

Soil bacteria to control invasive grasses

Relative to other control measures

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US Geological Survey, Boise ID

Funded by ITD and other sources

Photo credit: nolanpreece.com

Exotic annual grasses (cheatgrass) and fire cycle



Diversity of invaders



Bromus tectorum,
cheatgrass

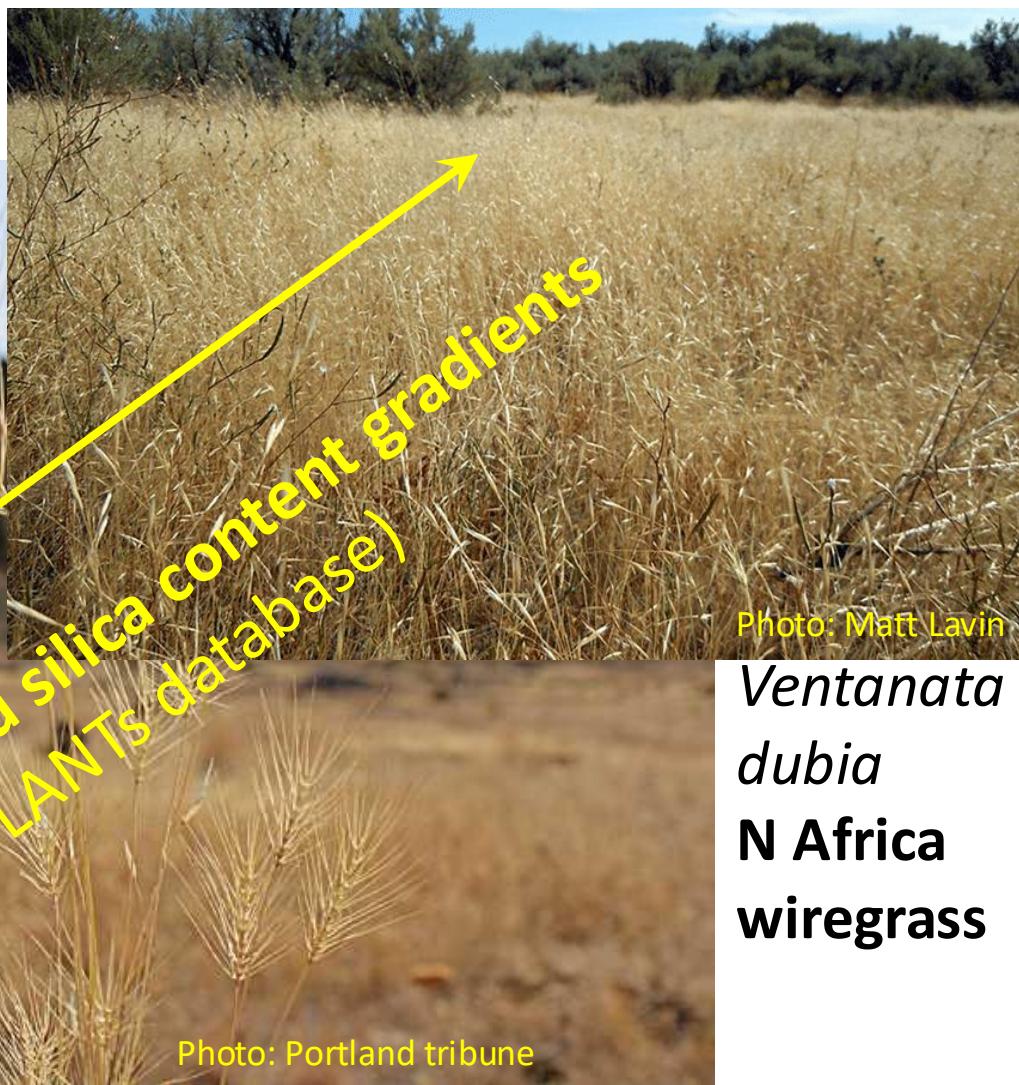


Photo: Matt Lavin
Ventanata
dubia
N Africa
wiregrass

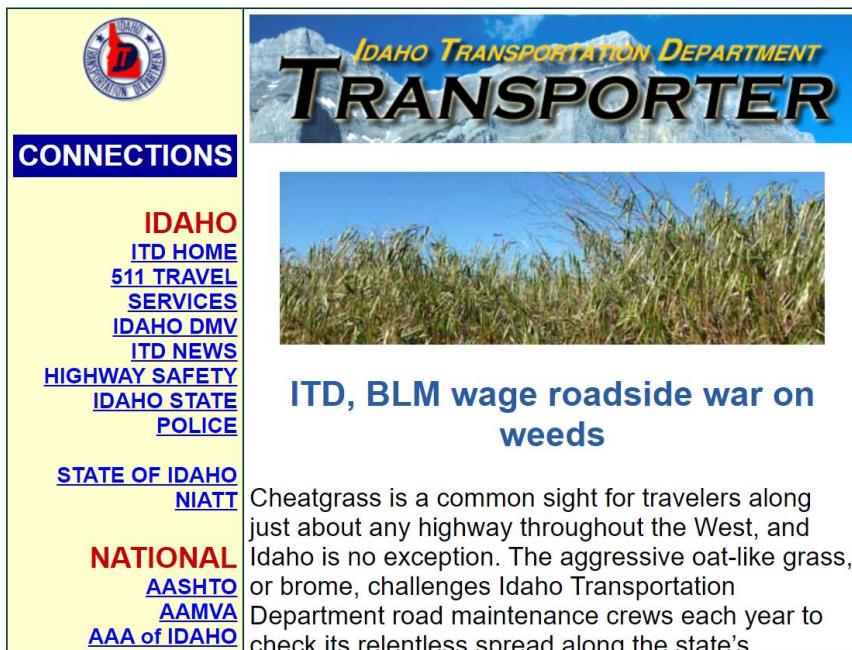
Taeniatherum
caput medusa
Medusahead

Perennial grass and soil surfaces of interspaces that confer resistance to annual grass invasion



Exotic annual grasses: critical factor connecting land health, fire, and risk factors between Idaho's highway corridors and surrounding landscapes.

The problem continues to get worse, over years and decades. Solutions and action now will prevent impacts, expenses, and highway hazards in the future.



The screenshot shows the ITD website with a yellow header bar. On the left, there's a logo for "IDAHO TRANSPORTATION DEPARTMENT" and a "CONNECTIONS" menu with links to "IDAHO ITD HOME", "511 TRAVEL SERVICES", "IDAHO DMV ITD NEWS", "HIGHWAY SAFETY", "IDAHO STATE POLICE", "STATE OF IDAHO NIATT", and "NATIONAL AASHTO AAMVA AAA of IDAHO". The main content area features a banner for "IDAHO TRANSPORTATION DEPARTMENT TRANSPORTER" with a background image of mountains. Below the banner is a photo of tall, green cheatgrass. A headline reads "ITD, BLM wage roadside war on weeds". A paragraph explains that cheatgrass is a common sight along highways and requires annual monitoring by ITD maintenance crews.

Exotic annual grasses: critical factor connecting land health, fire, and risk factors between Idaho's highway corridors and surrounding landscapes.

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ITD, BLM wage roadside war on weeds

Cheatgrass is a common sight for travelers along just about any highway throughout the West, and Idaho is no exception. The aggressive oat-like grass, or brome, challenges Idaho Transportation Department road maintenance crews each year to check its relentless spread along the state's

Massive black dust cloud mistaken for fire west of Idaho Falls



Nate Eaton, EastIdahoNews.com

Weather Published at 7:27 pm, August 1, 2019

SHARE THIS



Video courtesy Trevor Jolley

IDAHO FALLS — A massive dust cloud west of Idaho Falls was mistaken for a fire Thursday evening and crews from multiple agencies responded to the scene.

The cloud was reported 22 miles outside of the city on the Arco Highway. Video sent to EastIdahoNews.com by

(208) 528-

MOST POPULAR STORIES

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- No decision yet on changes to Chad Daybell case
- Popular BBQ restaurant has large kitchen fire
- Pocatello family claims they will cost them millions
- Rigby man accused of sexually assaulting teen over two years

General strategies for restoration - build or maintain resistant and resilient roadsides; increase perennial herbs, especially bunchgrasses.

Strategies:

Relieve stresses on plant community

- but DOT roadsides need to be used and maintained

Ensure areas that are uninvaded remain that way

- requires coordinating with adjacent landowners

Reduce annual grasses where they are invading or where they have invaded

- seed banks are the issue; targeting annual nature of exotic grasses = opportunity

- glyphosate and other post-emergent are not useful for sustained control.

- bio-herbicides such as weed-suppressive bacteria not proven despite testing**

- pre-emergent herbicides are likely the answer**

- imazapic, rimsulfuron, indaziflam – all differ in duration of control and cost**

- many unresolved factors affect them such as weather, litter**

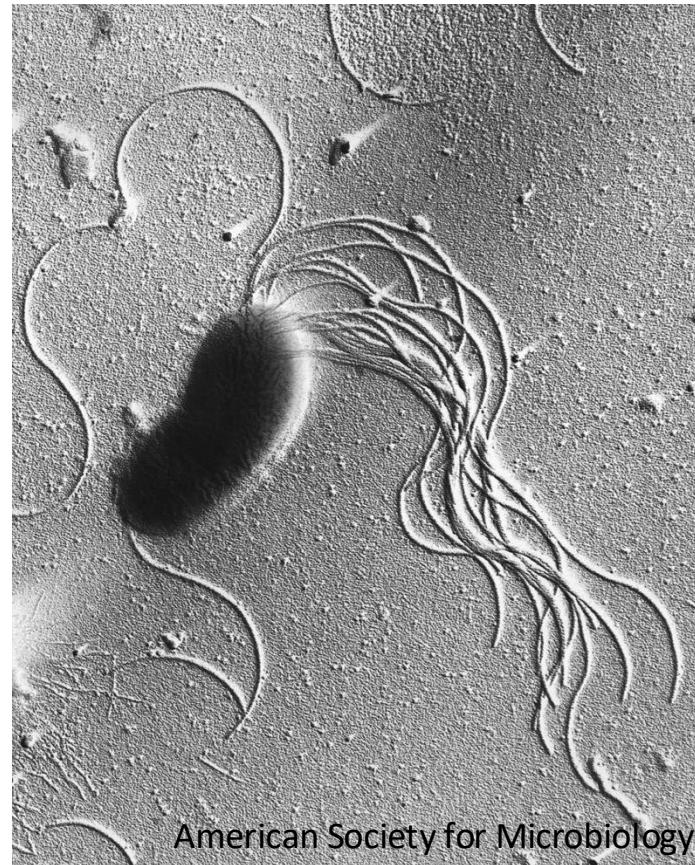
Longer-term resistant to invasion can only come from restoring perennial herbs

- how to seed when pre-emergent herbicides have been used?

- other options could including large-scale plantings.

What are weed-suppressive bacteria?

- *Pseudomonas fluorescens* occurs naturally in soil and water
- Genetically diverse species
- Strains of *P. fluorescens* are used to kill invasive zebra and Quagga mussels (Zequanox®), to make yogurt, and to protect strawberries from frost and apples from disease
- Weed-suppressive strains were isolated by Dr. Ann Kennedy (ARS) and colleagues in the late 1980's



American Society for Microbiology

The hope for WSB

- Potentially greater social acceptance
- Cost is in the range of conventional herbicides (\$8/acre)
- Able to be applied over large areas using conventional equipment – spray it on during cool autumn conditions
- Potential “temporal bridge” between short-term action of herbicides and longer-term benefits of perennial bunchgrass re-establishment.



Photos: Russ Lawrence and BLM



WSB Strains

- **D7** – EPA registered bioherbicide (Verdesian Life Sciences). No longer commercially available
- **MB906** – (Biowest, Nampa, ID) – labeled as soil amendment (not bioherbicide). Stop orders, product no longer made
- **ACK55** – licensed by Biowest, now available as BattalionPro

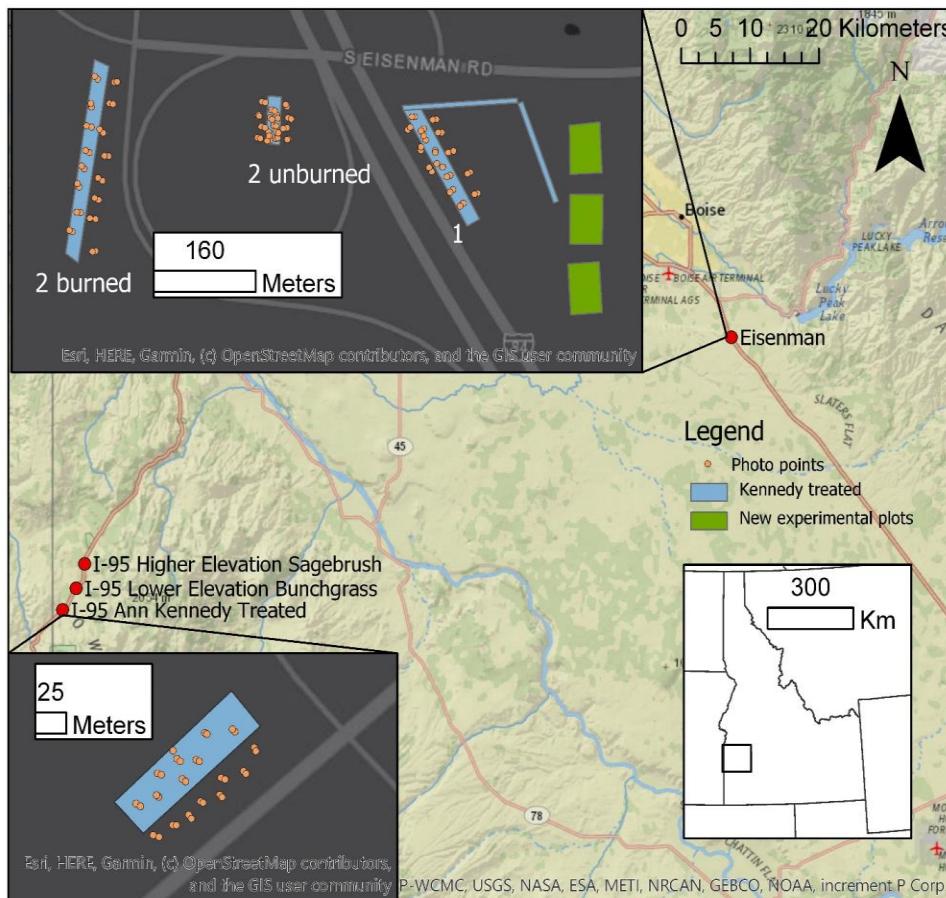
Coordination project findings to date

- **53 projects**
 - **14 scientific studies**
 - **39 manager trials**
- **30,000+ acres**

State	Acres
WY	21410
ID	8397
MT	1347
OR	1145
WA	449
CA	25
NM	24
UT	20
NV	10
CO	8

INTERIM REPORT ON SUBTASK FOCUSED ON RESAMPLING HISTORIC KENNEDY/ITD

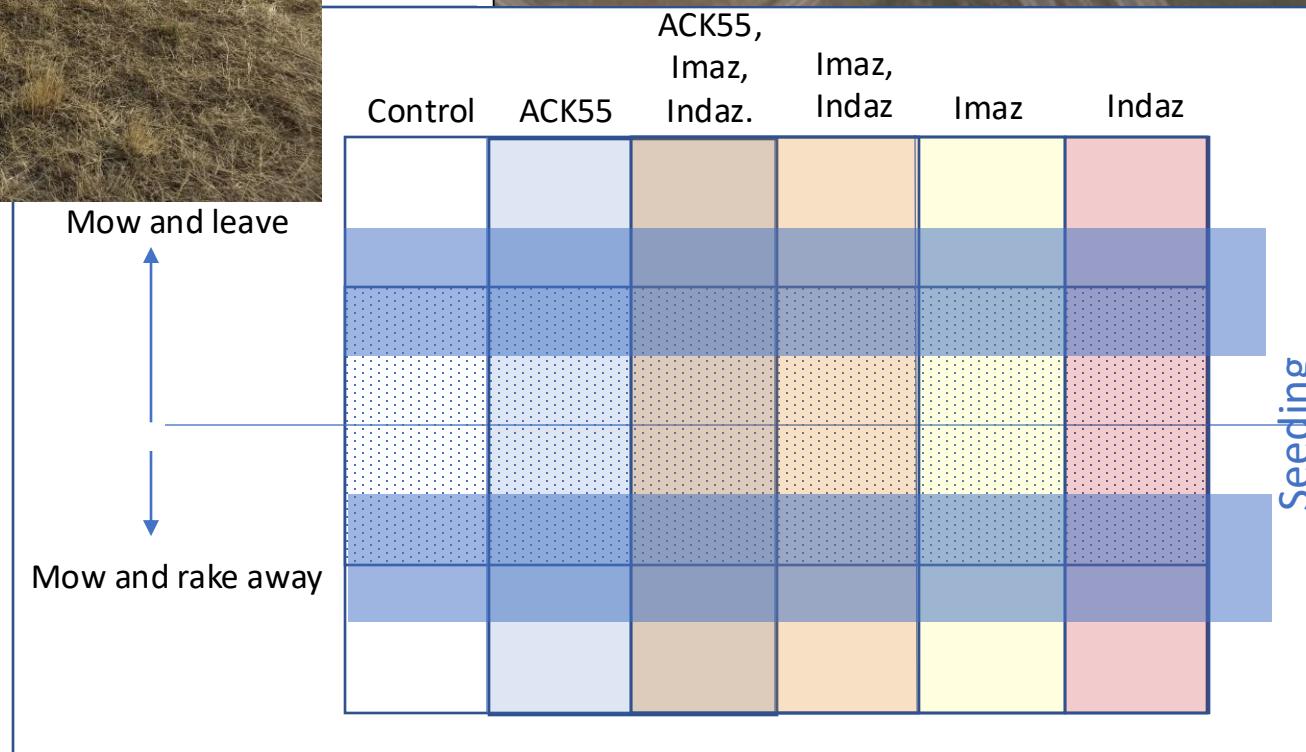
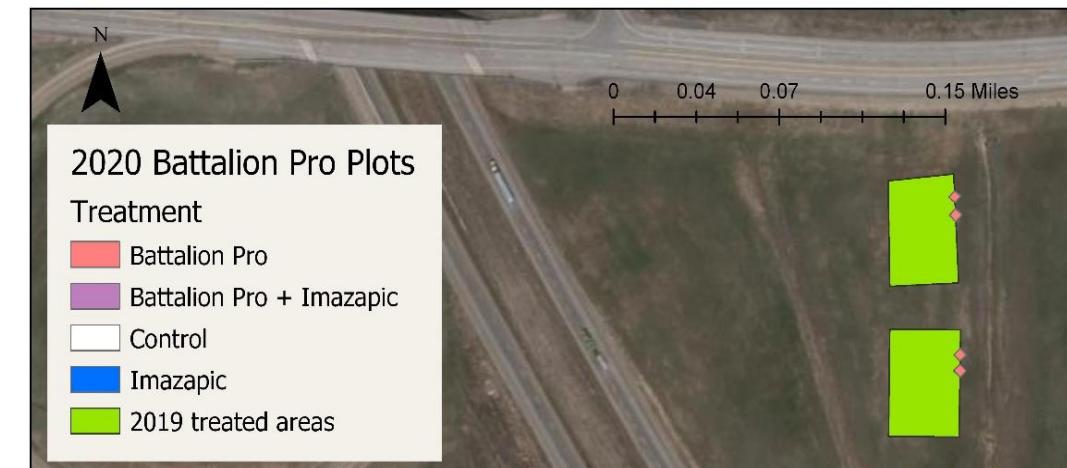
PLOTS FOR RP-284 “Integration of Weed-Suppressive Bacteria With Herbicides to Reduce Exotic Annual Grasses and Wildfire Problems on ITD Right-of-Ways”



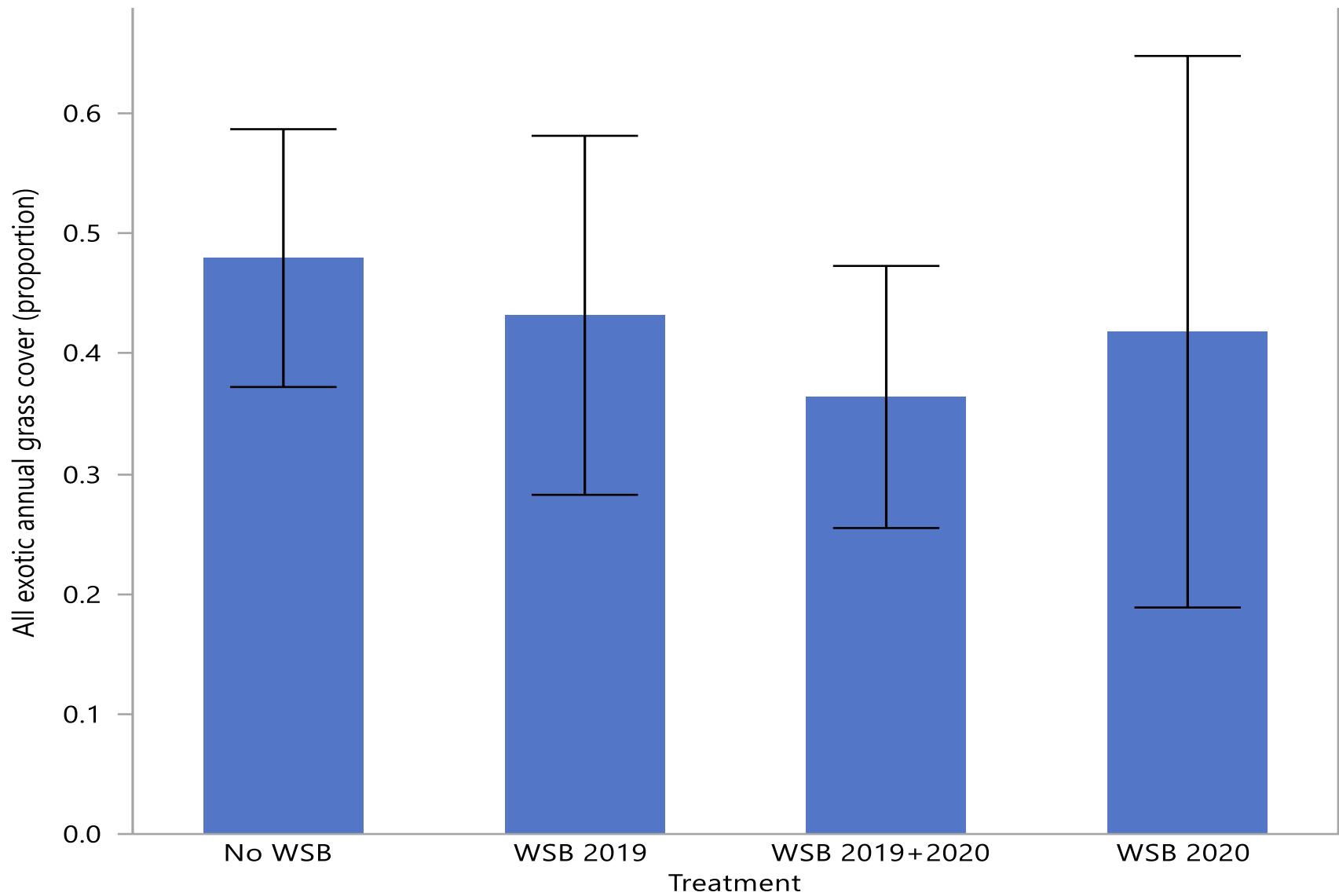
ACK55-Battalion Pro testing underway



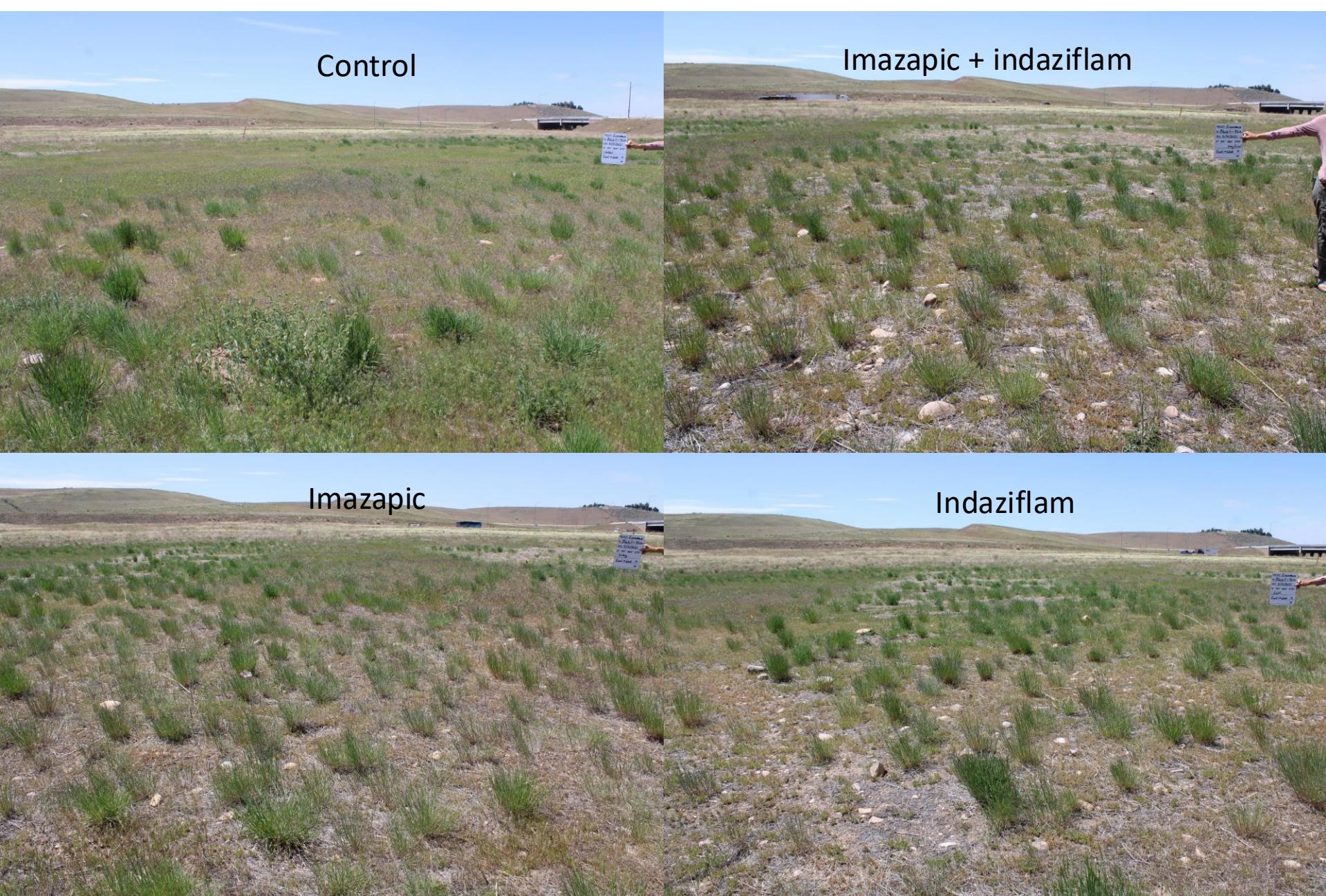
Eisenman site: mowing, raking, spraying



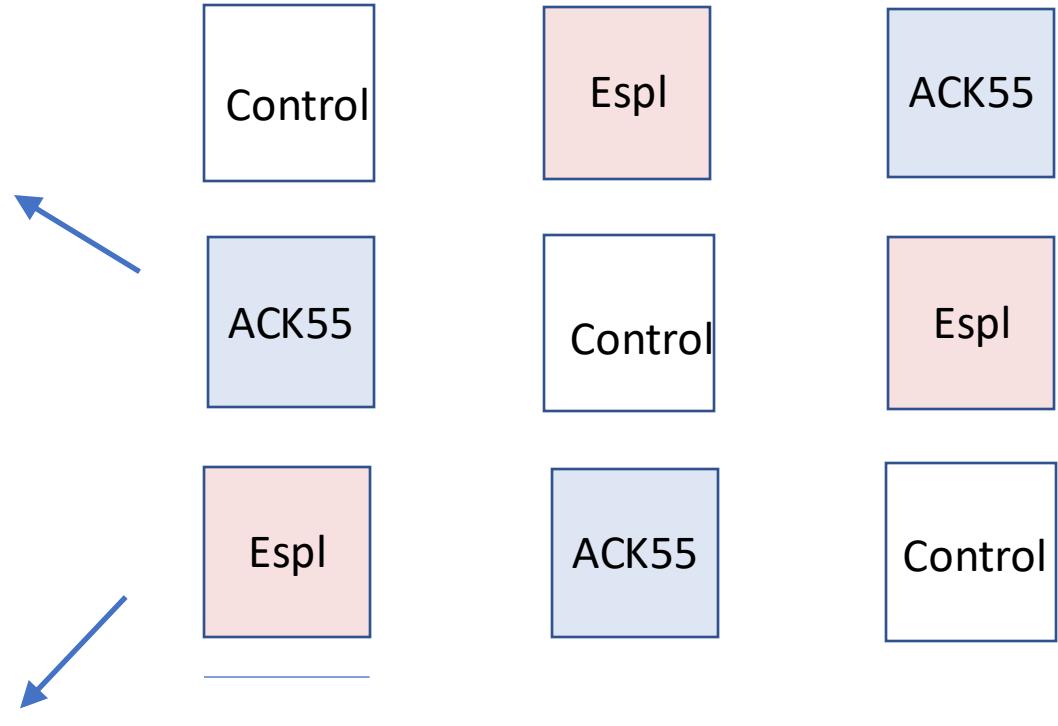
Eisenmann: no effects of WSB on cheatgrass



Eisenmann: Strong effects of Rejuvra (none for WSB or imazapic)



Rt 95 – Roadside near the Oregon border in the Owyhees



10 m (approx. 33 ft)



Indaziflam sprayed (as 5 oz/acre Esplanade in 60 GPA carrier volume) on 10/25/2019.

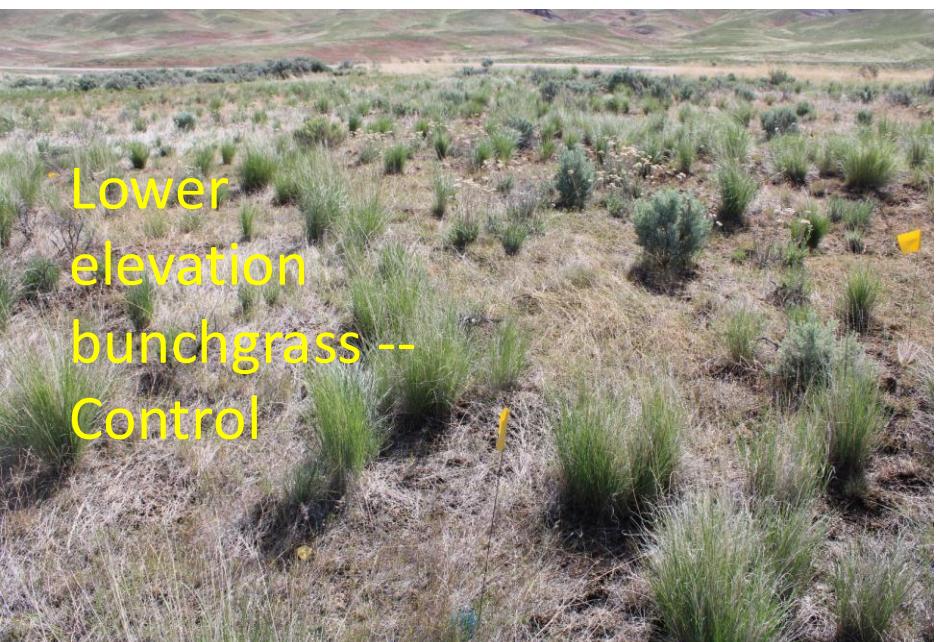
Higher
elevation
sagebrush --
Control



Higher
elevation
sagebrush --
Indaziflam



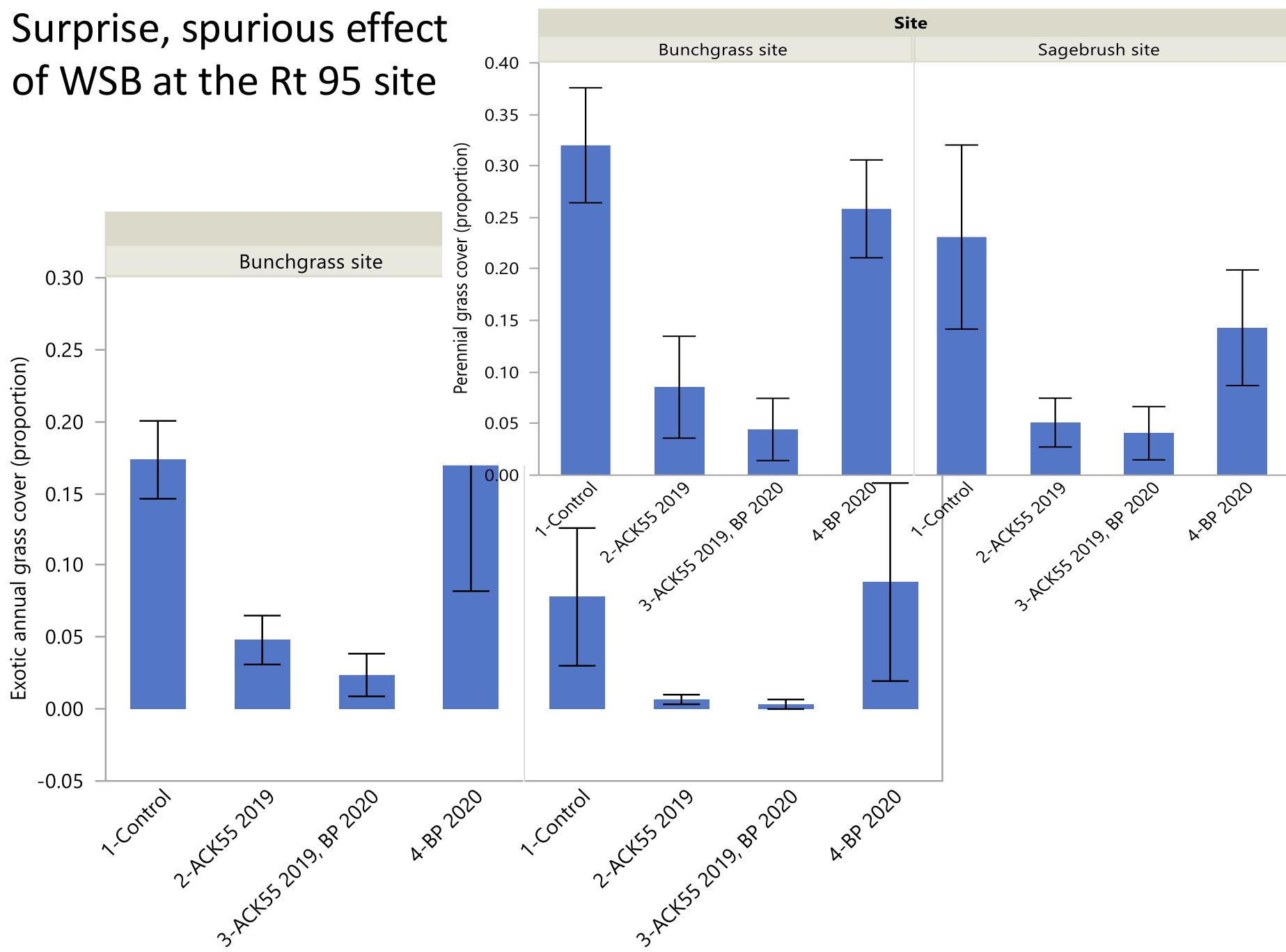
Lower
elevation
bunchgrass --
Control



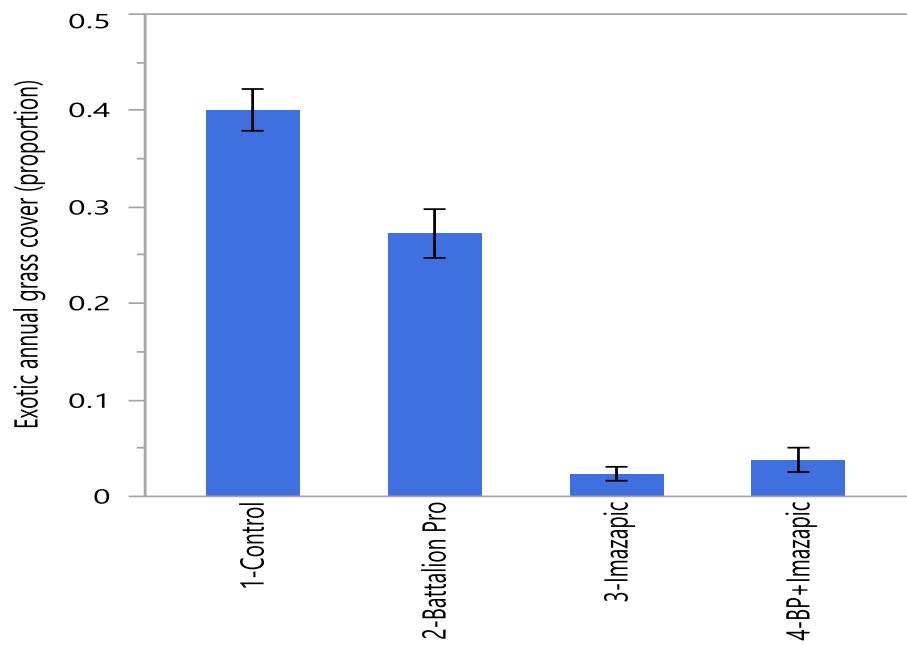
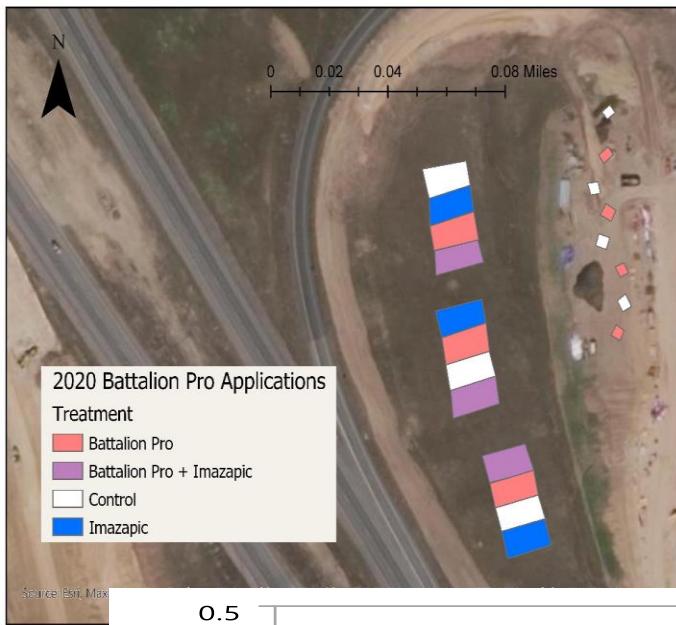
Lower
elevation
bunchgrass --
Indaziflam



Surprise, spurious effect of WSB at the Rt 95 site



Blacks Ck Site: first year after treatment, we are observing some small WSB effects in some plots. Will the effects last?

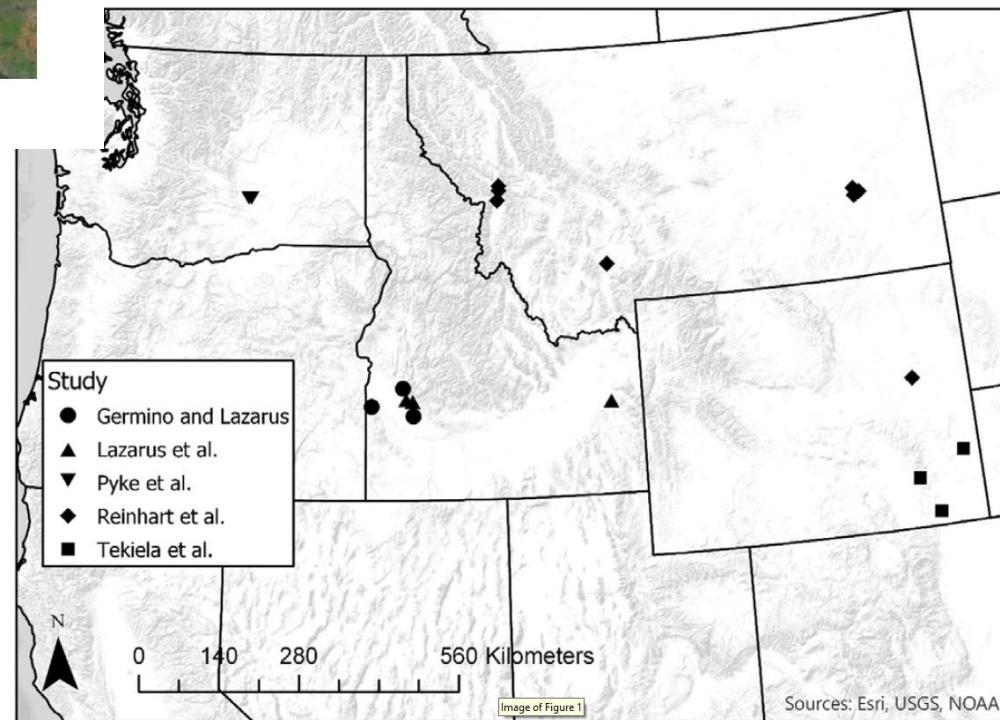


Rangeland Ecology & Management



Special Section on Weed-suppressive Bacteria
Guest Editors: Matthew J. Germino & Brynne E. Lazarus

Compilation of field evidence
in special issue of REM



Sources: Esri, USGS, NOAA



Weed-suppressive bacteria effects differ in culture compared to in soils and with or without microbial competition and separation of active ingredient



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Are the effects of WSB in petri dishes selective, and why do we see effects in petri dishes but not real soils?

- WSB had no effects in actual soils: with or without pre-sterilization,
- **On agar:** WSB effects increased by **pre-sterilizing seeds** prior to treatment
 - But, effects were non-selective at high WSB concentration.
 - Selective effects observed on agar at low WSB cell concentrations but a.i. present
 - But, completely removing WSB cells via filtration led to no WSB effects.

- Little evidence to date suggests weed-suppressive bacteria works.
- Herbicides, seeding, and managing for healthy communities are key tools, i.e. *Integrated Pest Management – IPM!*
- Learning in adaptive management is critical



Programmatic approach needed, putting science-based testing ahead of application?

