



Province of
British Columbia

Ministry of
Environment
Lands & Parks
Bulkley District
Smithers, B.C.

A RECONNAISSANCE INVENTORY OF JACK MOULD LAKE (ALIAS)

Watershed Code Unknown

FINAL REPORT

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MARCH, 1997

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March 19, 1997

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Mr. Paul Giroux

Dear Mr. Giroux:

The following represents our final report for a Reconnaissance Survey of Jack Mould Lake (alias); Watershed Code unknown.

Yours truly,

KLOHN-CRIPPEN CONSULTANTS LTD.

Richard Couture, R.P. Bio.
Project Manager

EXECUTIVE SUMMARY

Klohn-Crippen Consultants Ltd. was retained by the Fisheries Branch of the Ministry of Environment, Lands and Parks in Smithers, British Columbia, to conduct a reconnaissance survey of Jack Mould Lake (alias - Watershed Code unknown) which lies within the Bulkley River watershed. This lake, which is located 22.5 km west by northwest of Smithers near Kitsequecla Lake, was surveyed on September 16 and 17, 1996. There is trail access to the lake from the nearby 6100 Forestry Service road.

The shores of this lake are dominated by floating peat mats with dense grassy cover suggesting that the lake is successional advanced. Aquatic invertebrates were not observed but flying insects were abundant. Nutrient concentration and water color suggest that the lake is between a hyper-oligotrophic and meso-oligotrophic classification and might also be dystrophic (Wetzel 1983). The maximum depth is 9.2 metres with mean depths and volumes of 4.7 metres and 1,225,944 m³, respectively. There are no shoal areas that would present a hazard to navigation. This lake's water chemistry is suitable for salmonids (Anon. 1996b) and dissolved oxygen remains above 8 mg/L for the top 3 metres, below which it drops to a minimum of 0.5 mg/L. Fish were abundant in this lake with a maximum gillnet catch per unit effort of 73.9 fish/100 m² gillnet area/12-hr period. Cutthroat trout (*Oncorhynchus clarki*) and rainbow trout (*Oncorhynchus mykiss*) dominated the sportfish catch.

This lake is located near a Forest Service road and is accessible by a short (approximately 800 m) trail. The presence of two small boats tied up near the lakeshore at the junction of this trail indicates that the lake already provides some recreational opportunities. The lake also has an abundant population of fish which could provide significant angling opportunities. It is this potential for increase angling pressure that deserves management attention in the future.

This lake has one inlet and one outlet, both of which are bounded by beaver dams. The inlet drains a long marshy area while the outlet passes over a 1.2 metre high beaver dam prior to entering a marshy area with very dense vegetation. Neither the inlet or outlet streams were investigated for habitat or fish populations.

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1. INTRODUCTION

Klohn-Crippen Consultants Ltd. was retained by the Fisheries Branch of the BC Ministry of Environment, Lands and Parks (MELP) in Smithers, British Columbia, to conduct a Reconnaissance Inventory of Jack Mould Lake within the Bulkley River watershed. Although this lake is not gazetted, it is herein referred to as Jack Mould Lake but it is emphasized that this is not the lake's official name and is only an alias. This lake is located approximately 22.5 km west by northwest of Smithers, (Figure 1) just south of the larger Kitsegukula Lake. The field survey was conducted on September 16 and 17, 1996. The purpose of this survey was to provide essential fish and fish habitat information to aid in managing the resources of Jack Mould Lake.

Fish sampling was conducted using a combination of set lines, gillnets, and minnow traps. All surveys (except the bathymetric survey) were conducted according to Anon (1995a) and Warrington (1994). The bathymetric survey of this lake utilized a Trimble Pro-XL GPS-data logger combined with a Meridata depth sounder. After post-mission differential correction with base station data from Terrace, British Columbia, the GPS data provided sub-meter positional accuracy with which to plot individual depth soundings. The perimeter of this lake was also traced using the GPS system providing accuracy in lake perimeter and surface area estimates.

Data collected during this survey were entered into the appropriate data forms (Anon. 1995a) which are presented in Appendix I and stored electronically with the lake file in the MELP office in Smithers. All photographs and corresponding negatives are also stored in this lake file.

Figure 1 Lake Location

2. DATA ON FILE

The following represents a directory of the specific components that can comprise a reconnaissance lake survey and also indicate indicates those components that are completed in this survey.

Location	<u>√</u>	Winter Diss. O₂/Temp. Profiles	<u> </u>
Lake Morphometric Data	<u>√</u>	Netting record	<u>√</u>
Bench Mark	<u>√</u>	Lake Catch Summary	<u>√</u>
Terrain Features	<u>√</u>	Individual Fish Summary	<u>√</u>
Access	<u>√</u>	Fish Preserved	<u> </u>
Resorts and Campsites	<u>√</u>	Stomach Analysis	<u> </u>
Special Restrictions	<u>√</u>	Scale Reading	<u>√</u>
Aquatic Plants	<u>√</u>	Location of Inventory Sites	<u>√</u>
Wildlife Observations	<u>√</u>	Appendices:	<u>√</u>
Summary of Rare or Endangered Species	<u>√</u>	I: Data Forms	<u>√</u>
Wildlife Observations	<u>√</u>	II: Fish Scale Microfiche Prints	<u>√</u>
Lake Drainage	<u>√</u>	III: Water Chemistry Analysis	<u>√</u>
Fisheries Management Comments	<u>√</u>	IV: Photograph Directory	<u>√</u>
History of Previous Surveys	<u>√</u>	Bathymetric Map Reduction	<u> </u>
Water Chemistry Summary	<u>√</u>	Bathymetric Map	<u>√</u>
Dissolved O₂/Temp. Profiles	<u>√</u>		

3. SURVEY AND ANALYTICAL METHODS

3.1 Bathymetry

The bathymetric survey utilized a Trimble Pro-XL GPS datalogger unit coupled to a Meridata digital depth sounder. The datalogger was programmed to record position (NAD 83) once every second and depth and position every three seconds. The GPS antenna was attached to one end of a length of plywood (4' x 1/2' x 36') and the depth sounder transponder was attached to the other end. This plywood was then fixed to the boat's transom with a C-clamp and an angular wedge placed between the transom and plywood such that the plywood, antenna and transponder were oriented perpendicular to the water surface. The antenna was positioned approximately 1 m above the water while the transponder was positioned immediately below the surface.

Due to the inherent error in GPS signals, post-mission processing of the field GPS data was necessary to achieve the sub-meter accuracy required to plot bathymetric data. Post-mission differential correction was achieved with the P-Finder software package (Trimble Corp.) by matching the field GPS data with British Columbia Active Control System (BCACS) 1-second network base station data from the Maps BC continuous GPS recorder base station in Terrace, British Columbia. A base station very close to the actual field GPS unit would provide the most accurate post-mission differential correction but Terrace was close enough (<500 km) to still provide sub-meter accuracy (*pers. comm.*, Amin Kassam, September 9, 1996).

The first task during a bathymetric survey was to trace the perimeter of the study lake. This was done by placing the outboard motor in shallow drive (to avoid collisions with rocks and logs) and driving around the perimeter maintaining a constant distance from shore for the entire perimeter trace. A distance of 4 m was usually sufficient to avoid collisions and still allow a detailed trace of the perimeter. After differential correction and analysis of this perimeter trace data, the perimeter was expanded by 4 m to delineate the actual lake perimeter and not just the boat's path.

Following the perimeter trace, the lake's longest axis (e-line) was traced to illuminate the general depth trends and then transects were made across the shorter axis in directions generally perpendicular to the e-line. These shorter transects were conducted such that the depth sounder was allowed to track depths from shore to opposite shore. Additional depth data were obtained through excursions into small bays along the shoreline. The coordinates for these bathymetric data were then differentially corrected and analyzed along with the corrected perimeter data to generate bathymetric contours via the AdCADD® Civil/Survey software package. The resulting bathymetric map was then examined by Greg Scarborough (Klohn-Crippen, Aquatic Ecologist) and adjustments to

contours were made as necessary. Bathymetric statistics (volume, area at 6m, etc.) were also generated from the AdCADD® Civil/Survey software package.

3.2 Stream Surveys

Stream surveys were conducted according to Resource Inventory Committee (RIC) standards (Anon. 1995a). Wherever possible, 500 m of stream was walked or at least to the first lake or impassable barrier. At a section of the stream possessing representative habitat, an area no less than 9 bank-full widths long was surveyed and the mandatory fields of the DFO/MoELP stream card were completed. Wherever possible, electrofishing of at least 100 m² of fish habitat was also conducted. Photographs of stream habitat and views from the upstream and downstream limits of the survey site were also taken if they provided additional detail of the surrounding habitat.

3.3 Gillnetting

Mesh sizes of monofilament gillnets used in this study, in experimental order, were: 18, 38, 63 and 88 mm. Each gillnet panel measured 17.4 metres long by 2.8 metres deep and the panels were ganged together for a total net size of 69.6 metres by 2.8 metres representing a sample surface area of 194.9 m². Each gillnet gang was set with the 18 mm mesh closest to shore and mesh size increasing towards the lake's center.

The Resource Inventory Committee (RIC) standards for gillnetting require a gillnet with six panels of varying mesh sizes to be ganged together in a specific sequence (i.e., 25 mm, 76 mm, 51 mm, 89 mm, 38 mm and 64 mm). The gillnet dimensions used for this inventory did not exactly match the RIC standard. Gillnet mesh sizes increased in size in the order as stated above. The only difference with the RIC standard net design is the absence of the 54 mm and 76 mm panels. RIC standard nets were not used for this survey because the Lake and Stream Inventory manual was unavailable to Klohn-Crippen when this project was initiated. The gillnets used for this inventory have been used by Klohn-Crippen for many years and have produced consistently defensible catch results. For comparison purposes with RIC standard gillnets and where catch data permit, an analysis of the catch length distribution has been provided to highlight trends in the fish length data and the occurrence of any bias in the catch population. See results for this discussion.

3.4 Minnow Traps

Standard gee type minnow traps were used in this study. Each trap was baited with a small piece of salted roe that was suspended by a length of line near the trap's center. The traps were then attached to the shoreline with a long piece of line and the shoreline area was marked with flagging tape for easy re-location.

3.5 Set Lines

The set line used in this study consisted of a 30 lb monofilament center line with 1 m long 30 lb monofilament leaders extending outwards from this center line at 1 m intervals. Barbed hooks were fixed to the end of each leader and baited with small pieces of salted roe. The set line was weighted with a rock, then lowered to the bottom, after which the line was pulled taught and fixed to a large float at the surface.

3.6 Limnological Investigations

Bathymetric investigations (section 3.1) allowed the field crew to estimate the lake's deepest point. The boat was anchored here and general observations on weather and surface conditions were noted. Lake water temperature and dissolved oxygen were determined at 1 m intervals to the lake bottom and the resulting field data were examined to determine metalimnetic depth. Water samples were collected with a Van Dorn from the surface (0.5m) and from a depth below the metalimnion. Specific conductance and pH were also determined in the field at each of the sample depths.

3.7 Water Chemistry

Water chemistry was determined in the field (e.g., temperature, pH, specific conductance) or by a laboratory from samples collected in the field. Water samples collected in the field were stored in properly labeled, clean plastic sample bottles. A glass jar was used to store water for NH_3 analysis. These samples were then stored in a cooler under ice until the field crew returned to the motel where the samples were placed in a refrigerator at 4°C until shipment to Vancouver the following day. When samples were collected on a Friday or Saturday, they were placed in the freezer (-10°C) until shipment on Monday morning.

3.7.1 Alkalinity

Alkalinity was determined by the titration method outlined in Eaton et al. (1995).

3.7.2 Total Dissolved Solids

TDS was examined according to Eaton et al. (1995).

3.7.3 Ammonia (NH_3)

Ammonia was examined according to the Nessler method (Hach 1994).

3.7.4 Nitrate

Nitrate was examined according to the Nessler method (Hach 1994).

3.7.5 Total Phosphorus

Total phosphorus was examined through the ascorbic acid method using powder pillows. A method equivalent to USEPA method 365.2 and Standard Method 4500-P-E for wastewater (Hach 1994).

3.7.6 Total Dissolved Phosphorus

Total Dissolved Phosphorus was examined by the ascorbic acid method using powder pillows after first filtering the sample through a Whatman GFC filter (Hach 1994).

3.7.7 Chlorophyll *a*

The measurement of chlorophyll *a* followed APHA standard methods, 18th Edition, pages 10-17. Plankton are extracted from the sample through a Whatman GFC filter prior to pigment extraction in aqueous acetone. The optical density of the extract is then determined by spectrophotometry.

3.7.8 Total Kjeldhal Nitrogen

The measurement of total nitrogen followed APHA standard methods, 18th Edition, pages 94-94 as well as the EPA-600/4-79-020 method 351. The method basically involved conversion of all the solution's nitrogenous compounds into ammonia through acidification then distillation. Measurement is then made with an ammonia selective electrode.

3.7.9 Filterable Residue

Filterable residue was estimated by passing 25 ml of solution through a washed and weighed 0.45 µm filter. This filter was then washed again, dried and weighed with the amount of filterable residue equal to the difference in weight of the filter and the volume of sample used.

3.7.10 Metals (Sodium, Magnesium and Calcium)

Solution is filtered through a 0.45 µm filter then acidified with Nitric acid, prior to analysis with ICPMS.

3.8 Biogeoclimatic zone

Biogeoclimatic zone was determined with PC-Arc Info by matching lake outflow coordinates with those on a digital map of British Columbia's biogeoclimatic zones.

3.9 Native Land Claim Area

The Native land claim area applicable to each lake was determined from up to date land claim area maps provided by the British Columbia Treaty Commission and, for the Gitskan Nation claim, from a map provided directly from the Gitskan First Nation.

3.10 Mining Claims

Existing mining claims were searched under the Mineral and Placer, No Staking Reserve document, BC Reg. 91/91, March 24, 1993: Amended by BC Reg. 119/95 on March 29, 1995.

4. LAKE GEOGRAPHICAL AND MANAGEMENT INFORMATION

The following represents a summary of the geographical and management information for Jack Mould Lake.

Dates of Survey:	September 16-17, 1996
Watershed Name:	Bulkley River Watershed
Watershed Code:	Unknown
Watershed Area:	6,620,000 m ²
Location:	22.5 km west by north west of Smithers near Kitsequecla Lake
Elevation:	664.5 ± 0.4 m (determined from corrected GPS data)
Latitude/Longitude:	lat. - 54° 55' 21" long. - 127° 34' 27"
U.T.M.:	9. 591389. 6087110
N.T.S. Map No.:	93L.13
TRIM Map No.:	92L.093
Biogeoclimatic Zone:	Interior Cedar Hemlock, Moist Cold
Forest Region:	Prince Rupert
Forest District:	Bulkley
Wildlife Management Unit:	6-9
LRMP Planning Unit:	9: Kitsequecla
LRMP Management Zone:	Integrated Resource Management Zone <ul style="list-style-type: none">• A full range of resource values is recognized in this zone (see Anon. 1996c)• Equal consideration must be given to all values
LRMP Ecosystem Network:	Core Ecosystem and Landscape Corridor
Native Land Claim Area:	Wet'suwet'en Nation, Gitskan Nation
Drainage:	Unnamed outlet > Kitsequecla River

4.1 Lake Morphometric Data

An investigation of Jack Mould Lake's morphometry was conducted on September 17, 1996. Thirteen transects were made across the short axes of this lake and a single transect was made along the lake's long axis (the e-line) as well as a shorter transect that explored the center of the large bay on the north side of this lake. Because the survey technique used here involved a GPS unit with post-mission differential correction allowing sub-meter locational accuracy, the RIC standard method for bathymetric surveys was not followed in this study. This resulted in the lack of paper traces, transect calculation sheets and percentage distance along transect determinations (see Anon. 1996a) so these required items are not summarized here. However, the survey transects for assessing bathymetry have been recorded and are shown in Figure 2. The bathymetric map generated from these surveys is shown in Figure 3.

The following bathymetric summary statistics for Jack Mould Lake are:

Total surface area:	281,700 m ²
Surface area at 6 m contour:	98,600 m ²
Lake drainage area:	6,620,000 m ²
Shoreline perimeter:	3,910 m
Island perimeter:	0
Number of islands:	0
Maximum depth:	9.2 m
Mean depth:	4.7 m
Secchi depth:	2.3 m
Sounding device:	Meridata depth sounder

Figure 2 Bathymetric Survey Transects

Figure 3 Bathymetric Contours

Volume (by stratum, and total):

Stratum	Volume (m³)
0-2 m	518,690
2-4 m	385,005
4-6 m	246,572
6-8 m	153,025
8 m - max. depth	32,652
Total:	1,225,944

4.2 Benchmark

The benchmark in Jack Mould Lake was provided by an iron spike driven 96.9 cm above the water surface into a crevice on the face of a large nearshore boulder on the north side of the lake. The spike itself is marked by fluorescent orange flagging tape, as is the surrounding area, for easy re-location. Unfortunately, technical problems precluded a photographic record of the benchmark. The coordinates for the benchmark, as recorded in the field by GPS, are 9.592234.6087140 (NAD83). The location of the benchmark in relation to the lake is indicated in Figure 4. Figure 5 is an air photo enlargement that shows the location of the benchmark.

The high water mark for this lake was determined at the benchmark site as the boundary between lichen and bare rock. This boundary was not definite resulting in an approximation of the normal high water mark as 9 cm above the water surface at the time of this survey, suggesting that the lake was near its highest level.

4.3 Terrain Features

4.3.1 Immediate Shoreline

The immediate shoreline of Jack Mould Lake is composed of a mix of forested, rocky shoal areas, shallow mixed grassy shoals and swamp where dense floating vegetation delineates an artificial shoreline. In these latter areas, the actual shoreline was approximated based on the junction of this dense floating vegetation and the nearest line of standing trees. Wherever rocky shore existed, the substrate consisted of small pieces of broken rock or small pebbles, presenting potential salmonid spawning habitat. All remaining shoreline areas, however, did not present salmonid spawning habitat. The areas with dense floating vegetation presented abundant cover for juveniles because often the floating vegetation was suspended more than one meter from the lake bottom and extended out from the lake shore up to 50 metres.

Figure 4 Location of Lake Inventory Sites

Figure 5 Air Photo Enlargement Showing Location of Benchmark

4.3.2 Surrounding Terrain

Jack Mould Lake is situated in a broad flat valley extending west from the Bulkley River. A large mountain ridge known as "The Nipples" bounds the northern side of this valley (Plate 1) while a much less prominent hilly area bounds the southern side. Logging has occurred south of the lake and gravel roads head east and west along both the north and south sides of the lake. The road to the north passes quite close to the lake and a trail extends from this road to two small boats beached on the north shore near the lake's benchmark (Section 4.2). Overall, the surrounding terrain has very low relief, causing poor drainage and is probably the reason for many small marshes in the surrounding area.

4.4 Stream Surveys

Streams were not directly surveyed for this lake due to difficulty of access but general observations on channel condition were noted.

Stream #1 (Watershed Code unknown)

Stream #1 is the single inlet of Jack Mould Lake. This stream originates from a large marshy area east of the lake (Plate 2). A large beaver dam at the confluence of the stream and lake has resulted in the flooding of a large forested area upstream of the lake creating abundant treefall and dead, standing trees. The helicopter overflight revealed that this marsh extends for approximately 1 km. The channel through this flooded area was inconspicuous and seemed to pass from one clear water area to another through dense vegetation. Foot access to this swampy area was impossible because of the dense vegetation and also because of dangerous deep water pools hidden among the tree fall. An initial investigation of the area immediately upstream of the beaver dam indicated that the substrate was of a soft soil like texture and, thus, does not present suitable salmonid spawning habitat.

Stream #2 (Watershed Code unknown)

Stream #2 is the outlet of the lake which flows over a large beaver dam (Plates 3 and 4) prior to entering an extensive flooded area, suggesting that a second beaver dam may be located downstream of the first. This stream was not surveyed because the channel was inconspicuous and dense vegetation prevented access.

Plate 1 View of Jack Mould Lake from helicopter

Plate 2 View of inlet taken from lake

Plate 3 View of outlet and the beaver dam at this outlet

Plate 4 View of 1.2 m beaver dam in outlet

5. LAKE ACCESS AND AREA DEVELOPMENT

5.1 Access and Directions

A road passes very close to this lake at its north end but a short portage (approximately 300 m) via Jack Mould Lake Trail (Ministry of Forests 1994) is necessary to reach the lake. Due to this portage, access to the lake for this study was via helicopter chartered from Smithers. To reduce the amount of ferrying time required to transport all the necessary gear to the lake, a nearest-point pickup was arranged with the helicopter pilot. This pick-up point was located approximately 26.4 km west of Smithers and was reached by driving south of Smithers to the Hudson Bay Mountain road, following the Hudson Bay Mountain Road for approximately 10 km, then turning left onto the 7000 Forest Service Road (FSR) heading west for 16.3 km prior to turning right onto 7600 FSR. The pick up point was located approximately 7.7 km northwest along the FSR 7600 road in the loading area of a clear-cut. Jack Mould Lake was a 12 minute helicopter flight north from the clear cut, but was a 22 minute flight west by northwest from Smithers via the Toboggan Creek valley located north of Hudson Bay Mountain. The total distance by helicopter was approximately 34 km.

5.2 Road Type and Conditions

The road south from Smithers is paved but Hudson Bay Mountain road and all FSRs are gravel surface only. All roads are passable by two-wheel drive vehicle.

5.3 Restrictions

The FSRs are frequented by logging trucks so as a safety precaution, appropriate VHF radio channels should be monitored for logging truck activity. There are no known aircraft restrictions applicable to Jack Mould Lake.

5.4 Resorts and Campsites

Campsites are not located immediately near Jack Mould Lake although a small campground is located approximately 1.3 km to the northeast, on the shores of Taltzen Lake. This Ministry of Forests recreation site is suitable for camping and trailers or small RVs.

5.5 Mining Claims

There are no placer or mineral claims in close proximity to Jack Mould Lake.

5.6 Timber Harvests

Timber has been harvested to the south of the lake (Plate 1) but Forest Cover Maps do not indicate any further harvests in the immediate area around the lake.

5.7 Waste Permits

None is known (Remington and Lough 1995).

5.8 Water Licences

None is known (Remington and Lough 1995).

5.9 Pollution Sources

Sources of pollution were not observed in or around Jack Mould Lake.

5.10 Special Regulations and Restrictions

A bait ban exists from September 1 to December 31 for the Kitseguecla River to which Jack Mould Lake is tributary (BC Environment, 1996).

6. FLORA AND FAUNA

6.1 Aquatic Plants

Aquatic plants were identified in the field to genus with the aid of Prescott (1969) and Warrington (1994) and their distribution throughout the lake was recorded. Figure 6 summarizes the distribution of three aquatic plant species identified in the lake; lilly (*Nuphar sp.*), moss (*Sphagnum sp.*) and *Potamogeton sp.* Many areas of the shoreline were also covered with extensive shoals possessing mixed, unidentified sedges. These are also shown in Figure 6.

6.2 Aquatic Invertebrates

Aquatic invertebrates were not observed in this lake although flying insects were very abundant.

6.3 Wildlife Observations

Wildlife observed on or around Jack Mould Lake included moose, beaver, squirrels and a single osprey.

6.4 Summary of Rare and Endangered Species

Rare or endangered species were not encountered in or around this lake.

Figure 6 Distribution of Aquatic Plant Communities

7. FISH POPULATION SAMPLING

7.1 Total Fish Catch Summary

A total of 92 specimens were captured from Jack Mould Lake. This catch was composed of 24 cutthroat trout (*Oncorhynchus clarki*), 2 rainbow trout (*Oncorhynchus mykiss*) and 65 redbreasted shiners (*Richardsonius balteatus*). Twelve of the cutthroat trout and both of the rainbow trout were sampled for age determination by scale removal. Appendix I contains the fish collection data form while Appendix II contains photocopies of the fish scale microfiche prints and Table 1 summarizes the catch by species and site. The rainbow trout were also sampled for DNA analysis by removing and preserving in ethanol most of the adipose fin. The net, trap and set line gear sampled the lake for a total of 25 hours.

Table 1 Total Fish Catch Summary

Species	Site No.	Total No.	No. Sampled	No. Preserved	Size range (mm)	Weight range (g)
CT	1	24	12	0	160-296	40-242
CT	2	1	0	0	234	106
RB	1	2	2	0	200-242	74-126
RSC	1	4	0	0	75-91	4-8
RSC	2	3	0	0	74-77	4
RSC	3	44	0	0	60-128	2-16
RSC	4	3	0	0	84-106	10-12
RSC	5	5	0	0	56-87	2-4
RSC	6	5	0	0	93-107	6-12
RSC	7	2	0	0	87-100	8-12

Notes:

- See Figure 4 for location of sample sites.
- RB-rainbow trout (*Oncorhynchus mykiss*), CT-cutthroat trout (*Oncorhynchus clarki*), RSC-redbreasted shiner (*Richardsonius balteatus*).

7.2 Netting Record

Gillnets were set in Jack Mould Lake in the afternoon of September 16, 1996. Observations of the nets later that evening suggested that more than 30 fish had been captured so, in order to avoid killing too many fish, the nets and minnow traps were pulled. The gillnetting record for Jack Mould Lake is shown in Table 2.

Table 2 Gillnet Summary

Site No.	Net Type	Date Set	Time Set	Depths (m)		Date Lifted	Time Lifted	Soak Time (hr)	CPUE
				Shallow	Deep				
1	floating	96/9/16	16:20	0-2	0-2	96/9/16	18:50	2:30	73.9
2	sinking	96/9/16	16:20	0-2	0-5	96/9/16	19:35	3:15	9.5

Notes:

- See Figure 4 for location of gillnet sample sites.
- CPUE - #fish/100 m²/12 hr period.

7.3 Minnow Trap Record

The minnow trap sampling record for Jack Mould Lake is shown in Table 3.

Table 3 Minnow Trap Summary

Site No.	Gee Trap No.	Date Set	Time Set	Depth (m)	Substrate	Date Lifted	Time Lifted	Soak Time	CPUE
3	1	96/9/16	15:46	0.5	LWD, silt	96/9/16	19:10	3:24	150.9
4	2	96/9/16	15:50	0.5	LWD, silt	96/9/16	19:15	3:25	10.3
5	3	96/9/16	15:55	0.5	silt	96/9/16	19:18	3:23	17.1
6	4	96/9/16	16:00	0.5	rock	96/9/16	19:20	3:20	17.1
7	5	96/9/16	16:05	0.5	LWD, rock	96/9/16	19:22	3:17	25.8

Notes:

- See Figure 4 for location of minnow trap sample sites.
- LWD - large woody debris.
- CPUE - #fish/trap/12 hr period.

7.4 Set Line Record

The set line sampling record for Jack Mould Lake is shown in Table 4.

Table 4 Set Line Summary

Site No.	Date Set	Time Set	Depth (m)	Substrate	Date Lifted	Time Lifted	Soak Time	CPUE
8	96/9/16	16:40	0-7	Unknown	96/9/16	19:45	3:05	0.0

Notes:

- See Figure 4 for location of set line sample site.
- Roe was still intact on all hooks upon retrieval of set line.
- CPUE - #fish/set line/12 hr period.

7.5 Fish Data

Individual fish sampling data are shown in Table 5 while Table 6 provides fork lengths, weights and fish sex identification for the remaining fish captured in Jack Mould Lake.

Table 5 Individual Fish Data

Site No.	Species Code	Length FL (mm)	Weight (g)	Scale Sample No.	DNA Vial Sample No.	Sex	Age (yr)	Samples
1	CT	238	134	-	-	F	-	-
1	CT	250	154	-	-	M	-	-
1	CT	207	88	-	-	F	-	-
1	CT	252	150	-	-	M	-	-
1	CT	210	78	-	-	F	-	-
1	CT	195	70	-	-	M	-	-
1	CT	219	88	-	-	F	-	-
1	CT	183	54	-	-	F	-	-
1	CT	184	58	-	-	M	-	-
1	CT	200	74	-	-	M	-	-
1	CT	223	104	-	-	M	-	-
1	CT	162	40	-	-	M	-	-
1	CT	230	122	e223691-1	-	F	2+	SC
1	CT	176	52	e223691-10	-	M	2+	SC
1	CT	202	80	e223691-11	-	M	2+	SC
1	CT	216	92	e223691-12	-	F	2+	SC
1	CT	182	56	e223691-13	-	F	R	SC
1	CT	202	74	e223691-14	-	F	2+	SC
1	CT	296	242	e223691-2	-	M	3+	SC
1	CT	250	142	e223691-5	-	M	3+	SC
1	CT	160	40	e223691-6	-	F	2+	SC
1	CT	244	146	e223691-7	-	F	3+	SC
1	CT	240	122	e223691-8	-	M	3+	SC
1	CT	207	78	e223691-9	-	M	2+	SC
1	RB	200	74	e223691-3	e223691-3	M	1+	SC, AF
1	RB	242	126	e223691-4	e223691-4	M	3+	SC, AF
1	RSC	91	8	-	-	F		
1	RSC	90	7	-	-	F		
1	RSC	90	7	-	-	F		
1	RSC	75	4	-	-	M		
2	CT	234	106	-	-	M		
2	RSC	77	4	-	-	M		
2	RSC	74	4	-	-	M		
2	RSC	74	4	-	-	F		

Notes:

- See Figure 4 for location of sample sites.
- RB-rainbow trout (*Oncorhynchus mykiss*), CT-cutthroat trout (*Oncorhynchus clarki*), RSC-redside shiner (*Richardsonius balteatus*)
- Sex-M=male, F=female
- R-regenerated scale, could not be aged
- AF-Adipose fin clip for DNA analysis (DNA vial code is shown), SC-scale sample for age analysis.

Table 6 Individual Fish Data; Site, Species, Length and Weight Only

Site No.	Species Code	Length (mm)	Weight (g)	Site No.	Species Code	Length (mm)	Weight (g)	Site No.	Species Code	Length (mm)	Weight (g)
3	RSC	118	16	3	RSC	95	8	3	RSC	110	12
3	RSC	94	10	3	RSC	94	10	3	RSC	72	2
3	RSC	91	6	3	RSC	92	8	3	RSC	91	8
3	RSC	83	4	3	RSC	99	12	3	RSC	60	2
3	RSC	102	12	3	RSC	76	2	4	RSC	106	10
3	RSC	103	12	3	RSC	83	8	4	RSC	101	12
3	RSC	92	6	3	RSC	100	12	4	RSC	84	10
3	RSC	95	8	3	RSC	102	12	5	RSC	79	4
3	RSC	96	8	3	RSC	109	10	5	RSC	87	4
3	RSC	110	14	3	RSC	104	12	5	RSC	78	4
3	RSC	92	8	3	RSC	101	10	5	RSC	77	4
3	RSC	93	8	3	RSC	76	4	5	RSC	56	2
3	RSC	97	10	3	RSC	94	10	6	RSC	107	12
3	RSC	112	14	3	RSC	97	12	6	RSC	93	6
3	RSC	73	2	3	RSC	75	4	6	RSC	97	10
3	RSC	81	2	3	RSC	90	4	6	RSC	102	12
3	RSC	88	8	3	RSC	88	6	6	RSC	200	11.8
3	RSC	101	12	3	RSC	94	10	7	RSC	100	12
3	RSC	98	10	3	RSC	128	14	7	RSC	87	8
3	RSC	107	14	3	RSC	85	6				

Notes:

- See Figure 4 for location of net sample site.
- RSC-redside shiner (*Richardsonius balteatus*).

The relationships between fork length and weight for cutthroat trout, redside shiner and rainbow trout captured from this lake are shown in Figures 7, 8 and 9, respectively. Fulton's Condition index was also calculated for these species indicating a condition factor (K) of 0.93, 0.98 and 0.91 for cutthroat trout, redside shiner and rainbow trout, respectively. Furthermore, the relationship between cutthroat trout age and fork length is shown in Figure 10.

Figure 7 Cutthroat Trout Fork Length Versus Weight

Figure 8 Redside Shiner Fork Length Versus Weight

Figure 9 Rainbow Trout Fork Length Versus Weight

Figure 10 Cutthroat Trout Age Versus Fork Length

7.6 Fisheries Management Concerns

Fish were very abundant in this lake given the large specimen sample size and short sampling period (total sampling time = 25:29 hr). The fish population in this lake appeared healthy and individuals were abundant. Therefore, management issues directly aimed at the species do not exist at the moment.

An abundance of spawning habitat was not observed for this lake and the lake's fish population is already large. Therefore, enhancement is probably not a viable option. Additionally, the views around this lake are not particularly attractive so enhancement of the fishery might not attract additional anglers anyway. Although there is trail access to this lake and people appear to use the lake for recreational purposes, there are no camping facilities on the lake so excessive angling pressure is unlikely. Therefore, the current level of access appears appropriate for a sustainable level of fishing pressure and future management issues could possibly remain as is.

7.7 Catch Analysis - Fork Length Frequency Distribution

The frequency distribution of fish fork length groupings for all fish measured in this inventory is shown in Figure 11. These fork length range groupings were selected based on those used by Hamley (1972, cited in Anon. 1995a) who determined the average size of whitefish caught in various gillnet mesh sizes. The RIC Standards for experimental gillnet gangs are based on this research.

The gillnets Klohn-Crippen employed in this inventory did not have the mesh panels that select for fish in approximately the 179-228 mm and 281-345 mm fork length ranges as suggested by Hamley (1972 op. cit.). Figure 11 indicates that a large proportion of the fish captured from Jack Mould Lake were in the 0-114 mm fork length range (69%) and also that the second largest proportion (15%) of the total catch was from the 179-228 mm group. As there was an abundant catch in the 0-114 and 179-228 mm size ranges, it is unlikely that a size related bias occurred in this lake due to the absence of the 54 and 76 mm gillnet panels. Additionally, the mesh sizes used in this study targeted the maximum, average and minimum fish sizes and thus provided data to describe the entire size range of the fish population as a whole.

7.8 History of Previous Surveys

Previous surveys of Jack Mould Lake do not exist.

Figure 11 Frequency Distribution of Fish Fork Length Groupings

8. FIELD CONDITIONS AND WATER CHEMISTRY

The following is a summary of the limnological investigations of Jack Mould Lake.

Date: September 17, 1996 **Time:** 10:45
Limnology Station: LS **Maximum Depth:** 8 m
Seam Site: e 223691 **Water Sampler Used:** Van Dorn
Laboratories Used 1) Elemental Research Inc.: #309-267 West Esplanade, North Vancouver, British Columbia, V7M 1A5.
2) Klohn-Crippen in-house laboratory
3) Chlorophyll *a* and Total Kjeldahl Nitrogen were measured by the CAEAL certified laboratory: Analytical Services Laboratories Ltd., 1988 Triumph St., Vancouver, British Columbia, V5L 1K5.

8.1 Field Conditions

The limnology of Jack Mould Lake was investigated on a cool, cloudy day. Table 7 summarizes the field conditions at the time of the limnological survey.

Table 7 Field Conditions

Parameter Measured	Result	Method Used
Wind Velocity (m/s)	n/a	n/a
Wind Direction	n/a	n/a
Air Temperature (°C)	4°C	Glass thermometer
Cloud Cover	90%	Observation
Surface Condition	smooth	Observation
Water Colour	very brown	Observation
Water Clarity (m)	2.3	Secchi Disk

8.2 Water Chemistry

Water samples were removed from Jack Mould Lake at depths of 0.5 metres and 12 metres. The latter depth appeared to be in the hypolimnion. Table 8 presents the water chemistry analysis results for the two sample depths while Table 9 presents a summary of the water nutrient data from the two sample depths. Appendix III contains laboratory summary reports of the water quality analysis for Jack Mould Lake.

Table 8 Water Chemistry Summary

Parameter Measured	Result (0.5 m)	Result (7 m)	Method Used
Dissolved Oxygen (mg/L)	10.2	0.75	YSI model 57 O ₂ meter
Water Temperature (°C)	12.3	8.0	YSI model 57 O ₂ meter
pH (field)	7.8	7.8	Oakpon PH tester-2
Specific Conductance (µS/cm)	50	60	Oakpon TDS tester
Chlorophyll <i>a</i> (mg/m ³)	1.40	0.69	See Section 3
Filterable Residue(ppm)	<1	4	See Section 3
Dissolved Sodium (ppb)	1860	1900	See Section 3
Dissolved Magnesium (ppb)	2300	2120	See Section 3
Calcium (ppb)	9580	9350	See Section 3
Alkalinity (mg/L)	68.68	73.31	See Section 3
TDS (mg/L)	160.47	134.48	See Section 3

8.3 Water Nutrient Summary

Table 9 Summary of Available Phosphorus and Nitrogen

Parameter Measured	Result (0.5 m)	Result (8 m)	Method Used
NH ₃ (mg/L)	n/a	0.19	See Section 3
Total Dissolved Phosphorus (ppm)	0.02	0.07	See Section 3
Total Phosphorus (ppm)	0.03	0.08	See Section 3
Total Kjeldahl Nitrogen (ppm)	0.330	0.395	See Section 3
N:P Ratio	11	4.9	Average = 7.95

Notes:

- N:P ratio determined as:
$$\frac{\text{Total Kjeldahl Nitrogen}}{\text{Total Phosphorus}}$$

The nutrient data suggest that Jack Mould Lake is relatively low in inorganic nutrients and is between an ultra-oligotrophic and oligo-mesotrophic classification based in its total phosphorus concentration (Wetzel 1983). The rich brown water color suggests that the lake is rich in peat derived organic substances suggesting further that the lake might also be dystrophic (Wetzel 1983). Dystrophic lakes are generally low in algal productivity which is demonstrated here by the low chlorophyll *a* concentration, and they can also have rich and productive littoral zones which is also a characteristic demonstrated in this lake through its extensive littoral vegetation.

8.4 Dissolved Oxygen and Temperature Data

Dissolved oxygen concentration and temperature were determined at 1 metre intervals from a vertical profile below the limnological station in Jack Mould Lake on September 17, 1996. Table 10 summarizes these data.

Table 10 Dissolved Oxygen Concentration and Temperature Data

Depth (m)	Dissolved Oxygen (ppm)	Temperature (°C)
0	10.2	12.3
1	9.95	12.3
2	9.92	12.3
3	9.61	12.3
4	6.9	12.0
5	5.3	11.8
6	1.0	10.6
7	0.75	8.0
8	0.5	7.4

The relationships between depth and both temperature and dissolved oxygen are shown in Figure 12. This figure shows that both temperature and dissolved oxygen decrease with depth and that the most likely depth of the metalimnion is between 4 and 6 meters. This transitional zone is quite deep and the slow change in temperature and dissolved oxygen with depth at the time of sampling is indicative of low nutrient lakes late in the summer. The oxygen profile also demonstrates moderate clinograde characteristics (Wetzel 1983) suggesting that organic decomposition in the benthic zone regulates lake oxygen concentration.

Figure 12 Temperature and Dissolved Oxygen Profiles

9. SUMMARY AND RECOMMENDATIONS

Jack Mould Lake is located 22.5 km west by northwest of Smithers near Kitsequecla Lake. This lake is basically oligotrophic but contains many suspended humic particles and has an extensive littoral vegetation area, suggesting that it might also be dystrophic (Wetzel 1983). The lake is bounded at both its inlet and outlet by beaver dams with the dam at the outlet maintaining a lake depth that is 1.2 m deeper than would normally be possible without the beaver's influence. The shores of this lake are dominated by floating peat mats with dense sedge cover suggesting that the lake is successional advanced. The maximum depth in this lake is 9.2 m with mean depths and volumes of 4.7 metres and 1,225,944 m³, respectively. There are no shoal areas that would present a hazard to navigation. This lake's water chemistry is suitable for salmonids (Anon. 1996b) and dissolved oxygen remains above 8 mg/L for the top 3 metres, below which it declines to a minimum of 0.5 mg/L. Fish were abundant in this lake. Cutthroat trout and rainbow trout dominated the catch of sportfish.

Fish appeared healthy and other than the available trail access to this lake which might require management in the future, no management concerns are suggested for this lake.

KLOHN-CRIPPEN CONSULTANTS LTD.

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APPENDIX I

Fish Collection Data Form and Lake Biophysical Data Form

Lake Biophysical Data Form

Date (yy/mm/dd): n/a

Crew: GS/JS

Site ID

Watershed Code: n/a

Gazetted Name: n/a

FW Region: Prince Rupert

Management Unit: n/a

Sequence No.: n/a

Alias: Jack Mould Lake

UTM (Zone, Easting, Northing): 9.591389.6087110

NTS Map No.: 93L.13

Biophysical

Biogeo Zone: Interior Cedar Hemlock

Benchmark (Y/N) Y

Benchmark details: iron spike

Biogeo Zone No.: PR-131

Elevation (m): 664.5

Nutrient Status

SEAM No.: e223691

Secchi depth (m): 2.3

Other samples taken: water (0.5 m and 7 m)

Limno Station No.:	1(0.5 m)	1(7 m)	
H2S (mg/l)	n/a	n/a	
H2S comments	n/a	n/a	
TDS method	n/a	n/a	
TEMP method	YSI	YSI	
Alkalinity	68.68	73.31	

Field Conditions

Wind velocity (km/h): n/a

Wind direction: n/a

Air temp. (c): 4

Cloud cover (/10 O.C.): 90

Surface conditions: calm

Water colour: brown

Development

MOF rec sites (Y/N) N

Resort cmpsts (Y/N) N

Residences (Y/N) N

MOF campsites (Y/N) N

Resots (Y/N) N

Co. Rec facilities N

Parks cmpgrds (Y/N) N

Resort cabins (Y/N) N

Recreation

ROS N

Biophys features: N

Biophys subfeat.: N

Inlets/Outlets

see Stream Survey Card for mandatory fields

Biological

Fish Card attached (Y/N) Y

Fish Man. Com. N

Wildlife: Y

Reptiles: N

Aquatic Birds: Y

Invertebrates: Y

Amphibians: N

Aquatic Plants: N

Comments:

Fish Collection Data Form

Card 1 of 1

Date (yy/mm/dd): 1996/9/16-17
 Gazetted Name: n/a
 Lake/Stream/Wetland: Lake
 Sequence No.: n/a
 Watershed Code: n/a

Agency: Kohn-Crippen
 Alias: Jack Mould Lake
 Location: 22.5 km northwest of Smithers
 Weather: cool and cloudy
 Reach #: n/a

Crew: GS/JS
 UTM: 9.591389.6087110

Area Sampled: <u>n/a</u> Air Temp (C): <u>4</u> Water Temp (C): <u>12.3-7.4</u> EC ms/cm: <u>50-60</u>											
Site No.	Capture Method	Pass # or trap/net #	Species (code)	Mark or Tag No.	Length FL (mm)	Weight (g)	Fish #	Sex (code)	Maturity (code)	Activity (code)	Scale and DNA vial
1	GL	1	CT	n/a	230	122	1	F	n/a	n/a	e223691-1
1	GL	1	CT	n/a	176	52	2	M	n/a	n/a	e223691-10
1	GL	1	CT	n/a	202	80	3	M	n/a	n/a	e223691-11
1	GL	1	CT	n/a	216	92	4	F	n/a	n/a	e223691-12
1	GL	1	CT	n/a	202	74	5	F	n/a	n/a	e223691-14
1	GL	1	CT	n/a	160	40	6	F	n/a	n/a	e223691-6
1	GL	1	CT	n/a	207	78	7	M	n/a	n/a	e223691-9
1	GL	1	CT	n/a	296	242	8	M	n/a	n/a	e223691-2
1	GL	1	CT	n/a	250	142	9	M	n/a	n/a	e223691-5
1	GL	1	CT	n/a	244	146	10	F	n/a	n/a	e223691-7
1	GL	1	CT	n/a	240	122	11	M	n/a	n/a	e223691-8
1	GL	1	CT	n/a	238	134	12	F	n/a	n/a	
1	GL	1	CT	n/a	250	154	13	M	n/a	n/a	
1	GL	1	CT	n/a	207	88	14	F	n/a	n/a	
1	GL	1	CT	n/a	252	150	15	M	n/a	n/a	
1	GL	1	CT	n/a	210	78	16	F	n/a	n/a	
1	GL	1	CT	n/a	195	70	17	M	n/a	n/a	
1	GL	1	CT	n/a	219	88	18	F	n/a	n/a	
1	GL	1	CT	n/a	183	54	19	F	n/a	n/a	
1	GL	1	CT	n/a	184	58	20	M	n/a	n/a	
1	GL	1	CT	n/a	200	74	21	M	n/a	n/a	
1	GL	1	CT	n/a	223	104	22	M	n/a	n/a	
1	GL	1	CT	n/a	162	40	23	M	n/a	n/a	
1	GL	1	CT	n/a	182	56	24	F	n/a	n/a	e223691-13
2	GL	2	CT	n/a	234	106	25	M	n/a	n/a	
1	GL	1	RB	n/a	200	74	26	M	n/a	n/a	e223691-3, e223691-3
1	GL	1	RB	n/a	242	126	27	M	n/a	n/a	e223691-4, e223691-4
1	GL	1	RSC	n/a	91	8	28	F	n/a	n/a	

Area Sampled: <u> n/a </u> Air Temp (C): <u> 4 </u> Water Temp (C): <u> 12.3-7.4 </u> EC ms/cm: <u> 50-60 </u>											
Site No.	Capture Method	Pass # or trap/net #	Species (code)	Mark or Tag No.	Length FL (mm)	Weight (g)	Fish #	Sex (code)	Maturity (code)	Activity (code)	Scale and DNA vial
1	GL	1	RSC	n/a	90	7	29	F	n/a	n/a	
1	GL	1	RSC	n/a	90	7	30	F	n/a	n/a	
1	GL	1	RSC	n/a	75	4	31	M	n/a	n/a	
2	GL	2	RSC	n/a	77	4	32	M	n/a	n/a	
2	GL	2	RSC	n/a	74	4	33	M	n/a	n/a	
2	GL	2	RSC	n/a	74	4	34	F	n/a	n/a	
3	MT	3	RSC	n/a	118	16	35	n/a	n/a	n/a	
3	MT	3	RSC	n/a	94	10	36	n/a	n/a	n/a	
3	MT	3	RSC	n/a	91	6	37	n/a	n/a	n/a	
3	MT	3	RSC	n/a	83	4	38	n/a	n/a	n/a	
3	MT	3	RSC	n/a	102	12	39	n/a	n/a	n/a	
3	MT	3	RSC	n/a	103	12	40	n/a	n/a	n/a	
3	MT	3	RSC	n/a	92	6	41	n/a	n/a	n/a	
3	MT	3	RSC	n/a	95	8	42	n/a	n/a	n/a	
3	MT	3	RSC	n/a	96	8	43	n/a	n/a	n/a	
3	MT	3	RSC	n/a	110	14	44	n/a	n/a	n/a	
3	MT	3	RSC	n/a	92	8	45	n/a	n/a	n/a	
3	MT	3	RSC	n/a	93	8	46	n/a	n/a	n/a	
3	MT	3	RSC	n/a	97	10	47	n/a	n/a	n/a	
3	MT	3	RSC	n/a	112	14	48	n/a	n/a	n/a	
3	MT	3	RSC	n/a	73	2	49	n/a	n/a	n/a	
3	MT	3	RSC	n/a	81	2	50	n/a	n/a	n/a	
3	MT	3	RSC	n/a	88	8	51	n/a	n/a	n/a	
3	MT	3	RSC	n/a	101	12	52	n/a	n/a	n/a	
3	MT	3	RSC	n/a	98	10	53	n/a	n/a	n/a	
3	MT	3	RSC	n/a	107	14	54	n/a	n/a	n/a	
3	MT	3	RSC	n/a	95	8	55	n/a	n/a	n/a	
3	MT	3	RSC	n/a	94	10	56	n/a	n/a	n/a	
3	MT	3	RSC	n/a	92	8	57	n/a	n/a	n/a	
3	MT	3	RSC	n/a	99	12	58	n/a	n/a	n/a	
3	MT	3	RSC	n/a	76	2	59	n/a	n/a	n/a	
3	MT	3	RSC	n/a	83	8	60	n/a	n/a	n/a	
3	MT	3	RSC	n/a	100	12	61	n/a	n/a	n/a	
3	MT	3	RSC	n/a	102	12	62	n/a	n/a	n/a	
3	MT	3	RSC	n/a	109	10	63	n/a	n/a	n/a	
3	MT	3	RSC	n/a	104	12	64	n/a	n/a	n/a	

Area Sampled: <u> n/a </u>		Air Temp (C): <u> 4 </u>		Water Temp (C): <u> 12.3-7.4 </u>		EC ms/cm: <u> 50-60 </u>					
Site No.	Capture Method	Pass # or trap/net #	Species (code)	Mark or Tag No.	Length FL (mm)	Weight (g)	Fish #	Sex (code)	Maturity (code)	Activity (code)	Scale and DNA vial
3	MT	3	RSC	n/a	101	10	65	n/a	n/a	n/a	
3	MT	3	RSC	n/a	76	4	66	n/a	n/a	n/a	
3	MT	3	RSC	n/a	94	10	67	n/a	n/a	n/a	
3	MT	3	RSC	n/a	97	12	68	n/a	n/a	n/a	
3	MT	3	RSC	n/a	75	4	69	n/a	n/a	n/a	
3	MT	3	RSC	n/a	90	4	70	n/a	n/a	n/a	
3	MT	3	RSC	n/a	88	6	71	n/a	n/a	n/a	
3	MT	3	RSC	n/a	94	10	72	n/a	n/a	n/a	
3	MT	3	RSC	n/a	128	14	73	n/a	n/a	n/a	
3	MT	3	RSC	n/a	85	6	74	n/a	n/a	n/a	
3	MT	3	RSC	n/a	110	12	75	n/a	n/a	n/a	
3	MT	3	RSC	n/a	72	2	76	n/a	n/a	n/a	
3	MT	3	RSC	n/a	91	8	77	n/a	n/a	n/a	
3	MT	3	RSC	n/a	60	2	78	n/a	n/a	n/a	
4	MT	4	RSC	n/a	106	10	79	n/a	n/a	n/a	
4	MT	4	RSC	n/a	101	12	80	n/a	n/a	n/a	
4	MT	4	RSC	n/a	84	10	81	n/a	n/a	n/a	
5	MT	5	RSC	n/a	79	4	82	n/a	n/a	n/a	
5	MT	5	RSC	n/a	87	4	83	n/a	n/a	n/a	
5	MT	5	RSC	n/a	78	4	84	n/a	n/a	n/a	
5	MT	5	RSC	n/a	77	4	85	n/a	n/a	n/a	
5	MT	5	RSC	n/a	56	2	86	n/a	n/a	n/a	
6	MT	6	RSC	n/a	107	12	87	n/a	n/a	n/a	
6	MT	6	RSC	n/a	93	6	88	n/a	n/a	n/a	
6	MT	6	RSC	n/a	97	10	89	n/a	n/a	n/a	
6	MT	6	RSC	n/a	102	12	90	n/a	n/a	n/a	
6	MT	6	RSC	n/a	100	11.8	91	n/a	n/a	n/a	
7	MT	7	RSC	n/a	100	12	92	n/a	n/a	n/a	
7	MT	7	RSC	n/a	87	8	93	n/a	n/a	n/a	

1 Capture method: angler report (AR), angling (AG), creel census (CR), dead capture (DC), dip netting (DN), electroshocking (EL), gill netting (GN), minnow trapping (MT), seining (SN), swimming (SW), visual observation above water (VO), method unknown (UN).

2 Activity: migration (MI), spawning (S), incubation (I), rearing (feeding or resting) (R).

3a Level of life phase, Method 1: egg/alevin (E), fry (F), juvenile (J), adult (A) - or use Method 2.

3b Level of maturity, Method 2: egg/alevin (E), fry (F), immature (IM), maturing (MT), mature (M), spawning (SP), spent (ST).

4 Species codes: see manual.

APPENDIX II

Fish Scale Microfiche Prints

APPENDIX III

Water Chemistry Analysis

APPENDIX IV

Photograph Directory

Photo Survey Form 1 - Equipment Details**Survey Start Date:** 13/09/1996**Survey end Date:** 27/09/1996**Agency:** Klohn-Crippen**Crew:** GS/JS or GS/JC**Camera # 1**

Make and Model:	Ricoh LX-33W date	Lenses: A
Format:	35 mm film	

Camera # 2

Make and Model:	Fuji Disposable	Lenses: A
Format:	35 mm film	

Lenses

Focal Length (mm)
A - fixed

Roll and/or Batch Details

Roll #	Camera #	Output Medium	Film Type	ISO
1	1	neg, print	colour	400
2	1	neg, print	colour	400
3	2	neg, print	colour	400
4	1	neg, print	colour	400
5	1	neg, print	colour	400
6	1	neg, print	colour	400
7	1	neg, print	colour	400
8	1	neg, print	colour	400

Date	Roll	Negative	Counter	NTS Map Sheet	Watershed Code	Description	Photodocumentation Form 1 Direction	Photodocumentation Form 2 Reach	Site	Picture Type	UTM Zone	Efield	Nfield	Ecorrect	Ncorrect	Crew	Focal Length	Scale
12/09/1996	1	4	4	93L10	460-7449-858	Gee Trap #1 in North L, note the lack of aquatic vegetation	NW			L						GS/JS	St	n/a
14/09/1996	1	5	5	93L10	460-7449-858	View west over the Bulkley Valley taken from above North L	W			WS						GS/JS	St	n/a
14/09/1996	1	6	6	93L10	460-7449-858	Panoramic of the south end of North L taken from the helicopter				L						GS/JS	Wd	n/a
14/09/1996	1	7	7	93L10	460-7449-858	North L Inlet looking upstream from the L	W	1		Ch	9			677930	6048686	GS/JS	St	n/a
14/09/1996	1	8	8	93L10	460-7449-858	Marsh located 110m upstream of North L Inlet	Up	1		Ch						GS/JS	St	n/a
14/09/1996	1	9	9	93L10	460-7449-858	Looking S from outlet of L that drains into North L (190m upstream from North L)	S	1		Ch						GS/JS	St	n/a
14/09/1996	1	10	10	93L10	460-7449-858	Looking upstream from downstream limit of North L Inlet site	Up	1	1	Ch						GS/JS	St	Folding ruler hanging in tree
14/09/1996	1	11	11	93L10	460-7449-858	Old cabin near North L outlet				O	9			647794	6049278	GS/JS	St	n/a
14/09/1996	1	12	12	93L10	460-7449-858	Example of the falls that cover the North L Outlet (falls are 1.2 m high, 140 m downstream from outlet)	Up	1		Ch						GS/JS	St	Folding ruler placed near top of falls
14/09/1996	1	13	13	93L10	460-7449-858	looking down chute section of North L outlet	Dn	1	1	Ch						GS/JS	St	n/a
12/09/1996	1	14	14	93L10	460-7449-858	90 cm high falls 90 m downstream from North L outlet	Up	1	1	Ch						GS/JS	St	Folding ruler
14/09/1996	1	16	16	93L10	460-7449-858	Just upstream of falls in #14: Bottom end of North L Outflow site	Up	1	1	Ch						GS/JS	St	n/a
14/09/1996	1	17	17	93L10	460-7449-858	Upstream limit of North L outflow site	Dn	1	1	Ch						GS/JS	St	n/a
14/09/1996	1	18	18	93L10	460-7449-858	North L outlet taken from L	E			L,Ch	9			647794	6049278	GS/JS	St	n/a
14/09/1996	1	19	19	93L10	460-7449-858	Panoramic (#1) of north end of North L	S			L						GS/JS	Wd	n/a
14/09/1996	1	20	20	93L10	460-7449-858	Panoramic (#2) of north end of North L	S			L						GS/JS	Wd	n/a
14/09/1996	1	21	21	93L10	460-7449-858	Panoramic (#3) of north end of North L	S			L						GS/JS	Wd	n/a
14/09/1996	1	22	22	93L10	460-7449-858	Panoramic (#1) of south end of North L	N			L						GS/JS	Wd	n/a
14/09/1996	1	23	23	93L10	460-7449-858	Panoramic (#2) of south end of North L	N			L						GS/JS	Wd	n/a
14/09/1996	1	24	24	93L10	460-7449-858	Panoramic (#3) of south end of North L	N			L						GS/JS	Wd	n/a
14/09/1996	1	25	25	93L10	460-7449-858	Panoramic (#4) of south end of North L	N			L						GS/JS	Wd	n/a
14/09/1996	1	26	26	93L10	460-7449-858	Benchmark in North L (note aquatic vegetation)	E			L	9			647878	6048791	GS/JS	St	n/a
14/09/1996	1	27	27	93L10	460-7449-858	Aerial view of North L from helicopter	W			WS						GS/JS	St	n/a
14/09/1996	1	28	28	93L10	460-7449-858	Aerial view of North L from helicopter	E			WS						GS/JS	St	n/a
14/09/1996	1	30	30	93L10	460-5177-361	Zodiac in Coppermine L on shore near old mine entrance	N			L						GS/JS	St	10'2" Zodiac
14/09/1996	1	31	31	93L10	460-5177-361	Panoramic (#1, E to W) of Coppermine L taken from mine site	NE			L						GS/JS	Wd	n/a
14/09/1996	1	32	32	93L10	460-5177-361	Panoramic (#2, E to W) of Coppermine L taken from mine site	N			L						GS/JS	Wd	n/a
14/09/1996	1	34	34	93L10	460-5177-361	Panoramic (#4, E to W) of Coppermine L taken from mine site	NW			L						GS/JS	Wd	n/a
14/09/1996	1	35	35	93L10	460-5177-361	Panoramic (#5, E to W) of Coppermine L taken from mine site	W			L						GS/JS	Wd	n/a
14/09/1996	1	35	35	93L10	460-5177-361	Old cabin near the outlet of Coppermine L	NW			WS						GS/JS	St	n/a
14/09/1996	1	37	37	93L10	460-5177-361	Sunset over Coppermine L	W			L						GS/JS	St	n/a
15/09/1996	2	0	1	93L10	460-5177-361	Coppermine inflow from the edge of Coppermine L	Up	1		Ch						GS/JS		
15/09/1996	2	1	2	93L10	460-5177-361	Benchmark in Coppermine L	W			L	9			647157	6048020	GS/JS	St	n/a

Date	Roll	Negative	Counter	NTS Map Sheet	Watershed Code	Description	Photodocumentation Direction	Platform	Form2 Reach	Site	Picture Type	UTM Zone	Efield	Nfield	Ecorrect	Ncorrect	Crew	Focal Length	Scale
15/09/1996	2	2	3	93L10	460-5177-361	Coppermine L outflow taken from the lake, note the structure in background	n/a				L, Ch	9	647181	6047903			GS/JS	St	n/a
15/09/1996	2	3	4	93L10	460-5177-361	Upstream limit of Coppermine outflow stream site	Dn	1	1		Ch	9					GS/JS	St	n/a
15/09/1996	2	4	5	93L10	460-5177-361	Downstream limit of Coppermine L outlet	Up	1	1		Ch	9					GS/JS	St	n/a
15/09/1996	2	5	6	93L10	460-5177-361	Meadow below the downstream limit of Coppermine L outlet site	Dn	1			Ch	9					GS/JS	St	n/a
15/09/1996	2	6	7	93L10	460-5177-361	Coppermine L from helicopter	E				WS	9					GS/JS	St	n/a
15/09/1996	2	7	8	93L10	460-5177-361	North L form helicopter	N				WS	9					GS/JS	St	n/a
15/09/1996	2	8	9	n/a	n/a	Access (helicopter) to Ceber L from Smithers along Toboggan Creek	W				O	9					GS/JS	St	n/a
15/09/1996	2	9	10	n/a	n/a	Toboggan Glacier from helicopter	S				O	9					GS/JS	St	n/a
15/09/1996	2	10	11	93L13	n/a	Shoreline area where gee trap #2 was placed in Ceber L	NW				L	9					GS/JS	St	n/a
15/09/1996	2	11	12	93L13	n/a	Shoreline area where gee trap #3 was placed in Ceber L	NE				L	9					GS/JS	St	n/a
15/09/1996	2	13	13	93L13	n/a	Tree fall to which gee trap #4 was attached in Ceber L	E				L	9					GS/JS	St	n/a
15/09/1996	2	15	15	93L13	n/a	Shoreline area where gee trap #1 was placed in Ceber L. Note the aquatic vegetation	E				L	9					GS/JS	St	n/a
16/09/1996	2	17	17	93L13	n/a	Ceber L from helicopter (south end)	W				WS	9					GS/JS	St	n/a
16/09/1996	2	16	16	93L13	n/a	Ceber L from helicopter (north end)	NW				WS	9					GS/JS	St	n/a
15/09/1996	2	18	18	93L10	n/a	Rainbow trout mortality from gillnet in Ceber L	n/a				Fi	9					GS/JS	St	10 L pail near fish's head
16/09/1996	2	19	19	93L13	n/a	Greg releasing rainbow that remained alive in gillnet in Ceber L	n/a				Fi	9					GS/JS	St	Person
16/09/1996	2	20	20	93L10	n/a	Example of invertebrate (copepods) size found in Ceber L (also in North L and Coppermine L)	n/a				O	9					GS/JS	St	persons hand
16/09/1996	2	21	21	93L13	n/a	Ceber L outlet taken from lakeshore	S				L, Ch	9			589191	6077763	GS/JS	St	person and boat
16/09/1996	2	22	22	93L13	n/a	80 cm falls in Ceber L outlet, 60 m from lake	Up	1			Ch	9					GS/JS	St	folding ruler
16/09/1996	2	23	23	93L13	n/a	Habitat and vegetation at Ceber outlet sample site. Note the abundant tree fall	Up	1	1		Ch	9					GS/JS	St	n/a
16/09/1996	2	24	24	93L13	n/a	1.8 m chute in Ceber outflow 100 m from outlet	Up	1			Ch	9					GS/JS	St	field book with scale in inches
16/09/1996	2	25	25	93L10	n/a	Downstream limit of Ceber L outlet site	Up	1	1		Ch	9					GS/JS	St	n/a
16/09/1996	2	26	26	93L13	n/a	Upstream limit of Ceber L outlet site. Note the extensive cover	Dn	1	1		Ch	9					GS/JS	St	n/a
16/09/1996	2	27	27	93L13	n/a	Ceber L inlet from the shoreline	E, Up	1			L, Ch	9			582282	6078000	GS/JS	St	n/a
16/09/1996	2	28	28	93L13	n/a	Benchmark in tree near Ceber L (note flagging tape)	N				L	9	588883	6077755			GS/JS	St	n/a
16/09/1996	2	29	29	93L13	n/a	Jack Mould L from helicopter. Note access rode in foreground and background	N				WS	9					GS/JS	St	n/a
16/09/1996	2	30	30	93L13	n/a	Jack Mould L inlet taken from the boat. Note beaver dam in background	E				L, Ch	9					GS/JS	St	n/a
16/09/1996	2	31	31	93L13	n/a	Beaver dam in Jack Mould outlet, seperates lake from channel	W, Up	1			L, Ch	9					GS/JS	St	n/a
16/09/1996	2	32	32	93L13	n/a	1.2 m high beaver dam at Jack Mould L outlet	W, Up	1			L, Ch	9					GS/JS	St	note book with scale in inches

Date	Roll	Negative	Counter	NTS Map Sheet	Watershed Code	Description	Photodocumentation Platform Direction	Form2 Reach	Site	Picture Type	UTM Zone	Efield	Nfield	Ecorrect	Ncorrect	Crew	Focal Length	Scale
16/09/1996	2	33	33	93L13	n/a	1.2 m high beaver dam in Jack Mould L outlet	W			L, Ch	9					GS/JS	St	n/a
16/09/1996	2	35	35	103I16	440-6382-012	Mulwain Creek from helicopter, also represents access to Mulwain L	NW			WS	9					GS/JS	St	n/a
16/09/1996	2	36	36	103I16	n/a	Mulwain L from helicopter	n/a			WS	9					GS/JS	St	n/a
17/09/1996	3	0	1	103I16	n/a	Moose near Mulwain L inlet	E			O	9					GS/JS	St	n/a
17/09/1996	3	1	2	103I16	n/a	Moose near Mulwain L inlet	E			O	9					GS/JS	St	n/a
17/09/1996	3	2	3	103I16	n/a	Jamie under zodiac seeking protection from the rain	NW			L, O	9					GS/JS	St	10'6" boat & person
17/09/1996	3	3	4	103I16	n/a	Benchmark in Mulwain L	SE			L	9					GS/JS	St	n/a
17/09/1996	3	4	5	103I16	n/a	Unsurveyed inflow into Mulwain L	Up			L, Ch	9					GS/JS	St	n/a
17/09/1996	3	5	6	103I16	440-6382-012	Small 0.7 m falls in Mulwain L inlet	Up	1		Ch	9					GS/JS	St	note book with scale in inches
17/09/1996	3	6	7	103I16	440-6382-012	Downstream limit of Mulwain L outlet sample site	Up	1	1	Ch	9					GS/JS	St	30 m tape
17/09/1996	3	7	8	103I16	440-6382-012	Upstream limit of Mulwain L outlet sample site	Dn	1	1	Ch	9					GS/JS	St	n/a
17/09/1996	3	8	9	103I16	440-6382-012	Example of a ground water pool discharging into Mulwain L outlet. Pool was 0.7 m above main channel	Dn	1		Ch	9					GS/JS	St	notebook with scale in inches
17/09/1996	3	9	10	103I16	440-6382-012	Large meadow at 500m mark of Mulwain L outlet	Dn	1		Ch	9					GS/JS	St	n/a
17/09/1996	3	10	11	103I16	440-6382-012	Example of meandering outlet of Mulwain L	Up	1		Ch	9					GS/JS	St	n/a
17/09/1996	3	12	13	103I16	440-6382-012	Small 100m x 30m lake immediately downstream of Mulwain L	Dn	1		Ch	9					GS/JS	St	n/a
17/09/1996	3	11	12	103I13	440-6382-012	Area where large tributary empties into Mulwain L outlet	Dn	1		Ch	9					GS/JS	St	n/a
1006/9/17	3	13	14	103I16	n/a	Mulwain L outlet taken from stream section	Up, N	1		L, Ch	9					GS/JS	St	boat in background
17/09/1996	3	14	15	103I16	n/a	Downstream limit of Mulwain L inlet sampling site	Up	1	1	Ch	9					GS/JS	St	notebook with scale in inches
17/09/1996	3	15	16	103I16	n/a	Upstream limit of Mulwain L inlet sample site	Dn	1	1	Ch	9					GS/JS	St	rain jacket and 30m tape
17/09/1996	3	16	17	103I16	n/a	End of Mulwain L Inlet at a groundwater pool	Up	1		Ch	9					GS/JS	St	n/a
17/09/1996	3	17	18	103I16	n/a	Example of how Mulwain L inlet meanders through meadow	Up	1		Ch	9					GS/JS	St	20x13 cm field chemistry case placed in grass
17/09/1996	3	18	19	103I16	n/a	Mulwain L inlet taken from edge of lake	Up	1		Ch	9					GS/JS	St	n/a
17/09/1996	3	19	20	103I16	n/a	Gee trap #5 in Mulwain L	E			L	9					GS/JS	St	n/a
17/09/1996	3	24	24	103I16	n/a	Mulwain L from helicopter	NW			WS	9					GS/JS	St	n/a
18/09/1996	4	3	3	93L13	n/a	Old beaver dam across outlet of Bud L (doesn't hold water)	Dn	1		Ch	9			586644	6078191	GS/JS	St	n/a
18/09/1996	4	4	4	93L13	n/a	Second old beaver dam across Bud L outlet (doesn't hold water)	Up	1		Ch	9					GS/JS	St	30m tape coil
18/09/1996	4	5	5	93L13	n/a	Example of how Bud L outlet flows through a meadow area immediately downstream of outlet	Up	1	1	Ch	9					GS/JS	St	person (6')
18/09/1996	4	6	6	93L13	n/a	2 m high chute/falls in Bud L outlet	Up	1	1	Ch	9					GS/JS	St	Person (6')
18/09/1996	4	7	7	93L13	n/a	Looking upstream from 500 m mark on Bud L outlet	Up	1		Ch	9					GS/JS	St	Person (6')
18/09/1996	4	8	8	93L13	n/a	Upstream limit of Bud L outlet sample site	Dn	1	1	Ch	9					GS/JS	St	n/a
18/09/1996	4	9	9	93L13	n/a	Downstream limit of Bud L outlet sample site	Dn	1	1	Ch	9					GS/JS	St	n/a
18/09/1996	4	10	10	93L13	n/a	GS electrofishing in Bud L outlet	Up	1	1	Ch	9					GS/JS	St	Person (6'1")

Date	Roll	Negative	Counter	NTS Map Sheet	Watershed Code	Description	Photodocumentation Platform Direction	Platform Form2 Reach	Site	Picture Type	UTM Zone	Efield	Nfield	Ecorrect	Ncorrect	Crew	Focal Length	Scale
18/09/1996	4	11	11	93L13	n/a	Possible inlet to Bud L, no water or channel visible though	Up, XS			Ch	9					GS/JS	St	n/a
18/09/1996	4	12	12	93L13	n/a	Gee trap #1 in Bud L	S			L	9					GS/JS	St	Gee trap
18/09/1996	4	13	13	93L13	n/a	Gee trap # 3 in Bud L	NW			L	9					GS/JS	St	n/a
18/09/1996	4	14	14	93L13	n/a	Second possible inlet to Bud L. No water or channel visible	Up, S			L, Ch	9					GS/JS	St	n/a
18/09/1996	4	15	15	93L13	n/a	Shoreline area where gee trap # 5 was placed in Bud L	E			L	9					GS/JS	St	n/a
18/09/1996	4	16	16	93L13	n/a	Benchmark in Bud L. Note old high water marks	SW			L	9					GS/JS	St	n/a
19/09/1996	4	17	17	93L13	n/a	Gee trap # 5 in Bud L	E			L	9					GS/JS	St	n/a
19/09/1996	4	18	18	93L13	n/a	Gee trap # 4 in Bud L	N			L	9					GS/JS	St	Gee trap
19/09/1996	4	19	19	93L13	n/a	Shoreline area of Bud L where gee trap #2 was placed	W			L	9					GS/JS	St	n/a
19/09/1996	4	21	21	93L13	n/a	Example of invertebrates in Bud L	n/a			O	9					GS/JS	St	Note book with scale in inches
19/09/1996	4	22	22	93M3	n/a	Netalzul Meadow L from the helicopter	n/a			WS	9					GS/JC	St	n/a
19/09/1996	4	23	23	93M3	n/a	Netalzul Meadow L from the helicopter	n/a			WS	9					GS/JC	St	n/a
19/09/1996	4	24	24	93M3	n/a	Netalzul Meadow L from the helicopter	n/a			WS	9					GS/JC	St	n/a
19/09/1996	4	25	25	93M3	n/a	Netalzul Meadow L from the helicopter	n/a			WS	9					GS/JC	St	n/a
19/09/1996	4	26	26	93M3	n/a	Netalzul Meadow L from the helicopter	n/a			WS	9					GS/JC	St	n/a
19/09/1996	4	27	27	93M3	n/a	Netalzul Meadow L from the helicopter	n/a			WS	9					GS/JC	St	n/a
21/09/1996	4	28	28	93M3	n/a	Netalzul Meadow L from helicopter				WS	9					GS/JC	St	n/a
21/09/1996	4	29	29	93M3	n/a	Helicopter landing area and Netalzul Meadow inlet	Up, E			L, Ch	9					GS/JC	St	n/a
21/09/1996	4	30	30	93M3	n/a	Example of fish caught in gillnets	n/a			Fi	9					GS/JC	St	Zodiac pontoon
21/09/1996	4	31	31	93M3	n/a	Tadpoles and invertebrates captured in gee trap # 1 in Netalzul Meadow L	n/a			Fi	9					GS/JC	St	Zodiac pontoon
21/09/1996	4	32	32	93M6	n/a	Netalzul L. form N end, zodiac in foreground	S			L	9					GS/JC	St	10'6" zodiac
22/09/1996	4	34	34	93M6	n/a	Netalzul L from helicopter, approached from SE end	NW			WS	9					GS/JC	St	n/a
22/09/1996	4	35	35	93M6	n/a	Netalzul L from helicopter, approached from SE end	NW			WS	9					GS/JC	St	n/a
22/09/1996	4	36	36	93M6	n/a	Netalzul L from helicopter, view of N end of lake	NW			WS	9					GS/JC	St	n/a
22/09/1996	5	1	1	93M6	n/a	Gee trap #1 in Netalzul L	N			L	9					GS/JC	St	n/a
22/09/1996	5	2	2	93M6	n/a	Example of large lake trout captured in Netalzul L gillnets	n/a			Fi	9					GS/JC	St	n/a
22/09/1996	5	3	3	93M6	n/a	Example of abundant tree-fall in Netalzul L	n/a			L	9					GS/JC	St	n/a
22/09/1996	5	4	4	93M6	n/a	Netalzul L inflow. Note abundant cover	Up	1		Ch	9					GS/JC	St	n/a
22/09/1996	5	5	5	93M6	n/a	Upstream limit of Netalzul L inflow sample site	Dn	1	1	Ch	9					GS/JC	St	n/a
22/09/1996	5	6	6	93M6	n/a	Downstream limit of Netalzul L inflow sample site	Up	1	1	Ch	9					GS/JC	St	n/a
22/09/1996	5	7	7	93M6	n/a	Panoramic (#1) looking N from lake's S end	N			L	9					GS/JC	St	n/a
22/09/1996	5	8	8	93M6	n/a	Panoramic (#2) looking N from lake's S end	N			L	9					GS/JC	St	n/a
22/09/1996	5	9	9	93M6	n/a	Panoramic (#3) looking N from lake's S end	N			L	9					GS/JC	St	10'6" zodiac

Date	Roll	Negative	Counter	NTS Map Sheet	Watershed Code	Description	Photodocumentation Direction	Photo Form 2 Reach	Site	Picture Type	UTM Zone	Efield	Nfield	Ecorrect	Ncorrect	Crew	Focal Length	Scale
22/09/1996	5	10	10	93M6	n/a	Netalzul L outflow from lake's edge	S	1		L, Ch	9			624878	6128369	GS/JC	St	n/a
22/09/1996	5	11	11	93M6	n/a	Example of habitat in Netalzul L outlet	Bd	1	1	Ch	9					GS/JC	St	n/a
22/09/1996	5	12	12	93M6	n/a	lake downstream from Netalzul L	Dn	1		Ch, L	9					GS/JC	St	n/a
22/09/1996	5	13	13	93M6	n/a	Downstream limit of Netalzul lake outlet sample site	Up	1	1	Ch	9					GS/JC	St	note book
22/09/1996	5	14	14	93M6	n/a	Upstream limit of Netalzul L outflow sample site	Dn	1	1	Ch	9					GS/JC	St	notebook
22/09/1996	5	15	15	93M6	n/a	Benchmark in Netalzul lake	NE			L	9					GS/JC	St	n/a
23/09/1996	5	16	16	93M3	n/a	Helicopter access to Camp L	SW			WS	9					GS/JC	St	n/a
23/09/1996	5	17	17	93M3	n/a	Camp L from helicopter	NE			WS	9					GS/JC	Wd	n/a
23/09/1996	5	18	18	93M3	n/a	Gee trap #1 in Camp L	n/a			L	9					GS/JC	St	Side of zodiac
23/09/1996	5	19	19	93M3	n/a	Shoreline area near which gee trap #2 is placed	SW			L	9					GS/JC	St	n/a
23/09/1996	5	20	20	93M3	n/a	Tree fall where gee trap #3 is placed in Camp L	n/a			L	9					GS/JC	St	Side of zodiac
23/09/1996	5	21	21	93M3	n/a	Tree fall where gee trap #4 was placed in Camp L	n/a			L	9					GS/JC	St	n/a
23/09/1996	5	22	22	93M3	n/a	LOD where gee trap #5 was placed in Camp L	n/a			L	9					GS/JC	St	n/a
23/09/1996	5	23	23	93M3	n/a	Panoramic (#1) of Camp L from N end	NW			L	9					GS/JC	Wd	n/a
23/09/1996	5	24	24	93M3	n/a	Panoramic (#2) of Camp L from N end	NW			L	9					GS/JC	Wd	n/a
23/09/1996	5	25	25	93M3	n/a	Panoramic (#3) of Camp L from N end	W			L	9					GS/JC	Wd	n/a
23/09/1996	5	26	26	93M3	n/a	Panoramic (#4) of Camp L from N end	W			L	9					GS/JC	Wd	n/a
23/09/1996	5	27	27	93M3	n/a	Panoramic (#5) of Camp L from N end	SW			L	9					GS/JC	Wd	n/a
23/09/1996	5	28	28	93M3	n/a	Panoramic (#6) of Camp L from N end	SW			L	9					GS/JC	Wd	n/a
23/09/1996	5	29	29	93M3	n/a	Panoramic (#7) of Camp L from N end	S			L	9					GS/JC	Wd	n/a
23/09/1996	5	30	30	93M3	n/a	Dock for the hunting camp on Camp L	NE			L	9					GS/JC	St	n/a
23/09/1996	5	31	31	93M3	n/a	Road crossing on Camp L outlet, also bottom of sample site	Bd	1	1	Ch	9					GS/JC	St	n/a
23/09/1996	5	32	32	93M3	n/a	Upstream limit of Camp lake outlet sample site	Dn	1	1	Ch	9					GS/JC	St	n/a
23/09/1996	5	33	33	93M3	n/a	Black wolf shot the previous night at hunting camp	n/a			O	9					GS/JC	St	n/a
23/09/1996	5	34	34	93M3	n/a	Benchmark on Camp lake	NE			L	9	626275	6122305			GS/JC	St	n/a
23/09/1996	5	35	35	93M3	n/a	Camp L inlet taken from shoreline	NW			L, Ch	9	626275	6122305			GS/JC	St	n/a
23/09/1996	5	36	36	93M3	n/a	Camp L outlet taken from boat	S			L, Ch	9					GS/JC	St	n/a
23/09/1996	6	1	1	93M7	480-4026	Young bear swimming across Clota L	W			L	9					GS/JC	St	n/a
23/09/1996	6	2	2	93M7	480-4026	Young bear swimming across Clota L	W			L	9					GS/JC	St	n/a
24/09/1996	6	3	3	93M10		Twin L from floatplane	S			WS	9					GS/JC	Wd	n/a
24/09/1996	6	4	4	93M10		Twin L from floatplane	S			WS	9					GS/JC	Wd	n/a
24/09/1996	6	5	5	93M7	480-4026	Clota L from floatplane	S			WS	9					GS/JC	Wd	n/a
24/09/1996	6	6	6	93M7	480-4026	Clota L from floatplane	S			WS	9					GS/JC	Wd	n/a
24/09/1996	6	7	7	93M7	480-4026	Clota L from floatplane	S			WS	9					GS/JC	Wd	n/a
24/09/1996	6	8	8	93M7	480-4026	Clota L from floatplane	S			WS	9					GS/JC	Wd	n/a
24/09/1996	6	9	9	93M7	480-4026	Floatplane leaving Clota L	S			L	9					GS/JC	St	n/a
24/09/1996	6	10	10	93M7	480-4026	Shoreline area where gee trap #1 was placed in Clota L	W			L	9					GS/JC	St	n/a
24/09/1996	6	11	11	93M7	480-4026	Shoreline area where gee trap #2 was placed in Clota L	W			L	9					GS/JC	St	n/a
24/09/1996	6	12	12	93M7	480-4026	Shoreline area where gee trap #3 was placed in Clota L	W			L	9					GS/JC	St	n/a
24/09/1996	6	13	13	93M7	480-4026	Shoreline area where gee trap #4 was placed in Clota L	SE			L	9					GS/JC	St	n/a
24/09/1996	6	14	14	93M7	480-4026	Shoreline area where gee trap #5 was placed in Clota L	E			L	9					GS/JC	St	n/a
24/09/1996	6	15	15	93M7	480-4026	Panoramic (#1) showing marshy section between main and secondary basins of Clota L	SE			L	9					GS/JC	Wd	n/a

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24/09/1996	6	16	16	93M7	480-4026	Panoramic (#2) showing marshy section between main and secondary basins of Clota L	SE			L	9					GS/JC	Wd	n/a
24/09/1996	6	17	17	93M7	480-4026	Extensive marshy area surrounding Clota L inlet	N			L	9					GS/JC	St	n/a
24/09/1996	6	18	18	93M7	480-4026	Beaver dam at Clota L outlet	N	1		L, Ch	9	651187	6139961			GS/JC	St	notebook
24/09/1996	6	19	19	93M7	n/a	Upstream limit of Clota L outlet sample site	Dn	1	1	Ch	9					GS/JC	St	n/a
24/09/1996	6	20	20	93M7	n/a	Downstream limit of Clota L outlet sample site	Up	1	1	Ch	9					GS/JC	St	n/a
24/09/1996	6	21	21	93M7	n/a	Substrate of Clota L outlet sample site	Bd	1	1	Ch	9					GS/JC	St	Electrofischer backpack
24/09/1996	6	22	22	93M7	480-4026	Benchmark in Clota L	E			L	9	651606	6140218			GS/JC	St	n/a
24/09/1996	6	23	23	93M7	480-4026	Panoramic (#1) of Clota L from S end going E to W	SE			L	9					GS/JC	St	n/a
24/09/1996	6	24	24	93M7	480-4026	Panoramic (#2) of Clota L from S end going E to W	S			L	9					GS/JC	St	n/a
24/09/1996	6	25	25	93M7	480-4026	Panoramic (#3) of Clota L from S end going E to W	SW			L	9					GS/JC	St	n/a
24/09/1996	6	26	26	93M7	480-4026	Example of water lilies that are found throughout N, S, and W shores of Clota L	n/a			L	9					GS/JC	St	notebook with scale in inches
24/09/1996	6	27	27	93M7	480-4026	Panoramic (#1) of Clota L from N end going W to E	NW			L	9					GS/JC	St	Equipment on zodiac
24/09/1996	6	28	28	93M7	480-4026	Panoramic (#2) of Clota L from N end going W to E	NW			L	9					GS/JC	St	Equipment on zodiac
24/09/1996	6	29	29	93M7	480-4026	Panoramic (#3) of Clota L from N end going W to E	N			L	9					GS/JC	St	n/a
24/09/1996	6	30	30	93M7	480-4026	Panoramic (#4) of Clota L from N end going W to E	NE			L	9					GS/JC	St	n/a
24/09/1996	6	31	31	93M7	480-4026	Panoramic (#5) of Clota L from N end going W to E	NE			L	9					GS/JC	St	n/a
24/09/1996	6	32	32	93M7	480-4026	Example of tree fall and macrophyte habitat along shoreline of Clota L	W			L	9					GS/JC	St	n/a
24/09/1996	6	33	33	93M7	480-4026	GS on top of beaver lodge at N end of Clota L	W			L	9					GS/JC	St	n/a
25/09/1996	6	34	34	93M10	n/a	Gee trap #2 in Twin L	E			L	9					GS/JC	St	Gee trap
25/09/1996	6	35	35	93M10	n/a	Habitat in which gee trap #3 was placed in Twin L	n/a			L	9					GS/JC	St	n/a
25/09/1996	6	36	36	93M10	n/a	Gee trap #4 in Twin L	S			L	9					GS/JC	St	Gee trap
25/09/1996	6	37	37	93M10	n/a	Gee trap #5 in Twin L	n/a			L	9					GS/JC	St	Bow of zodiac
25/09/1996	7	1	1	93M10	n/a	Example of the number of fish caught in Twin L gillnets	n/a			L	9					GS/JC	St	Side of zodiac
25/09/1996	7	2	2	93M10	n/a	Only accessible site on Twin L inlet	Dn	1	1	Ch	9					GS/JC	St	n/a
25/09/1996	7	3	3	93M10	n/a	Only accessible site on Twin L inlet	Up	1	1	Ch	9					GS/JC	St	n/a
25/09/1996	7	4	4	93M10	n/a	Twin L inlet from lake shore: inaccessible	Dn, W	1		Ch, L	9	640730	6154528			GS/JC	St	n/a
25/09/1996	7	5	5	93M10	n/a	Panoramic (#1) of Twin L from S end	NE			L	9					GS/JC	St	n/a
25/09/1996	7	6	6	93M10	n/a	Panoramic (#2) of Twin L from S end	N			L	9					GS/JC	St	n/a
25/09/1996	7	7	7	93M10	n/a	Panoramic (#3) of Twin L from S end	N			L	9					GS/JC	St	n/a
25/09/1996	7	8	8	93M10	n/a	Panoramic (#4) of Twin L from S end	NW			L	9					GS/JC	St	n/a
25/09/1996	7	9	9	93M10	n/a	Panoramic (#5) of Twin L from S end	W			L	9					GS/JC	St	n/a
25/09/1996	7	10	10	93M10	n/a	Twin L outlet from boat	SE	1		L	9	640837	6154539			GS/JC	St	
25/09/1996	7	11	11	93M10	n/a	Panoramic (#1) of Twin L from N end going W to S	W			L	9					GS/JC	St	n/a
25/09/1996	7	12	12	93M10	n/a	Panoramic (#2) of Twin L from N end going W to S	W			L	9					GS/JC	St	n/a
25/09/1996	7	13	13	93M10	n/a	Panoramic (#3) of Twin L from N end going W to S	SW			L	9					GS/JC	St	n/a
25/09/1996	7	14	14	93M10	n/a	Panoramic (#4) of Twin L from N end going W to S	S			L	9					GS/JC	St	n/a

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25/09/1996	7	15	15	93M10	n/a	Panoramic (#5) of Twin L from N end going W to S	S				L	9					GS/JC	St	n/a
25/09/1996	7	16	16	93M7	n/a	Moose on shoreline of Boucher L. Note abundant macrophytes	E				L	9					GS/JC	St	n/a
26/09/1996	7	17	17	93M7	n/a	N end of Boucher L from helicopter	n/a				WS	9					GS/JC	St	n/a
26/09/1996	7	18	18	93M7	n/a	Boucher L from helicopter. Note old lake in top right corner	S				WS	9					GS/JC	St	n/a
26/09/1996	7	19	19	93M7	n/a	Looking NW from center of lake showing aquatic plant coverage	NW				L	9					GS/JC	St	n/a
26/09/1996	7	20	20	93M7	n/a	Habitat in which gee trap #1 was placed in Boucher L	n/a				L	9					GS/JC	St	n/a
26/09/1996	7	21	21	93M7	n/a	Habitat in which gee trap #2 was placed in Boucher L	n/a				L	9					GS/JC	St	bow of zodiac, gee trap
26/09/1996	7	22	22	93M7	n/a	Habitat in which gee trap #3 was placed in Boucher L	n/a				L	9					GS/JC	St	Gee trap
26/09/1996	7	23	23	93M7	n/a	Habitat in which gee trap #4 was placed in Boucher L	n/a				L	9					GS/JC	St	n/a
26/09/1996	7	25	25	93M7	n/a	Habitat in which gee trap #6 was placed in Boucher L	n/a				L	9					GS/JC	St	n/a
26/09/1996	7	26	26	93M7	n/a	Inlet to Boucher L. Note the 2 beaver dams	E				L, Ch	9			653205	6147248	GS/JC	St	n/a
26/09/1996	7	27	27	93M7	n/a	Another angle showing the aquatic vegetation infestation of Boucher L	E				L	9					GS/JC	St	n/a
26/09/1996	7	28	28	93M7	n/a	Boucher L outlet from boat	S				L, Ch	9			653289	6146103	GS/JC	St	n/a
26/09/1996	7	29	29	93M7	n/a	Beaver lodge 80 m from Boucher L outlet	S				L	9					GS/JC	St	n/a
26/09/1996	7	30	30	93M10	n/a	Upstream limit of Boucher L outlet sample site	Dn	1	1		Ch	9					GS/JC	St	notebook
26/09/1996	7	31	31	93M10	n/a	Downstream limit of Boucher L outlet sample site	Up	1	1		Ch	9					GS/JC	St	30m tape
26/09/1996	7	32	32	93M10	n/a	Example of habitat at Boucher L outlet sample site	Bd	1	1		Ch	9					GS/JC	St	30m tape
26/09/1996	7	33	33	93M10	n/a	Marsh above beaver dam at Boucher L inlet: not surveyed	E	1			L, Ch	9					GS/JC	St	n/a
26/09/1996	7	34	34	93M10	n/a	Beaver dam in Boucher L inlet	E	1			L, Ch	9					GS/JC	St	n/a
26/09/1996	7	35	35	93M10	n/a	Benchmark in Boucher L	E				L	9	653247	6146464			GS/JC	St	n/a
26/09/1996	7	36	36	93M10	n/a	Panoramic (#1) of Boucher L from S end going E to W	NE				L	9					GS/JC	St	n/a
26/09/1996	7	37	37	93M10	n/a	Panoramic (#2) of Boucher L from S end going E to W	N				L	9					GS/JC	Wd	n/a
26/09/1996	8	1	5	93M10	n/a	Panoramic (#3) of Boucher L from S end going E to W	N				L	9					GS/JC	Wd	n/a
26/09/1996	8	2	6	93M10	n/a	Panoramic (#4) of Boucher L from S end going E to W	N				L	9					GS/JC	Wd	n/a
26/09/1996	8	3	7	93M10	n/a	Panoramic (#5) of Boucher L from S end going E to W	N				L	9					GS/JC	Wd	n/a
26/09/1996	8	4	8	93M10	n/a	Panoramic (#6) of Boucher L from S end going E to W	NW				L	9					GS/JC	Wd	n/a
26/09/1996	8	5	9	93M10	n/a	Panoramic (#7) of Boucher L from S end going E to W	NW				L	9					GS/JC	Wd	n/a
26/09/1996	8	6	10	93M10	n/a	Panoramic (#8) of Boucher L from S end going E to W	NW				L	9					GS/JC	Wd	n/a
26/09/1996	8	7	11	93M10	n/a	Panoramic (#1) of Boucher L from N end going W to E	SW				L	9					GS/JC	Wd	n/a
26/09/1996	8	8	12	93M10	n/a	Panoramic (#2) of Boucher L from S end going W to E	S				L	9					GS/JC	Wd	n/a
26/09/1996	8	9	13	93M10	n/a	Panoramic (#3) of Boucher L from S end going W to E	SE				L	9					GS/JC	Wd	n/a
27/09/1996	8	11	15	93L10	n/a	Unnamed L from helicopter	E				WS	9					GS/JC	St	n/a
27/09/1996	8	12	15	93L10	n/a	S end of Unnamed L from helicopter including meandering inlet	E				WS	9					GS/JC	St	n/a

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27/09/1996	8	15	18	93L10	n/a	Gee trap #3 in littoral habitat of Unnamed L	E				L	9					GS/JC	St	Gee trap
27/09/1996	8	16	19	93L10	n/a	Littoral habitat of Unnamed L in which gee trap #4 was placed	S				L	9					GS/JC	St	n/a
27/09/1996	8	17	20	93L10	n/a	Unnamed L outlet including beaver lodge to right. Gee trap #5 placed at edge of dam	N				L	9	647527	6166191			GS/JC	Wd	n/a
27/09/1996	8	18	21	93L10	n/a	Gee trap #4 in Unnamed L	W				L	9					GS/JC	St	Gee trap
27/09/1996	8	19	22	93L10	n/a	View from behind 1m high beaver dam at Unnamed L outlet	S		1		L	9					GS/JC	St	30m tape roll
27/09/1996	8	20	23	93L10	n/a	Second beaver dam 20m below first in Unnamed L outlet	S		1		Ch	9					GS/JC	St	n/a
27/09/1996	8	21	24	93L10	n/a	Third beaver dam below second in Unnamed L outlet	S		1		Ch	9					GS/JC	St	n/a
27/09/1996	8	22	25	93L10	n/a	Fourth beaver dam below third in Unnamed L outlet	S		1		Ch	9					GS/JC	St	30m tape roll
27/09/1996	8	23	26	93L10	n/a	Downstream limit of Unnamed L outlet sample site	Up		1	1	Ch	9					GS/JC	St	30m tape roll
27/09/1996	8	24	27	93L10	n/a	Upstream limit of Unnamed L outlet sample site	Dn		1	1	Ch	9					GS/JC	St	30m tape roll
27/09/1996	8	25	28	93L10	n/a	GS electrofishing in Unnamed L outlet	XS		1	1	Ch	9					GS/JC	St	Person (6'1")
27/09/1996	8	26	29	93L10	n/a	Example of habitat in Unnamed L outlet sample site	Bd		1	1	Ch	9					GS/JC	St	Person (6'1")
27/09/1996	8	27	30	93L10	n/a	Beaver dam in Unnamed L inlet	Up, S		1		Ch, L	9					GS/JC	St	Person and notebook
27/09/1996	8	28	31	93L10	n/a	Benchmark in Unnamed L	E				L	9	651565	6054572			GS/JC	St	n/a
27/09/1996	8	29	32	93L10	n/a	Littoral habitat of Unnamed L in which gee trap #1 was placed	E				L	9					GS/JC	St	n/a
27/09/1996	8	30	33	93L10	n/a	Littoral habitat of Unnamed L in which gee trap #2 was placed	E				L	9					GS/JC	St	n/a
27/09/1996	8	32	35	93L10	n/a	Marshy area of Unnamed L Inlet: inaccessible by boat	S		1		WS, Ch	9					GS/JC	St	n/a