

Research Summary

Impacts of California Climate Change at the Edge of an Invasion

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My dissertation research examines how climate changes affects populations of the invasive annual grass, *Bromus tectorum* (cheatgrass), along the eastern Sierra Nevada. *B. tectorum* is one of the most problematic invasive species in the United States, with tens of millions of acres in the Great Basin and Intermountain West already infested and highly susceptible to devastating fires. This invasion has not progressed substantially into the Sierra Nevada, likely due to climatic limitations such as heavy winter snowpack and low growing season temperature. Warmer temperatures and a reduced snowpack (as predicted by several climate models) could benefit populations of *B. tectorum* and result in the spread of *B. tectorum* upslope into the Sierra Nevada. My research addresses the following questions: 1) what are the effects of snow depth on population growth and vital rates (survival, growth, and reproduction) of *B. tectorum* at high elevation, and 2) what is the influence of interannual climate variability on population dynamics?

Since Fall 2004, I have experimentally manipulated snow depth by erecting snowfences in a shrubland ecosystem near Mammoth Lakes, CA. Snowfences create zones of both increased and reduced snow accumulation without any of the disturbances associated with manual snow manipulations (e.g. shoveling). Following snowmelt, extensive sampling of *B. tectorum* individuals throughout their life cycle is used to construct demographic models of population growth and dynamics. Other factors, such as meteorological data, soil moisture, and stable isotopes (used to assess plant water stress and water source) are examined to help explain population-level patterns. This type of information – from abiotic/physical influences to population processes to overall population growth – is particularly important for the management of invasive species. Knowledge of population trajectory alone does not pinpoint particular life stages or other physical factors that would be most relevant to successful management.

As the climate continues to change, plant migration will be an important biological response/impact. If higher elevation sites become favorable for *B. tectorum* growth, populations along the eastern Sierra Nevada will not have far to disperse. In fact, it is likely that *B. tectorum* seeds are already being carried into the Sierra Nevada by the multitude of hikers and vehicles that visit the area each year. This region of California is treasured by millions for its sublime beauty and relatively pristine ecosystems. With one of the continent's worst invasive plants right at the edge, it is crucial to examine the potential impacts of anthropogenic climate change.