IS WATER THE NEW OIL?

How computer modeling helps protect our most precious resource

There is no more fresh water on Earth today than there was a million years ago—yet today, there are six billion people sharing it. Since 1950, the world population has doubled yet water use has tripled; it's estimated that demand for water will increase another 50 percent by 2030 and that nearly half the world's population will live in areas with severe water stress.

Water scarcity is already taking a global toll, even on the richest and most developed societies. Australia has finally accepted its lack of rain as a permanent condition rather than merely a long drought. Barcelona, Spain is so parched there's a €9,000 (about $11,500) fine if you're caught watering your flowers. And last year, the U.S. government warned that at least 36 states will face catastrophic water shortages within five years.

California is one of those states—and has been for a while. By the early 1990s, our most populous state was running out of water. Its high-quality water supplies were diminishing at the same time its levees faced an unacceptably high risk of breaching, and rising temperatures contributed to droughts increasing in both duration and severity.

Accordingly, state and federal agencies have been working to create programs that would stabilize, protect, restore, and enhance water quality and quantity. Among other tools sought, there was a recognized need to develop a rapid screening model that could simulate how various environmental conditions and management decisions would affect the state's water. How will changes in water flow or volume, for example, impact the salinity of delta water? What happens if a new canal is built?

California brought on board CH2M Hill, a global engineering, consulting, construction, and operations firm, to assist in developing such a screening tool. CH2M Hill in turn selected the GoldSim Technology Group's (GoldSim) probabilistic simulation software as the preferred technology with which to build the model.

User-Friendly Interface

"The interface is very simple and hides all the technical mathematics several layers deep," said Nazrul Islam, Ph.D., senior engineer. "We can educate decision-makers on various operations, both real-time and proposed, and can make interactive modifications on the fly during presentations or meetings."

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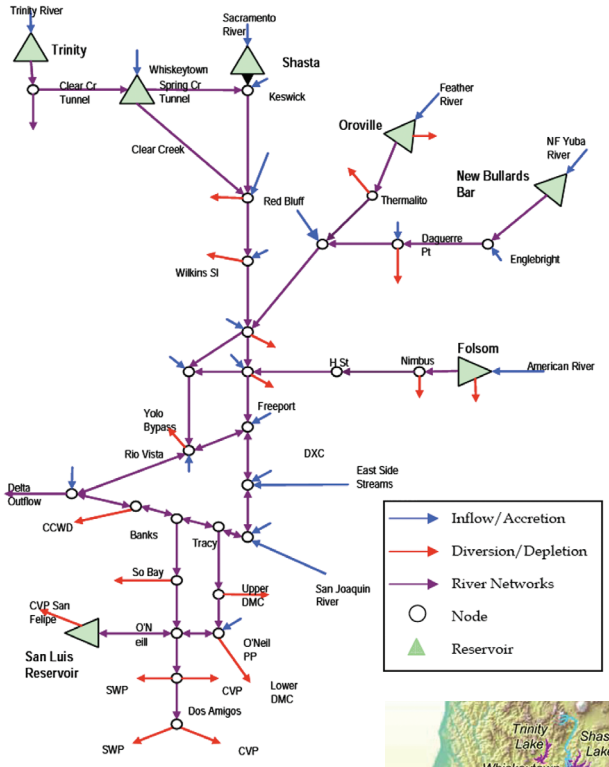
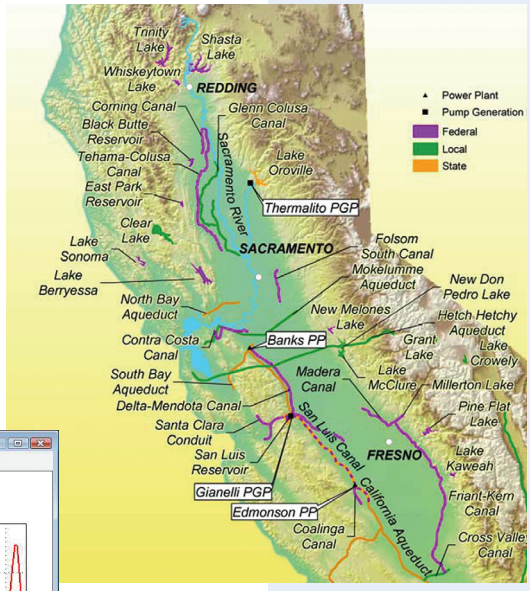
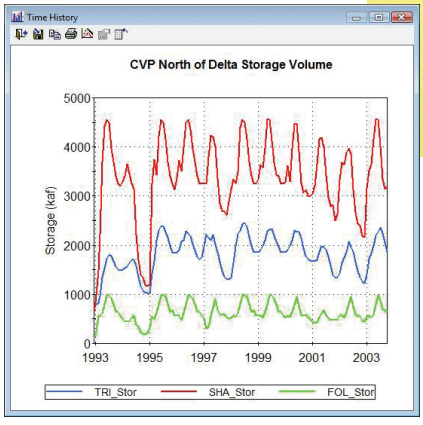


Representation of the model's network and interactive schematic



Geographic extent and general location of the facilities simulated through GoldSim



Typical CalLite output plots

"There are always opportunities for us to help our clients using GoldSim."

– Jason Lillywhite, water resource engineer

Scientists and engineers from the state and CH2M Hill developed and applied a screening model, dubbed "CalLite," to the state's Central Valley, a hugely important agricultural center that provides almost half the produce consumed in the United States. CalLite simulated water conditions in the valley over an 82-year planning period, taking into consideration reservoir operations and storage options and providing a basis for analysis of alternative water management strategies.

CalLite now serves as a key screening tool for proposed water management projects throughout California, and bridges the gap between more detailed system models and stakeholder demand for rapid and interactive policy evaluations.

Nazrul Islam, Ph.D., a senior engineer with the California Department of Water Resources, highlights GoldSim/CalLite as much for its political value as its scientific one. "The interface is very simple and hides all the technical mathematics several layers deep," he said. "We can educate decision-makers on various operations, both real-life and proposed, and can make interactive modifications on the fly during presentations or meetings."

The success of CalLite in California's Central Valley has spurred other GoldSim modeling projects within the state. Dr. Islam, for one, is using GoldSim to simulate how climate change will influence water management strategies, and his colleagues are similarly using GoldSim to explore future management alternatives.

Jason Lillywhite, a water resource engineer at CH2M Hill and part of the CalLite team, sees applications for GoldSim beyond hydrology and is utilizing its software for other industries, as well, including mining and waste management. "There are always opportunities for us to help our clients using GoldSim," he said.

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