

Factors Regulating Long-term, Large-Scale Grassland Community Assembly

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Two Studies

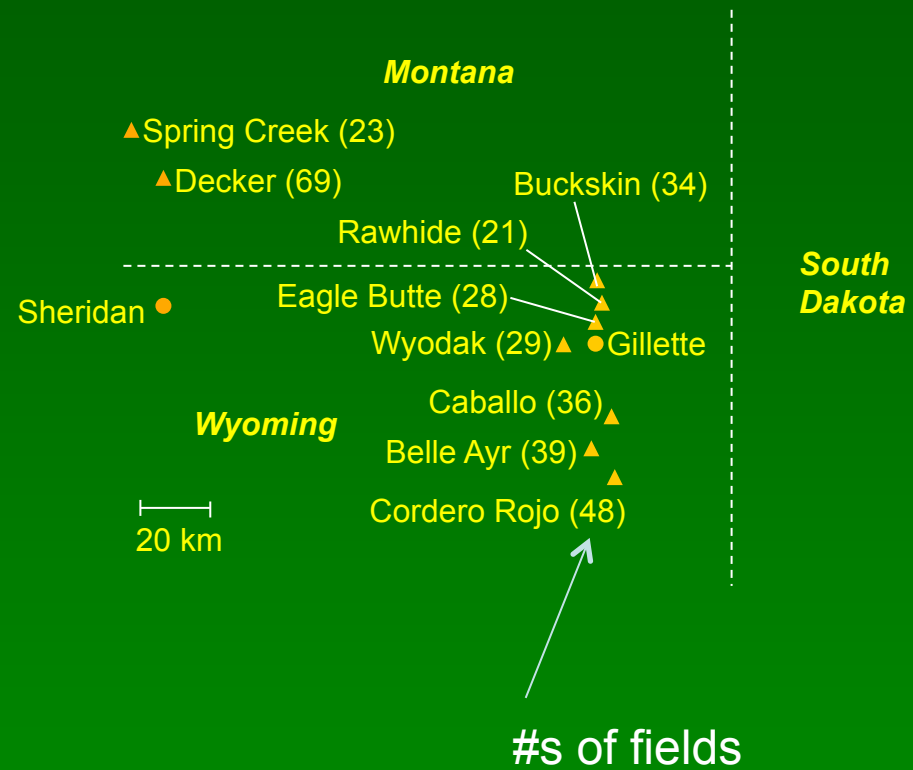
Office of Surface Mining (OSM)-funded study focused on constraining annual weeds, preventing crested wheatgrass invasion and increasing shrubs (i.e. winterfat, four-wing saltbrush, big sage, fringed sage) on surface-mined lands of the Great Plains. Shrubs are the most difficult plant group to establish on these lands.

Journal of Applied Ecology. (In press).

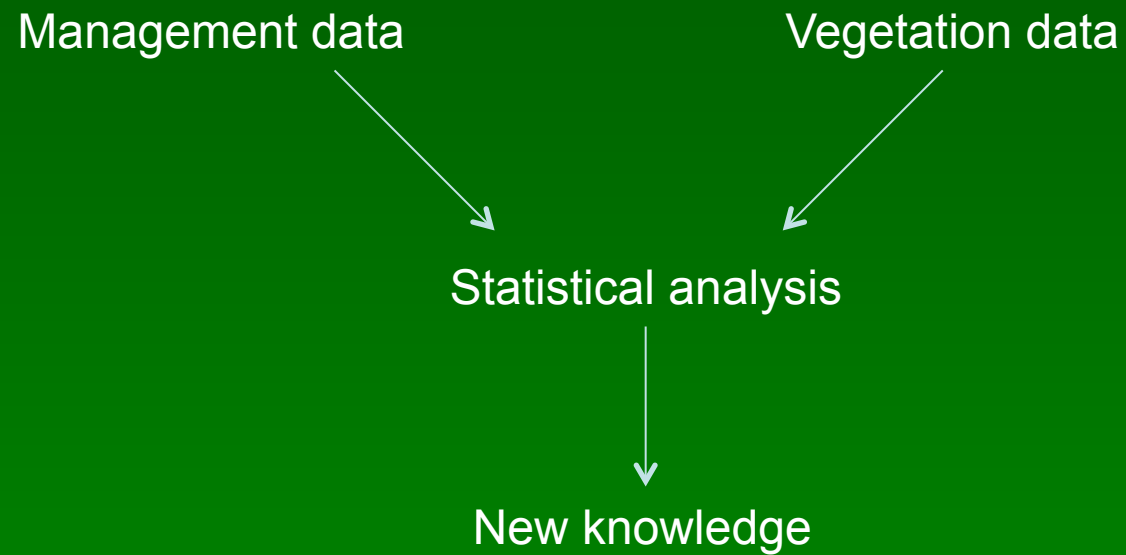
Montana Department of Environmental Quality (DEQ)-funded study investigating factors regulating shrub abundances.

Ecological Applications. 2015. 25:1044-1053.

Sites



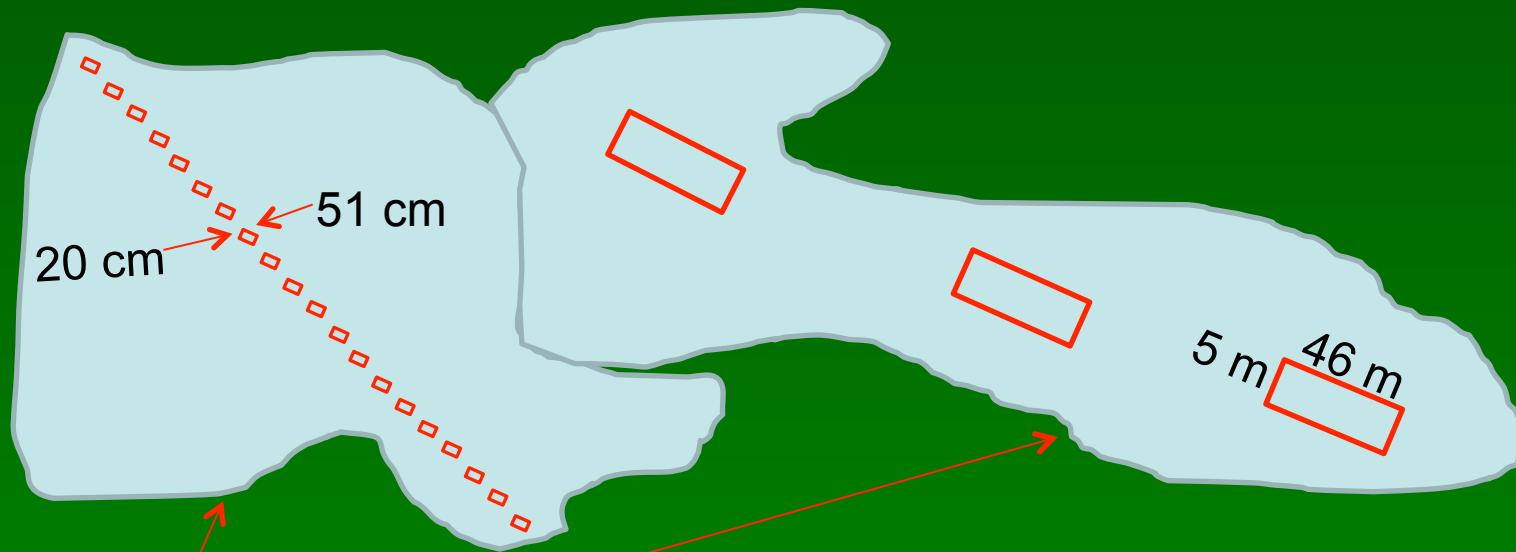
Approach



Sampling Designs

OSM project

DEQ project

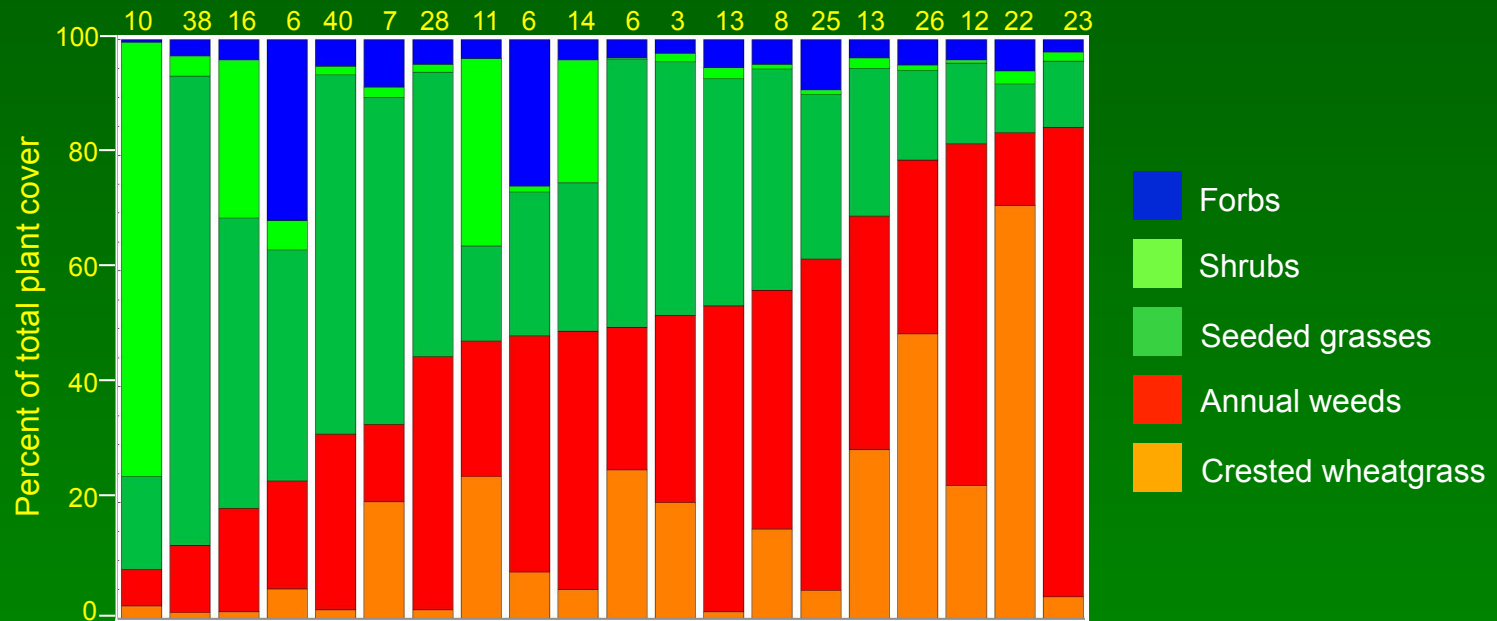


“Field” or area seeded and otherwise treated over a short period of time

Plant Cover

“Relative cover”

$$\sigma_{ij} = \frac{\sigma_{ij}}{\sum_{k=1}^n \sigma_{ik}}$$

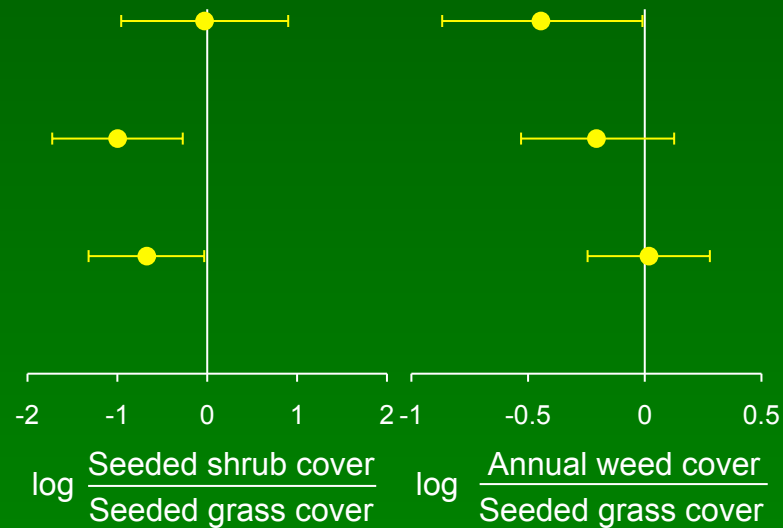


Effects of Grass Seed Rates on Plant Cover

Difference between 0.0 and low (>0.0 to 3.9 kg/ha)

Difference between low and medium (>3.9 to 7.8 kg/ha)

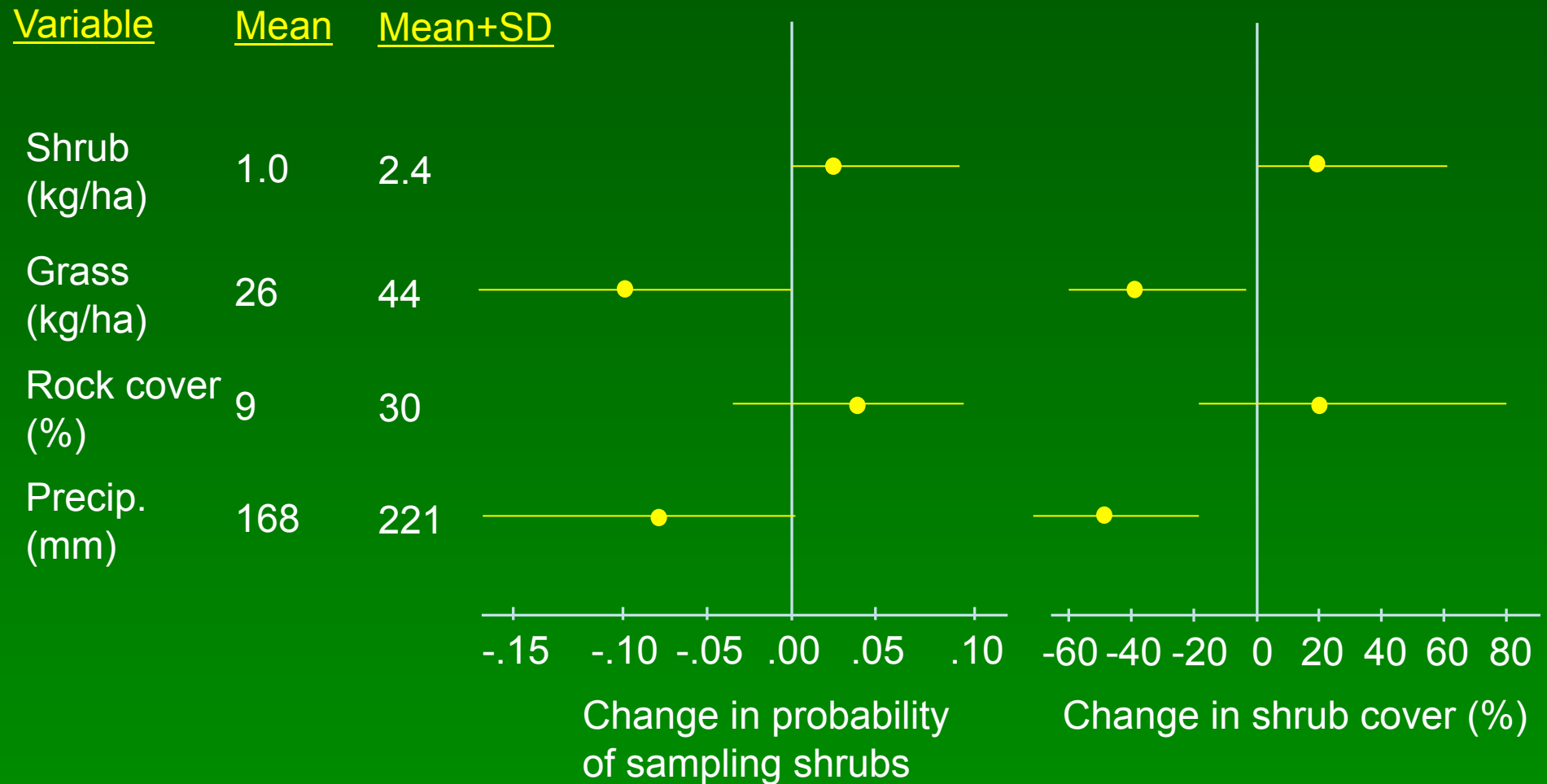
Difference between medium and high (>7.8 kg/ha)



Effects of Grass Seed Rates on Plant Cover

Grass seed rate	<u>Seeded shrubs</u> Seeded grasses	<u>Annual weeds</u> Seeded grasses
0.0 kg/ha	0.10(0.02, 0.53)	2.8(1.1,6.7)
<0.0 to 3.9 kg/ha	0.10(0.03, 0.41)	1.5(0.7,3.3)
>3.9 to 7.8 kg/ha	0.02(0.007, 0.09)	1.1(0.5,2.4)
>7.8 kg/ha	0.009(0.002,0.04)	1.1(0.5,2.4)

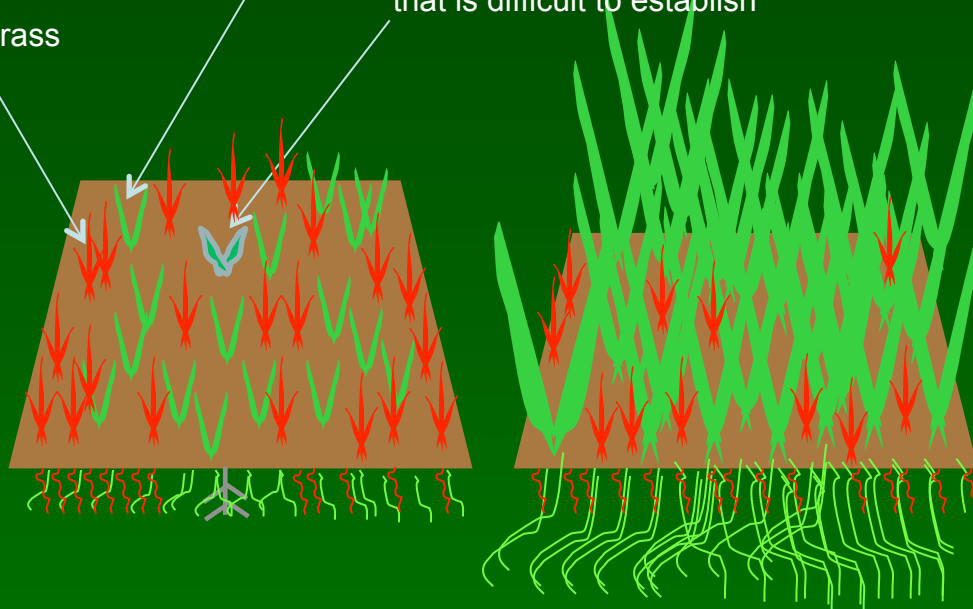
Shrubs-DEQ Study



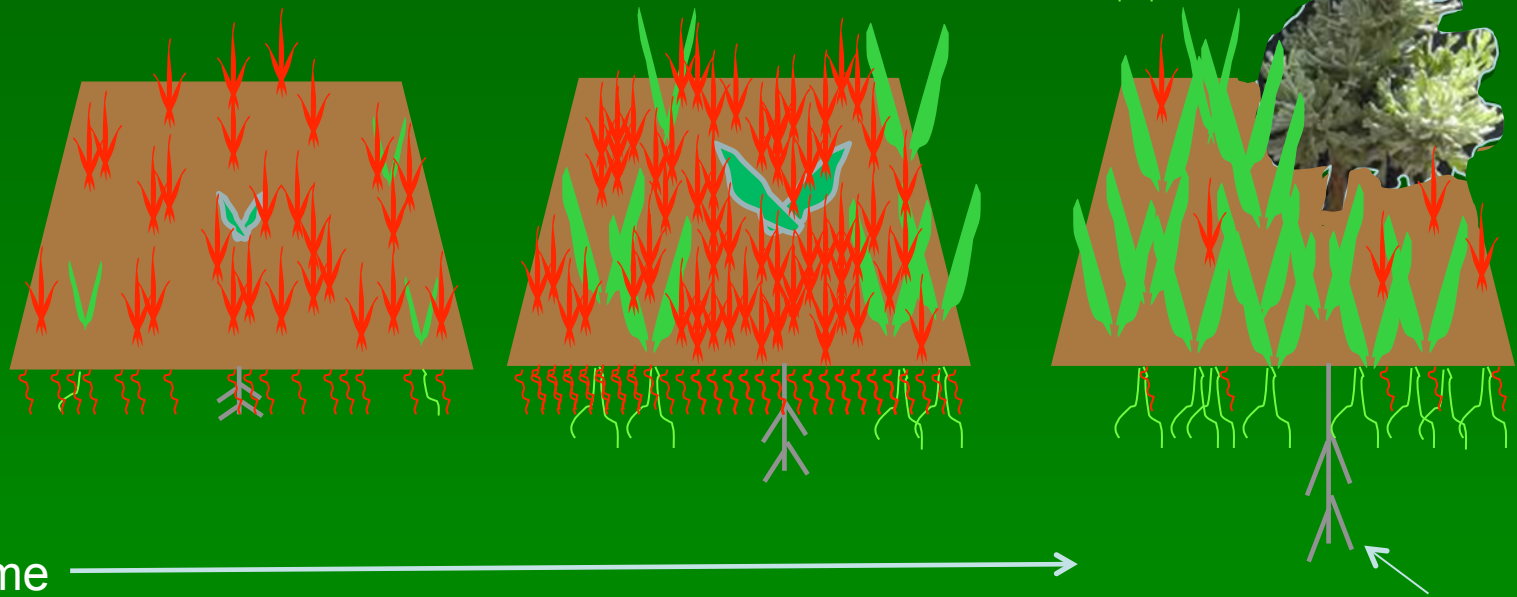
Why the Negative Precipitation Effect?

High grass seed rate:

Cheatgrass
Fast-growing seeded grass
Shrub, warm season grass or other slow growing species that is difficult to establish



Low grass seed rate:

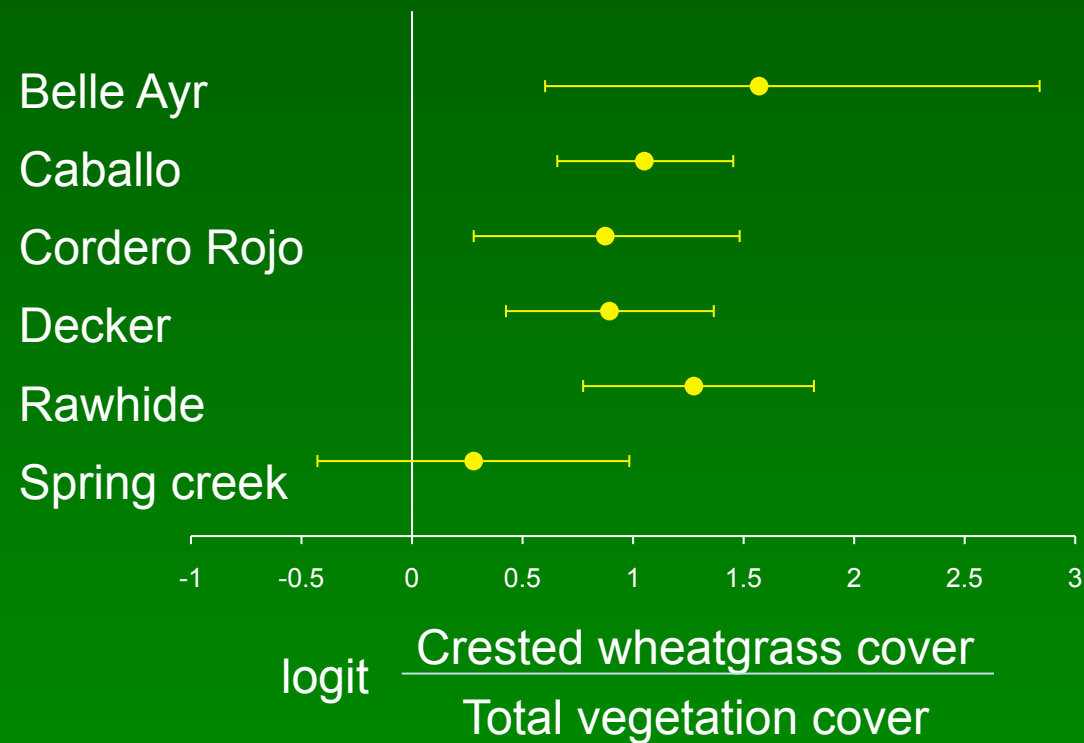


Time →

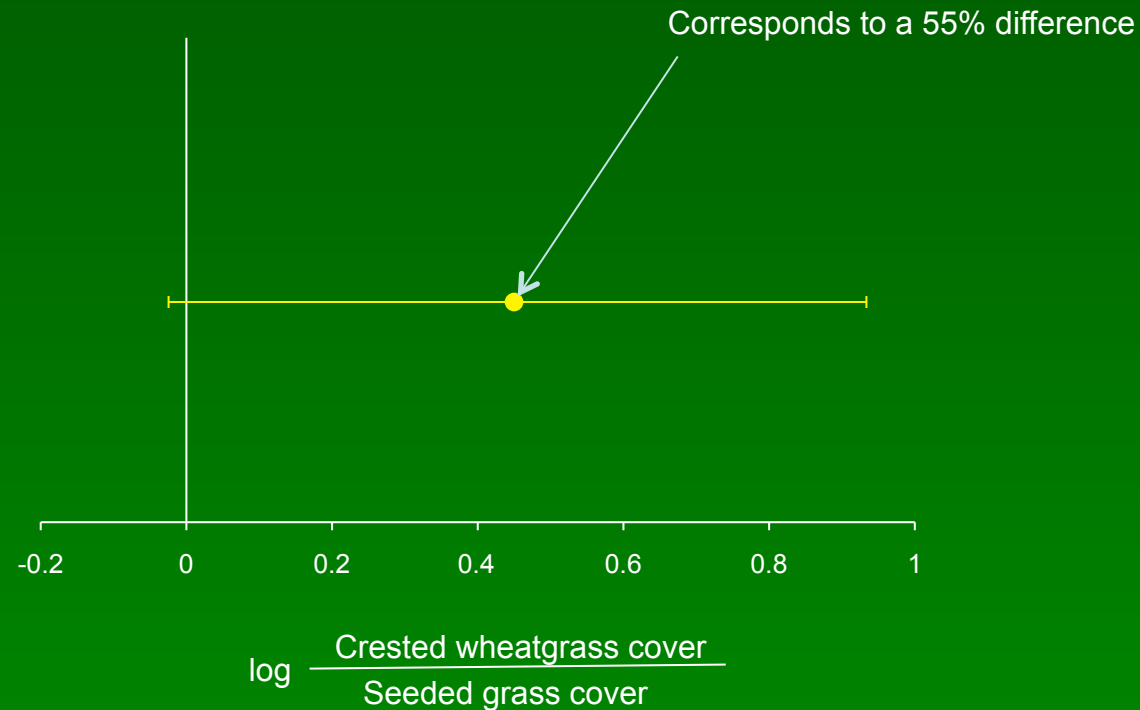
Niche partitioning promotes coexistence

Crested Wheatgrass Time Trends

Not all fields had crested wheatgrass



Direct Haul Effect on Crested Wheatgrass



Adaptive Management

Project evaluating aggressive grass seed rates well below rates commonly used (i.e. 0.2, 0.4, 1.0, 2.0 lb acre⁻¹)

Project spatially segregating difficult-to-establish shrubs from aggressive grasses

Final Thoughts

I believe this research has relevance in a variety of rangeland systems

If you see any potential for applying this research and have questions, please look me up today or feel free to contact me:

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