Upper Bulkley Fish and Aquatic Review
Summary of Data, Methodology, Results, and Thresholds
For Pressure Indicator Road Density

Road densities have been widely correlated to salmon habitat degradation and have been ranked as a high value indicator by the Wild Salmon Policy (WSP) Habitat Working Group.

1. GIS Data

The following spatial information was utilized in the analysis:

- FTEN (forestry roads)
- Digital Road Atlas (DRA)
- Amalgamated roads data provided by FLNRO (B. Ells)
- Freshwater Atlas (FWA) Assessment watersheds
- Wet'suwet'en House Territories
- Chinook Conservation Unit (Wild Salmon Policy)
- Morice Resource Management Zone (RMZ) for Bulkley River

2. Methodology

The FTEN and DRA data was amalgamated and visually verified with Bing imagery. The data amalgamation and verification process added 1,060.0 km of roads within the Upper Bulkley watershed. The railway has been included in the road density analysis as it is a permanent linear transportation feature. The GIS system QGIS was used to generate spatial statistics including area, road length, and road density.

3. Thresholds

Interim thresholds used in this analysis follow the recommendations put forth by the Wild Salmon Policy.
Low risk: road density < 0.40 km/km^2
Moderate risk: road density >= 0.40 km/km^2
High risk: density >=1.2 km/km^2

4. Results

The results of the road density indicator are reported out by a variety of boundaries including the Upper Bulkley Watershed, twenty-two sub-watersheds and face units within the Upper Bulkley basin, nineteen Wet'suwet'en house territories within or adjacent to the Upper Bulkley Watershed, the WSP Chinook Conservation Unit, and the Bulkley River Resource Management Zone as determined by the Morice LRMP.

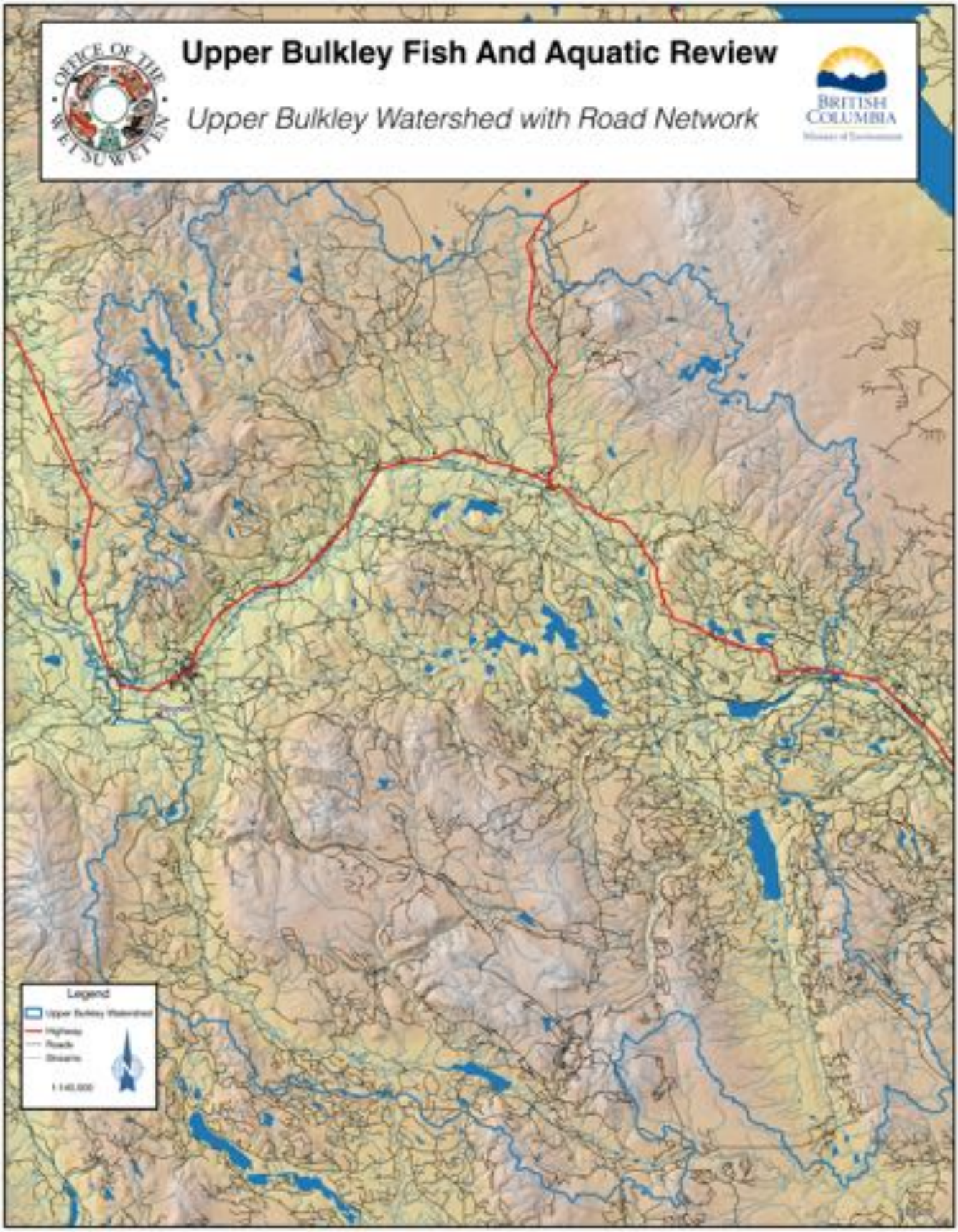
4.1. Upper Bulkley Watershed

The Upper Bulkley watershed has a total road network of 3,353.33 km, resulting in a road density of 1.45 km/km^2, well above the high risk threshold.

Table 4.1.1 Road Density within Upper Bulkley Watershed

Area (km^2)	Road Length (km)	Density (km/km^2)
2,315.07	3,353.33	1.45

Figure 4.1.1 Road Density within the Upper Bulkley Watershed



4.2. Wet'suwet'en House Territories within the Upper Bulkley Watershed

The nineteen Wet'suwet'en House Territories within or adjacent to the Upper Bulkley Watershed contain 11,493 km of roads with an average road density of 1.53 km/km^2. The road density values across the House Territories range from 0.3 km/km^2 in the Bikh C'idilyiz Ts'anli territory to 2.83 km/km^2 in the Tatl'at Bin Territory. One House Territory, the Bikh C'idilyiz Ts'anli Territory, has a road density value within the low risk category, four House Territories have a road density value within the moderate risk category, and the road density for the remaining fourteen House Territories falls within the high risk category.

Table 4.2.1 Road Density within Wet'suwet'en House Territories Situated within or Partially within the Upper Bulkley Watershed.

House Territory	Area (km^2)	Road Length (km)	Road Density (km/km^2)
'Ilh K'il Bin	305.26	304.82	1.00
Bi Wini	883.29	926.71	1.05
Bikh C'idilyiz Ts'anli	142.48	42.87	0.30
C'idi To Stan	505.42	439.28	0.87
C'iggiz	177.29	317.33	1.79
C'inilh K'it	396.40	547.90	1.38
Cosl'et Bin	361.06	628.56	1.74
Dets'inegh	70.79	125.62	1.77
Ggusgi Be Wini	288.66	352.86	1.22
Gguzih Keyikh	54.13	80.65	1.49
Honeagh Bin	1378.72	2314.98	1.68
Misdzi Kwah	453.47	742.98	1.64
Nelgi Cek	214.98	404.99	1.88
Nelhdzi Tezdli Bin	417.79	583.57	1.40
Tasdlegh	477.18	836.15	1.75
Tatl'at Bin	368.31	1040.87	2.83
Ts'in K'oz'ay	280.41	302.87	1.08
Tse Zul	131.12	169.87	1.30
Tselh K'iz Bin	611.49	1330.09	2.18
Subtotals	**7,518.25**	**11,492.97**	**1.53**

Figure 4.2.1 Road Density within Wet'suwet'en House Territories

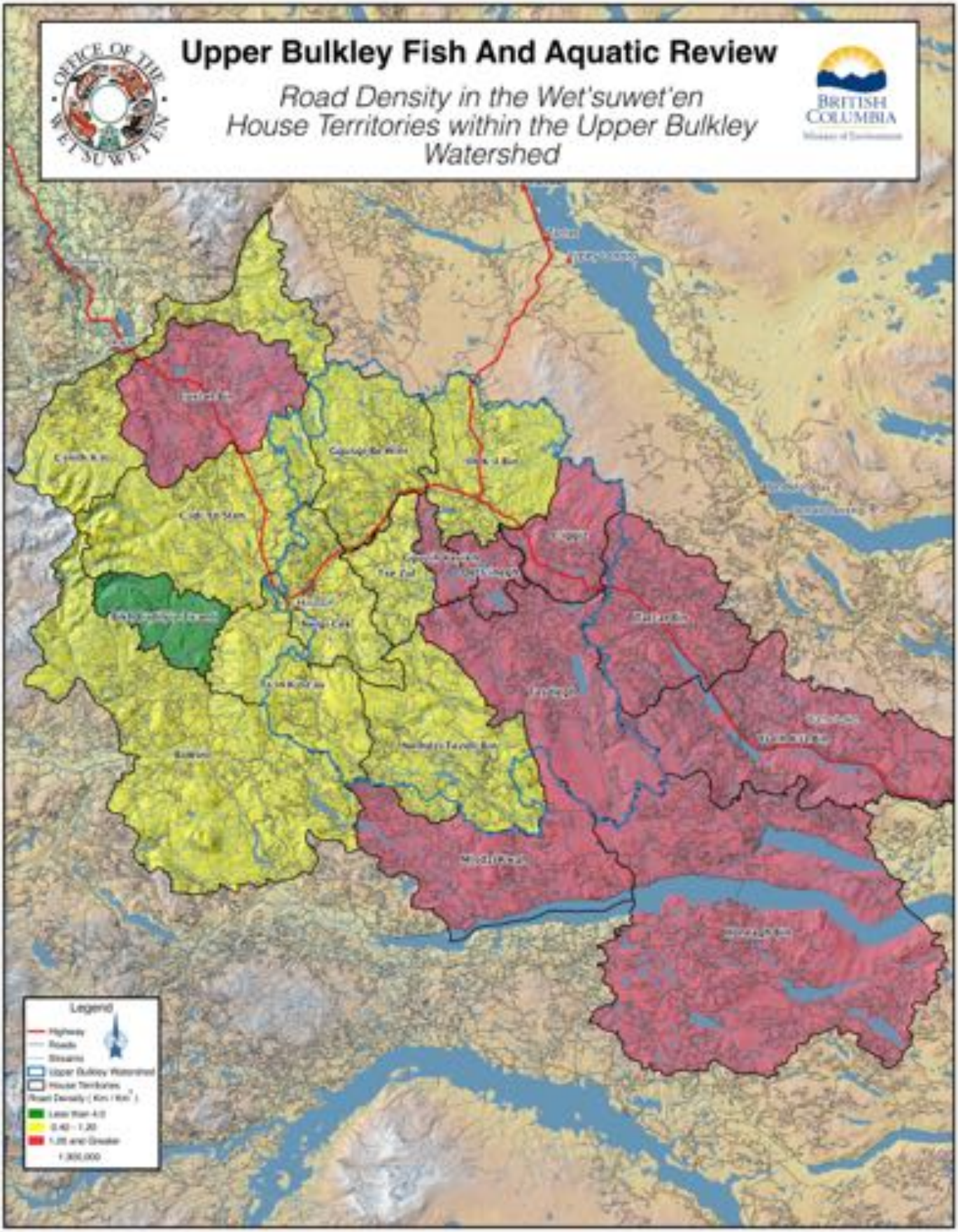
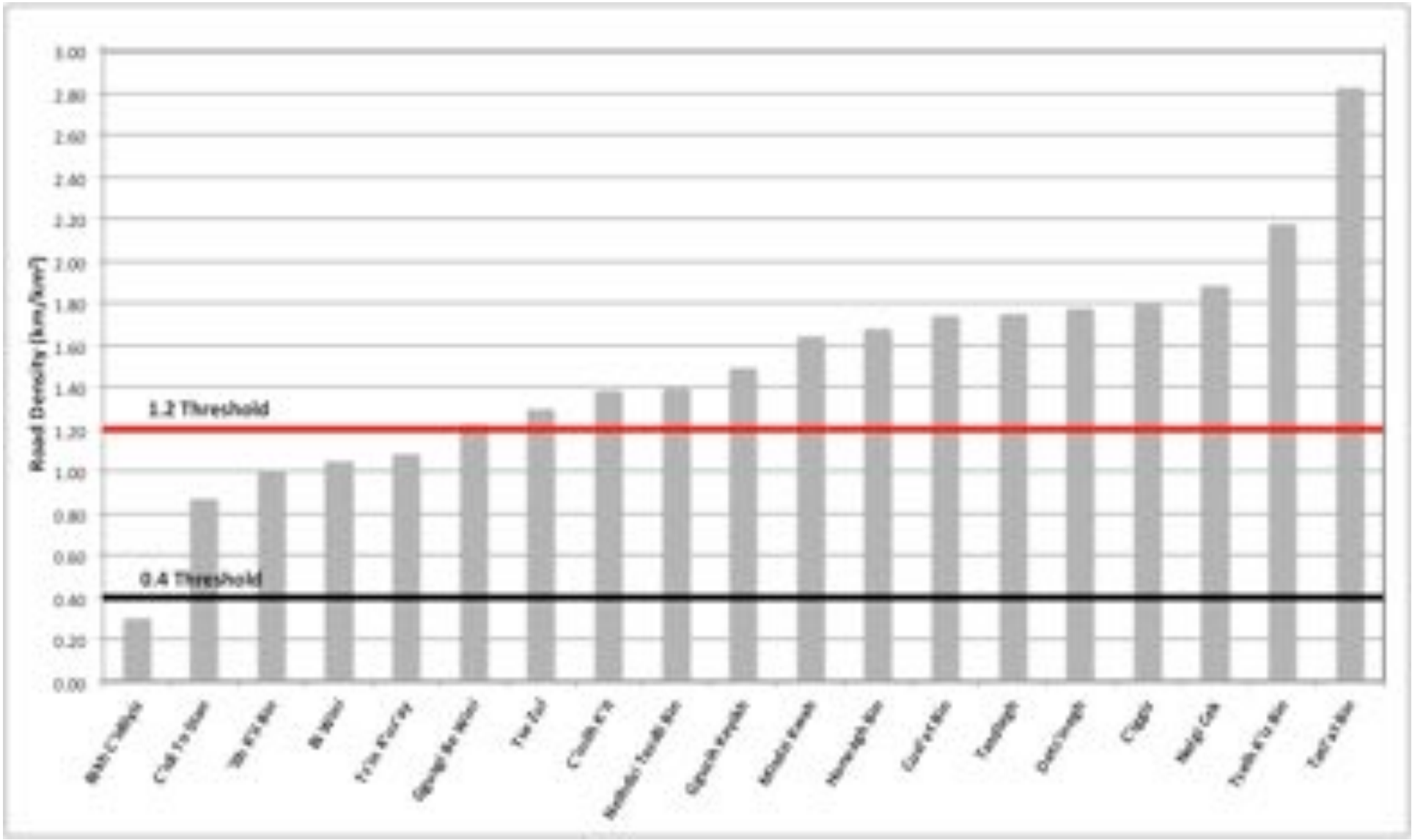


Figure 4.2.2 Road Density Thresholds within Wet'suwet'en House Territories



4.3. Upper Bulkley Sub-watersheds

The road density within the thirteen sub-watersheds and nine face units that are situated in the Upper Bulkley Watershed range from 0.57 km/km^2 in Cesford Creek to 2.04 km/km^2 in Crow Creek. Five of the sub-watersheds and face units contain a road density that falls within the moderate risk category, with the remaining face units and sub-watersheds all exhibiting a road density that exceeds the high risk threshold of 1.2 km/km^2

Table 4.3.1 Road Density within the Upper Bulkley Sub-watersheds

Sub-watershed Unit	Area (km^2)	Road Length (km)	Density (km/km^2)
Ailport	97.13	72.48	0.75
Aitken	148.66	202.79	1.36
Barren	25.81	36.61	1.42
Buck	566.77	757.97	1.34
Byman	94.04	71.78	0.76
Cesford	36.70	20.86	0.57
Crow	73.96	150.93	2.04
Johnny David	43.73	57.27	1.31
Maxan	370.73	573.80	1.55
McKilligan	38.20	54.14	1.42
McQuarrie	114.62	66.94	0.58
Perow	20.63	25.04	1.21
Richfield	161.81	118.01	0.73
Subtotal	**1,792.79**	**2,208.62**	**1.23**
Bukley River Face Units			
Bulkley River 1	78.47	220.26	2.81
Bulkley River 2	51.21	89.78	1.75
Bulkley River 3	75.84	134.04	1.77
Bulkley River 4	30.07	61.92	2.06
Bulkley River 5	36.87	82.92	2.25
Bulkley River 6	59.21	114.86	1.94
Bulkley River 7	64.63	164.59	2.55
Bulkley River 8	32.23	92.03	2.86
Bulkley River 9	93.77	184.31	1.97
Subtotal	**522.29**	**1,144.71**	**2.19**
Total	**2,315.07**	**3,353.33**	**1.45**

Figure 4.3.1 Road Density within the Upper Bulkley Sub-watersheds

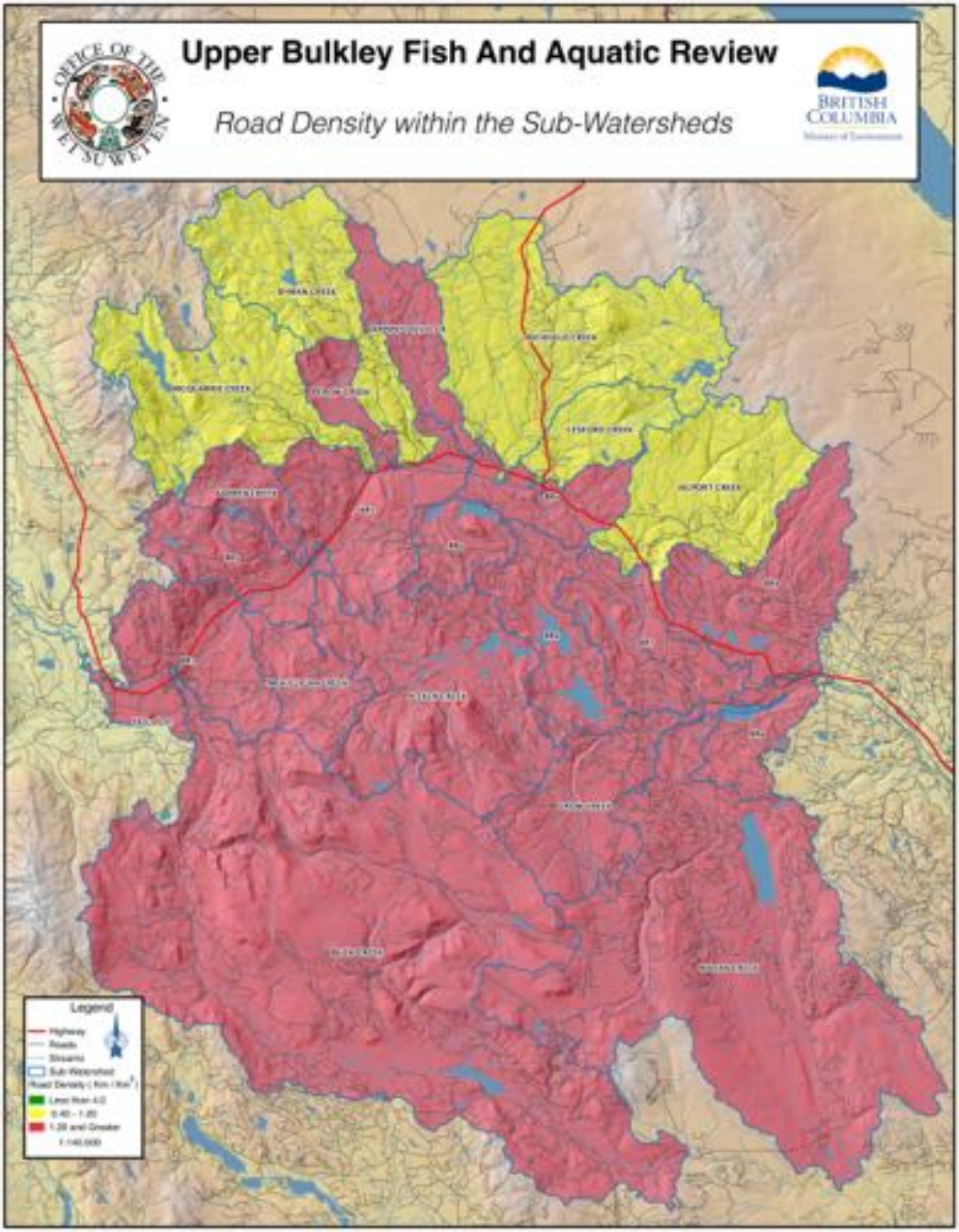
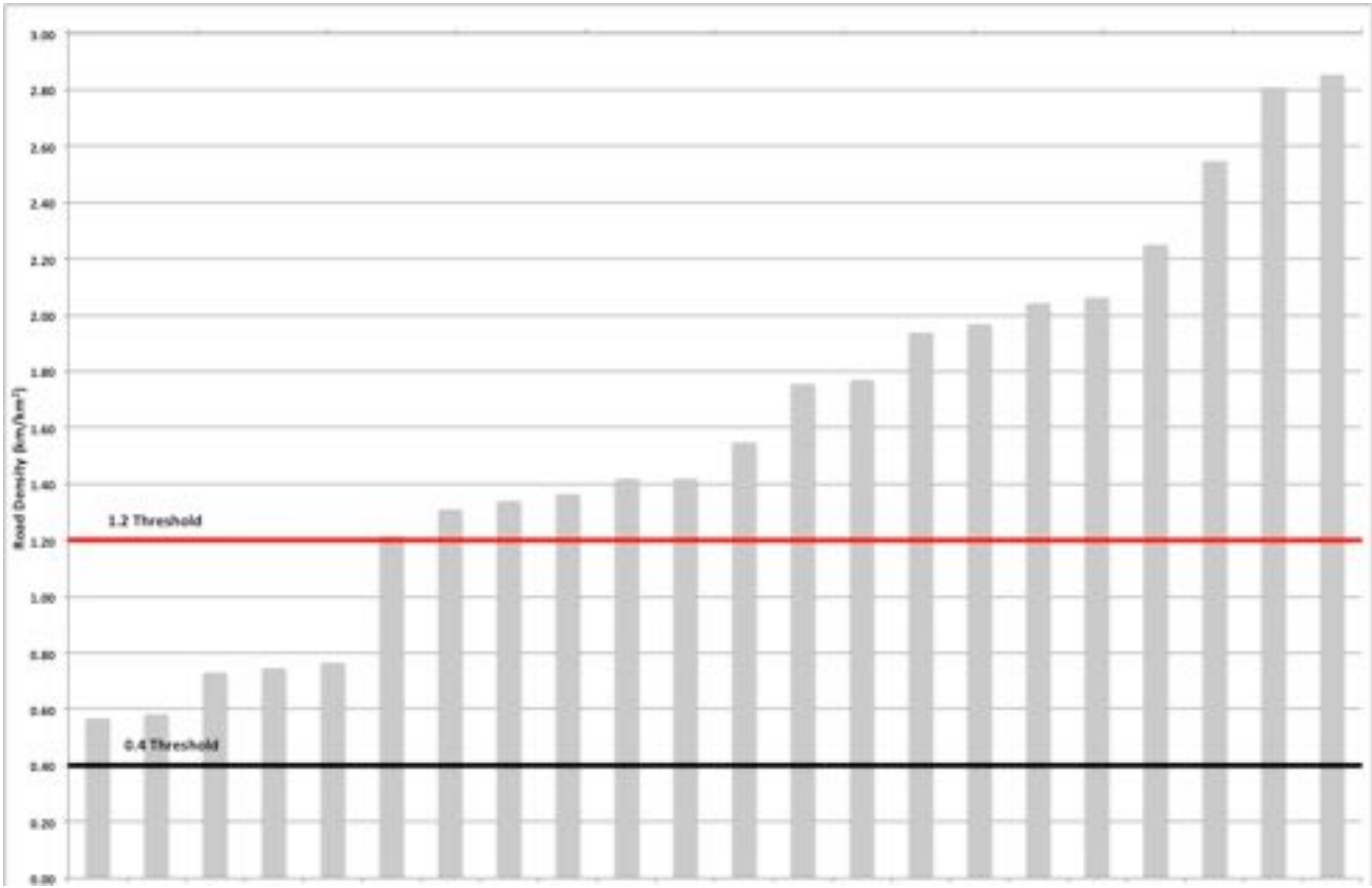


Figure 4.3.2 Road Density Thresholds within the Upper Bulkley Sub-watersheds



4.4. Additional Management and Resource Zones

This report includes two additional management and resource zones that relate to objectives within the Upper Bulkley Watershed. The road density for the WSP Chir Conservation Unit and the Bulkley River Resource Management Zone as determir Morice LRMP are presented below.

The road density within both of the management zones exceed the high-risk thresh km/km^2.

Table 4.4.1 Road Density within Additional Management and Resource Zone

Management Unit	Area (km^2)	Road Length (km)	Road Densi (km/km^2)
WSP Chinook Conservation Unit	117.88	330.81	
Bulkley River RMZ	53.20	150.36	

Figure 4.4.1 Road Density within Additional Management and Resources Zor

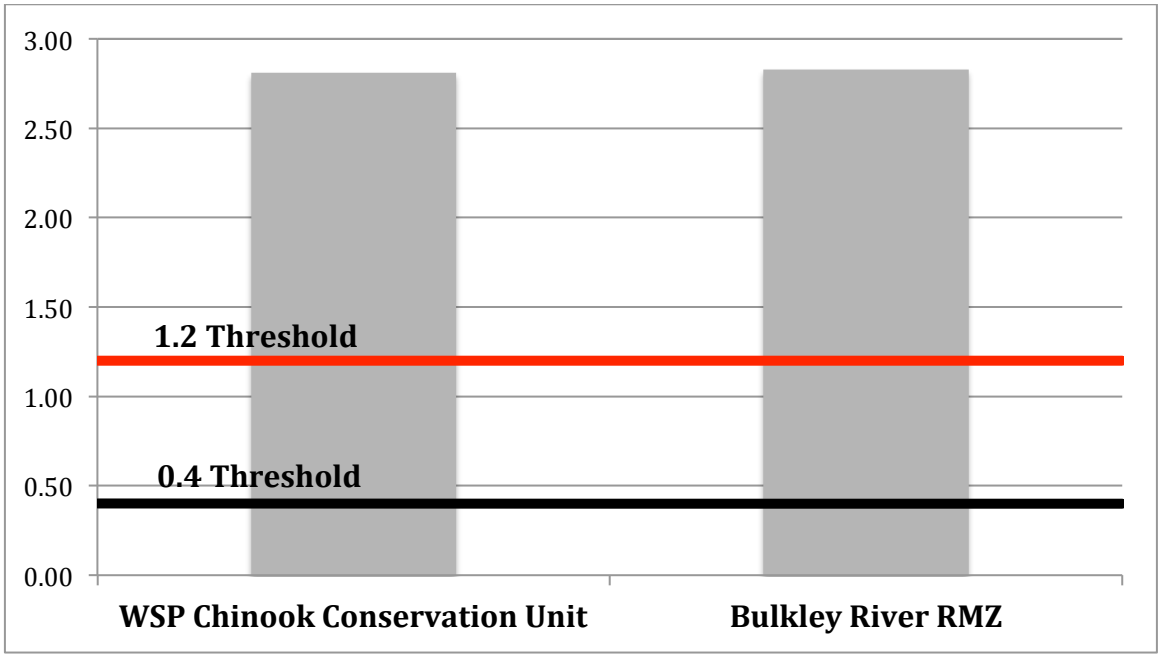


Figure 4.4.2 Road Network within the WSP Chinook CU and Morice LRMP RMZ