APPENDIX J.

Hydrology Memorandum

SWCA ENVIRONMENTAL CONSULTANTS

Water Resources Technical Memorandum

To: Idaho Panhandle National Forests and Lolo National Forest
From: Chris Garrett, SWCA Environmental Consultants
Date: November 6, 2015
Subject: Analysis of Environmental Consequences for Water Resources, Lookout Pass Ski Area Expansion Draft Environmental Impact Statement

PURPOSE OF MEMORANDUM

The purpose of this memorandum is to detail a series of technical analyses that were conducted to analyze the environmental consequences of the Lookout Pass Ski Area Expansion project with respect to water resources. Two general analyses are included: water yield and sediment yield.

WATER YIELD ANALYSIS

Water yield is known to increase with clearcutting. The primary concern with increases in water yield is the impact from higher peak flows on downstream stream channels and aquatic habitat. The Equivalent Clearcut Area (ECA) procedure dates from the 1970s and is a commonly used procedure in the Lolo National Forest (LNF) and Idaho Panhandle National Forests for estimating changes in water yield and peak flow. The ECA procedure is useful for timber harvesting because it allows estimations of hydrologic recovery over time, based on tree height and assumed canopy closure.

In the case of the proposed action for the Lookout Pass Ski Area Expansion DEIS, timber loss will result from clearing of new ski trails and construction of roads, lifts and other infrastructure. These areas would remain open for the duration of the project, preventing canopy recovery from occurring. Therefore, no hydrologic recovery (as measured in the ECA methodology) would occur.

- The estimated percent increase in water yield can be estimated using the ECA methodology. Data input needs are as follows:
- Area of the watershed: In this case, two subwatersheds are part of the water analysis area: St. Regis Headwaters (26,600 acres) and the Little North Fork South Fork Coeur d'Alene River-South Fork Coeur d'Alene River, referred to here as the Little North Fork-South Fork (32,200 acres).
- New equivalent clearcut area within each subwatershed: Because no hydrologic recovery would occur, this would be equal to the disturbance area of the project. For the St. Regis Headwaters subwatershed, this would be 53 acres. For the Little North Fork-South Fork subwatershed, this would be 76 acres.
- Runoff depth (feet): This is estimated as 2.5 feet, based on previous ECA analysis conducted by the LNF (Montana Department of Environmental Quality [MDEQ] 2008:Appendix L).

- Runoff increase factor. This is estimated as 0.4, based on previous ECA analysis conducted by the LNF (MDEQ 2008:Appendix L).
- Mean annual runoff. No stream gages exist on the two watersheds of interest, but one stream gage (U.S. Geological Survey [USGS] gage 12413131) is downstream on the South Fork Coeur d'Alene River, and another stream gage (USGS gage 12354000) is downstream on the St. Regis River. Mean annual runoff is available from these gages. The mean annual runoff for the subwatersheds of interest can be estimated based on contributing area of the subwatersheds to those existing USGS gages.
    - The annual runoff on the South Fork of the Coeur d'Alene River is 149,662 acre-feet/year (period of record 2010–2014), as measured at the stream gage. The total area of the watershed is 54,080 acres, of which 32,200 acres consists of the Little North Fork-South Fork subwatershed. This is equivalent to 59.2%, yielding an estimated mean annual runoff of 88,600 acre-feet/year for the Little North Fork-South Fork subwatershed.
    - The annual runoff on the St. Regis River is 389,045 acre-feet/year (period of record 1959–2014), as measured at the stream gage. The total area of the watershed is 193,920 acres, of which 26,600 acres consists of the St. Regis River-Headwaters subwatershed. This is equivalent to 13.7%, yielding an estimated mean annual runoff of approximately 53,400 acre-feet/year for the St. Regis Headwaters subwatershed.

The estimated increase in water yield due to the proposed action is shown in Table 1.

Table 1. Estimated Increase in Water Yield due to Proposed Action

Watershed	(A) Disturbed Area from Proposed Action (acres)	(B) ECA from Proposed Action (acres) [= A]	(C) Area of Watershed (acres)	(D) Percent of Watershed from Proposed Action (acres) [A/C]	(E) Runoff Depth (feet)	(F) Runoff Increase Factor	(G) Increase in Yield (acre-feet) [B*E*F]	(H) Watershed Mean Annual Runoff (acre-feet)	(I) Percentage Increase in Mean Annual Runoff [G/H]
St. Regis Headwaters	53	53	26,600	0.2%	2.5	0.4	53	88,600	0.06%
Little North Fork South Fork Coeur d'Alene River-South Fork Coeur d'Alene River	76	76	32,200	0.2%	2.5	0.4	76	53,400	0.14%
Total for water analysis area	**129**	**129**	**58,800**	**0.2%**	**2.5**	**0.4**	**129**	**142,000**	**0.09%**

SEDIMENT YIELD ANALYSIS

Sediment delivery generally increases with ground-disturbing activities in the absence of mitigation measures. Movement of sediment into surface waters has the potential to affect aquatic habitat and downstream waters. Analysis of sediment delivery from the proposed action consists of three components:

- Analysis of baseline sediment delivery from the current watershed, accomplished using the Water Erosion Prediction Project (WEPP) model and parameters that reflect existing slope vegetation coverage.
- Analysis of increased sediment delivery from post-construction disturbed slopes, also using the WEPP model. This was conducted for two separate periods: immediately after clearing before any revegetation would occur and after establishment of vegetation. The post-revegetation modeling was based on observations made on existing ski trails at the project site.
- Analysis of road crossings of perennial tributaries.

The Forest Service Disturbed WEPP interface was used for sediment yield modeling.[1] This model estimates likely runoff and sediment delivery for a given slope. The input parameters required are as follows:

- Slope geometry: Analysis was conducted for any project disturbance that would occur within 1,200 feet of any perennial tributary; the Disturbed WEPP model can analyze only slopes of 1,200 feet or shorter. The following tributaries were assessed:
    - CA1: The nearest disturbance would be from a ski trail that would be located approximately 1,200 feet due south of the tributary.
    - CA2: Three different disturbance areas were analyzed for this tributary: a ski trail that would be located approximately 950 feet west-southwest of the tributary, a ski trail that would directly cross the tributary (i.e., no vegetation buffer would exist), and a ski trail and road that would be located approximately 300 feet due south of the tributary.
    - CA3: The nearest disturbance would be from a ski trail that would be located approximately 700 feet due south of the tributary.
    - CA5: The nearest disturbance would be from a parking lot that would be located approximately 800 feet southwest of the tributary.
    - SR1: The nearest disturbance would be from a road that would be located approximately 800 feet north of the tributary.
    - SR2: The nearest disturbance would be from a ski trail that would be located approximately 600 feet northwest of the tributary. A planned road crossing of this tributary was analyzed separately.
- Climate: This analysis involved the use of climate data from the Wallace Woodland Park, Idaho, monitoring station, which is located approximately 8 miles from the project area.
- Soil texture: Soil texture of “sandy loam” was selected, based on previous investigations (U.S. Forest Service 2002).

[1] http://forest.moscowfsl.wsu.edu/cgi-bin/fswepp/wd/weppdist.pl

- Vegetation treatment: The user is able to select from eight pre-defined vegetation types. For the pre-development sediment delivery, “mature forest” was selected as the vegetation type. For the immediate post-development sediment delivery modeling, “skid trail” was selected as the vegetation type. For the revegetated post-development sediment delivery modeling, “poor grass” was selected as the vegetation type. “Mature forest” was always selected for the vegetation buffer.
- Percent cover and percent rock. These percentages were estimated based on the vegetation type selected but can also be customized. During the field visit, test plots were conducted for undisturbed forested areas and existing ski trails, and percent total cover (including vegetation, mulch/debris, and rock) and percent rock were estimated (see Attachments A and B).
  - For undisturbed slopes: 100% cover and 0% rock (based on field observations)
  - For disturbed slopes, prior to revegetation:
    - South-facing slopes: 28% cover (assumed) and 28% rock (based on field observations)
    - East-facing slopes: average of 17% cover (assumed) and 17% rock (based on field observations)
    - North-facing slopes: average of 37% cover (assumed) and 37% rock (based on field observations)
  - For disturbed slopes after revegetation (i.e., existing ski slopes):
    - South-facing slopes: average of 86% cover and 28% rock (both based on field observations)
    - East-facing slopes: average of 72% cover and 17% rock (both based on field observations)
    - North-facing slopes: average of 74% cover and 37% rock (both based on field observations)

The Disturbed WEPP model allows for use of an upper and lower slope with different properties. This is useful because it allows analysis of the efficacy of vegetation buffers by setting upper slopes to reflect disturbed conditions and lower slopes to reflect vegetation buffer conditions. Each profile analyzed consists of the following, from bottom of slope to top of slope:

- The toe of the lower slope begins at the nearest perennial tributary
- The top of the lower slope and toe of the upper slope is located at the edge of the vegetation buffer where disturbance begins.
- The top of the upper slope is at the farthest limit of project-related disturbance OR 1,200 feet, which is the maximum length allowed by the Disturbed WEPP model.

Table 2 shows sediment modeling results for pre-development conditions, Table 3 shows post-development conditions prior to revegetation, and Table 4 shows post-development conditions after revegetation. Results include erosion rates (tons/acre) for the upland slope and the amount of sediment leaving the profile (tons/acre) for the entire slope.

Table 2. Pre-Development Sediment Delivery

	Model							
	Tributary CA1 (ski trail to S)	**Tributary CA2 (ski trail to WSW)**	**Tributary CA2 (ski trail crossing directly)**	**Tributary CA2 (ski trail/road to S)**	**Tributary CA3 (ski trail to S)**	**Tributary CA5 (parking lot to SW)**	**Tributary SR2 (ski trail to N)**	**Tributary SR1 (road to N)**
Upper Profile								
Top slope	13.6%	36.1%	28.3%	35.1%	12.7%	51.2%	10.8%	12.9%
Bottom slope	34.1%	20.0%	28.3%	42.6%	14.1%	33.7%	10.1%	13.8%
Vegetation type	Mature forest	Mature forest	Mature forest	Mature forest	Mature forest	Mature forest	Mature forest	Mature forest
Percent rock	0	0	0	0	0	0	0	0
Percent cover	100	100	100	100	100	100	100	100
Horizontal length	1,000 feet	1,200 feet	130 feet	600 feet	1,200 feet	170 feet	1,200 feet	200 feet
Lower Profile								
Top slope	34.1%	20.0%	28.3%	42.6%	14.1%	33.7%	10.1%	29.2%
Bottom slope	38.2%	28.4%	28.3%	40.0%	88.0%	37.0%	16.5%	13.1%
Vegetation type	Mature orest	Mature forest	Mature forest	Mature forest	Mature forest	Mature forest	Mature forest	Mature forest
Percent rock	0	0	0	0	0	0	0	0
Percent cover	100	100	100	100	100	100	100	100
Horizontal length	1,200 feet	900 feet	1.5 feet (i.e., no vegetation buffer)	300 feet	700 feet	800 feet	580 feet	800 feet
Model Results								
Upland erosion rate (tons/acre)	0	0	0	0	0	0	0	0
Sediment leaving profile (tons/acre)	0	0	0	0	0	0	0	0

Table 3. Post-Development Sediment Delivery Prior to Revegetation

	Model Trail							
	Tributary CA1 (ski trail to S)	**Tributary CA2 (ski trail to WSW)**	**Tributary CA2 (ski trail crossing directly)**	**Tributary CA2 (ski trail/road to S)**	**Tributary CA3 (ski trail to S)**	**Tributary CA5 (parking lot to SW)**	**Tributary SR2 (ski trail to N)**	**Tributary SR1 (road to N**
Upper Profile								
Top slope	13.6%	36.1%	28.3%	35.1%	12.7%	51.2%	10.8%	12.9%
Bottom Slope	34.1%	20.0%	28.3%	42.6%	14.1%	33.7%	10.1%	13.8%
Vegetation type	Skid trail	Skid trail	Skid trail	Skid trail	Skid trail	Skid trail	Skid trail	Skid trail
Percent rock	37	37	37	37	37	0	28	0
Percent cover	37	37	37	37	37	0	28	0
Horizontal length	1,000 feet	1,200 feet	130 feet	600 feet	1,200 feet	170 feet	1,200 feet	200 feet
Lower Profile								
Top slope	34.1%	20.0%	28.3%	42.6%	14.1%	33.7%	10.1%	29.2%
Bottom slope	38.2%	28.4%	28.3%	40.0%	88.0%	37.0%	16.5%	13.1%
Vegetation type	Mature forest	Mature forest	Mature forest	Mature forest	Mature forest	Mature forest	Mature forest	Mature forest
Percent rock	0	0	0	0	0	0	0	0
Percent cover	100	100	100	100	100	100	100	100
Horizontal length	1,200 feet	900 feet	1.5 feet (i.e., no vegetation buffer)	300 feet	700 feet	800 feet	580 feet	800 feet
Model Results								
Upland erosion rate (tons/acre)	0.142	0.102	0.040	0.218	0.036	0.240	0.027	0.098
Sediment leaving profile (tons/acre)	0	0	0.040	0	0	0	0	0

Table 4. Post-Development Sediment Delivery After Revegetation

	Model Run							
	Tributary CA1 (ski trail to S)	**Tributary CA2 (ski trail to WSW)**	**Tributary CA2 (ski trail crossing directly)**	**Tributary CA2 (ski trail/road to S)**	**Tributary CA3 (ski trail to S)**	**Tributary CA5 (parking lot to SW)**	**Tributary SR2 (ski trail to N)**	**Tributary SR1 (road to N)**
Upper Profile								
Top slope	13.6%	36.1%	28.3%	35.1%	12.7%	51.2%	10.8%	12.9%
Bottom slope	34.1%	20.0%	28.3%	42.6%	14.1%	33.7%	10.1%	13.8%
Vegetation type	Poor grass	Poor grass	Poor grass	Poor grass	Poor grass	Skid trail	poor grass	Skid trail
Percent rock	37	37	37	37	37	0	28	0
Percent cover	74	74	74	74	74	0	86	0
Horizontal Length	1,000 feet	1,200 feet	130 feet	600 feet	1,200 feet	170 feet	1,200 feet	200 feet
Lower Profile								
Top slope	34.1%	20.0%	28.3%	42.6%	14.1%	33.7%	10.1%	29.2%
Bottom slope	38.2%	28.4%	28.3%	40.0%	88.0%	37.0%	16.5%	13.1%
Vegetation type	Mature forest	Mature forest	Mature forest	Mature forest	Mature forest	Mature forest	Mature forest	Mature forest
Percent rock	0	0	0	0	0	0	0	0
Percent cover	100	100	100	100	100	100	100	100
Horizontal Length	1,200 feet	900 feet	1.5 feet (i.e., no vegetation buffer)	300 feet	700 feet	800 feet	580 feet	800 feet
Model Results								
Upland erosion rate (tons/acre)	0	0	0.004	0	0	0.240	0	0.098
Sediment leaving profile (tons/acre)	0	0	0.004	0	0	0	0	0

Literature Cited

Hendrickson, S., K. Walker, S. Jacobson, F. Bower. 2008. Assessment of Aquatic Organism Passage at Road/Stream Crossings for the Northern Region of the USDA Forest Service. U.S. Department of Agriculture, Forest Service.

Montana Department of Environmental Quality (MDEQ). 2008. St. Regis Watershed Total Maximum Daily Loads and Framework Water Quality Restoration Assessment: Sediment and Temperature TMDLs. Helena, Montana: Montana Department of Environmental Quality.

U.S. Forest Service. 2002. ILookout Pass Ski and Recreation Area: Final Environmental Impact Statement. Idaho Panhandle National Forests, Coeur d'Alene River Ranger District. U.S. Department of Agriculture, Forest Service.

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ATTACHMENT A

Field Observations (June 23–24, 2015)

Fieldwork was conducted on June 23 and 24, 2015, to make observations about tributary drainages and current project area characteristics. The following observations were made:

- Ground cover and characteristics for existing ski slopes: A 3 x 3–foot grid was randomly placed on each slope, and cover types within each 1 x 1–foot section of the grid were noted. Of importance were percent vegetation and vegetation type (i.e., grass, shrub), percent mulch/debris, percent bare soil, and percent bare rock. Nine test plots were conducted (see Table A1).
- Ground cover and characteristics for undisturbed slopes within proposed disturbance footprint: Six test plots were conducted using the same procedure as for existing ski slopes (see Table A2).
- Stream characteristics of perennial tributaries: Streams were observed at selected access points, primarily at road crossings. Adequate measurements were taken to perform a Rosgen classification at most locations. Twelve locations were assessed (see Table A3 and Attachment B for photographs).
- Observations of culverts at existing road crossings: Where encountered in the project area, culvert observations were made in order to provide a rough estimate of failure risk as calculated using the constriction ratio. The constriction ratio is calculated by dividing culvert width by estimated bankfull width. The smaller the constriction ratio, the more the culvert is constricting the stream and the greater the risk of failure (Hendrickson et al 2008). A total of seven culverts were observed during field surveys (see Table A4).
- General observations of erosion
- Observations and estimations of woody debris within perennial streams: Twelve locations were assessed (see Table A5).

Table A1. Ground Cover and Characteristics for Existing Ski Slopes

Field ID and Location Description	Latitude	Longitude	# Sections and Percent Vegetation and Vegetation Type	# Sections and Percent Mulch/Debris	# Sections and Percent Bare Soil	# Sections and Percent Bare Rock
4. Existing south-facing slope	47.445	-115.709	5 sections (56%), grasses	0 sections (0%)	2 sections (22%)	2 sections (22%)
5. Existing south-facing slope	47.44518	-115.712	4 sections (44%), grasses and small shrubs	2 sections (22%)	1 section (11%)	2 sections (22%)
6. Existing south-facing slope	47.44603	-115.712	2 sections (22%), grasses and small shrubs	0 sections (0%)	2 sections (22%)	5 sections (56%)
7. Existing south-facing slope	47.44639	-115.714	6 sections (67%), grasses and small shrubs	2 sections (22%)	0 sections (0%)	1 section (11%)
13. Existing east-facing slope	47.45582	-115.7	2 sections (22%), grasses and small shrubs	0 sections (0%)	5 sections (56%)	2 sections (22%)

Table A1. Ground Cover and Characteristics for Existing Ski Slopes

Field ID and Location Description	Latitude	Longitude	# Sections and Percent Vegetation and Vegetation Type	# Sections and Percent Mulch/Debris	# Sections and Percent Bare Soil	# Sections and Percent Bare Rock
14. Existing east-facing slope	47.45456	-115.699	8 sections (89%), grasses	0 sections (0%)	0 sections (0%)	1 section (11%)
15. Existing north-facing slope	47.46087	-115.71	3 sections (33%), grasses	0 sections (0%)	4 sections (44%)	2 sections (22%)
16. Existing north-facing slope	47.46043	-115.71	4 sections (44%), grasses	0 sections (0%)	1 section (22%)	4 sections (44%)
18. Existing north-facing slope	47.45972	-115.711	4 sections (44%), grasses, small trees, shrubs	0 sections (0%)	1 section (11%)	4 sections (44%)

Table A2. Ground Cover for Undisturbed Slopes

Field ID and Location Description	Latitude	Longitude	# Sections and Percent Vegetation and Vegetation Type	# Sections and Percent Mulch/Debris	# Sections and Percent Bare Soil	# Sections and Percent Bare Rock
23. Undisturbed south-facing slope (proposed Lift 5)	47.44599	-115.72	9 sections (100%), forested slope with ground cover of grass	Debris and grass fully cover ground.	No bare soil observed.	No bare rock observed.
24. Undisturbed south-facing slope	47.4478	-115.721	9 sections (100%), forested slope with ground cover of grass	Debris and grass fully cover ground.	No bare soil observed.	No bare rock observed.
25. Undisturbed north-facing slope	47.44719	-115.728	9 sections (100%), forested slope with ground cover of grass	Debris and grass fully cover ground.	No bare soil observed.	No bare rock observed.
27. Undisturbed south-facing slope	47.44383	-115.736	9 sections (100%), forested slope with ground cover of grass and shrubs	Debris and grass fully cover ground.	No bare soil observed.	No bare rock observed.
28. Undisturbed north-facing slope	47.44825	-115.736	9 sections (100%), forested slope with ground cover of grass and shrubs	Debris and grass fully cover ground.	No bare soil observed.	No bare rock observed.
30. Undisturbed south-facing slope	47.44144	-115.74	9 sections (100%), forested slope with ground cover of grass and shrubs	Debris and grass fully cover ground.	No bare soil observed.	No bare rock observed.

Table A3. Stream Characteristics of Perennial Tributaries

Field ID and Location Description	Latitude	Longitude	Substrate	Width (feet)	Depth (feet)	Width to Depth Ratio	Slope (from map)	Estimated Bankfull Width (feet)	Estimated Entrenchment Ratio	Preliminary Rosgen Classification	Photograph IDs
1. Unmapped tributary to St. Regis River (Map ID SR2)	47.44433	-115.714	Boulders, bedrock	3	0.3	10	0.238	4	1.3	A1	583 (Upstream) 584 (Downstream)
9. St. Regis River near SR2 confluence	47.44352	-115.714	Cobbles	16	0.4 (average of 9 measurements)	40	0.037	50	3.1	B3	597 (Upstream) 598 (Downstream)
10. St. Regis River near old rail crossing	47.444	-115.708	Cobbles	10	0.8 (average of 2 measurements)	10	0.057	30	3.0	A3	600 (Upstream) 599 (Downstream and of Culvert)
11. Tributary adjacent to interstate (Map ID SR3) near confluence	47.44456	-115.694	Cobbles	6	0.4 (average of 3 measurements)	15	0.169	8	1.3	A3	602 (Upstream) 601 (Downstream and of Culvert)
12. St. Regis River below SR3 confluence	47.44368	-115.693	Boulders, bedrock	12	0.6 (average of 3 measurements)	20	0.055	24	2.0	A1	603 (Upstream) 604 (Downstream)
17. Unmapped spring runoff from existing ski slope (Map ID CA4)	47.45987	-115.711	Flows directly into culvert, no measurements feasible								613 (Upstream) 614 (Downstream and of Culvert)

Table A3. Stream Characteristics of Perennial Tributaries

Field ID and Location Description	Latitude	Longitude	Substrate	Width (feet)	Depth (feet)	Width to Depth Ratio	Slope (from map)	Estimated Bankfull Width (feet)	Estimated Entrenchment Ratio	Preliminary Rosgen Classification	Photograph IDs
19. Tributary on north slope (Map ID CA3, east branch)	47.45845	-115.717	Boulders, bedrock	~2 (channel not visible under vegetation)	~0.1	20	0.667	~2.5	~1.3	A1	617 (Upstream)
20. Tributary on north slope (Map ID CA3, west branch)	47.45804	-115.72	Bedrock	3	0.3 (average of 3 measurements)	10	0.571	4	1.3	A1	619 (Upstream) 618 (Downstream and of Culvert)
21. Tributary on north slope (Map ID CA2), at toe of slope	47.45584	-115.729	Boulders, bedrock	4	0.3 (average of 4 measurements)	13	0.454	5	1.3	A1	621 (Upstream) 620 (Downstream and of Culvert)
22. Tributary on north slope (Map ID CA1), at toe of slope	47.45801	-115.737	Boulders, bedrock	10	0.4 (average of 4 measurements)	25	0.268	12	1.2	A1	624 (Upstream) 623 (Downstream and of Culvert)
29. Tributary on north slope (Map ID CA1), at top of slope (four different stream braids)	47.44812	-115.74	Boulders, bedrock	0.8	0.1 (single measurement)	8	0.482	1	1.3	A1	641 (Upstream) 642 (Downstream)
31. Tributary adjacent to interstate (Map ID SR3) at headwaters	47.45296	-115.695	Boulders, bedrock	0.8	0.1 (single measurement)	5	0.095	1	1.3	A1	649 (Culvert)

Table A4. Culvert Observations

Field ID and Location Description	Latitude	Longitude	Culvert Width (feet)	Estimated Bankfull Width (feet)	Constriction Ratio
10. St. Regis River near old rail crossing	47.444	-115.708	12	30	0.4
11. Tributary adjacent to interstate (Map ID SR3) near confluence	47.44456	-115.694	3	8	0.4
17. Unmapped spring runoff from existing ski slope (Map ID CA4)	47.45987	-115.711	2	Unknown	Unknown
19. Tributary on north slope (Map ID CA3, east branch)	47.45845	-115.717	Unknown. Culvert currently obstructed with water backed up	2.5	Unknown
20. Tributary on north slope (Map ID CA3, west branch)	47.45804	-115.72	4	4	1.0
21. Tributary on north slope (Map ID CA2) at toe of slope	47.45584	-115.729	2	5	0.4
22. Tributary on north slope (Map ID CA1) at toe of slope	47.45801	-115.737	5	12	0.4

General Observations of Erosion

No systematic field measurements of erosion were undertaken during the field visit. However, general observations of erosion were noted as locations were visited. These are as follows.

- Most roads exhibited at least some evidence of erosion.
- On relatively flat or gently sloped roads, minor erosion rills were evident, primarily at low points near culverts or drainage crossings. There were at least two stream crossings without culverts, and in these cases direct disturbance of streams was observed from road traffic.
- Severe erosion was noted on steeply sloped roads. However, for the most part it appeared that sediment from these roads was directed (intentionally through the use of water bars or inadvertently from natural flow patterns) into vegetated areas. No steeply sloping roads with severe erosion were observed that directly entered surface waters.
- Moderate rilling and evidence of erosion were observed on existing ski slopes in locations where vegetation remains sparse. For the most part, any sediment coming off these slopes appeared to be captured by berms or ditches, usually alongside roads.
- No erosional features were observed on forest slopes not yet developed.

Observations of Woody Debris within Perennial Streams

Particular attention was paid to the presence of large woody debris within stream channels. These observations are not a formal survey of large woody debris but rather a general assessment of current site conditions. These observations were made from a single location on each stream (i.e., not by traversing a length of the stream).

Table A5. Large Woody Debris Observations

Field ID and Location Description	Latitude	Longitude	Number of Pieces (>3 m long, >10 cm in diameter) Partially or Fully Submerged	Number of Pieces (>3 m long, >10 cm in diameter) Not Submerged but within Bankfull Width
1. Unmapped tributary of St. Regis River (Map ID SR2)	47.44433	-115.714	0	0
9. St. Regis River near SR2 confluence	47.44352	-115.714	6 (likely debris associated with old Mullan Road crossing)	10 (likely debris associated with old Mullan Road crossing)
10. St. Regis River near old rail crossing	47.444	-115.708	4	0
11. Tributary adjacent to interstate (Map ID SR3) near confluence	47.44456	-115.694	1	5
12. St. Regis River below SR3 confluence	47.44368	-115.693	0	2
17. Unmapped spring runoff from existing ski slope (Map ID CA4)	47.45987	-115.711	0	0
19. Tributary on north slope (Map ID CA3, east branch)	47.45845	-115.717	1	1
20. Tributary on north slope (Map ID CA3, west branch)	47.45804	-115.72	4	0
21. Tributary on north slope (Map ID CA2) at toe of slope	47.45584	-115.729	1	0
22. Tributary on north slope (Map ID CA1) at toe of slope	47.45801	-115.737	4	0
29. Tributary on north slope (Map ID CA1), at top of slope (four different stream braids)	47.44812	-115.74	0	0
31. Tributary adjacent to interstate (Map ID SR3) at headwaters	47.45296	-115.695	0	0

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ATTACHMENT B

Field Photographs (June 23–24, 2015)

Photograph 583. Field point 1, tributary SR2, looking downstream.

Photograph 584. Field point 1, tributary SR2, looking upstream.

Photograph 597. Field point 9, St. Regis River near tributary SR2, looking upstream.

Photograph 598. Field point 9, St. Regis River near tributary SR2, looking downstream.

Photograph 600. Field point 10, St. Regis River at old rail crossing, looking upstream.

Photograph 599. Field point 10, St. Regis River at old rail crossing, looking downstream with culvert.

Photograph 602. Field point 11, tributary SR3, looking upstream.

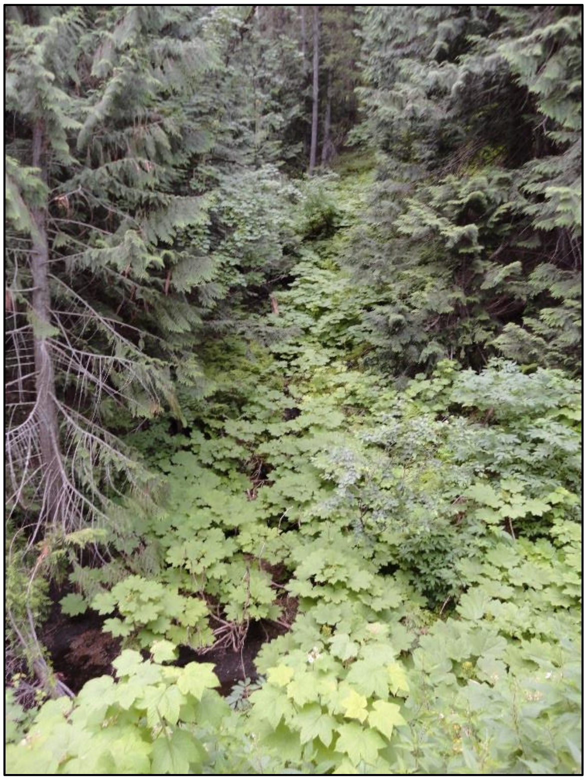
Photograph 601. Field point 11, tributary SR3 with culvert, looking downstream.

Photograph 603. Field point 12, St. Regis River below tributary SR3, looking upstream.

Photograph 604. Field point 12, St. Regis River below tributary SR3, looking downstream.

Photograph 613. Field point 17, unmapped spring runoff from existing ski slope (CA4), looking upstream at discharge point.

Photograph 614. Field point 17, unmapped spring runoff from existing ski slope (CA4), looking downstream at culvert exit.

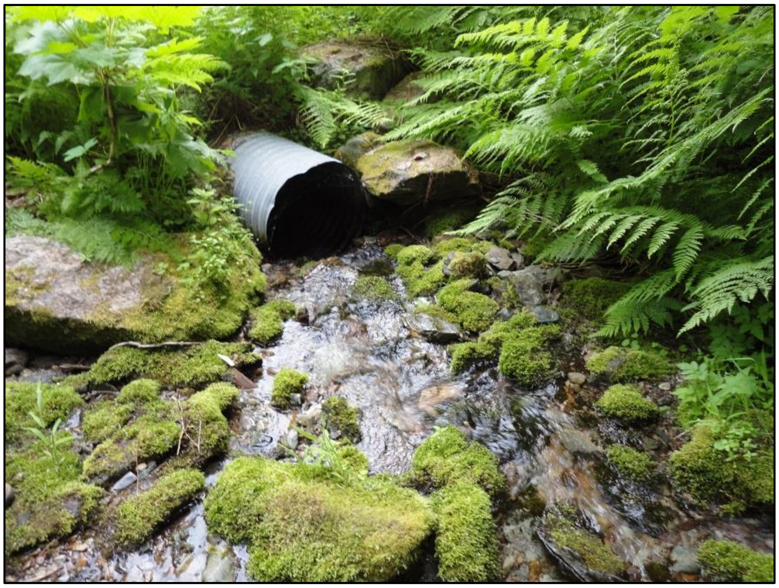


Photograph 617. Field point 19, tributary CA3 (east branch), looking upstream.

Photograph 619. Field point 20, tributary CA3 (west branch), looking upstream.

Photograph 618. Field point 20, tributary CA3 (west branch), looking downstream with culvert.

Photograph 621. Field point 21, tributary CA2 (toe of slope), looking upstream.



Photograph 620. Field point 21, tributary CA2 (toe of slope), looking downstream with culvert.

Photograph 624. Field point 22, tributary CA1 (toe of slope), looking upstream.

Photograph 623. Field point 22, tributary CA1 (toe of slope), looking downstream with culvert.

Photograph 641. Field point 29, tributary CA1 (top of slope), looking upstream.

Photograph 642. Field point 29, tributary CA1 (top of slope), looking downstream at flow along roadway.

Photograph 649. Field point 31, headwaters of tributary SR3, looking at culvert discharge (source unknown).