

WSP Indicator Analysis for the Babine Lake Watershed:

Riparian Disturbance

Freshwater Atlas (FWA) Assessment Watersheds

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Note to reader:

These Wild Salmon Policy (WSP) habitat indicator assessment reports are intended as a coarse filter approach to identify watersheds that are potentially at risk of exceeding thresholds for four WSP habitat indicators (Road Density, Stream Crossing Density, Total Land Cover Alteration, and Riparian Disturbance). These reports present the results of GIS-based (Tier 1) methods for assessing the status of a particular freshwater aquatic habitat pressure indicator and determining the watershed indicator "risk" status by comparing the measured values to indicator benchmarks. Pressure indicators are identified by Canada's WSP as proactive measures of identifying potential impacts to salmon habitat within a watershed. Additional information on the WSP is available at https://www.pac.dfompo.gc.ca/fm-gp/salmon-saumon/wsp-pss/ip-pmo/ip-smm-pmo-eng.html#assessment.

The analysis presented in this report was carried out using standardized provincial datasets and did not integrate field-based (Tier 2) information or industry datasets. The results are presented for informational purposes and are not intended to replace operational watershed assessments.

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WSP Indicator Analysis for the Babine Lake Watershed

Pressure Indicator: Riparian Disturbance

Assessment Units: FWA Assessment Watersheds

Description of Pressure Indicator

Riparian disturbance is used to describe streamside changes which may affect stream shade and water temperature, wood and organic matter inputs, bank stability, and other riparian processes, and is considered an important pressure indicator by the Wild Salmon Policy Habitat Working Group (Stalberg et al., 2009). Riparian disturbance is defined as the percentage of the riparian zone (30 m buffer around all water bodies) that has been altered by land use activities (Porter et al., 2014; Stalberg et al., 2009). Riparian disturbance is related to total land cover alteration and road development.

Study Area

The Babine Lake Watershed is situated in the interior of northwest BC and covers an area of $6,555 \text{ km}^2$ (Figure 1). Babine Lake is one of the largest natural lakes in BC and hosts important salmon spawning and rearing habitat. The Babine Lake Watershed falls within the Bulkley, Morice, Lakes, and Prince George Timber Supply Areas.

This report presents results for BC Freshwater Atlas (FWA) assessment watersheds within the Babine Lake Watershed. FWA assessment watersheds are mesoscale groupings of fundamental watersheds with a target size of between 2,000 ha and 10,000 ha (Province of BC, 2020). A reference map of the study area with FWA assessment watersheds identified is included as Appendix A.





Figure 1: The study area is indicated in red. The grey polygon indicates the outline of the Skeena River watershed.



Methodology

Data layers used to perform the spatial analysis include:

- Digital Road Atlas (BC Ministry of Land, Water & Resource Stewardship [MLWRS], 2024a)
- Forest Tenure Road Section Lines (BC Ministry of Forests, 2024b)
- Harvested Areas of BC (Consolidated Cutblocks) (BC Ministry of Forests, 2024c)
- Vegetation Resources Inventory (VRI) (BC Ministry of Forests, 2024d)
- BC Transmission Lines (BC MLWRS, 2024b)
- TANTALIS Crown Tenures (BC MLWRS, 2024c)
- Railway Track Line (BC MLWRS, 2024d)
- Fire Perimeters Historical (BC MLWRS, 2024e)
- TANTALIS Surveyed Right-of-way Parcels (BC MLWRS, 2024f)
- TANTALIS Crown Land Right-of-way Parcels (BC MLWRS, 2024g)
- Oil and Gas Commission Pipeline Segment Permits (BC Oil and Gas Commission, 2024)
- Permitted Mine Areas Major Mine (BC Ministry of Energy, Mines and Low Carbon Innovation, 2024)
- Baseline Thematic Mapping (BTM) (BC MFLNRORD, 2019b)
- Freshwater Atlas (FWA) Assessment Watersheds (BC MFLNRORD, 2019c)
- FWA Lakes (BC MFLNRORD, 2019d)
- FWA Atlas Manmade Waterbodies (BC MFLNRORD, 2019e)
- FWA Rivers (BC MFLNRORD, 2019f)
- Fish Habitat and Road Crossings Model (BC Ministry of Environment and Climate Change Strategy [MECCS], 2024)

Riparian Area Identification

Riparian areas within the study area were calculated using the methodology developed by the Pacific Salmon Foundation ([PSF], 2020):

- A buffer of 30 m (60 m corridor width) was applied to all features in the fish habitat and road crossings model (BC MECCS, 2019) classified as stream/river, ditch or canal. Ditch and canal features (if present) were inspected visually to confirm intersection with the stream network. Isolated ditch and canal features were removed if present.
- Features within the fish habitat and road crossings model with a FWA stream network feature code of WA24111170 (construction line flow inferred) were visually inspected for intersection with the stream network. Isolated stream segments were removed from the dataset if present. Interconnected lake and wetland features were identified through intersection with the inspected Fish Habitat and Road Crossings Model, and the selected lakes and wetlands were merged into one layer. The resultant layer was buffered by 30 m, the areas covered by lakes and wetlands were removed, and island or donut features were also removed.



- River polygons were buffered by 30 m, the areas covered by river features were removed, and buffer features around islands or donuts were also removed.
- The stream, lake/wetland, and river riparian layers were merged, overlaid with the assessment unit boundaries, and dissolved to produce the total riparian area within each assessment unit.

Disturbance Characterization

For the purposes of this study, anthropogenic alterations to the land base were calculated as well as natural disturbance from wildfires. Principal sources of human disturbance identified within the study area include forest harvesting (cutblocks) and resource road development.

Linear Disturbance Characterization

An updated roads layer was developed for the purposes of this analysis. Overlapping roads within the DRA and FTEN subsets were removed by applying a 30 m buffer to the DRA subset and selecting FTEN roads outside of the buffer. The extracted DRA and FTEN roads were then merged to produce the input roads dataset.

Calculated road, railway, and transmission line right-of-way buffer widths were applied to the respective disturbance layers as set out below, where buffer width refers to the total width of each right-of-way:

Description	Modelled Buffer Width (m)
Trail	0
Overgrown Road	5
Unimproved Road	10
Resource Road	15
Main Resource Road	20
Local Road	25
Highways Road	50
Railway	15
Transmission Line	30

Modelled buffer widths were derived for DRA, and FTEN road features with characterization estimated based on available attributes for each dataset. Refer to Appendix B for details on the method applied.

Land cover alteration along pipeline rights-of-way and other utility corridors was estimated from the TANTALIS – Crown Tenures dataset selected for utility and transportation with a tenure stage of "tenure" (i.e. active tenures), from the TANTALIS - Surveyed Right-of-way Parcels, the TANTALIS - Crown Land Rights of way with a tenure stage of "tenure", and the Oil and Gas Commission Pipeline Segment Permits with a construction description of "constructed" and a buffer width of 18m. The utility category does not include the Prince



Rupert Gas Transmission Project, which has been permitted but to our knowledge not constructed.

Forestry Disturbance Characterization

The Consolidated Cutblocks layer was used to identify disturbance from forest harvesting within the last 60 years (i.e. harvested since 1961). This is consistent with the approach used by the Pacific Salmon Foundation (2020).

Other Anthropogenic Disturbance Characterization

Additional sources of land cover alteration were estimated from the TANTALIS – Crown Tenures dataset selected for agriculture, industrial, commercial, quarrying, residential, and community tenure purposes with a tenure stage of "tenure" (i.e. active tenures).

Urban and developed areas were identified using the BTM filtered for a land use of "Urban", and the VRI filtered for land classifications of "urban" and "airport".

Areas disturbed by agriculture or rural residential use were identified using the BTM dataset filtered for land uses of "Agricultural" and "Residential Agricultural Mixtures", and the VRI dataset filtered for non-productive descriptors of "clearing" and "hayfield".

Mine footprints were estimated from the Permitted Mine Areas - Major Mine layer, the BTM filtered for a land use of "Mining", and the VRI filtered for land classifications of "mine spoils", "gravel pit", "open pit mining", and "tailings".

For the purposes of this analysis, 'other' disturbance includes disturbance from settlements, agriculture, industrial and commercial areas, mines, pipelines, transmission lines, and railways.

Natural Disturbance Characterization

The Fire Perimeters layer was used to estimate fire disturbance within the last 25 years (i.e. fires post 1997), consistent with the approach used by the Pacific Salmon Foundation (2020).

Riparian Disturbance Calculation

In order to report estimated total disturbed areas by disturbance type without overlaps, a hierarchy based on predicted degree of disturbance was applied: overlapping 'other' disturbances (railways, transmission lines, mines, settlements, and tenures) were removed from harvested areas, 'other' disturbances and harvested areas were removed from road areas, and 'other' disturbances, harvested areas, and road areas were removed from fire disturbance areas.

Riparian disturbance was calculated by merging all the disturbance layers into a total disturbance layer which was divided by the riparian area within each assessment unit using FWA assessment watersheds as assessment units. Figure 2 shows the location and types of land cover alteration with respect to the assessment units.



This analysis follows the methodology set out by the Pacific Salmon Foundation (2020) for Total Land Cover Alteration with the following adaptions:

• Application of the buffer widths provided by G. Buhr as they were considered more accurate for roads and more conservative for rail and transmission line disturbance.

Salmon Habitat Characterization

The streams layer from the Fish Habitat and Road Crossings Model developed by Mount et al. (2011) and revised by Norris (2022) was used to identify and characterize riparian habitat available to salmon. The model uses input data extracted from the BC Geographic Data Warehouse including the FWA Stream Network and Known Fish Observations among others. Output from the fish habitat model classifies fish habitat as accessible by specific species of fish based on stream gradient and absence of natural fish passage barriers such as waterfalls (Norris, 2022). For the purposes of this assessment, fish habitat was defined as habitat accessible by salmon species (up to a 15% grade) and is reported as "Accessible Salmon Habitat" and "Non-accessible Habitat". This is a change from previous assessments (Eclipse Geomatics Ltd., 2021) where salmon habitat was reported as "Observed", "Inferred" and "Non-habitat". This change was made due to reporting modification in the Fish Habitat and Road Crossings Model which no longer allows for the same type of characterization of stream habitat.

Riparian zones for streams and rivers were identified through the application of a 30 m buffer to stream/river features in the Fish Habitat and Road Crossings Model and to river polygons, for which fish presence attributes were extrapolated through intersection with the Fish Habitat and Road Crossings Model. The areas covered by river polygon features and buffer features around islands or donuts were removed. Stream riparian area was calculated and summed for each assessment unit by fish habitat.

Stream riparian area and fish habitat characterization is provided for context only and is not used to assess or qualify riparian habitat disturbance in this analysis.





Figure 2: Assessment units and disturbance type located within the study area, including roads; forest harvesting; wildfire; and agricultural, industrial, utility, transportation, commercial, quarrying, residential and community land tenures, railways, powerlines, and settlements, shown collectively as other disturbance.

Risk Thresholds

Categorical risk thresholds applied were generated by the Pacific Salmon Foundation based on recommendations from the Wild Salmon Policy Habitat Working Group (Porter et al., 2014; Stalberg et al., 2009) and are tabulated below:



Threshold Rating Percent of Riparian Area Disturbed (%)

Low	< 5%
Moderate	≥ 5% and < 15%
High	≥ 15%

Results of Analysis

A summary of the results of the riparian disturbance analysis with categorical risk thresholds for each assessment unit are shown as Figure 3; Figure 4 provides an overview of the results distribution. Detailed results for each assessment unit are tabulated in Appendix C, and the distribution of the assessment results are shown as a series of figures in Appendix D. Riparian habitat characterization for each assessment unit is included as Appendix E.





Figure 3: Riparian disturbance for each boundary in the study area is shown on a study area map. The results are colourized by risk threshold (low risk < 5% disturbed, moderate risk \ge 5% and < 15% disturbed, and high risk \ge 15% disturbed).





Figure 4: Distribution of results showing the number (count) of assessment units by riparian disturbance. The results are colorized by risk threshold (low risk < 5% disturbed, moderate risk \ge 5% and < 15% disturbed, and high risk \ge 15% disturbed).

Riparian disturbance was calculated for a total of 134 FWA assessment watersheds. Values ranged from 0 to a maximum of 100% within the Duncan Creek (394) sub-watershed in an area impacted by wildfire in the southeast portion of the study area (Figure 4; Appendix C and Appendix D). A majority of 76 assessment units had riparian disturbance values above the threshold for high risk with an additional 41 assessment units in the moderate risk threshold range (Figure 3). Assessment units at high and moderate risk of impacts from principally forestry cutblocks, road development, and wildfire disturbance are situated throughout the watershed (Figures 2 and 3).



Summary

Riparian habitat was characterized and riparian disturbance estimations from forestry activities, roads, utility and railway corridors, and settlements were calculated for 134 FWA assessment watersheds within the Babine Lake Watershed using datasets sourced from the Province of BC and BC Timber Sales. Risk categories derived by the Pacific Salmon Foundation based on recommendations from the Wild Salmon Policy Habitat Working Group were used to assess risk to freshwater habitat from riparian disturbance.

Results of the analysis indicated riparian disturbance ranged from 0 to 100% of riparian area disturbed, with 76 assessment units at high risk and 41 assessment units at moderate risk from riparian disturbance-related impacts situated throughout the study area.

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Appendix A: Reference Maps















Appendix B: Modelled Road Buffer Width Methodology



Description	Modelled Buffer Width (m)	FTEN Attributes	DRA Attributes	BCTS Attributes	
Trail	0	-	ROAD_CLASS = trail, driveway or proposed	LICRDCLASS = TRAIL and BUF_DIST = 5	
Overgrown Road	5	-	RDSURFACE = overgrown or seasonal	-	
Unimproved Road	10	-	ROAD_CLASS = resource or unclassified, RDSURFACE ≠ paved or overgrown, AND NUMLANES = 1	LICRDCLASS \neq TRAIL and BUF_DIST = 4 or 5	
Resource Road	15	FIL_TP_DSC = Road Permit	ROAD_CLASS = resource, recreation or unclassified, RDSURFACE ≠ rough, paved, overgrown or seasonal, AND NUMLANES = 2	BUF_DIST = 8, 9 or 10	
Main Resource Road	20	FIL_TP_DSC = Forest Service Road	ROAD_CLASS = resource or unclassified, AND RDSURFACE = rough, AND NUMLANES = 2	BUF_DIST = 14 or 15 and LICRDCLASS ≠ HWY	
MOT/Local Road	25	-	ROAD_CLASS = local, arterial, service, or strata, OR RDSURFACE = paved, AND ROAD_CLASS ≠ trail or highway	BUF_DIST = 20	
Highways	50	-	ROAD_CLASS = highway	BUF_DIST = 15 or 30 and LICRDCLASS = HWY	

Notes:

FIL_TP_DSC = file type description

RDSURFACE = road surface

NUMLANE = number of lanes

STLG = short-term low-grade

LTAW = long-term all-weather

LICRDCLASS = license road class;

BUF_DIST = buffer distance



Appendix C: Results Tables



	Cub	Total		Disturbed	I Riparian (k	m²)	Total		
Reference AU	watershed Name	Riparian (km²)	Roads	Harvested (Post 1961)	Other	Fire Disturbance (Post 1996)	Riparian Disturbed (km²)	Disturbed (%)	Risk
287		3.59	0.02	0.47	0.00	0.30	0.78	21.88	High
288		1.77	0.01	0.15	0.00	0.00	0.16	8.84	Moderate
289	Tsezakwa Creek	5.50	0.00	0.89	0.00	0.00	0.89	16.18	High
290		2.98	0.00	0.00	0.00	0.00	0.00	0.00	Low
291		2.71	0.00	0.00	0.00	0.00	0.00	0.01	Low
292	Heal Creek	3.12	0.02	0.50	0.01	0.00	0.53	16.94	High
293		3.78	0.01	0.51	0.00	0.00	0.52	13.83	Moderate
294	Five Mile Creek	5.26	0.04	0.22	0.02	0.00	0.28	5.35	Moderate
295		5.14	0.01	0.44	0.01	0.00	0.47	9.06	Moderate
296		3.07	0.02	0.58	0.01	0.00	0.61	19.84	High
297		2.43	0.01	0.37	0.00	0.00	0.38	15.78	High
298		1.89	0.03	0.15	0.02	0.16	0.35	18.50	High
299		3.85	0.02	1.67	0.01	0.38	2.08	54.03	High
300		3.96	0.02	1.33	0.03	0.01	1.38	34.91	High
301		2.99	0.01	0.68	0.00	0.00	0.69	23.03	High
302		2.00	0.01	0.25	0.00	0.00	0.26	13.16	Moderate
303		2.40	0.00	0.48	0.00	0.00	0.48	20.02	High
304		2.74	0.01	0.58	0.00	0.00	0.59	21.38	High
305		2.35	0.02	0.66	0.00	0.00	0.68	28.83	High
306	Morrison Creek	9.23	0.03	0.54	0.00	0.00	0.57	6.16	Moderate
307		6.29	0.02	1.66	0.00	0.00	1.68	26.80	High



	Sub	Tetal	Disturbed Riparian (km ²) Total Percent		Total				
Reference AU	watershed Name	Riparian (km ²)	Roads	Harvested (Post 1961)	Other	Fire Disturbance (Post 1996)	Riparian Disturbed (km²)	Disturbed (%)	Risk
308		4.07	0.01	0.71	0.00	0.00	0.72	17.77	High
309		2.84	0.01	1.03	0.00	0.00	1.04	36.66	High
310	Tahlo Creek	5.94	0.01	0.20	0.04	0.00	0.25	4.14	Low
311		5.56	0.01	0.15	0.00	0.00	0.15	2.74	Low
312		2.47	0.00	0.16	0.00	0.00	0.17	6.70	Moderate
313		3.81	0.01	0.18	0.00	0.00	0.19	4.91	Low
314	Tahlo Creek	4.46	0.02	0.36	0.00	0.00	0.38	8.46	Moderate
315	Tahlo Creek	8.04	0.07	0.12	0.05	0.00	0.24	2.97	Low
316	Haul Creek	3.07	0.01	0.34	0.05	0.00	0.41	13.20	Moderate
317		3.31	0.04	0.71	0.00	0.17	0.93	27.94	High
318		4.04	0.01	1.29	0.00	0.00	1.30	32.04	High
319	Fulton River	8.06	0.05	0.89	0.13	0.00	1.07	13.22	Moderate
320		6.66	0.01	0.23	0.10	0.00	0.34	5.13	Moderate
321		2.60	0.02	0.10	0.00	0.00	0.12	4.68	Low
322		3.34	0.01	0.87	0.00	0.00	0.88	26.42	High
323	Nicholson Creek	2.36	0.01	0.91	0.00	0.00	0.92	39.06	High
324	Broughton Creek	6.36	0.04	1.20	0.00	0.00	1.23	19.40	High
325	Guess Creek	6.08	0.02	1.02	0.00	0.00	1.04	17.05	High
326	Doray Creek	4.56	0.01	0.06	0.00	0.00	0.07	1.59	Low
327		1.97	0.01	0.29	0.00	0.00	0.30	15.04	High
328	Betty Creek	2.24	0.04	0.15	0.05	0.00	0.23	10.29	Moderate
329		7.70	0.03	1.88	0.00	0.00	1.91	24.81	High



	Sub	Tetal		Disturbed Riparian (km ²) Total Percent		Total Boreent			
Reference AU	watershed Name	Riparian (km²)	Roads	Harvested (Post 1961)	Other	Fire Disturbance (Post 1996)	Riparian Disturbed (km²)	Disturbed (%)	Risk
330	Guess Creek	3.14	0.01	0.75	0.00	0.00	0.76	24.06	High
331	Guess Creek	9.37	0.05	0.09	0.00	0.00	0.14	1.50	Low
332	Byron Creek	2.54	0.00	0.59	0.00	0.00	0.59	23.32	High
333	Tanglechain Creek	7.96	0.07	2.20	0.02	0.00	2.28	28.70	High
334	Tanglechain Creek	3.20	0.03	1.03	0.01	0.00	1.07	33.54	High
335	Bristow Creek	3.78	0.02	0.62	0.00	0.00	0.64	16.87	High
336	Fink Creek	2.23	0.00	0.61	0.00	0.00	0.62	27.57	High
337	McKendrick Creek	7.63	0.02	1.39	0.06	0.00	1.47	19.28	High
338	Little Joe Creek	2.43	0.00	0.04	0.00	0.00	0.04	1.72	Low
339	Cronin Creek	5.07	0.08	0.25	0.00	0.00	0.33	6.60	Moderate
340	Nata Creek	3.11	0.00	0.39	0.00	0.00	0.40	12.71	Moderate
341	Bristol Creek	2.73	0.01	1.35	0.00	0.00	1.36	49.66	High
342	Fulton River	2.39	0.01	0.44	0.00	0.00	0.45	18.70	High
343	Fulton River	5.70	0.01	2.02	0.00	0.00	2.03	35.63	High
344	Fulton River	3.72	0.02	1.40	0.00	0.00	1.42	38.24	High
345	Fulton River	5.51	0.04	1.81	0.03	0.00	1.88	34.09	High
346	Fulton River	3.86	0.01	2.06	0.00	0.00	2.07	53.73	High
347	Fulton River	3.55	0.01	0.88	0.00	0.00	0.90	25.19	High
348	Fulton River	5.64	0.01	1.33	0.00	0.00	1.34	23.81	High
349	Fulton River	4.33	0.01	0.15	0.00	0.00	0.16	3.60	Low
350	Tachek Creek	6.74	0.09	0.47	0.12	0.00	0.68	10.07	Moderate



	Sub	Total		Disturbed Riparian (km ²)		m²)	Total	Dereent	
Reference AU	watershed Name	Riparian (km²)	Roads	Harvested (Post 1961)	Other	Fire Disturbance (Post 1996)	Riparian Disturbed (km²)	Disturbed (%)	Risk
351		3.51	0.02	0.17	0.15	0.00	0.34	9.67	Moderate
352	Strimboldh Creek	3.41	0.02	0.29	0.00	0.00	0.31	9.01	Moderate
353		2.61	0.01	1.09	0.00	0.00	1.10	42.27	High
354	Big Loon Creek	5.39	0.01	0.45	0.00	0.00	0.47	8.68	Moderate
355		6.33	0.01	0.10	0.00	0.00	0.11	1.78	Low
356		2.57	0.02	0.24	0.00	0.00	0.26	10.07	Moderate
357		4.40	0.01	0.48	0.00	0.00	0.49	11.16	Moderate
358	Pierre Creek	7.50	0.01	0.53	0.00	0.00	0.54	7.22	Moderate
359		2.47	0.00	0.76	0.00	0.00	0.76	30.93	High
360		2.94	0.00	0.00	0.00	0.00	0.00	0.15	Low
361	Twain Creek	6.92	0.01	1.11	0.00	0.00	1.13	16.29	High
362		4.48	0.01	0.41	0.00	0.00	0.41	9.21	Moderate
363		2.15	0.01	0.40	0.00	0.00	0.41	19.02	High
364		3.67	0.02	0.42	0.00	0.00	0.44	11.86	Moderate
365	Cross Creek	3.48	0.01	0.72	0.02	0.00	0.76	21.78	High
366	Donalds Creek	2.08	0.03	0.31	0.00	0.00	0.35	16.60	High
367	Pinkut Creek	9.28	0.09	1.86	0.01	5.10	7.06	76.07	High
368	Marlin Creek	3.05	0.02	0.84	0.00	0.00	0.86	28.07	High
369	Henrietta Creek	6.43	0.06	1.56	0.00	3.33	4.95	76.96	High
370	Coldwater Creek	1.80	0.01	0.27	0.00	0.12	0.41	22.47	High
371		2.03	0.00	0.02	0.00	0.00	0.02	0.83	Low



	Sub	Tetal		Disturbed	l Riparian (k	m²)	Total	Dereent	
Reference AU	watershed Name	Riparian (km²)	Roads	Harvested (Post 1961)	Other	Fire Disturbance (Post 1996)	Riparian Disturbed (km²)	Disturbed (%)	Risk
372	Henrietta Creek	9.06	0.03	1.58	0.00	0.58	2.19	24.21	High
373		2.77	0.05	0.81	0.00	0.25	1.12	40.32	High
374		6.34	0.03	0.70	0.00	0.00	0.73	11.51	Moderate
375		4.07	0.03	0.63	0.00	0.00	0.66	16.18	High
376		3.44	0.08	0.65	0.02	0.00	0.74	21.53	High
377		2.19	0.03	0.63	0.00	0.00	0.66	30.28	High
378	Ling Creek	3.37	0.08	0.35	0.00	0.00	0.43	12.85	Moderate
379	Pinkut Creek	2.91	0.03	0.78	0.00	0.26	1.06	36.55	High
381		4.22	0.05	1.18	0.00	0.11	1.34	31.74	High
382	Pinkut Creek	1.63	0.03	0.25	0.00	0.41	0.70	42.90	High
383	Pinkut Creek	8.57	0.10	1.61	0.00	0.00	1.71	19.97	High
384	Pinkut Creek	9.44	0.03	1.36	0.00	0.00	1.39	14.71	Moderate
385	Gullwing Creek	5.81	0.01	0.48	0.00	0.00	0.49	8.41	Moderate
386	Four Mile Creek	5.76	0.03	0.41	0.00	0.11	0.55	9.55	Moderate
387		2.45	0.01	0.07	0.00	0.07	0.15	6.30	Moderate
388	Sutherland River	2.63	0.00	0.11	0.00	0.03	0.14	5.16	Moderate
389		1.86	0.01	0.40	0.00	0.00	0.41	22.16	High
390	Shass Creek	6.21	0.02	0.40	0.00	1.70	2.13	34.23	High
391	Shass Creek	7.32	0.01	0.59	0.00	0.00	0.60	8.15	Moderate



	Sub	Tetal	Disturbed Riparian (km²)		m²)	Total			
Reference AU	watershed Name	Riparian (km²)	Roads	Harvested (Post 1961)	Other	Fire Disturbance (Post 1996)	Riparian Disturbed (km²)	Disturbed (%)	Risk
392		2.28	0.02	0.00	0.00	0.00	0.03	1.20	Low
393		5.77	0.02	0.92	0.00	0.43	1.37	23.85	High
394	Duncan Creek	10.98	0.11	1.75	0.00	9.13	10.98	100.00	High
395	Sutherland River	9.45	0.00	0.04	0.00	0.00	0.04	0.45	Low
396	Sutherland River	4.71	0.00	0.00	0.00	0.00	0.00	0.04	Low
397	Sutherland River	7.87	0.06	0.22	0.00	0.77	1.05	13.36	Moderate
398	Sutherland River	5.63	0.03	1.06	0.00	3.80	4.89	86.83	High
399	Sutherland River	17.03	0.09	3.19	0.00	9.04	12.31	72.29	High
400	Babine River	2.80	0.03	0.30	0.03	0.00	0.36	13.01	Moderate
401	Babine River	3.56	0.02	1.25	0.00	0.12	1.39	39.07	High
402		6.43	0.02	1.13	0.05	0.00	1.20	18.66	High
404		4.47	0.05	0.43	0.07	0.66	1.22	27.26	High
405		3.70	0.03	0.41	0.00	0.00	0.44	11.96	Moderate
406		3.83	0.03	1.51	0.06	0.00	1.59	41.52	High
407		3.90	0.01	0.22	0.01	0.00	0.24	6.04	Moderate
408		7.80	0.03	0.45	0.11	0.00	0.59	7.53	Moderate
409		14.08	0.11	5.06	0.10	0.00	5.27	37.47	High
410		3.74	0.02	1.66	0.11	0.00	1.79	47.91	High
411		5.79	0.04	0.72	0.00	0.00	0.77	13.22	Moderate
412		3.59	0.02	0.90	0.00	0.00	0.92	25.68	High



	Cub	Total		Disturbed Riparian (km ²)			Total	Deveent	
Reference AU	watershed Name	Riparian (km²)	Roads	Harvested (Post 1961)	Other	Fire Disturbance (Post 1996)	Riparian Disturbed (km²)	Disturbed (%)	Risk
413		0.72	0.01	0.07	0.00	0.00	0.09	12.13	Moderate
414		4.27	0.01	0.94	0.00	0.00	0.95	22.20	High
415		2.67	0.01	0.69	0.00	0.00	0.71	26.59	High
416		4.02	0.01	0.54	0.00	0.00	0.55	13.70	Moderate
417		2.11	0.01	0.48	0.00	0.00	0.49	23.18	High
418		5.00	0.05	0.81	0.05	0.00	0.92	18.40	High
419		11.23	0.04	1.45	0.00	0.00	1.49	13.24	Moderate
420		3.96	0.02	1.22	0.00	0.00	1.25	31.60	High
421		5.31	0.04	0.40	0.00	1.47	1.91	35.98	High
422		3.38	0.01	0.25	0.00	0.02	0.28	8.34	Moderate

Note: Values were rounded to two decimal places following risk characterization.



Appendix D: Results Distribution



Results are colourized by risk threshold (low risk < 5%, moderate risk \ge 5% and < 15%, high risk \ge 15%).













Appendix E: Riparian Habitat Characterization



Deference	Sub-	Total	Riparian Ar (kn	ea by Type n²)	Total	Stream
AU	watershed Name	Area (km²)	Accessible Salmon Habitat	Non- accessible Habitat	Riparian (km²)	as % of Total Area
287		30.06	1.39	2.22	3.60	11.99
288		21.02	1.48	0.04	1.52	7.23
289	Tsezakwa Creek	53.00	0.96	4.57	5.53	10.43
290		24.25	0.00	2.96	2.96	12.21
291		25.06	0.00	2.69	2.69	10.75
292	Heal Creek	28.99	1.41	1.65	3.06	10.54
293		32.63	0.07	3.10	3.17	9.71
294	Five Mile Creek	43.44	4.27	0.80	5.08	11.68
295		48.76	2.90	2.13	5.03	10.32
296		28.89	2.90	0.12	3.02	10.46
297		22.43	0.75	1.52	2.27	10.10
298		21.74	1.56	0.23	1.79	8.23
299		31.71	3.63	0.15	3.79	11.94
300		34.19	3.23	0.72	3.95	11.56
301		23.16	2.42	0.59	3.02	13.03
302		20.47	1.48	0.55	2.03	9.93
303		22.15	1.77	0.47	2.24	10.12
304		20.95	1.80	0.85	2.66	12.67
305		22.08	2.16	0.18	2.35	10.63
306	Morrison Creek	94.71	4.15	3.65	7.80	8.23
307		52.87	5.40	0.63	6.03	11.40



Poforonoo	Sub-	Total	Riparian Ar (kn	ea by Type ¹²)	Total	Stream
AU	watershed Name	Area (km²)	Accessible Salmon Habitat	Non- accessible Habitat	Riparian (km²)	as % of Total Area
308		29.49	3.17	0.80	3.97	13.47
309		25.36	2.49	0.29	2.78	10.98
310	Tahlo Creek	59.12	5.10	0.36	5.46	9.24
311		40.01	3.22	2.12	5.34	13.35
312		25.64	2.33	0.14	2.47	9.62
313		28.07	2.62	1.21	3.83	13.64
314	Tahlo Creek	45.03	3.88	0.28	4.16	9.24
315	Tahlo Creek	65.33	5.92	2.16	8.08	12.36
316	Haul Creek	31.66	2.52	0.04	2.56	8.10
317		29.19	1.39	1.93	3.32	11.38
318		42.94	1.04	2.82	3.86	8.99
319	Fulton River	84.39	1.58	5.65	7.23	8.57
320		80.34	0.00	6.14	6.14	7.64
321		34.26	0.00	2.27	2.27	6.62
322		34.60	0.00	3.10	3.10	8.95
323	Nicholson Creek	24.15	0.00	2.27	2.27	9.41
324	Broughton Creek	54.20	0.00	6.26	6.26	11.54
325	Guess Creek	67.48	0.00	5.96	5.96	8.83
326	Doray Creek	38.70	0.00	4.51	4.51	11.65
327		32.87	0.00	1.84	1.84	5.61
328	Betty Creek	22.74	0.00	2.19	2.19	9.63
329		64.55	0.00	7.40	7.40	11.46



Deference	Sub- watershed Name	Total	Riparian Area by Type (km²)		Total	Stream
AU		Area (km²)	Accessible Salmon Habitat	Non- accessible Habitat	Stream Riparian (km²)	as % of Total Area
330	Guess Creek	31.69	0.00	3.06	3.06	9.65
331	Guess Creek	75.34	0.00	8.69	8.69	11.54
332	Byron Creek	26.04	0.00	2.38	2.38	9.15
333	Tanglechain Creek	70.56	0.00	7.33	7.33	10.39
334	Tanglechain Creek	32.00	0.00	3.18	3.18	9.95
335	Bristow Creek	38.27	0.00	3.76	3.76	9.81
336	Fink Creek	21.29	0.00	2.23	2.23	10.48
337	McKendrick Creek	69.57	0.00	7.54	7.54	10.84
338	Little Joe Creek	21.84	0.00	2.27	2.27	10.41
339	Cronin Creek	41.50	0.00	5.01	5.01	12.08
340	Nata Creek	34.48	0.00	3.10	3.10	8.99
341	Bristol Creek	34.33	0.00	2.49	2.49	7.25
342	Fulton River	32.29	0.00	2.12	2.12	6.56
343	Fulton River	62.91	0.00	4.99	4.99	7.93
344	Fulton River	35.39	0.00	3.66	3.66	10.34
345	Fulton River	54.96	0.00	4.86	4.86	8.84
346	Fulton River	46.31	0.00	3.59	3.59	7.76
347	Fulton River	37.77	0.00	3.43	3.43	9.09
348	Fulton River	70.81	0.00	5.45	5.45	7.70
349	Fulton River	50.04	0.00	4.30	4.30	8.58
350	Tachek Creek	63.98	5.93	0.76	6.70	10.46
351		29.92	2.47	1.07	3.54	11.83



Reference AU	Sub- watershed Name	Total Area (km²)	Riparian Area by Type (km²)		Total	Stream
			Accessible Salmon Habitat	Non- accessible Habitat	Stream Riparian (km²)	Riparian as % of Total Area
352	Strimboldh Creek	30.07	2.57	0.85	3.43	11.40
353		36.97	1.55	0.75	2.29	6.21
354	Big Loon Creek	60.03	2.74	2.30	5.04	8.40
355		49.09	0.24	6.02	6.26	12.76
356		24.20	1.57	0.94	2.52	10.40
357		31.55	0.68	3.70	4.38	13.89
358	Pierre Creek	48.00	0.57	6.83	7.40	15.43
359		21.01	0.00	2.47	2.47	11.76
360		24.36	0.00	2.73	2.73	11.20
361	Twain Creek	68.23	0.17	6.73	6.91	10.12
362		55.57	0.00	4.41	4.41	7.93
363		22.15	0.02	1.92	1.94	8.76
364		39.84	2.51	1.11	3.62	9.09
365	Cross Creek	35.17	0.10	3.26	3.35	9.54
366	Donalds Creek	22.01	0.13	1.87	2.00	9.10
367	Pinkut Creek	75.32	0.15	8.68	8.83	11.72
368	Marlin Creek	27.08	0.00	3.02	3.02	11.15
369	Henrietta Creek	59.05	0.00	6.15	6.15	10.41
370	Coldwater Creek	20.53	0.00	1.81	1.81	8.79
371		22.71	0.00	1.57	1.57	6.92
372	Henrietta Creek	97.51	0.00	8.59	8.59	8.81



Poforonco	Sub- watershed Name	Total Area (km²)	Riparian Area by Type (km²)		Total	Stream
AU			Accessible Salmon Habitat	Non- accessible Habitat	Stream Riparian (km²)	as % of Total Area
373		23.82	0.00	2.76	2.76	11.58
374		56.71	0.00	6.32	6.32	11.14
375		35.56	0.00	4.01	4.01	11.28
376		52.02	0.00	2.76	2.76	5.31
377		21.04	0.00	2.03	2.03	9.63
378	Ling Creek	38.68	0.00	2.63	2.63	6.80
379	Pinkut Creek	32.85	0.00	2.91	2.91	8.86
381		37.62	0.00	4.26	4.26	11.33
382	Pinkut Creek	13.73	0.00	1.62	1.62	11.82
383	Pinkut Creek	90.72	0.00	7.73	7.73	8.52
384	Pinkut Creek	95.82	0.00	9.36	9.36	9.76
385	Gullwing Creek	53.17	2.76	2.69	5.45	10.26
386	Four Mile Creek	49.23	0.10	5.55	5.65	11.48
387		26.98	0.05	2.29	2.34	8.66
388	Sutherland River	34.15	1.40	1.19	2.59	7.58
389		22.02	1.63	0.21	1.84	8.33
390	Shass Creek	75.12	0.08	4.72	4.80	6.40
391	Shass Creek	77.45	0.00	6.68	6.68	8.63
392		22.60	0.59	1.72	2.30	10.20
393		46.80	0.13	5.42	5.55	11.87
394	Duncan Creek	77.50	7.77	2.94	10.71	13.81



Reference AU	Sub- watershed Name	Total Area (km²)	Riparian Area by Type (km²)		Total	Stream
			Accessible Salmon Habitat	Non- accessible Habitat	Stream Riparian (km²)	as % of Total Area
395	Sutherland River	96.66	2.80	6.61	9.40	9.73
396	Sutherland River	40.01	1.80	2.94	4.74	11.85
397	Sutherland River	50.62	2.23	5.67	7.89	15.59
398	Sutherland River	32.68	1.76	3.74	5.49	16.81
399	Sutherland River	113.77	8.66	8.27	16.93	14.88
400	Babine River	30.15	1.93	0.48	2.41	7.98
401	Babine River	43.38	2.34	0.98	3.32	7.66
402		63.97	2.34	3.99	6.33	9.90
404		58.96	3.41	1.06	4.47	7.58
405		44.71	1.50	2.29	3.79	8.48
406		44.14	1.50	2.37	3.87	8.76
407		54.00	1.64	2.30	3.94	7.29
408		86.52	2.91	5.03	7.94	9.18
409		190.94	6.85	6.89	13.73	7.19
410		44.74	2.54	0.74	3.29	7.34
411		53.46	3.06	2.64	5.69	10.65
412		50.82	1.78	1.80	3.57	7.03
413		33.15	0.65	0.00	0.65	1.97
414		32.76	1.60	2.65	4.25	12.98
415		44.19	2.67	0.00	2.67	6.04



Reference AU	Sub- watershed Name	Total Area (km²)	Riparian Ar (kn	ea by Type n²)	Total Stream Riparian (km²)	Stream Riparian as % of Total Area
			Accessible Salmon Habitat	Non- accessible Habitat		
416		35.94	1.64	2.42	4.06	11.31
417		32.64	1.87	0.20	2.07	6.35
418		47.72	2.62	2.44	5.06	10.59
419		95.99	0.54	10.51	11.05	11.51
420		40.52	0.28	3.67	3.95	9.75
421		59.31	1.23	4.00	5.24	8.83
422		41.34	0.44	2.85	3.28	7.94