

# Dams ineffective for cold-water conservation

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Ann Willis, a researcher with the UC Davis Center for Watershed Sciences, takes measurements on the Little Shasta River with colleague Rob Lusardi in 2017. Credit: Joe Proudman/UC Davis

Dams poorly mimic the temperature patterns California streams require to support the state's native salmon and trout—more than three-quarters of which risk extinction. Bold actions are needed to reverse extinction

trends and protect cold-water streams that are resilient to climate warming, according to a study published in the journal *PLOS ONE* by the University of California, Davis.

The study helps identify where high-quality, cold-[water](#) habitat remains to help managers prioritize [conservation efforts](#).

"It is no longer a good investment to put all our cold-water conservation eggs in a dam-regulated basket," said lead author Ann Willis, a senior staff researcher at the UC Davis Center for Watershed Sciences and a fellow for the John Muir Institute of the Environment. "We need to consider places where the natural processes can occur again."

## **The uncommon cold**

Understanding where cold water is likely to stay cold is critical for conservation. But "cold" is more than just a number on a thermometer. The term represents the many factors that combine to create cold water capable of supporting [aquatic ecosystems](#).

Water managers deliver cold water from reservoirs to streams to support aquatic life. But Willis said this assumes that all cold water is the same—akin to giving blood to another person without understanding their blood type and health status.

While previous studies have suggested that dams can be operated to achieve ideal temperatures, few tested that hypothesis against the temperature patterns aquatic ecosystems need.

The UC Davis study assessed stream temperature data from 77 sites in California to model and classify their "thermal regimes," or annual temperature patterns. It found the state's reservoirs do not adequately replicate natural thermal patterns, making them incapable of supporting

cold-water species effectively.

"I'm an engineer; I thought we could operate ourselves into success, but the science doesn't support that," Willis said. "It's not a question of whether we remove a dam, but which dam, and how we need to restructure how we manage water. Or we need to be willing to take responsibility to be the generation that says, 'OK, we're letting this ecosystem go extinct.'"





Mill Creek, a spring-fed creek that flows from the base of Mt. Lassen to the Sacramento Valley, is an important cold-water stream. Credit: Ann Willis/UC Davis

## **What about the drought?**

Drought often tempts people to double-down on hard-infrastructure solutions for water storage.

"We falsely equate dams with water security," Willis said. "More storage does not mean more water. A giant, empty refrigerator doesn't help you if you're starving. The same is true for water."

Of California's 1,400 dams, only one very large and highly-engineered dam—Shasta—stood out in the study as replicating natural cold-water patterns.

The study does not suggest removing all dams. However, considering removing "deadbeat dams" where there are critical ecosystems could help restore natural processes and support fish, people and biodiversity amid climate warming.

## **Cold comfort**

Key [cold-water](#) conservation candidates include streams highly influenced by groundwater, such as in the Cascade Range, and places where water easily infiltrates the soil, such as Northern California's Feather River.

"Classifying these streams and understanding their thermal regimes is an effective way to focus our time and money on the places most likely to

make a difference," Willis said.

**More information:** Ann D. Willis et al, Classifying California's stream thermal regimes for cold-water conservation, *PLOS ONE* (2021).  
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