

Fraser River Action Plan



Survey of Agricultural Practices in the Thompson Basin - 1994

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Survey of Agricultural Practices in the Thompson Basin - 1994

Prepared for
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ABSTRACT

The reduction in loading of nutrients and other contaminants from agricultural runoff can be achieved through the identification of sources and contaminants and the implementation of abatement and prevention measures.

The Survey of Agricultural Practices in the Thompson Basin was initiated to develop an inventory of agricultural practices using four helicopter fly-overs. These fly-overs identified 103 sites of potential environmental impact from agriculture. The sites were prioritized and referred to the appropriate agency for evaluation.

Proximity of feeding areas and cattle access to watercourses were the most common management practices of concern identified in the survey. Site specific abatement and prevention measures are being addressed at each site.

The success of this effort will be ensured by using a multi-agency approach, follow-up inspections and on-going monitoring. Monitoring will include both site visits and water quality assessments. A comprehensive study of agricultural practices to coincide with the development of an educational proactive program will promote a sustainable agricultural industry.

1.0 INTRODUCTION

Identification of sources and contaminants from agricultural runoff is crucial to the reduction in the loading of nutrients and other contaminants to the Thompson River drainage basin. Nutrient and contaminate sources from agricultural operations are closely tied to the waste control measures used by producers. The *Agricultural Waste Control Regulation* (BC Reg. 131/92) and the *Code of Agricultural Practice for Waste Management*, April 1, 1992 ("Code") define acceptable practices for using, storing and managing agricultural waste in an environmentally sound manner. It is the mandate of BC Environment to administer this Regulation and "Code".

In February and March of 1994, staff from the Thompson-Nicola sub region of BC Environment, accompanied by a representative of the Department of Fisheries and Oceans, initiated an inventory of agricultural practices in the Thompson basin. The purpose of the inventory was to identify runoff and contaminant sources and to determine compliance with the "Code". The Survey of Agricultural Practices in the Thompson Basin employed helicopter routes flown in a general north, south, east and west direction (Figure 1). On the flights, sites were selected visually for potential impact and photographed.

The information collected from the four separate helicopter fly-overs (Tables 2.1, 2.2, 2.3, & 2.4) is tabulated. This information is being used to implement site specific abatement and prevention measures for every site identified.

2.0 SURVEY RESULTS

The four helicopter flight paths by area are shown in Figures 1.1 to 1.4 respectively. A representative selection of sites is seen in the attached photos (Appendix I).

The fly-overs identified a total of 103 impact sites. Still photos were taken and on-flight impressions of the impacts were tape recorded. Ownership of the properties, ground locations and addresses were then determined and referrals made to the appropriate agency.

2.1 DETERMINATION OF REFERRALS

The following factors were taken into consideration in determining the method of referral:

- compliance with the "Code".
- commodity.
- did the site already have a Best Agricultural Waste Management Plan?
- was the producer previously aware of concerns on the property?
- was there confusion regarding the actual impact, ground location or property owner?

Of the 103 sites identified in the fly-overs, 50 sites required a follow-up inspection by BC Environment staff. Peer advisors from the BC Cattlemen's Association are handling 26 referrals, AEPC received 1 referral and 26 sites are to be addressed in an educational, proactive manner.

2.2 PRIORITY RATING CRITERIA

A priority rating system showing impact based on criteria factors was formulated (see below). An impact rating was given to each of the 50 agricultural operations determined to require a Ministry of Environment site visit. From the aerial photos, the impacts were prioritized subjectively from 1 (low) to 5 (high).

IMPACT

CRITERIA

5 - HIGH

- direct noncompliance with agricultural "Code"
- impact to receiving environment as indicated visually, or by analysis of water quality sampling results

3 - MODERATE

- possible noncompliance with agricultural "Code"
- possible impact to receiving environment

1 - LOW

- uncertain, low or no impact to receiving environment

2.3 SITE RATING

Impacts rated at 4 and 2 were determined to lie in between the 1, 3, and 5 ratings due to the subjective nature of the priority rating criteria.

<u>IMPACT</u>	<u>NUMBER OF SITES</u>
5	5
4	13
3	13
2	12
1	7

2.4 WATER QUALITY SAMPLING

Water quality sampling of 22 sites was conducted during March 1994 by the Department of Fisheries and Oceans with technical assistance by BC Environment. The purpose of this sampling was to determine the impacts of spring runoff from agricultural operations on stream water quality. The results are summarized in the Thompson Basin Water Quality Analysis (Department of Fisheries and Oceans, 1994). The site reference number found in Tables 2.1 to 2.4 correspond to the upstream (US) and downstream (DS) sample identification found in column 2 in the summary of results of sample analysis, Appendix II.

At present, 2 of the 22 sites have been selected for ongoing water quality sampling. Both are considered to have high impact to the receiving environment. Based on meetings with BC Environment, the producers involved are currently undertaking initiatives to reduce their impacts. Water quality monitoring has received their full support. It is anticipated that these sites will exhibit noticeable trends in the reduction of impacts from agricultural runoff. Water quality monitoring is being considered for other sites in 1995 and monitoring during the spring 1995 spring runoff is anticipated.

3.0 MANAGEMENT PRACTICES

Historically, confined areas for livestock were constructed near or adjacent to a watercourse. Due to a lack of electrical power, these locations provided a site convenient for watering and feeding.

Implementation of the *Code of Agricultural Practice for Waste Management*, April 1, 1992 meant that many producers would be required to demonstrate that pollution was not occurring from such existing, nonconforming confined areas. In many cases it also meant that current access to a watercourse must now be denied.

3.1 ISSUES

As part of the Survey of Agricultural Practices in the Thompson Basin, interviews conducted with producers indicated that considerable progress has been made in education and implementation of the "Code" by various agencies and commodity groups. The Survey also revealed a significant number of producers who are as yet unaware of the "Code", its requirements, and the existence of environmental guidelines for producers. For a variety of reasons there has been a delay between the issuance of the "Code" and its implementation by many producers in the Thompson Basin.

It is estimated that ninety percent of the moderate to high priority sites identified in this study are related to nonconforming confined livestock areas, access to watercourses and feeding less than 30 meters from a watercourse. These sites are in noncompliance of Part 9, Sections 28 & 29 of the "Code".

3.2 SOLUTIONS

In order to bring the identified sites into compliance with the agricultural "Code", on-site inspections are being conducted on an ongoing basis by BC Environment and Ministry of Agriculture, Fisheries and Food (MAFF) staff and advisors from the BC Cattlemen's Association. Producers who are not in compliance with the "Code" must take remedial action to meet "Code" requirements and mitigate environmental impacts. In the case of water quality, remediation measures may include berming and containment of runoff, diversion of surface water away from agricultural operations, or physical relocation of facilities. For nonconforming confined livestock areas, a recommendation is given to contact the regional engineering technologist with the MAFF. If appropriate, this representative will then provide the producer with a report demonstrating to the satisfaction of the regional waste manager, that no pollution of any watercourse or domestic water supply is occurring from the permanent confined livestock area. When a Best Agricultural Waste Management Plan has previously been issued, an inspection by BC Environment staff is undertaken to confirm its implementation.

Follow-up inspections are required to ensure recommendations have been implemented and compliance of the agricultural "Code" has been achieved and is being maintained. In the majority of situations, several follow-up site visits are necessary.

4.0 CONCLUSION

The initial inventory of agricultural sites undertaken to assess the potential for environmental impact in the Thompson-Nicola sub region identified 103 sites. Evaluation of each of the 103 sites identified has been initiated. Peer advisors are in the process of following-up on twenty seven referrals. Twenty six sites are to be addressed in an educational, proactive manner.

Part 9 of the *Code of Agricultural Practice for Waste Management* addresses feeding areas and access to water. Noncompliance with this section of the "Code" was the foremost problem identified in this survey and in turn the primary source for the loading of pollutants to surface and ground water. The Survey of Agricultural Practices for the Thompson Basin demonstrates that ongoing identification and evaluation of sources and contaminants will reduce the loading of nutrients and other contaminants from agricultural runoff to the Thompson River Basin.

4.1 RECOMMENDATIONS

Based on the results of the survey, the following recommendations are offered:

1. A multi-agency approach in the identification, evaluation and remediation of impact sites is preferred and should be used.
2. Ground follow-up by BC Environment staff of the high impact sites identified in this survey should be conducted during the 1995 run-off to evaluate site specific abatement measures.
3. Water quality monitoring at sites designated high impact should be conducted during the 1995 runoff.
4. A *comprehensive* survey of agricultural practices by watershed should be conducted. Continued identification and evaluation of sources and contaminants is required as many sites may have yet to be identified. A questionnaire format should be used for continuity and reproducibility.
5. Development of an educational proactive package is required and should be presented to various associations and commodity groups.

REFERENCES

B.C. Reg.131/92 (O.C. 557/92), Agricultural Waste Control Regulation, Queens Printer for British Columbia, Victoria, 1992

Department of Fisheries and Oceans, Thompson Basin Water Quality Analysis, Elemental Research Inc., 1994

ACKNOWLEDGEMENTS

Funding and support for this project was provided by Environment Canada and the water quality data by the Department of Fisheries and Oceans, through the Fraser River Action Plan.

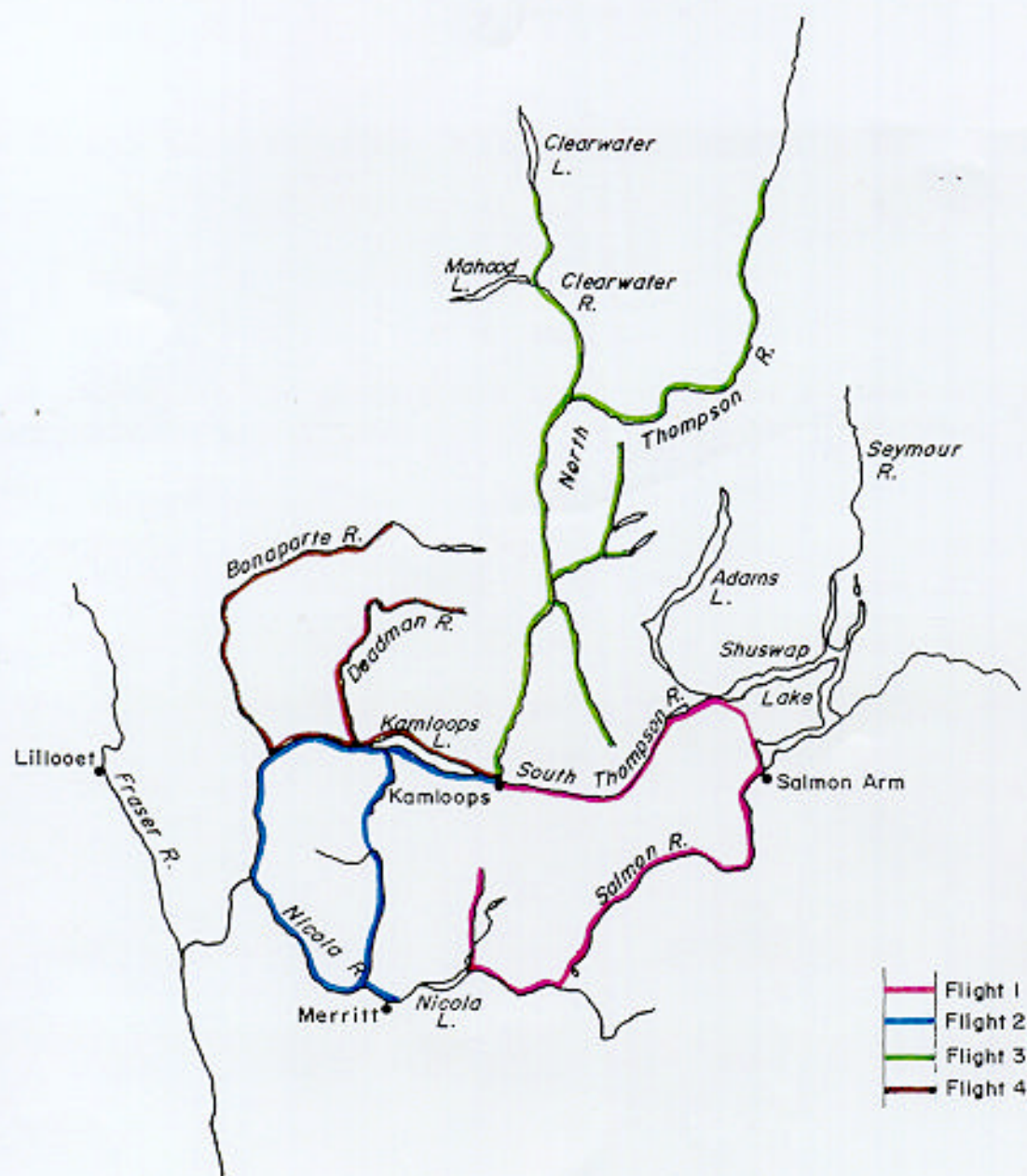


FIGURE 1: Flight Patterns.

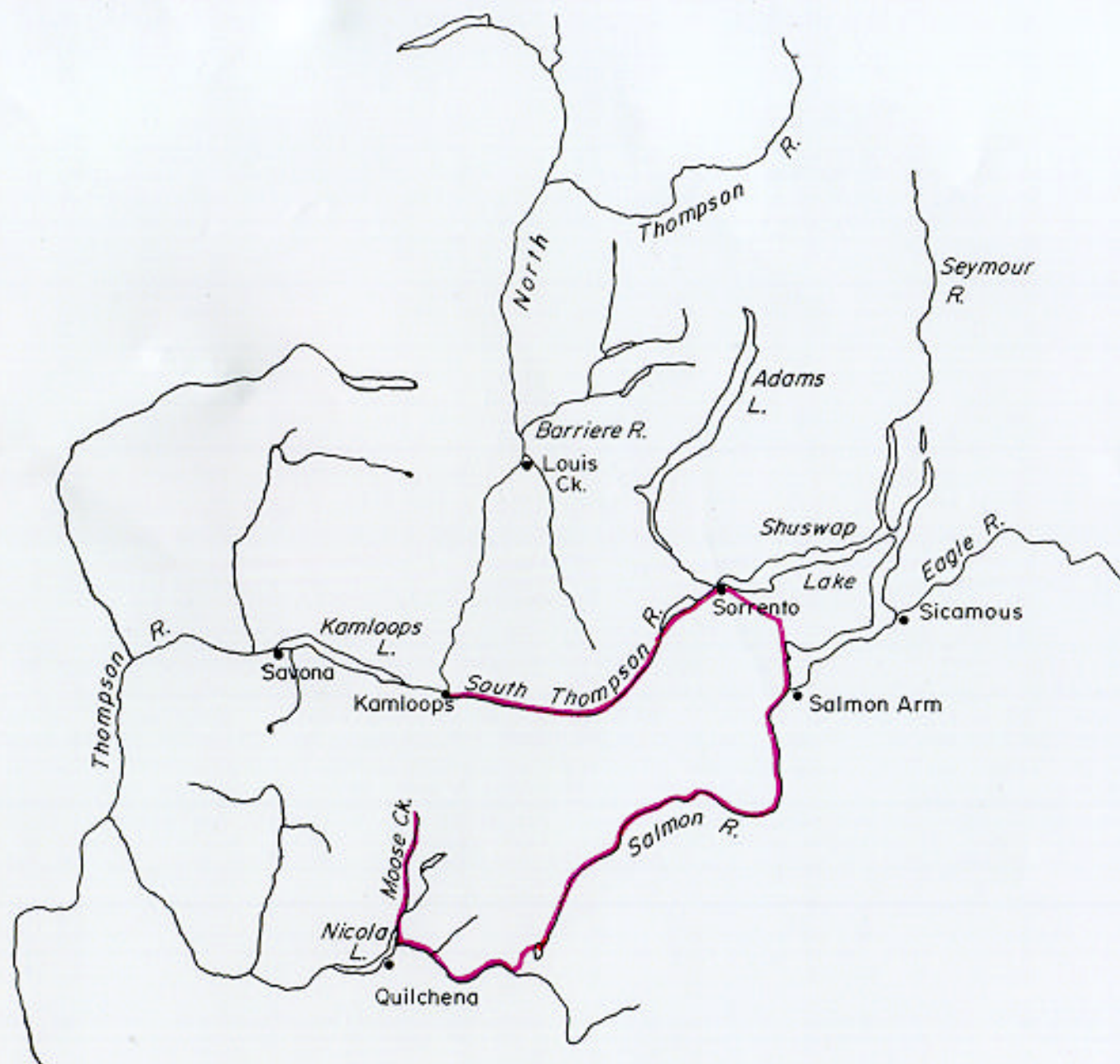


FIGURE 1.1: Flight 1 - Eastern Area Flight Pattern.

Table 2.1

Flight #1 Data for Eastern Area

Fly-over	Site	Commodity	Referral	Monitoring	Follow-up	Closed
Site	Reference #		MOE priority rating (1 - 5, low - high) (IR, Indian Reserve)	(XX, ongoing)	Required	
	<i>Flight #1</i>					
1	1.1	Beef	MOE (1)		X	
2	1.2	Beef	BCCA		X	
3	1.3		Miscount			
4	1.4		Miscount			
5	1.5	Beef	BCCA/MOE		X	
6	1.6	Beef	BCCA/MOE		X	
7	1.7	Beef	MOE (1)		X	
8	1.8	Beef	MOE (1)		X	
9	1.9	Beef	IR		X	
10	1.10	Beef	MOE (3)			X
11	1.11		Miscount			
12	1.12	Dairy/Beef	MOE (4)	X	X	
13	1.13	Beef	BCCA		X	
14	1.14	Dairy	AEPC		X	
15	1.15		Miscount			
16	1.16	Beef	BCCA		X	
17	1.17	Unknown				X
18	1.18	Unknown				X
19	1.19	Beef	MOE (4)		X	
20	1.20	Beef	MOE (4)		X	
21	1.21	Beef	BCCA	X	X	
22	1.22	Dairy				X
23	1.23		Miscount			
24	1.24	Beef	MOE (5)		X	
25	1.25	Beef	Location?			
26	1.26	Beef	Location?			
27	1.27	Beef	BCCA			X
28	1.28	Beef	MOE (3)		X	
29	1.29	Beef	MOE (3)		X	
30	1.30	Beef	MOE (3)		X	
31	1.31	Beef	MOE (3)			X
32	1.32	Beef	MOE (3)		X	
33	1.33	Beef	MOE (3)	X	X	
34	1.34	Beef	MOE (4)		X	
35	1.35	Beef	MOE (4)	X	X	



Site 1.1 Confined feeding area. No visible impact.



Site 1.2 Seasonal feeding area. Run-off into South Thompson River.



Site 1.5 Seasonal feeding area. Access to the South Thompson River.



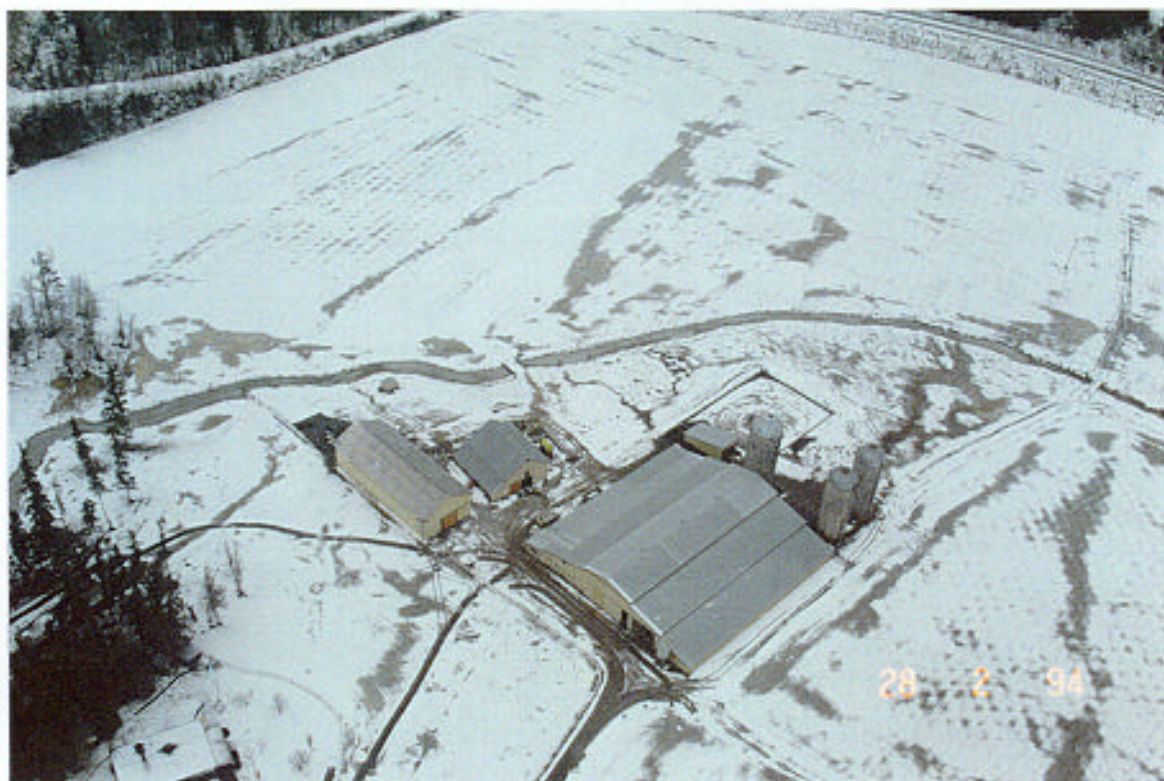
Site 1.6 Seasonal feeding area with access to the South Thompson River.



Site 1.12 Improper application of manure. Run-off escaping property.



Site 1.13 Snow run-off through confined feeding areas into White Creek.



Site 1.14 Run-off from dairy silage into White Creek.



Site 1.16 Seasonal feeding less than 30 meters from the watercourse with unrestricted access.



Site 1.19 Confined feeding area less than 30 meters from watercourse with access.



Site 1.20 Confined feeding area less than 30 meters with access to the Salmon River.



Site 1.21 Seasonal feeding area less than 30 meters from the Salmon River.



Site 1.24 Confined feeding area less than 30 meters from the watercourse.



Site 1.25 Confined feeding area less than 30 meters from watercourse with access.



Site 1.27 Feeding less than 30 meters from the watercourse.



Site 1.29 Confined feeding area less than 30 meters from the watercourse with unrestricted access.



Site 1.29 Run-off from confined feeding area towards the Nicola River.



Site 1.32 Seasonal feeding area with unlimited access and run-off into small watercourse.



Site 1.33 Confined feeding area less than 30 meters and run-off into Napier Lake.



Site 1.34 Confined feeding area less than 30 meters from watercourse with access.

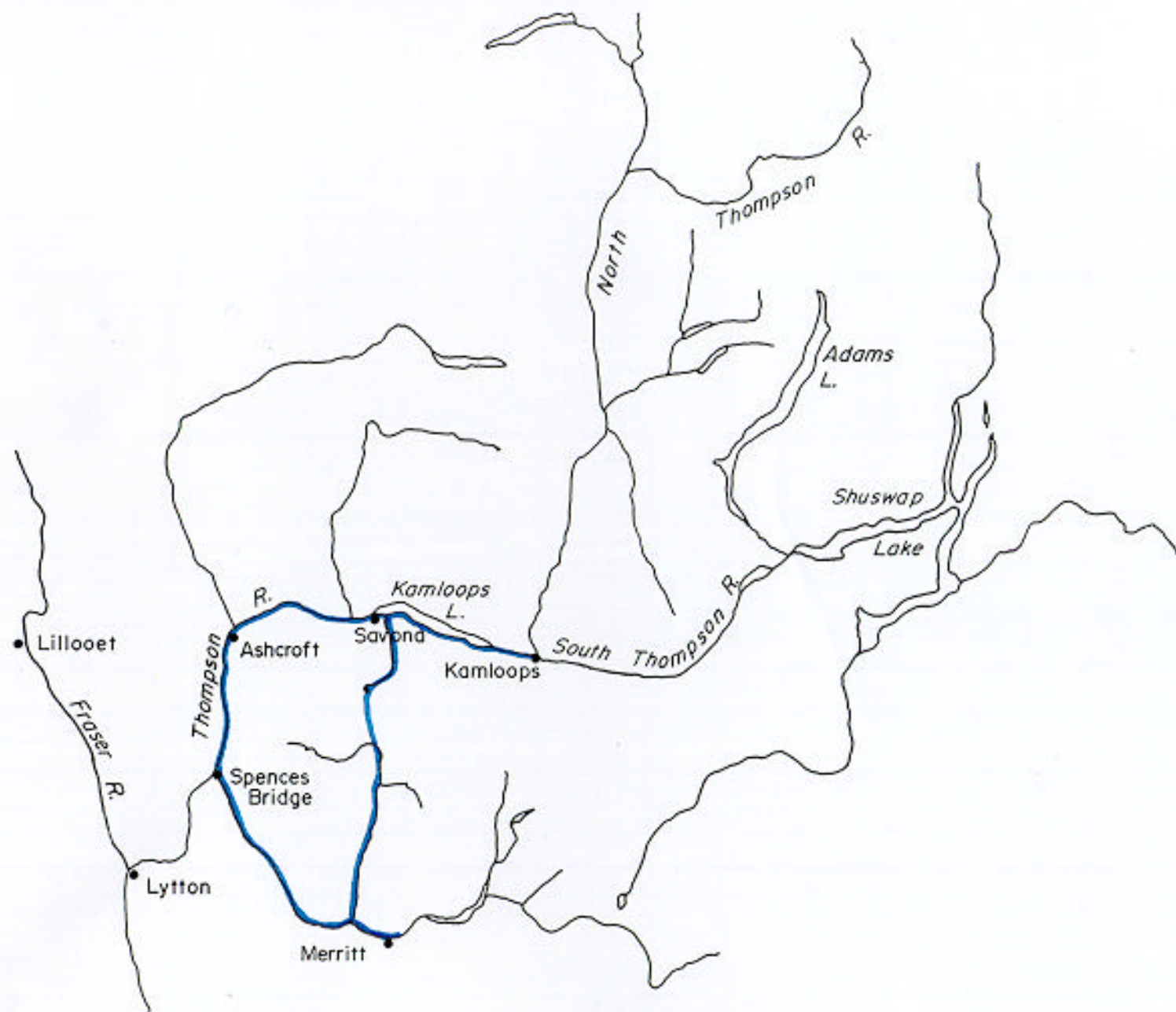


FIGURE 1.2: Flight 2 - Southern Area Flight Pattern.

Table 2.2

Flight #2 Data for Southern Area

Fly-over	Site	Commodity	Referral	Monitoring	Follow-up	Closed
Site	Reference #		MOE priority rating (1 - 5, low - high)	XX , ongoing)	Required	
			(IR , Indian Reserve)			
	<i>Flight #2</i>					
36	2.1	Beef	MOE (2)			X
37	2.2	Beef	MOE (1)		X	
38	2.3	Beef	IR		X	
39	2.4	Beef	BCCA		X	
40	2.5	Beef	IR		X	
41	2.6	Beef	IR		X	
42	2.7	Beef	MOE (1)		X	
43	2.8	Beef	BCCA			X
44	2.9	Beef	MOE (4)		X	
45	2.10	Beef	MOE (4)		X	
46	2.11	Beef	BCCA		X	
47	2.12	Unknown				X
48	2.13	Unknown				X
49	2.14	Unknown				X
50	2.15	Unknown				X
51	2.16	Unknown				X
52	2.17	Beef	BCCA	X	X	
53	2.18	Beef	BCCA	X	X	
54	2.19	Horse	MOE (5)	XX	X	
55	2.20	Beef	MOE (2)		X	
56	2.21	Beef	MOE (4)	X	X	
57	2.22	Beef	MOE (5)	XX	X	
58	2.23	Beef	MOE (5)	XX	X	
59	2.24	Beef	MOE (5)	X	X	



Site 2.3 Confined feeding area less than 30 meters from watercourse.



Site 2.4 Confined feeding area less than 30 meters from the Nicola River with access.



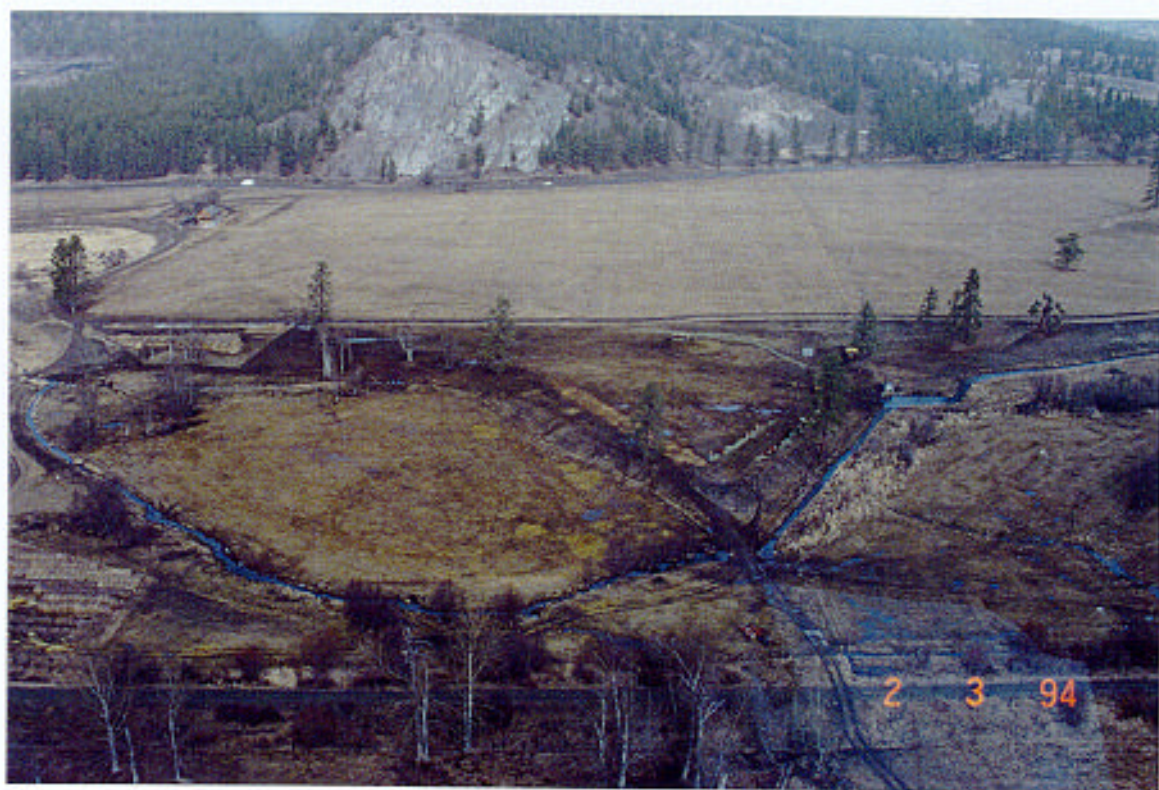
Site 2.5 Confined feeding area less than 30 meters from watercourse.



Site 2.6 Confined feeding area less than 30 meters from the watercourse.



Site 2.8 Feeding less than 30 meters from the Nicola River.



Site 2.10 Feeding less than 30 meters from watercourse.



Site 2.11 Confined feeding area with watercourse running through it.



Site 2.18 Feeding less than 30 meters from watercourse with unrestricted access.



Site 2.19 28 confined feeding areas with access to the watercourse.





Site 2.20 Confined feeding area less than 30 meters from watercourse with access.



Site 2.21 Surface run-off from confined areas entering watercourse.



Sites 2.22 & 2.23 Confined feeding area less than 30 meters from the watercourse.





Site 2.24 Confined feeding areas with watercourse running through.



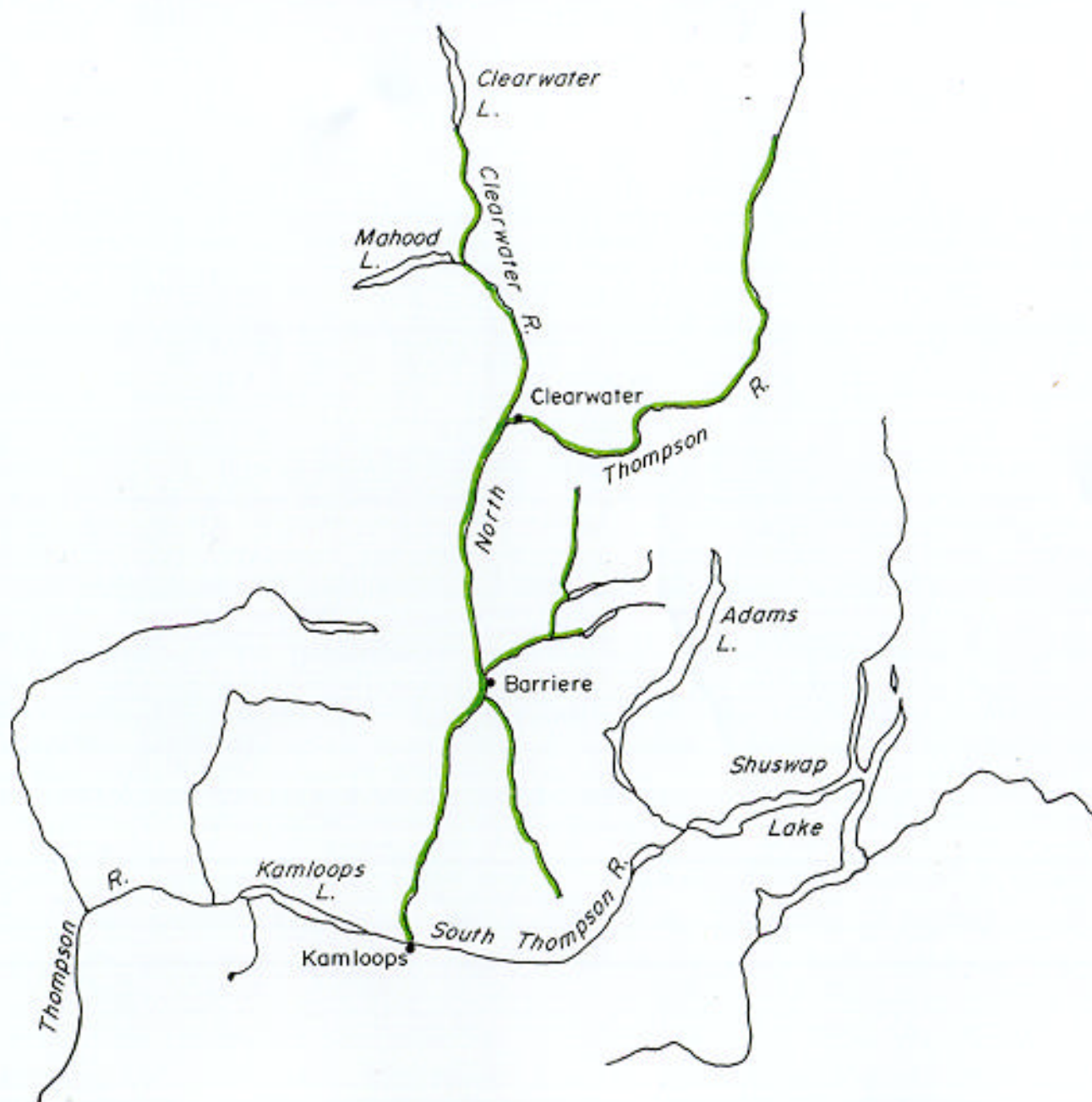


FIGURE 1.3: Flight 3 - Northern Area Flight Pattern.

Table 2.3

Flight #3 Data for Northern Area

Fly-over Site	Site Reference #	Commodity	Referral MOE priority rating (1 - 5, low - high) (IR , Indian Reserve)	Monitoring (XX , ongoing)	Follow-up Required	Closed
Flight #3						
60	3.1	Sheep	IR		X	
61	3.2	Beef	MOE (1)		X	
62	3.3	Beef	BCCA	X	X	
63	3.4	Beef	BCCA		X	
64	3.5	Beef	BCCA	X	X	
65	3.6	Beef	MOE (1)		X	
66	3.7	Beef	MOE (3)		X	
67	3.8	Beef	MOE (4)		X	
68	3.9	Beef	Location?		X	
69	3.10	Unknown	Location?		X	
70	3.11	Beef	MOE (4)		X	
71	3.12	Unknown	MOE (2)	X	X	
72	3.13	Unknown	MOE (3)		X	
73	3.14	Unknown	MOE (1)		X	
74	3.15	Beef	MOE (2)	X	X	
75	3.16	Beef	MOE (3)		X	
76	3.17	Beef	BCCA	X	X	
77	3.18	Beef	BCCA	X	X	
78	3.19	Beef/Sheep	BCCA		X	
79	3.20	Beef	BCCA			X
80	3.21	Beef	BCCA		X	



Site 3.3 Confined feeding area less than 30 meters from the watercourse with unrestricted access.



Site 3.4 Feeding less than 30 meters from the watercourse.



Site 3.5 Watercourse culverted to run through confined feeding area.



Site 3.7 Confined feeding area less than 30 meters from the watercourse.



Site 3.8 Feeding less than 30 meters from the watercourse.



Site 3.16 Confined feeding area less than 30 meters from the watercourse.



Site 3.17 Confined feeding area less than 30 meters from the watercourse with access.



Site 3.18 Confined feeding area with creek running through. Feeding less than 30 meters from the watercourse.



Site 3.19 Confined feeding area less than 30 meters from the watercourse with access.



Site 3.20 Confined feeding area less than 30 meters from the watercourse with access.



Site 3.21 Feeding less than 30 meters from the watercourse.

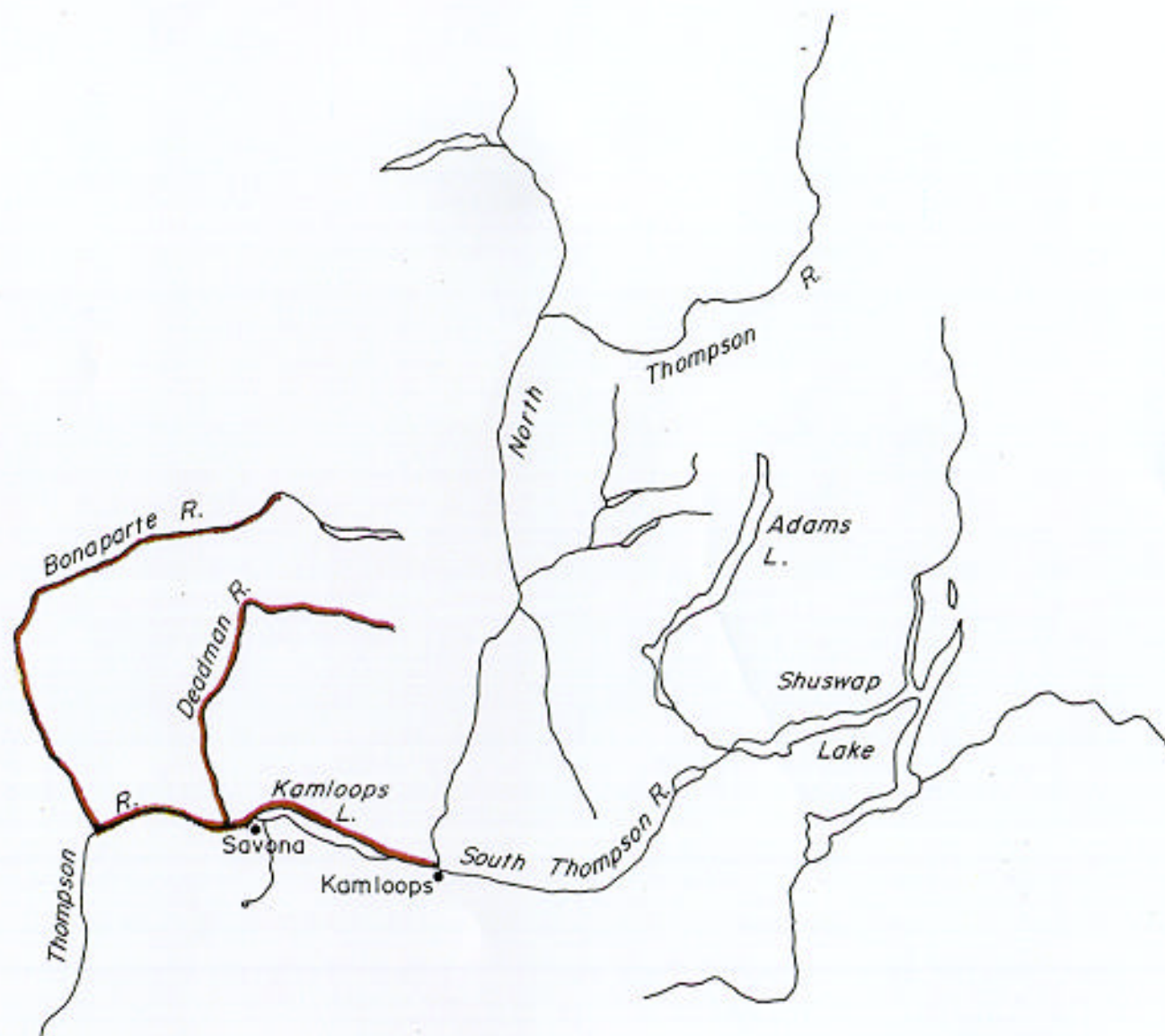


FIGURE 1.4: Flight 4 - Western Area Flight Pattern.

Table 2.4

Flight #4 Data for Western Area

Fly-over Site	Site Reference #	Commodity	Referral MOE priority rating (1 - 5, low - high) (IR , Indian Reserve)	Monitoring (XX , ongoing)	Follow-up Required	Closed
	Flight #4					
81	4.1	Horse	MOE (4)		X	
82	4.2	Nil	MOE (3)			X
83	4.3	Beef	IR		X	
84	4.4	Beef	BCCA		X	
85	4.5	Beef				X
86	4.6	Beef	MOE (2)		X	
87	4.7	Beef	MOE (3)		X	
88	4.8	Beef/Horse	MOE (4)	X	X	
89	4.9	Beef	MOE (2)		X	
90	4.10	Beef	MOE (2)		X	
91	4.11	Beef	MOE (1)		X	
92	4.12	Beef	MOE (3)		X	
93	4.13	Beef	MOE (2)	X	X	
94	4.14	Hobby	MOE (4)			X
95	4.15	Beef	MOE (2)		X	
96	4.16	Beef	MOE (1)		X	
97	4.17	Beef	MOE (1)		X	
98	4.18	Beef	BCCA		X	
99	4.19	Horse	MOE (1)		X	
100	4.20	Beef	MOE (1)		X	
101	4.21	Beef	MOE (2)		X	
102	4.22	Beef	BCCA		X	
103	4.23	Beef	MOE (2)		X	
104	4.24	Beef/Horse	BCCA	X	X	
105	4.25	Beef	BCCA	X	X	
106	4.26	Beef/Horse	MOE (2)	X	X	
107	4.27	Beef/Horse	BCCA	X	X	
108	4.28	Beef	IR		X	



Site 4.1 Confined feeding area with watercourse running through it.



Site 4.2 Confined feeding area less than 30 meters from the Bonaparte River with access.



Site 4.3 Confined feeding area less than 30 meters from the watercourse with access.



Site 4.4 Confined feeding area less than 30 meters from the watercourse with unrestricted access.



Site 4.7 Confined feeding area less than 30 meters from the watercourse with access.



Site 4.8 Confined feeding area with a watercourse running through it.



Site 4.10 Confined feeding area less than 30 meters from the watercourse.



Site 4.12 Confined feeding areas less than 30 meters from the watercourse with access.



Site 4.18 Confined feeding area less than 30 meters from the watercourse with access.



Site 4.22 Confined feeding area with watercourse running directly through it.



Site 4.23 Confined feeding area less than 30 meters from the watercourse with access.



Site 4.24 Confined feeding area with watercourse running directly through it.



Sites 4.25 & 4.26 Confined feeding areas less than 30 meters from the watercourse with access.





Sites 4.27 & 4.28 Confined feeding areas less than 30 meters from Deadman Creek with access.



APPENDIX II

Appendix II. Results of Water Quality Analyses - General Parameters. South Thompson

Sample ID	Parameter Units	Alkalinity mg/L	Hardness mg/L	pH pH units	Specific Conduct. umho/cm	Tot. Organ. Carbon mg/L	Turbidity NTU	Tot. Sus. Solids mg/L	Tot. Diss. Solids mg/L	Faecal Coliform MPN/100mL
US-1 1.12 Mar 1/94		120	120	7.6	320	5.1	12.0	14	180	11
US-2 1.12 Mar 1/94		170	120	7.7	300	6.5	1100.0	1300	150	17
DS 1.12 Mar 1/94		220	140	7.7	380	1.2	1400.0	1600	200	500
RO 1.12 Mar 1/94		530	330	7.8	1800	334.0	750.0	900	970	>16000
US 1.21 Mar 1/94		180	170	7.9	430	3.3	28.0	110	230	170
DS 1.21 Mar 1/94		180	170	8.0	410	4.3	28.0	66	250	170
RO 1.21 Mar 1/94		300	310	7.3	750	17.4	14.0	24	470	500
DS 1.33 Mar 3/94		120	65	7.8	190	19.0	400.0	880	140	130
US 1.35 Mar 3/94		360	380	7.6	900	12.8	13.0	12	690	110
DS 1.35 Mar 3/94		220	210	7.7	580	14.0	26.0	39	400	500
US 2.17 Mar 3/94		190	180	7.5	400	9.1	2.1	1	260	2
DS 2.17 Mar 3/94		180	170	7.7	380	8.9	3.8	6	260	2
US 2.18 Mar 3/94		90	76	6.9	240	10.9	7.6	9	170	220
DS 2.18 Mar 3/94		140	110	7.3	240	12.1	7.8	13	180	280
US 2.19 Mar 3/94		100	62	7.1	190	10.7	8.5	10	140	80
DS 2.19 Mar 3/94		100	89	7.3	200	10.0	7.2	13	150	130
US 2.21 Mar 3/94		200	150	7.7	350	10.1	10.0	28	230	13
DS 2.21 Mar 3/94		170	150	7.8	310	10.1	11.0	27	230	50
US 2.22 Mar 3/94		160	140	7.3	330	8.7	14.0	29	210	170
DS 2.22 Mar 3/94		170	150	7.6	360	9.5	15.0	32	230	2400
US 2.24 Mar 3/94		220	180	7.7	390	10.6	13.0	33	260	1600
DS 2.24 Mar 3/94		230	170	7.4	360	10.6	13.0	26	270	1600
Spius Crk Rd Mar 3/94		90	76	7.0	170	4.4	42.0	110	120	50
Guichon Ck-L. Nicola Mar 3		180	150	7.9	350	8.1	5.4	13	240	11
Nicola R.-US Merritt Mar 3		90	62	7.6	160	5.1	75.0	290	120	30
Sunshine Valley Rd Mar 3		110	68	7.6	170	22.5	30.0	270	93	17

US = Upstream

RO = Runoff

DS = Downstream

SL = Sample lost

Sampling was undertaken upstream and downstream of operations which appeared to have runoff problems. Where possible, runoff samples were collected.

Appendix II Continued. Results of Water Quality Analyses - Nutrients. South Thompson

Parameter Units	Free Ammonia mg/L	Nitrate + Nitrite mg/L	Kjeldahl Nitrogen mg/L	Total Nitrogen mg/L	Tot. Org. Nitrogen mg/L	Ortho Phosph. mg/L	Tot. Diss. Phosph. mg/L	Total Phosph. mg/L
Sample ID								
US-1 1.12 Mar 1/94	0.073	0.539	0.72	1.260	0.65	0.265	0.267	0.280
US-2 1.12 Mar 1/94	0.095	0.536	1.42	1.960	1.33	0.267	0.285	0.528
DS 1.12 Mar 1/94	2.830	0.534	5.95	6.480	3.12	0.397	0.644	0.743
RO 1.12 Mar 1/94	73.500	0.065	129.00	129.00	55.50	9.930	10.200	14.000
US 1.21 Mar 1/94	0.120	0.556	0.82	1.380	0.70	0.174	0.183	0.281
DS 1.21 Mar 1/94	0.142	0.534	1.15	1.680	1.01	0.203	0.209	0.279
Eff 1.21 Mar 1/94	1.630	0.902	5.54	6.440	3.91	0.283	0.309	0.352
DS 1.33 Mar 3/94	0.159	0.189	3.31	3.500	3.15	0.745	0.777	0.787
US 1.35 Mar 3/94	0.580	0.129	1.60	1.730	1.02	0.207	0.215	0.294
DS 1.35 Mar 3/94	0.790	0.198	3.24	3.440	2.45	0.508	0.559	0.675
US 2.17 Mar 3/94	0.148	0.020	0.75	0.770	0.60	0.027	0.029	0.038
DS 2.17 Mar 3/94	0.119	0.051	0.62	0.671	0.50	0.038	0.042	0.050
US 2.18 Mar 3/94	0.030	0.214	1.57	1.780	1.54	0.408	0.420	0.431
DS 2.18 Mar 3/94	0.460	0.206	1.75	1.960	1.29	0.371	0.484	0.508
US 2.19 Mar 3/94	0.180	0.047	0.86	0.907	0.68	0.395	0.406	0.412
DS 2.19 Mar 3/94	0.151	0.147	0.77	0.917	0.62	0.344	0.352	0.366
US 2.21 Mar 3/94	0.017	0.593	0.61	1.200	0.59	0.134	0.135	0.456
DS 2.21 Mar 3/94	0.019	0.556	0.66	1.220	0.64	0.176	0.177	0.200
US 2.22 Mar 3/94	0.120	0.388	0.87	1.260	0.75	0.200	0.202	0.231
DS 2.22 Mar 3/94	0.420	0.370	1.74	2.110	1.32	0.317	0.325	0.354
US 2.24 Mar 3/94	0.960	0.371	2.13	2.500	1.17	0.439	0.448	0.497
DS 2.24 Mar 3/94	0.940	0.351	1.94	2.290	1.00	0.372	0.432	0.493
Spius Crk Rd Mar 3/94	0.021	0.220	0.47	0.690	0.45	0.035	0.039	0.049
Guichon Ck-L. Nicola Mar	0.147	0.250	0.70	0.950	0.55	0.153	0.160	0.183
Nicola R.-US Merritt Mar	0.010	0.211	0.57	0.781	0.56	0.026	0.039	0.068
Sunshine Valley Rd Mar 3	0.014	0.207	0.30	0.507	0.29	0.036	0.040	0.045

Appendix II Continued. Results of Water Quality Analyses - General Parameters. North Thompson

Sample ID	Parameter Units	Alkalinity mg/L	Hardness mg/L	pH pH units	Specific Conduct. umho/cm	Tot. Organ. Carbon mg/L	Turbidity NTU	Tot. Sus. Solids mg/L	Tot. Diss. Solids mg/L	Faecal Coliform MPN/100mL
US 3.12 Mar 22/94		220	240	7.9	490	1.8	1.30	2	310	0
DS 3.12 Mar 22/94		160	250	7.8	480	2.5	2.10	2	320	4
US 3.15 Mar 22/94		200	200	7.6	410	1.8	3.90	12	250	130
DS 3.15 Mar 22/94		220	200	7.8	400	1.9	33.00	98	250	130
US 3.17 Mar 22/94		200	180	8.0	390	1.8	1.80	4	250	8
DS 3.17 Mar 22/94		160	180	7.9	380	1.1	1.50	5	250	4
US 3.18 Mar 22/94		180	200	8.1	380	1.3	2.40	8	250	30
DS 3.18 Mar 22/94		200	180	8.0	400	1.3	2.40	9	260	240
US 3.3 Mar 22/94		160	120	8.0	260	1.4	0.70	<1	180	2
DS 3.3 Mar 22/94		140	120	7.9	260	1.4	0.60	2	180	240
US 3.5 Mar 22/94		240	200	8.1	420	5.9	1.30	5	280	SL
DS 3.5 Mar 22/94		220	200	8.1	410	5.8	1.70	6	280	80
Loon Ck. Mar 24/94		190	150	8.0	340	6.0	2.00	13	220	80
Bonaparte 1 Mar 24/94		170	140	7.9	330	5.2	1.80	8	210	13
US 4.13 Mar 24/94		260	160	8.0	420	5.5	1.60	6	260	4
DS 4.13 Mar 24/94		260	170	8.0	420	5.2	1.40	6	260	4
DS2 4.13 Mar 24/94		250	160	8.0	420	5.3	1.70	7	260	13
US 4.24 Mar 24/94		230	160	8.2	400	3.5	0.31	1	250	0
DS 4.24 Mar 24/94		230	160	8.2	390	3.7	0.33	9	250	27
US 4.25 Mar 24/94		160	130	7.7	290	2.0	1.40	5	180	4
DS 4.25 Mar 24/94		140	120	7.7	250	3.5	0.58	9	150	26
US 4.26 Mar 24/94		150	110	8.1	280	3.1	0.64	4	180	80
DS 4.26 Mar 24/94		160	140	8.1	290	3.2	0.62	6	180	70
US 4.27 Mar 24/94		150	130	8.0	290	3.1	0.64	7	190	70
DS 4.27 Mar 24/94		160	120	8.0	270	3.1	1.60	8	180	6
US 4.8 Mar 24/94		290	340	8.0	650	1.8	7.40	28	460	34
DS 4.8 Mar 24/94		300	320	8.1	660	1.8	6.40	22	460	30

Note that sampling for the North Thompson was done after spring runoff was over.
Data were collected to provide background information on these areas.

Appendix II Continued. Results of Water Quality Analyses - Nutrients. North Thompson

Parameter Units	Free Ammonia mg/L	Nitrate + Nitrite mg/L	Kjeldahl Nitrogen mg/L	Total Nitrogen mg/L	Tot. Org. Nitrogen mg/L	Ortho Phosph. mg/L	Tot. Diss. Phosph. mg/L	Total Phosph. mg/L
Sample ID								
US 3.12 Mar 22/94	<0.005	0.381	0.11	0.491	0.11	0.001	0.005	0.017
DS 3.12 Mar 22/94	<0.005	0.356	0.20	0.556	0.20	0.005	0.005	0.012
US 3.15 Mar 22/94	0.011	0.126	0.17	0.296	0.16	0.004	0.010	0.030
DS 3.15 Mar 22/94	0.013	0.126	0.78	0.906	0.77	0.014	0.014	0.105
US 3.17 Mar 22/94	<0.005	0.288	0.15	0.436	0.15	0.003	0.016	0.016
DS 3.17 Mar 22/94	0.006	0.286	0.14	0.426	0.13	0.011	0.015	0.019
US 3.18 Mar 22/94	<0.005	0.266	0.16	0.426	0.16	0.005	0.014	0.035
DS 3.18 Mar 22/94	0.007	0.284	0.17	0.418	0.16	0.011	0.011	0.026
US 3.3 Mar 22/94	<0.005	0.277	0.09	0.367	0.09	<0.001	0.004	0.004
DS 3.3 Mar 22/94	<0.005	0.222	0.08	0.302	0.08	<0.001	0.002	0.002
US 3.5 Mar 22/94	0.005	0.258	0.29	0.548	0.29	0.061	0.061	0.083
DS 3.5 Mar 22/94	0.007	0.319	0.28	0.599	0.27	0.063	0.074	0.080
Loon Ck. Mar 24/94	<0.005	0.069	0.31	0.379	0.31	0.011	0.023	0.050
Bonaparte 1 Mar 24/94	<0.005	0.071	0.23	0.301	0.23	0.014	0.022	0.032
US 4.13 Mar 24/94	<0.005	0.055	0.29	0.345	0.29	0.062	0.066	0.087
DS 4.13 Mar 24/94	<0.005	0.076	0.29	0.366	0.29	0.061	0.072	0.083
DS2 4.13 Mar 24/94	<0.005	0.076	0.35	0.426	0.35	0.050	0.075	0.086
US 4.24 Mar 24/94	<0.005	0.193	0.15	0.343	0.15	0.003	0.008	0.013
DS 4.24 Mar 24/94	<0.005	0.159	0.19	0.349	0.19	0.020	0.021	0.022
US 4.25 Mar 24/94	<0.005	0.052	0.11	0.162	0.11	0.003	0.006	0.010
DS 4.25 Mar 24/94	<0.005	0.017	0.12	0.137	0.12	0.005	0.006	0.006
US 4.26 Mar 24/94	<0.005	0.020	0.11	0.130	0.11	0.005	0.005	0.005
DS 4.26 Mar 24/94	<0.005	0.016	0.12	0.136	0.12	0.005	0.006	0.007
US 4.27 Mar 24/94	<0.005	0.016	0.13	0.146	0.13	0.005	0.005	0.009
DS 4.27 Mar 24/94	<0.005	0.011	0.10	0.111	0.10	0.006	0.006	0.017
US 4.8 Mar 24/94	<0.005	0.577	0.28	0.857	0.27	0.010	0.014	0.040
DS 4.8 Mar 24/94	<0.005	0.570	0.36	0.930	0.35	0.012	0.015	0.045

Note that sampling on the North Thompson was done after spring runoff was over.