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Artificial floods from Glen Canyon Dam benefit the tailwater rainbow trout population due to changes in the invertebrate prey base

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Closure of Glen Canyon Dam on the Colorado River (Arizona, USA) and subsequent hydropeaking operations have led to changes in the geomorphology of the downstream ecosystem, particularly reductions in sandbars. Three artificial floods (1996, 2004, and 2008) have been released from Glen Canyon Dam to restore sandbar building processes and hopefully benefit the downstream ecosystem, including fish populations. We evaluated the effects of the March 2008 artificial flood on food availability for the rainbow trout population below Glen Canyon Dam (Colorado River, Arizona) by evaluating invertebrate production, invertebrate drift, and diets of trout two years before and one year after the flood. We found the flood strongly reduced total invertebrate production (from 29 to 13 g AFDM m2 yr-1) but production of two less-common taxa increased (chironomidae—0.6 to 0.9 g AFDM m2 yr-1; simuliidae—0.2 to 1.2 g AFDM m2 yr-1). In contrast, invertebrate drift concentrations increased by more than 2X after the flood (from around 0.9 mg/m3 to around 0.22 mg/m3). This increase in drift was driven by substantial increases in concentrations of chironomidae and simuliidae in the drift (4-8X increase, depending on taxa and which post-flood data are used for comparison). Proportionately more chironomidae and simuliidae production was present in drift relative to other taxa (10-15% vs. <1-3%), and consumption of these taxa also increased in trout diets after the flood. The effects of hydropeaking on invertebrate drift concentrations were minor compared to the effects of invertebrate biomass, which varied strongly among years. Studies in other systems have documented natural and artificial floods benefit salmonid populations due to improvements in spawning gravels. This study indicates artificial floods can also benefit salmonid populations due to changes in the invertebrate prey base.