

Project Title: Seasonal variation in soil resource availability in a complex karst landscape.

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Project summary: We monitored the predawn water potentials, a measure of root access to water, and the stem water isotope ratios, a measure of plant water origin, of Ashe juniper (*Juniperus ashei*) and live oak (*Quercus fusiformis*) for a year across four sites on the Pollard Property. Water potentials were less variable for oak than for juniper, though both species experienced reduced water status during spring and summer drought events. Site mattered: juniper became most water-stressed at the canyon bottom and oak at its top. Distance from an ephemeral stream did not matter since the stream flowed all but once during the experiment. Junipers were least water stressed at a sparsely vegetated and exposed site at mid-elevation, from where oaks were absent. The isotope ratios of stem water indicated more shallow and more flexible water uptake in juniper compared to oak. A second experiment on Freeman Ranch showed that tree size correlated negatively with the degree of water stressed experienced during summer in juniper and mesquite (*Prosopis glandulosa*). During drought, mesquite shifted water sources to less evaporatively enriched, hence deeper water sources, than those used by juniper. A secondary goal of this proposal was to study the water relations of *Nostoc commune*, a cyanobacterium that lives on the soil surface and fixes nitrogen. This study quantified the photosynthetic activity of *Nostoc* thalli as a function of water content and monitored the natural variability of water content in the field.