

CHANNEL MODIFICATION AND FISH HABITAT IN THE UPPER YELLOWSTONE RIVER^{AFS}

Zachary H. Bowen, Ken D. Bovee, and Terry J. Waddle
U.S. Geological Survey
Fort Collins Science Center
2150 Centre Avenue, Building C,
Fort Collins, CO 80526-8118
zack_bowen@usgs.gov

A two-dimensional hydrodynamic simulation model was coupled with a geographic information system (GIS) to produce a variety of habitat classification maps for three study reaches in the upper Yellowstone River basin in Montana. Data from these maps were used to examine potential effects of channel modification on shallow, slow current velocity (SSCV) habitats that are important refugia and nursery areas for young salmonids. At low flows, channel modifications were found to contribute additional SSCV habitat, but this contribution was negligible at higher discharges. During runoff, when young salmonids are most vulnerable to downstream displacement, the largest areas of SSCV habitat occurred in side channels, point bars, and overbank areas. Based on simulations in modified and unmodified sub-reaches, channel simplification results in decreased availability of SSCV habitat, particularly during runoff. The combined results of the fish population and fish habitat studies present strong evidence that during runoff, SSCV habitat is most abundant in side channel and overbank areas and that juvenile salmonids use these habitats as refugia. Channel modifications that result in reduced availability of side channel and overbank habitats, particularly during runoff, will probably cause local reductions in juvenile abundances during the runoff period. Effects of reduced juvenile abundances during runoff on adult numbers later in the year will depend on (1) the extent of channel modification, (2) patterns of fish displacement and movement, (3) longitudinal connectivity between reaches that contain refugia and those that do not, and (4) the relative importance of other limiting factors.