PEOPLE AND NATURE

Using social, ecological, and climate data to identify the most important places for conservation

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Human and freshwater systems are tightly intertwined, but climate change increasingly threatens the sustainability of these integrated systems. Conservation actions that increase available water can boost human water security and other benefits and services we derive from freshwater systems. However, the people in charge of deciding where and how to implement conservation programs face the difficult challenge of allocating water among competing human and environmental needs. Indeed, debates over water conservation are often contentious, and the potential for conflicts may make water conservation infeasible in some locations. The challenge of weighing these competing costs and benefits is even greater under climate change because factors like water availability and species distributions often vary widely among future scenarios.

In this paper, we present a framework for identifying sites where, across a range of climate scenarios, conservation actions would have high benefits for biodiversity, but also low potential for causing human conflicts. Our approach combines social, ecological, and climate data to rapidly winnow the number of sites under consideration for conservation actions. For example, conservation organizations could save time and money by using our three-part framework, considering: where conservation is most important (based on the species present and their conservation needs); where conservation is most feasible (based on tradeoffs between human and environmental needs); and where conservation actions would have consistent outcomes across a wide range of future climate conditions.

We demonstrate how conservation organizations might use this framework, by applying it to the challenge of conserving river flows in the Red River of the south-central USA. We used data on fish species locations, the availability of water for both human needs and the needs of these fish species, and future climate projections, to test the effectiveness of our method at identifying high priority sites. We found that we can reduce the number of sites decision makers need to consider for implementing conservation programs, and that some sites can be successfully identified as high priorities for conservation. Our framework thus provides decision makers with a tool for saving time and money identifying high conservation priority sites.

A photo of the Cimarron River in Western Oklahoma. Photo credit: Sean Wineland.