Climate Change: Great Basin Desert

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The global change factors that are thought to have the most profound effects on Great Basin ecosystems are elevated atmospheric CO2, increasing temperatures, altered precipitation regimes, and increased deposition of nitrogen. Temperature primarily affects the distribution limits of plants and animals, while precipitation and nitrogen inputs have strong effects on ecosystem structure and function.

The Nevada Desert Free-air CO2 Enrichment (FACE) Facility has examined how elevated CO2 will affect a desert ecosystem. Results from those studies have found that elevated CO2 increases primary production, but mainly in above-average rainfall years when soil resources are most available for photosynthesis and growth. Elevated CO2 has also been shown to differentially increase the growth and seed set of invasive brome grasses, which may in turn accelerate fire cycles in the region. This has extremely important implications for community structure in the Great Basin. Similar studies in which summer rain and nitrogen have been experimentally added have had less profound effects on plant productivity in this cold desert ecosystem.

Increasing temperatures, by themselves, should not significantly affect production processes in the Great Basin, but may significantly affect species distribution patterns, particularly if nocturnal temperatures increase more than daytime temperatures (as predicted). Animal species that occupy montane "sky islands" may be particularly susceptible to rapid temperature change, as the genetic population structure of several mammal species is unique in Great Basin montane habitats.

Finally, IPCC predictions of increased drought in the western U.S. could have the most profound consequences of all for species distributions and ecosystem function in the Great Basin.

Stan Smith is currently the Associate Vice President for Research and a Professor of Life Sciences at UNLV. He is a plant physiological ecologist who has been examining the effects of global change and invasive species on desert ecosystems over the past 25 years.