

# Adaptation Planning for Climate Change Impacts using Advanced Decision Support and Remote Sensing: Irrigated Agriculture in California's Central Valley

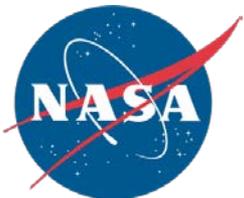
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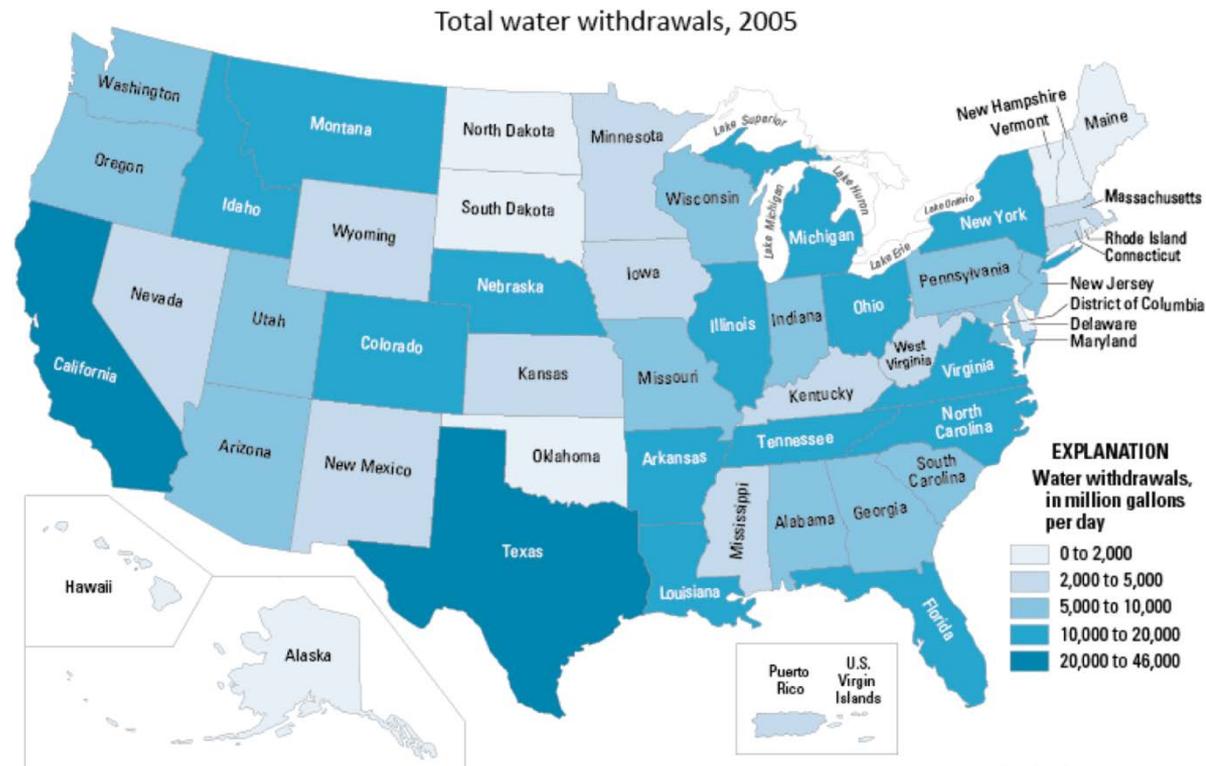
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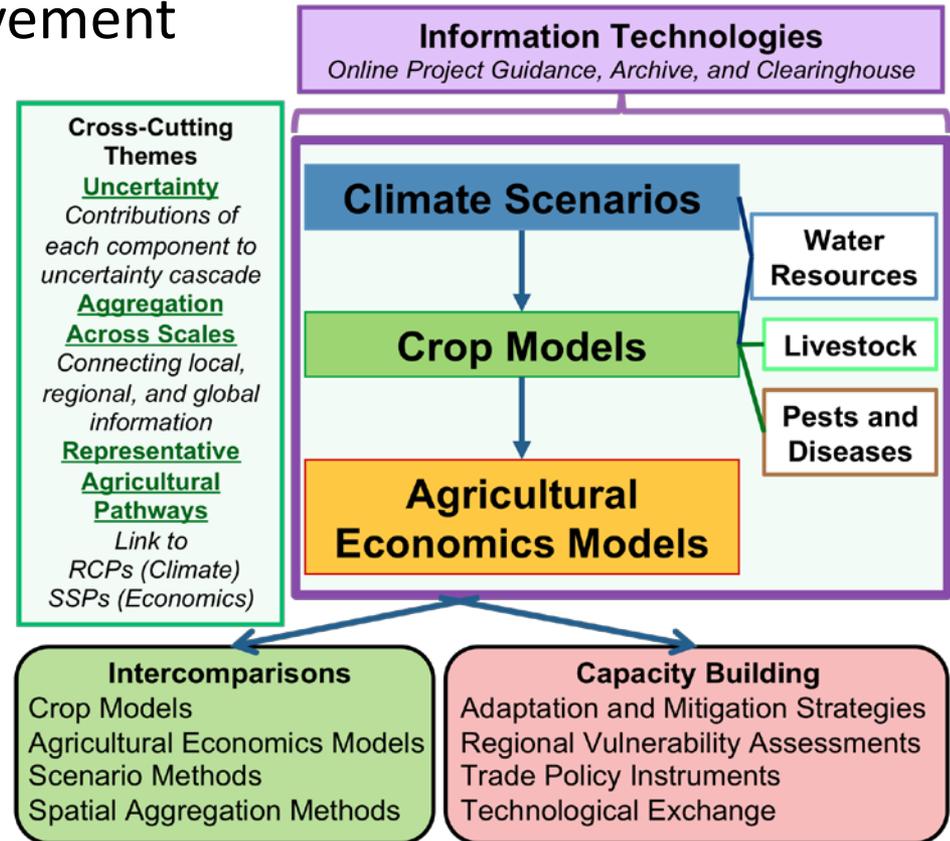
# Project Objectives

- Improve the representation of crops in hydrologic models
- Simulate current and future available water throughout the Central Valley and distributions of water among competing uses
- Assess the impacts of future water availability on crop yields in irrigated agricultural areas
- Create a regional framework of water resources for the broader western United States.



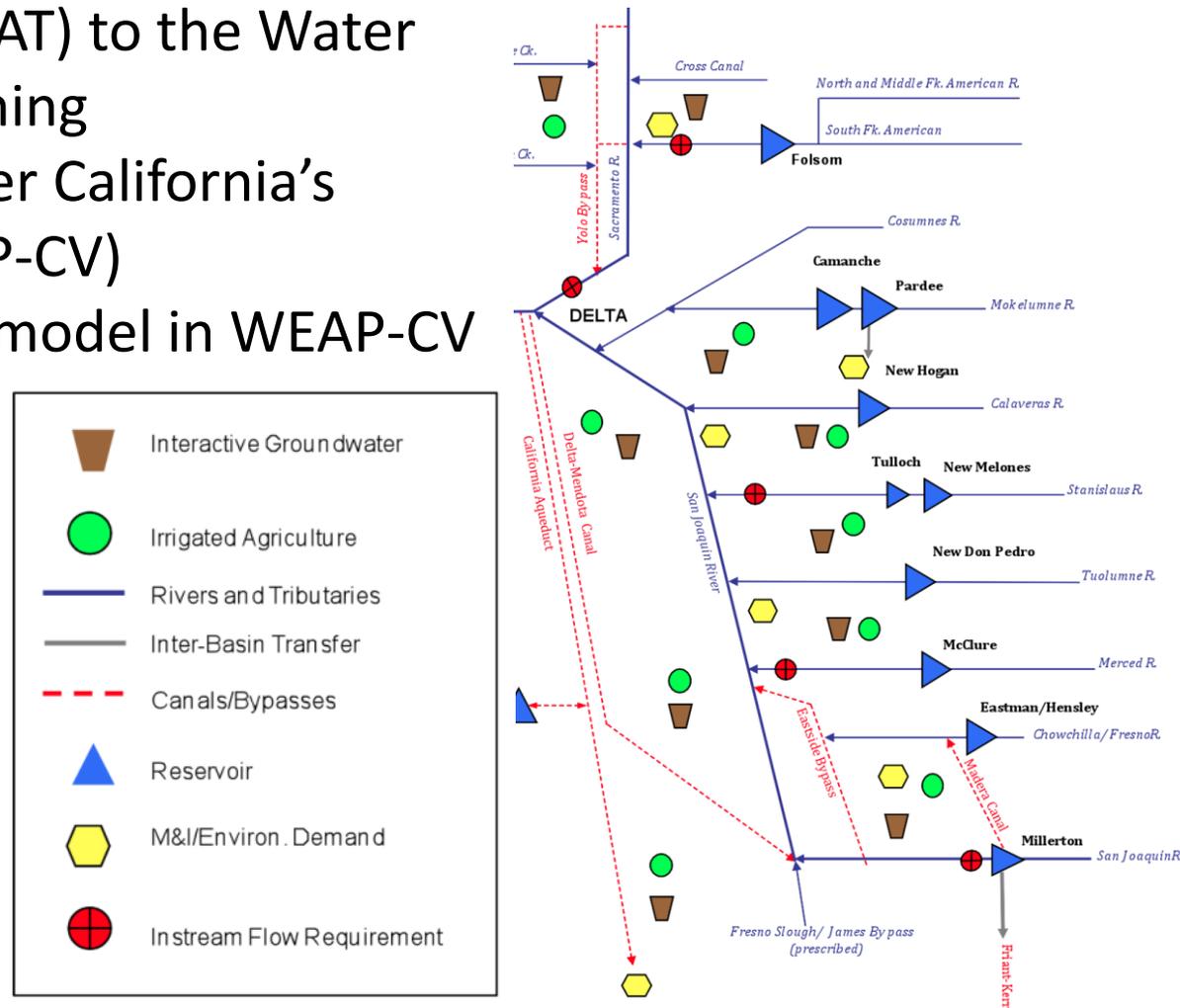
# Project Scope

- NNH11ZDA001N-WATER, Start Date 06/01/12
- Partner Organization: US Bureau of Reclamation
- Additional Collaborators: The Agricultural Model Intercomparison and Improvement Project (AgMIP)
- Potential Collaborators: California Department of Water Resources, University of California, Davis



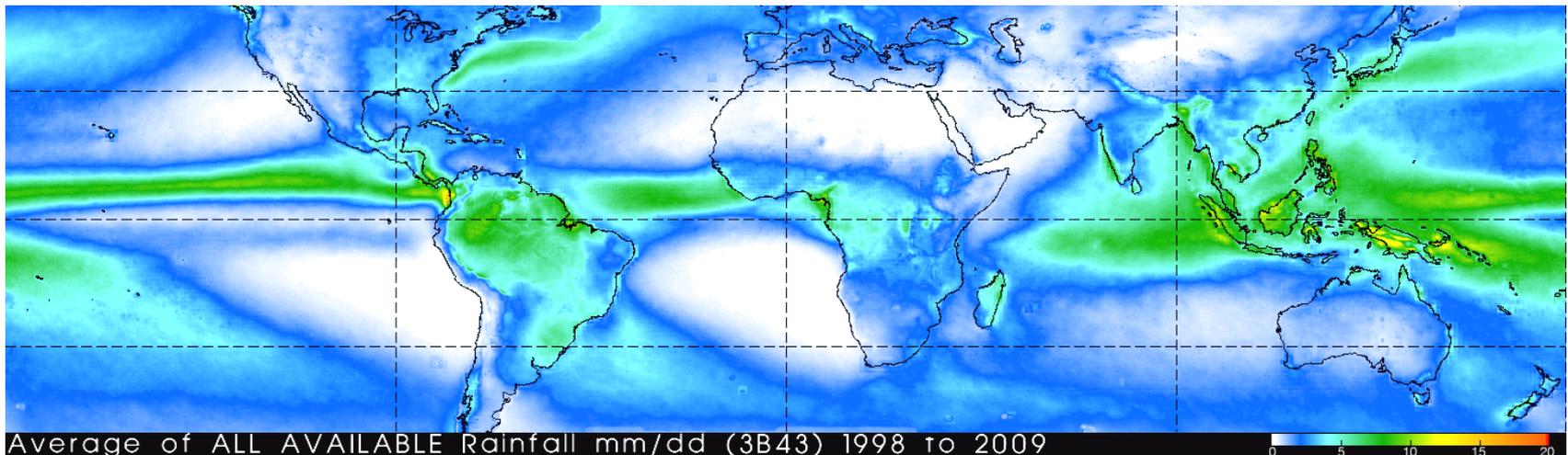
# Integrate DSSAT into WEAP-CV

- Couple the Decision Support System for Agrotechnology Transfer Model (DSSAT) to the Water Evaluation and Planning System deployed over California's Central Valley (WEAP-CV)
- Current agricultural model in WEAP-CV based on crop coefficient method
- Compile DSSAT as a Dynamically Linked Library in WEAP-CV



# Baseline Climate Analysis

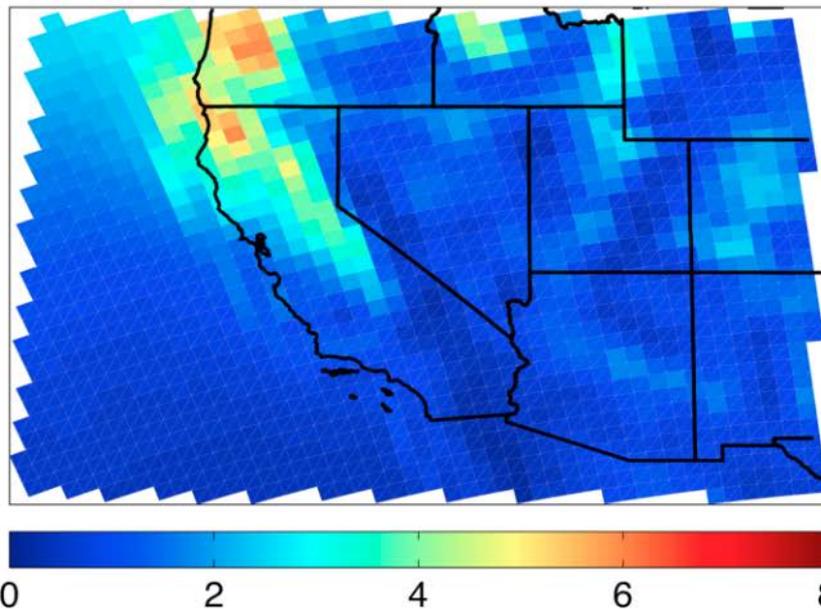
- WEAP-CV forced using the Bias-Corrected and Constructed Analogues (BCCA) Dataset (1980-1999)
- WEAP-CV forced using BCCA and TRMM 3B42 (2000-2010)
- WEAP-CV-DSSAT forced using BCCA Dataset (1980-1999), NASA POWER
- WEAP-CV-DSSAT forced using TRMM 3B42, BCCA, POWER (2000-2010)



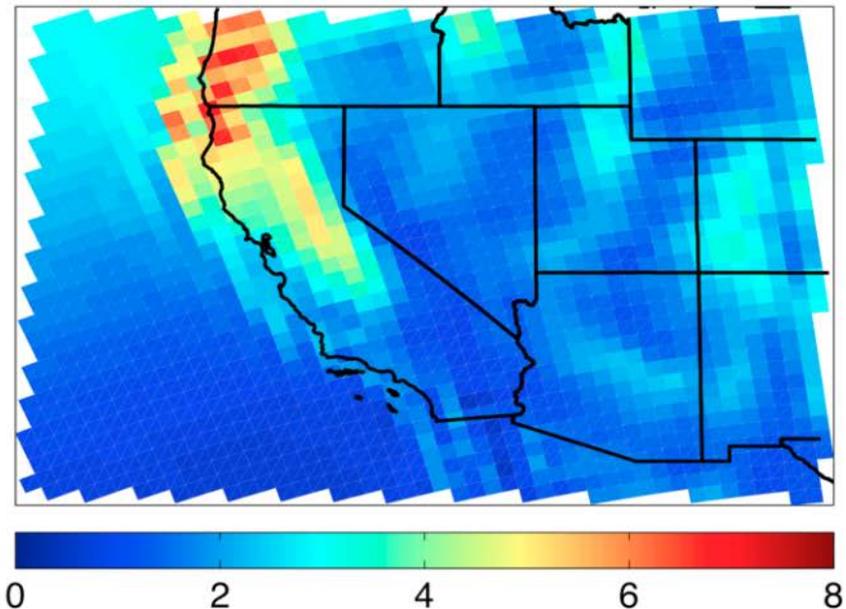
# Future Climate Analysis

- WEAP-CV forced using BCCA modified with NARCCAP deltas that integrate mean and variability changes (2050-2069)
- WEAP-CV-DSSAT forced using BCCA and POWER modified with NARCCAP deltas that integrate mean and variability changes (2050-2069)

CCSM-MM5 Precipitation [ $\text{mm d}^{-1}$ ]

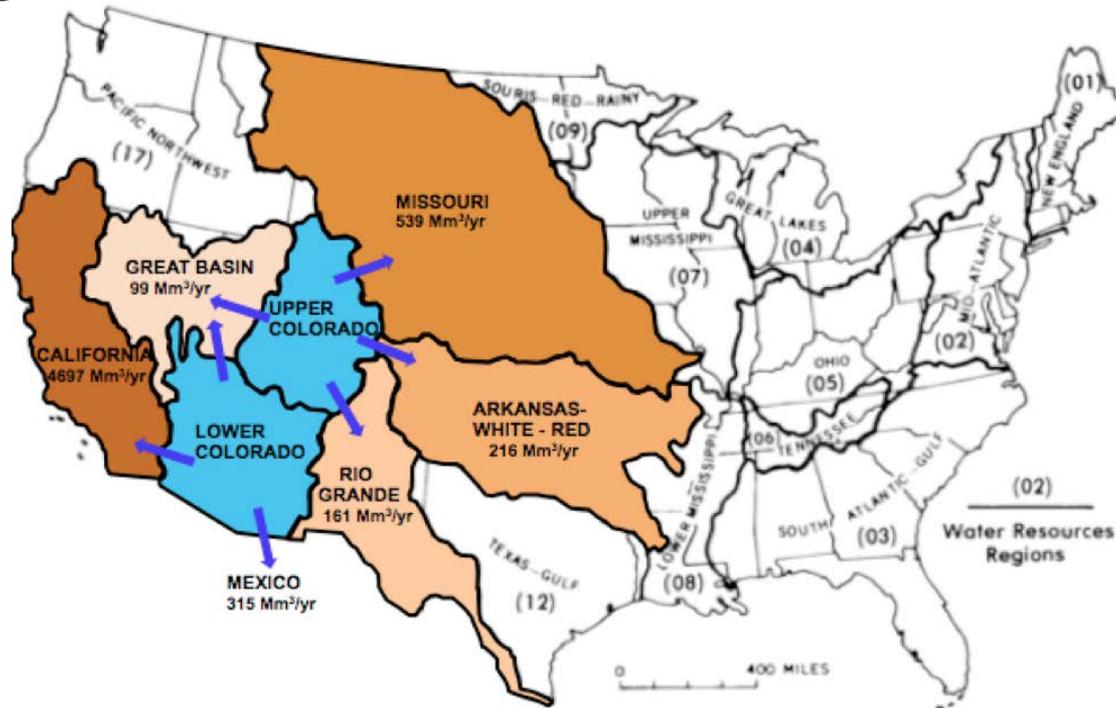


GFDL-RCM3 Precipitation [ $\text{mm d}^{-1}$ ]



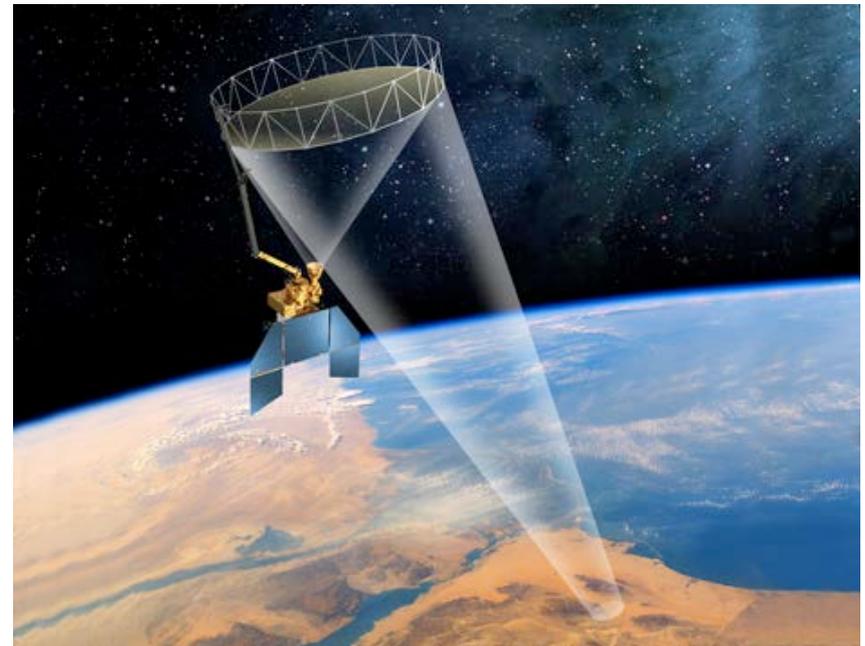
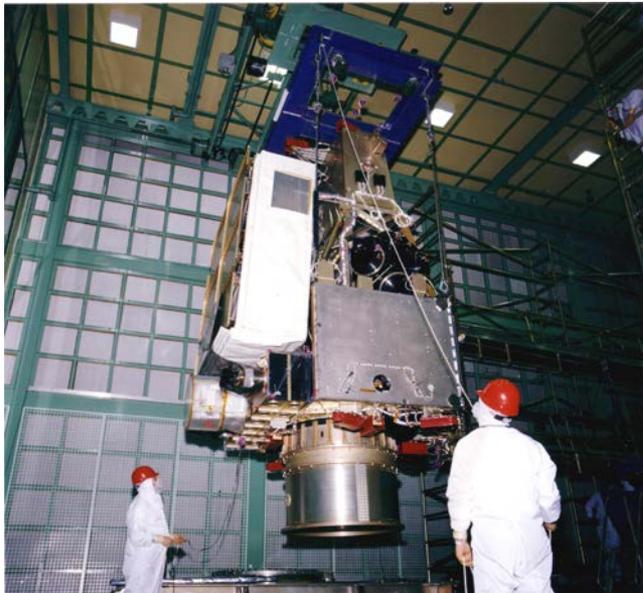
# Regional Drought Analysis

- Simulate the western United States using the Water Balance/Transport Model ( $WBM_{plus}$ ) forced by BCCA (1980-1999)
- $WBM_{plus}$  forced using BCCA modified with NARCCAP deltas that integrate mean and variability changes (2050-2069)



# Evaluating WEAP-CV and WBM<sub>plus</sub> with Remotely Sensed Data

- Vegetation phenology derived from active and passive microwave and optical sensors
- Freeze/thaw status and snow melt processes from the Freeze/Thaw Earth System Data Record
- Prototype and simulated products of the SMAP mission



# Anticipated Results/Impacts

- Develop scalable water-agriculture analysis tools over state and regional domains
- Introduce AgMIP crop models and additional remotely sensed data to WEAP-CV
- Improve understanding of how climate change impacts potential evapotranspiration
- Quantify impacts of climate change and carbon dioxide changes on irrigation demand, water resources management, and crop yields



# Current Research Activities

- Compiling DSSAT in the WEAP-CV framework
- Scripting iterative approach to irrigation management in DSSAT
- Processing BCCA data for use in WEAP-CV and WBM<sub>plus</sub>
- Creating and analyzing future climate scenarios from NARCCAP deltas
- Organizing remotely sensed data for model evaluation

