Climate and Water Supply in the Santa Ana River Watershed

SAWPA

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

Key Findings

- Annual surface water is likely to decrease over the future periods.
- Precipitation shows somewhat-long term decreasing trends.
- Temperature will increase, which may cause increased water demand and reservoir evaporation.
- April 1st SWE will decrease.

Results

Will surface water supply decrease?

Change analysis between the base reference period (1990s) and three future periods (2020s, 2050s, 2070s) was conducted for precipitation, temperature, April 1st Snow Water Equivalent (SWE), and flow at 36 sites throughout the basin. Figure 1, a summary at the Prado Dam Gage, shows the ensemble median change for precipitation is likely to increase by <1% over the basin during the 2020s, followed by a 5% in the 2050s, with increased decline through the 2070s (8%). Temperature ensemble median changes for the 2020s, 2050s, and 2070s show increasing temperatures throughout of 1.22°F, 3.11°F, and 4.10°F respectively. Spatial distribution of April 1st SWE shows a persistent decline through the future decades at 39% for 2020s, 80% for 2050s, and 93% for the 2070s.

Figure 2 shows annual seasonal streamflow impacts at Prado Dam Gage. The 2020s show an increase in annual runoff and winter runoff, while spring runoff will likely decrease. The 2050s and 2070s show a decrease in annual, winter, and spring runoff.

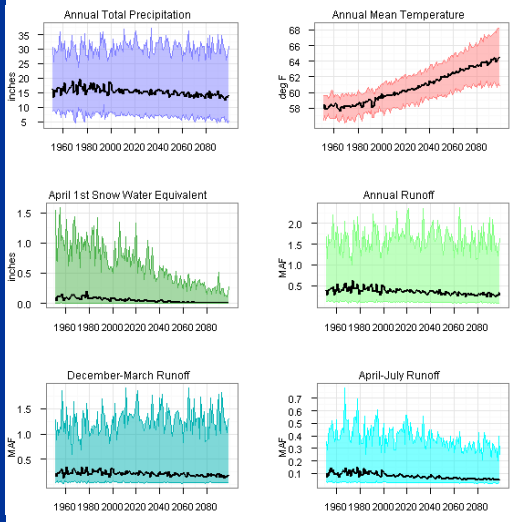

Figure 1 - Hydrology projections at Prado Dam Gage for P, T, SWE., and Flow, solid line is median, 5th and 95th percentile bounds

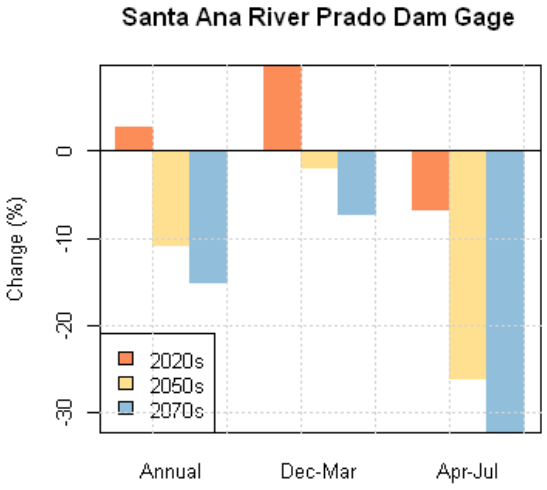

Figure 2 - Annual and seasonal streamflow impacts at Prado Dam Gage

Additional Considerations

- VIC was an existing model and no refinements were made for this analysis.
- The model is calibrated to reproduce monthly to annual runoff in large sub-basins.
- These models have biases, and are best used for relative change.

Methods

The Variable Infiltration Capacity (VIC) model was used to project streamflow for 112 different climate change projections. Daily precipitation, minimum temperature, maximum temperature, and wind speed came from the BCSD-CMIP3 archive. Modeled historical data from 1950-1999 came from Maurer et al. 2002, and subsequent extensions. For each grid cell daily forcings start on January 1, 1950 and run to December 31, 2099. Flow direction files and fractions were developed on a 1/8° x 1/8° (~12 km x 12km) grid. Through coordination with SAWPA key locations in the basin were determined, so that sub-basins could be delineated. Change factors were developed by calculating decade mean total precipitation and temperature, then calculating percent change, and finally calculating the median change for all the 112 projections.

Link to full technical report—http://www.usbr.gov/lc/socal/basinstudies/OWOW.html