**Hayes, B. R. 1995. Geomorphic and climatic controls on streamflow, sediment, and salt loads, upper Colorado River Basin. Ph.D. dissertation. Colorado State University. Fort Collins, Colorado. 184 pp.**

Suspended-sediment and dissolved-solids discharge in the Upper Colorado River Basin decreased after 1940, while streamflow in the principal rivers did not significantly change. This decline followed a period of high sediment yield caused by widespread arroyo incision around the turn of the century. Field investigation of 57 channels reveals that significant amounts of sediment and salt are being stored in the lower and middle reaches of the ephemeral streams as the channels evolve toward a new condition of relative stability.

The amount of soluble minerals (salt) within the alluvium primarily reflects the surrounding drainage basin geology and soil types; concentrations are especially high in areas underlain by marine shales in Utah, New Mexico and Colorado. Soluble mineral concentrations average 1.2 percent, range between 0 and 23 percent by weight, and generally increase with depth within the alluvium and distance downstream. The highest concentrations are found at the ground surface (effloresence) and immediately above impermeable boundaries such as silty-clay layers within the valley alluvium or the alluvium/bedrock interface. Individually the salt concentrations may appear low; however, when integrated over the volume of sediment within the tributary networks, the channels are storing 10 to 20 times the annual dissolved-solids load in the Colorado River at Hoover Dam.

Large-scale atmospheric circulation patterns significantly control streamflow within the basin and anomalously high (or low) discharges can be spatially correlated over hundreds of kilometers. Anomalously low annual mean discharges in southwestern Wyoming are positively correlated with the Central North Pacific (CNP) index, suggesting that streams in this region may be strongly influenced by the strength of the Aleutian Low in winter. Streamflow and dissolved-solids records in northern Arizona, northwestern New Mexico, and southwestern Colorado are negatively correlated with the Southern Oscillation Index (SOI), suggesting that these streams experience greater than normal discharges during years with strong El Nino-Southern Oscillation conditions. Streamflows and dissolved-solids discharges in east-central Utah and west-central Colorado are not significantly correlated with either climatic index.