Watershed Modeling in CASCaDE—Hydrologic Data Availability

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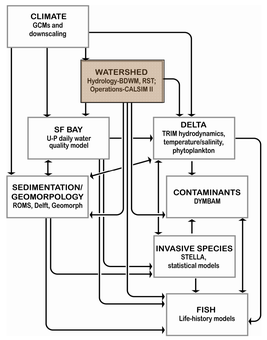
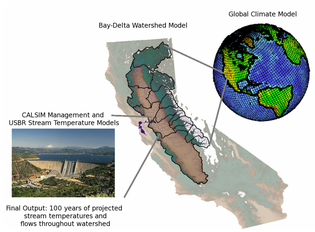
Description

CASCaDE is a multidisciplinary project in which a series of models are being used to assess potential effects of climate change on ecosystems in the Delta region which have been targeted for restoration by CALFED. The watershed modeling component of CASCaDE serves to translate downscaled climate data (see Dettinger poster) into managed streamflows and stream temperatures throughout the watershed for use by other CASCaDE components. This is done for each of four different climate scenarios. These data are also being made publicly available through the CASCaDE web site (see the URL at the bottom of this poster).





Two linked models are used to translate the downscaled global climate model outputs into managed flows. For each scenario, daily gridded precipitation and temperature data drive the Bay-Delta Watershed Model (BDWM), a distributed hydrological model spanning the entire watershed of the San Francisco Bay-Delta Estuary. The BDWM simulates snowpack and unimpaired runoff, among other quantities.

Inflows to the major reservoirs from the BDWM are in turn used to drive the CALSIM-II operations model.

CALSIM-II is a freshwater management optimization model developed and maintained by the California Department of Water Resources. It takes reservoir inflows as inputs and determines, at each time step, the set of freshwater management decisions that optimally meet the numerous management objectives inherent in this system such as flood prevention, freshwater deliveries, environmental flow requirements, and water quality control. The model simulates reservoir storage and releases for all major reservoirs, flows and freshwater deliveries in the Sacramento and San Joaquin valleys, and ultimately Delta inflows and outflows.

Additionally, the U.S. Bureau of Reclamation (USBR) has provided CASCaDE with a stream temperature model which is driven by CALSIM outputs. The USBR model simulates reservoir cold pool changes, temperature control device releases from reservoirs so equipped, and heat exchange with the atmosphere to determine downstream water temperatures. These stream temperature data are not shown on this poster, but they are used by other CASCaDE researchers to assess the effects of projected warmer climates on aquatic biology, and are available online.

This poster presents a sample of the data produced by the watershed modeling effort described above. The columns correspond to the four scenarios evaluated, and each row portrays a specific quantity. All quantities are presented as annual averages, though monthly data are available.

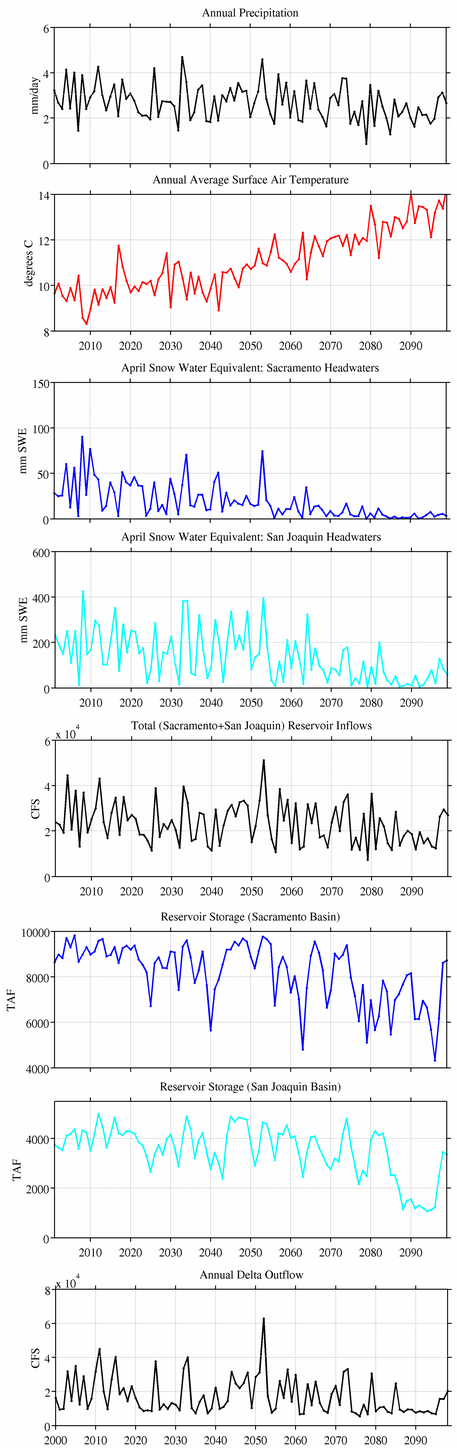
The data also represent spatial averages. Data portrayed as black or red represent averages over all of the headwater basins (i.e. the Sierra Nevada and Cascades). Dark blue and light blue represent averages over the northern and southern headwaters of the watershed, as indicated to the right.

This work was funded by the CALFED Science Program.

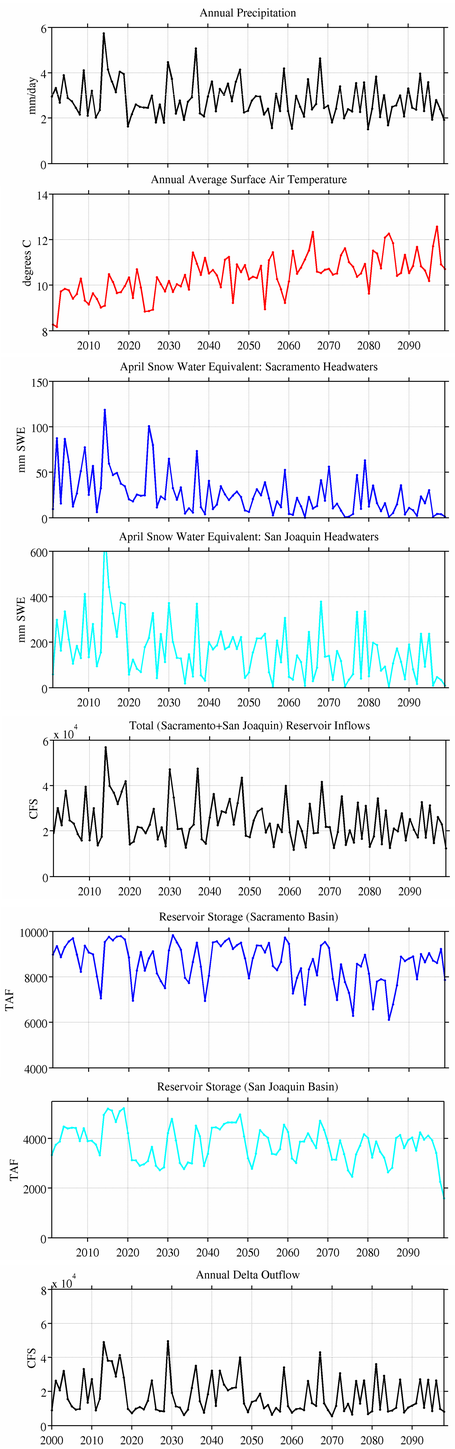
For questions regarding these data products, please contact Noah Knowles at *nknowles@usgs.gov*.

Hydrologic and Operations Data for Four Climate-Change Scenarios

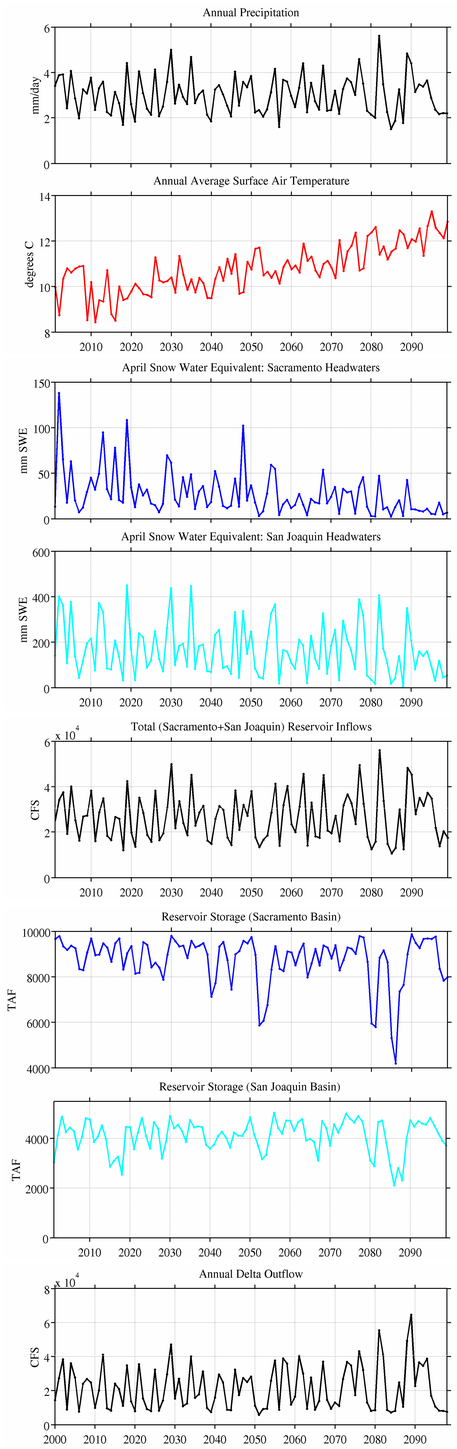
GFDL-A2



GFDL-B1



PCM-A2



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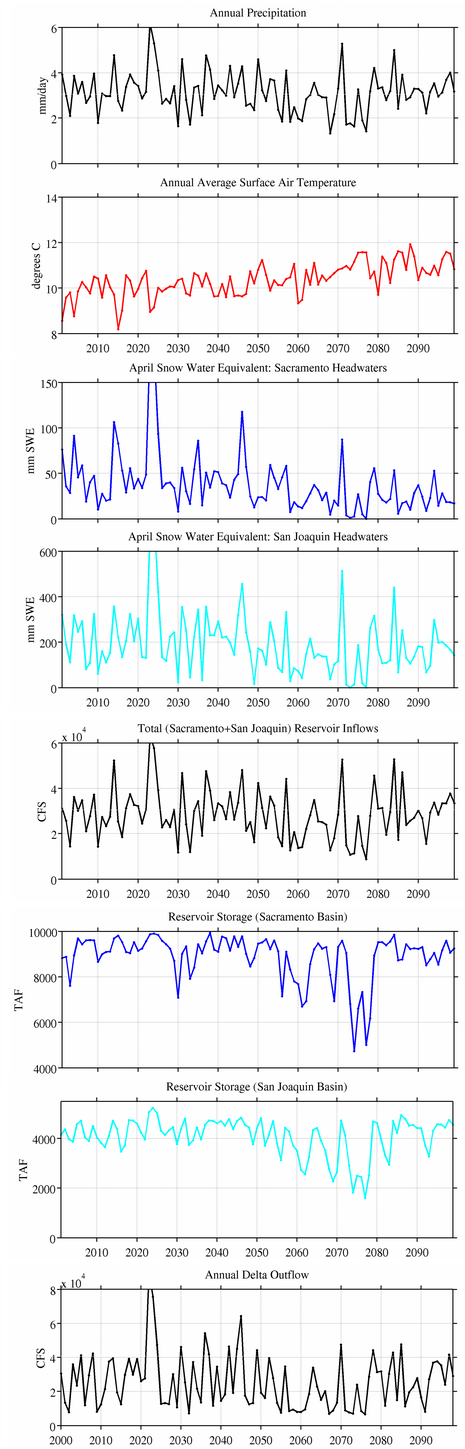

All hydrologic data are available at http://cascade.wr.usgs.gov/data/Task2-Watershed