

Ventura River Integrated Groundwater/Surface Water Model

Ventura County, California

CLIENT

California State Water Resources Control Board,
Los Angeles Regional Water Quality Control Board

HIGHLIGHTS

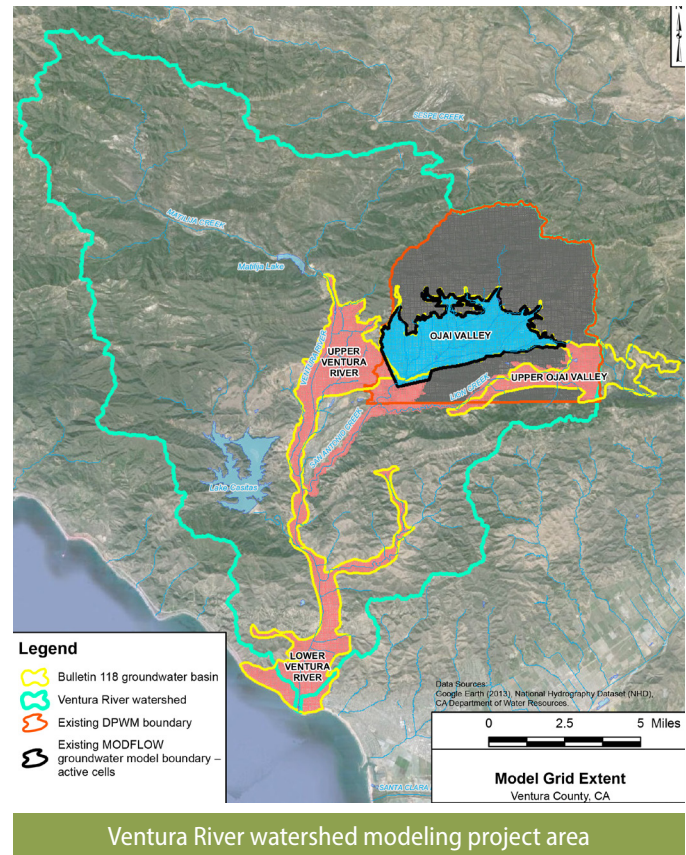
- Using MODFLOW-NWT to develop GSFLOW groundwater portion of integrated groundwater/surface-water model and participating in GSFLOW calibration
- Model will allow the state to estimate instream flows under scenarios with and without groundwater extraction and diversions
- Model will support TMDL-required nitrogen analyses and source assessment

The Ventura River was designated by the California State Water Resources Control Board (State Water Board) Instream Flow Unit as one of five priority stream systems under the California Water Action Plan for enhancement of instream flow to support critical habitat for anadromous fish. Daniel B. Stephens & Associates, Inc. (DBS&A), a wholly owned subsidiary of Geo-Logic Associates, is part of a team developing an integrated groundwater/surface water model of the Ventura River watershed that will assist the State Water Board in establishing instream flows that support critical habitat. Objectives of the model include:

- Representation of water use and other human activities that impact instream flows
- Estimation of instream flows under scenarios with and without groundwater extraction and diversions

In addition, the model supports the Los Angeles Regional Water Quality Control Board by refining information related to nitrogen source assessment and load allocations for agriculture and other sources identified in an existing Total Maximum Daily Load (TMDL) regulation that contribute to algae and eutrophic conditions in the Ventura River, and its estuary and tributaries.

DBS&A led the development of the groundwater portion of the model using the U.S. Geological Survey (USGS) Newton-Raphson formation for MODFLOW (MODFLOW-NWT), which was integrated with surface water flow using the USGS Groundwater and Surface water FLOW model (GSFLOW). DBS&A previously developed a numerical groundwater model of the Ojai Valley portion of the watershed. We built on that effort by extending the model domain to the Ventura River and Upper Ojai groundwater basins and stream-bed alluvium that connects the basins.



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Model development includes:

- Geologic evaluation of alluvium extent and thickness
- Representation of pumping from agriculture and municipal wells including estimating pumpage for wells without historical records
- Establishment of boundary conditions representative of recharge from deep percolation of precipitation, irrigation, and septic systems
- Riparian evapotranspiration
- Flow between groundwater and stream channels
- Groundwater exchange between alluvium and bedrock geologic units
- Groundwater inflow/outflow to the Pacific Ocean

The integrated model is calibrated to historical groundwater elevation data collected by Ventura County on a quarterly basis from a network of private wells, and to available surface water gage data for water years 1995 through 2015. In addition, nutrient loading and groundwater transport will be simulated (MT3D-USGS) and the model will be calibrated to available groundwater nitrate data.