WSP Indicator Analysis for the Kispiox TSA:

Total Land Cover Alteration

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 the 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 Sorochan for their contributions and feedback, and to Glen Buhr for his assistance and guidance.

WSP Indicator Analysis for the Kispiox TSA

Pressure Indicator: Total Land Cover Alteration

Assessment Units: IWAP Assessment Watersheds

Description of Pressure Indicator

Total Land Cover Alteration (TLCA) refers to the change in land surface cover following human development or natural disturbance events, resulting in a suite of potential changes to hydrological processes and sediment generation, with potential impacts to downstream salmon habitat as well as changes in biodiversity (Stalberg et al., 2009). Land cover alteration categories include agriculture, urban development, mining activity, road and utility development, forestry, and fire disturbance. TLCA is reported as a percentage of the total area assessed. The Wild Salmon Policy (WSP) Habitat Working Group has ranked TLCA as a high value pressure indicator (Stalberg et al., 2009).

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)
- BC Transmission Lines (BC MFLNRORD, 2020c)
- Harvested Areas of BC (Consolidated Cutblocks) (BC MFLNRORD, 2020d)
- TANTALIS – Crown Tenures (BC MFLNRORD, 2020e)
- Railway Track Line (BC MFLNRORD, 2019a)
- Municipalities - Legally Defined Administrative Areas of BC (BC Ministry of Municipal Affairs and Housing, 2019)
- Reserves & Band Names - Administrative Boundaries (BC MFLNRORD, 2019b)
- Permitted Mine Areas - Major Mine (BC MEMPR, 2020)
- Fire Perimeters - Historical (BC FLNRORD, 2020f)
- IWAP Watersheds (BC MECCS, 2004)

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 settlements, forest harvesting (cutblocks), and road, railway, and electric powerline corridors.

Linear Disturbance Characterization

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 dataset. 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.

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

The KRI roads layer is published with modelled buffer width as an attribute in the dataset according to the characterization above. Modelled buffer width was derived for DRA and FTEN road features with characterization estimated based on road class, road surface, and number of lanes in the case of the DRA and file type for the FTEN road segments. 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). 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 1959). This is consistent with the approach used by the Pacific Salmon Foundation (2020).

Other Anthropogenic Disturbance Characterization

Municipal and reserve boundaries were used to estimate disturbance from settlements in the study area. 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). Mine footprints were estimated from the Permitted Mine Areas - Major Mine layer.

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 1994), consistent with the approach used by the Pacific Salmon Foundation (2020).

TLCA 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.

TLCA was calculated by merging all the disturbance layers into a total disturbance layer for each assessment unit and dividing the total disturbed area by the area of each assessment unit using IWAP 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:

- 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;
- 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;
- Use of agricultural Crown tenures to estimate agricultural land area instead of the outdated Baseline Thematic Mapping dataset; and
- Use of the municipality and reserves layers in order to estimate urban areas and settlements instead of the Vegetation Resource Index dataset.

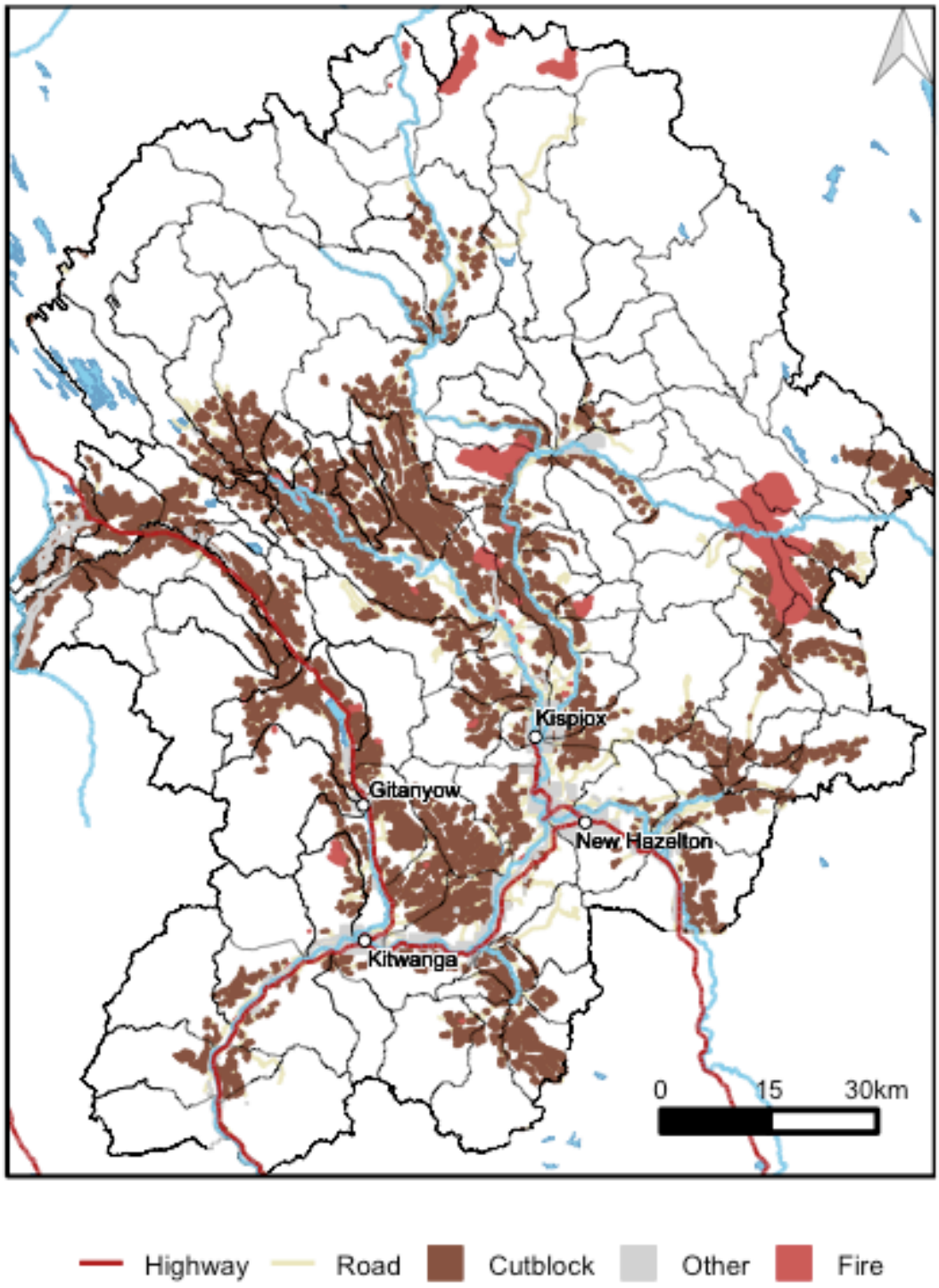

Figure 2: Assessment units and land cover alteration in the study area, including alteration by forest harvesting; roads; wildfire; and agricultural, industrial, utility, transportation, commercial, quarrying, residential and community land tenures, railways, powerlines, and settlements, shown collectively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

Risk Threshold

Categorical risk thresholds applied were generated by the Pacific Salmon Foundation based on the relative distribution of values across all Skeena River watersheds (Porter et al., 2014) and are tabulated below:

Threshold Rating	Percent of Total Land Cover Altered (%)
Low	< 6.4 %
Moderate	6.4 - 22 %
High	> 22 %

Results of Analysis

A summary of the results of the TLCA 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.

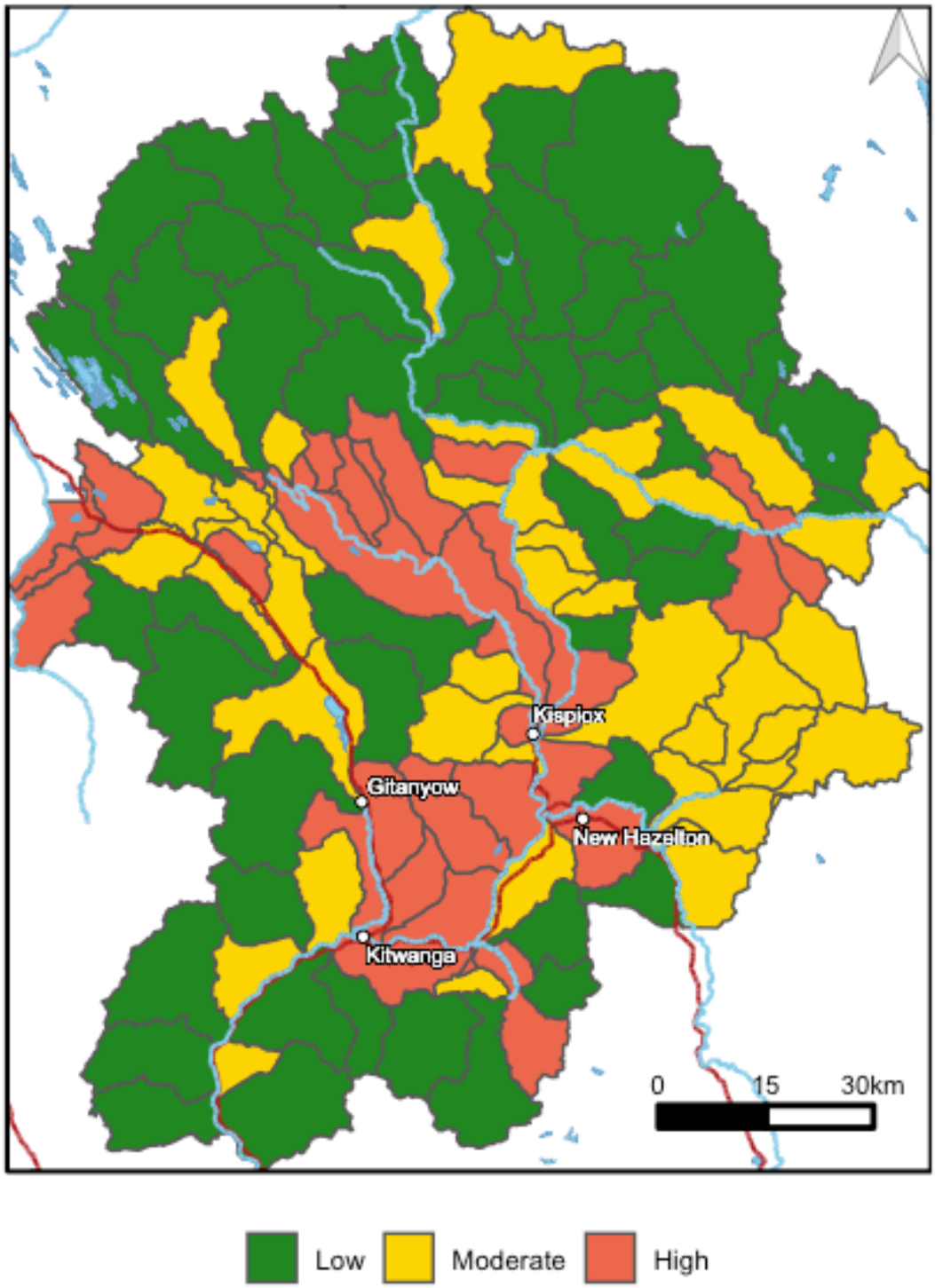

Figure 3: Total land cover alteration for each boundary in the study area is shown on a study area map. The results are colorized by risk threshold (low risk < 6.4 % of land area altered, moderate risk 6.4 - 22 % of land area altered, high risk > 22% of land area altered).

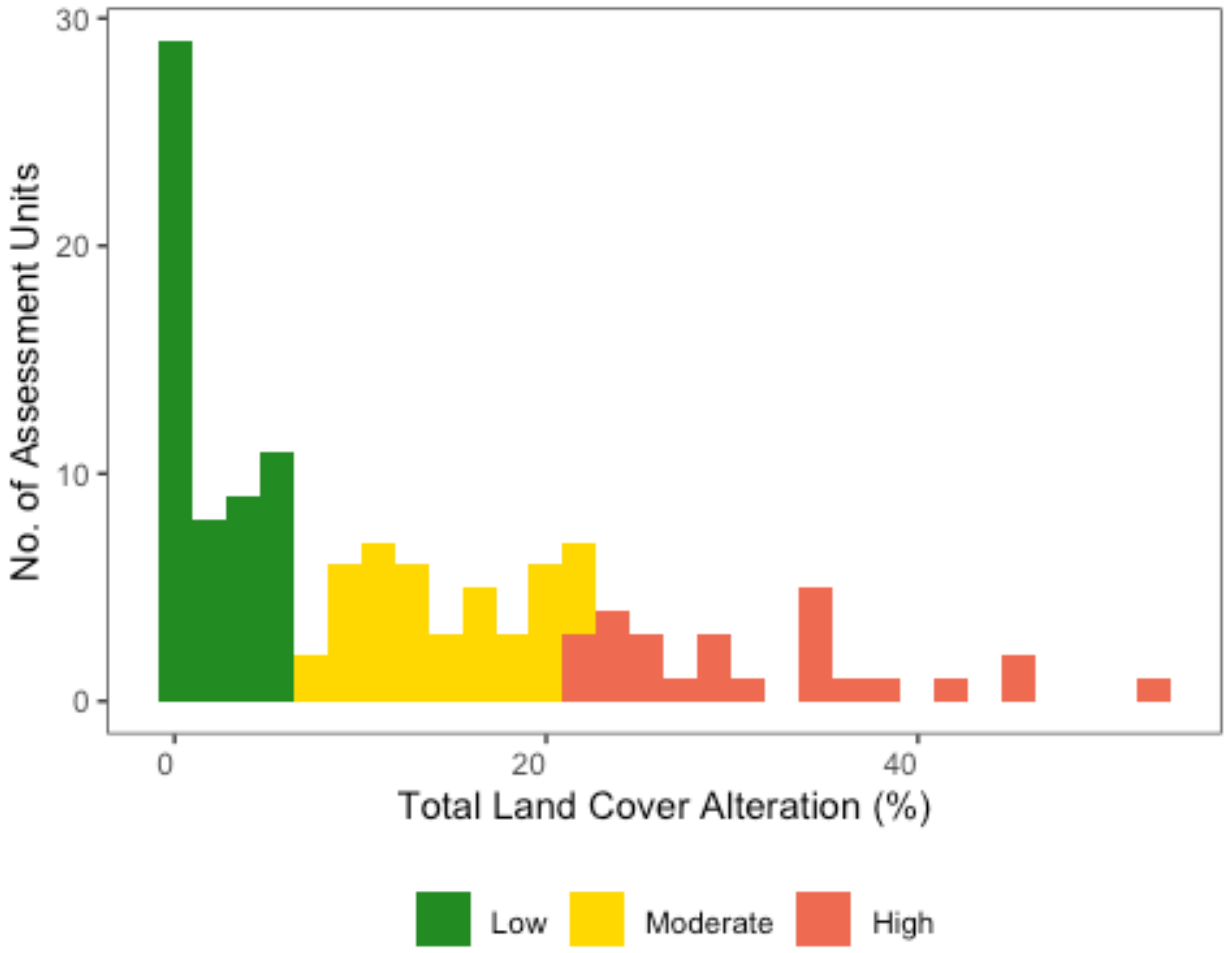

Figure 4: Distribution of results showing the number (count) of assessment units by total land cover alteration. The results are colorized by risk threshold (low risk < 6.4 % of land area altered, moderate risk 6.4 - 22 % of land area altered, high risk > 22% of land area altered).

Total land cover alteration was calculated for a total of 125 assessment units. Values ranged from 0 to a maximum of 52.72% within the Cataline IWAP watershed in the southeast portion of the study area (Figure 4; Appendix C and Appendix D). Twenty-six assessment units had TLCA values above the threshold for high risk, and were largely associated with disturbance from forestry activities, wildfires, or urban areas (Figure 2 and Figure 3; Appendix C). Forty-two assessment units had TLCA values in the moderate risk threshold range. Assessment units with moderate or high risk of TLCA impacts were largely situated within the central portion of the study area (Figure 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 of Results

Total land cover alteration estimations from forestry activities, transportation and utility corridors, agriculture, settlements, and other industrial activities 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 as a result of TLCA.

Results of the analysis indicated TLCA within the study area ranged from 0 to 52.72 % of the total assessment unit area, with 26 assessment units at high risk and 42 assessment units at moderate risk from TLCA-related impacts largely situated within the central portion of the study area.

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Appendix A: Reference Maps

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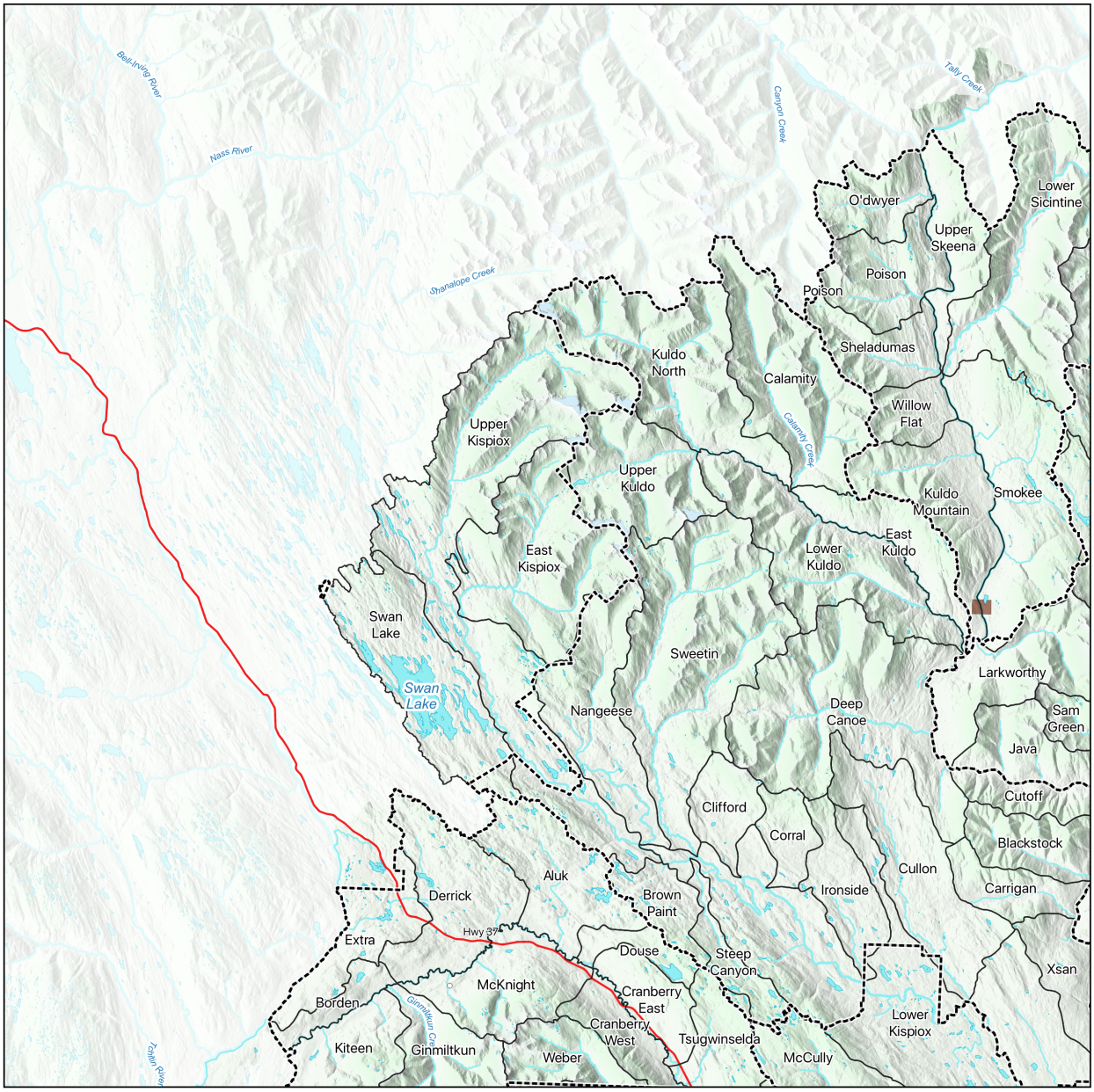
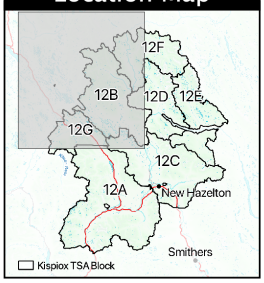
Kispiox Study Area Reference Map - Northwest



Location Map



Legend

Boundary

- IWAP Watershed Boundary
- Kispiox TSA Block
- Reserve Boundary

0 5 10 15 km

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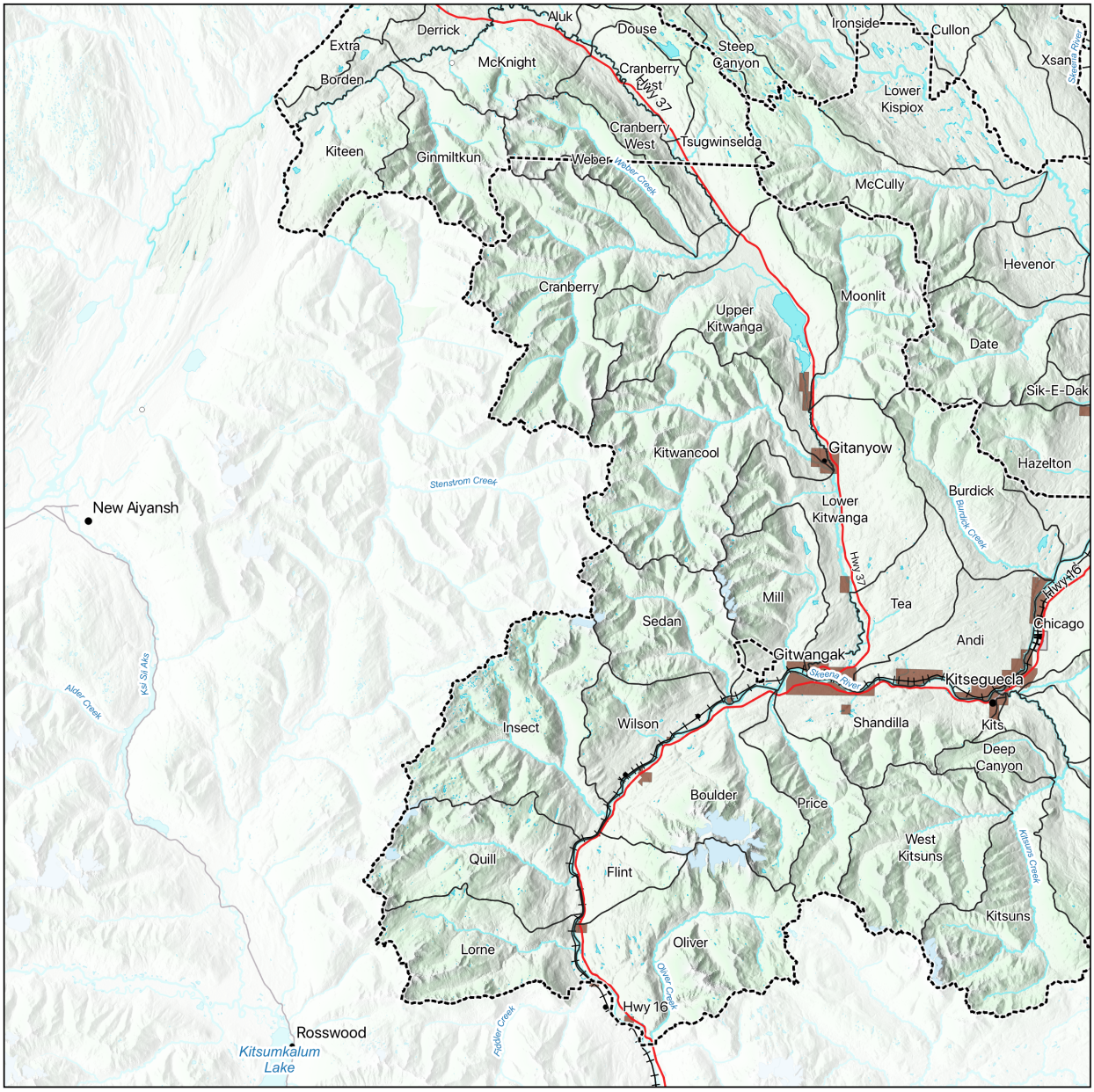
Kispiox Study Area Reference Map - Southwest



Location Map

Legend

Boundary

- IWAP Watershed Boundary
- Kispiox TSA Block
- Reserve Boundary

0 5 10 15 km

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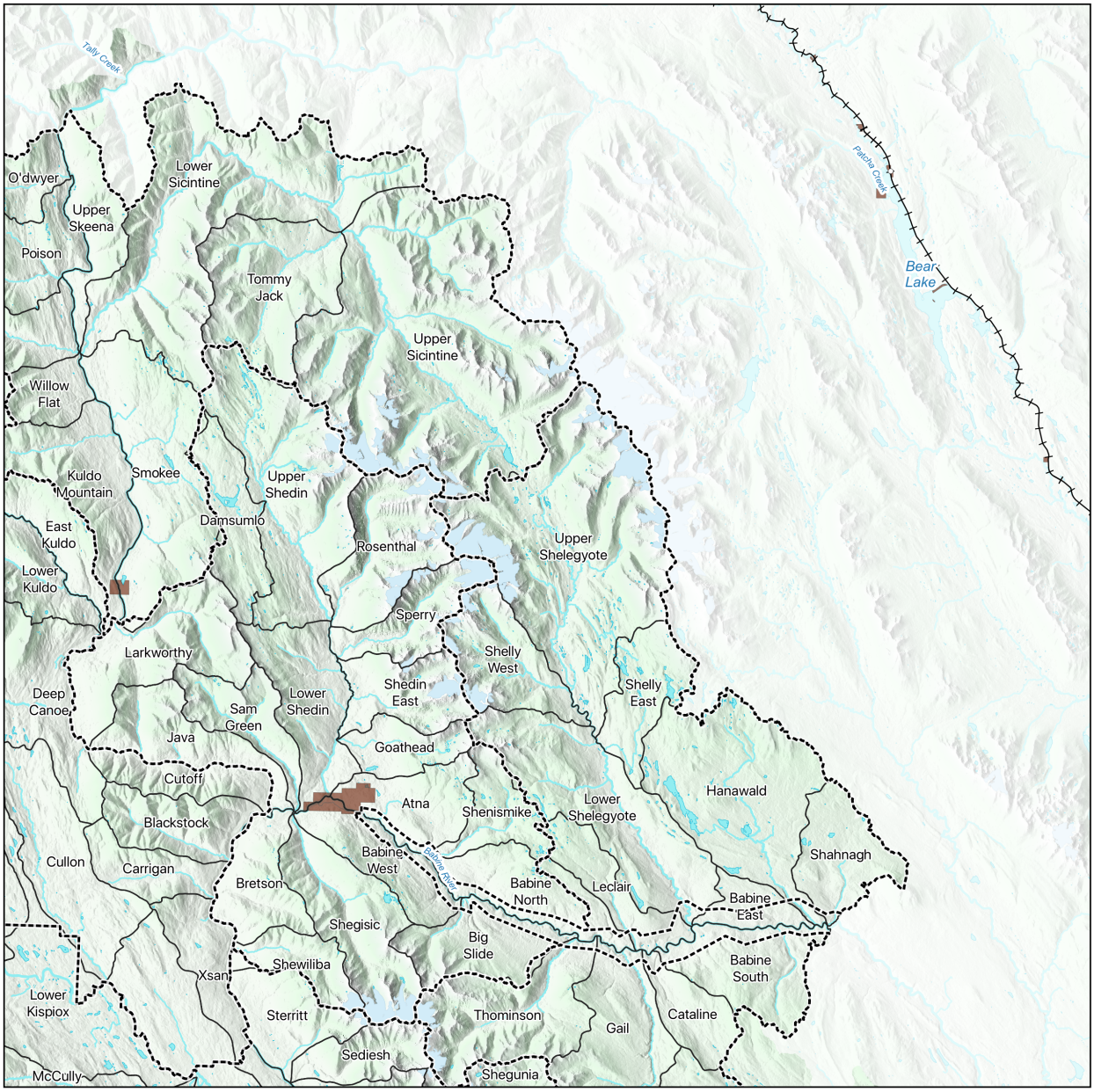
Kispiox Study Area Reference Map - Northeast



Location Map

Legend

Boundary

- IWAP Watershed Boundary
- Kispiox TSA Block
- Reserve Boundary

0 5 10 15 km

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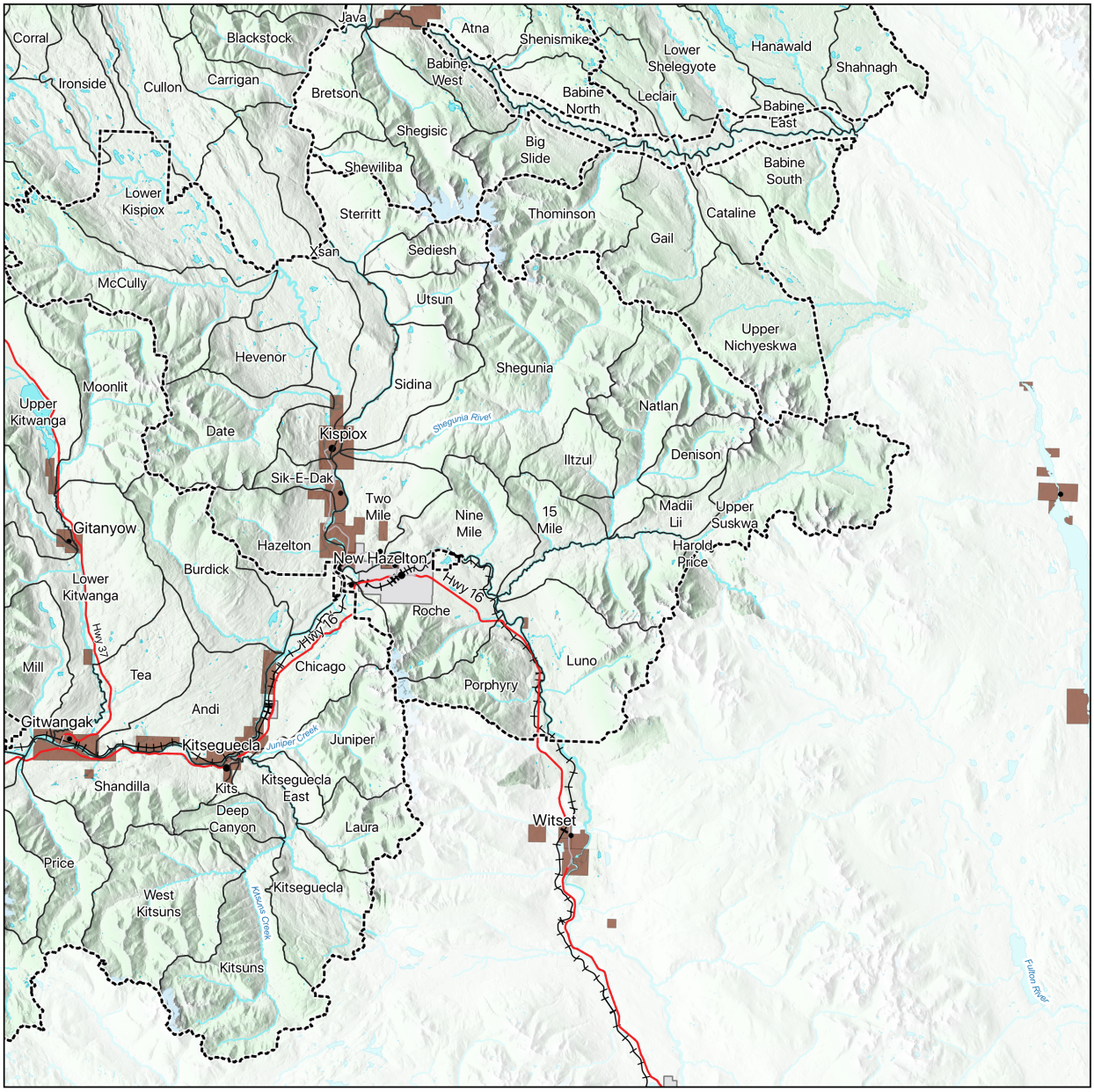
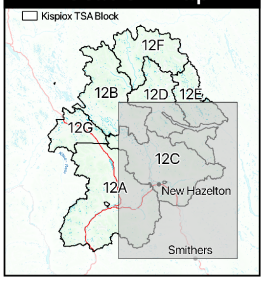
Kispiox Study Area Reference Map - Southeast



Location Map



Legend

Boundary

- IWAP Watershed Boundary
- Kispiox TSA Block
- Reserve Boundary

0 5 10 15 km

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Appendix B: Modelled Road Buffer Width Methodology

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

Notes:

FIL_TP_DSC = file type description

RDSURFACE = road surface

NUMLANE = number of lanes

Appendix C: Results Tables

The following tables present disturbed area and total area for each assessment unit, percent of land cover altered, and risk (determined by Pacific Salmon Foundation thresholds).

Reference AU	Area (km^2)	Disturbed Area (km^2)				Total Disturbed Area (km^2)	Percent Disturbed (%)	Risk
		Roads	Harvested (Post 1959)	Other Disturbance	Fire Disturbance (Post 1994)			
15 Mile	44.17	0.21	5.63	0.00	0.00	5.84	13.22	Moderate
Aluk	92.47	0.26	13.43	0.68	0.00	14.38	15.55	Moderate
Andi	95.46	0.51	31.10	12.55	0.00	44.16	46.26	High
Atna	59.47	0.12	0.35	5.31	0.00	5.78	9.71	Moderate
Babine East	27.33	0.00	0.00	0.00	0.00	0.00	0.00	Low
Babine North	71.80	0.00	0.00	0.00	14.73	14.73	20.52	Moderate
Babine South	79.19	0.47	5.78	0.00	4.31	10.55	13.33	Moderate
Babine West	58.02	0.35	4.82	3.12	0.00	8.29	14.29	Moderate
Big Slide	66.94	0.06	0.31	0.00	0.00	0.36	0.54	Low
Blackstock	58.65	0.02	7.44	0.00	19.15	26.61	45.37	High
Borden	24.06	0.11	5.54	0.34	0.00	6.00	24.93	High
Boulder	157.08	1.35	3.98	1.42	0.05	6.81	4.34	Low
Bretson	57.83	0.58	4.73	0.00	0.00	5.31	9.19	Moderate
Brown Paint	36.41	0.12	6.90	0.00	0.00	7.02	19.28	Moderate
Burdick	125.74	0.56	35.47	0.12	0.00	36.16	28.76	High
Calamity	143.52	0.00	0.00	0.00	0.00	0.00	0.00	Low
Carrigan	42.75	0.25	6.39	0.00	0.00	6.64	15.52	Moderate
Cataline	40.65	0.27	7.55	0.00	13.61	21.43	52.72	High
Chicago	97.58	1.83	1.36	7.75	0.04	10.98	11.25	Moderate
Clifford	39.54	0.09	7.09	0.14	0.00	7.33	18.53	Moderate
Corral	29.92	0.10	7.54	0.00	0.00	7.64	25.53	High
Cranberry	258.28	0.10	6.58	0.00	0.02	6.69	2.59	Low
Cranberry East	44.19	0.49	9.93	0.21	0.00	10.63	24.06	High
Cranberry West	57.15	0.30	8.84	0.00	0.00	9.14	15.99	Moderate
Cullon	122.83	0.49	46.86	0.00	0.00	47.35	38.55	High
Cutoff	40.70	0.02	3.52	0.00	0.84	4.38	10.75	Moderate
Damsumlo	59.14	0.10	0.34	0.00	0.00	0.44	0.75	Low
Date	114.07	0.39	9.72	0.41	0.00	10.52	9.22	Moderate
Deep Canoe	221.24	0.65	11.25	0.00	0.00	11.90	5.38	Low
Deep Canyon	26.81	0.06	5.08	0.00	0.00	5.14	19.19	Moderate
Denison	48.43	0.07	5.42	0.00	0.00	5.49	11.33	Moderate
Derrick	104.65	0.56	23.01	0.00	0.00	23.56	22.52	High
Douse	23.68	0.02	2.09	0.62	0.00	2.73	11.54	Moderate
East Kispiox	159.70	0.00	0.00	0.00	0.00	0.00	0.00	Low

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Reference AU	Area (km^2)	Disturbed Area (km^2)				Total Disturbed Area (km^2)	Percent Disturbed (%)	Risk
		Roads	Harvested (Post 1959)	Other Disturbance	Fire Disturbance (Post 1994)			
East Kuldo	58.96	0.06	1.79	0.00	0.00	1.86	3.15	Low
Extra	59.56	0.32	21.76	3.06	0.00	25.15	42.22	High
Flint	44.50	0.67	6.75	0.35	0.00	7.77	17.46	Moderate
Gail	101.39	0.55	13.09	0.00	22.90	36.53	36.03	High
Ginmiltkun	100.37	0.03	6.16	0.00	0.00	6.19	6.17	Low
Goathead	37.89	0.06	1.83	0.00	0.00	1.89	5.00	Low
Hanawald	171.46	0.02	2.08	0.00	0.00	2.10	1.22	Low
Harold Price	2.36	0.02	0.44	0.00	0.00	0.45	19.24	Moderate
Hazelton	105.88	0.69	16.25	6.86	0.15	23.95	22.62	High
Hevenor	53.93	0.47	10.90	0.00	0.00	11.37	21.08	Moderate
Iltzul	46.48	0.30	7.71	0.00	0.00	8.01	17.24	Moderate
Insect	206.96	0.09	1.20	0.07	0.00	1.35	0.65	Low
Ironside	54.75	0.15	16.86	0.00	0.00	17.01	31.07	High
Java	66.66	0.21	3.10	0.00	0.00	3.32	4.97	Low
Juniper	92.62	0.39	1.07	0.23	0.00	1.69	1.83	Low
Kiteen	93.65	0.30	19.46	1.67	0.01	21.43	22.89	High
Kits	3.80	0.00	0.21	0.88	0.00	1.10	28.92	High
Kitseguecla	105.43	0.30	35.54	0.26	0.00	36.10	34.24	High
Kitseguecla East	18.43	0.17	4.07	0.04	0.00	4.27	23.20	High
Kitsuns	163.67	0.20	5.57	0.00	0.00	5.77	3.52	Low
Kitwancool	242.75	0.12	5.77	1.51	0.20	7.61	3.13	Low
Kuldo Mountain	96.84	0.39	6.19	0.81	0.00	7.39	7.63	Moderate
Kuldo North	161.22	0.00	0.00	0.00	0.00	0.00	0.00	Low
Larkworthy	105.27	0.00	0.01	0.00	0.00	0.01	0.01	Low
Laura	58.15	0.11	2.99	0.00	0.00	3.10	5.33	Low
Leclair	47.45	0.00	0.00	0.00	16.77	16.77	35.34	High
Lorne	121.90	0.00	0.00	0.10	0.00	0.10	0.08	Low
Lower Kispiox	445.68	3.50	109.66	9.47	6.72	129.34	29.02	High
Lower Kitwanga	178.59	1.48	32.37	5.86	0.03	39.75	22.26	High
Lower Kuldo	138.84	0.03	1.02	0.00	0.00	1.04	0.75	Low
Lower Shedin	82.54	0.14	3.14	1.22	0.00	4.51	5.46	Low
Lower Shelegyote	154.43	0.00	0.00	0.00	19.23	19.23	12.45	Moderate
Lower Sicintine	274.37	0.00	0.00	0.00	25.35	25.35	9.24	Moderate
Luno	125.91	0.43	22.82	0.57	0.22	24.04	19.09	Moderate

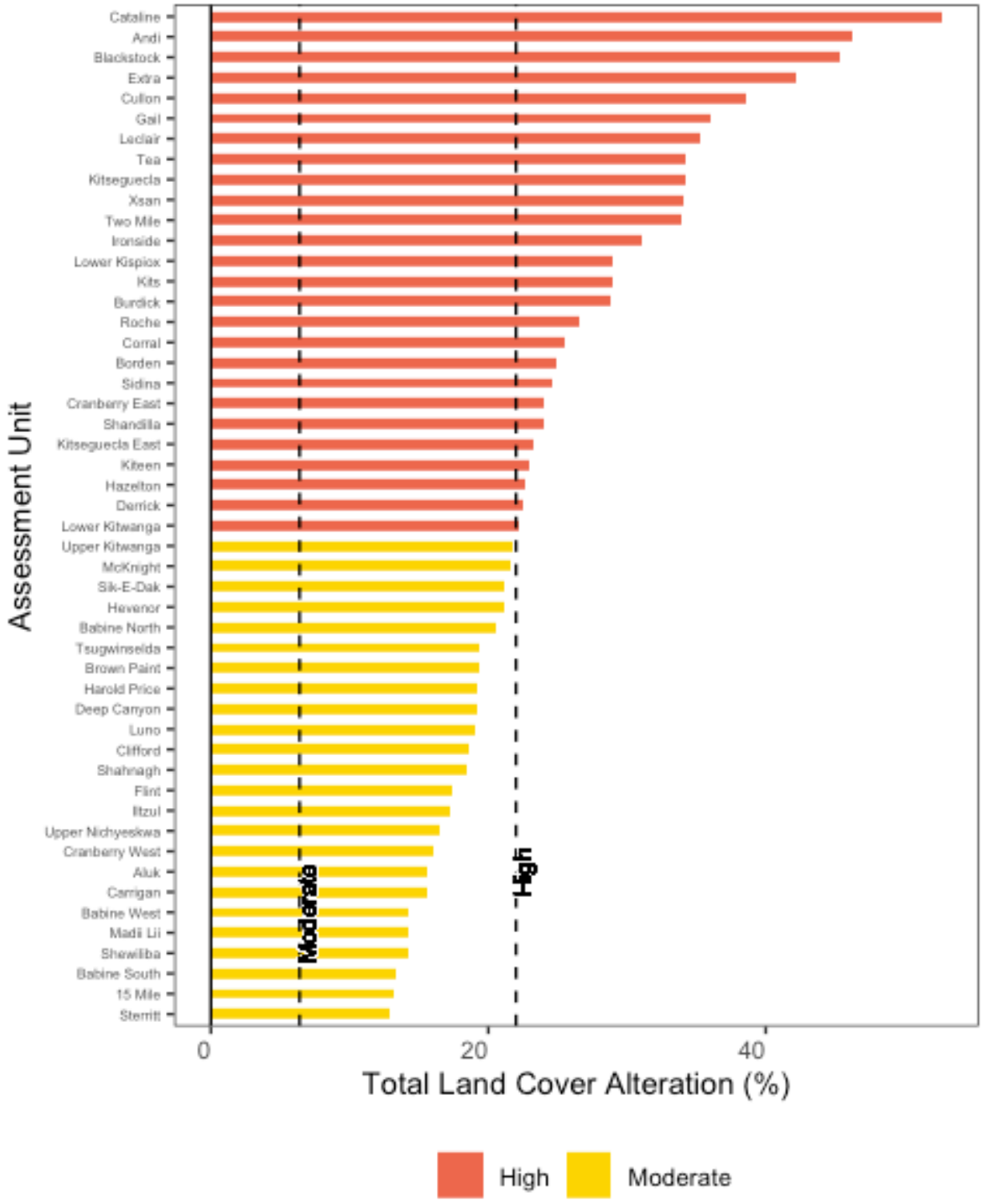
eclipse GEOMATICS

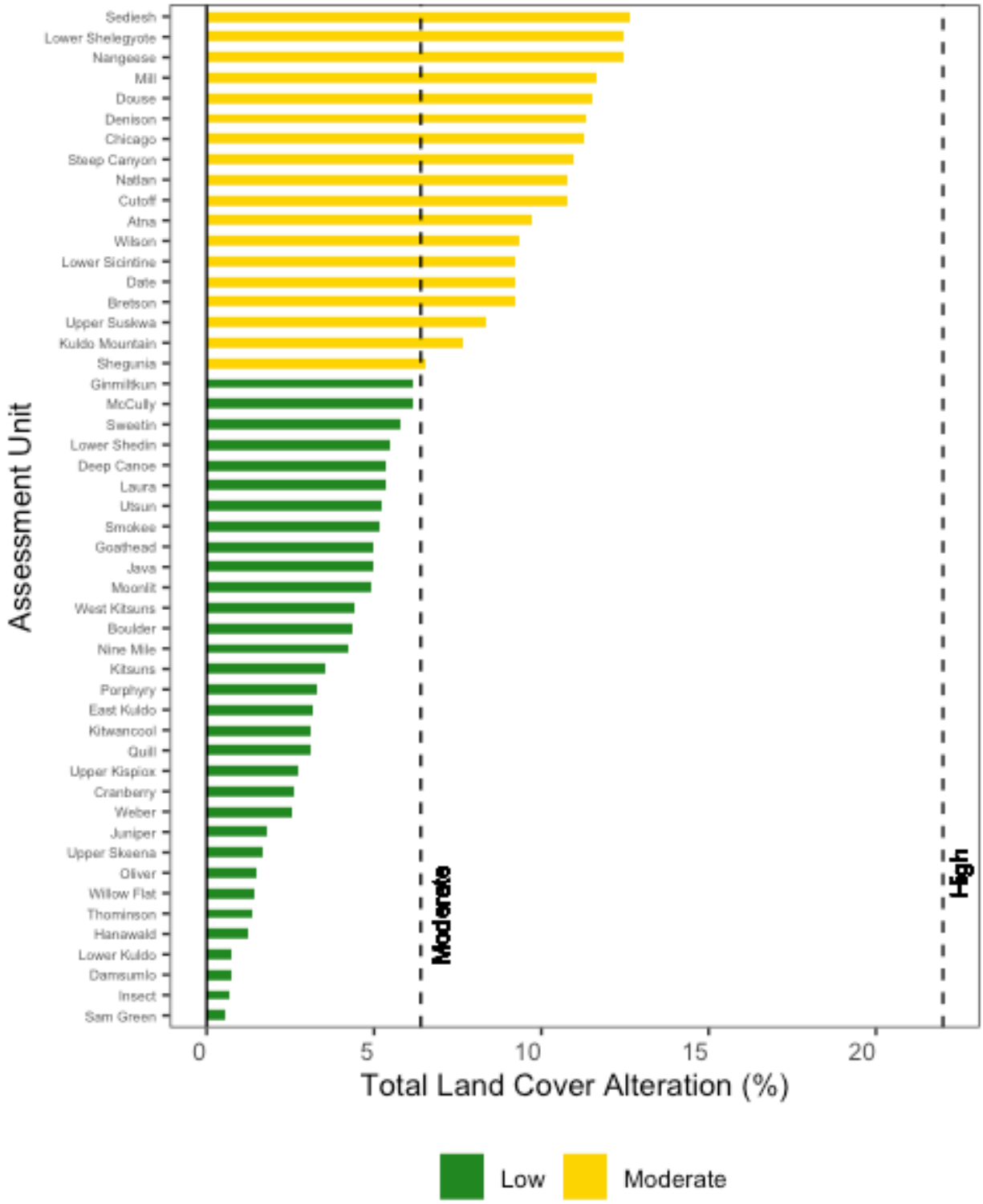
Reference AU	Area (km^2)	Disturbed Area (km^2)				Total Disturbed Area (km^2)	Percent Disturbed (%)	Risk
		Roads	Harvested (Post 1959)	Other Disturbance	Fire Disturbance (Post 1994)			
Madii Lii	28.68	0.08	3.90	0.10	0.00	4.08	14.22	Moderate
McCully	169.02	0.79	9.57	0.01	0.00	10.37	6.13	Low
McKnight	82.84	0.79	17.09	0.02	0.00	17.90	21.61	Moderate
Mill	107.54	0.36	6.54	2.41	3.24	12.56	11.68	Moderate
Moonlit	142.82	0.28	6.47	0.21	0.09	7.06	4.94	Low
Nangeese	109.48	0.51	12.88	0.23	0.00	13.61	12.43	Moderate
Natlan	137.62	0.36	14.38	0.08	0.00	14.81	10.76	Moderate
Nine Mile	84.59	0.48	2.51	0.60	0.00	3.59	4.25	Low
O'dwyer	48.44	0.00	0.00	0.00	0.00	0.00	0.00	Low
Oliver	205.76	0.71	1.17	1.14	0.00	3.02	1.47	Low
Poison	70.84	0.00	0.00	0.00	0.01	0.01	0.02	Low
Porphyry	77.36	0.66	0.03	1.85	0.00	2.54	3.28	Low
Price	80.93	0.03	0.23	0.00	0.00	0.26	0.32	Low
Quill	145.76	0.18	4.22	0.15	0.00	4.56	3.13	Low
Roche	111.68	0.88	1.43	27.35	0.06	29.72	26.61	High
Rosenthal	92.51	0.00	0.00	0.00	0.00	0.00	0.00	Low
Sam Green	51.12	0.02	0.26	0.00	0.00	0.28	0.55	Low
Sedan	121.55	0.02	0.00	0.21	0.01	0.24	0.20	Low
Sediesh	43.50	0.06	2.66	0.00	2.78	5.50	12.65	Moderate
Shahnagh	64.31	0.19	11.71	0.00	0.00	11.91	18.51	Moderate
Shandilla	114.22	0.79	14.84	11.84	0.00	27.48	24.05	High
Shedin East	58.85	0.02	0.16	0.00	0.00	0.19	0.32	Low
Shegisic	98.27	0.01	0.15	0.00	0.00	0.16	0.16	Low
Shegunia	263.15	0.90	15.31	0.93	0.00	17.14	6.51	Moderate
Sheladumas	55.83	0.00	0.00	0.00	0.00	0.00	0.00	Low
Shelly East	59.22	0.00	0.00	0.00	0.00	0.00	0.00	Low
Shelly West	75.86	0.00	0.00	0.00	0.00	0.00	0.00	Low
Shenismike	44.67	0.00	0.00	0.00	0.00	0.00	0.00	Low
Shewiliba	38.89	0.13	5.39	0.00	0.00	5.53	14.21	Moderate
Sidina	70.72	0.33	11.72	5.34	0.00	17.39	24.60	High
Sik-E-Dak	22.10	0.03	0.01	4.63	0.00	4.68	21.15	Moderate
Smokee	152.36	0.55	6.32	0.96	0.00	7.83	5.14	Low
Sperry	56.19	0.00	0.00	0.00	0.00	0.00	0.00	Low
Steep Canyon	31.80	0.05	3.43	0.00	0.00	3.48	10.95	Moderate
Sterritt	58.05	0.34	7.13	0.00	0.00	7.47	12.87	Moderate
Swan Lake	145.15	0.00	0.25	0.00	0.00	0.25	0.17	Low
Sweetin	244.45	0.28	13.86	0.00	0.00	14.14	5.79	Low

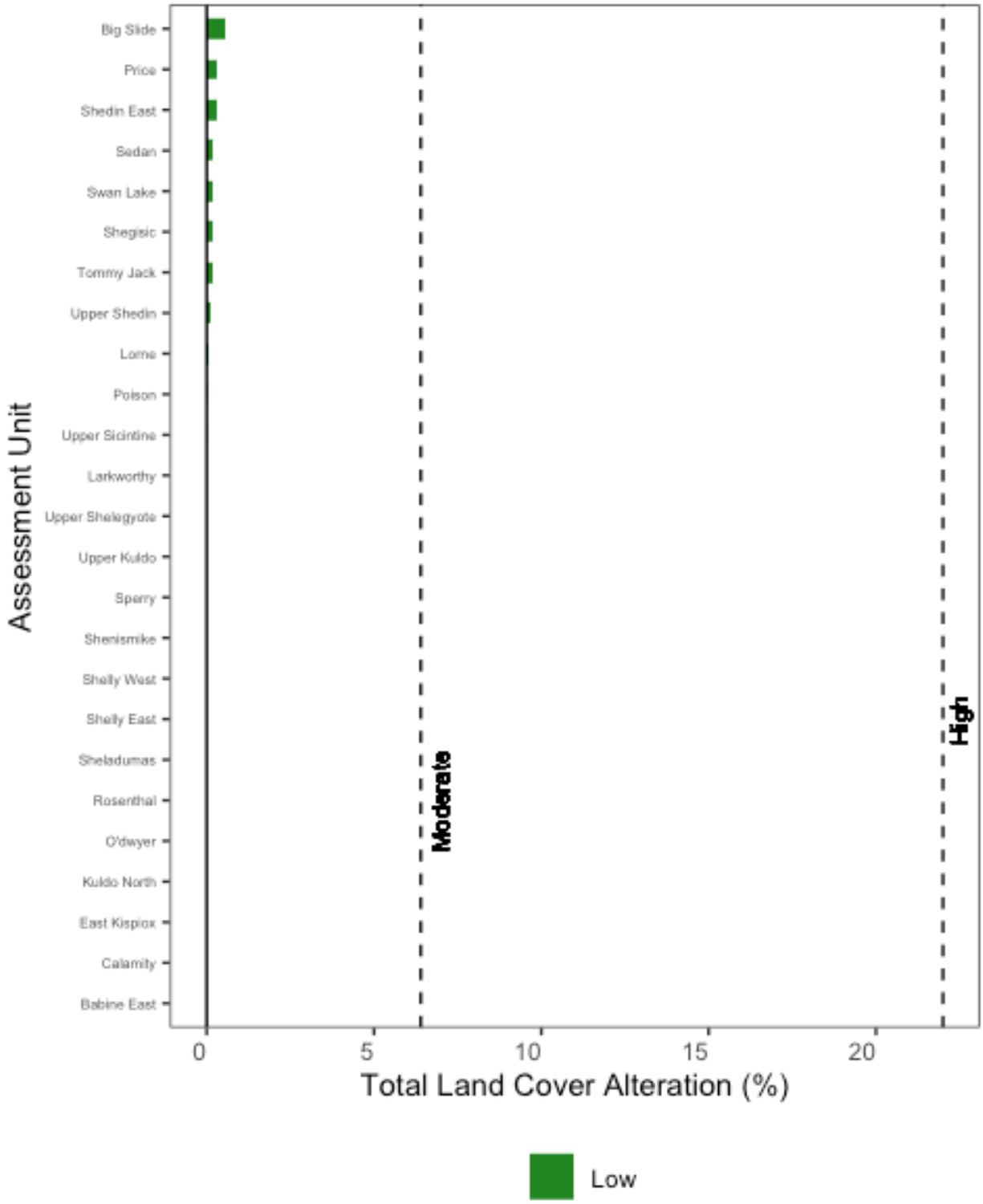
Reference AU	Area (km^2)	Disturbed Area (km^2)				Total Disturbed Area (km^2)	Percent Disturbed (%)	Risk
		Roads	Harvested (Post 1959)	Other Disturbance	Fire Disturbance (Post 1994)			
Tea	79.61	1.40	20.86	5.02	0.00	27.29	34.28	High
Thominson	111.14	0.20	0.37	0.00	0.96	1.53	1.38	Low
Tommy Jack	120.82	0.19	0.00	0.00	0.00	0.19	0.16	Low
Tsugwinselda	75.11	0.68	13.69	0.13	0.01	14.51	19.32	Moderate
Two Mile	71.46	1.04	6.43	16.67	0.05	24.19	33.86	High
Upper Kispiox	330.67	0.32	8.43	0.31	0.00	9.05	2.74	Low
Upper Kitwanga	194.62	1.50	36.26	4.31	0.25	42.32	21.75	Moderate
Upper Kuldo	99.36	0.00	0.00	0.00	0.00	0.00	0.00	Low
Upper Nichyeskwa	131.29	0.45	14.31	0.00	6.87	21.64	16.48	Moderate
Upper Shedin	172.60	0.25	0.00	0.00	0.00	0.25	0.14	Low
Upper Shelegyote	293.06	0.00	0.00	0.00	0.00	0.00	0.00	Low
Upper Sicintine	418.47	0.06	0.00	0.00	0.00	0.06	0.02	Low
Upper Skeena	53.04	0.00	0.00	0.00	0.88	0.88	1.65	Low
Upper Suskwa	245.81	0.68	19.65	0.15	0.00	20.48	8.33	Moderate
Utsun	49.16	0.17	2.39	0.01	0.00	2.57	5.23	Low
Weber	86.32	0.07	2.11	0.00	0.00	2.18	2.53	Low
West Kitsuns	149.94	0.19	6.47	0.00	0.00	6.66	4.44	Low
Willow Flat	32.61	0.05	0.42	0.00	0.00	0.46	1.42	Low
Wilson	80.49	0.53	6.19	0.58	0.23	7.54	9.37	Moderate
Xsan	96.04	0.66	27.80	3.64	0.64	32.75	34.10	High

Appendix D: Results Distribution

The results are colorized by risk threshold (low risk < 6.4 % of land area altered, moderate risk 6.4 - 22 % of land area altered, high risk > 22% of land area altered).




Sediesh
Lower Shelegyote
Nangeese
Mill
Douse
Denison
Chicago
Steep Canyon
Natlan
Cutoff
Atna
Wilson
Lower Sicintine
Date
Bretson
Upper Suskwa
Kuldo Mountain
Shegunia
Ginmiltkun
McCully
Sweatin
Lower Shedin
Deep Canoe
Laura
Utsun
Smokee
Goathead
Java
Moonlit
West Kitsuns
Boulder
Nine Mile
Kitsuns
Porphyry
East Kuldo
Kitwancool
Quill
Upper Kispiox
Cranberry
Weber
Juniper
Upper Skeena
Oliver
Willow Flat
Thominson
Hanawald
Lower Kuldo
Damsumlo
Insect
Sam Green
Assessment Unit
Moderate
High
0
5
10
15
20
Total Land Cover Alteration (%)
Low
Moderate


Big Slide
Price
Shedin East
Sedan
Swan Lake
Shegisic
Tommy Jack
Upper Shedin
Lorne
Poison
Upper Sicintine
Larkworthy
Upper Shalegyote
Upper Kuldo
Sperry
Shenismike
Shelly West
Shelly East
Sheladumas
Rosenthal
O'dwyer
Kuldo North
East Kispiox
Calamity
Babine East
Assessment Unit
0
5
10
15
20
Total Land Cover Alteration (%)
Moderate
High
Low