

RECONNAISSANCE INVENTORY OF

WEST JULIAN HOLLAND LAKE

WATERSHED CODE 460-6006-508-005-283-218-502-01

SURVEY DATES : AUGUST 03 - 05, 1996

Prepared for:

MINISTRY OF ENVIRONMENT, LANDS AND PARKS

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1. SUMMARY

West Julian Holland Lake is located in the Morice Forest District, 60 km south-southwest of the town of Smithers. Reconnaissance inventory of the lake was made August 03 - 05, 1996. The lake covers 53.9 surface hectares, is triangular/complex in shape and moderately deep (mean and maximum depths of 5.7 m and 21.3 m). It lies 860 m above sea level and drains via an unnamed creek to Gosnell Creek in the Skeena watershed. Access was achieved by 2WD and 4WD roads to East Julian Holland Lake. From the east lake, West Julian Holland Lake was accessed by Zodiac and a 90 m portage. The closest road is located at the east end of East Julian Holland Lake, 1 km east of the west lake. Bald eagles were seen soaring over the lake and a black bear was observed along the west shore.

During the survey the lake was thermally stratified and dissolved oxygen was depleted in the hypolimnion. The lake is neutral and has very low specific conductance. Nitrogen and phosphorus concentrations indicate oligotrophy and the N : P ratio suggests that phosphorus is likely limiting primary productivity. Chlorophyll *a* concentration in the surface water suggested low phytoplankton standing crop at time of survey.

The West Julian Holland Lake fish community was sampled with two standard experimental multi-mesh gillnets (one floating and one sinking) and five Gee-type minnow traps baited with salmon roe. Two species were captured: cutthroat trout (*Oncorhynchus clarki*) and Dolly Varden (*Salvelinus alpinus*). Cutthroat trout were at moderate abundance and had average population condition factor. The largest captured individual had 315 mm fork length. Dolly Varden were abundant and had low population condition factor. Angling provided high catch per effort of moderate size cutthroat trout.

The lake outlet stream and three inlet channels were examined for fisheries potential and sampled for fish presence by electrofishing where possible. One inlet channel was dry at time of survey. Fish were captured or observed in the watered channels. Beaver dams impound flow in one inlet and in the outlet. All channels surveyed were at low stage and apparently carry much higher flow seasonally. Fair spawning and fair rearing were found in the outlet though both would be improved with higher flow.

Pristine surroundings and spectacular mountain views create moderately high aesthetic value for West Julian Holland Lake. The area north of the lake is to be subjected to extensive timber harvest in 2001. Most of the north shore will border directly on a cutblock. A rough camp found at the west end of the lake was the only sign of human activity at time of survey. Timber harvest adjacent to the lake will improve access to the lake but the size of fish will not attract intensive fishing effort. Low gradient inlet-outlet streams of West Julian Holland Lake should be classified as fish bearing streams. No access management or special angling restrictions are recommended for the lake at this time.

2. INTRODUCTION

This document was prepared to fulfill requirements of Service Contract CSK 2043 between Joseph S. DeGisi and the Province of British Columbia for the term of July 22, 1996 to March 31, 1997. The contract was funded by Forest Renewal BC and administered by the Ministry of Environment, Lands and Parks, Fisheries Branch, Skeena Region.

The report presents the results of a reconnaissance level "Fish and Fish Habitat Inventory" of West Julian Holland Lake 460-6006-508-005-283-218-502-01 performed to the current standards provided by the Resources Inventory Committee (RIC). West Julian Holland Lake is located in the Morice Forest District, 60 km south-southwest of the town of Smithers. A search of Ministry files revealed no previous survey of the lake and its tributaries. In addition to the lake inventory as per the contract terms of reference, inlets and the outlet were surveyed to 500 channel metres from the lake.

The field component of the survey was carried out by Joseph DeGisi (crew leader), Chris Schell and Joe Jazvac (assistants) August 03- 05, 1996. Chris Schell, Joe Jazvac and Jay Leopkey contributed to data compilation. Chris Schell and Joseph DeGisi co-authored this report. Stream cards, photographs, negatives, field notes, lab reports and all other materials associated with this survey were deposited with the Ministry of Environment, Lands and Parks, Fisheries Branch, Skeena Region.

3. DATA ON FILE

Location	<u>√</u>	Dissolved Oxygen Profile	<u>√</u>
Physical Data	<u>√</u>	Temperature Profile	<u>√</u>
Bench Mark	<u>√</u>	Netting Record	<u>√</u>
Terrain Features	<u>√</u>	Lake Catch Summary	<u>√</u>
Access	<u>√</u>	Fisheries Comments	<u>√</u>
Resorts & Campsites	<u>√</u>	Individual Fish Data	<u>√</u>
Other Developments	<u>√</u>	Fish Preserved	<u>—</u>
Obstructions and Pollutions	<u>√</u>	Stomach Analysis	<u>—</u>
Special Restrictions	<u>√</u>	Scale Reading	<u>√</u>
Aquatic Plants	<u>√</u>	History of Previous Surveys	<u>√</u>
Wildlife Observations	<u>√</u>	Location of Inventory Sites	<u>√</u>
Miscellaneous Comments	<u>√</u>	Photograph Directory	<u>√</u>
Lake Drainage	<u>√</u>	Appendices	<u>√</u>
Inlets/Outlets	<u>√</u>	Bathymetric Reduction	<u>√</u>
Water Chemistry	<u>√</u>	Contour Map	<u>√</u>

4. GEOGRAPHIC AND MORPHOLOGIC INFORMATION**4.1 Location**

Survey Dates.....	August 03-05, 1996
Location	60 km south-southwest of the town of Smithers
Elevation	860 m
Drainage	Unnamed C → Shea C → Gosnell C → Morice R → Bulkley R → Skeena R
Watershed Code.....	460-6006-508-005-283-218-502-01
Latitude / Longitude.....	54° 16' 04'' / 127° 27' 36''
U.T.M.....	09.600306.6014215 (Watershed Atlas)
Biogeoclimatic Zone	SBS-mc2
N.T.S. Map.....	93 L/06 (1:50,000 scale)
TRIM Map.....	93L. 023 (1:20,000 scale)
Forest Region.....	Prince Rupert
Forest District	Morice
Management Unit.....	06-09
Native Land Claims.....	Wet'suwet'en Nation; Sekanni Carrier Nation

Figure 1. West Julian Holland Lake and surrounding features, as depicted on NTS mapsheet 93 L/06 (1:50,000 scale). Road to east lake is not mapped. Inset map shows the location within the province of British Columbia.

4.2 Physical Data

Elevation	860 m	Elevation Source	NTS Mapsheet
Water Surface Area	539 223 m ²	Area Above 6 m Contour	322 770 m ²
Lake Drainage Area	9.56 km ²	Flushing Time	479 days
Shoreline Perimeter	6 163 m	Volume	2 977 166 m ³
Number of Islands	0	Perimeter of Islands	N/A
Maximum Depth	21.3 m	Mean Depth	5.7 m
Secchi Depth	7.5 m	Filterable Residue (T.D.S.)...	56 mg/L
Sounding Device	Lowrance X15A		

4.3 Benchmark

The benchmark was established in 50 cm dbh subalpine fir 11 m from shore at the east end of the lake; 8 m north of the inlet from East Julian Holland Lake. An iron spike was placed in an orange circle painted on the tree trunk, 2.05 m above the current lake level. The location of the benchmark is shown in Figure 2. The high water mark was located 0.1 m above the current lake level.

4.4 Prior Surveys

A search of Skeena Region inventory files yielded no records for West Julian Holland Lake, its outlet or inlets.

4.5 Lake Drainage

Quantitative characteristics of the stream surveys and fish sampling can be found on the stream survey forms in Appendix B and in Table 1. Numbering of channels (C1, C2 etc.) in this section corresponds to labels on Figure 2 and other figures and tables in this report.

Four channels were examined.

- C1. Unnamed Creek WC 460-6006-508-005-283-218-502, inlet to the east end of West Julian Holland Lake at UTM 09.601975.6013833 (NAD27). See Photograph 8. Order 1, magnitude 1, drainage area 2.02 km², proposed classification S4. This 100 m channel connects East and West Julian Holland Lakes. Average gradient is 1.5 % and bed material is dominated by cobble and large gravel. Poor spawning substrate was found and rearing potential was fair though increased flow would improve both. Discharge at time of survey was estimated at 0.002 m³/s. Electrofishing for 30 seconds captured 1 juvenile salmonid.
- C2. Unnamed Creek WC 460-6006-508-005-283-218-502-088, inlet to the northernmost bay on the west shore of West Julian Holland Lake at UTM 09.600300.6014233 (NAD27). See Photograph 6. Order 1, magnitude 1, drainage area 2.23 km², proposed classification, S6. Channel was dry at time of survey. Bed material includes fines, gravel, and cobble. Gradient is 4.5 %. Channel size and substrate indicates flow volume may be significant at times.
- C3. Unnamed Creek WC 460-6006-508-005-283-218-502, outlet from the northernmost bay on the west shore of West Julian Holland Lake at UTM 09.600284.6014225 (NAD27). See

Photograph 7. Proposed classification S3. An old corduroy style bridge divides lake and outlet. This barrier is likely passable except during low stage. Flow appears to be impounded further downstream though the cause (likely a beaver dam) was not located and is beyond 500 channel metres from the lake. The channel bears mostly pools over a substrate of gravel and fines. Rearing potential is fair due to the low flow. Spawning would be poor in the fall but fair to good given early season flows. Spawning for Dolly Varden would be good in this channel. Electrofishing for 541 seconds captured 2 juvenile cutthroat trout.

- C4. Unnamed Creek WC 460-6006-508-005-283-218-502-231, inlet to the southernmost bay on the west shore of West Julian Holland Lake at UTM 09.600450.6013584 (NAD27). (See Photograph 5). Order 1, magnitude 1, drainage area 1.90 km², proposed classification S4. This channel drains a beaver pond and flows into a second beaver pond adjacent to lake. Two dams form barriers to fish passage except at high flows. The channel bears mostly pools over cobble, gravel and fines. Water temperature was 16.5°C. Fish were observed in the pond adjacent to the lake though electrofishing for 173 seconds captured no fish.

4.6 Terrain and Vegetation

4.6.1 Immediate Shore

Shoreline substrate is gravel and cobble covered by a thin layer of fines in sheltered locations. Sedges, alders, willow, and stunted conifers vegetate the shoreline, with mature forest beginning 3 m to 7 m from the shore. Sweepers are present along much of the shoreline, although not in large numbers. There are wetlands along the bays at the west end of the lake. The bay at the north end of the west shore is rimmed by floating bog vegetation including sundew plants.

4.6.2 Surrounding Country

The lake is located in the Babine variant of the Moist Cool subzone of the Sub-Boreal Spruce biogeoclimatic zone. The surrounding country consists of low rolling hills, forested by spruce, subalpine fir, and lodgepole pine. There are rock outcrops on the hills west of the lake. The glaciated peaks of the Howson Range 15 km to the northwest are visible from most vantage points on the lake surface.

5. ACCESS, DEVELOPMENTS AND LAND USE

5.1 Access

Access to the Julian Holland Lakes was by 2WD and 4WD logging roads to the shore of East Julian Holland Lake. Road travel from Houston proceeded on the following route. Odometer distances are cumulative from Houston. Kilometre 0.0 is at point of exit from Highway 16.

1. At Houston, exit Highway 16 and proceed south on the Morice Forest Service Road.
2. Turn right at odometer 26.8 km. There is a sign indicating the way to 'Nanika Kidprice'.
3. At odometer 27.8 km, the road passes the Owen Flats Forest Recreation Site.
4. Turn right onto the Morice West Forest Service Road, 500 m past Lamprey Creek, at odometer 44.7 km. The road is narrower beyond this point.
5. Turn left at odometer 74.3 km (just past the 74 km road marker). This road is very rough with large water bars (4WD only).
6. The shore of East Julian Holland Lake is reached at odometer 76.4 km.
7. The East Lake can be crossed by boat to the west bay. There, a 90 m trail located on the south side of the bay provides foot access to West Julian Holland Lake.

5.2 Development and Land Use

5.2.1 Resorts and Campsites

The survey crew camped at a site located at the east end of West Julian Holland Lake, beside the stream connecting the east and west lakes. An undeveloped campsite was observed on the large point at the west end of the lake. There were no cabins or developed campsites on the lake.

5.2.2 Mining Claims

No evidence of mineral exploration or mining was observed at the lake. Omineca Mining Division four-post registration files for the locale showed no claims. No placer staking is allowed in this area of the province.

5.2.3 Timber Harvest

The lake lies within the Northwood Pulp and Timber operating area, of the Morice TSA. The closest existing cutblock to the lake lies 1.0 km to the east on the south shore of East Julian Holland Lake. The block was logged in 1990. No forest harvest was visible from any vantage point on the surface of West Julian Holland Lake. The cutblock on the east shore of East Julian Holland Lake is visible from the trail that provides access to West Julian Holland Lake. Seven cutblocks within 2 km of West Julian Holland Lake are planned for harvest in 2000. The largest of these runs adjacent to the north shore of the lake for 1.5 km. Many of the planned cutblocks will be visible from the lake.

5.2.4 Waste Permits

A search of the provincial waste management database (WASTE) showed no active effluent permits in the watershed of West Julian Holland Lake.

5.2.5 Water Permits

A search of Skeena Region water permit files yielded no records for West Julian Holland Lake.

5.2.6 Obstructions and Pollutions

What appears to be a very old corduroy type bridge forms the border between the lake and the outlet stream. Axe and saw cut logs were found under shrub overgrowth. No evidence of old trails or roads was found nearby. Very old beaver dams overgrown with sedges impound the flow further downstream of the lake. None of the barriers on the outlet would impede fish passage. No waterfalls or cascades were found along any of the channels.

5.2.7 Recreation Resource Inventory

The latest Forest Service Recreation Resource Inventory for the Morice Forest District was completed over several years. Current IGDS-format coding for the polygon which includes West Julian Holland Lake is:

M3A1T1
aciC1
2

ROS status is thus "Semi-Primitive Non-Motorized".

5.2.8 Special Regulations and Restrictions

None known; none listed in the BC Freshwater Angling Regulations synopsis for 1996.

5.2.9 Comments

Pristine surroundings and spectacular views of the Howson Range to the northwest create moderately high aesthetic value for the lake. Extensive planned logging, adjacent to the lake will impact aesthetics significantly by 2000. Abundant cutthroat trout provide high angling catch per effort, although fish captured were not particularly large.

6. FISH POPULATION SAMPLING

Details of fish population sampling in West Julian Holland Lake and its inlets and outlet are given in Table 1. The raw data were recorded on RIC standard “Fish Collection Method Information Form” and “Fish Collection Data Form” which are reproduced in Appendix C. All landed catch was sampled for appropriate parameters.

Table 1. Fish sampling effort, catch and catch per effort for all methods used at West Julian Holland Lake and its inlet-outlet streams, August 03 - 05, 1996. **Water Body** gives the location where the gear was fished, where Lake = West Julian Holland Lake; and C1, C2 etc. are streams numbered as in Section 4.5. **Date** is the date of set for gear fished overnight. See appendix C for set and haul times. **Capture Effort** gives the time in minutes for which the gear was deployed. **Depth** unit is metres. GN(S) and GN(F) = MOE / RIC standard experimental sinking and floating gillnets, length 91.2 m and depth 2.4 m with panels (in order) of 25, 76, 51, 89, 38, and 64 mm mesh. The sinking net set was made with the smallest mesh close to shore. See Figures 2 and 3 for exact set locations and orientation. MT = Gee-type minnow trap baited with salmon roe; EL = electrofishing; VO = visual observation. **Number Sampled** refers to the number of fish measured for length (non-salmonids) or all parameters (salmonids). All salmonid catch was measured for length at least. **CPE** unit is catch per hour. Species codes: **CT** = cutthroat trout, **DV** = Dolly Varden.

Water Body	Capture Method	Site or Trap #	Date	Capture Effort	Depth	Catch (Number Sampled) [CPE]		
						CT		DV
Lake	MT	1	08/03/96	1404	1.0	1	[0.04]	
Lake	MT	2	08/03/96	1399	2.0			
Lake	MT	3	08/03/96	1399	0.5			
Lake	MT	4	08/03/96	1580	0.5			
Lake	MT	5	08/03/96	1580	0.4			
Lake	DN	6	08/03/96	15	0.3	1	[4.]	
Lake	GN (S)	7	08/03/96	545	0 to 12.0	27	(28) [2.97]	43 (43) [4.73]
Lake	GN (F)	8	08/03/96	545	0 to 2.4	32	(32) [3.52]	2 (2) [0.22]
Lake	AG	9	08/03/96	90	1.0	4	[2.67]	
C1	0	10	08/04/96	0.5	-	1	[120.]	
C3	0	12	08/04/96	9.0	-	2	[13.31]	
C4	0	13	08/04/96	2.9	-			

6.1 Fish Species Composition

Two species of fish were captured in West Julian Holland Lake and its watershed: cutthroat trout (*Oncorhynchus clarki*), and Dolly Varden (*Salvelinus alpinus*). Special status in MOE Region 6 is not currently attached to either of these species. The presence of cutthroat trout and Dolly Varden in West Julian Holland Lake requires that its low-gradient inlets and outlet be considered fish-bearing streams under the Forest Practices Code.

6.2 Relative Abundance

Gillnet catch per effort was 3.52 fish per net hour for cutthroat trout and 4.73 fish per net-hr for Dolly Varden. This indicating intermediate population density for cutthroat trout and fairly high density for Dolly Varden relative to other small lake populations (Table 1).

6.3 Size, Age, and Growth

Characteristics of the length distributions of fish captured by gillnet in West Julian Holland Lake are shown in Table 2, Figures 5 and 8. Due to gear selectivity, the samples are probably not representative of the true length structure of West Julian Holland Lake fish populations.

Table 2. Descriptive statistics for length distributions of cutthroat trout and Dolly Varden captured in West Julian Holland Lake, August 03 - 05, 1996. Fork lengths are given in mm. **CT** = cutthroat trout, **DV** = Dolly Varden.

Parameter	CT	DV
Mean	243	194
Standard Error	6.6	4.5
Median	257	193
Mode	218	185
Standard Deviation	51.1	30.5
Range	194	142
Minimum	121	124
Maximum	315	266
Count	60	45

6.3.1 Cutthroat Trout

Cutthroat trout growth in West Julian Holland Lake does not conform very well to the Von Bertalanffy model (Figure 8). This is likely due to small sample sizes for older age classes but may also be due to early ages following a different growth trajectory, or the growth model is inappropriate for this population

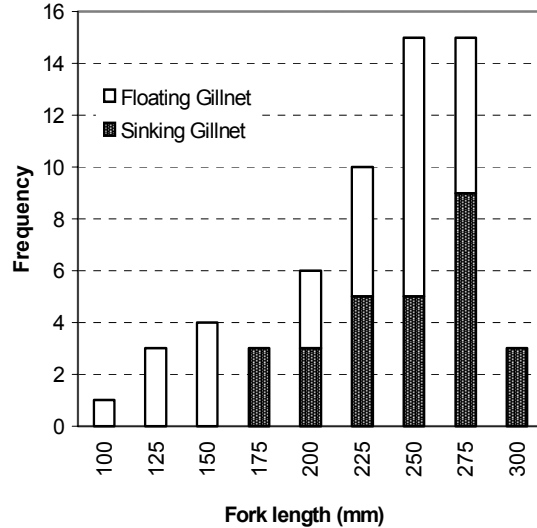


Figure 5. Length frequency distribution of cutthroat trout caught by sinking gillnet (shaded bar areas) and floating gillnet (open bar areas) at West Julian Holland Lake, August 03 - 05, 1996. The x-axis labels are the lower boundaries of length classes.

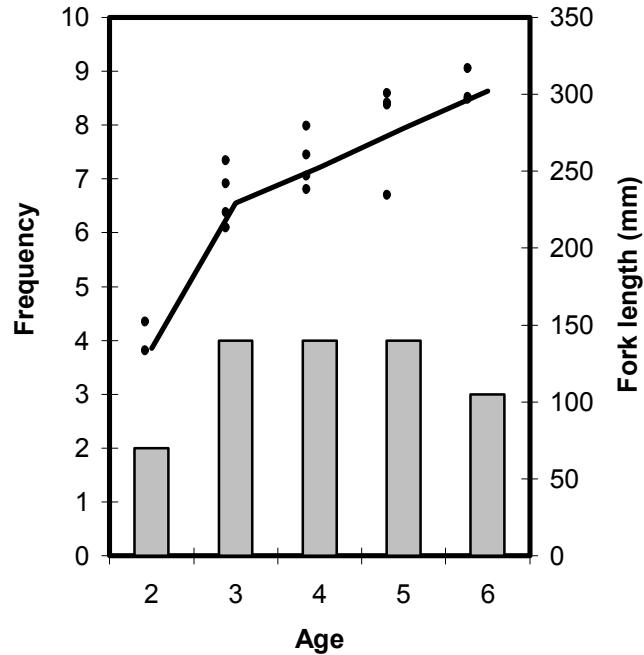


Figure 6. Age frequency histogram and length-at-age for cutthroat trout captured at West Julian Holland Lake and its inlets and outlet, August 03 - 05, 1996. The solid line shows mean fork length-at-age, while the filled circles indicate lengths-at-age for individual fish.

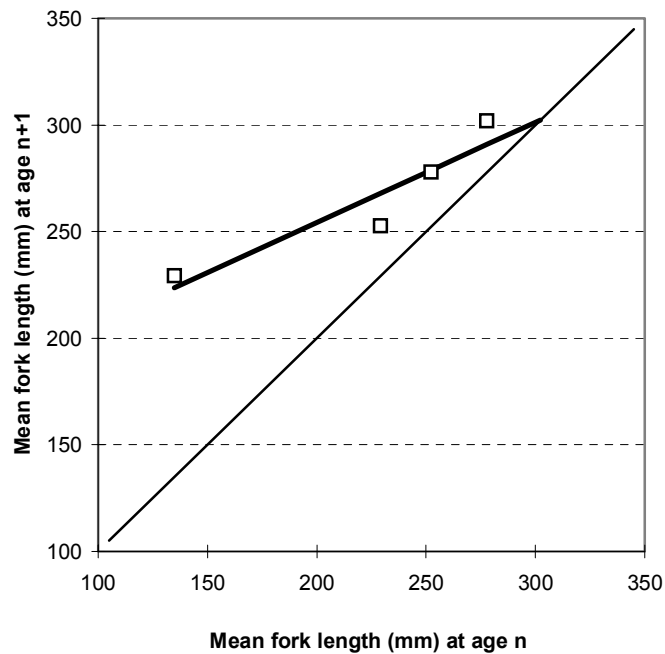


Figure 7. Ford-Walford plot for cutthroat trout captured in West Julian Holland Lake. Lengths-at-age are mean values. The heavy line shows the least-squares regression of {length-at-age n+1} on {length-at-age n}. Estimated terminal length (L_{∞}) occurs at the intersection of the regression line with the diagonal reference line; the parameters from the regression give $k = 0.469$ and $L_{\infty} = 302$ mm. The fit is generally poor, probably due to small sample size for older age classes.

6.3.2 Dolly Varden

Dolly Varden growth in West Julian Holland Lake does not conform well to the Von Bertalanffy model (Figure 11). This is likely due to small sample size but may also be due to early ages following a different growth trajectory, or the growth model is inappropriate for this population

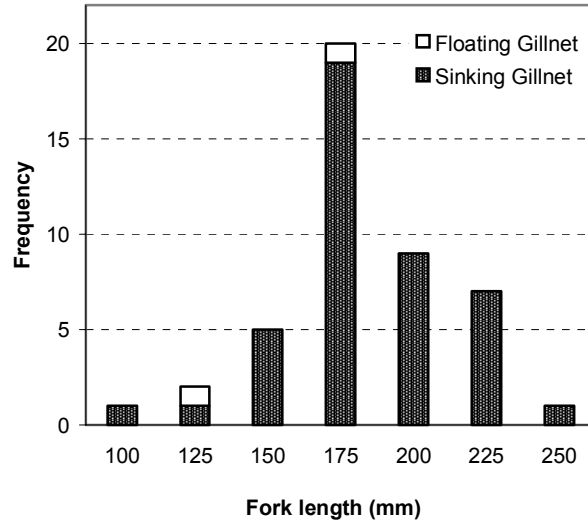


Figure 8. Length frequency distribution of Dolly Varden caught by sinking gillnet (shaded bar areas) and floating gillnet (open bar areas) at West Julian Holland Lake, August 03 - 05, 1996. The x-axis labels are the lower boundaries of length classes.

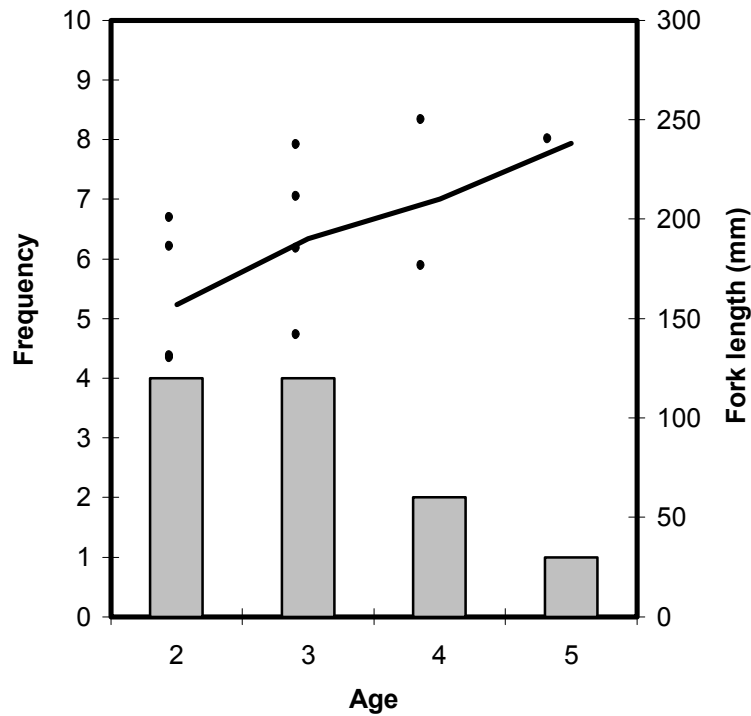


Figure 9. Age frequency histogram and length-at-age for Dolly Varden captured at West Julian Holland Lake and its inlets and outlet, August 03 - 05, 1996. The solid line shows mean fork length-at-age, while the filled circles indicate lengths-at-age for individual fish.

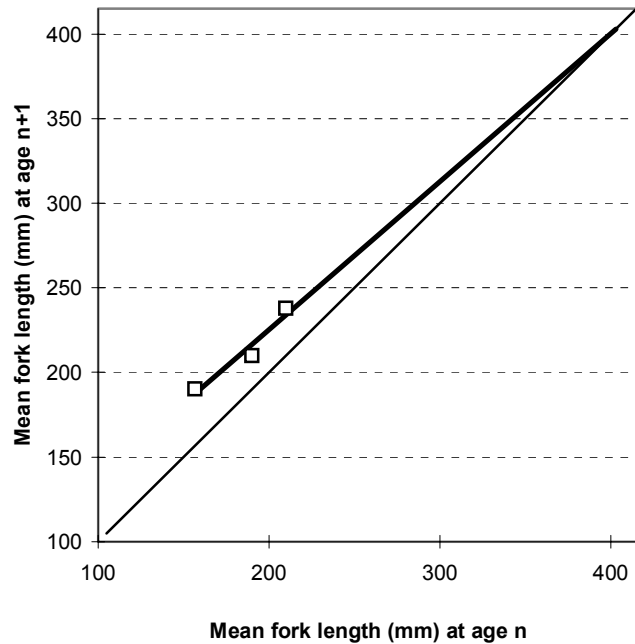


Figure 10. Ford-Walford plot for Dolly Varden captured in West Julian Holland Lake. Lengths-at-age are mean values. The heavy line shows the least-squares regression of {length-at-age $n+1$ } on {length-at-age n }. The first two points were excluded from the fit. Estimated terminal length (L_{∞}) occurs at the intersection of the regression line with the diagonal reference line; the parameters from the regression give $k = 0.876$ and $L_{\infty} = 402$ mm. The fit is generally poor, probably due to small sample sizes.

6.4 Sexual Maturity and Condition

6.4.1 Cutthroat Trout

Sample sizes are small, but cutthroat trout sexual maturity appears to occur by age 3 or 4 for females and age 4 for males in West Julian Holland Lake. The population condition factor is moderate, relative to other small lake cutthroat trout populations in Skeena region during late summer (Figure 11). Many cutthroat were infected with parasites, including nematodes and flatworms.

Table 3. Sexual maturity of West Julian Holland Lake cutthroat trout, by age. For the total catch, the ratio of males to females was 0.778 : 1.

Age	Females		Males	
	number	% mature	number	% mature
2	0	-	1	0
3	4	75	0	-
4	1	100	3	100
5	3	67	1	100
6	1	100	2	100
TOTAL	9	85	7	75

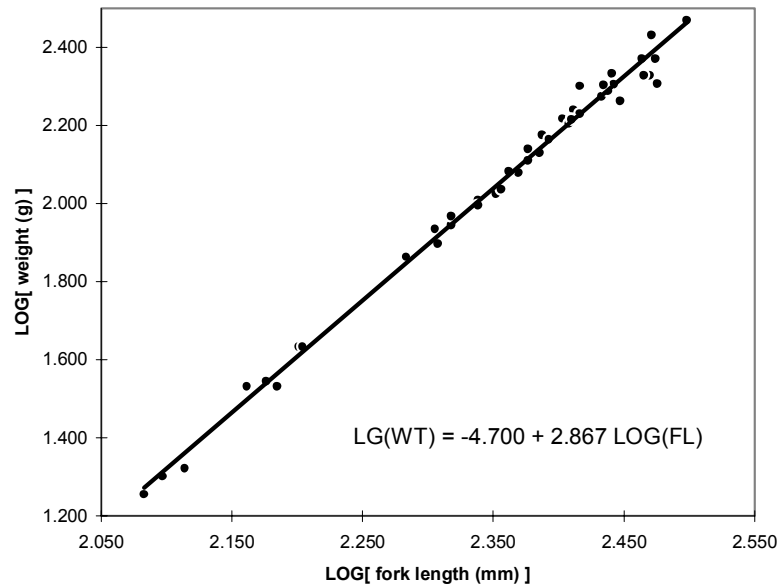


Figure 11. Estimated length - weight relationship for West Julian Holland Lake cutthroat trout captured by gillnet. Both length and weight are \log_{10} transformed. The GM regression equation is shown; the resulting estimate of Fulton's condition factor is thus $10^{-4.700} \cdot 10^5 = 2.00$.

6.4.2 Dolly Varden

Sample sizes were too small to estimate age of maturity for Dolly Varden. The ratio of males to females was 0.57 : 1. The population condition factor is very low, relative to other small lake Dolly Varden populations in Skeena region during late summer (Figure 12).

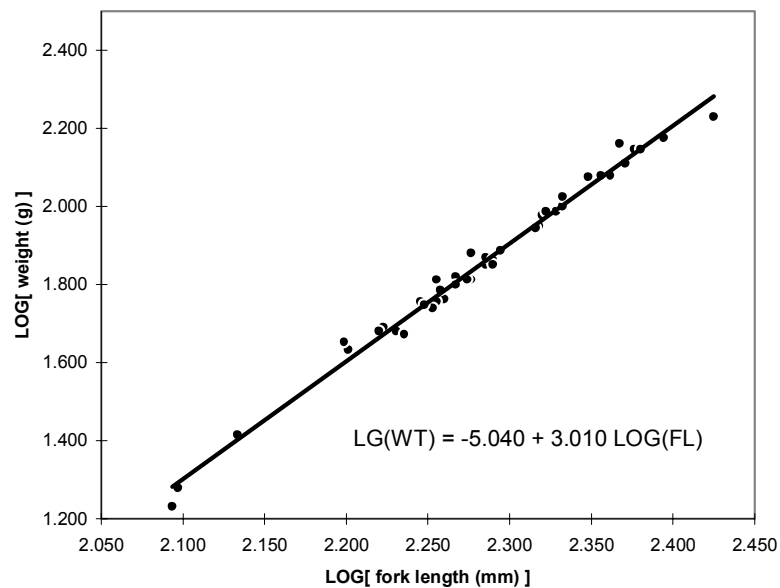


Figure 12. Estimated length - weight relationship for West Julian Holland Lake Dolly Varden captured by gillnet. Both length and weight are \log_{10} transformed. The GM regression equation is shown; the resulting estimate of Fulton's condition factor is thus $10^{-5.040} \cdot 10^5 = 0.912$.

7. LIMNOLOGICAL SAMPLING

Limnological sampling was conducted at midday on August 05, 1996 at the West Julian Holland Lake limnology station labelled on Figure 2. Weather during the survey was clear. Wind and lake surface were calm. Raw data and associated information were recorded on the RIC standard "Lake Biophysical Data Form" reproduced in Appendix D. Water samples were collected at 0.0 m, 8.0 m and 19.0 m depths, apportioned into aliquots for general chemistry and metals analysis, and shipped to Zenon Laboratories on ice for processing. Zenon's records show that the West Julian Holland Lake samples were received on August 09, 1996.

7.1 Stratification

The oxygen - temperature profile of West Julian Holland Lake on August 05, 1996 is shown in Figure 13. The lake was thermally stratified at time of survey. Dissolved oxygen was depleted in the hypolimnetic water but not to anoxia.

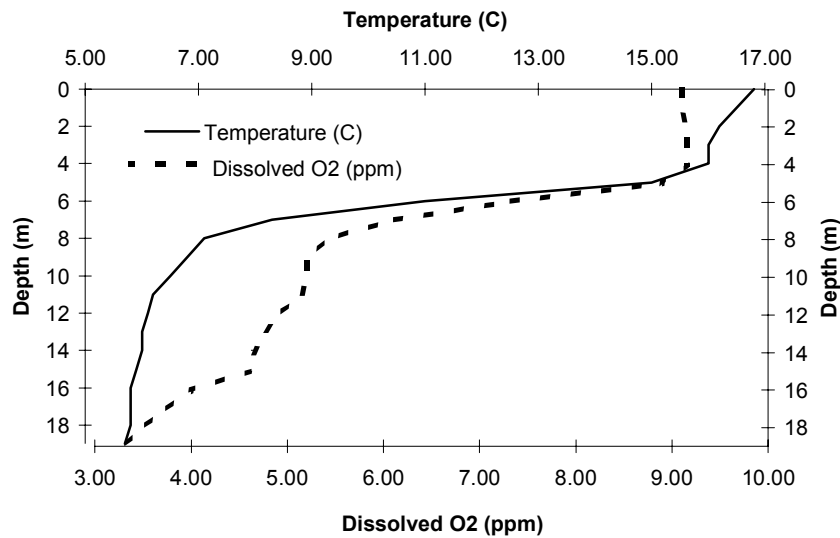


Figure 13. Temperature and dissolved O₂ profiles for West Julian Holland Lake on August 05, 1996. The sampling device was a YSI 57 temperature/oxygen meter. Sample interval was 1.0 m.

Table 4. Water chemistry parameters estimated by Zenon Laboratories. Samples were collected at the limnology station labelled in Figure 2. Each sample was collected by a single cast of a 3.2 L non-metallic Van Dorn bottle on August 05, 1996 and received by Zenon on August 09, 1996. MDC = minimum detectable concentration for the analytic method.

Parameter	Shallow	Thermocline	Deep	Unit	MDC	Method
Time of Day	13:20	13:15	13:00	h	-	-
Depth	0.0	8.0	19.0	m	-	-
pH	7.2	6.7	6.6	pH	0.1	Automated pH Meter
Specific Conductance	26	27	27	uS/cm	1	Cond.Meter Siebold
Residue Filterable 1.0u (TDS)	56	44	40	mg/L	4	Grav; Subsamp Buch 105C
Alkalinity Phen. 8.3	< 0.5	< 0.5	< 0.5	mg/L	0.5	Automated Electrometer
Alkalinity Total 4.5	12.5	12.9	13	mg/L	0.5	Automated Electrometer
Carbonate	< 0.5	< 0.5	< 0.5	mg/L		Calculated Result
Bicarbonate	15.2	15.7	15.8	mg/L		Calculated Result
Hydroxide	< 0.5	< 0.5	< 0.5	mg/L		Calculated Result
Organic Nitrogen - Total	0.17	0.14	0.37	mg/L		Calculated Result
Total Kjeldahl Nitrogen	0.18	0.15	0.38	mg/L	0.04	HgSO ₄ Dig.Auto.Colour.
Total Nitrogen	0.18	0.15	0.38	mg/L		Calculated Result
Ammonia Nitrogen	0.009	0.006	0.01	mg/L	0.005	Berthelot Reaction
Nitrate+Nitrite (N)	< 0.02	< 0.02	< 0.02	mg/L	0.02	Auto. Cadmium Reduction
Nitrate Nitrogen Dissolved	< 0.02	< 0.02	< 0.02	mg/L		Calculated Result
Nitrite Nitrogen	< 0.005	< 0.005	< 0.005	mg/L	0.005	Auto. Diazotization
Phosphorus Total Dissolved	< 0.003	< 0.003	0.004	mg/L	0.003	Dig.Auto.Ascorbic Acid
Phosphorus - Total	< 0.003	0.006	0.008	mg/L	0.003	Pres.Dig.Auto.Ascorbic A

7.2 Water Chemistry

Results of the general chemistry and metals analyses are given in Table 4 and Table 6. Lake water was clear at time of survey. Secchi depth was 7.5 m. West Julian Holland Lake is neutral with very low specific conductance and filterable residue. Phosphorus and nitrogen concentrations imply oligotrophy and the estimated N : P ratio (Table 5) was greater than 15 : 1, indicating phosphorus is likely limiting primary productivity. Chlorophyll *a* concentration in the surface water suggested low phytoplankton standing crop at time of survey.

Table 5. Estimated nitrogen : phosphorus ratio, and chlorophyll *a* concentration for surface water samples from West Julian Holland Lake. All analyses were performed by Zenon Laboratories, except calculation of ratio. Suction was used to draw 1.0 L of surface water through a 0.45 μ membrane filter which was desiccated immediately and shipped on ice to Zenon Laboratories for chlorophyll *a* extraction.

Parameter	Value	Unit	MDC	Method
Chlorophyll <i>a</i>	1.3	ug/L	0.5	Spectrophotometer
Nitrogen - Total	0.18	mg/L		Calculated result
Phosphorus - Total	< 0.003	mg/L	0.003	Pres. Dig. Auto Ascorbic Acid
N : P RATIO	> 60 : 1			Calculated result (total N / total P)

Table 6. Metals concentrations estimated by Zenon Laboratories. Sample collection is described in the caption to Table 4. All metals aliquots were fixed immediately after collection with 1 ml HNO₃ and subjected to HNO₃ digestion by Zenon. Analysis was performed using a Jarrell-Ash Model 61E (inductively coupled argon plasma analysis). MDC = minimum detectable concentration for the analytic method.

Parameter	Shallow	Thermocline	Deep	Unit	MDC	Method
Time of Day	13:20	13:15	13:00	h	-	-
Depth	0.0	8.0	19.0	m	-	-
Silver	< 0.03	< 0.03	< 0.03	mg/L	0.03	ICAP 61E
Aluminum	< 0.06	< 0.06	0.07	mg/L	0.06	ICAP 61E
Arsenic	< 0.04	< 0.04	< 0.04	mg/L	0.04	ICAP 61E
Boron	< 0.04	< 0.04	< 0.04	mg/L	0.04	ICAP 61E
Barium	0.002	0.003	0.003	mg/L	0.001	ICAP 61E
Beryllium	< 0.001	< 0.001	< 0.001	mg/L	0.001	ICAP 61E
Bismuth	< 0.02	< 0.02	< 0.02	mg/L	0.02	ICAP 61E
Calcium	3.59	3.53	3.59	mg/L	0.05	ICAP 61E
Cadmium	< 0.002	< 0.002	< 0.002	mg/L	0.002	ICAP 61E
Cobalt	< 0.004	< 0.004	< 0.004	mg/L	0.004	ICAP 61E
Chromium	< 0.002	0.003	< 0.002	mg/L	0.002	ICAP 61E
Copper	< 0.002	< 0.002	< 0.002	mg/L	0.002	ICAP 61E
Iron	< 0.05	0.08	0.18	mg/L	0.05	ICAP 61E
Potassium	0.4	0.6	< 0.4	mg/L	0.4	ICAP 61E
Magnesium	0.62	0.63	0.63	mg/L	0.02	ICAP 61E
Manganese	0.004	0.006	0.042	mg/L	0.002	ICAP 61E
Molybdenum	< 0.004	< 0.004	< 0.004	mg/L	0.004	ICAP 61E
Sodium	1.3	1.3	1.3	mg/L	0.4	ICAP 61E
Nickel	< 0.01	< 0.01	< 0.01	mg/L	0.01	ICAP 61E
Phosphorus	< 0.04	< 0.04	< 0.04	mg/L	0.04	ICAP 61E
Lead	< 0.03	0.03	< 0.03	mg/L	0.03	ICAP 61E
Sulphur	0.1	0.1	0.2	mg/L	0.1	ICAP 61E
Antimony	< 0.02	< 0.02	< 0.02	mg/L	0.02	ICAP 61E
Selenium	< 0.03	< 0.03	< 0.03	mg/L	0.03	ICAP 61E
Silicon	1.8	2	2.2	mg/L	0.8	ICAP 61E
Tin	< 0.02	< 0.02	< 0.02	mg/L	0.02	ICAP 61E
Strontium	0.015	0.014	0.014	mg/L	0.001	ICAP 61E
Tellurium	< 0.02	< 0.02	< 0.02	mg/L	0.02	ICAP 61E
Titanium	< 0.003	< 0.003	< 0.003	mg/L	0.003	ICAP 61E
Thallium	< 0.03	< 0.03	< 0.03	mg/L	0.03	ICAP 61E
Vanadium	< 0.003	< 0.003	< 0.003	mg/L	0.003	ICAP 61E
Zinc	< 0.01	< 0.01	0.02	mg/L	0.01	ICAP 61E
Zirconium	< 0.003	< 0.003	< 0.003	mg/L	0.003	ICAP 61E

8. OTHER FLORA AND FAUNA

8.1 Aquatic Plants

Greater than 95 % of the lake surface is open water. Emergent sedges grow near the shoreline. *Potamogeton richardsonii*, *Nuphar polysepalum*, and to a lesser extent *Hippuris vulgaris*, are common in bays and shallow areas of the lake. *Equisetum fluviatile* and emergent sedges grow near the shore in bays.

8.2 Zooplankton

The West Julian Holland Lake zooplankton community was numerically dominated by small cyclopoid and calanoid copepods. Macrozooplankton such as amphipods and chaoborids were not present in the plankton. The zooplankton taxonomic composition and size structure was suggestive of intense planktivory by the lake's cutthroat trout and Dolly Varden.

Table 7. Zooplankton collected by horizontal tow of a 150 μ mesh conical plankton net, West Julian Holland Lake offshore, 1345 h on August 05, 1996. Net mouth diameter was 30 cm and net length was 1 m. Tow duration was 2.5 minutes, at velocity of 0.4 m/sec and depth between 0 m and 2 m.

Taxa	No. / L	Max (mm)	Mode (mm)
<i>Eubosmina</i> sp.	1.7	0.8	0.7
Calanoida	6.4	1.3	0.9
Cyclopoida	8.6	0.8	0.6
Nauplii	0.9	-	-

8.3 Waterfowl and Other Fauna

Osprey, red-necked grebes and common loons were seen around the lake during the survey. A black bear was seen on the west shore and moose sign was abundant in wetlands. No molluscs were found during the survey.

8.4 Summary of Rare and Endangered Species

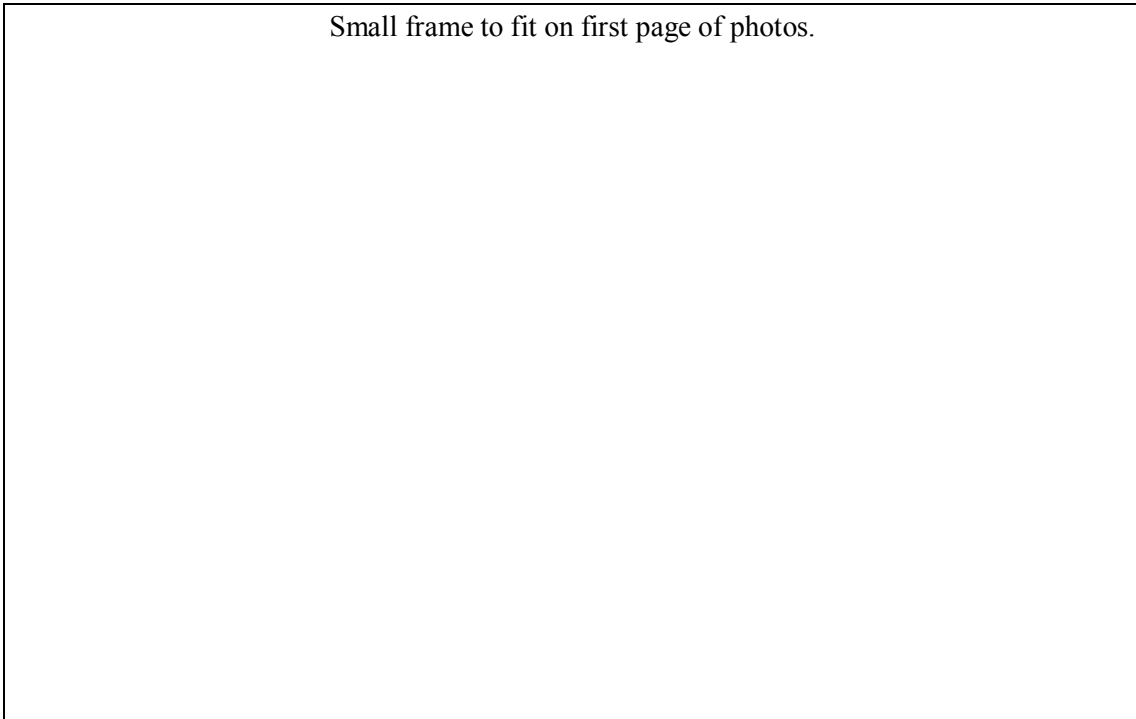
Bald eagles were seen soaring over the lake by the survey crew. No bull trout, tailed frogs or harlequin ducks were observed.

9. MANAGEMENT COMMENTS

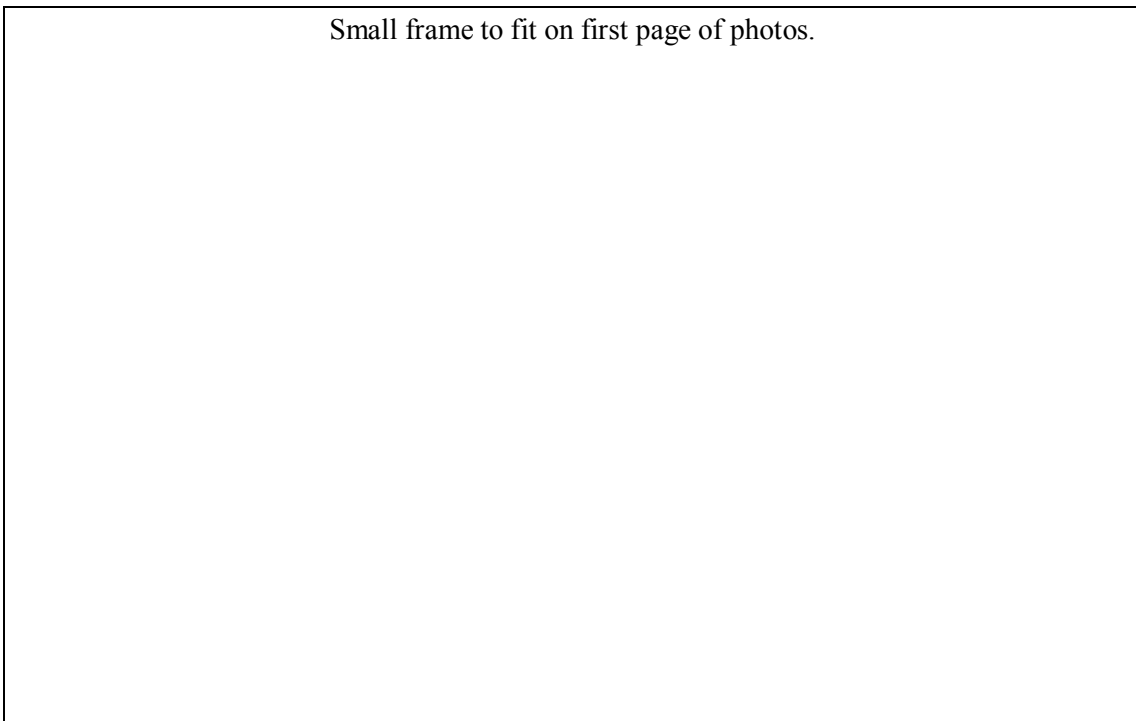
Pristine surroundings and spectacular mountain views create moderately high aesthetic value for West Julian Holland Lake. The area north of the lake is to be subjected to extensive timber harvest in 2001. Most of the north shore will border directly on a cutblock. A rough camp found at the west end of the lake was the only sign of human activity at time of survey.

West Julian Holland Lake cutthroat trout are moderately abundant and in average condition. The largest individual captured had a fork length of 315 mm. Angling provided a high catch per effort for moderately sized fish. Dolly Varden are in high abundance but in poor condition overall. Timber harvest adjacent to the lake will improve access but the size of the fish will likely not attract intensive fishing effort. The low gradient inlet and outlet streams of West Julian Holland Lake should be classified as fish bearing streams. No access management or special angling restrictions are recommended for the lake at this time.

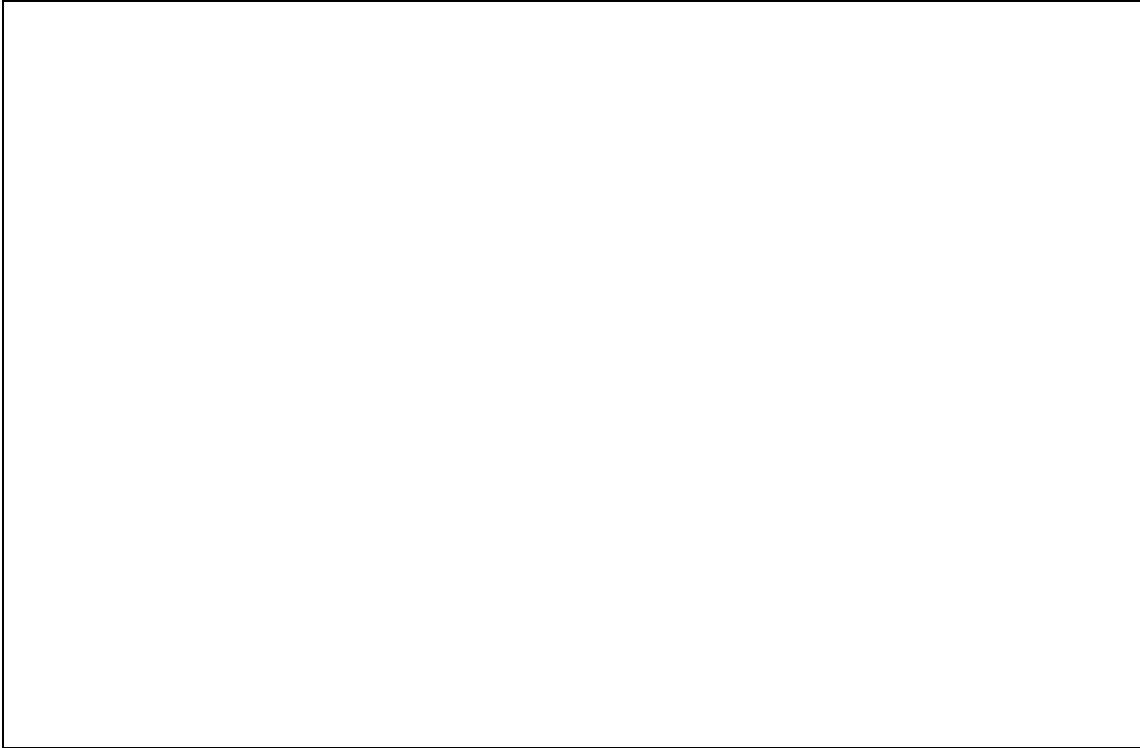
10. PHOTOGRAPHS



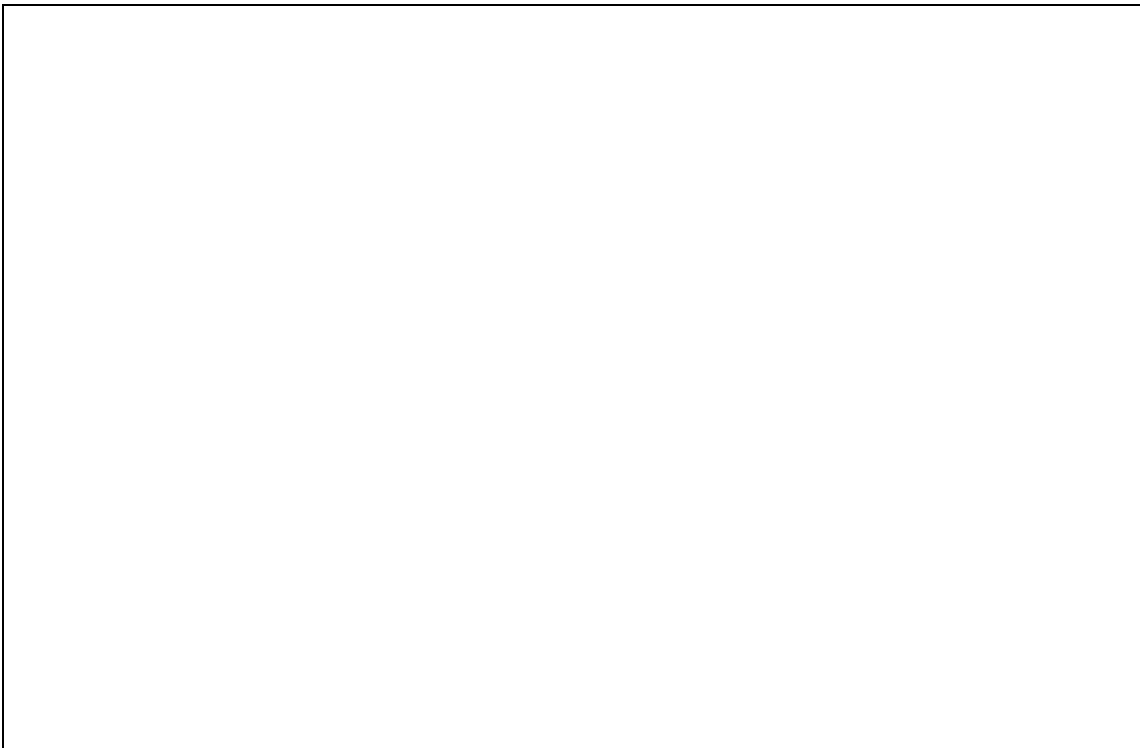
Photograph 1. View of Howson Group, looking northwest from West Julian Holland Lake.



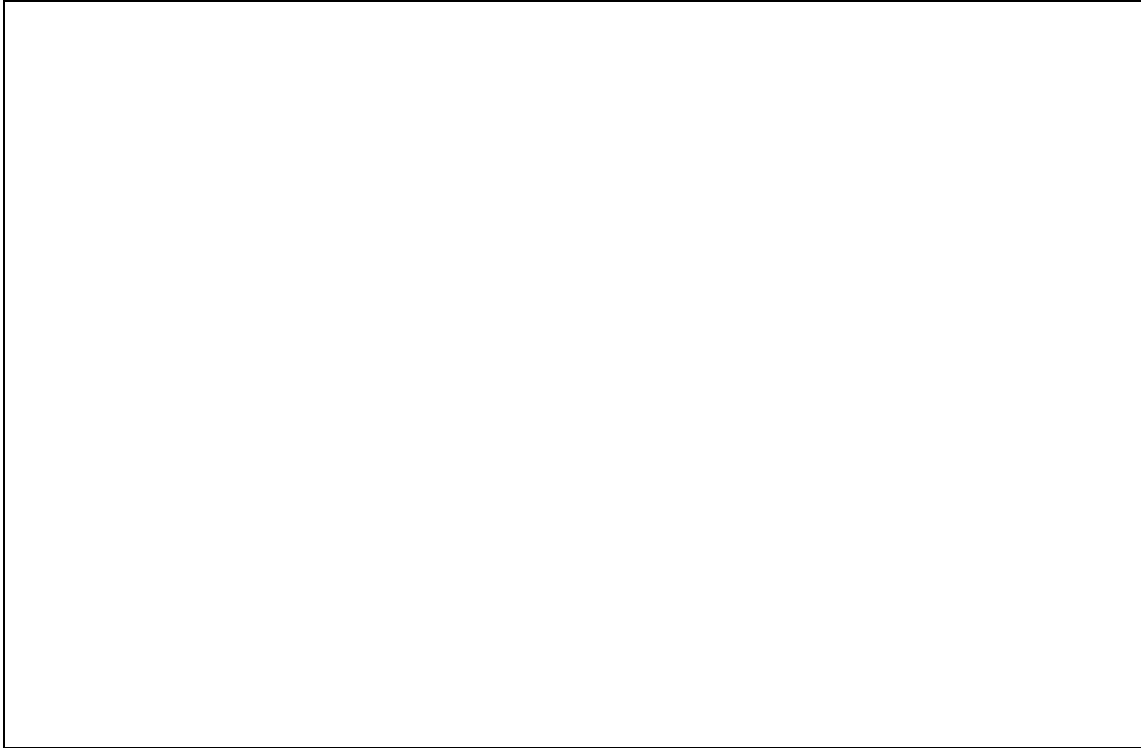
Photograph 2. View west from West Julian Holland Lake.



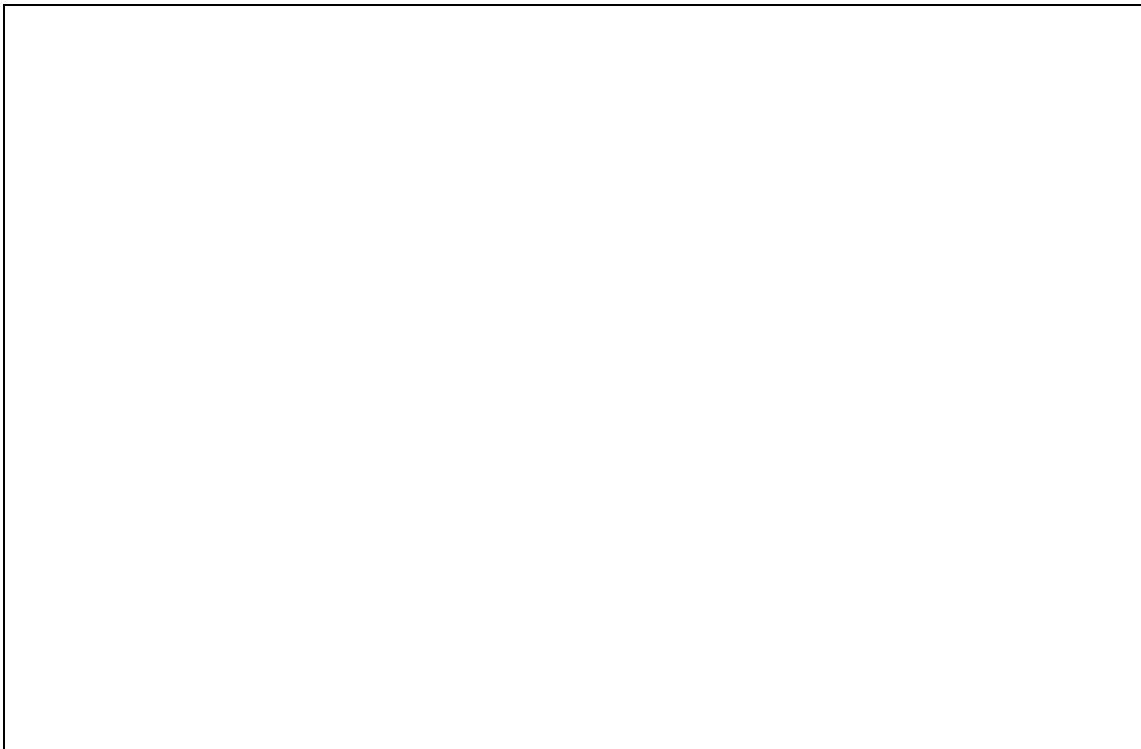
Photograph 3. Dolly Varden, gillnet catch.



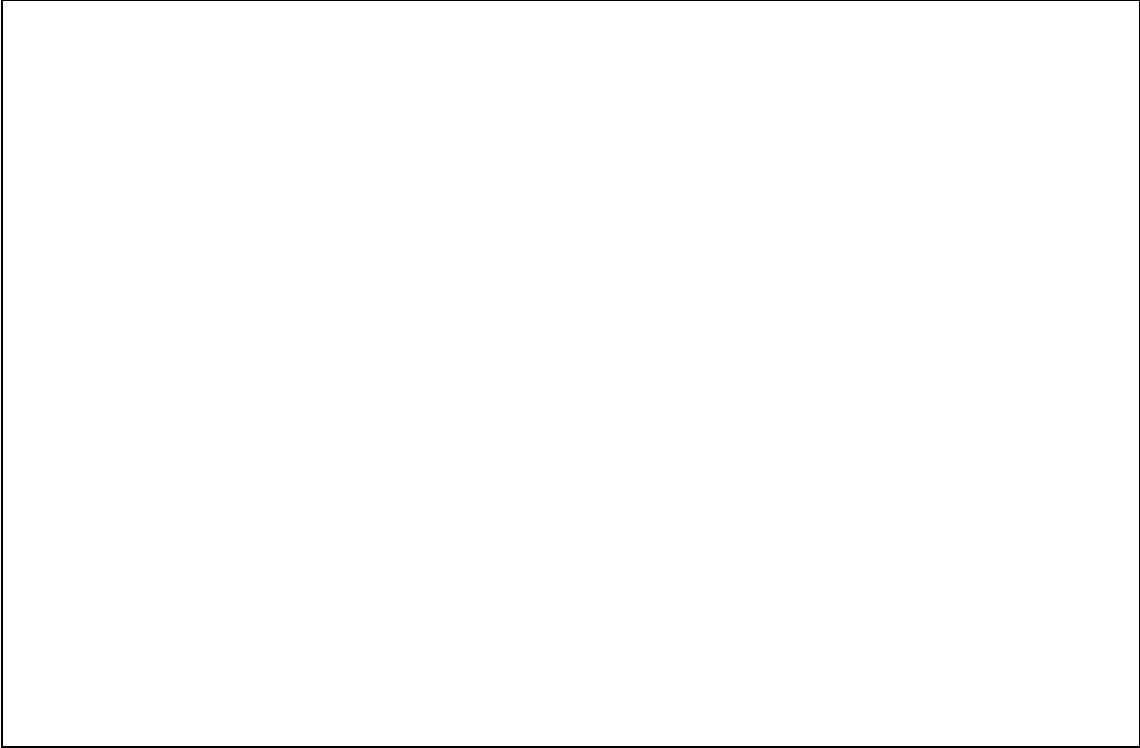
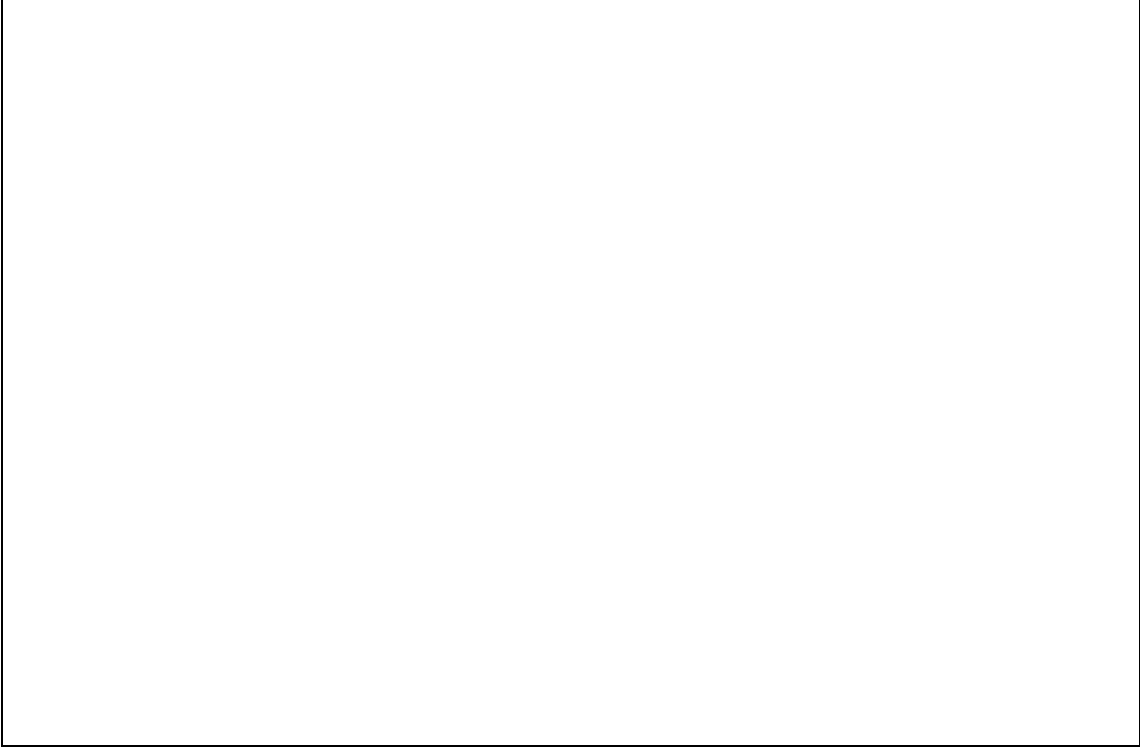
Photograph 4. Cutthroat trout, gillnet catch.



Photograph 5. Upstream view of C4 WC 460-6006-508-005-283-218-502-231, inlet to southwest bay of West Julian Holland Lake.



Photograph 6. View of ephemeral C2 WC 460-6006-508-005-283-218-502-088, inlet to northewst bay of West Julian Holland Lake.



APPENDIX A. ABBREVIATIONS AND OTHER NOTES

MOE = Ministry of Environment, Lands and Parks

RIC = Resources Inventory Committee

TSA = Timber Supply Area

UTM = Universal Transverse Mercator

WC = Watershed Code

WCD = Watershed Code Dictionary

NTS = National Topographic Survey

NAD27 = North American Datum 1927

Note: UTM values were derived from two sources:

1. For lakes, UTM at the outlet was obtained from the WCD, and this is noted after the UTM.
2. For streams, UTM at the point they enter/exit the lake was estimated from NTS 1:50,000 mapsheets, using interpolation. UTM datum year (i.e. NAD27) is recorded after the estimate.

NTS 1 : 50,000 scale mapsheets were used to determine lake drainage area, stream order, stream magnitude and stream drainage area. Corrections were made for NTS mapsheet inaccuracies noted during the survey.

Native land claims information was derived from the following source:

“Native Land Claims in Skeena Region.” Skeena Region GIS. Ministry of Environment Lands and Parks. February 1995. Map scale 1 : 1,500,000.

All information from the above source was confirmed current as of February 1997 by the following First Nation band council offices:

- Gitanyow Hereditary Chiefs
- Gitxsan Hereditary Chiefs
- Lake Babine Nation (Nat’oot’en)
- Wet’suwet’en Nation
- Nisga’a Nation

Fish growth rate and condition factor were estimated by methods detailed in:

Ricker, W.E. 1975. Computation and interpretation of biological statistics of fish populations. Canadian Bulletin of Fisheries and Aquatic Sciences No. 191.

Aquatic plants were identified using the following sources:

Brayshaw, T.C. 1985. Pondweeds and bur-reeds, and their relatives, of British Columbia. British Columbia Provincial Museum No. 26 Occasional papers series.

Pojar, J. and A. MacKinnon. 1994. Plants of coastal British Columbia including Washington, Oregon and Alaska. B.C. Ministry of Forests and Lone Pine Publishing.

Warrington, P.D. 1994. Identification keys to the aquatic plants of British Columbia. Resources Inventory Committee Report 029. Discussion Document.

The contractor assigned a reference number of 9604 to West Julian Holland Lake 460-6006-508-005-283-218-502-01. This number appears in field notes and other contractor records associated with this survey.

APPENDIX B. STREAM SURVEY FORMS

APPENDIX C. FISH SAMPLING FORMS

FISH COLLECTION METHOD INFORMATION

Card 1 of 1

Date (yy/mm/dd):	<u>03/08/96</u>	Agency:	<u>C58</u>	Crew:	<u>JD / JJ / CS</u>
Gazetted Name:	<u>West Julian Holland</u>	Alias:	<u>N/A</u>	UTM:	<u>9.600306.6014215</u>
Lake/Stream/Wetland	<u>Lake</u>	Location:	<u></u>	Source:	<u>Watershed Atlas</u>
Sequence No.	<u>01</u>	Weather:	<u>variable</u>		
Watershed code:	<u>460-6006-508-005-283-218-502</u>	Reach #:	<u>n/a</u>		

Date (yy/mm/dd)	Sample Site No.	Pass # or trap/net #	Capture Method	Time In (24 hr clock)	Time Out (24 hr clock)	Sampling time (min)	Depth (m)
03-Aug		1	MT	1750	1714	1404	1.0
03-Aug		2	MT	1800	1719	1399	2.0
03-Aug		3	MT	1805	1724	1399	0.5
03-Aug		4	MT	1810	2030	1580	0.5
03-Aug		5	MT	1812	2032	1580	0.4
03-Aug		1	DN	1700	1715	15	0.3
03-Aug			GN (S)	2100	0605	545	0-12.0
03-Aug			GN (F)	2115	0620	545	0-2.4
03-Aug			AG	1945	2115	90	1.0

Comments : All gear set over one night. Date recorded is date of set. GN (S) set with larger mesh inshore; GN (F) set with small mesh inshore.

**FISH COLLECTION DATA FORM
VERSION : LENGTH-ONLY**

Card 1 of 1.

Date (yy/mm/dd): 04/08/96 Agency: C58 Crew: JD / JJ / CS
 Gazetted Name: West Julian Holland Alias: N/A UTM: 9.600306.6014215
 Lake/Stream/Wetland: Lake Location: _____ Source: Watershed Atlas
 Sequence No. 01 Weather: cloudy
 Watershed code: 460-6006-508-005-283-218-502 Reach #: _____

Area sampled: (m2) _____			Air tmp : (C) _____	Wtr tmp : (C) _____				EC : (ms/cm) _____					
Site No.	Capture Method	Pass # or trap/net #	Species (code)	Length FL (mm)	Length FL (mm)	Length FL (mm)	Length FL (mm)	Length FL (mm)	Length FL (mm)	Length FL (mm)	Length FL (mm)	Length FL (mm)	Length FL (mm)
	DN		CT	45									
	AG		CT	210	280	260	240						
	MT	1	CT	90									

FISH COLLECTION DATA FORM

Card 1 of 3.

Date (yy/mm/dd): 04/08/96 Agency: C58 Crew: JD/JJ/CS
 Gazetted Name: West Julian Holland Alias: N/A UTM: 9.600306.6014215
 Lake/Stream/Wetland: Lake Location: _____ Source: Watershed Atlas
 Sequence No. 01 Weather: cloudy
 Watershed code: 460-6006-508-005-283-218-502 Reach #: _____

Area sampled: (m2)		Air tmp: (C)		Wtr tmp : (C)		EC : (ms/cm)					
Site No.	Capture Method	Pass # or trap/net #	Species (code)	Mark or Tag No.	Length FL (mm)	Weight (g)	Scale sample #	Sex (code)	Maturity (code)	Activity (code)	Comments
	GN (F)	1	CT	N/A	130	21		F	IMM		
	GN (F)	1	CT	N/A	121	18		M	IMM		
	GN (F)	1	CT	N/A	125	20	3	UNK	IMM		Age 2+
	GN (F)	1	CT	N/A	150	35		M	IMM		
	GN (F)	1	CT	N/A	153	34		F	IMM		
	GN (F)	1	CT	N/A	145	34	2	M	IMM		Age 2+
	GN (F)	1	CT	N/A	159	43		M	IMM		
	GN (F)	1	CT	N/A	160	43		F	IMM		
	GN (F)	1	CT	N/A	218	102	1	F	IMM		Age 3+
	GN (F)	1	CT	N/A	202	86		M	IMM		
	GN (F)	1	CT	N/A	258	173		F	MI		
	GN (F)	1	CT	N/A	280	183		F	MI		
	GN (F)	1	CT	N/A	276	215	6	M	MI		Age 4+
	GN (F)	1	CT	N/A	261	200		F	MI		
	GN (F)	1	CT	N/A	258	174		M	M		
	GN (F)	1	CT	N/A	298	235	5	M	MI		Age 5+
	GN (F)	1	CT	N/A	271	188		M	MI		
	GN (F)	1	CT	N/A	261	170		F	MI		
	GN (F)	1	CT	N/A	208	88	4	F	MI		Age 3+
	GN (F)	1	CT	N/A	225	106		M	IMM		
	GN (F)	1	CT	N/A	277	202		M	MI		
	GN (F)	1	CT	N/A	257	165		F	MI		
	GN (F)	1	CT	N/A	253	165	9	F	MI		Age 3+
	GN (F)	1	CT	N/A	238	138		M	IMM		
	GN (F)	1	CT	N/A	274	194		F	M		
	GN (F)	1	CT	N/A	238	129	8	F	MI		Age 3+
	GN (F)	1	CT	N/A	272	201		F	MI		
	GN (F)	1	CT	N/A	299	203		F	MI		
	GN (F)	1	CT	N/A	295	213	7	M	MI		Age 6+

FISH COLLECTION DATA FORM

Card 2 of 3

Date (yy/mm/dd): 04/08/96 Agency: C58 Crew: JD / JJ / CS
 Gazetted Name: West Julian Holland Alias: N/A UTM: 9.600306.6014215
 Lake/Stream/Wetland: Lake Location: _____ Source: Watershed Atlas
 Sequence No. 01 Weather: cloudy
 Watershed code: 460-6006-508-005-283-218-502 Reach #: _____

Area sampled: (m2)			Air tmp: (C)		Wtr tmp : (C)			EC : (ms/cm)			Comments
Site No.	Capture Method	Pass # or trap/net #	Species (code)	Mark or Tag No.	Length FL (mm)	Weight (g)	Scale sample #	Sex (code)	Maturity (code)	Activity (code)	
	GN (S)	1	CT	N/A	230	121	11	F	IMM		Age 5+
	GN (S)	1	CT	N/A	203	79		M	IMM		
	GN (S)	1	CT	N/A	218	99		M	MT		
	GN (S)	1	CT	N/A	234	120	12	F	MT		Age 4+
	GN (S)	1	CT	N/A	208	93		M	MT		
	GN (S)	1	CT	N/A	196	82		F	MT		
	GN (S)	1	CT	N/A	237	128		M	MT		
	GN (S)	1	CT	N/A	178	58	15	F	IMM		
	GN (S)	1	CT	N/A	253	122		F	MT		
	GN (S)	1	CT	N/A	270	196		F	MT		
	GN (S)	1	CT	N/A	292	213	14	F	MT		Age 5+
	GN (S)	1	CT	N/A	290	218		M	MT		
	GN (S)	1	CT	N/A	315	302		M	MT		
	GN (S)	1	CT	N/A	315	295	13	F	MT		Age 6+
	GN (S)	1	CT	N/A	295	275		M	MT		
	GN (S)	1	CT	N/A	273	196		M	MT		
	GN (S)	1	CT	N/A	278	196		M	MT		
	GN (S)	1	CT	N/A	257	164	16	M	MT		Age 4+
	GN (S)	1	CT	N/A	262	181		F	MT		
	GN (S)	1	CT	N/A	290	240		M	MT		
	GN (S)	1	CT	N/A	291	235	17	F	MT		Age 5+
	GN (S)	1	CT	N/A	297	265		M	MT		
	GN (S)	1	CT	N/A	297	275		M	MT		
	GN (S)	1	CT	N/A	296	270	18	M	MT		Age 6+
	GN (S)	1	CT	N/A	308	285		M	M		
	GN (F)	1	DV	N/A	136	26	21	F	IMM		Age 3+
	GN (F)	1	DV	N/A	170	48		M	IMM		
	GN (S)	1	DV	N/A	180	57		F	IMM		
	GN (S)	1	DV	N/A	159	43		M	M		
	GN (S)	1	DV	N/A	158	45		M	M		
	GN (S)	1	DV	N/A	172	47	20	F	IMM		Age 4+
	GN (S)	1	DV	N/A	176	57		F	IMM		
	GN (S)	1	DV	N/A	167	49		F	IMM		
	GN (S)	1	DV	N/A	166	48		F	IMM		
	GN (S)	1	DV	N/A	124	17	19	F	IMM		Age 2+

FISH COLLECTION DATA FORM

Card 3 of 3

Date (yy/mm/dd): 04/08/96
 Gazetted Name: West Julian Holland
 Lake/Stream/Wetland: Lake
 Sequence No.: 01
 Watershed code: 460-6006-508-005-283-218-502

Agency: C58
 Alias: N/A
 Location: _____
 Weather: cloudy
 Reach #: _____

Crew: JD / JJ / CS
 UTM: 9.600306.6014215
 Source: Watershed Atlas

Area sampled: _____ (m2)				Air tmp: _____ (C)		Wtr tmp : _____ (C)		EC : _____ (ms/cm)			
Site No.	Capture Method	Pass # or trap/net #	Species (code)	Mark or Tag No.	Length FL (mm)	Weight (g)	Scale sample #	Sex (code)	Maturity (code)	Activity (code)	Comments
	GN (S)	1	DV	N/A	179	55		M	MT		
	GN (S)	1	DV	N/A	177	56		F	IMM		
	GN (S)	1	DV	N/A	125	19	22	M	M		Age 2+
	GN (S)	1	DV	N/A	227	120		F	M		
	GN (S)	1	DV	N/A	180	65		F	MT		
	GN (S)	1	DV	N/A	197	77	23	M	MT		Age 2+
	GN (S)	1	DV	N/A	213	97		M	M		
	GN (S)	1	DV	N/A	208	89		M	MT		
	GN (S)	1	DV	N/A	209	95		M	M		
	GN (S)	1	DV	N/A	189	65		M	MT		
	GN (S)	1	DV	N/A	230	120		M	M		
	GN (S)	1	DV	N/A	266	170		M	MT		
	GN (S)	1	DV	N/A	248	150	24	M	M		Age 4+
	GN (S)	1	DV	N/A	233	145		F	M		
	GN (S)	1	DV	N/A	240	140		M	M		
	GN (S)	1	DV	N/A	238	140	25	M	M		Age 5+
	GN (S)	1	DV	N/A	189	76		M	M		
	GN (S)	1	DV	N/A	215	100		F	MT		
	GN (S)	1	DV	N/A	208	89	26	F	M		Age 3+
	GN (S)	1	DV	N/A	193	71		F	MT		
	GN (S)	1	DV	N/A	207	88		F	M		
	GN (S)	1	DV	N/A	215	106		M	M		
	GN (S)	1	DV	N/A	235	129	27	F	M		Age 3+
	GN (S)	1	DV	N/A	210	97		M	M		
	GN (S)	1	DV	N/A	223	119		F	M		
	GN (S)	1	DV	N/A	193	74	28	F	M		
	GN (S)	1	DV	N/A	185	66		F	MT		
	GN (S)	1	DV	N/A	185	66		F	MT		
	GN (S)	1	DV	N/A	182	58	29	F	MT		Age 2+
	GN (S)	1	DV	N/A	195	73		M	MT		
	GN (S)	1	DV	N/A	181	61	30	F	MT		Age 3+
	GN (S)	1	DV	N/A	195	73		M	MT		
	GN (S)	1	DV	N/A	185	63		F	MT		
	GN (S)	1	DV	N/A	188	65		F	MT		
	GN (S)	1	DV	N/A	195	71		M	MT		

APPENDIX D. LIMNOLOGICAL SAMPLING FORMS

Lake Biophysical Data Form					
Date (yy/mm/dd):	<u>08/08/96</u>	Crew:	<u>JD / JJ / CS</u>		
Site ID					
Watershed code:	<u>460-6006-508-005-283-218-502</u>	Sequence No.:	<u>01</u>		
Gazetted name:	<u>West Julian Holland</u>	Alias:	<u>N/A</u>		
FW Region:	<u>06</u>	UTM : Zone	<u>9.</u>		
Management Unit:	<u>09</u>	Easting	<u>00306.</u>		
NTS Map No.:	<u>93L/ 6</u>	Northing	<u>014215</u>		
		Source	<u>Watershed Atlas</u>		
<i>Biophysical</i>					
Biogeo Zone	<u>SBS-mc2</u>				
Benchmark (Y/N)	<u>Y</u>				
Benchmark details:	<u>see report</u>				
<i>Nutrient Status</i>					
SEAM No.:	<u>E223327</u>	Limno Station No:	<u>01</u>		
Secchi depth (m)	<u>7.5</u>	H2S (mg/l)	<u>0</u>		
Other samples taken:	<u>Zooplankton</u>	H2S comments	<u>no odour</u>		
		TDS method			
		DO method	<u>YSI 57</u>		
		TEMP method	<u>YSI 57</u>		
		Alkalinity			
<i>Field Conditions</i>					
wind velocity (km/h)	<u><1</u>	wind direction:	<u>W</u>	air temp. (c):	<u>20</u>
cloud cover (/10 O.C.)	<u>0</u>	surface condition:	<u>calm</u>	water colour:	<u>clear</u>
<i>Development</i>					
MOF rec sites (Y/N)	<u>N</u>	Resort cmpsts (Y/N)	<u>N</u>	Residences (Y/N)	<u>N</u>
MOF campsites (Y/N)	<u>N</u>	Resorts (Y/N)	<u>N</u>	Co. Rec facilities	<u>N</u>
Parks campgrds (Y/N)	<u>N</u>	Resort cabins (Y/N)	<u>N</u>		
<i>Recreation</i>					
ROS	<u>2</u>	Biophys features:		Biophys sub-feat.:	
<i>Inlets/Outlets</i>					
	<u>see Stream Survey Card for mandatory fields</u>				
<i>Biological</i>					
Fish Card attached (Y/N)	<u>Y</u>	Fish. Man. Com.	<u>see report</u>		
Wildlife:	<u>moose sign, black bear</u>	Reptiles:	<u>see report</u>		
Aquatic birds:	<u>ospreys, RN grebes, loons</u>	Invertebrates:	<u>see report</u>		
Amphibians:	<u>see report</u>	Aquatic Plants:	<u>see report</u>		
<i>Comments:</i>					
Water samples:	<u>19.0 m @ 1300</u>	Chlorophyll-a:	<u>L. f 1.0 L filterd</u>		
	<u>8.0 m @ 1315</u>	Zenon Invoice #	<u>6111164</u>		
	<u>0.0 m @ 1320</u>				
Zooplankton:	<u>horizontal tow for 150 s @ 0.4 m/s @ 1315; 150 um mesh, 30 cm diameter mesh</u>				

Lake Survey Profile Data									
Sequence number:		01			Date : 96/08/03		Time: 12:50		
					(yy/mm/dd)		(hhmm)		
Limnology station:		01							
Depth (m)	D.O. (mg/l)	Temp (c)	TDS (ppm)	Conduct. (umhos/cm)	Depth (m)	D.O. (mg/l)	Temp (c)	TDS (ppm)	Conduct. (umhos/cm)
surface	9.10	16.8			20.5				
0.5					21.0				
1.0	9.10	16.5			21.5				
1.5					22.0				
2.0	9.15	16.2			22.5				
2.5					23.0				
3.0	9.15	16.0			23.5				
3.5					24.0				
4.0	9.15	16.0			24.5				
4.5					25.0				
5.0	8.90	15.0			25.5				
5.5					26.0				
6.0	7.25	11.0			26.5				
6.5					27.0				
7.0	6.05	8.3			27.5				
7.5					28.0				
8.0	5.40	7.1			28.5				
8.5					29.0				
9.0	5.20	6.8			29.5				
9.5					30.0				
10.0	5.20	6.5			30.5				
10.5					31.0				
11.0	5.15	6.2			31.5				
11.5					32.0				
12.0	4.90	6.1			32.5				
12.5					33.0				
13.0	4.75	6.0			33.5				
13.5					34.0				
14.0	4.65	6.0			34.5				
14.5					35.0				
15.0	4.60	5.9			35.5				
15.5					36.0				
16.0	4.00	5.8			36.5				
16.5					37.0				
17.0	3.75	5.8			37.5				
17.5					38.0				
18.0	3.50	5.8			38.5				
18.5					39.0				
19.0	3.30	5.7			39.5				
19.5					40.0				
20.0									

APPENDIX E. PHOTOGRAPH / NEGATIVE DIRECTORY

Negative #	Photo # (report)	Description
9604 - 1	4	cutthroat trout, gillnet catch
9604 - 2		cutthroat trout, gillnet catch
9604 - 3		Dolly Varden, gillnet catch
9604 - 4	3	Dolly Varden, gillnet catch
9604 - 5		start of a 360° clockwise panorama, taken from the center of West Julian Holland Lake, view to the SW
9604 - 6		panorama continued, view to the W
9604 - 7	2	panorama continued, view to the NW
9604 - 8		panorama continued, view to the NNW
9604 - 9		panorama continued, view to the N
9604 - 10		panorama continued, view to the NNE
9604 - 11		panorama continued, view to the NE
9604 - 12		panorama continued, view to the ENE
9604 - 13		panorama continued, view to the ESE
9604 - 14		panorama continued, view to the SE
9604 - 15		panorama continued, view to the SSE
9604 - 16		panorama continued, view to the S
9604 - 17		panorama continued, view to the SSW
9604 - 18	6	unnamed channel C2 WC 460-6006-508-005-283-218-502-088, inlet to the far NW bay of West Julian Holland Lake
9604 - 19	7	unnamed channel C3 WC 460-6006-508-005-283-218-502, outlet of West Julian Holland Lake; downstream view, 100 m downstream of the lake
9604 - 20		old log bridge on unnamed channel C3, WC 460-6006-508-005-283-218-502, outlet of West Julian Holland Lake
9604 - 21	1	view of the Howson Range, to the NW of West Julian Holland Lake
9604 - 22	5	unnamed channel C4 WC 460-6006-508-005-283-218-502-231, inlet to the SW bay of West Julian Holland Lake; view of old beaver dam and pond
9604 - 23		unnamed channel C4 WC 460-6006-508-005-283-218-502-231, inlet to the SW bay of West Julian Holland Lake; view of 1.2 m drop from beaver pond to the channel
9604 - 24	8	unnamed channel C1 WC 460-6006-508-005-283-218-502, inlet to the far E end of West Julian Holland Lake; upstream view in forest
9604 - 25		unnamed channel C1 WC 460-6006-508-005-283-218-502, inlet to the far E end of West Julian Holland Lake; upstream view near lake
9604 - 26		aerial view of West Julian Holland Lake

APPENDIX F. BATHYMETRIC MAP

APPENDIX G. WATER CHEMISTRY ANALYSIS BY ZENON LABORATORIES

APPENDIX H. ORIGINAL FIELD NOTES

Figure 4. Planned cutblocks in the West Julian Holland Lake area. Reproduced with permission from Northwood Pulp and Timber.

Photograph 7. Downstream view of C3, WC 460-6006-508-005-283-218-502, outlet of West Julian Holland Lake.

Photograph 8. Upstream view of C1, WC 460-6006-508-005-283-218-502, inlet to east end of West Julian Holland Lake.