

## Silviculture Plan

Original  
 Amendment #

1. TENURE							
REGION Coast	DISTRICT Strathcona	LICENCE FLA 49543	LOCATION Quinsam River.	MAP SHEET 092K 004	TIMBER MARK FN5 020	OPENING # 456-001	CP 20
Wildlife Tree Retention requirement: 7%		Community Watershed YES <input type="checkbox"/> NO <input checked="" type="checkbox"/>		Fieldwork by: Neil Hughes, R.P.F.		Date (Y/M/D): July 2014 to March 2015	

2. AREA SUMMARY														
TAUP		NPUNN		NPNAT		Retention patches		WTR		Alder Selection		NAR		
Ha		Ha	%	Ha	%	Ha	%	Ha	%	Ha	%	Ha	%	
41.6				0.2		0.5		3.5	10				84	
Maximum Soil Dist @ Roadside			Max. permanent Access Structure			CWD requirement m <sup>3</sup> /ha			Max. soil disturbance in setting					
25%			7%			35 m <sup>3</sup> /ha			5% SU3 & 4 25% Su1 & 2					

**3. GENERAL COMMENTS**

This block is located in the Cold Creek sub-basin of the Quinsam watershed just west of Campbell River. Cold creek is the source of the water supply for the Quinsam fish hatchery, one of the most important hatcheries on the BC coast. This block will harvest an area of over-mature alder that drains a sub-basin of the Cold creek but now joins the creek below the fish hatchery intake pond. Extensive discussions and meeting were held with DFO staff in an effort to make sure the proposal would not have a negative impact upon water quality.

This proposed block was referred to the Campbell River, Comox and Cape Mudge first nations who collectively had no immediate concerns with the plans. Referral was carried out through the Nanwakolis Council.

**4. ECOLOGY AND CRITICAL SITE FACTORS**

The Quinsam watershed was heavily harvested in the last century and a severe fire burned much of the area in the 1930s. The particular area of the Cold creek watershed this prescription relates to has grown back with a very dominant stand of red alder with minor pockets of Fd and Mb on drier and better drained micro-sites. Much of this alder is now overmature and there are some areas with considerable dead standing or dead and down. The heavy disturbance during logging of the old growth and the fire has resulted in some very productive Dr forest; trees approaching 37m tall and over 50cm dbh are common and volume is quite high where the trees are still all live.

The critical feature around this block is the source of water for the Cold creek and its' tributaries. This water is being pushed out of McIvor lake by hydrostatic pressure through the gravel substrate and emerging out of the banks that surround this watershed. This feature has resulted in very high quality water for the hatchery, and also means the watershed is actually quite isolated from exterior rainfall events. Following the severe rainfall event of December 10/11<sup>th</sup> 2014 the Cold creek and its' tributary stream 1 was hardly affected with water running clear and no higher than normal while the Quinsam river and Campbell rivers were flooding and evacuation orders in place.

This deep gravel in this area is overlain with soils of fine silts and sands which can be highly erodible if they become waterlogged and are able to flow into drainage features. It would appear that this happened following the old growth harvest and it is essential to ensure site disturbance is kept to a low level. The majority of the block has a very low risk due to the gentle and hummocky nature of the terrain, but immediately adjacent to creek 1 these sensitive soils could be transported into the creek during heavy rain if harvesting is not conducted carefully. The sensitive areas are being managed as a Special Management Zone requiring dry and stable conditions before any activity begins.

A major objective in this prescription is to remove a component of the overmature and heavy alder density in proximity to the riparian features and replace it with conifers more suited to developing long term structure and function in the watershed. It is clearly apparent that where the alder is dying and falling down the forest is reverting to a "non-productive brush" complex due to the lack of understory conifer. In addition the alder collapse is damaging the banks of this stream and choking it with short term woody debris that in itself can cause more bank erosion as flows are diverted.

In the process of planning the harvest and reforestation of this block NWH employed consulting biologist, hydrologist and terrain specialist to help provide input for prescriptions.

Strat a	SU	AREA (ha)	BGC SUBZONE	SITE SERIES	GRID LOCATION (moist/nutr)	HUMUS FORM	SOIL DEPTH (cm)	SOIL TEXTURE	ELEVATION (m)			SLOPE %			ASPECT
									LOW	HIGH	AVG	MIN	MAX	AVG	
A	1	18.6	CWH xm1	13/14 & 05	4-6 / D-E	Mull	>100	SiL / fSL	75	115	95	0	45	15	V
B	2	5.9	CWH xm1	05 <sub>60</sub> 13 <sub>40</sub>	4-5 / D	Mull	>70	SiL / fSL	90	110	100	0	10	5	Flat
C	3	1.8	CWH xm1	01 <sub>70</sub> 13 <sub>30</sub>	4 / C	Moder	>70	fSL	110	115	112	0	5	2	Flat
D	4	9.9	CWH xm1	13/14 & 05	4-6 / D-E	Mull	>100	SiL / fSL	75	115	85	2	45	10	N

**SU – COMMENTS**

**Overview**  
The Standard Units are determined for the most part by the proposed reforestation strategies, whether returning to a conifer dominated forest around the riparian features or continuing with alder leading forest where management options are suitable. The dominant feature of this area is the lacustrine deposits that result in seasonal water tables; they are much wetter in the winter as the fine silts hold up drainage of the water while in the summer they actually dry down considerably. The heavy sword fern component

of the understory is the key indicator while veins of devils club indicate that the moisture is often concentrated in seeps on the surface or underground.

**Stratum A and D**

This is mostly a dominant deciduous forest type and the site is classed as having a seasonal fluctuating water table, specifically a site series 13 (drier) or a 14 (wetter) depending on the moisture regime. There are scattered raised knolls and ridges which are much better drained and are more typical 05 sites and here a heavier conifer canopy is found. The soils are all fine textured lacustrine deposits and range from SiL through to fSL with soil moisture generally fresh to moist. Organic layers range from shallow mulls with an obvious Ah to leaf litter over the A horizon. Vegetation is rich, dominated by Sword fern with lots of devils club in wetter veins and patchy Salmonberry especially where the canopy is open due to dead and dying alder. The stand is dominated by over mature Dr with smaller amounts of Fd, Ss, and Act. There is scattered understory conifer in places but large areas have very few and conifer regeneration after the alder dies will be very slow and patchy. There are a number of NPNat areas of ponds / swampy types which appear to have been created by the building of the old rail grade.

Stratum A will be replanted to alder while stratum B is the area of the Riparian Management Zone and adjacent to that and here a conifer dominated stand will be established to provide long term riparian function.

**Stratum B**

This is the flat bench above the terrace which is still dominated by deciduous forest due to a fluctuating water table as evidenced by occasional swampy pools and patches of Carex sedge. There is very little relief on the site (so it will be important not to compact the soils as this will result in ponding) and so there is still some devils club scattered through but the dominant vegetation is sword fern with some salmonberry. There is more conifer present with the alder and it is noticeable the alder is in a further advanced state of senescence here likely caused by the higher winter water table due to lack of drainage. This site is predominantly still suitable for regeneration to alder although there some transitional areas just adjacent to the terrace where drainage is quite rapid and it may get a little droughty for the best alder to develop.

**Stratum C**

The progression to a more regular zonal type develops here with only minor influences of the fluctuating water table, however the stand is still very mixed with big alder growing in amongst a vigorous Fd type. The understory is now trending away from the sword fern type to one with mixed sword fern, Vaccinium, dull Oregon grape and minor amounts of salmonberry. The soils also are becoming more obvious SLs with much better drainage. This site will be reforested with Fd although it is expected that a component of alder will regenerate on exposed soils.

**5. SILVICULTURE SYSTEMS**

The silviculture system for this project is best described as clearcut with reserves. With what is now an almost decadent alder stand in parts (SU2 especially) and with trees dying and falling with increasing regularity the stand should be replaced before it loses all value. However, there will be an effort made to retain a component of the existing conifers throughout with small leave patches and single trees to provide some long term structure in the stand for both biodiversity and visual aesthetics. In the riparian areas of SU4 much of the conifer will be retained (although there is in fact very little) to help speed the transition to a conifer dominated stand with better long term riparian function.

**6. FOREST HEALTH**

ISSUES / ACTIONS	SU	Pest Code	% Incidence (total trees)	Area affected (ha)	Expected future hazard
No concerns noted in regard to pests and disease although root rot is evident in the Fd. However, the alder in this stand (and over much of the watershed ) is beginning to senesce and trees are dying and falling with increasing regularity. This process will accelerate over the next 5 years. Alder bark beetles may be a concern for new stock. The site is heavily used by deer and elk are clearly present on a regular basis. Some browsing of conifers is expected and monitoring will be essential from the beginning to determine if browse protection is necessary.					

**7. PLANNED SILVICULTURE ACTIVITIES**

**7.1 SITE PREPARATION**

Roadside debris must be piled to ensure plantable spots are available. Utilising sec.7.2.1 sub-section 2d, up to 25% of the site in SU1 and 2 may be disturbed for the purposes of improving regeneration of the forest. Conventional hoe chuck debris should be piled within the block where slash is excessively deep along with some scarification of the soils to improve planting site selection and encourage natural regeneration of alder in SU1.

If timing and equipment availability mesh the roadside debris could be chipped to remove fire hazard and improve plantability.

**7.2 REFORESTATION PRESCRIPTION**

SU 1 and 2:

These stratum are rich and with good moisture status and unlikely to suffer from moisture deficits (minor issue in SU2). Because of this, the sites are good ones for alder (SU1 is extremely good) and some exceptionally large alder are present in the forest. SU1 and 2 will be managed for alder as it is well back from the stream channels and will have far less influence on future riparian forest development.

Plant 512 / 515 stock at 1400sph to ensure rapid establishment and canopy closure ahead of brush regrowth. If possible allow slash to weather for at least one summer prior to planting to let the alder bark beetle numbers decline.

SU3:

This better drained more zonal site is probably better suited to managing for Fd even though some alder regeneration is likely. Plant 412A or bigger stock at 1200 sph to provide some insurance against root rot or browse.

SU4:

The riparian area is to be managed for long term riparian function to help maintain high quality water flow into Cold creek and the Quinsam. This will be achieved by establishing a conifer dominated stand similar to that which was present prior to the old growth being harvested. Close to the creeks Ss and Cw will be the preferred choice while the better drained slopes and hummocks will get more Fd mixed in. The target stand density is lower than for a stand being established for timber, although initially the planting density will be higher as losses are expected through browsing by deer and elk as well as brush competition. Plant large stock, 512A

or larger and fertilize to ensure they get off to a rapid start. Plant at a density of 1000sph to allow for mortality as noted above.

### 7.3 BRUSHING

SU 1, 2 and 4

These will be a high brush hazard site and it will quickly develop throughout. Salmonberry, thimbleberry and elderberry will be vigorous within a few years and trees that did not establish quickly will need to be brushed. Some manual brushing will be necessary in year two or three. Ensure a brushing / survival survey is carried out at the end of the first growing season. In the riparian areas a lack of brushing will result in thin, spindly trees that will not provide the riparian benefits necessary – desired trees are bushy with low Ht/Dia ratios to develop windfirm characteristics from an early stage.

SU3

This will be a lower brush hazard site and good stock that establishes quickly without browse should not require brushing. However, alder regeneration may be an issue to manage for at the FG stage.

### 7.4 OTHER SILVICULTURE STRATEGIES :

SU1, 2 - Use free grow inventory numbers to plan for future spacing requirements. Block should be spaced if (funds available) and stocking levels 2000sph or greater (highest priority to stands >3000sph). Plan spacing for when the stand is around 10-12m high with a live crown of around 50% and set a target treatment density of 700-1000sph depending on stand conditions.

In SU4 if stocking is very good at FG then a habitat manipulation spacing could be planned for in the riparian areas at age 10-15 to reduce stocking to around 400 sph favouring the best trees for riparian development. This would also depend on LBI funding being available.

## 8. RESOURCE AND ENVIRONMENTAL STRATEGIES

No specific natural resource constraints were identified during block development; no FRPA resource features such as WHAs or OGMAs are located adjacent to the blocks.

The main item to be carefully managed for in this block is the sensitive soils in relation to ground based harvesting and the water quality of creek #1 and 2. More details on the latter under Riparian Management.

## 9. SAFETY CONCERNS

Assess for potentially dangerous snags prior to workers commencing silviculture activities especially in SU B. Large number of alder snags noted within and around the block due to it's age and stage of decay.

## 10. FREE GROWING STOCKING STANDARDS

SU	NAR (ha)	Stocking standard id	PREFERRED SPECIES (MIN HT)	ACCEPTABLE SPECIES (MIN HT)	TSS (#/ha)	MSSpa MSSp (#/ha)	Minimum Intertre	REGEN DELAY (Years)	EARLY FG (Years)	LATE FG (Years)	Height vs. competition (%)
1	18.6		Dr / 4.0	Mb / 4.0	1500	1000/800	2.0	3	5	20	150
2	5.9		Dr / 4.0	Mb / 4.0	1500	1000/800	2.0	3	5	20	150
3	1.8		Fd / 3.0	Cw/1.5 Hw/2.0 Pw/2.5	900	500	2.0	3	8	20	150
4	9.9		Cw/ 2.0 Ss / 4.0 Hw/4.0 Ba/2.3	Dr/4.0 Act 4.0	600	300 200	2.0	3	8	20	150

### SU COMMENTS

SU 4: for the wetter sites a minimum inter tree distance of 1.5m will be used to take advantage of the best planting micro sites.

## RIPARIAN MANAGEMENT STRATEGIES

### RIPARIAN RESERVE ZONE:

**NOTE – ALL CREEKS ARE WITHIN THE FLOODPLAIN OF A S1A LARGE RIVER AND AS SUCH CREEKS ONLY HAVE MANAGEMENT ZONES BUT WILL BE MANAGED AS FISH HABITAT.**

RIPARIAN I.D.	RIPARIAN/ CLASS	Reserve Zone m	SU XREF	DESCRIPTION OF THE PURPOSE AND EXTENT OF REMOVAL OR MODIFICATION OF TREES AND ANY RELATED FOREST PRACTICES IN RIPARIAN RESERVE ZONE(S)

### RIPARIAN MANAGEMENT ZONE

RIPARIAN/ I.D.	Riparian Class	Management Zone width	MANAGEMENT STRATEGIES FOR RIPARIAN OR LAKESHORE MANAGEMENT AREAS INCLUDING: PROTECTING STREAM BANKS (if there is no RRZ), MAINTAINING SHADE, AND DEBRIS MANAGEMENT. IF FELLING AND/OR YARDING ACROSS STREAMS. INCLUDE EITHER THE RESIDUAL BASAL AREA OR DENSITY FOR RMZ(S) AND LMZ(S).
			To Be Completed, see harvest plan for details.

For all RMZs within the block basal area retention will be between zero and 25%. Focus will be on retaining understory conifer, especially Cw and Ss.

A RIPARIAN ASSESSMENT HAS BEEN COMPLETED AND THE PRESCRIPTION IS CONSISTENT WITH THE RESULTS AND RECOMMENDATIONS OF THAT ASSESSMENT.

Assessments			Minimum Characteristics of Leave Trees
Type	Required	Completed	Large wolffy conifer , Maple and cottonwood that have little timber value may be left in SU1 and 2 as wildlife trees.
Visual Impact Assessment	No	No	
Gully Assessment	No	No	
Pest Incidence Survey	No	No	
Archaeological Impact Assessment	No	No	

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R.P.F Signature and Seal	Licensee Signing Authority
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