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Final Report

WATERSHED RESTORATION PROGRAM

MIDDLE SHUSWAP RIVER WATERSHED STREAM ASSESSMENT

Prepared for:

B.C. Ministry of Environment, Lands & Parks
Southern Interior Sub-Regional Office
201, 3547 Skaha Lake Road
Penticton, B.C.
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Prepared by:

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Project 511.03

March 28, 1996.

SUMMIT
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March 28, 1995

Reference: 511.03

Mr. Phil Epp, P.Ag.
B.C. Ministry of Environment, Lands & Parks
Southern Interior Sub-Regional Office
201, 3547 Skaha Lake Road
Penticton, B.C.
V2A 7K4

Dear Mr. Epp:

Re: Middle Shuswap River Watershed Stream Assessments

Summit Environmental Consultants Ltd. is pleased to provide you with four (4) bound and one (1) unbound copies of the **final report** for the above project. A total of 20 sites were identified as having high impacts due to forest harvest ativities. The impacts include reaches with excessive amounts of large woody debris (9 sites) landslides (5 sites), problems with bridges or culverts (4 sites) and road cutslope/fillslope erosion (2 sites).

We trust that this completes our assignment to your satisfaction. If you have any questions, please call.

Yours truly,

Summit Environmental Consultants Ltd.

Hugh Hamilton, Ph.D., P.Ag.
Senior Environmental Scientist

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1.0 INTRODUCTION

1.1 Background

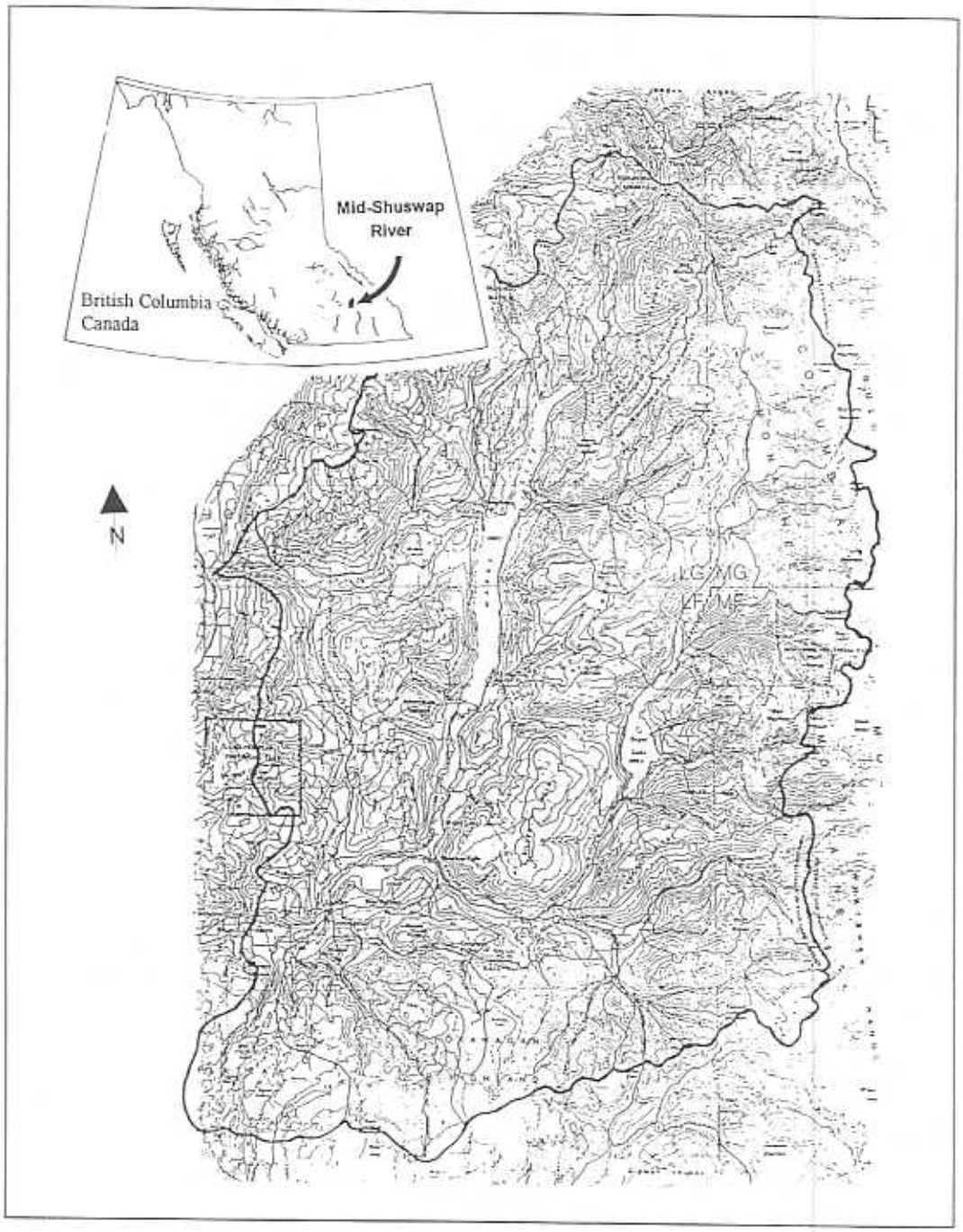
The Shuswap River is a tributary of the Thompson River, which is in turn part of the Fraser River system in British Columbia. The Fraser River is one of the world's most productive salmon rivers and maintaining fish habitat values and water quality throughout the Fraser Basin is important to ensure the sustainability of the Fraser's fisheries resources. There are five anadromous salmonid species, six resident sport fish species, and numerous non-game species distributed within the Shuswap River watershed upstream of Mara Lake. The life histories of the anadromous species have spatial and temporal variations within the watershed specific to each species. Some species spend several years in freshwater before migrating to the Pacific Ocean. Resident fish populations have life histories that can be lacustrine, fluvial, or migratory fluvial-adfluvial. These complex life histories are often represented within one species, for example rainbow trout, which adds difficulty in attempting to separately document these populations.

In 1994 the Middle Shuswap River watershed (Figure 1.1), which is defined as the watershed area upstream of the town of Enderby and downstream of the south end Mabel Lake (including Mabel Lake tributaries), was selected for inclusion in the provincial Watershed Restoration Program (WRP). The four phases of WRP are:

1. Assessment
2. Prescription
3. Implementation, and
4. Monitoring

In the Kamloops Forest Region the assessment phase has been divided into i) streams/riparian zones and ii) upslope areas. Summit Environmental Consultants Ltd. ("Summit") was retained by the B.C.

Figure 1.1 Middle Shuswap River location map.



Ministry of Environment, Lands and Parks (B.C. MELP) in October 1994 to conduct the assessment phase of the WRP for the Middle Shuswap watershed. The overall intent of the Middle Shuswap WRP assessment project is to identify and evaluate potential stream restoration opportunities to improve fish habitat and water quality within the watershed (see Appendix A - Terms of Reference). The watershed assessment phase includes fish habitat and stream channel assessments, with emphasis on those sites which are associated with forest harvest activities. The Upper Shuswap River, which is defined as the watershed upstream of the south end of Mabel Lake, has been assessed by Summit under a separate contract.

It is important to note that the definition of "Upper", "Middle" and "Lower" Shuswap River used in this report is different from that commonly used by the Department of Fisheries and Oceans (DFO), where the watershed downstream from the Mabel Lake outlet to the outlet of Mara Lake is called the Lower Shuswap.

1.2 Objectives

The specific objectives of the WRP assessment for the Middle Shuswap River are to:

1. Videotape a selected number of streams from a helicopter and provide audio commentary concerning geomorphological and stream habitat features and possible degraded sites. The streams that were inspected were pre-selected by B.C. MELP staff in Penticton and include Sowsap, Latewhos, Tsuius, Whip, Hound, Wap, Kingfisher, Cooke, and Brash Creeks;

2. Review the videotapes and map those sites which were identified as being potentially degraded. Classify the potentially degraded sites according to type, cause, source and degree of impact;

3. Conduct ground truthing surveys at each of the sites identified on the helicopter video at which there appeared to be a significant impact associated with forestry operations. Assess stream

channel morphology, photograph each site, and compile habitat information according to Appendices 2 and 3 of Watershed Restoration Technical Circular No. 8. (B.C. MELP/B.C. MOF, 1994);

4. Review existing literature, reports, historic and recent aerial photographs, and hydrotechnical data concerning each sub-watershed;

5. Compile an inventory of sediment sources to each stream;

6. Collect anecdotal information on the streams from persons and agencies familiar with the streams;

7. Priorize degraded sites, reaches and/or streams for restoration and propose initial remedial measures; and

8. Identify and recommend further assessment procedures, as required.

2.0 METHODS

2.1 Helicopter Surveys and Initial Site Classification

The helicopter surveys were conducted October 11-13, 1994. A hydrologist/geomorphologist and a fisheries biologist were present on all flights. A video camera was mounted in the nose of the helicopter, and a global positioning system (GPS) in the helicopter provided continuous location coordinates in latitude/longitude units (degrees/minutes/hundredths of minutes) which were imprinted on the video tape. All personnel in the helicopter were outfitted with a microphone and provided

verbal commentary direct to the video/audio tape regarding watershed and habitat characteristics and the location of potentially degraded sites.

When the helicopter surveys were completed, a coding system for stream impacts was drawn up for use when reviewing the video tape (Table 2.1). The video tapes were reviewed in late October 1994. To ensure consistency, a single individual reviewed all the video tape for the Middle Shuswap watershed, as well as the other three watersheds assessed in the 1994-95 WRP for the Okanagan-Shuswap Region (Mission Creek, Naramata/Robinson Creeks, Upper Shuswap River). The sites identified on the video were then classified according to the code on Table 2.1, and the information summarized into tables, with one table per stream. The locations of the sites were plotted on 1:50,000 scale NTS map sheets (see Section 3.0 - Project Deliverables).

2.2 Field Surveys

The field surveys were initiated during November 1994 and completed in the spring and early summer of 1995. The field crew consisted of hydrologist/geomorphologist and a fisheries biologist. The objective was to visit all sites which had been classified from the videotape as having a high probable impact and where the source was either forestry (i.e., F.1 - source of problem is forestry activities, high probable impact) or unknown (i.e., U.1 - uncertain source, high probable impact). This was about 10-15% of the total number of sites observed from the helicopter survey.

The steps taken in the field included:

1. The site location was verified using a hand-held GPS receiver and maps (1:50,000 NTS and larger scale forest cover maps)

Table 2.1 Coding system for stream impacts.

The coding system employed is a combination of four factors which are outlined in the order they appear in the code, as follows:

1. Potential Problem

Water quality	Q
Fish barrier	Fb
Fish spawning habitat degradation	Fs
Fish Rearing habitat degradation	Fr

2. Cause of the Problem

Streambanks (slumps, slides, bank erosion)	S
Road fill-slopes	F
Culverts or bridges	C
Debris	D
Bank Protection	P
Waterfall	W

3. Land Use Activity Contributing to the Problem

Forestry	F
Agriculture	A
Highways/Roads/Railways	Hw
Residential/recreational/industrial	R
Natural	N
Uncertain	U

4. Estimated Degree of Impact

High	1
Medium	2
Low	3
Unknown	4

Examples:

Q.F.F.2	Water quality • Road fill-slopes • Forestry • Medium Impact
Fs.D.F/N.1	Fish spawning habitat degradation • Debris • Forestry/Natural • High

2. A general reconnaisance of the reach was conducted, typically over a distance of 250 m upstream and 250 m downstream of the site identified from the video

3. Fish habitat information was compiled by completing DFO/MELP Stream Information Summary System (SIS) forms. The forms include stream gradient, width (channel and wetted), depth, bed material, cover, bank height, debris, obstructions, and observed fish species. The information collected meets and generally exceeds the information requirements in Technical Circular No. 8 (B.C. MELP/B.C. MOF, 1994)

4 Stream geomorphology was examined and documented, including bed and bank materials, stream gradient, sediment deposition areas, width of floodplain, slope of adjacent hillsides, presence/absence of exposed slopes, tree stability on banks and slopes, and potential sediment sources. The channel assessments were similar to the subsequently released Channel Assessment Procedure (B.C. MOF, 1995).

5. The amount of large woody debris (LWD) present in the streams was noted and any implications for fish passage, spawning and rearing were assessed

6. Photographs were taken of stream habitat features and potential sources of problems

7. Notes were made regarding any fish or wildlife observations

8. Estimates were made on how existing stream regimes (geomorphology, water quality, fish habitat) vary from natural (e.g., pre-harvest) conditions (including natural variation)

9. The nature and extent of forest harvest impacts were assessed, and

10. Site feasibility for restoration was assessed, including site sensitivity to restoration (i.e., level of effort needed to produce a significant result), possible methods, site access and logistics.

2.3 Information Review and Summary

The field investigations were supplemented by reviewing published information on the subject streams and by telephone or personal interviews with persons familiar with each stream. Published information included:

- NTS 1:50,000 topographic maps
- B.C. MOF forest cover maps (typical scales 1:15,000-1:30,000) and biogeoclimatic zone maps
- aerial photographs from 1992-1993 (colour, scale approx. 1:20,000) and the 1950s (black and white, scale approx. 1:15,000)
- DFO/MOELP Stream Information Summary sheets and MELP fisheries files
- MELP water licence data
- available geomorphological and soil survey reports and maps

For each stream, reaches were delineated based on changes in stream gradient and/or valley shape (e.g., U-shaped or incised) as determined from the topographic maps and field notes.

2.4 Sediment Source Inventory

The black and white aerial photographs from the 1950s were obtained for historical comparison with the 1992-93 aerial photographs. The comparisons assisted in determining locations and degrees of impacts caused by forest harvesting, and were used to locate sediment sources and to estimate rates of sediment supply, where feasible.

Erosion and sedimentation are naturally occurring processes. Even in watersheds where no forest harvest has occurred, erosion (surface, gully, bank) and natural mass movements contribute sediment to streams. These processes are considered "geologic" or natural erosion. Erosion caused by forest harvest or other land use activities is termed "accelerated" erosion. The overall contribution of individual sediment sources to the sediment load of a stream is difficult to determine, even in detailed studies. It is possible that high frequency but low magnitude sources, such as bank erosion, contribute as much or more sediment than low frequency - high magnitude sources such as landslides. However the large magnitude sources are easier to identify from aerial photographs and field reconnaisance, and are more likely to respond to mitigative measures. Thus the sediment source inventory focused on two sediment source types:

1. Large natural erosion (e.g., large exposures of soil on the outside of a river meander), and
2. Accelerated erosion (e.g., mass movements related to roads, erosion at bridges, and bank erosion near log jams).

A list of sources was compiled for each creek covered by the assessment. Where possible (e.g., land slide scars), the dimensions were determined and note was made on changes between the 1950s and 1990s.

3.0 REPORT FORMAT AND PROJECT DELIVERABLES

Each of the nine (9) streams included in this report is described in a separate report section. The tributaries of Mabel Lake are presented first, followed by the tributaries of Shuswap River between Mabel Lake and Enderby. Following the individual stream sections is a summary of the assessment work completed for the Middle Shuswap watershed, and recommendations on potential restoration sites (Section 13.0).

Laminated 1:50,000 scale NTS maps for the areas included in this report are presented in Attachment 1. The maps show the locations of reach breaks and the sites that were identified from the helicopter survey, with the final impact codes. Colour aerial photographs from the period 1989-1993 (henceforth referred to as the "1990s") are included as Attachment 2, and black-and-white aerial photographs from the 1950s are included as Attachment 3. Other information compiled for each sub-watershed, including photographs, SIS forms, SIS summaries, and video transcripts, are included in Appendices II through X.

4.0 SOWSAP CREEK

4.1 General Description

Sowsap Creek is a tributary of Mabel Lake. It discharges into the lake at the southern end, about 1 km west of the point where the Shuswap River flows into Mabel Lake. Sowsap Creek originates in the Trinity Hills just west of Mabel Lake. Styx Creek is a tributary. Additional information about Sowsap Creek is found in Table 4.1. The NTS map sheet covering the creek (82 L/7) is in Attachment 1, the colour aerial photographs from 1992-93 are included as Attachment 2, and the 1950s black and white photos are included as Attachment 3. The video transcripts, photographs, SIS survey forms, and DFO/MELP Stream Information Summary Sheet are provided in Appendix II.

No videotape is available of Sowsap Creek. Thus the following assessment was based on notes taken during the helicopter flight, a reconnaisance-level field inspection, and a review of aerial photographs.

4.2 Reach Descriptions

Reach #1 is a low gradient reach that crosses the floodplain of the Shuswap River at the south end of Mabel Lake. It is accessible to fish from Mabel Lake. Reach #2 is a steeper section that is incised into a v-shaped valley. Both the upper and lower boundaries of Reach #3, which has a mean gradient of 3%, are marked by increases in gradient. Styx Creek enters Sowsap Creek near the upper boundary of Reach #3. The channel in Reach #4 is more confined than in #3. The start of Reach #5 is marked by an increase in gradient, and the channel is deeply incised.

Reach #6 is a lower gradient section, bordered by wetlands. Reach #7 is a small lake, about 500 m in length. There is some sloping terrain along the west shore and some marshy areas along the

Table 4.1. General characteristics of Sowsap Creek.

Parameter	Information
Map sheet no.	82 L/7
Latitude & longitude of mouth	50° 27' N, 118° 45' W
Watershed area (km^2)	58.7
Stream length (km)	15
No. of reaches	n/a
Discharge (mean/highest month/lowest month)	not gauged
Biogeoclimatic zone(s)/subzone(s)[1]	ICHmw2
General flow direction	southeast
Next higher order stream or lake	Mabel Lake
Land use	forestry, recreation
Known water licences	none
Known fish species[2]	RB in Styx Cr. (a tributary)
No. of F1 and U1 sites identified	none
No. of field sites checked	2

Table 4.2 Stream reach data summary for Sowsap Creek.

Reach #	Reach length (m)	Gradient (%)	Map sheet #	Site #'s within Reach
1	550	7	82 L/7	n/a
2	1500	11	82 L/7	n/a
3	3750	3	82 L/7	n/a
4	1650	7	82 L/7	n/a
5	3050	10	82 L/7	n/a
6	2500	3	82 L/7	n/a
7	350	0	82 L/7, 82 L/10	n/a
8	750	1	82 L/10	n/a
9	250	0	82 L/10	n/a
Total	14350			n/a

[1] Biogeoclimatic zone codes are listed in Appendix XI.
[2] Fish species codes are listed in Appendix XII.

east shore. Reach #8 is a 750 m long reach that joins two small lakes (Reaches #7 and #9). It has a gradient of less than 5% with gently slopes on both side of the valley. Reach #9 is a small lake (250 m long) that forms the headwaters of Sowsap Creek.

4.3 Field Check Site Descriptions

Site #: 1
Impact Code: n/a
Reach #: 3
Date Inspected: Nov. 22/95
Coordinates: 50°27.04'N 118°50.31'W
Map sheet #: NTS 82 L/7

This site is a forest road bridge crossing near the confluence with Styx Creek. The bridge has good clearance and the banks are riprapped on both sides. The channel substrate is cobbles, gravel and sand. Channel gradient is 3.5%. The bridge is in good condition and is not having any adverse effects on Sowsap Creek.

Site #: 2
Impact Code: Q•S•N•1
Reach #: 3
Date Inspected: Nov. 22/95
Coordinates: 50°28.01'N 118°50.50'W
Map sheet #: NTS 82 L/7

This site is a natural landslide located on an outside meander of Sowsap Creek. The slide scar is approximately 15-20 m high and 23 m wide near the base. The slide was initiated by the creek undercutting the slope. The slide is visible on the 1989 aerial photographs, although it does not appear to be quite as large as the observations in 1995 indicate, suggesting that it has not stabilized.

On-going undercutting means that the exposure continues to erode. The materials on the exposure include a few boulders in a cobble-gravel-sand matrix. The material appeared to be unsorted, suggesting kame deposits. Some large woody debris is in the stream channel as a result of the erosion, although it does not appear to be influencing stream flow.

The channel has a gradient of 4% and a wetted width of 5 m at this site. On the day of the inspection the creek was 0.3 m deep and the flow velocity was about 0.4 m/s.

4.4 Sediment Source Inventory

The results of the sediment source inventory are summarized in Table 4.3. A total of 11 sources were identified from the review of aerial photographs. Eight of the sources are tributaries to the main stem of Sowsap Creek. The remaining three sources are all eroding stream banks that were sufficiently large that they could be identified on the photos (Note: Site #2 above is not one of these eroding banks). The eroding banks were all present on the 1950s photos, and none appeared noticeably larger on the photos from the 1989 photos compared to the 1950s photos.

4.5 Sowsap Creek Summary and Conclusions

Potential forest harvest effects on Sowsap Creek are related to two forest roads which run parallel to the creek from the Styx Creek confluence down to near the mouth. Based on a reconnaisance field survey and a review of aerial photographs, no sites were identified with a high level of impact due to forest activities. A natural slide and three areas of significant bank erosion were noted, but none of these are directly related to forest harvest.

Table 4.3 Sowsap Creek Sediment Source Inventory

Location symbol(1)	Coordinates		Feature	Composition(2)	Dimensions(3)		Present in(4)		Larger in
	Lat (N)	Long (W)			Width (m)	Length (m)	1950's yes/no?	1990's yes/no?	1990's yes/no?
3a	n/a	n/a	Tributary	sa, g	n/a	n/a	yes	yes	no
3b	n/a	n/a	Tributary	sa, g	n/a	n/a	yes	yes	no
3c	n/a	n/a	Tributary	sa, g	n/a	n/a	yes	yes	no
3d	n/a	n/a	Tributary	sa, g	n/a	n/a	yes	yes	no
3e	n/a	n/a	Tributary	sa, g	n/a	n/a	yes	yes	no
5a	n/a	n/a	Tributary	sa, g	n/a	n/a	yes	yes	no
5b	n/a	n/a	Eroding bank	sa, g	80	30	yes	yes	no
5c	n/a	n/a	Tributary	sa, g	n/a	n/a	yes	yes	no
5d	n/a	n/a	Eroding bank	sa, g	40	20	yes	yes	no
5e	n/a	n/a	Eroding bank	sa, g	20	20	yes	yes	no
5f	n/a	n/a	Tributary	sa, g	n/a	n/a	yes	yes	no

(1): Refer to map: 82 L/7, 82 L/10

(2): Composition is determined from aerial photographs. Locations which have been checked in the field are indicated by a subscript 'f'. Compositions in brackets indicate minor amounts of the given texture.
si = silt
sa = sand
g = gravel

(3): Width is distance measured along the stream. Length is distance measured from the toe to the zone of initiation (In the case of an eroding bank, length refers to 'bank height')

(4): Two sets of aerial photos were examined in this study: one set flown in 1950's and second set flown in 1990's

(5): n/c - No aerial photo coverage available at the time of the Sediment Source Inventory

(6): Location symbols designated with "R" are referenced by reach locations (e.g. R3a is located in Reach 3).

(7): Location symbols designated with a number are referenced by site numbers from the video transcript (e.g. 18a is located between sites #18 and #19).

5.0 LATEWHOS CREEK

5.1 General description

Latewhos Creek is a tributary of Mabel Lake which originates in the Park Range between Mabel and Sugar Lakes. Latewhos Creek discharges into Mabel Lake near the lake's south end, through Mabel Lake Provincial Park. Additional descriptive information about Latewhos Creek is found in Table 5.1. The NTS map sheet covering the creek (82 L/7) is provided in Attachment 1. The colour aerial photographs from 1992-93 are included as Attachment 2, and the 1950s black and white photos are included as Attachment 3. The video transcripts, photographs, SIS survey forms, and DFO/MELP Stream Information Summary Sheet are provided in Appendix III.

No videotape is available of Latewhos Creek. Thus the following assessment was based on notes taken during the helicopter flight, a reconnaisance-level field inspection, and a review of aerial photographs.

5.2 Reach Descriptions

Reach #1 is the low gradient section which flows across the delta at Mabel Lake. There is potential fish spawning habitat in the reach, and there are no obstructions to fish entering the creek from the lake. The start of Reach #2 is marked by a sharp increase in gradient. It is deeply incised with steep valley walls, and the gradient alone is likely a barrier to fish migration. Reach #3 is a relatively low gradient reach with some meanders. However the valley walls are still relatively steep.

Reach #4 is steeper than Reach #3, with many small tributaries. Reach #5 is the first portion of the stream located on the upper plateau. There is evidence of good fish habitat, based on low gradient,

Table 5.1. General characteristics of Latewhos Creek.

Parameter	Information
Map sheet no.	82 L/7
Latitude & longitude of mouth	50°28' N, 118°42' W
Watershed area (km^2)	55.6
Stream length (km)	18
No. of reaches	n/a
Discharge (mean/highest month/lowest month)	not gauged
Biogeoclimatic zone(s)	ICHmw2, ESSFwc2
General flow direction	southwest
Next higher order stream or lake	Mabel Lake
Land use	recreation forestry
Known water licences	none
Known fish species	no data
No. F1 and U1 sites identified	none
No. of field sites checked	1

Table 5.2 Stream reach data summary for Latewhos Creek.

Reach #	Reach length (m)	Gradient (%)	Map sheet #	Site #'s within Reach
1	1250	8	82 L/7	n/a
2	4000	18	82 L/7	n/a
3	2250	5	82 L/7	n/a
4	1250	17	82 L/7	n/a
5	900	5	82 L/7	n/a
6	950	3	82 L/10	n/a
7	2000	5	82 L/10	n/a
8	1000	17	82 L/10	n/a
Total	13600			n/a

wider valley walls, and the presence of spawning-sized gravels. Reach #6 shows some channel meandering, and the valley has widened. Reach #7 is more confined than #6, with a steeper gradient. At 17%, Reach #8 is much steeper than #7. Reach #9 marks a return to a lower gradient. Reach #10 is a small lake (150 m x 150 m) which forms the headwaters of Latewhos Creek.

5.3 Field Check Site Descriptions

Site #: 1 **Date Inspected:** Nov. 22/95

Impact Code: Q/Fs•C•F•3 **Coordinates:** 50°27.53'N 118°43.19'W

Reach #: 1 **Map sheet #:** NTS 82 L/7

This site is the crossing of the Mabel Lake Forest Service Road over Latewhos Creek. The bridge is 13 m wide and has a span height of about 3.0 m. The bridge appears to cause the creek to be constricted during high flows, but there are no signs of bank erosion or channel instability. There is bank riprap on both sides of the bridge. At the time of the inspection, the creek was 10 m wide at the bridge, with a depth of 0.5 m and a mean gradient of 6%. Flow velocity was estimated by the floating chip method to be about 0.5 m/s.

The substrate through much of Reach #1 is cobbles and boulders, although there are pockets of sand and gravel, including some spawning sized gravel. The channel splits in places, and there are areas with a natural levee. Trees on the delta include cedar, hemlock and aspen. At the upper end of the delta were a number of trees with root wads, indicating bank erosion upstream.

Other Sites

Due to snow cover on the day of the site inspection, the survey was limited to an overview assessment of Reaches #2 and #3. These reaches have steep valley walls, thus no logging has taken place within the valley. Several tributaries to Latewhos Creek through these reaches have

had logging in their watersheds. The tributaries have culverts where they cross the Latewhos Forest Service Road.

Forest harvest has taken place in the upper Latewhos Creek watershed. These areas were not inspected and no videotape is available to determine if there have been any related impacts.

5.4 Sediment Source Inventory

The results of the sediment source inventory are summarized in Table 5.3. A total of seven sources were identified from the review of aerial photographs, all being tributaries to the main stem of Latewhos Creek.

5.5 Latewhos Creek Summary and Conclusions

Latewhos Creek originates in the hills between Mabel and Sugar Lakes, and flows down towards Mabel Lake through a steep canyon. The gradient of Reaches #2 and #3 limits fish access from Reach #1, which is a short reach in the creek delta. The gradient of Reaches #2 and #3 has also meant that there has been no forest harvest along these reaches. Logging has taken place on the plateau, although the degree to which forest harvest has impacted the upper reaches of Latewhos Creek has yet to be determined.

Table 5.3 Latewhos Creek Sediment Source Inventory

Location symbol(1)	Coordinates		Feature	Composition(2)	Dimensions(3)		Present in(4)		Larger in 1990's yes/no?
	Lat (N)	Long (W)			Width (m)	Length (m)	1950's yes/no?	1990's yes/no?	
2a	n/a	n/a	Tributary	sa, g	n/a	n/a	yes	yes	no
3a	n/a	n/a	Tributary	sa, g	n/a	n/a	yes	yes	no
4a	n/a	n/a	Tributary	sa, g	n/a	n/a	yes	yes	no
4b	n/a	n/a	Tributary	sa, g	n/a	n/a	yes	yes	no
4c	n/a	n/a	Tributary	sa, g	n/a	n/a	yes	yes	no
7a	n/a	n/a	Tributary	sa, g	n/a	n/a	yes	yes	no
7b	n/a	n/a	Tributary	sa, g	n/a	n/a	yes	yes	no

(1): Refer to map: 82 L/7, 82 L/10

(2): Composition is determined from aerial photographs. Locations which have been checked in the field are indicated by a subscript 'f'. Compositions in brackets indicate minor amounts of the given texture.

si = silt
sa = sand
g = gravel

(3): Width is distance measured along the stream. Length is distance measured from the toe to the zone of initiation (In the case of an eroding bank, length refers to 'bank height')

(4): Two sets of aerial photos were examined in this study: one set flown in 1950's and second set flown in 1990's

(5): n/c - No aerial photo coverage available at the time of the Sediment Source Inventory

(6): Location symbols designated with "R" are referenced by reach locations (e.g. R3a is located in Reach 3).

(7): Location symbols designated with a number are referenced by site numbers from the video transcript (e.g. 18a is located between sites #18 and #19).

6.0 TSUIUS CREEK

6.1 General Description

Tsuius Creek is a tributary of Mabel Lake. It is known locally as Cottonwood Creek, and the forest service road is labelled as the Cottonwood Road. It enters the lake on the east side near "The Narrows" where it forms a delta. Its headwaters are located on the western flanks of Tsuius Mountain at an elevation of about 1830-1980 m (6000-6500') and some of the flow is derived from glacial meltwater. Major tributaries of Tsuius Creek include Mabel Creek, Hound Creek, and Whip Creek. The average gradient is about 6%, and there are some very steep sections as the creek descends into Mabel Lake. Fish were thought to occupy only the lowest 0.8 km (DFO/MOEP, 1990a). However large fish (30-40 cm) were observed from the air in the upper watershed.

Additional descriptive information about Tsuius Creek is found in Table 6.1. The NTS map sheets covering the creek (82 L/9, 82 L/10) are provided in Attachment 1. The colour aerial photographs from 1992-93 are included as Attachment 2, and the 1950s black and white photos are included as Attachment 3. The video transcripts, photographs, SIS survey forms, and DFO/MELP Stream Information Summary Sheet are provided in Appendix IV.

Two (2) sites were classified as having high potential impacts due to forest harvest or unknown activities (i.e., "F.1" or "U.1" - see Table 2.1) from the helicopter video, and both were inspected during November 1994.

6.2 Reach Descriptions

A total of eight (8) stream reaches were identified. Gradient and length data for the individual reaches are found in Table 6.2.

Table 6.1. General characteristics of Tsuius Creek.

Parameter	Information
Map sheet no.	82 L/9, 82 L/10
Latitude & longitude of mouth	50° 37' 48" N lat, 118° 40' 80"W long
Watershed area (km^2)	207.9
Stream length (km)	24
No. of reaches	8
Discharge (mean/highest month/lowest month)	not gauged
Biogeoclimatic zone(s)	ICHmw2, ICHwk1, ESSFwcp
General flow direction	south then west
Next higher order stream or lake	Mabel Lake
Land use	forestry, recreation
Known water licences	none
Known fish species	Coho salmon, Sockeye salmon in dominant Adams River cycle years only. Fish thought to be in lower 0.8 km only (DFO/MOEP, 1990a), although large fish were observed in the upper watershed during this study.
No. of F1 and U1 sites identified	2
No. of field sites checked	2

Table 6.2 Stream reach data summary for Tsuius Creek.

Reach no.	Reach length (km)	Gradient (%)	Map sheet no.	Site nos. within reach
1	1.3	2	82 L/10	1-2
2	2.0	8	82 L/10	3-9
3	4.8	5	82 L/10	10-18
4	2.0	9	82 L/10	19-22
5	7.0	3	82 L/10	23-33
6	2.3	3	82 L/9, 82 L/10	34
7	2.0	1	82 L/9	35
8	2.5	16	82 L/9	36-38
Total	**24.0**			**38**

Reach #1 is located on the delta of Tsuius Creek. The gradient is less than 5% and the channel has good spawning and rearing habitat. It is this reach that is utilized by spawning sockeye. The delta area has a number of private cabins, and dikes and bank protection have been installed along the creek. The upper end of the reach is delineated by a 12 m high waterfall that is a barrier to upstream fish passage.

Reach #2 has a moderate overall gradient (5-10%) with some steep sections, and steep bedrock canyon walls. The substrate is mostly bedrock with some large cobbles and a small amount of gravels and sand. Numerous deep pools and small falls are present in this reach of the stream. The active channel width is 20 - 25 m and the wetted width on the day of the field inspection was approximately 14 m. The fish habitat is generally poor in this reach.

Reach #3 is a low gradient but deeply incised portion of the stream. Several small tributaries enter the creek from both sides. Reach #4 is similar to Reach #3, with the exception that the valley is somewhat wider. Whip Creek and several other streams are tributaries to Reach #3.

Reach #5 is a low gradient, meandering reach. There are sections where the valley flat area is several hundred metres wide, although the valley walls are steep. Hound Creek plus numerous small streams are tributaries. Reach #6 is also a low gradient, meandering section, with the addition of several wetlands in the riparian zone. Reach #7 marks a further widening of the floodplain. The reach possesses excellent spawning and rearing habitat, including deep pools, spawning gravel, and overhanging vegetation. Numerous large salmonids were observed during the helicopter survey, despite the presence of significant barriers to fish passage in Reach #2.

Reach #8 is the final reach. It has a steep gradient throughout, and is characterized by natural avalanche tracks and debris fans which enter the riparian zone.

6.3 Field Check Site Descriptions

Site #: 4
Impact Code: Fb/Q•D•N•3
Reach #: 2
Date Inspected: Nov. 12/94
Coordinates: 50°37.19'N 118°39.53'W
Map sheet #: NTS 82 L/10

This site is located in the canyon section of Reach #2. The site was originally classified as Fb/Q•D•U•1 due to the presence of woody debris, but was changed to Fb/Q•D•N•3 following the site visit. The potential impact is that woody debris jams may act as a fish barrier. However the general steepness of the reach plus the presence of water falls severely limit fish access, and as a result, the presence of debris appears to have little bearing on access. Photo 1 (Appendix IV) shows the large debris jam at this site which has the potential to be transported downstream at higher water levels. However, the debris is very old (moss covered), suggesting that it is stable. The debris appears to be natural in origin and is not a concern for the WRP.

Site #: 7
Impact Code: Fs/Q•F•F•1
Reach #: 2
Date Inspected: Nov. 12/94
Coordinates: 50°37.23'N 118°38.71'W
Map sheet #: NTS 82 L/10

This site consists of a logging road (Mabel Lake Forest Service Road) fill slope which is actively eroding into the stream channel. The toe of the fill slope is on the natural slope above the stream, but rills and small debris tracks on the exposed slope indicate that sediment is likely being transported to the stream. The exposed hillslope has a 60% gradient and is mainly composed of coarse sand and fine gravel. There are some small trees growing on the slope.

A possible prescription to reduce erosion is seeding the exposed slope with hydro-seeding or geotextiles, if more surface protection is required. Given the proximity of this site to the sockeye spawning habitat in the lowest 0.8 km of the creek, this site should be a priority for action.

6.4 Sediment Source Inventory

The results of the sediment source inventory are summarized in Table 6.3. A total of 11 sources were identified from the review of aerial photographs. Six of the sources are tributaries to the main stem of Tsuius Creek.

Three of the identified sources are road fillslopes (Site #7 plus two additional sites not identified by the helicopter or field surveys). None of the roads were present in the 1950s aerial photographs, indicating that these are new sources of sediment since that time. Two landslides were also identified from the aerial photos. Neither was present in the 1950s.

6.5 Tsuius Creek Summary and Conclusions

Two sites on Tsuius Creek were given impact codes based on the helicopter survey ending with F.1 or U.1 (high potential impact due to either forest harvest or unknown activities). Both sites were inspected in November 1994. Following the field inspections, only Site #7 remained with an F.1 code:

Site #7	Logging road fillslope on an incised valley section. Surface erosion likely is transporting sediment to the stream. Since downstream areas include salmon spawning habitat, steps should be taken to control erosion.

In addition to Site #7, several other sites were identified from aerial photographs as being sources of sediment (Table 6.3). These are two additional fill slopes and two landslides.

Table 6.3 Tsuius Creek Sediment Source Inventory

Location symbol(1)	Coordinates		Feature	Composition(2)	Dimensions(3)		Present in(4)		Larger in 1990's yes/no?
	Lat (N)	Long (W)			Width (m)	Length (m)	1950's yes/no?	1990's yes/no?	
7	50°37.23'	118°38.71'	Road fillslope	g, sa, si	30	50	no	yes	yes
7a	n/a	n/a	Road fillslope	g, sa, si	20	30	no	yes	yes
R3a n/a	n/a	n/a	Tributary	g, sa	n/a	n/a	yes	yes	n/a
R3b	n/a	n/a	Tributary	g, sa	n/a	n/a	yes	yes	n/a
17	50°36.98'	118°35.33'	Slide	g, sa	10	150	no	yes	yes
18	50°36.99'	118°35.05'	Slide	g, sa	40	200	n/a	yes	yes
R4a	n/a	n/a	Tributary	g, sa	n/a	n/a	yes	yes	n/a
R4b	n/a	n/a	Tributary	g, sa	n/a	n/a	yes	yes	n/a
R5a	n/a	n/a	Tributary	g, sa	n/a	n/a	yes	yes	n/a
23	50°37.56'	118°32.80'	Road fillslope	g, sa	50	70	no	yes	yes
R5b	n/a	n/a	Tributary	g, sa	n/a	n/a	yes	yes	n/a

(1): Refer to map 82 L/9, 82 L/10

(2): Composition is determined from aerial photographs. Locations which have been checked in the field are indicated by a subscript 'f'. Compositions in brackets indicate minor amounts of the given texture.

si = silt
sa = sand
g = gravel

(3): Width is distance measured along the stream. Length is distance measured from the toe to the zone of initiation (In the case of an eroding bank, length refers to 'bank height')

(4): Two sets of aerial photos were examined in this study: one set flown in 1950's and second set flown in 1990's

(5): n/c - No aerial photo coverage available at the time of the Sediment Source Inventory

(6): Location symbols designated with "R" are referenced by reach locations (e.g. R3a is located in Reach 3).

(7): Location symbols designated with a number are referenced by site numbers from the video transcript (e.g. 18a is located between sites #18 and #19).

Two tributaries of Tsuius Creek were evaluated as part of this assessment, Hound Creek (Section 7.0) and Whip Creek (Section 8.0). Each has a number of potential sediment sources which ultimately contribute sediment to Tsuius Creek.

7.0 HOUND CREEK

7.2 General description

Hound Creek is a tributary of Tsuius Creek. It originates in the Sawtooth Range of the Monashee Mountains, west of Mabel Lake, and enters Tsuius Creek at a point approximately 14 km upstream from the mouth. Additional descriptive information about Hound Creek is found in Table 7.1. The NTS map sheets covering the creek (82 L/9, 82 L/10) are provided in Attachment 1. The colour aerial photographs from 1992-93 are included as Attachment 2, and the 1950s black and white photos are included as Attachment 3. The video transcripts, photographs, SIS survey forms, and DFO/MELP Stream Information Summary Sheet are provided in Appendix V.

Only one site was identified from the helicopter survey as an "F.1" site (Table 2.1). It was inspected in July 1995.

7.2 Reach Descriptions

There are a total of four (4) stream reaches identified from the 1:50,000 NTS map. Reach length and gradient data for the individual reaches is provided in Table 7.2.

Reach #1 has a moderately steep gradient with some areas of confining valley walls. There is some potentially good rearing habitat, and there are no barriers which would prevent accessing the creek from Tsuius Creek. Reach #2 is deeply incised with a moderate gradient. These factors contribute to the generally poor fish habitat. Reach #3 is less steep than #2 at about 5%, but still has steep valley walls. There is some meandering and several tributaries enter the stream in this reach.

Table 7.1. General characteristics of Hound Creek.

Parameter	Information
Map sheet no.	82 L/9, 82 L/10
Latitude & longitude of mouth	50° 38' 24'' N, 118° 32' 2'' W
Watershed area (km^2)	32.4
Stream length (km)	10.8
No. of reaches	4
Discharge (mean/highest month/lowest month)	not gauged
Biogeoclimatic zone(s)	ICHwk1, ESSFwc2
General flow direction	southwest
Next higher order stream or lake	Tsuius Creek
Land use	forestry
Known water licences	none
Known fish species	no data
No. of F1 and U1 sites identified	1
No. of field sites checked	1

Table 7.2 Stream reach data summary for Hound Creek.

Reach no.	Reach length (km)	Gradient (%)	Map sheet no.	Site nos. within reach
1	1.3	8	82 L/10	1
2	1.8	7	82 L/9, 82 L/10	2-5
3	4.5	5	82 L/9	6-8
4	3.3	9	82 L/9	9-10
Total	**10.8**			**10**

Reach #4 is mostly within a sub-alpine bowl that forms the headwaters of Hound Creek. The reach is characterized by a moderately steep gradient and steep valley walls.

7.3 Field Check Site Descriptions

Site #: 3 **Date Inspected:** July 5, 1995

Impact Code: Fs/Q•S•F•1 **Coordinates:** 50°38.16' N, 118°30.73'W

Reach #: 2 **Map sheet #:** 82 L/10

This site is a large landslide track which is up to 25 m wide, and extends from the creek upslope past a large cutblock on the south side of the creek (Photo 1). A large (30 m across) lobe of coarse material (up to 1.5 m diameter) is present at streamside, although it does not present a barrier to fish passage and appeared to be generally stable. Surface water was running along the base of the slide scar throughout its length on a gravel/cobble pavement. The flow from the scar flows around the lobe and enters Hound Creek on the downslope side. The road, which passes along the base of the cutblock, passes over the slide scar, and the flow presently runs over the road surface and through a partial rock drain. Mangled remnants of culvert suggest that the road has been washed out on at least two occasions (Photo 2). On the cutblock above the road, the exposed gully face shows lobes of colluvium overlying glacial till, suggesting that one or more major slides took place before the area was logged.

It appears that the landslide track pre-dates road construction and logging, but that the track has remained active or was re-activated by harvest. About five similar tracks run downslope through or adjacent to the cutblock. The track immediately to the east (Site #4) and within the cutblock contains stumps and ground cover (Photo 3), indicating that that track had apparently been stable for some time, and that logging did not re-activate the slide. The slope below the road remains forested. In contrast, the apparently active slide track has no stumps or ground cover, and there are signs of on-going slumping along the gully sides, as well as sheet and rill erosion. Thus the

slide scar remains a major source of sediment to Hound Creek, and there is a risk of a major slide re-occurring.

As described above, the track extends well above the cutblock, and it is unlikely that any steps can be taken to eliminate the risk of a large slide. It may be possible to improve road drainage by completing the installation of the rock drain (or re-installing a culvert) across the entire road, thus reducing the risk of the road washing out. The catch basin at the inlet to the drain could also be expanded to settle out more of the fines washed down from upslope. A slope stability assessment should be completed before any additional logging or road building takes place along this reach.

7.4 Sediment Source Inventory

A total of three sediment sources were identified on Hound Creek from the aerial photograph survey (Table 7.3); a single tributary, a landslide, and an eroding gully. The slide (Site#3) and the eroding gully (Site #4) have been described above.

7.5 Hound Creek Summary and Conclusions

Only one site, Site #3, was identified from the helicopter survey as an "F.1" site (high impact due to forestry operations). It was inspected in July 1995:

Site #3	Large landslide track. The slide likely pre-dates forest harvest, but harvest and/or road building appears to have re-activated it. Evidence of surface erosion and minor instability. Road over slide track apparently needs frequent repairs.

Table 7.3 Hound Creek Sediment Source Inventory

Location symbol(1)	Coordinates		Feature	Composition(2)	Dimensions(3)		Present in(4)		Larger in 1990's yes/no?
	Lat (N)	Long (W)			Width (m)	Length (m)	1950's yes/no?	1990's yes/no?	
R2a	n/a	n/a	Tributary	g, sa	n/a	n/a	yes	yes	n/a
3	50°38.17'	118°31.01'	Slide	g, sa	40	70	no	yes	yes
4	50°38.25'	118°30.59'	Eroding gully	g, sa	35	100	no	yes	yes

(1): Refer to map: 82 L/9, 82 L/10

(2): Composition is determined from aerial photographs. Locations which have been checked in the field are indicated by a subscript 'f'. Compositions in brackets indicate minor amounts of the given texture.
si = silt
sa = sand
g = gravel

(3): Width is distance measured along the stream. Length is distance measured from the toe to the zone of initiation (In the case of an eroding bank, length refers to 'bank height')

(4): Two sets of aerial photos were examined in this study: one set flown in 1950's and second set flown in 1990's

(5): n/c - No aerial photo coverage available at the time of the Sediment Source Inventory

(6): Location symbols designated with "R" are referenced by reach locations (e.g. R3a is located in Reach 3).

(7): Location symbols designated with a number are referenced by site numbers from the video transcript (e.g. 18a is located between sites #18 and #19).

Other old slide scars in the area of Site #3 suggest the potential for instability. Steps should be taken to improve road drainage at Site #3, and drainage throughout the slide area should be assessed to ensure that the road bed is properly drained.

8.0 WHIP CREEK

8.1 General description

Whip Creek is a tributary of Tsuius Creek. The headwaters are located in a marshy plateau area south of the Sawtooth Range. It flows in a general north-northeast direction until it meets Tsuius Creek about 4 km downstream of the Hound Creek confluence. Additional descriptive information about Whip Creek is found in Table 8.1. The NTS map sheets covering the creek (82 L/9, 82 L/10) are provided in Attachment 1. The colour aerial photographs from 1992-93 are included as Attachment 2, and the 1950s black and white photos are included as Attachment 3. The video transcripts, photographs, SIS survey forms, and DFO/MELP Stream Information Summary Sheet are provided in Appendix VI.

A total of three (3) sites were coded from the helicopter as "F.1" or "U.1" sites, indicating high potential impacts due to forestry or unknown activities. All of these sites were inspected in July 1995.

8.2 Reach Descriptions

A total of seven (7) stream reaches were identified. Stream gradient and reach length data for the individual reaches is provided in Table 8.2.

Reach #1 is moderately steep, which limits the likelihood of fish moving into Whip Creek from Tsuius Creek. Reach #2, in contrast, has a mean gradient of <5% and is situated within a wide valley flat.

Reach #3 has a moderate gradient with the channel being somewhat incised. The valley walls are relatively steep along both sides of the creek. The upstream end is delineated by a six metre high

Table 8.1. General characteristics of Whip Creek.

Parameter	Information
Map sheet no.	82 L/9, 82 L/10
Latitude & longitude of mouth	50° 37 ' N, 118° 33' W
Watershed area (km^2)	45.7
Stream length (km)	14.8
No. of reaches	6
Discharge (mean/highest month/lowest month)	not gauged
Biogeoclimatic zone(s)	ICHwk1, ESSFwc2
General flow direction	north and northeast
Next higher order stream or lake	Tsuius Creek
Land use	forestry
Known water licences	none
Known fish species	no data
No. of F1 and U1 sites identified	3
No. of field sites checked	3

Table 8.2 Stream reach data summary for Whip Creek.

Reach no.	Reach length (km)	Gradient (%)	Map sheet no.	Site nos. within reach
1	1.0	17	82 L/10	1
2	4.8	4	82 L/10	2-5
3	1.3	10	82 L/9	6
4	6.5	10	82 L/9, 82 L/10	7
5	5.0	5	82 L/10	8-10
6	0.8	0	82 L/10	-
7	0.55	0	82 L/10	-
Total	**14.8**			**10**

waterfall. Reach #4 is characterized by low gradient and several wetlands in the riparian zone. There is moderate fish rearing habitat with good cover and some deep pools. Stream banks are about one metre high with a high percentage of over stream vegetation.

Reach #5 has a mean gradient of about five percent. About 15% of the channel substrate is bedrock, 60% is cobble/boulder, and 25% is sand/gravel. There are some deep pools, but habitat values in Reach #5 are generally less than those in downstream reaches. An abundance of periphyton was noted in the channel.

Reach #6 includes two small lakes (each approx. 500 m long and 200-300 m wide), joined by a short section of stream flowing through a wetland. The lakes may be suitable for fish rearing, although the high altitude may mean that the lakes freeze solid in winter. Reach #7 is the headwaters. The stream is shown as ephemeral on the 1:50,000 scale maps, and fish habitat is likely poor.

8.3 Field Check Site Descriptions

Site #: 4 **Date Inspected:** July 5, 1995

Impact Code: Fb.D.F.2 **Coordinates:** 50°36.02'N 118°31.47'W

Reach #: 2 **Map sheet #:** 82 L/10

This site consists of a small log jam near a cutblock with a buffer of less than 15 m. The site was originally coded as Fb/Q.D.U.1 from the videotape, but was changed to Fb.D.F.2 based on the field inspection. Fish passage was possible on the day of the site visit, but may be restricted during low flow. The jam is relatively stable as the banks are bedrock and there is no bank erosion taking place. The presence of the log jam has created some pool habitat. Although the buffer is small, the riparian understory is well developed and there is good shade cover and a good source of detritus.

If convenient (i.e., if another WRP project is initiated nearby), removing the main cross piece of the jam could be considered. However, it is not a high priority site.

Site #: 7
Impact Code: Q•S•F•3
Reach #: 4
Date Inspected: July 10/95
Coordinates: 50°34.857'N 118°29.056'W
Map Sheet: 82 L/9

This site was originally identified as a road crossing with a cutblock on the left, and was coded as Fb/Q.C.F.1. However, field inspection revealed that although the road comes within 10 m of the right bank of Whip Creek, it does not cross the channel. There is no evidence that a bridge has ever been constructed across the channel at this site. There has been some sloughing of the road fill materials into the creek (Photo 1), however it is thought to have a minor impact upon Whip Creek.

Site #: 8
Impact Code: Fs/Q•C•F•1
Reach #: 4
Date Inspected: July 10/95
Coordinates: 50°33.951'N 118°30.295'W
Map Sheet: 82 L/10

A relatively recent bridge crosses Whip Creek at this site to access cutblocks in the headwaters area of Whip Creek. The bridge is constructed of two old steel flatbed railway cars with wood decks which span across the channel (Photo 2). The bridge deck is in poor condition and there are several holes through the deck where sediment is being transported to the creek. There is a gap in center portion of the bridge, where the two railway cars are joined, that also permits sediment to enter the creek. There has been some erosion of the road surface that has entered the creek along the left bank. The input of fine sediments from the bridge and the adjacent road may affect downstream spawning habitat.

The bridge should be repaired to meet the standards of the *Forest Practices Code*. As well, the road should be repaired and adjacent exposed soils seeded to minimize erosion.

8.4 Sediment Source Inventory

The results of the sediment source inventory are summarized in Table 8.3. A total of three sources were identified from the review of aerial photographs, two tributaries and an eroding bank. The eroding bank is adjacent to Site #8, described above.

8.5 Whip Creek Summary and Conclusions

Three sites on Whip Creek were identified from the helicopter survey as "F.1" or "U.1" sites. Following the field inspections in July 1995, one site remained with an "F.1" coding indicating high impacts related to forest harvest activities:

Site #8	Bridge over creek is in poor condition. Gaps in the bridge surface permit sediment to be introduced into the stream. Erosion is occurring on adjacent road surfaces.

The bridge should be repaired to bring it up to the standards required by the *Forest Practices Code*.

Table 8.3 Whip Creek Sediment Source Inventory

Location symbol(1)	Coordinates		Feature	Composition(2)	Dimensions(3)		Present in(4)		Larger in 1990's yes/no?
	Lat (N)	Long (W)			Width (m)	Length (m)	1950's yes/no?	1990's yes/no?	
R2a	n/a	n/a	Tributary	g, sa	n/a	n/a	yes	yes	n/a
R2b	n/a	n/a	Tributary	g, sa	n/a	n/a	yes	yes	n/a
8	50°34.00'	118°30.24'	Eroding bank	g, sa	10	10	no	yes	yes

(1): Refer to map: 82 L/9, 82 L/10

(2): Composition is determined from aerial photographs. Locations which have been checked in the field are indicated by a subscript 'f'. Compositions in brackets indicate minor amounts of the given texture.
si = silt
sa = sand
g = gravel

(3): Width is distance measured along the stream. Length is distance measured from the toe to the zone of initiation (In the case of an eroding bank, length refers to 'bank height')

(4): Two sets of aerial photos were examined in this study: one set flown in 1950's and second set flown in 1990's

(5): n/c - No aerial photo coverage available at the time of the Sediment Source Inventory

(6): Location symbols designated with "R" are referenced by reach locations (e.g. R3a is located in Reach 3).

(7): Location symbols designated with a number are referenced by site numbers from the video transcript (e.g. 18a is located between sites #18 and #19).

9.0 WAP CREEK

9.1 General Description

The headwaters of Wap Creek are located about 12 km southeast of Three Valley Gap, B.C., in the vicinity of Mount English, Davis Peak and Joss Mountain. It initially flows generally west before turning and flowing south until it enters Mabel Lake at the lake's northern end. The middle reach includes Wap Lake (area 40 ha) and several wetland (swamp/marsh) areas. Major tributaries include Iron, Devil, Dale, Cavenaugh, Derry and Bowman Creeks. Fish species present include Sockeye, Coho, and Chinook salmon, Bull trout, Kokanee, Rocky Mountain whitefish, Rainbow trout, and sculpins (DFO/MELP, 1990b). Two water falls (Frog Falls) located about 29 km upstream of the mouth restrict the passage of salmon beyond that point. Wap Creek was heavily impacted by logging activity in the 1940s and 1950s (K. Gray, personal communication, 1994), but natural restoration processes have at least partially restored stream productivity. However the after-effects of logging (debris accumulation, erosion and channelization) still limit fish habitat and water quality (DFO/MELP, 1990b).

Additional descriptive information about Wap Creek is found in Table 9.1. The NTS map sheets covering the creek (82 L/7, 82 L/15, 82 L/16) are provided in Attachment 1. The 1992-93 colour aerial photographs are in Attachment 2 and the 1950s black and white photos are are in Attachment 3. Video transcripts, photographs, SIS survey forms, and DFO/MELP Stream Information Summary Sheet are provided in Appendix VII.

Four (4) sites were given impact codes ending in "F.1" or "U.1" (Table 2.1) from the helicopter video. All of these sites were inspected.

Table 9.1. General characteristics of Wap Creek.

Parameter	Information
Map sheet no.	82 L/7, 82 L/15, 82 L/16
Latitude & longitude of mouth	50° 44' N lat, 118° 37'W long
Watershed area (km^2)	352.2
Stream length (km)	45
No. of reaches	9
Discharge (mean/highest month/lowest month)	Not gauged
Biogeoclimatic zone(s)	ICHmw2, ICHwk1, ICHvk1, ESSFwc2
General flow direction	west then south
Next higher order stream or lake	Mabel Lake
Land use	forestry, recreation
Known water licences	1 (Three Valley Motel)
Known fish species	Coho, Sockeye*, & Chinook salmon; Bull trout, Kokanee*, Rocky Mountain whitefish, Rainbow trout, and sculpins (DFO/MELP, 1990b).
No. of F1 and U1 sites identified	4
No. of field sites checked	4

Table 9.2 Stream reach data summary for Wap Creek.

Reach no.	Reach length (km)	Gradient (%)	Map sheet no.	Site nos. within reach
1	4.3	1	82 L/7, 82 L/15	1-5
2	3.0	2	82 L/15	6-9
3	12.3	0.5	82 L/15	10-20
4	1.0	0	82 L/15	21-22 (Wap L.)
5	3.0	0.5	82 L/15	23
6	4.5	0.7	82 L/15,82 L/16	24-27
7	1.0	7	82 L/16	28-31
8	14.0	8	82 L/16	32-42
9	1.3	6	82 L/16	-
Total	**44.3**			**42**

9.2 Reach Descriptions

There are a total of nine (9) stream reaches identified from the 1:50,000 NTS maps. Information on reach length and gradient is provided in Table 9.2.

Reach #1 has a mean gradient of 1% and a maximum channel width of 25 m. The banks are variable in height, ranging from < 1 m up to 3 m. The banks are actively eroding in places. Deep pools and good cover are present in this reach creating overall excellent fish habitat in some places, limited by excessive woody debris (see Site #4 below). Several spawning salmon were seen in this reach during the site visit (November 12, 1994) as well as some salmon carcasses.

Reach #2 runs between the confluences of Cavanaugh Creek and Derry Creek. It has a slightly steeper gradient than Reach #1. Reach #3 is a low gradient (<1%) reach with a wide valley flat up to about 750 m wide, bordered by alluvial terraces. Reach #4 is Wap Lake, which has an area of 40 ha. Reach #5 is characterized by tight meanders and a marshy floodplain. Two large ponds are connected by side channels to the main stem of Wap Creek. Reach #6 is still low gradient, but the valley is more confined.

Reach #7 begins at Frog Falls which marks the upper limit of fish migration in Wap Creek. The average channel gradient is about 7%. Reach #8 is a long (14 km) reach confined in a v-shaped valley. Reach #9 is made up of two small lakes, joined by a short section of stream, that make up the headwaters of Wap Creek.

9.3 Field Check Site Descriptions

Site #: 4 **Date Inspected:** Nov. 12/94

Impact Code: Fb/Q•D•F•1 **Coordinates:** 50°44.69'N 118°34.90'W

Reach #: 1 **Map sheet #:** NTS 82 L/7

In this case, "Site" refers to the majority of Reach #1. The floodplain was logged to streamside, including islands in the stream, and burned. Cover on the floodplain is presently dominated by alder and willow with some cedar. The stream banks are vertical and composed of interbedded fluvial and lacustrine sediments, and layers of peat (Photo 1, Appendix VII). The bank stratigraphy indicates changes in the level of Mabel Lake through the post-glacial period, including periods when the area around the site was covered by wetlands.

Site impacts are largely associated with large debris piles and log jams. As well, there are remnants of an old bridge that used to cross the creek. The collapsed bridge abutments (Photo 2) are located at the downstream end of a portion of the channel with extensive amounts of LWD. At high water levels much of this debris could potentially be washed downstream and into Mabel Lake. The large amount of LWD in the channel is contributing to increased bank erosion of the left bank (Photo 3). The bank erosion continues for a distance of 200 - 300 m. There is a side channel approximately 200 m upstream from the abandoned bridge which is completely blocked at the upstream end by debris. A beaver dam was noted on a side channel 700 m upstream from the washed out bridge. Several spawning salmon and some redds were observed at this site on the inspection date. Evidence of fish consumption by bears was also present.

This reach would benefit from a program of debris removal and stabilization. Since the reach is utilized by salmon, considerable care should be taken during the planning and implementation of any restoration programs.

Site #: 35 **Date Inspected:** Nov. 12/94

Impact Code: Fs/Q•S/D•F•1 **Coordinates:** 50°52.78'N 118°26.78,W

Reach #: 8 **Map sheet #:** NTS 82 L/16

Site # 35 is an incised section of the channel just downstream from a bridge crossing. The road above the left bank was built across an exposed slope that was partly blasted into bedrock, and blasted boulders form part of the fill slope. The cut and fill slopes also contain exposures of unconsolidated material. The stream bed includes large colluvial boulders and cobbles. Photo 4 shows the fill slope above the stream. Heavy snow cover prevented a comprehensive look at the type of material entering the channel, but fine sediments trapped behind boulders at the toe of the slope indicate that some erosion is taking place. Several large trees on the slope just downstream of the exposed slope were leaning toward the channel suggesting instability. Some LWD was noticed in the channel but it appears that the majority is very old and covered with moss.

A detailed assessment of this site is recommended to assess slope and road stability. Possible remediation measures include seeding of exposed slopes and improving road drainage.

Site #: 36

Date Inspected: July 10/95

Impact Code: Fs/Fb/Q•S/D•F•1

Coordinates: 50°52.500'N 118°26.396'W

Reach #: 8

Map Sheet: 82 L/16

Wap Creek at this site is confined in a narrow valley with steep side-slopes of 70-80%. The channel of Wap Creek has a gradient of 8-10% and the channel bed is dominated by cobbles and boulders. Logging occurred along both banks of Wap Creek several decades ago. Two logging roads are located along the right bank. An old inaccessible road is located approximately 10 m from the right bank of Wap Creek. A new logging road (Wap Creek Main) has been constructed higher up on a terrace. A cutblock, logged in 1974-1979, is located above the new road.

A large debris flow has initiated from the newer forestry road, impacting the right bank of Wap Creek at this site (Photo 5). The debris flow occurred through colluvial surficial materials overlying bedrock on a steep side slope (70-80%). The failure appears to have initiated at the road fill, as there was no evidence of instability in the road bed. The debris flow traveled approximately 100 m downslope before it started to deposit a large fan of debris along the right bank and into the channel (Photo 6). The debris did not appear to impact the left bank, however a lobe of sediment and LWD has been deposited in the channel. The LWD has created some large (1 m) waterfalls which may form a barrier to fish migration. There has been some localized bank erosion and scouring of the channel bed to accommodate flows through the debris. There is potential for good rainbow trout fish habitat at this site, however fish may not be present at this site due to possible barriers downstream at sites #28 and #30. No fish were observed when the site was inspected.

Potential remedial actions include re-vegetating the slide face to prevent further surface erosion from the slope, selective stabilization or removal of LWD deposited in the channel, and improved road drainage. This site is considered to be a high priority WRP site.

Site #: 37

Date Inspected: July 10/95

Impact Code: Fs/Fb/Q•S/D•F•1

Coordinates: 50°52.295'N 118°25.899'W

Reach #: 8

Map Sheet: 82 L/16

A large slide from a glacial terrace on the right bank has impacted Wap Creek by introducing a large amount of sediment and LWD to the channel. Two forestry roads are located along the right bank. The newer forest road (Wap Creek Main) is located approximately 100 m back from the right bank on the top of the glacial terrace. An older road is located at approximately mid-slope on the glacial terrace face and is within 20 m of the right bank. There is evidence of logging along both banks at this site, and many stumps remain along the banks and in the channel.

The slide at this site is approximately 200 m wide and 50 m long. It appears that the old road cut situated mid-slope on the terrace face may have unloaded the slope and initiated the slope failure. However, logging of the terrace slope when the old road was built may have also contributed to the slope failure. The slide face has revegetated with deciduous vegetation, and appears to have stabilized. No active erosion of the slide face was observed.

A large amount of LWD and sediment has been deposited in the creek for approximately 200 m. The majority of the debris is logging related, with some natural debris. A 2-3 m high waterfall has been created by a LWD jam formed in the channel (Photo 7). Approximately 90 m^3 of sediment has been stored behind this LWD jam. There has been some localized bank erosion as flows are deflected around the debris deposited in the channel. Much of the debris at this site appears to be unstable. If the LWD jams storing sediment collapse, a large amount of sediment and LWD would be washed downstream. Large boulders were observed buried in the channel, indicating that a very large amount of sediment has been input to the channel at this site. This site would benefit from selective removal and stabilization of LWD in the channel. As well, drainage patterns along the old road should be evaluated.

9.4 Sediment Source Inventory

A total of nine sediment sources were identified from the review of aerial photographs (Table 9.3). Three of the sources are tributaries to the main stem of Wap Creek. The remaining sources include four eroding banks and two landslides. None of the eroding bank sites were present on the 1950s photos, suggesting that forest harvest since then has contributed to bank instability. One of the slides was present in the 1950s, but had grown larger by the time the aerial photographs were taken in the 1990s.

9.5 Wap Creek Summary and Conclusions

Wap Creek is a major tributary of Mabel Lake. The creek was heavily impacted by historic logging which has reportedly affected stream fish populations. Four sites were identified from the helicopter survey as "F.1" or "U.1" sites. All sites were inspected. Following the inspections, all four sites maintained a code ending in "F.1.", indicating a high level of impact due to forest harvest activities.

Site #4	"Site" actually refers to much of Reach #1. Considerable large woody debris is contributing to bank erosion and blockage of side channels.
Site #35	Erosion from adjacent road cut and fill slopes. Leaning trees suggest slope instability.
Site #36	Debris flow introduced sediment and LWD into stream. Debris still potential fish barrier. Exposed mineral soils present.
Site #37	Landslide. Now apparently stabilized. Considerable woody debris in channel which may not be stable. Debris is trapping sediment.

In addition to the above sites, the review of aerial photographs found several additional sources of sediment which were present in the 1990s but were not present in the 1950s.

Table 9.3 Wap Creek Sediment Source Inventory

Location symbol(1)	Coordinates		Feature	Composition(2)	Dimensions(3)		Present in(4)		Larger in 1990's yes/no?
	Lat (N)	Long (W)			Width (m)	Length (m)	1950's yes/no?	1990's yes/no?	
9	n/a	118°33.01'	Tributary	sa, g	n/a	n/a	yes	yes	
13	n/a	118°34.01'	Eroding bank	sa, g, si	10	5	no	yes	yes
20	n/a	118°33.99'	Tributary	sa, g	n/a	n/a	yes	yes	
26	n/a	118°29.18'	Eroding bank	si, g, sa	10	6	no	yes	yes
32	n/a	118°27.77'	Eroding bank	sa, g	10	20	no	yes	yes
34	n/a	118°27.11'	Slides	sa, g	40	70	yes	yes	yes
35	50°25.75'	118°26.80'	Eroding bank	g	200	40	no	yes	yes
36	n/a	118°26.37'	Slides	sa, g	30	70	yes	yes	yes
38	n/a	118°25.46'	Tributary	sa, g	n/a	n/a	yes	yes	n/a

(1): Refer to map: 82 L/10, 82 L/15

(2): Composition is determined from aerial photographs. Locations which have been checked in the field are indicated by a subscript 'f'. Compositions in brackets indicate minor amounts of the given texture.
si = silt
sa = sand
g = gravel

(3): Width is distance measured along the stream. Length is distance measured from the toe to the zone of initiation (In the case of an eroding bank, length refers to 'bank height')

(4): Two sets of aerial photos were examined in this study: one set flown in 1950's and second set flown in 1990's

(5): n/c - No aerial photo coverage available at the time of the Sediment Source Inventory

(6): Location symbols designated with "R" are referenced by reach locations (e.g. R3a is located in Reach 3).

(7): Location symbols designated with a number are referenced by site numbers from the video transcript (e.g. 18a is located between sites #18 and #19).

10.0 KINGFISHER CREEK

10.1 General Description

Kingfisher Creek originates in the Cariboo Plateau about 15 km east of the town of Sicamous, within Ecological Reserve 49. It flows in a general southerly direction until it joins the Shuswap River just downstream of the outlet from Mabel Lake (50° 37'N lat, 118° 45'W long) at the small community of Kingfisher. Its major tributaries include Danforth Creek and Hunters Creek. Fish species include Coho salmon and Rainbow trout, and a number of salmonid enhancement projects have been inplemented in the Kingfisher Creek watershed (DFO/MOEP, 1990c). The stream is thought to be capable of supporting higher fish densities, with Rainbow trout and coho being the target species (DFO/MOEP, 1990c). "Violent" flooding is considered a limitation (DFO/MOEP, 1990c).

Additional descriptive information about Kingfisher Creek is found in Table 10.1. The NTS map sheets covering the creek (82 L/10, 82 L/15) are provided in Attachment 1. The 1992-93 colour aerial photographs are in Attachment 2 and the 1950s black and white photos are are in Attachment 3. Video transcripts, photographs, SIS survey forms, and DFO/MELP Stream Information Summary Sheet are provided in Appendix VIII.

A total of 13 sites had codes ending in "F.1" or "U.1" (Table 2.1) on the basis of the helicopter video, and five of these were inspected during the fall of 1994. The remainder were inspected in July 1995.

10.2 Reach Descriptions

A total of eight (8) stream reaches were identified. Length and gradient data for the individual reaches are provided in Table 10.2.

Table 10.1. General characteristics of Kingfisher Creek.

Parameter	Information
Map sheet no.	82 L/10, 82 L/15
Latitude & longitude of mouth	50° 37' N lat, 118° 45'W long
Watershed area (km^2)	191.8
Stream length (km)	24
No. of reaches	8
Discharge (mean/highest month/lowest month)	not gauged
Biogeoclimatic zones & subzones	ICHmw2, ICHwk1, ICHvk1, ESSFwc2
General flow direction	south
Next higher order stream or lake	Shuswap River
Land use	suburban, agriculture, forestry
Known water licences	3 (School District 89, Kingfisher Community Club, Kingfisher SEP)
Known fish species	CO, RB (DFO/MOEP, 1990c).
No. of F1 and U1 sites identified	15
No. of field sites checked	13

Table 10.2 Stream reach data summary for Kingfisher Creek.

Reach no.	Reach length (km)	Gradient (%)	Map sheet no.	Site nos. within reach
1	1.3	2	82 L/10	1-3
2	3.3	2	82 L/10	4-8
3	4.3	1	82 L/10	9-16
4	1.3	2	82 L/10	19-21
5	4.0	2	82 L/10	22-28
6	3.0	4	82 L/10	29-32
7	8.5	11	82 L/10, 82 L/15	33-41
Total	**24.0**			**41**

Reach #1 is characterized by a wide (20 - 25 m) channel with a low gradient (2%). The floodplain is of variable width and is confined by relatively steep slopes where the river has cut down through fluvioglacial terraces. The substrate is mainly small cobbles and large gravels but has many areas with spawning sized gravel. Some deep pools, undercut banks, overhanging vegetation and side channels are present in this reach creating moderate habitat for some fish species.

Reach #2 has moderate fish spawning and rearing habitat, and some small salmon were observed at the time of the field inspection. Many deep (>1 m) pools, overhanging vegetation, and boulders are providing good cover for fish rearing. Several areas of spawning sized gravels were identified along the stream banks. The stream channel is confined by a steep bedrock slope in places.

Reach #3 has a similar gradient to reach #1 but the channel is narrower (width approx. 16 m). The substrate is generally smaller in size and has many areas with spawning size gravel. At site #13 within this reach, 10 adult salmon were observed ranging in size from 50 - 70 cm fork length. The large debris jam at this site was preventing upstream migration of these salmon. Deep pools and good cover are present in this reach creating an overall excellent fish habitat.

Reach #4 has excellent fish spawning and rearing habitat. The channel meanders within a wide floodplain, and there are many side channels and abundant off-channel habitat. There are numerous pools greater than 2 m deep to provide over-wintering habitat for resident fish. Hundreds of salmon fry (30-50 mm length) were present in the pools within the reach when the reach was inspected.

Reach #5 is similar to Reach #3, with a slightly higher proportion of cobbles in the substrate. No fish were observed in this reach, but heavy snow cover obscured much of the channel.

Reach #6 is somewhat steep than Reach #5, and the valley is more narrow. There is potentially good rearing habitat in the reach, and perhaps some spawning habitat. Reach #7 is marked by an increase in gradient. The channel is incised throughout, and there are numerous avalanche tracks and ephemeral streams entering the main channel. Reach #8 is the headwater. The downstream boundary is delineated by a small lake at the base of an avalanche track. The lake outlet is blocked by woody debris.

10.3 Field Check Site Descriptions

Site #: 3 **Date Inspected:** Nov. 14/94

Impact Code: Fb/Q•D•N/F•1 **Coordinates:** 50°37.15'N 118°44.25'W

Reach #: 1 **Map sheet #:** NTS 82 L/10

The site is located just west of the Kingfisher community landfill. The level floodplain areas are bordered by fluvioglacial terraces with relatively steep slopes. The floodplain was logged to streamside in the past, but natural regeneration has occurred. Terrace materials around the landfill are primarily coarse sands. The floodplain deposits consist of interbedded sands, gravels and cobbles. Large cobble (25 cm diameter) are present on the floodplain surface in places. Some trees along the river bank are angled toward the stream suggesting active bank erosion.

Impacts at Site #3 consist of one large debris jam and a substantial amount of LWD scattered throughout the (Photo 1, Appendix VIII) for a distance of about 400 m. Photo 2 shows the eroding left bank immediately adjacent to the floodplain. Most of the debris appears unstable. The debris piles have apparently caused scouring out of some deep pools and accumulations of gravel and sand deposits.

Selective removal and/or stabilization of woody debris could prove beneficial at this site.

Site #: 5
Impact Code: N/A
Reach #: 2

Date Inspected: July 7/95
Coordinates: 50°38.341'N 118°44.854'W
Map Sheet: 82 L/10

Kingfisher Creek at Site #5 in incised into a deep canyon and the channel is frequently confined by bedrock outcrops. A small debris jam with trees across the channel was identified from the video transcript and coded as Fb/Q•D•U•1. However, no debris jams were noted between sites #4 and #8, and the debris accumulations noted from the video transcript have presumably been washed out since the time of the helicopter survey. There are occasional pieces of woody debris along the channel banks, but these have a minor impact upon either fish habitat or Kingfisher Creek.

Site #: 6
Impact Code: N/A
Reach #: 2

Date Inspected: July 7/95
Coordinates: 50°38.341'N 118°44.854'W
Map Sheet: 82 L/10

Kingfisher Creek at this site is very similar to Site #5. A large debris jam on the left was noted on the video transcript and coded as Fb/Q•D•U•1. However, no debris jams were observed between Sites #4 and #8, and the debris accumulations noted on the video transcript have presumably been washed out.

Site #: 8
Impact Code: Q•D•N/F•3
Reach #: 2

Date Inspected: July 4/95
Coordinates: 50°38'N 118°45.02'W
Map Sheet: 82 L/10

A large amount of debris covering the channel was noted from the video transcript at this site, and the site was originally coded Fb/Q.D.U.1. However, no debris jam covering the channel was encountered during field inspection of the site. Two small debris piles were observed on the left

bank of Kingfisher Creek. LWD in the debris piles is of both forestry and natural origin. It is believed that prior to the spring freshet, these debris piles may have covered the channel. The amount of debris present at this site has little impact upon Kingfisher Creek.

Site #: 9
Impact Code: Fb/Q•C•F•3
Reach #: 3
Date Inspected: July 4/95
Coordinates: 50°39.368'N 118°45.083'W
Map Sheet: 82 L/10

Kingfisher Creek at this site is a moderate gradient (5%) meandering river within a 50 m wide floodplain. A very old bridge crossing is present at this site, however only the concrete bridge abutments remain. The abutment on the left bank is still in its original position and is stable. The abutment on the right bank has shifted so that it is oriented lengthwise into the channel. The right bridge abutment has constricted the channel by approximately 3 m, and flows have scoured a large 2 m pool in response. There is a potential for a debris jam to form at this site due to the constricted channel. A small accumulation of LWD trapped by the right bridge abutment provides proof that the potential for LWD jams at this site does exist (Photo 6). At present, Site #9 has had a minimal impact upon Kingfisher Creek and is considered to be a low priority site for restoration.

Site #: 13
Impact Code: Fb/Q•D•N/F•1
Reach #: 3
Date Inspected: Nov. 14/94
Coordinates: 50°39.90'N 118°45.09'W
Map sheet #: NTS 82 L/10

Site #13 consists of a series of log jams around an island. There is a large debris jam (Photo 3) which has completely blocked the main channel on the right bank of the stream at the downstream end of the channel. At the time of the survey, approximately 10 adult salmon were stranded in the pool at the downstream end of this debris jam. The side channel around the left side of the island

in is partly blocked by debris at the upstream end of the island. Immediately upstream from the debris jam there is more LWD in the main channel.

On the left bank the channel runs along the edge of the floodplain against the valley slope. There is a cut block on the floodplain on the right bank where a buffer strip was retained. Some tree blowdown is occurring along the buffer and along the stream bank near the lower log jam. Soil conditions in the cut block are wet, and cattails occupy some of the depressions.

This site is a candidate for WRP. The site is located downstream of an existing salmonid enhancement project on Danforth Creek and log jams restrict fish access. As well, there is relatively good access to the site through the cut block.

Site #: 19
Date Inspected: July 7/95
Impact Code: Fb/Fs/Q•D•N/F•1
Coordinates: 50°41.216'N 118°44.965'W
Reach #: 4
Map Sheet: 82 L/10

Kingfisher Creek at this site is composed of multiple channels which span across the 50-70 m wide floodplain. Riparian logging occurred along the banks of Kingfisher Creek several decades ago. Islands present in the channel range from unstable ephemeral bars to stable vegetated islands with >10 years growth of coniferous and deciduous vegetation.

Several large debris jams were observed in the channel at this site for at least 500 m upstream from site #19. Between the debris jams, the channel of Kingfisher Creek is relatively free of LWD. The debris jams appear to be stable and composed of a combination of natural and logging-related debris. There are significant accumulations of sediment upstream of some of the debris jams. One large natural debris jam was observed, originating from windfall of several old hemlock trees across the channel. None of the debris jams observed formed a barrier to fish migration at the time of the site inspection, however there is potential for barriers to be created.

Flows have scoured pools beneath the debris, creating excellent rearing habitat for fish. Numerous salmon fry were observed in side channels and small pools at this site.

Site #: 20
Date Inspected: July 7/95
Impact Code: Fb/Fs/Q•D•N/F•1
Coordinates: 50°41.216'N 118°44.965'W
Reach #: 4
Map Sheet: 82 L/10

Site #20 can be considered as part of the same site as Site #19. The entire length of channel between Sites #19 and #20 (approximately 500 m) is very similar in character, with sporadic accumulations of LWD.

Site #: 23
Date Inspected: Nov. 14/94
Impact Code: Fb/Q•D•N/F•1
Coordinates: 50°44.41'N 118°44.13'W
Reach #: 5
Map sheet #: NTS 82 L/10

Impacts at Site #23 consist of LWD in the channel. Access to this site was not possible on foot due to the heavy snow cover. The downstream limit of the cut block as seen from the bridge is shown in Photo 4. It was not possible to determine if the LWD was natural or forestry related. However, given the amount of forest harvest debris throughout the reach, it is likely that this site also has remnant woody debris from logging.

Site #: 25

Impact Code: Fb/Q•D•F•1

Reach #: 5

Date Inspected: Nov. 14/94

Coordinates: 50°42.62'N 118°45.29'W

Map sheet #: NTS 82 L/10

Site #25 was initially assigned an F•2 code from the video. It was visited in the process of trying to access Site #23. The large amount of LWD in the channel (Photo 5) that was of logging origin warranted changing the classification to F•1. These accumulations of LWD have caused large amounts of gravel and cobbles to be deposited upstream of the debris. If the debris mobilizes, a flush of sediment could be released downstream. Some of the debris is natural in origin, probably originating from the eroding banks. The cut block along the left bank has approximately 20 years of regeneration and has a buffer retained along its length.

Site #: 26

Impact Code: Fb/Fs/Q•D•F•1

Reach #: 5

Date Inspected: July 7/95

Coordinates: 50°43.47'N 118°45.26'W

Map Sheet: 82 L/10

Site #26 is approximately 1 km downstream from Site #28. A forestry road comes within 10 m of the right bank of Kingfisher Creek. Several old stumps were observed along the channel banks, indicating that riparian logging has occurred several decades ago. LWD has accumulated in discrete debris piles along the channel similar to that seen at Sites #19-25. Three discrete debris jams were observed during field investigation to this site. The channel in between the debris jams was relatively free of debris. The debris jams observed are causing localized scour of the channel banks upstream of the debris jam and are also trapping large amounts of bedload. Several large trees along the channel banks have fallen across the channel due undercutting and erosion of the channel banks. It is believed that the majority of the LWD in the channel is a result of the riparian logging that occurred at the site several decades ago.

There is excellent fish habitat at this site. Several side channels, overhanging riparian vegetation, and undercut banks provide good rearing habitat for fish. Many of the gravel bars have spawning-sized gravels. One of the debris jams observed at this site may pose a barrier to fish migration. This site would benefit from selective removal and stabilization of debris in the channel.

Site #: 28
Impact Code: Fb/Fs/Q•D•F•1
Reach #: 5

Date Inspected: July 7/95
Coordinates: 50°43.47'N 118°45.26'W
Map Sheet: 82 L/10

Kingfisher Creek at this site is a low gradient, anastomozed stream which is very similar in appearance to Sites #19-#26. However, a large amount debris is scattered throughout the channel at this site which has not accumulated in discrete piles along the length of channel. Riparian logging along the channel banks has occurred several decades ago, and it appears that the banks have become inherently unstable. The channel banks (1-2 m high) appear recently undercut, exposing gravel, cobble, and sand materials. A large proportion of the channel substrate appears to be mobile, based on recent accumulations of gravel bars in the channels of Kingfisher Creek.

There is a large amount of LWD and debris jams scattered across the 50-70 m wide floodplain at this site. The debris appears to be both natural and forestry related. Some of the LWD has cut ends and is presumably related to the historical logging in the area. Several debris jams have accumulated at the entrance to side channels and eventually have blocked flows to the side channel (Photos 6 and 7). Kingfisher Creek has carved a new channel through the floodplain in response to the debris jams. LWD in the channel has enhanced fish habitat at this site through the creation of pools scoured beneath the LWD.

Due to the large forestry impact at this site, it has been recommended for further attention under WRP. Potential restoration projects include selective removal or stabilization of LWD in the

channel. Also, the side channels should be cleared of debris since they form potentially good rearing habitat.

Site #: 31a
Impact Code: Q•C•F•3
Reach #: 6
Date Inspected: Nov. 14/94
Coordinates: 50°44.41' N 118°44.13' W
Map sheet #: NTS 82 L/10

Photos were not taken at this site mainly due to the snow cover of the channel substrate and surrounding features. The bridge crossing at this site was not noted on the video and the site was assigned an Q•C•F•3 classification in the field. There are cut blocks on both sides of the channel at this site, both with buffers ranging from 10 - 20 m wide. Some erosion of the stream banks was noted as well as some LWD but all appears to be natural in origin. The banks range from 0.5 - 2.0 m in height and are composed of coarse sand and gravel. The stream substrate is large cobbles and boulders.

10.4 Sediment Source Inventory

A total of eight (8) sediment sources were identified on Kingfisher Creek from the aerial photograph review (Table 10.3). All were tributaries to the main stem. In addition to these major sources of sediment, there are cases of accelerated bank erosion in many areas, usually associated with accumulations of woody debris.

10.5 Kingfisher Creek Summary and Conclusions

Kingfisher Creek is utilized by Coho salmon as well as Rainbow trout and other fish species. Like nearby Wap Creek, it was heavily impacted by historic logging which has reportedly affected

Table 10.3 Kingfisher Creek Sediment Source Inventory

Location symbol(1)	Coordinates		Feature	Composition(2)	Dimensions(3)		Present in(4)		Larger in
	Lat (N)	Long (W)			Width (m)	Length (m)	1950's yes/no?	1990's yes/no?	1990's yes/no?
12	n/a	118°45.15'	Tributary	sa, g	n/a	n/a	yes	yes	n/a
17	n/a	118°45.08'	Tributary	sa, g	n/a	n/a	yes	yes	n/a
21	50°35.05'	118°44.83'	Tributary	sa, g	n/a	n/a	yes	yes	n/a
29	n/a	118°45.37'	Tributary	sa, g	n/a	n/a	yes	yes	n/a
R7a	n/a	n/a	Tributary	sa, g	n/a	n/a	yes	n/a	n/a
R7b	n/a	n/a	Tributary	sa, g	n/a	n/a	yes	n/a	n/a
36	n/a	118°45.63'	Tributary	sa, g	n/a	n/a	yes	n/a	n/a
39	n/a	118°45.59'	Tributary	sa, g	n/a	n/a	yes	n/a	n/a

(1): Refer to map: 82 I/10, 82 L/15

(2): Composition is determined from aerial photographs. Locations which have been checked in the field are indicated by a subscript 'f'. Compositions in brackets indicate minor amounts of the given texture.

si = silt
sa = sand
g = gravel

(3): Width is distance measured along the stream. Length is distance measured from the toe to the zone of initiation (In the case of an eroding bank, length refers to 'bank height')

(4): Two sets of aerial photos were examined in this study: one set flown in 1950's and second set flown in 1990's

(5): n/c - No aerial photo coverage available at the time of the Sediment Source Inventory

(6): Location symbols designated with "R" are referenced by reach locations (e.g. R3a is located in Reach 3).

(7): Location symbols designated with a number are referenced by site numbers from the video transcript (e.g. 18a is located between sites #18 and #19).

stream fish populations. A total of 13 sites were classified as "F.1" or "U.1" from the helicopter video, and five of these were inspected during the fall of 1994. The remainder were inspected in July 1995.

Following the inspections, eight sites maintained an impact code ending in "F.1.", indicating a high level of impact due to forest harvest activities.

Site #3	Debris jams, many appear unstable. Sediment accumulations behind some jams. Bank erosion.
Site #13	Large debris jams blocking fish access around an island. Blow down into channel from adjacent cutblock.
Sites #19, 20, 23, 26, 26	Large woody debris spread throughout reach. Potential fish barriers (main stem and side channels). Sediment accumulating behind some debris piles; risk of sediment flush.
Site #28	Similar to Sites 19-26, except debris is more scattered. Channel shifted and active bank erosion. Side channel blocked.

It is clear from the above that excessive amounts of large woody debris is the main type of habitat degradation found in Kingfisher Creek. The debris is contributing to bank erosion and is a barrier to fish passage. Although fish passage along the main stem is blocked in some places, at least through part of the year, access to side channels is more frequently blocked. The side channels are important for fish rearing. In some places, the debris is relatively stable and has contributed to habitat values by creating pools. The development of any restoration plan for Kingfisher Creek will need to address the balance between the positive and negative impacts of woody debris on stream habitat values.

11.0 COOKE CREEK

11.1 General description

Cooke Creek originates in the Hunters Range about 10 km east of the south end of Mara Lake. It flows southeast then south, and discharges into the Shuswap River about 10 km downstream of the Mabel Lake outlet. Additional descriptive information about Cooke Creek is found in Table 11.1. The NTS map sheet covering the creek (82 L/10) is provided in Attachment 1 of the final report. The 1992-93 colour aerial photographs are in Attachment 2 and the 1950s black and white photos are are in Attachment 3. Video transcripts, photographs, SIS survey forms, and the DFO/MELP Stream Information Summary Sheet are provided in Appendix IX.

A total of six (6) sites were given a code of "F.1" or "U.1" (Table 2.1) on the basis of the helicopter survey. Eight sites were inspected.

11.2 Reach Descriptions

A total of four (4) stream reaches were identified. Gradient and reach length data for the individual reaches are found in Table 11.2.

Reach #1 is a low gradient reach with a wide floodplain. It is accessible to fish present in the Shuswap River. The upstream end of the reach is delineated by a culvert crossing which is likely a barrier to upstream fish migration. Reach #2 is characterized by good fish spawning and rearing habitat. There reach includes many areas with spawning sized gravel, a split channel, deep pools and abundant cover. The upstream end is delineated by a series of waterfalls totalling a 4 m drop. Reach #3 has better fish habitat on average than Reach #2, but is probably not accessible to fish migrating from Reach #2 due to the waterfalls. Habitat values include a low gradient, overhanging banks, deep pools, and side channels.

Table 11.1. General characteristics of Cooke Creek.

Parameter	Information
Map sheet no.	82 L/10
Latitude & longitude of mouth	50°35.96' N, 118°50.6' W
Watershed area (km^2)	70.3
Stream length (km)	15.5
No. of reaches	4
Discharge (mean/highest month/lowest month)	not gauged
Biogeoclimatic zone(s)	ICHmw2, ICHwk1, ESSFwcp
General flow direction	east and south
Next higher order stream or lake	Shuswap River
Land use	agriculture, forestry
Known water licences	1 (Kingfisher Environmental Interpretive Centre)
Known fish species	no data. KO* in Shuswap R. near mouth of Cooke Cr.
No. of F1 and U1 sites identified	6
No. of field sites checked	8

Table 11.2 Stream reach data summary for Cooke Creek.

Reach no.	Reach length (km)	Gradient (%)	Map sheet no.	Site nos. within reach
1	1.0	9	82 L/10	1-2
2	4.5	6	82 L/10	3-9
3	2.8	7	82 L/10	10-12
4	7.3	13	82 L/10	13-19
Total	**15.5**			**19**

Reach #4 has a moderate gradient with a frequently confined channel and steep valley walls. The substrate includes a high percentage of cobbles. There is potentially good fish rearing habitat, characterized by abundant cover and a split channel.

11.3 Site Descriptions

Site #: 3
Impact Code: Q•S•N•2
Reach #: 2
Date Inspected: April 6/95
Coordinates: 50°36.74'N 118°50.85'W
Map Sheet: 82 L/10

This site was originally coded as Fs/Q.S.F.1 based on the presence of two landslides which approach the channel. Following the field inspection and a review of aerial photographs, the code was changed to Q•S•N•2 since the slides appear to be natural in origin. The failure slope is about 75%.

Site #: 4
Impact Code: Q•S/D•F•2
Reach #: 2
Date Inspected: April 6/95
Coordinates: 50°37.18'N 118°50.66'W
Map Sheet: 82 L/10

Originally coded Fs/Q.S.N.2, the coding was changed to Q•S/D•F•2 after the field inspection and aerial photo review. Although the slide originates about 35 m downslope of a logging road, the slide does not appear on photos which pre-date road construction, indicating a link between the presence of the road and the slide. While the slide did apparently extend to the stream, it is now apparently stable and is being revegetated naturally. The slide face has a slope of about 70% and is made up of coarse sand and gravel.

Although not presently impacting the creek directly, this slide and adjacent areas should be inspected periodically to ensure that road drainage is adequate and that the slides remain inactive.

Site #: 6a

Impact Code: Q•S•F•1

Reach #: 2

Date Inspected: April 6/95

Coordinates: 50°37.49'N 118°50.63'W

Map Sheet: 82 L/10

This site was not detected during the helicopter flight, but was identified during the field inspections of nearby sites. It consists of two relatively new landslides which originate from a forest road fillslope. The track of the first slide does reach the creek, while the second one does not. The second slide may be somewhat older, as indicated by small conifers growing in the track.

The first slide is about 150 m long and 40-45 m wide at the top, narrowing down to about 4 m wide at the bottom of the track. The base of the slide track has a cobble/boulder pavement, but the sides includes particles from sand to large cobbles. Trees adjacent to the track are falling into the track, suggesting that the track sides are eroding. On the day of the site inspection, cobbles and boulders from the cutslope had fallen onto the road surface, indicating cutslope erosion.

The second slide originates on the slope below the outlet of a 30 cm diameter culvert. It joins the first slide track just above Cooke Creek. Examination of aerial photos showed that the slides are located in a natural draw. No culvert is present at the location of the first slide.

This site should be re-inspected to evaluate the adequacy of road drainage and to assess the feasibility of seeding and other erosion control methods to stabilize the slide tracks and reduce the risk of future slides.

Site #: 8

Date Inspected: July 4/95

Impact Code: Fs/Q•C/D/S•F•1

Coordinates: 50°38.78'N 118°50.24'W

Reach #: 2

Map Sheet: 82 L/10

A very large slide, originating from a culvert, has impacted Cooke Creek from the right bank. The forest road from which the slide was initiated is approximately 100 m from the channel. It appears that the culvert crossing of the road has been a chronic problem area for several years. An old culvert which was not conveying flow was observed to be buried in the road bed. A newer culvert has been installed, however it is taking a small portion of flow. The majority of the flow is moving through the road fill.

The large slide at this site was initiated at the outfall of the culvert (Photo 1). Surficial materials consist of a thin (2-5 m) veneer of colluvium overlying bedrock. The culvert outfall apparently saturated these sediments, causing the slope to fail. The slide area is approximately 30 m wide and 100 m long. An estimated 2000 m^3 of sediment was displaced by the slide. As the slide flowed downslope it encountered a large (20 m high) knoll consisting of alluvial sands and bedrock (Photo 2). The knoll deflected the slide to the right. The knoll was subsequently eroded by the debris flow. Just past the knoll, most of the sediments entrained in the debris flow were deposited. Sediment did reach the channel of Cooke Creek, as evidenced from the 1 m high scars on trees located where the flow impacted the right bank. However the sediment which reached the creek was a small portion of the total slide volume. There is no evidence that the channel was moved due to the introduction of a large pulse of sediment to the creek. Also, there is no evidence of any sediment or debris deposited on the left bank of the creek. The majority of the debris and sediment displaced appeared to have been deposited in the last 25 m of the slide track above the right bank. A large debris jam was observed approximately 30 m downstream of where the debris flow impacted the right bank (Photo 3). Much of the LWD in the jam may be related to the debris flow. The debris jam does not appear to be a barrier to fish passage.

The failure observed at this site is a result of altering the natural drainage patterns present. The present culvert is not adequate and there is a possibility that the road may fail again in the near future. The culvert located at the road should be pulled and either a Squamish culvert or log culvert should be installed at this site. Stabilization of the exposed slide face by seeding is also suggested.

Site #: 8A
Date Inspected: July 4/95
Impact Code: Fb/Q•D/W•N•2
Coordinates: 50°38.78'N 118°50.24'W
Reach #: 2
Map Sheet: 82 L/10

This site is located just upstream from site #8, on the east side of the knoll described at Site #8. Cooke Creek has eroded a 20 m deep canyon through bedrock and created several large (1-3 m) chutes and waterfalls, which are barriers to upstream fish migration.

Just upstream of the knoll, there is a series of riffles and pools controlled by natural LWD. The floodplain is fairly wide (20 m) here with many bars and side channels providing excellent fish habitat. A very old side channel, blocked by LWD, was observed along the right bank. This side channel is presently inactive, however if the channel were active it would convey flows around the west side of the bedrock knoll. It is believed that the main channel of Cooke Creek has historically occupied channels on both the east and west sides of the knoll. LWD jams along the right bank at the entrance to the side channel are the main factor influencing whether the side channel around the west side of the knoll is occupied. If the side channel leading around the west side of the knoll is re-activated then there is a possibility that flows will remobilize much of the sediment deposited by the debris flow at Site #8.

Possible remedial actions could include reinforcing the right bank at the entrance to the side channel with rip-rap, to prevent the side channel from becoming re-activated.

Site #: 10

Impact Code: Fb/Q•D•N/F•2

Reach #: 3

Date Inspected: July 4/95

Coordinates: 50°39.11'N 118°50.24'W

Map Sheet: 82 L/10

Cooke Creek at this site is a single channel with a gradient of 5%. The channel is approximately 10 m wide and the bed is composed of cobbles and gravels. A bridge crossing Cooke Creek at this site was originally coded as Fb/Q•C•F•1. However field inspection of the bridge revealed it is constructed with steel stringers and there is no apparent constriction of the channel width. The bridge is having little impact upon Cooke Creek.

The code at this site has been revised to Fb/Q•D•N/F•2 to indicate the presence of several small LWD jams in the channel approximately 50 m downstream of the bridge. The LWD in the jams are both natural or forestry-related and appears to be stable. Some localized bank erosion has taken place where flows have been diverted around the debris. Flows have scoured beneath the LWD creating some nice pools beneficial for over-wintering fish habitat. Gravel has accumulated around the LWD, creating several small gravel bars.

There is excellent habitat for fish at this site. The LWD jams have improved fish habitat at this site by improving cover, deep pools, and undercut banks.

Site #: 15

Impact Code: Q•D/S•F•3

Reach #: 4

Date Inspected: July 4/95

Coordinates: 50°40.66'N 118°52.11'W

Map Sheet: 82 L/10

A recent cutblock has been logged to within 5 m of the right bank of Cooke Creek at this site. The channel of Cooke Creek has not been adversely impacted by the cutblock near the right bank. All logging debris from harvesting in the riparian zone has been pulled back approximately 10 m and gathered in debris piles. Along the length of the cutblock, only two trees were observed that

have fallen across the channel. It appears that these trees may pre-date the harvesting of the cutblock. There are no signs of bank erosion due to the cutblock or thin riparian buffer located along the right bank.

A steel span bridge to access the cutblock on the right bank crosses Cooke Creek at the downstream end of the cutblock. The bridge does not appear to constrict the channel width and rip-rap has been installed around the bridge abutments. The forest road continuing along the right bank has been deactivated and several cross-ditches and/or water bars have been installed. Several small slumps have occurred at the cross-ditches, however the sediment is being deposited on a small terrace. Little sediment is entering the creek from these slumps.

Site #: 16 **Date Inspected:** July 4/95

Impact Code: Fs/Q•S•F•2 **Coordinates:** 50°40.80'N 118°52.69'W

Reach #: 4 **Map Sheet:** 82 L/10

A large debris flow originating from the edge of a cutblock, logged in 1972-3, has come within 20 m of the left bank of Cooke Creek at this site. The debris flow occurred through glaciofluvial coarse sand and gravels on a 60% side-slope. The debris flow crossed a forest road, blocking the culvert and deposited a large fan of debris on the floodplain on the left bank. The fan of debris was deposited within 20 m of the left bank of the creek. A very small amount of sediment was routed to the channel. The debris fan is revegetated with horsetail (*Equisetum* sp.). The absence of later successional plants suggests that there is on-going surface erosion of the debris fan. However, the debris flow itself appears to be relatively stable and there is no evidence of subsequent debris flows occurring.

A makeshift road has been rebuilt across the slide area, however a culvert was not installed. Active seepage from the slide face above the road was observed in the field. There is a possibility that the absence of a culvert at this site may initiate further failure of the roadbed. The site should

be inspected to determine if the road could be deactivated. Whatever the status of the road, drainage should be improved and the slide face seeded.

11.4 Sediment Source Inventory

A total of 10 sediment sources were identified on Cooke Creek from the aerial photograph review (Table 11.3). There were five landslides, four tributaries, and a slump in a road fillslope. Four of the slides were not present in the 1950s photos. The fifth may have been present, but the resolution on the older photos made it difficult to confirm its presence. The fillslope was also not present on the older photos.

11.5 Cooke Creek Summary and Conclusions

A total of six sites on Cooke Creek were coded as "F.1" or "U.1" sites. Eight sites were inspected. Following the inspections, two sites remained with an "F.1" coding, indicating a high degree of impact due to forest harvest activities.

Site #6a	Two landslides which originate from a forest road which runs across a draw. Apparently unstable as indicated by falling trees and colluvium on the road surface.
Site #8	Landslide originating from a culvert under forest road. Culvert appears to be a chronic problem, but remains potentially undersized. Exposed slide deposits still a sediment source.

In addition to these specific problem areas, there are other areas of apparent slope instability along Cooke Creek. A road condition assessment is recommended for the forest roads which run parallel to Cooke Creek, including an evaluation of road drainage.

Table 11.3 Cooke Creek Sediment Source Inventory

Location symbol(1)	Coordinates Lat (N)	Coordinates Long (W)	Feature	Composition(2)	Dimensions(3) Width (m)	Dimensions(3) Length (m)	Present in(4) 1950's yes/no?	Present in(4) 1990's yes/no?	Larger in 1990's yes/no?
3	50°36.74'	118°50.85'	Slide	sa, g	30	30	no	yes	yes
4	50°37.18'	118°50.66'	Slide	sa, g	15	100	no	yes	yes
4a	50°37.49'	118°50.63'	Slide	sa, g	15	150	no	yes	yes
6a	n/a	n/a	Slide	sa, g	20	250	no	yes	yes
R2a	n/a	n/a	Tributary	sa, g	n/a	n/a	yes	yes	yes
8	50°38.69'	118°50.32'	Fillslope slump	sa, g	70	80	no	yes	yes
R2 n/a	n/a	n/a	Tributary	sa, g	n/a	n/a	yes	yes	n/a
R3a	n/a	n/a	Tributary	sa, g	n/a	n/a	yes	yes	n/a
14	50°40.71'	118°51.92'	Slide	n/a	n/a	n/a	----------unconfirmed----------		
R4	50°41.99'	118°54.34'	Tributary	sa, g	n/a	n/a	yes	yes	yes

(1): Refer to map: 82 L/10

(2): Composition is determined from aerial photographs. Locations which have been checked in the field are indicated by a subscript 'f'. Compositions in brackets indicate minor amounts of the given texture.
si = silt
sa = sand
g = gravel

(3): Width is distance measured along the stream. Length is distance measured from the toe to the zone of initiation (In the case of an eroding bank, length refers to 'bank height')

(4): Two sets of aerial photos were examined in this study: one set flown in 1950's and second set flown in 1990's

(5): n/c - No aerial photo coverage available at the time of the Sediment Source Inventory

(6): Location symbols designated with "R" are referenced by reach locations (e.g. R3a is located in Reach 3)

(7): Location symbols designated with a number are referenced by site numbers from the video transcript (e.g. 18a is located between sites #18 and #19)

12.0 BRASH CREEK

12.1 General description

Brash Creek flows into the Shuswap River at a point about seven kilometres upstream of the City of Enderby, and serves as a source of water for the City. The City has recently constructed a reservoir and will decrease the usage of Brash Creek as a source of domestic water, while increasing the use of water from the Shuswap River. Additional descriptive information about Brash Creek is found in Table 12.1. The NTS map sheets covering the creek (82 L/10, 82 L/11) are provided in Attachment 1. The 1992-93 colour aerial photographs are in Attachment 2 and the 1950s black and white photos are are in Attachment 3. Video transcripts, photographs, SIS survey forms, and DFO/MELP Stream Information Summary Sheet are provided in Appendix X.

A total of five (5) sites were given codes ending in "F.1" or "U.1" (Table 2.1) based on the helicopter survey. All were inspected.

12.2 Reach Descriptions

A total of three (3) stream reaches were identified. Length and gradient data for the individual reaches are found in Table 12.2.

Reach #1 is a low gradient section of Brash Creek which crosses the floodplain of the Shuswap River. It is accesible to fish migrating from the Shuswap River. The upstream end of Reach #1 is delineated by a small dam which is a barrier to fish passage. Reach #2 has a deeply incised valley cut into bedrock. The stream gradient ranges up to 40%. Reach #3 is less incised than Reach #2, but has a steeper average gradient. Between the effects of the dam at the beginning of Reach #2 and the gradient in Reaches #2 and #3, it is unlikely that fish occupy these reaches.

Table 12.1. General characteristics of Brash Creek.

Parameter	Information
Map sheet no.	82 L/10, 82 L/11
Latitude & longitude of mouth	50°33.18' N, 118°01.7' W
Watershed area (km^2)	34.4
Stream length (km)	10.0
No. of reaches	3
Discharge (mean/highest month/lowest month)	not gauged
Biogeoclimatic zone(s)	IDFxh1, IDFmw1, MSmm, ICHmw2
General flow direction	south & southwest
Next higher order stream or lake	Shuswap R.
Land use	agriculture, forestry
Known water licences	2 (City of Enderby, R.H. Baird)
Known fish species	RB (CH* & SK* in Shuswap R.above and below confluence, CO* above confluence)
No. of F1 and U1 sites identified	5
No. of field sites checked	5

Table 12.3 Stream reach data summary for Brash Creek.

Reach no.	Reach length (km)	Gradient (%)	Map sheet no.	Site nos. within reach
1	2.0	5.2	82 L/11	1-7
2	6.0	12.8	82 L/10, 82 L/11	8-15
3	2.0	15.2	82 L/10	16
Total	**10.0**			**16**

12.3 Field Check Site Descriptions

Site #: 4
Impact Code: n/a
Reach #: 1
Date Inspected: April 6/95
Coordinates: 50°33.53'N 119°02.24'W
Map Sheet: 82 L/11

This site is the location of the Shimole Lumber Ltd. sawmill, just downstream of where the gradient of Brash Creek decreases as it breaks out onto the terraces adjacent to the Shuswap River. The mill yard is immediately adjacent to the creek, with no buffer strip. The substrate of Brash Creek is about 70% cobble and 30% gravel, and the gradient is about 2.5%. The banks are about 2.5 m high with about 80% of the bank area vegetated with grasses and small deciduous trees. The banks appear relatively stable. A pump adjacent to the creek suggests that water is occasionally taken from the creek for mill yard operations (i.e., dust control). Several fish, probably Rainbow trout, were observed in the stream at the site on the day of the site inspection.

With the exception of lack of a buffer strip, the mill yard did not appear to having a negative impact on water quality or fish habitat. The original Fs/Q.S.F.1 code was changed to "not applicable", since the activity was not directly related to forest harvest.

Site #: 5
Impact Code: Q.C.F.1
Reach #: 1
Date Inspected: April 6/95
Coordinates: 50°33.82'N 119°02.39'W
Map Sheet: 82 L/11

There is a forest road bridge at this site which provides access to the Brash Mainline road. The banks are armoured with riprap beneath the bridge. The flow beneath the bridge is directed to the left bank causing the bank just downstream of the bridge to slump into the creek. This is apparently an on-going problem since logs have been placed alongside the creek in an attempt to control bank erosion. However the logs appeared to be in poor condition and erosion is

continuing. Other support logs have apparently been washed away. The bridge itself appeared to be in good condition.

The log structure should be replaced with riprap to prevent erosion and avoid potential future problems with bank and bridge stability.

Site #: 8
Impact Code: n/a
Reach #: 2
Date Inspected: April 6/95
Coordinates: 50°35.25'N 119°01.66'W
Map Sheet: 82 L/11

At this site Brash Creek is confined in a steep v-shaped valley. The gradient is 15% and the channel bed is primarily on bedrock. Some LWD was present in a series of chutes and falls, most of which appeared natural in origin and were stable. The falls suggest that fish are unlikely to access this section of the stream. Given the absence of apparent forest harvest impacts and the low fish habitat value, the code at this site was changed from Fb/Q.D.U.1 to "not applicable."

Site #: 12
Impact Code: Fs/Q•C•F•1
Reach #: 2
Date Inspected: June 15/95
Coordinates: 50°36.403'N 118°59.620'W
Map Sheet: 82 L/10

Brash Creek at this site is a high gradient (40%) stream with channel bed materials comprised of gravel, cobbles, and boulders. No fish are present at this site due to the high channel gradient.

A road crosses Brash Creek at this site with a 50 cm diameter culvert (Photo 1). Several old logs have been buried in the roadbed at the culvert inlet. The logs show signs of rotting and movement, indicating that the roadbed may fail in the near future. Poor road surface drainage has caused erosion of approximately 2 m^3 of sediment from the roadbed, which has been conveyed by large rills to Brash Creek along the right bank (Photo 2).

The status of this road should be reviewed to determine the need to maintain a culvert at the crossing. If the culvert is to remain, both the culvert and the road should be repaired to minimize the potential for surface erosion and/or road failure.

Site #: 13
Date Inspected: June 15/95
Impact Code: Fs/Q•C•F•1
Coordinates: 50°36.222'N 118°59.620'W
Reach #: 2
Map Sheet: 82 L/10

This site is very similar to Site #12 in both the degree and type of impact, and is located one switchback upslope from Site #12. The road crosses over Brash Creek using a 50 cm diameter culvert. Approximately 8-10 logs have been laid across the top of the culvert outlet to support the road fill. The culvert outlet has been crushed to half its original diameter due to settling of the road (Photo 3), and the flow is constricted. Presently, the logs do not show signs of losing strength. If the logs break down in the future, a large amount of sediment and LWD could be transported downstream in the form of a debris flow. If a debris flow occurs from this site, it will definitely affect downstream fish habitat and water quality.

As outlined for Site #12, the status of the road should be reviewed and, depending on the outcome, the culverts should be removed or replaced.

12.4 Sediment Source Inventory

A total of eight (8) sediment sources were identified on Brash Creek from the aerial photograph review (Table 12.3). There were three areas of bank erosion, four tributaries, and a single landslide. Two of the areas of bank erosion were similar in size on the 1990s aerial photos as on the photos from the 1950s, while the third was not present on the earlier photos. The landslide was also present on the older photos, and did not appear to have grown in size on the 1990s photos.

Table 12.3 Brash Creek Sediment Source Inventory

Location symbol(1)	Coordinates		Feature	Composition(2)	Dimensions(3)		Present in(4)		Larger in 1990's yes/no?
	Lat (N)	Long (W)			Width (m)	Length (m)	1950's yes/no?	1990's yes/no?	
5	50°33.82'	119°02.39'	Bank erosion	si, sa, g	5	2	no	yes	yes
R2a	50°35.25'	119°01.66'	Tributary	sa, g	n/a	n/a	yes	yes	n/a
9	50°35.33'	119°01.68'	Eroding bank	sa, g	70	50	yes	yes	no
10	50°35.85'	119°00.71'	Eroding bank	sa, g	50	50	yes	yes	no
10a n/a	n/a	n/a	Slide	g, sa	n/a	n/a	yes	yes	no
11	50°36.32'	119°00.05'	Tributary	sa, g	n/a	n/a	yes	yes	n/a
13	50°36.24'	118°59.72'	Tributary	sa, g	n/a	n/a	yes	yes	n/a
14	50°36.55'	119°00.04'	Tributary	sa, g	n/a	n/a	yes	yes	n/a

(1): Refer to map: 82 L/10, 82 L/11

(2): Composition is determined from aerial photographs. Locations which have been checked in the field are indicated by a subscript 'f'. Compositions in brackets indicate minor amounts of the given texture.
si = silt
sa = sand
g = gravel

(3): Width is distance measured along the stream. Length is distance measured from the toe to the zone of initiation (In the case of an eroding bank, length refers to 'bank height')

(4): Two sets of aerial photos were examined in this study: one set flown in 1950's and second set flown in 1990's

(5): n/c - No aerial photo coverage available at the time of the Sediment Source Inventory

(6): Location symbols designated with "R" are referenced by reach locations (e.g. R3a is located in Reach 3).

(7): Location symbols designated with a number are referenced by site numbers from the video transcript (e.g. 18a is located between sites #18 and #19).

12.5 Brash Creek Summary and Conclusions

A total of five sites on Brash Creek were identified from the helicopter survey as having a high level of impact from forestry (F.1) or unknown (U.1) activities. All were inspected. Following the field inspections, three sites remained with an "F.1" rating. These are:

Site # 5	Flow beneath forest service road bridge is directed to bank causing erosion. Bank should be protected.
Site # 12	Culvert in poor condition on steep section of stream. Road potentially unstable. Surface erosion. Risk of debris flow.
Site # 13	A second culvert in poor condition just upstream of Site #12

The most pressing problems are those associated with Sites #12 and #13. At the time of the site inspections in June 1995, the road in the vicinity of these sites, as well as other locations in the watershed, was in poor condition. Level 1 and 2 road condition assessments should be completed to assess the need for rehabilitation in the Brash Creek watershed road system.

13.0 MIDDLE SHUSWAP SUMMARY AND RECOMMENDATIONS

This report has presented the results of stream channel surveys completed on nine (9) tributaries of the middle reach of the Shuswap River, which is defined as the Mabel Lake to Enderby section of the river. The tributaries covered in the report are Sowsap, Latewhos, Tsuius (or Cottonwood), Hound, Whip, Wap, Kingfisher, Cooke and Brash Creeks. All of these creeks originate in rolling terrain on the Interior Plateau, and flow over some steep sections as they drop down from the plateau to either Mabel Lake or the Shuswap River.

The stream channel assessment was initiated by a helicopter survey which was used to identify sites with potential water quality and/or fish habitat impacts due to land use activities. Videotapes from the helicopter surveys were reviewed and each site assigned an impact code based on the the type of problem, the cause of the problem, the land use activity involved, and the degree of impact. Field inspections were carried out on those sites where the land use activity contributing to the potential problem was either forestry or unknown, and where the degree of impact was estimated to be high (i.e., those sites given a code ending in "F.1" or "U.1" [Table 2.1]). Videotapes were unavailable for two of the creeks, Sowsap and Latewhos, and field inspections were limited to reconnaisance-level surveys.

Within the watersheds surveyed, a total of 33 sites were identified from the helicopter survey as F.1 (forestry activity, high impact) or U.1 (unknown activity, high impact). The coding procedure was intentionally conservative to minimize the risk that a high impact site would not be inspected. Following the inspections, a total of 20 sites remained with an F.1 code, or 61%. Brief descriptions of these sites are provided in Table 13.1. The sources of impacts at the sites can be broken down into four categories:

1. Cutslope/Fillslope Erosion — 2 sites
2. Landslides — 5 sites

Table 13.1 Middle Shuswap River watershed: Summary of sites identified with high level of impact due to forest harvest activities.

Creek/Site	Description
Tsuius Creek	
Site #7	Logging road fillslope on an incised valley section. Surface erosion likely is transporting sediment to the stream. Since downstream areas include salmon spawning habitat, steps should be taken to control erosion.
Hound Creek	
Site #3	Large landslide track. The slide likely pre-dates forest harvest, but harvest and/or road building appears to have re-activated it. Evidence of surface erosion and minor instability. Road over slide track apparently needs frequent repairs.
Whip Creek	
Site #8	Bridge over creek is in poor condition. Gaps in the bridge surface permit sediment to be introduced into the stream. Erosion is occurring on adjacent road surfaces.
Wap Creek	
Site #4	"Site" actually refers to much of Reach #1. Considerable large woody debris is contributing to bank erosion and blockage of side channels.
Site #35	Erosion from adjacent road cut and fill slopes. Leaning trees suggest slope instability.
Site #36	Debris flow introduced sediment and LWD into stream. Debris still potential fish barrier. Exposed mineral soils present.
Site #37	Landslide. Now apparently stabilized. Considerable woody debris in channel which may not be stable. Debris is trapping sediment.
Kingfisher Creek	
Site #3	Debris jams, many appear unstable. Sediment accumulations behind some jams. Bank erosion.
Site #13	Large debris jams blocking fish access around an island. Blow down into channel from adjacent cutblock.
Sites #19, 20, 23, 26, 26	Large woody debris spread throughout reach. Potential fish barriers (main stem and side channels). Sediment accumulating behind some debris piles; risk of sediment flush.
Site #28	Similar to Sites 19-26, except debris is more scattered. Channel shifted and active bank erosion. Side channel blocked.
Cooke Creek	
Site #6a	Two landslides which originate from a forest road which runs across a draw. Apparently unstable as indicated by falling trees and colluvium on the road surface.
Site #8	Landslide originating from a culvert under forest road. Culvert appears to be a chronic problem, but remains potentially undersized. Exposed slide deposits still a sediment source.

Table 13.1 Middle Shuswap River watershed: Summary of sites identified with high level of impact due to forest harvest activities (continued).

Brash Creek	
Site # 5	Flow beneath forest service road bridge is directed to bank causing erosion. Bank should be protected.
Site # 12	Culvert in poor condition on steep section of stream. Road potentially unstable. Surface erosion. Risk of debris flow.
Site # 13	A second culvert in poor condition just upstream of Site #12

3.	Bridges/Culverts	4 sites
4.	Excessive Large Woody Debris	9 sites

Excessive accumulations of large woody debris was a problem on two creeks, Wap Creek and Kingfisher Creek. Of the nine creeks, these two have the longest sections of low gradient stream set within a wide valley. Both were logged to streamside in the past, permitting woody debris to be directly introduced to the channel. Selective removal and or stabilization of woody debris is recommended for both Wap and Kingfisher Creeks. Planning for a debris management program needs to take a number of factors into account, notably the distribution of fish habitat types within the impacted reaches, the positive role that some LWD accumulations play in habitat heterogeneity, site access, and effects of LWD on island and bank stability.

Landslides are an issue on Hound, Wap and Cooke Creeks. The largest of these is the slide on Hound Creek, which is a large debris flow that likely pre-dates forest harvest. However road building and/or harvest appears to have reactivated the slide to a degree, as indicated by evidence of repeated road wash-outs, surface erosion, and new deposition in the lobe area. The other landslides listed in Table 13.1 are smaller in area than the Hound Creek slide, and generally originate near forest roads which parallel the creeks, or on the outside of a stream meander. In addition to the specific slides listed on Table 13.1, a number of other slides were identified from aerial photographs as sediment sources.

Problems identified with culverts, bridges and cut and fill slopes in this study are limited to the main stems of the creeks surveyed. Culverts and bridges carrying the flow of tributaries (permanent and ephemeral) were not assessed. Road condition assessments (Moore, 1994) should be completed on those resource roads in the study area which are not presently being actively maintained. Of the watersheds evaluated in this study, Brash and Cooke Creeks appeared to be most in need of road rehabilitation.

As described earlier, forest harvest took place within the riparian zone of several creeks in the past (up to the 1960s), and some of the problems identified relate to this activity. Natural restoration processes have apparently partially offset losses in stream productivity resulting from riparian harvest, notably in Kingfisher and Wap Creeks. Further restoration should be able to accelerate the rate of stream restoration to improve habitat values in these systems.

14.0 REFERENCES

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DFO/B.C. Ministry of Environment, Lands and Parks. 1990b. Wap Creek Stream Information Summary. DFO/MOEP Fish Habitat Inventory and Information Program. Watershed Code 03-5400-240. Vancouver. 2 pp.

DFO/B.C. Ministry of Environment, Lands and Parks. 1990c. Kingfisher Creek Stream Information Summary. DFO/MOEP Fish Habitat Inventory and Information Program. Watershed Code 03-5400-210. Vancouver. 2 pp.

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15.0 GLOSSARY AND ACRONYMS

Alluvial fan	Sediment deposit usually occurring where a stream emerges from a confined valley into a broader valley. Typically resembles a segment of a cone.
Anastomozing	Stream channel consisting of distributaries which branch and rejoin. They resemble braided streams except that the channels are discrete, interconnected channels separated by bedrock or stable alluvium. Thus they are erosional rather than depositional forms.
Braided streams	Flow is divided by islands or bars formed of alluvium. Formed by excessive sediment deposition in stream channels.
Colluvial deposits	Gravity deposits (e.g., rock falls) along valley sides. Usually found in the more confined stream reaches.
DFO	Department of Fisheries and Oceans.
Fluvial deposits	Generally well sorted gravels, sands and silts transported and deposited by streams and rivers.
Fluvioglacial deposit	Materials deposited by glacial melt water either in contact with ice or beyond the ice margin as outwash.
GPS	Global Positioning System. A collection of earth-orbiting satellites which can be used to determine location on the ground. A receiver "picks up" signals from usually three or more satellites to fix the location.

Kames	Ice contact deposits resembling steep knolls. Formed when stagnant ice left hummocks of drift which were modified by water flowing around the base.
Kame terraces	Ice contact, stratified deposits along the valley sides originating from meltwaters flowing between the glacier and the valley wall.
MELP	B.C. Ministry of Environment, Lands and Parks.
MoF	B.C. Ministry of Forests
NTS	National Topographic System. The system of topographic maps produced by Natural Resources Canada.
Outwash terraces	Materials deposited by meltwaters downstream from a glacier. Subsequent down cutting leaves terrace features on the valley sides.
Oxbow Lake	Small lake created when a stream meander is isolated by the stream channel overrunning the meander loop during high flows. Oxbow lakes typically accumulate channel-fill deposits during subsequent floods.
Thalweg	In a stream, the line of maximum depth along the channel bottom.
WRP	Watershed Restoration Program.

APPENDIX I

Terms of Reference

SCHEDULE A - SERVICES	CONTROL NO.: 1080-20
Mid Shuswap River Stream Assessment	Water Restoration 8SC-94-26

TERMS OF REFERENCE

Background: This contract is funded under the Watershed Restoration Program. The intent of this project is to identify and evaluate potential stream restoration opportunities to improve fish habitat and water quality within the Mission Creek watershed. This will include fish habitat and stream channel assessments with emphasis on impacts associated with forest harvest activities.

The contractor will:

1) Provide fish habitat and hydrology assessments on preselected watersheds (Appendix 1) as follows:

   A) Video tape existing stream conditions using helicopter video with GPS mapping, all of which will be provided by MOELP.

   - participate directly in accompanying the helicopter and providing voice over describing the fish habitat and hydrological conditions of the subject stream. Stream habitat features should be recorded using the methods provided in Appendix 2 and 3 of Watershed Restoration Technical Circular No. 8 where applicable.
   - communicate directly with the helicopter contractor provided by MOELP to set up logistics of scheduling the flights on the preselected watersheds (Appendix 1).
   - helicopter flights should be timed to coincide with deciduous leaf drop and high sun angle to ensure good visibility.

   B) Review video tapes and compare with supplemental information as follows:

   - review existing literature, historical watershed information, relevant hydrotechnical data bases (including individuals with experience in the watershed).
   - review historical and recent air photos and interpret the degree of stream degradation and instability by stream reach.
   - document results of the video tape and supplemental information review on air photos and maps as appropriate.

   C) Ground truthing video habitat\feature parameter estimates.

   - for each stream reach, visually estimated values of parameters should be confirmed \ calibrated by ground measurement; ground truthing should not exceed 10% of representative habitat.
   - photographic records and stream habitat features from Appendix 2 and 3, Tech. Circular No. 8 should be recorded at ground truthing locations.

BTG

- weather may prevent completion of ground measurements, so a prioritized list of stream reaches should be completed after or during the video work; the prioritized list must be discussed with and approved by the contract monitors prior to execution.

D) Priorize Impacts and Propose Possible Remedial Measures

- identify near channel instabilities and all active or potential sources of stream sediment in the watershed on maps of appropriate scale.
- identify reaches that require remediation on maps of appropriate scale.
- suggest initial remedial measures for each stream reach or stream, and recommend further prioritized fish and hydrology assessment or restoration.

2) Provide progress reports on work to date with each billing period.

3) Be prepared to communicate closely with MOELP contract monitors and MOF upslope contractors for selected watersheds.

4) Be prepared to attend meetings with agency staff or the public regarding mitigation\restoration measures that the contractor may recommend.

5) Provide a draft final report by February 1, 1995 and a final report by March 31, 1995. Five (5) copies of the final report are required, including one (1) unbound master with maps suitable for copying.

   An interim report documenting the results of the work carried out may be required instead of a final report in the event that the ground truthing specified in Item 1C is not completed during the 1994 field season.

6) Be familiar with, and conform to the Worker's Compensation Board Industrial Health and Safety Regulations.

BTG

APPENDIX II

Sowsap Creek
Stream Information File

DFO / MOE
STREAM SURVEY FORM

Stream Name: (gaz.) Sockeye Ck (local)

Watershed Code:

Access: 4x4 Method:

Location: U/S of Bridge ≈ 200m 2300 ft Map: 82L 7 Reach No: #3 Length(km):

50° 28' 54" N 128° 50' 50" U.T.M. Zone 11 Site No: #2 Interval(m): 200 m

Date (YMD): 91 11 21 Time: 9:00 Observers: RK / JC / Photos: 5, 6 Air Photos: YES Fish Data: Y (N) Fish: Y (N)

C	PARAMETER	VALUE	METH.	SPECIFIC DATA
	Ave. Bankfull Width (m)	7 m		
	Ave. Wetted Width (m)	4.2 m		No obstructions at site or 100m u/s
	Ave. Max. Riffle Depth (cm)	20 cm		or d/s
	Ave. Max. Pool Depth (cm)	40 cm		
	Gradient %	4%		
	Stable % 85			
	COVER: Total %	70%		

Comp. sum 100%	Dp Pool	L.O.D.	Boulder	In Veg	Over Veg	Cutbank
	10	15	60		10	0

Crown Closure % 60 C Aspect SE

C	BED MATERIAL	%
Fines	clay, silt, sand (<2mm)	
Gravel	small (2-16mm)	
	large (16-64mm)	20
	sm. cobble (64-128mm)	
Rubble	lge. cobble (128-256mm)	10
	boulder (>256mm)	60
Bedrock		

D_{90} (cm): C: Compaction L M H

C	BANKS					
	Height(m)	1.5-2.0	%Unstable	10		
	Texture	(F) (G)	L	R		
	Confinement	EN	CO	FC	OC	UC N/A
	Valley: Channel Ratio	0-2	2-5	5-10	10+	N/A
	Stage	Dry (L)	M	H	Flood	
	Flood Signs H(m)		Braided	Y (N)		
	Bars (%)	NO	pH		O_2(ppm)	
	Water Temp (°C)		Turb.(cm)		Cond.(25°C)	

DISCHARGE

Parameter	Value	Method	Specific Data
Wetted Width (m)	4.2m		
Mean Depth (m)	30cm		
Mean Velocity (m/s)	3 sec / 1m	.5 m/s	leaf
Discharge (m^3/s)			

REACH SYMBOL
(Fish)

(Width, Valley, Channel, Slope) (Bed Material)

REVISED DEC 87 55187

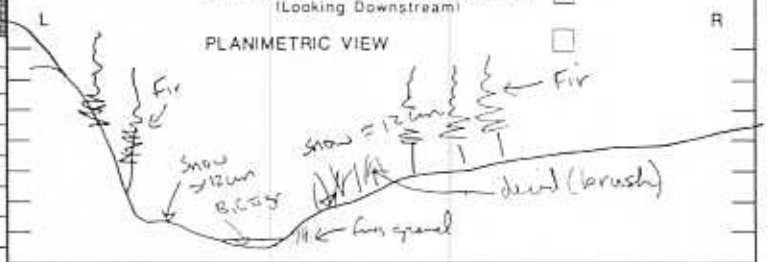
FISH SUMMARY

C	Species	No.	Size Range (mm)	Life Phase	Use	Method/Ref.
	No Fish					

STREAM/VALLEY CROSS-SECTION

(Looking Downstream) ☑

PLANIMETRIC VIEW ☐



COMMENTS

Channel Stability ☐ Debris ☐ Management Concerns ☐ Obstructions ☐ Riparian Zone ☐ Valley Wall Processes ☐ Etc.

- Doesn't appear to be adjacent logging
- channel appears to be very stable u/s of boulder ring and large exposed bank on LB.
- sinuosity ≈ 50 %
- natural Obstacles and ~~small~~ rock weirs may obstruct fish passage at low flow, at this time it does not. Some natural debris has fallen across and is trimmed, good fish cover.

PS - u/s of survey Photo 6 & d/s of survey (note the exposed bank LB)

Edited by:

Date Y M D

APPENDIX III

Latewhos Creek
Stream Information File

DFO/MOE
STREAM SURVEY FORM

Stream Name (gaz.) Latewhos Creek (local)

Watershed Code

Location ≈ 120 m u/s of bridge crossing

N 50° 27' 53" 118° 43' 19" W

Map # 82 L/7 U.T.M. Zone 11

Reach No. 1 Site No. 1 Fish Card Y (N) C

Access 4x4 Method

Length(km) Lthsurv.(m) 200

Field ☐ Hist. ☐

Date Y M D 95 11 21 Time 14.49 Agency Crew RK/JC/ Photos 16,17 Air Photos 465

C	PARAMETER	VALUE	METH.
	Ave.Chan.Width (m)	20	
	Ave.Wet.Width (m)	13	
	Ave.Max.Riffle Depth (cm)	30cm	
	Ave.Max.Pool Depth (cm)	50cm	
	Gradient %	5.5	
	% Pool 35 Riffle 65 Run Other		
	Side Chan.% 0 (X) 0-10 10-40 >40		
	Debris Area% 10 0 (X) 0-5 5-15 >15		
	Stable %	65	
	COVER: Total %		
	Comp. sum 100% / Dp Pool / L.O.D. / Boulder / In Veg / Over Veg / Cutbank	10 / 5 / 40 / 2 / 5	
	Crown Closure % 80	C Aspect NW	

SPECIFIC DATA

One slight obstruction - does not hinder fish passage or flow passage, - it is small debris pile on rock bar with small LOD - very minor

OBSTRUCTIONS

C	Ht(m)	Type	Loc'n
	NO		

C	BED MATERIAL		%
	Fines	clay,silt,sand (<2mm)	
	Gravels	small (2-16mm)	
		large (16-64mm)	10
	Larges	sm.cobble (64-128mm)	20
		ge.cobble (128-256mm)	20
		boulder (>256mm)	50
	Bedrock (R)		

D_{90}(cm) C Compaction L (M) H

C	BANKS					
	Height(m) 3	%Unstable				
	Texture	F	G	(L)	(R)	
	Confinement	EN	CO	FC	OC	UC N/A
	Valley: Channel Ratio	0-2	2-5	5-10	10+	N/A
	Stage	Dry	L	(M)	H	Flood
	Flood Signs Ht(m)		Braided	Y	(N)	
	Bars (%) —	pH —		O2(ppm)		
	Water Temp.(°C) —	Turb.(cm) —		Cond.(25°C)		

DISCHARGE

Parameter	Value	Method	Specific Data
Wetted Width (m)	13		
Mean Depth (m)	.40		
Mean Velocity (m/s)	.7		
Discharge (m^3/s)	3.64		

REACH SYMBOL
(Fish)

(Width,Valley Channel,Slope) (Bed Material)

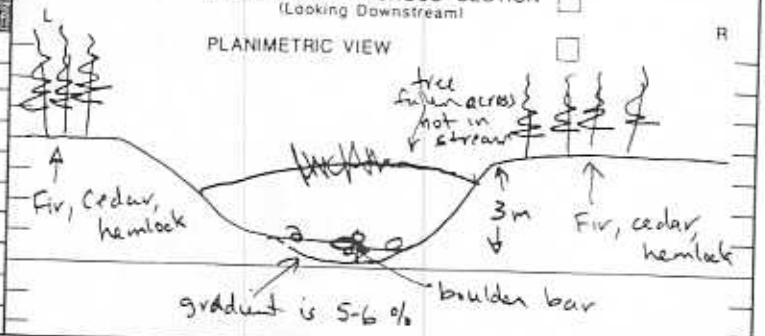
REVISED DEC 87 5S187

FISH SUMMARY

C	Species	No.	Size Range(mm)	Life Phase	Use	Method/Ref.
	No Fish					
	Spotted					

STREAM/VALLEY CROSS-SECTION ☐
(Looking Downstream)

PLANIMETRIC VIEW ☐



COMMENTS

Channel Stability ☐ Debris ☐ Management Concerns ☐ Obstructions ☐ Riparian Zone ☐ Valley Wall Processes ☐ Etc.

- bank material composed of boulder / cobble
- Creek appears to be unstable (moderately) - very uniform as there are large boulders scattered sporatically in middle along banks and on top of banks with no symetry
- creek has good potential for carring capacity (large material

photo 16 u/s of survey
17 d/s of survey.

Edited by

Date Y M D

APPENDIX IV

Tsuius Creek
Stream Information File

MID-SHUSWAP STREAM ASSESSMENT

STREAM: TSUIUS CREEK
DATE: October 11, 1994
TAPE: WRP Tape 1

LOCATION SYMBOL	CODE	COMMENTS	TIME	COORDINATES North	West
1	Fb-P-R-2	▸ fences to control flow away from cabin	2:05	50.37.48	118.40.88
2	Fb-P-R-2	▸ dyke on left bank	2:10	50.37.45	118.40.80
3	Fb-W-N-1	▸ 12m falls	3:40	50.37.17	118.39.84
4	Fb/Q-D-U-1	▸ major log jam	3:59	50.37.19	118.39.53
5	Q-S-N-3	▸ exposed bank	4:07	50.37.19	118.39.46
6	Q-S-U-2	▸ landslide scar	4:45	50.37.18	118.39.07
7	Q/Fs-F-F-1	▸ active fillslope erosion (road)	4:53	50.37.16	118.38.95
8	Q-C-F-2	▸ bridge crossing	5:05	50.37.13	118.38.80
9	Fs-P-F-2	▸ riprap along channel	5:16	50.37.12	118.38.68
10	Fs/Q-F-F-2	▸ slide from road cut	5:57	50.37.07	118.38.04
11		▸ recent cutblock with some greenup	6:10	50.37.03	118.37.71
12	Fs/Q-F-U-2	▸ slide on right side	6:22	50.37.01	118.37.65
13	Fs/Q-C-F-2	▸ logging road crossing (repl. wooden with steel)	7:23	50.36.93	118.36.77
14	Fs/Q-F-F-2	▸ road adjacent to stream	7:53	50.36.92	118.36.33
15		▸ large cutblock on left side	8:06	50.36.97	118.36.13
16	Fs/Q-S-F-2	▸ (old logging road here)	8:10	50.36.97	118.36.01
17	Fs/Q-S-U-2	▸ slide (exposure)	9:00	50.36.98	118.35.33
18	Fs/Q-S-U-2	▸ cutblock on right side with slide	9:22	50.36.99	118.35.05
19	Fs/Q-S-F-2	▸ gully into stream from old cutblock	10:29	50.37.01	118.34.23
20		▸ recent cutblock on right side	11:21	50.37.17	118.33.46
21	Fb/Q-D-U-2	▸ log jam (100m d/s)	11:30	50.37.22	118.33.25
22	Fs/Q-S-U-2	▸ exposed slopes on right side	11:55	50.37.39	118.33.09
23	Fs/Q-F-F-2	▸ active gully from the road into the stream	12:25	50.37.56	118.32.80

STREAM: TSUIUS CREEK
DATE: October 11, 1994
TAPE: WRP Tape 1

LOCATION SYMBOL	CODE	COMMENTS	TIME	COORDINATES North	West
24	Fs/Q-C-F-2	▸ bridge (steel span with wood deck)	12:54	50.37.74	118.32.51
25	Fb-D-U-2	▸ some blowdown across the stream	13:39	50.38.18	118.32.20
26	Fs/Q-S-F-2	▸ stream passes through an old cutblock logged up to the channel	14:06	50.38.32	118.32.06
27	Fs/Q-S-U-2	▸ exposed sand banks	15:46	50.39.39	118.31.62
28	Fb/Q-D-U-2	▸ large log jam	16:17	50.39.69	118.31.38
29	Fs/Q-C-F-2	▸ bridge (3800' elevation)	16:24	50.39.74	118.31.36
30	Fs/Q-S-F-2	▸ active slides from the road	16:50	50.39.97	118.31.27
31	Fb/Q-D-U-2	▸ debris in the channel, log jams	17:00	50.40.08	118.31.14
32	Fs/Q-S-N-1	▸ natural snow avalanche tracks & active slide areas	17:15	50.40.23	118.30.91
33	Fs/Q-F-F-2	▸ logging road with exposed cutbanks, sand	18:12	50.40.64	118.30.43
34	Fb/Q-D-U-2	▸ bridge (pool at u/s end) & some log jams u/s of the bridge	20:00	50.41.69	118.29.71
35		▸ fish observed in the stream	20:19	50.42.29	118.29.62
36	Fb-C-F-2	▸ culvert	23:37	50.42.72	118.28.27
37		▸ small cutblock on the right	24:13	50.42.71	118.27.56
38	Q-S-N-1	▸ natural debris fan	24:59	50.42.40	118.27.05

NOTE: 1-33: Map 82 L/10 1:50,000
34-38: Map 82 L/9 1:50,000

511-03

DFO/MOEP FISH HABITAT INVENTORY AND INFORMATION PROGRAM
STREAM INFORMATION SUMMARY

Watershed Code: 03-5400-260
Stream Name: TSUIUS CREEK

A. DESCRIPTION

Stream Name: TSUIUS CREEK Local Name: COTTONWOOD CREEK Watershed Code: 03-5400-260	O.F.O. Division: FRASER RIVER District: 1 KAMLOOPS Subdistrict: 29K SALMON ARM Statistical Subarea: - M.O.E. Region: 8 OKANAGAN Management Unit: 24

Tributaries	Code
WHIP CREEK HOUND CREEK	020 030

Topographic (1:50k) Map: 82L/10
B.C.G.S. (1:20k) Map:
U.T.M. Mouth: 11.3810.56095
Lat./Long. Mouth: 50 DG. 41' 0'' 118 DG. 38' 0''
Mainstem Length: 31.8 km Ref. No.: 29J-61
Watershed Area: Ref. No.:

Location: FLOWS S THEN W INTO MABEL LAKE, KAMLOOPS DISTRICT.

Gradient Class/Location (km upstream from mouth)					Comments
0 - .5%	.5 - 2%	2 - 5%	5 - 10%	>10%	FIRST 500 M, MODERATELY STEEP, LARGE BOULDERS; STEEP GRADIENT ABOVE. (REF. 29K-46)

B. OBSTRUCTIONS TO MIGRATION

Barrier (Type)	Height (meters)	Location (km U/S)	Impassable to (species)	Comments
NO INFORMATION AVAILABLE				

C. FLOW

Flow Control: W.S.C. Station No. 1:	Water Survey of Canada (WSC) Flow Gauge: No. 2:	No. 3:	No. 4:
NO INFORMATION AVAILABLE			

D. DISTRIBUTION SUMMARY

Species	Watershed Distribution
SK SOCKEYE SALMON	1982 ONLY; SPAWNING IN LOWER 0.8 KM. (IN DOMINANT CYCLE YEARS). (REF. 29K-46)
CO COHO SALMON	SPAWNING IN LOWER 0.8 KM (REF. 29K-46)

E. ESCAPEMENT SUMMARY

Species	Escapement			Maximum Recorded Escapement	Ref. No.	Management Target Escapement	Ref. No.
	Mean	Period of Record	Ref. No.				
SK SOCKEYE SALMON	35	1978 - 1987	28A-18	126	28A-18		
CO COHO SALMON		1978 - 1987		10	28A-18		

Comments: SOCKEYE ESCAPEMENT ONLY RECORDED DURING DOMINANT ADAMS RIVER CYCLE OF SOCKEYE (1986-1990). (REF. 29K-46)

10 COHO RECORDED IN 1987 ONLY. (REF. 29K-1)

F. LIFE HISTORY TIMING

Species	Activity	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	[illegible]	[illegible]
NO INFORMATION AVAILABLE													

G. ENHANCEMENT/MANAGEMENT ACTIVITIES IN WATERSHED

Type of Activity	Species	Location (km U/S)	Comments	Period of Operation Start-Finish
NO INFORMATION AVAILABLE				

H. LAND USE/WATER USE/WATER QUALITY

Activity	Description/Location
FO FORESTRY	EXTENSIVE LOGGING. (REF. 29K-22)

I. FISH PRODUCTION POTENTIAL/CONSTRAINTS/GENERAL COMMENTS

NO ENHANCEMENT POTENTIAL. (REF. 29K-46)

J. FISHERY OFFICER NARRATIVE

Date Prepared: 1988/04/01

Prepared By: B. KURTZ, OP. FRAMEWORK

K. SIS COMPLETED BY

Completed by:	D. FARRELL	Date:	1986/12/22
Checked by:	LIDIA JAREMOVIC	Date:	1988/04/27
Last checked by:	L. JAREMOVIC	Date:	1990/09/19

DFO / MOE
STREAM SURVEY FORM

Stream Name (gaz.) Tsiuis Creek (local)

Watershed Code

Location: lat 50 37.095 / 50 37.106; 118 39.803 / 118 39.762

Map; U.T.M.

Date Y M D 94 11 12; Time 15:30; Crew MCG/SHH /; Photos

Access		Method
Length (km)		
Gradient	200	

Reach No. · Site No. · Fish Data Y (N) · Air Photos

Parameter	Value	Meth.	Specific Data
Ave. Channel Width (m)			20-25
Ave. Wetted Width (m)			12-15
Ave. Max. Riffle Depth (cm)			30, 20
Ave. Max. Pool Depth (cm)			300, 200
Gradient	5-10		

Pattern: 50 · 20 · 20 · 10

Stable % 75

COVER: Total % 30

Comp. sum 100%	Dp Pool	L.O.D.	Boulder	In Veg	Over Veg	Cutbank
		10	50		40	

Crown Closure % · Aspect

Bed Material	%
Fines: clay, silt, sand (<2mm)	
Gravel: small (2-16mm)	
Gravel: large (16-64mm)	
Cobble: sm. cobble (64-128mm)	
Cobble: lge. cobble (128-256mm)	
boulder (>256mm)	
Bedrock (R)	

D_{90} (cm) 40 · Compaction L M (H)

Banks	
Height (m)	%Unstable
Texture	F G (L) (R)
Confinement	(EN) CO FC OC UC N/A
Valley: Channel Ratio	(0-2) 2-5 5-10 10+ N/A
Stage	Dry (L) M H Flood
Flood Signs Ht (m)	3 · Braided Y/(N)
Bars (%)	10 · pH · O_2 (ppm)
Water Temp (°C)	Turb. (cm) · Cond. (25°C)

Obstructions		
Ch.	Type	Loc'n
3	w/f	

DISCHARGE

Parameter	Value	Method	Specific Data
Wetted Width (m)			12
Mean Depth (m)			1
Mean Velocity (m/s)			0.5
Discharge (m^3/s)			

REACH SYMBOL (Fish)

(Width, Valley Channel, Slope) (Bed Material)

REVISED DEC 87 · SS1 87

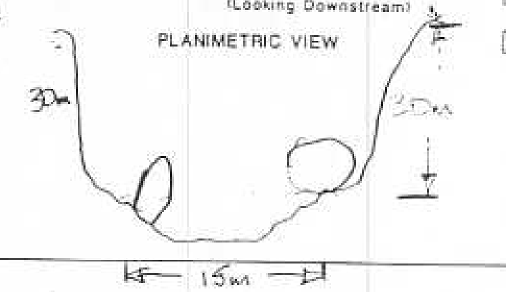
FISH SUMMARY

Species	No.	Size Range (mm)	Life Phase	Use	Method/Ref.

STREAM/VALLEY CROSS-SECTION (Looking Downstream) ☐

PLANIMETRIC VIEW ☐

L · R



COMMENTS

Channel Stability ☐, Debris ☐, Management Concerns ☐, Obstructions ☐, Riparian Zone ☐, Valley Wall Processes ☐, Etc.

- this reach is confined by bedrock cliffs (30m [illegible]) sides
- there are deep pools (>3m) and some areas with [illegible]
- this reach is not accessible (from d/s due to [illegible]) [illegible] m d/s.

Edited by:

Date Y M D:

1 REFERENC[illegible] INFORMATION

Stream Name: TSUIS CREEK

Watershed Code: 128-8355-373-000

Watershed Code cont:

SISS/RAB Code:

Alias 1:

Alias 2:

Confluence ID: Map No. 08241,0 ID: P C O N

Confluence UTM: ZONE EASTING NORTHING

Completed by: KOPECC, C

Date: (yymmdd) 950120

2 STREAM INFORMATION

WATER SURVEY OF CANADA STATIONS

Loc. Ref: Map No.	ID		Station No.
		P W S C	
		P W S C	
		P W S C	
		P W S C	

WATER QUALITY

Loc. Ref: Map No.	ID		Station No.	Ref No.
		P W Q S		
		P W Q S		
		P W Q S		
		P W Q S		

3 PROVINCIAL FISHERIES MANAGEMENT OBJECTIVES

Habitat type: 1,R Management Objective 1: Management Objective 2:

4 ENHANCEMENT AND MANAGEMENT ACTIVITIES

Map No.	ID	Type	Activity	Project	Start	Finish	Species (list all species by code)	Ref #
			Cmt					
			Cmt					
			Cmt					
			Cmt					
			Cmt					
			Cmt					
			Cmt					
			Cmt					
			Cmt					
			Cmt					

5 RESOURCE USE INFORMATION

St.Name _____

Map No.	ID	Type	Code	CATCH Mean	High	Low	EFFORT Mean	High	Low
			Seas.	Start To Finish	Cmt			Ref#	
			Seas.	Start To Finish	Cmt			Ref#	
			Seas.	Start To Finish	Cmt			Ref#	
			Seas.	Start To Finish	Cmt			Ref#	
			Seas.	Start To Finish	Cmt			Ref#	

6 FISHERIES POTENTIAL AND CONSTRAINTS

Map No.	ID	Type	Activity	P	L	Species	Comment	Ref. No.

7 OBSTRUCTIONS

St.Name TSUIS CREEK

Map No.	ID	Type	OBS	Height	Length	Species Blocked	Ref #
0,8,2,4,1,0	0,2,1	P	G			R,B, K,O,	8,0,1,0
Cmt	CASCADE PREVENTS UPSTREAM MIGRATION OF FISH						
Cmt							
Cmt							
Cmt							
Cmt							

8 LAND USE

Map No.	ID	Type	Land Use	Date	Comment	Ref. No.

9 VALUE / SENSITIVITY COMMENTS

Map No.	ID	Type	Code	Value Comment	Ref. No.

Map No.	ID	Type	Code	Sensitivity Comment	Ref. No.

10 SPECIES SIDE A

SPECIES / STOCK IDENTIFICATION

Species	Char	Stock	Stock Type	Mgt Cls	CDC Local	CDC Global
K,O,	R,S			WI		

11 FISH DISTRIBUTION

Map no.	ID	Type	Activity	Comment	Ref #
	0,2,1	U	S,P,L	SPAWNING IN LOWER 0.8 KM	8,0,1,0,
	0,2,0	D			

12 HARVEST AND USE

Map No.	ID	Type	Code	CATCH Mean	High	EFFORT Mean	High	CPU Mean	High
			Seas.	Start	To Finish	Cmt.			Ref #

13 ESCAPEMENT

Species	10 YR. Period	10 YR. Mean	10 YR. Max.	Period of Record	Max.	Year	Target

Cmt. Ref #

14 LIFE HISTORY AND TIMING

Ref #

Activity	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Migration												
Spawning												
Incubation												
Rearing												

SPECIES / STOCK IDENTIFICATION

Species	Char	Stock	Stock Type	Mgt Cls	CDC Local	CDC Global
R,B,	R,S			WI		

11 FISH DISTRIBUTION

Map no.	ID	Type	Activity	Comment	Ref #
		W	R,E,A,	REARING FOR UNKNOWN DISTANCE PAST INLET	8,0,1,0,
	0,2,1	U	S,P,L,	SPAWNING IN LOWER 0.8 KM	8,0,1,0,
	0,2,0,	D			

12 HARVEST AND USE

Map No.	ID	Type	Code	CATCH Mean	High	EFFORT Mean	High	CPU Mean	High
			Seas.	Start	To Finish	Cmt.			Ref #

13 ESCAPEMENT

Species	10 YR. Period	10 YR. Mean	10 YR. Max.	Period of Record	Max.	Year	Target

Cmt. Ref #

14 LIFE HISTORY AND TIMING

Ref #

Activity	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Migration												
Spawning												
Incubation												
Rearing												

10 A SPECIES

	Species	Char	Stock	Stock Type	Mgt Cls	CDC Local	CDC Global	Ref #
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								

Photo 1. Debris jam on the right bank jammed between the boulders and the bank.
Stream Name: Tsuius Creek **Site #:** 4 **Reach #:** 2
Coordinates: 50°37'19N 118°39'53W **Code:** Fb/Q•D•N•3

APPENDIX V

Hound Creek
Stream Information File

MID-SHUSWAP STREAM ASSESSMENT

STREAM: HOUND CREEK
DATE: October 11, 1994
TAPE: WRP Tape 1

LOCATION SYMBOL		CODE	COMMENTS	TIME	COORDINATES North	West
1			▸ mouth of creek	28:00	50.38.24	118.32.27
2			▸ cutblock on the right side ~100m uphill	29:33	50.38.16	118.31.07
3	*	Fs/Q-S-F-1	▸ slide from within the block into the stream	29:41	50.38.17	118.31.01
4		Fs/Q-S-U-3	▸ gully on the right side, historically contributed sediment to the stream	30:27	50.38.25	118.30.59
5		Fs/Q-C-F-2	▸ bridge, some exposed cutbanks	31:07	50.38.40	118.30.20
6			▸ cutblock on the left side	33:55	50.38.99	118.28.55
7		Fs/Q-C-F-2	▸ bridge	34:29	50.38.13	118.28.20
8			▸ cutblocks on both sides of the channel with 30-60m buffers	35:00	50.38.26	118.27.93
9		Fs/Q-C-F-2	▸ road crosses creek but no bridge @ 5400' elevation	37:46	50.40.17	118.27.20
10			▸ headwaters	40:06	50.41.30	118.26.35

NOTE: 1-5: Map 82 L/10 1:50,000
6-10: Map 82 L/9 1:50,000

DFO / MOE
STREAM SURVEY FORM

Stream Name (gaz.)	HOUND - SITE 3	(local)	
Watershed Code			
Location	50°35.17 N 118°31.01 W	Map#	
		U.T.M.	
Date Y M D	95 07 05	Time 11:00	Agency S	Crew HH / /	Photos	Air Photos

Access		Method	
Reach No.		Length(km)	
Site No.		Lth.surv.(m)	✓
Fish Card	Y N	C Field ☐	Hist. ☐

C	PARAMETER	VALUE	METH.	SPECIFIC DATA
	Ave.Chan.Width (m)	8		
	Ave.Wet.Width (m)	7		
	Ave.Max.Riffle Depth (cm)	0.5		
	Ave.Max.Pool Depth (cm)			
	Gradient %	15%		
	% Pool	Riffle 90	Run 10	Other
	Side Chan.%	0 ☒ 0-10 ☐ 10-40 ☐ >40 ☐		
	Debris Area%	0 ☐ 0-5 ☐ 5-15 ☒ >15 ☐		
	Debris Stable %			
	COVER: Total %			
	Comp. sum 100%	Dp Pool	L.O.D.	Boulder / In Veg / Over Veg / Cutbank
	Crown Closure %		C	Aspect

C	BED MATERIAL		%
	Fines	clay, silt, sand (<2mm)	
	Gravels	small (2-16mm)	
	Gravels	large (16-64mm)	10
	Larges	sm.cobble (64-128mm)	40
	Larges	lge.cobble (128-256mm)	40
	Larges	boulder (>256mm)	10
	Bedrock (R)		
	D_{90}(cm)	C Compaction	L M H

C	BANKS		
	Height(m) 0.5	%Unstable	20
	Texture	(F) G L R	
	Confinement	EN CO FC OC UC N/A	
	Valley: Channel Ratio	0-2 2-5 5-10 10+ N/A	
	Stage	Dry L (M) H Flood	
	Flood Signs Ht(m)	Braided	Y (N)
	Bars (%)	pH	O_2(ppm)
	Water Temp (°C) 8.5	Turb.(cm)	Cond.(25°C)

OBSTRUCTIONS			
C	Ht(m)	Type	Loc'n

DISCHARGE

Parameter	Value	Method	Specific Data
Wetted Width (m)	4	Floating chip	
Mean Depth (m)	.5		
Mean Velocity (m/s)	2 m/s		
Discharge (m^3/s)	4		

REACH SYMBOL
(Fish)

(Width Valley:Channel Slope) (Bed Material)

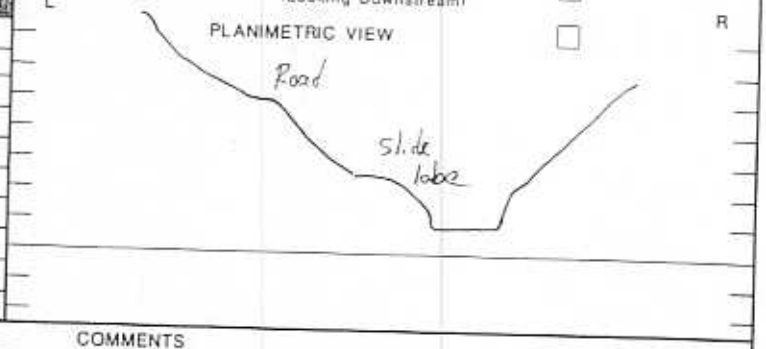
REVISED DEC. 87 SS187

FISH SUMMARY

C	Species	No.	Size Range (mm)	Life Phase	Use	Method/Ref.

STREAM/VALLEY CROSS-SECTION ☑ (Looking Downstream)

PLANIMETRIC VIEW ☐



COMMENTS

Channel Stability ☐ Debris ☐ Management Concerns ☐ Obstructions ☐ Riparian Zone ☐ Valley Wall Processes ☑ Etc.

Natural slide area - large slide scar possibly re-activated due to road construction and logging -

Edited by:

Date Y M D

Photo 1. Landslide track at Site #3, Hound Creek, looking upslope from the road.

Photo 2. Landslide track looking downslope towards Hound Creek. Note culvert remanants in the forground.

Photo 3. Stable landslide track to the east of one shown in Photos 2 and 3.

APPENDIX VI

Whip Creek
Stream Information File

MID-SHUSWAP STREAM ASSESSMENT

STREAM: WHIP CREEK
DATE: October 11, 1994
TAPE: WRP Tape 1

LOCATION SYMBOL	CODE	COMMENTS	TIME	COORDINATES North	COORDINATES West
1		▸ mouth of the creek	41:06	50.36.99	118.33.80
2	Q-S-F-3	▸ large cutblock on the left & right, generally a good buffer	41:48	50.36.29	118.32.91
3	Fb/Q-D-U-2	▸ LWD across the stream, some deposition zones in the channel	44:39	50.36.10	118.32.03
4	~~Fb/Q-D-U-1~~ Fb-D-F-2	▸ log jam, old cutblock with no buffer	45:34	50.36.02	118.31.47
5	Fb/Q-D-N-3	▸ natural blowdown across the stream	47:50	50.35.40	118.30.22
6	Fb-W-N-2	▸ waterfalls	48:45	50.35.28	118.29.54
7	~~Fb/Q-C-F-1~~ Q-S-F-3	▸ cutblock on left & road crossing (not sure if it is a bridge) with logging	50:13	50.34.857' ~~50.34.99~~	118.29.056' ~~118.29.20~~
8	Fs/Q-C-F-2	▸ bridge	50:25	50.33.951 ~~50.34.00~~	118.30.295 ~~118.30.24~~
9	Fs/Q-S-F-2	▸ large cutblock on the right with the road close to the stream @ 5900' elevation	54:25	50.33.49	118.31.55
10	Fb-W-N-2	▸ waterfalls just d/s of a small lake @ 6300' elevation	55:24	50.33.43	118.32.17
11		▸ headwaters of the stream	56:17	50.32.03	118.32.29

NOTE: 1-5: Map 82L/10 1:50,000
6-7: Map 82L/9 1:50,000
8-11: Map 82L/10 1:50,000

DFO / MOE
STREAM SURVEY FORM

Stream Name (gaz.) Whip Creek (local) | Access | | Method
Watershed Code | Reach No. R4 | Length(km) | |
Location site #7 | Map # | Site No. | Lth surv(m) 100
UTM | Fish Card Y (N) C | Field ☐ Hist. ☐
Date Y M D 95 07 10 | Time 1800 | Agency | Crew MG/DH / | Photos | Air Photos

C	PARAMETER	VALUE	METH.
	Ave.Chan.Width (m)	10	GE
	Ave.Wet.Width (m)	10	↓
	Ave Max Riffle Depth (cm)	10	
	Ave Max Pool Depth (cm)	50	↓
	Gradient %	5-10	CL
	% Pool 10 Riffle 60 Run 30 Other		GE
	Side Chan.% ☒ 0 ☐ 0-10 ☐ 10-40 ☐ >40 ☐		↓
	Debris Area% 25 ☐ 0 ☐ 0-5 ☒ 5-15 ☐ >15 ☐		
	Debris Stable %	90	↓
	COVER: Total %	30-40	
	Comp sum 100% — Dp Pool 10 / L.O.D. 10 / Boulder 20 / In Veg / Over Veg 50 / Cutbank 10		
	Crown Closure %	C Aspect	

SPECIFIC DATA

C	BED MATERIAL	%
	Fines: clay,silt,sand (<2mm)	
	Gravels: small (2-16mm)	
	Gravels: large (16-64mm)	40
	Larges: sm.cobble (64-128mm)	
	Larges: lge.cobble (128-256mm)	
	Larges: boulder (>256mm)	50
	Bedrock (R)	
	D_{90} (cm)	C Compaction L M H

C	BANKS					
	Height(m) 1	%Unstable 10				
	Texture F (G) L R					
	Confinement	EN (CO) FC	DC	UC	N/A	
	Valley: Channel Ratio	0-2	2-5	(5-10)	10+	N/A
	Stage	Dry	L	(M)	H	Flood
	Flood Signs Ht(m)		Braided	Y (N)		
	Bars (%) 0	pH		O_2 ppm		
	Water Temp.(°C) 11	Turb.(cm)		Cond.(25°C)		

OBSTRUCTIONS

C	Ht(m)	Type	Loc'n

DISCHARGE

Parameter	Value	Method	Specific Data
Wetted Width (m)			
Mean Depth (m)			
Mean Velocity (m/s)			
Discharge (m^3/s)			

REACH SYMBOL (Fish)

(Width, Valley Channel, Slope) (Bed Material)

REVISED DEC 87 SS187

DFO / MOE
STREAM SURVEY FORM

Stream Name (gaz.) Whip Creek (local) | Access | | Method
Watershed Code | Reach No. R5 | Length(km) | |
Location site #8 | Map # | Site No. | Lth surv(m) 100
UTM | Fish Card Y (N) C | Field ☐ Hist. ☐
Date Y M D 95 07 10 | Time 1700 | Agency | Crew MG/DH / | Photos | Air Photos

C	PARAMETER	VALUE	METH.
	Ave.Chan.Width (m)	7	GE
	Ave.Wet.Width (m)	7	↓
	Ave.Max.Riffle Depth (cm)	20	
	Ave.Max.Pool Depth (cm)	75	↓
	Gradient %	2	CL
	% Pool 20 Riffle 60 Run 20 Other		GE
	Side Chan.% ☒ 0 ☐ 0-10 ☐ 10-40 ☐ >40 ☐		↓
	Debris Area% 25 ☐ 0 ☐ 0-5 ☒ 5-15 ☐ >15 ☐		
	Debris Stable %	95	↓
	COVER: Total %	10	
	Comp sum 100% — Dp Pool 20 / L.O.D. 5 / Boulder 30 / In Veg / Over Veg 85 / Cutbank 20		
	Crown Closure %	C Aspect	

SPECIFIC DATA

C	BED MATERIAL	%
	Fines: clay,silt,sand (<2mm)	5
	Gravels: small (2-16mm)	
	Gravels: large (16-64mm)	20
	Larges: sm.cobble (64-128mm)	
	Larges: lge.cobble (128-256mm)	
	Larges: boulder (>256mm)	60
	Bedrock (R)	15
	D_{90} (cm)	C Compaction L M (H)

C	BANKS					
	Height(m) 1-2	%Unstable 5				
	Texture F G (L) R					
	Confinement	EN (CO) FC	DC	UC	N/A	
	Valley: Channel Ratio	0-2	2-5	(5-10)	10+	N/A
	Stage	Dry	L	(M)	H	Flood
	Flood Signs Ht(m) .5		Braided	Y (N)		
	Bars (%) 0	pH		O_2 ppm		
	Water Temp.(°C) 11	Turb.(cm)		Cond.(25°C)		

OBSTRUCTIONS

C	Ht(m)	Type	Loc'n

DISCHARGE

Parameter	Value	Method	Specific Data
Wetted Width (m)			
Mean Depth (m)			
Mean Velocity (m/s)			
Discharge (m^3/s)			

REACH SYMBOL (Fish)

(Width, Valley Channel, Slope) (Bed Material)

REVISED DEC 87 SS187

DFO/MOE
STREAM SURVEY FORM

Stream Name (gaz.) WHIP - #4 (local) | Access | | Method

Watershed Code | Reach No. | Length(km) |

Location | Map# | Site No.? | Lth surv.(m) |

UTM | Fish Card Y N C | Field ☐ Hist. ☐

Date Y M D 95 07 05 | Time | Agency | Crew / / | Photos | Air Photos

C	PARAMETER	VALUE	METH.	SPECIFIC DATA
	Ave.Chan.Width (m)	6.5		
	Ave.Wet.Width (m)	6		
	Ave.Max.Riffle Depth (cm)	0.3 0.5		
	Ave.Max.Pool Depth (cm)	0.8 1.2		
	Gradient %	8%		
	%Pool 30 Riffle 70 Run Other			
	Side Chan.% 0 ☐ 0-10 ☐ 10-40 ☐ >40 ☐			
	Debris Area% 0 ☑ 0-5 ☐ 5-15 ☐ >15 ☐			
	Debris Stable %	0-5		
	COVER: Total %			
	Comp. sum 100% — Dp Pool / L.O.D. / Boulder / In Veg / Over Veg / Cutbank			
	Crown Closure %	C	Aspect	

C	BED MATERIAL	%
	Fines clay,silt,sand (<2mm)	30
	Gravels small (2-16mm)	20
	Gravels large (16-64mm)	20
	Larges sm.cobble (64-128mm)	20
	Larges lge cobble (128-256mm)	10
	Larges boulder (>256mm)	
	Bedrock (R)	
	D_{90}(cm)	C Compaction L M H

C	BANKS					
	Height(m) 0.8	%Unstable				
	Texture	F	G	L	R	

Confinement	EN	CO	FC	OC	UC	N/A
Valley: Channel Ratio	0-2	2-5	5-10	10+		N/A
Stage	Dry	L	(M)	H	Flood	
Flood Signs Ht(m)		Braided	Y (N)			
Bars (%)		pH		O_2(ppm)		
Water Temp (°C) 10.5	Turb.(cm)		Cond.(25°C)			

OBSTRUCTIONS			
C	Ht(m)	Type	Loc'n

DISCHARGE

Parameter	Value	Method	Specific Data
Wetted Width (m)	6	Floating chip	
Mean Depth (m)	.5		
Mean Velocity (m/s)	1.5		
Discharge (m^3/s)	4		

REACH SYMBOL
(Fish)

(Width,Valley Channel,Slope) (Bed Material)

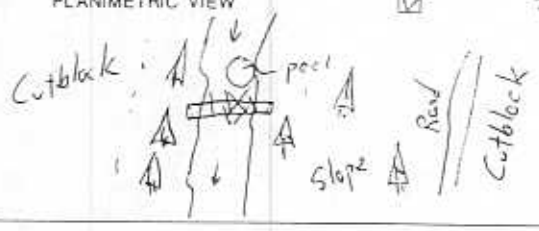
REVISED DEC. 87 SS187

FISH SUMMARY

C	Species	No.	Size Range (mm)	Life Phase	Use	Method (Rel)

STREAM/VALLEY CROSS-SECTION ☐
(Looking Downstream)

PLANIMETRIC VIEW ☑



COMMENTS

Channel Stability ☐, Debris ☐, Management Concerns ☐, Obstructions ☐, Riparian Zone ☐, Valley Wall Processes ☐, Etc.

Edited by:

Date Y M D

Photo 1. Exposed old road fill-slope with some gravels/boulders reaching the right bank of stream.
Stream Name: Whip Creek **Site #:** 7 **Reach #:** 4
Coordinates: 50°34.86' 118°29.05' **Code:** Q•S•F•3

Photo 2. Steel-span (railway cars) bridge with rotting wood deck and erosion of road surface, u/s view.
Stream Name: Whip Creek **Site #:** 8 **Reach #:** 4
Coordinates: 50°39.95' 118°30.30' **Code:** Fs/Q•C•F•1

APPENDIX VII

Wap Creek
Stream Information File

MID-SHUSWAP STREAM ASSESSMENT

STREAM: WAP CREEK
DATE: October 12, 1994
TAPE: WRP Tape 3

Review Aerial Photo Notes before proceeding to field !!! 05/04/95

LOCATION SYMBOL	CODE	COMMENTS	TIME	COORDINATES North	West
1		▸ mouth of the stream (north of *Mabel Lake*)	1:30:55	50.47.92*	118.37.04
2		▸ fish (salmon?) spawning in the channel	1:32:37		118.36.04
3	Q-F-F-2	▸ road visible on the right at the edge of the flood plain	1:33:52		118.35.22
12/11/94 ✱ 4	Fb/Q-D-F-1	▸ LWD some pieces with saw-cuts & continues u/s for quite a distance	1:34:34	50·44·69	118.35.00
5	Q-S-F-3	▸ cutblock on the left (~20 years regen.) with a 15-20m buffer	1:35:35		118.34.92
6	Fb-D-N-3	▸ series of beaver dams along the channel on the right	1:36:05		118.34.84
7		▸ fish (salmon?) in the channel	1:36:52		118.34.43
8	Fs/Q-S-N-3	▸ high eroding bank on the left with evidence of logging to the edge (gravel is of spawning size)	1:38:11		118.34.20
9		▸ confluence with *Derry Creek*	1:39:20		118.33.01
10	Fb-D-N-3	▸ beaver dams in the side channel on the right	1:39:48		118.34.03
11	Q-S-F-3	▸ historic cutblock on the left	1:40:27		118.34.43
12	Q-S-F-3	▸ large cutblock on the right with a 30m buffer	1:42:23		118.34.22
13	Fb/Q-C-F-2	▸ bridge	1:43:05		118.34.01
14	Fb-D-N-2	▸ large beaver dam across the channel; some broken areas	1:43:19		118.33.89
15	Q-S-F-2	▸ entire floodplain has been logged to the left of the channel & the right	1:44:36		118.33.39
16	Fb-D-N-3	▸ broken beaver dam	1:45:56		118.33.45
17	Fs/Q-S-F-2	▸ recent cutblock on the left	1:46:08		118.33.57
18	Fb/Q-C-F-2	▸ bridge & 500 KV powerline	1:46:25		118.33.80
19	Fb/Q-D-U-2	▸ stumps/LWD in the channel	1:49:02		118.34.39
20		▸ tributary on the left	1:49:47		118.33.99
21	Q-S-F-3	▸ cutblock on the right with a 15m buffer	1:49:47		118.33.9[illegible]

STREAM: WAP CREEK
DATE: October 12, 1994
TAPE: WRP Tape 3

LOCATION SYMBOL	CODE	COMMENTS	TIME	COORDINATES North	West
22		▸ *Wap Lake*, road runs along the shore on the right	1:50:46	50.47.92'	118.33.16
23	Fs/Q-F-F-2	▸ logging road <5m from the channel on the right	1:52:51		118.31.26
24	Fb-D-N-2	▸ broken beaver dam	1:53:33		118.30.84
25	Fb-D-N-2	▸ broken beaver dam	1:54:57		118.29.92
26	Fb/Q-C-F-2	▸ steel bridge with riprap	1:56:56		118.29.18
27	Fs/Q-S-N-3	▸ exposed bank on the right	1:57:19		118.28.90
28	Fb-W-U-2	▸ waterfall with a weir at the u/s end	1:57:29		118.28.81
29	Fs/Q-S-F-2	▸ logging roads on both sides a recent cutblock on the left	1:57:57		118.28.50
30	Fb-C-U-2	▸ adjustable weir	1:58:11		118.28.35
31	Fb-C-U-2	▸ small dam with a holding pool/pond u/s	1:58:37		118.27.95
32		▸ 500 KV powerline	1:58:47		118.27.77
33	Q-S-F-2	▸ cutblock on the left side	1:59:28		118.27.31
34	Fs/Q-S-N-3	▸ exposed bank on the left contributing sediment to the stream	1:59:44		118.27.11
12/11/94 35	Fs/Q-F-F-1	▸ cutblock on the right, road along the stream & evidence of erosion into the stream @ ~2600' elevation	2:00:14	50° 52.25	118.26.80
July 10/95 DH/mb 36	~~Fs/Q-S-F-1~~ Fs/Fb/Q-S/D-F-1	▸ slide on the left entering the stream corresponds with the road on the left @ ~3100' elevation	2:00:57	50.52.500' N	118.26.396' ~~118.26.37~~
July 10/95 DH/mb 37	~~Fs/Q-D-F-1~~ Fs/Fb/Q-S/D-F-1	▸ log jams/LWD with cut ends & sediment accumulating - slide on left entering stream	2:01:26	50°52.295'	118.25.899' ~~118.26.05~~
38	Q-F-F-2	▸ road on the left now ~10m from the channel ▸ tributary from *Joss Pass*	2:02:24		118.25.46
39	Fb/Q-C-F-2	▸ bridge	2:02:31		118.25.36
40	Fs/Q-S-F-2	▸ roads on both sides, cutblock on the right side some portions with no buffer	2:03:18		118.24.68
41		▸ abandoned "Skidder" on the road	2:03:34		118.24.42
42		▸ video ran out	2:03:47		118.24.26

STREAM: WAP CREEK
DATE: October 12, 1994
TAPE: WRP Tape 3

LOCATION SYMBOL	CODE	COMMENTS	TIME	COORDINATES North	West

* didn't quite reach the headwaters

* GPS Coordinate for latitude stuck

NOTE: 1-5: Map 82 L/10 1:50,000
6-24: Map 82 L/15 1:50,000
25-42: Map 82 L/16 1:50,000

511.03

DFO/MOEP FISH HABITAT INVENTORY AND INFORMATION PROGRAM
STREAM INFORMATION SUMMARY

Watershed Code: 03-5400-240
Stream Name: WAP CREEK

A. DESCRIPTION

Stream Name: WAP CREEK Local Name: Watershed Code: 03-5400-240	O.F.O. Division: FRASER RIVER District: 1 KAMLOOPS Subdistrict: 29K SALMON ARM Statistical Subarea: - M.O.E. Region: 8 OKANAGAN Management Unit: 24

Tributaries	Code
IRON CREEK	010
DEVIL CREEK	020
DALE CREEK	030
CAVENAUGH CREEK	040
DERRY CREEK	050
BOWMAN CREEK	060

Topographic (1:50k) Map: 82L/10 B.C.G.S. (1:20k) Map: U.T.M. Mouth: 11.3862.56205 Lat./Long. Mouth: 50 DG. 44' 0'' 118 DG. 37' 0'' Mainstem Length: 47.7 km Ref. No.: 29J-61 Watershed Area: Ref. No.:	Location: FLOWS SW INTO MABEL LAKE AT NORTH END, KAMLOOPS DISTRICT.

Gradient Class/Location (km upstream from mouth)					Comments
0 - .5%	.5 - 2%	2 - 5%	5 - 10%	>10%	GRADIENT DISCUSSED. BELOW FALLS, LOW TO MODERATE. (REF. 29K-40)

B. OBSTRUCTIONS TO MIGRATION

Barrier (Type)	Height (meters)	Location (km U/S)	Impassable to (species)	Comments
F FALLS	3.0	29.3	CH CHINOOK SALMON CO COHO SALMON SK SOCKEYE SALMON	TWO FALLS 3M, 21-30M (REF. 29K-2, REF. 29K-3, REF. 29K-40)

C. FLOW

Flow Control: W.S.C. Station No. 1: Water Survey of Canada (WSC) Flow Gauge: No. 2: No. 3: - No. 4:	
Comments: WAP LAKE IS LOCATED 22.5 KM UPSTREAM FROM THE MOUTH. WAP LAKE: AREA - 0.4 SQ.KM; PERIMETER - 3.4 KM. (REF. 29J-61, REF. 29K-3)	

D. DISTRIBUTION SUMMARY

Species	Watershed Distribution
SK SOCKEYE SALMON	SPAWNING IN LOWER 4 KM (REF. 29K-46)
CO COHO SALMON	5 KM ABOVE AND 5KM BELOW WAP LAKE. (REF. 29K-22)
CH CHINOOK SALMON	PRESENCE NOTED (REF. 29K-46)
CC SCULPINS (GENERAL)	PRESENCE NOTED (REF. 29K-34, REF. 29K-40)
DV DOLLY VARDEN	PRESENCE NOTED (REF. 29K-34, REF. 29K-40)
KO KOKANEE	LOWER SECTION (REF. 29K-40)
RW ROCKY MTN WHITEFISH	PRESENCE NOTED (REF. 29K-34, REF. 29K-40)
RB RAINBOW TROUT	PRESENCE NOTED (REF. 29K-34, REF. 29K-40)

E. ESCAPEMENT SUMMARY

Species	Escapement			Maximum Recorded Escapement	Ref. No.	Management Target Escapement	Ref. No
	Mean	Period of Record	Ref. No.				
SK SOCKEYE SALMON	176	1978 - 1987	28A-18	1069	28A-18		
CO COHO SALMON	218	1978 - 1987	28A-18	450	28A-18		

F. LIFE HISTORY TIMING

Species	Activity	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
CO COHO SALMON	Migration Spawning Incubation Rearing											I	I

Comments: COHO SPAWNING TIMING INFORMATION. (REF. 29D-14, REF. 29K-2)

G. ENHANCEMENT/MANAGEMENT ACTIVITIES IN WATERSHED

Type of Activity	Species	Location (km U/S)	Comments	Period of Operation Start/Finish
FS FISH SAMPLING	RB RAINBOW TROUT		BIOPHYSICAL RECONNAISSANCE STUDY. KINGFISHER COMMUNITY CLUB AND MOE. (REF. 29J-55)	1989/1989

H. LAND USE/WATER USE/WATER QUALITY

Activity	Description/Location
FO FORESTRY	LOGGING AFTER EFFECTS INCLUDE LOG JAMS, DEBRIS ACCUMULATION, EROSION AND CHANNELIZATION. (REF. 29K-22)
LD LINEAR DEVELOPMENT	B.C. HYDRO POWER TRANSMISSION LINES. (REF. 29K-22)
DA DAMS	SMALL HYDRO POWER DEVELOPMENT AT FROG FALLS. (REF. 29K-46)

I. FISH PRODUCTION POTENTIAL/CONSTRAINTS/GENERAL COMMENTS

ALTHOUGH HABITAT POTENTIAL IS NOT QUANTIFIED, IT APPEARS THIS STREAM OFFERS EXCELLENT OPPORTUNITY FOR COHO ENHANCEMENT. SYSTEM APPEARS TO BE IMPORTANT TO REGIONAL COHO AND SOCKEYE PRODUCTION. (REF. 29K-53)

POTENTIAL PROJECTS FOR ENHANCEMENT: 1. INCUBATION/REARING FACILITY FOR COHO AND CHINOOK 2. CHINOOK EGG OR FRY PLANTS 3. FRY STOCKING BEHIND BEAVER DAMS 4. PEN REARING IN WAP LAKE 5. DEVELOPMENT OF A SEMI-NATURAL SPAWNING/REARING CHANNEL. (REF. 29K-3)

J. FISHERY OFFICER NARRATIVE

Date Prepared: 1988/04/01 Prepared By: B. KURTZ, OP. FRAMEWORK

K. SIS COMPLETED BY

Completed by:	D. FARRELL	Date: 1986/12/22
Checked by:	LIDIA JAREMOVIC	Date: 1988/04/27
Last updated by:	CATHY GEE	Date: 1990/09/19
Last checked by:	L. JAREMOVIC	Date: 1990/09/19

1 REFERENCING INFORMATION

Stream Name: WAP CREEK

Alias#1:

Watershed Code: 128-8355-366-000

Alias#2:

Watershed Code cont:

SISS/RAB Code: 03-5400-240-000-

Confluence ID: Map No. | ID | P C O N | Confluence UTM: ZONE | EASTING | NORTHING

Completed by: KOPEC C

Date: (yymmdd) 950123

2 STREAM INFORMATION

WATER SURVEY OF CANADA STATIONS

Loc. Ref: Map No.	ID		Station No.
		P W S C	
		P W S C	
		P W S C	
		P W S C	

WATER QUALITY

Loc. Ref: Map No.	ID		Station No.	Ref No.
		P W Q S		
		P W Q S		
		P W Q S		
		P W Q S		

3 PROVINCIAL FISHERIES MANAGEMENT OBJECTIVES

Habitat type: IR Management Objective 1: Management Objective 2:

4 ENHANCEMENT AND MANAGEMENT ACTIVITIES

Map No.	ID	Type	Activity	Project	Start	Finish	Species (list all species by code)				Ref #
		W	MR				KO	DV	RB	MW	8081
			Cmt NO FISHING BELOW FROG FALLS (EXCLUDING WAP LAKE) OR ABOVE FROG FALLS SEPT 1 - JUNE 30								
			Cmt								
			Cmt								
			Cmt								
			Cmt								
			Cmt								
			Cmt								
			Cmt								
			Cmt								
			Cmt								

5 RESOURCE USE INFORMATION

St.Name

Map No.	ID	Type	Code	CATCH Mean	High	Low	EFFORT Mean	High	Low	Seas.	Start	To	Finish	Cmt	Ref#

6 FISHERIES POTENTIAL AND CONSTRAINTS

Map No.	ID	Type	Activity	P	L	Species	Comment	Ref. No.
0,7,2,4,1,5	8,0,7,8	U	E,H,S,	G	M	K,O,	KOKANEE SPAWNING IN LOWER 4 MILES	8,0,6,6,
	0,1,0,							
0,7,2,4,1,0	0,1,9,	D	E,H,S,	G	M	K,O,		8,0,6,6,
	0,1,8,							

7 OBSTRUCTIONS

St.Name WAP CREEK

Map No.	ID	Type	OBS	Height	Length	Species Blocked		Ref #
0.8.2.4.1.5	8.0.1.8	U	X			I		8.0.6.6
	0.1.3.	D	Cmt LARGE LOG JAMS AS A RESULT OF POOR LOGGING - MILE 4 TO MILE 6					
0.8.2.4.1.5	8.0.1.9	P	X			D,V		8.0.6.6
			Cmt SERIES OF LOG JAMS 1 MILE BELOW WAP LAKE					
	0.1.6.	U	B,D					8.0.6.6
	0.1.7.	D	Cmt BEAVER DAMS AT MOUTH OF TRIBUTARIES PREVENT FISH ACCESS EXCEPT IN PERIODS OF HIGH FLOW					
			Cmt					
			Cmt					

8 LAND USE

Map No.	ID	Type	Land Use	Date	Comment	Ref. No.

9 VALUE / SENSITIVITY COMMENTS

Map No.	ID	Type	Code	Value Comment	Ref. No.

Map No.	ID	Type	Code	Sensitivity Comment	Ref. No.

STREAMS / LAKES SPECIES INFO DATA FORM

WAP CREEK 1

10 SPECIES SIDE A

SPECIES / STOCK IDENTIFICATION

Species	Char	Stock	Stock Type	Mgt Cla	CDC Local	CDC Global
KO	RS			WI		

11 FISH DISTRIBUTION

Map no.	ID	Type	Activity	Comment	Ref #
0,8,2,4,1,5	8,0,1,8	D	6,P,L	SPAWNING FOR KOKANEE	8,0,6,6
0,8,2,4,1,0	0,1,0,				
0,8,2,4,1,0	8,0,1,8	U	5,P,L	KOKANEE SPAWNING	8,0,6,6
	0,1,9,				
0,8,2,4,1,5	8,0,1,8	D	0,B,L	NO KOKANEE OBSERVED PAST THIS POINT	8,0,6,6
	0,1,0,				
0,8,2,4,1,0	0,1,9,	U			
	0,1,8,				

12 HARVEST AND USE

Map No.	ID	Type	Code	CATCH Mean	High	EFFORT Mean	High	CPU Mean	High
			Seas.	Start	To Finish	Cmt			Ref #

13 ESCAPEMENT

Species	10 YR. Period	10 YR. Mean	10 YR.Max.	Period of Record	Max.	Year	Target

Cmt Ref #

14 LIFE HISTORY AND TIMING

Ref #

Activity	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Migration												
Spawning												
Incubation												
Rearing												

SPECIES / STOCK IDENTIFICATION

Species	Char	Stock	Stock Type	Mgt Cla	CDC Local	CDC Global
DV	RS			WI		

11 FISH DISTRIBUTION

Map no.	ID	Type	Activity	Comment	Ref #
0,8,2,4,1,5	8,0,1,9	P	0,B,L	DOLLY VARDEN REDDS OBSERVED AT THIS POINT	8,0,6,6

12 HARVEST AND USE

Map No.	ID	Type	Code	CATCH Mean	High	EFFORT Mean	High	CPU Mean	High
			Seas.	Start	To Finish	Cmt			Ref #

13 ESCAPEMENT

Species	10 YR. Period	10 YR. Mean	10 YR.Max.	Period of Record	Max.	Year	Target

Cmt Ref #

14 LIFE HISTORY AND TIMING

Ref #

Activity	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Migration												
Spawning												
Incubation												
Rearing												

10 A SPECIES

	Species	Char	Stock	Stock Type	Mgt Cls	CDC Local	CDC Global	Ref #
1	K,O,	R,S			WI			8066
2	D,V,	R,S			WI			8066
3	R,B,	R,S			WI			8,0,6,6,
4	M,W,	R,S			WI			8,0,6,6,
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								

LAKES INFO DATA [illegible]

REFERENCING INFORMATION

Lake Name: JAP LAKE

Alias 1:

Watershed Code: 1,2,8,-,8,3,5,5,-,3,6,6,-,0,0,0,-

Alias 2:

Watershed Code cont:

Lake Seq #: 011

SSS/RAB Code:

Outlet ID: Map No. 082L15 | ID | PCODE | Outlet UTM: ZONE | EASTING | NORTHING

Completed by: KP,P,E,G,C | Date: (yy/mm/dd)

LAKE INFORMATION

(yy/mm/dd)

Surface Area: Ha | Shed Area: Ha

Mean Depth: | Max Depth:

Perimeter: km | Tributaries: | Outlets: 1

Elevation: 545 | Inlets: permanent: 2

Ref #: | Intermittent:

Ref #	SPECIES SUMMARY (list all species by code)		
8,0,0,3,	RB,		

TDS: | PH: | Alkalinity: | Ref #:

Angler Access: A, | Facilities: M,F | Ref #:

PROVINCIAL FISHERIES MANAGEMENT OBJECTIVES

Habitat type: S,L | Management Objective 1: A,H | Management Objective 2:

ENHANCEMENT AND MANAGEMENT ACTIVITIES

Map No.	ID	Type	Activity	Project	Start	Finish	Species	(list all species by code)	Ref #
082L15		W	MP			TO-	RB,		8,0,0,3,
Cmt: SCENIC AND IMPORTANT FOR MIGRATORY FISH PROJECT IN PRISTINE STATE - HATCHERY STOCKING MAY BE WORTHWHILE TO CONSIDER									
						TO-			
Cmt:									
						TO-			
Cmt:									
						TO-			
Cmt:									
						TO-			
Cmt:									
						TO-			
Cmt:									
						TO-			
Cmt:									
						TO-			
Cmt:									
						TO-			
Cmt:									
						TO-			
Cmt:									

LAKES INFO DATA ENTRY

RESOURCE USE INFORMATION

DATA: WAP LAKE

Map No.	ID	Type	Code	DATA Mean	High	Low	EFFORT Mean	High	Low
0,8,2,4,1,0		W	R,E,C				5.1		

Season	Start	To	Finish	Cite	Ref #
	85		85	EFFORT MEAN OBTAINED FROM 'SLIM' INDEX - DOES NOT ACCOUNT FOR WINTER FISHING	8.007

FISHERIES POTENTIAL AND CONSTRAINTS

Map No.	ID	Type	Activity	P	L	Species	Comment	Ref. No.

LAKES INFO DATA FORM

INSTRUCTIONS

LAKE NAME: WAP LAKE

Map No.	ID	Type	OBS	Height	Length	Seasons Blocked
Cmt:						Ref. #
Cmt:						Ref. #
Cmt:						Ref. #
Cmt:						Ref. #
Cmt:						Ref. #

LAND USE

Map No.	ID	Type	Land Use	Date	Comment	Ref. No.

VALUE / SENSITIVITY COMMENTS

Map No.	ID	Type	Code	Value Comment	Ref. No.
		W	S-E-E	PRISTINE - LAKE	70-03

Map No.	ID	Type	Code	Sensitivity Comment	Ref. No.

PECIES SIDE A

SPECIES / STOCK IDENTIFICATION

Species	Char	Stock	Mgt Cls	CDC Local	CDC Global
R.B.	R.S.I		WI		

1 FISH DISTRIBUTION

Map no.	ID	Type	Activity	Comment	Ref #
		W	R, E, A	REARING THROUGHOUT LAKE	8003

2 HARVEST AND USE

Map No.	ID	Type	Code	CATCH Mean	High	EFFORT Mean	High	CPU Mean	High

Seas.	Start	To	Finish	Cmt	Ref #

3 ESCAPEMENT

Species	10 YR. Period	10 YR. Mean	10 YR. Max.	Period of Record	Max.	Year	Target

Cmt

Ref #

4 LIFE HISTORY AND TIMING

Ref #

Activity	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Migration												
Spawning												
Incubation												
Rearing												

SPECIES / STOCK IDENTIFICATION

Species	Char	Stock	Mgt Cls	CDC Local	CDC Global

11 FISH DISTRIBUTION

Map no.	ID	Type	Activity	Comment	Ref #

12 HARVEST AND USE

Map No.	ID	Type	Code	CATCH Mean	High	EFFORT Mean	High	CPU Mean	High

Seas.	Start	To	Finish	Cmt	Ref #

13 ESCAPEMENT

Species	10 YR. Period	10 YR. Mean	10 YR. Max.	Period of Record	Max.	Year	Target

Cmt

Ref #

14 LIFE HISTORY AND TIMING

Ref #

Activity	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Migration												
Spawning												
Incubation												
Rearing												

DFO / MOE
STREAM SURVEY FORM

Stream Name (gaz.)	Wap Creek	(local)		Access	Method
Watershed Code		Reach No.		Length(km)	
Location	site #37, #36	Map		Site No.	Lt.surv(m) 150
		U.T.M.		Fish Card Y N	C Field ☐ Hist. ☐
Date Y M D	95 07 10	Time 10^30	Agency	Crew MG / DH /	Photos	Air Photos

C	PARAMETER	VALUE	METH.	SPECIFIC DATA
	Ave.Chan.Width (m)	15	GE	
	Ave.Wet Width (m)	12	↓	
	Ave.Max.Riffle Depth (cm)	10	↓	
	Ave.Max.Pool Depth (cm)	200	↓	
	Gradient %	8-10	CL	
Cl	% Pool 20, Riffle 50, Run 10, Other 20		GE	
	Side Chan. %	0 ☐ 0-10 ☐ 10-40 ☐ >40 ☐	↓	
	Debris Area %	0 ☐ 0-5 ☐ 5-15 ☐ >15 ☐	↓	
	Debris Stable %		↓	
	COVER: Total %	15		

Comp. sum 100%	Dp Pool	L.O.D.	Boulder	In Veg	Over Veg	Cutbank
	20	20	10		30	20

Crown Closure % 10 | C Aspect W

C	BED MATERIAL		%
	Fines	clay, silt, sand (<2mm)	5
	Gravels	small (2-16mm)	30
	Gravels	large (16-64mm)	90 / 70
	Larges	sm.cobble (64-128mm)	30
	Larges	lge.cobble (128-256mm)	D 40
	Larges	boulder (>256mm)	30
	Bedrock (R)		
	D_{90}(cm)	C Compaction	L (M) H

C	BANKS				
	Height(m) 2	% Unstable 30			
	Texture	F (G L) R			
	Confinement	EN (CO) FC OC UC N/A			
	Valley: Channel Ratio	0-2 (2-5) 5-10 10+ N/A			
	Stage	Dry L (M) H Flood			
	Flood Signs Ht(m)		Braided	Y (N)	
	Bars (%) Ø	pH —	O_2(ppm) —		
	Water Temp.(°C) 7	Turb.(cm) —	Cond.(25°C) —		

OBSTRUCTIONS			
C	Ht(m)	Type	Loc'n

DISCHARGE

Parameter	Value	Method	Specific Data
Wetted Width (m)			
Mean Depth (m)			
Mean Velocity (m/s)			
Discharge (m^3/s)			

REACH SYMBOL
(Fish)

(Width,Valley,Channel,Slope) (Bed Material)

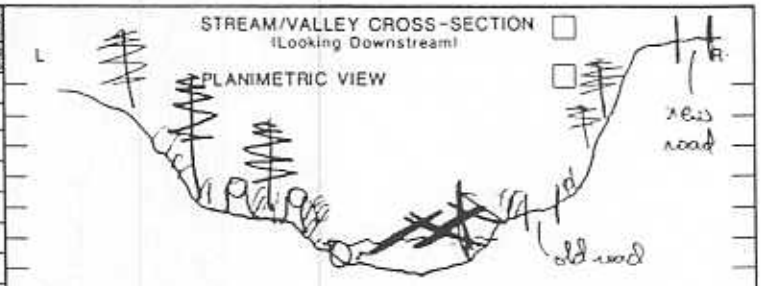
REVISED DEC. 87 SS187

FISH SUMMARY

C	Species	No.	Size Range(mm)	Life Phase	Use	Method/Rel

STREAM/VALLEY CROSS-SECTION ☐

(Looking Downstream)



COMMENTS

Channel Stability ☐, Debris ☐, Management Concerns ☐, Obstructions ☐, Riparian Zone ☐, Valley Wall Processes ☐, Etc.

C1 20% of the channel is rapids through cobbles/boulders

- some of the LWD at this site has created very deep pools (>3m) but also poses as a possible barrier to fish migr.
- optical LWD at site 36 has created some deep pools (3m) & is more of a barrier than the trees at site 37

- if fish have access to the reach, not likely due to d/s weirs/dam, it would be good spawning/rearing habitat for RT

Edited by

Date Y M D

DFO / MOE
STREAM SURVEY FORM

Stream Name (gaz.) Wap Creek (local) | Access | | Method
Watershed Code | Reach No. 12 | Length (km) |
Location | Map # | Site No. 4 | Length (m) |
UTM | Fish Card: Y (N) C | Field ☐ Hist ☐
Date Y M D 94 11 12 | Time 1300 | Agency | Crew MEG/SHH | Photos | Air Photos

C	PARAMETER	VALUE	METH.
	Ave. Chan. Width (m)		
	Ave. Wet. Width (m)		
	Ave. Max. Riffle Depth (cm)		
	Ave. Max. Pool Depth (cm)		
	Gradient %	3	
	% Pool 30 Rif 40 Run 30 Other		
	Side Chan. % 0 ☐ 0-5 ☐ 5-15 ☐ 15-40 ☐ >40 ☑		
	Debris Area % 30 0 ☐ 0-5 ☐ 5-15 ☐ >15 ☑		
	Debris Stable %	50	
	COVER: Total %	10	

Comp. sum 100%	Dp Pool	L.O.D.	Boulder	In Veg	Over Veg	Cutbank
		50			40	10

Crown Closure % | C | Aspect

SPECIFIC DATA
0-25 (flood level), 15-20 (peak flow)
12 (main flow), 12
10, 5
200, 100

C	BED MATERIAL		%
	Fines	clay, silt, sand (<2mm)	30
	Gravels	small (2-16mm)	40
		large (16-64mm)	50 60
	Larges	sm. cobble (64-128mm)	70
		lge. cobble (128-256mm)	20 30
		boulder (>256mm)	
	Bedrock (R)		

D_{90} (cm) 3 | C | Compaction | L (M) H

C	BANKS				
	Height (m)	2	% Unstable	70	
	Texture	F	G	L	R

Confinement	EN	CO	FC	(OC)	UC	N/A
Valley: Channel Ratio	0-2	2-5	5-10	(10+)		N/A
Stage	Dry (1)		M	H		Flood
Flood Signs Ht (m)	2		Braided	(Y)	N	
Bars (%)	40		pH		O_2 ppm	
Water Temp (°C)	3		Turb. (cm)		Cond. (25°C)	

OBSTRUCTIONS			
C	Ht (m)	Type	Loc'n

DISCHARGE

Parameter	Value	Method	Specific Data
Wetted Width (m)			
Mean Depth (m)			
Mean Velocity (m/s)			
Discharge (m^3/s)			

REACH SYMBOL (Fish)

(Width, Valley, Channel, Slope) (Bed Material)

REVISED DEC 87 SS1.87

DFO / MOE
STREAM SURVEY FORM

Stream Name (gaz.) Wap Creek (local) | Access | | Method
Watershed Code | Reach No. | Length (km) |
Location 50 52.784 118 26.789 939m elev. | Map # | Site No. 35 | Length (m) 200
UTM | Fish Card: Y (N) C | Field ☐ Hist ☐
Date Y M D 94 11 12 | Time 1015 | Agency | Crew MEG/SHH | Photos | Air Photos

C	PARAMETER	VALUE	METH.
	Ave. Chan. Width (m)		
	Ave. Wet. Width (m)		
	Ave. Max. Riffle Depth (cm)		
	Ave. Max. Pool Depth (cm)		
	Gradient %	10	
	% Pool 20 Rif 50 Run 20 Other		
	Side Chan. % 5 0 ☐ 0-5 ☑ 5-15 ☐ 15-40 ☐ >40 ☐		
	Debris Area % 5 0 ☐ 0-5 ☐ 5-15 ☑ >15 ☐		
	Debris Stable %	90	
	COVER: Total %	20	

Comp. sum 100%	Dp Pool	L.O.D.	Boulder	In Veg	Over Veg	Cutbank
		10	20		60	10

Crown Closure % | C | Aspect

SPECIFIC DATA
9.8
5.5
30, 40
150, 100

C	BED MATERIAL		%
	Fines	clay, silt, sand (<2mm)	5
	Gravels	small (2-16mm)	5
		large (16-64mm)	10
	Larges	sm. cobble (64-128mm)	
		lge. cobble (128-256mm)	50
		boulder (>256mm)	
	Bedrock (R)		30

D_{90} (cm) 40 | C | Compaction | L M (H)

C	BANKS				
	Height (m)	2	% Unstable	10	
	Texture	F	G	(L	R)

Confinement	EN	(CO)	FC	OC	UC	N/A
Valley: Channel Ratio	0-2	(2-5)	5-10	10+		N/A
Stage	Dry	(L)	M	H		Flood
Flood Signs Ht (m)	2		Braided	(Y)	N	
Bars (%)	5		pH		O_2 ppm	
Water Temp (°C)	3		Turb. (cm)		Cond. (25°C)	

OBSTRUCTIONS			
C	Ht (m)	Type	Loc'n

DISCHARGE

Parameter	Value	Method	Specific Data
Wetted Width (m)			
Mean Depth (m)			
Mean Velocity (m/s)			
Discharge (m^3/s)			

REACH SYMBOL (Fish)

(Width, Valley, Channel, Slope) (Bed Material)

REVISED DEC 87 SS1.87

C	Species	No.	Size Range(mm)	Life Phase	Use	Method/Ref.

STREAM/VALLEY CROSS-SECTION ☐ (Looking Downstream)

PLANIMETRIC VIEW ☐

L R

COMMENTS

Channel Stability ☐, Debris ☐, Management Concerns ☐, Obstructions ☐, Riparian Zone ☐, Valley Wall Processes ☐, Etc.

- this site has a very wide floodplain 50-100m
- extensive debris across the entire floodplain, it appears that the floodplain was logged & possibly burned long ago (50+ yrs)

excellent fish habitat with many deep (>2m) pools, areas of spawning size gravel & lots of off-channel habitat.

- a fish carcass was found in the channel just d/s of the beaver dam on the side channel
- one Salmon (sockeye) ~ 70 cm fl seen swimming [illegible] small side [illegible]

Edited by

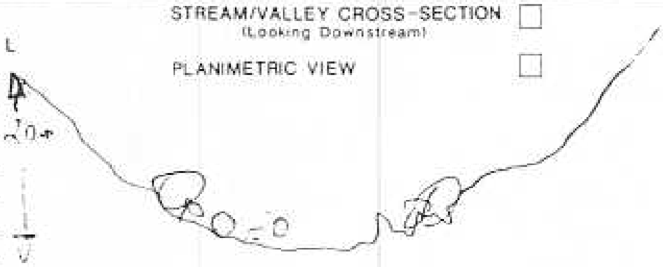
Date Y M D:

C	Species	No.	Size Range(mm)	Life Phase	Use	Method/Ref.

STREAM/VALLEY CROSS-SECTION ☐ (Looking Downstream)

PLANIMETRIC VIEW ☐

L R



COMMENTS

Channel Stability ☐, Debris ☐, Management Concerns ☐, Obstructions ☐, Riparian Zone ☐, Valley Wall Processes ☐, Etc.

- this portion of the reach has very little cover, steep gradient & very large substrate

→ very poor fish habitat

Edited by

Date Y M D:

Photo 1. Streambank at Site #4 showing interbedded layers of sand and peat. Note charcoal layers indicating historic fire.

Photo 2. Wap Creek: Washed out bridge abutments at Site #4.

Photo 3. LWD scattered across channel at Wap Creek Site #4. Note eroding bank at right.

Photo 4 Hill slump originating at the road 20 m above the channel on the left bank.
Stream Name: Wap Creek **Site #:** 35 **Reach #:** 8
Coordinates: 50°52'78N 118°26'78W **Code:** Fs/Q•S•F•1

Photo 5 Slide from the road with some active erosion and some regeneration of vegetation.
Stream Name: Wap Creek **Site #:** 36 **Reach #:** 8
Coordinates: 50°52.53' 118°26.26' **Code:** Fb/Fs/Q•D/S•F•1

Photo 6 Debris jam at the base of the slide with much of the debris being unstable, d/s view.
Stream Name: Wap Creek **Site #:** 36 **Reach #:** 8
Coordinates: 50°52.53' 118°26.26' **Code:** Fb/Fs/Q•D/S•F•1

Photo 7 Debris jam (2 m high) with accumulation of sediment and channel widened to 20 m.
Stream Name: Wap Creek **Site #:** 37 **Reach #:** 8
Coordinates: 50°52.30' 118°25.90' **Code:** Fb/Fs/Q•D/S•F/N•1

APPENDIX VIII

Kingfisher Creek
Stream Information File

July 14/9

MID-SHUSWAP STREAM ASSESSMENT

Site #32 visited in Nov 14/94 however no write-up in Interim report and I can't find field notes for the site. - DH

STREAM: KINGFISHER CREEK
DATE: October 13, 1994
TAPE: WRP Tape 4

* - to visit	LOCATION SYMBOL	CODE		COMMENTS	TIME		
	1		▸	mouth of the stream	1:14:33		
	2	Q-C-Hw-3	▸	bridge	114:33		
visited 14/11/94 *	3	~~Fb/Q-D-U-1~~ Fb/Q-D-N/F-1	▸	LWD on the right	1:15:59	50 38.15	118.44.29
	4	Fs/Q-S-N-3	▸	high eroding colluvial bank on the left	1:16:21	50.38.321'	~~118.44.40~~ 118.44.525
July 7/95 DH/mg *	5	Fb/Q-D-U-1 N/A.	▸	~~trees across the channel & a small debris jam~~ No debris jam observed	1:18:12	50.38.341	~~118.44.73~~ 118.44.85
July 7/95 DH/mg. *	6	~~Fb/Q-D-U-1~~ N/A	▸	~~large debris jam on the left~~ No debris jam observed.	1:18:26	50.38.341	~~118.44.81~~ 118.44.85
	7	Fs/Q-S-N-3	▸	small colluvial slide on the left	1:18:46		118.44.94
July 4/95 DH/mg *	8	Q-D-N/F-3 ~~Fb/Q-D-U-1~~	▸	large amount of debris covering the channel	1:19:58		118.45.02
July 4/95 mg *	9	~~Fb/Q-C-U-1~~ ~~Fb~~Q-C-F-3	▸	old concrete bridge abutment falling into the channel	1:20:57	50.39.368'	118.45.08 ~~118.45.21~~
	10	Fb-D-N-3	▸	side channel on the right controlled by a beaver dam	1:21:39		118.45.34
	11	Q-S-F-3	▸	cutblocks on both sides up on the terrace, not affecting the stream	1:22:01		118.45.25
	12		▸	tributary on the left side (not *Hunter's Creek* as was mentioned on the video)	1:22:18		118.45.15
visited 14/11/94 *	13	Fb/Q-D-N/F-1 ~~Fb/Q-D-U-1~~	▸	large amount of LWD covering the entire channel	1:22:29	50° 39.90	118.45.19
	14	Q-S-F-2	▸	old cutblocks on the terrace on the left	1:22:49		118.45.32
*	15	Fb/Q-D-U-1	▸	large debris jam	1:22:59		118.45.27
	16	Fs/Q-S-F-2	▸	recent cutblock on the left with a buffer of 5-10m	1:23:17		118.45.25
	17		▸	starting up *Hunter's Creek*, incorrectly named as being *Kingfisher* at the confluence with *Danforth Creek* *actually still ~1km d/s from *Danforth*	1:26:02		118.45.08
	18		▸	advanced video to point where *Kingfisher* is correctly named	1:35:55		118.45.22
July 7/95 mg *	19	~~Fb/Q-D-U-1~~ Fb/Fs/Q-D-N/F-1	▸	log jam	1:36:08	50.41.216'	118.44.965 ~~118.45.11~~
July 7/95 DH/mg *	20	~~Fb/Q-D-U-1~~ Fb/Fs/Q-D-N/F-1	▸	LWD across the channel	1:36:58	50.41.216'	~~118.44.87~~ 118.44.96

STREAM: KINGFISHER CREEK
DATE: October 13, 1994
TAPE: WRP Tape 4

LOCATION SYMBOL	CODE	COMMENTS	TIME	COORDINATES North	COORDINATES West
21		▸ 500 KV powerline, just d/s of confluence with *Danforth*	1:37:15	50:35:05*	118.44.83
22	Q-D-U-2	▸ LWD across the channel, not a barrier to fish; some LWD has cut ends	1:37:42		118.44.97
visited 4/11/94 * 23	Q-S-F-1	▸ large cutblock on the right; some areas with no buffer	1:38:44		118.45.26
visited 14/11/94 → 24	Q-S-R-2	▸ dolomite operation on the right	1:39:05		
Nov 14/94 * 25	~~Q-S-F-2~~ Fb/Q-D-F-1	▸ old cutblocks on both sides with buffers ranging from 10-15 m	1:40:03	50°42.62	118.45.29 ~~118.45.42~~
July 7/95 DH/MG * 26	~~Fb/Q-D-U-1~~ Fb/Fs/Q-D-F-1	▸ very extensive LWD through this section of the stream	1:40:14	50.42.989'	~~118.45.45~~ 118.45.32'
27	Q-F-F-2	▸ road on the left <5m from the channel	1:40:21		118.45.45
1 94 * 28 Re-visited July 7/95 DH/MG	~~Fb/Q-D-U-1~~ Fb/Fs/Q-D-F-1	▸ large debris jam	1:40:51	50.43.472'	~~118.45.42~~ 118.45.259'
29		▸ tributary on the left	1:41:32		118.45.37
30	Q-S-F-3	▸ cutblock on the left with ~5-10 years regen., up above the channel on the terrace	1:42:29		118.44.75
31	Q-S-F-3	▸ cutblock on the right ~30m buffer	1:43:46		118.44.16
visited 14/11/94 * 32	Fs/Q-F-F-1	▸ sand slumping from the road adjacent to the stream, not apparent if it impacted the stream	1:44:20	50 [illegible]	[illegible] 118.44.10
33	Q-S-F-2	▸ cutblock on the left ~5 years old	1:45:23		118.44.50
34	Fs/Q-S-N-3	▸ historic eroding bank on the left @ ~3500' elevation	1:46:34		118.44.89
35	Q-S-F-2	▸ recent cutblock on the left @ ~4000' elevation	1:48:10		118.45.49
36		▸ tributary on the left climbing steeply up a valley	1:49:24		118.45.63
37		▸ 4900' elevation	1:50:14		118.45.40
38	Fb/Q-D-U-2	▸ small lake at the base of an avalanche track on the right, blocked by LWD at the outlet	1:51:12		118.45.37
39	Fb-S-N-2	▸ large slide on the right has moved the channel to the left	1:52:23		118.45.59
40	Fb-W-N-3	▸ series of waterfalls over bedrock	1:52:36		118.45.48

STREAM: KINGFISHER CREEK
DATE: October 13, 1994
TAPE: WRP Tape 4

LOCATION SYMBOL	CODE	COMMENTS	TIME	COORDINATES North	West
41		▸ headwaters on the plateau @ ~5700' elevation	1:53:17		118.45.08

* GPS Coordinate for Latitude stuck

NOTE: 1-32: Map 82 L/10 1:50,000
33-41: Map 82 L/15 1:50,000

511.03

OFO/MOEP FISH HABITAT INVENTORY AND INFORMATION PROGRAM
STREAM INFORMATION SUMMARY

Watershed Code: 03-5400-210
Stream Name: KINGFISHER CREEK

A. DESCRIPTION

Stream Name: KINGFISHER CREEK	D.F.O. Division: FRASER RIVER
Local Name:	District: 1 KAMLOOPS
Watershed Code: 03-5400-210	Subdistrict: 29K SALMON ARM
	Statistical Subarea: -
	M.O.E. Region: 8 OKANAGAN
	Management Unit: 25

Tributaries	Code
HUNTERS CREEK	020
DANFORTH CREEK	030

Topographic (1:50k) Map: 82L/10
B.C.G.S. (1:20k) Map:
U.T.M. Mouth: 11.3768.56080
Lat./Long. Mouth: 50 DG. 37' 0'' 118 DG. 45' 0''
Mainstem Length: 28.3 km Ref. No.: 29J-61
Watershed Area: Ref. No.:

Location: FLOWS S INTO LOWER SHUSWAP RIVER APPROXIMATELY 1.4KM DOWNSTREAM OF MABLE LAKE, KAMLOOPS DISTRICT

Gradient Class/Location (km upstream from mouth)					Comments
0 - .5%	.5 - 2%	2 - 5%	5 - 10%	>10%	GRADIENT DISCUSSED. LOWER REACHES MODERATE TO RELATIVELY STEEP; UPPER MIDDLE SECTION IS FLAT; UPPER REACHES STEEP. (REF. 29K-46)

B. OBSTRUCTIONS TO MIGRATION

Barrier (Type)	Height (meters)	Location (km U/S)	Impassable to (species)	Comments
NO INFORMATION AVAILABLE				

C. FLOW

Flow Control: N
W.S.C. Station No. 1: Water Survey of Canada (WSC) Flow Gauge: N
No. 2: No. 3: No. 4:

NO INFORMATION AVAILABLE

D. DISTRIBUTION SUMMARY

Species	Watershed Distribution
CO COHO SALMON	SPAWN FROM 8 KM - 13 KM. (REF. 29K-46)
RB RAINBOW TROUT	LARGE MIGRATORY RAINBOW HAVE BEEN SEEN SPAWNING (REF. 29K-35)

E. ESCAPEMENT SUMMARY

Species	Escapement			Maximum Recorded Escapement	Ref. No.	Management Target Escapement	Ref. No.
	Mean	Period of Record	Ref. No.				
CO COHO SALMON	54	1978 - 1987	28A-18	120	28A-18		

F. LIFE HISTORY TIMING

Species	Activity	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
NO INFORMATION AVAILABLE													

G. ENHANCEMENT/MANAGEMENT ACTIVITIES IN WATERSHED

Type of Activity	Species	Location (km U/S)	Comments	Period of Operation Start/Finish
CO COLONIZATION	CO COHO SALMON		EGGS TO KINGFISHER HATCHERY ON LOWER SHUSWAP RIVER AND OUTPLANTED BACK TO KINGFISHER. EGG TARGET 20,000. (PIP PROJECT). (REF. 29K-46)	1982/
CF COUNTING FENCE	CO COHO SALMON RB RAINBOW TROUT	0.2	KINGFISHER COMMUNITY CLUB. (REF. 29K-55)	1984/1985

H. LAND USE/WATER USE/WATER QUALITY

Activity	Description/Location
FO FORESTRY	EXTENSIVE LOGGING IN UPPER WATERSHED. (REF. 29K-46)

I. FISH PRODUCTION POTENTIAL/CONSTRAINTS/GENERAL COMMENTS

AVERAGE COHO FRY DENSITY-0.44/METRE SQUARED; RAINBOW-0.27/METRE SQUARED; STREAM COULD BE CAPABLE OF SUPPORTING CONSIDERABLY HIGHER FISH DENSITIES. RAINBOW THE MOST APPROPRIATE SPECIES TO ENHANCE SOME LEVEL OF COHO ALSO. VIOLENT FLOODING IS LIMITING FACTOR. (REF. 29K-35)

J. FISHERY OFFICER NARRATIVE

Date Prepared: 1988/04/01 Prepared By: B. KURTZ, OP. FRAMEWORK

K. SIS COMPLETED BY

Completed by:	GEORGE FARRELL	Date:	1986/12/17
Checked by:	LIDIA JAREMOVIC	Date:	1988/04/27
Last updated by:	CATHY GEE	Date:	1990/09/19
Last checked by:	L. JAREMOVIC	Date:	1990/09/19

511.03

DFO/MOEP FISH HABITAT INVENTORY AND INFORMATION PROGRAM
STREAM INFORMATION SUMMARY

Watershed Code: 03-5400-000-000-000-000-991
Stream Name: SHUSWAP RIVER

A. DESCRIPTION

Stream Name:	SHUSWAP RIVER	D.F.O. Division:	FRASER RIVER
Local Name:	LOWER SHUSWAP RIVER	District:	1 KAMLOOPS
Watershed Code:	03-5400-000-000-000-000-991	Subdistrict:	29K SALMON ARM
		Statistical Subarea:	-
		M.O.E. Region:	8 OKANAGAN
		Management Unit:	25

Tributaries	Code

Topographic (1:50k) Map:	82L/11
B.C.G.S. (1:20k) Map:	
U.T.M. Mouth:	11.3556.56208
Lat./Long. Mouth:	50 DG. 43' 0'' 119 DG. 3' 0''
Mainstem Length:	88.6 km Ref. No.: 29J-61
Watershed Area:	Ref. No.:

Location: FLOWS FROM MABEL LAKE INTO THE SOUTH END OF MARA LAKE, KAMLOOPS DISTRICT. SISS TRIBUTARIES TO MARA L AND LOWER SHUSWAP R. HAVE WATERSHED CODES FROM 010 TO 210. (SEE SHUSWAP RIVER, 03-5400, FOR LISTING).

Gradient Class/Location (km upstream from mouth)					Comments
0 - .5%	.5 - 2%	2 - 5%	5 - 10%	>10%	
NO INFORMATION AVAILABLE					

B. OBSTRUCTIONS TO MIGRATION

Barrier (Type)	Height (meters)	Location (km U/S)	Impassable to (species)	Comments
NB NO BARRIER				ACCESS TO MABEL LAKE. (REF. 29K-46)

C. FLOW

Flow Control: W.S.C. Station No. 1: 08LC002	Water Survey of Canada (WSC) Flow Gauge: No. 2:	Y	No. 3:	No. 4:

Comments: LAKE FED. MABEL LAKE: 88.6 KM UPSTREAM; AREA - 59.1 SQ.KM; PERIMETER - 77.8 KM. (REF. 29J-61)

D. DISTRIBUTION SUMMARY

Species	Watershed Distribution
SK SOCKEYE SALMON	ASHTON CREEK TO MABEL LAKE; HEAVIEST JUST BELOW HUPEL (REF. 29K-2, REF. 29K-30)
CO COHO SALMON	SAME AS SOCKEYE (REF. 29K-2, REF. 29K-30)
PK PINK SALMON	PRESENCE NOTED (REF. 29K-1)
CH CHINOOK SALMON	JUVENILE REARING DISTRIBUTION SIMILAR TO ADULT SPAWNING DISTRIBUTION; FLOODED PASTURES, BACKWATERS AND SLOUGHS ADJACENT TO SPAWNING AREAS ARE THE PREFERRED REARING HABITATS. (REF. 29K-26)
CH CHINOOK SALMON	SAME AS SOCKEYE (REF. 29K-2, REF. 29K-30)
DV DOLLY VARDEN	PRESENCE THROUGHOUT (REF. 29K-53)
KO KOKANEE	SAME AS SOCKEYE (REF. 29K-30)
LT LAKE TROUT	PRESENCE THROUGHOUT (REF. 29K-53)
MW ROCKY MTN WHITEFISH	PRESENCE THROUGHOUT (REF. 29K-53)

Watershed Code: 03-5400-000-000-000-000-991
Stream Name: SHUSWAP RIVER

E. ESCAPEMENT SUMMARY

Species	Escapement			Maximum Recorded Escapement	Ref. No.	Management Target Escapement	Ref. No.
	Mean	Period of Record	Ref. No.				
SK SOCKEYE SALMON	133997	1978 - 1987	28A-18	600495	28A-18		
CO COHO SALMON	310	1978 - 1987	28A-18	350	28A-18		
PK PINK SALMON	5	1979 - 1987	28A-18	13	28A-18		
CH CHINOOK SALMON	7892	1978 - 1987	28A-18	12000	28A-18		
Comments: SOCKEYE DOMINANT CYCLE 1978, 1982, 1986 (REF. 29K-1)							

F. LIFE HISTORY TIMING

Species	Activity	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
SK SOCKEYE SALMON	Migration									I			
	Spawning										I I	I	
	Incubation												
	Rearing												
CO COHO SALMON	Migration												
	Spawning										I		
	Incubation											I I	
	Rearing												
CH CHINOOK SALMON	Migration												
	Spawning							I I	I I	I I			
	Incubation										I I	I	
	Rearing												
Comments: CHINOOK, COHO AND SOCKEYE TIMING INFORMARTION (REF. 29K-2)													
EMERGENCE OF CHINOOK FRY MID APRIL TO EARLY MAY (REF. 29K-26)													

G. ENHANCEMENT/MANAGEMENT ACTIVITIES IN WATERSHED

Type of Activity	Species	Location (km U/S)	Comments	Period of Operation Start/Finish
FS FISH SAMPLING	SK SOCKEYE SALMON		DOWNSTREAM FRY TRAPPING. (REF. 29I-100)	1987/1987
FS FISH SAMPLING	SK SOCKEYE SALMON		DOWSTREAM FRY TRAPPING. (REF. 29I-100)	1979/1979
MR MARK RECOVERY	CH CHINOOK SALMON	0.0	72,000 DOWNSTREAM CHINOOK FRY CODED WIRE TAGGED AND RELEASED -PART OF A FEASIBILITY STUDY FOR ENHANCEMENT POSSIBILITIES (REF. 29K-22)	1979/1981
FP MULTIPLE STRATEGY	CH CHINOOK SALMON	0.0	EGG TAKES AND OUTPLANTING FROM SHUSWAP RIVER HATCHERY (REF. 29K-20, REF. 29K-46)	1984/
MR MARK RECOVERY	CH CHINOOK SALMON	0.0	PETERSON DISC. SHUSWAP FALLS HATCHERY CREW. (REF. 29K-55)	1989/
MR MARK RECOVERY	CH CHINOOK SALMON	0.0	CODED WIRE TAG RECOVERY; SPAWNING ESCAPEMENT ESTIMATES; AGE, LENGTH AND SEX COMPOSITION. (REF. 29K-65, REF. 29K-66)	1983/1985
HY HATCHERY	CH CHINOOK SALMON	79.6	0.5KM DOWNSTREAM OF COOKE CREEK. KINGFISHER HATCHERY (KINGFISHER COMMUNITY CLUB). EGG TARGET 150,000. RELOCATED TO CONFLUENCE OF COOKE C. (1989). (REF. 29K-55)	1981/

H. LAND USE/WATER USE/WATER QUALITY

Activity	Description/Location
AG AGRICULTURE	ALFALFA CULTIVATION, DAIRY FARMING, AND HAY PRODUCTION THROUGHOUT (REF. 29K-22)
LD LINEAR DEVELOPMENT	CPR, HIGHWAY 97A FOLLOW THE RIVER FROM ENDERBY TO KAMA LAKE (REF. 29K-22)
WQ WATER QUALITY	CITY OF ENDERBY DISCHARGES CHLORINATED SEWAGE INTO THE RIVER (REF. 29K-22)
LD LINEAR DEVELOPMENT	REVELSTOKE TRANSMISSION LINE FOLLOWS AND CROSSES RIVER EAST FROM ENDERBY. (REF. 29K-46)

I. FISH PRODUCTION POTENTIAL/CONSTRAINTS/GENERAL COMMENTS

FEASIBILITY OF A PROPOSED HATCHERY SITE FOR CHINOOK AND COHO IMMEDIATELTY DOWNSTREAM OF MABEL LAKE HAS BEEN EXAMINED AND APPEARS PROMISING. (REF. 29K-22)

REARING SURVEYS INDICATED THAT COHO SALMON SMOLTS WERE MORE ABUNDANT THAN IN MIDDLE SHUSWAP RIVER. (REF. 29K-28)

WATER QUALITY DISCUSSED (REF. 29K-27)

J. FISHERY OFFICER NARRATIVE

Date Prepared: 1988/04/01 Prepared By: B. KURTZ, OP. FRAMEWORK

K. SIS COMPLETED BY

Completed by:	GEORGE FARRELL	Date: 1986/12/17
Checked by:	LIDIA JAREMOVIC	Date: 1988/04/27
Last updated by:	L. JAREMOVIC	Date: 1990/09/26
Last checked by:	L. JAREMOVIC	Date: 1990/09/19

STREAMS

1 REFERENCING INFORMATION

Stream Name: KINGFISHER CREEK

Watershed Code: 128-853553-353-00000

Watershed Code cont:

SISS/RAB Code:

Confluence ID: Map No. 082L10 ID: P C O N

ConfluenceUTM: ZONE EASTING NORTHING

Completed by: KOPEC, C.

Date: (yy/mm/dd) 95/01/23

2 STREAM INFORMATION

WATER SURVEY OF CANADA STATIONS

Loc. Ref:	Map No.	ID		Station No.
			P W S C	
			P W S C	
			P W S C	
			P W S C	

WATER QUALITY

Loc. Ref:	Map No.	ID		Station No.	Ref No.
			P W Q S		
			P W Q S		
			P W Q S		
			P W Q S		

3 PROVINCIAL FISHERIES MANAGEMENT OBJECTIVES

Habitat type: 1.R Management Objective 1: Management Objective 2:

ENHANCEMENT AND MANAGEMENT ACTIVITIES

Map No.	ID	Type	Activity	Project	Start	Finish	Species	(list all species by code)	Ref #
082L10	8.0.3.4	P	FS		84	84	R.B.	D.V.	8.0.7.1
Cmt	ONE OF SIX FISH SAMPLING SITES IN 1984 STUDY								
		W	E.H.S.				R.B.		
Cmt	Tagging Studies in 1984 determined that some Kingfisher Rb spawners originate from Mara LK.								8.0.1.0
Cmt									
Cmt									
Cmt									
Cmt									
Cmt									
Cmt									
Cmt									
Cmt									

7 OBSTRUCTIONS

St.Name KINGFISHER CREEK

Map No.	ID	Type	OBS	Height	Length	Species Blocked
Cmt						Ref #
Cmt						Ref #
Cmt						Ref #
Cmt						Ref #
Cmt						Ref #

8 LAND USE

Map No.	ID	Type	Land Use	Date	Comment	Ref. No.

9 VALUE / SENSITIVITY COMMENTS

Map No.	ID	Type	Code	Value Comment	Ref. No.

Map No.	ID	Type	Code	Sensitivity Comment	Ref. No.

10 A SPECIES

	Species	Char	Stock	Stock Type	Mgt Cls	CDC Local	CDC Global	Ref #
1	R.B.	R,S			W/T			8071
2	D.V.	R,S			W/T			8071
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								

DFO/MOE
STREAM SURVEY FORM

Stream Name (gaz.) Kingfisher (local)
Watershed Code
Location site #8 (+#6)
Map#
U.T.M.
Date YMD 96 07 04 Time 1400 Agency Crew NG DH / Photos
Reach No. 2 Site No. Fish Card Y (N) C
Access Length(km) Lth.surv.(m) 1500 GE Method Field ☐ Hist. ☐
Air Photos

C	PARAMETER	VALUE	METH.
	Ave.Chan.Width (m)	12	GE
	Ave.Wet.Width (m)	10	GE
	Ave.Max.Riffle Depth (cm)	20	GE
	Ave.Max.Pool Depth (cm)	120	GE
	Gradient %	5	CL
	% Pool 20 Riffle 60 Run 20 Other		GE
	Side Chan.% 0 ☐0 0-10 ☐10-30 ☐30-40 ☐>40		GE
	Debris Area% 5 ☐0 ☐0-5 ☐5-15 ☐>15		GE
	Stable % 40		GE
	COVER: Total % 20		
	Comp. sum 100% Dp Pool 20 / L.O.D. 10 / Boulder 10 / In Veg / Over Veg 40 / Cutbank 20		
	Crown Closure % 30 C Aspect		

SPECIFIC DATA

C	BED MATERIAL	%
	Fines: clay,silt,sand (<2mm)	5
	Gravels: small (2-16mm)	5
	Gravels: large (16-64mm)	15
	Larges: sm.cobble (64-128mm)	20
	Larges: lge.cobble (128-256mm)	10
	Larges: boulder (>256mm)	30
	Bedrock (R)	10
	D_{90}(cm) C Compaction L (M) H	

C	BANKS				
	Height(m) 1	%Unstable 10			
	Texture F (G) L R				
	Confinement	EN (CO) FC OC UC N/A			
	Valley: Channel Ratio	0-2 (2-5) 5-10 10+ N/A			
	Stage	Dry L (M) H Flood			
	Flood Signs Ht(m)		Braided	Y (N)	
	Bars (%) 5	pH		O2(ppm)	
	Water Temp.(°C) 11	Turb.(cm)		Cond.(25°C)	

OBSTRUCTIONS

C	Ht(m)	Type	Loc'n

DISCHARGE

Parameter	Value	Method	Specific Data
Wetted Width (m)			
Mean Depth (m)			
Mean Velocity (m/s)			
Discharge (m^3/s)			

REACH SYMBOL (Fish)

(Width,Valley Channel,Slope) (Bed Material)

REVISED DEC 87 SS187

DFO/MOE
STREAM SURVEY FORM

Stream Name (gaz.) Kingfisher Creek (local)
Watershed Code
Location from site #8 → site #4
Map#
U.T.M.
Date YMD 96 07 04 Time 1330 Agency Crew NG DH / Photos
Reach No. R2 Site No. Fish Card Y (N) C
Access Length(km) Lth.surv.(m) 2500 GE Method Field ☐ Hist. ☐
Air Photos

C	PARAMETER	VALUE	METH.
	Ave.Chan.Width (m)	13	GE
	Ave.Wet.Width (m)	10	
	Ave.Max.Riffle Depth (cm)	20	
	Ave.Max.Pool Depth (cm)	150	
	Gradient %	6	CL
C	% Pool 10 Riffle 40 Run 10 Other 40		
	Side Chan.% 5 ☐0 ☐0-10 ☒10-40 ☐>40		
	Debris Area% 5 ☐0 ☐0-5 ☒5-15 ☐>15		
	Stable % 90		
	COVER: Total % 20		
	Comp. sum 100% Dp Pool 20 / L.O.D. 10 / Boulder 10 / In Veg / Over Veg 40 / Cutbank 20		
	Crown Closure % 20 C Aspect 5		

SPECIFIC DATA

C	BED MATERIAL	%
	Fines: clay,silt,sand (<2mm)	5
	Gravels: small (2-16mm)	
	Gravels: large (16-64mm)	25
	Larges: sm.cobble (64-128mm)	
	Larges: lge.cobble (128-256mm)	50
	Larges: boulder (>256mm)	
	Bedrock (R)	20
	D_{90}(cm) C Compaction L (M) H	

C	BANKS				
	Height(m) 1-2	%Unstable 10			
	Texture F G (L) R				
	Confinement	EN CO (FC) OC UC N/A			
	Valley: Channel Ratio	0-2 (2-5) 5-10 10+ N/A			
	Stage	Dry L (M) H Flood			
	Flood Signs Ht(m) 1		Braided	Y (N)	
	Bars (%) 5	pH		O2(ppm)	
	Water Temp.(°C)	Turb.(cm)		Cond.(25°C)	

OBSTRUCTIONS

C	Ht(m)	Type	Loc'n

DISCHARGE

Parameter	Value	Method	Specific Data
Wetted Width (m)			
Mean Depth (m)			
Mean Velocity (m/s)			
Discharge (m^3/s)			

REACH SYMBOL (Fish)

(Width,Valley Channel,Slope) (Bed Material)

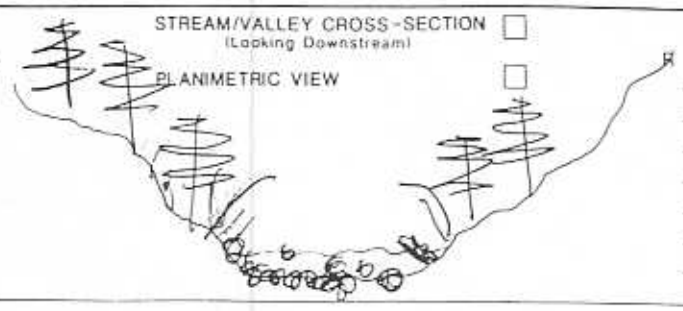
REVISED DEC 87 SS187

FISH SUMMARY

C	Species	No.	Size Range (mm)	Life Phase	Use	Method/Ref.

STREAM/VALLEY CROSS-SECTION ☐
(Looking Downstream)

PLANIMETRIC VIEW ☐



COMMENTS

Channel Stability ☐, Debris ☐, Management Concerns ☐, Obstructions ☐, Riparian Zone ☐, Valley Wall Processes ☐, Etc.

- moderate fish habitat in this reach
- much better in Reach #3
- coarse substrate, poor cover

Edited by

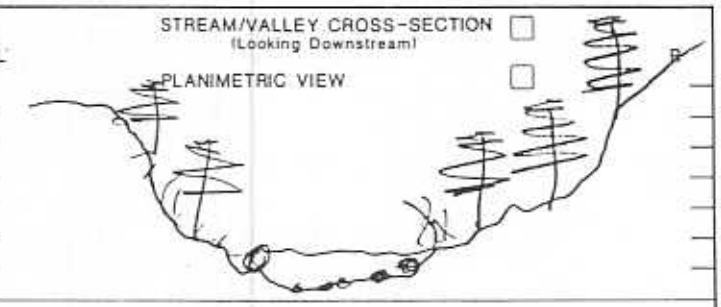
Date Y M D

FISH SUMMARY

C	Species	No.	Size Range (mm)	Life Phase	Use	Method/Ref.
	Salmon	6	30-40	fry		

STREAM/VALLEY CROSS-SECTION ☐
(Looking Downstream)

PLANIMETRIC VIEW ☐



COMMENTS

Channel Stability ☐, Debris ☐, Management Concerns ☐, Obstructions ☐, Riparian Zone ☐, Valley Wall Processes ☐, Etc.

C) 140% of the channel consists of rapids through bedrock substrate & an incised portion of the stream

- moderate fish habitat in this reach
- some fry (salmon) were observed in pools along the banks

Edited by

Date Y M D

DFO / MOE
STREAM SURVEY FORM

Stream Name (gaz.)	Kingfisher Creek	(local)		Access	Yes
Watershed Code		Reach No.	3	Length(km)	
Location	site #9	Map #		Site No.	
		U T M		Lth.surv(m)	1000 GE
Date Y M D	95 07 04	Time 1245	Agency	Crew MG/DH/	Photos
Fish Card	Y N (N circled)	C	Field ☐	Hist. ☐	Method
Air Photos					

C	PARAMETER	VALUE	METH.
	Ave.Chan.Width (m)	18	GE
	Ave.Wet.Width (m)	15	GE
	Ave.Max.Riffle Depth (cm)	20	GE
	Ave.Max.Pool Depth (cm)	180	GE
	Gradient %	5	CL
	% Pool 10 Riffle 60 Run 30 Other		GE
	Side Chan.% 5	0 ☐ 0-10 ☒ 10-40 ☐ >40 ☐	↓
	Debris Area% 5	0 ☐ 0-5 ☒ 5-15 ☐ >15 ☐	↓
	Debris Stable %	90	↓
	COVER: Total %	20	
	Comp. sum 100%: Dp Pool 10, L.O.D. 10, Boulder 10, In Veg –, Over Veg 50, Cutbank 20		
	Crown Closure %	10	C Aspect

SPECIFIC DATA

OBSTRUCTIONS C	Ht(m)	Type	Loc'n

C	BED MATERIAL		%
	Fines	clay, silt, sand (<2mm)	10
	Gravels	small (2-16mm)	30
	Gravels	large (16-64mm)	30
	Larges	sm.cobble (64-128mm)	40
	Larges	lge.cobble (128-256mm)	40
	Larges	boulder (>256mm)	20
	Bedrock (R)		
	D_{90}(cm)	C Compaction	L M H (M circled)

C	BANKS		
	Height(m) 1	%Unstable	10
	Texture	F G L R (G circled)	
	Confinement	EN CO FC OC UC N/A (FC circled)	
	Valley: Channel Ratio	0-2 2-5 5-10 10+ N/A (5-10 circled)	
	Stage	Dry L M H Flood (M circled)	
	Flood Signs Ht(m)	1	Braided Y N (N circled)
	Bars (%)	10	pH — O_2(ppm) —
	Water Temp.(°C)	11	Turb.(cm) — Cond.(25°C) —

DISCHARGE

Parameter	Value	Method	Specific Data
Wetted Width (m)			
Mean Depth (m)			
Mean Velocity (m/s)			
Discharge (m^3/s)			

REACH SYMBOL
(Fish)

(Width, Valley:Channel, Slope) (Bed Material)

REVISED DEC. 87 SS187

DFO / MOE
STREAM SURVEY FORM

Stream Name (gaz.)	Kingfisher Creek	(local)		Access	
Watershed Code		Reach No.	R4	Length(km)	
Location	site # 19 & 20	Map #		Site No.	
		U.T.M.		Lth.surv(m)	500 GE
Date Y M D	95 07 07	Time 1030	Agency	Crew MG/DH/	Photos
Fish Card	Y N	C	Field ☐	Hist. ☐	Method
Air Photos					

C	PARAMETER	VALUE	METH.
Cl	Ave.Chan.Width (m)	15	GE
	Ave.Wet.Width (m)	10	↓
	Ave.Max.Riffle Depth (cm)	10	↓
	Ave.Max.Pool Depth (cm)	100-200	↓
	Gradient %	3	CL
	% Pool 20 Riffle 60 Run 20 Other		GE
	Side Chan.% 30	0 ☐ 0-10 ☐ 10-40 ☒ >40 ☐	↓
	Debris Area% 30	0 ☐ 0-5 ☐ 5-15 ☒ >15 ☒	↓
	Debris Stable %	70	↓
	COVER: Total %	40	
	Comp. sum 100%: Dp Pool 20, L.O.D. 30, Boulder –, In Veg 10, Over Veg 20, Cutbank 20		
	Crown Closure %	20	C Aspect SW

SPECIFIC DATA

OBSTRUCTIONS C	Ht(m)	Type	Loc'n

C	BED MATERIAL		%
	Fines	clay, silt, sand (<2mm)	5
	Gravels	small (2-16mm)	40
	Gravels	large (16-64mm)	65 60
	Larges	sm.cobble (64-128mm)	60
	Larges	lge.cobble (128-256mm)	30 30
	Larges	boulder (>256mm)	10
	Bedrock (R)		
	D_{90}(cm)	C Compaction	L M H (M circled)

C	BANKS		
	Height(m) 1	%Unstable	20
	Texture	F G L R (F/G circled)	
	Confinement	EN CO FC OC UC N/A (OC circled)	
	Valley: Channel Ratio	0-2 2-5 5-10 10+ N/A (5-10 circled)	
	Stage	Dry L M H Flood (M circled)	
	Flood Signs Ht(m)	1	Braided Y N (Y circled)
	Bars (%)	40	pH — O_2(ppm) —
	Water Temp.(°C)	13	Turb.(cm) — Cond.(25°C) —

DISCHARGE

Parameter	Value	Method	Specific Data
Wetted Width (m)			
Mean Depth (m)			
Mean Velocity (m/s)			
Discharge (m^3/s)			

REACH SYMBOL
(Fish)

(Width, Valley:Channel, Slope) (Bed Material)

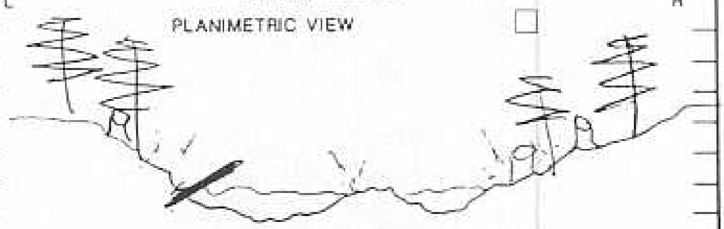
REVISED DEC. 87 SS187

FISH SUMMARY

Species	No	Size Range (mm)	Life Phase	Use	Method/Ref.
salmon	100	30-50	fry		

STREAM/VALLEY CROSS-SECTION ☐
(Looking Downstream)

PLANIMETRIC VIEW ☐



COMMENTS

Channel Stability ☐, Debris ☐, Management Concerns ☐, Obstructions ☐, Riparian Zone ☐, Valley Wall Processes ☐, Etc.

some portions of this reach have a single channel (~15m) & others consist of a braided channel with widths 3-5m

- excellent fish habitat in this reach for spawning & rearing
- many areas with spawning size gravel
- hundreds of salmon fry observed in the pools along the banks possibly from Danforth Creek

Edited by:

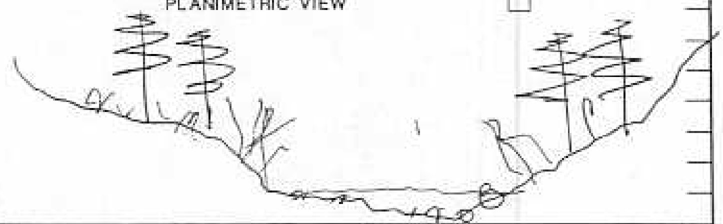
Date Y M D:

FISH SUMMARY

Species	No	Size Range (mm)	Life Phase	Use	Method/Ref.
salmon	6	35 mm	fry		vis obs

STREAM/VALLEY CROSS-SECTION ☐
(Looking Downstream)

PLANIMETRIC VIEW ☐



COMMENTS

Channel Stability ☐, Debris ☐, Management Concerns ☐, Obstructions ☐, Riparian Zone ☐, Valley Wall Processes ☐, Etc.

- some fry seen along the left bank at site #9 (≈ 35 mm)
- good fish habitat in this reach
  - many pools & overhanging veg
- surveyed from site #9 d/s to the reach boundary
- wide floodplain & braided channel at site #9
- many areas with spawning size gravel
- potential barrier to fish mig" if debris collects at the concrete bridge abutment extending 3m into the channel

Edited by:

Date Y M D:

DFO/MOE
STREAM SURVEY FORM

Stream Name (gaz.) Kingfisher Creek	(local)	Access	veh, ft
Watershed Code	Reach No. R5	Length(km)	Method
Location Site #28	Map	Site No.	Lth surv(m) 150 GE
	U.T.M.	Fish Coll. Y (N)	Field ☐ Hist. ☐
Date Y.M.D. 95 07 07	Time 0730	Agency	Crew MG/DH/
Photos	Air Photos		

C	PARAMETER	VALUE	METH.	SPECIFIC DATA
	Ave.Chan.Width (m)	15	GE	
	Ave.Wet.Width (m)	10	↓	
	Ave.Max.Riffle Depth (cm)	10	↓	
	Ave.Max.Pool Depth (cm)	75-100	↓	
	Gradient %	2-3	CL	
	% Pool 30 Riffle 40 Run 30 Other		GE	
	Side Chan.%	40 ☐ 0 ☐ 0-30 ☐ 30-40 ☐ >40	↓	
	Debris Area %	20 ☐ 0 ☐ 0-5 ☐ 5-10 ☐ >10	↓	
	Debris Stable %	70	↓	
	COVER: Total %	30		

Comp. sum 100%	Dp Pool	L.O.D.	Boulder	In Veg	Over Veg	Cutbank
	20	40		10	20	10

Crown Closure % 80 | Aspect SW

C	BED MATERIAL		%
	Fines	clay, silt, sand (<2mm)	
	Gravels	small (2-16mm)	60
	Gravels	large (16-64mm)	40
	Larges	sm.cobble (64-128mm)	40
	Larges	lge.cobble (128-256mm)	50
	Larges	boulder (>256mm)	10
	Bed (BCSR)		
	D_{90}(cm)	Compaction	L (M) H

C	BANKS			
	Height(m) 1-2	%Unstable 10		
	Texture	(F G) L R		
	Confinement	EN CO FC (OC) UC N/A		
	Valley: Channel Ratio	0-2 2-5 (5-10) 10+ N/A		
	Stage	Dry L (M) H Flood		
	Flood Signs Ht(m) 2	Braided (Y) N		
	Bars (%) 30	pH —	O_2(ppm) —	
	Water Temp.(°C) 8	Turb.(cm) —	Cond.(25°C) —	

OBSTRUCTIONS C	Ht(m)	Type	Loc'n

DISCHARGE

Parameter	Value	Method	Specific Data
Wetted Width (m)			
Mean Depth (m)			
Mean Velocity (m/s)			
Discharge (m^3/s)			

REACH SYMBOL
(Fish)

(Width, Valley Channel, Slope) (Bed Material)

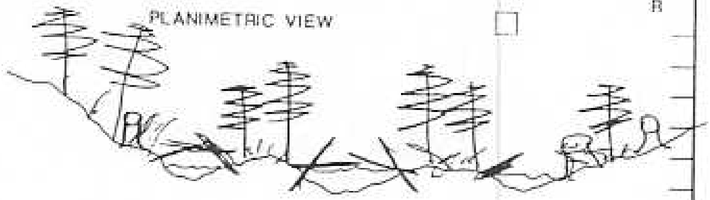
FISH SUMMARY

C	Species	No	Size Range (mm)	Life Phase	Use	Method/Ref.
	trout sp.	6	20-30	fry		
	"	1	100	1-2yr		

STREAM/VALLEY CROSS-SECTION ☐
(Looking Downstream)

PLANIMETRIC VIEW ☐

L R



COMMENTS

Channel Stability ☐, Debris ☐, Management Concerns ☐, Obstructions ☐, Riparian Zone ☐, Valley Wall Processes ☐, Etc.

1 the floodplain at site #28 is 50-70m wide with a lg amt. of LWD, mostly logging related
- numerous side channels recently formed flowing through the forest veg.
- very similar habitat at site #26 → v. good fish spawning/rearing habitat.

* excellent fish habitat at site #28 with many deep pools, undercut banks, overhanging veg. & side channels
- fry & juvenile trout sp. observed

Edited by:

Date Y M D

DFO / MOE

STREAM SURVEY FORM

(gaz.) Kwatisla Creek (local)

Access | Method

Length(km) | 500

50357.214

174 41 248

U.T.M.

Y N

Photos | Air Photos

PARAMETER	VALUE	METH.	SPECIFIC DATA
			20-25
			12-15 m (2 separate side channels d/s
Ave.Max.Riffle Depth (cm)			15
Ave.Max.Pool Depth (cm)			50
	2		
30 40 40			
30			
10			
Stable %	50		
COVER: Total %	5-10		

Comp. sum 100%	Dp Pool	L.O.D.	Boulder	In Veg	Over Veg	Cutbank
		20		10	60	10

Crown Closure % | Aspect

BED MATERIAL	%
clay, silt, sand (<2mm)	10
small (2-16mm)	20
large (16-64mm)	80
sm.cobble (64-128mm)	50
lge.cobble (128-256mm)	30
boulder (>256mm)	20

D_{90}(cm) 15 | Compaction L (M) H

BANKS	
Height(m) 2	%Unstable 50
Texture	F (G) (L) R

Confinement: EN CO FC OC UC N/A

Valley: Channel Ratio: 0-2 2-5 (5-10) 10+ N/A

Dry (L) M H Flood

Flood Signs Ht(m) 2 | Braided (Y) N

Bars (%) 50 | pH | O_2(ppm)

Water Temp.(°C) 1.0 | Turb.(cm) | Cond.(25°C)

OBSTRUCTIONS: Type | Loc'n

DISCHARGE

Parameter	Value	Method	Specific Data
Wetted Width (m)			
Mean Depth (m)			
Mean Velocity (m/s)			
Discharge (m^3/s)			

REACH SYMBOL (Fish)

(Width,Valley:Channel,Slope) (Bed Material)

REVISED DEC. 87 SS187

FISH SUMMARY

	No.	Size Range(mm)		Use	

STREAM/VALLEY CROSS-SECTION (Looking Downstream) ☐

PLANIMETRIC VIEW ☐

L R

COMMENTS

Channel Stability ☐, Debris ☐, Management Concerns ☐, Obstructions ☐, Riparian Zone ☐, Valley Wall Processes ☐, Etc.

- moderate fish habitat in this section - some [illegible]
  mostly large gravel/cobble
- some LOD with undercut banks & overhanging [illegible]
- numerous side channels [illegible]

Edited by:

Date Y M D:

DFO / MOE
STREAM SURVEY FORM

(gaz.) Kuic Fisher (local)

Lat. 50 39.677

118 45.087

914 11 11 H — 1992 — MCG/SKW/

Access		Method	
Length(km)			
	15		500
U.T.M.			
	Y N		
Photos		Air Photos	

PARAMETER	VALUE	METH.	SPECIFIC DATA
			6.6 (C. channel) 11.5 (...) 16.7 main
			7.4 (...) 3.5 (") 9.5 (")
Ave.Max.Riffle Depth (cm)			10 20
Ave.Max.Pool Depth (cm)			75 50
	2.3		
20 60 20			
10			
10			
Stable %	75		
COVER: Total %	30		

Comp. sum 100%	Dp Pool	L.O.D.	Boulder	In Veg	Over Veg	Cutbank
		30		30	50	10

Crown Closure % — Aspect

BED MATERIAL		%
clay,silt,sand (<2mm)		5
small (2-16mm)	60	30
large (16-64mm)		70
sm.cobble (64-128mm)		60
lge.cobble (128-256mm)	35	20
boulder (>256mm)		20

D_{90}(cm) 8 — Compaction L (M) H

BANKS	
Height(m) 2	%Unstable 50
Texture (F) (G) L R	
Confinement	EN CO (FC) OC UC N/A
Valley: Channel Ratio	0-2 2-5 (5-10) 10+ N/A
	Dry (L) M H Flood
Flood Signs Ht(m)	Braided (Y) N
Bars (%) 20	pH — O_2(ppm)
Water Temp.(°C) 14	Turb.(cm) — Cond.(25°C)

OBSTRUCTIONS		Type	Loc'n

DISCHARGE

Parameter	Value	Method	Specific Data
Wetted Width (m)			
Mean Depth (m)			
Mean Velocity (m/s)			
Discharge (m^3/s)			

REACH SYMBOL (Fish)

(Width,Valley:Channel,Slope) (Bed Material)

REVISED DEC. 87 SS1 87

	No.	Size Range(mm)		Use	

STREAM/VALLEY CROSS-SECTION ☐ (Looking Downstream)

L R

PLANIMETRIC VIEW ☐

COMMENTS

Channel Stability ☐, Debris ☐, Management Concerns ☐, Obstructions ☐, Riparian Zone ☐, Valley Wall Processes ☐, Etc.

- adult salmon (sockeye) 7 10 in number ranging in size from 50-70 cm stranded in the pool at the d/s end of a side channel around the island on the right side of the stream

Edited by:

Date Y M D:

Photo 1. Kingfisher Creek Site #3: Debris jam (approx 20 m wide).

Photo 2. Eroding left bank at Site #3.

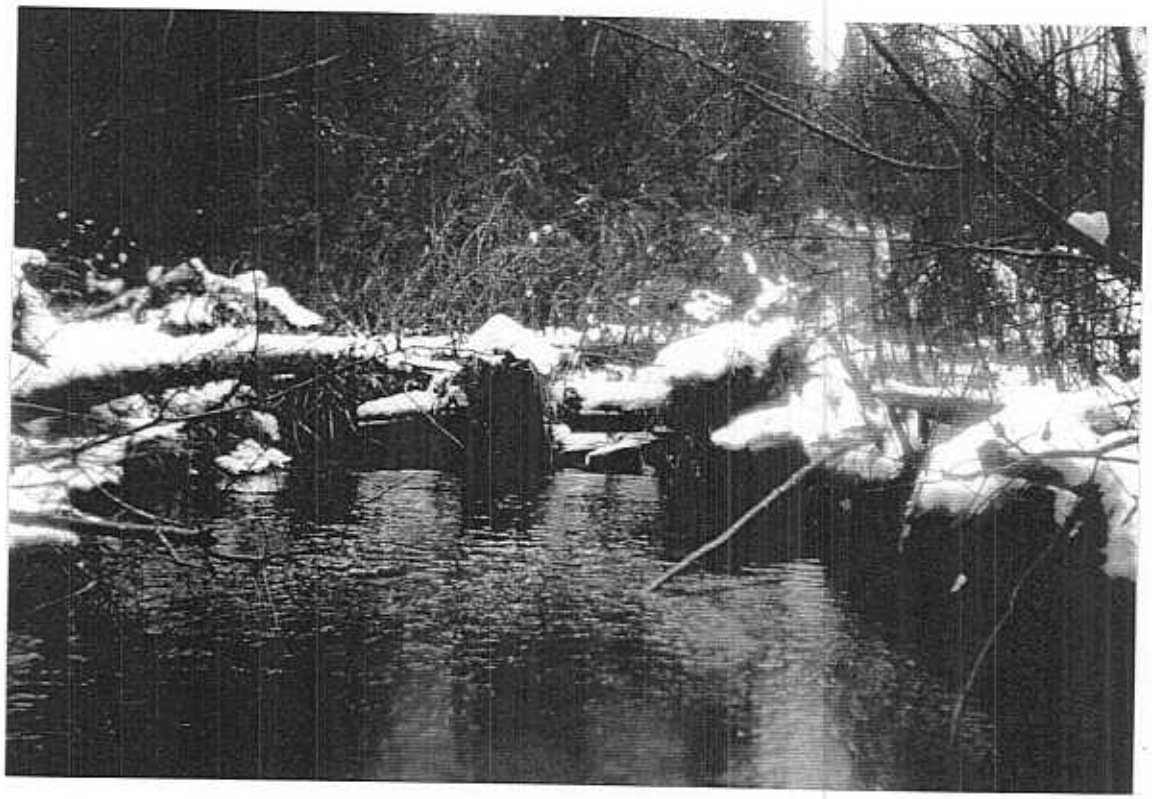


Photo 3. Debris jam at the downstream end of an island, blocking the main channel.

Photo 4 LWD across the channel 50 m upstream from the bridge crossing, upstream view.
Stream Name: Kingfisher Creek **Site #:** 23 **Reach #:** 5
Coordinates: 50°44'41N 118°44'13W **Code:** Fb/Q•D•N/F•2

Photo 5 LWD at the upstream end of the cutblock with a logged stump in the middle of the channel, downstream view.
Stream Name: Kingfisher Creek **Site #:** 25 **Reach #:** 5
Coordinates: 50°42'62N 118°45'29W **Code:** Fb/Q•D•F•1

Photo 6 Stream flowing through the forest as a result of a debris jam u/s, u/s view.
Stream Name: Kingfisher Creek **Site #:** 28 **Reach #:** 5
Coordinates: 50°43.47' 118°45.26' **Code:** Fb/Fs/Q•D•F•1

Photo 7 Substantial LWD blocking a side channel from the left bank of the main channel, u/s view.
Stream Name: Kingfisher Creek **Site #:** 28 **Reach #:** 5
Coordinates: 50°43.47' 118°45.26' **Code:** Fb/Fs/Q•D•F•1

APPENDIX IX

Cooke Creek
Stream Information File

MID-SHUSWAP STREAM ASSESSMENT

STREAM: COOKE CREEK
DATE: October 13, 1994
TAPE: WRP Tape 5

* = to visit	LOCATION SYMBOL	CODE	COMMENTS	TIME	COORDINATES North	West
	1		▸ mouth of the stream, very similar to *Brash Creek*	19:11	50.35.96	118.50.69
	2	Fb-C-Hw-1	▸ culvert & cement weirs	20:03	50.36.37	118.50.53
6/04/95 * GK	3	~~Fs/Q-S-F-1~~ no code	▸ slide from the road on the left & a slide from the right (both enter the stream) - can confirm slide on right (natural) but no on left (aerial photos) 05/04/95 RK	20:54	50.36.~~78~~ 71	118.50.~~72~~ 85
26/04/95 RK	4	Fs/Q-S-N-2 Q-S/D-F-2	▸ natural slide on the left entering the stream with LWD at the foot of the slide - aerial photos confirm it to be possible f-1/2 - road widens 05/04/95 RK	22:23	50.37.~~28~~ 18	118.50.~~59~~ 66
	* 5	Fb/Q-D-U-1	▸ large log jam unconfirmed by aerial photos 05/04/95 RK - tenure is too steep, very bld across 06/04/95 RK	22:59	50.37.26	118.50.59*
26/04/95	6 a / 7 changed to 6a from 4a RK 8/9/95	Q-S-F-1 Fb-W-N-2	▸ road visible on the left side ~~300~~ 450m from the stream - found slide not mentioned on video, reported, confirmed 06/04/95 RK ▸ chutes not a barrier to fish passage but would impede fish migration at low flow	23:55 25:01	50.37.26 50°37.49 50.38.57	118.50.59* 118°50.63 118.50.28
4/95 DH/MG	* 8	~~Fs/Q-F-F-1~~ Fs/Q-S/D-F-1	▸ slump from the road eminating at a culvert, on the left with erosion on the fill slope from water exiting the culvert	25:17	~~50.38.69~~ 50.38.779'	~~118.50.32~~ 118.50.24
July 4/95 DH/MG	8A	Fb/Q-D/W-N-2	▸ large (3-4 m) waterfall + bedrock canyon		50.38.779'	118.50.21
	9	Fs/Q-S-F-2	▸ large continuous cutblock on the right and a cutblock on the left @ ~2600' elevation	25:49	50.38.95	118.50.25
July 4/95 DH/MG	* 10	~~Fb/Q-C-F-1~~ Fb/Q-D-N/F-2	▸ bridge, small LWD jams d/s of bridge	26:06	50.39.11	118.50.24
	11	Fs/Q-S-F-2	▸ cutblocks on the left & right sides @ ~3000' elevation	27:26	50.39.81	118.50.46
	12	Fs/Q-F-F-2	▸ road running parallel to the right side	27:59	50.40.04	118.50.76
	13	Fs/Q-S-F-2	▸ cutblock on the right side, above the road	28:46	50.40.45	118.51.24
	14	Fs/Q-S-U-2	▸ old slide on the left	29:31	50.40.71	118.51.92
July 4/95 DH/MG	* 15	~~Fb/Q-C-F-1~~ Q-S/D-F-3	▸ new cutblock on the left & wood bridge buffer is ~5m wide with debris piles along the border	29:44	50.40.66	118.52.11
July 4/95 DH/MG	* 16	~~Fs/Q-S-F-1~~ Fs/Q-S-F-2	▸ large slump from a cutblock on the right side may have entered the stream	30:30	50.40.80	118.52.69
	17	Fs/Q-S-N-2	▸ natural slide entering the stream on the left	30:37	50.40.83	118.52.80
	18		▸ small waterfall entering the main channel from the left side ~200m d/s	32:55	50.41.99	118.54.34

STREAM: COOKE CREEK
DATE: October 13, 1994
TAPE: WRP Tape 5

LOCATION SYMBOL	CODE	COMMENTS	TIME	COORDINATES North	West
19		▸ headwaters of the stream @ ~5500' elevation	34:04	50.42.66	118.54.96

NOTE: 1-19: Map 82 L/10 1:50,000

51I.03

DFO/MOEP FISH HABITAT INVENTORY AND INFORMATION PROGRAM
STREAM INFORMATION SUMMARY

Watershed Code: 03-5400-000-000-000-000-991
Stream Name: SHUSWAP RIVER

A. DESCRIPTION

Stream Name: SHUSWAP RIVER Local Name: LOWER SHUSWAP RIVER Watershed Code: 03-5400-000-000-000-000-991	D.F.O. Division: FRASER RIVER District: 1 KAMLOOPS Subdistrict: 29K SALMON ARM Statistical Subarea: - M.O.E. Region: 8 OKANAGAN Management Unit: 25

Tributaries	Code

Topographic (1:50k) Map: 82L/11
B.C.G.S. (1:20k) Map:
U.T.M. Mouth: 11.3556.56208
Lat./Long. Mouth: 50 DG. 43' 0'' 119 DG. 3' 0''
Mainstem Length: 88.6 km Ref. No.: 29J-61
Watershed Area: Ref. No.:

Location: FLOWS FROM MABEL LAKE INTO THE SOUTH END OF MARA LAKE, KAMLOOPS DISTRICT. SISS TRIBUTARIES TO MARA L AND LOWER SHUSWAP R. HAVE WATERSHED CODES FROM 010 TO 210. (SEE SHUSWAP RIVER, 03-5400, FOR LISTING).

Gradient Class/Location (km upstream from mouth)					Comments
0 - .5%	.5 - 2%	2 - 5%	5 - 10%	>10%	
NO INFORMATION AVAILABLE					

B. OBSTRUCTIONS TO MIGRATION

Barrier (Type)	Height (meters)	Location (km U/S)	Impassable to (species)	Comments
NB NO BARRIER				ACCESS TO MABEL LAKE. (REF. 29K-46)

C. FLOW

Flow Control:
W.S.C. Station No. 1: 08LC002 Water Survey of Canada (WSC) Flow Gauge: Y
No. 2: No. 3: No. 4:

Comments: LAKE FED. MABEL LAKE: 88.6 KM UPSTREAM; AREA - 59.1 SQ.KM; PERIMETER - 77.8 KM. (REF. 29J-61)

D. DISTRIBUTION SUMMARY

Species	Watershed Distribution
SK SOCKEYE SALMON	ASHTON CREEK TO MABEL LAKE; HEAVIEST JUST BELOW HUPEL (REF. 29K-2, REF. 29K-30)
CO COHO SALMON	SAME AS SOCKEYE (REF. 29K-2, REF. 29K-30)
PK PINK SALMON	PRESENCE NOTED (REF. 29K-1)
CH CHINOOK SALMON	JUVENILE REARING DISTRIBUTION SIMILAR TO ADULT SPAWNING DISTRIBUTION; FLOODED PASTURES, BACKWATERS AND SLOUGHS ADJACENT TO SPAWNING AREAS ARE THE PREFERRED REARING HABITATS. (REF. 29K-26)
CH CHINOOK SALMON	SAME AS SOCKEYE (REF. 29K-2, REF. 29K-30)
DV DOLLY VARDEN	PRESENCE THROUGHOUT (REF. 29K-53)
KO KOKANEE	SAME AS SOCKEYE (REF. 29K-30)
LT LAKE TROUT	PRESENCE THROUGHOUT (REF. 29K-53)
RW ROCKY MTN WHITEFISH	PRESENCE THROUGHOUT (REF. 29K-53)

E. ESCAPEMENT SUMMARY

Species	Escapement			Maximum Recorded Escapement	Ref. No.	Management Target Escapement	Ref. No.
	Mean	Period of Record	Ref. No.				
SK SOCKEYE SALMON	133997	1978 - 1987	28A-18	600495	28A-18		
CO COHO SALMON	310	1978 - 1987	28A-18	350	28A-18		
PK PINK SALMON	5	1979 - 1987	28A-18	13	28A-18		
CH CHINOOK SALMON	7892	1978 - 1987	28A-18	12000	28A-18		
Comments: SOCKEYE DOMINANT CYCLE 1978, 1982, 1986 (REF. 29K-1)							

F. LIFE HISTORY TIMING

Species	Activity	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
SK SOCKEYE SALMON	Migration									X			
	Spawning										X X	X	
	Incubation												
	Rearing												
CO COHO SALMON	Migration												
	Spawning										X		
	Incubation											X X	
	Rearing												
CH CHINOOK SALMON	Migration												
	Spawning							X X	X X	X X			
	Incubation										X X	X	
	Rearing												
Comments: CHINOOK, COHO AND SOCKEYE TIMING INFORMARTION (REF. 29K-2)													
EMERGENCE OF CHINOOK FRY MID APRIL TO EARLY MAY (REF. 29K-26)													

G. ENHANCEMENT/MANAGEMENT ACTIVITIES IN WATERSHED

Type of Activity	Species	Location (km U/S)	Comments	Period of Operation Start/Finish
FS FISH SAMPLING	SK SOCKEYE SALMON		DOWNSTREAM FRY TRAPPING. (REF. 29I-100)	1987/1987
FS FISH SAMPLING	SK SOCKEYE SALMON		DOWSTREAM FRY TRAPPING. (REF. 29I-100)	1979/1979
MR MARK RECOVERY	CH CHINOOK SALMON	0.0	72,000 DOWNSTREAM CHINOOK FRY CODED WIRE TAGGED AND RELEASED -PART OF A FEASIBILITY STUDY FOR ENHANCEMENT POSSIBILITIES (REF. 29K-22)	1979/1981
FP MULTIPLE STRATEGY	CH CHINOOK SALMON	0.0	EGG TAKES AND OUTPLANTING FROM SHUSWAP RIVER HATCHERY (REF. 29K-20, REF. 29K-46)	1984/
MR MARK RECOVERY	CH CHINOOK SALMON	0.0	PETERSON DISC. SHUSWAP FALLS HATCHERY CREW. (REF. 29K-55)	1989/
MR MARK RECOVERY	CH CHINOOK SALMON	0.0	CODED WIRE TAG RECOVERY; SPAWNING ESCAPEMENT ESTIMATES; AGE, LENGTH AND SEX COMPOSITION. (REF. 29K-65, REF. 29K-66)	1983/1985
HY HATCHERY	CH CHINOOK SALMON	79.6	0.5KM DOWNSTREAM OF COOKE CREEK. KINGFISHER HATCHERY (KINGFISHER COMMUNITY CLUB). EGG TARGET 150,000. RELOCATED TO CONFLUENCE OF COOKE C. (1989). (REF. 29K-55)	1981/

H. LAND USE/WATER USE/WATER QUALITY

Activity	Description/Location
AG AGRICULTURE	ALFALFA CULTIVATION, DAIRY FARMING, AND HAY PRODUCTION THROUGHOUT (REF. 29K-22)
LO LINEAR DEVELOPMENT	CPR, HIGHWAY 97A FOLLOW THE RIVER FROM ENDERBY TO MARA LAKE (REF. 29K-22)
WQ WATER QUALITY	CITY OF ENDERBY DISCHARGES CHLORINATED SEWAGE INTO THE RIVER (REF. 29K-22)
LO LINEAR DEVELOPMENT	REVELSTOKE TRANSMISSION LINE FOLLOWS AND CROSSES RIVER EAST FROM ENDERBY. (REF. 29K-46)

I. FISH PRODUCTION POTENTIAL/CONSTRAINTS/GENERAL COMMENTS

FEASIBILITY OF A PROPOSED HATCHERY SITE FOR CHINOOK AND COHO IMMEDIATELTY DOWNSTREAM OF MABEL LAKE HAS BEEN EXAMINED AND APPEARS PROMISING. (REF. 29K-22)
REARING SURVEYS INDICATED THAT COHO SALMON SMOLTS WERE MORE ABUNDANT THAN IN MIDDLE SHUSWAP RIVER. (REF. 29K-28)
WATER QUALITY DISCUSSED (REF. 29K-27)

J. FISHERY OFFICER NARRATIVE

Date Prepared: 1988/04/01	Prepared By: B. KURTZ, DP. FRAMEWORK

K. SIS COMPLETED BY

Completed by:	GEORGE FARRELL	Date: 1986/12/17
Checked by:	LIDIA JAREMOVIC	Date: 1988/04/27
Last updated by:	L. JAREMOVIC	Date: 1990/09/26
Last checked by:	L. JAREMOVIC	Date: 1990/09/19

DFO / MOE
STREAM SURVEY FORM

Stream Name (gaz.) Cooke Creek (local)
Watershed Code
Location Mile ±8
Map #
U.T.M.
Reach No. 2
Site No.
Fish Card Y N C
Access Veh. Method
Length (km)
Lth surv (m) 200 GE
Field ☐ Hist. ☐
Date Y M D 85 08 04 Time 1000 Agency Crew MG/DH/ Photos Air Photos

C	PARAMETER	VALUE	METH.
	Ave.Chan.Width (m)	15	GE
	Ave.Wet.Width (m)	7	GE
	Ave.Max.Riffle Depth (cm)	20	GE
	Ave.Max.Pool Depth (cm)	100	GE
	Gradient %	5	CL
	% Pool 20 Riffle 60 Run 20 Other		GE
	Side Chan.% 1 0 ☐ 0-10 ☑ 10-40 ☐ >40 ☐		
	Debris Area% 1 0 ☐ 0-5 ☐ 5-15 ☑ >15 ☐		
	Stable %	80	
	COVER: Total %		
	Comp. sum 100% — Dp Pool / L.O.D. / Boulder / In Veg / Over Veg / Cutbank		
	Crown Closure % C Aspect		

SPECIFIC DATA

C	BED MATERIAL	%
Fines	clay,silt,sand (<2mm)	5
Gravels	small (2-16mm)	25
	large (16-64mm)	25
Larges	sm.cobble (64-128mm)	40
	lge.cobble (128-256mm)	30
	boulder (>256mm)	30
Bedrock (R)		5
D_{90} (cm)	C Compaction L (M) H	

C	BANKS			
	Height (m) 1-2	%Unstable 10		
	Texture F (G) L R			
	Confinement	EN CO (FC) OC UC N/A		
	Valley: Channel Ratio	0-2 (2-5) 5-10 10+ N/A		
	Stage	Dry L (M) H Flood		
	Flood Signs Ht (m)	Braided (Y) N		
	Bars (%) 20	pH —	O_2 (ppm)	
	Water Temp (°C) 9	Turb. (cm) —	Cond. (25°C) —	

OBSTRUCTIONS

C	Ht (m)	Type	Loc'n
Cl	3-4	Lf	10

DISCHARGE

Parameter	Value	Method	Specific Data
Wetted Width (m)			
Mean Depth (m)			
Mean Velocity (m/s)			
Discharge (m^3/s)			

REACH SYMBOL (Fish)
(Width, Valley Channel, Slope) (Bed Material)

REVISED DEC. 87 SS187

DFO / MOE
STREAM SURVEY FORM

Stream Name (gaz.) Cooke Creek (local)
Watershed Code
Location Mile ±10
Map #
U.T.M.
Reach No. 3
Site No.
Fish Card Y N C
Access Veh. Method
Length (km)
Lth surv (m) 100 GE
Field ☐ Hist. ☐
Date Y M D 85 08 04 Time 0830 Agency Crew MG/DH/ Photos Air Photos

C	PARAMETER	VALUE	METH.
	Ave.Chan.Width (m)	15	GE
	Ave.Wet.Width (m)	10	GE
	Ave.Max.Riffle Depth (cm)	20	GE
	Ave.Max.Pool Depth (cm)	100	GE
	Gradient %	5	CL
	% Pool 30 Riffle 60 Run 10 Other		GE
	Side Chan.% 1 0 ☐ 0-10 ☑ 10-40 ☐ >40 ☐		
	Debris Area% 1 0 ☐ 0-5 ☐ 5-15 ☑ >15 ☐		
	Stable %	90	
	COVER: Total %	40	
	Comp. sum 100% — Dp Pool 10 / L.O.D. 20 / Boulder 10 / In Veg / Over Veg 40 / Cutbank 20		
	Crown Closure % 30 C Aspect		

SPECIFIC DATA

C	BED MATERIAL	%
Fines	clay,silt,sand (<2mm)	5
Gravels	small (2-16mm)	40
	large (16-64mm)	30
Larges	sm.cobble (64-128mm)	60
	lge.cobble (128-256mm)	30
	boulder (>256mm)	65
Bedrock (R)		40
D_{90} (cm)	C Compaction L (M) H	30

C	BANKS			
	Height (m) 1	%Unstable 30		
	Texture F (G) L R			
	Confinement	EN CO (FC) OC UC N/A		
	Valley: Channel Ratio	0-2 2-5 (5-10) 10+ N/A		
	Stage	Dry L (M) H Flood		
	Flood Signs Ht (m) 1.0	Braided (Y) N		
	Bars (%) 20	pH —	O_2 (ppm) —	
	Water Temp (°C)	Turb. (cm) —	Cond. (25°C)	

OBSTRUCTIONS

C	Ht (m)	Type	Loc'n

DISCHARGE

Parameter	Value	Method	Specific Data
Wetted Width (m)			
Mean Depth (m)			
Mean Velocity (m/s)			
Discharge (m^3/s)			

REACH SYMBOL (Fish)
(Width, Valley Channel, Slope) (Bed Material)

REVISED DEC. 87 SS187

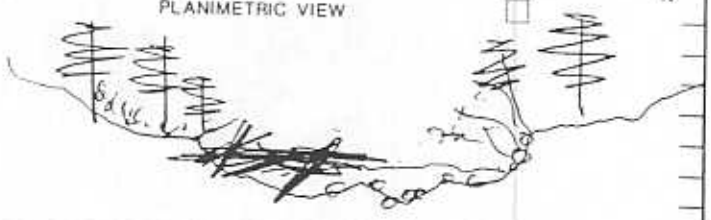
FISH SUMMARY

Species	No.	Size Range(mm)	Life Phase	Use	Method/Ref.
RnCt	6	100-150			VIS. obs

STREAM/VALLEY CROSS-SECTION (Looking Downstream) ☐

L R

PLANIMETRIC VIEW ☐



COMMENTS

Channel Stability ☐ Debris ☐ Management Concerns ☐ Obstructions ☐ Riparian Zone ☐ Valley Wall Processes ☐ Etc.

- excellent fish habitat in site ≈ 10
  - deep pools (>100 cm), undercut banks, overhanging veg., side channels
  - some large debris, LWD in the channel d/s from the bridge have modified & mostly improved habitat
- mixing reach with spawning size gravel

Edited by

Date Y M D

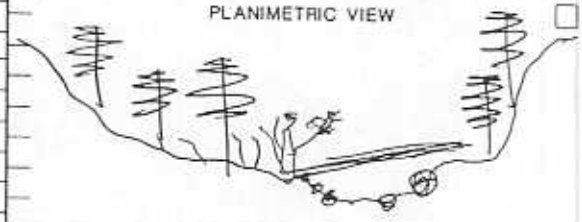
FISH SUMMARY

Species	No.	Size Range(mm)	Life Phase	Use	Method/Ref.

STREAM/VALLEY CROSS-SECTION (Looking Downstream) ☐

L R

PLANIMETRIC VIEW ☐



COMMENTS

Channel Stability ☐ Debris ☐ Management Concerns ☐ Obstructions ☐ Riparian Zone ☐ Valley Wall Processes ☐ Etc.

- u/s from the falls at the u/s end of this reach there is a series of pools/riffles controlled by natural LWD & wide floodplain
  - ⇒ excellent fish habitat
- the falls are most likely a barrier to fish passage but there is an alternate channel around the Knoll to the N of the falls
  good habitat in this reach (site #8)
- some areas with spawning size gravel.

Edited by

Date Y M D

DFO / MOE
STREAM SURVEY FORM

Stream Name (gaz.)	Cooke Creek	(local)		Access	rd.
Watershed Code		Reach No.	4	Length(km)	4?
Location	site # 15, 16	Map	Site No.	Lthsur(km)	100 GE
		U.T.M.	Fish Card	Y (N)	Field ☐ Hist ☐
Date Y.M.D. 15 07 04	Time 0630	Agency	Crew MG/DH /	Photos	Air Photos

C	PARAMETER	VALUE	METH.	SPECIFIC DATA
	Ave.Chan.Width (m)	10	GE	
	Ave.Wet.Width (m)	5	GE	
	Ave.Max.Riffle Depth (cm)	20	GE	
	Ave.Max.Pool Depth (cm)	50	GE	
	Gradient % 60	10	CL	
	% Pool 10 Riffle 70 Run 20 Other		GE	
	Side Chan.%	5	↓	
	Debris Area%	5	↓	
	Debris Stable %	90	↓	
	COVER: Total %	30		

Comp. sum 100%	Dp Pool	L.O.D.	Boulder	In Veg	Over Veg	Cutbank
	10	20	10		40	20

Crown Closure %	20	Aspect	

BED MATERIAL		%
Fines	clay, silt, sand (<2mm)	
Gravels	small (2-16mm)	20
Gravels	large (16-64mm)	20
Larges	sm.cobble (64-128mm)	20
Larges	lge. cobble (128-256mm)	40
Larges	boulder (>256mm)	40
Bedrock (R)		
D_{90} (cm)	Compaction	L (M) H

BANKS			
Height(m)	1	%Unstable	10
Texture	F (G) (L) R		
Confinement	EN CO (FC) OC UC N/A		
Valley: Channel Ratio	0-2 (2-5) 5-10 10+ N/A		
Stage	Dry L (M) H Flood		
Flood Signs Ht(m)	1	Braided	(Y) N
Bars (%)	—	pH	—
O_2 (ppm)	—	Water Temp.(°C)	
Turb.(cm)	—	Cond.(25°C)	—

OBSTRUCTIONS			
C	Ht(m)	Type	Loc'n

DISCHARGE

Parameter	Value	Method	Specific Data
Wetted Width (m)			
Mean Depth (m)			
Mean Velocity (m/s)			
Discharge (m^3/s)			

REACH SYMBOL
(Fish)

(Width, Valley:Channel, Slope) (Bed Material)

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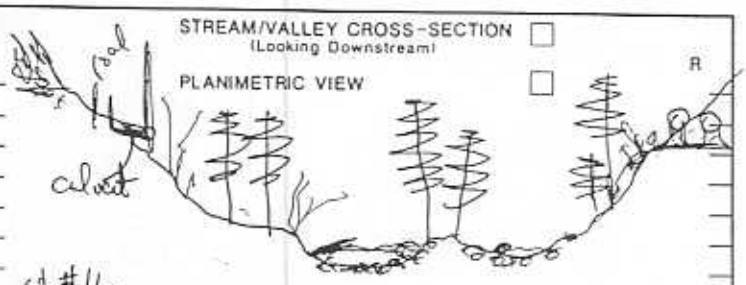
FISH SUMMARY

C	Species	No.	Size Range(mm)	Life Phase	Use	Method(s)

STREAM/VALLEY CROSS-SECTION ☐ (Looking Downstream)

PLANIMETRIC VIEW ☐



COMMENTS

Channel Stability ☐, Debris ☐, Management Concerns ☐, Obstructions ☐, Riparian Zone ☐, Valley Wall Processes ☐, Etc.

- mod. habitat for RT on this reach
- some deep pools; good cover (some pools 1m deep)
- some 1m high debris jams noted. 4/5 of the on this at site #16
- many deep pools, LOD; undercut banks at site #15
- better potential fish habitat at site #15 than at #16

Edited by:

Date Y M D

Photo 1. Debris and exposed bank associated with the slide at the culvert outlet, view from base of slide.
Stream Name: Cooke Creek **Site #:** 8 **Reach #:** 2
Coordinates: 49°45.23' 119°20.19' **Code:** Fb/Fs/Q•C•F•1

Photo 2. Actively eroding deposit (fines/gravels) at the base of the slide, approx. 30 m from the stream.
Stream Name: Cooke Creek **Site #:** 8 **Reach #:** 2
Coordinates: 49°45.10' 119°20.20' **Code:** Fb/Fs/Q•C•F•1

Photo 3. Debris jam on the right bank approximately 50 m d/s from the slide, d/s view.
Stream Name: Cooke Creek **Site #:** 8 **Reach #:** 2
Coordinates: 49°45.23' 119°20.19' **Code:** Fb/Fs/Q•C•F•1

APPENDIX X

Brash Creek
Stream Information File

MID-SHUSWAP STREAM ASSESSMENT

STREAM: BRASH CREEK
DATE: October 13, 1994
TAPE: WRP Tape 5

* - to visit	LOCATION SYMBOL	CODE	COMMENTS	TIME	COORDINATES North	West
	1		▸ mouth of the stream	02:08	50.33.18	119.01.79
	2	Fs/Q-C-Hw-1	▸ bridge	02:20	50.33.27	119.01.83
	3	Fs/Q-S-A-2	▸ agricultural fields on the left	02:38	50.33.40	119.01.90
16/04/95 RK *	4	~~Fs/Q-S-F-1~~ no code	▸ logging operation (mill) ~10m from the stream bank on the left side - might have potential water quality problems but not at present - see field notes (SHUSWAP LUMBER)	03:49	50.33.~~68~~ 53	119.02.~~37~~ 24
06/04/95 RK *	5	~~Fs/Q-C-F-1~~ Q-C-F-1	▸ bridge, bank erosion on both sides 06/04/95 RK	03:57	50.33.~~72~~ 82	119.02.~~42~~ 39
	6	Fs/Q-F-F-2	▸ road on the right side	04:27	50.33.89	119.02.60
	7	Fb-W-R-1	▸ dam/weir (15 x 50m pool impoundment)	04:51	50.34.05	119.02.59
06/04/95 *	8	no code ~~Fb/Q-D-W-1~~	▸ LWD across the channel	07:44	50.35.25	119.01.~~74~~ 66
	9	Fs/Q-S-N-2	very tough access RK 06/04/95 ▸ eroding bank of till material on the left side entering the stream @ ~2700' elevation	07:55	50.35.33	119.01.68
	10	Fs/Q-S-N-2	▸ eroding bank on the right side & left side with a succession of slides	09:36	50.35.85	119.00.71
	11	Fb-W-N-3	▸ waterfall (4-5m) on tributary entering from the left side	10:55	50.36.32	119.00.05
15-06-15 DH/MG *	12	Fs/Q-C-F-1	▸ bridge crossing with road material entering the stream	11:24	~~50.36.31~~ 50.36.403	~~118.59.91~~ 118.59.647
15-06-15 DH/MG *	13	Fs/Q-C-F-1	▸ road crossing (~~bridge~~ culvert) → unmarked branch of the stream	11:50	~~50.36.24~~ 50.36.222	~~118.59.72~~ 118.59.620
	14		▸ branch of *Brash Creek*, to the left of the unnamed branch	12:45	50.36.35	119.00.04
	15		▸ return to the main branch of *Brash Creek*	13:43	50.36.47	118.59.95
	16		▸ headwaters of the stream @ ~5000' elevation	16:20	50.37.66	119.00.13

NOTE: 1-11: Map 82 L/11 1:50,000
12-16: Map 82 L/10 1:50,000

511-03

DFO/MOEP FISH HABITAT INVENTORY AND INFORMATION PROGRAM
STREAM INFORMATION SUMMARY

Watershed Code: 03-5400-000-000-000-000-991
Stream Name: SHUSWAP RIVER

A. DESCRIPTION

Stream Name:	SHUSWAP RIVER	D.F.O. Division:	FRASER RIVER
Local Name:	LOWER SHUSWAP RIVER	District:	1 KAMLOOPS
Watershed Code:	03-5400-000-000-000-000-991	Subdistrict:	29K SALMON ARM
		Statistical Subarea:	-
		M.O.E. Region:	8 OKANAGAN
		Management Unit:	25

Tributaries	Code

Topographic (1:50k) Map:	82L/11
B.C.G.S. (1:20k) Map:	
U.T.M. Mouth:	11.3556.56208
Lat./Long. Mouth:	50 DG. 43' 0'' 119 DG. 3' 0''
Mainstem Length:	88.6 km Ref. No.: 29J-61
Watershed Area:	Ref. No.:

Location: FLOWS FROM MABEL LAKE INTO THE SOUTH END OF MARA LAKE, KAMLOOPS DISTRICT. SISS TRIBUTARIES TO MARA L AND LOWER SHUSWAP R. HAVE WATERSHED CODES FROM 010 TO 210. (SEE SHUSWAP RIVER, 03-5400, FOR LISTING).

Gradient Class/Location (km upstream from mouth)					Comments
0 - .5%	.5 - 2%	2 - 5%	5 - 10%	>10%	
NO INFORMATION AVAILABLE					

B. OBSTRUCTIONS TO MIGRATION

Barrier (Type)	Height (meters)	Location (km U/S)	Impassable to (species)	Comments
NB NO BARRIER				ACCESS TO MABEL LAKE. (REF. 29K-46)

C. FLOW

Flow Control:
W.S.C. Station No. 1: 08LC002 Water Survey of Canada (WSC) Flow Gauge: Y
No. 2: No. 3: No. 4:

Comments: LAKE FED. MABEL LAKE: 88.6 KM UPSTREAM; AREA - 59.1 SQ.KM; PERIMETER - 77.8 KM. (REF. 29J-61)

D. DISTRIBUTION SUMMARY

Species	Watershed Distribution
SK SOCKEYE SALMON	ASHTON CREEK TO MABEL LAKE; HEAVIEST JUST BELOW HUPEL (REF. 29K-2, REF. 29K-30)
CO COHO SALMON	SAME AS SOCKEYE (REF. 29K-2, REF. 29K-30)
PK PINK SALMON	PRESENCE NOTED (REF. 29K-1)
CH CHINOOK SALMON	JUVENILE REARING DISTRIBUTION SIMILAR TO ADULT SPAWNING DISTRIBUTION; FLOODED PASTURES, BACKWATERS AND SLOUGHS ADJACENT TO SPAWNING AREAS ARE THE PREFERRED REARING HABITATS. (REF. 29K-26)
CH CHINOOK SALMON	SAME AS SOCKEYE (REF. 29K-2, REF. 29K-30)
DV DOLLY VARDEN	PRESENCE THROUGHOUT (REF. 29K-53)
KO KOKANEE	SAME AS SOCKEYE (REF. 29K-30)
LT LAKE TROUT	PRESENCE THROUGHOUT (REF. 29K-53)
RW ROCKY MTN WHITEFISH	PRESENCE THROUGHOUT (REF. 29K-53)

Watershed Code: 03-5400-000-000-000-000-991
Stream Name: SHUSWAP RIVER

E. ESCAPEMENT SUMMARY

Species	Escapement			Maximum Recorded Escapement		Management Target Escapement	
	Mean	Period of Record	Ref. No.		Ref. No.		Ref. No.
SK SOCKEYE SALMON	133997	1978 - 1987	28A-18	600495	28A-18		
CO COHO SALMON	310	1978 - 1987	28A-18	350	28A-18		
PK PINK SALMON	5	1979 - 1987	28A-18	13	28A-18		
CH CHINOOK SALMON	7892	1978 - 1987	28A-18	12000	28A-18		
Comments: SOCKEYE DOMINANT CYCLE 1978, 1982, 1986 (REF. 29K-1)							

F. LIFE HISTORY TIMING

Species	Activity	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
SK SOCKEYE SALMON	Migration									X			
	Spawning										X X	X	
	Incubation												
	Rearing												
CO COHO SALMON	Migration												
	Spawning										X		
	Incubation											X X	
	Rearing												
CH CHINOOK SALMON	Migration												
	Spawning												
	Incubation							X X	X X	X X			
	Rearing										X X	X	
Comments: CHINOOK, COHO AND SOCKEYE TIMING INFORMARTION (REF. 29K-2)													
EMERGENCE OF CHINOOK FRY MID APRIL TO EARLY MAY (REF. 29K-26)													

G. ENHANCEMENT/MANAGEMENT ACTIVITIES IN WATERSHED

Type of Activity	Species	Location (km U/S)	Comments	Period of Operation Start/Finish
FS FISH SAMPLING	SK SOCKEYE SALMON		DOWNSTREAM FRY TRAPPING. (REF. 29I-100)	1987/1987
FS FISH SAMPLING	SK SOCKEYE SALMON		DOWSTREAM FRY TRAPPING. (REF. 29I-100)	1979/1979
MR MARK RECOVERY	CH CHINOOK SALMON	0.0	72,000 DOWNSTREAM CHINOOK FRY CODED WIRE TAGGED AND RELEASED -PART OF A FEASIBILITY STUDY FOR ENHANCEMENT POSSIBILITIES (REF. 29K-22)	1979/1981
FP MULTIPLE STRATEGY	CH CHINOOK SALMON	0.0	EGG TAKES AND OUTPLANTING FROM SHUSWAP RIVER HATCHERY (REF. 29K-20, REF. 29K-46)	1984/
MR MARK RECOVERY	CH CHINOOK SALMON	0.0	PETERSON DISC. SHUSWAP FALLS HATCHERY CREW. (REF. 29K-55)	1989/
MR MARK RECOVERY	CH CHINOOK SALMON	0.0	CODED WIRE TAG RECOVERY; SPAWNING ESCAPEMENT ESTIMATES; AGE, LENGTH AND SEX COMPOSITION. (REF. 29K-65, REF. 29K-66)	1983/1985
HY HATCHERY	CH CHINOOK SALMON	79.6	0.5KM DOWNSTREAM OF COOKE CREEK, KINGFISHER HATCHERY (KINGFISHER COMMUNITY CLUB), EGG TARGET 150,000. RELOCATED TO CONFLUENCE OF COOKE C. (1989). (REF. 29K-55)	1981/

H. LAND USE/WATER USE/WATER QUALITY

Activity	Description/Location
AG AGRICULTURE	ALFALFA CULTIVATION, DAIRY FARMING, AND HAY PRODUCTION THROUGHOUT (REF. 29K-22)
LD LINEAR DEVELOPMENT	CPR, HIGHWAY 97A FOLLOW THE RIVER FROM ENDERBY TO MARA LAKE (REF. 29K-22)
WQ WATER QUALITY	CITY OF ENDERBY DISCHARGES CHLORINATED SEWAGE INTO THE RIVER (REF. 29K-22)
LD LINEAR DEVELOPMENT	REVELSTOKE TRANSMISSION LINE FOLLOWS AND CROSSES RIVER EAST FROM ENDERBY. (REF. 29K-46)

I. FISH PRODUCTION POTENTIAL/CONSTRAINTS/GENERAL COMMENTS

FEASIBILITY OF A PROPOSED HATCHERY SITE FOR CHINOOK AND COHO IMMEDIATELTY DOWNSTREAM OF MABEL LAKE HAS BEEN EXAMINED AND APPEARS PROMISING. (REF. 29K-22)

REARING SURVEYS INDICATED THAT COHO SALMON SMOLTS WERE MORE ABUNDANT THAN IN MIDDLE SHUSWAP RIVER. (REF. 29K-28)

WATER QUALITY DISCUSSED (REF. 29K-27)

J. FISHERY OFFICER NARRATIVE

Date Prepared: 1988/04/01 Prepared By: B. KURTZ, OP. FRAMEWORK

K. SIS COMPLETED BY

Completed by:	GEORGE FARRELL	Date:	1986/12/17
Checked by:	LIDIA JAREMOVIC	Date:	1988/04/27
Last updated by:	L. JAREMOVIC	Date:	1990/09/26
Last checked by:	L. JAREMOVIC	Date:	1990/09/19

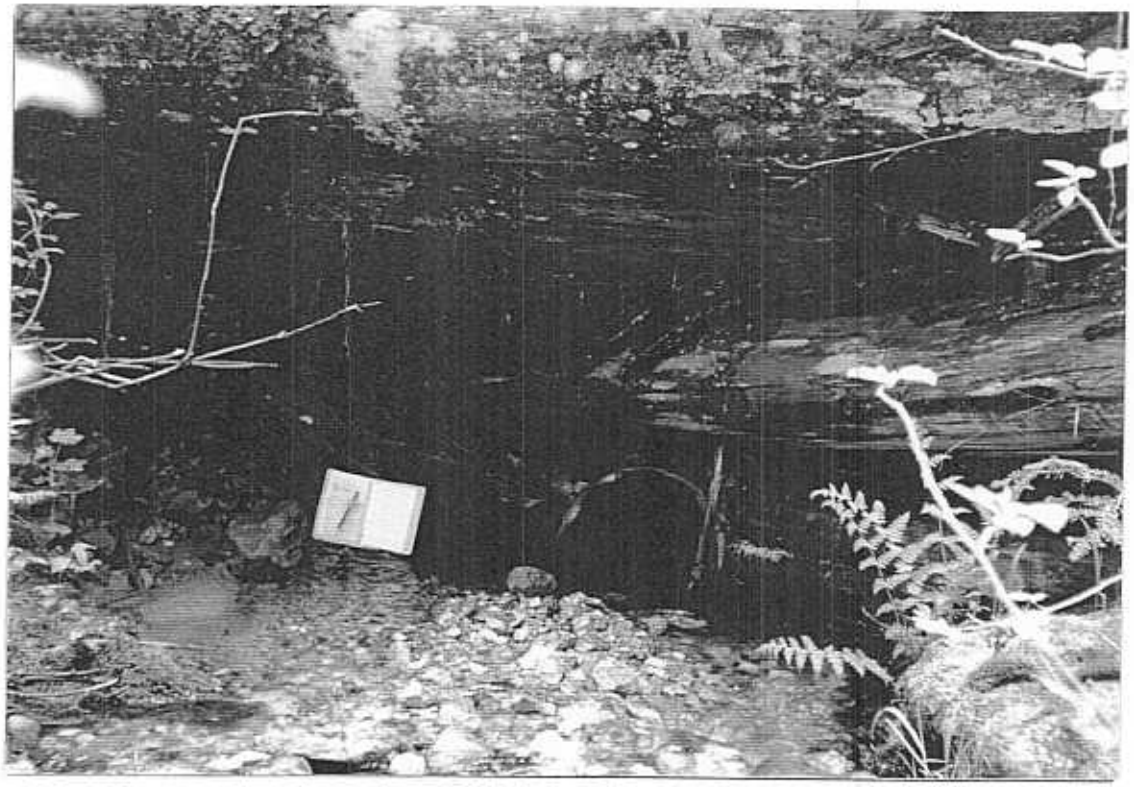


Photo 1. Culvert inlet with overlaying rotting wood and accumulation of gravel, d/s view.
Stream Name: Brash Creek **Site #:** 12 **Reach #:** 2
Coordinates: 49°45.23' 119°20.19' **Code:** Fs/Q•C•F•1

Photo 2. Erosion of the road surface adjacent to the d/s end of the culvert, d/s view.
Stream Name: Brash Creek **Site #:** 12 **Reach #:** 2
Coordinates: 49°45.10' 119°20.20' **Code:** Fs/Q•C•F•1

Photo 3. Culvert outlet with overlaying logs and restrictions on stream width and peak flow, u/s view.
Stream Name: Brash Creek **Site #:** 13 **Reach #:** 2
Coordinates: 49°45.23' 119°20.19' **Code:** Fs/Q•C•F•1

Photo 4. Restricted flow and partial blockage of the culvert inlet, d/s view.
Stream Name: Brash Creek **Site #:** 13 **Reach #:** 2
Coordinates: 49°45.10' 119°20.20' **Code:** Fs/Q•C•F•1

APPENDIX XI

Biogeoclimatic Zone/Subzone Codes

Appendix XI Key to Biogeoclimatic Zone, Subzone and Variant Unit Symbols in the Mid-Shuswap Watershed.

Biogeoclimatic unit symbols are arranged by zone/subzone/variant/phase. For example, ICHwk1 indicates:

Zone	**I**nterior **C**edar **H**emlock
Subzone	**w**et (precipitation) **k** cool (temperature)
Variant	**1** (Wells Gray)

Zones

ICH	Interior Cedar-Hemlock
ESSF	Engelmann Spruce - Subalpine fir

Subzones

Precipitation

m	moist
w	wet
v	very wet

Temperature

w	warm
m	mild
k	cool
c	cold

Variants

ICHmw2	Shuswap
ICHwk1	Wells Gray
ICHvk1	Mica
ESSFwcp	Parkland

Source: B.C. Ministry of Forests. 1989. Biogeoclimatic Units maps. Kamloops Forest Region. January 1989.

APPENDIX XII

Fish Species Codes and Middle Shuswap River Watershed Fish Species Summary Table

Appendix XII Fish species codes.

Code	Species
CM	Chum salmon
CH	Chinook salmon
PK	Pink salmon
SK	Sockeye salmon
KO	Kokanee
CT	Cutthroat trout
RB	Rainbow trout
DV	Dolly Varden
BB	Burbot
MW	Mountain whitefish
RSC	Redside shiner
STC	Spottail shiner
ESC	Emerald shiner
CBC	Chub, general
PCC	Peamouth chub
DC	Dace, general
LNC	Longnose dace
SU	Sucker, general
LSU	Longnose sucker
CSU	Coarsescale sucker (Largescale sucker)
CAS	Prickly sculpin
CCG	Slimy sculpin

Note: * indicates that the species spawns in the stream system.

BC MELP Fisheries Files

Reviewed map sheets in MELP Penticton office on February 17, 1995

Map Sheet	Stream	Location	Reference No.	Fish Species	Comments
82 L/2	Bessette	confluence w Creighton & Duteau		CO, CH, CH*, RB, MW, RB, SK, DC, RSC, SU	locations unclear on map
82 L/2	Bessette	5 km u/s Lumby	03-5400-350	CO, CH, RB, SK, MW, DC, CC, RSC, SU	
82 L/3	Bessette	at steep reach 4 km u/s mouth	03-5400-350-060	CO, CH, RB, CC, DC	
82 L/7	Bessette	at Lumby	03-5400-350-040	CO, CH, MW, RB	
82 L/7	Bessette	at mouth	03-5400-350	CO, CH, MW, RB, SK, DC, CC, RSC, SU, KO	
82 L/7	Bessette	at Vance Cr.	128-8355-541-352	RB	
82 L/8	Bill Fraser	near confluence with Spectrum	128-8355-758-453	RB	
82 L/11	Brash	at mouth	128-8355-234	RB	CH* & SK* in Shuwap just above & below Brash, CO* u/s
82 L/2	Cherry	at Cherryville	128-8355-618	RB, CCG	
82 L/7	Cherry	1 km u/s Shuswap	128-8355-618	RB, CCG	
82 L/8	Cherry				no notes
82 L/10	Cooke				no notes; KO* in Shuswap just u/s confluence
82 L/2	Creighton	lowest 4 km reach		CO*	
82 L/2	Creighton	Dennison L. near headwaters		RB	
82 L/8	Currie				no notes
82 L/3	Duteau		03-5400-350-040	CO, CO*, CH*	CO*,CH* in floodplain area approx. 3 km u/s Lumby
82 L/3	Duteau	headwaters		RB, RB*	numerous RB/RB* in small tribs and lakes
82 L/9	Gates	200 m u/s/ Shuswap		RB, DV, CC, FS	
82 L/9	Gates	unnamed lake at 5000'	128-8355-680	RB, RB*	RB* at lake inlet - N end
82 L/16	Greenbush	at inlet to Greenbush L.		RB*, DV*, MW*, LSU*, CSU*, RSC*	
82 L/16	Greenbush	near mouth	128-8355-936	RB, DV, MW, LSU, CSU, RSC	
82 L/16	Greenbush L.			RB, DV, MW, LSU, CSU, RSC	
82 L/2	Harris	3 km u/s McAuley Cr.	128-8355-541-736-	RB	small lakes at headwaters have RB*
82 L/2	Harris	at W. edge of map sheet	128-8355-541-736	RB, CO, CC, CH, DC	
82 L/2	Heckman				no notes
82 L/9	Hound				no notes - see Tsuis Cr.
82 L/8	Kate	on floodplain	128-8355-751	RB	
82 L/8	Kate	Pete Lake	8016	RB, RB*	RB* at lake outlet
82 L/8	Kate	at confl. w unnamed cr. from Pete L.	128-8355-751-752	RB, SP	
82 L/8	Kate L.			RB	
82 L/10	Kingfisher	reach 7.5 km to 14 km		CO*	
82 L/10	Kingfisher	100 m u/s Shuswap R.	03-5400-210	CO, CO*, RB	CO* along lowest 1.5 km
82 L/10	Kingfisher/Danfort	Danforth - 1.5 km reach u/s Kingfish.	03-5400-210-030	CO, CO*, RB	a Kingfisher tributary
82 L/7	Latewhos				no notes
82 L/7	Mabel L.	lake		SK, CO, CH, DV, KO, LT, MW, RB, LNC, CSU, NSC, PCC, RSC, CC	
82 L/2	Monashee				no notes
82 L/2	Monashee pass				no notes
82 L/7	Outlet	500 m u/s Sugar L.	128-8355-683	FS	
82 L/8	Outlet				no notes
82 L/8	Peters L.		128-8355-758-816	RB, RB*	RB* at creek inlets to lake
82 L/8	Severide				no notes
82 L/16	Shuswap	4.5 km d/s Joss Pass	128-8355-966	RB	
82 L/16	Shuswap	just u/s Greenbush	128-8355	RB, DV, KO, CC	
82 L/2	Shuswap	3 km d/s Jack's Creek	03-5400	SK, CO, KO, CH, DV, RB, MW, LT, LNC, CSU, NCS, PCC, RSC, CC	
82 L/7	Shuswap	at Ireland Creek	03-5400-320	CO, SK, RB	
82 L/7	Shuswap	100 m u/s Sugar L.	128-8355	KO, DV, CT, RB, BB, MW, RSC, CSU, LSY, CAS	
82 L/7	Shuswap	at Reiter Cr.	128-8355-655	RB, CCG, LNC	
82 L/7	Shuswap	at Cherry Creek	128-8355-618	RB,CCG	
82 L/7	Shuswap	d/s Shuswap Falls		SK, CO,CH, KO	
82 L/8	Shuswap	4 km u/s Spectrum	128-8355	RB, DV, KO, CC	
82 L/8	Shuswap	500 u/s Sugar L.	03-5400	RB, DV, KO, CC	
82 L/8	Shuswap	at Spectrum Cr.	128-8355-758	RB, SP	
82 L/9	Shuswap	at Star Cr.	128-8355-77	RB, DV	