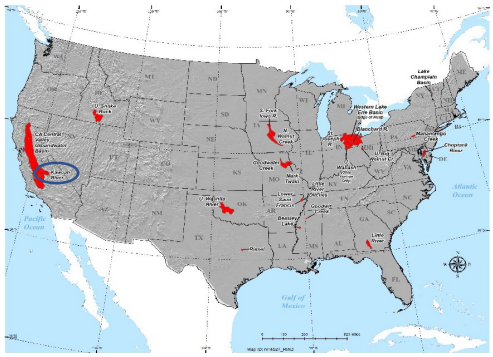
Kaweah River Watershed

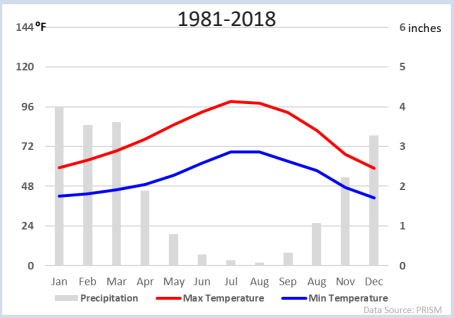


A Conservation Effects Assessment Project (CEAP) Watershed Assessment Study: A collaboration between the University of California–Riverside, the Natural Resources Conservation Service, and the Agricultural Research Service

Location

The 1,550-mi^2 Kaweah River Watershed on the western slopes of the southern Sierra Nevada in California extends to the agricultural regions of the Tulare basin in the Central Valley.

Temperature and Precipitation



Major land uses

Cropland: Citrus, fruit and nuts, grapes.
Grassland: Pasture and hay.
Forest: Evergreen needle leaf and mixed conifer forests.

Data collection

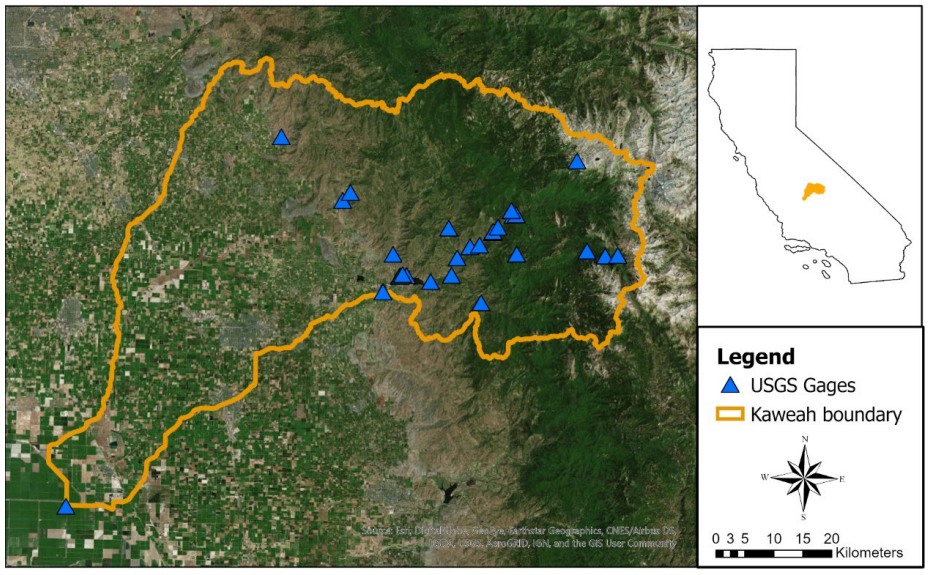
Since 1901, USGS stream gauges across the basin measure daily discharge. Hourly meteorological variables (precipitation, temperature, atmospheric pressure, wind speed, specific humidity, and solar radiation) are available from North American Land Data Assimilation System project phase 2 (NLDAS-2) (Xia et., 2012). Daily precipitation data is from the Parameter elevation Regression on Independent Slopes Model (PRISM) at 4 km resolution. The Kaweah Basin Water Quality Association and Kaweah Delta Water Conservation District have monitoring programs for surface water and groundwater quality and quantity.

Concerns

Groundwater pumping in the Kaweah watershed has caused significant overdraft. Therefore, efforts are underway to improve conjunctive water-use in the watershed and build more recharge basins for managed aquifer recharge. A major uncertainty in quantifying groundwater availability on the eastside of the Central Valley is recharge at the mountain front that supply water to the agricultural lands of the valley floor. Furthermore, limited knowledge is available on the impacts of on-farm irrigation practices and infiltration ponds on groundwater recharge in irrigated agricultural lands.

Main conservation practices used

A number of conservation practices are already used in the watershed. The Terminus Dam and Reservoir at the mountain front was built in 1962 for flood control and irrigation water storage. Recharge basins are also constructed in the valley floor for managing aquifer recharge and reducing groundwater overdraft. Deficit irrigation has been recommended as a conservation practice to reduce water use while maintaining the same level of crop productivity. We will assess the impact of deficit irrigation using simulation scenarios.



Kaweah River Watershed

Planned Research

Plot and field scale

- Transducers will be installed at selected existing wells in the watershed above mountain front to periodically monitor groundwater levels. These data will help to constrain mountain front recharge estimates and accurately close the basin water budget.
- Measured evapotranspiration estimates will be obtained from two towers that will be installed in the citrus orchards.
- These data along with recent streamflow and groundwater observations will be used for validating the hydrologic model of the study watershed.

Clockwise from top: Citrus groves in the watershed, Lake Kaweah is at the intersection of mountain front and valley floor, Marble Fork of Kaweah River in the mountains.

Watershed scale

- An integrated groundwater-land surface model (ParFlow.CLM) will be set up for the Kaweah watershed to estimate groundwater recharge on the agricultural lands below Lake Kaweah under actual and simulated irrigation and recharge practices.
- When possible, remotely sensed evapotranspiration and snow water equivalent data will be used for model evaluation.
- By simulating surface water/groundwater interactions in a fully integrated manner, valuable information regarding the watershed water balance and conjunctive surface water/groundwater use will be obtained.

Modeling Scenarios

- Deficit irrigation is a potential means of water conservation, especially for permanent crops in water-starved arid and semi-arid regions such as the California Central Valley.
- We perform model simulations by applying irrigation at 100% and 75% crop evapotranspiration to represent actual and deficit irrigation scenarios, respectively to assess their impacts on groundwater recharge.
- To assess the impacts of recharge from infiltration ponds, two scenarios will be used in model simulation: 1) recharge from existing infiltration ponds, and 2) recharge from existing plus 30% additional infiltration ponds.
- The Sustainable Groundwater Management Act (SGMA) in California was created to initiate sustainable conjunctive water-use management. The Kaweah River model provides a valuable tool to examine the impacts of various management decisions such as changes in groundwater pumping and land cover on streamflow and groundwater levels.

Collaborators and Stakeholders

Kaweah Delta Water Conservation District

Kaweah Basin Water Quality Association

Xia, Y. et al. (2012). Continental-scale water and energy flux analysis and validation for the North American Land Data Assimilation System project phase 2 (NLDAS-2): 1. Intercomparison and application of model products, *Journal of Geophysical Research* 117, D03109, doi:10.1029/2011JD016048.

More Information

CEAP Site Lead: Dong Wang, dong.wang@usda.gov
ARS website: ars.usda.gov NRCS website: nrcs.usda.gov
CEAP website: nrcs.usda.gov/wps/portal/nrcs/main/national/technical/nra/ceap/