Correct Implementation Of Variable Flow Flood Control (VARQ) At Libby Dam During 2006 Could Have Avoided Spill And Prevented Impacts To Kootenai River Fish

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The variable flow flood control strategy (VARQ) was designed to improve conditions for resident fish species including the endangered Kootenai white sturgeon (*Acipenser transmontanus*) and threatened bull trout (*Salvelinus confluentus*) while dam operations are modified to recover ESA-listed anadromous fish species in the lower Columbia River. Failure to follow VARQ at Libby Dam during 2006 caused an uncontrolled spill and flooding in the Kootenai River. As much as 31,000 ft^3/sec (cfs) was released through the spillway, exceeding Montana's water quality standard of 110 percent gas supersaturation for 19 days. Gas levels reached a maximum of 133.5 percent causing gas bubble trauma in Kootenai River fish. Flood stage at Bonners Ferry, Idaho, was exceeded, causing some stakeholders in the U.S. and Canada to doubt the effectiveness of this flood control strategy. The U.S. Army Corps of Engineers considered abandoning VARQ and reinstating standard flood control practices. Analysis of the event revealed that the Corps' discharge protocol had not been implemented as designed. Dam discharge during April and early May was therefore insufficient to control the slightly-above-normal inflow. Spill, flooding and gas bubble trauma in Kootenai River fish could have been avoided if VARQ had been implemented as designed.