APPENDIX 3 – DETAILS OF RECONSTRUCTION MODELING

This appendix consists of eight sub-appendices (3A-3H) with individual summaries of the reconstruction models for each of the eight gages. Gages A-H are as follows:

A: Colorado River at Lees Ferry
B: Salt+Verde+Tonto Rivers
C: Gila River at head of Safford Valley
D: Green River at Green River, Utah
E: Colorado River near Cisco, Utah
F: San Juan River near Bluff, Utah
G: Salt+Tonto Rivers
H: Verde River

The reconstruction for any given gage was done using sub-period reconstruction model to allow the reconstruction to take advantage of the increasing tree-ring site density with time. The "M1" model has the earliest tree-ring data and is aimed at capturing the flow variation back to the late A.D. 1200s. The "M2" model targets the late-1500s drought, and the "M3" model targets the drought of 1660s. Typically the number of sites is greatest in the "M3" model and least in the "M1" model. The sub-period models might also differ in strength of statistical signal for runoff. Separate reconstructions for each gage were generated by the three sub-period models. Time coverage by a sub-period reconstruction is of course limited to the common period of the tree-ring chronologies in the model. A final reconstruction was generated by merging the sub-period reconstructions with the following rule: the final reconstruction in year t is taken from the most accurate sub-period model with data for year t. Accuracy was judged by the root-mean-square error of cross-validation of the model. The final reconstruction for a gage is therefore merged from any combination of one or more of the sub-period reconstructions. For example, if the "M1" model, with longest time coverage, is also the strongest statistically, the entire final reconstruction is from the "M1" model. On the other hand, if the "M1" model is second in accuracy to the 'M3" model, the early part of the reconstruction is from "M1" and the later part from "M3."

Each of the appendixes 3A-3H has 3 figures and a variable number of tables. Figure numbers and table numbers include the gage letter and sub-period (if applicable). For example, Table 3H_M2_4 refers to Table 4, gage H, sub-period model 2.

Each appendix has three figures: (1) a map showing the tree-ring site locations for each sub-period reconstruction model actually used in the final reconstruction, (2) time series plots of observed and reconstructed runoff for the calibration period for each sub-period model used, and (3) a time series plot of the final, merged, long-term reconstructed runoff and its 50% confidence interval,

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Each appendix also has a summary table with statistics for all sub-period models used in the final reconstruction, and a sequence of four tables for each sub-period model used:

1. Table listing tree-ring chronology names, locations, species, time coverage, and persistence as modeled by autoregressive modeling.
2. Table summarizing regression models used to scale the individual chronologies into estimates of runoff. These scaled chronologies are referred to as "single-site reconstructions".
3. Table summarizing the stepwise multiple linear regression of runoff on the principal-component scores of the single-site reconstructions from step (2) above. This table is truncated at the final step in the stepwise regression – the last row corresponds to the actual sub-period model used for the reconstruction.
4. Table indicating relative importance of each chronology to the principal components of tree-ring index and to the runoff reconstruction.