



WSP Indicator Analysis for the Kispiox TSA:

Road Density

Interior Watershed Assessment Protocol (IWAP)

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.dfo-mpo.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.

Acknowledgements

We would like to thank Sarah Railton, Greg Knox, and Julia Hill Sorochnan for their contributions and feedback, and to Glen Buhr for his assistance and guidance.

WSP Indicator Analysis for the Kispiox TSA

Pressure Indicator: Road Density

Assessment Units: IWAP Assessment Watersheds

Description of Pressure Indicator

Road density has been widely correlated to salmon habitat degradation and declines of salmon populations in the Pacific Northwest, and has been ranked as a high value indicator by the Wild Salmon Policy (WSP) Habitat Working Group (Stalberg et al., 2009). Road development can interfere with natural flow and increase peak flows within a watershed as well as cause increased erosion and sediment deposition and stream turbidity (Porter et al., 2019).

Road density is defined as the total length of roads in an area divided by the total area (km/km^2), and is closely associated with watershed land cover alterations, stream crossings and barriers, and riparian habitat disturbance (Porter et al., 2019).

Study Area

The Kispiox timber supply area (TSA) is situated in the interior of northwest BC and encompasses the District of New Hazelton and the communities of Hazelton, South Hazelton, Kitwanga, Cedarvale, Kispiox, Gitsegukla, Gitwangak, Gitanyow, Hagwilget, Glen Vowell and Gitanmaax (Figure 1). The Kispiox TSA is part of the Skeena Natural Resource Region and is administered by the Skeena Stikine Natural Resource District office in Smithers.

The Kispiox TSA is comprised of seven TSA supply blocks (12A to 12G), with the Cranberry TSA consolidated with the Kispiox TSA on March 31, 2009 as Block 12G. The current allowable annual cut for the Kispiox TSA is 1,087,000 cubic metres (Province of BC, 2019).

This report presents results for Interior Watershed Assessment Protocol (IWAP) watersheds within the Kispiox TSA and the neighbouring upper Kispiox River and Swan Lake watersheds. The IWAP watersheds are primarily fourth order historical assessment watersheds delineated by the Kispiox Expert Water Panel and used as reporting units for 2004-2019 watershed assessment and monitoring projects (BC Ministry of Environment and Climate Change Strategy [BC MECCS], 2004). Reporting watershed assessment results by IWAP watershed allows for continuity and comparison with historical results. Reference maps showing the study area with Kispiox TSA and IWAP boundaries are 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:

- Kispiox Road Inventory (BC Ministry of Forests, Lands, Natural Resource Operations and Rural Development [BC MFLNRORD], 2017)
- Digital Road Atlas (BC MFLNRORD, 2020a)
- Forest Tenure Road Section Lines (BC MFLNRORD, 2020b)
- Kispiox TSA “Interior Watershed Assessment Procedure” (IWAP) Watersheds (BC MECCS, 2004)

The Kispiox Road Inventory data layer was developed by BC MFLNRORD Skeena-Stikine District staff using information sourced from provincial TRIM base mapping, the Digital Road Atlas (DRA), Forest Tenure Road Section Lines (FTEN), and major licensee digital road files. The dataset was refined using best available orthophoto and satellite imagery and non-existent roads were removed (e.g. phantom duplicate or parallel road sections and planned roads that were never constructed) while deactivated roads were left in the data set (G. Buhr, personal communication, October 15, 2020).

An updated roads layer was developed for the purposes of this analysis by adding new (post-2017) road segments from the DRA and FTEN data layers that do not appear in the Kispiox Road Inventory. These additional segments were extracted from the 2020 DRA and FTEN datasets by applying a buffer of 30 m to the Kispiox Road Inventory and selecting DRA and FTEN roads outside of this buffer added since 2017. 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 with the Kispiox Road Inventory to produce the input roads dataset.

This analysis follows the methodology set out by the Pacific Salmon Foundation (2020) for Road Development with the substitution of the updated Kispiox Road Inventory for the DRA and FTEN datasets as it is considered to be the more accurate road layer for the study area.

IWAP watersheds were used as assessment units for the road density analysis. Total road length (km) for each IWAP watershed was calculated by summing all the road segments within each assessment unit. Road density (km/km²) was calculated by dividing the total road length by the area of each assessment unit. An overview of road segments within the study area is provided as Figure 2.

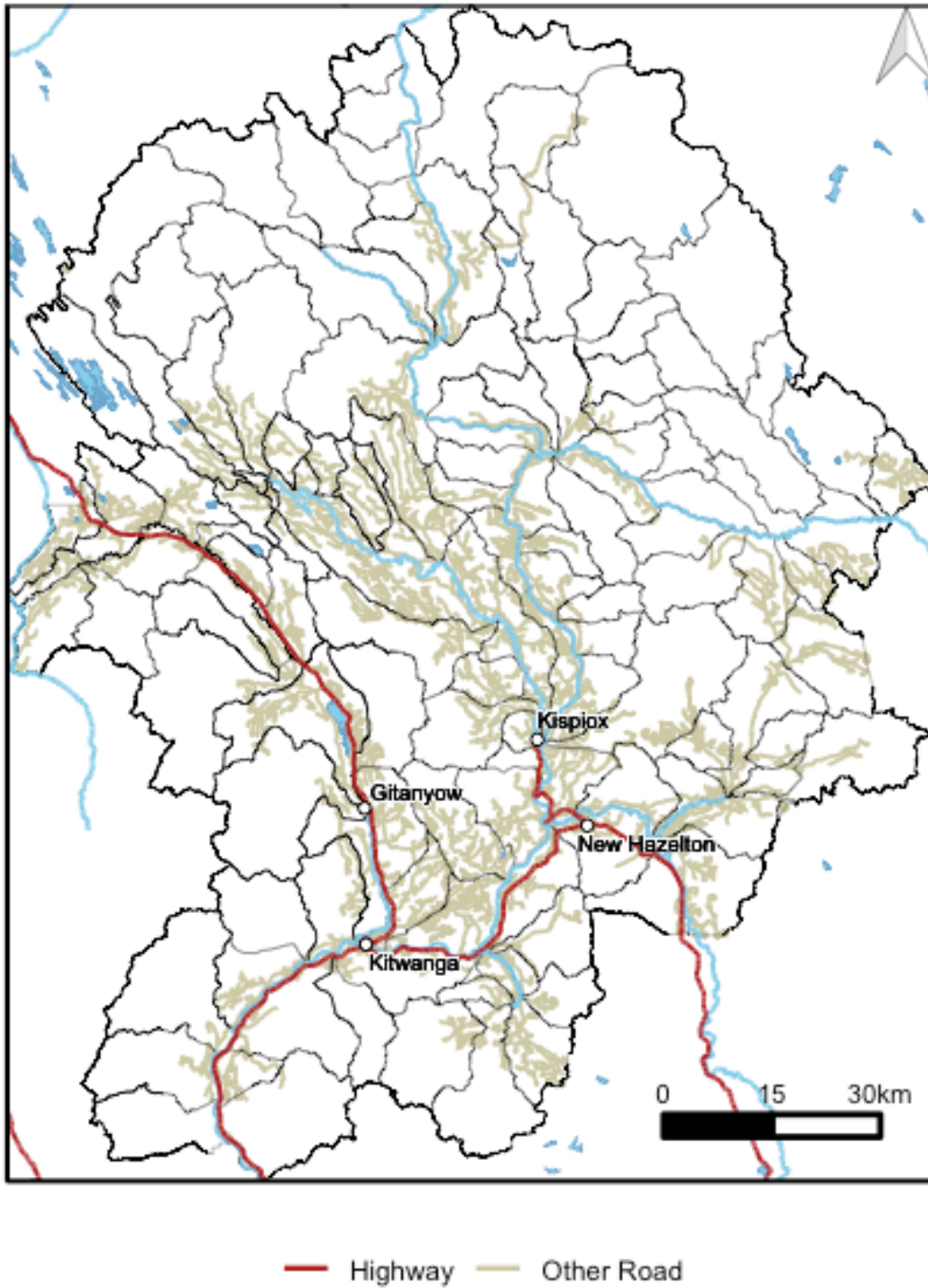


Figure 2: Roads located in the study area are shown.

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	Road Density (km / km²)
Low	< 0.40
Moderate	0.40 - 1.2
High	> 1.2

Results of Analysis

A summary of the results of the road density 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 B, and the distribution of the assessment results are shown as a series of figures in Appendix C.

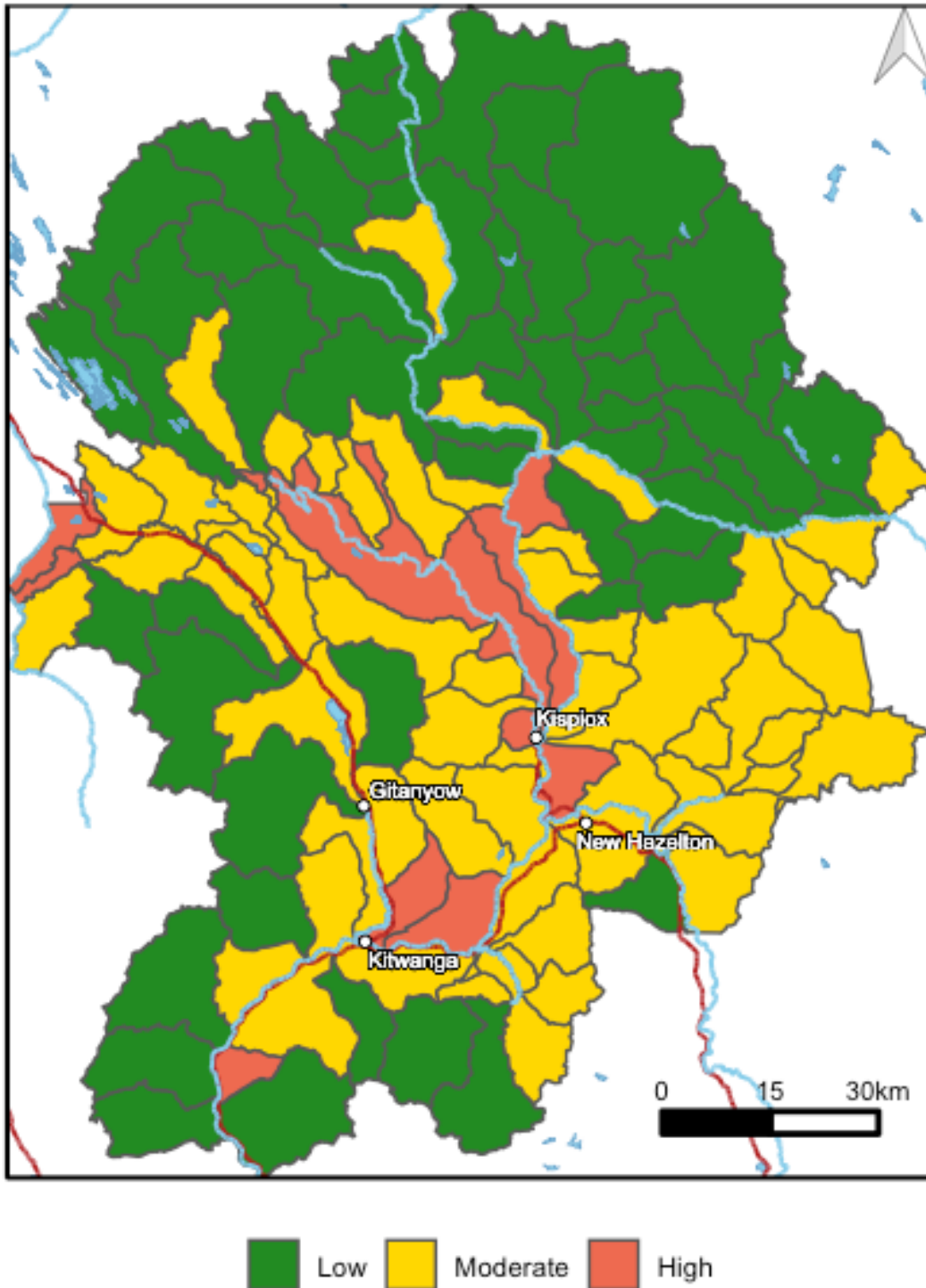


Figure 3: Road density (km/km²) for each boundary in the study area is shown on a study area map. The results are colorized by risk threshold (low risk < 0.40 km/km², moderate risk 0.40-1.2 km/km², high risk >1.2 km/km²).

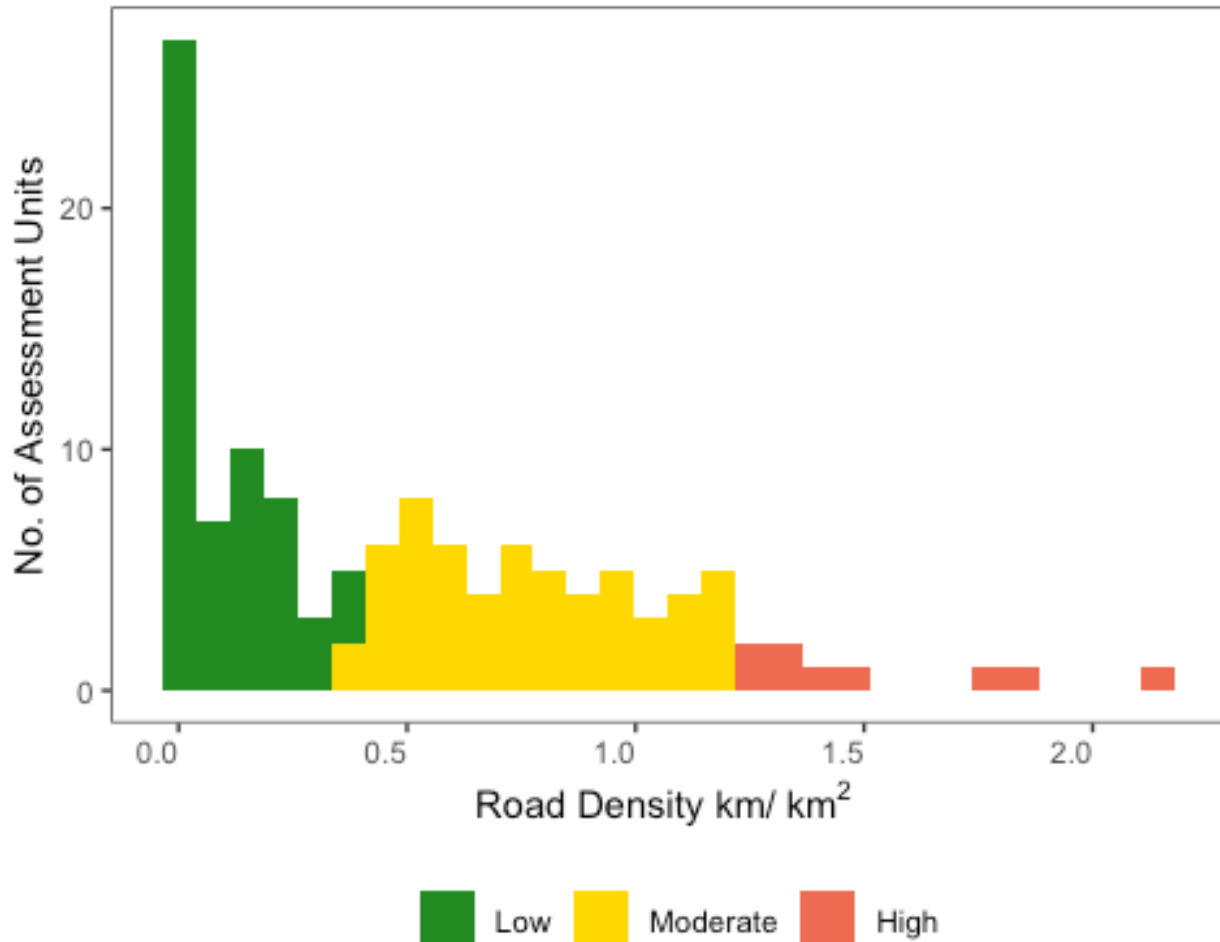


Figure 4: Distribution of results showing the number (count) of assessment units by road density. The results are colorized by risk threshold (low risk < 0.40 km/km², moderate risk 0.40-1.2 km/km², high risk >1.2 km/km²).

Road density was calculated for a total of 125 IWAP watersheds within the study area. Road density values ranged from 0 to 2.14 km/km², with road density values of nine assessment units above the upper threshold of 1.2 km/km² and 58 assessment units with road densities in the moderate risk threshold rating (Figure 4; Appendix B and Appendix C).

Assessment units with moderate and high road densities are associated with road development within the central portion of the study area (Figures 2 and 3).

Interactive visualizations of the indicator analysis results calculated as part of the Kispiox TSA WSP Indicator Analysis are available at <https://data.skeenasalmon.info/dataset/wild-salmon-policy-indicator-analysis-for-the-kispiox-tsa>.

Summary

Road density estimations were calculated for 125 IWAP watersheds within the Kispiox TSA and adjacent Swan Lake and upper Kispiox River sub-watersheds using datasets sourced from the Province of BC. Risk categories derived by the Pacific Salmon Foundation were used to assess risk to freshwater habitat from road development.

Results of the analysis indicated road density values ranged from 0 to 2.14 km/km², with nine assessment units at high and 58 units at moderate risk from road density impacts within the study area.

References

BC Ministry of Environment and Climate Change Strategy [BC MECCS]. 2004. Kispiox TSA “Interior Watershed Assessment Procedure” (IWAP) Watersheds (V.1) [Electronic dataset]. Provided by G. Buhr on April 8, 2020.

BC Ministry of Forests, Lands, Natural Resource Operations and Rural Development [BC MFLNRORD]. 2020a. Digital Road Atlas (DRA) - Master Partially-Attributed Roads [Electronic dataset]. Retrieved from <https://catalogue.data.gov.bc.ca/dataset/digital-road-atlas-dra-master-partially-attributed-roads> on October 20, 2020.

BC MFLNRORD. 2020b. Forest Tenure Road Section Lines [Electronic dataset]. Retrieved from <https://catalogue.data.gov.bc.ca/dataset/forest-tenure-road-section-lines> on October 20, 2020.

BC MFLNRORD. 2017. Kispiox Road Inventory (V.1) [Electronic dataset]. Provided by G. Buhr on April 8, 2020.

Pacific Salmon Foundation. 2020. Methods for Assessing Status and Trends in Pacific Salmon Conservation Units and their Freshwater Habitats. The Pacific Salmon Foundation, Vancouver BC, Canada. Version 1.0.

Province of BC. 2019. Kispiox Timber Supply Area. <https://www2.gov.bc.ca/gov/content/industry/forestry/managing-our-forest-resources/timber-supply-review-and-allowable-annual-cut/allowable-annual-cut-timber-supply-areas/kispiox-tsa>. Accessed Dec. 16, 2019.

Porter, M., Pickard, D., Casley, S., Ochoski, N., Bryan, K. and S. Huang. 2014. Sockeye Habitat Report Cards: Spawning Conservation Unit (CU). Pacific Salmon Foundation Skeena Salmon Program. <https://www.psf.ca/document-library/sockeye-habitat-report-cards-spawning-cu>. Accessed Dec. 16, 2019.

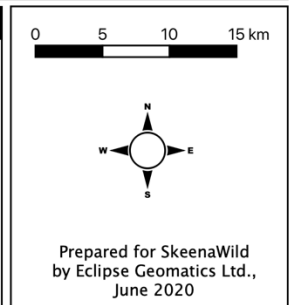
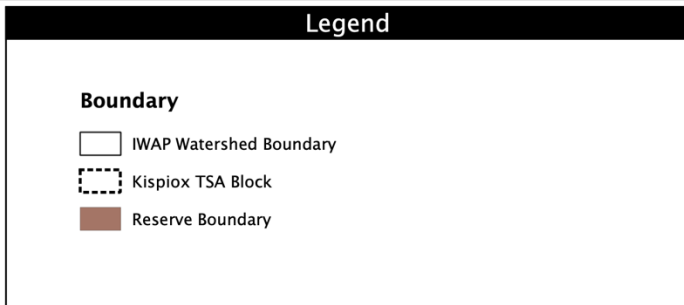
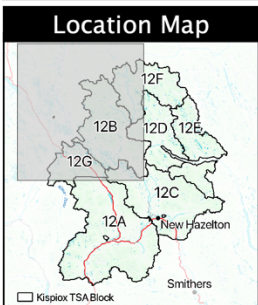
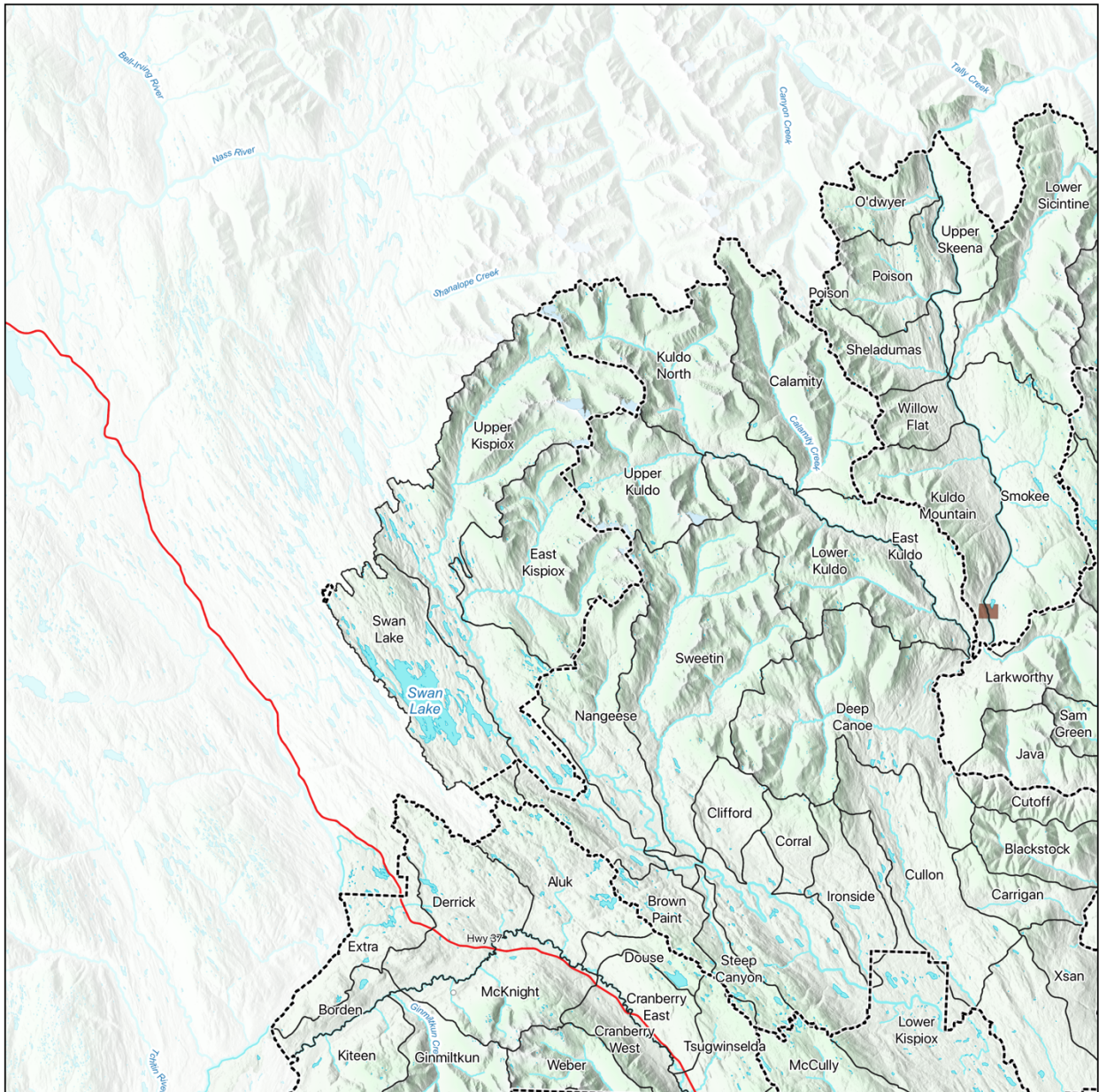
Porter, M., Casley, S., Pickard, D., Snead, E., Smith, R., and K. Wieckowski. 2017. Version 3.4, March 2019. Watershed Status Evaluation Protocol (WSEP): Tier 1 – watershed-level fish values monitoring. Report prepared by ESSA Technologies Ltd. for BC British Columbia

Ministry of Forests, Lands and Natural Resource Operations and BC Ministry of the Environment (MOE), Victoria, BC. 27 p.

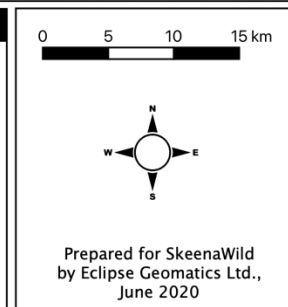
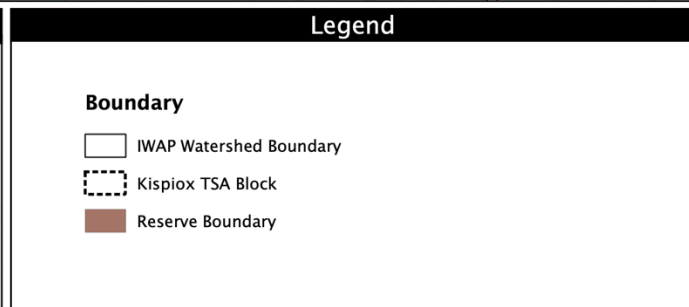
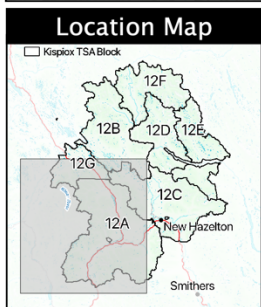
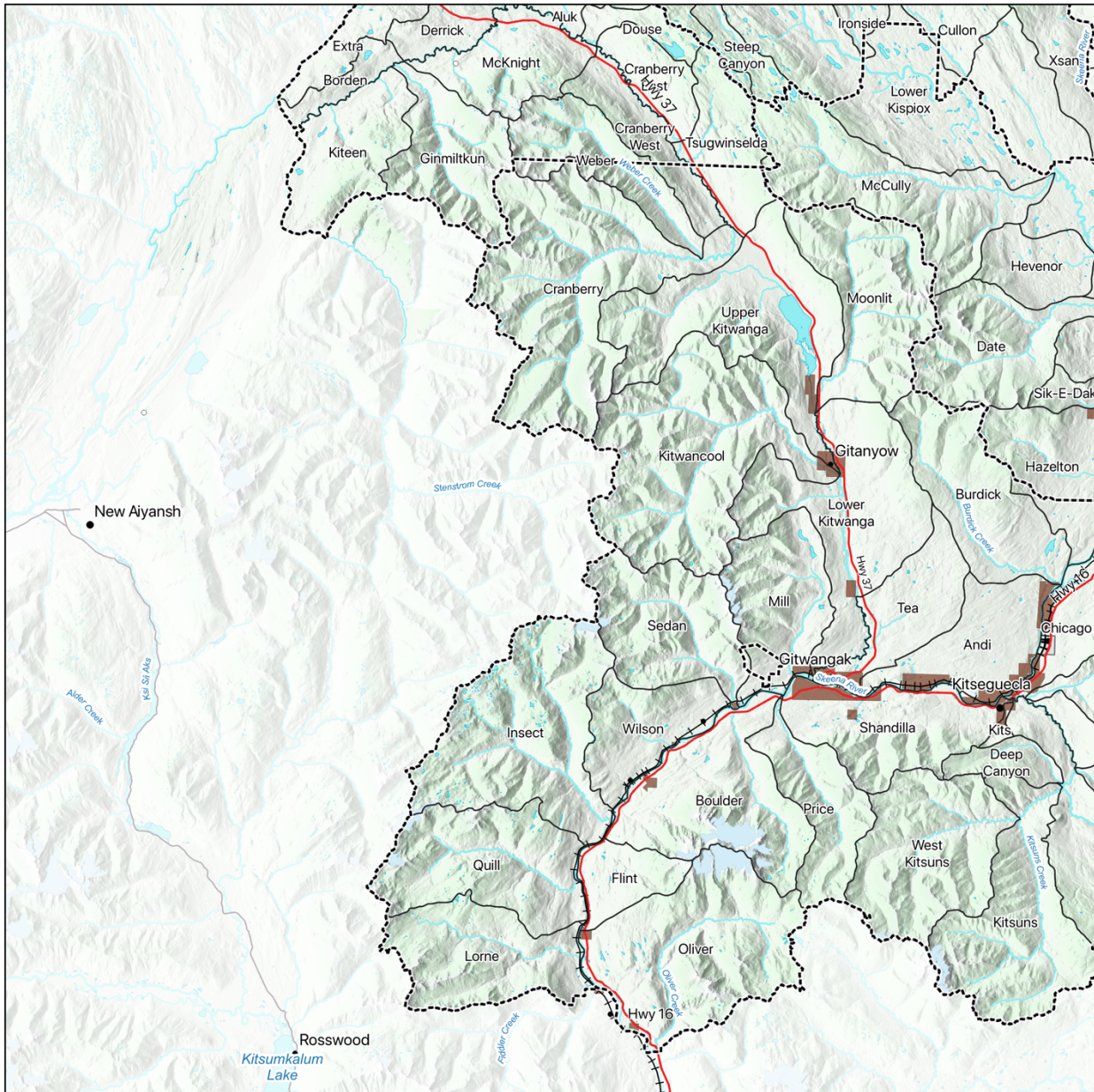
Stalberg, H.C., Lauzier, R.B., MacIsaac, E.A., Porter, M., and C. Murray. 2009. Canada's policy for conservation of wild pacific salmon: Stream, lake, and estuarine habitat indicators. Can. Manuscr. Fish. Aquat. Sci. 2859: xiii + 135p.

Appendix A: Reference Maps

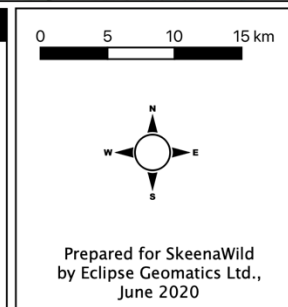
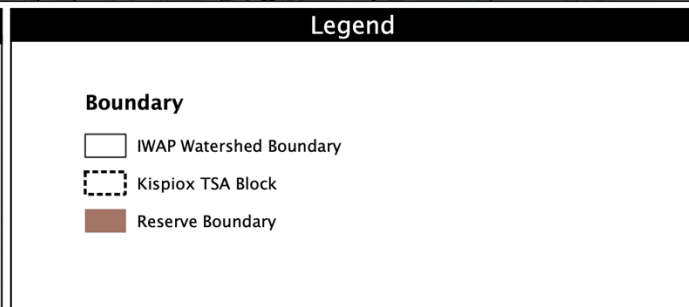
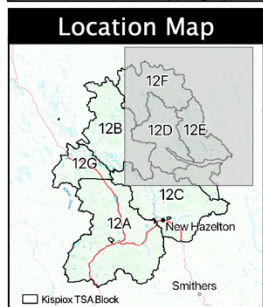
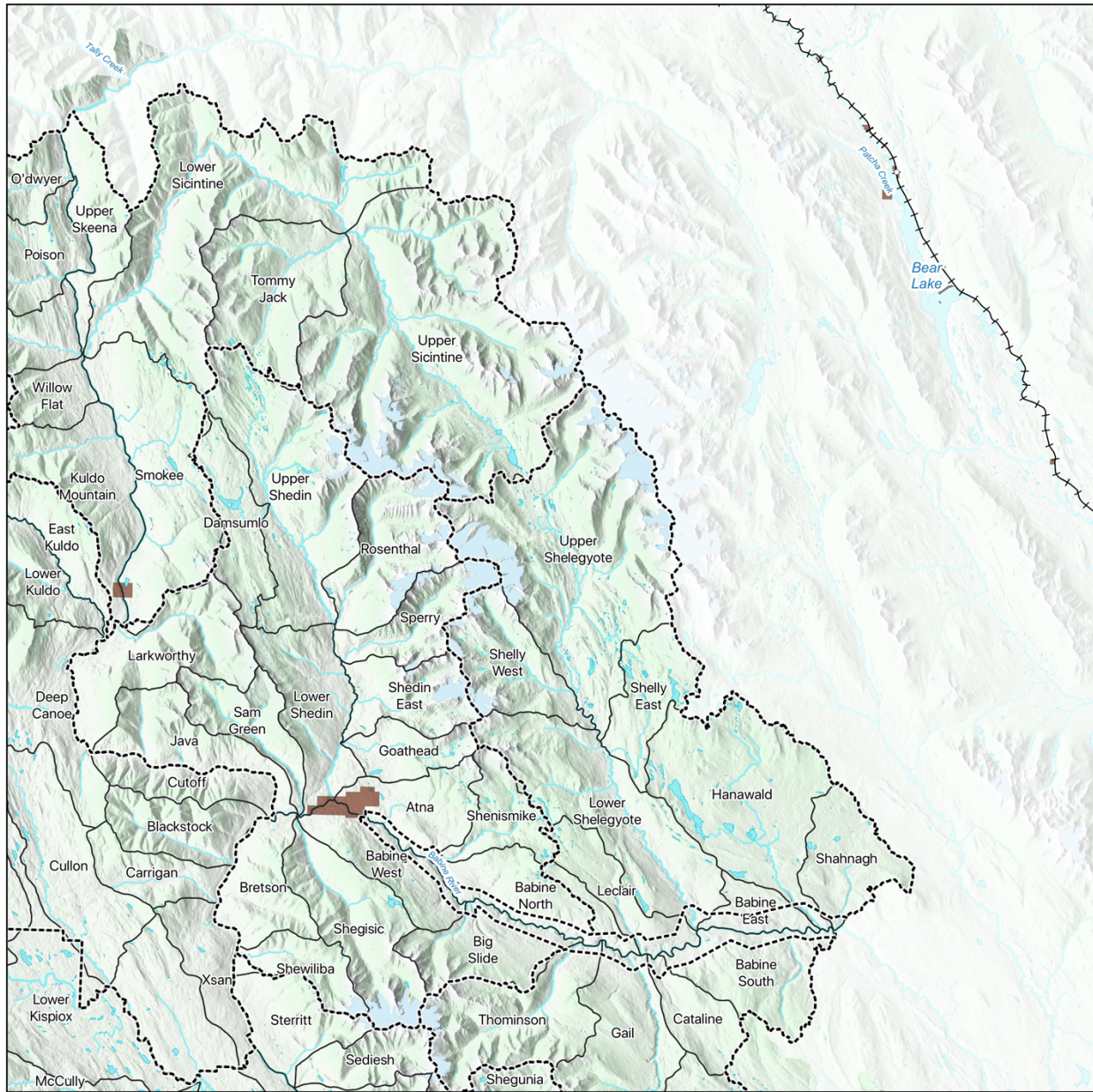
Kispiox Study Area Reference Map - Northwest



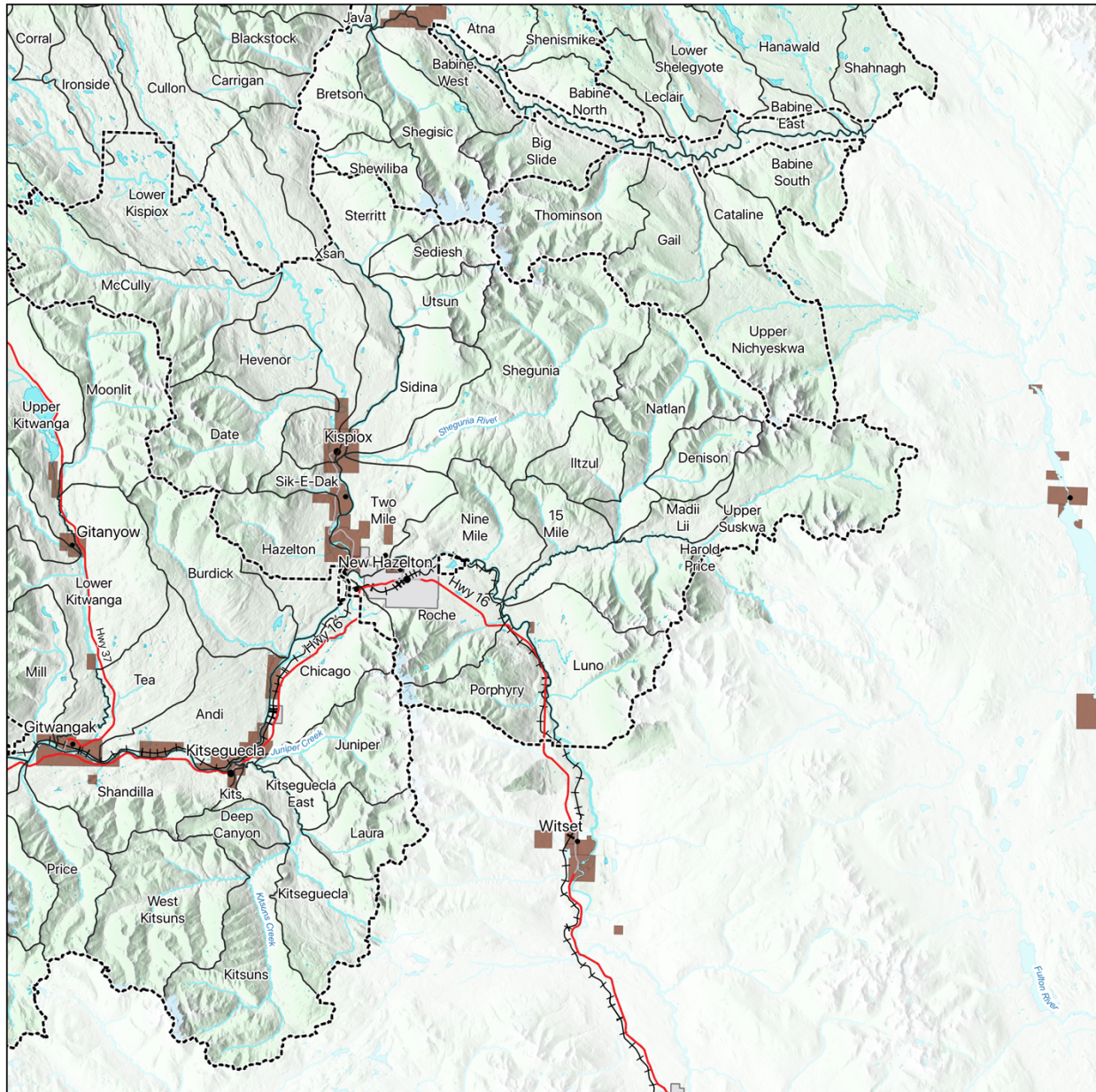
Kispiox Study Area Reference Map - Southwest



Kispiox Study Area Reference Map - Northeast



Kispiox Study Area Reference Map - Southeast






Location Map



Legend

Boundary

-  IWAP Watershed Boundary
-  Kispiox TSA Block
-  Reserve Boundary

0 5 10 15 km



Prepared for SkeenaWild
by Eclipse Geomatics Ltd.,
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Appendix B: Results Tables

The following tables present total area for each boundary studied, total road length for each boundary studied, road density, and risk (determined by Wild Salmon Policy thresholds).

Assessment Unit	Area (km ²)	Road Length (km)	Road Density (km/km ²)	Risk
15 Mile	44.17	33.78	0.76	Moderate
Aluk	92.47	57.14	0.62	Moderate
Andi	95.46	134.39	1.41	High
Atna	59.47	8.71	0.15	Low
Babine East	27.33	0.00	0.00	Low
Babine North	71.80	0.00	0.00	Low
Babine South	79.19	45.47	0.57	Moderate
Babine West	58.02	51.35	0.89	Moderate
Big Slide	66.94	5.57	0.08	Low
Blackstock	58.65	12.06	0.21	Low
Borden	24.06	31.45	1.31	High
Boulder	157.08	67.50	0.43	Moderate
Bretson	57.83	71.80	1.24	High
Brown Paint	36.41	31.88	0.88	Moderate
Burdick	125.74	135.18	1.08	Moderate
Calamity	143.52	0.00	0.00	Low
Carrigan	42.75	49.54	1.16	Moderate
Cataline	40.65	44.23	1.09	Moderate
Chicago	97.58	108.11	1.11	Moderate
Clifford	39.54	26.21	0.66	Moderate
Corral	29.92	25.53	0.85	Moderate
Cranberry	258.28	33.66	0.13	Low
Cranberry East	44.19	45.86	1.04	Moderate
Cranberry West	57.15	39.57	0.69	Moderate
Cullon	122.83	144.60	1.18	Moderate
Cutoff	40.70	10.13	0.25	Low
Damsumlo	59.14	8.92	0.15	Low
Date	114.07	63.54	0.56	Moderate
Deep Canoe	221.24	85.38	0.39	Low
Deep Canyon	26.81	18.49	0.69	Moderate

Assessment Unit	Area (km ²)	Road Length (km)	Road Density (km/km ²)	Risk
Denison	48.43	19.39	0.40	Moderate
Derrick	104.65	101.59	0.97	Moderate
Douse	23.68	9.71	0.41	Moderate
East Kispiox	159.70	0.00	0.00	Low
East Kuldo	58.96	13.80	0.23	Low
Extra	59.56	88.59	1.49	High
Flint	44.50	54.97	1.24	High
Gail	101.39	75.83	0.75	Moderate
Ginmiltkun	100.37	7.91	0.08	Low
Goathead	37.89	10.19	0.27	Low
Hanawald	171.46	10.54	0.06	Low
Harold Price	2.36	2.37	1.01	Moderate
Hazelton	105.88	99.57	0.94	Moderate
Hevenor	53.93	58.09	1.08	Moderate
Iltzul	46.48	37.63	0.81	Moderate
Insect	206.96	11.86	0.06	Low
Ironside	54.75	52.94	0.97	Moderate
Java	66.66	32.04	0.48	Moderate
Juniper	92.62	39.77	0.43	Moderate
Kiteen	93.65	64.97	0.69	Moderate
Kits	3.80	2.75	0.72	Moderate
Kitseguecla	105.43	123.83	1.17	Moderate
Kitseguecla East	18.43	17.61	0.96	Moderate
Kitsuns	163.67	36.43	0.22	Low
Kitwancool	242.75	28.42	0.12	Low
Kuldo Mountain	96.84	48.25	0.50	Moderate
Kuldo North	161.22	0.00	0.00	Low
Larkworthy	105.27	0.11	0.00	Low
Laura	58.15	24.80	0.43	Moderate
Leclair	47.45	0.00	0.00	Low
Lorne	121.90	0.16	0.00	Low

Assessment Unit	Area (km ²)	Road Length (km)	Road Density (km/km ²)	Risk
Lower Kispiox	445.68	582.47	1.31	High
Lower Kitwanga	178.59	147.90	0.83	Moderate
Lower Kuldo	138.84	4.72	0.03	Low
Lower Shedin	82.54	23.32	0.28	Low
Lower Shelegyote	154.43	0.00	0.00	Low
Lower Sicintine	274.37	0.00	0.00	Low
Luno	125.91	90.58	0.72	Moderate
Madii Lii	28.68	16.78	0.59	Moderate
McCully	169.02	92.76	0.55	Moderate
McKnight	82.84	60.87	0.73	Moderate
Mill	107.54	55.35	0.51	Moderate
Moonlit	142.82	36.51	0.26	Low
Nangeese	109.48	53.48	0.49	Moderate
Natlan	137.62	68.09	0.49	Moderate
Nine Mile	84.59	42.88	0.51	Moderate
O'dwyer	48.44	0.00	0.00	Low
Oliver	205.76	26.02	0.13	Low
Poison	70.84	0.00	0.00	Low
Porphyry	77.36	26.48	0.34	Low
Price	80.93	3.27	0.04	Low
Quill	145.76	32.31	0.22	Low
Roche	111.68	93.83	0.84	Moderate
Rosenthal	92.51	0.00	0.00	Low
Sam Green	51.12	1.58	0.03	Low
Sedan	121.55	1.71	0.01	Low
Sediesh	43.50	10.46	0.24	Low
Shahnagh	64.31	67.44	1.05	Moderate
Shandilla	114.22	89.94	0.79	Moderate
Shedin East	58.85	2.94	0.05	Low
Shegisic	98.27	1.03	0.01	Low
Shegunia	263.15	141.29	0.54	Moderate


Assessment Unit	Area (km ²)	Road Length (km)	Road Density (km/km ²)	Risk
Sheladumas	55.83	0.00	0.00	Low
Shelly East	59.22	0.00	0.00	Low
Shelly West	75.86	0.00	0.00	Low
Shenismike	44.67	0.00	0.00	Low
Shewiliba	38.89	45.82	1.18	Moderate
Sidina	70.72	84.67	1.20	Moderate
Sik-E-Dak	22.10	12.42	0.56	Moderate
Smokee	152.36	60.52	0.40	Low
Sperry	56.19	0.00	0.00	Low
Steep Canyon	31.80	13.73	0.43	Moderate
Sterritt	58.05	47.32	0.82	Moderate
Swan Lake	145.15	0.51	0.00	Low
Sweetin	244.45	51.56	0.21	Low
Tea	79.61	144.21	1.81	High
Thominson	111.14	14.70	0.13	Low
Tommy Jack	120.82	18.30	0.15	Low
Tsugwinselda	75.11	68.82	0.92	Moderate
Two Mile	71.46	126.04	1.76	High
Upper Kispiox	330.67	47.38	0.14	Low
Upper Kitwanga	194.62	190.36	0.98	Moderate
Upper Kuldo	99.36	0.00	0.00	Low
Upper Nichyeskwa	131.29	79.76	0.61	Moderate
Upper Shedin	172.60	12.27	0.07	Low
Upper Shelegyote	293.06	0.00	0.00	Low
Upper Sicitine	418.47	6.50	0.02	Low
Upper Skeena	53.04	0.00	0.00	Low
Upper Suskwa	245.81	102.67	0.42	Moderate
Utsun	49.16	19.71	0.40	Moderate
Weber	86.32	10.22	0.12	Low
West Kitsuns	149.94	43.67	0.29	Low
Willow Flat	32.61	5.78	0.18	Low


Assessment Unit	Area (km ²)	Road Length (km)	Road Density (km/km ²)	Risk
Wilson	80.49	62.26	0.77	Moderate
Xsan	96.04	205.88	2.14	High

Appendix C: Results Distribution

Results are colourized by risk threshold (low risk < 0.40 km/km², moderate risk 0.40-1.2 km/km², high risk >1.2 km/km²).



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