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Evaluation of the influence of plant invasions on arthropod food webs in sage steppe: Do disrupted aphid-ant mutualisms cause a cascading effect?

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Abstract

Aphid-ant mutualisms can have wide-ranging effects on ecological interaction webs. Cumulative evidence suggests that aphid-ant associations often impose negative indirect effects on one or a few group of herbivorous and predatory arthropods of a host plant. However, how aphid-ant mutualisms influence the dynamics of entire arthropod food webs remains uncertain. Preliminary data analysis suggests that the species richness and abundance of arthropod guild on big sagebrush (*Artemisia tridentata*) are altered by invasions of non-native cheat grass (*Bromus tectorum*) in fragmented sage steppe-ecosystems in southeast Idaho. Moreover, these responses differed among arthropod feeding groups. One hypothesis to explain observed patterns in arthropod communities is that the presence of *B. tectorum* may alter interactions between ant guilds. Studies have shown that presence of *B. tectorum* increases the number of seed harvesting ants, which in turn, may disturb activities of other arthropods on host shrubs. The ecological mechanisms underpinning how ant guilds influence the dynamics of the entire arthropod food web, however, remain unknown. Nevertheless, plant invasions have the potential to generate cascading disruptive effects for entire arthropod communities, and these effects need to be evaluated experimentally. In this study, I will conduct an ant-removal experiment along a gradient of cheat grass density to understand: 1) whether the likelihood of ant colonization will increase with increasing density of *B. tectorum* and 2) how disrupted aphid-ant mutualisms influence the diversity and abundance of arthropod food webs of *A. tridentata*. The results from this study will provide quantitative evidence to understand how plant invasions and insect-mutualisms interact and cause cascading-impact on arthropod food webs.