



Middle Rio Grande Montaña Reach: Morphodynamic Processes and Silvery Minnow Habitat

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The Middle Rio Grande (MRG) traverses through an urban corridor in New Mexico, spanning 190 miles from Cochiti Dam to Elephant Butte Reservoir. Over the last century, anthropogenic impacts (dams, levees, river straightening) have significantly impacted the river ecosystem, especially the endemic and endangered Rio Grande Silvery Minnow (RSGM). The Montaña reach of the Middle Rio Grande spans approximately 19 miles through Albuquerque, NM. The objective of this research is to summarize the flow and sediment regimes and relate these morphodynamic conditions to estimate available RSGM habitat in the Montaña reach.

River straightening techniques were implemented for flood control in the 1950s. Historical aerial imagery, maps, and survey data quantify changes in the average channel width (defined by vegetation). From 1918 to 1962, the width decreased from 1470 ft to 500 ft. The construction of Cochiti Dam (1973), in addition to diversion and tributary dams, further reduced the magnitude and frequency of large flow events and the natural sediment supply to the MRG. Subsequently, the channel continued to narrow from 1962 to 2019, to an average of 375 ft. HEC-RAS models were used to process survey data from 1962, 1972, 1992, 2002, and 2012 LiDAR and determine the changes in the channel bed elevation. The Montaña reach aggraded ~1 ft from 1962 to 1972. The channel incised ~2.5 ft from 1972 to 2002. The channel aggraded ~1 ft from 2002 to 2012. The narrowing and incision experienced in this reach emphasize the transition from a naturally wide and braided system to a more narrow and deep single-thread system that occurred.

One-dimensional hydraulic models (HEC-RAS) were used to estimate the velocity and depth variations across each cross-section for a range of flow rates up to 10,000 cfs. The results were filtered through RSGM velocity and depth criteria to quantify the hydraulically suitable habitat. More hydraulically suitable habitat is available for all life stages of the RSGM before Cochiti Dam (pre-1973) across all the flows except for 10,000 cfs. For example, ~4.5 million sq. ft/river-mile in 1972 versus ~0.5 million sq. ft/river-mile in 2012 at 4,000cfs for the juvenile life stage.