THE UNIVERSITY OF ARIZONA

School of Natural Resources and the Environment

Seminar Series: Fall 2023

IMPACTS OF WINTER SNOW AND SUMMER MONSOON RAINS ON FOREST WATER STRESS ACROSS THE SOUTHWESTERN U.S. - CASES FROM OF THE PAST AND TRAJECTORIES INTO THE FUTURE

SPEAKER: Jia Hu, UA SNRE

DATE: Wednesday, September 20th

TIME: 3:00-4:00 pm

LOCATION: ENR2 S210 & Zoom

ABSTRACT:

The U.S. Southwest is in a two-decade-long megadrought that, combined with expected increases in future drought under climate change, threatens the long-term vitality of regional forests. Seeking to understand the fate of these forests, we investigated how precipitation and atmospheric demand influenced water use during the megadrought by 17 different populations of Ponderosa pine forests. Using isotopes to track changes in source water (in the present day) and in water use efficiency (over time, as recorded in the cellulose of tree rings), we identified two key results. First, in the short term, we found that winter snowpack size strongly mediates the effect of summer monsoon rains, an important water source for these forests: heavier snowpacks facilitated infiltration of summer precipitation deeper into soils, while also keeping shallow fine roots active for longer (allowing them to quickly uptake summer rains). Second, the longer-term tree-ring record of water-use efficiency from 2000 to the present showed that tree populations at the northern margin of the North American Monsoon (NAM) system have been experiencing continued desiccation, while those populations within the NAM core appear to be buffered against the megadrought. This work suggests, however, that if NAM rain duration shortens, or completely fails with future climate changes, higher warm-season aridity and reduced water availability are a threat to the future of these critical forests.

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