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## **Are native perennial grasses slowing the spread of cheatgrass?**

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### **Background/Questions**

Cheatgrass (*Bromus tectorum*, downy brome) is a non-native annual grass that has invaded rangelands and sagebrush steppe in the western United States. This invasion has led to decreased plant diversity, reduced fauna habitat, and altered nutrient cycling. While these negative outcomes are widely documented in regions surrounding the Great Basin, they have not been apparent in the northern edge of cheatgrass's range which overlaps with the Greater Yellowstone Ecosystem. Analysis of the plant community composition and the spatial arrangement between cheatgrass and neighboring plant species through neighborhood studies can help us to determine how these species are interacting in the GYE. Neighborhood studies are a method that allow us to examine the response of a target individual to the identity, size, and proximity of neighbors. Our goals were to quantify relationships between cheatgrass and neighboring species, and identify which species are highly competitive with cheatgrass.

### **Methods**

We characterized neighborhoods that were centered around randomly selected target cheatgrass individuals (n=30), at two semi-arid grassland sites in southwestern Montana. We measured the percent cover, height, density, and location of the target and all neighboring species, and organized them by life-forms (grasses, forbs, or cheatgrass) for six different neighborhood sizes (5, 10, 15, 20, 25, 30 cm radius). These neighborhoods were nested (each target was observed at each size) so we could identify the size of neighborhood that best captured the relationships. We used linear models to analyze target cheatgrass volume (proxy for biomass) in response to neighboring grass, forb, and cheatgrass volume, neighboring grass, forb, and cheatgrass density, percent bare ground, species richness, distance to the nearest neighbor, and the identity of the nearest neighbor. This model was run for each neighborhood size, and each was reduced via a stepwise selection process to remove non-significant predictors using AIC and R<sup>2</sup> values to assess their performance. This assessment revealed that our largest neighborhood (30 cm) had the highest model performance, that is, impacts on target cheatgrass individuals can be detected from neighbors up to 30 cm away.

### **Results/Conclusions**

Two species negatively impacted cheatgrass; when Sandberg bluegrass (*Poa secunda*) or bluebunch wheatgrass (*Pseudoroegneria spicata*) were the closest plant to the target, cheatgrass volume decreased. This indicates that these two native perennial grasses are negatively impacting cheatgrass individuals. It also showed that the further away the nearest neighbor was from the target, the larger the target was. Identifying these potential competitive relationships between cheatgrass and native perennial grasses in the field can help inform management and restoration decisions in the GYE.