

Fish Stream Identification Tips to Avoid Misclassification

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Introduction

Observations of fish in streams classified as non-fish bearing during Forest and Range Evaluation Program (FREP) riparian assessments suggest a need to revisit standards for fish-stream identification in British Columbia. Since the launch of the Forest Practices Code's *Fish-stream Identification Guidebook (2nd Ed.)* in 1998, there has been an increase in information pertaining to fish habitat and population distributions, upgraded federal and provincial regulations, and enhanced audits of forest management identifying compliance issues related to riparian areas. Subsequently, there is a desire for updated guidance to improve stream/riparian classification procedures. This work is anticipated to be completed in collaboration with Indigenous partners in the near future.

Purpose

The purpose of this Extension Note is to explain why fish presence is assumed in lower gradient streams and emphasize some key considerations for field staff when conducting stream/riparian classification activities. This information is especially relevant given the last 25 years of fish-data reporting that confirms widespread distribution, demonstrating their persistence across the landscape.

Limits to Fish Distribution

The identification of *permanent* physical barriers is of primary importance when deciding whether a stream supports fish. Human-made barriers in fish streams, such as undersized or perched culverts, are considered *temporary* because of existing legislation that requires fish passage to be maintained through crossings (Forest Planning and

Practices Regulation, Fisheries Act). This legal requirement means that when older structures that are acting as barriers to upstream migration are replaced or upgraded to current standards, connectivity will be restored to comply with provincial and federal regulations. Natural barriers composed of wood or surficial materials such as log jams, sediment wedges or beaver dams, are also considered temporary impediments to fish movement as they will eventually break down, allowing for future fish passage. For these reasons, temporary barriers should not be used as justification for a non-fish bearing designation. Natural geologic obstacles such as waterfalls or steep cascades are considered permanent barriers to upstream fish movement, but there is the potential for resident populations to exist above the barrier, which is why additional investigative work and sampling may be required.



Figure 1. A log and debris jam that may affect fish passage for a period of time but is considered a temporary barrier.

FREP VISION:

Collect and communicate trusted and scientifically robust natural resource monitoring information to inform decision making and improve resource management outcomes.

<https://www2.gov.bc.ca/gov/content/industry/forestry/managing-our-forest-resources/integrated-resource-monitoring/forest-range-evaluation-program>



Figure 2. This 9 m long, 33% gradient bedrock chute is a permanent barrier to upstream fish passage; however, a resident population of cutthroat trout were found upstream in a 6% gradient stream reach.

Fish Populations Above Permanent Barriers

Climate change, geological processes, and human activities have shaped fish distribution in B.C. waterbodies for millennia. What may seem like an isolated segment of a watershed upstream of impassable falls or steep cascades can often contain resident populations of fish that have survived and thrived over the course of many centuries. The question is, how did they get there?

As the glaciers gradually retreated thousands of years ago, some of the ice sheets were slower to melt, which formed dams and backed up flows, often in confined valleys. When the ice blockages altered flow direction, the surrounding watershed was subject to flooding, raising water levels far above those of today. When water levels were above the elevation of what are present-day obstructions to upstream fish migration, those areas would have been inundated and populated by fish. No barriers would have been present as long as the ice dam persisted. For example, on Vancouver Island, an ice dam was present where the town of Lake

Cowichan is now situated, which backed up the water and forced it to flow out to the west, through what is now the Nitinat River, instead of Cowichan Lake's present outflow to the east through the Cowichan River. As a result, there are many streams containing fish in this area that might otherwise be perceived as inaccessible.

In a related, but different process, the immense weight of an ice sheet up to two kilometers thick forced the Earth's crust to indent below its present level. In some areas it was pushed below the sea level, a process called isostatic depression. As the ice later melted, the ocean was free to flood the newly exposed landscape. As a result, marine life, including fish, had access to what were previously inland areas. After the weight of the ice was lifted, the "elastic" nature of the Earth's crust rebounded to near its previous level. The isostatic depression was 250 m or more below present levels in some areas and the corresponding "rebound" occurred in as little as 1000-2000 years. Over time, many species adapted to what is now a freshwater environment.

Dams and stocking activities are two human-caused reasons for fish to be found upstream of barriers. In the 1900s, numerous hydroelectric dams were built in B.C. to satisfy the growing demand for power by the increasing population and developing industry. This resulted in elevated water levels in newly created reservoirs, enabling fish to access watercourses that were formerly inaccessible. Fish may also be stocked above barriers by Fisheries and Oceans Canada or provincial hatchery programs to enhance populations for recreational, Indigenous, and commercial purposes.

Predicting the Presence of Fish

The preceding scenarios underscore the importance of investigating above physical, permanent barriers to ascertain whether there are any perennially (year-round) wetted waterbodies, such as lakes, ponds, wetlands, or sufficiently large or spring-fed watercourses that have resisted drying or freezing to the bottom, thereby contributing to the survival of resident fish populations. Fish habitat is often a mosaic of connected features that together contribute to the success of a population; therefore, it is important to involve a qualified professional (QP) when a reach upstream of a permanent barrier is suspected to be non-fish bearing. An exception would be where there are no connected lakes or wetlands, and all reaches upstream of the permanent barrier exceed 20% gradient and/or are confirmed to be simultaneously dry or completely frozen at any time of the year, precluding the survival of a local population. The 20% gradient threshold is recognized in regulation as limiting upstream passage for most fish species, especially in smaller streams.

While the classification of non-fish bearing reaches should be done by a QP, such as a registered professional biologist with an in-depth knowledge of fish and fish habitat, there are steps that non-specialists can take to determine whether retaining an expert is cost effective. These include reviewing spatial files and air imagery to identify potential reach breaks for field classification activities, and where a natural physical barrier is identified, searching the upstream drainages for perennially wetted habitat, such as large streams, lakes or wetlands, that act as holding areas when smaller streams are not flowing. Where these perennial waterbodies exist upstream of migration barriers, there is a higher probability of resident fish populations, and a more intensive field effort is required to ensure all potential habitats are sampled using appropriate fish-capture techniques, preferably during low-flow conditions.



Figure 3. Abundant Dolly Varden were identified in this small indirect tributary to the Nilkitkwa River, 600 m upstream of a permanent barrier. The presence of underground springs allows for year-round flow and the continued survival of this resident population.

In many cases, it is more cost effective to default upstream reaches to fish-bearing status rather than retain a QP to undertake extensive sampling efforts as there is a good chance fish will be discovered. *Habitat Wizard* is an online tool that can be used to review any previously documented fish observations in an area, although it is not an appropriate method for inferring fish absence. The attributes of the physical setting as summarized here plus use of existing information and predictive tools on fish distribution within the local area can be used together to determine whether a default fish-bearing status is warranted versus the time, effort, and cost involved to complete a defensible and reliable survey to confirm the absence of fish at all times of the year.

Key Messages

- A variety of past events have contributed to widespread distribution of fish across the landscape, which is why low-gradient streams in B.C. are assumed to be fish bearing until proven otherwise.
- Fish habitat may consist of a variety of connected features that together contribute to the success of a population. Where perennially wetted habitat exists above a permanent barrier and a non-fish bearing status is suggested, a qualified professional with expertise in fish and fish habitat should be retained to conduct an appropriate field survey that includes all habitat types upstream of the barrier.

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