COOPERATIVE ECOSYSTEM STUDIES UNITS
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CESU Final Report Summary for
Development of Riverware Model of the Rio Grande for Water Resources Management in the Paso del Norte Watershed - *W912HZ-10-2-0038*

Purpose: The scope of work of this project covers two main objectives. (1) Collection and compilation of necessary data and performance of analyses to expand the URGWOM RiverWare® Model for Water Operations in Mesilla Basin. The model is developed to cover water operations in the Mesilla Basin and includes the proper physical layout of diversions, reaches, crop and riparian depletions, groundwater sub basins, drains, canals, etc., with an emphasis on surface and groundwater interaction, compiling and managing appropriate data, and simulate river flow and water operations planning as well as conjunctive management scenarios for Rincon and Mesilla Valleys. (2) Collection and compilation of necessary data and performance of analyses to expand the URGWOM RiverWare® Model to Simulate Flows and Water Operations Planning for the El Paso Lower Valley. The model is developed to cover the reaches between El Paso and Fort Quitman and includes the proper physical layout of diversions, reaches, crop and riparian depletions, groundwater sub basins, drain, canal, etc., compiling and managing appropriate data, and simulate river flow and water operations planning scenarios for entire Rio Grande Project area (Caballo Dam, NM to Fort Quitman, TX). This report includes three parts, covering (I) Rincon Valley and Mesilla Basin RiverWare model, (II) El Paso-Juarez Valley RiverWare model; (III) Hydrologic Modeling of Main Tributaries to Estimate Runoff Potential into the Rio Grande-Rio Bravo at Irrigation District 009 Valle de Juarez.

Location: Rincon Valley and Mesilla Basin of the Lower Rio Grande (Texas, New Mexico, Mexico).

Methods: Part I of this report includes configuration of two RiverWare models for the Rincon Valley and Mesilla Basin (RV&MB). These models used groundwater objects to simulate surface-water/groundwater interaction within the valley by incorporating regional groundwater flow model (MODFLOW) results to define the deep aquifer hydrologic conditions. Part II of the report presents the El Paso-Juarez Valley (EP-JV) RiverWare model. In this phase, a conceptual model was developed for the reaches between El Paso and Fort Quitman, Texas. The conceptual (EP-JV) model incorporated key features, the Rio Grande reach between El Paso and Fort Quitman, major canals and drains, key diversion points for water delivery within three irrigation districts as well as water supplies for the City of El Paso. Part III of this report presents the results of a hydrologic modeling of most important tributaries connecting with the main stream of Rio Grande-Rio Bravo at Irrigation District 009-Valle de Juarez. Twelve main subwatersheds were identified, out of which three were classified as urban subwatersheds and nine were classified as rural-rangeland subwatersheds.

Results: In RiverWare, model configurations for both Rincon Valley and Mesilla Basin, the river reaches were divided based on the length of reach and shape of river reach, as well as locations of gaging stations. Groundwater objects have been used to simulate exchange of groundwater in the shallow aquifer and surface water. Further refinement and integration will help us better characterize hydrological process within both areas. In future phase of this project, the following improvements are recommended.

1. Combine two models within the Rincon Valley and Mesilla Basin. The model will be integrated with the model for the El Paso-Juarez Valley presented in Part II of this report to cover entire Rio Grande Project area. The integrated model is expected to link with RiverWare model that have been developed for the Rio Grande reaches above the Elephant Butte Reservoir.
2. To better calibrate the integrated model, more gaging stations with long-term historical flow data will be used to calibrate the model.
3. To better simulate groundwater and surface interaction, the simulated seepage losses will be verified with seepage measurements to further validate hydraulic conductivity values of the riverbed and drain bed. In addition, impacts of groundwater pumping on such interactions will also be evaluated. Impacts of seepage losses from the canals will also be evaluated.
4. Surface return flows and deep percolation from irrigation will be further evaluated so that drain flows and impacts of irrigation on groundwater storage can be better understood. Groundwater objects will be further refined to better simulate the relationship between the shallow aquifer and deep aquifer as well as lateral regional hydrological boundary conditions simulated by MODFLOW models.
5. Crop acreage and crop consumptive uses including riparian vegetation will be incorporated to better simulate consumptive uses of water within the basin.
6. Different diversions patterns, for example, low flow/drought conditions, will be further evaluated based on conjunctive uses of groundwater and surface water. Different routing methods and travel time lags will be further evaluated. It is anticipated that different water operations planning scenarios based on water operations agreement, Rio Grande Compact and US-Mexico Treaty, and/or other policy can be evaluated by the integrated RiverWare model.

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CESU: Gulf Coast