

**A Reconnaissance Inventory of
WHALEN LAKE**

**Watershed Code: 915-4883-754-01
Date Inventoried: September 11 to 14, 1996**

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1. INTRODUCTION

Triton Environmental Consultants Ltd. was retained by the British Columbia Ministry of Environment, Lands and Parks, Fisheries Branch to conduct a Reconnaissance Level Lake Inventory on Whalen Lake, within the North Coast Forest District. Whalen Lake is located approximately 145 km southeast of Prince Rupert by float plane and had not previously been surveyed. The purpose of the survey was to collect information on lake bathymetry, lake drainage, including stream surveys, terrain and vegetation, access, developments and land use, fish populations, limnology, aquatic plants and wildlife. The lake survey was conducted according to the Lake and Stream Inventory Standards and Procedures of the Resource Inventory Committee (MELP 1995). Stream information was entered into the Department of Fisheries and Oceans / Ministry of Environment Stream Survey Database. The reconnaissance level survey was completed on September 11 to 14, 1996 by Kristine Mason, Brian Leaf and Stacey Brown. Original field data and photos are included with the original copy of the lake report.

2. DATA ON FILE

Location	X	Individual Fish Data	X
Physical data	X	Fish Preserved	
Bench Mark	X	Stomach Analysis	
Lake Drainage	X	Scale and/or Otolith Reading	X
Stream Surveys	X	DO, Temperature and Conductivity Profiles	X
Terrain Features	X	Water Chemistry Summary	X
Terrestrial Vegetation	X	Aquatic Plants	X
Access	X	Wildlife Observations	X
Resorts and Campsites	X	Fishery Management Comments	X
Mining claims	X	Photograph Directory / Photos	X
Timber Harvest	X	Appendices	
Waste Permits	X	I. Bathymetric Data	X
Water Permits	X	Bathymetric Map	X
Recreation Values	X	II. Tributary Stream Data	X
Special Regulations and Restrictions	X	III. Catch Data	X
History of Previous Surveys	X	IV. Water Chemistry	X
Netting Record	X	V. Bottom Sediment Analysis	
Lake Catch Summary	X	VI. Fish Tissue Analysis	

3. GEOGRAPHIC AND MORPHOLOGIC INFORMATION

3.1 Location

Gazetted Name: Whalen Lake
Watershed Code: 915-4883-754-01
Location: Whalen Lake is 145 km southeast of Prince Rupert, located on Princess Royal Island
Elevation: 118 m (Source: Topographic N.T.S. Map 103H/2)
Latitude/Longitude: 53°15'2", 129°3'50"
U.T.M.: 09.495949, 5899971
N.T.S. Map #: 103H/2,3&6
TRIM Map #: 103H 016, 017, 026, 025
Air Photos: 30BCB92023.11-18
SEAM #: E223465
Management Unit: 6-3
Biogeoclimatic Zone: Coastal Western Hemlock
Forest Region: Prince Rupert Forest Region
Forest District: North Coast Forest District
Drainage: Whalen Lake⇒Whalen Creek⇒Whale Channel
Date of Survey: September 11 to 14, 1996

3.2 Physical Data

Lake Drainage Area:	91.3 km ²	Volume:	2.26 x 10 ⁹ m ³
Water Surface Area:	22.0 km ²	Number of Islands:	0
Area Above 6m Contour:	4620 m ²	Shoreline Perimeter:	50.2 km
Maximum Depth:	240 m	Mean Depth:	103 m
Secchi Depth:	6.25 m	Sounding Device:	Lowrance X-16

Whalen Lake is a large lake, 22.5 km in length and 2200 ha in area. The lake is at an elevation of 118 m and is surrounded by hills rising to peaks approximately 900 m in elevation.

3.3 Lake Morphometry

Whalen Lake is a very long but narrow lake, with three basins. Bathymetric information was collected during the survey according to the Bathymetric Standards for Lake Inventories (MELP 1996). A Lowrance X-16 electronic sounder was used in the field to provide paper traces of the depth soundings of the e-line and transects. Random measurements of boat speed were taken while driving the e-line of Whalen Lake, to ensure that a constant speed was maintained. The bathymetric map was created using manual procedures as outlined in the manual. Measurements were taken of distance and depth data from the paper traces and entered into a spreadsheet. The depth contours on the bathymetric map were calculated by linear interpolation of these depth data. The bathymetric map, raw bathymetric data and map of transect locations are included in Appendix I. Photo 1 shows an aerial view of a small part of Whalen Lake, looking east. This photo shows the narrow width of the lake compared to the length.

3.4 Benchmark

U.T.M.: 09.504000, 5895300

The benchmark was established on the south shore of the lake on the west bank of the inlet stream (C). A spike (centre of orange circle) was nailed into a mature shore pine 4 m from the water's edge at approximately 2.2 m above the water surface.

3.5 Lake drainage

The outflow of Whalen Lake (Whalen Creek) flows southwest into Whale Channel. The watershed drains approximately 91 km² (source: metric dot grid, 1:50 000 map). Figure 1 shows Whalen Lake on the 1:50 000 N.T.S. map.

3.5.1 Stream surveys

The Stream Information Survey System (SISS) has no information on the Whalen Lake watershed. The DFO Salmonid Enhancement Program (DFO, North Coast) released 75,300 coho fry (size: 2.0 g) in June 1995 and 61,000 coho fry (size: 2.5 g) in June 1996 into Whalen Lake (M. Forbes, pers. comm.).

3.5.1.1 *Major systems*

The locations and flow directions of the streams surveyed in Whalen Lake are shown in Figure 2. Five inlet streams were surveyed. The stream cards for the major streams of Whalen Lake are located in Appendix II.

Whalen Creek (outflow)

There is a log jam at the west end of the lake approximately 150 meters from the outflow stream. The stream is a waterfall cascade series (Photo 2) and therefore not surveyed. Photo 3 shows a downstream view of the Whalen Lake outflow. The stream is approximately 15 m in width. There is a great volume of logs and large woody debris along both sides of the creek but the flow is not obstructed (Photo 4).

Unnamed Creek : Stream A

UTM: 09.496376, 5898180

Photos 5 and 6

This inlet, flowing into the south shore of Whalen Lake (first bay from the west end) was surveyed to 467 m. The stream had an average wetted width of 5.2 m, with the bed material being primarily small cobble, gravels and fines. The gradient was 2% and the flow was 50% run. The creek had fairly extensive cover (70%) from cutbank, overhanging vegetation, and deep pool. This stream provides good spawning and rearing habitat for fish due to the suitable substrate and available cover.

Unnamed Creek : Stream B

UTM: 09.503932.5896853

Watershed Code: 915-4883-754-402-000

Photos 7 and 8

This inlet, flowing into the south shore of Whalen Lake (second bay from the west end) was surveyed to 500 m. The stream had an average wetted width of 8.2 m, with the bed material being primarily fines, gravels and small cobble. The gradient was 1% and the flow was 60% run. The creek had somewhat limited cover (45%), provided by cutbank, large organic debris, overhanging vegetation, and deep pool. Conspicuous beaver activity was present in this stream. This stream provides good spawning and rearing habitat for fish due to the suitable substrate and available cover.

Unnamed Creek : Stream C

UTM: 09.504020.5895400

Photos 9 and 10

This inlet, flowing into the south shore of Whalen Lake (third bay from the west end) was surveyed to 400 m. The stream had an estimated wetted width of 19 m, with the bed material being 95% fines. The gradient was 0.5% and the flow was 70% run and 30% pool. The creek had limited cover (20%) primarily from deep pool and cutbank. This stream would provide poor spawning habitat, due to the lack of suitable gravel substrate, but may provide fair rearing habitat.

Unnamed Creek : Stream D

UTM: 09.509960.5891840

Watershed Code: 915-4883-754-756-000

Photos 11 and 12

This inlet, flowing into the south side of Whalen Lake (second bay from the east end) was surveyed to 332 m. The average wetted width was 6.4 m, with the substrate being fairly equally divided between fines, gravels, cobble and boulder. The gradient was quite steep

(12%) and the flow was mainly riffle (70%). There is fairly extensive cover (70%) mostly from large organic debris, overhanging vegetation and boulder. There are numerous drops of 0.5 to 1.5 m in height. At 332 m, the gradient is 20% with a 1.5 m drop. This stream has poor spawning habitat but may provide some rearing habitat near the mouth.

Unnamed Creek : Stream E

UTM: 09.512440.5892480

Watershed Code: 915-4883-754-863-000

Photos 13 and 14

This inlet, flowing into the south shore of Whalen Lake (first bay from the east end) was surveyed to 500 m. The stream had an average wetted width of 10.4 m, with the bed material being fairly equally divided between fines, gravels, cobble and boulder. The gradient was 2% and the flow was 10% pool, 50% riffle and 40% run. The creek had fairly low cover (40%) primarily from boulder, overhanging vegetation and cutbank. This stream provides poor spawning habitat due to the abundance of large cobble and boulder, but may provide fair rearing habitat. It appeared that the next reach above 500 m may provide good spawning habitat (lower gradient, more gravel and less boulder).

3.6 Terrain and vegetation

3.6.1 Immediate Shoreline

The shoreline of Whalen Lake is rocky, with boulder and bedrock banks. There is limited littoral area as the lake drops off very steeply. Many slides are also present along the shores of Whalen Lake, in many cases originating in or at the base of logged areas (Photo 15). Flatter areas exist around the mouth of the streams and at the east end of the lake. At the east end, a small hard sand beach is present. The shoreline substrate is hard sand and rock.

The perimeter features of Whalen Lake are fairly uniform. Bedrock banks and rock surround most of the lake, except for very small sand areas at the inlets and at the east end. Most of the vegetation is reforested areas from previous clearcut or thinning (Photo 16). Snags are present around the shores of the lake, floating in the lake and a log jam is present at the outlet. Photos 17 and 18 show views of Whalen Lake looking towards the west and east ends, respectively.

3.6.2 Surrounding Country

Whalen Lake is within the Coastal Western Hemlock biogeoclimatic zone. The western end of the lake is in the Very Wet Hypermaritime subzone (CWHvh) (Ministry of Forests 1988). This subzone is characterised by mild, wet summers (mean temperature of warmest month 13.9°C, mean precipitation of driest summer month 96 mm) and cool, wet winters (mean temperature of coldest month 3.0°C, mean precipitation of wettest winter month 431 mm) (Meidinger and Pojar 1991). The remainder of the lake is considered to be in the Very Wet Maritime subzone (CWHvm) (Ministry of Forests 1988). This subzone is characterised by warm, wet summers (mean temperature of warmest month 16°C, mean precipitation of driest summer month 75 mm) and cool, very wet winters (mean temperature of coldest month 0.3°C, mean precipitation of wettest winter month 436 mm) (Meidinger and Pojar 1991).

There are many previously logged areas along Whalen Lake, including clearcut patches. The remaining forest is dominated by western hemlock (*Tsuga heterophylla*), Sitka spruce (*Picea sitchensis*) and western redcedar (*Thuja plicata*). Red alder (*Alnus rubra*) was abundant as well, growing on disturbed areas. Along the streams, the understory consisted of bunchberry (*Cornus canadensis*), red huckleberry (*Vaccinium parvifolium*), copperbush (*Cladothamnus pyroliflorus*), devil's club (*Oplopanax horridus*), false azalea (*Menziesia ferruginea*) and salmonberry (*Rubus spectabilis*). Various ferns and mosses were also present. Terrestrial plants included skunk cabbage (*Lysichiton americanum*), deer cabbage (*Fauria crista-galli*), Indian hellebore (*Veratrum viride*) and violets. Unknown trees, bushes and wildflowers were identified using Pojar and MacKinnon (1994).

Whalen Lake is surrounded by hills rising to peaks approximately 900 m in elevation. Whalen Lake is located in the Western System of British Columbia (Holland 1976), in the Coast Mountains, within the Kitimat Ranges. These granitic mountains are characteristically round-topped, dome-like mountains rising to peaks between 1980 and 2285 m in elevation (Holland 1976). Whalen Lake is situated south of Elephant Head Mountain (approximately 900 m).

4. DEVELOPMENTS AND LAND USE

4.1 Access

Whalen Lake was accessed by float plane, a trip of approximately 145 km southeast from Prince Rupert. This was a long flight of about 1 hour and 20 minutes.

4.2 Development and land use

The land surrounding Whalen Lake has been used for forestry practices in the past, as large clearcut areas exist. The lake does not appear to have been used for agricultural land use. Recreational use of the lake is limited by the difficulty in access, the lack of camping facilities and the unaesthetic surroundings. Pollutants, such as garbage, gasoline and oil, were observed at Whalen Lake.

4.2.1 Resorts and campsites

There are no established campsites on Whalen Lake, but there is an old logging road at the very west end of the lake, on the south shore of the outlet, where a camp can be set up (Photo 19). Although not very attractive, much of this area is cleared and makes for a quick and easy camp set up. In this area there is logging debris, such as, cables, spikes and fuel drums, as well as garbage and spilled gas.

4.2.2 Mining claims

There are no mining claims within the Whalen Lake watershed.

4.2.3 Timber harvest

Whalen Lake is in the International Forest Products Ltd. (INTERFOR) district. According to the INTERFOR Five Year Development Plan, Whalen Lake and the associated streams are unclassified. There are numerous blocks of prior logging around the lake. The south side of the lake is restocked but not free to grow (SR) and the forest cover around north and east of the lake is at age class < 7 and height > 3 m. No further logging is planned according to the Five Year Development Plan.

4.2.4 Waste permits

There are no waste permits held for Whalen Lake.

4.2.5 Water permits

White Bear Water Ltd. holds a water license for Whalen Lake (water license number C070663, file 6462). An application for a water license also exists for Kermode Water Export Ltd. (number 2101335, file 6-493).

4.2.6 Recreation values

Whalen Lake is a fairly unattractive lake surrounded by logged hillsides, with clearcut patches. There are many floating and partially submerged logs making boat navigation difficult. As well, Whalen Lake is such a large lake that high winds and stormy weather could make boating quite dangerous. To safely use Whalen Lake for boating, it would be necessary to have a trustworthy boat and motor. Camping sites are limited to the old road at the west end of the lake. There are no established hiking trails, but it may be possible to hike through clearcut vegetation. There are only very small beach areas, but in the summer, the lake is warm enough for swimming.

4.2.7 Special regulations and restrictions

According to the B.C. Freshwater Fishing Regulations, there were no special restrictions at the time of the survey, beyond those limitations applying to the region for catch limits and gear.

5. FISH POPULATION SAMPLING

5.1 Fish species composition

Gill netting and minnow trapping captured Dolly Varden (*Salvelinus malma*) and kokanee (*Oncorhynchus nerka*) in Whalen Lake. Table 1 shows the site characteristics of the gill nets and minnow traps set in Whalen Lake.

5.2 Relative abundance

Table 2 shows the catch for each trap type by species caught in Whalen Lake. The raw catch data are presented in Appendix III. 2 Dolly Varden and 2 kokanee were caught in the floating gill net. In the sinking gill net, 20 Dolly Varden and 1 kokanee were captured. Dolly Varden were much more abundant in the sinking net (catch per unit effort of 1.3 fish/h) than the floating net (CPUE of 0.2 fish/h), possibly indicating a preference for the hypolimnion. The sinking net was fished with only five panels due to irreparable damage to the 64 mm panel and CPUEs reported for the sinking net were adjusted for the missing panel (CPUE x 5/6). Kokanee were not very abundant in either gill net, with only three caught in total.

Juvenile Dolly Varden were fairly abundant in minnow traps set in the Whalen Lake watershed. 59 Dolly Varden were caught in four traps set in the lake itself and one trap set in inlet stream (C) caught 32. At least one Dolly Varden was captured in all other minnow traps. Although coho fry have been released into Whalen Lake, none were captured in the minnow traps. These coho fry are probably heavily foraged upon by Dolly Varden and kokanee for the year or more that they remain in freshwater, until they migrate downstream to the sea as smolts. Because of the steep gradient of the outflow stream, adult coho would be unable to swim as far upstream as Whalen Lake during their spawning migration.

5.3 Size, age and growth

5.3.1 Salmonids

Dolly Varden from Whalen Lake and its streams ranged in size from 38 to 580 mm in fork length (FL), with an average of 123 mm and a standard deviation of 83 mm (± 83 mm). The Dolly Varden in Whalen Lake grew to a very large size (Photo 20), with the largest fish caught in the gill net weighing 2150 g. Ageing of the otoliths from the five largest Dolly Varden indicated that these fish ranged from 11 to 18 years of age. Dolly Varden living to 18 years of age is somewhat unusual as most Dolly Varden live for 10 - 12 years over the whole range (Scott and Crossman 1973). However, ages to 20 years have been found in California (Carlander 1953). Figure 3 shows the length weight regression, Figure 4 shows the length frequency distribution and Figure 5 shows the age frequency distribution for Dolly Varden in Whalen Lake.

The three kokanee ranged in size from 119 to 158 mm FL, and in weight from 17.4 to 42.9 g. Scale samples indicated that these fish ranged in age from 1 to 3 years. Figures 6, 7 and 8 show length, weight and age data for kokanee in Whalen Lake.

Scales from kokanee were aged by Bryan Williams, B.Sc., a fisheries biologist of the Triton Terrace office. Otoliths from Dolly Varden were aged by AMC Technical Services Ltd., Lantzville, B.C.

5.3.2 Non-salmonid species

There were no non-salmonid species captured in Whalen Lake.

5.4 Sexual maturity and condition

Of the 19 Dolly Varden sampled at Whalen Lake, 5 were female (3 immature, 1 maturing and one resting (adult sized fish with small gonads)) and 14 were male (9 immature, 2 maturing, 2 resting and one spawning). Dolly Varden spawn in the fall, from September

to early November (Scott and Crossman 1973). The 12 fish classified as immature may have been juveniles or individuals that were not going to spawn that fall. Sexual maturity is usually achieved in Dolly Varden in years 3 to 6, but inland, high-altitude and northern populations are often stunted and not all adults spawn every year (Scott and Crossman 1973). The 3 fish that were maturing (ovaries and testes beginning to fill out and take up a large part of the body cavity), would have been preparing to spawn in the coming season. The 3 fish that were resting would not yet have begun investing energy into reproduction, i.e. gonadal growth, for the fall spawning season. The one male that was classified as spawning was in full spawning coloration. Parasitic worms (nematodes) were present in the Dolly Varden sampled in Whalen Lake.

The three kokanee from the gill nets were all males, two immature and one spawning. The sexually mature fish was found to be 3 years of age. Kokanee spawn in the fall, generally during September and October in British Columbia (Scott and Crossman 1973).

6. LIMNOLOGICAL SAMPLING

6.1 Water sampling

Table 3 shows a summary of all limnological sampling performed at Whalen Lake. The limnology site was in the middle of the lake, close to the north west end, at 240 m in depth.

Water samples from depths of 0.5 m and 30 m (labelled surface and bottom, respectively), as well as a field blank, were collected from Whalen Lake on September 14, 1996 at 1:00 p.m. These samples were analysed for general water chemistry and metals by Northern Laboratories Ltd., Prince Rupert, B.C. The full report from the laboratory is included in Appendix IV.

6.2 Stratification

Table 4 and Figure 9 show the dissolved oxygen, temperature and conductivity profiles performed at Whalen Lake on September 14, 1996. The lake was thermally stratified with the thermocline present at approximately 12 m in depth. The temperature in the epilimnion was warm, 15.5°C at the surface, with the temperature in the hypolimnion dropping to 4.8°C at 30 m. The dissolved oxygen readings range from 9.15 mgL⁻¹ at the surface to 11.73 mgL⁻¹ at 30 m. The oxygen concentration increases with depth, indicating that there is not significant oxygen depletion in the hypolimnion.

The conductivity profile for Whalen Lake shows values ranging from 6.8 µmhoscm⁻¹ at the surface to 5.8 µmhoscm⁻¹ at 30 m. There is a slight decrease in conductivity with depth, corresponding with a decrease in temperature. Conductivity measurements are highest at 12 m in depth (6.9 µmhoscm⁻¹), corresponding with the thermocline.

7. OTHER FLORA AND FAUNA

7.1 Aquatic plants

There is limited littoral area in Whalen Lake for aquatic plant growth. Claspingleaved pondweed (*Potamogeton richardsonii*) and narrow-leaved bur-reed (*Sparganium angustifolium*) were present in shallow sections around the lake, especially near the inlets. Aquatic plants were identified in the field using Pojar and MacKinnon (1994) and Warrington (1994).

7.2 Wildlife observations

Deer tracks were observed at inlet streams (A) and (B). Beaver activity was also evident in stream (B), that is, chewed trees, beaver trails and a dam being built 257 m upstream from the mouth. Also by this stream, a beer can was found that a sharp-toothed animal had bitten. Small toads were found at Whalen Lake. Dragonflies (Odonata), mayflies

(Ephemeroptera), water boatmen (Hemiptera, Family: Corixidae) and caddisfly adults (Tricoptera) were observed at Whalen Lake, along with an inchworm.

Many birds were observed at Whalen Lake, including common ravens (*Corvus corax*), winter wrens (*Troglodytes troglodytes*), Steller's jays (*Cyanocitta stelleri*) and a male hairy woodpecker (*Picoides villosus*). A bald eagle (*Haliaeetus leucocephalus*) was observed in flight, as well as another unidentified large, grey/brown hawk-like bird. An American dipper (*Cinclus mexicanus*) was observed by inlet stream (E).

7.3 Summary of Rare and Endangered Species

The bald eagle observed at Whalen Lake is a yellow-listed species (B.C. Conservation Data Centre: Rare Vertebrate Animal Tracking List, North Coast Forest District (FD #28), June 10, 1996) meaning that the species is not considered at risk, but is actively managed at a population level. The bald eagle is ranked as S4 (apparently secure), that is, uncommon but not rare, and usually widespread. There is possibly cause for long-term concern. No rare vascular plants were noted at Whalen Lake (B.C. Conservation Data Centre: Rare Vascular Plant Tracking List, North Coast Forest District (FD #28), June 10, 1996).

8. MANAGEMENT COMMENTS

Only Dolly Varden and kokanee were captured in gill nets and minnow traps set in Whalen Lake. However, a Prince Rupert air charter company maintains that cutthroat trout are present as well. The Dolly Varden in Whalen Lake are large (over 2000 g) and long living (up to 18 years). In Whalen Lake, the Dolly Varden are likely piscivorous, feeding on kokanee. Whalen Lake is a very deep (240 m), oligotrophic lake (low in nutrient inputs, with low organic production, Wetzel 1983). Phosphorus concentrations and conductivity measurements are low ($< 0.05 \text{ mgL}^{-1}$ and $5.8 - 6.8 \text{ } \mu\text{mhoscm}^{-1}$, respectively), indicating that the fish populations are likely slow growing.

Logging has already occurred in the Whalen Lake watershed and clearcut blocks extend directly to the shore in many places. Large woody debris from logging has accumulated in the lake, on the shores and on the bottom of Whalen Lake, which would effect aquatic communities, including fish populations. Logging has not occurred along the spawning streams, and it is important to protect these sensitive areas from sediment accumulation and further riparian modification to allow successful reproduction in the future.

Fish production in Whalen Lake could conceivably be increased through autochthonous fertilization of the lake. Nitrogen and phosphorus additions can increase zooplankton and benthic production, which in turn can increase salmonid production (Hyatt and Stockner 1985, Johnston et al. 1990, Ashley et al. 1994). However, it may not be advantageous to manipulate Whalen Lake at the present time, as it is not a salmon producing lake and is already a disturbed ecosystem. Existing angling regulations are adequate because of the low fishing pressure at the present time. Although Whalen Lake is known by anglers for the large Dolly Varden present in the lake, Whalen Lake is a long flight from Prince Rupert by float plane, and the present low fishing effort is adequately managed by existing regulations. Whalen Lake does not provide great sport fishing opportunities due to its remoteness, huge size, unattractive surroundings, floating snags and brisk winds.

9. REFERENCES

- Ashley, K., L.C. Thompson, L. Haywood-Farmer, R. Rae, F.R. Pick, P.B. Hamilton, D.C. Lasenby, K.E. Smokorowski and L. McEachern. 1994. Kootenay Lake Fertilization Experiment - Year 2 (1993/94) B.C. Ministry of Environment, Lands and Parks, Fisheries Branch, Fisheries Project Report No. RD 41.
- Carlander, K.D. 1953. Handbook of freshwater fishery biology with the first supplement. Wm. C. Brown Co., Dubuque, Iowa. 430 p. *in* Scott, W.B. and E.J. Crossman. 1973. Freshwater Fishes of Canada. Fisheries Research Board of Canada, Bulletin 184.
- Harcombe, A., B. Harper, S. Cannings, D. Fraser and W.T. Munro. 1994. Terms of Endangerment. Pages 11-28 *in* Harding, L.E. and E. McCullum, eds. Biodiversity in British Columbia: Our Changing Environment. Environment Canada, Canadian Wildlife Service, Pacific and Yukon Region, Vancouver, 425 pp.
- Holland, S.S. 1976. Landforms of British Columbia. A Physiographic Outline. British Columbia Department of Mines and Petroleum Resources. Bulletin 48. 138 pp.
- Hyatt, K.D. and J.G. Stockner. 1985. Responses of sockeye salmon (*Onchorhynchus nerka*) to fertilization of British Columbia coastal lakes. *Can. J. Fish. Aquat. Sci.* 42: 320-331.
- Johnston, N.T., C.J. Perrin, P.A. Slaney and B.R. Ward. 1990. Increased juvenile salmonid growth by whole river fertilization. *Can. J. Fish. Aquat. Sci.* 47: 862-872.
- Meidinger, D. and Pojar, J. 1991. Ecosystems of British Columbia. Special Report Series 6. Ministry of Forests.
- Ministry of Environment, Lands and Parks, Fisheries Branch, Inventory Unit. May 1995. Lake and Stream Inventory: Standards and Procedures.
- Ministry of Environment, Lands and Parks, Fisheries Branch and Water Management Program. February 1996. Bathymetric Standards for Lake Inventories (Final Draft), prepared for the Resources Inventory Commission (RIC).
- Ministry of Forests and Lands, Research Branch. 1988. Biogeoclimatic and Ecoregion Units of the Prince Rupert Forest Region.

- Pojar, J. and A. MacKinnon. 1994. Plants of Coastal British Columbia including Washington, Oregon & Alaska. B.C. Ministry of Forests and Lone Pine Publishing: Vancouver, B.C.
- Scott, W.B. and E.J. Crossman. 1973. Freshwater Fishes of Canada. Fisheries Research Board of Canada, Bulletin 184.
- Udvardy M.D.F. and J. Farrand Jr. 1994. National Audubon Society Field Guide to North American Birds: Western Region. Alfred A. Knopf: New York, NY.
- Warrington, P.D. 1994. Identification Keys to the Aquatic Plants of British Columbia. Water Quality Branch, Water Management Division. B.C. Ministry of Environment, Lands and Parks.
- Wetzel, R.G. 1983. Limnology: Second Edition. Saunders College Publishing: Philadelphia, PA.

Table 1: Table showing the time and date set and collected, as well as the site characteristics, for each gill net (GL) and minnow trap (MT) set in Whalen Lake. Monofilament gill nets had six panels of mesh sizes: 25 mm, 76 mm, 51 mm, 89 mm, 38 mm and 64 mm. Due to irreparable damage, the sinking net had the 76 mm and 64 mm panels removed, with one 76 mm floating net panel attached. Minnow traps were baited with salmon roe. The orientation of the gill nets and the locations of all sample sites can be seen on the aerial photo (Figure 2).

Method	Number	Date Set	Time Set	Date Coll.	Time Coll.	Time Fished (h:min)	Location
GL	01	13-Sep-96	20:00	14-Sep-96	8:10	12:10	floating net, set perpendicular to shore
GL	02	11-Sep-96	20:30	12-Sep-96	9:15	12:45	sinking net, to 14-26m in depth
MT	01	12-Sep-96	19:27	13-Sep-96	15:22	19:55	lake, sandy
MT	02	12-Sep-96	19:43	13-Sep-96	16:50	21:07	inlet E, 122m upstream
MT	03	12-Sep-96	20:00	13-Sep-96	14:00	18:00	inlet D, 188m upstream
MT	04	12-Sep-96	20:15	13-Sep-96	12:59	16:44	lake
MT	05	13-Sep-96	7:38	14-Sep-96	11:19	27:41	at outlet in log jam
MT	06	13-Sep-96	8:55	14-Sep-96	12:41	27:46	inlet A, 55m upstream
MT	07	13-Sep-96	9:44	14-Sep-96	8:53	23:09	lake
MT	08	13-Sep-96	10:02	14-Sep-96	10:00	23:58	inlet B, 130m upstream
MT	09	13-Sep-96	10:55	14-Sep-96	9:08	22:13	lake, near small runoff channel
MT	10	13-Sep-96	11:20	14-Sep-96	9:30	22:10	inlet C, 132m upstream

Table 2: Data for gill netting and minnow trapping in Whalen Lake. Species are Dolly Varden (DV) and kokanee (KO). CATCH is a count of each species of fish caught in the net or trap.

Sum of CATCH		SPP		
METHOD	LOCATION	DV	KO	Total
Gill net	Floating	2	2	4
	Sinking	20	1	21
Gill net Total		22	3	25
Minnow trap	Lake (4)	59	0	59
	Outlet	3	0	3
	Stream A	2	0	2
	Stream B	1	0	1
	Stream C	32	0	32
	Stream D	1	0	1
	Stream E	3	0	3
Minnow trap Total		101	0	101
Grand Total		123	3	126

Table 3: Limnology summary for Whalen Lake, showing the method used, field conditions and the date and time of each measurement.

SEAM #: E223465

Measurement	Data	Method	Date	Time
bottom depth	240 m	X - 16 Sounder	14-Sep-96	13:00
water clarity	6.25 m	Secchi disk	14-Sep-96	13:00
pH at surface	6.4	pH stick	14-Sep-96	13:00
air temperature				
wind velocity	10 km/h	estimate	14-Sep-96	13:00
wind direction	west	estimate	14-Sep-96	13:00
surface condition	choppy	estimate	14-Sep-96	13:00
cloud cover	10/10 occluded	estimate	14-Sep-96	13:00
water colour	green	estimate	14-Sep-96	13:00
weather	rain, windy		14-Sep-96	13:00
description				
water temperature	Table 4, Fig. 9	YSI 85	14-Sep-96	13:00
dissolved oxygen	Table 4, Fig. 9	YSI 85	14-Sep-96	13:00
conductivity	Table 4, Fig. 9	YSI 85	14-Sep-96	13:00
water sampling	Appendix IV	Van Doren bottle	14-Sep-96	13:00

Table 4: Dissolved oxygen, temperature and conductivity measurements for Whalen Lake taken at increments from the surface to a depth of 30 m on September 14, 1996. SEAM site number is E223465.

Depth	Dissolved oxygen	Temperature	Conductivity
(m)	(mg/L)	(°C)	(µmhos/cm)
0	9.15	15.5	6.8
1	9.16	15.5	6.8
2	9.21	15.5	6.8
3	9.20	15.5	6.8
4			
5	9.25	15.5	6.8
6			
7	9.23	15.5	6.8
8			
9	9.22	15.4	6.8
10			
11	9.20	15.3	6.8
12	9.24	14.4	6.9
13	10.26	11.2	6.7
14			
15	10.60	8.5	6.3
16			
17	11.22	7.2	6.1
18			
19	11.48	6.3	6.0
20			
21	11.40	5.6	5.8
22			
23	11.62	5.3	5.8
24			
25	11.62	5.1	5.8
26			
27	11.72	5.0	5.7
28			
29	11.70	4.9	5.8
30	11.73	4.8	5.8

Figure 1: Location of Whalen Lake on 1:50 000 N.T.S. Map 103H/2,3 and 6

Figure 2: Air photo of Whalen Lake

Figure 3: Length weight regression for Dolly Varden in Whalen Lake.

Figure 4: Length frequency distribution for Dolly Varden in Whalen Lake.

Figure 5: Age frequency for Dolly Varden in Whalen Lake.

Figure 6: Length weight regression for kokanee in Whalen Lake.

Figure 7: Length frequency distribution for kokanee in Whalen Lake.

Figure 8: Age frequency for kokanee in Whalen Lake.

Figure 9: Limnological profiles for Whalen Lake.

Photo 1: Aerial view of Whalen Lake looking east showing the surrounding hillsides
(Roll 10, #3)

Photo 2: Aerial view of Whalen Creek (outflow) flowing from Whalen Lake (*Roll 10, #1*)

Photo 3: Downstream view of Whalen Lake outflow (*Roll 11, #14*)

Photo 4: View of log jam near Whalen Lake outflow (*Roll 11, #12*)

Photo 5: Upstream view of inlet stream (A) south side of Whalen Lake (*Roll 10, #24*)

Photo 6: Downstream view of inlet stream (A) (*Roll 10, #24a*)

Photo 7: Upstream view of inlet stream (B) 915-4883-754-402-000 south side of Whalen Lake (*Roll 11, #2*)

Photo 8: Downstream view of inlet stream (B) 915-4883-754-402-000 (*Roll 11, #1*)

Photo 9: Upstream view of inlet stream (C) south side of Whalen Lake (*Roll 11, #5*)

Photo 10: Downstream view of inlet stream (C) (*Roll 11, #4*)

Photo 11: Upstream view of inlet stream (D) 915-4883-754-756-000 south side Whalen Lake (*Roll 11, #9*)

Photo 12: Downstream view of inlet stream (D) 915-4883-754-756-000 (*Roll 11, #8*)

Photo 13: Upstream view of inlet stream (E) 915-4883-754-863-000 south side of Whalen Lake (*Roll 11A, #11*)

Photo 14: Downstream view of inlet stream (E) 915-4883-754-863-000 (*Roll 11A, #12*)

Photo 15: View of slides on the south shore of Whalen Lake (*Roll 10, #18*)

Photo 16: View of clearcut on the south shore in the middle of Whalen Lake (*Roll 10, #17*)

Photo 17: View towards the west end of Whalen Lake (*Roll 10, #15*)

Photo 18: View towards the east end of Whalen Lake (*Roll 10, #22*)

Photo 19: Camp on old logging road at Whalen Lake (*Roll 11, #15*)

Photo 20: Photo of Dolly Varden char from Whalen Lake (*Roll 10, #13*)

Appendix I: BATHYMETRIC DATA

Appendix II: STREAM CARDS

Appendix III: RAW CATCH DATA

Appendix IV: WATER SAMPLING REPORT

Appendix V: RAW FIELD NOTES