

# Burns Lake Community Forest Fish Inventory of 2019-2020 and 2020-2021 Harvest Areas

## **Prepared For**

Frank Varga  
Burns Lake Community Forest  
153 Francois Lake Drive  
Burns Lake, BC V0J 1E0

## **Prepared By**

**EDI Environmental Dynamics Inc.**  
301 George Street  
Prince George, BC V2L 1R4

## **EDI Contact**

Eric O'Bryan  
Senior Biologist

## **EDI Project**

18P0613  
October 2019





*This page is intentionally blank.*



## AUTHORSHIP

This report was prepared by EDI Environmental Dynamics Inc. Staff who contributed to this project include:

Chris Cena, M.Sc., R.P.Bio..... Primary Author

Alison MacPhail, B.Sc. B.I.T..... Secondary Author

Hanna Donaldson, B.Sc., R.P.Bio..... Senior Review



## TABLE OF CONTENTS

<b>1</b>	<b>INTRODUCTION .....</b>	<b>1</b>
1.1	STUDY AREA .....	1
<b>2</b>	<b>METHODS .....</b>	<b>3</b>
2.1	STREAM ASSESSMENT .....	3
2.2	FISH SAMPLING .....	4
2.3	STREAM CLASSIFICATION.....	5
2.4	DATA MANAGEMENT AND QA/QC.....	5
<b>3</b>	<b>RESULTS.....</b>	<b>6</b>
3.1	EXISTING FISHERIES RESOURCE INFORMATION.....	6
3.2	FISH BEARING REACHES.....	6
3.2.1	<i>Fish capture</i> .....	8
3.2.1.1	Follow-up Sampling .....	9
3.2.2	<i>Non-Fish bearing</i> .....	9
3.2.3	<i>Stream Crossings</i> .....	13
<b>4</b>	<b>DISCUSSION.....</b>	<b>16</b>
<b>5</b>	<b>REFERENCES CITED .....</b>	<b>17</b>
5.1	INTERNET SITES.....	17

## LIST OF APPENDICES

- APPENDIX A. STREAM CLASSIFICATION MAPS
- APPENDIX B. REPRESENTATIVE SITE PHOTOGRAPHS



## LIST OF TABLES

Table 1. Forest Practice Code of BC key to stream classification criteria.....	5
Table 2. Summary of confirmed fish bearing reaches identified within the Burns Lake Community Forest.....	7
Table 3. Summary of sampled reaches defaulted to fish bearing status within the Burns Lake Community Forest. ....	7
Table 4. Summary of fish species captured in the Burns Lake Community Forest (May – June, 2019). ....	8
Table 5. Summary of non-fish bearing reaches sampled within the Burns Lake Community Forest.....	10
Table 6. Summary of NCD, NVC and wetland reaches identified within the Burns Lake Community Forest.....	12
Table 7. Follow – up sampling to confirm fish bearing status in the Burns Lake Community Forest.....	9
Table 8. Proposed watercourse crossings. ....	14

## LIST OF FIGURES

Figure 1. Overview map of stream inventory project area within the Burns Lake Community Forest.....	2
---	---

*This page is intentionally blank.*



## 1 INTRODUCTION

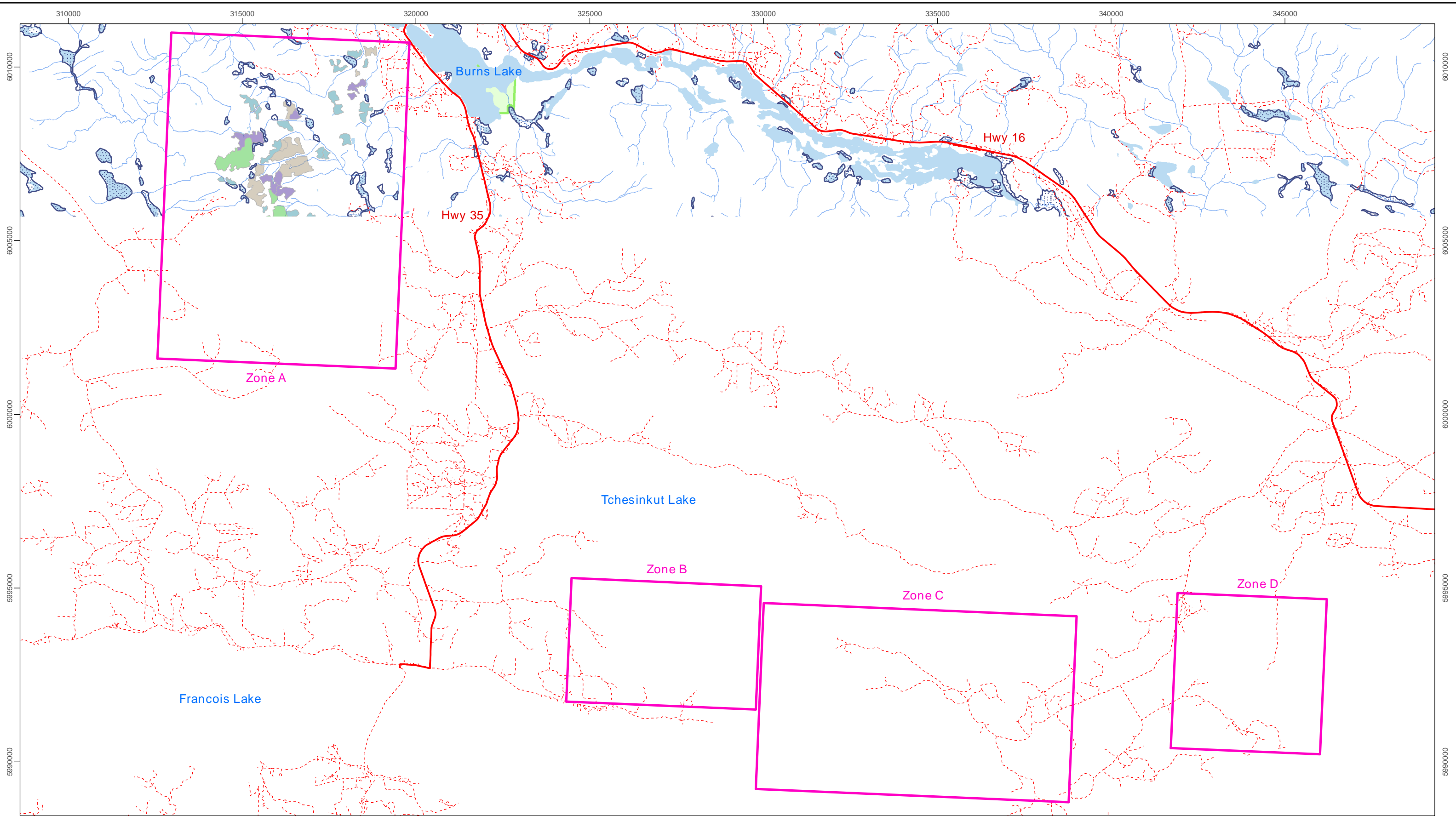
Environmental Dynamics Inc. (EDI) was retained by Burns Lake Community Forest Ltd (BLCF) to provide a detailed operational level stream inventory for proposed timber harvest areas within the community forest area base tenure. The objective of the stream inventory was intended to: provide stream classifications within areas where harvesting is proposed in the 2019-2020 (Year 1) and 2020-2021 (Year 2) harvest years, support the broader 5-yr harvest plan, and meet KPI for FSC certification. Additional inventory objectives included assessing stream habitat quality at proposed stream crossing sites to support crossing structure design and regulatory review processes (both federal and provincial).

This report summarizes the results of the stream inventory that was completed between May 23 to June 19, 2019. It is intended that these results will assist BLCF with managing the forest base and liabilities and will provide an understanding of the fisheries resource values which can be of benefit for community and other stakeholder discussions.

### 1.1 STUDY AREA

The BLCF, located within the Francois Lake watershed south of the village of Burns Lake, operates within the traditional territory of the Wet'suwet'en and Carrier Nations. The area is managed to provide the sustainable development of timber resources for the village of Burns Lake, First Nations partners and regional wood processing facilities.

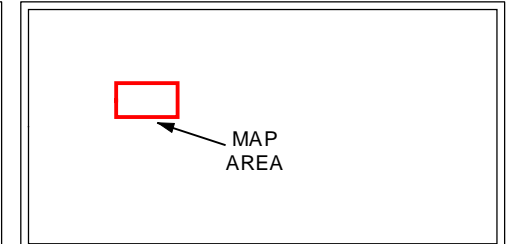
The project area within the BLCF was divided into four operational zones: Zone A included all watercourses that drain north into Burns Lake and south into Tchesinkut Lake; Zones B and C watercourses drain north to Tchesinkut Lake and south into Francois Lake; Zone D watercourses drain into Tchesinkut Creek which is a tributary of Tchesinkut Lake (Figure 1).



**Burns Lake Stream Class Project Area**

- |                            |                |                           |
|----------------------------|----------------|---------------------------|
| <b>K1A Proposed Blocks</b> | Main Road      | Wetlands                  |
| <b>Year Harvest</b>        | Secondary Road | Waterbodies               |
| 1                          | Streams        | Parks and Protected Areas |
| 2                          |                |                           |
| 3                          |                |                           |
| 4                          |                |                           |
| 5                          |                |                           |

Drawn: Y. Navarro	Checked: A. MacPhail	Figure 1	Date: 2019-09-30
----------------------	-------------------------	----------	---------------------



Data Sources

Disclaimer  
EDI Environmental Dynamics Inc. has made every effort to ensure this map is free of errors. Data has been derived from a variety of digital sources and, as such, EDI does not warrant the accuracy, completeness, or reliability of this map or its data.

0 1 2 3 4 5  
Kilometers

Map Scale = 1:100,000 (printed on 11 x 17)  
Map Projection: NAD 1983 UTM Zone 10N

**3**





## 2 METHODS

Stream classifications and crossing assessments were conducted for all streams within 100 m of proposed block boundaries and new harvest block access roads requiring stream crossing structures. Mapped watercourses were investigated and then identified as being either a stream, a non-classified drainage (NCD), no visible channel (NVC) or wetland. Streams identified had a continuous channel of at least 100 m with evidence of scour or mineral alluvium deposition. Water flow in the channel could be perennial, ephemeral or intermittent (Forest Practice Code, 1998). Sites classified as a NCD did not exhibit defined stream bed or banks (for 100 m continuously) and were often characterized as having pooling water present, water seeping subsurface, or overland flow. Sites identified as NVC were typically a depression in the topography exhibiting no evidence of water flow, channelization, pooling water or area saturation and did not meet the FPC definition of a stream. Wetlands were identified as areas where water was at, above or near the surface for most of the year and where vegetation appeared to have adapted to saturated conditions. Wetlands were identified and defined for planning purposes but were not included as part of the stream inventory assessments.

Inventory methods followed protocols described in the Reconnaissance (1:20,000) Fish and Fish Habitat Inventory: Standards and Procedures (RISC 2001, internet site), Forest Practices Code Guidebooks (BC MoF 1995, 1998, 2002), and all other applicable Resource Inventory Standards Committee (RISC; formerly Resource Inventory Committee (RIC)) standards (RIC 2000, 2001; 2008 internet site). Details on inventory methodologies are provided in the following sub-sections. All field data collected was recorded on provincial Resource Inventory Standards Committee (RISC) site cards and fish collection forms.

### 2.1 STREAM ASSESSMENT

Pre-field planning involved the selection of stream reaches for assessment based on proximity (i.e., within 100 m) to Year 1 and Year 2 block harvest operations and access. A review of all existing fish and fish habitat data and inventory reporting for streams within the BLCF tenure was also completed to identify knowledge gaps in the tenure and direct sampling design. Each stream requiring sampling was identified by either a provincial watershed code (WSC) or unique stream Interim Location Point (ILP) following methods outlined in the Reconnaissance 1:20,000 Fish and Fish Habitat Inventory Procedures.

Field sampling was conducted from May 23 to June 19, 2019 to represent spring/early summer stream conditions. A total of 87 stream reaches (corresponding to 56 streams) and 25 proposed road crossings (divided among the four operational areas) were assessed by 2-3 person crews. All sites were accessed via pick-up truck, ATV or foot off main forest service roads and various spur roads.

Crews walked the selected streams and identified where changes in channel characteristics such as gradient, channel width and confinement occurred (e.g., delineated reach breaks). Stream reaches were identified with a decimal point (e.g., site 10.1 indicates the first reach in stream 10). Sampling sites were placed in representative habitat within each identified reach.



Information was collected at each individual sample site according to Reconnaissance (1:20,000) Fish and Fish Habitat Inventory: Standards and Procedures and photographs were taken to document site conditions. Collection of representative stream characteristics included:

- channel morphology,
- channel and wetted widths (m),
- residual pool depth (m),
- bankfull channel depth (m),
- gradient (%),
- streambed substrate composition,
- type and abundance of in-stream cover, and
- riparian vegetation.

Measurement of water quality parameters were collected using either a YSI ProPlus or Oakton Multimeter and included:

- temperature (°C),
- specific conductance ( $\mu\text{S}/\text{cm}$ ),
- pH, and
- turbidity

Field data and observations were used to assess the fish habitat suitability. The specific habitat requirements for fish species documented in the watershed at various life stages were considered when evaluating the quality of spawning, rearing and overwintering habitat.

## 2.2 FISH SAMPLING

Fish Collection Permit SM-19-512215 was obtained from the Ministry of Forests, Lands Natural Resource Operations and Rural Development (MFLNRORD) prior to sampling. Within each reach, effort was taken to establish fish species presence at all stream sample sites with sufficient water depth. Fish sampling effort consisted of single-pass backpack electrofishing with a Smith-Root 12B or LR-24 backpack electrofisher. All fish were identified to species and life stage (i.e., fry, juvenile and adult) and measured for fork length (mm).

To minimize stress, captured fish were placed in a plastic bucket containing water from the stream being sampled. Fish were held for a minimal time period during processing. As soon as fish were deemed to be recovered, by exhibiting stability within the water column and active gill movement, they were released at or near the area of capture.



## 2.3 STREAM CLASSIFICATION

Streams were classified following the Forest and Range Practices Act: Forest Planning and Practices Regulation Part 4 Division 3 Section 47 using channel width and fish bearing status. A summary of stream classification criteria is provided in Table 1. Streams were either classified as fish bearing or non-fish bearing. Stream reaches were confirmed as non-fish bearing if the gradient was greater than 20% or that a known fish barrier was present, and all reaches upstream of the barrier were dry for a period of time throughout the year or void of overwintering habitat. If no fish were captured during fish sampling efforts and the reach lacked the above criteria for non-fish bearing status, reaches were defaulted to fish bearing.

**Table 1. Forest Planning and Practices Regulation key to stream classification criteria.**

Stream Classification	Average Channel Width (m)	Fish present
S1	>20	Yes
S2	>5-20	Yes
S3	1.5-5	Yes
S4	<1.5	Yes
S5	>3	No
S6	<3	No

## 2.4 DATA MANAGEMENT AND QA/QC

Several quality assurance and quality control measures were implemented during planning and execution of the BLCF inventory program. All crews were familiar with the protocols for data collection following methodology outlined in the RISC (2001) Reconnaissance 1:20,000 Fish and Fish habitat Inventory Standards and Procedures. This assured that data were consistently collected between crews. All fish sampling and site cards were reviewed at the end of each field day for completeness, accuracy and consistency. Upon completion of the field assessments, data were entered into a Microsoft Access database similar to the Field Data Information System (FDIS) developed by the province for Reconnaissance 1:20,000 Fish and Fish Habitat Inventories. This provided a secure location for data allowing crews to efficiently analyse data and provide a mechanism to accurately present information spatially. Additionally, field cards, the electronic database and digital mapping data were compared to detect potential transcription errors or inconsistencies among stream classifications.



## 3 RESULTS

### 3.1 EXISTING FISHERIES RESOURCE INFORMATION

A review of existing fish and fish habitat data within the BLCF tenure was conducted to identify historical fisheries information within the study area. Resources reviewed included the Fisheries Information Summary System (FISS), HabitatWizard, and iMap BC. Available fish presence and obstruction data was primarily documented on lower elevation streams outside of the proposed cut block areas or on 1<sup>st</sup> and 2<sup>nd</sup> order streams that are direct tributaries flowing into Tchesinkut and Francois lakes. Fish species previously documented within the project area included: rainbow trout (*Oncorhynchus mykiss*), longnose sucker (*Catostomus catostomus*), lake chub (*Couesius plumbeus*), red side shiner (*Richardsonius balteatus*), northern pike minnow (*Ptychocheilus oregonensis*), and white sucker (*Catostomus commersoni*).

Review of existing information in EcoCatalogue BC and Fisheries Inventory Data Queries identified the presence of several barriers within the Operational Areas downstream of the proposed harvest activities (Table 1). Two potential obstacles identified in existing information included a culvert in Area A (WSC 180-374000-95200-01900-7840) and a beaver dam in Area C (WSC 180-374000-95200-36800). The culvert in Area A is on Eagle Creek Road and not on BLCF road network. Neither of these features were considered a barrier under the Fish-Stream Identification guidebook; however, the current road manager should review this culvert using Ministry of Environment’s fish passage status protocol (MOE 2011). Open waterbodies were identified that may support a resident fish population upstream of the beaver dam in Area C. Crews identified one additional feature barrier to fish passage during field sampling: a waterfall (12 m in height) on ILP 23 in Reach 23.2.

**Table 2. List of barriers to fish passage identified in Fisheries Inventory Data Queries (2019).**

Operational Area	Watershed Code	Feature Type	Description
B	180-374000-95200-01900-3580-5640	Fall	1.5 m height
C	180-374000-95200-02900-3580-4670	Chute/cascade	16 m height; 67 m length (23% gradient)
C	180-374000-95200-0190-3580-4715	Chute/cascade	4 m height; 14 m length (28% gradient)

### 3.2 FISH BEARING REACHES

Of the 87 reaches assessed during the fish and fish habitat inventory, a total of 21 (24.1%) reaches were classified as fish bearing based on single pass electrofishing efforts and historical data (Tables 2 and 3). Of the 21 fish bearing reaches assessed, only two locations were confirmed to be fish bearing; a total of seven rainbow trout were captured between both sites. The remaining 19 reaches were classified as fish bearing by default due to the absence of fish barriers being identified (e.g. gradient, falls, chutes, etc.) and assumed downstream connectivity to known fish bearing watercourses or waterbodies.

The reaches classified as fish bearing had riffle-pool or cascade-pool morphologies with mean channel widths ranging from 0.43 to 5.86 m and residual pool depths of 0.07 to 0.34 m. Habitat in the confirmed fish bearing



reaches (14.1 and 58.1) provided moderate to good spawning habitat with an abundance of gravels and good rearing potential for both juvenile and adult fish. Spawning habitat provided in defaulted fish bearing reaches was generally considered lower quality with gravels and cobbles either absent or heavily embedded by fine sediment and organics. Consistently, overhanging streamside vegetation and large woody debris, tended to be the dominant habitat components that contributed to providing moderate summer rearing habitats within the assessed reaches.

Residual pool depths and overall water depth varied among the fish bearing reaches. Reaches confirmed as fish bearing were considerably larger in width and had deeper channels than the defaulted reaches. Reaches with intermittent, dewatered or sub-surface sections (<100 m in length) were observed but were not considered as a reach barrier based on the conclusion that spring freshet would likely provide sufficient water levels to allow for the movement of fish upstream.

**Table 3. Summary of habitat characteristics of confirmed fish bearing reaches identified within the Burns Lake Community Forest.**

Operational Area	Reach / Site ID	WSC/ILP <sup>1</sup>	Stream Class	Coordinates		Channel Width (m)	Channel Gradient (%)	Residual Pool depth (m)	Dom. Substrate <sup>2</sup>	Morphology <sup>3</sup>	Habitat Ratings <sup>4</sup>		
				Easting	Northing						Spawning	Rearing	Overwintering
A	14.1	180-374000-95200-01900-3580	S2	315284	6001693	5.86	4.5	0.25	G	RP	G	G	P
A	58.1	58	S3	317565	6007512	1.53	5	0.34	G	RP	M	G	P

<sup>1</sup> WSC= watershed Code; ILP = Interim Locational Point

<sup>2</sup> G= gravels

<sup>3</sup> RP= riffle-pool

<sup>4</sup> G= good; M= moderate; P= poor

**Table 4. Summary of habitat characteristics of sampled reaches defaulted to fish bearing status within the Burns Lake Community Forest.**

Area Group	Reach/Site ID	WSC/ILP <sup>1</sup>	Stream Class	Coordinates		Channel Width (m)	Channel Gradient (%)	Residual Pool Depth (m)	Dom. Substrate <sup>2</sup>	Morphology <sup>3</sup>	Habitat Ratings <sup>4</sup>		
				Easting	Northing						Spawning	Rearing	Overwintering
A	2.1	180-374000-95200-01900-7840	S4	318414	6010696	1.49	5	0.30	F	CP	P	G	P
A	2.2	180-374000-95200-01900-7840	S3	318228	6010072	1.67	4	0.27	G	RP	M	G	P
A	5.1	5	S4	316318	6008472	0.45	15.5	0.18	G	CP	P	P	P
A	7.1	7	S4	317299	6007754	1.17	3.5	0.22	G	RP	M	M	P



Area Group	Reach/Site ID	WSC/ILP <sup>1</sup>	Stream Class	Easting	Northing	Channel Width (m)	Channel Gradient (%)	Residual Pool Depth (m)	Dom. Substrate <sup>2</sup>	Morphology <sup>3</sup>	Habitat Ratings <sup>4</sup>		
											Spawning	Rearing	Overwintering
A	7.2	7	S4	316924	6007483	1.07	13.5	0.18	C	CP	P	P	P
A	10.1	10	S4	317629	6007334	0.43	2	0.11	F	RP	P	M	P
A	11.1	11	S4	317757	6007021	0.67	4.7	0.13	F	RP	P	P	P
A	17.1	180-374000-95200-01900-3580-8217	S3	317952	6002207	1.57	2	0.28	G	RP	M	G	P
A	17.2	180-374000-95200-01900-3580-8217	S3	317824	6002502	2.33	2	0.17	G	RP	P	G	P
A	17.5	180-374000-95200-01900-3580-8217	S4	317219	6002800	0.92	2.5	0.17	F	RP	P	P	P
B	36.1	180-374000-95200-01900-3580-5640	S4	328182	5992359	0.44	2	0.10	F	RP	P	P	P
C	44.1	180-374000-95200-36800	S4	336311	5990464	0.72	2	0.07	G	RP	P	P	P
C	45.1	45	S4	336375	5991276	1.19	2	0.14	F	RP	P	P	P
C	46.1	46	S4	336644	5991539	1.09	2	0.12	F	RP	P	P	P
A	58.2	58	S4	316445	6009013	0.77	10.5	0.17	G	RP	P	M	P
A	63.1	63	S4	318660	6008320	0.76	4	0.15	F	RP	P	P	P
A	63.2	63	S4	318506	6008359	0.66	11	0.21	G	CP	P	M	P

<sup>1</sup> WSC= watershed Code; ILP = Interim Locational Point

<sup>2</sup> C= cobble; F= fines; G= gravels

<sup>3</sup> CP= cascade pool; RP= riffle-pool

<sup>4</sup> G= good; M= moderate; P= poor

### 3.2.1 FISH CAPTURE

Electrofishing was conducted at 26 sites for a total effort of 4,221 seconds. A total of seven rainbow trout were captured at two sites during the field program. Both sites were located in Operational Area A. Fork lengths ranged from 46 to 118 mm. Presence of young of year rainbow trout in reach 14.1 (fork length 46-60 mm) indicate spawning habitat is nearby. These two mainstem creeks (ILP 14 and ILP 58) provide important spawning and rearing stream habitat for adfluvial rainbow trout populations residing in Burns, Guyishton, and Tchesinkut lakes.

**Table 5. Summary of fish species captured in the Burns Lake Community Forest (May – June, 2019).**

Site ID	WSC/ILP	Electrofishing Effort (Seconds)	Species Present	Number of fish caught	CPUE	Mean fork Length (mm)
14.1	180-374000-95200-01900-3580	362	RB	6	0.02	69
58.1	58	67	RB	1	1.49	67



### 3.2.1.1 Follow-up Sampling

Single season sampling efforts to determine fish absence within reach habitats are not always sufficient, especially when water is a limiting factor for fish to access various habitat types. Low water conditions often require a two-season sampling approach in determining whether a stream or reach does not support fish under different flow regimes. Similarly, life history requirements of fish species need to be considered regarding the likelihood that sections of a stream may only be utilized on a seasonal basis, such as rearing and refuge habitats that experience higher flows or spawning areas that provide suitable substrate and are inundated only at certain times of the year. Realization of seasonal changes to flow regimes affecting habitat availability, influences stream connectivity and fish access to habitat within a stream, therefore influencing the fish-bearing status of a specific reach. Table 6 summarizes the defaulted reaches that are recommended for follow-up sampling at a period of increased water levels or freshet periods (e.g. early-mid May) which would assist in defining the upper limits of fish distribution within these reaches.

**Table 6. Follow – up sampling to confirm fish bearing status in the Burns Lake Community Forest.**

Operational Area	Reach / Site ID	WSC/ ILP	Stream Class	Easting	Northing
A	2.1	180-374000-95200-01900-7840	Default-S4	318414	6010696
A	2.2	180-374000-95200-01900-7840	Default-S4	318228	6010072
A	5.1	5	Default-S4	316318	6008472
A	7.2	7	Default-S4	316924	6007483
A	17.1	180-374000-95200-01900-3580-8217	Default-S4	317952	6002207
A	17.3	180-374000-95200-01900-3580-8217	Default-S4	317824	6002502
A	17.5	180-374000-95200-01900-3580-8217	Default-S4	317219	6002800
B	36.1	180-374000-95200-01900-3580-5640	Default-S4	328182	5992359
C	44.1	180-374000-95200-36800	Default-S4	336311	5990464
C	55.2	55	Default-S4	343539	5991217
A	63.1	63	Default-S4	318660	6008320
A	63.2	63	Default-S4	318506	6008359

### 3.2.2 NON-FISH BEARING

When fish are not captured during sampling efforts, additional factors must be considered in order to support the rationale that the stream does not support fish at any time of the year (i.e. non-fish bearing). Evaluation of biological factors in determining non-fish bearing status include known local fish species distribution and fish behavior. Other factors include physical migration/movement barriers, gradient, habitat quality, and the presence/absence of lakes and ponds that provide overwintering habitat to support fish populations.





Non-fish bearing streams identified within the project area were determined as being highly improbable to support or be accessed by local fish species throughout the year. These classifications were supported by one or more of the following criteria:

- reach gradients in excess of 20%
- poor fish habitat that would not support fish populations such as no spawning and overwintering potential
- location of the reaches within the watersheds (i.e., small 1<sup>st</sup> order tributaries)
- lack of connectivity downstream (i.e. discontinuous channels), and
- limited fish capture results

Where stream conditions allowed, fish sampling efforts were carried out above identified barriers. Some reaches were not sampled for fish due to a lack of water or the channel gradient was greater than 20%. A total of 15 (17.2%) stream reaches were identified as non-fish bearing and an explanation for each stream reach is provided in Table 4.

In initial communications with BLCF, reaches 47.1, 48.1, and 49.1 had been considered defaulted to an S4 classification. Upon review of the data this classification was changed to S6, non-fish bearing, as these reaches are obstructed by a fish barrier approximately 800 m upstream from the confluence with Tchesinkut Lake (FINS 2002). This barrier is a 16 m high cascade barrier with a gradient greater than 32%. The watershed upstream of this barrier consists of 1<sup>st</sup> order tributaries within a small drainage area. No lakes or wetlands are present that would provide suitable overwintering habitat. Assessed stream reaches indicated poor quality spawning, rearing and overwintering habitat that is insufficient to support a resident population upstream of the barrier.

Of the reaches surveyed, 51 (58.6%) were not sampled as they were either a wetland or did not fit the definition of a stream under the FPC (i.e., NCD or NVC). These occurrences are identified in Table 5.

**Table 7. Summary of non-fish bearing reaches sampled within the Burns Lake Community Forest.**

Operational Area	Reach / Site ID	WSC/ILP	Stream Class	Easting	Northing	Channel Width (m)	Channel Gradient (%)	Non-Fish Bearing Status
								Rationale
A	1.1	1	S5	318862	6010842	4.97	4	Lacks connection downstream of culvert between 2 private properties (vegetated swale at this location).
A	7.3	7	S6	316075	6007244	0.84	26	No spawn, rearing, overwinter habitat; gradient >20%
A	13.1	180-374000-95200-01900-3580	S6	314329	6006923	0.62	4	No spawning, rearing, overwinter habitat; 1 <sup>st</sup> order tributary headwater channel
A	17.7	180-374000-95200-01900-3580-8217	S6	316338	6003136	0.85	10	NCD d/s of reach; no overwintering or spawning habitat.





Operational Area	Reach / Site ID	WSC/ILP	Stream Class	Easting	Northing	Channel Width (m)	Channel Gradient (%)	Non-Fish Bearing Status
								Rationale
A	17.8	180-374000-95200-01900-3580-8217	S6	316167	6003334	0.78	33	Gradient >20%; no overwintering, spawning or rearing habitat; several cascades (1.5m height); shallow flow limiting u/s access
A	22.1	22	S6	316685	6004426	1.32	11	No spawning, rearing, overwintering habitat; numerous step pools (0.3m) with limited flow; 1 <sup>st</sup> order tributary in headwaters.
A	23.1	23	S6	317150	6005632	1.37	16	Extremely poor spawning, rearing, overwintering habitat, sub-surface flow due alluvial deposits in channel
A	23.2	23	S6	316988	6005554	1.57	24	No spawning, rearing, overwintering habitat; restricted access from d/s due to 12 m falls; sub-surface flow.
A	23.3	23	S6	316721	6005480	1.15	26	No spawning, rearing, overwintering habitat; sections of channel dewatered; 12 m falls present in d/s reach.
A	24.1	24	S6	316272	6005821	0.52	10	Extremely poor spawning, rearing, overwintering habitat; channel dewatered/sub-surface flow; 22% gradient before start of reach
A	25.1	25	S6	314384	6004870	0.91	3	No spawning or overwintering habitat with moderate rearing habitat; 1 <sup>st</sup> order tributary in headwaters.
A	26.1	26	S6	313714	6005201	0.85	3	No spawning or overwintering habitat with moderate rearing habitat; 1 <sup>st</sup> order tributary in headwaters.
B	35.1	35	S6	327575	5992587	0.65	5	Extremely poor spawning, rearing, overwinter habitat; channel dewatered/sub-surface flow; channel gradient $\geq$ 20% before start of reach (near Francois Lake).
C	47.1	47	S6	334299	5991853	0.66	5	Extremely poor spawning, rearing, overwintering habitat; sub-surface/dewatered sections; cascade (16 m height, 67 m long; gradient 23%) 650 m below the Tercer-Echo FSR restricts u/s access. Watershed upstream of this barrier is small, no lake or wetlands to provide overwintering habitat. Streams assessed provided no fisheries habitat that would support population.
C	48.1	48	S6	334011	5991376	0.31	10	Extremely poor spawning, rearing, overwintering habitat; sub-surface/dewatered sections; cascade (16 m height, 67 m long; gradient 23%) 650 m below the Tercer-Echo FSR restricts u/s access. Watershed upstream of this barrier is small, no lake or wetlands to provide overwintering habitat. Streams assessed provided no fisheries habitat that would support population.



Operational Area	Reach / Site ID	WSC/ILP	Stream Class	Easting	Northing	Channel Width (m)	Channel Gradient (%)	Non-Fish Bearing Status
								Rationale
C	49.1	49	S6	333948	5992031	0.44	10	Extremely poor spawning, rearing, overwintering habitat; sub-surface/dewatered sections; cascade (16 m height, 67 m long; gradient 23%) 650 m below the Tercer-Echo FSR restricts u/s access. Watershed upstream of this barrier is small, no lake or wetlands to provide overwintering habitat. Streams assessed provided no fisheries habitat that would support population.
D	55.2	55	S6	343539	5991217	0.58	8	No connection downstream; habitat does not support fish population.

WSC- Watershed Code      d/s – downstream    u/s – upstream

**Table 8. Summary of NCD, NVC and wetland reaches identified within the Burns Lake Community Forest.**

Operational Area	Site ID	WSC/ILP	Stream Class	Location	
				Easting	Northing
A	3.1	180-374000-95200-01900-7840	NCD	315395	6009405
A	4.1	180-374000-95200-01900-7630-6080	NCD	315531	6008956
A	6.1	6	NCD	316929	6007923
A	7.4	7	NCD	315817	6007241
A	8.1	8	NCD	315784	6007179
A	9.1	9	NCD	316079	6007240
A	10.2	10	NCD	316843	6007308
A	11.2	11	NCD	317093	6006862
A	11.3	11	NVC	317005	6006805
A	12.1	12	NCD	314875	6006132
A	12.2	12	NCD	315003	6006701
A	13.2	180-374000-95200-01900-3580	NCD	314481	6006791
A	15.1	15	NCD	318665	6001773
A	16.1	16	NVC	318648	6001954
A	17.2	180-374000-95200-01900-3580-8217	Wetland	317873	6002278
A	17.4	180-374000-95200-01900-3580-8217	Wetland	317298	6002726
A	17.6	180-374000-95200-01900-3580-8217	NCD	316446	6003072
A	17.9	180-374000-95200-01900-3580-8217	NCD	315755	6003942
A	19.1	19	NCD	317033	6003713
A	20.1	20	NVC	316714	6003449
A	21.1	21	Wetland	318340	6002567
A	26.2	26	NCD	314081	6005224



Operational Area	Site ID	WSC/ILP	Stream Class	Location	
				Easting	Northing
B	27.1	27	NVC	325378	5993306
B	28.1	28	NVC	324952	5993339
A	29.1	180-374000-95200-51200-7522	Wetland	326547	5993015
A	31.1	180-374000-95200-01900-3580-5640	Wetland	326089	5993805
B	32.1	180-374000-95200-51200	NCD	326689	5992393
B	33.1	33	NCD	326850	5992227
B	34.1	34	NCD	327738	5992648
B	35.2	35	Wetland	326925	5992977
B	36.2	180-374000-95200-01900-3580-5640	NCD	328257	5992760
B	37.1	37	NVC	329005	5992528
B	38.1	38	Wetland	328984	5992636
B	39.1	180-374000-95200-49100	NCD	329094	5993073
C	40.1	40	NCD	337234	5989698
C	42.1	42	NVC	336542	5989988
C	43.1	43	NCD	335593	5989971
C	44.2	180-374000-95200-36800	Wetland	335508	5990144
C	45.2	45	NCD	336075	5991218
C	47.2	47	NCD	334431	5991688
C	49.2	49	NCD	333643	5991516
C	49.3	49	NVC	333478	5991103
C	50.1	50	NCD	333565	5991238
D	52.1	52	NCD	344056	5991347
D	53.1	53	NCD	344096	5992007
D	55.1	55	Wetland	343853	5992070
C	57.1	57	NVC	336865	5989959
A	60.1	60	NCD	318886	6002570
B	61.1	61	NCD	325452	5993052
A	62.1	62	NCD	318287	6007521
A	64.1	180-374000-95200-01900-7840	NCD	316393	6009014

NVC – No visible channel    NCD – Non-classified drainage

### 3.2.3 STREAM CROSSINGS

An objective of the program was to characterize fish habitat and determine stream classifications at proposed stream crossings to facilitate forest development activities. EDI had intended sampling the 45 crossings identified during pre-field planning however, since several of these crossings were located upstream of NCD or NVC stream reaches, additional site assessments were not warranted. There were also instances in which the crews were unable to safely investigate proposed stream crossings due to hazardous terrain conditions (e.g., steep gullies with significant blow down present). In total EDI assessed 25 stream crossings.



Table 7 presents stream channel characteristics and general habitat conditions along with stream classifications for these crossings. Suitable crossings structures have been recommended based on gradient and habitat quality criteria listed in the Fish-Stream Crossing Guidebook (2002). Where snowfills have been recommended it is anticipated that streams will be either dry or frozen to the substrate. Snowfills should be constructed of only clean snow (i.e., no logs, dirt, or other debris) and be deactivated prior to spring thaw.

Three crossings are proposed on defaulted fish bearing reaches with S4 stream classifications. These reaches provide marginal habitat overall with no spawning or overwintering opportunities for fish. Based on gradients, culvert installation is considered suitable for 44.1(1) while open-bottom structures such as a small bridge are recommended for crossings 7.2 (1) and 55.2(2) given the higher stream gradients at these locations. Stream reaches 7.2 and 55.2 have been identified for further sampling. If additional sampling at these locations confirm non-fish bearing status (i.e., S6), culverts could be considered appropriate crossing structures.

**Table 9. Proposed watercourse crossings.**

Site ID	Easting	Northing	Status	Channel Width (m)	Wetted Width (m)	Residual Pool Depth (m)	Average Gradient (%)	Suitable Crossing Structure	Notes
4.1(1)	315519	6007193	NCD	-	-	-	-	Snowfill/culvert	Valley depression with abundant LWD, steep terrain (15-20%)
7.2 (1)	316796	6007437	S4	0.9	1.2	0.3	13.5	Open-bottom structure	Crossing at a gully with steep banks
13.2 (1)	314531	6006717	NCD	-	-	-	-	Snowfill/culvert	No defined channels present
17.8 (1)	315755	6003942	NCD	-	-	-	-	Snowfill/culvert	Crossing located adjacent to wetland, pooling water present at crossing location
17.9 (1)	315567	6004268	NCD	-	-	-	-	Snowfill/culvert	Crossing is located adjacent to wetland. Ground is saturated at crossing location.
19.1 (1)	315936	6004125	NCD	-	-	-	-	Snowfill/culvert	Saturated ground present at crossing location.
23.3 (1)	316684	6005468	S6	1.1	0.9	0.05	26	Snowfill/culvert	Numerous avulsions and dewatered sections; steep gradient
27.1 (1)	325378	5993306	NCD	-	-	-	-	Snowfill/culvert	Existing crossing, no crossing structure present. Channel is NCD upstream and downstream of existing road.
27.1 (2)	325456	5993510	NVC	-	-	-	-	Snowfill/culvert	No evidence of pooling water present.
27.1 (3)	325540	5993616	NVC	-	-	-	-	Snowfill/culvert	Crossing is located adjacent to wetland. Saturated ground present.



Site ID	Easting	Northing	Status	Channel Width (m)	Wetted Width (m)	Residual Pool Depth (m)	Average Gradient (%)	Suitable Crossing Structure	Notes
27.1 (4)	325241	5993055	NVC	-	-	-	-	Snowfill/culvert	Crossing located in low point of land. No evidence of pooling water.
32.1 (1)	326689	5992393	NCD	-	-	-	-	Snowfill/culvert	Large tree down at crossing, pooling water present in exposed soil. No channel present upstream and downstream of exposed soil.
33.1 (1)	326829	5992142	NVC	-	-	-	-	Snowfill/culvert	No evidence of pooling water present
36.2 (1)	328251	5992961	NCD	-	-	-	-	Snowfill/culvert	Ground saturated, no defined channel present.
40.1 (1)	336981	5989519	NCD	-	-	-	-	Snowfill/culvert	No defined bank, ground saturated, some pooling of water.
43.1 (1)	335866	5990180	NVC	-	-	-	-	Snowfill/culvert	No evidence of pooling water present.
44.1 (1)	336182	5990421	S4	0.89	0.87	0.05	2	Open-bottom structure	Classified based on gradient and no barriers downstream
47.1 (1)	334422	5991724	S6	0.60	0.35	0.05	5	Culvert	Classified based on gradient and defined channel.
48.1 (1)	334022	5991481	S6	0.9	0.8	0.1	10	Culvert	Intermittent flow with pools present, low gradient immediately upstream of crossing.
48.1 (2)	334033	5991624	S6	0.2	0.1	0.1	10	Culvert	Intermittent flow present with vegetated bridges throughout.
49.1 (1)	333674	5991698	S6	0.95	0.8	0.1	10	Culvert	Visible flow with moderate gradient.
49.1 (2)	333615	5991498	NVC	-	-	-	-	Snowfill/culvert	No water present. Crossing located in steep gully.
49.1 (3)	333478	5991103	NCD	-	-	-	-	Snowfill/culvert	No water present. Located in steep gully with ~19% gradient banks.
55.2 (1)	343539	5991219	NCD	-	-	-	-	Snowfill/culvert	Low point in land with no water visible. Ground saturated.
55.2(2)	343667	5991904	S4	0.8	0.4	0.05	8	Snowfill/culvert	Located in gully with steep banks. Minimal flow present.



## 4 DISCUSSION

Fish distribution within the assessed watersheds is based on topography, stream size and location within the watershed. Operational Area A has a significantly large watershed area with two substantial mainstem watercourses: Guyishton Creek and Tchesinkut Creek. Both watercourses are 4<sup>th</sup> order at their confluences. There is a large escarpment within the Guyishton Creek water that separates the middle reaches from the upper headwaters. Operational Areas B, C, and D encompass watersheds that are much smaller in comparison, consisting of 1<sup>st</sup> and 2<sup>nd</sup> order watercourses that are connected to downstream lakes within two to three kilometers. Most reaches selected for sampling were located on 1<sup>st</sup> and 2<sup>nd</sup> order streams in the upper reaches of the watersheds. The only confirmed fish bearing reaches were identified in Operational Area A. These reaches had considerably larger channel widths being located on large 2<sup>nd</sup> and 3<sup>rd</sup> order reaches in Guyishton Creek watershed below the escarpment.

Middle and lower elevation reaches with gentle gradients were frequently impounded by beaver dams. These created ponds which provide important overwintering habitat and refuge for fish populations in the immediate area. The absence of suitable deep pools throughout most of the assessed reaches strongly indicate that overwintering does not occur within these reaches and fish likely migrate to suitable deeper water habitats such as ponds, lakes and larger riverine systems lower in the watershed.

Gradient and other permanent barriers such as waterfalls also limit upstream fish distribution. Gradient barriers (i.e., reaches with gradients exceeding 20%) were present within the BLCF, particularly in the upper reaches along the escarpment in Operational Area A. These gradient barriers represent the upstream limit of fish distribution as they are considered impassable to fish at all times of the year.

While fish abundance and distribution may be limited within the watersheds, it is important to maintain forestry and aquatic resource values when developing the land base. Ongoing developments within the area should be consistent with environmental guidance from provincial and federal regulators. Guidance documents such as British Columbia Forest Practices Code guidebooks, and guidelines for instream work timing windows describe standard best management practices that should be implemented to reduce potential effects on fish and fish habitat and maintain functional fish populations within the BLCF.



## 5 REFERENCES CITED

- BC Environment. 1997. Terrain Resource Information Management (TRIM). 1:20,000 scale maps.
- BC Ministry of Environment. 2011. Field Assessment for Determining Fish Passage Status of Closed Bottom Structures. 4<sup>th</sup> ed. Victoria BC.
- BC Ministry of Forests 1995. Riparian Management Area Guidebook. Forest Practices Branch. Victoria, BC.
- BC Ministry of Forests 1996. Channel Assessment Procedure Guidebook. Forest Practices Branch. Victoria, B.C.
- BC Ministry of Forests 1998. Forest Practices Code of British Columbia. Fish-stream Identification Guidebook. Second Edition, Version 2.1. Forest Practices Branch. Victoria, BC.
- BC Ministry of Forests. 2002. Fish-stream crossing guidebook 2<sup>nd</sup> ed. Forest Practices Branch. Victoria, B.C.
- Forest and Range Practices Act: Forest Planning and Practices Regulation (SBC 2002, C. 69), amendments up to B.C. Reg.124/2019, March 13, 2018.
- FINS Consulting Ltd. 2002. Reconnaissance (1:20,000) Fish and Fish Habitat Inventory Tchesinkut Lake Tributaries 2001/02 General Watershed Code: 180-374000-95200-01900-3580.
- McPhail, J.D. and R. Carveth. 1994. Field Key to the Freshwater Fishes of British Columbia. Resource Inventory Committee.
- Province of British Columbia 1997. Fish collection methods and standards. Version 4.0. and Errata 1 (1999). B.C. Ministry of Fisheries. Fisheries Inventory Section. Victoria, B.C.
- Resource Inventory Committee 2000. Reconnaissance (1:20,000) Fish and Fish Habitat Inventory: Quality Assurance Procedures, including Errata (2004). BC Fisheries, Information Services Branch. Victoria, B.C.
- Resource Inventory Committee 2001. Standards for Fish and Fish Habitat Maps, version 3.0, including Errata (2009). BC Fisheries, Information Services Branch. Victoria, B.C.

### 5.1 INTERNET SITES

- Resources Information Standards Committee 2001. Reconnaissance (1:20,000) Fish and Fish Habitat Inventory: Standards and Procedures. Version 2.0. Available at:  
<http://ilmbwww.gov.bc.ca/risc/pubs/aquatic/index.htm>
- Resources Information Standards Committee 2008. Reconnaissance (1:20,000) Fish and Fish Habitat Inventory. Site Card Field Guide. Available at:  
<https://www2.gov.bc.ca/assets/gov/environment/natural-resource-stewardship/nr-laws-policy/risc/sitecard20.pdf>

*This page is intentionally blank.*





## **APPENDIX A. STREAM CLASSIFICATION MAPS**

*This page is intentionally blank.*



## **APPENDIX B. REPRESENTATIVE SITE PHOTOGRAPHS**

*This page is intentionally blank*