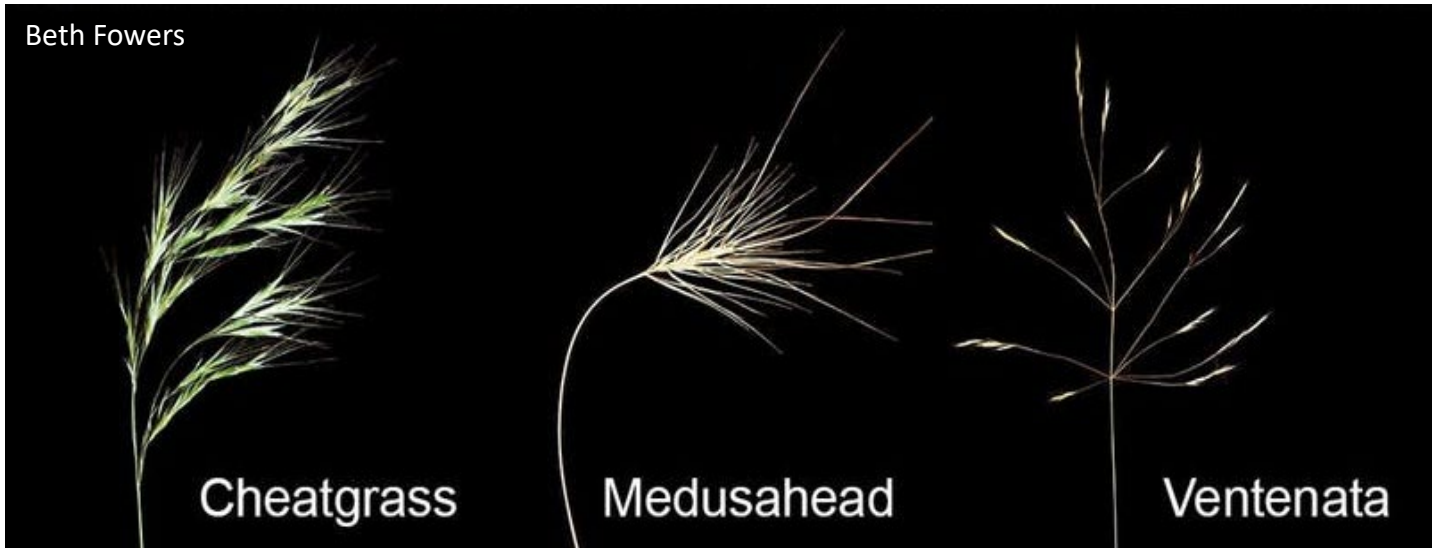
Forage and Economics of African wiregrass (*Ventenata dubia*) Control in Northeastern Wyoming with Drought Considerations

Tanner Hart

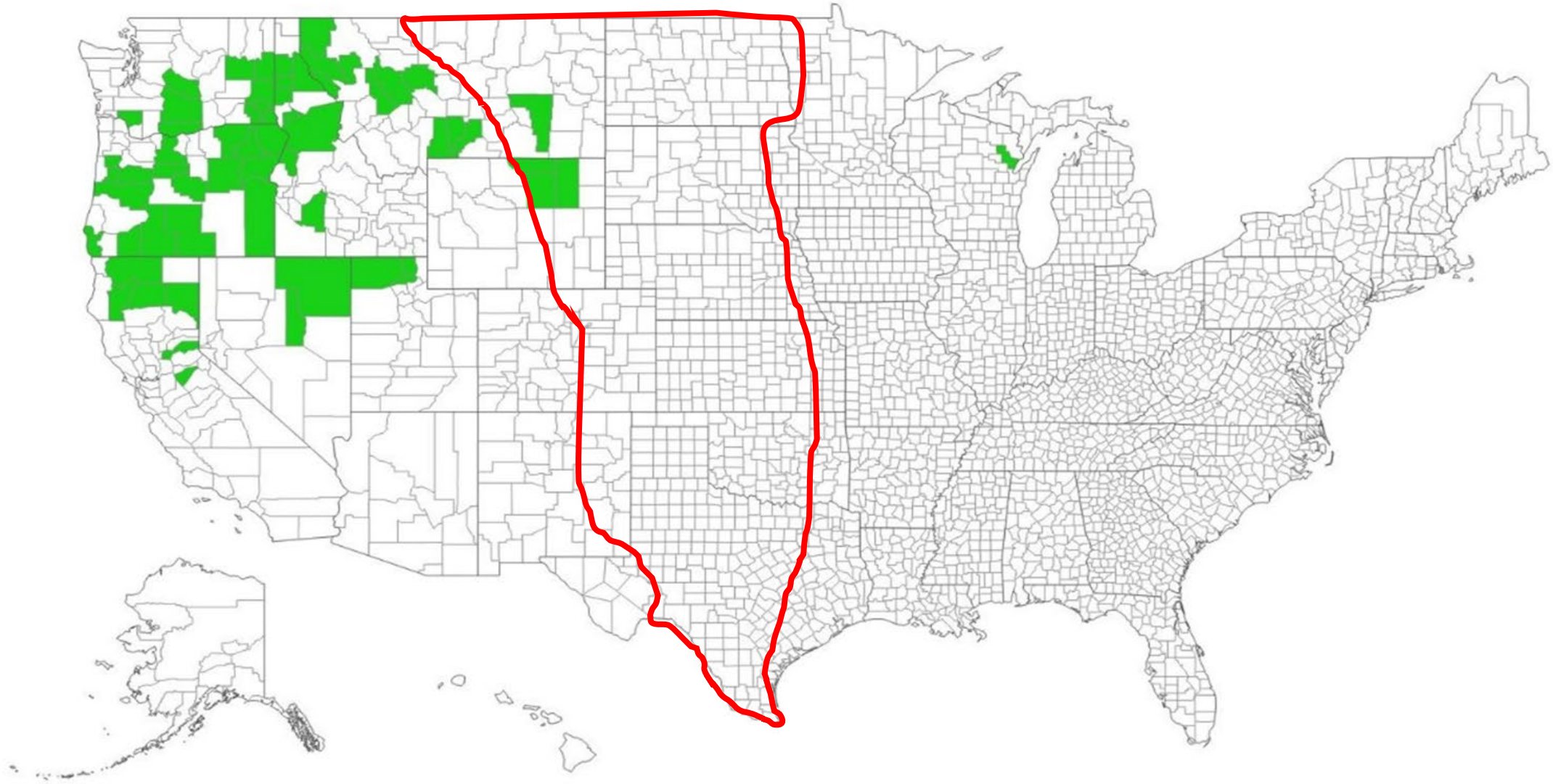
Invasive Species

- Invasive annual grasses are widespread in western states
  - Reduce biodiversity
  - Lower forage production
  - Increase erosion
  - Increase fire



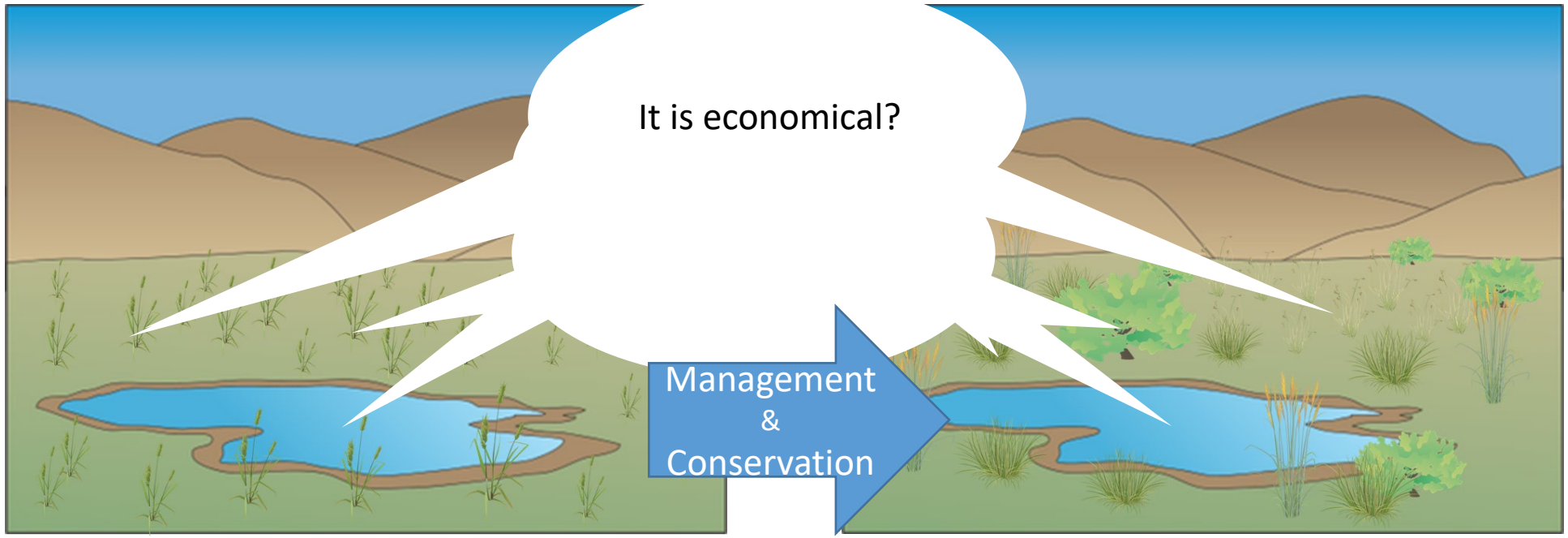
Ventenata (*Ventenata dubia*)

Ventenata (*Ventenata dubia*)



https://www.eddmaps.org/species/subject.cfm?sub=6589

Effects of Invasive Plant Management

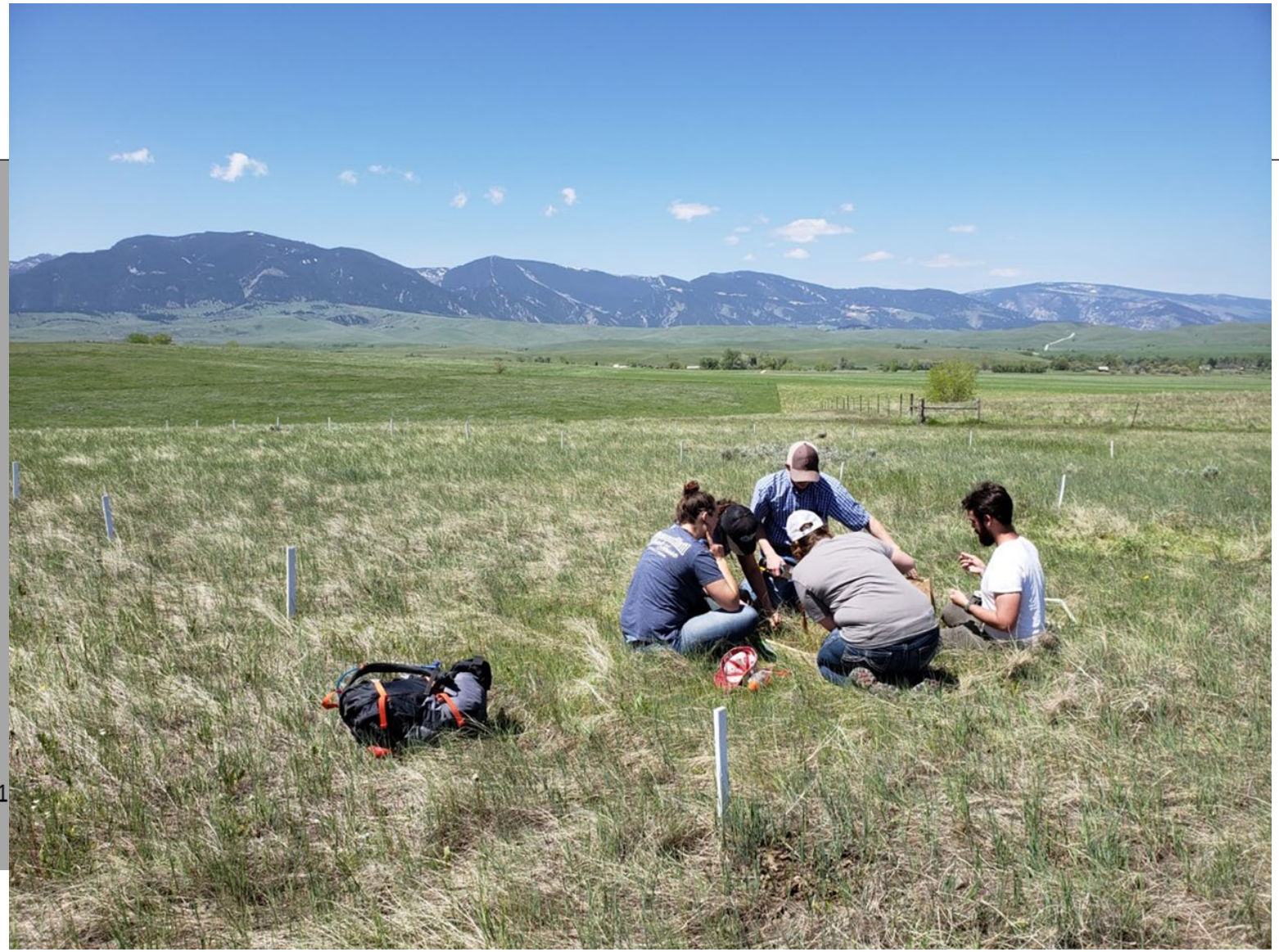


Objectives and Questions

- Does forage quality/quantity change after ventenata removal?
    - Does this change differ through a season?
- Does diversity change after removal?

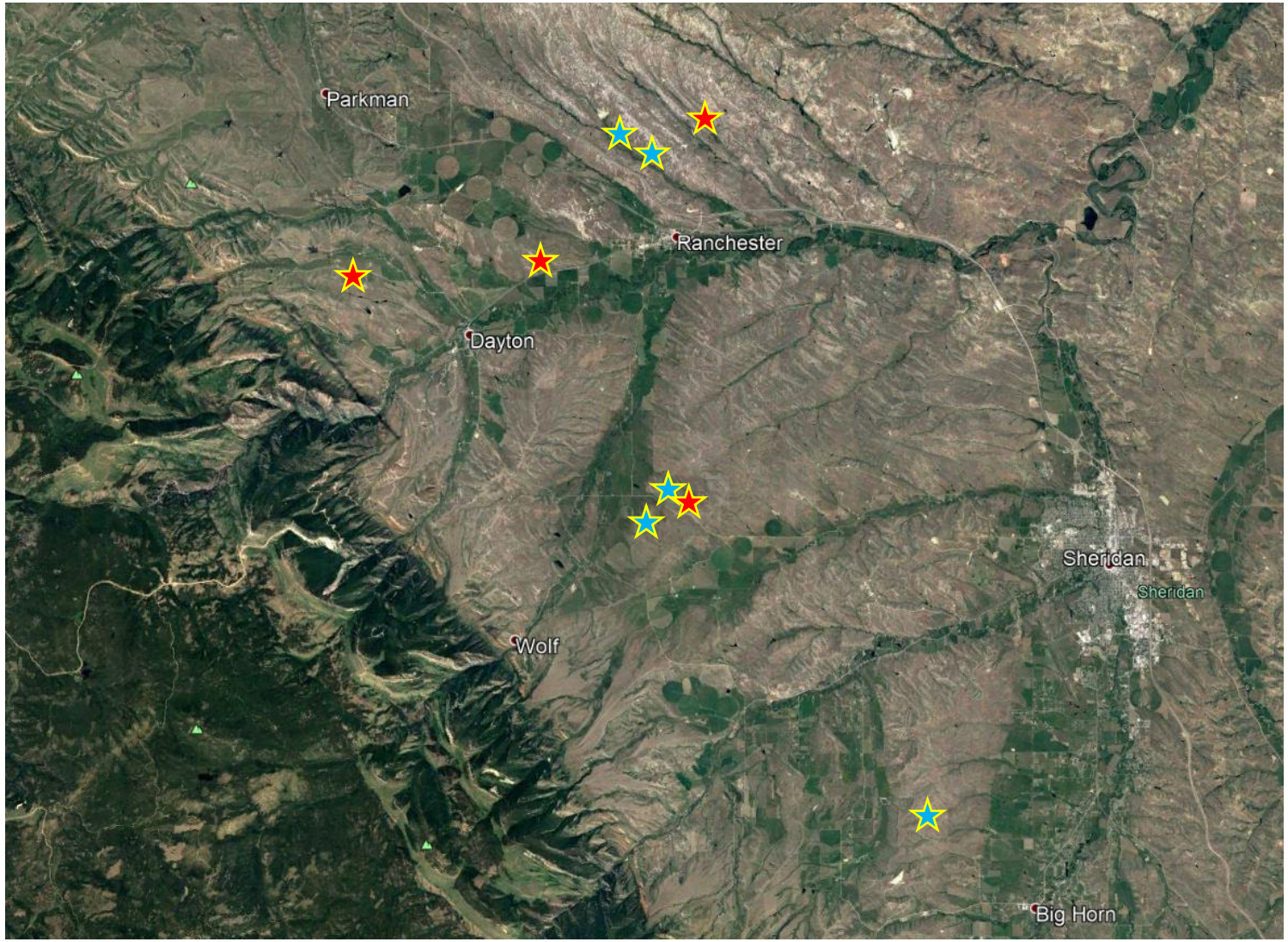
Methods

Methods

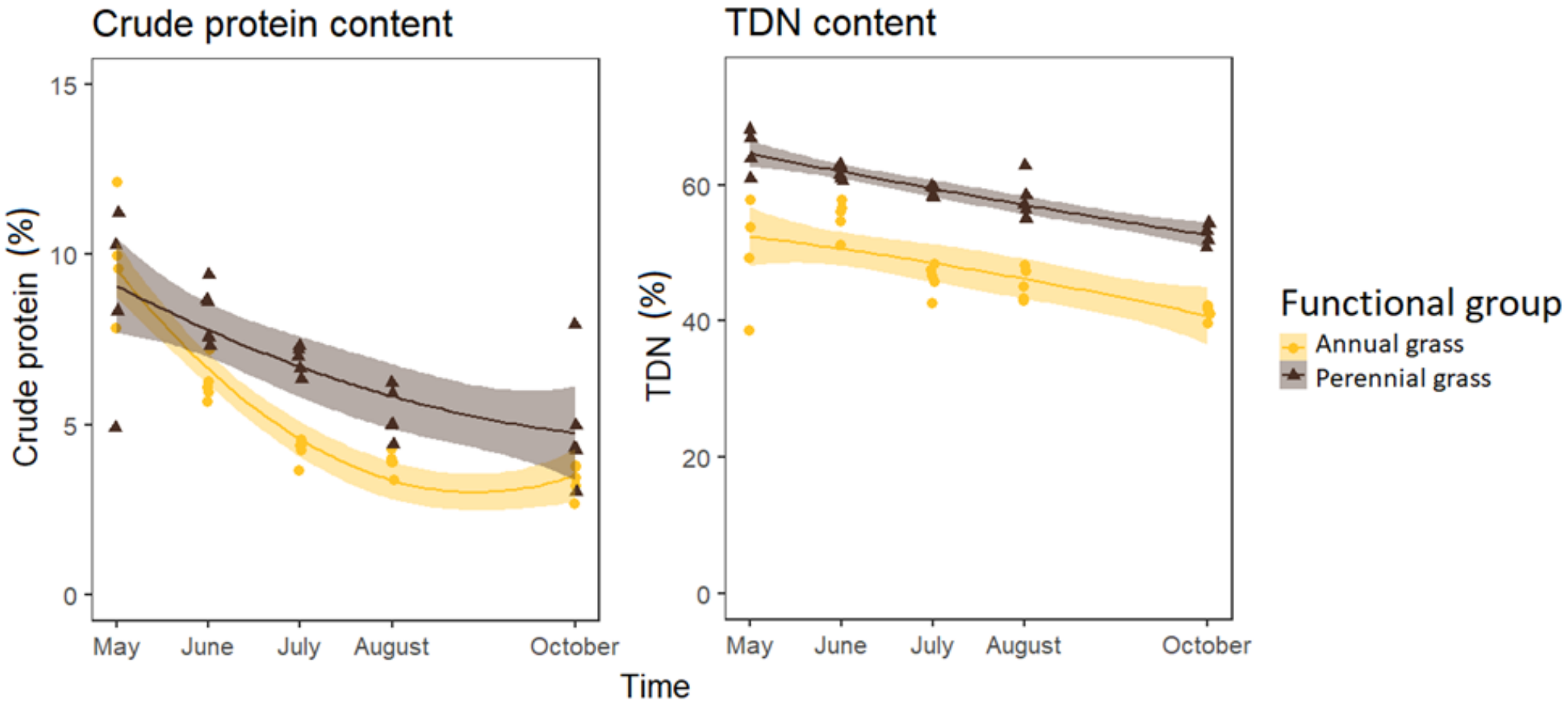


Methods

2018 Sites
2019 Sites



Results and Discussion



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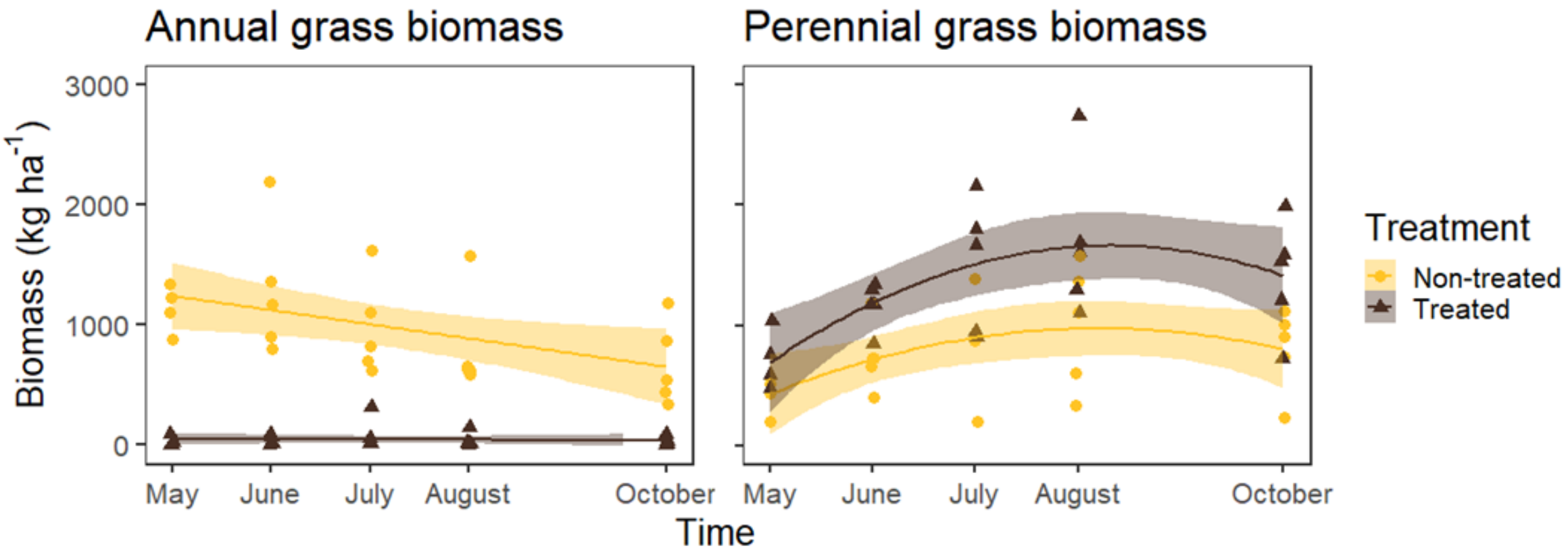

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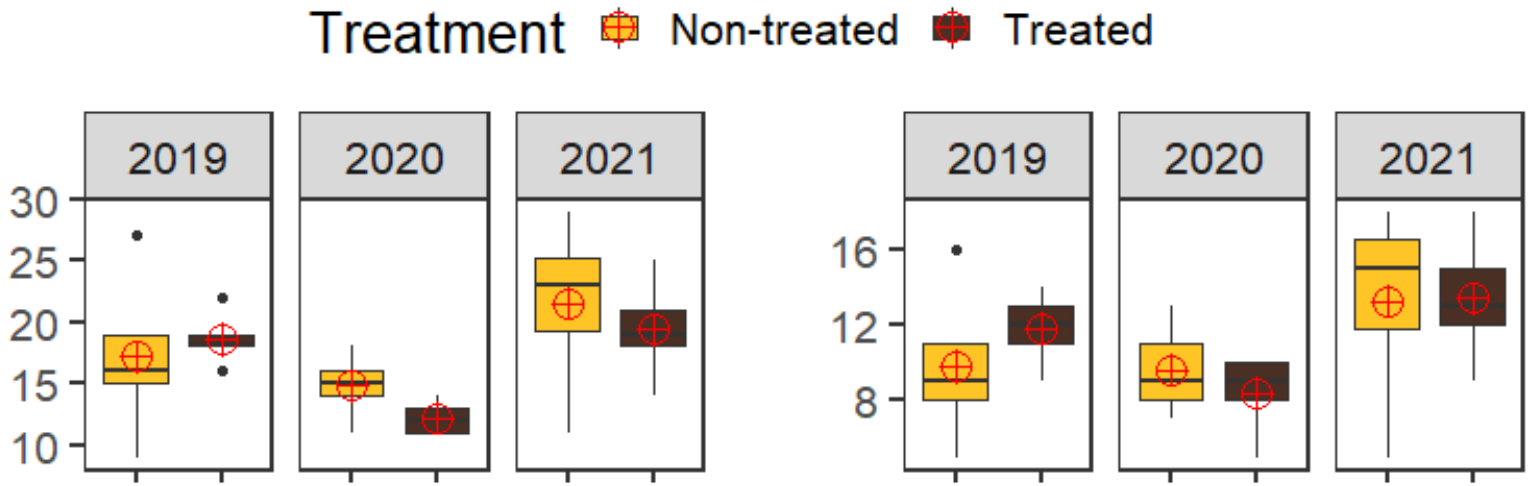
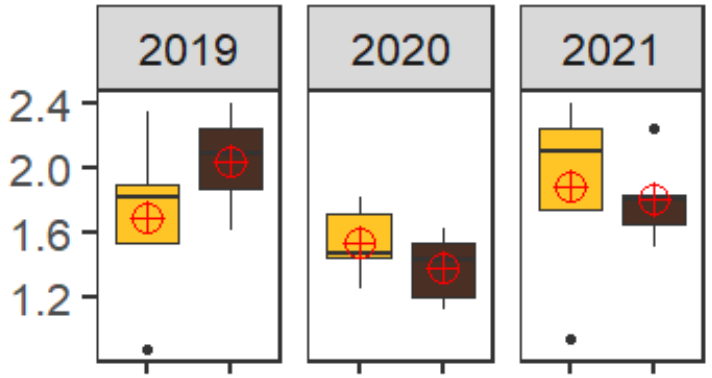
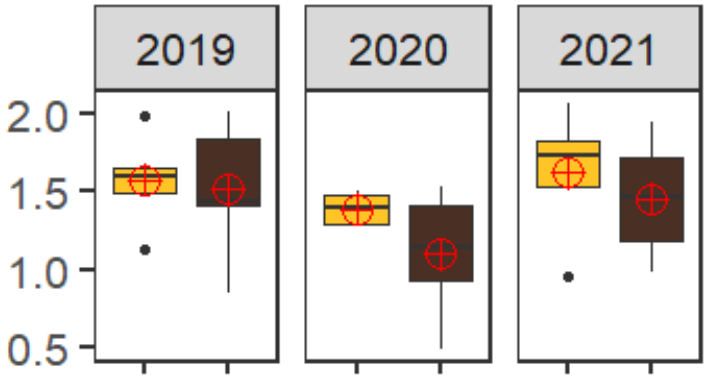


Total Richness

Native Richness



Total Shannon Diversity



Native Shannon Diversity

Summary and Conclusions

- Perennial grasses have higher nutritive content
- Perennial grasses provide a longer grazing window
- Perennial grasses increase from ventenata removal
- Diversity was not changed by these herbicides
  - Except annual forbs

Summary and Conclusions

- What can we infer about ventenata invasion?
  - Forage recovered is conservative estimate of forage lost
  - What was lost could be more than recovered
    - Did not test a non-invaded rangeland
    - Prevention often preferable

Does annual grass invasion affect rangeland drought resistance?

Objectives and Questions

- Drought may play a role in shifting community composition
  - Drought is common in this region

- Corbin, J. D., & D'Antonio, C. M. (2004). Competition between native perennial and exotic annual grasses: implications for an historical invasion. *Ecology*, *85*(5), 1273-1283.
- Heisler-White, J. L., Knapp, A., Collins, S., Blair, J., & Kelly, E. (2008, December). Contingenet Productivity Responses to More Extreme Rainfall Regimes Across a Grassland Biome. In *AGU Fall Meeting Abstracts* (Vol. 2008, pp. B21C-0389).

Objectives and Questions

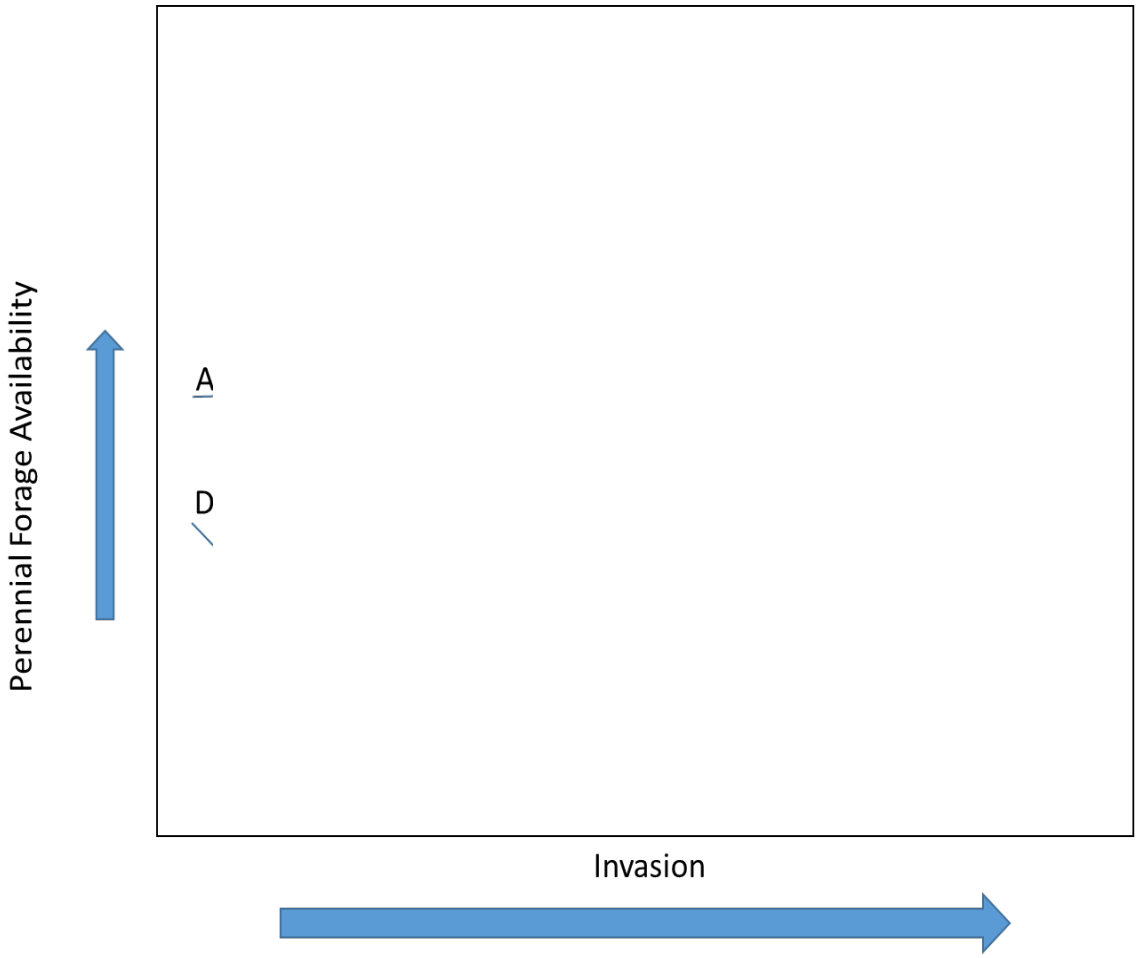
- Annual grasses may reduce forage stability
  - Fluctuate more with precipitation
  - Compete with perennial forages

- Hull, A. C., & Pechanec, J. F. (1947). Cheatgrass--a challenge to range research. *Journal of Forestry*, *45*(8), 555-564.
- Larsen, R. E., Shapero, M. W., Striby, K., Althouse, L., Meade, D. E., Brown, K., ... & Dahlgren, R. A. (2021). Forage quantity and quality dynamics due to weathering over the dry season on California annual rangelands. *Rangeland Ecology & Management*, *76*, 150-156

Objectives and Questions

- Study the interaction between invasion and drought on forage stability
  - Are perennial grasses impacted more by drought when annual grasses are present?
  - Do perennial grasses have a similar effect on annual grasses?
  - Are invaded rangelands less stable?

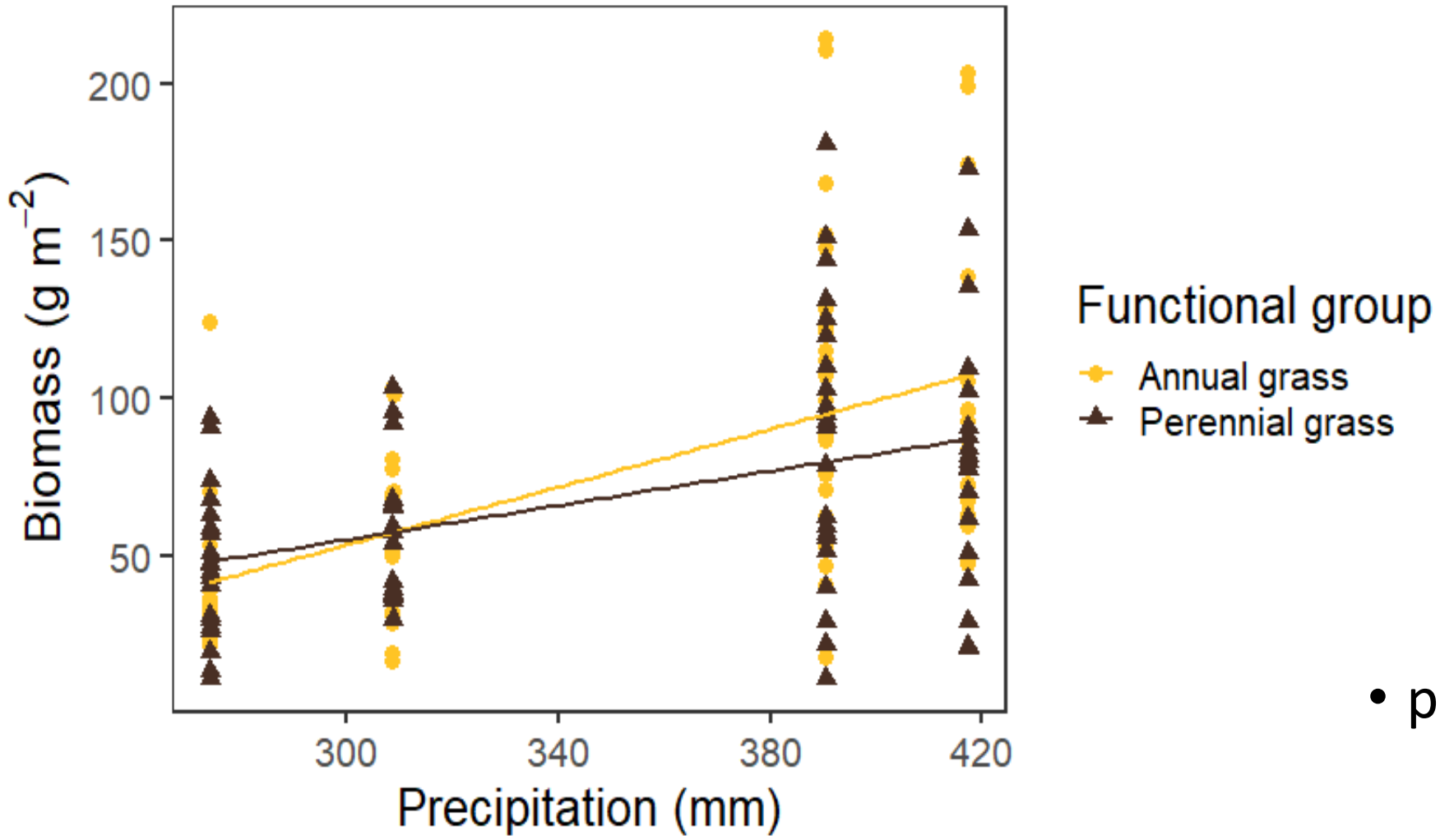
Objectives and Questions



A- Average Precip.
D- Drought Precip.

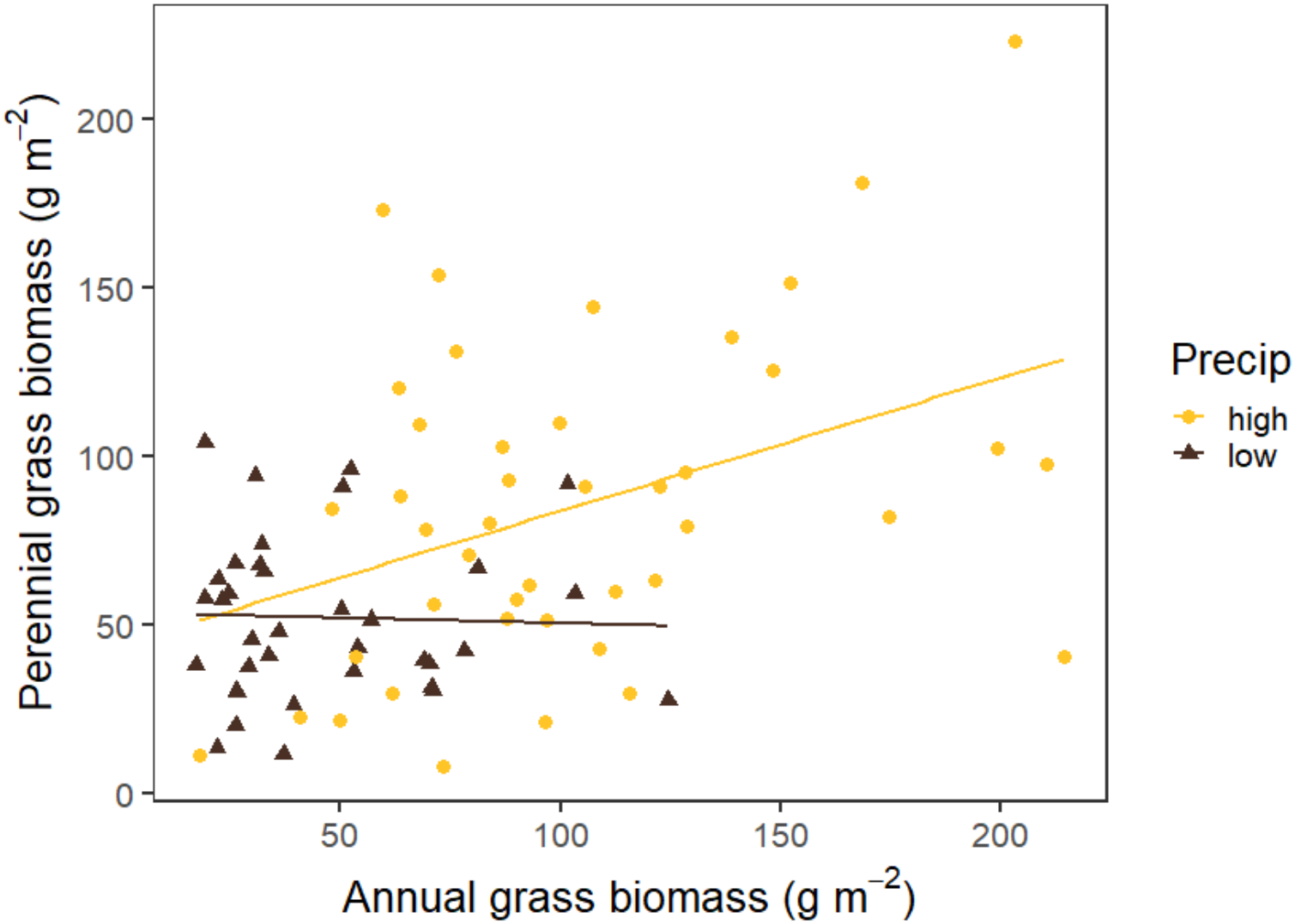
Methods

Results and Discussion



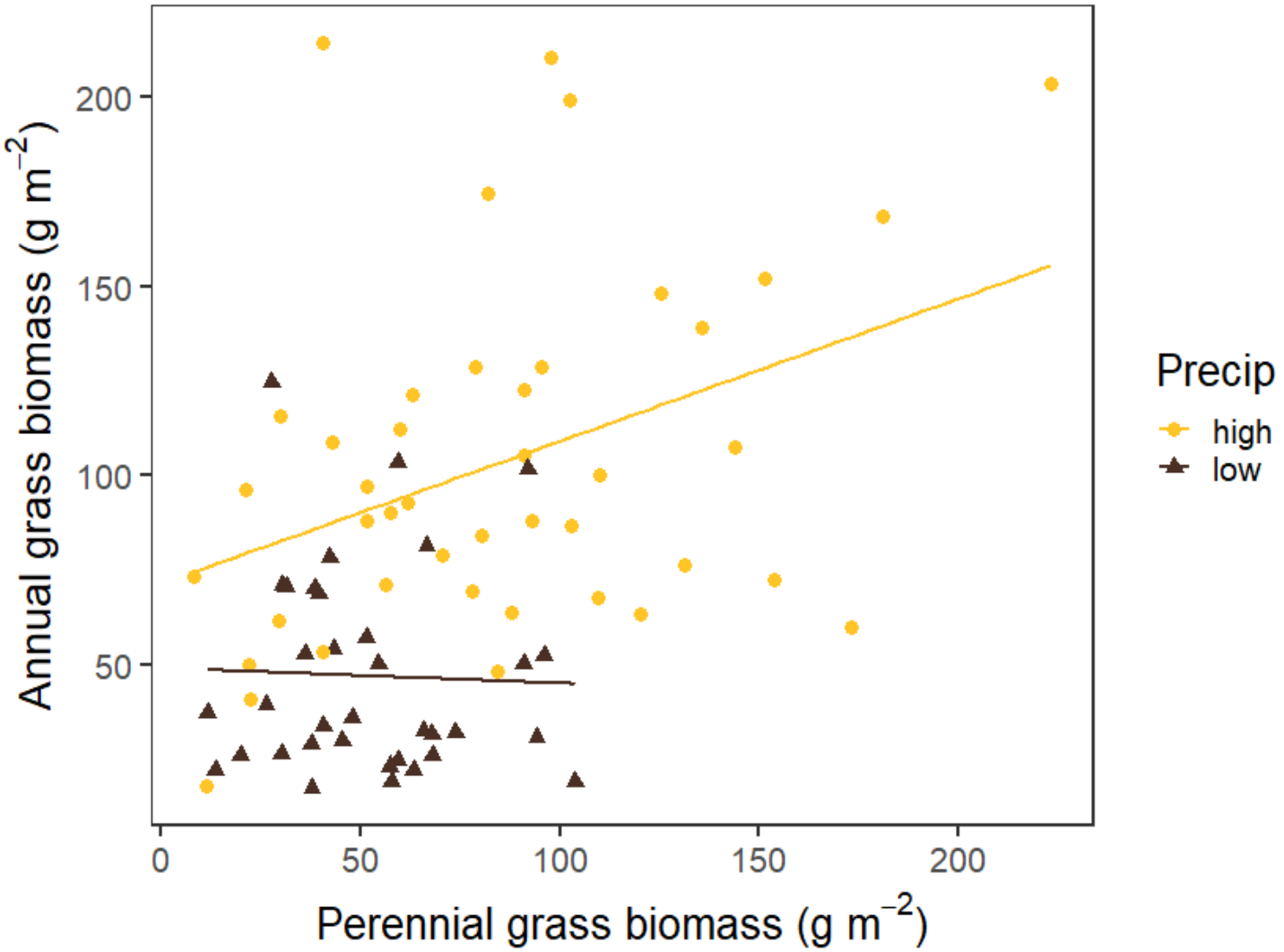
- p=0.05

Results and Discussion



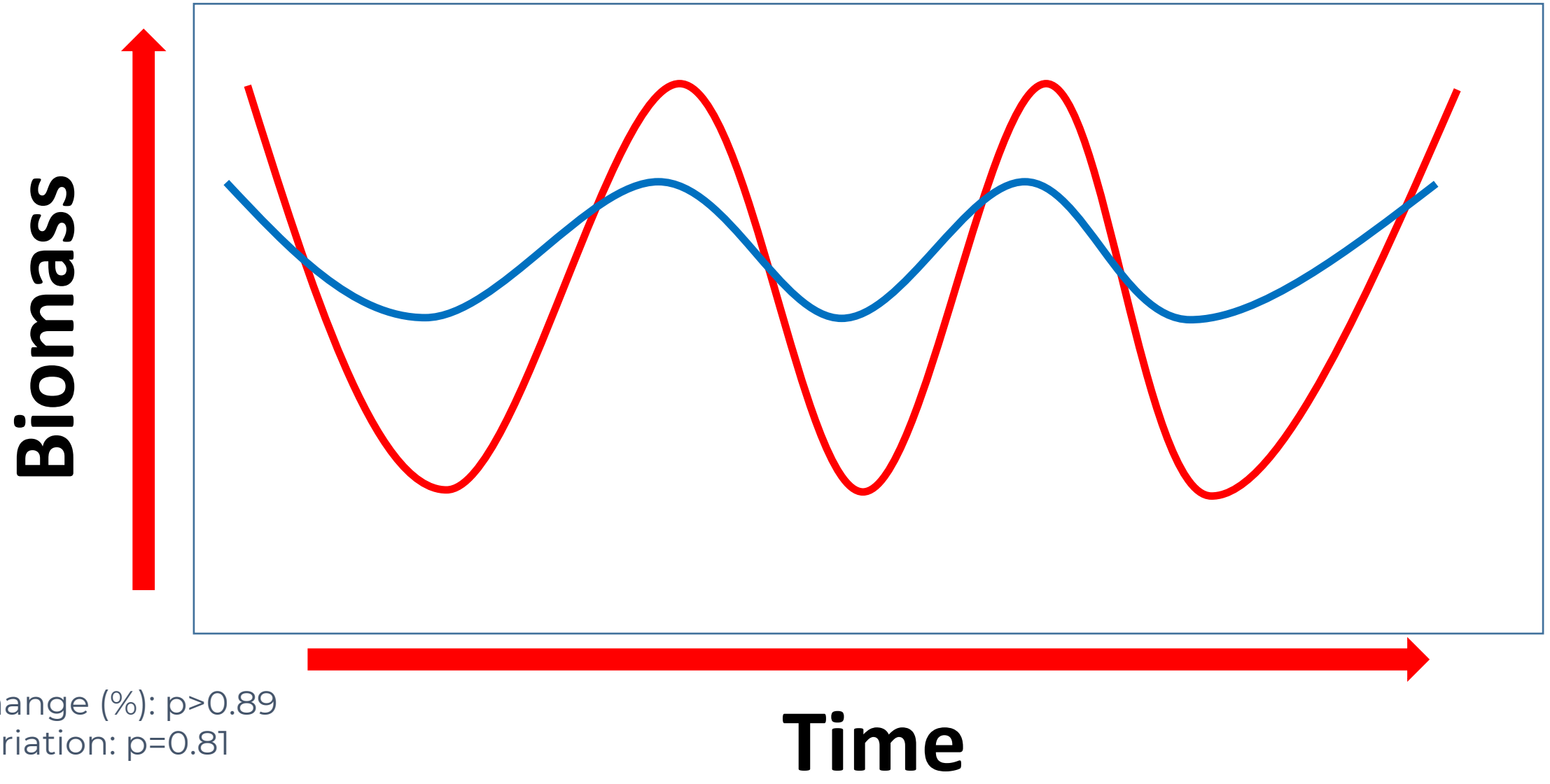
- Interaction: p=0.05

Results and Discussion



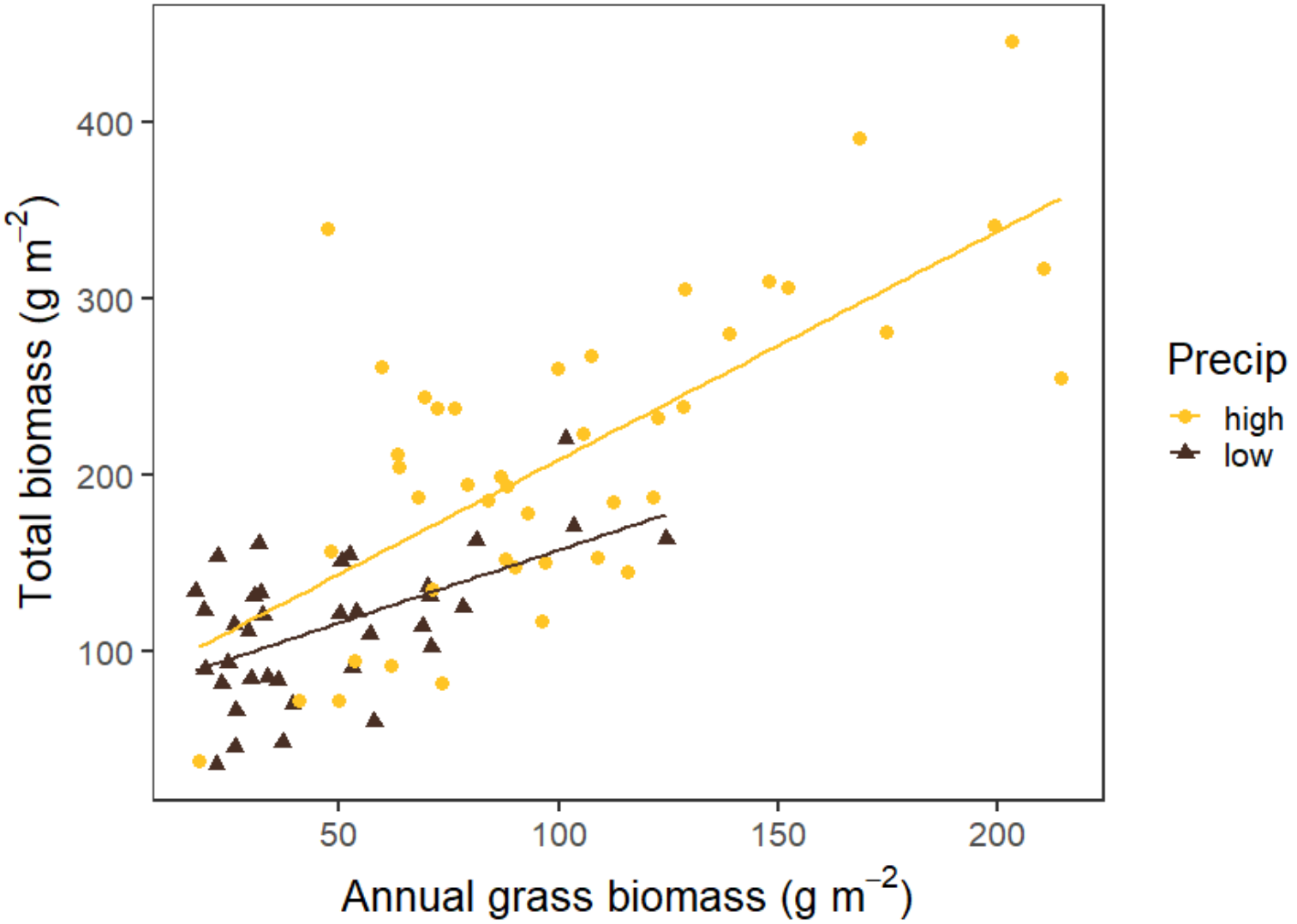
- Main effects:
  - Precipitation effect (p=0.005)
  - Perennial grass biomass (p=0.747)
- Interaction: p=0.996

Results and Discussion



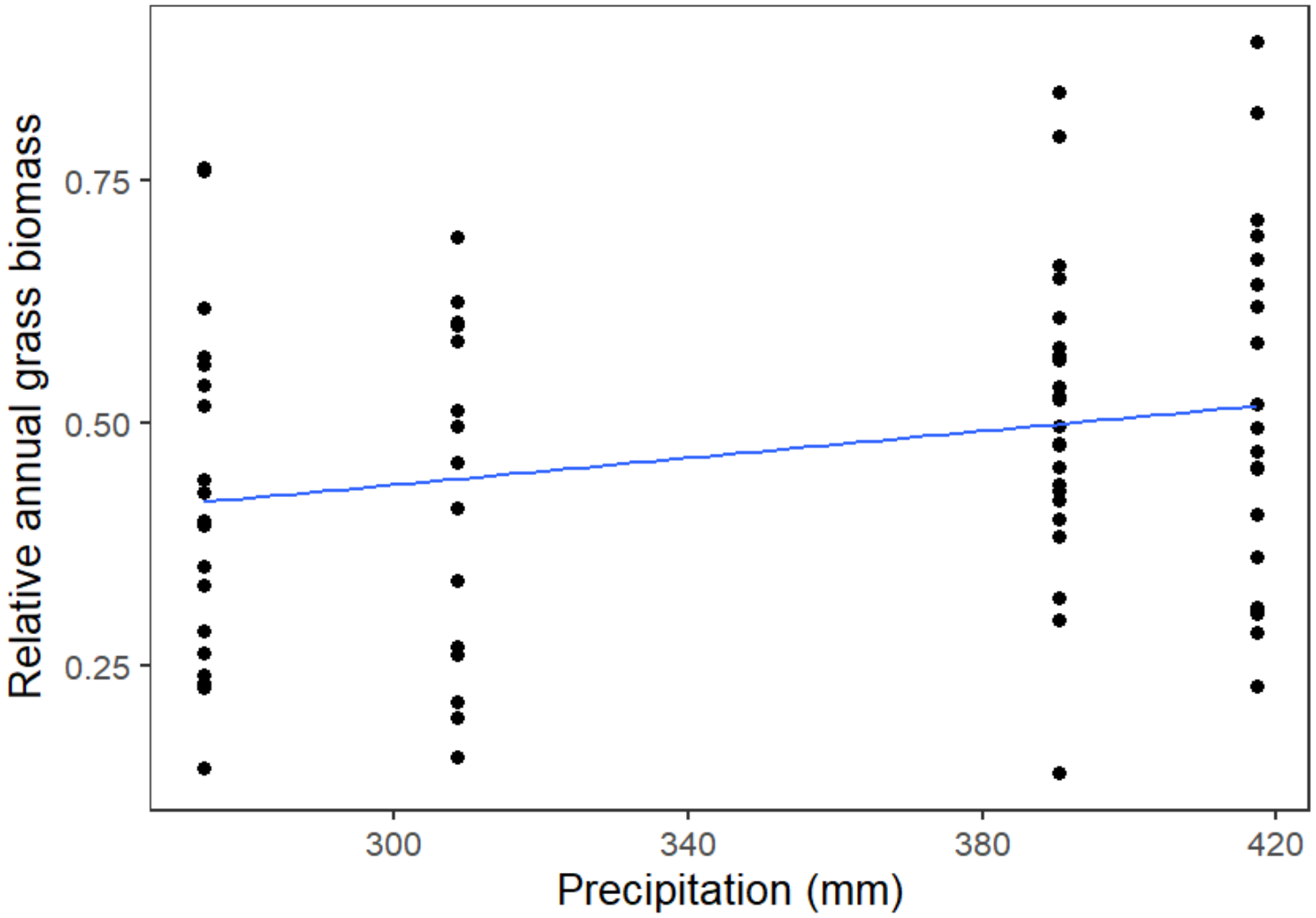
- Change (%): p>0.89
- Variation: p=0.81

Results and Discussion



- Main effects
  - Precipitation: p=0.10
  - Annual grass: p<0.01
- Interaction: p=0.20

Results and Discussion



- P=0.05

Summary and Conclusions

- Annual grasses have a greater negative impact on perennial grasses in drought years
- Perennial grasses do not exert as strong of an effect on annual grasses
- Annuals do have a stronger response to precipitation
  - Our rangelands still seem stable
- Will annual grasses become a larger issue in the future due to drought?

A ranching economic analysis of ventenata control in northeast Wyoming

Invasive Species

- Management usually not profitable for ranches
  - Contradicts findings that prevention and control are beneficial economically
- Exist on mosaics of private land
  - Most studies assess the problem at landscape scales

Invasive Species

- Private management and public benefit disconnect
  - Those in a position to prevent invasive species are not always affected
  - Individual landowners incur only a subset of total landscape scale costs

Invasive Species

- Management doesn't fit well into ranch budgets
  - Non-market goods and services can be of greater value
  - Externalities can't be sold
    - Money spent on management of these non-market EGS could be spent elsewhere on more tangible investments

- https://i.dailymail.co.uk/1s/2020/12/21/13/37101658-0-image-a-17_1608557947373.jpg

Invasive Species

- Prevention doesn’t fit well into ranch budgets
    - Could establish anyway, might not either way
  - Costs
    - Infrastructure, labor, herd management changes
    - Prevent decline, not increase production
      - Greater profitability in lower condition than recommended
- Long term control investments may not see net benefits for many years

Objectives and Questions

- Is control of Ventenata economically feasible in this region?
  - When

Methods

- 500 head
- 2890 AUM
- Meadow hay costs $201.05
- Alfalfa hay costs $225.92
  - Wyoming 2019-2021 inflation adjusted

	Area infested	Loss of forage
Low	20%	8%
High	80%	32%
Worst case	80%	50%

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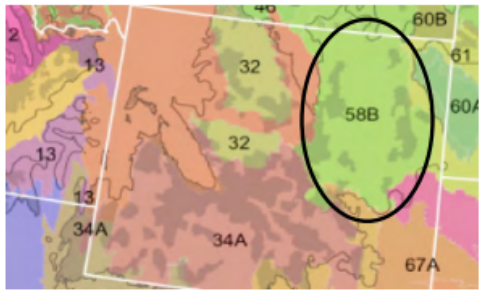
B-1332.35
December 2018

Enterprise budget for large, private-land ranch

Northern Rolling High Plains

MLRA 58b

Holly Dyer[1], Holly Kirkpatrick[2], Tom Hilken[1], Kendall Roberts[1], Anna Maher[1], Nicolas Quintana Ashwell[1], Bridger Feuz[2], John Tanaka[3], John Ritten[4], and Kristie Maczko[3]



Wyoming counties: Campbell, Converse, Johnson, Natrona, Niobrara, Sheridan, Weston
Montana counties: Big Horn

This budget represents typical cost and returns for a 500-head, cow-calf operation in Major Land Resource Area (MLRA) 58B, the Northern Intermountain Desertic Basins. A panel of producers from Campbell, Converse, Johnson, Natrona, Niobrara, Sheridan, and Weston counties in Wyoming assisted with the information contained in this enterprise budget.

Feed Sources

Feed sources for private land ranches include deeded rangeland, non-irrigated pasture, and hay meadow aftermath grazing. Aftermath grazing occurs during October and November. Deeded non-irrigated pasture is grazed from early to mid-December when winter feed begins. Ranchers typically put up their own meadow hay and alfalfa to supply 70% of the required winter feed. They purchase the remaining feed required to meet the herd's demand. Purchased feed is comprised of equal amounts meadow hay and alfalfa hay. After winter, the herd is moved to deeded non-irrigated pasture close to the home operation for about one month of grazing before summer grazing

[1] Department of Ecosystem Science and Management, University of Wyoming.
[2] Extension Educator and Livestock Marketing Specialist, Uinta County Extension, University of Wyoming.
[3] Wyoming Agricultural Experiment Station, University of Wyoming; Sustainable Rangelands Roundtable.

Methods

- Indaziflam application costs $58.18/ac
  - Helicopter application
- Acreage?
  - How much will control cost?

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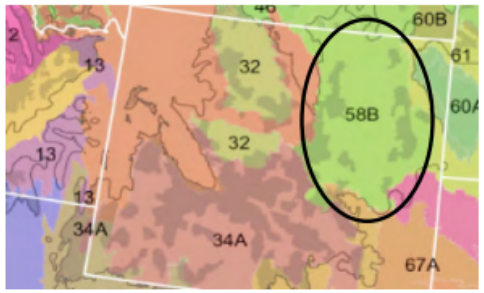

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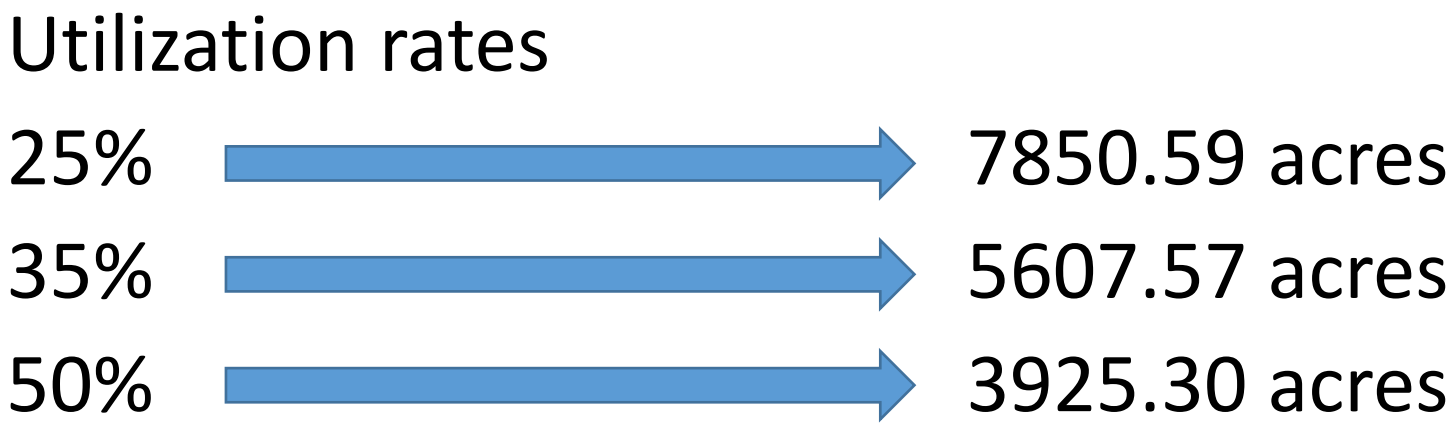
Methods

	Productivity (lbs ac^{-1})			
Year	2019	2020	2021	3-yr average
Ranch A	2062.00	1223.84	1033.09	1439.64
Ranch B	1875.13	1220.27	1459.38	1518.26
Ranch C	953.13	478.96	732.70	721.61
Ranch D	1330.59	512.64	288.44	710.56
Ranch E	2381.44	808.00	1312.79	1500.74
Yearly average	1720.46	848.74	965.28	1178.16

Methods

- 2890 AUM must be maintained
- Utilization rates vary
  - Analogous to productivity



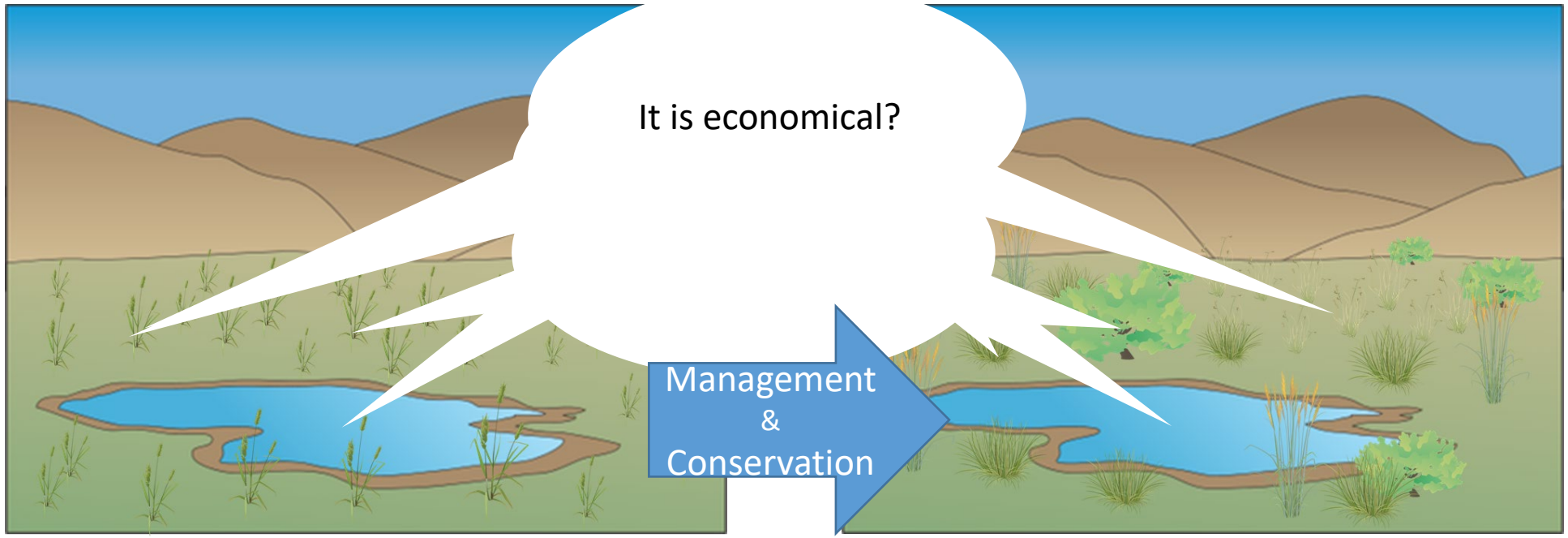
Results and Discussion – 3yr Net Present Value

		Option cost (NPV)		
		Low case (8% loss)	High case (32% loss)	Worst case (50% loss)

Summary

- Herbicide control of Ventenata is feasible in many cases
- Control while the population is small is better
- Coordination is needed where control is not feasible
  - Inaction results in greater landscape costs

Summary



Acknowledgements

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- Little Wolf Ranch
- JC Ranch
- Wolf Creek Ranch
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Nebraska

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Questions