Stream Survey Toolkit

Prepared by
Ministry of Sustainable Resource Management
Aquatic Branch
for the
Resources Information Standards Committee

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Version 1.0

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Introduction

Perspective

Good survey information becomes increasingly valuable as time passes and conditions change.

Standards have been developed to document the characteristics of BC's fish and fish habitat resources to provide a factual basis for fish and fish habitat assessment, planning, and management.

Using the Stream Survey Toolkit

This is one of six toolkits that provide the suite of information capture tools that are required for completing specific surveys.

It **elaborates** on information located in the Site Card Field Guide.

Bookmarks and the **Table of Contents** in this Stream Survey Toolkit provide quick access to three levels of description:

Level 1: The survey phase: data collection and recording, data entry, data reporting, and quality assurance.

Level 2: The category to be described for the survey. For example: **Waterbody**.

Level 3: The metric or supporting information. For example: **Waterbody Type**

There are **three types of tools** that practitioners can access directly from this toolkit: Forms, Databases and Manuals and Resources. Practitioners can also access these tools from the Quick Links located on the web page or from the **Appendix** in this toolkit.

Data Collection and Recording

Forms and Field Guides

Site Card front (pdf) Site Card back (pdf)

Site Card Field Guide, Site Card Field Guide Errata, Site Card Field Guide Errata #2

Stream Site Description

When performing a Stream Survey, the stream site description provides identifying information about the stream such including waterbody referencing (name, watershed code), location (reach #, site #, UTM coordinates, and site length). Also included is the survey date, and who performed the survey (crew and agency).

Streams, Lakes, Wetlands

Use air photo interpretation to determine initially whether an aquatic feature is a wetland, stream or lake, and to give a preliminary class for wetlands. Then verify the waterbody type and wetland class in the field. For a Reconnaissance Inventory, include all shallow open water wetlands as part of the lake inventory. If the wetlands have a distinct channel flowing through them include them in the stream inventory, rather than in the lake inventory.

Stream

In BC, a stream is defined as a reach, flowing on a perennial or seasonal basis having a continuous channel bed, whether or not the bed and banks of the reach are locally obscured by overhanging or bridging vegetation or soil mats, if the channel bed is scoured by water, or contains observable deposits of mineral alluvium.

The primary feature for determining whether a watercourse is a stream is the presence of a continuous channel bed. If a continuous channel bed exists, then either one of two other key features must be present demonstrating fluvial processes; that is, where flowing water has a scoured the channel bed, or deposited any amount of mineral alluvium within the channel.

Water flow in the channel may be perennial, ephemeral (seasonal), or intermittent (spatially discontinuous).

Lake

A lake is an open waterbody with a depth greater than 2 m and with less than 25% of its surface area covered with wetland vegetation. By default, any open waterbody less than 2 m deep is a wetland. In many cases it may not be possible to distinguish shallow, open wetlands from lakes using airphotos; therefore, review and complete your determination of lake/wetland status in the field.

Wetland

A wetland is an area where the water table is at, near, or above the surface, or where soils are water saturated for a sufficient time so that the principle determinants of vegetation and soil development are excess water and low oxygen. Five major types or classes of wetlands have been described in Canada based on vegetation physiognomy, environmental gradients of waterflow, hydrochemistry, and degree of water-level fluctuation.

Stream Name – Gazetted

The Minister of Sustainable Resource Management is responsible for naming geographical features in British Columbia. The Minister delegates this responsibility through the Director of Base Mapping and Geomatic Services Branch to the Geographical Names Unit. The official or gazetted name of a geographical feature in BC is the name that the Government has approved for use on current provincial and federal maps, and has listed as an official place name in Gazetteers of British Columbia and Canada. Coordination of geographical naming by one authority is an essential element in maintaining an effective system for identifying physical features.

The **Gazetteer of Canada** is an alphabetical listing of the official names of places in Canada (e.g. communities, parks, mountains, rivers, lakes and native reserves). Each line item provides the gazetted name, the NTS map number and the exact latitude and longitude of the place.

The **Canadian National Topographic System (NTS)** provides general-purpose topographic map coverage of Canada. These maps are produced by the Government of Canada and depict in detail ground relief (landforms and terrain), drainage (lakes and rivers), forest cover, administrative areas, populated areas, transportation routes and facilities (including roads and railways), and other man-made features. NTS maps are available at a scale of 1:50,000 and 1:250,000.

Terrain Resource Information Management (TRIM) mapping consists of 7027 mapsheets covering the province of British Columbia at a scale of 1:20,000. The Government of British Columbia produces TRIM maps. The cartographic framework for this mapping is the Universal Transverse Mercator coordinate system, based on NAD83 (1983 North American Datum). Each map sheet is precisely 12 minutes of longitude wide by 6 minutes of latitude high. These maps depict man-made features (such as roads, buildings and power lines), natural features (such as streams, lakes and wetlands), and elevations (20 m contours and point elevations).

If an official name exists for an aquatic feature, the name is printed on the **National Topographic Series (NTS)** 1:50,000 maps produced by the federal government. Official names are also printed on the Terrain Resource Information Management (TRIM) 1:20,000 maps produced by the British Columbia Ministry of Sustainable Resource Management, Base Mapping Services Branch. Hardcopy NTS and TRIM maps are available for purchase from private map dealers. To find map dealers in your area, consult the Yellow Pages under the heading of *Maps*. NTS maps can also be ordered on the Internet from *International Travel Maps and Books*. TRIM maps can be ordered in person from a Provincial Government Agent, or online from the LandData BC system.

To find official names for aquatic features from the BC Geographical Names Information System (BCGNIS), either search by name to confirm that the name you have is the official name, or search by location if you have the approximate latitude and longitude of the aquatic feature.

To obtain the gazetted name of an aquatic feature by using the Fish Wizard, you need to know the watershed code of the aquatic feature, or the location of the feature within the province of BC.

Stream Name - Local

Local names are given to many small lakes and streams in British Columbia. Many of these lakes and streams have only a local name and do not have an official government gazetted name or they have local or historic names that differ from the approved gazetted name.

Consult the Geographical Names Branch of the BC Ministry of Sustainable Resource Management, Base Mapping and Geomatic Services Branch to determine if a local or historic name exists for the aquatic feature in question.

Consult the regional or district offices of the BC Ministry of Sustainable Resource Management, the BC Ministry of Forests, and/or the BC Ministry of Water, Land and Air Protection to find local names. Ministry archives containing old lake summary reports could provide local names.

BC Forest Service, Forest Recreation maps often indicate local names for streams and lakes. Other recreation or community maps such as search and rescue maps may give local names.

The BC Ministry of Sustainable Resource Management, Fisheries Data Warehouse, manages the *BC Watershed Dictionary* as part of the *BC Watershed Atlas*. This dictionary lists aliases (local names) for aquatic features that are recognized by the Government. To find if an alias exists for an aquatic feature in the BC Watershed Dictionary, you need to know the official (gazetted) name, the Watershed code or the Waterbody ID of the aquatic feature.

Fish Wizard is a map display tool that allows you to locate an aquatic feature and obtain its official name and alias or local name, without GIS capability. This site can be used if you know the watershed code of the aquatic feature, or if you know where the feature is in the province. If the aquatic feature has a well known local name, it will be displayed as an “alias” on the next line below the official name.

Watershed Code

BC Watershed/Waterbody Identifier System

The BC Watershed/Waterbody Identifier System assigns every aquatic feature in BC a unique code for identification. This is necessary because many aquatic features are either unnamed, or have the same name as other aquatic features. Many private and public sector organizations gather qualitative and quantitative data that describes waterbodies and watersheds in BC. To ensure that organizations can combine and analyze these data, all data gathering methodologies should use the BC Watershed/Waterbody Identifier System. For additional information refer to the *User's Guide to the British Columbia Watershed/Waterbody Identifier System, Version 2.2*.

The Watershed/Waterbody Identifier System is a computer-generated coding system developed by the BC Government that uniquely identifies watersheds and waterbodies in BC. It is a component of the 1:50,000 *British Columbia Watershed Atlas*, a computerized base map of aquatic features in the province. Although it was originally designed for use at a scale of 1:50,000 as a component of the BC Watershed Atlas, it has been re-designed to allow for the identification of watersheds and waterbodies represented on 1:20,000 mapping, the TRIM Watershed Atlas.

The Watershed Atlas (WSA) is a digital representation of the stream network of British Columbia as depicted on 1:50,000 National Topographic Series maps along with watershed boundaries or 3rd order and larger watersheds. This atlas also contains the Watershed Dictionary.

The Trim Watershed Atlas is a digital representation of the stream network of BC as depicted on 1:20,000 TRIM maps. It is currently under development, with representations for the southern part of the province included.

Watershed Code and Waterbody Identifier

The Watershed/Waterbody Identifier System has two parts: a Watershed Code, and a Waterbody Identifier. The BC Government generates watershed codes and waterbody identifiers according to a system and does not randomly assign them. It is mandatory to follow proper procedures to obtain a watershed code from the Government.

Watershed Code

A Watershed Code is a computer generated 45-digit numeric label that uniquely identifies each stream in BC. The numbering system provides information about the location of a stream.

There are nine major watersheds in BC as shown on the map below. The first number in the watershed code indicates the major watershed that the stream is in. Each of the 9 major watersheds is divided into smaller watersheds, which are indicated by the second number in the watershed code. These watersheds can be subdivided further into smaller watersheds which are indicated by the third number in the code.

For example, the Mackenzie watershed identified by the integer 2 has three subsets, the Liard (210), the Hay (220) and the Peace (230). The Peace River watershed (230) has nine sub-divisions coded 231, 232, 233, 234, 235, 236, 237, 238, and 239.

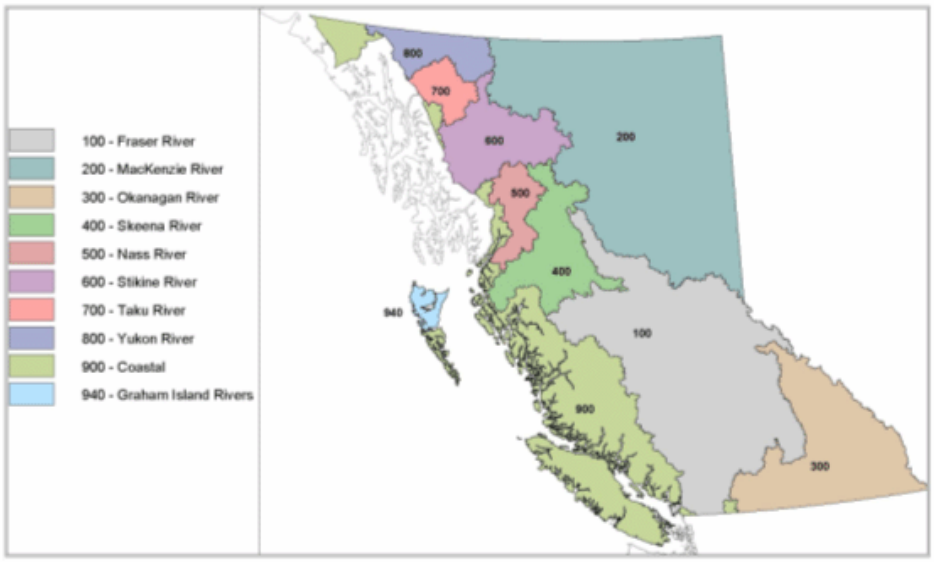

Figure 1- Watersheds in BC

The watershed code for the mainstem Peace River is 230-000000-00000-00000-0000-0000-000-000-000-000-000-000. Each subsequent group of numbers after the first group of three (which indicate the major watershed) represents a tributary to the previous group of numbers.

The remaining numbers in the code, after the first three, reflect the location of the mouth of a tributary along the length of the stream into which it flows. The location of the confluence of a tributary with its parent stream, measured as the proportional distance between the mouth and headwaters of the parent stream, determines the watershed code.

The example below describes the proportional length derivation of watershed codes for Gething Creek. A demonstration follows showing the use of proportional distances in generating the watershed code for Gething Creek.

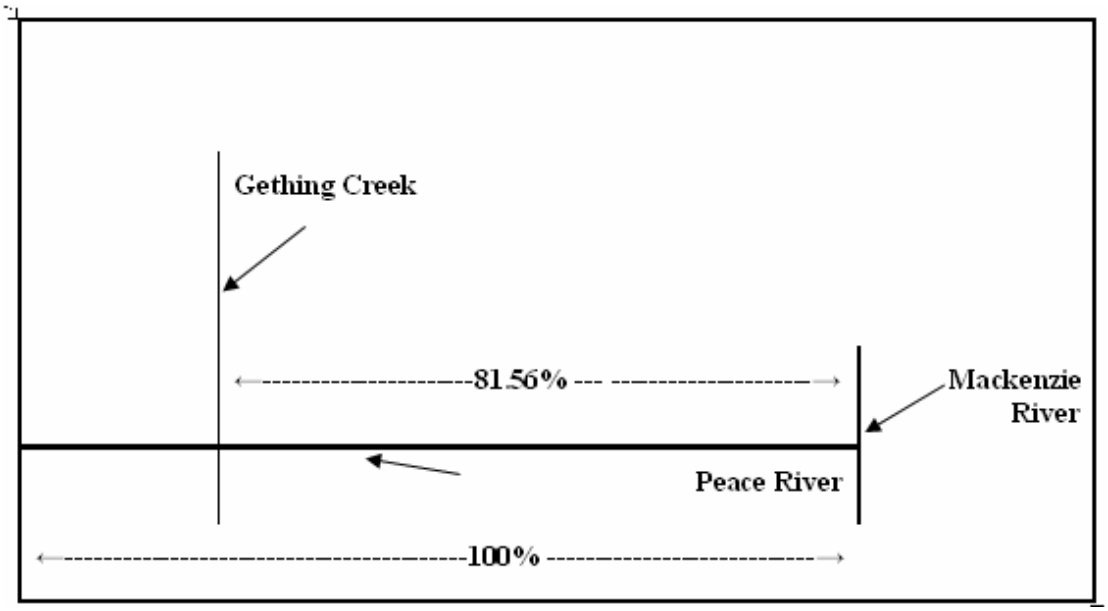

Figure 2 - Diagram of Proportional Length Derivation of Watershed Codes for Gething Creek

Peace River ↓

230		000000		00000		00000		0000

Gething Creek: a tributary joining the Peace River 81.56% (of the total Peace River mainstream length) upstream from Peace River/Mackenzie River Confluence ↓

230		815600		00000		00000		0000

Figure 3 - Explanation of Gething Creek Watershed Code

The diagram below describes the proportional length derivation of watershed codes for Carbon Creek and Eleven Mile Creek. A demonstration of how the proportional distances are included in the watershed code for Eleven Mile Creek follows.

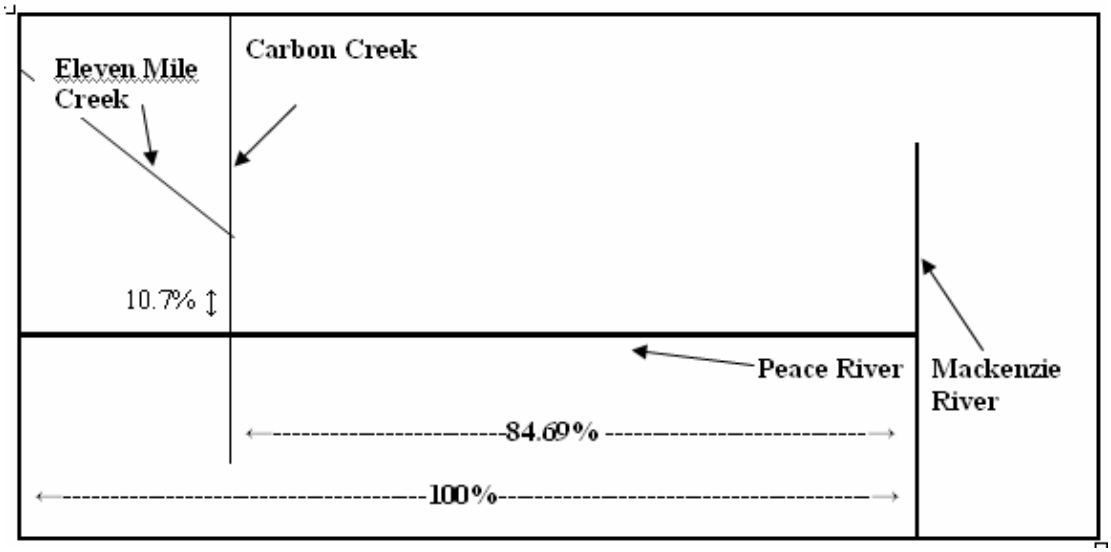

Figure 4 - Diagram of Proportional Length Derivation of Watershed Codes for Carbon Creek

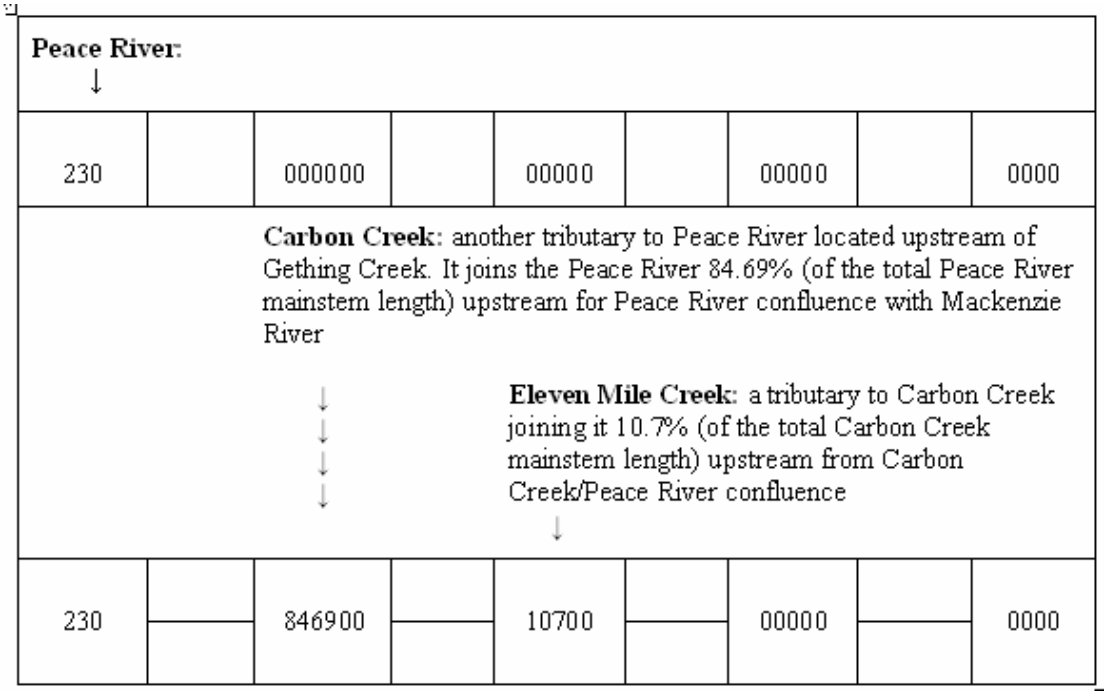

Figure 5 - Explanation of the Eleven Mile Creek Watershed Code, a Tributary to Carbon Creek in the Peace River Watershed

Waterbody Identifier

A Waterbody Identifier is a computer generated alphanumeric label that uniquely identifies a waterbody within a watershed and within the Province of BC. A waterbody is a lake, pond, swamp, marsh, bog, reservoir, or canal or stream segment shown as double lines on 1:50,000 maps. The letters in the waterbody identifier indicate which of the 246 watersheds in BC that which the waterbody is located.

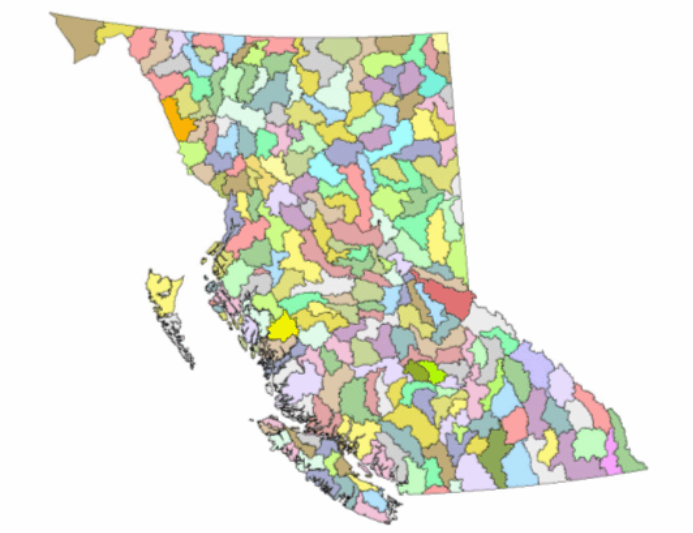

Figure 6 - The 246 Watersheds in BC

Reach Number (#)

Reach Delineation

A stream reach is a relatively homogeneous length of stream having a sequence of repeating structural characteristics (or processes) and fish habitat types. In a stream reach the channel morphology, channel dimension (and thus width and discharge), and gradient are uniform. Reaches are part of a hierarchical classification structure used for many purposes, such as identifying fish habitat.

Reach delineation is performed at the start of a fish and fish habitat inventory process to allow for selection of survey site locations. Dividing streams into homogeneous sections allows for sampling in a portion of a reach to collect information that is representative of the entire reach. For example, if a portion of each reach were surveyed, the fish habitat in the entire stream length could be described, providing an understanding of fish distribution and habitat capability for the whole stream.

A reach break marks the boundary between adjoining reaches. Each reach on a stream is assigned a unique number in an upstream-ascending order, the first being the reach closest to the mouth of the stream.

Reach delineation is initially performed in the office using maps and air photos, and then confirmed in the field. Identify reaches and reach breaks in the project area using all available data sources, including at a minimum, the most recent air photos and maps. Use the scale of

maps and air photos that the inventory is based on. Use the following key physical factors to determine reaches:

- Channel pattern
- Channel confinement
- Gradient, and
- Streambed and bank materials.

A stream reach generally shows uniformity in these characteristics and in discharge.

Reach boundaries, called reach breaks, usually occur at:

- Significant changes in stream channel form or confinement (and/or coupling), such as the change from a single channel to braided, multiple channels, or at the change from a wide floodplain to a confined canyon
- Significant changes in gradient
- Significant changes in streambed and bank materials, such as a change from erodible to non-erodible materials and
- Significant tributary confluences

For a Reconnaissance inventory, obstructions or potential barriers to fish distribution are reach boundaries only if they meet both the following characteristics:

- Are less than 100 m or 10 bankfull widths (W_b) in length (if they are longer than these lengths, they are defined as a reach); and
- Are consistent with the changes in physical criteria listed above. For example, a steep bedrock falls, approximately 50 m long, with a cascade step pool reach upstream, and an entrenched gorge with an 8% gradient downstream (the falls characteristics are different from both the upstream and downstream reaches).

Stream Reach Numbering

Reach numbers start at 1 at the mouth and increase sequentially upstream (e.g. 1, 2, 3, etc.). If an additional reach is identified after reach delineation and numbering has been done (for instance during field sampling), and needs to be broken out within the existing reaches, the new reach can be numbered using decimals (e.g. 1, 2.1, 2.2, 2.3, 3, etc.). This will require changing only the numbers of the reaches directly adjacent to the new reach.

Like stream reaches, lakes and wetlands in the stream network are numbered. Assume that each lake or wetland is a single reach and assign each one a unique number in a sequential, upstream-ascending order, consistent with the stream reach numbering system.

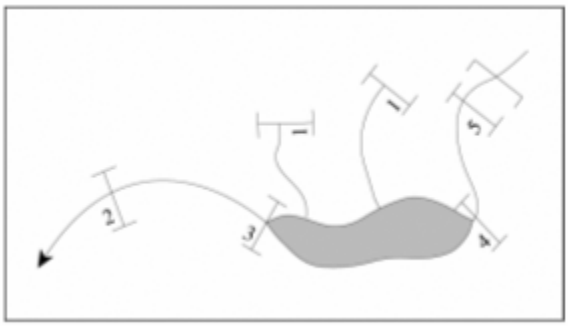

Figure 7 - Excerpt of map showing reach breaks and reach numbering for lakes and streams

Once all of the reaches in the project area have been delineated, collect general physical data for all reaches in the project area including watershed code, mapsheet number, UTM coordinates, and reach number..

Once reaches for field sampling have been chosen, determine the following characteristics for each reach to be surveyed, from maps and air photos: reach order, upstream elevation, downstream elevation, length, gradient, pattern, confinement, anastomosed/braided, basin type, and whether or not it is a wetland.

Reach Order

Reach order, magnitude and gradient are map-derived data. The reach order describes the relative size and topology of a stream in a drainage network. A first order stream has no tributaries. A second order stream results from the joining of two first order streams. A third order stream results from the joining of two second order streams.

Elaboration

Enter the following additional information for the reaches that will be surveyed in the field: stream order, upstream elevation, downstream elevation, length, gradient (calculated automatically by FDIS), pattern, confinement, anastomosed/braided, basin type, and whether or not it is a wetland.

UTM (Universal Transverse Mercator) Coordinates

Universal Transverse Mercator Projection

The Universal Transverse Mercator (UTM) Projection is a projection of the earth onto a cylinder wrapped around it with contact along a meridian (or longitude). It allows the earth (a sphere) to be represented on a flat sheet of paper with minimal distortion.

The UTM projection divides the earth into 60 zones, each 6 degrees of longitude wide. The zones are numbered eastwards starting at the meridian 180 degrees from Greenwich. Four zones numbered 8, 9, 10, and 11 cover British Columbia.

UTM Rectangular Grid

The UTM Rectangular Grid is a system of squares superimposed on a map drawn on the UTM projection. The rectangular grid consists of straight vertical lines parallel to the central meridian, and at right angles to them, straight horizontal lines parallel to the equator. Horizontal lines are designated by the distance in metres from the equator and are called the "northings". Over BC, the values of northings range from approximately 5,350,000 m at the south end of Vancouver Island, to 6,650,000 metres at the 60th parallel. Vertical lines are designated by the distance in metres from an imaginary point or "false origin" 500,000 metres west of each central meridian, and are called the "eastings". In the latitude of BC, the values of eastings range from a minimum of 280,000 metres to a maximum of 720,000 metres. The false origin is used so that all eastings are positive.

UTM Coordinates

The UTM coordinates (easting and northing) are used to geographically reference (identify the location of) any point on the ground such as a lake, stream or sample site. Any locational point in a fish inventory must be geo-referenced with a UTM. This includes lakes, stream reach breaks, sample sites, stream features, and photo locations.

To record a unique location, include the UTM zone, the east coordinate and the north coordinate in that order. To record to a precision of 1 metre, record as a single string of characters separated by periods such as: 10.437823.5603104 which is zone 10, easting 437823 and northing 5603104.

Precision to 10 m has one less number in the easting and the northing, for example: 10.43782.560310.

The UTM always has one more digit in the northing than in the easting.

If precision to better than 1 metre is required, then the zone, easting and northing must be recorded separately and not as a single string, e.g. Zone 10 Easting 472703.900. Northing 5362806.990 indicates precision to 1 millimetre.

Obtain a listing of UTM coordinates from The BC Ministry of Sustainable Resource Management, Fisheries Data Warehouse, *BC Watershed Dictionary*.

If you know the name or watershed code of a stream this site will list the UTM coordinates for the mouth of the stream. If you know the name or waterbody identifier of a lake this site will list the UTM coordinates for the outlet of the lake (or the geographic centre of the lake if it has no outlet). UTMs for other locational points such as sample sites and reach breaks cannot be obtained from this web site. They must be determined using one of the other methods listed above in the Method section.

Geographic Information System (GIS)

A computer system capable of assembling, storing, manipulating and displaying geographically referenced information.

Global Positioning System (GPS)

The Global Positioning System is a US military satellite system that provides continuous, accurate, and instantaneous positioning anywhere on or above the earth.

Orthophoto

This is a uniform-scale photograph or a photographic map. It combines the image qualities of a photograph with the geometric qualities of a map. A digital orthophoto is a digital image of an aerial photograph in which distortion caused by the camera and the topography have been removed by a rectification process.

Methods for obtaining UTMs

There are two main methods for obtaining UTMs. The first is from maps or orthophotos as an office exercise, and the second is using a GPS unit in the field.

UTMs can be obtained from hardcopy maps or orthophotos using the UTM grid numbers printed on the map surround or overlaid on the orthophoto. However, a more accurate method is to use GIS computer software such as ArcView or ArcInfo to pinpoint locations on the digital version of the map or orthophoto. To use this method, you need to have the digital TRIM maps which can be ordered from LandData BC, or digital orthophotos with the UTM grid overlaid.

Global Positioning System units can be used in the field to obtain UTMs for locational points. Refer to the British Columbia Standards Specifications and Guidelines for Resource Surveys Using Global Positioning System Technology.

Obtain the correct UTM coordinates (easting and northing) for the locational point of interest (lake, stream, reach break, sample site etc.) from maps or orthophotos, or by using global positioning system (GPS) as follows:

- For Reconnaissance (1:20,000) and Overview (1:50,000) Fish and Fish Habitat Inventories UTMs must be to 1 metre accuracy.
- For stream reaches, use the UTM coordinates of the upstream reach break for geographical referencing.
- For sample sites in streams, use the UTM coordinates of the downstream end of the site.
- For lakes, use the UTM coordinates at the main outlet of the lake, unless there is no outlet present. In that case, use the geographic centre of the lake.
- For sample sites in lakes, use the UTM coordinates for the approximate centre of the site.

Channel

Channel descriptions are based on the channel width, depth, and gradient, which together describe channel shape and morphology. Channel dimensions are not arbitrary. Through the processes of erosion and deposition, bank dimensions adjust to the quantity of water and sediment moving through a cross-section of a channel so that the channel can contain all but the highest flows (usually referred to as the flood stage). The channel measurements describe aspects of channel stability (especially the width and depth). Any increase in the discharge of water or sediment, or any disturbance to the banks, may result in the widening and a decrease in the depth of the channel.

Channel width, depth and gradient influence fish habitat. The width and depth of a channel describe the current wetted area of a stream and the potential wetted area at high flows. The width and depth of a stream can limit the amount and size of fish that are able to utilize its habitat.

Useful definitions include:

- Reach: A relatively homogenous length of stream having a sequence of repeating structural characteristics (or processes) and fish habitat types.

- Site: A section (segment) of a stream or wetland reach where the field sampling is conducted.

- Stream: A stream is defined as a reach , flowing on a perennial or seasonal basis having a continuous channel bed, whether or not the bed and banks of the reach are locally obscured by overhanging or bridging vegetation or soil mats, if the channel bed is scoured by water, or contains observable deposits of mineral alluvium.

- Wetland: An open waterbody that does not have a maximum depth greater than 2m and less than 25% of its surface area covered with wetland vegetation.

For further information, refer to:

Channel Assessment Procedures Guidebook.

Fish Stream Identification Guidebook

Riparian Management Area Guidebook

Reconnaissance (1:20,000) Fish and Fish Habitat Inventory Standards and Procedures Version 2.0

Channel Width (m)

Use only those criteria relevant to the particular field site. Consider the following to identify top of the flood stage bank:

- A change in vegetation (>2 years old) from bare ground, with no trees, to vegetated ground with trees, from no moss to moss covered ground, or from bare ground to grass-covered ground, particularly in range lands (i.e., where rooted, terrestrial vegetation begins);
- A topographic break from vertical to flat floodplain;
- A topographic break from steep bank to more gentle slope;
- The highest elevation below which no fine woody debris (needles, leaves, cones or seeds) occurs; and
- A change in texture of deposited sediment (e.g., from clay to sand, or sand to pebbles, or boulders to pebbles).

To measure the channel width:

- The widths can be measured using a spacing of the bankfull width (from the first measurement), or they can be equally spaced over the site depending on the number of measurements you are taking. For small streams it is suggested the measurements be taken equally spaced over the site; for larger streams, choose the method that is most representative of the site.
- Generally, do not take widths near stream crossings, unusually wide or narrow areas (e.g., impoundments), or disturbances. However, you can outline width estimates for these areas in the comments section of the site card.

Gradient

- The sighting length should be at least 60 m long and preferably longer. Where visibility is restricted, to 30 m or less, take sightings in both upstream and downstream directions from a given point to maximize the length of stream used to calculate gradient.
- When shorter sections of channel are used, make sure measurements are sighted from similar habitat units (e.g., riffle crest to riffle crest).
- The use of an Abney level or a more accurate measuring device is suggested where accurate measurements are required, such as where the gradient is less than 3% and where the gradients is between 18 and 22%.
- When shorter sections of channel are used to measure gradient, make sure sections of channel have even numbers of pools and riffles in a sequence. Pools and riffles have unique slopes, so measuring the slope of a pool will underestimate channel gradient, while measuring the slope of a riffle will overestimate channel gradient. This applies equally to cascade-pool and step-pool channels.

Stage

When the channel is completely dry, do not classify stage.

- If pooled water is present within the site, classify the stage as low.
- Observe the amount of water in the channel in relation to the bankfull depth.
- Look for the low flow indicators including:
  - Distinct sequence of riffles and pools or steps and pools.
  - High bank tops.
  - Wetted width significantly smaller than channel width.
  - Dry, unvegetated channel bars.
  - Debris and jam pile ups well above water surface.
- Look for high flow indicators including:
  - Distinction between riffles and pools or steps and pools is difficult to determine.
  - Water level at or over bank tops.
  - Wetted width similar to or greater than channel width.
  - No bars or bank sides visible.
  - Debris movement in channel.
  - Submerged riparian vegetation.
  - Flood channels full of water.

No Visible Channel - No Vis. Ch.

Where site assessment in the field reveals no visible channel, this could signify the following situations:

- The mapping was incorrect and there was no channel in the field where the map identified one
- The channel may flow subsurface (in the field, running water may be heard under a moss/vegetated area).
- There is a wet area that acts as a path for snowmelt and/or overland flow.
- Water is running over the land with no definable banks. This is common during spring melt when frozen soils do not permit percolation of water into the ground (especially in the northern interior).
- Damp/wet areas identifying seepage areas with (sometimes) water flowing over organic soils. They are usually located in alder and willow thickets.

Dry/Int - Dry/Intermittent

- Where flow is seasonal in a channel (i.e., intermittent), flow may occur for several months each year but will seldom occur during the dry season. Flow is usually in the winter and spring in coastal drainages and in the spring and early summer in interior drainages.

- Streams that have a channel with the flow below the surface are known as subsurface channels. Subsurface channels that have sufficient width and water flow may permit fish passage. Consider subsurface flow a feature if it appears to be a potential obstruction to fish passage.

DW – Dewatering

At high flows dewatering may not present a barrier to fish passage. Dewatering primarily occurs during periods of low flow which usually occur during the summer months.

Figure 8 – Presence of a dewatered channel

Cover

Cover is any structure in the wetted channel or within 1 m above the water surface that provides hiding, resting or feeding places for fish.

The success of fish within their habitat is largely dependent on the type, quality and quantity of available cover. Fish abundance is often directly related to the quality and quantity of available cover.

Cover (Total), Type, Amount and Location

Total Cover

Total Cover consists of the cover types (type of structure (material that provides hiding, resting or feeding places for fish); small woody debris (SWD), large woody debris (LWD), boulders (B), undercut banks (C), deep pools (DP), overhanging vegetation (OV) and instream vegetation (IV). Estimate the total amount of cover, not the amount of cover types within the channel. For instance, boulders may make up 50% of the streambed but provide cover over only 10% of the channel.

Observe the entire stream channel (including primary, secondary and off-stream channels) within the site and visually estimate the percentage of stream surface area affected by one or more cover types.

Features

Features refer to habitat attributes that may affect the ability of a site/reach/watershed to sustain fish (salmonids) populations.

Features are structures (e.g. bridges, culverts), natural steam features (e.g. cascades, waterfalls) or anthropogenic influences (e.g. hatcheries, fishways) found within the site which may affect fish populations or fish habitat. These may have either positive or negative impacts on habitat quality.

Water Quality

Water quality applies to the suitability of water for a specific purpose, which in the case of this assessment is water's ability to support fish.

In addition to indicating the current quality of fish habitat, the description of water quality parameters provides baseline data for comparison if there is future site disturbance.

Water quality measurements provide baseline information about a site, ensure habitat requirements are met and are used to evaluate the potential effectiveness of electrofishing.

Generally, water samples are required for quality assurance purposes. However, water samples may also be taken to clarify information regarding fish presence, theoretical fish densities, or where fish are diseased or otherwise abnormal.

Collecting Water Samples

Consult with the laboratory prior to field sampling for specific requirements regarding sample bottles, preservations and requisition forms.

Obtain ice packs and coolers for transporting samples from the laboratory.

Collect all water samples from the downstream end of a site, when required. Filter and preserve water samples as required. Store water samples in specifically cleaned, standard sample collection bottles. Add preservatives as required to ensure that chemical reactions do not alter the sample prior to laboratory analysis. Keep samples cool (near 4^{o}C).

Transport samples to the lab for analysis (within 3 days) to avoid deterioration.

Make arrangements with the lab to enter results into the database.

Refer to *Ambient Fresh Water and Effluent Sampling Manual*

Temperature, pH, Conductivity and Turbidity

Measure the **water temperature** of the stream to the nearest 1°C using a standard (e.g., mercury) or digital thermometer. Measure in flowing water at a location representative of the stream site. For example: Measure water temperature in the shade if the rest of the reach is in the shade and visa versa. Measure in areas of flowing water since pools tend to be warmer.

Measure the **pH** (a measure of the hydrogen ion concentration of the water) in the field using a hand-held pH meter. Measure pH to the nearest tenth (e.g., 7.1). Follow the instructions provided with each sampling tool to ensure accurate results. For example: If using a pH meter, frequently calibrate with a low ionic strength electrode (buffer). Colourimetric paper indicators may be best in field situations or as a back-up method. Always carry pH paper in waterproof container.

Measure **conductivity** in the field using a portable or hand-held conductivity meter according to the instructions provided with sampling tool. Measure conductivity to the nearest 1 μS/cm, standardized to 25 °C. Most conductivity meters automatically adjust conductivity measurements to 25°C. If the meter does not automatically standardize to 25°C, measure the water temperature at the same time as conductivity, convert the EC reading to the 25°C standard using a conductivity nomograph. Electrical conductivity (EC) is a measure of the total concentration of dissolved salts in water; the higher the conductivity, the higher the salt (e.g., sodium, calcium, sulphate) concentration.

Visually estimate **turbidity**, a measure of the relative water clarity in a stream. Turbidity indicates the concentration of suspended sediments and particulate matter in water. Visually assess the turbidity from the streambank or take a sample using a clear bottle that is held up against a piece of white paper. Classify the turbidity. Note: Turbidity should not be confused with water colour. Darkly stained water that has poor visibility may not necessarily be turbid. This dark colouration is usually due to tannins released from the decomposition of organic material. In this case classify the turbidity as clear and record a comment about the colour of the water.

Morphology

Channel morphology refers to the shape of a channel and the processes that create that shape. As sediment and water are transported downstream, they interact with their surroundings and develop characteristic channel types. For example, channels that flow through boulders or bedrock in the headwaters look very different from those that flow through gravel or cobbles on a valley flat. The processes and disturbances that influence these channels are also different.

Channel morphology is best assessed within a watershed context. When collecting data at a particular site keep in mind where the stream reach fits into the larger watershed. Observe particular morphological structures that influence habitat units of species likely to be found there.

Channel morphology provides fish with the environmental conditions necessary for survival. To recognize the characteristics of channel morphology consider:

- The physical processes that determine channel morphology.
- How channel morphology changes throughout a watershed.
- How channel morphology influences fish habitat.

Channel morphology and behaviour is determined by the characteristic movement of water and sediment throughout the drainage network, the boundary materials through which the channel flows, and the surrounding geology.

Boundary materials refer to the nature of the materials through which the stream flows determines the degree to which a channel to adjust its boundaries.

Flood Signs Fld Sns

Look for channel characteristics that provide flood signs:

- LWD and other debris deposits above the current or high water level.
- Scoured banks and recent bank sloughing.
- Scoured or uprooted vegetation above bank top.
- Sediment deposition on the forest floor or vegetation.
- Recently deposited bank or bed material as a result of increased sediment supply from upstream scour.

Look for indicators that a channel is currently in flood:

- Above bank top water levels.
- Silted or cloudy water.
- Large amounts of debris transported in the channel.

Record any comments on the type(s) of observed flood sign(s), the height of the sign(s), the width of the flooding and the method(s) used for measurement. If no flood signs are observed, record N/A. If there is any doubt about the flood origin of a potential flood sign do not record.

Channel Morphology Classification (Morph.)

As a check, consider channel size. Small channels have a step-pool morphology and usually have a D/d > 1.0. Intermediate channels have cascade-pool or riffle-pool morphology, and usually have a D/d between 0.1 and 1.0. Channel size in this instance does not refer to stream width. Streams with step-pools can often be wider than streams with riffle-pool morphology.

In low-lying areas, non-alluvial channels with fine-textured (e.g. sand or silt) or organic substrates do not easily fall into this classification. These are often narrow channels near the headwaters with gradients <0.5% (e.g., Figure 8:6). If D/d < 0.1, record LC (large-size morphology) in the appropriate Site Card field.

Next, determine if there is any LWD in the channel. Consider the width of the channel and determine if the LWD is functional (functional LWD is able to influence sediment storage, scour, and/or water surface elevation). As the width of the channel increases, LWD tends to become less functional (usually at bankfull widths of 30 m or more).

Finally, consider the dominant bed materials. Boulders are dominant in step-pool channels, cobbles and boulders in cascade-pool channels, and cobbles and/or gravels in riffle-pool channels.

It could be difficult to determine the stream morphology where there has been a lot of disturbance to the site channel. In such cases determine the morphology based on the gradient since the gradient of the site will remain the same and this will give the morphology of the pre-disturbed site. Record comments.

Channel morphology is usually classified following a visual assessment of the site. In certain situations (e.g. morphology is unclear or an individual crewmember lacks sufficient experience), a nomogram developed to classify the channel can be used to help make this determination. The nomogram is based on bankfull width and depth, D, and slope. Results are approximate, but can lead towards the proper classification and help refine observations. Refer to *Channel Assessment Procedures Guidebook* for further elaboration.

LWD is an important sub-code in this classification. The key is to identify functional LWD (e.g., it is oriented perpendicular or diagonal, relative to the banks, and influences sediment storage and/or local flow conditions). Non-functional LWD (e.g. LWD resting above the banks or floated onto the tops of bars) is not included.

Disturbance Indicators

Disturbance indicators describe impacts from changes in sediment supply and/or discharge, and are grouped into categories of sedimentological characteristics, bank impacts, morphological features, and LWD. These impacts can be natural or anthropogenic.

Disturbance indicators are visually assessed and based on your interpretation of the channel. Many indicators are not a question of presence or absence, but weighting the indicator as a spatial average across the channel and its general importance in influencing the overall character of the site. For example, most channels have some evidence of recent bank erosion. Banks are a primary source of sediment to the channel and some erosion is not an indicator of disturbance. However, if most of the banks were eroding, you would consider circling the code on the Site Card.

Disturbance indicators are applicable in both developed and undeveloped watersheds. Landslides, wildfires, and insect infestations, in conjunction with large floods, create natural disturbances that can be described with this same set of disturbance indicators.

Visually assess each disturbance indicator. Refer to the *Channel Assessment Procedures Guidebook* for a further elaboration of each indicator and a corresponding photograph. Use the following table in the Data Recording section to assess the disturbance indicator.

Channel Pattern (PATTERN)

When recording the channel pattern, consider the channel at bankfull discharge (channel pattern does not apply to the pattern represented by the wetted width).

Islands

Islands are any bar with permanent (perennial) vegetation over at least half the surface area and appear relatively stable (not likely to be eroded during the next high flow.) Some difficulty arises when bars are sparsely vegetated and the distinction between bars and islands becomes blurred. Generally, if the bar in question supports perennial vegetation (> 1m in height) over at least half its surface area, and it appears to be relatively stable (e.g. not likely to be eroded during the next high flow), it is considered an island.

Visually assess the type of islands present within the site according to the following island descriptors (after Church, 1992):

Bar types (Bars)

Bars are sediment deposits in the channel that is typically more than one particle diameter high or has lengths of the same order as the channel. Stream bars consist of exposed bed materials deposited by stream flow within the stream channel. Bars are sparsely vegetated to moderately vegetated and are distinct from islands, which are heavily vegetated and more stable. Bar type may be used to estimate stream stability.

Visually determine the dominant bar type for each site. In practice, identifying bar types can be difficult, especially in complex channels with a variety of morphological features. If you are unsure of the bar type, determine if the sediment is stored in the middle of the channel or against one of the banks.

Coupling

Coupling considers the connections among the stream channel, valley bottom, and hillslopes, and describes the potential for sediment mobilized on the hillslopes to enter a stream channel.

Coupling is a subjective assessment of sediment transfer routes from hillslopes to stream channels. Generally, the degree of coupling describes the short-term response of the stream channel to events that occur on the hillslope and the importance of the valley flat as a buffer to sediment transfer. Degrees of coupling include:

Decoupled (DC) – A channel is considered decoupled from a hillslope when sediment mobilized on the hillslope by a landslide would not normally enter the stream channel (at any point—either side).

Elaboration: Normal fluvial processes dominate sediment movement through a decoupled channel. Sediment is delivered to the channel through bank erosion and delivery from upstream. Channel gradient is typically <2 per cent.

Observe indicators of decoupled reaches including:

- The valley flat intercepts sediment or debris mobilized by a landslide, preventing material from directly entering the stream channel.
- Surrounding slopes are steep (>65 per cent gradient) but of sufficiently limited extent to prevent the delivery of significant volumes of sediment to the channel (e.g. the channel is incised into a relatively wide valley flat).
- The channel 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).

Partially Coupled (PC) – A channel is considered partially coupled to a hillslope when a portion of the sediment mobilized on the hillslope by a landslide may directly enter the stream channel.

Elaboration: Sediment delivery to a partially coupled channel is dominated by debris flows or persistent erosion from fluvially undercut till or outwash bluffs. The transfer of sediment out of the reach is by normal fluvial processes. Channel gradient ranges from 2 to 10 percent.

Observe indicators of partially coupled hillslopes including:

- Landslides either directly enter the channel 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 reach can be impacted from upstream by a debris flow or torrent.
- A reach with a discontinuous valley flat impinges on some parts of the hillside, so landslides mobilized from some hillside locations are apt to enter the channel.

Coupled (CO) – A channel is considered coupled to a hillslope when sediment mobilized on the hillslope by landslide activity will directly enter the stream channel (on either side).

Elaboration: Landslides dominate sediment delivery to coupled reaches, while sediment movement through the reach is by debris flow and fluvial processes. Channel gradient is typically >5 per cent.

Observe indicators of coupled reaches including:

- There is no valley flat; sediment or debris mobilized by landslides directly enters the stream channel.
- The surrounding slopes are steep (>65 per cent) and likely to initiate landslides that can transfer sediment directly to the stream channel.
- The channel 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 the reach.

Confinement

Confinement is the ability of the channel to migrate laterally on a valley flat between surrounding slopes.

Visually assess the degree to which the lateral movement of a river channel is limited by relic terraces or valley walls.

Photodocumentation

Photodocumentation is a visual documentation of general stream characteristics including channel morphology, riparian vegetation, obstructions and major disturbances of the site.

Photodocumentation of the site and all important features within the site is essential as a visual baseline reference.

Photo documentation is a major part of watershed, stream and lake inventories and serves three primary purposes:

- Photos contain much information about a site's characteristics.
- Photos can be stored and retrieved for reference.
- Photos provide information that aids field data evaluation for the purposes of report production and management decisions.

  All photographic images delivered must be of high quality for archival purposes.

  In order for a slide, print or negative to be useful, it must be properly referenced and labeled with useful information.

  Only high quality digital cameras capable of producing images that will meet reconnaissance inventory standards will be accepted.

Roll #, #, Focal Length, Direction and Comments

Take one upstream-oriented and one downstream-oriented photograph at each site to show general stream characteristics including channel morphology, riparian vegetation, obstruction, and major disturbances. Get both banks in the photo.

Have a scale item included in the photograph. For example have a person stand in the water in big systems or place a ruler or measuring tape in small streams, to give an idea of the depth and velocity.

Take photos for identified features.

Take additional photos to aid in documentation of the site characteristics.

Reference photos to identify photos or scanned photo images. There are two types:

CD photo-referencing

A digital table on the CD can be used to cross-reference the image file name to the photo referencing information.

For those projects using FDIS 7.3 (or newer): The photo-documentation file is exported (use the Excel format option) and stored on the CD (remember to enter the photo CD number and image number into FDIS before the export is completed).

For projects using older versions of FDIS, an Excel table should be created to cross-reference the image file name to the photo-referencing information.

Example:

Filename	**Photo Reference**
BubbaCreek001.tif	R3, F15, 123-123456-12345, Reach 3, Site 1

NOTE: IF FDIS 7.3 (or newer) is used, storing the photodoc file on the CD is mandatory.

Photo labeling

It is also recommended that labeling be incorporated into the photos. There are two options as follows: Include a whiteboard with referencing information in the photograph when the picture is taken or use a software/graphics package to label the image before it is stored on CD. If adding a label to the photograph, the label should not be placed directly on the digital image. The label should be added to some white space above or below the photo image.

Figure 9 - Photo Labeling

Scanning Requirements

The following describes the scanning requirements for project photographs. All photographs must be colour, of high quality, and the scaling should be 100%.

Hardware

A good quality flatbed scanner with an optical resolution of at least 1200 dpi should be used. Many scanners that offer a 1200 dpi resolution, actually have an optical resolution of 600 dpi, and achieve higher resolutions through interpolation schemes. These should be avoided. The colour depth has to be at least 24 bit colour for prints, negatives and slides.

File type

Only PCD (*.pcd) and TIFF (*.tiff or *.tif) file formats are acceptable. Do not submit *.jpg files as a primary product. The TIFF files can be compressed with a lossless scheme, such as "run length encoding," RLE. RLE is also known as "recurrence encoding."

CD Type

The preferred product is the Kodak Photo CD, also known as the Kodak Photo CD Master. These files are in *.pcd format, in the following formats (in pixels): 128 × 192, 256 × 384, 512 × 768, 768 × 1024, 1024 × 1536, and 2048 × 3072. Although the 1024 by 1536 picture file is considered "adequate," and is the minimum requirement, the 2048 × 3072 is usually part of the package. The Kodak Pro Photo CD is also quite acceptable, but the 4096 × 6144 file is not required and should not be asked for if 35 mm slides or negatives were used. See <*http://home.earthlink.net/~ritter/tiff/*> for more information regarding TIFF file formats.

DO NOT USE THE KODAK PICTURE CD *or* THE KODAK PICTURE DISK. These products may go up to the minimum requirement of 1024 by 1536 pixel resolution, in the case of the Picture CD, but the files are JPEG files. The Kodak Picture Disk gives 400 by 600 pixel images in JPEG format. In this case, neither the resolution nor the format is acceptable for the reconnaissance inventory.

Resolution

- Slides: 1200 dpi

Since there is some loss in going from slide to print, it is better to scan the slide directly. This should be done at a minimum of 1200 dpi, to give the same size of image file (1200 by 1800 pixels) in TIFF format. As noted, these TIFF files can be compressed using loss-less algorithms such as RLE.

- Photographs (4"×6"): 300 dpi

Scan 4 by 6 inch prints at a minimum of 300 dpi (dots per inch) to give a 1200 × 1800 pixel image file in TIFF format. For this to be successful, the scanner has to be of good quality and the photographic print must be of excellent quality.

Photo Survey Form 1

Record camera equipment details on Photo Survey Form 1, Equipment Details, records equipment details for up to two cameras used in a photo survey; if more than two cameras are used, attach a second copy of the form and change the camera number(s) accordingly. This Form will accommodate images from film cameras, digital cameras, and still video. Instructions for completing the form follow:

Survey Start and End Dates

Enter the start and end dates for the photo survey in the format "yyyymmdd."

Agency

Record the agency code for the agency, group or company that completed the photo survey form.

Crew

Record the initials of up to three crew members using a maximum of three letters per member.

Camera Information

For each camera used, indicate the make, model and format: 135 mm film, other film (specify format), digital or still video. If only one camera is used, circle "n/a" for camera #2.

Circle the letter(s) corresponding to the lens information, below. If the camera has a built-in lens, circle the appropriate letter, and write "fixed lens" and the focal length in the lens table.

For digital and still video cameras, indicate the image resolution and the output file type.

Lens Information

- For each lens, provide the focal length opposite a letter in the "lenses" box, then circle the appropriate lens letter associated with each camera. If the lens is used with a converter, indicate this as well (e.g., 50 mm ×2).
- For zoom lenses, indicate the range of focal length.
- If the lens is built-in, write "fixed" and the focal length in the "lenses" box.

Roll and/or Batch Details

- Number the rolls and/or batches sequentially, so that each number is used only once.
- For each roll or batch, circle the output medium: negative, slide or file.
- For film cameras, indicate colour, black-and-white (B&W), or other (specify, for example, colour infrared, black-and-white infrared), and ISO film speed.

PHOTO SURVEY FORM 1 - EQUIPMENT DETAILS

Survey start date (yyyymmdd): ____|____|____|____|____|____|____|____ Agency: ____|____

Survey end date: ____|____|____|____|____|____|____|____ Crew: ____|____|____

CAMERA #1

Make & model:							Lenses:	A	B	C	D E F
Format:	135mm film			Other film _____			Digital				Still video
Resolution (for digital and video cameras):											
Output file type (for digital and video cameras):											

CAMERA #2

n/a	Make & model:						Lenses:	A	B	C	D E F
Format:	135mm film			Other film _____			Digital				Still video
Resolution (for digital and video cameras):											
Output file type (for digital and video cameras):											

LENSES

Focal length (mm)		Focal length (mm)	
A		D	
B		E	
C		F	

ROLL AND/OR BATCH DETAILS

Roll# or Batch#	Camera #	Output medium			For film cameras: Film type			ISO
		neg	slide	file	color	B&W	other: _____	
		neg	slide	file	color	B&W	other: _____	
		neg	slide	file	color	B&W	other: _____	
		neg	slide	file	color	B&W	other: _____	
		neg	slide	file	color	B&W	other: _____	
		neg	slide	file	color	B&W	other: _____	
		neg	slide	file	color	B&W	other:	
		neg	slide	file	color	B&W	other:	
		neg	slide	file	color	B&W	other: _____	
		neg	slide	file	color	B&W	other: _____	
		neg	slide	file	color	B&W	other: _____	
		neg	slide	file	color	B&W	other: _____	
		neg	slide	file	color	B&W	other: _____	

Figure 10 - Photo Survey Form

Wildlife

Wildlife includes all reptiles, amphibians, mammals, birds and aquatic invertebrates that inhabit the waterbody and its immediate vicinity. Wildlife can directly affect fish and/or fish habitat or indirectly indicate fish presence/absence and/or water quality. For example: The presence of indicator aquatic invertebrates, such as stoneflies, indicates that there is good quality habitat within the stream and food is available for the fish within the stream. Large ungulate herbivores such as deer, elk and moose affect riparian plant community structure by forage consumption and trampling. Shrubs provide cover and nutrients for streams. Heavy browsing that reduces the abundance of shrubs may reduce fish productivity

Data Entry

Databases

Enter the data into the Field Data Information System (FDIS).

FDIS is a data capture, storage and reporting system that is devoted to field information as it is collected on the standard provincial field cards. It is a two part system where the first part is an MS Access tool to allow contractors and staff to enter, verify and edit data. The second part is the Oracle based components where all the data is eventually loaded. The Oracle components provide for data storage, some data editing, summary of the data to other systems (FISS), integration and access to the data for other systems and data reporting.

For instructions for using FDIS, link to FDIS Getting Started.

The following provides some additional hints.

FDIS software automatically inserts the gazetted name into the tables when the watershed code and/or waterbody ID is entered.

Data Reporting

Manuals and Resources

This lists the data reporting deliverables and their associated reference manuals and resources.

Overview maps show the entire project area (with boundary lines. They show the TRIM/Forest Cover (FIC) and aquatic features as background. In addition they show the location of all sample sites. Refer to **Fisheries Overview Map**

The following highlights selected information regarding data reporting.

FDIS Reach/Site Summary Photographs

For each FDIS Reach/Site Summary attach at least one and as many as four photos, with an associated caption, to the reverse side of the summary. Alternatively, place them on the next page if you do not wish to double-side photocopy. Treat the photos as an integral part of the site, referring to them in your comments:

- The most representative photos of the sample site are best, but a view of the site looking downstream is preferred. The minimum requirement is a downstream or upstream shot of the site, but other photos of important features and typical fish are also appropriate;
- Draft reports copies are to contain halftone or grayscale photos, where all final report copies photos are to be in color.

Quality Assurance

Manuals and Resources

Refer to Reconnaissance (1:20,000) Fish and Fish Habitat Inventory ***Quality Assurance Procedures Version 1.0***.

Appendix 1

Forms

- Fish Collection Form front (pdf) Fish Collection Form back (pdf)
- Individual Fish Form front (pdf) Individual Fish Form back (pdf)
- Lake Survey Form front (pdf) Lake Survey Form back (pdf)
- Site Card front (pdf) Site Card back (pdf)
- SLAM Boat (Air) form (pdf), SLAM Boat (Ground) form (pdf), SLAM Creel form (pdf), SLAM Fish Data form (pdf)
- SLAM Instructions: SLAM Boat (Air) form (pdf), SLAM Boat (Ground) form (pdf), SLAM Creel form (pdf), SLAM Fish Data form (pdf)

Field Guides

- Fish Collection Form Field Guide, Fish Collection Form Field Guide Errata, Fish Collection Form Field guide Errata #2
- Lake Survey Form Field Guide, Lake Survey Form Field Guide Errata, Lake Survey Form Errata #2
- Site Card Field Guide, Site Card Field Guide Errata, Site Card Field Guide Errata #2

Data Entry Tools

AquaCat

AquaCat is a searchable catalogue and storage system for fisheries and water reports, maps and datasets. It is a two tiered system that is browser based, built with JAVA and stores data to an Oracle database. The first tier allows staff and contractors to use the government's intranet to upload reports, datasets and maps into the catalogue and store the information in Oracle. The second tier produces a searchable browser based catalogue on the Internet site that the public may use to discover information and download their own copies of the reports, datasets and maps.

FDIS (Field Data Information System)

FDIS is a data capture, storage and reporting system that is devoted to field information as it is collected on the standard provincial field cards. It is a two part system where the first part is an MS Access tool to allow contractors and staff to enter, verify and edit data. The second part is the Oracle based components where all the data is eventually loaded. The Oracle components provide for data storage, some data editing, summary of the data to other systems (FISS), integration and access to the data for other systems and data reporting. For instructions for using FDIS, link to FDIS Getting Started.

FISS (Fisheries information Summary System)

FISS is a comprehensive Oracle database providing summary level fish and fish habitat data for water bodies throughout the province of British Columbia that allows the data to be entered, stored, geo-referenced (mapped), distributed (accessed) and reported on. It is a main source of information to many other systems and data products.

FPR (Fisheries Project Registry)

FPR is a joint effort between BC Fisheries and the federal Department of Fisheries ad Oceans to compile an ongoing list of all projects within the province that focus on fish and fish habitats including habitat restoration, biological enhancement, stock and habitat inventories and monitoring, stream mapping, and fish farming to name a few.

Manuals and Resources

- **A Guide to Photodocumentation for Aquatic Inventory**
- **Ambient Fresh Water and Effluent Sampling Manual**
- **Bathymetric Standards for Lake Inventories**
- **BC Conservation Data Centre**
- **British Columbia Standards Specifications and Guidelines for Resource Surveys Using Global Positioning System Technology**
- **British Columbia Watershed Atlas**
- **British Columbia Watershed Dictionary**
- **Channel Assessment Procedures Guidebook**
- **Example Products – Fisheries Overview Map, Fisheries Project Map, Fisheries Interpretive Map, Final Lake Report**
- **Field Key to the Freshwater Fishes of British Columbia**

- **Fish Collection Methods and Standards Version 4.0**
- **Fish Collection Methods and Standards Version 4.0 Errata #1**
- **User's Guide to the Fish and Fish Habitat Assessment Tool (FHAT20) Version 2.0**
- **Fish Inventory Mapping System (FishMap) For 2000 Fish Inventory Data, User Manual, Version 1.0.**
- **Fish Stream Identification Guidebook**
- **FISS Fisheries Information Summary System Data Compilation and Mapping Procedures**
- **LandData BC**
- **Overview Fish and Fish Habitat Inventory Methodology**
- **Riparian Management Area Guidebook**
- **Reconnaissance (1:20,000) Fish and Fish Habitat Inventory Quality Assurance Procedures Version 1.0**
- **Reconnaissance (1:20,000) Fish and Fish Habitat Inventory Reach Information Guide Version 1.0**
- **Reconnaissance (1:20,000) Fish and Fish Habitat Inventory Standards and Procedures Version 2.0**
- **Standards for Fish and Fish Habitat Maps Version 3.0**
- **User's Guide to the BC Watershed/Waterbody Identifier System**