

Impacts of hydrologic and geomorphic alteration to the availability of shallow, low-velocity habitats in an intensively managed arid-land river

Jacob G. Mortensen¹, Pierre. Y. Julien², Brianna Corsi², Chelsey Radobenko², and Tristen Anderson²

¹Trinity Southwest University Library

²Colorado State University Department of Civil and Environmental Engineering

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Abstract

This study seeks better understanding of linkages between channel morphology, streamflow, and aquatic habitat for the effective rehabilitation of imperiled species in rivers subjected to intensive water resource management. We focused on the variability of shallow, low-velocity (SLV) habitats over 50 years for a 56 km reach of the Rio Grande of central New Mexico (Middle Rio Grande). Hydraulic models used topographic data obtained through long-term systematic monitoring between 1962 and 2012 to derive relationships between discharge and SLV habitat availability. We developed a temporally integrated habitat metric (TIHM) to facilitate quantitative comparisons of SLV habitat availability over seasonal hydrologic periods (base flow, spring runoff, and summer low flow) for selected years representative of contemporary discharge variations. Results showed that SLV habitat availability, as captured by TIHM values, decreased on average by 83% over the study period (1962–2012), corresponding to completion of Cochiti Dam (1973), which profoundly altered flow and sediment regimes. Resulting channel incision and floodplain disconnection, caused shifts in discharge-habitat relationships whereby considerably higher discharges are required to produce equivalent increases in SLV habitat availability relative to pre-dam conditions. Ecological implications of losses to SLV habitat availability include recovery of the federally endangered Rio Grande Silvery Minnow *Hybognathus amarus*.

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