Barrier Assessment Of The Chadbourne Diversion Dam On The Shields River

Matt Blank, Western Transportation Institute, Montana State University, P.O. Box 174250, Bozeman, MT 59717, mblank@coe.montana.edu

Mike Cox and Drake Burford, OASIS Environmental, P.O. Box 582, Livingston, MT 59047, mike.cox@oasisenviro.com

The Shields River supports widely distributed populations of Yellowstone cutthroat trout (*Oncorhynchus clarkii bouvieri*) that show little to no evidence of introgression with rainbow trout (*O. mykiss*) or westslope cutthroat trout (*O. c. lewis i*). The Chadbourne diversion dam, approximately 12.5 river miles upstream of the confluence with the Yellowstone River, is suspected to be a partial barrier to upstream passage of large trout. We performed a fish passage assessment of the diversion using a combination of hydraulic modeling under a range of flows combined with fish swimming and leaping abilities of Yellowstone cutthroat, rainbow, brown (*Salmo trutta*) and brook trout (*Salvelinus fontinalis*) to characterize its barrier status. We analyzed three potential passage scenarios: (1) the development of a side-channel that bypasses the diversion at high flows, (2) the potential for trout to leap over the structure, and (3) the potential for trout to pass through a keyhole or notch in the structure. Results indicate that a side-channel may form at flows exceeding the 2-year recurrence interval (RI) when the diversion is operating with wooden planks in place and a 10-yr RI when the diversion is operating without wooden planks in place. The analysis also indicated that the leap heights are too

great for all operating scenarios and flows. However, the analysis indicated that large trout of all four species might pass the structure by swimming up the key hole or notch at some flows.