Herbicide treatment of an invaded grassland following a prescribed fire

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- Joint research between Cal-IPC SC, Department of Fish and Game, and the Nature Conservancy on the Santa Rosa Plateau Ecological Reserve.

- Question arose from previous research conducted on the reserve and through the need of the reserve manager.

Goals and Questions

- Goal
  - This study sought to evaluate the efficacy of herbicide and seeding treatments in an invaded grassland previously treated with prescribed fire.
  - Perform a project that is useful for real world management at this particular reserve.

- Questions
  - Will the combination of prescribed fire and herbicide treatment increase the control of exotic plants in an invaded grassland and restore the native annual community?

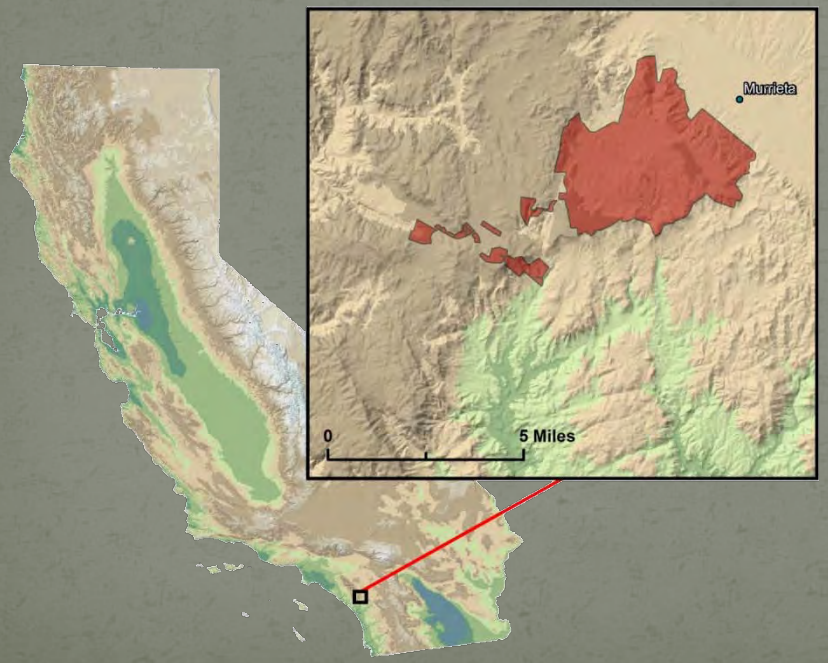
  - Will seeding the treated areas with native annuals increase the effectiveness of treatments?

Background

- Study site
  - Santa Rosa Plateau Ecological Reserve
- Prescribed Fire
- Herbicide
  - Fusilade II ®
  - Rodeo ®

Santa Rosa Plateau

- The Reserve consists of 9,400 acres and protects unique ecosystems such as Engelmann oak woodlands, riparian wetlands, coastal sage scrub, chaparral, bunchgrass prairie and vernal pools.



Invasive Annual Grassland

- Covers over 9 million hectares of California. (Seabloom et al. 2003)
- Invasion began over 200 years ago, significantly depleting native seedbanks. (Cox and Allen, 2008)
- *Nassela pulchra* within the grasslands responds positively to prescribed fire.

Dominant Invasive Species

- Grasses
  - *Avena fatua/barbata*
  - *Vulpia myuros*
- Forbs
  - *Erodium brachycarpum*

Vulpia myuros

Avena fatua

Erodium brachycarpum

Invasive Species Management

- Prescribed Fire
  - SRP's controlled burned program began in 1985.
  - Burns are completed in late spring after vegetation has dried, but before grasses drop their seed.

Invasive Species Management

- Herbicide
  - Fusilade II® syngenta
    - Active Ingrdient: *Fluazifop-P-butyl*
    - A selective post-emergent herbicide for control of grass weeds.
    - Known to not affect some grass species including *Vulpia myuros*.
    - It has also been shown to damage *Erodium* species (Christopher and Holtum 1998, 2000) and specifically control *E. cicutarium* in Southern California (Steers 2008).

Invasive Species Management

- Herbicide
  - Rodeo®
    - Active Ingrdient: *Glyphosate*
    - Nonselective post-emergent herbicide for control of all vegetation

Hypotheses

- Rodeo® would be a more effective herbicide on site due to the presence of *Vulpia myuros* which is not affected by Fusilade®, but would also produce more non-target effects.

- Seeding treatments will be necessary due to a depleted seedbank, will be most effective in the Rodeo treatment, and will have little to no effect in control plots, which will likely continue to be out competed by invasive species.

Methods

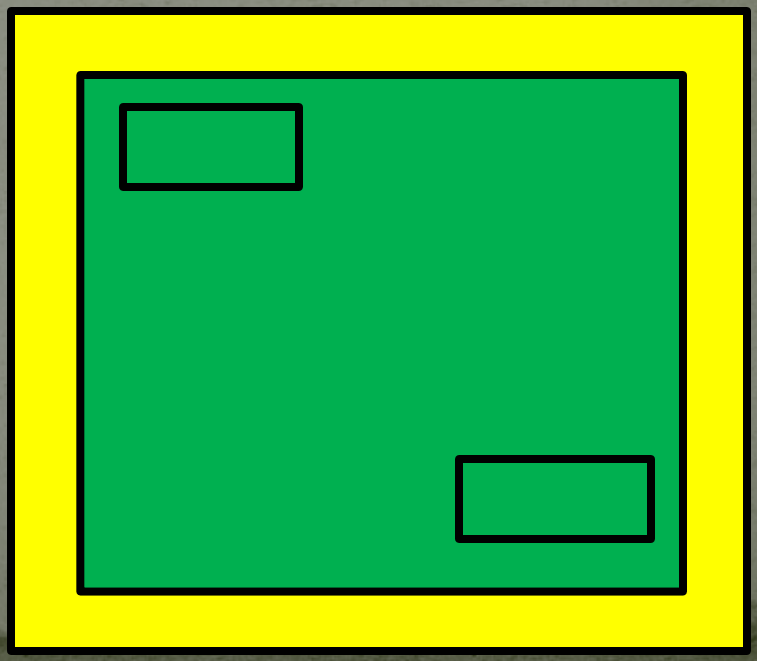
- Prescribed fire (June 2009)

- 3 Herbicide Treatments (January 2010)
  - Control
  - Fusilade
  - Rodeo

- 2 Seeding Treatments (February 2010)
  - Seeded with a mix of native annual seeds
  - Unseeded

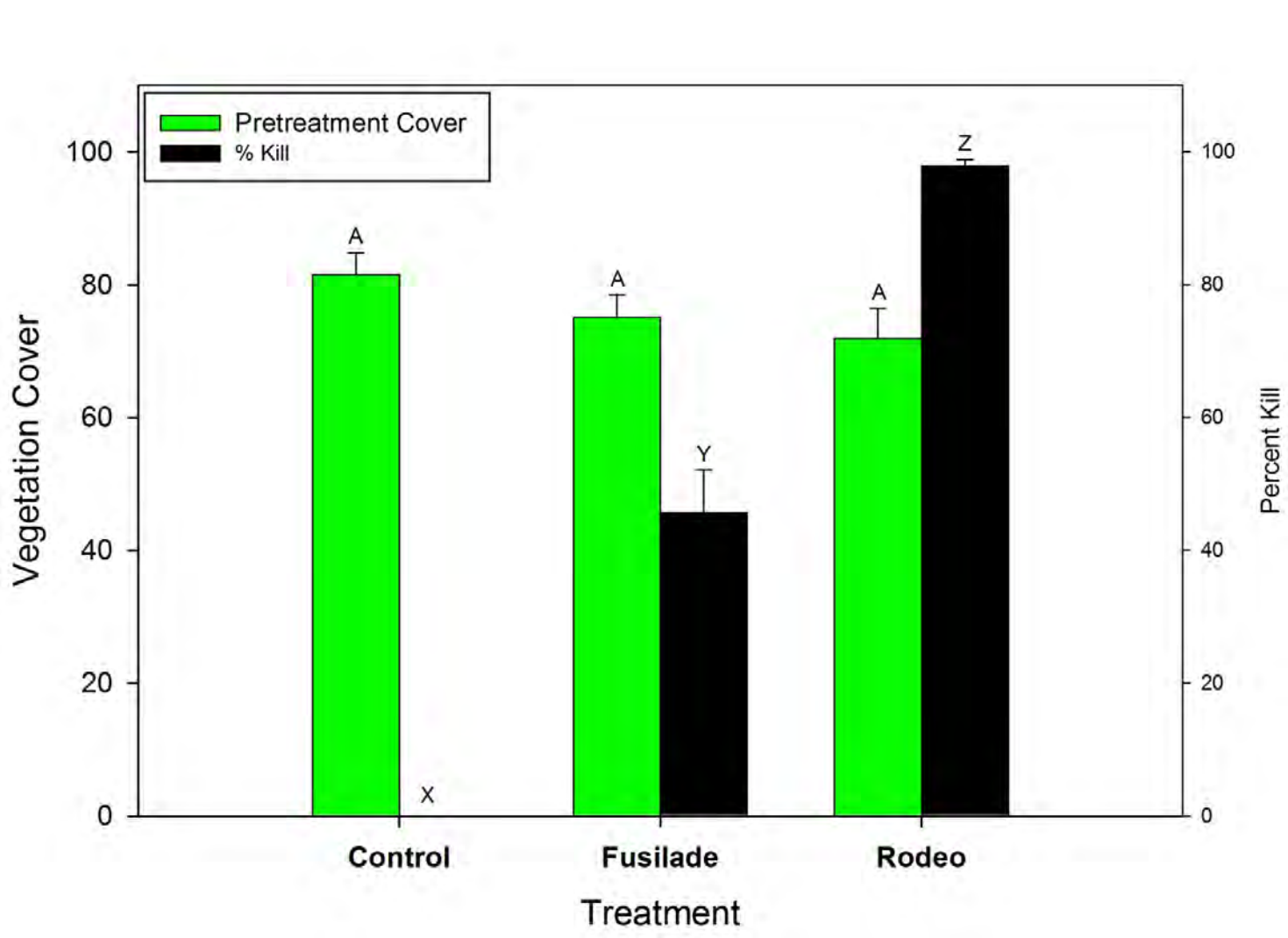
Methods

- 4 replicates per treatment organized in a randomized complete block
- Each replicate was a 5m x 5m plot with a 1 m buffer
- Vegetation data was collected from two 0.5m x 1m quadrats within each block.



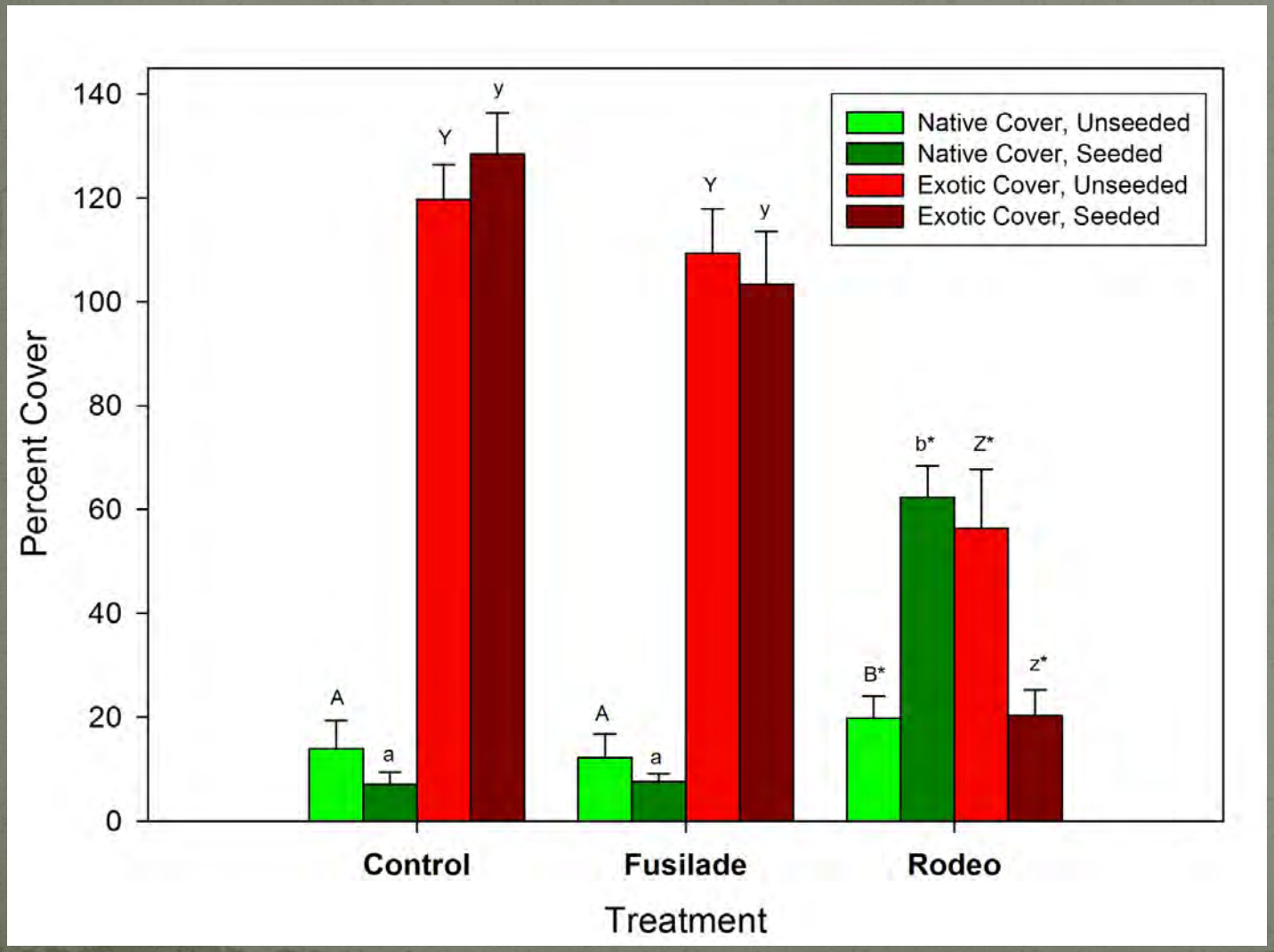

CONTROL
FUSILADE
RODEO

Results – Percent Kill



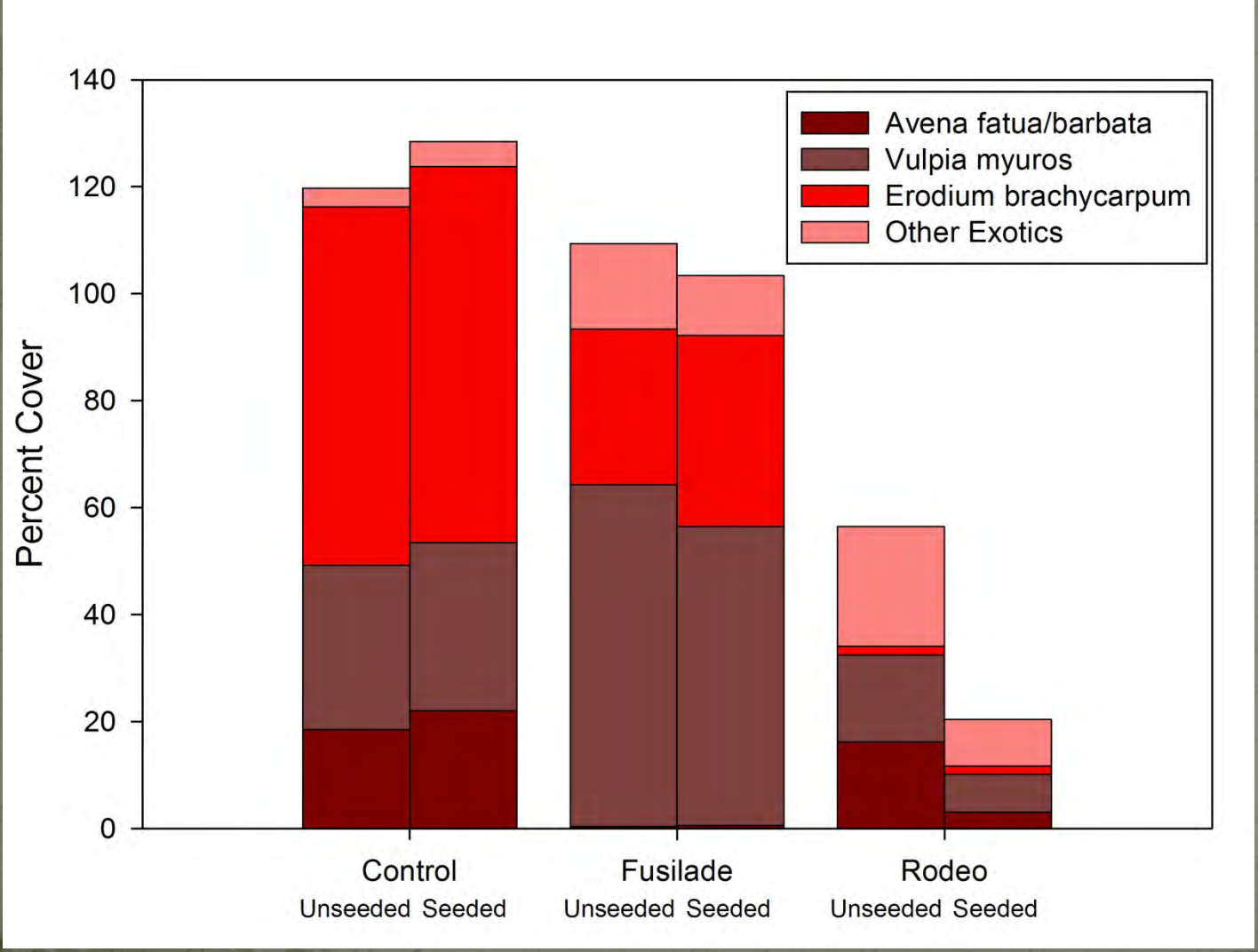
- Pretreatment cover was consistent across sites
- Rodeo was more effective than Fusliade at killing invasive species.

Results – Vegetation Cover



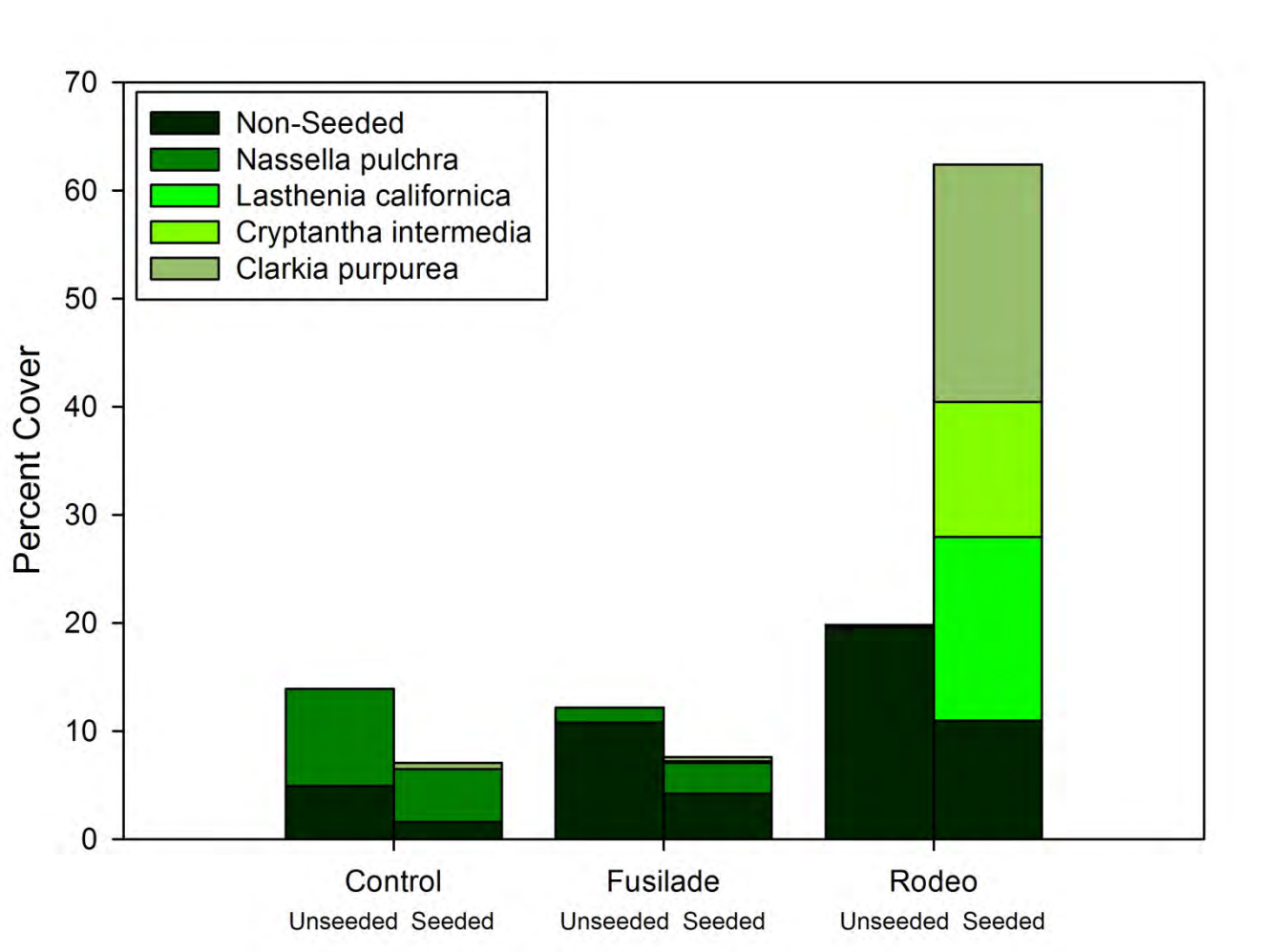
- Fusilade did not reduce total invasive cover and had no effect on natives
- Rodeo reduced invasive cover and allowed native species to increase productivity.

Results – Exotic Cover



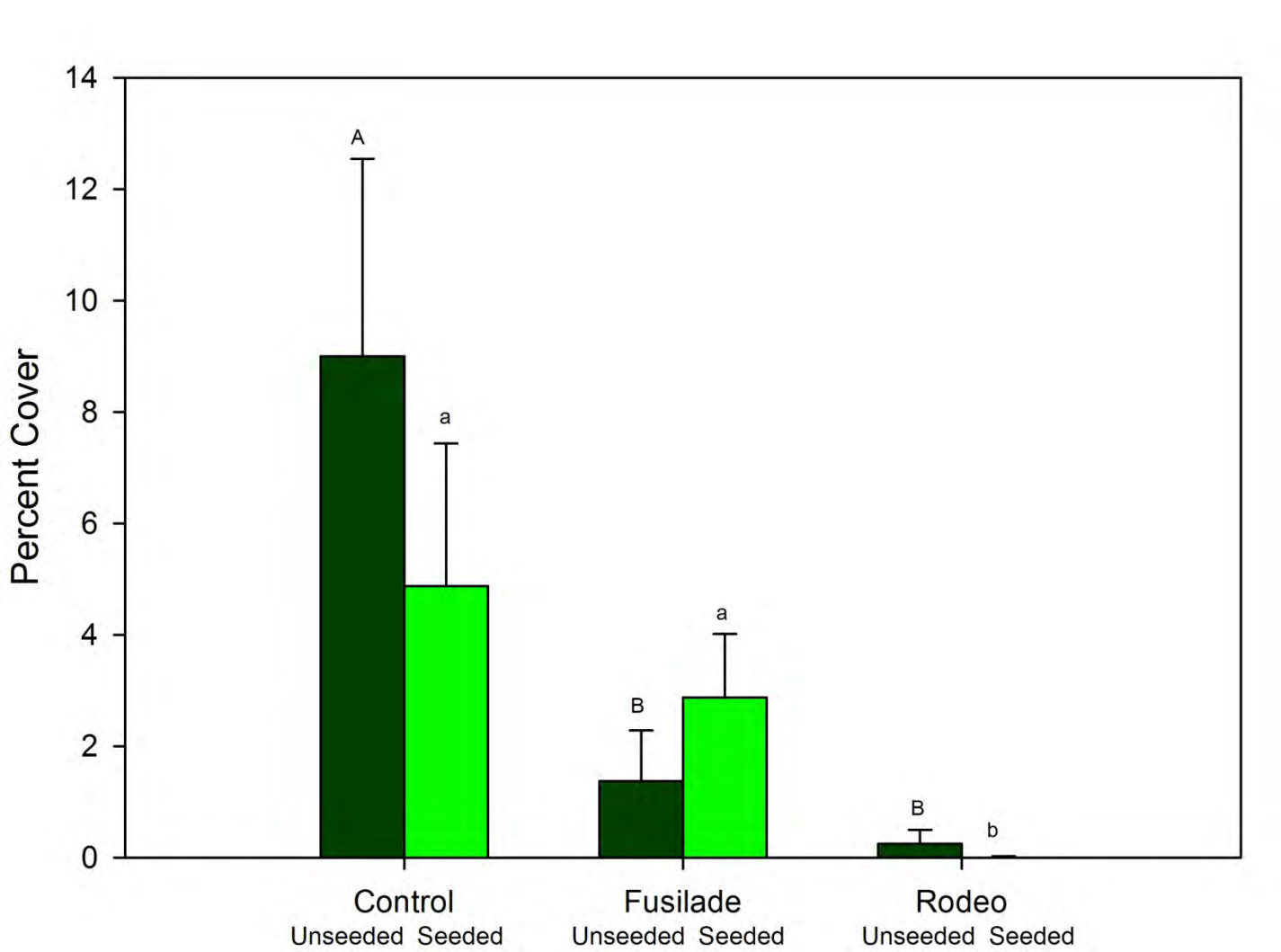
- Fusilade changes community composition by increasing presence of *Vulpia myuros*.
- Rodeo treatment changes community composition by increasing cover of exotic forbs.

Results – Seeding Species



- Seeding is not effective with high presence of invasive species.
- Seeding increase native cover after exotic species are removed.

Results – Native Grasses



- Herbicides reduce the cover of *Nassela pulchra*

Discussion - Herbicide

- At peak flowering season there was not a significant difference between total cover of invasive species within the Control and Fusilade plots.

- Rodeo was effective at reducing exotic species cover post burn.

Discussion - Seeding

- Seeding treatments increased native propagule pressure to the plot which increased establishment in areas where invasive plants had been removed.
- This creates the possibility of seedbank restoration in future years.
- The results of our seeding efforts are consistent with prior research in which seeding treatments only worked on plots sprayed with herbicide. (Cione et al. 2002)

Discussion – Non Target Effects

- Nasella pulchra was negatively affected by both herbicides.
- Dormancy?
- No germination was recorded in year one

Discussion – Overall

- Small sample size. Site specific results.
- Not recommending bulk treatment of prescribed burns with herbicide.
- Additional data needs to be collected to determine longer term effects.

What's Next

- Second year of data collection
- Expand to larger areas of land without Nasella.

Thank you

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