

WEAP: The Analytical Engine Behind California's Water Future

A scenario-based planning tool supporting California Water Plan implementation and SB 72 compliance

Introduction

California is planning for a more uncertain water future shaped by climate change, shifting demand, aging infrastructure, and ecosystem pressures. The state already uses multiple planning tools and datasets but needs a consistent way to compare future conditions and evaluate potential strategies across regions and sectors.

A California-specific application of the Water Evaluation and Adaptation Planning (WEAP) model, known as WEAP-Future Scenarios (**WEAP-FS**), is being developed to provide a common analytical framework. This hydrologic and operations model will integrate data on water supply, demand, and future conditions to help California test planning scenarios, understand tradeoffs, and inform decisions as part of the California Water Plan. The WEAP-FS model will play a central role in quantifying water supply targets at the watershed scale and evaluate performance of adaptation strategies.

What the WEAP-FS Model Is

WEAP is an integrated water systems modeling framework that represents watershed-scale inflow-outflow connectivity, tracking supplies, demands, storage, and return flows to evaluate how well different management strategies meet water needs under varying conditions.

WEAP-FS is a California-specific application of WEAP that applies this framework to test planning scenarios, quantify water supply targets, and assess tradeoffs among agricultural, urban, and environmental uses.

Key WEAP capabilities:

- Represents surface water, groundwater, infrastructure, and end uses in an integrated framework
- Identifies where and when water shortages may occur under different hydrologic and water supply assumptions
- Simulates future conditions under climate change, population growth, and land use changes
- Provides a physics-based representation of tradeoffs across regions, sectors, and strategies
- Produces outputs that support planning, discussion, and decision-making

The WEAP-FS model is organized at the watershed scale and evaluates scenarios and system behavior as a screening tool, rather than predicting precise localized outcomes. It is used alongside other models and datasets to explore specific outcomes and trends.

How WEAP-FS Will Support the California Water Plan

2028 Water Plan: Understanding Conditions and Exploring Options

- Build a more consistent picture of water supply and demand gaps within the Sacramento, San Joaquin, Tulare, San Francisco Bay and South Coast hydrologic regions
- Begin to test potential strategies such as conservation, storage, and recharge
- Support stakeholder discussions using shared assumptions and data

2033 Water Plan: Refining Targets and Strategies

- Refine watershed-level targets statewide
- Refine analysis of future risks and system vulnerabilities
- Evaluate regional project portfolios to determine what is most effective and how projects perform together

What This Means for Water Managers

The statewide WEAP-FS model provides water managers with a tool that:

- Provides a shared baseline for comparing conditions across regions
- Allows tradeoffs to be tested before investments or policy decisions are made
- Supports alignment between local planning and statewide planning priorities
- Enables clearer, data-informed discussions with stakeholders

Why WEAP Is Trusted

WEAP is an accessible, cost-effective modeling platform widely used by water managers and planners for policy analysis and water supply planning. In California, it has been applied by state agencies – including both DWR and the State Water Resources Control Board – water suppliers, and academic researchers for watershed-scale allocation modeling, reservoir operations, level-of-service analysis, and studies of water-energy interactions and ecosystems impacts. Following a rigorous public vetting to evaluate available tools, DWR selected WEAP as the analytical foundation for statewide scenario planning.

WEAP-FS helps California move from understanding water challenges to evaluating potential solutions.

- Integrates multiple components of the water system into a single framework
- Enables rapid testing of future scenarios and strategies
- Supports transparent, shared analysis across regions and sectors
- Complements other models by focusing on screening and comparison
- Has been developed and refined over multiple Water Plan updates
- Used by local, state, and international agencies, including water utilities, governments, and organizations such as the World Bank and UN agencies, for long-term water planning and scenario analysis
- Established and continuously refined since the 1990s, with decades of application in California and globally across a wide range of water management contexts

By supporting consistent analysis and testing tradeoffs, the WEAP-FS model will play a central role in advancing a more coordinated and actionable California Water Plan.