

Fish Passage Improvements at the Big Lake Dam (Fish Creek)

S. Justin Marcum¹

The Big Lake dam is located at the outlet of Big Lake on Fish Creek in the southeastern corner of the lake and immediately north of the South Big Lake Road bridge. The dam, installed by the Alaska Department of Fish and Game (ADF&G) in 1969, is a sheet pile weir that raises the lake level by approximately 18 inches. The dam also had two, non-functioning, small fish ladders. The upstream edge of the dam was constructed of dam boards used to control the lake water level.

Resource agencies were of the opinion that this dam did not provide passage to sockeye salmon fry, which would normally migrate into the lake during spring. It was the assumption of ADF&G that the installation of the dam structure has caused a decline in the wild stock production of sockeye salmon in this location and this could be a major contributing factor of the decline in the Fish Creek sockeye salmon over the past 25 years (Litchfield & Willette, 2002).

Cook Inlet Aquaculture Association (CIAA) identified the dam as a restoration project and hired HDR Alaska to assist with the restoration design and construction. Funding for the project was provided to CIAA by the U.S. Fish and Wildlife Service.

The project first evaluated conceptual improvement alternatives including removing the dam, constructing a roughened channel over the dam, constructing a step/pool channel, constructing a side channel, and installation of a Parshall flume through the dam. One major consideration taken into account in determining the feasibility of all alternatives included the affect that each alternative would have on the lake level. This concern eliminated the dam removal alternative. The recommended alternative became the construction of a roughened channel.

The roughened channel consisted of modifying the dam by removing the dam boards and building a roughened channel downstream that would allow passage of small fish over the dam. The roughened channel was steeper than the natural channel, but included large rocks that provide rest areas for ascending fish. Outside of this channel, the level of the existing streambed was raised in order to pass flow during high water events.

The purpose of this project was to create average cross sectional velocities within the limits of fish passage criteria. Streambed width and bed roughness were designed to reach the desired average velocity in order to allow salmon fry to pass during spring migration flows. Bed roughness was increased by placing riprap within the constructed channel, which increased the turbulence and reduced the average velocity. The material in the streambed was sized to withstand a flood. The streambed porosity was designed to prevent subsurface flow and drying of the channel during low flow conditions. Smaller material was placed between the larger rocks to prevent this from occurring. Software used to confirm fish passage capabilities included FishPass and FISHXING.

The project was constructed in July 2004. Immediately after construction small fish were observed ascending the channel and later in the summer adult sockeye were observed ascending the channel.

¹EIT, HDR Alaska, Inc, 2525 C Street., Suite 305, Anchorage, Alaska 99503, (907) 644-2000, justin.marcum@hdrinc.com