

Genetic Variation & Local Climate Adaptation in Grassland Species: Implications for seed sourcing

April Goebel and Rebecca Hufft

Denver Botanic Gardens, Denver, CO, USA

Planting native species is a proactive approach that can be effective in restoring biodiversity and ecological function following ecosystem degradation. Semi-arid grasslands, a dominant biome in the western United States, are becoming increasingly degraded by human impacts and the effects of climate change. Following grassland disturbance, a primary aim of active restoration is rapid establishment in current conditions as well as long-term persistence in a changing environment. Wild-collected seed may have advantages in addressing this aim due to the presence of genetic diversity that has evolved as species have adapted to a range of natural habitats. In turn, this genetic diversity can be crucial for restored populations to adapt to the myriad of selective pressures that may be encountered following planting. However, determining where to source genetically appropriate seed for a given restoration project is challenging. To better understand and address this challenge, we are conducting a multi-year field-based common garden experiment at Denver Botanic Gardens Chatfield Farms in Colorado. Common garden experiments can be used to quantify levels of genetic variation (both within and between populations), and to assess local adaptation to key ecological drivers, such as climate. We are using seed collected by the Bureau of Land Management's Seeds of Success (SOS) program for four focal species: one grass (*Bouteloua gracilis*), one shrub (*Ericameria nauseosa*), one sub-shrub (*Artemisia frigida*), and one forb (*Penstemon virens*). In this highly replicated study, we are growing individuals from multiple (6 to 21) populations, sourced from a range of habitats in the western U.S. This experiment was initiated in 2022; data collection includes plant growth rate, size, leaf characteristics, flowering phenology, and reproductive output. Results show considerable variation in traits between populations and differing levels of intra-population variation. We identify climate variables with strong correlations to several traits in each species.

Contact Information: April Goebel, Assistant Research Scientist, Denver Botanic Gardens, Research and Conservation, 909 York St., Denver, CO, 80206, USA, Phone: 720-865-3650, Email: april.goebel@botanicgardens.org