

Submitted Abstract

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First Author First Name Last Name	Christian (1) Larson
Submitting Author First Name Last Name	Tim Seipel
Correspondence	tim.seipel@gmail.com
Co-Authors >> E-Mails will be not listed	Chichinsky, Daniel (1); Maggio, Melissa (2); Rew, Lisa (1); Seipel, Tim (1)
Organisations	1: Dept Land Resources and Environmental Sciences, Montana State University, United States of America 2: Montana Biocontrol, USA
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Abstract

Cirsium arvense is a perennial plant species with a broad environmental tolerance and is often distributed from low elevations to high elevations. It is native to south-eastern Europe but is a cosmopolitan weed throughout global temperate ecosystems, especially Europe and North America. *Cirsium arvense* is a weed that causes crop yield loss, reduces forage quality, and, in its non-native range, is associated with a reduction of native plant abundance and decreased biodiversity. Management of *C. arvense* is difficult because of its deep root rhizomes and substantial seed production, and usually includes mechanical disturbance or herbicides. The obligate *C. arvense* fungal pathogen (*Puccinia punctiformis*) can affect *C. arvense* performance and has potential to be used as a management tool. The aim of our study was to assess the occurrence and potential impact of *P. punctiformis* on *C. arvense* across an elevation gradient. Using *C. arvense* records from multiple land management agencies between 2017 and 2022, spanning across the Pacific Northwest USA, we evaluated populations demographics across its range. The records estimated patch size, percent cover of *C. arvense*, cover of plant functional groups, bare ground, and litter. In 2021, we expanded the project to include the total number of *C. arvense* ramets demonstrating symptoms of *P. punctiformis* infection in each patch, as well as the number of symptomatic *C. arvense* ramets in 1 m² frames within each patch. We found that that as elevation increased *C. arvense* patch size decreased, its cover decreased, while its density increased. In addition, we found that *P. punctiformis* probability of occurrence increased as *C. arvense* density increased and, subsequently, the density of symptomatic *C. arvense* ramets and the probability of occurrence of *P. punctiformis* increased with elevation gain. To further evaluate the effects of *P. punctiformis* on *C. arvense*'s population expansion and individual performance across the environmental gradient, *C. arvense* populations were inoculated with the pathogen beginning in 2017. Starting in 2022, the effects of these inoculations will be assessed by evaluating patch size, fungal disease severity (presence/absence of infection and density of *P. punctiformis* infected ramets), and any associated changes in *C. arvense* cover or density.