Slamgeesh Fence Rebuild 2007

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Introduction

The Slamgeesh River is located about 160 km north of Hazelton, BC and drains south into the Skeena River. The Slamgeesh watershed is highly productive for coho, Chinook and sockeye salmon. The most productive tributary for coho and sockeye is Damshilgwet Creek, which flows through Damshilgwet Lake and then Slamgeesh Lake before meeting with Shilahou Creek and draining into the Slamgeesh River. Most of the coho and sockeye spawning occurs between these two lakes (Figure 1). The Gitksan Watershed Authorities (GWA) has performed research and collected biological data on salmon from within the Slamgeesh watershed for the past 8 years. The adult salmon counting weir site is on Damshilgwet Creek below Slamgeesh Lake (Figure 2). Salmon smolts have been enumerated since 2001 using a variety of temporary traps at various sites along Damshilgwet Creek.

The original adult fence built in 2000 was constructed with ½" galvanized EMT tubing set in drilled wood 2x4s assembled into 8' or 10' foot panels, as can be seen in the pier structure in Figure 3. The panels leaned against a log set across the creek and were sealed at the bottom with sand bags. This temporary fence had to be reconstructed for each field season. There were complications with pipes rusting through and with sockeye escaping at the base of the fence especially near the trap entrance. In 2007, money was obtained from the Pacific Salmon Commission to construct an aluminum & concrete structure. Eli Brook, an engineering student at the University of Alberta, was hired for the fence design. Engineering took place in May and June 2007, preassembly of welded panels in early July. Construction in the field started on July 18th and the weir was fully installed by July 29th. The weir fished successfully and sockeye and coho escapement was recorded from July 30th to freeze-up at the end of October.

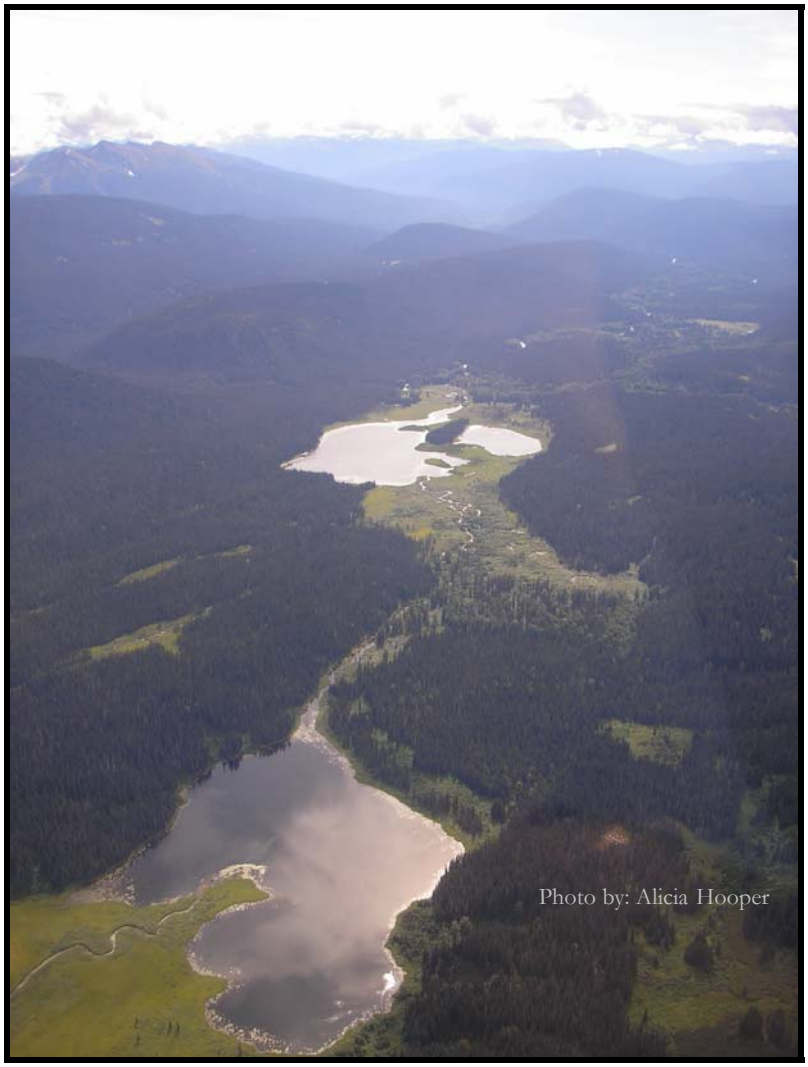


Figure 1. Damshilgwet watershed view downstream. Damshilgwet Creek (bottom) drains down Damshilgwet Creek to Slamgeesh Lake (top) and the outlet where the weir site is.

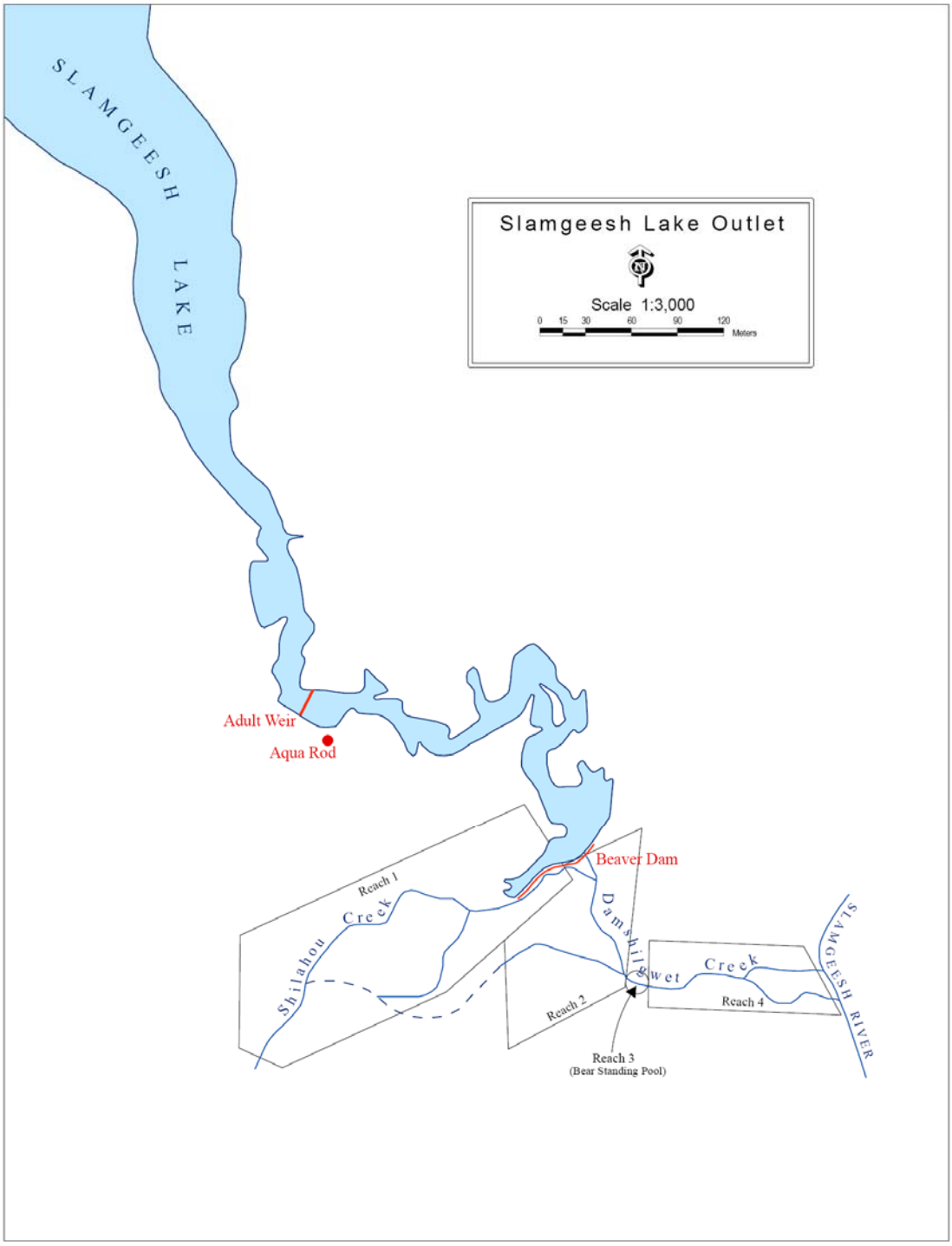


Figure 2. Slamgeesh outlet and weir site.

Description

Site selection

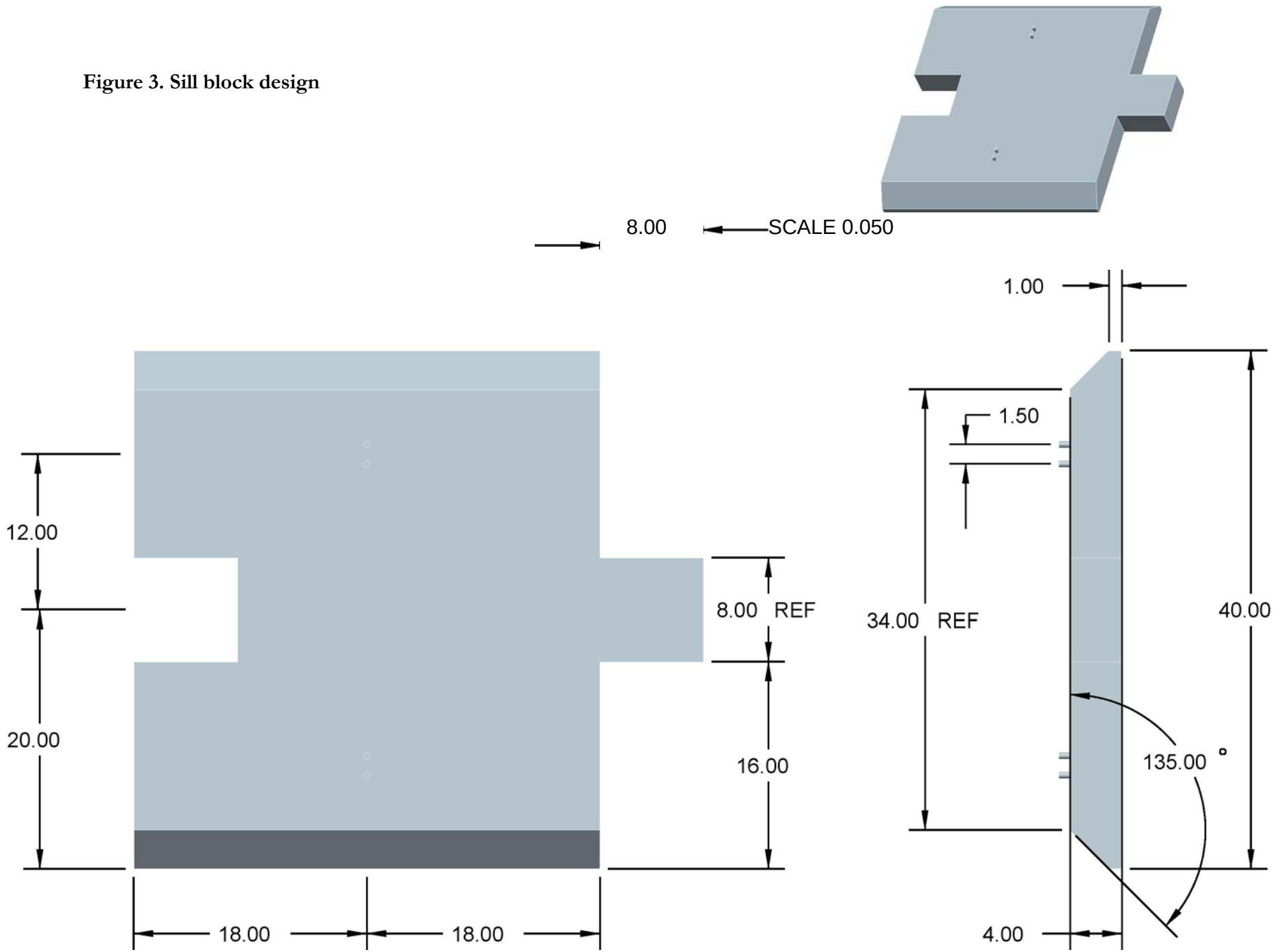
The weir site was selected to be below Slamgeesh Lake where flood flows are expected to be moderated by the lake storage volume. Damshilgwet Creek has been gauged near this site since 2000. The discharge was determined and a channel cross section was measured on June 5th, 2007 approximately at the peak of a large spring snowmelt event. In the Skeena watershed as a whole the flood event had a 1 in 20 year recurrence interval. At Slamgeesh it was the highest stage since recording began. The concept of the fence design was to build a structure to withstand the June 2007 conditions. The selected weir site was close to the temporary fence site to take advantage of the shallow cross section and construction ease provided by the existing clearing and cabin site.

Modules

The new Slamgeesh fish fence is a novel design. The weir design provides for a fence that can be assembled and disassembled by two workers in a day. The truss design will accommodate two panel designs, one for an adult fence configuration and one for a smolt fence. The design is modular, built of 3 foot wide units. The modular design could be modified for use in a variety of streams of different widths and depths. The principal requirement would be to select a site with fairly uniform stream cross section.

The weir was built of prefabricated, aluminum components and reinforced concrete blocks cast on site of hand mixed concrete. There are 19 of these modules, each consisting of an adult panel that slides between the downstream side of two trusses. The alternative smolt trapping configuration is a double walled structure with upstream screens and a downstream stop-log dam.

Figure 3. Sill block design



Concrete Foundation

The foundation or sill consists of a series of pre-cast concrete blocks 36” x 36” which are interlocked with an 8” tongue (Figure 3, 4). The blocks were set along a graded but close to natural profile of the original weir site’s cross section. This site was selected for its nearly flat profile but not a uniform depth. The sill blocks were leveled along a uniform line using a total station. Where additional material was added beneath sill blocks it was in the form of sand bags of gravel and cement so that the foundation would set into a permanent configuration. Each sill block was cast with two pairs if ½” stainless steel bolts to enable the attachment of aluminum clevis pieces which are the connectors to the trusses that make up the main component of the weir framework.

Figure 3. Concrete block being moved into position.

The weir design we developed does not require a flat cross-section. Hinge pins at the base of the trusses will allow use of this design on irregular bottom cross-sections. The maximum angle of slope for use of this design would be approximately 20 degrees.

Aluminum Trusses & Panels

The trusses are made of 2 ½ x 3 inch H-beams, joined with two H beam cross members and reinforced laterally with square tubing (Figure 6).

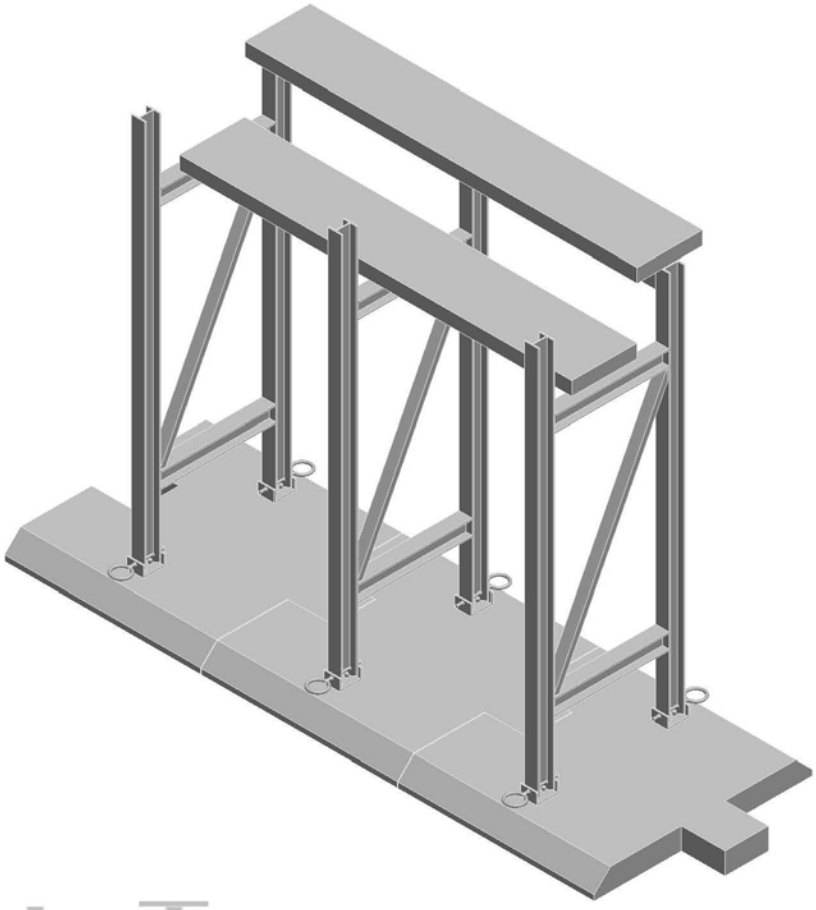
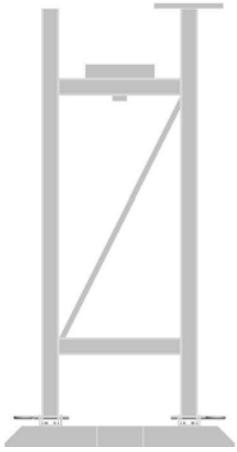


Figure 6. Truss design.



The adult panels (Figure 7) were prefabricated to fit between the trusses. The panels are filled with 1 inch aluminum tubing with 24 mm gaps in spacing. The frames of the adult panels are welded on a 40º angle to a small panel of perforated screen which slots into the I-beam (Figure 8). These lower perforated sections were scaled in height to adjust for varying channel depth so as to produce a level appearance along the top of adult panels. Along the top of the panels, 1/8" stainless steel aircraft cables fasten the corners of the panels together.

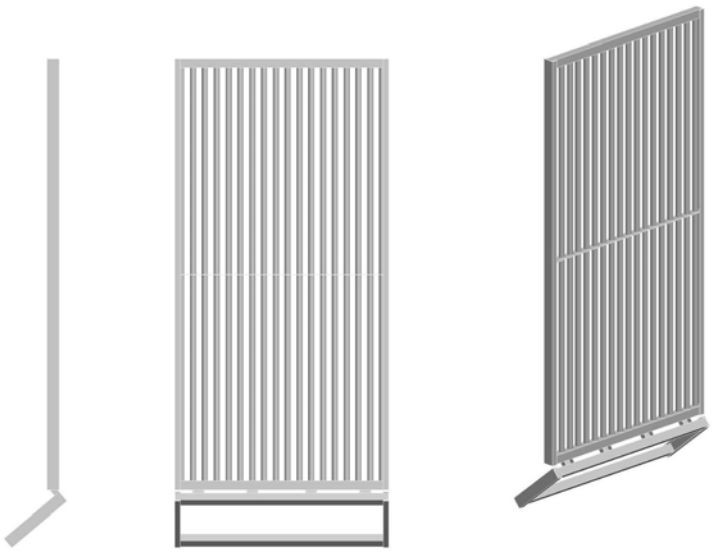


Figure 7. Adult panel design.

The smolt panels intended for spring use are designed to be placed in the upstream channels of the trusses. They are simple screens 36"x 72" made with a frame of 1½" aluminum channel and are filled with 1/4" (3/8" stagger) perforated 18 gauge sheeting. In use the upstream panels will be backwatered by a dam constructed of 6" height wood blocks set in the downstream channel position of the trusses.

Piers

There are large cement piers on both shores (Figure 8). They are 80” square and 48” high. To save on concrete mixing they were built with cores of gravel with outer layers of at least 6” of concrete. They provide the fence trusses with lateral stability. The piers also reduce the possibility of bank erosion and provide a base for one of the highline supports. A highline with a chain hoist was mounted to move the cement blocks of the foundation. This cable system was also used for moving components of the fence during set up and disassembly.

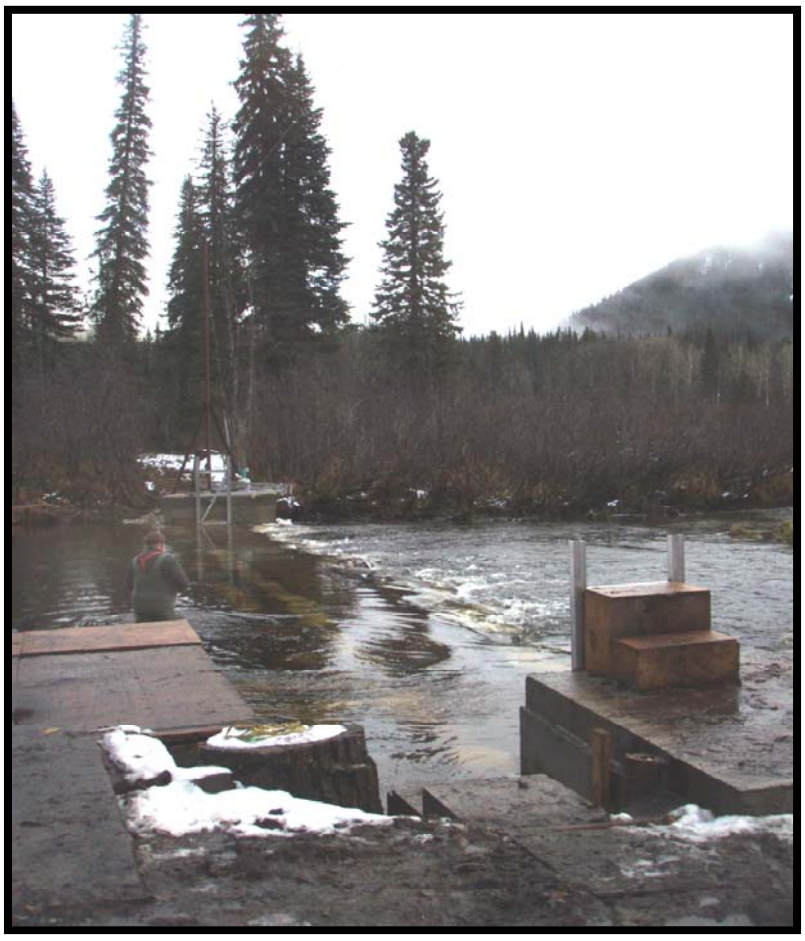


Figure 8. Cement piers at each bank anchor the weir in place.

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Trap and Live Box

The entrance to the live box is located close to bank right close to the original thalweg position. It is formed by eliminating the perforated sheeting in the lower portion of one of the adult panels. The larger end of the trapezoidal entrance is inserted in this gap. This aluminum tapered box tunnel leads into the live box (Figure 11). The live box is fitted with a fyke. The narrow end can be closed off with a plywood panel to retain trapped fish. The tapered passage to the live box is fitted with a door to facilitate cleaning.

Figure 9. Aluminum opening inserted into panel frame to create the fence entrance. The narrow end (bottom left) inserts into a live box.

Function

Observations in the field were that sockeye and coho entered the trap entrance readily (Figure 10) and held overnight in the live box without apparent stress.

Figure 10. Sockeye going into the fence opening leading to the live box.

Season efficiency for sockeye

The fence was very efficient for sockeye capture and counting. For the reported population estimate, the actual weir count was used, which was 363 not including jacks. The weir count was within the confidence interval for the Petersen Mark Recapture Estimate which was 369 Sockeye (357-383) with a 95% confidence interval. In the mark recapture analysis, sockeye jacks were not included in the weir capture or stream walk counts, nor were residuals. The initial marked at weir number was decreased by 5% for tag loss (345 sockeye).

Season efficiency for coho

Coho were more abundant than sockeye in 2007. We marked 1093 at the weir. The Petersen Mark Recapture Population Estimate with a 95% confidence interval used for reporting was 1349 coho (1294 – 1409). The number marked at the weir (actual weir count 1093) was not within that interval and therefore not used. The initial marked number was decreased by 5% for tag loss in this analysis to 1038. We apparently had leakage during the late September storm high water. When we disassembled the weir at the end of October 2007 we found a single spot where the EMT galvanized tubing in the swamp portion east of the weir had been bent so as to provide a narrow passage. The remedy will be to improve the barrier through the eastern swamp portion.

Setup efficiency

As with most smolt counting installations in B.C. in the spring of 2007, the Slamgeesh weir had to wait for flood water to subside. We began fishing on July 27. In the previous five years the installation at Slamgeesh occurred only a few days earlier, ranging from July 23rd to 25th. With the new design of the adult fence, taking apart and storing the weir modules was much more efficient and took less than a day with a small crew. The foundation remains in place for next season. We will have to modify several aspects of the weir to enable use of the Canadian fan traps we obtained from the Fulton River spawning channels. The intention is to fit three traps across double gaps created by omitting a truss in the middle of each trap position. We expect to make these modifications and modifications to the highline system so we can move the fan traps in April 2008.

Concluding remarks

Pre-Fabrication of the fence modules took approximately 10 days and the on site construction took 10 days. Seasonal field staff was used for most of the construction labor. The overall construction cost was approximately $100,000. The project was completed on time and on budget. The Slamgeesh fence performed well during fall storm flows and was successful in providing population estimates for 2007 sockeye and coho returns.