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FINAL REPORT

UPPER BONAPARTE RIVER WATERSHED – CHANNEL, RIPARIAN AND SEDIMENT SOURCE ASSESSMENT

VOLUME 1: TEXT AND APPENDICES

Prepared for:

Ministry of Environment, Lands and Parks
Southern Interior Region
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Project #754

December 1998

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December 23, 1998

Reference: 754

Mr. George Smith, AscT
Southern Interior Regional Headquarters
Ministry of Environment, Lands and Parks
1259 Dalhousie Drive
Kamloops, B.C.
V2C 5Z5

Dear Mr. Smith:

Re: Final Report: Upper Bonaparte River Watershed – Channel, Riparian and Sediment Source Assessment (Contract No: 99-58)

Summit Environmental Consultants Ltd. is pleased to provide you with one bound and one unbound copy of Volume 1: Text and Appendices; and one copy of Volume 2: Photograph Log, Photographs and Videotapes of the above report. Please note that digital deliverables and hardcopy maps are provided as attachments to both copies of Volume 1.

We have enjoyed this project and look forward to working with you again. Please call if you have any questions.

Yours truly,
Summit Environmental Consultants Ltd.

Brian T. Guy, Ph.D., P.Geo., P.H.
Senior Geoscientist
President

EXECUTIVE SUMMARY

This report presents the results of a channel assessment completed in the Upper Bonaparte watershed, defined as the watershed of the Bonaparte River upstream of the confluence of the Bonaparte River and Scottie Creek. The work was funded by Forest Renewal B.C. (FRBC). It was preceded by four previous FRBC-funded studies. For consistency, sub-basin boundaries developed during previous work were used for this study, and reach breaks were adopted with only minor modifications. The objectives of the channel assessment were to identify and priorize channel disturbance, and to priorize restoration opportunities. At an early stage in the project, it became apparent that physical channel changes represent a much less significant restoration issue in the study area than disturbance to the overall aquatic environment (i.e. channel, riparian zone, and water quality). Therefore, we increased the scope of the investigation by considering riparian conditions in our rankings of disturbance, and in setting priorities for restoration. In addition, the physiography of most of the study area precludes the isolation of a dominant mainstem channel in the tributary sub-basins; so we changed the usual practice of examining one mainstem per sub-basin, and included all significant tributaries.

The study area covers 4,139 km^2 and has a total relief of about 1,700 m. The Bonaparte River rises on the Interior Plateau at about 1,600 m elevation and flows west and south to its confluence with Scottie Creek at 528 m elevation. Much of the study area consists of a relatively flat-lying plateau at elevations ranging from 1,100 to 1,600 m, into which the major streams either meander over the surface, or have incised significant valleys. Ten sub-basins have been identified, including a community watershed (for the town of Clinton). There is a wide range of land use within the study area, including agriculture, forestry, recreation, mining, and ranching; and 138 water licenses. The climate is continental, and the hydrologic regime is dominated by the annual spring freshet. Steelhead trout, chinook salmon, and coho salmon utilize the Bonaparte River up to Young Lake. Native and stocked rainbow trout, mountain whitefish, and coarse fish are found throughout the Bonaparte River. Major lakes in the study area also support kokanee and eastern brook trout. Of the Bonaparte River tributaries, only Rayfield River supports anadromous salmonids.

To efficiently achieve the project objectives, a customized study design was developed, in which more reliance was placed on aerial photograph and helicopter/videotape observations, and less on ground-based assessment, than is the usual practice in detailed channel assessment work. The study began with a general and a detailed assessment of recent and historic aerial photographs, in which sediment sources to the channel network were identified and assessed, and channel reaches were inspected. This was followed by a low-level, slow-speed helicopter reconnaissance over most the channel length in the study area, during which detailed notes were taken, and an audio and videotape record was obtained. The helicopter reconnaissance was followed by ground-based inspections at many of the sites and reaches, in order to obtain detailed notes at these key locations, but also to "calibrate" observations made from aerial photos and the helicopter.

Following this method, 182 point sources of sediment to streamchannels in the study area were identified, described, and ranked in terms of priority for restoration. A total of 633 km of streamchannel (360 reaches) were assessed and ranked in terms of level of disturbance to channels and associated riparian zones, and in terms of priority for restoration.

The conclusions of the study are as follows:

- Disturbance to channels and riparian zones in the study area has been caused by agriculture, range use, forestry, and transportation networks (roads and rail lines);

- Comparison of historic and recent aerial photos indicates some changes in channel position, but no changes in morphology or stability. In addition, there has been limited disturbance to the physical condition of the channels in the study area. However, many study area channels have a lack of large woody debris, which has likely impacted the quantity and quality of fish habitat.

- Channel impacts on Crown land tend to be localized point-sources, whereas impacts on private land are both point (such as locations of heavy cattle use) and non-point (such as long sections of riparian disturbance or general cattle access along reaches);

- It is inferred (but not measured during this study) that the combination of riparian disturbance (particularly within private land) and streamside land use has disturbed the aquatic ecosystem. It is likely that parameters such as summer water temperature, availability of shade and cover for fish, turbidity, and concentrations of pesticides, coliforms, suspended sediment, and nutrients have been affected;

- Twenty-seven reaches (62 km) are high priority for restoration, 106 reaches (193 km) are medium priority, and 50 reaches are low priority. The proportion of each reach needing restoration varies from about 5% to 90%. No restoration work is needed within 177 reaches; and,

- Seven sediment sources are high restoration priority (four on crown land and three on private land), 37 are medium priority (28 on crown land and nine on private land), and 55 are low priority. Eighty-three sediment sources do not require rehabilitation.

Project recommendations are as follows:

- None of the sediment sources requires urgent repair. Nevertheless, it is recommended that rehabilitation prescriptions be developed and implemented for the high priority sites in 1999;

- Rehabilitation of sediment sources should include activities such as fill pullback, drainage improvement, streambank stabilization and protection, revegetation, restricting cattle access, and riparian fencing and planting;

- None of the high priority reaches require urgent restoration. Nevertheless, it is recommended that restoration of the high priority reaches commences in 1999;

- Stream restoration activities should include placement of large woody debris to create fish habitat, use of large woody debris for streambank stabilization and habitat improvement, channel excavation and stabilization, riparian planting and fencing, and restricting cattle access to specific points which can be armoured to prevent erosion;

- Cooperation should be sought from private landowners in the study area, since watershed-wide restoration can only be achieved with extensive restoration efforts on private land. One or more sources of funding may be needed to achieve restoration on private land; and,

- Restoration options on private land should be chosen such that the landowners do not acquire long-term maintenance responsibilities. For example, it is recommended that planting of native species occurs on the stream side of any new fences, in order to speed re-establishment of a healthy riparian zone, and reduce or eliminate the need for long-term maintenance of the fencing.

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1.0 INTRODUCTION

1.1 PROJECT BACKGROUND AND OBJECTIVES

Summit Environmental Consultants Ltd. (Summit) was retained by Ministry of Environment, Lands and Parks in 1998 to carry out a channel assessment within the upper Bonaparte River watershed, defined as the watershed upstream of the confluence of Scottie Creek and the Bonaparte River. The project was funded by the Watershed Restoration Program (WRP) of Forest Renewal B.C. (FRBC), and follows four previous FRBC studies:

- level 1 Interior Watershed Assessment Procedure (IWAP) (BioTerra Consulting, 1997);
- preliminary Access Management Plan (BioTerra Consulting, 1998);
- sediment source survey (Terra Engineering Ltd., 1998); and,
- Fish Habitat Assessment Procedure (FHAP) (Arc Environmental Ltd., 1998).

The present project was initiated following the recommendations of the FHAP. The sub-basins defined in the previous reports were adopted for the present study, and the reach breaks defined in the FHAP were adopted with only minor modifications.

The basic goal of the study was to focus efforts during subsequent prescription and implementation stages of the watershed restoration process. The two study objectives were:

1. to identify and priorize channel disturbance; and,
2. to priorize channel restoration priorities.

To meet these objectives in a cost-efficient manner, a customized contract for the work was developed, which reduced the emphasis on the usual "channel assessment procedure" (CAP) methods of data collection and recording, digital deliverables, and other detailed specifications; and allowed the latitude to develop a customized approach and methodology to efficiently achieve the study objectives.

Very early in the study, several key factors became apparent:

- the primary channel restoration issue is related to disturbance of the overall aquatic ecosystem due to significant riparian alteration, rather than strictly disturbance to the physical condition of the streamchannels;
- riparian zones are disturbed as a result of several types of land-use, in addition to activities related to forest harvesting on Crown land (the FRBC focus); and,
- because of the morphology of the watershed, many of the tributary sub-basins have more than one significant tributary stream.

Based on these factors, the technical and spatial scope of the study increased:

- it was broadened to include assessment of riparian conditions and disturbance, and to incorporate riparian factors in the determination of restoration priority; and,
- it was increased in geographic scope to include significant tributaries within the major sub-basins of the study area, as well as the mainstems of the tributary sub-basins.

The project report is presented in two volumes: Volume 1 provides the text, appendices, map, and digital data, and Volume 2 contains photographs and videotapes.

1.2 WATERSHED CHARACTERISTICS

Physiography and geology:

The Bonaparte River (Figures 1.1 and 1.2 and Map 1) flows generally west from the eastern headwaters on the Interior Plateau (at approximately 1,600 m elevation) to the Chasm Creek confluence, then south to the confluence with Scottie Creek (at 528 meters elevation). The area northwest of Green Lake is relatively level, at elevations between 1,100 and 1,200 m. Mountain peaks along the western boundary of the study area rise to about 2,200 m. The study area covers approximately 4,139 km^2 and has a total relief of about 1,700 meters. It consists of 10 sub-basins, including one community watershed (for the town of Clinton).

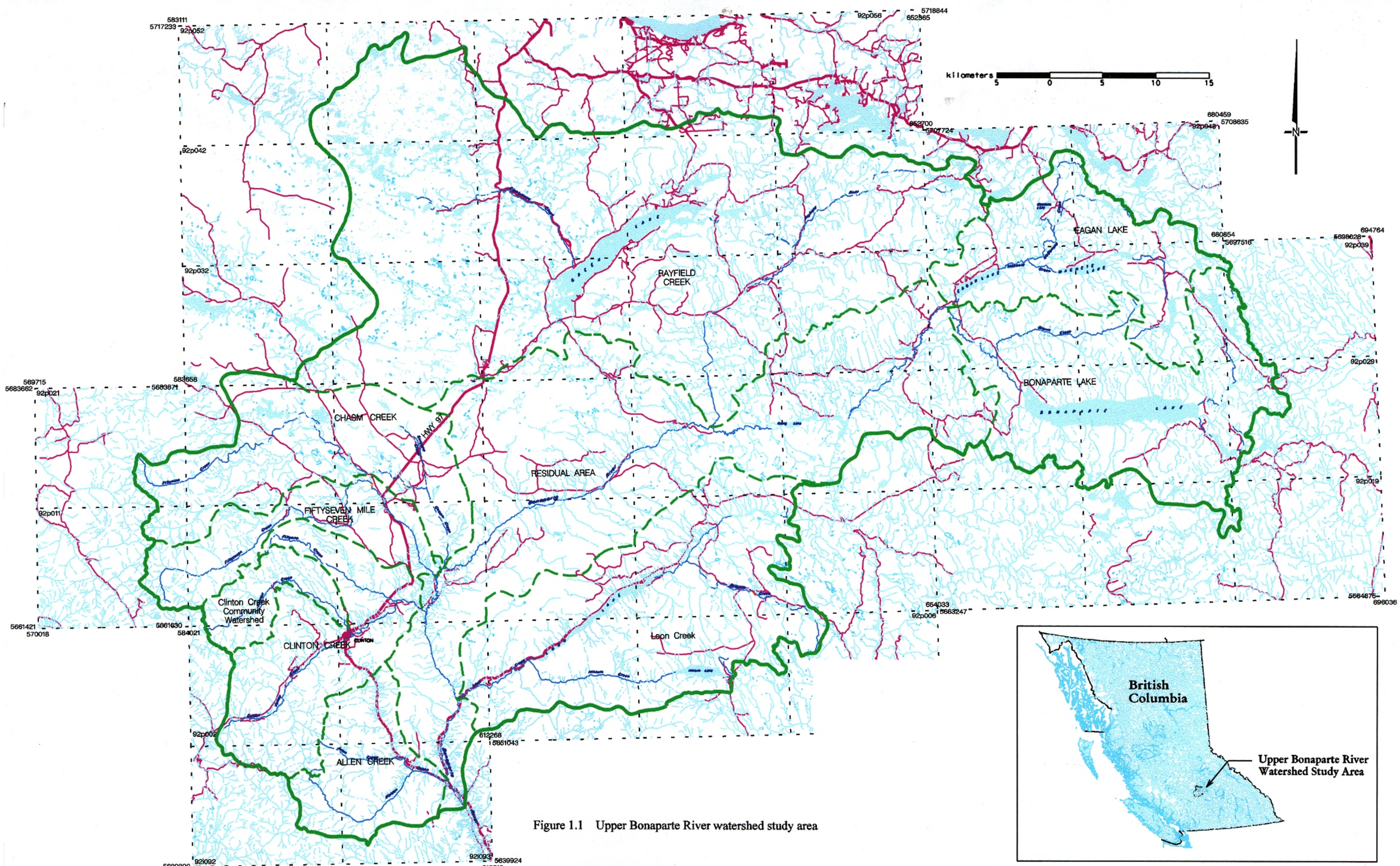

Figure 1.1 Upper Bonaparte River watershed study area

Figure 1.2 Satellite image covering approximately 96% of study area
- pink and light green areas indicate cleared areas or grasslands
(Reference: MELP - Bonaparte Lake Satellite Image Map, 1993)

Basin morphology has been strongly influenced by glaciation and fluvial erosional processes throughout the lower elevations of the watershed. In the upper elevations (1,200-1,500 m elevation) it is characterized by flat to gently rolling relief with large portions of granitic rock intruding through sedimentary and volcanic Paleozoic formations (BioTerra Consulting, 1997).

Biogeoclimatic context:

The study area covers six biogeoclimatic zones with 13 sub-zones; Interior Douglas Fir (IDF-dk1, xw, dk3), Englemann Spruce-Subalpine Fir (ESSF-xc, xcp, xv, Fdc2), Montane Spruce (MS-xk, dm2), Alpine Tundra (AP-p), Sub-Boreal Pine-Spruce (SBPS-mk), and Sub-Boreal Spruce (SBS-dw2, unk) (MELP, 1996).

Land and water use:

The study area includes the town of Clinton and two smaller centres (70 Mile House and Chasm), and supports a wide range of land use activities, including forestry, recreation, mining, and agriculture (including ranching). Private land covers a substantial portion of the study area (see Map 1), much of which has been developed for agricultural purposes.

There are approximately 138 water licenses on watercourses in the study area (for irrigation, domestic and residential use, enterprise use, stock watering ponds, and wildlife conservation). Of these, approximately 40 licenses are within the Loon and Allen Creek sub-basins (MELP, 1998) and 98 licenses upstream of the Loon Creek confluence (Arc Environmental Ltd, 1998). Clinton Creek, a 5th order tributary to the Bonaparte River, is a Community Watershed for the town of Clinton. The main water intake and reservoir is located in Reach 9 of Clinton Creek, at approximately 1,010 m elevation.

Climate:

Two climate stations have been operated by Environment Canada within the study area – Loon Lake and Clinton. However, there is insufficient data from these stations to reliably describe the climatic regime. Nevertheless, the climatic regime of the study area can be reasonably described using data from 100 Mile House (51°39'N 121°18'W), about 15 km

north of the northern boundary of the study area. The 100 Mile House station is at an elevation of 1059 m and has a 20 year record (1970 to 1990) (Atmospheric Environment Service, 1993). The annual total precipitation at 100 Mile House averages about 415 mm, comprised of about 260 mm rainfall and 155 mm snowfall (expressed as mm of water equivalent). On average, snowfall is recorded in all but three months of the year, with December and January the months of maximum accumulation. The distribution of total precipitation is relatively uniform, with peaks in both summer (reflecting a continental influence) and late fall/early winter (reflecting a maritime influence). The wettest month on average is July. The average annual temperature at 100 Mile House is 4°C. Mean monthly temperatures are below zero between November and February (mean temperatures for that period range between –2.6°C and –8.3°C). The warmest month is July with a mean monthly temperature of 15.1°C. During the period of record (1970 to 1990), the extreme minimum and maximum temperatures recorded were 46.5°C (30 December 1984) and 36°C (08 August 1978 and 04 September 1988) (Atmospheric Environment Service, 1993).

Hydrology:

The hydrologic database within the Upper Bonaparte River study area is extensive compared with that of many areas of British Columbia. The study area is located within zone 12 (the Southern Interior zone), about 80% within sub-zone 12A, and 20% within sub-zone 12B (Coulson and Obedkoff, 1998). The annual flow regime of study area streams (Figures 1.3 and 1.4) is characterized by low flows in winter, followed by a spring period of increasing flows related to snowmelt, leading to a peak in May or June. Streamflow then progressively declines through the summer and fall. Occasional rainstorm-related peak flows occur in summer. Table 1.1 provides basic flow data for 12 stations which were operated by the Water Survey of Canada (WSC) in the study area. Although the length of record ranges up to 36 years, no stations are currently active – the last year of record for any of the stations was 1996.

Fisheries:

Fisheries information for the watershed is summarized by Arc Environmental Ltd. (1998). That study reports that since construction of the Bonaparte River fishway in 1988, chinook

salmon have been observed spawning in Reaches 6, 7, and 8 of the Bonaparte River, steelhead trout have been observed spawning in reaches 3, 6, 7, and 8, and coho spawning has been documented in Reach 2. The upper limit for steelhead trout, and chinook, coho, and pink salmon has been observed to be at the outlet of Young Lake (Map 1). Rayfield River is reported to be the only tributary that supports anadromous salmonids. Native and stocked rainbow trout, mountain whitefish, and coarse fish species are found throughout the Bonaparte River. The notable headwater lakes (such as the Bonaparte Lake, Green Lake, Eagan Lake, and Machete Lake) contain these and other species, including kokanee and eastern brook trout. Fish presence is limited in most of the tributaries to the Bonaparte River, although Fisheries Information Summary System (FISS) data indicates fish in Reach 1 of Clinton Creek and Reaches 1 and 5 of Fifty Seven Creek. During the present study, fish were observed in Hihium Creek (within the Loon Creek sub-basin).

Level 1 watershed assessment results:

The results of the Level 1 IWAP (BioTerra Consulting, 1997) are summarized as follows:

- The Peak Flow hazard index is "low" (<.0.50) in all sub-basins including the Bonaparte River Residual area;
- The Surface Erosion hazard index is "high" in Allen Creek sub-basin (0.73), "medium" in Eagan Lake sub-basin (0.51), and "low" in all other sub-basins;
- The Riparian Buffer hazard index is "low" in all sub-basins; and
- The Mass Wasting index is "low' in all sub-basins.

As a result of the low Riparian Buffer hazard indices in all sub-basins, a Level 2 channel assessment was not recommended in the IWAP report. Because of the limitations of a level 1 IWAP for identifying and priorizing follow-up WRP activities in a watershed with such a long history of development as the Bonaparte, a combination of types of land tenure, and a diversity of land use, the present study did not rely heavily on the results of the level 1 IWAP.

Table 1.1: Data for Water Survey of Canada hydrometric stations within the study area.

Station		Record		Drainage Area (km^2)	Mean Annual Runoff			Mean annual max. daily Q (m^3/s)	Mean annual 7-day, low Q (m^3/s)
Name	No.	Period	Length (years)		m^3/s	$L/s/km^2$	cm		
Cutoff Valley near Clinton	08LF037	1923-27, 1953-54, 1965-74	5 2 10	58.0	0.28	4.83	15.2	0.68	0.1
Clinton Ck at Clinton	08LF038	1923-28, 1956-60	6 5	63.7	0.11	1.73	5.4	0.43	0.0
Fifty Seven Ck near Clinton	08LF047	1948-55, 1980	8 1	80.5	0.3	3.73	11.8	0.79	0.1
Fifty Nine Ck near Chasm	08LF048	1947-55	9	203.0	0.12	0.59	1.9	0.39	0.0
Bonaparte River near Bridge Lake	08LF062	1960-95	36	666.0	2.74	4.11	13.0	13.00	0.4
Clinton Ck near mouth	08LF064	1968-69, 1971, 1973-75	2 1 3	252.0	0.35	1.39	4.4	1.03	0.2
Bonaparte River above Clinton	08LF065	1968-71	4	3,210.0	6.07	1.89	6.0	49.00	0.6
Bonaparte River above Loon Ck	08LF066	1968-71, 1983-95	4 13	3,520.0	4.09	1.16	3.7	20.00	0.8
Loon Ck near mouth	08LF071	1968-71, 1982-95	4 14	479.0	0.24	0.50	1.6	1.42	0.0
Green Lake near 70 Mile House	08LF075	1969-95	27	N/A	0.96	N/A	N/A	1.10	0.8
McDonald Ck near Bridge Lake	08LF095	1984-94	11	20.4	0.09	4.41	13.9	0.69	0.0
Loon Ck above Loon Lake	08LF096	1987-89	3	N/A	N/A	N/A	N/A	N/A	N/A

N/A - Data not available

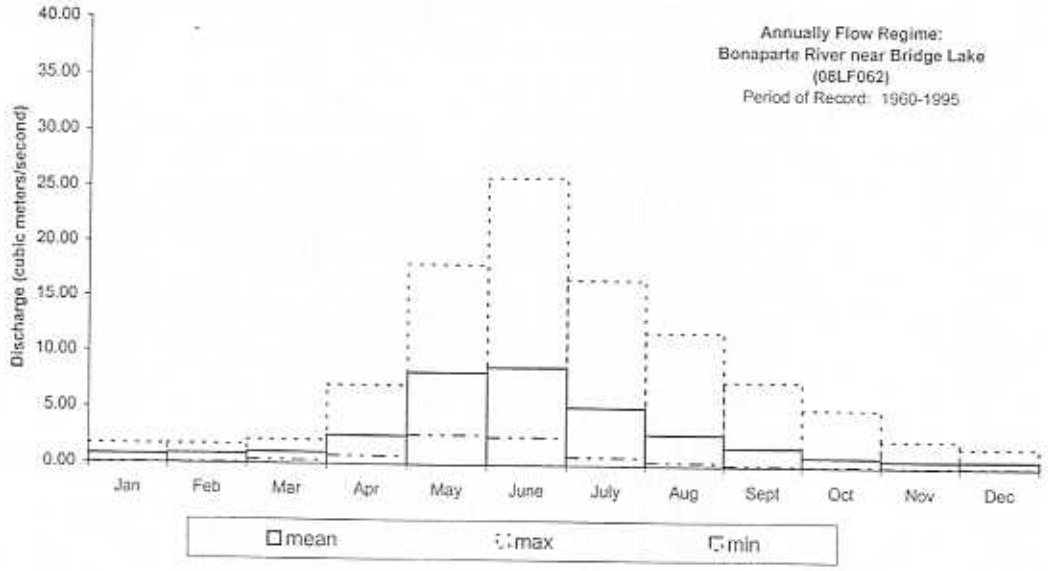

Figure 1.3: Mean, maximum, and minimum monthly flows for Bonaparte River near Bridge Lake (08LF062) (Environment Canada, 1997).

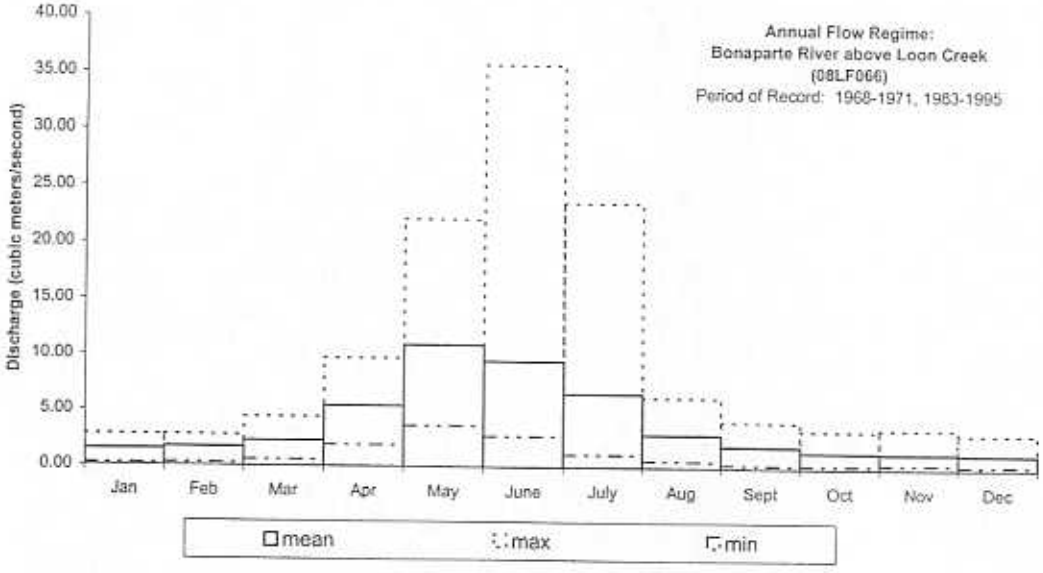

Figure 1.4: Mean, maximum, and minimum monthly flows for Bonaparte River above Loon Creek (08LF066) (Environment Canada, 1997).

2.0 METHODS

2.1 WORK PROGRAM

In order to efficiently achieve the study objectives of identifying and priorizing channel disturbance and restoration works, the following work program was developed and undertaken:

- an **office review** of previous reports and maps;
- a general and detailed **aerial photograph assessment**, covering channels and sediment sources, utilizing 1997 and 1995 color photographs, as well as 1958 black and white photographs;
- a slow-speed, low-level **helicopter flight** conducted over a period of two days over the mainstems and significant tributaries of all sub-basins in the study area, including **videotaping** (with audio commentary) of the creeks;
- a **ground assessment** of high, medium, and low priority restoration sites identified from the aerial photos, helicopter flight, and videotape review; and
- a **ranking** (high, moderate, and low), and **mapping** of sediment sources and channel reaches, in terms of disturbance and priority for restoration.

Section 2 outlines the methods followed to complete each of these steps.

2.2 OFFICE REVIEW OF EXISTING INFORMATION

The review of existing information for this study included the following:

- B.C. Government aerial photographs (1997 and 1995 color, and 1958 –1974 historic black and white);
- 1:20,000 TRIM maps (92I092-93, 92P002-006, 92P011-019, 92P021-029, 92P032-039, 92P042-048, 92P052-056);
- 1:50,000 NTS maps (92I13-14 and 92P01-08);
- 1:250,000 NTS maps (92-I and 92-P);
- 1:150,000 Biogeoclimatic Ecosystem Classification with Rivers, Lakes and Wetlands map (MELP, 1996);
- 1:250,000 Surficial Geology Map – Bonaparte Lake (Map 1293A, G.S.C, 1971);

- 1:500,000 Hydrometric Stations map – Lower Fraser River (Environment Canada, 1986);
- Surface Water and Sediment Data to 1995 – Hydat CD-ROM version 4.95 (Environment Canada, 1997);
- Canadian Climate Normals 1961-90 report (Environment Canada, 1993);
- Water Licenses (MELP B.C. data base, 1998);
- Bonaparte River Interior Watershed Assessment (BioTerra Consulting, 1997);
- Bonaparte River Watershed: Fish Habitat Assessment Procedure report (Arc Environmental Ltd., 1998);
- Sediment Source Survey of Bonaparte River Watershed 70 Mile House, British Columbia (Terra Engineering Ltd., 1998); and
- Bonaparte River Watershed Preliminary Access Management Final Report (BioTerra Consulting, 1998).

In addition to the above sources, the following agencies and person(s) were contacted for additional information on domestic, resource and agricultural land-use:

- Ducks Unlimited - Ken Johnson, Field Technician (Johnson, pers. comm., 1998);
- Range Officers Kamloops and 100 Mile House Forest District - Mike Dedels (Dedels, pers. comm., 1998) and Wendy Hayes-Van Vliet (Hayes-Van Vliet, pers. comm., 1998).

2.3 AERIAL PHOTOGRAPH ASSESSMENT

To guide efforts, the four previous FRBC-funded reports (listed in Section 1.0) were reviewed before conducting the aerial photograph analysis. The aerial photograph review followed the objectives outlined in the CAP Guidebook (MOF/MELP, 1996a). The review consisted of a general channel assessment (Form 1), a detailed channel assessment (Form 2) and a sediment source survey (Form 3). Forms 1 and 2 are presented in Appendix A, and Form 3 is presented in Appendix B. A list of sub-basins and tributaries assessed is presented in Table 2.1. A total stream length of 633 km was assessed in the project.

Table 2.1: List of sub-basins and streams included within the study

Sub-basin	Total Area (km^2)	Streams	Length of stream assessed (km)[1]
Allen Creek	139	Maiden Creek	19.9
		Allen Creek	10.4
Loon Creek	477	Loon Creek	40.7
		Brigade Creek	19.8
		Hihium Creek	25.4
Clinton Creek	245	Clinton Creek	11.9
		Cutoff Valley Creek	15.8
		Fifty One Creek	15.0
Clinton Creek Community Watershed	59	Clinton Creek	18.8
Fifty Seven Creek	129	Fifty Seven Creek	45.8
Chasm Creek	305	Chasm Creek	8.3
		Sixty One Creek	6.8
		Fifty Nine Creek	36.7
Rayfield River	1,280	Rayfield River	52.1
		Green Creek	29.4
		Eighty Three Creek	24.6
Eagan Lake	240	Machete Creek	34.9
		McDonald Creek	16.3
		Montana Creek	11.7
Bonaparte Lake	413	Bonaparte River	41.0
		Brown Creek	19.8
		Caverhill Creek	21.6
Bonaparte Residual	852	Bonaparte River	106.0
Watershed Total	**4,139**		**632.7**

1. The length assessed includes the length of any lakes within the stream system.

For consistency with the FHAP report, we adopted the same reach breaks, with minor modifications based on information gathered from 1995 and 1997 color aerial photographs and 1:20,000 scale TRIM maps. The main criteria used in refining the reach break locations were channel form and confinement, streamflow, sediment inputs, and gradient. As a result of our re-assessment, 25 reach breaks were added. All reach break locations were confirmed during the field assessment component of the project.

Channels:

The general channel assessment (recorded on Form 1) utilized the recent (colour 1997 and 1995) aerial photographs and maps and involved documenting reach data and basic channel characteristics. The detailed assessment (recorded on Form 2) utilized both recent and historic (1958) photos, and involved identification of more detailed information about the channel, streamside land-use and disturbances, and channel changes as a result of streamside land-use.

Sediment sources:

Previously identified sediment sources (from Arc Environmental Ltd., 1998 and Terra Engineering Ltd., 1998) were verified, and additional sediment sources were identified from the recent colour aerial photographs (the information is recorded on Form 3). (Note that Form 3 was used throughout the study; i.e. the aerial photograph review, the helicopter reconnaissance, and the ground-based assessment). Information recorded for each sediment source included the likely cause, sediment delivery potential, size, material texture, level of activity, and priority for field assessment. The classification systems used for each of these parameters is presented on Form 3 (Appendix B).

2.4 AERIAL RECONNAISSANCE

A helicopter reconnaissance was completed on October 14 and 15, 1998. The reconnaissance consisted of a slow speed, low-level helicopter flight up the mainstems and significant tributaries of each sub-basin (as listed in Table 2.1). Approximately 316 reaches representing 490 km of channel length (not counting lake reaches) were covered by helicopter, most of which is recorded on videotape. The video camera was mounted in the nose of the helicopter, and a global positioning system (GPS) receiver in the helicopter provided continuous location coordinates in latitude/longitude units (degrees/minutes/hundredths of minutes) and UTM coordinates, which were imprinted on the videotapes. The two study team members in the helicopter were equipped with microphones and provided verbal commentary direct to the videotape. The helicopter flight proved to be very useful in identifying and verifying channel morphologies and characteristics, confirming reach break

locations, identifying streamside land-use, and locating disturbances such as sediment sources and riparian alteration.

Information obtained during the aerial reconnaissance was documented on two forms: Form 3 (for sediment sources – Appendix B), and Form 4 (a reach summary form – Appendix C). Form 3 was used to identify new sediment sources, confirm the characteristics of sediment sources identified in the aerial photo assessment, specify the properties of the resulting channel disturbance (i.e. the level, type, and cause), and determine the priority for ground-based assessment. Form 4 was used to identify and verify channel morphologies, quantity of woody debris, bed and bank textures, and channel stability. In addition, the general level of disturbance within the reach, and the priority for ground-based inspection were recorded. The videotape was viewed the evening following the flight, to review and confirm the information recorded on Forms 3 and 4 during the flight, and confirm priorities for ground-based inspections.

Two VHS videotapes and several 35 mm photographs taken during the helicopter reconnaissance are included in Volume 2.

2.5 GROUND ASSESSMENT

Ground inspection locations were chosen based on priorities determined through the aerial reconnaissance and video review. The ground assessment was completed October 16 – 23, 1998. The work consisted of inspecting the channel at a number of accessible locations, which included private land, to confirm conditions at key locations and to calibrate the observations derived from aerial photos and aerial reconnaissance. As such, the ground inspections were focussed on high priority reaches and sites, but other sites were also visited. Representative ("Rep") sites were chosen within reaches to be inspected, and data recorded on two forms (Appendix D). "Ground-based Field Form 1 of 2" documents general stream measurements and characteristics (including bed and bank texture) as well as riparian characteristics (including percent herb, shrub and tree cover), and degree of disturbance of the channel and riparian zone at each specific site. Channel morphology, bed and bank

stability, and woody debris stability is also documented. The terminology follows the CAP Field Guidebook (MOF/MELP, 1996b; p.14):

- RP_g-w Riffle Pool with gravel and functional woody debris;
- RP_c-w Riffle Pool with cobble and functional woody debris;
- CP_c-w Cascade Pool with cobble and functional woody debris;
- CP_b Cascade Pool with boulder;
- SP_b-w Step Pool with boulder and functional woody debris;
- SP_b Step Pool with boulder; and
- SP_r Step Pool with boulder-block.

"Ground-based Field Form 2 of 2" was used to record information for sediment sources, impacted sites, and reaches requiring stream restoration. Priorities for restoration were assigned to each site visited. All photographs taken during ground-based inspections have been documented and provided in Volume 2.

2.6 RANKING AND MAPPING OF DISTURBANCE AND RESTORATION PRIORITY

For sites and reaches inspected on the ground, the two field forms (Appendix D) were utilized to assign disturbance level and restoration priority. The state of channel disturbance was assigned one of three values: H (morphology obscured or riparian zone severely disrupted); M (moderate disturbance); or L (not detectable or slight disturbance to channel or riparian zone). The assigned value included consideration both of the channel and its associated riparian zone. The categories and definitions were kept simple and semi-quantitative to provide guidance and consistency to the judgements, without unduly constraining the field crew. Restoration priority was judged from a combination of the following five factors:

- existing state of disturbance;
- potential for future disturbance;
- restoration benefit (considering the degree and type of habitat benefit, the potential for success, and the likely duration of effectiveness of restoration works);

- expected restoration cost; and,
- ease of access.

It is important to note that "restoration priority" was established based on the characteristics of the site, not the likelihood of obtaining FRBC (or any other) funding for restoration. Similar to disturbance, the assigned value (L, M, or H) reflects consideration of both the channel and the riparian zone.

For reaches not inspected on the ground, the approach outlined above was used to determine disturbance level and restoration priority; based on the aerial photographs, helicopter reconnaissance, and review of the videotape. Map 1 was produced after completion of the disturbance and restoration priority rankings. Key features of the map include:

- sub-basin boundaries, streams and lakes, reach breaks, private land, major roads, and contours;
- location, identifier, delivery potential, routing, and restoration priority for each sediment source (from Form 3);
- locations of representative ("Rep") sites at which ground-based reach information was obtained (details on each site are provided in Appendix D);
- state of disturbance of each reach (incorporating both channel and riparian zone); and,
- priority for restoration of each reach.

3.0 ASSESSMENT RESULTS AND RESTORATION OPPORTUNITIES

3.1 SEDIMENT SOURCES

All 182 identified sediment sources have been recorded on Form 3 (Appendix B). A total of 134 sediment sources have a **direct** connection to a stream or gully, of which 80 are related to human activity. The 182 sediment sources are shown on Map 1, colour coded by restoration priority. Tables 3.1 and 3.2 summarize key information for sites having "high" and "medium" priority for prescription, respectively.

Of the 182 sediment sources, seven sites are considered high priority for restoration, of which four are located on crown land and three are located on private land. Anthropogenic sediment inputs from these seven sites are related to roads or rail lines, logged riparian zones, and streambanks cleared for farming. Two sites are associated with steep eroding slopes with sediment directly entering the channel, one of which is a BC Rail fillslope (FS-S5.1) and the other is an eroding embankment being undercut by the Bonaparte River which has been exacerbated by road and beaver activity (BRR-B10.7). Revegetation and stabilization of the streambanks and hillslopes are restoration strategies that can be used at these sites. Potential restoration approaches at other sites include fill pullback, improvement of drainage conditions, restricting cattle access to exposed and trampled streambanks, and riparian planting and fencing.

Thirty seven (37) sites have been assigned medium restoration priority, of which 28 are located on crown land, and nine are located on private land. Roads, road crossings, railway crossings, and landslides are responsible for the majority of these sites. Cattle impacts and agricultural land use are also associated with many of them. Potential restoration approaches include road and crossing stabilization, stream bank protection (armouring), riparian planting, and fence installation to keep cattle out of disturbed and sensitive areas.

Fifty five (55) sites have been assigned low priority. The remaining 83 sites have been assigned no priority for restoration. The "no priority" sites are natural, or are sufficiently removed from the channel, or supply sediment at such a low rate that restoration is considered not worthwhile.

Table 3.1: Summary data on sediment sources with high priority for restoration

SUB-BASIN (Stream)	Site Number[1]	Map Reference	Causative Agent (N/H)[2]	Delivery Potential		Size (m^2)[4]	Material[5]	Type[6]	Level of Disturbance (L,M,H)[7]	Photograph(P), Roll(R) (Refer to Volume 2)	Cause, location, land tenure, comments
				Direct/Indirect/None	Routing[3]						
High Priority for Restoration Prescription											
Chasm Ck-Fiftynine Creek	CH-FN-B15.1	92P023	H	D	B	S	F	B/F	H	P23, R4	Logged stream and crossing. Access via Meadow Lake Road (Private Land)
Chasm Ck-Fiftynine Creek	CH-FN-B41.1	92P022	H	D	B	S	F		H	P22, R6	Beaver dam, partial-function culverts. Access via Big Bar Road (Private)
Fiftyseven Creek	FS-S5.1	92P013	H	D	S	H	F	F	H	P8, R3	BC Rail crossing-d/s. Access via Hwy 97 (Crown Land)
Allen Creek	AC-B3.1	92I093	H	D	B	S	F	F	H	P20,21, R3	Farmed land, stream and crossing. Access via Hwy 97 (Private)
Loon Ck- Hihium Creek	LC-HC-S3.5	92P004	N/H	D	S	H	C/F	F	M	P1, R1.1	Natural slide and steep unstable road. Access via Loon Lake Road (Crown)
Clinton Creek Community Watershed	CCW-B10.1	92P012	H	D	B	S	F	F/B	H	-	Road crossing, culverts-access via Clinton Pavilon Road (Crown/Private)
Bonaparte River Residual	BRR-B10.7	92P026	H/N	D	B	M	F	B/F	H	P8-11, R5	Removed crossing, beaver activity, large eroding bank. Access via East Young Lake Road (Crown)
Total Sites:	7								**Land Tenure Site Total:**		**Crown (4), Private (3)**

1. Site number example: EL-MA-B1.1(Eagan Lake sub-basin, Machete Creek, Streambank (routing), Reach 1, Site 1)
2. H = Human, N = Natural.
3. Routing: B = Stream Bank, G = Gully, S = Slope and/or Slide.
4. Potential Size: H=>5000 m^2, M=1000-5000 m^2, S=<1000 m^2.
5. Material: C=dominant clast size > 256 mm, F=dominant clast size <256 mm.
6. Disturbance type: A=Aggradation, D=Degradation, B=Bank erosion, F=Fine sediment input.
7. Level of Disturbance: L=Low, M=Moderate, H=High.

Table 3.2: Summary data on sediment sources with medium priority for restoration

SUB-BASIN (Stream)	Site Number[1]	Map Reference	Causative Agent (N/H)[2]	Sediment Delivery		Size (m^3)[4]	Material[5]	Type[6]	Level of Disturbance (L,M,H)[7]	Photograph(P), Roll(R) (Refer to Volume 2)	Cause, location, comments
				Direct/Indirect/None	Routing[3]						
Medium Priority for Restoration Prescription											
Clinton Creek	CC-B2.1	92P013	H	D	B	S	F/C	B/F	L	P17,R2	Crossing access via Clinton Valley Rd(Crown)
Clinton Creek	CC-S3.1	92P013	H	D	S	M	F	F	M	-	BC Rail crossing-access via Hwy 97 (Crown)
Clinton Creek	CC-S3.2	92P013	H	D	S	S	F	F	M	-	BC Rail crossing-access via Hwy 97 (Crown)
Clinton Creek	CC-B6.1	92P013	H	D	B	S	F	B/F	M	P17,R3	Eroded bank-access via Clinton Valley Rd (Private)
Clinton Ck-Fiftyone Ck	CC-FO-B3.1	92P013	H	D	B	S	F	F	M	-	Highway crossing-access via Hwy 97 (Crown)
Clinton Ck-Fiftyone Ck	CC-FO-S3.2	92P013	H	D	S	M	F	B/F	M	-	BC Rail crossing-access via Hwy 97 (Crown)
Clinton Ck-Fiftyone Ck	CC-FO-S3.3	92P013	H	D	S	S	F	F	M	-	Road erosion-access via Hwy 97 (Crown)
Bonaparte Lk-Brown Ck	BL-BC-B2.1	92P037	H	D	B	S	F	B/F	M	-	Cattle and road-access via 3700 Rd (Private)
Bonaparte Lk-Brown Ck	BL-BC-B5.2	92P038	H	D	B	S	F	B/F	M	-	Road crossing-access via 3700 Rd (Crown)
Bonaparte Lk-Caverhill Ck	BL-CA-S13.4	92P039	H/N	D	S	M	C/F	F	M	P5,R1.1	Slide & cutblock-access via Unnamed Rd (Crown)
Fiftyseven Creek	FS-B6.1	92P013	H	D	B	S	C	F	M	P5,R3	dam debris blocking ck access via Hwy 97(Crown)
Fiftyseven Creek	FS-B23.1	92P013	H/N	D	B	S	F	F	H	P25,R6	Crossing/cattle- access via Big Bar Rd (Private)
Fiftyseven Creek	FS-B25.1	92P012	H	D	B	S	F	F	M	-	Crossing/cattle- access via Big Bar Rd (Private)
Fiftyseven Creek	FS-B25.2	92P012	H	D	B	S	F	F	M	-	Crossing/cattle- access via Big Bar Rd (Private)
Eagan Lk- Machete Ck	EL-MA-S6.1	92P038	H/N	D	S	S	F	B/F	M	-	Slide/cutblock access via Unnamed Rd(Crown)
Eagan Lk-McDonald Ck	EL-MC-B9.1	92P047	H	D	B	S	F	B/F	M	-	Road crossing-access via Machete Lk Rd (Crown)
Eagan Lk-Montana Ck	EL-MO-B4.1	92P047	H	D	B	S	F	B/F	M	P3,R4	Road crossing-access via Montana Lk Rd (Crown)
Allen Ck-Maiden Ck	AC-MD-B4.2	92I093	H	I	B	S	F	F	M	P22,R2	Crossing, aggrading creek - via Hwy 97(Crown)
Allen Ck-Maiden Ck	AC-MD-S8.1	92I092	H/N	D	S	S	F	F	M	-	Slide and cutblock access via Hwy 97(Crown)
Allen Ck-Maiden Ck	AC-MD-S8.2	92I092	H/N	D	S	S	F	F	M	-	Slide and cutblock access via Hwy 97(Crown)
Allen Ck-Maiden Ck	AC-MD-G8.3	92I092	H/N	D	G	S	F	F	M	-	Slide and logged gully access via Hwy 97 (Crown)
Rayfield River	RR-B14.1	92P036	H	D	B	S	F	B/F	L	-	Crossing-cattle-access Bonaparte Pub Rd(Crown)
Rayfield River	RR-B16-1.1	92P046	H	D	B	S	F	B/F	M	-	Crossing-cattle-Little Green Lk Rd (Crown)
Loon Creek-Brigade Ck	LC-BG-B3.1	92P015	H	D	B	S	F	B/F	L	P15,R2	Crossing-cattle access via 3400 Rd (Crown)
Loon Creek-Hihium Ck	LC-HC-S3.2	92P004	N/H	D	S/B	S	F	F/B	L	-	Natural slide & road access via Loon Lk Rd (Crown)
Loon Creek-Hihium Ck	LC-HC-S3.3	92P004	N/H	D	S/B	S	F	F/B	M	-	Natural slide & road access via Loon Lk Rd(Crown)
Loon Creek-Hihium Ck	LC-HC-S3.4	92P004	N/H	D	S/B	S	F	F/B	M	-	Natural slide & road access via Loon Lk Rd(Crown)
Loon Creek-Hihium Ck	LC-HC-S3.6	92P004	N/H	D	S	M	F	F	M	P2,R1.1	Natural slide & road access via Loon Lk Rd(Crown)
Loon Creek-Hihium Ck	LC-HC-S3.7	92P004	N/H	D	S	M	F	F	M	-	Natural slide & road access via Loon Lk Rd(Crown)
Bonaparte River Residual	BRR-B1.1	92I093	H	D	B	S	F	F/B	L	P25,R2	Road/cow/human impacts - via Hwy 97(Private)
Bonaparte River Residual	BRR-S5-1.1	92P003	H	D	S	M	C	B/F	M	P15,R4	Road & eroding slope - via Loon Lk Rd (Private)
Bonaparte River Residual	BRR-B7.5	92P025	H	D	B	S	F	B/F	L	-	Road/eroding slope - via Thibert Pub.Rd (Crown)
Bonaparte River Residual	BRR-G7.6	92P025	H/N	D	G	S	F	B/F	L	-	Road & eroding slope Thibert Pub Rd (Crown)
Bonaparte River Residual	BRR-B8-1.1	92P025	H	D	S	S	F	B/F	M	-	Road & eroding slope-Thibert Pub.Rd (Crown)
Bonaparte River Residual	BRR-B8-1.2	92P025	H/N	D	B	H	F	B/F	M	-	Cattle/bank impacts-access Thibert Lk Rd(Private)
Bonaparte River Residual	BRR-B8.1	92P025	H	D	B	S	F/C	B/F	L	-	Road/crossing access via Thibert Lk Rd(Crown)
Bonaparte River Residual	BRR-B11-1.8	92P036	H	D	S	S	F	F	H	P14,R5	Cattle/bank erosion - via Sharpe Lk Rd (Private)
Total Sites:	**37**								**Land Tenure Site Total:**		**Crown (28), Private (9)**

1. Site number example: EL-MA-B1.1(Eagan Lake sub-basin, Machete Creek, Streambank (routing), Reach 1, Site 1)
2. H = Human, N = Natural.
3. Routing: B = Stream Bank, G = Gully, S = Slope and/or Slide.
4. Potential Size: H=>5000 m^3, M=1000-5000 m^3, S=<1000 m^3.
5. Material: C=dominant clast size > 256 mm, F=dominant clast size <256 mm.
6. Disturbance type: A=Aggradation, D=Degradation, B=Bank erosion, F=Fine sediment input.
7. Level of Disturbance: L=Low, M=Moderate, H=High.

3.2 General Channel Descriptions

The following results were obtained from the aerial photograph assessment:

- The upper Bonaparte River watershed is comprised entirely of "small" channels (<20-30 m width);
- Although the channels are "small", about 70% are visible on the recent aerial photographs because of the low degree of hillslope coupling and extensive riparian vegetation removal on private land;
- The bankfull width of Bonaparte River (the largest of the channels) ranges from 12-18 m, and due to extensive removal of riparian vegetation, virtually the entire length of the channel downstream of Bonaparte Lake is visible on aerial photos;
- Channel impacts in the watershed have resulted primarily from the clearing of riparian vegetation and range use; and,
- A review of the 1958 historic photographs covering the Bonaparte River downstream of both Loon Creek and Fifty Seven Creek confirms that the channel position has changed slightly since 1958, but that there is no change in the plan-view morphology or channel stability. It is possible that vegetation removal has affected channel processes, but this could not be confirmed from the aerial photos.

The following paragraphs outline the general nature of the channels and channel disturbance in each of the study area sub-basins.

Allen Creek Sub-basin:

Two channels (Maiden and Allen Creek) were inspected within the Allen Creek sub-basin. Maiden Creek is a 4th order stream comprised of 12 reaches. Channel morphologies range from riffle-pool with gravel in the lower reaches to cascade-pool in the mid and upper reaches. Allen Creek is a 3rd order channel with six reaches in total. Channel morphologies range from riffle-pool in the lower two reaches to cascade-pool in the other reaches. With the exception of the fans, both channels are inscised and coupled to the adjacent hillslopes. High channel disturbance resulting from riparian vegetation clearing for farming are apparent in

the lower reaches of both Maiden and Allen Creeks. Channel disturbance decreases dramatically through the upper (steeper and uninhabited) reaches of both creeks.

Loon Creek Sub-basin:

Loon Creek sub-basin is comprised of one mainstem (Loon Creek) and two significant tributaries (Hihium Creek and Brigade Creek). Loon Creek flows east to west within a wide u-shaped valley. There are 15 reaches (including three lakes), and the dominant morphology is riffle-pool. Hihium and Brigade Creeks are 4th and 5th order tributaries that flow north into Loon Creek. Channel morphologies in both cases are mainly riffle-pool with gravel and cobble and cascade-pool with gravel and cobble. In Loon Creek, moderate and high channel disturbances have resulted mainly from vegetation removal for pasture in the riparian zones of private land throughout Reaches 1-9. Moderate levels of disturbance associated with agriculture in the lower reaches, and forestry activity in the upper reaches are present in Brigade Creek.

Clinton Creek Sub-basin (including Clinton Creek Community Watershed):

Two major tributaries flow into the Clinton Creek mainstem. Fifty One Creek is a 4th order tributary comprised of nine reaches with one small lake. The morphology ranges from riffle-pool to cascade-pool with sand and gravel bed and banks. Cutoff Valley Creek is a 5th order tributary that flows west into Clinton Creek at the town of Clinton. Two lakes and six channel reaches with riffle-pool morphology characterize this tributary. The Clinton Creek mainstem is a 5th order stream that flows east into the Bonaparte River. The majority of the reaches in Clinton Creek have a riffle-pool morphology. Lower Fifty One Creek, Clinton Creek and Cutoff Valley Creek have moderate levels of channel disturbance, attributed to rural-residential land use and pastured fields impacting both channels and riparian zones. Clinton Creek has been severely impacted within the Town of Clinton, as channel morphology has been modified through residential and industrial development.

Two lakes (one reservoir) along with nine reaches (with riffle-pool morphology) comprise the Clinton Creek Community Watershed. Impacts to the community watershed are relatively minor, with the exception of Reach 10 (Clinton Creek), where private land and

associated cattle and grazing have created a moderate disturbance to the riparian zone and channel.

Fifty Seven Creek Sub-basin:

Fifty Seven Creek sub-basin has one 4th order mainstem (Fifty Seven Creek) comprised of 38 reaches (including five small lakes and several wetland reaches) that flows north-east, then south into the Bonaparte River. With the exception of the lakes and three cascade-pool reaches located in the lower elevations of the sub-basin, the remaining reaches are situated on the Cariboo Plateau and have a riffle-pool morphology, with sand and gravel bed and banks. Private farmland with pastures and livestock create moderate and high channel and riparian disturbances from the mouth to the upper end of reach 25. Impacts on crown land are attributed to a Highway 97 crossing near reach 8 and 9, and a BC Rail crossing in reach 5.

Chasm Creek Sub-basin:

The three major creeks assessed in the Chasm Creek Sub-basin are Sixty One Creek, Fifty Nine Creek and Chasm Creek. Chasm Creek (4th order) and the lower reaches of the two tributaries (also 4th order) have cascade-pool to riffle-pool morphology and bedrock/colluvial falls in the portion which is incised into the Cariboo Plateau. Once on the plateau, these creeks are characterized by low gradient reaches with riffle-pool morphology and lakes. Moderate levels of channel disturbance are present through the middle reaches of Sixty One Creek and the mid and upper reaches of Fifty Nine Creek. Vegetation removed for pasture and farms on private land are the main causes of disturbance in Chasm Creek Sub-basin.

Rayfield River Sub-basin:

Rayfield River and two major tributaries dissect the Rayfield River Sub-basin. The majority of the sub-basin is located on the Cariboo Plateau. Eighty Three Creek is a low gradient, 4th order, riffle-pool stream that flows east across the plateau, then south where it discharges into Green Lake. Eighty Three Creek has several small lakes (11) interconnected by 10 reaches. Green Creek is a 5th order tributary (5 reaches) that connects Green Lake and numerous other lakes with Rayfield River. Rayfield River is a low gradient, riffle-pool, 6th order tributary

that flows west along the plateau, then south through a steeply-incised valley to the Bonaparte River. Rayfield River has been divided into 28 reaches including 15 lakes.

With the exception of three larger lakes, the lakes within Rayfield River are small ponds with relatively little riparian disturbance. Reaches 14 to 28 have moderate levels of disturbance attributed to farmed and pastured private land. As for Rayfield River, Eighty Three Creek has a large section with moderate levels of disturbance (reaches 1-18) mainly within private farmed land, with the exception of small lakes having low disturbance. Four reaches have a high level of disturbance along Eighty Three Creek because of severe livestock and farm impacts to the riparian zone and channel. Moderate levels of disturbance were noted through reaches 1 and 5 of Green Creek. Channel diversions and irrigation trenching is present along reach 5 and riparian logging within private land is apparent in reach 1.

Eagan Lake Sub-basin:

Machete Creek is a 5th order mainstem channel of Eagan Lake sub-basin which flows west into Bonaparte River. Two 4th order tributaries (Montana and McDonald Creek) flow south into Machete Creek just upstream of Eagan Lake. Low gradient riffle-pool reaches connecting small lakes describe the fluvial network within the sub-basin. Disturbances to the channel are attributed mainly to forest harvesting and private farmland. Moderate disturbances to the riparian zone and channel due to land clearing for agriculture are visible in the lower reaches of Machete Creek, and the middle reaches of McDonald Creek. The mid-reaches of Machete Creek have moderate disturbances such as aggrading streams and substantial amounts of small woody debris, likely attributed to nearby cutblocks.

Bonaparte Lake Sub-basin:

The Bonaparte Lake Sub-basin includes the headwaters of Bonaparte River (5th order stream) and Bonaparte Lake. Two notable 4th order tributaries (Brown and Caverhill Creeks) were included in the present study. Brown Creek consists of seven riffle-pool reaches including one lake, which flows south west into Bonaparte River downstream of Bonaparte Lake. Caverhill Creek is comprised of 22 reaches (mainly riffle-pool) including several small lakes and a large lake (Caverhill Lake). The creek flows south-west, discharging into the eastern

end of Bonaparte Lake. The overall level of disturbance is low to none in the Bonaparte Lake sub-basin, with the exception of moderate disturbances found in Brown Creek. Logging and farmed-pastured areas are responsible for the impacts found in the sub-basin.

Bonaparte River Residual:

The Bonaparte River within the Residual sub-basin flows south-west from its confluence with Machete Creek through to Fifty Seven Creek, then south to the lower limit of the study area at the Scottie Creek confluence. The Bonaparte River is a low gradient, regular to tortuously meandering channel in a relatively wide valley. There are 20 reaches (mainly riffle-pool), including Young Lake, that extend through the Residual sub-basin. Private land occupies much of the floodplain of the Bonaparte valley downstream of Chasm Creek.

Channel disturbances attributed to the private land are mainly moderate, with substantial riparian vegetation removed to support pastures, crops, and livestock. Farmed areas linked with roads dissect the floodplain with several crossings creating sediment sources, which are used by vehicles and livestock. Many natural eroding banks contribute to the sediment supplied to the channel. One highly disturbed reach (Reach 11-1) is located at the upper limit of the Residual sub-basin. The disturbance in this reach has been caused by a combination of highly eroded banks (due to cattle), and heavy removal of vegetation in the riparian areas.

3.3 CHANNEL RESTORATION OPPORTUNITIES

Tables 3.3 and 3.4 summarize key data for reaches that are designated "high" and "medium" priority for restoration, respectively. The tables list reach length, level of disturbance, photograph references, disturbance cause, recommended restoration activities, access, and land ownership. Of the 360 reaches assessed in the watershed, 27 are high priority for restoration. The total length of these 27 reaches is approximately 62 km. It is important to note that not all of each reach requires restoration - the proportion requiring restoration ranges from about 5% to 90%. A total of 106 reaches (approximately 193 km) are medium priority for restoration, 50 reaches are low priority, and 177 reaches do not require restoration.

As agricultural and riparian logging impacts are extensive throughout the study area, effective restoration methods include planting of native trees, shrubs, and grasses on channel banks and within the riparian zone, fence installation, and construction of armoured fords to allow cattle to access drinking areas and cross the stream. These restoration methods would benefit areas such as the upper reaches of Bonaparte River Residual sub-basin (mainly Reach 11-1), where extensive riparian alteration has occurred as a result of agriculture and high concentrations of livestock. Techniques such as placement of large woody debris for bank stabilization and creation of fish habitat, placement of boulder (rip-rap) for localized bank protection, and channel excavation (e.g. in Allen Creek) are other appropriate restoration strategies for the study area.

Table 3.3: Summary data for reaches with high priority for restoration

Sub-basin (Stream)	Reach(es)	Length (m)[1]	Level of Disturbance (L,M,H)[2]	Representative Ground-Site No.	Photograph(P), Roll(R) (Refer to Volume 2)	Disturbance, Prescription, Access, Comments	Land Tenure- Crown or Private? (C/P)[3]
High Priority							
Rayfield River-Eightythree Ck	14	1,100	H	Rep14.1	P1,R5	Recommend riparian planting and fencing along channel, high impacts in private land. Access via 83 Mile Public Rd	P
Chasm Ck-Fiftynine Ck	39 to 41	2,000	M	Rep41.1	P19-24(R6)	Beaver problems and logging on private land. Access via Big Bar Rd	P
Allen Creek	1 to 3	2,740	H	Rep3.1	P20-25,R3	Potential channel excavation through private land and lower reaches along Hwy. Access via Hwy 97	P,C
Clinton Creek	7,8	5,320	H	-	P3 (R1)	Riparian removal from farming, channel impacted from town development. Recommend fencing/riparian planting. Access via Clinton Valley Rd.	P,C
Clinton Ck-Cutoff Valley Ck	1	3,680	H	Rep1.1	P19 (R2)	Riparian removal from farming, channel impacted from town development. Recommend fencing/riparian planting. Access via Clinton-Pavilon Rd.	P,C
Eagan Lake-Machete Ck	5-1	3,400	M	Rep5-1	P1, R4	Channel is aggrading, over-abundance of SWD, inspect entire reach. Suspect cutblock. Access via Machete Lk Rd	C
Fiftyseven Creek	1,3,4,10,12, 23 to 25	18,320	H	Rep10.1, Rep23.1	P1(R1), P2-4(R4), P25-27(R6)	Riparian removal from farming. Recommend fencing/riparian planting. Access via Big Bar Rd and Hwy 97	P
Loon Creek	1 to 4	5,480	H	Rep2.1, Rep4.1	P5-11,R2	Definite cattle impacts, erodible banks, 2 gully sediment sources, and road impacts. Access via Loon Lk Rd	C,P
Loon Creek	9 to 11	6,780	H	Rep9.1	P12, R2	Channel is dry and seriously impacted by riparian veg. removal and cattle. Access via Loon Lk Rd	P
Bonaparte River Residual	11-1	13,040	H	Rep11-1.2	P13,14 (R5)	Riparian vegetation removed for farming. Recommend fencing/riparian planting. Access via Sharpe Lake Rd	P
Total (m)	**27**	**61,860**				**Crown land length (m): 19,360 Private land (m): 42,500**	

1. Total length of reach (not specifically total length requiring detailed assessment/prescription.)
2. Level of Disturbance: low (L), moderate (M), high (H)
3. Land tenure with dominant prescription length (>50% of total reach) comes first followed by subdominant (<50% of total reach). If one land tenure type is shown, assume >80% of total reach is occupied by that tenure.

Table 3.4: Summary data for reaches with medium priority for restoration

Sub-basin (Stream)	Reach(es)	Length (m)[1]	Level of Disturbance (L,M,H)[2]	Representative Ground-Site No.	Photograph(P), Roll(R) (Refer to Volume 2)	Disturbance,prescription, access, comments	Land Tenure-Crown or Private? (C/P)
Medium Priority							
Rayfield River	14 to 28 (except lake reaches)	24,520	M	Rep14.1, Rep16-1.1, Rep22.1	P5-7, R5	Riparian disturbance-vegetation removal and cattle pastures. Recommend riparian fencing/planting. Lake reaches also could have riparian impacts. Access via Little Green Lake Rd and North Bonaparte Rd	P
Rayfield River-Eightythree Creek	1 to 20 (except lake reaches)	16,120	M-H	Rep1.1, Rep9.1, Rep14.1	P1,2, R5	Riparian vegetation removal and cattle pastures. Recommend riparian fencing/planting. Lake reaches also could have riparian impacts. Access via 83 Mile Public Rd and Bullock Lk Rd	P
Clinton Creek	1,4 to 6	3,210	M-H	Rep6.1	P17,18(R2) P16,17(R3)	Riparian disturbance (pastures), recommend fencing/planting, LWD placement. Access via Clinton Valley Rd	P
Clinton Ck-Cutoff Valley Creek	3 to 6	8,260	M	-	-	Riparian disturbance (pasture and residential). Recommend planting/fencing. Access via Clinton-Pavilon Rd	P
Clinton Ck-Fiftyone Ck	1 to 3	2,920	M	Rep2.1	P3, R1	Heavy amounts of SWD, recommend SWD removal. Access via Hwy 97	C,P
Clinton Ck Community Watershed	1,2	2,910	L-M	Rep9.1	P14, R3	Eroding banks, recommend bank revegation Reach 9 (reservoir), fencing/planting in reach 10. Access via Clinton Community Watershed road.	C,P
Chasm Ck-Fiftynine Ck	2 to 16, 18 to 26, 43 (except 20)	14,700	M	Rep2.1, Rep8.1	P17,18,22-24, R4	Riparian disturbance vegetation, clearing/pastures. Recommend riparian fencing/planting. Access via Hwy 97, Meadow Lk Rd, Big Bar Rd.	P,C
Allen Creek	4,5	4,240	M	Rep4.1	P19, R3	Carry out detailed assessment, cattle impacts here, aggrading channel. Access via Hwy 97.	P,C
Allen Ck-Maiden Ck	1,2,4,5	9,500	M	Rep2.1, Rep4.1	P18(R3) P22,23(R2)	Unstable/aggrading reach, Hwy impacts. Recommend detailed inspection. Access via Hwy 97	C,P
Allen Ck-Maiden Ck	8	3,720	M	Rep8.1	P21, R2	Poor visibility from helicopter. Recommend detailed inspection-cutblocks/slides. Access via Hwy 97	C
Bonaparte Lk-Brown Ck	2,4,5	10,880	M	Rep2.1	P19, R5	Riparian disturbance(pasture). Recommend planting/fencing, inspect cutblocks, crossings through reaches 4,5. Access via 3700 Rd.	P,C
Bonaparte Lk-Caverhill Ck	13	3,300	L	Rep13.1	P5 (R1.1)	Series of slides possibly caused by cutblock. Inspect as far as Site BL-CA-B13.1 via Machete Lk Rd	P

Table 3.4 continued next page:

Table 3.4: Summary data for reaches with medium priority for restoration (continued)

Sub-basin (Stream)	Reach(es)	Length (m)[1]	Level of Disturbance (L,M,H)[2]	Representative Ground-Site No.	Photograph(P), Roll(R) (Refer to Volume 2)	Disturbance,prescription, access, comments	Land Tenure-Crown or Private? (C/P)
Medium Priority							
Eagan Lake-Machete Ck	1,5,6	3380	M	Rep1.1, Rep6.1	P16,25, R5	Channel not visible during aerial check, suspect avulsions (SWD) - cutblocks. Recommend detailed inspection. Access via Machete Lk Rd	C
Eagan Lk-Machete Ck	3-1	4220	M	Rep3-1.1	P22, R5	Riparian disturbance. Recommend fencing/planting (Machete Lk Rd)	P
Eagan Lk-McDonald	9	2200	M	Rep9.1	P2, R4	Riparian disturbance. Recommend fencing/planting (Machete Lk Rd)	P
Fiftyseven Creek	6 to 9, 11, 15 to 20	9,300	M	Rep6.1	P2-6(R3), P25-27(R6)	Riparian disturbance - vegetation clearing for pastures. Recommend riparian fencing/planting. Access via Meadow Lk Rd.	P,C
Fiftyseven Creek	5	1,400	M	Rep5.1	P7-11, R3	BC Rail crossing-aggrading reach. Recommend detailed inspection. Access via Hwy 97	C
Loon Creek	5,6,8	8,260	M	-	P3,4, R1.1	Riparian disturbance, recommend fencing/planting. Access via Loon Lk Rd	P
Loon Ck-Brigade Creek	1,4,8 to 10	4,360	M	Rep4.1	P14 (R2)	Riparian disturbance, recommend fencing/planting. Access 3400 Rd.	C
Bonaparte River	1 to 6,7,10	47,960	M	Rep1.1 to Rep10.1	Many photos	Riparian disturbance - vegetation clearing for pastures. Recommend riparian fencing/planting. Access Hwy 97, Loon Lk Rd, 3400 Rd, East Young Lk Rd.	P
Bonaparte River	7-3, 8-1	7,120	M	-	-	Many natural slides, recommend detailed inspection. Access via 3400 Rd, Thibert Public Rd.	C
Total (m)	**106**	**192,480**				**Crown land length (m): 85,980 Private land (m): 106,500**	

1. Total length of reach (not specifically total length requiring detailed assessment/prescription.)
2. Level of Disturbance: low (L), moderate (M), high (H)
3. Land tenure with dominant prescription length (>50% of total reach) comes first followed by subdominant (<50% of total reach). If one land tenure type is shown, assume >80% of total reach is occupied by that tenure.

4.0 CONCLUSIONS AND RECOMMENDATIONS

As a result of aerial photograph assessment, a helicopter reconnaissance, and ground-based checks, 182 point sources of sediment to streamchannels in the study area have been identified, described, and ranked in terms of priority for restoration. A total of 633 km of streamchannel (360 reaches) have been assessed and ranked in terms of level of disturbance to channels and associated riparian zones, and in terms of priority for restoration.

Study conclusions are as follows:

- Disturbance to channels and riparian zones in the study area has been caused by agriculture, range use, forestry, and transportation networks (roads and rail lines);

- Comparison of historic and recent aerial photos indicates some changes in channel position, but no changes in morphology or stability. In addition, there has been limited disturbance to the physical condition of the channels in the study area. However, many study area channels have a lack of large woody debris, which has likely impacted the quantity and quality of fish habitat.

- Channel impacts on Crown land tend to be localized point-sources, whereas impacts on private land are both point (such as locations of heavy cattle use) and non-point (such as long sections of riparian disturbance or general cattle access along reaches);

- It is inferred (but not measured during this study) that the combination of riparian disturbance (particularly within private land) and streamside land use has disturbed the aquatic ecosystem. It is likely that parameters such as summer water temperature, availability of shade and cover for fish, turbidity, and concentrations of pesticides, coliforms, suspended sediment, and nutrients have been affected;

- Twenty-seven reaches (62 km) are high priority for restoration, 106 reaches (193 km) are medium priority, and 50 reaches are low priority. The proportion of each reach needing restoration varies from about 5% to 90%. No restoration work is needed within 177 reaches; and,

- Seven sediment sources are high restoration priority (four on crown land and three on private land), 37 are medium priority (28 on crown land and nine on private land), and 55 are low priority. Eighty-three sediment sources do not require rehabilitation.

Project recommendations are as follows:

- None of the sediment sources requires urgent repair. Nevertheless, it is recommended that rehabilitation prescriptions be developed and implemented for the high priority sites in 1999;

- Rehabilitation of sediment sources should include activities such as fill pullback, drainage improvement, streambank stabilization and protection, revegetation, restricting cattle access, and riparian fencing and planting;

- None of the high priority reaches require urgent restoration. Nevertheless, it is recommended that restoration of the high priority reaches commences in 1999;

- Stream restoration activities should include placement of large woody debris to create fish habitat, use of large woody debris for streambank stabilization and habitat improvement, channel excavation and stabilization, riparian planting and fencing, and restricting cattle access to specific points which can be armoured to prevent erosion;

- Cooperation should be sought from private landowners in the study area, since watershed-wide restoration can only be achieved with extensive restoration efforts on private land. One or more sources of funding may be needed to achieve restoration on private land; and,

- Restoration options on private land should be chosen such that the landowners do not acquire long-term maintenance responsibilities. For example, it is recommended that planting of native species occurs on the stream side of any new fences, in order to speed re-establishment of a healthy riparian zone, and reduce or eliminate the need for long-term maintenance of the fencing.

5.0 REFERENCES

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Appendix A

CHANNEL ASSESSMENT

OFFICE FORMS

Form 1: Channel Information (General Aerial Photograph Assessment)

Watershed - Sub-basin (Stream)	Map #	Reach #	Stream order	Reach Length (m)	Valley Length (m)	D/S Elev. (m)	U/S Elev. (m)	Stream Gradient (%)	Sinuosity	Stream											Comments
										Type (1)			Gradient (2)			Entrenchment (3)		Width (4)			
										A	B	C	1	2	3	a	b	i	ii	iii	
ALLEN CREEK SUB-BASIN																					
Maiden Creek	921093	1	4	780	740	542	570	3.6	1.1	X			X			X			X		
	"	2	4	2,700	2,680	570	675	3.9	1.0	X			X				X		X		
	"	3	4	420	410	675	700	6.0	1.0	X			X			X			X		
	"	4	4	4,080	3,960	700	945	6.0	1.0	X			X				X		X		
	"	5	4	1,940	1,820	945	1,035	4.6	1.1	X			X				X		X		
	"	6	4	2,080	2,000	1,035	1,240	9.9	1.0	X				X			X		X		
	921093,92	7	4	1,940	1,820	1,240	1,319	4.1	1.1	X			X				X		X		
	921092	8	3	3,720	3,380	1,319	1,460	3.8	1.1	X			X				X		X		
	"	9	2	240	240	1,460	1,460	0.0	1.0												LAKE
	"	10	2	760	740	1,460	1,481	2.8	1.0	X			X				X		X		
	"	11	2	140	140	1,481	1,481	0.0	1.0												LAKE
	"	12	2	1,080	1,040	1,481	1,762	26.0	1.0	X					X		X		X		
Allen Creek	921093	1	3	1,400	1,340	675	730	3.9	1.0	X			X			X			X		
	"	2	3	380	380	730	742	3.2	1.0	X			X				X		X		
	"	3	3	960	860	742	793	5.3	1.1	X			X			X			X		
	"	4	3	3,580	3,540	793	1,138	9.6	1.0	X				X			X		X		
	"	5	3	660	660	1,138	1,295	23.8	1.0		X				X		X		X		
	"	6	3	3,440	3,400	1,295	1,760	13.5	1.0	X				X			X		X		

1
A = Erodible
B = Non-erodible
C = Artificial

2
1 = gradient less than 8 per cent
2 = gradient in the 8-20 per cent range
3 = gradient greater than 20 per cent

3
a = not entrenched
b = entrenched

4
(i) = channel width less than 1.5 m
(ii) = channel width between 1.5 m and 20 m
(iii) = channel width greater than 20 m

Form 2: Detailed Air Photo Assessment (Upper Bonaparte River Watershed CAP)

Sub-basin (Stream)	Reach	Hillslope coupling (1)	Incision (2)	Sediment Supply Phase (3)	Morphology (4)	Morphology Comments	Streamside landuse			Disturbance type			Observed disturbance (% of reach)	Potential disturbance (% of reach) (10)	Logging related impact likely? (11)	Aerial Photograph Inventory	
							Logging (5)	Roads (6)	Other	Observed (7)	Inferred (8)	Cause of disturbance/notes (9)				Recent Air Photo Number (only for potentially impacted sites/sections)	Historic Photo Number (s) (only for potentially impacted sites/sections)
ALLEN CREEK SUB-BASIN																	
Maiden	1	P-N	VF/VH	W	I-RP	SINUOUS	R	C	HYDRO-BCRAIL	CP-CW	LB	ANTHROPOGENIC	90	100	N	95101:54,55	Not available
Creek	2	P-N	VH/VF	T	I-RP	SINUOUS	R	C	RANGE	-	LB.SC	RANGE	-	100	N	95101:55,54	"
	3	P	VH/VF	T	I-RP	SINUOUS	-	-	-	-	-	-	-	-	-	-	"
	4	C	VH	T	I-RP	SINUOUS	B	C	-	-	SC-SU	ROADS, LOGGING	-	75	Y	95101:55,56	"
	5	P-C	VH	T	I-RP	SINUOUS	-	C	RANGE	-	SC-LB	RANGE	-	60	N	97192:11,12	"
	6	C	VH	T	I-RP	SINUOUS	-	-	-	-	-	-	-	-	-	-	"
	7	C	VH	T	I-RP	SINUOUS	B		-	-	SC	ROAD CROSSING	-	5	Y	97192:12,13	"
	8	C	VH	B-T	I-RP	SINUOUS	B/P	C	RANGE	-	SC-SU,LB	ROAD CROSSING, CUTBLOCK	-	45	Y	97192:48,47	"
	9	C	VF	W	-	LAKE	-	C	-	-	-	-	-	-	-	-	
	10	C-P	VH	B-T	I-RP	SINUOUS	-	-	-	-	-	-	-	-	-	-	
	11	P	VF	W	-	LAKE	-	-	-	-	-	-	-	-	-	-	
	12	P	B	B	I-CP	STRAIGHT	-	-	-	-	-	-	-	-	-	-	
Allen	1	N	VF	W	I-RP	SINUOUS	R	C	RANGE	CP	LB	DRY CHANNEL	100	-	-	97192:71,70	Not available
Creek	2	C	VH	W-T	I-RP	SINUOUS	R	A	MOTH	CP	SC,LB	DRY CHANNEL	100	-	-	97192:70,71	"
	3	P-N	VF	W	I-RP	SPLIT	R	C	RANGE	CP	LB	CROPS-AGRICULTURE	100	-	-	97192:70,71	"
	4	C-P	VH	T	I-RP	SINUOUS	U	A-U	-	-	SU	LOGGING, ROADS	-	20	-	971972:72,73	"
	5	C	B	B	I-CP	STRAIGHT	-	-	-	-	-	-	-	-	-	-	-
	6	C	VH-B	B	I-CP	STRAIGHT	-	-	-	-	-	-	-	-	-	-	-

1: Coupled; Partially coupled; Not coupled.

2: VF - into erodible valley flat material; VH - into erodible valley hillside material; B - confined by bedrock; N - not incised.

3: Wash material supply-dominated phase; Transitional phase; Bed material supply-dominated phase (see Fig. 6, *Channel Assessment Procedure Guidebook, Dec. 1996* for definitions)

4: Visible/Inferred - Riffe-Pool, Cascade-Pool, Step-Pool, Non-Alluvial (eg. V- RP).

5: Riparian logging (no buffer); Partial buffer left, Buffer left; Upslope logging.

6: Crossing; Adjacent to channel; Upslope.

7: Channel Pattern (eg. CP); Sediment Storage Pattern; Lateral Instability; Channel Width; Sinuousity; Meander Wavelength.

8: Sediment source impacting Channel (eg. SC); Sediment source Upslope; Logged to channel Bank; Windthrow in Riparian zone.

9: If channel disturbance is directly observed from the air photos, note the channel condition (aggrading, stable, degrading)

10: Potenially changed channel morphology is defined by the CAP Guidebook as "the length of erodible channel downstream of forestry-related activities...(giving) the maximum length of channel where changes in morphology may have occurred after logging."

11: Record all potential field sites on Air photo (indicate location and type of potential disturbance)

Form 1: Channel Information (General Aerial Photograph Assessment)

										Stream												
										Type (1)			Gradient (2)			Entrenchment (3)		Width (4)			
Watershed - Sub-basin (Stream)	Map #	Reach #	Stream order	Reach Length (m)	Valley Length (m)	D/S Elev. (m)	U/S Elev. (m)	Stream Gradient (%)	Sinuosity	A	B	C	1	2	3	a	b	i	ii	iii	Comments
LOON CREEK SUB-BASIN																					
Brigade Creek	92P015	1	5	480	420	903	930	5.6	1.1	X			X			X			X		
	"	2	5	400	400	930	960	7.5	1.0	X			X			X			X		
	"	3	5	1,000	980	960	995	3.5	1.0	X			X			X			X		
	"	4	5	1,000	870	995	1,030	3.5	1.1	X			X			X			X		
	"	5	5	900	900	1,030	1,030	0.0	1.0												LAKE
	"	6	5	800	580	1,030	1,035	0.6	1.4	X			X				X		X		
	"	7	4	3,640	3,000	1,035	1,095	1.6	1.2	X			X			X			X		
	"	8	4	600	440	1,095	1,102	1.2	1.4	X			X			X			X		
	"	9	4	1,000	1,000	1,102	1,102	0.0	1.0												LAKE
	"	10	3	1,280	1,060	1,102	1,125	1.8	1.2	X			X			X			X		
	92P015,16	11	3	2,980	2,980	1,125	1,127	0.1	1.0												LAKE
	92P016	12	2	1,160	1,000	1,127	1,140	1.1	1.2	X			X			X			X		
	"	13	2	1,360	1,360	1,140	1,140	0.0	1.0												LAKE
	"	14	1	1,400	1,360	1,140	1,202	4.4	1.0	X			X			X			X		
	"	15	1	1,780	1,680	1,202	1,390	10.6	1.1	X			X			X			X		
Hihium Creek	92P004	1	4	600	600	818	842	4.0	1.0	X			X			X			X		
	"	2	4	2,000	2,000	842	960	5.9	1.0	X			X				X		X		
	"	3	4	6,080	6,080	960	1,243	4.7	1.0	X			X				X		X		
	"	4	4	2,920	2,860	1,243	1,342	3.4	1.0	X			X				X		X		
	92P005	5	4	1,580	1,380	1,342	1,364	1.4	1.1	X			X				X		X		
	"	6	4	1,940	1,380	1,364	1,368	0.2	1.4	X			X			X			X		LAKES
	"	7	4	1,500	1,360	1,368	1,372	0.3	1.1	X			X			X			X		LAKES
	"	8	4	4,960	4,960	1,372	1,372	0.0	1.0												HIHIUM LAKE
	"	9	2	440	440	1,372	1,376	0.9	1.0	X			X			X			X		
	"	10	1	3,340	1,900	1,376	1,390	0.4	1.8	X			X			X			X		
Loon Creek	92p003	1	5	360	360	590	602	3.3	1.0	X			X				X		X		
	"	2	5	1,340	1,320	602	684	6.1	1.0	X			X				X		X		
	"	3	5	1,740	1,680	684	717	1.9	1.0	X			X			X			X		
	92P003,04	4	5	2,120	2,040	717	762	2.1	1.0	X			X				X		X		
	"	5	5	3,740	3,220	762	818	1.5	1.2	X			X			X			X		
	"	6	5	800	780	818	820	0.3	1.0	X			X			X			X		
	92P04,14,15	7	5	13,620	13,620	820	820	0.0	1.0												Loon Creek
	92P015	8	5	3,720	3,260	820	903	2.2	1.1	X			X			X			X		
	"	9	4	5,580	5,120	903	958	1.0	1.1	X			X				X			X	
	"	10	4	240	240	958	959	0.4	1.0	X			X			X			X		
	"	11	4	960	940	959	965	0.6	1.0	X			X			X			X		
	"	12	4	4,700	4,700	965	967	0.0	1.0												UPPER LOON
	"	13	2	180	175	967	968	0.6	1.0	X			X			X			X		
	"	14	2	140	140	968	968	0.0	1.0												LAKE
	92P015,16	15	2	1,300	700	968	1,020	4.0	1.9	X			X			X			X		

1 A = Erodible
B = Non-erodible
C = Artificial

2 1 = gradient less than 8 per cent
2 = gradient in the 8-20 per cent range
3 = gradient greater than 20 per cent

3 a = not entrenched
b = entrenched

4 (i) = channel width less than 1.5 m
(ii) = channel width between 1.5 m and 20 m
(iii) = channel width greater than 20 m

Form 2: Detailed Air Photo Assessment (Upper Bonaparte River Watershed CAP)

Sub-basin (Stream)	Reach	Hillslope coupling (1)	Incision (2)	Sediment Supply Phase (3)	Morphology (4)	Morphology Comments	Streamside landuse			Disturbance type			Observed disturbance (% of reach)	Potential disturbance (% of reach) (10)	Logging related impact likely? (11)	Aerial Photograph Inventory	
							Logging (5)	Roads (6)	Other	Observed (7)	Inferred (8)	Cause of disturbance/notes (9)				Recent Air Photo Number (only for potentially impacted sites/sections)	Historic Photo Number (s) (only for potentially impacted sites/sections)
LOON CREEK SUB-BASIN																	
Loon	1	N	VF	T-W	I-RP	IRREG. WANDERING	R	C	RANGE	-	SC	MOTH	-	100	N	97192:120,121	BCC510:186-189
Creek	2	C	B-VH	B-T	I-RP	STRAIGHT	R	C,A	"	CP,CW	SC,LB	MOTH	100	100	N	97192:120,121	BCC510:186-189
	3	P-N	VF	W	I-RP	IRREG. WANDERING	P/R	C,A	"	-	LB,SC	CROP, AGRICULTURE	-	100	N	97192:120,119	BCC510:186-189
	4	C-P	VH	T	I-RP	STRAIGHT	P	C	"	-	LB,SC	" "	-	30	N	97192:120,119	
	5	C-P	VF	W	I-RP	IRREG.MEANDERING	R/P	C	"	-	LB,SC	" "	-	100	N	97192:118,117	
	6	C-P	VF	W	I-RP	IRREG.WANDERING	P	C,A	"	-	LB,SC	" "	-	75	N	97192:116,117	
	7	C	VF	W	-	LAKE	-	A	RECREATION	-	-	-	-	-	-		
	8	DC	VF-VH	T-W	I-RP	IRREG.MEANDERING	R/P	C,A	RANGE	-	LB,SC	CROP, AGRICULTURE	-	100	N	97166:171,172	
	9	DC	VF	W	I-RP	IRREG. MEANDER.	R	C,A	"	-	LB,SC	RANGE	-	100	N	95060:160,161	
	10	DC	VF	W	I-RP	IRREG. MEANDER	R	-	"	-	LB	RANGE	-	100	N	95060:222,223	
	11	DC	VF	T-W	I-RP	IRREG. MEANDER	R/U	C	"	-	LB,SC	RANGE	-	100	N	95060:222,223	
	12	P	VF	W	-	LAKE	-	-	"	-	-	-	-	-	-		
	13	N	VH	W	I-RP	IRREG. WANDER	-	-	-	-	-	-	-	-	-		
	14	N	VF	W	-	LAKE	-	-	-	-	-	-	-	-	-		
	15	N	VH	W	I-RP	IRREG. WANDER	-	-	-	-	-	-	-	-	-		

1: Coupled; Partially coupled; Not coupled.

2: VF - into erodible valley flat material; VH - into erodible valley hillside material; B - confined by bedrock; N - not incised.

3: Wash material supply-dominated phase; Transitional phase; Bed material supply-dominated phase (see Fig. 6, *Channel Assessment Procedure Guidebook, Dec. 1996* for definitions)

4: Visible/Inferred - Riffe-Pool, Cascade-Pool, Step-Pool, Non-Alluvial (eg. V- RP).

5: Riparian logging (no buffer); Partial buffer left, Buffer left; Upslope logging.

6: Crossing; Adjacent to channel; Upslope.

7: Channel Pattern (eg. CP); Sediment Storage Pattern; Lateral Instability; Channel Width; Sinuousity; Meander Wavelength.

8: Sediment source impacting Channel (eg. SC); Sediment source Upslope; Logged to channel Bank; Windthrow in Riparian zone.

9: If channel disturbance is directly observed from the air photos, note the channel condition (aggrading, stable, degrading)

10: Potenially changed channel morphology is defined by the CAP Guidebook as "the length of erodible channel downstream of forestry-related activities...(giving) the maximum length of channel where changes in morphology may have occurred after logging."

11: Record all potential field sites on Air photo (indicate location and type of potential disturbance)

Form 2: Detailed Air Photo Assessment (Upper Bonaparte River Watershed CAP)

Sub-basin (Stream)	Reach	Hillslope coupling (1)	Incision (2)	Sediment Supply Phase (3)	Morphology (4)	Morphology Comments	Streamside landuse			Disturbance type			Observed disturbance (% of reach)	Potential disturbance (% of reach) (10)	Logging related impact likely? (11)	Aerial Photograph Inventory	
							Logging (5)	Roads (6)	Other	Observed (7)	Inferred (8)	Cause of disturbance/notes (9)				Recent Air Photo Number (only for potentially impacted sites/sections)	Historic Photo Number (s) (only for potentially impacted sites/sections)
LOON CREEK SUB-BASIN																	
Brigade	1	N	VH-VF	T-W	I-RP	SINUOUS	R/P	-	-	-	LB	LOGGING, RANGE	-	80	Y	95060:147,148	Not available
Creek	2	P	VH	T	I-RP	SINUOUS	-	-	-	-	-		-				
	3	N	VH	T	I-RP	SINUOUS	R	C	-	-	SC,LB	LOGGING, ROADS	-	20	Y	95060:147,148	Not available
	4	N	VH	T	I-RP	SINUOUS	R	C	-	-	SC,LB	LOGGING	-	100	Y	95060:105,106	"
	5	N	VF	W	I-RP	LAKE	P/R	A	RANGE	-	LB	LOGGING	-	10	Y	95060:105,106	"
	6	N	VF	W		SINUOUS	-	-		-	-		-				
	7	N	VH	T	I-RP	SINUOUS	P	CA	DAM	-	LB,SC	LOGGING	-	40	Y	95060:107,108	Not available
	8	N	VF	W	I-RP	IRREG. MEANDER	P	-	DAM	-	LB	LOGGING	-	5	Y	95060-109,110	"
	9	N	VF	W		LAKE	R	A	-	-	LB	LOGGING	-	80	Y	95060-109,110	"
	10	N	VH	T	I-RP	IRREG. WANDERING	P/R	A	DAM	-	LB,SC	LOGGING	-	40	Y	95060-109,110	"
	11	N	VF	W		IRREG. WANDERING	P	A	-	-	LB	LOGGING	-	90	Y	95060:83,84	"
	12	N	VH	T	I-RP	IRREG. WANDERING	B	A	-	-	SC	ROADS	-	5	Y	95060:82,83	"
	13	N	VF	W		LAKE	R	A	-	-	SC,LB	LOGGING	-	20	Y	95060:82,83	"
	14	N	VF	T-B	I-RP	IRREG. WANDERING	-	-	-	-	-		-				
	15	N	VF	T-B	I-RP	IRREG. WANDERING	R	-	LOGGING	-	SC,LB	LOGGING	-	30	Y	95060:82,83	Not available
Hihium	1	N	VH-VF	T-W	I-RP	SINUOUS	-	-		-	-		-				
Creek	2	P-C	VH	T	I-RP	STRAIGHT	-	-		-	-		-				
	3	C	VH	T-B	I-CP	STRAIGHT	-	A	ROAD	-	SC	ROAD (NORTH)	-	10	Y	97192:113-116	Not available
	4	P-C	VH	T	I-RP	STRAIGHT	-	A	ROAD	-	0		-				
	5	N	VF	T	I-RP	IRREG.WANDERING	-	-		-	0		-				
	6	N	VF	W-T	I-RP	LAKES/WETLAND	R	A	LOGGING	-	LB	LOGGING	-	100	Y	97192:109,110	BCC947:14-24
	7	N	VF	W	I-RP	LAKES/WETLAND	-	-		-	-		-				
	8	N	VF	W	-	LAKE	-	-		-	-		-				
	9	N	VF	T	I-RP	IRREG.WANDERING	-	C		-	SC	ROAD CROSSING	-	1	Y	95060:42,43	Not available
	10	N	VF	W	I-RP	LAKES	R	C	LOGGING,ROADS	-	LB,SC	RIPARIAN LOGGING	-	10	Y	95060:42,43	Not available

1: Coupled; Partially coupled; Not coupled.

2: VF - into erodible valley flat material; VH - into erodible valley hillside material; B - confined by bedrock; N - not incised.

3: Wash material supply-dominated phase; Transitional phase; Bed material supply-dominated phase (see Fig. 6, *Channel Assessment Procedure Guidebook, Dec 1996* for definitions)

4: Visible/Inferred - Riffe-Pool, Cascade-Pool, Step-Pool, Non-Alluvial (eg. V- RP).

5: Riparian logging (no buffer); Partial buffer left, Buffer left; Upslope logging.

6: Crossing; Adjacent to channel; Upslope.

7: Channel Pattern (eg. CP); Sediment Storage Pattern; Lateral Instability; Channel Width; Sinuousity; Meander Wavelength.

8: Sediment source impacting Channel (eg. SC); Sediment source Upslope; Logged to channel Bank; Windthrow in Riparian zone.

9: If channel disturbance is directly observed from the air photos, note the channel condition (aggrading, stable, degrading)

10: Potenially changed channel morphology is defined by the CAP Guidebook as "the length of erodible channel downstream of forestry-related activities...(giving) the maximum length of channel where changes in morphology may have occurred after logging."

11: Record all potential field sites on Air photo (indicate location and type of potential disturbance)

Form 1: Channel Information (General Aerial Photograph Assessment)

Watershed - Sub-basin (Stream)	Map #	Reach #	Stream order	Reach Length (m)	Valley Length (m)	D/S Elev. (m)	U/S Elev. (m)	Stream Gradient (%)	Sinuosity	Stream												Comments
										Type (1)			Gradient (2)			Entrenchment (3)		Width (4)				
										A	B	C	1	2	3	a	b	i	ii	iii	
CLINTON CREEK SUB-BASIN																						
Clinton Creek	92P013	1	5	480	480	655	660	1.0	1.0	X			X			X			X		
	"	2	5	1,520	1,440	660	696	2.4	1.1	X			X				X		X		
	"	3	5	800	720	696	785	11.1	1.1	X				X			X		X		
	"	4	5	650	500	785	795	1.5	1.3	X			X			X			X		
	"	5	5	480	420	795	822	5.6	1.1	X			X			X			X		
	"	6	5	1,600	1,300	822	833	0.7	1.2	X			X			X			X		
	92P003,13	7	5	4,460	3,680	833	855	0.5	1.2	X			X				X		X		
	92P003	8	4	860	780	855	923	7.9	1.1	X			X				X		X		
	92P003,13	8a	4	1,040	1,020	923	1,010	8.4	1.0	X				X			X		X		
Cutoff Valley	92P003,02	1	5	3,680	3,440	855	936	2.2	1.1	X			X			X			X		
Creek	92P002	2	5	140	140	936	936	0.0	1.0												LAKE
	"	3	5	5,500	5,200	936	1,005	1.3	1.1	X			X			X			X		
	"	4	4	2,540	2,300	1,005	1,021	0.6	1.1	X			X			X			X		
	"	5	4	100	90	1,021	1,022	1.0	1.1	X			X			X			X		
	"	6	4	120	110	1,022	1,023	0.8	1.1	X			X			X			X		
	"	7	4	100	100	1,023	1,023	0.0	1.0												LAKE
	"	8	4	3,620	3,480	1,023	1,058	1.0	1.0	X			X			X			X		
Fiftyone Creek	92P013	1	4	300	280	790	800	3.3	1.1	X			X			X			X		
	"	2	4	420	400	800	882	19.5	1.1	X				X			X		X		
	"	3	4	2,200	2,020	882	948	3.0	1.1	X			X				X		X		
	"	4	3	260	260	948	955	2.7	1.0	X			X				X		X		
	"	5	2	5,060	4,760	955	1,220	5.2	1.1	X			X				X		X		
	92P012	6	2	300	300	1,220	1,220	0.0	1.0												
	"	7	2	2,820	2,420	1,220	1,240	0.7	1.2	X			X				X		X		
	"	8	2	3,600	3,200	1,240	1,335	2.6	1.1	X			X				X		X		

1 A = Erodible
B = Non-erodible
C = Artificial

2 1 = gradient less than 8 per cent
2 = gradient in the 8-20 per cent range
3 = gradient greater than 20 per cent

3 a = not entrenched
b = entrenched

4 (i) = channel width less than 1.5 m
(ii) = channel width between 1.5 m and 20 m
(iii) = channel width greater than 20 m

Form 2: Detailed Air Photo Assessment (Upper Bonaparte River Watershed CAP)

Sub-basin (Stream)	Reach	Hillslope coupling (1)	Incision (2)	Sediment Supply Phase (3)	Morphology (4)	Morphology Comments	Streamside landuse			Disturbance type			Observed disturbance (% of reach)	Potential disturbance (% of reach) (10)	Logging related impact likely? (11)	Aerial Photograph Inventory	
							Logging (5)	Roads (6)	Other	Observed (7)	Inferred (8)	Cause of disturbance/notes (9)				Recent Air Photo Number (only for potentially impacted sites/sections)	Historic Photo Number (s) (only for potentially impacted sites/sections)
CLINTON CREEK SUB-BASIN																	
Clinton	1	N	VF	T-W	I-RP	STRAIGHT		A-C	RANGE		LB	REMOVED RIPARIAN		100		97166:156,157	
Creek	2	C-P	VH-VF	T	I-RP	STRAIGHT		A-C	RANGE		SC	REMOVED RIPARIAN		95		97166:156,157	
	3	C	VH	W	I-CP	STRAIGHT		A	MOTH		SC	HIGHWAY					
	4	P	VF	W	I-RP	IRREG. WANDER			RANGE		LB	REMOVED RIPARIAN		100		97166:156,155	
	5	P	VF	W	I-RP	IRREG. WANDER		C	RANGE		LB	REMOVED RIPARIAN		70		97166:156,155	
	6	N	VF	W	I-RP	IRREG. WANDER			RANGE		LB	REMOVED RIPARIAN		100		97166:156,155	
	7	N	VF	T	I-RP	IRREG. WANDER		C	RANGE		LB	REMOVED RIPARIAN		75		97165:144,145	
	8	N-P	VH	T-W	I-CP	IRREG. WANDER		C-A	TOWN	CP	LB	REMOVED RIPARIAN	90	100		97165:144,145	
	8a	P	VF/VH		I-CP	IRREG. WANDER		A			SC	REMOVED RIPARIAN		25		97165:144,145	
Cutoff	1	N-P	VF	W	I-RP	IRREG. WANDER		C	MOTH		LB	REMOVED RIPARIAN		40		97165:146,145	
Valley	2	N	VF	W	L	LAKE			RANGE		LB	REMOVED RIPARIAN		85		97165:106,107	
Creek	3	N	VF	W	I-RP	IRREG. WANDER			RANGE		LB	REMOVED RIPARIAN		20		97192:131,132	
	4	N	VF	W	I-RP	IRREG. WANDER			RANGE		LB	REMOVED RIPARIAN		40		97108:097,98	
	5	N	VF	W	I-RP	IRREG. WANDER			RANGE		LB	REMOVED RIPARIAN		30		97108:097,99	
	6	N	VF	W	I-RP	IRREG. WANDER			RANGE		LB	REMOVED RIPARIAN		30		97108:097,100	
	7	N	VF	W	L	LAKE			RANGE		LB	REMOVED RIPARIAN		30		97108:097,101	
	8	P-N	VF	W	I-RP	IRREG. WANDER		C	RANGE		LB	REMOVED RIPARIAN		20-25		97108:097,102	
Fiftyone	1	P	VF	W	I-RP	IRREG. WANDER			RANGE		LB	REMOVED RIPARIAN		100	Y	97166:156	
Creek	2	C-P	VH	T	I-CP	STRAIGHT			RANGE			REMOVED RIPARIAN					
	3	P	VF	T	I-RP	IRREG. WANDER		C-A	RANGE		SC	REMOVED RIPARIAN		5	Y	97166:155	
	4	C-P	VH	T	I-RP	STRAIGHT			RANGE		SC	REMOVED RIPARIAN		100	Y	97166:188	
	5	C-P	VF	B	I-RP	IRREG. WANDER			RANGE			REMOVED RIPARIAN					
	6	N	N	W	L	LAKE			RANGE								
	7	N	VF	B	I-RP	IRREG. WANDER			RANGE		LB			90	Y	97167:174,175	
	8	N	VF	B	I-RP	IRREG. WANDER		C	RANGE		SC			1	U	97167:172,173	

1: Coupled; Partially coupled; Not coupled.

2: VF - into erodible valley flat material; VH - into erodible valley hillside material; B - confined by bedrock; N - not incised.

3: Wash material supply-dominated phase; Transitional phase; Bed material supply-dominated phase (see Fig. 6, *Channel Assessment Procedure Guidebook, Dec. 1996* for definitions)

4: Visible/Inferred - Riffe-Pool, Cascade-Pool, Step-Pool, Non-Alluvial (eg. V- RP).

5: Riparian logging (no buffer); Partial buffer left, Buffer left; Upslope logging.

6: Crossing; Adjacent to channel; Upslope.

7: Channel Pattern (eg. CP); Sediment Storage Pattern; Lateral Instability; Channel Width; Sinuousity; Meander Wavelength.

8: Sediment source impacting Channel (eg. SC); Sediment source Upslope; Logged to channel Bank; Windthrow in Riparian zone.

9: If channel disturbance is directly observed from the air photos, note the channel condition (aggrading, stable, degrading)

10: Potenially changed channel morphology is defined by the CAP Guidebook as "the length of erodible channel downstream of forestry-related activities...(giving) the maximum length of channel where changes in morphology may have occurred after logging."

11: Record all potential field sites on Air photo (indicate location and type of potential disturbance)

Form 1: Channel Information (General Aerial Photograph Assessment)

Watershed - Sub-basin (Stream)	Map #	Reach #	Stream order	Reach Length (m)	Valley Length (m)	D/S Elev. (m)	U/S Elev. (m)	Stream Gradient (%)	Sinuosity	Stream												Comments
										Type (1)			Gradient (2)			Entrenchment (3)		Width (4)				
										A	B	C	1	2	3	a	b	i	ii	iii	
CLINTON CREEK COMMUNITY WATERSHED																						
Clinton Creek	92P012	9	4	130	130	1,010	1,010	0.0	1.0													LAKE
	"	10	4	2,780	2,740	1,010	1,200	6.8	1.0	X			X				X		X		
	"	11	4	6,100	5,600	1,200	1,440	3.9	1.1	X			X				X		X		
	"	12	4	160	160	1,440	1,440	0.0	1.0													LAKE
	"	13	4	3,400	3,200	1,440	1,535	2.8	1.1	X			X				X		X		
	"	14	4	540	400	1,535	1,541	1.1	1.4	X			X			X			X		
	"	15	4	280	220	1,541	1,543	0.7	1.3	X			X			X			X		
	"	16	4	880	760	1,543	1,553	1.1	1.2	X			X			X			X		
	"	17	4	420	320	1,553	1,557	1.0	1.3	X			X			X			X		
	"	18	3	2,340	2,120	1,557	1,618	2.6	1.1	X			X				X		X		
	92P002	19	2	1,720	1,600	1,618	1,770	8.8	1.1	X				X		X			X		

1
A = Erodible
B = Non-erodible
C = Artificial

2
1 = gradient less than 8 per cent
2 = gradient in the 8-20 per cent range
3 = gradient greater than 20 per cent

3
a = not entrenched
b = entrenched

4
(i) = channel width less than 1.5 m
(ii) = channel width between 1.5 m and 20 m
(iii) = channel width greater than 20 m

Form 2: Detailed Air Photo Assessment (Upper Bonaparte River Watershed CAP)

Sub-basin (Stream)	Reach	Hillslope coupling (1)	Incision (2)	Sediment Supply Phase (3)	Morphology (4)	Morphology Comments	Streamside landuse			Disturbance type			Observed disturbance (% of reach)	Potential disturbance (% of reach) (10)	Logging related impact likely? (11)	Aerial Photograph Inventory	
							Logging (5)	Roads (6)	Other	Observed (7)	Inferred (8)	Cause of disturbance/notes (9)				Recent Air Photo Number (only for potentially impacted sites/sections)	Historic Photo Number (s) (only for potentially impacted sites/sections)
CLINTON CREEK COMMUNITY WATERSHED																	
Clinton	9	P-N	N	-	L	LAKE	-	-	-	-	LB	LOGGED TO BANKS	-	50	Y	97166-152,153	BC2629:100-106
Creek	10	P-N	VH-VF	B-W	I-RP	SINUOUS	-	A	AGRICULTURE	-	LB	AGRICULTURE	-	35	-	97166-152,153	-
	11	P-N	VH-VF	B	I-RP	SINUOUS	-	-	-	-	-	-	-	-	-	-	-
	12	P-N	N	-	L	LAKE	-	-	-	-	-	-	-	65	-	97166-149	-
	13	P-N	VF-VH	B	I-RP	SINUOUS	-	C	-	-	SC	-	-	45	-	97166-148	-
	14	N	N	B	I-RP	WETLAND	-	-	-	-	-	-	-	-	-	-	-
	15	N	N	B	I-RP	WETLAND	-	-	-	-	-	-	-	-	-	-	-
	16	N	VF	B	I-RP	WETLAND	-	-	-	-	-	-	-	-	-	-	-
	17	N	VF	B	I-RP	WETLAND	-	-	-	-	-	-	-	-	-	-	-
	18	P-N	VH-VF	B	I-RP	SINUOUS	-	-	-	-	-	-	-	-	-	-	-
	19	P,C	VH	B	I-RP	STRAIGHT	-	-	-	-	-	-	-	-	-	-	-

1: **C**oupled; **P**artially coupled; **N**ot coupled.

2: **VF** - into erodible valley flat material; **VH** - into erodible valley hillside material; **B** - confined by bedrock; **N** - not incised.

3: **W**ash material supply-dominated phase; **T**ransitional phase; **B**ed material supply-dominated phase (see Fig. 6, *Channel Assessment Procedure Guidebook, Dec. 1996* for definitions)

4: **V**isible/**I**nferred - **R**iffe-**P**ool, **C**ascade-**P**ool, **S**tep-**P**ool, **N**on-**A**lluvial (eg. V- RP).

5: **R**iparian logging (no buffer); **P**artial buffer left, **B**uffer left; **U**pslope logging.

6: **C**rossing; **A**djacent to channel; **U**pslope.

7: **C**hannel **P**attern (eg. CP); **S**ediment **S**torage **P**attern; **L**ateral **I**nstability; **C**hannel **W**idth; **S**inuousity; **M**eander **W**avelength.

8: **S**ediment source impacting **C**hannel (eg. SC); **S**ediment source **U**pslope; **L**ogged to channel **B**ank; **W**indthrow in **R**iparian zone.

9: If channel disturbance is directly observed from the air photos, note the channel condition (aggrading, stable, degrading)

10: Potenially changed channel morphology is defined by the CAP Guidebook as "the length of erodible channel downstream of forestry-related activities...(giving) the maximum length of channel where changes in morphology may have occurred after logging."

11: Record all potential field sites on Air photo (indicate location and type of potential disturbance)

Form 1 Channel Information (General Aerial Photograph Assessment)

Watershed - Sub-basin (Stream)	Map #	Reach #	Stream order	Reach Length (m)	Valley Length (m)	D/S Elev. (m)	U/S Elev. (m)	Stream Gradient (%)	Sinuosity	Stream Type (1) A	B	C	Gradient (2) 1	2	3	Entrenchment (3) a	b	Width (4) i	ii	iii	Comments
FIFTYSEVEN CREEK SUB-BASIN																					
Fiftyseven Creek	92P013	1	4	720	600	660	705	6.3	1.2	X			X				X		X		
	"	2	4	1,060	1,000	705	778	6.9	1.1	X			X				X		X		
	"	3	4	920	900	778	880	11.1	1.0	X				X			X		X		
	"	4	4	2,200	2,200	880	920	1.8	1.0	X			X				X		X		
	"	5	4	1,400	1,340	920	1,045	8.9	1.0	X				X			X		X		
	"	6	4	1,940	1,880	1,045	1,080	1.8	1.0	X			X				X		X		
	92P013,23	7	4	1,740	1,580	1,080	1,095	0.9	1.1	X			X				X		X		
	92P023	8	4	500	460	1,095	1,096	0.2	1.1	X			X				X		X		
	"	9	4	1,160	1,140	1,096	1,102	0.5	1.0	X			X				X		X		
	"	10	4	260	260	1,102	1,103	0.4	1.0	X			X				X		X		
	"	11	4	240	240	1,103	1,103	0.0	1.0												LAKE
	"	12	4	1,580	1,460	1,103	1,110	0.4	1.1	X			X				X		X		
	"	13	4	880	720	1,110	1,115	0.6	1.2	X			X				X		X		
	"	14	4	300	300	1,115	1,115	0.0	1.0												LAKE
	"	15	4	760	700	1,115	1,121	0.8	1.1	X			X				X		X		
	"	16	4	540	540	1,121	1,123	0.4	1.0	X			X				X		X		
	92P013,23	17	4	1,060	1,000	1,123	1,125	0.2	1.1	X			X			X			X		
	92P013	18	4	400	380	1,125	1,126	0.3	1.1	X			X			X			X		
	"	19	4	800	620	1,126	1,130	0.5	1.3	X			X			X			X		
	"	20	4	160	150	1,130	1,132	1.3	1.1	X			X			X			X		
	"	21	4	140	140	1,132	1,132	0.0	1.0												LAKE
	"	22	4	200	200	1,132	1,133	0.5	1.0	X			X			X			X		
	92P012,13	23	4	5,360	4,960	1,133	1,185	1.0	1.1	X			X			X			X		
	92P012	24	4	1,100	960	1,185	1,200	1.4	1.1	X			X			X			X		
	"	25	4	6,180	5,700	1,200	1,382	2.9	1.1	X			X				X		X		
	"	26	4	4,680	4,340	1,382	1,493	2.4	1.1	X			X				X		X		
	"	27	4	120	120	1,493	1,493	0.0	1.0												LAKE
	"	28	4	780	720	1,493	1,510	2.2	1.1	X			X				X		X		
	"	29	4	460	340	1,510	1,512	0.4	1.4	X			X				X		X		
	"	30	4	1,060	960	1,512	1,530	1.7	1.1	X			X				X		X		
	"	31	4	780	760	1,530	1,540	1.3	1.0	X			X				X		X		
	"	32	4	260	240	1,540	1,542	0.8	1.1												
	92P011,12	33	4	300	300	1,542	1,544	0.7	1.0	X			X			X			X		
	92P011	34	4	200	200	1,544	1,544	0.0	1.0												LAKE
	"	35	4	1,640	1,580	1,544	1,600	3.4	1.0	X			X			X			X		
	"	36	4	1,040	1,000	1,600	1,640	3.8	1.0	X			X				X		X		
	"	37	2	2,320	2,240	1,640	1,860	9.5	1.0	X				X			X		X		
	"	38	1	600	600	1,860	2,100	40.0	1.0	X					X		X		X		

1 A = Erodible
B = Non-erodible
C = Artificial

2 1 = gradient less than 8 per cent
2 = gradient in the 8-20 per cent range
3 = gradient greater than 20 per cent

3 a = not entrenched
b = entrenched

4 (i) = channel width less than 1.5 m
(ii) = channel width between 1.5 m and 20 m
(iii) = channel width greater than 20 m

Form 2: Detailed Air Photo Assessment (Upper Bonaparte River Watershed CAP)

Sub-basin (Stream)	Reach	Hillslope coupling (1)	Incision (2)	Sediment Supply Phase (3)	Morphology (4)	Morphology Comments	Streamside landuse			Disturbance type			Observed disturbance (% of reach)	Potential disturbance (% of reach) (10)	Logging related impact likely ? (11)	Aerial Photograph Inventory	
							Logging (5)	Roads (6)	Other	Observed (7)	Inferred (8)	Cause of disturbance/notes (9)				Recent Air Photo Number (only for potentially impacted sites/sections)	Historic Photo Number (s) (only for potentially impacted sites/sections)
FIFTY SEVEN CREEK SUB-BASIN																	
FIFTY	1	P	VF	W	I-RP	SINUOUS	-	C	Agriculture/Residential	-	LB	Riparian logging	-	100	N	97166:184,185	-
SEVEN	2	C	VH	T	I-CP	STRAIGHT	-	-	Agriculture	-	LB	Riparian logging	-	20	N	97166:184,185	-
CREEK	3	C	VH	T	I-CP	STRAIGHT	-	-	Agriculture	-	LB	Riparian logging	-	60	N	97166:184,185	-
	4	C	VH	T	I-CP	STRAIGHT	-	-	Agriculture	-	LB	Riparian logging	-	100	N	97166:184,185	-
	5	P	VH	T	I-CP	STRAIGHT	-	C	BC Rail	-	SC	Railway crossing	-	30	N	97167:177-180	-
	6	P	VH	T	I-CP	STRAIGHT	-	C,A	BC Rail	-	SC	Railway crossing	-	5	N	97167:177-180	-
	7	N	VF	T	I-RP	SINUOUS	-	C,A	Agriculture/Residential	-	LB	Highways	-	-	N	97167:177-180	-
	8	N	VF	T	I-RP	IRREG. WANDERING	-	C,A	Agriculture/Residential	-	LB	Highways	-	100	N	97167:177-180	-
	9	N	VF	T	I-RP	IRREG. WANDERING	-	C,A	Agriculture	-	LB	Riparian logging	-	100	N	97167:177-180	-
	10	N	N	W	I-RP	IRREG. WANDERING	-	C,A	Agriculture	-	LB	Riparian logging	-	10	N	97167:177-180	-
	11	N	N	W	N-A	LAKE	-	C,A	Agriculture	-	LB	Riparian logging	-	50	N	97167:177-180	-
	12	N	N	W	I-RP	IRREG. WANDERING	R	C,A	Agriculture	-	LB	Riparian logging	-	75	Y	97167:177-180	-
	13	N	N	W	I-RP	IRREG. WANDERING	-	-	-	-	-	-	-	-	-	-	-
	14	N	N	W	N-A	LAKE	-	-	-	-	-	-	-	-	-	-	-
	15	N	N	W	I-RP	IRREG. WANDERING	-	-	-	-	-	-	-	-	-	-	-
	16	N	N	W	I-RP	IRREG. WANDERING	-	-	-	-	-	-	-	-	-	-	-
	17	N	N	W	I-RP	IRREG. WANDERING	-	-	-	-	-	-	-	-	-	-	-
	18	N	N	W	I-RP	IRREG. WANDERING	-	-	Agriculture	-	LB	Riparian logging	-	30	N	97193:38-45	-
	19	N	N	W	I-RP	IRREG. WANDERING	-	-	Agriculture	-	LB	Riparian logging	-	100	N	97193:38-45	-
	20	N	N	W	I-RP	IRREG. WANDERING	-	-	Agriculture	-	LB	Riparian logging	-	100	N	97193:38-45	-
	21	N	N	W	N-A	LAKE	-	-	Agriculture	-	LB	Riparian logging	-	100	N	97193:38-45	-
	22	N	N	W	I-RP	IRREG. WANDERING	-	-	Agriculture	-	LB	Riparian logging	-	100	N	97193:38-45	-
	23	N	N	W	I-RP	IRREG. WANDERING	-	C,A	Agriculture	-	LB	Riparian logging	-	80	N	97193:38-45	-
	24	N	N	W	I-RP	IRREG. WANDERING	-	C,A	Agriculture	-	LB	Riparian logging	-	60	N	97193:38-45	-
	25	P-N	VF	W	I-RP	IRREG. WANDERING	R	C,A	Agriculture	-	LB	Riparian logging	-	75	Y	97193:38-45	-
	26	C-P	VF	T	I-RP	IRREG. WANDERING	-	-	-	-	-	-	-	-	-	-	-
	27	N	VF	T	N-A	LAKE	-	-	-	-	-	-	-	-	-	-	-
	28	N	VF	T	I-RP	IRREG. WANDERING	-	-	-	-	-	-	-	-	-	-	-
	29	N	VF	T	I-RP	IRREG. WANDERING	-	-	-	-	-	-	-	-	-	-	-
	30	N	VF	T	I-RP	IRREG. WANDERING	-	-	-	-	-	-	-	-	-	-	-
	31	N	VH	B	I-CP	IRREG. WANDERING	-	-	-	-	-	-	-	-	-	-	-
	32	N	VH	B	I-CP	IRREG. WANDERING	-	-	-	-	-	-	-	-	-	-	-
	33	N	VH	B	I-CP	IRREG. WANDERING	-	-	-	-	-	-	-	-	-	-	-
	34	N	VH	B	N-A	LAKE	-	-	-	-	-	-	-	-	-	-	-
	35	N	VH	B	I-CP	STRAIGHT	-	-	-	-	-	-	-	-	-	-	-
	36	P	VH	B	I-CP	STRAIGHT	-	-	-	-	-	-	-	-	-	-	-
	37	C	VH	B	I-CP	STRAIGHT	-	-	-	-	-	-	-	-	-	-	-
	38	C	VH	B	I-CP	STRAIGHT	-	-	-	-	-	-	-	-	-	-	-

1: Coupled; Partially coupled; Not coupled.

2: VF - into erodible valley flat material; VH - into erodible valley hillside material; B - confined by bedrock; N - not incised.

3: Wash material supply-dominated phase; Transitional phase; Bed material supply-dominated phase (see Fig. 6, *Channel Assessment Procedure Guidebook, Dec. 1996* for definitions)

4: Visible/Inferred - Riffe-Pool, Cascade-Pool, Step-Pool, Non-Alluvial (eg. V- RP).

5: Riparian logging (no buffer); Partial buffer left, Buffer left; Upslope logging.

6: Crossing, Adjacent to channel; Upslope.

7: Channel Pattern (eg. CP); Sediment Storage Pattern; Lateral Instability; Channel Width; Sinuousity; Meander Wavelength.

8: Sediment source impacting Channel (eg. SC); Sediment source Upslope, Logged to channel Bank; Windthrow in Riparian zone.

9: If channel disturbance is directly observed from the air photos, note the channel condition (aggrading, stable, degrading)

10: Potenially changed channel morphology is defined by the CAP Guidebook as "the length of erodible channel downstream of forestry-related activities...(giving) the maximum length of channel where changes in morphology may have occurred after logging."

11: Record all potential field sites on Air photo (indicate location and type of potential disturbance)

Form 1: Channel Information (General Aerial Photograph Assessment)

Watershed - Sub-basin (Stream)	Map #	Reach #	Stream order	Reach Length (m)	Valley Length (m)	D/S Elev. (m)	U/S Elev. (m)	Stream Gradient (%)	Sinuosity	Stream: Type (1) A	B	C	Gradient (2) 1	2	3	Entrenchment (3) a	b	Width (4) i	ii	iii	Comments
CHASM CREEK SUB-BASIN																					
Chasm Creek	92P013	1	4	780	760	675	739	8.2	1.0	X				X			X		X		
	"	2	4	1,680	1,680	739	761	1.3	1.0	X			X				X		X		
	"	3	4	980	980	761	761	0.0	1.0												LAKE
	"	4	4	1,340	1,280	761	800	2.9	1.0	X			X			X			X		
	"	5	4	1,740	1,740	800	878	4.5	1.0	X			X			X			X		
	92P023,13	6	4	1,220	1,220	878	900	1.8	1.0	X			X			X			X		
	92P023	7	4	580	580	900	915	2.6	1.0	X			X			X			X		
Fiftynine Creek	92P023	1	4	420	420	915	1,060	34.5	1.0	X					X		X		X		
		2	4	1,700	1,480	1,060	1,078	1.1	1.1	X			X			X			X		
		3	4	220	220	1,078	1,078	0.0	1.0												LAKE
		4	4	120	120	1,078	1,080	1.7	1.0	X			X				X		X		
		5	4	200	200	1,080	1,080	0.0	1.0												LAKE
		6	4	380	378	1,080	1,085	1.3	1.0	X			X				X		X		
		7	4	200	200	1,085	1,085	0.0	1.0												LAKE
		8	4	760	620	1,085	1,091	0.8	1.2	X			X			X			X		
		9	4	160	160	1,091	1,091	0.0	1.0												LAKE
		10	4	520	460	1,091	1,098	1.3	1.1	X			X			X			X		
		11	4	100	100	1,098	1,098	0.0	1.0												LAKE
		12	4	1,060	880	1,098	1,105	0.7	1.2	X			X			X			X		
		13	4	480	480	1,105	1,105	0.0	1.0												LAKE
		14	4	620	620	1,105	1,106	0.2	1.0	X			X			X			X		
		15	4	1,060	1,040	1,106	1,110	0.4	1.0	X			X			X			X		
		16	4	160	160	1,110	1,110	0.0	1.0												LAKE
		17	4	560	500	1,110	1,112	0.4	1.1	X			X			X			X		
		18	4	180	180	1,112	1,112	0.0	1.0												LAKE
		19	4	140	140	1,112	1,113	0.7	1.0	X			X			X			X		
		20	4	580	580	1,113	1,113	0.0	1.0												LAKE
		21	4	4,540	4,000	1,113	1,115	0.0	1.1	X			X			X			X		
		22-46	SEE MAP																		

1 A = Erodible
B = Non-erodible
C = Artificial

2 1 = gradient less than 8 per cent
2 = gradient in the 8-20 per cent range
3 = gradient greater than 20 per cent

3 a = not entrenched
b = entrenched

4 (i) = channel width less than 1.5 m
(ii) = channel width between 1.5 m and 20 m
(iii) = channel width greater than 20 m

Form 1: Channel Information (General Aerial Photograph Assessment)

Watershed - Sub-basin (Stream)	Map #	Reach #	Stream order	Reach Length (m)	Valley Length (m)	D/S Elev. (m)	U/S Elev. (m)	Stream Gradient (%)	Sinuosity	Stream: Type (1) A	B	C	Gradient (2) 1	2	3	Entrenchment (3) a	b	Width (4) i	ii	iii	Comments
CHASM CREEK SUB-BASIN																					
Fiftynine Creek	92P022	22	4	140	140	1,115	1,115	0.0	1.0												
	"	23	4	480	440	1,115	1,116	0.2	1.1	x			x			x			x		
	"	24	4	220	220	1,116	1,116	0.0	1.0												Lake
	"	25	4	140	140	1,116	1,117	0.7	1.0	x			x			x			x		
	"	26	4	1,820	1,820	1,117	1,117	0.0	1.0												Lake
	"	27	4	1,020	1,020	1,117	1,118	0.1	1.0	x			x			x			x		
	"	28	4	300	300	1,118	1,118	0.0	1.0												Lake
	"	29	4	280	280	1,118	1,119	0.4	1.0	x			x			x			x		
	"	30	4	140	140	1,119	1,119	0.0	1.0												Lake
	"	31	4	80	80	1,119	1,119	0.0	1.0	x			x			x			x		
	"	32	4	180	180	1,119	1,119	0.0	1.0												Lake
	"	33	4	580	580	1,119	1,119	0.0	1.0	x			x			x			x		
	"	34	4	880	880	1,119	1,119	0.0	1.0												Lake
	"	35	4	1,420	1,340	1,119	1,120	0.1	1.1	x			x			x			x		
	"	36	4	220	220	1,120	1,120	0.0	1.0												Lake
	"	37	4	180	180	1,120	1,121	0.6	1.0	x			x			x			x		
	"	38	4	280	280	1,121	1,121	0.0	1.0												Lake
	"	39	4	980	950	1,121	1,126	0.5	1.0	x			x			x			x		
	"	40	4	40	40	1,126	1,130	10.0	1.0												Lake
	"	41	4	740	740	1,130	1,138	1.1	1.0	x			x			x			x		
	"	42	4	860	840	1,138	1,140	0.2	1.0												Lake
	"	43	4	6,360	5,120	1,140	1,262	1.9	1.2	x			x			x			x		
	"	44	4	2,460	2,460	1,262	1,400	5.6	1.0	x			x			x			x		
	92P021	45	4	5,900	5,800	1,400	1,700	5.1	1.0	x			x			x			x		
	"	46	3	1,940	1,940	1,700	2,135	22.4	1.0	x					x		x		x		
Sixty One Creek	92P023	1	2	240	240	915	916	0.4	1.0	x			x				x		x		incl. Lakes
	"	2	2	640	640	916	940	3.8	1.0	x			x				x		x		
	"	3	2	300	300	940	1,062	40.7	1.0		x				x		x		x		
	"	4	2	480	460	1,062	1,071	1.9	1.0	x						x			x		
	"	5	2	340	340	1,071	1,071	0.0	1.0												Lake
	"	6	2	3,160	3,080	1,071	1,089	0.6	1.0	x			x			x			x		
	"	7	2	320	320	1,089	1,089	0.0	1.0												Lake
	"	8	2	780	740	1,089	1,091	0.3	1.1	x			x			x			x		
	"	9	2	140	140	1,091	1,091	0.0	1.0												Lake
	"	10	2	480	420	1,091	1,094	0.6	1.1	x			x			x			x		
	"	11	1	220	220	1,094	1,094	0.0	1.0												Lake

1 A = Erodible
B = Non-erodible
C = Artificial

2 1 = gradient less than 8 per cent
2 = gradient in the 8-20 per cent range
3 = gradient greater than 20 per cent

3 a = not entrenched
b = entrenched

4 (i) - channel width less than 1.5 m
(ii) channel width between 1.5 m and 20 m
(iii) channel width greater than 20 m

Form 2: Detailed Air Photo Assessment (Upper Bonaparte River Watershed CAP)

Sub-basin (Stream)	Reach	Hillslope coupling (1)	Incision (2)	Sediment Supply Phase (3)	Morphology (4)	Morphology Comments	Streamside landuse			Disturbance type			Observed disturbance (% of reach)	Potential disturbance (% of reach) (10)	Logging related impact likely ? (11)	Aerial Photograph Inventory	
							Logging (5)	Roads (6)	Other	Observed (7)	Inferred (8)	Cause of disturbance/notes (9)				Recent Air Photo Number (only for potentially impacted sites/sections)	Historic Photo Number (s) (only for potentially impacted sites/sections)
CHASM CREEK SUB-BASIN																	
Chasm	1	C	VH	T	I-CP	STRAIGHT	-	-	AGRICULTURE	-	LB	RIPARIAN CLEARING	-	10	NO	97167 181,182	-
Creek	2	C-P	VH	W	I-RP	STRAIGHT	-	-	-	-	-	-	-	-	-	-	-
	3	PC	N	W	V-NA	LAKE	-	-	-	-	-	-	-	-	-	-	-
	4	PC	N	W	I-RP	STRAIGHT	-	C	AGRICULTURE	-	LB	RIPARIAN CLEARING	-	70	NO	97168 013,014	-
	5	C	VH	B	I-RP	STRAIGHT	-	-	-	-	-	-	-	-	-	-	-
	6	PC-C	VH	B	I-RP	STRAIGHT	-	-	-	-	-	-	-	-	-	-	-
	7	PC-C	VH	B	I-RP	STRAIGHT	-	-	-	-	-	-	-	-	-	-	-
Sixty One	1	C-P	VF	W	I-RP	STRAIGHT	-	-	-	-	-	-	-	-	-	-	-
Creek	2	P	VF-VH	T	I-RP	STRAIGHT	-	-	-	-	-	-	-	-	-	-	-
	3	C	B	B	I-SP	STRAIGHT	-	-	-	-	-	-	-	-	-	-	-
	4	N	VF	W-T	I-RP	STRAIGHT	R	C-A	-	-	LB	PARK,BC RAIL, HWY	-	60	NO	97193 75,76	-
	5	N	VF	W	I-NA	LAKE	P	A	-	-	LB	RIPARIAN LOGGING	-	10	NO	97193 75,76	-
	6	N	VF	W	I-RP	SINUOUS	P	C-A	AGRO./HWY/RES.	-	LB-SC	RIPARIAN LOGGING	-	30	NO	97202 16,17	-
	7	N	-	W	I-NA	LAKE	R	C-A	AGRO./HWY/RES.	SSP	LB-SC	RIPARIAN LOGGING	30	40	NO	97202 16,17	FHAP SITE
	8	N	N	W	I-RP	SINUOUS	R	C	AGRO./HWY/RES.	-	LB	RIPARIAN LOGGING	-	60	NO	97202 16,17	-
	9	N	-	W	I-NA	LAKE	R	A	AGRO./HWY/RES.	-	LB-SC	RIPARIAN LOGGING	-	100	NO	97202 16,17	-
	10	N	N	W	I-RP	SINUOUS	R	-	AGRO./HWY/RES.	-	LB	RIPARIAN LOGGING	-	100	NO	97202 16,17	-
	11	N	-	W	I-NA	LAKE	R	-	AGRO./HWY/RES.	-	LB	RIPARIAN LOGGING	-	90	NO	97202 17,18	-
Fifty Nine	1	C	VH-B	T-B	I-SP	STRAIGHT	-	-	-	-	-	-	-	-	-	-	-
Creek	2	DC	VF	W	I-RP	IRREG. WANDERING	R/P	C-A	RANGE/AGRO.	-	CS-LB	AGRO/RESIDENTIAL	-	90	NO	97193 77,78	-
	3	DC	N	W	I-NA	LAKE	R/P	-	RANGE/AGRO.	-	LB	RIPARIAN LOGGING	-	30	YES	97193 77,78	-
	4	DC	VF	W	I-RP	IRREG. WANDERING	P	-	RANGE/AGRO.	-	LB	RIPARIAN LOGGING	-	40	YES	97193 77,78	-
	5	DC	N	W	I-NA	LAKE	P	-	RANGE/AGRO.	-	LB	RIPARIAN LOGGING	-	20	YES	97193 77,78	-
	6	DC	VF	W	I-RP	IRREG. WANDERING	-	-	-	-	-	-	-	-	-	-	-
	7	DC	N	W	I-NA	LAKE	P	-	RANGE/AGRO.	-	LB	RIPARIAN LOGGING	-	50	YES	97193 77,78	-
	8	DC	VF	W	I-RP	IRREG. WANDERING	R/P	C	RANGE/AGRO.	-	LB	RIPARIAN LOGGING	-	30	YES	97193 77,78	-
	9	DC	N	W	I-NA	LAKE	R/P	-	RANGE/AGRO.	-	LB	RIPARIAN LOGGING	-	80	YES	97193 77,78	-
	10	DC	VF	W	I-RP	IRREG. WANDERING	R/P	-	RANGE/AGRO.	-	LB	RIPARIAN LOGGING	-	75	YES	97193 77,78	-
	11	DC	N	W	I-NA	LAKE	-	-	-	-	-	-	-	-	-	-	-
	12	DC	N	W	I-RP	SINUOUS	R	-	-	-	LB	BC HYDRO	-	5	NO	97193 79,80	-
	13	DC	N	W	I-NA	LAKE	-	-	-	-	-	-	-	-	-	-	-
	14	DC	N	W	I-RP	SINUOUS	R	-	-	-	LB	RIPARIAN LOGGING	-	95	YES	97193 80,79	-
	15	DC	VF	W	I-RP	SINUOUS	-	C	-	-	-	-	-	-	-	-	-
	16	DC	N	W	I-NA	LAKE	-	-	-	-	-	-	-	-	-	-	-
	17	DC	VF	W	I-RP	SINUOUS	-	C	-	-	-	-	-	-	-	-	-
	18	DC	N	W	I-NA	LAKE	-	-	-	-	-	-	-	-	-	-	-
	19	DC	N	W	I-RP	SINUOUS	-	-	-	-	-	-	-	-	-	-	-
Note: See Map for Reaches 20-46 (totally not visible on airphotos)																	

1. Coupled; Partially coupled; Not coupled.
2. VF - into erodible valley flat material; VH - into erodible valley hillside material, B - confined by bedrock; N - not incised.
3. Wash material supply-dominated phase; Transitional phase; Bed material supply-dominated phase (see Fig. 6, *Channel Assessment Procedure Guidebook, Dec. 1996* for definitions)
4. Visible/Inferred - Riffe-Pool, Cascade-Pool, Step-Pool, Non-Alluvial (eg. V- RP).
5. Riparian logging (no buffer); Partial buffer left, Buffer left; Upslope logging.
6. Crossing; Adjacent to channel; Upslope.
7. Channel Pattern (eg. CP); Sediment Storage Pattern; Lateral Instability; Channel Width; Sinuousity; Meander Wavelength.
8. Sediment source impacting Channel (eg. SC); Sediment source Upslope; Logged to channel Bank; Windthrow in Riparian zone.
9. If channel disturbance is directly observed from the air photos, note the channel condition (aggrading, stable, degrading)
10. Potenially changed channel morphology is defined by the CAP Guidebook as "the length of erodible channel downstream of forestry-related activities...(giving) the maximum length of channel where changes in morphology may have occurred after logging."
11. Record all potential field sites on Air photo (indicate location and type of potential disturbance)

Form 1 Channel Information (General Aerial Photograph Assessment)

Watershed - Sub-basin (Stream)	Map #	Reach #	Stream order	Reach Length (m)	Valley Length (m)	D/S Elev. (m)	U/S Elev. (m)	Stream Gradient (%)	Sinuosity	Stream Type (1) A	B	C	Gradient (2) 1	2	3	Entrenchment (3) a	b	Width (4) i	ii	iii	Comments
RAYFIELD RIVER SUB-BASIN																					
Rayfield River	92P025	1-1	6	1,460	1,120	885	889	0.3	1.3	X			X			X			X		
	92P025,35	1	6	7,540	6,720	889	922	0.4	1.1	X			X			X			X		
	92P035	2	6	3,300	3,300	922	970	1.5	1.0	X			X				X		X		
	"	3	6	480	480	970	970	0.0	1.0												LAKE
	"	4	6	360	360	970	1,002	8.9	1.0	X			X				X		X		
	"	5	6	360	360	1,002	1,010	2.2	1.0												LAKE
	"	6	6	220	220	1,010	1,012	0.9	1.0	X			X				X		X		
	"	7	6	280	280	1,012	1,012	0.0	1.0												LAKE
	"	8	6	220	220	1,012	1,015	1.4	1.0	X			X				X		X		
	"	9	6	940	940	1,015	1,015	0.0	1.0												LAKE
	"	10	6	300	300	1,015	1,016	0.3	1.0	X			X				X		X		
	"	11	6	3,300	3,300	1,016	1,017	0.0	1.0												LAKE
	"	12	6	620	620	1,017	1,022	0.8	1.0	X			X				X		X		
	"	13	6	260	260	1,022	1,022	0.0	1.0												LAKE
	92P036	14	6	6,100	3,920	1,022	1,035	0.2	1.6	X			X				X		X		
	92P036,46	15	6	760	760	1,035	1,035	0.0	1.0												LAKE
	92P046	16-1	5	3,100	2,500	1,035	1,038	0.1	1.2	X			X				X		X		
	"	16-2	4	6,100	4,760	1,038	1,058	0.3	1.3	X			X				X		X		
	"	16	4	2,640	2,420	1,058	1,085	1.0	1.1	X			X				X		X		
	"	17	3	1,120	1,120	1,085	1,085	0.0	1.0												LAKE
	"	18	3	1,240	1,200	1,085	1,090	0.4	1.0	X			X				X		X		
	"	19	3	540	540	1,090	1,120	5.6	1.0	X			X				X		X		
	"	20-1	3	560	560	1,120	1,120	0.0	1.0												LAKE
	"	20	3	2,280	2,120	1,120	1,130	0.4	1.1	X			X			X			X		
	92P046,47	21	3	1,780	1,780	1,130	1,130	0.0	1.0												LAKE
	"	22	3	460	460	1,130	1,141	2.4	1.0	X			X			X			X		
	"	23	3	2,380	2,380	1,141	1,141	0.0	1.0												LAKE
	"	24	2	160	160	1,141	1,143	1.3	1.0	X			X			X			X		
	"	25	2	520	520	1,143	1,143	0.0	1.0												LAKE
	"	26	2	1,020	1,020	1,143	1,150	0.7	1.0	X			X			X			X		
	"	27	2	820	820	1,150	1,150	0.0	1.0												LAKE
	"	28	1	880	880	1,150	1,155	0.6	1.0	X			X			X			X		

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2 = gradient in the 8-20 per cent range
3 = gradient greater than 20 per cent

3 a = not entrenched
b = entrenched

4 (i) = channel width less than 1.5 m
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Form 1: Channel Information (General Aerial Photograph Assessment)

Watershed - Sub-basin (Stream)	Map #	Reach #	Stream order	Reach Length (m)	Valley Length (m)	D/S Elev. (m)	U/S Elev. (m)	Stream Gradient (%)	Sinuosity	Stream											Comments
										Type (1)			Gradient (2)			Entrenchment (3)		Width (4)			
										A	B	C	1	2	3	a	b	i	ii	iii	
RAYFIELD RIVER SUB-BASIN																					
Green Creek	92P046	1-1	5	760	760	1,035	1,035	0.0	1.0												LAKE
	"	1	5	1,000	1,000	1,035	1,037	0.2	1.0	X			X			X			X		
	92P045,46	2	5	880	880	1,037	1,038	0.1	1.0	X			X			X			X		
	92P045	3	5	760	760	1,038	1,041	0.4	1.0	X			X			X			X		
	"	4	5	5,820	5,820	1,041	1,065	0.4	1.0												LAKE
	"	5	5	1,380	1,380	1,065	1,070	0.4	1.0	X			X			X			X		
	"	6	5	18,800	18,800	1,070	1,072	0.0	1.0												GREEN LAKE
Eightythree	92P044,34	1	4	2,940	2,935	1,079	1,095	0.5	1.0	X			X			X			X		
Creek	92P044	2	4	420	420	1,095	1,098	0.7	1.0												LAKE/WETLAND
	"	3	4	380	380	1,098	1,099	0.3	1.0	X			X			X			X		
	"	4	4	720	720	1,099	1,105	0.8	1.0	X			X			X			X		
	"	5	4	320	320	1,105	1,105	0.0	1.0												LAKE
	"	6	4	300	300	1,105	1,108	1.0	1.0	X			X			X			X		WETLAND
	"	7	4	1,720	1,560	1,108	1,115	0.4	1.1	X			X			X			X		
	"	8	4	140	140	1,115	1,115	0.0	1.0												LAKE
	"	9	4	5,200	4,900	1,115	1,120	0.1	1.1	X			X			X			X		
	"	10	4	620	620	1,120	1,120	0.0	1.0												LAKE
	"	11	4	460	460	1,120	1,123	0.7	1.0	X			X			X			X		
	92P043,44	12	4	1,060	1,000	1,123	1,125	0.2	1.1	X			X			X			X		
	"	13	4	2,840	2,840	1,125	1,126	0.0	1.0												83 LAKE
	"	14	3	1,100	1,100	1,126	1,128	0.2	1.0	X			X			X			X		
	"	15	3	760	760	1,128	1,128	0.0	1.0												LAKE
	"	16	3	420	400	1,128	1,130	0.5	1.1	X			X			X			X		
	"	17	3	1,100	1,100	1,130	1,130	0.0	1.0												LAKE
	"	18	3	280	280	1,130	1,132	0.7	1.0	X			X			X			X		
	"	19	3	400	400	1,132	1,132	0.0	1.0												LAKE
	"	20	3	1,540	1,540	1,132	1,135	0.2	1.0	X			X			X			X		
	"	21	1	1,940	1,940	1,135	1,135	0.0	1.0												LAKE

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B = Non-erodible
C = Artificial

2 1 = gradient less than 8 per cent
2 = gradient in the 8-20 per cent range
3 = gradient greater than 20 per cent

3 a = not entrenched
b = entrenched

4 (i) = channel width less than 1.5 m
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Form 2: Detailed Air Photo Assessment (Upper Bonaparte River Watershed CAP)

Sub-basin (Stream)	Reach	Hillslope coupling (1)	Incision (2)	Sediment Supply Phase (3)	Morphology (4)	Morphology Comments	Streamside landuse			Disturbance type			Observed disturbance (% of reach)	Potential disturbance (% of reach) (10)	Logging related impact likely? (11)	Aerial Photograph Inventory	
							Logging (5)	Roads (6)	Other	Observed (7)	Inferred (8)	Cause of disturbance/notes (9)				Recent Air Photo Number (only for potentially impacted sites/sections)	Historic Photo Number (s) (only for potentially impacted sites/sections)
RAYFIELD RIVER SUB-BASIN																	
Rayfield	1-1	C	VF	W	I-RP	SINUOUS	-	A	RESIDENTIAL		LB	RESIDENTIAL	-	100	N	95074:8,9	NO
River	1	C-N	VH	W-T	I-RP	STRAIGHT											
	2	Note Channel is small, very difficult to see, detailed aerial photograph assessment is not required															
	3																
	4																
	5																
	6																
	7																
	8																
	9																
	10																
	11																
	12																
	13																
	14																
	15																
	16-1																
	16-2																
	16																
	17																
	18																
	19																
	20-1																
	20																
	21																
	22																
	23																
	24																
	25																
	26																
	27																
	28																

1. Coupled; Partially coupled; Not coupled.
2. VF - into erodible valley flat material; VH - into erodible valley hillside material; B - confined by bedrock; N - not incised
3. Wash material supply-dominated phase; Transitional phase; Bed material supply-dominated phase (see Fig. 6, *Channel Assessment Procedure Guidebook, Dec. 1996* for definitions)
4. Visible/Inferred - Riffe-Pool, Cascade-Pool, Step-Pool, Non-Alluvial (eg. V- RP).
5. Riparian logging (no buffer); Partial buffer left, Buffer left; Upslope logging.
6. Crossing, Adjacent to channel, Upslope.
7. Channel Pattern (eg. CP); Sediment Storage Pattern; Lateral Instability; Channel Width; Sinuousity; Meander Wavelength
8. Sediment source impacting Channel (eg. SC); Sediment source Upslope; Logged to channel Bank; Windthrow in Riparian zone
9. If channel disturbance is directly observed from the air photos, note the channel condition (aggrading, stable, degrading)
10. Potenially changed channel morphology is defined by the CAP Guidebook as "the length of erodible channel downstream of forestry-related activities...(giving) the maximum length of channel where changes in morphology may have occurred after logging."
11. Record all potential field sites on Air photo (indicate location and type of potential disturbance)

Form 1: Channel Information (General Aerial Photograph Assessment)

Watershed - Sub-basin (Stream)	Map #	Reach #	Stream order	Reach Length (m)	Valley Length (m)	D/S Elev. (m)	U/S Elev. (m)	Stream Gradient (%)	Sinuosity	Stream											Comments
										Type (1)			Gradient (2)			Entrenchment (3)		Width (4)			
										A	B	C	1	2	3	a	b	i	ii	iii	
EAGAN LAKE SUB-BASIN																					
Machete Creek	92P037	1	5	880	700	1,045	1,048	0.3	1.3	X			X			X			X		
	"	2	5	4,580	4,580	1,048	1,048	0.0	1.0												LAKE
	"	3-1	5	4,220	3,000	1,048	1,057	0.2	1.4	X			X				X		X		
	"	3	5	3,380	3,100	1,057	1,120	1.9	1.1	X			X				X		X		
	92P037,38	4	5	7,500	7,500	1,120	1,122	0.0	1.0												MACHETE LK
	92P038	5-1	5	3,400	3,800	1,122	1,172	1.5	0.9	X			X			X			X		
	"	5	4	480	460	1,172	1,202	6.3	1.0	X			X				X		X		
	"	6	4	2,020	1,980	1,202	1,382	8.9	1.0	X				X			X		X		
	"	7	4	1,540	1,460	1,382	1,415	2.1	1.1	X			X			X			X		
	"	8	4	3,520	3,520	1,415	1,415	0.0	1.0												AKEHURST LK
	"	9	3	1,760	1,680	1,415	1,440	1.4	1.0	X			X			X			X		
	"	10	1	880	860	1,440	1,520	9.1	1.0	X				X			X		X		
	"	11	1	560	520	1,520	1,525	0.9	1.1	X			X			X			X		
	"	12	1	160	160	1,525	1,525	0.0	1.0												LAKE
				34,880																	
Montana Creek	92P047	1	4	1,200	1,100	1,110	1,118	0.7	1.1	X			X			X			X		
		2	4	1,480	880	1,118	1,125	0.5	1.7	X			X			X			X		
		3	4	2,700	2,700	1,125	1,125	0.0	1.0												MONTANA LK
		4	3	2,360	2,160	1,125	1,170	1.9	1.1	X			X				X		X		
		5	3	1,060	1,060	1,170	1,170	0.0	1.0												LAKE
		6	3	2,940	2,740	1,170	1,322	5.2	1.1	X			X			X			X		

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Form 1 Channel Information (General Aerial Photograph Assessment)

Watershed - Sub-basin (Stream)	Map #	Reach #	Stream order	Reach Length (m)	Valley Length (m)	D/S Elev. (m)	U/S Elev. (m)	Stream Gradient (%)	Sinuosity	Stream: Type (1) A	B	C	Gradient (2) 1	2	3	Entrenchment (3) a	b	Width (4) i	ii	iii	Comments
EAGAN LAKE SUB-BASIN																					
McDonald	92P037	1	4	2,500	2,140	1,057	1,078	0.8	1.2	X			X			X			X		
Creek	"	2	4	300	300	1,078	1,081	1.0	1.0	X			X				X		X		
	92P047	3	4	2,220	1,940	1,081	1,110	1.3	1.1	X			X				X		X		
	"	4	4	420	400	1,110	1,110	0.0	1.1												LAKE
	"	5	3	660	640	1,110	1,112	0.3	1.0	X			X			X			X		
	"	6	3	380	380	1,112	1,112	0.0	1.0												LAKE
	"	7	3	260	220	1,112	1,113	0.4	1.2	X			X				X		X		
	"	8	3	460	460	1,113	1,113	0.0	1.0												LAKE
	"	9	3	2,200	1,980	1,113	1,170	2.6	1.1	X			X			X			X		
	92P048	10	3	880	880	1,170	1,170	0.0	1.0	X			X			X			X		
	"	11	3	220	220	1,170	1,173	1.4	1.0	X			X			X			X		
	"	12	3	460	440	1,173	1,175	0.4	1.0	X			X			X			X		
	"	13	3	480	480	1,175	1,182	1.5	1.0												LAKE
	"	14	3	200	200	1,182	1,182	0.0	1.0	X			X			X			X		
	"	15	3	200	140	1,182	1,186	2.0	1.4	X			X			X			X		
	"	16	3	340	340	1,186	1,188	0.6	1.0	X			X			X			X		
	"	17	3	2,840	2,840	1,188	1,190	0.1	1.0												LAKE
	"	18	1	840	780	1,190	1,310	14.3	1.1	X				X			X		X		
	"	19	1	140	140	1,310	1,310	0.0	1.0												LAKE
	"	20	1	160	160	1,310	1,330	12.5	1.0	X				X			X		X		
	"	21	1	120	120	1,330	1,330	0.0	1.0												LAKE

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Form 2: Detailed Air Photo Assessment (Upper Bonaparte River Watershed CAP)

Sub-basin (Stream)	Reach	Hillslope coupling (1)	Incision (2)	Sediment Supply Phase (3)	Morphology (4)	Morphology Comments	Streamside landuse			Disturbance type			Observed disturbance (% of reach)	Potential disturbance (% of reach) (10)	Logging related impact likely? (11)	Aerial Photograph Inventory	
							Logging (5)	Roads (6)	Other	Observed (7)	Inferred (8)	Cause of disturbance/notes (9)				Recent Air Photo Number (only for potentially impacted sites/sections)	Historic Photo Number (s) (only for potentially impacted sites/sections)
EAGAN LAKE SUB-BASIN																	
Machete	1	N	VF	W	I-RP	IRREG. MEANDER	P	C			SC-LB	AGRICULTURE,ROADS		10	N	95074:221,222	Not available
Creek	2	N	VF	W	L	LAKE		A	RECREATION								
	3-1	N	VF	B-T	I-RP	IRREG. MEANDER		C	RECREATION		SC-LB	AGRICULTURE,ROADS		85	N	95080-204,205	
	3	N	VH	B-T	I-RP	IRREG. WANDER											
	4	N	VF	W	L	LAKE		A	RECREATION		LB-SC	RESIDENCE		10		95080-196,197	
	5-1	N	VF	W-T	I-RP	IRREG. MEANDER	R/P	C			LB-SC	LOGGING		20	Y	95080-194,195	
	5	N-P	VH	B	I-RP	STRAIGHT	P	C			LB-SC	LOGGING		100	Y	95080-194,196	
	6	N-P	VH	B-T	I-RP	SINUOUS	R	C,A			LB-SC	LOGGING		100	Y	90058-248	
	7	N	VH	T	I-RP	SINUOUS	P/R	C,A			LB-SC	LOGGING		85	Y	90058-248,249	
	8	P-N	VF	W	L	LAKE	B				SU	LOGGING		10	Y	90059-8,9	
	9	N	VF	B	I-RP	IRREG. WANDER	P	C			LB,SC	LOGGING		20	Y	90059-8	
	10	N	VH	B	I-RP	STRAIGHT											
	11	N	VF	W	I-RP	IRREG. WANDER											
	12	N	VF	W	L	LAKE											
Montana	1	N	VF	W	I-RP	IRREG.WANDER		C			SC,LB			40	Y	95073:72,73	
Creek	2	N	VH	W	I-RP	TORT. MEANDER	R	C	AGRICULTURE		SC,LB	LOGGING		80	Y	95073:72,74	
	3	N-P	VF	W	L	LAKE		A	RECREATION		LB						
	4	P-N	VH	T-B	I-RP	IRREG. WANDER	R	C			LB,SC	LOGGING		40	Y	95073:85,86	
	5	P-C	VF	W	L	LAKE	R	A	RECREATION		LB,SC	LOGGING		100	Y	95073:151,152	
	6	P	VH	B-T	I-RP	SINUOUS		C	RECREATION, RANGE		LB,SC	RANGE		20	Y	95073:151,152	

1: Coupled; Partially coupled; Not coupled.

2: VF - into erodible valley flat material; VH - into erodible valley hillside material; B - confined by bedrock; N - not incised.

3: Wash material supply-dominated phase; Transitional phase; Bed material supply-dominated phase (see Fig. 6, *Channel Assessment Procedure Guidebook, Dec. 1996* for definitions)

4: Visible/Inferred - Riffe-Pool, Cascade-Pool, Step-Pool, Non-Alluvial (eg. V- RP).

5: Riparian logging (no buffer); Partial buffer left, Buffer left; Upslope logging.

6: Crossing; Adjacent to channel; Upslope.

7: Channel Pattern (eg. CP); Sediment Storage Pattern; Lateral Instability; Channel Width; Sinuousity; Meander Wavelength.

8: Sediment source impacting Channel (eg. SC); Sediment source Upslope; Logged to channel Bank; Windthrow in Riparian zone.

9: If channel disturbance is directly observed from the air photos, note the channel condition (aggrading, stable, degrading)

10: Potenially changed channel morphology is defined by the CAP Guidebook as "the length of erodible channel downstream of forestry-related activities...(giving) the maximum length of channel where changes in morphology may have occurred after logging."

11: Record all potential field sites on Air photo (indicate location and type of potential disturbance)

Form 2: Detailed Air Photo Assessment (Upper Bonaparte River Watershed CAP)

Sub-basin (Stream)	Reach	Hillslope coupling (1)	Incision (2)	Sediment Supply Phase (3)	Morphology (4)	Morphology Comments	Streamside landuse			Disturbance type			Observed disturbance (% of reach)	Potential disturbance (% of reach) (10)	Logging related impact likely? (11)	Aerial Photograph Inventory	
							Logging (5)	Roads (6)	Other	Observed (7)	Inferred (8)	Cause of disturbance/notes (9)				Recent Air Photo Number (only for potentially impacted sites/sections)	Historic Photo Number (s) (only for potentially impacted sites/sections)
EAGAN LAKE SUB-BASIN																	
McDonald	1	N	VF	W	I-RP	IRREG. WANDER	R/P	C	AGRICULTURE		SC,LB	LOGGING/RANGE		40	Y	95073:10,11	
Creek	2	P-C	VH	T	I-RP	IRREG. WANDER											
	3	N	VH	T	I-RP	IRREG. WANDER											
	4	N	VF	W	L	LAKE			AGRICULTURE		LB	RANGE		90		95073:10	
	5	N	VF	W	I-RP	IRREG. MEANDER					LB			60		95073:74,73	
	6	N	VF	W	L	LAKE	R		LOGGING, AGRO.	CP	LB	DUCKS UNLIMITED		100		95073:74,73	
	7	N	VF	W	I-RP	IRREG. MEANDER	R	C	LOGGING, AGRO.	CP	LB	DUCKS UNLIMITED		100		95073:74,73	
	8	N	VF	W	L	LAKE	R	C	LOGGING, AGRO.	CP	LB	DUCKS UNLIMITED		100	Y	95073:74,73	
	9	N	VH	T	I-RP	IRREG. WANDER	R	C	LOGGING, AGRO.	CP	LB	DUCKS UNLIMITED		100		95073:74,73	
	10	N	VF	W	I-RP	IRREG. WANDER			RANGE		LB			30		95073:74,74	
	11	N	VF	W	I-RP	IRREG. WANDER			RANGE		LB	PRIVATE RANGE		100	Y	95073:84,85	
	12	N	VH	W	I-RP	IRREG. WANDER			RANGE		LB	PRIVATE RANGE		100	Y	95073:84,85	
	13	P	VF	W	L	LAKE											
	14	P-N	VF	T-W	I-RP	IRREG. WANDER											
	15	C	VF	T-W	I-RP	IRREG. WANDER											
	16	P-C	VF	T-W	I-RP	IRREG. WANDER											
	17	C	VF	W	L	LAKE											
	18	P-C	VH	B	I-RP	STRAIGHT	R	C			LB,SC	LOGGING		10	Y	95073:78,79	
	19	P	VF	W	L	LAKE											
	20	P	VH	B-T	I-RP	STRAIGHT											
	21	P-C	VF	W	L	LAKE											

1: Coupled; Partially coupled; Not coupled.

2: VF - into erodible valley flat material; VH - into erodible valley hillside material; B - confined by bedrock; N - not incised.

3: Wash material supply-dominated phase; Transitional phase; Bed material supply-dominated phase (see Fig. 6, *Channel Assessment Procedure Guidebook, Dec. 1996* for definitions)

4: Visible/Inferred - Riffe-Pool, Cascade-Pool, Step-Pool, Non-Alluvial (eg. V- RP).

5: Riparian logging (no buffer); Partial buffer left, Buffer left; Upslope logging.

6: Crossing; Adjacent to channel; Upslope.

7: Channel Pattern (eg. CP); Sediment Storage Pattern; Lateral Instability; Channel Width; Sinuousity; Meander Wavelength.

8: Sediment source impacting Channel (eg. SC); Sediment source Upslope; Logged to channel Bank; Windthrow in Riparian zone.

9: If channel disturbance is directly observed from the air photos, note the channel condition (aggrading, stable, degrading)

10: Potenially changed channel morphology is defined by the CAP Guidebook as "the length of erodible channel downstream of forestry-related activities...(giving) the maximum length of channel where changes in morphology may have occurred after logging."

11: Record all potential field sites on Air photo (indicate location and type of potential disturbance)

Form 1 Channel Information (General Aerial Photograph Assessment)

Watershed - Sub-basin (Stream)	Map #	Reach #	Stream order	Reach Length (m)	Valley Length (m)	D/S Elev. (m)	U/S Elev. (m)	Stream Gradient (%)	Sinuosity	Stream: Type (1) A	B	C	Gradient (2) 1	2	3	Entrenchment (3) a	b	Width (4) i	ii	iii	Comments
BONAPARTE LAKE SUB-BASIN																					
Bonaparte River	92P037	11	5	720	680	1,045	1,053	1.1	1.1	X			X			X			X		
	"	12-1	5	5,160	3,900	1,053	1,127	1.4	1.3	X			X			X			X		
	"	12-2	5	1,120	700	1,127	1,129	0.2	1.6	X			X			X			X		
	92P037,27	12-3	5	2,600	2,080	1,129	1,145	0.6	1.3	X			X			X			X		
	92P027	12	5	4,420	3,980	1,145	1,175	0.7	1.1	X			X				X			X	
	92P028	13	5	17,220	17,220	1,175	1,180	0.0	1.0												BONAPARTE LK
	"	14	4	1,620	1,500	1,180	1,250	4.3	1.1	X			X				X		X		
	"	15	4	400	400	1,250	1,250	0.0	1.0												LAKE
	"	16	4	360	340	1,250	1,254	1.1	1.1	X			X			X			X		
	"	17	4	3,340	3,340	1,254	1,254	0.0	1.0												LAKE
	92P029	18	3	520	440	1,254	1,257	0.6	1.2	X			X			X			X		
	"	19	3	600	600	1,257	1,257	0.0	1.0												LAKE
	"	20	2	820	780	1,257	1,310	6.5	1.1	X			X			X			X		
	"	21	2	420	420	1,310	1,310	0.0	1.0												LAKE
	"	22	2	440	360	1,310	1,319	2.0	1.2	X			X			X			X		
	"	23	2	260	260	1,319	1,320	0.4	1.0												LAKE
	"	24	2	750	740	1,320	1,325	0.7	1.0	X			X			X			X		
	"	25	1	200	200	1,325	1,325	0.0	1.0												

1 A = Erodible
B = Non-erodible
C = Artificial

2 1 = gradient less than 8 per cent
2 = gradient in the 8-20 per cent range
3 = gradient greater than 20 per cent

3 a = not entrenched
b = entrenched

4 (i) = channel width less than 1.5 m
(ii) = channel width between 1.5 m and 20 m
(iii) = channel width greater than 20 m

Form 1: Channel Information (General Aerial Photograph Assessment)

Watershed - Sub-basin (Stream)	Map #	Reach #	Stream order	Reach Length (m)	Valley Length (m)	D/S Elev. (m)	U/S Elev. (m)	Stream Gradient (%)	Sinuosity	Stream												Comments
										Type (1)			Gradient (2)			Entrenchment (3)		Width (4)				
										A	B	C	1	2	3	a	b	i	ii	iii	
BONAPARTE LAKE SUB-BASIN																						
Brown Creek	92P037	1	4	1,660	1,480	1,148	1,160	0.7	1.1	X			X				X		X		
	"	2	4	4,160	3,100	1,160	1,179	0.5	1.3	X			X			X			X		
	92P037,38	3	4	5,580	5,180	1,179	1,338	2.8	1.1	X			X			X			X		
	92P038	4	3	2,920	2,400	1,338	1,416	2.7	1.2	X			X			X			X		
	"	5	3	3,800	3,660	1,416	1,485	1.8	1.0	X			X			X			X		
	"	6	2	960	960	1,485	1,485	0.0	1.0												LAKE
	"	7	1	720	720	1,485	1,523	5.3	1.0	X			X			X			X		
Caverhill	92P028	1	4	800	740	1,180	1,207	3.4	1.1	X			X			X			X		
Creek	"	2	4	230	230	1,207	1,207	0.0	1.0												LAKE
	"	3	4	1,500	980	1,207	1,238	2.1	1.5	X			X			X			X		
	"	4	4	160	160	1,238	1,242	2.5	1.0	X			X			X			X		
	"	5	4	960	960	1,242	1,242	0.0	1.0												LAKE
	"	6	4	160	155	1,242	1,244	1.3	1.0	X			X			X			X		
	"	7	4	340	340	1,244	1,244	0.0	1.0												LAKE
	"	8	4	200	180	1,244	1,246	1.0	1.1	X			X			X			X		
	"	9	4	700	700	1,246	1,246	0.0	1.0												LAKE
	"	10	4	60	60	1,246	1,247	1.7	1.0	X			X			X			X		
	92P029	11	4	960	960	1,247	1,248	0.1	1.0												LAKE
	"	12	4	1,900	1,700	1,248	1,298	2.6	1.1	X			X				X		X		
	92P029,38	13	4	3,300	2,900	1,298	1,398	3.0	1.1	X			X				X		X		
	92P038,39	14	4	6,360	6,360	1,398	1,398	0.0	1.0												CAVERHILL LK
	92P038	15	3	280	270	1,398	1,405	2.5	1.0	X			X				X		X		
	92P038,39	16	3	480	480	1,405	1,405	0.0	1.0												LAKE
	92P039	17	3	100	100	1,405	1,406	1.0	1.0	X			X				X		X		
	"	18	3	460	460	1,406	1,406	0.0	1.0												LAKE
	"	19	3	320	240	1,406	1,412	1.9	1.3	X			X				X		X		
	"	20	3	240	240	1,412	1,412	0.0	1.0												LAKE
	"	21	1	780	775	1,412	1,500	11.3	1.0	X				X			X		X		
	"	22	1	1,260	1,255	1,500	1,720	17.5	1.0	X				X			X		X		

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4 (i) = channel width less than 1.5 m
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Form 2: Detailed Air Photo Assessment (Upper Bonaparte River Watershed CAP)

Sub-basin (Stream)	Reach	Hillslope coupling (1)	Incision (2)	Sediment Supply Phase (3)	Morphology (4)	Morphology Comments	Streamside landuse			Disturbance type			Observed disturbance (% of reach)	Potential disturbance (% of reach) (10)	Logging related impact likely? (11)	Aerial Photograph Inventory	
							Logging (5)	Roads (6)	Other	Observed (7)	Inferred (8)	Cause of disturbance/notes (9)				Recent Air Photo Number (only for potentially impacted sites/sections)	Historic Photo Number (s) (only for potentially impacted sites/sections)
BONAPARTE LAKE SUB-BASIN																	
Bonaparte	11	N	VF-VH	W-T	I-RP	SINUOUS											
River	12-1	P-N	VF-VH	W-T	I-RP	IRREG. MEANDER	P				SC	RIPARIAN LOGGING		5	Y	95074:193-194	
	12-2	N	VF	W	I-RP	IRREG. MEANDER	R				LB	RIPARIAN LOGGING		90	Y	95074-143,142	
	12-3	N	VF	W	I-RP	IRREG. WANDER	R				LB	RIPARIAN LOGGING		60	Y	95074-143,143	
	12	N	VF-VH	T	I-RP	SINUOUS	P	C	DAM		SC,LB	BCHYDRO, LOGGING		30	Y	95074-119,120	
	13	P	VF	W	L	LAKE	P/U	A/U	RECREATION		SC,SU	LOGGING		10	Y	95074-59,60	
	14	P-N	VH	T	I-RP	IRREG. WANDER		C			SC			1		95074-43,44	
	15	N-P	VF	W	L	LAKE											
	16	N	VF	W	I-RP	IRREG. WANDER											
	17	P	VF	W	L	LAKE	B/U				SU	ADJACENT LOGGING		5	Y	90060-213,214	
	18	N	VF	W	I-RP	IRREG. WANDER	R	C			SC,LB	LOGGING		50	Y	90060-213,214	
	19	N	VF	W	L	LAKE	P				LB	LOGGING		10	Y	90060-213,214	
	20	N	VF	B/W	I-RP	SINUOUS											
	21	N	VF	W	L	LAKE	P/R				LB,SU	LOGGING		40	Y	95074-44,45	
	22	N	VF	B/W	I-RP	SINUOUS	P/R	C			SC,LB	LOGGING		100	Y	95074-44,45	
	23	N	VF	W	L	LAKE	P/R	A			LB,SU	LOGGING		100	Y	95074-44,45	
	24	N	VF	B/W	I-RP	SINUOUS											
	25	N	VF	B/W	L	LAKE	P/U				SU	LOGGING		30	Y	95074-44,45	

1: Coupled; Partially coupled; Not coupled.

2: VF - into erodible valley flat material; VH - into erodible valley hillside material; B - confined by bedrock; N - not incised.

3: Wash material supply-dominated phase; Transitional phase; Bed material supply-dominated phase (see Fig. 6, *Channel Assessment Procedure Guidebook, Dec. 1996* for definitions)

4: Visible/Inferred - Riffe-Pool, Cascade-Pool, Step-Pool, Non-Alluvial (eg. V- RP).

5: Riparian logging (no buffer); Partial buffer left, Buffer left; Upslope logging.

6: Crossing; Adjacent to channel; Upslope.

7: Channel Pattern (eg. CP); Sediment Storage Pattern; Lateral Instability; Channel Width; Sinuousity; Meander Wavelength.

8: Sediment source impacting Channel (eg. SC); Sediment source Upslope; Logged to channel Bank; Windthrow in Riparian zone.

9: If channel disturbance is directly observed from the air photos, note the channel condition (aggrading, stable, degrading)

10: Potenially changed channel morphology is defined by the CAP Guidebook as "the length of erodible channel downstream of forestry-related activities...(giving) the maximum length of channel where changes in morphology may have occurred after logging."

11: Record all potential field sites on Air photo (indicate location and type of potential disturbance)

Form 2: Detailed Air Photo Assessment (Upper Bonaparte River Watershed CAP)

Sub-basin (Stream)	Reach	Hillslope coupling (1)	Incision (2)	Sediment Supply Phase (3)	Morphology (4)	Morphology Comments	Streamside landuse			Disturbance type			Observed disturbance (% of reach)	Potential disturbance (% of reach) (10)	Logging related impact likely? (11)	Aerial Photograph Inventory	
							Logging (5)	Roads (6)	Other	Observed (7)	Inferred (8)	Cause of disturbance/notes (9)				Recent Air Photo Number (only for potentially impacted sites/sections)	Historic Photo Number (s) (only for potentially impacted sites/sections)
BONAPARTE LAKE SUB-BASIN																	
Brown	1	N	VF	T-W	I-RP	IRREG. WANDER	R	C	-	-	SC,LB	LOGGING, ROADS	-	30	Y	95074-140,141	Not available
Creek	2	N	VF	W	I-RP	IRREG. MEANDER	R/P	C	-	-	SC,LB	LOGGING, ROADS	-	80	Y	95074-138-140	"
	3	N	VF	W	I-RP	IRREG. WANDER	R/P	C	-	-	SC,LB	LOGGING, ROADS	-	25	Y	95074-134-136	"
	4	N	VF	W	I-RP	IRREG. WANDER	P	C	-	-	SC,LB	LOGGING, ROADS	-	50	Y	95074-132-134	"
	5	N	VH	T	I-RP	SINUOUS	P/R	C	-	-	SC,LB	LOGGING, ROADS	-	35	Y	95074-205-207	"
	6	N	VF	W	L	LAKE	-	-	-	-		-	-	-	-	-	
	7	N	VH	T-B	I-RP	STRAIGHT	-	-	-	-	-	-	-	-	-	-	
Caverhill	1	N	VH	T	I-RP	IRREG. WANDER	P	C	-	-	SC,LB	ADJACENT CUTBLOCK	-	15	Y	95074-47,48	Not available
Creek	2	N	VF	W	L	LAKE	P/R	A	-	-	LB	WEST BLOCK	-	40	Y	95074-47,48	"
	3	N	VF-VH	W	I-RP	IRREG. WANDER	-	-	-	-	-	-	-	-	-		
	4	N	VF	T	I-RP	IRREG. WANDER	-	-	-	-	-	-	-	-	-		
	5	N	VF	W	L	LAKE	-	-	-	-	-	-	-	-	-		
	6	N	VF	W	I-RP	IRREG. WANDER	-	-	-	-	-	-	-	-	-		
	7	N	VF	W	L	LAKE	-	-	-	-	-	-	-	-	-		
	8	N-P	VF	W	I-RP	IRREG. WANDER	-	-	-	-	-	-	-	-	-		
	9	N-P	VF	W	L	LAKE	-	-	-	-		-	-	-	-		
	10	N-P	VF	T	I-RP	IRREG. WANDER	-	-	-	-	-	-	-	-	-		
	11	N-P	VF	W	L	LAKE	-	-	-	-	-	-	-	-	-		
	12	P-N	VH	T-B	I-RP	IRREG. WANDER	-	-	-	-	-	-	-	-	-		
	13	P-C	VH	T-B	I-RP	IRREG. WANDER	-	C	-	-	SC	MAINLINE CROSSING	-	2	Y	950059-175,176	Not available
	14	P-N	VF	W	L	LAKE	-	-	-	-	-	-	-	-	-		
	15	P-N	VH	T	I-RP	SINUOUS	-	-	-	-	-	-	-	-	-		
	16	P	VF	W	L	LAKE	-	-	-	-	-	-	-	-	-		
	17	P	VF	T	I-RP	SINUOUS	-	-	-	-	-	-	-	-	-		
	18	P	VF	W	L	LAKE	P	C	HISTORIC LOGGING	-	LB	-	-	15	Y	90058-244,245	Not available
	19	N-P	VF	W	I-RP	IRREG. WANDER	-	-	-	-	-	-	-	-	-		
	20	P-N	VF	W	L	LAKE	-	-	-	-	-	-	-	-	-		
	21	P-C	VH	B-T	I-RP	STRAIGHT	-	-	-	-	-	-	-	-	-		
	22	P-C	VH	B	I-CP	STRAIGHT	-	-	-	-	-	-	-	-	-		

1: Coupled, Partially coupled; Not coupled.

2. VF - into erodible valley flat material; VH - into erodible valley hillside material; B - confined by bedrock; N - not incised.

3. Wash material supply-dominated phase; Transitional phase; Bed material supply-dominated phase (see Fig. 6, *Channel Assessment Procedure Guidebook, Dec. 1996* for definitions)

4. Visible/Inferred - Riffe-Pool, Cascade-Pool, Step-Pool, Non-Alluvial (eg. V- RP).

5. Riparian logging (no buffer), Partial buffer left, Buffer left; Upslope logging.

6. Crossing, Adjacent to channel; Upslope.

7. Channel Pattern (eg. CP); Sediment Storage Pattern; Lateral Instability; Channel Width; Sinuousity; Meander Wavelength

8. Sediment source impacting Channel (eg. SC); Sediment source Upslope; Logged to channel Bank; Windthrow in Riparian zone

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11. Record all potential field sites on Air photo (indicate location and type of potential disturbance)

Form 1: Channel Information (General Aerial Photograph Assessment)

										Stream												
										Type (1)			Gradient (2)			Entrenchment (3)		Width (4)			
Watershed - Sub-basin (Stream)	Map #	Reach #	Stream order	Reach Length (m)	Valley Length (m)	D/S Elev. (m)	U/S Elev. (m)	Stream Gradient (%)	Sinuosity	A	B	C	1	2	3	a	b	i	ii	iii	Comments
BONAPARTE RIVER RESIDUAL																					
Bonaparte River	92I093	1	7	3,340	2,900	528	542	0.4	1.2	X			X			X			X		
	92IO93	2	7	7,300	6,180	542	578	0.5	1.2	X			X			X			X		
	92P003	3	7	2,580	2,260	578	592	0.5	1.1	X			X			X			X		
	"	4	7	4,320	3,760	592	617	0.6	1.1	X			X				X		X		
	"	5-1	7	480	480	617	618	0.2	1.0	X			X			X			X		
	"	5-2	7	1,380	1,260	618	631	0.9	1.1	X			X				X		X		
	"	5	7	1,700	1,660	631	649	1.1	1.0	X			X				X		X		
	92P013	6-1	7	2,960	1,440	649	652	0.1	2.1	X			X				X		X		
	"	6-2	7	8,000	3,820	652	661	0.1	2.1	X			X				X		X		
	"	6-3	7	920	740	661	664	0.3	1.2	X			X			X			X		
	"	6	7	760	420	664	666	0.3	1.8	X			X			X			X		
	"	7-1	7	2,160	1,720	666	673	0.3	1.3	X			X				X		X		
	92P013,14	7-2	7	16,700	15,840	673	802	0.8	1.1	X			X			X			X		
	92P024	7-3	7	4,440	3,960	802	830	0.6	1.1	X			X				X		X		
	92P024,25	7	7	7,900	6,660	830	865	0.4	1.2	X			X			X			X		
	92P025	8-1	7	2,680	2,160	865	882	0.6	1.2	X			X			X			X		
	"	8	6	9,260	6,340	882	938	0.6	1.5	X			X			X			X		
	92P025,26	9	6	9,800	9,800	938	938	0.0	1.0												Young Lake
	92P026	10	6	6,320	5,380	938	985	0.7	1.2	X			X			X			X		
	92P036,37	11-1	6	13,040	9,640	985	1,045	0.5	1.4	X			X			X			X		

1 A = Erodible
B = Non-erodible
C = Artificial

2 1 = gradient less than 8 per cent
2 = gradient in the 8-20 per cent range
3 = gradient greater than 20 per cent

3 a = not entrenched
b = entrenched

4 (i) = channel width less than 1.5 m
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Form 2: Detailed Air Photo Assessment (Upper Bonaparte River Watershed CAP)

Sub-basin (Stream)	Reach	Hillslope coupling (1)	Incision (2)	Sediment Supply Phase (3)	Morphology (4)	Morphology Comments	Streamside landuse			Disturbance type			Observed disturbance (% of reach)	Potential disturbance (% of reach) (10)	Logging related impact likely? (11)	Aerial Photograph Inventory	
							Logging (5)	Roads (6)	Other	Observed (7)	Inferred (8)	Cause of disturbance/notes (9)				Recent Air Photo Number (only for potentially impacted sites/sections)	Historic Photo Number (s) (only for potentially impacted sites/sections)
BONAPARTE RIVER RESIDUAL																	
Bonaparte	1	P	VF	W	I-RP	IRREG. MEANDER	U	A,C	MOTH, AGRICULTURE	CP,S	SC,SU	RIPARIAN REMOVAL, ROADS	25	75		95101:53,54	BC511:132,133
River	2	P	VF	W	I-RP	"	U	A,C	"	CP,S	SC,SU	"	35	65		97108:70,71	BC2629:110-111
	3	P-C	VF	W	I-RP	"	U	A,C	"	CP,S	SC,SU	"	25	75		97108:70,71	BC510:184,185
	4	P-C	VF	W	I-RP	"	U	A,C	"					100		97192:122,123	
	5-1	C-P	VH/VF	W-T	I-RP	STRAIGHT		A			SC,SU	ADJACENT ROAD		100		97165-112,113	BCC510:162,163
	5-2	P	VF	W	I-RP	IRREG. MEANDER	U		AGRICULTURE		SC	RANGE		90		97165-112,114	
	5	C	VH/VF	T	I-RP	STRAIGHT											
	6-1	N	VF	W	I-RP	TORT. MEANDER	U		AGRICULTURE			RIPARIAN REMOVAL, RANGE		100		97166-158,159	BC2548:97
	6-2	N	VF	W	I-RP	"	U	A,C	AGRI.,RESIDENTIAL		LB	"		100		97166-158,160	BCC510:112,113
	6-3	P	VF/VH	W-T	I-RP	IRREG. MEANDER	U	A	"		LB,SC	"		80		97166-183,182	
	6	P	VH	T-W	I-RP	"	U	A			LB	"		100		97166-183,182	
	7-1	P	VH/VF	T	I-RP	"	U	A	AGRICULTURE		LB	"		45		97166-183,182	
	7-2	C-P	VH	T	I-RP	SINUOUS	U		"		LB			5		97168-4-12	
	7-3	P-N	VF	W	I-RP	IRREG. MEANDER	P	C,A	"		SC	RIPARIAN REMOVAL, RANGE		75		97193-64,65	
	7	P	VF/VH	W-T	I-RP	IRREG. WANDER	P	C,U	LOGGING		LB,SC	LOGGING, ROADS		30	Y	97202-01,02	
	8-1	N-P	VF	W	I-RP	"		A,U	"		LB,SC	LOGGING, ROADS		80	Y	95074-7,8	
	8	N	VF	W	I-RP	TORT. MEANDER	P	A,U			LB,SC	LOGGING, ROADS		60	Y	95074-12,13	
	9	P-C	VF	W	-	YOUNG LAKE	U	A	RECREATION		SC,LB			10		95074-13-17	
	10	N-P	VH/VF	W-T	I-RP	IRREG. MEANDER	U	A,C	RANGE		SC,LB	RIPARIAN REMOVAL, RANGE		50		95074-72,73	
	11-1	N	VF	W	I-RP	"	U	A,C	"		SC,LB			60		95074-108,109	

1: Coupled; Partially coupled; Not coupled.

2: VF - into erodible valley flat material; VH - into erodible valley hillside material; B - confined by bedrock; N - not incised.

3: Wash material supply-dominated phase; Transitional phase; Bed material supply-dominated phase (see Fig. 6, *Channel Assessment Procedure Guidebook, Dec. 1996* for definitions)

4: Visible/Inferred - Riffe-Pool, Cascade-Pool, Step-Pool, Non-Alluvial (eg. V- RP).

5: Riparian logging (no buffer); Partial buffer left, Buffer left; Upslope logging.

6: Crossing; Adjacent to channel; Upslope.

7: Channel Pattern (eg. CP); Sediment Storage Pattern; Lateral Instability; Channel Width; Sinuousity; Meander Wavelength.

8: Sediment source impacting Channel (eg. SC); Sediment source Upslope; Logged to channel Bank; Windthrow in Riparian zone.

9: If channel disturbance is directly observed from the air photos, note the channel condition (aggrading, stable, degrading)

10: Potenially changed channel morphology is defined by the CAP Guidebook as "the length of erodible channel downstream of forestry-related activities...(giving) the maximum length of channel where changes in morphology may have occurred after logging."

11: Record all potential field sites on Air photo (indicate location and type of potential disturbance)

Appendix B

SEDIMENT SOURCE SURVEY - OFFICE AND FIELD SUMMARY FORMS

Form 3: Aerial photograph, helicopter and ground-based assessment summary for sediment source inventory and classification

SUB-BASIN (Stream)	Site Number[1]	Map Reference	FHAP or SSS Reference[2]	AERIAL PHOTOGRAPH ASSESSMENT[3]							Checked from air? (Y/N)	HELICOPTER ASSESSMENT				Checked from ground? (Y/N)	GROUND-BASED RESULTS/ OVERALL[13]	
				Causative Agent (N/H)[4]	Sediment Delivery Potential		Potential Size (m^2)[5,6]	Material[7]	Level of Activity (I,L,M,H)[8]	Assessment Priority (Preliminary) (L,M,H,N)[9]		Disturbance			Priority for Ground-Based Inspection (L,M,H,N)[9]		Level of Disturbance (L,M,H)[10]	Prescription Priority (L,M,H,N)[9]
					Direct/Indirect/None	Routing[5]						Level (L,M,H)[10]	Type (A,D,B,F)[11]	Cause[12]				
ALLEN CREEK SUB-BASIN																		
Allen Creek	AC-B3.1	92I093	-	H	D	B	S	F	M	M	Y	H	F	Rx,Ca,C	M	Y	H	H
	AC-S4.2	"	-	N	D	S	S	F	M	M	Y	M	F	S/F	M	Y	M	L
	AC-S5.1	"	-	N	D	S	M	F/C	M	L	Y	L	F	S	N	N	L	N
	AC-S6.1	92I092	-	N	D	S	S	F/C	L	L	Y	L	F	S	N	N	L	N
Kay Creek	AC-KC-B1.1	92P003	-	N	D	B	S	F	M	L	N	-	-	-	-	Y	L	N
	AC-KC-S1.2	"	-	N	D/I	S	S	F	M	L	N	-	-	-	-	Y	L	N
	AC-KC-S1.3	"	-	N	D	S	S	F	M	L	N	-	-	-	-	Y	L	N
Maiden Creek	AC-MD-S2.1	92I093	-	N	I	S	S	F	L	N	Y	L	B	S	N	N	L	N
	AC-MD-B4.2	"	-	H	I	B	S	F	L	H	Y	H	A	Rx,Ca	H	Y	M	M
	AC-MD-S8.1	92I092	-	H/N	D	S	S	F	M	M	Y	SNOW-UNKNOWN				N	M	M
	AC-MD-S8.2	"	-	H/N	D	S	S	F	M	M	Y	SNOW-UNKNOWN				N	M	M
	AC-MD-G8.3	"	-	H/N	D	G	S	F	M	M	Y	SNOW-UNKNOWN				N	M	M
	AC-MD-B8.4	"	-	H/N	D	B	S	F	M	M	Y	SNOW-UNKNOWN				Y	L	L
	AC-MD-S8.5	"	-	N	I	S	S	F	L	L	Y	SNOW-UNKNOWN				N	L	L
	AC-MD-S8.6	"	-	N	I	S	S	F	L	L	Y	SNOW-UNKNOWN				N	L	L
	AC-MD-B11.1	"	-	N	D	B	S	F	M	L	Y	SNOW-UNKNOWN				N	L	L
	AC-MD-S12.1	"	-	N	D	S	M	F/C	M	L	Y	SNOW-UNKNOWN				N	L	L

1. Site number example: EL-MA-B1.1(Eagan Lake sub-basin, Machete Creek, Streambank (routing), Reach 1, Site 1)
2. Site number source identified from previous FHAP (Arc Environmental Ltd., 1998) and/or SSS report (BioTerra Consulting, 1998)
3. All site characteristics were originally identified on photos, and adjusted through higher levels of assessment (ie. helicopter and ground assesssment).
4. H = Human, N = Natural.
5. Routing: B = Stream Bank, G = Gully, S = Slope and/or Slide.
6. Potential Size: H=>5000 m^2, M=1000-5000 m^2, S=<1000 m^2.
7. Material: C=dominant clast size > 256 mm, F=dominant clast size <256 mm.
8. Level of activity: I=Inactive, L=Low, M=Medium, H=High.
9. Priority level: L=Low, M=Medium, H=High, N=none.
10. Disturbance level: L=Low, M=Moderate, H=High.
11. Disturbance type: A=Aggradation, D=Degradation, B=Bank erosion, F=Fine sediment input.
12. Disturbance cause: Rx=road crossing, R=road, C=culvert, S=slide, F=failure (bank), Ca=cattle, BL=blowdown, other
13. Determination following ground-based assessment and data/video review

Form 3: Aerial photograph, helicopter and ground-based assessment summary for sediment source inventory and classification

				AERIAL PHOTOGRAPH ASSESSMENT[3]								HELICOPTER ASSESSMENT					GROUND-BASED RESULTS/ OVERALL[13]	
					Sediment Delivery Potential							Disturbance						
SUB-BASIN (Stream)	Site Number[1]	Map Reference	FHAP or SSS Reference[2]	Causative Agent (N/H)[4]	Direct/Indirect/None	Routing[5]	Potential Size (m^2)[6]	Material[7]	Level of Activity (I,L,M,H)[8]	Assessment Priority (Preliminary) (L,M,H,N)[9]	Checked from air? (Y/N)	Level (L,M,H)[10]	Type (A,D,B,F)[11]	Cause[12]	Priority for Ground-Based Inspection (L,M,H,N)[9]	Checked from ground? (Y/N)	Level of Disturbance (L,M,H)[10]	Prescription Priority (L,M,H,N)[9]
LOON CREEK SUB-BASIN																		
Loon Creek	LC-S2.1	92P003	-	N	D	S	H	F/C	M	M	Y	L	F	S	L-M	Y	L	N
	LC-S2.2	"	-	N	I	S	H	F/C	M	M	Y	M	F	S	M	Y	L	N
	LC-B3.1	"	-	H	D	B	S	F	M	M-L	N	-	-	-	-	N	M	L
	LC-G4.1	92P004	-	N/H	D	G	S	F	L-M	L	Y	L	F	S	L	N	L	L
	LC-G4.2	"	-	N/H	D	G	S	F	L-M	L	Y	L	F	S	L	Y	L	L
	LC-G5.1	"	-	H/N	D	G/B	S	F	L	L	Y	L	F	R	L	N	L	L
	LC-B5.2	"	-	H	D	B	S	F	L	M	N	-	-	-	-	N	M	L
	LC-B5.3	"	-	N	D/I	B/S	H	F	L	L	N	-	-	-	-	N	L	N
	LC-G7.1	"	-	N	I	G	S	F	L	L	Y	L	F	S	L-N	N	L	N
	LC-G7.2	"	-	N	I	G	S	F	L	L	Y	L	F	S	L-N	N	L	N
	LC-G7.3	"	-	N	I	G	H	F	L	L	Y	L	F	S	L-N	N	L	N
	LC-G11.1	92P015	-	N	I	G	H	F	L	L	Y	L	F	S	L	N	L	L
Brigade Creek	LC-BG-B3.1	92P015	-	H	D	B	S	F	L	M	Y	M	B/F	Rx,Ca	M	Y	L	M
	LC-BG-B7.1	"	-	H	D	B	M	F	M	M	Y	L	F	R	N	N	L	N
	LC-BG-B7.2	"	-	H	D	B	M	F	M	M	Y	L	F	R	N	N	L	N
	LC-BG-B13.1	92P006	-	H	D	B	H	F	H	M	Y	L	F	Cutblock	L	N	L	L
Hihium Creek	LC-HC-S2.1	92P004	-	N/H	I	S	H	C/F	M	L	Y	L	F	R,Rx,S	M	Y	L-N	N
	LC-HC-S3.1	"	-	N	D	S/B	S	F	M-H	H	Y	L	F/B	S	M	Y	L	N
	LC-HC-S3.2	"	-	N/H	D	S/B	S	F	M-H	H	Y	L	F/B	S,R	M	Y	L	M
	LC-HC-S3.3	"	-	N/H	D	S/B	S	F	M-H	H	Y	M	F/B	R,S	H	Y	M	M
	LC-HC-S3.4	"	-	H/N	D	S/B	S	F	M-H	H	Y	H	F/B	R,S	H	Y	M	M
	LC-HC-S3.5	"	-	N/H	D	S	M	C/F	M-H	H	Y	H	F	S	H	Y	M	H
	LC-HC-S3.6	"	-	H/N	D	S	M	F	M-H	H	Y	H	F	S,R	H	Y	M	M
	LC-HC-S3.7	"	-	H/N	D	S	M	F	M-H	H	Y	H	F	R,S	H	Y	M	M

1. Site number example: EL-MA-B1.1(Eagan Lake sub-basin, Machete Creek, Streambank (routing), Reach 1, Site 1)
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13. Determination following ground-based assessment and data/video review

Form 3: Aerial photograph, helicopter and ground-based assessment summary for sediment source inventory and classification

SUB-BASIN (Stream)	Site Number[1]	Map Reference	FHAP or SSS Reference[2]	AERIAL PHOTOGRAPH ASSESSMENT[3]							Checked from air? (Y/N)	HELICOPTER ASSESSMENT				Checked from ground? (Y/N)	GROUND-BASED RESULTS/ OVERALL[13]	
				Causative Agent (N/H)[4]	Sediment Delivery Potential		Potential Size (m^2)[2,6]	Material[7]	Level of Activity (I,L,M,H)[8]	Assessment Priority (Preliminary) (L,M,H,N)[9]		Disturbance			Priority for Ground-Based Inspection (L,M,H,N)[9]			
					Direct/Indirect/None	Routing[5]						Level (L,M,H)[10]	Type (A,D,B,F)[11]	Cause[12]			Level of Disturbance (L,M,H)[10]	Prescription Priority (L,M,H,N)[9]
CLINTON CREEK SUB-BASIN																		
Clinton Creek	CC-B2.1	92P013	-	H	D	B	S	F/C	L-M	M	Y	L	B/F	Rx,R	M	Y	L	M
	CC-S2.2	"	-	N	I	S	H	F	M	M-H	Y	L	B/F	S	N	Y	L	N
	CC-S3.1	"	-	H	D	S	M	F	M	M	N	-	-	-	-	N	M	M[14]
	CC-S3.2	"	-	H	D	S	S	F	M	M	N	-	-	-	-	N	M	M[14]
	CC-B6.1	"	-	H	D	B	S	F	M	M-H	Y	H	B/F	Ca,F	M-H	Y	M	M
Cutoff Valley	CC-CV-S1.1	92P002	-	H	I	S	S	F	M	M	Y	L	F	S	L	N	L	N
Creek	CC-CV-S2.1	"	-	N	D	S	M	F	M	M	Y	L	F	S	L	N	L	N
	CC-CV-S3.1	"	-	N	I	S	M	C	M	M	Y	L	F	S	N	N	L-N	N
	CC-CV-S4.1	"	-	H	I	S	S	F	M	M	Y	L	F	S	L	N	L	N
	CC-CV-S4.2	"	-	N	I	S	S	C	M	L	N	-	-	-	-	N	L	L
	CC-CV-S8.1	"	-	N	I	S	S	C	M	M-L	Y	L	F	S	N	N	L-N	N
Fiftyone Creek	CC-FO-B3.1	92P013	-	H	D	B	S	F	M	M	Y	H	F	C	H	Y	M	M[15]
	CC-FO-S3.2	"	-	H	D	S	M	F	M-H	M	Y	M	B/F	Railx	M	N	M	M[14]
	CC-FO-S5.1	"	-	N	I	S	M	C	M	M	Y	L	F	S	L-N	N	L	N
	CC-FO-S5.2	"	-	N	I	S	M	C	M	M	Y	L	F	S	L-N	N	L	N
	CC-FO-S5.3	92P012	-	H	I	S	S	F	M	M	N	-	-	-	-	N	L	N
	CC-FO-S3.3	92P013	Arc-C16 (R3)	H	D	S	S	F	M-H	H	Y	M	F	R	M	N	M	M

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12. Disturbance cause: Rx=road crossing, R=road, C=culvert, S=slide, F=failure (bank), Ca=cattle, BL=blowdown, other
13. Determination following ground-based assessment and data/video review
14. Responsibility of BC Rail
15. Responsibility of Ministry of Transportation and Highways

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				Causative Agent (N/H)[4]	Sediment Delivery Potential		Potential Size (m^2)[6]	Material[7]	Level of Activity (I,L,M,H)[8]	Assessment Priority (Preliminary) (L,M,H,N)[9]		Disturbance			Priority for Ground-Based Inspection (L,M,H,N)[9]			
					Direct/Indirect/None	Routing[5]						Level (L,M,H)[10]	Type (A,D,B,F)[11]	Cause[12]			Level of Disturbance (L,M,H)[10]	Prescription Priority (L,M,H,N)[9]
CLINTON CREEK COMMUNITY WATERSHED																		
Clinton Creek	CCW-B9.1	92P013	-	H	D	B	S	F	M	M	Y	M	F/B	R/Dam	M-H	Y	L	L
	CCW-B10.1	92P012	-	H	D	B	S	F	M	M	Y	H	F/B	Rx,C	H	N	H	H

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Form 3: Aerial photograph, helicopter and ground-based assessment summary for sediment source inventory and classification

				AERIAL PHOTOGRAPH ASSESSMENT[3]								HELICOPTER ASSESSMENT					GROUND-BASED RESULTS/ OVERALL[13]	
					Sediment Delivery Potential							Disturbance						
SUB-BASIN (Stream)	Site Number[1]	Map Reference	FHAP or SSS Reference[2]	Causative Agent (N/H)[4]	Direct/Indirect/None	Routing[5]	Potential Size (m^2)[6]	Material[7]	Level of Activity (I,L,M,H)[8]	Assessment Priority (Preliminary) (L,M,H,N)[9]	Checked from air? (Y/N)	Level (L,M,H)[10]	Type (A,D,B,F)[11]	Cause[12]	Priority for Ground-Based Inspection (L,M,H,N)[9]	Checked from ground? (Y/N)	Level of Disturbance (L,M,H)[10]	Prescription Priority (L,M,H,N)[9]
FIFTYSEVEN CREEK SUB-BASIN																		
Fiftyseven	FS-S5.1	92P013	-	H	D	S	H	F	M	M-H	Y	M-H	B/F	Railx	M	Y	H	H
Creek	FS-B6.1	"	-	H	D	B	S	C	L	M	Y	Not Visible		-	-	Y	M	M
	FS-B23.1	"	-	H/N	D	B	S	F	M	M	Y	M-H	F	Rx	H	Y	H	M
	FS-B25.1	92P012	-	H	D	B	S	F	M	M	Y	M	F	Rx	M	N	M	M
	FS-B25.2	"	-	H	D	B	S	F	M	M	Y	M	F	Rx	M	N	M	M

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				Causative Agent (N/H)[4]	Sediment Delivery Potential		Potential Size (m^2)[6]	Material[7]	Level of Activity (I,L,M,H)[8]	Assessment Priority (Preliminary) (L,M,H,N)[9]		Disturbance			Priority for Ground-Based Inspection (L,M,H,N)[9]			
					Direct/Indirect/None	Routing[5]						Level (L,M,H)[10]	Type (A,D,B,F)[11]	Cause[12]			Level of Disturbance (L,M,H)[10]	Prescription Priority (L,M,H,N)[9]
CHASM CREEK SUB-BASIN																		
Chasm Creek	CH-S6.1	92P023	-	N	D	S	H	C/F	L	L	Y	L	F	S	L-N	N	L	N
Sixtyone Creek	CH-SO-S3.1	92P023	-	N	D	S	M	C	L	L	Y	L	F	S	N	Y	L	N
	CH-SO-S7.1	"	Arc-17(R7)	H	D	S	S	F	M	M	Y	L	F	R	L-M	Y	L	N
Fiftynine Creek	CH-FN-B15.1	92P023	-	H	D	B	S	F	M	M	N	-	-	-	-	Y	H	H
	CH-FN-B18.1	"	-	H	D	B	S	F	M	M	N	-	-	-	-	Y	L	L
	CH-FN-B41.1	92P022	-	H	D	B	S	F	M-H	H	N	-	-	-	-	Y	H	H
	CH-FN-B43.1	"	-	N	D	B	H	F	M	M	N	-	-	-	-	N	M	L
	CH-FN-B43.2	"	-	H	D	S	S	F	M	L	N	-	-	-	-	N	L	L
	CH-FN-B45.1	"	BioTerr (R45)	N	D	B/S	S	F	H	M	N	-	-	-	-	N	M	L
Eleven Mile Creek	CH-EM-B4.1	92p022	-	N	D	B	H	F	M	M	N	-	-	-	-	N	M	L
	CH-EM-B5.1	"	-	N	D	B	H	F	M	M	N	-	-	-	-	N	M	L
	CH-EM-B6.1	"	-	N	I	B	H	F	M	M	N	-	-	-	-	N	M	L
	CH-EM-B14.1	"	Arc-CH16-14-11	N	D	B	S	F	M	M	N	-	-	-	-	N	M	L
	CH-EM-B14.2	"	-	N	D	B	H	F	M	M	N	-	-	-	-	N	M	L
	CH-EM-B14.3	"	Arc-CH16-14-11	N	D	B	S	F	M	M	N	-	-	-	-	N	M	L

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Form 3: Aerial photograph, helicopter and ground-based assessment summary for sediment source inventory and classification

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				Causative Agent (N/H)[4]	Sediment Delivery Potential		Potential Size (m^2)[6]	Material[7]	Level of Activity (I,L,M,H)[8]	Assessment Priority (Preliminary) (L,M,H,N)[9]		Disturbance			Priority for Ground-Based Inspection (L,M,H,N)[9]			
					Direct/Indirect/None	Routing[5]						Level (L,M,H)[10]	Type (A,D,B,F)[11]	Cause[12]			Level of Disturbance (L,M,H)[10]	Prescription Priority (L,M,H,N)[9]
RAYFIELD RIVER SUB-BASIN																		
Rayfield River	RR-B1-1	92P035	-	H	D	B	S	F	M	L	Y	L	F	Rx	L	N	L	L
	RR-S2.1	"	-	N	I	S	H	F/C	M	L	Y	L	F	S	N	N	L	N
	RR-S2.2	"	-	N	D	S	S	F	M-L	L	Y	L	F	S	L	N	L	N
	RR-S2.3	"	-	N	D	S	M	F	M	L	Y	L	F	S	L	N	L	N
	RR-S2.4	"	-	N	D	S	S	F	M	L	N	-	-	-	-	N	L	N
	RR-S2.5	"	-	N	D	S	H	C	L	L	Y	L	F	S	L	N	L	N
	RR-S2.6	"	-	N	D	S	S	F	M	L	Y	L	F	S	L	N	L	N
	RR-S11.1	"	-	N	D	S	M	C	M	L	N	-	-	-	-	N	L	N
	RR-B14.1	92P036	-	H	D	B	S	F	M	M	Y	M	B/F	Rx,Ca	M	Y	L	M
	RR-S14.2	"	-	N	I	S	M	F	M	L	Y	Flown but not found				N	L	N
	RR-S14.3	"	-	N	I	S	S	F	M	L	Y	Flown but not found				N	L	N
	RR-S14.4	"	-	N	I	S	S	F	M	L	Y	Flown but not found				N	L	N
	RR-B16-1.1	92P046	-	H	D	B	S	F	M	M	Y	M	B/F	Rx,Ca	M	Y	M	M
Eightythree Creek	RR-ET-S9.1	92P044	-	H	D	S	S	F	L	L	Y	L	F	R	L	Y	L	L[14]
Eightyseven Creek	RR-ES-S2.1	92P044	-	H	D	S	M	F	L	L	N	Flown but not found				N	L	L
Si Creek	RR-SC-S1.1	92P045	-	H/N	I	S	S	F	M	L	N	Flown but not found				N	L	L
Watch Creek	RR-WC-S4.1	92P045	-	N	D	S	M	F	M	L	N	Flown but not found				N	L	L

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					Direct/Indirect/None	Routing[5]						Level (L,M,H)[10]	Type (A,D,B,F)[11]	Cause[12]			Level of Disturbance (L,M,H)[10]	Prescription Priority (L,M,H,N)[9]
EAGAN LAKE SUB-BASIN																		
Machete	EL-MA-B3-1.1	92P037	-	H	D	B	S	F	M	M	Y	L	F	Rx	M	Y	L	L
Creek	EL-MA-B3.1	"	-	N	D	B	S	F	L	L	Y	L	F/B	F	L	N	L	N
	E.-MA-S6.1	92P038	Arc-E(R6)	H/N	D	S	S	F	M	M	Y	M	B/F	F	M-H	Y	M	M
McDonald	EL-MC-B2.1	92P047	-	N	D	B/S	S	F	L-M	L	Y	L	B	F	L	N	L	N
Creek	EL-MC-B3.1	"	-	N	I	B	S	F	L	L	Y	L	B	F	L	N	L	N
	EL-MC-B9.1	"	-	H	D	B	S	F	M	M	Y	M	B/F	Rx	M	Y	M	M
Montana	EL-MO-B4.1	92P047	-	H	D	B	S	F	L-M	M	Y	M	B/F	Rx	M	Y	M	M
Creek																		

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SUB-BASIN (Stream)	Site Number[1]	Map Reference	FHAP or SSS Reference[2]	AERIAL PHOTOGRAPH ASSESSMENT[3]							Checked from air? (Y/N)	HELICOPTER ASSESSMENT				Checked from ground? (Y/N)	GROUND-BASED RESULTS/ OVERALL[13]	
				Causative Agent (N/H)[4]	Sediment Delivery Potential		Potential Size (m^2)[6]	Material[7]	Level of Activity (I,L,M,H)[8]	Assessment Priority (Preliminary) (L,M,H,N)[9]		Disturbance			Priority for Ground-Based Inspection (L,M,H,N)[9]			
					Direct/Indirect/None	Routing[5]						Level (L,M,H)[10]	Type (A,D,B,F)[11]	Cause[12]			Level of Disturbance (L,M,H)[10]	Prescription Priority (L,M,H,N)[9]
BONAPARTE LAKE SUB-BASIN																		
Bonaparte	BL-BR-S12-1.1	92P037	-	N	D	S/B	M	F	M	L	Y	L	F	S/F	L	Y	L	N
River	BL-BR-B12-1.3	"	-	N/H	D	B/S	S	F	M	H	Y	M	B	F	M	Y	M	L
	BL-BR-B12.2	92P027	-	N	D	B/S	S	F	M	L	Y	L	B	F	L	N	L	N
	BL-BR-B12.3	"	-	N	D	B	S	F	M	L	Y	L	B	F	L	N	L	N
Brown Creek	BL-BC-B2.1	92P037	Arc-B15(R2)	H	D	B	S	F	M	M	Y	M	B/F	Ca,R	M-H	N	M	M
	BL-BC-B4.1	92P038	-	H	D	B	S	F	M	M	Y	L	F	Rx	L	N	L	L
	BL-BC-B5.1	"	Arc-B15-30	H	D	B/G	S	F	M	M	Y	L	F	R	L	N	L	L
	BL-BC-B5.2	"	-	H	D	B	S	F	M	M	Y	M	B/F	Rx	M	N	M	M
Caverhill Creek	BL-CA-S13.1	92p039	-	N	D	S/B	M	F/C	L	M	Y	L	F	S	L	Y	L	L
	BL-CA-S13.2	"	-	N/H	D	S	H	C/F	L	M	Y	L	F	S	L	Y	L	L
	BL-CA-S13.3	"	-	N/H	D	S	M	C/F	L	M	Y	L	F	S	L	Y	L	L
	BL-CA-S13.4	"	-	H/N	D	S	M	C/F	M	M	Y	M	B	F/R	M	Y	M	M
	BL-CA-G14.5	92p038	Arc-B65-35	N	I	G	H	F	M-H	I	Y	I	F	S	L	N	L-N	N

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				AERIAL PHOTOGRAPH ASSESSMENT[3]								HELICOPTER ASSESSMENT					GROUND-BASED RESULTS/ OVERALL[13]	
					Sediment Delivery Potential							Disturbance						
SUB-BASIN (Stream)	Site Number[1]	Map Reference	FHAP or SSS Reference[2]	Causative Agent (N/H)[4]	Direct/Indirect/None	Routing[5]	Potential Size (m^2)[6]	Material[7]	Level of Activity (I,L,M,H)[8]	Assessment Priority (Preliminary) (L,M,H,N)[9]	Checked from air? (Y/N)	Level (L,M,H)[10]	Type (A,D,B,F)[11]	Cause[12]	Priority for Ground-Based Inspection (L,M,H,N)[9]	Checked from ground? (Y/N)	Level of Disturbance (L,M,H)[10]	Prescription Priority (L,M,H,N)[9]
BONAPARTE RIVER RESIDUAL																		
Bonaparte	BRR-B1.1	921093	-	H	D	B	S	F	M	M	Y	M	B/F	R,Ca	M	Y	L	M
River	BRR-B1.4	"	-	N/H	D	B	S	F	M	M	Y	M-H	B	R,Ca	M-H	Y	L	L
	BRR-B1.6	"	-	H	D	B/S	S	C	L	L	Y	L	B/F	R	L	Y	L[14]	N
	BRR-S2.1	"	-	N	D	S	M	C/F	M	M	Y	M	F	S	M	Y	M	L
	BRR-B2.3	92P003	-	H	D	B	S	F	M	L	N	-	-	-	-	N	L	L
	BRR-S2.4	"	-	H/N	N	S	S	F	M	M	Y	L	F	S	L	N	L	N
	BRR-S2.5	"	-	N	N	S/G	M	F	M	L	Y	L	-	S	L	N	L	N
	BRR-G2.6	"	-	N	N/I	G	M	F/C	L	M	Y	L	F	S	L	Y	L	N
	BRR-B4.1	"	-	N	D	B/S	S	F	M	M	Y	M-H	B/F	F	L	Y	M	L
	BRR-B4.2	"	-	N	D	B/S	S	F	L-M	L-M	Y	L	B/F	F	M	Y	L	L
	BRR-B4.3	"	-	N	D	B	S	F	M	M	Y	M	B/F	F	M	Y	L-M	L
	BRR-B4.4	"	-	N	I	B	S	F	M	M	Y	M	B	F	M	Y	L	L
	BRR-B4.5	"	-	N	D	B	S	F	M	L	N	L	F	Rx	L	N	L	L
	BRR-B4.6	"	-	N	D	B	S	F	M	L	N	L	F	Rx	M-L	N	L	L
	BRR-S5-1.1	"	-	H	D	S	M	C	M	M-H	Y	M	B/F	R,S	H	Y	M	M
	BRR-S5-2.1	"	-	N	I	S	S	F/C	M	L	Y	L	F	S	L	N	L	N
	BRR-S5.1	"	-	N	I	S	S	F/C	M	L	Y	L	F	S	L	N	L	N
	BRR-B2.2	"	-	H/N	D	B/S	M	F	M	M-H	Y	M	F/B	R/F	M	Y	L	L
	BRR-S6-2.1	92P016	-	N	I	S	M	F	M	L	Y	L	F	S	L	Y	L	N
	BRR-S6-2.2	"	-	N	I	S	M	F	M	L	Y	L	F	S	L	N	L	N
	BRR-S6-2.3	"	-	N	I	S	M	F	M	L	Y	L	F	S	L	N	L	N
	BRR-S6-2.4	"	-	N	I	S	M	F	M	L	Y	L	F	S	L	Y	L	N
	BRR-G6-2.5	"	-	N	D	G	S	F	M	L	Y	L	F	S	L	N	L	N
	BRR-B7-2.1	"	-	N	D	B	S	F	M	M	Y	M	B/F	S/F	L	N	M	N

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BONAPARTE RIVER RESIDUAL																		
Bonaparte	BRR-S7-2.2	92P013	-	N	I	S	H	C	L	L	Y	L	F	S	L	N	L	N
River	BRR-S7-2.3	"	-	N	I	S	H	C	L	L	Y	L	F	S	L	N	L	N
	BRR-S7-2.4	"	-	N	I	S	H	C	L	L	Y	L	F	S	L	N	L	N
	BRR-B7-2.5	"	-	N	D	B	S	F	M	M	Y	M	B/F	F/S	L	N	M	N
	BRR-B7-2.6	92P014	-	N	D	B	S	F	M	L	Y	M	B/F	F	L	N	M	N
	BRR-S7-2.7	"	-	N	I	S	S	F	M	L	N	-	-	-	-	N	L	N
	BRR-B7-2.8	"	-	N	D	B	M	F/C	M	M	Y	M	B/F	F	L	N	M	N
	BRR-S7-2.9	"	-	N	I	S	H	C	L	L	Y	L	F	F/S	N	N	L	N
	BRR-B7-2.10	"	-	N	D	B	S	C/F	M	L	Y	M	B/F	F	L	N	M	N
	BRR-B7-2.11	92P024	-	N	D	B	S	F/C	M	M	Y	M	F	F	L	N	M	N
	BRR-G7-2.12	"	-	N	D	G/B	S	F/C	M	L	Y	L	F	F	L	N	L	N
	BRR-S7-2.13	"	-	N	I	S	H	F	M	L	Y	L	F	S	N	N	L	N
	BRR-S7-3.1	"	-	H	I/N	S	S	F	H	M	Y	L	F	S	N	N	L	N
	BRR-S7.1	"	-	N	D	S	S	F	M	L	N	-	-	-	-	N	L	L
	BRR-S7.2	"	-	N	D	S	S	F	M	L	N	-	-	-	-	N	L	L
	BRR-S7.3	92P025	-	N	I	S	M	F	L	L	Y	L	F	S	N	N	L	N
	BRR-B7.5	"	-	H	D	B	S	F	M	M	Y	M	B/F	R	M	N	L	M
	BRR-G7.6	"	-	H/N	D	G	S	F	M	M	Y	L	B/F	R	M	N	L	M
	BRR-B8-1.1	"	-	H	D	S	S	F	H	H	Y	M-L	B/F	R	M	N	M	M
	BRR-B8-1.2	"	-	H/N	D	B	H	F	H	H	Y	M	B/F	Ca,F	M	N	M	M
	BRR-B8.1	"	-	H	D	B	S	F/C	M	M	Y	L	B/F	Rx,R	M	N	L	M
	BRR-S8.2	"	-	N	D	S	H	F	H	M	Y	M	B/F	S	M	N	M	N
	BRR-S8.3	"	-	N	D	S	H	F	H	M	Y	M	B/F	S	L	N	M	N
	BRR-S8.4	"	-	N	I	S	S	F	H	M	Y	M	F	S	L	N	M	N

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7. Material: C=dominant clast size > 256 mm, F=dominant clast size <256 mm.
8. Level of activity: I=Inactive, L=Low, M=Medium, H=High.
9. Priority level: L=Low, M=Medium, H=High, N=none.
10. Disturbance level: L=Low, M=Moderate, H=High.
11. Disturbance type: A=Aggradation, D=Degradation, B=Bank erosion, F=Fine sediment input.
12. Disturbance cause: Rx=road crossing, R=road, C=culvert, S=slide, F=failure (bank), Ca=cattle, BL=blowdown, other
13. Determination following ground-based assessment and data/video review

Form 3: Aerial photograph, helicopter and ground-based assessment summary for sediment source inventory and classification

SUB-BASIN (Stream)	Site Number[1]	Map Reference	FHAP or SSS Reference[2]	AERIAL PHOTOGRAPH ASSESSMENT[3]							Checked from air? (Y/N)	HELICOPTER ASSESSMENT				Checked from ground? (Y/N)	GROUND-BASED RESULTS/ OVERALL[13]	
					Sediment Delivery Potential							Disturbance						
				Causative Agent (N/H)[4]	Direct/Indirect/None	Routing[5]	Potential Size (m^2)[6]	Material[7]	Level of Activity (I,L,M,H)[8]	Assessment Priority (Preliminary) (L,M,H,N)[9]		Level (L,M,H)[10]	Type (A,D,B,F)[11]	Cause[12]	Priority for Ground-Based Inspection (L,M,H,N)[9]		Level of Disturbance (L,M,H)[10]	Prescription Priority (L,M,H,N)[9]
BONAPARTE RIVER RESIDUAL																		
Bonaparte	BRR-S8.5	92P025	-	N	D	S	M	F	H	M	Y	M	B/F	S	L	N	M	L
River	BRR-S8.6	"	-	N	D	S	M	F	M	M	Y	M	B/F	S	L	Y	L	L
	BRR-B8.7	"	-	N	D	B	S	F	H	M	Y	M	B/F	Ca,F	M	Y	M	L
	BRR-S9.1	92P026	-	N	I	S	H	C	L	L	N	-	-	-	-	N	L	N
	BRR-S9.2	"	-	N	D	S	H	C	L	L	N	-	-	-	-	N	L	N
	BRR-S9.3	"	-	N	I	S	H	C	L	L	N	-	-	-	-	N	L	N
	BRR-B10.1	"	Arc-195-2-1	H	D	B	S	F	L	M-L	N	-	-	-	-	N	M	L
	BRR-B10.2	"	Arc-192	H	D	B	S	F	L	M-L	N	-	-	-	-	N	M	L
	BRR-B10.7	"	-	N/H	D	B	M	F	M	M	Y	M	B/F	S	M	Y	H	H
	BRR-S10.8	"	-	N	I	S	H	C	L	M	Y	L	B	S	L	N	M	L
	BRR-B10.9	92P036	Arc-195-2-1	H	D	B	S	F	L	L	N	-	-	-	-	N	L	L
	BRR-S11-1.1	92P026	-	N	D	S	S	F	M	L	Y	L	F	S	L	N	L	N
	BRR-S11-1.2	"	-	N	D	S	S	F	M	L	Y	L	F	S	L	N	L	N
	BRR-S11-1.3	"	-	N	D	S	S	F	M	L	Y	L	F	S	L	N	L	N
	BRR-S11-1.4	"	-	N	D	S	S	F	M	L	Y	L	F	S	L	N	L	N
	BRR-S11-1.5	92P036	-	N	D	S	S	F	M	L	Y	L	F	S	L	N	L	N
	BRR-S11-1.6	"	-	N	D	S	S	F	M	L	Y	L	F	S	L	N	L	N
	BRR-B11-1.8	"	-	H	D	S	S	F	H	M	Y	M-H	F	Ca	M-H	Y	H	M

1. Site number example: EL-MA-B1.1(Eagan Lake sub-basin, Machete Creek, Streambank (routing), Reach 1, Site 1)
2. Site number source identified from previous FHAP (Arc Environmental Ltd., 1998) and/or SSS report (BioTerra Consulting, 1998)
3. All site characteristics were originally identified on photos, and adjusted through higher levels of assessment (ie. helicopter and ground assesssment).
4. H = Human, N = Natural.
5. Routing: B = Stream Bank, G = Gully, S = Slope and/or Slide.
6. Potential Size: H=>5000 m^2, M=1000-5000 m^2, S=<1000 m^2.
7. Material: C=dominant clast size > 256 mm, F=dominant clast size <256 mm.
8. Level of activity: I=Inactive, L=Low, M=Medium, H=High.
9. Priority level: L=Low, M=Medium, H=High, N=none.
10. Disturbance level: L=Low, M=Moderate, H=High.
11. Disturbance type: A=Aggradation, D=Degradation, B=Bank erosion, F=Fine sediment input.
12. Disturbance cause: Rx=road crossing, R=road, C=culvert, S=slide, F=failure (bank), Ca=cattle, BL=blowdown, other
13. Determination following ground-based assessment and data/video review

Appendix C

REACH-BASED HELICOPTER AND GROUND-BASED ASSESSMENT FIELD FORMS

Form 4: Reach-based helicopter and ground-based assessment summary

Sub-basin: ALLEN CREEK Creek: MAIDEN CREEK, ALLEN CREEK

		PARAMETERS DETERMINED AFTER HELICOPTER ASSESSMENT							PARAMETERS DETERMINED AFTER GROUND-BASED ASSESSMENT AND VIDEO REVIEW		
Reach	Morphology (RP,CP,SP,R)[1]	Quantity of woody debris (s,o,c,a,oa)[2]	Texture[3]		Channel Stability (s,e,u)[4]	Level of Disturbance (L,M,H)[5]	Priority for Ground-based Inspection (L,M,H,N)[6]	Checked from ground? (Y/N)	Representative Ground-Site No.	Level of Disturbance (L,M,H)[5]	Priority for Detailed Assessment/ Prescription (L,M,H,N)[6]
			bed (s,g,c,b,R)	bank (s,g,c,b,R)							
MAIDEN CREEK											
1	RP	s	g	s-g	e	H	H	N	-	M	M
2	RP	s	g	s-g	e	H	H	Y	Rep 2.1	M	M
3	RP	c	g-c	g	e	L	L	N	-	L	N
4	RP	c	s-g-c	s-g	e-u	L	L	Y	Rep 4.1	M	M
5	RP	c	s-g	s	u	M	M	N	-	M	M
6	CP	c	g	s	e	L	L	N	-	L	N
7	CP	c	g		e	L	L	N	-	L	N
8	RP	c	g		e	L-M	M	Y	Rep 8.1	M	M
9	LAKE	c	-	-	-	L	N	N	-	L	N
10	RP	c	g		e	L	L	N	-	L	N
11	LAKE	c	-	-	-	L	N	N	-	L	N
12	CP	c	g	g	e	L	L	N	-	L	N
ALLEN CREEK											
1	RP	NO CHANNEL/DRY		-	u	H	H	Y	-	H	H
2	RP	NO CHANNEL/DRY		-	u	H	H	Y	-	H	H
3	CP	c	g	s-g	e	L	L	Y	-	H	H
4	CP	c	g	s-g	e	L	L	Y	Rep 4.1	M	M
5	CP	c	c-b	g	e	L	L	N	-	M	M
6	CP	c	NOT VISIBLE FROM AIR			L	L	N	-	L	N

1 Morphology types: riffle - pool (RP), cascade - pool (CP), step - pool (SP), and bedrock (R)
2 Quantity of woody debris: scarce (s), occasional (o), common (c), abundant (a), over-abundant (oa)
3 Texture types: sand (s), gravel (g), cobble (c), boulder (b), bedrock (R)
4 Stability types: stable (s), equilibrium (e), unstable (u). Values have been adjusted where necessary based on ground-based assessment.
5 Level of disturbance: low (L), moderate (M), high (H). Level of disturbance means level of impact on channel or riparian zone.
6 Priority for ground-based inspection and/or detailed assessment prescription: L=Low, M=Moderate, H=High, N=none

Form 4: Reach-based helicopter and ground-based assessment summary

Sub-basin: LOON CREEK Creek: LOON CREEK

		PARAMETERS DETERMINED AFTER HELICOPTER ASSESSMENT							PARAMETERS DETERMINED AFTER GROUND-BASED ASSESSMENT AND VIDEO REVIEW		
Reach	Morphology (RP,CP,SP,R)[1]	Quantity of woody debris (s,o,c,a,oa)[2]	Texture[3]		Channel Stability (s,e,u)[4]	Level of Disturbance (L,M,H)[5]	Priority for Ground-based Inspection (L,M,H,N)[6]	Checked from ground? (Y/N)	Representative Ground-Site No.	Level of Disturbance (L,M,H)[5]	Priority for Detailed Assessment/ Prescription (L,M,H,N)[6]
			bed (s,g,c,b,R)	bank (s,g,c,b,R)							
1	RP	s	c	g-c	u	H	H	N	-	M	H
2	CP	s	c-b	c	e	H	M	Y	Rep 2.1	H	H
3	RP	c	s-g	s	e	M-H	H	N	-	M	H
4	RP	c	g-c	g-c	e	L	L-M	Y	Rep 4.1	M	H
5	RP	s	g-c	s (vertical)	e	M-H	H	N	-	M	M
6	RP	s	s	s	s	L-M	M	N	-	M	M
7	LOON LAKE	-	-	-	-	L	N	N	-	L	N
8	RP	s	g-c	fines	e	M	H	N	-	M	M
9	RP	s	fines	fines	e	H	H	Y	Rep 9.1	H	H
10	RP	s	fines	fines	e	H	H	N	-	H	H
11	RP	s	fines	fines	e	H	H	N	-	H	H
12	LAKE	-	-	-	-	L	N	N	-	L	N
13	MEADOW	none	fines	fines	e	L	L	N	-	L	N
14	LAKE	-	-	-	-	L	N	N	-	L	N
15	RP	NO CHANNEL, NO VISIBLE IMPACTS				L	N	N	-	L	N

1 Morphology types: riffle - pool (RP), cascade - pool (CP), step - pool (SP), and bedrock (R)

2 Quantity of woody debris: scarce (s), occasional (o), common (c), abundant (a), over-abundant (oa)

3 Texture types: sand (s), gravel (g), cobble (c), boulder (b), bedrock (R)

4 Stability types: stable (s), equilibrium (e), unstable (u). Values have been adjusted where necessary based on ground-based assessment.

5 Level of disturbance: low (L), moderate (M), high (H). Level of disturbance means level of impact on channel or riparian zone.

6 Priority for ground-based inspection and/or detailed assessment/prescription: L=Low, M=Moderate, H=High, N=none.

Form 4: Reach-based helicopter and ground-based assessment summary

Sub-basin: LOON CREEK Creek: BRIGADE CREEK, HIHIUM CREEK

		PARAMETERS DETERMINED AFTER HELICOPTER ASSESSMENT						Checked from ground? (Y/N)	PARAMETERS DETERMINED AFTER GROUND-BASED ASSESSMENT AND VIDEO REVIEW		
Reach	Morphology (RP,CP,SP,R)[1]	Quantity of woody debris (s,o,c,a,oa)[2]	Texture[3]		Channel Stability (s,e,u)[4]	Level of Disturbance (L,M,H)[5]	Priority for Ground-based Inspection (L,M,H,N)[6]		Representative Ground-Site No.	Level of Disturbance (L,M,H)[5]	Priority for Detailed Assessment/ Prescription (L,M,H,N)[6]
			bed (s,g,c,b,R)	bank (s,g,c,b,R)							
BRIGADE CREEK											
1	RP	a	g-c	g	e	L-M	L	N	-	M	M
2	RP	a	g-c-b	g	e	L	L	N	-	M	L
3	CP	c	c-b	g	e	L	L	Y	Rep 3.1	L	N
4	RP	o	g-c	g	e	L	L	Y	Rep 4.1	M	M
5	LAKE	-	-	-	-	L	N	N	-	L	N
6	RP	c	g	s (fines)	e	L	L	N	-	L	L
7	RP	s	s	s (fines)	e	L	L	N	-	L	L
8	RP	s	s	s (fines)	e	M	M	N	-	M	M
9	RESERVOIR	s	s	s (fines)	e	H	H	N	-	H	M
10	RP	s	s	s (fines)	e	M	M	N	-	M	M
11	LAKE	-	-	-	-	L	N	N	-	L	N
12	RP	s	(VERY SMALL CHANNEL - CAN'T SEE FROM AIR)				L	N	-	L	N
13	LAKE	-	-	-	-	L	N	N	-	L	N
14	RP	NO CHANNEL - NO IMPACTS			-	L	L	N	-	L	N
15	RP	NO CHANNEL - NO IMPACTS			-	L	L	N	-	L	N
HIHIUM CREEK											
1	RP	s	g-c	g-c	e	L	L	N	-	L	L
2	RP	c	c-b	c-b	e	L	L	Y	Rep 2.1	L	N
3	CP	c-a	c-b	c-b	e	L	M	Y	Rep 3.1	L	L
4	RP	a	g-c	g	e	L	L	Y	Rep 4.1	L	L
5	RP	a	g-c	s (fine)	s	L	L	N	-	L	L
6	RP	s (none)	g-c	s (fine)	e	L	L	N	-	L	L
7	RP	s	g-c	s (fine)	e	L	L	N	-	L	L
8	LAKE	-	-	-	-	L	N	N	-	L	N
9	WETLAND	s (none)	fines	fines	s	L	L	N	-	L	N
10	WETLAND	s (none)	fines	fines	s	L	L	N	-	L	N

1. Morphology types: riffle - pool (RP), cascade - pool (CP), step - pool (SP), and bedrock (R)
2. Quantity of woody debris: scarce (s), occasional (o), common (c), abundant (a), over-abundant (oa)
3. Texture types: sand (s), gravel (g), cobble (c), boulder (b), bedrock (R)
4. Stability types: stable (s), equilibrium (e), unstable (u). Values have been adjusted where necessary based on ground-based assessment.
5. Level of disturbance: low (L), moderate (M), high (H). Level of disturbance means level of impact on channel or riparian zone.
6. Priority for ground-based inspection and/or detailed assessment/prescription: L=Low, M=Moderate, H=High, N=none.

Form 4: Reach-based helicopter and ground-based assessment summary

Sub-basin: CLINTON CREEK Creek: CLINTON CREEK, CUTOFF VALLEY CREEK, FIFTYONE CREEK

		PARAMETERS DETERMINED AFTER HELICOPTER ASSESSMENT						Checked from ground? (Y/N)	PARAMETERS DETERMINED AFTER GROUND-BASED ASSESSMENT AND VIDEO REVIEW		
Reach	Morphology (RP,CP,SP,R)[1]	Quantity of woody debris (s,o,c,a,oa)[2]	Texture[3]		Channel Stability (s,e,u)[4]	Level of Disturbance (L,M,H)[5]	Priority for Ground-based Inspection (L,M,H,N)[6]		Representative Ground-Site No.	Level of Disturbance (L,M,H)[5]	Priority for Detailed Assessment/ Prescription (L,M,H,N)[6]
			bed (s,g,c,b,R)	bank (s,g,c,b,R)							
CLINTON CREEK											
1	RP	s	g	g	e-u	M	M	N	-	M	M
2	RP	s	g	g	e-u	M	M	Y	Rep 2.1	L	N
3	CP (bedrock)	s	R	R	s	L	L	N	-	L	N
4	RP	s	g	s-g	e	M	M	N	-	M	M
5	RP	s	g	s-g	e	M	M	N	-	M	M
6	RP	s	g-s	s-g	e	M	M	Y	Rep 6.1	M	M
7	RP	s	s	s	u	H	H	N	-	H	H (Town)
8	CP	s	s	s	e	M-H	M	N	-	H	H (Town)
8-1	CP	s	s	s	e	M-H	M	Y	Rep 8-1.1	L	L
CUTOFF VALLEY CREEK											
1	RP	s	s-g	s	e	M	M	Y	Rep 1.1	H	H
2	LAKE	-	-	-	-	L	N	N	-	L	L
3	RP	s	s-g	s	e	M	M	N	-	M	M
4	RP	s	g	s	e	M	M	N	-	M	M
5	RP	s	s	s	e	M	M	N	-	M	M
6	RP	s	s	s	e	M	M	N	-	M	M
7	LAKE	-	-	-	-	L	N	N	-	L	L
8	RP	s	s	s	e	M	M	Y	Rep 8.1	M	L
FIFTYONE CREEK											
1	RP	s	s-g	s	e	M-H	H	N	-	M	M
2	CP	s	s-g	s	e	H	H	Y	Rep 2.1	M	M
3	RP (Pond)	s	s	s	e	M	M	N	-	M	M
4	RP (Ponds)	-	-	-	-	L	N	N	-	L	N
5	RP	c	s-g-c	s-g	e	L	L	N	-	L	N
6	LAKE	-	-	-	-	L	N	N	-	L	N
7	RP	c	s-g-c	s-g	e	L	L	N	-	L	N
8	RP	c	s-g-c	s-g	e	L	L	N	-	L	N

1 Morphology types: riffle - pool (RP), cascade - pool (CP), step - pool (SP), and bedrock (R)

2 Quantity of woody debris: scarce (s), occasional (o), common (c), abundant (a), over-abundant (oa)

3 Texture types: sand (s), gravel (g), cobble (c), boulder (b), bedrock (R)

4 Stability types: stable (s), equilibrium (e), unstable (u). Values have been adjusted where necessary based on ground-based assessment

5 Level of disturbance: low (L), moderate (M), high (H). Level of disturbance means level of impact on channel or riparian zone.

6 Priority for ground-based inspection and/or detailed assessment/prescription: L=Low, M=Moderate, H=High, N=none.

Form 4: Reach-based helicopter and ground-based assessment summary

Sub-basin: CLINTON CK. COMMUNITY WATERSHED Creek: CLINTON CREEK

		PARAMETERS DETERMINED AFTER HELICOPTER ASSESSMENT						Checked from ground? (Y/N)	PARAMETERS DETERMINED AFTER GROUND-BASED ASSESSMENT AND VIDEO REVIEW		
Reach	Morphology (RP,CP,SP,R)[1]	Quantity of woody debris (s,o,c,a,oa)[2]	Texture[3]		Channel Stability (s,e,u)[4]	Level of Disturbance (L,M,H)[5]	Priority for Ground-based Inspection (L,M,H,N)[6]		Representative Ground-Site No.	Level of Disturbance (L,M,H)[5]	Priority for Detailed Assessment/ Prescription (L,M,H,N)[6]
			bed (s,g,c,b,R)	bank (s,g,c,b,R)							
9	LAKE	RESERVOIR	-	-	-	L	L	Y	Rep 9.1	L	M
10	CP	C	g	s-g	e	M	M	N	-	M	M
11	RP	C	g	g	e	L	L	N	-	L	N
12	LAKE	RESERVOIR	-	-	-	L	N	N	-	L	N
13	RP	S	s	s	e	L	L	N	-	L	N
14	RP	S	s	s	e	L	L	N	-	L	N
15	RP	S	s	s	e	L	L	N	-	L	N
16	RP	S	s	s	e	L	L	N	-	L	N
17	RP	S	s	s	e	L	L	N	-	L	N
18	RP	S	s	s	e	L	L	N	-	L	N
19	RP	S	s	s	e	L	L	N	-	L	N

1. Morphology types: riffle - pool (RP), cascade - pool (CP), step - pool (SP), and bedrock (R)
2. Quantity of woody debris: scarce (s), occasional (o), common (c), abundant (a), over-abundant (oa)
3. Texture types: sand (s), gravel (g), cobble (c), boulder (b), bedrock (R)
4. Stability types: stable (s), equilibrium (e), unstable (u). Values have been adjusted where necessary based on ground-based assessment.
5. Level of disturbance: low (L), moderate (M), high (H). Level of disturbance means level of impact on channel or riparian zone.
6. Priority for ground-based inspection and/or detailed assessment/prescription: L=Low, M=Moderate, H=High, N=none.

Form 4: Reach-based helicopter and ground-based assessment summary

Sub-basin: FIFTYSEVEN MILE Creek: FIFTYSEVEN CREEK

		PARAMETERS DETERMINED AFTER HELICOPTER ASSESSMENT						Checked from ground? (Y/N)	PARAMETERS DETERMINED AFTER GROUND-BASED ASSESSMENT AND VIDEO REVIEW		
Reach	Morphology (RP,CP,SP,R)[1]	Quantity of woody debris (s,o,c,a,oa)[2]	Texture[3]		Channel Stability (s,e,u)[4]	Level of Disturbance (L,M,H)[5]	Priority for Ground-based Inspection (L,M,H,N)[6]		Representative Ground-Site No.	Level of Disturbance (L,M,H)[5]	Priority for Detailed Assessment/ Prescription (L,M,H,N)[6]
			bed (s,g,c,b,R)	bank (s,g,c,b,R)							
1	RP	s	g-c	g	u	H	H	N	-	H	H
2	RP-CP	s	g-c	g	e	M	M	Y	Rep 2.1	M	L
3	RP-CP	s	g-c	g	e	H	H	N	-	H	H
4	RP	c	g	s-g	e-u	M	H	N	-	H	H
5	CP/SP	c	g	s-g	e-u	M	M	Y	Rep 5.1	M	M
6	RP	s	g	s-g	e-u	M	M	Y	Rep 6.1	M	M
7	RP	s	g	s-g	e-u	M	M	Y	-	M	M
8	LAKES	-	-	-	-	L	N	Y	-	M	M
9	LAKES	-	-	-	-	L	N	Y	-	M	M
10	RP	s	s-g	s	e-u	H	H	Y	Rep 10.1	H	H
11	LAKE	-	-	-	-	L	N	N	-	M	M
12	RP	s	s-g	s	e	M	M	N	-	H	H
13	LAKES	-	-	-	-	L	N	N	-	L	N
14	LAKE	-	-	-	-	L	N	N	-	L	N
15	RP	s	s-g	s	e	M	M	N	-	M	M
16	RP	s	s-g	s	e	M	M	N	-	M	M
17	RP	s	s-g	s	e	M	M	N	-	M	M
18	RP	s	s-g	s	e	M	M	N	-	M	M
19	RP	s	s-g	s	e	M	M	N	-	M	M
20	RP	s	s-g	s	e	M	M	N	-	M	M
21	LAKES	-	-	-	-	L	N	N	-	L	L
22	LAKES	-	-	-	-	L	N	N	-	L	L
23	RP	s	s	s	e	M	H	Y	Rep 23.1	H	H
24	RP (LAKES)	s	s	s	e	H	H	N	-	H	H
25	RP	s	s	s	e	M	H	N	-	M	H
26	RP	s	s	s	e	L	L	N	-	L	N
27	LAKE	-	-	-	-	L	N	N	-	L	N
28	RP	s	s	s	e	L	L	N	-	L	N
29	RP	s	s	s	e	L	L	N	-	L	N
30	RP	s	s	s	e	L	L	N	-	L	N
31	RP	s	s	s	e	L	L	N	-	L	N
32	RP	s	s	s	e	L	L	N	-	L	N
33	RP	s	s	s	e	L	L	N	-	L	N
34	LAKE	-	-	-	-	L	N	N	-	L	N
35	RP	c	g-c	g-c	e	L	L	N	-	L	N
36	RP	c	g-c	g-c	e	L	L	N	-	L	N

1. Morphology types: riffle - pool (RP), cascade - pool (CP), step - pool (SP), and bedrock (R)
2. Quantity of woody debris: scarce (s), occasional (o), common (c), abundant (a), over-abundant (oa)
3. Texture types: sand (s), gravel (g), cobble (c), boulder (b), bedrock (R)
4. Stability types: stable (s), equilibrium (e), unstable (u). Values have been adjusted where necessary based on ground-based assessment.
5. Level of disturbance: low (L), moderate (M), high (H). Level of disturbance means level of impact on channel or riparian zone.
6. Priority for ground-based inspection and/or detailed assessment/prescription: L=Low, M=Moderate, H=High, N=none.

Form 4: Reach-based helicopter and ground-based assessment summary

Sub-basin: CHASM CREEK Creek: CHASM CREEK, SIXTYONE CREEK

		PARAMETERS DETERMINED AFTER HELICOPTER ASSESSMENT						Checked from ground? (Y/N)	PARAMETERS DETERMINED AFTER GROUND-BASED ASSESSMENT AND VIDEO REVIEW		
Reach	Morphology (RP,CP,SP,R)[1]	Quantity of woody debris (s,o,c,a,oa)[2]	Texture[3]		Channel Stability (s,e,u)[4]	Level of Disturbance (L,M,H)[5]	Priority for Ground-based Inspection (L,M,H,N)[6]		Representative Ground-Site No.	Level of Disturbance (L,M,H)[5]	Priority for Detailed Assessment/ Prescription (L,M,H,N)[6]
			bed (s,g,c,b,R)	bank (s,g,c,b,R)							
CHASM CREEK											
1	CP	s	c-b	c-b	e	L	L	N	-	L	N
2	CP	c	c-b	c-b	s-e	L	L	N	-	L	N
3	LAKE	-	-	-	-	L	N	N	-	L	N
4	RP	c	g-c	g	e	L	L	N	-	L	N
5	RP	c	g (c-b)	g	s-e	L	L	N	-	L	N
6	RP	c	g (c-b)	g	s-e	L	L	N	-	L	N
7	RP	c	g (c-b)	g	s-e	L	L	N	-	L	N
SIXTYONE CREEK											
1	FALLS	s	R	R	s	L	L	N	-	L	N
2	FALLS	s	R	R	s	L	L	N	-	L	N
3	FALLS	s	R	R	s	L	L	N	-	L	N
4	RP	s	s	s	e	L	L	N	-	M	N
5	LAKE	s	s	s	e	M	M	N	-	M	N
6	RP	s	s	s	e	M	M	Y	Rep 6.1	M	L
7	LAKE	s	s	s	s	L	L	Y	-	M	L
8	RP	s	s	s	s	L	L	N	-	L	N
9	LAKE	UNCONNECTED LAKES		-	-	L	N	N	-	L	N
10	RP	s	s	s	s	L	L	N	-	L	N
11	LAKE	-	-	-	-	L	N	N	-	L	N
FIFTYNINE CREEK											
1	SP (FALLS)	s	R	R	s	L	L	N	-	L	N
2	NOT FLOWN - DRY - SEE GROUND BASED FIELD NOTES							Y	Rep 2.1	M	M
3 to 7	NOT FLOWN -							N	-	M	M
8 to 10	NOT FLOWN - SEE GROUND BASED FIELD NOTES							Y	Rep 8.1	M	M
11 to 14	NOT FLOWN -							N	-	M	M
15,16	NOT FLOWN -							Y	-	M	M
17	NOT FLOWN - SEE GROUND BASED FIELD NOTES							Y	Rep 17.1	L	L
18,19	NOT FLOWN -							N	-	M	M
20	NOT FLOWN -							N	-	L	L
21 to 26	NOT FLOWN -							N	-	M	M
27 to 38	NOT FLOWN -							N	-	L	L
39 to 41	NOT FLOWN - SEE GROUND BASED FIELD NOTES							Y	Rep 41.1	M	H
42	NOT FLOWN -							N	-	L	L
43	NOT FLOWN -							N	-	L	M
44 to 46	NOT FLOWN -							N	-	L	N

1 Morphology types: riffle - pool (RP), cascade - pool (CP), step - pool (SP), and bedrock (R)

2 Quantity of woody debris: scarce (s), occasional (o), common (c), abundant (a), over-abundant (oa)

3 Texture types: sand (s), gravel (g), cobble (c), boulder (b), bedrock (R)

4 Stability types: stable (s), equilibrium (e), unstable (u). Values have been adjusted where necessary based on ground-based assessment.

5 Level of disturbance: low (L), moderate (M), high (H). Level of disturbance means level of impact on channel or riparian zone.

6 Priority for ground-based inspection and/or detailed assessment/prescription: L=Low, M=Moderate, H=High, N=none.

Form 4: Reach-based helicopter and ground-based assessment summary

Sub-basin: RAYFIELD RIVER Creek: RAYFIELD RIVER

		PARAMETERS DETERMINED AFTER HELICOPTER ASSESSMENT							PARAMETERS DETERMINED AFTER GROUND-BASED ASSESSMENT AND VIDEO REVIEW		
Reach	Morphology (RP,CP,SP,R)[1]	Quantity of woody debris (s,o,c,a,oa)[2]	Texture[3]		Channel Stability (s,e,u)[4]	Level of Disturbance (L,M,H)[5]	Priority for Ground-based Inspection (L,M,H,N)[6]	Checked from ground? (Y/N)	Representative Ground-Site No.	Level of Disturbance (L,M,H)[5]	Priority for Detailed Assessment/ Prescription (L,M,H,N)[6]
			bed (s,g,c,b,R)	bank (s,g,c,b,R)							
1-1	RP	s	s-c	g-c	e	L	L	N	-	L	L
1	RP	c	s-c	g-c	e	L	L	N	-	L	N
2	RP	c	c	g-c	e	L	L	N	-	L	N
3	LAKE	-	-	-	-	L	N	N	-	L	N
4	BEDROCK FALLS		c-b-R	c-b-R	e	L	L	N	-	L	N
5	LAKE	-	-	-	-	L	N	N	-	L	N
6	RP	c	c	g-c	e	L	L	Y	Rep 6.1	L	N
7	LAKE	-	-	-	-	L	N	N	-	L	N
8	RP	c	c	g-c	e	L	L	N	-	L	N
9	LAKE	-	-	-	-	L	N	N	-	L	N
10	RP	c	c	g-c	e	L	L	N	-	L	N
11	LAKE	-	-	-	-	L	N	N	-	L	L
12	RP/LAKE	-	-	-	-	L	N	N	-	L	L
13	LAKE	-	-	-	-	L	N	N	-	L	L
14	RP	c	s	s	e	L-M	L-M	Y	Rep 14.1	M	M
15	LAKE	-	-	-	-	L	N	N	-	L	L
16-1	RP	s	s-b	s	s-e	M	M	Y	Rep 16-1.1	M	M
16-2	RP	s	s-b	s	s-e	M	M	N	-	M	M
16	RP	s	s-b	s	e	M	M	N	-	M	M
17	LAKE	-	-	-	-	L	N	N	-	L	L
18	LAKE/WETLAND	s	s-b	s	e	M	M	N	-	M	M
19	RP	s	s-b	s	e	M	M	N	-	M	M
20-1	LAKE/WETLAND	-	-	-	-	L	N	N	-	L	L
20	RP	s	s-b	s	e	M	M	N	-	M	M
21	LAKE	-	-	-	-	L	N	N	-	L	N
22	RP	s	s-b	s	e	M	M	Y	Rep 22.1	M	M
23	CRYSTAL LAKE		-	-	-	L	N	N	-	L	N
24	RP	s	s-b	s	e	M	M	N	-	M	M
25	LAKE	-	-	-	-	L	N	N	-	L	L
26	RP	s	s-b	s	e	M	M	N	-	M	M
27	LAKE	-	-	-	-	L	N	N	-	L	N
28	RP	s	s-b	s	e	M	M	N	-	M	M

1. Morphology types: riffle - pool (RP), cascade - pool (CP), step - pool (SP), and bedrock (R)
2. Quantity of woody debris: scarce (s), occasional (o), common (c), abundant (a), over-abundant (oa)
3. Texture types: sand (s), gravel (g), cobble (c), boulder (b), bedrock (R)
4. Stability types: stable (s), equilibrium (e), unstable (u). Values have been adjusted where necessary based on ground-based assessment.
5. Level of disturbance: low (L), moderate (M), high (H). Level of disturbance means level of impact on channel or riparian zone.
6. Priority for ground-based inspection and/or detailed assessment/prescription: L=Low, M=Moderate, H=High, N=none.

Form 4: Reach-based helicopter and ground-based assessment summary

Sub-basin: RAYFIELD RIVER Creek: EIGHTYTHREE CREEK, GREEN CREEK

		PARAMETERS DETERMINED AFTER HELICOPTER ASSESSMENT						Checked from ground? (Y/N)	PARAMETERS DETERMINED AFTER GROUND-BASED ASSESSMENT AND VIDEO REVIEW		
Reach	Morphology (RP,CP,SP,R)[1]	Quantity of woody debris (s,o,c,a,oa)[2]	Texture[3]		Channel Stability (s,e,u)[4]	Level of Disturbance (L,M,H)[5]	Priority for Ground-based Inspection (L,M,H,N)[6]		Representative Ground-Site No.	Level of Disturbance (L,M,H)[5]	Priority for Detailed Assessment/ Prescription (L,M,H,N)[6]
			bed (s,g,c,b,R)	bank (s,g,c,b,R)							
EIGHTYTHREE CREEK											
1	RP	s	c-b	g-c	e	H	H	Y	Rep 1.1	M	M
2	LAKE	-	-	-	-	L	N	N	-	L	L
3	LAKE/RP	s	s-g	s-g	e	M	M	N	-	M	M
4	RP	s	s-g	s-g	e	M	M	N	-	M	M
5	LAKE	-	-	-	-	L	N	N	-	L	L
6	LAKE/RP	s	s-g	s-g	e	M	M	N	-	M	M
7	RP	s	s-g	s	e	M	M	N	-	M	M
8	LAKE	-	-	-	-	L	N	N	-	L	L
9	RP	s	s-g	s	e	H	H	Y	Rep 9.1	H	M
10	LAKE	-	-	-	-	L	N	N	-	L	L
11	RP	s	s-g	s	e	M	M	N	-	M	M
12	RP	s	s-g	s	e	M	M	N	-	M	M
13	EIGHTYTHREE LAKE		-	-	-	L	N	N	-	L	N
14	RP	s	s-g	s	e	H	H	Y	Rep 14.1	H	H
15	LAKE	-	-	-	-	L	N	N	-	L	N
16	RP	s	g-c	g	e	H	M	N	-	H	M
17	LAKE	-	-	-	-	L	N	N	-	L	N
18	RP	s	g-c	g	e	M	M	N	-	M	M
19	LAKE	-	-	-	-	L	N	N	-	L	L
20	RP	s	g-c	g	e	H	M	N	-	H	M
21	BULLOCK LAKE		-	-	-	L	N	N	-	L	N
GREEN CREEK											
1-1	backwater	c			e	L	L	N	-	L	N
1	RP	c	c-b	c	s	M	M	N	-	M	L
2	RP	s	c-b	c	e	L	L	N	-	L	N
3	RP	s	c-b	c	e	L	L	N	-	L	N
4	LAKE	-	-	-	-	L	N	N	-	L	N
5	RP/POND	s	s	s	e	M	M	N	-	M	L
6	GREEN LAKE	-	-	-	-	L	N	N	-	L	N

1 Morphology types: riffle - pool (RP), cascade - pool (CP), step - pool (SP), and bedrock (R)

2 Quantity of woody debris: scarce (s), occasional (o), common (c), abundant (a), over-abundant (oa)

3 Texture types: sand (s), gravel (g), cobble (c), boulder (b), bedrock (R)

4 Stability types: stable (s), equilibrium (e), unstable (u). Values have been adjusted where necessary based on ground-based assessment.

5 Level of disturbance: low (L), moderate (M), high (H). Level of disturbance means level of impact on channel or riparian zone.

6 Priority for ground-based inspection and/or detailed assessment/prescription: L=Low, M=Moderate, H=High, N=none

Form 4: Reach-based helicopter and ground-based assessment summary

Sub-basin: EAGAN LAKE

Creek: MACHETE CREEK, MCDONALD CREEK, MONTANA CREEK

		PARAMETERS DETERMINED AFTER HELICOPTER ASSESSMENT							PARAMETERS DETERMINED AFTER GROUND-BASED ASSESSMENT AND VIDEO REVIEW		
Reach	Morphology (RP,CP,SP,R)[1]	Quantity of woody debris (s,o,c,a,oa)[2]	Texture[3]		Channel Stability (s,e,u)[4]	Level of Disturbance (L,M,H)[5]	Priority for Ground-based Inspection (L,M,H,N)[6]	Checked from ground? (Y/N)	Representative Ground-Site No.	Level of Disturbance (L,M,H)[5]	Priority for Detailed Assessment/ Prescription (L,M,H,N)[6]
			bed (s,g,c,b,R)	bank (s,g,c,b,R)							
MACHETE CREEK											
1-1	LAKE/WETLAND	-	-	-	-	L	N	N	-	L	N
1	RP	s-c	c-b	c	e	L-M	M	Y	Rep 1.1	M	M
2	EAGAN LAKE	-	-	-	-	L	N	N	-	L	N
3-1	RP	s-c	c-b	c	e	M	M	Y	Rep 3-1.1	M	M
3	RP	c	c	g-c	e	L	L	Y	-	L	L
4	MACHETE LK	-	-	-	-	L	N	N	-	L	N
5-1	RP	s	s-g	s-g	s-e	L	L	Y	Rep 5-1.1	M	H
5	RP	c	g	g	e	L	L	N	-	M	M
6	RP	c	c-b	c-b	s-e	L	L-M	Y	Rep 6.1	M	M
7	RP	c	c-b	c-b	s-e	L	L-M	N	-	L	N
8	AKEHURST LK	-	-	-	-	L	N	N	-	L	N
9	RP	s	s	s	s-e	L	L	N	-	L	N
10	RP	s	s	s	s-e	L	L	N	-	L	N
11	RP	s	s	s	s-e	L	L	N	-	L	N
12	LAKE/WETLAND		-	-	-	L	N	N	-	L	N
McDONALD CREEK											
1	RP	s-c	c-b	g-c	e	M	M	Y	Rep 1.1	L	N
2	CP	c	c-b	g-c	e	L	L	N	-	L	N
3	RP	c	c-b	g-c	e	L	L	N	-	L	N
4	LAKE	-	-	-	-	L	N	N	-	L	N
5	RP	s (none)	s	s	s-e	L-M	L	N	-	M	N
6	LAKE	-	-	-	-	L	N	N	-	M	N
7	RP	s (none)	s	s	s-e	L-M	L	N	-	M	N
8	LAKE	-	-	-	-	L	N	N	-	M	N
9	RP	c	c	g-c	e	L	L	Y	Rep 9.1	M	M
10	RP	c	c	g-c	e	L-M	L	N	-	M	L
11	RP	c	c	g-c	e	L-M	L	N	-	M	L
12	RP	c	c	g-c	e	L-M	L	N	-	M	L
13	LAKE	-	-	-	-	L	N	N	-	L	N
14	WETLAND	s	s-g	s	e	L	L	N	-	L	L
15	WETLAND	s	s-g	s	e	L	L	N	-	L	L
16	WETLAND	s	s-g	s	e	L	L	N	-	L	L
17	TOBE LAKE	-	-	-	-	L	N	N	-	L	N
18	RP	NOT VISIBLE - LOW TO NO IMPACTS						N	-	L	N
19	LAKES	NOT VISIBLE - LOW TO NO IMPACTS						N	-	L	N
20	LAKES	NOT VISIBLE - LOW TO NO IMPACTS						N	-	L	N
21	LAKES	NOT VISIBLE - LOW TO NO IMPACTS						N	-	L	N
MONTANA CREEK											
1	RP	s	s	s (fine)	e	M	M	N	-	M	L
2	RP	s	fine	fine	s	L	L	N	-	L	N
3	LAKE	-	-	-	-	L	N	N	-	L	N
4	RP	c	g	g	e	L	L	Y	Rep 4.1	L	N
5	LAKE	-	-	-	-	L	N	N	-	L	N
6	RP	c	s-g-c	s-g	e	L	L	N	-	L	N

1. Morphology types: riffle - pool (RP), cascade - pool (CP), step - pool (SP), and bedrock (R)
2. Quantity of woody debris: scarce (s), occasional (o), common (c), abundant (a), over-abundant (oa)
3. Texture types: sand (s), gravel (g), cobble (c), boulder (b), bedrock (R)
4. Stability types: stable (s), equilibrium (e), unstable (u). Values have been adjusted where necessary based on ground-based assessment.
5. Level of disturbance: low (L), moderate (M), high (H). Level of disturbance means level of impact on channel or riparian zone.
6. Priority for ground-based inspection and/or detailed assessment/prescription: L=Low, M=Moderate, H=High, N=none.

Form 4: Reach-based helicopter and ground-based assessment summary

Sub-basin: BONAPARTE LAKE Creek: BONAPARTE RIVER

		PARAMETERS DETERMINED AFTER HELICOPTER ASSESSMENT						Checked from ground? (Y/N)	PARAMETERS DETERMINED AFTER GROUND-BASED ASSESSMENT AND VIDEO REVIEW		
Reach	Morphology (RP,CP,SP,R)[1]	Quantity of woody debris (s,o,c,a,oa)[2]	Texture[3]		Channel Stability (s,e,u)[4]	Level of Disturbance (L,M,H)[5]	Priority for Ground-based Inspection (L,M,H,N)[6]		Representative Ground-Site No.	Level of Disturbance (L,M,H)[5]	Priority for Detailed Assessment/ Prescription (L,M,H,N)[6]
			bed (s,g,c,b,R)	bank (s,g,c,b,R)							
11	RP	c	g-c	s-g-c	e	L	L	N	-	L	N
12-1	RP	c	g-c	s-g-c	e	L	L	Y	Rep 12-1.1	L	N
12-2	LAKE-WETLAND		-	-	-	L	N	N	-	L	N
12-3	RP	c	g-c	g	e	L	L	N	-	L	L
12	RP	s-c	g-c	s-g	e	L	L-M	Y	Rep 12.1	L	N
13	LAKE	-	-	-	-	L	N	N	-	L	N
14	RP	a	c-b	g-c	e	L	L	N	-	L	N
15	LAKE	-	-	-	-	L	N	N	-	L	N
16	RP	c	g-c	g	e	L	L	N	-	L	N
17	LAKE	-	-	-	-	L	N	N	-	L	N
18	RP	c	g-c	g	e	L	L	N	-	L	N
19	LAKE	-	-	-	-	L	N	N	-	L	N
20	RP	c	g-c	s-g	e	L	L	N	-	L	N
21	LAKE	-	-	-	-	L	N	N	-	L	N
22	RP	c	g	s-g	e	L	L	N	-	L	N
23	LAKE	-	-	-	-	L	N	N	-	L	N
24	RP	c	g	s-g	e	L	L	N	-	L	N
25	LAKE	-	-	-	-	L	N	N	-	L	N

1 Morphology types: riffle - pool (RP), cascade - pool (CP), step - pool (SP), and bedrock (R)

2 Quantity of woody debris: scarce (s), occasional (o), common (c), abundant (a), over-abundant (oa)

3 Texture types: sand (s), gravel (g), cobble (c), boulder (b), bedrock (R)

4 Stability types: stable (s), equilibrium (e), unstable (u) Values have been adjusted where necessary based on ground-based assessment

5 Level of disturbance: low (L), moderate (M), high (H) Level of disturbance means level of impact on channel or riparian zone

6 Priority for ground-based inspection and/or detailed assessment/prescription: L=Low, M=Moderate, H=High, N=none.

Form 4: Reach-based helicopter and ground-based assessment summary

Sub-basin: BONAPARTE LAKE *Creek:* BROWN CREEK, CAVERHILL CREEK

		PARAMETERS DETERMINED AFTER HELICOPTER ASSESSMENT						Checked from ground? (Y/N)	PARAMETERS DETERMINED AFTER GROUND-BASED ASSESSMENT AND VIDEO REVIEW		
Reach	Morphology (RP,CP,SP,R)[1]	Quantity of woody debris (s,o,c,a,oa)[2]	Texture[3]		Channel Stability (s,e,u)[4]	Level of Disturbance (L,M,H)[5]	Priority for Ground-based Inspection (L,M,H,N)[6]		Representative Ground-Site No.	Level of Disturbance (L,M,H)[5]	Priority for Detailed Assessment/ Prescription (L,M,H,N)[6]
			bed (s,g,c,b,R)	bank (s,g,c,b,R)							
BROWN CREEK											
1	RP	c	g-c	s	e	L	L	Y	Rep 1.1	L	N
2	RP	s	s-g	s	e	M	M	Y	Rep 2.1	M	M
3	RP	c	s-g-c	s-g-c	e	L	L-M	N	-	L	N
4	RP	c	c	g-c	e	L	M	N	-	M	M
5	RP	c	c	s-g-c	e	L	M	N	-	M	M
6	LAKE	-	-	-	-	L	N	N	-	L	N
7	RP	NOT VISIBLE	-	-	e	L	M	N	-	L	N
CAVERHILL CREEK											
1	RP	c	c	g-c	e	L	L	N	-	L	N
2	LAKE	-	-	-	-	L	N	N	-	L	N
3	RP	c	c	g-c	e	L	L	N	-	L	N
4	LAKE/POND	-	-	-	-	L	N	N	-	L	N
5	LAKE	-	-	-	-	L	N	N	-	L	N
6	RP	c	c	g-c	e	L	L	N	-	L	N
7	LAKE	-	-	-	-	L	N	N	-	L	N
8	RP	c	c	g-c	e	L	L	N	-	L	N
9	LAKE	-	-	-	-	L	N	N	-	L	N
10	RP	c	s-g	s-g	e	L	L	N	-	L	N
11	LAKE	-	-	-	-	L	N	N	-	L	N
12	RP	c	c	g-c	e	L	L	N	-	L	L
13	RP	c-a	s-g	s-g	e	L	L	Y	Rep 13.1	L	M
14	LAKE	-	-	-	-	L	N	N	-	L	N
15	RP	c	c-b	c	e	L	L	N	-	L	N
16	LAKE	-	-	-	-	L	N	N	-	L	N
17	RP	c	c-b	c	e	L	L	N	-	L	N
18	LAKE	-	-	-	-	L	N	N	-	L	N
19	RP	s	s	s	e	L	L	N	-	L	N
20	LAKE	-	-	-	-	L	N	N	-	L	N
21	RP	c	NOT VISIBLE - NO IMPACTS VISIBLE				L	N	-	L	N
22	CP	c	NOT VISIBLE - NO IMPACTS VISIBLE				L	N	-	L	N

1 Morphology types: riffle - pool (RP), cascade - pool (CP), step - pool (SP), and bedrock (R)

2 Quantity of woody debris: scarce (s), occasional (o), common (c), abundant (a), over-abundant (oa)

3 Texture types: sand (s), gravel (g), cobble (c), boulder (b), bedrock (R)

4 Stability types: stable (s), equilibrium (e), unstable (u) Values have been adjusted where necessary based on ground-based assessment.

5 Level of disturbance: low (L), moderate (M), high (H) Level of disturbance means level of impact on channel or riparian zone.

6 Priority for ground-based inspection and or detailed assessment/prescription: L=Low, M=Moderate, H=High, N=none

Form 4: Reach-based helicopter and ground-based assessment summary

Sub-basin: BONAPARTE RESIDUAL Creek: BONAPARTE RIVER

		PARAMETERS DETERMINED AFTER HELICOPTER ASSESSMENT							PARAMETERS DETERMINED AFTER GROUND-BASED ASSESSMENT AND VIDEO REVIEW		
Reach	Morphology (RP,CP,SP,R)[1]	Quantity of woody debris (s,o,c,a,oa)[2]	Texture[3]		Channel Stability (s,e,u)[4]	Level of Disturbance (L,M,H)[5]	Priority for Ground-based Inspection (L,M,H,N)[6]	Checked from ground? (Y/N)	Representative Ground-Site No.	Level of Disturbance (L,M,H)[5]	Priority for Detailed Assessment/ Prescription (L,M,H,N)[6]
			bed (s,g,c,b,R)	bank (s,g,c,b,R)							
1	RP	s	g-c	s-g	e	H	H	Y	Rep 1.1&2	M	M
2	RP	s	g-c	s-g	e	H	H	Y	Rep 2.1	M	M
3	RP	s	g-c	s-g	e	H	H	N	-	M	M
4	RP	s	g-c	g	e	H	H	Y	Rep 4.1	M	M
5-1	CP	s	c-b	g-c-b	e	H	H	Y	Rep 5-1.1	M	M
5-2	RP	s	c-b	g-c	e	H	H	N	-	M	M
5	RP	s	c-b	g-c	e	H	H	N	-	M	M
6-1	RP	s	s	s	e	H	H	N	-	M	M
6-2	RP	s	g	s	e	H	H	Y	Rep 6-2.1	M	M
6-3	RP	s	g	s	e	H	H	N	-	M	M
6	RP	s	g	s	e	H	H	N	-	M	M
7-1	RP	s	g-c	s-g	e	L	L	N	-	M	L
7-2	RP	c	g-c-b	s-g	e	L	L	N	-	L	L
7-3	RP	s	g-c	s-g	e	M	H	N	-	M	M
7	RP	c	g-c	g	e	M	M	N	-	M	M
8-1	RP	c	g	g	u	M	M	Y	Rep 8-1.1	M	M
8	RP	c	s-g	s-g	e	L	L	N	-	M	L
9	YOUNG LK	-	-	-	-	L	N	N	-	L	N
10	RP	c	g-c-b	g-c	e	L-M*	L/M*	Y	Rep 10.1	M	M
11-1	RP	c	g-c-b	g-c	e	L/H*	L/H*	Y	Rep11-1&2	H	H

*Crown Land: L= (1/2), Private Land: M/H= (1/2)

1 Morphology types: riffle - pool (RP), cascade - pool (CP), step - pool (SP), and bedrock (R)

2 Quantity of woody debris: scarce (s), occasional (o), common (c), abundant (a), over-abundant (oa)

3 Texture types: sand (s), gravel (g), cobble (c), boulder (b), bedrock (R)

4 Stability types: stable (s), equilibrium (e), unstable (u). Values have been adjusted where necessary based on ground-based assessment.

5 Level of disturbance: low (L), moderate (M), high (H). Level of disturbance means level of impact on channel or riparian zone.

6 Priority for ground-based inspection and/or detailed assessment/prescription: L=Low, M=Moderate, H=High, N=none.

Appendix D

GROUND-BASED CHANNEL ASSESSMENT AND SEDIMENT SOURCE FIELD FORMS

Helicopter Reach/Site Survey

	Reach	Site
Level of Disturbance:	H	–
Assessment Priority:	H	–

Ground-based Field Form 1of 2:

Survey Location: Maiden Ck Rep 2.1

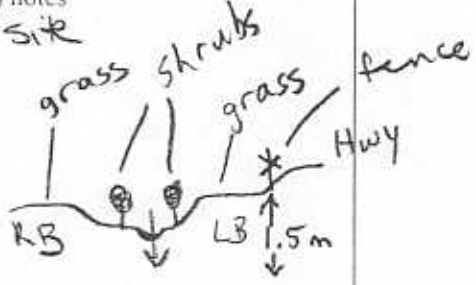
Date: Oct. 18/98 Crew: CB\RK Weather: sunny, cool

Photos 1) roll 3 2) exposure 18 3)location u/s bridge 4) notes at Rep site

Width (W, in m) 1) Bankfull (Wb) 1.93 2) Wetted (Ww) 1.5

Max. Depth (D, in m) 1) Bankfull (Db) 0.45 2) Wetted (Dw) 0.15

Slope (S, in %) 1) Channel 0.7 % 2) Side slopes (if incised)



Valley Flat (VF, in m) (at 2 times bankfull depth): check map

Entrenchment ratio (VF/Wb):

Profile morphology (using CAP terminology): RP

Channel Bed:
Texture: 0 %Z 35 %S 60 %G 5 %C 0 %B 0 %R Stability: (stable) aggrading, degrading

Channel Banks:
Texture: 0 %Z 60 %S 40 %G 0 %C 0 %B 0 %R Stability: high, (moderate) low
(bank stability is the opposite of bank erosion potential)

Small Woody Debris:
Quantity: (scarce) occasional, common, abundant, over-abundant (choking channel)
Stability: high, (moderate) low

Large Woody Debris:
Quantity: (scarce) occasional, common, abundant, over-abundant (choking channel)
Stability: high, moderate, low none observed

Notes:
- ck ~ 12-15 m from highway 97
- RB rip. zone intact ~5m width
- LB " " " " " "
- ch. is incised w/in 1.5 m high floodplain

(Rosa sp, alder) shrub 40 % of shoreline - ave. overhang 2 m
(Act) tree 10 % of shoreline - " " " "
(grass, herb 80 % " " - " " 5 cm
knapweed)

- LB not as vegetated as right bank (highway side) - riparian planting rec. at site, not needed along whole reach
- cattle droppings seen in grassy area above ck.

Ground-based Field Form 2 of 2:

Survey Location: Allen Creek SB - Maiden Creek - Reach 1-2

Date: 18/10/18 Crew: RK, CB Weather:

Photos 1) roll 2) exposure 3) location 4) notes

↳ see Rep 2.1

1. Existing Channel Disturbance (CD): (L,M,H)
L = not detectable-slight; M = moderate; H = high-extreme (morphology obscured)
(Map code 1)

Disturbance Cause: Highway 97 ~< 20 m to creek, lack riparian veg.
- Housing + FARM PASTURE through reach 1

2. Potential for future channel disturbance: (L,M,H)
(as defined for Existing Channel Disturbance)

3. Restoration benefit: L,M,H (average of degree of benefit, success, duration)

Degree of habitat benefit (L,M,H) L:marginal improvement likely, short length of channel; M: moderate improvement likely, moderate channel length affected; H: large improvement likely, long length of channel)

Type of habitat benefit, and description (R,S,M)
(R=improved rearing habitat, S=improved spawning habitat, M=improved migration)

- R + S will benefit - improve through restoration

potential for success: (L,M,H)

likely duration of effectiveness (<5 yrs; 5-20 yrs; >20 yrs)

4. Restoration cost (<$10,000; $10,000-$100,000; >$100,000)
(includes prescription and implementation)

5. Existing access: (fly; trail; road)

6. Priority for Prescription: L,M,H (weighted average of factors 1-5)
(Map code 2)

Restoration Options: PLANT TREES + SHRUBS THROUGH GAPS along Reach 2 + Fence + plant riparian veg. along pastured land in Reach 1.

Other Notes:

Helicopter Reach/Site Survey

	Reach	Site
Level of Disturbance:	L	—
Assessment Priority:	L	—

Ground-based Field Form 1of 2:

Survey Location: 100 m u/s R4 xing of Maidenck Rep. 4.1

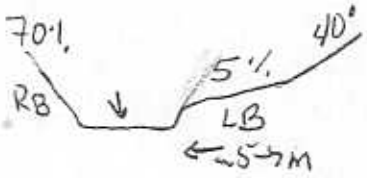
Date: Oct-16/98 Crew: CB/RK Weather: sunny, cool

Photos 1) roll 2 2) exposure 23 3)location 4) notes u/s

Width (W, in m) 1) Bankfull (Wb) 15.0 2) Wetted (Ww) 15.0

Max. Depth (D, in m) 1) Bankfull (Db) 0.40 2) Wetted (Dw) 0.33

Slope (S, in %) 1) Channel 6% d/s 3% u/s 2) Side slopes (if incised)



Valley Flat (VF, in m) (at 2 times bankfull depth): 20.0m

Entrenchment ratio (VF/Wb): 20/15

RP, CB SP br

Profile morphology (using CAP terminology): Cascade pool (-w)

Channel Bed:

Texture: 20 %Z 30 %S 50 %G 0 %C 0 %B 0 %R Stability: stable, aggrading, degrading

Channel Banks:

Texture: 10 %Z 80 %S 10 %G 0 %C 0 %B 0 %R Stability: high, moderate, low

(bank stability is the opposite of bank erosion potential)

bank material not exposed Vegetated to channel

Small Woody Debris:

Quantity: scarce, occasional, common, abundant, over-abundant (choking channel)

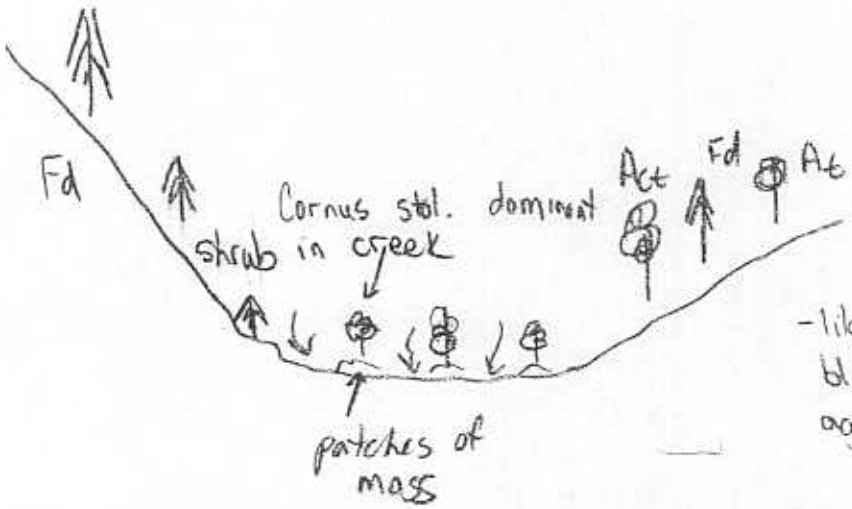
Stability: high, moderate, low

Large Woody Debris:

Quantity: scarce, occasional, common, abundant, over-abundant (choking channel)

Stability: high, moderate, low

Notes:



- gravel is fine
- bank % approx.
- no exposed banks
- banks essentially topsoil

- likely d/s of site blocked creating aggrading environment

Helicopter Reach/Site Survey

	Reach	Site
Level of Disturbance:	L	L
Assessment Priority:	L	L

Ground-based Field Form 2 of 2:

Survey Location: Road Crossing Reach 4 Maiden Ck (B4.2)

Date: Oct 16/98 **Crew:** RK, CB **Weather:** Sunny cool

Photos 22 1) roll 2 2) exposure 200 3) location Road x-ing looking u/s 4) notes

1. Existing Channel Disturbance (CD): (L,(M),(H))
L = not detectable-slight; M = moderate; H = high-extreme (morphology obscured)
(Map code 1)

Disturbance Cause: Extensive SWD + occasional LWD combines to create diversions and aggradation - channel splits. Bridg is located at aggradation zone + widening along the banks is apparent. Banks are sandy fill - erodible + prone to fail u/s of the crossing. Bridge is situated low + water depth to bridg is ≥ 1 m (too low.)

2. **Potential for future channel disturbance:** (L,M,(H)) Some minor cattle disturbance
(as defined for Existing Channel Disturbance)

3. **Restoration benefit:** L,(M),H **(average of degree of benefit, success, duration)**

Degree of habitat benefit ((L),M,H) L:marginal improvement likely, short length of channel; M: moderate improvement likely, moderate channel length affected; H: large improvement likely, long length of channel)

Type of habitat benefit, and description: (R,S,M)
((R)=improved rearing habitat, S=improved spawning habitat, (M)=improved migration)
- poor at moment - sandy (fine gravel bed)
- unknown at time when the source for sand and fine material came from.

potential for success: (L,(M),H)

likely duration of effectiveness (<5 yrs; 5-20 yrs; >20 yrs)

4. **Restoration cost** ((<$10,000); ($10,000-$100,000); >$100,000) $10K for bank stabilization
(includes prescription and implementation) 10K-100K for bridg removal + replacement and bank stabilization - short term for just bank stabilization

5. **Existing access:** (fly; trail; (road))

6. **Priority for Prescription:** L,(M),H **(weighted average of factors 1-5)**
(Map code 2)

Restoration Options: Stabilize Rb u/s of bridg (large silty bank on left of photo)
Clean SWD + LWD directly u/s of bridg.
- Raise bridg + stabilize banks with rip rap

Other Notes:

- Note: Stretching has caused gradient to decrease - probably heavy log jams d/s - H sensitivity here - good home for CCPA
- ie: remove SWD + clean debris d/s of here.
- fire in past possibly creates source for SWD.

Helicopter Reach/Site Survey

	Reach	Site
Level of Disturbance:	L-M	–
Assessment Priority:	M	–

Ground-based Field Form 1 of 2:

Survey Location: Maiden Ck xing Reach 8, ~20m u/s of rd Rep 8-1 B8.4

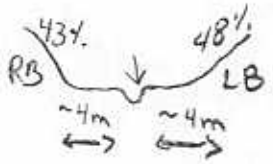
Date: Oct 16/98 Crew: CB/RK Weather: -sunny, 3-4cm snow -snow melting

Photos 1) roll 2 2) exposure 21? 3) location 4) notes looking u/s

Width (W, in m) 1) Bankfull (Wb) 1.10 2) Wetted (Ww) 1.10

Max. Depth (D, in m) 1) Bankfull (Db) 0.47 2) Wetted (Dw) 0.27

Slope (S, in %) 1) Channel 2% u/s 1% d/s 2) Side slopes (if incised)



Valley Flat (VF, in m) (at 2 times bankfull depth): ~10 m

Entrenchment ratio (VF/Wb): 10.0 / 1.10

Profile morphology (using CAP terminology): riffle/pool (-w)

Channel Bed:
Texture: 1 %Z 95 %S 2 %G 2 %C 0 %B 0 %R Stability: (stable), aggrading, degrading

Channel Banks:
Texture: 30 %Z 70 %S 0 %G 0 %C 0 %B 0 %R Stability: high, (moderate), low
(bank stability is the opposite of bank erosion potential) fine sand, organics

Small Woody Debris:
Quantity: scarce, occasional, (common), abundant, over-abundant (choking channel)
Stability: high, (moderate), low

Large Woody Debris:
Quantity: scarce, (occasional), common, abundant, over-abundant (choking channel)
Stability: high, (moderate), low

Notes:

- cattle have been watering from creek
- riparian zone shows little impact
- Pl, Salix spp, Yg Spruce in riparian

Helicopter Reach/Site Survey

	Reach	Site
Level of Disturbance:	L-M	L
Assessment Priority:	M	L

Ground-based Field Form 2 of 2:

Survey Location: Maiden Ck Rd Xing Reach 8 (B8.4)

Date: Oct 16 Crew: RK, CB Weather: Sunny - clear

Photos 21 of 163 1) roll 2 2) exposure 2003) location at road crossing looking d/s 4) notes

1. Existing Channel Disturbance (CD): (L),M,H)
L = not detectable-slight; M = moderate; H = high-extreme (morphology obscured)
(Map code 1)

Disturbance Cause: Road crossing - active haulin road - minimal sed source cattle access u/s Lb + Rb side. CMP 900 mm. Requires coarse cobble + gravel at u/s inlet - both banks to reduce cattle drinking impacts

2. Potential for future channel disturbance: (L),M,H)
(as defined for Existing Channel Disturbance)

3. Restoration benefit: (L),M,H (average of degree of benefit, success, duration)

Degree of habitat benefit (L),M,H) L:marginal improvement likely, short length of channel; M: moderate improvement likely, moderate channel length affected; H: large improvement likely, long length of channel)

Type of habitat benefit, and description: (R,S,M)
(R) improved rearing habitat, (S) improved spawning habitat, M=improved migration)

Fish passage is currently good - culvert inlet is clear + outlet is well armoured.

potential for success: (L),M,H)

likely duration of effectiveness (<5 yrs; 5-20 yrs; >20 yrs)

4. Restoration cost (<$10,000; $10,000-$100,000; >$100,000) < 1000
(includes prescription and implementation)

5. Existing access: (fly; trail; road)

6. Priority for Prescription: (L),M,H (weighted average of factors 1-5)
(Map code 2)

Restoration Options: - Very minimal - seed cutbanks associated with Lb road + Rb. Deactivated + ford crossing when road use is no longer needed. At this time some bank pullback - (Light) would be required - Place coarse material at inlet - cobble + gravel.

Other Notes: - Very low insignificant site.

Ground-based Field Form 2 of 2:

Survey Location: ALLEN CK. REACH 8

Date: 18/10/98 Crew: RK, CB Weather:

Photos 1) roll 2) exposure 3) location 4) notes
↳ see Rep Site

1. Existing Channel Disturbance (CD): (L,M,H)
L = not detectable-slight; M = moderate; H = high-extreme (morphology obscured)
(Map code 1)

Disturbance Cause: - POSSIBLE INCREASED SEDIMENT INPUT INTO CHANNEL VIA SLIDES + LOGGED GULLYS.
- SNOW COVER THRU AERIAL RECON

2. Potential for future channel disturbance: (L,M,H)
(as defined for Existing Channel Disturbance)

3. Restoration benefit: L,M,H (average of degree of benefit, success, duration)

Degree of habitat benefit (L,M,H) L:marginal improvement likely, short length of channel; M: moderate improvement likely, moderate channel length affected; H: large improvement likely, long length of channel)

Type of habitat benefit, and description: (R,S,M)
(R=improved rearing habitat, S=improved spawning habitat, M=improved migration)

- Slides + sediment input could affect migration - doesn't appear to be vital reach for K+S

potential for success: (L,M,H)

likely duration of effectiveness (≤5 yrs; 5-20 yrs; >20 yrs) N/A

4. Restoration cost (<$10,000; $10,000-$100,000; >$100,000) CCPIA
(includes prescription and implementation)

5. Existing access: (fly; trail; road)

6. Priority for Prescription: L,M,H (weighted average of factors 1-5)
(Map code 2) CCPIA

Restoration Options:

Inspect Reach thoroughly - esp at adjacent cutblock sections

Other Notes:

Ground-based Field Form 2 of 2:

Survey Location: Reach 1 - 2 Allen Ck.

Date: 18/10/98 Crew: RK, CB Weather:

Photos 1) roll 2) exposure 3) location 4) notes
↓SEE Rep Site Photos

1. Existing Channel Disturbance (CD): (L,M,(H))
L = not detectable-slight; M = moderate; H = high-extreme (morphology obscured)
(Map code 1)

Disturbance Cause: CHANNEL HAS BEEN DIVERTED UP NEAR CROSSING OF REACH 3. CHANNEL DRAINS INTO TO POND (MAN-MADE RESERVOIR). FARMER SAYS MOTH RESPONSIBLE FOR CREEK DIVERSION. AS A RESULT NO OVERLAND FLOW FROM UPPER REACH 2 TO MOUTH.

2. Potential for future channel disturbance: ((L),M,H)
(as defined for Existing Channel Disturbance)

3. Restoration benefit: L,M,(H) (average of degree of benefit, success, duration)

Degree of habitat benefit (L,M,(H)) (L:marginal improvement likely, short length of channel; M: moderate improvement likely, moderate channel length affected; H: large improvement likely, long length of channel)

Type of habitat benefit, and description: ((R),(S),M)
(R=improved rearing habitat, S=improved spawning habitat, M=improved migration)

- ALL ASPECTS OF FISH HABITAT WILL BENEFIT BY CREATING NEW CHANNEL OR RETURNING CHANNEL TO NORMAL
- RIGHT NOW CATTLE GRAZE ON FIELD + GRASS CROPS ARE SITUATED ON OR ADJACENT TO OLD CHANNEL BED

potential for success: (L,M,(H))

likely duration of effectiveness (<5 yrs; 5-20 yrs; (>20 yrs))

4. Restoration cost (<$10,000; ($10,000-$100,000; >$100,000)
(includes prescription and implementation)

5. Existing access: (fly; trail; (road))

6. Priority for Prescription: L,M,(H) (weighted average of factors 1-5)
(Map code 2)

Restoration Options:

- EXCAVATE OLD CHANNEL + PLANT VEGETATION + FENCE
- NEED TO CARRY OUT DETAILED ASSESSMENT - CCPA HERE + REACH 3+4

Other Notes:

Ground-based Field Form 2 of 2:

Survey Location: Allen Ck Reaches 3

Date: 18/10/98 Crew: Weather:

Photos 1) roll 2) exposure 3) location 4) notes

↳ see Rep site photos

1. Existing Channel Disturbance (CD): (L,(M),H) LIKELY HIGH IN REACH 3
L = not detectable-slight; M = moderate; H = high-extreme (morphology obscured)
(Map code 1)

Disturbance Cause: - FARMING - CHANNEL DIVERSIONS, IRRIGATION, DAMMING + CATTLE + NATURAL ERODING BANKS

2. Potential for future channel disturbance: (L,(M),H)
(as defined for Existing Channel Disturbance)

3. Restoration benefit: L,M,(H) (average of degree of benefit, success, duration)

Degree of habitat benefit (L,M,(H)) L: marginal improvement likely, short length of channel; M: moderate improvement likely, moderate channel length affected; H: large improvement likely, long length of channel)

Type of habitat benefit, and description: ((R),(S),(M))
(R=improved rearing habitat, S=improved spawning habitat, M=improved migration)

- ALL ASPECTS OF HABITAT WILL BENEFIT.

potential for success: (L,M,(H))

likely duration of effectiveness (<5 yrs; (5-20 yrs); >20 yrs)

4. Restoration cost (<$10,000; ($10,000-$100,000); >$100,000)
(includes prescription and implementation)

5. Existing access: (fly; (trail); (road))

6. Priority for Prescription: L,M,(H) (weighted average of factors 1-5)
(Map code 2)

Restoration Options:

- LIKELY FENCE + EXCAVATE PROPER CHANNEL TO LINK WITH RECOMMEND CHANNEL EXCAVATION THRU REACH 1 + 2.

Other Notes:

Helicopter Reach/Site Survey

	Reach	Site
Level of Disturbance:	L	—
Assessment Priority	L	—

Ground-based Field Form 1of 2: Rep 3.1

Survey Location: Allen Ck - Reach 3

Date: Oct 18/98 **Crew:** CB/RK **Weather:** cloudy, cold

-see additional photo notes below

Photos 1) roll 3 2) exposure 25 3) location - pond, 1king d/s 4) notes - ch in #24, 25 is manmade and dry

24 - 1king u/s

Width (W, in m) 1) Bankfull (Wb) 2) Wetted (Ww)

Max. Depth (D, in m) 1) Bankfull (Db) 2) Wetted (Dw)

Slope (S, in %) See notes below 1) Channel 2) Side slopes (if incised)

Valley Flat (VF, in m) (at 2 times bankfull depth):

Entrenchment ratio (VF/Wb):

Profile morphology (using CAP terminology):

Channel Bed: See notes below

Texture: ___%Z ___%S ___%G ___%C ___%B ___%R Stability: stable, aggrading, degrading

Channel Banks:

Texture: ___%Z ___%S ___%G ___%C ___%B ___%R Stability: high, moderate, low

(bank stability is the opposite of bank erosion potential)

Small Woody Debris:

Quantity: scarce, occasional, common, abundant, over-abundant (choking channel)

Stability: high, moderate, low

Large Woody Debris:

Quantity: scarce, occasional, common, abundant, over-abundant (choking channel)

Stability: high, moderate, low

Reach 3

Notes:

- ck does not connect to Bonaparte R.
- manmade ch above pond 70% G, 10% C, 20% S
- " " 2.2m Wb, Db 0.27m
- MOTH changed direction of Ck ~30 yrs ago, MOTH extracted gravel and ck disappeared into ground
- (check map) ~300m above pond
- Mr. Klaus (resident) says ck flows above grd to pond only during spring peak flows

(see sketch on back)

→ R3 photo 23 u/s where ck starts to flow on sfc before goes subsfc - ck used by cattle

- resident fish in Allen Ck. resident thinks trout

→ R3 Ph 22 1king d/s where ch. splits - ch. 6% slope * QVE →

- ch. on RB side has been diverted

→ R3 Ph 21 1king u/s at culvert - from where H_2O

Helicopter Reach/Site Survey:

	Reach	Site
Level of Disturbance:	L	M-H
Assessment Priority:	L	M

Ground-based Field Form 2 of 2:

Survey Location: Allen Ck (Reach 3 - Fan) Dam area B3.1

Date: 10/18/98 Crew: RK, CB Weather: Cloudy - cool

Photos 20 1) roll 3 2) exposure 100 3) location Allen Ck 4) notes double culvert looking u/s @ outlet

1. **Existing Channel Disturbance (CD):** (L,M,H)
L = not detectable-slight; M = moderate; H = high-extreme (morphology obscured)
(Map code 1)

Disturbance Cause: FARMING - LOGGING - Channel division + irrigation piping. Point sed source is the double culverts raised at outlet + scouring road fill slope + fine material - no rip rap

2. **Potential for future channel disturbance:** (L,M,H)
(as defined for Existing Channel Disturbance)

3. **Restoration benefit:** L,M,H (average of degree of benefit, success, duration)

Degree of habitat benefit (L,M,H) L:marginal improvement likely, short length of channel; M: moderate improvement likely, moderate channel length affected; H: large improvement likely, long length of channel)

Type of habitat benefit, and description: (R,S,M)
(R=improved rearing habitat, S=improved spawning habitat, M=improved migration)

- Fan is gravelly + sand - channel has been modified along reach
3. Old channel along Rb has been diverted to man made ~~[illegible]~~ channel. Farmers sup fish do pass through here

potential for success: (L,M,H)

likely duration of effectiveness (<5 yrs; 5-20 yrs; >20 yrs)

4. **Restoration cost** (<$10,000; $10,000-$100,000; >$100,000)
(includes prescription and implementation)

5. **Existing access:** (fly; trail; road)

6. **Priority for Prescription:** L,M,H (weighted average of factors 1-5)
(Map code 2)

Restoration Options: Excavate channel through this section and through to the old natural or

- To retain road through here and reduce sed source + allow better fish passage, steps or boulders @ culvert inlet should be placed
- Road fill + armour should be placed @ pipeline outlet.

Other Notes:

NOTE cattle access banks and creek @ outlet here

Disturbance to channel is "H"

- Reach 4 AND 3 are "highly" disturbed due to cattle inputs + channel

Helicopter Reach/Site Survey

	Reach	Site
Level of Disturbance:	L	–
Assessment Priority:	L	–

Ground-based Field Form 1of 2:

Survey Location: Allen Ck – Reach 4 Rep Site 4.1 (Riffle)

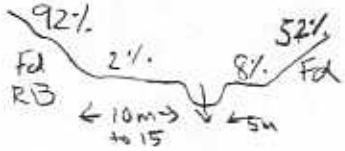
Date: Oct 18/98 Crew: CB/RK Weather: cloudy

Photos 1) roll 3 2) exposure 19 3)location u/s taken approx. 30m above site 4) notes

Width (W, in m) 1) Bankfull (Wb) 2.57 2) Wetted (Ww) 2.57

Max. Depth (D, in m) 1) Bankfull (Db) 0.28 2) Wetted (Dw) .10m

Slope (S, in %) 1) Channel 3%-4% 2) Side slopes (if incised)



Valley Flat (VF, in m) (at 2 times bankfull depth): ~25m

Entrenchment ratio (VF/Wb): $\frac{25}{2.57}$

Profile morphology (using GAP terminology): riffle pool (-w)

Channel Bed:
Texture: 8 %Z 20 %S 65 %G 7 %C 0 %B 0 %R Stability: stable, (aggrading), degrading

Channel Banks:
Texture: 30 %Z 70 %S 0 %G 0 %C 0 %B 0 %R Stability: high, moderate, (low) (cattle)
(bank stability is the opposite of bank erosion potential)

Small Woody Debris:
Quantity: scarce, occasional, (common), (abundant), over-abundant (choking channel)
Stability: high, (moderate), low

Large Woody Debris:
Quantity: scarce, occasional, (common), abundant, over-abundant (choking channel)
Stability: high, (moderate), low

Notes: – Reach 4 – above dam
– area used by cattle moderate impact to high impacted creek widening – almost 100% shoreline by cattle
– rip. zone natural, a few old stumps from logging

Cover in rip. zone comparable to banks
- Tree cover (Act, Paper Birch) 15-20%.
- Shrub cover 20%. (alder)(cornus stol.)
- Herb cover 3%. (mostly mosses)

Ground-based Field Form 2 of 2:

Survey Location: Reaches 4 - 5 Allen Creek

Date: 18/10/98 Crew: Weather:

Photos 1) roll 2) exposure 3) location 4) notes
↳ see Rep 4.1

1. Existing Channel Disturbance (CD): (L,M,H)
L = not detectable-slight; M = moderate; H = high-extreme (morphology obscured)
(Map code 1)

Disturbance Cause: SWD is abundant to overabundant.
- channel is aggrading - pockets of fine sa/gr in common gravel bed - unknown source upstream - cattle tracks in channel

2. Potential for future channel disturbance: (L,M,H)
(as defined for Existing Channel Disturbance)

3. Restoration benefit: L,M,H (average of degree of benefit, success, duration)

Degree of habitat benefit (L,M,H) L:marginal improvement likely, short length of channel; M: moderate improvement likely, moderate channel length affected; H: large improvement likely, long length of channel)

Type of habitat benefit, and description: (R,S,M)
(R=improved rearing habitat, S=improved spawning habitat, M=improved migration)
- All habitat type will benefit.

potential for success: (L,M,H)

likely duration of effectiveness (<5 yrs; 5-20 yrs; >20 yrs)

4. Restoration cost (<$10,000; $10,000-$100,000; >$100,000)
(includes prescription and implementation)

5. Existing access: (fly; trail; road)

6. Priority for Prescription: L,M,H (weighted average of factors 1-5)
(Map code 2)

Restoration Options: Clean SWD - control sediment sources upstream if caused by road (unknown)
- inspect both reaches in detail.

Other Notes:

Helicopter Reach/Site Survey

	Reach	Site
Level of Disturbance:	H-M	—
Assessment Priority:	H-M	—

Ground-based Field Form 2 of 2:

Survey Location: LOON CK (Reaches 1 + 3, 4)

Date: 7/10/98 Crew: RK, CB Weather:

Photos 1) roll 2) exposure 3) location 4) notes

1. Existing Channel Disturbance (CD): (L,M,H) RIPARIAN + CHANNEL
L = not detectable-slight; M = moderate; H = high-extreme (~~morphology obscured~~)
(Map code 1)

Disturbance Cause: RIPARIAN veg lacks through Reach 1 + 3.
- channel through Reach 4 (see Rep 4.1) is aggrading - several sediment source gullies (possibly natural) - cattle entry in creek all reaches.

2. **Potential for future channel disturbance:** (L,M,H)
(as defined for Existing Channel Disturbance)

3. **Restoration benefit:** L,M,H (average of degree of benefit, success, duration)

Degree of habitat benefit (L,M,H) L:marginal improvement likely, short length of channel; M: moderate improvement likely, moderate channel length affected; H: large improvement likely, long length of channel)

Type of habitat benefit, and description: (R,S,M)
(R=improved rearing habitat, S=improved spawning habitat, M=improved migration)

- R+S will improve with riparian restoration.
- crossings at Farming settlements + impacted banks attributed to Residences along fan of Reach 1

potential for success: (L,M,H)

likely duration of effectiveness (<5 yrs; 5-20 yrs; >20 yrs)

4. **Restoration cost** (<$10,000; $10,000-$100,000; >$100,000)
(includes prescription and implementation)

5. **Existing access:** (fly; trail; road)

6. **Priority for Prescription:** L,M,H (weighted average of factors 1-5)
(Map code 2)

Restoration Options:
1. PLANT + fence creek
2. PLACEMENT OF LWD ALONG Reach 1
3. control sediment input at gullies of R4 + fence + plant.

Other Notes:

Helicopter Reach/Site Survey

	Reach	Site
Level of Disturbance:	H	–
Assessment Priority:	H	–

Ground-based Field Form 2 of 2:

Survey Location: Loon Creek (Reach 2) HIGHWAY IMPACTS

Date: 7/10/98 **Crew:** RK/CB **Weather:**

Photos 1) roll 2) exposure 3) location 4) notes

↳ see LC-52.2 site write up

1. Existing Channel Disturbance (CD): (L,M,H)
L = not detectable-slight; M = moderate; H = high-extreme (morphology obscured)
(Map code 1)

Disturbance Cause: LOON LAKE PAVED RD THRU CANYON – NO RIPARIAN HABITAT OR LWD IN CHANNEL.

2. **Potential for future channel disturbance:** (L,M,H)
(as defined for Existing Channel Disturbance)

3. **Restoration benefit:** L,M,H (average of degree of benefit, success, duration)

Degree of habitat benefit (L,M,H) L:marginal improvement likely, short length of channel; M: moderate improvement likely, moderate channel length affected; H: large improvement likely, long length of channel)

Type of habitat benefit, and description: (R,S,M)
(R=improved rearing habitat, S=improved spawning habitat, M=improved migration)

– ALL ASPECTS –

potential for success: (L,M,H)

likely duration of effectiveness (<5 yrs; 5-20 yrs; >20 yrs)

4. **Restoration cost** (<$10,000; $10,000-$100,000; >$100,000)
(includes prescription and implementation)

5. **Existing access:** (fly; trail; road)

6. **Priority for Prescription:** L,M,H (weighted average of factors 1-5)
(Map code 2)

Restoration Options:

– PLACEMENT OF LWD THRU INSCISED CANYON SECTIONS – PROVIDE SOME COVER FOR FISH.

Other Notes:

Helicopter Reach/Site Survey

	Reach	Site
Level of Disturbance:	H	M
Assessment Priority:	M	L

Ground-based Field Form 2 of 2:

Survey Location: SITE LC-~~B~~2.2 LOON CREEK (NOTE: was originally B2.2 - make changes)

Date: 10/17/98 **Crew:** RK, CB **Weather:** Cloudy + Rain

Photos 5,6,7 1) roll 2 2) exposure 200 3) location 7,6 is panoramic view of B2.2 upstream, 5 views of S2.2 + smaller ones 4) notes - S2.2 consists of 1 large + smaller connected

Photo 4?

1. Existing Channel Disturbance (CD): (L, (M), H)
L = not detectable-slight; M = moderate; H = high-extreme (morphology obscured)
(Map code 1)

Disturbance Cause: Anthropogenic - MOTH - Highway is confined within canyon + channel is confined by Highway + canyons

2. **Potential for future channel disturbance:** ((L),M,H)
(as defined for Existing Channel Disturbance)

3. **Restoration benefit: L,M,H (average of degree of benefit, success, duration)** N/A

Degree of habitat benefit ~~(L,M,H)~~ N/A L:marginal improvement likely, short length of channel; M: moderate improvement likely, moderate channel length affected; H: large improvement likely, long length of channel)

Type of habitat benefit, and description: (R,S,M) N/A
(R=improved rearing habitat, S=improved spawning habitat, M=improved migration)

Notes: Step Pool boulder + bedrock morphology.
* photo 5 indicates Large slide S2.2 on Right side of photo + smaller slides in middle (connected to S2.2) + 1 small slide on left side of photo. material size gravel + cobble + sand. ~~[illegible]~~ slide on left

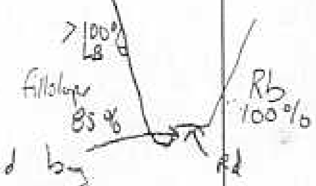
potential for success: (L,M,H) N/A

likely duration of effectiveness (<5 yrs; 5-20 yrs; >20 yrs) N/A

4. **Restoration cost (<$10,000; $10,000-$100,000; >$100,000)** N/A
(includes prescription and implementation)

5. **Existing access: (fly; trail; (road))**

6. **Priority for Prescription: L,M,H (weighted average of factors 1-5)** N/A
(Map code 2)



Restoration Options: ~~None~~ - (Moderate) - H - sediment source caused by natural sliding + minor (L) sediment source caused by road fillslope.
- Road fillslope is rip rapped + well drained. Highway is paved therefore minimal sed. from road prism + surface.

Other Notes:
- Road appears to be constructed on coarse local material + is very well drained. RB (Valley) water sources drain well below road + don't require culverts.
- Possibly well constructed road ...

Helicopter Reach/Site Survey

	Reach	Site
Level of Disturbance:	L	M
Assessment Priority:	L-M	L

Ground-based Field Form 1of 2:

Survey Location: LOON CK R4 Rep Site 4.1

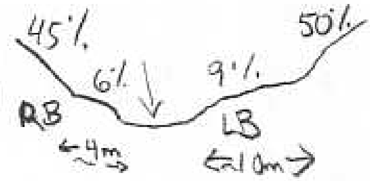
Date: Oct. 17/98 **Crew:** CB/RK **Weather:** raining

Photos 1) roll 2 2) exposure 10 3)location 4) notes lking u/s at site

Width (W, in m) 1) Bankfull (Wb) 5.1 2) Wetted (Ww) 1.4

Max. Depth (D, in m) 1) Bankfull (Db) 0.74 2) Wetted (Dw) 0.14

Slope (S, in %) 1) Channel 1% 2) Side slopes (if incised)



Valley Flat (VF) in m) (at 2 times bankfull depth): 20m

Entrenchment ratio (VF/Wb): 1.4/20

Profile morphology (using CAP terminology): riffle pool

Channel Bed:
Texture: 0 %Z 33 %S 45 %G 20 %C 2 %B 0 %R Stability: stable, aggrading, (degrading)

Channel Banks:
Texture: 0 %Z ~~25~~ 53 %S ~~35~~ ~~44~~ 35 %G 10 %C ~~28~~ 2 %B 0 %R Stability: high, moderate, (low)
(bank stability is the opposite of bank erosion potential)

Small Woody Debris:
Quantity: scarce, (occasional), common, abundant, over-abundant (choking channel)
Stability: high, (moderate), low, 1 SWD jamseen

Large Woody Debris:
Quantity: scarce, (occasional), common, abundant, over-abundant (choking channel)
Stability: high, (moderate), (low), LWD jam

} abundant on banks

Notes:
- banks (VF) covered w short grass, grazed by cattle
- area used by cattle, banks trampled in places impact moderate - channel is widening
- riparian zone relatively natural yg and old spruce, Cornus stol, alder (Fd and Py further up hill)
- canopy closure over creek 20%.
- herb cover along shore 60% ave. overhang 0.5 cm
- shrub cover along bank 40% ave overhang 3-4 m
- tree cover along bank (>10m tall) ~50% negligible overhang most trees set back a few metres
- LB MFc RB yger conifer forest w some mature trees

Helicopter Reach/Site Survey

	Reach	Site
Level of Disturbance:	H	H
Assessment Priority:	H	M

Ground-based Field Form 1of 2:

Survey Location: Loon Ck Reach 9 u/s of rd xing Rep. 9.1

Date: Oct 17/98 Crew: CB\RK Weather: raining

Photos 1) roll 2 2) exposure 12 3)location 4) notes u/s from rd.

Width (W, in m) 1) Bankfull (Wb) 1.5 2) Wetted (Ww) dry

Max. Depth (D, in m) 1) Bankfull (Db) 0.14 2) Wetted (Dw) dry

Slope (S, in %) 1) Channel 1% 2) Side slopes (if incised)

Valley Flat (VF, in m) (at 2 times bankfull depth): see map

Entrenchment ratio (VF/Wb):

Profile morphology (using CAP terminology):

Channel Bed:
Texture: __%Z 20%S 30%G 50%C 0%B 0%R Stability: ?stable, aggrading, degrading (dry)

Channel Banks:
Texture: __%Z 40%S 40%G 20%C 0%B 0%R Stability: high, moderate, low (dry)
(bank stability is the opposite of bank erosion potential)

Small Woody Debris:
Quantity: scarce, occasional, common, abundant, over-abundant (choking channel)
Stability: high, moderate, low none observed

Large Woody Debris:
Quantity: scarce, occasional, common, abundant, over-abundant (choking channel)
Stability: high, moderate, low none observed.

Notes:
- grassy wet pasture
- high use by cattle in area
- no tree cover, shrub cover ~ 10% of shoreline average overhang 0.10m, herb cover 90% of shoreline ave. overhang 0.10m
- shrub buffer RB ~5m
- " " LB blends into forest
- cattle damage to creek not significant, no sed. sources, cattle use evident

Ground-based Field Form 2 of 2:

Survey Location: LOON CK - Reach 9 (ALL) - APPLIES TO REACHES 10, 11 & 12

Date: 7/10/98 Crew: RK/CB Weather: RAINING

Photos 1) roll 2) exposure 3) location 4) notes

↳ see Rep site

1. **Existing Channel Disturbance (CD)**: (L,M,H)
L = not detectable-slight; M = moderate; H = high-extreme (morphology obscured)
(Map code 1)

Disturbance Cause: CHANNEL COMPLETELY DRY - Difficult to SEE IMPACTS HOWEVER ENTIRE REACH HAS RIPARIAN VEG REMOVED + CATTLE HAVE ACCESS.

2. **Potential for future channel disturbance:** (L,M,H)
(as defined for Existing Channel Disturbance)

3. **Restoration benefit: L,M,H (average of degree of benefit, success, duration)**

Degree of habitat benefit (L,M,H) L:marginal improvement likely, short length of channel; M: moderate improvement likely, moderate channel length affected; H: large improvement likely, long length of channel)

Type of habitat benefit, and description: (R,S,M)
(R=improved rearing habitat, S=improved spawning habitat, M=improved migration)

- ALL ASPECTS -

potential for success: (L,M,H)

likely duration of effectiveness (<5 yrs; 5-20 yrs; >20 yrs)

4. **Restoration cost** (<$10,000; $10,000-$100,000; >$100,000)
(includes prescription and implementation)

5. **Existing access:** (fly; trail; road)

6. **Priority for Prescription: L,M,H (weighted average of factors 1-5)**
(Map code 2)

Restoration Options:

- FENCE + PLANT RIPARIAN AREAS.
CREATE WATERING PONDS LIKE SEEN IN REACH 8

Other Notes:

Helicopter Reach/Site Survey

	Reach	Site
Level of Disturbance:	L	L
Assessment Priority:	L	L

Ground-based Field Form 2 of 2:

Survey Location: BRIGADE CK SITE # LC-BG-B3.1 NOTE: REP 3.1 SITE TAKEN ≈ 30m u/s

Date: Oct 17/98 **Crew:** RK, CB **Weather:** cloudy 10°C

Photos 15 1) roll 2 2) exposure 200 3) location shooting d/s of culvert inlet 4) notes

1. Existing Channel Disturbance (CD): (L,(M),H)
L = not detectable-slight; M = moderate; H = high-extreme (morphology obscured)
(Map code 1)

Disturbance Cause: CATTLE TRACKS LEADING DOWN BANK AT CULVERT INLET
AREA SURROUNDING IS A NATURAL WETLAND
NOTE - MUCH OF BRIGADE CK IS WETLAND MORPHOLOGY

2. **Potential for future channel disturbance:** (L,(M),H)
(as defined for Existing Channel Disturbance)

3. **Restoration benefit:** L,(M),H **(average of degree of benefit, success, duration)**

Degree of habitat benefit ((L),M,H) L:marginal improvement likely, short length of channel; M: moderate improvement likely, moderate channel length affected; H: large improvement likely, long length of channel)

Type of habitat benefit, and description: (R,S,M)
((R)=improved rearing habitat, (S)=improved spawning habitat, (M)=improved migration)

potential for success: (L,(M),H)

likely duration of effectiveness ((<5 yrs); 5-20 yrs; >20 yrs)

4. **Restoration cost** ((<$10,000); $10,000-$100,000; >$100,000)
(includes prescription and implementation)

5. **Existing access:** (fly; trail; (road)) SB MAP SAYS IT IS PERMANENT DEACT. ROAD.

6. **Priority for Prescription:** L,(M),H **(weighted average of factors 1-5)** CULVERT SHOULD BE REMOVED
(Map code 2)

Restoration Options: REMOVE CULVERT (2000 mm CMP) AND REPLACE WITH FORD. ARMOUR FORD AND INLET BANKS WHERE CATTLE TRACKS EXIST TO REDUCE SEDIMENTATION. THIS ROAD APPEARS TO BE JUST AT BOTTOM OF WETLAND THEREFOR IMPACTS (SEDIMENTATION) WILL BE CARRIED/TRANSPORTED DIS (POSSIBLE REACH BREAK HERE.

Other Notes:

CHECK MAPS TO VERIFY POSSIBLE NEW REACH BREAK HERE

Helicopter Reach/Site Survey

	Reach	Site
Level of Disturbance:	L	L
Assessment Priority:	L	L

Ground-based Field Form 1of 2: LOON CK. SUB-BASIN

Survey Location: Brigade Ck Rep Site 4.1 u/s of rd xing

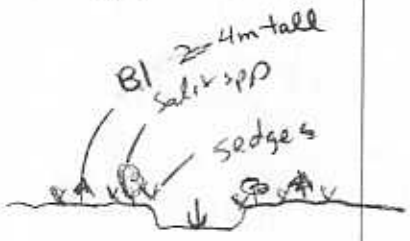
Date: Oct 17/98 **Crew:** CB/RK **Weather:** cloudy

Photos 1) roll 2 2) exposure 14 3)location 4) notes u/s of site

Width (W, in m) 1) Bankfull (Wb) 2.10 2) Wetted (Ww) 1.90

Max. Depth (D, in m) 1) Bankfull (Db) 0.50 2) Wetted (Dw) 0.29

Slope (S, in %) 1) Channel 1% 2) Side slopes (if incised)



Valley Flat (VF, in m) (at 2 times bankfull depth): check map

Entrenchment ratio (VF/Wb):

Profile morphology (using CAP terminology): RP (-w)

Channel Bed:
Texture: 7 %Z 90 %S 1 %G 1 %C 1 %B 0 %R Stability: (stable) aggrading, degrading

Channel Banks:
Texture: 7 %Z 90 %S 1 %G 0 %C 0 %B 0 %R Stability: high (moderate) low
(bank stability is the opposite of bank erosion potential) organics

Small Woody Debris:
Quantity: scarce, occasional, (common) abundant, over-abundant (choking channel)
Stability: high, (moderate) low

Large Woody Debris:
Quantity: (scarce), occasional, common, abundant, over-abundant (choking channel)
Stability: high, moderate, low none observed in channel, but subalpine fir growing near ck would eventually be LWD

Notes:
- creek runs through (sedge-grass) wet meadow/shrub carr (willow, a few sg Bl)
- 98% shoreline vegetated
  - → sedge overhang 10cm for ~80% of shoreline
  - → willow overhang 2m for ~15-20% of shoreline
- herb cover riparian area 95%, shrub cover 15%, tree cover (Bl) 1%

- cattle tracks near creek, drinking from ck, cattle droppings near creek
- damage appears to be minimal from cattle except at culvert + where creek banks have ~~been trampled~~
- natural wetland

Ground-based Field Form 1of 2: Hixum Ck - Loon Ck SB

Survey Location: Rep Site at 13+750 - rd close to ch. <15m
Rep 2.1

Date: 20/10/98 Crew: RK, CB Weather: Cloudy

Photos 1) roll 4 2) exposure 7 3)location looking u/s at Rep site 4) notes

Width (W, in m) 1) Bankfull (Wb) 4.70 2) Wetted (Ww) 1.90

Max. Depth (D, in m) 1) Bankfull (Db) .93 2) Wetted (Dw) .18

Slope (S, in %) 1) Channel 6% 2) Side slopes (if incised) LB = 60%

Valley Flat (VF, in m) (at 2 times bankfull depth): ~25 m

Entrenchment ratio (VF/Wb):

Profile morphology (using CAP terminology):

Helicopter Reach/Site Survey

	Reach	Site
Level of Disturbance:	L	—
Assessment Priority:	L	—

Channel Bed:
Texture: __%Z 5 %S 35 %G 40 %C 20 %B 0 %R Stability: stable, aggrading, degrading

Channel Banks:
Texture: __%Z 20 %S 50 %G 20 %C 10 %B __ %R Stability: high, moderate, low
(bank stability is the opposite of bank erosion potential)

Small Woody Debris:
Quantity: scarce, occasional, common, abundant, over-abundant (choking channel)
Stability: high, moderate, low

Large Woody Debris:
Quantity: scarce, occasional, common, abundant, over-abundant (choking channel)
Stability: high, moderate, low

Notes: - Moss on boulders

Channel ~~has been~~ is incised v-shaped gentle valley
- channel bed is course + relatively stable - can withstand high flows

- IMPACTS "LOW" Rd on RB 15 m from channel

- CC over ck ~ 3-5%

TREE 20% cover bank 10% ave overhang 1m (Act)(Fd)
SHRUB 35% " " 40% " " 0.5m (Rosa, Alder, yg sp)
MOSS/HERB 30% " " 80% " " 0.02m (grass/moss

Leaf litter on grd.

Helicopter Reach/Site Survey

	Reach	Site
Level of Disturbance:	L	
Assessment Priority:	L	II

Ground-based Field Form 1of 2: HIHIUM CK LOON CREEK

Survey Location: Rep Site ~~Ho+450?~~ 14+650 Rep 2.2

Date: Oct 20/98 **Crew:** RK, CB **Weather:**

Photos 1) roll 4 2) exposure 5 3)location Hking u/s above Rep Site 4) notes
(Photo 6 likely above this site)

Width (W, in m) 1) Bankfull (Wb) 4.90 2) Wetted (Ww) 1.70

Max. Depth (D, in m) 1) Bankfull (Db) 1.00 2) Wetted (Dw) .16

Slope (S, in %) 1) Channel 2% 2) Side slopes (if incised) LB 45% RB unknown.

Valley Flat (VF, in m) (at 2 times bankfull depth): see map >100 m

Entrenchment ratio (VF/Wb):

Profile morphology (using CAP terminology): RPgk-w

Channel Bed:
Texture: __%Z 5 %S 40 %G 40 %C 15 %B 0 %R Stability: (stable), aggrading, degrading

Channel Banks:
Texture: 5 %Z 20 %S 30 %G 45 %C 0 %B 0 %R Stability: high, (moderate), low
(bank stability is the opposite of bank erosion potential)

Small Woody Debris:
Quantity: (scarce), (occasional), common, abundant, over-abundant (choking channel)
Stability: high, moderate, (low)

Large Woody Debris:
Quantity: scarce, (occasional), common, abundant, over-abundant (choking channel)
Stability: high, (moderate), low

Notes: Channel is less confined - not inscised nor entrenched
- moss covered boulders + banks.

IMPACTS ARE LOW - HOWEVER CHANNEL APPEARS MORE SENSITIVE TO HIGH FLOWS + DISTURBANCES.

RIP. ZONE - NATURAL

→ Tree 25% cover, bank 25%, overhanging veg ave. 0.25 m range 0-3m
(Fd, Act, Spruce)
→ Shrub 40% " , " 50% , " " ave. 0.25m
(Cornus stol., Alder, Ribes lac.)
→ Herb 10% " , " 80% , " " " 0.02m

Ck - Canopy Closure 2%.

Lots of woody debris and leaf litter on RB

Helicopter Reach/Site Survey

	Reach	Site
Level of Disturbance:	L	
Assessment Priority:	M	

Ground-based Field Form 1of 2: LOON CK

Survey Location: HIHIUM CK Rep 3.1

Date: Oct. 20/98 **Crew:** CB\RK **Weather:** sunny

Photos 1) roll 4 2) exposure 8 3)location Hiking U/S 4) notes

Width (W, in m) 1) Bankfull (Wb) 4.5 2) Wetted (Ww) 2.60

Max. Depth (D, in m) 1) Bankfull (Db) .98 2) Wetted (Dw) .08

Slope (S, in %) 1) Channel 2% 2) Side slopes (if incised) RB 43% LB: 41%

Valley Flat (VF, in m) (at 2 times bankfull depth): 10 m

Entrenchment ratio (VF/Wb): 1

Profile morphology (using CAP terminology): RPglc - w

Channel Bed:
Texture: 0 %Z 5 %S 60 %G 35 %C 0 %B 0 %R Stability: (stable) aggrading, degrading

Channel Banks:
Texture: 2 %Z 20 %S 38 %G 40 %C 0 %B 0 %R Stability: high, (moderate), low
(bank stability is the opposite of bank erosion potential)

Small Woody Debris:
Quantity: scarce, occasional, (common), abundant, over-abundant (choking channel)
Stability: high, moderate, (low)

Large Woody Debris:
Quantity: scarce, (occasional), common, abundant, over-abundant (choking channel)
Stability: high, (moderate), low

Notes: Channel is more incised here - mainly cobble + gravel stable + firm bed. Lacks LWD @ site
Minimal impacts here
- clear colored water

RIPARIAN ZONE (MFc)

(Spruce)	Tree	cover	10%.	banks	10%.	ave overhang	1m
(Alder, juniper)	Shrub	cover	~~30~~ 35%.	"	~~50~~ 60%,	"	0.5m
(grass, lichen)	Herb	"	50%.	"	90%.	"	0.02m
			(snow cover)				

CC over creek 5%. (live) 7% including woody debris

FA/PL on higher slopes

Helicopter Reach/Site Survey

	Reach	Site
Level of Disturbance:	L	L+
Assessment Priority:	M	L/M

Ground-based Field Form 2 of 2:

Survey Location: REACH 3 OF HIHIUM CK

Date: 20/10/98 Crew: RK, CB Weather:

Photos 1) roll 2) exposure 3) location 4) notes (check CB's photo references

No Sed. Source photos were taken due to large exterior slides not visible on photos

1. Existing Channel Disturbance (CD): (L,M,H)
L = not detectable-slight; M = moderate; H = high-extreme (morphology obscured)
(Map code 1)

Disturbance Cause: steep colluvial slides + gravel sandy till slides ~~cut~~ mainly on Rb hillslope. Road dissects through + several failures are chronic and initiated @ the road. Many of the slides are natural - slopes >70% throughout reach 3.

2. Potential for future channel disturbance: (L,M,H)
(as defined for Existing Channel Disturbance)

3. Restoration benefit: (L,M,H) (average of degree of benefit, success, duration)

Degree of habitat benefit (L,M,H) L:marginal improvement likely, short length of channel; M: moderate improvement likely, moderate channel length affected; H: large improvement likely, long length of channel)

Type of habitat benefit, and description: (R,S,M)
(R=improved rearing habitat, S=improved spawning habitat, M=improved migration)

- Channel through reach 3 does not appear to be favorable for spawning. Stream bed substrate may be too coarse.
- chronic sliding caused by natural undercutting of the stream channel will continue.

potential for success: (L,M,H)

likely duration of effectiveness (<5 yrs; 5-20 yrs; >20 yrs)

4. Restoration cost (<$10,000; $10,000-$100,000; >$100,000)
(includes prescription and implementation)

5. Existing access: (fly; trail; road)

6. Priority for Prescription: (L,M,H) (weighted average of factors 1-5)
(Map code 2)

Restoration Options: improve on Road - install drainages above slides + pullback road where needed

Other Notes:

Helicopter Reach/Site Survey

	Reach	Site
Level of Disturbance:	L	2
Assessment Priority:	M	L

Ground-based Field Form 2 of 2: Hitkum Ck - Loon Lake

Survey Location: 12+610 ~~(possibly 53.2 on map)~~ (53.2 = 12+850 to 13+100)

Date: 26/10/98 Crew: RK, CB Weather:

Photos 1) roll 2) exposure 3) location 4) notes

1. Existing Channel Disturbance (CD): (L,M,H) Bedrock + coarse boulder
L = not detectable-slight; M = moderate; H = high-extreme (morphology obscured)
(Map code 1)

Disturbance Cause: Natural slide below road. road does not impact on entire sliding
- glacial fluvial gravel, sc, cobble

2. Potential for future channel disturbance: (L,M,H)
(as defined for Existing Channel Disturbance)

3. Restoration benefit: L,M,H (average of degree of benefit, success, duration)

Degree of habitat benefit (L,M,H) L:marginal improvement likely, short length of channel; M: moderate improvement likely, moderate channel length affected; H: large improvement likely, long length of channel)

Type of habitat benefit, and description: (R,S,M)
(R=improved rearing habitat, S=improved spawning habitat, M=improved migration)

Channel undercuts steep unstable slopes.
Sediment source is "L-M"

potential for success: (L,M,H)

likely duration of effectiveness (<5 yrs; 5-20 yrs; >20 yrs) NO

4. Restoration cost (<$10,000; $10,000-$100,000; >$100,000) NO
(includes prescription and implementation)

5. Existing access: (fly; trail; road)

6. Priority for Prescription: L,M,H (weighted average of factors 1-5) M
(Map code 2)

Restoration Options: TOE ENFORCEMENT - TRY HYDROSEEDING ~~- [illegible]~~

ALL NATURAL CONDITION IMPACTS - HOWEVER SHOULD INSPECT BY GEO TECH/ P.ENG.

Other Notes:

Ground-based Field Form 2 of 2:

Survey Location: LOON CK Hilum CK (53.3)

Date: 20/10/98 Crew: RK, CB Weather: Sunny, clear

Photos NO 1) roll ~~2) exposure: 3) location 4) notes~~

1. Existing Channel Disturbance (CD): (L,M,H)
L = not detectable-slight; M = moderate; H = high-extreme (morphology obscured)
(Map code 1)

Disturbance Cause: Natural slide ~~stop~~ below road - Road is situated on terrace - colluvium - unlikely that road is cause of slide - most likely deep unstable terrain

2. Potential for future channel disturbance: (L,M,H)
(as defined for Existing Channel Disturbance)

3. Restoration benefit: L,M,H (average of degree of benefit, success, duration)

Degree of habitat benefit: (L,M,H) L: marginal improvement likely, short length of channel; M: moderate improvement likely, moderate channel length affected; H: large improvement likely, long length of channel)

Type of habitat benefit, and description: (R,S,M)
(R=improved rearing habitat, S=improved spawning habitat, M=improved migration)

- ALL ASPECTS OF FISH ARE THREATENED BY ROAD

potential for success: (L,M,H)

likely duration of effectiveness (<5 yrs; 5-20 yrs; >20 yrs)

4. Restoration cost (<$10,000; $10,000-$100,000; >$100,000)
(includes prescription and implementation)

5. Existing access: (fly; trail; road)

6. Priority for Prescription: L,M,H (weighted average of factors 1-5)
(Map code 2)

Restoration Options: - HYDROSEED BELOW ROAD FOR SURFACE EROSION reduction + stabilization - low cost (low-marg. returns)

- consider removing road or stabilizing better. # concerns here.

Other Notes:

Helicopter Reach/Site Survey

	Reach	Site
Level of Disturbance:	L	H
Assessment Priority:	M	H

Ground-based Field Form 2 of 2:

Survey Location: S3.5 Hitlerun 11+800 m from Lake resort

Date: 20/10/98 **Crew:** RK, CB **Weather:** Sunny - clear

Photos 1) roll 2) exposure 3) location 4) notes

1. Existing Channel Disturbance (CD): (L,M,H)
L = not detectable-slight; M = moderate; H = high-extreme (morphology obscured)
(Map code 1)

Disturbance Cause: slide + Road above is eroding + will eventually collapse.

2. **Potential for future channel disturbance: (L,M,H)**
(as defined for Existing Channel Disturbance)

3. **Restoration benefit: L,M,H (average of degree of benefit, success, duration)**

Degree of habitat benefit (L,M,H) L:marginal improvement likely, short length of channel; M: moderate improvement likely, moderate channel length affected; H: large improvement likely, long length of channel)

Type of habitat benefit, and description: (R,S,M)
(R=improved rearing habitat, S=improved spawning habitat, M=improved migration)

AGAIN - similar to S3.7 - chance that slide below road ≃ 110 % will give + road will go. Channel appears to be undercutting the unstable slopes @ high flows

potential for success: (L,M,H)

likely duration of effectiveness (<5 yrs; 5-20 yrs; >20 yrs)

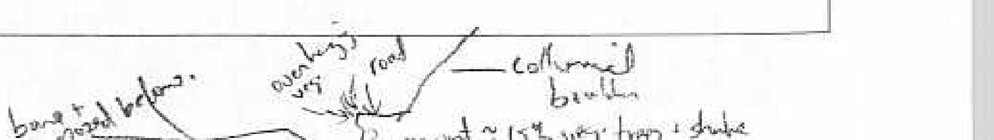
4. **Restoration cost (<$10,000; $10,000-$100,000; >$100,000)**
(includes prescription and implementation)

5. **Existing access: (fly; trail; road)**

6. **Priority for Prescription: L,M,H (weighted average of factors 1-5)**
(Map code 2)

Restoration Options: Move road back into upper hillslope - false slope of colluvium + boulder above road then bedrock cliffs.
- restore or install drainage above road.
Road is ≃ 15 %

Other Notes: - Channel is cobble + gravel substrate appears to be widened somewhat moderately impacted
- Vegetation is low >15 % on upper part of slide



Ground-based Field Form 2 of 2:

Survey Location: S3.6 HITHUM CK (LOON CK SUB-BASIN)

Date: 20/10/98 Crew: RK, CB Weather: Sunny-clear

Photos NO 1) roll 2) exposure 3) location 4) notes

1. Existing Channel Disturbance (CD): (L,M,H)
L = not detectable-slight; M = moderate; H = high-extreme (morphology obscured)
(Map code 1)

Disturbance Cause: ROAD SITUATED ON COARSE TALUS/COLLUVIAL TERRACE (NATURAL SLIDE) WITH UNSTABLE ERODIBLE FINES FAILING AT ROAD EDGE

2. Potential for future channel disturbance: (L,M,H)
(as defined for Existing Channel Disturbance)

3. Restoration benefit: L,M,H (average of degree of benefit, success, duration)

Degree of habitat benefit (L,M,H) L:marginal improvement likely, short length of channel; M: moderate improvement likely, moderate channel length affected; H: large improvement likely, long length of channel)

Type of habitat benefit, and description: (R,S,M)
(R=improved rearing habitat, S=improved spawning habitat, M=improved migration)

ALL ASPECTS ARE POTENTIALLY AT RISK

potential for success: (L,M,H)

likely duration of effectiveness (<5 yrs; 5-20 yrs; >20 yrs)

4. Restoration cost (<$10,000; $10,000-$100,000; >$100,000)
(includes prescription and implementation)

5. Existing access: (fly; trail; road)

6. Priority for Prescription: L,M,H (weighted average of factors 1-5)
(Map code 2)

Restoration Options:

- Relocate Road further back from terrace edge - very difficult to determine if Road material is directly failing into channel "L*M" levels or if material is native + road was situated on unstable edge later.

Other Notes:

Helicopter Reach/Site Survey

	Reach	Site
Level of Disturbance:	L	L
Assessment Priority:	M	L

Ground-based Field Form 2 of 2:

Survey Location: S3.7 Hilium

Date: 20/10/98 **Crew:** RK, CB **Weather:** Cool clear 8°

Photos 1) roll 2) exposure 3) location 4) notes

1. Existing Channel Disturbance (CD): (L,M,H)
L = not detectable-slight; M = moderate; H = high-extreme (morphology obscured)
(Map code 1)

Disturbance Cause: - coarse debris cobble + gravel deposited on Rb @ base of slide. Note fir + Pine growing on the slope of slide indicates slide is ≥ 15 years. Unknown if road created the slide. Slope of slide is 90% - Road is starting to erode.

2. Potential for future channel disturbance: (L,M,H) - Channel bar migrated over to Lb side
(as defined for Existing Channel Disturbance)

3. Restoration benefit: L,M,H (average of degree of benefit, success, duration)

Degree of habitat benefit (L,M,H) L:marginal improvement likely, short length of channel; M: moderate improvement likely, moderate channel length affected; H: large improvement likely, long length of channel)

Type of habitat benefit, and description: (R,S,M)
(R=improved rearing habitat; S=improved spawning habitat; M=improved migration)

- IF THE ROAD WERE TO COLLAPSE IT could create a barrier blockage into the channel. Channel @ base of slide is ≥ 12-15 m away.
- large decids growing @ base of slide appear to provide stability

potential for success: (L,M,H)

likely duration of effectiveness (<5 yrs; 5-20 yrs; >20 yrs)

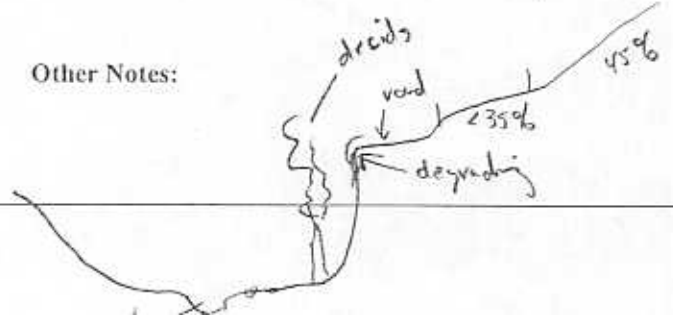
4. Restoration cost (<$10,000; $10,000-$100,000; >$100,000)
(includes prescription and implementation)

5. Existing access: (fly; trail; road)

6. Priority for Prescription: L,M,H (weighted average of factors 1-5)
(Map code 2)

Restoration Options: - pullback edge of road - move road further into the above hillside - slope
- install drainage above road chose

Other Notes:



- slope is ≈ 35% re-vegetated of trees + shrubs

Helicopter Reach/Site Survey

	Reach	Site
Level of Disturbance:	L	—
Assessment Priority:	L	—

Ground-based Field Form 1of 2: LOON CK

Survey Location: Hittium CK REP 4.1

Date: 20/10/98 **Crew:** RK, CB **Weather:** Cool - Sunny - 7°C

Photos 1) roll 4 2) exposure 9 3) location 1k'ing d/s 4) notes

Width (W, in m) 1) Bankfull (Wb) 235 2) Wetted (Ww) 1.76

Max. Depth (D, in m) 1) Bankfull (Db) 36 2) Wetted (Dw) 16 cm

Slope (S, in %) 1) Channel 2.5 % 2) Side slopes (if incised) 42 % LB 48 % RB

Valley Flat (VF, in m) (at 2 times bankfull depth): 12 m

Entrenchment ratio (VF/Wb):

Profile morphology (using CAP terminology): RP_c - CP_c (inbetween)

Channel Bed:
Texture: ___%Z 10 %S 30 %G 52 %C 8 %B 0 %R Stability: stable, aggrading, degrading

Channel Banks:
Texture: 5 %Z 50 %S 45 %G 10 %C 0 %B 0 %R Stability: high, moderate, low
(bank stability is the opposite of bank erosion potential)

Small Woody Debris:
Quantity: scarce, (occasional) (common) abundant, over-abundant (choking channel)
Stability: high, (moderate) low

Large Woody Debris:
Quantity: scarce, occasional, common, (abundant) (over-abundant) (choking channel)
Stability: high, (moderate) low Blowdown, Root Rot? d/s of Site, Diameter ave for 75% of blowdown < 10 cm

Notes: Channel is incised both valley hillslopes gentle v-shaped.
- not alot of colluvium present - larger coarse material on the bed is alluvial
- Overall channel is stable + has minimal impacts - cutblocks present on the Rb hillslope - skinny sm dia. pine.

RIPARIAN ZONE - natural MFc

			bank	ave. overhang	
Tree	cover		10%		0.5m (Spruce)
Shrub	"	10%	" 10%	" "	0.1m (Sp, Alder)
(snow cover) Herb	"	65%?	" 80%	" "	0.02m (Grass)

(cover values are for valley flat)

- sm. fish spotted in ck 1" long
- P_L on plateau, skinny trees, stands dense

Helicopter Reach/Site Survey

	Reach	Site
Level of Disturbance:	M	n/a
Assessment Priority:	M	n/a

Ground-based Field Form 1of 2:

Survey Location: CLINTON CK - REP SITE 2.1

Date: Oct. 16/98 Crew: CB\RK Weather: cloudy\cool

Photos 1) roll 2 2) exposure 18 3)location 4) notes d/s

Width (W, in m) 1) Bankfull (Wb) 1.20 2) Wetted (Ww) 1.20

Max. Depth (D, in m) 1) Bankfull (Db) 0.72 2) Wetted (Dw) 0.42

Slope (S, in %) 1) Channel 1% 2) Side slopes (if incised)

Valley Flat (VF, in m) (at 2 times bankfull depth): 100m (check map)

Entrenchment ratio (VF/Wb):

Profile morphology (using CAP terminology): RP (wetland)

Channel Bed:
Texture: 10%Z 60%S 30%G 0%C 0%B 0%R Stability: (stable), aggrading, degrading

Channel Banks:
Texture: 10%Z 60%S 30%G 0%C 0%B 0%R Stability: high, (moderate), low
(bank stability is the opposite of bank erosion potential)

Small Woody Debris:
Quantity: scarce, (occasional), common, abundant, over-abundant (choking channel)
Stability: high, (moderate), low

Large Woody Debris:
Quantity: (scarce), occasional, common, abundant, over-abundant (choking channel)
Stability: high, moderate, low (none seen)

Notes:

- ck runs through shrub carr wetland of red-osier dogwood, alder, reed canary grass, salix spp, rosa spp.
- 100% bank vegetated
  - → shrub 20% of banks, average overhang 1m
  - → grass 95% of banks, " " 0.2m
- wetland 20% shrub covered, no lg. trees, 95% herb cov
- shrubs vary in height from 2 to 8m tall

Helicopter Reach/Site Survey

	Reach	Site
Level of Disturbance:	~~M~~ L	L
Assessment Priority:	n/a	L

Ground-based Field Form 2 of 2:

Survey Location: Clinton Creek - top of Reach 1 (possibly start of Reach 2) (B2.1)

Date: Oct 16/98 Crew: RK, CB Weather: cloudy - windy + 6°C

Photos ~~16~~ (17)) roll 2 2) exposure 200 3) location Clinton ck shooting u/s around culvert 4) notes

1. Existing Channel Disturbance (CD): (L),M,H)
L = not detectable-slight; M = moderate; H = high-extreme (morphology obscured)
(Map code 1)

Disturbance Cause: channel in flat wetland approaches Valley Road - Major Road.

2. Potential for future channel disturbance: (L,M,H)
(as defined for Existing Channel Disturbance)

3. Restoration benefit: L,M,H (average of degree of benefit, success, duration)

Degree of habitat benefit (L,M,H) L:marginal improvement likely, short length of channel; M: moderate improvement likely, moderate channel length affected; H: large improvement likely, long length of channel)

Type of habitat benefit, and description: (R,S,M)
(R=improved rearing habitat; S=improved spawning habitat; M=improved migration)
- Channel through wetland is excellent habitat - however the direction it takes is into the road paralleling it.

potential for success: (L,M,(H))

likely duration of effectiveness (<5 yrs; 5-20 yrs; >20 yrs)

4. Restoration cost (<$10,000; $10,000-$100,000; >$100,000)
(includes prescription and implementation)

5. Existing access: (fly; trail; road)

6. Priority for Prescription: L,M,H (weighted average of factors 1-5)
(Map code 2)

Restoration Options: RIP-RAP ROAD then vegetate with local plants - willow + grasses.
- currently the channel is beginning to degrade the road and around the culvert (see diagram). Simple fix - cheap. High returns.
- minimal excavation of the road to properly place rock.

Other Notes:

- Bank material is fines with some angular cobble + gravel from the road
- Bank material is 70% fines 30% gravel + cobble

Helicopter Reach/Site Survey

	Reach	Site
Level of Disturbance:	H	n/a
Assessment Priority:	H	n/a

Ground-based Field Form 1of 2:

Survey Location: CLINTON CK Rep Site 6.1

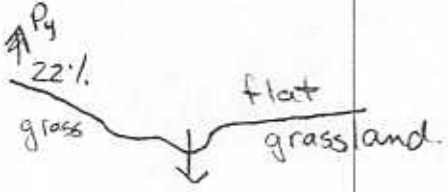
Date: OCT 18/98 Crew: CB\RK Weather: cloudy

Photos 1) roll 3 2) exposure 16 3)location 1king d/s 4) notes at Rep Site

Width (W, in m) 1) Bankfull (Wb) 2.0 2) Wetted (Ww) 2.0

Max. Depth (D, in m) 1) Bankfull (Db) 0.54 2) Wetted (Dw) 0.16

Slope (S, in %) 1) Channel 1% 2) Side slopes (if incised)



Valley Flat (VF, in m) (at 2 times bankfull depth): check map

Entrenchment ratio (VF/Wb):

Profile morphology (using CAP terminology): riffle pool

Channel Bed:
Texture: 0 %Z 18 %S 80 %G 2 %C 0 %B 0 %R Stability: (stable) aggrading, degrading

Channel Banks:
Texture: 20 %Z 70 %S 10 %G 0 %C 0 %B 0 %R Stability: high (moderate) low
(bank stability is the opposite of bank erosion potential)

Small Woody Debris:
Quantity: (scarce) occasional, common, abundant, over-abundant (choking channel)
Stability: high, moderate, low none observed

Large Woody Debris:
Quantity: (scarce) occasional, common, abundant, over-abundant (choking channel)
Stability: high, moderate, low none observed

Notes:

- creek runs through grazing pastures
- riparian zone consists of herbs only 95% of shoreline grasses, average overhang 10cm.
- cattle watering from ck. have trampled banks in some places
- moderate impact
- horse manure also seen on walk into site

Helicopter Reach/Site Survey

	Reach	Site
Level of Disturbance:	H	H
Assessment Priority:	H	H

Ground-based Field Form 2 of 2:

Survey Location: Clintonct Reach 6 just u/s of Rep Site 6.1

Date: 18/10/98 **Crew:** RK, CB (B6.1) **Weather:** Cloudy - cool

Photos 17 1) roll ~~2~~ 3 2) exposure 100 3) location Clinton looking d/s 4) notes

1. Existing Channel Disturbance (CD): (L,(M),H)
L = not detectable-slight; M = moderate; H = high-extreme (morphology obscured)
(Map code 1)

Disturbance Cause: Cattle entering channel + channel bank instability + eroding into channel

2. **Potential for future channel disturbance:** (L,(M),H)
(as defined for Existing Channel Disturbance)

3. **Restoration benefit:** L,M,H **(average of degree of benefit, success, duration)**

Degree of habitat benefit ((L),M,H) L:marginal improvement likely, short length of channel; M: moderate improvement likely, moderate channel length affected; H: large improvement likely, long length of channel)

Type of habitat benefit, and description: (R,S,M)
((R)=improved rearing habitat, (S)=improved spawning habitat, M=improved migration)

- this fix won't improve migration very much but it will improve rearing + spawning significantly

potential for success: (L,M,(H))

likely duration of effectiveness (<5 yrs;(5-20 yrs;) >20 yrs)

4. **Restoration cost** (<$10,000;) $10,000-$100,000; >$100,000)
(includes prescription and implementation)

5. **Existing access:** (fly;(trail;) road)

6. **Priority for Prescription:** L,(M),H **(weighted average of factors 1-5)**
(Map code 2)

Restoration Options: Fencing + riparian planting + installing coarse material such as cobble + gravel so cattle can't enter

Other Notes:
- LB side is fenced by cattle
- cattle appear to be crossing at this point
- banks are fine sa (80%) + (10% silt) + 1% boulder, 5% cobble

Ground-based Field Form 2 of 2:

Survey Location: CLINTON CREEK Reaches 1 + 4 to Town
AS PER HELICOPTER + FIELD INSPECTIONS

Date: 15/10/98 Crew: RK, CB Weather:

Photos 1) roll 2) exposure 3) location 4) notes
↳ see rep site + SS sites

1. Existing Channel Disturbance (CD): (L,M,H)
L = not detectable-slight; M = moderate; H = high-extreme (morphology obscured)
(Map code 1)

Disturbance Cause:

RIPARIAN CLEARING FOR CATTLE + PASTURES
ESP. ON PRIVATE LAND

2. Potential for future channel disturbance: (L,M,H)
(as defined for Existing Channel Disturbance)

3. Restoration benefit: L,M,H (average of degree of benefit, success, duration)

Degree of habitat benefit (L,M,H) L:marginal improvement likely, short length of channel; M: moderate improvement likely, moderate channel length affected; H: large improvement likely, long length of channel)

Type of habitat benefit, and description: (R,S,M)
(R=improved rearing habitat, S=improved spawning habitat, M=improved migration)

R+S will benefit with riparian prescriptions

potential for success: (L,M,H)

likely duration of effectiveness (<5 yrs; 5-20 yrs; >20 yrs)

4. Restoration cost (<$10,000; $10,000-$100,000; >$100,000)
(includes prescription and implementation)

5. Existing access: (fly; trail; road)

6. Priority for Prescription: L,M,H (weighted average of factors 1-5)
(Map code 2)

Restoration Options:

1. FENCE
2. PLANT
3. LWD + CWD PLACEMENT.

Other Notes:

Helicopter Reach/Site Survey

	Reach	Site
Level of Disturbance:	m	L
Assessment Priority:	m	L

Ground-based Field Form 1of 2:

Survey Location: CLINTON ~~COPPAA WSHED~~ CREEK Rep 8.1.1 (Riffle)

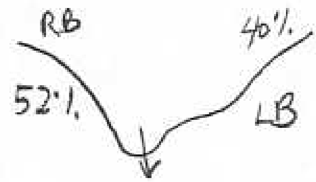
Date: Oct. 18/98 **Crew:** **Weather:** cloudy

Photos 1) roll 3 2) exposure 15 3) location 1 km u/s of Rep Site 4) notes

Width (W, in m) 1) Bankfull (Wb) 3.1 2) Wetted (Ww) 2.34

Max. Depth (D, in m) 1) Bankfull (Db) 0.47 2) Wetted (Dw) 0.17

Slope (S, in %) 1) Channel 7% 2) Side slopes (if incised)



Valley Flat (VF, in m) (at 2 times bankfull depth): 15

Entrenchment ratio (VF/Wb): 15 / 3.1

Profile morphology (using CAP terminology): CP (-w)

Channel Bed:
Texture: 0 %Z 15 %S 30 %G 30 %C 25 %B 0 %R Stability: (stable) aggrading, degrading

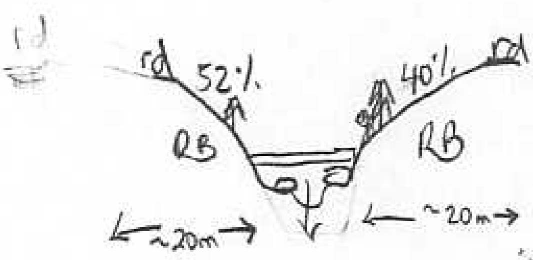
Channel Banks:
Texture: 15 %Z 25 %S 0 %G 30 %C 30 %B 0 %R Stability: high, (moderate,) low
(bank stability is the opposite of bank erosion potential)

Small Woody Debris:
Quantity: scarce, occasional, common, (abundant,) over-abundant (choking channel)
Stability: high, moderate, (low)

Large Woody Debris:
Quantity: scarce, occasional, common, (abundant,) over-abundant (choking channel)
Stability: high, (moderate,) low

Notes:

- Riparian zone relatively undisturbed, wild fire sign



applies to shore/banks and rip. zone:
- tree cover ~30% ave overhang ~2m
- shrub cover ~20% ave overhang ~2m
- herb cover 3% ave overhang 0m
- canopy closure 25%-35% over creek

Fd
Alder
Cornus stol.
} growing in area

- CWD abundant on slopes.

- moss covered boulders on banks + bed

* - lack of herbaceous plants and steep slopes may cause/result in surface erosion delivering sediment to creeks
- ground was covered with leaves which would [illegible]

Ground-based Field Form 2 of 2:

Survey Location: CLINTON CREEK (Reaches 7-8 + Reach 1 of Cutoff Valley.

Date: 16/10/98 Crew: RK, CB Weather:

Photos NO 1) roll 2) exposure 3) location 4) notes

1. Existing Channel Disturbance (CD): (L,M,(H)) RIPARIAN SLAMMED
L = not detectable-slight; M = moderate; H = high-extreme ~~(Morphology Disturbed)~~
(Map code 1)

Disturbance Cause: (1) RIPARIAN COMPLETELY REMOVED - CHANNEL IS NOT TOO BAD
(2) CHANNEL THROUGH TOWN IS COMPLETELY MODIFIED - disappears below streets.

2. Potential for future channel disturbance: (L,M,(H))
(as defined for Existing Channel Disturbance)

3. Restoration benefit: L,(M,H) (average of degree of benefit, success, duration)

Degree of habitat benefit (L,M,(H)) L:marginal improvement likely, short length of channel; M: moderate improvement likely, moderate channel length affected; H: large improvement likely, long length of channel)

Type of habitat benefit, and description: (R,S,M)
(R=improved rearing habitat, S=improved spawning habitat, M=improved migration)

- ALL ASPECTS WOULD BENEFIT - UNKNOWN WHERE CHANNEL RUNS THEREFORE UNSURE IF THERE ARE ANY OBSTRUCTIONS FOR FISH - DEFINATELY OBSTRUCTED AT INTAKE (REACH 9)

potential for success: (L,(M),H)

likely duration of effectiveness (<5 yrs; 5-20 yrs; (>20 yrs))

4. Restoration cost (<$10,000; ($10,000-$100,000; >$100,000)
(includes prescription and implementation)

5. Existing access: (fly; trail; (road))

6. Priority for Prescription: L,(M,H) (weighted average of factors 1-5)
(Map code 2)

Restoration Options: (1) PLANT + FENCE THRU LOWER REACH 7.
(2) MAP OUT CREEK THRU TOWN - INSPECT FOR OBSTRUCTIONS - CONCENTRATE ON REACH 1 OF CUTOFF VALLEY CK.

Other Notes:

Helicopter Reach/Site Survey

	Reach	Site
Level of Disturbance:	m	n/a
Assessment Priority:	m	n/a

Ground-based Field Form 1of 2:

Survey Location: Cutoff Valley Creek, mouth just west of highway 97
Rep site 1.1

Date: Oct 16/98 Crew: CB/RK Weather: cloudy

Photos 1) roll 2 2) exposure 19 3)location ← 4) notes u/s from Hwy xing

Width (W, in m) 3.5-4 1) Bankfull (Wb) 3-4 m 2) Wetted (Ww) 3-4 m

Max. Depth (D, in m) 1) Bankfull (Db) ~~80~~ 2) Wetted (Dw) ~~70~~ cm

Slope (S, in %) 1) Channel .5 2) Side slopes (if incised) not incised

Valley Flat (VF, in m) (at 2 times bankfull depth): check map

Entrenchment ratio (VF/Wb): ~~not~~ slightly entrenched

Profile morphology (using CAP terminology): RP-w

Channel Bed:
Texture: __%Z 90%S 10%G 0%C 0%B 0%R Stability: stable, aggrading, degrading

Channel Banks:
Texture: __%Z 90%S 10%G __%C __%B __%R Stability: high, moderate, low
(bank stability is the opposite of bank erosion potential)

Small Woody Debris:
Quantity: scarce, (occasional) common, abundant, over-abundant (choking channel)
Stability: high, (moderate) low

Large Woody Debris:
Quantity: (scarce) occasional, common, abundant, over-abundant (choking channel)
Stability: ~~high, moderate, low~~ N/A - no LWD

Notes:
- Aquatic vegetation - 25% cover.
- banks of creek wet meadow containing sedges and grasses
- cultivated to creek banks, horse pasture u/s of site
- average overhang 30 cm wide for 95% of channel length (grasses + sedges)
- shrubs ~5% of channel length average overhang 2m wide - many shrubs look dead - willow?, alder reed canarygrass alive
- minimal bank scour + erosion indicating stable + adequately protected.
- definite temperature concerns - open with exposed sections to SW
- channel is moderately stable

Helicopter Reach/Site Survey

	Reach	Site
Level of Disturbance:	M	L
Assessment Priority:	M	L

Ground-based Field Form 1of 2:

Survey Location: Cutoff valley, Xing by RR tracks, Rep Site 8.1

Date: Oct 16/98 Crew: RK/CB Weather:

Photos 1) roll 2 2) exposure 20 3)location 4) notes d/s from xing

Width (W, in m) 1) Bankfull (Wb) 3.5 2) Wetted (Ww) 3.5

Max. Depth (D, in m) 1) Bankfull (Db) 1.2 2) Wetted (Dw) 1.4

Slope (S, in %) ~~X~~ 1) Channel 0.5 2) Side slopes (if incised) not incised

Valley Flat (VF, in m) (at 2 times bankfull depth): 200 m (check map)

Entrenchment ratio (VF/Wb):

Profile morphology (using CAP terminology): RP-W

Channel Bed:
Texture: 4 %Z 85 %S 10 %G 1 %C 0 %B 0 %R (Stability: stable) aggrading, degrading

Channel Banks:
Texture: %Z 85 %S 10 %G 5 %C 0 %B 0 %R Stability: high, (moderate), low
(bank stability is the opposite of bank erosion potential)

Small Woody Debris:
Quantity: (scarce), occasional, common, abundant, over-abundant (choking channel)
Stability: high, moderate, (low)

Large Woody Debris:
Quantity: (scarce), occasional, common, abundant, over-abundant (choking channel)
Stability: high, (moderate), low

Notes: RIPARIAN VEGTATION
- banks covered with reed canarygrass
- some red osier dogwood and willow (sample)
- grass overhang average width 0.5m - 100% of shoreline has overhang 10 - 20% shrub
- beaver activity d/s
- wetlands (shrub/carr) u/s
- 1 little fish seen last year
- cultivated to shore/banks

Helicopter Reach/Site Survey

	Reach	Site
Level of Disturbance:	#	
Assessment Priority:	4	C

Ground-based Field Form 1of 2: CLINTON SUB-BASIN

Survey Location: FIFTYONE CK ~50 m d/s of Hwy97 Rep Site 2.1

Date: Oct. 19/98 Crew: CB/RK Weather: sunny, cool

Photos 1) roll 3 2) exposure 13 3)location 1king d/s 4) notes

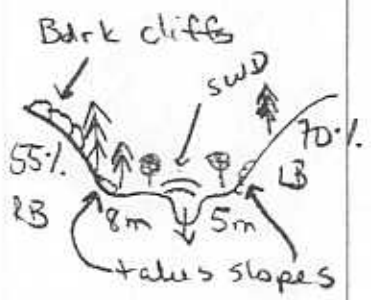
Width (W, in m) 1) Bankfull (Wb) 1.73 2) Wetted (Ww) 1.73

Max. Depth (D, in m) 1) Bankfull (Db) 0.45 2) Wetted (Dw) 0.21

Slope (S, in %) 1) Channel 4% 2) Side slopes (if incised)

Valley Flat (VF, in m) (at 2 times bankfull depth): 15m

Entrenchment ratio (VF/Wb): 15/1.73



Profile morphology (using CAP terminology): RP with over abundant SWD

Channel Bed:
Texture: 10 %Z 72 %S 3 %G 5 %C 10 %B 0 %R Stability: (stable) aggrading, degrading
boulders angular from talus slopes

Channel Banks:
Texture: 30 %Z 50 %S 3 %G 5 %C 10 %B 0 %R Stability: high, (moderate) low
(bank stability is the opposite of bank erosion potential)

Small Woody Debris:
Quantity: scarce, occasional, common, abundant, (over-abundant) (choking channel)
Stability: (high) moderate, low not much movement because so much in channel

Large Woody Debris:
Quantity: scarce, occasional, common, (abundant) over-abundant (choking channel)
Stability: (high) moderate, low

Notes: - valley flat acts as a rip. zone

R1 zone:
- Tree cover 5% average overhang 0m (Fd, S)
- Shrub cover 80% " " 2m (cornus stol, Salix spp, yg S, Fd, alder, Ribes lac, Rosa spp, Raspberry, Juniper)
- Herb/Moss cover 20% " 0.05m (grasses, moss)

Banks same as above except herb cover 80% of bank lines

- All of R2 appears to have an over abundance of SWD
- Sighted a healthy black bear

Note - R1 - R3 Possibly in same condition, Recommend CCPA.

Helicopter Reach/Site Survey

	Reach	Site
Level of Disturbance:	H	L
Assessment Priority:	H	L

Ground-based Field Form 2 of 2:

Survey Location: FIFTYONE CK + HIGHWAY CROSSING (CLINTON CK) (B3:I) Reach 3

Date: 19/10/98 Crew: RK, CB Weather: cloudy + cool 5°C

Photos No 1) roll 2) exposure 3) location 4) notes

1. Existing Channel Disturbance (CD): (L,(M),H)
L = not detectable-slight; M = moderate; H = high-extreme (morphology obscured)
(Map code 1)

Disturbance Cause: Culvert @ highway appears too small and is sticking out of the inlet surface @ 45° angle. Sediment source here is "L" to "M"

2. Potential for future channel disturbance: (L,(M),H)
(as defined for Existing Channel Disturbance)

3. Restoration benefit: L,(M),H (average of degree of benefit, success, duration)

Degree of habitat benefit (L,M,H) L:marginal improvement likely, short length of channel; M: moderate improvement likely, moderate channel length affected; H: large improvement likely, long length of channel)

Type of habitat benefit, and description: (R,S,M)
(R=improved rearing habitat, S=improved spawning habitat, M=improved migration)

Unknown if upstream has restrictions to fish – this site is likely a barrier as culvert angle is too steep for fish + too narrow

potential for success: (L,M,H)

likely duration of effectiveness (<5 yrs; 5-20 yrs; >20 yrs)

4. Restoration cost (<$10,000; $10,000-$100,000; >$100,000)
(includes prescription and implementation)

5. Existing access: (fly; trail; road) HIGHWAY 97

6. Priority for Prescription: L,M,H (weighted average of factors 1-5) MOTH CONCERN
(Map code 2)

Restoration Options: MAY HAVE TO INSTALL NEW DRAINAGE + PASSAGE WITH. WILL NEED TO DETERMINE IF SITE WILL BENEFIT IN TERMS OF FISH PASSAGE

NOTES: There is marsh / Lake upstream of highway separated by one culvert (500mm c. INLET + OUTLET LOOK GOOD. Second culvert @ highway (500mm) has a screen @ inlet that covers ~ 50% upper half of the opening. The road fillslope is ~ 60%

Other Notes: "L" to "M" sed source - culvert is well vegetated with grasses

NOTE: outlet is definitely flowing but is covered by brush + hip rap - not exposed

Helicopter Reach/Site Survey

	Reach	Site
Level of Disturbance:	L	L
Assessment Priority:	L	M

Ground-based Field Form 2 of 2:

Survey Location: Clinton Ck Community Watershed B9.1

Date: 18/10/98 **Crew:** RK,CB **Weather:** Cloudy-cool 5°C

Photos 14 1) roll 3 2) exposure 100 3) location shooting west on Dam reservoir ~~not~~ outlet. 4) notes

1. Existing Channel Disturbance (CD): (L,M,H)
L = not detectable-slight; M = moderate; H = high-extreme (morphology obscured)
(Map code 1)

Disturbance Cause: Bank ravelling + exposed banks in reservoir. "L" sed. source

2. **Potential for future channel disturbance:** (L,M,H)
(as defined for Existing Channel Disturbance)

3. **Restoration benefit:** L,M,H (average of degree of benefit, success, duration)

Degree of habitat benefit (L,M,H) L:marginal improvement likely, short length of channel; M: moderate improvement likely, moderate channel length affected; H: large improvement likely, long length of channel)

Type of habitat benefit, and description: (R,S,M)
(R=improved rearing habitat, S=improved spawning habitat, M=improved migration)

potential for success: (L,M,H)

likely duration of effectiveness (<5 yrs; 5-20 yrs; >20 yrs)

4. **Restoration cost** (<$10,000; $10,000-$100,000; >$100,000)
(includes prescription and implementation)

5. **Existing access:** (fly; trail; road)

6. **Priority for Prescription:** L,M,H (weighted average of factors 1-5)
(Map code 2)

Restoration Options: Grass seed^ lake banks on fillslope of road crossing reservoir.
- minimal benefits to habitat or stream restoration however good idea for water intake

Other Notes: - Roads adjacent to stream + outlet near this location are minimal in terms of sediment sources (L-N).

Ground-based Field Form 1of 2:

Survey Location: CLINTON CK COMMUNITY WATERSHED (REP 9.1)

Date: 18/10/98 Crew: RK, CB Weather: NOTE CB is writing up Rep 8.1

Photos 14 1) roll 3 2) exposure 00 3)location looking west on Dam 4) notes

Width (W, in m) ~~1) Bankfull (Wb)~~ ~~2) Wetted (Ww)~~

Max. Depth (D, in m) 1) Bankfull (Db) 2) Wetted (Dw) LAKE/RESERVOIR.

Slope (S, in %) ~~1) Channel~~ ~~2) Side slopes (if incised)~~

Valley Flat (VF, in m) (at 2 times bankfull depth): N/A

Entrenchment ratio (VF/Wb): —

Profile morphology (using CAP terminology): LAKE

~~Channel Bed:~~ LAKE

Texture: ~~X~~%Z X%S ___%G ___%C ___%B ___%R Stability: stable, aggrading, degrading

~~Channel Banks:~~ LAKE

Texture: ___%Z X%S X %G ___%C ___%B ___%R Stability: high, moderate, low
(bank stability is the opposite of bank erosion potential)

Small Woody Debris:
Quantity: scarce, occasional, common, abundant, over-abundant (choking channel)
Stability: high, moderate, low N/A

Large Woody Debris:
Quantity: scarce, occasional, common, abundant, over-abundant (choking channel)
Stability: high, moderate, low N/A

Notes:

BANKS SURROUNDING RESERVOIR EXPOSED AT THE ROAD - SEE B9.1 SITE SED. SOURCE

- could use planting for stabilization + geotechnical erosion control ie. grass seed.

- NO CATTLE IMPACTS HERE
- HUMAN TRACKS - 4x4 * QUAD USE AREA.

OVERALL "M" Disturbance - probably "L" if it wasn't a community watershed.

Ground-based Field Form 2 of 2:

Survey Location: Clinton Ck Community watershed. - R10 - per helicopter + site inspection from R9

Date: 18/10/98 Crew: RK, CB Weather:

Photos 1) roll → NO 2) exposure 3) location 4) notes

1. **Existing Channel Disturbance (CD)**: (L,M,H)
L = not detectable-slight; M = moderate; H = high-extreme (morphology obscured)
(Map code 1)

Disturbance Cause: RIPARIAN DISTURBANCE + POSSIBLY CATTLE + ASSOCIATED CROSSINGS - likely in PRIVATE LAND ONLY

2. **Potential for future channel disturbance:** (L,M,H)
(as defined for Existing Channel Disturbance)

3. **Restoration benefit:** L,M,H (average of degree of benefit, success, duration)

Degree of habitat benefit (L,M,H) (L: marginal improvement likely, short length of channel; M: moderate improvement likely, moderate channel length affected; H: large improvement likely, long length of channel)

Type of habitat benefit, and description: (R,S,M)
(R=improved rearing habitat, S=improved spawning habitat, M=improved migration)

- R+S will Benefit with restoration

potential for success: (L,M,H)

likely duration of effectiveness (<5 yrs; 5-20 yrs; >20 yrs)

4. **Restoration cost** (<$10,000; $10,000-$100,000; >$100,000)
(includes prescription and implementation)

5. **Existing access:** (fly; trail; road)

6. **Priority for Prescription:** L,M,H (weighted average of factors 1-5)
(Map code 2)

Restoration Options: - FENCE - SOME FENCING ALREADY BUT SHOULD BE CHECKED + IMPROVED.
- PLANT MORE VEG to EXISTING Riparian Veg. - trees.

Other Notes:

Helicopter Reach/Site Survey

	Reach	Site
Level of Disturbance:	M	–
Assessment Priority:	M	–

Ground-based Field Form 1 of 2: *RK MODIFY REACH BREAK

Survey Location: FIFTY SEVEN CK REP 2.1 (RIFFLE)

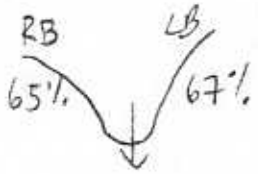
Date: Oct 19/98 Crew: CB\RK Weather: Cloudy

Photos 1) roll 3 2) exposure 12 3) location Iking W/S from Rep Site 4) notes

Width (W, in m) 1) Bankfull (Wb) 2.20 2) Wetted (Ww) 2.20

Max. Depth (D, in m) 1) Bankfull (Db) 0.62 2) Wetted (Dw) 0.22

Slope (S, in %) 1) Channel 9% 2) Side slopes (if incised)



Valley Flat (VF, in m) (at 2 times bankfull depth): incised

Entrenchment ratio (VF/Wb):

Profile morphology (using CAP terminology): CPclb (-w)

Channel Bed:
Texture: 0 %Z 20 %S 20 %G 40 %C 20 %B 0 %R Stability: (stable) aggrading, degrading

Channel Banks:
Texture: 0 %Z 15 %S 15 %G 40 %C 30 %B 2 %R Stability: (high) (moderate) low
(bank stability is the opposite of bank erosion potential)

Small Woody Debris:
Quantity: scarce, occasional, (common) abundant, over-abundant (choking channel)
Stability: high, (moderate), low

Large Woody Debris:
Quantity: scarce, occasional, (common), abundant, over-abundant (choking channel)
Stability: high (moderate) low

Notes:
- found fish ≈ 2" in length @ one of the pools.
- riparian zone natural, mature Forest - conifer
→ Tree cover 15% average overhang ~1m (Spruce)
→ Shrub cover 30% " " ~1m (Rosa, Cornus sto/alb, yg Spruce, Vaccinium)
→ Herb/Moss " 40% " " ~0.05m (grass, twinflower, moss)
- Along Banks Tree 15% Shrub 40% Herb 90%
(see above notes for overhang)
- moss on banks and boulders in ck.
- bedrk outcrop in places
- no cattle use seen below rd by ck.
- cattle droppings/tracks seen above rd.

NOTE - water box contains ≥ 50 m dls of Rep site. intake currently not in use however box structure appears to be obstruction to fish.

~~Ground-based~~ Field Form 2 of 2:
HELICOPTER-VIDEO BASED

Survey Location: Reach 3 + 4 of FIFTY SEVEN CK

Date: 19/11/98 Crew: AK, CB Weather:

Photos 1) roll 2) exposure 3) location 4) notes

1. Existing Channel Disturbance (CD): (L,M,(H))
L = not detectable-slight; M = moderate; H = high-extreme (morphology obscured)
(Map code 1)

Disturbance Cause: Logged / FARMED RIPARIAN ZONE + BATTLE IN CHANNEL

2. Potential for future channel disturbance: (L,M,(H))
(as defined for Existing Channel Disturbance)

3. Restoration benefit: L,M,(H) (average of degree of benefit, success, duration)

Degree of habitat benefit (L,M,(H)) L:marginal improvement likely, short length of channel; M: moderate improvement likely, moderate channel length affected; H: large improvement likely, long length of channel)

Type of habitat benefit, and description: (R,S,M)
(R=improved rearing habitat, S=improved spawning habitat, M=improved migration)

All will benefit - R + S gravels appear adequate +
M will benefit to some degree - check crossings for blockages along farm yards

potential for success: (L,M,(H))

likely duration of effectiveness (<5 yrs; (5-20 yrs); >20 yrs)

4. Restoration cost ((<$10,000); $10,000-$100,000; >$100,000)
(includes prescription and implementation)

5. Existing access: (fly; trail; (road))

6. Priority for Prescription: L,M,(H) (weighted average of factors 1-5)
(Map code 2)

Restoration Options:

① Fence creek
② plant riparian species (native) all types - grasses shrubs + trees
③ armour fords for cattle at drinking areas.

Other Notes:

Helicopter Reach/Site Survey

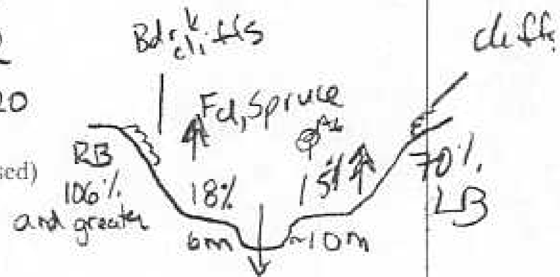
	Reach	Site
Level of Disturbance:	M	–
Assessment Priority:	M	–

Ground-based Field Form 1of 2: (at end of riffle beginning of pool)

Survey Location: FIFTYSEVEN CK Rep 5.1 ~50m d/s of RR xing

Date: Oct 19/98 **Crew:** CB/RK **Weather:** sunny w clouds

Photos 1) roll 3 2) exposure 7 3)location lking w/s at Rep Site 4) notes close to typical ch still impacted by sed.



Width (W, in m) 1) Bankfull (Wb) 2.3 2) Wetted (Ww) 1.2

Max. Depth (D, in m) 1) Bankfull (Db) 0.60 2) Wetted (Dw) 0.20

Slope (S, in %) 1) Channel 4% 2) Side slopes (if incised)

Valley Flat (VF, in m) (at 2 times bankfull depth): 19

Entrenchment ratio (VF/Wb): 19/2.3

Profile morphology (using CAP terminology): RP (-w)

Channel Bed:
Texture: 0 %Z 30 %S 35 %G 25 %C 10 %B 0 %R Stability: stable, (aggrading), degrading

Channel Banks:
Texture: 0 %Z 35 %S 30 %G 25 %C 10 %B 0 %R Stability: high, (moderate), low
(bank stability is the opposite of bank erosion potential)

Small Woody Debris:
Quantity: scarce, occasional, common, (abundant), over-abundant (choking channel)
Stability: high, (moderate), (low)

Large Woody Debris:
Quantity: scarce, occasional, (common), abundant, over-abundant (choking channel)
Stability: high, (moderate), low

Notes: - Riparian Zone Natural MFc snags in forest

Tree cover 40% Banks 20% ave. overhang ~1m (Fd, At, S

Shrub cover 40% Banks 40% " " ~1.5m (Cornus stol, Ribes bc, S, Alder, Fd) ~0.02

Moss/Herb cover 50% " 90% " "
(bunchberry, grass, 45% mosses)

Canopy closure over ck. 50%.

* - Channel is moderately disturbed by RR xing.

- Fish seen in pool just d/s of culvert outlet and w/s of rep site, and at rep site, 4" long white on fins

* - Water is not clear contains sediment

- slope d/s of RR xing could be planted w Fd, Py, Kinnickinnik, fungrass grass at a time where there is enough moisture for seeds to germinate

- slope ~15% revegetated.

Ground-based Field Form 2 of 2:

Survey Location: Reach 5 (whole reach)

Date: 19/10/98 Crew: RK, CB Weather:

Photos 1) roll 2) exposure 3) location 4) notes

↳ See Rep Sites

1. Existing Channel Disturbance (CD): (L,M,H)
L = not detectable-slight; M = moderate; H = high-extreme (morphology obscured)
(Map code 1)

Disturbance Cause: BC RAIL Crossing is suspect to adding significant sediment in channel to affect entire reach.

2. Potential for future channel disturbance: (L,M,H)
(as defined for Existing Channel Disturbance)

3. Restoration benefit: L,M,H (average of degree of benefit, success, duration)

Degree of habitat benefit (L,M,H) L: marginal improvement likely, short length of channel; M: moderate improvement likely, moderate channel length affected; H: large improvement likely, long length of channel)

Type of habitat benefit, and description: (R,S,M)
(R=improved rearing habitat, S=improved spawning habitat, M=improved migration)

Migration would benefit - not good R+S for reach

potential for success: (L,M,H)

likely duration of effectiveness (<5 yrs; 5-20 yrs; >20 yrs)

4. ~~Restoration cost~~ CCPA (<$10,000; $10,000-$100,000; >$100,000)
(includes prescription and implementation)

5. Existing access: (fly; trail; road)

6. Priority for ~~Prescription~~ CCPA: L,M,H (weighted average of factors 1-5)
(Map code 2)

Restoration Options:

Inspect whole Reach 5 for sediment accumulations as a result of BC RAIL Sed. source site.

Other Notes: FISH ARE PRESENT HERE - POSSIBLY BROOK TROUT.

Helicopter Reach/Site Survey

	Reach	Site
Level of Disturbance:	M	H
Assessment Priority:	M	H

Ground-based Field Form 2 of 2:

Survey Location: 57 CREEK BELOW RAILWAY crossing Reach 5 S5.1

Date: 19/10/98 **Crew:** RK, CB **Weather:** clear + cool 8°C

Photos 9 1) roll 3 2) exposure 100 3) location D/s pond of concrete outlet 4) notes P11 - shooting east on LB hillslope - exposed clay formations
8 concrete outlet
P10 - shooting west on d/s fillslope of train crossing - note rivelling + surface erosion

1. Existing Channel Disturbance (CD): (L,M,H)
L = not detectable-slight; M = moderate; H = high-extreme (morphology obscured)
(Map code 1)

Disturbance Cause: RAILWAY crossing steep fillslope consisting of clay 10%, sand 50, gravel 30 boulders + cobbles 10 eroding via surface into outlet - "H" sed source here.
fillslope gradient = 39 - 70 % (see diagram)

2. **Potential for future channel disturbance:** (L,M,H)
(as defined for Existing Channel Disturbance)

3. **Restoration benefit:** L,M,H (average of degree of benefit, success, duration)

Degree of habitat benefit (L,M,H) L: marginal improvement likely, short length of channel; M: moderate improvement likely, moderate channel length affected; H: large improvement likely, long length of channel)

Type of habitat benefit, and description: (R,S,M)
(R=improved rearing habitat, S=improved spawning habitat, M=improved migration)

located ≈ 12 (brook trout ??) in outlet pond @ base of large concrete culvert - culvert itself looks good fish are stranded in pool due to incoming sediment clogged + debris SWD + man-made planks 2x4's etc This pond should not exist here. Normal conditions would dictate CP/B morphology

potential for success: (L,M,H)

likely duration of effectiveness (<5 yrs; 5-20 yrs; >20 yrs)

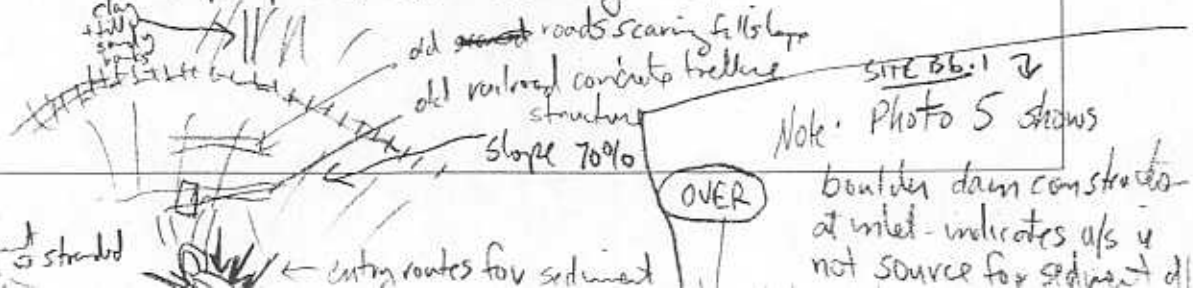
4. **Restoration cost** (<$10,000; $10,000-$100,000; >$100,000)
(includes prescription and implementation)

5. **Existing access:** (fly; trail, road) + railroad

6. **Priority for Prescription:** L,M,H (weighted average of factors 1-5) only because it is BC Rail responsibility "H" if it were forestry related.
(Map code 2)

Restoration Options: By hand - clean out sediment with shovels. its very unstable + can easily be excavated by hand shovels.
- Stabilize banks by planting cottonwoods + grass seed + fertilize railway fillslopes.
- Toe enforcements + rip rap are not necessary here.

Other Notes:



SITE 66.1 ↓
Note: Photo 5 shows boulder dam constructed at inlet - indicates d/s is not source for sediment

OVER

Helicopter Reach/Site Survey

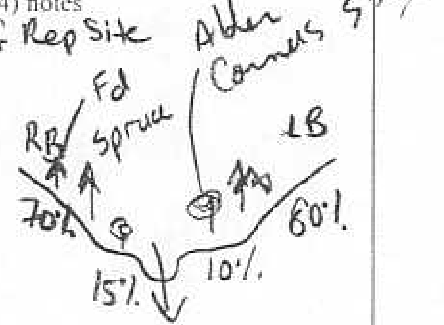
	Reach	Site
Level of Disturbance:	m	—
Assessment Priority:	m	—

Ground-based Field Form 1of 2: (RIFFLE)

Survey Location: Rep 6.1 FIFTYSEVEN CK ~100-150 m u/s of RR xing

Date: Oct 19/98 Crew: CB\RK Weather: Sunny

Photos 1) roll 3 2) exposure 6 3) location lking d/s ~80 m u/s of Rep Site 4) notes



Width (W, in m) 1) Bankfull (Wb) 2.7 2) Wetted (Ww) 0.90

Max. Depth (D, in m) 1) Bankfull (Db) 0.32 2) Wetted (Dw) 0.08

Slope (S, in %) 1) Channel 2% 2) Side slopes (if incised)

Valley Flat (VF, in m) (at 2 times bankfull depth): ~10 m

Entrenchment ratio (VF/Wb): 10/2.7

Profile morphology (using CAP terminology): RP (-w)

Channel Bed:
Texture: 0 %Z 15 %S 57 %G 20 %C 8 %B 0 %R Stability: stable, (aggrading), degrading

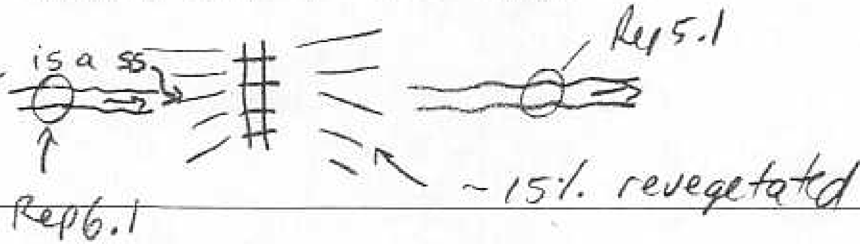
Channel Banks:
Texture: 0 %Z 44 %S 22 %G 25 %C 8 %B 0 %R Stability: high, (moderate), low
(bank stability is the opposite of bank erosion potential)

Small Woody Debris:
Quantity: scarce, occasional, common, (abundant), over-abundant (choking channel)
Stability: high, (moderate), (low)

Large Woody Debris:
Quantity: scarce, occasional, common, (abundant), over-abundant (choking channel)
Stability: high, (moderate), low

Notes: - Ch. incised between a terrace
- Riparian Zone similar to Rep Site 5.1 - scouring rush also seen
- Periodic sections of sand + gravel (stable)
- dam just u/s of RR xing (wood boards) -
- fish seen above dam. - see Rep Site 5.1 notes and FORM 2 of 2 for R.6

- Slope is a SS



- slope ~15% revegetated Yg spruce, Fd, Pl growing on slope
- erosion ch ~0.3 m deep

Helicopter Reach/Site Survey

	Reach	Site
Level of Disturbance:	M	M
Assessment Priority:	M	L-M

Ground-based Field Form 2 of 2:

Survey Location: B6.1 u/s of railway crossing of "57 Creek"

Date: 19/10/98 Crew: RK, CB Weather: clear - cool

Photos 5 1) roll 3 2) exposure 00 3) location 57 Creek 4) notes

1. Existing Channel Disturbance (CD): (L,(M),H)
L = not detectable-slight; M = moderate; H = high-extreme (morphology obscured)
(Map code 1)

Disturbance Cause: Old man-made dam structure has collapsed and is clogging between boulders right@ inlet of railway crossing

2. Potential for future channel disturbance: (L,(M),H)
(as defined for Existing Channel Disturbance)

3. Restoration benefit: L,(M),H (average of degree of benefit, success, duration)

Degree of habitat benefit (L,(M),H) L:marginal improvement likely, short length of channel; M: moderate improvement likely, moderate channel length affected; H: large improvement likely, long length of channel)

Type of habitat benefit, and description: (R,S,(M))
(R=improved rearing habitat, S=improved spawning habitat, M=improved migration)

- Several "4" size fish spotted in pools u/s of site and @ inlet pool.

potential for success: (L,M,(H))

likely duration of effectiveness (<5 yrs; (5-20 yrs); >20 yrs)

4. Restoration cost ((<$10,000); $10,000-$100,000; >$100,000)
(includes prescription and implementation)

5. Existing access: (fly; trail;(road)) Railroad + road leading to railroad

6. Priority for Prescription: L,(M),H (weighted average of factors 1-5)
(Map code 2)

Restoration Options: Remove old dam material and restore channel to natural conditions.
- leave large boulders @ inlet - doesn't appear to be fish passage blockage.

Other Notes:

Ground-based Field Form 2 of 2:

Survey Location: Reaches 6-9 FIFTY SEVEN CREEK

Date: 19/10/98 Crew: RK/CB Weather:

Photos NO 1) roll 2) exposure 3) location 4) notes

1. Existing Channel Disturbance (CD): (L,M,H)
L = not detectable-slight; M = moderate; H = high-extreme (morphology obscured)
(Map code 1)

Disturbance Cause: HEAVILY DEVELOPED AREA WITH HIGHWAY + ROADSIDE/CREEK SIDE LOTS. NO RIPARIAN VEGETATION ON AT LEAST ONE BANK + MANY SECTIONS WITH BOTH BANKS CLEARED

2. Potential for future channel disturbance: (L,M,H)
(as defined for Existing Channel Disturbance)

3. Restoration benefit: L,M,H (average of degree of benefit, success, duration)

Degree of habitat benefit (L,M,H) L:marginal improvement likely, short length of channel; M: moderate improvement likely, moderate channel length affected; H: large improvement likely, long length of channel)

Type of habitat benefit, and description: (R,S,M)
(R=improved rearing habitat, S=improved spawning habitat, M=improved migration)

- LIKELY OPTIMAL R+S REACH SECTIONS (Bed textures are optimal gravels for spawning.

potential for success: (L,M,H)

likely duration of effectiveness (<5 yrs; 5-20 yrs; >20 yrs)

4. Restoration cost (<$10,000; $10,000-$100,000; >$100,000)
(includes prescription and implementation)

5. Existing access: (fly; trail; road)

6. Priority for Prescription: L,M,H (weighted average of factors 1-5)
(Map code 2)

Restoration Options: ① FENCE OFF ^ BOTH BANKS

② PLANT NATIVE GRASSES, SHRUBS + TREES.

③ ARMOUR FORDS FOR DOMESTIC LIVESTOCK WATERING PONDS.

Other Notes:

- OBSERVATIONS MADE FROM HIGHWAY + INSPECTION LOOKING D/S AT REP 10.1 11

Helicopter Reach/Site Survey

	Reach	Site
Level of Disturbance:	4	—
Assessment Priority:	4	—

Ground-based Field Form 1of 2:

Survey Location: FIFTYSEVEN (RIFFLE) Rep 10.1 ~150m u/s of Hydro Lines

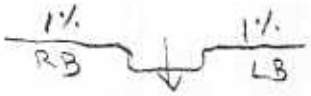
Date: Oct. 19/98 Crew: CB/RK Weather: Sunny

Photos 1) roll 3 2) exposure 4 3)location looking u/s at Rep site 4) notes

Width (W, in m) 1) Bankfull (Wb) 2.75 2) Wetted (Ww) 2.35

Max. Depth (D, in m) 1) Bankfull (Db) 0.57 2) Wetted (Dw) 0.14

Slope (S, in %) 1) Channel 5% 2) Side slopes (if incised)



Valley Flat (VF, in m) (at 2 times bankfull depth): check map

Entrenchment ratio (VF/Wb):

Profile morphology (using CAP terminology): RP (-w)

Channel Bed:
Texture: 22%Z 30%S 10%G 30%C 5%B 0%R Stability: stable, aggrading, degrading (cattle use)

Channel Banks:
Texture: 30%Z 55%S 4%G 3%C 8%B 0%R Stability: high, moderate, low
(bank stability is the opposite of bank erosion potential) - high organic content -black soil

Small Woody Debris:
Quantity: scarce, occasional, common, abundant, over-abundant (choking channel)
Stability: high, moderate, low

Large Woody Debris:
Quantity: scarce, occasional, common, abundant, over-abundant (choking channel)
Stability: high, moderate, low none observed in channel, but lg trees do exist in riparian zone

Notes: RIPARIAN BUFFER - wetland area extends 10-20m either side of channel
-natural, low lying wetland area

Tree Cover 20%. banks 20%. average overhang ~0.5m (Spruce)(A
Shrub Cover 35%. banks 45%. " " ~2m (Salix spp
Moss/Herb Cover 60%. banks 90%. average overhang 0.02cm
(sedge and moss and grass)
-canopy closure 50%.

* IMPACTS
- cattle have ~~moderately~~ to highly impacted ch.
-Channel widening taken place throughout reach herbaceous cover grazed and valley flat mucky full of cow tracks

* water murky slightly more than at Rep Sites 5.1 & 6.1

Rip zone impacted low at Rep site d/s ring zone highly impacted (field)

Helicopter Reach/Site Survey

	Reach	Site
Level of Disturbance:	H	H
Assessment Priority:	H	H

Ground-based Field Form 2 of 2:

Survey Location: FIFTYSEVEN (57) CREEK - Whole Reach 10 is highly disturbed

Date: 9/10/98 Crew: RK, CB Weather: Cleary - cool 10°C

Photos 2,3 1) roll 3 2) exposure 100 3) location 3 shooting u/s 4) notes along reach b/w crossing + Rep site 2 shooting d/s on east d/s of crossing (note bit of decids in riparian

1. Existing Channel Disturbance (CD): (L,M,(H))
L = not detectable-slight; M = moderate; H = high-extreme (morphology obscured)
(Map code 1)

Disturbance Cause: CATTLE ENTRY INTO ERODIBLE, SILTY-SANDY BANKS + Bed. Channel has Basaltic boulders + cobble in periodic sections but mainly erodible silty sandy loam. Crossing is sed source however so is entire reach.

2. Potential for future channel disturbance: (L,M,(H))
(as defined for Existing Channel Disturbance)

3. Restoration benefit: L,(M),H (average of degree of benefit, success, duration)

Degree of habitat benefit (L,M,(H)) L:marginal improvement likely, short length of channel; M: moderate improvement likely, moderate channel length affected; H: large improvement likely, long length of channel)

Type of habitat benefit, and description: ((R),S,M)
(R=improved rearing habitat, S=improved spawning habitat, M=improved migration)

* - ~~no fish seen~~, water is murky. definitely quality is contaminated due to impacted bed + banks as well as fecal matter introduced to channel
* - fish found d/s of crossing.

potential for success: (L,M,(H))

likely duration of effectiveness (<5 yrs; (5-20 yrs); >20 yrs)

4. Restoration cost (<$10,000; ($10,000-$100,000; >$100,000)
(includes prescription and implementation)

5. Existing access: (fly; trail; (road))

6. Priority for Prescription: L,M,(H) (weighted average of factors 1-5)
(Map code 2)

Restoration Options:

- Clearly need to remove cattle from riparian sections of channel. Fencing will ensure this + ford/armored crossing will allow watering sections.
- Repair planting of trees below the road crossing is needed.

Other Notes:

Helicopter Reach/Site Survey

	Reach	Site
Level of Disturbance:	M	M
Assessment Priority:	H	H

Ground-based Field Form 2 of 2:

Survey Location: REACH 23 of FIFTY-SEVEN CK.

Date: 23/10/98 **Crew:** RK, CB **Weather:** cool-clear 10°C

Photos 27 1) roll Fuji 2) exposure 25 → 3) location looking d/s ←23+24 on private property 4) notes

1. Existing Channel Disturbance (CD): (L,M,H)
L = not detectable-slight; M = moderate; H = high-extreme (morphology obscured)
(Map code 1)

Disturbance Cause: Streamside Farm + cattle use especially on the d/s side of culvert (LB). Rb is road + some brush.
- obvious cattle impacts. Cattle are fenced in @ road
- impacts look less severe than R25

2. **Potential for future channel disturbance:** (L,M,H)
(as defined for Existing Channel Disturbance)

3. **Restoration benefit:** L,M,H (average of degree of benefit, success, duration)

Degree of habitat benefit (L,M,H) L:marginal improvement likely, short length of channel; M: moderate improvement likely, moderate channel length affected; H: large improvement likely, long length of channel)

Type of habitat benefit, and description: (R,S,M)
(R=improved rearing habitat, S=improved spawning habitat, M=improved migration)

SAME AS MOST SITES IN BONAPARTE STUDY AREA.
Intense Agro-Farm-Range use.
- Migration may be affected also

potential for success: (L,M,H)

likely duration of effectiveness (<5 yrs; 5-20 yrs; >20 yrs)

4. **Restoration cost** (<$10,000; $10,000-$100,000; >$100,000)
(includes prescription and implementation)

5. **Existing access:** (fly; trail; road)

6. **Priority for Prescription:** L,M,H (weighted average of factors 1-5)
(Map code 2)

Restoration Options: FENCE + CREATE GAPS WITH ARMOUR (FORD CROSSINGS) TO REDUCE BANK INSTABILITY + EROSION.
- Plant Riparian veg such as brush alder + Herbs + grasses.
- RESTORATION APPLIES TO ALL PRIVATE LAND D/S OF CROSSING.

Other Notes:
- U/S "M" IMPACTS HOWEVER RIPARIAN IS IMPROVED TO A CERTAIN EXTENT

NOTE - CHANNEL IS ENTRENCHED IN 1 M HIGH BANKS DIRECTLY D/S THEREFORE OBVIOUS AGGRADATION + CHANGES TO CHANNEL ARE LESS APPARENT

Helicopter Reach/Site Survey

	Reach	Site
Level of Disturbance:	M	—
Assessment Priority:	H	—

Ground-based Field Form 1of 2:

Survey Location: FIFTYSEVEN CK Reach 23 Rep 23.1 (RIFFLE) u/s of Big Bar Rd xing by ~75m

Date: Oct 23/98 Crew: CB\RK Weather: Sunny

Photos 1) roll 6 (FUJI) 2) exposure 26 3)location 1king u/s 4) notes

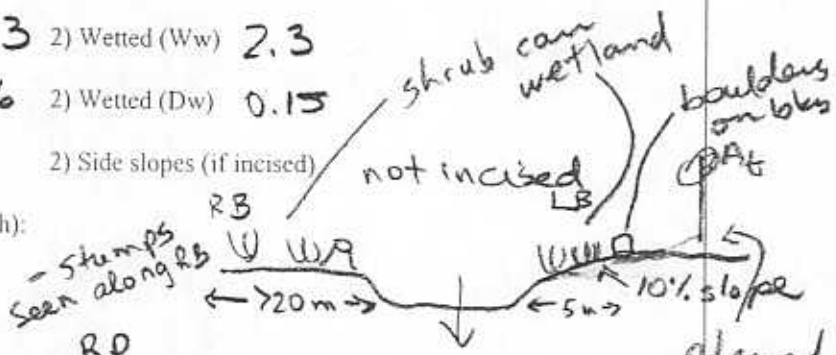
Width (W, in m) 1) Bankfull (Wb) 2.3 2) Wetted (Ww) 2.3

Max. Depth (D, in m) 1) Bankfull (Db) .36 2) Wetted (Dw) 0.15

Slope (S, in %) 1) Channel 2% 2) Side slopes (if incised)

Valley Flat (VF, in m) (at 2 times bankfull depth): check map

Entrenchment ratio (VF/Wb):



Profile morphology (using CAP terminology): RP

Channel Bed:
Texture: 0 %Z 10 %S 10 %G 75 %C 5 %B 0 %R Stability: stable, (aggrading) degrading

Channel Banks:
Texture: 40 %Z 45 %S 5 %G 5 %C 5 %B 0 %R Stability: high, (moderate) (low)
(bank stability is the opposite of bank erosion potential) high organics

Small Woody Debris:
Quantity: scarce, (occasional) (common) abundant, over-abundant (choking channel)
Stability: high, moderate, (low)

Large Woody Debris:
Quantity: (scarce) occasional, common, abundant, over-abundant (choking channel)
Stability: high, moderate, low none seen lack of riparian deciduous trees

Notes:

IMPACTS "M"
- cattle grazing banks and trampling banks
- lack of LWD due to land clearing on Left bank and logging on RB
- Thistle invading LB
RIP ZONE. -1 stump on LB chewed by beaver seen while doing survey

CC over ck. 2%

T: 0%

(willow) S: 10% banks, ah 0.10m, rip zone cover RB 30%, LB 30%

(sedge) H: 95% banks, ah 0.10m, " " " 70%

Helicopter Reach/Site Survey

	Reach	Site
Level of Disturbance:	M	H
Assessment Priority:	H	H

Ground-based Field Form 2 of 2:

Survey Location: REACH 23 FIFTY-SEVEN CK. B23.1

Date: 23/10/98 Crew: RK, CB Weather:

Photos 25 1) roll FUJI 2) exposure – 3) location looking south @ culvert inlet 4) notes

1. **Existing Channel Disturbance (CD)**: (L,M,(H))
L = not detectable-slight; M = moderate; H = high-extreme (morphology obscured)
(Map code 1) "H" sed source site right at the inlet.

Disturbance Cause: TRAMPLED BANKS + AND EXTENDING CATTLE USE OF POND U/S OF CULVERT INLET
- Road fillslope is also providing some sediment input to the channel.

2. **Potential for future channel disturbance**: (L,(M),H)
(as defined for Existing Channel Disturbance)

3. **Restoration benefit**: L,M,(H) (average of degree of benefit, success, duration)

Degree of habitat benefit ((L),M,H) L: marginal improvement likely, short length of channel; M: moderate improvement likely, moderate channel length affected; H: large improvement likely, long length of channel)

Type of habitat benefit, and description: ((R),(S),M)
(R=improved rearing habitat, S=improved spawning habitat, M=improved migration)

- R+S AS JUVAL WILL BENEFIT FROM RESTORING INLET THROUGH HERE. REDUCE SEDIMENT + CHANNEL WILL BE GOOD HABITAT

potential for success: (L,(M),H)

likely duration of effectiveness ((<5 yrs); 5-20 yrs; >20 yrs)

4. **Restoration cost** ((<$10,000); $10,000-$100,000; >$100,000)
(includes prescription and implementation)

5. **Existing access**: (fly; trail; (road))

6. **Priority for Prescription**: L,(M),H (weighted average of factors 1-5)
(Map code 2)

Restoration Options: ① Apply cobble + gravel material to inlet banks + sections immediately u/s of here.
② FENCE OF AREAS U/S – SEE REACH 23 WRITE-UP OF RESTORATION TOWARDS PRIVATE LAND SITE.

Other Notes:

Bed + banks - erodible. Bed are gravel + sand with ~ 10% boulder 20% cobble.

Banks are ~ 70% 30% silt + organics

Helicopter Reach/Site Survey

	Reach	Site
Level of Disturbance:	M	
Assessment Priority:	M	

Ground-based Field Form 1of 2: CHASM SUB-BASIN

Survey Location: Sixty One Ck ~ 50m u/s of culvert Rep 6.1

Date: Oct 19/98 Crew: CB/AK Weather: Sunny

Photos 1) roll 4 2) exposure 21 3)location looking U/S of Rep site 4) notes

Width (W, in m) 1) Bankfull (Wb) 0.70 2) Wetted (Ww) 0.52

Max. Depth (D, in m) 1) Bankfull (Db) 0.53 2) Wetted (Dw) 0.30

Slope (S, in %) 1) Channel 1% 2) Side slopes (if incised)

Valley Flat (VF, in m) (at 2 times bankfull depth): check map

Entrenchment ratio (VF/Wb):

Profile morphology (using CAP terminology): RP

Channel Bed:
Texture: 50 %Z 50 %S 0 %G 0 %C 0 %B 0 %R Stability: (stable) aggrading, degrading
high organic matter

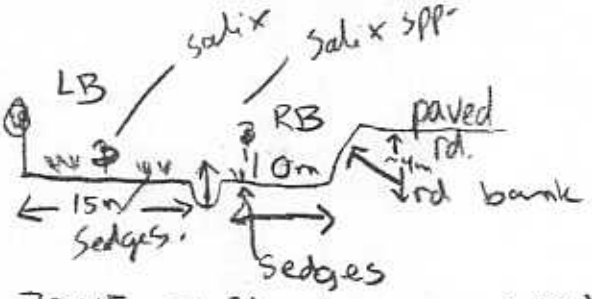
Channel Banks:
Texture: 50 %Z 50 %S 0 %G 0 %C 0 %B 0 %R Stability: high, (moderate) low
(bank stability is the opposite of bank erosion potential) high org. matter

Small Woody Debris:
Quantity: scarce, (occasional), common, abundant, over-abundant (choking channel)
Stability: high, (moderate), low

Large Woody Debris:
Quantity: (scarce), occasional, common, abundant, over-abundant (choking channel)
Stability: high, moderate, low none observed

Notes: IMPACTS

Paved Rd ~ 15 m from channel.



RIPARIAN ZONE - shrub carr wetland, appears natural

Tree	0% cover,	banks 0%,	ave. overhang	0m
Shrub	25% "	" 25%,	" "	~1m
Herb	95% "	" 95%,	" "	~0.4m

~~canopy~~ closure 60% (mostly sedge cover)

culvert 900mm

Helicopter Reach/Site Survey

	Reach	Site
Level of Disturbance:	L	L
Assessment Priority:	L	L

Ground-based Field Form 2 of 2:

Survey Location: CHASM CK. SIXTY ONE CK SITE 57.2 (NOTE- ARC SITE)

Date: Oct 19, 1998 Crew: RK, CB Weather: SUNNY

Photos NO 1) roll NO 2) exposure NO 3) location NO 4) notes NO

1. Existing Channel Disturbance (CD): (L,(M),H)
L = not detectable-slight; M = moderate; H = high-extreme (morphology obscured)
(Map code 1)

Disturbance Cause: ROAD ADJACENT TO ~~LAKE (DRY)~~ - CREATES FILLSLOPE SED SOURCE.
- LAKE IS DRY + UNCONNECTED

2. Potential for future channel disturbance: (L,M,H)
(as defined for Existing Channel Disturbance)

3. Restoration benefit (L,M,H (average of degree of benefit, success, duration)

Degree of habitat benefit (L,M,H) L:marginal improvement likely, short length of channel; M: moderate improvement likely, moderate channel length affected; H: large improvement likely, long length of channel)

Type of habitat benefit, and description: (R,S,M)
(R=improved rearing habitat, S=improved spawning habitat, M=improved migration)

- INTRODUCTION OF SEDIMENT FROM ROAD INTO CHANNEL

potential for success: (L,M,H)

likely duration of effectiveness (<5 yrs; 5-20 yrs; >20 yrs)

4. Restoration cost (<$10,000; $10,000-$100,000; >$100,000)
(includes prescription and implementation)

5. Existing access: (fly; trail; road)

6. Priority for Prescription: (L,M,H (weighted average of factors 1-5)
(Map code 2)

Restoration Options:

VEGETATE FILLSLOPE - CURRENTLY UNVEGETATED ≈ 50%
- POSSIBLE HYDRO OR DRY SEED PRESCRIPTION - UNSURE IF LAKE/POND IS CONNECTED - VERY LOW PRIORITY

Other Notes:

Helicopter Reach/Site Survey

Reach Site

Level of Disturbance:
Assessment Priority: NOT FLOWN

Ground-based Field Form 1of 2: CHASM SUBBASIN

Survey Location: FIFTYNINE CK REP 2.1 u/s of rd. xing and RR tracks

Date: Oct 19/98 Crew: CB/RK Weather: sunny

Photos 1) roll 4 2) exposure 18 3)location 1 xing u/s at 59 ck above rd xing 4) notes

distances approx. from behind property fence

Width (W, in m) 1) Bankfull (Wb) 1.0 2) Wetted (Ww) 0.9

Max. Depth (D, in m) 1) Bankfull (Db) 0.5 2) Wetted (Dw) 0.3

Slope (S, in %) 1) Channel 1% 2) Side slopes (if incised)

Valley Flat (VF, in m) (at 2 times bankfull depth): check map

Entrenchment ratio (VF/Wb):

Profile morphology (using CAP terminology): RP

textures approx. from behind property fence

Channel Bed:
Texture: 50 %Z 50 %S 0 %G 0 %C 0 %B 0 %R Stability: stable, aggrading, degrading

Channel Banks:
Texture: 50 %Z 50 %S 0 %G 0 %C 0 %B 0 %R Stability: high, moderate, low
(bank stability is the opposite of bank erosion potential)

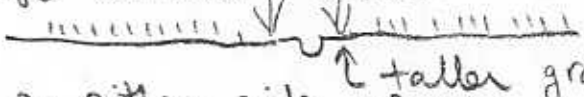
Small Woody Debris:
Quantity: (scarce) occasional, common, abundant, over-abundant (choking channel)
Stability: high, moderate, low none observed

Large Woody Debris:
Quantity: (scarce) occasional, common, abundant, over-abundant (choking channel)
Stability: high, moderate, low none observed

Notes:

RIPARIAN:
Tree 0%
Shrub 0%
Herb 98%, reed canarygrass along banks
ave. overhang 0.3m
closure over ch. 30%

IMPACTS:
rip. zone cleared for pasture horse in field
some areas of field dom. by sedge. impact medium, may have been a sedge wetland before.



↑ taller grass by ck. 2-5m wide on either side of ck.

* Channel Similar to Rep 6.1 on Sixtyone Ck; however, riparian zone has been cleared for pasture at this site and Rep 6.1 on 61 Ck appeared to be a nat. wetland.

Helicopter Reach/Site Survey

Reach Site
Level of Disturbance:
Assessment Priority: NOT FLOWING

Ground-based Field Form 2 of 2:

Survey Location: CHASM SB - 59 ck Reach 2 (

Date: 19/10/98 Crew: RK, CB Weather: Clear - cool

Photos 16,17,18 1) roll 4 2) exposure 100 3) location 18: u/s @ culvert 4) notes
+ HORSE
17 = Colleen - u/s + horses
16 = d/s of railroad tracks

1. Existing Channel Disturbance (CD): (L,(M),H)
L = not detectable-slight; (M) = moderate; H = high-extreme (morphology obscured)
(Map code 1)

Disturbance Cause: Riparian logging. Channel is dry d/s - unknown if it is usually subsurface but is definitely now. Sediment sources are low through here - due to Road fillslopes + cattle + Domestic animal creek use

2. Potential for future channel disturbance: (L,(M),H)
(as defined for Existing Channel Disturbance)

3. Restoration benefit: L,(M),H (average of degree of benefit, success, duration)

Degree of habitat benefit (L,M,(H)) - if fish normally present
L: marginal improvement likely, short length of channel; M: moderate improvement likely, moderate channel length affected; H: large improvement likely, long length of channel)

Type of habitat benefit, and description: ((R),(S),(M)) All of the above
(R=improved rearing habitat, S=improved spawning habitat, M=improved migration)

- Channel is dry below railroad tracks - farmland - range use is "M"
- u/s of road there is flow but very difficult to determine if fish are present. (Possibly)

potential for success: (L,(M),H)

likely duration of effectiveness (<5 yrs; (5-20 yrs); >20 yrs)

4. Restoration cost (<$10,000; ($10,000-$100,000); >$100,000)
(includes prescription and implementation)

5. Existing access: (fly; trail; (road))

6. Priority for Prescription (L),(M),H (weighted average of factors 1-5)
(Map code 2)

Restoration Options: - Fence creek + riparian plant -
- Possibly install gaps in fence to allow cattle + horse use.

Other Notes:

Helicopter Reach/Site Survey

	Reach	Site
Level of Disturbance:		
Assessment Priority:	NOT FLOWN	

Ground-based Field Form 1 of 2: CHASM SUB-BASIN

Survey Location: FIFTYNINE CK just d/s of HWY 97 by 15m in front of fence Rep Site 8.1

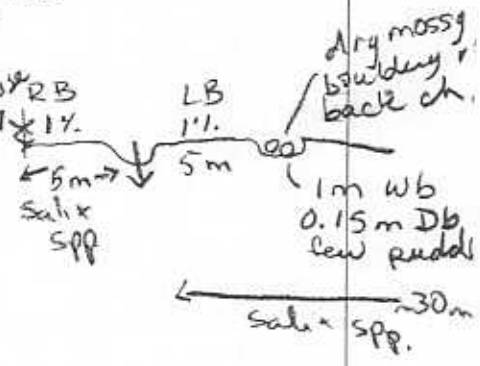
Date: Oct 19/98 **Crew:** CB/RK **Weather:** SUNNY

Photos 1) roll 4 2) exposure 22 3) location looking d/s at rep site 4) notes

Width (W, in m) 1) Bankfull (Wb) 1.80 2) Wetted (Ww) 1.15

Max. Depth (D, in m) 1) Bankfull (Db) 0.42 2) Wetted (Dw) 0.12

Slope (S, in %) 1) Channel 2% 2) Side slopes (if incised)



Valley Flat (VF, in m) (at 2 times bankfull depth): check map

Entrenchment ratio (VF/Wb):

Profile morphology (using CAP terminology): RP

Channel Bed:
Texture: 5 %Z 60 %S 10 %G 20 %C 5 %B 0 %R Stability: (stable), aggrading, degrading

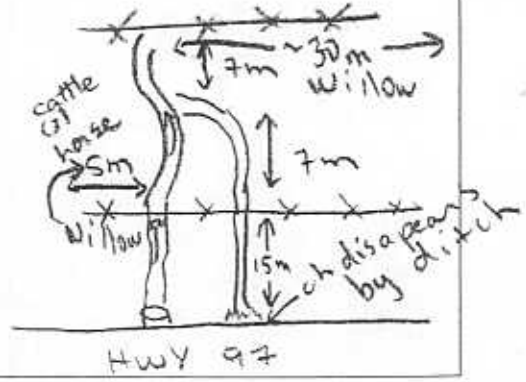
Channel Banks:
Texture: 20 %Z 25 %S 15 %G 30 %C 10 %B 0 %R Stability: high, (moderate), low
(bank stability is the opposite of bank erosion potential) cattle grazing along ck d/s of fence - sm. hobbing 13 acres

Small Woody Debris:
Quantity: scarce, occasional, (common), abundant, over-abundant (choking channel)
Stability: high, (moderate), low

Large Woody Debris:
Quantity: (scarce), occasional, common, abundant, over-abundant (choking channel)
Stability: high, moderate, low none observed,

Notes: Riparian Zone

- Tree 0%.
- Shrub 40% cover, banks 50%, average overhang ~ 1.5m (Salix spp)
- Herb/moss 80% cover, banks 95%, " ~ 0.02m (Grass, Sedge, Moss)
  moss on some boulders in banks
  canopy closure over ch. 40%.



IMPACTS:
- cattle grazing (3 cows, 1 horse) trampling banks impact low to mod.
- water coming under HWY 97 through culvert

Helicopter Reach/Site Survey

	Reach	Site
Level of Disturbance:		
Assessment Priority:	NOT Flown	

Ground-based Field Form 2 of 2:

Survey Location: Road Crossing of "59 CREEK" ~~Reach 15~~ SITE B15.1 includes reach 15, 16 - inspect entire lengths

Date: 9/10/98 Crew: RE, CB Weather:

Photos 24, 23 1) roll 4 2) exposure 16 3) location 24 looking north @ outlet 4) notes

23 = shows inlet + logged private property + cattle use

1. **Existing Channel Disturbance (CD):** (L,M,H)
L = not detectable-slight; M = moderate; H = high-extreme (morphology obscured) excavated
(Map code 1)

- Sed Source is "M-H" due to unvegetated & loose soiled banks/

Disturbance Cause: DRY CHANNEL CAUSED BY POSSIBLE LOW WATER RELEASE FROM MACANASE LAKE COMBINED WITH LOGGING OF PRIVATE PROPERTY + HEAVY STREAMSIDE CATTLE USE

- Culvert looks good + clear - Neighbor says it was plugged. Channel is "H" above culvert inlet - OK "L" d/s of culv

2. **Potential for future channel disturbance:** (L,M,H) Culvert size = ~ 900 mm CMP
(as defined for Existing Channel Disturbance)

3. **Restoration benefit:** L,M,H (average of degree of benefit, success, duration)

Degree of habitat benefit (L,M,H) L:marginal improvement likely, short length of channel; M: moderate improvement likely, moderate channel length affected; H: large improvement likely, long length of channel)

Type of habitat benefit, and description: (R,S,M)
(R=improved rearing habitat, S=improved spawning habitat, M=improved migration)

- No fish present
- local says trout inhabit above the road, + Magamese Lake.

potential for success: (L,M,H)

likely duration of effectiveness (<5 yrs; 5-20 yrs; >20 yrs)

4. **Restoration cost** (<$10,000; $10,000-$100,000; >$100,000)
(includes prescription and implementation)

5. **Existing access:** (fly; trail; road)

6. **Priority for Prescription:** L,M,H (weighted average of factors 1-5)
(Map code 2)

Restoration Options:
- Vegetate channel banks @ both inlet + outlet.
- install cobble armour @ inlet + outlet.
- plant Riparian Trees @ inlet side adjacent to Highway.

Other Notes: Unknown where the water stops flowing between here + Rep Site 17.1

- Channel is highly disturbed upstream of crossing - land use on private property includes cattle - possible water diversions, clearcutting.

See over

Helicopter Reach/Site Survey

Reach Site

Level of Disturbance:

Assessment Priority: NOT FLOWN

Ground-based Field Form 1of 2: CHASM CK. SUB-BASIN

Survey Location: FIFTYNINE CK Rep 17.1 d/s of Magnesia Lk. Dam ~ 50m

Date: Oct. 19/98 Crew: CB\RL Weather: SUNNY

Photos 1) roll 4 2) exposure 25 3)location shooting d/s at Rep Site 4) notes

Width (W, in m) 1) Bankfull (Wb) 2.20 2) Wetted (Ww) 2.20

Max. Depth (D, in m) 1) Bankfull (Db) 0.51 2) Wetted (Dw) 0.39

Slope (S, in %) 1) Channel 1% 2) Side slopes (if incised) 1% RB 1% LB

Valley Flat (VF, in m) (at 2 times bankfull depth): check map

Entrenchment ratio (VF/Wb):

Profile morphology (using CAP terminology): RP

Channel Bed:
Texture: __%Z 49%S 48%G 1%C 2%B 0%R Stability (stable) aggrading, degrading

Channel Banks:
Texture: 17%Z 70%S 10%G 1%C 2%B 0%R Stability: high, (moderate) low
(bank stability is the opposite of bank erosion potential) high in organic matter

Small Woody Debris:
Quantity: scarce, (occasional) common, abundant, over-abundant (choking channel)
Stability: high, (moderate) low

Large Woody Debris:
Quantity: (scarce) occasional, common, abundant, over-abundant (choking channel)
Stability: high, moderate, low none observed

Notes: Riparian Zone wetland extending 5-10m on both sides of channel MFc
- mature spruce sm. diameter (30cm dia, ~20-25m tall)

(Spruce) Trees 10% bank 2% ave. overhang 0.0m

(Salix spp. Rosa spp.) Shrub 25-30% bank 30% " " 0.5m

Herb 95% bank 95% average overhang 0.2m
(sedges)

Canopy Closure 10% over ch.
- Magnesia Lk Ducks Unlimited project

* Impacts - Cattle grazing impact low at Rep Site some sedges grazed, but very wet at sfc soil close to saturated and little evidence of cattle walking in wetland Forest grazed and rip. zone just below dam

Helicopter Reach/Site Survey

Reach Site
Level of Disturbance:
Assessment Priority: NOT FLOWN

Ground-based Field Form 2 of 2:

Survey Location: "59 CREEK" (B18.1) FIFTYNINE CREEK d/s of Magnese Lake

Date: 19/10/98 Crew: RK, CB Weather: clear - 15°C

Photos 1 1) roll 3 2) exposure 100 3) location d/s of Magnese Lake Reach 18 4) notes

1. Existing Channel Disturbance (CD): (L,M,H)
L = not detectable-slight; M = moderate; H = high-extreme (morphology obscured)
(Map code 1)

Disturbance Cause: CATTLE TRACKS DOWN TO CHANNEL ALONG BOTH BANKS
Low sed source + channel disturbance is "L"

2. Potential for future channel disturbance: (L,M,H)
(as defined for Existing Channel Disturbance)

3. Restoration benefit: L,M,H (average of degree of benefit, success, duration)

Degree of habitat benefit (L,M,H) L:marginal improvement likely, short length of channel; M: moderate improvement likely, moderate channel length affected; H: large improvement likely, long length of channel)

Type of habitat benefit, and description: (R,S,M)
(R=improved rearing habitat, S=improved spawning habitat, M=improved migration)

- No fish seen however dam is flowing @ lake - the debris @ outlet is mainly small woody debris - currently is definately fish obstruction

potential for success: (L,M,H)

likely duration of effectiveness (<5 yrs; 5-20 yrs; >20 yrs)

4. Restoration cost (<$10,000; $10,000-$100,000; >$100,000)
(includes prescription and implementation)

5. Existing access: (fly; trail; road)

6. Priority for Prescription: L,M,H (weighted average of factors 1-5)
(Map code 2)

Restoration Options: Armour banks @ downstream end with gravel + small cobble in the channel + the banks.
- Armour u/s end of dam on d/s of Magenese Lake with gravel + cobble.
- Both the banks u/s + d/s are Low sed. sources. Banks leading to lake are obviously less priority due to lake (settling), however since it is right at the outflow of the lake - suspended sed. will not have time to settle before the sediment is flushed through.

Other Notes:

Helicopter Reach/Site Survey

Reach Site
Level of Disturbance:
Assessment Priority: NOT FLOWN

Ground-based Field Form 1of 2: (CHASM SB)

Survey Location: FIFTYNINE CK Rep 41.1 ~150 m d/s of BIG BAR ROAD, ~150 m u/s of 1k

Date: Oct 23/98 **Crew:** CB/RK **Weather:** sunny

Photos 1) roll (FUJI) 6 2) exposure 24 23 3) location 1king d/s 1king u/s 4) notes

Width (W, in m) 1) Bankfull (Wb) 2.90 2) Wetted (Ww) 2.90

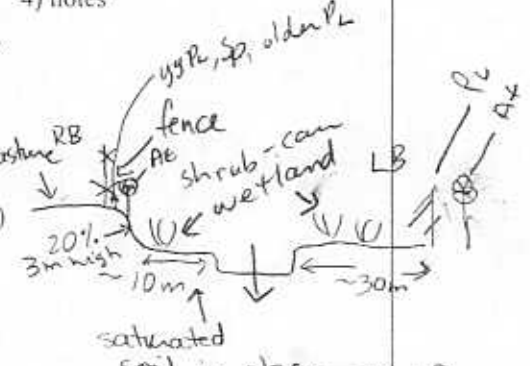
Max. Depth (D, in m) 1) Bankfull (Db) 0.39 2) Wetted (Dw) 0.27

Slope (S, in %) 1) Channel /'/. 2) Side slopes (if incised)

Valley Flat (VF, in m) (at 2 times bankfull depth): check map

Entrenchment ratio (VF/Wb):

Profile morphology (using CAP terminology): RP



Channel Bed:
Texture: 41 %Z 50 %S 0 %G 1 %C 0 %B 0 %R Stability: stable (aggrading) degrading
aquatic veg growing from bottom of ch

Channel Banks:
Texture: 49 %Z 50 %S 0 %G 1 %C 0 %B 0 %R Stability: high, (moderate) low
(bank stability is the opposite of bank erosion potential)
high organics

Small Woody Debris:
Quantity: scarce, occasional, (common), abundant, over-abundant (choking channel)
Stability: high, moderate (low)

Large Woody Debris:
Quantity: (scarce) occasional, common, abundant, over-abundant (choking channel)
Stability: high, (moderate) low

Notes: RIP ZONE Shrub-carr wetland
* Trees dying in rip zone likely due to raised H_2O levels
T: 0'/. bank, ave overhang 0m, rip zone 2'/. alive, 2'/. dead (willow)
S: 15'/. " , " " 1.0m, rip zone 20'/.
H: 90'/. " , " " 0.20m, rip zone 85'/. (sedge, grass, lg leaved avens, thistle, moss)
CC over ck:

IMPACTS "LOW" for cattle, "~~LOW~~-MOD" for beaver
1) beaver have cut trees down
2) cattle drinking water from creek
3) stumps on LB and RB (deciduous logging? or hazard tree ctrl after beaver activity?)
4) lack of LWD in channel

Helicopter Reach/Site Survey

Reach Site
Level of Disturbance:
Assessment Priority: NOT FLOW

Ground-based Field Form 2 of 2:

Survey Location: Road Crossing "Big Bar Road" FIFTYNINE CK REACH-41 B41 3

Date: 23/10/98 Crew: RK, CB Weather:

Photos 22 1) roll FUJI 2) exposure 3) location 22 - looking north @ inlet 4) notes PHOTO 20 - looking south @ pond
21 - looking @ outlet/weir
19 - looking @ beaver dam u/s ≃ 60m

1. **Existing Channel Disturbance (CD)**: (L,M,(H))
L = not detectable-slight; M = moderate; H = high-extreme (morphology obscured)
(Map code 1)

Disturbance Cause: culverts (double) 1 600 (cmp) + 1 500 CMP ARE AT 25% capacity yet area above road crossing is badly flooded
CROSSING ~~IS~~ IS NOT SED SOURCE BUT THE FLOODING UP TO THE ROAD AND BEYOND NORMAL BANKS IS SERIOUS

2. **Potential for future channel disturbance**: (L,M,(H))
(as defined for Existing Channel Disturbance) ROAD CAN GO HIGHER WITH LOW GRADIENT.

3. **Restoration benefit: L,M,H (average of degree of benefit, success, duration)**

Degree of habitat benefit (L,M,H) L:marginal improvement likely, short length of channel; M: moderate improvement likely, moderate channel length affected; H: large improvement likely, long length of channel)

Type of habitat benefit, and description: ((R)(S)M)
(R=improved rearing habitat, S=improved spawning habitat, M=improved migration)

- SEDIMENTATION FROM logged banks + cattle disturbed banks - no fencing

potential for success: (L,M,(H))

likely duration of effectiveness (<5 yrs; 5-20 yrs; (>20 yrs))

NOTE: FARM + PRIVATE LAND SEEMS TO HAVE PROPERLY FENCED AREAS (POSSIBLY DUE TO WATER INTAKE / WEIR.

4. **Restoration cost** (<$10,000; $10,000-$100,000; >$100,000)
(includes prescription and implementation)

5. **Existing access:** (fly; trail; (road))

6. **Priority for Prescription: L,M,(H)** (weighted average of factors 1-5)
(Map code 2)

Restoration Options: ① Lower culverts in the road - ~~DEE~~ inlets are situated too high @ the surface

- BEAVER DAMS ARE THE RESULT OF THE ENCROACHMENT FLOODED ≃ 60m u/s ZONE + RAISED culverts are other possible

Other Notes: - One large dam is located ≃ 60 m u/s of Road

- Other impacts are logging in this private land.

NOTE: THERE IS A CONTRA-REGULATOR WEIR IMMEDIATELY D/S OF THE CULVERTS + CROSSING. IMPACTS APPEAR RELATIVELY "L" below in terms of channel disturbance + streamside VOR

Helicopter Reach/Site Survey

	Reach	Site
Level of Disturbance:	L	n/a
Assessment Priority:	L	n/a

Ground-based Field Form 1of 2:

Survey Location: RAINFIELD RIVER ~200 m d/s from rd xing Rep 6.1 (upper R.6) betwn canyon and wetland 2 (R5)

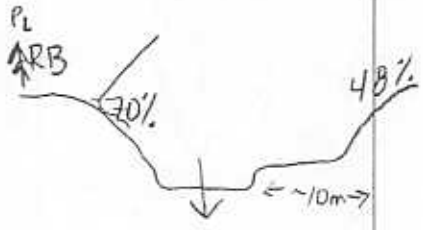
Date: Oct 23/98 Crew: CB/RK Weather: Sunny

Photos 1) roll 5 2) exposure 4 3)location lkng d/s 4) notes

Width (W, in m) 1) Bankfull (Wb) 9.75 2) Wetted (Ww) 3.8

Max. Depth (D, in m) 1) Bankfull (Db) 0.5 2) Wetted (Dw) 0.19

Slope (S, in %) 1) Channel 1·1· 2) Side slopes (if incised)



Valley Flat (VF, in m) (at 2 times bankfull depth): ~23m

Entrenchment ratio (VF/Wb):

Profile morphology (using CAP terminology): CPb

Channel Bed:
Texture: __%Z __%S 2%G 33%C 60%B 5 %R Stability: (stable) aggrading, degrading

Channel Banks:
Texture: 0%Z 15%S 5%G 20%C 50%B 10 %R Stability (high) moderate, low
(bank stability is the opposite of bank erosion potential)

Small Woody Debris:
Quantity: scarce, occasional, (common) abundant, over-abundant (choking channel)
Stability: high, moderate, (low)

Large Woody Debris:
Quantity: (scarce), occasional, common, abundant, over-abundant (choking channel)
Stability: high, moderate, (low)

Notes:

RIP ZONE

(Bl, Sp) T: 35%-40% rip zone, banks 40%, ave dh 0.25m

(Willow, Ribes lac, Twinfl, Pyrobs sp. Rosa, ug sp) S: 5%, " ", " 30%, " " 2.0m

(moss, bunchberry, grass) m/H: 60% " ", " 80%, " " 0.05m

- no snags seen

CC over ck. 3%.

IMPACTS "LOW"

- cattle trails, droppings on LB

-

Wetland d/s "shallow open water" with b&rk/boulder banks and possibly coarse bed, sedges around perimeter

Helicopter Reach/Site Survey

	Reach	Site
Level of Disturbance:	L-M	NA
Assessment Priority:	L-M	NA

Ground-based Field Form 1of 2:

Survey Location: RAYFIELD RIVER Rep 14.1 ~100 m d/s rd xing

Date: Oct 23/98 Crew: CB/RK Weather: Sunny

Photos 1) roll 5 2) exposure 5 3)location l/king d/s 4) notes

Width (W, in m) 1) Bankfull (Wb) 5.5 2) Wetted (Ww) 3.50 } estimated

Max. Depth (D, in m) 1) Bankfull (Db) 1.05 2) Wetted (Dw) 0.45

Slope (S, in %) 1) Channel 1% 2) Side slopes (if incised) not incised but ch. entrenched w/in 1.5 m flood plain both sides

Valley Flat (VF, in m) (at 2 times bankfull depth): (see map)

Entrenchment ratio (VF/Wb):

Profile morphology (using CAP terminology): RP

Channel Bed:
Texture: 0 %Z 30 %S 50 %G 20 %C 0 %B 0 %R Stability: stable (aggrading) degrading

Channel Banks:
Texture: 0 %Z 50 %S 40 %G 10 %C 0 %B 0 %R Stability: high (moderate) low
(bank stability is the opposite of bank erosion potential)

Small Woody Debris:
Quantity: scarce, occasional, (common) (abundant) over-abundant (choking channel)
Stability: high, moderate (low)

Large Woody Debris:
Quantity: (scarce) occasional, common, abundant, over-abundant (choking channel)
Stability: high, moderate, low none observed

Notes: RIP ZONE: shrub buffer ~ 3m wide both sides

T: 0%

S: 60% banks, ave ht 2 m (approximately 33% of shrub (20% of cover) looks dead
H: 20% " " " 0 m
(Willow)
(Grass)

cc over ck 25%.

IMPACTS "Moderate" ~~to "Low"~~ "High" in some sections

1) both sides of ck used for grazing
2) cattle trampled banks ~15% of shoreline
3) lack of trees, pasture appears dry enough for some riparian tree species.

Ground-based Field Form 2 of 2:

Survey Location: RAYFIELD RIVER REACH(S) 14 and above (all private land) (AS PER HELICOPTER area

Date: 23/10/98 Crew: RK, CB Weather: FIELD RECCON.)

Photos 1) roll 2) exposure 3) location 4) notes

↳ see Rep sites

1. Existing Channel Disturbance (CD): (L,M,H)
L = not detectable-slight; M = moderate; H = high-extreme (morphology obscured)
(Map code 1)

Disturbance Cause: RIPARIAN CLEARING FOR CATTLE PASTURES - CONSIDERABLE LACK OF VEGETATION ALONG BANKS + ERODING BANKS CAUSED BY CATTLE PRESENCE

2. Potential for future channel disturbance: (L,M,H)
(as defined for Existing Channel Disturbance)

3. Restoration benefit: L,M,H (average of degree of benefit, success, duration)

Degree of habitat benefit (L,M,H) L: marginal improvement likely, short length of channel; M: moderate improvement likely, moderate channel length affected; H: large improvement likely, long length of channel)

Type of habitat benefit, and description: (R,S,M)
(R=improved rearing habitat, S=improved spawning habitat, M=improved migration)

- R+S are affected considerably at present. With riparian planting + fencing - R+S will improve

potential for success: (L,M,H)

likely duration of effectiveness (<5 yrs; 5-20 yrs; >20 yrs)

4. Restoration cost (<$10,000; $10,000-$100,000; >$100,000)
(includes prescription and implementation)

5. Existing access: (fly; trail; road)

6. Priority for Prescription: L,M,H (weighted average of factors 1-5)
(Map code 2)

Restoration Options: (1) RIPARIAN PLANT

(2) FENCE WITH GAPS FOR CATTLE - UTILIZE ROAD CROSSING PONDS

(3) POSSIBLY LWD PLACEMENT + LWD AT SPOTS.

Other Notes:

Helicopter Reach/Site Survey

	Reach	Site
Level of Disturbance:	L-M	M
Assessment Priority:	L-M	M

Ground-based Field Form 2 of 2:

Survey Location: B14.1 RAYFIELD CK

Date: 23/10/98 Crew: RK, CB Weather: sunny 5°C

Photos 1) roll 2) exposure 3) location 4) notes

1. Existing Channel Disturbance (CD): (L,M,H) CROSSING Double culvert 1 active 2600 mm 1 storm (dry) 1200 mm
L = not detectable-slight; M = moderate; H = high-extreme (morphology obscured)
(Map code 1)

Disturbance Cause: SEDIMENTATION FROM ROAD + BANKS INTO INLET BY COWS ACCESSING FOR WATER. AREAS OF CHANNEL U/S + D/S OF CROSSING IS FENCED (GOOD). OLD DEAD ALDER BRUSH AT INLET APPEARS TO BE LIKELY + POTENTIAL SOURCE FOR PLUGGING THE CHANNEL - SOMEONE HAS PURPOSELY PUT LWD + SWD AT U/S SIDE TO RESTRICT CATTLE ENTRY - GOOD

2. Potential for future channel disturbance: (L,M,H)
(as defined for Existing Channel Disturbance)

3. Restoration benefit: L,M,H (average of degree of benefit, success, duration)

Degree of habitat benefit (L,M,H) L:marginal improvement likely, short length of channel; M: moderate improvement likely, moderate channel length affected; H: large improvement likely, long length of channel)

Type of habitat benefit, and description: (R,S,M)
(R=improved rearing habitat, S=improved spawning habitat, M=improved migration)
- MIGRATION COULD POTENTIALLY BE AFFECTED DUE TO PLUGGING AT U/S END BY DEAD DECIDS BRUSH

potential for success: (L,M,H)

likely duration of effectiveness (<5 yrs; 5-20 yrs; >20 yrs)

4. Restoration cost (<$10,000; $10,000-$100,000; >$100,000)
(includes prescription and implementation)

5. Existing access: (fly; trail; road)

6. Priority for Prescription: L,M,H (weighted average of factors 1-5)
(Map code 2)

Restoration Options: 2 Things: ① unplug u/s end by removing dead brush - use brush to block inlet entrance of u/s - RB
② APPLY COARSER COBBLE + GRAVELS AT INLET + OUTLET TO REDUCE SEDIMENTATION INTO CHANNEL

Other Notes: - channel appears to have large deposition ground 1 sa bar directly d/s - could be result of road crossing.
- channel is widening + aggrading. However it is entrenched within 1.5 m fp. (good)

Helicopter Reach/Site Survey

	Reach	Site
Level of Disturbance:	M	n/a
Assessment Priority:	M	n/a

Ground-based Field Form 1of 2:

Survey Location: Rayfield River (Rep16-1.1) ~150m u/s rd xing

Date: Oct 23/98 Crew: CB\RK Weather: sunny

Photos 1) roll 5 2) exposure 6 3)location Rkng u/s 4) notes

Width (W, in m) 1) Bankfull (Wb) 5 2) Wetted (Ww) 5 } est. ice on ck.

Max. Depth (D, in m) 1) Bankfull (Db) 1.0 2) Wetted (Dw) 0.35 } est. ice on ck.

Slope (S, in %) 1) Channel 1% 2) Side slopes (if incised) not incised

Valley Flat (VF, in m) (at 2 times bankfull depth): see map

Entrenchment ratio (VF/Wb):

Profile morphology (using CAP terminology): RP runs through wetland

Channel Bed:
Texture: 10%Z 50%S 5%G 30%C 5%B 0%R Stability: stable, (aggrading), degrading } texture est.

Channel Banks:
Texture: 50%Z 50%S 0%G 0%C 0%B 0%R Stability: high, (moderate), low } ice on ck
(bank stability is the opposite of bank erosion potential) high organics

Small Woody Debris:
Quantity: scarce, (occasional), common, abundant, over-abundant (choking channel)
Stability: high, moderate, (low)

Large Woody Debris:
Quantity: (scarce), occasional, common, abundant, over-abundant (choking channel)
Stability: high, moderate, low none seen

Notes:

RIP ZONE - sedge wetland 20 - 30m RB, 20m LB

T 0.1

(willow) S 10% banks, rip zone cover LB 25%, RB 5%, ave ht 0.25m

(sedge) H 95% " " " " 95%, ave ht 0.20m

- backchannels in wetland most were dry
- cc over ck ~1%.

IMPACTS - Moderate to Low

1) - cattle accessing ck trampled ~5% shoreline
2) ck narrows in places natural? accumulation of woody debris occurs at these sites
3) pasture along RB up to edge of sedge wetland
4) ch likely widened by aqi in R.16 and above

Helicopter Reach/Site Survey

	Reach	Site
Level of Disturbance:	M	M
Assessment Priority:	M	M

Ground-based Field Form 2 of 2:

Survey Location: B16-1.1 RAYFIELD CREEK - REACH 16-1

Date: 23/10/98 Crew: RK, CB Weather: clear cool 2°C

Photos check 1) roll 2) exposure 3) location 4) notes
REP 16-1.2

1. Existing Channel Disturbance (CD): (L,M,H)
L = not detectable-slight; M = moderate; H = high-extreme (morphology obscured)
(Map code 1)

Disturbance Cause: CATTLE INTRUSION ON ERODIBLE BANKS (MAINLY LB) near crossing (culvert 1750 cmp)
- SILTY SANDY BANKS ARE ERODING CREATING A "M" sed source @ inlet mainly. also outlet however there appears to be more armoured coarse material @ outlet.

2. Potential for future channel disturbance: (L,M,H):
(as defined for Existing Channel Disturbance)

3. Restoration benefit: L,M,H (average of degree of benefit, success, duration)

Degree of habitat benefit (L,M,H) L:marginal improvement likely, short length of channel; M: moderate improvement likely, moderate channel length affected; H: large improvement likely, long length of channel)

Type of habitat benefit, and description: (R,S,M)
(R=improved rearing habitat, S=improved spawning habitat, M=improved migration)
- MIGRATION NOT A PROBLEM - channel is wide enough + banks are very low gradient.

potential for success: (L,M,H)

likely duration of effectiveness (<5 yrs; 5-20 yrs; >20 yrs)

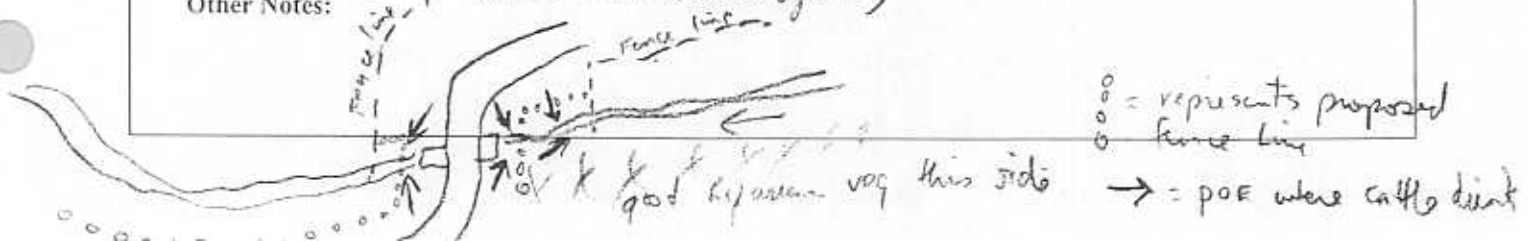
4. Restoration cost (<$10,000; $10,000-$100,000; >$100,000)
(includes prescription and implementation)

5. Existing access: (fly; trail; road)

6. Priority for Prescription: L,M,H (weighted average of factors 1-5)
(Map code 2)

Restoration Options: 2 restoration plans
① - apply cobble + gravels along all banks adjacent to road to reduce sedimentation in to channel
② Fence of both banks at each ~~side~~ side (u/s + d/s) up to current fence of both pastures (see ~~notes~~ diagram)

Other Notes:



Helicopter Reach/Site Survey

	Reach	Site
Level of Disturbance:	M	M
Assessment Priority:	M	M

Ground-based Field Form 2 of 2:

Survey Location: REACH 16-1 + ABOVE + BELOW

Date: 23/10/98 Crew: RK, CB Weather:

Photos NO 1) roll 2) exposure 3) location 4) notes

1. Existing Channel Disturbance (CD): (L,(M),H)
L = not detectable-slight; M = moderate; H = high-extreme (morphology obscured)
(Map code 1)

Disturbance Cause: Unfenced creek with cattle eroding banks and allowing sedimentation into channel

2. Potential for future channel disturbance: (L,(M),H)
(as defined for Existing Channel Disturbance)

3. Restoration benefit: L,(M),H (average of degree of benefit, success, duration)

Degree of habitat benefit (L,M,(H)) L: marginal improvement likely, short length of channel; M: moderate improvement likely, moderate channel length affected; H: large improvement likely, long length of channel)

Type of habitat benefit, and description: ((R),(S),M)
(R=improved rearing habitat, S=improved spawning habitat, M=improved migration)
- MAINLY R+S AS CATTLE DISTURBANCE CREATES "M" AD. SOURCES + LESS DESIRABLE HABITAT CONDITIONS FOR FISH

potential for success: (L,(M),H)

likely duration of effectiveness (<5 yrs; (5-20 yrs); >20 yrs)

4. Restoration cost (<$10,000; ($10,000-$100,000); (>$100,000))
(includes prescription and implementation)

5. Existing access: (fly; (trail); (road)) large area - probably rely on trails

6. Priority for Prescription: L,(M),H (weighted average of factors 1-5)
(Map code 2)

Restoration Options: FENCE RIPARIAN ZONES THROUGH AGRICULTURAL IMPACTED AREAS.
- Create gaps for sections of watering for cattle.

Other Notes:

Helicopter Reach/Site Survey

	Reach	Site
Level of Disturbance:	m	nk
Assessment Priority:	m	N/c

Ground-based Field Form 1of 2:

Survey Location: RAYFIELD RIVER Rep 22.1 betwn Crystal Lk and Muskrat Lk

Date: OCT 23/98 **Crew:** CB/RK **Weather:** Sunny, ice on River

Photos 1) roll 5 2) exposure 7 3)location lkng d/S 4) notes

Width (W, in m) 1) Bankfull (Wb) 5.0 2) Wetted (Ww) 5.0 } est. ice on ck.

Max. Depth (D, in m) 1) Bankfull (Db) 0.45 2) Wetted (Dw) 0.25

Slope (S, in %) 1) Channel 0.5% 2) Side slopes (if incised) not incised

Valley Flat (VF, in m) (at 2 times bankfull depth): Check map

Entrenchment ratio (VF/Wb):

Profile morphology (using CAP terminology): ~~RP~~ wetland

Channel Bed:
Texture: 50 %Z 50 %S 0 %G 0 %C 0 %B 0 %R Stability: stable, (aggrading) degrading } est. ice on ck

Channel Banks:
Texture: 50%Z 50 %S 0 %G 0 %C 0 %B 0 %R Stability: high, (moderate), low
(bank stability is the opposite of bank erosion potential) high organics

Small Woody Debris:
Quantity: scarce, occasional, common, (abundant), over-abundant (choking channel)
Stability: high, (moderate), low

Large Woody Debris:
Quantity: (scarce), occasional, common, abundant, over-abundant (choking channel)
Stability: high, moderate, low none observed

Notes:

RIP ZONE (Shrub-carr wetland)

RB buffer ~5m
LB buffer ~ 20m

(sp) T: 3% rip zone, 0% banks) (Lichen growing on woody debris and trees)

(alder, willow, dying yg trees) S: 40% rip zone cover, banks 70%, ave ht 2m

(moss, sedge) M/H: 30% " " ", " 30%, " " 0.02m

CC over ck ~ 25%

IMPACTS

1) RB pasture up to buffer.
2) area very wet, saturated soils in wetland small signs of cattle mainly on LB side

Over-all impacts are "L" here

Helicopter Reach/Site Survey

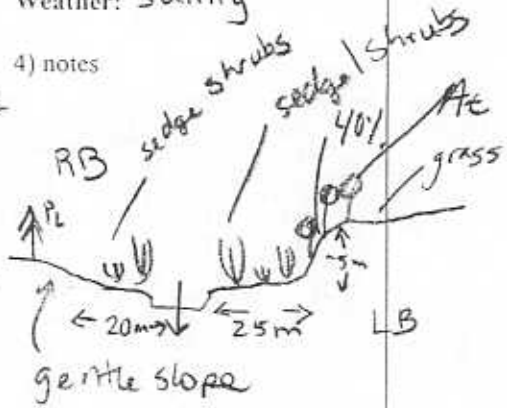
	Reach	Site
Level of Disturbance:	4	na
Assessment Priority:	4	na

Ground-based Field Form 1of 2: (RAYFIELD CK SB)

(RIFFLE) Survey Location: Eighty-Three Ck Rep 1.1 ~700m South of RR tracks ~200 m S. of pipeline

Date: Oct. 23/98 Crew: CB/RK Weather: Sunny

Photos 2 1) roll 5 2) exposure 00 3)location u/s of 83 creek 4) notes



Width (W, in m) 1) Bankfull (Wb) 6.4 2) Wetted (Ww) 2.18

Max. Depth (D, in m) 1) Bankfull (Db) .45 2) Wetted (Dw) .06

Slope (S, in %) 1) Channel 0.0 % 2) Side slopes (if incised)

(intermittent connected channel)

Valley Flat (VF, in m) (at 2 times bankfull depth): check map

(measurements for wetlands deep. vary-wide)

Entrenchment ratio (VF/Wb):

Profile morphology (using CAP terminology): ~~RP~~ (wetland complex) + RP/b (interconnected channel)

Channel Bed:

(Wetland-channel) Texture: 10 %Z 80 %S __ %G 10 %C __ %B 0 %R Stability: stable, aggrading, degrading

" : — % 20 " 10 " 40 " 30 " 0 " interconnecting boulder ch.

(stable)

Channel Banks:

Texture: 9 %Z 80 %S 0 %G 10 %C 1 %B 0 %R Stability: high, moderate, low

(bank stability is the opposite of bank erosion potential)

Small Woody Debris:

Quantity: scarce, occasional, common, abundant, over-abundant (choking channel)

Stability: high, moderate, low

Large Woody Debris:

Quantity: scarce, occasional, common, abundant, over-abundant (choking channel)

Stability: high, moderate, low none observed

Notes:

RIP ZONE - sedge/shrub-can wetland

T: 0% likely too wet for trees

(willow) S: 20% rip zone, 30/40% banks, ave dh 0.10m

(sedge/grass) H: 90% " " 80% " " " " 0.10m

cc over ck. 1%

IMPACTS

Human - none

Beaver dams have impacted ch.

Over-all - impacts are "L" and

Helicopter Reach/Site Survey

	Reach	Site
Level of Disturbance:	#	n/a
Assessment Priority:	H	n/a

Ground-based Field Form 1of 2: (RAYFIELD Ck SB)

Survey Location: Eighty Three Ck Rep 9.1 (RIFFLE)
~80 m d/s 83 mile FSR xing

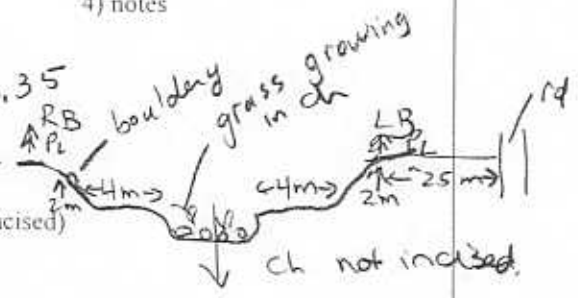
Date: Oct. 23/98 **Crew:** CB\RK **Weather:** sunny

Photos NO PHOTO 1) roll 2) exposure 3)location 4) notes

Width (W, in m) 1) Bankfull (Wb) 3.35 2) Wetted (Ww) 3.35

Max. Depth (D, in m) 1) Bankfull (Db) 0.27 2) Wetted (Dw) 0.7

Slope (S, in %) 1) Channel 1% 2) Side slopes (if incised)



Valley Flat (VF, in m) (at 2 times bankfull depth): See map

Entrenchment ratio (VF/Wb):

Profile morphology (using CAP terminology): RP

Channel Bed:
Texture: 0 %Z 13 %S 25 %G (20) %C 2 %B 0 %R Stability: stable (aggrading) degrading
- cobbles (some) covered w/ aquatic veg

Channel Banks:
Texture: 5 %Z 80 %S 5 %G 10 %C 0 %B 0 %R Stability: high, (moderate), low
(bank stability is the opposite of bank erosion potential) high organics

Small Woody Debris:
Quantity: scarce, occasional, (common), abundant, over-abundant (choking channel)
Stability: high, moderate, (low)

~~lg woody~~

Large Woody Debris:
Quantity: (scarce), occasional, common, abundant, over-abundant (choking channel)
Stability: high, moderate, low none seen

Notes:

RIP ZONE: Shrub-carr wetland
cc over ch 10%.

(Pl, Sp) T 2% rip cover, banks 0%, ave ch 0.0m
(willow, yr sp.) S 40% rip cover, " 40%, " " 0.50m
(reed canary grass, sedge) H: 80% rip cover, banks 95%, ave ch 0.30m

IMPACTS: "L", chlacking LWD
1) logging on RB, Pl has been replanted up to 10 m tall
2) Rd on LB ~25 m away

Helicopter Reach/Site Survey

	Reach	Site
Level of Disturbance:	L	H
Assessment Priority:	L	H

Ground-based Field Form 2 of 2:

Survey Location: EIGHTYTHREE CREEK ⇒ RANFIELD RIVER (PRIVATE LAND AREAS + SOME CROWN AREAS.
Reach 1-3, 4, 6, (9) 11, 12, 16, 18, 20

Date: 23/10/18 Crew: RR, CB → H disturbance - heavily cleared riparian. Weather: Sunny 14°C

Photos NO FILM 1) roll ~ 2) exposure ~ 3) location — 4) notes

1. Existing Channel Disturbance (CD): (L,M,H)
L = not detectable-slight; M = moderate; H = high-extreme (morphology obscured)
(Map code 1)

Disturbance Cause: RANGELAND USE ALONG RIPARIAN AREAS + IN PRIVATE LAND AREAS. "M" because minimal banks exposed - all banks are well vegetated with grasses
NOTE: COLLEEN ENTERED CREEK IN NON-IMPACTED ARE TO GET REPRESENTATIVE BANK + BED TEXTURED NOT DISTURBED

2. Potential for future channel disturbance: (L,M,H) - Reach 9 appears more severely disturbed (Video)
(as defined for Existing Channel Disturbance)

3. Restoration benefit: L,M,H (average of degree of benefit, success, duration)

Degree of habitat benefit (L,M,H) L:marginal improvement likely, short length of channel; M: moderate improvement likely, moderate channel length affected; H: large improvement likely, long length of channel)

Type of habitat benefit, and description: (R,S,M)
(R=improved rearing habitat, S=improved spawning habitat, M=improved migration)

R+S will benefit due to minimal erosion/deposition from streamside erosion.

potential for success: (L,M,H)

likely duration of effectiveness (<5 yrs; 5-20 yrs; >20 yrs)

4. Restoration cost (<$10,000; $10,000-$100,000; >$100,000)
(includes prescription and implementation)

5. Existing access: (fly; trail; road)

6. Priority for Prescription: L,M,H (weighted average of factors 1-5)
(Map code 2)

Restoration Options:
① FENCE AREA BOTH BANKS
② RIPARIAN PLANT SHRUBS + TREES - (GRASS IS GOOD)
③ ARMOUR SECTIONS + KEEP OPEN FOR CATTLE.

Other Notes:
OTHER IMPACTS ARE BEAVER ACTIVITY.
- NOTE: PRIVATE AREAS REALLY LACK LWD IN STREAM.

Helicopter Reach/Site Survey

	Reach	Site
Level of Disturbance:	M	M
Assessment Priority:	M	M

Ground-based Field Form 2 of 2:

Survey Location: WRITE UP BELOW crossing RM. "83 Creek" (private property)

Date: 23/10/98 Crew: RK, CB Weather:

Photos [1) roll 5 2) exposure 100 3) location looking u/s of crossing 4) notes

1. Existing Channel Disturbance (CD): (L,M,(H))
L = not detectable-slight; M = moderate; H = high-extreme (morphology obscured) (Map code 1)

bed texture - 80% gr, 10% cobble, 10% sa, 2% bou
BANKS 80% sa, 10% gr, 10% cobble

Disturbance Cause: FARMING + RANGE USE BOTH BANKS BELOW, "H" sediment source + impacts due to cattle use along the banks
Culvert

2. Potential for future channel disturbance: (L,M,H)
(as defined for Existing Channel Disturbance)

3. Restoration benefit: L,M,H (average of degree of benefit, success, duration)

Degree of habitat benefit (L,M,H) L:marginal improvement likely, short length of channel; M: moderate improvement likely, moderate channel length affected; H: large improvement likely, long length of channel)

Type of habitat benefit, and description: (R,S,M)
(R=improved rearing habitat, S=improved spawning habitat, M=improved migration)
R + S are effected greatly due to "H" amounts of sediment in channel

potential for success: (L,M,H)

likely duration of effectiveness (<5 yrs; 5-20 yrs; >20 yrs)

4. Restoration cost (<$10,000; $10,000-$100,000; >$100,000)
(includes prescription and implementation)

5. Existing access: (fly; trail; road)

6. Priority for Prescription: L,M,H (weighted average of factors 1-5)
(Map code 2)

Restoration Options: FENCE ALONG CHANNEL - UNKNOWN HOW LONG ITS BEEN DRY.??
RIPARIAN PLANT INSIDE PRESCRIBED FENCING
- suspect why channel is dry ???

Other Notes: Culvert looks good. Not sed. source.
- This location appears typical of reaches u/s between lakes. - should group into high impact category. - "H" priority only in private land area

Ground-based Field Form 1of 2:

Survey Location: Rep 14.1 - NOTE- RK wrote up this site + Colleen determined textures

Date: 23/10/98 Crew: RK, CB Weather: Sunny

Photos 1 1) roll 5 2) exposure 100 3)location view u/s 4) notes

Width (W, in m) 1) Bankfull (Wb) ~2.5 2) Wetted (Ww) DRY

Max. Depth (D, in m) 1) Bankfull (Db) 0.3 2) Wetted (Dw) —

Slope (S, in %) 1) Channel 0.5 % 2) Side slopes (if incised)

Valley Flat (VF, in m) (at 2 times bankfull depth):

Entrenchment ratio (VF/Wb): NOT INCISED

Profile morphology (using CAP terminology): RP

Channel Bed:
Texture: ___%Z 10 %S 80 %G 10 %C 1 %B ___%R Stability: stable, aggrading, degrading

Channel Banks:
Texture: ___%Z 80 %S 10 %G 10 %C ___%B ___%R Stability: high, moderate, low
(bank stability is the opposite of bank erosion potential)

Small Woody Debris:
Quantity: scarce occasional, common, abundant, over-abundant (choking channel)
~~Stability: high, moderate, low~~

Large Woody Debris:
Quantity: scarce occasional, common, abundant, over-abundant (choking channel)
~~Stability: high, moderate, low~~

Notes: Serious cattle impacts in bed + banks. Vegetation along riparian areas are trampled especially d/s of road into private land areas.

Overall ~~the~~ level of disturbance is "H"

	Reach	Site
Level of Disturbance:	L-M	–
Assessment Priority:	L	–

Ground-based Field Form 1of 2: EAGAN LK SB.

Survey Location: Machette Ck Rep1.1 (~150m u/s of rd bridge xing)

Date: Oct 22/98 **Crew:** CB/RK **Weather:** Sunny

Photos 1) roll 5 2) exposure 16 3)location lking/us 4) notes

Width (W, in m) 1) Bankfull (Wb) 20* 2) Wetted (Ww) 9.5

- Wb probably 30m unknown if bank lowering results from cattl
* cattle tracks has flattened RB "L"

Max. Depth (D, in m) 1) Bankfull (Db) .60 2) Wetted (Dw) .30

Slope (S, in %) 1) Channel 1% 2) Side slopes (if incised) LB ≃ 4m high & 100% but well vegetated + stable

Valley Flat (VF, in m) (at 2 times bankfull depth): see map

Entrenchment ratio (VF/Wb): –

Profile morphology (using CAP terminology): RPc/b

Channel Bed:
Texture: __%Z 0 %S 5 %G 75 %C 20 %B 0 %R Stability: (stable) (aggrading) degrading

Channel Banks:
Texture: 8 %Z 60 %S 30 %G – %C 2 %B 0 %R Stability: high (moderate) low
(bank stability is the opposite of bank erosion potential)

Small Woody Debris:
Quantity: scarce (occasional) common, abundant, over-abundant (choking channel)
Stability: high, moderate (low)

Large Woody Debris:
Quantity: (scarce) (occasional) common, abundant, over-abundant (choking channel)
Stability: high (moderate) (low)

Notes: RIP ZONE (YFc to MFc RB, SHRts LB)
CCover CK 1%

(Sp, Bl, At, Pl) T: rip zone cover 30% RB, 10% LB, bank 20%, ave ht 0.25m
(alder, willow) S: " " " 50%, " 50%, " " 2.0 m
(sedge) H: " " " 7%; ," 20%, " " 0.10 m

- impacts Low – due to Rb disturbance
IMPACTS – cattle tracks + fecal matter in the channel & on the centre boulder cobble bar
- Road on Rb comes within 15-20 m of channel but does not appear to present impact or disturbance (SS)
- v-low flow

Helicopter Reach/Site Survey

	Reach	Site
Level of Disturbance:	L-M	L
Assessment Priority:	L	L

Ground-based Field Form 2 of 2:

Survey Location: Reach 1 of Machette Ck (Eagan Lk)

Date: 22/10/98 **Crew:** RIC, CB **Weather:** Warm-Hot 16°C

Photos Check 1) roll 5 2) exposure 16 3) location Hwy 4) notes
Repl. 1 site

1. Existing Channel Disturbance (CD): (L,M,H)
L = not detectable-slight; M = moderate; H = high-extreme (morphology obscured)
(Map code 1)

Disturbance Cause: CATTLE PRESENCE IN THE CHANNEL CREATING MINOR SED SOURCE "IL" BUT HAS TRAMPLED FINE TEXTURED COMPLEX COMPONENT OF THE RB + POSSIBLY ALTERING (LOWERING) BANKS ∴ widening channel

2. **Potential for future channel disturbance:** (L,M,H)
(as defined for Existing Channel Disturbance)

3. **Restoration benefit:** (L,M,H) **(average of degree of benefit, success, duration)**

Degree of habitat benefit (L,M,H) L:marginal improvement likely, short length of channel; M: moderate improvement likely, moderate channel length affected; H: large improvement likely, long length of channel)

Type of habitat benefit, and description: (R,S,M)
(R=improved rearing habitat, S=improved spawning habitat, M=improved migration)
- won't affect migration substantially but R+S could possibly be affected (probably more rearing as substrate appears too coarse for spawning

potential for success: (L,M,H)

likely duration of effectiveness (<5 yrs; 5-20 yrs; >20 yrs)

4. **Restoration cost** (<$10,000; $10,000-$100,000; >$100,000)
(includes prescription and implementation)

5. **Existing access:** (fly; trail; road)

6. **Priority for Prescription:** (L,M,H) **(weighted average of factors 1-5)**
(Map code 2)

Restoration Options:
NO FENCE ON LB SIDE NEAR CROSSING - THERE IS FENCE ON LB SIDE ≈ 40-50 m d/s but cattle can easily enter channel at or adjacent to crossing. Complete the fencing to the road.

Other Notes:
-THERE IS FENCING ON RB SIDE THROUGHOUT.

	Reach	Site
Level of Disturbance:	L	—
Assessment Priority:	L	—

Ground-based Field Form 1of 2: EAGAN LK SB Rep 3-1.1

Survey Location: Machete Ck d/s of Machete/McDonald confluence and d/s of ford xing ~ 20m

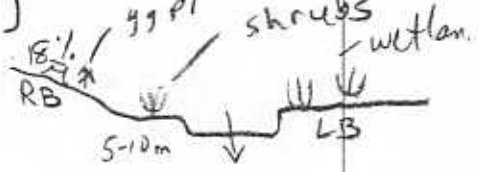
Date: Oct. 22/98 Crew: CB\RK Weather: sunny

Photos 1) roll 5 2) exposure 22 3)location Xing d/s 4) notes

Width (W, in m) 1) Bankfull (Wb) 5.5 2) Wetted (Ww) 5.5 } - estimated ice on creek

Max. Depth (D, in m) 1) Bankfull (Db) 0.9 2) Wetted (Dw) 0.6

Slope (S, in %) 1) Channel 0.5% 2) Side slopes (if incised)



Valley Flat (VF, in m) (at 2 times bankfull depth): check map

Entrenchment ratio (VF/Wb):

Profile morphology (using CAP terminology): Wetland RP

Channel Bed:
Texture: 50 %Z 50 %S 0 %G 0 %C 0 %B 0 %R Stability: (stable) aggrading, degrading } textures estimated - ice on ck

Channel Banks:
Texture: 50 %Z 50 %S 0 %G 0 %C 0 %B 0 %R Stability: high, (moderate), low
(bank stability is the opposite of bank erosion potential)

Small Woody Debris:
Quantity: scarce, (occasional), common, abundant, over-abundant (choking channel)
Stability: high, moderate, (low)

Large Woody Debris:
Quantity (scarce), occasional, common, abundant, over-abundant (choking channel)
Stability: high, moderate, low none seen

Notes:
RIPARIAN ZONE - wetland see notes from McDonald Ck Rep Site 1.1

IMPACTS
- cattle in area, banks do not appear trampled
- impact "Low", Ford xing impact Low
- RB logged and replanted w PL, logged approx 20m and > from RB

NOTE: REACH 3-1 - consists of partial wetlands + RP c/g morphology complex. ~ 3/4 of reach (Lower) has 20% cobble, 40% gravel + 40% boulder rest appear to be sand. Impacts all appear to be (L) due to Range land use on both bank sides.

	Reach	Site
Level of Disturbance:	L	L
Assessment Priority:	L	L

Ground-based Field Form 2 of 2: Reach 3of1 (B3-1.1)

Survey Location: MACHETTE CK (DS OF CONFLUENCE WITH McDONALD) EAGAN LAKE

Date: 22/10/98 Crew: RK, CB Weather: Sunny

Photos check 1) roll 5 2) exposure 3) location 1km d/s 4) notes
CB Photo 22

1. Existing Channel Disturbance (CD): (L,M,H)
L = not detectable-slight; M = moderate; H = high-extreme (morphology obscured)
(Map code 1)

Disturbance Cause: FORD CROSSING WITH HIGH VOLUME CATTLE TRACK ENTERING CHANNEL + CROSSING
- LOW SED SOURCE HERE - LOW GRADE BANKS + CHANNEL - POSSIBLY STILL IN WETLAND COMPLEX

2. Potential for future channel disturbance: (L,M,H)
(as defined for Existing Channel Disturbance)

3. Restoration benefit: L,M,H **(average of degree of benefit, success, duration)**

Degree of habitat benefit (L,M,H) L:marginal improvement likely, short length of channel; M: moderate improvement likely, moderate channel length affected; H: large improvement likely, long length of channel)

Type of habitat benefit, and description: (R,S,M)
(R=improved rearing habitat, S=improved spawning habitat, M=improved migration)

R+S has potential to be moderately impacted due to sedimentation from exposed ford banks

potential for success: (L,M,H)

likely duration of effectiveness (<5 yrs; 5-20 yrs; >20 yrs)

4. Restoration cost (<$10,000; $10,000-$100,000; >$100,000)
(includes prescription and implementation)

5. Existing access: (fly; trail; road) BAD 4x4 trail

6. Priority for Prescription: L,M,H **(weighted average of factors 1-5)**
(Map code 2)

Restoration Options: - ARMOUR FORD + POSSIBLY FENCE AROUND ADJACENT BANKS. FORD CONSISTS MAINLY OF FINES gr $\underline{50}$, sa $\underline{50}$
- TRY TO CONCENTRATE CATTLE AT CURRENT LOCATION + KEEP OUT OF u/s + d/s banks that have good wetland brush.

Other Notes: WETLAND COMPLEX THERE FOR IMPACTS ARE REDUCED HOWEVER BANKS ARE STILL ERODIBLE AND HAVE POTENTIAL TO BE DEGRADED.

WIDTH OF FORD IS ≈ 15 m (good for high volumes of cattle.)

Ground-based Field Form 2 of 2:

Survey Location: EAGAN LAKE - MACHETE CK REACH 5-1

Date: 21/10/98 Crew: RE, CB Weather:

Photos 1) roll 2) exposure 3) location 4) notes
↳ check rep site

1. Existing Channel Disturbance (CD): (L,M,H)
L = not detectable-slight; M = moderate; H = high-extreme (morphology obscured)
(Map code 1)

Disturbance Cause: SWD in channel - channel is aggrading + widening - serious lengthy sed. source Possibly associated with adjacent cutbank.

2. Potential for future channel disturbance: (L,M,H)
(as defined for Existing Channel Disturbance)

3. Restoration benefit: L,M,H (average of degree of benefit, success, duration)

Degree of habitat benefit (L,M,H) L:marginal improvement likely, short length of channel; M: moderate improvement likely, moderate channel length affected; H: large improvement likely, long length of channel)

Type of habitat benefit, and description: (R,S,M)
(R=improved rearing habitat, S=improved spawning habitat, M=improved migration)

- LOWER SEDIMENT INPUT BY POSSIBLY REMOVING SWD + CREATING ONE SINGLE THREAD CHANNEL

potential for success: (L,M,H)

likely duration of effectiveness (<5 yrs; 5-20 yrs; >20 yrs)

4. Restoration cost (<$10,000; $10,000-$100,000; >$100,000)
(includes prescription and implementation)

5. Existing access: (fly; trail; road)

6. Priority for Prescription: L,M,H (weighted average of factors 1-5)
(Map code 2)

Restoration Options:

REMOVAL OF SWD + CHANNEL EXCAVATION, FIRST STEP IS TO WALK ENTIRE REACH, CCPA.

Other Notes:

Helicopter Reach/Site Survey

	Reach	Site
Level of Disturbance:	L	–
Assessment Priority:	L	–

Ground-based Field Form 1of 2: EAGAN LK SB

Survey Location: Rep 5-1.1 MACHETTE CK ~100m d/s from bridge

Date: Oct 21/98 **Crew:** RK\CB **Weather:** Sunny

Photos 1) roll 4 2) exposure 1 3)location 1 kig d/s 4) notes

Width (W, in m) 1) Bankfull (Wb) 8.05 + 3.45 = 11.5 2) Wetted (Ww) 6.55 + 0 = 6.55

Max. Depth (D, in m) 1) Bankfull (Db) 2) Wetted (Dw) back channel has pools, but no flowing H_2O

Slope (S, in %) 1) Channel 1% 2) Side slopes (if incised)

Valley Flat (VF, in m) (at 2 times bankfull depth): (see map, >100m)

Entrenchment ratio (VF/Wb):

Profile morphology (using CAP terminology): RP (-w)

Channel Bed:
Texture: 0 %Z 33 %S 60 %G 5 %C 2 %B 0 %R Stability: stable, (aggrading), degrading stability very low

Channel Banks:
Texture: 20 %Z 70 %S 10 %G 0 %C 0 %B 0 %R Stability: high, moderate, (low)
(bank stability is the opposite of bank erosion potential)

Small Woody Debris:
Quantity: scarce, occasional, common, abundant, (over-abundant) (choking channel)
Stability: high, moderate, (low)

Large Woody Debris:
Quantity: scarce, occasional, (common) abundant, over-abundant (choking channel)
Stability: high, moderate, (low) - LWD appears to be natural possibly disease - very LWD covered w moss

Notes:

RIPARIAN ZONE ~20 m wide.

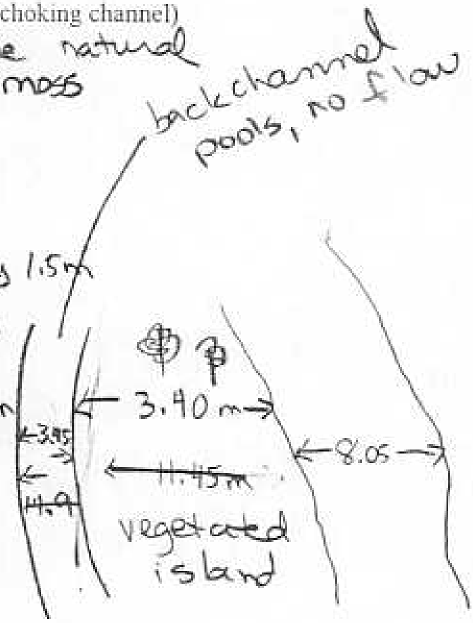
(Sp.)

TREE 10% cover, banks 20%, ave overhang 1.5m

(Devil's club, Ribes lac, Alder, Rosa sp, yg Sp, yg Bl, yg Fd, Cornus (sto)) SHRUB 40% " , " 75%, " " 2m

(Bunchberry, Moss, Lg leaved avens) HERB 70% " , " 90%, " " 0.05m

C.C. over creek 15%.



IMPACTS:

- natural due to LWD in ch.
cutblock (North EAST SIDE) channel buffer looks okay -
- suspect cutblocks adjacent - carry out inspection (detailed)

Helicopter Reach/Site Survey

	Reach	Site
Level of Disturbance:	L	L
Assessment Priority:	L-M	L

Ground-based Field Form 1of 2: EAGAN LK SD

Survey Location: Machette Ck - Rep 6.1 ~ 60 m u/s of bridge

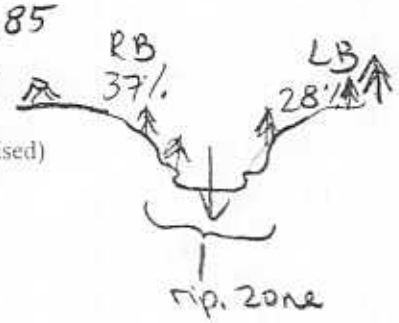
Date: Oct 21/98 Crew: CB/RK Weather: sunny

Photos 1) roll 5 2) exposure 25 3)location 1king u/s 4) notes

Width (W, in m) 1) Bankfull (Wb) 7.6 2) Wetted (Ww) 3.85

Max. Depth (D, in m) 1) Bankfull (Db) 0.70 2) Wetted (Dw) 0.31

Slope (S, in %) 1) Channel 9% 2) Side slopes (if incised)



Valley Flat (VF, in m) (at 2 times bankfull depth): 10 m

Entrenchment ratio (VF/Wb):

Profile morphology (using CAP terminology): SP/CP c1b

Channel Bed:
Texture: 0 %Z 5 %S 5 %G 50 %C 40 %B 0 %R Stability: (stable), aggrading, degrading
- moss covered boulders in bed and banks

Channel Banks:
Texture: 0 %Z 2 %S 8 %G 60 %C 30 %B 0 %R Stability: (high), moderate, low
(bank stability is the opposite of bank erosion potential)

Small Woody Debris:
Quantity: scarce, occasional, (common), abundant, over-abundant (choking channel)
Stability: high, moderate, (low)

Large Woody Debris:
Quantity: scarce, occasional, common, (abundant), over-abundant (choking channel)
Stability: high, moderate, (low)

Notes: RIPARIAN ZONE (MF)

TREE 30% cover, bank 30% ave overhang 0.5 m
(Sp.) SHRUB 45% cover bank 45% " " 1.0 m
(Devil's club, Alder, Lgs, Lgg, Bl)
(moss, clubmoss, bunchberry) MOSS/HERB 85% cover, bank 95% ave. overhang 0.02 m

C.C. over ck 15%

- snags by creek
- drier sites out of gully forested w/ Pl, S, Bl

IMPACTS:
- cutblock ~10m from RB
- blowdown into ck from cutblock
- impact to ch. "M" to "L", potential "M" to "H"

Helicopter Reach/Site Survey

	Reach	Site
Level of Disturbance:	L	L
Assessment Priority:	L-M	L

Ground-based Field Form 2 of 2:

Survey Location: S6.1 Machete Ck EAGAN LAKE

Date: 21/10/98 **Crew:** RK, CB **Weather:**

Photos 1) roll 2) exposure 3) location 4) notes

1. Existing Channel Disturbance (CD): (L,M,H) → channel appears to be partially blocked by slide material - has potential to be "H"
L = not detectable-slight; M = moderate; H = high-extreme (morphology obscured)
(Map code 1)

Disturbance Cause: Natural slide RB side "on unstable hillslope ≈ 80%
Cutblock on top. cutblock is ≈ 3-6 years old. Possibly accelerated slope however old slides natural adjacent u/s prior to cutblock.

2. **Potential for future channel disturbance:** (L,M,H)
(as defined for Existing Channel Disturbance)

3. **Restoration benefit:** L,M,H **(average of degree of benefit, success, duration)**

Degree of habitat benefit (L,M,H) L:marginal improvement likely, short length of channel; M: moderate improvement likely, moderate channel length affected; H: large improvement likely, long length of channel)

Type of habitat benefit, and description: (R,S,M)
(R=improved rearing habitat, S=improved spawning habitat, M=improved migration)
Migration can be affected here

potential for success: (L,M,H)

likely duration of effectiveness (<5 yrs; 5-20 yrs; >20 yrs)

4. **Restoration cost** (<$10,000; $10,000-$100,000; >$100,000)
(includes prescription and implementation)

5. **Existing access:** (fly; trail; road) ≈ 50 m away

6. **Priority for Prescription:** L,M,H **(weighted average of factors 1-5)**
(Map code 2)

Restoration Options: clean out channel at toe of slide - remove wood currently in the channel + place it on toe side of slide
- channel appears to have enough flow to clean out finer sed.
- vegetate + hydroseed slide.

Other Notes: - FACE of SLIDE 15-20% vegetated with grass + herbs
- toe is ≈ 30-35 % vegetated " herbs + shrubs
Slide Material - Sandy 70%, gravel 20% with cobble (15%) + 2% boulder
- looks to be ~~glacial~~ till material
- silt content ≈ 10%

Helicopter Reach/Site Survey

	Reach	Site
Level of Disturbance:	L	L
Assessment Priority:	L-M	L

Ground-based Field Form 2 of 2:

Survey Location: Reach 6 Machete Creek

Date: 21/10/98 Crew: RK, CB Weather: clear - 10°C

Photos 1) roll 2) exposure 3) location 4) notes
↳ see Rep 6.1 site

1. Existing Channel Disturbance (CD): (L,M,H)
L = not detectable-slight; M = moderate; H = high-extreme (morphology obscured)
(Map code 1)

Disturbance Cause: Blow Down across creek all along cutblock boundary - Buffer of ≈ 15 m 30 m was left however many of mature stand spruce + sub-alpine fir have fallen in ≈ 20% of Rb buffer

2. Potential for future channel disturbance: (L,M,H) channel is stable - boulder cobble morphology.
(as defined for Existing Channel Disturbance)

3. Restoration benefit: L,M,H (average of degree of benefit, success, duration)

Degree of habitat benefit (L,M,H) L:marginal improvement likely, short length of channel; M: moderate improvement likely, moderate channel length affected; H: large improvement likely, long length of channel)

Type of habitat benefit, and description: (R,S,M)
(R=improved rearing habitat, S=improved spawning habitat, M=improved migration)
- not preferable reach for rearing or spawning however migration can be affected

potential for success: (L,M,H)

likely duration of effectiveness (<5 yrs; 5-20 yrs; >20 yrs)

4. Restoration cost (<$10,000; $10,000-$100,000; >$100,000) ✗
(includes prescription and implementation)

5. Existing access: (fly; trail; road)

6. Priority for Prescription: L,M,H (weighted average of factors 1-5)
(Map code 2)

Restoration Options: - Remove uprooted stands across channel.

First assess entire reach - CCPA possibilities

Other Notes: Channel is ~~vulnerable~~ insensitive in terms of bank + bed stability. Also very unlikely that sediment can deposit enough to create large enough jam to create hazard to d/s bridge crossing.

Helicopter Reach/Site Survey

	Reach	Site
Level of Disturbance:	m	—
Assessment Priority:	m	—

Ground-based Field Form 1of 2: EAGAN LK SB3
REP 1.1 McDonald

Survey Location: McDonald Ck d/s of EAGAN LAKE + JUST u/s of CONFLUENCE w MACHETTE Ck

Date: 22/10/98 Crew: RK, CB Weather: clear - cool 5°C

Photos 23 1) roll 5 2) exposure 100 3)location looking d/s 4) notes

Width (W, in m) 1) Bankfull (Wb) 5m 2) Wetted (Ww) 5m } wetland Estimate

Max. Depth (D, in m) 1) Bankfull (Db) 105 2) Wetted (Dw) 105 } wetland Estimate

soil saturated at bank edge

Slope (S, in %) 1) Channel .5 % 2) Side slopes (if incised) N/A

Valley Flat (VF, in m) (at 2 times bankfull depth): check map - not incised

Entrenchment ratio (VF/Wb):

Profile morphology (using CAP terminology): Wetland / RP d/s

Channel Bed: - organic in bed.
Texture: 80 %Z 20 %S __ %G __ %C __ %B __ %R Stability: (stable) aggrading, degrading } texture estimated - ice on ck

Channel Banks: - organic
Texture: 50 %Z 50 %S __ %G __ %C __ %B __ %R Stability: high, (moderate), low
(bank stability is the opposite of bank erosion potential)

Small Woody Debris:
Quantity: (scarce), occasional, common, abundant, over-abundant (choking channel)
Stability: high, moderate, low N/A

Large Woody Debris:
Quantity: (scarce), occasional, common, abundant, over-abundant (choking channel)
Stability: high, moderate, low N/A

Notes:

IMPACTS - RB ~~moderate~~ LOW
- cattle droppings by creek RB
- LB looks good
- RB 20m from creek rangeland
- lack of shrubs along ck at rep site, likely grazed by cattle. - * Banks do not appear trampled by cattle

RIPARIAN ZONE 10-15m RB, LB 30-40 m
- sedge/shrub wetland (SHRUBS)

TREES 0%. (would likely not occur naturally at this site)

(willow) SHRUB Rep site 3%. (d/s + u/s 40%), banks 3%, ave overhang 0.5m (banks d/s and u/s 40%)

(grass, sedge) HERB Rep site 98%. banks 98%. (Herb u/s + d/s ~50%.)
ave over. 0.2m

- shrubs 1-4m tall, average 3m tall

Helicopter Reach/Site Survey

	Reach	Site
Level of Disturbance:	M	L
Assessment Priority:	M	L

Ground-based Field Form 2 of 2:

Survey Location: REACH 1 of MCDONALD CK (EAGAN LAKE)

Date: 22/10/98 Crew: RK, CB Weather:

Photos 23 1) roll 5 2) exposure 10 3) location looking d/s 4) notes ~~Fence on photo to property line~~.

1. Existing Channel Disturbance (CD): (L,M,H)
L = not detectable-slight; M = moderate; H = high-extreme (morphology obscured)
(Map code 1)

Disturbance Cause: RANGE LAND USE ON RB - Channel is wetland ≈ 10-15 m each bank ~~to~~ the upper range land use. overall wetland = 30m

2. Potential for future channel disturbance: (L,M,H)
(as defined for Existing Channel Disturbance)

3. Restoration benefit: (L,M,H) (average of degree of benefit, success, duration)

Degree of habitat benefit (L,M,H) L:marginal improvement likely, short length of channel; M: moderate improvement likely, moderate channel length affected; H: large improvement likely, long length of channel)

Type of habitat benefit, and description: (R,S,M)
(R=improved rearing habitat, S=improved spawning habitat, M=improved migration)

- MIGRATION WILL NOT BE ALTERED BUT R+S could be altered due to ongoing bank disturbance by cattle.

potential for success: (L,M,H)

likely duration of effectiveness (<5 yrs; 5-20 yrs; >20 yrs)

4. Restoration cost (<$10,000; $10,000-$100,000; >$100,000)
(includes prescription and implementation)

5. Existing access: (fly; trail; road) - Rd is bad shape - slow + heavy 4x4 road/trail look for wash-out but crossable at Wilson ck.

6. Priority for Prescription: (L,M,H) (weighted average of factors 1-5)
(Map code 2)

Restoration Options: FENCE + RIPARIAN VEG. (Leave gaps for cattle to water)

- REFERENCE TO MAP NOTES: MAP SAYS ENTIRE AREA INCLUDING RB IS WETLAND HOWEVER PRESENCE OF CATTLE ON HIGHER GROUND IS APPARENT

Other Notes: POSSIBLY BEAVER DAM IMPACTS HERE

- LB Adjacent to CREEK IS WELL + PROPERLY VEGETATED.

Helicopter Reach/Site Survey

	Reach	Site
Level of Disturbance:	L	—
Assessment Priority:	C	—

Ground-based Field Form 1of 2: EAGAN LK (58)

Survey Location: McDonald Ck Rep 9.1 ~80m u/s of rd xing

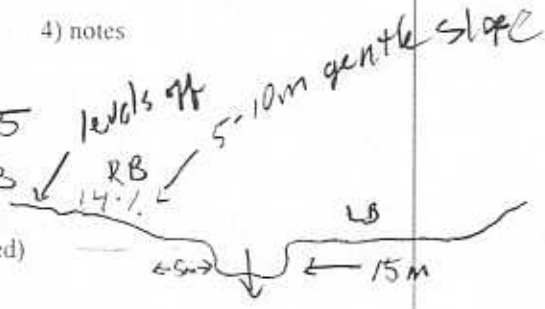
Date: Oct 21/98 Crew: CB & RK Weather: sunny, cool, frost

Photos ~~40~~ 1) roll 4 2) exposure 2 3)location looking u/s 4) notes

Width (W, in m) 1) Bankfull (Wb) 2.35 2) Wetted (Ww) 1.75

Max. Depth (D, in m) 1) Bankfull (Db) 0.78 2) Wetted (Dw) 0.13

Slope (S, in %) 1) Channel ~~37.~~ 2% 2) Side slopes (if incised)



Valley Flat (VF, in m) (at 2 times bankfull depth): ~ 23 to 25m

Entrenchment ratio (VF/Wb):

Profile morphology (using CAP terminology): RP4q/CPc

Channel Bed:
Texture: 0 %Z 0 %S 50 %G 40 %C 10 %B 0 %R Stability: stable, aggrading, degrading

Aggrading closer to crossing.

Channel Banks:
Texture: 0 %Z 25 %S 40 %G 30 %C 5 %B 0 %R Stability: high, moderate, low
(bank stability is the opposite of bank erosion potential)

Small Woody Debris:
Quantity: scarce, occasional, common, abundant, over-abundant (choking channel)
Stability: high, moderate, low

Large Woody Debris:
Quantity: scarce, occasional, common, abundant, over-abundant (choking channel)
Stability: high, moderate, low

Notes: RIPARIAN ZONE

(Spruce, Af) Tree cover 20% bank 10% ave. overhang ~1m

(Alder, yg Spruce) Shrub " 30% bank 30% " " ~0.5m

(Grasses, moss, stinging nettle) Herb/Moss " 95% bank 95% " " ~0.02m

CC over CL ~10%.

- snags seen in riparian zone

IMPACTS - "M".

- cattle have trampled banks by rd.
- less impact 30m u/s up to Rep site, trail (flattened grass) by ck., but not trampled banks

- TREES CAN POSSIBLY GROW ALONG BANKS HERE
- cattle impacts are moderate throughout the stream banks of this reach

Helicopter Reach/Site Survey

	Reach	Site
Level of Disturbance:	L	H
Assessment Priority:	L	H

Ground-based Field Form 2 of 2:

Survey Location: McDonald Ck (EAGAN LAKE) B9.1

Date: 21/10/98 Crew: RK, CB Weather:

Photos No photos 1) roll 2) exposure 3) location 4) notes

1. Existing Channel Disturbance (CD): (L,M,H)
L = not detectable-slight; M = moderate; H = high-extreme (morphology obscured)
(Map code 1)

Disturbance Cause: CATTLE HAVE ENTERED BOTH u/s + d/s culverts inlet + outlet + trampled down the banks, loosened soil - removed vegetation + created M-H sediment source u/s + d/s. Banks are loose gravel with sand material and sediment sa/gr bars are formed either in center d/s or along the banks

2. **Potential for future channel disturbance:** (L,M,H)
(as defined for Existing Channel Disturbance)

3. **Restoration benefit:** L,(M),H **(average of degree of benefit, success, duration)**

Degree of habitat benefit (L,M,H) L:marginal improvement likely, short length of channel; M: moderate improvement likely, moderate channel length affected; H: large improvement likely, long length of channel)

Type of habitat benefit, and description: (R,S,M)
(R=improved rearing habitat, S=improved spawning habitat, M=improved migration)

- APPEARS TO BE IMPACTS IN ALL THREE ASPECTS FOR FISH
- ACCESS WILL NEED TO BE CUT OFF OR CHANNEL CLEANED OUT HERE + REPLACED WITH COARSE gravel + small cobble.

potential for success: (L,(M),H)

likely duration of effectiveness (<5 yrs; 5-20 yrs; >20 yrs)

4. **Restoration cost** (<$10,000; $10,000-$100,000; >$100,000)
(includes prescription and implementation)

5. **Existing access:** (fly; trail;(road)) Machete Lake Road

6. **Priority for Prescription:** L,(M),H **(weighted average of factors 1-5)**
(Map code 2)

Restoration Options: FENCE THE CHANNEL + PLANT RIPARIAN VEG U/S. OR PILE ALONG THE BANKS W/ COARSE LARGE BOULDERS TO BLOCK ACCESS. (NOTE - cattle will find other entry point if rip rap option is used.
- LEAVE AS IS BUT CLEAN FINER MATERIAL + REPLACE WITH COARSER MATERIAL TO REDUCE CATTLE IMPACTS.

Other Notes:

DOUBLE 2000 mm CMP culvert

Helicopter Reach/Site Survey

	Reach	Site
Level of Disturbance:	C	–
Assessment Priority:	C	–

Ground-based Field Form 1of 2: EAGAN LK SB

Survey Location: MONTANA CK, Rep 4.1, u/s of rd xing

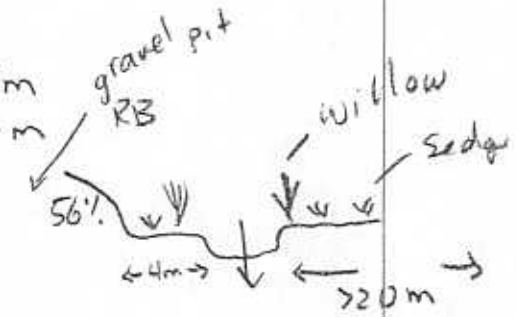
Date: OCT 21/98 **Crew:** CB\RK **Weather:** Sunny, cool, frost, some ice on ck.

Photos 1) roll 4 2) exposure 4 3)location Hking u/s at xing 4) notes

Width (W, in m) 1) Bankfull (Wb) 4.5m 2) Wetted (Ww) 4.5m

Max. Depth (D, in m) 1) Bankfull (Db) 0.9m 2) Wetted (Dw) 0.7m

Slope (S, in %) 1) Channel 0.5% 2) Side slopes (if incised)



Valley Flat (VF, in m) (at 2 times bankfull depth): see map

Entrenchment ratio (VF/Wb):

Profile morphology (using CAP terminology): RP

difficult to access ck for texture ??

Channel Bed:
Texture: 50 %Z 50 %S 0 %G 0 %C 0 %B 0 %R Stability: stable, aggrading, degrading
high organics

Channel Banks:
Texture: 50 %Z 50 %S 0 %G 0 %C 0 %B 0 %R Stability: high, moderate, low
(bank stability is the opposite of bank erosion potential)
high organics

Small Woody Debris:
Quantity: (scarce) occasional, common, abundant, over-abundant (choking channel)
Stability: high, (moderate) (low).

Large Woody Debris:
Quantity: (scarce) occasional, common, abundant, over-abundant (choking channel)
Stability: high, moderate, (low) none observed u/s, 1 piece observed d/s

Notes: RIPARIAN WETLAND
Sedge 90% } of riparian area
Shrub 2% (willow) } and banks
d/s of rd xing PL in drier areas

IMPACTS
Wildlife trails?
- Cattle trails in drier parts of riparian area (ie) 3-5 m from RB
- old bridge xing d/s of rd xing, logs rotting into ck
- impacts LOW

	Reach	Site
Level of Disturbance:	L	M
Assessment Priority:	L	M

Ground-based Field Form 2 of 2: (B4.1)

Survey Location: Reach 4 d/s crossing Machete Lake Road @ Montana Ck

Date: 21/10/98 **Crew:** RK, CB **Weather:** clear-cool 4°C

Photos 3 1) roll 4 2) exposure 100 3) location Reach 4 4) notes Montana Lake looking d/s @ regular crossing

1. Existing Channel Disturbance (CD): (L,(M),H)
L = not detectable-slight; M = moderate; H = high-extreme (morphology obscured)
(Map code 1)

Disturbance Cause: OLD LOG BRIDGE CROSSING THAT HAS BEEN SUPERCEEDED BY Road crossing adjacent + u/s is collapsed and appears to be creating blockage of the channel

2. Potential for future channel disturbance: (L,(M),H)
(as defined for Existing Channel Disturbance)

3. Restoration benefit: L,(M),H **(average of degree of benefit, success, duration)**

Degree of habitat benefit (L,(M),H) L:marginal improvement likely, short length of channel; M: moderate improvement likely, moderate channel length affected; H: large improvement likely, long length of channel) - This spot could affect migration of fish u/s

Type of habitat benefit, and description: (R,S,(M))
(R=improved rearing habitat, S=improved spawning habitat, M=improved migration)

- simply put - log structure appears to be affecting the passage of fish - water flow has ~~also~~ not been affected

potential for success: (L,(M),H) could be high for fish reasons.

likely duration of effectiveness (<5 yrs; (5-20 yrs); >20 yrs)

4. Restoration cost ((<$10,000); $10,000-$100,000; >$100,000)
(includes prescription and implementation)

5. Existing access: (fly; trail; (road))

6. Priority for Prescription: L,(M),H **(weighted average of factors 1-5)**
(Map code 2)

Restoration Options:

Remove old bridge structure - pile up wood + logs on Rb side to block old road leading to bridge. Wetland u/s + d/s also see Collems Bnotes.

Riparian planting is not necessary.

Other Notes:

- Site is "L" Sed source
- no cattle impacts here

Helicopter Reach/Site Survey

	Reach	Site
Level of Disturbance:	L	–
Assessment Priority:	L	–

Ground-based Field Form 1of 2: BONAPARTE LK

Survey Location: Rep 12-1.1 BONAPARTE RIVER (RIFFLE)

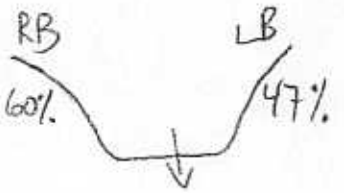
Date: Oct 22/98 Crew: CB\RK Weather: sunny, cool

Photos 1) roll 5 2) exposure 20 3)location Hwy u/s 4) notes

Width (W, in m) 1) Bankfull (Wb) 16.5 2) Wetted (Ww) 10.1

Max. Depth (D, in m) 1) Bankfull (Db) 1.39 2) Wetted (Dw) 0.57

Slope (S, in %) 1) Channel 3% 2) Side slopes (if incised)



Valley Flat (VF, in m) (at 2 times bankfull depth): 0

Entrenchment ratio (VF/Wb):

Profile morphology (using CAP terminology): RP clb

Channel Bed:
Texture: 0 %Z 5 %S 25 %G 30 %C 40 %B 0 %R Stability: (stable), aggrading, degrading

Channel Banks:
Texture: 0 %Z 0 %S 10 %G 70 %C 20 %B 0 %R Stability: high, (moderate), low
(bank stability is the opposite of bank erosion potential)

escarpment RB unstable terrain

Small Woody Debris:
Quantity: scarce, occasional, (common), abundant, over-abundant (choking channel)
Stability: high, moderate, (low)

Large Woody Debris:
Quantity: scarce, occasional, (common), abundant, over-abundant (choking channel)
Stability: high, (moderate), low moss (a little) on some CWD

Notes: RIPARIAN ZONE - little to no valley flat (MFc)

(Spruce) Tree: 50% banks (w/in 4-5 m of ch.), ave overhang 0.25m, rg 0-2,

(Alder, Snowberry, ggSp, Rosa sp) Shrub: 60% " (w/in 1-2 m of ch), " " ", rg 0-5m

(Grass, Moss, bunchberry, sedestraws, twinflower, scouring rush) Moss/Herb: 80% " " " 0m

Canopy closure over ch: 3%

IMPACTS - very little other than natural slides.

	Reach	Site
Level of Disturbance:	L	L
Assessment Priority:	L	L

Ground-based Field Form 2 of 2:

Survey Location: BONAPARTE RIVER B12-1.1 (Bonaparte Lake) (schematic)

Date: 22/10/98 **Crew:** RK, CB **Weather:** clear - 8°C

Photos 21 1) roll 5 2) exposure 100 3) location looking d/s on sed source Rb 4) notes

1. Existing Channel Disturbance (CD): (L),M,H)
L = not detectable-slight; M = moderate; H = high-extreme (morphology obscured)
(Map code 1)

Disturbance Cause: Natural fine sandy textured hill escarpment is being undercutted by Bonaparte River as it meanders into the steep 65-70% erodible hillslope.

2. Potential for future channel disturbance: ((L),M,H)
(as defined for Existing Channel Disturbance)

3. Restoration benefit: L,M,H (average of degree of benefit, success, duration) ND

Degree of habitat benefit (L,M,H) L:marginal improvement likely, short length of channel; M: moderate improvement likely, moderate channel length affected; H: large improvement likely, long length of channel) ND

Type of habitat benefit, and description: (R,S,M)
(R=improved rearing habitat, S=improved spawning habitat, M=improved migration) ND

potential for success: (L,M,H)

likely duration of effectiveness (<5 yrs; 5-20 yrs; >20 yrs)

ND

4. Restoration cost (<$10,000; $10,000-$100,000; >$100,000)
(includes prescription and implementation)

5. Existing access: (fly; trail; road)

6. Priority for Prescription: L,M,H (weighted average of factors 1-5)
(Map code 2)

NOTES: TOE OF FAILING BANK APPEARS TO BE RELATIVELY COARSE WITH MAINLY BOULDER + COBBLE TO HELP INTERCEPT FINES AS WELL AS ARMOUR TOE THROUGH REGULAR FLOW - DURING FLOODS + PEAK FLOWS THE BOULDERY TOE WILL PLAY LESS OF A ROLE IN PROVIDING STABILITY.

~~Restoration Options:~~

Other Notes:

- THE NATURAL BANK APPEARS TO BE REVEGING WITH HERBS + GRASSES HOWEVER INSTABILITY IS APPARENT THROUGH GAPS IN THE HILLSLOPE (WITH EXPOSED FINES) ~ 5% cobble, 15% gravels + the rest is sand.

Helicopter Reach/Site Survey

Level of Disturbance: Reach L Site L or M
Assessment Priority: L M

Ground-based Field Form 2 of 2:

Survey Location: B12-1.3 Bonaparte River (Bonaparte Lake)

Date: 22/10/98 **Crew:** RK, CB **Weather:** Sunny 10°C

Photos No 1) roll 2) exposure 3) location 4) notes
PHOTO (will not capture the enormous

1. Existing Channel Disturbance (CD): (L,M,H)
L = not detectable-slight; M = moderate; H = high-extreme (morphology obscured)
(Map code 1)

Disturbance Cause: NATURAL BANK FAILURE AS IN B12-1.1. This slide has a very small buffer b/w creek + cutblock. cutblock ≈ 10-15 years dd - slide looks chronic + likely very old but in a continuum.

2. **Potential for future channel disturbance:** (L,M,H)
(as defined for Existing Channel Disturbance)

3. **Restoration benefit:** L,M,H **(average of degree of benefit, success, duration)**

Degree of habitat benefit (L,M,H) L:marginal improvement likely, short length of channel; M: moderate improvement likely, moderate channel length affected; H: large improvement likely, long length of channel)

Type of habitat benefit, and description: (R,S,M)
(R=improved rearing habitat, S=improved spawning habitat, M=improved migration)
Channel appears to be too wide for migration routes to be disturbed but the fine gvl, cobble, sa(matrix)

potential for success: (L,M,H)

likely duration of effectiveness (<5 yrs; 5-20 yrs; >20 yrs)

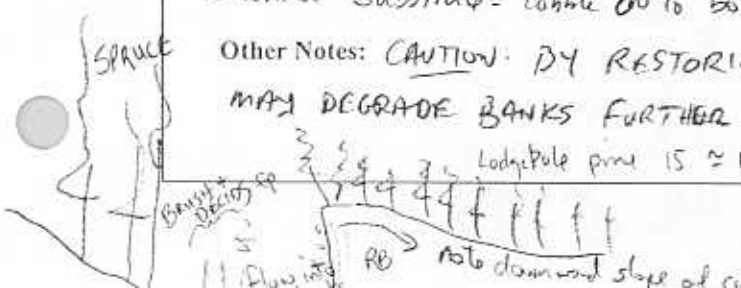
4. **Restoration cost** (<$10,000; $10,000-$100,000; >$100,000)
(includes prescription and implementation)

5. **Existing access:** (fly; trail; road) might be able to build road.

6. **Priority for Prescription:** L,M,H **(weighted average of factors 1-5)**
(Map code 2)

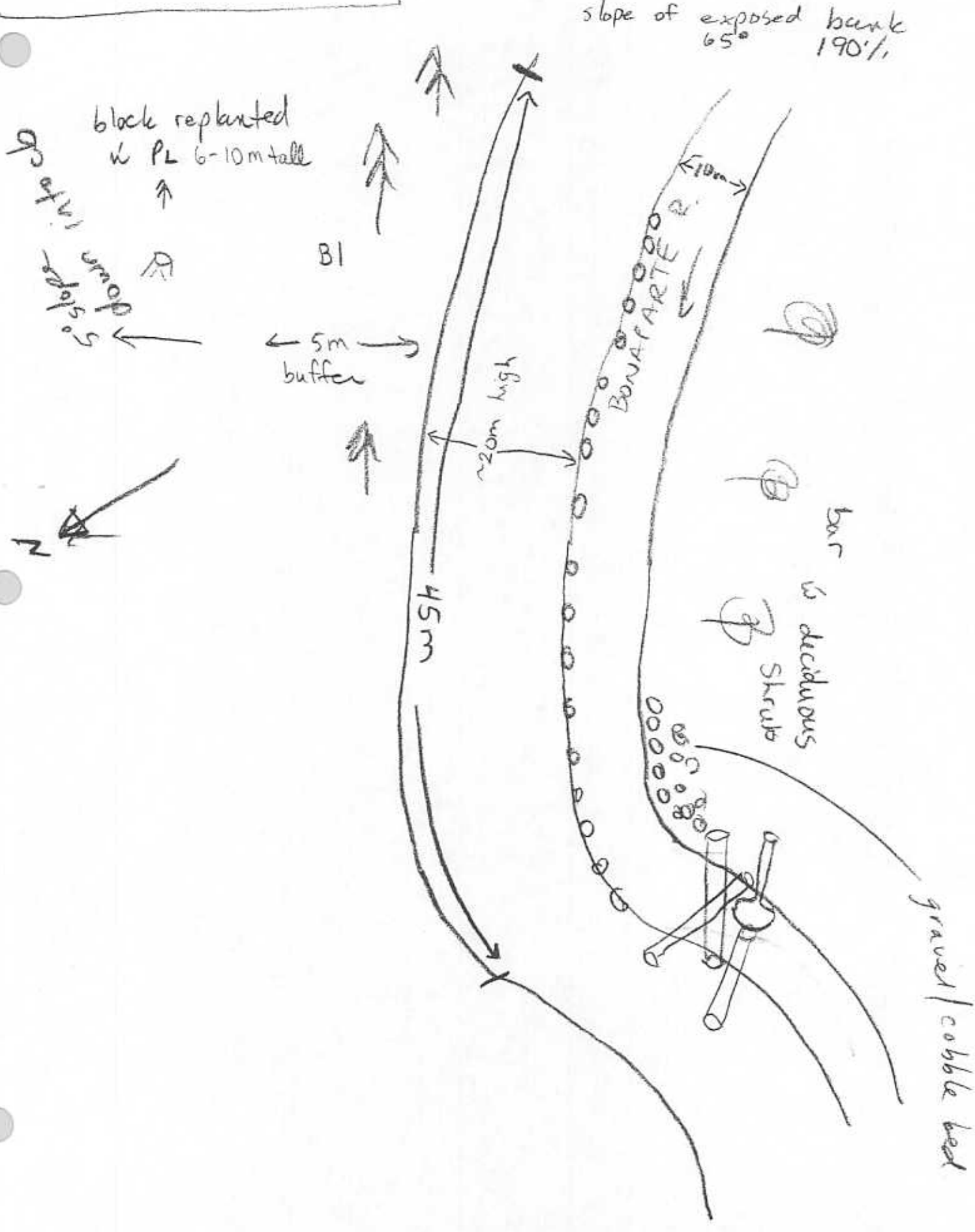
Restoration Options: ARMOUR TOE WITH LWD from Debris jam just d/s of the slide/failure. Boulder rip rap can be an option too.
NOTE: RESTORATION WORK IS UNLIKELY HERE - TO NATURAL + LARGE SCALE
Channel substrate: cobble 60% boulder 20%, + gvl 20

Other Notes: CAUTION: BY RESTORING SITE HERE - ENERGY OF CHANNEL MAY DEGRADE BANKS FURTHER D/S.



BONAPARTE LK 313

B12-1.3 - BONAPARTE R.



Helicopter Reach/Site Survey

Level of Disturbance: Reach L Site –
Assessment Priority: Lm –

Ground-based Field Form 1of 2: BONAPARTE RIVER

Survey Location: REP 12.1 (just d/s of bridge crossing ~150m)

Date: 22/10/98 **Crew:** RK, CB **Weather:** sunny

Photos 17 1) roll 5 2) exposure 17 3)location 1km d/s 4) notes

Width (W, in m) 1) Bankfull (Wb) 10.27 2) Wetted (Ww) 10.27

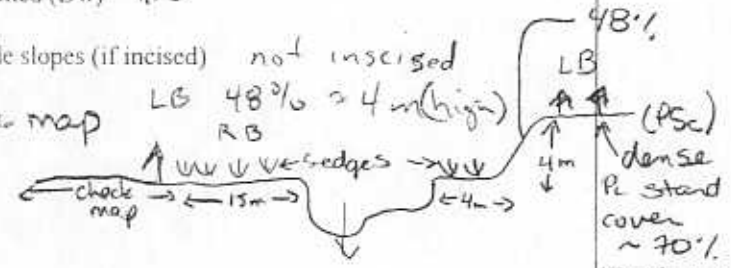
Max. Depth (D, in m) 1) Bankfull (Db) 1.56 2) Wetted (Dw) 1.13

Slope (S, in %) 1) Channel .7 % 2) Side slopes (if incised) not incised

Valley Flat (VF, in m) (at 2 times bankfull depth): see map

Entrenchment ratio (VF/Wb):

Profile morphology (using CAP terminology):



Channel Bed:
Texture: 0 %Z 10 %S 50 %G 30 %C 10 %B 0 %R Stability: (stable), aggrading, degrading
- veg. growing on bed in sandy areas

Channel Banks:
Texture: 0 %Z 50 %S 50 %G 0 %C 0 %B 0 %R Stability: high, (moderate), low
(bank stability is the opposite of bank erosion potential)

Small Woody Debris:
Quantity: (scarce), occasional, common, abundant, over-abundant (choking channel)
Stability: high, (moderate), low

Large Woody Debris:
Quantity: scarce, (occasional), common, abundant, over-abundant (choking channel)
Stability: high, (moderate), low

Notes: - RIP ZONE - sedge wetland
- backed up side ch. in 5m from RB
- wetland area encompasses channel ~ 10-15 m on Rb side - (ie channel is entrenched by Lb upper flood plain or terrace
- Fenced area on wetland on Rb side - therefore no impacts by cattle grazing here for both banks.
~~- fish present (RK)~~

(Bl, Pl) T: banks 5% ave ht: 0.5m, cover in zone 5-7%
(Willow, Rosa) S: banks 20% " " 0.25m, " " " 25%
(Sedge) H: banks 98% " " 0.30m, " " " 98%
cc over ck <1%

- IMPACTS - "LOW"
- lack of CWD perhaps due to logging

Helicopter Reach/Site Survey

Level of Disturbance: Reach L Site —
Assessment Priority: L —

Ground-based Field Form 1of 2: BON. LK. SB

Survey Location: Brown Ck Rep. 1.1 ~ 60 m a/s of new bridge xing

Date: Oct 22/98 Crew: CB/RK Weather: sunny

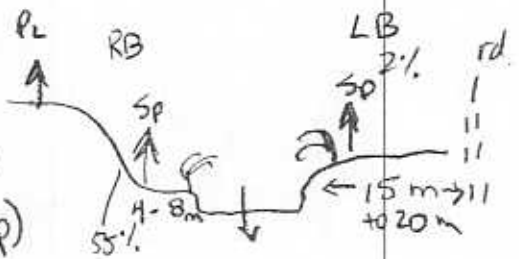
Photos 1) roll 5 2) exposure 18 3)location 1 king u/s 4) notes

Width (W, in m) 1) Bankfull (Wb) 4.5 2) Wetted (Ww) 3.4

Max. Depth (D, in m) 1) Bankfull (Db) 0.88 2) Wetted (Dw) 0.26

Slope (S, in %) 1) Channel 3.5%. 2) Side slopes (if incised)

Valley Flat (VF, in m) (at 2 times bankfull depth): ~25m (check map)



Entrenchment ratio (VF/Wb):

Profile morphology (using CAP terminology): RP/CP (RP$_c$)

Channel Bed:
Texture: 0%Z 0%S 10%G 75%C 25%B 0%R Stability: (stable) aggrading, degrading

Channel Banks:
Texture: 0%Z 10%S 20%G 40%C 30%B 0%R Stability: high, (moderate) low
(bank stability is the opposite of bank erosion potential) moss covered boulders in ck and along banks

Small Woody Debris:
Quantity: scarce, occasional, (common) abundant, over-abundant (choking channel)
Stability: high, (moderate) low

Large Woody Debris:
Quantity: scarce, (occasional) common, abundant, over-abundant (choking channel)
Stability: high, (moderate) low

Notes: - RIP ZONE: Tree cover ↑ as dist from ch ↑

(SP, PL) (willow)

Tree: 10% cover in rip zone, 10% bank, ave ht ~2m
Sh: 35% " , 30% " , " " ~1m
H/M: 90% " , 90% " , " " ~0.05m

CC over ck 5-7%

- IMPACTS (Low - moderate)
  - Cattle use grazing in rip zone and trampling of banks, banks trampled ~ 5% shoreline
  - new bridge xing

Helicopter Reach/Site Survey

	Reach	Site
Level of Disturbance:	M	~~M~~
Assessment Priority:	M	~~MOD~~

Ground-based Field Form 1of 2: BONAPARTE LK SB

Survey Location: BROWN CK Rep 2.1 ~ 40m u/s rd xing

Date: Oct 21/98 Crew: CB/RK Weather: sunny

Photos 1) roll 5 2) exposure 19 3)location 1king d/s 4) notes

Width (W, in m) 1) Bankfull (Wb) 7.45 2) Wetted (Ww) 4.75

Max. Depth (D, in m) 1) Bankfull (Db) 1.25 2) Wetted (Dw) .75

Slope (S, in %) 1) Channel .75 % 2) Side slopes (if incised) not incised

Valley Flat (VF, in m) (at 2 times bankfull depth): check map

Entrenchment ratio (VF/Wb):

Profile morphology (using CAP terminology): RP_{SIG} - possible wetted complex u/s + d/s

Channel Bed:
Texture: 15%Z 60%S 25%G __%C __%B __%R Stability: stable, aggrading, degrading

Channel Banks:
Texture: 40%Z 55%S 5%G __%C __%B __%R Stability: high, moderate, low
(bank stability is the opposite of bank erosion potential)

Small Woody Debris:
Quantity: scarce, occasional, common, abundant, over-abundant (choking channel)
Stability: high, moderate, low

Large Woody Debris:
Quantity: scarce, occasional, common, abundant, over-abundant (choking channel)
Stability: high, moderate, low none seen

Notes: RIP. ZONE

T: 0%. RB pasture for cattle

(Willow) S: 20%. banks ave ht 1.5m

(sedge, grass) M/H: 75%. " " " 0.1m

CC for ck 2%.

* IMPACTS - Medium to High
- RB pasture for cattle
- LB pasture and corals
- banks trampled by cattle ~30% shoreline

Helicopter Reach/Site Survey

	Reach	Site
Level of Disturbance:	M	M
Assessment Priority:	M	M-H

Ground-based Field Form 2 of 2:

Survey Location: REACH 2 - BROWN CK (BONAPARTE LAKE)

Date: 22/10/98 **Crew:** RK, CB **Weather:** Sunny 14°C

Photos check 1) roll 5 2) exposure 19 3) location Kingdale 4) notes
CB's Rep Site

1. Existing Channel Disturbance (CD): (L,M,H)
L = not detectable-slight; M = moderate; H = high-extreme (morphology obscured)
(Map code 1)

Disturbance Cause: CATTLE GRAZING + RANGELAND USE ON BOTH BANKS
BANKS ARE ERODABLE + V-FINE TEXTURE.
- CHANNEL HAS WIDENED CONSIDERABLY IN SECTIONS THROUGH REACH 2 (PRIVATE LOT AREAS)

2. **Potential for future channel disturbance:** (L,M,H)
(as defined for Existing Channel Disturbance)

3. **Restoration benefit:** L,M,H **(average of degree of benefit, success, duration)**

Degree of habitat benefit (L,M,H) L: marginal improvement likely, short length of channel; M: moderate improvement likely, moderate channel length affected; H: large improvement likely, long length of channel)

Type of habitat benefit, and description: (R,S,M)
(R=improved rearing habitat, S=improved spawning habitat, M=improved migration)

REARING + SPAWNING APPEAR TO BE THE MOST IMPACTED THROUGH THESE RIPARIAN AREAS USED FOR CATTLE USE. WATER IS MURKY + ORGANICS + SILTY FINES ARE LAYERED ON BED (BOTTOM) + BANKS ARE TRAMPLED + EXPOSED

potential for success: (L,M,H)

likely duration of effectiveness (<5 yrs; 5-20 yrs; >20 yrs)

4. **Restoration cost** (<$10,000; $10,000-$100,000; >$100,000)
(includes prescription and implementation)

5. **Existing access:** (fly; trail; road)

6. **Priority for Prescription:** L,M,H **(weighted average of factors 1-5)**
(Map code 2)

Restoration Options: - Construct Fencing + Plant on Riparian Areas.
CHANNEL DISTURBANCE IS "M" BUT CAN BE REDUCED TO NO DISTURBANCE RELATIVELY QUICKLY.
- RAMP DOWN ARMOURED FORDS FOR FREQUENT CATTLE DRINKING AREAS.

Other Notes:

Helicopter Reach/Site Survey

	Reach	Site
Level of Disturbance:	L	—
Assessment Priority:	L	—

Ground-based Field Form 1of 2: BOWRON TR LK SB

Survey Location: CAVERHILL CK Rep 13.1 ~ 50m d/s of bridge ~ 100 m d/s of Caverhill LK.

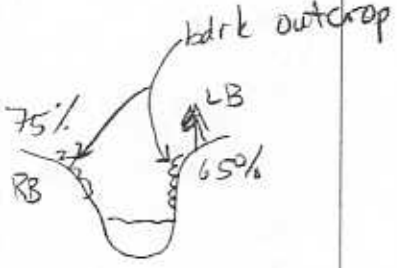
Date: Oct 21/98 **Crew:** CB\RK **Weather:** Sunny

Photos 1) roll 5 2) exposure 24 3) location 1km d/s 4) notes

Width (W, in m) 1) Bankfull (Wb) 3.35 2) Wetted (Ww) 1.75

Max. Depth (D, in m) 1) Bankfull (Db) 0.90 2) Wetted (Dw) 0.35

Slope (S, in %) 1) Channel 24.1. d/s 13.1. u/s towards rd 2) Side slopes (if incised)



Valley Flat (VF, in m) (at 2 times bankfull depth):

Entrenchment ratio (VF/Wb): 0 m

Profile morphology (using CAP terminology): SP (-w)

Channel Bed:
Texture: 0 %Z 0 %S 5 %G 5 %C 80 %B 10 %R Stability: (stable), aggrading, degrading

Channel Banks:
Texture: 0 %Z 0 %S 5 %G 5 %C 40 %B 50 %R Stability: (high) moderate, low
(bank stability is the opposite of bank erosion potential) rocks on banks covered w moss, not much moss on rks in ck.

Small Woody Debris:
Quantity: scarce, occasional, (common), abundant, over-abundant (choking channel)
Stability: high, moderate, (low)

Large Woody Debris:
Quantity: scarce, occasional, common, (abundant), over-abundant (choking channel)
Stability: high, (moderate), (low)

Notes: RIPARIAN ZONE - RIP ZONE COVER AND % BANKS EQUIVALENT

(SB, Bl)	TREE	60% (mfc)	(snags not seen but lots of CWD) ave. overhang 0 m	range 0-1m
(Alder, 99 Bl, 99 Sp)	SHRUB	30%	" " 0.5m	" 0-2m
(moss, lichen)	MOSS/HERB	90%	" " 0.0 m	

Canopy Closure 3%, but ck incised so shaded by terrain

IMPACTS - none-to low with natural slides

Helicopter Reach/Site Survey

	Reach	Site
Level of Disturbance:	L	M-H
Assessment Priority:	L	H

Ground-based Field Form 2 of 2:

Survey Location: NEAR SITE S13.4 CAVERHILL CK-REACH 13

Date: 21/10/98 **Crew:** RK, CB **Weather:** Sunny - 10°C

Photos No 1) roll 2) exposure 3) location 4) notes

1. Existing Channel Disturbance (CD) (L,M,H) - FROM HELICOPTER
L = not detectable-slight; M = moderate; H = high-extreme (morphology obscured)
(Map code 1)

Disturbance Cause: STEEP SANDY GRAVEL TILL TERRACE ESCARPMENT ON RB SIDE OF CHANNEL CUTBLOCK is situated RIGHT TO EDGE OF TERRACE + VERY UNSTABLE - WELL VEGETATED. SECTIONS OF SLIDES POSSIBLY CAUSED BY ROAD DRAINAGE ABOVE (NO OBVIOUS SIGNS) - ARGUEABLY WETHER S13.4 IS NATURAL OR NOT.
- SOURCE FOR INSTABILITY AT SLIDE IS GROUND WATER FLUCTUATIONS.

2. Potential for future channel disturbance: (L,M,H)
(as defined for Existing Channel Disturbance)

3. Restoration benefit: L,M,H (average of degree of benefit, success, duration)

Degree of habitat benefit (L,M,H) L:marginal improvement likely, short length of channel; M: moderate improvement likely, moderate channel length affected; H: large improvement likely, long length of channel)

Type of habitat benefit, and description: (R,S,M)
(R=improved rearing habitat, S=improved spawning habitat, M=improved migration)

- unknown whether rearing + spawning suitable
- migration for sure

CPA INSPECTION

potential for success: (L,M,H)

likely duration of effectiveness: (<5 yrs; 5-20 yrs; >20 yrs)

landslide rehabilitation if linked to cutblocks + impacting channel

4. Restoration cost (<$10,000; $10,000-$100,000; >$100,000)
(includes prescription and implementation)

- Colleen rated Reach Sig Site Low - I think it should be "M" given significant woody debris in channel.

5. Existing access: (fly; trail; road)

6. Priority for Prescription: L,M,H (weighted average of factors 1-5)
(Map code 2)

Restoration Options: POSSIBLY INSPECT REACH 13 MORE IN DETAIL. SUSPECT OF SERIES OF SLIDES LIKELY ASSOCIATED WITH CUTBLOCK

- concentrate on road drainage.

LOW-MOD IMPACTS FROM CUTBLOCK. !!!

Other Notes: "Low" Sed. Source - confirmed from air photos.

- should inspect Reach 12 - likely will be

Helicopter Reach/Site Survey

	Reach	Site
Level of Disturbance:	II	
Assessment Priority:	H	

Ground-based Field Form 1of 2: Bonaparte River Rep Site

Survey Location: BD.1 approx. 30m u/s Scottie Ck/Bonaparte Conf.

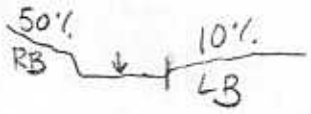
Date: Oct 16/98 Crew: CB/RK Weather: Sunny, Frost

Photos 1) roll 2 2) exposure 24 3)location 4) notes u/s

Width (W, in m) 1) Bankfull (Wb) 16.8 2) Wetted (Ww) 10.3

Max. Depth (D, in m) 1) Bankfull (Db) 1.86 2) Wetted (Dw) 0.46

Slope (S, in %) 1) Channel u/s 2%, d/s 1% 2) Side slopes (if incised) 50% RB, 10% LB



Valley Flat (VF, in m) (at 2 times bankfull depth): fan

Entrenchment ratio (VF/Wb):

Profile morphology (using CAP terminology): riffle/pool (-w)

Channel Bed:
Texture: 10 %Z 10 %S 50 %G 30 %C 0 %B 0 %R Stability: (stable), aggrading, degrading

Channel Banks:
Texture: 10 %Z 30 %S 30 %G 30 %C 0 %B 0 %R Stability: high, (moderate), low
(bank stability is the opposite of bank erosion potential)

Small Woody Debris:
Quantity: (scarce), occasional, common, abundant, over-abundant (choking channel)
Stability: high, (moderate), low

Large Woody Debris:
Quantity: (scarce), occasional, common, abundant, over-abundant (choking channel)
Stability: high, (moderate), low

Notes:

- gravel/cobble banks exposed in most places
- silty ~~clay~~ banks appear in places
- cattle have been drinking from creek
- banks trampled in places
- Alder, willow, water birch, Act, Rosa spp dominant shrub

Helicopter Reach/Site Survey

	Reach	Site
Level of Disturbance:	M	L
Assessment Priority:	H	L

Ground-based Field Form 2 of 2:

Survey Location: BRR-BΦ.1 (Scottie Creek confluence)

Date: Oct 16, 98 Crew: RK, CB Weather: Sunny - cool

Photos 25 1) roll 2 2) exposure 200 3) location RB @confluence notes Advance film - descending order

1. Existing Channel Disturbance (CD): (L,M,H) check Heli notes
L = not detectable-slight; M = moderate; H = high-extreme (morphology obscured)
(Map code 1)

Disturbance Cause: Access road enters on Rb from road above - major logging/private road ~ 3-5 m from channel - Banks are unprotected + road + cattle tracks permit livestock to enter channel.

2. Potential for future channel disturbance: (L,M,H) M-H - with confluence + storm periods (as defined for Existing Channel Disturbance) the bank is vertually unprotected + exposed

3. Restoration benefit: L,M,H (average of degree of benefit, success, duration)

Degree of habitat benefit (L,M,H) L marginal improvement likely, short length of channel; M: moderate improvement likely, moderate channel length affected; H: large improvement likely, long length of channel)

Type of habitat benefit, and description: (R,S,M)
(R=improved rearing habitat, S=improved spawning habitat, M=improved migration)

- check Bonaparte River Map notes for fish use!

potential for success: (L,M,H)

likely duration of effectiveness (<5 yrs; 5-20 yrs; >20 yrs)

4. Restoration cost (<$10,000; $10,000-$100,000; >$100,000)
(includes prescription and implementation)

5. Existing access: (fly; trail; road)

6. Priority for Prescription: L,M,H (weighted average of factors 1-5)
(Map code 2)

Restoration Options: - Rip Rap river bank bend - ~~eat~~ eliminate access here to cattle - humans can access over rip rap - Riparian planting along left bank - current vegetation is cottonwood - some red osier + other brush 20 % vegetated. Rb = 60-70 % decid. + other brush - looks good. Road fillslope could benefit by planting

Other Notes: of coltons or native plants
- Note exposed bedrock on Rb just d/s of site - provides stability
other species: ~~wild rose, grass~~ pine (ponderosa) + douglas fir ~ 5-10% on Rb side.

	Reach	Site
Level of Disturbance:	H	L
Assessment Priority:	H	L

Ground-based Field Form 2 of 2:

Survey Location: B2.2 Bonaparte River Residual.

Date: 10/17/98 Crew: RK, CB Weather: Cloudy - cool 5°c

Photos NO PHOTO 1) roll — 2) exposure — 3) location — 4) notes —

Photo 4? Roll 2?

1. Existing Channel Disturbance (CD): (L,(M),H)
L = not detectable-slight; M = moderate; H = high-extreme (morphology obscured)
(Map code 1)

Disturbance Cause: MOTH - Highway. Rd fillslope is "L - M" sed source. grass is apparent @ fillslope toe (80%)

2. **Potential for future channel disturbance:** (L,(M),H)
(as defined for Existing Channel Disturbance)

3. **Restoration benefit:** L,(M),H **(average of degree of benefit, success, duration)**

Degree of habitat benefit ((L),M,H) L:marginal improvement likely, short length of channel; M: moderate improvement likely, moderate channel length affected; H: large improvement likely, long length of channel)

Type of habitat benefit, and description: (R,S,M)
((R)=improved rearing habitat, (S)=improved spawning habitat, (M)=improved migration)

NOTES: UPSLOPE OR HIGHWAY
65% natural hillslope
135% cutbank - bedrock
- Check to see if [illegible] Hydro
- fillslope has 15% cover herbs + shrubs. (pretty exposed)

potential for success: (L,(M),H)

likely duration of effectiveness (<5 yrs; (5-20 yrs); >20 yrs)

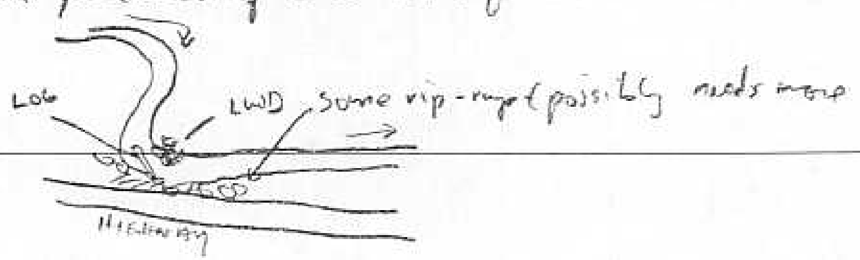
4. **Restoration cost** ((<$10,000); $10,000-$100,000; >$100,000)
(includes prescription and implementation)

5. **Existing access:** (fly; trail; (road))

6. **Priority for Prescription:** (L),M,H **(weighted average of factors 1-5)**
(Map code 2)

Restoration Options: RIP RAP TOE OF SLOPE PROPERLY TO ENSURE DEFLECTION FROM RD.
- Hydro seed fillslope - (possibly fertilize) - Hydroseed with native seeds.
- possible placement of LWD for deflectors as well.

Other Notes:



Helicopter Reach/Site Survey

	Reach	Site
Level of Disturbance:	H	–
Assessment Priority:	H	–

Ground-based Field Form 1of 2: BONAPARTE RIVER RESIDUAL

Survey Location: REP 21 d/s of riprap ~30m (RIFFLE)

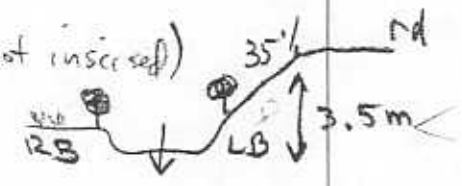
Date: 20/10/98 Crew: RK, CB Weather: Cloudy - cool

Photos 1) roll 4 2) exposure 10 3)location 1king d/s 4) notes

Width (W, in m) 1) Bankfull (Wb) 15.4 2) Wetted (Ww) 10.3

Max. Depth (D, in m) 1) Bankfull (Db) 1.01 2) Wetted (Dw) .62

Slope (S, in %) 1) Channel 1.5 % 2) Side slopes (if incised) (not incised)



Valley Flat (VF, in m) (at 2 times bankfull depth): check MAP

Entrenchment ratio (VF/Wb):

Profile morphology (using CAP terminology): RP_{cb}-w

Channel Bed:
Texture: __%Z __%S 10%G 45%C 45%B 0%R Stability: (stable) aggrading, degrading

Channel Banks:
Texture: __%Z 20%S 40%G 30%C 10%B 0%R Stability: high, (moderate), low
(bank stability is the opposite of bank erosion potential)

Small Woody Debris:
Quantity: (scarce) (occasional) common, abundant, over-abundant (choking channel)
Stability: high, moderate (low)

Large Woody Debris:
Quantity: (scarce) occasional, common, abundant, over-abundant (choking channel)
Stability: high, moderate (low)

Notes: IMPACTS - LOW, but lacking CWD.
RB ~ 5m shrub buffer, ~~pasture~~ field of grasses and a few shrubs
LB ~ 5m " " , paved road ~ 10m from ck.

RIPARIAN ZONE

Tree -	banks	10%	ave. overhang 1.5m	(Act
Shrubs -	"	75%	" "	1.0m (Cornus stol, alder, yg Act, water birch
Herbs -	"	10%	" "	0m (grasses)

banks are very cobbly/ no alders

Canopy Closure of River ~ 3-4%

-green aquatic veg on rocks in ck.

Helicopter Reach/Site Survey

	Reach	Site
Level of Disturbance:	M	–
Assessment Priority:	H	–

Ground-based Field Form 1of 2:

Survey Location: REP 4.1 BON. RIV. RES.

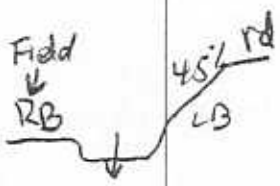
Date: 20/10/98 **Crew:** RK, CB **Weather:** Cool-cloudy - 4°C

Photos 11 1) roll 4 2) exposure 100 3)location looking d/s from side slope LB 4) notes

Width (W, in m) 1) Bankfull (Wb) 13.75 2) Wetted (Ww) 10.8

Max. Depth (D, in m) 1) Bankfull (Db) 1.45 2) Wetted (Dw) .35

Slope (S, in %) 1) Channel 1% 2) Side slopes (if incised) LB 45%



Valley Flat (VF, in m) (at 2 times bankfull depth): CHECK MAP - not inserted

Entrenchment ratio (VF/Wb):

Profile morphology (using CAP terminology): RPg-w

Channel Bed:
Texture: __%Z 10 %S 83 %G 5 %C 2 %B 0 %R Stability: stable, aggrading, degrading

Channel Banks:
Texture: __%Z 25 %S 70 %G 5 %C 0 %B 0 %R Stability: high, moderate, low
(bank stability is the opposite of bank erosion potential)

Small Woody Debris:
Quantity: scarce, occasional, common, abundant, over-abundant (choking channel)
Stability: high, moderate, low

Large Woody Debris:
Quantity: scarce, occasional, common, abundant, over-abundant (choking channel)
Stability: high, moderate, low

Notes:

-IMPACTS - "Medium" R4, but RepSite "Low"
RB cleared for pasture
LB rd. ≈ 15-20 m away
LB + RB cattle have grazed and accessed river

RIPARIAN ZONE

Tree 0% along banks (some alder almost lg enough to be trees
Shrub banks LB 70% RB 10% ave. overhang 1.5m (alder, Cornus stol, Snowberry, Rosa spp)
Herb LB 40% RB 90% ave overhang 0.3m (grass)
Canopy closure over ex 2%

LB - shrub cover 40%
herb cover 50%
tree " 2% (Fd)

Helicopter Reach/Site Survey

	Reach	Site
Level of Disturbance:	H	M
Assessment Priority:	H	M

Ground-based Field Form 2 of 2:

Survey Location: BONAPARTE RIVER RESIDUAL B4.1

Date: 20/10/98 **Crew:** RK, CB **Weather:** Foggy + cool 4°C

Photos 13 1) roll 4 2) exposure 100 3) location SHOOT U/S 4) notes AT LB FAILURE

1. Existing Channel Disturbance (CD): (L,(M),H)
L = not detectable-slight; M = moderate; H = high-extreme (morphology obscured)
(Map code 1)

Disturbance Cause: CREEK IS MEANDERING INTO SANDY GRAVEL (with clay) DOMINATION OVER FLUVIAL MATERIAL POSSIBLY COVERED OVER BY TRIB ON LB SIDE DEPOSITING. CONE SHAPE STEEP FANS MARK the Bonaparte River valley side walls. Disturbance is natural possibly exacerbated by logging in upslope

2. **Potential for future channel disturbance:** (L,(M),H)
(as defined for Existing Channel Disturbance)

3. **Restoration benefit:** (L),M,H **(average of degree of benefit, success, duration)**

Degree of habitat benefit ((L),M,H) L:marginal improvement likely, short length of channel; M: moderate improvement likely, moderate channel length affected; H: large improvement likely, long length of channel)

Type of habitat benefit, and description: ((R),S,M)
(R=improved rearing habitat, S=improved spawning habitat, M=improved migration)
- Preferable spawning area with cobble + gravel spawning bed material

potential for success: ((L),M,H)

likely duration of effectiveness ((<5 yrs); 5-20 yrs; >20 yrs)

4. **Restoration cost** (<$10,000; ($10,000-$100,000;) >$100,000)
(includes prescription and implementation)

5. **Existing access:** (fly; trail; (road))

6. **Priority for Prescription:** (L),M,H **(weighted average of factors 1-5)**
(Map code 2)

Restoration Options: STABILIZE TOE OF SLOPE - ITS NATURAL WITH POSSIBLY LOGGING INDUCED INSTABILITYS OF SURFACE DUE TO REMOVAL OF PINES AT TOP. NOT A GOOD SITE FOR RESTORATION - TYPICAL OF MOST SED SOURCES THROUGH HERE

Other Notes: * PHOTO 12: LOOKING D/S STANDING ABOVE B4.1 - NOTE LARGE POCKETS/BARS OF GRAVELS ON RB side in foreground + centre of photo.

Helicopter Reach/Site Survey

	Reach	Site
Level of Disturbance:	H	M
Assessment Priority:	H	M

Ground-based Field Form 2 of 2:

Survey Location: REACH 4 (ALL) BONAPARTE RIVER RESIDUAL

Date: 20/10/98 **Crew:** RK, CB **Weather:** Cloudy - cool 4°C.

Photos check REP SITE 4.1 1) roll 4 2) exposure 100 3) location 4) notes REACH 4 WRITE-UP ABOVE REP 4.1

1. Existing Channel Disturbance (CD): (L,(M),H)
L = not detectable-slight; M = moderate; H = high-extreme (morphology obscured)
(Map code 1) SOME SECTIONS ARE LOW + SOME HIGH - OVERALL IS "M"

Disturbance Cause: RIPARIAN LOGGING MAINLY ON RB SIDE WHERE GRAZING PASTURES ARE LOCATED. BANKS ARE ERODING SUBSTANTIALLY ESPECIALLY WHERE COMPLETE RIPARIAN VEG HAS BEEN REMOVED. MULTIPLE SED SOURCES DUE TO CATTLE PRESENCE + NATURAL HILLSLOPE FAILURES ON EAST SIDE FROM MEANDERING CHANNEL SLOUGHING ERODIBLE SANDY, with clay + gravel hillslopes

2. Potential for future channel disturbance: (L,(M),H)
(as defined for Existing Channel Disturbance) RIPARIAN REMOVAL @ 70-80% through Reach 4

3. Restoration benefit: L,(M),H **(average of degree of benefit, success, duration)**

Degree of habitat benefit (L,(M),H) L:marginal improvement likely, short length of channel; M: moderate improvement likely, moderate channel length affected; H: large improvement likely, long length of channel)

Type of habitat benefit, and description: ((R),(S),M)
(R=improved rearing habitat, S=improved spawning habitat, M=improved migration)
REACH 4 looks to have preferable substrate for spawning + rearing potential is high if Riparian trees were planted.

potential for success: (L,M,(H))

likely duration of effectiveness (<5 yrs; (5-20 yrs); >20 yrs)

4. Restoration cost (<$10,000; ($10,000-$100,000); >$100,000)
(includes prescription and implementation)

5. Existing access: (fly; trail; (road))

6. Priority for Prescription: L,(M),H **(weighted average of factors 1-5)**
(Map code 2)

Restoration Options: RIPARIAN PLANT + FENCE LEAVING OCCASIONAL GAPS FOR CATTLE WATERING.

- LEAVE NATURAL HILLSLOPE EROSION SOURCES - THEY ARE NATURAL AND would TAKE EXTENSIVE TIME + $ TO FIX - POINTLESS !!!
- BOTTOM LINE IS ITS NATURAL.

Other Notes:

REACH 3 = INCISED BUT OVERALL "M" DISTURBANCES DUE TO CATTLE + RIPARIAN REMOVAL - BED + BANKS ARE COARSER - RIPARIAN VEG OVERALL IS ≈ 50% - 60% through this reach

REACH 3-1: REP SITE 3-1.1 Also APPEARS TO BE "L" possibly "M" due to

Helicopter Reach/Site Survey

	Reach	Site
Level of Disturbance:	H	—
Assessment Priority:	H	—

Ground-based Field Form 1of 2: RESIDUAL SUBBASIN

Survey Location: BONAPARTE RIVER Rep 57.1 (RIFFLE)

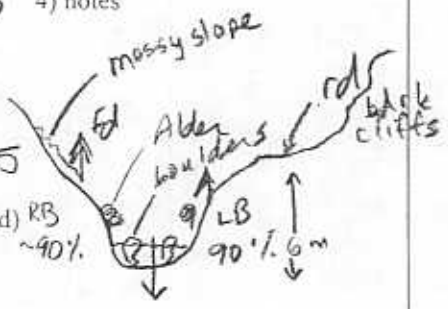
Date: Oct. 20/98 **Crew:** CB\RK **Weather:** cloudy, cold

Photos 1) roll 4 2) exposure 14 3)location Iking u/s 4) notes

Width (W, in m) 1) Bankfull (Wb) ~12 2) Wetted (Ww) ~10

Max. Depth (D, in m) 1) Bankfull (Db) 1.35 2) Wetted (Dw) 0.65

Slope (S, in %) 1) Channel 4% 2) Side slopes (if incised) RB ~90% LB 90% 1.6m



Valley Flat (VF, in m) (at 2 times bankfull depth): ~12m

Entrenchment ratio (VF/Wb): 12/12

Profile morphology (using CAP terminology): cascade pool CP$_b$

Channel Bed:
Texture: 0 %Z 5 %S 10 %G 40 %C 45 %B 0 %R Stability: (stable) aggrading, degrading
no bdrk observed on ch bed

Channel Banks:
Texture: 0 %Z 5 %S 20 %G 35 %C 30 %B 10 %R Stability (high) moderate, low
(bank stability is the opposite of bank erosion potential)

Small Woody Debris:
Quantity: scarce, (occasional) common, abundant, over-abundant (choking channel)
Stability: high, (moderate), (low)

Large Woody Debris:
Quantity: scarce (occasional) common, abundant, over-abundant (choking channel)
Stability: high, (moderate) (low)

* IMPACTS

Notes: -RIPARIAN ZONE NATURAL ON RB, RD ABOVE LB and TREES REMOVED IN PLACES ALONG LB LOWER 5
- IMPACT "LOW" OVERALL

* RIPARIAN ZONE (MFc)
- CK CANOPY COVER ~ 5%
- TREE ALONG BANKS 25% AVE. OVERHANG 2m (Fd, Alder)

- SHRUB ALONG BANKS 60% AVE. OVERHANG 1m (Cornus stol, Alder, Rosa spp, Raspberry, Ribes lac.)
5% " " " 0m

- HERB (Grass/moss)

- RKS IN CK COVERED W MOSS AND AQUATIC VEG

Helicopter Reach/Site Survey

	Reach	Site
Level of Disturbance:	H	L
Assessment Priority:	H	M

Ground-based Field Form 2 of 2:

Survey Location: Bonaparte River Residual SS-1.1

Date: 20/10/98 Crew: RK, CB Weather: FOGGY + COOL 2°C

Photos 15 1) roll 4 2) exposure 100 3) location Looking north on LB 4) notes

1. Existing Channel Disturbance (CD): (L,M,H)
L = not detectable-slight; M = moderate; H = high-extreme (morphology obscured)
(Map code 1)

Disturbance Cause: LARGE SLIDE ON LB CAUSED BY BLASTED ROAD ALONG STEEP VALLEY WALLS. (NATURAL GRADE ≈ 80 %). ROAD/TRAIL FILLSLOPE IS 85 % Grade + is depositing gravel mixed shales + fine sand into channel. Channel is wider @ bottom + some pockets of fine local material appear to be deposited between the bedrock + boulder channel bottom

2. Potential for future channel disturbance: (L,M,H)
(as defined for Existing Channel Disturbance)

3. Restoration benefit: L,M,H (average of degree of benefit, success, duration)

Degree of habitat benefit (L,M,H) L:marginal improvement likely, short length of channel; M: moderate improvement likely, moderate channel length affected; H: large improvement likely, long length of channel)

Type of habitat benefit, and description: (R,S,M)
(R=improved rearing habitat, S=improved spawning habitat, M=improved migration)
- MATERIAL ALONG TYPICAL CHANNEL DOES NOT APPEAR TO BE BENEFICIAL FOR SPAWNING HABITAT.
- BENEFIT FOR MIGRATION + REARING IS SUPPORTED DUE TO LIKELY CHANNEL BLOCKAGE DUE TO SLIDING

potential for success: (L,M,H)

likely duration of effectiveness (<5 yrs; 5-20 yrs; >20 yrs)

4. Restoration cost (<$10,000; $10,000-$100,000; >$100,000)
(includes prescription and implementation)

NOTE: ROAD GRADIENT CUTTING THROUGH THE HILLSLOPE IS 16 %.

5. Existing access: (fly; trail; road)

6. Priority for Prescription: L,M,H (weighted average of factors 1-5)
(Map code 2)

Restoration Options: PULLBACK FILLSLOPE TO QUAD ACCESS ONLY - IT WILL REDUCE THE STRESS ON THE LOWER SLOPE. HYDRO SEED THE SLOPE (check to see what can grow on almost pure gravel + sand - no silt or clay or soil/organics.
- Control overland/road drainage from road above with cross drain - north
- possibly plant pine trees (Ponderosa)

Other Notes: SLIDE CONSISTS OF THIN veneer of colluvium (fine sand + gravel) over bedrock. Above road is stabilized but below is material that can give any time.

Slide length is ≈ 80 m + height is 35 m.

NOTE: CHANNEL MORPHOLOGY + SUBSTRATE + BANKS IS FAVORABLE FOR THIS

Helicopter Reach/Site Survey

	Reach	Site
Level of Disturbance:	H	—
Assessment Priority:	H	—

Ground-based Field Form 1of 2:

Survey Location: Rep 6-2.1 Bonaparte River

Date: Oct 16/98 **Crew:** RK, CB **Weather:** cloudy cool 5°C

Photos 16 1) roll 2 2) exposure 200 3)location d/s of Rep 4) notes

Width (W, in m) 1) Bankfull (Wb) 12.8 2) Wetted (Ww) 9.1 m

Max. Depth (D, in m) 1) Bankfull (Db) 1.7m 2) Wetted (Dw) 1.0m

Slope (S, in %) 1) Channel 1% 2) Side slopes (if incised) not incised

Valley Flat (VF, in m) (at 2 times bankfull depth): check map

Entrenchment ratio (VF/Wb): later

Profile morphology (using CAP terminology): RP-(w) - check

Channel Bed:
Texture: __%Z 50%S 39%G 10%C 1%B 0%R Stability: stable, aggrading, degrading

Channel Banks:
Texture: present %Z 90%S 10%G __%C __%B __%R Stability: high, moderate, low
(bank stability is the opposite of bank erosion potential)

Small Woody Debris:
Quantity: scarce, (occasional) common, abundant, over-abundant (choking channel)
Stability: high, (moderate) (low)

Large Woody Debris:
Quantity: (scarce), occasional, common, abundant, over-abundant (choking channel)
Stability: high, moderate, low none observed

Notes:

- red-osier dogwood, willow, reed canary grass growing along banks
- Cultivated up to banks, horse pasture
- % bank overhang 80% shoreline - average 1m overhang
- shrub along shoreline 65%, grass 15%
- buffer (riparian) ~ 3m wide each side of river
- shrub roots exposed in places along banks
- horses have accessed river for water, a few places of bank trampled down, but mostly OK
- erosion does not appear to be a problem

Helicopter Reach/Site Survey

	Reach	Site
Level of Disturbance:	L	—
Assessment Priority:	L	—

Ground-based Field Form 1of 2: (BONAPARTE RESI [illegible])

Survey Location: BONAPARTE RIVER Rep. 8.1 ~100 m d/s of deacti xing

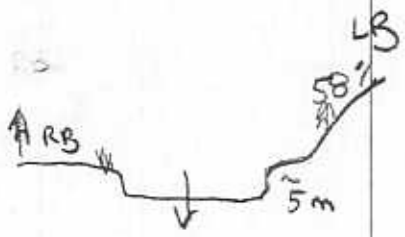
Date: Oct 23/98 **Crew:** CB\RK **Weather:** sunny, cool

Photos 1) roll 5 2) exposure 3 3)location l king u/s at Red Sk 4) notes

Width (W, in m) 1) Bankfull (Wb) 16.25 2) Wetted (Ww) 11.8

Max. Depth (D, in m) 1) Bankfull (Db) 1.07 2) Wetted (Dw) 0.47

Slope (S, in %) 1) Channel 1% 2) Side slopes (if incised)



Valley Flat (VF, in m) (at 2 times bankfull depth): check map

Entrenchment ratio (VF/Wb):

Profile morphology (using CAP terminology): RP

Channel Bed:
Texture: __%Z 8%S 85%G 5%C 1%B 1%R Stability: stable, (aggrading), degrading

Channel Banks:
Texture: 0%Z 45%S 45%G 6%C 2%B 2%R Stability: high, (moderate), (low)
(bank stability is the opposite of bank erosion potential)

Small Woody Debris:
Quantity: scarce, (occasional), (common), abundant, over-abundant (choking channel)
Stability: high, moderate, (low)

Large Woody Debris:
Quantity: scarce, (occasional), common, abundant, over-abundant (choking channel)
Stability: high, moderate, (low)

Notes: RIP ZONE
- RB wetland, LB forest

T: 15% rip zone, banks 30%. ave ht 0 m
S: 15% " " , banks 35%, " " 0.5 m
m/H: 70% " " , " 70%, ave ht 0 m

ck cc ~1%

IMPACTS: "LOW" along banks, "MOD" RB rip zone
1) cattle grazing RB and trampled RB

(Sp (Alder, Willow) Rosa sp (Sedge, Moss

	Reach	Site
Level of Disturbance:	L	m
Assessment Priority:	L	m

Ground-based Field Form 2 of 2:

Survey Location: B8.7. Bonaparte River Residual

Date: 23/10/98 **Crew:** RK, CB **Weather:**

Photos check 1) roll 2) exposure 3) location 4) notes
Rep 8-2.1

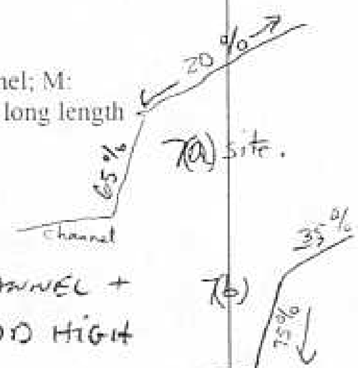
1. Existing Channel Disturbance (CD): (L,(M),H)
L = not detectable-slight; M = moderate; H = high-extreme (morphology obscured)
(Map code 1) 2 eroding bank sites adjacent to each other B8-2.7(a) u/s + (b) d/s (2nd site is likely S8.6)

Disturbance Cause: NATURAL ERODING BANKS THROUGH MEANDERING CHANNEL BEING UNDERCUTTED
- SED SOURCE IS "H" BANKS CONSISTS OF SANDY (MATRIX) GRAVEL TILL.

2. **Potential for future channel disturbance:** (L,(M),H)
(as defined for Existing Channel Disturbance)

3. **Restoration benefit:** ((L),M,H (average of degree of benefit, success, duration)

Degree of habitat benefit ((L),M,H) L:marginal improvement likely, short length of channel; M: moderate improvement likely, moderate channel length affected; H: large improvement likely, long length of channel)



Type of habitat benefit, and description: ((R,S),M)
(R=improved rearing habitat, S=improved spawning habitat, M=improved migration)
MIGRATION WILL NOT BE AFFECTED DUE TO WIDE CHANNEL + THE ERODING RB HILLSLOPES DO NOT APPEAR STEEP AND HIGH ENOUGH.
- R+S can be potentially impacted with new introduction of accelerated erosion.

potential for success: ((L),M,H)

likely duration of effectiveness (<5 yrs; (5-20 yrs); >20 yrs)

- cattle are grazing fields on the Rb side - recommend keeping them out here.

4. **Restoration cost** ((<$10,000); $10,000-$100,000; >$100,000)
(includes prescription ~~and implementation~~)

5. **Existing access:** (fly; (trail;) road) via ROAD OFF OF THE MAIN ROAD NORTH EAST OF HERE

6. **Priority for Prescription:** ((L),M,H (weighted average of factors 1-5)
(Map code 2)

Restoration Options: Fence above eroding bank area. Currently cows are grazing up to edge of bank - can potentially accelerate erosion as well as destabilize by removal of grasses.
- NO TREES AT ERODING BANK SECTION POSSIBLY PLANT SPRUCE OR FIR.

Other Notes:
- CHANNEL IMPACTS HERE ARE "M-H". LWD + MATERIAL FROM slides + maybe Road crossing (two) (removed) u/s can be result of center gravel bar + LWD deposited. As a result channel is widening - aggrading + cutting into unstable + erodible hillslopes.

	Reach	Site
Level of Disturbance:	L/M	—
Assessment Priority:	L/M	—

Ground-based Field Form 1of 2: (BONAPARTE RIVER ...

Survey Location: BON. RIVER Rep Site 10.1 ~ 100 m u/s slide and ~300 m u/s of beaver dam

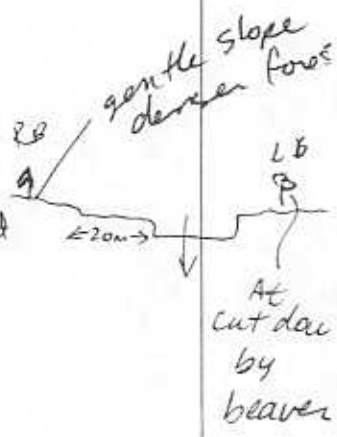
Date: Oct 22/98 Crew: CB/RK Weather: sunny

Photos 1) roll 5 2) exposure 12 3)location Rep u/s 4) notes

Width (W, in m) 1) Bankfull (Wb) 16.9 2) Wetted (Ww) 11.6

Max. Depth (D, in m) 1) Bankfull (Db) 1.35 2) Wetted (Dw) 0.45

Slope (S, in %) 1) Channel 2% 2) Side slopes (if incised) not incised



Valley Flat (VF, in m) (at 2 times bankfull depth): See map

Entrenchment ratio (VF/Wb):

Profile morphology (using CAP terminology): RP

Channel Bed:
Texture: 0 %Z 40 %S 46 %G/ 13 %C 2 %B 0 %R Stability: stable, (aggrading) degrading

Channel Banks:
Texture: 0 %Z 15 %S 50 %G 25 %C 10 %B 0 %R Stability: high, (moderate) low
(bank stability is the opposite of bank erosion potential)

Small Woody Debris:
Quantity: scarce, occasional, (common) abundant, over-abundant (choking channel)
Stability: high, moderate (low)

Large Woody Debris:
Quantity: scarce, occasional, (common) abundant, over-abundant (choking channel)
Stability: high, (moderate), (low)

Notes:

IMPACTS: d/s of Rep Site "High", at Rep Site "Low"
1) beaver cut down trees on LB
2) slide ~100 m d/s
3) beaver dam ~300 m d/s and H_2O is backed up
4) hooved animal tracks along banks no cattle droppings seen

RIP. Zone. extends ~ 20 m either side of ch.
cc over ch. 2-3%

(Sp., Ab by Sp. (Rosa spp., Willow, Alder) (Grass))
T: 10% cover rip zone, banks 30%, ave ht 0.25 m
S: 40%, 50%, " " 70%, " " 0.5 m
H: 80% " " " banks 50%, " " 0.05 m

Helicopter Reach/Site Survey

	Reach	Site
Level of Disturbance:	H/M	H
Assessment Priority:	H/M	H

Ground-based Field Form 2 of 2:

Survey Location: B10.7 BONAPARTE RIVER RESIDUAL

Date: 22/10/98 **Crew:** RK, CB **Weather:** clear - 15°C

Photos 11, 10, 9 1) roll 5 2) exposure 100 3) location 11, 10 looking ds 4) notes 9 - looking directly @ glacial fluvial with (2 layers) silty sandy fine lacustrine in between. minor amts of silt - 99% sand

1. Existing Channel Disturbance (CD): (L,M,(H))
L = not detectable-slight; M = moderate; H = high-extreme (morphology obscured)
(Map code 1) Sed Source is "V-H"

Disturbance Cause: NATURAL LARGE FAILING BANK LOCATED d/s of old road crossing now removed, probably blown out by the failure. Channel is undercutting failure @ the toe and is continually active. Material is erodible.

2. **Potential for future channel disturbance:** (L,M,(H))
(as defined for Existing Channel Disturbance)

3. **Restoration benefit:** L,M,H **(average of degree of benefit, success, duration)** TO LARGE TO RESTORE

Degree of habitat benefit (L,(M),H) L:marginal improvement likely, short length of channel; M: moderate improvement likely, moderate channel length affected; H: large improvement likely, long length of channel)

Type of habitat benefit, and description: ((R),(S),(M))
(R=improved rearing habitat, S=improved spawning habitat, M=improved migration)

- The amplitude of this slide could affect all three - especially Migration.
- LWD from this is already damming up below - good restoration project

potential for success: ((L),M,H)

likely duration of effectiveness ((<5 yrs); 5-20 yrs; >20 yrs)

Slide/Failure is ≈ 102 %

4. **Restoration cost** (<$10,000; ($10,000-$100,000); >$100,000)
(includes prescription and implementation)

5. **Existing access:** (fly; trail; (road)) - blown out @ crossing

6. **Priority for Prescription:** L,M,(H) **(weighted average of factors 1-5)**
(Map code 2)

Restoration Options:

Clear woody debris that is creating jam below - water is being backed up and forced against the failing bank - unknown if road has anything to do with this - need to come back + have P.GEO - P.ENG inspect slide + assess whether it can be reduced or channel diverted. LWD d/s should be removed - Beaver intervention is an issue also.

Other Notes:

PHOTOS - Looking AT LWD DAMMING WATER AT OLD ~~WATER~~ ROAD CROSSING

Helicopter Reach/Site Survey

	Reach	Site
Level of Disturbance:	L/H	—
Assessment Priority:	4/H	—

Ground-based Field Form 1 of 2:

Survey Location: BONAPARTE RIVER Rep Site 11-1.2 (~~TOP OF~~ RIFFLE)

Date: Oct 22/98 **Crew:** CB/RK **Weather:** Sunny

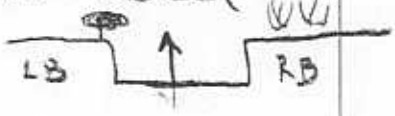
Photos 1) roll 5 2) exposure 13 3) location King d/s 4) notes

Width (W, in m) 1) Bankfull (Wb) 10.10 2) Wetted (Ww) 7.90

Max. Depth (D, in m) 1) Bankfull (Db) 1.70 2) Wetted (Dw) 0.51 m

Slope (S, in %) 1) Channel 1.5% 2) Side slopes (if incised) not incised

Valley Flat (VF, in m) (at 2 times bankfull depth): check map



Entrenchment ratio (VF/Wb):

Profile morphology (using CAP terminology): RP

Channel Bed:
Texture: 0 %Z 15 %S 70 %G 13 %C 2 %B 0 %R Stability: stable, (aggrading), degrading

Channel Banks:
Texture: 20 %Z 80 %S 0 %G 0 %C 0 %B 0 %R Stability: high, (moderate), (low)
(bank stability is the opposite of bank erosion potential)

Small Woody Debris:
Quantity: scarce, (occasional), common, abundant, over-abundant (choking channel)
Stability: high, moderate, (low)

Large Woody Debris:
Quantity: (scarce), occasional, common, abundant, over-abundant (choking channel)
Stability: high, moderate, (low) 1 piece seen

Notes: RIP ZONE:

T: 0%. land cleared for agri

(willow) S: 45%. bank, ave oh ~1.5m

(grass) H: 45%. bank, " " ~0.05m

CC over ck: 5%

IMPACTS: "Moderate"
- Land cleared for pasture, agri, tree removal
- Cattle watering in ck
- % banks trampled by cattle ~5%.

	Reach	Site
Level of Disturbance:	L/H	L
Assessment Priority:	L/H	L

Ground-based Field Form 2 of 2:

Survey Location: Bonaparte River Residual u/s of ~~Reach 2~~ (~35m) B11-1.8

Date: 22/10/98 **Crew:** RK, CB **Weather:** Sunny 17°C

Photos 14 1) roll 5 2) exposure 100 3) location looking u/s on RB side 4) notes

1. Existing Channel Disturbance (CD): (L,M,H)
L = not detectable-slight; M = moderate; H = high-extreme (morphology obscured)
(Map code 1)

Disturbance Cause: CATTLE TRACKS DOWN EXPOSED BANKS + LOSS OF RIPARIAN VEGETATION.
SED SOURCE is "M-H" AT THIS SPOT AS SANDY, GRAVEL BANKS ARE ERODING INTO channel. Material from banks is actually diverting some flow. Serious RB erosion

2. Potential for future channel disturbance: (L,M,H)
(as defined for Existing Channel Disturbance)
- FIELD GRASS CUTTING TO THE BANKS - SEE REP 11-1,2 for RIPARIAN SITUATION.

3. Restoration benefit: L,M,H **(average of degree of benefit, success, duration)**

Degree of habitat benefit (L,M,H) L: marginal improvement likely, short length of channel; M: moderate improvement likely, moderate channel length affected; H: large improvement likely, long length of channel)

Type of habitat benefit, and description: (R,S,M)
(R=improved rearing habitat, S=improved spawning habitat, M=improved migration)

- CHANNEL APPEAR WIDE ENOUGH TO KEEP MIGRATORY FORM
- R+S COULD DEFINATELY BE ALTERED THROUGH HERE. SEDIMENTATION + PRESENCE OF ACCELERATED COARSE COBBLE FROM ERODING BANKS

potential for success: (L,M,H)

likely duration of effectiveness (<5 yrs; 5-20 yrs; >20 yrs)

4. Restoration cost (<$10,000; $10,000-$100,000; >$100,000)
(includes prescription and implementation)

BANK TEXTURE: (matrix) SA, with silt 15-20%

5. Existing access: (fly; trail; road)

6. Priority for Prescription: L,M,H **(weighted average of factors 1-5)**
(Map code 2)

Restoration Options: FENCE - BOTH BANKS. NO FENCING AT PRESENT. "CATTLE AT LARGE" sign posted
COARSE-ARMOURED FORDS ~~(R)~~ THROUGH STRAIGHT SECTIONS OF THE CHANNEL. THIS SPOT IS U-POOLS DUE TO HIGHER

Other Notes: FLOWS + MIGRATING CHANNEL.

SEVERAL SECTIONS OF HEAVY AGGRADATION WAS NOTICED DRIVING ALONG THE UPPER PORTION OF THIS REACH. CHANNEL MAY BE POSSIBLY UNSTABLE OR NOT AT EQUILIBRIUM.

Ground-based Field Form 2 of 2:

Survey Location: Bonapate River Residual (Reach 11-1)

Date: Oct 22/98 Crew: RE/CB Weather:

Photos 1) roll 5 2) exposure 13-14) location 4) notes

1. Existing Channel Disturbance (CD): (L,M,(H))
L = not detectable-slight; M = moderate; H = high-extreme (morphology obscured)
(Map code 1)

Disturbance Cause: SERIOUS BANK EROSION + RIPARIAN VEGETATION REMOVAL DUE TO PASTURE + FARMING. Banks are eroding + fine sediment is entering due to cattle drinking.

2. Potential for future channel disturbance: (L,(M),H)
(as defined for Existing Channel Disturbance)

3. Restoration benefit: L,M,(H) (average of degree of benefit, success, duration)

Degree of habitat benefit (L,M,(H)) L:marginal improvement likely, short length of channel; M: moderate improvement likely, moderate channel length affected; H: large improvement likely, long length of channel)

Type of habitat benefit, and description: (R,S,M)
(R=improved rearing habitat, S=improved spawning habitat, M=improved migration)

R+S will benefit from Riparian prescriptions + cutting off access to creek. (cattle)

potential for success: (L,M,(H))

likely duration of effectiveness (<5 yrs; (5-20 yrs); >20 yrs)

4. Restoration cost (<$10,000; $10,000-$100,000; >$100,000)
(includes prescription and implementation)

5. Existing access: (fly; trail; (road))

6. Priority for Prescription: L,M,(H) (weighted average of factors 1-5)
(Map code 2)

Restoration Options: (1) FENCE
(2) PLANT TREES + MORE SHRUBS.
(3) Leave sections for cattle to water/armour bed + banks.

Other Notes:

This applies to 3/4 of lower reach. Near Rep 11-1.1 is better - Not on private land.

NOTE: Colleen says creek is "M" disturbed - I agree at her site but overall is "H" disturbed

Helicopter Reach/Site Survey

	Reach	Site
Level of Disturbance:	L/M	–
Assessment Priority:	L/H	–

Ground-based Field Form 1of 2:

Survey Location: BONAPARTE RIVER RESIDUAL REP 11-1.1

Date: Oct 22/98 Crew: CB\RK Weather: Sunny

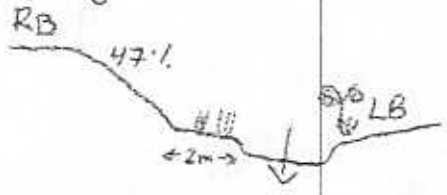
Photos 1) roll 5 2) exposure 15 3)location 1 lings 4) notes

Width (W, in m) 1) Bankfull (Wb) 11.4 2) Wetted (Ww) 8.4

Max. Depth (D, in m) 1) Bankfull (Db) 1.00 2) Wetted (Dw) 50

Slope (S, in %) 1) Channel 1% 2) Side slopes (if incised) RB 40%

Valley Flat (VF, in m) (at 2 times bankfull depth): check map



Entrenchment ratio (VF/Wb):

Profile morphology (using CAP terminology): PPC-W

Channel Bed:
Texture: __%Z __%S 15%G 70%C 15%B 0%R Stability: (stable), aggrading, degrading

Channel Banks:
Texture: 5%Z 80%S 15%G 0%C 0%B 0%R Stability: high, (moderate), low
(bank stability is the opposite of bank erosion potential)

Small Woody Debris:
Quantity: scarce, occasional, (common), abundant, over-abundant (choking channel)
Stability: high, (moderate), low

Large Woody Debris:
Quantity: scarce, (occasional), (common), abundant, over-abundant (choking channel)
Stability: high, (moderate), low

Notes: RIP ZONE:

(Cs, Bl, Pl, Ae) Tree: RB riparian zone 35%, LB 5%, bank 25%, ave overhang 0.25

(Alder, Salix spp, Rosa sp.) Shrub: riparian zone 40%, 60% bank, " " 2.0m

(Sedge, moss) Herb: " " 70%, 50% " , " " 0.0m

Canopy Closure Over Ck: 2%

IMPACTS - SOME CATTLE TRACK PRESENCE "L"
ROAD ~ 20-25 m AWAY - no problem, RB
BEAVER PRESENCE - SWD

OVERALL - LOW IMPACTS - NO RESTORATION CONCERNS.

SUMMIT Environmental Consultants Ltd.
17A-100 Kalamalka Lake Road, Vernon, B.C. V1T 5M2 *Phone: (250) 545-3672 * Facsimile: (250) 545-3654

Date: Dec 23/98

Your Reference:

Our Reference: 754

We are sending you:

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DOCUMENT TRANSMITTAL

To: MINISTRY OF ENVIRONMENT, LANDS AND PARKS

1259 DALHOUSIE DRIVE

KAMLOOPS

ATTENTION: G. SMITH

NO. OF COPIES	ITEM	DATED	REMARKS
1	unbound Volume 1		
1	bound Volume 1		
1	bound Volume 2 (WITH	VIDEOTAPES (2 VHS TAPES))	
-	including 2 copies of map	+ CD ROM DIGITAL DELIVERABLES.	

PLANNING & ASSESSMENT
RECEIVED
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KAMLOOPS, BC

These Documents are also transmitted to:

By:

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Environmental Consultants Ltd.
17A - 100 Kalamalka Lake Road
Vernon, BC • V1T 7M3

VOLUME 2 – PHOTOGRAPHS AND VIDEOTAPES

TABLE OF CONTENTS

Upper Bonaparte River Watershed - Channel, Riparian and Sediment Source Assessment (Photograph Log)

SUB-BASIN: Bonaparte River Residual

Exp	Roll	Date(d/m/y)	Bank	View	ID #	Location	Description
8	1.1	14/10/98		n-east		Bonaparte River Residual	Helicopter aerial view
25	2	16/10/98	RB	west	B0.1	Bonaparte River Residual	near Scottie Creek confluence
24	2	16/10/98	RB	u/s	Rep1.1	Bonaparte River Residual	~100 m u/s of Scottie Creek confluence
4	2	17/10/98		u/s	no	Bonaparte River Residual	u/s of Highway 97 junction with Loon Lake Highway
3	2	17/10/98		d/s	Rep1.2	Bonaparte River Residual	Bonaparte River - Reach 1
2	2	17/10/98	RB	u/s	B1.4	Bonaparte River Residual	Bonaparte River - Reach 1
1	2	17/10/98	RB	u/s	B1.4	Bonaparte River Residual	Bonaparte River - Reach 1
10	4	20/10/98		d/s	Rep2.1	Bonaparte River Residual	Reach 2 (d/s of Loon Creek confluence)
13	4	20/10/98	LB	u/s	B4.1	Bonaparte River Residual	Reach 4
12	4	20/10/98		d/s		Bonaparte River Residual	Reach 4
11	4	20/10/98	RB	d/s	Rep4.1	Bonaparte River Residual	Reach 4
15	4	20/10/98	LB	north	S5-1.1	Bonaparte River Residual	Reach 5-1
14	4	20/10/98		u/s	Rep5-1.1	Bonaparte River Residual	Reach 5-1
8	1	15/10/98				Bonaparte River Residual-d/s of Fiftyseven Creek	Helicopter aerial view
6	1.1	14/10/98		n-east		Bonaparte River Residual	Helicopter aerial view-Reach 6
16	2	16/10/98		d/s	Rep6-2.1	Bonaparte River Residual	Bonaparte River - Reach 6-2
3	5	23/10/98		u/s	Rep8-2.1	Bonaparte River Residual Sub-basin - Bonaparte R.	Reach 8-2
12	5	22/10/98		u/s	Rep10.1	Bonaparte River Residual Sub-basin - Bonaparte R.	Reach 10
11	5	22/10/98	RB	d/s	B10.7	Bonaparte River Residual Sub-basin - Bonaparte R.	Reach 10
10	5	22/10/98	RB	ds	B10.7	Bonaparte River Residual Sub-basin - Bonaparte R.	Reach 10
9	5	22/10/98	RB		B10.7	Bonaparte River Residual Sub-basin - Bonaparte R.	Reach 10
8	5	22/10/98		d/s	B10.7	Bonaparte River Residual Sub-basin - Bonaparte R.	Reach 10
15	5	22/10/98		u/s	Rep11-1.1	Bonaparte River Residual Sub-basin - Bonaparte R.	Reach 11-1 - Bonaparte River
14	5	22/10/98	RB	u/s	B11-1.8	Bonaparte River Residual Sub-basin - Bonaparte R.	Reach 11-1 - Bonaparte River
13	5	22/10/98		d/s	Rep11-1.2	Bonaparte River Residual Sub-basin - Bonaparte R.	Reach 11-1 - Bonaparte River
7	1	15/10/98				Chasm Creek Watershed	Helicopter aerial view
6	1	15/10/98				Rayfield Creek Plateau	Helicopter aerial view
5	1	15/10/98				Eagan Lake-McDonald Creek	Helicopter aerial view
4	1	15/10/98		d/s		Eagan Lake-McDonald and Montana Creek confluence	Helicopter aerial view
3	1	15/10/98				Clinton Creek Watershed-Fiftyone Cree	Helicopter aerial view
2	1	15/10/98				Chasm Creek Watershed	Helicopter aerial view
1	1	15/10/98				Fiftyseven Creek Watershed	Helicopter aerial view

SUB-BASIN: Allen Creek

Exp	Roll	Date(d/m/y)	Bank	View	ID #	Location	Description
18	3	18/10/98		u/s	Rep2.1	Allen Creek Sub-basin-Maiden Creek	Reach 2 of Maiden Creek
23	2	16/10/98		u/s	Rep4.1	Allen Creek Sub-basin	Maiden Creek looking u/s in Reach 4
22	2	16/10/98	RB	u/s	B4.2	Allen Creek Sub-basin	Maiden Creek near road crossing in Reach 4
21	2	16/10/98		u/s	Rep8.1	Allen Creek Sub-basin	Maiden Creek-Reach 8
25	3	18/10/98	RB	south		Allen Creek Sub-basin	Reach 3
24	3	18/10/98		u/s		Allen Creek Sub-basin	Reach 3
23	3	18/10/98		u/s		Allen Creek Sub-basin	Reach 3
22	3	18/10/98		d/s		Allen Creek Sub-basin	Reach 3
21	3	18/10/98		u/s	B3.1	Allen Creek Sub-basin	Reach 3
20	3	18/10/98		u/s	B3.1	Allen Creek Sub-basin	Reach 3 - both culvert outlets
19	3	18/10/98		u/s	Rep4.1	Allen Creek Sub-basin	Reach 4

SUB-BASIN: Loon Creek

Exp	Roll	Date(d/m/y)	Bank	View	ID #	Location	Description
3	1.1	14/10/98		u/s		Loon Creek	Helicopter aerial view-Reach 8
4	1.1	14/10/98		u/s		Loon Creek	Helicopter aerial view-Reach 8
12	2	17/10/98		u/s	Rep9.1	Loon Creek Sub-basin	Loon Creek-Reach 9
11	2	17/10/98	RB	d/s	no	Loon Creek Sub-basin	Loon Creek-Reach 4
10	2	17/10/98		u/s	Rep4.2	Loon Creek Sub-basin	Loon Creek-Reach 4
9	2	17/10/98	RB	north	B4.1	Loon Creek Sub-basin	Loon Creek-Reach 4
8	2	17/10/98		d/s	no	Loon Creek Sub-basin	RB tributary - Reach 4
7	2	17/10/98	RB	u/s	S2.2	Loon Creek Sub-basin	Loon Creek-Reach 2 Panoramic with photo 6
6	2	17/10/98	RB	u/s	S2.2	Loon Creek Sub-basin	Loon Creek-Reach 2 Panoramic with photo 6
5	2	17/10/98	RB	u/s	S2.2	Loon Creek Sub-basin	Loon Creek-Reach 2 looking along Loon Lake Highway
15	2	17/10/98		d/s	B3.1	Loon Creek Sub-basin-Brigade Creek	Brigade Creek-Reach 3
14	2	17/10/98		u/s	Rep4.1	Loon Creek Sub-basin-Brigade Creek	Brigade Creek-Reach 4
13	2	17/10/98		d/s	Rep3.1	Loon Creek Sub-basin-Brigade Creek	Brigade Creek-Reach 3
7	4	20/10/98		u/s	Rep2.1	Loon Creek Sub-basin-Hihium Creek	Reach 2 - Hihium Creek
6	4	20/10/98		u/s		Loon Creek Sub-basin-Hihium Creek	Reach 2 - Hihium Creek
5	4	20/10/98		u/s	Rep2.2	Loon Creek Sub-basin-Hihium Creek	Reach 2 - Hihium Creek
1	1.1	14/10/98	R/B	u/s	S3.5	Loon Creek- Hihium Creek	Helicopter aerial view-Reach 3
2	1.1	14/10/98	R/B	u/s	S3.6	Loon Creek- Hihium Creek	Helicopter aerial view-Reach 3
8	4	20/10/98		u/s	Rep3.1	Loon Creek Sub-basin-Hihium Creek	Reach 3 - Hihium Creek
9	4	20/10/98		d/s	Rep4.1	Loon Creek Sub-basin-Hihium Creek	Reach 4 - Hihium Creek

SUB-BASIN: Clinton Creek

Exp	Roll	Date(d/m/y)	Bank	View	ID #	Location	Description
18	2	16/10/98		d/s	Rep2.1	Clinton Creek Sub-basin	Clinton Creek-Reach 2
17	2	16/10/98	LB	u/s	B2.1	Clinton Creek Sub-basin	Clinton Creek-Reach 2
17	3	18/10/98	RB	d/s	B6.1	Clinton Creek Sub-basin	Reach 6
16	3	18/10/98		d/s	Rep6.1	Clinton Creek Sub-basin	Reach 6
15	3	18/10/98		u/s	Rep8.1	Clinton Creek Sub-basin	Reach 8
19	2	16/10/98		u/s	Rep1.1	Clinton Creek Sub-basin	Cutoff Valley Creek-Reach 1
20	2	16/10/98		d/s	Rep8.1	Clinton Creek Sub-basin	Cutoff Valley Creek-Reach 8
13	3	19/10/98		d/s	Rep2.1	Clinton Creek Sub-basin-Fifty One Creek	Reach 2

SUB-BASIN: Clinton Creek Community Watershed

Exp	Roll	Date(d/m/y)	Bank	View	ID #	Location	Description
14	3	18/10/98		west	B9.1	Clinton Creek Community Watershed	Reach 9

SUB-BASIN: Fifty Seven Creek

Exp	Roll	Date(d/m/y)	Bank	View	ID #	Location	Description
12	3	19/10/98		u/s	Rep2.1	Fiftyseven Creek Sub-basin	Reach 2
11	3	19/10/98	LB	east	S5.1	Fiftyseven Creek Sub-basin	Reach 5
10	3	19/10/98		west	S5.1	Fiftyseven Creek Sub-basin	Reach 5
9	3	19/10/98		d/s	S5.1	Fiftyseven Creek Sub-basin	Reach 5
8	3	19/10/98		u/s	S5.1	Fiftyseven Creek Sub-basin	Reach 5
7	3	19/10/98		u/s	Rep5.1	Fiftyseven Creek Sub-basin	Reach 5
6	3	19/10/98		d/s	Rep6.1	Fiftyseven Creek Sub-basin	Reach 6
5	3	19/10/98		u/s	B6.1	Fiftyseven Creek Sub-basin	Reach 6-u/s of culvert inlet
4	3	19/10/98		u/s	Rep10.1	Fiftyseven Creek Sub-basin	Reach 10
3	3	19/10/98	RB	d/s	B10.1	Fiftyseven Creek Sub-basin	Reach 10
2	3	19/10/98		d/s		Fiftyseven Creek Sub-basin	Reach 10-d/s of culvert outlet
27	6	23/10/98		d/s		Fiftyseven Creek Sub-basin	Reach 23
26	6	23/10/98		u/s	Rep23.1	Fiftyseven Creek Sub-basin	Reach 23
25	6	23/10/98		south	B23.1	Fiftyseven Creek Sub-basin	Reach 23 (culvert inlet)

SUB-BASIN: Chasm Creek

Exp	Roll	Date(d/m/y)	Bank	View	ID #	Location	Description
7	1.1	14/10/98		north		Chasm Creek	Helicopter aerial view
20	4	19/10/98		south		Chasm Creek Sub-basin	Chasm Creek Provincial Park (1of2)
19	4	19/10/98		south		Chasm Creek Sub-basin	Chasm Creek Provincial Park (2of2)
21	4	19/10/98		u/s	Rep6.1	Chasm Creek Sub-basin-Sixtyone Creek	Reach 6-Sixtyone Creek
18	4	19/10/98		u/s	Rep2.1	Chasm Creek Sub-basin-Fiftynine Creek	Reach 2-Fiftynine Creek
17	4	19/10/98		u/s	Rep2.1	Chasm Creek Sub-basin-Fiftynine Creek	Reach 2-Fiftynine Creek
16	4	19/10/98		d/s		Chasm Creek Sub-basin-Fiftynine Creek	Reach 2-Fiftynine Creek (d/s of BCRail Crossing)
22	4	19/10/98		d/s	Rep8.1	Chasm Creek Sub-basin-Fiftynine Creek	Reach 8-Fiftynine Creek(d/s of Highway 97
24	4	19/10/98		north	B15.1	Chasm Creek Sub-basin-Fiftynine Creek	Reach 15-Fiftynine Creek(culvert outlet)
23	4	19/10/98		u/s	B15.1	Chasm Creek Sub-basin-Fiftynine Creek	Reach 15-Fiftynine Creek(culvert inlet)
25	4	19/10/98		d/s	Rep17.1	Chasm Creek Sub-basin-Fiftynine Creek	Reach 17-Fiftynine Creek
1	3	19/10/98		u/s	B18.1	Chasm Creek Sub-basin	Reach 18-Fiftynine Creek
24	6	23/10/98		d/s	Rep41.1	Chasm Creek Sub-basin - Fiftynine Creek	Reach 41 - Fiftynine Creek
23	6	23/10/98		u/s	Rep41.1	Chasm Creek Sub-basin - Fiftynine Creek	Reach 41 - Fiftynine Creek
22	6	23/10/98		north	B41.1	Chasm Creek Sub-basin - Fiftynine Creek	Reach 41 - Fiftynine Creek (culvert inlet)
21	6	23/10/98		d/s	B41.1	Chasm Creek Sub-basin - Fiftynine Creek	Reach 41 - Fiftynine Creek (culvert outlet)
20	6	23/10/98		south	B41.1	Chasm Creek Sub-basin - Fiftynine Creek	Reach 41 - Fiftynine Creek (culvert inlet)
19	6	23/10/98		u/s		Chasm Creek Sub-basin - Fiftynine Creek	Reach 41 - Fiftynine Creek (Beaver Dam)

SUB-BASIN: Rayfield River

Exp	Roll	Date(d/m/y)	Bank	View	ID #	Location	Description
4	5	23/10/98		d/s	Rep6.1	Rayfield River Sub-basin - Rayfield River	Reach 6
5	5	23/10/98		d/s	Rep14.1	Rayfield River Sub-basin - Rayfield River	Reach 14
6	5	23/10/98		u/s	Rep16-1.1	Rayfield River Sub-basin - Rayfield River	Reach 16-1
7	5	23/10/98		d/s	Rep22.1	Rayfield River Sub-basin - Rayfield River	Reach 22
2	5	23/10/98		u/s	Rep1.1	Rayfield River Sub-basin - Eightythree Creek	Reach 1 - Eightythree Creek
1	5	23/10/98		u/s		Rayfield River Sub-basin - Eightythree Creek	Reach 14 - Eightythree Creek

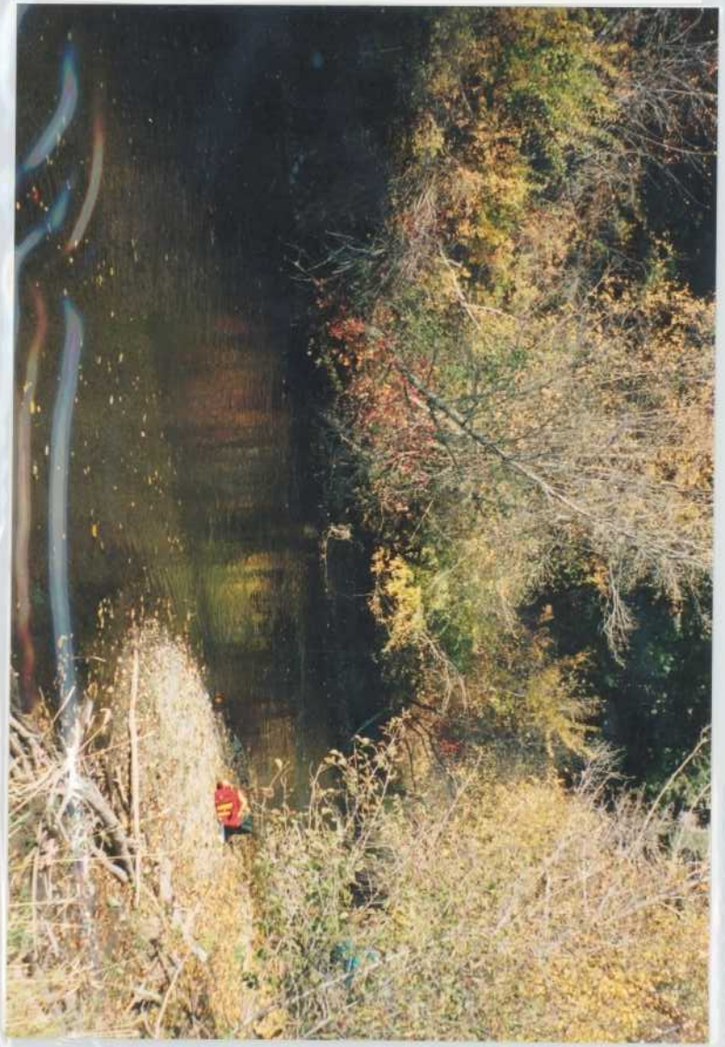
SUB-BASIN: Eagan Lake

Exp	Roll	Date(d/m/y)	Bank	View	ID #	Location	Description
16	5	22/10/98		u/s	Rep1.1	Eagan Lake Sub-basin - Machette Creek	Reach 1 - Machette Creek
22	5	22/10/98		d/s	Rep3-1	Eagan Lake Sub-basin - Machete Creek	Reach 3-1 - Machete Creek
1	4	21/10/98		d/s	Rep5-1.1	Eagan Lake Sub-basin-Machette Creek	Reach 5-1 - Machette Creek
25	5	21/10/98		u/s	Rep6.1	Eagan Lake Sub-basin - Machette Creek	Reach 6 - Machette Creek
4	4	21/10/98		u/s	Rep4.1	Eagan Lake Sub-basin-Montana Creek	Reach 4 - Montana Creek
3	4	21/10/98		d/s	B4.1	Eagan Lake Sub-basin-Montana Creek	Reach 4 - Montana Creek
23	5	22/10/98		d/s	Rep1.1	Eagan Lake Sub-basin - McDonald Creek	Reach 1 - McDonald Creek
2	4	21/10/98		u/s	Rep9.1	Eagan Lake Sub-basin-McDonald Creek	Reach 9 - McDonald Creek

SUB-BASIN: Bonaparte Lake

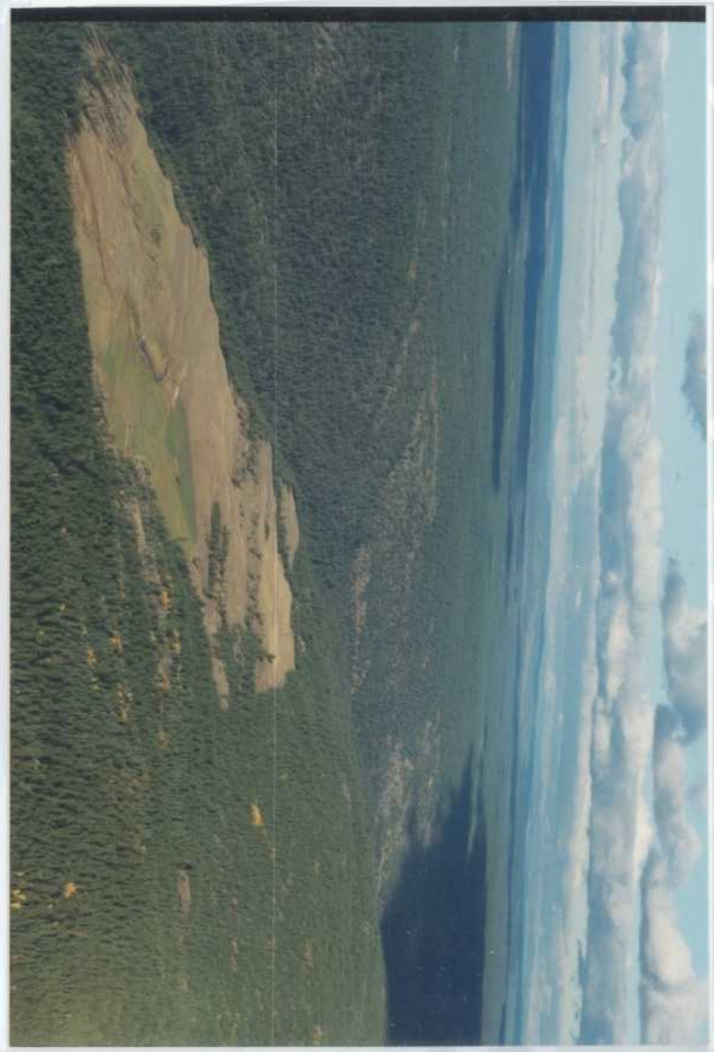
Exp	Roll	Date(d/m/y)	Bank	View	ID #	Location	Description
21	5	22/10/98	RB	d/s	B12-1.1	Bonaparte Lake Sub-basin - Bonaparte River	Reach 12-1 - Bonaparte River
20	5	22/10/98		u/s	Rep12-1.1	Bonaparte Lake Sub-basin - Bonaparte River	Reach 12-1 - Bonaparte River
17	5	22/10/98	LB	d/s	Rep12.1	Bonaparte Lake Sub-basin - Bonaparte River	Reach 12 - Bonaparte River
19	5	22/10/98		d/s	Rep2.1	Bonaparte Lake Sub-basin - Brown Creek	Reach 2 - Brown Creek
18	5	22/10/98		u/s	Rep1.1	Bonaparte Lake Sub-basin - Brown Creek	Reach 1 - Brown Creek
5	1.1	14/10/98	R/B	west	S13.4	Bonaparte Lake-Caverhill Creek	Helicopter aerial view-Reach 13
24	5	22/10/98		d/s	Rep13.1	Bonaparte Lake Sub-basin - Caverhill Creek	Reach 13 - Caverhill Creek

SUB-BASIN: BONAPARTE RIVER RESIDUAL
CREEK: BONAPARTE RIVER
Description: VIEW UPSTREAM AT REP BRR-1.1
Photo: 24
Roll: 2
Date: 16/10/98



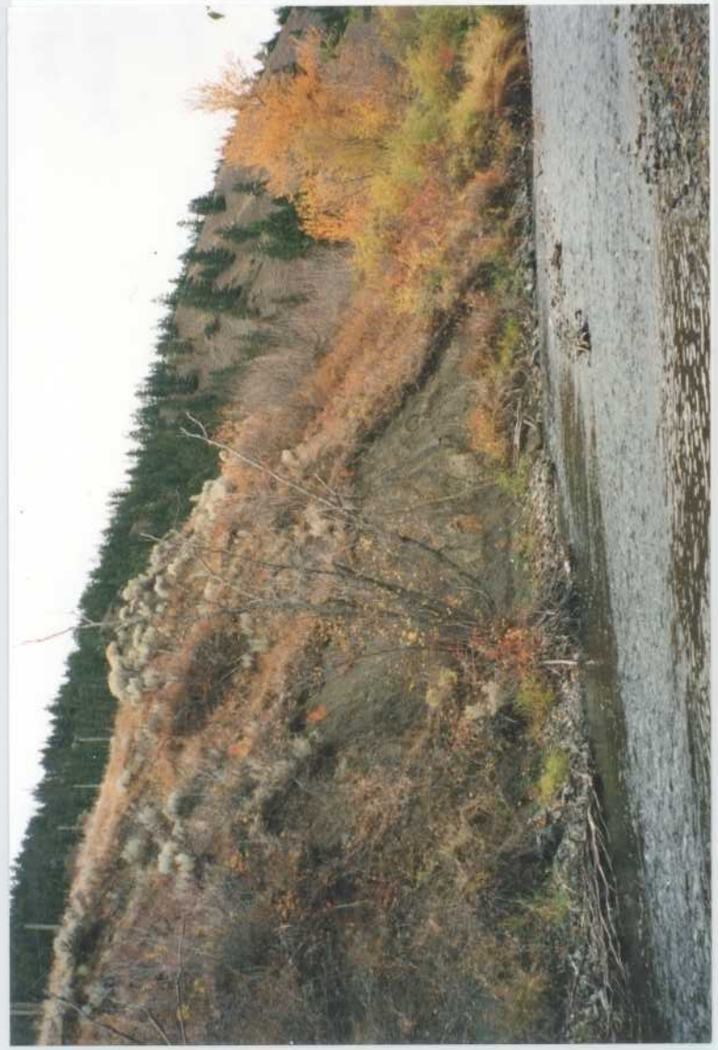
SUB-BASIN: BONAPARTE RIVER RESIDUAL
CREEK: BONAPARTE RIVER
Description: REACH 1, SITE-BRR-B1.1
Photo: 25
Roll: 2
Date: 16/10/98

SUB-BASIN: BONAPARTE RIVER RESIDUAL
CREEK: BONAPARTE RIVER
Description: VIEW NORTH-EAST
Photo: 8
Roll: 1.1
Date: 14/10/98



SUB-BASIN: BONAPARTE RIVER RESIDUAL
CREEK: BONAPARTE RIVER
Description: VIEW DOWNSTREAM AT REP BRR - 1.2
Photo: 3
Roll: 2
Date: 17/10/98

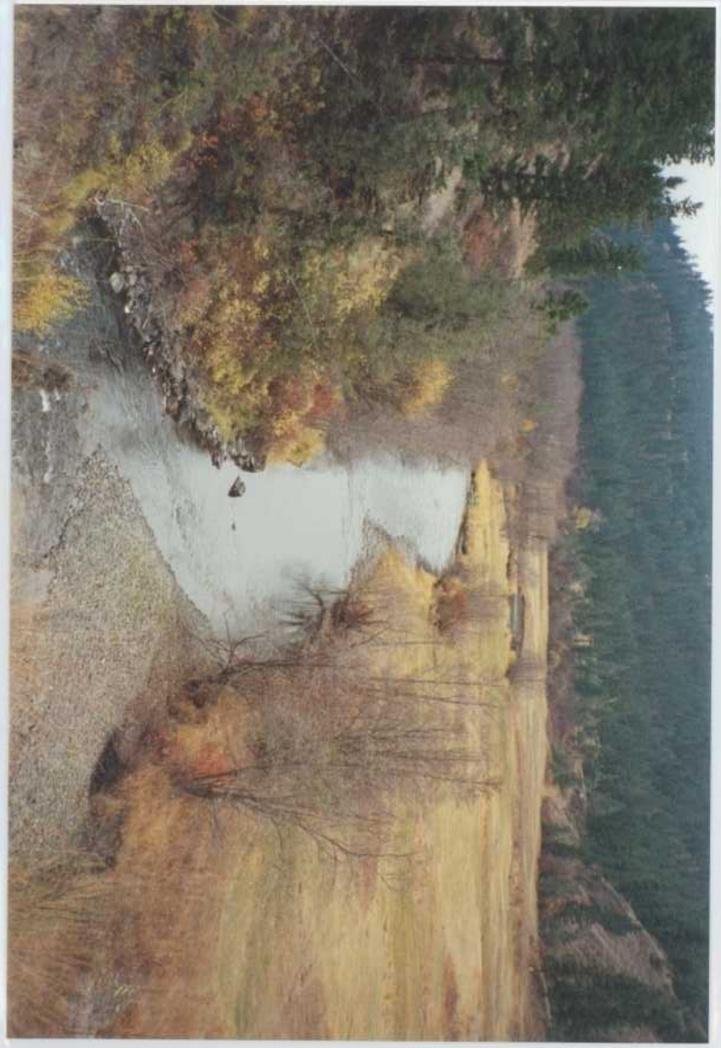
SUB-BASIN: BONAPARTE RIVER RESIDUAL
CREEK: BONAPARTE RIVER
Description: VIEW UPSTREAM REACH 1 SITE BRR - B1.4
Photo: 2
Roll: 2
Date: 17/10/98



SUB-BASIN: BONAPARTE RIVER RESIDUAL
CREEK: BONAPARTE RIVER
Description: FOCUSED VIEW OF SITE BRR - B1.4
Photo: 1
Roll: 2
Date: 17/10/98

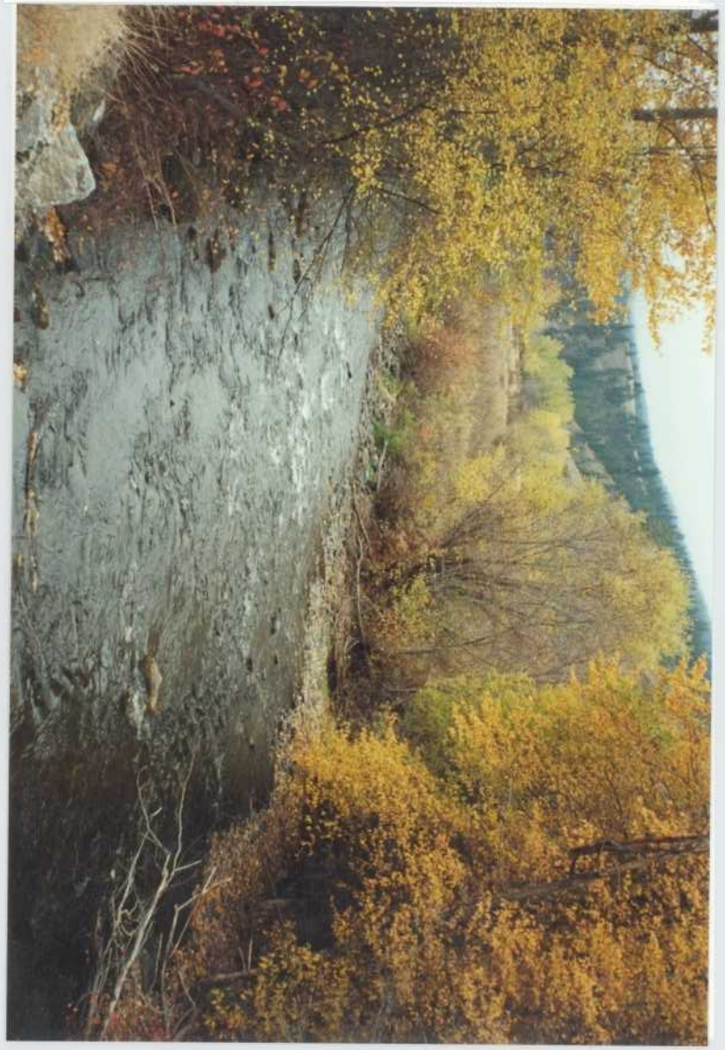
SUB-BASIN: BONAPARTE RIVER RESIDUAL
CREEK: BONAPARTE RIVER
Description: VIEW DOWNSTREAM OF REACH 4

Photo: 12
Roll: 4
Date: 20/10/98



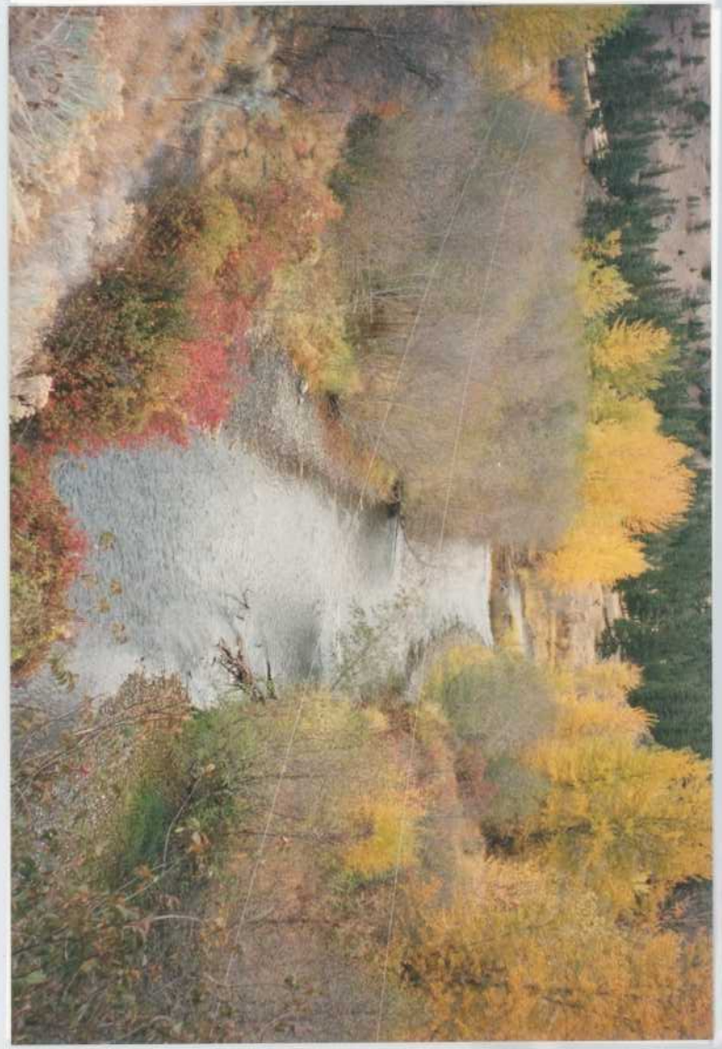
SUB-BASIN: BONAPARTE RIVER RESIDUAL
CREEK: BONAPARTE RIVER
Description: REP 2.1 ; VIEW DOWNSTREAM OF REACH 2

Photo: 10
Roll: 4
Date: 20/10/98

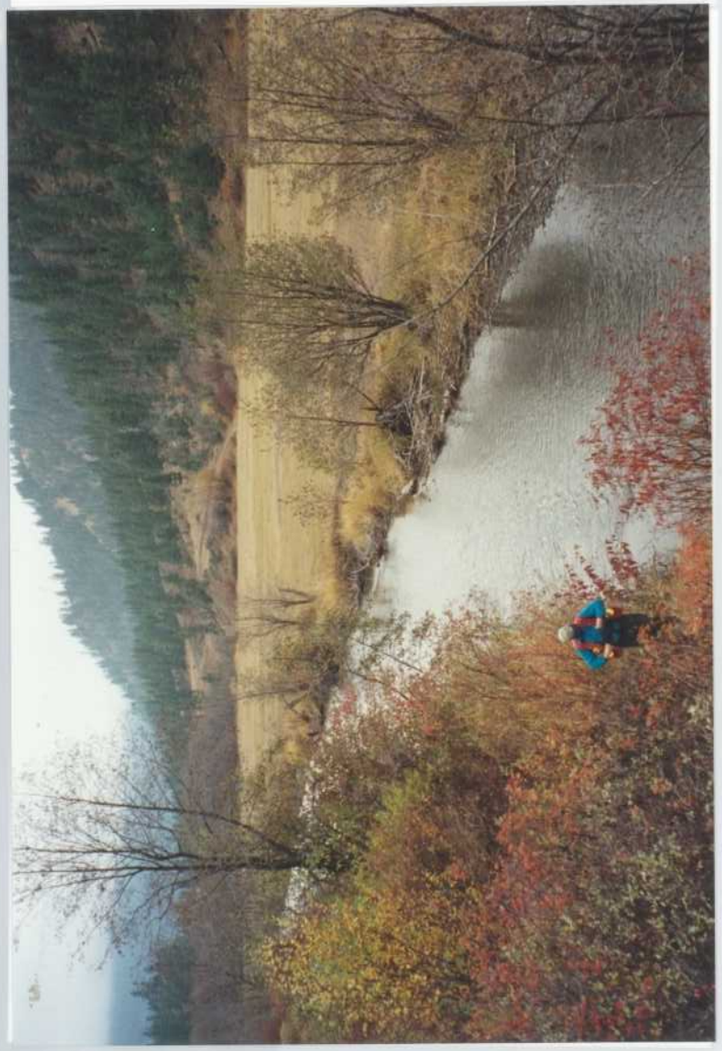


SUB-BASIN: BONAPARTE RIVER RESIDUAL
CREEK: BONAPARTE RIVER
Description: VIEW UPSTREAM ABOVE HWY 97 & LOON LAKE RD

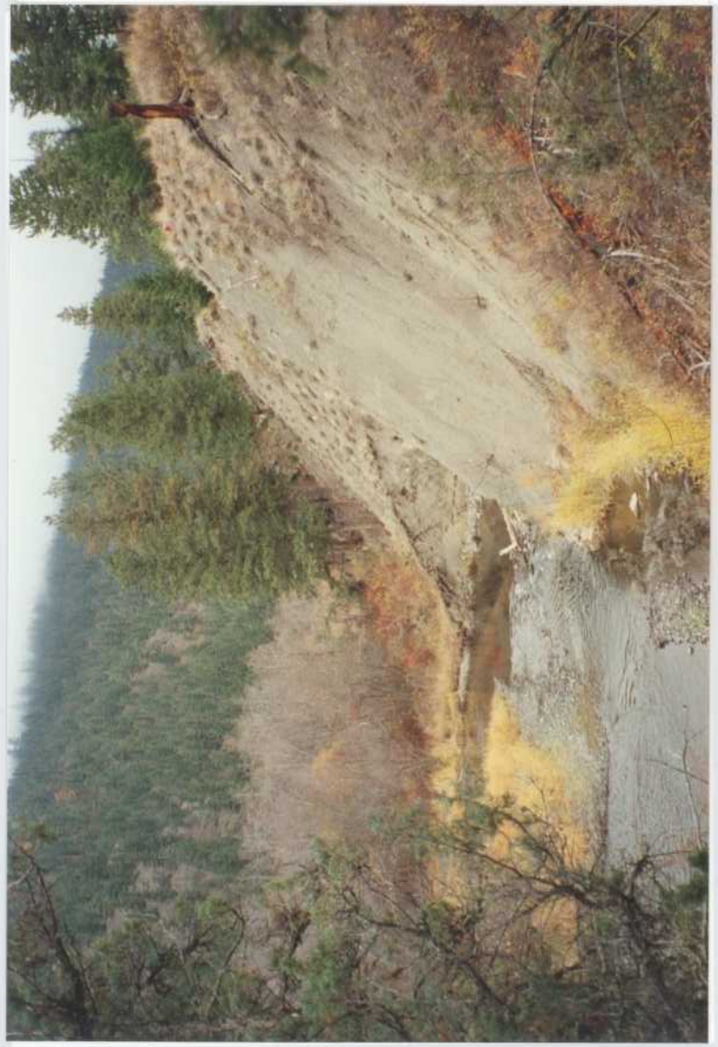
Photo: 4
Roll: 2
Date: 17/10/98



SUB-BASIN: BONAPARTE RIVER RESIDUAL
CREEK: BONAPARTE RIVER
Description: REP 4.1 ; VIEW DOWNSTREAM ON RIGHT BANK FLOODPLAIN
Photo: 11
Roll: 4
Date: 20/10/98

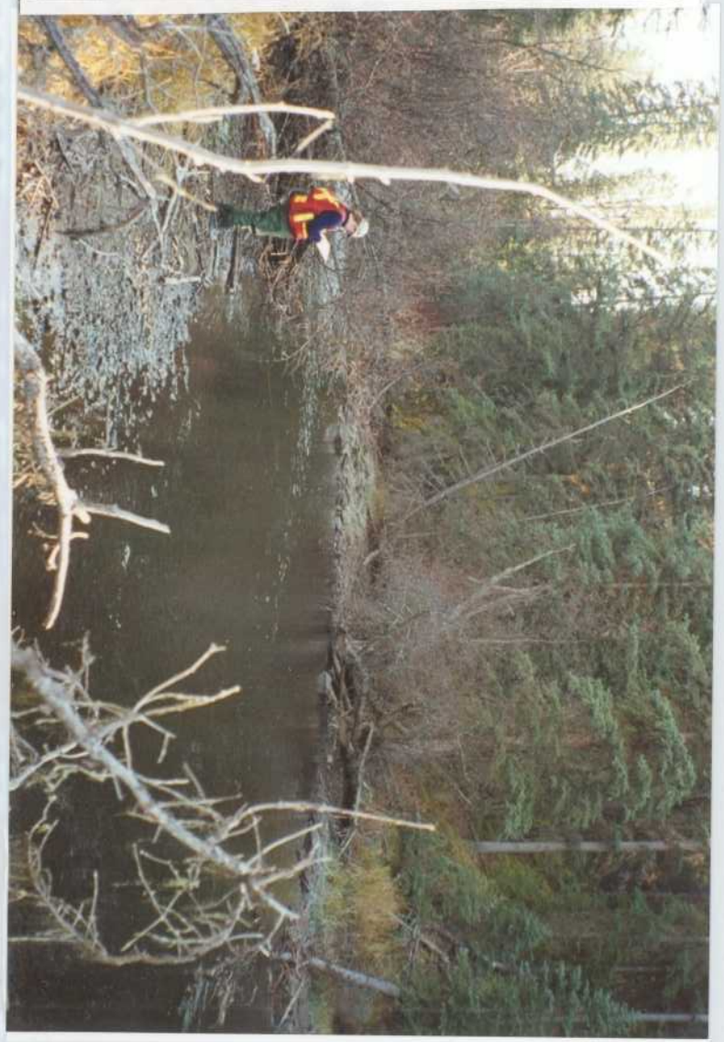


SUB-BASIN: BONAPARTE RIVER RESIDUAL
CREEK: BONAPARTE RIVER
Description: SITE B4.1 ; VIEW UPSTREAM OF REACH 4
Photo: 13
Roll: 4
Date: 20/10/98



SUB-BASIN: BONAPARTE RIVER RESIDUAL
CREEK: BONAPARTE RIVER
Description: VIEW UPSTREAM AT REP 5-1.1, REACH 5-1
Photo: 14
Roll: 4
Date: 20/10/98

SUB-BASIN: BONAPARTE RIVER RESIDUAL Photo: 3
CREEK: BONAPARTE RIVER Roll: 5
Description: REP 8-1.1, VIEW UPSTREAM OF REACH 8.2 Date: 23/10/98



SUB-BASIN: BONAPARTE RIVER RESIDUAL Photo: 16
CREEK: BONAPARTE RIVER Roll: 2
Description: VIEW DOWNSTREAM REP BRR6-2.1 Date: 16/10/98

SUB-BASIN: BONAPARTE RIVER RESIDUAL Photo: 15
CREEK: BONAPARTE RIVER Roll: 4
Description: SITE 55-1.1, VIEW NORTH ON LEFTBANK Date: 20/10/98

SUB-BASIN: BONAPARTE RIVER RESIDUAL
CREEK: BONAPARTE RIVER
Description: VIEW UPSTREAM, REP 10.1
Photo: 12
Roll: 5
Date: 22/10/98

SUB-BASIN: BONAPARTE RIVER RESIDUAL
CREEK: BONAPARTE RIVER, REACH 10
Description: SITE B10-7, VIEW DOWNSTREAM
Photo: 10
Roll: 5
Date: 22/10/98

SUB-BASIN: BONAPARTE RIVER RESIDUAL
CREEK: BONAPARTE RIVER REACH 10
Description: SITE B10.7, VIEW DOWNSTREAM
Photo: 10
Roll: 5
Date: 22/10/98

SUB-BASIN: BONAPARTE RIVER RESIDUAL Photo: 13
CREEK: BONAPARTE RIVER Roll: 5
Description: REACH 11-1 VIEW DOWNSTREAM, REP 11-1.2 Date: 22/10/98

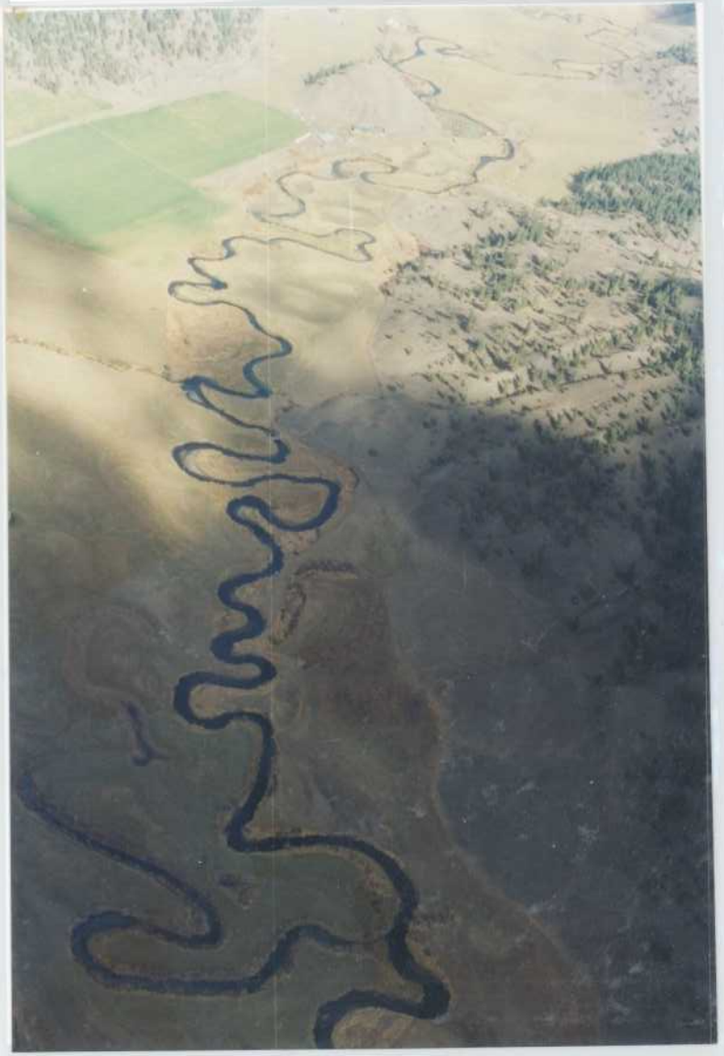
SUB-BASIN: BONAPARTE RIVER RESIDUAL Photo: 8
CREEK: BONAPARTE RIVER Roll: 5
Description: SITE B10.7, VIEW DOWNSTREAM ON DEBRIS JAM Date: 22/10/98

SUB-BASIN: BONAPARTE RIVER RESIDUAL Photo: 9
CREEK: BONAPARTE RIVER Roll: 5
Description: SITE B10.7 Date: 22/10/98

SUB-BASIN: BONAPARTE RIVER RESIDUAL Photo: 14
CREEK: BONAPARTE RIVER Roll: 5
Description: SITE B11-1.8, VIEW UPSTREAM Date: 22/10/98

SUB-BASIN: BONAPARTE RIVER RESIDUAL Photo: 15
CREEK: BONAPARTE RIVER Roll: 5
Description: REP 11-1.1, VIEW UPSTREAM Date: 22/10/98

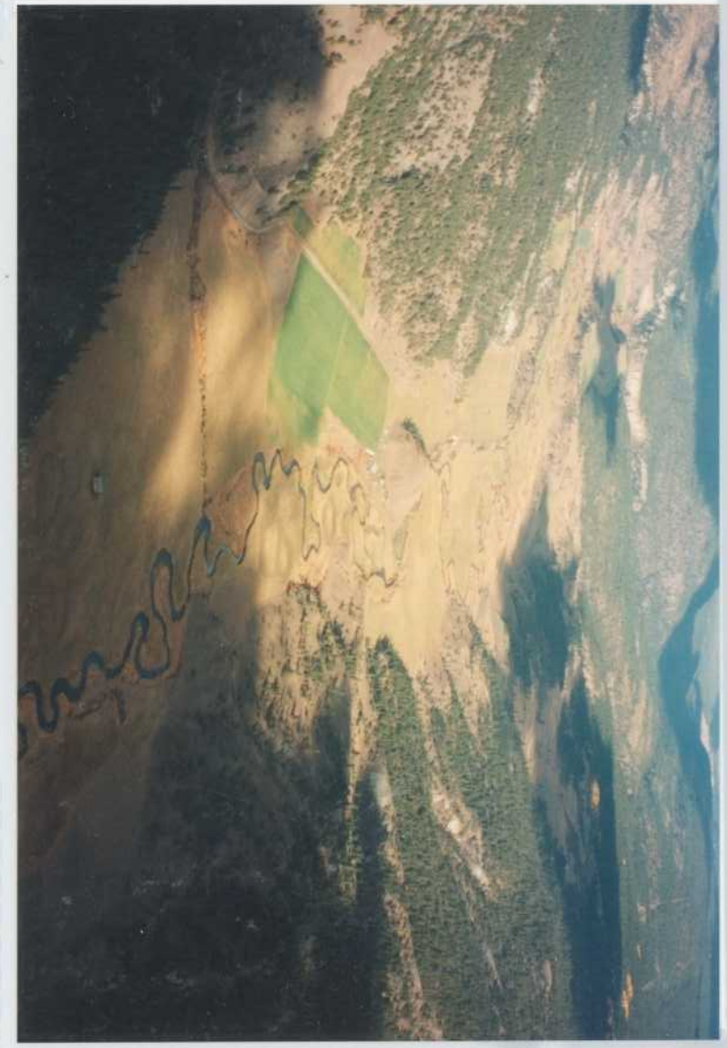
SUB-BASIN: BONAPARTE RIVER RESIDUAL Photo: 6
CREEK: BONAPARTE RIVER Roll: 1.1
Description: VIEW UPSTREAM OF REACH 6 Date: 14/10/98



SUB-BASIN: ALLEN CREEK Photo: 22
CREEK: MAIDEN CREEK Roll: 2
Description: VIEW UPSTREAM OF REACH 4 SITE AC-MC-B4.2 Date: 16/10/98

SUB-BASIN: ALLEN CREEK Photo: 18
CREEK: MAIDEN CREEK Roll: 3
Description: VIEW UPSTREAM, REP 2.1 REACH 2 Date: 18/10/98

SUB-BASIN: BONAPARTE RIVER RESIDUAL Photo: 8
CREEK: BONAPARTE RIVER Roll: 1
Description: HELICOPTER VIEW NORTH DOWNSTREAM OF FIFTY-SEVEN CREEK Date: 15/10/98



SUB-BASIN: ALLEN CREEK
CREEK: MAIDEN CREEK
Description: VIEW UPSTREAM REACH 4
Photo: 23
Roll: 2
Date: 16/10/98

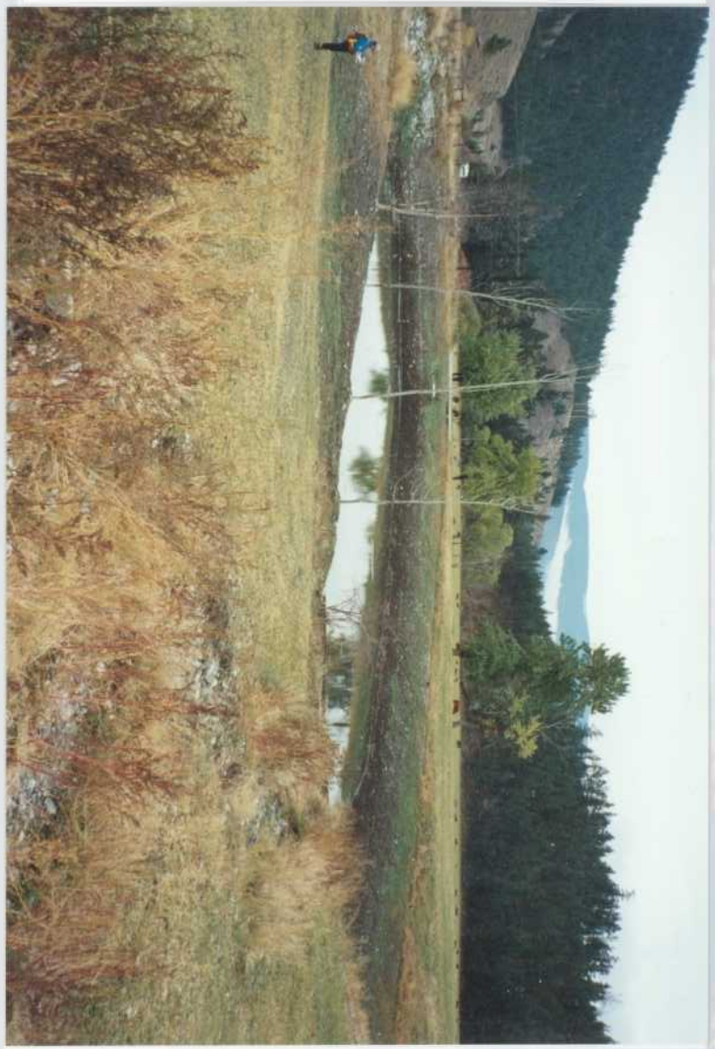
SUB-BASIN: ALLEN CREEK
CREEK: MAIDEN CREEK
Description: VIEW UPSTREAM REACH 8 REP AC-MC - 8.1
Photo: 21
Roll: 2
Date: 16/10/98

SUB-BASIN: ALLEN CREEK
CREEK: ALLEN CREEK
Description: REACH 3 VIEW UPSTREAM
Photo: 24
Roll: 3
Date: 18/10/98

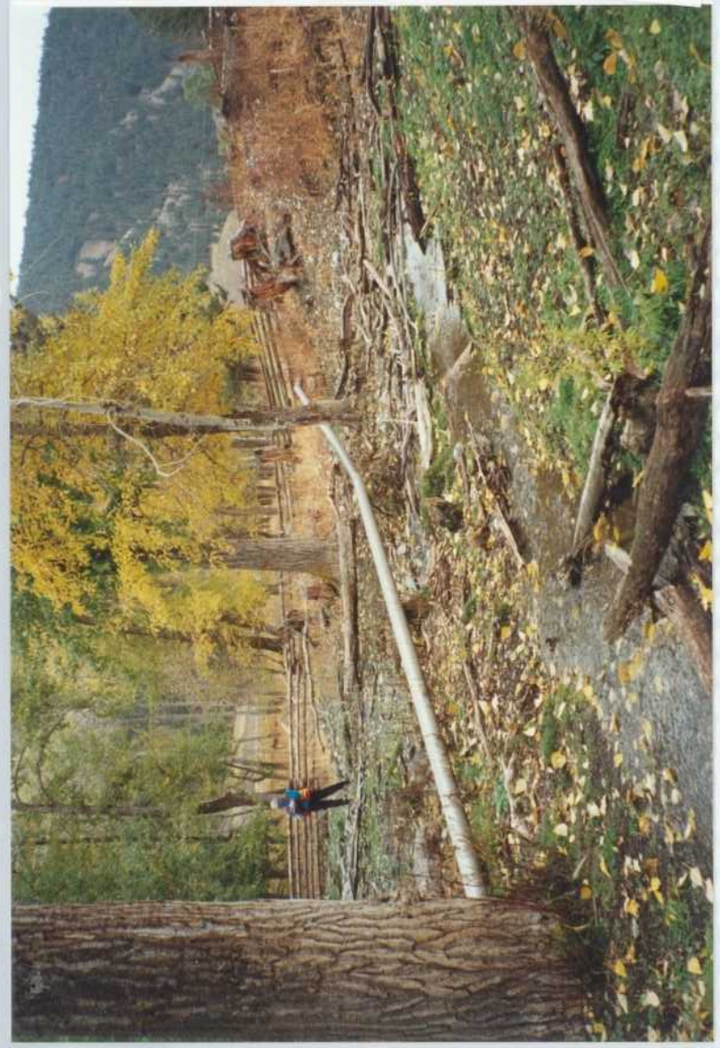
SUB-BASIN: ALLEN CREEK
CREEK: ALLEN CREEK
Description: VIEW UPSTREAM. REACH 3 SITE AC- B3.1
Photo: 20
Roll: 3
Date: 18/10/98

SUB-BASIN: ALLEN CREEK
CREEK: ALLEN CREEK
Description: REACH 3 VIEW UPSTREAM
Photo: 23
Roll: 3
Date: 18/10/98

SUB-BASIN: ALLEN CREEK
CREEK: 1
Description: ALLEN CREEK REACH 3 VIEW SOUTH
Photo: 25
Roll: 3
Date: 18/10/98



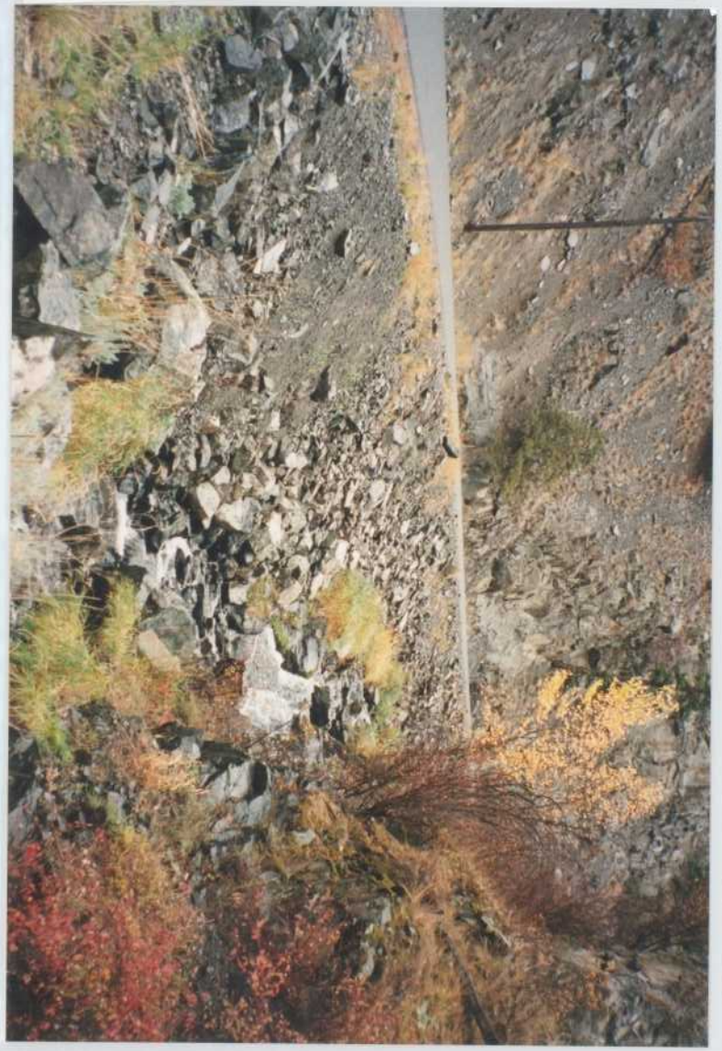
SUB-BASIN: ALLEN CREEK
CREEK: ALLEN CREEK
Description: REACH 3 VIEW DOWNSTREAM
Photo: 22
Roll: 3
Date: 18/10/98



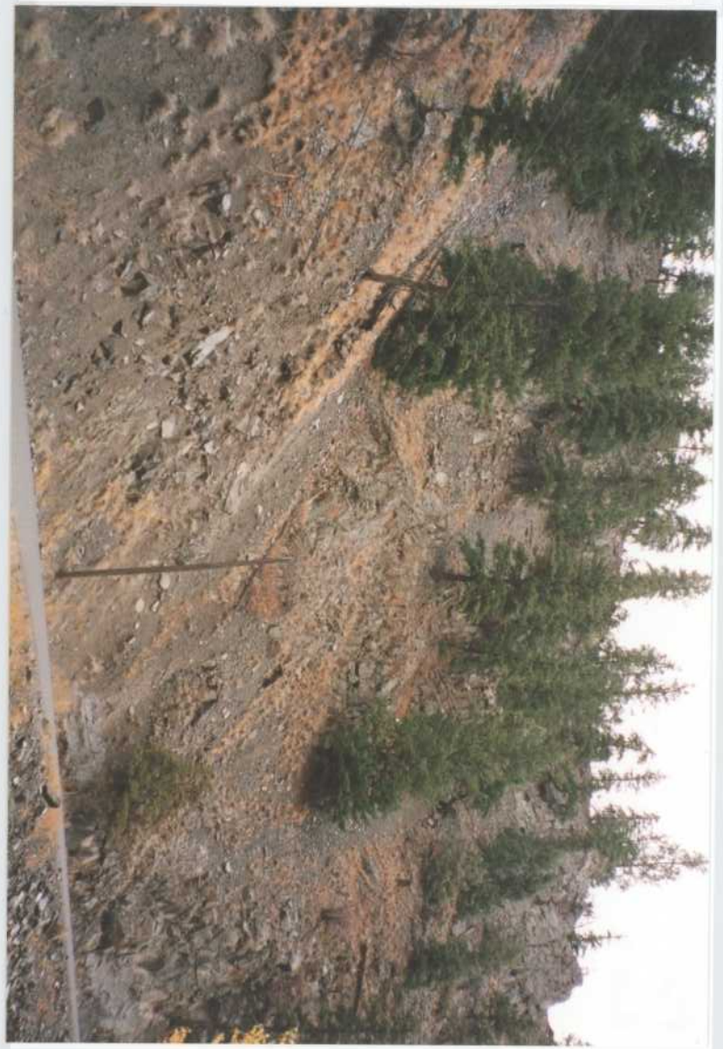
SUB-BASIN: ALLEN CREEK
CREEK: ALLEN CREEK
Description: REACH 3 VIEW UPSTREAM, SITE AC-B3.1
Photo: 21
Roll: 3
Date: 18/10/98

SUB-BASIN: ALLEN CREEK
CREEK: ALLEN CREEK
Description: VIEW UPSTREAM, REP 4.1
Photo: 19
Roll: 3
Date: 18/10/98

SUB-BASIN: LOON CREEK Photo: 7
CREEK: LOON CREEK Roll: 2
Description: SITE LC-52.2 Date: 17/10/98



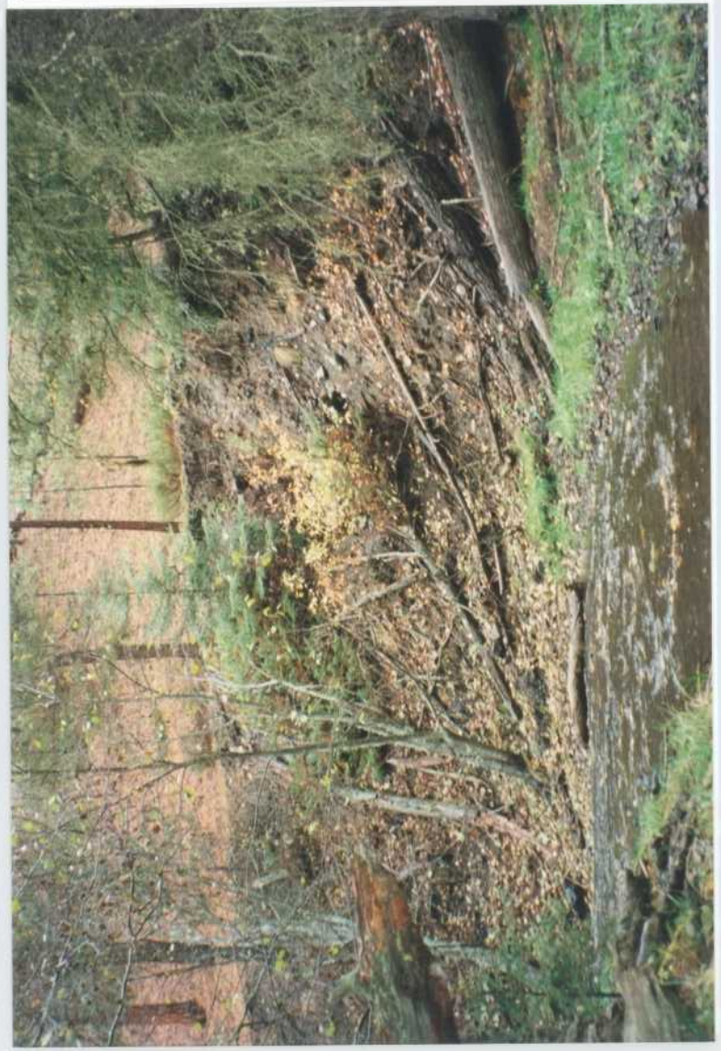
SUB-BASIN: LOON CREEK Photo: 6
CREEK: LOON CREEK Roll: 2
Description: SITE LC-52.2 Date: 17/10/98



SUB-BASIN: LOON CREEK Photo: 5
CREEK: LOON CREEK Roll: 2
Description: VIEW UPSTREAM REACH 2 SITE #-LC-52.2 Date: 17/10/98

SUB-BASIN: LOON CREEK
CREEK: LOON CREEK
Photo: 10
Roll: 2
Description: VIEW UPSTREAM REACH 4 REP LC4.2
Date: 17/10/98

SUB-BASIN: LOON CREEK
CREEK: LOON CREEK
Photo: 9
Roll: 2
Description: SITE LC-B4.1
Date: 17/10/98



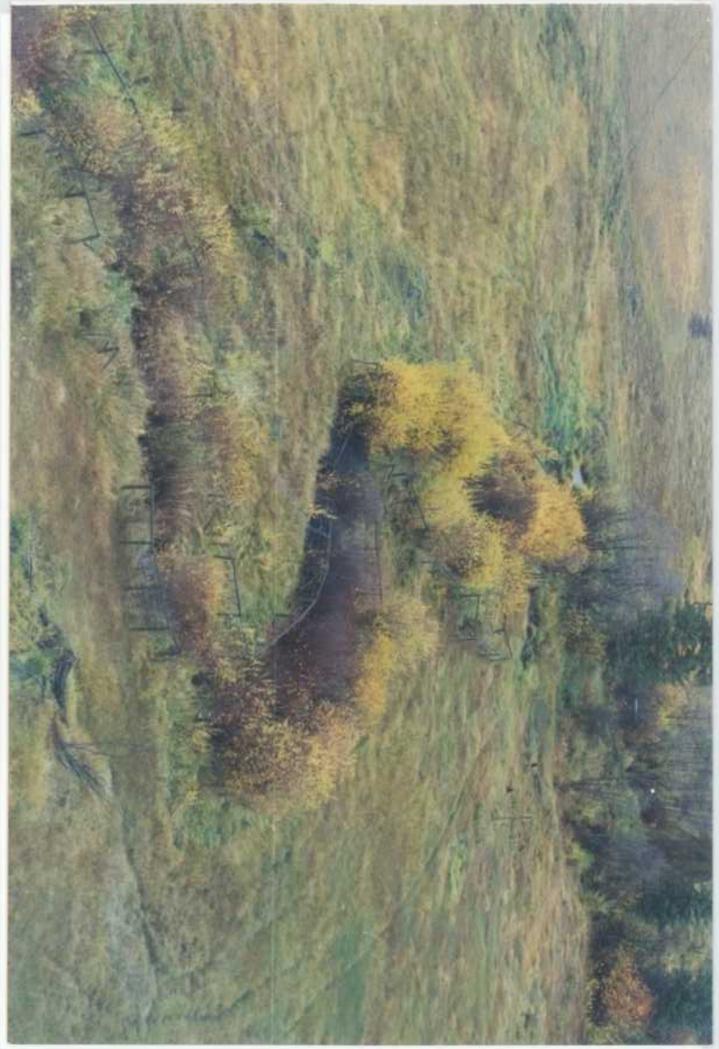
SUB-BASIN: LOON CREEK
CREEK: LOON CREEK
Photo: 11
Roll: 2
Description: VIEW DOWNSTREAM REACH 4
Date: 17/10/98

SUB-BASIN: LOON CREEK
CREEK: LOON CREEK
Description: REACH 8

Photo: 3
Roll: 1.1
Date: 14/10/98

SUB-BASIN: LOON CREEK
CREEK: LOON CREEK
Description: REACH 8
RIPARIAN FENCE

Photo: 4
Roll: 1.1
Date: 14/10/98

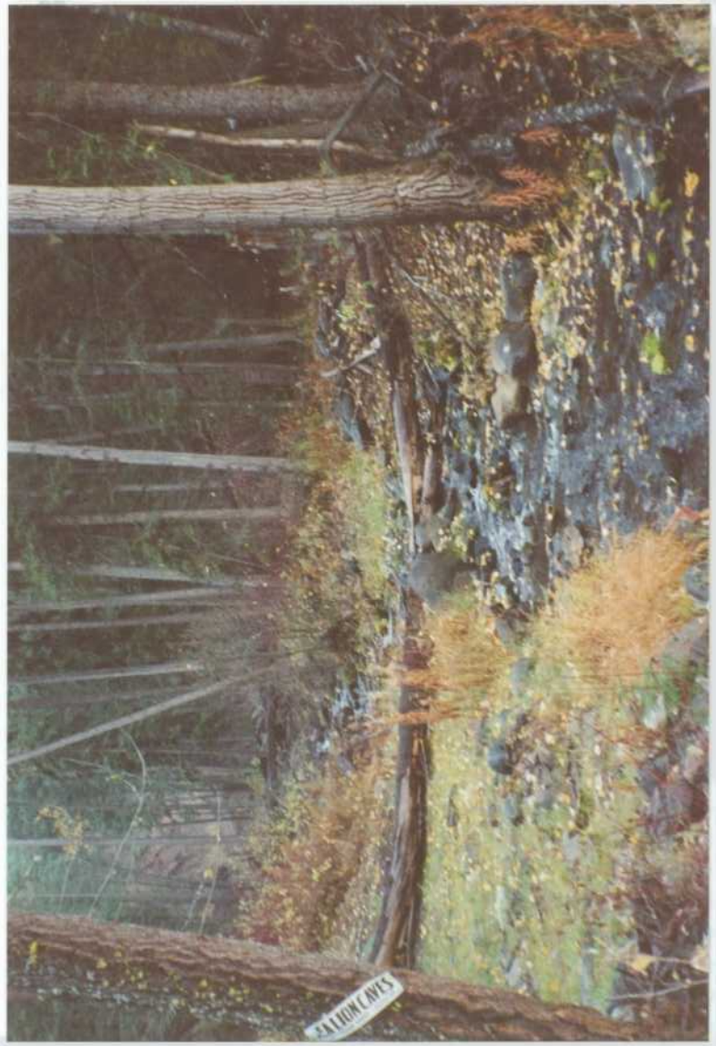


SUB-BASIN: LOON CREEK
CREEK: LOON CREEK
Description: VIEW DOWNSTREAM OF REACH 4 TRIBUTARY / GULLY

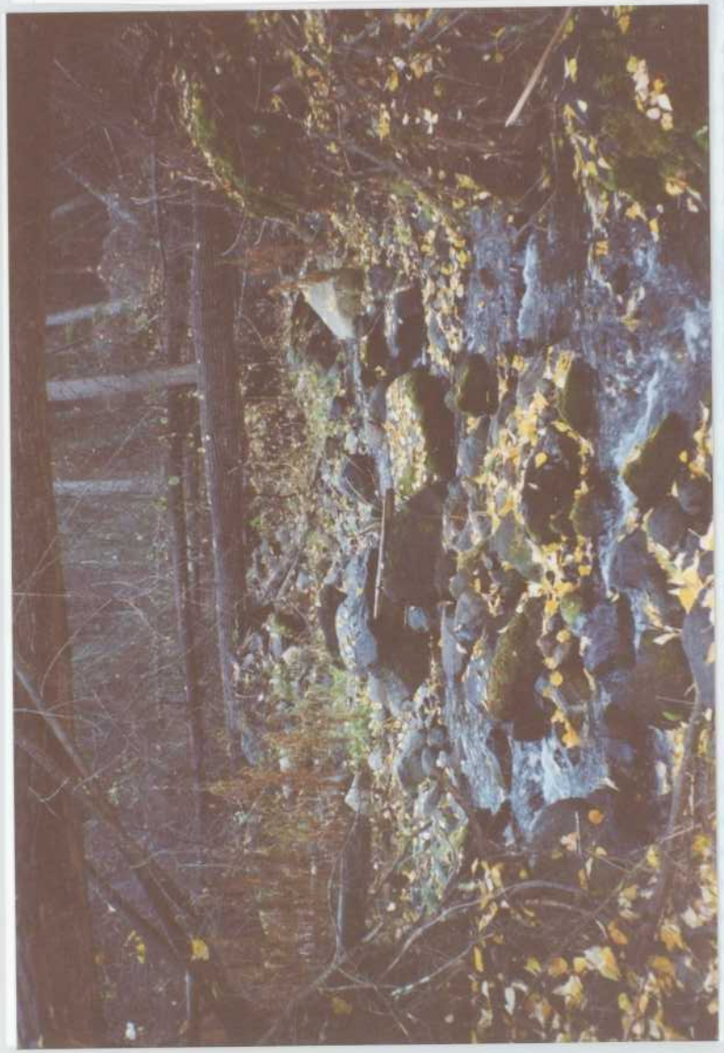
Photo: 8
Roll: 2
Date: 17/10/98

SUB-BASIN: LOON CREEK
CREEK: LOON CREEK
Description: VIEW UPSTREAM REACH 9 REP LC9.1
Photo: 12
Roll: 2
Date: 17/10/98

SUB-BASIN: LOON CREEK
CREEK: HITHIUM CREEK
Description: VIEW UPSTREAM AT REACH 2
Photo: 6
Roll: 4
Date: 20/10/98



SUB-BASIN: LOON CREEK
CREEK: HITHIUM CREEK
Description: REP 2.1, VIEW UPSTREAM
Photo: 7
Roll: 4
Date: 20/10/98



SUB-BASIN: LOON CREEK
CREEK: HIHIUM CREEK
Description: SLIDE, SITE 53.6
Photo: 2
Roll: 1.1
Date: 14/10/98

SUB-BASIN: LOON CREEK
CREEK: HIHIUM CREEK
Description: SLIDE, SITE 53.5
Photo: 1
Roll: 1.1
Date: 14/10/98

SUB-BASIN: LOON CREEK
CREEK: HIHIUM CREEK
Description: REP 2.2; VIEW UPSTREAM
Photo: 5
Roll: 4
Date: 20/10/98

SUB-BASIN: LOON CREEK Photo: 8
CREEK: HIHIUM CREEK Roll: 4
Description: VIEW UPSTREAM, REP 3.1 Date: 20/10/98

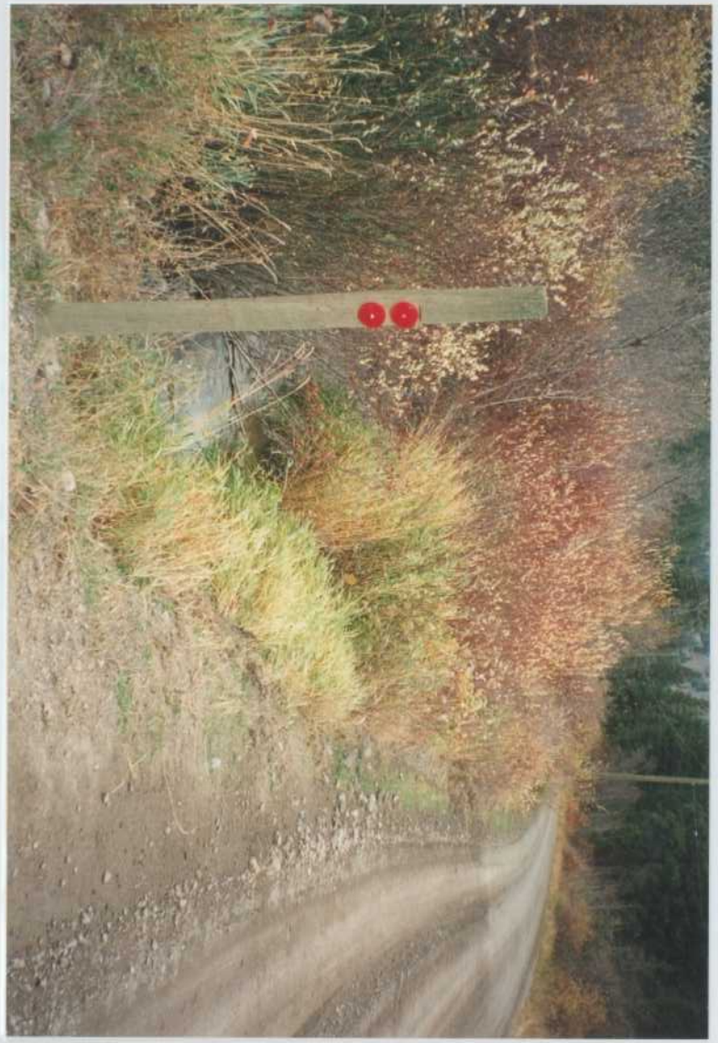
SUB-BASIN: LOON CREEK Photo: 9
CREEK: HIHIUM CREEK Roll: 4
Description: REP 4.1, VIEW DOWNSTREAM OF REACH 4 Date: 20/10/98

SUB-BASIN: LOON CREEK Photo: 13
CREEK: BRIGADE CREEK Roll: 2
Description: VIEW DOWNSTREAM REACH 3-1 REP 3.1 Date: 17/10/98

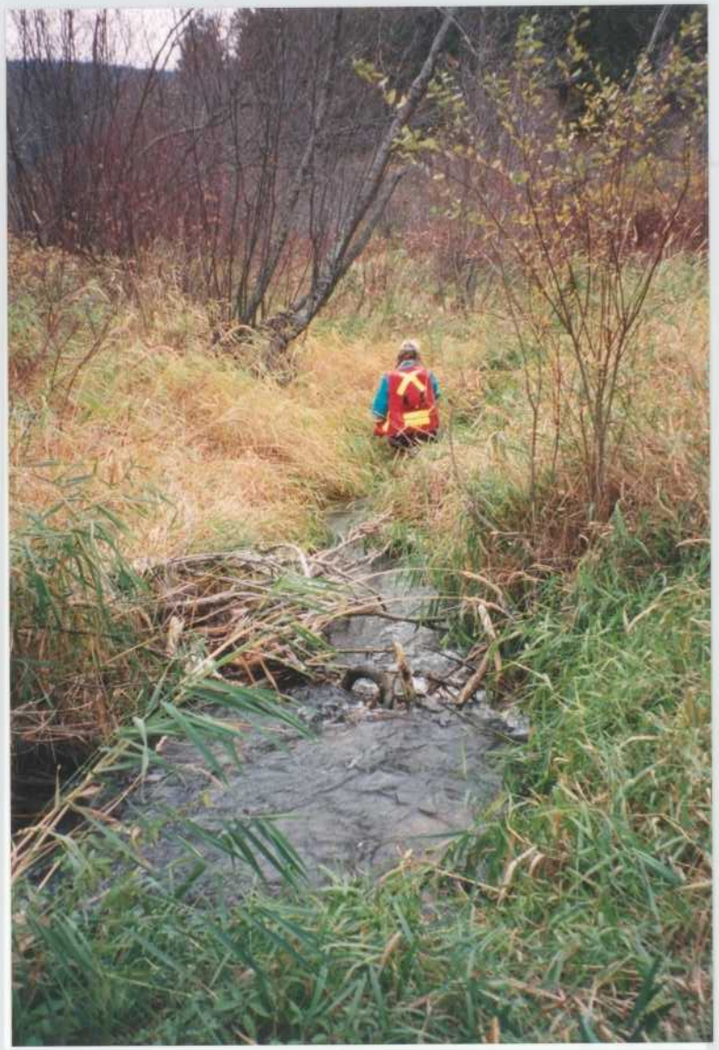
SUB-BASIN: LOON CREEK
CREEK: BRIGADE CREEK
Description: VIEW UPSTREAM REP LC-BC4.1
Photo: 14
Roll: 2
Date: 17/10/98

SUB-BASIN: LOON CREEK
CREEK: BRIGADE CREEK
Description: VIEW DOWNSTREAM REACH 3 SITE LC-BG-B3.1
Photo: 15
Roll: 2
Date: 17/10/98

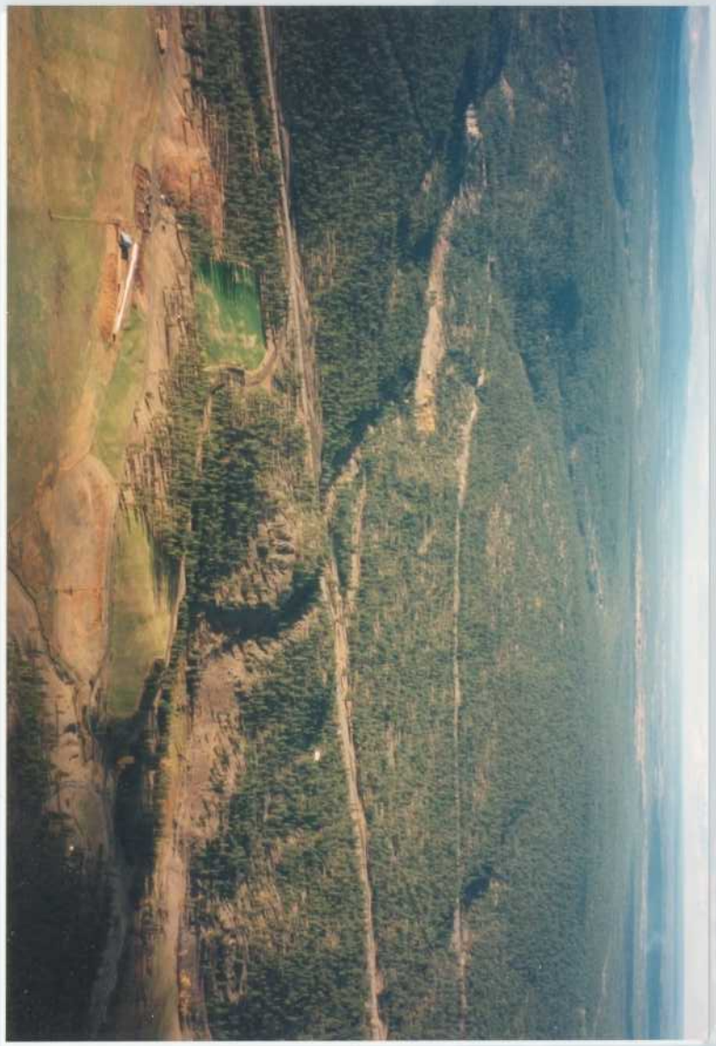
SUB-BASIN: CLINTON CREEK
CREEK: CLINTON CREEK
Description: REACH 2
SITE CC-B211
Photo: 17
Roll: 2
Date: 16/10/98



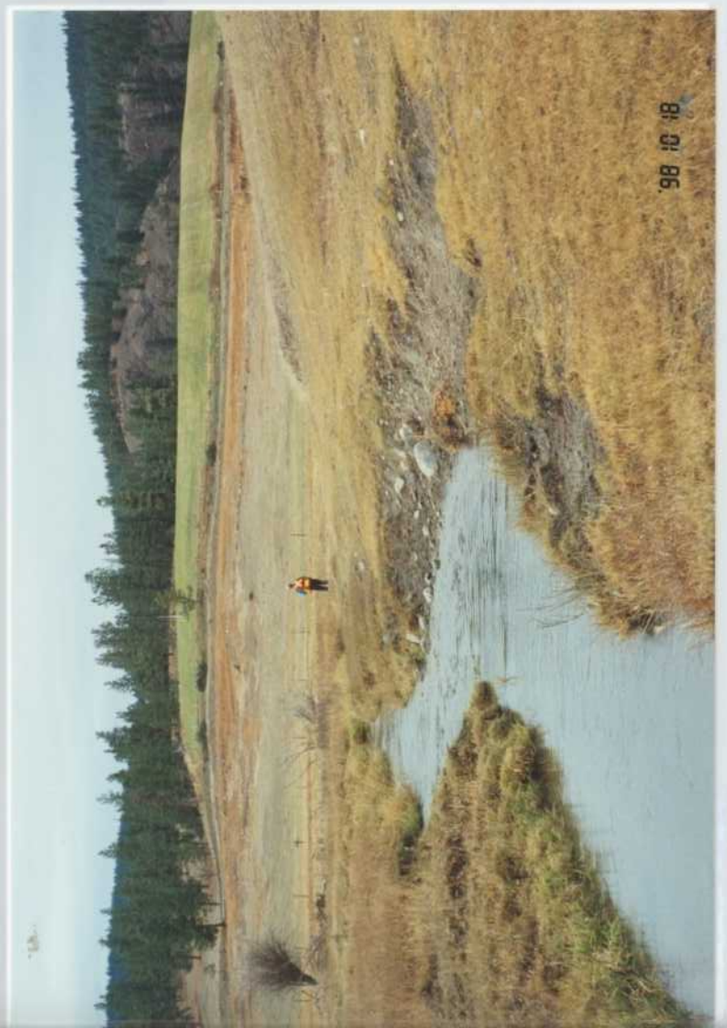
SUB-BASIN: CLINTON CREEK
CREEK: CLINTON CREEK
Description: VIEW DOWNSTREAM OF
REACH 2
REP CC2.1
Photo: 18
Roll: 2
Date: 16/10/98



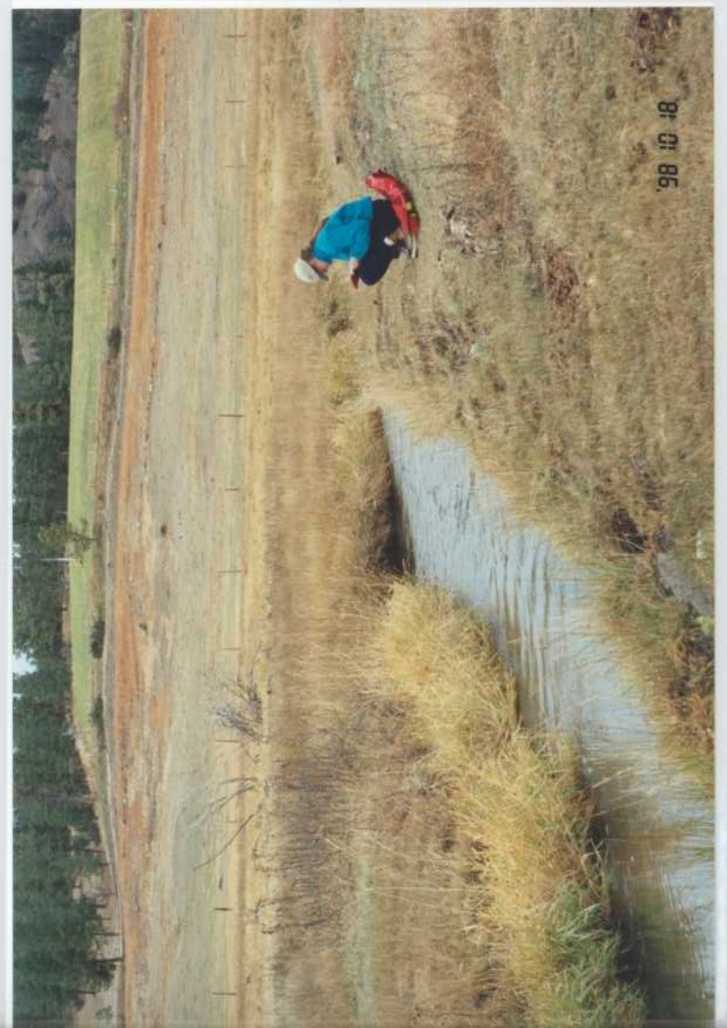
SUB-BASIN: CLINTON CREEK
CREEK: FIFTY ONE CREEK
Description:
Photo: 3
Roll: 1
Date: 15/10/98



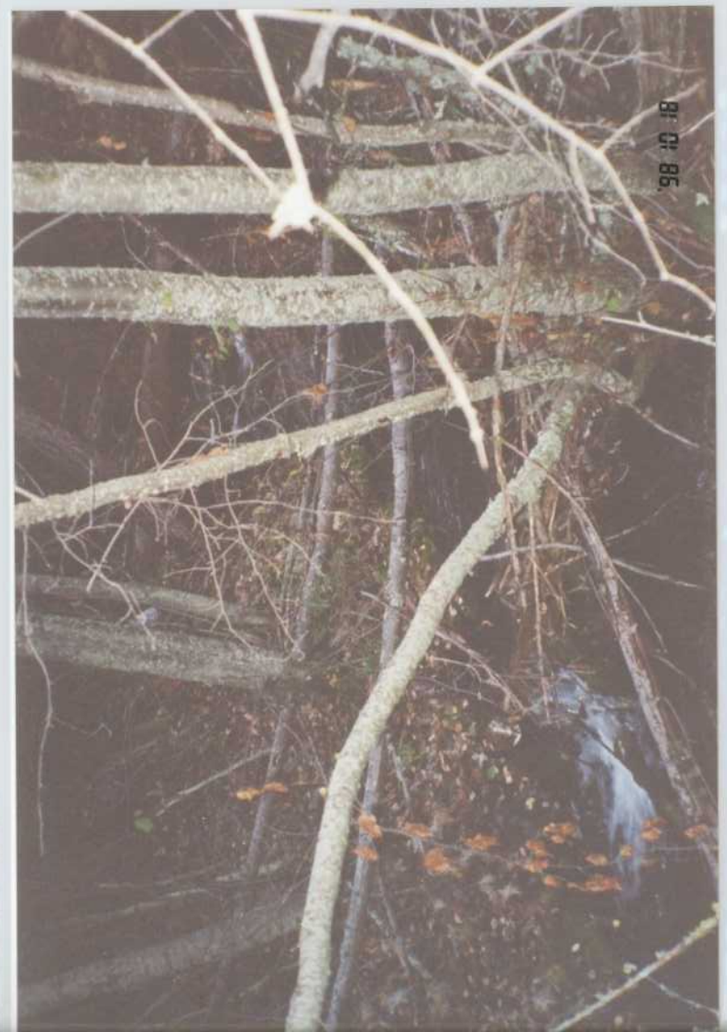
SUB-BASIN: CLINTON CREEK
CREEK: CLINTON CREEK
Description: VIEW DOWNSTREAM SITE # B6.2
Photo: 17
Roll: 3
Date: 18/10/98



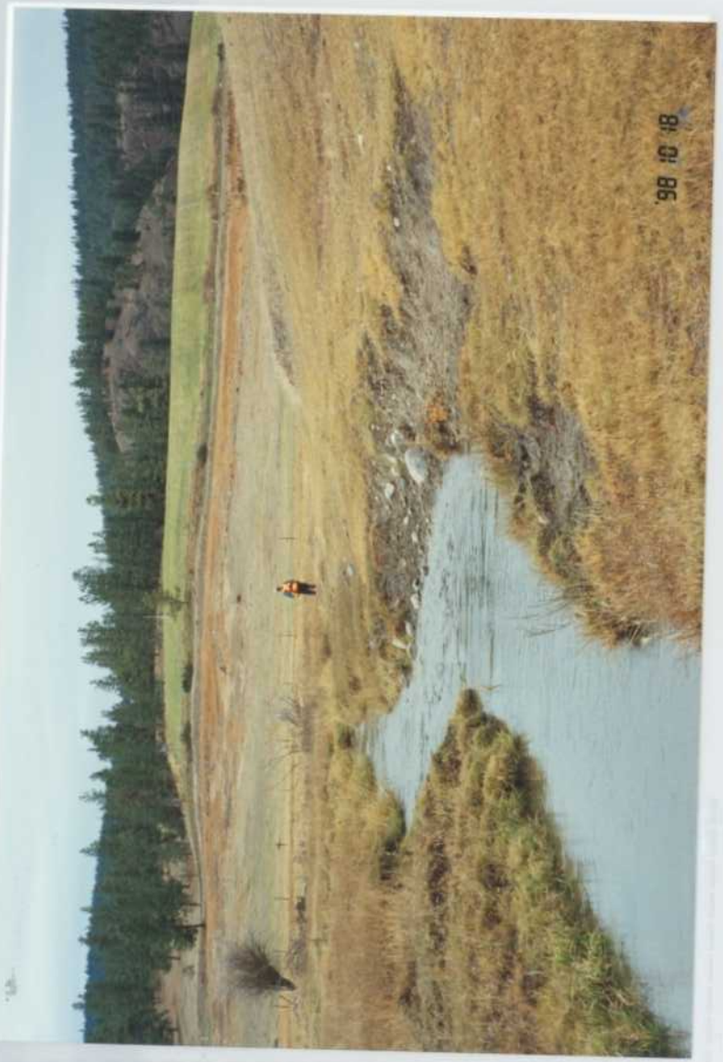
SUB-BASIN: CLINTON CREEK
CREEK: CLINTON CREEK
Description: REACH 6 VIEW DOWNSTREAM REP 6.1
Photo: 16
Roll: 3
Date: 18/10/98



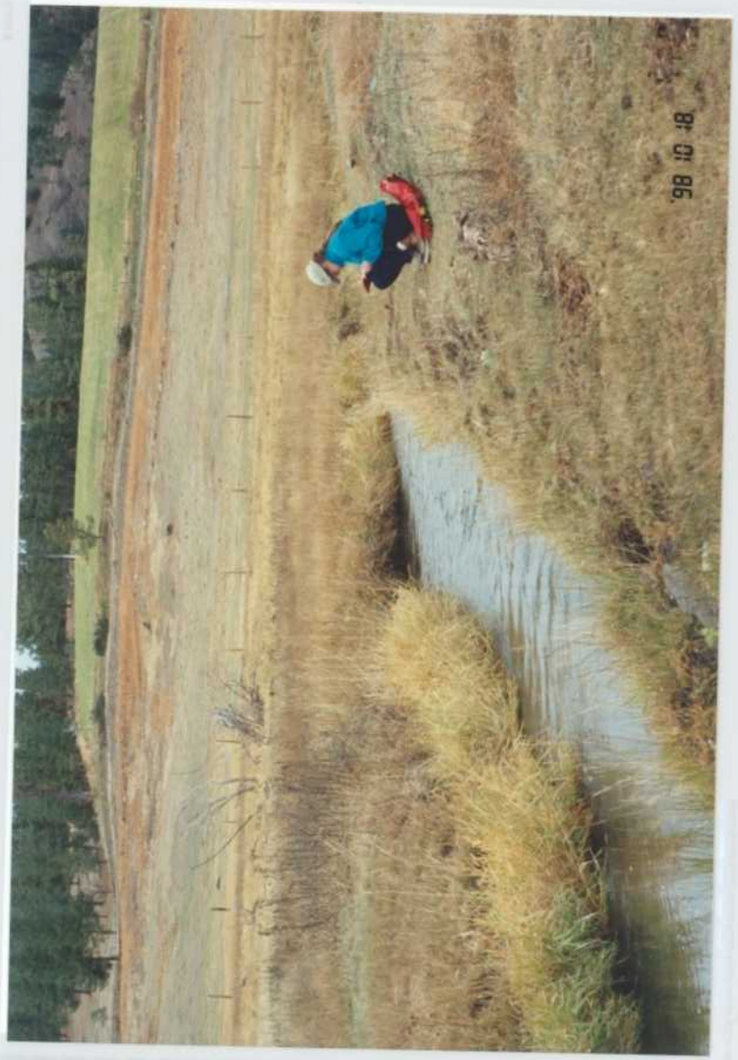
SUB-BASIN: CLINTON CREEK
CREEK: CLINTON CREEK
Description: REACH 8 VIEW UPSTREAM REP 8.1
Photo: 15
Roll: 3
Date: 18/10/98



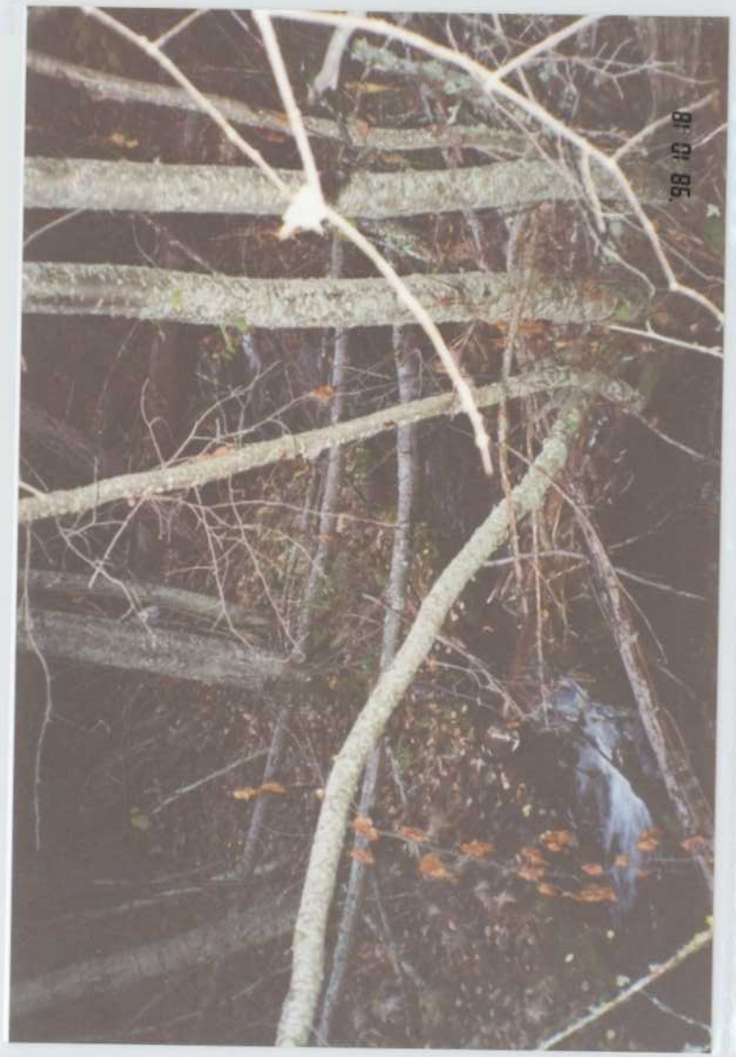
SUB-BASIN: CLINTON CREEK
CREEK: CLINTON CREEK
Description: VIEW DOWNSTREAM SITE # B6.2
Photo: 17
Roll: 3
Date: 18/10/98



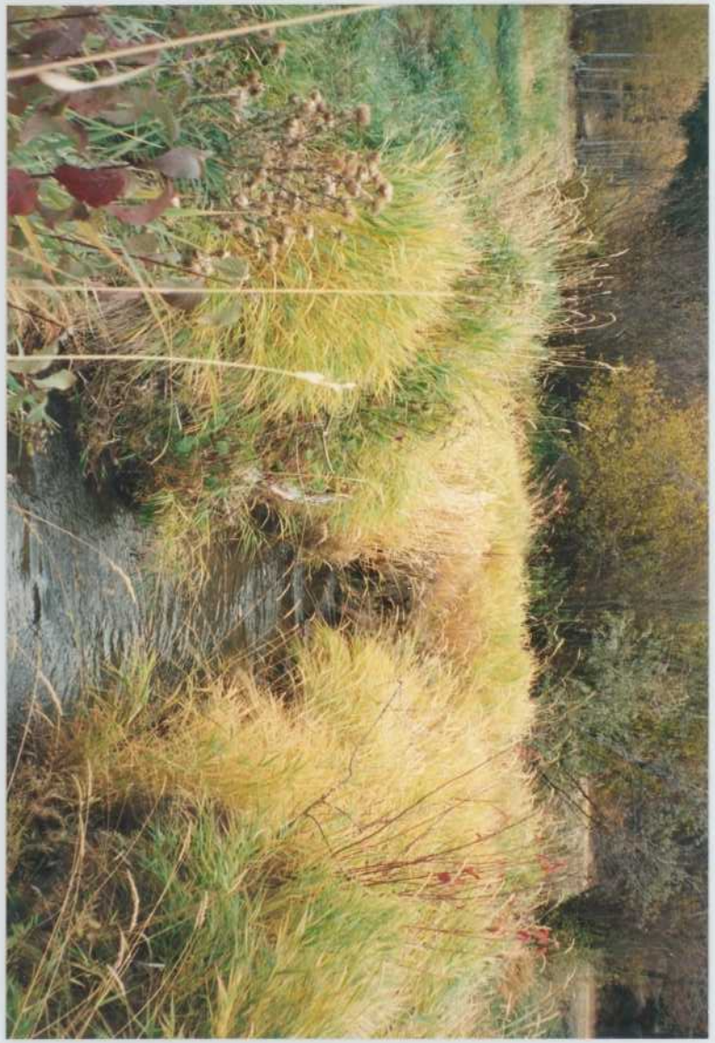
SUB-BASIN: CLINTON CREEK
CREEK: CLINTON CREEK
Description: REACH 6 VIEW DOWNSTREAM REP 6.1
Photo: 16
Roll: 3
Date: 18/10/98



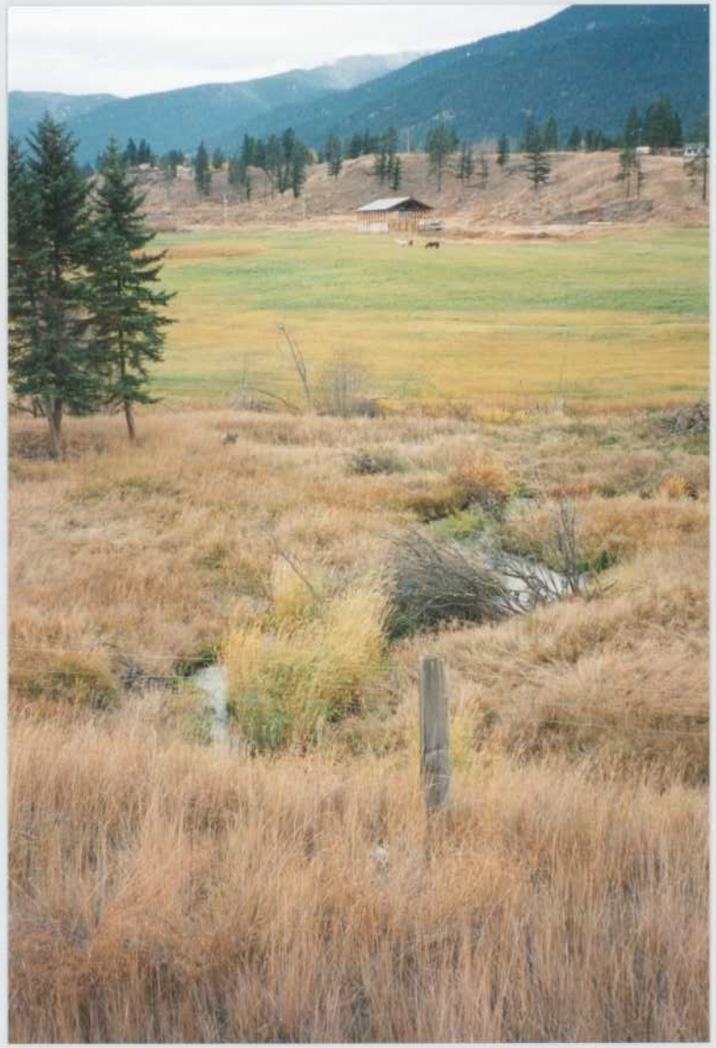
SUB-BASIN: CLINTON CREEK
CREEK: CLINTON CREEK
Description: REACH 8 VIEW UPSTREAM REP 8.1
Photo: 15
Roll: 3
Date: 18/10/98



SUB-BASIN: CLINTON CREEK
CREEK: CUTOFF VALLEY CREEK
Description: VIEW DOWNSTREAM REACH 8 REP CC-COV-8.1
Photo: 20
Roll: 2
Date: 16/10/98



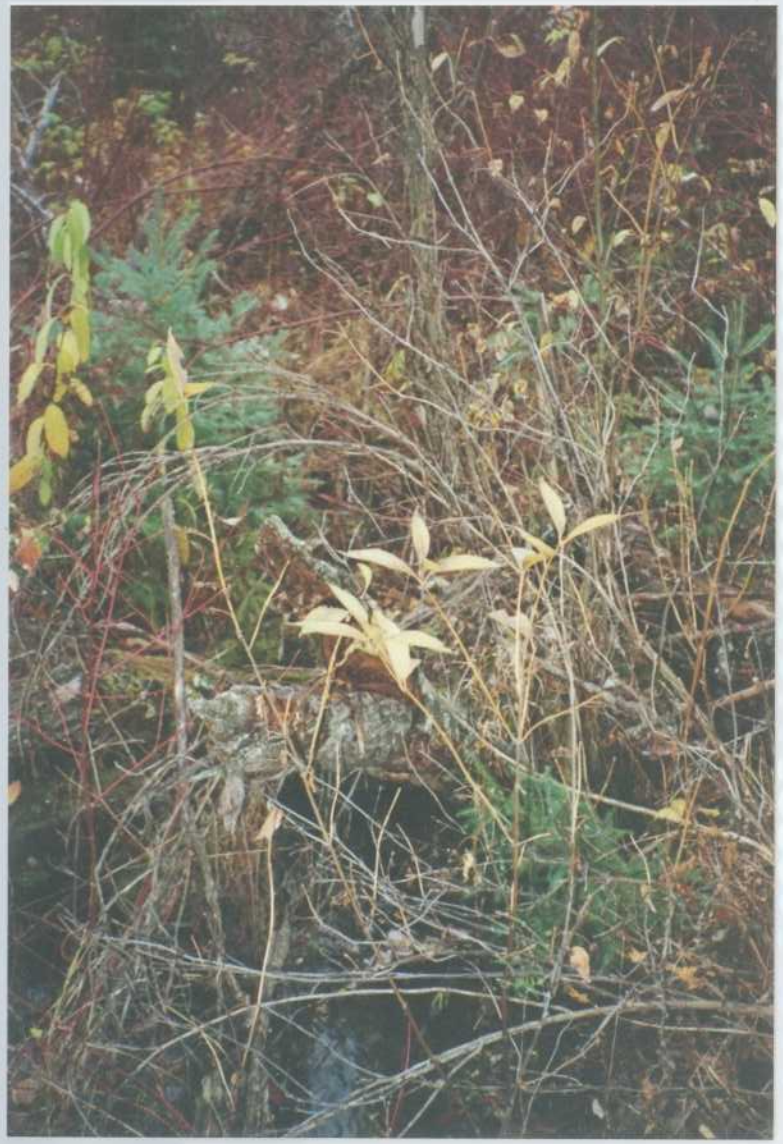
SUB-BASIN: CLINTON CREEK
CREEK: CUTOFF VALLEY CREEK
Description: VIEW UPSTREAM REACH 1 REP CC-COV-1.1
Photo: 19
Roll: 2
Date: 16/10/98



SUB-BASIN: CLINTON CREEK COMMUNITY WATERSHED
CREEK: CLINTON CREEK
Description: SITE 89.1 - REACH 9 VIEW WEST
Photo: 14
Roll: 3
Date: 18/10/98

SUB-BASIN: CLINTON CREEK
CREEK: FIFTY ONE CREEK
Description: VIEW DOWNSTREAM REP 2.1

Photo: 13
Roll: 3
Date: 19/10/98



P19
Roll 2

P20
Roll 2

SUB-BASIN: FIFTYSEVEN CREEK Photo: 7
CREEK: FIFTYSEVEN CREEK Roll: 3
Description: view upstream, Rep S. 1 Date: 19/10/98

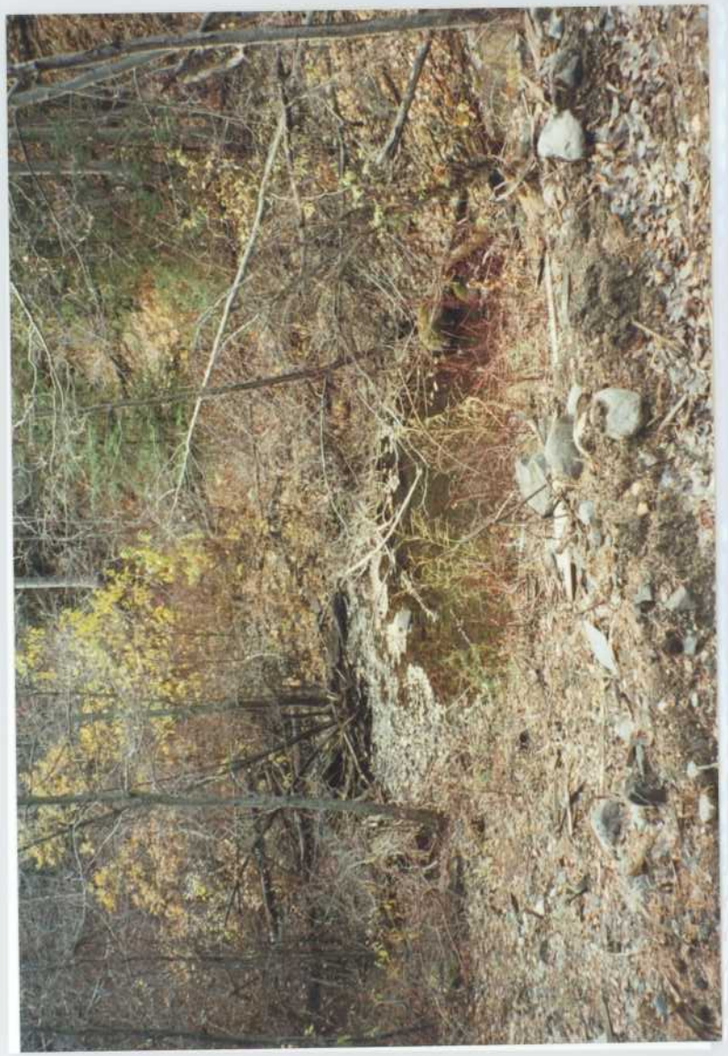
SUB-BASIN: FIFTY SEVEN CREEK Photo: 12
CREEK: FIFTY SEVEN CREEK Roll: 3
Description: REACH 2 VIEW UPSTREAM REP 2.1 Date: 19/10/98

SUB-BASIN: FIFTY SEVEN CREEK Photo: 1
CREEK: FIFTY SEVEN CREEK Roll: 1
Description: HELICOPTER VIEW Date: 15/10/98

SUB-BASIN: FIFTY SEVEN CREEK
CREEK: FIFTY SEVEN CREEK
Description: REACH 5 VIEW EAST, SITE # 55.1
Photo: 11
Roll: 3
Date: 19/10/98

SUB-BASIN: FIFTY SEVEN CREEK
CREEK: FIFTY SEVEN CREEK
Description: VIEW DOWNSTREAM REACH 5 near #55.1
Photo: 10
Roll: 3
Date: 19/10/98

SUB-BASIN: FIFTY SEVEN CREEK
CREEK: FIFTY SEVEN CREEK
Description: SITE #55.1 VIEW DOWNSTREAM
Photo: 9
Roll: 3
Date: 19/10/98



SUB-BASIN: FIFTYSEVEN CREEK Photo: 7
CREEK: FIFTYSEVEN CREEK Roll: 3
Description: view upstream, Rep 5.1 Date: 19/10/98

SUB-BASIN: FIFTY SEVEN CREEK Photo: 12
CREEK: FIFTY SEVEN CREEK Roll: 3
Description: REACH 2 VIEW UPSTREAM REP 2.1 Date: 19/10/98

SUB-BASIN: FIFTY SEVEN CREEK Photo: 1
CREEK: FIFTY SEVEN CREEK Roll: 1
Description: HELICOPTER VIEW Date: 15/10/98

SUB-BASIN: FIFTY SEVEN CREEK
CREEK: FIFTY SEVEN CREEK
REACH 5
Description: VIEW EAST,
SITE # 55.1

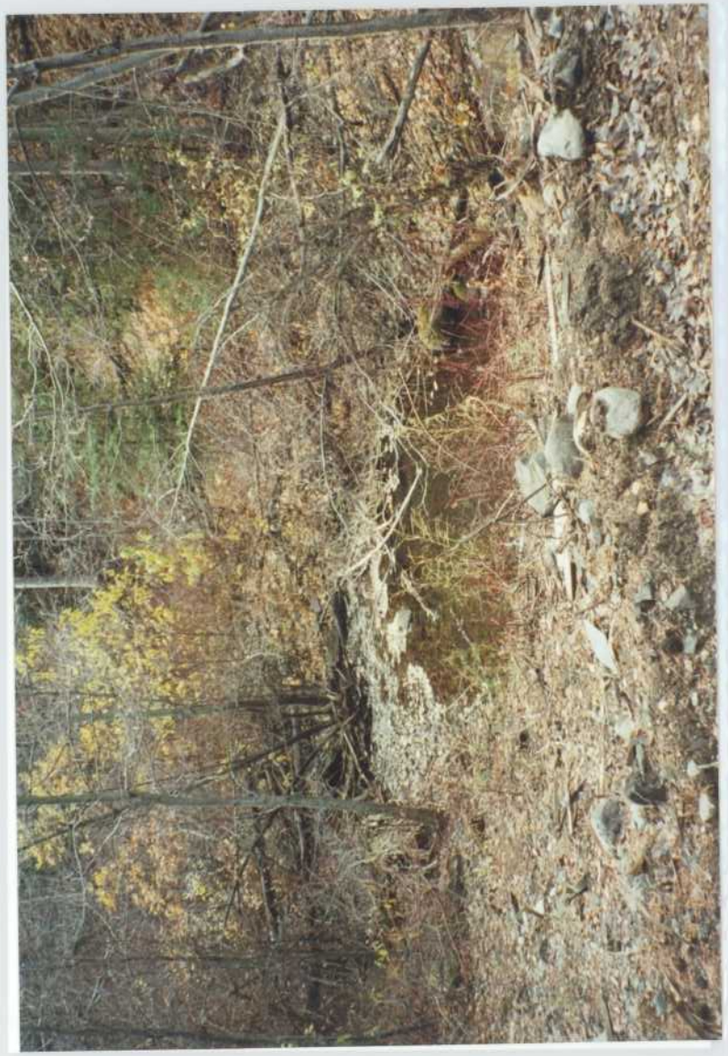
Photo: 11
Roll: 3
Date: 19/10/98

SUB-BASIN: FIFTY SEVEN CREEK
CREEK: FIFTY SEVEN CREEK
Description: VIEW DOWNSTREAM
REACH 5
near #55.1

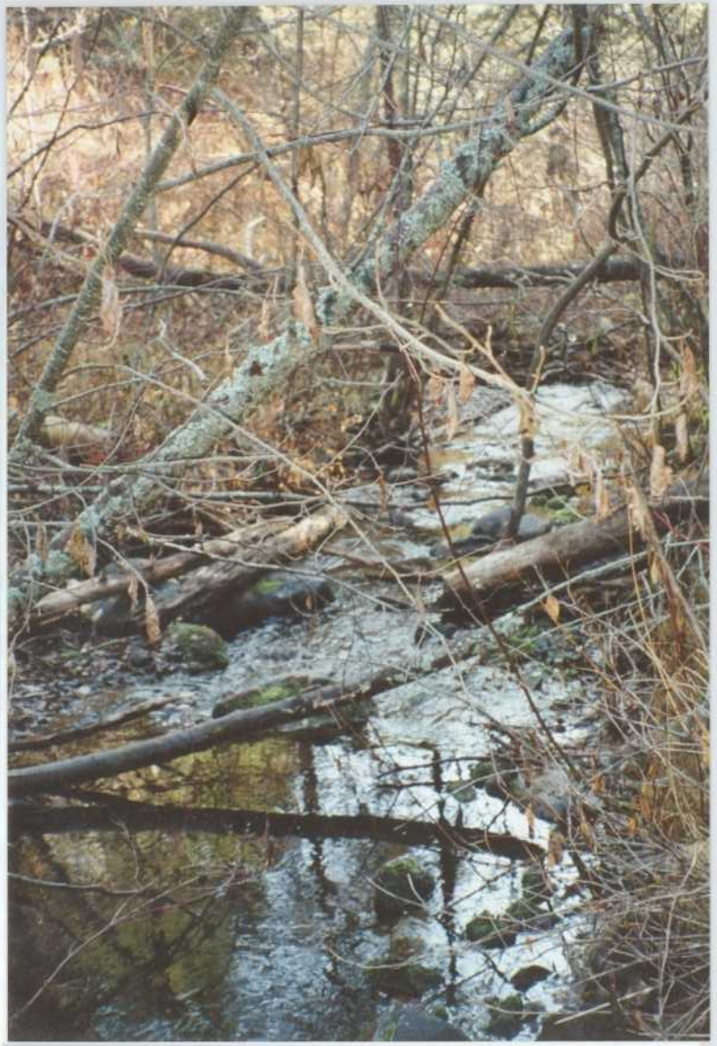
Photo: 10
Roll: 3
Date: 19/10/98

SUB-BASIN: FIFTY SEVEN CREEK
CREEK: FIFTY SEVEN CREEK
Description: SITE #55.1
VIEW DOWNSTREAM

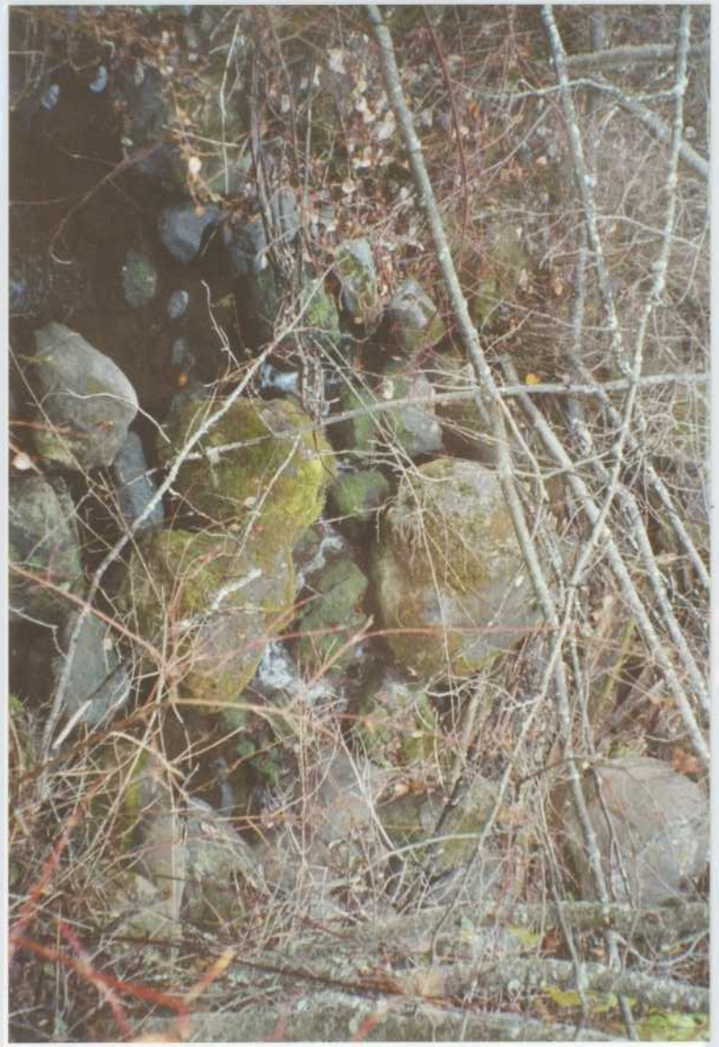
Photo: 9
Roll: 3
Date: 19/10/98



SUB-BASIN: FIFTY SEVEN CREEK
CREEK: FIFTY SEVEN CREEK
Description: VIEW DOWNSTREAM REACH 6 REP 6.1
Photo: 6
Roll: 3
Date: 19/10/98

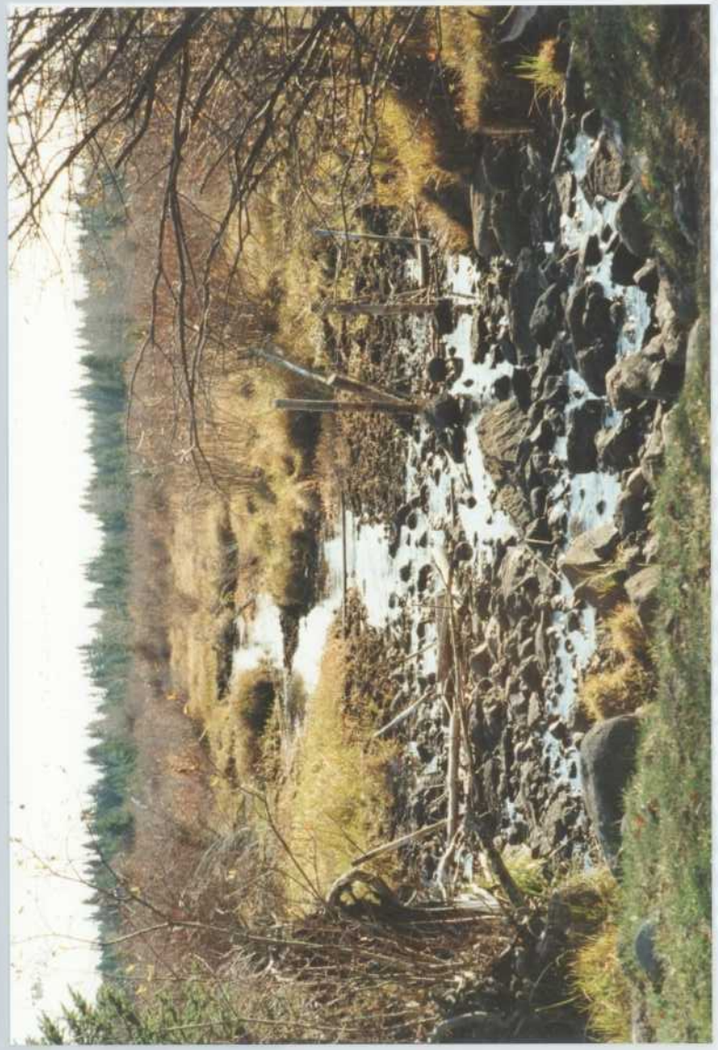


SUB-BASIN: FIFTYSEVEN CREEK
CREEK: FIFTY SEVEN CREEK
Description: VIEW UPSTREAM SITE # BG.1
Photo: 5
Roll: 3
Date: 19/10/98



SUB-BASIN: FIFTY SEVEN CREEK
CREEK: FIFTY SEVEN CREEK
Description: REACH 5 SITE # 55.1 VIEW UPSTREAM
Photo: 8
Roll: 3
Date: 19/10/98

SUB-BASIN: FIFTY SEVEN CREEK Photo: 2
CREEK: FIFTY SEVEN CREEK Roll: 3
Description: REACH 10 DOWNSTREAM Date: 19/10/98



SUB-BASIN: FIFTY SEVEN CREEK Photo: 3
CREEK: FIFTY SEVEN CREEK Roll: 3
Description: VIEW DOWNSTREAM SITE # B 10.1 REACH 10 Date: 19/10/98

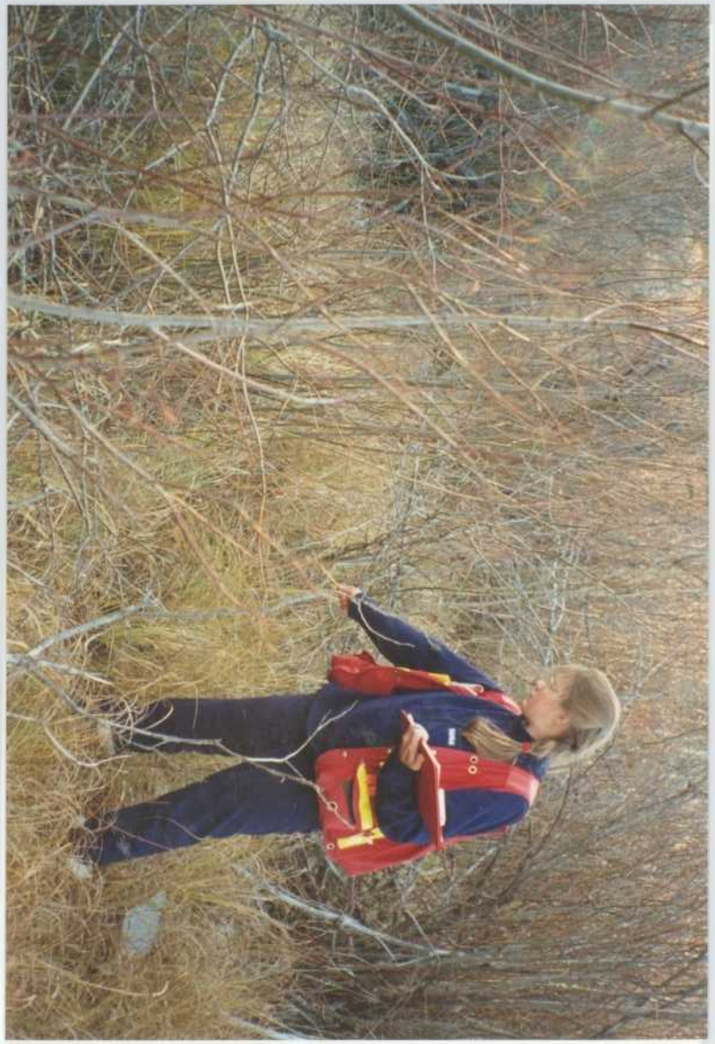
SUB-BASIN: FIFTY SEVEN CREEK Photo: 4
CREEK: FIFTY SEVEN CREEK Roll: 3
Description: VIEW UPSTREAM REACH 10 REP 10.1 Date: 19/10/98

SUB-BASIN: FIFTY SEVEN CREEK
CREEK: FIFTY SEVEN CREEK
Description: SITE B23.1, VIEW SOUTH
Photo: 25
Roll: 6
Date: 23/10/98

SUB-BASIN: FIFTY SEVEN CREEK
CREEK: FIFTY SEVEN CREEK
Description: VIEW DOWNSTREAM (REACH 23)
Photo: 27
Roll: 6
Date: 23/10/98

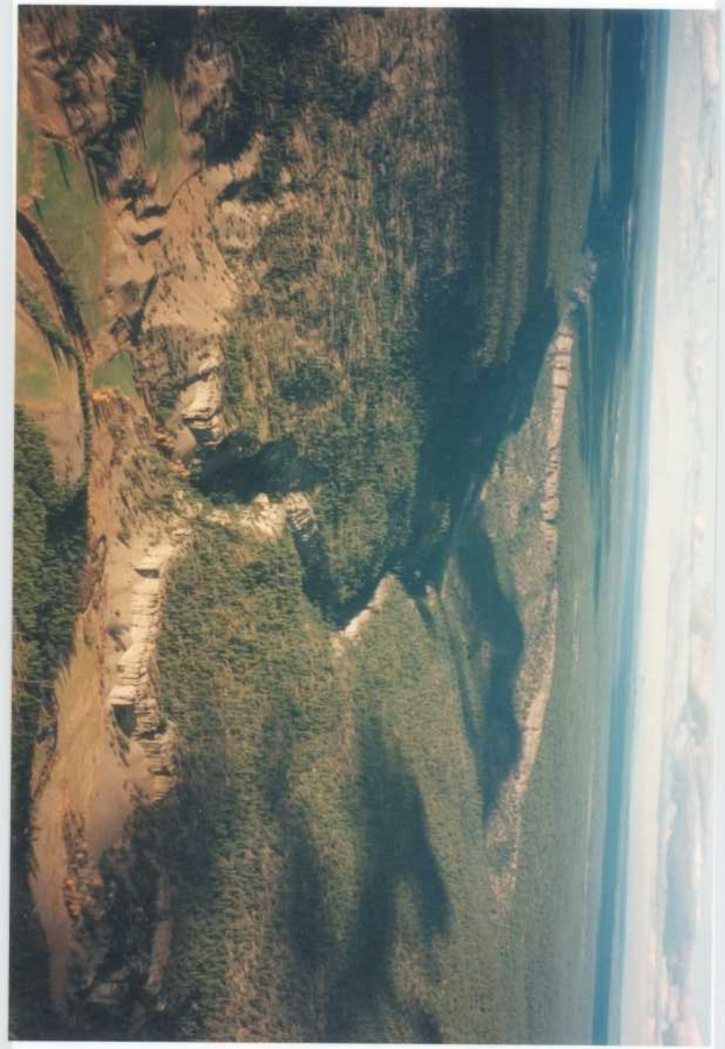
SUB-BASIN: FIFTY SEVEN CREEK
CREEK: FIFTY SEVEN CREEK
Description: REACH 23 REP 23.1, VIEW UPSTREAM
Photo: 26
Roll: 6
Date: 23/10/98

SUB-BASIN: CHASM CREEK
CREEK: SIXTY ONE CREEK
Description: VIEW UPSTREAM AT REP 6.1
Photo: 21
Roll: 4
Date: 19/10/98



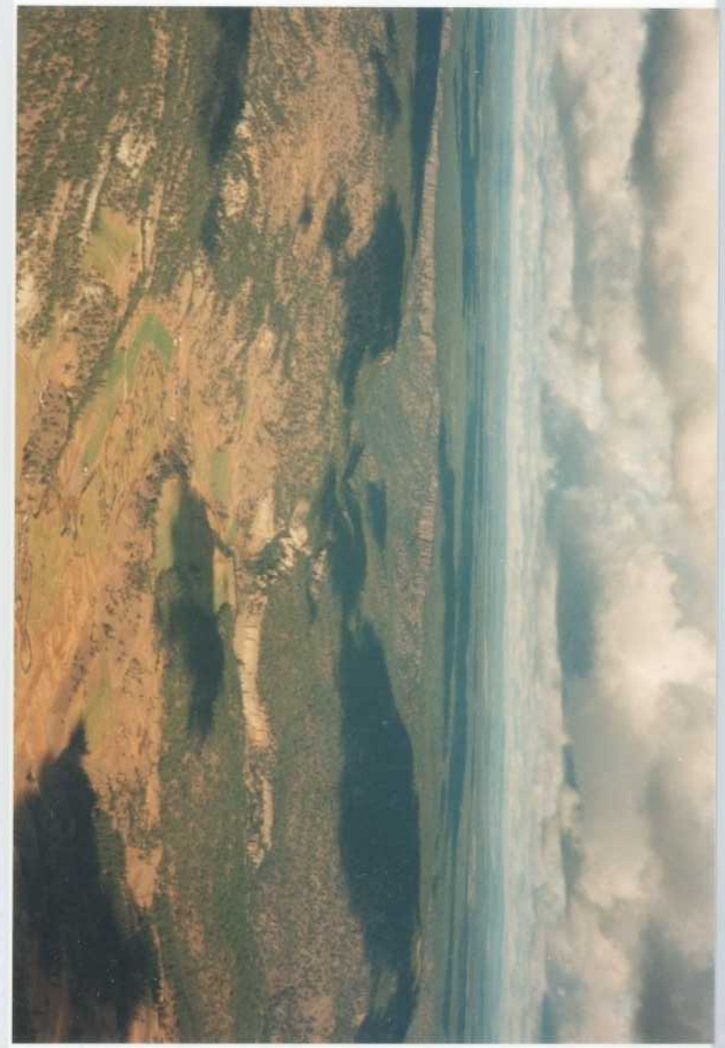
SUB-BASIN: CHASM CREEK
CREEK: CHASM CREEK
Description: HELICOPTER VIEW
Photo: 2
Roll: 1
Date: 15/10/98

P19 Roll #4



SUB-BASIN: CHASM CREEK
CREEK: CHASM CREEK
Description: HELICOPTER VIEW
Photo: 7
Roll: 1
Date: 15/10/98

P20 Roll #4



SUB-BASIN: CHASM CREEK
CREEK: CHASM CREEK
Description: 1 of 2 - PANORAMIC VIEW SOUTH
Photo: 20
Roll: 4
Date: 19/10/98

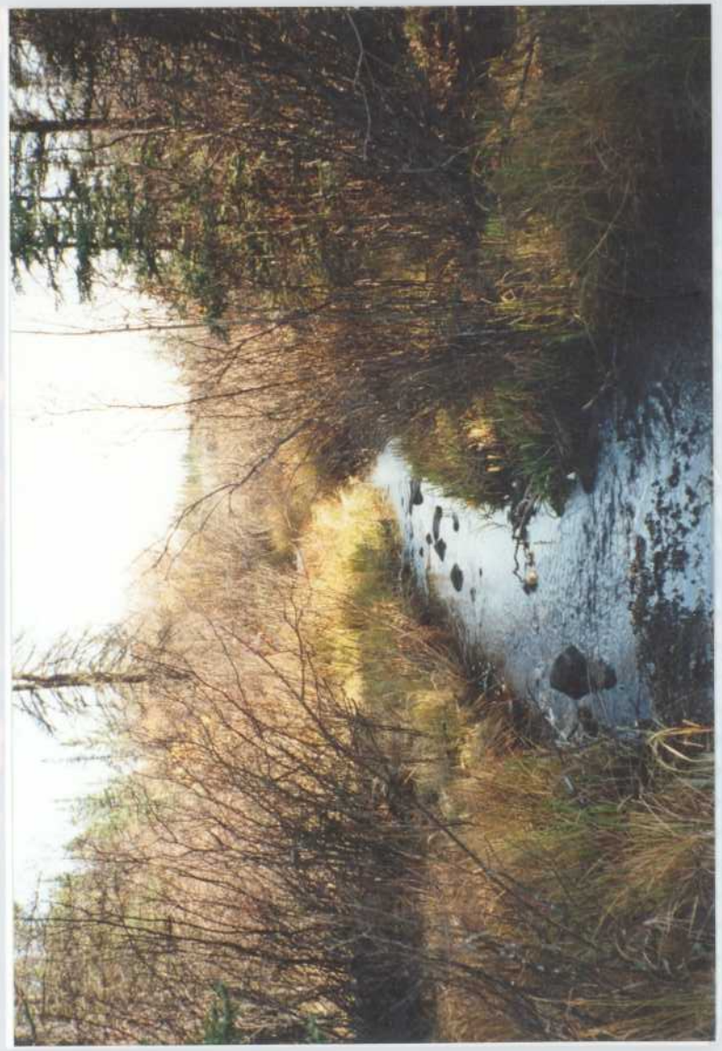
SUB-BASIN: CHASM CREEK
CREEK: CHASM CREEK
Description: 2 of 2 - PANORAMIC VIEW
Photo: 19
Roll: 4
Date: 19/10/98

SUB-BASIN: CHASM CREEK
CREEK: FIFTY NINE CREEK
Description: VIEW DOWNSTREAM NEAR REP 2.1
Photo: 16
Roll: 4
Date: 19/10/98

SUB-BASIN: CHASM CREEK
CREEK: FIFTYNINE CREEK
Description: VIEW NORTH + DOWNSTREAM SITE B 15.1
Photo: 24
Roll: 4
Date: 19/10/98

SUB-BASIN: CHASM CREEK
CREEK: FIFTY NINE CREEK
Description: VIEW UPSTREAM, SITE B 15.1
Photo: 23
Roll: 4
Date: 19/10/98

SUB-BASIN: CHASM CREEK
CREEK: FIFTYNINE CREEK
Description: VIEW DOWNSTREAM, REP17.1 REACH 17
Photo: 25
Roll: 4
Date: 19/10/98



SUB-BASIN: CHASM CREEK
CREEK: FIFTY NINE CREEK
Description: REP 41.1 VIEW UPSTREAM
Photo: 23
Roll: 6
Date: 23/10/98

SUB-BASIN: CHASM CREEK
CREEK: FIFTYNINE CREEK
Description: SITE B41.1, VIEW NORTH
Photo: 22
Roll: 6
Date: 23/10/98

SUB-BASIN: CHASM CREEK
CREEK: FIFTYNINE CREEK
Description: VIEW UPSTREAM OF MAGENESE LAKE OUTLET SITE B18.1
Photo: 1
Roll: 3
Date: 19/10/98

SUB-BASIN: CHASM CREEK
CREEK: FIFTY NINE CREEK
Description: SITE B 41.1, VIEW DOWNSTREAM (REACH 41)
Photo: 21
Roll: 6
Date: 23/10/98

SUB-BASIN: CHASM CREEK
CREEK: FIFTYNINE CREEK
Description: SITE B41.1, VIEW SOUTH (REACH 41)
Photo: 20
Roll: 6
Date: 23/10/98

SUB-BASIN: CHASM CREEK
CREEK: FIFTYNINE CREEK
Description: REP 41.1, VIEW DOWNSTREAM
Photo: 24
Roll: 6
Date: 23/10/98

SUB-BASIN: RAYFIELD RIVER Photo: 5
CREEK: RAYFIELD RIVER Roll: 5
Description: REP 14.1, VIEW DOWNSTREAM Date: 23/10/98

SUB-BASIN: RAYFIELD RIVER Photo: 4
CREEK: RAYFIELD RIVER Roll: 5
Description: VIEW DOWNSTREAM REP 6.1 Date: 23/10/98

SUB-BASIN: RAYFIELD RIVER PLATEAU Photo: 6
CREEK: RAYFIELD RIVER Roll: 1
Description: HELICOPTER VIEW Date: 15/10/98

SUB-BASIN: RAYFIELD RIVER Photo: 6
CREEK: RAYFIELD RIVER Roll: 5
Description: REP 16.1, VIEW UPSTREAM Date: 23/10/98

SUB-BASIN: RAYFIELD RIVER Photo: 7
CREEK: RAYFIELD RIVER Roll: 5
Description: REP 2.2.1, VIEW DOWNSTREAM Date: 23/10/98

SUB-BASIN: RAYFIELD RIVER Photo: 2
CREEK: EIGHTYTHREE CREEK Roll: 5
Description: REP 1.1, VIEW UPSTREAM Date: 23/10/98

SUB-BASIN: EAGAN LAKE
CREEK: MACHETE CREEK
Description: VIEW DOWNSTREAM, REP 5-1.1 (REACH 5-1)
Photo: 1
Roll: 4
Date: 21/10/98

SUB-BASIN: EAGAN LAKE
CREEK: MACHETE CREEK
Description: VIEW UPSTREAM REP 6.1
Photo: 25
Roll: 5
Date: 21/10/98

SUB-BASIN: EAGAN LAKE
CREEK: McDONALD CREEK
Description: REP 1.1, VIEW DOWNSTREAM
Photo: 23
Roll: 5
Date: 22/10/98

SUB-BASIN: EAGAN LAKE Photo: 4
CREEK: MONTANA CREEK Roll: 4
Description: VIEW upstream, Rep 4.1 Date: 21/10/98

SUB-BASIN: EAGAN LAKE Photo: 3
CREEK: MONTANA CREEK Roll: 4
Description: VIEW DOWNSTREAM OF SITE B4.1 (REACH 4) Date: 21/10/98

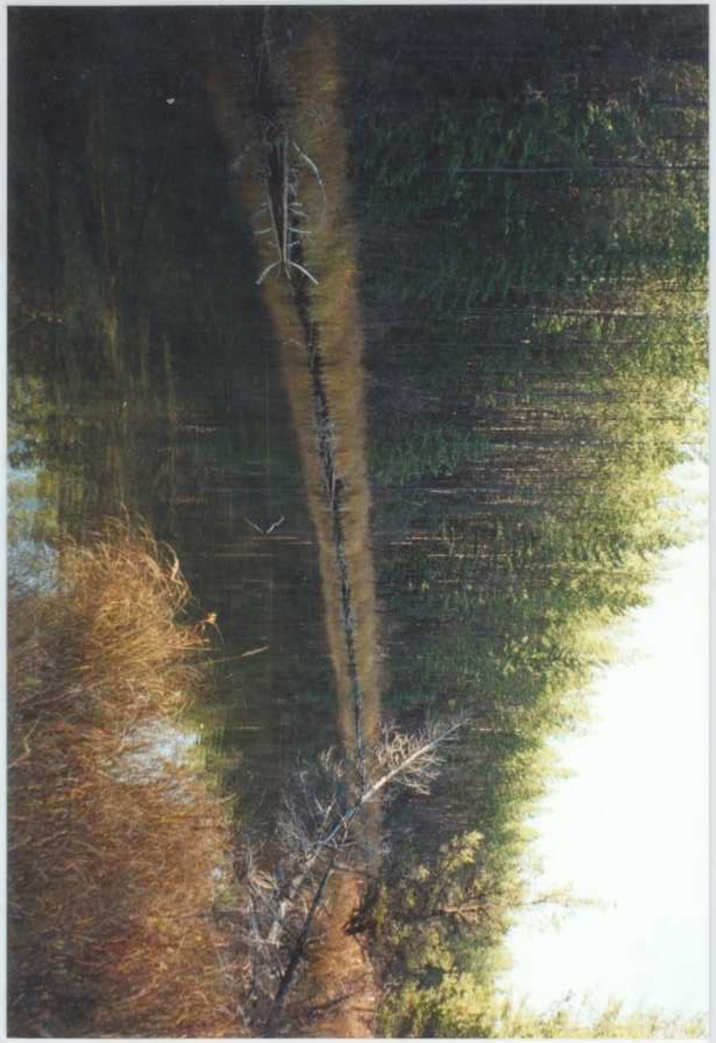
SUB-BASIN: EAGAN LAKE Photo: 2
CREEK: McDONALD CREEK Roll: 4
Description: VIEW UPSTREAM, REP 9.1 (REACH 9) Date: 21/10/98

SUB-BASIN: EAGAN LAKE
CREEK: McDONALD CREEK + MONTANA CREEK
Description: HELICOPTER VIEW LOOKING DOWNSTREAM
Photo: 4
Roll: 1
Date: 15/10/98

SUB-BASIN: EAGAN LAKE
CREEK: McDONALD CREEK
Description: DUCKS UNLIMITED PROJECT
Photo: 5
Roll: 1
Date: 15/10/98

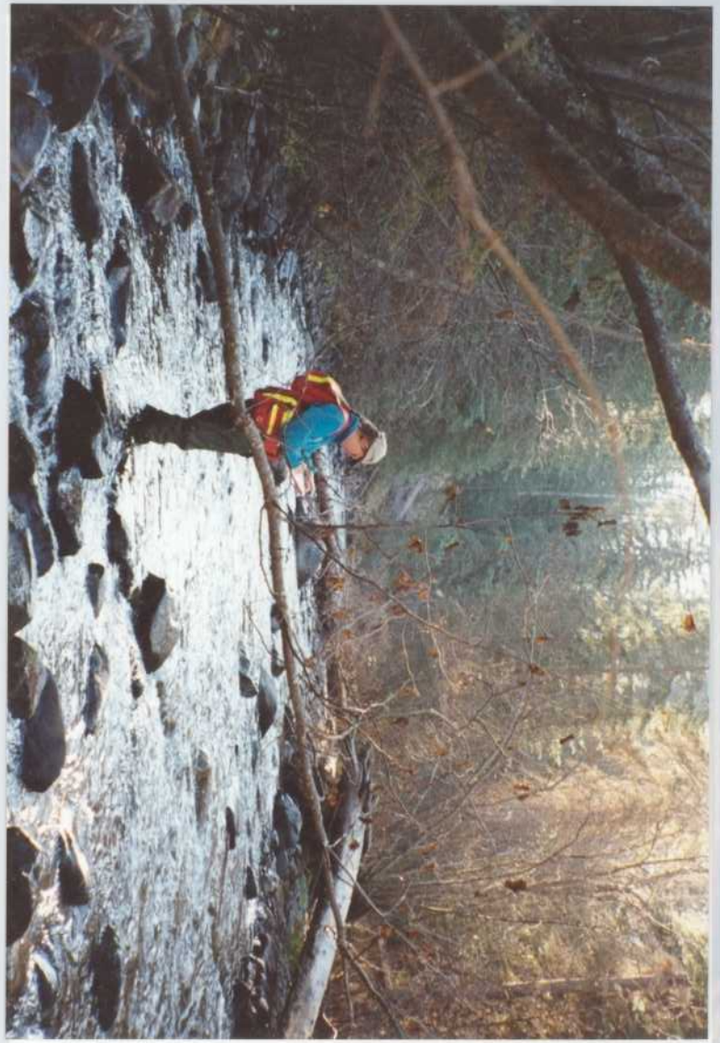
P4
Roll 4

SUB-BASIN: BONAPARTE LAKE
CREEK: BONAPARTE RIVER
Description: VIEW DOWNSTREAM REP 12.1
Photo: 17
Roll: 5
Date: 22/10/98



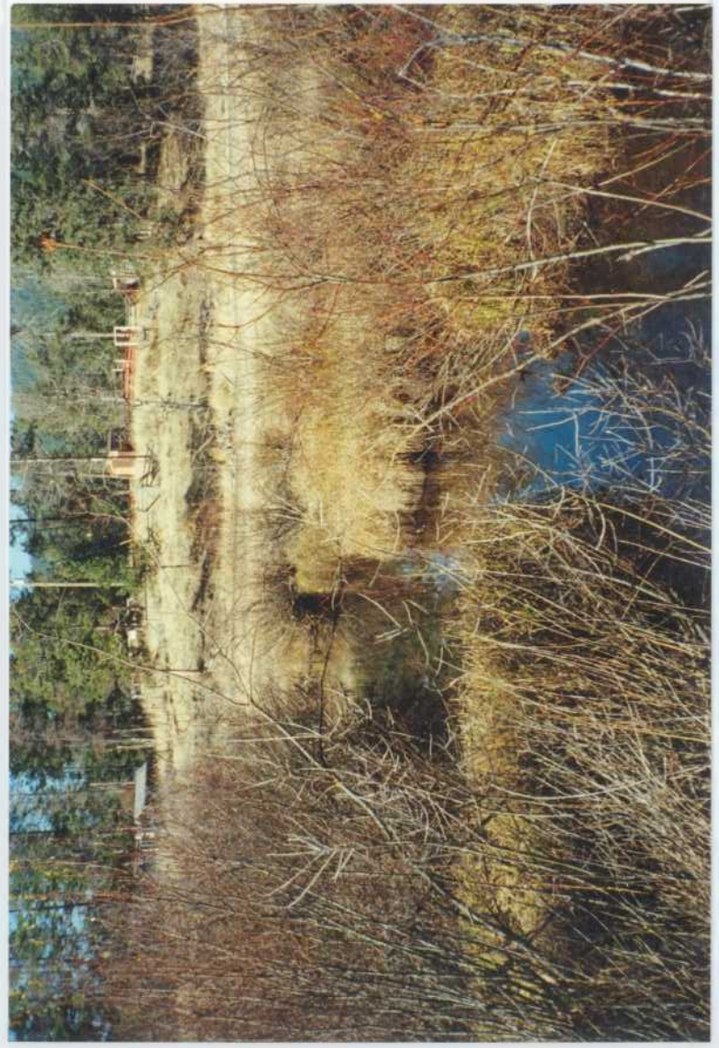
SUB-BASIN: BONAPARTE LAKE
CREEK: BONAPARTE RIVER
Description: VIEW DOWNSTREAM, B12-1.1
Photo: 21
Roll: 5
Date: 22/10/98

SUB-BASIN: BONAPARTE LAKE
CREEK: BONAPARTE RIVER
Description: VIEW UPSTREAM. REP 12-1.1
Photo: 20
Roll: 5
Date: 22/10/98



SUB-BASIN: BONAPARTE LAKE
CREEK: BROWN CREEK
Description: VIEW UPSTREAM REP 1.1
Photo: 18
Roll: 5
Date: 22/10/98

SUB-BASIN: BONAPARTE LAKE
CREEK: BROWN CREEK
Description: REP 2.1 VIEW DOWNSTREAM
Photo: 19
Roll: 5
Date: 22/10/98



SUB-BASIN: BONAPARTE LAKE
CREEK: CAVERHILL CREEK
Description: VIEW DOWNSTREAM REP 13.1
Photo: 24
Roll: 5
Date: 22/10/98

SUB-BASIN: BONAPARTE LAKE
CREEK: CAVERHILL CREEK
Description: BL-CA-513.4, VIEW WEST

Photo: 5
Roll: 1.1
Date: 14/10/98

Photo 7
Roll 1.1

CHASM CREEK SUB-BASIN

SUB-BASIN: CHASM CREEK
CREEK: FIFTY NINE CREEK
Description: VIEW UPSTREAM (REACH 41)
Photo: 19
Roll: 6
Date: 23/10/98

SUB-BASIN: CHASM CREEK
CREEK: CHASM CREEK
Description: VIEW NORTH
Photo: 7
Roll: 1.1
Date: 14/10/98