The effects of climate change on the growth of Barbed Goatgrass (*Aegilops triuncialis*) in serpentine grasslands

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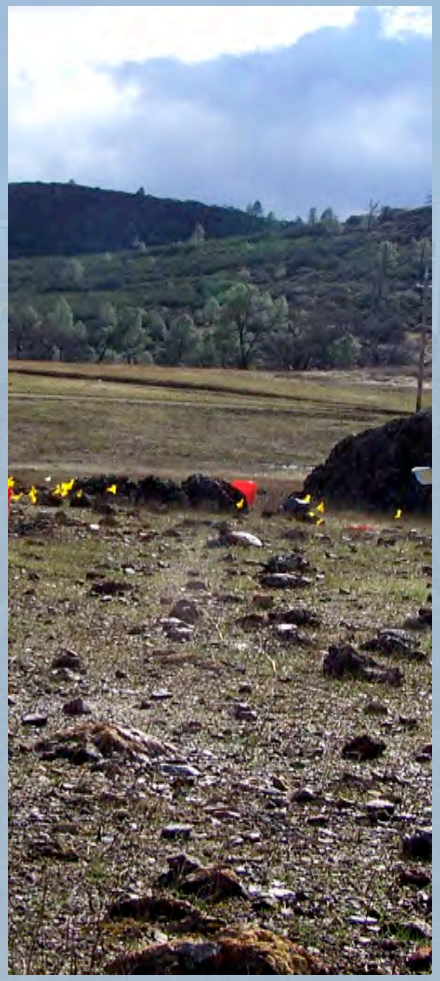
Invasion and Climate Change



Climate change may:

- alter current trajectories of invasive species
- disrupt the competitive balance between invasive and native species
- increase the invasibility of native communities

BUT the extent and magnitude is unclear…

- Understanding is essential for developing and prioritizing future management strategies

Thomsen 2007

California Grasslands and Invasion

Invasives have transformed CA grasslands:

- Native communities restricted to harsh soils
- Serpentine grasslands
  - High endemism
  - Dominated by native forbs and grasses
  - Relatively resistant to invasion due to:
    - Low nutrients
    - High heavy metals
    - Low calcium-magnesium ratio
    - Competition from native community?

Going et al. 2008

Aegilops triuncialis

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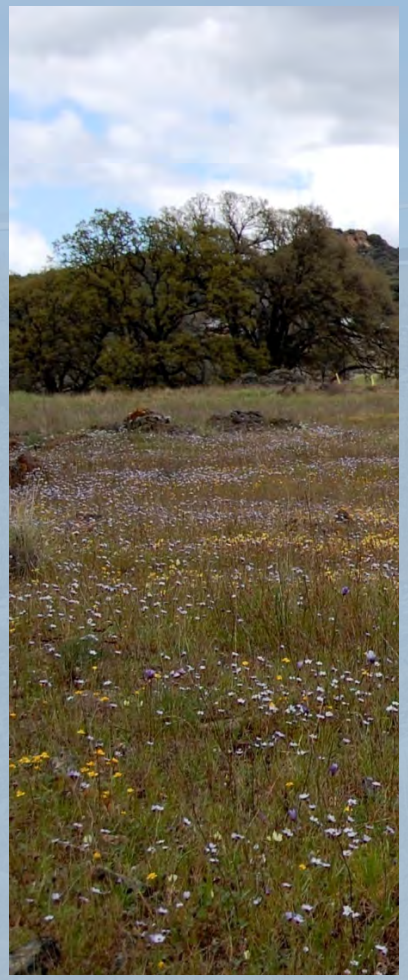
Currently, serpentine grasslands are threatened by *A. triuncialis*, Barbed Goatgrass:

- Late season annual grass
- Aggressive invader in rangelands and wildlands
- Cal-IPC Inventory rating: High
- Class B Noxious Weed

Climate Change and Serpentine Grasslands



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Models estimate changes in CA precipitation:

- 44% increase to almost 70% decrease
- Unclear how Barbed Goatgrass will respond

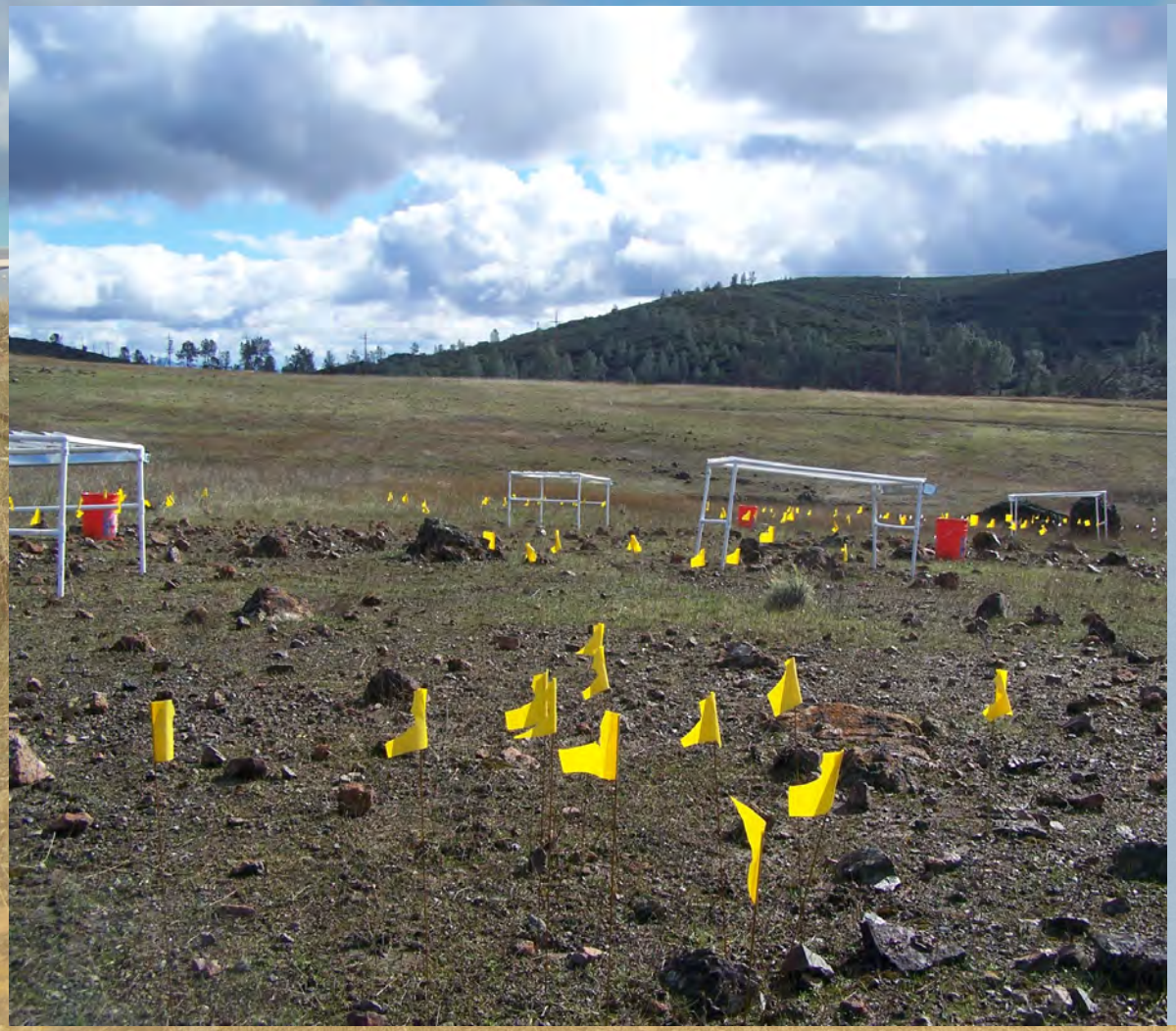
Our Questions

How will alterations in spring precipitation influence the growth of Barbed Goatgrass on serpentine grasslands?

How will Barbed Goatgrass respond to competition with the native community?

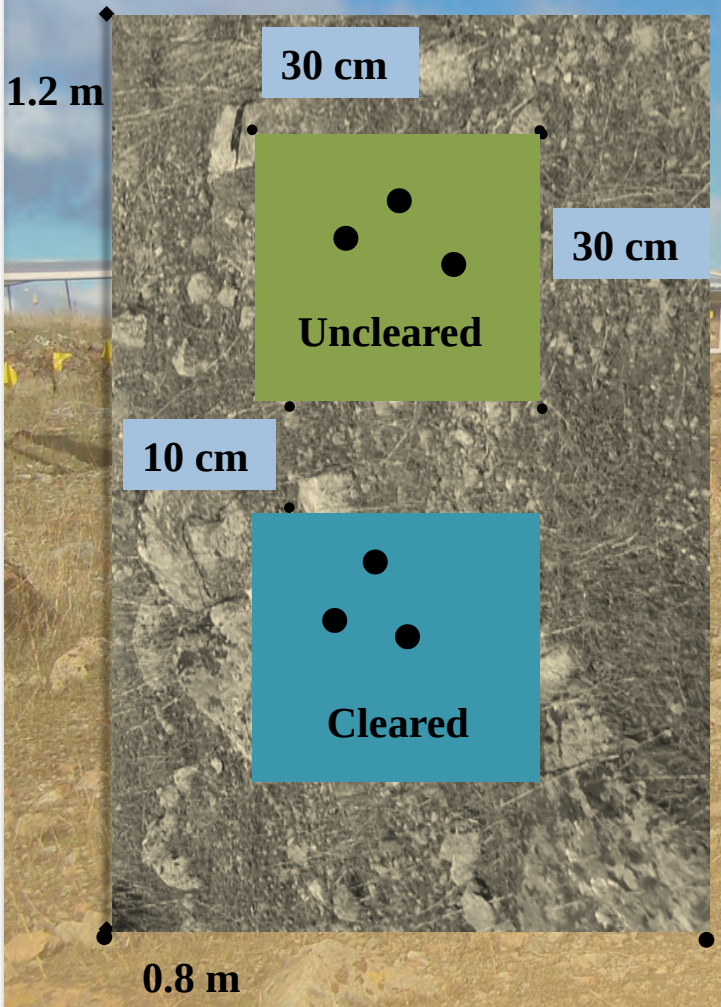
Cayan et al. 2008

Study Site



- Donald and Sylvia McLaughlin Natural Reserve (UC Davis)
- In 2010, this site received 35.5 cm of spring precipitation
- In the past ten years, this site received an average of 30.1 cm of spring precipitation each year
- 18% greater than average

Experimental Design

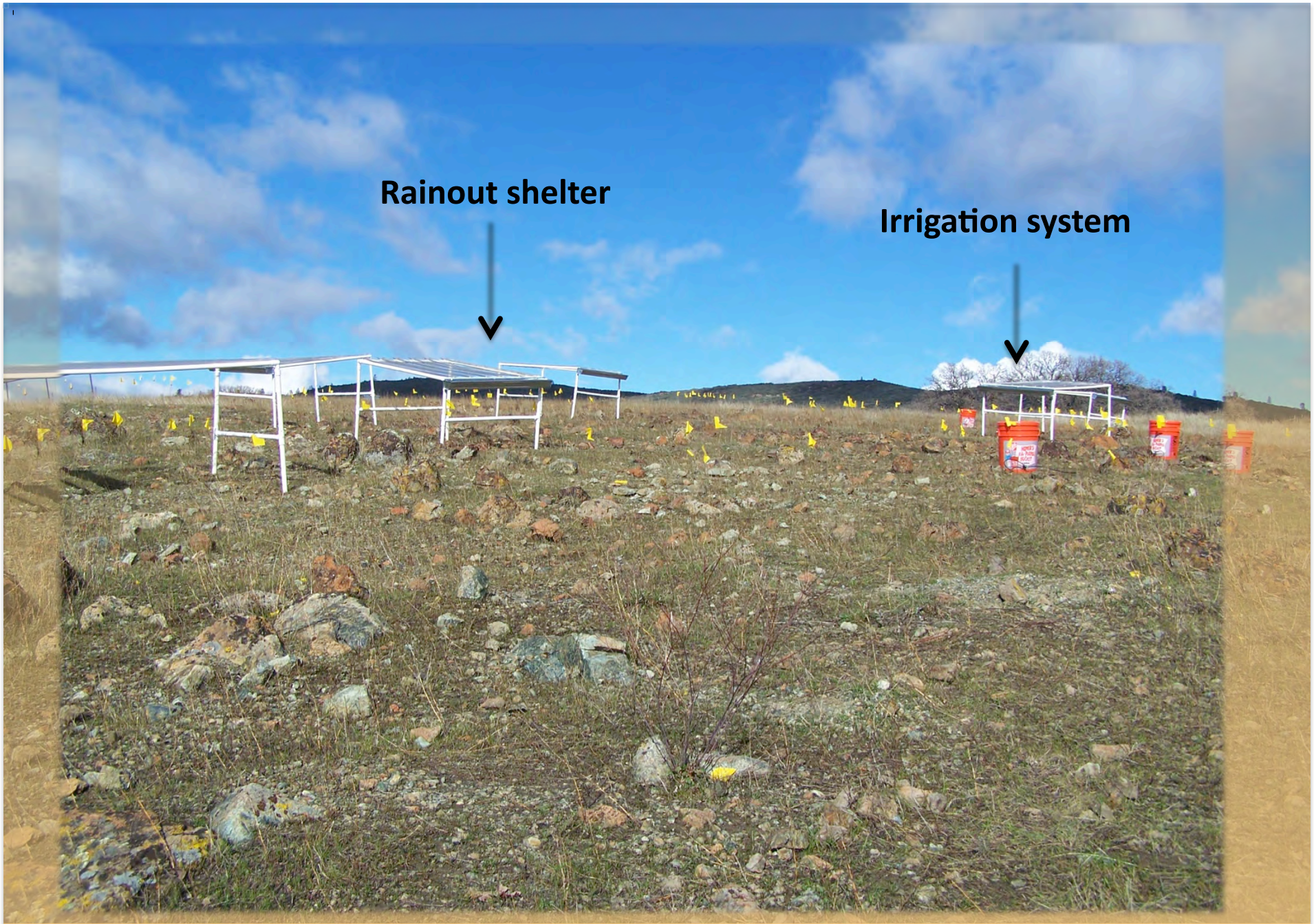


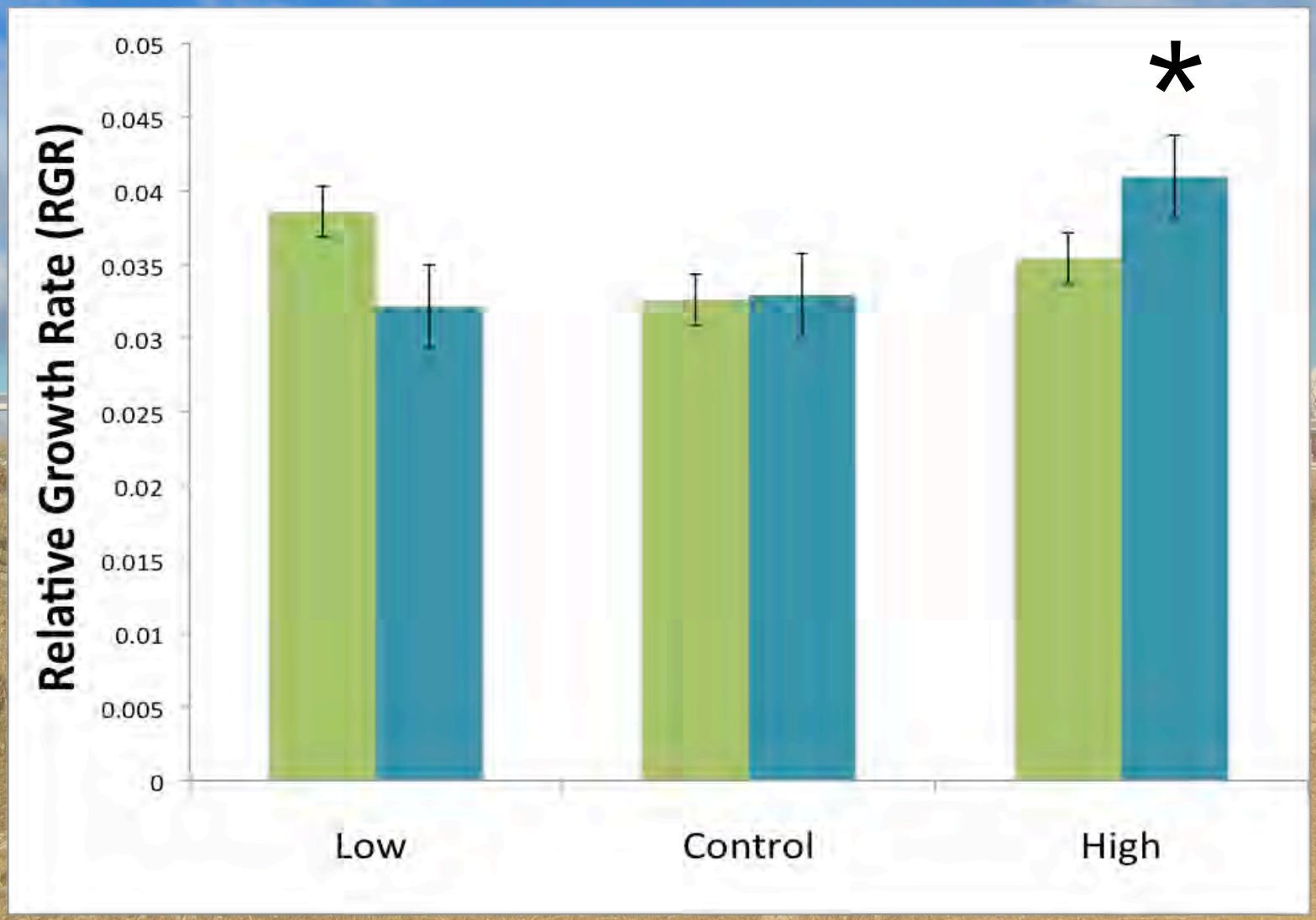
Three precipitation treatments:

- High 150% ambient
- Control ambient
- Low 50% ambient

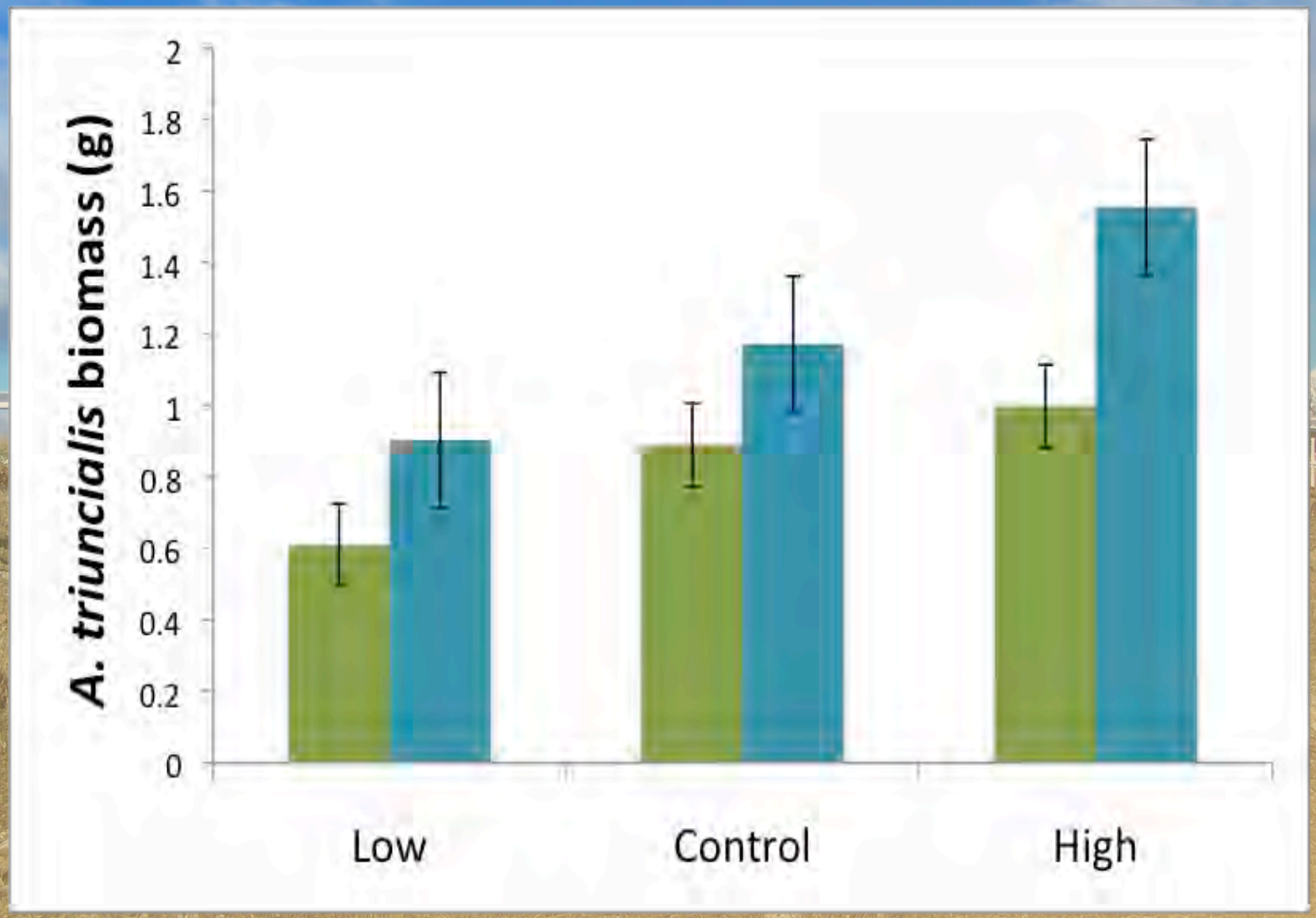
Two nested competition treatments:

- With Competition (Uncleared)
- Without Competition (Cleared)


Rainout shelter
Irrigation system



June RGR showed a significant interaction between the precipitation and competition treatments ($p = 0.0307$).



Competition had a marginally significant effect on *A. triuncialis* (Barbed Goatgrass) biomass (p = 0.0596).

Summary

Precipitation and Competition:

- Native community has a competitive effect on Barbed Goatgrass growth late in the season, particularly in the high precipitation treatment
- Suggests that community resistance may depend on water availability
- Native community also reduced Barbed Goatgrass biomass

The native community may be able to compete with invaders, depending on the direction of climate change

Management Implications

If climate change increases precipitation:

- Could improve biomass production of Barbed Goatgrass in serpentine grasslands
- Might require heightened vigilance in wet years

However, the native community is able to compete:

- Maintaining an intact native community may help reduce the risk of invasion

Ultimately, the spread of Barbed Goatgrass in serpentine grasslands will depend on the direction of climate change...

Acknowledgements

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©Barbara Going, *Hemizonia congesta*

Questions?