RE: Mackenzie / PG Overview Flight on July 25th

From: Nussbaum, Albert F FLNR:EX <Albert.Nussbaum@gov.bc.ca>
To: Izzard, Kelly D FLNR:EX <Kelly.Izzard@gov.bc.ca>
Cc: Salkeld, Tim H FLNR:EX <Tim.Salkeld@gov.bc.ca>, Prasad, Atmo P FLNR:EX <Atmo.Prasad@gov.bc.ca>
Sent: July 30, 2018 1:44:56 PM PDT
Attachments: image001.jpg

Kelly
Thanks for the summary of your observations. I would like to discuss the following thought with you when you are back.
s.13

I need more information on what exactly you are pointing to here. Is it shelf-life or amount of pine or…….?
Thanks Albert

Albert Nussbaum, R.P.F.
Director, Forest Analysis and Inventory Branch
Ministry of Forests, Lands, Natural Resource Operations and Rural Development
Phone: 250 356 5958
Cell: 250 888 5609
Email: Albert.Nussbaum@gov.bc.ca

From: Izzard, Kelly D FLNR:EX
Sent: Sunday, July 29, 2018 4:10 PM
To: Prasad, Atmo P FLNR:EX; Nussbaum, Albert F FLNR:EX; Nicholls, Diane R FLNR:EX
Subject: RE: Mackenzie / PG Overview Flight on July 25th

Impressions and observations of the Canfor/TSA16 overview flight

Canfor

s.21

- TSA16 harvest economics are dominated geography (by lake transportation) and haul distance.
- Equipment(logging trucks) and qualified staff appear to be a limiting factor for all operators.
- Canfor is shifting harvest operations to the north of the Peace Arm and recognises the high levels of disturbance that have occurred in the "partition zone" historically as a function of economics and MPB salvage.

Pine

- Pure pine-leading stands (> 70% gross volume) appear to be in an accelerated stage of break-up with significant volumes classified as pulp and/or biomass. s.21 s.21 and that these stand types are becoming exceedingly rare with most of pine leading stands in the partition zone dominated by pulp or stands with v. small piece sizes and significant green pine volume.
- The merchantability of 'fibre dominated' stands needs to be assessed and addressed by the Pine DAWG - from a timber supply perspective it seems to me we need a common, defensible approach across the MPB region.

Spruce Beetle

- The southeast portion of the TSA (south of Peace Arm, East of Williston Lake) is experiencing significant catastrophic loss to IBS. This spring's flight has expanded the areas that will be classified as severely impacted (by the upcoming FHOF) and talking to the regional entomologist, she suggests we are only ~ half way through the current epidemic and the beetle expansion is beginning to appear similar to the MPB expansion. The highway corridor heading east to Tumbler Ridge (the Pine Pass) has been especially heavily hit so folks expect elevated levels of public concern by the end of the summer.
- The impacted areas falls predominately in BCTS pricing units (> 80%) with v. limited activity west or the Williston reservoir….I also note that BCTS has a 3Mm3 undercut in TSA16…….

Canfor's ask

s.21

My observations and opinions
s.13

That's what I (think I) saw……..hope that helps.
As discussed with the CF I'll be picking up the partition gaming with the timber supply model in September and should have some results to share early in October.
Enjoy the rest of your summer and I'll see you in September

From: Prasad, Atmo P FLNR:EX
Sent: Friday, July 27, 2018 2:25 PM
To: Izzard, Kelly D FLNR:EX
Subject: Re: Mackenzie / PG Overview Flight on July 25th
Kelly, are you able to document your impressions before you go on vacation?

Sent from my iPhone

On Jul 27, 2018, at 8:45 AM, Izzard, Kelly D FLNR:EX <Kelly.Izzard@gov.bc.ca> wrote:

FYI

From: Uhrich, Kalin [mailto:Kalin.Uhrich@canfor.com]
Sent: Friday, July 27, 2018 6:40 AM
To: Nicholls, Diane R FLNR:EX; Izzard, Kelly D FLNR:EX
Cc: Martin, Russ FLNR:IN; XT:Augustine, Carmen FLNR:IN; XT:Preston, Andrew FLNR:IN; Horsnell, Kevin; XT:Baird, Peter FLNR:IN
Subject: Mackenzie / PG Overview Flight on July 25th

Hi Diane, I just wanted to say on behalf of our Canfor team in Mackenzie what a pleasure it was to have you and Kelly Izzard spend a very informative day with us, to hear about our challenges and opportunities in Mackenzie. We are grateful for the time you were able to spend with us and I know that you love to get out and see what's happening on the ground (and from the air), so hopefully you found this trip as enjoyable and informative as we did.
I thought I'd take the liberty of recapping the day and share a bit of perspective as well, please let me know if I have not captured this accurately or if there is anything else you would like to add.

- Diane Nicholls and Kelly Izzard, met with Russ Martin, GM North Region Woodlands and myself in PG.
- Flew direMm3ct from PG to Mackenzie, saw evidence of significant pockets of spruce beetle attack north of PG and west of Highway 97 (Sinclar, BCTS, Canfor) and some recent harvesting.
- Landed in Mackenzie, met with Canfor staff - Carmen Augustine, Sara Rowe, Sara Curtis and Andy Preston.
    - Staff introductions and Russ provided a quick overview and thanks to you and Kelly for visiting with us.
- Carmen provided an excellent and concise power point presentation of the challenges we face in Mackenzie. The presentation generated a lot of questions and dialogue.

- Key themes were:
    - Overview of Mackenzie sawmill
    - Customer focused
    - Pine beetle harvest – what's left and where, shelf life expiry, VRI unreliability
    - Spruce beetle – where it is, access to harvest in non-Canfor operating areas
    - Operational challenges
        - Remote operations
        - Shortage of contractor capacity (harvesting and hauling)
        - Steep slopes
        - First Nations stewardship concerns
    - Canfor harvest priorities, now and in near term
    - AAC non-pine partition is not feasible to meet, given our fibre needs
- Departed Mackenzie for various stops in the SW portion (Canfor operating area) to look at dead pine stands and VRI anomalies, plus some spruce beetle blocks (AOS did not pick these up), as well as the Finlay log transporter and Manson Dump.
- Stopped for lunch at Munro Camp, currently being dismantled for move up to Ospika
    - Soup and sandwiches were great, kitchen staff very hospitable!
- Proceeded north to Eklund / Muscovite to see more dead pine stands in the Williston Lake Trench (pine in the Trench is the hardest hit in terms of fibre quality).
- Proceeded to Ospika to view our pine beetle harvest plans there and to review First Nations concerns and how we accommodated them.
- Ospika River valley – green timber, beautiful river!
- Returned south along east side of Williston Lake, crossed Peace Arm and within the BCTS operating area, observed evidence of severe spruce beetle infestation down virtually the entire length of the lake back to Mackenzie.
- Some evidence of salvage logging was present but much of the area remains unaddressed to date.
- Looked at severely attacked OGMA just northeast of Mackenzie that we were not successful in convincing Region to allow any salvage harvest; we also viewed an area where Canfor had undertaken logging on an "UTSL" (Undeveloped TSL).

- Dropped Carmen off at Mackenzie, carried on back to PG.
- Flew Canfor's Anzac and Table areas – spruce beetle appearing in these areas.
    - Evidence of activities to address (harvesting, access being built, crews doing layout/cruising, etc.).
- Flew Arctic Lake and Pacific Lake watersheds – beautiful valley! Doug Wayland our pilot, gave an interesting account of the history of this area, explored by Alexander Mackenzie in 1792.
- Flew TFL 30, not much evidence of spruce beetle and we have been very diligent in our control efforts here.
- Landed in PG, the 4 of us reviewed/recapped the day and potential next steps.

<u>Some observations, takeaways and things discussed:</u>

- Canfor believes it has demonstrated that much of the remaining pine beetle stands are largely uneconomic, especially in the south and in the Trench.
- We agreed that the spruce beetle infestation continues to spread and areas impacted continue to grow.
- Canfor has been largely frustrated in its attempts to harvest spruce beetle, as most of this is in BCTS areas and remains out of reach at the moment.
    - We appreciate you raising this issue with Chris Stagg, ADM and I have also reached out again to him as well – I remain hopeful that we can find a way to work together on addressing the problem.
- We agreed that harvesting of the timber profile is key to the long term sustainability of the timber supply and of maximizing the AAC.

- You clarified that the recent CF Expectations letter for harvesting prioritization of spruce beetle is meant to be applied in areas where spruce beetle is active and not meant to be applied over the entirety of the TSA (or province, since this is a provincial scope document not just Omineca) – see profile reference below.
- We agreed (I think) that focused harvesting on forest health factors disrupts the ability of licensees to 'log the profile', particularly from a species and geographic perspective (i.e. focus on south).
- You expressed concerns about concentrating harvest in the south and what impacts this could have from a community stability perspective – this puts a finer point on the critical importance of harvesting the geographic profile alongside the need to salvaging dead and dying stands.
    - This is exacerbated by any harvesting of non-priority stands in the south.
- You confirmed that the AAC is not likely to be altered for at least a couple of years and in any event cannot be done without a TSR; you further stated that there is no ability (or appetite) to do an expedited TSR in this TSA, given the issues and challenges.
- We agreed (I think) that AAC partitions currently in place may be driving or inadvertently influencing undesirable outcomes and are not 100% achievable.
- As CF, you are bending your mind around the utility of the existing partitions and some options around what could/should be done, in order to ensure that long term sustainability is not compromised – however, there is a need to balance this with the potential to create unintended consequences or impose undue hardships on licensees and their operations.

Diane, I am sure I have not captured everything so please feel free to chime in with whatever observations you and Kelly had. Also, we will turn our minds to some of the weightier questions around long term sustainability and short term measures (i.e. AAC partitions, modelling shelf life and operability assumptions, and so forth) and I will get back to you with some additional thoughts on this, as you contemplate these same questions as well.

Once again, thank you and Kelly very much for your interest and time. I can now say that I have spent more time with you in the field than I have with almost anyone else this year!

Regards,

Kalin Uhrich
Chief Forester, BC
Forest Management Group Canada
Canadian Forest Products Ltd
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kalin.uhrich@canfor.com www.canfor.com
5162 Northwood Pulp Mill Road, Prince George, BC V2L 4W2

24 TUESDAY JULY

205-160

DPG

7:00 7:30 8:00 8:30 9:00 9:30 10:00 10:30 11:00 11:30 12:00 12:30 1:00 1:30 2:00 2:30 3:00 3:30 4:00 4:30 5:00 5:30 6:00 6:30 7:00 evening

* – new provincial beetle boss on the way (confirmed by CF)

Brownline

WEDNESDAY JULY 25

206-159

7:00 7:30 8:00 8:30 9:00 9:30 10:00 10:30 11:00 11:30 12:00 12:30 1:00 1:30 2:00 2:30 3:00 3:30 4:00 4:30 5:00 5:30 6:00 6:30 7:00 evening

Mackenzie overview flight

Pine

- 40-50% sawlog recovery in "salvageable stands"
- available equipment/people a major constraint
- Manson dump is economic threshold for truck haul of sawlog → appraisal system defining haul choice

Woodlands staff

Andy – Woodlands mgr Carmen Forestry superintendent

s.21

lake levels fluctuation dictate when transporter can move volume ⇒ low levels restrict loading of barge

Big ask: not to have dead partition for northern portion (north of Peace arm) so as not to restrict the harvest of northern green vol to offset costs of moving north. (~~the~~ damage pine)

Why did VDT31 fail? ask Buck!

BRITISH COLUMBIA

MINISTRY OF FORESTS, LANDS

AND NATURAL RESOURCE OPERATIONS

Mackenzie
Timber Supply Area

Rationale for
Allowable Annual Cut (AAC)
Determination

(amended January 6, 2015)

Effective November 14, 2014

Diane Nicholls

Deputy Chief Forester

This document was amended on January 6, 2015. The amendments provide clarification regarding the definition of the partitions within the new allowable annual cut. The level of the allowable annual cut and partitions remain unchanged from the document published on November 14, 2014.

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Objective of this document

This document is intended to provide an accounting of the factors I have considered and the rationale I have employed in making my determination, under Section 8 of the *Forest Act*, of the allowable annual cut (AAC) for the Mackenzie Timber Supply Area (TSA). This document also identifies where new or better information is needed for incorporation in future determinations.

Acknowledgement

For preparation of the information I have considered in this determination, I am indebted to staff of the British Columbia Ministry of Forests, Lands and Natural Resource Operations (FLNR) in the Mackenzie Natural Resource District, the Omineca Natural Resource Region, and the Forest Analysis and Inventory Branch (FAIB). I am also grateful to the local residents, First Nations, BC Timber Sales staff, forestry consultants and licensees who contributed to this process.

Statutory framework

Section 8 of the *Forest Act* requires the chief forester to consider a number of specified factors in determining AACs for timber supply areas (TSAs) and Tree Farm Licences (TFLs). In addition, the deputy chief forester is authorized under Section 23 (3) of the *Interpretation Act* to carry out the functions of the chief forester, including those required under Section 8 of the *Forest Act* Section 8 of the *Forest Act* is reproduced in full as Appendix 1 of this document.

Description of the TSA

The Mackenzie TSA is situated in north-eastern British Columbia. It is the fourth largest TSA in the province, covering 6.41 million hectares, and is one of two TSAs in the FLNR Omineca Natural Resource Region (region). It is administered from the Mackenzie Natural Resource District (district) office located in the town of Mackenzie. The Mackenzie TSA is bordered by the Prince George TSA to the west and south, by Tree Farm Licence 48 and the Dawson Creek TSA to the southeast, by the Fort St. John TSA to the east, by the Fort Nelson TSA to the northeast and north, and by the Cassiar TSA to the northwest.

The terrain of the TSA is mountainous except for the flat to gently-sloping Rocky Mountain Trench, which runs north to south through the centre of the TSA. The rugged Rocky Mountains border the trench on the eastern side and the more rounded Omineca Mountains border it on the western side. Williston Lake, a hydroelectric reservoir created by the W.A.C. Bennett Dam on the Peace River, lies in the trench in the central portion of the TSA. At a length of approximately 250 kilometres, Williston Lake is the largest body of fresh water in BC.

Due to the large size of Williston Lake plus the mountainous terrain and cold climate of the Mackenzie TSA, almost half of the total TSA consists of water, rock, ice, alpine, and other non-forested areas. Except for small amounts of private and federal land plus cleared rights of way, the remaining area 52 percent of the TSA is Crown forest land.

Despite the diverse terrain of mountains and river valleys, which contribute to distinct ecological features and high biodiversity values, the forests of the Mackenzie TSA are fairly homogeneous. The majority of the operable forest area lies in the Sub-boreal Spruce Biogeoclimatic Zone north of Williston Lake, the Sub-boreal Pine Spruce Zone covers low elevation areas; and throughout the TSA the forested upper slopes lie in the Englemann Spruce-Subalpine Fir Zone. The most common tree species in the TSA are lodgepole pine, spruce, and subalpine fir; with several deciduous species present in smaller amounts. About 75 percent of the mature lodgepole pine in the TSA has been killed by mountain pine beetles (MPB).

The TSA provides habitat for a variety of wildlife species, including: grizzly and black bears, moose, caribou, Stone's sheep, mountain goats and bull trout.

The Mackenzie TSA is sparsely populated, with the majority of the population living in the community of Mackenzie. Other settlements include Germansen Landing and Manson Creek; and the First Nations communities of Kwadacha (Fort Ware) and Tsay Keh. Forestry, recreation, trapping, guide-outfitting, mining, and tourism are the dominant economic activities within the TSA; with forestry providing about 70 percent of local employment. The area has oil and gas resources, but neither is currently being extracted in the TSA. Planning is underway for two proposed liquefied natural gas pipelines that would cross the TSA from east to west.

The Mackenzie TSA falls within the asserted territories of the Gitxsan First Nation, Halfway River First Nation, Kwadacha First Nation, McLeod Lake Indian Band, Nak'azdli First Nation, Saulteau First Nations, Takla Lake First Nation, Tahltan First Nation, Tsay Keh Dene First Nation, and West Moberly First Nations. Treaty 8 First Nations include: the McLeod Lake Indian Band, Saulteau First Nations and the Moberly First Nations.

History of the AAC

The Mackenzie TSA was established in 1981 with an AAC of 2 900 000 cubic metres. Since then the AAC has remained fairly constant, with only minor adjustments and the institution of a deciduous stand partition in 1996. The deciduous partition was 50 000 cubic metres per year from 1996 to 2001; thereafter, it was increased to 100 000 cubic metres per year. The AAC was last determined in 2001 as 3 050 000 cubic metres. In 2004, the determination of the next AAC was postponed by order of the chief forester under Section 8 (3.1) of the *Forest Act*.

Table 1 shows the apportionment of the AAC by the Minster of Forests, Lands and Natural Resource Operations current to April 2014.

Table 1. Apportionment of the AAC determined December 1, 2001

Category	Total m^3	Percent (%)	Conventional	Percent (%)	Deciduous leading	Percent (%)
Forest Licence (replaceable)	2 015 404	66.08	2 015 404	68.31		
Forest Licence (non-replaceable)	156 808	5.14	106 808	3.62	50 000	50
BC Timber Sales	768 886	25.21	718 886	24.37	50 000	50
Community Forest Agreements	30 000	0.99	30 000	1.02		
Woodlots	8 000	0.26	8 000	0.27		
Forest Service Reserve	41 511	1.36	41 511	1.41		
Bill 28 volume (FNWL)	29 391	0.96	29 391	1.00		
Total	3 050 000	100.00	2 950 000	100.00	100 000	100.00

New AAC determination

Effective November 14, 2014 the new AAC for the Mackenzie TSA will be 4 500 000 cubic metres, of which a maximum of 950 000 cubic metres is attributable to non-pine leading coniferous stands. Of this partition, no more than 300 000 cubic metres is attributable to non-pine leading coniferous stands from the southwest portion of the TSA, west of Williston Lake and south of Omineca Provincial Park and Omineca Arm.

With regard to the 3.55 million cubic metres of unpartitioned AAC, it is my expectation that this volume be harvested from pine-leading stands in which pine represents at least 70 percent of the total stand volume and from deciduous-leading stands. As described in "**Implementation**", I request that district and FAIB staff monitor the species composition and geographic origin of timber harvested in the Mackenzie TSA and to report this information to the chief forester annually. In the event that licensees can no longer locate pine-leading stands in which more than 70 percent of the total volume is pine, I expect the district staff to inform FAIB and the chief forester.

This AAC will remain in effect until a new AAC is determined, which must take place within 10 years of this determination.

Information sources used in the AAC determination

Information considered in determining the AAC for the Mackenzie TSA includes the following:

- *Forest and Range Practices Act* and regulations;
- *Forest Act*;
- *Ministry of Forests and Range Act*;
- *Forest Practices Code of British Columbia Act* and amendments and guidebooks, January 31, 2004;
- *Heritage Conservation Act*;
- *Land Act*;
- *Muskwa-Kechika Management Area Act*;
- Muskwa-Kechika Management Plan Regulation;
- Mackenzie Land and Resource Management Plan, November 2000, Province of BC;
- Identified Wildlife Management Strategy—Accounts and Measures for Managing Identified Wildlife, Version 2004, Province of BC;
- Order Establishing Non-spatial Landscape Biodiversity Objectives in the Mackenzie Forest District, April 9, 2008, BC Ministry of Agriculture and Lands;
- Amendment Order for the Non-spatial Landscape Biodiversity Objectives in the Mackenzie Forest District, September 23, 2010, BC Ministry of Agriculture and Lands;
- Order to Establish Land Use Objectives for Agricultural Development Areas and Settlement Reserves, November 21, 2006, BC Ministry of Agriculture and Lands;
- Order to Establish the Obo River and Fox Landscape Units and Objectives, October 24, 2002, BC Ministry of Sustainable Resource Management;
- Order to Establish a Sensitive Area and Objectives for Mugaha Marsh, October 24, 2001, BC Ministry of Forests;
- Order Establishing Spatial Land Use Objectives for the Southern Portion of the Mackenzie Forest District, September 23, 2011, BC Ministry of Agriculture and Lands;

- Approved Wildlife Habitat Areas, BC Ministry of Environment, available online at http://www.env.gov.bc.ca/wld/frpa/iwms/wha.html;
- Approved Ungulate Winter Ranges, BC Ministry of Environment, available online at http://www.env.gov.bc.ca/wld/frpa/uwr/approved_uwr.html;
- Provincial Logging Residue and Waste Measurement Procedures Manual, BC Ministry of Forests and Range, current to April 6, 2014;
- Procedures for Factoring Visual Resources into Timber Supply Analyses, 1998, BC Ministry of Forests, and the update bulletin, Modelling Visuals in TSR III;
- Summary of dead potential volume estimates for management units within the Northern and Southern Interior Forest Regions, 2006, BC Ministry of Forests and Range;
- A Biophysical Model for Estimating Site Index for the Major Commercial Species in British Columbia, 2012, BC Ministry of Forest, Lands and Natural Resource Operations, draft report;
- Pine Stem Rust Management Guidebook, 1996, BC Ministry of Forests;
- Omineca Rust Strategy, 2013, BC Ministry of Forest, Lands and Natural Resource Operations;
- Mackenzie Timber Supply Archaeological Overview Assessment Final Report-Archaeological Field Reconnaissance and Heritage Potential Modelling; 1997; T. Gibson, J. Finnigan and C. Ramsay; Western Heritage Services Inc.;
- Mackenzie Timber Supply Archaeological Overview Assessment Final Report- Heritage Potential Modelling, 1997; T.H. Gibson, J Finnigan, C. Ramsay, and B. Low; Western Heritage Services Inc.;
- Mackenzie TSA Archaeological Inventory Assessment, 1998; B. Low, V. Brandzin-Low, and T. Gibson; Western Heritage Services Inc.;
- An Archaeological Inventory of the Mackenzie Forest District, Northeastern British Columbia; T.H. Gibson and Dale Russell; Western Heritage Services Inc.;
- The Mackenzie Timber Supply Area Archaeological Overview Assessment Final Report-Archaeological Field Reconnaissance; T.H. Gibson, C. Ramsay, and B. Low; Western Heritage Services Inc.;
- Bull trout (Salvelinus confluentus) occurrence and abundance influenced by cumulative industrial developments in a Canadian boreal forest watershed; 2005; T. Ripley; Canadian Journal of Fisheries and Aquatic Sciences 62(11), pages 2431-2442;
- A Recovery Action Plan for Northern Caribou Herds in North-Central British Columbia; 2008; R.S. McNay, D. Heard, R. Sulyma, and R. Ellis; FORREX Series 22;
- Recovery Strategy for the Woodland Caribou, Southern Mountain population (*Rangifer tarandus caribou*) in Canada. 2014. *Species at Risk Act* Recovery Strategy Series. Environment Canada, Ottawa;
- Grizzly bear summer habitat supply modeling in the Mackenzie Forest District; 2012; V. Brumovsky, R.K. McCann, and G.D. Sutherland; Report No. 395, Wildlife Infometrics Inc.; Mackenzie, BC;
- Mackenzie Timber Supply Area Rationale for Allowable Annual Cut (AAC) Determination, December 1, 2001, BC Ministry of Forests;
- Chief Forester Order Respecting the AAC Determination for the Mackenzie TSA, June 16, 2004, BC Ministry of Forests and Range;
- Mackenzie Timber Supply Area Timber Supply Review Data Package, September 2012, BC Ministry of Forests, Lands, and Natural Resource Operations;

- Mackenzie TSA Timber Supply Analysis Public Discussion Paper, October 2013, BC Ministry of Forests, Lands, and Natural Resource Operations;
- Mackenzie TSA Timber Supply Review Public Input Companion Document-Determination Meeting, April 8-9, 2014 BC Ministry of Forests, Lands, and Natural Resource Operations;
- Mackenzie TSA Timber Supply Review First Nations Consultation Companion Document-Determination Meeting, April 8-9, 2014 BC Ministry of Forests, Lands, and Natural Resource Operations;
- Growing Fibre, Growing Value, August 2012, Special Committee on Timber Supply, Province of BC;
- Beyond the Beetle: A Mid-term Timber Supply Action Plan, October 2012, BC Ministry of Forests, Lands, and Natural Resource Operations;
- Letter from the Minister of Forests and Range to the chief forester stating the economic and social objectives of the Crown, July 4, 2006;
- Letter from the Minister of Forests and Range to the chief forester stating the economic and social objectives of the Crown regarding mid-term timber supply in areas affected by the mountain pine beetle, October 27, 2010;
- Discussions with the Kwadacha First Nation during a meeting held in Prince George, BC on April 7, 2014;
- Discussions with the McLeod Lake Indian Band during a meeting held in Mackenzie, BC on April 8, 2014; and
- Technical review and evaluation of information and current operating conditions in the Mackenzie TSA through comprehensive discussions with staff from FLNR, including the AAC determination meeting held in Mackenzie, BC April 8-9, 2014.

Role and limitations of the technical information used

Section 8 of the *Forest Act* requires the chief forester, in determining AACs, to consider biophysical, social and economic information. Most of the technical information used in determinations is in the form of a timber supply analysis and its inputs of inventory and growth and yield data. These are concerned primarily with biophysical factors – such as the rate of timber growth and the definition of the land base considered available for timber harvesting – and with management practices.

The analytical techniques used to assess timber supply necessarily are simplifications of the real world. Many of the factors used as inputs to timber supply analysis have differing levels of uncertainty associated with them, due in part to variation in physical, biological and social conditions. Ongoing scientific studies of ecological dynamics will help reduce some of this uncertainty.

Furthermore, computer models cannot incorporate all of the social, cultural and economic factors that are relevant when making forest management decisions. Technical information and analysis; therefore, do not necessarily provide the complete answers or solutions to forest management decisions such as AAC determinations. Such information does provide valuable insight into potential impacts of different resource-use assumptions and actions, and thus forms an important component of the information I must consider in AAC determinations.

In determining this AAC for the Mackenzie TSA, I have considered known limitations of the technical information provided. I am satisfied that the information provides a suitable basis for my determination.

Guiding principles for AAC determinations

Section 8 of the *Forest Act* requires the chief forester to consider particular factors in determining the AACs for timber supply areas and tree farm licences.

Given the large number of periodic AAC determinations required for British Columbia's many forest management units, administrative fairness requires a reasonable degree of consistency of approach in addressing relevant factors associated with AAC determinations. In order to make our approach in these matters explicit, we, the chief forester and deputy chief forester, jointly established the following body of guiding principles. However, in any specific circumstance in a determination where we consider it necessary to deviate from these principles, we will explain our reasoning in detail.

When considering the factors required under Section 8, we are also mindful of our obligation as stewards of the forests of British Columbia, of the mandate of the Ministry of Forests, Lands and Natural Resource Operations as set out in Section 4 of the *Ministry of Forests and Range Act*, and of our responsibilities under the *Forest Act* and *Forest and Range Practices Act (FRPA)*.

Integrated decision-making

One of the key objectives of the Ministry of Forests, Lands and Natural Resource Operations is to take an integrated approach to all resource management decisions that consider all resource values. In considering the factors outlined in Section 8 of the *Forest Act*, we will continue to consider all available information on timber and non-timber resources in the management unit, and all available information on the interactions of the management of those resources on timber supply.

Information uncertainty

Given the complex and dynamic nature of forest ecosystems coupled with changes in resource use patterns and social priorities there is always a degree of uncertainty in the information used in AAC determinations.

Two important ways of dealing with this uncertainty are:

(i) managing risks by evaluating the significance of specific uncertainties associated with the current information and assessing the various potential current and future, social, economic and environmental risks associated with a range of possible AACs; and

(ii) re-determining AACs frequently, in cases where projections of short-term timber supply are not stable, to ensure they incorporate current information and knowledge.

In considering the various factors that Section 8 of the *Forest Act* requires the chief forester to take into account in determining AACs, it is important to reflect those factors, as closely as possible, that are a reasonable extrapolation of current practices. It is not appropriate to base decisions on proposed or potential practices that could affect the timber supply but are not substantiated by demonstrated performance or are beyond current legal requirements.

In many areas, the timber supply implications of some legislative provisions remain uncertain, particularly when considered in combination with other factors. In each AAC determination, this

uncertainty is taken into account to the extent possible in the context of the best available information.

It is not appropriate to speculate on timber supply impacts that may eventually result from land-use decisions not yet finalized by government, nor about the possible effect on timber supply that could result from possible eventual legal proof of aboriginal title. However, where specific protected areas, conservancies, or similar areas have been designated by legislation or by order in council, these areas are deducted from the timber harvesting land base (THLB) and are not considered to contribute any harvestable volume to the timber supply in AAC determinations, although they may contribute indirectly by providing forest cover to help in meeting resource management objectives such as for biodiversity.

In some cases, even when government has made a formal land-use decision, it is not necessarily possible to fully analyse and account for the consequent timber supply impacts in a current AAC determination. Many government land-use decisions must be followed by detailed implementation decisions requiring, for instance, further detailed planning or legal designations such as those provided for under the *Land Act* and FRPA. In cases where there is a clear intent by government to implement these decisions that have not yet been finalized, we will consider information that is relevant to the decision in a manner that is appropriate to the circumstance. The requirement for regular AAC reviews will ensure that future determinations address on-going plan implementation decisions.

Where appropriate, information will be considered regarding the types and extent of planned and implemented silviculture practices as well as relevant scientific, empirical and analytical evidence on the likely magnitude and timing of their timber supply effects.

We acknowledge the perspective that alternate strategies for dealing with information uncertainty are to delay AAC determinations or to generally reduce AACs in the interest of caution. However, given that there will always be uncertainty in information and due to the significant impacts that AAC determinations can have on communities, we believe that no responsible AAC determination can be made solely on the basis of a response to uncertainty.

Nevertheless, in making a determination, allowances may need to be made to address risks that arise because of uncertainty by applying judgement to the available information. Where appropriate, the social and economic interests of the Crown, as articulated by the Minister of Forests, Lands and Natural Resource Operations, can assist in evaluating this uncertainty.

Climate change

One key area of uncertainty relates to climate change. While some controversy appears to remain on the causes of climate change, there is substantial scientific agreement that climate is changing, that the changes will affect forest ecosystems, and that forest management practices will need to be adapted. Nevertheless, the potential rate, amount, and specific characteristics of climate change in different parts of the province are uncertain. As research provides more definitive information on climate change, we will consider the findings in AAC determinations. Where forest practices are implemented to mitigate or adapt to the potential effects of climate change on forest resources, we will consider related information in our determinations.

In addition, vulnerability assessments can provide information on the potential risks associated with climate change, and could be useful in defining how to consider climate change in different AAC determinations. Such assessments could also highlight key topics in need of research that could improve climate change considerations for future determinations.

We note, however, that even with better information on climate change there will be a range of reasonable management responses. Considerations of how to respond in anticipation of uncertain, potential future impacts and risks differ from those related to responding to known or on-going processes such as the recent mountain pine beetle (MPB) infestation. For example, it is not clear if either increases or decreases to current harvest levels would be appropriate in addressing potential future increases in natural disturbance due to climate change. Conversely, the present forest conditions resulting from the MPB infestation provide a clearer circumstance to which to respond.

To some extent, decisions on the preferred management responses to potential future risks, including potential changes to allowable timber harvests, are appropriately informed by broad discussion among interested parties. We will monitor such discussions and consider them insofar as they are relevant to AAC determinations. In general, the requirement for regular AAC reviews will allow for the incorporation of new information on climate change and its effects on forests and timber supply as it emerges.

First Nations

Aboriginal Title Lands and other areas, such as Treaty Lands or Indian Reserves, are not provincial Crown land. Consequently, the timber on these lands does not contribute to the AAC of the timber supply area or tree farm licence with which they overlap. For other areas, where aboriginal title has not been legally proven, the Crown has a legal obligation to consult with First Nations regarding their asserted rights and title (aboriginal interests) in a manner proportional to the strength of their aboriginal interests and the degree to which the decision may impact these interests. In this regard, full consideration will be given to:

(i) the information provided to First Nations to explain the timber supply review process;

(ii) any information brought forward respecting First Nations' aboriginal interests, including how these interests may be impacted; and

(iii) any operational plans and/or other information that describe how First Nations' interests are addressed through specific actions and forest practices.

Aboriginal interests that may be impacted by AAC decisions will be addressed consistent with the scope of authority granted to the chief forester under Section 8 of the *Forest Act*. When information is brought forward that is outside of the chief forester's jurisdiction, this information will be forwarded to the appropriate decision makers for their consideration. Specific considerations identified by First Nations in relation to their aboriginal interests and the AAC determination are addressed in the various sections of this rationale.

AAC determinations should not be construed as limiting the Crown's obligations under court decisions in any way, and in this respect it should be noted that the determinations do not prescribe a particular plan of harvesting activity within the management units. They are also independent of any decisions by the Minister of Forests, Lands and Natural Resource Operations with respect to subsequent allocation of wood supply.

The role of the base case

In considering the factors required under Section 8 of the *Forest Act* to be addressed in AAC determinations, I am assisted by timber supply forecasts provided to me through the work of the Timber Supply Review Program (TSR) for TSAs and TFLs.

For most AAC determinations, a timber supply analysis is carried out using an information package including data and information from three categories: land base inventory, timber growth and yield, and management practices. Using this set of data and a computer model, a series of timber supply forecasts can be produced to reflect different starting harvest levels, rates of decline or increase, and potential trade-offs between short- and long-term harvest levels.

From a range of possible forecasts, one is chosen in which an attempt is made to avoid both excessive changes from decade to decade and significant timber shortages in the future, while ensuring the long-term productivity of forest lands. This is known as the *base case* forecast and forms the basis for comparison when assessing the effects of uncertainty on timber supply. The base case is designed to reflect current management practices.

Because it represents only one in a number of theoretical forecasts, and because it incorporates information about which there may be some uncertainty, the base case forecast is not an AAC recommendation. Rather, it is one possible forecast of timber supply, whose validity - as with all the other forecasts provided - depends on the validity of the data and assumptions incorporated into the computer model used to generate it.

Therefore, much of what follows in the considerations outlined below is an examination of the degree to which all the assumptions made in generating the base case forecast are realistic and current, and the degree to which resulting predictions of timber supply must be adjusted to more properly reflect the current and foreseeable situation.

These adjustments are made on the basis of informed judgment using currently available information about forest management, and that information may well have changed since the original information package was assembled. Forest management data are particularly subject to change during periods of legislative or regulatory change, or during the implementation of new policies, procedures, guidelines or plans.

Thus, in reviewing the considerations that lead to the AAC determination, it is important to remember that the AAC determination itself is not simply a calculation. Even though the timber supply analysis I am provided is integral to those considerations, the AAC determination is a synthesis of judgment and analysis in which numerous risks and uncertainties are weighed. Depending upon the outcome of these considerations, the AAC determined may or may not coincide with the base case forecast. Judgements that in part may be based on uncertain information are essentially qualitative in nature and, as such, are subject to an element of risk. Consequently, once an AAC has been determined, no additional precision or validation would be gained by attempting a computer analysis of the combined considerations.

Base case for the Mackenzie TSA

The current AAC was determined in 2001 before the rapid expansion of the mountain pine beetle (MPB) infestation in the Mackenzie TSA. After the peak of the initial MPB epidemic in 2009, the beetle population declined significantly. Recent surveys indicate that scattered endemic populations are present in the TSA, but only a small number of areas have high MPB populations. Although there is no significant new infestation, large volumes of dead pine have accumulated and have been the focus of targeted salvage harvesting. The base case accounts for the ongoing salvage harvest and the transition to lower mid-term harvest levels.

In timber supply reviews for management units severely impacted by MPB, *mid-term* refers to that portion of a harvest forecast when dead pine is no longer a commercially viable source of timber and before regenerating pine stands reach harvestable condition. In the timber supply analysis for the Mackenzie TSA, it is assumed that dead pine trees retain commercial value as long as they

remain standing, which is assumed to be 15 years after MPB attack. This time period is referred to as *shelf life*.

The base-case forecast and the other timber supply forecasts were prepared using PySIM (v0.9). PySIM (v0.9) is an inventory projection and timber harvest scheduler developed by FAIB that accounts for overlapping non-timber objectives. Based on my discussions with forest analysis staff I accept that this model is appropriate for use in generating the forecasts prepared to inform this determination.

The data and assumptions used in the base case attempt to reflect current legislation, legally-established resource objectives, and demonstrated current forest management practices and conditions.

Following release of the *Mackenzie TSA Timber Supply Analysis Public Discussion Paper* (PDP) in October 2013, licensees and government staff identified a number of concerns regarding the base case. Consequently the base case in the PDP was revised to incorporate the following changes:

- Stands suitable for cable logging with volumes greater than 250 cubic metres per hectare and balsam-leading stands previously excluded from the area assumed to be available for timber harvesting - referred to as the *timber harvesting land base* (THLB) - were added back into the THLB. This change was based on a review of historic appraisal data that indicated that harvesting had occurred in these stand types prior to the MPB epidemic.
- Errors in the modelling of ungulate winter range (UWR), the establishment density for stands with deciduous species and the condition of MPB-killed stands after the dead pine trees collapsed were corrected.

For the purposes of my determination and throughout this rationale document, the term *base case* refers to the original base case reported in the PDP amended as described above.

In the base case, which starts in 2012, an initial harvest level of 3 050 000 cubic metres per year is maintained for 15 years before declining to a mid-term level of 2 510 000 cubic metres per year. This decline coincides with the end of the pine shelf life and marks the end of the salvage period. After six decades, the harvest increases to a stable long-term level of 3 050 000 cubic metres per year for the remainder of the 200-year forecast.

In order to establish an appropriate harvest profile for use in the base case, staff reviewed the harvest information from 2006 to 2012. The results indicate that during this time, about 66 percent of the total harvest originated from pine-leading stands. Consequently, in the base case the harvest contribution of pine-leading stands was set 2 008 000 cubic metres per year. After the salvage period ends in 2027, no pine-leading stands are harvested until 2042, when the regenerating pine stands established prior to 2012 reach merchantable condition. The harvest contributions of spruce-leading and balsam-leading stands were set at 850 000 cubic metres per year and 92 000 cubic metres per year for the entire forecast, respectively. The harvest contribution of deciduous-leading stands was set at 100 000 cubic metres per year.

As the harvest constraints are applied on the basis of leading-species, the volume harvested by species differs from the volume specified in the constraint. During the salvage period, the base case harvest consists of 1.7 million cubic metres per year of pine, one million cubic metres per year of spruce, 227 000 cubic metres per year of balsam and 87 000 cubic metres per year of deciduous timber.

I have reviewed the assumptions and methodology used in the base case, as well as the total growing stock, the age-class distribution, the harvest contributions from managed and unmanaged stands, the average volume per hectare and average age of harvested stands, and the total annual

harvest area. Based on my review, I am satisfied, subject to the qualifications accounted for in various sections of this document, that the information presented to me provides a suitable basis from which I can assess the timber supply for the Mackenzie TSA. In addition to the base case, I was provided with alternative harvest forecasts, a number of sensitivity analyses carried out using the base case as a reference, and supplemental analysis. This and other information noted below have been helpful in the considerations and reasoning leading to my determination.

Consideration of Factors as Required by Section 8 of the *Forest Act*

I have reviewed the information for all of the factors required to be considered under Section 8 of the *Forest Act*. Where I have concluded that the modelling of a factor in the base case appropriately represents current management or the best available information, and uncertainties about the factor have little influence on the timber supply projected in the base case, no discussion is included in this rationale. These factors are listed in Table 2.

Table 2. List of factors accepted as modelled in the base case

***Forest Act* section and description**	**Factors accepted as modelled**
8(8)(a)(i) Land base contributing to timber harvesting	• Rock, ice, water, alpine • Cleared right of ways • Parks and reserves • Unstable ground • Steep ground with volumes too low for cable logging • Low volume and non-commercial species • Isolated stands • Future roads • "Problem" forest types
8(8)(a)(i) Composition of the forest and expected rate of growth	• Volume estimates for natural stands • Volume estimates for managed stands
8(8)(a)(ii) Expected time for the forest to be re-established following denudation	• Regeneration delay
8(8)(a)(iii) Silvicultural treatments to be applied	• Silviculture systems
8(8)(a)(iv) Standard of timber utilization and allowance for decay, waste, and breakage	• Utilization standards • Decay, waste and breakage • Log grade changes

(continued on the next page)

Table 2. List of factors accepted as modelled in the base case (concluded)

Forest Act **section and description**	**Factors accepted as modelled**
8(8)(a)(v) Constraints on the amount of timber produced by use of the area for other purposes	• Muskwa-Kechika Management Area • Agriculture Development Areas • Settlement Reserve Areas • Mugaha Marsh Sensitive Area • Obo/Fox Landscape Units • Landscape-level biodiversity • Watershed sensitivity and hydrology • Scenic resources • Recreation sites and trails Wildland resource management
8(8)(a)(vi) Other information	
8(8)(b) Short and long-term implications of alternative rates of timber harvesting from the area	• Alternative harvest flows

For other factors, where more uncertainty exists or where public or First Nations' input indicates contention regarding the information used, modelling, or some other aspect under consideration, this rationale incorporates an explanation of how I considered the essential issues raised and the reasoning that led to my conclusions. I have applied the same principles to discussion of public input as I applied to First Nations' interests; that is, when information is brought forward that is outside of the chief forester's jurisdiction, this information will be forwarded to the appropriate decision makers for their consideration. Specific considerations identified by the public in relation to my powers under Section 8 of *the Forest Act* and the AAC determination are addressed in the various sections of this rationale.

Section 8 (8)

In determining an allowable annual cut under subsection (1) the chief forester, despite anything to the contrary in an agreement listed in section 12, must consider

(a) the rate of timber production that may be sustained on the area, taking into account

(i) the composition of the forest and its expected rate of growth on the area

Land base contributing to timber harvesting

- general comments

The total area of Crown forest land in the Mackenzie TSA, as reported in the October 2013 *Mackenzie TSA Timber Supply Analysis Public Discussion Paper*, is 3 312 997 hectares. Of this area, 1 500 726 hectares are currently available for timber harvesting, which is about four percent greater than the THLB assumed in the 2001 base case.

As part of the process used to define the THLB, a series of deductions was made from the Crown forest land base. These deductions account for economic or ecological factors that operate to reduce the forest area available for harvesting. In reviewing these deductions, I am aware that some areas may have more than one classification. Hence, a specific deduction for a given factor does not necessarily reflect the total area within that classification, since some portion of the classification may be deducted under another factor.

As noted above under "**Base case for the Mackenzie TSA**"; the base case was revised following the public consultation period to include cable-harvesting ground and balsam-leading stands.

A forest company representative urged FLNR to consider expanding the THLB to include stands that could be used to produce non-lumber products, such as bioenergy. I acknowledge that such uses may offer the potential for inclusion of additional areas in the THLB in future. However, as discussed in "**Guiding principles for AAC determinations**", until such time as there is demonstrated harvest performance in these stands, the areas should continue to be excluded from the THLB.

- area-based tenures

In general, the initial harvest level in a base case is set at or below the current AAC unless a higher level can be maintained for the entire forecast period. Exceptions include management units in which the initial harvest level has been increased to salvage MPB-killed pine. In 2009, 24 218 hectares of forest land and 30 000 cubic metres of timber were transferred from the area and AAC attributable to the Mackenzie TSA, respectively, in order to issue the McLeod Lake Mackenzie Community Forest Agreement. For the base case, the THLB was reduced to account for the area transferred to the new tenure; however, the initial harvest level was not reduced to account for the transfer of AAC. Consequently, the base case initial harvest level is 30 000 cubic metres per year or about one percent higher than the current effective AAC of the Mackenzie TSA.

As discussed later in this document, there is a large volume of dead pine remaining in the Mackenzie TSA available for salvage. Regardless of whether this volume is salvaged or not, the eventual projected decrease in mature growing stock will result in a decrease in mid-term timber supply. When compared to the magnitude of the decrease in growing stock due to the MPB infestation, the slightly higher initial harvest level used in the base case is insignificant; therefore, I will not adjust the base case on this account and I will consider this factor no further in my determination.

- haul distance

Due to the large size of the Mackenzie TSA, much of the timber harvest must be hauled long distances, either by water or road, to reach processing facilities in Mackenzie or elsewhere. Historically, timber was transported on Williston Lake by means of tug and tow or large log transporter. The log transporter has ice-breaking capabilities and can operate year round; whereas, tow boats can only operate about six months of the year. Consequently, since the log transporter was taken out of service, the capacity for log transportation on Williston Lake has been significantly reduced.

As the distance from the Community of Mackenzie (Mackenzie) increases, the cost of hauling logs also increases until the cost is so high that timber harvesting becomes uneconomical. Areas south of the Peace Arm and Omineca Provincial Park are sufficiently close to Mackenzie that haul distance is not a barrier to harvesting. In order to establish a maximum haul distance criterion for use in the base case, the haul distances associated with about 115 000 hectares of cutblocks north of the Peace Arm and Omineca Provincial Park were calculated. The results indicate that 99 percent

of the areas harvested had haul distances less than 293 kilometres from Mackenzie. Application of a 293-kilometre maximum economic haul distance resulted in the exclusion of 609 454 hectares that would otherwise contribute to the THLB.

The Tsay Keh and Kwadacha First Nations are both active in the forest sector and are interested in pursuing further opportunities to obtain forest tenures near their communities. The Kwadacha First Nation reiterated this point when I met with their representatives in Prince George, BC. They noted that because their communities are relatively close to the forest area excluded from the THLB, they may be able to offset some of the operating costs. I will discuss these interests and the fibre attributable to the area delineated in the Kaska Dene Strategic Engagement Agreement later in this document under "*Kaska Dene Strategic Engagement Agreement*".

I am mindful that prior to 2008, Abitibi-Bowater Ltd., a former licensee, had laid out a number of harvest blocks approximately 40 kilometres north of the community of Kwadacha, which is about 330 kilometres from Mackenzie. Although these blocks have not been harvested, Abitibi-Bowater presumably considered them to be at least marginally viable to harvest.

In response to the public discussion paper Canadian Forest Products Limited stated that the company is in the process of re-commissioning the large log transporter that formerly operated on Williston Lake. This would increase the likelihood that blocks similar to those described above would be harvested in the future.

A member of the public commented that it is unlikely that much pine will be salvaged at hauling distances greater than 150 kilometres from Mackenzie. However, hauling has occurred in recent years up to 300 kilometres from Mackenzie; and examination of the cutblock distance data showed that greater than 50 percent of the harvest has come from distances beyond 150 kilometres.

In a sensitivity analysis, expanding the economically-operable area to include the proposed Abitibi-Bowater blocks increased the size of the THLB by about 77 000 hectares or five percent and resulted in a mid- to long-term harvest level 110 000 cubic metres per year higher than projected in the base case. No attempt was made in this analysis to flow the additional timber supply over the entire forecast period, including the short term.

Having considered the information regarding haul distance, the expressed interests of the Tsay Keh and Kwadacha First Nations, and the input received from the public, I conclude that the base case mid- to long-term harvest levels have likely been underestimated by about 110 000 cubic metres per year or four percent. I will discuss this further under both "*Kaska Dene Strategic Engagement Agreement*" and in "**Reasons for Decision**".

Forest inventory

The Vegetation Resources Inventory (VRI) used in the base case was generated using aerial photography acquired over a range of dates from 1956 to 2010. The forest inventory for the southern two-thirds of the TSA, which includes essentially all of the THLB, was generated from photography acquired between 1999 and 2010. An inventory audit was conducted to verify the inventory estimates, but most of the audit samples were collected outside the THLB.

Using the Variable Density Yield Projection Version 7 (VDYP7) growth model, inventory attributes were projected to January 2012. The resulting data were then updated to account for recent timber harvesting and fires, excluding the 2014 fires (see "*2014 fires*" later in this document), using a forest cover depletion layer created from openings and harvest history recorded in the RESULTS program of FLNR, plus change detection layer derived from satellite imagery.

Several comments were received that related to the forest inventory:

- BCTS asserted that the VRI is considered by experienced forest professionals to underestimate stand volumes by 20 to 30 percent; and to misclassify approximately 30 percent of forest cover polygons, often overestimating the proportion of spruce and underestimating the proportion of balsam. BCTS asserts that these two errors, in combination, could "exert a downward pressure on the AAC".
- Two forest company representatives commented that the sawlog volume of mature pine is overstated in the VRI.
- A forest company representative stated that pine stands are losing sawlog volume incrementally every year, and that the volume of merchantable pine in stands composed of more that 70 percent pine is overestimated.
- Two forest company representatives and a member of the public stated that, based on their experience, pine-leading stands composed of 70 percent or more pine are less common than indicated in the forest inventory, especially in the southern part of the district.
- I acknowledge that the forest inventory for the Mackenzie TSA is subject to uncertainty. However, in the absence of reliable data demonstrating any systematic bias in the forest inventory information for the Mackenzie TSA, I accept that the best available information was used in the base case.

Prior to the next determination, as indicated in "**Implementation**", I request that the district and FAIB, subject to funding and provincial inventory priorities: a) update the imagery available for the northern portion of the TSA and b) gather additional inventory audit samples within areas identified as THLB.

- site productivity estimates

In general, forest stands between 30 years and 150 years of age provide the most accurate measurements of site productivity. These measurements, which are based on tree height at age 50 years at breast height, are referred to as *site indices*. Site indices based on information from younger stands and older stands may not accurately reflect potential site productivity. In stands younger than 30 years, growth often depends as much on recent weather, stocking density, and competition from other vegetation as it does on site quality. In stands older than 150 years, which have not been subject to management of stocking density, the trees used to measure site productivity may have grown under intense competition or may have been damaged, and therefore may not reflect the true growing potential of the site. This has been verified in many areas of the province where studies of old-growth site index suggest that actual site indices may be higher than those indicated by existing data from mature forests.

Inventory site indices were used to estimate the growth and yield of naturally-established stands. For a small portion of the TSA, Terrestrial Ecosystem Mapping (TEM) or Predictive Ecosystem Mapping (PEM) was available and was used along with FLNR's Site Index Biogeoclimatic Ecosystem Classification (SIBEC) to estimate site indices for managed stands. Where neither TEM nor PEM was available, site indices from the ministry's biophysical site index model were used.

In the *Rationale for the Mackenzie TSA AAC Determination* (December 2001), the chief forester noted that local data would reduce the uncertainty around the magnitude of site productivity adjustments appropriate for managed stands in the Mackenzie TSA, and strongly encouraged the collection of data from stands within the TSA prior to the next determination.

I conclude that the best available site productivity estimates were used in the base case. However, I share the concern expressed by the chief forester during the previous determination that there is significant uncertainty associated with site productivity due to lack of local sample data. Several existing programs of modelling, monitoring, and research offer the opportunity to greatly reduce this uncertainty; notably Young Stand Monitoring under the Forest Inventory Program, Stand Development Monitoring conducted under the Forest and Range Evaluation Program, and forest health monitoring. As noted under "**Implementation**", I encourage the district to collaborate with other FLNR districts, FAIB and the leaders of aforementioned programs to create a robust monitoring system, the results of which can be used to reduce the uncertainty associated with site productivity for subsequent AAC determinations.

- minimum harvest criteria

In order to establish minimum harvestable volume criteria for use in the base case, staff reviewed the forest cover inventory and information in the ministry's General Appraisal System (GAS) data base. The results indicate that 99 percent of harvested stands in the inventory had projected volumes of greater than 151 cubic metres per hectare and 95 percent of harvested stands had projected volumes greater than 209 cubic metres per hectare. A review of appraised timber volumes from a sample of 888 timber marks harvested in the district between 1988 and 2011 found that 99 percent of the harvested stands had volumes that exceeded 158 cubic metres per hectare and 95 percent of the harvested stands had volumes that exceeded 210 cubic metres per hectare.

On this basis, the minimum volume limit for a stand to be eligible for harvest in the base case was greater than 151 cubic metres per hectare. Since a minimum stand-volume limit based on only one percent of the harvested stands would allow more low volume stands to contribute to the base case than is actually occurring in the Mackenzie TSA, a minimum average volume limit of 200 cubic metres per hectare was also applied. In addition to the minimum harvestable volume criteria, only dead pine stands on slopes less than 35 percent could contribute to the base case.

In order to examine the effect of minimum harvest criteria on the base case, two sensitivity analyses were prepared. In the first, increasing the minimum average volume per hectare from 200 cubic metres per hectare to 250 cubic metres per hectare, while maintaining the minimum stand volume limit at 151 cubic metres per hectare, resulted in a mid-term harvest level of 1 810 000 cubic metres per year. This is 700 000 cubic metres per year lower than projected in the base case. In the second, increasing the minimum average volume per hectare to 300 cubic metres per hectare, while maintaining the minimum stand volume limit at 151 cubic metres per hectare, resulted in a mid-term harvest level 1 500 000 cubic metres per year lower than projected in the base case.

In addition to the sensitivity analyses described above, I requested an additional analysis in which the minimum stand volume limit was maintained at 151 cubic metres per hectare but the 200-cubic metre per hectare minimum average volume limit was removed. In the resultant forecast, an initial harvest level of 3 050 000 cubic metres per year, which is the same as in the base case, could be sustained for the entire forecast period. However, I note that in the 60-year period from 2057 to 2117 of this forecast, stands with less than 200 cubic metres per hectare contributed 88 percent of the total harvest volume. By comparison, in the base case stands having less than 200 cubic metres per hectare contributed only 25 percent of the total volume over the same 60-year period.

During public consultation Mackenzie Fibre suggested that FLNR consider making mixed pine stands with less than 150 cubic metres per hectare of green timber available for harvest because it is unlikely they would be harvested 15 years from now or later. A member of the public commented that stands of less than 200 cubic metres per hectare are unlikely to be harvested. In contrast, Canadian Forest Products Ltd. stated that it anticipates that stands with volumes below

200 cubic metres per hectare will be harvested as soon as 2014. Canadian Forest Products Ltd. also requested that the analysis not be based on an average volume of 200 cubic metres per hectare, but rather should employ only the stand volume minimum of 150 cubic metres per hectare.

In response to Mackenzie Fibre, I note that current policy already allows stands with less than 150 cubic metres per hectare to be harvested at the licensees' discretion. Given the results of the sensitivity analysis in which a decrease in the minimum average volume limit eliminates the projected decline in the base case mid-term timber supply, I strongly encourage Mackenzie Fibre to work with licensees to explore opportunities to harvest lower volume stands in the Mackenzie TSA.

With regard to Canfor's ' recommendation that an average stand volume limit of 200 cubic metres not be applied in the base case, I note that removal of this limit in a sensitivity analysis resulted in a much higher contribution of low-volume stands than is currently supported by demonstrated harvest performance in the Mackenzie TSA.

After careful consideration of all the information available to me, I conclude that the minimum harvest criteria used in the base case reasonably reflect demonstrated harvest performance in the Mackenzie TSA and I will make no adjustments to the base case on this account. However, I am also mindful of the results of the sensitivity analysis that suggest that if licensees' can significantly increase the harvest of low volume stands, rather than only those stands reaching minimum harvest criteria, it may be possible to mitigate the projected decrease in mid-term timber supply, as discussed in "**Reasons for Decision**".

Section 8 (8) (a) (ii) the expected time that it will take the forest to become re-established on the area following denudation,

As noted in Table 2, I accept as modelled the factors considered under this section, and I will not discuss them further.

Section 8 (8) (a) (iii) siliviculture treatments to be applied to the area,

As noted in Table 2, I accept as modelled the factors considered under this section, and I will not discuss them further.

Section 8 (8) (a) (iv) the standard of timber utilization and the allowance for decay, waste and breakage expected to be applied with respect to timber harvesting on the area,

As noted in Table 2, I accept as modelled the factors considered under this section, and I will not discuss them further.

Section 8 (8) (a) (v) the constraints on the amount of timber produced from the area that reasonably can be expected by use of the area for purposes other than timber production,

Factors considered under Section 8(8) (a)(v)

In addition to the factors listed under this section in Table 2 above, I have also considered the following factors, which require additional comment.

- Mackenzie Land and Resource Management Plan

In the Mackenzie TSA, additional guidance for resource management activities, including designation of new protected areas and planning for forest development, and the establishment of integrated resource management (IRM) objectives is provided by the Mackenzie Land and

Resource Management Plan (MLRMP). Government approval of the MLRMP on November 14, 2000, added over 600 000 hectares to BC's parks and recreation areas.

Other elements of the MLRMP have been established as legal requirements through orders issued under either Section 7 of the Forest Planning and Practices Regulation (FPPR) or Section 93.4 of the *Land Act*. These include: creation of the Mugaha Marsh Sensitive Area (2002); establishment of agriculture development and settlement reserve areas (2006); and establishment of the Obo River and Fox Landscape Unit management objectives (2002); old growth management areas in several landscape units in the southern portion of the TSA (2010); and revised non-spatial biodiversity management objectives in the other landscape units of the TSA (2010). In determining the AAC for the Mackenzie TSA, I have considered the legal requirements established in these orders and, to the extent reflected in current management, I have considered the other provisions of the MLRMP.

- wildlife requirements

northern caribou

The Mackenzie Natural Resource District is home to several northern caribou herds that generally utilize low elevation forests with abundant ground lichens or higher elevation windswept alpine areas and subalpine forests. The caribou herds found in the district include: Kennedy Siding, Wolverine, Chase, Scott, Finlay (Akie), Frog and Gataga; as well as portions of the ranges for the Moberly and Graham herds extend into the eastern edge of the Mackenzie TSA. These herds are classified by the federal government as either being of *special concern* or *threatened* and although this listing indicates that these populations are declining, it offers no legal protection.

A Recovery Action Plan for Northern Caribou Herds in North-Central BC was developed in 2008. This plan provides herd-specific recovery recommendations for the Wolverine, Chase and Scott Herds. Subsequent caribou-recovery work has grouped several caribou herds with the southern Peace Region in a South Peace Northern Caribou Plan area. The caribou herds that have some of their home range in the Mackenzie TSA, that are also included in the plan area are Kennedy Siding, Scott, Moberly and Graham.

In March 2013, the province released the Peace Northern Caribou Implementation Plan that includes specific management actions and objectives: protection of 90 percent of identified high elevation winter habitat; address threats such as predation; manage industrial development in high and low elevation habitat areas; and in all ranges, monitor the compliance and effectiveness of the actions and objectives and adapt actions as necessary.

Some areas of the South Peace northern caribou area that overlap the eastern edge of the Mackenzie TSA have been conditionally withdrawn from Crown land for the purpose of conservation and wildlife management, in accordance with Section 17s of the *Land Act*.

Environment Canada recently issued its *Recovery Strategy for the Woodland Caribou (Rangifer tarandus caribou), Southern Mountain population in Canada under section 37 of the Species at Risk Act (SARA)*. For the Mackenzie TSA, this includes the following herds: Wolverine, Chase, Scott, Kennedy Siding, Graham and Moberly. In the short term, the objective is to stop the decline in the size and distribution of herds. Ultimately, the goal is to increase the size of local populations to self-sustaining levels, and where possible, to levels that can sustain an aboriginal harvest.

Achievement of these objectives will require coordinated land and/or resource planning, habitat restoration and management, as well as predator and alternate prey management. Under SARA, one or more action plans need to be completed in BC to implement this strategy by December 31, 2017. At this point no new legal land use requirements have been established.

ungulate winter range and wildlife habitat

In addition to northern caribou, the Mackenzie TSA includes important winter ranges for mountain goat, elk and Stone's sheep. In order to protect some of these areas, government established legal objectives for ungulate winter ranges (UWR) under Section 7 of FPPR. After allowing for overlaps with areas previously excluded to account for other factors, a net area of 27 291 hectares was excluded from the THLB used in the base case.

In addition to the established UWRs, regional biologists have proposed the establishment of northern caribou high elevation winter ranges for the Wolverine, Chase, Scott, Finlay-Akie, Frog and Gatanga herds and additional UWRs for Stone's sheep and mountain goat. At the time of this determination, no legal orders have been issued to establish these UWRs.

In addition to the UWRs, some wildlife habitat areas (WHA) have also been legally established for identified wildlife species. These WHAs include one mountain goat mineral lick and some northern caribou rutting and calving areas for the Graham and Moberly herds. In order to account for these areas, 13 612 hectares were excluded from the THLB.

Regional biologists will be proposing the establishment of several new WHAs for northern caribou migration corridors, post-rut aggregation areas, and calving areas for Wolverine, Chase and Finlay/Akie herds as well WHAs for known fisher denning sites, and high value bull trout spawning locations. At the time of this determination, no legal orders have been issued to establish these WHAs.

The Nak'azdli and Tsay Keh Dene First Nations have expressed concern to FLNR regional biologists regarding the effectiveness of some low elevation UWRs in managing the risks to caribou due to increased industrial development. They also indicated that habitat designations and measures established under *FRPA*, such as UWRs and WHAs, should apply to all resource development activities, not just forestry.

The general wildlife measures associated with UWRs do apply to mineral exploration activities if timber cutting or road building outside of the mineral tenure is required. However, regional biologists indicate that oil and gas activities are exempt from these requirements and separate UWRs have to be established under the *Oil and Gas Activities Act*.

The Tsay Keh Dene First Nation is concerned about the decline in caribou and the risk associated with increased timber harvesting and road development and increased wolf populations. They question the effectiveness of the low elevation UWR (U-7-007) and are supportive of the proposed high elevation winter range for northern caribou (U-7-025). During consultation on the proposed northern caribou high elevation UWR, and the additional UWRs for Stone's sheep and mountain goat, the Takla First Nation made the following comments:

"…these ungulates are critical resources to our people. We have great interest in maintaining healthy, robust populations of these ungulates to ensure our cultural ways are secured for generations to come in our territory.

" *We encourage the BC government to secure these critical ungulate winter range habitats as a starting point for ensuring these resources are not extirpated or reduced to such low population number that it further impacts our aboriginal rights, title and interests.*"

The West Moberly First Nations expressed particular concern for the Peace northern caribou herds.

The McLeod Lake Indian Band is supportive of protecting caribou by controlling moose populations. They noted that moose are a secondary prey species and when their numbers increase, more predators are attracted to the area. This increases the predation on the caribou. They noted that one of the ways to control moose populations is to limit the amount of young seral forest which moose rely on for browsing.

The Tsay Keh Dene First Nation and the McLeod Lake Indian Band are concerned about the need to maintain fisher.

In considering the input received from First Nations, I note that both the provincial and federal governments share their concerns regarding species at risk, including caribou. Although an implementation plan for the federal caribou recovery strategy has not yet been developed, the province's high elevation UWR proposal (U-7-025) currently before the statutory decision maker specifies actions and objectives that will help to protect high elevation habitat and address threats such as predation and industrial development.

Regional staff have been attentive to the concerns raised by First Nations regarding their wildlife interests. In addition to implementation of existing provisions, staff submitted a proposal that would establish new caribou UWRs to the appropriate statutory decision maker and have consulted First Nations regarding this proposal. In addition they are working on proposals for caribou WHAs. Predation risks from wolves are a major factor influencing the recovery of northern caribou, and wolves are sustained by prey such as moose. Near high elevation caribou winter range, regional biologists have proposed an associated general wildlife measure that limits the increase in preferred moose browse. Although this habitat management strategy is intended to address predation risk to caribou, it is consistent with the moose population management objective of maintaining moose densities that are reflective of those found under natural conditions across the landscape.

In considering the foregoing information I note that implementation of the federal woodland caribou recovery strategy and development of new UWRs and WHAs represents an opportunity for government staff, First Nations and resource developers (oil and gas tenure-holders) to work collaboratively to optimize the location and management of existing and planned wildlife provisions. Such collaboration could ensure that designated habitat areas meet wildlife requirements and are connected in such a way to allow for effective migration, are collocated to minimize the impact on other forest resource values and accommodate First Nations' wildlife interests. This recommendation is reiterated in this document under "**Implementation**".

In my consideration of the information and assumptions used in the base case, I am mindful that base case directly accounts for wildlife habitat through the exclusion of established UWRs and WHAs and indirectly through the area exclusions or forest cover constraints applied for other values (e.g. riparian areas, wildlife tree retention, landscape-level biodiversity). Furthermore, I note that AAC determinations are strategic in nature and do not specify how forest management will occur in the TSA. With respect to the potential for the AAC or maximum rate of harvest to affect other non-timber values, I note that I have considered the risk of concentrating harvesting in the southern portion of the TSA, as discussed in '**Mountain pine beetle**' and "**Reasons for Decision**".

I conclude that the base case accounts for the legally established UWRs and WHAs. In keeping with my guiding principle not to speculate on the timber supply impacts that may eventually result from land-use decisions not yet finalized or implemented by government, I will not account for the proposed UWRs and WHAs, nor will I account for the potential land use changes that may arise during implementation of the federal Recovery Strategy for the Woodland Caribou. If following this determination, additional areas become unavailable for timber harvesting or the rate of harvest is constrained such that there may be a risk of concentrating the harvest in the remainder of the TSA, I am prepared to revisit this determination earlier than the 10-year period required under the *Forest Act*.

- wildlife tree patches and riparian areas

In order to estimate the amount of mature timber retained in wildlife tree patches (WTP) and riparian management areas (RMA), staff reviewed information in the ministry's RESULTS

database. The results indicated these areas include 4.7 percent of the mature timber present before logging.

A member of the public commented that RMAs and WTPs would have a significantly higher impact on the timber supply in steeper, wetter portions of the TSA as compared to flatter, drier pine sites; and questioned whether this had been accounted for in the analysis. In response, I note that licensees are required to report information regarding WTPs and RMAs in RESULTs after harvesting. Consequently the information used in the base case reflects the actual retention occurring in the TSA, regardless of site topography, climate and species.

I accept that the wildlife tree patches and riparian area assumptions reflect the best available information and will make no adjustment to the base case on this account.

- cultural heritage resources

A cultural heritage resource (CHR) is an object, site, or location of a traditional societal practice that is of historical, cultural or archaeological significance to the province, a community, or an aboriginal people. CHRs include, but are not limited to, archaeological sites, structural features, heritage landscape features and traditional use sites.

Several studies have been conducted in the Mackenzie TSA, including a traditional use study for the Tsay Keh Dene, *the Mackenzie Timber Supply Archaeological Overview Assessment Final Report* (1997), the *Mackenzie TSA Archaeological Inventory Assessment* (1998), and the report *An Archaeological Inventory for Mackenzie Forest District* (2000). These reports indicate that archaeological sites and cultural heritage resources occupy a very limited part of the land base in the Mackenzie TSA, in part because many areas traditionally used by First Nations were flooded when the WAC Bennett Dam was constructed.

BCTS commented that spatial information on cultural heritage resources is available from the reports cited above, and should have been used to conduct sensitivity analysis on the potential impacts of managing those resources.

I am advised that licensees, First Nations and district staff have worked cooperatively to identify areas of cultural importance. Where appropriate, areas reserved from harvest to manage for other resource values, e.g. WTPs or RMAs, are co-located to protect CHRs. Where this is not an option, CHR sites may be treated as 'log-around' areas. Although the latter have no legal designation and the associated area was not accounted for in the base case, the area is not of sufficient size to have any significant effect on timber supply. From this, I conclude that the assumptions used in the base case reflect current management and I will consider this factor no further in my determination.

Section 8 (8) (a) (vi) any other information that, in the chief forester's opinion, relates to the capability of the area to produce timber,

- First Nations considerations

In June 2014, the Supreme Court of Canada (SCC) released its decision on the *Tsilhqot'in Nation* v. *British Columbia* case (*Tsilhqot'in* decision). This decision provided further clarification on the nature of and tests for aboriginal title, and established that the Tsilhqot'in Nation holds aboriginal title over an extensive area in the central interior of the province. I have considered the *Tsilhqot'in* decision and its relevance for this AAC determination. Of the First Nations with territory in the Mackenzie, three are signatories to Treaty 8, in which title to the land was ceded to the Crown. Consultation obligations with respect to asserted aboriginal rights and title and confirmed treaty rights, as outlined in the SCC *Haida* and *Sparrow* decisions, the Economic Benefits Agreement, and the Kaska Strategic Engagement Agreement still apply in the Mackenzie TSA and I discuss the consultation process below.

There is a rich, diverse aboriginal history in the Mackenzie TSA and the traditional territories of ten First Nations cover all or part of the TSA. Two First Nations communities are physically located within the TSA. These two communities are home to the Tsay Keh Dene First Nation and the Kwadacha First Nation. Eight more First Nations maintain communities outside the TSA, but assert rights and title that overlap it. They are the Gitxsan First Nation, Halfway River First Nation, McLeod Lake Indian Band (whose community lies just outside the TSA boundary to the southeast), Nak'azdli First Nation, Saulteau First Nations, Takla Lake First Nation, Tahltan First Nation, and West Moberly First Nations.

The West Moberly First Nations and Saulteau First Nations signed onto Treaty 8 in 1914. The West Moberly First Nations split into the West Moberly Lake and Halfway River First Nations in 1977. The McLeod Lake Indian Band adhered to Treaty 8 in 2000.

First Nations in the Mackenzie TSA have entered into a variety of agreements including: Forestry Consultation and Revenue Sharing Agreements (FCRSA), Forest and Range Opportunity Agreements (FRO), Forest Tenure Opportunity Agreements (FTOA), and three non-replaceable forest licences (NRFL). In addition, the Kwadacha First Nation is party to a Strategic Engagement Agreement (SEA) between the Province of BC and the Kaska Dena Council.

The FCRSA and FRO provide for revenue-sharing and forest tenure opportunities, and contain a framework for establishing consultation processes to guide consultation on administrative decisions, including AAC determinations. The First Nations consultation requirements specified in these agreements were followed during the consultation conducted as part of this timber supply review.

The Treaty 8 signatories have Economic Benefits Agreements with government that are intended to provide the First Nations with a share of resource revenues in compensation for infringement of Aboriginal rights during the term of the agreements. The consultation undertaken for this decision is consistent with the consultation matrix for forestry decisions that forms part of the Economic Benefits Agreements.

As part of the consultation process a preliminary assessment was completed. This assessment included a review of available information on aboriginal interests and an analysis of the potential impacts the AAC decision might have on these interests. Sources of information reviewed include: available traditional use studies; ethno-historical assessments; archaeological overview assessments; remote access to archaeological data (RAAD); agreements between First Nations and the Province; and information from past consultation processes. Based on this review the district undertook consultation at the normal level of the consultation spectrum, as outlined in the *Haida* decision[1], with five First Nations: the Gitxsan First Nation, the Halfway River First Nation, the Saulteau First Nations, the Tahltan First Nation, and the West Moberly First Nations. With four others - the McLeod Lake Indian Band, the Nak'azdli First Nation, the Takla Lake First Nation, and the Tsay Keh Dene First Nation-consultation was at the deep level.

Consultation with the Kwadacha First Nation was conducted in accordance with the SEA between the Province of British Columbia and the Kaska Dena Council, under which timber supply reviews impacting the Kaska traditional territory are strategic shared decisions. As specified in the SEA, a Shared Decision Working Group was struck, in which FLNR staff and Kaska/Kwadacha representatives participated.

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[1] *Haida Nation v. British Columbia* (Ministry of Forests), 2004 SCC73

The consultation undertaken in support of this AAC determination was reviewed following the *SCC Tsilhqot'in* decision and no additional consultation was deemed to be necessary.

The First Nations consultation process was comprised of three main phases of engagement:

- notification of the upcoming AAC determination and information sharing in October 2011;
- release of the draft data package in October 2012; and
- release of the *Mackenzie TSA Timber Supply Analysis Public Discussion Paper* in October 2013.

In the course of the consultation process a number of concerns and aboriginal interests were expressed by First Nations that pertain to issues I have considered in making my determination. Where those concerns and interests pertain to specific factors considered in the timber supply analysis, I have discussed them in the appropriate section. Concerns of a broader nature are discussed here.

First Nations expressed concerns regarding biodiversity and the general well-being of wildlife populations; their sustenance needs; and the cultural connection aboriginal people have with wildlife species including fisher, caribou, mountain goats, and Stone's sheep. Hunting and fishing remain key aboriginal interests and continue to provide food supplies for many aboriginal people. First Nations are concerned that roads constructed during logging create access to a wider user group, thereby increasing the impacts on wildlife. They are also concerned wildlife resources are poorly documented in the TSA, and that the size and scale of large openings could have implications for forest health and wildlife.

Earlier in this document, under "*wildlife habitat*"', I noted the specific comments of First Nations that pertain to UWRs. The base case also reflected other management practices such as leaving wildlife habitat areas and wildlife tree patches, retaining old growth for landscape-level biodiversity, and reserving riparian areas and unstable terrain. These areas also provide for wildlife habitat. Measures to address concerns or mitigate impacts continue to be identified during operational planning.

The Takla Lake First Nation emphasized the connection that aboriginal people have with water and fish. Specific concerns included the adverse effects of forest management activities and soil erosion on surface runoff control, water quality, and stream temperatures.

The Takla First Nation requested they be provided with reviews of current scientific literature pertaining to many of the concerns described above, and with descriptions of proposed solutions to their concerns. In response, I can confirm that the information I was provided with in making my determination is based in part on scientific studies carried out by FLNR research scientists and monitoring programs; and that the ministry maintains ongoing programs of research on water, wildlife, soils, and biodiversity. Following this determination, district staff will follow-up with the Takla First Nations to share the information pertaining to their concerns and to discuss measures to mitigate any potential adverse impacts.

The Takla Lake First Nation asked how their interests would be accommodated if there was future damage to the health of forested lands and resources due to the determination of the AAC. In response, I note that the AAC decision itself does not direct the operational aspects of forest management, although it does establish the maximum rate of harvest permissible in a management unit. Legislation, such as the *Forest and Range Practices Act*, *Land Act*, and *Forest Act* in conjunction with legally-established land use objectives dictate how forests are managed operationally. If new information becomes available that is significantly different than the information I considered in making this determination, including changes in forest health, I am prepared to re-visit this decision earlier than required by legislation.

The Tsay Keh Dene First Nation expressed concern about the poor quality of road access to the villages of Tsay Keh and Kwadacha, and suggested that FLNR ensure that revenue generated in the Mackenzie TSA be allocated toward capital and maintenance costs of improving the roads. Decisions regarding road development and maintenance are beyond the scope of my determination. However, I have shared this suggestion with the district manager for his consideration. With regard to road access, I note that increased harvesting in the northern portion of the TSA will require the development of new access structures. I will discuss harvesting in the northern portion of the TSA under "**Reasons for Decision**".

With respect to First Nations timber interests, I note that under the AAC in effect immediately before this determination, the minister apportioned 53 404 cubic metres per year to the Tsay Keh Dene Band, and the same amount to Kwadacha Natural Resources. Several other First Nations tenures provide timber volume derived from past undercuts and mountain pine beetle salvage, most of which were offered as pine salvage opportunities since the MPB infestation. Kwadacha Natural Resources holds a woodlot licence with a volume of 1069 cubic metres per year; the Mackenzie Fibre Management Corporation holds a licence for 4 000 000 cubic metres total over a five-year period that is issued to the McLeod Lake Indian Band; and the Three Feathers consortium between the McLeod Lake Indian Band, the Tsay Keh Dene First Nation, and the Kwadacha First Nation has access to 88 000 cubic metres per year. Several other First Nations tenures have also been offered since 2007, some of which are currently in the process of being issued.

During the consultation process, the Kwadacha First Nation endorsed the results of the timber supply sub-analysis for the Kaska territory described below under "*Kaska Strategic Engagement Agreement*", and requested that they be actively involved in the planning, management, and harvesting of the volume in their territory. I note that decisions regarding these activities are the responsibility of the district manager, and he is aware of these requests.

No specific information was presented to me by either district staff or First Nations that quantifies the amount of wildlife or wildlife habitat, or the area for collection of non-timber resources required by First Nations. However, I am aware that the provisions for UWRs, old-growth management areas, riparian reserve zones and other areas excluded from the THLB do, to some extent, provide for hunting, trapping, gathering and other aboriginal interests. In addition, district staff informed me that where First Nations identify specific areas of interest or concern, operational plans are modified, including changes in the physical layout of cutblocks. To date there has been sufficient flexibility to accommodate these changes without unduly restricting timber harvesting.

From this I conclude, that to some extent, the aboriginal interests of First Nations in the Mackenzie TSA are being accommodated through the exclusion of area to provide for non-timber resources and at an operational level. On this basis, I accept that the assumptions used in the base case account for First Nations wildlife, fish and gathering requirements. In the event that I am provided with additional information regarding aboriginal interests, I am prepared to re-visit this determination earlier than required in legislation.

The Takla Lake First Nation stated that it must have increased consultation and accommodation due to cut levels and locations of forest harvesting in the Mackenzie TSA and AAC determinations. Based on my review of the information sharing and consultation processes described above, the available information regarding aboriginal interests, and the potential impact my decision may have on these interests, I conclude that the consultation requirements have been met. Furthermore, I note that district staff will continue to be available to meet and consult with First Nations following this determination.

I am satisfied that opportunities were provided to all First Nations to share their concerns related to specific aboriginal interests that may be impacted by this decision and, to the extent possible within the scope of my authority under Section 8 of the *Forest Act*, I have accommodated those aboriginal

interests that were made known to me during consultation on this decision. As indicated throughout this rationale document, if new information regarding First Nations' aboriginal interests becomes available that significantly varies from the information that was available for this determination and that may affect timber supply, I am prepared to revisit this determination sooner than required by legislation.

Kaska Strategic Engagement Agreement (SEA)

Through the Shared Decision Working Group under the SEA between the Province and the Kaska Dena Council, the Kwadacha First Nation identified their areas of interest for forest harvesting and protection of non-industrial values. During the timber supply analysis for this determination, a sub-analysis of the Kaska territory overlapping the Mackenzie TSA, as defined under the SEA, was conducted and recommendations from the Shared Decision Working Group and Kwadacha First Nation were presented in December 2013.

In addition to the original base case, a sub-analysis was prepared that projected the timber harvest attributable to Kaska territory. Following the corrections that were made to the base case, discussed earlier in this document under "**Base case for the Mackenzie TSA**", the sub-analysis was repeated. The results indicate that stands in Kaska territory contribute 221 500 cubic metres per year to the base case initial harvest level of 3 050 000 cubic metres per year for 15 years, before their contribution decreases to 198 500 cubic metres per year between 2017 and 2087, and increases to 225 500 cubic metres per year after 2087.

As discussed in "*haul distance*", increasing the maximum haul distance used in the base case to include the Abitibi-Bowater proposed cutblocks increases the base case mid- to long-term harvest levels by 110 000 cubic metres per year. I am aware that the Kwadacha First Nation is interested in timber harvesting in areas near the community of Kwadacha and I accept their statement that although these areas are far removed from the community of Mackenzie, the proximity to Kwadacha could make harvesting in this area viable if managed from Kwadacha.

The results of a separate sub-analysis indicate that adding the areas near the community of Kwadacha to the THLB increases the total timber supply attributable to Kwadacha territory by 60 000 cubic metres per year. Due to the overlap between these areas and the Abitibi-Bowater proposed cutblocks, this additional volume is included within the 110 000-cubic metre per year underestimation in the base case mid- to long-term harvest levels that I accounted for under "*haul distance*". Following this determination, district staff and the Kwadacha First Nation can make this information available to the minister for consideration in the apportionment of the new AAC.

Section 8 (8) (b) the short and long term implications to British Columbia of alternative rates of timber harvesting from the area,

As noted in Table 2, I accept as modelled the factors considered under this section, and I will not discuss them further.

Section 8 (8) (d) the economic and social objectives of the government, as expressed by the minister, for the area, for the general region and for British Columbia,

- Minister's letters

The Minister of Forests and Range expressed the economic and social objectives of the Crown in two letters to the chief forester, dated July 4, 2006 (attached as Appendix 3) and October 27, 2010 (attached as Appendix 4). The minister asked for consideration, during AAC determinations, of the

importance of a stable timber supply in maintaining a competitive and sustainable forest industry while being mindful of other forest values.

In respect of this, in the base case projection and in the alternative harvest flow projections described above, a primary objective in the harvest flow has been to attain a stable, long-term harvest level where the growing stock also stabilizes.

Finally, the minister suggested that the chief forester should consider the local social and economic objectives expressed by the public, and relevant information received from First Nations.

During my consideration of the factors required under Section 8 of the *Forest Act*, I have been mindful of the local objectives, as provided in the Mackenzie Land and Resource Management Plan and associated plans and orders. I have also reviewed the public consultation process undertaken by the district and considered the input received in making my determination. On this basis, I am satisfied that this determination accords with the objectives of government as expressed by the minister.

- community dependence

According to the 2006 census, Mackenzie is the most heavily forestry-dependent TSA in BC, with approximately 70 percent of the population within the TSA employed by the forest industry. The public sector and tourism industry are the second and third largest employers, at 18 and 8 percent respectively.

Timber harvesting in the majority of the Mackenzie TSA typically involves high operating costs associated with long haul distances. Harvesting rates have shown to be highly dependent on fluctuating commodity prices and market cycles. As a consequence, harvest levels in the past eight years have been well below the AAC, having declined significantly from 2006 through 2008 as a result of the collapse of the North American housing market. Since 2009, demand for wood fiber has increased steadily and harvest performance in the TSA has recovered to near pre-recession levels.

In meetings with the Kwadacha First Nation in Prince George and with the McLeod Lake Indian Band, and in written comments received from the Kwadacha First Nation, the Takla Lake First Nation, and the Tsay Keh Dene First Nation, these First Nations expressed concern about how I will consider their interests in increasing their participation in the forest industry to create long-term jobs and promote economic viability in their communities.

With regard to the economic interests expressed by First Nations, I note that although the AAC I set is a key determinant in the level of forest sector activity in the TSA, apportionment of the AAC, and government and industry investments and business decisions are not within the scope of my authority under the *Forest* Act. In this regard, I note that district and regional staff will make the interests expressed by First Nations during consultation on this decision available to the minister for consideration in the apportionment of the new AAC and to the regional executive director for consideration in the disposition of any undercut volume on the TSA.

During the public consultation period, the forest industry suggested that the AAC should be set as high as possible to support local mills and offset wood shortages in neighbouring areas; and that more attention needs to be paid to the importance of the forest industry's contribution to employment and the tax base in the Mackenzie TSA.

A member of the public commented that the AAC should remain at its current level, other than being supplemented by a pine salvage allocation. Another member of the public argued for increasing the AAC to much higher levels in the short term and mid-term, based on potential increased volume yields from intensive forest management.

In addition to the many bio-geophysical factors that I am required to consider in determining an AAC, I am also mindful of the critical importance to local communities of an abundant and stable timber supply for current and future generations, while protecting the productivity of all forest lands and resources. In determining the AAC for the Mackenzie TSA, balancing the recovery of economic benefits from dead pine while it retains commercial value and maintaining a stable timber supply and protecting the full range of forest values are pivotal and I will discuss this further in my "**Reasons for Decision**". While I recognize the role that intensive forest management has in maintaining or increasing timber supply, I am not prepared to speculate on the possible outcome of forest management activities that have yet to be implemented.

- summary of public consultation

The Minister's letter of July 4, 2006 suggests that the chief forester should consider important social and economic objectives that may be derived from public input during the timber supply review, where these are consistent with government's broader objectives. To this end, two 60-day public review periods were provided, one for the data package and one for the public discussion paper. The submissions received during these reviews were either used to amend the data package on which the timber supply analysis was based and/or were presented for my consideration prior to determining a new AAC for the Mackenzie TSA.

Submissions were received from local residents, the forest industry, and BCTS. I have considered all of the comments provided during public and First Nations consultation that are within the scope of my authority under Section 8 of the *Forest Act*. These considerations are described in the relevant sections of this document. Other submissions included comments related to long-term fibre needs outside the Mackenzie TSA and allocation of fibre, matters that are outside of my authority. Where I have received submissions that are outside of my authority as deputy chief forester in determining AACs under Section 8 of the *Forest Act*, I have forwarded them to the appropriate decision makers.

Section 8 (8) (e) abnormal infestations in and devastations of, and major salvage programs planned for, timber on the area,

- pine stem rust

Pine stem rust hazard rating surveys were conducted in the Mackenzie TSA to determine if key predictive variables could be used to predict high hazard areas. Sampling confirmed that mean rust levels in certain ecosystems in the Mackenzie TSA are among the highest in BC. Further examination of the RESULTS database showed that, although the incidence may be high, the area affected by high rust levels appears to be lower than in other districts.

Well-spaced stand density estimates derived from RESULTS data were used to predict the managed-stands yields used in the base case. No additional adjustments were applied to account for stem rust losses. In the Mackenzie TSA, managed-stand yield tables based on well-spaced stems are considered to be acceptable predictors of future yields, since rust-affected trees typically die at an early age.

BCTS commented that hard pine rusts impact a large area of the Mackenzie TSA and result in significant losses in reforested stands, impacting overall stand productivity. BCTS suggested that this information should be incorporated into a sensitivity analysis to establish whether the effects of hard pine rusts should be considered as part of the timber supply review analysis.

In response, I note that the FLNR regional forest pathologist has reviewed the methodology employed in the base case and confirmed that it appropriately accounts for the impact of pine stem rusts in the Mackenzie TSA.

For this determination, I accept the assumptions used in the base case to account for pine stem rusts.

- mountain pine beetle

The MPB epidemic in the Mackenzie TSA occurred in two distinct phases. The first phase started in 2005 and was limited to the area west of Williston Lake and south of the Omineca Arm. The outbreak appeared contained in this area of the TSA until 2009, but in that year the second phase of the infestation occurred and the beetles spread rapidly to the rest of the TSA. Since 2009, MPB populations in the TSA have declined sharply. In the base case, pine trees in stands west of Williston Lake and south of the Omineca Arm were assumed to have been killed in 2005 and pine trees in stands throughout the remainder of the TSA were assumed to have been killed in 2009. No further mortality was assumed to occur after 2009.

Generally, MPB mortality projections for use in timber supply reviews are generated using the BC Mountain Pine Beetle model (BCMPB). BCMPB mortality projections are updated annually on the basis of aerial overview surveys. For the Mackenzie TSA, weather conditions did not allow aerial surveys to be conducted across the entire TSA in 2007 and 2008. Similarly, the northern half of the TSA was not surveyed in 2009. In the absence of reliable BCMPB projections for this management unit, pine stands older than 60 years at the start of the base case were assumed to have a pine mortality of 75 percent. This estimate is based on the observations of district staff made during repeated aerial reconnaissance flights over MPB-infested areas.

In the base case, dead pine is assumed to retain commercial value for 15 years after death. Most of the dead pine in the Mackenzie TSA is estimated to have been killed five years ago; therefore, the salvage period ends in 2027. In order to reflect recent harvest performance (2006 – 2012), the base case was constrained so that two-thirds of the annual harvest during the salvage period had to come from pine-leading stands. Hence, of the base case initial harvest of 3.05 million cubic metres per year, about 2 million cubic metres per year and 1 million cubic metres per year are attributable to pine-leading and non-pine leading stands, respectively. In order to maintain the base case initial harvest level until 2027, salvage in the model has to shift from the southern part of the TSA to almost exclusively the northern part of the TSA.

At the end of the salvage period in the base case, 73 million cubic metres of dead pine remain unsalvaged and the mid-term merchantable growing stock is 106 million cubic metres. In a sensitivity analysis increasing the initial harvest level to 5.5 million cubic metres per year, by allowing the model to harvest an additional 2.45 million cubic metres per year of pine-leading stands, had no effect on the base case mid- to long-term harvest levels. However, the volume of unsalvaged pine remaining at the end of the salvage period decreased by half. The mid-term merchantable growing stock decreased from 106 million cubic metres to 103 million cubic metres. The northward shift in salvage required to maintain the higher initial harvest level occurs earlier in this forecast than in the base case, as stands in the south are depleted more rapidly.

Two sensitivity analyses were prepared to examine the effect of immediately abandoning the salvage of dead pine - the first at the base case initial harvest level and the second at an initial harvest level of 5.5 million cubic metres per year. In the first forecast, the mid-term merchantable growing stock decreases from 106 million cubic metres to 81 million cubic metres. In the second, the mid-term merchantable growing stock decreases from 103 million cubic metres to 51 million cubic metres.

From this I conclude that if the harvest of pine-leading stands is increased, the harvest of non-pine leading stands remains at the base case level and salvage operations shift northwards, there is a significant opportunity to reduce the volume of unsalvaged dead pine. However, if the salvage of dead pine stops or is significantly lower than in the base case and the northward shift in harvesting does not occur, the mid-term merchantable growing stock is significantly reduced.

In addition to the considerations discussed above, I am also mindful of the potential negative impacts that an acceleration of pine salvage could have on wildlife, water, landscape connectivity, aboriginal interests and cumulative effects from all resource development. In this regard, I was advised by FLNR staff that increased pine salvage south of Omineca Park would reduce the habitat for fur bearing animals, particularly American martin. Staff informed me that this species is of particular interest to trappers, whose livelihoods have been adversely impacted in areas where extensive pine salvage has already occurred. In addition to furbearers, they noted that an increase in pine salvage has the potential to negatively affect the threatened northern caribou, increase hydrological risks, decrease landscape connectivity and increase the cumulative effects of resource development. However, staff did indicate that some of the risk associated with an increase in salvage could be alleviated by application of the chief forester's guidance regarding salvage harvesting and the comments provided by the Forest Practices Board related to the conservation of biodiversity during salvage logging.

Two forest companies and BCTS each commented that they supported increasing the harvest level in the short term to salvage the dead pine.

A member of the public commented that it is unlikely that the actual pine harvest will be as high a proportion of the total harvest as was assumed in the base case; or that extensive pine salvage will occur further than 150 kilometres from Mackenzie. A forest company representative suggested that the remaining shelf life of dead pine may be no more than six to seven years.

As noted earlier under "**First Nations' considerations**", both the McLeod Lake Indian Band and the Kwadacha First Nation expressed their interest in acquiring forest tenures to harvest dead pine.

In response, I agree that increasing the rate of harvest in the Mackenzie TSA would allow for more of the dead pine to be salvaged while it still retained economic value. However, I am concerned that if I increase the AAC to provide for an increase in pine salvage, and harvesting does not shift to the northern portion of the TSA or pine salvage decreases, mid-term timber supply will be significantly reduced. Increasing the rate of harvest may also adversely affect non-timber values such as wildlife, fish, watershed functionality and the traditional and subsistence resources of First Nations. These effects would be amplified if harvesting remained concentrated in the southern part of the TSA. I will consider the information and concerns noted in this factor further in this determination, as discussed in "**Reasons for Decision**".

With regard to the interest expressed by the MacLeod Lake Indian Band and the Kwadacha First Nation in acquiring additional forest tenures, district and regional staff will provide this information to the minister for consideration in the apportionment of the new AAC.

- harvest performance

Based on a review of data from the ministry's Harvest Billing System, pine and spruce were the dominant species harvested in the Mackenzie TSA from 2006 to 2013. During the most recent recession, licensees did not harvest the full AAC allocated to their licenses. As a result there will be unharvested volume, referred to as *undercut* available for disposition over the next few years.

In considering whether to dispose of the undercut volume through the issuance of new licences, I ask that the regional executive director consider the following: the stands that would support the harvest of undercut volume are assumed to contribute to the base case harvest levels that form an integral part of this AAC determination. Consequently, if the undercut volume is harvested in addition to the full AAC, harvesting will exceed the AAC I determine. Offsetting this risk is that the historic under harvest of the AAC that resulted in an undercut may continue.

Since 2006, the proportion of pine harvested in the Mackenzie TSA has varied between 62 and 73 percent. More specifically, between 2006 and 2008 it varied between 62 and 63 percent,

between 2009 and 2011 it ranged from 72 percent to 73 percent, in 2012 it was 65 percent, and in 2013 it was 62 percent. To date there has been little harvest of green pine, i.e. pine trees that were alive at the time of harvest.

In 2001, the chief forester requested that the district monitor harvest performance in balsam-leading stands. The results show that prior to the MPB epidemic, an average of 11 percent of the harvest was balsam. Performance in deciduous-leading stands has been very low. As discussed in "**Reasons for Decision**" given the demonstrated, albeit limited, harvest of balsam and deciduous stands, I will not exclude these stands from the THLB. In considering partitions in the AAC, I find it more important to conserve non-pine timber in the short term to minimize the projected decline in mid-term timber supply and to maintain a focus on the salvage of dead pine before the end of the salvage period. On this basis, I will not institute partitions in the AAC for balsam or deciduous timber. However, as described under "**Implementation**", it is my expectation that once the salvage period ends, harvest performance in balsam and deciduous stands will increase to meet the harvest profile.

District staff informed me that, since 2004, timber harvesting in the Mackenzie TSA has been concentrated in the southwestern portion of the TSA in order to salvage MPB-impacted stands. As discussed under "*mountain pine beetle*" later in this document, in both the base case and the accelerated salvage harvest forecast, the projected harvest levels are based on the assumption that salvage will shift northward in the near future. If this does not occur, the mid- to long-term harvest levels projected in the base case may be significantly overestimated. In addition to the concerns that I expressed previously regarding operating costs and the merchantability of dead pine, the lack of salvage performance in areas outside of the south-west of the TSA, in combination with the concerns identified earlier in this document, increase the uncertainty regarding the mid- to long-term timber supply.

One issue that was not examined in the base case or other harvest forecasts prepared for this determination was the effect of non-forestry industrial development on the land base. Developments such as mines, pipelines, power lines and the related access roads require the clearing of forested land. District staff advised me that harvesting for non-forestry development is not being tracked well resulting in uncertainty about how much forested land base will be available for forest dependent resources, such as timber. Based on my knowledge of other management units in BC, I note that this concern is not limited to the Mackenzie TSA and that there is a need for government to improve the tracking and sharing of information about energy and mine development on forest based resources. To this end, I request that district staff work with tenure holders and the staff of other government agencies across the natural resource sector to improve information about the cumulative effects on forest values that result from the broad range of industrial activity in the Mackenzie TSA, as discussed in "**Implementation**".

I appreciate the level of public, stakeholder and First Nations interest in this AAC determination and the comments that have been provided for my consideration. Due to the amount of input received, I have grouped and listed the comments received from the public and stakeholders below. First Nations information provided during consultation and how I considered this information are provided in other sections of this document.

Comments received during public consultation include:

- The size of the THLB may be overestimated, particularly given the concentration of harvesting in the southern third of the TSA in recent years.

- A partition should be established for mixed-pine stands with less than 150 cubic metres per hectare of green timber.
- The harvest of non-pine stands should be directed to the salvage of stands damaged by blowdown, spruce beetles, and balsam bark beetles.
- Support for local forest operations moving into more spruce-leading stands in concert with pine salvage, while not compromising the long-term economy or values such as biodiversity, wildlife, and old growth.
- The chief forester should be prepared to revisit the AAC determination as necessary.

Comments received from the forest industry include:

- Deciduous volume should be "netted out of the AAC" since no licensee is harvesting deciduous species.
- Opportunities should be provided to harvest balsam in the future, subject to market demand.
- The AAC should be partitioned into pine and non-pine categories to minimize the impact on mid- and long-term timber supply.
- Other forms of partitions (deciduous, cable, low volume and geographic) are necessary to fully utilize the range of fibre types across the landscape in order to maintain the AAC as high as possible.
- Geographic partitions could be used to direct more harvesting to the northern part of the TSA and to establish varying targets by area for the percentage of pine to be harvested.
- Due to the high operating costs for timber harvesting north of Williston Lake, the AAC should be partitioned to include a separate zone for the north.

Comments received from BCTS include:

- An uplift volume should be made available to facilitate the salvage of dead pine. (The term *uplift* refers to an increase in an AAC specifically for the salvage of dead pine).
- In the event there is a pine partition, there should be a clear definition of what constitutes a damaged stand.
- A sensitivity analysis should be prepared to examine the effect of targeting the harvest towards pine-leading stands with at least 70 percent pine.

My responses to the input summarized above are as follows:

- I acknowledge the importance of the forests in the northern part of the TSA in contributing to the timber supply, and discuss the issue of the geographic distribution of available timber and forest harvesting in "**Reasons for Decision**".
- Balsam has always been available for harvest in the Mackenzie TSA. Even in the absence of a partition specifically for balsam, the AAC I determine does not prevent licensees from harvesting balsam.
- I agree that it is important to harvest damaged non-pine stands as quickly as possible; however, as approval authority rests with the district manager, I have made this comment available to him for his consideration.
- I recognize the importance of revisiting AAC decisions on both a regular basis and in response to significant changes in the information, forest management, land use requirements and First Nations aboriginal interests on which my determination was based. As indicated in

other parts of this document, if significant new information or changes occur that have the potential to significantly impact timber supply, I am prepared to re-visit this determination earlier than required in legislation.

- I have considered the merits of a short-term increase in the AAC, and I will discuss this further in my "**Reasons for Decision**". I agree that clear definitions of partition criteria are important in ensuring that harvesting is directed or limited as intended.
- A sensitivity analysis was not prepared to examine the effect of targeting stands with more than 70 percent pine by volume for harvest. However, I am aware of the contribution of volume by species, regardless of leading-species label, that indicates that pine-leading stands with a high proportion of pine are being harvested in the base case.
- I agree that balancing the harvest of spruce and pine is an important issue, and I will discuss this matter further in my "**Reasons for Decision**". Examination of the contribution of volume by species (regardless of leading species), however, indicates that the base case reflects the harvest of pine-leading stands with a high proportion of pine.

- other bark beetles

According to district staff, older balsam stands within the Mackenzie TSA are experiencing considerable mortality due to an endemic population of the western balsam bark beetle (*Dryocoetes confusus)*. Although no surveys have been conducted in the Mackenzie TSA, surveys undertaken in the neighboring Fort St. James district indicate that 28 percent of the total balsam volume in that district has been killed.

To account for balsam mortality due to the western balsam bark beetle, an average balsam mortality of 28 percent was applied in the base case to all balsam-leading stands older than 140 years of age.

A forest company commented that the health status of the balsam-leading stands should be assessed over the next five years, as balsam will increase in value over time. Other licensees and members of the public also expressed concern about the impacts of the balsam bark beetle and the spruce bark beetle.

I accept that the volume reduction applied in the base case to account for the western balsam bark beetle represents the best available information and was appropriate for use in the base case. I share the concerns expressed by licensees and the public regarding bark beetles and request that ministry staff assess balsam mortality in the Mackenzie TSA, as discussed under "**Implementation**".

- 2014 wildfires

In 2014, a total of 112 000 hectares in the Mackenzie TSA were affected by wildfires. Of this area, 62 000 hectares or about four percent contributed to the THLB used in the base case. About 70 percent and 20 percent of the THLB losses occurred immediately below Chase Provincial Park or about 30 kilometres north of the park, respectively. The remaining burnt THLB is scattered throughout the south-eastern portion of the TSA.

As some of the timber in burnt stands may be salvageable it is not possible to estimate what, if any impact the fires may have had on the base case, consequently I will not account for the 2014 wildfires at this time. However, prior to the next timber supply review, the unsalvaged loss estimates used in the base case will be updated to account for any fires that occur between this determination and the next, including the 2014 wildfires.

Reasons for Decision

In reaching my AAC determination for the Mackenzie TSA I have considered all of the factors required under Section 8 of the *Forest Act* and I have reasoned as follows.

The base case proposed in the timber supply review public discussion paper was revised based on the input received during consultation. The term *base case* in this document refers to the revised base case as described in "**Base case for the Mackenzie TSA**".

In the base case, which starts in 2012, an initial harvest level of 3 050 000 cubic metres per year is maintained for 15 years before declining to a mid-term level of 2 510 000 cubic metres per year. This decline coincides with the end of the pine shelf life and marks the end of the salvage period. After six decades, the harvest increases to a stable long-term level of 3 050 000 cubic metres per year for the remainder of the 200-year forecast.

In my considerations for the Mackenzie TSA, I have identified one factor as a reason why the timber supply projected in the base case may have been underestimated.

As discussed in "*haul distance*", excluding the area associated with the Abitibi-Bowater proposed cutblocks, including the area near the community of Kwadacha from the THLB resulted in a 110 000-cubic metre per year or four percent underestimation in the base case mid- to long-term harvest levels. However, in a management unit such as the Mackenzie TSA in which the overriding concern is the extent to which a large volume of dead pine can be salvaged while it retains commercial value, an influence of this magnitude is relatively minor. On this basis, I will not consider this factor further in this determination. I do note; however, that the extent to which these areas are harvested will be reflected in subsequent timber supply reviews.

I am aware that recent harvesting in the Mackenzie TSA has been focused on the salvage of dead pine. This was reflected in the base case by requiring the timber supply model to harvest two-thirds of the total harvest volume from pine-leading stands. However, at an initial harvest level of 3 050 000 cubic metres per year - the level of the current AAC – 73 million cubic metres of dead pine remain unsalvaged at the end of the salvage period.

In considering how to reduce the volume of unsalvaged dead pine, while conserving mid-term timber supply, I am mindful of the sensitivity analysis in which the initial harvest level was increased to 5 500 000 cubic metres per year. In this forecast, increasing the harvest of pine-leading stands by 2 450 000 cubic metres per year, while maintaining the harvest of non-pine leading stands at the base case level, reduced the unsalvaged pine volume by half. The mid- to long-term harvest levels were unchanged from the base case levels and there was only a small decrease in the mid-term merchantable growing stock from 106 million cubic metres in the base case to 103 million cubic metres.

Conversely, I am also mindful of the results of the sensitivity analyses in which the salvage of dead pine ended immediately. The results indicate that if this occurs and harvesting continues at the base case initial harvest level – the level of the current AAC – the merchantable volume available for harvesting in the mid-term decreases from 106 million cubic metres to 81 million cubic metres. If the initial harvest level is increased to 5 500 000 cubic metres per year and salvage ends, the mid-term merchantable volume is reduced by an additional 30 million cubic metres to 51 million cubic metres.

I note the base case prepared for this determination is predicated on the assumption that salvage operations will shift northwards after 10 years. If this shift does not occur, and salvage remains concentrated in the southern part of the TSA, the projected decline in mid-term timber supply will be exacerbated, as will the risk to non-timber values. In the sensitivity analysis in which the initial

harvest level is increased 5 500 000 cubic metres per year, pine salvage must shift northwards earlier than ten years.

From this I conclude that I must balance the benefits of increasing the AAC to recover more dead pine during the salvage period with the risk to mid-term timber supply if harvesting does not remain focused on pine salvage and if the salvage of dead pine in the northern part of the TSA does not occur. On this basis, I am unwilling to increase the AAC to the full 5 500 000 cubic metres per year. However, I am equally unwilling to maintain the AAC at the current level of 3 050 000 cubic metres that results in the loss of 73 million cubic metres of timber. Therefore, I am setting the AAC at 4 500 000 cubic metres.

In order to achieve a balance between salvage optimization and exacerbating the projected decline in mid-term timber supply, I am instituting a partition in the AAC to limit the harvest of non-pine leading coniferous stands. The level of this partition – 950 000 cubic metres per year - reflects the contribution of non-pine leading stands, less the contribution of deciduous-leading stands, in the base case and is consistent with recent harvest performance. In order to avoid a concentration of timber harvesting in the southern portion of the TSA, of the 950 000-cubic metre non-pine coniferous leading stand partition, no more than 300 000 cubic years is to be harvested from that portion of the Mackenzie TSA west of Williston Lake and south of Omineca Provincial Park and Omineca Arm.

In addition to the sensitivity analyses described earlier in this section, I requested an additional analysis in which the minimum stand volume limit was maintained at 151 cubic metres per hectare but the 200-cubic metre per hectare minimum average volume limit was removed. In the resultant forecast, an initial harvest level of 3 050 000 cubic metres per year, which is the same as in the base case, could be sustained for the entire forecast period. However, I note that in the 60-year period from 2057 to 2117, stands with less than 200 cubic metres per hectare contributed 88 percent of the total harvest volume. By comparison, in the base case stands having less than 200 cubic metres per hectare contributed only 25 percent of the total volume over the same 60-year period.

From this I have concluded that if licensees can demonstrate significant performance in lower volume stands, it may be possible to mitigate the projected mid-term decline. On this basis, I strongly encourage Mackenzie Fibre to work with licensees to explore opportunities to harvest lower volume stands in the Mackenzie TSA.

As I concluded in "*harvest performance*", it is important at this time to conserve non-pine timber to help mitigate the projected decline in mid-term timber supply. I also noted the importance of optimizing the salvage of dead pine while it retains commercial value. On this basis, I decided not to partition the AAC for either balsam or deciduous timber. However, I expect that once the salvage period ends, harvest performance in balsam and deciduous stands will increase to better align with the timber profile.

Determination

I have considered and reviewed all the factors as documented above, including the risks and uncertainties of the information provided. It is my determination that an AAC that accommodates objectives for all forest resources during the next 10 years and that reflects current management practices as well as the socio-economic objectives of the Crown, can be best achieved in the Mackenzie TSA by establishing an AAC of 4 500 000 cubic metres, of which a maximum of 950 000 cubic metres is attributable to non-pine leading coniferous stands. Of this partition, no more than 300 000 cubic metres is attributable to non-pine leading coniferous stands from the southwest portion of the TSA, west of Williston Lake and south of Omineca Provincial Park and Omineca Arm. This AAC takes effect immediately.

If additional significant new information is made available to me, or major changes occur in the management assumptions upon which I have predicated this decision, then I am prepared to revisit this determination sooner than the 10 years required by legislation.

Implementation

In the period following this decision and leading to the subsequent determination, I encourage Ministry of Forests, Lands and Natural Resource Operations (FLNR) staff and licensees to undertake or support the tasks and studies noted below, the particular benefits of which are described in appropriate sections of this rationale document. I recognize that the ability of staff and licensees to undertake or support these projects is dependent on available resources, including funding. These projects are; however, important to help reduce the risk and uncertainty associated with key factors that affect the timber supply in the Mackenzie TSA.

1. It is my expectation that district and FAIB staff will monitor the species composition and geographic origin of timber harvested in the Mackenzie TSA and to report this information to the chief forester annually.
2. It is my expectation that district staff will work with licensees to ensure that salvage operations remain focused on pine-leading stands in which 70 percent or more of the total volume is pine. In the event that licensees can no longer locate such stands, I expect district staff to bring this to the attention of FAIB and the chief forester.
3. I request that the district and FAIB, subject to funding and provincial inventory priorities: a) update the imagery available for the northern portion of the TSA, b) gather additional inventory audit samples within areas identified as THLB and c) collaborate with other FLNR districts and the leaders of existing modelling, monitoring and research programs to reduce the uncertainty associated with site productivity estimates.
4. I encourage provincial and federal government staff, First Nations and resource developers (including forest licensees) to work collaboratively to ensure that designated habitat areas meet wildlife requirements and are connected in such a way to allow for effective migration and are collocated to minimize the impact on other forest resource values.
5. I request that district staff work with industrial developers and the staff of other government agencies across the natural resource sector to improve the information required to assess the cumulative effects of resource development on all forest values, including non-industrial values.
6. I request that FLNR staff review the available information in order to better estimate the timber volume losses associated with western balsam bark beetle infestation.

Other Considerations

1. *Climate change:* Climate change may impact site productivity estimates, forest health and other factors that were addressed in this determination. I encourage staff to try and understand projected climate change impacts in the TSA so that this important consideration can be factored into the next determination.
2. *Dead potential volume:* By accounting for this factor in my determination, dead potential volumes (i.e. grade 3 endemic and grade 5 log volumes) that are harvested in the future in the TSA should be charged against the AAC.

Diane Nicholls, RPF
Deputy Chief Forester

November 14, 2014

Appendix 1: Section 8 of the *Forest Act*

Section 8 of the *Forest Act*, Revised Statutes of British Columbia 1996, c. 157, (current to October 22, 2014), reads as follows:

Allowable annual cut

8 (1) The chief forester must determine an allowable annual cut at least once every 10 years after the date of the last determination, for

(a) the Crown land in each timber supply area, excluding the Crown land in the following areas:

(i) tree farm licence areas;

(ii) community forest agreement areas;

(iii) first nations woodland licence areas;

(iv) woodlot licence areas, and

(b) each tree farm licence area.

(2) If the minister

(a) makes an order under section 7 (b) respecting a timber supply area, or

(b) amends or enters into a tree farm licence to accomplish a result set out under section 39 (2) or (3),

the chief forester must make an allowable annual cut determination under subsection (1) for the timber supply area or tree farm licence area

(c) within 10 years after the order under paragraph (a) or the amendment or entering into under paragraph (b), and

(d) after the determination under paragraph (c), at least once every 10 years after the date of the last determination.

(3) If

(a) the allowable annual cut for the tree farm licence area is reduced under section 9 (3), and

(b) the chief forester subsequently determines, under subsection (1) of this section, the allowable annual cut for the tree farm licence area,

the chief forester must determine an allowable annual cut at least once every 10 years from the date the allowable annual cut under subsection (1) of this section is effective under section 9 (6).

(3.1) If, in respect of the allowable annual cut for a timber supply area or tree farm licence area, the chief forester considers that the allowable annual cut that was determined under

subsection (1) is not likely to be changed significantly with a new determination, then, despite subsections (1) to (3), the chief forester

(a) by written order may postpone the next determination under subsection (1) to a date that is up to 15 years after the date of the relevant last determination, and

(b) must give written reasons for the postponement.

(3.2) If the chief forester, having made an order under subsection (3.1), considers that because of changed circumstances the allowable annual cut that was determined under subsection (1) for a timber supply area or tree farm licence area is likely to be changed significantly with a new determination, he or she

(a) by written order may rescind the order made under subsection (3.1) and set an earlier date for the next determination under subsection (1), and

(b) must give written reasons for setting the earlier date.

(4) If the allowable annual cut for the tree farm licence area is reduced under section 9 (3), the chief forester is not required to make the determination under subsection (1) of this section at the times set out in subsection (1) or (2) (c) or (d), but must make that determination within one year after the chief forester determines that the holder is in compliance with section 9 (2).

(5) In determining an allowable annual cut under subsection (1) the chief forester may specify that portions of the allowable annual cut are attributable to one or more of the following:

(a) different types of timber or terrain in different parts of Crown land within a timber supply area or tree farm licence area;

(a.1) different areas of Crown land within a timber supply area or tree farm licence area;

(b) different types of timber or terrain in different parts of private land within a tree farm licence area.

(c) [Repealed 1999-10-1.]

(6) The minister must determine an allowable annual cut for each woodlot licence area, in accordance with the woodlot licence for that area.

(7) The minister must determine an allowable annual cut for

(a) each community forest agreement area in accordance with the community forest agreement for that area, and

(b) each first nations woodland licence area in accordance with the first nations woodland licence for that area.

(8) In determining an allowable annual cut under subsection (1) the chief forester, despite anything to the contrary in an agreement listed in section 12, must consider

(a) the rate of timber production that may be sustained on the area, taking into account

(i) the composition of the forest and its expected rate of growth on the area,

(ii) the expected time that it will take the forest to become re-established on the area following denudation,

(iii) silviculture treatments to be applied to the area,

(iv) the standard of timber utilization and the allowance for decay, waste and breakage expected to be applied with respect to timber harvesting on the area,

(v) the constraints on the amount of timber produced from the area that reasonably can be expected by use of the area for purposes other than timber production, and

(vi) any other information that, in the chief forester's opinion, relates to the capability of the area to produce timber,

(b) the short and long term implications to British Columbia of alternative rates of timber harvesting from the area,

(c) [Repealed 2003-31-2.]

(d) the economic and social objectives of the government, as expressed by the minister, for the area, for the general region and for British Columbia, and

(e) abnormal infestations in and devastations of, and major salvage programs planned for, timber on the area.

(9) Subsections (1) to (4) of this section do not apply in respect of the management area, as defined in section 1 (1) of the ***Haida Gwaii Reconciliation Act***.

(10) Within one year after the chief forester receives notice under section 5 (4) (a) of the ***Haida Gwaii Reconciliation Act***, the chief forester must determine, in accordance with this section, the allowable annual cut for

(a) the Crown land in each timber supply area, except the areas excluded under subsection (1) (a) of this section, and

(b) each tree farm licence area

in the management area, as defined in section 1 (1) of the ***Haida Gwaii Reconciliation Act***.

(11) The aggregate of the allowable annual cuts determined under subsections (6), (7) and (10) that apply in the management area, as defined in section 1 (1) of the ***Haida Gwaii Reconciliation Act***, must not exceed the amount set out in a notice to the chief forester under section 5 (4) (a) of that *Act*.

Appendix 2: Section 4 of the *Ministry of Forests and Range Act*

Section 4 of the *Ministry of Forests and Range Act* (current to October 22, 2014) reads as follows:

Purposes and functions of ministry

4 The purposes and functions of the ministry are, under the direction of the minister, to do the following:

(a) encourage maximum productivity of the forest and range resources in British Columbia;

(b) manage, protect and conserve the forest and range resources of the government, having regard to the immediate and long term economic and social benefits they may confer on British Columbia;

(c) plan the use of the forest and range resources of the government, so that the production of timber and forage, the harvesting of timber, the grazing of livestock and the realization of fisheries, wildlife, water, outdoor recreation and other natural resource values are coordinated and integrated, in consultation and cooperation with other ministries and agencies of the government and with the private sector;

(d) encourage a vigorous, efficient and world competitive

(i) timber processing industry, and

(ii) ranching sector

in British Columbia;

(e) assert the financial interest of the government in its forest and range resources in a systematic and equitable manner.

Appendix 3: Minister's letter of July 4, 2006

BRITISH COLUMBIA

JUL 0 4 2006

Jim Snetsinger
Chief Forester
Ministry of Forests and Range
3rd Floor, 1520 Blanshard Street
Victoria, British Columbia
V8W 3C8

Dear Jim:

Re: Economic and Social Objectives of the Crown

The *Forest Act* gives you the responsibility for determining Allowable Annual Cuts-decisions with significant implications for the province's economy, communities and environment. This letter outlines the economic and social objectives of the Crown you should consider in determining Allowable Annual Cuts, as required by Section 8 of the *Forest Act*. This letter replaces the July 28, 1994 letter expressing the economic and social objectives of the Crown, and the February 26, 1996 letter expressing the Crown's economic and social objectives for visual resources. The government's objective for visual quality is now stated in the Forest Practices and Planning Regulation of the *Forest and Range Practices Act*.

Two of this government's goals are to create more jobs per capita than anywhere in Canada and to lead the world in sustainable environmental management. The Ministry of Forests and Range supports these objectives through its own goals of sustainable forest and range resources and benefits. In making Allowable Annual Cut determinations, I ask that you consider the importance of a stable timber supply in maintaining a competitive and sustainable forest industry, while being mindful of other forest values.

The interior of British Columbia is in the midst of an unprecedented mountain pine beetle outbreak. Government's objectives for management of the infestation are contained in British Columbia's Mountain Pine Beetle Action Plan. Of particular relevance to Allowable Annual Cut determinations are the objectives of encouraging long-term economic sustainability for communities affected by the epidemic; recovering the greatest value from dead timber before it burns or decays, while respecting other forest values; and conserving the long-term forest values identified in land use plans.

Minister of Forests and Range and Minister Responsible for Housing

Office of the Minister

Mailing Address:
PO Box 9049 Stn Prov Govt
Victoria BC V8W 9E2
Telephone: 250 387-6240
Facsimile: 250 387-1040

Location:
Parliament Buildings
Victoria BC V8V 1X4
e-mail: FOR.Minister@gov.bc.ca

Jim Snetsinger

To assist the province and affected communities in planning their responses to the beetle infestation, it would be best to have realistic assessments of timber volumes that can be utilized economically. Therefore, in determining the best rate of harvest to capture the economic value from beetle-killed timber, I ask that you examine factors that affect the demand for such timber and products manufactured from it, the time period over which it can be utilized, and consider ways to maintain or enhance the mid-term timber supply.

The coast of British Columbia is experiencing a period of significant change and transition. In making Allowable Annual Cut determinations I urge you to consider the nature of timber supply that can contribute to a sustainable coast forest industry, while reflecting decisions made in land and resource management plans.

You should also consider important local social and economic objectives expressed by the public during the Timber Supply Review process, where these are consistent with the government's broader objectives as well as any relevant information received from First Nations.

Sincerely yours,

Rich Coleman
Minister

Appendix 4: Minister's letter of October 27, 2010

BRITISH COLUMBIA
The Best Place on Earth

File: 280-30/MPB
Ref: 126097

OCT 2 7 2010

Jim Snetsinger, Chief Forester
ADM Forest Resource Stewardship Division
Ministry of Forests and Range
3rd Floor, 1520 Blanshard Street
Victoria, British Columbia
V8W 3C8

Dear Mr. Snetsinger:

Re: Economic and Social Objectives of the Crown Regarding Mid-Term Timber Supply in Areas Affected by the Mountain Pine Beetle

On July 4, 2006, Rich Coleman, former Minister of Forests and Range, wrote to you outlining the social and economic objectives of the Crown for AAC determination (in accordance with Section 8 of the *Forest Act*) with respect to issues associated with the Mountain Pine Beetle (MPB) epidemic. The aforementioned letter articulated the Crown's objectives of ensuring long-term economic sustainability for communities affected by the epidemic; recovering the greatest value from dead timber before it burns or decays, while respecting other forest values; and conserving the long-term forest values identified in land use plans. I am writing to you regarding the Crown's objectives with respect to mid-term timber supply in areas affected by the mountain pine beetle.

The MPB infestation has had a profound impact on the timber supply outlook for the interior of the province. In particular, forecasts of timber supply in the mid-term—the period between the ending of the economic shelf life of killed pine and the time when the forest has re-grown and again become merchantable—are now significantly lower than prior to the infestation. These shortages threaten the wellbeing of forest-dependent cities and towns. The

Ministry of Forests and Range and Minister Responsible for Integrated Land Management Bureau
Minister's Office
Mailing Address:
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Victoria, BC V8W 1X4
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Website:
gov.bc.ca/forilmbwww.gov.bc.ca

Jim Snetsinger, Chief Forester

Government of British Columbia is working closely with beetle action committees, municipalities, and the private sector to diversify economies. However, for many forestry-dependent towns mid-term timber supply shortages could still have significant socio-economic impacts.

During this challenging time it will be necessary to reassess management objectives and administrative approaches that were developed when forest conditions in the province's interior were very different than now exist. In this reassessment it will be important to enhance the understanding of how best to balance objectives for non-timber forest values with objectives for timber supply to achieve a range of socio-economic benefits. It will also be important to assess how innovative practices and incremental silviculture could mitigate mid-term timber supply shortfalls in MPB affected areas, and if flexibilities can be found in timber supply administration.

During the Timber Supply Review process, in addition to the considerations included in the July 2006 letter, I would like you to undertake analysis that can provide information on how changes to current management practices and administration could increase mid-term timber availability in MPB-affected areas. This information should be shared with Ministry of Forest and Range Executive and used to inform discussions among interested parties, and considered by appropriate land use and management decision makers. If formal changes are made to management objectives and administration, you will be in a position to incorporate those changes in Timber Supply Reviews and AAC determinations.

Sincerely,

Pat Bell
Minister

pc: Dana Hayden, Deputy Minister

Canadian Forest Products Ltd.

and affiliated companies

April 27, 2018

David Schwarz, RPF
District Manager, Ministry of Forest & Range
Mackenzie Forest District
1 Cicada Road Box 2260
Mackenzie BC
V0J 2C0

Dear Sir:

RE: *DM Letter of Expectation DMK TSA – April 2018*

In response to your letter dated April 23rd, 2018 we would like to re-iterate Canfor's commitment in the Mackenzie TSA to prioritizing harvest of both spruce and pine beetle impacted stands to the greatest degree possible. However, we would like to highlight the barriers and challenges we currently face in attempting to increase the proportion of these stands in our current operational plan.

We previously reviewed with you our rationale for how we prioritize stands for harvest and this document is attached below. To summarize this document, we continue to plan and prioritize our harvesting in the order below:

1) Sanitation harvest of spruce beetle in our chart areas
2) Sanitation harvest of spruce beetle in other chart areas
3) Salvage logging of both spruce and pine in our chart areas
4) Harvest of spruce beetle susceptible areas in our chart areas
5) Purchasing wood for harvest
6) Harvest of green wood stands

Using the best available data we believe that we have addressed all stands with live spruce beetle and all spruce and pine beetle salvage stands within our chart areas that are practicable. We have also attempted to gain access through the Mackenzie Fibre license to BCTS area where the majority of the spruce beetle epidemic is located with very limited success. We continue to attempt to work with BCTS to gain access to those areas that require immediate attention to contain active beetle and to salvage both spruce and pine beetle fibre.

Currently we manage licenses totaling 1.75 million m3 of AAC and our current sawlog demand is 1.9 million m3 for our Mackenzie sawmill and also partial volume for our Vanderhoof sawmill. Currently we do not have enough volume available in spruce and pine beetle impacted stands to supply our mill and this is why our current plan includes significant volume in the susceptible

and green wood categories, which remain the lowest priority for us. It should be noted that the majority of the green wood in our 5 year plan is outside of the southwest portion of the TSA.

Some additional challenges we face are:

- Lack of pine leading stands in our chart area, the increasingly poor fibre quality and increased blowdown in these stands
- Other licensees operating within our chart areas, especially in the southwest corner of the TSA
- Unreliable inventory data
- First Nations concerns and accommodations – i.e. OSP006 - a pine leading block that we recently dropped 70,000m3 of volume due to concerns from Tsay Keh.
- Other constraints – i.e. Mischinsinlika OGMA – we attempted to salvage portions of this heavily hit spruce beetle area but were ultimately rejected by the Region.
- Old growth deficits and retention strategies for those Landscape Units without spatial OGMAs – i.e. Germansen Mountain Landscape unit – this retention strategy has been submitted for close to a year and is still not approved. The blocks within this area are pine-leading.

In regards to the spruce beetle data requested for spruce beetle stands, it is our understanding that the recent changes we have made to the data we collect during our timber recces meets this requirement. This was discussed in detail with Graham Burrows and Darin Hancock. If there remain gaps in the data being required we are willing to re-visit this and modify our process.

Canfor also remains fully committed to participating with the Mackenzie Spruce Beetle Working Group.

To conclude, Canfor is willing and able to manage more spruce and pine beetle impacted stands given the opportunity and is working on several strategies to achieve this. If successful this would defer some of the susceptible and green stands in our current plan. However, at this time we must continue along a path in line with our above planning priorities to ensure a constant flow of fibre to our facilities.

If you have any questions or concerns regarding this letter please contact the undersigned at 250-997-2629.

Sincerely,
Canadian Forest Products Ltd.

CARMEN AUGUSTINE, RPF
Forestry Superintendent
Canadian Forest Products Ltd.

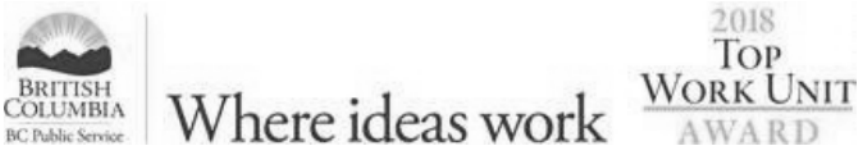
T 250-997-2629 **F** 250-997-2568
Carmen.augustine@canfor.com www.canfor.com
1801 Mill Road, Mackenzie, BC, V0J 2C0

FW: Mackenzie / PG Overview Flight on July 25th

From: Schwarz, David FLNR:EX <David.Schwarz@gov.bc.ca>
To: Bichon, Ryan FLNR:EX <Ryan.Bichon@gov.bc.ca>, Hancock, Darin FLNR:EX <Darin.Hancock@gov.bc.ca>
Sent: August 2, 2018 at 9:27:10 AM Pacific Daylight Time
Attachments: image001.jpg

Just fyi for you

David Schwarz, RPF
District Manager
Mackenzie Natural Resource District
Ministry of Forests, Lands, Natural Resource Operations and Rural Development
(250) 997-2203 (o)
(250) 997-8070 (cell)



From: Preston, Andy [mailto:Andrew.Preston@canfor.com]
Sent: Thursday, August 2, 2018 8:55 AM
To: Schwarz, David FLNR:EX
Subject: FW: Mackenzie / PG Overview Flight on July 25th

FYI

As mentioned yesterday on the phone.

-Andy Preston

From: Uhrich, Kalin
Sent: July-27-18 6:40 AM
To: Diane Nicholls ; Kelly.Izzard@gov.bc.ca
Cc: Martin, Russ ; Augustine, Carmen ; Preston, Andy ; Horsnell, Kevin ; Baird, Peter
Subject: Mackenzie / PG Overview Flight on July 25th

Hi Diane, I just wanted to say on behalf of our Canfor team in Mackenzie what a pleasure it was to have you and Kelly Izzard spend a very informative day with us, to hear about our challenges and opportunities in Mackenzie. We are grateful for the time you were able to spend with us and I know that you love to get out and see what's happening on the ground (and from the air), so hopefully you found this trip as enjoyable and informative as we did. I thought I'd take the liberty of recapping the day and share a bit of perspective as well, please let me know if I have not captured this accurately or if there is anything else you would like to add.

- Diane Nicholls and Kelly Izzard, met with Russ Martin, GM North Region Woodlands and myself in PG.
- Flew direct from PG to Mackenzie, saw evidence of significant pockets of spruce beetle attack north of PG and west of Highway 97 (Sinclar, BCTS, Canfor) and some recent harvesting.
- Landed in Mackenzie, met with Canfor staff - Carmen Augustine, Sara Rowe, Sara Curtis and Andy Preston.
    - Staff introductions and Russ provided a quick overview and thanks to you and Kelly for visiting with us.

- Carmen provided an excellent and concise power point presentation of the challenges we face in Mackenzie. The presentation generated a lot of questions and dialogue.
- Key themes were:
    - Overview of Mackenzie sawmill
    - Customer focused
    - Pine beetle harvest – what's left and where, shelf life expiry, VRI unreliability
    - Spruce beetle – where it is, access to harvest in non-Canfor operating areas
    - Operational challenges
        - Remote operations
        - Shortage of contractor capacity (harvesting and hauling)
        - Steep slopes
        - First Nations stewardship concerns
    - Canfor harvest priorities, now and in near term
    - AAC non-pine partition is not feasible to meet, given our fibre needs
- Departed Mackenzie for various stops in the SW portion (Canfor operating area) to look at dead pine stands and VRI anomalies, plus some spruce beetle blocks (AOS did not pick these up), as well as the Finlay log transporter and Manson Dump.
- Stopped for lunch at Munro Camp, currently being dismantled for move up to Ospika
    - Soup and sandwiches were great, kitchen staff very hospitable!
- Proceeded north to Eklund / Muscovite to see more dead pine stands in the Williston Lake Trench (pine in the Trench is the hardest hit in terms of fibre quality).
- Proceeded to Ospika to view our pine beetle harvest plans there and to review First Nations concerns and how we accommodated them.
- Ospika River valley – green timber, beautiful river!
- Returned south along east side of Williston Lake, crossed Peace Arm and within the BCTS operating area, observed evidence of severe spruce beetle infestation down virtually the entire length of the lake back to Mackenzie.
- Some evidence of salvage logging was present but much of the area remains unaddressed to date.
- Looked at severely attacked OGMA just northeast of Mackenzie that we were not successful in convincing Region to allow any salvage harvest; we also viewed an area where Canfor had undertaken logging on an "UTSL" (Undeveloped TSL).
- Dropped Carmen off at Mackenzie, carried on back to PG.
- Flew Canfor's Anzac and Table areas – spruce beetle appearing in these areas.
    - Evidence of activities to address (harvesting, access being built, crews doing layout/cruising, etc.).
- Flew Arctic Lake and Pacific Lake watersheds – beautiful valley! Doug Wayland our pilot, gave an interesting account of the history of this area, explored by Alexander Mackenzie in 1792.
- Flew TFL 30, not much evidence of spruce beetle and we have been very diligent in our control efforts here.
- Landed in PG, the 4 of us reviewed/recapped the day and potential next steps.

<u>Some observations, takeaways and things discussed:</u>

- Canfor believes it has demonstrated that much of the remaining pine beetle stands are largely uneconomic, especially in the south and in the Trench.
- We agreed that the spruce beetle infestation continues to spread and areas impacted continue to grow.
- Canfor has been largely frustrated in its attempts to harvest spruce beetle, as most of this is in BCTS areas and remains out of reach at the moment.
    - We appreciate you raising this issue with Chris Stagg, ADM and I have also reached out again to him as well – I remain hopeful that we can find a way to work together on addressing the problem.
- We agreed that harvesting of the timber profile is key to the long term sustainability of the timber supply and of maximizing the AAC.
- You clarified that the recent CF Expectations letter for harvesting prioritization of spruce beetle is meant to be applied in areas where spruce beetle is active and not meant to

be applied over the entirety of the TSA (or province, since this is a provincial scope document not just Omineca) – see profile reference below.

- We agreed (I think) that focused harvesting on forest health factors disrupts the ability of licensees to 'log the profile', particularly from a species and geographic perspective (i.e. focus on south).
- You expressed concerns about concentrating harvest in the south and what impacts this could have from a community stability perspective – this puts a finer point on the critical importance of harvesting the geographic profile alongside the need to salvaging dead and dying stands.
    - This is exacerbated by any harvesting of non-priority stands in the south.
- You confirmed that the AAC is not likely to be altered for at least a couple of years and in any event cannot be done without a TSR; you further stated that there is no ability (or appetite) to do an expedited TSR in this TSA, given the issues and challenges.
- We agreed (I think) that AAC partitions currently in place may be driving or inadvertently influencing undesirable outcomes and are not 100% achievable.
- As CF, you are bending your mind around the utility of the existing partitions and some options around what could/should be done, in order to ensure that long term sustainability is not compromised – however, there is a need to balance this with the potential to create unintended consequences or impose undue hardships on licensees and their operations.

Diane, I am sure I have not captured everything so please feel free to chime in with whatever observations you and Kelly had. Also, we will turn our minds to some of the weightier questions around long term sustainability and short term measures (i.e. AAC partitions, modelling shelf life and operability assumptions, and so forth) and I will get back to you with some additional thoughts on this, as you contemplate these same questions as well.
Once again, thank you and Kelly very much for your interest and time. I can now say that I have spent more time with you in the field than I have with almost anyone else this year!
Regards,

Kalin Uhrich
Chief Forester, BC
Forest Management Group Canada
Canadian Forest Products Ltd
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5162 Northwood Pulp Mill Road, Prince George, BC V2L 4W2

Where ideas work

2018
TOP
WORK UNIT
AWARD

FW: Partition data, Results and Presentation_2017/2018

From: Bichon, Ryan FLNR:EX <Ryan.Bichon@gov.bc.ca>
To: Bambrick, Elaine FLNR:EX <Elaine.Bambrick@gov.bc.ca>
Sent: December 10, 2018 at 10:56:01 AM Pacific Standard Time
Attachments: mkz2018_Combined_sx_beetle_FLNORD copy.xlsx, master_copy_mkz_tsa_vol_2018_review_vol_change_09_10_2018.xlsx, 2017 – 2018 Mackenzie Partition Results.pdf

Hi Elaine,

As requested, here is info from Terry Lazaruk.

Ryan Bichon
Resource Operations Manager
FLNRORD Mackenzie District
250-997-2269 office

From: Lazaruk, Terry [mailto:Terry.Lazaruk@canfor.com]
Sent: Friday, November 9, 2018 8:02 AM
To: Hancock, Darin FLNR:EX; Bichon, Ryan FLNR:EX
Cc: XT:Hodder, Cheryl FLNR:IN; 'prakochy@forsite.ca'; Dave Watt; XT:Preston, Andrew FLNR:IN; XT:Augustine, Carmen FLNR:IN; John-Paul Wenger (jwenger@kdlgroup.net); XT:Baird, Peter FLNR:IN; XT:Uhrich, Kalin FLNR:IN
Subject: Partition data, Results and Presentation_2017/2018

Hi Group,

Attached is the presentation from yesterday's meeting along with the standard partition report with the new addition for this year, the Sx beetle data set which includes a couple of summaries.
A couple of key notes that are not included in the above:

- MPB attack levels were extrapolated from Conifex and Chucho data. Next year, all Licensees will be providing this data as part of the 'attacked volume report'
- Only sx beetle attack data is available for this last reporting period, as we did not have a standardized approach to collecting the data up to this point.

If there are any questions as you go through the results, please let me know.

Terry Lazaruk, RPF
Strategic Planning Coordinator
Canfor Woodlands
Canadian Forest Products Ltd.

T 250-567-8260 **C** 250-570-8444 **F** 250-567-3911
Terry.Lazaruk@canfor.com www.canfor.com
1399 Bearhead rd, Vanderhoof, BC, V0J 3A0

2017 – 2018 Mackenzie Partition Results

Including Sx Beetle updates associated with reporting period

BCTS BC Timber Sales

CANFOR

CHU CHO FORESTRY

CONIFEX

Quick Background

- Reporting period : April 1, 2017 to March 31, 2018, where Harvest is completed
- Data collected/reported:
  - VRI volumes by species
  - Gross Cruise Volumes by Species
  - Cruise Volumes net pre-beetle DWB by species
  - Gross Cruise volumes for Partition zones (South, and Total) where
    - Pine <50% of total Gross Cruise Volume
    - All volume from those blocks contributes towards partition limits

Key Factors

- Initial shift in operation focus
- Operating areas not providing equal opportunity to target ‘the right’ stands
  - Steps were taken to address this, however it took time
  - These were temporary in nature meant to address MPB volume
- Introduction of Sx Beetle (2016/2017)

Previous Results (Partition)
Targets: South 350,000 m^3 TSA: 950,000 m^3

- 2015 – 2016:
  - Total TSA – 1,450,383 m^3
  - South Zone – 1,179,282 m^3

- 2016 – 2017 (at this time Sx beetle harvest started):
  - Total TSA – 783,141 m^3
  - South Zone – 488,161 m^3

Results (Partition)
Limits: South 350,000 m^3 TSA: 950,000 m^3

- 2017 – 2018 Results:
  - Total TSA – 1,704,590 m^3 of non-pine leading block volume
  - South Zone – 1,147,611 m^3 of non-pine leading block volume
- In addressing Sx beetle attacked stands, blocks where the attacked Sx volume is >9% green attack, the total blocks volume should be partition exempt.
- Impact:
  - TSA: 1,704,590 m^3 subtract 904,726 m^3 = 799,864 m^3 (Green attack >9%)
  - All attack levels, subtract 1,066,293m^3 = 638,297 m^3
  - South Zone: 1,147,611 m^3 subtract 648,519 m^3 = 499,092 m^3 (Green attack >9%)
  - All attack levels, subtract 739,480 m^3 = 408,131 m^3

Sx Beetle Blocks

- Total of 261 blocks harvested in TSA during reporting period
- 174 (67%) had some level of Sx beetle attack (TSA)
- 112 of 179 (63%) in the South Zone had some level of Sx beetle attack
- Average % of attacked volume for blocks with Sx beetle attack:
  - TSA: 45% of total volume (includes Sx and Pine attack)
  - South Zone: 43% of total volume (includes Sx and Pine attack)

Take away messages

- With the introduction of Sx beetle, existing partition isn't aligning with harvest priorities

- Total Dead harvested across TSA: 50% (2,101,829 m^3)
- Total Dead harvested within South Zone: 50% (1,363,575 m^3)

- When we account for the blocks with >9% of the Sx volume that is attacked, the total volumes start to align with Partition limits:

  - TSA: 799,864 m^3 (Green attack >9%) **versus 950,000 m^3 limit**
  - All attack levels (>9%) removed: 638,297 m^3

  - South Zone: 499,092 m^3 (Green attack >9%) **versus 300,000 m^3 limit**
  - All attack levels (>9%) removed: 408,131 m^3

Scammell, Nancy E FLNR:EX

From:	Mackenzie District Office, Forests FLNR:EX
To:	Martin, Russ FLNR:IN; XT:Augustine, Carmen FLNR:IN; XT:McLellan, Andrew FLNR:IN; XT:Hodder, Cheryl FLNR:IN; BQuick@mackenziefibre.com; XT:Perdue, Doug FLNR:IN; Stratton, Len D FLNR:EX; Greenfield, Jeremy A FLNR:EX; XT:Rakochy, Patience FLNR:IN
Cc:	Nicholls, Diane R FLNR:EX; Rawling, Greg FLNR:EX; Van Dolah, David FLNR:EX; Huybers, John FLNR:EX; Robert, Jeanne FLNR:EX
Subject:	DM Letter of Expectation DMK TSA - April 2018
Attachments:	Scan_20180423.pdf

Please see attached letter from David Schwarz, Mackenzie Natural Resource District Manager.

BRITISH COLUMBIA

File: 18810-01

April 23, 2018

EMAILED

To: Mackenzie Natural Resource District Major Licensees

Re: Mackenzie TSA – Chief Forester TSR Determination

The purpose of this letter is to reconfirm the Mackenzie TSA AAC Determination along with my expectations for meeting the components of it. The AAC Determination in November, 2014 set the cut for the Mackenzie TSA at 4.5 million m3 with the expectation to focus on mountain pine beetle impacted stands (greater than 70 percent pine). The Determination also included a non-pine partition of 950,000 m3 which was divided into 300,000 m3 from the southwest portion of the TSA and the remaining 650,000 m3 from elsewhere in the TSA.

As a result of the spruce beetle outbreak, timber harvesting has shifted towards non-pine leading stands and harvesting in the non-pine partition, especially in the SW partition area, far exceeds the Chief Forester's (CF) Determination. This has resulted in pressure on the midterm timber supply. We need operations to focus on spruce beetle impacted stands and minimize harvesting non-attacked spruce in order to protect the mid-term timber supply. Our common goal should be the reduction of live beetle populations and capturing the value of older attacked stands.

It is my expectation the prioritization of harvest will focus on mountain pine beetle salvage and spruce beetle impacted stands. In order to demonstrate that a stand has been significantly impacted by spruce beetle, the necessary spruce beetle data must be provided to corroborate this. Cutting permits supported by beetle data will demonstrate that harvest of non-attacked spruce is being minimized. I recommend the *Spruce Beetle Ground Survey Guidelines for the Omineca and North East Regions BC MFLNRORD* as the information required for my consideration.

It is my continued expectation the Mackenzie Spruce Beetle Working Group will have an operational focus to proactively manage the spruce beetle outbreak in a coordinated fashion to maintain ecosystem function, recognize the CF Determination and protect the midterm timber supply within the Mackenzie Timber Supply Area.

Ministry of Forests, Lands, Natural Resource Operations and Rural Development

Mackenzie Natural Resource District

Location:
1 Cicada Road
Mackenzie, BC

Mailing Address:
Box 2260
Mackenzie, BC V0J 2C0
Tel: (250) 997-2200
Fax: (250) 997-2236

Should you have further questions regarding my expectations concerning our goal of recognizing the CF Determination requirements, please contact David Schwarz at 250-997-2203 or email david.schwarz@gov.bc.ca.

Yours truly,

David G. Schwarz, RPF
District Manager
Mackenzie Natural Resource District

Cc: Dianne Nicholls, Assistant Deputy Minister and Chief Forester
Greg Rawling, Regional Executive Director, Omineca Region
David Van Dolah, District Manager, Stuart Nechako District
John Huybers, District Manager, Prince George Forest District
Darin Hancock, Resource Manager, Mackenzie Natural Resource District
Jeanne Robert, Forest Entomologist, Omineca Region

Mackenzie TSA Steering Committee
Minutes
May 31, 2018
1:00 – 3:00 P.M.
MFLNRO Mackenzie Office, Nelson Boardroom

Attendees: David Schwarz, Quinton Hayward, Ryan Bichon, Darin Hancock, Dave Watt, Patience Rakochy, Cheryl Hodder.
Via Conference Call: Jeremy Greenfield, Russ Martin, Brian Quick, Dan Turner

March 7, 2018 Minutes and Action Items – reviewed

Action Item – Quinton to provide a guideline/reference document for other licensees regarding fibre opportunities – in Progress

Timber Management Goals, Objectives & Targets (TSA) – Dan Turner

- Version 2 – targets become more measurable/verifiable
- Timber objectives only
- Targets are aimed at provincial and local (TSA) levels; local target reports are "one size fits all" and may not be relevant in every TSA.
- The Chief Forester's expectation is that reports provide, at a high level, annual updates on key timber measures that impact AAC. This assists the CF and helps avoid surprises with respect to TSR.
- The next Version will be released in early-mid July, for the past 5 or 10 year timeframe (depending on the data presented).
- Are there other targets we would like to see reported? Dan welcomes feedback.

Action Items – Darin to follow-up with report details and links to Mackenzie ISS, and to lead other targets to be reported

Forestry Committee – Ryan

Updates:

- Haul speed matrix – more changes coming soon
- OGMA – taking too long to have permits approved in these areas. Looking at ways to resolve this
- LOWG – the accuracy of data since 2013, particularly in the Clearwater, is in question. Work is ongoing to rectify this.
- Ongoing discussions regarding beetle management and expectations
- Communication of DM expectations regarding road maintenance during breakup
- Cruising and timber typing –more discussion to come regarding FN rationales

LOWG update – Patience

- Meeting occurred yesterday, Patience is the new chair (2 year term)
- 2016-2017 data output was incorrect – data will be sent to a 3rd party (FES) to re-do the analysis.

- Data to be run this summer, may be that in earlier outputs the Old growth and Old interior data columns were flipped
- The 2013 CFLB data is very different from 2014, this may also be part of the issue
- Canfor and Conifex will be running Clearwater data independently to determine accuracy

Spruce Beetle Working Group – David

- Questions have been raised regarding the effectiveness of the Sx beetle working groups. There are currently 3 groups and lots of duplication.
- Expect to see changes to district tables. Potentially have one Omineca group that meets in the fall and provides the higher level direction/guidance
- David wants to see the DMK group be more effective with respect to day to day operations and planning.

Mackenzie Stewardship Initiative – Darin

- MSI – now called ISS type 4 is complete, and data is available on the FTP site.
- Would be a good venue to look deeper into the data Dan Turner presented, compare data.
- Includes an implementation plan with a smaller group trying to figure out how to integrate this plan into day-to-day management.
- Darin will keep TSA group informed as this initiative moves forward

Action Items - Darin to send FTP site link to the group.
- Licensees to read, review the TSA Implementation Plan and Tactical Plan
- Darin to link to Mackenzie Timber Management Objectives Report

Partition outside SW area of TSA - David

- Do not want to be in the same situation outside the SW as we have seen in the SW.
- Request licensees act in a coordinated manner to achieve the partition targets in the rest of the TSA.

Action Item: create a licensee action plan that illustrates how partition targets are being achieved – All Licensees

Action Item: Set up a meeting to facilitate this discussion - Cheryl

Next Meeting - July 18, 2018

July, 2015

Summary of Harvested Volumes by Cutblock (Volumes are VRI-based), for year ending March 31st 2015 (2014 Analysis): Nov 1, 2014 to March 31, 2015

Utilization Levels: 12.5cm for Pine, 17.5cm for Non-Pine

		VRI Inventory Volumes (m3)						VRI Inventory Volumes (%)						Gross Cruise m3				Gross Cruise Net of DWB 1 (m3)				Gross Cruise Net of DWB 1 (%)				Gross Cruise m3 blocks where pine is <50%					
South	Licensee	Pine	Balsam	Fir	Spruce	Other	Total	Pine	Balsam	Fir	Spruce	Other	Total		Pine	Balsam	Fir	Spruce	Pine	Balsam	Fir	Spruce	Pine	Balsam	Fir	Spruce	Pine	Balsam	Fir	Spruce	Total Non-Pine	
														DWB 1	15.7	16.4	0	7														
Y	BCTS	541,077	38,570	-	108,366	92,014	780,027	69%	5%	0%	14%	12%	100%		524,437	127,651	-	218,122	**442,100**	**106,716**	-	**202,853**	58.82%	14.20%	0.00%	26.99%	77,754	55,703	-	126,824	260,281	
Y	Canfor	133,126	19,728	-	107,231	25,239	285,324	47%	7%	0%	38%	9%	100%		103,847	45,636	-	103,306	**87,543**	**38,152**	-	**96,075**	39.47%	17.20%	0.00%	43.32%	75,145	43,125	-	92,142	210,412	
Y	KNRA	17,692	924	-	7,663	1,402	27,681	64%	3%	0%	28%	5%	100%		15,490	4,300	-	11,669	**13,058**	**3,595**	-	**10,852**	47.48%	13.07%	0.00%	39.46%	9,735	3,546	-	7,109	20,390	
Y	Chu Cho	16,490	22,190	-	56,117	140	94,937	17%	23%	0%	59%	0%	100%		11,012	56,853	-	53,617	**9,283**	**47,529**	-	**49,864**	8.70%	44.55%	0.00%	46.74%	-	19,133	-	16,256	35,389	
Y	Conifex	82,938	12,930	4,387	52,209	2,049	154,514	54%	8%	3%	34%	1%	100%		78,644	35,439	-	66,550	**66,297**	**29,627**	-	**61,892**	42.01%	18.77%	0.00%	39.22%	26,166	32,778	-	53,091	112,035	
Y	MackFibre	16,538	407		3,509	1,053	21,508	77%	2%	0%	16%	5%	100%		33,652	5,266	-	8,838	**28,369**	**4,402**	-	**8,219**	69.21%	10.74%	0.00%	20.05%	-	-	-	-	-	
Y	**All Licensees**	**807,861**	**94,749**	**4,387**	**335,096**	**121,897**	**1,363,991**	**59%**	**7%**	**0%**	**25%**	**9%**	**100%**		**767,082**	**275,145**	**-**	**462,102**	**646,650**	**230,021**	**-**	**429,755**	49.50%	17.61%	0.00%	32.90%	**188,800**	**154,285**	**-**	**295,422**	**638,507**	**Applies to Partition Limit in South zone**
														DWB 1	15.7	16.4	0	7														
N	BCTS	109,882	59	-	19,010	14,471	143,421	77%	0%	0%	13%	10%	100%		112,493	3,308	-	37,749	**94,832**	**2,765**	-	**35,107**	71.46%	2.08%	0.00%	26.45%	14,822	1,916	-	14,446	31,184	
N	Canfor														0	0	-	0	-	-	-	-										
N	KNRA														0	0	-	0	-	-	-	-										
N	Chu Cho														0	0	-	0	-	-	-	-										
N	Conifex														0	0	-	0	-	-	-	-										
N	MackFibre														0	0	-	0	-	-	-	-										
Y	**All Licensees**	**109,882**	**59**	**-**	**19,010**	**14,471**	**143,421**	**77%**	**0%**	**0%**	**13%**	**10%**	**100%**		**112493**	**3308**	**0**	**37749**	**94,832**	**2,765**	**-**	**35,107**	71.46%	2.08%	0.00%	26.45%	**14,822**	**1,916**	**-**	**14,446**	31,184	
																														669,691	**Applies to Partition Limit Total**

		VRI Inventory Volumes (%)						Gross Cruise m3				Gross Cruise Net of DWB 1 (%)									
								879,575	**278,453**	**0**	**499,851**										
TSA	**All Licences**	**917,743**	**94,807**	**4,387**	**354,106**	**136,368**	**1,507,412**	**60.9%**	**6.3%**	**0.3%**	**23.5%**	**9.0%**	**100.0%**	**53.1%**	**16.8%**	**0.0%**	**30.2%**	741,482	232,787	0	464,861	**51.5%**	**16.2%**	**0.0%**	**32.3%**

June, 2016

Summary of Harvested Volumes by Cutblock (Volumes are VRI-based), for year ending March 31st 2016 (2015 Analysis): April 1, 2015 to March 31, 2016

Utilization Levels: 12.5cm for Pine, 17.5cm for Non-Pine

		VRI Inventory Volumes (m3)						VRI Inventory Volumes (%)						Gross Cruise m3				Gross Cruise Net of DWB 1 (m3)				Gross Cruise Net of DWB 1 (%)				Gross Cruise m3 blocks where pine is <50%					
South	Licensee	Pine	Balsam	Fir	Spruce	Other	Total	Pine	Balsam	Fir	Spruce	Other	Total		Pine	Balsam	Fir	Spruce	Pine	Balsam	Fir	Spruce	Pine	Balsam	Fir	Spruce	Pine	Balsam	Fir	Spruce	Total Non-Pine	
														DWB 1	15.7	16.4	0	7														
Y	BCTS	1,135,408	78,321		284,494	70,322	1,568,545	72%	5%	0%	18%	4%	100%		1,214,590	168,990		385,054	**1,023,899**	**141,276**	-	**358,100**	67.22%	9.27%	0.00%	23.51%	56,532	67,462	-	190,740	314,734	
Y	Canfor	736,714	45,867		207,662	100,581	1,090,824	68%	4%	0%	19%	9%	100%		842,786	96,176		325,658	**710,469**	**80,403**	-	**302,862**	64.96%	7.35%	0.00%	27.69%	104,410	52,687	-	132,406	289,503	
Y	3 Feathers	2,910			121	1	3,032	96%	0%	0%	4%	0%	100%		4,043			55	**3,408**	-	-	**51**	98.52%	0.00%	0.00%	1.48%					-	
Y	Chu Cho	6,174	13,886	-	14,799	29,031	63,890								23,242	89,956	-	91,540	**19,593**	**75,203**	-	**85,132**	10.89%	41.80%	0.00%	47.31%	23,242	89,956	-	91,540	204,738	
Y	Conifex	366,192	66,866		160,513	48,040	641,612	57%	10%	0%	25%	7%	100%		413,368	168,859	-	242,334	**348,469**	**141,166**	-	**225,371**	48.74%	19.74%	0.00%	31.52%	55,731	151,944	-	162,632	370,307	
Y	MackFibre																		-	-	-	-									-	
Y	**All Licensees**	**2,247,397**	**204,940**	**-**	**667,590**	**247,974**	**3,367,902**	**67%**	**6%**	**0%**	**20%**	**7%**	**100%**		**2,498,029**	**523,981**	**-**	**1,044,641**	**2,105,838**	**438,048**	**-**	**971,516**	59.90%	12.46%	0.00%	27.64%	**239,915**	**362,049**	**-**	**577,318**	**1,179,282**	**Applies to Partition Limit in South zone**
														DWB 1	15.7	16.4	0	7														
N	BCTS	218,941	17,968		83,272	32,487	352,668	62%	5%	0%	24%	9%	100%		273,435	39,714		133,682	**230,506**	**33,201**	-	**124,324**	59.40%	8.56%	0.00%	32.04%	23,846	30,711	-	71,261	125,818	
N	Canfor	5,013	400		1,477	-	6,890	73%	6%	0%	21%	0%	100%		5,018	2,818		3,767	**4,230**	**2,356**	-	**3,503**	41.93%	23.35%	0.00%	34.72%	5,018	2,818	-	3,767	11,603	
N	3 Feathers																		-	-	-	-					-	-	-	-	-	
N	Chu Cho	3,423	5,774	0	17,725	46	26,969								4,574	12,493		15,569	**3,856**	**10,444**	-	**14,479**	13.40%	36.29%	0.00%	50.31%	4,574	12,493	-	15,569	32,636	
N	Conifex	453,050	10,817		101,980	26,920	592,767	76%	2%	0%	17%	5%	100%		458,960	54,432	-	155,440	**386,903**	**45,505**	-	**144,559**	67.06%	7.89%	0.00%	25.05%	35,371	16,815	-	48,858	101,044	
N	MackFibre																		-	-	-	-					-	-	-	-	0	
Y	**All Licensees**	**680,426**	**34,959**	**0**	**204,454**	**59,453**	**979,293**	**69%**	**4%**	**0%**	**21%**	**6%**	**100%**		**741,987**	**109,457**	**-**	**308,458**	**625,495**	**91,506**	**-**	**286,866**	62.31%	9.12%	0.00%	28.58%	**68,809**	**62,837**	**-**	**139,455**	271,101	
																														1,450,383	**Applies to Partition Limit Total**

		VRI Inventory Volumes (%)						Gross Cruise m3						Gross Cruise Net of DWB 1 (%)			
		Pine	Balsam	Fir	Spruce	Other	Total	Pine	Balsam	Fir	Spruce			Pine	Balsam	Fir	Spruce
TSA	**All Licences**	**2,927,824**	**239,899**	**0**	**872,044**	**307,427**	**4,347,195**	**67.3%**	**5.5%**	**0.0%**	**20.1%**	**7.1%**	**100.0%**	**3,240,016**	**633,438**	**0**	**1,353,099**	**2,731,333**	**529,554**	**0**	**1,258,382**	**60.4%**	**11.7%**	**0.0%**	**27.8%**

June, 2017

Summary of Harvested Volumes by Cutblock (Volumes are VRI-based), for year ending March 31st 2017 (2017 Analysis): April 1, 2016 to March 31, 2017

Utilization Levels: 12.5cm for Pine, 17.5cm for Non-Pine

		VRI Inventory Volumes (m3)						VRI Inventory Volumes (%)					
South	Licensee	Pine	Balsam	Fir	Spruce	Other	Total	Pine	Balsam	Fir	Spruce	Other	Total
Y	BCTS	80,381	39,211	-	131,036	33,480	284,028	28%	14%	0%	46%	12%	100%
Y	Canfor	455,606	140,821	-	584,495	99,782	1,253,504	36%	11%	0%	45%	8%	100%
Y	3 Feathers						-	0%	0%	0%	0%	0%	0%
Y	Chu Cho	13,203	14,157	-	34,781	27,050	89,191	15%	16%	0%	39%	30%	100%
Y	Conifex	58,283	14,608	-	53,831	35,353	168,105	35%	9%	0%	34%	22%	100%
Y	MackFibre												
Y	All Licensees	606,473	208,627	-	784,143	195,585	1,794,838	34%	12%	0%	44%	11%	100%
N	BCTS	88,588	8,528	-	39,600	25,730	162,438	55%	5%	0%	24%	16%	100%
N	Canfor	-	-	-	-	-	-	0%	0%	0%	0%	0%	0%
N	3 Feathers												
N	Chu Cho	2,772	5,752	-	17,749	45	26,298	11%	22%	0%	67%	0%	100%
N	Conifex	269,027	24,355	-	187,508	53,789	534,679	50%	5%	0%	35%	10%	100%
N	MackFibre												
Y	All Licensees	360,387	38,607	-	244,897	79,524	723,415	50%	5%	0%	34%	11%	100%

		Gross Cruise m3				Gross Cruise Net of DWB 1 (m3)				Gross Cruise Net of DWB 1 (%)			
South	Licensee	Pine	Balsam	Fir	Spruce	Pine	Balsam	Fir	Spruce	Pine	Balsam	Fir	Spruce
	DWB 1	35.7	16.4	0	7								
Y	BCTS	170,815	60,510		111,831	143,323	50,586	-	104,003	48.11%	16.98%	0.00%	34.91%
Y	Canfor	734,305	135,627		211,808	609,819	113,384	-	196,981	66.61%	12.30%	0.00%	21.39%
Y	3 Feathers					-	-	-	-	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Y	Chu Cho	42,121	27,803	-	38,783	35,508	23,243	-	36,069	37.45%	24.51%	0.00%	38.04%
Y	Conifex	182,210	35,758	-	90,105	153,603	29,894	-	83,797	57.47%	11.18%	0.00%	31.35%
Y	MackFibre					-	-	-	-				
Y	All Licensees	1,128,451	259,698	-	452,528	951,453	217,107	-	420,851	59.06%	13.65%	0.00%	26.46%
	DWB 1	35.7	16.4	0	7								
N	BCTS	86,181	6,292		51,820	72,651	5,260	-	48,286	57.57%	4.17%	0.00%	38.26%
N	Canfor					-	-	-	-	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
N	3 Feathers					-	-	-	-				
N	Chu Cho	4,574	12,493		15,569	3,856	10,444	-	14,479	13.40%	36.29%	0.00%	50.31%
N	Conifex	693,449	82,600		253,560	584,578	69,054	-	235,811	65.72%	7.76%	0.00%	26.51%
N	MackFibre					-	-	-	-				
Y	All Licensees	784,204	101,385	-	321,849	661,884	84,758	-	298,576	63.38%	8.12%	0.00%	28.59%

		Gross Cruise m3 blocks where pine is <50%					
South	Licensee	Pine	Balsam	Fir	Spruce	Total Non-Pine	
Y	BCTS	18,041	38,700		75,394	132,135	
Y	Canfor	50,834	91,892		80,178	222,842	
Y	3 Feathers					-	
Y	Chu Cho	9,584	21,902		25,252	56,738	
Y	Conifex	26,738	8,169		41,719	76,626	
Y	MackFibre					-	
Y	All Licensees	104,997	160,623	-	222,540	488,181	Applies to Partition Limit in South zone
N	BCTS	9,490	4,079		27,432	41,001	
N	Canfor					-	
N	3 Feathers					-	
N	Chu Cho	4,574	12,493		15,569	32,636	
N	Conifex	64,212	50,873		106,258	221,343	
N	MackFibre					0	
Y	All Licensees	78,276	67,445	-	149,258	294,580	
						783,341	Applies to Partition Limit Total

								VRI Inventory Volumes (%)						Gross Cruise m3								Gross Cruise Net of DWB 1 (%)			
														1,912,655	361,083	0	773,577	1,612,537	301,865	0	719,427				
TSA	All Licensees	966,860	247,234	-	1,029,040	275,109	2,518,243	38.4%	9.8%	0.0%	40.9%	10.9%	100.0%	62.0%	11.8%	0.0%	25.4%					61.2%	11.5%	0.0%	27.3%

2018

Summary of Harvested Volumes by Cutblock (Volumes are VRI-based), for year ending March 31st 2018: April 1, 2017 to March 31, 2018
Utilization Levels: 12.5cm for Pine, 17.5cm for Non-Pine

		VRI Inventory Volumes (m3)						VRI Inventory Volumes (%)						Gross Cruise m3					Gross Cruise Net of DWB 1 (m3)					Gross Cruise Net of DWB 1 (%)					Gross Cruise m3 blocks where pine is <50%					
South	Licensee	Pine	Balsam	Fir	Spruce	Other	Total	Pine	Balsam	Fir	Spruce	Other	Total		Pine	Balsam	Fir	Spruce	Pine	Balsam	Fir	Spruce	Pine	Balsam	Fir	Spruce	Pine	Balsam	Fir	Spruce	Total Non-Pine	
														DWB 1	15.7	16.4	0	7														
Y	BCTS	144,632	55,518	-	118,393	34,843	356,385	41%	16%	0%	34%	10%	100%		423,422	148,297	-	194,248	**356,945**	**123,976**	-	**180,651**	53.95%	18.74%	0.00%	27.31%	52,316	107,740		138,320	298,376	
Y	Canfor	453,694	137,709	-	504,246	83,009	1,178,658	38%	12%	0%	43%	7%	100%		761,682	181,653	5	508,900	**642,098**	**151,862**	5	**473,277**	50.67%	11.98%	0.00%	37.35%	126,187	151,470	5	338,724	616,386	
Y	3 Feathers	-	-	-	-	-	-	0%	0%	0%	0%	0%	0%		-	-	-	-	-	-	-	-									-	
Y	Cha Cho	12,211	13,267	-	58,359	1,328	88,165	14%	17%	0%	67%	2%	100%		44,025	36,960	-	55,722	**37,113**	**30,899**	-	**51,821**	30.97%	25.78%	0.00%	43.24%	27,247	16,657		51,885	115,789	
Y	Conlins	108,961	17,731	-	122,332	52,127	301,150	36%	6%	0%	41%	17%	100%		218,622	25,779	-	120,254	**184,298**	**21,551**	-	**111,836**	58.01%	6.78%	0.00%	35.20%	12,882	16,821		87,357	117,060	
Y	MacMillans	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-									-	
Y	**All Licensees**	**721,498**	**226,224**	-	**803,330**	**171,307**	**1,924,359**	**37%**	**12%**	**0%**	**42%**	**9%**	**100%**		**1,447,751**	**392,689**	**5**	**879,124**	**1,220,454**	**328,288**	**5**	**817,585**	51.58%	13.87%	0.00%	34.55%	**218,632**	**312,688**	**5**	**616,286**	**1,147,611**	Applies to Partition Limit in South zone
														DWB 1	15.7	16.4	0	7														
N	BCTS	59,011	30,578	-	80,281	16,798	186,648	32%	16%	0%	43%	9%	100%		78,864	88,501	-	137,935	**66,482**	**73,987**	-	**128,280**	24.74%	27.53%	0.00%	47.73%	33,200	83,184	-	113,788	230,172	
N	Canfor	-	-	-	-	-	-	0%	0%	0%	0%	0%	0%		-	-	-	-	-	-	-	-									-	
N	3 Feathers	-	-	-	-	-	-								-	-	-	-	-	-	-	-									-	
N	Cha Cho	-	-	-	-	-	-	0%	0%	0%	0%	0%	0%		-	-	-	-	-	-	-	-									-	
N	Conlins	368,673	45,615	-	341,365	65,849	821,502	45%	6%	0%	42%	8%	100%		686,978	120,265	-	342,231	**570,122**	**100,542**	-	**318,275**	58.08%	10.07%	0.00%	31.89%	95,147	63,977		167,683	326,807	
N	MacMillans	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-									0	
Y	**All Licensees**	**427,684**	**76,194**	-	**421,625**	**82,646**	**1,008,150**	**42%**	**8%**	**0%**	**42%**	**8%**	**100%**		**765,842**	**208,766**	-	**480,166**	**645,605**	**174,528**	-	**446,554**	50.97%	13.78%	0.00%	35.25%	**128,347**	**147,161**	-	**281,471**	556,979	
																														1,704,590	Applies to Partition Limit Total

		VRI Inventory Volumes (m3)						VRI Inventory Volumes (%)						Gross Cruise m3					Gross Cruise Net of DWB 1 (m3)					Gross Cruise Net of DWB 1 (%)				
		Pine	Balsam	Fir	Spruce	Other	Total	Pine	Balsam	Fir	Spruce	Other	Total		Pine	Balsam	Fir	Spruce	Pine	Balsam	Fir	Spruce	Pine	Balsam	Fir	Spruce
TSA	All Licences	1,149,182	302,418	-	1,226,955	253,954	2,932,508	39.2%	10.3%	0.0%	41.8%	8.7%	######		2,213,593	601,455	5	######	1,866,059	502,816	5	######					51.4%	13.8%	0.0%	34.8%

Summary of Harvested Volumes by Cutblock (Volumes are VRI-based), for year ending March 31st 2018
Utilization Levels: 12.5cm for Pine, 17.5cm for Non-Pine

South	Licensee	VRI Inventory Volumes (m3) Pine	Balsam	Fir	Spruce	Other	Total	VRI Inventory Volumes (%) Pine	Balsam	Fir	Spruce	Other	Total
Y	BCTS	1,903,487	311,620	-	643,389	230,579	2,989,085	64%	7%	0%	22%	8%	100%
Y	Canfor	1,780,148	343,925	-	1,383,635	388,610	3,836,309	47%	9%	0%	36%	8%	100%
Y	3 Feathers	2,918	-	-	121	1	3,032	96%	0%	0%	4%	0%	100%
	KNRA	17,692	924	-	7,663	1,402	27,681						
Y	Chu Cho	48,878	65,580	-	165,056	57,549	336,183	14%	19%	0%	49%	17%	100%
Y	Conifex	614,375	112,164	4,387	388,885	137,559	1,257,381	49%	9%	0%	31%	11%	100%
Y	MackFibre												
Y	All Licensees	4,366,492	734,133	4,387	2,588,649	735,711	8,429,571	52%	9%	0%	31%	9%	100%
N	BCTS	476,422	57,125	-	222,143	89,485	845,175	56%	7%	0%	26%	11%	100%
N	Canfor	5,013	480	-	1,477	-	6,880	73%	6%	0%	21%	0%	100%
N	3 Feathers												
N	Chu Cho	6,195	11,586	0	35,431	95	53,287	12%	22%	0%	67%	0%	100%
N	Conifex	1,090,758	80,787	-	600,893	146,518	1,948,947	56%	4%	0%	32%	8%	100%
N	MackFibre												
N	All Licensees	1,578,380	149,818	0	889,987	236,094	2,854,279	55%	5%	0%	31%	8%	100%

South	Licensee	Gross Cruise m3 Pine	Balsam	Fir	Spruce	Gross Cruise Net of DWB 1 (m3) Pine	Balsam	Fir	Spruce	Gross Cruise Net of DWB 1 (%) Pine	Balsam	Fir	Spruce
	DWB 1	35.7	16.4	0	7								
Y	BCTS	2,332,464	585,440	-	909,255	1,996,267	422,555	-	845,637	68.79%	13.06%	0.00%	26.14%
Y	Canfor	2,442,828	459,892	5	1,349,672	2,099,139	383,801	5	1,869,195	58.63%	18.95%	0.00%	38.44%
Y	3 Feathers	4,843	-	-	55	3,408	-	-	51	98.52%	0.00%	0.00%	1.48%
	KNRA	15,890	4,800	-	11,669	10,818	3,395	-	10,852	47.48%	13.07%	0.00%	39.46%
Y	Chu Cho	120,400	211,572	-	226,663	101,497	176,874	-	222,887	20.15%	35.29%	0.00%	44.47%
Y	Conifex	892,844	265,835	-	519,243	752,668	222,238	-	402,896	51.63%	15.34%	0.00%	33.12%
Y	MackFibre					-	-	-	-				
Y	All Licensees	5,807,861	1,446,147	5	2,829,557	4,894,837	1,209,862	5	2,631,488	56.04%	13.84%	0.00%	30.12%
	DWB 1	35.7	16.4	0	7								
N	BCTS	550,973	137,815	-	361,286	464,478	115,213	-	335,996	58.72%	12.58%	0.00%	36.69%
N	Canfor	5,018	2,818	-	5,767	4,238	2,356	-	5,503	41.99%	23.35%	0.00%	34.72%
N	3 Feathers					-	-	-	-				
N	Chu Cho	9,148	24,986	-	31,138	7,712	20,888	-	28,958	33.48%	36.39%	0.00%	50.31%
N	Conifex	1,839,387	257,297	-	751,231	1,550,603	215,100	-	698,645	62.92%	8.73%	0.00%	28.35%
N	MackFibre					-	-	-	-				
N	All Licensees	2,404,526	422,916	-	1,147,422	2,027,015	353,558	-	1,867,103	58.79%	10.25%	0.00%	30.95%

South	Licensee	Gross Cruise m3 blocks where pine is <50% Pine	Balsam	Fir	Spruce	Total Non-Pine	
Y	BCTS	304,643	268,605	-	516,276	1,005,526	
Y	Canfor	356,376	308,134	5	643,448	1,338,963	
Y	3 Feathers	-	-	-	-	-	
	KNRA	9,705	3,546	-	7,109	20,380	
Y	Chu Cho	60,873	167,648	-	184,833	412,654	
Y	Conifex	121,517	209,732	-	344,798	676,028	
Y	MackFibre					-	
Y	All Licensees	752,344	989,645	5	1,711,567	3,458,561	Applies to Partition Limit in South zone
N	BCTS	81,258	119,890	-	326,927	428,175	
N	Canfor	5,018	2,818	-	5,767	11,603	
N	3 Feathers	-	-	-	-	-	
N	Chu Cho	9,148	23,986	-	31,138	65,272	
N	Conifex	194,730	131,665	-	322,798	648,394	
N	MackFibre	-	-	-	-	0	
N	All Licensees	290,254	279,559	-	584,631	1,154,244	
						4,607,805	Applies to Partition Limit Total

		VRI Inventory Volumes (m3) Pine	Balsam	Fir	Spruce	Other	Total	VRI Inventory Volumes (%) Pine	Balsam	Fir	Spruce	Other	Total
TSA	All Licensees	5,945,871	883,951	4,387	3,478,636	971,805	11,283,850	52.7%	7.8%	0.0%	30.8%	8.6%	100.0%

	Gross Cruise m3 Pine	Balsam	Fir	Spruce	Gross Cruise Net of DWB 1 Pine	Balsam	Fir	Spruce	Gross Cruise Net of DWB 1 (%) Pine	Balsam	Fir	Spruce
TSA (m3)	8,212,387	1,869,163	5	3,976,979								
TSA (%)	58.4%	13.3%	0.0%	28.3%	6,923,043	1,562,620	5	3,698,591	56.8%	12.8%	0.0%	30.4%

				Sx Beetle Gross Vol (m3)																Sx	
Licensee	License	Permit	Block	Green	Red	Grey	Data Collection Method	Gross Pli (m3)	Gross Bl (m3)	Gross Sx (m3)	Total (m3)	Green %	Red %	Grey %	Partition Zone	Pli %	Total Dead Sx	dead Sx in block	% dead all	vol wtd av	% of sx that is attacked
BCTS	A88932	TRC003		153.566	0	271.091	Cruise data	454	15345	7835	23634	1.96%	0.00%	3.46%	North	2%	424.657	2%	3%	0.000132744	5%
BCTS	A88932	TRC004		0	0	344.6322	Cruise data	948	16449	6666	24063	0.00%	0.00%	5.17%	North	4%	344.6322	1%	5%	0.000107729	5%
BCTS	A91682	MK061		925.865	0	1270.5545	Cruise data	11435	2263	11155	25172	8.30%	0.00%	11.39%	North	45%	2196.4195	9%	47%	0.000686581	20%
BCTS	A91682	MK065		0	0	723.1469	Cruise data	10643	5902	21083	37826	0.00%	0.00%	3.43%	North	28%	723.1469	2%	26%	0.000226049	3%
BCTS	A91709	4		0	0	0	Cruise data	10825	265	666	11839	0.00%	0.00%	0.00%	South	91%	0		78%		0%
BCTS	A91709	24		0	0	0	Cruise data	21210		573	21862	0.00%	0.00%	0.00%	South	97%	0		82%		0%
BCTS	A92230	724		0	0	259.8075	Cruise data		9866	2025	11891	0.00%	0.00%	12.83%	South	0%	259.8075	2%	2%	0.000134756	13%
BCTS	A92230	727		0	0	0	Cruise data		6858	884	7742	0.00%	0.00%	0.00%	South	0%	0		0%		0%
BCTS	A92249	396		70.8136	0	246.1144	Cruise data	1069	295	2476	3840	2.86%	0.00%	9.94%	South	28%	316.928	8%	32%	0.000635679	13%
BCTS	A92266	MK059		464.5569	0	2849.9984	Cruise data	13360	2692	8951	25179	5.19%	0.00%	31.84%	North	53%	3314.5553	13%	58%	0.0010361	37%
BCTS	A92266	MK060		341.3332	0	111.5036	Cruise data	5566	482	2132	8303	16.01%	0.00%	5.23%	North	67%	452.8368	5%	62%	0.000141553	21%
BCTS	A92266	MK063		0	0	0	Cruise data	3565		145	3736	0.00%	0.00%	0.00%	North	95%	0		81%		0%
BCTS	A92379	MK056		122.5578	0	115.3036	Cruise data	3624	38	1909	5704	6.42%	0.00%	6.04%	North	64%	237.8614	4%	58%	7.43533E-05	12%
BCTS	A92379	MK057		345.714	0	374.34	Cruise data	19549	2105	11010	33005	3.14%	0.00%	3.40%	North	59%	720.054	2%	53%	0.000225082	7%
BCTS	A92381	811		0	0	0	Cruise data	14410	70	3976	18508	0.00%	0.00%	0.00%	South	78%	0		66%		0%
BCTS	A92381	811A		0	0	0	Cruise data	29694		3411	33133	0.00%	0.00%	0.00%	South	90%	0		76%		0%
BCTS	A92381	NATI0013		0	0	0	Cruise data	10561	30	1827	12418	0.00%	0.00%	0.00%	South	85%	0		72%		0%
BCTS	A92383	395		242.531	0	275.954	Cruise data	4650	1461	8570	14690	2.83%	0.00%	3.22%	South	32%	518.485	4%	30%	0.002318996	6%
BCTS	A92383	733		0	0	203.3856	Cruise data	3260	5377	5136	13778	0.00%	0.00%	3.96%	South	24%	203.3856	1%	22%	0.001542745	4%
BCTS	A92390	189		0	0	1328.8236	Cruise data	4147	2180	8034	14361	0.00%	0.00%	16.54%	South	29%	1328.8236	9%	34%	0.00251754	17%
BCTS	A92390	190		140.3875	0	271.586	Cruise data	4163	5143	5105	14440	2.75%	0.00%	5.32%	South	29%	411.9735	3%	27%	0.002049045	8%
BCTS	A92393	1		122.6542	0	72.2652	Cruise data	13980	3208	2458	19646	4.99%	0.00%	2.94%	South	71%	194.9194	1%	61%	0.006264536	8%
BCTS	A92393	5		0	0	0	Cruise data	16132	234		16366	0.00%	0.00%	0.00%	South	99%	0		84%		
BCTS	A92398	879		120.0016	0	53.9672	Cruise data	30764	894	1676	33334	7.16%	0.00%	3.22%	South	92%	173.9688	1%	79%	0.01365332	10%
BCTS	A92410	864		0	0	0	Cruise data	7635		641	8276	0.00%	0.00%	0.00%	South	92%	0		78%		0%
BCTS	A92410	865		0	0	0	Cruise data	10918	196	2268	13382	0.00%	0.00%	0.00%	South	82%	0		69%		0%
BCTS	A92413	JG079		0	0	412.7728	Cruise data	3665	494	1996	6155	0.00%	0.00%	20.68%	South	60%	412.7728	7%	57%	0.001829903	21%
BCTS	A93645	4205		1054.1364	0	310.5208	Cruise data	7936	13631	20429	42084	5.16%	0.00%	1.52%	South	19%	1364.6572	3%	19%	0.004206602	7%
BCTS	A93645	4206		0	0	139.86	Cruise data	6437	8142	9324	23945	0.00%	0.00%	1.50%	South	27%	139.86	1%	23%	0.002910456	2%
BCTS	A93729	JG048		0	0	949.1489	Cruise data	7588	2137	3983	13709	0.00%	0.00%	23.83%	South	55%	949.1489	7%	54%	0.003837663	24%
BCTS	A93729	JG090		508.424	0	394.9365	Cruise data	27619	11722	9079	48390	5.60%	0.00%	4.35%	South	57%	903.3605	2%	50%	0.012645086	10%
BCTS	A93729	JG091		0	0	208.9395	Cruise data	39891	7039	6633	53669	0.00%	0.00%	3.15%	South	74%	208.9395	0%	64%	0.017695327	3%
BCTS	A94394	858		0	0	0	Cruise data	32200	9635	9732	51567	0.00%	0.00%	0.00%	South	62%	0		53%		0%
BCTS	A94394	859		0	0	0	Cruise data	31125	2046	682	33853	0.00%	0.00%	0.00%	South	92%	0		78%		0%
BCTS	A94414	1		1420.5544	0	1162.9646	Cruise data	7804	3090	15242	26257	9.32%	0.00%	7.63%	South	30%	2583.519	10%	35%	0.004780602	17%
BCTS	A94414	2		2719.9524	0	2362.8572	Cruise data	558	8609	23188	32403	11.73%	0.00%	10.19%	South	2%	5082.8096	16%	17%	0.002882344	22%
BCTS	A94613	MK001		140.8995	0	941.4387	Cruise data	616	11620	5751	18003	2.45%	0.00%	16.37%	South	3%	1082.3382	6%	9%	0.000832963	19%
BCTS	A94613	MK005		168.1066	0	0	Cruise data	6877	6342	12094	25348	1.39%	0.00%	0.00%	South	27%	168.1066	1%	24%	0.003119092	1%
BCTS	A94619	MK013		0	0	89.5776	Cruise data	10117	635	1376	12128	0.00%	0.00%	6.51%	South	83%	89.5776	1%	72%	0.004506797	7%
BCTS	A94620	SCT001		6156.5394	0	4455.6515	Cruise data	1077	22521	19847	43445	31.02%	0.00%	22.45%	North	2%	10612.1909	24%	27%	0.003317274	53%
BCTS	A94620	SCT002		5418.7896	0	6735.7254	Cruise data	8643	20704	47202	76549	11.48%	0.00%	14.27%	North	11%	12154.515	16%	25%	0.00379939	26%
BCTS	A94637	823		0	0	0	Cruise data	4211	143	1097	5451	0.00%	0.00%	0.00%	South	77%	0		66%		0%
BCTS	A94637	824		0	0	0	Cruise data	5856	461		6317	0.00%	0.00%	0.00%	South	93%	0		79%		
BCTS	A94638	4797		0	0	78.6048	Cruise data	260	11137	4416	15814	0.00%	0.00%	1.78%	South	2%	78.6048	0%	2%	0.000155398	2%
BCTS	A94677	786		0	0	0	Cruise data	3351	81	427	3859	0.00%	0.00%	0.00%	South	87%	0		74%		0%
BCTS	A94677	787		0	0	0	Cruise data	4104		212	4316	0.00%	0.00%	0.00%	South	95%	0		81%		0%
BCTS	A94677	788		0	0	0	Cruise data	6861	77	73	7012	0.00%	0.00%	0.00%	South	98%	0		83%		0%
BCTS	A94677	793		0	0	0	Cruise data	4770	106	140	5030	0.00%	0.00%	0.00%	South	95%	0		81%		0%
BCTS	A94677	794		332.6216	0	0	Cruise data	23619	1084	3002	27780	11.08%	0.00%	0.00%	South	85%	332.6216	1%	73%	0.010585556	11%
BCTS	A94795	861		0	0	0	Cruise data	4539	11970	11322	27789	0.00%	0.00%	0.00%	South	16%	0		14%		0%
BCTS	A95289	MK014		506.3404	0	136.6384	Cruise data		2019	4324	6342	11.71%	0.00%	3.16%	South	0%	642.9788	10%	10%	0.000333498	15%
Canfor	A15384	H34	419	5104.6	0.0	2101.9	Cruise	5247	23629.2	50,044.8	79,504.7	10.20%	0.00%	4.20%	South	7%	7206.4512	9%	15%	0.006051091	14%
Canfor	A15384	C42	1429	0.0	0.0	336.4	Cruise	2862.5	191.2	1,673.8	4,727.4	0.00%	0.00%	20.10%	South	61%	336.4338	7%	59%	0.001436506	20%
Canfor	A15384	C55	1689	0.0	0.0	730.9	Cruise	23546.5		4,972.0	28,590.1	0.00%	0.00%	14.70%	South	82%	730.884	3%	73%	0.010760162	15%
Canfor	A15384	C51	1691	0.0	0.0	0.0	Cruise	7715.9		703.1	8,419.0	0.00%	0.00%	0.00%	South	92%	0		78%		0%
Canfor	A15384	D72	5540	0.0	0.0	39.8	Cruise	962.3	376.7	144.8	1,483.9	0.00%	0.00%	27.50%	South	65%	39.82	3%	58%	0.000444908	28%
Canfor	A15384	B44	5571	217.3	0.0	247.3	Cruise	3845.1		3,747.0	7,592.1	5.80%	0.00%	6.60%	South	51%	464.628	6%	49%	0.001936201	12%
Canfor	A15384	B44	5572	0.0	0.0	436.9	Cruise	3004		9,709.1	12,713.1	0.00%	0.00%	4.50%	South	24%	436.9095	3%	24%	0.001551004	5%
Canfor	A15384	D72	5586	0.0	0.0	0.0	Cruise	3815.8	416.3	707.8	4,939.9	0.00%	0.00%	0.00%	South	77%	0		66%		0%
Canfor	A15384	D73	5641	104.1	0.0	93.7	Cruise	4634.5	1706.8	2,081.6	8,422.9	5.00%	0.00%	4.50%	South	55%	197.752	2%	49%	0.002145806	10%
Canfor	A15384	G07	6752	3322.6	0.0	1753.6	Cruise	18008.4	15428.9	23,073.5	56,510.7	14.40%	0.00%	7.60%	South	32%	5076.17	9%	36%	0.010572349	22%
Canfor	A15384	G64	6766	0.0	0.0	0.0	Cruise	4406.6	97.4	460.8	4,964.9	0.00%	0.00%	0.00%	South	89%	0		75%		0%
Canfor	A15384	C42	1429A	0.0	0.0	0.0	Cruise	661			661.0	0.00%	0.00%	0.00%	South	100%	0		85%		
Canfor	A15384	C57	BUR018	0.0	0.0	0.0	Cruise	5788.8		1,504.6	7,307.6	0.00%	0.00%	0.00%	South	79%	0		67%		0%
Canfor	A15384	C81	BUR020	59.6	0.0	0.0	Cruise	2175.7	609	1,026.8	3,811.5	5.80%	0.00%	0.00%	South	57%	59.5544	2%	50%	0.000990102	6%
Canfor	A15384	C81	BUR022	0.0	0.0	0.0	Cruise	2611.2	216.9	280.0	3.108.1	0.00%	0.00%	0.00%	South	84%	0		71%		0%
Canfor	A15384	C66	BUR023	253.3	0.0	164.4	Cruise	2129.3		1,111.1	3,240.4	22.80%	0.00%	14.80%	South	66%	417.7736	13%	69%	0.001155445	38%
Canfor	A15384	C66	BUR025	2091.2	0.0	178.4	Cruise	10242.1	1280.1	4,458.9	15,981.1	46.90%	0.00%	4.00%	South	64%	2269.5801	14%	69%	0.005692667	51%
Canfor	A15384	C90	BUR026	1656.5	0.0	1369.6	Cruise	4439.1	2155.3	5,413.3	12,007.6	30.60%	0.00%	25.30%	South	37%	3026.0347	25%	57%	0.003526623	56%
Canfor	A15384	C66	BUR032	3041.5	0.0	622.9	Cruise	9556.7	5819.3	8,089.2	23,465.2	37.60%	0.00%	7.70%	South	41%	3664.4076	16%	50%	0.006113956	45%
Canfor	A15384	C73	BUR033	937.7	0.0	213.5	Cruise	1728.2	216.6	4,186.0	6,145.1	22.40%	0.00%	5.10%	South	28%	1151.15	19%	43%	0.001358995	28%
Canfor	A15384	C73	BUR034	1370.1	0.0	384.6	Cruise	85.3	88	8,012.5	8,207.1	17.10%	0.00%	4.80%	South	1%	1754.7375	21%	22%	0.000947748	22%
Canfor	A15384	C62	BUR041	414.1	0.0	307.0	Cruise			1,020.0	1,020.0	40.60%	0.00%	30.10%	South	0%	721.14	71%	71%	0.000374039	71%
Canfor	A15384	C61	BUR042	2630.7	0.0	4148.7	Cruise	1051.8	2391.9	7,369.0	10,812.7	35.70%	0.00%	56.30%	South	10%	6779.48	63%	71%	0.003980071	92%
Canfor	A15384	C74	BUR047	335.6	0.0	364.0	Cruise	5110.3	981.8	5,687.4	11,779.5	5.90%	0.00%	6.40%	South	43%	699.5502	6%	43%	0.002615845	12%
Canfor	A15384	C81	BUR051	62.9	0.0	0.0	Cruise	6658.5	233	873.2	7,780.1	7.20%	0.00%	0.00%	South	86%	62.8704	1%	74%	0.002968177	7%
Canfor	A15384	C81	BUR052	158.5	0.0	0.0	Cruise	3928.4	122	1,116.4	5,172.9	14.20%	0.00%	0.00%	South	76%	158.5288	3%	68%	0.00181416	14%
Canfor	A15384	C81	BUR053	0.0	0.0	47.2	Cruise	7666.3	247	647.0	8,582.3	0.00%	0.00%	7.30%	South	89%	47.231	1%	76%	0.00340438	7%
Canfor	A15384	C74	BUR056	546.2	0.0	1831.5	Cruise	4575.2	2837.5	8,032.8	15,445.4	6.80%	0.00%	22.80%	South	30%	2377.7088	15%	41%	0.003250355	30%
Canfor	A87345	CJ	BUR551	0.0	0.0	0.0	Cruise	3286.2		126.3	3,412.6	0.00%	0.00%	0.00%	South	96%	0		82%		0%
Canfor	A87345	CJ	BUR552	0.0	0.0	0.0	Cruise	14750.2	286	584.5	15,620.6	0.00%	0.00%	0.00%	South	94%	0		80%		0%
Canfor	A87345	CM	BUR568	0.0	0.0	0.0	Cruise	1476.6	163.5	174.1	1,819.6	0.00%	0.00%	0.00%	South	81%	0		69%		0%
Canfor	A87345	CM	BUR569	0.0	0.0	0.0	Cruise	3585.9	182.3	862.7	4,635.3	0.00%	0.00%	0.00%	South	77%	0		66%		0%
Canfor	A87345	CM	BUR570	89.7	0.0	0.0	Cruise	2279.5	505.2	741.1	3,525.8	12.10%	0.00%	0.00%	South	65%	89.6731	3%	57%	0.001051487	12%
Canfor	A87345	CM	BUR571	0.0	0.0	0.0	Cruise	18668.6	2876.7	3,541.4	25,086.7	0.00%	0.00%	0.00%	South	74%	0		63%		0%
Canfor	A87345	CM	BUR572	0.0	0.0	0.0	Cruise	559.9	30	49.8	639.7	0.00%	0.00%	0.00%	South	88%	0		74%		0%
Canfor	A87345	CM	BUR573	0.0	0.0	0.0	Cruise	3254.2	697	1,080.9	5,040.3	0.00%	0.00%	0.00%	South	65%	0		55%		0%
Canfor	A87345	CM	BUR574	0.0	0.0	0.0	Cruise	128.3	12.7	28.4	169.3	0.00%	0.00%	0.00%	South	76%	0		64%		0%
Canfor	A87345	CU	DAS007	171.1	0.0	491.9	Cruise	519.6	2571.7	10,693.7	13,943.9	1.60%	0.00%	4.60%	South	4%	663.0094	5%	8%	0.000572966	6%
Canfor	A87345	CU	DAS008	0.0	0.0	1223.7	Cruise	652	1955.1	13,596.6	16,337.8	0.00%	0.00%	9.00%	South	4%	1223.694	7%	11%	0.000922152	9%
Canfor	A15384	C91	DAS017	150.4	0.0	659.4	Cruise	172.1	606.4	11,569.2	12,406.1	1.30%	0.00%	5.70%	South	1%	809.844	7%	8%	0.000495922	7%
Canfor	A87345	CV	DAS021	2059.9	0.0	1632.7	Cruise	7230.4	5907.6	15,258.6	28,489.3	13.50%	0.00%	10.70%	South	25%	3692.5812	13%	35%	0.005102961	24%
Canfor	A87345	CV	DAS022	0.0	0.0	0.0	Cruise		804.6	632.9	1,448.2	0.00%	0.00%	0.00%	South	0%	0		0%		0%
Canfor	A15384	C91	DAS023	0.0	0.0	576.4	Cruise	444.9	727.7	6,625.0	7,890.8	0.00%	0.00%	8.70%	South	6%	576.375	7%	12%	0.000495098	9%
Canfor	A15384	C52	EKL036	3143.2	0.0	3120.4	Cruise	13321.4	18356.8	22,776.5	54,474.0	13.80%	0.00%	13.70%	South	24%	6263.5375	11%	32%	0.009121827	28%
Canfor	A15384	C54	EKL039	467.4	0.0	53.9	Cruise	2872.4	305.2	1,253.0	4,430.6	37.30%	0.00%	4.30%	South	65%	521.248	12%	67%	0.001536729	42%
Canfor	A15384	C57	EKL043	169.6	0.0	122.1	Cruise	23720.5	0.1	6,784.1	30,586.4	2.50%	0.00%	1.80%	South	78%	291.7163	1%	67%	0.010609088	4%
Canfor	A15384	C77	EKL047	0.0	0.0	0.0	Cruise	8653.6	72.6	2,678.0	11,470.1	0.00%	0.00%	0.00%	South	75%	0		64%		0%
Canfor	A15384	C86	EKL048	380.8	0.0	0.0	Cruise	27287.7	272.2	12,692.8	41,154.9	3.00%	0.00%	0.00%	South	66%	380.784	1%	57%	0.012227976	3%
Canfor	A15384	C76	EKL049	0.0	0.0	0.0	Cruise	2608.5	93.3	1,554.4	4,267.0	0.00%	0.00%	0.00%	South	61%	0		52%		0%
Canfor	A15384	C76	EKL050	0.0	0.0	0.0	Cruise	4602.6		883.4	5,510.9	0.00%	0.00%	0.00%	South	84%	0		71%		0%
Canfor	A15384	C76	EKL051	0.0	0.0	0.0	Cruise	13665.8	75.4	3,356.2	17,429.3	0.00%	0.00%	0.00%	South	78%	0		67%		0%
Canfor	A15384	C76	EKL052	0.0	0.0	64.3	Cruise	1525		834.8	2,397.3	0.00%	0.00%	7.70%	South	64%	64.2796	3%	57%	0.000705675	8%
Canfor	A15384	C57	EKL053	0.0	0.0	0.0	Cruise	3200		406.3	3,622.0	0.00%	0.00%	0.00%	South	88%	0		75%		0%
Canfor	A15384	C57	EKL054	69.5	0.0	0.0	Cruise	5201.2		1,417.4	6,647.3	4.90%	0.00%	0.00%	South	78%	69.4526	1%	68%	0.002329104	5%
Canfor	A15384	C57	EKL055	0.0	0.0	0.0	Cruise	5195.3		1,784.1	6,984.0	0.00%	0.00%	0.00%	South	74%	0		63%		0%
Canfor	A15384	C77	EKL059	0.0	0.0	0.0	Cruise	1811.7		35.1	1,846.7	0.00%	0.00%	0.00%	South	98%	0		83%		0%
Canfor	A15384	C77	EKL060	0.0	0.0	0.0	Cruise	3763.7		43.5	3,807.1	0.00%	0.00%	0.00%	South	99%	0		84%		0%
Canfor	A15384	C83	EKL063	0.0	0.0	142.5	Cruise	1044	932	931.3	2,907.2	0.00%	0.00%	15.30%	South	36%	142.4889	5%	35%	0.000534179	15%
Canfor	A15384	C76	EKL071	0.0	0.0	0.0	Cruise	24610.2		2,836.7	27,503.7	0.00%	0.00%	0.00%	South	89%	0		76%		0%
Canfor	A15384	C60	EKL075	0.0	0.0	215.8	Cruise	34319.9		3,270.1	37,609.9	0.00%	0.00%	6.60%	South	91%	215.8266	1%	78%	0.015242739	7%
Canfor	A15384	C60	EKL075	0.0	0.0	215.8	Cruise	34319.9		3,270.1	37,609.9	0.00%	0.00%	6.60%	South	91%	215.8266	1%	78%	0.015242739	7%
Canfor	A15384	C60	EKL076	0.0	0.0	0.0	Cruise	9438.9		355.3	9,810.9	0.00%	0.00%	0.00%	South	96%	0		82%		0%
Canfor	A15384	C68	EKL078	2146.5	0.0	948.6	Cruise	2706.7	2499.5	6,080.7	11,287.0	35.30%	0.00%	15.60%	South	24%	3095.0763	27%	48%	0.002798661	51%
Canfor	A15384	C53	EKL083	0.0	0.0	0.0	Cruise					4.60%	0.00%	0.00%	South	0%	0				
Canfor	A15384	C52	EKL084	872.1	0.0	296.5	Cruise	811.1	2494.9	2,907.0	6,233.4	30.00%	0.00%	10.20%	South	13%	1168.614	19%	30%	0.000963727	40%
Canfor	A15384	C76	EKL087	0.0	0.0	0.0	Cruise	582.4		143.5	735.8	0.00%	0.00%	0.00%	South	79%	0		67%		0%
Canfor	A15384	G72	GER012	0.0	0.0	812.7	Cruise	41009.4	1952.1	19,349.8	62,367.3	0.00%	0.00%	4.20%	South	66%	812.6916	1%	57%	0.018501554	4%
Canfor	A15384	G73	GER021	0.0	0.0	0.0	Cruise	30588.8	216.2	2,374.3	33,320.4	0.00%	0.00%	0.00%	South	92%	0		78%		0%
Canfor	A15384	G83	GER022	0.0	0.0	322.9	Cruise	9722.8	455.8	3,471.7	13,656.0	0.00%	0.00%	9.30%	South	71%	322.8681	2%	63%	0.004454006	9%
Canfor	A15384	G83	GER027	0.0	0.0	0.0	Cruise	13099.7	9961.3	12,485.4	35,555.9	0.00%	0.00%	0.00%	South	37%	0		31%		0%
Canfor	A15384	H37	HOL004	0.0	0.0	201.1	Cruise	7013.5	772.9	10,582.0	18,660.6	0.00%	0.00%	1.90%	South	38%	201.058	1%	33%	0.003196363	2%
Canfor	A15384	H34	HOL005	672.8	0.0	1134.7	Cruise	219.6	3998.6	10,041.6	14,410.7	6.70%	0.00%	11.30%	South	2%	1807.488	13%	14%	0.001034318	18%
Canfor	A15384	H44	HOL006	333.9	0.0	289.3	Cruise	932.1	2890.8	11,128.5	15,017.9	3.00%	0.00%	2.60%	South	6%	623.196	4%	9%	0.000734177	6%
Canfor	A15384	H43	HOL008	376.4	0.0	428.5	Cruise		2738.8	5,790.5	8,576.8	6.50%	0.00%	7.40%	South	0%	804.8795	9%	9%	0.000417472	14%
Canfor	A15384	H37	HOL010	0.0	0.0	590.8	Cruise	1550.4	2852.5	6,284.6	10,818.5	0.00%	0.00%	9.40%	South	14%	590.7524	5%	18%	0.000989943	9%
Canfor	A15384	H43	HOL018	0.0	0.0	1481.3	Cruise	1379.6	8402.5	16,833.2	26,977.6	0.00%	0.00%	8.80%	South	5%	1481.3216	5%	10%	0.001376559	9%
Canfor	A15384	H45	HOL020	67.3	0.0	799.5	Cruise	437.5	2083	8,415.3	11,071.6	0.80%	0.00%	9.50%	South	4%	866.7759	8%	11%	0.000642459	10%
Canfor	A15384	H43	HOL021	0.0	0.0	885.6	Cruise	1472.4	2436	10,800.6	15,001.1	0.00%	0.00%	8.20%	South	10%	885.6492	6%	14%	0.00110851	8%
Canfor	A15384	D71	MAN004	424.7	0.0	560.1	Cruise	7743.9	1001.4	6,155.3	14,900.7	6.90%	0.00%	9.10%	South	52%	984.848	7%	51%	0.003924912	16%
Canfor	A15384	G68	MAN011B	0.0	0.0	0.0	Cruise	8040.1		885.1	8,925.2	0.00%	0.00%	0.00%	South	90%	0		77%		0%
Canfor	A15384	D71	MAN027	0.0	0.0	0.0	Cruise	3479.6	220.5	1,069.2	4,769.2	0.00%	0.00%	0.00%	South	73%	0		62%		0%
Canfor	A15384	D71	MAN028	150.9	0.0	286.3	Cruise	7807.2	3707	2,602.3	14,116.5	5.80%	0.00%	11.00%	South	55%	437.1864	3%	50%	0.00366876	17%
Canfor	A15384	D93	MAN029	0.0	0.0	376.0	Cruise	2587.2	4490.2	2,960.8	10,038.1	0.00%	0.00%	12.70%	South	26%	376.0216	4%	26%	0.001335666	13%
Canfor	A15384	D81	MAN034	0.0	0.0	0.0	Cruise	9340.2	60.9	3,850.9	13,292.2	0.00%	0.00%	0.00%	South	70%	0		60%		0%
Canfor	A15384	D81	MAN035	0.0	0.0	0.0	Cruise	678.5		28.5	707.0	0.00%	0.00%	0.00%	South	96%	0		82%		0%
Canfor	A15384	D81	MAN038	0.0	0.0	0.0	Cruise	4368.8		40.7	4,409.5	0.00%	0.00%	0.00%	South	99%	0		84%		0%
Canfor	A15384	D81	MAN039	420.9	0.0	687.9	Cruise	15106.3	1850.7	10,267.0	27,249.6	4.10%	0.00%	6.70%	South	55%	1108.836	4%	51%	0.007235121	11%
Canfor	A15384	D90	MAN053	0.0	0.0	0.0	Cruise	22841.4	64.2	5,456.8	28,378.9	0.00%	0.00%	0.00%	South	80%	0		68%		0%
Canfor	A15384	D90	MAN054	186.5	0.0	0.0	Cruise	14984.5	1982	5,329.1	22,316.8	3.50%	0.00%	0.00%	South	67%	186.5185	1%	58%	0.006703038	4%
Canfor	A15384	D82	MAN064	0.0	0.0	325.5	Cruise	37353.1	4916.6	13,561.1	55,855.5	0.00%	0.00%	2.40%	South	67%	325.4664	1%	57%	0.016636869	2%
Canfor	A15384	D82	MAN067	186.2	0.0	0.0	Cruise	14459.7	646.7	3,325.4	18,472.7	5.60%	0.00%	0.00%	South	78%	186.2224	1%	68%	0.006471513	6%
Canfor	A15384	D76	MAN069	0.0	0.0	0.0	Cruise	16987.3		1,555.2	18,562.2	0.00%	0.00%	0.00%	South	92%	0		78%		0%
Canfor	A15384	D76	MAN071	0.0	0.0	80.7	Cruise	3963	96.8	2,691.0	6,770.0	0.00%	0.00%	3.00%	South	59%	80.73	1%	51%	0.001789061	3%
Canfor	A15384	D72	MAN073	0.0	0.0	315.1	Cruise	4450.4	1436.3	1,864.6	7,751.3	0.00%	0.00%	16.90%	South	57%	315.1174	4%	53%	0.002125515	17%
Canfor	A15384	D96	MAN074	177.3	0.0	340.9	Cruise	17482	5651.6	13,637.6	36,776.2	1.30%	0.00%	2.50%	South	48%	518.2288	1%	42%	0.007976174	4%
Canfor	A15384	C74	MAN075	60.8	0.0	0.0	Cruise	31.3	110.3	90.9	232.5	66.90%	0.00%	0.00%	South	13%	60.8121	26%	38%	4.53412E-05	67%
Canfor	A87345	CK	NAT547	216.5	0.0	283.1	Cruise	16559.8	507.2	8,327.0	25,394.0	2.60%	0.00%	3.40%	South	65%	499.62	2%	57%	0.007559947	6%
Canfor	A15384	C72	RUP018	1454.2	0.0	711.6	Cruise		4791	3,867.6	8,658.6	37.60%	0.00%	18.40%	South	0%	2165.856	25%	25%	0.001123379	56%
Canfor	A15384	C72	RUP021	1163.4	0.0	1512.1	Cruise		9736.5	3,789.7	13,526.3	30.70%	0.00%	39.90%	South	0%	2675.5282	20%	20%	0.001387734	71%
Canfor	A87345	CL	SNT423	744.8	0.0	116.9	Cruise	12917.5		1,601.8	14,519.3	46.50%	0.00%	7.30%	South	89%	861.7684	6%	82%	0.006141985	54%
Canfor	A87345	CT	SNT462	0.0	0.0	48.1	Cruise	273.9	149.6	306.6	730.2	0.00%	0.00%	15.70%	South	38%	48.1362	7%	38%	0.000145723	16%
Canfor	A87345	BS	SNT466	0.0	0.0	0.0	Cruise	4073.4		72.3	4,145.8	0.00%	0.00%	0.00%	South	98%	0		84%		0%
ChuCho	A90829	7	BUR022	510		804	Cruise Data	8934	4564	4798	18296	10.63%	0.00%	16.76%	South	49%	1314	7%	49%	0.004620321	27%
ChuCho	A90829	H07	NAT01				Cruise Data	13945	303	2896	17144	0.00%	0.00%	0.00%	South	81%	0		69%		0%
ChuCho	A90829	H07	NAT02				Cruise Data	2833	0	941	3774	0.00%	0.00%	0.00%	South	75%	0		64%		0%

ChuCho	A90829	H08	NAT03	3085		3010	Cruise Data	7776	4269	11363	23408	27.15%	0.00%	26.49%	South	33%	6095	26%	54%	0.006589581	54%
ChuCho	A90829	H09	PP08	1861		345	Cruise Data	0	4066	6890	10956	27.01%	0.00%	5.01%	South	0%	2206	20%	20%	0.001144201	32%
ChuCho	A90829	K13	BOW032	863		954	Cruise Data	1380	495	7120	8995	12.12%	0.00%	13.40%	South	15%	1817	20%	33%	0.001550844	26%
ChuCho	A90829	K13	BOW033	364		944	Cruise Data	3057	1872	3057	7986	11.91%	0.00%	30.88%	South	38%	1308	16%	49%	0.002026185	43%
ChuCho	A90829	K14	PHI034	407		315	Cruise Data	103	5024	4,507.0	9,634.0	9.03%	0.00%	6.99%	South	1%	722	7%	8%	0.000419895	16%
ChuCho	A94309	H11	GAF06	80	195	2655	Cruise Data/Probe	5997	16367	14150	36514	0.57%	1.38%	18.76%	South	16%	2930	8%	22%	0.004163652	21%
Conifex	A15385	A25	7101	2191		393	Cruise	878	696	10312	11886	21.25%	0.00%	3.81%	North	7%	2584	22%	28%	0.000807735	25%
Conifex	A15385	A25	7102	485		311	Cruise	1328	739	3515	5582	13.80%	0.00%	8.85%	North	24%	796	14%	34%	0.000248822	23%
Conifex	A15385	A25	7105	1250		856	Cruise	0	1160	2411	3571	51.85%	0.00%	35.50%	North	0%	2106	59%	59%	0.000658316	87%
Conifex	A15385	A25	7113	682		1833	Cruise	310	114	8247	8671	8.27%	0.00%	22.23%	North	4%	2515	29%	32%	0.000786166	30%
Conifex	A15385	A25	7120	0		739	Cruise	0	0	2950	2950	0.00%	0.00%	25.05%	North	0%	739	25%	25%	0.000231005	25%
Conifex	A15385	A25	7174	1408		688	Cruise	160	707	5556	6423	25.34%	0.00%	12.38%	North	2%	2096	33%	35%	0.00065519	38%
Conifex	A15385	A25	7177 1	71		238	Cruise	175	270	531	976	13.37%	0.00%	44.82%	North	18%	309	32%	47%	9.65906E-05	58%
Conifex	A15385	A25	7177 2	202		0	Cruise	0	0	470	470	42.98%	0.00%	0.00%	North	0%	202	43%	43%	6.31434E-05	43%
Conifex	A15385	A25	7177 3	711		246	Cruise	97	445	1900	2442	37.42%	0.00%	12.95%	North	4%	957	39%	43%	0.000299149	50%
Conifex	A15385	A27	7122	843		1256	Cruise	0	2621	2275	4896	37.05%	0.00%	55.21%	North	0%	2039	43%	43%	0.000656128	92%
Conifex	A15385	A27	7123	593		1050	Cruise	0	3311	1919	5230	30.90%	0.00%	54.72%	North	0%	1643	31%	31%	0.000513587	86%
Conifex	A15385	A27	7124	6984		3294	Cruise	0	13213	11575	24788	60.34%	0.00%	28.46%	North	0%	10278	41%	41%	0.003212809	89%
Conifex	A15385	A30	6120	0		0	Cruise	16357	379	4898	21634	0.00%	0.00%	0.00%	North	76%	0		64%		0%
Conifex	A15385	A32	1401	0		0	Cruise	4247	32	677	4956	0.00%	0.00%	0.00%	North	86%	0		73%		0%
Conifex	A15385	A32	6104	0		0	Cruise	2734	62	856	3652	0.00%	0.00%	0.00%	North	75%	0		64%		0%
Conifex	A15385	B5P	5810 1	0			Probe					0.00%	0.00%	0.00%	South	0%	0				
Conifex	A15385	H14	1543	1129		1241	Cruise	12133	1998	6545	20676	17.25%	0.00%	18.96%	North	59%	2370	11%	61%	0.00074084	36%
Conifex	A15385	H15	1541	864		574	Cruise	9319	9506	12269	31094	7.04%	0.00%	4.68%	North	30%	1438	5%	30%	0.000449506	12%
Conifex	A15385	H39	1539	0		0	Cruise	8653	545	1736	10934	0.00%	0.00%	0.00%	North	79%	0		67%		0%
Conifex	A15385	H39	1540	0		241	Cruise	27623	5597	10628	43848	0.00%	0.00%	2.27%	North	63%	241	1%	54%	7.53344E-05	2%
Conifex	A15385	H41	4311	0		65	Cruise	3077	0	145	3222	0.00%	0.00%	44.83%	North	99%	65	2%	83%	2.03184E-05	45%
Conifex	A15385	H41	4312	0		109	Cruise	3298	140	686	4124	0.00%	0.00%	15.89%	North	80%	109	3%	71%	3.40724E-05	16%
Conifex	A15385	H43	5507	0		53	Cruise	8627	27	518	9172	0.00%	0.00%	10.23%	North	94%	53	1%	81%	1.65673E-05	10%
Conifex	A15385	H46	4301	410		0	Cruise	33497	1840	5179	40516	7.92%	0.00%	0.00%	North	83%	410	1%	71%	0.000128162	8%
Conifex	A15385	H49	5464	0		0	Cruise	2180	609	666	3455	0.00%	0.00%	0.00%	North	63%	0		54%		0%
Conifex	A15385	H52	4626	0		0	Cruise	2405	0	491	2896	0.00%	0.00%	0.00%	North	83%	0		71%		0%
Conifex	A15385	H54	4228	216		91	Cruise	4773	171	3968	8912	5.44%	0.00%	2.29%	North	54%	307	3%	49%	9.59654E-05	8%
Conifex	A15385	H54	4401	0		299	Cruise	7542	3563	10703	21808	0.00%	0.00%	2.79%	North	35%	299	1%	31%	9.34647E-05	3%
Conifex	A15385	H54	4702	0		198	Cruise	6950	1999	3669	12618	0.00%	0.00%	5.40%	North	55%	198	2%	48%	6.1893E-05	5%
Conifex	A15385	J41	5717	0		264	Cruise	27379	693	3024	31096	0.00%	0.00%	8.73%	North	88%	264	1%	76%	8.2524E-05	9%
Conifex	A15385	J43	5703	1488		3409	Cruise	4422	2061	17468	23951	8.52%	0.00%	19.52%	North	18%	4897	20%	36%	0.001530757	28%
Conifex	A15385	J46	4213	0		0	Cruise	4315	297	2068	6680	0.00%	0.00%	0.00%	North	65%	0		55%		0%
Conifex	A15385	J46	4225	0		0	Cruise	4971	553	684	6208	0.00%	0.00%	0.00%	North	80%	0		68%		0%
Conifex	A15385	J46	4703	0		0	Cruise	3552	67	584	4203	0.00%	0.00%	0.00%	North	85%	0		72%		0%
Conifex	A15385	J46	4708	0		0	Cruise	1893	0	0	1893	0.00%	0.00%	0.00%	North	100%	0		85%		
Conifex	A15385	J56	6722	107		0	Cruise	46205	2177	4209	52591	2.54%	0.00%	0.00%	North	88%	107	0%	75%	3.34472E-05	3%
Conifex	A15385	J57	6404	211		274	Cruise	3137	3499	5684	12320	3.71%	0.00%	4.82%	North	25%	485	4%	26%	0.000151607	9%
Conifex	A15385	J57	6415	156		217	Cruise	10173	4142	8475	22790	1.84%	0.00%	2.80%	North	45%	393	2%	40%	0.000122848	5%
Conifex	A15385	J57	6701	0		0	Cruise	2106	1313	1351	4770	0.00%	0.00%	0.00%	North	44%	0		38%		0%
Conifex	A15385	J57	6708	0		0	Cruise	6475	1283	1184	8942	0.00%	0.00%	0.00%	North	72%	0		62%		0%
Conifex	A15385	J57	6709	122		212	Cruise	14614	3332	6039	23985	2.02%	0.00%	3.51%	North	61%	334	1%	53%	0.000104405	6%
Conifex	A15385	J59	4304	0		1457	Cruise	4427	7526	8003	19956	0.00%	0.00%	18.21%	North	22%	1457	7%	26%	0.000455445	18%
Conifex	A15385	J59	4701	0		88	Cruise	3545	1479	1113	6137	0.00%	0.00%	7.91%	North	58%	88	1%	51%	2.7508E-05	8%
Conifex	A15385	J62	4707	0		0	Cruise	3294	2044	974	6312	0.00%	0.00%	0.00%	North	52%	0		44%		0%
Conifex	A15385	J62	6748	0		393	Cruise	11521	2177	4579	18277	0.00%	0.00%	8.58%	North	63%	393	2%	56%	0.000122848	9%
Conifex	A15385	K14	4524	0		131	Cruise	11221	3556	6540	21317	0.00%	0.00%	2.00%	North	53%	131	1%	45%	4.09494E-05	2%
Conifex	A15385	K14	5506	69		158	Cruise	1380	0	1150	2530	6.00%	0.00%	13.74%	North	55%	227	9%	55%	7.09581E-05	20%
Conifex	A15385	K14	5507	0		227	Cruise	6173	0	1354	7527	0.00%	0.00%	16.77%	North	82%	227	3%	73%	7.09581E-05	17%
Conifex	A15385	K14	5510	0		257	Cruise	1324	215	697	2236	0.00%	0.00%	36.87%	North	59%	257	11%	62%	8.03358E-05	37%
Conifex	A15385	K14	5520	195		53	Cruise	601	0	507	1108	38.46%	0.00%	10.45%	North	54%	248	22%	68%	7.75225E-05	49%
Conifex	A15385	K17	6400	0		257	Cruise	16810	0	6307	23117	0.00%	0.00%	4.07%	North	73%	257	1%	63%	8.03358E-05	4%
Conifex	A15385	K17	6402	0		0	Cruise	590	0	191	781	0.00%	0.00%	0.00%	North	76%	0		64%		0%
Conifex	A15385	K17	6407	0		0	Cruise	8879	305	2313	11497	0.00%	0.00%	0.00%	North	77%	0		66%		0%
Conifex	A15385	K17	6527	634		494	Cruise	36891	997	8862	46750	7.15%	0.00%	5.57%	North	79%	1128	2%	69%	0.000352602	13%
Conifex	A15385	K17	6529	198		0	Cruise	11136	3488	2630	17254	7.53%	0.00%	0.00%	North	65%	198	1%	56%	6.1893E-05	8%
Conifex	A15385	K17	6706	0		409	Cruise	6737	1164	1965	9866	0.00%	0.00%	20.81%	North	68%	409	4%	62%	0.00012785	21%
Conifex	A15385	K19	6505	945		808	Cruise	31074	1519	16132	48725	5.86%	0.00%	5.01%	North	64%	1753	4%	58%	0.000547972	11%
Conifex	A15385	K19	6526	0		0	Cruise	17919	0	2995	20914	0.00%	0.00%	0.00%	North	86%	0		73%		0%
Conifex	A15385	K19	6541	0		0	Cruise	12177	0	2130	14307	0.00%	0.00%	0.00%	North	85%	0		72%		0%
Conifex	A15385	K20	4625	395		189	Cruise	17434	1447	5638	24519	7.01%	0.00%	3.35%	North	71%	584	2%	63%	0.000182553	10%
Conifex	A15385	K23	5519	0		0	Cruise	2877	541	433	3851	0.00%	0.00%	0.00%	North	75%	0		64%		0%
Conifex	A15385	K24	4219	359		0	Cruise	6524	2965	3364	12853	10.67%	0.00%	0.00%	North	51%	359	3%	46%	0.00011222	11%
Conifex	A15385	K24	6535	306		1496	Cruise	33660	5875	29097	68632	1.05%	0.00%	5.14%	North	49%	1802	3%	44%	0.000563289	6%
Conifex	A15385	M37	3507	3049		699	Cruise	12214	880	13915	27009	21.91%	0.00%	5.02%	North	45%	3748	14%	52%	0.00117159	27%
Conifex	A15385	M48	5604	480		1615	Cruise	10531	2440	6819	19790	7.04%	0.00%	23.68%	North	53%	2095	11%	56%	0.000654878	31%
Conifex	A15385	M52	6027	78		42	Cruise	491	0	1261	1752	6.19%	0.00%	3.33%	North	28%	120	7%	31%	3.75109E-05	10%
Conifex	A15385	P42	5810 4	1049		994	Cruise	192	1888	4874	6954	21.52%	0.00%	20.39%	South	3%	2043	29%	32%	0.001144305	42%
Conifex	A15385	P43	5810 5	86		372	Cruise	7463	1968	3375	12806	2.55%	0.00%	11.02%	South	58%	458	4%	53%	0.003527806	14%
Conifex	A15385	P44	5812	72		80	Cruise	6352	0	1173	7525	6.14%	0.00%	6.82%	South	84%	152	2%	73%	0.002791103	13%
Conifex	A15385	P68	3347	0		32	Cruise	3771	1336	1918	7025	0.00%	0.00%	1.67%	South	54%	32	0%	46%	0.001679138	2%
Conifex	A15385	P71	4222	0		0	Cruise	62374	3016	9605	74995	0.00%	0.00%	0.00%	South	83%	0		71%		0%
Conifex	A15385	P73	3332	550		0	Cruise	15005	236	5384	20625	10.22%	0.00%	0.00%	South	73%	550	3%	65%	0.006900605	10%
Conifex	A15385	P73	3333	456		412	Cruise	3874	486	2436	6796	18.72%	0.00%	17.73%	South	57%	868	13%	62%	0.002168536	36%
Conifex	A15385	P76	5808	0		0	Cruise	9240	302	2635	12177	0.00%	0.00%	0.00%	South	76%	0		64%		0%
Conifex	A15385	P83	5820	675		3612	Cruise	2106	2305	8464	12875	7.97%	0.00%	42.67%	South	16%	4287	33%	47%	0.003152051	51%
Conifex	A15385	P83	5821	5811		2427	Cruise	6053	6891	48795	61739	11.91%	0.00%	4.97%	South	10%	8238	13%	22%	0.006941477	17%
Conifex	A15385	P84	4234	0		86	Cruise	5296	206	1432	6934	0.00%	0.00%	6.01%	South	76%	86	1%	66%	0.002379482	6%
Conifex	A15385	P89	6802	0		0	Cruise	12186	54	3468	15708	0.00%	0.00%	0.00%	South	78%	0		66%		0%
Conifex	A15385	P89	6809	0		57	Cruise	16821	949	1755	19525	0.00%	0.00%	3.25%	South	86%	57	0%	74%	0.007445527	3%
Conifex	A15385	P92	BUR464	86		0	Cruise	15819	714	1392	17925	6.18%	0.00%	0.00%	South	88%	86	0%	75%	0.007018812	6%
Conifex	A15385	P92	BUR465	0		0	Cruise	18043	0	626	18669	0.00%	0.00%	0.00%	South	97%	0		82%		0%
Conifex	A15385	P92	BUR467	0		0	Cruise	19480	0	74	19554	0.00%	0.00%	0.00%	South	100%	0		85%		0%
Conifex	A15385	P92	BUR468	0		0	Cruise	6929	0	145	7074	0.00%	0.00%	0.00%	South	98%	0		83%		0%
Conifex	A15385	P94	6332	0		0	Cruise	4145	120	482	4747	0.00%	0.00%	0.00%	South	87%	0		74%		0%
Conifex	A15385	P95	7301	0		0	Cruise	41287	312	1783	43382	0.00%	0.00%	0.00%	North	95%	0		81%		0%
Conifex	A15385	P96	7131	899		186	Cruise	0	1738	3548	5286	25.34%	0.00%	5.24%	South	0%	1085	21%	21%	0.000562764	31%
Conifex	A15385	P96	7132	1584		930	Cruise	0	1372	4163	5535	38.05%	0.00%	22.34%	South	0%	2514	45%	45%	0.001303953	60%
Conifex	A15385	P96	7136	159		140	Cruise	439	206	1438	2083	11.06%	0.00%	9.74%	South	21%	299	14%	32%	0.000348629	21%
Conifex	A15385	P96	7137	0		0	Cruise	283	221	1510	2014	0.00%	0.00%	0.00%	South	14%	0		12%		0%
Conifex	A15385	P96	7139	0		71	Cruise	0	46	501	547	0.00%	0.00%	14.17%	South	0%	71	13%	13%	3.68261E-05	14%
Conifex	A15385	P96	7140	0		0	Cruise	0	211	113	324	0.00%	0.00%	0.00%	South	0%	0		0%		0%
Conifex	A15385	P96	5811 1	264		687	Cruise	937	0	3670	4607	7.19%	0.00%	18.72%	South	20%	951	21%	38%	0.000906362	26%
Conifex	A15385	P96	5811 2	228		663	Cruise	1809	46	2761	4616	8.26%	0.00%	24.01%	South	39%	891	19%	53%	0.001259684	32%
Conifex	A15385	P97	1403	0		113	Cruise	2787	62	2225	5074	0.00%	0.00%	5.08%	North	55%	113	2%	49%	3.53228E-05	5%
Conifex	A15385	P98	7133	0		68	Cruise	205	1468	4517	6190	0.00%	0.00%	1.51%	South	3%	68	1%	4%	0.000125649	2%
Conifex	A15385	P99	7200	0		223	Cruise	4708	2336	7796	14840	0.00%	0.00%	2.86%	North	32%	223	2%	28%	6.97078E-05	3%
Conifex	A93631	J58	1536	436		0	Cruise	21759	765	5855	28379	7.45%	0.00%	0.00%	North	77%	436	2%	67%	0.00013629	7%
Conifex	A93631	J58	6706A	184		1130	Cruise	51154	5592	25989	82735	0.71%	0.00%	4.35%	North	62%	1314	2%	54%	0.000410744	5%
Conifex	A93631	K16	5513	0		247	Cruise	10248	3419	3549	17216	0.00%	0.00%	6.96%	North	60%	247	1%	52%	7.72099E-05	7%
											4,181,299										

Row Labels	Sum of Gross Pli (m3)	Sum of Gross Sx (m3)	Sum of Gross Bl (m3)	Total Vol
North	**765,842**	**480,166**	**208,766**	**1,454,774**
BCTS	78,864	137,935	88,501	305,300
Conifex	686,978	342,231	120,265	1,149,474
South	**1,447,751**	**879,124**	**392,689**	**2,719,565**
BCTS	423,422	194,248	148,297	765,967
Canfor	761,682	508,900	181,653	1,452,236
ChuCho	44,025	55,722	36,960	136,707
Conifex	218,622	120,254	25,779	364,655
Grand Total	**2,213,593**	**1,359,290**	**601,455**	**4,174,339**

	MPB Vol	% of total harvest	Sx Beetle	% of total harvest
Conifex	751,288		78,864	
Chucho	40,691		16,392	
1,650,836	**791,979**	**48%**	**95,256**	**6%**

% pli attacked **83%**

Assume 85% of Pli vol is attacked

TSA all blocks

Row Labels	Sum of Gross Pli (m3)	Sum of Gross Bl (m3)	Sum of Gross Sx (m3)	Sum of Total (m3)	Sum of Total Dead Sx	Average of Green %	Average of Red %	Average of Grey %	Average of % dead all
North	**765,842**	**208,766**	**480,166**	**1,456,090**	**87,289**	**7.4%**	**0.0%**	**9.4%**	**53%**
BCTS	78,864	88,501	137,935	306,616	31,181	7.6%	0.0%	9.7%	41%
Conifex	686,978	120,265	342,231	1,149,474	56,108	7.4%	0.0%	9.3%	54%
South	**1,447,751**	**392,689**	**879,124**	**2,725,209**	**132,986**	**6.0%**	**0.0%**	**6.2%**	**52%**
BCTS	423,422	148,297	194,248	766,727	17,448	2.0%	0.0%	4.0%	50%
Canfor	761,682	181,653	508,900	1,457,120	76,390	7.0%	0.0%	6.0%	53%
ChuCho	44,025	36,960	55,722	136,707	16,392	10.9%	0.2%	13.1%	41%
Conifex	218,622	25,779	120,254	364,655	22,756	6.3%	0.0%	7.5%	50%
Grand Total	**2,213,593**	**601,455**	**1,359,290**	**4,181,299**	**220,275**	**6.4%**	**0.0%**	**7.2%**	**52%**

TSA non-pine leading

Pli %	(Multiple Items)

Row Labels	Sum of Gross Pli (m3)	Sum of Gross Bl (m3)	Sum of Gross Sx (m3)	Sum of Total (m3)	Sum of Total Dead Sx	Average of Green %	Average of Red %	Average of Grey %	Average of % dead all
North	**128,347**	**147,161**	**281,471**	**557,496**	**67,642**	**15.4%**	**0.0%**	**14.9%**	**34%**
BCTS	33,200	83,184	113,788	230,689	26,456	8.8%	0.0%	10.0%	22%
Conifex	95,147	63,977	167,683	326,807	41,186	17.1%	0.0%	16.2%	37%
South	**217,774**	**312,259**	**613,283**	**1,146,367**	**114,656**	**10.3%**	**0.0%**	**10.9%**	**27%**
BCTS	52,316	107,740	138,320	298,727	14,182	3.1%	0.0%	5.9%	19%
Canfor	126,187	151,470	338,724	619,081	63,635	12.8%	0.0%	11.3%	29%
ChuCho	27,247	36,657	51,885	115,789	16,392	14.1%	0.2%	16.9%	34%
Conifex	12,024	16,392	84,354	112,770	20,447	10.1%	0.0%	12.6%	27%
Grand Total	**346,121**	**459,420**	**894,754**	**1,703,863**	**182,298**	**11.8%**	**0.0%**	**12.0%**	**29%**

Sx green attack >9%

Green %	(Multiple Items)

Row Labels	Sum of Gross Pli (m3)	Sum of Gross Bl (m3)	Sum of Gross Sx (m3)	Sum of Total (m3)	Sum of Total Dead Sx	Average of Green %	Average of Red %	Average of Grey %	Average of % dead all
North	**49,396**	**72,712**	**133,976**	**256,207**	**53,015**	**28.3%**	**0.0%**	**19.6%**	**44%**
BCTS	15,286	43,707	69,181	128,297	23,220	19.5%	0.0%	14.0%	38%
Conifex	34,110	29,005	64,795	127,910	29,795	30.2%	0.0%	20.8%	45%
South	**177,381**	**143,747**	**326,391**	**648,519**	**90,541**	**23.5%**	**0.0%**	**12.7%**	**43%**
BCTS	31,981	14,802	45,756	92,782	8,642	11.0%	0.0%	5.2%	34%
Canfor	98,587	95,838	172,262	367,444	52,820	29.3%	0.0%	13.3%	48%
ChuCho	21,250	20,290	37,735	79,275	13,462	16.3%	0.0%	16.6%	36%
Conifex	25,563	12,817	70,638	109,018	15,617	19.5%	0.0%	11.5%	40%
Grand Total	**226,777**	**216,459**	**460,367**	**904,726**	**143,556**	**25.0%**	**0.0%**	**14.8%**	**43%**