Reconnaissance Inventory
of
Reed Lake

Watershed Code: 920-627900-26536
Waterbody ID: 00054CAMB

Prepared for:

BC Ministry of Environment, Lands and Parks

Vancouver Island Region
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December 1999
Reconnaissance Lake Inventory - Reed Lake

Project Reference Information

- MELP Project Number: IVNOI103N
- FRBC Project Number: PA96163 IN/TR
- FRBC Region: Vancouver Region
- MELP Region: 01
- MELP District: Campbell River
- FW Management Unit: 1-10
- Fisheries Planning Unit: Campbell Oyster
- Forest Region: 01
- Forest District: Campbell River

Watershed Information

- Watershed Group: Campbell
- Watershed Code: 920-627900-26536
- Sequence Number: none
- Waterbody Identifier: 00054CAMB
- UTM at Lake Outlet: 10.325693.5547324
- Number of TRIM Tributaries: 1 inlet
- Magnitude: 1
- Elevation: 235 m
- NTS Map: 92K/3
- TRIM Map: 92K.003
- Biogeoclimatic Zone: CWHxm1
- Air Photos: BCB91031:154-155

Lake Sampling Summary

- Lake Survey Type: Secondary (97 RIC Standards)
- EMS Number: E225246
- Water Surface Area: 35,126 m²
- Maximum Depth: 7 m
- Mean Depth: 2.9 m
- Secchi Depth: 7.0 m
- Volume: 72,818 m³
- Area above 6 m Contour: 31,864 m²
- Shoreline Perimeter: 1,093 m
- Lake Length: 230 m
- Number of Islands: 0

mjl
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(250) 721-4356

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Disclaimer

The Province of BC has not accepted the contents of this product for the purposes of the Forest Practices Code, and reserves the right to dispute the validity of summarized results. The Province of BC does not necessarily agree with the classification, assigned to any individual stream reach, for use in logging plans, silviculture prescriptions or any other application.

Acknowledgments

Forest Renewal BC provided funding for this inventory.
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1.0 Introduction

1.1 Project Scope and Objectives

This report documents the findings of a reconnaissance lake survey conducted on Reed Lake (Waterbody ID 00054CAMB), a small ungaetzetted lake in the Campbell River Watershed. MJ Lough and Associates surveyed this lake on October 5-6, 1996 as part of the Sayward Landscape Unit Fish and Fish Habitat Inventory, which was conducted between 1996 and 1998.

The primary objectives of this fish and fish habitat inventory project are:

- To provide the fish and fish habitat information required for resource management planning.
- To provide information needed for the lake classification process according to the Forest Practices Code.
- To establish the "normal high water mark" of lakes, needed to identify and map the Riparian Reserve Zone adjacent to lakes in the study area.

1.2 Location

- Reed Lake is located in the Sayward Provincial Forest on Vancouver Island, approximately 10 kilometers (km) west of the town of Campbell River and .75 km north of Loveland Bay on Campbell Lake. Reed Lake flows into Campbell Lake which empties into Campbell River, and eventually discharges into the Pacific Ocean in Discovery Passage (Figure 1).

1.2.1 Access

Directions to Reed Lake from Campbell River are as follows:

- Proceed west on the Gold River Highway (paved 2-lane) out of Campbell River.
- At 4.3 km (top of General Hill), turn right onto the paved road that crosses the John Hart Dam, and drive across the dam.
- At 1.9 km, turn left onto the Brewster Lake Road (good 2-wheel drive gravel logging mainline).
- At 9.1 km Reed Lake is immediately to the southeast of the Brewster Lake Road. The road grade forms the east shore of the lake. There is no boat ramp at the lake, but a car-top boat can be launched down the steep road embankment.
Figure 1  Arrow indicates the location of Reed Lake on excerpt from NTS map 92K/3 (scale 1:50,000)
2.0 Resource Information

2.1 Native Issues

- Reed Lake is included in the traditional claims to land title by the Campbell River and Cape Mudge Bands. The Kwakiutl Laich-kuwill-Tach Council of Chiefs represents these and other bands in land claim issues, and have included the area in their Statement of Intent documents which were accepted by the BC Treaty Commission in February, 1997. Negotiations with the Federal and Provincial governments are currently proceeding through the BC Treaty Commission (Armstrong pers. comm.).

2.2 Development and Land Use

2.2.1 Logging

- Reed Lake is in the Sayward Provincial Forest, which is a public forest managed by the British Columbia Ministry of Forests (MOF), Campbell River District. The primary resource based activity in the region is logging. Most of the Sayward Forest was logged in the early 1900’s (BCMOF-CRD Undated). The extensive logging resulted in a network of old railway grades and gravel roads throughout the Sayward Forest.
- Reed Lake is also within the Snowden Demonstration Forest. This is an active forest where silviculture systems are integrated with environmental concerns, recreation, education, research, and wildlife management, to raise public awareness about Integrated Resource Management of Provincial Forests (Snowden Demonstration Forest undated).
- In 1938, 38,000 hectares of forest from Campbell River to Courtenay was destroyed in the Bloedel Forest Fire (BCMOF-CRD Undated). Also burned were approximately 5,200 ha of the Sayward Provincial Forest, between Boot Lake and the north shore of what is now John Hart Lake. Reed Lake bordered on the burned area.
- The land to the north of Reed Lake was planted in 1946 and 1972 and has regenerated into 41 to 60 year-old Douglas fir (*Pseudotsuga menziesii* ssp. *menziesii*), western hemlock (*Tsuga heterophylla*) and western redcedar (*Thuja plicata*). The land to the east and west of Reed Lake was logged in the late 1970’s and planted with Douglas fir in 1981 (Sayward Forest 1994)
- The MOF Sayward Provincial Forest 1995-2000 Forest Development Plan indicates a 15 ha commercial thin to be cut in 1996 which is adjacent to the outlet stream of Reed Lake, 200 m south of the lake (BCMOF-CRD 1995). The Sayward Provincial Forest 1996-1999 Road Deactivation and Maintenance Plan shows a new access road that runs from the Brewster Lake Road into the commercial thin (BCMOF-CRD 1996).
- Currently the Brewster Lake Road (maintained by MOF) runs along the west, north and east shores of Reed Lake, although it is only visible from the lake along the southwest shore.
2.2.2 Recreation

- There are no formal camping facilities at Reed Lake but Loveland Bay Provincial Park is 600 m to the south, along the Brewster Lake Road.
- There is a clearing with a stone fire ring on the north shore of Reed Lake that appears to be used by picnickers.
- Reed Lake is in the Snowden Demonstration Forest. Several mountain biking and hiking trails have been constructed along old, abandoned railroad grades throughout the Snowden Demonstration Forest. The MOF is promoting the recreational use of the Snowden Forest through public awareness programs that include posters that display the trails and lakes in the area.
- The biophysical feature code for Reed Lake and the surrounding area, from the MOF Recreation Resource Inventory Map 92K/3, is W^3 E^3 M^2 jqi (B1). This classification describes the terrain as containing highly unique biophysical features such as large mammals, coniferous forest and small surface waters, which attract recreational use for hunting, wildlife viewing and camping. It further stipulates that MOF Recreation staff must be consulted prior to the making of resource use decisions (Quadra Island 1987).

2.3 Water Quality

- British Columbia Ministry of Environment Lands and Parks (MELP) Lake Inventory files contain no record of any previous surveys on Reed Lake (BCMELP-FB-VIR 1996).

2.4 Wildlife

- Reed Lake is in the Coastal Western Hemlock Biogeoclimatic Zone (British Columbia 1996) which is reported to be potentially the most productive region on Vancouver Island for Columbia blacktail deer (*Odocoileus hemionus columbianus*) and Roosevelt elk (*Cervus canadensis roosevelti*) (Diggle and Addison 1977).
- The forest land to the south of Reed Lake has an Environmentally Sensitive Area (ESA) rating of Ew on the MOF Forest Cover Map 92K.003 (Sayward Forest 1994). This indicates that the area is of critical importance for wildlife.

2.5 Fisheries

- MELP Lake Inventory files contain no record of any previous surveys on Reed Lake (BCMELP-FB-VIR 1996).
- Reed Lake was stocked with steelhead (*Oncorhynchus mykiss*) juveniles from the Quinsam River Salmon Hatchery in 1992 (Law pers. com.).
2.6 Inlets and Outlets

- MELP Lake Inventory files contain no record of any previous surveys on Reed Lake (BCMELP-FB-VIR 1996).

3.0 Methods and Equipment

3.1 Standards

This survey was conducted according to standards described in the British Columbia Ministry of Environment, *Lake and Stream Inventory Standards and Procedures* (BCMELP-FB-IU 1995). The Service Contract details changes made to these standards for the inventory of Reed Lake which include the following:

- The lake and stream sample sites were specified in the service contract, and were not selected randomly.
- This lake is smaller than 5 hectares and was therefore surveyed to standards similar to those required for a Secondary Lake Inventory as described in the Resources Inventory Committee (RIC) manual *Reconnaissance (1:20,000) Fish and Fish Habitat Inventory: Standards and Procedures* (BCMELP-FB-IU 1997).
- The 1996 DFO/MOE Stream Survey Form Site Cards were used for stream data collection. The MELP Lake Biophysical Data Form was used to record Lake Survey data. The Fish Collection Method and Data Form was used to record Fish data. The Photo Survey Form 1 and Form 2 were used to record photographic information. Field data was subsequently entered into Excel spreadsheets provided by MELP, except for the Site Card data which was entered into the DFO/MOE Stream Survey Data Entry Tool (Nelson version).
- *RIC Standards* for surveys of tributaries to secondary lakes require that the streams be enumerated and subjectively assessed for fisheries values. For this survey however, DFO/MOE Stream Survey Forms were completed for all tributaries, although 6 channel widths were not always collected.
- Mapping standards stipulate that only the streams that are indicated on Terrain Resource Information Management 1:20,000 (TRIM) maps should be mapped in the provincial GIS database. Any non-TRIM streams that were located in the field, appear in this report, but are only indicated on the GIS maps with a “tributary” symbol and stream summary symbol at the sample site location.
- A single, integrated water sample for laboratory analysis was collected on March 4, 1997 prior to thermal stratification of the lake. Field limnology data was also measured during the lake survey on October 5, 1996.
- *RIC Standards* for bathymetric data collection on secondary lakes require only an e-line, maximum depth and water level. However, for this survey a full bathymetric survey was conducted at Reed Lake and a bathymetric map was produced.
- The target sample size of sport fish at each lake was 30 fish per species, lake and tributary samples combined.

The *Sayward Landscape Unit Fish and Fish Habitat Inventory Phase 2 Report* refines the project objectives and describes the project plan (Attachment 4).
3.2 Procedures

3.2.1 Bathymetry

- A 4 m aluminum skiff with a 6 horsepower outboard motor was used to conduct sounding transects for bathymetric mapping. A Lowrance X-16 recording depth sounder (Lowrance Electronics Inc., Tulsa, OK) at a boat speed of one meter/second recorded sounding plots of the lake. Field data was then digitized and plotted by Pacific Spatial Systems Limited, using PC ARC/INFO and an ARCVIEW custom developed extension program.

3.2.2 Limnology

- EMS number E225246 was assigned to the limnology station at Reed Lake by MELP in Nanaimo.
- Water chemistry samples were collected on March 4, 1997, in order to sample the lake during the period when lake nutrients were expected to be evenly mixed and most representative of the lake’s character. To further minimize any effects of stratification, a single incremental water sample was collected at the deepest part of the lake. A hose (2.5 cm in diameter) was lowered from a boat to within 1 m of the lake bottom, sealed, then brought to the surface. The contents were then emptied into a bucket, and the water samples collected from the bucket. Water samples were immediately shipped via courier to Philip Analytical Services (Vancouver) for lab analysis (Appendix 2).
- Field water chemistry measurements were recorded during the lake survey on October 5, 1996 (Appendix 1). A Hanna instruments Model HI 9024C pH meter (Hanna Instruments Inc., Wainsocket, RI) was used to measure pH at the surface; and a YSI Model 85-10 Temp/DO meter (YSI Inc. Yellow Springs OH) with a 30 m probe, recorded the temperature, dissolved oxygen and specific conductance profile in the lake. Total dissolved solid (TDS) values were estimated by multiplying field-sampled specific conductance by 0.65. Total alkalinity was measured using a Lamotte field titration kit (Lamotte Co., Chestertown, MD). A standard Limnology Secchi Disc (Wildco, Saginaw, MI) was used to obtain turbidity and water color information.

3.2.3 Stream Fish Samples

- Although fish sampling in tributaries of lakes less than 5 ha was not required, minnow trapping was performed in 2 of the inlet streams and the outlet stream of Reed Lake. Baited minnow traps were set in a variety of stream habitats.
- As well, all streams were visually assessed for rearing and spawning capability and probable fish presence.

3.2.4 Lake Fish Samples

- Fish samples were collected on October 5-6, 1997 using a 91.5 m long by 2.4 m deep sinking gillnet made up of standard gillnet gangs. The net was originally set for the day, and then reset and left overnight to try to obtain a larger sample of fish.
Fish collected by gillnet were weighed to 1 g using an Ohaus Model LS 2000 portable electronic balance (Ohaus Industries, Florham, NJ), measured and inspected for gonad maturation then photographed.

3.2.5 Fish Age and Growth

- Scale samples and length/weight data were collected from all fish captured in the gillnet (Attachment 7).
- Fish age was determined through scale analysis. Scale samples were aged and archived using a 3M Microfiche Viewer/Printer to produce enlarged printed images of the scales. The original scales were then replaced in the scale envelopes after the reading and attached to the photocopy enlargements for archival storage (Attachment 7).

3.2.6 Photodocumentation

- Photographs were taken with a Pentax ME 35 mm single lens reflex camera (cameras #1 and #3), an Olympus AF-10, 35 mm camera (camera #2), and a Yashica Microtec 35 mm camera (camera #4).
- Photo Survey Form 1 is included in Attachment 1 and Photo Survey Form 2 is in Appendix 5.

3.2.7 Site Sampling

- A 50 m tape, meter stick and a hip chain were used for all depth and length measurements of stream channels and obstructions. A Suunto clinometer was used for measuring stream gradients. An alcohol thermometer was used to measure water temperature.

3.2.8 Digital Mapping

- GIS Interpretive Maps were produced by SRM-Levelton according to MELP Standards for Fish and Fish Habitat Mapping Version 2.0 (BCMOF-FIS 1998) (Attachment 9).
- Digital 1:20,000 maps were created from the DFO/MOE Stream Survey Data Entry Tool database plotted on TRIM linework.

4.0 Results and Discussion

4.1 Logistics

- The Waterbody Identifiers for the lakes in the study area were obtained from MELP in September 1996. Since that time, the Waterbody ID’s for this area have been changed several times. The Waterbody ID’s have been updated with the correct ones in the computer databases, and the current Waterbody ID for Reed Lake is presented in this report. However, the original field notes, photographs and the water chemistry analysis show the incorrect Waterbody ID that was obtained in 1996.
• Reach identification and numbers were not available for the Campbell Watershed when this lake survey was conducted. Reach breaks for the reaches adjacent to Reed Lake were established using TRIM maps and air photos, then verified in the field. The reach numbering of this lake and tributaries however is independent of the rest of the watershed. The sample site furthest downstream of the Reed Lake (in this case the first reach of the outlet stream below Reed Lake) was arbitrarily labeled as Reach 99. Reed Lake was therefore Reach 100 and the first reach of the main inlet stream was Reach 101. The Interpretive Maps show the correct reach breaks and numbering for the Campbell Watershed, which are different from the ones used in the Reed Lake Inventory.

• The DFO/MOE Stream Survey Form and Data Entry Tool used in this survey were designed for use with the old 37 digit watershed code. However, the Data Entry Tool stores the watershed codes without the hyphens between the number sequences (Spence pers. com.). Since the 45 digit watershed codes were used for stream identification during this project, they were used on the field cards and entered into the DFO/MOE Stream Survey Data Entry Tool. The Stream Survey Reports in Appendix 4 appear to display 37 digit watershed codes, however, they contain the 45 digit watershed codes with the hyphens in the wrong places.

• Two unmapped inlet streams to Reed Lake were found during the field inventory. A DFO/MOE Stream Survey Form (Sites 6 and 7) was completed for each of these tributaries.

• Gillnetting success in Reed Lake was poor during the day so the gillnet was re-set and left overnight to obtain a larger fish sample. After a total of 22 hours, however, only 2 fish were caught. Netting was therefore terminated due to concerns about over-harvesting the evidently small fish population in the lake.

• Stream discharges were low during this survey. The outlet stream was flowing but the inlet streams were dewatered or dry.

4.2 Immediate Shoreline

• Reed Lake is “U” shaped with a small isthmus abutting from the south shore. This isthmus becomes an island at very high water levels.

• The west shore of Reed Lake has been encroached upon by road fill from the Brewster Lake Road.

• The remainder of the shore is primarily a wetland edge, surrounded by bracken fern (Pteridium aquilinum), salal (Gaultheria shallon) and hard-hack (Spirea douglasii ssp. douglasii), and this is rimmed by a mixed second growth coniferous forest, with scattered old-growth veterans, predominantly Douglas fir.

• The west end of the south shore is formed by a 5 m high rock bluff that drops down into the lake.

• Square-end logs from historical logging, and natural blowdown were floating perpendicular to the shoreline around the lake.

• The visible lake bottom is composed of soft organic fines.
4.3 Terrain

- Reed Lake is situated in a glacial piedmont setting and is surrounded by gently rolling hills characteristic of the Vancouver Island eastern coastal plain.
- The land surrounding the north, east and south sides of the lake is mostly forested with 41 to 60 year old Douglas fir with a small percentage of western hemlock. A small patch of timber on the south shore of Reed Lake is currently forested with old growth Douglas fir (251 years plus) (Sayward Forest 1994)
- The small cut block along the west shore of the lake that was harvested in the late 1970’s has now greened up with Douglas fir, western redcedar and western hemlock.

4.4 Aquatic Flora

- Aquatic macrophyte distribution for Reed Lake is displayed on the annotated air photo in shown Figure 2.
- Sweet gale (*Myrica gale*) emergent vegetation rimmed the lake up to the high water mark. Sedges (*Carex* spp.) grew along the lake edge inside of the rim of sweet gale.
- Sparse watershield (*Brasenia schreberi*) grew at the mouth of the east inlet, and small patches of grass-leaved pondweed (*Potamogeton gramineus*) grew near the shore in the southeast bay.

4.5 Site Summary

- Sample sites and feature locations are summarized in Table 1 and described on the annotated air photograph of Reed Lake shown in Figure 3.

Table 1  Reed Lake survey site descriptions and locations, October 5-6, 1996

<table>
<thead>
<tr>
<th>Site Number</th>
<th>Location</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>North tip of isthmus</td>
<td>Benchmark</td>
</tr>
<tr>
<td>2</td>
<td>Reed Lake deepest basin</td>
<td>Limnology station 1/ EMS # E225246</td>
</tr>
<tr>
<td>3</td>
<td>Reed Lake center</td>
<td>4-way lake panorama photographs</td>
</tr>
<tr>
<td>4</td>
<td>Reed Lake northeast basin</td>
<td>Sinking gillnet #1</td>
</tr>
<tr>
<td>5</td>
<td>North inlet, reach 1</td>
<td>DFO/MOE Stream Survey Form and minnow trap #3</td>
</tr>
<tr>
<td>6</td>
<td>Northeast inlet, reach 101</td>
<td>DFO/MOE Stream Survey Form and minnow trap #4</td>
</tr>
<tr>
<td>7</td>
<td>East inlet, reach 1</td>
<td>DFO/MOE Stream Survey Form</td>
</tr>
<tr>
<td>8</td>
<td>Reed Lake</td>
<td>Sinking gillnet #2</td>
</tr>
<tr>
<td>9</td>
<td>South outlet</td>
<td>DFO/MOE Stream Survey Form and minnow traps #1 and #2</td>
</tr>
</tbody>
</table>
Figure 2  Location of macrophyte communities at Reed Lake on October 5, 1996 shown on enlargement from air photo BCB 91031 #154 (scale 1:4,800)
Figure 3 Location of sample sites and features at Reed Lake on October 5, 1996 shown on enlargement from air photo BCB 92031 #154 (scale 1:4,700)
4.6 Bathymetry

- The Reed Lake bathymetric map generated from the sounding transects in Figure 4, is shown in Figure 5 ("A" size) and Appendix 6 ("E" size).
- Reed Lake has a gently sloping bottom with a 7.0 m deep basin in the west part of the lake, and 3 shallower (3.5 m to 4.0 m deep) basins in the eastern part of the lake.

4.7 Limnological Sampling

- The Reed Lake temperature profile measured on October 5, 1996 showed the lake to be fairly isothermic at that time of year. The water temperatures declined from 13.2°C at the surface to 12.8°C at the 7 m maximum depth.
- The dissolved oxygen profile indicated a thin layer of anoxic water in the deepest 1 m of the lake.
- Results of the laboratory analysis of the water samples collected from Reed Lake on March 4, 1997 are included in Appendix 2.

4.8 Inlets and Outlets

- Reed Lake has 3 small ephemeral inlets (2 are not mapped on TRIM) and one outlet to Campbell Lake (Table 2).
- A DFO/MOE Stream Survey Form was completed for the first reach adjacent to the lake in the 3 inlets and the outlet (Appendix 4).

Table 2  Stream characteristics and sites at Reed Lake on October 5, 1996

<table>
<thead>
<tr>
<th>Stream Type</th>
<th>Mapped on TRIM</th>
<th>Site Number</th>
<th>Flow Regime</th>
<th>Watershed Code</th>
<th>Stream Order</th>
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<tbody>
<tr>
<td>NW inlet</td>
<td>yes</td>
<td>5</td>
<td>intermittent</td>
<td>920-627900-26536-96849</td>
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<tr>
<td>NE inlet</td>
<td>no</td>
<td>6</td>
<td>intermittent</td>
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<td>1</td>
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<tr>
<td>E inlet</td>
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<td>intermittent</td>
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<td>outlet</td>
<td>yes</td>
<td>9</td>
<td>intermittent</td>
<td>920-627900-26536</td>
<td>1</td>
</tr>
</tbody>
</table>

4.9 Fish

4.9.1 Fish Sample Summary

- Sinking gillnet #1 (Site 4) was set in Reed Lake for 4 hours on October 5, 1996. Although 2 trout were observed in the net, both managed to escape before the net was hauled. The net was re-set (Sinking gillnet #2, Site 8) and left overnight for 18 hours, and 2 rainbow trout (Oncorhynchus mykiss) were caught (Table 3).
- On October 5, 1996, 1 minnow trap was placed in each of the 2 north inlet streams and 2 minnow traps were placed in the outlet stream (Table 4). The minnow traps were left in the streams overnight for 18 hours but no fish were captured.
Figure 4  Depth soundings transects and spot soundings at Reed Lake on October 5, 1996, used for bathymetric mapping (scale 1:3,300)
Table 3  Summary of fish sampling in Reed Lake on October 5-6, 1996.

<table>
<thead>
<tr>
<th>Site Number</th>
<th>Method</th>
<th>Duration (hours)</th>
<th>Species</th>
<th>Number of Fish Captured</th>
</tr>
</thead>
<tbody>
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<td>4</td>
<td>Sinking gillnet #1</td>
<td>4</td>
<td>--</td>
<td>0</td>
</tr>
<tr>
<td>8</td>
<td>Sinking gillnet #2</td>
<td>18</td>
<td>RB</td>
<td>2</td>
</tr>
</tbody>
</table>

Table 4  Summary of fish sampling in Reed Lake inlet and outlet streams, October 5-6, 1996

<table>
<thead>
<tr>
<th>Site #</th>
<th>Watershed Code</th>
<th>Inlet/Outlet</th>
<th>Method</th>
<th>Duration (hours)</th>
<th>Species</th>
<th>Number of Fish Caught</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>920-627900-26536</td>
<td>NW inlet</td>
<td>minnow trap #3</td>
<td>18</td>
<td>-</td>
<td>0</td>
</tr>
<tr>
<td>6</td>
<td>920-627900-26536</td>
<td>NE inlet</td>
<td>minnow trap #4</td>
<td>18</td>
<td>-</td>
<td>0</td>
</tr>
<tr>
<td>9</td>
<td>920-627900-26536</td>
<td>outlet</td>
<td>minnow trap #1</td>
<td>18</td>
<td>-</td>
<td>0</td>
</tr>
</tbody>
</table>

4.9.2 Fish Age, Size and Life History

- Scale analysis found that the 2 captured rainbow trout were aged 1+ and 5+ (Table 5). A steep section of chutes in the outlet stream and a dewatered section 70 m downstream of the lake appear to be a barrier to upstream migration from Campbell Lake, making it unlikely that these fish migrated upstream from Campbell Lake. It is more likely that the large fish is a 5+ steelhead from the 1992 stocking of Reed Lake and the small fish is the 1+ progeny from that stocked steelhead.
- The small sample size obtained was inadequate for age and growth analysis.

4.9.3 Fish and Fish Habitat Comments

- Sampling in Reed Lake indicates that the lake is inhabited by a rainbow trout monoculture. The population apparently originated from steelhead juveniles that were stocked from the Quinsam River Salmon Hatchery in 1992.
- Although the tributaries of Reed Lake are not high quality fish habitat, the sampled 1+ juvenile indicates that limited spawning and juvenile recruitment is possible, at least during some years. This most likely occurs in the outlet stream.

Table 5  Summary of age and growth data of fish sampled at Reed Lake on October 5-6, 1996

<table>
<thead>
<tr>
<th>Species</th>
<th>Age</th>
<th>Number of Fish</th>
<th>Length (mm)</th>
<th>Weight (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>RB</td>
<td>1+</td>
<td>1</td>
<td>162</td>
<td>53</td>
</tr>
<tr>
<td>RB</td>
<td>5+</td>
<td>1</td>
<td>334</td>
<td>464</td>
</tr>
</tbody>
</table>
• Only 2 fish were caught in 22 hours of gillnetting which suggests that the fish population in Reed Lake is small. The presence of large and small fish in the population suggests that over-fishing may not be the cause. It is more likely that limited spawning and juvenile rearing habitat during low flows have limited the population size.

• The outlet stream is now essentially a ditch at the base of the Brewster Lake Road. Road fill encroachments have resulted in a stream with limited pools and tail-outs, with little spawning habitat.

• A poorly installed culvert on the outlet stream, 70m downstream of the lake has created a 10m dewatered section that is a barrier to fish movements during low flows. Downstream of this area, in the second reach below Reed Lake, the gradient increases to 20% making upstream migration of fish from Campbell Lake unlikely.

• Although fish sampling in the tributaries was limited to minnow trapping, the lack of juveniles suggests that recruitment to Reed Lake is limited by intermittent flows and poor rearing conditions in these streams.

• The poor success of fish sampling was probably due to a small fish population in the lake.

4.9.3.1 Fisheries Sensitive Zones

• No fisheries sensitive zones were identified in the Reed Lake study area.

4.9.3.2 Restoration and Rehabilitation Opportunities

• The culvert barrier on the outlet stream 70 m downstream of Reed Lake has created sub-surface flows. Replacement or removal of the culvert would improve fish passage.

• Opportunities to improve the encroached portion of the outlet stream include the creation of spawning habitat with pools for holding, and gravel tail-outs for spawning. This habitat complexing would also improve juvenile rearing habitat.

4.9.4 Sport Fishery Comments

• Reed Lake is a pretty lake near Campbell River Town with 2 wheel-drive vehicle access to the lake and excellent shore fishing opportunities. The apparently small fish population and natural recruitment limitations appear to limit future angling opportunities.

4.10 Wildlife

• Columbia blacktail deer sign was abundant around the lake.
5.0 Cited References


6.0 Personal Communications

7.0 Additional References


British Columbia Ministry of Forests, Campbell River Forest District. 1996. Sayward Provincial Forest 1996 to 1999 Road Deactivation and Maintenance Plan. Campbell River: British Columbia Ministry of Forest, Campbell River Forest District


Campbell River, Sayward, Oyster River and Buttle Lake Area. 1995. Logging and Highway Road Map. Campbell River: Campbell River Search and Rescue Society. 1 sheet, scale 1: 70,000.


Department of Fisheries and Oceans and British Columbia Ministry of Environment, Lands and Parks. 1990. Fish Habitat Inventory and Information Program, Stream Information Summary System database and hardcopy maps.

Department of Fisheries and Oceans and British Columbia Ministry of Environment, Lands and Parks. 1996. Resources Inventory Branch. Fisheries Information Summary System database.

Environment Canada. 1965-1993 Canadian Climate Data, Campbell River, British Columbia.


Quinsam River Salmon Hatchery. 1996. Fish Fry Stocking database.


APPENDIX 1

Reed Lake Biophysical Data Form
APPENDIX 2

Water Chemistry Analysis
APPENDIX 3

Fish Collection Method and Data Forms
APPENDIX 4

DFO/MOE Stream Survey Reports and Site Photos
APPENDIX 5

Lake Photographs
APPENDIX 6

Bathymetric Map (E Size)