Study identifies first step to beating water scarcity

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New research has revealed the locations and industries in the U.S. where efforts to improve water consumption would have the greatest benefit for economic activity and the environment.

The study, led by researchers from Virginia Tech, used a spatially

detailed database of water productivity to set realistic benchmarks for more than 400 industries and products. It is published today in the journal *Environmental Research Letters*.

Lead author Dr. Landon Marston, from Virginia Tech, said: "Nearly one-sixth of U.S. river basins cannot consistently meet society's water demands while also providing sufficient water for the environment. Water scarcity is expected to intensify and spread as populations increase, new water demands emerge, and climate changes.

"However, improving water productivity by meeting realistic benchmarks for all water users could enable US communities to expand economic activity and improve environmental flows. We asked ourselves the questions: if water productivity is improved across the US economy, how much water can be saved and in which industries and locations?' Our study is the first attempt to answer this question on a nationwide scale, and develop benchmarks to inform future action."

Using their data, the research team looked at how much water savings or how much improvement in water productivity (production or dollars earned per unit of water consumed) could be achieved by improving all users' water productivity to meet a target benchmark, such as up to the 50th percentile (median productivity), 25th percentile (high productivity), or 10th percentile (outstanding productivity).

Co-author Dr. Kyle Davis, from the University of Delaware, said: "One of the good things about a benchmarking approach is that it is not prescriptive in the practices or technologies used to reduce water consumption. Instead, it enables individuals and companies to select from a portfolio of strategies, tailored to the constraints and opportunities they face in their businesses and geographic or climatic context.

"The benchmarks we've developed represent actual water productivities achieved by a water user's regional industry peers and are therefore realistically achievable in most cases. Our study provides an upper bound of potential water savings, because we recognise that financial and regulatory barriers may prevent some water users from attaining water productivities achieved by their peers."

The study also found that some of the most water stressed areas in the US West and South have the greatest potential for water savings, with around half the savings obtained by improving water productivity in the production of corn, cotton, and alfalfa.

Dr. Marston added: "By incorporating benchmark-meeting water savings within a national hydrological model, we show that depletion of river flows across Western US regions can be reduced on average by 6.2 to 23.2 percent, without reducing economic production.

"We also identified the US industries and locations that can make the biggest impact by working with their suppliers to reduce water use 'upstream' in their supply chain. The agriculture and manufacturing sectors have the largest indirect water footprint, due to their reliance on water-intensive inputs, but these sectors also show the greatest capacity to reduce water consumption throughout their supply chains.

"Our study is an important first step towards understanding locations and industries where improved water productivity has the greatest potential to conserve water. Meeting the direct and indirect water demands of a growing population while providing enough water to meet local environmental flow requirements will be a key challenge in the coming decades. Improving water productivity will be critical in meeting this challenge, by putting water to more economically-beneficial uses, reducing unsustainable water use, and making water available for other uses, including the environment."

More information: Reducing water scarcity by improving water productivity in the United States, *Environmental Research Letters* (2020). DOI: 10.1088/1748-9326/ab9d39