Fish Passage in BC – Status, Issues and Solutions

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Resource roads in British Columbia:
Environmental challenges at the site level workshop

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Why did the fish cross the road? Read on...the answer will be obvious!

Introduction

There are approximately 550,000 km of resource roads in B.C., with an estimated 320,000 crossings of fish streams. Based on culvert assessments done to date under the fish passage program, as many as 70%, or about 224,000, of these crossings are expected to be closed-bottom culverts. Of those closed-bottom culverts, about 60-90% (135,000 to 200,000) are likely to impede fish passage. Closed bottom structures (culverts) can act as a barrier to fish mainly due to increased water velocity, turbulence, a vertical drop at the culvert outlet, and/or maintenance issues.

Considering only the crossing with highest quality habitat, priority fish species and the most egregious blockages, there are tens of thousands of fish stream crossings that currently require remediation in B.C., and therefore thousands of kilometres of quality fish habitat that are under-utilized.

This paper will outline the basis for these conclusions, explain recent efforts to address the problems, and chart a course of the next steps that are required to help BC deliver on the goal of world-class fisheries management, bar none.

Implications of poor connectivity of fish habitat

Fish passage failure at steam crossings constitutes a major loss of freshwater habitat for both migratory and resident fish populations in BC (Northcote and Hartman, 2004).

Loss of habitat is a major threat to freshwater species at risk such as west slope cutthroat trout, bull trout and others.

Fish form an integral link in aquatic and terrestrial ecosystems. For example, salmon returning to spawn are a major source of marine-derived nitrogen and their absence can impact an entire forest ecosystem, from grizzly bears to tree growth (SFU 2008, Field and Reynolds 2011).

The isolation and restriction of fish populations can affect gene flow and lead to populations less able to adapt to changing conditions.

Freshwater sport fishing supports the BC economy. In 2005, anglers spent $480 million in BC, creating 3,875 person-years of employment and contributing $125 million in tax revenues (GS Gislason & Associates Ltd. 2009).

Recent history of the fish passage issue in BC

The provincial government's Ministries of Environment and Forests (et al) and the federal Department of Fisheries and Oceans have long been aware of issues associated with fish passage through culverts, and for many years were addressing those concerns in local, ad-hoc ways. One excellent example is the report by Harper and Quigley from 2000.

Stream crossings that were built before the *Forest Practices Code* legislation was passed in June 1995 are solely government's responsibility to maintain and to remediate where required.

Dedicated funding for fish passage restoration work began in 1995 when the BC government introduced the Watershed Restoration Program under Forest Renewal BC (FRBC). The program was designed to restore, protect and maintain forest resources, including non-timber values such as fisheries, which had been adversely impacted by past forest management activities. Funding for fish restoration and rehabilitation was reshaped in 2002 with the introduction of the Forest Investment Account (FIA). In 2007, with direction from the MoF/MoE/DFO Joint Management Committee, targeted funds were allocated to specifically set priorities and fix the pre 1995 problem fish stream crossings.

In 2009 the Forest Practices Board surveyed over 1,100 crossings across 19 watersheds and found that closed-bottom structures, which include culverts, posed a moderate to high risk to fish passage about 90% of the time on important and critical fish habitat and 96% of the time on marginal habitat. In response to these findings, the Board recommended that the, "government take the necessary action to ensure fish access is maintained and restored".

In 2010, funding for the Fish Passage program was shifted to the Land Based Investment Program (LBI), and the Fish Passage Technical Working Group (FPTWG) was charged with administering the funds to achieve government objectives.

Developing the strategic approach to fish passage remediation

After collaborating on the original Fish-stream Crossing Guidebook (2002), and monitoring its implementation during the FPC days, and with evidence mounting on the magnitude and distribution of impeded stream crossings, the Government of BC together with Fisheries and Oceans Canada, the Council of Forest Industries, and the Coast Forest Products Association, determined that government should play a larger role in prioritizing future restoration activities. Starting in 2007, those agencies produced the *Strategic Approach: Protocol for Planning and Prioritizing Culverted Sites for Fish Passage Assessment and Remediation (now in third edition, 2009).*

The objective of the strategic approach is to ensure that the most important fish passage issues can be identified and restored in a cost effective manner. The process, in its design, is systematic and efficient. The approach is also flexible and can be implemented at various scales while still maintaining provincial applicability. The approach has four key components:

1. Identify high value fish watersheds to focus work;
2. Develop and apply in a systematic manner a standardized assessment methodology to determine fish passage;
3. Review data from all culverts assessed in a watershed area so that repair of the highest priority problem culverts can be carried out; and
4. Monitor to ensure objectives are being achieved.

This strategic approach outlines the process for undertaking a systematic, watershed-based approach to assessing and prioritizing fish passage at culverted stream crossings. This process covers project planning through to implementation. It is to be used in conjunction with the companion document "Field Assessment for Fish Passage Determination of Closed Bottomed Structures " (Field Protocol), which provides the detail for the field data collection phase of the

overall process. (NOTE: the assessment methodology is covered in more detail in the paper delivered to this workshop by Richard Thompson.)

The strategic approach is based on MoE's GIS stream model, and TRIM-based roads data, which together identify stream crossings on fish habitat, and combines this with assessment data that have verified problem sites and fish habitat. Together these two data inputs are used to identify the highest priority remediation projects in terms of the potential to gain high quality fish habitat.

The roles of the Fish Passage Technical Working Group

The Fish Passage Technical Working Group (FPTWG) was formed in 2007 following a directive from the inter-agency Joint Steering Committee (JSC). Members of the FPTWG currently include representatives from the BC Ministry of Environment; BC Ministry of Forests, Lands and Natural Resource Operations (including BC Timber Sales), BC Ministry of Transportation and Infrastructure, and Fisheries and Oceans Canada. Efforts are also underway to include the Ministry of Energy, Mines and Natural Gas, and the Oil and Gas Commission.

The overarching goal of the FPTWG is to raise awareness of the fish passage problem at stream crossings and to identify and implement solutions. The work carried out by the FPTWG is currently funded through the LBI-Fish (formerly Fish Passage) Program. The FPTWG, however, is also working to expand its network of partners (and funding sources) to target the remediation of stream crossings on all roads (rather than just pre-1995 forest roads), and to ensure that the installation of new culverts is done in a manner that does not impede fish passage.

Specific objectives of the FPTWG are to:

1. Refine the scope of the problem through a combination of field assessments and GIS analysis.
2. Develop and refine the strategic approach for selecting remediation sites, which will provide the greatest return on investment in terms of amount of high-value fish habitat restored.
3. Allocate funding to remediate road crossing sites which block fish passage.
4. Conduct targeted training and extension, and provide guidance to practitioners.
5. Identify and acquire funding for stream crossing remediation.

Under FRBC and FIA and until 2009/2010, the fish passage program (like other FIA programs) was proponent-driven, with licensees identifying projects and applying for funds to complete the work. During that time, PriceWaterhouseCoopers, a third party administrator, played a major role in the delivery of the program by approving applications and managing funds. This delivery model began to become more focused on meeting government's objectives in 2007 with the establishment of the Fish Passage Technical Working Group.

As of the start of fiscal 2011/12, the fish passage program of LBI is no longer proponent driven. Although a third party still provides administrative support and financial management to other LBI programs, the Fish Passage Technical Working Group (FPTWG), rather than licensees, now identifies high priority watersheds for assessments and crossings for remediation. The FPTWG now works directly with BC Timber Sales to complete assessments and to restore crossings.

Accomplishments to date
In addition to achieving a higher level of engagement of government agencies, with closer aligned to government objectives, the key "on the ground" accomplishments are summarized below:

Fiscal Year	Expenditures (millions)	Assessments	Installed Culverts*	Installed Bridges*	Remediation (general)	Km fish habitat recovered
2008/09	$6.1	4 683	27.5	16.5	-	158
2009/10	$3.6	4 594	23	11	-	184
2010/11	$2.4	8 171	-	-	17	305
2011/12	$1.5	1 987			2	25
2012/13	$2.0	3 000			*18 (includes 11 deactivations)	*27
Total	**$15.6**	**22 435**	**50.5**	**27.5**	**39**	**699**

* half values indicate work carried over between fiscal years

With this large influx of culvert assessment data, it became clear that the Excel spreadsheet being used was insufficient, and that a proper database was necessary to store, analyze and communicate the data. The team has developed the Provincial Stream Crossing Information System (PSCIS; pronounced "pisces"), a new spatially referenced database which houses information about assessments, designs, and completed installations. This "one-stop" database allows the FPTWG to identify areas of high priority, coordinate the delivery of the fish passage restoration work, and share information with licensees and other delivery partners. The database, and the underlying modelling that informs the strategic approach, are explained in more detail in the presentation to this workshop by Craig Mount.

Another important accomplishment of the FPTWG is the revision of the Fish-stream Crossing Guidebook, published in September of 2012. Nearly one thousand paper copies have been distributed to key practitioners and decision makers around BC, and a limited number will be handed out during this workshop. Additional copies can be downloaded from the FPTWG's webpage.

The FPTWG has been working on creating a series of on-line training courses on fish passage. To date, the group has completed the first module, which outlines the strategic approach, and presents the details on culvert assessment methodology. Further module(s) on fish stream crossing design, installation and maintenance are in the planning stages.

Lastly, the group has been working on raising awareness of the extent of fish passage concerns, and enlisting partners and other collaborators to address those concerns. Participation in this natural resource roads workshop is a key "awareness" event for the FPTWG this year. We have also delivered less-formal presentations to key stakeholder groups, most recently the advisory committee for the Natural Resource Roads Act.

Current issues
In respect of the large number of fish-stream crossings that do not provide for adequate fish passage, the most pressing issue is funding. At the current funding level of $1.5 million per year, the province's ability to have meaningful impact is severely limited. The FPTWG is developing a funding proposal that will (if/when approved) significantly improve our capacity to identify and remediate the highest priority crossings.

The other large issue that is still looming is how to engage a much broader spectrum of agencies, stakeholders, industries and local governments in collaborating on fish passage. Specifically, there is a need to engage municipalities, regional districts, railroads, and transmission companies, all of whom manage crossings on fish streams. The FPTWG will continue to seek engagement with these entities as time and resources permit.

Next steps/solutions
A key advancement this year has been developing some linkages between the natural resource sector and the Ministry of Transportation and Infrastructure. The next step is to formalize that relationship and to begin collaborative planning of remediation works.

Similarly, another important next step will be expanding the scope of the FPTWG to fully represent the entire natural resources sector within the provincial government. This will entail developing linkages with the Ministries of Agriculture; Energy, Mines and Natural Gas; and Aboriginal Relations and Reconciliation.

At a more operational level, the FPTWG is actively amending the engineering standards for crossing remediation, and the associated standards for data capture in PSCIS. This year, the group has funded our first crossing remediation works that do not involve merely replacing a poor crossing with a good one; specifically we have funded a road relocation/crossing deactivation project, and assisted with funding a larger road deactivation project, where some of the crossings were on fish streams. Developing decision–making criteria for these types of works compared to more "traditional" replacements is also under discussion.

Last words
To give some perspective to BC's fish passage problems, the FPTWG has recently been in touch with the Washington state Fish and Wildlife program. Even through the worst housing crisis in America's history, the state's forest owners have remained committed to protecting water quality and fish habitat.

Since the state's Forests and Fish Law was approved a decade ago, large forest landowners have improved 18,700 miles of logging roads and opened 4,700 passages for fish and 2,600 miles of fish habitat. Last year was especially productive, with the opening of 1,000 fish passages and restoration of 900 miles of fish habitat. Collaboration works.

The FPTWG is developing the collaborative tools and relationships here in BC that will bring us to similar levels of achievement. Our valuable fisheries resource deserves nothing less.

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