Predicting changes in California's diverse environments: Introducing the ORIDE climate change experiment

Kristen M. Kaczynski1* and Kerry M. Byrne2
1Department of Geological and Environmental Sciences, California State University - Chico, Chico, CA 95929
2Department of Natural Sciences, Oregon Institute of Technology, Klamath Falls, OR 97601
* kkaczynski@csuchico.edu

INTRODUCTION

Climate change models predict that the duration and intensity of drought in the Western United States, including the Great Basin sagebrush ecosystem, will increase in future climate regimes (1).

As water is the primary driver of community structure and ecosystem processes in grasslands and shrublands worldwide (2), these climate change predictions indicate that grass- and shrub-dominated ecosystems may be particularly sensitive to changes in climate (3, 4).

Little climate change research has occurred in the Great Basin sagebrush ecosystem. To date, we still do not understand how sagebrush and the associated plant communities will respond to predicted changes in climate.

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Our goal is to investigate the impacts of intense, long-term drought on the western Great Basin sagebrush ecosystem. To accomplish this, we implemented a drought experiment (Fig. 1) in native sagebrush vegetation. This experiment is part of a large network of concurrent drought experiments using the same methods, called the International Drought Experiment (IDE) network.

RESEARCH OBJECTIVES

Over the next four years, we will track changes in

- species composition
- forage and root production
- sagebrush seedling recruitment
- drought stress of both Artemisia cana and A. arbuscula

These data will help inform future species conservation and grazing management decisions for the Bureau of Land Management.

FIRST YEAR RESULTS

Plant Community Composition

AA site

- Species richness ranged from 12 - 19 species 4.0 m^-2; mean species richness was 16.3 species 4.0 m^-2 (0.9 SE).
- The most abundant grasses were Festuca idahoensis and Elymus elymoides, while common forbs included Navarretio intertexta, Blepharipappus scalar, Lamotium sp., and Gilio sp. Common shrubs included Artemisia arbuscula and Epilobium sp.

AC site

- Species richness ranged from 12 - 18 species 4.0 m^-2, and mean species richness was 14.2 species 4.0 m^-2 (0.6 SE).
- The most abundant grasses were Festuca idahoensis, Elymus elymoides, and Bromus japonicus, while common forbs included Epilobium brachycarpum, Collinia grandiflora, and Achillea millefolium. Artemisia cana was the most abundant shrub, although a few of the plots also contained A. arbuscula.

Aboveground Net Primary Production

- As expected, mean ANPP was greater at the AC site (145.6 g m^-2; 15.9 SE) than the AA site (66.6 g m^-2; 10.0 SE). There were no treatment differences.

Xylem pressure potentials

- Artemisia cana demonstrated greater drought stress in August compared with July, as expected. Plants in both July and August recovered overnight (Table 1).
- There were no significant differences between drought and control plants both midday and predawn, in both July and August (p > 0.5).

UPCOMING RESEARCH

- Continued collection of plant community, ecosystem, and sagebrush physiological measurements for three more years.
- Sagebrush seedling germination and establishment study in collaboration with other Great Basin sagebrush IDE sites (Summer 2017).
- Effect of drought on annual leaf litter decomposition rates.
- Cross-site analysis with other Great Basin sagebrush IDE sites in western Wyoming and Utah (collaboration with Drs. Lynn Moore, Karen Beard, and Andrew Kulmatski).

LITERATURE CITED & ACKNOWLEDGEMENTS


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