

Freshwater sustainability challenges shared by Southwest and Southeast, researchers find

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Water scarcity in the western U.S. has long been an issue of concern. Now, a team of researchers studying freshwater sustainability in the U.S. have found that the Southeast, with the exception of Florida, does not have enough water capacity to meet its own needs.

Twenty-five years ago, environmentalist Marc Reisner published *Cadillac Desert: The American West and Its Disappearing [Water](#)*, which predicted that water resources in the West would be unable to support the growing demand of cities, agriculture and industry. A paper co-authored by a University of Georgia researcher and just published in a special issue of the journal [Proceedings of the National Academy of Sciences](#) offers new support for most of Reisner's conclusions, using data and methods unavailable to him in 1986.

Although the paper focuses on freshwater sustainability in the Southwest, co-authors Tushar Sinha, a postdoctoral scientist at North Carolina State University; John Kominoski, a postdoctoral associate at the UGA Odum School of Ecology; and William Graf, a professor of geography at the University of South Carolina, said that the findings have important implications for the Southeast as well. "It turns out that the Southeast has a relatively low capacity for [water storage](#)," said Graf.

In order for water supply to be considered sustainable, the researchers calculated that no more than 40 percent of freshwater resources can be appropriated for human use, to ensure that streamflow variability, navigation, recreation and ecosystem use are accommodated. They also

determined how much water a region would need to meet all its municipal, agricultural and industrial needs—its virtual water footprint. The VWF includes the water needed if a region were to grow enough food to support its own population.

The researchers found that neither the Southwest nor the Southeast have enough water capacity to meet all their own needs; both these regions virtually import water from other parts of the country, in the form of food. "The Southeast has virtually no positive, inland VWFs," said Kominoski, who earned his doctoral degree from the Odum School. "The largest population centers in southeastern states, with the exception of Florida, are inland. Piedmont cities such as Atlanta, Charlotte and Birmingham rely on small watersheds, which may be why our VWFs are negative."

Study lead author John Sabo, associate professor at Arizona State University, added that the Southeast's municipal and industrial water demands are higher than supported by locally generated streamflow.

Reisner also predicted the loss of reservoir capacity. The researchers found that both eastern and western reservoirs have lost storage capacity to sedimentation, although not at the rate predicted by Reisner. "The good news is that the minimum life span of most of the dams in the Southeast is greater than two centuries, which is much longer than what Reisner anticipated," said Graf.

The researchers also found that reservoirs lose enormous amounts of water to evaporation each year, resulting in a drop in reliable water yield. "The Eastern U.S. has a higher density of reservoirs, but similar water losses as the West," Graf said, adding that although there are more reservoirs in the East, they are smaller than their Western counterparts. The researchers found that smaller reservoirs are more susceptible to evaporation losses than larger ones are.

Sinha added that most of these smaller reservoirs in the Southeast are designed to capture precipitation that falls within a year, as opposed to larger western reservoirs which carry water surplus or deficit over multiple years. Furthermore, changes in precipitation in the Southeast rapidly influence reservoir water levels. "The recent droughts in the Southeast during the summers of 2002, 2005 and 2007 clearly indicate severe water shortages due to very low rainfall, and water supply is dependent upon precipitation, which is likely to be more uncertain in the near future," said Sinha.

Loss of storage capacity and lack of enough water to support human needs is not the only freshwater sustainability issue in the Southeast. "The fragmentation of river networks threatens the level of aquatic biodiversity of the Southeast, which is the highest in North America, in terms of both native and non-native species," Kominoski said. "Our current system doesn't support the needs of people, let alone ecosystems."

The authors also cautioned that the paper's estimates are conservative. "The data we used is from 1950-99," Sinha said. "The last decade, which had some of the highest recorded temperatures and most extreme droughts, as well as higher population figures, was not included. Also, the estimates don't take climate change into account. We expect to have less precipitation in the summer, during the growing season, and more severe droughts."

Kominoski agreed, and added that the 2000 Census predicts continuing population growth in the sunbelt. "As population grows, so does demand for water," he said.

The paper's conclusion that the Southwest is near its limit in terms of water capacity holds true for the Southeast as well. "We need a new strategy for water storage and conservation in the U.S., including the

Southeast," said Kominoski. "Because we have mostly inland metropolitan areas in small watersheds, we need to use less water. Less water comes to us, and our ability to store water is challenged by our climate and geographic location."

Graf added that demand for water is already an issue of major disagreement among Southeastern states. "We hope that these findings and recommendations will inform the debate and help lead to workable solutions," he said.

Provided by University of Georgia

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