

## Plant Stress, Mortality, and Recovery in the Mogollon Highlands

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It has been a tough few years for the plants of the Mogollon Highlands. Rising temperatures, causing many to flower and set seed early, and drought conditions for so many years, have resulted in some very disturbing trends. At the NHI, we have asked for help in following these trends this summer. Observers have seen drought deciduous characteristics (leaves browning and dropping) in shrubs that often do not resort to this strategy. For example, oaks (*Quercus* sp), manzanitas (*Arctostaphylos* sp) and silktassel (*Garrya wrightii*) looked essentially dead in June in many places. One of the most common and startling observations in the Prescott National Forest was what appeared to be dying Alligator Junipers, where crowns were nearly totally brown. Other juniper species, normally the hardiest of trees, have exhibited total browning as well north of Prescott and into the Flagstaff areas as well as southeastern Utah. Interestingly, pinon pines (*Pinus edulis* and *P. fallax*) have tolerated the drought fairly well, and no widespread signs of insect attacks or direct drought effects have been reported.

But, with the return of the monsoons these past few weeks, we have seen some encouraging signs in plant re-growth. As Greg Stewart has documented in these pictures, species with the ability to resprout have begun producing new leaves (Emory oak for example). While most Juniperus species do not have the ability to resprout vegetatively after fires or other disturbances, Alligator juniper (*Juniperus deppeana*) does have this characteristic. Like after fires, we are now seeing reprotouting from the base of these trees! While it has been very unusual to see the deterioration of the crowns, the resprouting in response to monsoonal moisture is very encouraging. It does not appear that the other juniper species can recover, and widespread swaths of land are covered with dead Utah juniper (*Juniperus osteosperma*) and one seeded, shaggy bark juniper (*J. monosperma*). We need to keep an eye on these important trees.

Keep your eyes open to further signs of plant recovery and report on our survey please, and of course, enjoy the moisture!



Note new leaves at the base of this oak that had, only a few weeks ago, appeared dead. Photo by Greg Stewart.



Resprouting of new photosynthetic material, Alligator Juniper, Prescott. Photo by Greg Stewart.