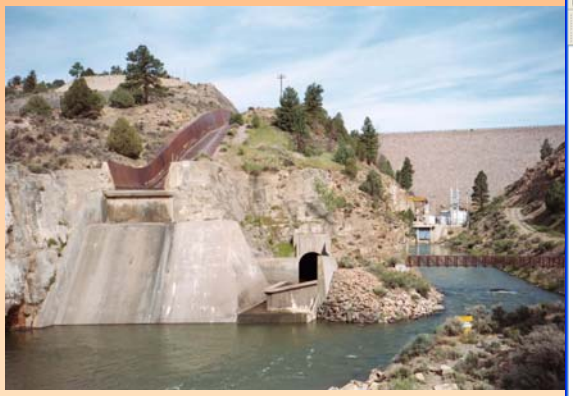
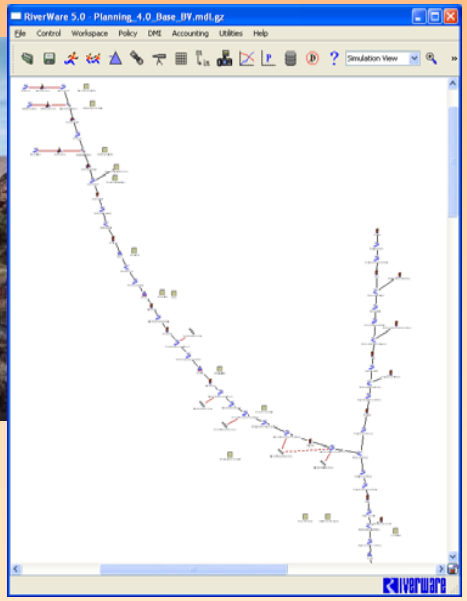
Upper Rio Grande Water Operations Model (URGWOM) Runs for the Middle Rio Grande Endangered Species Act Collaborative Program





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URGWOM Technical Team

2008 RiverWare User Group Meeting

Upper Rio Grande Basin

System from Colorado state-line to Texas state-line modeled with URGWOM

including the Rio Chama and San Juan-Chama Project diversions

Middle Rio Grande

Upper Rio Grande Basin

Middle Rio Grande Endangered Species Act Collaborative Program

- Partnership involving 20 signatories organized to protect and improve the status of endangered species
  - Rio Grande silvery minnow
  - southwestern willow flycatcher

  along the Middle Rio Grande while simultaneously protecting existing and future regional water uses.

Need for Pending Study

- There is concern over the ability to meet the 2003 Biological Opinion (BO) with the decreasing amount of available water.

- Amount of San Juan-Chama Project water available for lease will decrease significantly from ~50,000 acre-ft/year to ~8,000 acre-ft/year as Albuquerque starts up new surface water diversions.

Model Runs

- Collaborative Program is leading the effort to study different scenarios.

- In addition to remaining potential leases, other contributions from stakeholders, or tools, for meeting targets and other flow needs will be analyzed such as the following:
  - Relinquished Compact Credits,
  - Cochiti Deviations,
  - Waivers for San Juan-Chama Project Water at Heron.

Impacts to Silvery Minnow Population

- Results from runs completed with the Planning Model will be used as inputs for the Population Viability Analysis (PVA) model for the silvery minnow.

- Impacts of contributions/tools on the survivability of the minnow to be analyzed for identifying the long-term effect on the population of the silvery minnow.

  ➔ Annual Timestep Population Model

Silvery Minnow Population Model

$$\begin{bmatrix} N_0(t+1) \\ N_1(t+1) \end{bmatrix} = \begin{bmatrix} F_0 & F_1 \\ S_1 & 0 \end{bmatrix} \begin{bmatrix} N_0(t) \\ N_1(t) \end{bmatrix}$$

N_0 = number of age 0 minnows (0 – 12 months)

N_1 = number of age 1 minnows (12 – 24 months)

fecundity = maternity * survivability

$F_0 = m_0 S_0$ $\qquad$ $F_1 = m_1 S_0$

➔ $N_0(t+1) = F_0 * N_0(t) + F_1 * N_1(t)$

$N_1(t+1) = S_1 * N_0(t) + 0$

➔ $TotalPopulation(t+1) = F_0 * N_0(t) + F_1 * N_1(t) + S_1 * N_0(t)$

$TotalPopulation(t+1) = TotalPopulation(t) * \lambda$

Analysis of Results

- Impacts on various indicators to be evaluated:
  - Flows at Target Locations for ESA Interests
    - Additional Water Needed for Predefined Targets Unlimited Supply Modeling
  - River Drying
  - Occurrence of Recruitment Flows
  - Compact Credit
  - Deliveries
  - Depletions in the Basin

Model Needs for Study

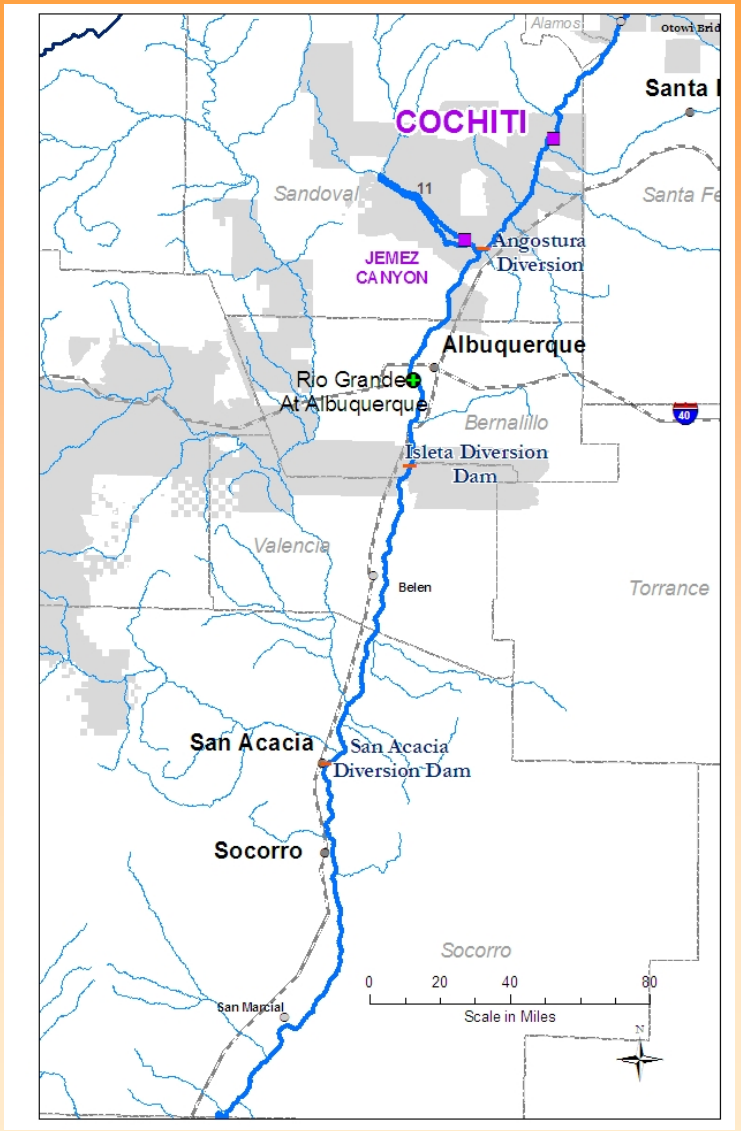
- Needs in regards to the capabilities of the Planning Module of URGWOM, and recent work, are currently driven by the needs for this study.

Model Needs and Recent Work

- Middle Valley Rework

System in Middle Valley

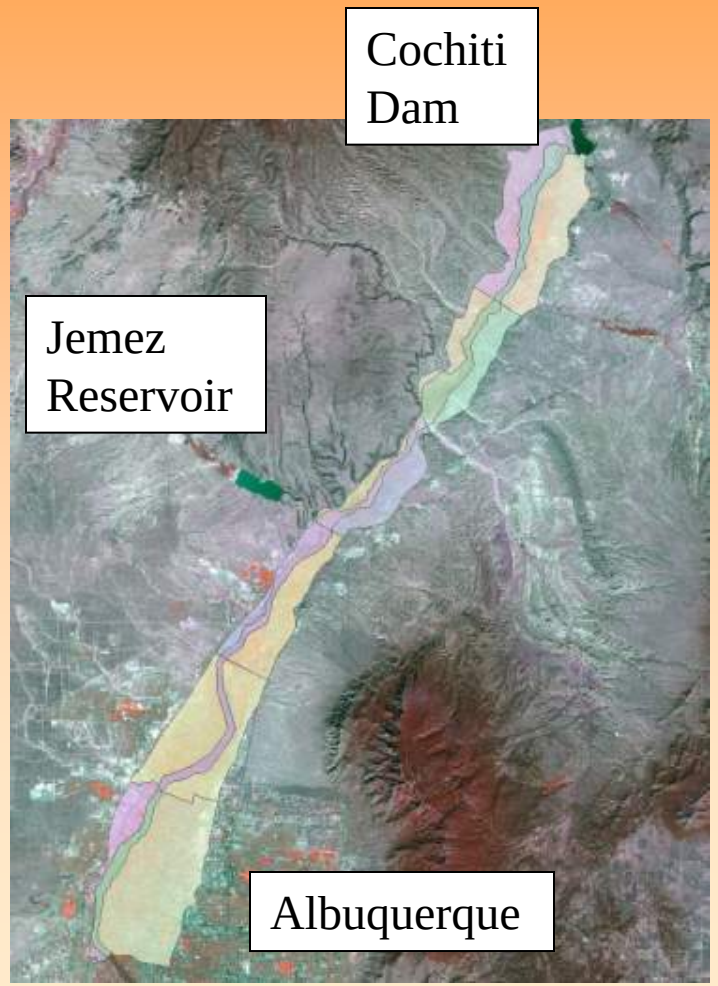
- River Channel;
- Riparian Vegetation;
- Riverside Drains, Levee and Irrigation System.



Groundwater Reaches

- Middle Rio Grande is divided into 21 separate groundwater reaches along the following six river reaches:
  - Cochiti to San Felipe
  - San Felipe to Central
  - Central to Isleta
  - Isleta to Bernardo
  - Bernardo to San Acacia
  - San Acacia to San Marcial
- Sub-reaches ~ 5 to 7 miles long
- 3 groundwater areas for each reach.
  - east of the river, below the river, and west of the river

➔ 63 cells



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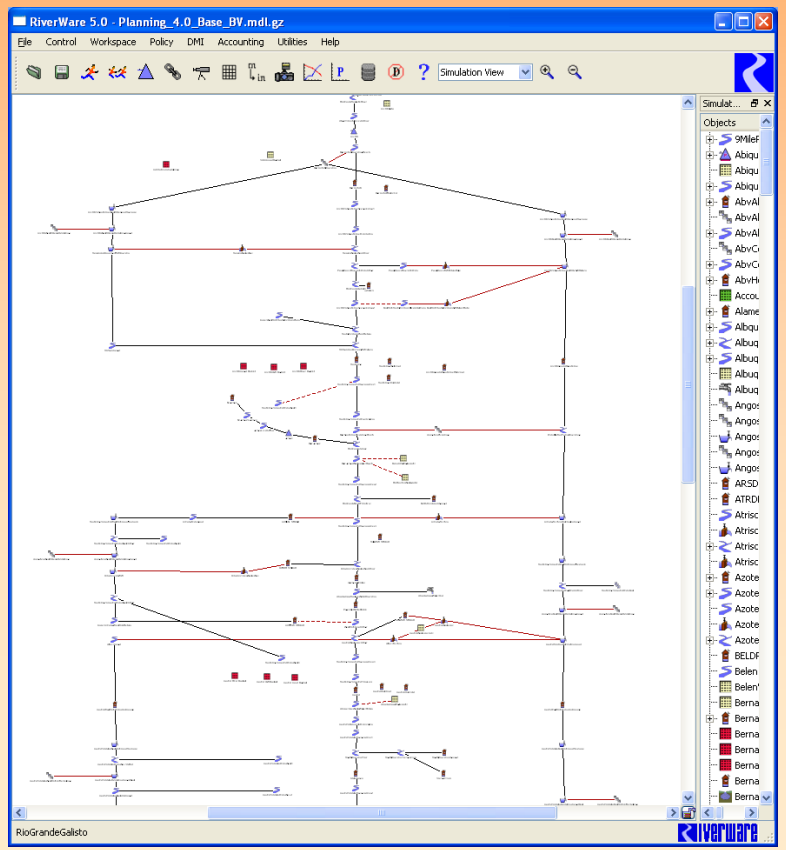
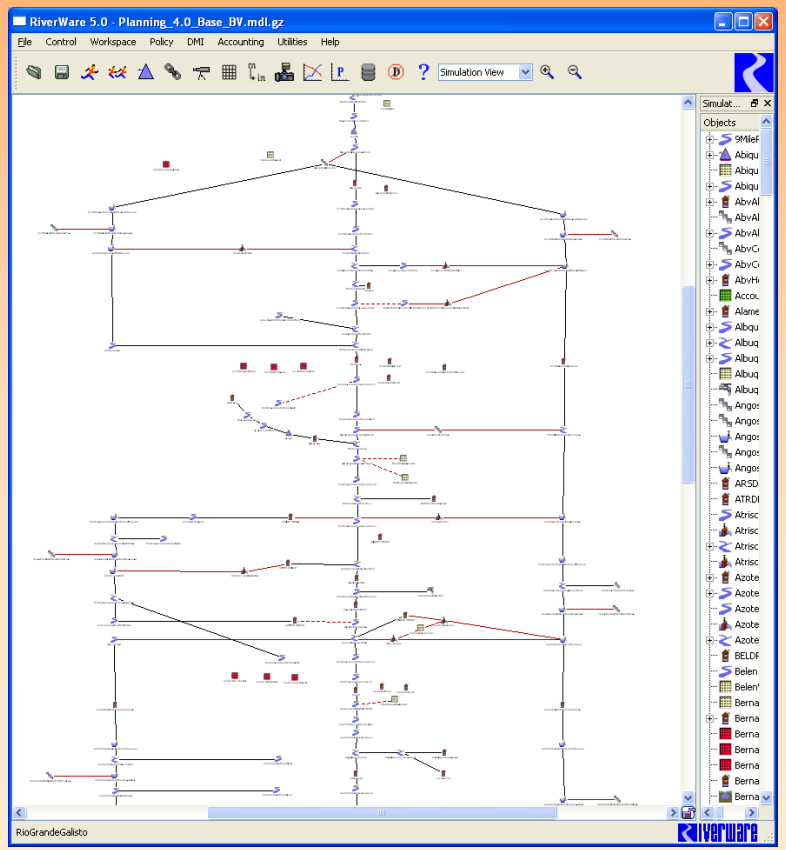


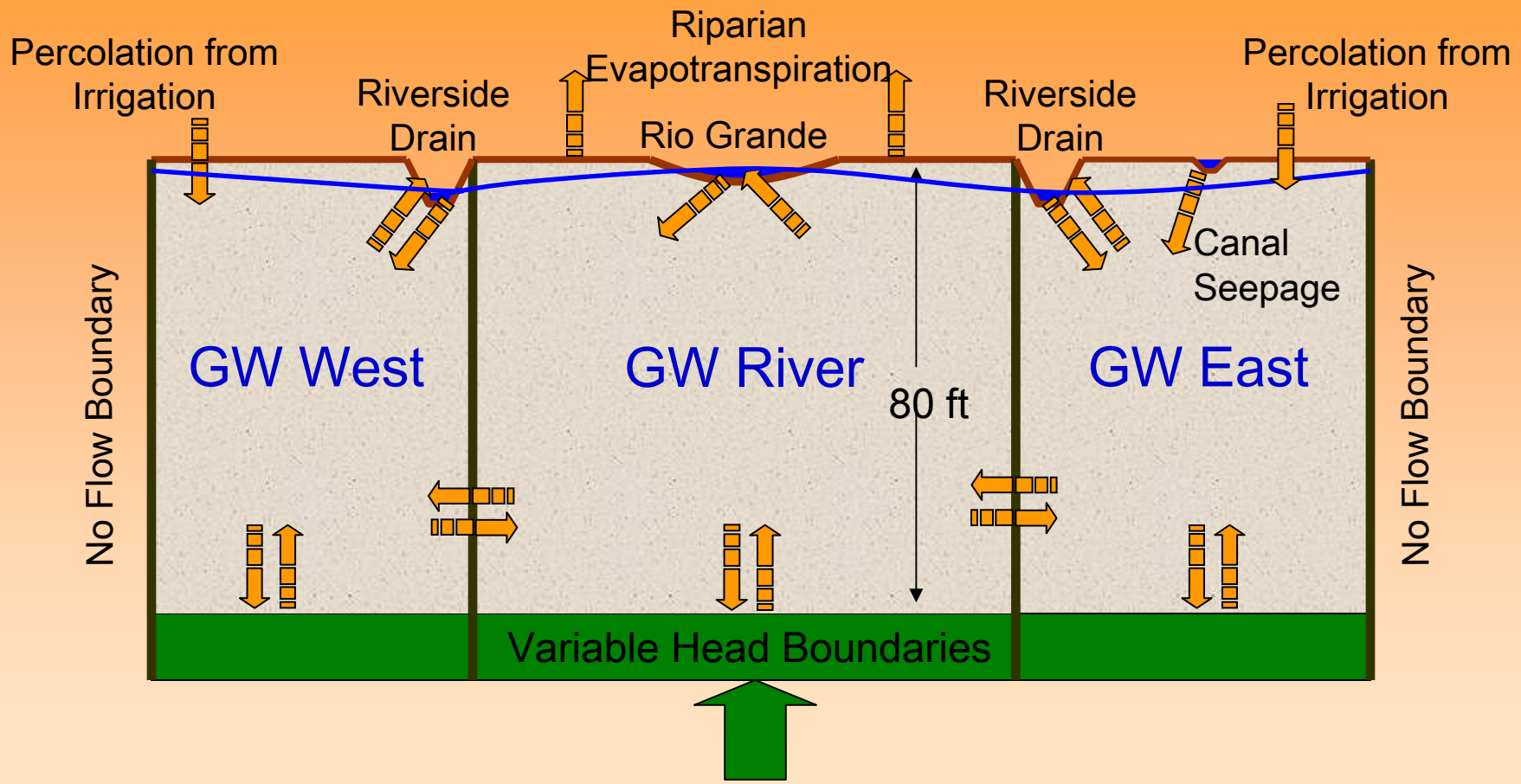
Groundwater Reaches

- Rough discretization of shallow aquifer

➔ Physically based representation of shallow aquifer in model for computing fluxes between shallow aquifer and river (and drains)



Groundwater-Surface Water Interaction



Model Needs and Recent Work

- Middle Valley Rework
  - Incorporated into URGWOM
  - Companion MODFLOW Runs
- DSS Direct Connection
- Database Update
  - Update to DSS Files about Finished
  - References to ET Toolbox Data
  - Includes New Updates Required for the Middle Valley Rework
- New Synthetic Sequences
  - New sequences developed to produce wet spells and drought spells evident in tree ring data.
  - 10-year sequences to be selected with consideration for other parameters in addition to inflow volumes.
- Rules Work for Contributions/Tools to be Analyzed
  - Assumptions still being defined.

Schedule

- Albuquerque surface water diversions will commence next year.
- Model runs and analysis to be completed over the fall.