Climate Change and the Sonoran Desert

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Semi-arid and arid ecosystems should be rather responsive to different aspects of climate change, since plant function in these systems is primarily limited by water availability, and many global change factors (CO2 rise, alteration in precipitation, temperature rise, nitrogen deposition) impact surface water budgets on landscapes. The prediction of an increase in 'global warming type' droughts such as those early in 21st Century will increase rates of perennial plant mortality, especially in the Sonoran Desert, which has the highest relative productivity of the North American deserts and contains functional types at risk to such mortality. This should accelerate rates of erosion, and create opportunities for exotic plant invasions. The proliferation of non-native annual and perennial grass will predispose sites to fire resulting in a loss of native woody plants and charismatic mega flora and primarily impacting low elevation sites that will now experience climate-fire synchronization where none previously existed. The climate-driven dynamics of the fire cycle is likely to become the single most important feature controlling future plant distributions in U.S. arid lands. Arid land soils are deficient in nitrogen, so erosional losses of soil nitrogen will further restrict regional productivity; and vegetation, especially exotic grasses, will be very responsive to N-deposition associated with increasing anthropogenic activities. Land use change, increased nutrient availability, increasing human water demand, and the continued pressure from non-native species will act synergistically with climate warming to restructure the rivers and riparian of the southwestern US. Increases precipitation intensity and the proportion of precipitation that comes in high-intensity storms will increase water erosion from uplands and delivery of nutrient-rich sediment to riparian areas. Combined these issues are likely to produce emergent features at the regional scale that may impact our systems in yet to be determined manners.

Travis Huxman received a Bachelor of Science and Master of Science in biology from California State University, San Bernardino in 1996. He earned his doctorate in biological sciences from the University of Nevada, Las Vegas in 2000. He was a post-doctoral fellow at the University of Colorado before joining The University of Arizona in Tucson in 2001. Huxman is a broadly trained biologist who is interested in the evolution of plant traits and the impacts of climate change on ecosystems. He has worked in deserts, grasslands and forests throughout North America, studying the physiological underpinning of how plants grow and reproduce, how climate variability and change affects plant and ecosystem processes and how ecosystems services relate to the human endeavor. His current research focuses on understanding the role of deserts in global climate. How deserts acquire and process carbon from the atmosphere and use water on the landscape are important feedbacks on global change that affect resource availability for consumption by society. Some important aspects of this current research include how ecological phenomena such as non-native species invasions affect the relationship between ecosystem carbon balance, water use and climate.