Enumeration of Adult Steelhead in the Upper Sustut River 1998

Appendix Report 1

Fence Modifications

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Abstract

This report describes several modifications of the Sustut River fence and devices that were constructed and used to improve the efficiency of operations at the fence. Several key changes in fence design and operation were successfully implemented in both 1997 and 1998 to help reduce the impact of the fence operations on the fish being studied.

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1.0 Introduction

During operation of the Susut River steelhead counting fence in 1997, personnel observed that some features of the Sustut River fence could be easily modified to reduce handling stress and mortality of fish species passing the fence. Other small modifications and devices were built to aid fence personnel.

The main objectives were:

1. to reduce the incidence of downstream swimming behaviour of fish after they have been handled by increasing the availability of holding water upstream of the fence,
2. to eliminate low water stranding mortalities of healthy steelhead on the fence,
3. to eliminate trap box mortalities of bull trout and other small fish,
4. to increase the general 'fish friendliness' of the fence,
5. to reduce handling time of fish that are to be sampled,
6. to increase the efficiency of fence operations.

Several design modifications were successfully implemented in both the 1997 and 1998 field seasons.

2.0 Changes in Fence Design

2.1 Fish Holding Areas

Several modifications to the fence trap box and holding area were made in 1998 to reduce repeat downstream swimming behaviour of handled fish. It can be assumed that for most fish entering the fence trap-box, the objective is to continue to migrate upstream after passing the fence. Fence personnel have observed that handled fish tend to look for holding areas to rest in before continuing migration. On the upstream side of the fence there is very little effective cover for at least 200 meters. Fish handled at the fence have three options: a) to hold under the trap deck or in front of the trap box, b) to swim upstream to look for cover c) to swim downstream to the deep pool below the fence. Prior to 1998, most fish chose to swim upstream or downstream. Fish swimming downstream most often became stranded on the fence and had to be rescued. Fish repeating this behaviour three times were released downstream to recover. For the 1998 field season, a covered holding area was constructed in the deeper water immediately in front of the trap box (Photo Figure 1). In 1997, over ten percent of the steelhead released upstream of the fence had to be

rescued and approximately five percent had to be released downstream. In 1998 after constructing a covered holding area only three steelhead had to be released downstream. The main holding area in front of the trap box was constructed around a scour depression in the streambed immediately in front of the trap box. In previous years a section of the old upper Sustut fence was used as a lead in front of the trap box. For 1998, a 1.2 m x 1.5 m section of aluminum panelling from Babine River fence was used to extend the width of the holding area toward the river left bank (Photo Figure 2). A set of 0.6 m x 1.2 m wide panels from the Babine fence was added to the upstream end of the lead and angled toward the river right bank (Photo Figure 1). To support a plywood cover for shade, an aluminum pole was fastened to the trap box and to the top of the angled panels (Photo Figure 2).

2.2 Low Water Baffle

Seven out of ten steelhead mortalities at Sustut fence in 1997 were healthy fish that became stranded overnight on the river left side of the fence in low water (Williamson 1998). Williamson, recommended that a baffle-like device should be installed on the upstream leading edge of the fence in low water to prevent these mortalities. During the field season in 1998 fence personnel built a and installed a baffle on the river left side of the fence (Photo Figure 3). There were no mortalities of healthy steelhead observed after installation of the baffle. The baffle was constructed from three 20 foot sections of 3.8 cm diameter PVC pipe that was attached to five approximately 40 cm lengths of 2" x 4" lumber. The pipe was attached using 2 inch hose clamps that were screwed on to the 2" x 4" with wood screws (Photo Figure 4). Duct tape was used to tape the pipes together between the 2" x 4"'s for added strength. The 2" x 4" supports were wedged on end between the upstream edge of the fence panels and the steel railway rail on the streambed. The baffle was placed flush against the fence panels and sandbags were placed to block any gaps. One section of baffle was sufficient to prevent strandings in 1998; however, another section may be needed if the river falls to the levels recorded in 1997.

2.3 Trap Box Modifications

During operation of the fence in 1997 and 1998 eleven bull trout died in the Sustut fence trap box. Most of these fish would enter the trap box in the late evening and after dark. Mortalities would occur presumably because the fish would tire and slide backwards (downstream) and become 'gilled' in between the dowels in the rear of the trap box. The dowels form a 'vee' shaped opening into the trap box and are designed to prevent the escape of fish migrating into the box once they are in the box. A set of two plywood panels with 6-mm wide vertical slots were used to cover the upstream side of the dowels while allowing the passage of fish upstream into the box (Photo Figure 5). Further evaluation

of the effectiveness of the panels must be undertaken in future years. In1998 the plywood panels were only used for the last four days of fence operation.

2.3 General Modifications and Operational Aids

Several small modifications were made in 1997 to improve the efficiency of fence operations.

1. Personnel operating the fence in 1996 recommended replacement of the 2x4 and chicken wire panels used to block fish passage between the trap box and the right bank. The chicken wire panels were difficult to clean and often injured fish. In 1997, the chicken wire panels were replaced with aluminum panels (Photo Figure 6). Debris was more easily removed and fish that came into contact with the panels were less likely to be injured.

2. After handling, steelhead that were particularly tired would sometimes become pinned against the aluminum panels between the trap box and the right bank. A piece of plywood was placed in the water on the upstream side of the panels to create a dead water space below the trap deck. The dead water was frequently used by the fish to recover. As a result fewer fish became pinned on the panels. In low water conditions debris was allowed to accumulate on the aluminum panels to further aid in creating a low velocity area under the trap deck.

3. A piece of plywood was used to extend the height of the panels between the trap box and the right bank. Fish frequently attempted to jump over the panels. Without the plywood extension they would have easily escaped upstream uncounted (Photo Figure 6). On several occasions after installation of the board, sockeye and steelhead were observed attempting unsuccessfully to jump over the panels.

4. Metal doweling was originally used to block the ‘vee’ entrance of the trap box to prevent fish from escaping while they are being netted out of the box. Typically three or four dowels were used to block passage. Placing the dowels was cumbersome, especially in high turbid water and fish often escaped downstream. In 1997, a shroud was built that could be used to block the trap box entrance rapidly in one motion while minimising downstream escapees (Photo Figure 7).

5. During rain events, run-off from the Omenica Mining Access Road enters the Sustut River. The increased tubidity of the river during these periods prevents visual observation of fish captured in the trap box. Fish in the trap box often have to be netted out in order to facilitate correct species identification. To reduce stress on the fish caused by handling in nets, an acrylic bottomed viewing box was constructed in 1997 to help fence personnel identify fish in turbid water (Photo Figures 7, 9). The box was made from a 2” x 12” lumber frame with a 3-mm thick acrylic plastic bottom.

The viewing box was also to count and sex fish as they swam out the front of the trap box.

6. During a high water event in 1997, the netting used to block fish passage on the panel beside the trap box became extremely clogged with debris. The netting did not have anything holding it up vertically out of the water, which allowed it to become completely blocked. After the water receded an aluminum pole was added as a support to keep the net more out of the water preventing excessive debris accumulation (Photo Figure 8).

7. It was found in 1997 that the aluminum poles used to hold the fence panels together would slide downstream, creating small spaces that would allow small fish to pass upstream or become lodged between the panels. Hose clamps had been used only on the downstream end of the poles to prevent the pole from sliding out. In 1998, a second set of clamps was added to the poles on the upstream end to keep them from moving under water pressure. The addition of the second clamp locked the poles in placed and prevented fish from attempting to migrate upstream through the fence panels.

8. In 1998 a new free standing measuring tray was built to accommodate the entire size range of fish sampled from the Sustut River. The old measuring tray was only 97 cm. In the past some steelhead and a significant number of chinook salmon sampled were well over 97 cm.

9. Fish that escape from the measuring tray while being handled in the measuring often jump out headfirst. To reduce the number of fish that escaped this way fence personnel in 1998 used a sandbag to cover one end of the measuring tray. The sandbag allowed for easy handling of fish in the tray while minimising escapees.

10. During the 1997 field season fence personnel noted that several years of activities around the fence had killed some of the vegetation along the right bank. The bank area immediately above the fence trap box was destabilised and was beginning to slough into the river. A walkway was built along the bank using sandbags, small logs and gravel to minimise future bank disturbance as well as to correct the existing problem (Photo Figure 9). Willows and other streamside vegetation were also planted in an effort to stabilise the bank. Sandbags were placed in the water along the right river margin to decrease undercutting.

Photo Figure 1. View of holding area and the front of the trap box look downstream from the right bank.

Photo Figure 2. View of the downstream end of holding area and left side of the trap box looking upstream towards the right bank. Note the 1.2-m wide aluminum panel in the center of the photo.

Photo Figure 3. View of low water baffle system. Note the lack of water on top of the panels.

Photo Figure 4. Close-up, showing the baffle raised up off the panel. Note the 2x4 wood and the duct tape holding the P.V.C. pipes together.

Photo Figure 5. Slotted plywood panel.

Photo Figure 6. View of downstream end of the fence trap box showing aluminum panels between the trap box and the right bank.

Photo Figure 7. View of trap box shroud sitting on top of the fence work deck. Note the acrylic bottomed viewing box behind the shroud.

Photo Figure 8. View from right banking of aluminum pole holding up panel netting.

Photo Figure 9. View of the right bank looking downstream towards the trap box deck. Note a) the blue foam lined measuring tray; b) the viewing box (top right); c) efforts to improve bank stabilisation around the fence working areas.

3.0 Acknowledgements

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4.0 Literature Cited

Williamson, C.J. 1999. Enumeration of adult steelhead in the Upper Sustut River 1998. British Columbia Ministry of Environment, Lands and Parks. Fisheries Branch. Skeena Fisheries Report SK 120.