Reconnaissance (1:20,000) Fish and Fish Habitat Inventory: Lake Survey Form Field Guide

Prepared by
Ministry of Environment
Ecosystems Branch
for the
Resources Information Standards Committee

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Version 2.0

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The Resources Information Standards Committee evolved from the Resources Inventory Committee which received funding from the Canada-British Columbia Partnership Agreement of Forest Resource Development (FRDA II), the Corporate Resource Inventory Initiative (CRII) and by Forest Renewal BC (FRBC), and addressed concerns of the 1991 Forest Resources Commission.

For further information about the Resources Information Standards Committee, please access the RISC website at: http://ilmbwww.gov.bc.ca/risc/index.htm

Standard Authority: *Reconnaissance (1:20,000) Fish and Fish Habitat Inventory: Standards and Procedures, version 2.0,* RIC (2001); Errata (April 2007)

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INTRODUCTION

This *Field Guide* assists Lake Field Inventory crewmembers in collecting and recording relevant field data for the Lake Survey Form. It includes an equipment list and descriptions of how to achieve the deliverables. The *Field Guide* is organized in the same order as the Lake Survey Form. This *Field Guide* includes information on definitions, methods, and recording procedures. More detailed standards regarding the inventory can be found in the *Reconnaissance (1:20 000) Fish and Fish Habitat Inventory: Standards and Procedures Manual*. Additional information on methodology for Lake Survey Form field data collection can be found in the *Reconnaissance Level Lake Survey Toolkit* at http://www.env.gov.bc.ca/fish/pdf/recce_lake_survey.pdf. Lake Survey Form information that is required for the minimum data submission standards of a BC Scientific Fish Collection Permit is described on the Fish Data Submission website at http://www.env.gov.bc.ca/fish_data_sub/index.html.

Complete all fields of the card for which it is possible to collect data. When a particular field cannot be completed for the lake use a squiggly line to strike through the blank field or write N/A. This distinguishes the field as not applicable rather than one that was omitted. Explain why a particular field was not completed, reference in the comment indicator box (if there is one for the section) and record in the comments section.

Some Lake Survey Form sections (Inlets/Outlets, Photo Documentation) have comment indicator box(es) which are shaded light blue. These boxes refer to comments made about data recorded within the section. For example, a number written in the comment indicator box (C) in the Photo Documentation Section would refer to statements written in the comments section with a corresponding number. There is also a Comments section for the form to add specific or general comments for the survey.

LAKE INVENTORY EQUIPMENT CHECKLIST

ACCESS
- ☐ Access maps
- ☐ Air photos
- ☐ Compass

SURVEY FORMS AND SUPPLIES
- ☐ Lake Survey Forms
- ☐ Site Cards
- ☐ Fish Collection Forms
- ☐ Individual Fish Data Forms
- ☐ Lake outline maps on waterproof paper
- ☐ Plastic clipboard (covered is best)
- ☐ Site card binder (e.g., Duksbak book)
- ☐ Pencils and grease pencils (omnichromes™)

SAFETY
- ☐ Communications (e.g., VHF radios, satellite phone, whistles, etc.)
- ☐ Emergency Plan
- ☐ First Aid Kit
- ☐ Survival gear

FISH SAMPLING
- ☐ Fish collection permit(s)
- ☐ Fish ID field reference guide
- ☐ 2 floating gill-nets
- ☐ 2 sinking gill-nets
- ☐ Gill-net anchors
- ☐ Minnow traps with clips and lines
- ☐ Bait for minnow traps
- ☐ Dip-net for handling fish
- ☐ Electroshocker and WCB approved linesman gloves
- ☐ Spare netting for anode ring of electroshocker
- ☐ Stop nets if required
- ☐ Buckets for handling fish
- ☐ ***Fish sampling kit***:
  - ☐ Dissecting kit
  - ☐ Weigh scales and spare batteries
  - ☐ Scale envelopes
  - ☐ Fish measuring boards
  - ☐ DNA sample kit
  - ☐ Whirlpak or zip-lock bags
  - ☐ Anaesthetic (e.g., Alka-Seltzer)

BOAT
- ☐ Boat and motor equipped to meet Coast Guard safety standards (e.g., PFD, oars, bailing can)
- ☐ Fuel and oil for boat motor
- ☐ Tool-kit and spare parts (spark plugs, extra pull cord)
- ☐ Anchor with adequate line for deep lakes
- ☐ Propeller, cotterpins, shearpins

WATER SAMPLING KIT
- ☐ Temp/DO/conductivity meter(s) with 30 m marked cable, spare membranes, and calibration solutions
- ☐ pH meter, spare probe and calibration solution
- ☐ Lab water sample collection bottles (e.g., VanDorn), messengers and 30 m marked line
- ☐ Secchi disc and 30 m marked line
- ☐ Hydrogen sulphide test kit
- ☐ Thermometer
- ☐ Sample bottles and fixative solutions for water samples
- ☐ Labels, pencils, felt markers, requisition forms
- ☐ Coolers and ice
- ☐ Packing tape

BENCHMARK
- ☐ Spikes or eye-bolts
- ☐ Aluminum survey plates
- ☐ Ball-point pens
- ☐ Hatchet and file
- ☐ Fluorescent spray paint
- ☐ Flagging tape
- ☐ Clinometer, line level, Abney, etc.
- ☐ Measuring tape (metric)

BATHYMETRIC SURVEY
- ☐ Lowrance X-16 recording sounder (or approved equivalent) and transducer
- ☐ Battery for sounder
- ☐ Spare paper for sounder
- ☐ Spare fuses
- ☐ Spare stylus
- ☐ Operators manual
- ☐ Spare hardware for mounting transducer to transom
- ☐ Spare power cable

PLANT SAMPLING EQUIPMENT
- ☐ Plant press
- ☐ Plant identification guide

PHOTODOCUMENTATION

- ☐ Camera
- ☐ Spare film

White board and marker pen (optional)

STREAM SURVEY KIT

- ☐ Hip chain with spare rolls of topofil
- ☐ Survey rod or metre stick with metal cap at base
- ☐ Clinometer or Abney level
- ☐ 30 metre tape measure

PERSONAL

- ☐ Rain gear
- ☐ Waders and patch kit
- ☐ Lunch
- ☐ Polarized sun glasses
- ☐ Clear safety glasses (optional)
- ☐ Hat with brim
- ☐ Sun screen
- ☐ Bear spray

REFERENCING

The accurate location of the lake is referenced in the *Waterbody* section of the Lake Survey Form during the Pre-field Preparation stage of the lake inventory project. The *Waterbody Type* is verified in the field.

LAKE SURVEY FORM
WATERBODY

WATERBODY TYPE **WETLAND** 01 ☐ 02 ☐ 03 ☐ 04 ☐ 05 ☐ **OR LAKE** Primary ☐ Secondary ☐					FISH COLLECTION FORMS ATTACHED? Y ☐ N ☐	
LAKE NAME (gaz.) (local)						
WATERSHED CODE						
REACH # –	AIR PHOTO REF.		ILP MAP #	ILP #	REF. COMMENTS	
WATERBODY ID				PROJECT ID	MAGNITUDE	mthd
NID MAP #	NID #	UTM		SURFACE AREA ha	SOURCE	
TRIM MAP #	YEAR	TRIM MAP #	YEAR	ELEVATION m	SOURCE	
				BIOGEOCLIMATIC ZONE AT SWB BWBS SBPS SBS		
				MH ESSF BG PP IDF CDF ICH CWH MS		

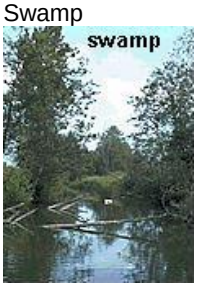
Wetland, Lake

Definition: A **lake** is an open waterbody with a depth greater than 2 m, and less than 25% of its surface area covered with wetland vegetation. All lakes within an inventory project are designated as primary or secondary in the pre-field planning phase. **Wetland** is any open waterbody less than 2 m deep. There are 5 major classes of wetlands:

Method: Review the lake table and pre-field data. Confirm in the field.

Recording Procedure: Choose “wetland” or “lake.” If wetland, circle the appropriate type code, as given below. If lake, identify as “primary” or “secondary.”

Code	Wetland Type	Description
01	Shallow open water 	• Intermittently or permanently flooded areas with open expanses of standing or moving water less than 2m deep in mid-summer • Vegetation is submerged and floating aquatics (e.g., yellow pond-lily, pondweed, bladderwort, watershield)
02	Marsh 	• Shallow flooded mineral wetland dominated by emergent grass-like vegetation (e.g., rushes, reeds, grasses, sedges) • Seasonally fluctuating water levels with declining levels exposing matted vegetation or mudflats • Standing or slow moving water • Nutrient –rich fresh water.

Code	Wetland Type	Description
03	Swamp 	• Dominated by flood-tolerant trees or tall shrubs and herbaceous species (e.g., glowmoss, skunk cabbage, mountain alder, ladyfer, Bebb's willow, twinberry, hardhack) • Internal water movement from adjacent mineral areas • Substrate of woody peat or mineralized material
04	Fen 	• Organic soils • Water table above the surface, Seepage groundwater or open channels • Peatlands dominated by sedges, grasses, reeds, mosses, and some shrubs. May be treed or treeless. • Mineral enriched water table
05	Bog 	• Organic soils predominantly composed of poorly to moderately decomposed sphagnum moss peats • Water table is at or near the surface • Usually covered with hummock-forming sphagnum mosses and ericaceous plants (heathers) and may have labrador tea, shorepine

Fish Collection Form(s) Attached:

Definition: The Fish Collection Form is a separate field record sheet used to document detailed information obtained from fish sampling.

Method: N/A

Recording Procedure: Circle Y (Yes) or N (No) to indicate if a fish collection form(s) was completed for the site.

Lake Name (Gazetted):

Definition: The official name of the lake being surveyed as listed with *BC Geographical Names*.

Method: Determine from *BC Geographical Names* at http://ilmbwww.gov.bc.ca/bcnames/ .

Recording Procedure: Record official name. If not official, record "unnamed."

Local (Alias):

Definition: An unofficial or locally used lake name.

Method: Obtain from old lake summary reports, regional Ministry of Environment (MoE) offices, etc.

Recording Procedure: Record the local/alias name.

Watershed Code:

Definition: A 45-digit, unique number assigned to the watersheds and waterbodies in British Columbia.

Method: Obtain using the *BC Watershed Atlas* See *User's Guide to the British Columbia's Watershed/waterbody Identifier System, RISC (2004),* or obtain from *Fisheries Inventory Data Queries (FIDQ)* http://a100.gov.bc.ca/pub/fidq/main.do .

Recording Procedure: Record the complete code to the first set of zeros.

Reach Number (#):

Definition: A reach is a channel segment with relatively repetitious and homogenous sequence of physical processes and habitat types (e.g., homogenous slope, discharge, habitat, channel type, and riparian features); lakes and wetlands are also considered reaches for the purpose of planning. Reach number is the number given to individual reaches.

Method: Assign the reach number to the reaches in a sequential, upstream, ascending order, starting at (1) at the downstream end of the stream. . If an additional reach needs to be added, a decimal system is used. For example if it is discovered in the field that reach 2 was really three reaches, then the reach would be renumbered using the decimal system. The recommended reach renumbering in this case would then be 1, 2.1, 2.2, 2.3, 3…

Recording Procedure: Record the reach number. If additional reaches are identified during fieldwork (after planning has been completed), they are recorded as (1.1-), (1.2-), etc.

Air Photo Reference:

Definition: The number of the air photograph and flight line used for planning the survey and for recording lake characteristics.

Method: N/A

Recording Procedure: Record the air photo number and flight line as given on the photograph.

Referencing Comments:

Definition: Any relevant comments regarding the air photographs such as photo quality, most recent, colour, etc.

Method: N/A

Recording Procedure: Record any comments.

Waterbody Identifier:

Definition: An alpha-numeric, nine-string of characters that uniquely identifies a waterbody within the province of British Columbia. It is composed of five numeric digits followed by a four-letter acronym of the parent watershed group.

Method: See *User's Guide to the British Columbia's Watershed/waterbody Identifier System*, March 31, 2004, Version 3.0.

Recording Procedure: Record the complete nine-character alpha-numeric watershed identifier.

ILP Map Number (ILP Map #):

Definition: The number of the mapsheet used to identify assigned ILP numbers.

Method: Read from the map, for waterbodies without watershed codes and/or waterbody identifiers. See *User's Guide to the British Columbia's Watershed/waterbody Identifier System*, March 31, 2004, Version 3.0.

Recording Procedure: Record the mapsheet number (e.g., 92L.005).

ILP (Interim Locational Point) Number (ILP #):

Definition: A number unique to any particular point on the mapsheet, used to identify waterbodies lacking a watershed code and/or waterbody identifier. For lakes, the ILP is assigned at the outlet.

Method: Refer to the *User's Guide to the British Columbia's Watershed/waterbody Identifier System, March 31, 2004, Version 3.0.*

Recording Procedure: Record the five- digit user defined ILP number (e.g., 00091).

Project ID:

Definition: A ministry-defined identification code for the project.

Method: Obtain from the regional Fisheries Inventory specialist.

Recording Procedure: Record the unique project ID code.

Magnitude:

Definition: The total number of first order channels draining into a waterbody. See Shrever, R.L. (1966) *Statistical law of Stream Numbers*, Journal of Geology, vol. 74, pp. 17–37.

Method: Determine from TRIM maps.

Recording Procedure: Record the magnitude.

NID numbers: Assigning NIDs is a method of identifying features on a mapsheet. Each feature identified on a mapsheet is assigned a five-digit number, unique to that mapsheet, such as 00001, 00002, etc. The mapsheet number followed by this feature identifier number forms a complete NID reference code that is unique to the project. Only the unique, five-digit feature identifier is marked on the mapsheet, adjacent to each feature. On the data forms, however, both the mapsheet number and the feature identifier are recorded in their respective, corresponding columns, as explained below.

NID Map Number (NID Map #):

Definition: The number of the mapsheet on which the specific NID number occurs.

Method: Read from map.

Recording Procedure: Record the mapsheet number (e.g., 92L.005).

NID Number (NID #):

Definition: A unique five-digit number that identifies the lake inlet on a mapsheet.

Method: N/A

Recording Procedure: Record the five-digit NID number unique to mapsheet in the corresponding NID Map No. column (e.g., 00012).

UTM:

Definition: The Universal Transverse Mercator (UTM) coordinates that identify the location of the lake outlet. In lakes with no outlet, the UTM of the geographic centre of the lake is recorded.

Method: Interpret from TRIM, or record from GPS.

Recording Procedure: Record UTM (Zone/Easting/Northing) to metre level, if possible (e.g., 10.697501.598412).

TRIM Map number(s):

Definition: TRIM is the Terrain and Resource Information Mapping system – a 1:20,000 mapping base and is used for data review of the watershed.

Method: Obtain from Base Mapping and Geomatic Services at http://ilmbwww.gov.bc.ca/bmgs/.

Recording Procedure: Record the TRIM map number. If the lake extends over more than one mapsheet, record the map number of each mapsheet (e.g., 103P.004, 005).

Year (map year number):

THIS FIELD IS NO LONGER REQUIRED FOR RECONNAISSANCE INVENTORIES.

Surface Area, Source:

Definition: The total estimated surface area of the lake and the source from where it is derived.

Method: Measured, with allowable ±5% error, from TRIM map, airphotos.

Recording Procedure: Record the surface area in hectares, the codes for its *source,* and the *method* used to determine the surface area.

Source	Code
TRIM	TRIM
NTS maps	NTS
Air photo	AP
Bathymetric maps	BT
Lake reports	R
Watershed Atlas	WSA
Other	O

Surface Area, Method:

Method	Code
Planimeter	PL
GIS	GIS
Historic	H
Other	O
Not specified	NS
Ground estimate	GE
Aerial estimate	AE
Bathymetric	BT

Elevation, Source:

Definition: The known elevation of the lake above sea level and the source from where the elevation is determined.

Method: Measure with allowable ±5m error from TRIM map, airphotos.

Recording Procedure: Record the elevation in metres and the codes for its *source* and the *method* used to determine the elevation.

Source	Code
TRIM	TRIM
NTS maps	NTS
Air photo	AP
Bathymetric maps	BT
Lake reports	R
Watershed Atlas	WSA
Other	O

Elevation Method:

Method	Code
Geodetic survey grade GPS (differential correction applied)	GP1
Survey grade GPS (differential correction applied)	GP2
Recreational grade GPS (differential correction applied)	GP3
GPS, uncorrected	GPU
Geographic Information System	GIS
Map interpretation	MAP
Altimeter	AL
Historic	H
Other	O
Not specified	NS

Biogeoclimatic Zone (BGC):

Definition: The biogeoclimatic zone of the study area as identified from the 1992, 1:2 000 000 BGC map.

Method: Review data, interpret from map.

Recording Procedure: Circle the appropriate code.

Code	Description	Code	Description
AT	Alpine tundra	BG	Bunchgrass
SWB	Spruce-Willow-Birch	PP	Ponderosa Pine
BWBS	Boreal White and Black Spruce	IDF	Interior Douglas Fir
SBPS	Sub-boreal Pine Spruce	CDF	Coastal Douglas Fir
SBS	Sub-boreal Spruce	ICH	Interior Cedar Hemlock
MH	Mountain Hemlock	CWH	Coastal Western Hemlock
ESSF	Englemann Spruce–subalpine Fir	MS	Montane Spruce

TERRAIN CHARACTERISTICS

This section of the Lake Survey Form is used to characterize the physical features of the terrain surrounding the lake. These features are first identified in the office on airphotos and maps, and then verified in the field.

TERRAIN CHARACTERISTICS								
SETTING VF VW MP PN PD						ASPECT		
HILLSLOPE COUPLING DC PC CO			LAKE BASIN GENESIS					
LAND USE	NO	AG	FB	FR	MI	PR	UD	OT
PERCENTAGE								

Setting

Definition: The general site in which the lake can be expected to occur in the landscape, such as a mountain plateau, in a valley, or on a plain, etc.

Method: Review data. Confirm assessment in the field.

Recording Procedure: Circle the code that corresponds to the dominant setting observed in the lake vicinity.

Type	Description	Type	Description
VF	Valley floor	PN	Plain/large plateau
VW	Valley wall	HV	Hanging valley
MP	Mountain plateau	PD	Piedmont

Aspect:

Definition: The orientation of the longitudinal axis of the lake and water flow direction with respect to the geographic north.

Method: Use compass, maps. When using maps, the lake outlet is used to determine aspect. For example, if a lake is oriented E-W with the outlet at the east end, the aspect is given at E.

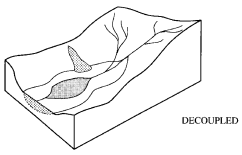
Recording Procedure: Record aspect using eight-point compass (i.e., N, NE, E, SE, S, SW, W and NW).

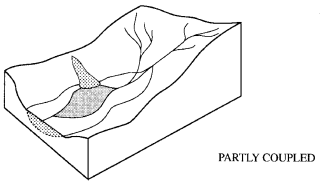
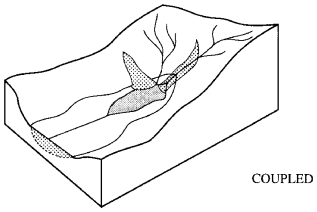
Hillslope Coupling:

Definition: A subjective assessment of sediment transfer routes from hillslopes to waterbody. Coupling considers the connections among a lake, valley bottom, and hillslopes, and the potential for sediment mobilized on the hillslopes to enter a lake. Generally, the degree of coupling describes the short-term response of a lake to events that occur on the hillslope and the importance of the valley flat as a buffer to sediment transfer. Landslides that transfer sediment to a lake can infill all or part of the lake, impair water quality, and limit aquatic habitat.

Method: Visual observation.

Recording Procedure: Circle the appropriate code.

Code	Type of coupling and definition	Indicators of type of coupling
DC	**Decoupled**: A lake is decoupled from a hillslope when sediment mobilized on the hillslope by a landslide does not enter the lake.  DECOUPLED	The valley flat intercepts sediment or debris mobilized by a landslide, preventing material from directly entering the lake. The lake is large relative to the volume of sediment and debris that may be transferred from the surrounding hillslopes. The surrounding slopes are gentle (<35 per cent gradient) and unlikely to initiate landslides. There are no surrounding hillslopes (a valley flat is not necessarily present).

Code	Type of coupling and definition	Indicators of type of coupling
PC	**Partially Coupled**: A lake is partially coupled to a hillslope when only a portion of the sediment mobilized on the hillslope by a landslide enters the lake.  PARTLY COUPLED	Landslides either directly enter the lake or are buffered by the valley flat (only some of a landslide deposit is stored on the valley flat). The surrounding slopes are steep (>65 per cent) and likely to initiate landslides. A lake with a discontinuous valley flat that impinges on some parts of the hillside, so landslides mobilized from some hillside locations are apt to enter the lake.
CO	**Coupled**: A lake is coupled to a hillslope when the bulk of the sediment mobilized on the hillslope by a landslide directly enters the lake.  COUPLED	There is no valley flat; sediment or debris mobilized by landslides directly enters the lake. The surrounding slopes are steep (>65 per cent) and likely to initiate landslides that can transfer sediment directly to the lake. The lake is small relative to the volume of sediment and debris that may be transferred from the surrounding hillslopes. Debris flows may be initiated from within stream channels that drain directly into the lake.

Lake Basin Genesis:

Definition: Lake origin (i.e., if the lake was formed by glacial action on a valley floor, by valley blockage caused by a landslide or volcanic eruption, by beaver dams, etc.).

Method: Review data. Confirm in field.

Recording Procedure: Record the appropriate code(s). In the case where more than one “lake origin” category is applicable, record only the two dominant ones. If genesis type cannot be determined to the sub-code level then record the type code only. Thus if lake genesis is determined to be a glacial cirque, then GC is recorded. If it is determined to be glacial but further differentiation is not possible, then record GL.

Type	Code	Sub-code	Description
Volcanic	**VD**	–	Volcanic dam lakes
Landslide	**LL**	–	Landslide dam lakes
Glacial	**GL**	GI	Glacial ice lakes
		GS	Glacial scour lakes
		GC	Glacial cirque
		GF	Glacial fjord-like
		GP	Glacial piedmont
		GM	Glacial moraine
		GK	Glacial kettle
		DC	Dead ice complex
Solution	**SL**	–	Solution lakes
Fluvial	**FL**	FA	Fluvial abandoned channel lakes
		FD	Alluvial fan dam lakes
		OX	Oxbow lakes
		LV	Levee lakes
Shoreline	**BL**	–	Barrier lakes
Organic	**OL**	PH	Phytogenetic lakes
		BV	Beaver dam lakes
Anthropogenic	**AL**	RV	Reservoir lakes
		AQ	Anthropogenic quarries

Land Use, Percentage:

Definition: The dominant land use in the vicinity of the lake.

Method: Visual observations.

Recording Procedure: Note the approximate percentage of the use in the corresponding box. Landuse percentage must add up to a total of 100%.

Code	Description	Code	Description
NO	none/natural	MI	mining
AG	agriculture	PR	park
FB	logging, to banks	UD	urban development
FR	logging, with reserves	OT	others

SHORELINE CHARACTERISTICS

Shoreline characteristics provide a brief overview or 'snapshot' of the immediate shoreline of the lake.

SHORELINE CHARACTERISTICS						
SHORELINE TYPE		i	ii	iii	iv	v
PERCENTAGE OF TYPE						
COVER	NONE	SPARSE	MODERATE	ABUNDANT		
RECREATIONAL FEATURES	RESORTS	CAMPSITES	BOAT LAUNCH			

Shoreline Type, Percentage of Type:

Definition: The type of immediate shoreline as defined by the five categories given below.
The shoreline includes all the area affected by the lake margin from the low water mark to the average annual high water mark, and the riparian zone around the lake.

Method: Visual observation, air photo interpretations.

Recording Procedure: Record the approximate percentage presence of the appropriate type of shoreline in the corresponding box. The percentage of various shoreline types should add up to 100.

	Shoreline Type	Description
i	Sand or gravel beach	Often associated with low rocky shoreline areas or adjacent to inlets.
ii	Low, rocky shore	Cobble, boulder or bedrock substrate, prevalent along the base of steeper shorelines.
iii	Cliffed or bluff shore	Areas adjacent to steeper slopes or in higher elevation lakes. Usually indicates a steep-sided lake basin or sudden drop off.
iv	Wetland shore	Characteristic of lakes in coastal plain or lowland areas. Often associated with abundant emergent vegetation such as sedges, reeds, cattails, etc.
v	Vegetated shore	Characteristic of lakes in coastal plain or lowland areas. Vegetation is commonly shrubs and small trees.

Shoreline Cover:

Definition: The debris and overhanging vegetation within 1 m height of the shoreline.

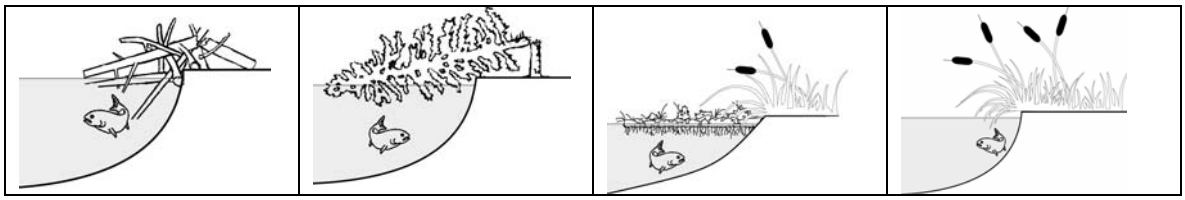


Figure 1 Overhanging debris, bog cover and vegetation cover

Method: Visual observation.

Recording Procedure: Circle the appropriate shoreline coverage density as **none**, **sparse**, **moderate** or **abundant**.

	Percentage of shoreline coverage
None	0
Sparse	< 5%
Moderate	5 to 20%
Abundant	> 20 %

Recreational Features:

Definition: Any manmade structure that encourages or facilitates increased recreational use of the lake environment.

Method: Visual observation, air photo.

Recording Procedure: Record the approximate number of recreational facilities present in the corresponding boxes.

	Description
Resorts	Generally refers to large-scale commercial developments. Road access into the area is usually blacktop or all season 2-wheel drive gravel road.
Campsites	No distinction is made between a rough wilderness campsite and a drive-in MOF recreation site; all qualify.
Boat launches	Similar to campsites, with no requirement to describe the type of facility.

Elaboration: Note in the Comments section on the reverse side of the Lakes Survey Form, other common recreational features including hiking/mountain bike trails, water ski jumps, swim platforms, piers and manmade beaches. Note the number of each.

Note in the Comments section on the reverse side of the Lakes Survey Form the kind of boat launch (e.g., describe it as ‘paved, 2-wheel drive gravel, 4-wheel drive gravel or rough').

INLETS/OUTLETS

This section is used to record the number and location of the Inlets and Outlets on the Lake Survey Form.

INLETS / OUTLETS						
# INLETS (PERM.)	# INLETS (OTHER)	# OUTLETS	INLET (2° LAKES) SPAWNING HABITAT PRESENT Y ☐ N ☐			
I/O	WATERSHED CODE			C	ILP MAP #	ILP #

 # Inlets (permanent):

Definition: The total number of permanent streams or rivers flowing into a lake.

Method: Interpret air photos or maps, or visually observe.

Recording Procedure: Record the determined number of permanent inlets.

 # Inlets (other):

Definition: The total number of intermittent or unmapped streams or rivers flowing into a lake.

Method: Interpret air photos or maps, or visually observe.

Recording Procedure: Record the determined number of other inlets.

 # Outlets:

Definition: The total number of streams or rivers flowing out of a lake.

Method: Interpret air photos or maps, or visually observe.

Recording Procedure: Record the determined number of outlets.

Inlet (secondary lakes only) Spawning Habitat Present:

Definition: State whether or not streams connected to the lake have suitable spawning habitat. *This is completed for secondary lakes only.*

Method: Visual observation.

Recording Procedure: Check-mark Yes (Y) or No (N). Comments can be indexed in the comment index box and recorded in the Comments (Specific / General) section on the back of the Lake Survey Form.

Watershed Code Table:

Method: Data review.

Recording Procedure: For each tributary stream, record in the following order:

If the stream is an inlet or outlet (i/o).

Its watershed code.

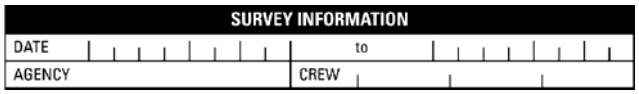
Reference No. for any comments regarding the inlet and outlet. Place corresponding comment in Comments (Specific / General)

The ILP map number.

The ILP number.

SURVEY INFORMATION

Crew details are recorded in this section of the Lake Survey Form.



(Survey) Date (yyyy/mm/dd):

Definition: The date of field inventory.

Method: N/A

Recording Procedure: Record the survey dates in the following sequence: year (YYYY)/month/date. (e.g.1996/06/21 to 1996/06/24).

Agency:

Definition: The name of the agency contracting the inventory.

Method: For the current list, consult the inventory webpage at <*http://www.env.gov.bc.ca:80/fsh/ids/invent/*>. For agencies not listed, please contact the Data Management Group at Fisheries Inventory Section.

Recording Procedure: Record the code of the organization contracting out the inventory (e.g., C055).

Crew:

Definition: Initials of crew conducting inventory.

Method: N/A

Recording Procedure: Record two to three letter initials of the principal individual(s) who conducted the survey (e.g., CPL/MOP).

ACCESS

Information that will allow a person to find the lake again is recorded in this section.

ACCESS								
AIR	FW	H	ROAD	V2	V4	AUTO WITHIN		m OF LAKE
OFF ROAD		FT		ATV	V4	DISTANCE		km
TRAIL		Y ☐ N ☐				DISTANCE		km
CLOSEST COMMUNITY								
COMMENTS								

Air, Road, Off Road (type):

Definition: The mode of transport used to arrive at the lake. Off road refers to access to the lake when no paved or gravel road is available.

Method: Review data; make field observations.

Recording Procedure:

Circle the relevant Mode(s) of transportation used for air, road and off road access:

Code	Method	Code	Method
ATV	All terrain vehicle	V4	Four-wheel drive
B	Boat	H	Helicopter
FW	Fixed-wing plane	HO	Horse
FP	Float Plane	V2	Two-wheel drive
FT	Foot		

2.For Road, record in the Auto Within field, the closest approximate driving distance in km to an off-road site that can be used to gain access to the lake.

3.For Off Road, record the approximate distance to the lake in km.

Trail:

Definition: The access to the lake by a marked trail when no paved or gravel road is available.

Method: Make field measurements (e.g., hip chain).

Recording Procedure: Circle Y if a trail is present and record distance to lake in km. Circle N if there is no trail present.

Closest Community:

Definition: The name of the closest, inhabited town or city.

Method: Data review, field observations.

Recording Procedure: Record the name of the closest community.

Comments:

Recording Procedure: Record detailed access descriptions in the comments field

- For road access, include descriptions of all turns, distance between turns, road types and conditions, commencing from the nearest community and proceeding to the lake. Surface materials (e.g., paved, smooth gravel, rough gravel) and associated vehicle requirements, or constraints (e.g., four-wheel drive), should be indicated over the entire distance. The entire driving distance should be reported, as should any restrictions to the use of any associated roads, or sections thereof (e.g., time restrictions on industrial roads, gates).
- For hike-in destinations, record trail conditions and distances in addition to any road access comments.
- For fly-in destinations without other access, the direction, distance and approximate flying time to the lake from the air base is reported. If any aircraft restrictions apply to the lake, these should also be indicated. Where air transport has been adopted for a lake with other access options (e.g., trails), survey the flightpath (in and/or out) to the extent permitted by flying conditions and safety.
- List other modes if required."

AQUATIC FLORA

The type and general abundance of macrophyte communities observed in the lake are recorded to provide a quick characterization of the amount of the fish habitat available in the littoral area of the lake.

AQUATIC FLORA			
EMERGENT VEG. SPARSE ☐ OR %		SUBMERGENT VEG. SPARSE ☐ OR %	
DOMINANT SPECIES	i	DOMINANT SPECIES	i
	ii		ii
	iii		iii
	iv		iv
FLOATING ALGAE PRESENT Y ☐ N ☐		SPECIES LIST ATTACHED Y ☐ N ☐	
NO. OF VOUCHER SPECIMENS COLLECTED (OPTIONAL)			

Emergent Vegetation:

Definition: Plants that are rooted in water and have most of the vegetative growth above water.

Method: Visually estimate.

Recording Procedure: Record the approximate percentage (to the nearest 10%) of emergent vegetation compared to the area of the lake, or checkmark '**sparse**' if vegetation is present but is less than 10%. If no vegetation is present, checkmark '**sparse**' and record as a comment.

Dominant Species:

Definition: Species of plants most abundant in a given region, in this case, the lake.

Method: Visual observation.

Recording Procedure: List the dominant emergent vegetation in the lake in descending order of abundance.

Submergent Vegetation:

Definition: Aquatic plants, rooted or free-floating, having all of the vegetative growth under water.

Method: Visually estimate.

Recording Procedure: Record the approximate percentage (to the nearest 10%) of submergent vegetation compared to the area of the lake, or checkmark '**sparse**' if vegetation is present but is less than 10%. If no vegetation is present, checkmark '**sparse**' and record as a comment.

Dominant Species:

Definition: Species of plants most abundant in a given region, in this case, the lake.

Method: Visual observation.

Recording Procedure: List the dominant submergent vegetation in the lake in descending order of abundance.

Floating Algae Present:

Definition: The occurrence of substantial pelagic algae in the water.

Method: Observe visually.

Recording Procedure: Circle Y (Yes) or N (No).

Species List Attached:

Definition: List of all plant species observed in the lake.

Method: N/A

Recording Procedure: Circle **Y** (Yes) if a species list is attached or **N** (No) if not submitted.

Number of Voucher Specimens Collected (optional):

Definition: N/A

Method: N/A

Recording Procedure: Record the total number of plant voucher specimens collected for submission.

LAKE BATHYMETRY

Benchmark details and a summary of bathymetric information are recorded in this section.

LAKE BATHYMETRY							
TYPE OF SURVEY	FL	EL	SS	NO	LITTORAL AREA	%	
MAX. DEPTH	m	BENCHMARK ht		m	MAX. WATER LEVEL		m
BENCHMARK TYPE / LOCATION/COMMENTS							

Type of Survey:

Definition: The type of bathymetric survey.

Method: Conduct as per project plan.

Recording Procedure: Circle the type of bathymetric survey that was conducted.

Type	Description
FL	Full: Bathymetry available for entire waterbody.
EL	E-line: One transect completed along the long axis of the lake.
SS	Spot sounding
NO	None: Bathymetry not available or conducted.

% Littoral Area:

Definition: The shallow shoreward region of a lake in which the water is less than 6 m deep. It usually has light penetration to the bottom and is often occupied by rooted macrophytes

Method: Conduct Bathymetric Survey.

Recording Procedure: Record the approximate percentage of littoral area and the code of the method used to determine littoral area.

Method	Code	Method	Code
Bathymetry	BT	Other	O
Aerial estimate	AE	Not specified	NS
Ground Estimate	GE		

Maximum Depth (in metres):

Definition: The maximum depth of the lake.

Method: Conduct Bathymetric Survey.

Recording Procedure: Record the maximum depth of the lake in metres.

Benchmark Height:

Definition: Benchmark height is the elevation of the benchmark from the level of the lake at the time of survey.

Method: Record from previous descriptions or by direct measurement with tape, metre stick or Abney level. Refer to Figure 2 below.

Recording Procedure: Record the height on the benchmark in metres.

Maximum Water Level:

Definition: The maximum water level as determined by examining field evidence (e.g., wave-cut terrace, mudline, etc.). It is given as the difference in height between the high water mark and the water level at the time of survey.

Method: Examine the surrounding area for evidence of: Wave-cut terrace, erosion, pollen and driftwood deposition, mudline, ice damage on tree trunks, or presence of lichen on rocks

Recording Procedure: Record the maximum water level in metres.

Benchmark Type/Location/Comments:

Definition: Details of the benchmark type (e.g., spike in a cedar; iron pin in a rock) and its specific location.

Method: Use visual observations, previous records, and measurements. Refer to Figure 2 below.

Recording Procedure: Record, in comment form, the type and location of the benchmark or any other relevant comments.

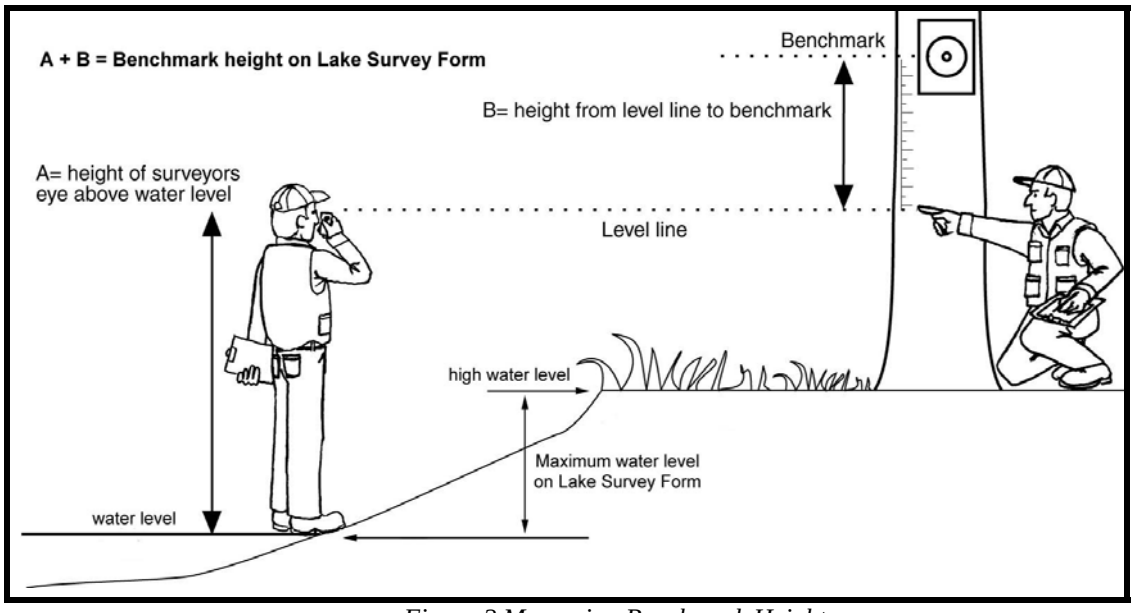


Figure 2 Measuring Benchmark Height

PHOTODOCUMENTATION

Details of the photographs taken for the lake inventory are recorded in this section.

PHOTO DOCUMENTATION									
C	ROLL #	#	FOC LG	DIR	NID MAP #	NID #	UTM	mtd	COMMENTS

Roll number:

Definition: (For Film Cameras) The film roll number corresponding to each photograph.

Method: N/A

Recording Procedure: Record the film roll number.

Frame number (#):

Definition: (For Film Cameras) The negative frame number corresponding to each photograph.

Method: N/A

Recording Procedure: Record the frame number (e.g., 1, 2, or 1A, 2A, etc.).

Focal Length (mm):

Definition: The focal length of the lens used to take the photograph.

Method: N/A

Recording Procedure: Record the code for the respective focal length of the lens.

Code	Description	Focal length
Wd	wide	<35 mm
St	Standard	35–50 mm
Te	Telephoto/zoom	>50 mm

Photo Direction (Dir.):

Definition: The general direction of each photograph with respect to the site from which the photograph was taken (i.e., N, S, E or W).

Method: N/A

Recording Procedure: Record the general direction of the photograph as N, S, E or W.

NID Map No (NID Map #):

Definition: The number of the mapsheet on which the specific NID number occurs.

Method: Read from map.

Recording Procedure: Record the mapsheet number (e.g., 92L.005).

NID Number (NID #):

Definition: The NID Number is a unique five-digit number that identifies the feature on a mapsheet.

Method: N/A

Recording Procedure: Record the five-digit NID number unique to the mapsheet recorded in the corresponding NID Map No. column (e.g., 00012).

UTM:

Definition: The Universal Transverse Mercator (UTM) co-ordinates that identify the location from where the photograph of the lake or the surrounding terrain was taken.

Method: Interpret from TRIM, or record from GPS.

Recording Procedure: Record UTM (Zone/Easting/Northing) to metre level, if possible (e.g., 10.697501.598412.)

UTM Method:

Definition: The method used to determine the UTM co-ordinates.

Method: Obtain from GPS or TRIM map.

Recording Procedure: Record the code of the method employed to determine UTM co-ordinate. If uncorrected GPS was used for locating site on map, record MAP as the method.

Method	Code
Geodetic survey grade (differential correction applied)	GP1
Survey grade GPS (differential correction applied)	GP2
Recreational grade GPS (differential correction applied)	GP3
Geographic Information System	GIS
GPS, uncorrected	GPU
Aerial photo	AP
Map interpretation	MAP
Other	O
Not specified	NS

Comment:

Definition: N/A

Method: N/A

Recording Procedure: Record any relevant comments about the photograph and/or site using a corresponding comment number in the comment indicator box. Use the comments field to track your photos if using a digital camera.

AQUATIC WILDLIFE OBSERVATIONS

Aquatic wildlife, other than fish, that is observed in the lakes and streams and associated riparian habitats are listed in this section.

AQUATIC WILDLIFE OBSERVATIONS	
GROUP	SPECIES / COMMENTS

Wildlife Observations:

Definition: Aquatic invertebrates, reptiles, amphibians, mammals and birds that inhabit the waterbody and its immediate vicinity, with particular focus on species that have substantial impact on fish populations.

Method: Visually observe aquatic species listed with the *Conservation Data Centre (CDC)* at http://www.env.gov.bc.ca/cdc/index.html (only if species is encountered or evidence of use found).

Recording Procedure: Note the codes (as given below) for the major groups in column 1: Group and record the comments in the corresponding column.

Code	Description	Code	Description
INV	Invertebrates	BIR	birds
REP	Reptiles	MAM	mammals
AMP	Amphibians		

WEATHER COMMENTS

Ambient weather conditions on the lake and immediate environment are recorded here.

WEATHER COMMENTS

Definition: Any relevant comments regarding the weather conditions.

Method: Visually observe at the time of survey.

Recording Procedure: Record any comments.

Parameter	Description
Precipitation	Describe the form of precipitation encountered (e.g., snow, rain, sleet, etc.).
Wind Velocity and Direction	Estimate the wind strength in kilometres per hour and the direction it is coming from.
Cloud Cover	Estimate the percentage of cloud cover observed.
Lake Surface Conditions	Describe the lake surface as calm, rippled, moderate waves or white caps.
Air Temperature	Measure the ambient air temperature using a standard mercury or alcohol pocket thermometer. Record in degrees Celsius.

COMMENTS (SPECIFIC / GENERAL)

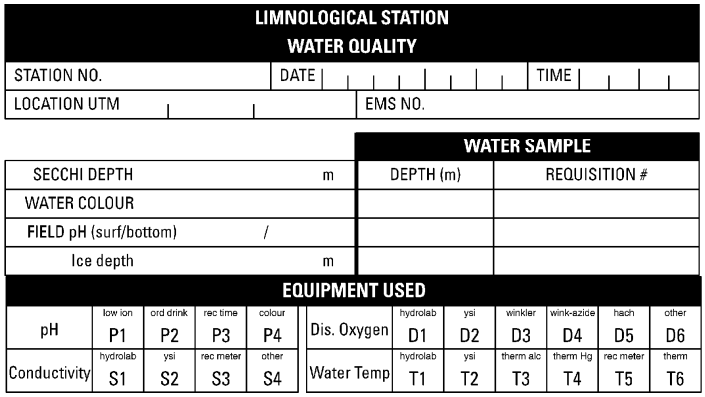
Definition: Comments from the lake survey, that were observed while collecting data for specific sections of the lake Survey Form, or are general comments that should be noted from the Lake Survey

Method: Make note of comments from observations during the lake Survey.

Recording Procedure: Record comment number in the light blue comment indicator box(es) and write a correspondingly numbered comment in the provided spaces. Comments may also correspond to numbers recorded in specific sections (Inlets / Outlets).

LIMNOLOGICAL STATION

Field water quality readings taken from the deepest part of the lake are recorded here.



LIMNOLOGICAL STATION WATER QUALITY		
STATION NO.	DATE	TIME
LOCATION UTM	EMS NO.	

	WATER SAMPLE	
SECCHI DEPTH m	DEPTH (m)	REQUISITION #
WATER COLOUR		
FIELD pH (surf/bottom) /		
Ice depth m		

EQUIPMENT USED												
pH	low ion P1	ord drink P2	rec time P3	colour P4	Dis. Oxygen	hydrolab D1	ysi D2	winkler D3	wink-azide D4	hach D5	other D6
Conductivity	hydrolab S1	ysi S2	rec meter S3	other S4	Water Temp	hydrolab T1	ysi T2	therm alc T3	therm Hg T4	rec meter T5	therm T6

Station Number:

Definition: A unique, sequential number assigned to each limnological station set on a lake. Most lakes will require only one limnological station.

Method: N/A

Recording Procedure: Record the limnological station number.

Date:

Definition: The date when the water was sampled.

Method: N/A

Recording Procedure: Fill in the following sequence: year (YYYY)/month/date (e.g., 1996/06/21).

Time:

Definition: The time (using a 24-hr clock system) when the water was sampled.

Method: N/A

Recording Procedure: Record the time of water sampling (e.g., 1700).

Location UTM:

Definition: The Universal Transverse Mercator (UTM) numbers that identifies the location of the limnological station.

Method: Interpret from TRIM, or record from GPS.

Recording Procedure: Record UTM (Zone/ Easting/ Northing) to metre level, if possible (e.g.10.697501.598412).

EMS No.:

Definition: The Environmental Monitoring System (EMS) site number (previously called SEAM).

Method: Obtain from Regional Fisheries Inventory Specialists.

Recording Procedure: Record the EMS number.

Secchi Depth (m):

Definition: Secchi Depth is a measurement of the transparency of water using a circular metal or plastic plate, 20 cm in diameter, painted in black and white quadrants that is suspended from a weighted line and lowered into the lake.

Method: Lower the disk until it is no longer visible and record the depth. Then lower the disk beyond this depth and gradually pull back up until it reappears, and record the depth. The Secchi depth (extinction depth) is the average of these two readings. Readings should not be taken less than two hours after dawn or before dusk.

Recording Procedure: Record the Secchi depth reading in metres.

Water Colour:

Definition: The colour of the water.

Method: Visually observe water sample or white section of the submerged Secchi disk.

Recording Procedure: Record the closest match to the colour of the water sample from the table below.

Standard water colour descriptions established for lake surveys in BC

Code	Colour	General indications
GR	Green	– due to phytoplankton blooms; likely indicative of higher productivity
BR	Brown	– staining from tannic acid; may also be zooplankton or solids
RD	Red	– could reflect high iron content and associated plankton and bacteria
BL	Blue	– indicates marl deposits on the bottom and/or water of lower productivity
PU	Purple (or pink)	– bottom samples only; indicates the presence of purple sulphur bacteria and high hydrogen sulphide Caution: This water is very toxic and corrosive; rinse equipment well
MP	Milky/ Pale blue	– often results from the influence of glacial meltwater; may also be a marl lake or having relatively low productivity
NC	Colourless	– no particular condition other than low productivity

Field pH (surface/bottom):

Definition: pH is an indicator of the acidity or alkalinity of a substance. It is a measure of the hydrogen-ion activity in a solution, expressed as the negative $\log_{10}$ of hydrogen-ion concentration on a scale of 0 (highly acidic) to 14 (highly alkaline), with a pH of 7 being neutral.

Method: Varied.

Recording Procedure: Record the surface and bottom pH values respectively to the nearest 0.1. Circle the appropriate method code in the *Equipment Used* section.

Code	Description
FD	Field Testing
P1	pH meter, low ionic strength electrode
P2	pH meter, ordinary “drinking water” electrode
P3	pH meter, recording (over a time period)
P4	Colourimetric (paper, indicator)
O	Other

Ice Depth:

Definition: The thickness of ice layer on the lake (during winter limnological surveys only).

Method: Measure with metre stick, tape.

Recording Procedure: Record the thickness of ice in metres.

Water Sample

Water Sample Depth (m):

Definition: The depth at which the water sample(s) was collected.

Method: Measure with measuring tape, etc.

Recording Procedure: Record the depth in metres.

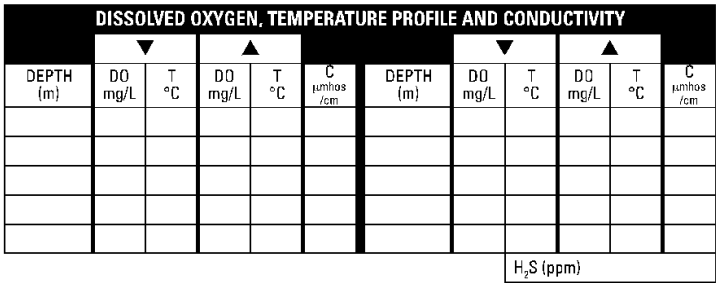
Water Sample Requisition Number:

Definition: The serial number on the laboratory Water Analysis Requisition form.

Method: N/A

Recording Procedure: Record the number from the requisition form.

DISSOLVED OXYGEN, TEMPERATURE PROFILE AND CONDUCTIVITY



DISSOLVED OXYGEN, TEMPERATURE PROFILE AND CONDUCTIVITY											
	▼		▲				▼		▲		
DEPTH (m)	DO mg/L	T °C	DO mg/L	T °C	C µmhos /cm	DEPTH (m)	DO mg/L	T °C	DO mg/L	T °C	C µmhos /cm
								H_2S (ppm)			

Note: Both descending (🡻) and ascending (🡹) dissolved oxygen and temperature profile must be recorded at the same depth intervals. Conductivity is recorded at the surface and bottom only, in the box corresponding to the recording depth.

Depth (m):

Definition: The depth at which the dissolved oxygen (DO), temperature and conductivity were measured.

Method: Varied, commonly obtained from measuring cord or portable units used for other measurements.

Recording Procedure: Record the depth in metres.

DO (mg/L):

Definition: The concentration of oxygen dissolved in water, expressed in mg/L.

Method: Varied.

Recording Procedure: Record the DO value in mg/L. Circle the appropriate method code in the *Equipment Used* section.

Code	Description
D1	Hydrolab
D2	YSI
D3	Winkler
D4	Winkler-Azide
D5	Hach
D6	Other

Water Temperature (°C):

Definition: The temperature of the water in degrees Celsius (°C).

Method: Varied.

Recording Procedure: Record the water temperature to the nearest 0.1°C. Circle the appropriate method code in the *Equipment Used* section.

Code	Description
T1	Hydrolab
T2	YSI
T3	Thermometer, alcohol
T4	Thermometer, mercury
T5	Recording meter
T6	Thermister
O	Other

Conductivity (µS/cm):

Definition: A measure of the ability of a solution to carry an electrical current, dependent on the total concentration of dissolved salts in water.

Method: Varied.

Recording Procedure: Record the conductivity to the nearest 1 µS/cm standardized to 25 °C as calculated from a nomograph or as given by instrument employing automatic temperature compensation. Circle the appropriate method code in the *Equipment Used* section.

Code	Description
S1	Hydrolab
S2	YSI
S3	Recording meter
S4	Other meter

H_2S (ppm):

Definition: The gas, hydrogen sulphide (H_2S) is indicative of bacterial action on organic matter.

Method: Smelling the water sample. H_2S has a rotten egg-like smell. If detected, determine its concentration using a Hach kit.

Recording Procedure: If H_2S odour is detected, measure and record its concentration in parts per million (ppm).