Hidalgo-Leon, H. 2001. Tree-ring reconstructions of hydroclimatic variability in the Upper Colorado River Basin. Ph.D. dissertation. University of California, Los Angeles. 136 pp.

Three major sources of improvements in tree-ring analysis and reconstruction of hydroclimatic variables are presented for the Upper Colorado River Basin (UCRB) in the southwestern U.S.: (1) Cross validation statistics are used for identifying optimal reconstruction models based on different alternatives of PCA-based regression. Results showed that a physically-consistent parsimonious model with low mean square error can be obtained by using strict rules for principal component selection and cross validation statistics. The improved methods were used to produce a _500 year high-resolution reconstruction of the UCRB's streamflow and compared with results of a previous reconstruction based on traditional procedures. (2) Tree-species' type was found to be a factor for determining chronology selection from dendrohydroclimatic models. The relative sensitivity of six tree species (Pinus edulis, Pseudotsuga menziesii, Pinus ponderosa, Pinus flexilis, Pinus aristata , and Picea engelmanni) to hydroclimatic extreme variations was determined using contingency table scores of tree-ring growth (at different lags) against hydroclimatic observations. Pinus edulis and Pseudotsuga menziesii were found to be the species most sensitive to low water. Results showed that tree-rings are biased towards greater sensitivity to hot-dry conditions and less responsive to cool-moist conditions. Resulted also showed higher streamflow response scores compared to precipitation implying a good integration and persistence representation of the basin through normal hydrological processes. (3) Previous reconstructions on the basin used data extending only up to 1963. This is an important limitation since hydroclimatic records from 1963 to the present show significantly different variation than prior to 1963. The changes are caused by variations in the strength of forcing mechanisms from the Pacific Ocean. A comparative analysis of the influence of North Pacific variation and El Niño/Southern Oscillation (ENSO) showed that the responses of Tropical and North Pacific forcing in UCRB's hydroclimate are different for annual precipitation and total streamflow and that these relationships have changed at decadal time scales. Furthermore, most of the few tree-rings available up to 1985, present the same shifts as the hydroclimatic variables studied. To capture the full range of variability observed in instrumental data is necessary to collect new tree-ring samples.