# Management Plan Amendment # 2

Creston Valley Forest Corporation
Community Forest Agreement
K3D

September 2015

Authorized Signatory:

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John Chisamore, Chair

RPF Signature and Seal:

_____
Daniel Gratton, RPF

"*If a man walk in the woods for love of them half of each day, he is in danger of being regarded as a loafer; but if he spends his whole day as a speculator, shearing off those woods and making earth bald before her time, he is esteemed an industrious and enterprising citizen. As if a town had no interest in its forests but to cut them down!"*

- Henry David Thoreau

# Acknowledgements

The Timber Supply Analysis (TSA) was a collaborative project of the Creston Valley Forest Corporation (CVFC) and Forsite Consultants Ltd.

Project work and documentation for the TSA was provided by Reg Davis, RPF with support by Patrick Bryant, RPF, both of Forsite Consultants Ltd.

Project oversight for the TSA and preparation of the Management Plan was provided by Daniel Gratton, RPF.

Assistance and edits to the Management Plan was provided by Kelsey Syfchuck, TFT and Jim Smith, RPF (Ret).

# Table of Contents



# Figures



# Tables



# Appendices

# 1.0 Introduction

The Creston Valley Forest Corporation (CVFC) manages long term *Community Forest Agreement (CFA) K3D* and is a non-profit organization consisting of five shareholders and five Directors at large. The current shareholders include: Wildsight, the Erickson Community Association, the Regional District of Central Kootenay, the Kitchener Valley Recreation and Fire Protection Society and the Town of Creston.

Since receiving its CFA in October 2008, the Creston Community Forest has maintained an Annual Allowable Cut (AAC) of 15,000 $m^3$/year on a Crown landbase of approximately 18,159 hectares. In July 2012, the Ministry of Forests and Land Resource Operations (MFLRO) announced that 10,000 $m^3$/year had been assigned to the Community Forest Program allowing for an expansion to CVFC's management area and increase to its AAC.

Under Section 6.0 of the *Community Forest Agreement K3D*, a management plan is a requirement. This management plan outlines the Community Forest's management objectives, management philosophies, forestry and silvicultural practices and includes a detailed Timber Supply Analysis (TSA) that estimates the harvest flow per year.

This management plan is consistent with current forest legislation governing Community Forest Agreements and Higher Level Plans (the *Kootenay Boundary Higher Level Plan Order*) under the *Forest and Range Practices Act* (FRPA). More information on CVFC's strategies to meet FRPA values and objectives and higher level plans is provided in CVFC's approved Forest Stewardship Plan Amendment # 2 dated February 2, 2009.

# 2.0 Area Description

## *2.1 CFA Description*

The majority of CVFC's management area is in close proximity to the town of Creston, BC and is wholly contained in the Kootenay Lake Timber Supply Area. Directly north of the town includes Arrow Mountain, Arrow Creek and Big Bear Creek. The remaining management area is located east of Creston, encompassing Russell Creek, Thompson Creek, Mount Thompson, Loss Creek, Found Creek and Birch Creek. Many of the watersheds operated in by CVFC are either Community or Domestic, with the Arrow Creek watershed being the main source of water for the Town of Creston.

Figure 1 on the following page provides an overview of CVFC's management area in relation to the Town of Creston showing the approximate Timber Harvest Land base (THLB), Caribou Reserve, Old Growth Management Areas (OGMA's) and areas deemed unsuitable for timber management. The areas that form part of the expansion include planning cells 207, 208 and 502 (located along the eastern portion on the management area). These planning cells were selected based on their ability to provide an additional AAC of 10,000 $m^3$/year and their contiguity with CVFC's existing area.

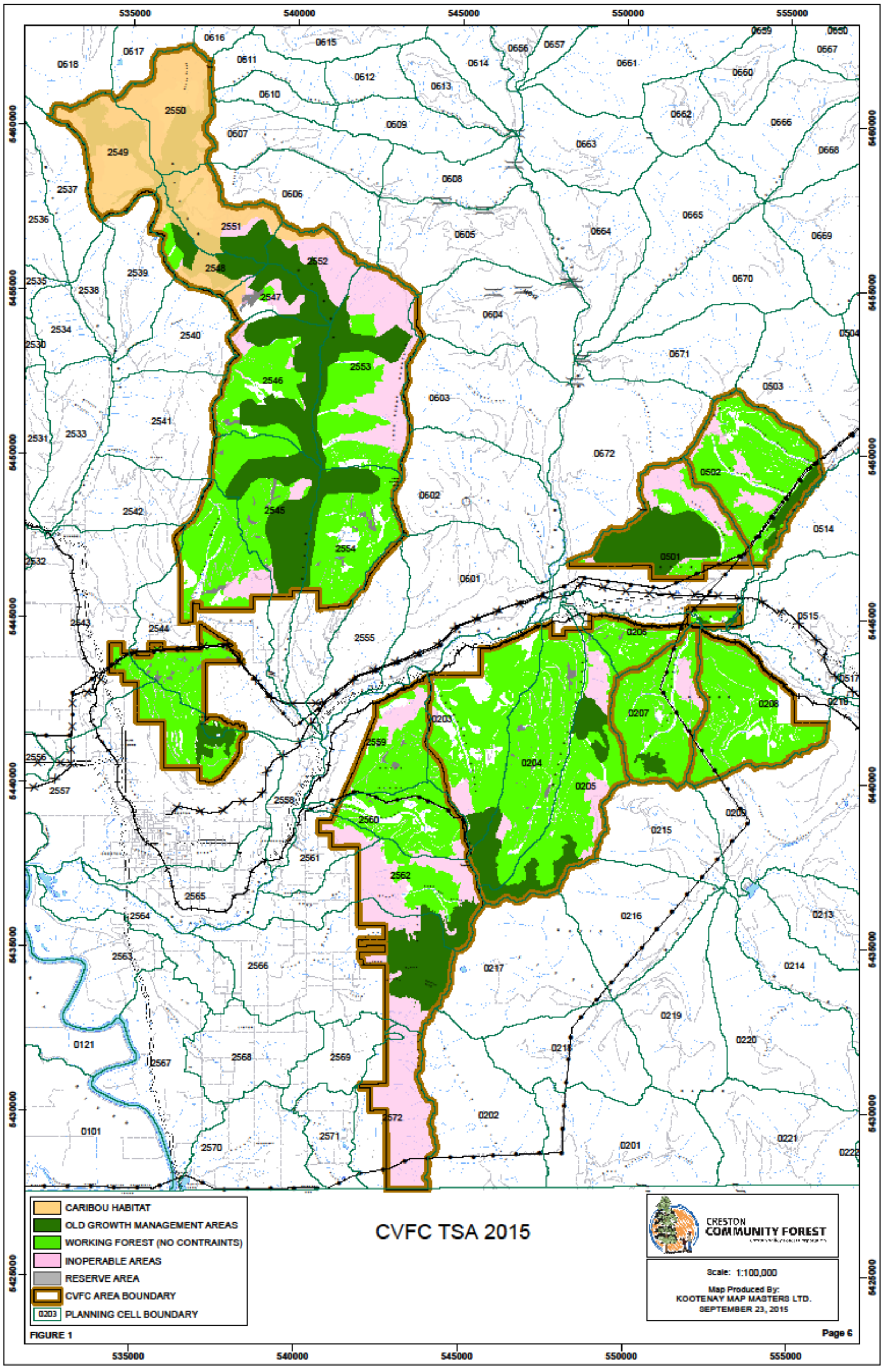


***Figure 1. Creston Valley Forest Corporation Management Area.***

## 2.2 Allowable Annual Cut

Based on the Timber Supply Analysis (TSA) prepared in August 2015, CVFC proposes an Allowable Annual Cut (AAC) of 25,000 $m^3$/year. This harvest flow is estimated for seven decades, falling to 20,300 $m^3$/year in decade nine and further declining to 18,800 $m^3$/year in the decades thereafter.

This harvest flow assumption is reasonable to the CVFC given the management objectives for those areas identified as Wildland Urban Interface (WUI) and Natural Disturbance Type (NDT) 4. These management objectives and how they determine harvest flow are discussed in Section 6 of Appendix 1.

There are four Forest Development Units (FDU's) with some containing more than one drainage system or watershed. Table 1 lists these development units and their respective areas.

| Community Forest Development Units | Area in Hectares |
|---|---|
| Arrow Creek | 8560 |
| Goat Mountain | 977 |
| Russell Creek/Sullivan Creek/Thompson Mountain/Birch Creek | 9521 |
| Kitchener Mountain/Found Creek | 2256 |
| **Total** | **21, 314** |

***Table 1. Community Forest Development Units***

## 2.3 Biogeoclimatic Ecosystem Classification (BEC) zones

The Biogeoclimatic Ecosystem Classification (BEC) zones in CVFC's management area include the Interior Cedar-Hemlock (ICH) and Engelmann Spruce-Subalpine Fir (ESSF) zones. The subzones for the ICH include xw (very dry/warm), dw (dry/warm), and mw2 (moist/warm). For the ESSF the only subzone is wm (wet/mild).

The ICH zone is characterized by long, warm summers and cool, damp winters, creating a typically warm, moist climate. The ICH has the greatest diversity of tree species over any other zone in the province and includes the growth of western red-cedar, western hemlock, lodgepole pine, Douglas-fir, ponderosa pine, western white pine, western larch, paper birch, trembling aspen, sub-alpine fir and spruce. The moist conditions and long growing seasons provide the most productive sites in the interior of BC, as well as creating an ideal habitat for wildlife. Historically, the drier regions of the ICH experienced frequent fire activity however suppression efforts over the past several decades have reduced the occurrence and size of wildfires.

The presence of long, cold winters and deep snowpacks are characteristic of the ESSF zone. Tree species in this zone include; Engelmann spruce, sub-alpine fir, western white pine, western larch, western hemlock and lodgepole pine. Historically, the growing season in the ESSF has been short, with snow covering the landscape 5-7 months out of the year.

## *2.4 Watersheds*

The Community Forest's management area contains six Community Watersheds. This includes: Arrow Creek, Sullivan Creek, Camp Run Creek, Floyd/Orde Creek, Russell Creek and Bear Brook Creek.

In addition, seven Domestic watersheds are contained within CVFC's management area.

## *2.5 Anticipated Effects of Climate Change*

Climate change is expected to alter ecosystems over the coming years. The southern portion of the province is expected to experience decreased precipitation and rising temperatures, as well as an increase in fire events and drought. Elevated winter temperatures and drought stress are also expected to escalate insect and disease populations, resulting in higher rates of timber mortality. Predictions are being made regarding significant losses to subalpine ecosystems. Consideration of this will need to be made when planning for silviculture operations in areas that are currently in the ESSF and selecting species that will tolerate the shift from cold, wet conditions to a drier, warmer environment. Adapting forest and range management to climate change in the Thompson-Okanagan Region (2014).

# 3.0 Management Objectives

## *3.1 Government Objectives*

The province of British Columbia (BC) has stated goals for the community forest program. This management plan is required to respond to those goals, which are quoted below and are itemized numerically in italics. These goals are achievable in spite of their broad general scope, the many constraints that the Community Forest operates within and the management parameters the Community Forest has proposed.

*This form of tenure is intended to provide new opportunities for community management of Crown forest land. By providing communities with greater flexibility to manage local forests, government seeks to:*

1. *provide long term opportunities for achieving a range of community objectives, values and priorities;*

Over the years, the Community Forest has reached out to the community in the form of public meetings, slide shows and a recently designed website, on how watershed management can be accomplished. The objective is to manage for fully forested watersheds and protect those forests from catastrophic change. To accomplish this, the Creston Community Forest's strategy is to:

- Encourage a diversity of tree species and age classes across the landscape through the implementation of Ecosystem Based Management (EBM). Wildland Urban Interface (WUI) stocking standards have been developed by the CVFC and will continue to be improved upon.

- Plan, build and maintain a network of roads and trails to provide access to accomplish management activities and protection from catastrophic disturbances. Consult with the community and target non industrial utilization in road planning and maintenance decisions. Investigate enhancing or maintaining berry picking opportunities where appropriate. Plan and sponsor a network of hiking trails in close proximity to urban areas, ecological and destination features.

- Monitor water quality and quantity in conjunction with licenced water users. Encourage third party research on water quality.

- Harvest the forest in a profitable manner in order to assist community needs.

- Meet or exceed the forest practice standards and apply a precautionary principal towards forest harvesting.

*2. diversify the use of and benefits derived from the community forest area;*

Historically the Community Forest's only source of revenue has been from the sale of raw logs to local mills and beyond. However, the Creston Valley receives large economic benefits from the water contained within the CVFC's management area which is available for domestic, industrial and agricultural use. The benefit of water production from our watersheds is assumed to conflict with forest harvesting but the Community Forest will continue to maintain higher development costs to achieve the protection of water quality and production. The economic benefit to our community from water is very important and it is assumed to be stable and not really thought about by those that benefit from what the watersheds provide.
The Community Forest will take extra care when operating in watersheds and realize reduced profit margins to maintain watershed values. To help pay for this eco-system style of forest management, CVFC's strategy is to:

- Consult on ways of gaining other forms of direct revenue from the management of its licence area.
- Undertake to enhance access to non-timber resources such as huckleberries, wild mushrooms and floral greens.

*3. provide social and economic benefits to British Columbia;*

CVFC's strategy is to:

- Continue consulting and applying practices that are acceptable to the public in order to maintain the privilege of accessing the watersheds, which will result in social and economic benefits to British Columbia.

- Prioritize harvested timber to local industry and community groups to enhance our social value and licence.
- Maintain economic stability for local industry and community groups to enhance our social values and licence.

*4. undertake community forestry consistent with sound principles of environmental stewardship that reflect a broad spectrum of values;*

The CVFC is committed to forest practices that protect all of our natural resources. Over the past sixteen years, CVFC has gained invaluable experience managing in community watersheds and subscribes to the concept of EBM. The goal is to continue implementing these practices throughout the CFA area.
Considering the aesthetics of the Valley, other highly esteemed values include visuals and wildlife habitat, which the Community Forest realizes the importance of. The strategy is to:

- Plan and implement practices that meet and in most cases exceed the government established Visual Quality Objectives through the use of well designed block shapes and partial retention silviculture systems.

- Implement the guidelines provided in the CVFC's approved Forest Stewardship Plan which follows the *Forest and Range Practices Act* and the *Forest Planning and Practices Regulation*.

The risk of fire in the Creston Valley's Wildland Urban Interface (WUI) is an issue that the CVFC has considered not only for its own management area but for private and municipal lands. The Community Forest has the knowledge for implementing WUI prescriptions and is exploring the scope of such a program. The strategy is to:

- Educate the public on the need to mitigate fuel levels throughout the Valley, partner with the Town of Creston and the Regional District of the Central Kootenay and then implement fuel reduction projects as provincial government funding becomes available.

*5. promote community involvement and participation;*

CVFC's management area is heavily used by the community members for recreation, hunting and berry picking. Over the years, the Community Forest has developed a network of ongoing communication amongst primary stakeholders. The strategy will include the following practices:

- Presentation to schools, stakeholders, Creston Town council and community groups.
- Field trips for local citizens interested in forest management. Articles in the local newspaper and monthly magazine regarding a specific activity or position.
- Field trips for elementary and high-school students.
- Ownership of the CVFC includes primary stakeholders and a cross section of the general public. All of CVFC's monthly Board meetings are open to the public.
- Keeping an up-to-date website.

*6. promote communication and strengthen relationships between Aboriginal and non-Aboriginal communities and persons;*

Up until four years ago, the Community Forest was in the unique position of having the Lower Kootenay Band (LKB) as one its shareholders and an active participant in the management of the CVFC. Unfortunately, the LKB decided to relinquish their share in order to pursue their own forestry related activities, in which the Band could economically profit from those operations in contrast to CVFC's 'non-profit' community forest.
Notwithstanding, the Community Forest's strategy is to:

- Re-engage and look for opportunities to assist the LKB in accomplishing their community goals.
- Have the Board Directors communicate directly to the Town of Creston and the RDCK in order to foster communication and strengthen relationships throughout the Creston Valley.

*7. advocate forest worker safety.*

In December 2008, the CVFC became safe certified with the BC Forest Safety Council. The Creston Community Forest realizes the many dangers of forestry work and has developed a well structured safe work procedure for its employees, contractors and consultants. Monthly meetings are held to formally review and discuss any concerns and to re-affirm the need for employee care and safety. CVFC's strategy is to:

- Advocate forest worker safety by holding monthly meetings and referring to its well developed safety policy.

## *3.2 Directors' Objectives for the Creston Community Forest*

The following objectives were developed by the CVFC Board of Directors in response to a series of meetings and Open Houses held over the past decade:

- to continue using an ecosystem-based, ecologically responsible philosophy of forest stewardship that respects all forest values and functions.
- to encourage involvement and to inform the public in the management of forest resources.
- to provide local employment in harvesting, silviculture, forestry and milling sectors.
- to be financially sustainable.
- to encourage education and training in all aspects of sustainable forestry.
- to provide the maintenance of water quality, quantity and flow regime of all streams and lakes within the area of Community Forest Agreement (CFA K3D).
- to use existing local facilities for primary timber/wood processing. Local refers to an area from Yahk to Riondel.
- to provide a timber supply for existing value-added enterprises and to promote local, value-added opportunities in the community.

- to pursue Forest Stewardship Council certification on all timber harvested under CFA K3D.
- to pursue incremental forestry projects as opportunities occur.
- to pursue effective, biologically oriented methods dealing with forest health issues.
- to be proactive with community wildfire/urban interface issues.

### *3.3 Community Values*

An Open House was held in July 2015 inviting the local public to discuss recent developments completed by the Community Forest and to gather information on community values. The purpose of the Open House was to seek the public's perspective on the role of the Community Forest regarding forest education and the management of local watersheds in the face of climate change.

The main concern from those attending the Open House was the continued availability of water. Discussions centered on diminishing water levels and stream flow and the impact that forestry could be having on their drinking water. Climate change was also seen as a concern, although some members of the public were unconvinced that it was directly contributing to drought and lower than normal water levels.

As such, water is the primary resource within the CVFC's management area and has been a source of contention and discussion for the past several decades. In light of what is currently happening throughout BC in terms of lower than normal snow packs and increasingly hotter and drier summers, it is expected that water users will become even more concerned in the coming years.

## 4.0 Resource Management Objectives

***4.4.1*** Water Objectives – CVFC will maintain water quality, timing and flow in both Domestic and Community watersheds. The impact of road construction and timber development will be minimized in terms of soil disturbance that could result in stream sedimentation.

***4.4.2*** Riparian Area Objectives - During the planning and development phase, riparian areas will be identified. The objective is to maintain soil stability and stream channel integrity as well as maintain forest connectivity along major riparian corridors.

***4.4.3*** Biological Diversity Objective - During the planning and development phase, the objective will be to maintain and enhance forest structural legacies such as old growth forests and identify and protect rare, threatened and endangered ecosystems. This will be carried out while considering the impacts of climate change.

***4.4.4*** Wildlife Habitat Objectives – During the planning and development phase, the objective will be to manage for forest composition and structures compatible with the habitat needs of a wide range of wildlife. In addition, habitat for threatened and endangered wildlife species will be maintained.

***4.4.5*** Soil Objectives - Minimizing soil disturbance during all forest development will be carried out to maintain productivity and the hydrological functioning of forest soils. Geoscientists will be used wherever Class IV terrain is encountered during potential developments or when CVFC suspects problems with mass wasting or soil erosion. The recommendations provided by the geoscientist will form an integral part of the development.

***4.4.6*** Wildfire Protection Objectives – The objective will be to continue identifying and treating areas that form part of the Wildland Urban Interface and areas assigned as Natural Disturbance Type 4 status. These areas are identified in CVFC's management area and have been included as part of the Timber Analysis completed by Forsite Consultants Ltd. The impacts of climate change and the fire suppression program that was implemented have created areas in close proximity to Creston that need to be addressed.

***4.4.7*** Forest Health Objectives – While considering the impacts that climate change is starting to have on local forests, maintain resilient and healthy forests over the course of the next few decades.

***4.4.8*** Visual Objectives – Much of CVFC's management area is visible from the Town of Creston and along Highway 3 which is a major scenic area. The objective will be to continue to minimize the impacts of road building and logging.

***4.4.9*** Recreational Objectives – The Creston Community Forest maintains two designated hiking trails; the Lady's Slipper trail and the Thompson Rim trail. A third hiking trail is planned for formal designation in the near future. The objective is to continue maintaining and where possible, create additional recreational opportunities in the Community Forest.

***4.4.10*** Timber Objectives - The objective will be to manage the licence area in order to provide for a diverse range of wood products, including sawlogs, poles, peelers, building logs, pulp and firewood. An AAC of 25,000 m3/year will be maintained while working to address the Wildland Urban Interface area, providing suitable logs to the local sawmills while working to implement ecosystem resilience.

***4.4.11*** Non-timber Forest Products – The objective will be to continue to explore opportunities for sustainable management of non-timber forest products, including medicinal herbs, wild foods, wild-crafting materials and floral products.

# 5.0 Resource Inventories

***5.1 Soils and Terrain mapping -*** Level 'B' and 'C' Terrain Mapping – Arrow Creek, Arrow Mtn. and adjacent areas – Forterra Consultants 1999

***5.2 Fish habitat and stream Inventory -*** Fish Stream Identification for Thompson Creek – Kootenay Natural Resource Consulting, 2010

***5.3 Visual Quality Objectives Mapping -*** Kootenay Lake Timber Supply Area – Visual Land Management Government Action Regulations Order, 2013

***5.4 Biogeoclimatic Ecosystem Classification -*** Ministry of Forests – Provincial Biogeoclimatic subzone/variant Mapping Version 9 - 2014

# 6.0 Silviculture Systems and Forest Products

Over the past sixteen years, the Creston Community Forest has extensively used partial cut and shelter-wood silvilculture systems as part of its harvest operations. The reason for doing so is to meet landscape level objectives such as Visual Quality Objectives and Ungulate Winter Range, but most importantly to provide a post-harvest area containing multiple tree species with multiple age classes.

Another important reason that is becoming more evident is to address the Wildland Urban Interface (WUI) and areas identified by Natural Disturbance Type (NDT) 4 regimes defined as areas that historically saw 'frequent, stand maintaining fires'. Both the WUI and the NDT 4 zones form a large portion of the Community Forest's management area and form an integral component to the Timber Supply Analysis. Over the next decade, CVFC will become even more pro-active in addressing these areas in order to foster more resilient eco-systems, while helping to fire proof the Town of Creston and adjacent private land.

CVFC is committed to providing the local mills in the Creston Valley with logs harvested from the Community Forest landbase. Figure 2 provides a breakdown of the forest products that have been sold from CVFC's landbase over the past three years.

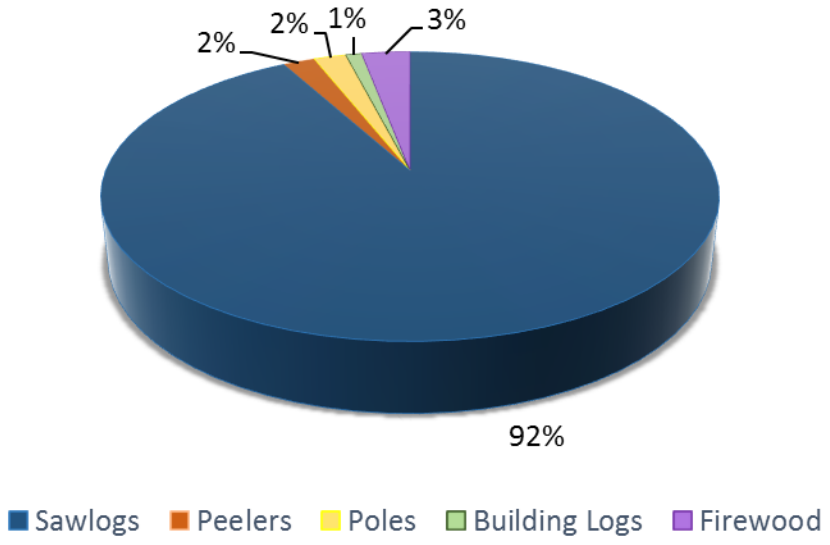


***Figure 2. Products sold from the CVFC landbase.***

# 7.0 Reforestation and Fuel Mitigation

## *7.1 Planning for Climate Change*

The rapid growth of the average global temperature in the past thirty years and the possibility of the next hundred years rising by 3-6°C, will require substantial consideration when planning the management of current operations.

The management strategies that have been modeled into the TSA completed by Forsite Consultants are based on the 'best available information' along with a host of educated assumptions in terms of selecting suitable tree species that will tolerate the shifting climate envelope.

Keeping diversity at the forethought will be important when selecting a variety of leave trees and seedlings, as diverse stands are known to be more resilient to insect and disease. Much of the CVFC's area is directly adjacent to homes and private land, therefore treating stands that fall victim to pest and disease epidemics will be crucial in reducing fire hazard. This may include the removal of dead stands or the use of trap trees to prevent further damage. Another target for reducing fire hazard will be treating fuel levels in areas that are in close proximity to communities and residences. Removal of dense timber and thick underbrush will aid in slowing the spread and intensity of a fire in the event of its occurrence.

Another fundamental planning consideration with regards to climate change will be to ensure the preservation of landscape connectivity. There has been renewed interest on managing for connectivity (*Conservation Planning in the face of Climate Change, Kutenai – 2015*). CVFC's management area has networks of important wildlife corridors, which connect the valley bottom to the upper mountains. As temperatures warm, protected corridors will provide routes of travel for wildlife migrating in search of new areas supporting the same habitat they once occupied.

CVFC's management philosophy is that forest management cannot be excluded from a watershed and that a passive approach to management is not a sustainable forest strategy to ecosystems that have a substantial history of natural disturbance. Simply allowing for decades of fuel to accumulate in order leave an area in its 'natural state' will inevitably translate into decades of recovery following a catastrophic wildfire. In essence, fuel management and water management have become inextricably linked.

## *7.2 TSA Modeling Assumptions*

CVFC identified five key management zones in determining its AAC. These management zones are identified in Table 12 of Appendix 1 and have been modeled into the analysis. The management zones are shown on Figure 3, 4 and 5 and include:

- Natural Disturbance Type 4
- Wildland Urban Interface
- Community and Domestic watersheds
- Visual Quality Objective polygons
- Remaining area of CFA not defined by first four management zones

These zones are defined by a specific management regime to be implemented and when combined with the BEC and existing stand type information, these key aspects determine what kind of silviculture system will be applied.

CVFC's analysis shows an even flow AAC of 21,000 $m^3$/year that can be maintained for 250 years. Alternatively, the 'base case' scenario shows an AAC of 25,000 $m^3$/year for the first seven decades and declining in subsequent decades to 18,800 $m^3$/year by decade twenty.

Given the impacts of climate change and the amount of WUI and NDT4 areas that will be left untouched after treatment, CVFC is confident that the current timber volumes and growth rates used in the base case are realistic and that mature timber volumes will inevitably decline during this century.

'*Either way, we can be sure of one thing. The forests our grandchildren walk in will be very different from those we grew up with'* (*BC Business* June 2015).

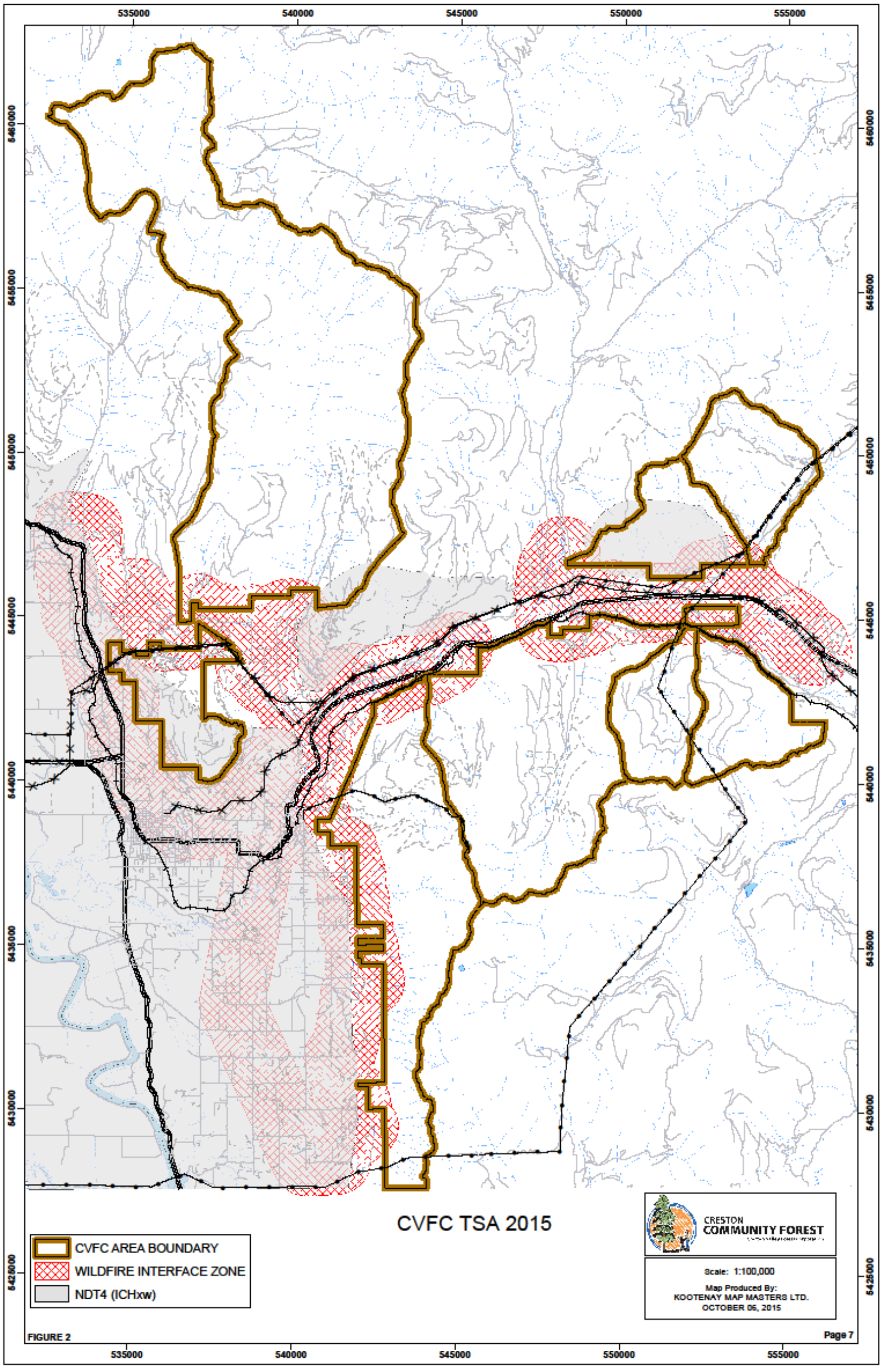


***Figure 3. Shows the area within Natural Disturbance Type 4 and the Wildland Urban Interface.***

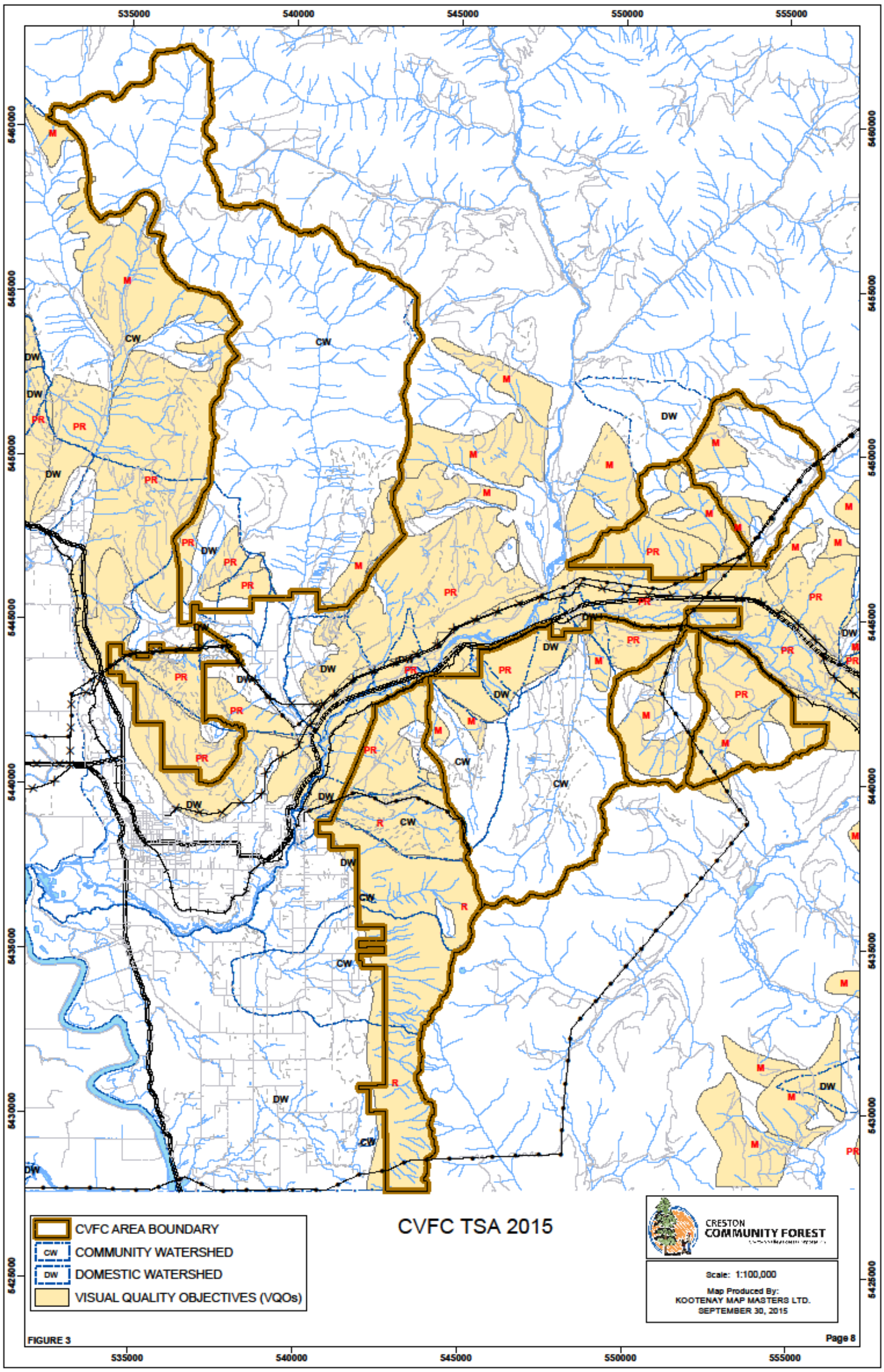


***Figure 4. Shows the Domestic and Community Watersheds and the Visual Quality Objectives; Modified (M), Partial Retention (PR) and Retention (R).***

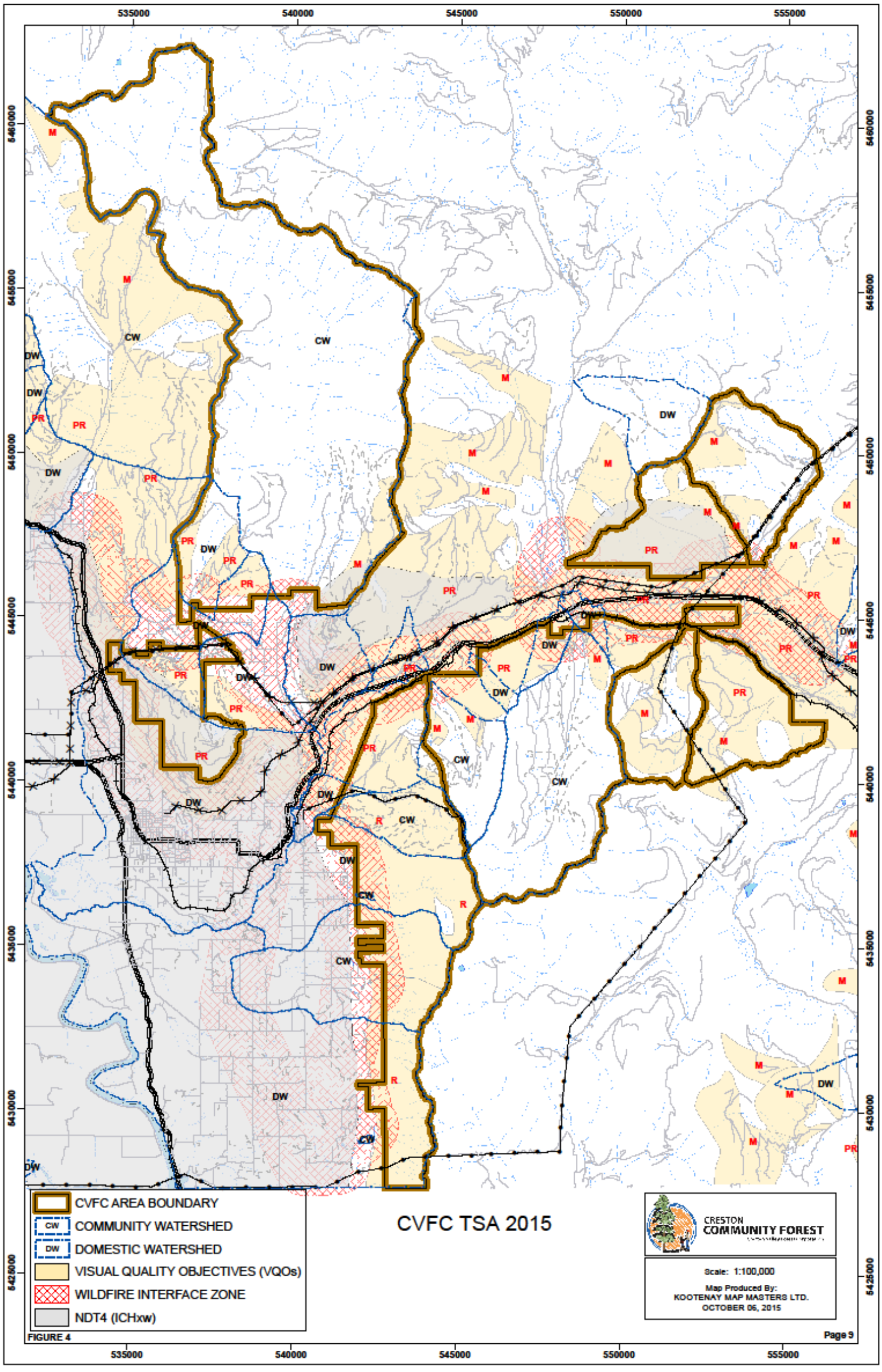


***Figure 5. Shows all five management zones listed in section 7.2.***

# Appendix 1
# Creston Valley Forest Corporation Timber Supply Analysis

## Appendix to the Management Plan for the Creston Community Forest Agreement

Print date: September 18, 2015

Modelling results for the period: May 15 to Aug 18, 2015
Forsite Project Number: 1266-2

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# *Acknowledgements*

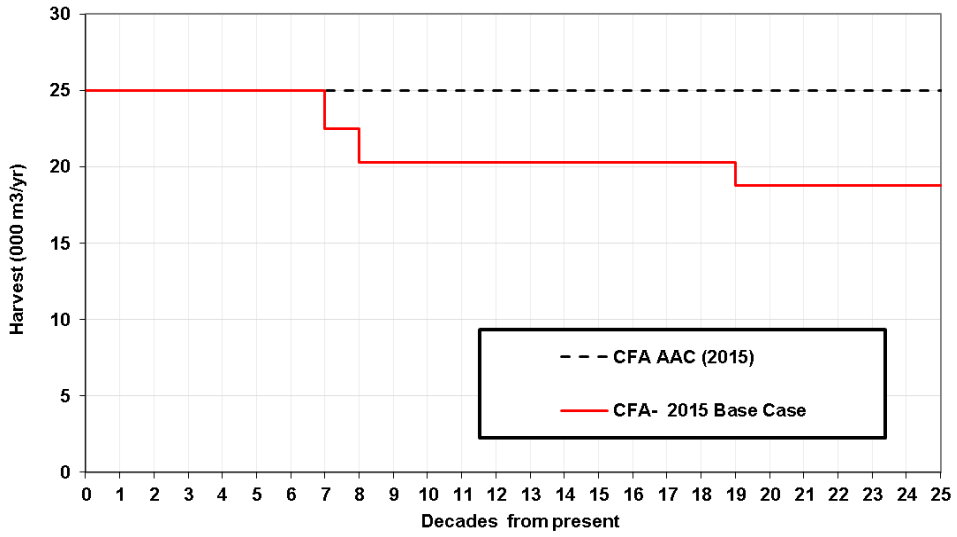
This was a collaborative project of the Creston Valley Forest Corporation (CVFC), and Forsite Consultants Ltd.

Project oversight was provided by Daniel Gratton, R.P.F., of the CVFC.

Project work and documentation was completed by Reg Davis, R.P.F., of Forsite Consultants Ltd.

# *Executive Summary*

This analysis estimates a harvest flow for the Creston community forest agreement, located to the northeast of Creston, B.C. as starting at 25,000 m³/year for 7 decades, then declining to a mid-term level of 20,300 m³/year in decade 9, then declining further in decade 20 to a long term harvest flow of 18,800 m³/year.




This analysis entailed:

- Starting with the assumptions that were used in the 2009 timber supply review (TSR)[1] process for the adjacent Kootenay Lake TSA;
- Modifying those assumptions to better reflect the historic, and intended future management within the community forest;
- Building a Forest Planning Studio (FPS)-version forest estate model of the community forest; and
- Modelling the harvest flow.

While the previous timber supply analyses have included objectives for non-timber resource values, the TSR-based management can be summarized as "100% clearcut and plant" management regime. The historic and future, intended management of the CFA is much different. A significant portion of the harvesting is partial cutting, and a significant amount of permanent retention of volume, on-site, after harvesting is underway. These practices are associated with the management philosophy of the CFA, which includes the retention during harvesting of *"multiple age classes and species".*

As well as partial cutting and volume retention, the intended management that is modeled here includes climate change-based objectives, such as open-grown stands that are resilient to fire (which are implemented as a "Wildfire Urban Interface" management zone), and the retention and regeneration of drought resistant species (e.g. Fd, Lw and Py).

These practices are modeled, in this analysis, as the "2015 Base Case" scenario.

[1] TSR is the timber supply analysis process for Timber Supply Areas.

# *Table of Contents*



# *List of Figures*

# *List of Tables*

# *List of Acronyms*

| | |
|---|---|
| AAC | Allowable Annual Cut |
| AU | Analysis Unit |
| BEC | Biogeoclimatic Ecosystem Classification |
| BEO | Biodiversity Emphasis Option |
| CFA | Community Forest Agreement |
| CFLB | Contributing Forest Land Base |
| CMAI | Culmination of Mean Annual Increment |
| DBH | Diameter at Breast Height |
| ECA | Equivalent Clearcut Area |
| ESA | Environmentally Sensitive Area |
| FPS | Forest Planning Studio |
| FRPA | Forest and Range Practices Act |
| FPPR | Forest Planning and Practices Regulation |
| KLTSA | Kootenay Lake Timber Supply Area |
| LU | Landscape Unit |
| MPB | Mountain Pine Beetle |
| MHA | Minimum Harvest Age |
| NDT | Natural Disturbance Type |
| NHLB | Non-Harvestable Land Base |
| NRL | Non-Recoverable Losses |
| OAF | Operational Adjustment Factor |
| PFLB | Productive Forest Land Base |
| REA | Resources Emphasis Area |
| RESULTS | Reporting Silviculture Updates and Land status Tracking System |
| RPF | Registered Professional Forester |
| SIBEC | Site Index Biogeoclimatic Ecosystem Classification |
| SPH | Stems Per Hectare |
| TIPSY | Table Interpolation for Stand Yields (software) |
| TFL | Tree Farm License |
| THLB | Timber Harvesting Land Base |
| TSA | Timber Supply Area |
| TSR | Timber Supply Review |
| UWR | Ungulate Winter Range |
| WHA | Wildlife Habitat Area |
| VDYP | Variable Density Yield Prediction (software) |
| VQO | Visual Quality Objective |
| VRI | Vegetation Resources Inventory |

# 1 Introduction / Background

*On October 9, 2013 Natural Resource Operations Minister Steve Thomson announced that the Province had increased the area covered by the Creston community forest agreement by adding 10,000 hectares to the existing 18,159 hectare agreement, and increased the annual allowable timber harvest in the community forest by 10,000 cubic metres, bringing the total to 25,000 cubic metres per year.* [2]

## 1.1 Project Objectives

The objective of this analysis is to estimate the harvest flow from the new Creston community forest landbase, using revised management assumptions.

Phase 1 of this analysis was to review and confirm the current management practices, which can be summarized into three broad categories:

(1) landbase netdowns,
(2) growth and yield assumptions, and
(3) non-forest management strategies.

Significant changes from previous analyses have been made in all three categories in this analysis.

In Phase 2, these three components were modeled, and long term harvest flow estimates were made for several scenarios, including one chosen as the 2015 Base Case.

Eventually, this analysis will be included as part of the CFA's next Management Plan, as per the requirements of Section 8 of the CFA Application Requirements (BC Min of Forests and Range. 2009)

[2] BC Community Forest Association website: http://bccfa.ca/index.php/item/431-b-c-increases-size-of-creston-community-forest

## 1.2 Location of the Creston Community Forest

The Creston community forest is located in the south east portion of British Columbia, to the north east of the town of Creston (Figure 1 and Figure 2).

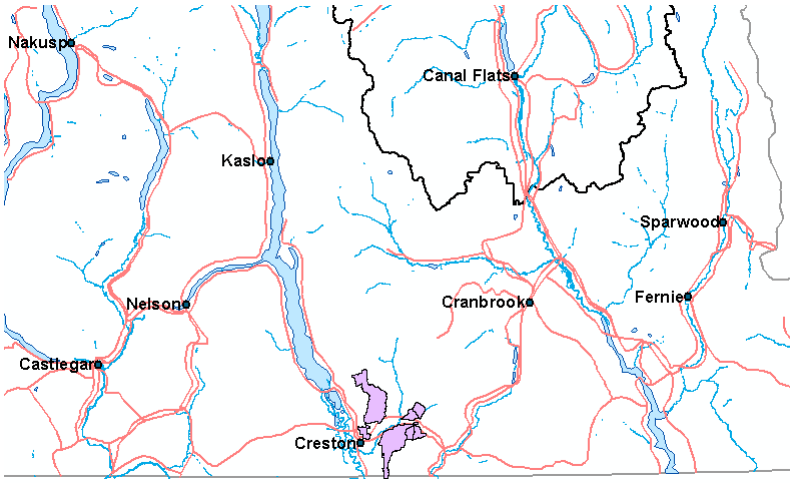



***Figure 1. Overview Map of the Creston Community Forest***

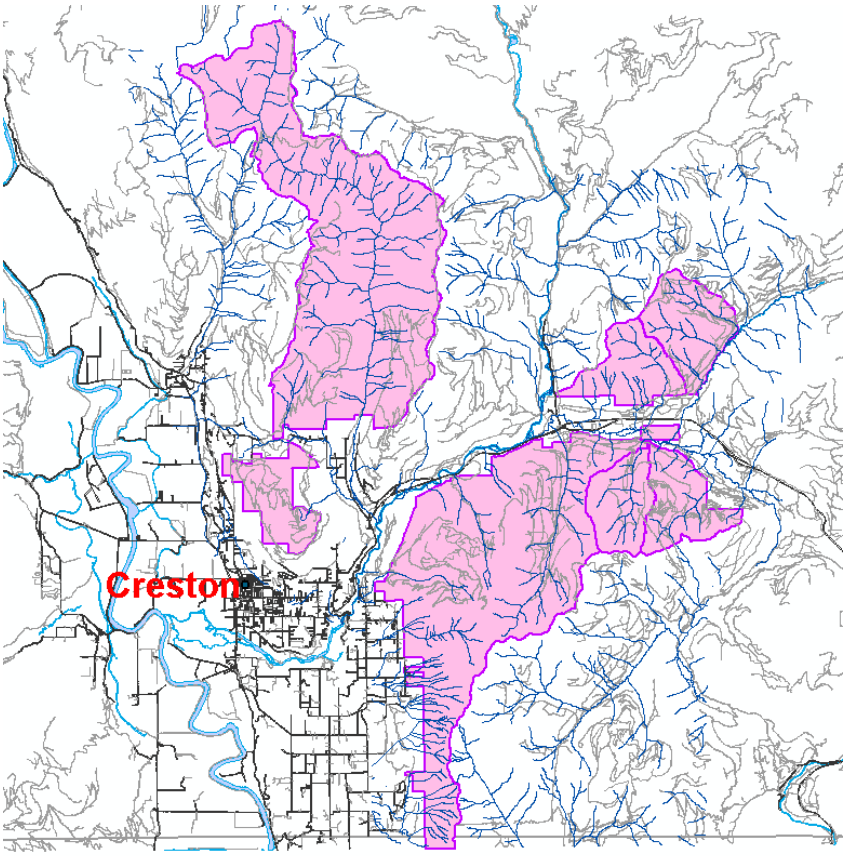



***Figure 2. Local Area Map of the Creston Community Forest***

## 1.3 A General Description of the CFA Landbase

The Community Forest gross area is 21,310 ha, of which 20,333 is productive forest, and of that 10,124 ha is timber harvest land base, aka the "working forest".

***Table 1. Community Forest Net Landbase***

| Netdown or Landbase Category | Area (ha) |
|---|---|
| Gross Area | 21,310 |
| Net CFLB | 20,333 |
| **Net THLB** | **10,124** |

The majority of both the NHLB and the THLB of the CFA is within the ICHdw, ICHmw2 and ESSwm biogeoclimatic subzones (Figure 3).

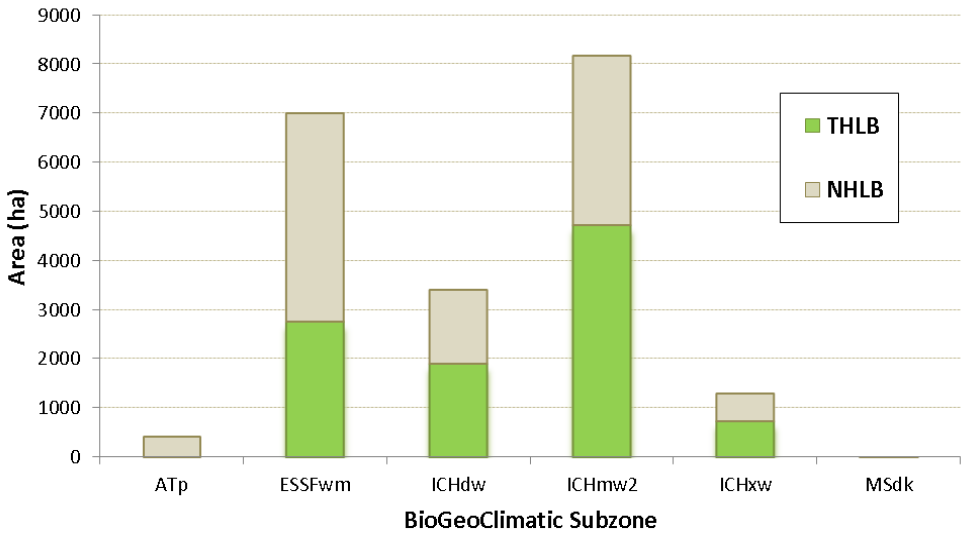



***Figure 3. BioGeoClimatic Subzones in the CFA***

The productive forest is primarily comprised of western larch (Lw), lodgepole pine (Pl), Douglas-fir (Fd) and balsam fir (Bl) -leading stands. All deciduous-leading stands are considered to be non-THLB (NHLB, Figure 4).

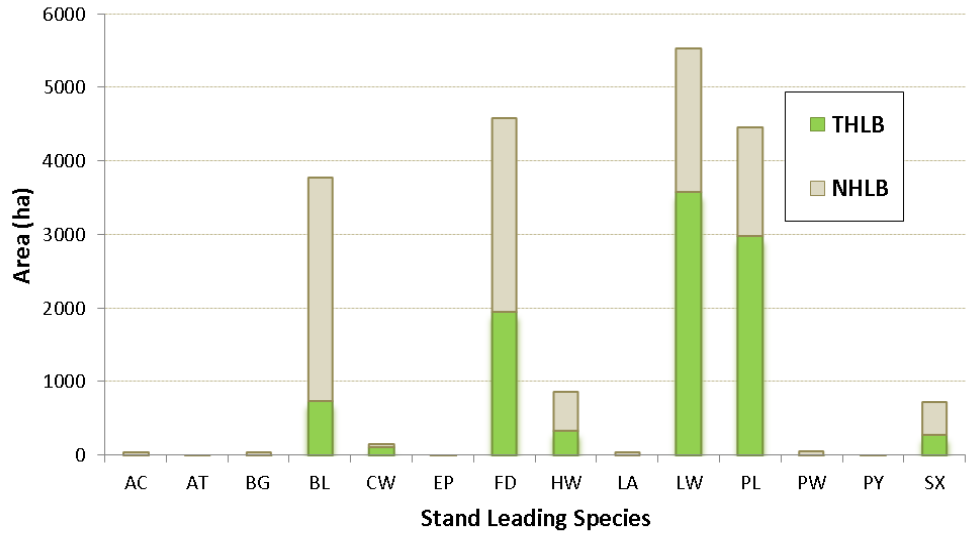



***Figure 4. Leading Species***

The productive forest in the non-THLB (NHLB) is mainly comprised of site indices between 11 and 19, while the THLB is primarily composed of site indices from 11 to 24 (Figure 5, site index is defined as height in meters at breast-height-age=50).

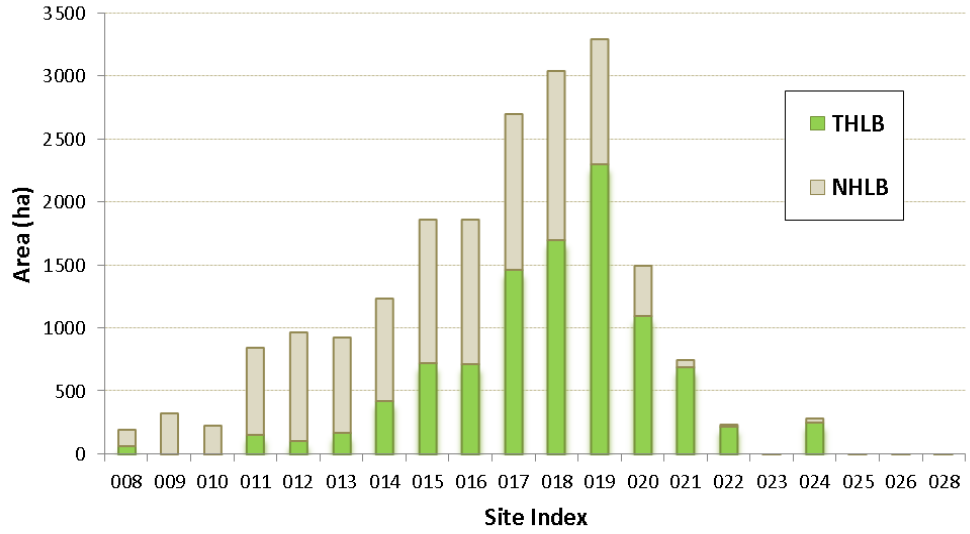



***Figure 5. Productive Forest Site Index Distribution***

# 2 Modelling Approach

This analysis followed these steps:

**Phase 1.**

- Review of the previous analyses modeling assumptions (landbase, growth and yield, management)
- Acceptance of the previous assumptions, or
- Creation or adoption of alternative assumptions.

**Phase 2.**

- Gathered the spatial data features for the study area to match the assumptions;
- Prepared a resultant dataset with the required spatial data features;
- Set up and ran the forest estate model (Forest Planning Studio, see section 2.2) and adjusted the harvest request targets to achieve appropriate harvest flows;
- Examined, checked and summarized the results; and
- Prepared this report to document the methods and the results.

## 2.1 Modelling Assumptions

The modelling assumptions used in this analysis are summarized in Appendix A - Table 1. The majority of these assumptions were adopted from the latest Kootenay Lake TSA Timber Supply Review (TSR) Reports available at:

http://www.for.gov.bc.ca/hts/tsa/tsa13/tsr3/13tspdp09.pdf and
http://www.for.gov.bc.ca/hts/tsa/tsa05/tsr3/05ts04ar_v3.pdf.

A number of unpublished, technical documents were also used. These were provided by the Forest and Analysis and Inventory Branch, who completed the 2009 Timber Supply Review.

This analysis also contains a number of assumptions that are significantly different from previous analyses. These new assumptions better match the historic, and the expected future management practices within the community forest.

### Non-timber Resource Areas

The assumptions for non-timber resources (aka "non-timber constraints") are almost entirely the same as those from the Kootenay lake TSR. The areas of these resources, in the CFA, are in Table 2.

***Table 2. CFA Non-timber Resource Emphasis Areas***

| Non-timber Resource Emphasis Areas | THLB (ha) | NHLB (ha) |
|---|---|---|
| Watersheds: Community and Domestic | 5,811 | 7,503 |
| Visual Quality Objectives (VQO) | 4,145 | 3,220 |
| Integrated Resource Management (IRM) | 9,392 | 0 |
| Biodiversity: Mature plus Old Seral | 1,180 | 1,415 |
| Biodiversity: Old Seral (Low BEO only) | 4,428 | 1,216 |
| Ungulate Winter Range (UWR) Early Seral | 2,130 | 737 |
| UWR Snow Interception Cover (SIC) | 2,004 | 735 |

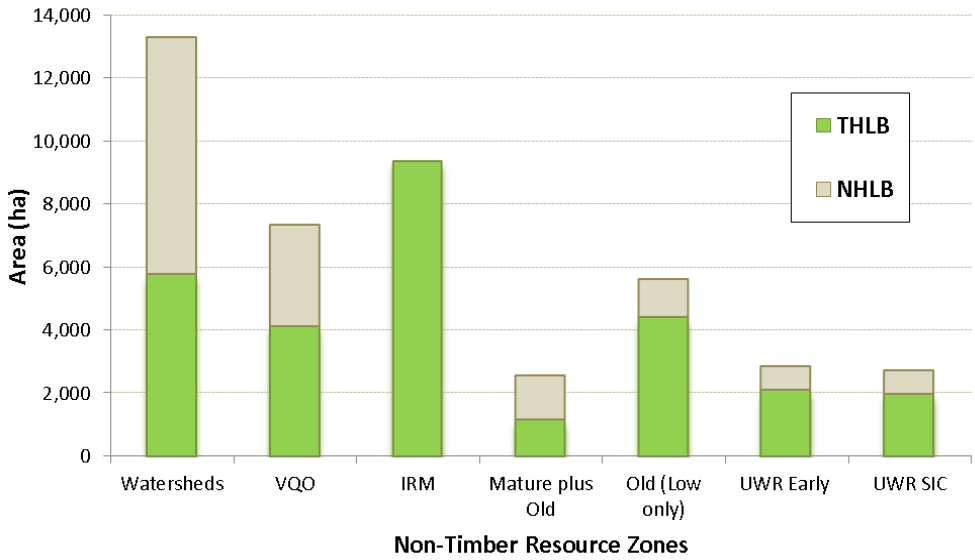



***Figure 6. CFA Non-timber Resource Emphasis Areas***

The most significant modeling changes in this analysis are itemized in Table 3.

***Table 3 Major Modeling Changes.***

| Factor | Previous Analysis Assumption | Current (new) Assumption |
|---|---|---|
| Historic partial cutting | Modeled as clearcut with adjustments made to the initial stand ages | Modeled as partial cuts |
| Future partial cutting | Modeled as clearcut | Modeled as partial cuts |
| Natural stand yield tables | VDYP6 software, older inventory | VDYP7 software, new VRI inventory |
| Managed stand yield tables | TSR-type methodology based on clearcuts, included large genetic worth values | New TIPSY inputs reflecting retention and open-stand type densities, no genetic worth |
| Management of VQOs | Assumed clearcuts, only WTP retention, TSR-type non-Veg greenup thresholds | 20% stand retention of stand volume within all VQO classes, increased non-Veg thresholds due to the volume retention |
| Riparian Buffers | TSR3-type retention within riparian management zones, varies depending on stream or wetland class. | FRPA-based, with a constant retention of 60% of basal area within all the riparian management zones. |
| Minimum harvest age threshold. | The greater MHA of two thresholds: (1) 100 $m^3$/ha, and (2) 95% of CMAI | Minimum volume threshold of 150 $m^3$/ha; no CMAI threshold. |

These are discussed in more detail throughout the following sections.

**Riparian Buffers (a Landbase Netdown)**

Riparian buffers are modeled as no-harvest zones, based on an "effective buffer width" concept. The effective buffer width is the total of the [reserve-zone-width x reserve-zone-retention %] plus the [management-zone-width X management-zone-retention %].

The Forest Stewardship Plan commits the licensee to maintaining 60% of the basal area within the management zone of streams, wetlands and lakes. This is a greater percentage than the retention assumed in the last TSR (and all previous analyses). The impact of the 60% is to increase the effective buffer width for all of the riparian buffers, as per the following tables.

***Table 4. Typical TSR, FRPA-based Riparian Buffers vs. Creston CFA Stream Buffers***

| Stream Class | Riparian Reserve Width | Management Zone Width (m) | FPPR Minimum Retention | FPPR Effective Width (m) | | CFA Retention (%) | CFA Effective Buffer Width (m) |
|---|---|---|---|---|---|---|---|
| S1 | 50 | 20 | 20% | 54 | | 60% | 62 |
| S2 | 30 | 20 | 20% | 34 | | 60% | 42 |
| S3 | 20 | 20 | 20% | 24 | | 60% | 32 |
| S4 | 0 | 30 | 10% | 3 | | 60% | 18 |
| S5 | 0 | 30 | 10% | 3 | | 60% | 18 |
| S6 | 0 | 20 | N/A (5%) | 1 | | 60% | 12 |

***Table 5. Typical TSR, FRPA-based Wetland Buffers vs. Creston CFA Wetland Buffers***

| Wetland Class | Riparian Reserve Width | Management Zone Width (m) | FPPR Minimum Retention | FPPR Effective Width (m) | | CFA Retention (%) | CFA Effective Buffer Width (m) |
|---|---|---|---|---|---|---|---|
| W1 | 10 | 40 | 10 | 14 | | 60% | 34 |
| W2 | 10 | 20 | 10 | 12 | | 60% | 22 |
| W3 | 0 | 30 | 10 | 3 | | 60% | 18 |
| W4 | 0 | 30 | 10 | 3 | | 60% | 18 |
| W5 | 10 | 40 | 10 | 14 | | 60% | 34 |

***Table 6. Typical TSR, FRPA-based Lake Buffers vs. Creston CFA Wetland Buffers***

| Lake Class | Riparian Reserve Width | Management Zone Width (m) | FPPR Minimum Retention | FPPR Effective Width (m) | | CFA Retention (%) | CFA Effective Buffer Width (m) |
|---|---|---|---|---|---|---|---|
| L1A | 0 | 0 | 10 | 0 | | 60% | 0 |
| L1B | 10 | 0 | 10 | 5 | | 60% | 10 |
| L2 | 10 | 20 | 10 | 2 | | 60% | 32 |
| L3 | 0 | 30 | 10 | 3 | | 60% | 18 |
| L4 | 0 | 30 | 10 | 3 | | 60% | 18 |

**Silviculture Regimes / Analysis Units**

> *The Creston Valley Forest Corporation Forest has been employing an 'ecosystem-based philosophy' of forest management since its inception in 1997. Ecosystem-based management is defined as integrating the 'scientific knowledge of relationships within a complex sociopolitical and values framework toward the general goal of protecting native ecosystem integrity over the long term'.*
>
> *Incorporating non-timber values in forest management ultimately ensure ecosystem health and long-term timber production for the community forest. Because we often operate in areas which are naturally host to the Kootenay mix (Pl, Fd, Sx, etc.), multiple age classes and species are retained to maintain a forest that is resilient to insects and disease.*
>
> *Ref: CVFC's website, Management Philosophy*

In practice this means increased retention of volume left on-site after logging, and increased use of partial cutting silviculture systems compared to the rest of the TSA, and previous analyses.

It was estimated that 60 percent of the historic logging is "clearcutting" which includes clearcut-with-reserves, and conversely 40% of historic logging is some form of "partial cutting" (Figure 7 and Table 7). These estimates were determined from a compilation of licensee cut-blocks, RESULTS openings, satellite imagery (Google Earth) and VRI.

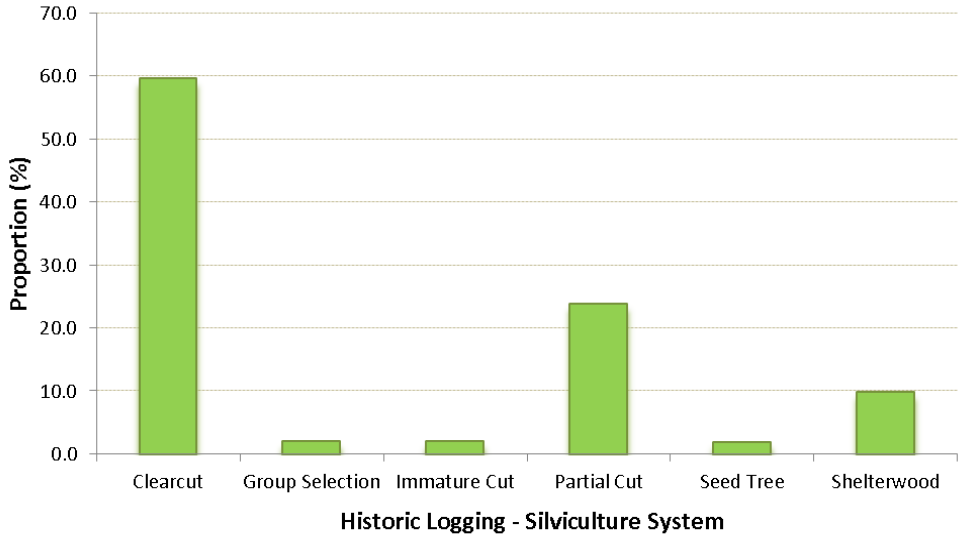



***Figure 7. Historic Logging - Proportion by Silviculture System***

***Table 7. Historic Logging - Proportion by Silviculture System***

| Historic Silviculture System | Proportion of THLB (%) |
|---|---|
| Clearcut | 59.7 |
| Group Selection | 2.1 |
| Immature Cut | 2.1 |
| Partial Cut | 24.0 |
| Seed Tree | 2.1 |
| Shelterwood | 9.9 |

### Management Zones and Associated Silviculture Systems

Future harvesting will also include a significant component of partial cutting. However, stand types themselves did not define where, or what type of partial cutting will take place.

In order to guide the modeling of future clearcut and non-clearcut harvesting, resource management zones were created (Table 8). These zones define the general management intent of the zone, and when combined with BEC and leading species information, they define the location where future silviculture systems will be applied.

Note that these zones are non-overlapping - the first zone encountered in table, starting at the top, defines the zone any stand belongs to.

***Table 8. Definition of Resource Zones***

| Resource Management Zone | Description | Resource Management Code |
|---|---|---|
| Non-Timber Harvest Land Base Zone | All productive forest stands that are not in the Timber Harvest Land Base (i.e. productive, but not in THLB) Note that non-timber resource guidelines will be applied to (or overlap with) these stands, such as the watershed ECA threshold if these stands fall within a watershed. | 08_NHLB |
| Fire Maintained Ecosystem. NDT 4 Zone | All stands not in the above, and in the ICHxw. Stands will be converted to Open Range (OR) or Open Forest (OF). Harvesting will remove all but 15m$^3$/ha, which will be permanent retention. No further harvesting is expected. No regeneration requirements are expected. | 02_NDT4 |
| Wildfire Urban Interface Zone | All stands that are not in the above, and are within 1 km of public infrastructure (major highways, settlements, houses). Stands will be converted to relatively open (few, larger stems), concentrating on the retention and regeneration of Fd, Lw and Py. Understory treatments may occur in the future to reduce ladder fuels, but those treatments are not part of this analysis. Shelterwood with first entry of 50% removal (Fd+Lw>50%' stands) or 60% removal (in other stands.) | 03_WUI- |
| Watershed Zone | All stands not in the above, and are within community watersheds or domestic watersheds. Partial cuts with 75% removal in the first entry in the ICHmw2 where Pl<80%; otherwise clear-cut-with-reserves with 100% removal in other stands and BEC types. Note: ECA percentage thresholds are also applied during modelling, within the watershed units. | 04_WSHD |
| Visual Quality Objective Zone | Clearcut-with-reserves with 100% removal in Pl>=80% stands; and partial cuts with 80% removal in one entry, and a permanent 20% retention of the original volume, in other stands. Note: Non-veg green-up thresholds are also applied, during modelling, to the LU-VQO units, as per the TSR 3 methodology | 05_VQO- |
| Remaining Stands | All stands not in the above. Clearcut-with-reserves with 100% removal. | 06_NORM |

Note: A proposed WHA 205 for Screech Owl habitat was included (and is still in) the database. The intent was to model it as a separate management zone. This was a 5-entry, partial cutting regime, which was to be coded as "01_WHA". It would have been placed immediately above the "02_NDT4" regime in the above table. However, the entire WHA was found to be within the non-THLB (i.e. code = "08_NHLB", outside of the "working forest") and so the management regime was redundant, and it dropped out of the analysis.

The area of each zone is provided in Table 9 and Figure 8.

***Table 9. Resource Management Zones***

| Resource Management Zone | Area (ha) | Proportion (THLB only, %) |
|---|---|---|
| 02_NDT4 | 732 | 7.2 |
| 03_WUI- | 967 | 9.6 |
| 04_WSHD | 5,256 | 51.9 |
| 05_VQO- | 2,037 | 20.1 |
| 06_NORM | 1,132 | 11.2 |
| 08_NHLB | 10,208 | 0 |
| **Total (ha)** | **20,333** | |
| **Total (THLB, %)** | | **100** |

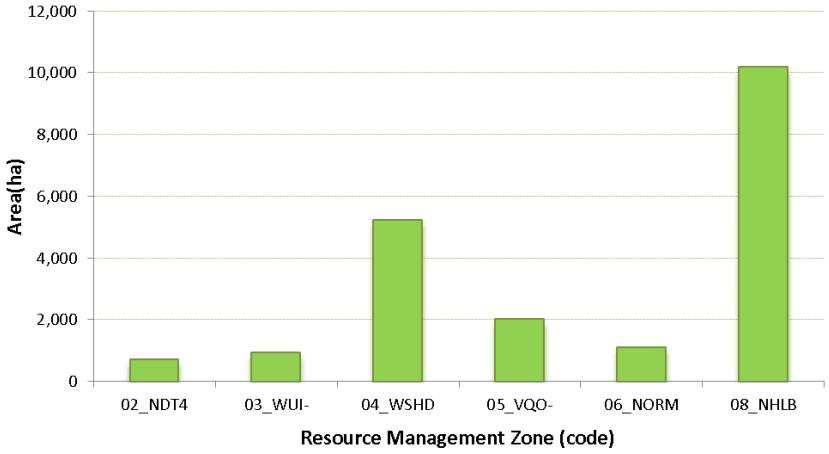



***Figure 8. Area of Resource Management Zones***

The resource zones are further split by BEC and stand type to arrive at the silviculture system for that combination of zone, BEC, and species group, as per Table 10. The silviculture system codes are defined in Table 11.

***Table 10. Resource Management Zones and Silviculture Systems***

| Management Zone | BEC | Species Group | Silviculture System Code | Area (ha) |
|---|---|---|---|---|
| 02_NDT4 | ANY--- | ANY-- | CON | 732 |
| 03_WUI- | ANY--- | FL>50 | SHE | 921 |
| | | OTHER | PCT | 47 |
| 04_WSHD | ICHmw2 | OTHER | PCT | 2,048 |
| | | PL>80 | CCR | 446 |
| | OTHER- | OTHER | CCR | 2,761 |
| 05_VQO- | ESSFwm | ANY-- | CC2 | 248 |
| | ICH--- | OTHER | CC2 | 1,557 |
| | | PL>80 | CCR | 232 |
| 06_NORM | ANY--- | ANY-- | CCR | 1,132 |

***Table 11. Silviculture System Definitions***

| Silviculture System | Area (ha) |
|---|---|
| CON | First harvest is conversion of the stand to open range (OR) or open forest (OF); Permanent retention of 15m$^3$/ha. No further harvest entries. |
| SHE | First entry = 50% at year=0; Second entry = 50% at year =25. |
| PCT | First entry = 80% at year =0; Second entry = 20% at year =25. |
| CCR | One entry at 100% removal, at year =0 |
| CC2 | One entry = 80% removal, then Permanent retention of the remaining 20% |

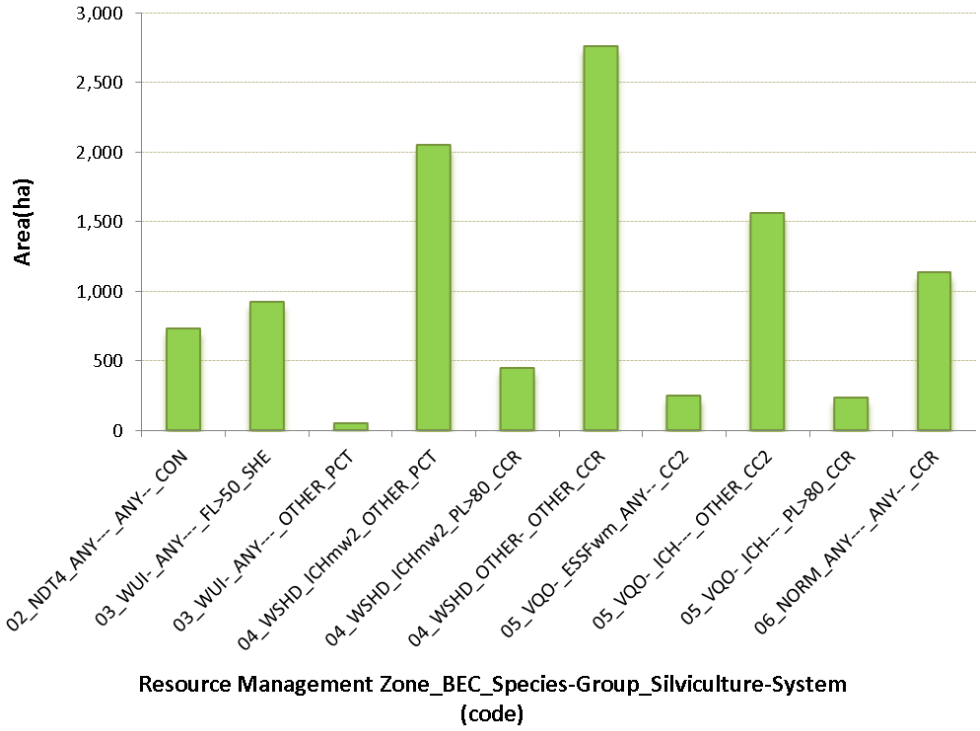



***Figure 9. THLB Resource Management Zones, BEC, Species Group, and Silviculture system***

### Growth and Yield - Managed Stand Yield Tables (Regeneration Assumptions)

The "core" TIPSY inputs for the regenerating (or post-harvest) stands are tallied in Table 12. Natural stands in the non-timber harvest landbase will undergo natural disturbance, and will regenerate back to themselves.

***Table 12. Managed Stands' TIPSY Inputs***

| Resource Zone | BEC | Species Group | Silv-Syst | Core TIPSY AU | Site Index | Plant / Nat | Pct | Spp | Pct | Spp | Pct | Spp | Pct | Spp | Pct | Density | Regen Delay |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NDT4 | ANY--- | ANY-- | CON | 2001 | 19.5 | Plant | 50 | Py | 50 | Fd | 50 | | | | | 500 | 2 |
| | | | | | | Nat | 50 | Pl | 40 | Pw | 40 | Lw | 10 | Bg | 10 | 200 | 2 |
| WUI | ANY--- | FL>50 | SHE | 2002 | 19.5 | Plant | 50 | Py | 50 | Fd | 50 | | | | | 500 | 2 |
| | | | | | | Nat | 50 | Pl | 40 | Pw | 40 | Lw | 10 | Bg | 10 | 200 | 2 |
| | | OTHER | PCT | 2003 | 18.96 | Plant | 80 | Py | 30 | Pw | 30 | Fd | 30 | Lw | 10 | 500 | 2 |
| | | | | | | Nat | 20 | Bg | 60 | Pl | 40 | | | | | 200 | 2 |
| WSHD | ICHmw2 | OTHER | PCT | 2004 | 17.8 | Plant | 80 | Py | 25 | Fd | 25 | Pw | 25 | Lw | 25 | 800 | 2 |
| | | | | | | Nat | 20 | Bg | 50 | Cw | 25 | Hw | 25 | | | 600 | 2 |
| | | PL>80 | CCR | 2005 | 17.86 | Plant | 80 | Pw | 30 | Fd | 30 | Lw | 30 | Py | 10 | 1200 | 2 |
| | | | | | | Nat | 20 | Bg | 50 | Cw | 25 | Hw | 25 | | | 400 | 2 |
| | OTHER | OTHER | CCR | 2006 | 16.18 | Plant | 80 | Pw | 30 | Fd | 30 | Lw | 30 | Py | 10 | 1200 | 2 |
| | | | | | | Nat | 20 | Bg | 50 | Cw | 25 | Hw | 25 | | | 400 | 2 |
| VQO- | ESSFwm | ANY-- | CC2 | 2007 | 16.43 | Plant | 80 | Pw | 30 | Fd | 30 | Lw | 30 | Py | 10 | 1200 | 2 |
| | | | | | | Nat | 20 | Bl | 50 | Se | 25 | Hw | 25 | | | 400 | 2 |
| | ICH--- | OTHER | CC2 | 2008 | 19.02 | Plant | 80 | Py | 25 | Fd | 25 | Pw | 25 | Lw | 25 | 1000 | 2 |
| | | | | | | Nat | 20 | Bg | 50 | Cw | 25 | Hw | 25 | | | 400 | 2 |
| | | PL>80 | CCR | 2009 | 17.16 | Plant | 80 | Pw | 30 | Fd | 30 | Lw | 30 | Py | 10 | 1200 | 2 |
| | | | | | | Nat | 20 | Bg | 50 | Cw | 25 | Hw | 25 | | | 400 | 2 |
| NORM | ANY--- | ANY-- | CCR | 2010 | 18.57 | Plant | 80 | Fd | 25 | Sx | 25 | Pw | 25 | Lw | 25 | 1200 | 2 |
| | | | | | | Nat | 20 | Bl | 50 | Hw | 25 | Bg | 25 | | | 400 | 2 |

Note that the density values in the above table are very low (e.g. some 200 and 400 stems/ha in some analysis units) which reduces the stand yields, and causes higher-than-expected minimum harvest ages (MHA, Table 13) compared to what one normally sees in timber supply analyses.

***Table 13. Minimum Harvest Ages for the Core TIPSY Analysis Units***

| Core TIPSY AU Number | MHA |
|---|---|
| 2001 | n/a (NDT 4 conversion) |
| 2002 | 118 |
| 2003 | 114 |
| 2004 | 93 |
| 2005 | 79 |
| 2006 | 90 |
| 2007 | 99 |
| 2008 | 92 |
| 2009 | 83 |
| 2010 | 70 |

Individual analysis units are further defined by the additional parameters of landbase (NHLB/THLB), leading species and site index class (Table 14).

***Table 14. AU Species Groups and Site Index Classes***

| Landbase | Species Group | Site Index Class | THLB (ha) | NHLB (ha) | Total (ha) |
|---|---|---|---|---|---|
| THLB | BS------ | 00-99 | 1,064 | 0 | 1,064 |
| | Cw_Hw--- | 00-99 | 461 | 0 | 461 |
| | Fd-Lw--- | 00-18 | 1,362 | 0 | 1,362 |
| | Fd-Lw--- | 18-99 | 4,210 | 0 | 4,210 |
| | Pl------ | 00-17 | 1,190 | 0 | 1,190 |
| | Pl------ | 17-99 | 1,837 | 0 | 1,837 |
| NHLB | Conif--- | 00-99 | 0 | 10,162 | 10,162 |
| | Decid--- | 00-99 | 0 | 47 | 47 |
| **Totals** | | | **10,124** | **10,208** | **20,333** |

A total of 141 analysis units were derived after all the criteria are applied to the landbase to represent the existing stands, and after additional AUs are created to represent the future, managed stands (the post-harvest regenerating stands).

## 2.2 Forest Estate Model

Forest Planning Studio (FPS) version 6.0.2.0 was used to complete the timber supply analysis. This model has been used previously in the timber supply analysis of several other TSA and TFL management units.

FPS was developed by Dr. John Nelson at the University of British Columbia (UBC) and is a spatially explicit forest estate simulation model. All events in the model are directly linked to stand level polygons or harvest units and thus allow tracking of individual stand attributes and spatial relationships through time. Each polygon belongs to a specific stand group (analysis unit) and has attributes such as age, harvest system, and land base status (THLB or Non-THLB). Results are typically aggregated for reporting at higher levels, such as the harvest flow for the entire unit.

A wide range of constraints can be modeled on the land base: harvest exclusion, spatial adjacency or maximum cut-block size, maximum disturbance/young seral, minimum mature/old seral, and equivalent clear-cut area (ECA) limits. Constraints are applied to groups of polygons (cliques) and harvest is restricted if a constraint is not satisfied. A single polygon can belong to many overlapping cliques and each of them must be satisfied in order to allow harvest of the polygon. Where a mature or old cover constraint is not met, harvesting may still occur if there are any eligible stands remaining after the oldest stands are reserved to meet the constraint.

Harvest is implemented using a set of priorities to queue stands for harvest. In each period, the model harvests the highest priority eligible stands until it reaches the harvest target or exhausts the list of opportunities. Harvest periods can be set at single years, multiple year periods or a combination of these. Where periods are used, (as in the 10-year periods in this analysis) the midpoint of the period is used as the point where harvest opportunity is evaluated because it is a good balance between the start of the period (pessimistic) and the end of the period (optimistic).

Modelling was completed for a minimum of 300 years for each scenario to confirm that the harvest and growing stock levels remain stable, but only the first 250 years are reported. The results presented here do not define a new AAC – they are intended only to provide insight into the likely future timber supply for the community forest. The final harvest level decision will be made by a statutory decision maker.

## 2.3 Harvest Flow Objectives

A harvest flow is developed by gradually adjusting the harvest level to arrive at a balance between the short- and the long-term harvest level. A wide range of harvest flows is possible. Choices include:

- non-declining even flow (constant, no changes over time);
- non-declining (but possibly rising) flow; and
- variable flow (possibly rising, or falling, or both) over time.

For example, the last TSR harvest flow for the Kootenay Lake TSA was a declining pattern from a high of 645,000 m³/year during decades 1 and 2, decreasing to 544,000 m³/year by decade 4 (Figure 10).

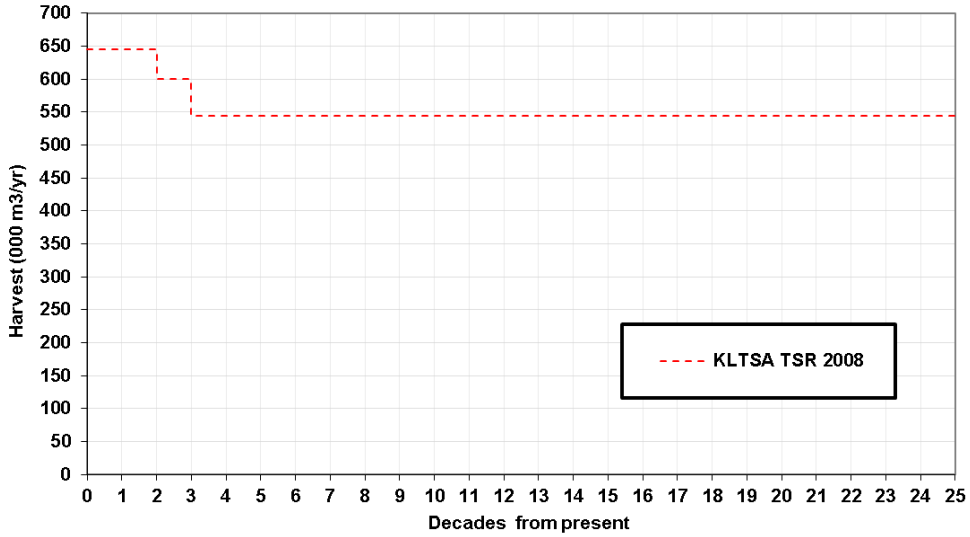



***Figure 10. Kootenay Lake TSA Base Case Harvest Flow - TSR3 2008***

## 2.4 Historic Harvest Flows for the Creston Community Forest

The harvest flows derived for the community forest from some of the previous analyses (2007, 2014a, b, c) are summarized in Table 15 and Figure 11. These were all non-declining even flows.

***Table 15. Creston Community Forest - THLB and Harvest Flow Summaries - 2007 vs. 2014 a,b,c***

| Category | 2007 TSR (T. Bradley) | 2014a (P. Lewis) | 2014b (R. Davis) | 2014c (R. Davis) |
|---|---|---|---|---|
| **Net THLB** | 7,519 ha | 6,971 ha | 7,834 ha | 7,342 ha |
| **Harvest Rate** | 14,600 m³/year | 19,953 m³/ year (*) | 18,900 m³/year | 18,600 m³/year |

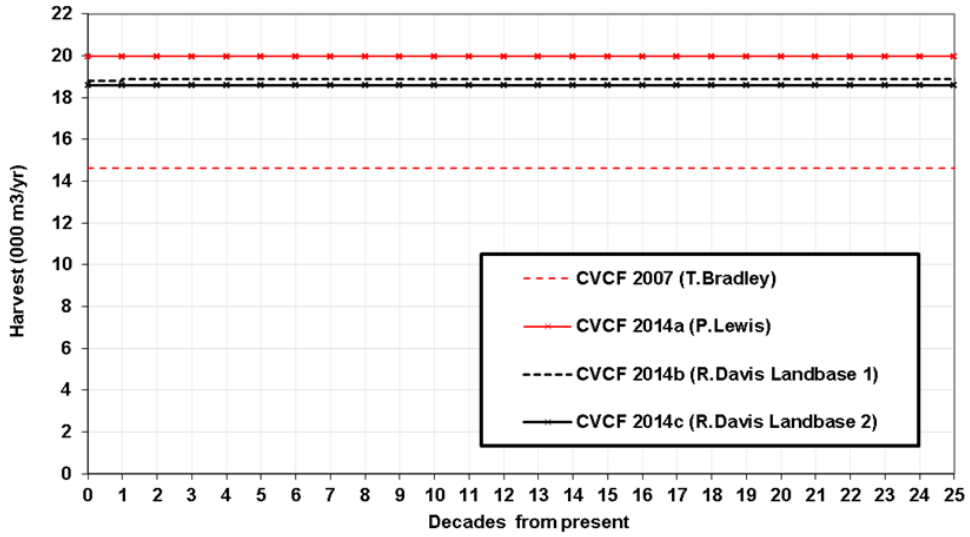



***Figure 11. Creston Community Forest – Harvest Flows - 2007 vs. 2014 a, b, c.***

## 3 Results - First Decade Scenarios

Figure 12 compares the current AAC to three model runs:

(1) CFA 2015 Non-declining Even Flow (no change over time after the first decade);

(2) CFA 2015 First Decade at Current AAC (with variable harvest over time); and

(3) CFA 2015 Maximum First Decade harvest (then variable harvests over time).

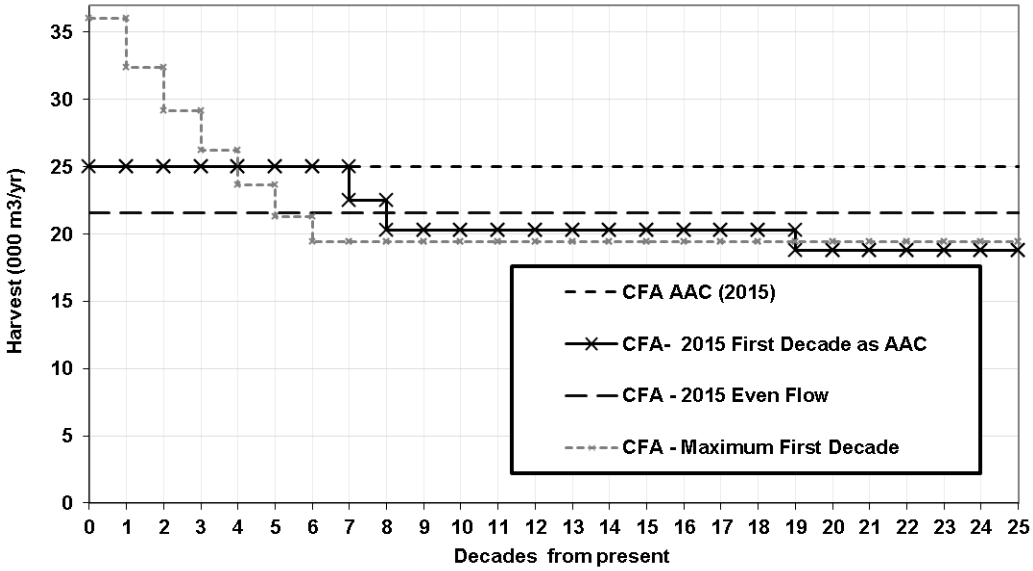



***Figure 12. Three Possible CFA Harvest Flows***

The **CFA - 2015 First Decade at Current AAC** run was chosen as the **2015 Base Case** for this analysis.

# 4 Results - 2015 Base Case

Figure 13 depicts the 2015 Base Case harvest forecast to the current, 2015 AAC. The Base Case harvest flow maintains the AAC (25,000 $m^3$/year) for 7 decades, then it falls by decade 9 to 20,300 $m^3$/year which is 4,700 $m^3$/ha less than the AAC. It falls again in decade 20 to 18,800 $m^3$/year which is 6,200 $m^3$/ha less than the current AAC.

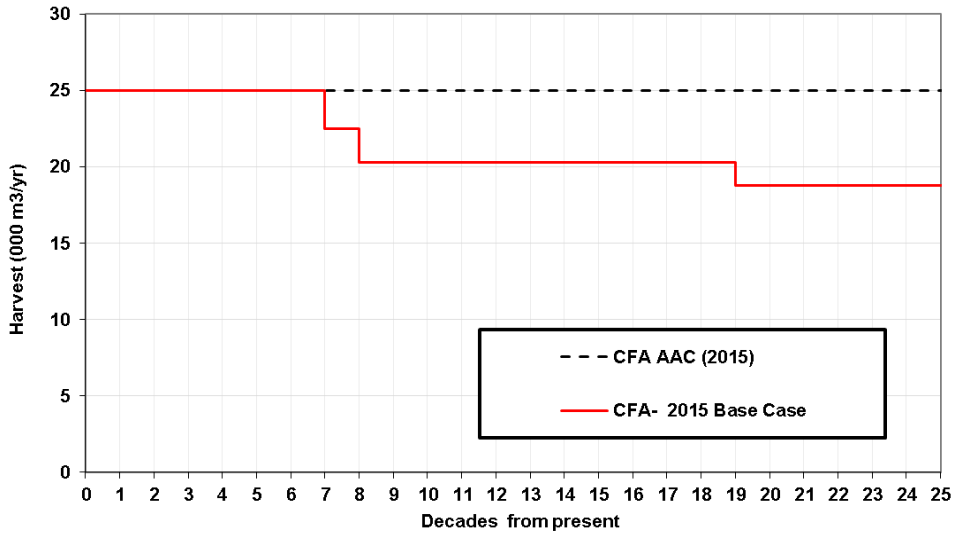



***Figure 13. 2015 Base Case vs. 2015 AAC***

This decline in harvest is attributed to the regeneration assumptions for the future, managed stands (this is described in section 5). Many of the TIPSY software input density values are very low, compared to other management units, which delays the stands from reaching minimum harvest volume for a significant number of years. In turn, that reduces the available volume and the harvest level.

## 4.1 Growing Stock

The growing stock throughout the planning period is presented in Figure 14 and Table 16. The initial (year=0) total standing volume of timber on the THLB is 1.84 million $m^3$, of which 1.70 million $m^3$ is merchantable timber (i.e., with an age over the minimum harvest age).

The merchantable growing stock declines over the whole of the planning horizon until it reaching its lowest level in decade 25.

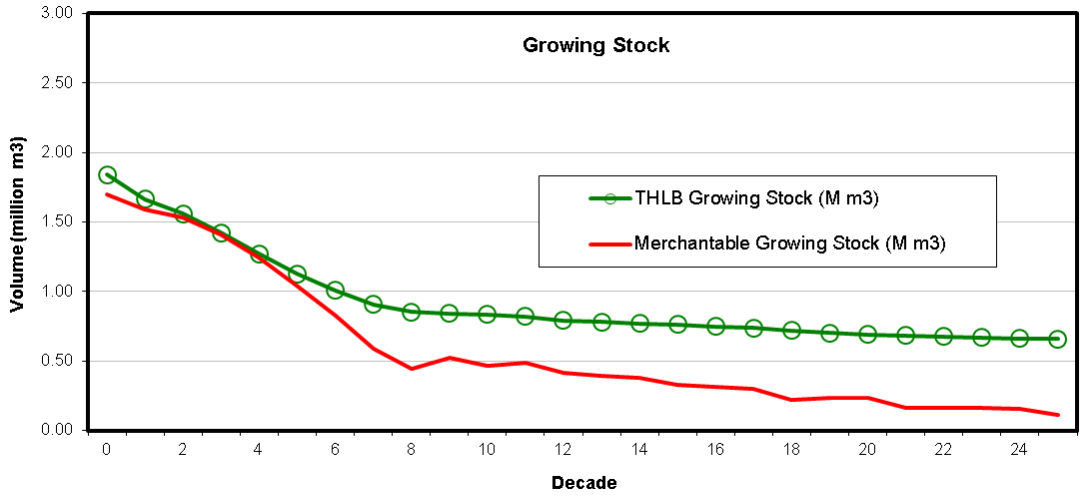



***Figure 14. 2015 Base Case Growing Stock***

***Table 16. Base Case Growing Stock***

| Period | Total Growing Stock (million m³) | Merchantable Growing Stock (million m³) |
|---|---|---|
| **0** | 1.84 | 1.70 |
| **1** | 1.66 | 1.59 |
| **2** | 1.56 | 1.53 |
| **3** | 1.42 | 1.41 |
| **4** | 1.27 | 1.24 |
| **5** | 1.13 | 1.04 |
| **6** | 1.01 | 0.82 |
| **7** | 0.91 | 0.59 |
| **8** | 0.85 | 0.44 |
| **9** | 0.84 | 0.52 |
| **10** | 0.83 | 0.46 |
| **11** | 0.82 | 0.49 |
| **12** | 0.79 | 0.41 |
| **13** | 0.78 | 0.39 |
| **14** | 0.77 | 0.38 |
| **15** | 0.76 | 0.33 |
| **16** | 0.75 | 0.31 |
| **17** | 0.74 | 0.30 |
| **18** | 0.72 | 0.22 |
| **19** | 0.70 | 0.23 |
| **20** | 0.69 | 0.24 |
| **21** | 0.68 | 0.16 |
| **22** | 0.68 | 0.16 |
| **23** | 0.67 | 0.16 |
| **24** | 0.66 | 0.16 |
| **25** | 0.66 | 0.11 |
| | | |
| **Minimum** | 0.66 | 0.11 |
| **Maximum** | 1.84 | 1.70 |

## 4.2 Harvest Attributes

***Natural to Managed Stand Transition***

Figure 15 depicts the harvest transition from natural stands to managed stands. In the first 8 decades timber was harvested almost exclusively from existing natural stands. In the 9th decade the harvest of natural stands dropped significantly as existing managed stands became available for harvest. From the 13th decade onward, managed stands comprised the majority of the harvest.

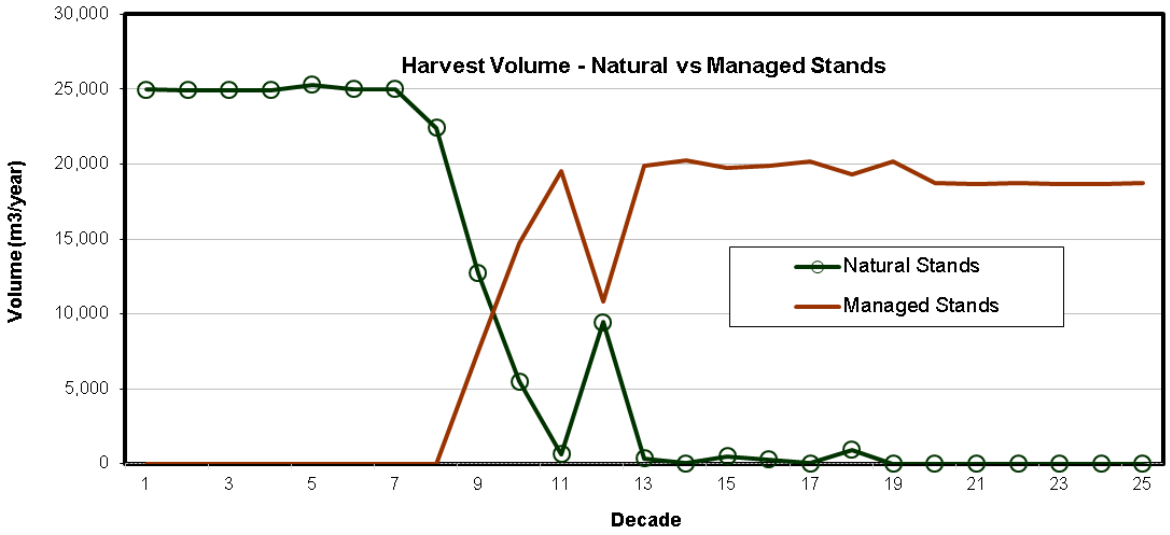



***Figure 15. Transition of Harvesting from Natural Stands to Managed Stands***

***Harvest Age***

Figure 16 shows that throughout the planning horizon, harvest ages ranged between 70 and 300 years and a significant number of stands continued to attain old ages prior to being harvested. The mean harvest age begins at 165 years then dropped to approximately 100 years in the long term; consistent with harvesting relatively older, natural stands early in the planning horizon.

The small spike in harvest age at decade 12 corresponds to the spike of age class 0 stands (i.e. the logged, age=0, managed stands in Figure 19) that are reaching maturity, and the model is working through that spike. The result is a temporary reversal of the trend from natural to managed stands, and then a switch back to the original trend.

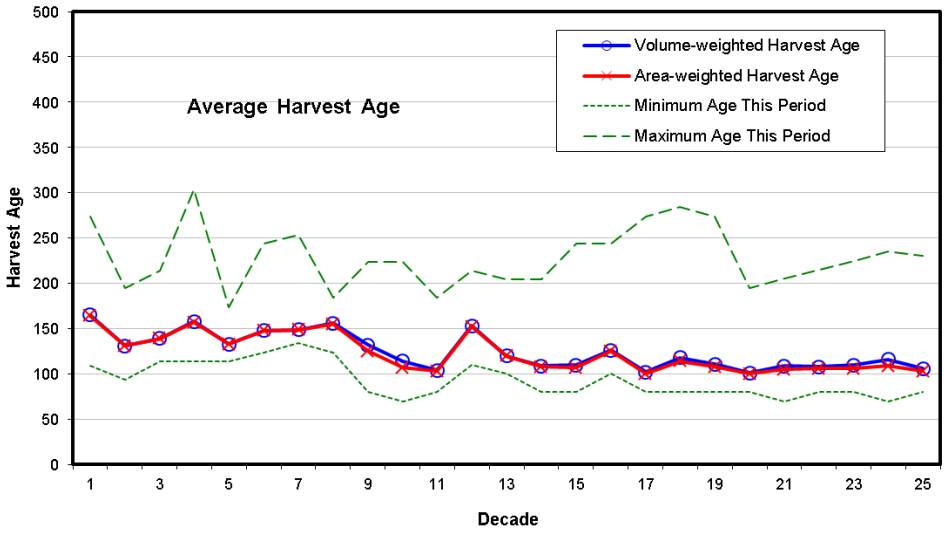



***Figure 16. Mean Harvest Age for All Stands Combined***

***Harvest Volume Per Hectare***

During the first 8 decades the mean harvest volume per hectare (Figure 17) remained relatively constant at 340 to 320 $m^3$/ha, then fell abruptly to 200 $m^3$/ha in period 10, rose to 320 $m^3$/ha by period 12 and then the trend-line fell to 220 $m^3$/ha by decade 20 (although between decades 10 to 20 there are large fluctuations) After period 20 the average volume harvested remained at approximately 230 $m^3$/ha.

Overall, this trend is typical of most management units, where the older, high-volume natural stands are harvested earlier in the planning horizon, and the mean harvest volume is highest at the beginning of the planning period. Then, as the oldest of the natural stands are depleted, and as managed stands come on-line, the average volume harvested is lower.

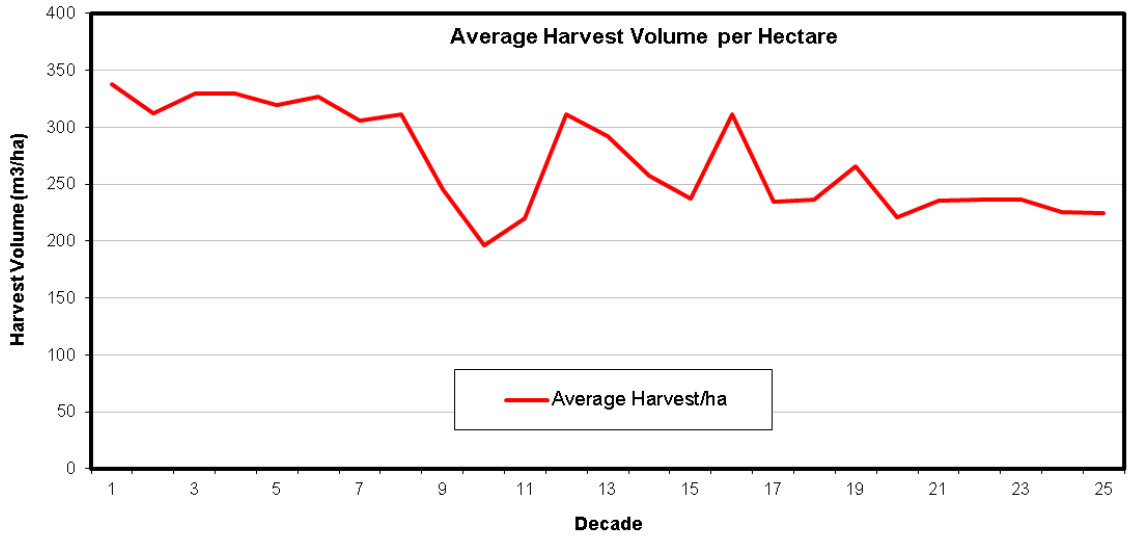



***Figure 17. Average Volume per Hectare Harvested***

### ***Harvest Area***

Figure 18 shows the total area harvested over time is generally inversely related to harvest volume per hectare shown in Figure 17. Given the same harvest level, as the average harvest volume/ha increased the average area harvested decreased, and vice versa. Over the planning horizon, harvest area varied between 46 to 83 hectares per year.

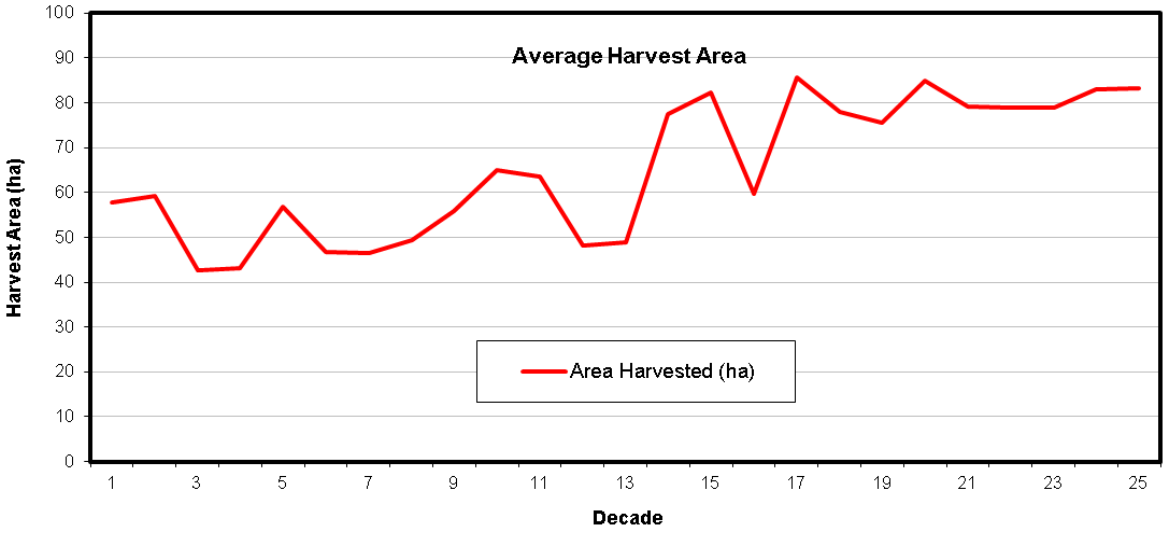
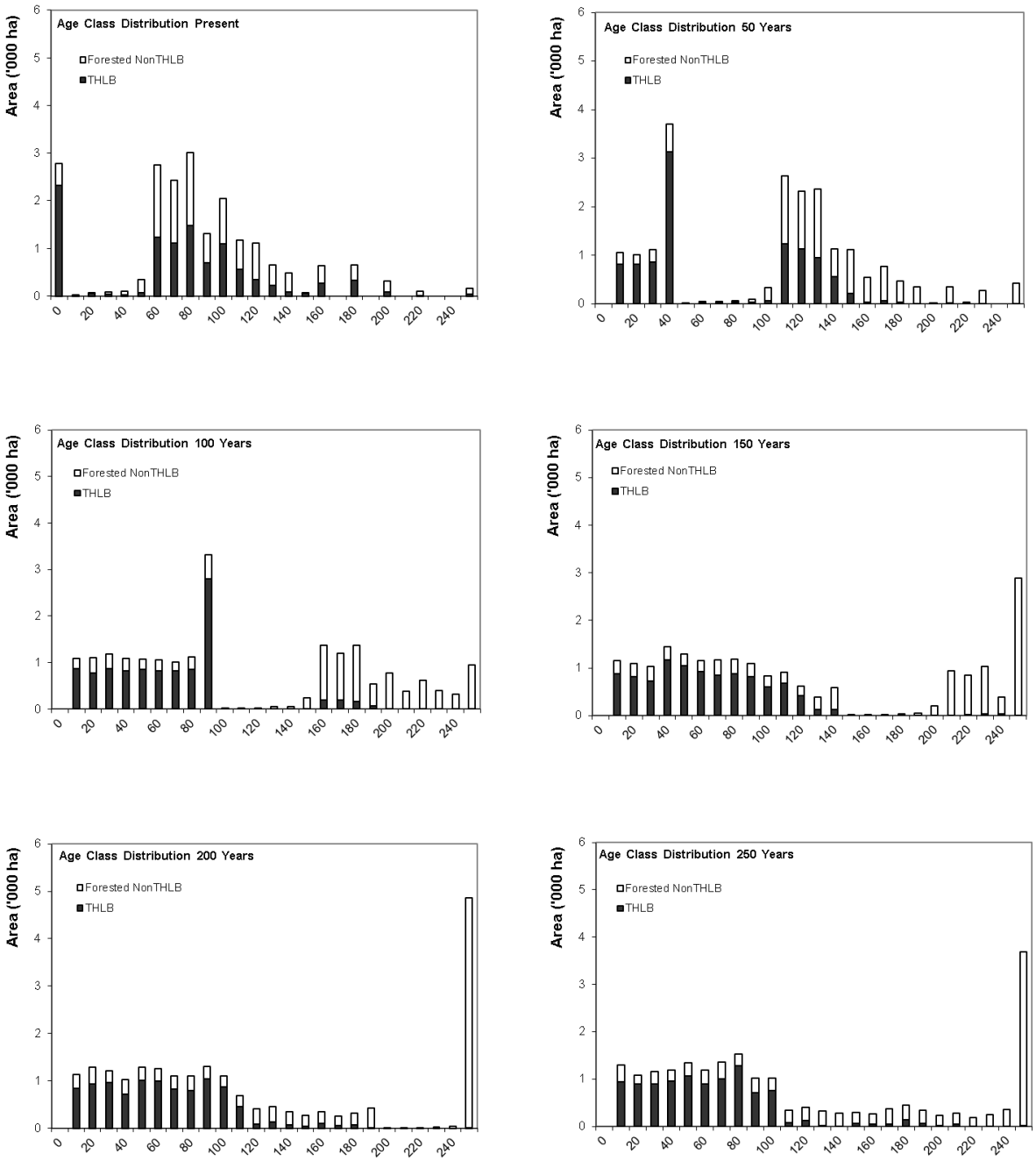



***Figure 18. Total Harvest Area per Year***

## ***Age Class Distribution***

Figure 19 provides a temporal forecast of the age-class distribution in 50-year increments.




Note: The upper left figure is year=0, the upper right is year=50, followed by year=100 and year=150 in the middle, and the lowest left figure is year=200, and lowest right is year=250.

***Figure 19. Age Class Projections for the 2015 Base Case Scenario***

The present stand ages in the THLB are concentrated in the 60 to 120 year age classes, with an isolated spike in the 0 age class. The 0 age class are almost totally comprised of historic clearcut harvested stands, or logged cohorts in the partial cut stands. The size of the cohort is exaggerated by our assumed age of zero for most of the existing logging. Over time, the distribution of stands in the THLB becomes concentrated in the 10 to 120 year age classes, which is indicative of a relatively constant harvest area, and preponderance of harvesting of stands that are around 100 years old.

In the long term, natural disturbances within the non-harvestable land base (NHLB) stands also created a relatively uniform age class distribution. In this case the average rate of natural disturbance was approximately 240 (or more) years so all age classes contain approximately the same area. Since disturbances are randomly assigned, all the stands in the NHLB were not necessarily disturbed within a set time interval. In fact, some stands escaped being disturbed, while others were disturbed at intervals less than the average. This, plus the arbitrary planning horizon of 250 (i.e., all stands above 250 years old are lumped into the 250 category) created a disproportionately large - or visually dynamic - class of 250+ year old stands.

### ***Timber Availability***

Figure 20 illustrates the trend in timber availability over time for a conceptual landbase and management scenario. This figure identifies periods along the planning horizon where timber harvesting options are constrained after balancing the growth and harvest potential of the forest, plus all the non-timber resource requirements.

Rather than a representation of potential harvest flow, the timber availability (upper line) identifies the merchantable volume available for harvest in any decade; assuming the harvest flow (lower line on the chart) was followed for all prior periods. Harvesting all the available timber in any one period would result in a reduction of the harvest level below the target harvest level (the lower line) in one or more successive periods.

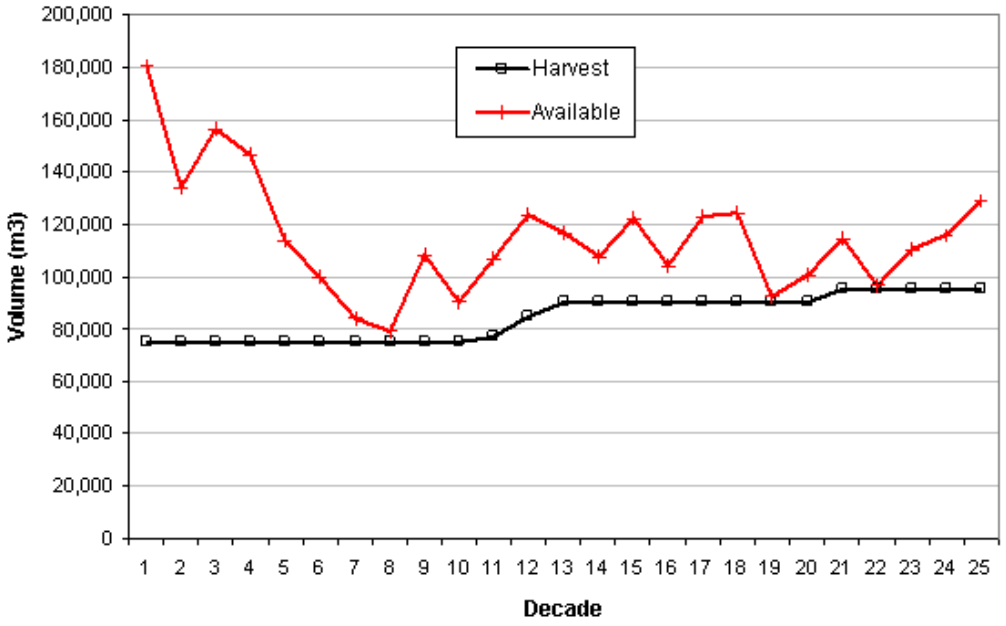



***Figure 20. Periodic Timber Availability (Conceptual Example)***

In this example, the available wood supply was progressively "metered out" until the available timber is essentially depleted. This illustrates that the harvest level is governed by a major 'pinch point' that occurs in decade 8. This determines the maximum, non-declining-even-flow harvest level as it is the lowest point of timber availability throughout the planning horizon.

Each pinch-point controls the harvest for some period(s) prior to that pinch-point. As the model passes through a pinch-point (such as at decade 8) the harvest level may increase to a higher level, until another pinch-point is encountered later in the planning horizon (i.e., decades 19 and 22).

Since no modelling parameters control timber availability during a simulation, this can only be assessed after the harvest flow is completed. To determine the availability for a harvest flow, each of the 25 reporting periods was assessed - one by one- with separate model runs. The relationship between harvest level and timber availability was then examined by iteratively establishing a harvest forecast (several model runs) and then determining the timber availability for the forecast (25 runs). The next harvest flow is established based on an assessment of the impact resulting from changing the preceding flow.

If the harvest flow is reduced in one period, then the availability will generally rise during that and subsequent periods. However, the number of periods and magnitude of the increase is unknown since harvested stands have a range of minimum harvest ages that produce volume at different times in the future. These volumes effectively form a "standing wave" - harvested in one period, and then becoming merchantable again in the future. Meanwhile, non-timber resource values tend to dampen and spread the timber availability out by constraining (or capping) harvest when the non-timber thresholds are 'tight', or by freeing up volume when the non-timber thresholds are met, whether or not the stands are merchantable (i.e. above their minimum harvest age).

The availability for the 2015 Base Case harvest flow is depicted in *Figure 21*. There is relatively high availability for the first 9 decades. After that point, the pinch-points in decades 15, 18 and 21 (and points beyond the graphed time period) serve to both limit, and reduce, the harvest in the mid and long term.

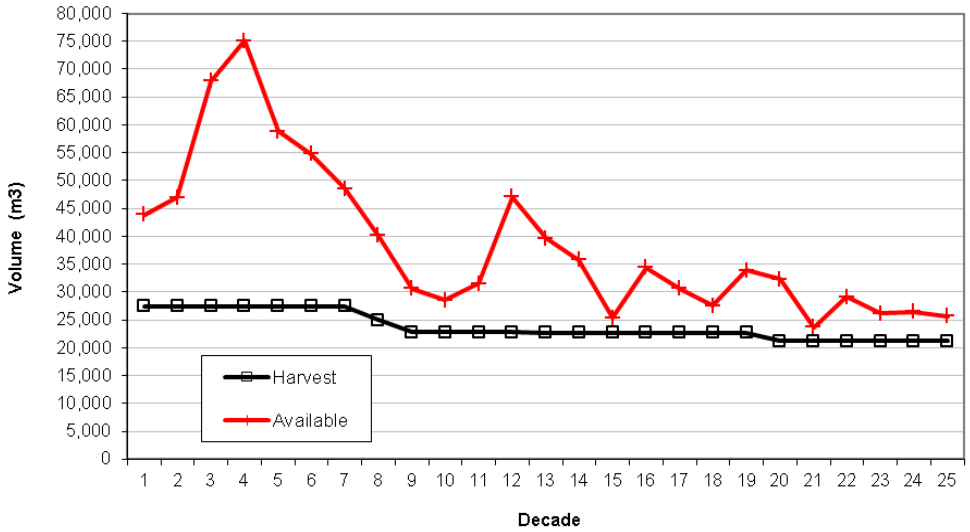



***Figure 21. 2015 Base Case - Harvest Flow and Availability***

## 5 Results - TSR-Like Model Scenario

As a test to see if the CFA landbase can support its AAC if the TSR assumptions were applied (i.e. the landbase netdowns, growth and yield, and management assumptions from the latest TSR) a TSR-equivalent model was built. The harvest flow from that model does support the AAC (Figure 22).

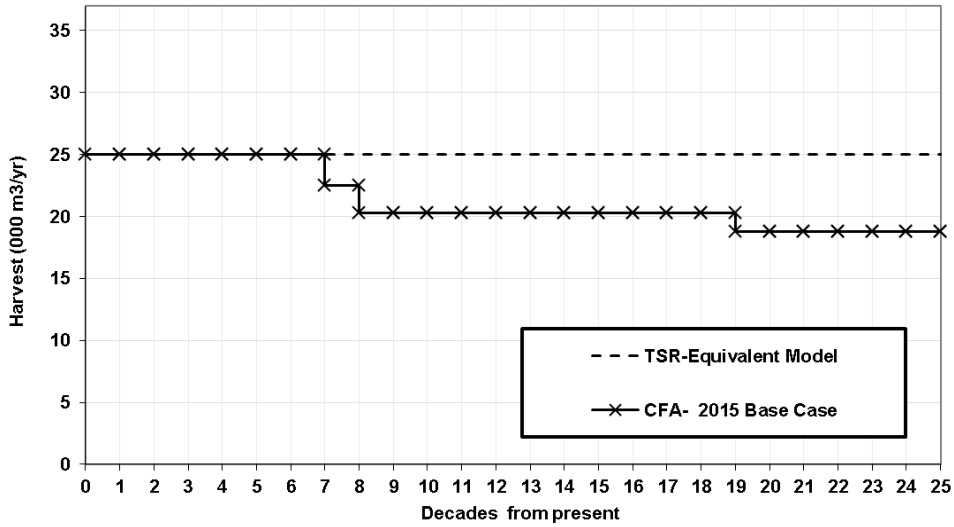



***Figure 22. Harvest Flows from the TSR-Equivalent Model and the 2015 Base Case***

The difference is largely due to the future managed stand yield tables that were used in the TSR-based model. The weighted yield tables for the two models are depicted in Figure 23, and a summary of the

culmination of mean annual increment values, and weighted minimum harvest age (MHA) for the two scenarios is in Table 17.

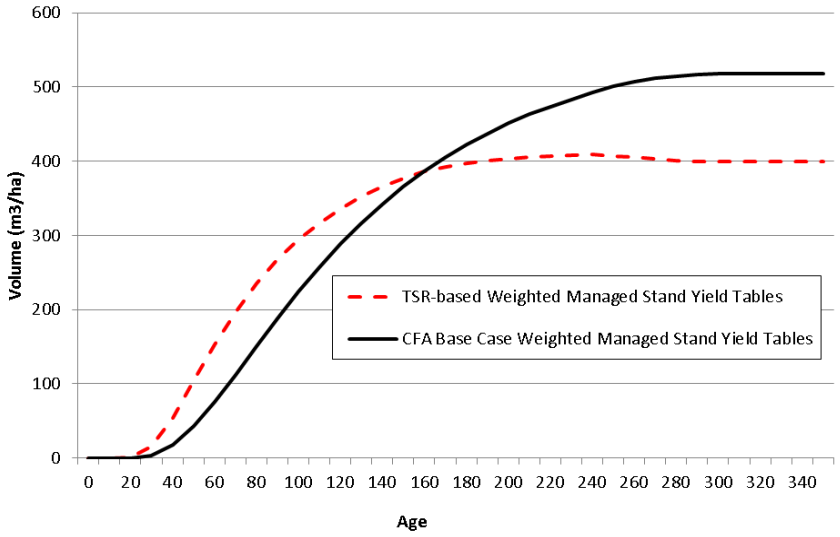



***Figure 23. Weighted Future Managed Stand Yield Table***

***Table 17. Weighted CMAI and MHA for the TSR-based and 2015 Base Case Scenarios***

| Scenario | Culmination of mean annual increment (CMAI, $m^3$/ha/yr.) | Weighted Minimum Harvest Age (MHA, years) |
|---|---|---|
| TSR-equivalent | 2.98 | 73 |
| 2015 Base Case | 2.44 | 98 |

Our 2015 Base Case has a CMAI value that is 18 %lower than the TSR-based weighted yield table, and a weighted MHA that is 25 years higher.

The overall impact is seen in the 2015 Base Case scenario, in reduced mid- and long-term harvest flow, when the combination of lower, average harvest volume per hectare and stands taking longer to reach maturity are being experienced.

# 6 Discussion and Conclusion

If we model using TSR-based assumptions, a non-declining, even-flow harvest equal to the current AAC (25,000 $m^3$/year) can be maintained over the whole planning horizon. TSR-based management can be summarized as a "100% clearcut and plant" management regime.
If we model based on assumptions that are more closely matched to the historic, and the future management intent within the community forest, then the harvest rate can be maintained at the current AAC (25,000 $m^3$/year) for 7 decades, and then a drop in harvest will be necessary.

Current management is based on a significant proportion of partial cutting, along with conservative estimates of the initial stand densities in the future, managed stands, which results in conservative volumes in the managed stand yield tables.

It is unclear whether or not the silvicultural practices have been modelled accurately, as the CFA's management practices are, apparently, still in transition. There isn't, for example, a reliable history of silvicultural practices and post-harvest regeneration within each of the types of partially cut stands.

Once the post harvest information has been gathered on all of its older partial cut stands logged under F.L. A54214, the Community Forest will re-estimate the harvest flow to determine a more accurate projection of the long term AAC. This will be completed in the next 2-4 years.

It is felt that the historic and future management intent is much better represented here, in the 2015 Base Case scenario, than in the previous analyses.

However, at this time, the current AAC of 25,000 $m^3$/year appears to be suited to the CFA, and there is ample time to refine the modeling in subsequent timber supply analyses.

# 7 References

Bradley, T. 2007. Creston Community Forest Analysis Assessment of Potential Harvest Rates from Creston Valley Forest Corporation Landbase Option 2. Report prepared for the Creston Valley Forest Corporation.

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Davis, R. 2014. . Timber Supply Analysis. Harvest Flow Estimates Based on the 2008 Kootenay Lake TSA TSR3 Methodology. Report prepared for the Creston Valley Forest Corporation. May 1 2014.

Stone, Jeff. 2009. Kootenay Lake TSR 3 Word Documents, Excel Workbooks., Text files, and PDF documents. Unpublished Data. Province of British Columbia, Ministry of Forests and Range, Forest Analysis and Inventory Branch

# *Appendix A. Modelling Assumptions*

***Appendix A - Table 1. Summary of modelling approaches***

| Section | Aspect | Description |
|---|---|---|
| **Forest Inventory** | Data Source | Vegetation Resource Inventory (VRI) format with single flat file attributes including only rank 1 stand information.<br>VRI data has been projected to January 1, 2015 using VDYP7.<br>Harvesting disturbance was updated using licensee data. |
| **Land Base Assumptions** | Ownership | Not relevant, because all land within the CFA boundary, as downloaded from the LRDW website, was included in the CFA area.<br>The LRDW data is already net of private lands (ref: personal communication, Peter Lewis, MoFLNRO). Note that the boundary does not exactly follow the boundary of the three planning cells added to the CFA, due to removal of private lands within those planning cells.<br>No Parks or protected areas occur within the CFA. |
| | Non-Forest and Non-Productive | Areas classified in the forest inventory as lakes, swamps, rock, alpine, brush, etc., were excluded from the productive forest land base (PFLB). |
| | Non-Commercial Cover | Areas classified in the forest inventory as NCBR were excluded from the PFLB. |
| | Existing Roads, Trails and Landings | Buffer areas associated with logging-type roads (line features) were removed from the PFLB / CFLB.) These features were obtained from the 2013 KLTSA Operating Area project. |
| | Parks and Ecological Reserves | N/A |
| | Inoperable | As per TSR3, 30% of the area of slopes over 70%, or any area considered as inoperable, were removed from the THLB. |
| | ESAs | Selected ESA categories were removed from the THLB. |
| | Non-productive (NP) areas. | NP codes > 1 (corresponding to Rock, Water, etc.) were removed from the PFLB. |
| | Non-Merchantable or Problem Stands | Non-merchantable, as defined in the TSR 3 were removed from the THLB. Example: Deciduous-leading stands are removed from the THLB. |
| | Low Productivity Sites | Stands were excluded from the THLB if their site index was too low. Example: Pine leading stands on slopes less than 40% were removed from the THLB if their site index values was <10 m. |

| Section | Aspect | Description |
|---|---|---|
| | Wildlife Habitat Areas | No WHAs were removed from the THLB in TSR3, but in this project, the caribou "no harvest" areas (Approved UWR Order u-4-013) were removed from the THLB.<br><br>A proposed WHA 4-205 for Interior Western Screech-Owl was added to the data, but the entire WHA was found to fall within the inoperable. Therefore, no netdown or management practices are applicable to this WHA. |
| | Ungulate Winter Range | The Approved UWR Order 4-001 was implemented in this project. |
| | Riparian Reserves | A new riparian buffer layer was created for this project to match the basal area retention levels stated in the Forest Stewardship Plan.<br><br>The classified stream line-work (centerlines) from the 2013 KLTSA Operating Area Project was used as the starting point for the stream buffers.<br><br>Effective riparian reserve areas were excluded from the THLB according to the classified stream and wetland inventories, using buffer widths based on FRPA regulation, but with 60% basal area retention within all riparian management zones. E.g. this increases the previous, effective reserve width for S3 streams from 24 m. (each side) to 32 m. (each side). |
| | Recreation | Buffers (40 m. each side) around the Thompson Trail, and Lady Slipper Trails were treated as 'no harvest zones'. |
| | Visual | A 20% retention (volume-based, at time of harvest) was applied within all VQOs.<br><br>As well, forest requirements were assigned for VQOs, as described below in the forest cover targets, MPB Dynamics, Harvest Priority section. |
| | Future roads, trails and landings | As per TSR3, reductions for future roads, trails and landings (RTL) were incorporated as managed stand yield table reductions.<br><br>Managed stand yield tables were adopted from the Kootenay Lake TSA's TSR 3. |
| | Timber License Reversions | N/A. |
| **Growth and Yield Assumptions** | Establishment Eras | See Appendix B. Designation and Modeling of Silviculture Systems. |
| | NSR | In this project, all logged blocks, including NSR, were included in the THLB and are assumed to regenerate according to standard management assumptions. NSR areas are assigned an age of 0. |
| | Stand Yield Models | Natural stand analysis unit yield tables were developed, using VDYP7, for all natural stand analysis units. |
| | DWB (natural stands) | Default factors for decay, waste and breakage were applied in the yield curves. |

| Section | Aspect | Description |
|---|---|---|
| | OAF (managed stands) | The TSR 3 OAFs were incorporated into the managed stand yield curves.<br><br>TSR 3 used non-standard operational adjustment factors (OAF1 @ 15%; OAF2@ 5%). No OAFs were applied for Armillaria in Fd and/or Pl stands. |
| | Site index Adjustments | No site index adjustments were made. |
| | Site Curves | As per TSR3, standard site curve sources were used as identified in Site Tools. |
| | Deciduous | Deciduous volumes in conifer-leading stands were not included with natural yields.<br><br>Deciduous-leading stands were included in the PFLB and contributed towards addressing forest-level targets but were excluded from the THLB. |
| | Analysis Units (AU) | New analysis unit definitions were created, as per the Modeling Assumptions section.<br><br>Combinations of resource management zone, BEC, leading species, and site index classes were used to define the AUs |
| | Utilization Level | Like TSR3, minimum dbh was17.5 cm (non-pine) and 12.5 cm (pine).<br><br>Both are applied with a minimum top dib of 10 cm and maximum stump heights of 30 cm. |
| | Regeneration Method | New regeneration assumptions were developed, and reflect the new Analysis Unit definitions. |
| | Regeneration Delay | A regeneration delay of 2 years is assumed. |
| | Species Composition | Species compositions were applied to each AU and incorporated into the managed stand yields.<br><br>The proportion of mixed species varies by AU. |
| | Initial Density | Initial densities were applied to each AU and incorporated into managed stand yields. These values varied by A.U. |
| | Genetic Gain | No genetic gain (genetic worth) values were applied to any of the managed stand yields. |
| | Minimum Harvest Age | Minimum harvest ages were applied to each AU. These were defined using only one criterion: a minimum volume of 150 $m^3$/ha. |
| | Non-Recoverable Losses (NRL) | A total, fixed volume is subtracted from the annual harvest flow which comes from the model to account for non-recoverable losses due to factors including mountain pine beetles, wind, fire, and other insects.<br><br>The NRL value of **2450** $m^3$/year was derived by prorating the TSR3 estimate of NRLs by the THLB in the TSA, versus the THLB in the CFA.<br><br>As well, both natural and managed stand yields incorporated considerations for endemic pest losses. |

| Section | Aspect | Description |
|---|---|---|
| | Disturbance in the Non-THLB | Natural disturbance regimes in the non-THLB were applied according to the natural disturbance types, and fire return intervals documented in the Biodiversity Guidebook. Annual disturbed targets were achieved by randomly selecting, without replacement, stands from the non-THLB to be disturbed in each period. |
| **Forest Cover Targets, MPB Dynamics, Harvest Priority** | Integrated Resource Management (IRM) (or Cutblock Size/Adjacency) | A forest cover requirement was applied to limit the disturbance of THLB areas that are not within the NDT4-type AUs (open forest or open range) types).<br>The IRM requirement allows a maximum of 33 % of young seral less than 2.0 meters within each LU. |
| | Visual | Like TSR3, VQOs were assigned maximum non-veg (NVEG) percentages based on combinations of VQO class, slope class and viewing distance.<br><br>TSR3 does not state the strata that visual requirements were applied to. Combinations of LU and VQO class (e.g. LU_K02_VQO_PR) were used in this analysis. |
| | Deer winter range. | The Approved UWR Order #UWR_U4_001 (Kootenay Lake) was applied in this project. The Orders covers a large portion of the lower elevation zone of the TSA. The Order prescribes a maximum percentage of young seral stands, and a minimum percentage of older stands of various ages.<br><br>Guidelines were applied to individual Ungulate Management Units (UMU, i.e. "individual polygons" in the UWR layer). |
| | Landscape-level Biodiversity | Old growth management areas (OGMA) have been established in the CFA. However, mature management areas (MMA) have not been established.<br><br>A number of LUs and BEC combinations have mature plus old (MO) requirements in the HLPO. Where MO requirements are "turned on" in the HLPO, they are modeled, in this analysis, throughout the planning horizon.<br><br>In this analysis, OGMAs are modeled as "no harvest" zones for the whole planning horizon.<br><br>In low BEO zones, "old seral phase in" (or "draw down") was applied: 1/3 of the old seral target was applied for the first 70 years (but turned off as it was assumed the OGMAs covered this requirement), 2/3 of the old seral target was applied for the next 80 years (and OGMAs were maintained, but the additional 2/3 target was turned on), and then full old seral targets (3/3) were applied for the remainder of the planning horizon.<br><br>The BEC (and NDT and BEO) version that was in effect at the time that the HLPO was established was used in this analysis. Any of the newer BEC versions was ignored. It was not necessary, therefore, to assign seral targets to newer BEC variants based on the best matching, older, HLPO versions (as done in Cranbrook and Invermere TSAs) |

| Section | Aspect | Description |
|---|---|---|
| | Mountain Pine Beetle Killed Volumes | N/A. It is assumed that the licensee has kept up with salvaging the MPB killed stands in the CFA, and no significant MPB-induced volume losses are occurring. |
| | Mountain Pine Beetle Killed Pine Volume Recovery; MPB-killed ECA reduction factor. | N/A. |
| | Other (Bark) Beetle Killed Volumes; Non-Pl Volume Recovery; Non-Pl Killed ECA | N/A |
| | ECA estimates - clearcut stands. | As in TSR3, an ECA was modelled using an ECA surrogate requirement of "a maximum 25% of stands less than 6 m can occur within the forested area of each watershed". |
| | ECA estimates - partial cut stands. | The ECA surrogate requirement was also used for partial cut stands.<br>However, partial cut stands are modeled as cohorts, and each cohort individually contributes to the ECA in direct proportion to it's equivalent area (essentially the exact same way as clearcut stands contribute). |
| | Harvest Profile | No target harvest profiles were applied. |
| | Harvest Priority | A relative oldest first rule was used as the harvest priority.<br>This means that the model will prioritize each stand for harvest according to the difference between the age of the stand and the minimum harvest age. |

### *Appendix A - Table 2. Creston Community Forest - Detailed Landbase Netdowns*

| Netdown or Landbase Category | Area (ha) | Area (ha) |
|---|---|---|
| **Gross Area** | | **21,310** |
| NP | 627 | |
| Roads | 350 | |
| Total Non CFLB netdowns | **977** | |
| **Net CFLB** | | **20,333** |
| OGMAs | 4,475 | |
| Inoperable | 4,231 | |
| Trails_Uneconomic | 11 | |
| PFT | 47 | |
| Caribou | 543 | |
| ESAs or Sensitive Terrain | 487 | |
| Riparian | 244 | |
| WTRA | 170 | |
| Total THLB Netdowns | **10,208** | |
| **Net THLB** | | **10,124** |

### *Appendix A - Table 3. GIS Input Layers to the Net Landbase Resultant*

| Coverage | Description | Source | Use |
|---|---|---|---|
| **cvc_bnd** | LRDW Managed Tenures layer | LRDW | Outer Boundary of CFA |
| **cvc_trb** | Trail Buffers | MapMasters (licensee consultant) | Landbase Netdown |
| **dkl_fir** | Compilation of Fire Boundaries | LRDW historic and current fire layer | Update VRI ages |
| **dkl_pce** | Planning Cells | Forsite, Previous Project | Landbase Netdown |
| **ek_psp** | PSP Buffers | LRDW Buffered PSP layer | Landbase Netdown |
| **cvc_fiz** | Fire Interface Zone, a one kilometer buffer around all infrastructure | Forsite, derived using Google Earth | Management Zone |
| **dkl_uwr** | UWR habitat zones | Approved UWR Order website | Non-timber Management Zone |
| **dkl_car** | Caribou habitat zones | Approved UWR Order website | Non-timber Management Zone |
| **ek_wha** | Wildlife Habitat Areas | LRDW | Landbase Netdown |
| **dkl_obe** | (Old) BEC | Historic BEC layer corresponding to the HLPO | Management Zone |
| **cvc_cws** | Watersheds - Domestic and Community | Previous Forsite Project, Rationalized CWS and DWS | Non-timber Management Zone |
| **dkl_vqo** | Visual Quality Objectives | LRDW | Non-timber Management Zone |
| **dkl_ope** | C:\Work_ai\Source\DKL\dkl_ope | LRDW | Landbase Netdown |
| **dkl_esa** | Environ. Sensitive Area mapping | TSR version layer | Landbase Netdown |
| **dkl_ter** | Terrain Stability mapping | TSR version layer | Landbase Netdown |
| **cvc_fci** | RESULTS forest cover inventory | LRDW | Update VRI ages |
| **cvc_rtn** | Historic Logging classified by retention class | Forsite, derived from RESULTS opening | Management Zone |
| **cvc_np** | Block level NP | RESULTS forest cover inventory (a subset) | Landbase Netdown |
| **cvc_wtp** | Block level WTP | Composite and subset of the RESULTS forest cover inventory and CFA Blocks | Landbase Netdown |
| **cvc_op2** | Historic Logging classified into Silviculture system classes | Forsite, derived and classified RESULTS opening layer | Management Zone |
| **cvc_blk** | CFA Blocks | Logging (some historic, most recent) for the CFA | Update VRI Ages, Management Zones |
| **dkl_ogm** | Old Growth Management Areas | LRDW OGMA layer | Landbase Netdown |
| **dkl_slp** | Slope Classes | TSR version slope class mapping | Landbase Netdowns |
| **cvc_vri** | Vegetation Resource Inventory (forest cover) | LRDW | Forest Inventory Layer |
| **cvc_rib** | Riparian Buffers | Forsite, derived from the Kootenay Lake Operating Area Project's riparian features layer | Landbase Netdown |
| **dkl_rdb** | Road Buffers | Kootenay Lake Operating Area Project's road buffers | Landbase Netdown |

# *Appendix B. 2015 Base Case - Harvest Flow Table*

***Appendix B - Table 1. 2015 Base Case Harvest Flow***

| Period | AAC | 2015 Base Case |
|---|---|---|
| 1 | 25,000 | 25,000 |
| 2 | 25,000 | 25,000 |
| 3 | 25,000 | 25,000 |
| 4 | 25,000 | 25,000 |
| 5 | 25,000 | 25,000 |
| 6 | 25,000 | 25,000 |
| 7 | 25,000 | 25,000 |
| 8 | 25,000 | 22,500 |
| 9 | 25,000 | 20,300 |
| 10 | 25,000 | 20,300 |
| 11 | 25,000 | 20,300 |
| 12 | 25,000 | 20,300 |
| 13 | 25,000 | 20,300 |
| 14 | 25,000 | 20,300 |
| 15 | 25,000 | 20,300 |
| 16 | 25,000 | 20,300 |
| 17 | 25,000 | 20,300 |
| 18 | 25,000 | 20,300 |
| 19 | 25,000 | 20,300 |
| 20 | 25,000 | 18,800 |
| 21 | 25,000 | 18,800 |
| 22 | 25,000 | 18,800 |
| 23 | 25,000 | 18,800 |
| 24 | 25,000 | 18,800 |
| 25 | 25,000 | 18,800 |