oct-23	2023
psp_buf	100m buffer around 2 permanent sample plots (plot coordinates supplied by BCF)	FESL	psp_buf	18-Jan-24	2024
roads	Updated roads	BCF	Roads.shp	5-Jan-24	2024
rd_buf	Buffered roads	FESL	Roads.shp	5-Jan-24	2024
roaded	Areas within 200m of a road	FESL	Roads.shp	17-Jan-24	2024
riparian	Buffers around lakes and wetlands	FESL	WHSE_BASEMAPPING.FWA_LAKES_POLY, WHSE_BASEMAPPING.FWA_WETLANDS_POLY	17-Jan-24	2024
strm_buf	Buffers around streams	BCF	Stream_Buffer_2024_01_03.shp	5-Jan-24	2024
tapog	Technical Advisory Panel Old Growth priority deferral areas	BCGW	WHSE_FOREST_VEGETATION.OGSR_TAP_PRIORITY_DEF_AREA_SP	18-Aug-23	2023
vqo	Visual Landscape Inventory	BCGW	WHSE_FOREST_VEGETATION.REC_VISUAL_LANDSCAPE_INVENTORY	9-Jan-24	2024
wha	Wildlife Habitat Areas	BCGW	WHSE_WILDLIFE_MANAGEMENT.WCP_WILDLIFE_HABITAT_AREA_POLY	10-Oct-23	2023

### 3.1 Forest Cover Inventory

The forest cover data used for this analysis is the Provincial VRI, projected to December 31, 2022. The inventory was updated for depletions, using Consolidated Cutblocks for older harvest, and blocks provided by BCF for recent logging activity (2019-2022).

After adding the depletions to the forest inventory, for all harvested blocks, the expected age was calculated as 2024 – harvest year, and the age in 2024 updated as follows:

1. For all harvest in 2019 or later, age\_2024 = expected age
2. For all earlier harvest, if VRI projected age > (expected age + 5), age\_2024 = expected age
3. If VRI age is null and there is a harvest date, age\_2024 = expected age
4. If polygon is forested, VRI age is null, but no harvest date, assume NSR and set age\_2024 = 0
5. All other stands, update age\_2024 = VRI age + 2

### 3.2 Riparian Data

Classified and buffered streams were provided by BCF. For lakes and wetlands, the Freshwater Atlas was used. The lakes and wetlands were classified as per the Riparian Management Guidebook, based on size. These were buffered, again as per the Riparian Management Guidebook. A summary of the riparian features and buffers is shown in Table 2.

**Table 2: Riparian Features in the BCF**

Riparian Class	Buffer Width (m)	Length (km)	Area (ha)
L1	10		32
L3	15		5
NCL	0		2
W3	15		21
NCW	0		2
S2	40	13	
S3	30	52	
S4	10	15	
S5	5	14	
S6	5	32	
NC	5	139	
NCD	0	9	
<b>Total</b>		<b>274</b>	<b>61</b>

## **4 Description of the Land Base**

### **4.1 Timber Harvesting Land Base**

Land base assumptions define the land base classification in the BCF. The different classes are a result of a land base netdown. The netdown is an exclusionary process. Once an area has been removed, it cannot be deducted further along in the process. For this reason, the gross area of netdown factors (e.g. inoperable) is often greater than the net area removed, a result of overlapping resource issues. The BCF is classified in the following classes:

**Excluded Land Base (EXLB)** — non-forested areas and roads are excluded from the land base. These areas are excluded because they do not contain forest.

**Crown Forest Land Base (CFLB) or Forested Area** – the CFLB is identified as the broader land base that contains forest and can contribute towards meeting both timber and non-timber objectives (i.e., biodiversity). The CFLB is called “**Forested Area**” in this analysis.

**Timber Harvesting Land Base (THLB)** – the THLB is the portion of the forested area considered to be physically, environmentally, economically, and socially available for timber harvesting. It is productive forest land that is harvestable according to current forest practices and legislation.

**Non-Harvestable Land Base (NHLB)** — this is the portion of the forested area where harvesting is not expected to occur according to current forest practices and legislation. There is a possibility that some of these NHLB areas could become harvestable under different economic conditions.

The THLB netdown for the BCF is shown in Table 3. Each netdown line item is further discussed below.

The BCF has defined a biodiversity management zone (BMZ), which includes most of the older stands within the tenure. In the proposed management scenario, the BMZ is a no-harvest zone except for the first 35 years of the planning horizon.

The total area of the BCF in the data file is 6,567 ha, while the forested area is 6,282 ha. The THLB is 2,762 ha. Note that Table 3 shows the THLB with and without the biodiversity management zone separately for context. Also, note that 306 ha will be temporarily added to the THLB to allow for a short-term (35 years) limited harvesting of old growth in the BMZ.

**Table 3: BCF THLB netdown**

Description	Net Area (ha)	Gross Area (ha)
<b>Total BCF Area</b>		<b>6,567</b>
Non-Forest	76	76
Roads	210	210
<b>CFLB Area</b>	<b>6,282</b>	
Wildlife Habitat Areas	87	87
Marbled Murrelet reserves	188	190
Riparian Management Areas	565	619
Low Stocking	575	673
Non-Merchantable	378	453
Inoperable	449	657
Wildlife Tree Retention	314	314
<b>NHLB Area</b>	<b>2,556</b>	
<b>THLB Area</b>	<b>3,726</b>	
Future Road reduction	31	
<b>Future THLB Area</b>	<b>3,695</b>	
Less Biodiversity Management	964	
<b>Current THLB</b>	<b>2,762</b>	
<b>Future THLB</b>	<b>2,749</b>	
NHLB	3,519	

#### 4.1.1 Non-forest

The VRI attribute forest management land base (FMLB) was used as the starting point to define forest and non-forest. If an area has been harvested, it is considered forested. Lakes and wetlands from the Freshwater Atlas were considered non-forest, regardless of logging history.

The total area of non-forest removed from the CFLB was 76 ha.

#### 4.1.2 Roads

Road data for this project was provided by BCF. The roads were classified into three categories:

- FSR – 20m wide
- Access Road – 15m wide
- Old Road – 10m wide

The total area of roads is 210 ha, which is removed from the CFLB.

#### 4.1.3 Wildlife Habitat Areas

There is one wildlife habitat area (WHA) within the BCF, for marbled murrelet. It is a no-harvest zone, 87 ha in size. This area was removed from the THLB. Note that this area is located within the BMZ, which is designated as a no-harvest area.

#### 4.1.4 Marbled Murrelet Reserves

In addition to the WHA described above, an additional 190 ha in the BCF have been set aside as marbled murrelet reserves. These areas were removed from the THLB. As with the MAMU WHAs, these reserves are located within the BMZ, which is designated as a no-harvest area.

#### 4.1.5 Riparian Management Areas

Lakes, wetlands, and streams were buffered as described in section 3.2, and the buffer areas were removed from the THLB. The total area of riparian management is 619 ha.

#### 4.1.6 Low Stocking

As described in the Arrowsmith TSA TSR data package, stands older than 250 with less than 300 m<sup>3</sup>/ha of volume were removed from the THLB. The total area removed as low stocking was 673 ha.

#### 4.1.7 Unmerchantable Stands

As per the Arrowsmith TSR data package, young and mature natural stands that do not meet the minimum harvest criteria of 350 m<sup>3</sup>/ha were removed from the THLB. There were 453 ha in this category.

#### 4.1.8 Inoperable

There is no specific spatial layer to define inoperable areas within the BCF, so an aspatial reduction of 10% was applied to account for inoperable. This reduction removed 657 ha from the THLB.

#### 4.1.9 Wildlife Tree Retention

A 7% reduction was applied to the THLB to account for Wildlife tree retention areas (WTRA).

#### 4.1.10 Future Road Reduction

The existing road network was buffered by 200 m (yarding distance) to account for future roads in the BCF. All areas within this 200 m buffer are considered “roaded”, i.e. no new roads would be needed to access them. Areas more than 200 m from a road are classed as “unroaded”, with the assumption that new roads would need to be constructed for timber harvesting. The percent coverage of road within the roaded area was calculated as 4.2% (There are 210 ha of roads within 4,977 ha of the roaded area). The same percentage was applied to the unroaded area to account for future road construction.

## **5 Model**

**Model Name:** Forest Simulation and Optimization System (FSOS)

**Model Developer:** Dr. Guoliang Liu

**Model Development:** UBC, Hugh Hamilton Limited, Forest Ecosystem Solutions Ltd., aiTree Ltd.

**Model Type:** Landscape Design Model

For this analysis Forest Simulation Optimization System (FSOS) is used for modelling. FSOS can operate as both a simulation and a heuristic optimization model using the same database.

Simulation allows for sensitivity analysis and utilizes a hard constraint-based approach.

Optimization is a target-oriented approach representing a shift in modeling approach from “what can we take from the forest” to “what can we create in the forest.”

Blocking and scheduling is conducted separately in simulation, and simultaneously in optimization. Scheduling in simulation progresses one period at a time, while optimization planning considers all periods at the same time. Data can be spatial and/or non-spatial. FSOS accommodates overlapping resource values and constraints and can account for multiple values such as timber, silviculture treatments, carbon allocation, biodiversity, wildlife, and visual quality. Algorithms employed in FSOS include simulated annealing, Tabu search algorithms, and Hill Climbing.

This analysis used the simulation mode of FSOS.

## 6 Model Setup

### 6.1 Visual Quality Objectives

Visual quality objectives are managed on the Forested Area. Forest cover requirements for visual quality objectives are composed of two values:

- Visually Effective Greenup (VEG)—the stand height at which regeneration is perceived as a newly established forest, above which the stand is considered to have no visual impact; and
- Percent Planimetric Denudation—the maximum proportion of the productive area of a visual polygon that can be below the VEG height.

There are 65 VQO polygons in the BCF, covering 3,931 ha (63%) of the Forested Area (Table 4). No visual constraints were applied in the modification VQO. According to the BCF, the areas with the modification VQOs can be managed through cutblock design. In the partial retention (PR) VQO a green-up height of 5 m was used. The maximum denudation % is based on the visual absorption capacity (VAC) class.

**Table 4: VQO constraints in the BCF**

VQO	VAC	Number of polygons	Maximum Denudation (%)	Forest Area (ha)
PR	M	22	10%	1,130
	L	12	5%	870
M	H	2	25%	5
	M	28	20%	1,913
	L	1	15%	13
<b>Total</b>		<b>65</b>		<b>3,931</b>

### 6.2 Non-Visual Green-Up

The BCF is mostly in the Maggie Landscape Unit, which is an enhanced forestry zone of the Vancouver Island Land Use Plan (VILUP). The green-up rule requires that a maximum of 25% of the THLB within a landscape unit can be under 1.3 m tall. In the remainder of the study area, the green-up height is 3 m.

### 6.3 Community Watersheds

There is one community watershed (930.016) that overlaps the BCF, however, only 40 ha out of approximately 1,300 ha are within the BCF. Due to its small size within the BCF, the community watershed was not modeled in the analysis.

### 6.4 Fisheries Sensitive Watersheds

A very small portion of fisheries sensitive watershed (FSW) f-1-011 overlaps the BCF. Approximately 50 ha out of 10,000 ha falls within the BCF. The FSW was not modeled in the analysis.

## **6.5 Harvest Rule, Initial Harvest Level and Partitions**

### **6.5.1 Harvest Rule**

Simulation models are rule-driven and require harvest scheduling rules to control the order in which stands are harvested. It is important that these rules can organize the harvest in a way that realizes the productive potential of the land base in a reasonable manner to understand the impacts of the timber supply assumptions and constraints.

The highest volume first harvest rule has been gaining popularity recently due to its ability to mimic operations more realistically than other commonly used harvest rules, such as oldest first or relative oldest first. In this rule, the stands that have the greatest volume per ha are given priority for harvest, subject to forest cover requirements. The highest volume first harvest rule was used in this analysis to be consistent with the latest Arrowsmith TSA TSR.

### **6.5.2 Initial Harvest Level**

The initial harvest level was set to 12,500 m<sup>3</sup> per year.

### **6.5.3 Partitions and Constraints on Harvesting Old Growth**

Partitions are used when a specific level of harvest is required from a geographic area. The partition can be a minimum or maximum. Minimums are often used to promote harvest when it is uncertain whether harvest in an area will occur at all. An example of this would be marginally economic harvest areas within the THLB containing less valuable species such as hemlock and balsam. Maximums are used when there is a need to limit the rate of cut from a geographic area within the tenure area.

Partitions can also be non-spatial, i.e., not tied to specific geographic areas. An example would be a maximum volume of harvest of a specific species within a TSA. Non-spatial partitions are usually more difficult to implement and monitor.

#### **6.5.3.1 Cw-Leading Old Growth Stands in the BMZ**

In the proposed management scenario only Cw-leading old growth stands within the BMZ are eligible for harvest during the first 35 years, while no harvest of stands currently younger than 121 within the BMZ is allowed. Furthermore, a target was set to maintain a minimum of 25% of old growth within the forested area of the BCF throughout the planning horizon. Forests older than 120 are defined as old growth.

The modelling attempted to harvest a relatively consistent volume (even flow) from the old growth Cw-leading stands within the first 20 years of the planning horizon or longer (up to 35 years).

## **6.6 Utilization Level**

The utilization level defines the minimum top diameter (inside bark) and minimum diameter (dbh) of stems that must be removed from harvested areas. It also specifies the maximum height of stumps that may be left. These factors are used to determine the merchantable stand volume in the analysis.

The utilization levels used in this analysis are shown in Table 5.



**Table 5: Utilization levels used in the analysis**

Leading species	Utilization		
	Minimum dbh (cm)	Maximum stump height (cm)	Minimum top dib (cm)
Natural conifer >120 years of age	17.5	30	15
Natural conifer between 64 and 120 years of age	12.5	30	10
Managed conifer	12.5	30	10
Alder >45 years of age	17.5	30	15

## 6.7 Minimum Harvest Age/Volume

### 6.7.1 Natural Stands

The minimum harvest volume will be set at 350 m<sup>3</sup> per ha for natural stands.

### 6.7.2 All Stands

The minimum harvest age for areas where the slope is greater than 65% is set to 120 years. This condition is applied to all stands.

### 6.7.3 Managed Stands

For a managed stand to be eligible for harvest it must reach an age where 90% of the mean annual increment (MAI) is reached. In addition, the stand must reach a minimum volume of 350 m<sup>3</sup> per ha.

## 6.8 Non-Recoverable Losses (NRL)

Non-recoverable losses provide an estimate of the average annual volume of timber damaged or killed within the THLB and not salvaged or accounted for by other factors. The final estimate for the NRL in the Arrowsmith TSA TSR was 9,105 m<sup>3</sup> per year from a THLB of 59,721 ha (MoF, 2017). The ratio of 59,721 ha/9,105 m<sup>3</sup> was used to estimate the NRLs for the THLB in this project. The NRLs were set at 421 m<sup>3</sup> per year (Table 6).

**Table 6: Non-recoverable losses**

THLB/NRL	Area	
	Arrowsmith TSA	Barkley Community Forest
THLB	59,721 ha	2,762 ha
NRL	9,105 m <sup>3</sup> per year	421 m <sup>3</sup> per year

## 7 Growth and Yield

The forests in the BCF were classified into eras using the same principles as in the latest Arrowsmith TSA TSR. The classification is based on the level of management with the following eras: natural stands, old managed stands, contemporary managed stands, and future managed stands.

### 7.1 Natural Stands

All stands established before 1950 are considered natural stands in this analysis. Their growth and yield is modelled using the Variable Density Yield Projection (VDYP) version 7 developed by the MoF. VDYP is what is used to populate the volume estimates in the VRI. The site index for natural stands comes from the VRI. The yield curves were generated by FAIB staff on January 9, 2024. No aggregation was done on the natural stands, each VRI polygon has a separate yield curve. There are approximately 250 natural yield curves in the BCF.

### 7.2 Old Managed Stands

Old managed stands (OM) are those established between 1951 and 1985. The growth and yield for these stands is modelled in the Table Interpolation Program for Stand Yields (TIPSY) version 4.4. Since most OM stands are natural regeneration after harvesting, the species composition of each stand was taken from the VRI, and the site index from the Provincial site productivity dataset. The curves were run in TIPSY as natural regeneration, with no genetic gain applied. Each VRI polygon was run separately, there are approximately 260 OM yield curves in the BCF.

### 7.3 Contemporary Managed Stands

Contemporary managed stands (CM) are those established between 1986 and 2005. These stands were planted after harvest, with some seedlings of higher genetic worth. These stands were divided into analysis units, based on BEC subzone and cedar site index. BCF provided the species composition, and the site index came from the Provincial site productivity dataset. Rather than defining low, medium, and high site index classes, a curve was run for each cedar site index, at one-meter intervals. The species composition is shown in Table 7.

**Table 7: Contemporary managed stands, regeneration assumptions**

BEC	Cw site index range	Spcs 1	Pct 1	Spcs 2	Pct 2	Spcs 3	Pct 3	Spcs 4	Pct 4	Spcs 5	Pct 5	regen meth	density
CWHvm	12-23	Cw	85%	Yc	7%	Hw	3%	Ss	3%	Ba	2%	plant	1000
CWHvh	14-22	Cw	75%	Yc	20%	Hw	5%					plant	1000

### 7.4 Future Managed Stands

All stands established after 2005 and into the future are considered future managed stands (FM). These stands are planted after harvest with seedlings of high genetic worth. The analysis units for FM stands are also based on BEC subzone and cedar site index, in 1 m intervals. The species composition was provided by BCF, and the site index came from the Provincial site productivity dataset. The species composition is shown in Table 8.

**Table 8: Future managed stands, regeneration assumptions**

BEC	Cw site index range	Spcs 1	Pct 1	Spcs 2	Pct 2	Spcs 3	Pct 3	Spcs 4	Pct 4	Spcs 5	Pct 5	regen meth	density
CWHvm	12-24	Cw	75%	Hw	10%	Ba	7%	Ss	4%	Fd	4%	plant	1200
CWHvh	8-24	Cw	75%	Yc	20%	Hw	5%					plant	1000

## 7.5 Genetic Gain

Contemporary and future managed stands used seedlings with genetic worth. The amount of gain for each era and species is shown in Table 9.

**Table 9: Genetic gain by species and era**

Species	CM	FM
Cw	1.96%	9.5%
Yc	0%	10.08%
Hw	0.53%	14%
Ba	0%	0%
Ss	0%	0%
Fd	3.91%	11%

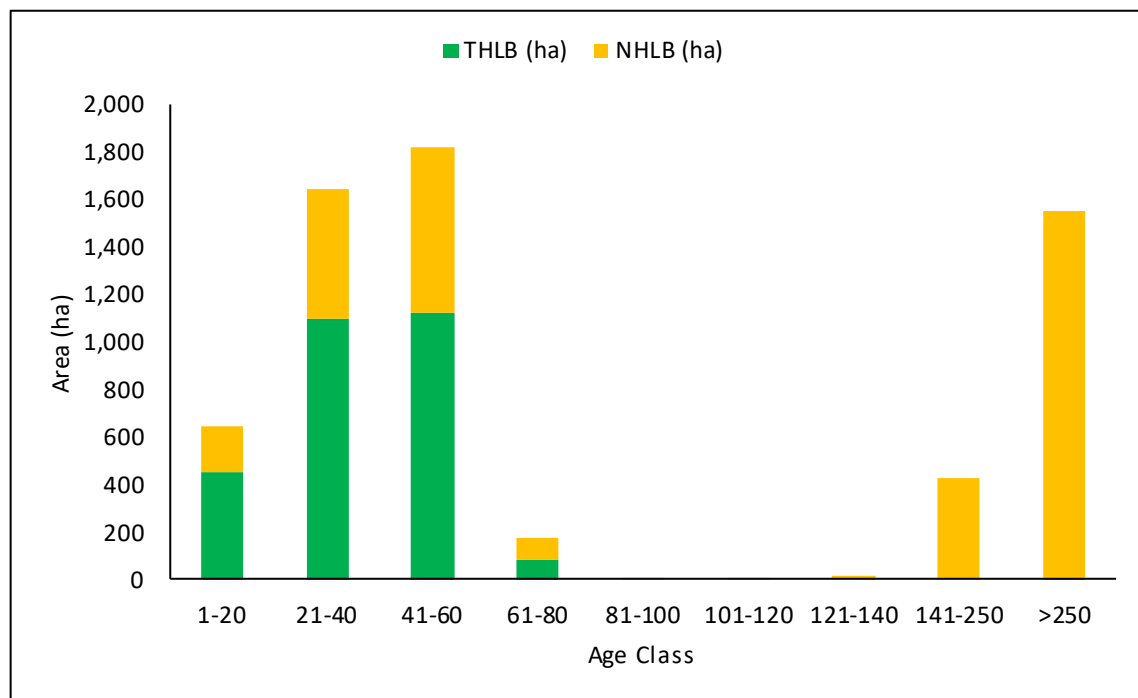
## 8 Land Base Statistics

The study area is briefly summarized in Table 10. The timber harvesting land base (THLB) is 2,762 ha, while the non-harvestable land base (NHLB) is 3,520 ha. The mean annual increment (MAI) for the study area is 7.7 m<sup>3</sup>/ha/year. The corresponding projected long-range sustained yield (LRSY) is 21,126 m<sup>3</sup> per year. The LRSY depicts the theoretical long-term maximum harvest level for the area in the absence of any land base constraints and non-recoverable losses.

**Table 10: Area summary**

Forest (ha)	NHLB (ha)	THLB (ha)	LRSY (m <sup>3</sup> /yr)	MAI (m <sup>3</sup> /ha/yr)
6,282	3,520	2,762	21,126	7.7.

Figure 2 shows the age class distribution for the forested land base. Approximately 97% of the THLB is younger than 61 years old (age classes 1 to 3). Only 0.1% of the THLB consists of old growth stands; these represent data noise as all old growth is by design located in the BMZ. In contrast, the majority (67%) of the NHLB is in stands older than 120.

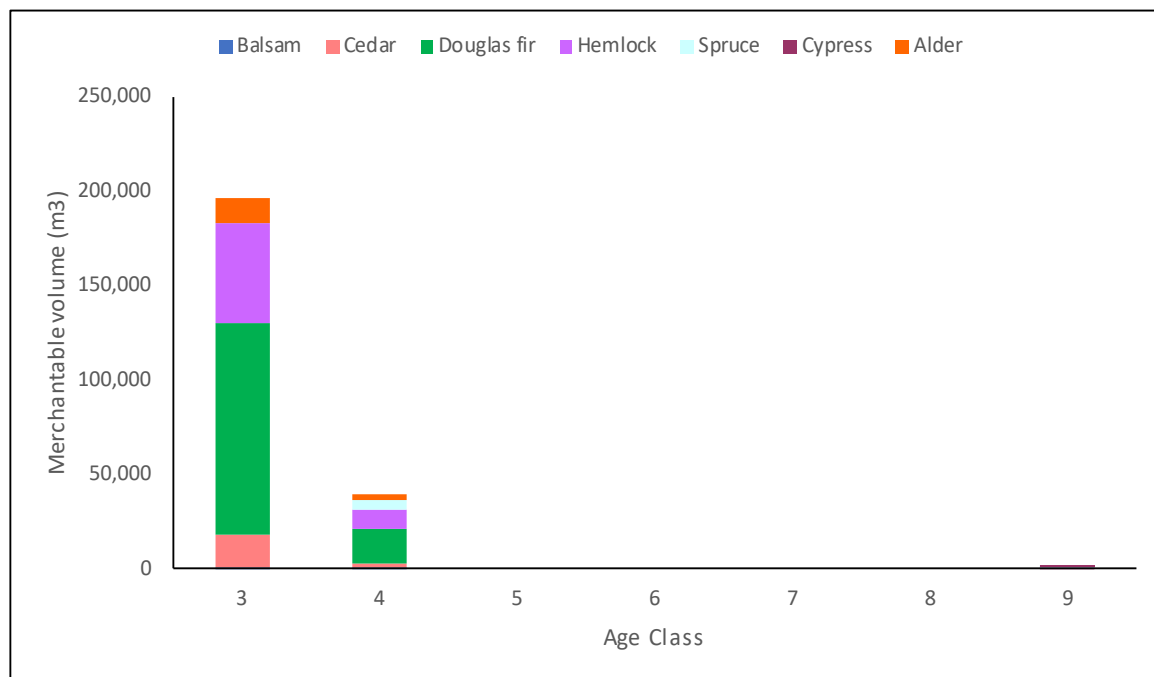


**Figure 2: Age class distribution, THLB**

Table 11 and Figure 3 show the THLB merchantable growing stock by species and age class in the study area. The merchantability is based on the Arrowsmith TSA TSR assumption of 350 m<sup>3</sup> per ha for minimum harvest criteria. Ninety-nine percent of the merchantable timber is in age classes 3 (83%) and 4 (16%). Fifty-five percent of the merchantable volume consists of Douglas fir.

**Table 11: Merchantable timber by species and age class**

Species	Volume by Age Class (m <sup>3</sup> )			
	3	4	9	Total
Balsam	356	254	76	<b>686</b>
Cedar	17,903	2,834	244	<b>20,981</b>
Douglas fir	111,689	17,706	10	<b>129,405</b>
Hemlock	53,020	10,853	386	<b>64,259</b>
Spruce	486	4,392	62	<b>4,940</b>
Cypress			4	<b>4</b>
Alder	12,629	2,968		<b>15,597</b>
<b>Total</b>	<b>196,084</b>	<b>39,007</b>	<b>781</b>	<b>235,872</b>



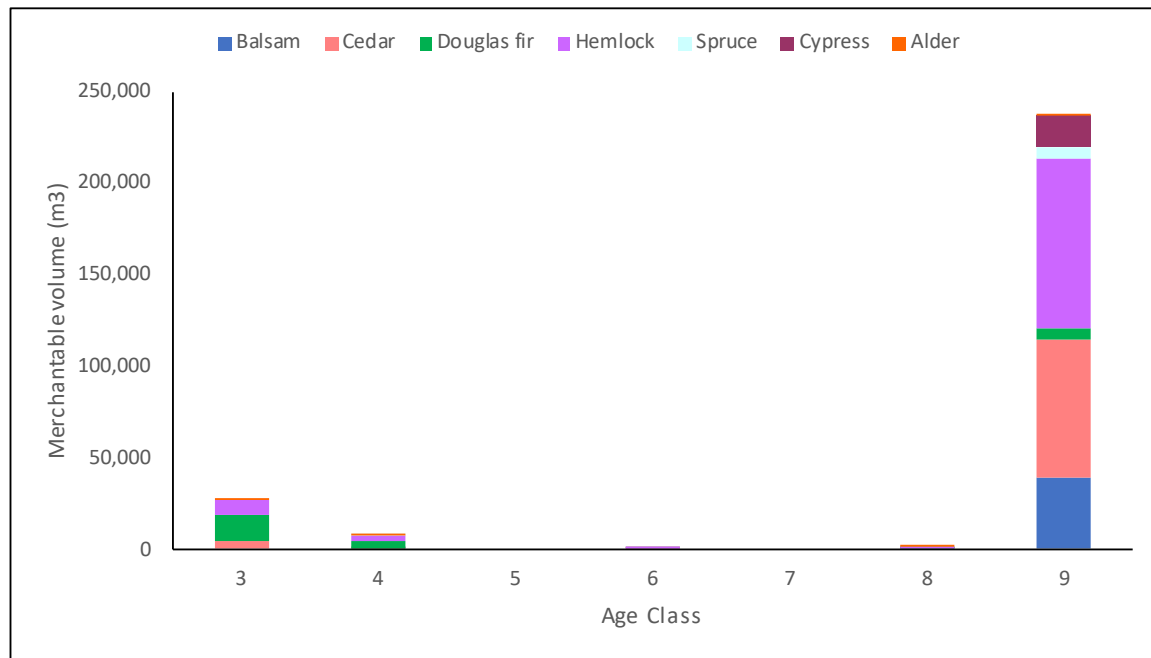
**Figure 3: Merchantable timber by species and age class**

### 8.1 Merchantable Timber in the Biodiversity Zone

Table 12 and Figure 4 illustrate the THLB merchantable growing stock by species and age class in the BMZ. Eighty-seven percent of the merchantable timber is in age classes 8 and 9. Thirty-eight percent of the merchantable volume consists of hemlock, while the share of cedar is 30%.

**Table 12: Merchantable timber by species and age class in the biodiversity zone**

Species	Volume by Age Class (m <sup>3</sup> )					
	3	4	6	8	9	Total
Balsam	0	453	228	79	38,719	<b>39,479</b>
Cedar	4,140	331	10	289	76,142	<b>80,912</b>
Douglas fir	14,930	3,246	0	240	5,963	<b>24,378</b>
Hemlock	7,540	3,506	88	439	92,938	<b>104,511</b>
Spruce	0	357	0	0	5,433	<b>5,790</b>
Cypress	0	0	0	0	17,713	<b>17,713</b>
Alder	939	319	0	46	321	<b>1,625</b>
<b>Total</b>	<b>27,549</b>	<b>8,212</b>	<b>326</b>	<b>1,092</b>	<b>237,229</b>	<b>274,408</b>



**Figure 4: Merchantable timber by species and age class in the biodiversity zone**

## 9 Analysis Results

The following management direction applied to the proposed management scenario:

- The initial harvest level was set to 12,500 m<sup>3</sup> per year.
- The harvest of old growth was allowed in the BMZ over a period of 35 years. After 35 years, no harvest is allowed in the BMZ.
- A minimum of 25% of old growth must be maintained within the forested area of the BCF throughout the planning horizon. Forests older than 120 are defined as old growth.
- Only Cw-leading old growth stands within the BMZ are eligible for harvest during the first 35 years.
- Attempt to harvest a relatively consistent volume (even flow) from the old growth Cw-leading stands within the first 20 years of the planning horizon or longer (up to 35 years).
- No harvest of stands currently younger than 121 within the BMZ is allowed.
- The minimum harvest age for areas where the slope is greater than 65% is set to 120 years. This condition is applied to all stands.
- For a managed stand to be eligible for harvest it must reach an age where 90% of the mean annual increment is reached. In addition, the stand must reach a minimum volume of 350 m<sup>3</sup> per ha.

Table 13 shows the temporary increase in the THLB for the first 35 years of the planning horizon when harvest is allowed from the BMZ.

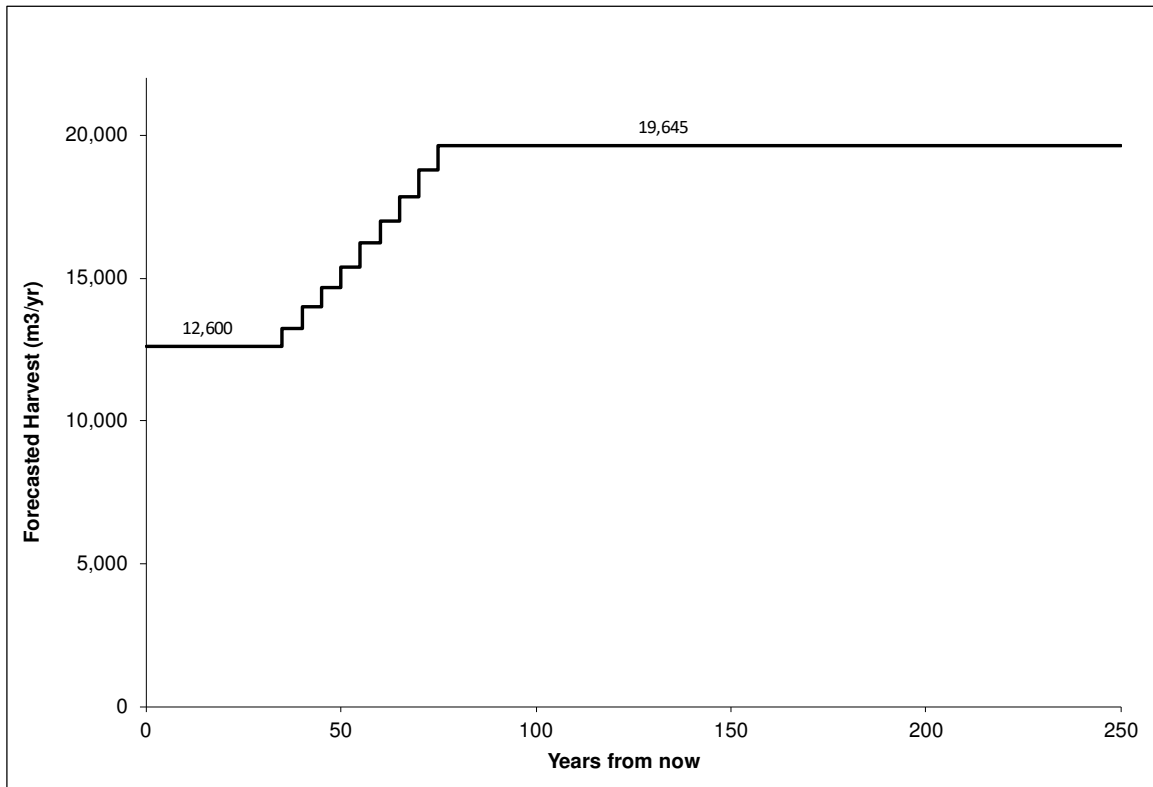
**Table 13: THLB, proposed management scenario**

Description	Proposed Management Scenario
THLB	3,726
Less Biodiversity Management Area	964
Remaining THLB	2,762
Add old growth to the THLB (35 years only)	306
Net THLB	3,068

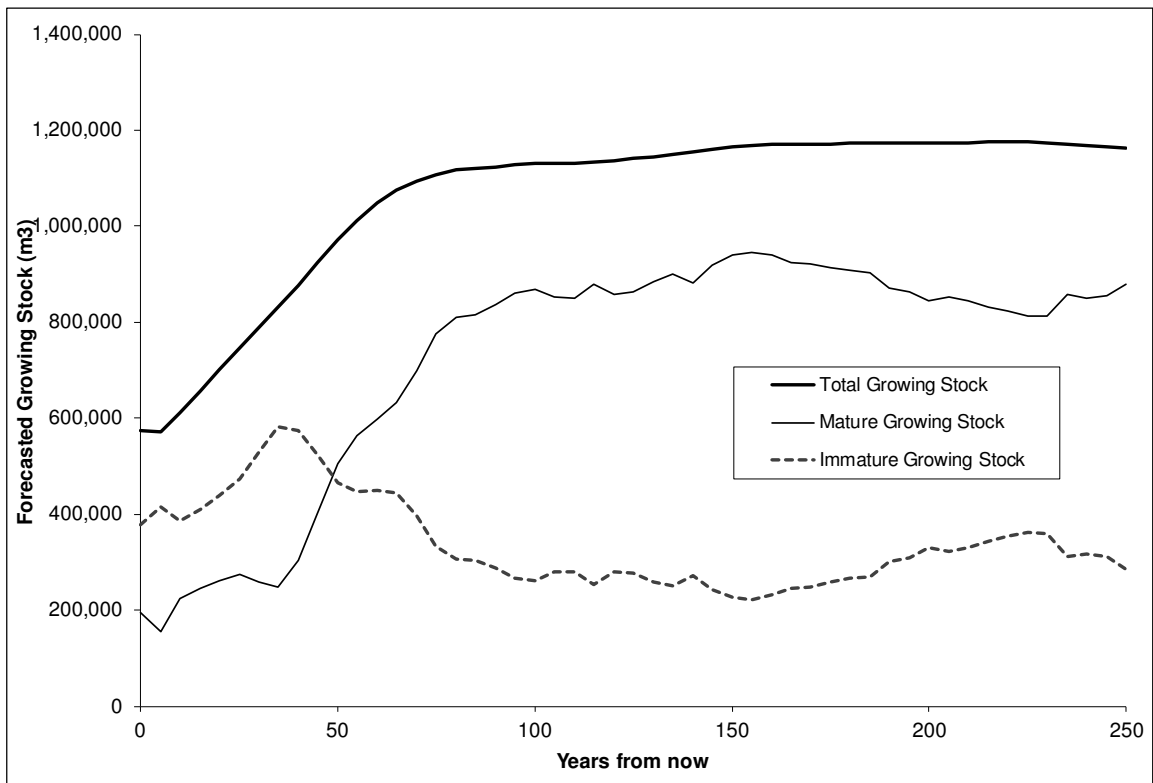
Figure 5 illustrates the Proposed Management Scenario harvest forecast. While the initial harvest target was set to 12,500 m<sup>3</sup> per year, the model exceeded this target by 100 m<sup>3</sup>. The initial harvest level of 12,600 m<sup>3</sup> per year is maintained for 35 years until it can be increased in nine consecutive steps to the long-term harvest level (LTHL) of 19,645 m<sup>3</sup> per year.

The predicted development of the growing stock is illustrated in Figure 6.

Figure 7 shows the Proposed Management Scenario harvest projection within the BMZ and outside of it. During the first 30 years of the planning horizon, 2,660 m<sup>3</sup> (20.3%) is annually projected to be harvested from the BMZ. Between years 31 and 35 this volume is reduced to 1,755 m<sup>3</sup> per year. These stands are all old (>120 years) Cw leading stands. After year 35, no harvest is allowed from the BMZ. Excluding the BMZ from harvesting increases the achievement of old growth in the BCF to approximately 58% over time (Figure 8).



**Figure 5: Proposed Management Scenario harvest forecast**



**Figure 6: Predicted growing stock development, Proposed Management Scenario**



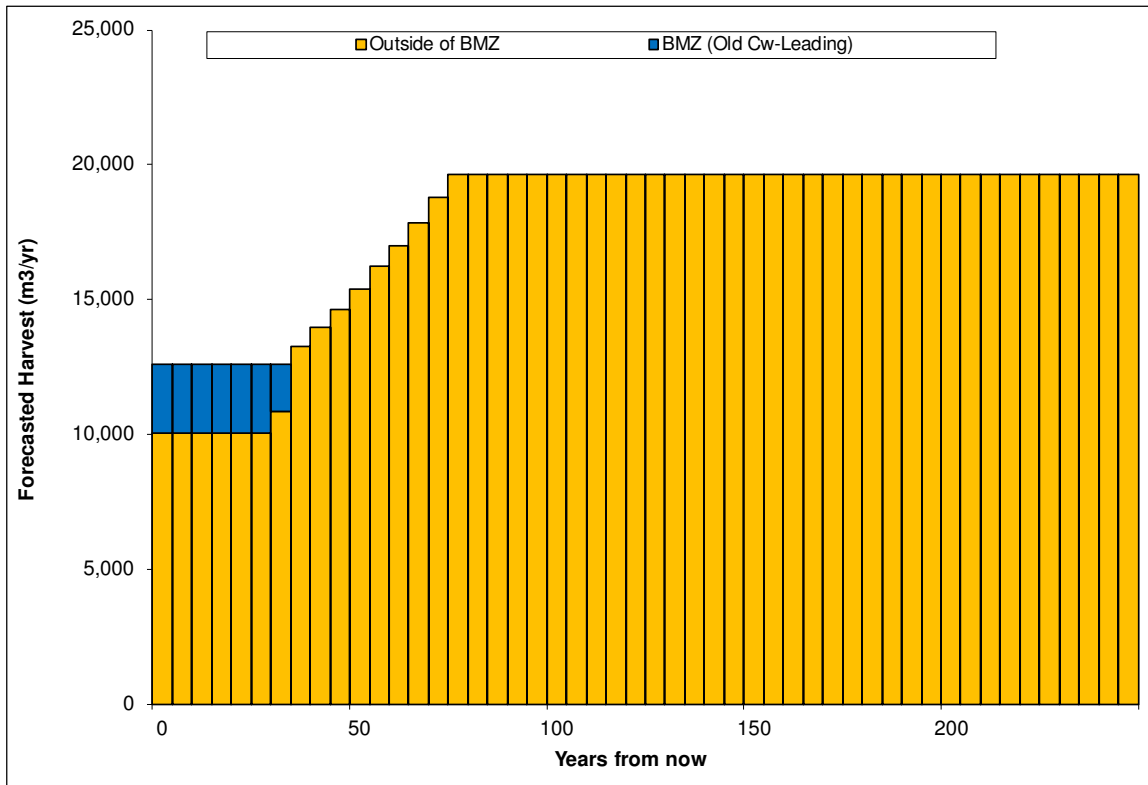


Figure 7: Harvest forecast within and outside of the BMZ, Proposed Management Scenario

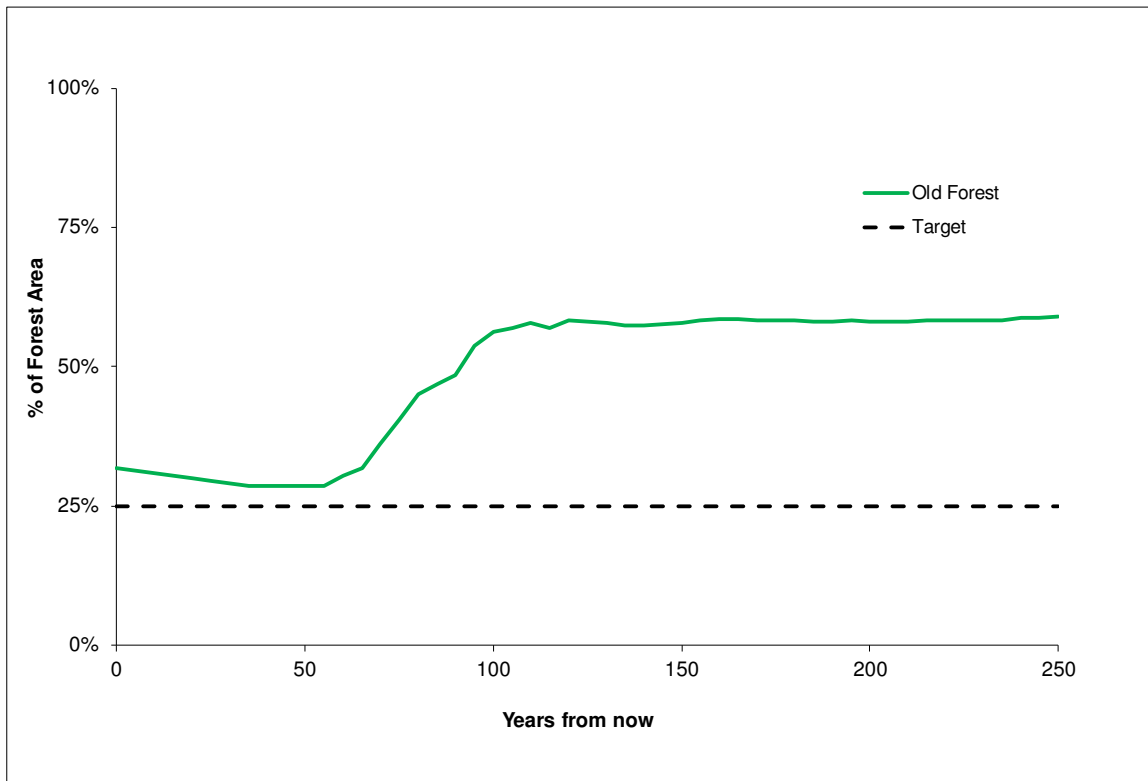
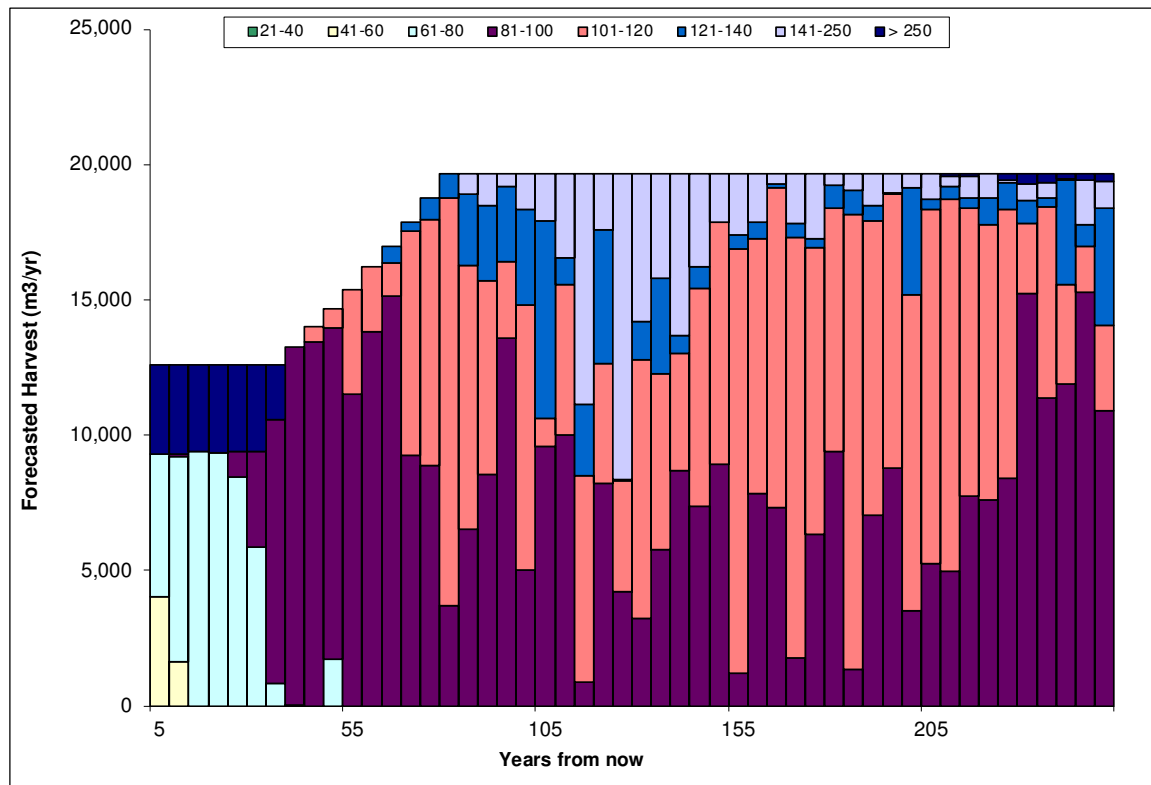


Figure 8: Achievement of old (>120), Proposed Management Scenario

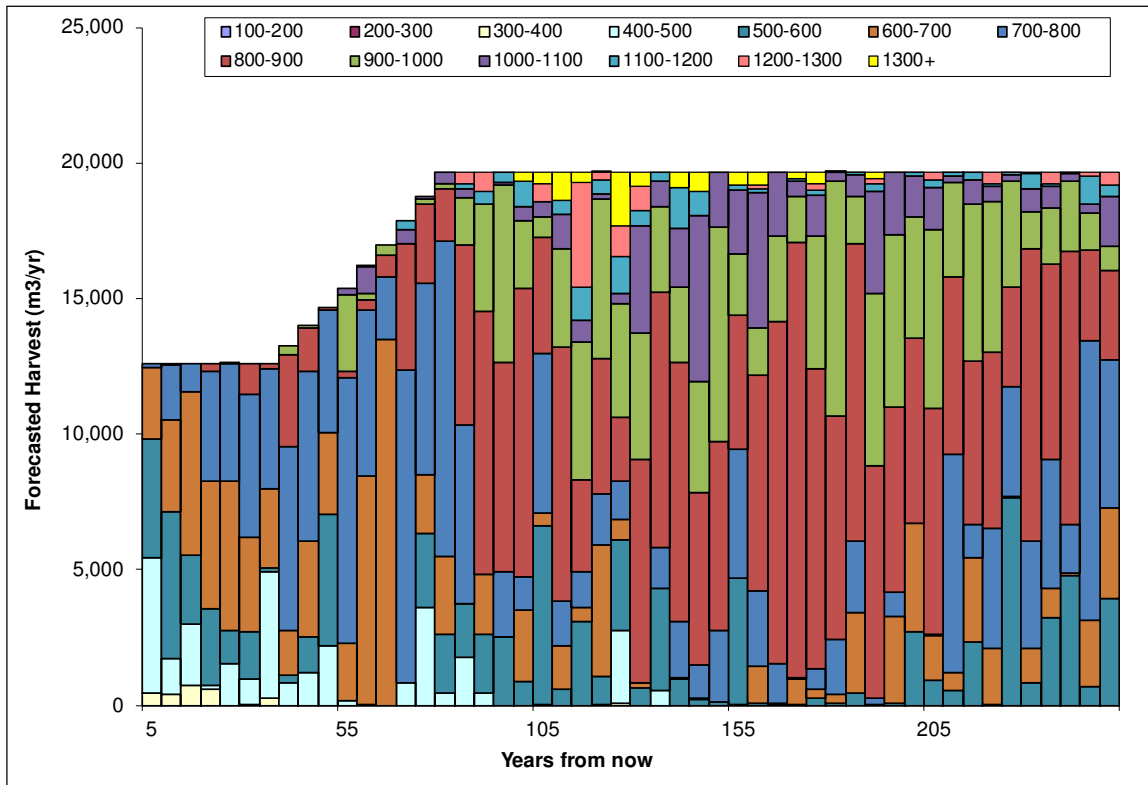
Figure 9 illustrates the harvest forecast by age class. The harvest of old growth stands is evident during the first 35 years of the planning horizon. Relatively old age classes are harvested throughout the planning horizon. This is a result of allowing harvest to occur within the BMZ while also setting the initial harvest level relatively low.

Additional factors contributing to the harvest of older age classes over time are the relatively low initial harvest volume and the more constraining harvest criteria. As noted above the managed stands must reach an age where 90% of the mean annual increment is reached. In addition, the stand also must reach a minimum volume of 350 m<sup>3</sup> per ha.

As older age classes are harvested throughout the planning horizon, so are high volumes per ha as shown in Figure 10.



**Figure 9: Proposed Management Scenario harvest forecast by age class**



**Figure 10: Proposed Management Scenario harvest forecast by vol/ha class**

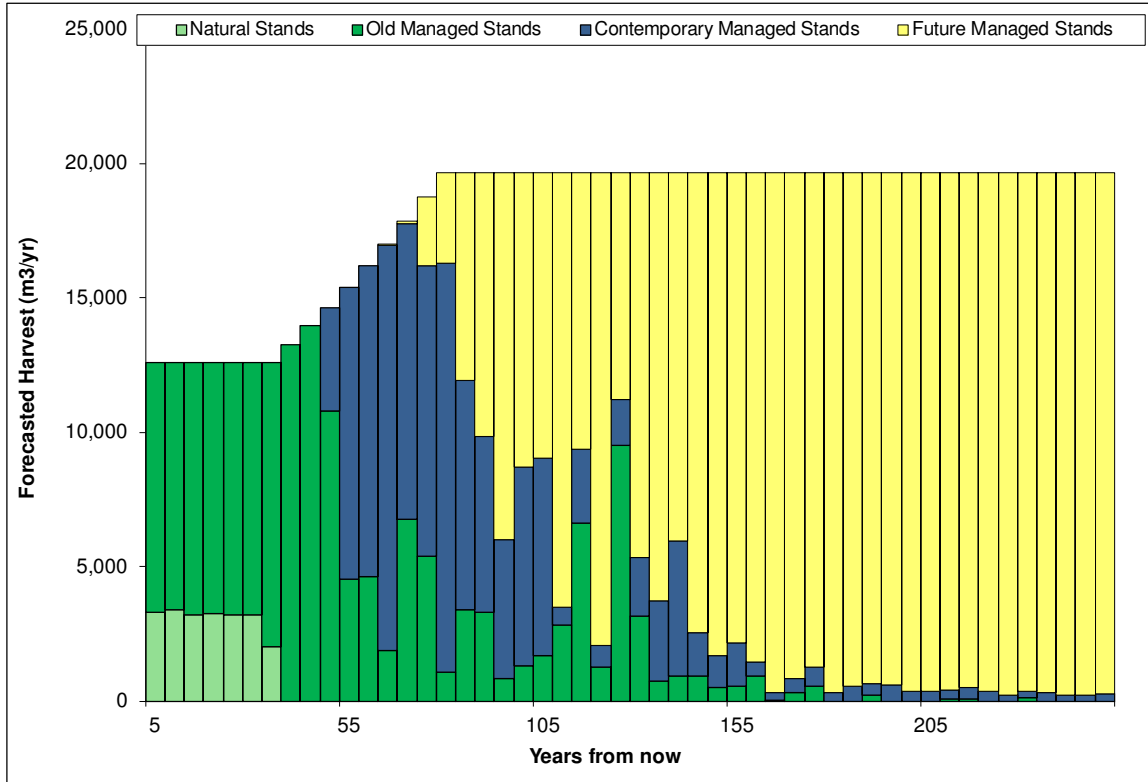
Harvest from yield types is shown in Figure 11. Natural stands contribute to the harvest forecast for 35 years as expected given the setup of the model.

Old managed stands dominate the harvest until year 50, when the harvest of contemporary managed stands becomes a significant source of volume. The harvest of future managed stands starts at year 75.

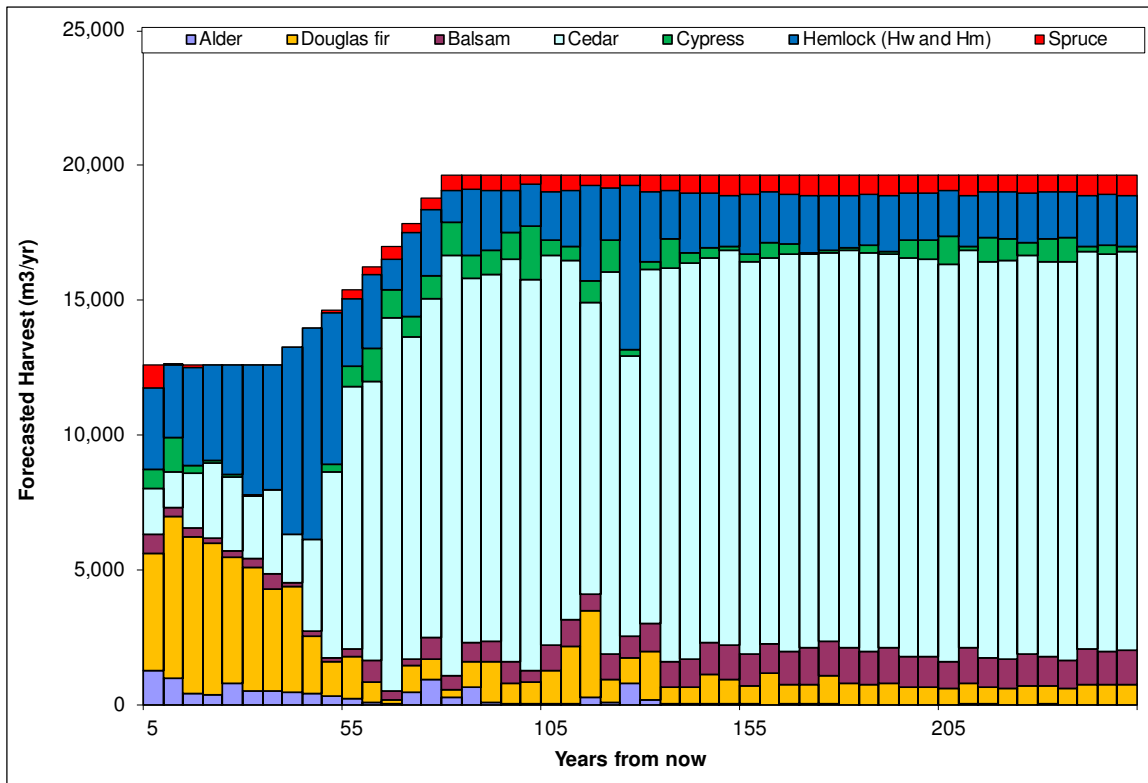
Figure 12 shows the contribution of major tree species to volume harvested over the planning horizon for the Proposed Management Scenario.

Figure 13 depicts the projected age class distribution over time on the THLB. Note that Figure 13 is somewhat misleading in that the CW-leading old growth stands are included in the graph, while they are part of the THLB only for the first 35 years.

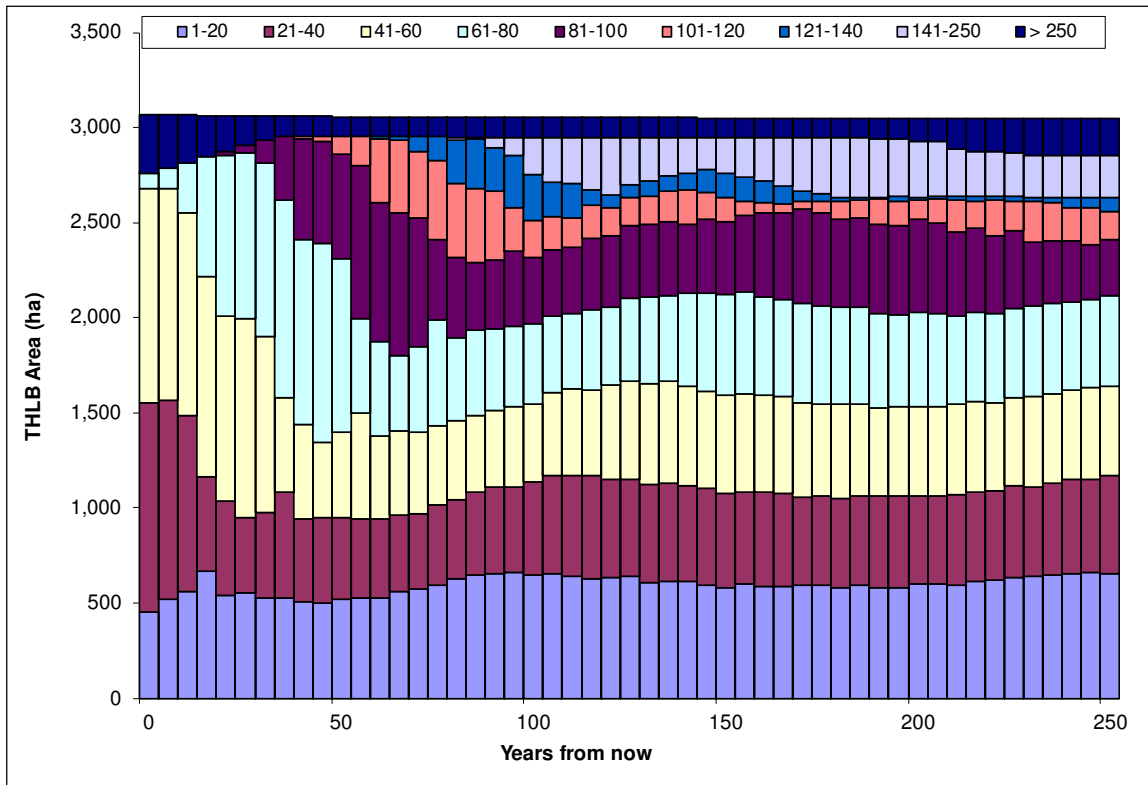
Figure 14 illustrates the projected age class distribution over time on forested land in the BCF.



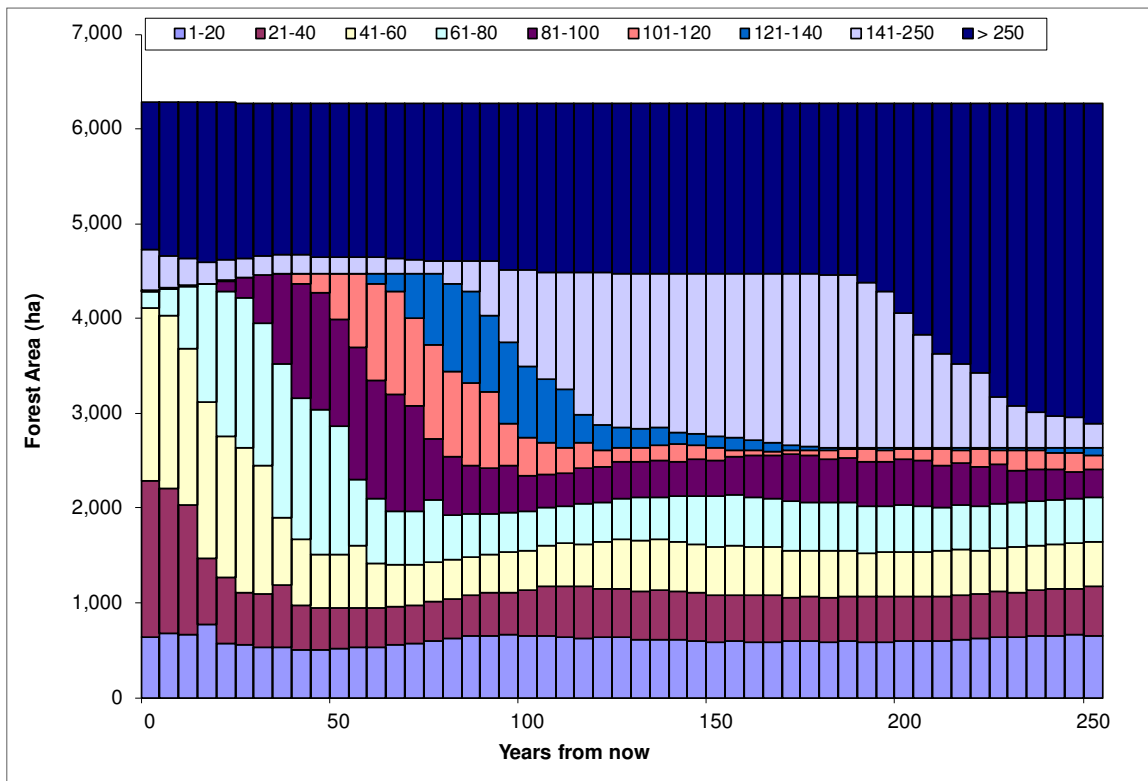
**Figure 11: Proposed Management Scenario harvest forecast by yield type**



**Figure 12: Proposed Management Scenario harvest forecast by species.**



**Figure 13: Predicted age class distribution, THLB, Proposed Management Scenario**



**Figure 14: Predicted age class distribution, Forest, Proposed Management Scenario**

## **References**

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