Predictive Modeling of Bluebunch Wheatgrass (*Pseudoroegneria spicata*) Traits Using High Throughput Phenotyping.

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Abstract

Compositional changes within dryland ecosystems in the Intermountain West and projected climatic shifts will negatively impact sagebrush-steppe communities. Restoration of native perennial bunchgrasses can sustainably increase ecosystem resistance to invasive plant species and resilience to environmental stress and disturbance. Bluebunch wheatgrass (*Pseudoroegneria spicata*) is a native, perennial grass commonly used for large-scale restoration projects in the western U.S. Creating and utilizing spatially explicit models of phenotypic traits of bluebunch wheatgrass will establish consistent methods for evaluating seedling establishment and plant persistence. These predictive models will aid in the development of plant materials used for restoration, assist management practices that decrease the adverse impact of invasives, and increase ecosystem services of semiarid rangelands. High throughput phenotyping (HTP) uses an unmanned aerial vehicle (UAV) to capture multispectral imagery at incremental periods throughout the growing season. Images are analyzed for phenotypic traits associated with seedling establishment and plant persistence. In-field measurements for phenotypic traits are collected on a random sample of plots. Data mining and exploration will be done to assess relationships between imagery and field data, which will be used to construct models utilizing machine learning algorithms and be validated to determine error and bias. HTP will improve our understanding of seedling establishment and plant persistence traits and facilitate the development of germplasm used to produce plant materials needed for large-scale restoration projects on public and private lands. The re-establishment of native bunchgrasses on public lands could increase vegetative biodiversity within the ecosystem and create more suitable habitats for ruminants and wildlife.

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