THE UNIVERSITY OF ARIZONA

HOW CLIMATE AND FORESTS JOINTLY REGULATE THE EPHEMERAL SNOWPACKS OF THE US SOUTHWEST

SPEAKER: Joel Biederman, USDA Agricultural Research Service

DATE: Wednesday, October 4th

TIME: 3:00-4:00 pm

LOCATION: ENR2 S210 & Zoom

ABSTRACT:

Many mountain forests are undergoing unprecedented changes due to wildfire or management designed to reduce fire risk. It was long expected that reducing forest cover would enhance soil moisture and streamflow by reducing canopy interception and transpiration, but there are many exceptions in the Southwest US, where snowmelt dominates streamflow. Over the last decade, we have assessed how trees interact with snowfall, sun and wind to regulate sublimation, soil moisture and streamflow.

We have developed new approaches suited to the dynamic, ephemeral snowpacks of the Southwest. Despite the importance of trees, snow is often assessed using data from treeless clearings (SNOTEL), 2D imagery, or infrequent depth maps from UAVs or airplanes. Therefore, we have developed a network of low-cost, flexible Snowtography stations in Arizona where daily automated snow photography and soil moisture measurements are made across gradients of forest disturbance.

In this talk, I will review evidence for how forest changes alter water balance in the snow-dominated mountains of the Southwest, from plot to watershed scales. I will show how the 3D structure of forest (i.e. clusters and gaps) regulates the amount and timing of snowmelt, and how these effects vary with forest type and winter climate. Next, I will show how we are combining snow and soil moisture measurements and models to assess the fate of snowmelt in the soil, affecting forest drought stress and streamflow. Finally, I will illustrate our current efforts to scale these hydrologic results across Arizona's 2.4 M Acre Four Forests Restoration Initiative and to build SnowPix, an open-data network of daily Snowtography measurements across the Colorado River Basin.

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