

Salmon Habitat Indicator Monitoring Project

Summary of Data, Methodology, Results, and Thresholds

For Pressure Indicator: Stream Crossing Density

The road stream crossing data is a derived product from the BC Environment Culvert Assessment Project¹. The potential number of culverted stream crossings were calculated, and cross-referenced with a fish habitat model to assign fish habitat classes to the stream crossings. Fish habitat classes are represented as fish presence – observed or inferred. The fish habitat model used to assess the stream crossing data is the same model used to calculate the Total Accessible Stream Length indicator.

Crossings determined unlikely to bear fish were removed. Only closed-bottom structures (CBS), such as corrugated metal pipes, are included in the analysis.

The stream crossing data does not include any culvert information collected by industry.

1. GIS Data

- Salmon presence and spawning data produced by SkeenaWild 2010-2012
- Road Stream Crossings (BC Environment Culvert Assessment Project)
- Digital Road Atlas (DRA)
- Forest Tenure Roads (FTEN roads)
- Freshwater Atlas Streams (1:20,000)
- Freshwater Atlas Lakes (1:20,000)
- Freshwater Atlas Assessment Watersheds (edited by K. Rabnett Nov 2012)
- Wet'suwet'en House Territory boundaries
- Morice Watershed Management Area

2. Methodology

The spatial overlay tool in Manifold GIS was used to assign analysis units to stream crossings. The resultant table was exported to excel where a pivot table was generated to summarize results.

3. Thresholds

Categorical risk thresholds used are taken from the Ministry of Forests watershed assessments procedures guidebook (MOF WAP)². Updated thresholds in use by the Pacific Salmon Foundation are also referenced below.

Threshold Rating	MOF WAP	PSF
Low	< 0.40	<0.20
Medium	>= 0.40	>=0.20 to < 0.58
High	>= 0.80	>=0.58

The PSF threshold values are applied in this report.

¹ For technical specifications as to how stream crossings were derived, see the document Fish Passage GIS Analysis, Methodology and Output Data Specifications. BC Ministry of Environment. Prepared by S. Norris, Hillcrest Geographics, Victoria BC. March 19, 2009.

² B.C. Ministry of Forests (MOF). 1995a. Interior watershed assessment procedure guidebook. (IWAP). <http://www.for.gov.bc.ca/tasb/legsregs/fpc/fpcguide/iwap/iwap-toc.htm>

4. Results

The results of the stream crossing density indicator is reported out by analysis units including the Morice Watershed, eighteen subwatersheds and face units within the Morice Watershed, the Morice Watershed Management Area (designated through the Morice LRMP), and the ten Wet'suwet'en house territories within or partly within the Morice Watershed.

4.1. Morice Watershed

The Morice Watershed contains a potential 1,043 total road/stream crossings. 12.5 % (130) of these crossings have confirmed fish presence and 87.5% (913) are designated with inferred fish presence. The total stream crossing density is 0.24/km².

**Table 4.1.1 Stream Crossing Density in Morice Watershed
(Number of crossings/km²)**

Area (km ²)	Number of Stream Crossings			Total Stream Crossing Density
	Fish Presence - Observed	Fish Presence - Inferred	Total	
4,379.62	130.0	913.0	1,043.0	0.24

Within the Morice Watershed, nine stream crossings are situated directly over salmon bearing streams.

Figure 4.1.1

 **Habitat Indicator Monitoring Project**
Salmon Pressure Indicator: Stream Crossings
Morice Watershed

 **SkeenaWild**
CONSERVATION TRUST

DRAFT January 2013

 *Eclipse GIS*

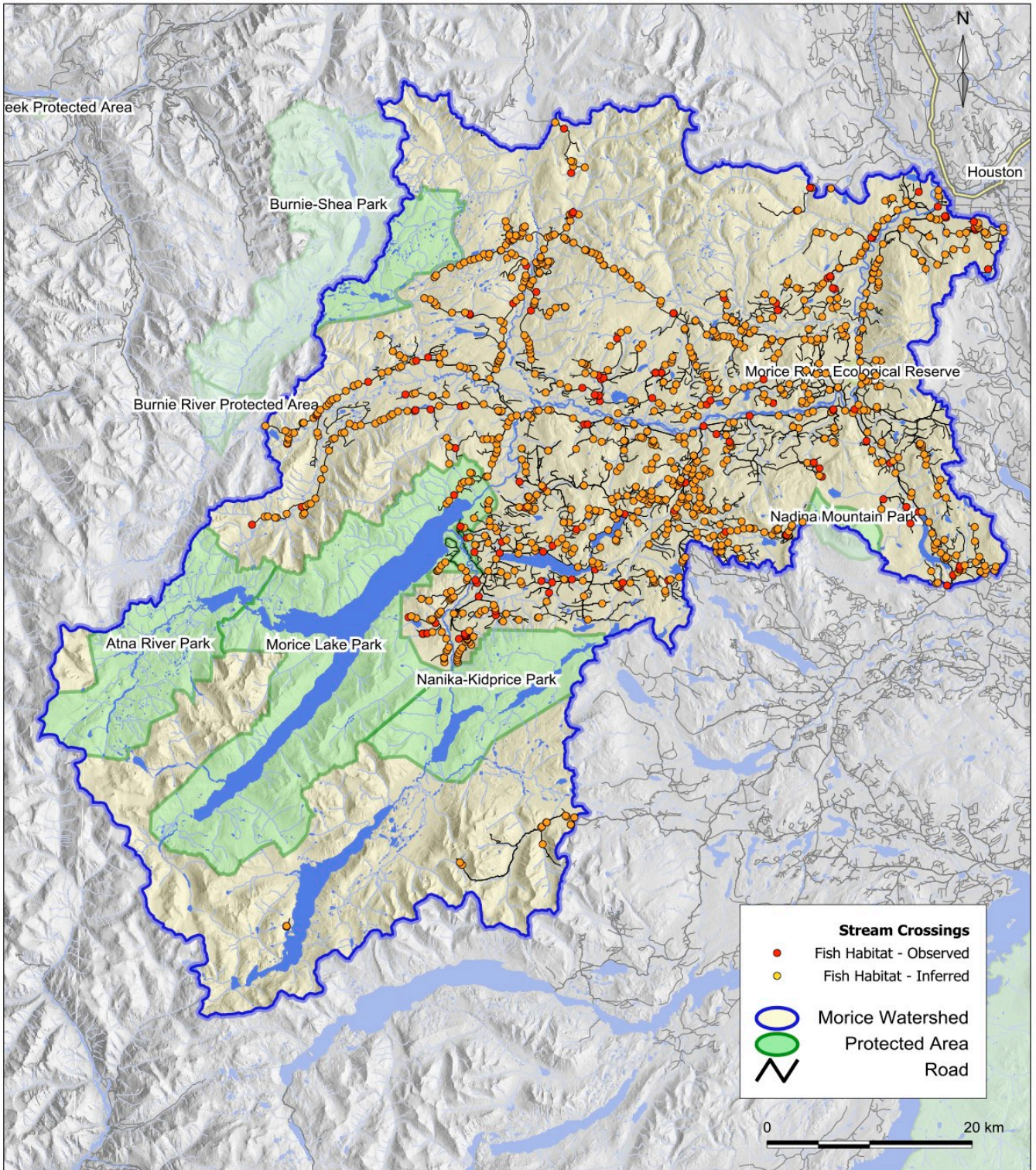
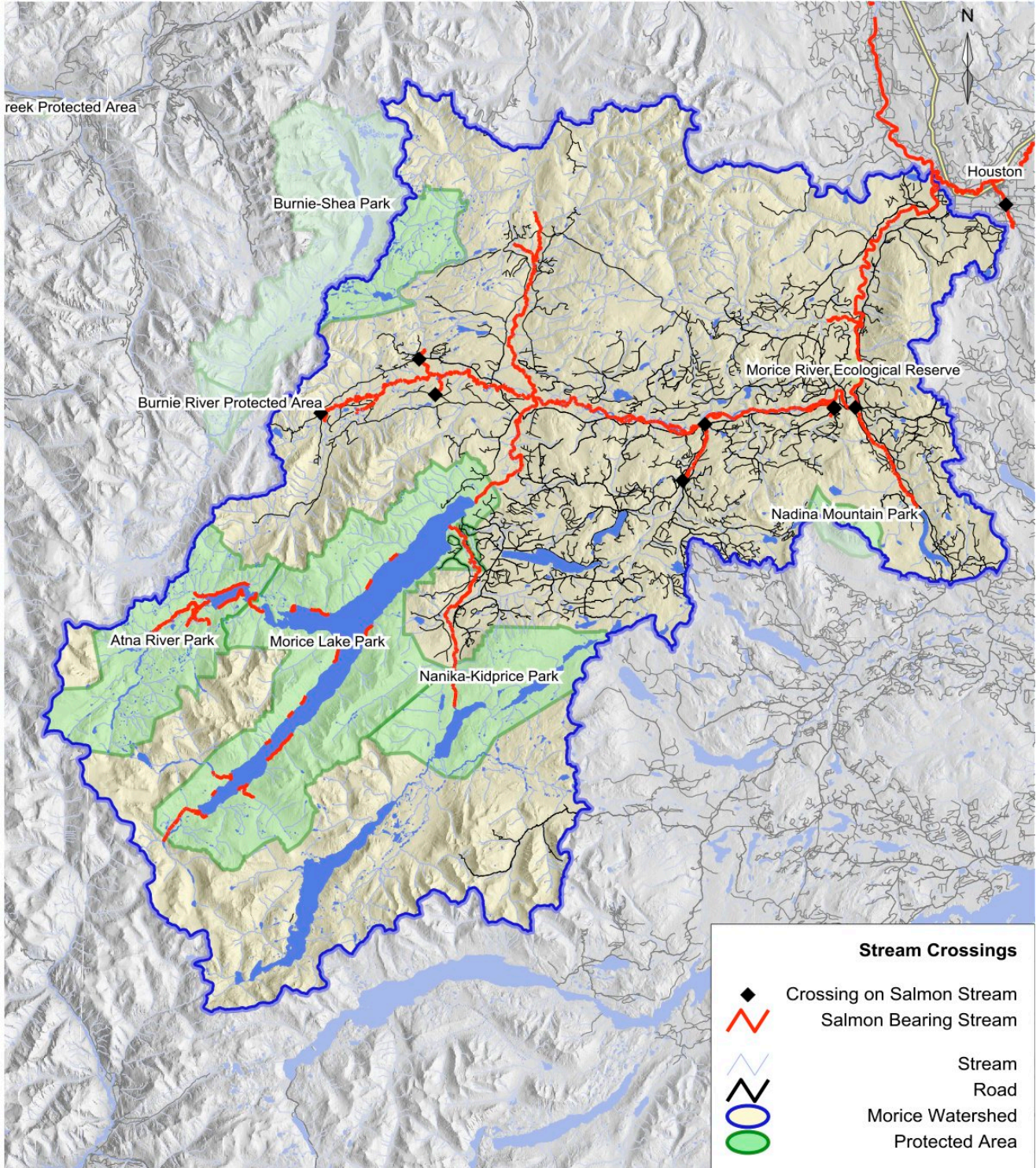


Figure 4.1.2

Habitat Indicator Monitoring Project
Stream Crossings over Identified Salmon Habitat



4.2. Morice Watershed Management Area

The Morice Watershed Management Area contains a potential 453 total stream crossings. 12.8 % (58) of these crossings have identified fish presence and 87.2% (395) are designated with inferred fish presence. The total stream crossing density is 0.13/km².

**Table 4.2.1 Stream Crossing Density in Morice Watershed Management Area
(Number of crossings/km²)**

Area (km ²)	Number of Stream Crossings			Total Stream Crossing Density
	Fish Presence - Observed	Fish Presence - Inferred	Total	
3,403.51	58.0	395.0	453.0	0.13

The Morice Watershed Management Area contains three stream crossings directly over salmon bearing streams. These are located within the Gosnell and Shea sub-watersheds.

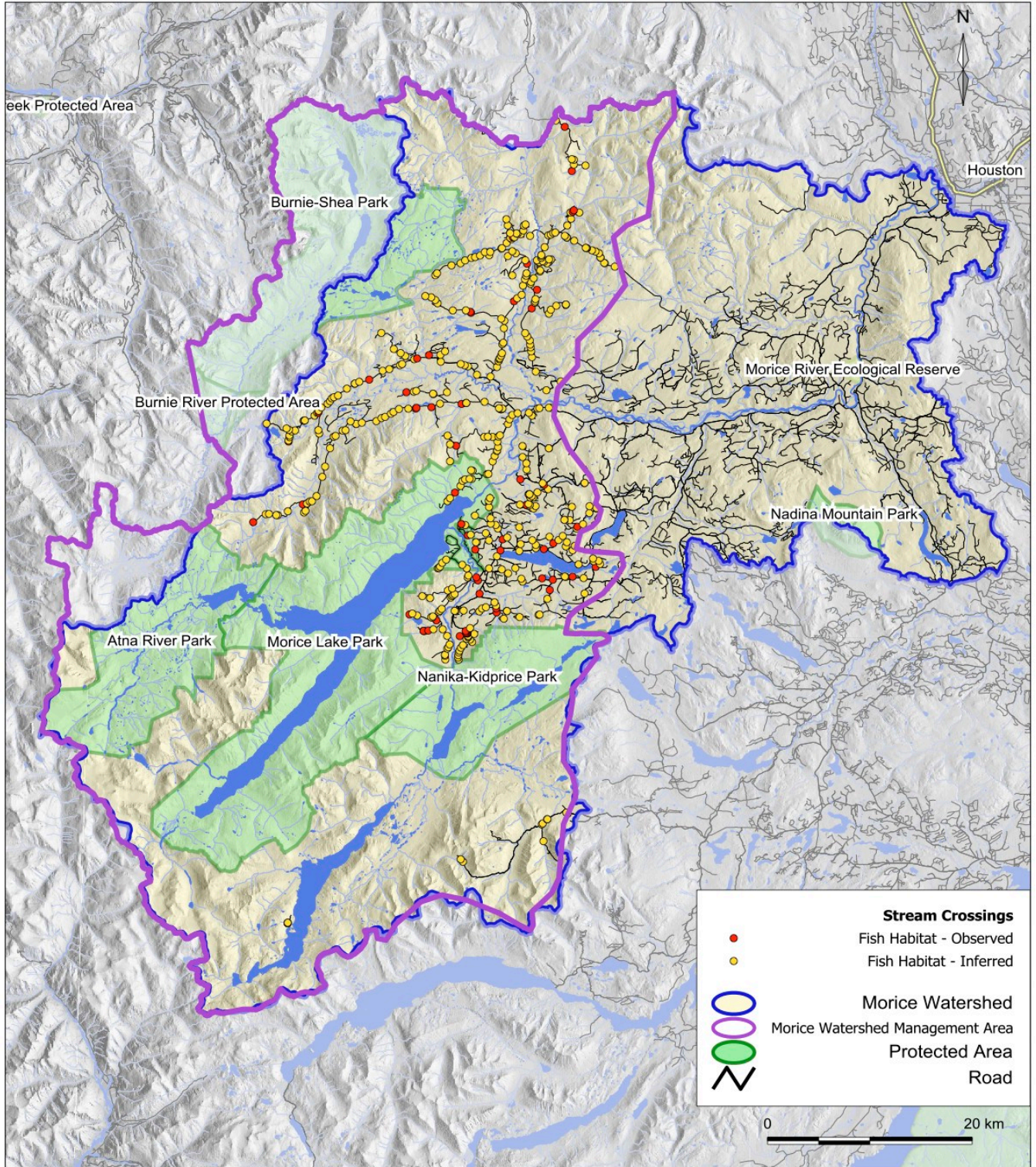


Habitat Indicator Monitoring Project
Salmon Pressure Indicator: Stream Crossings
Morice Watershed Management Area



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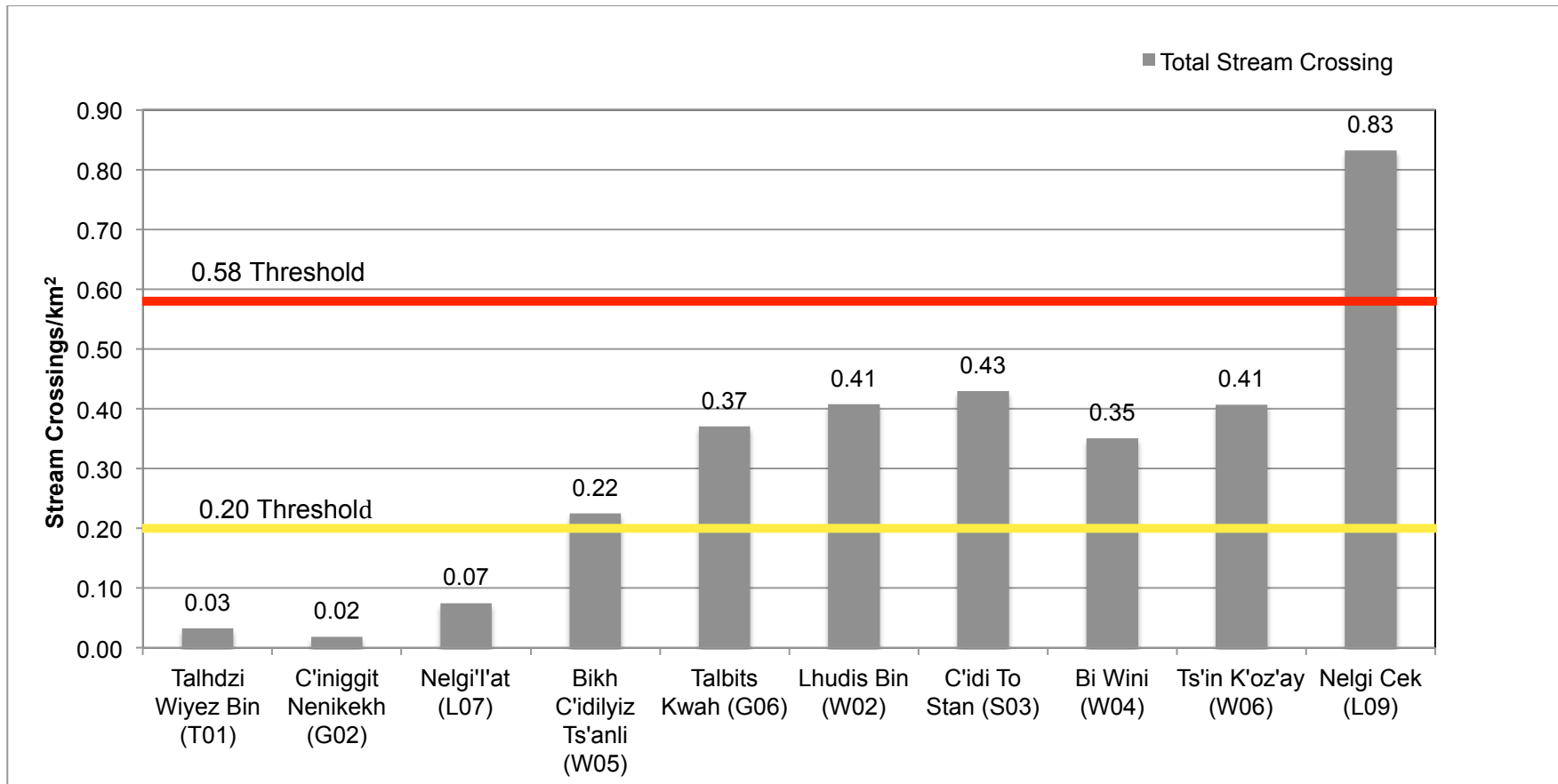
4.3. Wet'suwet'en House Territories within Morice Watershed

The ten Wet'suwet'en House Territories within the Morice Watershed contains 1,587 potential stream crossings, with 13.7% (218) situated in observed fish habitat and 86.3% (1369) situated in inferred fish habitat. The stream crossing density for the house territories ranges from 0.02/km² in the C'iniggit Nenikekh house to 0.83/km² in the Nelgi Cek house territory. The overall stream crossing density for the ten Wet'suwet'en houses is 0.31/km². Nine of the stream crossings are situated over salmon bearing streams.

**Table 4.3.1 Stream Crossing Density in Wet'suwet'en House Territories within Morice Watershed
(Number of crossings/km²)**

House Territory	Area (km ²)	Number of Stream Crossings			Total	Total Stream Crossing Density
		Salmon Bearing Stream	Fish Presence - Observed	Fish Presence - Inferred		
Talhdzi Wiyez Bin (T01)	494.78		0	16	16	0.03
C'iniggit Nenikekh (G02)	1,293.94		0	24	24	0.02
Nelgi'l'at (L07)	387.11		24	5	29	0.07
Bikh C'idilyiz Ts'anli (W05)	142.48		8	24	32	0.22
Talbits Kwah (G06)	710.28	3	37	226	263	0.37
Lhudis Bin (W02)	989.37	2	48	355	403	0.41
C'idi To Stan (S03)	505.42		25	192	217	0.43
Bi Wini (W04)	883.29	3	46	264	310	0.35
Ts'in K'oz'ay (W06)	280.41		17	97	114	0.41
Nelgi Cek (L09)	214.98	1	13	166	179	0.83
Total	5,902.06	9	218	1369	1587	0.31

Figure 4.3.1 Total Stream Crossing Density within Wet'suwet'en House Territories

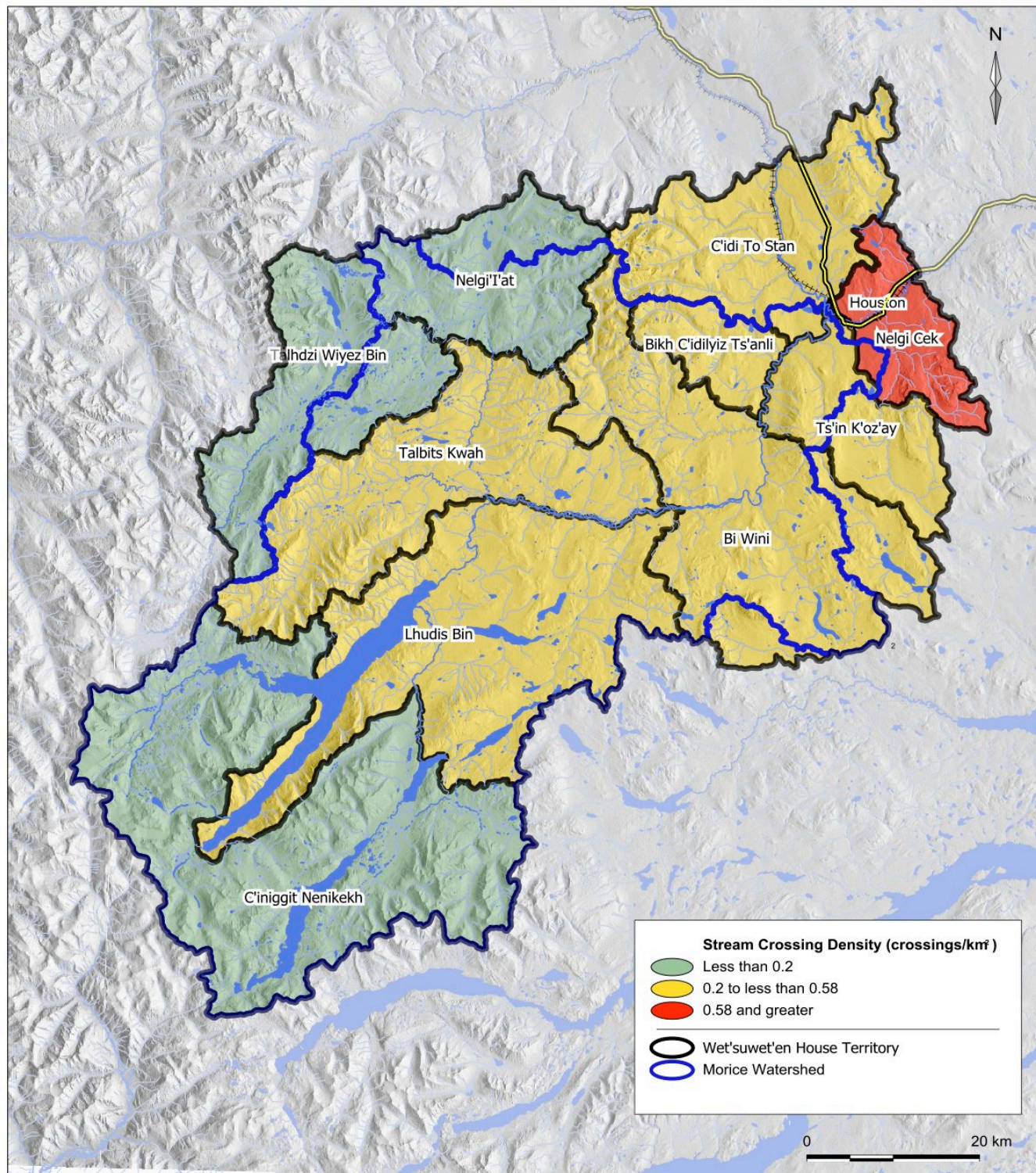




Habitat Indicator Monitoring Project
Salmon Pressure Indicator: Stream Crossing Density
Wet'suwet'en House Territories
Within the Morice Watershed



Eclipse GIS



4.4. Morice Sub-watersheds

The eighteen sub-watersheds within the Morice Watershed contain a total of 1,040 potential stream crossings, with 12.5% (129) crossing observed fish habitat and 87.6% (911) situated over inferred fish habitat. The stream crossing densities for the sub-watersheds range from 0.0/km² in the Atna River sub-watershed to 0.76/km² in the Morice River reach 1 west sub-watershed. The total stream crossing density for the Gosnell sub-watershed is 0.22 crossings/ km².

Table 4.4.1 Stream Crossing Density in Morice sub-watersheds (number of crossings/km²)

Sub-watershed Unit	Area (km ²)	Stream Crossings			Total Crossings	Total Stream Crossing Density
		Salmon Bearing Streams	Fish Presence - Observed	Fish Presence - Inferred		
Gosnell Watershed						
Crystal Creek	62.5		2	5	7	0.11
Shea Creek	195.0	1	4	24	28	0.14
Gosnell Creek	279.4	2	10	71	81	0.29
Subtotal	536.9	3	16	100	116	0.22

Continued ...

Sub-watershed Unit	Area (km ²)	Salmon Bearing Stream	Stream Crossings			Total Stream Crossing Density
			Fish Presence - Observed	Fish Presence - Inferred	Total Crossings	
Atna River	283.9		0	0	0	0.00
Houston Tommy Creek	248.2		4	58	62	0.25
Lamprey Creek	240.3	2	13	166	179	0.75
McBride Creek	115.0		13	51	64	0.56
Nanika River	889.7		16	71	87	0.10
Owen Creek	212.4	1	10	58	68	0.32
Thautil River	423.0		9	103	112	0.26
Morice Lake	599.6		1	9	10	0.02
Morice River Face Units						
MR R1 East	71.7		3	26	29	0.40
MR R1 West	41.0		0	31	31	0.76
MR R2 North	206.2		18	76	94	0.46
MR R2 SE	101.6	2	6	20	26	0.26
MR R2 SW	61.6		2	35	37	0.60
MR R3 East	165.8		9	70	79	0.48
MR R3 West	181.9		9.0	37.0	46.0	0.25
Subtotal	829.9	5	47.0	295.0	342.0	0.41
Total	4,378.9	8	129.0	911.0	1,040.0	0.24

Figure 4.4.1a Total Stream Crossing Density within Morice Sub-watersheds

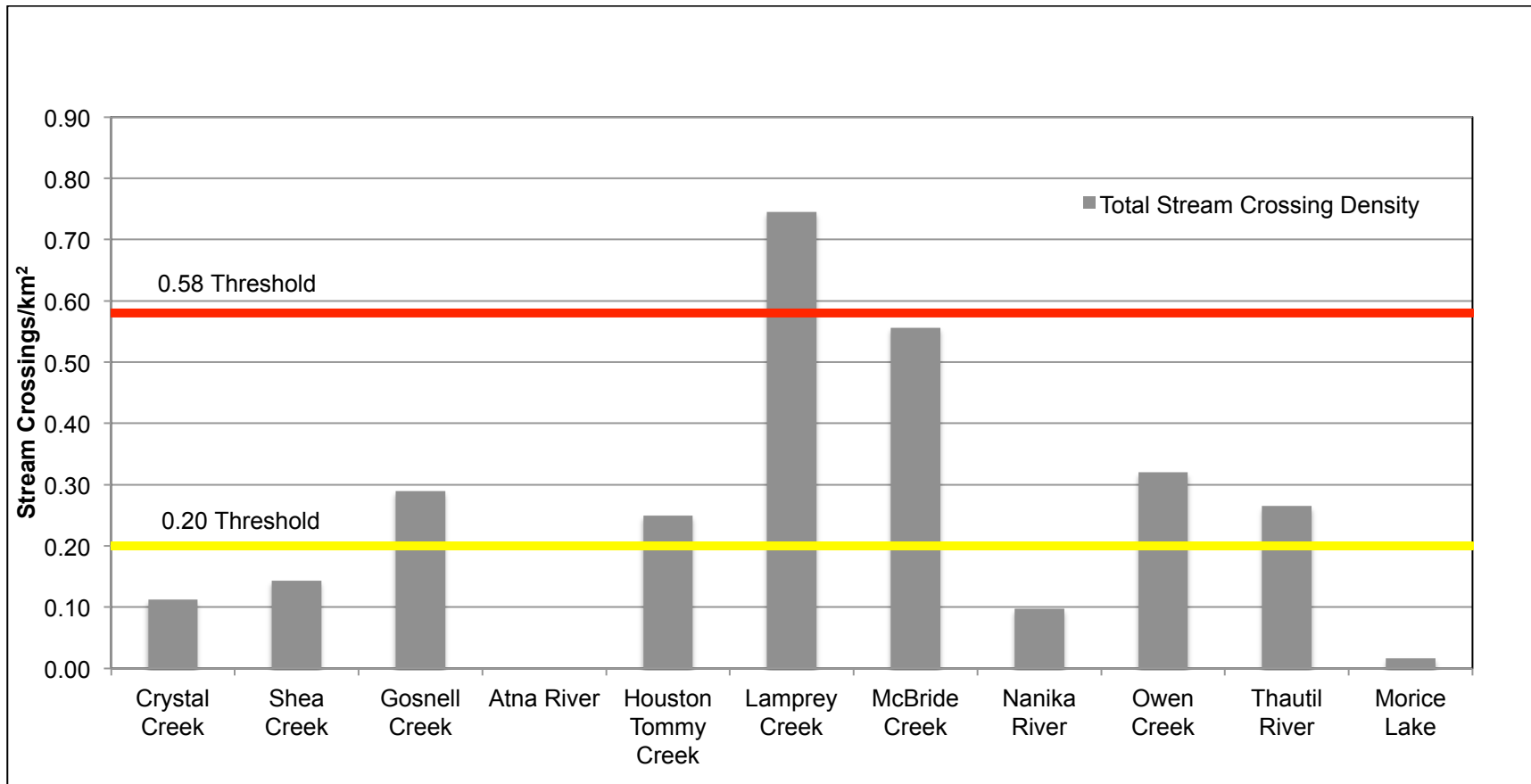
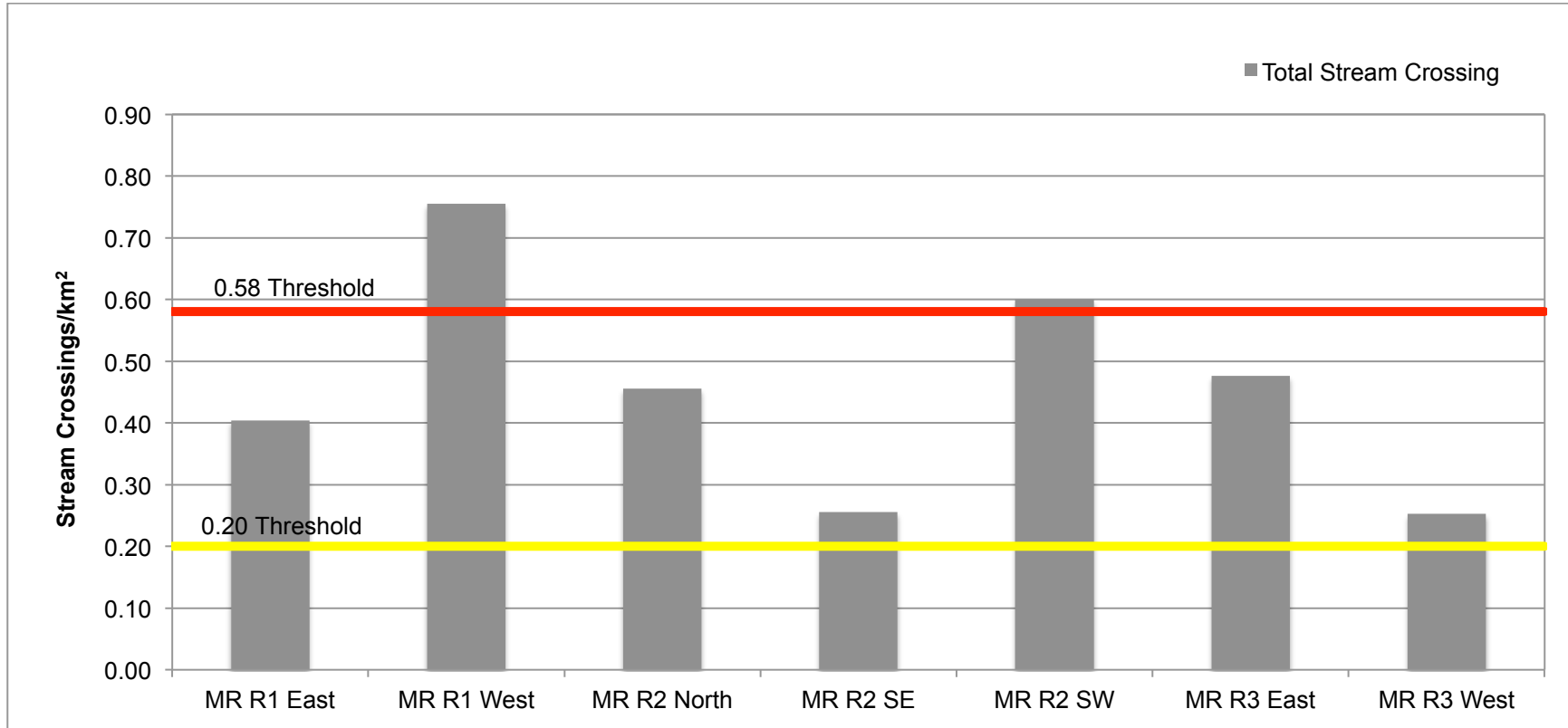


Figure 4.4.1b Total Stream Crossing Density within Morice River Face Units

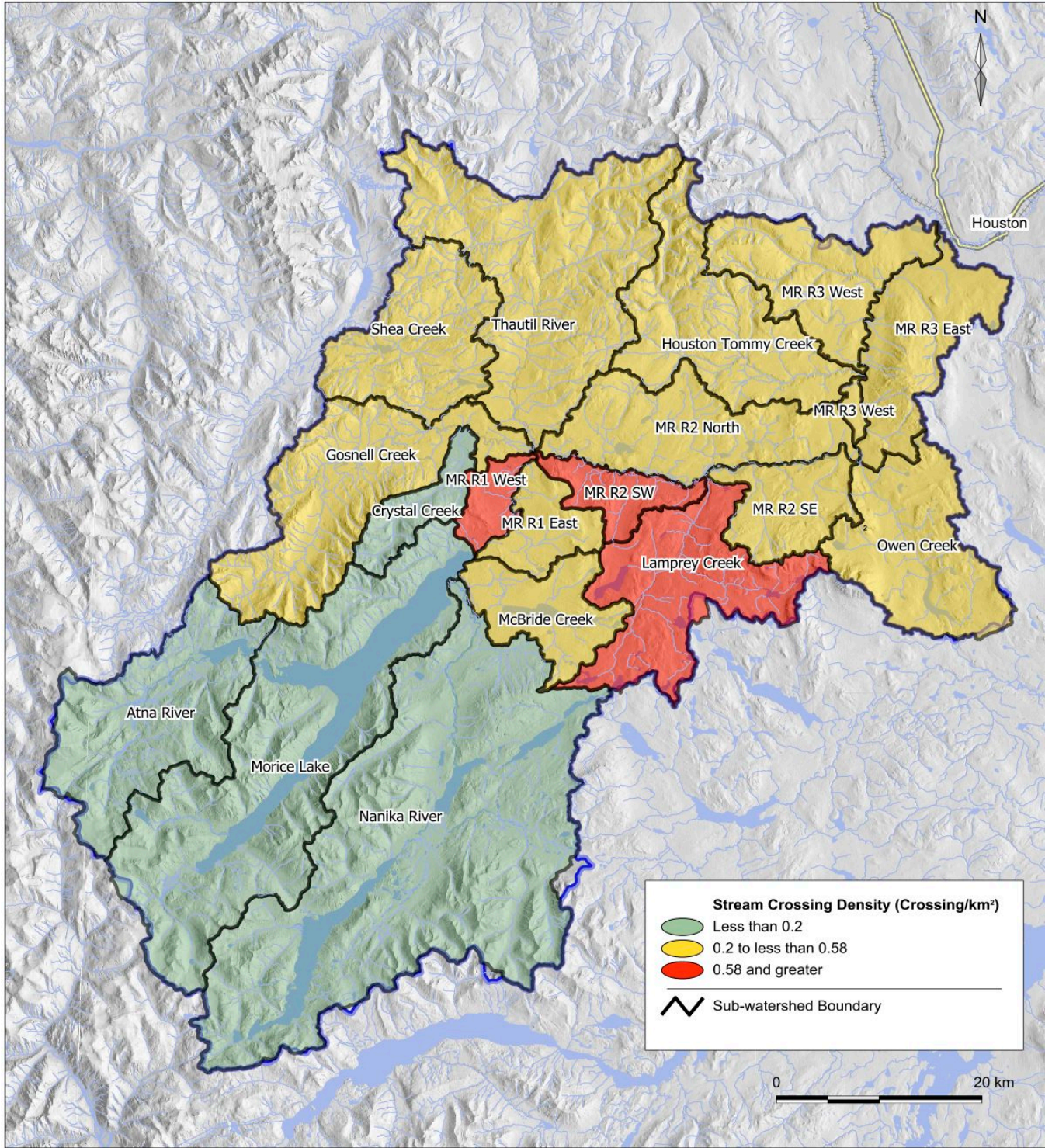




Habitat Indicator Monitoring Project
Salmon Pressure Indicator: Stream Crossing Density
Morice Sub-watersheds



Eclipse GIS



4.4.1. Supplementary Information

In 2009 the Forest Practices Board conducted a special investigation into fish passage at stream crossings. Of the 19 watersheds assessed, three reside within the Morice Watershed. This study is unique as it is the first study to include all types of fish passage structures, including closed bottom structures, and a wider variety of open bottom structures. The results for the Lamprey, McBride, and Houston Tommy are provided below to provide additional information regarding stream crossings within these three sub-watersheds.

Table 4.4.2 Excerpt from Fish Passage at Stream Crossings, Appendix 2.³

A total of 1,159 crossings of fish streams were reviewed for this project. The summary results for the crossings (Table A-3) are tabulated for each watershed, showing the type of crossing and the results (none, partial, total) for each habitat class (marginal, important, and critical).

TABLE A-3. Watershed summaries of number of crossings by habitat type and rating of likelihood of a barrier to fish passage.

				Ratings of likelihood of a barrier to fish passage											
				Total Crossings			Marginal Habitat			Important Habitat			Critical Habitat		
				All	OBS	CBS	OBS (assumed low)	low	moderate	high	OBS (assumed low)	low	moderate	high	OBS (assumed low)
Lamprey	68	18	50	0	1	17	11	9	1	13	5	9	0	0	2
McBride	29	9	20	0	1	2	6	4	2	4	2	5	2	0	1
Houston Tommy	39	15	24	1	0	6	7	9	0	7	4	5	0	0	0

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³ Forest Practices Board (FPB) 2009. Fish Passage at Stream Crossings: Special Investigation. FPB/SIR/25.