

## **Forest Development Plan 2018 to 2020**

**Applicable to Approved CNC Research Forest  
Management Plan #3 and Amendments**

**Development Plan Updated: February 2019**

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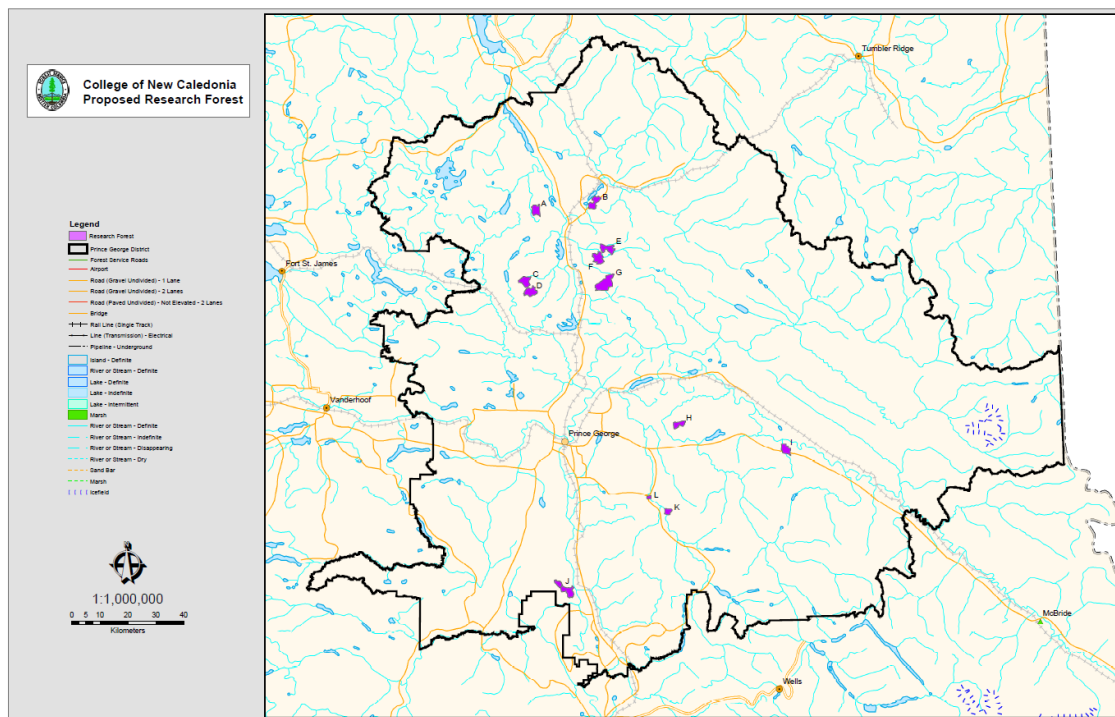
# Research Forest Tenure and Management Plan Requirement

The use and occupation of the CNC Research Forest areas is authorized under Special Use Permit (SUP) S24940 issued by the BC Ministry of Forests Lands and Natural Resource Operations. Authority to cut and remove timber is provided under Occupant License to Cut (OLTC) L49404. Both tenure documents are effective until November 2037.

The SUP designates the land area of the Research Forest and requires that the Research Forest be managed under an approved Management Plan containing details as specified in the SUP document. This Development Plan was initiated after submission of Amendment #1 to Management Plan #3, which is proposed to be effective until June 30, 2022. Amendment #1 was submitted to incorporate the new timber supply review completed in September 2017. The new TSR involved new vegetation, stream, and road inventory information, revised modelling assumptions, revised spruce beetle mortality assumptions and new timber supply modelling software. Wherever possible, the content and requirements of this Development Plan are consistent with direction under Amendment # 1, Management Plan #3.

Figure 1 provides a map of the CNC Research Forest locations within the Prince George Natural Resource District.

**Figure 1: Research Forest General Location Map**



## Purpose and Content of the Development Plan

Because the OLTC, which authorizes the cutting and removing of timber, is a minor tenure and, since there is no requirement to prepare a forest stewardship plan, many of the requirements under the *Forest and Range Practices Act* and the *Forest Planning and Practices Regulation* do not apply to forest and research operations within the Research Forest. Furthermore, the SUP does not require the preparation of a Development Plan for the Research Forest. This leaves the Management Plan as the sole provincial planning requirement for the CNC Research Forest.

This Development Plan is prepared as an important professional planning link between the Management Plan and the various forestry and research operations implemented within the Research Forest. The purpose of the Development Plan is multi-fold:

- 1) To provide further direction and practice standards applicable to site plans and prescriptions;
- 2) To provide further information which was considered and analyzed in support of the Management Plan objectives, strategies, and commitments;
- 3) To demonstrate that planned and completed operations are consistent with the Management Plan;
- 4) To provide information and rationale where operations may not be fully consistent with the Management Plan;
- 5) To provide evidence that the commitments in the Management Plan have been achieved;
- 6) To summarize the annual forest development operations planned and completed within the Research Forest; and
- 7) To record and track important information that may be used to continuously improve the Management Plan and future Development Plans and the operations implemented to achieve both plans.

Since the Development Plan is, in many ways, a furthering of the Management Plan content and commitments, both content and structure in this Development Plan are similar to the Management Plan. In some cases, the Management Plan provides sufficient specificity that further detail in the Development Plan is not required. Where this applies, the Development Plan will simply include the Management Plan content as necessary. This duplication is necessary for the Development Plan to be the primary source of information regarding annual operations.

The Development Plan is not intended to provide mapping of all future harvesting, road building and research locations for the entire term of the Management Plan, although future versions may include this. The primary expectation is that the Development Plan will be regularly revised to reflect current mapping for harvested cutblocks and roads, all known proposed/planned cutblocks and roads, along with mapping of all current research sites.

## Regular Development Plan Replacement and Revision

The intent is to annually replace the Development Plan coinciding with each annual operating year of approved Management Plan #3, which was effective as of July 1<sup>st</sup>, 2016. This Development Plan replacement occurs during the midst of the third Management Plan

operating year, and such includes plans and information for more than one operating year. In particular, this Plan includes the current status up to October 31, 2018 and includes future development planned between November 1, 2018 and June 30, 2020. The intent is to replace this Development Plan on or about July 1<sup>st</sup>, 2020, unless an earlier update or revision is necessary due to unforeseen circumstances.

The Development Plan may be revised and updated at any time during the year to reflect current operating information and conditions. This includes Development Plan revisions and updates to:

- Ensure consistency with each new approved Management Plan or amendment, including new forest development planning,
- Incorporate new natural resource information,
- Reflect innovation and findings from research, and
- Incorporate revised practice standards, and to incorporate new input from the public, First Nations and natural resource stakeholders.

Professional signing of each material revision or update to the Development Plan is required. Important changes to each Development Plan version will be highlighted. Depending on the scope and nature of operations, it may be possible that there are no revisions within a Development Plan year.

## **Regular First Nations, Stakeholder and Public Input**

Since regular information exchange with natural resource stakeholders and First Nations is an expected outcome of the Management Plan, each Development Plan version that includes revised or new forest development will require a new operational referral or notification to potentially affected First Nations and natural resource stakeholders. This ensures that concerned parties may regularly provide input or otherwise become involved in the Research Forest planning and operations. It may also be necessary to refer proposed cutblocks, roads and research sites to Provincial Ministries and Agencies and other affected persons to ensure input into planning and operations is achieved as per the Management Plan strategies and commitments.

## **Results, Strategies, Procedures, and Standards for Achieving Management Plan Direction**

The major section headings that follow reflect the sections of the Management Plan that contain objectives, results, and strategies. Substantial wording from the Management Plan was copied into this document as *italicized* text.

Each of the subsequent major section headings provide all necessary results, strategies, procedures and standards for achieving the direction specified within the Management Plan. Where applicable, this document may also provide past or current operational results in order to demonstrate achievement of the Management Plan requirements or that operational outcomes are consistent with the Management Plan. To ensure no confusion between Management Plan and Development Plan content, the Development Plan procedures, standards, critical information, and operational results, are displayed in non-italicized blue font.



## Development Plan Schedule and Overview Maps

Appendix A includes one or more maps for each Research Forest Unit (A to L), showing all of the currently proposed and harvested cutblocks and roads. Like the Management Plan maps, the Development Plan maps include all other features or areas within or adjacent to the Research Forest (e.g. Recreation features, trapline boundaries or visual quality objectives). Maps of the active and previous Research Sites are provided under Appendix C.

Table 1 summarizes the area (hectares) of the proposed and existing cutblocks within each Research Forest Unit. Proposed cutblocks, or cutblocks where harvesting is not complete, are highlighted in light grey.

**Table 1: Summary of Proposed and Existing Cutblocks by Research Forest Unit**

CNC Research Forest Unit	Cutblock ID	Proposed Harvest Area	Harvested Area Not Reforested	Harvested Area with Forest <20 Years Old	Harvested Area with Forest 20 to 39 Years Old	Natural Crown Forest Landbase	Comments
A	A-1			134.3			
	A18171-141-6				121.7		
	A27990-B20-1				91.5		
	A-2			74.9			
	A-8			36			
	A-3		51.2				
	A-4		36.2				
	A-5		110.6				
	A-6		42.6				
<b>Totals</b>		-	<b>240.6</b>	<b>245.2</b>	<b>213.2</b>	<b>933.8</b>	

CNC Research Forest Unit	Cutblock ID	Proposed Harvest Area	Harvested Area Not Reforested	Harvested Area with Forest <20 Years Old	Harvested Area with Forest 20 to 39 Years Old	Natural Crown Forest Landbase	Comments
B	A18171-875-3				53.3		
	A18171-876-6				62.5		
	A18171-875-2				63.2		
	A18171-876-5			50.9			
	A48792-E-1				40.6		
	A48792-E-2			16.6			
	B-1			109.9			
	B-2		121.5				
	B-3	75.7					
	B-4	23.6					
	B-5	21.5					
	B-6	10.9					
<b>Totals</b>		<b>131.7</b>	<b>121.5</b>	<b>177.4</b>	<b>219.6</b>	<b>1,053.4</b>	

CNC Research Forest Unit	Cutblock ID	Proposed Harvest Area	Harvested Area Not Reforested	Harvested Area with Forest <20 Years Old	Harvested Area with Forest ≥20 Years Old	Natural Crown Forest Landbase	Comments
C	Partial-1						284.9 ha of Partial Cut (1966)
	A18167-710-2			64.6			
	A28479-1			98.0			
	A18167-707-2			47.5			
	C-1			173.9			
	C-2			319.0			
	C-3			31.5			
<b>Totals</b>		-	-	<b>734.5</b>	-	<b>1,043.5</b>	
D	A18167-701-2			98.9			
	A18167-701-1			101.6			
	A18167-746-2			83.3			
	A18167-746-1			98.1			
	D-1			314.0			
	D-2			104.9			
	D-3			87.8			
	D-4			22.2			
<b>Totals</b>		-	-	<b>910.8</b>	-	<b>1,081.9</b>	

CNC Research Forest Unit	Cutblock ID	Proposed Harvest Area	Harvested Area Not Reforested	Harvested Area with Forest <20 Years Old	Harvested Area with Forest ≥20 Years Old	Natural Crown Forest Landbase	Comments
E	A40873-360-16				102.8		
	A40873-672-21			40.9			
	A40873-680-14			35.7			
	E-1			100.9			
	E-2			97.5			
	E-3			60.0			
	E-4			11.5			
	E-5		36.6				
	E-6		39.1				
	E-7		15.7				
	E-8		33.3				
	E-9	14.5					
	E-10	9.9					
<b>Totals</b>		<b>24.4</b>	<b>124.7</b>	<b>346.5</b>	<b>102.8</b>	<b>1,078.0</b>	

CNC Research Forest Unit	Cutblock ID	Proposed Harvest Area	Harvested Area Not Reforested	Harvested Area with Forest <20 Years Old	Harvested Area with Forest ≥20 Years Old	Natural Crown Forest Landbase	Comments
F	A02955-1				103.3		Harvested in 1974
	A18166-416-2				41.9		
	A40873-680-7			54.0			Overlaps with F-2
	A40873-680-5			47.4			
	A40873-U05-34			59.1			
	F-1			68.0			
	F-2			95.6			
	F-3			126.0			
	F-4			106.8			
	F-5	16.7					
	F-6	93.1					
	F-7	59.2					
	F-8	30.5					
	F-9	65.4					
	F-11	10.1					
<b>Totals</b>		<b>275.0</b>	<b>-</b>	<b>556.9</b>	<b>145.2</b>	<b>1,198.7</b>	

CNC Research Forest Unit	Cutblock ID	Proposed Harvest Area	Harvested Area Not Reforested	Harvested Area with Forest <20 Years Old	Harvested Area with Forest ≥20 Years Old	Natural Crown Forest Landbase	Comments
G	A40873-675-119			43.2			
	A02955-10-4				50.6		Harvested in 1978
	A40873-635-120			55.6			
	A40873-636-81			47.0			
	A40873-636-100			62.9			
	A40873-616-109			41.0			
	A40873-616-116			51.6			
	A40873-636-93			48.5			
	A40873-365-2				50.1		
	A40873-364-73				58.2		
	A40873-365-1			49.9			
	G-1			142.6			
	G-2			70.1			
	G-3			188.5			
	G-4			117.0			
	G-5		120.9				
	G-6		159.2				
	G-7		66.4				
	G-8		64.7				
	G-9		62.2				
	G-10		67.9				
<b>Totals</b>		-	<b>541.3</b>	<b>917.9</b>	<b>158.9</b>	<b>2,185.2</b>	

CNC Research Forest Unit	Cutblock ID	Proposed Harvest Area	Harvested Area Not Reforested	Harvested Area with Forest <20 Years Old	Harvested Area with Forest ≥20 Years Old	Natural Crown Forest Landbase	Comments
H	A18165-821-2			57.1			
	A18165-832-1			25.9			
	A49818-A-2			33.0			
	A49818-A-1			63.4			
	A18165-824-8				4.4		
<b>Totals</b>		-	-	<b>179.4</b>	<b>4.4</b>	<b>567.1</b>	
I	A02993-1				154.1		Two blocks, harvested in 1975
	A09673-1				6.9		Harvested in 1978
<b>Totals</b>		-	-	-	<b>161.0</b>	<b>844</b>	

CNC Research Forest Unit	Cutblock ID	Proposed Harvest Area	Harvested Area Not Reforested	Harvested Area with Forest <20 Years Old	Harvested Area with Forest ≥20 Years Old	Natural Crown Forest Landbase	Comments
J	A18158-617-1				19.7		Two blocks, harvested in 1975
	A07772-1						158.4ha of Partial Cutting, harvested in 1982
	A18158-606-2			49.9			
	A18158-606-3			11.4			
	A18158-604-679			28.2			
	Carrier			174.4			
<b>Totals</b>		-	-	<b>263.9</b>	<b>19.7</b>	<b>1,581.2</b>	



CNC Research Forest Unit	Cutblock ID	Proposed Harvest Area	Harvested Area Not Reforested	Harvested Area with Forest <20 Years Old	Harvested Area with Forest <20 Years Old	Natural Crown Forest Landbase	Comments
K	W0210				36.7		Harvested in 1970
	W0210				93.6		Harvested in 1970
	A18166-14				5.3		Harvested in 1986
	W0210-A-1				22.4		Harvested in 1989
	A24957-1				1.2		Harvested in 1987
	A02958				38.8		Harvested in 1979
	W0210-B-1				11.3		Harvested in 1995
	K-1	28.0					
	K-2	61.0					
	K-3	14.7					
	K-4	19.7					
	K-5	23.3					
<b>Totals</b>		<b>146.7</b>	-	-	<b>209.3</b>	<b>460.3</b>	
L	W0210-S			94.4			
<b>Totals</b>		-	-	<b>94.4</b>	-	<b>158.5</b>	

## Varying from the Management Plan

*Upon approval, CNC has committed to implementing this Management Plan as written and as per any direction by the District Manager. It is expected that any variances from the following natural resource management objectives, results, and strategies will be planned and prescribed in advance with appropriate professional rationale. A variance will most often be documented through individual signed site plans but may also include documentation within the Development Plan or other documented information and rationale. It is expected that variances from this plan will most often be a result of various forms of research. Examples of research include conducting experimental forestry practices, establishing operational treatment trials, and undertaking educational activities.*

*It is also possible that a variance may be necessary due to unforeseen or changed environmental conditions or unidentified circumstances. However, in the case of a persistent unexpected environmental condition, (such as extreme, prolonged drought) or other circumstance that requires regular variance, the Management Plan will be revised or amended accordingly.*

*Some of the Management Plan requirements are those specified under the Forest Planning and Practices Regulation that apply to minor forest tenures and forest tenures without Forest Stewardship Plans. Where planned operations may not comply with a regulated requirement, then it will be necessary for CNC to submit a request for exemption to the Minister, as per subsection 91 (1) (b) of the Forest Planning and Practices Regulation, specifying the type of the exemption and the rationale for the request.*

## Landscape Biodiversity and Old Forest Maintenance

### Old Forest Objective

*The importance of maintaining biodiversity and old forest within the Research Forest is acknowledged and, therefore, the management objective is to meet the provincial old forest implementation guidance that specifically applies to the CNC Research Forest.<sup>1</sup> In particular, the Provincial guidance provides an option to retain 19% of the Research Forest Crown Forest Landbase as old forest, which is defined as stands greater than 120 years old.*

### Old Forest Results

The expected area of old forest remaining after the harvesting of all proposed cutblocks under this Development Plan is mapped and included under Appendix J. In order to not over-estimate the expected remaining old forest, the amount calculated is based on minimal wildlife tree and riparian retention being applied to all proposed cutblocks. To further prevent over-estimation

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<sup>1</sup> Ministry of Forests, Lands, and Natural Resource Operations, 2009. Regional Executive Director Implementation Guidance for the PG TSA Landscape Biodiversity Objectives. [https://www.for.gov.bc.ca/tasb/slrp/srmp/north/prince\\_george\\_tsa/pg\\_tsa\\_guidance\\_document\\_20091008.pdf](https://www.for.gov.bc.ca/tasb/slrp/srmp/north/prince_george_tsa/pg_tsa_guidance_document_20091008.pdf)

of expected old forest, this analysis excluded low density forest types (<100 stems/ha), which may have limited old forest attributes. Table 2 summarizes the amount of the expected old forest area within each unit, expressed in hectares and as a percentage of each unit.

Consistent with the Management Plan requirements for reporting, this information satisfies the annual requirement to report on old forest retention areas. The area reported in Table 2 and mapped in Appendix J only includes areas that were pine-leading, (prior to mountain pine beetle attack), if the remaining live trees are 120 years old or greater (age is based on leading live species). The forest typing and ages used in this analysis are from the 2017 CNC forest inventory. This analysis does not project (increase) the tree ages for when all the forest development is planned to be completed. This potentially represents a small under-estimation of the old forest amount. A portion of the retained old forest riparian areas were deleted and not recorded, which represents another small under-estimation of the old forest amount. While this analysis excluded the smallest old forest fragments, a few old forest fragments, outside of riparian areas, were included in the analysis. These remaining old forest fragments potentially represent a small over-estimation of the expected old forest amount. These old forest fragments are shown on the Appendix J maps. In all, the old forest amounts recorded in Table 2 are a reasonable and safe estimation of the actual old forest to remain after implementing all of the harvesting proposed in this development plan.

**Table 2: Remaining Old Forest Projection if All Proposed Cutblocks Were Harvested with Minimal Retention**

Research Forest Unit	Crown Forest Land Base (CFLB) (ha)	Projected Old Forest Area (ha)	Projected Old Forest Percentage	Comments
A – Kerry Lake	933.8	157.6	<b>17%</b> (10% Minimum)	
B – Tacheeda Lakes	1,053.4	297.9	<b>28%</b> (14% Minimum)	
C – Caine Creek	1,043.5	138.1	<b>13%</b> (10% Minimum)	Change from previous Dev. Plan (14%) is likely due to exclusion of old forest fragments
D – Caine Creek	1,081.9	123.4	<b>11%</b> (10% Minimum)	Change from previous Dev. Plan (12%) is likely due to exclusion of old forest fragments
E – Chuchinka Creek	1,078.0	379.1	<b>35%*</b>	

			(10% Minimum)	
F – Chuchinka Creek	1,198.7	183.9	<b>15%</b> (10% Minimum)	
G – Angusmac Creek	2,185.2	456.0	<b>21%</b> (10% Minimum)	Over 15ha of existing old forest is not included due to inventory errors
H – Purden Mountain	727.3	546.4	<b>75%</b> (25% Minimum)	
I – Hungary Creek	844.0	425.8	<b>50%</b> (25% Minimum)	Another 22% is occupied by stands 100 to 119 years old
J – Fraser River	1,581.2	735.7	<b>47%</b> (10% Minimum)	Another 10% is occupied by stands 100 to 119 years old
K – Willow River	460.3	112.3	<b>24%**</b> (25% Minimum)	
L – Willow River	158.5	12.0	<b>8%***</b> (10% Minimum)	Another 9% is occupied by stands 110 and 119 years old
Total for All Units	<b>12,345.7</b>		<b>29%</b> (19% Minimum)	
<p>*This analysis does not include the newest proposed salvage cutblocks (E-9 and E-10) within Unit E. These cutblocks will reduce the old growth percentage within Unit E by approximately 3% for a total of 32%.</p> <p>**Old forest forecast is less than target (24% vs 25%), so additional wildlife tree retention areas need to be considered as part of final proposed cutblock designs. Unit K also benefits from having another 2% of the area with forest stands 100 to 119 years old.</p> <p>***The small old forest retention is a result of the harvesting being conducted under another license and management plan (Woodlot License W0210). Although current old forest retention is below target, retention of mature forest 100 years old and greater is above target at 16%, and the retention of mature forest is approximately 40%.</p>				

## Interior Old Forest Objective

*Because of the multiple small units that compose the Research Forest and the amount of existing young forest within and adjacent to the Research Forest Units, maintaining Interior Old Forest as per the PGTSA Landscape Biodiversity Order is not a reasonable expectation. However, the importance of the intent of the interior old forest objectives is recognized. Consistent with that intent, the management goal is to develop strategies to retain old forest areas that are valued for their biodiversity and which will sustain multiple old forest attributes. Strategies consistent with the management goal may include but are not limited to the following, where practicable:*

- 1) Retention areas that are not within or not adjacent to riparian management areas may only contribute to the old forest percentage, if they meet a specified minimum width and size as specified within the Development Plan;*

The specified width and size is 150m and 2.25ha.

- 2) Maintain old forest retention continuity with spatially identified old forest retention areas planned by other forest tenure holders;*

There is a recruitment strategy for old forest retention being implemented within Natural Disturbance Unit A4 with the McGregor Plateau, as per the PGTSA Biodiversity Order. Figures 2, 3 and 4 show the areas currently being managed for biodiversity and old forest conservation (shown in green hatching) within Research Forest Units B, E, and G respectively, and how they align with the recruitment areas identified under the A4 strategy.

Figure 2: Old Forest Planning Adjacent to Unit B

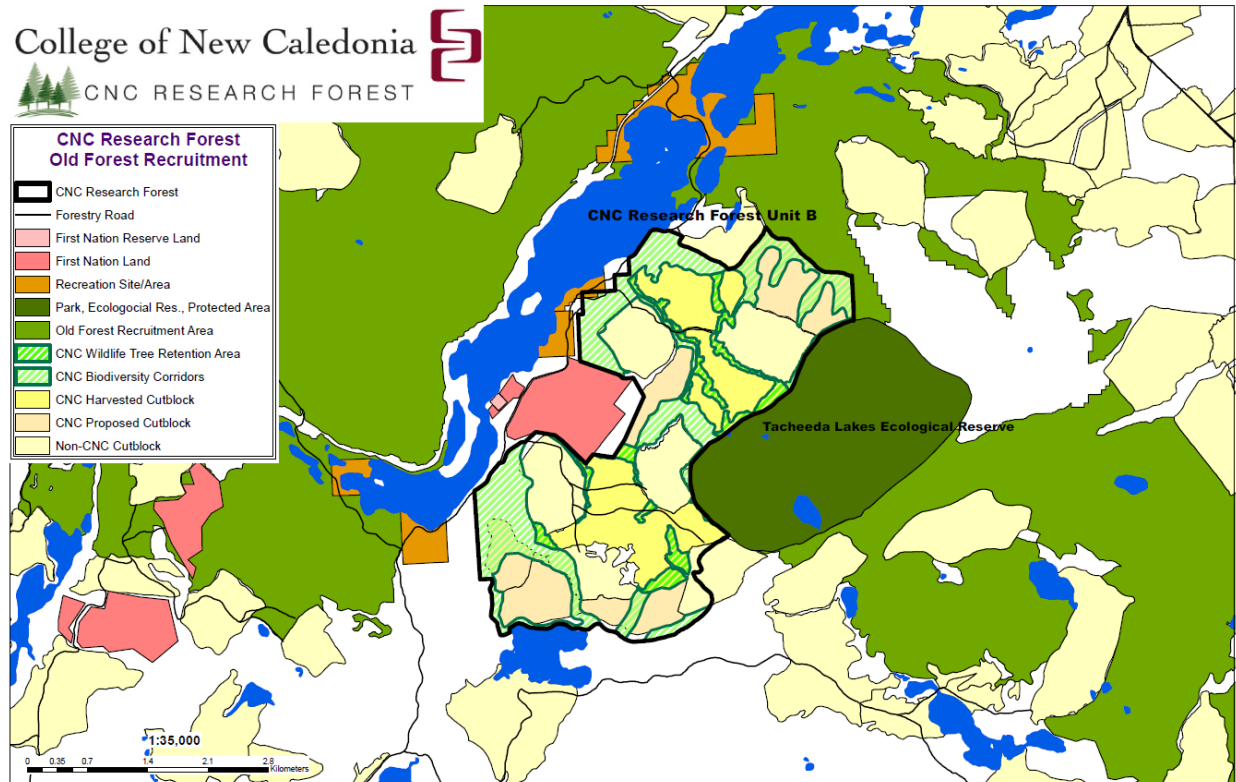


Figure 3: Old Forest Planning Adjacent to Unit E

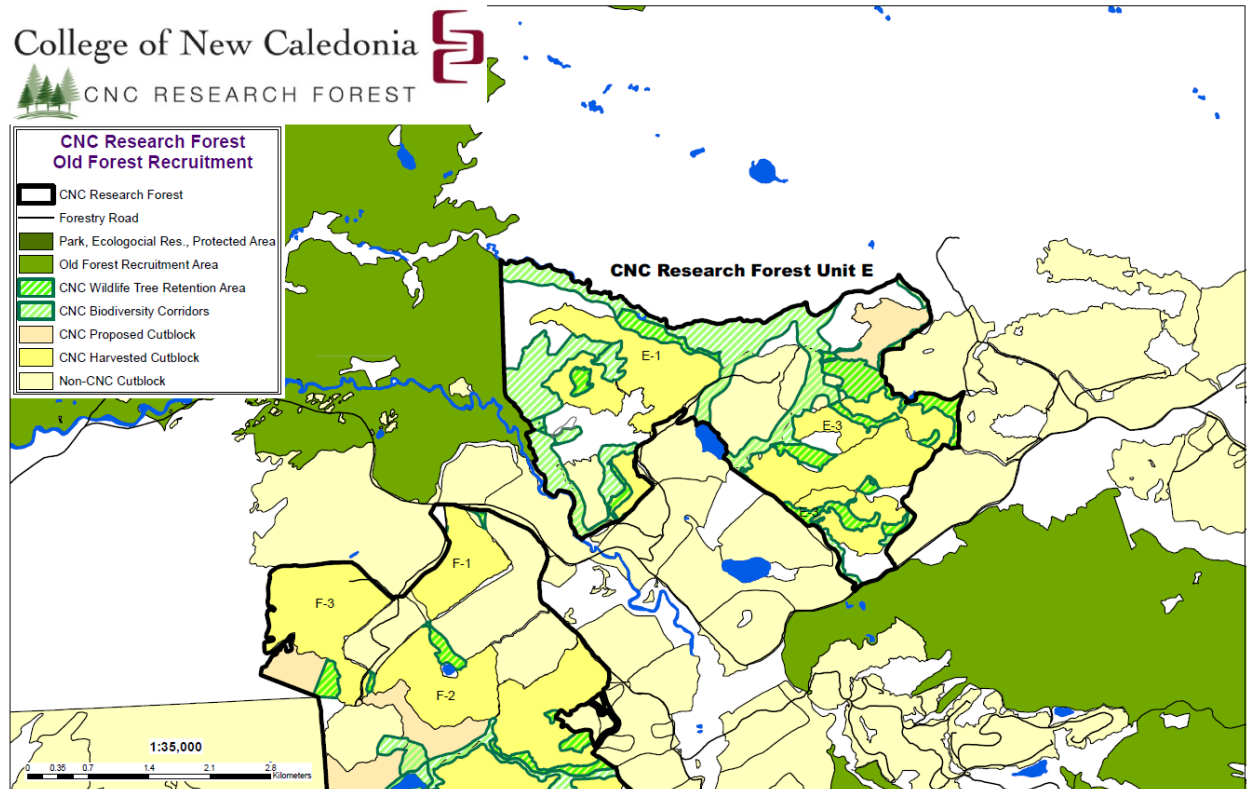
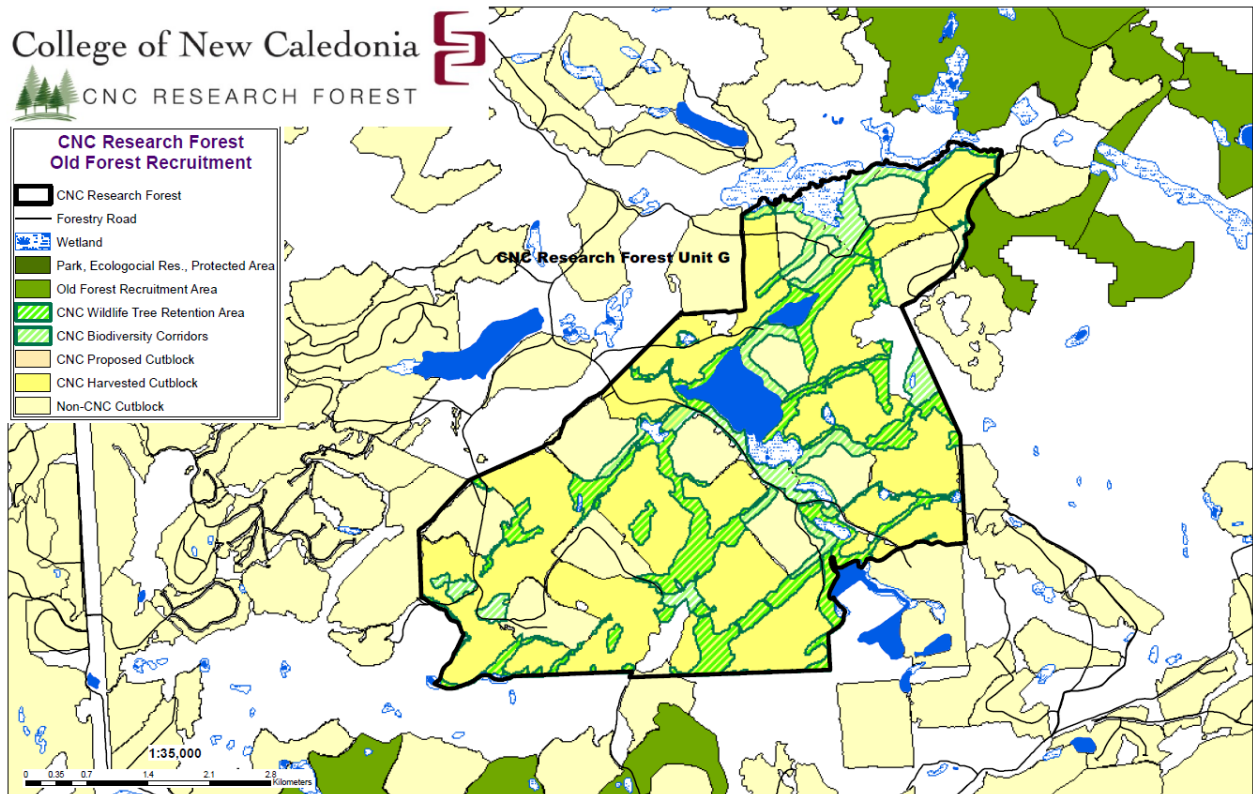


Figure 4: Old Forest Planning Adjacent to Unit G



- 3) Anchor old forest retention on significant wildlife habitat features (e.g., nests, dens, and mineral licks) or areas supporting blue or red-listed ecosystems or species;
- 4) Maintain a minimum buffer of forests >3m in height around all identified wildlife habitat features, as specified within the Development Plan;

The intent is to conserve and protect significant wildlife features or areas that have unique or rare qualities. The beneficial amount of retention and type of retention may vary depending on the size and type of feature and the species affected. Available professional expertise is necessary to determine the potential treatment options in each case. Where professional expertise may not be available and conservation or protection is deemed necessary, then 200m shall be the minimum buffer applied for a habitat feature within old forest (>120 years old). This buffer width is expected to conserve old forest attributes (avoid edge effects) near the habitat feature where old forest conservation is determined to be important.

- 5) Within each unit, maintain a minimum percentage of old (>120 years), non-pine-leading forest stands based on area, as specified within the Development Plan; and

With regard to the “non-pine-leading” wording, the intent of this Management Plan objective is to ensure that no areas of primarily dead pine forest are contributing to the old forest amount. With the 2017 CNC forest inventory, the live portion of the mountain pine



beetle attacked forest types is now fully described. This allows the remaining live forest in mountain pine beetle areas to be properly assessed as old forest. The result is that, in some areas formerly described as dead, mature pine stands are now included as old forest providing they have sufficient live, old trees including live pine. The areas that have significant pine and contribute to old forest due to sufficient old, live stems are shown in dull yellow on the maps within Appendix J.

For each Research Forest unit, the specified minimum percentage of old forest (120 years and greater) that may occupy the forested land base (area not included within wetlands and water) is listed under the column titled, “Projected Old Forest Percentage”, within Table 2. The minimum old forest amount per unit ranges from 10% to 25%.

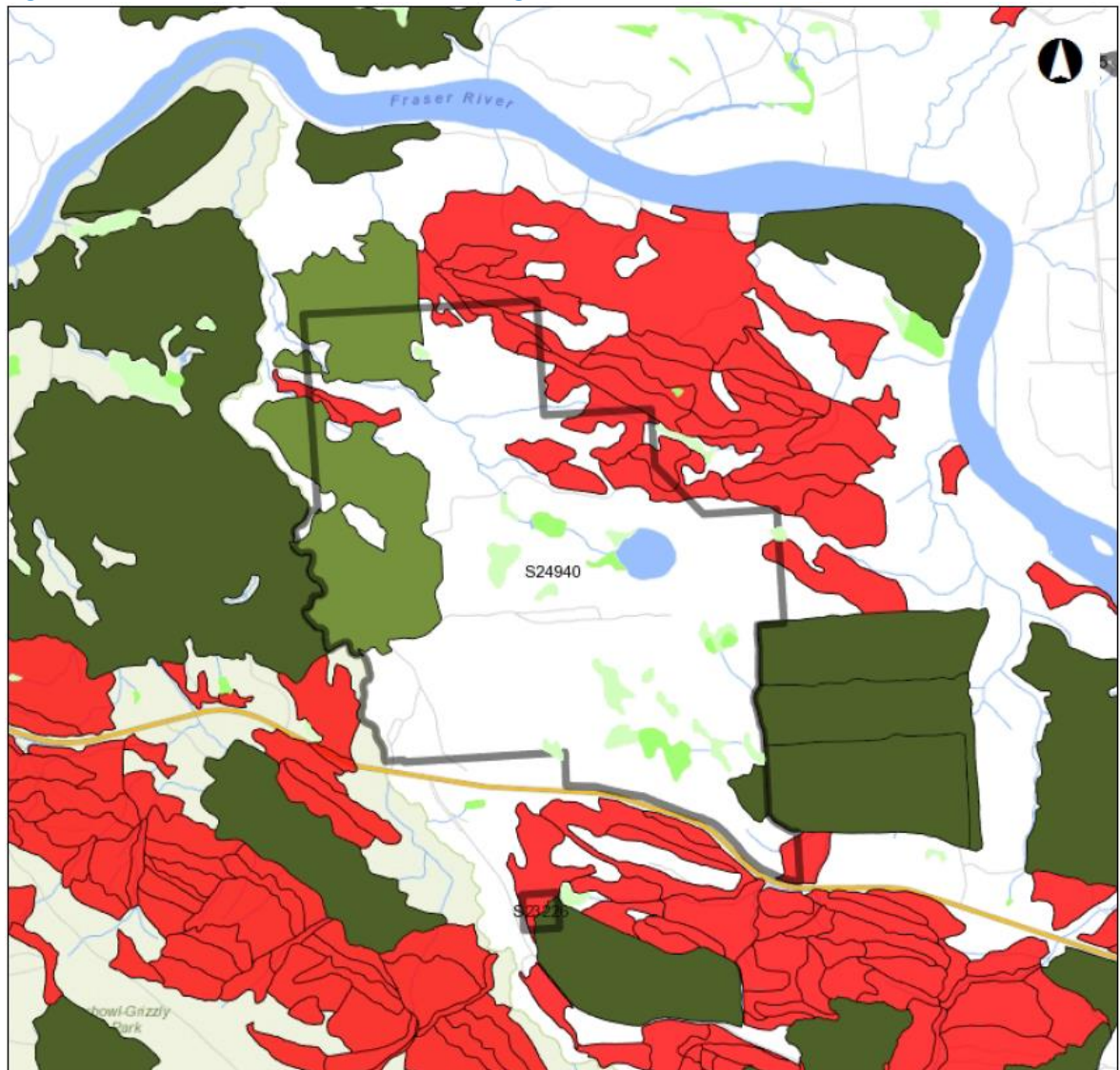
The projected remaining amount (hectares) of old forest after harvesting all of the proposed cutblocks under this Development Plan is also included in Table 2.

- 6) *Within Unit I, retain all mature cedar and hemlock leading stands within the approximate areas shown in red within Figure 5. This is consistent with maintaining the forested areas rated as having a moderate to high potential biodiversity value as identified on the 2008 map produced by the Provincial Integrated Land Management Bureau.<sup>2</sup>*

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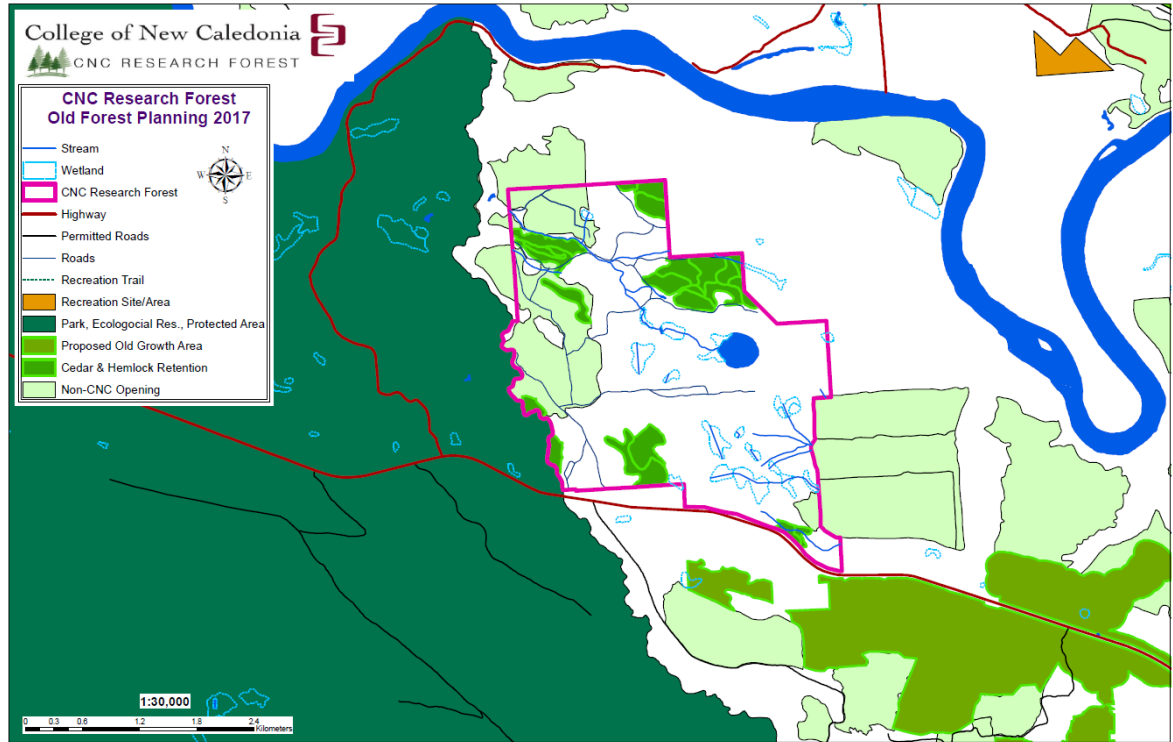
<sup>2</sup> Integrated Land Management Bureau, Province of British Columbia, 2008. Guidance Biodiversity Management of ICH in the Prince George LRMP Area.

Figure 5: Mature Cedar and Hemlock Leading Stands in Unit I



Applying the new forest inventory completed in 2017, the approximate location of the cedar or hemlock-leading stands that are to be retained from harvesting within Unit I are shown in Figure 6, below.

**Figure 6: Mature Cedar and Hemlock Leading Stands for Retention within Unit I (as per 2017 forest inventory)**



## Species at Risk Conservation and Protection

### Caribou Corridor

*Unit I, adjacent to Sugarbowl Park and Protected Area, is within an area identified as habitat for the southern Mountain Caribou population, which is a red-listed species. In particular, the area in and around Unit I is recognized as a movement corridor for southern Mountain Caribou between the Torpy River area and the Sugarbowl Mountain area. Managing the overall integrity of the caribou movement corridor requires due consideration when planning for forest harvesting and roads. To ensure that Research Forest operations are consistent with the intent of the movement corridor, consultation will occur with available, qualified natural resource professionals to determine any necessary measures to be implemented. This may include, but is not limited to, specified timing for all forestry practices and research undertakings, alteration of road and cutblock design, modification of forest cover and vegetation retention, implementation of monitoring before and post-treatment, and postponement of operations. These strategies will also be undertaken where a significant wildlife habitat feature is identified prior to or during Research Forest operations.*

## Ecosystems or Species at Risk

*Any identified ecosystems or species at risk habitat may be partially conserved or fully protected after consulting with available natural resource professionals. In addition, other forest practice modifications or research modifications may be undertaken to minimize current and future hazards to areas supporting listed ecosystems and species. As an example, hazards may include, but are not limited to, windthrow, disease, insects, or invasive plants.*

For the upcoming development plan year, all proposed and planned operations are all within the SBS wk1 biogeoclimatic subzone. Using the terrestrial ecosystem mapping, completed in 2017, potential ecosystems listed in Table 3 will be both identified and verified by map and field prior to completion of harvesting.

Only the upland ecosystems and plants are provided in Table 3. Forestry harvesting operations are not planned for the ecosystems and plants within non-forest types (eg. wetlands, bogs, marshes, ponds, and lakeshores), as these are riparian areas planned for conservation. No further actions to identify and manage plants dependent on these non-forest types are being implemented at this time.

**Table 3. Listed Upland/Terrestrial Ecosystems and Plants Potentially Impacted by Forest Development within the Development Plan Year**

English Name for Ecosystem		BC List	Identified Wildlife	Biogeoclimatic Units	Ecosystem Group
Hybrid White Spruce / Hardhack / Oak Fern		Red		SBSwk1/06	Terrestrial - Forest: Coniferous - moist/wet
Lodgepole Pine / Black Huckleberry / Reindeer lichens		Blue		SBSvk/09;SBSwk1/02	Terrestrial - Forest: Coniferous - dry
Lodgepole Pine / Black Huckleberry - Velvet-leaved Blueberry		Blue		SBSvk/02;SBSwk1/03	Terrestrial - Forest: Coniferous - dry
Douglas-fir - Hybrid White Spruce / Knight's Plume		Blue		SBSmk1/04;SBSwk1/04	Terrestrial - Forest: Coniferous - dry
Douglas-Fir - Hybrid White Spruce / Thimbleberry		Blue		SBSmh/01;SBSmh/05;SBSmh/06;SBSvk/03	Terrestrial - Forest: Coniferous - dry;Terrestrial - Forest: Coniferous - mesic
Scientific Species Name	English Name	BC List	Identified Wildlife	Name Category	Biogeoclimatic Units
<i>Rhodobryum roseum</i>	Rose moss	Blue		ICHwk;SBSwk	

<i>Malaxis paludosa</i>	Bog Adder's-mouth Orchid	Blue		SBSdw;SBSwk	Bog;Swamp;Conifer Forest - Moist/wet
<i>Malaxis brachypoda</i>	White Adder's-mouth Orchid	Blue		SBSvk	Fen;Riparian Forest;Rock/Sparsely Vegetated Rock;Conifer Forest - Moist/wet;Mudflats - Intertidal
<i>Epilobium halleianum</i>	Hall's Willowherb	Blue		ICHwk;SBSwk	Vernal Pools/Seasonal Seeps;Stream/River; Meadow;Conifer Forest - Moist/wet;Alpine/S ubalpine Meadow
<i>Nymphaea tetragona</i>	Pygmy Waterlily	Red		SBSmk;SBSwk	Bog;Riparian Forest;Riparian Shrub;Meadow;Deci duous/Broadleaf Forest;Conifer Forest - Mesic (average);Conifer Forest - Dry;Conifer Forest - Moist/wet;Mixed Forest (deciduous/conifero us mix);Riparian Herbaceous;Gravel Bar

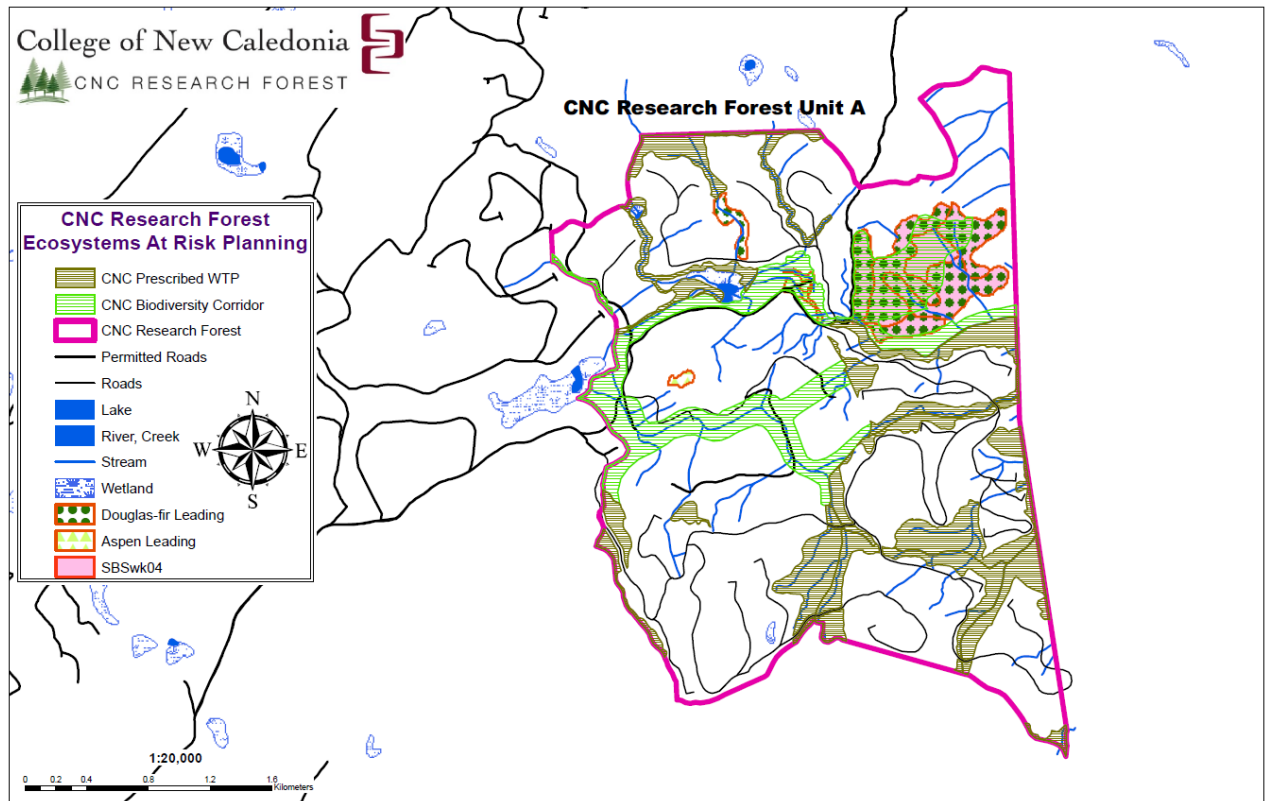
## Species at Risk Results

Figures 7 to 13 show the ecosystems at risk that are within or adjacent to harvested areas or proposed harvest areas. The ecosystems as identified from the 2017 Terrestrial Ecosystem Mapping or from field assessments completed during or after 2016. Based on current inventory and assessments, this includes areas that are dominated by SBS wk1 02, 03, 04, or 06 ecosystems. The maps also show the areas that are Douglas-fir leading or deciduous leading.

A significant portion of the ecosystems at risk, along with Douglas-fir and deciduous leading areas are being planned for retention as part of prescribed wildlife tree retention areas/patches or the biodiversity/wildlife corridors. The overlap between currently planned retention areas and ecosystems at risk may easily be observed within Figures 7 to 13.

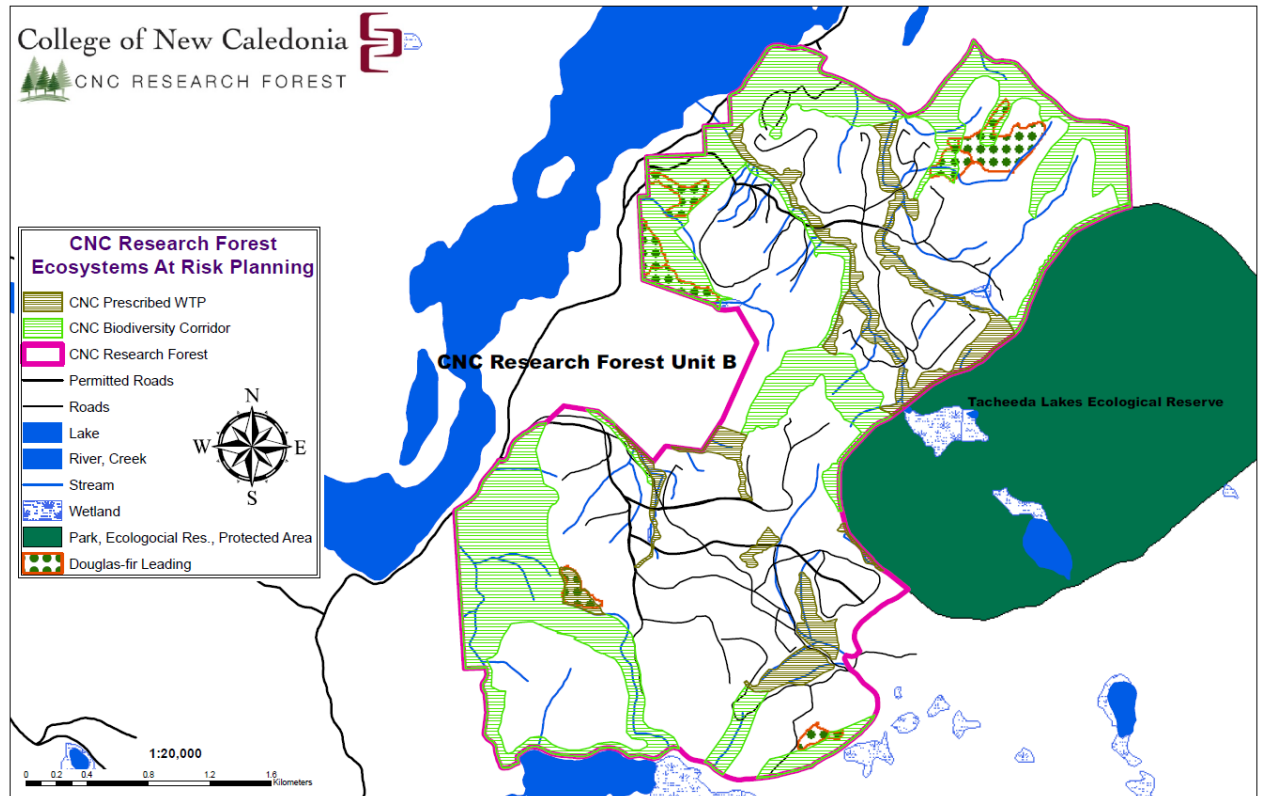
Approximately 4 ha of area within the mid portion of Cutblock D-1 is typed as SBS wk 1 02 within the Terrestrial Ecosystem Mapping, but subsequent field work assessed the area as SBS wk1 01/05. Either way, approximately 0.7 ha of the area was prescribed for wildlife tree retention.

Figure 7. Retention Planning Overlap with Ecosystems at Risk within Unit A





**Figure 8. Retention Planning Overlap with Ecosystems at Risk within Unit B**



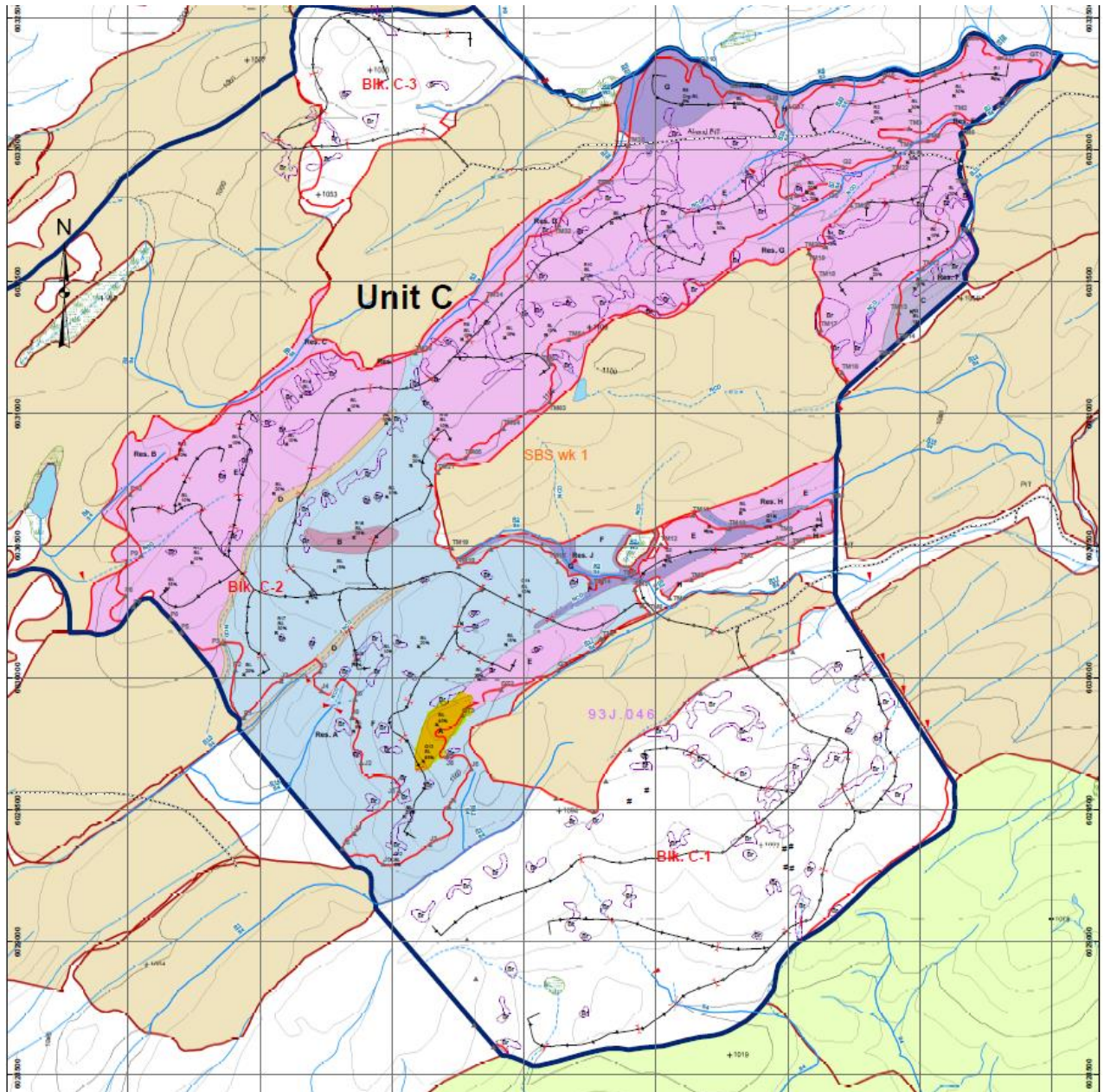


The area shown in yellow was field assessed as being 70% SBS wk1 04 and 30% SBS wk1 02. The area shown is 1.8 ha. This area was harvested along with the rest of Cutblock C-1 during the winter of 2017.

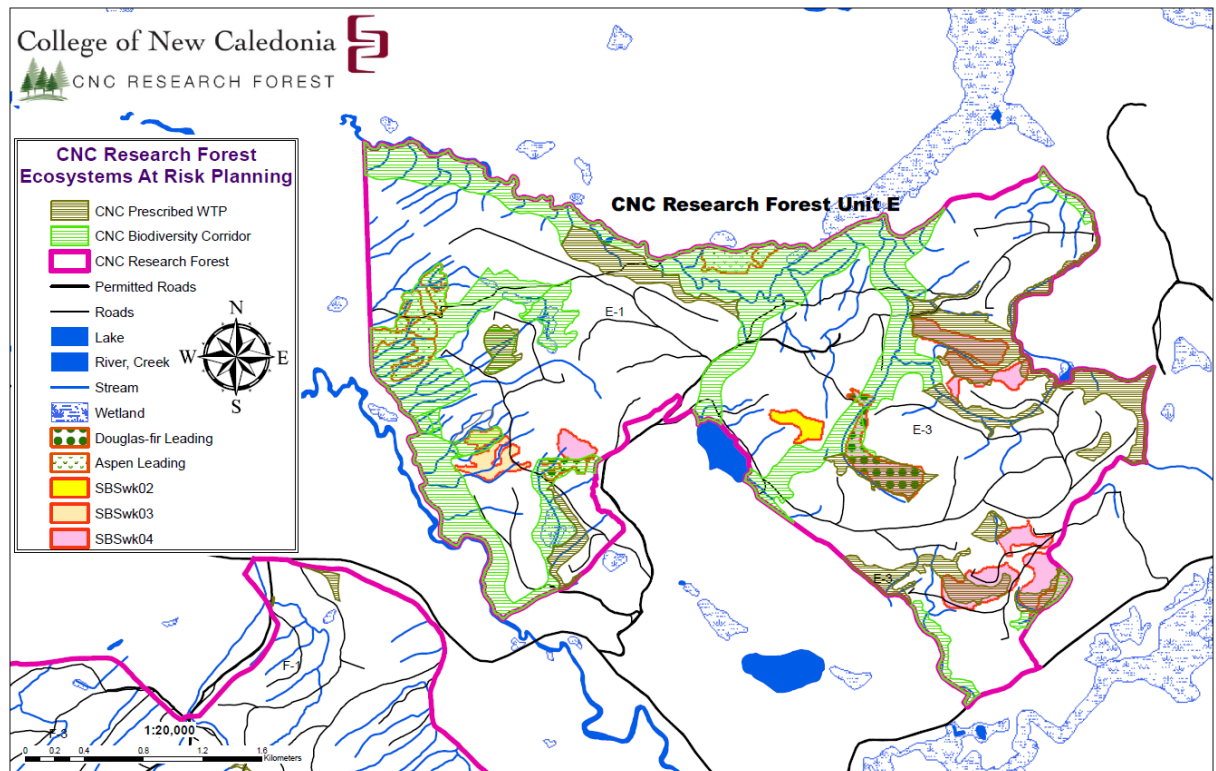


**Figure 10. Ecosystem at Risk Field Assessed within Cutblock C-2**

The area shown in orange was field assessed as being 70% SBS wk1 04 and 30% SBS wk1 02. The area shown is 2.5 ha. A very small portion of this SBS wk1 04 type was reserved (note overlapping red line) within a prescribed wildlife tree retention area. The remainder of the SBS wk1 04/02 type was harvested along with the rest of Cutblock C-2 during the winter of 2017.



**Figure 11. Retention Planning Overlap with Ecosystems at Risk within Unit E**



**Figure 12. Retention Planning Overlap with Ecosystems at Risk within Unit F**

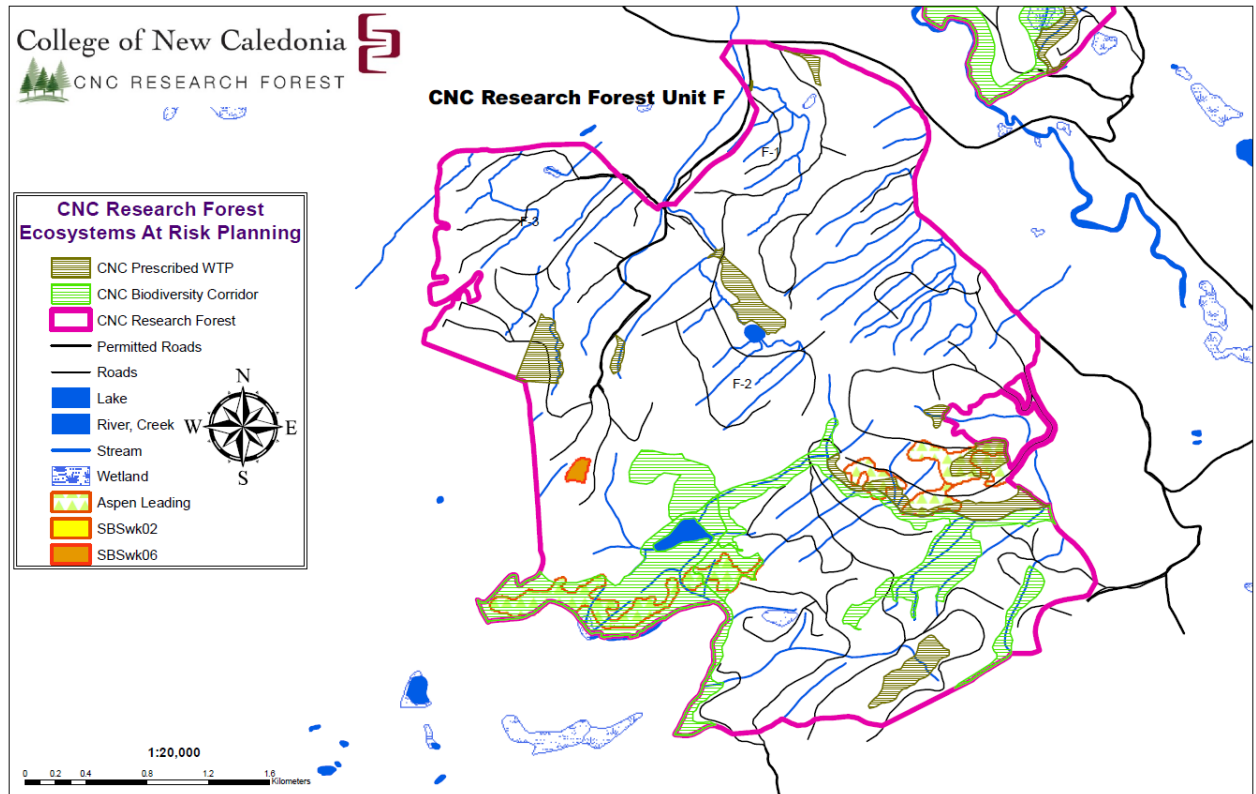
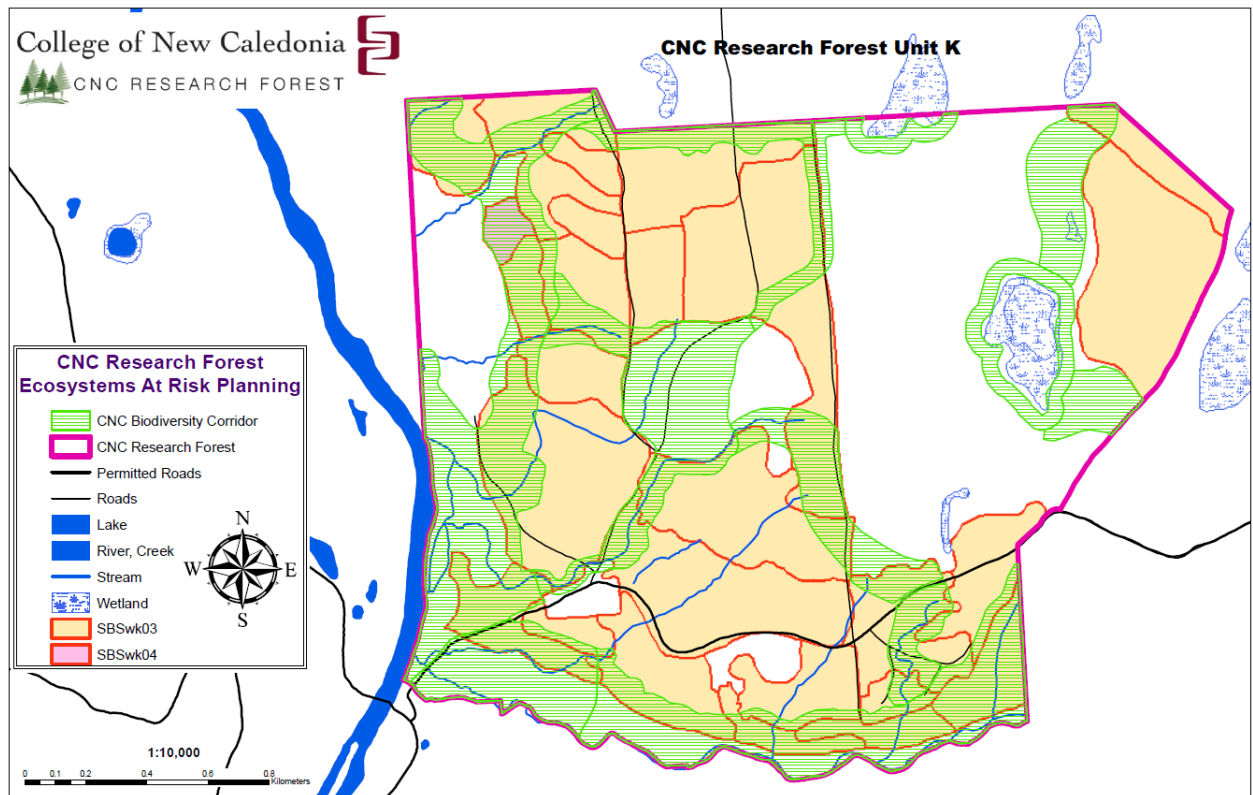




Figure 13. Retention Planning Overlap with Ecosystems at Risk within Unit K



# Wildlife Tree and Coarse Woody Debris Retention

## Wildlife Tree Retention

*The Forest Planning and Practices Regulation requires the following to be met (shown in italics). The objective is to meet or exceed the regulated practice requirements. For item 1, below, the minimum wildlife retention for any 12 month period is 10%. The regulatory requirements under items 2 to 4 remain unchanged.*

- 1) If an agreement holder completes harvesting in one or more cutblocks during any 12 month period beginning on April 1 of any calendar year, the holder must ensure that, at the end of that 12 month period, the total area covered by wildlife tree retention areas that relate to the cutblocks is a minimum of 7% of the total area of the cutblocks.*
- 2) An agreement holder who harvests timber in a cutblock must ensure that, at the completion of harvesting, the total amount of wildlife tree retention areas that relates to the cutblock is a minimum of 3.5% of the cutblock.*
- 3) For the purposes of subsection (1) and (2), a wildlife tree retention area may relate to more than one cutblock if all of the cutblocks that relate to the wildlife tree retention area collectively meet the applicable requirements of this section.*
- 4) An agreement holder must not harvest timber from a wildlife tree retention area unless the trees on the net area to be reforested of the cutblock to which the wildlife tree retention area relates have developed attributes that are consistent with a mature seral condition.<sup>3</sup>*

*In addition, a management goal is to retain areas of wildlife trees that are valued for their ecology and wildlife habitat. Strategies consistent with the management goal may include but are not limited to the following, where practicable:*

- 1) Anchor wildlife tree retention on wildlife habitat features (e.g., nests, dens, and mineral licks) or areas containing blue- or red-listed ecosystems or species; and*
- 2) Maintain wildlife tree retention connectivity with spatially identified wildlife tree retention areas and old forest retention areas planned by other forest tenure holders.*

Refer to Figures 2, 3, and 4 for existing old forest retention planning by other forest tenure holders

*In addition, specific strategies will be identified in the Development Plan for:*

- 3) Conserving large diameter standing Douglas-fir trees;*

Retain Douglas-fir trees  $\geq 50\text{cm DBH}$

- 4) Conserving a representative proportion of any larger Douglas-fir leading stands;*

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<sup>3</sup> Ministry of Forests, Lands and Natural Resource Operations, 2016. Statutes and Regulations Webpages. [http://www.bclaws.ca/Recon/document/ID/freeside/14\\_2004](http://www.bclaws.ca/Recon/document/ID/freeside/14_2004)

Within Units A, B, C, D, E, F, G, I, K and L, retain at least 1ha of any Douglas-fir leading stand.  
Within Units H and J, retain at least 2.25ha of any Douglas-fir leading stand.

5) *Conserving large diameter cottonwood, birch and aspen trees;*

Retain cottonwood, birch, and aspen trees  $\geq 45\text{cm}$

6) *Conserving a representative proportion of larger deciduous leading stands;*

Within all units, retain at least 2.25ha of any deciduous leading stand

7) *Retaining a minimum amount of stubbed live trees in otherwise clearcut areas; and*

Within all units, retain a minimum of 5 stub trees per hectare, of any species. Stubs are to be  $\leq 5.0\text{m}$  tall.

The above was achieved on all cutblocks harvested between April 2017 and March 2018, and is planned for all cutblocks to be harvested during 2018-19.

8) *Retaining non-commercial sized understory tree species, in particular spruce, balsam and Douglas-fir in otherwise clearcut areas.*

Understory retention was prescribed for all cutblocks harvested from April 2017 to March 2018. Variable results were achieved depending on original stand conditions, winter logging conditions and individual machine operators.

For the upcoming year, multiple cutblocks are being selected for enhanced levels of understory and mature leave tree retention. These cutblocks, with enhanced retention, will be studied to determine the effect on harvesting productivity and cost and to assess the potential the benefits to cutblock biodiversity and wildlife habitat.

As mentioned in the previous Development Plan, computer analysis of LiDAR data was undertaken to identify potential areas with high understory density. The computer analysis of the LiDAR data was not reliable in identifying understory trees, and therefore the LiDAR findings have not been applied to site plans or logging plans. During the upcoming year, the CNC LiDAR data will be further examined for its potential to efficiently and reliably identify stands that have greater potential for enhanced retention within the main canopy.

## **Wildlife Tree Retention Results**

### **Wildlife Tree Retention Anchored on Wildlife Habitat Features or Species/Ecosystems at Risk**

The prescribed retention that aligns with ecosystems at risk may be observed via the Figures provided under the section titled, "Species At Risk Results".

## **Wildlife Tree Retention Connectivity with Other Forest Tenure Holders**

Mature and old forest retention has been planned and prescribed to connect to old forest recruitment areas adjacent to the Research Forest. This may be observed by referring to the Figures provided under the section titled, “Interior Old Forest Objectives”.

### **Conserving Large Diameter Douglas-fir**

Retention of Douglas-fir >50 cm is prescribed for every cutblock containing Douglas-fir. Figure 14, below, provides an example of recent Douglas-fir and deciduous tree retention within Cutblock A-6, logged during the fall of 2018.

### **Conserving a Representative Proportion of Any Larger Douglas-fir Leading Stands**

#### **Unit A**

The majority of Douglas-fir leading stands within Unit A, based on the 2017 forest inventory, are planned for retention. This may be observed in Figure 7, shown previously, which displays both the Douglas-fir leading areas and the ecosystems at risk.

#### **Unit B**

The Douglas-fir leading stands within Unit B, based on the 2017 forest inventory, are all included within areas planned for visual retention or biodiversity/wildlife retention as may be observed in Figure 8, shown previously.

#### **Units C, D, F and G**

There were no Douglas-fir leading stands identified within the 2017 forest inventory or during field work.

#### **Unit E**

All of the Douglas-fir leading stands within Unit E, based on the 2017 forest inventory, are planned for retention. This may be observed in Figure 11, shown previously, which displays both the Douglas-fir leading areas and the ecosystems at risk.

### **Conserving Large Diameter Cottonwood, Birch and Aspen Trees and Conserving Deciduous Stands**

#### **Units A, B, C, D and G**

There are no identified mature deciduous leading stand within Units A, B, C, D, and G.

#### **Units E and F**

The majority of the deciduous leading stands within Unit E and F, based on the 2017 forest inventory, are planned for retention. This may be observed in Figures 11 and 12, shown previously, which displays both the deciduous leading areas and the ecosystems at risk.

For all cutblocks containing deciduous trees, stubbing and full retention of deciduous trees is prescribed.

Figure 14, below, provides an example of recent Douglas-fir and deciduous tree retention within Cutblock A-6, logged during the fall of 2018.



**Figure 14: Individual Douglas-fir and Deciduous Tree Retention within Cutblock A-6**



#### **Retaining Stubbed Live Trees**

For all cutblocks, a minimum of 5 stub trees per hectare, of any species, is prescribed. Stubs are prescribed to be < 5.0m tall.

#### **Retaining Non-commercial Sized Understory Trees**

Currently, all prescriptions include a requirement to retain understory patches and individual understory trees.

#### **Wildlife Tree Retention Areas within Every Cutblock**

The wildlife tree retention achieved for all cutblocks harvested during the 2017-18 fiscal year (April 2017 to March 2018) are shown in Table 4, along with the wildlife tree retention for cutblocks with harvesting planned or initiated during the 2018-19 fiscal year (April 2018 to March 2019). It may be observed that the management requirement for a minimum of 3.5% of each cutblock area to be retained as wildlife tree retention areas was well surpassed with prescribed cutblock retention ranging from 6.2% to 54.1% from 2017 to 2019. In addition, the annual requirement for an average of 10% of all cutblock areas to be wildlife tree retention was well surpassed with an average of 29.2% for 2017-18 and an average of 29.4% for 2018-19.

**Table 4: Summary of Annually Prescribed Wildlife Tree Retention Areas (April 1 2017 to March 31, 2019)**

Cutblock	Total Forest Area within Cutblock (Includes NCC, but does not include natural NP area) (ha)	Wildlife Tree Retention Area (ha)	Wildlife Tree Retention % (Proportion of forest area in cutblock)	Comments
A-2	104.5	29.6	28.3%	Harvest Complete
A-8	57.5	21.5	37.4%	Harvest Complete
B-2	152.3	30.8	20.2%	Harvest Complete
E-5	54.2	17.6	32.5%	Harvest Complete
E-7	21.2	5.5	25.9%	Harvest Complete
E-8	39.1	5.8	14.8%	Harvest Complete
G-2	95.4	25.3	26.5%	Harvest Complete
G-5	202.7	81.8	40.4%	Harvest Complete
G-6	222.1	62.9	28.3%	Harvest Complete
G-7	84.0	17.6	21.0%	Harvest Complete
G-8	100.1	35.4	35.4%	Harvest Complete
G-9	99.6	37.4	37.6%	Harvest Complete
G-10	79.2	11.3	14.3%	Harvest Complete
<b>Total for 2017-18</b>	<b>1,311.9</b>	<b>382.5</b>	<b>29.2%</b>	
A-3	69.7	18.5	26.5%	Harvest Complete
A-4	48.4	12.2	25.2%	Harvest Complete
A-5	133.3	22.7	17.0%	Harvest Complete. Final retention area exceeded 22.7 ha
A-6	50.7	8.1	16.0%	Harvest Complete
B-3	101.1	25.4	25.1%	Harvest Planned
B-4	32.5	8.9	27.4%	Harvest Planned
B-5	37.8	16.3	43.1%	Harvest Planned
B-6	14.7	3.8	25.9%	Harvest Planned
E-6	66.4	27.3	41.1%	Harvest Complete
E-9	26.8	14.5	54.1%	Harvest Planned
E-10	38.5	28.6	74.3%	Harvest Planned. The prescribed retention may be reduced prior to harvest
F-5	23.0	6.3	27.4%	Harvest Initiated
F-6	135.2	42.1	31.1%	Harvest Initiated
F-8	32.5	2.0	6.2%	Harvest Initiated
F-11	16.6	6.5	39.2%	Harvest Initiated
<b>Total for 2018-19</b>	<b>827.2</b>	<b>243.2</b>	<b>29.4%</b>	

## Coarse Woody Debris Retention

*The Forest Planning and Practices Regulation requires the following to be met for coarse woody debris retention (shown in italics). The objective is to meet or exceed the regulated practice requirements, so for the requirement below, the minimum logs on a cutblock is an average 16 logs per hectare, each being a minimum of 5 m in length and 7.5 cm in diameter.*

*An agreement holder who carries out timber harvesting must retain at least the following logs on a cutblock: If the area is in the Interior, a minimum of 4 logs per hectare, each being a minimum of 2 m in length and 7.5 cm in diameter at one end.<sup>4</sup>*

*During the term of this plan, a goal is to monitor and study trends in the natural amount and distribution of coarse woody debris within forested areas within and surrounding the Research Forest. In addition, a goal is to determine which combinations of coarse woody debris attributes can be used to optimize the beneficial effects to small mammals within recent clearcut areas and young forests. Retention related practices that significantly increase beneficial effects to small mammals will be incorporated into the Development Plan on an annual basis and into future Management Plans upon scheduled revisions.*

## Coarse Woody Debris Treatment and Study Results

During this Development Plan period, a systematic sampling of the amount, size and distribution of coarse woody debris (CWD) remaining post-harvest is not planned. Because all harvesting is focused in old-aged spruce and balsam stands that are highly damaged from spruce beetle and blowdown, there is relatively high amounts of coarse woody debris existing pre-harvest.

Based on casual observations of the completed 2017-18 harvesting within Units A, B, E, and G, the remaining CWD levels are adequate. The few exceptions may be within the harvested areas that were occupied by large alder patches where the original forest density was low. The provision of future coarse woody debris across all cutblocks is also expected to be adequate due to the post-harvest retention of mature Douglas-fir, mature deciduous trees, tree stubs ( $\leq 5$ m tall) and understory trees.

### CWD Piling for Marten and Meso-carnivore Habitat:

During the spring and summer of 2018, CWD piling was completed post-harvest. The CWD piling consists of small individual piles near tree edges (preferably along riparian edges) as well as long, continuous CWD piles to connect areas of mature forest habitat. A map and pictures of Cutblock G-8 and E-8 are shown in Figures 15, 16 and 17 as an example of the type and location of CWD piling implemented within the 2017-18 cutblocks.

Some form of CWD piling for habitat improvement was implemented for all cutblocks that were harvested during April 2017 to March 2018. The long, continuous CWD piles are intended to

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<sup>4</sup> Ministry of Forests, Lands and Natural Resource Operations, 2016. Statutes and Regulations Webpages. [http://www.bclaws.ca/Recon/document/ID/freeside/14\\_2004](http://www.bclaws.ca/Recon/document/ID/freeside/14_2004)

provide suitable travel and feeding corridors between separated areas of mature tree habitat. The CWD piles are expected to attract large quantities of rodents, a food source for marten and other meso-carnivores, and to provide protective cover for travel across otherwise clearcut areas. To provide for continuous improvement of the CWD piling, some of the piles are being continuously monitored with game cameras. This is currently occurring within Cutblocks B-1, D-3, E-7 and G-8. Cutblocks previously monitored throughout the summer of 2018 include C-2 and G-10. The results of the monitoring and other observations will be shared with the John Prince Research Forest to further aid their continuing study of CWD treatments post-harvest.

**Figure 15. Cutblock G-8: Planned Locations of CWD Piling Treatments**

The black circles represent CWD piling treatments. Where multiple circles are shown as a continuous line that represents the location of a CWD corridor. The individual or paired black circles indicated individual CWD piles.

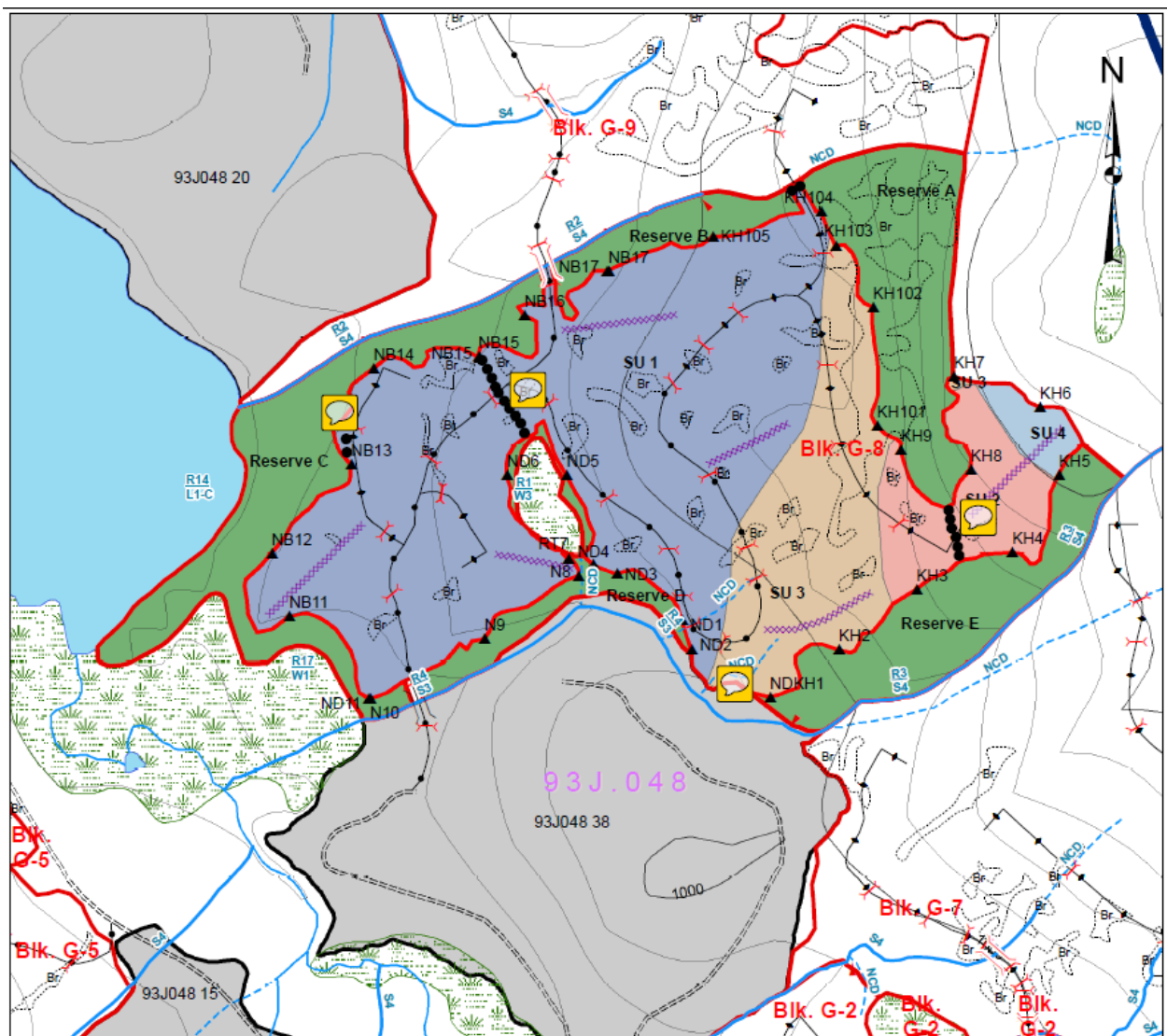




Figure 16. Cutblock G-8: Pictures of CWD Corridor Connecting Mature Forest Types



Figure 17. Cutblock E-8: Picture of Individual CWD Pile near Forest Edge



## Riparian Management

*The Forest Planning and Practices Regulation (FPPR) requires the following to be met regarding the establishment of riparian management areas and forest retention within riparian management areas (shown in italics):*

### ***Designated Riparian Management Areas***<sup>5</sup>

*The following types of streams, wetlands, and lakes are required to have the following riparian reserve zones and management zones established:*

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<sup>5</sup> Ministry of Forests, Lands and Natural Resource Operations, 2016. Statutes and Regulations Webpages. [http://www.bclaws.ca/Recon/document/ID/freeside/14\\_2004](http://www.bclaws.ca/Recon/document/ID/freeside/14_2004)

<i>Riparian Class</i>	<i>Qualities that Define Stream Class</i>	<i>Riparian Management Area (meters)</i>	<i>Riparian Reserve Zone (meters)</i>	<i>Riparian Management Zone (meters)*</i>
<i>S1-A</i>	<i>Fish Bearing &amp; &gt;20m Wide with Large Flood Plain</i>	<i>100</i>	<i>0</i>	<i>100</i>
<i>S1-B</i>	<i>Fish Bearing &amp; &gt;20m Wide</i>	<i>70</i>	<i>50</i>	<i>20</i>
<i>S2</i>	<i>Fish Bearing &amp; 5m to 20m Wide</i>	<i>50</i>	<i>30</i>	<i>20</i>
<i>S3</i>	<i>Fish Bearing &amp; 1.5m to 5m Wide</i>	<i>40</i>	<i>20</i>	<i>20</i>
<i>S4</i>	<i>Fish Bearing &amp; &lt;1.5m Wide</i>	<i>30</i>	<i>0</i>	<i>30</i>
<i>S5</i>	<i>Non-Fish Bearing &amp; &gt;3m Wide</i>	<i>30</i>	<i>0</i>	<i>30</i>
<i>S6</i>	<i>Non-Fish Bearing &amp; &lt;3m Wide</i>	<i>20</i>	<i>0</i>	<i>20</i>

*\*Minimum width unless active floodplain extends beyond management zone, then the width of the riparian management zone extends to the outer edge of the active flood plain.*

<i>Riparian Class</i>	<i>Qualities that Define Wetland Class</i>	<i>Riparian Management Area (meters)</i>	<i>Riparian Reserve Zone (meters)</i>	<i>Riparian Management Zone (meters)</i>
<i>W1 or W5*</i>	<i>&gt;5ha</i>	<i>50</i>	<i>10</i>	<i>40</i>
<i>W3</i>	<i>1 to 5ha</i>	<i>30</i>	<i>0</i>	<i>30</i>

*\* Two or more W1 wetlands within 100m of each other OR One W1 within 80m of one or more W3 wetlands OR Two or more W3 wetlands within 60m of each other, if total area >5ha*

<i>Riparian Class</i>	<i>Qualities that Define Wetland Class</i>	<i>Riparian Management Area (meters)</i>	<i>Riparian Reserve Zone (meters)</i>	<i>Riparian Management Zone (meters)</i>
<i>L1-B</i>	<i>&gt;5ha to 1000ha OR If designated L1B by Minister</i>	<i>10</i>	<i>10</i>	<i>0</i>
<i>L3</i>	<i>1ha to 5ha</i>	<i>30</i>	<i>0</i>	<i>30</i>

### **Restrictions within Riparian Management Zones**

*Must ensure that the percentage of the total basal area within the riparian management zone specified in Column 2 is left as standing trees, and*

- *The standing trees are reasonably representative of the physical structure of the riparian management zone, as it was before harvesting and*
- *Retain enough trees adjacent to the stream to maintain the stream bank or channel stability if the stream is S4, S5, or S6, and has trees that contribute significantly to the maintenance of stream bank or channel stability, and is a direct tributary to an S1, S2 or S3 stream.*

<i>Column 1 Riparian Class</i>	<i>Column 2 Basal Area to be Retained Within Riparian Management Zone (%)</i>
<i>S1-A or S1-B stream</i>	<i>≥20</i>
<i>S2 stream</i>	<i>≥20</i>
<i>S3 stream</i>	<i>≥20</i>
<i>S4 stream</i>	<i>≥15 (see item #1 below)</i>
<i>S5 stream</i>	<i>≥20 (see item #2 below)</i>
<i>S6 stream</i>	<i>Not applicable or ≥ 15 (where drains into S1, S2, S3 or S4 stream)</i>
<i>All classes of wetlands or lakes</i>	<i>≥10 or ≥40 (where wildlife feature)</i>

*The objective is to meet or exceed the regulated practice requirements described previously, in order to conserve valuable riparian wildlife habitat, maintain stream channel stability, long-term large woody debris, shading of the stream channel and to minimize new fine organic debris and new sediment input into the stream channels. As such, the target for:*

- 1) S4 streams is to retain ≥15% of the original basal area within the RMZ;*
- 2) S5 streams is to retain a 20m RRZ, and retain a 20m RMZ with ≥20% of the original basal area;*
- 3) S6 streams is to retain ≥15% of the original basal area within the RMZ of S6 streams that drain directly into a S1, S2, S3, or S4 stream;*
- 4) W1, W3, and W5 wetlands is to retain ≥40% of the original basal area within the RMZ where there is an obvious wildlife feature identified at the time of assessment (e.g., a well-used animal trail, an animal den, raptor nest, mineral lick, heavy ungulate rutting evidence, or heavy ungulate browse) within the RMA; and*
- 5) L1B and L3 lakes is to retain ≥40% of the original basal area within the RMZ (30m for L3 and 40m for L1B lakes) where, identified at the time of assessment, there is an obvious wildlife feature within the RRZ or RMZ, or where at the time of assessment, regulated game fish are observed or known to be present within a lake.*

*In the absence of an obvious wildlife feature, the retention for wetlands and lakes will be a riparian reserve zone as identified under “Designated Riparian Management Areas” and the basal area retention as stated under “Restrictions within Riparian Management Zones”.*

*In addition to the previous, the following practices are intended to conserve riparian habitat, water quality, and minimize disturbance to the stream channel.*

- 6) There is to be no machine wheels or tracks operated within 5m of any stream.*
- 7) Where practicable considering original forest structure, all resource features and windthrow hazard:
  - a) Retention within a RMZ is to be concentrated within 10m of the stream channel or riparian reserve edge, and*
  - b) Within all RMZs, achieve or exceed the wildlife tree and coarse woody debris retention strategies listed under the “Wildlife Tree Retention” and “Coarse Woody Debris Retention” sections of this Development Plan.**

There are a number of other legal practice requirements, specified under the FPPR related to the management of riparian features and areas. These are listed below:

None of the following may be carried out in a riparian reserve zone:

- 1) Grazing or broadcast herbicide applications for the purpose of brushing;
- 2) Mechanized site preparation or broadcast burning for the purpose of site preparation;
- 3) Spacing or thinning;
- 4) Cut, modify or remove trees, except for the following purposes:
  - a) Felling or modifying a tree that is a safety hazard, if there is no other practicable option for addressing the safety hazard;
  - b) Topping or pruning a tree that is not wind firm;
  - c) Constructing a stream crossing;
  - d) Creating a corridor for full suspension yarding;
  - e) Creating guyline tiebacks;
  - f) Carrying out a sanitation treatment. This does not include clearcut harvesting for bark beetles;
  - g) Felling or modifying a tree that has been windthrown or has been damaged by fire, insects, disease or other causes, if the felling or modifying will not have a material adverse impact on the riparian reserve zone. This does not include clearcut harvesting for bark beetles;
  - h) Felling or modifying a tree for the purpose of establishing or maintaining an interpretive forest site, recreation site, and recreation facility or recreation trail.



## Riparian Management Results

A summary of all the resulting riparian treatments for all cutblocks harvested during 2017-18 is shown in Table 5.

**Table 5: Summary of Riparian Treatments (April 1 2016 to March 31, 2017)**

Cutblock	Riparian Features	Riparian Reserve Zone - No harvest Area	Retention in Riparian Management Zone	Comments
A-2	R1 – S4 Stream	5m	Approx. 50% of stems from 5m to 12m. (Including road crossing clearings, about 20% of RMZ retained along 300m <sup>3</sup> of stream)	2 Road Crossings.  About 25% of total stream length altered by harvesting*
<p>*An unintended harvesting error resulted in harvesting very near the R1 stream channel within cutblock A-2. The intent was to achieve approximately 25% retention within the 30m RMZ, but even the management plan minimum of 15% retention within the RMZ was not achieved. This is a typical harvesting error that may result every few years despite diligent efforts otherwise. A full riparian assessment was completed to assess the functioning of the riparian area and water channel. The assessment found that the R1 stream is functioning but at risk due to the combined loss of riparian vegetation, fine sediment loading and a lack of invertebrate diversity. The road crossings prescribed for R1 were rehabilitated following harvesting in summer 2018 and further improved later in the summer of 2018 to ensure previous road building effects are minimized. At this time, there are no other reasonable mitigating measures that may be undertaken to lessen the impacts to the R1 stream and associated riparian area.</p>				
	R2 – S4 Stream	20m+	1 side of RMZ affected: >80% retained	Stream outside of harvest area
	R3 – S4 Stream	20m+	>90% of RMZ retained	Between A-2 and A-8 1 Road Crossing
	R6 – S4 Stream	30m+	100% of RMZ retained	Stream outside of harvest area
	R7 – S4 Stream	20m+	1 side of RMZ affected: >80% retained	Stream outside of harvest area
	R8 – S4 Stream	20m+	1 side of RMZ affected:	Stream outside of harvest area

			>80% of RMZ retained	
A-3	R1, R2, R3, and R6 – S4 Streams	20m+	>65% of RMZ retained	Streams outside of harvest area
A-3	R8 – S4 Stream	5m	>25% of RMZ retained	Streams starts within harvest area
A-4	R6 – S4 Stream	30m+	100% of RMZ retained	Stream adjacent, but RMZ outside of harvest area
A-5	R2 & R3 – S4 Stream	30m+	100% of RMZ retained	Stream RMZ outside of harvest area
A-5	R1 – S4 Stream	10m+	>40% of RMZ retained	Stream outside of harvest area
A-5	R9 – S4 Stream	5m	>25% of RMZ retained	Stream starts within harvest area
A-6	R1 – S4 Stream	5m+	>25% of RMZ retained	Stream outside of harvest area
A-8	R3 – S4 Stream	Same as above	Same as above	Same as above
	R4 - S4 Stream	35m+	100% of RMZ retained	Stream outside of harvest area
	R5 – S4 Stream	5m	Approx. 50% of stems from 5m to 12m. (Including road crossing clearings, 13% of RMZ retained along 100m of stream)	1 Road crossing.  About 25% of total stream length altered by harvesting
B-2	R1 – S4 Stream	20m+	1 side of RMZ affected: >80% retained	Stream outside of harvest area
	R2 – S4 Stream	5m+	1 side of RMZ affected: >25% of RMZ retained	Stream outside of harvest area. Less than 100m of stream adjacent to harvesting
	R3 – S4 Stream	5m+	1 side of RMZ affected: 25% retained	Stream outside of harvest area.
	R4 – S4 Stream	5m+	1 side of RMZ affected: >25% retained	Stream outside of harvest area

	R5 – S4 Stream	10m+	1 side of RMZ affected: >50% retained	Stream outside of harvest area
	R6 – S4 Stream	5m+	1 side of RMZ affected: >25% retained	Stream outside of harvest area
E-5	No classifiable streams			
E-6	R1 – S4 Stream	5m+	1 side of RMZ affected. >25% retained	Stream outside of harvest area
E-7	R3 – S4 Stream	20m+	1 side of RMZ affected: >90% retained	Vast majority of stream RMZ outside of harvest area
	R4 – S4 Stream	20m+	1 side of RMZ affected: >80% retained	Stream outside of harvest area
E-8	R1 – S4 Stream	5m+	>25% of RMZ retained	Approx. 500m of stream in harvest area. 2 stream crossings; rehabilitated 2018
	R2 - S4 Stream	5m+	>25% of RMZ retained	Approx. 900m of stream in harvest area. 2 stream crossings; Rehabilitated 2018
G-2	R1 – S3 Stream	40m+	>100% of RMZ retained	Stream outside of harvest area
	R2- W3 Wetland	20m+	>90% of RMZ retained	Wetland Outside of harvest area
	R3 – W1 Wetland	50m+	100% of RMZ retained	Wetland outside of harvest area
	R16 – W3 Wetland	5m+	>25% of RMZ retained	Wetland between cutblock G-2 and G-7
	R4 – L1 Lake	50m+	100% of RMZ retained	Lake outside of harvest area
	R5 – S3 Stream	25m+	1 side of RMZ affected: >50% retained	Stream outside of harvest area
	R6 – S3 Stream	25m+	>50% of RMZ retained	Flows through center of cutblock
	R7 – S4 Stream	5m+	1 side of RMZ affected: >30% of RMZ retained	Stream outside of harvest area

	R8 – S4 Stream	30m+	100% of RMZ retained	Stream outside of harvest area
	R9- S4 Stream	5m+	>25% of RMZ retained	Stream flows through southeastern end of G-2
	R10 – S4 Stream	5m+	>50% of RMZ retained	Within reserve for upper R6-S3 stream
	R11/12 – S4 Stream	5m+	>25% of RMZ retained	Within reserve for upper R6-S3 stream
	R13 – S4 Stream	5m+	>25% of RMZ retained	Stream flows between G-2 and G-7
G-5	R1 – S4	30m+	100% of RMZ retained	Stream flows through large reserve between G-5 and G-6. Outside harvest area
	R2 – S4	5m+	>25% of RMZ retained	2 Stream crossings
	R3 – S4	5m+	>25% of RMZ retained	1 Stream crossing
	R4 – S4	5m+	>25% of RMZ retained	Stream outside of harvest area (southern boundary)
	R8 – W3 Wetland	30m+	100% of RMZ retained	Wetland outside of harvest area (northeastern corner)
G-6	R5 – S4 Stream	30m+	100% of RMZ retained	Outside of harvest area
	R14 – S4 Stream	5m+	>25% of RMZ retained	Approx. 300m of stream inside cutblock
	R6 – W3 Wetland	85m+	100% of RMZ retained	Wetland is well outside of harvest area
	R4 – L1 Lake	85m+	100% of RMZ retained	Lake is well outside of harvest area
G-7	R4 – S3 Stream	25m+	>90% of RMZ	Stream outside of cutblock and essentially not affected
	R7 – S4 Stream	5m+	>25% of RMZ retained	Stream flows through

				southwestern part of G-7. 1 Stream crossing; rehabilitated 2018.
	R10 – S4 Stream	5m+	>25% of RMZ retained	Stream flows from G-7, then between G-7 and G-2. 1 stream crossing; rehabilitated 2018.
	R11/R12/R13	5m+	>25% of RMZ retained	Streams flow from G-7 then into G-2. R11: 2 stream; rehabilitated 2018. crossings R13: 1 stream crossing; rehabilitated 2018.
	R16 – W3 Wetland	Same as above	Same as above	Same as above
	R3 – S4 Stream	5m+	>90% of RMZ retained	Stream flows between Cutblocks G-7 and G-8
G-8	R3 – S4 Stream	30m+	100% of RMZ retained against G-8	Same stream as immediately above
	R4 – S3 Stream	25m+	>50% of RMZ retained	Stream flows between old Canfor cutblock G-8. 1 stream crossing.
	R1 – W3 Wetland	5m+	>25% of RMZ retained	
	R14 – L1-C Lake	80m+	100% of RMZ retained	
	R17 – W1 Wetland	20m+	>70% of RMZ retained	
	R2 – S4 Stream	30m+	100% of RMZ retained	Stream flows between G-8 and G-9. 1 stream crossing; rehabilitated 2018.
<p>A S4 stream reach was discovered within the harvest area of cutblock G-8, during September 2008, which was approximately 6 months post-harvest. The riparian area of the stream was fully harvested and a log bundle, which was used to skid across the small stream gully, was still in place. Harvesting debris was also deposited into the stream channel. This stream requires remedial works including an excavator to remove the remaining log bundle and manual removal of the debris deposited within the channel. The harvesting result for this stream, which is approximately 150m in length did not meet the management plan objectives</p>				

as there was no resulting retention in the RMZ. This is primarily a result of not identifying and mapping the stream pre-harvest and not being able to detect the stream during harvest due to deep snow conditions.				
G-9	R2 – S4 Stream	10m+	>80% of RMZ retained against G-9	Same stream as immediately above
	R5 - S4 Stream	5m+	>25% of RMZ retained	300m of stream in G-8. 1 stream crossing; rehabilitated 2018.
	R4 – L1-C Lake	80m+	100% of RMZ retained	Lake outside of harvest area
	R1 – S3 Stream	75m+	100% of RMZ retained	Stream outside of harvest area
G-10	R6 – S4 Stream	10m+	>40% of RMZ retained	Stream outside of harvest area
	R3 – S2 Stream	40m+	>50% of RMZ retained	Stream outside of harvest area
	R5 – W1 Wetland	30m+	>60% of RMZ retained	Wetland outside of harvest area

## Water Quality Management

*The Forest Planning and Practices Regulation (FPPR) requirements and the additional Management Plan targets specified under the “Riparian Management” section are designed, in part, to conserve water quality in streams, wetlands, and lakes. It is also recognized that minimizing the sediment delivery to streams from roads and stream crossings is critical to the overall management of water quality. Therefore, it is necessary to implement additional strategies that are known to prevent or reduce road sediment delivery to streams. This includes strategies for road location, design, maintenance and deactivation. These strategies are stated in the Development Plan and are consistent with the practices identified in the 2013 report by Carson and Maloney<sup>6</sup>, which considered 4,033 sites assessed under the Provincial Water Quality Effectiveness Evaluation.*

The following strategies are consistent with practices identified in the 2013 Carson and Maloney report. These strategies are applicable to the design, construction, maintenance, and deactivation of roads for forest development, research, and education.

When locating and designing roads:

- 1) Minimize road length that parallels streams and minimize road length within riparian management areas;
- 2) Minimize roads across steep slopes;

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<sup>6</sup> B. Carson and D. Maloney. 2013. Provincial Water Quality Effectiveness Evaluation Results (2008-2012). Ministry of Forests, Lands and Natural Resource Operations, Resource Practices Br., Victoria BC FREP Report 35. <http://www.for.gov.bc.ca/hfp/frep/publications/index.htm>

- 3) Minimize roads within unstable areas;
- 4) Minimize sensitive stream crossings;
- 5) Minimize stream crossings with steep approaches; and
- 6) Maximize control of ditch water and run-off from road surface through proper identification of cross-drain culvert placement.

When constructing roads or harvesting cutblocks:

- 7) Minimize the amount of disturbed soil within road right-of-ways;
- 8) Minimize the time that any roadside areas with disturbed soil remain non-vegetated or non-armoured, particularly where silty or fine-textured soils exist;
- 9) For all season roads, minimize amount of road surface composed of fine-textured material;
- 10) Maximize amount of subgrade and road surface that is crowned to promote immediate removal of surface water;
- 11) Minimize distance of interrupted ditch flow towards streams; and
- 12) Minimize amount of sediment that may be delivered directly to streams from non-vegetated soil cuts, ditches and road surfaces through careful implementation of the following near streams: ditch depth, stream crossing armour, ditch armour, ditch blocks, cross-drain culverts, and ditch run-outs.

When maintaining roads:

- 13) Minimize the creation of berms that may hold run-off water on road surface for long-distances;
- 14) Maintain or enhance road crowning;
- 15) Minimize prolonged existence of wheel ruts in road surface;
- 16) Minimize use of fine-textured material for re-surfacing; and
- 17) Regularly monitor and maintain road sections that are partially deactivated (Ex: where there was removal of stream crossings or installation of water bars and cross ditches).

When deactivating roads:

- 18) Maximize the control of ditch water and run-off from road surface through careful placement of stream crossing armour, ditch armour, ditch blocks, water bars, cross-drains and ditch run-outs;
- 19) Minimize the time that any roadside areas with disturbed soil remain non-vegetated or non-armoured, particularly where silty or fine-textured soils exist;
- 20) Where improved soil stability and reduction of sediment delivery may be achieved, re-contour stream crossings to natural angle of approach or less; and
- 21) Where re-planting roads, maximize water absorbing capability of the former road surface and subgrade by de-compacting soil and placing woody debris on the ground surface.

## **Watershed Management**

A preliminary watershed assessment of 3<sup>rd</sup> order and greater watersheds occupied by the Research Forest was completed by the Ministry of Forests, Lands and Natural Resource Operations during 2015 and 2016.

The results of this preliminary study of watersheds are summarized in Table 6. Where future operations within a Research Forest unit may have the potential to negatively impact conditions within one or more watersheds, this is also identified in Table 6. For these streams and watersheds, the strategy is to have a qualified professional undertake a watershed assessment to further understand the predicted watershed hazards and risks. Future forest planning, forest practices and research projects will consider the professional recommendations for reducing downstream impacts to the watersheds identified in this plan. As watershed conditions and planned harvest levels change, the Development Plan will be annually updated to identify the current watersheds to which this strategy applies. It is acknowledged that the ability to reduce downstream impacts outside of the Research Forest may be limited by how effectively operations may be coordinated with other forest and land tenure holders.

For additional information, a more complete description of each watershed and the preliminary assessment is provided in Appendix B.

**Table 6. Summary of Watershed Conditions within Research Forest**

<b>Research Forest Unit</b>	<b>Watershed Description</b>	<b>Interim Hazard Rating</b>	<b>Potential Watershed Concerns</b>	<b>Watershed Assessment Recommended</b>
A	Basin that drains directly into Kerry Lake	Stream Flow – VL Sediment – VL Riparian - VL	None	N
	Basin that drains directly into Crooked River	Stream Flow – L Sediment – M Riparian - M	None	N
	5 <sup>th</sup> order basin that drains into Weedon Creek	Stream Flow – H Sediment – H Riparian - M	None	N
B	Basin that drains directly into Tacheeda Lakes	Stream Flow – VL Sediment – VL Riparian - M	None	N
	Basin that drains into Horseshoe Lake	Stream Flow – L Sediment – VL Riparian - M	None	N
C	4 <sup>th</sup> order basin that drains into lower section of Caine Creek	Stream Flow – H Sediment – H Riparian – M	High interim hazard ratings, along with severe spruce beetle and significant planned harvesting	Y
	Basin that drains directly into Caine Creek via small streams	Stream Flow – M Sediment – L Riparian - M	See Unit D comments for this watershed	Y
	Basin that drains directly into Merton Creek headwaters	Stream Flow – M Sediment – M Riparian - M	None	N



<b>Research Forest Unit</b>	<b>Watershed Description</b>	<b>Interim Hazard Rating</b>	<b>Potential Watershed Concerns</b>	<b>Watershed Assessment Recommended</b>
	<i>Basin that drains directly into Merton Lake and Merton Creek via small streams</i>	<i>Stream Flow – M Sediment – M Riparian – M</i>	<i>None</i>	<i>N</i>
	<i>Negligible portion 3<sup>rd</sup> order basin that drains into Merton Creek</i>	<i>n/a</i>	<i>None</i>	<i>N</i>
<i>D</i>	<i>Basin that forms part of headwaters for Caine Creek</i>	<i>Stream Flow – H Sediment – M Riparian – M</i>	<i>High interim stream flow hazard, along with severe spruce beetle and significant planned harvesting</i>	<i>Y</i>
	<i>Negligible portion 4<sup>th</sup> order basin that drains into lower section of Caine Creek</i>	<i>n/a</i>	<i>See Unit C comments for this watershed</i>	<i>Y</i>
	<i>Basin that drains directly into Caine Creek via small order streams. Same basin as described for Unit C.</i>	<i>Stream Flow – M Sediment – L Riparian – M</i>	<i>There is a small order stream basin (see Appendix C) that may be largely modified by planned harvesting in Units D and C</i>	<i>N</i>
<i>E</i>	<i>Basin that drains directly into the northern branch of Chuchinka Creek</i>	<i>Stream Flow – VL Sediment – VL Riparian – VL</i>	<i>None</i>	<i>N</i>
	<i>Basin that drains directly into the southern branch of Chuchinka Creek. Together Unit E and F, may have a large potential influence on this watershed.</i>	<i>Stream Flow – VL Sediment – VL Riparian – VM</i>	<i>None</i>	<i>N</i>
<i>F</i>	<i>Same basin as described immediately above that drains directly into the southern branch of Chuchinka Creek</i>	<i>Stream Flow – L Sediment – L Riparian – M</i>	<i>None</i>	<i>N</i>
	<i>Basin that drains directly into the mid and lower section of Angusmac Creek</i>	<i>Stream Flow – L Sediment – L Riparian – M</i>	<i>None</i>	<i>N</i>

<b>Research Forest Unit</b>	<b>Watershed Description</b>	<b>Interim Hazard Rating</b>	<b>Potential Watershed Concerns</b>	<b>Watershed Assessment Recommended</b>
<i>G</i>	<i>Basin that drains directly into the mid-section of Angusmac Creek</i>	<i>Stream Flow – L Sediment – VL Riparian – L</i>	<i>None</i>	<i>N</i>
	<i>Negligible portion of basin that drains into mid and lower section of Angusmac Creek. Same basin as described for Unit F.</i>	<i>n/a</i>	<i>None</i>	<i>N</i>
	<i>4<sup>th</sup> order basin that flows northward into the Crooked River</i>	<i>Stream Flow – L Sediment – L Riparian – M</i>	<i>None</i>	<i>N</i>
	<i>Negligible portion of 4<sup>th</sup> order basin located, mostly south of Unit G, that ultimately drains towards the Crooked River</i>	<i>n/a</i>	<i>None</i>	<i>N</i>
<i>H</i>	<i>Basin that drains directly into the Bowron river via small order streams</i>	<i>Stream Flow – VL Sediment – VL Riparian – M</i>	<i>None</i>	<i>N</i>
	<i>3<sup>rd</sup> order basin, mostly to east of Unit H, that drains into the Bowron River</i>	<i>Stream Flow – VL Sediment – VL Riparian – M</i>	<i>None</i>	<i>N</i>
<i>I</i>	<i>Basin that drains directly into the south side of the Fraser River via small order streams</i>	<i>Stream Flow – L Sediment – H Riparian – L</i>	<i>None</i>	<i>N</i>
	<i>Basin that drains directly into Hungary Creek via small order streams</i>	<i>Stream Flow – L Sediment – M Riparian – L</i>	<i>There is a small order stream basin (see Appendix C) that may be largely modified by planned harvesting in Unit I</i>	<i>N</i>
<i>J</i>	<i>4<sup>th</sup> order basin that occupies north western majority of Unit J and drains into Fraser River</i>	<i>Stream Flow – L Sediment – M Riparian – M</i>	<i>None</i>	<i>N</i>
	<i>Basin that drains directly into the west side of the Fraser River via small order streams</i>	<i>Stream Flow – L Sediment – VH Riparian – L</i>	<i>There is a small order stream basin (see Appendix C) may be largely modified by planned harvesting in Unit J</i>	<i>N</i>

<b>Research Forest Unit</b>	<b>Watershed Description</b>	<b>Interim Hazard Rating</b>	<b>Potential Watershed Concerns</b>	<b>Watershed Assessment Recommended</b>
<i>K</i>	<i>Basin that drains directly into the east side of the Willow River from small order streams</i>	<i>Stream Flow – H Sediment – M Riparian – M</i>	<i>None</i>	<i>N</i>
	<i>Basin that drains into Pitoney Creek</i>	<i>Stream Flow – L Sediment – VL Riparian – M</i>	<i>None</i>	<i>N</i>
<i>L</i>	<i>Basin that drains directly into the east side of the Willow River from small order streams. Same basin as described for Unit K.</i>	<i>Stream Flow – H Sediment – M Riparian – M</i>	<i>None</i>	<i>N</i>

\*The percentage of area that Unit E and F occupy within the watershed draining into the southern branch of Chuchinka Creek is notable. Where areas adjacent to Units E and F may experience significant loss of mature forest cover, then the influence of future forest development in Units E and F may significantly add to the watershed impact and require assessment.

#### **Unit A:**

About 3% of the 5<sup>th</sup> order watershed draining into the Weedon system is occupied by mature forest within Unit A. The preliminary assessment shows a high stream flow hazard, but it is not expected that Research Forest operations would significantly affect the overall hazard rating due to the limited mature forest area within the watershed that will be harvested. Operations within Unit A will apply measures to reduce negative watershed effects including road rehabilitation for more than 50% of the roads, and increased riparian area retention as part of the biodiversity corridor planning.

#### **Unit B:**

About 14% of the lands that drain directly into Tacheeda Lakes are contained within the Research Forest. Currently, both stream flow and sediment hazard is very low. Considering that the level of harvest in Unit B will be reduced for visual management and biodiversity maintenance, and that road rehabilitation will also be prescribed for the majority of new roads, it is expected that Research Forest harvesting will have a limited measurable effect on the Tacheeda Lakes watershed.

#### **Unit C and D:**

Prior to 2016/17 winter harvesting, it was recognized that Unit C and Unit D occupy a significant area within two Caine Creek watersheds that have a high peak flow hazard\* based on a preliminary, level 1 assessment. A further higher-level assessment prior to harvest was anticipated, but was dependent on securing the appropriate professional expertise to undertake the assessment. For further information regarding the completed operations within the Caine Creek watersheds, along with currently completed assessments and findings, refer to the section titled, "Watershed Assessment and Management Results."

#### **Unit E and F:**

Combined, Units E and F occupy approximately 23% of the area within the watershed that drains directly into the mid-lower section of the southern branch of Chuchinka Creek. Because of the large old growth recruitment planning Prince George forest licensees (for the McGregor Plateau merged biogeoclimatic unit), and the lack of fully mature timber types in the western part of the watershed, limited harvesting is expected in this watershed, excluding those planned for the Research Forest. Even with full salvage harvest of the remaining mature spruce and balsam stands within the Research Forest, the hazard for this watershed is not expected to reach a high rating. Currently, the preliminary provincial assessment indicates both a low stream flow and low sediment hazard. Any watershed effects will be partially mitigated by the planned road rehabilitation and the enhanced riparian retention.

#### **Unit G:**

About 21% of land that contributes to the watershed draining directly into the mid-upper section of Angusmac Creek is located within Unit G. With the recent large amount of spruce salvage harvesting completed in Unit G, a notable change in watershed conditions may have occurred. In addition, Canfor is also harvesting spruce beetle affected stands adjacent to Unit G, and has additional harvesting planned. Based on the preliminary watershed assessment provided by the province, the Angusmac watershed is currently assessed with a low stream flow hazard and very low sediment and riparian area hazards.

During 2017-18, CNC contacted BCTS and Canfor by email to communicate about the total salvage harvest plans within the Angusmac watershed. Canfor identified that they are tracking watershed modifications and the resulting hazards. In July 2017, I provided Canfor with estimates of our future harvesting to salvage across CNC Unit G. At one point in time, Canfor communicated that the Angusmac watershed has the capacity for approximately 1,700ha of harvest while CNC was proposing up to 750ha of harvesting (final harvesting amount was approximately 636 ha). With the last communication, Canfor replied stating that the Angusmac watershed should not be of concern due the current equivalent clearcut area. Canfor also communicated in November 2017 to confirm that they have correct mapping for the harvested areas within CNC Research Forest Unit G.

#### **Unit K:**

For the drainage basin that flows directly into the Willow River from small order streams, the stream flow hazard is rated as high while the sediment hazard is medium. Unit K only occupies approximately 2% of that watershed area, and currently a maximum of about 45 ha of harvesting proposed within this watershed. This amount of harvesting is not expected to measurably affect the future watershed hazard ratings for this basin.

The other drainage basin affected by Unit K is the Pitoney Creek watershed. A maximum of about 105 ha of CNC harvesting is proposed within this watershed area. With little watershed change expected from the proposed harvesting and the current low stream flow and low sediment, the future watershed conditions are not of concern.

## Watershed Assessment and Management Results

Where the services of a qualified person may not be available to assess a potentially affected watershed to the appropriate level, as an alternative, collaboration with the Ministry of FLNRO or other forest licensees in monitoring or studying the future watershed conditions will be pursued.

No watershed assessments were undertaken since the last Development Plan, and none are currently planned.

## Roads

*The Forest Planning and Practices Regulation requires the following to be met for permanent roads (shown in italics). The objective is to meet or exceed the regulated practice requirements in order to conserve the long-term productivity of the Research Forest landbase. This will be achieved through rehabilitating sections of road that are not required for long-term access.*

- (1) An agreement holder must ensure that the area in a cutblock that is occupied by permanent access structures built by the holder or used by the holder does not exceed 7% of the cutblock, unless
  - (a) There is no other practicable option on that cutblock, having regard to
    - (i) The size, topography and engineering constraints of the cutblock,*
    - (ii) In the case of a road, the safety of road users, or*
    - (iii) The requirement in selection harvesting systems for excavated or bladed trails or other logging trails, or**
  - (b) Additional permanent access structures are necessary to provide access beyond the cutblock.**
- (2) If an agreement holder exceeds the limit for permanent access structures described in subsection (1) for either of the reasons set out in that subsection, the holder must ensure that the limit is exceeded as little as practicable.*
- (3) An agreement holder may rehabilitate an area occupied by permanent access structures by
  - (a) Removing or redistributing woody materials that are exposed on the surface of the area and are concentrating subsurface moisture, as necessary to limit the concentration of subsurface moisture on the area,*
  - (b) De-compacting compacted soils, and*
  - (c) Returning displaced surface soils, retrievable side-cast and berm materials.**
- (4) If an agreement holder rehabilitates an area under subsection (3) (a) and erosion of exposed soil from the area would cause sediment to enter a stream, wetland or lake, or a material adverse effect in relation to one or more of the subjects listed in section 149 (1) of the Act, the agreement holder, unless placing debris or revegetation would not materially reduce the likelihood of erosion, must
  - (a) Place woody debris on the exposed soils, or**

*(b) Revegetate the exposed mineral soils.<sup>7</sup>*

## **Managing the Amount of Permanent Roads**

It is expected that road rehabilitation will be a regular undertaking within most cutblocks to reduce long-term road disturbance levels, consistent with the timber supply review (TSR) assumption of an 1.37% average reduction in productive area for future roads within new harvesting areas.

At the same time, reliable long-term access to cutblock boundaries and between cutblocks is desired for the ease of managing the continuing silviculture obligations, research access, and the ability to quickly respond to various forest health factors.

Each cutblock site plan is to recognize and estimate the amount of permanent road and be revised for actual outcomes in rehabilitation and permanent roads. When identifying both the permanent and temporary roads with each site plan, it is important that communication occur with all concerned parties so that planned road access will properly support all expected use while conserving the soil and other forest resources. As more planning is undertaken within each Research Forest Unit, it is expected that the predicted amount and location of permanent roads versus temporary roads within each site plan will become more accurate.

## **Permanent Road Disturbance Results**

In order to ensure ongoing timber supply analysis properly accounts for the reduction in productive forest landbase from permanent road construction, accurate recording of final road rehabilitation and remaining permanent roads is necessary for each cutblock. With the completion of the 2017 timber supply review, the total amount of road disturbance included the existing permanent roads resulting from harvesting up to April 2017. This included the following cutblocks: A-1, B-1, C-1, C-2, C-3, D-1, D-2, D-3, D-4, E-1, E-2, E-3, E-4, F-1, F-2, F-3, F-4, G-1, G-3, and G-4.

Road construction beyond April 2017 is targeted between 1.0 to 1.4%. This includes roads associated with the following harvested cutblocks: A-2, A-3, A-4, A-5, A-8, B-2, E-5, E-6, E-7, E-8, G-2, G-5, G-6, G-7, G-8, G-9, and G-10. Table 7 summarizes the prescribed amount of permanent roads within these cutblocks, and where known, the actual amount of permanent roads (as in a few cases, the area occupied by permanent roads is less than prescribed). Table 7 also includes the prescribed amount of permanent roads for the upcoming cutblocks with completed site plans, which includes: B-3, B-4, B-5, B-6, F-5, F-6, F-8, and F-11. Although the actual outcome for currently harvested cutblocks slightly exceeds the road disturbance target, with the combined effect of the upcoming planned cutblocks, the target is achieved at 1.25%. There is also an opportunity to further surpass the target by increasing the road rehabilitation in Cutblocks A-2, A-3, A-5, A-8, B-2, E-5, E-6, G-5, and G-6. A review of the future road

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<sup>7</sup> Ministry of Forests, Lands and Natural Resource Operations, 2016. Statutes and Regulations Webpages. [http://www.bclaws.ca/Recon/document/ID/freeside/14\\_2004](http://www.bclaws.ca/Recon/document/ID/freeside/14_2004)

rehabilitation for these cutblocks is planned for the winter of 2019, with potential implementation during summer/fall 2019.

**Table 7: Summary of Permanent Road Disturbance within each Cutblock**

Cutblock	Harvest Year	Total Forest Area within Cutblock (Includes NCC, but does not include natural NP area)	Prescribed Permanent Road Area	Permanent Road % (Proportion of forest area in cutblock)	Final Permanent Road Area Post-Rehabilitation	Permanent Road % (Proportion of forest area in cutblock)	Comments
A-2	2017	104.5	2.7	2.58%	2.7	2.58%	If final perm. road area as prescribed
A-3	2018	69.7	1.2	1.72%	1.2	1.72%	If final perm. road area as prescribed
A-4	2018	48.4	0.2	0.41%	0.2	0.41%	If final perm. road area as prescribed
A-5	2018	132.8	2.8	2.11%	2.8	2.11%	0.5ha of Natural NP. If final perm. road area as prescribed
A-8	2017	57.5	1.3	2.26%	1.3	2.26%	If final perm. road area as prescribed
B-2	2018	152.3	3.0	1.97%	3.0	1.97%	If final perm. road area as prescribed
E-5	2018	54.2	0.5	0.92%	0.5	0.92%	If final perm. road area as prescribed
E-6	2018	27.3	0.6	2.20%	0.6	2.20%	If final perm. road area as prescribed
E-7	2018	21.2	0.6	2.83%	0.6	2.83%	
E-8	2018	39.1	0.3	0.77%	0.3	0.77%	
G-2	2017	95.0	2.3	2.42%	2.3	2.42%	0.4ha of Natural NP
G-5	2018	202.7	1.0	0.49%	1.0	0.49%	If final perm. road area as prescribed
G-6	2018	221.2	4.0	1.81%	4.0	1.81%	0.9ha of Natural NP. If final perm. road area as prescribed
G-7	2017	84.0	0.5	0.60%	0.0	0.00%	
G-8	2018	100.1	2.1	2.10%	0.8	0.80%	
G-9	2018	99.6	1.8	1.81%	1.3	1.31%	
G-10	2018	79.1	2.3	2.91%	2.3	2.91%	0.1ha of Natural NP
<b>Total for Harvested Cutblocks</b>		<b>1639.4</b>	<b>27.2</b>	<b>1.66%</b>	<b>24.9</b>	<b>1.52%</b>	

Cutblock	Harvest Year	Total Forest Area within Cutblock (Includes NCC, but does not include natural NP area)	Prescribed Permanent Road Area	Permanent Road % (Proportion of forest area in cutblock)	Final Permanent Road Area Post-Rehabilitation	Permanent Road % (Proportion of forest area in cutblock)	Comments
B-3	Planned	101.1	0.0	0.00%	0.0	0.00%	If final perm. road area as prescribed
B-4	Planned	32.5	0.0	0.00%	0.0	0.00%	If final perm. road area as prescribed
B-5	Planned	37.8	0.0	0.00%	0.0	0.00%	If final perm. road area as prescribed
B-6	Planned	14.5	0.0	0.00%	0.0	0.00%	0.2ha of Natural NPIf final perm. road area as
F-5	Planned	23.0	0.0	0.00%	0.0	0.00%	If final perm. road area as prescribed
F-6	Planned	135.2	1.7	1.26%	1.7	1.26%	If final perm. road area as prescribed
F-8	Planned	32.5	0.0	0.00%	0.0	0.00%	If final perm. road area as prescribed
F-9	Planned	96.9	0.4	0.41%	0.4	0.41%	If final perm. road area as prescribed
F-11	Planned	16.6	0.4	2.41%	0.4	2.41%	If final perm. road area as prescribed
<b>Total for Planned Cutblocks</b>		<b>569.0</b>	<b>2.8</b>	<b>0.49%</b>	<b>2.8</b>	<b>0.49%</b>	
<b>Total for All Cutblocks</b>		<b>2208.4</b>	<b>30.0</b>	<b>1.28%</b>	<b>27.7</b>	<b>1.25%</b>	

## Dispersed Soil Disturbance

*The value of conserving natural soil properties within the non-roaded areas of cutblocks is recognized as important for ensuring properly functioning ecosystems and watersheds and for maximizing the long-term productivity of the forests. To achieve soil conservation across cutblocks, a management goal for each Research Forest Unit, as a whole, is to limit the average dispersed soil disturbance from new harvesting to the following:*

- 1) 5%, which is applicable to the average soil disturbance within all prescribed standard units that are predominantly comprised of sensitive soils in a Research Forest Unit,*
- 2) 10%, which is applicable to the average soil disturbance within all prescribed standard units that are not predominantly comprised of sensitive soils in a Research Forest Unit, and*



- 3) 25%, which is applicable to the average soil disturbance within all the roadside work areas within a Research Forest Unit.

## **Preventative and Remedial Actions for Dispersed Soil Disturbance**

The targets stated previously are to be achieved by having every prescribed Standard Unit meet these targets. Regular harvesting supervision is to observe on-going soil disturbance and undertake the necessary corrective actions to prevent excessive soil disturbance within each Standard Unit.

In the event that excessive soil disturbance is observed within any prescribed Standard Unit, it will then be documented and any necessary revisions or amendments to the site plan will be undertaken, along with any field actions to minimize impacts to natural resource values (e.g., water quality) and any measures to reduce the soil disturbance, where practicable.

## **Dispersed Soil Disturbance Results**

Without completing actual soil disturbance surveys, it is expected that all prescribed standard units within cutblocks A-2, A-3, A-4, A-5, A-6, A-8, E-5, E-6, E-7, E-8, G-2, G-5, G-6, G-7, G-8, G-9, and G-10 are meeting the prescribed dispersed soil disturbance limits. This is based on active harvesting inspections during the winter and spring and subsequent field visits to the cutblocks after snow melt (approximately after mid-May, 2018). Excavator treatment of soil disturbance within cutblock E-7 was completed in June 2018 to ensure that the prescribed dispersed soil disturbance limits are being met.

### **Cutblock E-7: Harvested Winter 2017-18**

With the completion of the 2017-18 harvesting, it was observed that amount of dispersed disturbance with Cutblock E-7 may near the 10% prescribed limit. No riparian areas were affected by the disturbance. This was observed on May 29<sup>th</sup>, 2018 after snow melt. To increase the productivity of the area, an excavator and operator was deployed to the cutblock within a few days to conduct further debris piling, lessen the soil compaction and rehabilitate areas with embedded corduroy and cut trails. It is expected that the treated areas no longer have limited soil conditions and the amount of dispersed disturbance is consistent with the site plan.

# Visual Quality Management

*The following Research Forest Units are located where visual quality objectives (VQO) have been established.<sup>8</sup>*

## Unit A: Modification VQO

*Two map polygons with a modification VQO are established within the eastern portion of Unit A due to visibility from the Crooked River, Kerry Lake, and/or Highway 97.*

## Unit B: Retention and Partial Retention VQO

*One narrow visual polygon with a retention VQO is established along the western edge of Unit B along Tacheeda Lakes. Two polygons representing a partial retention VQO are established across the majority of the remaining area within Unit B due to visibility from Tacheeda Lakes.*

## Unit G: Modification VQO

*A small visual polygon with a modification VQO is established along one of the western facing slopes in the southern part of Unit G due to visibility from Highway 97.*

## Unit H: Modification and Partial Retention VQO

*One visual polygon with a partial retention VQO and one polygon with a modification VQO occupy the southern portion of Unit H due to visibility from Highway 16 East. The slopes of Mount Bowron, within Unit H, are covered by a polygon with a partial retention VQO due to visibility from Highway 16 East.*

## Unit I: Partial Retention VQO

*One narrow visual polygon, with a partial retention VQO, occupies the southern edge of Unit I adjacent to Highway 16 East.*

## Unit J: Partial Retention VQO

*One visual polygon with a partial retention VQO is established over the eastern edge of Unit J due to visibility from the Fraser River.*

## Unit K: Retention VQO

*One visual polygon with a retention VQO objective is established over the western side of Unit K due to visibility from Tsitniz Lake. Another polygon is established over the southern portion of Unit K due to visibility from Ispah Lake.*

*The objective for all VQO polygons is to undertake forest development so that the visible landscapes within the VQO polygons meet the definition of altered forest landscape within Sections 1 and 1.1 of the Forest Planning and Practices Regulation.*

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<sup>8</sup> DataBC, Province of British Columbia. 2016. Natural Resources Dataset – Visual Landscape Inventory.

[https://catalogue.data.gov.bc.ca/dataset?sector=Natural+Resources&download\\_audience=Public](https://catalogue.data.gov.bc.ca/dataset?sector=Natural+Resources&download_audience=Public)

## **Proposed Development within Visually Sensitive Areas**

For the 2018-20 development period, planned operations potentially affect the areas with established visual quality objectives within Unit B with the planned harvesting of Cutblocks B-3, B-4, B-5, and B-6. The digital model representations of the proposed harvesting are provided within Appendix I, along with any available pre-harvest photographs.

### **Cutblock B-3**

This cutblock is proposed for sanitation and salvage harvesting during the winter of 2019 and is located along the southern end of Unit B. The cutblock design has been finalized and a visual assessment has been completed as there is potential that the western portion of the planned cutblock may be visible from the southern end of Tacheeda Lakes. The proposed harvest area falls under a partial retention visual quality objective. The assessment selected two viewpoints within the southern end of Tacheeda Lakes and predicted that the proposed harvesting will not be visible from viewpoint #2, which is the northern-most viewpoint. The assessment also predicted that a change in the visible tree canopy line may occur, but no bare ground will be viewable. Based on this assessment, the proposed harvesting is not expected to increase the level of alteration from the viewpoints.

### **Cutblock B-4**

This cutblock is proposed for sanitation and salvage harvesting and is located upslope of the First Nation lands within the mid portion of Unit B. A visual assessment was completed on the prescribed cutblock design as it is likely portions of the harvest area will be visible from the main body of Tacheeda Lakes, and there may be limited harvesting visibility from the Tacheeda Lakes Recreation Site. The proposed harvest area falls under the partial retention visual quality objective. The assessment selected considered two viewpoints on Tacheeda Lakes, only one was fully assessed as the other was determined to be fully terrain blocked. The remaining viewpoint was located near the central portion of the main Tacheeda Lake. The assessment predicted that a small amount of bare ground may be visible along with a change in the tree line. Overall, it is predicted that the amount of visible bare ground disturbance may increase by 1.5%, but the affected landform will still meet the definition of a partial retention visual quality objective.

### **Cutblocks B-5 and B-6**

These cutblocks are proposed for salvage harvesting and are located at relatively elevated positions within the northern end of Unit B. An visual assessment was undertaken as portions of this area are likely visible from the main body of Tacheeda Lakes and the Tacheeda Lakes Recreation Site. The proposed harvest area falls under the partial retention visual quality objective. The assessment considered three different viewpoints from the main Tacheeda Lake, including the view from the Tacheeda Lakes Recreation Site. The assessment predicted that the harvesting for Cutblock B-5 will result in visible bare ground from viewpoints #2 and #3, which are located on northern half of the main Tacheeda Lake. From viewpoint #1, which is at the Recreation Site, the predicted visible bare ground is expected to be very minimal. From all viewpoints, the landform is expected to maintain its partial retention characteristic with the harvesting of Cutblock B-5. The same viewpoints were also examined for the combined effect of Cutblock B-5 and B-6 harvesting, with a slightly different viewing angle focused more upslope towards Cutblock B-6. The assessment predicted that there will be no addition of visible bare

ground with the harvesting of Cutblock B-6, although the upper treeline of the viewable landform is expected to change from viewpoint #2 and #3. As such, the partial retention characteristic of the landform is expected to be maintained.

## **Visual Quality Management Results**

The following sections describe the post-harvest visual quality results for the landforms affected by the harvesting of Cutblocks A-2, A-3, A-4, A-6, A-8, B-2 and G-4. The digital model representations of the proposed harvesting are provided within Appendix I, along with any available post-harvest photographs.

### **Cutblock G-4: Harvested Winter 2017**

A portion of cutblock G-4 included harvesting within the modification visual quality objective polygon. In consideration of a number of factors, it was concluded that, regardless of the landscape condition, the landscape will meet the definition of “modification”, simply due to the its viewable size and the difficulty of discerning any colours or features on the landscape from any of the viewpoints.

To ensure that the post-harvest view of G-4 had not changed from the most important view point (Crystal Lake, which is the closest recreation site), photographs were taken in September of 2018 to evaluate G-4 post-harvest. Photographs were taken from the western shoreline of Crystal Lake and from the small parking area just north of the Crystal Lake Recreation Site. These photos may be viewed in Appendix I. As may be observed from the post-harvest photos, the visible landform containing Cutblock G-4 is only partially visible above the treeline surrounding Crystal Lake. The G-4 landform may only be viewed from a small area along the western shore of Crystal Lake, and even from the best view, the G-4 landform is not prominent and very little disturbed ground is visible. It is determined that the view from Crystal Lake meets the visual quality objective. The other viewpoints investigated prior to harvest (Bear Lake and Hart within Crooked River Provincial Park, Highway 97 at rail crossing, and Emerald Lake) were not considered significant viewpoints as the landform containing G-4 is barely visible.

### **Cutblocks A-2, A-3, A-4, and A-8: A-2 & A-8 Harvested Summer/Fall 2017, A-3 & A-4 Harvested Summer 2018**

A visual impact assessment was completed for the eastward facing landform containing Cutblocks A-2, A-3, A-4, and A-8 which are potentially viewable from Kerry Lake (including Kerry Lake Recreation Site) and Crooked River/Highway 97. Digital modelling supporting the assessment showed that a portion of the harvesting may be visible from Kerry Lake and the Kerry Lake Recreation Site. Actual pre-harvest and post-harvest photograph from the Kerry Lake Recreation Site clearly demonstrate that the landform and cutblock harvesting is not visible due to screening from the foreground landform on the west side of Kerry Lake. A restricted view from viewpoint #1 is also expected, but even if partially visible, the amount of negatively altered landform is predicted to meet the visual quality objective (as estimated from the digital modelling.)

It was noted that portions of Cutblock A-5 (A-5 is outside of the area with visual quality objectives), which is located at a higher elevation than the surrounding cutblocks (A-2, A-3, A-4, and A-8), is visible from a very small portion of highway 97. This area is not recognized as a

viewpoint as there is no pull-out or viewing area in the vicinity, and when travelling the highway, the landform containing A-5 is only viewable for a brief, few seconds. It is also expected that A-5 may be visible from the northern portion of Kerry Lake, as this portion of Kerry Lake is visible from the upper parts of A-5.

#### **Cutblocks A-6: Harvested Summer/Fall 2018**

A visual impact assessment was completed for the eastward facing landform containing Cutblock A-6, which is north of Cutblock A-8 and A-2 as it is potentially viewable from Kerry Lake (including Kerry Lake Recreation Site). Digital modelling supporting the assessment showed that a portion of the harvesting may be visible from Kerry Lake and the Kerry Lake Recreation Site. This is backed by photos from summer 2018, which show that the upper slope containing A-6 is visible from the Kerry Lake Recreation Site. The assessment considered two viewpoints; one from Kerry Lake and one from the Kerry Lake Recreation site. The visual assessment predicted that the A-6 harvesting will be barely visible from viewpoint #1 on Kerry Lake and will be partially visible from the Kerry Lake Recreation Site. A photograph taken from the Kerry Lake Recreation Site confirmed that the predicted amount of visible harvesting is very similar to the actual outcome. Based on this observation, the A-6 harvesting was determined to meet the visual quality objective as viewed from the Kerry Lake Recreation Site.

#### **Cutblock B-2: Harvested Summer/Fall 2017 and Winter 2018**

A visual impact assessment was completed for the landform(s) containing Cutblock B-2, which may be visible from multiple points within the southern half of Tacheeda Lakes. A single representative viewpoint on Tacheeda Lakes was selected for visual impact assessment. The digital modelling supporting the assessment predicts that no ground disturbance will be seen, but there may be a change in the visible tree canopy. The current visibly altered ground represents 7% of the landform area. Based on numerical assessment alone, the visible landform is expected to continue to meet the limits of a partial retention visual quality objective.

## **Existing and New Recreation Use of Research Forest**

*For all Research Forest areas, the objective is to support existing and new recreational use of the Provincial Forest. Strategies to support this objective may include, but are not limited to, the following:*

- 1) Maintain road access to all Research Forest Units;*
- 2) Install signage identifying each Research Forest Unit at the main road entrance;*
- 3) Install additional signage within or near Research Forest Units providing information about the area, points of interest, or ongoing Research Forest activities; and*
- 4) Develop new trails for both short-term and long-term research access, education, and recreation.*

## **Proposed Strategies Regarding Existing and New Recreation Opportunities within Research Forest**

Up to summer 2020, the following strategies are expected to be undertaken:

- 1) Existing road access is to be left intact or improved unless its continued existence or current use is a risk to public safety or the environment. Existing road access may also be deactivated or rehabilitated where its continued existence and use may materially affect a First Nation or natural resource stakeholder.
- 2) Improvement of the road access into Unit K and Unit L is planned for the summer of 2019. This road improvement will aid with the field instruction of Natural Resources and Forest Technology students during the fall semesters, and will provide increased vehicle and recreation access to Unit K.
- 3) Road signage along forestry roads is to be installed and maintained to provide directions to CNC Research Forest Units A, B, C, D, E, F, G, K and L. Road signage for Research Forest Units H and J are not being considered as the current access roads are not being regularly maintained. Directional road signage for Unit I is not being considered as this unit is accessed via Highway 16 east of Prince George.
- 4) During 2019, large wooden signs to support the future display of maps and information are to be installed at CNC Research Forest Units A, B, C, D, E, F, G, I, K and L. Units H and J do not have well-maintained road access at this time, so the value of information signs is limited.
- 5) During 2019 and 2020, plans will be considered, and where feasible, developed for short hiking trails and minor facilities (ex: picnic tables) within Research Forest Units A, B, D, E, F, G, I, L and K.

## **Recreational Access Management Results**

- 1) Permanent road access to Research Forest Units A, B, E, F, and G was improved and expanded during the winter and summer of 2018, while permanent road access to Research Forest Units C and D was maintained.
- 2) Directional signs were placed along the Forestry road systems accessing all Research Forest Units during the summer and fall 2017. An example of one the installed road signs is shown in Figure 18.
- 3) The construction of large wooden sign kiosks was started during summer 2018 and the majority of signs are now constructed. These signs are planned for installation at all Research Forest Units, except Unit H and J, during 2019. These signs will be used to display maps and information about each Research Forest Unit.
- 4) A preliminary reconnaissance for trail development in Unit L was completed in the fall of 2018. There is evidence of cultural heritage and possibly archaeological values that will require further investigation prior to developing further recreational plans.



Figure 18. Directional Road Sign near Research Unit L



## Provincial Recreation Sites and Trails

*The following recreational features are located adjacent to or near Research Forest units.<sup>9</sup>*

### ATV & Snowmobile Road Routes – Unit K and L

*The Willow-Coalmine Forest Service Road, which runs along the northern boundary of Unit L, is identified as an ATV and snowmobile route when the road is not being actively maintained for industrial purposes.*

*The Willow Forest Service Road (FSR), which runs past the southwest corner of Unit K, is identified as an ATV and snowmobile route when the road is not being actively maintained for industrial purposes.*

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<sup>9</sup> DataBC, Province of British Columbia. 2016. Natural Resources Dataset – Visual Landscape Inventory.  
[https://catalogue.data.gov.bc.ca/dataset?sector=Natural+Resources&download\\_audience=Public](https://catalogue.data.gov.bc.ca/dataset?sector=Natural+Resources&download_audience=Public)

Tsitniz Lake / Camp Friendship and Recreation Reserve – Unit K

*Camp Friendship is located next to Tsitniz Lake. A Provincial Recreation Reserve encloses the area around Tsitniz Lake and the nearby area between the Willow Forest Service Road and the Willow River.*

Ispah Lake – Unit K

*A Provincial Recreation Site is established on Ispah Lake along the Willow FSR, just south of Unit K.*

Tacheeda Lakes Recreation Sites – Unit B

*The Tacheeda Lakes Middle and Tacheeda Lakes Point Provincial Recreation Sites are established on Tacheeda Lakes just north of Unit B.*

Tacheeda Lookout Trail

*A Provincial Recreation Trail has been established along the trail to the Tacheeda Fire Lookout site. This trail runs towards the east, just north of Unit B.*

Fishhook Lake Recreation Site – Unit B

*A Provincial Recreation Site is established on Fishhook Lake, just south of Unit B.*

*The strategy for all these recreation features is to consult and seek input from the Ministry of Forests, Lands and Natural Resource Operations when undertaking forest development and research project planning. The coinciding strategy is to achieve results from forest development, silviculture practices, and research projects that are consistent with the continued recreational use and enjoyment of the existing sites, trails, and camps.*

## **Proposed Development Adjacent to Provincial Recreation Areas**

**Tacheeda Lakes and Kerry Lake Recreation Sites:**

None of the currently proposed forest developments are expected to measurably affect the recreation features identified in the Management Plan. The visually sensitive landscapes viewable from the Tacheeda Lakes and Kerry Lake Recreation Sites are expected to be altered with proposed harvesting, but only to the extent that the established visual quality objectives allow.

## **Recreation Referral Results**

**Tacheeda Lakes Recreation Site**

In December 2016, Cutblock B-1 was referred to the Ministry of Forests, Lands and Natural Resource Operations as part of the referral to BC Parks. At that time, no concerns were expressed in regard to the Tacheeda Lakes Recreation Site and Tacheeda Lookout Trail, except to ensure that the partial retention visual quality objective is achieved.



## Road and Trail Access Management

*The objective is to maintain a reliable road network, and trail network where applicable, to and within each Research Forest Unit to support continuing access for forest operations, educational sites, research sites, First Nation use, stakeholder use, and general recreational use by the public.*

*For roads that are required for temporary operational or research access the objective is to reduce their footprint to conserve the available productive forest soils and to reduce water quality and watershed impacts over the long-term. This will be accomplished by rehabilitating or deactivating the non-necessary road sections. Rehabilitation will occur as described under Section 36 of the Forest Planning and Practices Regulation and therefore will involve re-vegetating the former road area.*

## Proposed Road and Trail Access Management

Consistent with the the road and trail objective and strategies, rehabilitation of roads is planned within all of the cutblocks scheduled for 2018 and 2019 as not all of the planned harvesting roads are required for long-term operations, education and research.

There is currently no deactivation or rehabilitation treatment planned for existing roads and trails (ones present prior to CNC development) that are regularly used by motorized vehicles.

## Road and Trail Access Management Results

The Development Plan Maps provided in Appendix A show the current road network for all Research Forest Units. CNC roads are displayed as either temporary or permanent. Most of the mapped temporary roads are already rehabilitated, and the remaining temporary roads are planned for rehabilitation within three years. Rehabilitated road sections are not expected to function as roads or trails as they are intended to be part of the productive forest area.

## Research Site Locations

*CNC and its research partners have established numerous sites and areas that have and are supporting natural resource monitoring, studies, and trials. Some of these sites and areas are used for multiple years of study while others may only be used for one season. Tracking these sites over time is important, as there may be value in revisiting inactive sites to support or complement future study and research. The previously established research site locations that are within or immediately adjacent to the Research Forest units are shown on the maps in the Appendix, along with a table summarizing specific information for each research site.*

*In addition to the sites established by CNC, one pre-existing provincial research site has been identified within the CNC Research Forest. It is located in Unit D and is shown on Provincial maps as EP 0886.13.09. It is identified as a fertilization trial. Its approximate location is shown on the*

*Unit D map in the Appendix. Depending on its current condition and the applicability of the previous data collected, this site may be excluded from harvesting, road development, and silviculture practices for a significant period of time.*

Knowing the location of existing and previous research projects is important information when planning the location of permanent and temporary road access and in finalizing the design of cutblocks. Within Appendix C of this Development Plan, a current list of the previous and on-going research projects is provided. Mapping of the research project site locations is also provided in Appendix C, but is only updated once per year, unless significant new project additions warrant map updating. The maps currently provided are updated to October 2018.

## Provincial Designations and Forest/Land Tenures

*The following Provincial Parks, Protected Areas, and Ecological Reserves were identified using the geographic data provided by DataBC, Province of British Columbia.<sup>10</sup>*

### **Tacheeda Lakes Ecological Reserve**

*Unit B of the Research Forest is situated immediately adjacent to the west side of the Tacheeda Lakes Ecological Reserve. The reserve is composed of 526ha of mostly mature spruce-leading forests within the McGregor Plateau ecosection of which only 0.64% is under designated protection. Although small, the ecological reserve contributes 11.85% of the overall protected areas system of the McGregor Plateau.<sup>11</sup>*

*The primary purpose of this Provincial Ecological Reserve is to protect the mature forest ecosystems representative of the wet cool Sub-Boreal Spruce subzone (SBSwk1 subzone) and its transition with the Engelmann Spruce-Subalpine Fir Zone (ESSFwk2 subzone).<sup>12</sup> This type of Provincial Reserve is not created for outdoor recreation. Most ecological reserves, however, are*

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<sup>10</sup> DataBC, Province of British Columbia. 2016. Natural Resources Dataset – Visual Landscape Inventory.  
[https://catalogue.data.gov.bc.ca/dataset?sector=Natural+Resources&download\\_audience=Public](https://catalogue.data.gov.bc.ca/dataset?sector=Natural+Resources&download_audience=Public)

<sup>11</sup> British Columbia Ministry of Environment, Omineca Region. 2005. BC Parks Webpages, Tacheeda Lake Ecological Reserve: Purpose Statement and Zoning Plan.  
[http://www.env.gov.bc.ca/bcparks/planning/mgmtplns/tacheeda\\_lake\\_er/tacheeda\\_lake\\_er\\_p\\_s.html](http://www.env.gov.bc.ca/bcparks/planning/mgmtplns/tacheeda_lake_er/tacheeda_lake_er_p_s.html)

<sup>12</sup> British Columbia Ministry of Environment, Omineca Region. 2005. BC Parks Webpages, Tacheeda Lake Ecological Reserve: Purpose Statement and Zoning Plan.  
[http://www.env.gov.bc.ca/bcparks/planning/mgmtplns/tacheeda\\_lake\\_er/tacheeda\\_lake\\_er\\_p\\_s.html](http://www.env.gov.bc.ca/bcparks/planning/mgmtplns/tacheeda_lake_er/tacheeda_lake_er_p_s.html)

*open to the public for non-destructive pursuits like hiking, nature observation and photography. As well, research and educational activities may be carried out but only under permit.<sup>13</sup>*

#### **Sugarbowl-Grizzly Den Provincial Park and Protected Area**

*Unit I is situated immediately east of the northern part of the Sugarbowl-Grizzly Den Provincial Park and Protected area.*

*The primary roles of the park and protected area are to protect critical habitat for the Mountain Caribou, protect the historically significant Grand Canyon of the Fraser, and to provide outstanding backcountry recreation opportunities within one hour of Prince George via the Sugarbowl and Viking Ridge Trails. The secondary role of the park and protected area is to provide representation of the Upper Fraser Trench ecosection and the Interior Cedar-Hemlock very wet, cool variant (ICHvk2) biogeoclimatic zone.<sup>14</sup>*

#### **Fraser River Provincial Park**

*Unit J is situated immediately adjacent to the southern boundary of Fraser River Park, which encompasses an area along the west side of Fraser River just north of the confluence of Naver Creek and the Fraser River.*

*The primary role of Fraser River Provincial Park is to provide representation of the Quesnel Lowlands ecosection, and moist hot and dry warm Sub-boreal Spruce forests. Fraser River Provincial Park currently provides the greatest extent of representation in the protected areas system of the Quesnel Lowlands ecosection and Sub-boreal Spruce moist hot (SBSmh) and Sub-Boreal Spruce dry warm, Blackwater variant biogeoclimatic zones. In the future, a secondary role will be to provide backcountry recreation access to the Fraser River, and opportunities for wildlife and nature-related recreation associated with a large river valley.<sup>15</sup>*

*The area provides excellent elk, deer and moose winter range. The high ungulate winter range values can be attributed to the south easterly facing slopes, the lower elevation and milder climate, which contributes to a lower snow depth.<sup>16</sup>*

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<sup>13</sup> British Columbia Ministry of Environment. 2013. BC Parks Webpages, Tacheeda Lakes Ecological Reserve Webpage.

[http://www.env.gov.bc.ca/bcparks/eco\\_reserve/tacheeda\\_er.html](http://www.env.gov.bc.ca/bcparks/eco_reserve/tacheeda_er.html)

<sup>14</sup> British Columbia Ministry of Environment, Omineca Region. 2005. BC Parks Webpages, Sugarbowl-Grizzly Den Provincial Park and Protected Area: Purpose Statement and Zoning Plan.

[http://www.env.gov.bc.ca/bcparks/planning/mgmtplns/sugarbowl\\_grizzly/sugarbowl\\_grizzly\\_ps.pdf?v=1450743905560](http://www.env.gov.bc.ca/bcparks/planning/mgmtplns/sugarbowl_grizzly/sugarbowl_grizzly_ps.pdf?v=1450743905560)

<sup>15</sup> British Columbia Ministry of Environment, Omineca Region. 2005. BC Parks Webpages, Fraser River Provincial Park: Purpose Statement and Zoning Plan.

[http://www.env.gov.bc.ca/bcparks/planning/mgmtplns/fraser\\_river/fraser\\_river\\_ps.pdf?v=1459895694354](http://www.env.gov.bc.ca/bcparks/planning/mgmtplns/fraser_river/fraser_river_ps.pdf?v=1459895694354)

<sup>16</sup> British Columbia Ministry of Environment, Omineca Region. 2005. BC Parks Webpages, Fraser River Provincial Park: Purpose Statement and Zoning Plan.

*The strategy for all of the Parks and the Ecological Reserves is to consult with available expertise within the British Columbia Ministry of Environment and the British Columbia Ministry of Forests, Lands and Natural Resource Operations when proposing operations immediately adjacent to the Parks or Reserve Boundaries. The coinciding strategy is to achieve outcomes from forest and research operations that do not limit the achievement of the current, primary purposes, and secondary purposes where applicable, of the potentially affected Parks and Ecological Reserves.*

## **Proposed Development Adjacent to Provincial Parks**

Proposed operations within Unit B may affect the Tacheeda Lakes Ecological Reserve. The strategy described, immediately above, will be implemented. If there is any significant direction resulting from communication with the provincial government agencies, then this Development Plan will be updated accordingly.

## **Provincial Park Referral Results**

In December 2016, Cutblock B-1 was referred to BC Parks, Ministry of Environment, in particular, to see if there were any concerns regarding planned road development near the Tacheeda Lakes Ecological Reserve. BC Parks expressed a preference for a no harvest buffer between CNC Research Forest harvesting and the Ecological Reserve boundary, however they did not specify a minimum width or size when asked. Prior to harvesting, the Cutblock B-1 boundary was adjusted for increased conservation of the riparian management area along the W1 wetland situated near the western boundary of the Ecological Reserve. The final cutblock boundary is located 17 m to 165 m from the Ecological Reserve, with the vast majority of the boundary more than 50 m from the Ecological Reserve.

## **Forest Tenure Holders**

### **Tree Farm License 30**

*Tree Farm License 30, held by Canadian Forest Products Ltd, is located immediately adjacent to the eastern boundary of Unit G of the Research Forest.<sup>17</sup>*

### **Forestry License to Cut, Special Use Permit, Road Permit, and Road-use Permit Holders**

*It is recognized that over time, there may be forestry licenses to cut and special use permits issued and held by various persons who may be operating adjacent to Research Forest Units. In most cases, it is expected that these users will be advised of the CNC Research Forest when issued their license or permit and that they will contact CNC as necessary to coordinate planning and operations.*

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[http://www.env.gov.bc.ca/bcparks/planning/mgmtplns/fraser\\_river/fraser\\_river\\_ps.pdf?v=1459895694354](http://www.env.gov.bc.ca/bcparks/planning/mgmtplns/fraser_river/fraser_river_ps.pdf?v=1459895694354)

<sup>17</sup> DataBC, Province of British Columbia. 2016. Natural Resources Dataset – Tree Farm License. [https://catalogue.data.gov.bc.ca/dataset?sector=Natural+Resources&download\\_audience=Public](https://catalogue.data.gov.bc.ca/dataset?sector=Natural+Resources&download_audience=Public)

### **Forest License Holders**

*There are numerous small and large forest licensees within the Prince George Timber Supply Area who operate immediately adjacent to the Research Forest and who may require new road access or the use of existing roads within the Research Forest.*

*The strategy for all Research Forest Units, in respect of adjacent or overlapping forest tenure and permit holders, is to consult with available forest tenure and road permit holders when proposing operations that may influence a neighboring license area or may involve shared road use. This may include, but is not limited to, consultation regarding timing of operations, road access planning, shared road use, old forest retention planning, and wildlife tree retention planning.*

*Because new forest tenures and permits are regularly issued and existing tenure and permit holders change over time, the Development Plan will be annually updated to identify current forest tenure and permit holders.*

## **Forest Licensee and BCTS Referral Results**

Nearby or adjacent forest licensees that may be affected by planned operations include:

- 1) Canfor – Tree Farm License 030 and various forest licenses (Units C, D, E, F, and G),
- 2) Sinclair Group (Lakeland Mills & Winton Global) – various forest licenses (Units A, B, C, D, E, and F), and
- 3) British Columbia Timber Sales – various timber sales licenses (Units A and G)

The Management Plan was referred to British Columbia Timber Sales and the identified licensees as part of the public review process. The Management Plan referral letter identified the areas that CNC will be operating within during 2016-17. No specific concerns were brought forward as a result of this process.

As mentioned under the section titled “Old Interior Forest Objective”, retention planning within Units B, E, F, and G is designed to be complementary to the old growth recruitment area that is being implemented by forest licensees and BCTS within the McGregor Plateau area.

In 2018, BCTS and Canfor were contacted by CNC about potential widespread salvage in Research Forest Unit G and the potential combined impacts on the upper-Angusmac watershed. Canfor has since further communicated in regards to the Angusmac watershed condition and the future tracking of watershed hazards.

Canfor and Lakeland Mills have been in contact with CNC numerous times concerning planning and operations adjacent to Units A, C, D, F and G. Information concerning Research Forest planning and adjacent licensee planning has been shared and discussed freely. To date, there are no unresolved issues concerning adjacent licensee harvesting and road construction. The adjacent licensee plans are not expected to negatively impact the Research Forest Management Plan objectives and strategies.

Regular sharing of harvesting operations with all forest tenure holders is also regularly occurring through the Prince George Timber Supply Area Beetle Working Group.

## **Road Use Coordination Results**

Where Canfor, the Sinclair Group, and other licensees hold road permits or road-use permits that may be affected by planned CNC road use, contact will be made prior to the start-up of operations to coordinate road use and maintenance. Where upgrades to road permits, held by other forest licensees, may be necessary, the affected licensee will be contacted well in advance to discuss the potential road construction works.

### **Road Use Specific to Units C and D:**

During the summer of 2016, there were discussions with Canfor over continuing use of the main Caine Creek Road (Canfor Road Permit R02852) north of 14Km. Canfor was originally planning to remove and reuse the road bridges along this portion of the road, but agreed to leave them in place while harvesting operations were underway within CNC Units C and D. The long-term existence of these Canfor installed bridges on the Caine Road is not certain at this time. The long-term existence of these bridges is not critical to CNC operations at this time.

Canfor recently contacted CNC to discuss sharing roads built and maintained by CNC within the Research Forest, so that they may access new spruce beetle cutblocks adjacent to the west side of Research Forest Units C and D. This includes Canfor road construction work within the Research Forest and Canfor applying for road permit authority through Research Forest Units C and D. Canfor is still expected to apply for a road permit authority for the sections of CNC road that they will use, maintain and potentially modify. These additional constructions are not expected to negatively impact the Research Forest Management Plan objectives and strategies. In fact, the proposed Canfor road permit authority is expected to lessen CNC and Dunkley Lumber's road maintenance responsibilities and associated road liabilities for the foreseeable future.

### **Road Use Specific to Unit A:**

Lakeland Mills was in contact with CNC and Dunkley Lumber during spring 2018 concerning road hauling routes and potentially shared road use within Research Forest Unit A. Lakeland Mills is proposing new cutblocks adjacent to the south side of Unit A, and due to terrain, will require some of the log hauling to travel north through the Research Forest. Based on current scheduling, there will be no overlapping road use with Lakeland Mills operations, but Lakeland is planning to construct short sections of road through Research Forest Unit A for access to their cutblocks. These additional constructions are not expected to negatively impact the Research Forest Management Plan objectives and strategies.

### **Road use Specific to Unit G:**

Dunkley Lumber, on behalf of CNC, installed new long-term steel and concrete bridges on the 6700 Road and 6600 Road during 2017. These are both Canfor road permits, but also within the special use permit authorizing the CNC Research Forest. Canfor is likely to also benefit from the use of the new 6600 Bridge in the future.

During both the summer and winter of 2018 there has been overlapping road use on the 6900, 6600 and 6700 Roads (Angusmac Creek area) with both CNC and Canfor operations occurring at the same time. CNC has not been made aware of any significant issues regarding the shared use. Canfor utilized the road system through the spring break-up period, but also applied significant effort in adding rock and gravel to help stabilize the 6900 Road to support the spring hauling. Canfor was in regular contact with both CNC and Dunkley Lumber regarding the road use and road safety.

Canfor is currently planning to harvest adjacent to the southeastern portion of Research Forest Unit G and will require road access through Unit G. Information about road use, road conditions and prescribed wildlife tree retention areas has been shared with Canfor to facilitate their planning and operations. Canfor construction of an additional short road section within Unit G (Cutblock G-6) is currently proposed to access Canfor's planned cutblock. This additional road construction and the planned Canfor cutblock is not expected to negatively impact the impact the Research Forest Management Plan objectives and strategies.

#### **Future Road Use Concerning Units B, E, and F:**

Planned harvesting in Research Forest Units B, E and F during the fall 2018 and winter/spring 2019, will involve hauling along the 800 Chuchinka-Colbourne Forest Service Road, 700 Chuchinka Forest Service Road, and 6900 Road (Canfor road permit R01863). CNC is currently not aware of any notable issues regarding shared road use and maintenance of these primary hauling roads and their tributaries.

## **Trapping, Guiding, and Range Tenures**

*The Research Forest is widely spread over a number of trapping and guiding tenures. These tenure holders are identified in Table 8 along with each overlapping forest unit.*

*Trapping cabin locations near the boundary of Unit J (trapping license 710T003) are identified within the Provincial natural resources dataset.*

*A hunting camp near the northern boundary of Unit E (guiding license 716G001) is identified within the Provincial natural resources dataset.*



**Table 8. Trapping and Guiding Licenses Overlapping with the Research Forest<sup>18</sup>**

<b>Unit</b>	<b>Trapper</b>	<b>Provincially Mapped Cabins or Other Sites</b>	<b>Guide/Outfitter</b>	<b>Provincially Mapped Cabins or Other Sites</b>
A	716T008, 724T004		724G002	
B	716T008		716G001	
C	724T004, 714T010		724G002	
D	724T004		724G002	
E	716T007, 716T008		716G001	Hunting Camp
F	716T007, 716T006		716G001	
G	716T006, 716T005		716G001	
H	707T004		707G001	
I	705T012		705G001	
J	710T003	Two Cabins	710G003	
K	707T001, 709T004		709G001	
L	709T004		709G001	

*It is recognized that in some cases the activities associated with a trapping license may also be associated with a First Nation's treaty or aboriginal rights. Therefore, some trapline holders or users may be contacted more than once about proposed Research Forest operations as a result of information being provided directly to stakeholders as well as First Nations' offices.*

*Units K and L, near the Willow River, are located within a range tenure associated with the licensed hunting guide territory.<sup>19</sup>*

*The strategy, in respect of the overlapping trapping, guiding and range tenures, is to consult with available trappers and guides (guides hold the range tenures) when proposing operations that may influence a trapline, guiding area, or range resources. This may include, but is not limited to, consultation regarding timing of operations, road access planning, shared road use, old forest retention planning, and wildlife tree retention planning.*

*The specific timing of operations may be very important to trapping, guiding, and range tenure holders. Therefore, prior to initiating operations that may influence their territories, the holder will be notified of the commencement date and the approximate duration.*

<sup>18</sup> DataBC, Province of British Columbia. 2016. Natural Resources Dataset – Traplines and Guide Outfitter Areas.

[https://catalogue.data.gov.bc.ca/dataset?sector=Natural+Resources&download\\_audience=Public](https://catalogue.data.gov.bc.ca/dataset?sector=Natural+Resources&download_audience=Public)

<sup>19</sup> DataBC, Province of British Columbia. 2016. Natural Resources Dataset – Range Tenure.

[https://catalogue.data.gov.bc.ca/dataset?sector=Natural+Resources&download\\_audience=Public](https://catalogue.data.gov.bc.ca/dataset?sector=Natural+Resources&download_audience=Public)



*Because trapping and guiding license holders change over time and new range tenures may be issued, the Development Plan will be annually updated to identify current trapping, guiding, and range tenure holders.*

## **Trappers and Guides Referrals**

For operations proposed for 2018-19 and beyond, referrals identifying newly designed cutblock development within Unit A, B, E, F and K was sent to affected trappers and guides. This includes:

- 1) Guiding License 716G001 Vince Cocciolo (Units B, E, and F)
- 2) Guiding License 724G002 Steve Saunders (Unit A)
- 3) Guiding License 709G001 Ken Watson (Unit K)
- 4) Trapping License 724T004 – Matthew and Daniel Morris (Unit A)
- 5) Trapping License 716T008 – Albert and Eugene Isadore (Unit A and B)
- 6) Trapping License 716T007 – See Guiding License 716G001 (Units E and F)
- 7) Trapping License 716T006 – Micheal and Earl Erickson (Unit F)
- 8) Trapping License 707T001 – Wayne Sharpe (Unit K)
- 9) Trapping License 709T004 - Wayne Sharpe (Unit K)

The 2016 Management Plan was also referred to all trapline holders as part of the public review process, along with the Amendment #1 (concerning new timber supply review) to the Management Plan referred during fall 2017.

In addition to all of the above, stakeholders will be notified 2 weeks prior to the start-up of any harvesting and road building operations.

The referrals and notifications sent to the Trappers and Guides for Units A, B, E, F, and K are provided in Appendix D.

## **Trappers and Guides Referral Results**

### **Applicable to Research Forest Units A, B, C, D, E, F, G, and K**

Numerous referral and notification letters have been sent to trappers and guides potentially affected by proposed operations within Research Forest Units A, B, C, D E, F, G and K. Additional attempts were also undertaken to contact individual trappers in regards to their knowledge of furbearer populations and habitat within and surrounding Units A to G. The previous efforts have provided little to no input from the trappers and guides. There was some discussion with Vince Cocciolo, during 2016, about the potential effects of harvesting (particularly log hauling) on his guiding business, but essentially there has been no other trapper and guide input concerning CNC's forestry operations. Vince's concerns were more related to overall industry log hauling activity within parts of this guiding territory. Vince has not contacted CNC further about the proposed or ongoing operations within the Research Forest.

### **Applicable to Research Forest Unit H**

Don Wilkins, representing trapping license 707T004 in which Unit H is located, has expressed repeated interest in reviewing and being involved in CNC forest development planning within Unit H. Don Wilkins received a copy of the previous Development Plan, but with no development planned for Unit H, he was not interested in further discussing CNC operations. There is a commitment to ensure Don Wilkins is involved in any future development planning that may occur for Unit H.

## **Range Tenure Referrals**

There is no range tenure affected by proposed operations.

## **Mining Tenure and Notice of Work**

*There are mining tenures within all the units of the Research Forest, but there is only one active Notice of Work for current exploration or mining activities, which is located in the area of Unit L along the Willow River.<sup>20</sup>*

*With respect to the ongoing mining operations affecting Unit L and in the event of a new Notice of Work, the strategy for all Research Forest units is to consult with available expertise within the British Columbia Ministry of Energy and Mines and the British Columbia Ministry of Natural Gas Development and consult with the exploration/mining proponent in coordinating forestry development and research activities with exploration and mining activities. This may include, but is not limited to coordination of road access management, old forest retention planning, and wildlife tree retention planning.*

None of the proposed operations are expected to affect any existing mining tenure or active notice of work for mining.

During October 2018, the mineral license holder for the area along the Willow River adjacent to Unit L was contacted about the existing trail that originates in the southwestern end of Unit L and travels towards the Willow River. The license holder stated that he is not actively using the trail nor is he expecting to use the trail in the near future, but he does not want to see the trail deactivated or blocked as he has continuing interests in the mineral license.

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<sup>20</sup> DataBC, Province of British Columbia. 2016. Natural Resources Dataset – Mineral, Placer and Coal Tenure.  
[https://catalogue.data.gov.bc.ca/dataset?sector=Natural+Resources&download\\_audience=Public](https://catalogue.data.gov.bc.ca/dataset?sector=Natural+Resources&download_audience=Public)

## Other Land Tenures

*A communications site and an associated access right-of-way is located within the southern end of Unit G.*

*The objective, in respect of the overlapping land tenure right-of-way, is to appropriately involve the Ministry of Forests, Lands and Natural Resource Operations in planning regarding forest development and research projects, so that any existing and future use of the communication site and right-of-way may be appropriately accommodated.*

## Other Land Tenure Referral Results

### Unit G – Communication Site

In September 2016, the Prince George Natural Resource District office informed CNC that the communication site is held by Telus and provided CNC with contact information. CNC contacted Telus by phone and email to explain the harvesting operations proposed within Cutblock G-4. This included information that CNC harvesting is proposed within the right-of-way tenure for the communication site. Telus did not have any objections or concerns. As a result of the communications with Telus, CNC committed to providing post-harvest information to Telus (pictures and information showing the communication site and the resulting adjacent harvesting). Pictures of the resulting harvesting adjacent to the communication site were sent to Telus on June 9, 2017. To date, there has been no response from Telus regarding the post-harvest update.

## Adjacent Land Owners

*The western boundary of Research Forest Unit B is immediately adjacent to privately held land as is displayed on the Management Plan Content Maps within Appendix G.<sup>21</sup>*

*The strategy, in respect of these lands, is to consult with the land owner when proposing operations that may influence the adjacent lands. This may include, but is not limited to, consultation regarding timing of operations, road access planning, shared road use, visual quality planning, old forest retention planning, and wildlife tree retention planning.*

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<sup>21</sup> DataBC, Province of British Columbia. 2016. Geographic Dataset – TANTALIS – Crown Tenures.

[https://catalogue.data.gov.bc.ca/dataset?q=tantalis&download\\_audience=Public&type=Geographic&sort=score+desc%2C+record\\_publish\\_date+desc&page=1](https://catalogue.data.gov.bc.ca/dataset?q=tantalis&download_audience=Public&type=Geographic&sort=score+desc%2C+record_publish_date+desc&page=1)

## Land Owner Referral Results

The operations planned for Unit B includes harvesting near the private lands described above. The Forestry Manager for the McLeod Band committed to providing any applicable McLeod Lake Band referral information to the land holder. To date, the referral process has not garnered any concerns from the landowner regarding the CNC proposed or ongoing operations.

## Archaeological and Cultural Heritage Resources

*There are no previously identified archaeological sites within or immediately adjacent to the Research Forest Units, but there is potential for new findings with the completion of future assessments.*

*There is also potential for future cultural heritage resource findings within or adjacent to Research Forest Units. When discussing cultural heritage resources, this plan is referring to resources, sites or features important to the culture, traditional use, treaty rights and aboriginal rights of a First Nation. It is recognized that a cultural heritage resource may have various meanings that are unique to a First Nation and unique to a Nation's treaty and aboriginal rights. By regularly referring proposed operations to affected First Nations, there will be multiple opportunities for a First Nation to communicate about cultural heritage resources and provide the necessary knowledge, advice, and input to CNC.*

*The objective with respect to Archaeological and Cultural Heritage Resources is to provide reasonable opportunities for potentially affected First Nations to be involved in the assessment and the management of archaeological and cultural heritage resources. In order to achieve this objective, the following strategies will be undertaken:*

- 1) Offer opportunities for First Nations members to be involved in identifying and assessing archaeological and cultural heritage resources;*
- 2) All proposed cutblocks and roads will be referred to the affected First Nation(s) for a period of 30 days in advance of operations (or another length of time as agreed with the affected First Nations), so that the First Nations have an opportunity to offer knowledge and input;*
- 3) Where operations are planned to remove forest cover, the following assessments will be undertaken to identify archaeological and cultural heritage resources and to provide recommendations regarding their conservation and protection:*
  - a) Where an area is not covered by a provincially recognized Archaeological Predictive Model or a previous Archaeological Overview Assessment, an Archaeologist will undertake an Archeological Overview Assessment and/or Preliminary Field Assessment to identify potential archaeological sites and to identify cultural heritage resources;*
  - b) Where an area is covered by a provincially recognized Archaeological Predictive Model or Mapping or a previous Archaeological Overview Assessment, an Archaeologist will undertake an Archeological Overview Assessment and/or Preliminary Field Assessment to identify potential archaeological sites and to identify cultural heritage resources; and*
  - c) Where the potential for a cultural heritage feature is identified by a First Nation or a person with interests in the area, an Archaeologist will undertake an Archaeological Overview Assessment and/or Preliminary Field Assessment to identify cultural heritage features or potential archaeological features.*

- d) *Where there is potential for archaeological resources as identified by a First Nation, a person with interests in the area, an Archaeological Predictive Model, an Archaeological Overview Assessment or Preliminary Field Assessment, an Archaeologist will undertake or oversee an Archaeological Impact Assessment;*
- 4) *Archaeological or cultural heritage resource findings from any field assessments completed by an Archaeologist are to be shared with the affected First Nation(s) for a period of 30 days in advance of operations (or another length of time as agreed to with the affected First Nations), so that the First Nation(s) has a reasonable time to offer knowledge and input;*
- 5) *Reasonable efforts to incorporate a First Nation's input regarding conservation or protection of an archaeological or cultural heritage site will be undertaken, particularly as it relates to a treaty right or an aboriginal right; and*
- 6) *Where a previously unidentified site, which is expected to be an archaeological or cultural heritage site, is discovered while undertaking a forest practice or research, the forest practice or research will be modified or stopped to protect the remaining site until it may be assessed, referred, and incorporated into plans and final designs as described in items 1 to 5 above.*

## **Archaeological and Cultural Heritage Resources Assessment Results**

Prior to forest development, the potential for archaeological resources (and coinciding cultural heritage resources) is determined using a standardized ranking protocol developed by an archaeologist. This potential ranking is then reviewed by an archaeologist who takes into account other critical site information and historic information. These combined activities are expected to fulfill the requirement under item 3) a), above, to complete an an archaeological overview assessment where there is no provincially recognized Archaeological Predictive Model.

### **Archaeological Assessment Results for Units B, E, and F**

Since the last Development Plan, a number of archaeological assessments have been completed for cutblock areas within Units B, E and F. A summary of the assessments completed and the associated findings is provided in Table 9, immediately below.

**Table 9: Summary of Completed Archaeological Assessments for Cutblocks and Roads (2017-2018)**

<b>CNC Cutblock</b>	<b>Assessment Date</b>	<b>Type of Assessment(s) Required</b>	<b>Findings</b>
<b>B-3</b>	September 2017	Archaeological Detailed Review Archaeological Impact Assessment (east portion only)	Low archaeological potential on the western portion of block; no Arch features found within the harvest area
<b>B-4</b>	September 2017	Archaeological Detailed Review	Low Archaeological potential; no AOA or AIA needed
<b>B-5</b>	September 28, 2017	Archaeological Detailed Review	Low Archaeological potential; no AOA or AIA needed
<b>B-6</b>	September 26, 2018	Archaeological Detailed Review	Low Archaeological potential; no AOA or AIA needed
<b>E-9</b>	November 16, 2018	Archaeological Detailed Review	Low Archaeological potential; no AOA or AIA needed
<b>E-10</b>	November 16, 2018	Archaeological Detailed Review	Low Archaeological potential; no AOA or AIA needed
<b>F-5</b>	June 15, 2017	Archaeological Detailed Review	Low Archaeological potential; no AOA or AIA needed
<b>F-6</b>	June 15, 2017	Archaeological Detailed Review	Low Archaeological potential; no AOA or AIA needed
<b>F-7</b>	June 15, 2017	Archaeological Detailed Review	Low Archaeological potential; no AOA or AIA needed
<b>F-8</b>	June 15, 2017; September 10, 2018	Archaeological Detailed Review	Low Archaeological potential; no AOA or AIA needed
<b>F-9</b>	June 15, 2017	Archaeological Detailed Review	Low Archaeological potential; no AOA or AIA needed
<b>F-11</b>	June 15, 2017	Archaeological Detailed Review	Low Archaeological potential; no AOA or AIA needed

## All Forest Health Factors

*As per the “Current Management Challenges” section of this Management Plan, the Research Forest is expected to experience notable occurrences of forest pathogens, insects, and other forms of natural damage within all types of forest stands. This presents a regular challenge for on-going timber supply management and for implementing strategies to conserve and protect various forest resources. Given the significant ongoing and future forest health hazard for both mature and young timber, forest health management is expected to be an ongoing management focus.*

*The objective for forest health management is to minimize the risk to timber loss while conserving and protecting natural resources consistent with all the objectives within this plan. This is to be achieved by (the following strategies do not apply to existing pine mortality from mountain pine beetle):*

- 1) Implementing annual aerial detection and assessment of forest health factors;*
- 2) Implementing ground reconnaissance, inspections, or assessments for any areas identified having a non-endemic level of forest health factors from aerial detection or other fieldwork;*
- 3) Undertaking previously recognized insect trapping and baiting treatments to hold or suppress insect populations where there are non-endemic levels of insect attack and where adjacent stands are assessed with a high hazard for insect attack;*
- 4) Undertaking experiments within mature forests, young forests, and clearcut areas to evaluate new trapping and baiting treatments for conifer bark beetles.*
- 5) Undertaking sanitation and salvage harvesting treatments of various sizes and forms within stands greater than 50 years old, prior to sawlog shelf-life expiry, where there is a moderate to high likelihood of the stand being reduced to less than 140m<sup>3</sup>/ha of net live conifer timber;*

*A cutblock is deemed a required salvage operation when the current amount of live timber (or predicted amount of live timber within 2 years) equates to 140 m<sup>3</sup>/ha of net timber volume or 130 m<sup>3</sup>/ha of sawlog volume. Due to speculative value of subalpine fir (balsam), stands that are dominated by live balsam volume (>75%) may also be considered salvage stands even where the live volume exceed 140 m<sup>3</sup>/ha of net volume or 130 m<sup>3</sup>/ha of sawlog volume.*

- 6) Where possible, coordinate forest health treatments with adjacent forest tenure holders to improve effectiveness of treatments for areas within and outside of the Research Forest;*

*CNC continues to participate in the Prince George Timber Supply Area Beetle Working Group, which has included updates on current and proposed operations and sharing of beetle information gained from forestry operations and experiments. CNC and Dunkley have also been in discussion with other forest licensees, particularly Canfor-Prince George, concerning harvesting operations, log hauling and road-use.*

- 7) *Subject to considering biodiversity, riparian, water quality, and wildlife habitat values, undertaking sanitation treatments, and re-stocking, if necessary, in young, managed stands (0 to 20 years old) where there is moderate to high likelihood of not achieving 160m<sup>3</sup>/ha of conifer yield by age 65 without treatment (the volume threshold will be evaluated on the average yield of the existing cutblock containing the effected stand);*

To date, there have been no areas identified for treatment within cutblocks reforested under a CNC Research Forest Management Plan.

- 8) *Subject to considering biodiversity, riparian, water quality, and wildlife habitat values and subject to Provincial funding, undertaking partial cut or clearcut sanitation and salvage harvesting treatments, and re-stocking, if necessary, in intermediate aged stands (21 to 50 years of age) where there is moderate to high likelihood of not achieving 160m<sup>3</sup>/ha of conifer yield by age 65 without treatment. (The volume threshold will be evaluated on the average yield of the existing cutblock or the expected future cutblock containing the affected stand. The maximum forecasted mid-term timber supply effect of forest health treatments in stands 21 to 50 years old is to be less than an average of 500m<sup>3</sup>/year during the 10 to 60-year period.); and*

A thorough assessment of the intermediate-aged stands within the Research Forest has not been undertaken. It is expected that any potential treatment areas may be initially identified using available provincial information, new inventory data, LiDAR data, and recent imagery. There should be reasonable provincial information for most of the intermediate-aged stands within the Research Forest as most are a result of previous harvesting. Any areas identified from the available information will require additional verification from ground reconnaissance.

- 9) *When considering isolated occurrences of forest health factors, other than bark beetle, the minimum treatment size is 15ha.*
- 10) *When undertaking harvesting treatments under objectives 3, 4 or 6, the objectives concerning retention of trees are to be achieved regardless of forest health factors.*

## **Forest Health Assessment Results**

The total Research Forest area is assessed for forest health factors via a combination of self-implemented aerial and/or ground assessment along with provincial aerial assessments. A self-implemented aerial overview assessment of Research Forest Units was conducted on June 6<sup>th</sup> and June 21<sup>st</sup>, 2018. All Research Forest Units were viewed via helicopter flight. There is some level of notable spruce or Douglas-fir beetle within or adjacent to every Unit. The Cutblocks with damage percentages listed are those that were harvested recently (winter 2018 or summer 2018) or are currently scheduled for harvest.

### **Research Forest Unit A**

The vast majority of Unit A was deemed salvage harvesting priority due to spruce attack and mortality, which largely occurred during the spring of 2016 and 2017. Based on timber cruising, Unit A recorded the highest levels of spruce beetle damage of the northern Research Forest Units. There are large remaining mature spruce-balsam stands that will remain post-harvest,



but these areas are intended to contribute to visual quality, biodiversity, and wildlife habitat and are not being actively managed for bark beetle attack.

Cutblock	Total Conifer Damage	Total Spruce Damage
A-3	55%	99% (salvage treatment)
A-4	43%	96% (salvage treatment)
A-5	57%	87% (salvage treatment)
A-6	32%*	54%* (salvage treatment)

\*An additional beetle flight occurred prior to harvest, which was not included in these damage percentages.

### **Research Forest Unit B**

Based on timber cruising, timber ground reconnaissance and helicopter viewing, there is still active spruce beetle and Douglas-fir beetle within Unit B, following the harvest of Cutblock B-1 and B-2. The Douglas-fir beetle is largely located in the northeastern portion of Unit B. Further timber cruising and ground reconnaissance is planned to verify potential beetle removal and salvage operations in the southeastern, mid, and northeastern portions of Unit B. Large areas are planned to be left untreated to provide for visual quality (from Tacheeda Lakes) as well as biodiversity and wildlife habitat.

Cutblock	Total Conifer Damage	Total Spruce Damage
B-2	62%	79% (salvage treatment)
B-3	37%	55% (sanitation and salvage treatment)
B-4	67%	90% (salvage treatment)
B-5	Not reported. Expected to be high salvage priority	
B-6	81%	93% (salvage treatment)

### **Research Forest Unit C/D**

Research Forest Units C and D were the first areas to display the effects of large-scale epidemic spruce beetle attack, which was easily visible in 2015. Salvage harvesting across the vast majority of the spruce-balsam stands occurred during the winter of 2016-17. The remaining mature timber within Unit D is composed primarily of prescribed riparian/lakeshore reserves and wildlife tree retention. A sizeable area of balsam-leading mature timber is remaining within Unit C. No further beetle harvesting may be supported as the old forest amount is near the minimum amount specified in the management plan.

### **Research Forest Unit E**

There was still small amounts of active spruce beetle evident from the helicopter flight in June 2018, but with the harvesting of Cutblock E-6 this summer, there will be very little susceptible spruce stands remaining, except those that are intended as wildlife tree and biodiversity retention areas. Based on current spruce beetle activity in the Chuchinka Creek area, very little attack on the healthy younger mature spruce trees within Unit E is expected. Within the mid-section of Research Unit E, a couple notable Douglas-fir stands were observed. While Douglas-fir beetle attack is prevalent, these areas are being reserved due to the rarity of the Douglas-fir in the area and as rare ecosystems and habitat. The spruce and Douglas-fir areas will continue to be monitored.

Cutblock	Total Conifer Damage	Total Spruce Damage
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E-5	66%	92% (salvage treatment)
E-6	64%	78% (salvage treatment)
E-7	23%	31% (small sanitation/salvage treatment)
E-8	18%	30% (small sanitation treatment)
E-9	Not reported. Expected to be high salvage priority	
E-10	Not reported. Expected to be high salvage priority	

#### **Research Forest Unit F**

Sizeable areas of recent spruce beetle attack were evident from the helicopter flight in June 2018. This was most evident in the southeastern portion of Unit F. Recent timber cruising is showing active widespread spruce beetle although the percentage of green attack is relatively low in many areas. Further timber cruising and timber ground reconnaissance will be undertaken to verify the potential beetle removal and salvage operations in the southern half of Unit F. Planning is underway to ensure that biodiversity, old forest habitat and rare ecosystems are being conserved as required under the Management Plan.

Cutblock	Total Conifer Damage	Total Spruce Damage
F-5*	25%*	29%* (salvage treatment)
F-6*	28%*	49%* (salvage treatment)
F-8*	33%*	44%* (small sanitation/salvage treatment)
F-11*	57%*	40%* (salvage treatment - blowdown)

\*An additional beetle flight occurred prior to harvest, which was not included in these damage percentages.

#### **Research Forest Unit G**

After completing beetle control measures and salvage harvesting within the southwestern portion of Research Forest Unit G during the fall of 2016 and winter of 2017, ground reconnaissance confirmed moderate to heavy spruce beetle attack within the mid to northeastern portion of Unit G. Seven large cutblocks were harvested during fall 2017 and winter 2018 to address operable spruce and spruce/balsam stands with moderate to high damage. Cutblock G-2 was laid-out in previous years, but is now planned for harvest due to high spruce beetle damage. Timber cruising was completed this summer with the following combined beetle and blowdown damage results for the seven cutblocks (including Cutblock G-2). The remaining mature forest is largely composed of a mix of spruce-balsam and balsam-spruce stands, much of which are being retained for biodiversity and old forest habitat maintenance. No further harvesting treatments are planned for this area.

Cutblock	Total Conifer Damage	Total Spruce Damage
G-2	49%	84% (salvage treatment)
G-5	46%	83% (salvage treatment)
G-6	39%	83% (salvage treatment)
G-7	37%	65% (salvage treatment)
G-8	47%	85% (salvage treatment)
G-9	39%	56% (salvage treatment)
G-10	44%	48% (large sanitation/salvage treatment)

#### **Unit H**

The eastern portion of Research Forest Unit H has a mosaic of forest types, including some Douglas-fir leading areas. The 2018 provincial aerial overview survey identified approximately

40 beetle attacked Douglas-fir trees within or near Research Unit H as well as very light balsam bark beetle attack. The Douglas-fir attack was also noted during the previous provincial OAS. From the June helicopter flight, there was evident Douglas-fir beetle activity, particularly in the northeastern portion of Unit H. This Unit will continue to be aurally monitored to ensure early detection of any non-endemic levels of beetle attack.

#### Unit I

A trace amount of spruce bark beetle was recorded in the northern portion and southeastern portion of Unit I via the 2018 provincial aerial overview survey. No bark beetle activity was recorded in the previous provincial aerial assessment. A notable finding from the 2018 OAS is the amount of budworm attack on both the north and south side of the Fraser River near Hungary Creek. This potentially increases the hazard of further spruce beetle and western balsam bark beetle attack due to increased stress on the balsam and spruce trees. The helicopter reconnaissance completed in June 2018 noted that there was very little active spruce beetle, which appears to be associated with riparian areas that have been experiencing endemic levels of spruce beetle attack over many years. This Unit will continue to be aurally monitored to ensure early detection of any non-endemic levels of beetle attack.

#### Unit J

The 2018 provincial aerial overview survey (OAS) noted individual beetle attacked Douglas-fir, but no active spruce beetle within Unit J. Of note from the OAS is the occurrence of sizeable areas of spruce beetle attack across the Fraser River to both the northeast and northwest of Unit J. The previous provincial aerial overview also noted limited areas of Douglas-fir beetle attack. The helicopter flight completed in June 2018 detected little change from the flight completed in June 2017. The spruce beetle appears to be limited to endemic levels, mostly within the riparian area along the park boundary and the within the riparian area that divides the unit. There was also a couple small patches of red Douglas-fir mortality, but they did not appear to be larger than was detected in 2017. Due to younger average age of the forest types and the mixed forest composition, widespread bark beetle outbreaks are not expected, but the area will continue to be aurally monitored to ensure early detection of any non-endemic levels of beetle attack.

#### Unit K

The 2018 provincial aerial overview survey noted western balsam bark beetle and spruce beetle in trace amounts in the vicinity of Research Unit K. Large areas of budworm attack were noted to the southwest of Unit K. On ground reconnaissance during September 2018 identified very small patches (individual trees) of balsam mortality from western balsam bark beetle. There were no notable spruce beetle areas detected, although a few very small patches of endemic spruce beetle were noted in from the ground in both 2017 and 2018.

#### Unit L

No notable forest health factors were noted within Unit L as a result of the 2018 provincial aerial overview survey or from the helicopter reconnaissance in June 2018.

## **Forest Health Treatment Results**

### **Research Forest Unit A**

All of the cutblocks identified under Forest Health Assessment results are considered salvage harvesting operations due to the low remaining live volume. Harvesting is now complete on all areas identified for salvage and sanitation harvest, including Cutblocks A-3, A-4, A-5, and A-6, which were harvested during the summer and fall of 2018.

For the purposes of old forest conservation, forest biodiversity maintenance and wildlife habitat conservation, a number of interconnecting riparian reserves and wildlife tree retention area are planned where no sanitation or salvage treatment is to be applied.

### **Research Forest Unit B**

The salvage harvesting for Cutblock B-2 was started in September 2017 and was finished in late summer 2018. Further sanitation or salvage harvesting is now planned for the highly attacked areas in northeastern (B-5 and B-6), mid (B-4), and southeastern (B-3) sections of Unit B. This harvesting is planned for winter 2019, and is expected to have minimal visual impact from Tacheeda Lakes and the recreation site.

For the purposes of old forest conservation, visual quality maintenance, forest biodiversity maintenance and wildlife habitat conservation, a number of interconnecting riparian reserves and wildlife tree retention area are planned where no sanitation or salvage treatment is to be applied.

### **Research Forest Unit E**

The salvage harvesting is completed within Cutblocks E-5 and Cutblock E-6 during the summer of 2018. The sanitation harvesting within Cutblocks E-7 and E-8 was completed during the winter of 2018. Additional small areas of high spruce beetle attack were noted between Cutblocks E-7 and E-8. These areas are planned for salvage harvesting during the winter of 2019. No other sanitation and salvage volume is being planned at this time.

For the purposes of old forest conservation, visual quality maintenance, forest biodiversity maintenance and wildlife habitat conservation, a number of interconnecting riparian reserves and wildlife tree retention area are planned where no sanitation or salvage treatment is to be applied.

### **Research Forest Unit F**

Cutblocks F-5, F-6, F-8, and F-11 were initiated in the fall of 2018 for beetle removal and salvage within southern portion of Unit F. A further cable harvesting area, Cutblock F-7, has been identified as another high priority area for beetle removal and salvage, along with F-9, which is considered a moderate priority based on current beetle levels. There may be opportunity for using felled spruce trap trees to reduce the spruce beetle effect within Cutblock F-9 during the winter of 2019. Beyond Cutblocks F-7 and F-9, no sizable sanitation and salvage operations are proposed. The remaining area is required for biodiversity and habitat purposes.

For the purposes of old forest conservation, forest biodiversity maintenance and wildlife habitat conservation, interconnecting riparian reserves and wildlife tree retention areas are planned within the southern half of Unit F, where no sanitation or salvage treatment is to be applied.

### **Research Forest Unit G**

All harvesting of the Cutblocks G-2, G-5, G-6, G-7, G-8, G-9, and G-10 is now complete. This totals over 600 ha of primarily salvage harvesting. No other sanitation and salvage volume is being planned at this time.

For the purposes of old forest conservation, visual quality maintenance, forest biodiversity maintenance and wildlife habitat conservation, a number of interconnecting riparian reserves and wildlife tree retention area are planned where no sanitation or salvage treatment is to be applied.

### **Research Forest Units H**

No treatments are currently planned, but further monitoring is planned to assess Douglas-fir beetle activity.

### **Research Forest Units I**

No treatments are currently planned, but further monitoring is planned to assess spruce beetle activity.

### **Research Forest Unit J**

No treatments are currently planned, but further monitoring is planned to assess spruce beetle and Douglas-fir beetle activity.

### **Research Forest Unit K**

No treatments are currently planned, but further monitoring is planned to assess spruce beetle and western balsam bark beetle activity.

### **Research Forest Unit L**

No treatments are currently planned, but further monitoring is planned.

### **Spruce Beetle Collection and Monitoring**

During the spring and summer of 2017 and 2018, CNC installed funnel traps with spruce beetle lures at multiple sites with the Chuchinka Creek area and at the Hart Highway Log Yard. Air temperature monitors were also deployed at all the collection sites. The intent is to trap beetles throughout the entire spruce beetle flight period to better correlate air temperature with the emergence and flight activity of spruce beetles. The entire 2017 beetle collection was provided to Natural Resource Canada (Victoria) for counting and potential analysis. The 2018 collection was identified, sorted and counted by CNC staff. CNC is using the beetle collection and temperature data to produce reports of spruce beetle activity relative to fluctuating air temperature in an attempt to better guide the strategies for the storage and transportation of spruce beetle infested logs.

## Forest Health Experimental Results

### 2016 Spruce Beetle Funnel Trapping Trials

One funnel trapping trial was implemented to test the effectiveness of a new funnel trap design within mature spruce/balsam stands. The new funnel trap designs were not successful in capturing increased amounts of spruce beetle compared to the standard Lindgren funnel traps.

The other funnel trapping trial was implemented to test the effectiveness of adding an ethanol vapor component to individual funnel traps within a recent clearcut and within a mature spruce/balsam stand. There was no significant difference in spruce beetle catch between the traps with ethanol enhanced lures and the traps with traditional lures.

At this time, it is uncertain whether further studies into potential funnel trap and beetle lure improvements will be implemented with the Research Forest.

### 2018 Spruce Shelf-Life Study

CNC recently partnered with the Ministry of Forests, Lands, Natural Resource Operations and Rural Development (Ministry) to prepare and study spruce log samples collected from spruce beetle sites during the winter of 2018. The results of this work are expected to further supplement the early spruce shelf-life findings that the Ministry has been communicating to the forest industry. There also plans to more closely study the occurrence and nature of wood rots typically found within the old-aged spruce trees being attacked by spruce bark beetle north of Prince George.

## Mountain Pine Beetle Salvage

*The remaining areas of mountain pine beetle damaged pine-leading stands within the Research Forest are now reaching the end of their economic shelf-life due to remaining volume per hectare and degradation of wood quality.*

*The objective for pine-leading stands killed by mountain pine beetle is to salvage remaining fibre value and return sites to productive conifer forests, subject to considering biodiversity, riparian, water quality, and wildlife habitat values. This will be achieved through the following strategies:*

- 1) Salvage harvesting damaged pine-leading areas greater than 15ha, if there is remaining pine sawlog shelf-life as determined through an in-field assessment, where the average net tree size is greater than 0.18m<sup>3</sup>/tree and average tree height is greater than 22m and where the remaining live trees are not expected to achieve 160m<sup>3</sup>/ha of conifer yield by age 65 (this only applies when undertaking the harvest of adjacent stands where the average volume per hectare across all the areas – pine salvage area and adjacent stands -- is greater than 180m<sup>3</sup>/ha of net conifer timber); and*
- 2) Isolated damaged pine-leading stands less than 15ha or stands that have exceeded sawlog shelf life as determined from an in-field assessment, will be considered for rehabilitation treatments and full re-stocking where the remaining live trees are not*

*expected to achieve 160m<sup>3</sup>/ha of conifer yield by age 65 (rehabilitation treatments are dependent on the availability of Provincial funding).*

#### **Units A, B, E, F, J and L**

There are currently no plans to harvest or rehabilitate the areas occupied by standing dead pine within Units A, B, E, F, I, J, K and L, which totals approximately 300ha. In most cases, these areas contain a low volume of dead pine for salvage that is of marginal quality. The areas with dead pine also commonly contain a moderate to high density of mature spruce-leading, balsam-leading or Douglas-fir-leading (Unit J) timber. Many of these remaining live tree layers are expected to produce merchantable volume in the foreseeable future. In addition, a notable amount of the dead pine stands occupy riparian areas, rare ecosystems (SBS wk1 02, 03, and 04), and uncommon mature forests (aspen and Douglas-fir leading in Units A to G), and are planned for inclusion in prescribed tree reserves and biodiversity corridors.

There is no harvest priority associated with the dead pine stands under the current timber supply review and under current operational plans. All dead pine volume is considered non-operable, and therefore dead pine stands do not contribute any timber volume to the forecasted allowable annual cut.

Where stands are not being retained for biodiversity or wildlife habitat, it is possible that portions of the remaining dead pine areas may be included with upcoming spruce beetle harvesting, but the included area is expected to be minimal.

## **Mountain Pine Beetle Salvage Results**

The following summarizes the remaining dead pine stands as identified within the 2017 CNC forest inventory.

#### **Unit A**

There is 32 ha of dead, mature pine stands remaining in the northeast portion of Unit A. At this time, the vast majority of this area is planned for biodiversity retention. There is a high component of Douglas-fir throughout these stands and much of area is SBS wk04 (rare ecosystem) on steep terrain with rock outcrops.

#### **Unit B**

There is 13 ha of dead, mature pine stands remaining in the northwest portion of Unit B, but the area is not contiguous and is largely within a retention visual quality objective. The entire area of pine is planned for biodiversity and visual quality retention.

#### **Unit C**

There are no remaining mature pine stands within this unit.

#### **Unit D**

There are no remaining mature pine stands within this unit.

### **Unit E**

In the most-southeastern portion of Unit E, there is a 19 ha stand of dead mature pine timber. This area is not planned for harvest due to the steep slopes and the relatively low volume of damaged pine. The area also supports a significant volume of live balsam-leading timber that is expected to provide future merchantable volume.

In the northeastern portion of Unit E, there is an 11 ha stand of beetle attacked mature pine-leading timber. This area is not planned for harvest as the damaged pine volume is relatively low and the area supports a significant volume of live spruce-leading timber that is expected to provide future merchantable volume.

There is 62 ha of beetle attacked mature pine stands that are somewhat contiguous throughout the southwestern portion of Unit E. Approximately half of the area is planned for biodiversity retention, particularly those stands that support live aspen-leading timber, Douglas-fir leading timber or that support rare SBS wk1 03 and 04 ecosystems. The majority of the other stands contain significant live volumes of spruce or balsam leading timber that are expected to provide future merchantable volume.

### **Unit F**

There are no contiguous pine-leading areas > 15 ha. In total, there is 36 ha of beetle attacked mature pine timber remaining in the southern half of Unit F. Another 7 ha remains adjacent to the eastern boundary of Cutblock F-4 as a prescribed wildlife tree retention area. The majority of the 36 ha is not planned for harvest as it will be maintained for conservation of riparian area, rare SBS wk1 02 ecosystems, mature aspen, forest cover diversity, and wildlife habitat.

### **Unit G**

There are no mature pine stands remaining within Unit G.

### **Unit H**

There are no mature pine stands within Unit H.

### **Unit I**

There are two dead, mature pine areas identified within the 2017 forest inventory. One is approximately 8 ha and is located west of the small lake within a wetland and bog complex. This area is currently planned to be reserved from harvesting to conserve the wetland complex. The other pine area is approximately 3 ha and is located near the highway, partly within the partial visual quality objective that runs parallel to the highway. This area will be left to grow as it also supports a good density of spruce-leading forest.

### **Unit J**

There is approximately 59 ha with a dead, mature pine layer, but it is distributed in 11 separate patches within the western half of Unit J. These same patches support a moderate density of Douglas-fir or spruce-leading mature timber, while the average dead pine density is relatively low (approximately 200 stems/ha). Virtually all of this area is operable for future harvest, but the low dead pine density makes this area a low salvage priority.



### **Unit K**

There is approximately 11 ha of dead mature pine in the southeastern portion of Unit K located on the steep slopes above Pitoney Creek. This area will be retained to maintain riparian values, slope stability, visual quality. This area also supports a good density of mature spruce.

There is approximately 42 ha of area that supports dead, mature pine along the western side of Unit K. It is not fully contiguous area, but there is one patch that is 26 ha. Nearly all of the 42 ha is located within a retention visual quality, and approximately 12 ha is located on the steep slopes above the Willow River. There is a moderate density of mature spruce growing throughout these areas while the dead pine density is relatively low (200 stems/ha). Harvesting across about 30 ha of the area may be operationally feasible in the future, but will be undertaken to capture the spruce timber. No operations are planned to salvage the low density dead pine through these areas.

### **Unit L**

There is a 1 ha area located within the west, central area of Unit L that is identified as have a dead mature pine layer. It is part of the larger area that was not chosen for harvest when the area was salvage harvested for pine. This area has a low mature spruce density, but will be left to grow and develop along with the remaining mature forest areas within Unit L.

## **Spruce Beetle Sanitation and Salvage**

*A very large outbreak of spruce beetle attack on mature spruce trees is being experienced largely in the northeast portion of the Prince George Forest District (Parsnip River and Crooked River drainages). At the time of writing this Management Plan, this current outbreak has affected the majority of the mature spruce timber throughout Research Forest Units C and D. As well, a large amount of attack has been detected in Units E, F, and G. Greater than endemic levels of spruce beetle attack have also been observed in portions of Unit B.*

*The objective, with respect to spruce beetle, is to rapidly reduce beetle populations within all Research Forest Units and rapidly recover the commercial value of attacked trees. This will be achieved through the following results and strategies:*

- 1) Within areas that are not prescribed for the conservation of natural resources, the goal is to limit non-salvaged losses from spruce beetle to 20,000m<sup>3</sup> over five years;*
- 2) Undertaking the regular detection, treatment, sanitation, and salvage of spruce beetle affected areas as per the strategies under the section "All Forest Health Factors"; and*
- 3) Collaborating with business partners to implement hauling and milling strategies consistent with current best management practices distributed by the Ministry of Forests, Lands, and Natural Resource Operations.*

## **Spruce Beetle Sanitation and Salvage Results**

### **Non-salvaged Losses**

Upon the completion of the vast majority of the spruce salvage harvesting, which is expected to be summer 2019, an estimation of the spruce non-salvageable losses will be undertaken. The area of non-salvageable losses is expected to be largely composed of forests that contribute to wildlife tree retention, riparian conservation, rare ecosystems, biodiversity and wildlife habitat.

### **Sanitation and Salvage Harvesting**

The efforts to reduce spruce beetle populations and salvage infested volume are described under the “Forest Health Treatment Results”

### **Hauling and Milling Plans**

A large portion of the logs harvested during the fall of 2017 and winter of 2018 were temporarily stored at the log yard located south of Bear Lake on the east side of the Hart Highway. This is an operational necessity as there is not enough trucking resources to move the logs from the Bear Lake area to the Dunkley Sawmill (primary destination of most logs) due to the long haul return time. In some cases, there are further hauling limitations due to safe logging truck numbers on certain sections of forest road.

Approximately half of the volume stored at the log yard was spruce logs, of which the majority was spruce beetle attacked. Hauling from the log yard to the final mill destinations has occurred continuously throughout the winter and was increased dramatically after March. Much of the log hauling occurred during the current spruce beetle flight, which began approximately about the middle of May (small amounts of spruce beetle were emerging and flying in early May). Funnel traps were installed in the log yard in early May to monitor beetle emergence and to schedule truck hauling accordingly. Hauling continues from the log yard at the time of this Development Plan.

Starting in April 2018, hauling from the log yard prioritized the hauling of large diameter spruce beetle logs. The logs were destined for the Dunkley Mill site, where milling prioritized spruce beetle logs over green logs. Hauling from the log yard was restricted to night shift when temperatures were between 16°C and 25°C and spruce beetle was notably present in funnel traps. No hauling was to occur when temperatures exceed 25°C and spruce beetle was notably present in funnel traps. In addition to prioritizing the removal of spruce beetle logs, the bark debris within the log and mill yard was to be disposed of. The hauling and milling plan submitted for the 2018 spring/summer period is included in Appendix E.

Storing logs at the Hart Highway log yard will be necessary for logs harvested during the fall/winter of 2018/19 and beyond. Based on the recent spruce beetle trapping and monitoring, a new report will be developed prior to spring 2019 with recommendations regarding monitoring spruce beetle activity within the log yard and managing future log hauling restrictions. A new hauling and milling plan will follow and is planned for submission to the Ministry of Forests, Lands and Natural Resource Operations prior to the spring 2019 spruce beetle flight.

# Harvesting Consistency with Chief Forester Guidance Regarding Spruce Beetle Sanitation and Salvage

## Stand and Landscape-Level Retention for Harvesting in Response to Spruce Beetle Outbreaks

The Chief Forester guidance regarding stand and landscape-level retention was released in September 2017, aimed at those involved in designing harvesting in response to spruce beetle outbreaks within the Omineca Region (includes Prince George and MacKenzie Timber Supply Areas). There are 25 items listed in the guidance. The following summarizes the key categories of guidance relevant to the management of the CNC Research Forest. For each category of guidance, the Research Forest harvesting since September 2017 is examined to test consistency with the Chief Forester guidance. This includes examination of the following cutblocks: A-2, A-3, A-4, A-5, A-6, A-8, E-5, E-6, E-7, E-8, G-2, G-5, G-6, G-7, G-8, G-9, and G-10. The design and layout of many of these cutblocks was finalized prior to the implementation of the Chief Forester guidance.

## Coordinated Harvest and Landscape-Level Retention Planning

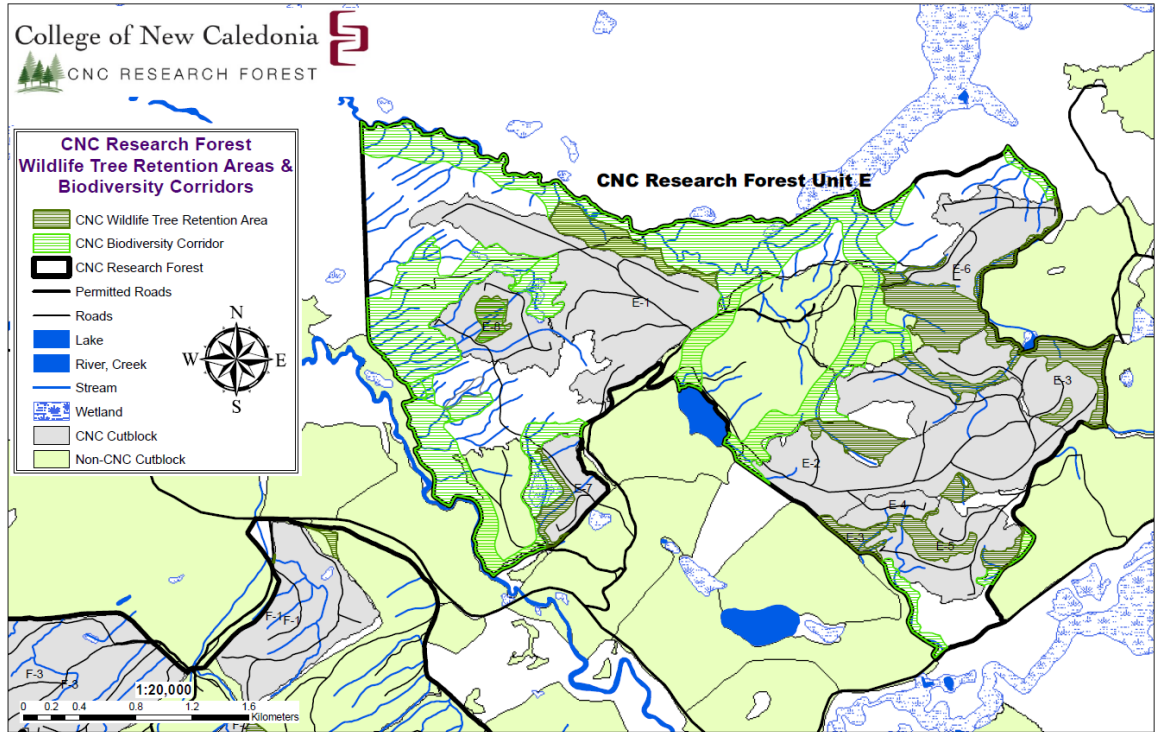
There should be an effort between licensees, in partnership with government and First Nations, to coordinate harvest planning and develop a spatialized retention plan that identifies areas retained from harvesting for a minimum of 40 years. The plan should be long-ranging and minimize large amalgamated openings. Retention areas should be located to benefit multiple values. Landscape biodiversity thresholds established in orders are legal requirements to be met. There should be collaboration on the tracking of harvesting, partial harvesting and retention in response to the beetle outbreak.

## Results:

During 2017, spatial planning of potential retention areas (referred to as biodiversity corridors) was completed for all remaining non-harvested areas within Units A, B, E, F and G. These retention areas were aimed at maintaining mature forest connectivity where possible and largely included old forest (>120 year old) spruce and balsam stands but also included retention of rare ecosystems (primarily SBS wk1 02, 03, and 04 sites), riparian areas, and both Douglas-fir leading and deciduous-leading stands.

In terms of future forest development, these biodiversity corridors were intended for the establishment of wildlife tree retention areas which are assumed to remain unharvested for 60 years or may remain as biodiversity corridors where only 33% of the area may be less than 60 years old at any time. This supersedes the requirement to leave the areas unharvested for a minimum of 40 years. As an example Figure 18, shows the current configuration of wildlife tree areas and biodiversity corridors within Research Forest Unit E. It should be noted that some of the biodiversity corridor area includes non-mature forests, in which harvesting is to be delayed to ensure recruitment of connecting mature forests.

**Figure 18: Wildlife Tree Retention Areas and Biodiversity Corridors within Research Forest Unit E**



#### **Mid-Term Timber Supply Considerations in Retention Planning**

Marginal or non-impacted stands should be retained in order to contribute to the mid-term timber supply. Ensure the impacts on all forest values including mid- and long-term stand yields are considered.

#### **Results**

For the vast majority of spruce beetle cutblocks harvested or planned, the bark beetle attack percentages were very high, so there was limited opportunities for retaining significant sized areas suitable for mid-term timber supply. In almost every case, the only areas predicted to provide sufficient mid-term timber volume were balsam-leading, therefore the mid-term timber was forecasted to be 80% or greater balsam. The future economic viability of these stands was deemed highly speculative as similar mature balsam stands are considered problem stands under current timber supply assumptions. In consideration of this, the location of retention areas was primarily based on the potential to contribute to various forest values rather mid-term timber supply (ex. Riparian areas, uncommon habitat, and ecosystems at risk).

#### **Stand-Level Retention Relative to Early Seral Patch Size**

New harvesting is expected to take into account existing harvest openings. Early seral is considered 0 to 40 years old. Minimize the creation of large early seral patches (>1,000ha) and provide rationalization when doing so. Stand-level retention of mature / old forest structure should increase as the size of the harvest patches increases:

Patch Size	Percent of Patch Unharvested/Retained
<50 ha	10%
50-100 ha	>10%
101-1,000 ha	>15%
>1,000 ha	>25%

### **Results:**

Due the existing pattern of previous harvesting and current wide distribution of large early seral patches within and adjacent to the Research Forest, it is not possible to undertake any sizeable spruce beetle harvesting without contributing to relatively continuous early seral patches greater than 1,000 ha. This is the case for many extensive areas within the Prince George Timber Supply Area. The alternative is to ensure that all management objectives are met within each Research Forest Unit (ex.: old forest retention, riparian management, coarse woody debris retention, etc) and that the resulting area contains an appropriate percentage of remaining mature forest. The Chief Forester recommendation is >25% when the resulting continuous early seral patch >1,000 ha. Table 10, below, summarizes the total percentage of cutblock area prescribed as wildlife tree retention area within each Research Forest unit since the release of the Chief Forest guidance. Besides Research Forest Unit A, which is slightly below the recommended target (24.3% vs 25%), the post-guidance harvesting in all other units has achieved the Chief Forester guidance of 25% for mature forest retention associated with cutblocks contributing to >1,000 ha early seral patches (less than 40 years old).

**Table 10: Wildlife Tree Retention within Each Research Forest Unit**

Cutblock ID	Harvest Year	Total Cutblock Area (ha)	Harvest Area (ha)	Reserve Area (ha)	Wildlife Tree Area %
<b>UNIT A</b>					
A-2	2017	104.5	74.9	29.6	28.3%
A-3	2018	69.7	51.2	18.50	26.5%
A-4	2018	48.4	36.2	12.2	25.2%
A-5	2018	133.3	110.6	22.7	17.0%
A-6	2018	50.7	42.6	8.1	16.0%
A-8	2017	57.5	36.0	21.5	37.4%
<b>Unit A: Total Retention Post-guidance</b>		<b>464.1</b>	<b>351.5</b>	<b>112.6</b>	<b>24.3%</b>
A-1	2015	158.7	134.3	24.4	15.4%
<b>Unit A: Total Retention Pre-guidance</b>		<b>158.7</b>	<b>134.3</b>	<b>24.4</b>	<b>15.4%</b>
<b>Unit A: Overall Retention Total</b>		<b>622.8</b>	<b>485.8</b>	<b>137.0</b>	<b>22.0%</b>

Cutblock ID	Harvest Year	Total Cutblock Area (ha)	Harvest Area (ha)	Reserve Area (ha)	Wildlife Tree Area %
<b>UNIT B</b>					
B-2	2018	152.3	121.5	30.8	20.2%
B-3	2019	101.1	75.7	25.4	25.1%
B-4	2018	32.5	23.6	8.9	27.4%
B-5	2019	37.8	21.5	16.3	43.1%
B-6	2019	14.7	10.9	3.8	25.9%
<b>Unit B: Total Retention Post-guidance</b>		<b>338.4</b>	<b>253.2</b>	<b>85.2</b>	<b>25.2%</b>
B-1	2017	146.8	109.9	36.9	25.1%
<b>Unit B: Total Retention Pre-guidance</b>		<b>146.8</b>	<b>109.9</b>	<b>36.9</b>	<b>25.1%</b>
<b>Unit B: Overall Retention Total</b>		<b>485.2</b>	<b>363.1</b>	<b>122.1</b>	<b>25.2%</b>

Cutblock ID	Harvest Year	Total Cutblock Area (ha)	Harvest Area (ha)	Reserve Area (ha)	Wildlife Tree Area %
<b>UNIT C</b>					
N/A					N/A
<b>Unit C: Total Retention Post-guidance</b>		-	-	-	N/A
C-1	2017	193.8	174.3	19.5	10.1%
C-2	2017	417.7	319.0	98.7	23.6%
C-3	2017	39.6	31.5	8.1	20.5%
<b>Unit C: Total Retention Pre-guidance</b>		<b>651.1</b>	<b>524.8</b>	<b>126.3</b>	<b>19.4%</b>
<b>Unit C: Overall Retention Total</b>		<b>651.1</b>	<b>524.8</b>	<b>126.3</b>	<b>19.4%</b>
<b>UNIT D</b>					
N/A					N/A
<b>Unit D: Total Retention Post-guidance</b>					N/A
D-1	2017	407.2	314.0	93.2	22.9%
D-2	2017	118.0	104.9	13.1	11.1%
D-3	2017	121.6	87.8	33.8	27.8%
D-4	2016	34.4	22.2	12.2	35.5%
<b>Unit D: Total Retention Pre-guidance</b>		<b>681.2</b>	<b>528.9</b>	<b>152.3</b>	<b>22.4%</b>
<b>Unit D: Overall Retention Total</b>		<b>681.2</b>	<b>528.9</b>	<b>152.3</b>	<b>22.4%</b>



Cutblock ID	Harvest Year	Total Cutblock Area (ha)	Harvest Area (ha)	Reserve Area (ha)	Wildlife Tree Area %
<b>UNIT E</b>					
E-5	2018	54.2	36.6	17.6	32.5%
E-7	2018	21.2	15.7	5.5	25.9%
E-8	2018	39.1	33.3	5.8	14.8%
E-6	2018	66.4	39.1	27.3	41.1%
<b>Unit E: Total Retention Post-guidance</b>		<b>180.9</b>	<b>124.7</b>	<b>56.2</b>	<b>31.1%</b>
E-1	2012	139.1	133.3	5.8	4.2%
E-2	2016	110.6	97.4	13.2	11.9%
E-3	2016	82.9	60.0	22.9	27.6%
E-4	2016	11.5	11.5	0	0.0%
<b>Unit E: Total Retention Pre-guidance</b>		<b>344.1</b>	<b>302.2</b>	<b>41.9</b>	<b>12.2%</b>
<b>Unit E: Overall Retention Total</b>		<b>525.0</b>	<b>426.9</b>	<b>98.1</b>	<b>18.7%</b>

Cutblock ID	Harvest Year	Total Cutblock Area	Harvest Area	Reserve Area	Wildlife Tree Area %
<b>UNIT F</b>					
F-5	2018	23.0	16.7	6.3	27.4%
F-6	2018	135.2	93.1	42.1	31.1%
F-7	2019	78.9	59.2	19.7	25.0%
F-8	2018	32.5	30.5	2.0	6.2%
F-9	2019	96.9	65.4	31.5	32.5%
F-11	2018	16.6	10.1	6.5	39.2%
<b>Unit F: Total Retention Post-guidance</b>		<b>383.1</b>	<b>275.0</b>	<b>108.1</b>	<b>28.2%</b>
F-1	2011	78.3	76.0	2.3	2.9%
F-2	2011	99.6	95.6	4.0	4.0%
F-3	2011	136	126.0	10.0	7.4%
F-4	2016	125.8	106.8	19.0	15.1%
<b>Unit F: Total Retention Pre-guidance</b>		<b>439.7</b>	<b>404.4</b>	<b>35.3</b>	<b>8.0%</b>
<b>Unit F: Overall Retention Total</b>		<b>822.8</b>	<b>679.4</b>	<b>143.4</b>	<b>17.4%</b>

Cutblock ID	Harvest Year	Total Cutblock Area (ha)	Harvest Area (ha)	Reserve Area (ha)	Wildlife Tree Area %
<b>UNIT G</b>					
G-2	2017	95.4	70.1	25.3	26.5%
G-5	2018	202.7	120.9	81.8	40.4%
G-6	2018	222.1	159.2	62.9	28.3%
G-7	2018	84.0	66.4	17.6	21.0%
G-8	2019	100.1	64.7	35.4	35.4%
G-9	2018	99.6	62.2	37.4	37.6%
G-10	2018	79.2	67.9	11.3	14.3%
<b>Unit G: Total Retention Post-guidance</b>		<b>883.1</b>	<b>611.4</b>	<b>271.7</b>	<b>30.8%</b>
G-1	2011-12	172.9	143.1	29.8	17.2%
G-3	2016	211.9	188.5	23.4	11.0%
G-4	2017	133.0	117.0	16.0	12.0%
<b>Unit G: Total Retention Pre-guidance</b>		<b>517.8</b>	<b>448.6</b>	<b>69.2</b>	<b>13.4%</b>
<b>Overall Retention Total</b>		<b>1,400.9</b>	<b>1,060.0</b>	<b>340.9</b>	<b>24.3%</b>

Assuming that all Research Forest Units north of Prince George now have relatively continuous early seral patches in excess of 1,000 ha (considering continuous areas within and adjacent to the Research Forest), then it is important that the remaining mature and old forest within each Unit is 25% or greater. Table 11, summarizes, by Research Forest Unit, the amount of area occupied by young (early seral) stands as well as the area occupied by mature and old forest. In this case, the amount of remaining mature and old forest is calculated after considering the harvest of all existing and planned cutblocks.

It may be observed that Research Forest Unit A is projected to be at 22% mature and old forest retention if the last proposed salvage cutblock (A-7) is harvested. Knowing this, no further clearcut salvaging will be considered at this time. Without the harvest of Cutblock A-

7, the mature and old forest retention will be near 24%. Unit F is projected to be at 18% retention with the harvesting of proposed salvage cutblocks F-7 and F-9. This is largely a result of very low retention prescribed with the harvest of the first three non-salvage cutblocks during 2011 and 2012. Knowing this, opportunities to reserve additional mature timber will be pursued, in attempts to increase the total mature and old forest retention near 20%. Although there is no further harvesting planned for Unit D, the previous salvage harvesting in 2016 and 2017 has resulted in approximately 24% mature and old forest retention. The other Research Forest units (B, C, E and G) have also undergone significant salvage harvesting, but are projected to well exceed the 25% mature and old forest target, ranging between 27% and 45% mature and old forest after all current development is completed. The location of the young forest relative to the mature and old forest may be observed on the maps provided in Appendix K. The old forest mapping in Appendix K differs from the mapping provided in Appendix J as slightly different cutblock designs and mapping criteria were applied in creating each set of maps.

**Table 11: Summary of Resulting Young, Mature, and Old Forest within Research Forest Units A to G**

Research Forest Unit	Early Seral Forest Area (<40 years old) (ha)	% of Unit with Early Seral Forest	Mature Forest Area (ha)	% of Unit with Mature Forest	Old Forest Area (120 years old) (ha)	% of Unit with Old Forest	Mature and Old Forest Area (ha)	% of Unit with Mature and Old Forest	Total Forest Area
A	730	78%	39	4%	165	18%	204	22%	934
B	640	61%	52	5%	361	34%	413	39%	1,053
C	702	67%	196	19%	146	14%	342	33%	1,043
D	825	76%	126	12%	131	12%	257	24%	1,082
E	591	55%	80	7%	407	38%	487	45%	1,078
F	982	82%	13	1%	203	17%	217	18%	1,199
G	1,605	73%	99	5%	481	22%	580	27%	2,185

#### **Composition and Design of Landscape-Level and Stand-Level Retention**

Retention areas should be representative of the forest that was present before harvesting (not limited to non-economic stands), including as many live and non-susceptible trees as possible. There should be an emphasis on connectivity and consideration of potential blowdown. Retention should capture multiple values wherever possible. The distance to standing tree cover for animals should not exceed 250 m (also adds natural seed dispersal). Secondary stand structure should be retained along with large CWD in various patterns. Special consideration needs to be made in areas identified for Caribou management; must follow government guidance for recovery.

Because the spruce beetle attacked Research Forest Units are well-dominated by spruce and balsam-leading stands, the vast majority of the retention areas are quite representative of the stands harvested. As a result, this recommendation was met. In addition, any significant areas of mature deciduous and Douglas-fir were retained, along with notable areas with ecosystems at risk.

As previously mentioned, live tree retention was often a secondary consideration due to both the high levels of spruce beetle attack and the few stands with predicted, economical mid-term timber volume. Despite the previous, the majority of retained stands have considerable live balsam content to provide ongoing live biodiversity.

Connectivity of retention areas was a primary consideration for Research Forest Units A, B, E, F, and G, but was not part of design for Unit C and D. Particularly in the case of Unit D, this has resulted in a comparatively low retention of old forest and a dominance of early seral stage patches.

The distance to tree cover of 250 m for potential animal movement was not considered in the planning, and therefore is only achieved where smaller cutblocks were designed.

Secondary stand structure was prescribed for retention on all cutblocks, but variable results were achieved based on abundance of understory, original stand damage conditions, snow levels, operational considerations and individual operator experience and discretion. This continues to be an area of improvement. To further pursue improvement, enhanced secondary stand structure and individual mature tree retention will be attempted in a few targeted cutblocks over the next few seasons.

Significant amounts of coarse woody debris have been left scattered on the cutblocks in all Units as harvesting contractors were directed not to skid all potential pulp log pieces. In addition, roadside debris and other harvesting debris has been gathered and piled to produce potential habitat targeted for rodents and mesocarnivores. For multiple cutblocks, some of the CWD piling was done as long continuous corridors to provide favourable protective cover to allow mesocarnivores to travel between mature forest areas in otherwise clearcut areas. It is expected that the recommendations regarding CWD have been met.

The caribou management recommendations do not apply to the Research Units harvested to date.

### **Partial Harvesting**

Partial harvesting should be utilized to optimize harvest of trees attacked by beetle while retaining healthy trees.

### **Results**

No partial retention harvesting has been attempted to date. Partial retention harvesting, in spruce beetle areas, is most applicable in areas of leading-edge attack where small patch cuts and individual tree removal is expected to be effective at controlling or removing live beetle populations from a targeted area. Due to the extensive and severe attack within and surrounding the Research Forest, to date, there have been essentially no spruce beetle stands to support this approach to harvesting

# Vegetation Management

## Invasive Plants

*The objective is to minimize the introduction and spread of invasive plant species where Research Forest operations causes soil disturbance. Where the invasive plants are found to occur within the Research Forest, the objective is to report the occurrences and support necessary treatments to reduce or remove the invasive plants. Strategies to achieve these objectives may include, but are not limited to the following:*

- 1) Revegetate portions of disturbed soil to reduce the conditions favorable to establishment of invasive plants;*

*Treatments involving revegetation of bare soil to prevent excess siltation into classified streams, wetlands and lakes are expected to limit the introduction and spread of invasive plants. For the most part, this includes using a grass seed mix to revegetate and stabilize exposed soil resulting from road building, and the installation and deactivation of stream crossings. Areas with road rehabilitation may also be vegetated using a grass seed mix for the same reasons.*

- 2) Rehabilitate unnecessary short-term roads so they are not a vector for the establishment of invasive plants;*

*A substantial amount of new road construction (greater than 50%) will be regularly rehabilitated to limit the various impacts of road building. This regular road rehabilitation is also expected to limit the establishment of invasive plants. The amount of temporary road (road planned for rehabilitation) is provided within each cutblock site plan.*

- 3) Record the occurrence of the species identified as noxious within all regions of the Province and those identified as noxious within the Fraser-Fort George Region as per the Field Guide to Noxious Weeds and Other Selected Invasive Plants of British Columbia;*
- 4) Report the occurrence of invasive species to the Northwest Invasive Plants Council so that they may determine any necessary treatments to reduce or remove invasive plants; and*
- 5) Subject to available resources, provide assistance and support to the Council in undertaking invasive plants treatments.*

*With regard to items # 4, 5 and 6, above, there has been no reported occurrences of notable noxious weeds within the Research Forest at this time.*

## Deciduous and Brush Competition for Conifer Trees

*Deciduous trees, brush-type plants, and herbaceous plants are valued for their contribution to fish and wildlife habitat and overall ecosystem and species diversity. However, where they are suppressing conifer growth, deciduous and brush competition may require direct treatment to achieve the stocking and timber objectives in this plan.*

*The objective is to reduce deciduous and brush competition where prescribed stocking standards are at risk of not being met or free growing achievement may be significantly delayed. This will be achieved by:*

- 1) Implementing a variety of brushing treatments, including but not limited to, manual brushing treatments, prescribed fire, animal grazing, and herbiciding to remove or suppress the growth of deciduous trees, brush-type plants, and herbaceous plants where conifer-leading regeneration is prescribed;*

There is considerable young aspen cover within Cutblock E-1, which was harvested during winter 2011. In 2017, low elevation digital photography was captured using an unmanned aerial vehicle. A high resolution orthophoto of Cutblock E-1 was created and subsequently the current forest cover was typed for all areas with significant aspen coverage. The aspen types (approximately 10 ha) were laid-out in late May 2018 and the aspen was manually brushed by saw in early June.

- 2) Undertaking experiments within cutblocks to evaluate new brushing and vegetation suppression techniques targeted at deciduous trees, brush species, and herbaceous plant species;*

Within Unit L, there is a continuing study examining differing brushing techniques to reduce aspen cover in young conifer stands. Another study in Unit L is examining the effects of herbicide treatments on blueberry plants. See Appendix C for a brief description of the on-going research projects within the Research Forest.

- 3) Consulting with potentially affected stakeholders and First Nations when proposing any herbiciding operations; and*

No application of herbicide is planned within the Research Forest at this time.

- 4) Limiting the type or amount of brushing treatments if they may materially affect the retention of trees and other plants that are important to achieving objectives within areas prescribed for the conservation and protection of natural resources.*

#### **Cutblock E-1**

Only the aspen dominated areas were treated. No riparian management zones were treated. A few small areas with significant aspen cover were left untreated for biodiversity purposes as they are not expected to limit the achievement of free growing.

## **Managing for Forest Products**

*Consistent with the current and foreseeable demand for timber products, the objective is to manage forests stands to maximize the yield of sawlog quality conifer trees. For all Research Forest Units, this means a priority on the production of quality spruce trees. Despite the previous, it is recognized that the dominance of spruce regeneration may be reduced in respect of other tree species that are expected to be better adapted for yield under predicted climate and ecosystem conditions.*

*In order to help inform future tree regeneration and future timber yield decisions, applied research and innovation is expected to continue regarding tree species adaptation and survival outside of their current natural range of ecology and climate.*

For the upcoming development year, sanitation and salvage harvesting in spruce and spruce/balsam stands is the focus. Conifer regeneration is expected to be dominated by the planting of spruce seedlings for all the cutblocks currently planned.

## **Non-Sawlog Wood Fibre**

*The objective for non-sawlog wood fibre is to explore, study, and implement options for recovering and utilizing all wood fibre that is remaining after fulfilling the conservation and protection objectives for all forest resource values.*

Although the focus is the sanitation and salvage of sawlog-quality spruce logs, there is notable damaged pine and balsam volume in some areas. Harvesting in these areas will focus on the recovery of sawlog pieces and the remaining non-sawlog timber will be processed for recovery of pulp logs. A portion of the non-utilized logs left after processing sawlogs and pulp logs will be left on site for CWD retention while the remainder is to be burned.

Bioenergy producers in both Prince George and Mackenzie were contacted in the spring and summer of 2017 to discuss the possibility of recovering roadside harvesting debris from harvested areas within Units B, C, D, and G. During the winter 2018, Pacific Bioenergy was provided information on the 2017 fall and 2018 winter harvesting operations within Units A, B, E, and G to support the potential recovery of fibre from roadside harvesting debris. To date, there is no agreement on recovery of waste debris from CNC harvested cutblocks.

## **Natural Non-Productive Forest and Natural Non-commercial Cover**

*Areas that were naturally non-productive forest or non-commercial cover (brush cover) are valued for their unique habitat qualities and contribution to overall ecosystem and species diversity.*

*The objective for any individual area that is naturally non-productive or non-commercial cover (equal to or greater than 0.2ha) is to avoid reforestation and avoid alteration of the soil and soil moisture attributes. The existing vegetation cover in these areas may be disturbed at the time of harvest to facilitate efficient operations.*

The following Table 12 indicates the inclusion of natural non-productive area and non-commercial cover included within cutblocks boundaries that were harvested by CNC since summer 2016. Since the amount of non-commercial cover within cutblocks is sizable at 122 ha, a portion of this area with potential for conifer reforestation may be considered for planting. At this time, it is expected that the majority of the non-commercial area within cutblocks will be left unplanted as per the management plan objective.



**Table 12: Summary of Natural Non-Commercial Cover in cutblocks within Research Units A, B,C,D,E, and G**

<b>Cutblock</b>	<b>Total Area Under Plan (ha)</b>	<b>Non-Productive Area (ha)</b>	<b>Non-commercial Area (ha)</b>
G-3	212.0	2.0	0.0
G-4	133.0	0.0	6.0
D-1	407.2	0.0	0.0
D-2	118.0	0.0	0.0
D-3	121.6	0.0	0.0
D-4	34.4	0.0	0.0
C-1	193.8	0.4	10.3
C-2	417.7	0.0	22.9
C-3	39.6	0.0	0.8
B-1	146.8	0.0	1.5
A-2	102.3	0.0	4.0
A-8	56.8	0.0	3.9
A-3	69.7	0.0	3.6
A-4	48.4	0.0	3.9
A-5	133.3	0.5	3.7
B-2	152.3	0.0	3.3
E-5	54.2	0.0	0.0
E-6	66.4	0.0	2.3
E-7	21.2	0.0	0.0
E-8	39.1	0.0	1.2
G-2	95.4	0.4	3.9
G-5	202.7	0.0	16.3
G-6	222.1	0.9	13.7
G-7	84.0	0.0	3.4
G-8	100.1	0.0	5.4
G-9	99.6	0.0	9.8
G-10	79.2	0.1	2.4
<b>Total</b>	<b>3,238.9</b>	<b>2.3</b>	<b>122.3</b>

## Problem Forest Types

*Areas that are naturally hemlock and cedar leading forests are valued for their unique habitat qualities and contribution to overall ecosystem and species diversity. As described under the section titled, “Interior Old Forest Objective”, natural hemlock and cedar leading stands within Unit I will be conserved for biodiversity. Within Unit H, the objective is to further explore the economic recovery of timber and wood fiber value from hemlock and cedar stands. The conversion of mature hemlock and cedar leading stands to other conifer species may be undertaken; however, a representative portion of the natural hemlock and cedar stands will be retained consistent with the “Old Forest Retention” and “Wildlife Tree Retention” sections.*

There is no development planned within hemlock or cedar leading stands during this development period.

## **Tree Seed**

*The objective is to realize the growth and yield benefits from Provincial tree seed improvement, while allowing experimentation with different seed sources to facilitate continuing study into assisted tree species migration and species adaptation to climate change.*

*The Chief Forester's Standards for Seed Use will be used in the selection and utilization of seed for conifer regeneration in cutblocks within all Research Forest Units. The application of the seed that does not meet the Chief Forester's Standards is subject to not significantly increasing the risk to future timber supply and subject to achieving the conservation and protection objectives for all natural resource values.*

## **Tree Seed Results**

A planting trial was established within Cutblock D-1 during May 2018. The planting trial is intended to study the site differences and tree survival and growth differences between a burned area and non-burned area. This study involves spruce, lodgepole pine, Douglas-fir and western larch seedlings. Only the Larch seedling are not compliant with the Chief Forester's standards, including the new climate based seed transfer standards applicable to larch in the Prince George area. That is because the trial area is located approximately 6 Km east of the climate based seed transfer area applicable the northwest portion of the Prince George Natural Resource District. The trial also involved planting of western white pine, ponderosa pine and subalpine fir as novelty species. There is a site plan with free growing standards applicable to the trial area, but the effect of the western larch, western white pine and ponderosa pine is not expected to compromise the achievement of free growing within the applicable standard unit of Cutblock D-1.

Otherwise tree seed sourced for cutblock regeneration, under Management Plan #3, has been compliant with the Chief Forester's Standards for Seed Use.

It is expected that any future use of non-compliant seed will be limited to experimental purposes within relatively small areas.

## **Tree Species and Tree Density Selection**

*The objective is to realize the growth and yield benefits from implementing Provincial stocking standards while allowing experimentation to facilitate continuing studies into assisted tree species migration and species adaptation to climate change.*

*The Provincial Reference Guide for FDP Stocking Standards will be used to prescribe preferred and acceptable conifer tree species and minimum stocking densities within each differing ecosystem association within each cutblock.*

To facilitate further study, the following exceptions to the Provincial standards may be implemented.

- 1) *There is strong preference for regenerating spruce on all Research Forest Units, but this preference may be reduced in respect of other tree species that are expected to be better adapted for growth and yield under the predicted climate and ecosystem conditions.*

Same comment as under “Managing for Forest Products”. For the upcoming development period, sanitation and salvage harvesting in spruce and spruce/balsam stands is the focus. The majority of conifer regeneration is to be achieved via the planting of spruce seedlings, consistent with the Chief Forester’s Standards for Seed Use.

- 2) *The experimentation and monitoring of planted conifer species expected to be better adapted for growth and yield under predicted climate and ecosystem conditions may be a focus of research in all Research Forest units. The planting of such tree species is subject to not significantly increasing the risk to future timber supply and subject to achieving the conservation and protection objectives for all natural resource values.*

#### Cutblock D-1

A small plantation trial was established within Cutblock D-1 in early June, which includes spruce, lodgepole pine, Douglas-fir, western larch, ponderosa pine, subalpine fir and western white pine. The focus of the trial is to compare the survival and growth of the spruce, lodgepole pine, Douglas-fir and western larch species between the wildfire area of the cutblock and the non-burned portion. There are approximately 100 of each the four species planted in the wildfire area and 100 of each planted in the non-burned area. The ponderosa pine, subalpine fir and western white pine are novelty species added to the trial for additional study. There is no recognized seed planning zone applicable to Cutblock D-1 for western larch, ponderosa pine and western white pine, so these are species that are being studied for their potential suitability to current and future climate.

#### Units E, K, and L

For this development period, no additional area is planned for planting with alternative tree species. The existing species trials within Units E, K, and L will continue to be monitored as part of the climate adaptation studies.

- 3) *Where it may be demonstrated that long-term yield is not expected to be reduced, then different free growing criteria may be applied than is recognized through the provincial Reference Guide for FDP Stocking Standards. Different procedures for assessing free growing may also be applied than is recognized in the provincial Silviculture Surveys Procedures Manual.*

Since the introduction of this exception to the provincial stocking standards, all harvested cutblocks are being reforested and assessed using standard provincial free growing criteria and assessment methods.

- 4) *To increase conifer yield (volume per hectare) and conifer timber quality (reduced large branch production), increasing target planting densities will be considered for all ecosystem associations showing a target stocking of 1000 stems/ha or greater within the Provincial Reference Guide for Stocking Standards. The total density considered will*

*be supported by growth modelling or best information that demonstrates the beneficial volume gains.*

All standard units within CNC harvested cutblocks have been prescribed with a target density of 1,600 stems/ha.

## **Tree Planting Density Results**

To date, the following cutblocks have been planted under the direction of Management Plan #3.:

A-2, A-8  
B-1, B-2  
G-2, G-3, G-4, G-7  
C-1, C-2, C-3  
D-1, D-2, D-3, D-4

Upon initial information from planting quality/density surveys in 2017, the target of density of 1,600 well-spaced stems per hectare was not being consistently achieved, largely due to loss of plantable ground from slash loading within the spruce beetle affected cutblocks. The cutblocks below the target were within 100 stems/ha (>1,500 stems/ha).

For the 2018 planting season, a density of 1,800 stems/ha was targeted for all cutblocks, which included large portions of A-2, A-8, B-1, B-2, C-2, C-3, D-1, and G-2. The resulting regenerated density for planting units was increased to a range of 1,600 to 1,980 stems/ha, and therefore, the originally stated tree density result of 1,600 stems/ha was achieved.

*Within prescribed riparian management areas, the achievement of free growing status is dependent on each assessed tree meeting a minimum height, along with minimum form and health criteria. Conifer free growing status is not dependent on conifer height relative to competing brush species or deciduous trees or conifer position relative to competing brush species or deciduous trees.*

In instances where different stocking standards or free growing criteria may be prescribed for individual cutblocks, all changes will be recorded under the “Stocking Standards” section of this Development Plan.

Since the introduction of this exception to the provincial stocking standards, no cutblocks have been prescribed alternate free growth criteria within riparian management areas

## **Tree Regeneration Delay**

*The objective is to minimize average conifer regeneration delay to minimize the time that any area is not yielding conifer volume. The expectation is that the majority of tree planting will be implemented the next spring or summer season following the completion of harvesting.*

## Regeneration Delay Results

The regeneration delay objective was largely up held until the spring of 2018, after which approximately half of the harvested area from fall 2017 to fall 2019 may have a regeneration delay of 1 year. With the expected return of regular harvesting (non-salvage), cutblocks harvested beyond fall 2019 are expected to have less than a 1 year regeneration delay.

At this time, this small change in regeneration delay is not expected to measurably change the forecasted timber supply and available harvest level.

## Tree Planting

*The objective is to optimize the site selection for the majority of planted trees to ensure improved conifer seedling survival and initial growth.*

*As such, a minimum intertree spacing of 1.6m may prescribed for any ecosystem association. A minimum intertree spacing of less than 1.6m may be prescribed where site conditions, soil conditions or necessary site preparation severely limit optimum planting sites.*

Across all standard units and cutblocks planned during this Development Plan, 1.6m is the prescribed minimum intertree spacing.

## Stocking Standards

The stocking standards specified in this Development Plan are highly reflective of the provincial Reference Guide to FDP Stocking Standards. Standards for the following subzones within the Research Forest are included in Appendix F: SBSwk1, SBSvk, ESSFwk2, ICHwk4, ICHvk2, SBSmk1, SBSdw2, and SBSmh.

## Prescribed Stocking Standards Results

Since the approval of Management Plan #3, the cutblocks listed below were prescribed with variations from the Appendix F stocking standards. The stocking standard variations applicable to each cutblock are also provided below

### Stocking Standard Variations for Cublocks harvested during 2016/17 (fiscal year):

#### **Cutblocks: B-1, C-1, C-2, C-3, D-1, D-2, D-3, D-4, G-3, and G-4:**

As described under the section titled “Tree Planting Density Results”, a target planting/regeneration density of 1,600 stems/ha was prescribed. On average, all of these cutblocks are quite productive with few notable limitations, and therefore 1,600 stem/ha density is expected to provide growth and yield advantages in the short and long-term.

### Stocking Standard Variations for Cublocks harvested during 2017-18 (fiscal year):

**Cutblocks: A-2, A-8, E-5, E-7, E-8, G-2, G-6, G-7, G-8, G-9, G-10:**

Same as stated for cutblocks harvesting during 2016/17 fiscal year.

**Stocking Standard Variations for Cublocks harvested during 2018-19 (fiscal year to date):**

**Cutblocks: A-3, A-4, A-5, A-6, B-2, E-6, and G-5:**

Same as stated for cutblocks harvesting during 2016/17 and 2017/18 fiscal years.

## **Silviculture Treatments**

*The objective is to minimize silviculture treatment time to minimize the time that any area is not yielding acceptable conifer volume or quality.*

*Where a prescribed conifer area is determined to require silviculture treatments, such as, but not limited to, site preparation, brushing, fill-planting, or forest health sanitation, then the treatment(s) is to be undertaken within two growing seasons of detection.*

At this time, no necessary silviculture treatments have been identified for CNC harvested cutblocks.

## **Managing Allowable Annual Cut (AAC)**

*For the purposes of reducing uncertainty about sustainable harvest levels and reliable forecasting, the Management plan timber supply analysis is planned to be updated every five years or more often, if new information or circumstances change significantly, as is currently the situation with increasing spruce beetle hazard and mortality.*

## **Timber Supply Review Results**

A new timber supply review (TSR) was completed in September 2017, which was fully included within the 2017/18 Development Plan. This current TSR includes multiple improvements to the forest inventory and natural resource information, as well as more accurate harvest modelling assumptions. With these improvements, a harvest level of 108,000 m<sup>3</sup> for five years was recommended for the period between July 1, 2017 and June 30, 2022. The following sections summarize some of the key improvements and changes incorporated into the current timber supply review.

### **Land Base Assumptions**

Non-Forest / Non-Productive – Area was reviewed again using a combination of CNC inventory and the provincial freshwater wetlands.

Road Area – derived from current inventory of all existing roads identified via new digital photos and LiDAR, includes disturbed road width for all road sections.

Low Productivity Area Determination – this includes all areas with a site index less than 8 or those that never reach 140m<sup>3</sup>/ha using the new forest inventory.

Subalpine Fir (Balsam) Inventories – reduced by 30% when assessed against the 140m<sup>3</sup>/ha threshold. Recent operational information demonstrates that over 30% of the measured balsam volume within a stand cannot be recovered for sawlog products.

Steep Slopes – Operable cutoff is 45% slope, which matches current physical limits of ground-based skidding that is being implemented. This will be reviewed in the future, as cable yarding options are now readily available.

Riparian Reserves – Area was spatially defined from new stream classification identified via current digital photos and LiDAR. Reserve widths used are consistent with operational riparian retention for S4, S5, and S6 streams, wetlands, and lakes, which is well above regulatory minimums.

Stand Level Retention – 9% Stand Level retention applied to timber harvesting land base. This assumes that another 3% of stand level retention includes physically inoperable areas, problem forest types, and riparian reserves. In addition, wildlife and biodiversity corridors are spatially specified, in which the available harvest area is reduced within every 60 year period.

### **Non-Timber Management**

Wildlife and Biodiversity Corridors - For the remaining salvage areas (currently Units A, B, E, F and G), biodiversity corridors spatially identified are to remain largely intact as mature forest throughout time. Harvest is restricted to areas that are >119 years old; only 34% of the area may be harvested within each 60 year period.

Landscape-Level Biodiversity / PGTSA Biodiversity Order – For each of the Research Forest Units, a minimum percentage of the crown forest land base must be old forest (>120 years old) at all times. By Research Forest Unit, the minimum percentage of old growth per Research Forest Unit ranges from 10% to 25%. This exceeds the requirement for an average of 19% old forest to be maintained across all Units. To qualify as old growth, a stand must be non-pine-leading.

Visual Quality Objectives – As per the previous TSR, plan to perspective ratios applied to 5% slope classes were used to determine the minimum forest height that must be maintained within the non-altered areas of each visual polygon.

### **Minimum Harvest Criteria**

Consistent with other provincial TSRs, the minimum threshold value of 140m<sup>3</sup>/ha is applied, however, to ensure volume recovery from each stand is optimized, harvest selection is limited to stands that have achieved 95% of their culmination mean annual increment.

### **Harvest Priority**

Dead Pine – After considering the new inventory information and new operability thresholds, no dead pine stands were identified for salvage harvest. The existing dead pine volume has been fully discounted and does not contribute to the harvest volume. Some dead pine stands, however, may still be selected for harvest in the near future due to other live conifer volume.

Harvesting priority is applied to all stands with spruce beetle mortality for the first two periods.

### **Spruce Mortality**

Based on recent assessments and timber cruising, up to 83% spruce mortality is assumed in all stands >99 years old within Research Forest Units A, B, C, D, E, F, and G. For Units H, I, J, K, and L, 83% spruce mortality was applied to the oldest spruce stands until 33% of all the spruce-leading stand volume was selected for mortality.

## **Harvest Volume Results**

### **Management Plan #3, Amendment #1 (Applicable to July 2017 to July 2022):**

With the completion of the new timber supply review in September 2017, the recommended harvest level was 108,000 m<sup>3</sup> for five years to continue the removal and salvage of spruce beetle affected timber. This equate to 540,000 m<sup>3</sup> of timber between the period of July 1, 2017 to June 30, 2022.

Consistent with the timber supply analysis and forecasting, harvesting has focused on spruce beetle affected stands within Research Forest Units A, B, E, F and G from July 1, 2017 till October 31, 2018 (cut-off for this Development Plan update). The resulting scaled harvest volume up to the end of October 2018 is recorded in Table 13, along with the remaining allowable harvest for the period from July 2017 to the end of June 2022. With the harvesting up to the end of October 2018 accounted for, a total of 328,458 m<sup>3</sup> has been harvested since July 2017, with 211,547 m<sup>3</sup> remaining for forest health focused operations. At this time, it is expected that timber supply will be fully reviewed prior to utilizing the full 211,547 m<sup>3</sup> of timber volume remaining in the previous timber supply forecast.



**Table 13: Harvested Volume under Management Plan #3, Amendment #1 from July 1, 2017 to October 31, 2018.**

Cutblock	Year of Harvest	Spruce Volume* (m³)	Pine Volume* (m³)	Total Volume* (m³)	Comments
A-2	2017	19,823	-	30,842	Very high spruce damage from insect & blowdown
A-3	2018	7,894	-	15,265	Very high spruce damage from insect & blowdown
A-4	2018	3,912	-	10,118	Very high spruce damage from insect & blowdown
A-5	2018	25,739	-	42,803	Very high spruce damage from insect & blowdown
A-6	2018	4,801	507	13,225	High spruce damage from insect & blowdown
A-8	2017	6,252	-	11,129	Very high spruce damage from insect & blowdown
B-2	2017	9,181	-	13,415	High spruce damage from insect & blowdown
E-5	2018	1,465	-	2,534	Very high spruce damage from insect & blowdown
E-6	2018	7,425	-	10,756	High spruce damage from insect & blowdown
E-7	2017-18	3,192	-	4,645	Moderate spruce damage from insect & blowdown (spruce beetle removal priority)
E-8	2017-18	5,490	63	12,329	Moderate spruce damage from insect & blowdown (spruce beetle removal priority)
F-8	2018	2,736	-	4,641	Moderate to spruce damage from insect and blowdown
G-2	2017-18	9,390	-	19,746	High spruce damage from insect & blowdown
G-5	2018	4,762	-	11,578	High spruce damage from insect & blowdown

Cutblock	Year of Harvest	Spruce Volume* (m³)	Pine Volume* (m³)	Total Volume* (m³)	Comments
G-6	2017-18	12,476	-	37,536	High spruce damage from insect & blowdown
G-7	2017-18	11,919	-	25,411	High spruce damage from insect & blowdown
G-8	2017-18	10,062	-	20,156	High spruce damage from insect & blowdown
G-9	2017-18	13,495	-	20,101	Moderate to High damage from insect & blowdown
G-10	2017-18	19,905	-	22,223	Moderate to High damage from insect & blowdown
Total Harvest Volume 2017-18		179,919	570	328,453	
Remaining 5-Year AAC Volume	211,547				The recommended AAC total between July 2017 and June 2022 is 540,000 m3 as per TSR completed in September 2017 (108,000 m³/yr X 5 yrs = 540,000 m3). The remaining volume is currently 211,547 m3 (540,000 m3 – 328,453 m3)
<p>*The volume shown for each cutblock is the proportion of the total CNC Research Forest scale volume (July 2017 to October 2018) that equates to the proportion of the net cruise volume of each cutblock to the total net cruise volume of all the listed cutblocks.</p> <p>**The total volume is exactly the provincially recorded scale volume for the CNC harvesting from July 2017 to the end of October 2018.</p> <p>***The total volume is exactly the provincially recorded scale volume for the CNC Research Forest from July 2017 to the end of October 2018</p>					

## First Nations Involvement in the CNC Research Forest Society

*First Nations' representation on the CNC Research Forest Society Board of Directors (Board) is a fundamental membership goal within the bylaws of the CNC Research Forest Society. In previous years, Board membership included First Nation's representatives, but the Board is currently operating without any First Nations members. The Board invites the McLeod Lake, Lheidli T'enneh, Nazko, West Moberly and Halfway River Nations to participate on the Board.*

Upon request of the CNC Research Forest Manager, the McLeod Lake Indian Band nominated their current Youth Councilor to be a CNC Research Forest Society member. At the December 2017 annual general meeting, the existing CNC Research Forest Society directors unanimously

voted to accept the McLeod Lake Youth Councilor as a director of the CNC Research Forest Society.

## **First Nations Strategic Planning Involvement**

*CNC welcomes the involvement of First Nations in strategic planning processes regarding future resource development and future research. Sharing and seeking input on specific operational plans is not the sole focus of First Nations involvement. Regular, proactive involvement in CNC's ongoing operational and research strategies is the desired goal to ensure that all stages of planning and operational implementation are respectful of the preferred management direction of each First Nation. CNC is striving to develop improved relationships and protocols with each First Nation to improve future planning and to improve the mutual benefits derived from the continued operation of the Research Forest.*

To date, involvement of First Nations in Research Forest planning has been limited to annual referrals and related discussions regarding individual cutblock and road development.

## **First Nations Consultation Regarding Management Plan**

*Upon providing the proposed Management Plan to Ministry of Forests, Lands and Natural Resource Operations, it is expected that the Province will undertake consultation with affected First Nations, and directly involve CNC in the consultation process as appropriate. Prior to submission for approval to the District Manager, all First Nations' input will be summarized and considered in the proposed plan, along with any revisions to the plan to address the input. All of this information will be submitted as part of the proposed plan, which will be considered in the District Manager's approval decision.*

Refer to document titled "Management Plan #3 - Public Review and First Nations Consultation". Any Management Plan direction resulting from the First Nations consultation regarding the Management Plan is recognized in the other sections of this Development Plan document.

## **Sharing and Involvement in Specific Resource Operations**

*CNC commits to providing First Nations all proposed plans for forest development operations within the Research Forest. When seeking input on significant operations, the proposed plans will be provided well in advance of implementation so that there is ample time to consider input. Where the proposed harvesting or resource extraction is small in area (less than 15ha) and proposed to control forest health factors (ex. spruce beetle), or otherwise time sensitive, CNC may respectfully notify the First Nation or request the First Nation's assistance in expeditiously resolving the Nation's input. The information from this process will be provided to the Ministry of Forests, Lands and Natural Resource Operations for their ongoing consideration of Treaty rights and aboriginal rights related to the Research Forest administration.*

*Aside from the above, CNC may also regularly contact First Nations for input and advice regarding an individual forest practice, a site plan, research implementation, research results, management of individual sites or areas within the territory, or early input on a proposed*

*Management Plan amendment or replacement. The goal is regular and meaningful First Nation involvement in CNC's planning processes and the implementation of operations.*

The following cutblocks were initially proposed or underwent development during 2018. A summary of the information sharing and communication with First Nations is provided in Appendix G.

Cutblock A-2, A-3, A-4, A-5, A-6, A-8 (Kerry Lake)

Cutblock B-2, B-3, B-4, B-5, B-6 (Tacheeda Lakes)

Cutblock E-5, E-6, E-7, E-8, E-9, E-10 (Chuchinka Creek)

Cutblock K-1, K-2, K-3, K-4, K-5

## **First Nations Related Research and Innovation**

*The Research Forest is intended to provide educational and applied research and innovation benefits to all the peoples of the region, and therefore CNC supports educational and research projects that may fulfill a need that is important to First Nations' and their territory. CNC is continuously willing to discuss ideas for new research projects or research activities that may supplement or support previously established innovative projects. CNC's interest in cooperative projects with First Nations is not limited to the CNC Research Forest Units.*

There are currently no active research projects involving First Nations. Since 2016, representatives from the McLeod Lake, Nazko and Nak'azdli Nations have expressed interest in three different projects, but collectively the First Nations representatives and CNC have not been available to advance these ideas.

## **Public Input and Review**

*To ensure a fair opportunity for public input, any proposed replacement or amended Management Plan that requires approval by the District Manager will be advertised for public review for a period of at least 60 days, prior to being delivered to the District Manager. At least 60 days before the plan is to be submitted to the District Manager for an approval decision, the proposed plan will also be distributed to the Ministry of Forests, Lands and Natural Resource Operations, adjacent major forest tenure holders, guiding license holders, and trapping license holders so all may review and provide input regarding the proposed plan. Other stakeholders and other concerned members of the public may also receive a proposed plan at least 60 days prior to submission to the District Manager.*

*A proposed plan will also be made available to the public at the CNC campus in Prince George, at least 60 days before being submitted to the District Manager. This allows for anyone who may be interested in or affected by the plan, to easily review and provide direct input to CNC. A representative of CNC will be available during this period to meet directly with the public and natural resource stakeholders to discuss and receive input on the proposed plan.*

*Prior to submission to the District Manager, all input will be summarized and considered in the proposed plan. Any revisions to the plan to address input will also be identified in the proposed*

*plan. All of this information will be submitted as part of the proposed plan, which will be considered in the District Manager's approval decision.*

Refer to document titled "Management Plan #3 - Public Review and First Nations Consultation". Any Management Plan direction as a result of the public consultation regarding the Management Plan is recognized in the other sections of this Development Plan document.

## **Notifying and Reporting to Government**

*CNC will be annually reporting new cutblock openings into the Provincial RESULTS database, and for existing cutblock openings in RESULTS, annually reporting changes to prescribed tree stocking, prescribed soil disturbance, the net area to reforest, forest inventory, and regeneration status.*

### **RESULTS Reporting**

#### **Cutblocks E-2, E-3, E-4, and F-4 (Harvested Winter 2015-16)**

These openings were part of the initial spruce beetle harvesting during the winter of 2015/2016. These cutblock openings are reported in RESULTS including subsequent reforestation.

#### **Cutblocks B-1, C-1, C-2, C-3, D-1, D-2, D-3, D-4, G-3, and G-4 (Harvested Winter 2016-17)**

These new cutblocks were part of a large spruce beetle salvage harvest during the winter of 2016-17. These new openings are now reported in RESULTS including subsequent reforestation.

#### **Cutblocks A-2, A-8, E-7, E-8, G-2, G-6, G-7, G-8, G-9, and G-10 (Harvested Summer of 2017 and Winter 2017-18)**

These new cutblocks were part of a large spruce beetle salvage harvest during the summer of 2017 and winter of 2016-17. These new openings are now reported in RESULTS including subsequent reforestation. The Annual Report for 2017/18 also includes information about currently reported cutblocks/openings and reported activities within those cutblocks.

#### **Cutblocks to be Harvested Fall 2018 and Winter 2018**

The cutblocks to be harvested during this period will be reported during the spring of 2019 and acknowledged in the next Development Plan.

### **Annual Report 2017-18**

An annual report summarizing Research Forest activities was completed and submitted to the Prince George Natural Resource District Manager in June 2018. It is included within Appendix H.

## **Site Plans**

*Site plans for individual cutblocks and roads will be completed in advance of any primary forest activity but are not submitted to the District Manager unless requested. Site plans will not be completed for minor road upgrading works necessary to improve road safety and reduce environmental impacts. Site plans for cutblocks will include the area prescribed for regeneration, the stocking standards and free growing standards that apply to each ecosystem association, the allowable amount of soil disturbance, the location of roads, and identify how the content and objectives of this Management Plan will be achieved. Site plans will be amended from time to*

*time to adjust for changing conditions, previously unidentified resources, and to allow for the modification of forest practices consistent with this Management Plan.*

*A RPF must confirm that a site plan may not be required where very limited harvesting and road building operations are involved.*

#### **New Site Plans for Cutblocks and Associated Roads**

Site Plans were completed and signed for the following cutblocks which were planned for harvest from summer 2017 to October 2018.

A-2, A-3, A-4, A-5, A-6, A-8, B-2, E-5, E-6, E-7, E-8, F-8, G-2, G-5, G-6, G-7, G-8, G-9, and G-10

#### **No Site Plans Required**

For the 2017-18 development period, all cutblocks planned for harvest require a site plan.

#### **Signatures of persons required to prepare plan.**

Preparing Forester  <i>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 prepare the work.</i>		
	<b>Carl Pollard, R.P.F.</b> Manager, Research Forest College of New Caledonia	<b>Date</b>

## **Appendix A: Development Plan Maps**

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**Appendix B: 2016 Watershed Description and Preliminary  
Assessment / 2017 Watershed Assessment for Caine Creek  
Basin**

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## **Appendix C: Research Site Information and Locations**

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## **Appendix D: Operational Referrals to Stakeholders**

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## **Appendix E: Hauling and Milling Plans (Bark Beetle Control)**

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## **Appendix F: Stocking Standards**

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## **Appendix G: First Nations Referrals**

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## **Appendix H: Research Forest Annual Report**

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## **Appendix I: Visual Quality Assessments**

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## **Appendix J: Predicted Old Forest Distribution after Proposed Forest Development**

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## **Appendix K: Predicted Young, Mature and Old Forest Distribution after Proposed Forest Development**