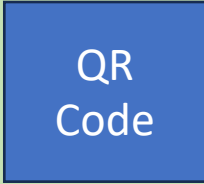


Tiny plants, big impact? An assessment of invasiveness in small-sized, exotic annual forbs in Alberta and western North America.

Britton McNerlin, Kelly Wu, Viktoria Wagner
Department of Biological Sciences, University of Alberta



UNIVERSITY OF ALBERTA



Introduction

- Small-sized exotic annual forbs are frequent in mountain meadows & grasslands, yet their invasiveness is not well understood.
- Potential impacts include a suppression of ...
 - (1) native perennial seedlings, resulting in a change in the community trajectory
 - (2) small-sized native annual forbs, leading to a loss in native biodiversity in habitats where annual native forbs make up a large share of the biodiversity e.g.1,2

Objectives

- Compare germination rates of small-sized exotic annual forbs other species groups (→ germination trial)
- Understand the effect of small-sized exotic annual forbs on the growth and germination of native perennial seedlings & small-sized native annual forb species (→ growth chamber experiments)
- Compare the competitive abilities of small-sized exotic annual forbs to exotic annual grasses (→ growth chamber experiments)

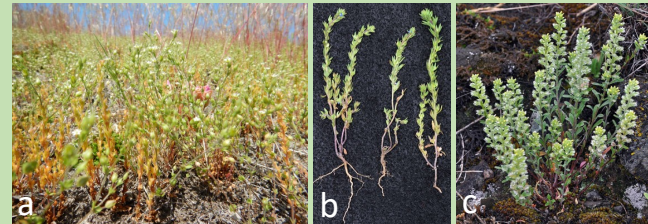
Methods

Germination trial (Completed)



Setup: 20 seeds of study species per petri dish, with four replicates. In total, the germination trial encompassed 40 petri dishes and 10 different study species.

Small-sized exotic annual forbs



a) *Arenaria serpyllifolia* (thyme-leaf sandwort), photo credit: Matt Lavin (Flickr, no mods, CC BY-SA 2.0 DEED).
b) *Veronica verna* (spring speedwell), photo credit: Robert L. Carr,
c) *Alyssum alyssoides* (small alyssum) photo credit: Robert L. Carr

Methods (Continued)

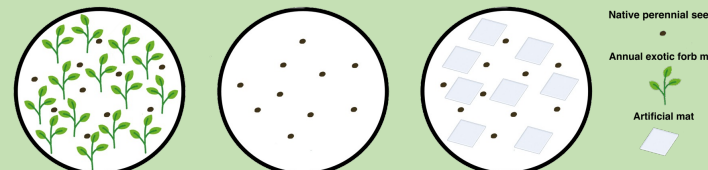
Growth Chamber Experiments (In progress)

(1) Competition Experiment

Table 1. Overview of the proposed competition experiment

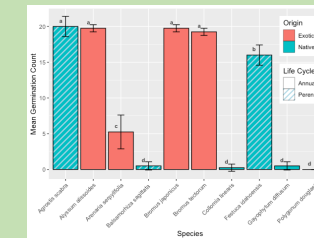
Hypothesis addressed	Competition partner	Number of pots
H1: Effect on growth of perennial native seedlings	<i>Agrostis scabra</i> , <i>Balsamorhiza sagittata</i> , <i>Festuca idahoensis</i>	= 3 small-sized annual exotic forb species × 3 competition partners × 10 replicates = 90 pots
H2: Effect on small-sized native annual forbs	<i>Collomia linearis</i> , <i>Gayophytum diffusum</i> , <i>Hemizonella minima</i> , <i>Polygonum douglasii</i> , <i>Veronica peregrina</i> subsp. <i>xalapensis</i>	= 3 small-sized annual exotic forbs × 5 competition partners × 10 replicates = 150 pots
H3: Comparison with small-sized exotic annual grasses	<i>Bromus japonicus</i> , <i>Bromus tectorum</i>	= 3 small-sized annual exotic forbs × 2 competition partners × 10 replicates = 60 pots
Not applicable (control)	No competition partner	= 13 study species (small-sized exotic annual forbs and competition partners) × 10 replicates = 130 pots

(2) Perennial Seed Germination Experiment



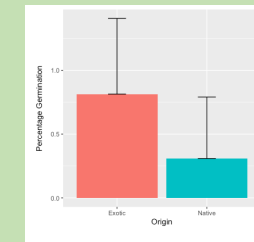
Assesses whether mats formed by annual exotic forbs prevent the germination of native species, compared to an artificial mat made of plastic, to determine whether this result is due primarily to abiotic factors such as light availability.

Results (Germination trial)

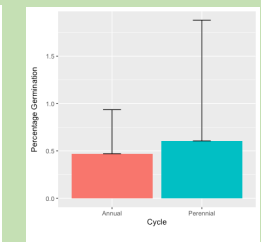


Error bars represent 95% confidence intervals.

Germination differed widely among species



There was no significant difference in germination between origins ($t = 1.82$, $df = 8$, $p = 0.11$) and life cycle ($t = -0.39$, $df = 8$, $p = 0.71$).



Conclusion

The envisioned growth chamber experiments will inform us if small-sized exotic annual forbs lower the germination and growth of native species, and outcompete them, thus potentially altering plant communities.

We are also planning another project that will examine a large vegetation survey dataset to understand how landscape features influence levels of invasion in mountain meadows and grasslands.

Acknowledgements



We acknowledge the support of the Natural Sciences and Engineering Research Council of Canada (NSERC) (Discovery Grant Program) Nous remercions le Conseil de recherches en sciences naturelles et en génie du Canada (CRSNG) de son soutien (Discovery Grant Program)

We would like to thank all lab assistants and volunteers who aided with seed collecting and processing!

Contact: mcnerlin@ualberta.ca