Stockholm Environment Institute

The water model behind California's Bay-Delta plan

SEI fact sheet
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The Sacramento-San Joaquin Delta is the hub of the California water system, providing water to 25 million people and 3 million acres of farmland. It is also a vitally important ecosystem that includes habitat for hundreds of species of wildlife.

California officials have tried for years to strike the right balance between water use and ecosystems. Climate change has complicated matters; during droughts, the conflict is intensified. Cities and farms need the freshwater supply, but water managers must also limit water exports to maintain the flows in rivers and streams to support a healthy ecosystem.

California's State Water Resources Control Board was charged with creating a plan to balance both society and ecosystem needs – and to get there, it needed a water model that could mimic one of the most complex water systems in the United States. The Board turned to SEI and its Water Evaluation And Planning (WEAP) system.

The Board chose WEAP for the task because the platform is user-friendly and facilitates transparent model construction. Stakeholders were able to understand how the model was built and how to use it.

The result is the Sacramento Water Allocation Model, known as SacWAM. This WEAP-based hydrologic and system operations model not only shows how the Delta's complex water system currently operates; it also shows the Delta's unimpaired state, or how its water would flow if there were no dams, diversions or infrastructure.

The Board is now using SacWAM to update the Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary. Known as the Bay-Delta Plan, it outlines how much water can be taken from the tributaries of the Sacramento River and how much must stay to restore the Delta's struggling ecosystem.

LEARN MORE

Visit the SEI US Water Program at: www.sei.org/us/water

Read about the Sacramento Water Allocation Model at https://www.sei.org/projects-and-tools/projects/sacwam/

Photo (above):
Aerial view of Sacramento River, California © JUPITERIMAGES / GETTY

FEATURES OF WEAP USED IN SACWAM

- Daily crop water use model based on the FAO-56 dual crop coefficient
- Representation of water service contracts and water rights
- Option to use prescribed inflow hydrology or WEAP's native rainfall-runoff routines
- Flexible formulation of complex operations rules through use of user-defined constraints

Balancing competing needs

In its update of the Bay-Delta Plan, the Board is assessing numerous proposed changes that aim to improve ecosystem health while still allowing enough water to flow to cities and farms.

These options include:

- new flow requirements for the Sacramento River, its tributaries, and the eastside tributaries to the Delta (the Mokelumne, Calaveras and Cosumnes rivers)
- new and modified Delta outflow requirements
- new requirements for cold water habitat
- new and modified interior Delta flow requirements
- recommendations for complementary ecosystem protection actions that others should take
- adaptive management, monitoring, evaluation, special study, and reporting provisions.

The impact of water management policies is hard to tease out because the system is a labyrinth of extensive infrastructure, complicated operating rules, and numerous regulations. This is where SacWAM comes in: it allows users to see the effects of proposed policies on agriculture, water supply and fisheries, among other things.

The Board used the model to estimate the flow of the Sacramento River and its tributaries under a range of regulatory options. Based on these simulations, the Board has come up with recommendations and will either implement new regulations or come to an agreement with water diverters on stream flow requirements.

The result will be flows in streams and rivers that more closely mimic the natural variation, but still allow cities and farms to meet their water needs.

PEER REVIEW

SacWAM was subject to a peer review that provided an independent review in 2016, and that has led to a set of improvements. For example, the simulation period was extended from September 2009 through September 2015, additional climate data was incorporated, and the groundwater representation was modified. This led to a recently released new version that is subject to public review and that will continue the iterative peer-review process of improving the model.

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