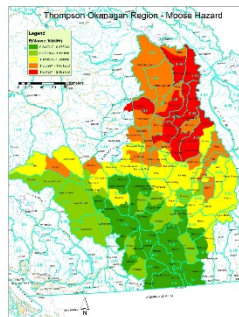
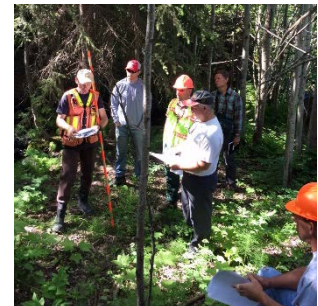


Moose and Watershed Stewardship Pilot Project Criss Creek, Tranquille River and Jamieson Creek Watersheds

Final Plan - April 5, 2016

Recommended for approval by Tripartite Working Group on Dec 9, 2015
Ratified by the Tripartite Working Group on April 5, 2016



Content created by the Tripartite Working Group. Process facilitated by, and content collated and captured by:

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Executive Summary

A Tripartite Working Group (TWG) consisting of representation from Secwepemc governments and organizations, the provincial government, the forest industry and BC Timber Sales worked collaboratively from November 2014 to December 2015 to create this plan for three watersheds northwest of Kamloops. Known as the *Moose & Watershed Stewardship Pilot Project*, the three main goals were generated by the TWG at their first meeting:

- Goal 1 - improved land and resource management planning
- Goal 2 - improved communications, relationships and trust
- Goal 3 - improved resource management

Over the course of 13 months, the Tripartite Working Group met for 12 half day meetings and one field tour, and was supported by a Moose Subcommittee (3 half day meetings), a Hydrology Subcommittee (2 half day meetings), and one joint meeting of the Moose and Hydrology Subcommittees. All TWG and subcommittee meetings were facilitated by an impartial third party, the Fraser Basin Council.

Section 1 of the plan contains background information on the plan area, First Nations rights, other authorizations and laws and existing plans. Section 2 of the plan contains background information on the critical issues in the plan area, focusing on moose, water, habitat connectivity, other issues and cumulative effects assessment. Content for the chapters in Sections 1 & 2 were generated by volunteer members of the TWG.

Section 3 of the plan contains Resource Management Commitments that were discussed in detail at the TWG meetings. Most of the content has been agreed to by consensus; it is noted where no agreement was reached. **Section 3 of the plan is where the reader should focus his or her attention to understand the commitments made that will be implemented by the forest industry and BCTS within the plan area.** These are commitments over and above what is required by legislation and the current content of forest stewardship plans.

Key commitments from Section 3 for moose include the following:

- Identification of moose polygons (areas of high densities of wetlands and deciduous stands) with enhanced management measures for moose habitat
- Commitment to maintain 40% of moose polygons as thermal cover (conifer, $\geq 15\text{m}$ in height, $\geq 5\text{ ha}$ in size) with a spatial distribution over a moose home range of 10km^2
- Commitment to maintain 40% of areas outside of moose polygons as thermal cover, with a spatial distribution over one of 22 sub-basins in the plan area
- Identification of key habitat elements for moose (wetlands and lakes $\geq 1\text{ ha}$, wetland complexes) and partial cutting requirements in a 200m management zone surrounding them
- Commitments around maintaining thermal cover within 400m of new harvesting
- Commitments around permanent roads in proximity to key habitat elements, and around temporary roads in relation to blocking access and the need for rehabilitation
- Agreement to manage brush differently, respecting the forage values for moose

Key commitments from Section 3 for hydrology and riparian values include the following:

- Commitments for enhanced retention on streams, with a number of criteria to consider, including the recommendation to map and identify fans and floodplains where more retention is desirable
- Best practices for road building and maintenance for permanent roads
- Commitments for prompt reforestation and retention of regeneration to intercept snow and hasten hydrologic recovery, and retention of logging slash in some riparian areas to retain soil moisture
- Hire a hydrologist to assess several hydrology parameters and recommend retention strategies by 3 watersheds and 22 sub-basins

Section 3 also contains a recommendation to create an access management plan, addressing multiple goals, using multiple approaches, and with a list of desired deliverables.

The Tripartite Working Group agreed by consensus to recommend this final draft plan for approval at their meeting of December 9, 2015. Approval steps are outlined in Chapter 18. The plan is proposed to be implemented by April 1, 2016.

The Tripartite Working Group ratified this plan on April 5, 2016.

This document, and all related maps and background, can be found online at:

<https://www.for.gov.bc.ca/dka/Moose%20and%20Water%20Values%20Stewardship%20Pilot/MWVSP%20main%20page.html>

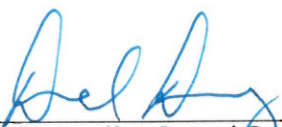
Ratification and Commitment

We, the members of the Moose-Watershed Tripartite Working Group, hereby approve and ratify the Moose and Watershed Stewardship Pilot Project Plan for Criss Creek, Tranquille River and Jamieson Creek Watersheds. Implementation will begin immediately.

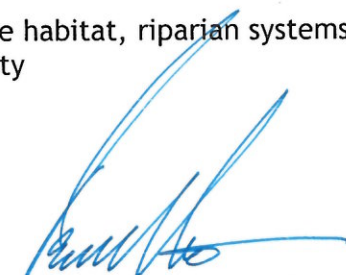
We commit to working together to implement this plan; to conduct ourselves consistent with the plan, and follow the plan's guidance, and to use a continuous improvement approach, so that the plan objectives and outcomes can be realized:

- Improved land and resource management planning - utilize landscape and watershed/basin approach; use best info, tools and emerging research; incorporate Secwepemc values
- Improved communications, relationships and trust - amongst the province, Secwepemc communities, the forest industry and resource professionals, leading to shared decision making
- Improved resource management - of moose habitat, riparian systems and functioning, access while maintaining forest productivity

Ratified April 5, 2016, in Kamloops BC, by:



Counsellor Darrel Draney, Skeetchestn Indian Band and Responsible Official for the signatory communities to the Secwepemc Reconciliation Framework Agreement
Co-Sponsor



Rick Sommer *RPF*
Thompson Rivers Forest District (FLRNO)
Co-Sponsor



Mark Eikland
Chief of Staff for the signatory communities of the Secwepemc Reconciliation Framework Agreement



Marino Bordin *RPF*
Interfor Corp.



Michael Bragg, *RPF*
Tolko Industries Ltd.



Rob Ballinger, *RPF*
West Fraser



Zoran Boskovic, *RPF*
BC Timber Sales, Kamloops TSO (FLNRO)

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List of Acronyms

Acronyms are explained in the text on the first occurrence; common ones are listed here:

AMP - access management plan
BCTS - BC Timber Sales
BEC - biogeoclimatic ecosystem classification
CEA - cumulative effects assessment
CP - cutting permit
CRMZ - cultural resource management zone
ESSF - Englemann Spruce Sub-alpine Fir (a BEC zone)
FRPA - Forest and Range Practices Act
FSP - forest stewardship plan
IDF - Interior Douglas-fir (a BEC zone)
LRMP - land and resource management plan
MFLNRO (or FLNR) - Ministry of Forests, Lands and Natural Resource Operations
MS - Montane Spruce (a BEC zone)
OGMA - old growth management area
RFA - Reconciliation Framework Agreement
RMA - riparian management area
RMZ - riparian management zone
RRZ - riparian reserve zone
TSL - timber sale licence
TWG - tripartite working group

Acknowledgements

The Moose and Watershed Stewardship Pilot is a tripartite collaborative initiative of representatives from Government, Forest Industry and Secwepemc First Nation (see individual names in Appendix 1 Terms of Reference). The working group each contributed to the costs of the pilot, and members provided significant in-kind contributions of time and travel related expenses. The Tripartite Working Group would also like to acknowledge the contributions of numerous experts and presenters who shared their technical knowledge, which greatly assisted in the development of this plan.

Chapter 1 - Context, goals, objectives of plan, and limitations

Context

This collaborative pilot project, and the development of this plan, is a tangible, specific initiative of the Secwepemc Reconciliation Framework Agreement (RFA) dated April 10, 2013.

The process of developing this plan will likely contribute towards the larger purpose of the RFA:

2.2 d) of the RFA is to foster a positive and respectful government-to-government relationship based on a common understanding of all Parties' respective interests.

2.2 e) "support dialogue and increase understanding between the Parties on Secwepemc Cultural Heritage Resources".

Goals and objectives of the plan are as follows:

Goal 1 - Improved land and resource management planning

Objectives

- Utilize a watershed, basin and/or landscape approach to issues
- Improve understanding and implementation of best practices, new and old information, and application of various tools (e.g., cumulative effects assessment, emerging research)
- Incorporate Secwepemc values and views of stewardship, land and resource management, leading to co-management/shared decision making
- Identify and address information gaps
- The plan is implemented by multiple resource ministries

Goal 2 - Improved communications, relationships and trust

Objectives

- Improved relationships and trust amongst the tripartite membership
- Create more efficient, less resource intense referral process

Goal 3 - Improved resource management

Objectives

- Maintain or restore habitat connectivity and cover to support moose populations and other wildlife species
- Maintain or improve watershed function including riparian habitat and function, stream channel stability/resilience, fish habitat/passage, water quality, flow, and sediment.)
- Manage access to address moose and watershed values including consideration to 'no net road gain', and decreased access.
- Maintain forest productivity

See Section 3 of this plan for commitments on how to achieve these objectives.

Chapter 2 – Tripartite Working Group

A tripartite working group, with representation from Secwepemc communities, provincial government and the forest industry, met monthly from November 2014 to December 2015 to develop this collaborative plan.

The purpose of the Working Group is to collaboratively develop a coordinated plan that all participants support and agree to follow to ensure stewardship of moose and watershed values in the pilot area.

The objectives of the Working Group are

- To foster improved management of moose habitat, access and watershed values within the pilot area, which may inform stewardship throughout Thompson Rivers District and beyond
- To improve working relationships, communications and information exchange among the parties

See terms of reference (Appendix 1) or refer to the MWSP Working Group public website <https://www.for.gov.bc.ca/dka/> click on “Moose & Watershed Stewardship Pilot” on the left hand side, or go directly [here](#), which includes meeting summaries and plan related resources.

Chapter 3 – Engagement, Consultation and Referral Process

Although this draft plan is being collaboratively created by the Tripartite Working Group, it is recognized that what is decided by this group “at the table” may have impacts on the following:

- other orders of government who may have jurisdiction over this plan area
- other first nations who assert rights and title
- other authorization holders, stakeholders, and interest groups including the general public. (see chapter 6)

The following orders of government have been informed/will continue to be informed of this planning process as described below:

- **Secwepemc RFA:** Members of the Secwepemc RFA are members of the MWSP Tripartite Working Group. Secwepemc RFA responsible officials, Darrell Draney and Tracy Ronmark (previously Greg Perrins), will ensure good communication to Senior Council on the progress of the MWSP. Natural Resource Technical Committee Co-Chairs, Mark Eikland and John McQueen, will ensure good communication to NRTC on the progress of the MWSP. Each Secwepemc representative on the MWSP Working Group will ensure that their respective Chief and Council and administration are regularly informed about the MWSP. Mike Anderson and Jim McGrath will ensure that their First Nation’s respective forestry businesses are regularly informed about the collaborative decision making progress of the MWSP.
- **Other Secwepemc Nation Bands (Non-RFA):** Secwepemc First Nations that are not part of the Secwepemc RFA have an interest in the MWSP (Simpchw, Bonaparte, Neskonlith and Whispering Pines Clinton Indian Band). This was discussed at the NRTC meeting of January 21, 2015. A letter was sent to all Secwepemc First Nations not part of the Secwepemc RFA on February 23, 2015.
- **Other provincial government agencies:** There is a need for good communication between Provincial Ministries: Ministry of Forests, Lands and Natural Resource Operations (MFLNRO); Ministry of Environment (MOE -Parks); Ministry of Energy, Mines and Natural Gas (MEM). This can be achieved by communicating at the Interagency Management Team. Good communication within FLNR is being achieved through representation of staff from different business lines on the MWSP Working Group, and periodic updates to Resource Management Team (RMT)
- **Federal Government:** Communicate federally with Fisheries and Oceans Canada (DFO) pertaining to watershed issues especially related to salmon

Individuals or corporations that have been granted rights for land or resource management or use (see chapter 6) have been sent a letter and map outlining the planning process, the plan area, and providing contact information for them to follow up with comments or concerns.

Transparency and Public Website: Ensuring transparency of this planning process was a commitment that the Tripartite Working Group made early on. All Tripartite Working Group resources including meeting summaries are posted on the Thompson Rivers District public website <http://www.for.gov.bc.ca/dka/> - click on “Moose & Watershed Stewardship Pilot” on the left hand side, or go directly [here](#). The website has an email communication link to an MFLNRO contact to enable feedback.

It was acknowledged within the Terms of Reference (Appendix 1) that once the Tripartite Working Group has reached agreement that the approval steps will be as follows, ideally concurrently:

- Approval steps as per the RFA
- Secwepemc communities - each community is responsible to determine their own approach
- BC Timber Sales (BCTS) - approval by management
- Forest licensees, First Nations Woodland Licences - approval by management

SECTION 1 - The Plan Area

The purpose of this section of the plan is to simply describe the plan area; what First Nations rights are asserted, what laws apply, what existing plans are in place, what authorizations have been granted over the pilot project area.

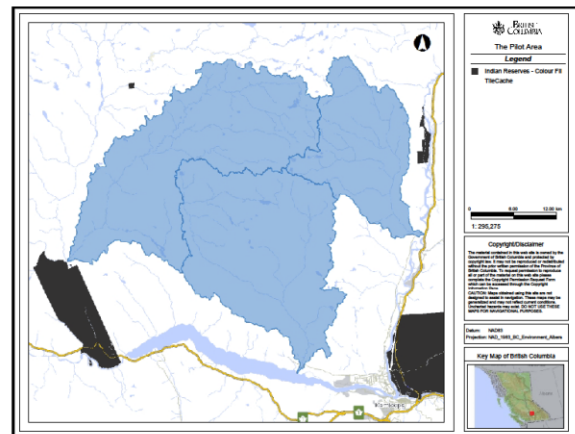
Chapter 4 - Description of the Area

The Pilot Area for the Moose and Watershed Stewardship Pilot (MWSP) is located north of Kamloops Lake. The western most tip of the Pilot Area almost touches the north side of Skeetchestn IR 1, and the eastern side of the Pilot Area is approximately 7.5 km west of Tk'emlups te Secwepemc IR 1 (Figure 1, at right).

The Pilot Area encompasses three watersheds:

Watershed	Gross area (ha)
Criss Creek	47 725.2
Jamieson Creek	23 912.1
Tranquille River	44 240.5
Total	115 877.8

These watersheds are part of Secwepemc traditional territory, and are designated as primarily Crown Land, although there are some fee simple properties in each Watershed.



Ecoregion and Eco-sections

The Pilot Area is primarily within the Thompson-Okanagan Plateau Ecoregion, and is comprised primarily of the Tranquille Upland Ecosection (TRU), with minor overlap to the north with the Cariboo Plateau Ecosection and, at lower elevations, with the Thompson Basin Ecosection (THB). Provincial Parks and Protected Areas that overlap with the Pilot Area are: Lac Du Bois Porcupine Meadows, Tsintsunko Lakes. The following descriptions of the THB and TRU are from the public government website:

<http://www.env.gov.bc.ca/ecology/ecoregions/dryeco.html>.

The **THB** is a warm and exceptionally dry, broad low elevation basin, one of its characteristics is the cream-coloured silt cliffs, remnants of stagnated glacial ice and the ponding of silt-filled lakes during the waning of past ice ages. Elsewhere deep deposits of sand and gravel indicate where fast moving streams enter the glacial lakes and dropped their load of coarser materials. Volcanic rocks are common on the upland.

In the summer this basin has high temperatures and strong convective currents; skies over the valleys in summer are often free of clouds, even though there is extensive cloud cover over the adjacent uplands. There are occasional irruptions of hot, dry air from the Great Basin in the summer. In winter and early spring, there are frequent outbreaks of cold, dense Arctic air because there is no effective barrier in the north. That cold air can get trapped in the large basins once the eastward flow of moist air resumes, causing the valleys to be much cloudier

than the uplands. When the cold air fills a valley and is subsequently capped with warmer moister air, deep inversions and prolonged periods of cold weather at middle and low altitudes results. Much of the basin has been settled or developed into livestock and hay production and inter-community roads are extensive.

TRU has a rolling upland that has a plateau-front with steep sides on the south and east, but towards the north and west it grades onto the Cariboo Plateau and Cariboo Basin. It is the northern portion of the Thompson Plateau physiographic unit. It has thick basaltic lava beds that have been buried under extensive glacial debris, and which has been highly eroded along the south side above the Thompson River valley. Many lakes now fill the glacial depressions. This ecosection is drained by: the upper segments of: Deadman and Tranquille streams, as well as Criss, Watching, Jamieson and Wentworth streams.

The climate is moist and cool, except during the summer months, which can be warm and dry. Pacific frontal systems reach this area via the open Chilcotin to the northwest or the Fraser canyon to the southwest. Cold Arctic air can irrupt across the Cariboo moving southward and imbed this ecosection with very cold conditions. The extensive lodgepole pine forests have been severely impacted by the recent mountain pine beetle outbreak. Logging with its attendant roads has been extensive across this upland area. While not extensive, hay farming has occurred in the Tranquille Creek and Deadman River valleys. Free ranging cattle have been allowed to graze much of the upland.

Biogeoclimatic Zones (BEC)

The following BEC information was drawn from the Selkirk College Website at <http://selkirk.ca/discover/bec/zones/BG.html> - please see this website for more details.

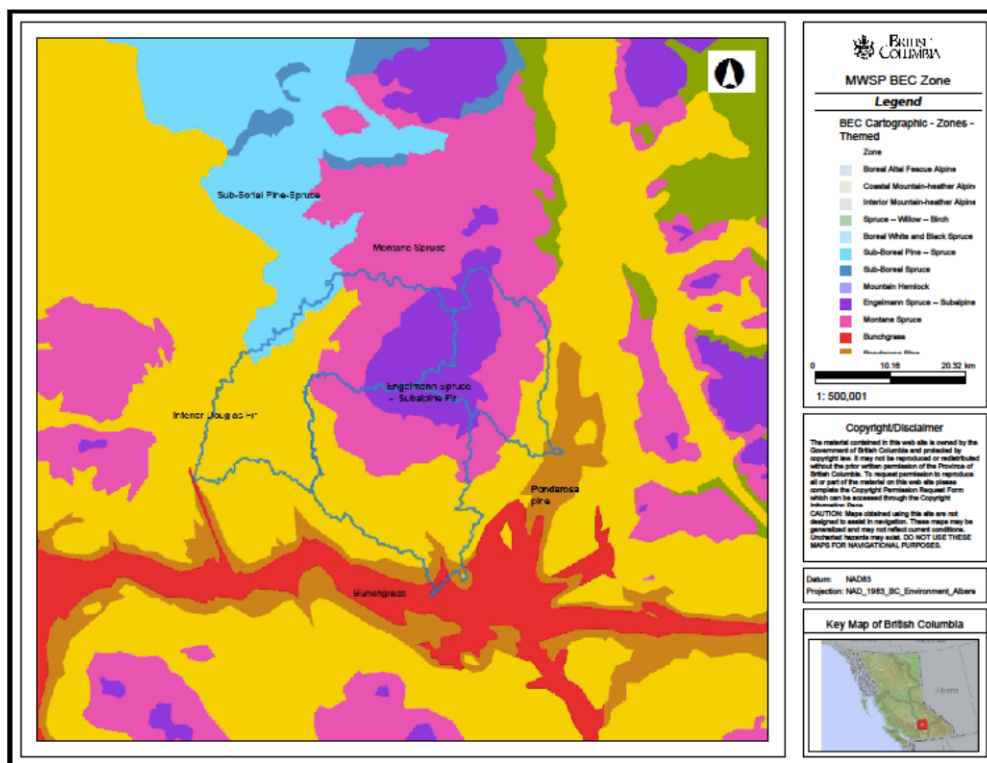


Figure 2. BEC Zones pertaining to the Pilot Area

Bunchgrass Zone (BG): The BG Zone (shown in red in Figure 2) has only minor overlap with the Pilot Area, with contours ranging from 340 metres (on Kamloops Lake) to 660 metres.

The BG Zone is located at the lowest elevations of the driest and hottest interior valleys such as the Thompson. The BG Zone generally grades directly into Ponderosa Pine or Interior Douglas Fir.

Features of the BG Zone include:

- The climate consists of dry, hot summers with a water deficit and cold winters. Mean annual precipitation ranges from 242mm - 328mm, and mean annual temperatures range from 5.8C to 9.2C;
- Plant species in the grasslands can be found in 'A Guide for Site Identification and Interpretation in the Kamloops Forest Region' (Lloyd et. al. 1990);
- Due to the narrow geographic range that this zone occupies and its unique climate, a large number of rare or endangered plants and animals occur here such as the badger and the western rattlesnake;
- Cattle grazing, agriculture, recreation and human habitation are some of the most common uses of this zone. Lack of continuous forest cover in this zone limits forestry activities.

The Ponderosa Pine Zone (PP): The PP Zone (shown in Light Brown in Figure 2) has only a minor overlap with the Pilot Area, with contours ranging from 360 metres (lower part of Jamison) to 1300 metres (near Tranquille Creek Road).

The PP Zone occurs in valley bottoms above the BG zone (where present), and is situated beneath the IDF zone. Features of the PP Zone include:

- The driest forested zone in the province with mean annual precipitation ranges between 250mm - 400mm and the mean annual temperature ranges between 5.4C to 9.0C;
- This zone is used extensively for cattle grazing in the spring, and provides ideal ungulate winter range habitat. Additional agricultural crops include a variety of orchards and ginseng;
- Due to the population density and rolling topography, urban development is common and widespread in some areas. Forestry activities are often limited due to poor productivity and sparse coverage of commercial trees. Recreational activities include hiking, mountain biking, hunting and fishing.

The Interior Douglas-fir Zone (IDF): The IDF Zone (shown in Yellow in Figure 2) is the most common BEC zone in the Pilot Area, with contours ranging from lows of 520 (near the deadman) and 460 (lower part of Jamison) metres to highs of 1520 metres (near Syndey Lake).

The IDF occupies mid to low elevations throughout the southern and central interior of British Columbia. Generally, this zone occurs above the Ponderosa Pine zone and below the Montane Spruce zone. The IDF typically dominates an area that is in the rain shadow of the major mountain ranges of BC.

Features of the IDF are:

- Annual precipitation ranges from 295mm-750mm and mean annual temperatures ranges between 1.6C to 9.5C;
- The IDF is comprised of open to closed forests of Douglas-fir, Ponderosa pine, Lodgepole pine (absent from drier regions) and hybrid white spruce. Open grasslands are common in the drier regions. Ponderosa pine occurs on dry sites in the southern part of the range and western redcedar is sometimes found in moist draws in the drier parts of the zone and on zonal sites in the transitional areas with the interior wetbelt. Lodgepole pine and Trembling aspen (*Populus tremuloides*) occur commonly as seral species in all regions except where it is dry. Pinegrass (*Calamagrostis rubescens*) is a common understory species throughout all of the subzones;
- Forestry is an important use of the resources in the IDF. Silvicultural options are wide ranging on these sites and are often well-suited to uneven aged management and various forms of shelterwood cutting. This is largely due to the moderate shade tolerance of Douglas-fir which makes it suitable for regeneration under its own canopy. Interior Douglas-fir is a prized species for sawlog production due to the slow growing rate which provides strong wood with tight annual ring growths;
- Cattle grazing is common and extensive areas are under grazing leases. Pinegrass is the dominant species for forage throughout the zone. Recreation opportunities include many popular sports such as hunting, fishing hiking, biking and cross-country skiing.

The Tk'emlups te Secwepemc Preliminary Access Management Plan (2012) cites the following: Trees such as Douglas-fir with pinegrass, Ponderosa Pine, and spruce; vegetation including red-stem ceanothus, snowbrush and snowberry; Unique wetland ecosystem consisting of saline meadows dominated by saltgrass. Ungulates find winter habitat in this zone as the Douglas-fir forests, low snowpack and abundant shrubs are prime conditions for these species. South aspect forests are important winter habitats for deer, elk and big-horned sheep. There is an abundance of animal species in the area, but several are vulnerable and at risk of extinction like the Great Blue Heron, American Bittern and Painted Turtles.

The Montane Spruce Zone (MS): The MS Zone (shown in pink in Figure 2) is also well represented in the Pilot Area, with contours ranging from 1100 metres (Rushton Creek area) to 1620 metres (Horace Lake area).

The MS Zone occurs in mid-elevation sites in south-central British Columbia. It is a transitional zone between the dry Interior Douglas-fir and the wetter, colder ESSF. The MS is typified by short, warm summers and long cold winters. Features of the MS Zone include:

- Annual precipitation is between 380mm-900mm and the mean annual temperature is between 0.5C to 4.7C;
- The MS zone is characterized by a widespread fire history that has left extensive regions of seral plant communities dominated by lodgepole pine. Hybrid white spruce is a common canopy species but rarely reaches dominance in the overstory due to slow growing conditions. Subalpine fir is more prevalent in the cooler regions of the MS;
- Forestry is a common resource use in the MS zone. Extensive stands of lodgepole pine are subject to periodic Mountain Pine beetle epidemics. Much of this is a result of fire suppression that has left many forest stands overcrowded and stressed which allow the beetles to quickly take hold;
- Cattle grazing is very common in this zone due to the abundance of native pinegrass in the understory. In addition, many areas have been grass seeded with desirable forage species to enhance grazing along forest roads and cutblocks;

- Recreational activities include hunting, fishing, horseback riding, snowmobiling and cross-country skiing.

The Tk'emlups te Secwepemc Preliminary Access Management Plan (2012) cites the following: It is mostly forested but also contains many wetland areas and many different species of wildlife and vegetation that make the area an attractive site for recreation activities. Species such as subalpine fir, grouseberry, black-huckleberry, and Utah honeysuckle indicate the Montane Spruce Zone's connection with the Engelmann Spruce-Subalpine Fir Zone, while the occurrence of Douglas-fir, pinegrass, and soapberry reflects its close association with the Interior Douglas-Fir and Sub-Boreal Pine-Spruce zone. This zone is home to ungulates like caribou, moose and mule deer, different species of Woodpecker, and other varieties of birds and fur-bearing mammals like grizzly bears, big-horn sheep and the golden-mantled ground squirrel. Waterbirds and amphibians are located in the wetland areas. The food in fast-moving streams attracts the American Dipper and Harlequin Duck, the spotted frog, western toad and long-toed salamander. Moose and mule deer also inhabit this area, as the moist conditions are favourable for rearing their young. The area includes valuable fishing, camping and hunting areas as well as some fur harvesting.

The Engelmann Spruce Subalpine Fir Zone (ESSF): The ESSF Zone (shown in purple in Figure 2) is also well represented in the Pilot Area, with elevations from 1500 metres to 1860 metres (Heller Creek area).

The ESSF Zone occupies high elevation subalpine habitat throughout the province. In the south, it occurs above the Interior Cedar Hemlock zone and the Montane Spruce zone. In central BC, the ESSF occurs above the Subboreal Spruce.

Feature of the ESSF Zone include:

- The ESSF is typified by long cold winters and deep snowpacks. In the wetter regions of the interior, snowfall accumulation can be as much as several meters. The drier ESSF zones have annual precipitation between 400mm to 500mm and the wetter regions have as much as 2200mm of which 50-70% falls as snow (Meidinger and Pojar 1991). Mean annual temperatures range between -1C to +2C;
- Although forestry is common in the ESSF, accessibility is the main limitation in some of the steep, mountainous terrain. Regeneration in the upper elevations of the ESSF is often hindered by a short growing season. In areas where harvesting occurs, Engelmann Spruce and Lodgepole pine are the most common tree species for regeneration;
- The forested and parkland zones are common hiking destinations during the summer months for people to access the high elevation lakes or alpine meadows. During the winter, the ESSF is widely used for alpine skiing, cross-country skiing and snowmobiling;
- The ESSF is an important area for water production in the province. Together with the Alpine Tundra zone, the area provides late season snowmelt to refill watersheds.

The Tk'emlups te Secwepemc Preliminary Access Management Plan (2012) cites the following trees, shrubs and wildlife: Trees include Sub alpine fir, Engelmann spruce, limber pine, alpine birch, mountain hemlock, western white pine, Douglas-fir, western hemlock and western red cedar. Ground cover vegetation includes black huckleberry, grouseberry, false azalea, Indian hellebore, arrowleaved groundsel, paintbrush and Sitka valerian. There are a variety of large and small wildlife utilizing the zone including Moose, black bear, grizzly bear,

Rocky Mountain elk, Rocky Mountain bighorn sheep, white-tailed deer, Mountain goat, caribou, mule deer, and wolverine. Bird species include Gray Jay, Pine Siskin and Golden Eagles.

The Sub-Boreal-Pine-Spruce Zone (SBPS): The SBPS Zone (shown in light blue in Figure 2) has only minor overlap with the Pilot Area, with elevations from 1260 metres to 1360 metres.

The SBPS Zone occupies the high plateau regions of the west-central interior (mostly in the Chilcotin west of Williams Lake). This zone occurs above the Interior Douglas-fir zone and Subboreal Spruce zone and below the Montane Spruce zone.

Features of the SBPS Zone include:

- The climate consists of cold, dry winters and cool summers. Mean annual precipitation ranges between 335mm to 580mm and mean annual temperature ranges from 0.3C to 2.7C, and approximately 30-50% of the annual precipitation falls as snow;
- The dominant tree species in this zone is lodgepole pine which has resulted largely from a frequent fire return interval of large scale, stand-replacing fires. White spruce occurs less frequently and is restricted to wet sites or rarely occurring old forest stands that have been missed by several fire cycles. Although white spruce is the theoretical climax tree species in this zone, forest stands tend to be dominated by lodgepole pine and never actually pass through succession to a white spruce dominated ecosystem;
- In the drier subzone, white spruce is virtually absent and is replaced by lodgepole pine and subalpine fir;
- Wetlands are common in this area due to the poor drainage patterns resulting from the subdued topography and fine-textured soils. Common wetlands include fens, shrub carrs, swamps and wet meadows;
- Timber harvesting in the SBPS is relatively common and has been quite high in response to Mountain Pine Beetle outbreaks in the region. However, low productivity has resulted in dense stands of small diameter trees over wide areas. Many of the trees have diameters ranging between 15-25cm and heights between 15-25m;
- Fishing, hunting, trapping and horseback riding are all common activities in this region. Many guide-outfitting and guest ranch operations are active in this region.

The Tk'emlups te Secwepemc Preliminary Access Management Plan (2012) cites the following trees, shrubs and wildlife. This zone also provides winter habitat for caribou that depend on lichens that grow on the soils and trees for food. The aspen and spruce forests provide forage for moose, mule deer, black bear, grizzly bear, grey wolf, coyote and lynx. Wetlands are dominated by sedges, mosses and lichens, and these wetlands provide year round forage for moose, beaver, and muskrat. Birds like the endangered White Pelican and small mammals are also indigenous in the wetlands. Cattle grazing is wide spread and relies on wetlands for forage.

Chapter 5 – First Nations Rights within the Area

While the pilot is not intended to address aboriginal rights and title, the Province and Secwepemc acknowledge that the Secwepemc RFA includes the following ‘whereas’ clauses that are provided here for information:

- A. In the summer of 1910, Prime Minister Sir Wilfred Laurier met with a delegation of chiefs, which included those from the Secwépemc Nation, who presented him with a document known as the Memorial whereby the chiefs asserted the persistence of the their aboriginal nation’s title and sovereignty, vowing that they would continue to struggle for a just and reciprocal relationship with the government until it was achieved (see Appendix G).
- B. The Parties recognize implementing this Agreement and developing a successful long term working relationship are steps towards advancing reconciliation of their interests, including the interests presented by the Secwépemc Nation in the 1910 Memorial to Sir Wilfred Laurier.
- C. The Constitution Act, 1982, section 35(1) states, “The existing aboriginal and treaty rights of the aboriginal peoples of Canada are hereby recognized and affirmed”.
- D. Without prejudice to their differing views with regard to sovereignty, jurisdiction, title, laws and ownership, the Parties intend to work collaboratively and are committed to: engaging across a spectrum of land and resource issues, improving business and government-to-government relationships, and to fulfilling legal obligations.

This collaborative pilot project was undertaken following the June 2014 decision of the Supreme Court of Canada on the Tsilhqot’in Decision, as well as proceeding Aboriginal rights and title related case law.

Secwepemc has submitted the following information to the Working Group pertaining to their asserted Aboriginal Interests:

“These watersheds are asserted by Secwepemc to be within the core traditional territory of the Tk’emlups and Skeetchestn bands both member bands of the Stk’emlups division (campfire) of the Secwepemc Nation. As such the foremost Aboriginal right of the Stk’emlups people in these watersheds is underlying Aboriginal Title. In addition to this the other rights encompassed within this area also include hunting, trapping, fishing, gathering, mining, trade, transportation, free access, and the right to manage the land and resources to secure an aboriginal economy.

Aboriginal title: These watersheds lie squarely within what the Secwepemc have asserted as Secwepemc Traditional Territory and are within the core area of responsibility of the Stk’emlups people. James Teit the foremost ethnographer of the Nlaka’pamux in his 1909 ethnography of the Shuswap described the core territory of the Stk’emlups people:

“These are the people of Kamloops and of Savona. They hunt in the country south to Stump Lake, in all the territory around Kamloops Lake, and along part of the South

and main Thompson rivers. Northwards they claim all of Deadmans Creek, some of the headwaters of the Bonaparte, and the country on each side of the North Thompson for some 15 miles or more (some say near Louis Creek). ”

Recent ethnographic research and oral testimony has also confirmed that these watersheds are well within Stk’emlups territory. Aboriginal title in the Interior of B.C. has never been surrendered or otherwise ceded and cases such as the Six Mile Ranch negotiations, Delgamuukw, Haida and the recent Williams decision help to confirm the continuing existence of First Nations title within these watersheds.

Hunting: Traditionally this was an extremely important hunting area for Stk’emlups people as it was in close proximity to Tranquille which at one time for many centuries pre-contact was a major settlement of the Stk’emlupsemc. Traditionally game hunted within this area included large ungulate species such as elk, (*Cervus elaphus*) mule deer (*Odocoileus hemionus*) and caribou (*Rangifer rangifer*). In more recent years since contact elk, the major terrestrial food species of importance to the Secwepemc, has been extirpated from the territory. In their absence, moose (*Alces alces*) and whitetail deer (*Odocoileus virginiana*) have encroached on what was once traditional elk habitat and with the recent re-introduction of Rocky Mountain sheep (*Ovis canadensis*) has moved the focus to these species with moose being the species of choice when available. In addition to the larger ungulate species, black bear, badgers, marmots and a number of game bird species including ducks, geese and grouse have been hunted in the past and in many cases all except badger are still hunted for a variety of uses integral to Secwepemc culture including food, medicine, trade, technological uses (hides for tanning etc.) ceremonial, and spiritual reasons.

Trapping: A number of fur bearing species were and still are trapped and otherwise harvested for their hides, as well as other attributes, within these watersheds. Historically with the advent of the non-First Nations and establishment of a trading post in Kamloops a great variety of fur bearing and food species became of increasing importance for trade purposes. There has been a great deal of continuous use of these watersheds both prehistorically and historically as evidenced by remnants of Andy Manuel’s trap line cabin found in Heller creek in the 1990’s as well as in the few historical records still to be found in Government files. During the past century there is record and evidence of Andy Manuel utilizing Heller creek, Alec Thomas in Tranquille and Tommy Casimer in Jamieson Creek. All these Stk’emlups people and their families trapped, hunted and otherwise utilized these watersheds for the duration of the last century and quite likely long before that as well.

Fishing: Both Criss Creek and Tranquille River once supported healthy runs of various species of salmon. Tranquille was a very important traditional fishery as it was in close proximity to a major Stk’emlups village site up until the 19th century. With the advent of the gold rush and later on the damming of this river to meet the needs of both mining and agriculture the fishery was severely compromised and a good deal of it was lost. Recent restoration work by Tk’emlups Band in conjunction with the Secwepemc Fisheries commission and D.F.O. has begun to re-establish habitat in order to once again restore the fishery. Criss Creek once had a healthy population of bull trout during the earlier part of the last century however this very sensitive species has now been extirpated from these waters, most likely due to the combined effects of agricultural land clearing, mining, logging and road building. Criss creek

still supports a healthy population of spawning Coho salmon which utilize portions of the creek up to 13 kilometers from its confluence with Deadman creek. These are part of a practically endangered strain both in the Deadman river system as well as the Thompson River where they have been identified as a population of concern in the federal Species at Risk Act (SARA). Nevertheless Criss Creek is still identified as a critical habitat area specifically for spawning and rearing of Thompson River Steelhead, another population which is critically in danger, as returns to the whole mid Thompson system including the Deadman, Nicola and Bonaparte populations are well below a total 1000 escapements per year.

***Gathering:** During their cultural heritage inventory over the past 10-15 years Skeetchestn has identified many species of plants that were or still are of traditional importance in these and similar watersheds and eco systems in the territory. During an initial cultural heritage assessment of one cutting permit conducted in Heller creek in 1999 Stk'emlups people inventoried no less than 65 culturally important plant species. Our present list of culturally important plants found within the Territory, in these and similar watersheds, includes no less than 150 species. Of these species, 93 have medicinal uses, 58 are food species, 58 have technological use, 13 have spiritual value, 11 are used in ceremony and 18 have other values and uses to the Secwepemc peoples.*

***Mining:** Some of the first gold brought into the fort in Kamloops prior to the 1858 gold rush was reportedly found by a First Nations individual in Tranquille Creek. Obviously Secwepemc people had knowledge of this mineral even if they had little use of it and did not actively mine it to any great degree prior to white contact. Gold was also mined in Criss and Deadman creeks as Skeetchestn elders have testified to the mining of this material by their parents as recently as the 1950s-1960s. Copper was also mined pre-contact in close proximity to the mouth of Tranquille creek. Old Indian copper mines on the North shore of Kamloops Lake were noted in the maps and journals of George Dawson of the Geological Surveys of Canada in the 1870s.*

***Trade:** Trade items of importance that came from these watersheds and the general area included copper which was one of the major trade items of the Secwepemc as well as ochre, an important cultural item which can still be found in Heller Creek. Other trade items harvested in the past included badgers that were traded with the fort in Kamloops in the early years as well as other meat and fish. Fish, various meats and other items such as sxusem (*Shepherdia Canadensis*) and Labrador tea all of which are still found in these watersheds are still of importance and traded to this day.*

***Transportation:** The North side of Kamloops Lake had a number of key travel corridors running through these watersheds including the Hudsons Bay trail heading North as well as the main transportation route along the North side of Kamloops Lake between Kamloops and destinations to the West. Most existing highways roads and many of the newer main logging roads in this area have been constructed on top of what were once Secwepemc travel trails and corridors.*

***Right to free access:** All Secwepemc peoples had a right to access all parts of their Traditional Territory and its resources if the correct protocols were followed. These watersheds were open exclusively to the Secwepemc and no others as they were in*

the core of Secwepemc territory. The subject watersheds were and are under the care of the Stkemlups (Skeetchestn and Tk'emlups people) as this is the core territory of the Stk'emlups people which revolved around and was centered on Kamloops Lake.

Right to an aboriginal economy: Secwepemc assert that the whole Stk'emlups traditional economy was based upon the lands and resources available within their Traditional Territory. All that was required for the basics of life were available to the Secwepemc people from these watersheds and others like them within the territory. Until contact with Europeans and for some time after the whole First Nations economy was based upon the lands and waters within their territory and much of that traditional economy is still ongoing and dependent upon the resources found within these watersheds".

Chapter 6 - Other Authorizations within the Area

Authorizations for land and resource use and/or management (tenure, permits, licences, etc.) have been granted by the provincial government within the plan area as follows:

Forest management and timber harvesting

- Tree farm licence 35 is issued to West Fraser Mills and covers most of the Jamieson Creek watershed
- current forest licence issued to West Fraser
- A First Nations Woodland Licence will be issued to Tk'emlupsemc Forestry Corp. in the near future
- recent forest licences, now expired, were issued to Interfor, Tolko Industries
- BC Timber Sales, on behalf of the provincial government, is authorized sell timber
- In the recent past, small scale salvage tenures have been issued. This salvage program is now complete
- Non-replaceable forest licences
- Woodlot Licence 1599 is within the Criss Creek watershed near Cayuse Lake, granted to Thomas and Norwell Forestry Consulting

Mines, Gravels, Placer Operations

- Numerous authorizations have been issued for mineral claims, gravel and placer operations within the plan area

Trappers (note that no trapline cabins exist in the plan area)

- | | |
|---------------------------------|-------------------------------|
| ▪ TRO329T001 - Shawn Freeman | ▪ TRO329T003 - Brian Bett |
| ▪ TRO329T002 - Douglas Chambers | ▪ TRO329T005 - Daniel Coleman |

Guide outfitters

- There are no guide outfitting licences that overlap with the plan area

Range Tenure Holders

- | | |
|----------------------------|---|
| ▪ 0820443 BC LTD | ▪ Kenuc'entwec Development Corporation |
| ▪ Warren & Carolyn Beppe | ▪ Knucwentwecw Range and Farm Corporation |
| ▪ Brian Stuart | |
| ▪ Linnea & Terrence Inskip | |

Range License Holders

- RAN077579 - Tamihi Reforestation & Farming LTD, Brian Dorman
- RAN077574 - Paul Kempter
- RAN077577 - William Pete Puhallo
- RAB077565 and RAN077567 - Ray Frolek
- RAN077686
- RAN077573
- RAN077685 - Jon Peachey
- RAN077459 - Wayne Gardner
- RAN077582 - Brian Stuart
- RAN077851 - Robert Thorpe
- RAN077156 - John Philip
- RAN077255 - Floyd Bohnet
- RAN076706 - Ed Monical
- RAN077572 - Indian Gardens Ranch c/o Dave Haywood-Farmer

Other authorizations granted:

- Commercial tourism - Tranquille on the Lake, BC Wilderness Tours, 3411398 Lands
- Water licenses - numerous
- Water storage - Agri-Eco Tourist Destination Resort, residential and commercial elements
- Fishing camp - Dagger Lake Scachine Lodge
- Snowmobiling - Kamloops Snowmobile Club

Chapter 7 - Legislation and Existing Plans

Forestry Legislation

The *Forest Act* and the *Forest and Range Practices Act* (FRPA) and its regulations are the two main pieces of legislation that govern forest management on British Columbia's Crown lands.

The primary focus of the *Forest Act* is: determining the allowable annual cut (AAC); granting tenure rights to Crown timber; designating forest land for administrative purposes; and establishing rules for measuring, valuing, transporting and milling timber.

The primary purpose of FRPA is to set the requirements for operational planning, forestry practices (road building, logging, reforestation, grazing, etc.), protection, compliance, enforcement and monitoring. Like the *Forest Practices Code of BC Act* (FPC) that went before it, it is supported by several regulations. However, it is less prescriptive and places more emphasis on professional reliance of industry professionals. In BC, the practice of professional forester is mandated by the *Foresters Act* and any person practising must belong to the Association of BC Forest Professionals.

Collectively, FRPA and its regulations define the legal requirements for planning and practices for forest, range and woodlot agreement holders on Crown lands, as well as any associated private land.

The functional architecture of FRPA includes:

- Three pillars - objectives, plan and practices requirements, and compliance and enforcement;
- Two foundational elements: professional reliance and effectiveness evaluations; and
- Supporting policy such as timber supply impacts, and expectations from the legal and non-legal realm.

Government objectives actions can address an array of forest and range values. The FRPA framework was built on the key principle that agreement holders and resource professionals will manage the risks associated with achieving any specified results or strategies that are consistent with government set objectives, and that government will hold agreement holders accountable for achieving those results and/or carrying out their strategies. In addition, licensees must comply with all applicable requirements in other legislation such as the Drinking Water Protection Act and the Heritage Conservation Act.

Forest Planning and Practices Regulation (FPPR)

In the context of “without unduly reducing the supply of timber from British Columbia’s forests,” the FPPR describes the following ‘objectives set by government’ that Forest Stewardship Plans (FSPs) must address:

- Soils
- Wildlife Habitats
- Water Quality, Fish Habitat, Wildlife Habitat and Biodiversity in riparian areas
- Fisheries Sensitive Watersheds
- Community Watersheds*
- Wildlife and biodiversity, landscape level
- Wildlife and biodiversity, stand level
- Visual quality
- Cultural Heritage Resources

*Tranquille River is a designated community watershed.

Legislative Authority

One of Government’s key roles under FRPA is establishing objectives and other legal actions that provide direction to forest, range and woodlot agreement holders as they prepare operational plans and undertake forest and range practices.

Types of Legal Actions*	
Objectives Planning Requirement**	Other Legal Actions Practice requirement
<ul style="list-style-type: none"> ▪ Land Use Objectives ▪ Objectives In Regulation ▪ Objectives Enabled By Regulation ▪ Grandparented Objectives 	<ul style="list-style-type: none"> ▪ General Wildlife Measures ▪ Resource Features ▪ Wildlife Habitat Features ▪ Temperature Sensitive Streams

**also establishing categories of species at risk, regionally important wildlife and ungulate species which may help set up objectives or general wildlife measures for an area*

***objectives normally are a planning requirement; in some cases they constitute a practice requirement and/or a supporting (default) practice requirement option is provided in regulation.*

Types of Objectives

There are four ways that objectives can be ‘set by Government’: Land Use Objectives, Objectives in Regulations, Objectives enabled by Regulation and Grandparented Objectives.

Land Use Objectives:

- objectives established under s. 93.4 of the Land Act consistent with the requirements under the Land Use Objectives Regulation; and

- 'higher level plans' under s. 3-5 of the Forest Practices Code of BC that continue under the authority of s. 93.8 of the Land Act as objectives established under s. 93.4 of the Land Act. (*certain parts of the Kamloops LRMP, such as the provisions regarding zones, objectives and strategies, were declared to be 'a higher level plan' in 1996*).

Land use objectives enable key provisions of approved land use plans that are relevant to the management and use of forest and range resources to be given legal effect for the purposes of FRPA and can be used to update/revise higher level plan objectives that were carried forward from FPC to FRPA.

Objectives in Regulation: Objectives in regulation are derived from authority in Section 149 of the FRPA (the eleven FRPA values - soils, visual quality, timber and associated plant communities, water, fish, wildlife, biodiversity, recreation resources, resource features and cultural heritage resources) and only exist in the following regulations:

- Sections 5-10 of the Forest Planning and Practices Regulation;
- Sections 6-11 of the Range Planning and Practices Regulation; and
- Section 9 of the Woodlot License Planning and Practices Regulation.

Objectives in regulation are intended to provide goal posts for managing and protecting forest and range values. Results and/or strategies in operational plans must address and be consistent with these objectives.

Objectives Enabled By Government Action Regulation (GAR): GAR is an important tool that government can use to set objectives and require certain actions for the stewardship of wildlife, fish, water, biodiversity, visual quality, cultural heritage resources, recreation resources, resource features and community watersheds.

GAR Orders are established by the appropriate Minister for a specified area. These objectives are not stated in regulations, but the legislation gives authority to establish them consistent with the Government Actions Regulation (GAR).

One of the limitations on actions in GAR is that actions 'not unduly reduce the supply of timber from BC forests'. Under GAR policy, the advice is that the following should be considered as a 'benchmark' to assess if this test has been met:

- Government's policy regarding timber supply impacts associated with implementation of forest practices legislation;
- Government's approved land and resource use decision; and,
- Assumptions in support of the AAC decision for TSAs, TFLs and woodlots.

The following are some existing GAR orders:

- **Ungulate Species:** On May 3, 2004 a category of ungulate species by order made under section 11(3) of the Government Actions Regulation (BC Reg. 17/04) of the Forest and Range Practices Act. This category of ungulate species represents those species for which an ungulate winter range may be required for winter survival;
- **Species at Risk:** On May 3, 2004 a category of species at risk by order made under section 11(1) of the Government Actions Regulation (BC Reg. 17/04) of the Forest and Range Practices Act. This category of species at risk represents those species that may be affected by forest or range management on Crown land and are listed by the Committee on the Status of Endangered Wildlife in Canada COSEWIC). Currently there are 85 species and plant communities included in the category of species at risk. The

85 species included in this category of species at risk form the basis for the Identified Wildlife Management Strategy (IWMS);

- The Province's Identified Wildlife Management Strategy (IWMS) 2004 contains an updated list of identified wildlife, updated species accounts, and updated procedures for implementing the IWMS. Government has limited the impact of management for identified wildlife to a maximum of one percent of the short-term harvest level for the province;

Other opportunities to use GAR orders are for the following:

- Ungulate winter ranges and objectives;
- Wildlife habitat areas (WHAs) and objectives;
- General Wildlife Measures for species at risk, regionally important wildlife or specified ungulate species
- Wildlife Habitat Features
- Fisheries Sensitive Watersheds and objectives
- Temperature sensitive streams
- Designating community watersheds
- Water quality objectives for community watersheds
- Resource features
- Lakeshore management zones and objectives
- Scenic areas and visual quality objectives
- Protection of recreation and range resources on Crown Land
- Establish interpretative forest sites, recreation sites, recreation trails, and objectives
- Identify recreation-related resource features.

Grandparented Objectives: those established under the FPC that are listed under s.180 of FRPA. This ensures continuation of objectives established under FPC to FRPA. Although these objectives exist, appropriate agency delegated decision makers can take legal actions to amend or cancel these objectives. In some cases, this may be needed to update or replace objectives designed for the FPC so that they are more appropriate within the FRPA framework.

Hierarchy of objectives

In setting objectives, government agencies must consider the interactions among established objectives, and the legal requirements for 'consistency' among objectives and across different legislation and geographic scales.

In the event of inconsistency in the 'objectives set by government', Land Use Objectives have the highest priority, followed by Objectives In Regulation followed by Objectives Enabled By Regulation (FRPA as well as grandparented FPC and GAR).

Other Legislation

While the Forest Act and FRPA are the primary pieces of legislation governing forest management on Crown land, the following are also relevant to note:

- | | |
|-----------------------------|--------------------------------|
| ▪ Heritage Conservation Act | ▪ Land Act |
| ▪ Range Act | ▪ Mineral Tenures Act |
| ▪ Wildfire Act | ▪ Water Act |
| ▪ Wildlife Act | ▪ Environmental Management Act |

Forest Stewardship Plans (FSPs)

FSPs are an operational plan that show areas on a map where a forest licensee may carry out forest development activities such as forest harvesting, road building and silviculture activities. FSPs are approved for five years with the possibility of being extended for an additional period of five years. The areas included in the FSP are called Forest Development Units. Under FRPA, forest professionals are responsible to use their own professional knowledge and judgement to develop Forest Stewardship Plans (FSPs) that identify results and/or strategies in relation to “objectives set by government”.

By law, forest licensees must give First Nations, other resource users, and the public a chance to review and comment on FSPs. Once the FSP has been approved by government, the licensee develops individual site plans within the area described by the FSP. Enforcement is then based on the licensee’s compliance with the original FSP, and occurs in accordance with FRPA, its regulations, and the resource values identified by FRPA.

Kamloops Land and Resource Management Plan (LRMP)

The Kamloops LRMP involves the Crown-land resources spanning Kamloops, Clearwater, Logan Lake, Ashcroft and Chase. This was the first LRMP to be approved in B.C. (1995). The KLRMP was intended as a 'living' plan, and was amended in 1996, and 2001. The KLRMP Monitoring Table was intended to meet each year, but is currently inactive.

The Kamloops TSA Rationale for AAC Determination 2008 (BC Ministry of Forests and Range 2008) states that *“Forest management in the Kamloops TSA must be consistent with legislative direction and objectives specified in the Kamloops Land and Resource Management Plan (KLRMP), originally designated a higher level plan on January 23, 1996. This plan provides legal land use direction to the Kamloops TSA. All major forest tenure holders are required to prepare legally binding Forest Stewardship Plans that reference the 26 objectives of the KLRMP. A 2006 Monitoring Report indicates that the goals and objectives of the KLRMP are generally being met...”*

The Determination 2008 also states that *“Many ungulate management objectives are met through normal practice in the KLRMP area, for example, through selective harvesting in dry Interior Douglas-fir zones. However, certain critical habitat areas have been identified where particular habitat values must be maintained. The Kamloops LRMP identifies five wildlife habitat zones: for caribou, early winter habitat, late winter habitat, and travel corridors; for deer, critical winter range; and for moose, critical winter range”.*

The Determination 2008 states that *“...in the timber supply analysis, consistent with the previous two timber supply analyses for the TSA, provisions for critical moose winter range were assumed to be met without incurring implications for timber supply.*

For deer, a total of 31 critical winter range zones are identified in the TSA, covering 59 173 hectares of the THLB, where the management objective is to maintain or enhance forage production and habitat requirements. In critical deer winter range, at all times the forest cover on at least 25 percent of the gross forested area must be over 20 metres tall (typically achieved by trees aged 75 years), and no more than 20 percent of the gross forested land base may be less than 3 metres in height. These requirements were applied in the 2007 base case analysis.

Associated management strategies for deer in the KLRMP include dispersing timber harvests throughout the winter range and spreading them evenly through the rotation age of the forest; maintaining at least 25 percent of the forested area in thermal cover; linking thermal cover units with suitable travel corridors, especially with mature Douglas-fir trees on ridges; practicing uneven-aged management wherever possible; applying clearcuts smaller than 5 hectares where uneven aged management cannot be practiced; ensuring maintenance of browse species such as Ceanothus, wild rose and Saskatoon berries throughout range management practices; pursuing mixed forest management with similar species distribution to natural stands including deciduous species; establishing access management guidelines; and incorporating management objectives for Critical Deer Habitat into local level planning for the area. All of these management strategies are expected to be accomplished within the constraints identified above.

The forest cover constraints required for critical deer winter range as well other integrated resource management strategies were appropriately applied in the analysis, and I am satisfied that the associated timber supply implications are therefore adequately incorporated in the base case projection.

The MOE is currently updating the Kamloops LRMP mule deer winter range mapping and management. When this update is finalized, the new information will be included in analysis for consideration in a subsequent determination."

The Determination 2008 also states that "The KLRMP includes government-approved Special Resource Management Zones for Habitat and Wildlife Management Areas which have been established where there is regionally or provincially significant wildlife habitat. Management in these zones is intended to ensure the long-term viability of identified wildlife habitat through a wide variety of management tools and activities. Seventeen Wildlife Habitat Areas (WHAs) totalling 1567 hectares are spatially located on the landscape in the Kamloops TSA, five for Rattlesnake, three for Western Screech Owl, and nine for Lewis' Woodpecker. These WHAs cover 1567 hectares, 82 hectares of which are in the THLB. On the THLB, the forest cover on 66 hectares is older than 80 years. A further 4 WHAs have been identified in draft and it is anticipated that the provincial Ministry of Environment (MOE) will establish more WHAs in 2008.

The establishment of WHAs is an integral component of wildlife management and in most areas of the province the one-percent impact that is permitted for the special management of Identified Wildlife provides for an important contribution toward achieving associated objectives. In this TSA, so far, much of the land for WHAs has been located in non-THLB areas or in poorer quality stands, but I cannot be certain that this will be so in the case of each and all of the WHAs anticipated to be established in the future. To accommodate this uncertainty, I have accounted in my determination for up to a one-percent impact on the timber supply in the mid and long terms for the management of Identified Wildlife, as discussed in 'Reasons for Decision'.

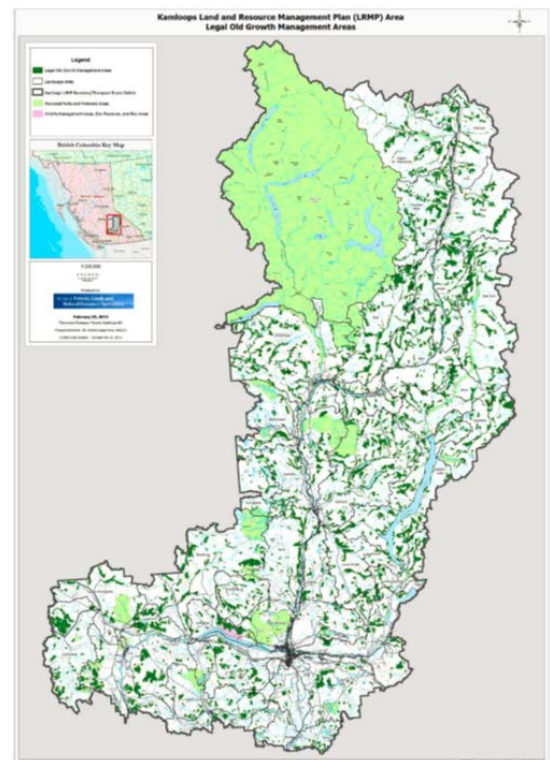
Old Growth Management Areas (OGMAs)

OGMAs are legally established and spatially defined areas of old growth forest that are identified during landscape unit planning or an operational planning process (Figure 3, next page). Forest licensees are required to maintain legally established OGMAs when preparing FSPs. OGMAs, in combination with other areas where forestry development is prevented or constrained, are used to achieve biodiversity targets.

Effective March 5, 2013, the Old Growth Management Objective for the Kamloops LRMP was brought into law through the Land Use Objectives Regulation.

The Objectives of the order are:

- Conservation of biodiversity by retaining old forest values and attributes, or rare features within the OGMAs across the landscape units over time;
- Maintain all timber within OGMAs except as required to accommodate certain purposes;
 - prevent the spread of insect infestations or diseases;
 - address safety hazards;
 - provide for guyline clearances and tailhold anchors;
 - address fuel management concerns and related safety hazards;
 - provide road access where no alternative practical options; or,
 - to facilitate timber harvesting that will result in operational practicable cutblock boundaries.



Parks & Protected Areas

The Pilot Area includes Tsintsunko Lakes Park and Porcupine Meadows Park, and Lac Du Bous Grasslands Protected Area. Licensed Forestry activity is not authorized in these areas, but range use is permitted. Mining is also prohibited with the exception of gold panning in Lac Du Bous Grasslands Protected Area. Oil and Gas related activities are also excluded. An Order in Council would be required to allow activities such as Oil and Gas related activities with in these areas.

Hunting and Fishing are authorized in these areas. Also, First Nations may practice aboriginal interests such as hunting, fishing and gathering.

Cultural Resource Management Zones (CRMZ)

The Determination 2008 states that the Chief Forester is able, within the scope of statutory authority under Section 8 of the Forest Act, where appropriate can seek to address aboriginal interests that will be impacted by a proposed TSR. Aboriginal interests raised outside of the Chief Foresters jurisdiction, endeavours to forward these interest for consideration by appropriate decision makers.

Third Party Forest Management Certification

Currently, West Fraser has Sustainable Forestry Institute (SFI) certification, and BC Timber Sales has CSA certification within the plan area.

Management of the forest and range within the Kamloops, Merritt and Lillooet TSAs is also guided by the Sustainable Forestry Management (SFM) Plan which is participated in by forest tenure holders who retain or seek environmental certification of their management practices by the Canadian Standards Association (CSA). The SFM plan sets performance values, objectives, indicators and targets addressing environmental, social and economic aspects of forest management in the TSA. The SFM plan is monitored by the SFM advisory group which is made up of a cross-section of local interest groups. Participants in the plan report annually to the public. See http://thompsonokanaganustainableforestry.ca/nicola_thompson_fraser_top.htm for more info.

SECTION 2 – Critical Issues in the Plan Area

The purpose of this section of the plan is to address the critical issues in the plan area; to explain why a collaborative plan is needed; to document the current state of the issue, explain any background science and information.

Chapter 8 – Moose

Secwépemc perspective on Moose (excerpt from Mike Anderson)

The Skeetchestn LRMP (Skeetchestn Indian Band, 2013) states that moose and deer are the most important wildlife species that are hunted by the Skeetchestn Indian Band.

Hunting:

- Tranquille at one time for many centuries pre-contact was a major settlement of the Stk'emlupsemc.
- Large ungulate species such as elk (*Cervus elaphus*) mule deer (*Odocoileus hemionus*) and caribou (*Rangifer rangifer*) were harvested .
- Since European contact, elk, the major terrestrial food species of importance to the Secwepemc has been extirpated from the territory.
- Moose (*Alces alces*), and whitetail deer (*Odocoileus virginiana*) have replaced them.
- Re-introduction of Rocky Mountain sheep (*Ovis Canadensis*) moved the focus to these species with moose being the species of choice when available.
- Larger ungulate species, black bear, badgers, marmots and a number of game bird species including ducks, geese and grouse have a variety of uses integral to Secwépemc culture food, medicine, trade, clothing, ceremonial and spiritual to name a few.
- Badger is not hunted anymore out of fear of extirpation.

Moose Biology

The following information on moose biology was presented by Chris Proctor RPBio on March 11, 2015 to the Tripartite Working Group:

- Moose are susceptible to heat stress during winter (temperatures warmer than -5C) and summer (temperatures warmer than +14C). Negative energy balance in winter that becomes a greater issue when there are numerous disturbances that interfere with feeding.
- For all seasons moose need forage and cover in close proximity
- Moose are considered an edge species - if there is no cover nearby then habitat is generally avoided.
- Moose winter range:
 - Is shrub dominated (willow is preferred) riparian complexes, deciduous stands, logged settings and burns with abundant shrub growth)
 - Has adjacent coniferous stands for cover within 400 metres
 - Thermal cover (protection from heat or cold)
 - Security cover (screening from humans/predators)
 - Interception cover (reduced snowpack for locomotion and forage availability)
 - Closed Canopy especially important in late winter/early spring
 - Low levels of disturbance (road density etc)

- Spring/summer Ranges
 - Need productive habitat to recover from negative energy balance experienced in winter and put on reserves for next winter
 - Aquatic habitats often selected - forage, escape heat and bugs
 - These riparian complexes are often used as calving sites, therefore low disturbance, cover and forage required in very close proximity
- Forestry
 - Complicated as effects vary spatially, temporally and with intensity
 - Direct and Indirect effects
 - Logging can be a positive effect as it can create forage
 - Logging that disregards the needs of moose can have direct and indirect impacts on the moose value:
 - Inappropriate road locations, inadequately buffered, excessive road density, unmanaged access;
 - Insufficient cover (large blocks without corridors)
 - Lack of connectivity
 - Inadequate buffering of streams and riparian complexes

Moose Harvest Management

Goal in moose management is sustainability over the longer term. The recreational harvest rate is established after taking into account recruitment levels, various mortality factors, First Nations harvest, etc. In Region 3, recruitment is usually between 20-25% and we use 6% of population estimate to establish annual allowable harvest (AAH) for bulls and 1.0-1.5% for cows and calves. First Nations harvest are additive to these rates.

There are two broad harvest strategies: Limited Entry Hunting (LEH) and General Open Season (GOS). Hunters prefer GOS but given high demand need some harvest control to maintain harvest within sustainable limits. Other restrictions include antler restrictions and season length. LEH provides control of hunter numbers and distribution, which helps avoid localized overharvest and therefore harvests. Adaptive management means monitoring the populations, harvests and seasons to ensure system is working and adjust if there are problems. Monitoring includes the following:

- Moose Stratified Random Block surveys
- Composition Surveys - Target important wintering ranges
- Harvest Statistics

Moose Research

- Initiative in the Winter of 2011/12, this moose research is being conducted in the Deadman/Bonaparte area to assess rates and causes of adult female moose mortality and landscape conditions or features that contribute to mortality.
- In the Winter of 2013/14 the Deadman/Bonaparte project joined Provincial level research initiative to investigate moose declines of up to 70% in some areas of the province.

This research is investigating:

- Pregnancy rates, disease and parasite surveillance and calf survival. To date, this research indicates that adult survival is good. Calf survival may be an issue, but more research is required to determine if there is a trend.
- Landscape condition or features that contribute to moose mortality - annual home range, seasonal ranges and fine movements

University of Victoria will assess habitat use and selection, risk of mortality (Bonaparte Plateau only). University of Northern BC will assess survival and landscape conditions that contribute to mortality for all study areas in the province.

Proposed Guiding Principles

The following Guiding Principles were presented by Chris Procter on March 11, 2015, for Forest Development in Moose Habitat. Reference S. Lemke Lillooet Forest District Moose Habitat Handbook, 2001. These were the basis for consideration by the Tripartite Working Group; see Section 3 of this plan for the actual committed principles.

1. Thermal/snow interception (mature timber cover - stand age >60 yrs and canopy closure >40-65%) and security cover (>5m vegetation height) needs to be dispersed across the landscape. Patches need to be large enough to provide interior forest conditions (>3-5ha). These patches are best located immediately adjacent to important key habitat elements (wetlands, riparian meadows, lakes, deciduous stands)
2. Maintain forest cover adjacent to key habitat elements on all sides. Avoid harvest of mature timber cover within 200m of important key habitat elements
3. Cut and leave patterns should provide connectivity between key habitat elements. Corridors need to be minimum 5m in height and minimum 100m in width to provide sufficient lateral cover
4. Logged settings should be designed such that areas >400m from sufficient thermal and security cover are minimized. Irregular block boundaries and WTPs (>3-5ha) can be used to assist with this
5. New blocks adjacent to existing cuts should not be harvested until a 5m green-up has been attained
6. Locate all roads minimum 200m, preferably 400m, from all key habitat elements
7. No net increase in road density. Where new roads are built, the equivalent amount should be rehabilitated in adjacent areas. Focus should be on roads leading to or near key habitat elements
8. Avoid loop roads
9. All branch and spur roads should be deactivated immediately following harvesting activities. The scattering of debris on in-block roads is a good strategy to minimize traffic. Roads should be completely rehabilitated following achievement of silviculture obligations
10. Avoid brushing/treatment of key browse species, especially by broadcast herbicide treatments

Susan L. Lemke -Upper Deadman River Moose Habitat Study

The study illustrates impacts of forest development on the moose population. Riparian and wetland sites are utilized by cow moose throughout the year, especially during and immediately following parturition, timber harvest prescriptions must address this issue.

Additionally the study found:

- Thermal and security cover need to be provided by the retention of a coniferous buffer zone.
- Where spruce borders wetland habitats, harvesting should only occur only where there are significant forest health concerns for it is excellent security cover.
- Limiting block size to no greater than 10 hectares will minimize the distance to adjacent coniferous stands for travel corridors.
- Develop an access management plan.

- The mean annual home range for bulls was 67 km², while the mean for cows was 72 km².
- When harvesting of adjacent stands allow for adequate 5-meter green-up in previous cutovers to maintain adequate security cover values.
- Researchers in Saskatchewan (TAEM 1988) recommended that a rotation age of 40-50 years in mixed aspen stands for forage and cover. Ideally, one-third to one-half of the planning area in stands less than 20 years of age result in the maximum forage benefits.
- Critical habitat features, wetland, meadow and riparian willow complexes.
- Moose utilizing these important foraging areas must be protected from disturbance at all times, particularly during calving season and the winter months.
- Extensive coniferous buffer zones must border any identified high value sites.
- Cutblocks within these buffer zones open a maximum of 25% of the wetland/riparian edge in a single pass (Figures 10 & 11). Excessive harvest around these areas may result in decreased utilization or abandonment of these critical sites.
- Human disturbance related to forest development operations or recreational activities can lead to altered behavior which can negatively impact the ability of moose to forage and breed effectively.
- Removal of overstory vegetation increases forage production, if access is unrestricted cattle will forage opportunistically.
- Salting in or near blocks and the seeding of grass on roads and landings, should be discouraged attractant for cattle and large game.

Working Group June 10 Field Tour

Stop #2 of the field tour looked at riparian management, road deactivation, habitat connectivity. Mark Runge led us across a recently harvested block, along a deactivated in-block road, to look at retention on a non-classifiable (NC) drainage. We also looked at advanced regeneration that was protected in the block. Some discussion points to consider for our plan and/or general discussion:

- Excellent example of retention, above and beyond what is required on an NC drainage;
- Connectivity in-block, even though not very wide, still contributes to wildlife and habitat values - including Western toad (suspected in pools on the deactivated road) and sandhill crane;
- Could consider feathering/buffering to promote wind firmness of retention areas;
- The values for wildlife and habitat provided by connectivity corridors or retention on the landscape are of more value, than removing them for the risk of wildfire;
- Increased road access on the landscape, from beetle salvage over the last 10-15 years has various impacts:
 - Good for ranchers, they can access previously inaccessible portions of range;
 - Provides more access for hunters, pressure on wildlife, and increased fire risk;
 - Roads can provide a fire break and access to fight wildfires;

Towards the end of the field tour day, the following ideas were suggested to include in our plan:

- Managing for connectivity, green-up better - as in the pre-beetle salvage days (concern noted that this leaves road networks open for long periods of time);
- Need key habitat areas for moose identified from Chris Procter;
- "Stack the values" - let's focus retention planning on areas that have multiple values, and/or are already constrained (e.g., unmovable OGMA's);

- Continue to promote modified harvesting in riparian areas, as seen at Stop #2;
- Implement the principle of no net road gains - find the right balance of access management and control, and road deactivation/rehabilitation;
- Ensure we have good baseline hydrology data, and consider five factors that impact hydrology: pre-FPC roads; timber harvesting; current rate of cut; current road system; cattle grazing;

Kamloops LRMP Critical Moose Winter Range

The following is from the Kamloops LRMP.

Objective	Strategies	Indicators
Maintain thermal and visual cover for moose, and enhance browse production	<ul style="list-style-type: none"> • Maintain suitable forest cover attributes with respect to thermal cover and forage production. • Ensure adequate forage is maintained during silviculture activities (brushing and weeding, stand tending). • Provide visual screening of swamps and openings along highways, secondary roads, and main forestry roads • Pursue mixed forest management with similar species distribution to natural stands including deciduous). • Ensure grazing management practise that maintain browse species such as red osier dogwood and willow • Establish access management guidelines • Incorporate management objectives for critical moose habitat into local level planning in the area 	Area (ha) of critical moose winter range available in good condition

Skeetchestn LRMP (Deadman Watershed) - 2013

Special Resource Management - Habitat/Wildlife Management Areas

Areas where resource development activities are supported provided that habitat objectives are met. This includes the most important areas within the LUP for Moose and Deer winter range.

The plan states that “an effectively managed access plan on important seasonal moose ranges is an important aspect to maintaining sustainable populations. Excessive harvest and abandonment of suitable habitat can result from uncontrolled vehicular access and accompanying human disturbance”. The Skeetchestn LRMP (2013) cites the following:

The upper Deadman River and Criss Creek valleys provide a wide range of winter habitat for moose populations including riparian shrub habitat and wetland complexes (Lemke 1998). Riparian areas (riparian willow habitat and spruce/sedge meadows) within the Deadman and Criss Creek areas also provide optimum area for moose calving habitat (Lemke 1998) as they provide secluded shelter, high browse availability and close proximity to water. Lemke (1998) also suggests that mature conifers that border riparian and wetlands provide crucial thermal cover throughout the year. Lemke's (1998) research in the Upper Deadman River area on moose habitat suggests that harvesting should be conducted in a manner to minimize damage to

understory vegetation. She also suggests that riparian buffers of 300m be established around all riparian and wetland complexes greater than one hectare, 200m for high forage sites, and riparian/wetland edges should retain 75% of its vegetation. [Karakatsoulis et al. 2005: 29]

Section 2.1.12.2 Critical Moose Winter Range

The upper Deadman River and Criss Creek valleys provide a wide range of winter habitat for moose populations including riparian shrub habitat and wetland complexes (Lemke 1998). Riparian areas (riparian willow habitat and spruce/sedge meadows) within the Deadman and Criss Creek areas also provide optimum area for moose calving habitat (Lemke 1998) as they provide secluded shelter, high browse availability and close proximity to water. Lemke (1998) also suggests that mature conifers that border riparian and wetlands provide crucial thermal cover throughout the year. Lemke's (1998) research in the Upper Deadman River area on moose habitat suggests that harvesting should be conducted in a manner to minimize damage to understory vegetation. She also suggests that riparian buffers of 300m be established around all riparian and wetland complexes greater than one hectare, 200m for high forage sites and riparian/wetland edges should retain 75% of its vegetation (Karakatsoulis et al. 2005).

The following table outlines the objectives and strategies for management of Critical Moose Winter Range in the Skeetchestn LRMP (Skeetchestn Indian Band, 2013).

Objective	Strategies	Indicators
Rebuild moose populations	<ul style="list-style-type: none"> • Implement 200 meter buffers on important wetland complexes as recommended in 1998 moose study. • Implement Skeetchestn road deactivation and management strategies • Reduce kilometers of road plowed in winter. • Reduce unrestricted uncontrolled sled access in winter. • Reduce wolf populations. 	To be Determined

Skeetchestn Cultural Resource Management Zones (CRMZ)

Presentation to the MWSP Working Group in May 2015 by Mike Anderson. These were the basis for consideration by the Tripartite Working Group; see Section 3 of this plan for what was agreed to.

In an attempt to address the deterioration of their watersheds and the loss of fisheries and riparian habitats as well as other important cultural values Skeetchestn Indian Band implemented the concept of Cultural Resource Management Zones (CRMZs) throughout their Traditional Territory CRMZs are to be established within 100 meters of all water and riparian features in Skeetchestn Traditional Territory.

All CRMZs require Cultural Heritage Overviews

The canopy within these zones is to be managed for:

- Wildlife habitat and movement corridor values.
- Fisheries habitat in terms of:
- Water temperatures

-contributions to stream processes and biology

-amelioration of spiking in the hydrograph

-sediment filtration capacity

- Traditional medicine and plants for a variety of other uses.
- Windfirmness of residual stands.

Applicable constraints within CRMZs:

- No more than 50 % basal area removal in any single pass within 50 meters of water.
- Use of selection and shelterwood silvicultural systems.
- Use of light impact equipment and labor intensive harvesting methods.
- Assessment and protection of all potential and existing wildlife snags.
- Inventory and protection of all regeneration and non-merchantable stems.
- Aspen, birch and sub-alpine fir will be considered preferred species within these zones and are to be encouraged for their wildlife habitat, medicinal and other Traditional values.
- Minimal road building within Cultural Resource Management Zones
- Minimum 20 meter reserves on all fish bearing and direct tributary streams where recommended by Department of Fisheries and Oceans.

During this period of intense Mountain Pine Bark Beetle infestation, due to the unpredictable rates and duration of attack it is very difficult to determine if and when unacceptable ECAs (Equivalent Clearcut Areas) will occur within any one watershed or portion thereof. These unacceptably high ECAs can have extremely detrimental effects to important cultural and other First Nations values. In the case of Mountain Pine Beetle Blocks, harvesting is occurring primarily to address forest health Issues further constraints will therefore apply.

These constraints include:

- The retention of all advanced regeneration and species other than pine within 100 meters of water and water bearing features.
- The removal of green attack pine only within 50 meters of water and water bearing features.

Skeetchestn contends that if these constraints had been followed during the past 15 plus years of large scale beetle harvesting within our territory many of the issues around hydrological function and landscape connectivity could have been avoided. We continue to put these forth as good guidelines to follow within the forests of our territory which happen to be situated just uphill from the desert

Chapter 9 – Water

The MWSP Working Group included learning opportunities on Water:

- January 16, 2015 Rich McCleary, Regional Aquatic Ecologist, FLNR, explaining the connection between Forestry (harvest and roads) and Stream and Riparian function that support fish and fish habitat;
- April 9, 2015 Michael Milne, Consulting Hydrologist, and Doug Lewis, Resource Practices Specialist with FLNR, presented an overview of Watershed Management and Cumulative Watershed Effects assessment procedure.

Secwepemc Perspective on Water

From a First Nations perspective, water is a highly spiritual living entity. “Water is the lifeblood that circulates through the ecosystem, providing sacred and profane sustenance for all beings” (Blackstock, 2002). As a general rule, the higher up the watershed the more spiritually significant the water and the stronger the medicine and their healing values are.

What is a Riparian Area?

The riparian area refers to the habitat adjacent to streams that include moisture loving plants and soils modified by water. This riparian habitat supports a diversity of wildlife including BC listed species.

The Riparian Area is important for the following reasons:

- Helps to armour stream channel banks to provide cover for fish and resiliency during flood events;
- Serves as a filter that helps to screen out sediment from runoff;
- Supports terrestrial insects that end up in the stream providing food for fish;
- Provides shading that maintains cool water temperatures that support fish and aquatic insects; and,
- Contributes coarse woody debris including dead trees that armour the channel and provide cover for fish.
- They provide critical habitat for up to 75% of threatened and endangered terrestrial species



Figure 4: Before Rain Event - Disturbed Site



Figure 5: After Rain Event - Disturbed Site

What Determines Stream Channel Shape?

The shape of the stream channel is determined by the flows that routinely occur, but also by the type and quantity of sediment that is conveyed by the water.

Features of a stable channel include:

- Riparian vegetation providing adequate shade and woody debris;
- Intact stream banks providing armouring of the bank against high flows;
- Mix of new and well secured coarse woody debris that tend to be perpendicular (across) the stream;
- Variety of pools of different depths;
- Channel that is not braided;
- Road-related sediment inputs minimized; and,
- Diversity of fish cover features.

In contrast, streams at risk are indicated by higher sediment loads that causes braiding, creation of sediment wedges and islands, and sediment infilled gravels. High water events can be indicated by new coarse woody debris running parallel to the stream, infilled streams and eroded high banks.

The benefits of a properly functioning stream are:

- Greater resiliency to floods, droughts, and human caused problems;
- Enhanced functions and values including cleaner, cooler water and more fish and wildlife;
- Better stability that tends to persist over time.

Riparian Assessment Procedure

The Riparian Assessment Procedures was developed to assess how well streams are functioning. This rigorous procedure involves extensive stream sampling and measurements that assist in developing objective answers to fifteen questions related to stream function.

Some of these questions include:

- Level of disturbance of the stream channel bed;
- Level of erosion of the stream bank;
- Diversity of fish cover features;
- Amount of Road-related sediment inputs; and,
- Adequacy of riparian vegetation supporting shade and woody debris.

Once these questions are answered the assessment procedure provides an objective overall assessment of stream function as 'functioning', 'at risk', or 'not functioning'. Maintaining high functioning streams provides greater resiliency for the stream to handle natural disturbances such as fire or changes that may be occurring due to climate change. In contrast, poor resource management practices can have negative physical impacts to streams resulting in biological consequences.

Physical Impact	Biological Consequence
Eroding banks due to loss of forest cover	Loss of hiding cover, increased sedimentation
Gravel infilled with fine sediment	Loss of aquatic insect food and habitat Lower egg survival Major impacts on spawning habitats
In-filling of pools with sediment	Loss of summer habitat for larger fish and over-wintering habitat for all fish
Harvesting of forest cover resulting in loss of woody debris	Fewer hiding places for juvenile fish
Harvesting of forest cover resulting in loss of stream bank vegetation	Higher summer water temperatures can reduce growth rates and increase mortality of juvenile trout and salmon. Reduced leaf litter impacts food chain starting with aquatic insects, then fish. Reduces filtration of sediments prior to them entering the water courses
Increased summer water temperatures	Low oxygen levels, often delays entry of spawning fish into natal streams, thus putting excess stress on fish, reducing their fat reserves and disrupting their natural spawning patterns



Figure 6: Sediment Infill of substrate

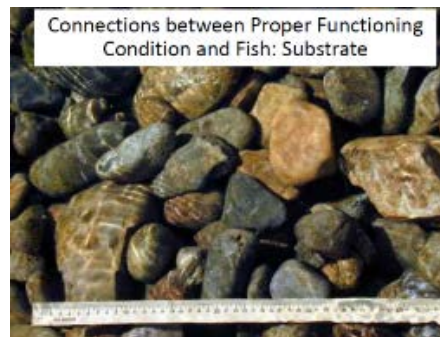
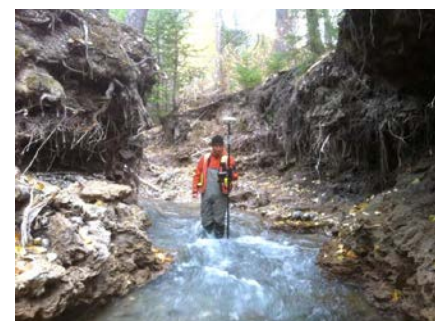


Figure 7: Good habitat for spawning and juveniles

Water Balance Considerations

Research has shown that less snow reaches the ground under a forest due to snow accumulation on the trees, which allows sublimation. The result is that logged area can receive 20-40% more snow accumulation on the ground. Also, live trees in forested areas use water for transpiration.

Consequently if areas are heavily logged then total runoff increases and runoff can happen earlier and quicker. Excessive clearcut harvesting not only increases peak spring flows but it can also reduce subsequent late season flows thus affecting fisheries. This results in physical impacts to stream channels. Some streams may re-size in response to higher flows (degrade or blow out, Figure 8 at right). Other streams may infill with sediment from upstream degraded channels.



Impact of poorly designed or maintained roads

Roads can impact stream channels if improperly constructed or maintained. Fine sediment from road surfaces can impact water quality. Fine sediment particles can enter the gills and tissue of developing fry and alevins thus causing future irreparable harm. Large sediment loads can bury habitat features and force the channel to split or migrate.

Watershed Health and Recovery

Watershed health and recovery can be approached in the same logical manner as the health care system uses for 'community heart health and recovery':

1. Screen: risk screening of watersheds for risk factors including livestock, harvest, roads, recent floods, fires, and geography. This is largely a GIS flagging exercise that combines potential hazards with potential consequences to get potential risks;
2. Assess: utilize the Riparian Assessment Procedure and undertake field assessments, where warranted, for individual streams. Assess channel bed, banks, riparian vegetation, sediment load, aquatic insects etc. Field assessment is an important part of the Cumulative Effects Assessment (CEA) riparian assessment procedure.
3. Diagnosis: The Riparian Assessment Procedures provides a scientific rating of the stream as 'properly functioning' or 'at risk' or 'not properly functioning'.
4. Treatment Plan: For streams that are 'at risk' or 'not properly functioning' develop a treatment plan for the stream/watershed (rest, road deactivation, addressing sediment inputs, etc). Government objectives including Fisheries Sensitive Streams can help ensure watershed value are maintained or recovered.
5. Checkups: Follow-up field monitoring of the watershed and ongoing watershed screening.

Watershed Management Considerations

Watershed Management requires a coordinated approach with the following necessary elements:

- input from experts and interest groups;
- a leader
- a decision making process
- social and financial support
- continuity

It is important to define the area and to use a watershed, basin, sub-basin and residual area approach. Watershed Management should be focused on values meaning that management approach should focus on specific consequences to values (people, property, infrastructure, fish, and water quantity and water quality) at specific locations. It is important to understand the threats (For example, are we concerned about too much water; not enough water, dirty water, physical damage, instability, or barriers such as sediment, culverts etc.). The processes that can cause these threats include: Amount of precipitation as rain or snow; Snowmelt, Runoff, Stream flow, Erosion, and Sedimentation.

How Land-Use contributes:

- Over allocation and over use of water;
- Increases in runoff or changes in timing that can result from reductions in forest cover;

- Increases in stream sedimentation from road erosion, landslides and channel destabilizations; and,
- Reductions in Riparian function from clearing for agriculture, forestry and other industry activity.

How it can be managed:

- Balanced allocation of water for fish, irrigation, and domestic use;
- Controls on the rate and location of forest harvesting and other forest cover alterations;
- Sediment controls; and,
- Protection of critical riparian area.

Skeetchestn CRMZ 2002

The Working Group meeting of May 13, 2015 included a learning opportunity by Mike Anderson, Skeetchestn. These were the basis for consideration by the Tripartite Working Group; see Section 3 of this plan for what was agreed to.

In an attempt to address the deterioration of their watersheds and the loss of fisheries and riparian habitats as well as other important cultural values Skeetchestn Indian Band implemented the concept of Cultural Resource Management Zones (CRMZs) throughout their Traditional Territory.

CRMZs are to be established within 100 meters of all water and riparian features in Skeetchestn Traditional Territory. All CRMZs require Cultural Heritage Overviews. The canopy within these zones is to be managed for:

- Wildlife habitat and movement corridor values;
- Fisheries habitat in terms of Water temperatures;
- Contributions to stream processes and biology;
- Amelioration of spiking in the hydrograph;
- Sediment filtration capacity;
- Traditional medicine and plants for a variety of other uses; and,
- Wind firmness of residual stands.

Applicable constraints within C.R.M.Z.s:

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- Use of selection and shelter wood silviculture systems;
- Use of light impact equipment and labor intensive harvesting methods;
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- Inventory and protection of all regeneration and non-merchantable stems;
- Aspen, birch and sub-alpine fir will be considered preferred species within these zones and are to be encouraged for their wildlife habitat, medicinal and other traditional values;
- Minimal road building within Cultural Resource Management Zones; and,
- Minimum 20 meter reserves on all fish bearing and direct tributary streams where recommended by Department of Fisheries and Oceans.

During this period of intense Mountain Pine Bark Beetle infestation, due to the unpredictable rates and duration of attack it is very difficult to determine if and when unacceptable Equivalent Clearcut Areas (ECAs) will occur within any one watershed or portion thereof.

These unacceptably high ECAs can have extremely detrimental effects to important cultural and other First Nations values. In the case of Mountain Pine Beetle Blocks, where harvesting is occurring primarily to address forest health issues, further constraints will therefore apply. These constraints include:

- The retention of all advanced regeneration and species other than pine within 100 meters of water and water bearing features; and,
- The removal of green attack pine only within 50 meters of water and water bearing features.

Skeetchestn contends that if these constraints had been followed during the past 15 plus years of large scale beetle harvesting within our territory many of the issues hydrological function and landscape connectivity could have been avoided. Skeetchestn continues to put these forth as good guidelines to follow within the forests of our territory which happen to around be situated just uphill from the desert.

The following is an excerpt from an email from Michael Milne, consulting hydrologist, following his April 2015 presentation to the Tripartite Working Group:

The blanket approach to riparian management is not appropriate for a couple of reasons. Sometimes you need more retention and sometimes you need less, all depends upon the nature of the system in question and energy (i.e. stream power).

After 20 years of looking, some patterns became clear. Channels greater than about 1.5 m in width have power which can destabilize the system if mature timber is not left to provide bank stability and a source of wood to the channel. That's regardless of stream class. Less than about 1.5 m in width the power is not there, the key issue is site level disturbance and accumulation of logging related debris.

The qualifiers are referred to as active fluvial units, which is code for alluvial fans and floodplains. Those are the alluvial reaches and where there's power (i.e. >1.5) there's good reason to retain and protect the entire feature or landform. There are a couple of other qualifiers where you have debris flow and/or debris flood activity but those are mostly confined to the steeper and wetter portions of the province, but not always!

The message is.....bundle up your retention and park it where it counts from a hydrologic and geomorphic perspective. The bonus is that retention where it counts also gives you a lot of what you need to keep temperature down and critters happy - corridors that are of sufficient size and connectivity to meet their needs.

I can't tell you how many times I've reviewed a non-classified drainage and/or small S6 stream (<1.5 m in width) along which trees were retained only to get flattened by the wind resulting in damage that would not have occurred if the riparian area were logged as per the above protocol. Would the damage have been less if 200 m were retained on either side? Sure, but it's not required and that kind of approach would just shut down operations over most of province. At least 50% of the licensees in the N. Okanagan, Shuswap, and N. Thomson areas are running according to above riparian management protocol. They're asking for it because it makes sense and it works.

Detailed Office Review of Hydrologic Assessments Completed in the Tranquille Community Watershed, Dr. Rob Scherer, May 9, 2013

This paper by Dr. Rob Scherer was circulated to the Working Group and posted to the MWSP Website as one of many resources pertaining to watershed stewardship in the pilot area. This review was undertaken as a result of the Forest Practices Board special investigation regarding community watersheds.

During the office review the Tranquille River watershed was highlighted as being of concern due to several factors. These factors included:

- The high level of proposed forest development associated with MPB infestation;
- The presence of multiple forest licensees operating in the watershed;
- The recent completion of numerous watershed and hydrologic assessment completed in the watershed;
- The potential high consequences and risk that could be negatively affected by forest disturbance associated with MPB and/or salvage logging; and,
- Lack of integration and observed differences in opinion between the completed watershed and hydrologic assessment reports.

Six watershed/hydrological assessments completed in the Tranquille River Community watershed were reviewed. Three key issues/concerns were identified in the review of the six Tranquille River watershed assessment reports:

- The lack of an integrated watershed level approach in the assessment of cumulative hydrological effects of primary forest activities within this community watershed and apparent differences in opinion between reports;
- Potential consequences to public safety, private property and infrastructure; and,
- Limited improvement and succession in the evaluation of risk with limited information provided in regards to risk mitigation.

Variable-retention riparian harvesting effects on riparian air and water temperature of sub-boreal headwater streams in BC, J.F. Rex et.al., Forest Ecology and Management 269 (2012).

This paper was circulated to the Working Group and posted to the public sharepoint site.

Abstract: A 5-year (2002-2006) before-after control impact study was initiated in three watersheds of the British Columbia central interior to assess the ability of a variable retention riparian treatment to maintain fish habitat conditions in small sub-boreal streams (<2 m width).

This paper presents findings for the stream shade and air and stream temperature component of the study. Eight streams were studied to assess stream shade, riparian air, and stream water temperature response during summer months to a policy retention level of at least 10 stems of merchantable timber per 100 m of channel length. After harvesting there was a significant decrease in shade as well as an increase in air and stream temperature at all treatment sites.

Riparian harvesting reduced stream shade by 30-50% from pre-harvest levels but shade was recovering to pre-harvest levels 2-3 years after harvesting. Mean weekly average and maximum air temperatures at treatment sites increased more than 3C compared to control locations. Mean weekly average and maximum stream temperatures at treatment sites increased by as much as 5 and 6C, respectively.

Despite the recovery of shade measured at the water surface, mean and maximum water temperatures remained significantly higher at treatment sites than control sites. The discrepancy between shade recovery and temperature response indicates that vegetative surface height receiving radiation must be considered along with shade. Shade from overstory may be more effective at maintaining riparian air and stream temperatures than lower understory because it can limit energy transfer to lower layers of the forest canopy and ground surface.

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Kamloops TSA Watershed Risk Analysis Submitted to FLNR, Submitted by Forsite Consultants Ltd. In collaboration with M.J. Milne & Associates Ltd. May 24, 2012.

The project provides a relative ranking of potential risk in over 570 reporting units. A ranking is provided for both social and environmental (fisheries) elements at risk. Results can be used to direct more detailed analysis in priority areas for development, conservation, rehabilitation, or other purpose as required.

A summary of project findings is provided along with detailed methods, data and maps in the appendices. Key information for managers includes:

- relative risk rankings and maps for all reporting units - used to compare reporting units based on relative potential risk; and,
- hazard and consequence related information for each reporting unit - used to understand current water related conditions, the type of elements potentially at risk, and factors that contribute to the relative potential risk score.

Watershed	Environmental Risk Score	Social Risk Score
Criss Creek	7.6 *	3.7
Jamieson- Kamloops residual	3.9	7.9 *
Tranquille River	4.5	5.8

**indicates top 10 of 570 reporting units*

Attention to the highest ranking units is important as results suggest high to very high potential risk to either fish or social values in these areas. Attention to the remainder of the relative ranking is also important as significant values are contained within many of the lower ranking units and high hazard conditions could be present. Therefore, a comprehensive approach is recommended for use of information provided in this report.

Working Group June 10 Field Tour

Stop #1 of the field tour looked at stream channel assessment, habitat connectivity. Some discussion points to consider for our plan and/or general discussion:

- Road building facilitates cattle access to streams; trampling causes sedimentation
- Good practice to remove trees that will likely blow down in riparian management areas

- FREP is not compliance monitoring. Most S6 streams post-harvest are likely in a “not properly functioning” state, but there is nothing illegal or non-compliant about that.
- Need better communication of FREP results to industry
- Pre-Forest Practices Code roads vs. post, and FRPA roads and standards. It was observed that sediment in the ditches was being transported into the stream. As a Forest Service Road (FSR) this is an FLNR responsibility.

Stop #2 of the field tour looked at riparian management, road deactivation, habitat connectivity. Mark Runge led us across a recently harvested block, along a deactivated in-block road, to look at retention on a non-classifiable (NC) drainage. We also looked at advanced regeneration that was protected in the block. Some discussion points to consider for our plan and/or general discussion:

- Excellent example of retention, above and beyond what is required on an NC drainage;
- Connectivity in-block, even though not very wide, still contributes to wildlife and habitat values - including Western toad (suspected in pools on the deactivated road) and sandhill crane;
- Could consider feathering/buffering to promote wind firmness of retention areas;
- Grasses coming back are good forage value for cattle;
- Mechanical site preparation removes this forage value, creates access challenges;
- The values for wildlife and habitat provided by connectivity corridors or retention on the landscape are of more value, than removing them for the risk of wildfire;
- Increased road access on the landscape, from beetle salvage over the last 10-15 years has various impacts:
 - Good for ranchers, they can access previously inaccessible portions of range;
 - Provides more access for hunters, pressure on wildlife, and increased fire risk;
 - Roads can provide a fire break and access to fight wildfires;
- Deactivation of roads impacts ranchers; need good communication in advance;
- Deactivation of roads also impacts Wildfire Management Branch, and access for fires;
- This block, post-harvest, even though slash piles have been burned, has an elevated fire risk in the short term;
- Prescribed fire of harvested areas is becoming a lost art. The risks of over-achieving have become greater over the last few decades; smoke concerns and air quality is an issue; licensees have limited availability of good venting days to burn piles, let alone do prescribed burning;
- Leaving debris piles on-block, at least some, provides habitat for some species;
- Water is a living, spiritual thing.

Towards the end of the field tour day, the following ideas were suggested to include in our plan:

- Managing for connectivity, green-up better - as in the pre-beetle salvage days (concern noted that this leaves road networks open for long periods of time);
- Need key habitat areas for moose identified from Chris Procter;
- “Stack the values” - let’s focus retention planning on areas that have multiple values, and/or are already constrained (e.g., unmovable OGMAs);
- Continue to promote modified harvesting in riparian areas, as seen at Stop #2;
- Implement the principle of no net road gains - find the right balance of access management and control, and road deactivation/rehabilitation;
- Ensure we have good baseline hydrology data, and consider five factors that impact hydrology: pre-FPC roads; timber harvesting; current rate of cut; current road system; cattle grazing;

Chapter 10 - Habitat Connectivity

Definition

Habitat connectivity is considered to be one of the most important factors in maintaining biological diversity. Not just maintaining gene flow is essential for genetic fitness and allows for adaptation to environmental changes. For some species with limited ranges, especially reptiles and small mammals, habitat loss can threaten survival of a population if species cannot migrate to suitable replacement habitat. Maintaining connectivity allows limited-range species to shift habitats to adjacent areas if populations experience loss of habitat. For larger species, habitat connectivity is required across a much larger swath of the landscape because resources are dispersed across a broader area. Individuals traveling between isolated populations allow gene flow to occur, which is important for avoiding inbreeding.

Tk'emlúps te Secwépemc Definition

Our diverse ecosystems in our area of responsibility range from mountains to deserts, which include a wide variety of life forms from wild grassland to Old Growth Forests (See Figure 1). The Secwépemc were practicing habitat connectivity for thousands of years. It began with the human interactions of neighboring tribes and nations. The Secwépemc people knew that they could not survive without new DNA entering their nations, so they intermarried and kept new blood ties coming into their communities for healthy future populations.

Animals rely on habitat connectivity to move and connect along pathways searching for food, water, mating partners, and shelter. Unfortunately the wildlife in the Secwépemc area of responsibility doesn't possess the same knowledge as humans and cannot protect themselves from outside circumstances. The Secwépemc are facing the harsh reality that their once subsistence based diet will be a thing of the past, unless there can be a change in the habitat connectivity within their territory.

Preserving Habitat Connectivity

The protection of wildlife connectivity diversity in BC starts in the Natural Resource Sectors; Logging, Mining, Road Construction, Off-Road Vehicles and Population Expansion to name a few. The time has come for the First Nations to stand up and start participating in how these natural resources are being extracted from British Columbia.

Chapter 11 – Other Issues

In addition to moose, water and habitat connectivity covered in separate chapters, there are other issues of concern as a result of the wide-scale Mountain pine beetle impacts and the subsequent timber harvesting that are related and inter-connected. These include but are not limited to biodiversity, species at risk, mule deer winter range, culturally important plant species, range, public safety, private property, infrastructure and invasive species.

The landscape level biodiversity in the plan area has changed; the amount of early seral stage has increased, in particular in the high-elevation plateau portion of the plan area. Forest fire suppression activities over the past century have limited the natural disturbance and the maintenance of certain plant communities, such as wild asparagus at low elevations, as discussed during the June 10, 2015 field tour.

Species at risk that may exist in the plan area include but are not limited to the Great Basin spadefoot toad, western toad, Western screech owl and white wintergreen to name a few.

Mule deer winter range polygons exist within the IDF BEC zone of the plan area, and in the near future, other planning initiatives will be introduced.

As mentioned at the June 10, 2015 field tour, over 65 species of plants and animals that exist in the plan area are culturally important and used by Secwepemc people. The wide-scale Mountain pine beetle impacts to overstory forests, and the subsequent timber harvesting, have likely had significant impacts on these plant communities.

As noted in Chapter 6, there are a significant number of range tenures within the plan area. Impacts from Mountain pine beetle and subsequent timber harvesting and road building activities on range operations may generally include but are not limited to: increased forage opportunities in cutblocks and disturbed area; increased range access through new roads; increased blowdown impacting fences and infrastructure; and changes in water availability from higher peak flows and longer periods of low summer flows. Impacts from increased access to range can result in increased sedimentation, as seen on the June 10, 2015 field tour.

Scherer (2013) noted that previous hydrologic assessments completed in the Tranquille watershed identified risks to public safety, private property and infrastructure related to the watershed status and possible outcomes of an extreme storm event.

Common causes of the spread of invasive species are increased soil disturbance, changes in forest cover, the development of linear corridors (e.g., roads), and the multiple users who may transport seeds or plant material from other infestations. The creation of new roads to salvage harvest Mountain pine beetle killed timber has also created new vectors for the introduction of invasive species, through recreational users, hunters, range licensees. Impacts of the introduction of invasive species are loss of biodiversity, loss of forage for wildlife and domestic animals, reduction in quality of hay crops, and financial costs to treat infestations.

Chapter 12 – Cumulative Effects Assessment

Cumulative Effects Definition

Cumulative Effects are defined as changes to environmental, social and economic values caused by the combined effect of past, present and proposed activities and events.

B.C. Cumulative Effects Framework

The Province wants a strong economy but also desires to sustain social, economic and environmental values. Recognizing that unintended impacts to these important values were occurring over time - due to a range of activities and events - the Ministries of Environment, and Forests, Lands and Natural Resource Operations, set out to develop the procedures and tools required to help assess and manage for cumulative effects.

In BC, Cumulative Effects Assessment was traditionally undertaken as part of Major Projects through the BC Environmental Assessment Office - these are project specific cumulative effects assessments led by EAO on behalf of the Federal Government.

The Cumulative Effects Framework (CEF) is a new approach for assessing and managing cumulative effects in B.C. is known as the Cumulative Effects Framework (CEF). CEF Value Assessments include tracking the condition of values over time and projecting into the future in consideration of potential developments. With this information, decision makers are able to understand if the risk to values is trending up or down, or if these values are stable.

By measuring and assessing the cumulative effects of past, present and reasonably foreseeable activities on the land base we can improve our ability to manage for desired outcomes of CEF values, support decision making, encourage cumulative effects mitigation strategies, ensure more effective First Nations consultation, and assist proponents in coordinating their activities together in order to minimize cumulative effects and develop more effective and efficient proposals.

CEF developed criteria for identifying and selecting CEF Values that can be monitored going forward:

- Existing legal or policy objectives
- Support for Aboriginal/Treaty Right
- Coarse filter/represents nested values
- Spatially mappable
- Available Data

The initial suite of CEF Values that have been selected are: Forest Ecosystem Biodiversity; Aquatic Ecosystems; Water Quantity and Quality; Priority Fish and Wildlife Species; Air Quality; Cultural Heritage; Visual Quality; Resource Capability (e.g. timber) and Economic and Social Wellbeing.

Over time, some of the values may be replaced. If a new value of high importance is identified, a strategic decision has to be made whether the data can be collected to incorporate the value in to CEF. Fifteen values have been selected as an initial suite of CEF Values. All except the Priority Fish and Wildlife Species will be provincially consistent, which

has remained flexible to accommodate the variance in species distribution and regional differences.

Key considerations in the Application of Cumulative Effects Assessment (CEA) information are:

- Assessment outcomes are not used to evaluate compliance with regulation as it includes effects from multiple resource sectors as well as natural disturbance
- Assessments are not intended to represent first nation views nor replace the requirement for consultation, rather they are the best available data from government
- Assessments are GIS based and strategic in nature thus are used to convey potential risk rather than actual risk.
- As a result, all outcomes have uncertainty inherent within them. Increased confidence in assertions of risk comes with inclusion of on the ground monitoring information and alignment with staff experience.
- On the ground monitoring data was used as input to some value assessments (e.g. moose harvest surveys) or as additional sources of information (e.g. FREP monitoring).
- Assessment results and mitigation options are offered as a starting point for discussion and management action, not as the unconditional answers or direction.
- Assessments at a strategic scale necessarily render down complex landscape dynamics into the essential elements that can be utilized to guide strategic management discussions and actions. Thus, the strategic assessments are intended to compliment expertise applied at tactical (planning) or operational (on the ground) levels but not replace them

CEF Implementation is rolling out throughout the Province in a staged manner:

- Phase 1 is now complete - Establishing the program, accountability and resourcing; implementing pilots, developing policy.
- Phase 2 is currently underway - Developing additional values and developing long term scenarios, improving tools and collaborating/partnering
- Phase 3 is full implementation throughout the province.

On May 26, 2015 the BC Auditor General released her report on BC's cumulative effects framework. The AG made nine recommendations to government on cumulative effects. There is a significant amount of overlap between the AG recommendations the CEF proposal to government in 2013. The scale and pace of some activities are being re-scoped due to the AG recommendations.

CEF & the Thompson Okanagan Region

In TOR, FLNR is developing CEF values including watershed condition, landscape biodiversity, visual quality, moose, mule deer and old growth, are being examined at a landscape level. This analysis is being verified with data collected on a watershed and site level. This work is being undertaken in order to refine value assessment procedures and to begin using CEF information in resource management decisions including Kamloops TSA TSR 5.

The MWSP Working Group included learning opportunities on the Cumulative Effects Framework (CEF) specifically as pertaining to moose and riparian values:

- On January 14, 2015 Eric Valdal, Team Lead Cumulative Effects Thompson Okanagan Region, provided a high level introduction to CEF followed by a presentation by Doug Lewis on Kamloops area CEF work related to water and watershed values.

- On March 11, 2015 Doug Lewis provided an overview of CEF for moose value in the Kamloops area followed by a power point presentation by Chris Procter, Regional Moose Biologist. The Power Point presentation is available on the SharePoint Site <https://www.for.gov.bc.ca/dka/> or click [here](#) for a direct link.

CEF and Moose Value in Thompson Okanagan Region

The key elements of the presentation are presented here including a brief summary of the condition of the Moose Value and associated factors for the Pilot Area.

In Thompson Okanagan Region, FLNR is currently undertaking Values Assessment for Mule Deer, Moose, and Watershed Values to inform decision making including Kamloops TSA TSR 5. With respect to the Moose Value, this CEF work in Thompson Okanagan Region is intended to support a range of strategic-level applications including:

- Supporting open and transparent government communication to promote general understanding of the condition and trend of moose populations to First Nations, stakeholders and the general public,
- Providing input into strategic-level natural resource allocation decision processes (e.g. timber supply review) that may affect moose,
- Supporting cooperative tactical planning of resource development with First Nations, government and industry.
- Supporting strategic-level allocation of hunting and guide-outfitting permits,
- Providing input for project-level natural resource permitting and authorization decision processes,
- Providing input to guide regional inventory, monitoring and research needs related to moose management.

For the Moose Value, CEF uses sub-Wildlife Management Units as moose planning cells. CEA considers all factors that may affect moose populations including human caused effects on habitat or mortality and predation, wildfire or insect impacts on habitats. The model uses GIS-based indicators to model our knowledge of factors that impact moose populations. These knowledge factors are referred to as a 'Bayesian Belief Network Model' (BBN), which refers to the factors that may impact Moose as well as their relative importance in influencing the Moose Value. This Risk-based approach measures how risk ratings are used to express how likely the condition will result in a declining moose population.

The advice of regional moose biologist, Chris Procter, is utilized to obtain ratings of effects on adult moose survival and recruitment related to factors such as habitat loss or alteration, hunting pressure, predation. The expert also helps to define consequence ratings that include qualitative or quantitative estimates of relative effects of factors on the moose value. This risk based approach results in a Moose Population Risk rating for the Moose Planning Cell as low, moderate or high hazard and consequences to the moose value.

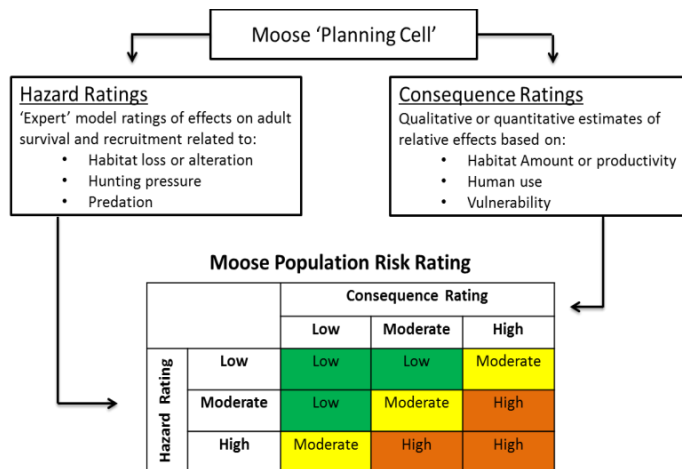


Figure 9: The Risk Based Approach

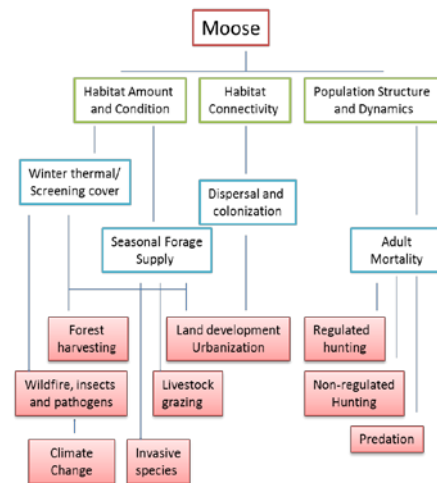


Figure 10: Moose Value Factors

Moose are an 'early seral' species. Disturbances such as logging or wildfire create forage. However, livestock grazing can affect availability of winter forage. Also, moose require some forested canopy for shade in spring (thermal habitat to avoid heat stress). Moose require less thermal habitat in mountainous terrain.

The 'Habitat Hazard' shows that the pilot area has a mix of good forage and thermal cover, with some areas where the forage and thermal cover is a risk to the Moose Value.

The model shows that terrain affects wolf density as wolves are more concentrated when there is limited moose winter habitat in valley bottoms.

The northern part of the Thompson Okanagan Region, the steep terrain limits the availability of moose winter range. This concentrates the moose in valley bottoms, and wolves target these limited areas resulting in high wolf density on moose winter ranges and therefore a high risk to the Moose Value.

In the Pilot Area, Wolf Density on Winter Range poses a moderate risk to the Moose Value. The plateau terrain of the Pilot Area means moose winter range is more dispersed and consequently moose utilize more of the landscape and wolf density is less concentrated but still moderately high.

The model shows that predation is the main factor affecting moose recruitment. The highest moose recruitment occurs in areas of Thompson Okanagan Region with the lowest wolf density. Moose recruitment in the Pilot Area poses a moderate risk to the Moose Value.

The model shows that hunting and predation are the main factors affecting adult moose survival. Adult moose survival is greatest in areas with less hunting and lower predation.

In the Pilot Area, the Adult Moose Survival poses a moderate high to moderate risk to the Moose Value.

The model estimates the greatest risk to the Moose Value in the North Thompson. There is generally less Moose Hazard in the south and west of Kamloops; the impacts are primarily driven by wolves and the overlap of wolves and hunting.

In the Pilot Area the hazard to the Moose Value is moderate and moderate high.

These GIS-based 'results' are 'ground truthed' to include field data such as: moose population monitoring, catch per unit effort data, population inventories such as aerial composition surveys (cow:calf ratios and cow:bull ratios) and Aerial Stratified Random Block SRB Surveys. This field data will confirm and calibrate the Moose Value model.

Note that current research estimates the adult moose population as fairly stable at approximately 800 adults in the Bonaparte Plateau. There is a concern with calf recruitment rate in some MUs of the Bonaparte Plateau.

In conclusion, the overall trends throughout the Kamloops TSA include an increase in wolf density on winter ranges in the last 10 years. The MPB salvage logging has increased the availability of forage, but also resulted in a reduction in thermal/visual cover and an increase in human access with roads. These factors are interacting to have greater pressure on the moose population in the study area. Maintaining sustainable moose populations means we need to manage what we can control.

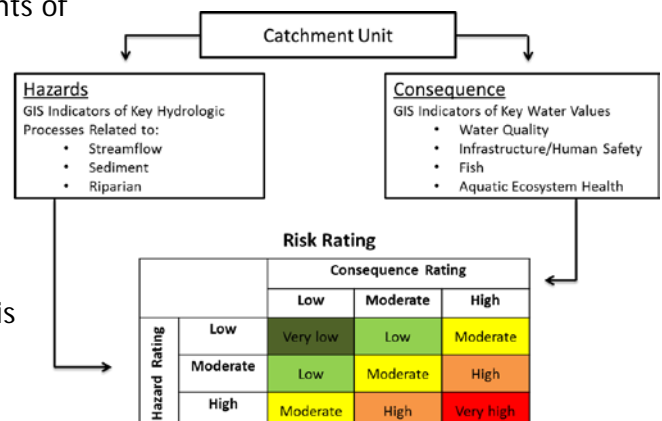
CEA and the Watershed Value in TOR

The Cumulative Effects Assessment (CEA) Watershed Assessment Procedure developed out of the need to understand potential cumulative watershed effects of land use activity and natural disturbance over broad geographic areas. The procedure builds from existing watershed assessment procedures developed in BC (e.g. BC MOF 1999, Carver and Utzig 2000, Green 2005). The work is now used to support strategic-level cumulative effects assessment as part of BC's Cumulative Effects Framework (Lewis et al. 2015). The procedure is intended as a first step to flag 'higher risk' catchments as part of a multi-step watershed assessment approach.

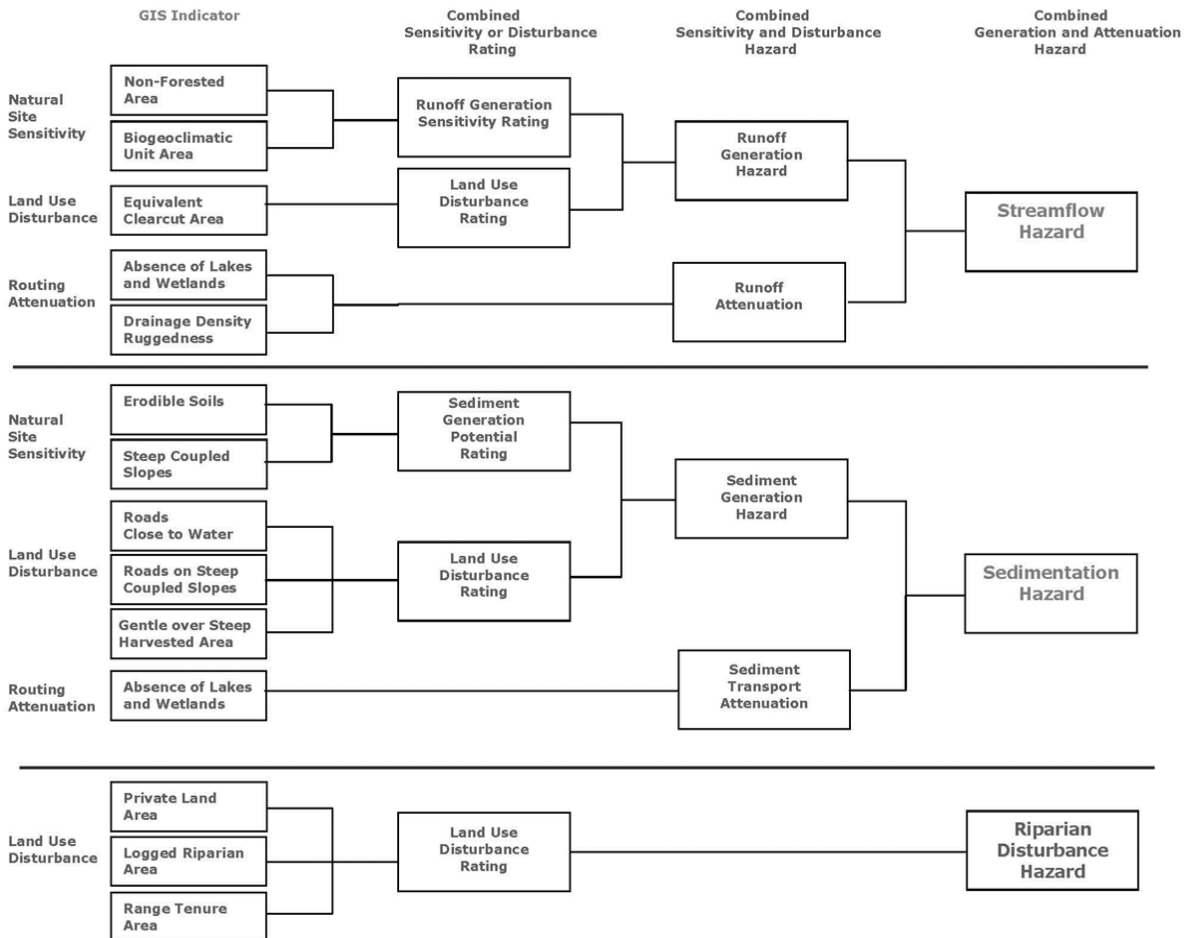
It is important to understand the difference between Forest and Range Evaluation Program (FREP) monitoring and CEA monitoring. FREP monitoring involves random assessment of stream function in relation to specific cutblocks related to forestry and FRPA values. CEA monitoring adapts the FREP protocol to look at stream function and condition as a whole.

The CEA watershed assessment procedure targets the bottom of watersheds where upstream effects can accumulate. Subsequent field assessments of stream functioning condition at these spots correlated well with the highest hazard ratings and riparian hazard ratings assigned to those watershed using the CEA watershed analysis.

Assessment of Watershed Cumulative Effects uses a similar risk-based approach as described above for the moose value. Figure 11 (at right) shows the Watershed Risk Matrix used in watershed risk analysis (adapted from Wise et al., 2004).

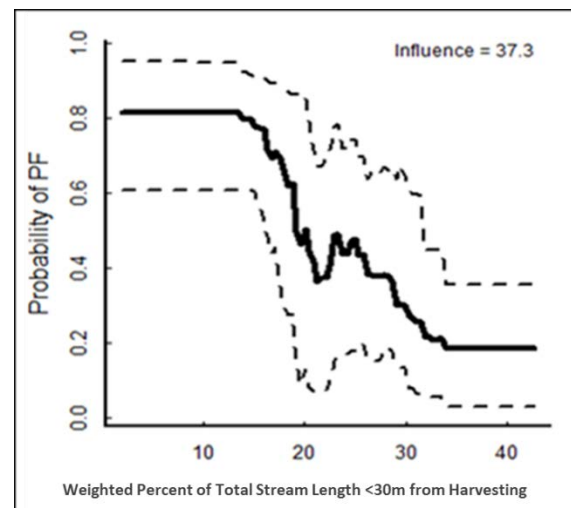


The BC Freshwater Atlas is 1:20,000 Watershed Assessment Unit (AU) boundaries are the base units for analyzing hazard, consequence and risk ratings. The analysis uses GIS-based indicators of inherent watershed sensitivity and land use activity/natural disturbance to three key watershed processes: streamflow, sedimentation and riparian function. Indicators are combined in ratings tables to provide sensitivity, disturbance and hazard ratings (Figure 12 below).



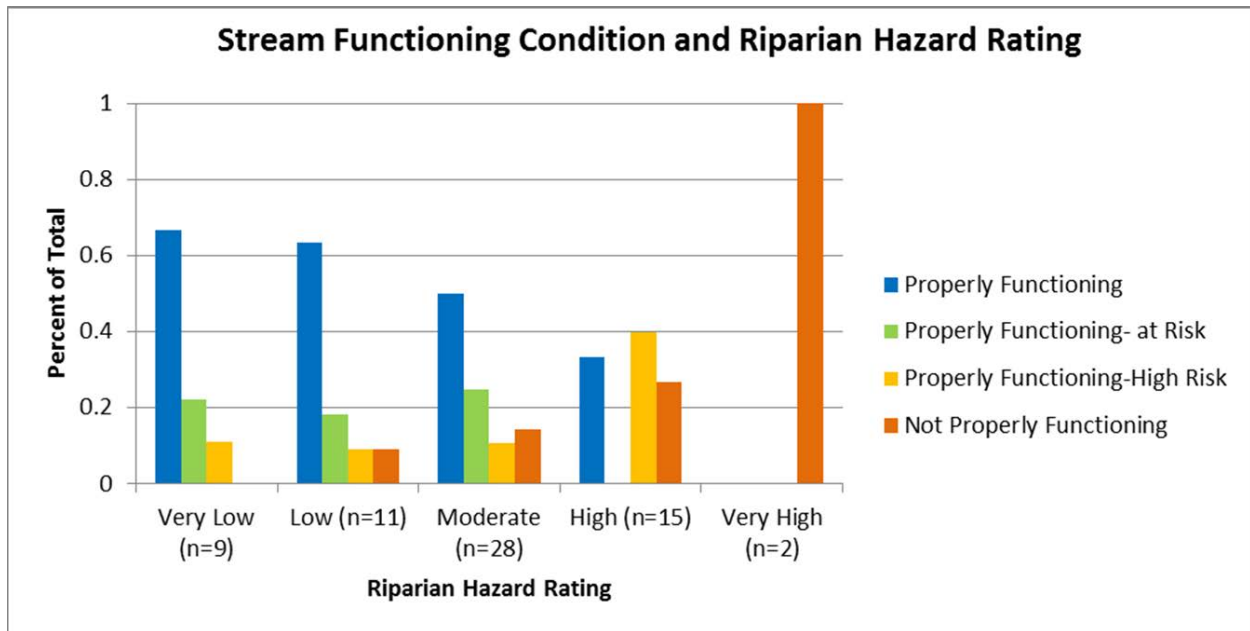
To further refine preliminary estimates, independent measures of impacts, collected through targeted field-based monitoring in local catchments, are being used to calibrate indicator measures and associated hazard ratings. The results are used to calibrate hazard ratings in subsequent versions and help validate model outcomes.

CEA includes targeted field-based assessments of stream function condition using the Riparian Assessment Protocol (Tripp 2009). These field assessments were compared with GIS-based



hazard ratings. GIS based hazard ratings of stream function showed strong correlation to both highest hazard watershed risk ratings.

Figure 13 (bottom right of previous page) shows that the percent of total watershed stream length adjacent (<30 m) from harvesting showed the strongest relationship to stream functioning condition.



Results to date indicate that further work is required to validate model outcomes, and adjust indicators, scores and hazard ratings accordingly. Nonetheless, there is a high level of confidence that the indicators and their application in this method give a useful approximation of the key hydrologic processes and watershed characteristics affecting streamflow, sediment and riparian function (Figure 14 above).

CEA for Watersheds in Kamloops TSA

While the Hydrologic hazard for the Merritt TSA has been completed, this type of report has not yet been completed for Kamloops TSA. However, preliminary CEA of watershed condition indicates similar concerns in the Kamloops TSA. Field monitoring is ongoing using the Riparian Assessment Procedure. There is strong correlation between the CEA assessments and the field assessments.

Secwepemc Environmental Monitoring Pilot

In late July 2015, the Secwepemc Environmental Monitoring Pilot was launched. This pilot provided an opportunity for Secwepemc and FLNR to collaborate and facilitate training of Secwepemc RFA Signatory communities' staff to support environmental monitoring. This project is with a view to developing capacity to support the RFA Signatories to collaborate on environmental stewardship in the future.

The objectives of the pilot are:

- To offer training and field experience to Secwepemc community members who desire proficiency in FLNR's protocol for stream and riparian assessment, and who are

interested in building capacity in environmental monitoring for the benefit of their own communities;

- To collaborate in order to efficiently and effectively monitor stream and riparian function in the pilot area; and,
- To improve working relationships, communications and information exchange including a better understanding of environmental values and First Nation cultural heritage resources.

The successes of the pilot to date includes a successful three day training course for eleven Secwepemc in undertaking riparian assessment, and successful field assessments of 30 streams within Secwepemc traditional territory.

Several streams have been assessed in the Moose and Watershed Stewardship Pilot area (see Table on p.55-56 below). Condition was assessed in partnership between FLNR stewardship staff and trained Secwepemc Monitors using BC FREP Routine Riparian Effectiveness Evaluation (RREE), which can be accessed here: <https://www.for.gov.bc.ca/hfp/frep/>. Conditions include Properly Functioning (PF), Properly Functioning but at Risk (PF-R), Properly Functioning but at High Risk (PF-HR), and Not Properly Functioning (NPF).

Field assessments show the following:

- Jamieson Creek Watershed: Field-based assessments show that this stream is not properly functioning (NPF) at the confluence and properly functioning but at risk upstream.
- West Jamieson Creek - Basin: Field-based not completed to date
- Criss Creek-Watershed: Field-based assessments show that this stream is properly functioning but at high risk at the confluence and properly functioning- at risk upstream.
- Heller Creek Basin: Properly functioning at the confluence and properly functioning but at risk upstream.
- Mow Creek Basin: Properly functioning
- Tranquille Lake - Basin: Properly Functioning

Moose/Watershed Pilot Area - Summary of GIS results and Field Monitoring

Catchment	GIS-Based Assessment Ratings				Field-based Assessments		Comments
	Streamflow	Sediment	Riparian	Contributing Factors	Condition*	Factors	
Jamieson Creek - Watershed	High	Mod	High	High ECA, limited attenuation in watershed. Indicators for logging and range streams near (<30m) streams increase riparian hazard.	PF-at risk upstream	Logging/natural events	Evidence of potentially higher flows, channel has recently moved, riparian in good shape where sampled
					NPF at confluence	Multiple factors	Human-related impact in riparian responsible for most impacts. Evidence of impacts from high flows that could be natural events or logging upstream
West Jamieson Crk. - basin	Mod	Mod	V. High	High ECA, limited attenuation in watershed. Indicators for logging near (<30m) streams and range increase riparian hazard.	Not assessed to date.		
Upper Jamieson Crk. - basin	High	Low	V. High				
Wentworth Crk - basin	High	Mod	High				
Rushton Crk - basin	High	V. Low	V. High				
Criss Creek-Watershed	Low	V. Low	High	Indicators for logging and range tenures near (<30m) streams increase riparian hazard.	PF-at Risk upstream	Logging/natural events	Bank disturbance and recently deposited LWD debris suggest higher flows, riparian mostly intact
					PF-at High Risk at confluence	Logging/natural events, Human disturbance	Sampled upstream of private land, human impacts in riparian, naturally eroding banks, evidence of high flows causing bank

							disturbance and new wood jams contribute to risk.
Upper Criss Crk - Basin	Low	V. Low	Mod		Not assessed to date.		
Heller Crk - Basin	High	V. Low	High	High ECA increase streamflow hazard despite gentle terrain and limited attenuation	PF- at risk upstream	Logging/natural events	Some evidence of higher flows (bank disturbance, sediment and debris deposition above banks)
					PF- confluence	No factors noted	Riparian in good condition
Mow Creek basin	Mod	V. Low	High	Relatively High ECA, but flat basin with attenuation	Properly Functioning	No factors noted	Riparian well protected, no range impacts observed
Tranquille River Lg. Watershed	Mod	Low	High	Logging near streams, private land adjacent to streams and range tenures near streams increase riparian hazard	Not assessed to date.		
Watching Crk- Watershed	Low	Low	High				
Watching Creek- Basin	Mod	Low	High				
Cannel Creek - Basin	Mod	Low	High				
Tranquille Lake - Basin	Mod	V. Low	High		PF- at risk	Livestock impact in riparian	Bank erosion, bare ground, trampling and grazing in riparian

Condition was assessed using BC Ministry of Forests and Range's Forest and Range Evaluation Program (FREP) Routine Riparian effectiveness Evaluation (RREE), which can be accessed here: <https://www.for.gov.bc.ca/hfp/frep/>. Conditions include Properly Functioning (PF), Properly Functioning but at Risk (PF-R), Properly Functioning but at High Risk (PF-HR), and Not Properly Functioning (NPF).

SECTION 3 – Resource Management Commitments

These commitments address the goals and objectives from Chapter 1.

Chapter 13 – Landscape or Watershed/Basin Level Commitments

The following polygons at a landscape or watershed/basin level have been created:

- Identification of moose polygons
- Identification of key habitat elements for moose guiding principles
- Enhanced, variable width retention strategies on streams and/or NCDs
- Identification of fans and floodplains
- Utilization of 10km² moose home range planning cell approach to assess thermal cover
- Utilization of sub-basin approach to assess thermal cover

See Chapter 14 operational commitments for what has been agreed to in these polygons.

Chapter 14 – Operational Commitments – forest industry, BCTS, licensees

General comments on language and wording in this chapter:

- Enable flexibility; use “avoid where possible” instead of “avoid”
- Consider these as guiding principles or best practices, but recognize they may not be operationally feasible all the time; fire, forest health agents and abiotic factors may change the forest over time such that the objective is no longer being met; exemptions may be considered with an appropriate rationale
- Maintain – implies that if it’s not there, recover to this amount

14.1 - Hydrology/riparian commitments

14.1.1 - retention hydrology/riparian commitments

Acronyms and definitions

- RMA - riparian management area; includes a reserve zone (RRZ) and a management zone (RMZ)
- LMA - lakeshore management area; includes a reserve zone and a management zone
- Original estimated basal area - the intent is to “stand up” the trees that were logged in the original 200m MZ, and base calculations on that original amount. The intent is NOT to remove a portion of what remains at the current time.
- Stream (excerpt from FPPR definition) - means a watercourse, including a watercourse that is obscured by overhanging or bridging vegetation or soil mats, that contains water on a perennial or seasonal basis, is scoured by water or contains observable deposits of mineral alluvium; and has a continuous channel bed >100m (see more in FPPR)
- S4 stream - fish bearing stream <1.5m in width
- S5 stream - non-fish bearing stream >3m in width
- S6 stream - non-fish bearing stream <3m in width
- NCD - non-classifiable drainage; does not meet definition of a stream

Retention refers to what is retained in a riparian management area (RMA), whether through a reserve zone (no harvest) or a management zone (modified harvest). **Objectives for retention are as follows:**

- Maintain ecological and biological functions for wildlife, fish and plant species
- Protect water quantity and improving connectivity, and riparian habitat
- Maximize shade for streams and minimize water temperatures
- Provide large woody debris input over time

The opportunities to meet the retention objectives above will vary across the plan area. Therefore, retention strategies should be applied differently across the plan area, based on the following criteria to consider (including but not limited to the following):

- areas of confluence with other tributaries
- connectivity to classifiable streams
- temperature sensitive streams, areas of cold water refugia, groundwater upwelling
- topography and aspect (more retention on steep slopes; no harvest of incised, steep ravines; less retention on 0% clay soils where high blowdown risk due to shallow rooting; consider aspect on peak flows and hydrology considerations)
- deciduous stands (retain more in deciduous stands)
- seral stage of the reach of stream (retain more of what is in deficit)
- dominant winds and wind direction, blowdown risk
- BEC subzone - more retention in IDF; less in higher elevation BEC subzones

Hydrology/riparian Commitment	Rationale, or objective	Geographic applicability	Agreement?
Option A - CRMZ policy approach			
<p>Apply riparian component of Skeetchestn Cultural Resource Management Zones (CRMZs) on 100m either side of all water features, on a CP/TSL basis</p> <p>Retain advanced regeneration in the outside 50m; have more retention closest to the water feature; aspire to have no more than 50% of basal area removed within 50m buffer of water; provide rationale why not achievable</p> <p>Focus on areas where it flows/attaches to other systems, not stand alone non-flowing wetlands/NCDs</p>	<p>Skeetchestn Cultural Heritage Resources are highest density near water</p> <p>See retention objectives above (p.58)</p>	Entire landscape of the plan area	No. Some felt this was the only appropriate approach.
Apply 50% basal area retention analysis on each 1km reach of stream for the CRMZ commitment (i.e., 50m either side of streams, 50% basal area retention) - demonstrate how this will be met on a CP basis with a GIS analysis of a 50m wide swath over a 1km reach of stream.	Demonstrate how retention will be met on a CP/TSL basis	Entire landscape of the plan area	No

Hydrology/riparian Commitment	Rationale, or objective	Geographic applicability	Agreement?
Option B - enhanced FRPA approach			
<p>If a block area is within 50 meters of a classified stream, assess the retention along the stream within a 30m RMA for a distance of 500 meters upstream and downstream from the midpoint of the block. This defines the "stream reach."</p> <p>Within the applicable stream reach, maintain a minimum 30% of the original estimate basal area within the entire 1km reach through the following:</p> <ul style="list-style-type: none"> plan a mix of reserve zones and management zones to address the retention objectives, using various implementation techniques (e.g., basal area retention, diameter limits, protect advanced regeneration, machine free zones) focus retention within 10m of stream minimum of 10 mature trees/100m parallel to stream within the first 10m from the stream <p>Identify the management considerations (confluence, connectivity, temperature sensitive/groundwater upwelling, topography/aspect, deciduous, seral stage, dominant winds/windthrow risk) to help determine the best overall riparian management strategy within the reach.</p> <p>Demonstrate how this will be met by using a GIS analysis of a 30m RMA over the applicable stream reach</p> <p>In addition to the retention in the 30m RMA, retain advanced regeneration or non-merchantable trees in clumps where practicable up to 50m from the stream.</p> <p>Track this over time and raise awareness with other licensees (consider in implementation plan if this is an issue or not; track reserve zones, not management zones. Future TSR tracking as well).</p>	See retention objectives above (p.58)	All classifiable streams in entire landscape of plan area	No. This is the minimum approach agreed to by some licensees who cannot agree with the Skeetchestn CRMZ policy approach.
Identify NCDs, ribbon them in the field, and retain all understory where feasible, some mature stems within 5m, and apply 5-10m machine free zone	See above	NCDs in entire landscape of plan area	

Hydrology/riparian Commitment	Rationale, or objective	Geographic applicability	Agreement?
<p>Implement either Option A or Option B.</p> <p>Consider option A and option B in operations for year 1 of implementation; be prepared to report back in April 2017 on experiences of what the impacts would have been in applying either option.</p> <p>Consider new information and revisit the two options with the goal of coming to consensus on a common approach.</p>	Learn from experience and new information (i.e., adaptive management)	Entire landscape of the plan area	Yes - Dec 9 TWG
<p>Map and identify the fans and floodplains; apply more retention at transition from steep to shallow gradients (i.e., fans and floodplains); also more monitoring</p> <ul style="list-style-type: none"> Utilize macroreach mapping layer to identify where fans/floodplains exist; use LIDAR where it exists (BCTS, Tk'emlups Forestry); consult with Deepa Filatow; terrain stability maps 	Bundle retention where it is needed most to maintain and protect riparian function.	Entire landscape of the plan area	Yes - Oct 14 TWG

14.1.2 - other hydrology/riparian commitments

Hydrology/riparian Commitment	Rationale, or objective	Geographic applicability	Agreement?
Deactivation - manage water; best practices for road deactivation and removal or rehabilitation; maintain natural drainage patterns; could apply to in-block temporary roads; and old roads; apply to high risk areas as opposed to all roads everywhere; merge with moose values.	High road density leads to higher moose mortality. Road density can impact riparian function	Entire landscape of the plan area	Yes - Oct 14 TWG
Best practices for road building and maintenance for permanent roads <ul style="list-style-type: none"> ▪ Crowning of road surfaces ▪ Stormproof road systems (future design, but also re-sizing and replacing existing culverts) ▪ Regular inspections and maintenance of culverts, bridges; upgrade if needed ▪ Adequate cross drains on permanent roads ▪ Sumps and settling ponds on ditchlines to settle sediment ▪ Minimize new road construction ▪ Design road locations to minimize number of stream crossings required, while considering other terrain factors ▪ Crossings over fish bearing streams must maintain natural substrate in the stream and protect the banks 	Sediments from roads can impact riparian function	Entire landscape of the plan area	Yes - Oct 14 and Nov 4 TWG
Prompt reforestation to achieve earlier hydrologic recovery; aim to plant within 3 years; plant multiple species where ecologically appropriate	Restoring forest cover quickly will expedite hydrologic recovery	Entire landscape of the plan area	Yes - Oct 14 TWG
Retain regeneration, green non-merchantable timber and non-commercial species where operationally feasible and where it doesn't impact silviculture standards	Retaining live trees on site maintains some evapotranspiration, intercepts snow	Entire landscape of the plan area	Yes - Oct 14 TWG
Leave logging slash on site where possible to retain soil moisture and hold moisture (difficult planting, ranchers won't like this) - utilize this in riparian CRMZs and moose polygons; explore seeking exemptions for fire hazard assessment and abatement	Unlimited access to streams by cows can impact riparian function. Logging slash reduces access by cows, yet moose are adapted to move through blow down.	Entire landscape of the plan area	Yes - Oct 14 TWG

Hydrology/riparian Commitment	Rationale, or objective	Geographic applicability	Agreement?
Commit to collaboration with other water users, water licensees, other users that impact water in the future (e.g., ranching, water licensees, etc.); look to address some legacy issues	Understanding other impacts on water resources prevents decisions being made in isolation, and results in better decision making	Entire landscape of the plan area	Yes - Oct 14 TWG
Hire a hydrologist to assess ECA, synchronicity of runoff, define the "H zone" or snow sensitive elevation line for each watershed; and make recommendations for retention or additional constraints - in the 3 watersheds, and in 22 sub-zones. Issue about who would fund this. Use LIDAR to supplement this work.	Specific recommendations at different scales could help minimize future hydrology/riparian impacts	Entire landscape of the plan area	Yes - Oct 14 TWG
Capture LIDAR data for entire plan area; can be used to manage for many values, not just hydrology/riparian	Better information leads to better decision making	Entire landscape of the plan area	Yes - Oct 14 TWG

14.2 - Moose Commitments

Moose habitat value definitions (Appendix 2):

- Thermal - conifer leading, $\geq 15\text{m}$ in height, and $\geq 5\text{ ha}$ in size
- Security - conifer leading $\geq 5\text{m}$ in height, at least 100m wide
- Connectivity - at minimum, this should be security cover, but ideally thermal cover
- Deciduous leading - a deciduous species leads the VRI label

Geographic Applicability definitions:

- Entire landscape - the whole pilot project planning area
- Moose polygons - areas with high densities of wetlands (light green on map) and high densities of deciduous stands $\geq 3\text{ ha}$ (yellow on map) as defined by Chris Procter
- Key habitat elements - wetlands and lakes $\geq 1\text{ ha}$; wetland complexes where ≥ 5 wetlands $< 1\text{ ha}$ are within 100m of each other; and deciduous leading stands $\geq 3\text{ ha}$.
 - These exist within the moose polygons (dark green) as well as outside of the moose polygons
- Sub-basins - there are 22 sub-basins across the 3 watersheds; sub-basin analysis implies analysis of the gross area of all polygons

Type of commitment definitions:

- Forest operations - a commitment that can be applied within future areas to be logged, road building, or silviculture
- Retention - a commitment to *not log* a certain area for a specified time period
- Access management - proposed priorities for access management activities on current roads

Field evaluation or air photo interpretation of forage value in wetlands by a qualified person before final commitments are made:

- High forage value - dominated by shrubs that are willows and red osier dogwood; see Lemke (2001) and wetland classification guidelines
- Low forage value - dominated by sedge; add images and reference Lemke, wetland classification guidelines

Acronyms and definitions

- RMA - riparian management area; includes a reserve zone (RRZ) and a management zone (RMZ)
- LMA - lakeshore management area; includes a reserve zone and a management zone
- MZ - management zone
- Original estimated basal area - the intent is to "stand up" the trees that were logged in the original 200m MZ, and base calculations on that original amount. The intent is NOT to remove a portion of what remains at the current time.
- Partial Cutting - a variety of silvicultural systems in which a stand may be cut to ensure regeneration. In a partial cutting system, only some of the trees are felled during the harvesting phase. The selection method may specify 'removal' or 'leave' trees. Some examples of selection criteria are diameter, species, volume, age, height, disease, or other damage.

Moose Commitment	Rationale, or objective	Geographic applicability	Type of commitment	Agreement?
Maintain a minimum of 40% thermal cover; utilize a floating planning cell approach with a 1.8km radius (10km ² or 1000 ha) centred around each proposed block to demonstrate how ≥40% thermal cover will be retained	Moose need access to thermal cover within a reasonable distance; 10km ² is a moose home range	Moose polygons	Retention, forest operations	Yes - Nov 4 TWG
Maintain a minimum of 40% thermal cover; utilize a sub-basin planning cell approach using the 22 sub-basins (avg. 6000 ha) as defined by FREP for this plan area (inclusive of moose polygons), to demonstrate how ≥40% thermal cover will be retained	Moose need access to thermal cover within a reasonable distance; flexible for larger area outside of moose polygons	Sub-basins across entire landscape	Retention, forest operations	Yes - Nov 4 TWG
No harvest in deciduous leading stands >3 ha	Deciduous provide forage	Entire landscape	Retention	Yes - Sept 9 TWG.
Thermal and security cover needs to be dispersed across the landscape. Patches need to be large enough to provide interior forest conditions (>3-5ha). These patches are best located immediately adjacent to important key habitat elements on a priority basis	Moose need access to thermal cover within a reasonable distance	Key habitat elements are priority, but apply across entire landscape	Retention	Yes - Sept 9 TWG.
Maintain some attributes of thermal cover (may not be ≥5ha, or at minimum security cover) around key habitat elements that are wetlands with high forage value . Apply a 200m management zone inclusive of existing LMA/RMA; maintain a minimum of 50% of the <i>original estimated basal area</i> within the entire management zone through either partial cutting or small clearcuts. <ul style="list-style-type: none"> Partial cut - maximum disturbed area is 20% of the MZ every 20 years. Clearcuts - maximum disturbed area is 10% of the MZ every 20 years with openings <2 ha and maximum block length of 100m. 	Moose need access to security and/or thermal cover within a reasonable distance	Key habitat elements - wetlands with high quality forage	Forest operations	Yes - Nov 4 TWG

Moose Commitment	Rationale, or objective	Geographic applicability	Type of commitment	Agreement?
<p>Maintain some attributes of thermal cover (may not be ≥ 5ha, or at minimum security cover) around key habitat elements that are lakes or wetlands with low forage value.</p> <p>Apply a 200m management zone inclusive of existing LMA/RMA; maintain a minimum of 50% of the <i>original estimated basal area</i> within the entire management zone through either partial cutting or small clearcuts.</p> <ul style="list-style-type: none"> Partial cut - maximum disturbed area is 40% of the MZ every 20 years. Clearcuts - maximum disturbed area is 20% of the MZ every 20 years with openings <2 ha and maximum block length of 100m. 	Moose need access to security and/or thermal cover within a reasonable distance	Key habitat elements - lakes or wetlands with poor quality forage	Forest operations	Yes - Nov 4 TWG
Between cutblocks, maintain connectivity between key habitat elements	Connectivity provides security cover so moose can't be seen	Entire landscape	Forest operations	Yes - Sept 9 TWG
Within cutblocks, no point will be more than 400m from thermal cover (or at minimum security cover). Irregular block boundaries and WTPs or short-term retention areas (>3-5ha) can be used to assist with this	Moose need access to thermal or security cover within a reasonable distance	Entire landscape	Forest operations	Yes - Sept 9 TWG
Locate all new permanent roads minimum 200m, preferably 400m, from all key habitat elements	Minimizes hunter access to key areas used by moose	Key habitat elements	Forest operations	Yes - Sept 9 TWG
No net increase in road density. Where new roads are built, the equivalent amount should be rehabilitated in adjacent areas. Focus should be on roads leading to or near key habitat elements	Minimizes hunter access; maximizes amount of area in THLB	Entire landscape	Access management and forest operations	No agreement; see Chapter 17 for strategies to address road density

Moose Commitment	Rationale, or objective	Geographic applicability	Type of commitment	Agreement?
All new built roads will have a plan regarding its use, term/longevity and status for how it will address moose and watershed values	Encourages thinking about road density, no net gain, and impacts on moose and watershed values	Entire landscape	Forest operations	Yes - Nov 4 TWG
Avoid new loop roads, unless for harvesting purposes only and temporary in nature - block access if the road exists more than 1 year	Minimize hunter access	Entire landscape	Forest operations	Yes - Sept 9 TWG
New inter-block roads should have access blocked, except for future forest operations. New on-block roads should be put in a non-passable state within 6 months following harvesting. On-block roads will be rehabilitated to a productive state and regenerated following achievement of silviculture obligations.	Minimize hunter access Minimize hunter access	Entire landscape	Forest operations, and could inform access management	Yes - Sept 9 TWG
Respect the value of deciduous species and brush post-harvest. Avoid "administrative brushing," and recognize that conifers will out-compete deciduous and brush in most circumstances. Only brush where absolutely necessary. Do not include deciduous in stocking standards.	Moose need browse/forage in these polygons	▪ Moose polygons	Forest operations	Yes - Sept 9 TWG

14.3 - Other Commitments

Commitment	Rationale, or objective	Geographic applicability	Type of commitment	Agreement?
<p>Create coarse woody debris (CWD) windrows and/or piles during logging or site preparation activities. Piles should be at least 2 m high and 5 m in width or diameter.</p> <p>Windrows need to have openings every hundred meters to ensure that silviculture activities, moose and other wildlife can pass through the area.</p> <p>It is acknowledged that this cannot and should not be implemented everywhere. Considerations are as follows:</p> <ul style="list-style-type: none"> ▪ Equipment on site - there will not always be the right equipment on site during logging or site preparation to create piles or windrows ▪ Fire risk and people access - do not create piles or windrows adjacent to roads that are frequently used by the public; placing of windrows is important; keep away from road access; pile at "back" of blocks. ▪ Fire risk and proximity to standing timber - don't create wicks of windrows to standing timber; have good separation from timber. 	Coarse woody debris piles provide value to small furbearers and other species	Entire landscape of plan area	Forest operations	Yes - Dec 9 TWG

Chapter 15 - Operational Commitments - other sectors

- Construct and utilize off-channel watering areas to minimize sedimentation and channel damage (needs more work; where, when, with what objectives, etc.)

Chapter 16 - Operational Commitments - governments

- Utilize ecosystem restoration or prescribed burning to achieve moose habitat objectives (needs more work; where, when, with what objectives, etc.)
- Identify and address sources of sedimentation associated with pre-Forest Practices Code roads that are provincial government responsibility

Chapter 17 - Access Management

It is recommended that an access management plan (AMP) be created by March 31, 2016, addressing existing roads.

The AMP will address multiple goals (listed here, not in any order of priority):

- Reduce human access
- Reclaim lost habitat and productive forest land (i.e., rehabilitation)
- Reduce predator pressure on moose
- Reduce timing and flow of runoff, contribute towards hydrologic stability, or natural drainage patterns
- Determine an ideal threshold for road density for the plan area

The AMP will address all roads in the plan area, focusing on loop roads and non-status roads as top priority. Spur roads and on-block roads are of secondary priority to address.

The AMP will consider multiple tools or activities to achieve the access management goals, recognizing their effectiveness and limitations, including but not limited to:

- Full deactivation or rehabilitation (e.g., restoring roads to productive forest land)
- Blocking access by physical means (e.g., limiting entry of humans to an area, whether by boulders, tank traps, gates)
- Road closures or re-directing certain activities (e.g., through regulation, orders)

Within the plan area, moose polygons defined in this plan (map/appendix ___) will be given higher priority for reducing human access and predator pressure on moose. Secondary consideration should be given to the key habitat features as defined in chapter 14.

Information used to create the AMP should include, but not be limited to the following:

- Ben Vinje's map of identified polygons of roads
- Chris Procter's moose polygons
- [Bonaparte Plateau Preliminary Access Management Plan](#)
- Cumulative effects assessment results
- Any new information, such as moose collar data results
- Existing cost data for access management (Jim McGrath estimates \$1200-\$1500/km for full rehabilitation)
- Existing road density

Deliverables of the AMP will be the following:

- A range of strategies on various scales recommending a mix of types of access management to address the multiple goals:
 - Where road networks no longer needed
 - Where key habitat features for moose are located
 - Where “return on investment” in road deactivation/rehabilitation or access management has the largest benefits for moose or other values
- Proposed communication and public input approach
- A budget for access management activities
- A report by 3 watersheds and 22 sub-basins on the following:
 - Existing road density
 - Road risk analysis
 - Proposed road density threshold for future management consideration

SECTION 4 – Implementation and Monitoring of the Plan, Recommendations

Chapter 18 – Implementation

The last working group meeting will be December 9, 2015. By December 10, 2015 the MWSP will be ready for approval by the working group membership, and all approvals are anticipated to be complete before the implementation date of April 1, 2016. The following is the proposed timeline:

- Dec 9, 2015 – last Tripartite Working Group meeting, draft plan goes for approval
- Dec 10, 2015 to March 31, 2016 – approval steps initiated:
 - Approval steps as per the RFA
 - Secwepemc communities – each community is responsible to determine their own approach
 - BC Timber Sales (BCTS) – approval by management
 - Forest licensees, First Nations Woodland Licences – approval by management
- March 31, 2016 – receive, consider any feedback on the plan from approving bodies
- April 1, 2016 – implementation date; have commitment letter signed by all participating orders of government (MFLNRO, Skeetchestn, Tk'emlups te Secwepemc, others), licensees and companies involved
- April 1 to June 30, 2016 – develop the following:
 - an implementation plan (e.g., how is it working, can it be implemented)
 - an effectiveness monitoring plan (e.g., longer term monitoring of how it's addressing Goal 3 objectives of improved resource management)
 - a transition plan for whether/how to address plan commitments in existing cutting permits or authorizations
- April, 2017 – assess implementation, consider new information (e.g., analysis of moose collar data, how the riparian retention strategy on streams worked over year 1)

All working group participants are asked to ensure that their respective orders of government (FLNR, Secwepemc RFA, and Secwepemc First Nations) and companies provide signed commitment letters by April 1, 2016.

Components of implementation includes transitioning of existing forest development, monitoring and continuous improvement (Chapter 19).

From the outset, the tripartite working group acknowledged that there was limited time and financial resources available to undertake information gathering and sharing that would inform resource management commitments. The working group also understands that moving forward there will be new information on the status of moose and riparian values and how to best maintain, or if necessary, recover these important values. Moreover, the working group acknowledges that the implementation plan must include mechanisms to assess the resource management commitments with respect to not only new information but also with respect to how practicable these commitments are to implement and monitor.

Existing forest development

The working group understands that existing forest development in the pilot area is at different stages of a cycle that can take several years. Forest licensees including First Nations

and BCTS are asked to implement the resource management commitments on “low hanging fruit” to the extent practicable effective on the first day of the approval period of December 10, 2015, recognizing that the plan is not yet approved by all organizations and governments.

Chapter 19 - Monitoring and Continuous Improvement

It was agreed to develop an implementation plan (e.g., how is it working, can it be implemented) and a monitoring and continuous improvement plan (e.g., longer term monitoring of how it’s addressing Goal 3 objectives of improved resource management) during the first quarter of 2016.

Suggested content of an effectiveness monitoring plan could include the following performance measures:

- Quantify impacts on timber supply
- Time, scale, things out of our control
- Number of forest stewardship plans adopting this

The MWSP steering committee should meet once per year with each licensee that operates in the Pilot Area (West Fraser, TteS, BCTS) to review forest development plans being considered or in process. These meetings should commence on the one year anniversary, in April, 2017.

This annual meeting will allow for monitoring and continuous improvement pertaining to the resource management commitments. New information available to inform these commitments (e.g., analysis of moose collar data) combined with on the ground implementation learning will also foster continuous improvement.

It is recommended that following this meeting a field trip be organized to view specific situations that will inform monitoring and continuous improvement.

Chapter 20 - Recommendations for Other Processes

The following are recommendations to improve the management of moose populations, that fall outside of the scope of this plan and the mandate of the Tripartite Working Group, but that are endorsed:

- In exchange for shared decision making responsibilities, First nations may be willing to share their moose harvest numbers with MFLNRO, for the purpose of having more accurate information for which to plan annual allowable harvest of moose
- Investigate the use of wolf culls as a tool to manage moose in the plan area
- Stream restoration - need further work to identify specifically where, and to identify priorities; having these identified through a collaborative process will enable identification in funding applications
- Advocate for changes to the Interior Appraisal Manual to address access management costs
- Licensees and BCTS to share stream classifications with MFLNRO to update the provincial database - figure out the data standard and what MFLNRO needs

References

Note: many Chapter 12 references in the text are not noted here. The reader is asked to follow up with Doug Lewis, MFLNRO, contact info in Appendix 1, to access the references.

- BC Ministry of Forests and Range. (2008). *Kamloops Timber Supply Area: Rationale for Allowable Annual Cut (AAC) Determination effective June 1, 2008*. Available at https://www.for.gov.bc.ca/hts/tsa/tsa11/current_tsr/11ts08ra.pdf
- Blackstock, M. (2002). Water-based ecology: A First Nations' proposal to repair the definition of a forest ecosystem. *BC Journal of Ecosystems and Management* vol. 2(1). Available at http://www.forrex.org/sites/default/files/publications/jem_archive/ISS2/vol2_no1_art4.pdf
- Lemke, S.L. (2001). *Lillooet Forest District Moose Habitat Handbook*. Available at <https://www.for.gov.bc.ca/dka/Moose%20and%20Water%20Values%20Stewardship%20Pilot/Lemke%20Moose%20Habitat%20Handbook.pdf>
- Kamloops Land and Resource Management Plan* (1995). Available at https://www.for.gov.bc.ca/tasb/slrp/lrmp/kamloops/kamloops/plan/files/klrmp_full.pdf
- Scherer, R. (2013). *Detailed office review of hydrologic assessments completed in the Tranquille Community Watershed*. Available at <https://www.for.gov.bc.ca/dka/Moose%20and%20Water%20Values%20Stewardship%20Pilot/Tranquille%20May%209%202013.pdf>
- Skeetchestn Indian Band. (2013). *Skeetchestn Land and Resource Management Plan, Deadman Watershed*. Not published.
- Rex, J.F., Maloney, D.A., Krauskopf, D.N., Beaudry, P.G., and Beaudry, L.J. (2012). Variable retention riparian harvesting effects on riparian air and water temperature of sub-boreal headwater streams in BC. *Forest Ecology and Management* 269. Available at <https://www.for.gov.bc.ca/dka/Moose%20and%20Water%20Values%20Stewardship%20Pilot/Variable-Retention-Rex%20et%20al%202012.pdf>
- Tk'emlups Te Secwepemc. (2012). *Bonaparte Plateau Preliminary Access Management Plan*. Available at https://www.for.gov.bc.ca/dka/Moose%20and%20Water%20Values%20Stewardship%20Pilot/BP-AccessMgtPlan_Mar26_12.pdf

Appendix 1 - Tripartite Working Group Terms of Reference

PROPOSED MOOSE AND WATERSHED STEWARDSHIP PILOT TRIPARTITE WORKING GROUP TERMS OF REFERENCE - DEC 10, 2014; UPDATED NOVEMBER 6, 2015

PREAMBLE

Secwepemc and some Resource Professionals have expressed concerns that moose and watershed values may have been impacted by increased timber harvesting and road construction associated with the mountain pine beetle epidemic. Numerous initiatives are underway (Cumulative Effects Framework, Values Assessment for mule deer, moose and watershed values for the Kamloops TSA). Secwepemc and the Province have entered into the Secwepemc Reconciliation Framework Agreement (Secwepemc RFA) effective April 10, 2013 - planning for important First Nations values is an important part of implementing this agreement

A facilitated collaborative approach between the Ministry of Forests, Lands and Natural Resources (MFLNRO), Secwepemc, and licensees that focuses on a pilot area is proposed.

PURPOSE

To collaboratively develop a coordinated plan that all participants support and agree to follow to ensure stewardship of moose and watershed values in the pilot area.

OBJECTIVES

- to foster improved management of moose habitat, access and watershed values within the pilot area, which may inform stewardship throughout Thompson Rivers District and beyond.
- to improve working relationships, communications and information exchange among the parties

OUTCOMES (*what are the desired, tangible results on the ground that are expected to come out of this pilot?*)

- **Improved land and resource management planning** - utilize landscape and watershed/basin approach; use best info, tools and emerging research; incorporate Secwepemc values
- **Improved communications, relationships and trust** - amongst the province, Secwepemc communities, the forest industry and resource professionals, leading to shared decision making
- **Improved resource management** - of moose habitat, riparian systems and functioning, access while maintaining forest productivity

DELIVERABLES (*what are the physical products that will come out of this pilot?*)

A "plan" with maps that includes but is not limited to goals, objectives, strategies, actions, commitments.

GEOGRAPHIC AREA

Three adjacent watersheds (Criss Creek, Tranquille River and Jamieson Creek) are of particular interest to the Secwepemc.

DECISION MAKING PROCESS

The working group will operate on a consensus decision making model wherever possible, with the identification of no consensus for issues, which parties dissented and why. Decisions may be deferred to a subsequent meeting. All Working Group members listed, whether or not they have current operations or asserted territory within the planning area, have input on decisions as this pilot project may expand to a larger area.

Recognizing limited budget and timeframes, the working group will seek to prepare a plan by summer 2015 that maximizes consensus.

MEETINGS, LOGISTICS AND FACILITATOR ROLE

The Working Group will meet approximately monthly, or as needed, as determined by the working group.

Agendas will be circulated at least one week in advance of meetings, and meeting summaries no later than one week following meetings.

The facilitator shall impartially develop and circulate agendas, coordinate meeting logistics, lead discussions and seek consensus at meetings, create meeting summaries, generate the content of the plan, and provide support for the pilot project. The content for the plan will be generated by the working group participants at the meetings. The facilitator will seek agreement on content at meetings, and the coordinated plan will evolve from meeting to meeting.

PROPOSED GOVERNANCE/OVERSIGHT/AUTHORITY (see Appendix 1)

The proposed pilot is an initiative of the Secwepemc Reconciliation Framework Agreement (RFA) Natural Resource Technical Council (NRTC). Co-sponsors are Rick Sommer, MFLNRO District Manager and Darrell Draney, RFA Responsible Official.

A Steering Committee shall serve the following purposes:

- Administrative and financial oversight, fund development, provide support to the process
- Connection to RFA Natural Resource Technical Committee, Senior Council
- Linkage to implementation options

The Steering Committee shall include the following as its membership

- MFLNRO - Rick Sommer, Rachel Pollard, Rob Purdy
- Secwepemc RFA - Darrel Draney, Mark Eickland
- Ministry of Aboriginal Relations and Reconciliation - Tracy Ronmark
- Fraser Basin Council - Mike Simpson (support role)

APPROVAL STEPS

The coordinated plan and its content that is created by this committee must go through these approval steps, ideally concurrently:

- Approval steps as per the RFA
- Secwepemc communities - each community is responsible to determine their own approach
- BC Timber Sales (BCTS) - approval by management
- Forest licensees, First Nations Woodland Licences - approval by management

APPLICABILITY OF DELIVERABLES

The deliverables from this pilot project will apply to the following, whether or not they participated in the working group:

- Forest licensees, current and future
- BC Timber Sales and TSL holders
- First Nation Woodland Licensees, current and future
- MFLNRO
- Ministry of Environment, BC Parks
- Woodlot licensees, small scale salvage licensees

IMPLEMENTATION MECHANISMS - will vary depending on the final deliverable created

- Commitment letter from forest licensees?
- Formal adoption into forest stewardship plans?
- Amendments to land use plans, establishment of GAR orders or amendment of land use objectives
- Third party certification systems

WORKING GROUP MEMBERSHIP

In order to be effective, members of this steering committee *must be delegated to make decisions on behalf of the organization they represent* at the Working Group Table. It was agreed that there is no need for a chair or co-chairs.

Individual	Organization/Title	Contact Information
Darrel Draney	Secwepemc RFA Responsible Official,	(250) 373-2493 -201 ddraney@skeetchestn.ca Cell: (250)371-1955
Rick Sommer	DTR District Manager,	(250) 371-6501 Rick.B.Sommer@gov.bc.ca
Adam Neil	Splatsin First Nation	Adam_Neil@splatsin.ca
Ben Vinje	West Fraser	ben.vinje@westfraser.com
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Appendix 2 – Mapping Parameters

The following are the mapping parameters used to map different attributes. These moose attributes were initially created on March 24, 2015 (Corinne Bexson, Rob Purdy, Candice Steinke, Rick Sommer, Mike Simpson), and fine-tuned April 10, 2015 (Chris Procter, Phil Belliveau, Corinne Bexson, Rob Purdy, Mike Simpson). Some revisions were made at the Sept 29, 2015 Moose Subcommittee meeting – notably, to remove a crown closure component of thermal cover.

Moose value	Current information to map							Height growth to apply for future maps	Future principles to consider
	Species	Height	Age	Crown closure	Polygon type	Size	Comments		
Security/hiding	Conifer leading	≥5m	N/A	N/A	Forested	Map all	Only really has value if ≥100m width	0.4m/yr conifer below ESSF, 0.2m/yr in ESSF	Commit to ≥100m width
Thermal	Conifer leading	≥15m	N/A	N/A	Forested	≥5ha and ≥10 ha		0.4m/yr conifer below ESSF, 0.2m/yr in ESSF	Aim to create ≥10ha patches in future, and ≥60yr old
Forage	Deciduous leading	N/A	N/A	N/A	Forested	N/A	Deciduous stands of all ages provide forage	N/A	
	Conifer leading	N/A	2-20yr	N/A	Forested	N/A	Use combo of Results, VRI to define 2-20yr	N/A	
	N/A	N/A	N/A	N/A	Wetlands	≥1 ha, and complexes where ≥5 wetlands <1 ha are within 100m of each other	Remains static over time.	N/A	
Calving	N/A	N/A	N/A	N/A	Wetlands and lakes	≥1 ha, and complexes where ≥5 wetlands <1 ha are within 100m of each other		N/A	

Maps are to be created in the following increments: present, then 20, 40, 60, 80 and 100 years in the future.

The following constraints were applied to understand netdowns on the timber harvesting landbase; they arose from the Feb 11, 2015 meeting (need to capture from Corinne Bexson):

- Hard - archaeological sites, provincial parks and reserves, growth and yield plots, research installations, inoperable, terrain stability class 4 & 5, sites with low growing potential, OGMAs, riparian reserve areas, wildlife habitat areas
- Medium - recreation sites, recreation trails, problem forest types, deciduous, wildlife management areas, stand level biodiversity (WTPs)
- Soft - established visual quality objectives, riparian management zones, lake management zones, mule deer winter range, moose winter range, ungulate winter range

The following approach was used to identify moose polygons; they arose from a methodology used by Chris Procter, following the July 29, 2015 Moose Subcommittee meeting:

- Convert wetlands and lakes ≥ 1 ha, and complexes where ≥ 5 wetlands < 1 ha are within 100m of each other to a point. Identify where there is > 0.8 point/km². These are the moose polygons.
- Convert deciduous stands > 3 ha to a point. Identify where there is > 1 point/km². These are the high value deciduous stands.

Appendix 3 - Tables of Analysis, thermal cover by sub-basin, current

Total % of Sub-Basin

	THLB				Non-THLB				Grand Total
	Moose Polygon		Non-Moose Polygon		Moose Polygon		Non-Moose Polygon		
	IDF	Non-IDF	IDF	Non-IDF	IDF	Non-IDF	IDF	Non-IDF	
Criss Creek									
Criss Creek 1	28.6%		34.9%		6.0%		7.7%		77.2%
Criss Creek 2	16.0%	21.0%	1.7%	10.5%	5.9%	7.9%	0.1%	0.3%	63.4%
Criss Creek 3	22.0%	5.1%	22.9%	1.7%	9.7%	0.4%	3.8%	0.0%	65.5%
Heller Creek	3.8%	10.7%	6.7%	12.9%	0.9%	0.9%	1.9%	25.4%	63.1%
Mow Creek	1.3%	23.9%	5.1%	9.2%	2.2%	16.8%	2.1%	5.2%	65.7%
Sparks Creek	20.2%		40.9%		14.7%		7.6%		83.4%
Tsintsunko Creek		34.6%		1.9%		25.0%		0.0%	61.5%
Welland Creek	17.6%		27.3%		4.3%		7.1%		56.3%
Jamieson Creek									
Jamieson Creek 1	1.1%		20.8%	1.3%	14.4%	12.2%	9.8%	13.5%	72.9%
Jamieson Creek 2		1.2%				23.5%		22.4%	47.1%
Jamieson Creek Unnamed		1.3%				32.8%		21.1%	55.2%
Rushton Creek		0.2%		0.0%	3.3%	19.4%		31.2%	54.1%
Wentworth Creek		1.2%			1.4%	20.6%	1.5%	34.8%	59.4%
Tranquille River									
Cannell Creek	1.1%	12.7%	31.4%	0.4%	0.1%	5.9%	7.2%	0.1%	58.8%
Tranquille River 1	5.7%		7.4%	0.2%	0.6%		30.3%	31.1%	75.3%
Tranquille River 2		26.7%		16.5%		4.3%		11.1%	58.6%
Tranquille River 3	5.5%	2.5%	39.2%	1.9%	0.2%	0.4%	8.3%		58.2%

Total % of Sub-Basin

	THLB				Non-THLB				Grand Total
	Moose Polygon		Non-Moose Polygon		Moose Polygon		Non-Moose Polygon		
	IDF	Non-IDF	IDF	Non-IDF	IDF	Non-IDF	IDF	Non-IDF	
Tranquille River 4	2.8%	20.4%	6.4%	10.6%	2.6%	0.7%	2.3%	0.4%	46.1%
Tranquille River 5	3.9%	0.1%	39.5%	0.2%	0.8%	0.3%	26.5%	0.0%	71.3%
Tranquille River Unnamed			1.5%		1.2%		72.0%	3.2%	77.8%
Watching Creek 1		5.4%		31.6%		2.7%		20.1%	59.7%
Watching Creek 2	6.3%	5.7%	4.5%	10.9%	15.4%	2.7%	19.9%	3.6%	69.1%

Appendix 4 - Thermal cover analysis of implications on timber supply

Implications for Timber Supply of Minimum Retention Proposal of Moose subcommittee of Moose and Watershed Stewardship Pilot

Executive Summary

The non-timber management objectives and minimum harvestable age objectives of the Kamloops TSA as modelled in the 2015 Timber Supply Review were compared to the proposed minimum retention proposal of the moose subcommittee of the moose and watershed stewardship pilot.

The comparison involved transforming the objectives to an implied rotation age and comparing the area weighted averages within the moose stewardship pilot areas. The average implied rotation ages of the moose stewardship objectives over the project area were found to be lower than the non-timber objectives and minimum harvestable age objectives. At a strategic level, the proposed management objective of maintaining at least 40% of the watershed CMFLB with a stand height greater than 15 m will not likely have significant timber supply impact at the watershed level.

Background

For the Moose and Watershed Stewardship Pilot - Tripartite Working Group, Jeff Stone, Timber Supply Forester, Forest Analysis and Inventory Branch was asked to comment on the potential timber supply impacts of a management objective of a minimum of 40% of the forested land base must meet thermal cover requirements.

Methods

As an initial assessment, without detailed timber supply analysis whether a timber supply impact will occur due to a new management objective can be assessed by first looking at the current land base composition with respect to proposed management objective and secondly how does the new management objective compared against other objectives on the landbase.

To see if the new moose stewardship/management objective is violated based on the current forest composition can be determined by overlaying the proposed management area over existing inventory and management data sets (e.g., 2014 VRI data, the timber harvesting land base of the 2015 Timber Supply Review of the Kamloops TSA) and then summarizing the management zone by the percent of the thermal cover to the managed land base. Corrine Bexson, FLNR, is completing this work. A violation infers that there must be a delay to at least some further harvesting at the local level. However, at a larger management level where timber harvest may come from anywhere in the management area, the timber supply impact (if any) of the delay will depend on many other factors (e.g., desired harvest level, timber supply availability elsewhere in management area).

The proposed management objective may or may not be more constraining than the existing management objectives on the land base. If the proposed objective is less constraining it may be that there are no timber supply impacts. The relationship of different management objectives can be determined by translating all forest management objectives, as expressed by minimum retention (e.g., at least 60% greater than 100 years old) or maximum disturbance constraints (e.g., no more than 20% less than 15 years old) into an implied rotation age. The implied rotation would be the age at which a forest could be harvested given the constraint and assuming an equal harvest each year.

The formulae used for determining implied rotation age were

Minimum retention: $\text{implied rotation age} = \text{minimum age} / (1 - \text{retention percent}/100)$

Maximum disturbance: $\text{implied rotation age} = \text{maximum disturbance age} / (\text{disturbance percent}/100)$

In this note, I compared the implied rotation age for the moose stewardship objective against the implied rotation ages modelled in the Kamloops TSA 2015 Timber Supply Review (TSR) base case. The other non-timber objectives were for community watersheds, visual objectives, lakeshore management, deer winter range and general integrated resource management (e.g., cut block adjacency). See the Kamloops TSA Timber Supply Review data package for details about these objectives.

The implied rotation of the proposed moose objectives was also compared against the modelled TSR managed stand minimum harvestable age that was based on the age where the modelled forest stand growth reaches 95% of the maximum cumulative mean annual increment (CMAI). The age at maximum CMAI is the desired rotation age to maximum volume production of a forest stand.

The management objective modelled for moose was a minimum retention of 40% of the crown managed forest land base (CMFLB) with a height greater than 15 m. For modelling purposes 15 m was translated to the age based on the top height to age relationships of the managed stand yield tables used in the 2015 Kamloops TSA timber supply review. This determines the age based on the site productivity and species relationships and as projected by the growth and yield model TIPSYS.

As not all management objectives are present on all of the land base, my summary comparison was based on the area weighted average of the implied rotation ages on the THLB.

Results

Table 1 identifies that the proposed moose stewardship minimum retention requirements are on average less than the requirement of the largest other non-timber management objectives and lower than the age that near maximizes timber production. For example in the Criss Creek watershed the proposed moose management objectives average an implied rotation age of 55.8 years as compared to 62.6 for other management objectives (i.e., visuals and integrated resource management)

Table 1. Implied rotation ages of management objectives for the Moose and Watershed Stewardship Pilot Project Area.

Watershed	Implied Rotations (years)		
	Largest Other Objective	95% CMAI	Proposed Moose
Jamieson	57.1	73.9	56.0
Tranquille	88.2	67.6	54.7
Criss Creek	62.6	68.4	55.8
Total	73.7	68.2	55.4

Discussion

The proposed moose minimum retention requirement that was modelled was to maintain at least 40% of the zone with a stand height greater than 15 m. On average these requirements

are seen to be less constraining than the existing non-timber management objectives within the project area and desirable harvest objectives. Nevertheless, with any strategic level analysis it is important to understand the assumptions used and if there any operational considerations that may have been overlooked that would further constrain timber supply.

The use of an area weighted average implied rotation combines information across the project area and the attribute strength (i.e., higher difference between implied rotation the greater the impact). However, this averaging may hide some implications. In the analysis, except for integrated resource management objectives, the other non-timber objectives are not found on all the timber harvesting land base within the moose stewardship project area. In fact comparing the area where the implied rotation age for the moose objective is greater than another non-timber objective and vice-versa, there is an equal likelihood that either the moose or the other non-timber objective is constraining. Nevertheless, comparing the implied rotation age of the moose stewardship objective with the 95% of the maximum CMAI value, the moose stewardship implied rotation is less for 99% of the project area.

The strategic level analysis assumed that all areas within the project area that meet the minimum retention height (or as translated to age via height/age relationships) requirements are suitable for moose thermal cover. It is unlikely that all such area is currently suitable as harvesting operations have not been designed to meet the moose stewardship objectives. The strategic level analysis assumes that future operations should be able to address such issues and avoid creating unsuitable areas (e.g., small isolated blocks). The GIS exercise being completed by Corrine Bexson, FLNR should provide further information on the current status.

Conclusion

At a strategic level, the proposed management objective of maintaining at least 40% of the watershed CMFLB with a stand height greater than 15 m will not likely have significant timber supply impact at the watershed level.

References

FLNR. 2015. Kamloops Timber Supply Area Timber Supply Analysis Discussion Paper. Forest Analysis and Resource Inventory Branch. Ministry of Forests, Lands and Natural Resource Operations, Victoria. September 2015.

FLNR. 2015. Kamloops Timber Supply Area Timber Supply Review Data Package Update. Forest Analysis and Resource Inventory Branch. Ministry of Forests, Lands and Natural Resource Operations, Victoria. September 2015.

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