HOUGHTON - With California's surface water resources perhaps a year away from depletion, the question of how to address water supply is of critical importance.

Peter Goodwin, director of the University of Idaho's Center for Hydraulics Research, spoke on river restoration and flood management at the Great Lakes Research Center at Michigan Technological University Monday. The talk was part of Tech's series of World Water Day events.

California is deciding whether to invest $25 billion on a tunnel project to increase water resource reliability and protect an ecosystem "literally on the brink of collapse," Goodwin said.

The project includes two 30-mile tunnels with a capacity of 9,000 cubic feet per second. To maintain the ecosystem, the project also includes an ambitious goal of creating 450 square kilometers of tidal wetlands.

"Straight after I graduated, I was working on some of the restoration projects in San Francisco Bay," Goodwin said. "Those projects are still being studied today and nothing has happened. With this project, it means bringing 600 acres of fully functioning tidal habitat online every month for the next 20 years. That's the scale of the challenge that they're facing."

Adding to the complexity of California's problems is that any tinkering with the water supply in one area of the state affects the rest. About 40 percent of the state's energy budget goes to moving around water, Goodwin said.

Having a Mediterranean climate, California is prone to large swings in moisture. Researchers identified a 17-year drought in recent historical records; California's current one is only in its fourth.

The climate is also sensitive to even small changes in temperature. Assuming moderate warming, Goodwin said, the snowpack - "the natural reservoir system of the state of California" - will be only 20 percent of its current level. This year's snowpack is at the lowest point ever recorded.

"If you lose that, you've either got to build more dams, with all of those problems, or you're going to have less over-year storage," he said.
The state has tried pumping groundwater to make up the difference, leading to a deficit of 45 cubic kilometers. Over the past 25 years, the ground in the Central Valley, where pumping has been most severe, has sunk by 40 feet in places.

Most of California’s water comes from the California Delta, which provides water for about two-thirds of California residents. That water also goes towards producing about 45 percent of the agriculture in the United States.

It’s home to 700-plus species, including 50 endangered species.

"It's a global hotspot for biodiversity, but it's also the problem child for loss of biodiversity," Goodwin said.

The delta has 1,400 miles of levees, versus 112 miles in New Orleans. In the event of a 6.5 earthquake, about 20 levees are estimated to fail, Goodwin said. The area would fill with saline water from San Francisco Bay and the Pacific Ocean, he said.

"Some of the projections are it could be years before you could get a fix put in place," he said.

While restoring the original system would be impossible, because of the amount of work done to the land, Goodwin said a historical study allows them to look at how the ecosystem functioned in the past.

"If you wanted to reconnect certain elements of how the ecosystem functions, here's the blueprint," he said. "It's not going to look like what was there historically, it's a start."

In 2009, the state passed legislation creating the Delta Stewardship Council, putting the long-existing Delta Science Program under it. It's driven by co-equal goals of providing a reliable water supply and protecting, restoring and enhancing the delta ecosystem, he said.

"By law in California, you can't deal with water supply and reliability without dealing with ecosystem," Goodwin said. "Similarly you can't do a restoration project without understanding the implications of water supply."

A future challenge is in Chile, which is facing a large energy problem. Argentina, which had provided much of Chile's natural gas, revised its estimates of its resources radically downward.

Chilean researchers created a research center in Chilean Patagonia, which has pointed out that the Chilean hydropower system has comparatively little difference between winter flows and summer flows, which might not require the large-scale dams used in areas with greater variation.

The issue has led to large public-relations campaigns on both the pro-dam and anti-dam sides.

Goodwin also spoke briefly about the Napa River project, started as a lawsuit brought by the Sierra Club against the U.S. Army Corps of Engineers and Napa County over a proposed flood control project.

A year-long planning period led to a "living river strategy," in which the river was reconnected to its historic flood plain and much of the natural character of the river is retained. A mix of new construction such as levees and the restoration of marshlands was used to mitigate flooding.

"It shows what a community can do," Goodwin said.