Green River Water Rights Distribution Model

Model Building and Calibration Assumptions

Important major assumptions used in the Green River MODSIM model are described below.

The model assumes that current demands are a representation of historical beneficial uses and that water demand distribution schedule for each demand node remains the same from one year to the next. Daily demand curves were computed outside the model using an excel spreadsheet. Irrigation demands are based on current irrigated acreages, estimated depletion (consumptive use), and irrigation duty.

Travel times and routing along the river are not explicitly modeled. Thus any lagging in streamflow that occurs for periods longer than a day is assumed to be implicitly included in the gains and losses calculation through differences in gaged flows for successive gaging stations. That is, as flows pass through individual gages during successive days the calculated gains and losses account for the differences in streamflow and thus the difference in timing of the flows at each gage.

Channel losses and evaporation on the stream which are expected to vary with changes in streamflows are assumed to be part of the ungaged losses used during the calibration process of the model.

It is assumed that the selected hydrologic period of analysis (1970 to 2000) and computational time interval is a good representation of periods of wet and dry hydrologic stages. The period of analysis is being extended to the year 2005.

Every link in a network flow model is required to have a predetermined flow direction with flows restricted by a lower and upper bound. In the Green River model the lower bound on a demand node is usually zero with the exception of instream flow requirements. The upper bound is set to the corresponding total seasonal capacity (volume limit per year in acre-feet) of each water right to ensure that the diversions do not exceed the acre-feet duty limit. Although the capacity of diversion structures delivering the flow dictates the maximum possible total delivery to particular diversion points, the model spatially groups demand nodes and thus does not constrain the links by the channel's physical capacities.

Demands are satisfied either by natural flow or direct flow rights or by storage right contracts from reservoirs. Storage rights and storage volume targets are not explicitly modeled; therefore water in the streams is considered natural flow that could be diverted for beneficial use.

The model apportions the available supply based on priority, i.e. the diversions are satisfied in priority based upon the date of appropriation of the water right. Priority dates are used by the model to allocate and distribute river flows among competing demands. The amount of water diverted by a particular demand node is constrained by the actual water rights links in the model. All approved and perfected surface water rights along the Green River from Flaming Gorge to the confluence of the Colorado River were tabulated and analyzed for input into the model. The model does not include water rights on tributaries.