Managing our water resources is essential.

Clean water is essential for drinking, agriculture, energy, recreation, aquatic habitats, and other uses, but America's water resources face complex issues such as climate change, pollution, and increasing demand. Many farmers, communities, and leaders are concerned about water scarcity and quality.

Research guides effective solutions.

Researchers at land-grant universities and partners across the U.S. are working together to find ways to efficiently and fairly allocate water. This research guides water policies and programs, making them more cost-effective and easier to implement. These programs and policies can alleviate water conflicts, protect ecosystem services, and ensure enough water for all uses now and in the future.

The multistate approach works.

Team members with diverse expertise can pool resources and brainstorm new ideas with less duplication and overlap of research. Data from one state can inform analyses and solutions in other states experiencing similar issues.

Project funding and participation

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RESEARCH HIGHLIGHTS

Scientists provided nuanced data and realistic models that show how technological, economic, environmental, and social factors influence water use. These models also predict the impacts of water use and identify behaviors that can be managed to reduce water use.

Researchers projected water supply for the continental U.S. for 10 different future climate scenarios, providing critical information for sustainable water management.

Better data and models enable water users, managers, and policymakers to objectively and accurately weigh the costs and benefits of complex water supply decisions. For example, water use projections guided policy in Georgia. In Washington, a cost-benefit analysis of water use in the Yakima Basin was used extensively in legislative testimony and the popular press, influencing decisions on a major water management plan.

Researchers monitored water quality across the U.S. and guided management plans. For example, researchers documented salinity issues due to excessive groundwater pumping in the western U.S and looked at saltwater intrusion in Louisiana aquifers. In Minnesota, a research-based framework helped the Department of Health manage risks to drinking water. Researchers also helped citizen-led lake associations enhance lake water quality and studied how floating wetlands can reduce algal blooms due to nutrient runoff in Lake Erie. Other research showed that society may obtain as much as nine dollars for every one dollar spent on restoring wetlands in the Prairie Pothole Region (North Dakota, South Dakota, Iowa, Minnesota, Montana).

Researchers tracked changes in irrigation over time across the nation, showed the decrease in cash rental rates for cropland with water deficits, and created tools to improve irrigation efficiency. Scientists improved soil moisture sensors, estimated evapotranspiration rates, and released AquaCrop-OS, an open source version of an important crop-water productivity model. Outreach showed farmers weather/climate data and models that can help them make water use decisions. These tools are used worldwide to fine-tune irrigation so less water is wasted.

Research led to cost-effective ways to manage agricultural water use, including options that work well for small farmers and Native American farmers. Scientists also explored the environmental and economic benefits of using recycled water, which is usually saltier than freshwater. Researchers determined acceptable salinity levels for crops like avocados in California, and studies in Texas showed that energy crops perform well irrigated with recycled municipal wastewater. Other insights helped set pricing structures that encourage recycled water use instead of groundwater.

Researchers shared strategies to mitigate the impacts of climate change, such as the best designs for water management institutions and drought-tolerant plants.

Research guides energy policy. For example, researchers examined the impacts of hydroelectric energy production on water availability. Researchers also estimated the impacts that drought may have on the amount of water available for oil and gas production and power plant cooling.

Researchers shed light on why and how farmers adopt tools and practices that conserve water or protect water quality. This information helps design successful conservation programs and management plans. For example, studies showed that farmers' decisions are influenced by nearby peers. Researchers also found that reducing contract stringency could improve water quality program participation and cost-effectivness. Other studies showed that subsidizing efficient irrigation practices may not conserve water in the longterm because farmers may switch to more water intensive crops. Many farmers primarily reduce irrigation intensity rather than reducing irrigated acreage or changing cropping patterns.

Researchers advanced the theory of water trading and provided workshops on water banking. These markets can help balance economic and environmental benefits of water management for all users. For example, excess nutrients that run off farms into the Chesapeake Bay can seriously impair the ecosystem, recreation, and public health, but strategies to reduce runoff can be expensive. Studies showed that nutrient trading would be cost-beneficial for over 50% of medium and large animal feeding operations, but only 35% of small operation.

Data and models helped resolve water conflicts and form agreements among competing water uses and communities, including those in bordering states or nations. Research-based information, tools, and negotiation strategies can reduce the time and legal resources used to make agreements and increase the likelihood agreements are amenable to all parties.