A Checklist for Fish Habitat Confirmation Prior to the Rehabilitation of a Stream Crossing

Prepared by the Fish Passage Technical Working Group December 2011

Overview

The Fish Passage Technical Working Group (FPTWG) developed this checklist to guide biologists confirming fish habitat value at a stream crossing which has been identified as a potential high-priority restoration site. In general, sites with high restoration value will have (1) high fish habitat value at the stream crossing as well as upstream and downstream of the crossing; (2) the potential to gain a large amount of habitat through remediation (i.e., distance to the next barrier upstream); and (3) no barriers to fish passage immediately downstream.

Confirmation of fish habitat at a stream crossing is a check in a series of steps that begins with a watershed scale assessment of closed bottom structures and ends with remediating a crossing to restore fish passage. Prior to the confirmation of fish habitat, a basic assessment of the closed bottom structure will have already been done and will have found the crossing to be a barrier to fish passage. The purpose of the fish habitat confirmation is to determine the amount and quality of habitat present and whether or not the site is a good candidate for remediation. This checklist provides guidance to biologists conducting this type of confirmation.

Preparation Before Going Out To the Field

1. **Collect All Relevant Background Information**

- Review the provincial fish habitat modeling that was done for the province. Contact Craig Mount, Ministry of Environment (craig.mount@gov.bc.ca) for access to this dataset
- Search the Ministry of Environment's Environmental Information Resources System (available online at http://www.env.gov.bc.ca/eirs/epd/) and the Cross-Linked Information Resources Database (available online at: (http://www.env.gov.bc.ca/clir/) for any background information such as habitat assessment reports, CAP, WAP, CWAPS, FHIIPs, etc.
- Gather Ortho-Photos for the area and good road maps (sites can sometimes be difficult to locate, particularly if the original assessment crew did not flag the crossings with the Crossing ID#)

2. **Contact Local Offices as Required For Additional Local Information**

- Regional Ministry of Forests, Lands and Natural Resource Operations (FLRNO) Fish Habitat Biologist / Ecosystem Biologist
- Fisheries and Oceans Canada Habitat Management Program Fish Habitat Biologists

3. **Review maps of downstream and upstream reaches**

- Assess distance to potential barriers both downstream and upstream of stream crossing
- Determine if stream crossings downstream and upstream have been assessed for fish passage by checking the Provincial Stream Crossing Inventory System. Contact Craig Mount, Ministry of Environment (craig.mount@gov.bc.ca) for access to this dataset
- Determine the downstream distance to the point where fish-bearing status is known. If this distance is >500 m a fish sampling permit may need to be obtained prior to the site visit to determine fish bearing status.

NOTE: If any of the following four conditions are found while conducting background research, then the site is unsuitable for rehabilitation and further work at the site is not warranted:

- site shown to be non-fish habitat based on fish habitat modeling (above a barrier or steep section);
- evidence found in past reports which show the site to be non-fish bearing;
- plans are in place to permanently deactivate the road; or
- recognition that numerous other downstream crossings would need to be fixed first in order to realize the habitat gains at this site.

During the Site Visit

1. At Stream Crossing

- Record GPS location and compare to original assessment. Check photographs from original assessment to confirm correct location.
- Confirm the original finding of FAIL at the site by conducting a second assessment using the protocol described in "Field Assessment for Determining Fish Passage Status of Closed bottom Structures"
- Determine average channel width at stream crossing as part of this confirmation (refer to protocol in Appendix A)
- Determine average slope gradient of the channel at stream crossing as part of this confirmation (refer to protocol in Appendix B)
- Assess fish habitat quality (see instructions, Appendix C)
- Mark the site with flagging and include Crossing ID, date, and crew names

2. Downstream of Crossing

- Walk downstream of crossing to check for barriers (for example drops of >1 m or crossings that impede fish passage). It is recommended that the crew walk downstream until the point is reached where the fish bearing status is known. For example, walk down the stream to the confluence with a larger channel that is known to support fish.
- Track and record your progress with a GPS unit
- Assess fish habitat quality (see instructions, Appendix C)
- Document habitat types with photographs and provide a description and coordinates for each photo

3. Upstream of Crossing

- Walk upstream of crossing to check for fish passage barriers (for example; waterfalls, steps of >1 m, other road crossings that impede fish passage, sustained gradient of greater than 25-30% or any other obstacle that would pose a barrier to the migration of the fish species found in that particular system)
- Track and record your progress with a GPS unit
- Assess fish habitat quality (see instructions, Appendix C)
- Document habitat types with photographs and provide a description and coordinates for each photo

Note: If the following conditions are discovered on-site, then this site would be unsuitable for rehabilitation and further work at the site is not warranted:

- Discovering that the crossing is actually a PASS through conducting a second assessment using the protocol described in "Field Assessment for Determining Fish Passage Status of Closed bottom Structures"
- Finding a downstream barrier which renders the site non-fish bearing

Submit Survey Summary and Conclusions

Submit a brief document (2-4 pages long) using the headings provided below to structure the document.

Site Location

- Provide UTMs and any other information that will help others locate the site
- Comment on any access concerns

Findings from Background Information Search

- Summarize the findings from the literature search and conversations with local experts
- Describe findings regarding local fish species
- Comment on the road network and plans for the road (e.g., is the road slated for deactivation)
- Describe the context for this crossing. For example, note whether there are any other road crossings downstream (or upstream) that would need to be fixed in order for the habitat gains at this site to be fully realized.

Stream Characteristics at Crossing

- Provide average channel width and average channel slope gradient
- Confirm that the closed bottom structure is a fail
- Describe habitat quality

Stream Characteristics Downstream

- Provide the distance downstream of the crossing to the point where the fish bearing status is known
- If a downstream barrier is found, provide distance to barrier and describe barrier. If there is a barrier downstream, the site is no longer a candidate for remediation
- Describe habitat quality (use photos to illustrate habitat types)

Stream Characteristics Upstream

- Provide the distance to upstream barrier and describe the barrier (if any)
- Describe habitat quality (use photos to illustrate habitat types)

Conclusions

- Provide an overall assessment of habitat quantity and quality and species present if known
- Comment on the overall value of rehabilitating stream crossing

Photos

- Provide photos with descriptions and coordinates for habitat quality at the stream crossing, as well as upstream and downstream of stream crossing

Maps

- Pull together all relevant mapping with GPS track of survey included and location of photos noted

Appendix A: Determination of stream channel width

Average channel width must be determined from measurements made consistently, objectively, and accurately. The methodology followed here is identical to that in the Fish-stream Identification Guidebook (B.C. Ministry of Forests 1998) except that only three widths are required instead of six recommended in that guidebook. Because mean width varies between the headwaters of a stream and the mouth, width measurements should be made within each stream reach.

A reach is a length of a watercourse having similar channel morphology, channel dimension, and gradient. Uniform channel morphology, channel dimension (and thus width and discharge), and gradient are primary attributes of reaches which encompass a number of component physical characteristics including channel pattern, confinement, and streambed and streambank materials.

Stream channel width is the horizontal distance between the streambanks on opposite sides of the stream measured at right angles to the general orientation of the banks. The point on each bank from which width is measured is usually indicated by a definite change in vegetation and sediment texture. This border is the "normal" high-water mark of the stream and is sometimes shown by the edges of rooted terrestrial vegetation. Above this border, the soils and terrestrial plants appear undisturbed by recent stream erosion. Below this border, the banks typically show signs of both scouring and sediment deposition.

Stream width measurements should not be made at unusually wide or narrow points, or in areas of atypically low gradient such as marshy or swampy areas, beaver ponds, or other impoundments.

Avoid measuring channel width in disturbed areas. "Normal" channel widths can be increased greatly by both natural and human-caused disturbances. These disturbances include debris torrents, logging operations (e.g., direct machine disturbance), and removal of LWD from the channel.

To determine the mean reach width of a stream channel:

1. A fibre survey chain at least 50 m long can be used.
2. Include all unvegetated gravel bars in the measurement (these usually show signs of recent scouring or deposition).
3. Where multiple channels are separated by one or more vegetated islands, the width is the sum of all the separate channel widths. The islands are excluded from the measurement.
4. The width of the stream reach can be calculated by averaging at least three separate width measurements taken at equally spaced intervals
   (i) along a representative 100-m length of the reach (i.e., one measurement near either end of the 100-m sample and at one or more locations in between), or alternatively
   (ii) along the entire reach (i.e., one measurement near either end of the reach and at one or more at locations in between).

5. Always determine the undisturbed channel boundary. If there is evidence of disturbance, the proponent should consult with the local resource agencies on the appropriate stream width to be used. Generally, the following options will provide guidance:

- move either upstream or downstream to points along the stream that do not show signs of disturbance (e.g., where banks are not eroded)
- use the boundary of recently recolonized vegetation (e.g., alder, aspen, cottonwood).

Appendix B: Determination of stream gradient

Gradient should be measured by obtaining one or more sightings that cover at least 100 lineal meters of stream channel. Measurements should be made along the longest sighting within a stream reach. The sighting distance should be at least 60 m long and preferably longer (for example, 100 m). However, sighting distances along many small streams with thick riparian vegetation may be 30 m or less; therefore, where visibility is restricted, sightings in both upstream and downstream directions can be taken from a given point to maximize the length of stream covered from one location. More conveniently, the number of measurements can be increased by taking sequential readings in either the upstream or downstream direction.

The following acceptable procedures are based upon the use of a clinometer (for example; a Suunto® clinometer). Clinometers are commonly used to determine gradients. However, accuracy and precision is generally increased by using Abney Levels and Water Levels (see RISC inventory manuals). The best precision is obtained by using Rod and Stadia.

1. The objective is to determine the average gradient for a reach and for sites within 100 m of a proposed stream crossing.
2. Gradient will be measured over a representative 100-m length of the reach, or for long reaches (e.g., 0.5 - 1.0 km long) or where sighting distances are short, obtain measurements at three to six sites along the reach.
3. Stream gradients should be measured with a clinometer to the nearest percentage at each site. The clinometer measures angles in a vertical plane upward or downward from the horizontal, expressed in degrees or percent. The following steps detail the use of the clinometer:

- One person stands at the water surface edge, for example, at the downstream end of the section to be measured. A second person stands at the upstream end at the water surface edge. The second person holds a rod or pole marked with fluorescent tape at the eye level of the person using the clinometer.
- The person with the clinometer holds the instrument in front of one eye so that the scale can be read through the optics and round scale-window faces. The other eye is used to sight the eye-level mark on the pole held by the other person.
- The instrument is aimed at the pole until the hair line viewed through the right eye is sighted at the eye-level mark on the pole.
- The position of the hair line against the scale in the clinometer gives the slope reading in degrees (plus or minus) on the left scale and in percent (plus or minus) on the right.

4. The gradient at each point in a stream reach can be measured in both upstream and downstream directions if possible, and readings averaged. Ideally, the sections in each direction should be at least 30 m long. Alternatively, average gradient can be determined from sequential and continuous sightings taken in either the upstream or downstream direction. Where heavy understory vegetation limits visibility within a reach, shorter distances will have to be used, and measurement frequency increased.
5. If there are doubts about gradient uniformity within a long reach, obtain measurements at sites spaced at 100-200-m intervals to ensure that a reliable mean gradient is determined. If the reach is known to be very uniform, gradient is determined sufficiently

over a representative 100-m length. For surveys made over a large number of stream reaches, or for the entire watershed, a minimum number of measurements in specific reaches would be taken.

6. Be sure to note any points where the gradient changes abruptly. These points represent one type of reach break.

7. Where the channel has a strongly stepped profile or consists of a series of short segments bounded by morphological breaks such as falls, record (if possible) both the average slope over a long distance, and the average length and gradient of representative areas of the short segments (each < 100 m long) between the steps.

Appendix C – Guidance for Assessing Habitat Value

For each reach answer the following fish habitat questions:

1. What is the channel type (riffle-pool; cascade-pool, step-pool and non-alluvial channel)?
2. What is the flow (perennial, intermittent, ephemeral)?
3. Are deep pools[1] present?
4. Are un-embedded boulders present (free of fine sediments)?
5. Are there stable gravels and cobbles with space for fish to hide in (i.e. free of fine sediments, e.g. sand)?
6. Is woody debris present in the channel?
7. Are undercut banks present?
8. Is aquatic vegetation present?
9. Is riparian vegetation overhanging the channel present?

Using this information refer to the following table to determine if the habitat is of high, medium or low value.

Table 1: Habitat Value Criteria

Habitat Value	**Fish Habitat Criteria**
High	• The presence of high-value spawning or rearing habitat (e.g., locations with abundance of suitably sized gravels, deep pools, undercut banks, or stable debris, which are critical to the fish population.
Medium	• Important migration corridor • Presence of suitable spawning habitat • Habitat with moderate rearing potential for the fish species present
Low	• The absence of suitable spawning habitat, and habitat with low rearing potential (e.g., locations without deep pools, undercut banks, or stable debris, and with little or no suitably sized spawning gravels for the fish species present.

[1] To decide if a pool can be characterized as a deep pool, first measure pool depth, which is the distance from the bottom of the pool to top of the channel, and then measure the riffle depth, which is from the crest of riffle to top of channel. A deep pool is a pool with a channel depth at least two times the channel depth at the riffle. Note that the top of the channel is shown by a water scour line or the start of rooted terrestrial vegetation. It is sometimes called the “normal high water mark”.