2008

Fish Passage Culvert Inspection Planning

Prepared for:

TEMBEC

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Enclosed is the Fish Passage Culvert Inspection 2008 for portions of the St. Mary's River Watershed, Findlay River Watershed and Skookumchuck River Watershed. This document contains a signed and sealed report outlining the recommendations for restoration on 23 FPCI locations. This report details the procedures and rationale used to develop the recommendations. The report also provides text regarding the assessment procedure and possible changes to the procedure for future FPCI work. The primary focus of this report is to provide recommendations in restoring fish passage at culverted sites within portions of the Cranbrook and Invermere TSA's using the procedures outlined in the *Fish Passage Protocol for Culverted Sites (June 2008*) and the *Field Assessment for Fish Passage Determination of Closed Bottom Structures (May 2008).*

Sincerely,

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Sean Beswick, RPBio
Fisheries and Wildlife Biologist
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1.0 Introduction

1.1 Project Background

Corrugated metal culverts are the most common method of passing streams at road crossings. These culverts are also one of the major contributors for loss of important fish habitat. Improperly installed culverts prevent access for both resident and migratory populations of fish to natural ranges. There are a number of factors that influence fish passage through a culvert including, increased velocity, turbulence and hung or perched outlet drops. Culverts may act as full or partial fish barriers depending on the streams yearly flow characteristics and specific fish and or fish life stages.

When the Forest Practices Code (FPC) was introduced in1995 it required that safe fish passage is provided at forest road crossings on all fish streams. Pre-1995 legislation did not require safe fish passage and has resulted in a significant portion of once productive fish habitat to be cut off by improperly installed culverts.

The Fish Passage Culvert Inspection (FPCI) Procedures, developed by Parker in 1999 were used to identify fish barriers at Closed Bottom Structures (CBS) in the past. In June, 2008 the British Columbia Ministry of Environment published the *Fish Passage Protocol for Culverted Sites (June 2008*) and the *Field Assessment for Fish Passage Determination of Closed Bottom Structures (May 2008).* Kootenay Natural Resource Consulting used the methodology outlined within these two documents to complete the Planning phase, Data Collection Phase and Analysis Phase of the 5 Phase process in restoring fish passage at culverted sites within Cranbrook and Invermere TSAs.

1.2 Scope and Objectives

The scope and objective of this project was to systematically identify (within identified units of the Cranbrook and Invermere TSAs), all culverts that are potential barriers to fish movement and to prioritize these structures based on the amount of potential upstream fish habitat quality and quantity called the Habitat Gained Index (HGI).

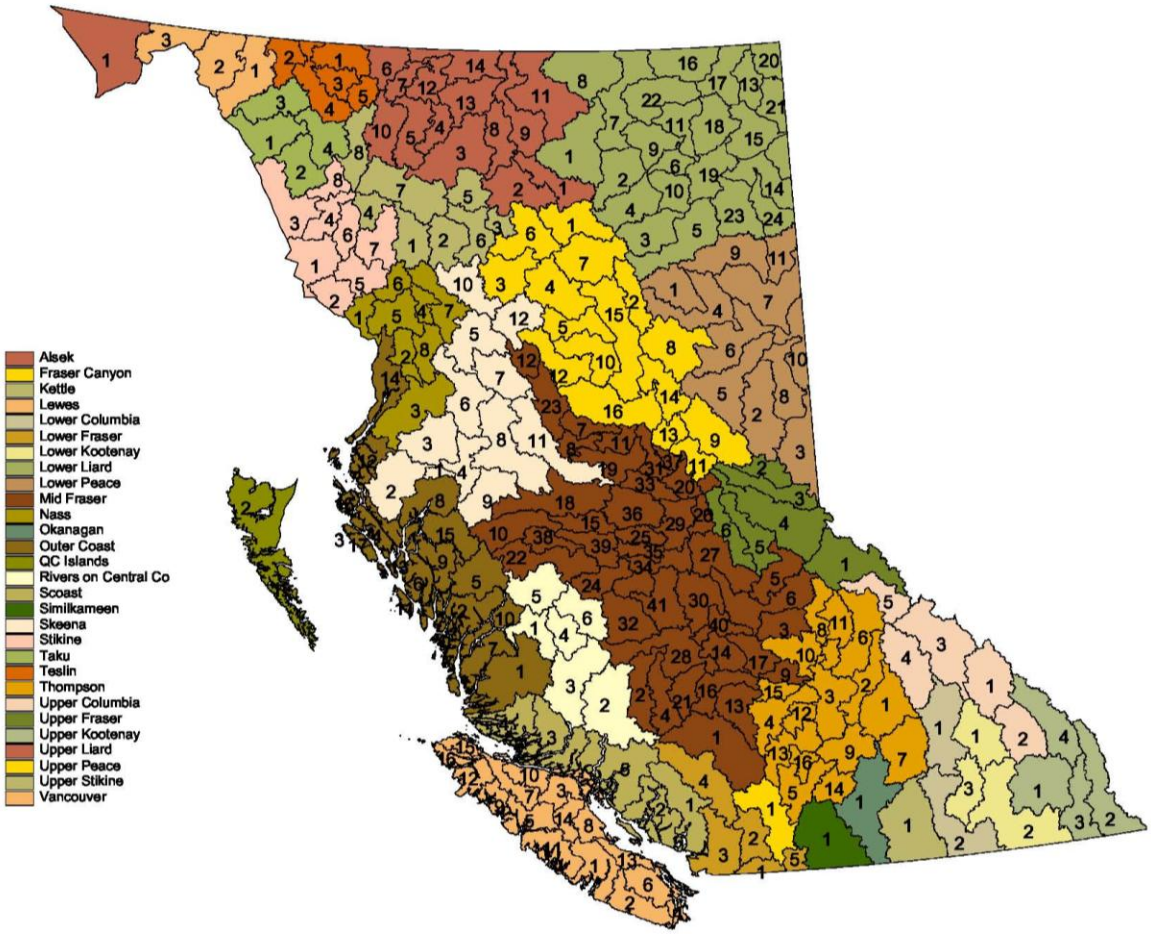
The process was guided by the Ministry of Environment, *Fish Passage Protocol for Culverted Sites (June 2008*) document which identifies a four step approach (Planning, Data Collection, Analysis, and Implementation) to assessing and prioritizing fish passage at culverted stream crossings.

Ultimately, the objective of this work is to ensure that adequate assessments are carried out in priority watershed groups that will allow for future designs and structure replacement in subsequent years.

1.3 Study Area

The Ministry of Environment has produced a map identifying priority watershed groups within provincial watershed sub-basins. This map and associated ranking provides guidelines surrounding eligibility of watershed groups for Fish Passage – FIA related work. See Figure 1, Provincial Watershed Sub-basins. The watersheds groups are aggregates of individual watersheds and have been given a 4 letter code which are then followed by a rank from 1 - 4 with 1 being the best in terms of “fisheries value”.

Figure 1
Provincial Watershed Sub-basins



Cranbrook TSA

The Cranbrook TSA lies in Region 4: Kootenay and is located entirely within the Upper Kootenay sub-basin. It includes the following watershed groups and their associated ranking:

- St. Mary River - SMAR-1 (shared with the Invermere TSA)
- Elk River - ELKR-2
- Bull River Bull-3.

Invermere TSA

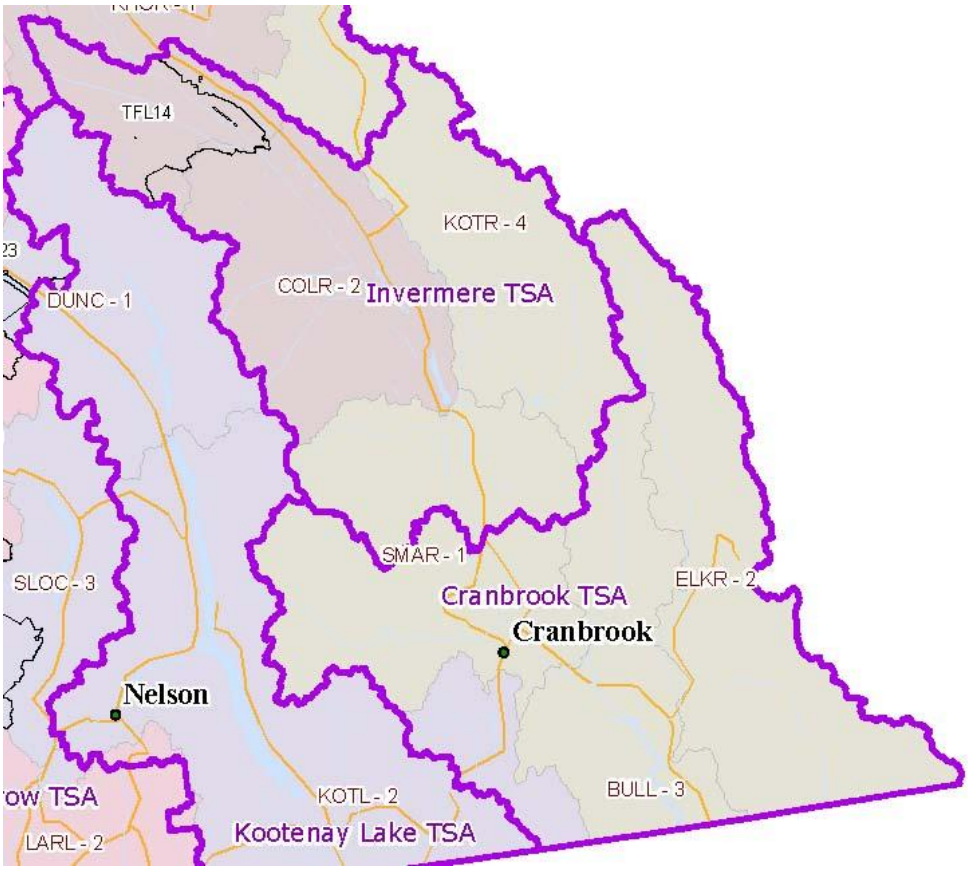
The Invermere TSA also lies in Region 4: Kootenay and is located in the Upper Kootenay and the Upper Columbia sub-basins. It includes the following watershed groups and their associated ranking:

- St. Mary River - SMAR-1 (shared with the Cranbrook TSA)
- Columbia River COLB-2
- Kootenay River KOTR-4

See Figure 2 – Fish Passage Watershed Groups for the Cranbrook and Invermere TSAs.

The Findlay, Skookumchuck and St. Mary rivers are all part of the Kootenay river system. The watersheds within the study area have diverse but similar fish species populations, including the provincially blue-listed Bull trout *(Salvelinus confluentus)* and the popular sport fish species Westslope Cutthroat trout *(Onchorhynchus clarki lewisi).* These watersheds also provide valuable habitat for Rainbow trout *(Onchorhynchus mykiss), (Onchorhynchus nerka)* and Mountain whitefish *(Prosopium williamsoni).*

Figure 2
Fish Passage Watershed Groups for the Invermere and Cranbrook TSA's



A funding request was made by Tembec for a review / assessment of all groups within both TSAs. Funding approval was provided for the SMAR in Cranbrook and Invermere and for the Columbia River in Invermere.

After a preliminary review, the SMAR Watershed Group became the primary study area. It includes the watersheds of the Findlay and Skookumchuck rivers (Figure 3) in the Invermere TSA and the St. Mary watershed in the Cranbrook TSA (Figure 3).

Planning and further reviews should be conducted in the other watershed groups as well. In addition, Tembec operating area information was the primary source of review for this area. Additional information should be sourced further from the other licensees as time and budgets permit.

Figure 3
Study Area Overview Map

2.0 Methodology and Standards

The BC Ministry of Environment document titled *Fish Passage Protocol for Culverted Sites, 1st Edition, March, 2008, revised June 2008* was the guiding document used to assess and prioritize fish passage at culverted stream crossings for this project. It was used in conjunction with *the Field Assessment for Fish Passage Determination of Closed Bottomed Structues, 2nd Edition, May, 2008*.

This project reflects work in the following three phases: planning, data collection, and analysis.

2.1 Planning Phase

This phase involved the gathering, review and researching of information previously completed within the Cranbrook and Invermere TSAs involving FPCI planning and restoration works.

Background Information

The majority of FPCI related work was completed between 1999 and 2001 when only non-status roads where eligible for restorations as opposed to the new guide-lines which include FSR and pre-1995 road permit roads. A report titled *Fish Passage Culvert Inspection – Planning Phase,* prepared by Alan Thompson of ARTA Consulting was produced in 1999. Through an intense mapping exercise, stream crossings, classifications and rankings were summarized and presented in tables for various key watersheds in both the Cranbrook and Invermere TSAs.

At that time, possible restoration sites within the SMAR Watershed group were identified by reviewing 1:40 000 scale, TRIM based contour maps. This work did not involve a field study component but involved a series of mapping exercises in order to produce a working map with the sampling priorities and schedule for phase II (sampling phase) of the FPCI procedure.

Preparation of Maps Showing Road Networks and Known Fish Data

The previously identified restoration sites were then transferred to new 1:40000, TRIM based contour maps that had the most up to date color coded fish stream classifications. Solid red lines indicate that fish presence has been confirmed within the stream while sections of streams with slopes less than 20% (potential fish streams) (30% slopes needed to be considered for bull trout) were indicated by dashed red lines. Solid blue lines indicated that a stream had been confirmed as having no fish while stream slopes greater than 20% (suspected non-fish streams) were shown with dashed blue lines. All road stream crossings where known or potential fish streams were indicated were marked and labeled with a unique letter number combination. Each road stream crossing was marked sequentially using the first letter or 2 letters of the drainage combined with numbers starting at 1 (eg. Perry Creek Site #1 = P1). This combination gave each site a unique location identifier.

Road status information was also available in a GIS layer and was added to the 1:40 000 TRIM based contour maps. The information was used to eliminate possible restoration sites based on road status. Under the terms of this project only Forest Service Roads (FSR), pre-1995 (pre-Forest Practice Code) road permit roads and non-status roads were eligible for restoration. The road status layers on the maps did not always coincide or were incomplete. Therefore, the actual Forest Development Plans (Site Plans) for the sections of roads where possible restoration may be possible but the road status was in question were used to identify the status of the road and or the date the road permit was awarded.

KNRC used the most up to date fish inventory information available through both the Cranbrook FIA office and Tembec's Kootenay Central and Kootenay Columbia regions fish inventory libraries to determine fish presence and distribution throughout the project area. The Provincial FISS database and information gained through personal interviews and phone conversations with local people (eg. Guide Outfitters / Tembec Planners) was also used to finalize the list of potential stream crossings that would require a review and help recognize special concerns in the project area.

Field Sample Plan Development

After all of the road-stream crossings were identified within the SMAR watershed group during phase I of planning, the road-stream crossings were then prioritized for field sampling using the *"Field Protocol for Fish Passage Determination of Closed Bottom Structures"* document.

A field sampling plan was developed. This included a final table listing all sites to be reviewed and working maps depicting location of roads and crossings to be sampled.

See Appendix 1 – Cranbrook TSA – Fish Passage Sample Plan and Invermere TSA – Fish Passage Sample Plan.

The sampling plan is a set of tables that lists road/stream crossings that have been deemed eligible for restoration through the planning phase of this project. The tables contain information pertaining to the eligibility of each site. They list their location (drainage/UTM Coordinates/road and km mark), road status, fish presence or possible fish presence and their priority according to the Habitat Gained Index (HGI) and comments regarding eligibility.

2.2 Data Collection / Field Assessment

Once the prioritization was complete and a field sampling plan developed, field assessments were completed following the procedures outlined in the *Field Assessment for Fish Passage Determination of Closed Bottom Structures* manual which provides the detail in determining whether a CBS is a barrier to fish movement.

Using the *"Field Protocol for Fish Passage Determination of Closed Bottom Structures, 2008"* KNRC determined the likelihood that identified culverted stream crossings provided safe fish passage. The new 2008 protocol uses a ranking system based on 5 criteria. The criteria used is the amount of embedded natural material located inside the culvert, the height of the outlet drop, the slope of the culvert, the stream width ratio (SWR), and the length of the culvert. Each of the criteria is given a score of 0, 5 or 10 were a cumulative score of 20 or higher establishes a barrier to fish passage (Table 1). A score between 15 and 19 is prioritized as a partial barrier and a score less than 15 are considered to be passable to fish (Table 2).

A "Closed Bottom Structure (CBS) Field Measurement Form" was completed for each site assessed along with photo documentation. Some sites that were prioritized as field sampling sites and documented on the sampling plan did not get assessed were suspended when the field visit verified that there was no culvert no stream, the crossing was a ford/bridge or other non-fish barrier. All the information gathered through the field assessments was summarized in the "Field Data Submission Form" which can be viewed in Appendix II.

In the Cranbrook TSA KNRC completed 20 full field assessments for Fish Passage Determination of Closed Bottom Structures, 21 initiated field assessments for Fish Passage Determination of Closed Bottom Structures but were suspended due to site characteristics (Fords/Bridges) and 18 uninitiated field assessments for Fish Passage Determination of Closed Bottom Structures due to site characteristics (no culvert/no stream/no road-stream crossing/ford).

In the Invermere TSA KNRC completed 8 full field assessments for Fish Passage Determination of Closed Bottom Structures, 5 initiated field assessments for Fish Passage Determination of Closed Bottom Structures but were suspended due to site characteristics (Fords/Bridges) and 21 uninitiated field assessments for Fish Passage Determination of Closed Bottom Structures due to site characteristics (no culvert/no stream/no road-stream crossing/ford).

Table 1
Fish Barrier Scoring

Risk	Embedded*	value	Outlet drop	value	Slope	value	SWR	value	Length	value
low	> 30 cm. or > 20% of Diameter and continuous	0[2]	< 15	0	< 1	0	< 1.0	0	< 15	0
mod	< 30 cm. or 20% of Diameter but continuous	5[3]	15 - 30	5	1 - 3	5	1.0 - 1.3	3	15 – 30	3
high	No embeddment or discontinuous	10	> 30	10	> 3	10	> 1.3	6	> 30	6

Table 2
Fish Barrier Results

Cumulative Score	Result
0 - 14	passable
15 - 19	potential barrier
> 20	barrier

3.0 Analysis of Results and Recommendations

3.1 Site Scores and Priority Ranking - Cranbrook TSA

Of the 59 Field Assessment sites located within the Perry, Hellroaring, Meachen, Angus, White, Dewar and Main-Stem St. Mary's watersheds 20 potential restoration sites where initially identified upon completion of the field work. Subsequent field work, local knowledge and/or analysis resulted in further refinement in the number of potential sites. The following table outlines the remaining 12 potential restoration sites and their ranking. Further detail, discussion and recommendations for the potential restoration sites are included in 3.2 of the report. Initial potential restoration sites that have not been included in this table are also discussed to outline the rational for exclusion.

It is important to remember that more site specific information should be gathered before proceeding with any future restoration works. Fish presence/absence/species/life stage(s) and distribution coupled with stream habitat quality and quantity will provide concrete evidence to add to the information already gathered enabling the finalization of the restoration assignments.

Table 3
Cranbrook TSA Potential Restoration Sites and Rankings

Site Location	Site Number	Priority Rank (H/M/L)	Ranking Score	Barrier Rating B-Barrier / PB-Partial Barrier	Restoration Rank *(1-4)
Main-stem St-Mary's	SMAR-R02	H	39	B	2
Main-stem St-Mary's	SMAR-R03	H	26	B	1
Main-stem St-Mary's	SMAR-R05	H	42	B	1
Angus Creek	SMAR-A02	H	31	B	1
Angus Creek	SMAR-A05	M	36	B	2
Angus Creek	SMAR-A06	M	16	PB	2
Perry Creek	SMAR-P06	M	31	B	4
Hellroaring Creek	SMAR-H04	M	36	B	3
Hellroaring Creek	SMAR-H05	M	36	B	3
Hellroaring Creek	SMAR-H06	H	31	B	2
Main-stem St-Mary's	SMAR-S01	M	36	B	3
Dewar Creek	SMAR-D01	H	36	B	4

*For the complete list of potential restoration sites see Appendix I / * Restoration Rank: 1= Highest / 4=Lowest

3.2 Cranbrook TSA Recommendations

SMAR-R02

This culvert is located at the 13.9km mark on the St. Mary's River Road FSR. The culvert is a full fish barrier. Fish have been inventoried up to the culvert. Replacing the culvert with an open bottom structure would provide approximately 200m of moderate fish habitat. A bedrock outcrop with a boulder and debris drop of ~1.5 meters is located 200m upstream of the culvert. This is a potential fish barrier and requires further assessment. The barrier should be visited in late spring, early summer when water flow conditions are optimal. An additional 1.5-2.5km of HGI is available dependent on the results of the u/s barrier assessment. This site is considered a moderate priority for restoration.

SMAR-R03

Two culverts are located at the site on a non-status road below the 21.6km St. Mary's River Road FSR (SMAR-R05). A portion of the water flow appears to have been diverted (years ago) to flow past a non-status campground. The remainder of the water flows overland and down the non-status road and back into what appears to be the original stream bed. This stream is highly productive as all fish life stages were seen while completing the field assessment. Removal of culverts and the construction of site appropriate ford crossings is recommended. In addition, consideration should be given to implementing stream rehabilitation works to restore the creek to natural channels. Access within the riparian zone should be restricted. Further assessment of fish species utilizing the stream would be beneficial. See SMAR-R05 for further pertinent information. The site is considered a high priority for restoration regardless of the SMAR-R05 consultation process.

SMAR-R05

This culvert is located at the 21.6 km on the St. Mary's River Road FSR. Site SMAR-R03 is located d/s and forms part of an important stream complex (Pudding Creek). Fish has been inventoried on both sides of this culvert. Additional non-status crossings u/s should be assessed even though maps indicated non fish bearing. Significant work and cost would be required to replace the current structure. Further on site consultation with all pertinent agencies is recommended to review options and feasibility prior to completing additional restoration assessments and works. The stream is highly productive and should be assessed in its entirety as it provides yearly habitat requirements for both migratory and resident populations of fish.

SMAR-A02

This culvert is located at the 9.9 km on the Angus Creek Road Permit R06052 Section 15 which meets the eligibility criteria for potential restoration work. This stream is confirmed fish bearing, can provide yearly habitat for both resident and migratory populations and is considered to be a good site for potential restoration.

SMAR-A03

This site is located at the 10.5km on non status portion of the Angus Creek road. Reference maps indicate that the stream is fish bearing. However, field assessment found multiple falls and stream gradients >30%. The existing wood culvert calculates as a barrier, but due to the stream characteristics no further fish passage restoration work is recommended.

SMAR-A05

This culvert is located at the 12.2 km on the Angus Creek Road Permit R06052 Section 15 which meets the eligibility criteria for potential restoration work. Fish have been inventoried both above and below this culvert. This site is u/s of SMAR-A02. It is recommended that the culvert be removed and replaced with an OBS. The area licensee requires access as it currently exists precluding the option of a ford. An additional non status crossing located u/s was not assessed. Further assessment of this crossing is recommended. The site is considered to be a moderate priority for restoration works.

SMAR-A06

This site is located at the 12.7km on the Angus Creek Road Permit R06052 Section 15 which meets the eligibility criteria for potential restoration work. This site is u/s of SMAR-A02. An old failing wood culvert is located within the stream and is acting as at least a partial fish barrier. The area licensee has placed a portable steel bridge structure over the wood culvert to facilitate hauling. It is recommended that upon the licensee's removal of the portable bridge the wood culvert be removed and a site appropriate ford constructed. There is limited u/s fish habitat which basically includes one large pool. This site is considered a low-moderate priority for restoration.

SMAR-P06

This culvert is located at the 20.9 km mark on the Perry Creek FSR. Fish presence is confirmed below the culvert and in the lake above. However, a 1.5m bedrock barrier is located approximately 300m upstream restricting u/s passage and moderate quality habitat gain to that length. The site is considered a low priority for restoration. Further works should only occur if surplus funding is available.

SMAR-P10

This culvert is located at the 29.1 km on the Perry Creek, beyond the end of the FSR on a non status road. Fish have been inventoried up to the culvert barrier. However, limited u/s habitat gain due to a significant increase in stream gradient immediately above the culvert. No further fish passage restoration work is recommended.

SMAR-H03

Failing wood culvert on Road Permit R07119 Section 10 which meets the eligibility criteria for potential restoration work. Calculations indicate the site may be a potential barrier but no significant fish passage concerns were evident in the field. No further fish restoration works is recommended.

SMAR-H04

This culvert is located at the 12.5 km on the Hellroaring FSR. Further stream and fish presence assessment is suggested to verify potential habitat gains and distribution as indicated on referenced maps. There is potential to gain approximately 500-600m of poor to moderate fish habitat by installing an OBS. The site is considered a low priority for restoration.

SMAR-H05

This culvert is located at the 12.9 km on the Hellroaring FSR. All information referenced indicates that the stream is fish bearing up to and potentially above the culvert. A minimum of 100m of good quality fish habitat would be gained with installation of an OBS. A cursory field assessment suggests that there is good habitat and water flow conditions upstream with the possibility of a resident fish population. A fish presence and habitat survey is recommended to provide additional information to assess overall feasibility of restoration work. The site is presently considered a low priority for restoration.

SMAR-H06

This culvert barrier is located at the 15.2 km on the Hellroaring FSR. All information referenced indicates that the stream is fish bearing up to and potentially above the culvert. A minimum of 200m of high value habitat would become available u/s of this culvert. Further fish presence and habitat assessment is recommended u/s as a cursory field assessment suggests that additional habitat may be available with a resident fish population. The site is considered a high priority for restoration based on habitat value.

SMAR-S01

This large culvert is located at the 41.9 km on the St. Mary's FSR. The full fish barrier passes Pyramid Creek into the main St. Mary's River downstream. No fisheries information is available for this stream. Referenced mapping indicates potential fish gradient for a minimum of 800 meters. Further assessment of the potential habitat is recommended during spring/early summer flows to more accurately verify anticipated habitat quality and quantity. Moderate to good potential restoration site to be confirmed with recommended assessment.

SMAR-W01

This culvert is located at approximately the 53.1km on the non-status White River Road. Limited u/s habitat (200m) of poor quality. A potential full fish barrier is located downstream. No further fish passage restoration work recommended.

SMAR-D01

This site is located at the 8km on the Dewar Creek FSR. Potential for significant amount of u/s habitat based on cursory assessment of site and indicated by potential fish gradient on referenced maps. Debris jams and short 20-30% stream gradients below the culvert should not restrict fish movement to the culvert. Further fish presence and habitat assessment both u/s and d/s is recommended to more accurately verify habitat quality and quantity. A number of lakes are located u/s and there is potential for a resident fish population. Moderate potential restoration site to be confirmed with recommended assessment.

SMAR-D02

This site is located at the 16.6km on the Dewar Creek FSR. The culvert flows onto bedrock which appears to be a barrier. Referenced maps indicate potential fish gradients. Limited u/s habitat due to ineligible road permit crossing (200m) upslope. No significant habitat u/s of road permit crossing. No further fish passage restoration work recommended.

SMAR-D04

This site is located at the 19.2km on the Dewar Creek FSR. Referenced maps indicate potential fish gradients, however, continuous boulder falls are barriers. No further fish passage restoration work recommended.

SMAR-D05

This site is located at the 20.5km on the Dewar Creek FSR. Referenced maps indicated that the stream was non fish bearing. Current barriers are located above and below the culvert. Limited u/s habitat. No further fish passage restoration work recommended.

3.3 Site Scores and Priority Ranking - Invermere TSA

Of the 34 Field Assessment sites located within the Skookumchuck and Findlay Creek watersheds 8 yielded potential restoration sites when initially identified upon completion of the field work. Subsequent field work, local knowledge and/or analysis resulted in further refinement in the number of potential sites. The following table outlines the 3 potential restoration sites and their ranking. Further detail, discussion and recommendations for each potential site are included in 3.4 of the report. Sites that have not been included in this table are also discussed to outline the rational for exclusion.

Table 4
Invermere TSA Potential Restoration Sites and Rankings

Site Location	Site Number	Priority Rank (H/M/L)	Ranking Score	Barrier Rating B-Barrier PB-Partial Barrier	Restoration Rank *(1-4)
Skookumchuck River	SMAR-SK02	H	31	B	3
Findlay River	SMAR-F01	H	29	B	1
Skookumchuck River	SMAR-F21	H	26	B	4

* Restoration Rank: 1= Highest / 4=Lowest

3.4 Invermere TSA Recommendations

SMAR-SK01

This culvert is located at the 39.3 km on the Skookumchuck FSR. A full fish barrier (1.3-1.5m bedrock) is located downstream of the culvert barrier. No further fish passage restoration work is recommended.

SMAR-SK02

This culvert is located at the 40.3 km on the Skookumchuck FSR. Further assessment of potential partial and/or full fish barriers located downstream is recommended. A non-status road accessing a Recreation site has a potential culvert barrier. Alternative access is available to the Recreation site, possibly facilitating fordconstruction. Stream is fish gradient on maps. A fish presence/distribution and habitat survey is recommended. The quality and quantity of potential fish habitat above and below the culvert should be verified prior to further fish passage restoration work. Site is considered low priority for restoration work.

SMAR-SKO3/SMAR-SK04

These culverts are located at the 54.5km on the Buhl Creek FSR. Fish stream maps indicate that the streams are non-fish bearing, however, fish seen below SMAR-SK03 which is connected by ditchline to SMAR-SK04. Limited u/s poor quality habitat due to stream gradient that increases to >30% within 100m above the culvert. No further work is recommended.

SMAR-F01

This culvert is located at the 16.7 km on the Findlay FSR. Fish presence is confirmed both above and below this culvert. The culvert is a partial barrier to some life stages of fish as well as a potential seasonal barrier due to flows. Backflooding, culvert baffles, boulder weir or an OBS are potential options. Further crossing assessments u/s is also recommended. Good potential restoration site.

SMAR-F15 / SMAR-F16

These culverts are located at the 40.6 km on the Doctor Creek Road Permit R06470 Section 13 which meets the eligibility criteria. Culverts are at the same creek location. This creek is inter-connected with site SMAR-F14 (existing ford) that provides full fish passage. As a result, no further work is recommended.

SMAR-F21

This culvert barrier is located at the 15km on the Skookumchuck FSR. Fish maps indicate that the stream is non-fish bearing. Although the fish maps indicate that the stream is non-fish bearing there is no information to why. A cursory field review suggests that a fish presence survey may be beneficial. No further work should be conducted until additional assessment work is completed. Site is considered a low priority

4.0 Cost Benefit Analysis

Fish passage restoration costs can range greatly depending on a number of factors. One of the main factors to consider is not only the amount of fish habitat gained but also to the quality of that habitat. All viable solutions in attaining fish passage at a culvert need to be considered from simple back watering to complete replacement with an OBS. Other factors include the type of equipment needed, man power, access, possible road deactivation and the time it will take to achieve the desired goal. All factors need to be analyzed together in order to get the greatest cost benefit as restoration can cost as little as a few hundred dollars to tens of thousands. A cost benefit analysis cannot be completed until more information is gained at each proposed FPCI restoration location. The major factor contributing to the uncertainty of replacing a culvert with a bridge or other OBS is the current fish status of the stream and the amount and type of available upstream fish habitat. It is not fiscally responsible to spend the amount of money involved in replacing a culvert with an OBS without knowing exactly what the benefit will be. A cost benefit analysis will be completed as soon as this information is obtained.

5.0 Summary and Conclusions

A total of 60 possible restoration sites were identified out of the hundreds of potential fish-stream road crossings within the 3 main watersheds within the SMAR sub-basin (St. Mary River/ Skookumchuck River/Findlay River). After the fieldwork phase 16 of the 60 still yielded potential restoration sites, 13 within the Cranbrook TSA and 3 within the Invermere TSA. Fish passage restoration sites that were dropped were done so due to the following:

- no culvert to assess
- site was a bridge
- site was a ford
- no current road/stream crossing found
- stream was not a fish stream
- a full fish barrier was located at the culvert location itself.
- The culvert was a cross ditch culvert for drainage (no stream or stream bed to assess)

The main factor influencing the restoration of a FPCI site is the fish habitat gained index. Not only does the amount of habitat gained need to be considered but also the type and quality of that habitat. The HGI is simply a mapping exercise indicating the potential fish habitat available above the culvert. This potential fish habitat needs to be verified in terms of exactly how much potential habitat is available but also what species, age class or classes, if the species would be migratory, resident or both and when these population(s) of fish may be utilizing the stream. The FPCI initial assessment does a good job at short listing the possible restoration sites but falls short on the inventory and habitat elements.

Even though all fisheries inventory information is gained prior to field sampling many streams do not have inventory information, very little, or very old information. I believe that prior to any restoration a full fish presence, species, age class and distribution inventory be completed along with a fish habitat survey. The cost of completing these surveys is minimal compared to that of a bridge replacement and verifies for the company what culverts should be replaced and their priority.

FPCI planning should be conducted in the late spring, early summer months as numerous streams that are important fish streams dry up in the later summer months and or become ice/snow covered within the fall and winter months which makes determining if the stream is a viable fish stream very difficult. As mentioned above streams that are seriously being considered for restoration should be verified as fish streams and the species/age class of fish caught noted and used in the planning and prioritizing process. Conducting FPCI in early late spring, early summer allows for the FPCI process to be completed and restoration sites prioritized because fish presence, distribution and habitat quality can all be determined during this time frame. Streams that contain Bull trout can only be sampled with an electro-fisher between June 15th and September 15th and is an abundant and important Blue Listed species in the Kootenays.

During the initial planning phase fish stream maps should be used that consider streams up to 30% slopes. Numerous potential fish streams may be missed. For example, Bull trout in the East Kootenay's utilize streams with slopes up to 30%. Thirty percent stream slopes along with stepped habitats need to be considered when assessing streams at road/stream crossings.

Finally, monies that have been earmarked for FPCI studies and restoration through this process should go to the best possible fish passage restoration sites even if they fall out of the Provincial Fisheries Watershed Groups and Sub-Basin ranks. There are numerous known culvert barriers throughout the East Kootenay that may not ever be considered for restoration due to the Provincial ranking system. I believe that the process can be reworked to allow for these locations to be considered.

Sean Beswick, RPBio
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6.0 REFERENCES

Thomson, Alan. ARTA Consulting. Fish Passage Culvert Inspections – Planning Phase, Crestbrook Forest Industries, Cranbrook, BC. November 25th, 1999.

BC Ministry of Fisheries. 2000. Fisheries Information Summary System. Programs and Operations Division, Planning and Information Branch, Inventory Section. Website accessed in March 2000 (www.env.gov.bc.ca/fsh/IS/products/fiss/fiss_home.htm).

MoF (BC Ministry of Forests). 1998. Fish-stream identification guidebook. Second edition. Forest Practices Code of British Columbia Act, Operational Planning Regulation. Queen's Printer for British Columbia: Victoria. August.

Parker, M.A. 1999. Fish Passage – Culvert Inspection Completion Procedures (Draft 3C). BC Ministry of Environment, Lands and Parks, Cariboo Region, Williams Lake, BC. March.

B.C. Ministry of Forests. 2002. Fish-stream crossing guidebook. For. Prac. Br., Min. For., Victoria, B.C. Forest Practices Code of British Columbia Guidebook.

B.C. Ministry of Environment. 2008. Fish Passage Protocol for Culverted Sites. 1st Edition, Revised June, 2008.

B.C. Ministry of Environment. 2008. Field Assessment for Fish Passage Determination of Closed Bottomed Structures. 2nd Edition, May, 2008.

Appendix I

Cranbrook TSA – Fish Passage Sample Plan
Invermere TSA – Fish Passage Sample Plan

Appendix II

Cranbrook TSA – FPCI Field Data Submission Form
Invermere TSA – FPCI Field Data Submission Form

Appendix III

FPCI 2008 Project Map