

Forest Stewardship Plan – FSW Amendment

FOR

Merritt TSA

Cascades Natural Resource District

Thompson/Okanagan Forest Region

Approved (Original) - June 12, 2018
FSW Amendment Approved _____

FSP Term: 5 Years (2018 – 2023)

FSP ID # 76

Ed Nedokus, RPF

Date: January 21, 2020

“I certify that the work described herein fulfills the standards expected of a member of the Association of British Columbia Forest Professionals and that I did personally supervise the work”

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5 Results or Strategies

5.1 Objectives Set by Government

5.1.2 Fisheries Sensitive Watersheds

Information about Applicable Objective	
Objective	<p>The Acting Regional Executive Director, on behalf of the Ministry of Forest, Lands, Natural Resource Operations and Rural Development, has issued an order under sections 14(1) and 14(2) of the Government Actions Regulation (B.C. Reg. 582/2004) for Fisheries Sensitive Watershed – Cascades Forest District, dated March 27th, 2018. It establishes a list of Fisheries Sensitive Watersheds (applicable Watersheds, Basins or Residual areas of the Spius Creek and Coldwater River watersheds) – refer to Schedule A of the Order for description of the area.</p> <ul style="list-style-type: none"> a. For the Fisheries Sensitive Watersheds identified by this Order, the objectives are: <ul style="list-style-type: none"> a. Maintain channel stability and riparian function by retaining and protecting all mature timber and/or other natural vegetation on all active fluvial units on: <ul style="list-style-type: none"> i. Fish streams, and ii. Streams that are a direct tributary to fish streams. b. Minimize adverse sediment related effects to fish and fish streams by maintaining a very low likelihood of harmful sediment delivery from un-natural sources to: <ul style="list-style-type: none"> i. Fish streams, and ii. Streams that are direct tributary to fish streams. c. To protect the quantity and timing of annual and seasonal flows establish and maintain a sustainable rate of cut for the fisheries sensitive watershed and/or specific basins, that does not exceed 25% Equivalent Clearcut Area (ECA) above the snowline; with forest harvesting distributed by aspect, sub-basin, and elevation where possible.
Date in Effect	Dated March 27, 2018 (effective April 13, 2018)

Strategy

5.1.2.1 Definitions

In Paragraph 5.1.2.2, 5.1.2.3 and 5.1.2.4:

The terminology used in the strategies originates from the definitions provided in the orders, and includes additional considerations or details for clarification. Where additional context is provided, this is highlighted as *italicized* text below. These definitions are to be incorporated into the strategy where they are used.

GAR Order Definitions:

“**Active Fluvial Unit (AFU)**” means that portion of a *Floodplain* over which water can be expected to flow during a runoff event of magnitude 1 in 100 years, and that portion of an AFU on which there is evidence of hydrogeomorphic processes, active within at least one full rotation (*100 years on average*). *The ‘active’ portion is defined by the size and power of the stream and the dominant hydrogeomorphic processes;*

“**Annual Flow**” means the total amount of water passing a given point in one year;

“**Equivalent Clearcut Area (ECA)**” means the area of forest that has been disturbed (e.g. harvested, affected by insects, cleared or burned, with consideration given to the silvicultural system, regeneration, and location of forest stand within a watershed). ECA is an indicator used to measure the relative loss and recovery of hydrologic function of a forest canopy. *A **Qualified Professional** defines the specific assumptions and approaches utilized in developing the ECA calculation;*

“**Establish**” means, for the purposes of Objective 1(c), that forest licensees operating within a designated watershed or basin work cooperatively with *Qualified Professionals* to complete an analysis to determine a *Sustainable Rate-of-Cut* based on best available information;

“**Harmful**” means lethal, sub-lethal, or behavioural effects¹ on fish due to concentration and duration of exposure to suspended sediments, and/or levels of stream sedimentation that reduce the productivity of spawning or rearing habitats, and/or restrict fish passage;

“**Protect**” means, for the purposes of Objective 1(a), additional measures required to ensure a retained area of *Mature Timber (individual trees)* and/or other natural vegetation on an *Active Fluvial Unit* remains intact from subsequent disturbances that may result from *Primary Forest* and other land-use activities (i.e. windthrow);

“**Retain**” means, for the purposes of Objective 1(a), *Mature Timber (individual trees)* and/or other vegetation purposefully excluded from timber harvest during *Primary Forest* and other land-use activities. *This includes the protection of this retained vegetation by implementing additional measures to ensure the retained area on an Active Fluvial Unit remains intact from subsequent disturbances that may result from Primary Forest and other land-use activities (i.e. windthrow);*

“**Riparian Function**” is defined as, in the context of watershed management: 1) the ability for stream banks to remain stable during peak flood events with the provision of bank stability, particularly where alluvial materials are involved, 2) the ability to filter runoff, 3) the ability to store and safely release water, 4) the recruitment of large woody debris to the stream, and 5) the provision of shade to aquatic systems;

“**Seasonal Flows**” means the annual variation in streamflow including peak and low flows;

¹ As defined by Newcombe and Jensen (1996) and reported in *Guidance for Minimizing Adverse Sediment Effects on Fish and Fish Habitat in Fisheries Sensitive Watersheds* (FLNRORD, 2018).

“**Sediment Delivery**” means the deposition of sediment from a sediment source into a *Fish Stream* or *Direct Tributary* to a fish stream;

“**Snowline**” means the lower extent of elevation in a watershed at which snow is still present on the ground at the commencement of the peak flow period. The area of the watershed above that elevation is the source area that contributes to snowmelt to spring peak flows. Has been referred to as the ‘snow sensitive zone’, and typically modeled as an H60-line, where 60% of the watershed area falls above that point;

“**Sustainable Rate-of-Cut**” means a *Non-declining Average Annual Rate* of merchantable forest cover removal or alteration by *Primary Forest Activities* and/or other land-use activities within the forest land base of the FSW. The sustainable rate of cut for the watershed and its basins must consider disturbances resulting from *Primary Forest Activities*, natural events (wildfires, insects, pathogens, etc.), and other land-use activities, including disturbances on private land;

“**Un-natural Sediment Source**” means a sediment generation site or area that is directly related to forest management or other land-use activity. It includes active *Roads*, trails, landings, cutblocks, other clearings, and adjacent terrain features that can be affected by forest cover removal and/or water management associated with forest and other land-use activity;

“**Very Low Likelihood**” means a qualitative estimate of probability that a specified outcome is ‘Very Unlikely’ or less (<10 chances out of 100);

Additional Definitions

Additional definitions are required in order to maintain the spirit and intent of the regulation while implementing measures to achieve or maintain these objectives. The following definitions are provided:

“**Active Floodplain**”² means areas “typically flooded every few years and may be less extensive than the broader floodplain.” It is better defined by less frequent, channel forming events such as up to 1 in 100 year flood events;

“**Active Fluvial Unit Assessment**” means an assessment carried out by a *Qualified Professional* that:

- (a) Identifies the potential for *Primary Forest Activities* within *Active Fluvial Units* to result in a material impact to:
 - (i) natural hydrological conditions, natural stream bed dynamics, and integrity of stream channels;
 - (ii) water quality required by fish; and
 - (iii) fish habitat; and

² As defined in the draft document *Guidance for Maintaining Riparian Function in Fisheries Sensitive Watersheds* (FLNRORD, 2018) from the *Riparian Management Guidebook* (BC Ministry of Environment, 1995).

- (b) Includes recommendations to mitigate potential material impacts identified within this assessment, including measures regarding the retention of *Mature Timber* and other natural vegetation, and the design and location of newly constructed roads;

“**Alluvial Fans**”³ means a cone-shaped deposit of sediment formed where a stream emerges from the confines of a mountain. Sediment is delivered to the channel through erosion in upstream areas and transported to the fan by hydrogeomorphic processes such as *Floods*, *Debris Floods* and *Debris Flows*. Alluvial fans are formed as cone-shaped depositional landforms occurring where a stream ‘loses confinement’ as it emerges from the confines of a mountain or draw. Fans occur wherever channels lose confinement in lower, mid and upper slope areas;

“**Channel Stability**” means the likelihood of development impacting the state of *Dynamic Channel Equilibrium*⁴ along a stream (e.g. causing channel destabilization) as a result of changes in stream flow and/or sediment delivery. Reach-specific response is affected by influences such as channel confinement, riparian vegetation, and in-channel large woody debris. Differences in reach morphology and physical processes result in different potential responses to similar changes in discharge or sediment delivery;

“**Debris Flow**” means levees consisting of coarse sediment up to large boulders in size with large accumulations of sediment and debris. They are the most powerful and destructive fan forming process, removing or altering entire stands or portions thereof. They are characterized by multiple active and inactive channels and gradients near the apex greater than 7% on average. Mature forest and deadfall within fans plays an important role in energy dissipation. Removal of mature forest from fans where this process dominates can result in events travelling farther downstream or beyond the feature where non-forest values can be affected, such as fish;

“**Debris Flood**” means debris flood deposits that are more liquid (compared to debris flows) and consists of sediment bars, sheets, splays and small fans with the larger active feature. This is the second most powerful and destructive fan forming process, removing or altering entire stands or portions thereof. They are characterized by multiple active and inactive channels and gradients near the apex greater than 7% on average. Mature forest and deadfall within fans plays an important role in energy dissipation. Removal of mature forest from fans where this process dominates can result in events travelling farther downstream or beyond the feature where non-forest values can be affected, such as fish;

“**Direct Tributary**” (to fish streams)⁵ means a channel that has the ability to transport *Harmful* levels of fine and coarse sediment to downstream fish-bearing waters as a result of stream power and physical connection. This definition differs from the *Fish Stream Identification Guidebook* which is based primarily on stream order, however using stream order may be inadequate to identify important upstream reaches that are capable of affecting downstream fish habitat;

³ As defined in the draft document *Guidance for Maintaining Riparian Function in Fisheries Sensitive Watersheds* (FLNRORD, 2018) from the BC Land Management Handbook 57 *Forest Management on Fans: Hydrogeomorphic Hazards and General Prescriptions* (Wildford et al. 2005).

⁴ See the Background Document section for a discussion on “dynamic channel equilibrium”.

⁵ As defined in the draft documents *Guidance for Maintaining Riparian Function in Fisheries Sensitive Watersheds* and *Guidance for Minimizing Adverse Sediment Effects on Fish and Fish Habitat in Fisheries Sensitive Watersheds* (FLNRORD, 2018).

“Equivalent Clearcut Area (ECA) Threshold” means the maximum ECA above the *Snowline* identified for watersheds, basins and sub-basins as per the GAR Order;

“Fish Habitat”⁶ means in channel, off channel, and adjacent to channel areas that provide habitat for fish that is determined to be valuable by a *Qualified Professional*;

“Fish Streams” means a stream in which fish presence and/or fish habitat is confirmed or inferred by a *Qualified Professional*;

“Fisheries Sensitive Watershed” means an area identified under GAR Order – Fisheries Sensitive Watershed – Cascades Forest District dated March 27, 2018 (effective April 13, 2018).

“Flooding” means multiple channels of water in reference to being the third most destructive fan forming process; however, deposits are less extensive with smaller particle sizes compared to debris flows and debris floods. Deposits include bars, sheets, splays and small fans. Gradients near the apex are less than 7% on average. Mature forest and deadfall plays a role in energy dissipation, particularly where channels are of sufficient size to erode their beds and banks during high flow events;

“Floodplain” means:

- (a) as per the *Guidelines for Maintaining Riparian Function in Fisheries Sensitive Watersheds* (FLNRORD, 2018), an “area of land adjacent to a stream or river, that varies in width according to local topography and inputs from tributary channels, generally composed of alluvial or semi-alluvial materials deposited by the channel either contemporarily or historically under flow conditions that exceed bankfull discharge”; or
- (b) as per the *Riparian Management Guidebook* (BC Ministry of Environment, 1995), “any level area with alluvial soils, adjacent to streams, which is flooded by stream water on a periodic basis and is the same elevation as areas showing evidence of:
 - (i) flood channels free of terrestrial vegetation;
 - (ii) rafted debris or fluvial sediments newly deposited on the surface of the forest floor or suspended on trees or vegetation;
 - (iii) recent scarring of trees by material moved by flood waters;”

“Mature Timber”⁷ means stands of timber where the age of the leading species in a stand is greater than the specified cutting age established to meet forest management objectives. For example, stands with lodgepole pine or a deciduous species as the leading species are usually classified as mature timber when the stand age is greater than 80 years. All stands having conifers other than lodgepole pine and whitepark pine as the leading species are mature when the stand age is greater than 120 years;

⁶ As defined in the draft document *Guidance for Maintaining Riparian Function in Fisheries Sensitive Watersheds* (FLNRORD, 2018).

⁷ As defined in *Glossary of Forestry Terms in British Columbia* (Ministry of Forests and Range, 2008).

“Non-Declining Average Annual Rate” means the maximum area that can be disturbed each year and result in a steady state ECA of 25% in the long term (otherwise interpreted as maximum sustainable disturbance rate). In practice, this can be applied as a maximum area in any 5 year period. Disturbance is considered to be any impact to forested areas that result in it functioning like an early seral stand (significant fire, pest mortality, harvesting, etc.);

“Primary Forest Activities” means one or more of the following, as defined in the *Forest Planning and Practices Regulation* section 1:

- (a) timber harvesting;
- (b) silviculture treatments; or
- (c) road construction, maintenance and deactivation;

“Qualified Professional”(QP) means a registered member in good standing with a professional association whose training, ability and experience makes the member professionally competent in the relevant area of practice (copied from section 1.1 Definitions of the approved FSP);

“Roads” means, for the purpose of this strategy, to incorporate newly designed and constructed roads or previously constructed non-status roads for which a Road Permit is secured, newly constructed on-block roads, and previously constructed non-status roads that are used as on-block roads;

“Sediment Hazard Assessment” means an assessment carried out by a *Qualified Professional* that:

- (a) Identifies the potential for *Primary Forest Activities* to result in sediment related hazards, including areas where activities are most likely to generate and deliver sediment to fish streams;
- (b) Develops recommendations to manage sediment generation and delivery, including:
 - (i) Mitigation options to manage sediment related hazards including *Road* location, construction, upgrades, deactivation, monitoring and maintenance;
 - (ii) The potential for *Sediment Delivery* from *Primary Forest Activities*;
 - (iii) Identifies shut-down protocols that may be needed in response to road conditions and weather in order to manage sediment related hazards (e.g. high flow or rainfall events); and
 - (iv) The potential need for communication and collaboration with other licensed users in the watershed;

“**Streamflow Assessment**” means an assessment carried out by a *Qualified Professional* that:

- (a) Includes an analysis of current Equivalent Clearcut Area (ECA) levels above the *Snowline*;
- (b) Subject to #4, identifies a *Sustainable Rate-of-Cut* that is intended to ensure *ECA Thresholds* are achieved;
- (c) Includes recommendations to protect the quantity and timing of annual and seasonal flows, which includes the distribution of harvesting across different zones (i.e. sub-basin, aspect, elevation) within the watershed where possible;
- (d) *ECA Thresholds* may be exceeded where a *Qualified Professional* has identified the long-term benefit of salvage harvesting. *ECA thresholds* will not exceed 35%; and
- (e) Identifies the potential need for communication and collaboration with other licensed users in the watershed; and

“**Stream Reach**”⁸ means the length of a watercourse with similar channel morphology, channel dimension, gradient;

⁸ As defined in the *Fish-Stream Identification Guidebook* (BC Ministry of Forests and Ministry of Environment, 1998).

5.1.2.2 Objective 1a – Channel Stability and Riparian Function

In relation to Objective 1a of the identified *Fisheries Sensitive Watershed* GAR Order, prior to conducting *Primary Forest Activities* the FSP holder will:

- (a) Ensure that a *Qualified Professional* assesses the *Primary Forest Activities* for the presence of an *Active Fluvial Unit* that is associated with:
 - (i) a *Fish Stream*, or
 - (ii) a stream that is a *Direct Tributary* to a *Fish Stream*;
- (b) Where an *Active Fluvial Unit* as described in (a)(i) or (a)(ii) is identified within that cutblock, ensure that an *Active Fluvial Unit Assessment* is completed and that the recommendations of the assessment are implemented.

5.1.2.3 Objection 1b – Sediment (Very Low Likelihood)

In relation to Objective 1b of the identified *Fisheries Sensitive Watershed* GAR Order, prior to conducting *Primary Forest Activities* the FSP holder will:

- (a) Ensure that a *Sediment Hazard Assessment* is completed for the proposed cutblocks and *Roads*, and that the recommendations of the assessment are implemented.

5.1.2.4 Objective 1c - Streamflow

In relation to Objective 1c of the identified *Fisheries Sensitive Watershed* GAR Order the FSP holder will:

- (a) Prior to carrying out *Primary Forest Activities* within the portions of the *Fisheries Sensitive Watersheds* with established *ECA Thresholds* as indicated in Table 1, ensure that a *Streamflow Assessment* is completed and that the recommendations of the assessment are implemented.

Table 1: Maximum Equivalent Clearcut Areas (ECA) above the *Snowline* for the Cascades TSA Watersheds and Basins

Gazetted Name	Watershed, Basins or Residual	GIS FSW Identifier	Unit Number	Maximum ECA (%)
Spius Creek		F-3-007	1	N/A
	Richardson Creek Watershed	F-3-007	2	N/A
	Tepee Creek Basin	F-3-007	3	25
	Upper Prospect Creek Basin	F-3-007	4	25
	West Prospect Creek Basin	F-3-007	5	25
	Southwest Prospect Creek Basin	F-3-007	6	25
	South Prospect Basin	F-3-007	7	25
	West Upper Spius Creek Watershed	F-3-007	8	25
	South Upper Spius Creek Watershed	F-3-007	9	25
	Upper Spius Creek Watershed	F-3-007	10	25
	Upper Maka Creek Basin	F-3-007	11	25
	East Upper Maka Creek Basin	F-3-007	12	25
	Maka Creek Residual Basin	F-3-007	13	25
Coldwater River		F-3-008	1	N/A
	Middy Creek Watershed	F-3-008	2	N/A
	Voght Creek Watershed	F-3-008	3	N/A
	Godey Creek Watershed	F-3-008	4	N/A
	Brook Creek Basin	F-3-008	5	25
	Upper Coldwater River Watershed	F-3-008	6	25
	Juliet Creek Basin	F-3-008	7	25
	July Creek Basin	F-3-008	8	25
	Upper Coldwater Residual Basin	F-3-008	9	25

Additional Information – To be considered as part of the FSP Rationale Document

Additional details included as supplementary information but is not legally binding within the FSP strategies are as follows:

- Active Fluvial Units (AFUs) – there are GIS analysis tools available that provide a coarse filter location of AFUs to support practitioners and QPs in completing assessments. A preliminary list of potential tools and resources has been provided below.
- Direct Tributary – the definition provided differs from that used in the *Fish-Stream Identification* Guidebook which defines direct tributaries based primarily on stream order. Using stream order to define direct tributaries may be inadequate to identify important upstream reaches that are capable of affecting downstream fish habitat. An assessment carried out by a Qualified Professional will consider erodibility, size of channel, etc.
- Un-natural Sediment Source – one of the biggest challenges is that you could have elevated peak flows due to forestry (fire, etc.) that could then destabilize a channel and that could be considered un-natural (or not).
- AFU Assessment – timber may not be needed as a part of the retention strategy if the channel stability is maintained by other vegetation retention, for example. This factor will be considered and included in the assessment carried out by the Qualified Professional.
- Dynamic Channel Equilibrium – describes a state of balance resulting from the interplay of four basic factors (sediment discharge, sediment particle size, streamflow, and channel gradient) that maintains alluvial stream channels in their most efficient and least erosive form. The term “dynamic” is important, as the energy of a stream is always at work sustaining or re-establishing its equilibrium condition. Land-use impacts at site-specific or watershed scales can upset the dynamic equilibrium thereby triggering a process of stream adjustments. If one of the four factors change, one or more of the other variables must increase or decrease proportionally if equilibrium is to be maintained. For example, if channel gradient is increased (e.g. by channel straightening) and streamflow remains the same, either the sediment load or the size of the particles must also increase. Likewise, if flow is increased (e.g. by upslope forest cover removal) and the channel gradient stays the same, sediment load or sediment particle size has to increase to maintain channel equilibrium. Under these examples’ conditions, a stream seeking a new equilibrium will tend to erode more of its banks and bed, transporting larger particle sizes and a greater sediment load. Such stream adjustments may be undesirable, particularly where they affect downstream elements-at-risk.

- Riparian vegetation serves many purposes (e.g. provide shade, cover, stream habitat, stream bank stability, etc.) and can be a major factor contributing to the robustness of channels and observed channel response. Loss of riparian function can affect channel equilibrium and result in bank erosion, channel shifting, and sedimentation. The level of past riparian forest cover disturbance and the level of recovery of the riparian vegetation are both considered in characterizing channel response.
- Sediment generation and delivery – potential issues regarding:
 - Other road users contributing to sedimentation issues
 - Design of roads and design of road maintenance, as well as adequate implementation of maintenance activities/ best practices
 - Implementation and monitoring of road maintenance
- Licensees could consider a risk rating approach for roads that will then result in different practices, maintained within a road risk database as suggested by the Sediment Guidance document (FLNRORD, 2018).
- Distribution of forest harvesting and the “where possible” caveat should consider:
 - Where is past harvesting
 - Where is current timber available
 - Access to certain areas
 - Concern for elevated road networks that may be needed to distribute cut
 - Balance between increased sediment delivery potential (larger road network) and the objective to distribute harvesting amongst aspect, sub-basin and elevation

Additional Considerations:

- FPPR section 47(5) states: “If the width of the active floodplain of a stream exceeds the specified width for the riparian management zone (RMZ), the width of the RMZ extends to the outer edge of the active floodplain.”
 - Despite this, most vegetation can still be legally removed within a RMZ without contravention to FRPA
- Regarding sediment delivery, the following regulations apply:
 - Federal Fisheries Act section 36(3) – deposit of deleterious substance prohibited
 - FRPR section 8 – objectives set by government
 - FPPR section 37 – landslides
 - FPPR section 39 – natural surface drainage patterns
 - FPPR section 55 – stream crossings
 - FPPR section 56 – fish passage
 - FPPR section 57 – protection of fish habitat

- FPPR section 12.31(1 to 3) – provides conditional exemption in which agreement holder required to prepare a FSP is exempt from section 55, 56 or 57 as it pertains to cumulative hydrological effects on fish habitat in FSWs if the agreement holder:
 - Prepares and submits to the minister the proposed plan, including intended R/S
 - Receives the minister’s approval to the plan – expectation that licensees will provide strategies that describe in more detail how activities will not damage fish habitat

Tools and Resources:

The following is a list of tools and resources available for licensees when planning and implementing primary forestry activities within FSWs:

- *Guidance for Maintaining Riparian Function in Fisheries Sensitive Watersheds*, draft v. 1.2 (MFLNRORD, Thompson-Okanagan Region, 2018)
- *Guidance for Minimizing Adverse Sediment Effects on Fish and Fish Habitat in Fisheries Sensitive Watersheds*, draft version 1.0 (MFLNRORD, Thompson-Okanagan Region, 2018)
- FLNRORD’s Equivalent Clearcut Area (ECA) Guidance Document
- *Fish-Stream Identification Guidebook* (Ministry of Forests and Ministry of Environment, 1998)
- *Fish Habitat Assessment Procedures* (Johnston and Slaney, 1996)
- *Riparian Management Area Guidebooks* (Ministry of Forests and Ministry of Environment, 1995)
- BCGW (fish occurrences, barriers to fish based on field inventory data)
- Ecological Reports catalogue (Ecocat) (fish and fish habitat inventories)
- Forest licensee fish stream classification and mapping
- terrain mapping and/or bioterrain mapping (that describes characteristics and spatial distribution of surficial materials, landforms and geomorphological processes)
- contour mapping (BCGW, isolines bend out in downstream direction for larger fan features)
- GIS-based Digital Elevation Models (DEM)
- Aerial photography

- LiDAR products (i.e. bare earth images and low interval contour mapping)
- BC Land Management Handbook 57 and 61(Wilford et al. 2009)
- *Interior Watershed Assessment Procedure Guidebook* (BC Ministry of Forests, 1999)
- *Gully Assessment Procedure Guidebook* (BC Ministry of Forests, 2001)
- FREP Watershed Quality Effectiveness Evaluation (WQEE) system

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