

Sagebrush Steppe Climate Change Vulnerability Assessment



Brief for Resource Managers

Response of common plants to annual climate variation in sagebrush communities

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We compiled long-term records on canopy cover from permanent vegetation plots across the western United States to examine how the cover of common grasses and sagebrush changes in response to yearly variation in precipitation and spring temperature. We performed the analysis by comparing the change in species' cover at each site in each year to the climate conditions experienced during that year. Big sagebrush cover decreased significantly in response to spring temperatures (Figure 1). On the other hand, cheatgrass cover and Sandberg's bluegrass cover increased mostly in wetter years (Figure 1). Three other species analyzed, three-tip sagebrush, needle-and-thread grass and bluebunch wheatgrass, showed very weak responses to annual climate (regressions with $|R^2| < 0.03$). This analysis shows that species commonly found together may differ in how they respond to annual climate variation. The weak response to annual climate variation we observed is in contrast to the strong sensitivity to climate predicted by species distribution models. Our

Management Implications

- Sagebrush cover declines in hotter years.
- Cheatgrass and Sandberg's bluegrass increase in wetter years.
- In the short-term, many species are not very sensitive to annual climate fluctuations, but they may be more sensitive to long-term changes in climate.

analysis suggests that species' responses to climate may require long-term changes in climate or may be driven by other indirect effects of climate, such as fire frequency.

Most relevant references:

Munson SM, Muldavin EH, Belnap J, et al. (2013) Regional signatures of plant response to drought and elevated temperature across a desert ecosystem. *Ecology* 94:2030–2041. doi: 10.1890/12-1586.1

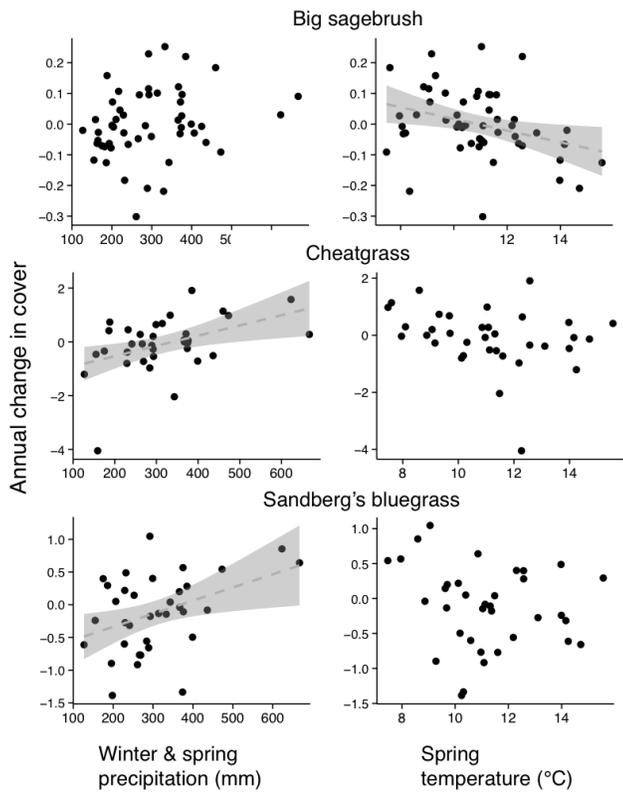


Fig. 1. Response of three common species to variation in annual climate. Each data point shows the change in cover over one year in one location. For species that responded significantly to annual climate we show the best fit regression line and the standard error. Sagebrush declined significantly in response to warmer spring temperatures. Cheatgrass (middle) and Sandberg's bluegrass (bottom) were more sensitive to precipitation than to temperature and increased in wetter years.