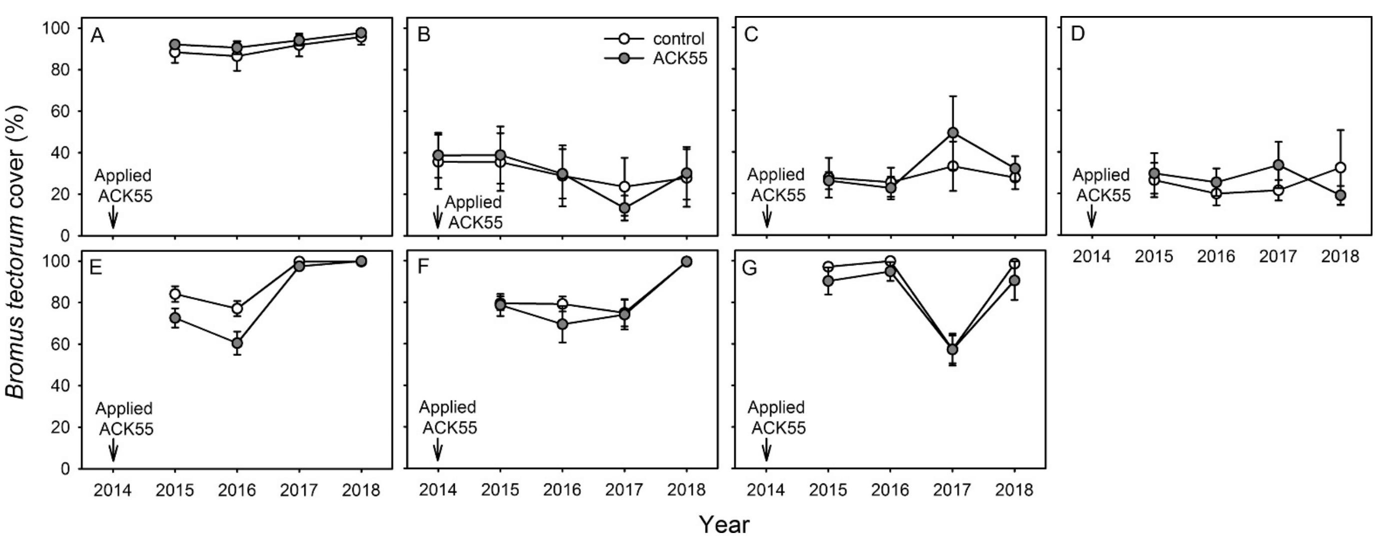
Field Trials Test Efficacy of Cheatgrass-suppressive Bacteria

Introduction: Cheatgrass (*Bromus tectorum*) is one of the most widespread invasive plants in the western U.S. Because cheatgrass can form large infestations of hundreds to thousands of acres, often in remote and inaccessible locations, biological control is an attractive option. Various strains of the soil bacterium *Pseudomonas fluorescens* (e.g. D7, ACK55, MB906) were proposed as bioherbicides because they were shown to inhibit cheatgrass growth in Petri-plate and growth chamber environments as well as some wheat fields in eastern Washington. The bioherbicide was to be applied during cold, wet weather in fall or winter, and it would colonize cheatgrass roots resulting in decreased seedling vigor, tillers, and seeds. Over two to three years, desired vegetation would outcompete cheatgrass. Replicated field trials testing efficacy of P. fluorescens bioherbicides were limited until now. The results of one such field trial are presented here.

Methods: In November-December 2014, *P. fluorescens* ACK55 was applied at 7 sites (6 in Montana, 1 in WY) to rangeland infested with cheatgrass or a combination of cheatgrass and Japanese brome (*B. japonicus*). Application methods followed guidelines for using *P. flourescens* as a bioherbicide. Plots were 5 by 5-meters, and each plot was paired with a non-treated control of the same size. Treatments were replicated 4 (2 sites) or 8 (5 sites) times. For four years following application (2015-2018), cover of cheatgrass and Japanese brome was recorded at each site.

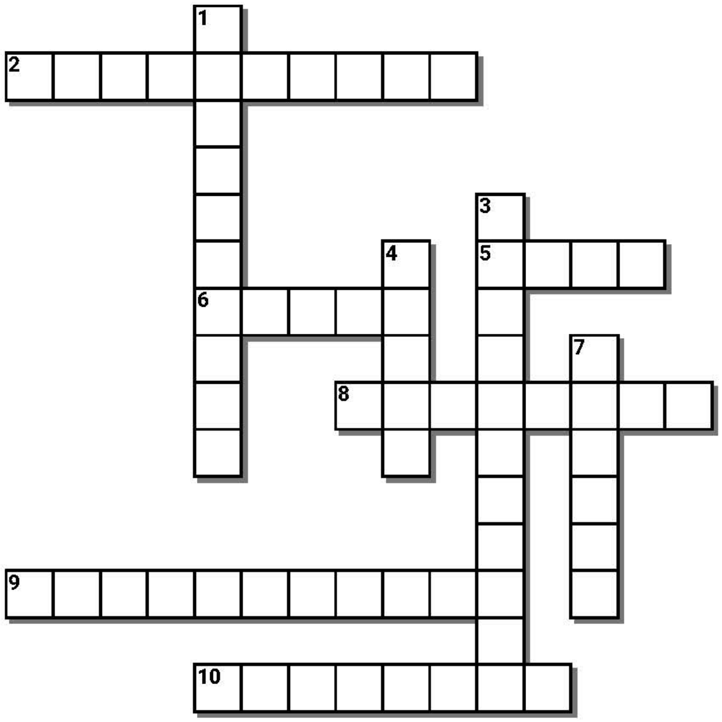
Results: There was no evidence that *P. fluorescens* ACK55 reduced cheatgrass at the 7 sites. At one of the sites in eastern Montana, treated plots had less cheatgrass than the non-treated control the first (2015) and second (2016) year after treatment, however the effect did not persist in 2017 and 2018, suggesting observed differences in 2015 and 2016 were short-term or due to pre-treatment differences between plots. Read the entire paper at Reinhart et al. (2020).



Cheatgrass cover (%) across 7 sites (A-D in western or southwestern MT; E-F in eastern MT; G in northeastern WY) in plots treated with *Pseudomonas fluorescens* ACK55 (shaded circles) or left non-treated (open circles). From 2015 through 2018, there was no difference between treated and non-treated except for one site (panel E) in 2015 and 2016.

Results from additional studies: Results from 4 additional field trials are now available in Rangeland Ecology and Management. In summary, those trials tested different strains of *P. fluorescens* at different application rates and methods and with/without herbicide. Study sites occurred in Idaho, Washington, and Wyoming. None of the studies found *P. fluorescens* to reduce cheatgrass abundance. Collectively, these studies suggest *P. fluorescens* is unlikely to be an effective bioherbicide for cheatgrass, at least as it is currently available.

Test Your Knowledge of: Field Trials Test Efficacy of Cheatgrass-suppressive Bacteria



Across

2. setting where bacteria has inhibited cheatgrass the most (2 words)
5. Pseudomonas fluorescens' home
6. one of four states where field trials have occurred
8. Pseudmonas fluorescens affects grasses at this stage of growth
9. necessary component of valid field research
10. cousin of cheatgrass

Down

1. management approach appealing for large infestations that are hard to access
3. bacteria explored as cheatgrass bioherbicide
4. measure of cheatgrass, or any plant species for that matter, abundance
7. time of year that cheatgrass-suppressive bacteria was applied

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