Application of a Two-dimensional Habitat Model for Instream Flow Investigations on the Flathead River, Upstream of Flathead Lake, Montana[AFS]

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A modified Instream Flow Incremental Methodology (IFIM) approach was used on the mainstem Flathead River from the South Fork Flathead River downstream to Flathead Lake. This study quantified changes in habitat for the target fish species, bull trout (*Salvelinus confluentus*) and westslope cutthroat trout (*Oncorhynchus clarki lewisi*), as a function of discharge. Two- dimensional hydraulic simulations were combined with habitat suitability criteria in a GIS analysis format to determine habitat area as a function of discharge. Results of the analysis showed that habitat area is more available at lower discharges than higher discharges. Comparison of the pre-dam hydrology with post-dam hydrology showed that pre-dam baseflows provided more stable habitat than the highly variable post-dam flow regime. The GIS analysis showed that sub-adult fish, in particular bull trout, were required to use less productive stream margin areas that are constantly wet and then dried as flows fluctuate. These areas have highly varying productivity for lower trophic levels and consequently are less productive for higher trophic levels, especially bull trout sub-adults. The analysis demonstrates that highly variable flows likely put stress on a bull trout subadult and westslope cutthroat trout, due to the additional movement required to find suitable habitat. The GIS approach presented here provides both a visual characterization of habitat as well as Arcview project data that can be used for additional analysis of flow regimes and spatial variability of habitat within the three reaches of the river.