Equitable Stewardship of California's Water in a Changing Climate

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COEQWAL
COLLABORATORY FOR EQUITY IN WATER ALLOCATION

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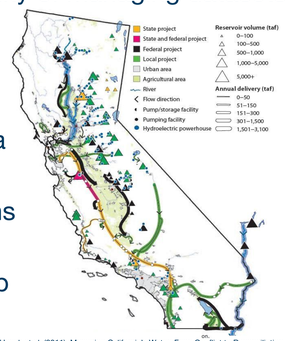
Introduction

The **Collaboratory for Equity in Water Allocations** (COEQWAL) is a pioneering research initiative led by experts from six UC campuses and CSU Sacramento. COEQWAL collaborates closely with state and federal agencies, Native American tribes, community groups, water districts, and NGOs to address California's multifaceted water challenges. The project emphasizes creating **equitable and resilient water management strategies** that consider the diverse needs of agricultural, urban, and environmental stakeholders. California's water systems move limited fresh water across the state to meet the demand of millions of people. As **climate change** alters our system, we must tackle an increasingly **urgent** question about how water is allocated and where it gets distributed. COEQWAL aims to address this by developing an **accessible**, **data-driven water planning** platform, enabling stakeholders to explore **solutions** for water scarcity, water justice, **sustainable resource distribution**, and **ecosystem preservation**.

Objective

CalSim3 is a water resources planning tool developed by state and federal agencies to facilitate **modeling our water system**. Though a powerful tool, it has strictly been the domain of experts due to the difficulty of managing datasets of this size and nature.

We previously created an **open-source repository** for data analysis to open access to this data for **hydrological data processing**, visualization, and metric calculations that enables people with minimal programming knowledge to develop sophisticated plots and analyses.



Hanak et al. (2011). Managing California's Water: From Conflict to Reconciliation

This semester, our goal was to improve our existing plots, develop a powerful **interactive data dashboard** (see demo), and make the **complex data easier to analyze, visualize, and understand**. We focused on turning **information into stories** that we can share with a wide range of stakeholders.

Variables and Scenarios

Igor Lačan, Vincent H. Resh (2016). A case study in integrated management

We focus on three main types of variables:

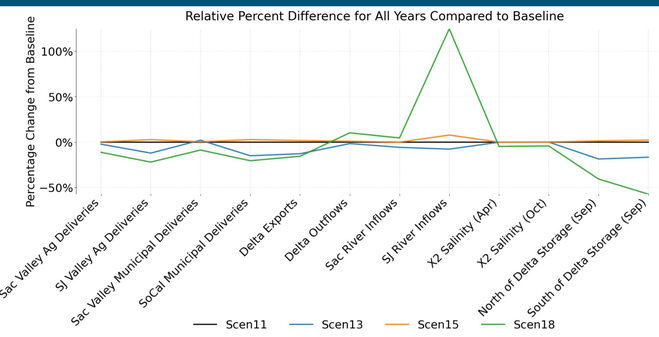
- **Storage**: Reservoirs
- **Deliveries**: Water for agricultural, urban, and environmental deliveries through the State Water Project (SWP) and Central Valley Project (CVP)
- **Flows**: Rivers and canals

We compare different scenarios to a baseline. The baseline model serves as a reference point, reflecting current operations under historical climate and hydrology.

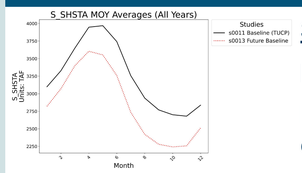
Scenario	Climate	Operations	Additional Features
11	Adjusted Historical (**Baseline**)	*TUCPs in extreme dry years	--
13	75th Percentile (DWR Level of Concern)	Same as Baseline	30 cm of Sea Level Rise
15	Same as Baseline	Same as Baseline	Groundwater Pumping Restrictions (San Joaquin Valley)
18	Same as Baseline	Same as Baseline	Minimum Flow Requirements

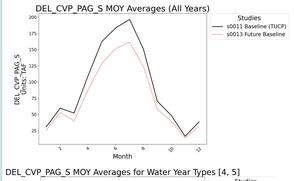
*Temporary Urgency Change Petition

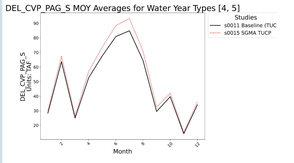
Results

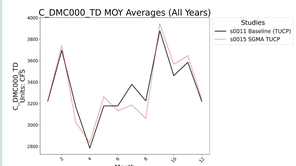


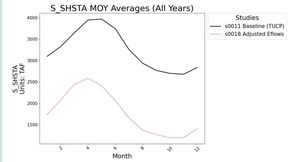
Discussion

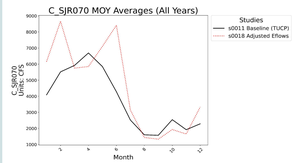












Scenario 13 (climate change):

Reservoir storage is generally below baseline levels, particularly in spring, winter, and dry years, with smaller differences in wet years. Water deliveries, especially for CVP agricultural contractors, are reduced more significantly during dry years and summer, while they remain more stable in wet years. Flows tend to be lower in summer and winter, but may be slightly higher in early spring, regardless of the year type.

Scenario 15 (pumping restrictions):

Reservoir storage is generally slightly higher than the baseline, particularly in dry years. Water deliveries remain mostly consistent, except for increased deliveries to the CVP agricultural sector during dry years and summer. Flows are largely stable, though the San Joaquin River sees an increase, while summer flows in the Delta-Mendota Canal decline, possibly due to higher surface water demand caused by restriction in groundwater.

Scenario 18 (environmental flows):

Reservoir storage is significantly lower than the baseline throughout the year, with larger differences observed in dry years. Water deliveries to most contractor groups decline, especially during summer and dry years. Flows are generally higher in spring but lower in other seasons, with variations across rivers and channels depending on year type.

Takeaways

- Scenario 13: Under a warmer climate, reduced precipitation and snowpack decrease water storage. Water tends to be released in spring, increasing flow. But overall water deliveries decline, particularly in agriculture because of priorities.
- Scenario 15: Groundwater contributes more towards the San Joaquin River, reducing the use of reservoirs and increasing the CVP agricultural deliveries.
- Scenario 18: Reservoir storage is significantly lower than the baseline due to water being allocated for environmental flows, which decreases deliveries.

This work provides an invaluable tool for decision-makers and stakeholders to collaboratively prepare for the future of California's water resource management.