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UW researchers publish geophysics study in *Science*

James St. Clair, a recent doctoral graduate from the University of Wyoming's Department of Geology and Geophysics, made significant contributions to the understanding of rock weathering and watersheds with a paper published in the journal October 2015 edition of *Science*. "Geophysical imaging reveals topographic stress control of bedrock weathering," co-authored by others at UW along with collaborators from the Massachusetts Institute of Technology, the University of Hawaii, Johns Hopkins University, Colorado School of Mines and Duke University, discovered that the underground water-holding capacity of mountain watersheds may be controlled by Earth's regional crustal stress.

Above, a picture of the cover of the edition of *Science* in which St. Clair's work was published.

This study focused on three sites in the Critical Zone Observatory Network—a program of the National Science Foundation (NSF) which serves as a community resource to enhance the scientific understanding of the Earth's surface—and used advanced geophysical imaging conducted by the new Wyoming Center for Environmental Hydrology and Geophysics (WyCEHG).

Below, an aerial view of the Yellowstone River in Wyoming. The erosion of bedrock along the river's edge can be seen in this picture.

These three sites were chosen because they showed different types of mountain geography and tectonic stress—meaning the amount of force shifting Earth's tectonic plates.

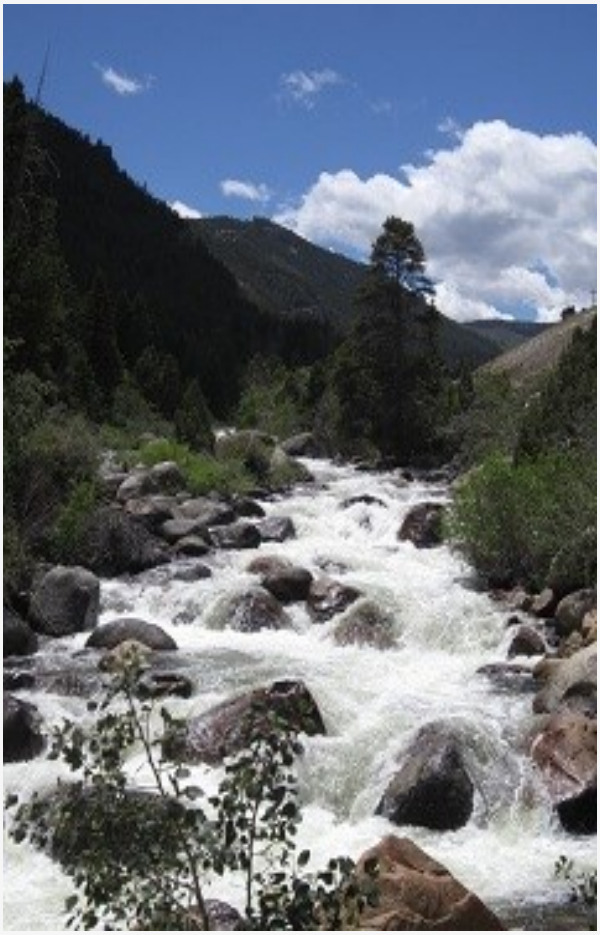
WyCEHG, developed through a large, multi-year, EPSCoR Track-1 Research Infrastructure Improvement award from the NSF in 2012, employed geophysical surveys to estimate the volume of open pore space in the subsurface. Understanding these "open spaces" in the rock is important as it's an indication of how much water the subsurface may hold. Computer models of the state of stress at those sites showed striking correlation with open pore space measurements. This means that scientists may be able to use measurements of the stress in the Earth's crust to estimate water-holding capacity.

"Our results may be important to hydrologists, geomorphologists and geophysicists," St. Clair says. St. Clair, *pictured right*, is excited to be publishing research in Science, the prestigious academic journal of the American Association for the Advancement of Science.

Right, UW researcher and lead author of the *Science* article, James St. Clair.

Did you know?

Science—a publication from the American Association for the Advancement of Science—is considered one of the most important journals in the academic world and is exceptionally influential in the scientific community. Considered a "high-impact journals" by the National Institutes of Health, the publication's acceptance rate is exclusive, with roughly only ten percent of submitted articles actually being selected for print.



Above, an example of a mountain watershed as seen at The Popo Agie River in Sinks Canyon State Park in Lander, WY.

Dr. Steve Holbrook, the Co-Principal Investor for WyCEHG and co-author on the paper said, "I think this paper is important because it proposes a new theoretical framework for understanding the large-scale porosity structure of watersheds, especially in areas with crystalline bedrock (such as granite or gneiss)." He believes that, "This has important implications for understanding runoff in streams, aquifer recharge and the long-term evolution of landscapes."

Holbrook adds that there is still a lot of work to be done to test this model in different environments. However, he says, "Now we have a theoretical framework to guide that work, as well as unique geophysical data to suggest that the hypothesis has merit."

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—Dr. Steve Holbrook, Co-Principal Investigator for WyCEHC