

WATERSHED REVIEW

PIERRE CREEK WATERSHED

Draft March 14, 2012

Ministry Contract No: CS12NRH-012

BIOPHYSICAL AND LAND-USE CHARACTERISTICS OF THE WATERSHED

Table 1. Summary Information – Watershed Characteristics – (see Figures 1 and 2)

Size (km ²)	Dominant BEC Zones	Dominant NDT	Elevation Range (m)	Surficial Geology near the Mouth (i.e. sensitive area)	Stream Density (km/km ²)	Biggest % of watershed in same elevation band ¹	Distribution of slope gradients within the watershed (% of watershed)			
							<10% slope	10 to 30% slope	30 to 60% slope	>60% slope
93	SBSmc2 ESSFmc	NDT2	728-1649	Coarse textured till	2.54	69	72	26.7	1.27	0.03

¹ The entire watershed is divided into 300 m elevation bands. The less elevation bands there are and the more area is represented by any given single elevation band, then the greater will likely be the effect of forest harvesting on increased peak flows due to the theoretical concept of “synchronization” (i.e. the melt from the cutblocks is synchronized as much of it comes from the same elevation), and the greater sensitivity it will have.

Table 2. Rating of “Sensitivity” of Watershed to Increased Peak Flow at the lower reaches

Rosgen Stream Channel Type	Rosgen Stream Channel Sensitivity Score	Sensitivity score relative to topography	Sensitivity score relative to lateral connectivity	Sensitivity score relative to vertical conductivity	Sensitivity score relative to climate	Sensitivity score relative to flow synchronization potential	Sensitivity score relative to NDT type	Sensitivity Score	Sensitivity Rating
C4- Stable onto fan	3.8	0.8	1.1	0.95	1.1	1.15	1	4.03	High

Table 3. Rating of “Sensitivity” of Watershed to Increased Production of Fine Sediment at lower reaches

Stream Channel Type	Reach Sensitivity Score	Sensitivity score relative to topography	Sensitivity score relative to lateral connectivity	Sensitivity score relative to drainage density	Sensitivity score relative to climate	Sensitivity score relative to soils	Sensitivity Score	Sensitivity Rating
Riffle-pool gravel	5	0.75	1.2	1	1.1	0.8	4.0	High

Table 4. Rating of “Sensitivity” of Watershed to a Loss In riparian Function.

Stream Channel Type	Reach Sensitivity Score	Sensitivity score relative to Aspect	Sensitivity score relative to climate	Overall watershed sensitivity to loss of riparian	Loss of Riparian Sensitivity Rating
C3-C6	4.82	0.95	1.1	5.04	High

Table 5. Peak Flow Hazard Rating, as indexed by HEDA – current scenario (i.e. no proposed harvesting considered)

Watershed area (km ²)	Total area Pine Leading (km ²)	Total area Pine Mixed (km ²)	Total area harvest (km ²) ¹	Total HEDA from Pine Beetle alone (%)	Total HEDA from logging alone (%)	Total HEDA from logging and Pine Beetle mortality (%)
93.0	21.0	13.76	3.40	15.71	2.54	18.24

¹Note: This includes openings from VRI database, and non-overlapping openings from RESULTS and FTEN databases.

Table 5 (continued)

Total area in Agriculture (km ²)	Total area in Agriculture (% of watershed)	Total area in Proposed Harvest (km ²)	Total HEDA (%)	HEDA Hazard rating Score	HEDA Hazard Rating
0.00	0.00	0.00	18.24	1.55	Low

Table 6. Fine Sediment Hazard Rating, as indexed by the Stream Crossing Density

Watershed area (km ²)	# of x-ings	#of fish bearing X-ings ¹	#of non-fish bearing X-ings	density of x-ings (#/km ²)	Density of fish bearing X-ings (#/km ²)	Density of non-fish bearing X-ings (#/km ²)	Hazard Rating Score	Hazard Rating
93.0	15	15	0	0.2	0.2	0.00	0.99	Very Low

¹Note: The information on stream crossings was provided by MoE and was generated with a GIS model, not fieldwork.

Table 7. Loss of Riparian Function Hazard Rating (See Figures 4 to 9)

Reach Number	Rosgen Stream Type	Reach Length (m)	% riparian logged (as interpreted from air photos)	Apparent stability and other comments (as viewed from air photos)
1	C4- Stable onto fan	299	0.0	Stable
2	C4- Stable onto fan	1225	0.0	Stable
3	B4- Steep banks only	2571	0.0	Stable
4	B4- Steep banks only	910	0.0	Stable
5	B4- Stable	2084	0.0	Stable
6	B4- Steep banks only	2974	0.0	Stable
7	B4- Steep banks only	2123	0.0	Stable
8	B4- Steep banks only	909	0.0	Stable
9	B4- Steep banks only	1186	0.0	Stable
10	C4- Stable	4014	10.0	Stable
11	C4- Stable	2561	0.0	Stable
Hazard Scores:			Hazard Rating Score	Hazard Rating
			0.25	Very Low

Table 8. Risk Rankings for the Different Hazards in the watershed current scenario (i.e. no proposed harvesting considered)

Watershed Hazard Types	Sensitivity Score	Sensitivity Rating	Hazard Score	Hazard Rating	Risk Score	Risk Rating
Increased Peak Flow	4.03	High	1.55	Low	6.3	Low
Increase in Production of Fine Sediment	3.96	High	0.99	Very Low	3.9	Low
Loss of Riparian function	5.04	High	0.25	Very Low	1.3	Very Low

Table 9. Summary Table for Fish Values^{1,2}

Watershed Name	Size (km ²)	FID	Species	Productivity	Diversity	Significant Species	Ranking ³	Comments
Pierre Creek	93.0	24,25	SK, RB, KO, CT, CO		x	x	VH	

¹ Note: The “Fish Values” were assessed and provided by Fisheries Biologists from the Ministry of Forest, Lands, and Natural Resource Operations. Fisheries value score (High, Very High, or Extreme) is based on the occurrence of (1) exceptional fisheries productivity, or (2) high fish species diversity (more than three species), or (3) notable significance of fish species (i.e. listed species, stock at risk, large piscivorous rainbows), or (4) a combination of 1, 2, and/or 3. If none of these characteristics occurred in the watershed it was not considered for FSW status

² Note: This table was extracted from Tables 26 and 27 provided in Appendix 1 of the methodology document.

³ Ranking System:

- 3x = Extreme (E)
- 2x = Very High (VH)
- 1x = High (H)
- 0x = No rating

Table 9. Fisheries Sensitive Watershed Score and Rating

Name	Size (km ²)	Peak Flow Sensitivity	Sed Sensitivity Rating	Riparian Sensitivity	Fish Value ¹	FSW Score PF vs Fish	FSW Score Seds vs Fish	FSW Score Rip vs Fish	Overall FSW Score	Overall FSW Rating
Pierre Creek	93.0	High	High	High	Very High	4	4	4	12	Very High

¹ Note: The fish value class is obtained from Table 9 above.

INTERPRETATIONS AND RECOMMENDATIONS FOR MANAGEMENT STRATEGIES FOR PROTECTION OF WATER RESOURCES IN THIS WATERSHED

Brief Watershed Description (Table 1 and Figures 1 and 2)

Pierre Creek watershed, which flows directly into the west side of Babine Lake, has a flat to rolling topography typical of the Nechako Plateau. Elevations in this watershed range between 728 and 1649 m. The distribution of elevations bands is dominated by the second one which extends between 1028 and 1328m and represents 69% of the watershed area. This is the “plateau” elevation band. The elevation band above this one only represents 20% of the area, while the one below it represents 10%. This watershed has a very limited amount of steep ground with 98.7% of the watershed having slopes less than 30% (Table1). The dominant biogeoclimatic zones in this watershed are the SBSmc2 and ESSFmc.

Most of the mainstream of Pierre Creek is deeply incised in the surficial tills as it flows down from the upper plateau to the lower elevations of Babine Lake. The stream flows out from the bottom of reach 3, which is confined with moderate gradient, onto a large alluvial fan at the top of reach 2 (Figures 4 and 5). At this point the alluvium spreads out to form the top of the more sensitive fan (reach 1 and 2). The surficial geology of this watershed is dominated by a mixture of fine and moderately coarse morainal tills with some coarser textured fluvial and glacio-fluvial sections, especially around reaches 1 and 2 (Figure 1 and 2).

Most of the reaches above #2 have been classified as stable with steep banks created as the channel has downcut through the deep till deposits. Because the channels are highly confined, there is not much alluvial floodplain along them. Although reaches #1 and # 2 are stable, they are much more sensitive to increased flows as they can easily migrate across the alluvial fan.

Sensitivities, Hazards and Risks in this Watershed

The overall sensitivity of the watershed to increases in peak flows has been classified as a high (Table 2). This classification is largely driven by the sensitive nature of the lower reaches, despite the generally low topography of the watershed and the deep porous soils (Table 2). The overall sensitivity to a loss in riparian function and increases in fine sediments have both been assessed as a high also (Tables 3 and 8). This is due to a combination of sensitive reach types near the lower end of the watershed, high drainage density, wetter climate and an abundance of flat over steep terrain.

None of the current risk ratings are high which is largely due to low hazard ratings for all three hazard types (Table 8).

When considering both the overall physical sensitivities in this watershed and the fisheries values, the Fisheries Sensitive Watershed (FSW) rating is assessed as Very High (Tables 9 and 10).

Suggested Management Objectives and Strategic Directions for this Watershed

- 1) Given the high sediment sensitivity for this watershed, it is recommended that the maintenance of best management erosion and sediment control practices around stream crossings be a priority, along with very careful management of flat over steep terrain (see Figures 12 and 14). I recommend that the Water Quality Effectiveness Evaluation (WQEE) tool be used and that the WQEE rating be maintained below a moderate level for all crossing in the Pierre Creek watershed (i.e. Low or Very Low). The most recent WQEE protocol can be found at the following web link:
<http://www.for.gov.bc.ca/ftp/hfp/external/!publish/frep/indicators/Indicators-WaterQuality-Protocol-2009.pdf>
- 2) Special attention in this watershed should be focused on the protection of riparian function. For all S4 streams wider than 0.5 m, maintain long term large woody debris (LWD) recruitment to the stream channel by retaining at least 90% of the riparian area in a state undisturbed by primary forest activities. Note that the riparian area refers to the management area measured from the closest streambank to a distance 15m upslope from the streambank.
- 3) Since the overall sensitivity of this watershed to increases in peak flows has been assessed as a high, I suggest that this is an important hazard to manage for this watershed, especially if it is designated as fisheries sensitive. If such as designation is given, then I suggest that the peak flow risk should be maintained at a low level, or lower. Since the risk is currently at a low level, this would mean that an additional 182 ha could be harvested before reaching a moderate risk level. The current HEDA value for Pierre Creek watershed is 18% and this would have to be maintained below 20%, if a low risk level was to be maintained.

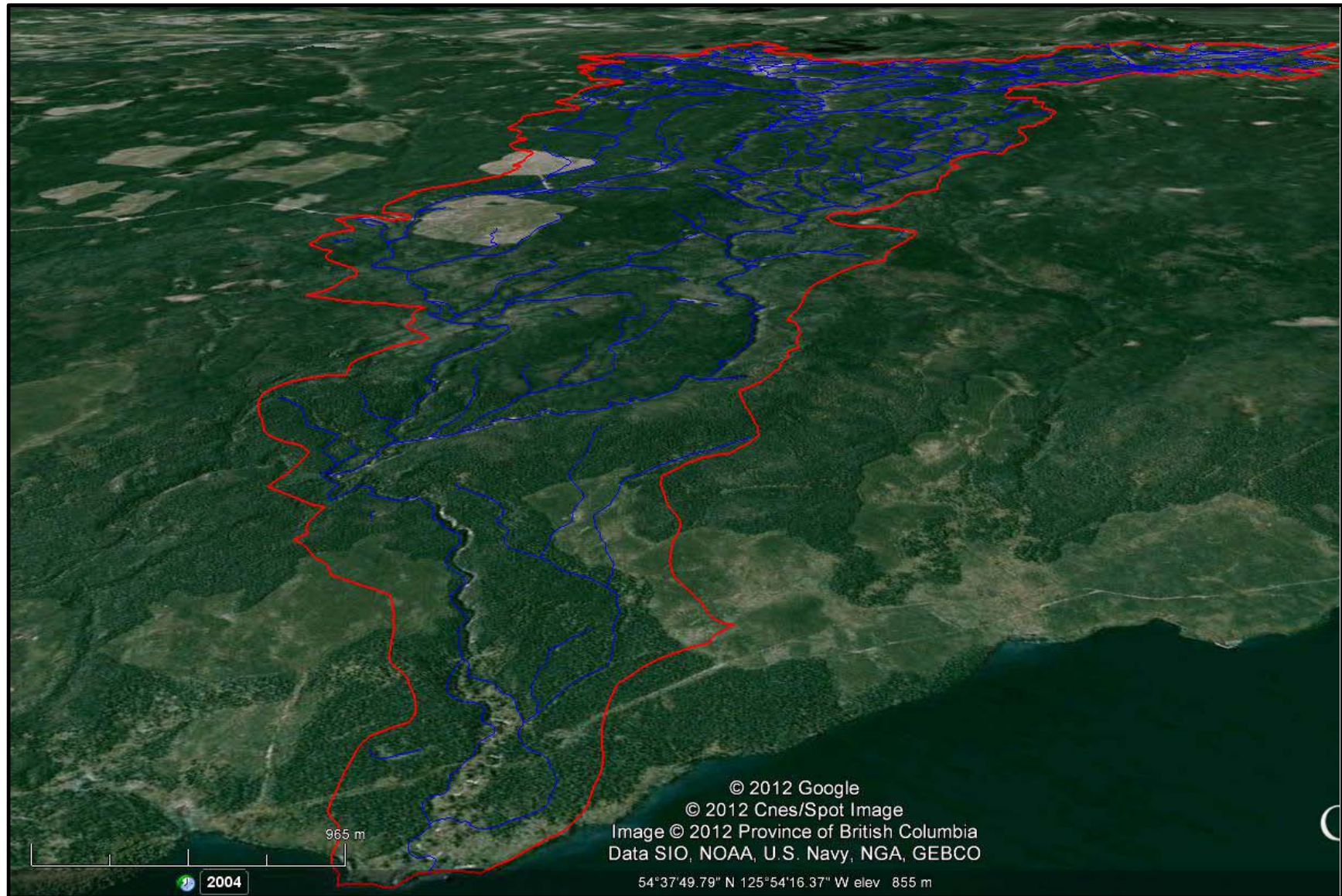


Figure 1. Google earth overview image of Pierre Creek watershed, looking upstream into the watershed.

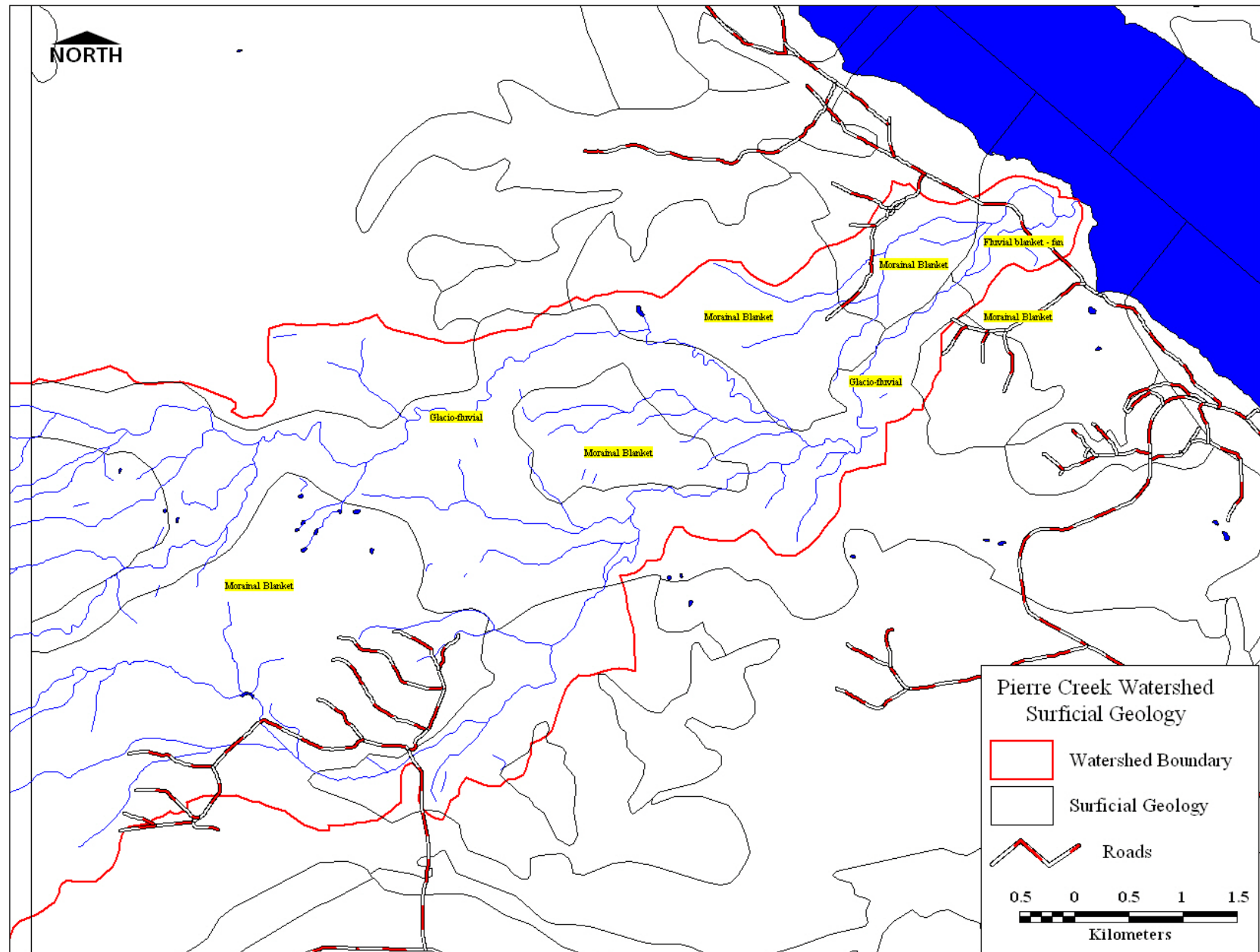


Figure 2. Distribution of surficial geology types near the mouth of Pierre Creek watershed.

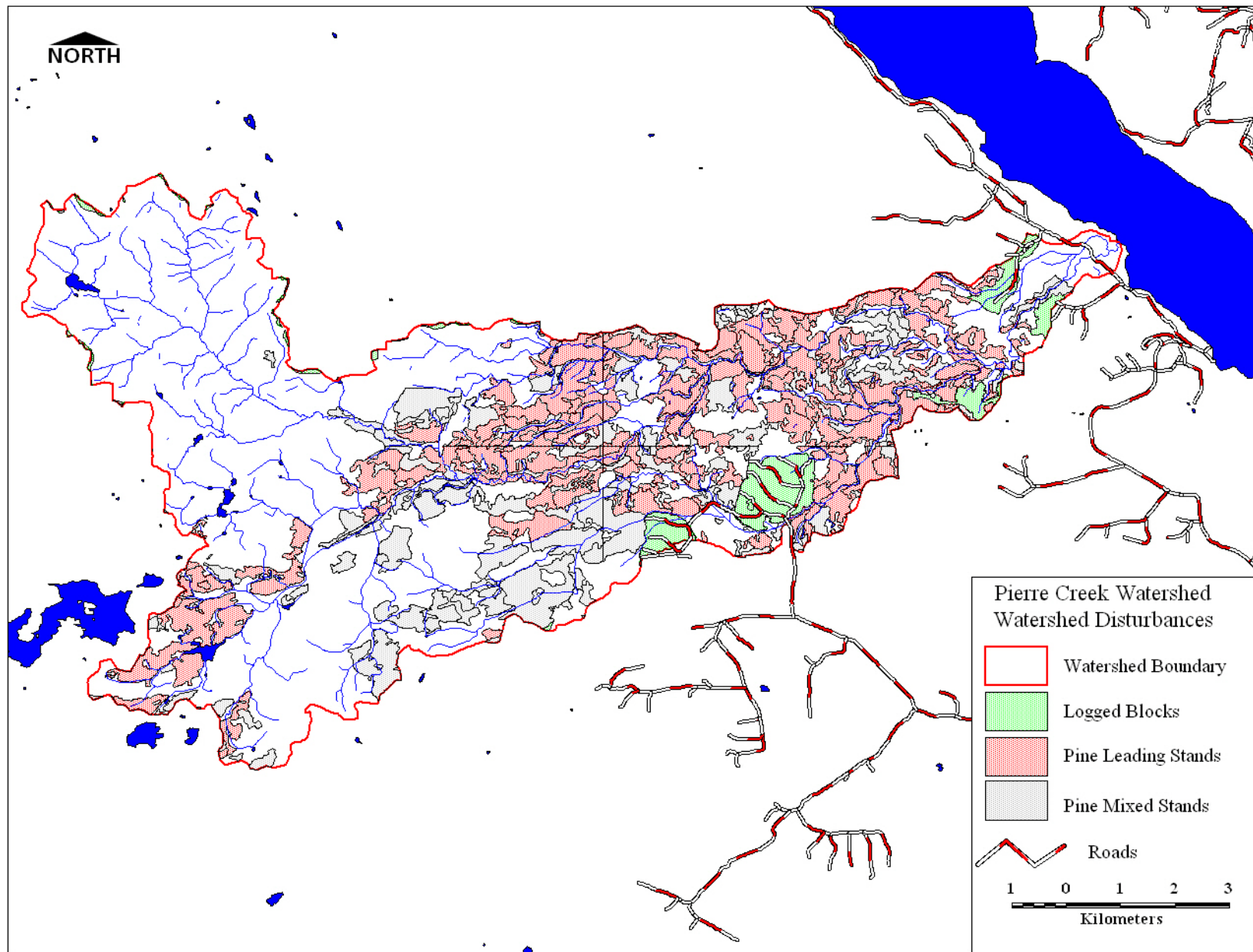


Figure 3. Land-use related and large natural disturbances in the Pierre Creek Watershed

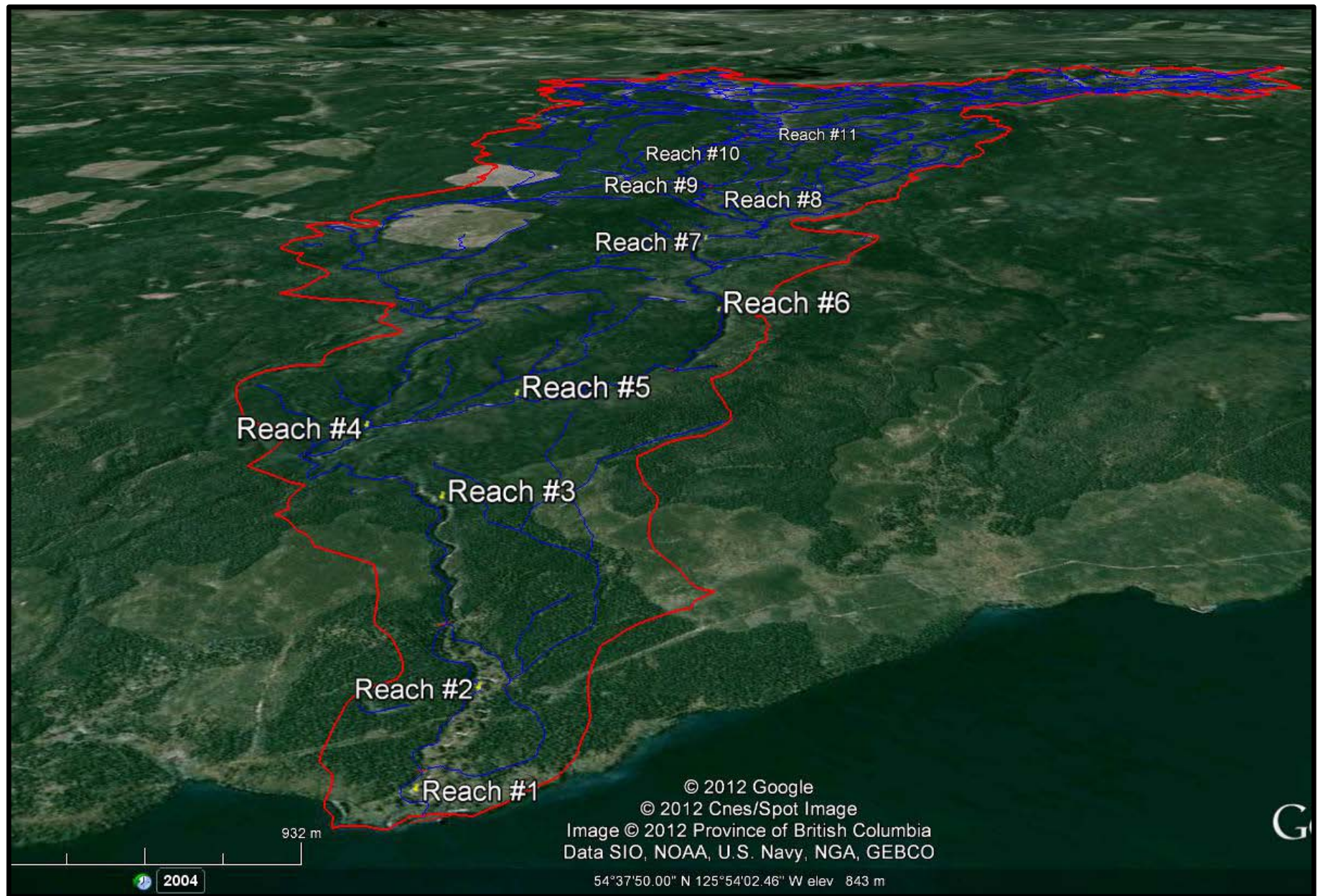


Figure 4. Identification of reaches along the mainstem of Pierre Creek watershed

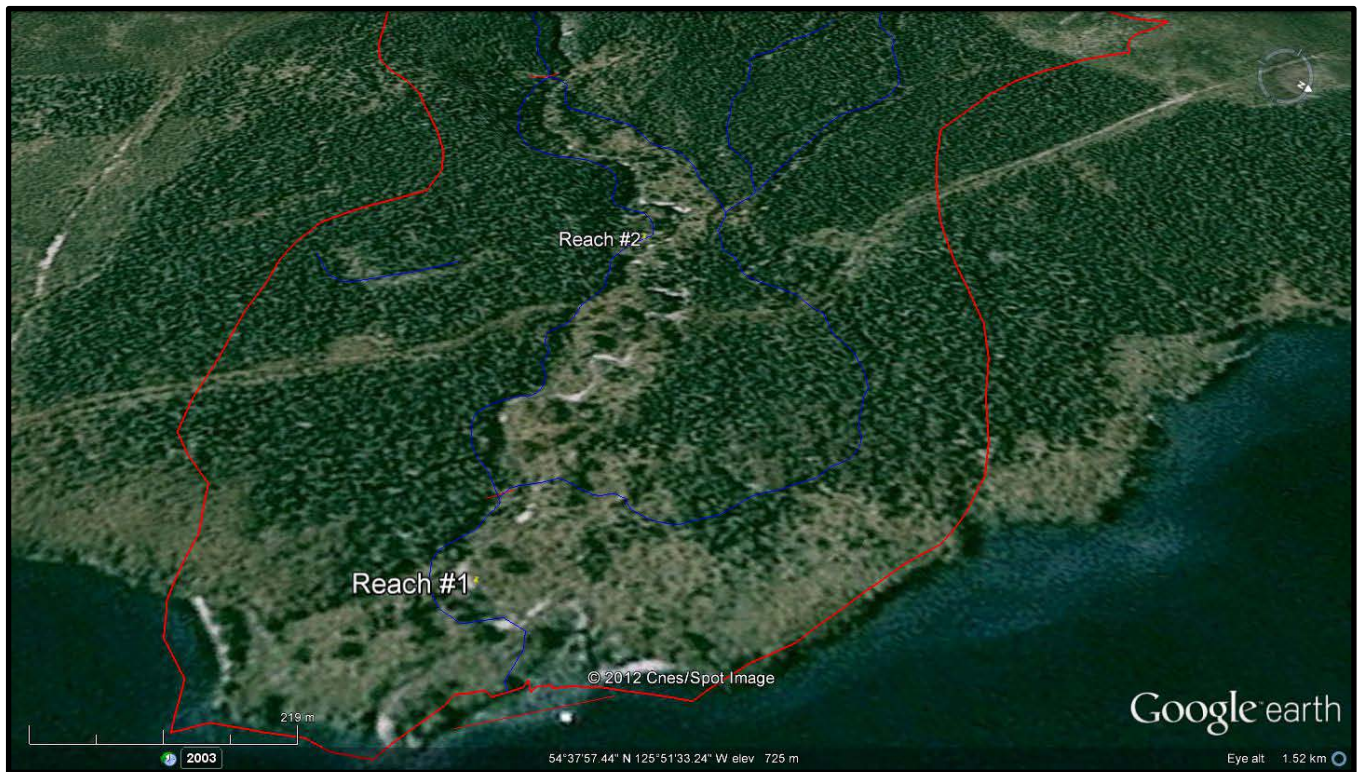


Figure 5. Google Earth image looking upstream along Reach #1 and 2 of Pierre Creek.

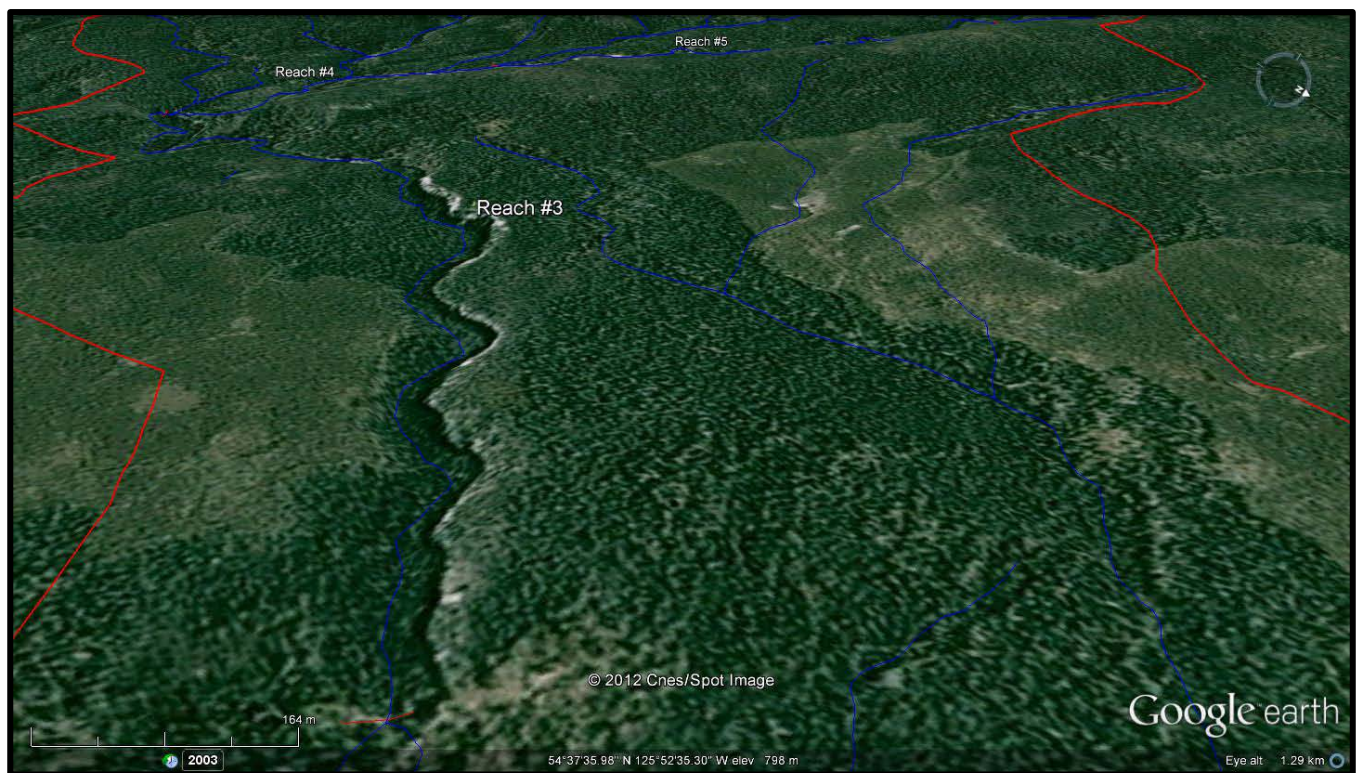


Figure 6. Google Earth image looking upstream along Reach #3 of Pierre Creek.

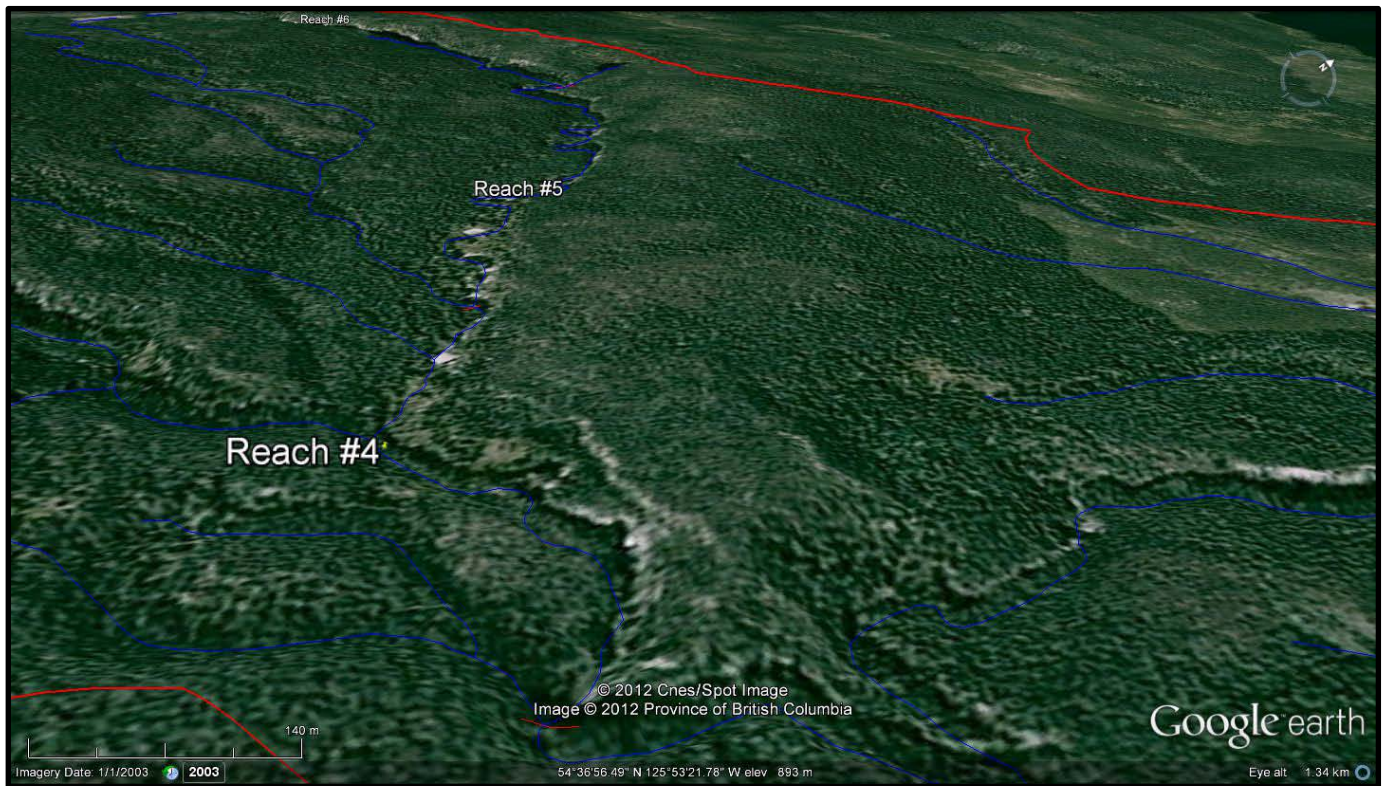


Figure 7. Google Earth image looking upstream along Reach #4 and 5 of Pierre Creek.

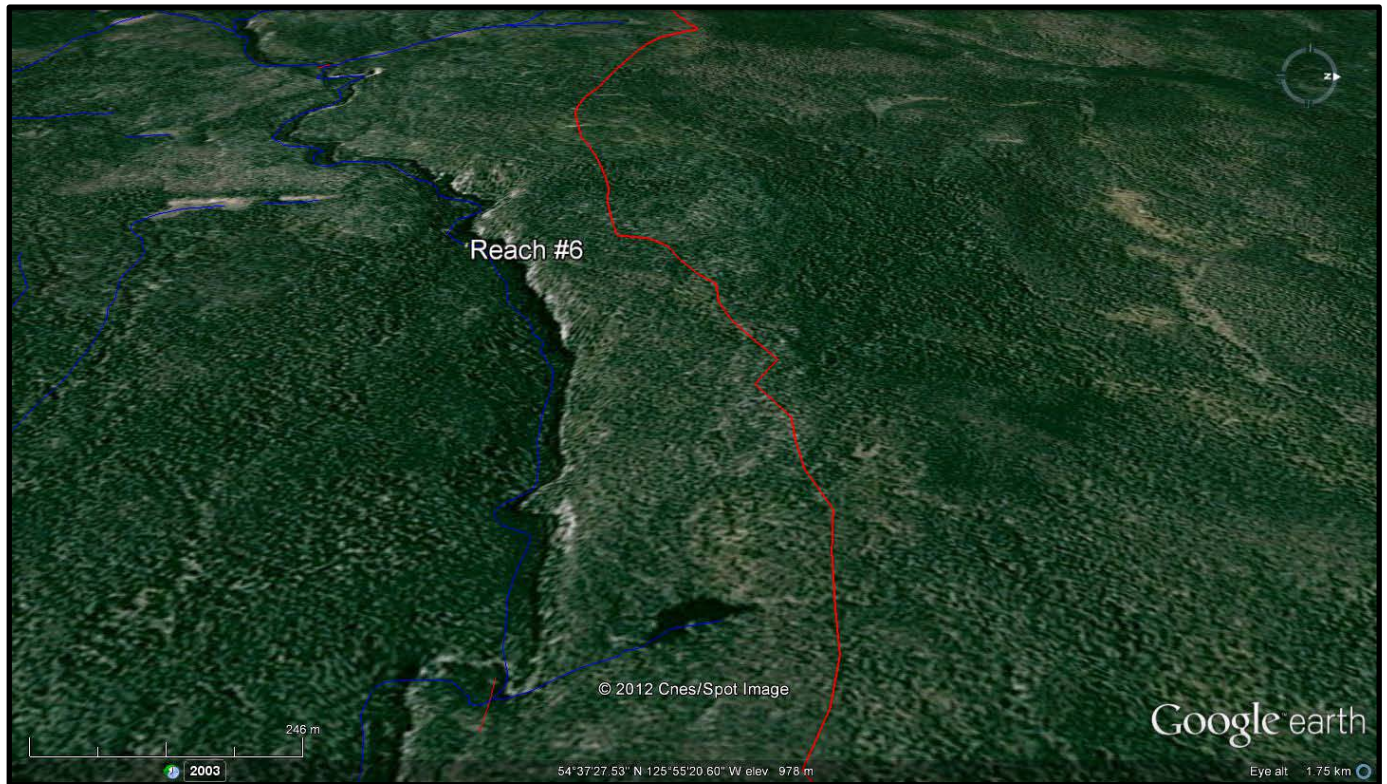


Figure 8. Google Earth image looking upstream along Reach #6 of Pierre Creek.



Figure 9. Google Earth image looking upstream along Reach #7 of Pierre Creek.

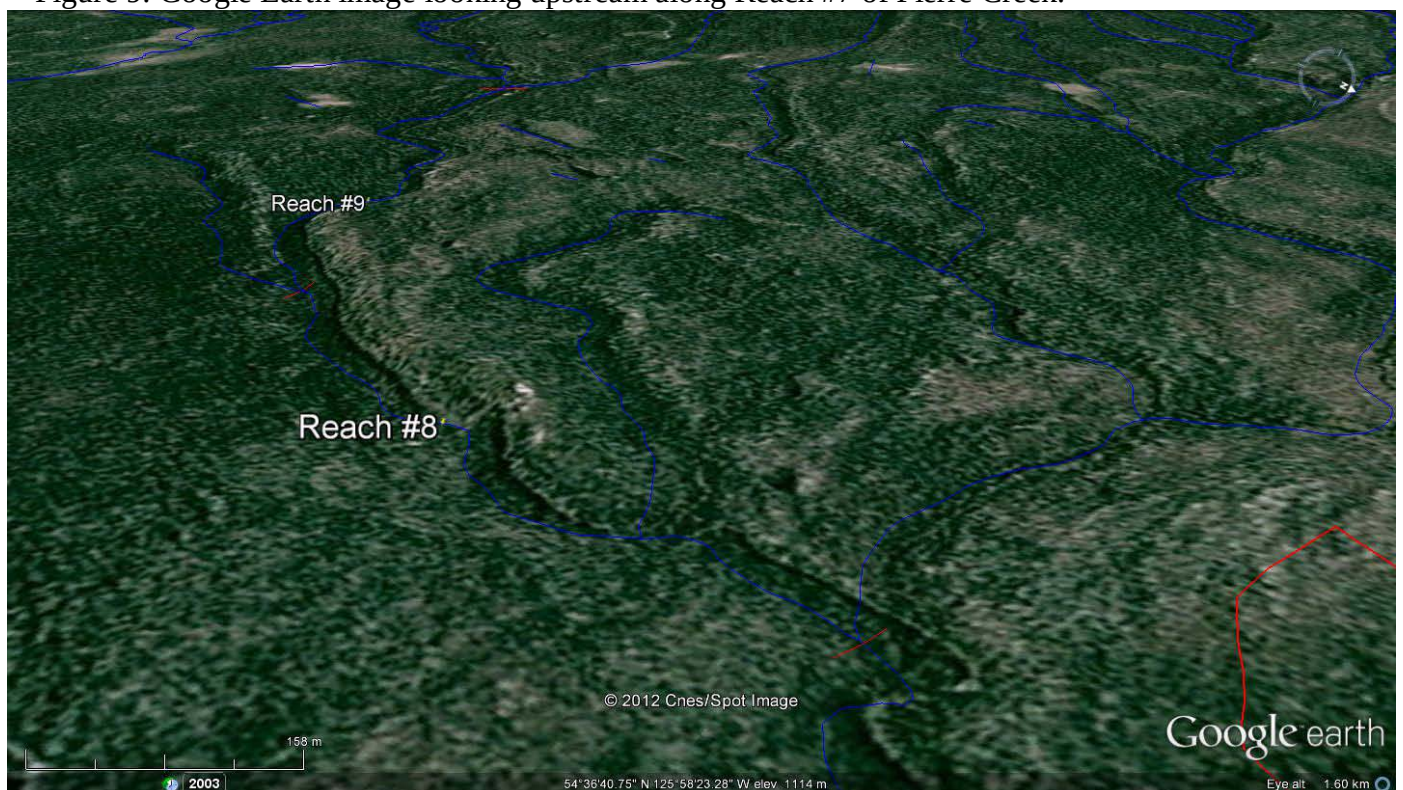


Figure 10. Google Earth image looking upstream along Reach #8 and 9 of Pierre Creek.