



TR-340

Extending and Condensing the Brazos River Basin Water Availability Model

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The Water Availability Modeling (WAM) System developed and maintained by the Texas Commission on Environmental Quality includes the generalized Water Rights Analysis Package (WRAP) simulation model and WRAP input datasets for all of the river basins of Texas. This report documents an investigation that consisted of developing, testing, and applying procedures for (1) extending WAM hydrology datasets to cover a longer period-of-analysis and (2) condensing WAM water right datasets to focus on a particular water management system while reflecting the effects of all other water rights in the stream flow inflows. The WRAP computer programs HYD and SIM were expanded to provide the necessary computational capabilities. The procedures were applied to the WRAP input dataset for the Brazos River Basin from the Texas WAM System (Brazos WAM). The modeling methods developed are applicable to other river basins as well.

The Brazos WAM has a 1940-1997 hydrologic period-of-analysis. The research included developing and applying methods to extend the period-of-analysis to 1900-2007 providing a better representation of river basin hydrology. The 1998-2007 extension included adjusting observed flows at gaging stations to develop sequences of monthly naturalized flows and then distributing the naturalized flows to ungaged sites. A new methodology was developed for converting gaged flows to naturalized flows utilizing water management/use information available in the WAM System supplemented with additional observed data. Available gaged stream flows compiled in a previous study were adopted without naturalization adjustments to extend the hydrologic period-of-analysis to cover the period 1900-1939. Monthly flows for 1900-1939 were synthesized for ungaged sites. The impacts on simulation results of lengthening the hydrologic period-of-analysis from 1940-1997 to 1940-2007 and 1900-2007 were evaluated.

The Brazos WAM has 3,830 control points, 670 reservoirs, and hundreds of water rights. The research included developing and applying methods to create a much easier-to-apply condensed dataset with only 48 control points

and 14 reservoirs that is focused on a reservoir system operated by the Brazos River Authority and associated water rights. The effects of all of the numerous other reservoirs and water rights in the river basin are incorporated in the stream flow inflows at the 48 selected control points while properly maintaining the priority system reflected in the water right permits. A comparison of simulation results obtained with the condensed versus full WAM datasets confirms that the methodology does properly preserve the effects of the numerous water rights, reservoirs, and control points removed from the WAM dataset in creating the condensed dataset. Modeling applications and issues are explored.

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