

## **Changes in Seasonal Precipitation and Temperature Signals over the 20<sup>th</sup> Century and Corresponding Response in Historic versus Reconstructed Natural Streamflows for the Gunnison River**

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**Abstract.** Recent research shows that water supply forecast accuracy in the Colorado River basin is decreasing due to increasing hydrologic and climatic variability in the basin. Variability is influenced by: (a) physical changes (e.g., land and water use changes), and (b) changes in climate (e.g., climate cycles and long-term climate change). Thus far, no studies have determined combined effects of climatic and physical changes in the basin on streamflow response to precipitation and temperature patterns, and how results for historic data compare to those for reconstructed natural (i.e., undepleted) flows. A new methodology was developed and applied to the Gunnison River to determine changes in temperature and precipitation signals between September and March for the period of record (POR), WY1911-2005. Results ( $\alpha \leq 0.02$ ) include the determination that: (a) hydroclimatic conditions develop a distinct pattern between September and March that is unique for dry compared to wet years; (b) while the general patterns over the POR are the same, details differ in earlier versus later years of record; (c) September and/or October temperature, precipitation and streamflow variables are significant precursors of upcoming hydroclimatic conditions (i.e., winter into spring) and annual basin yield (ABY); (d) while average annual rainfall is essentially constant over the POR, the range in ABY has widened at both extremes; and (e) average timing of snowmelt runoff has advanced approximately 10 days over the POR, and occurs over a wider range of time. Applications of results include improving undepleted flow data and hydrologic forecast models for the Gunnison River basin.

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