Restoring Dynamic Disturbance Processes to Promote Ecological Services

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Historically, rangelands were complex…

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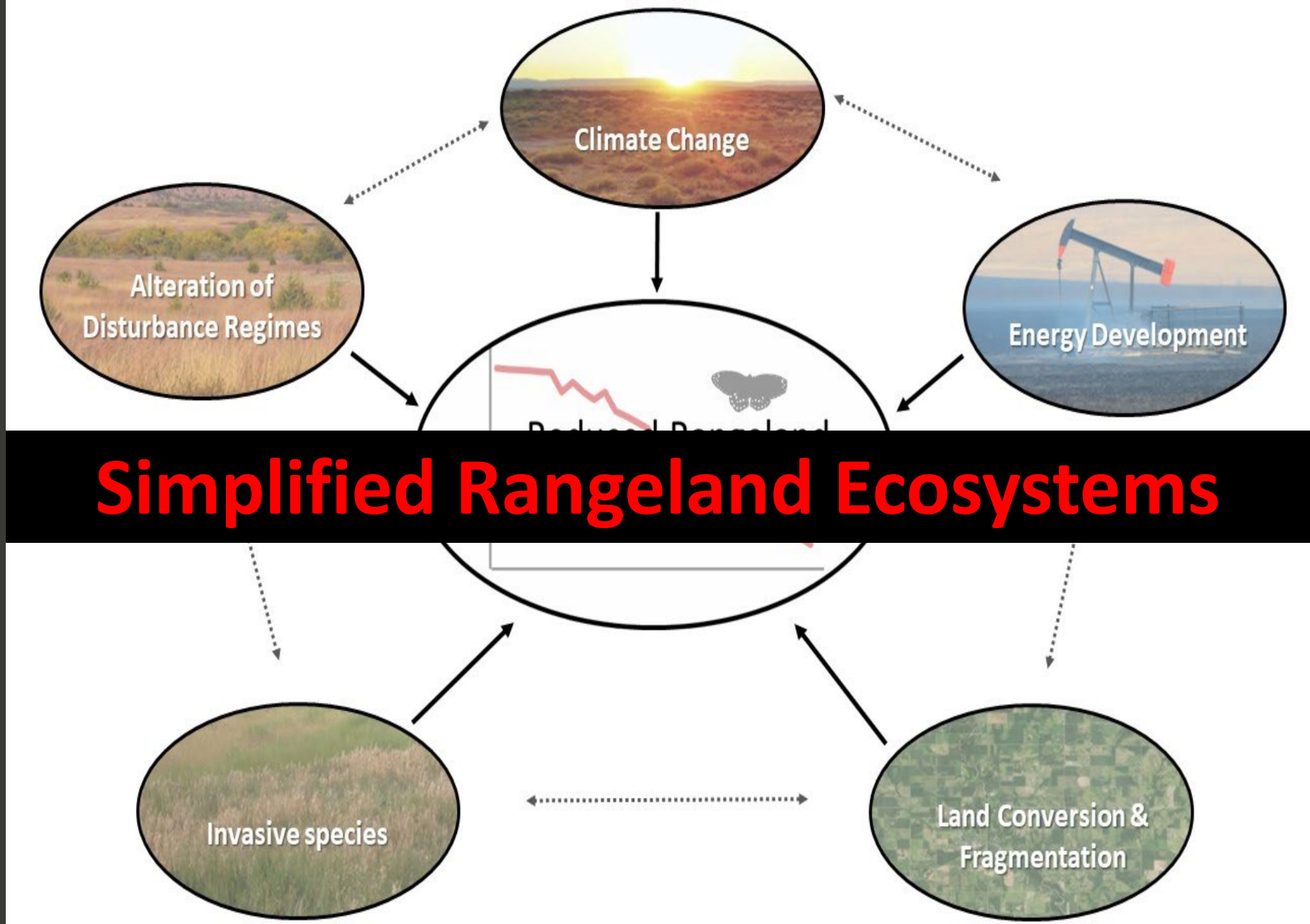
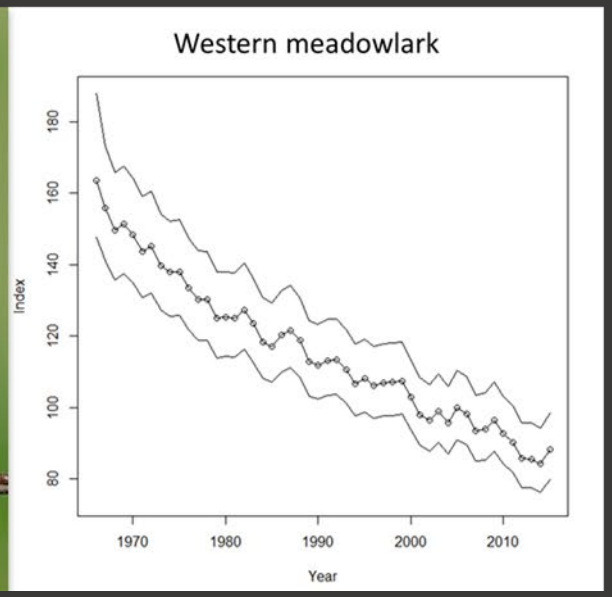
Anthropogenic actions have changed the landscape



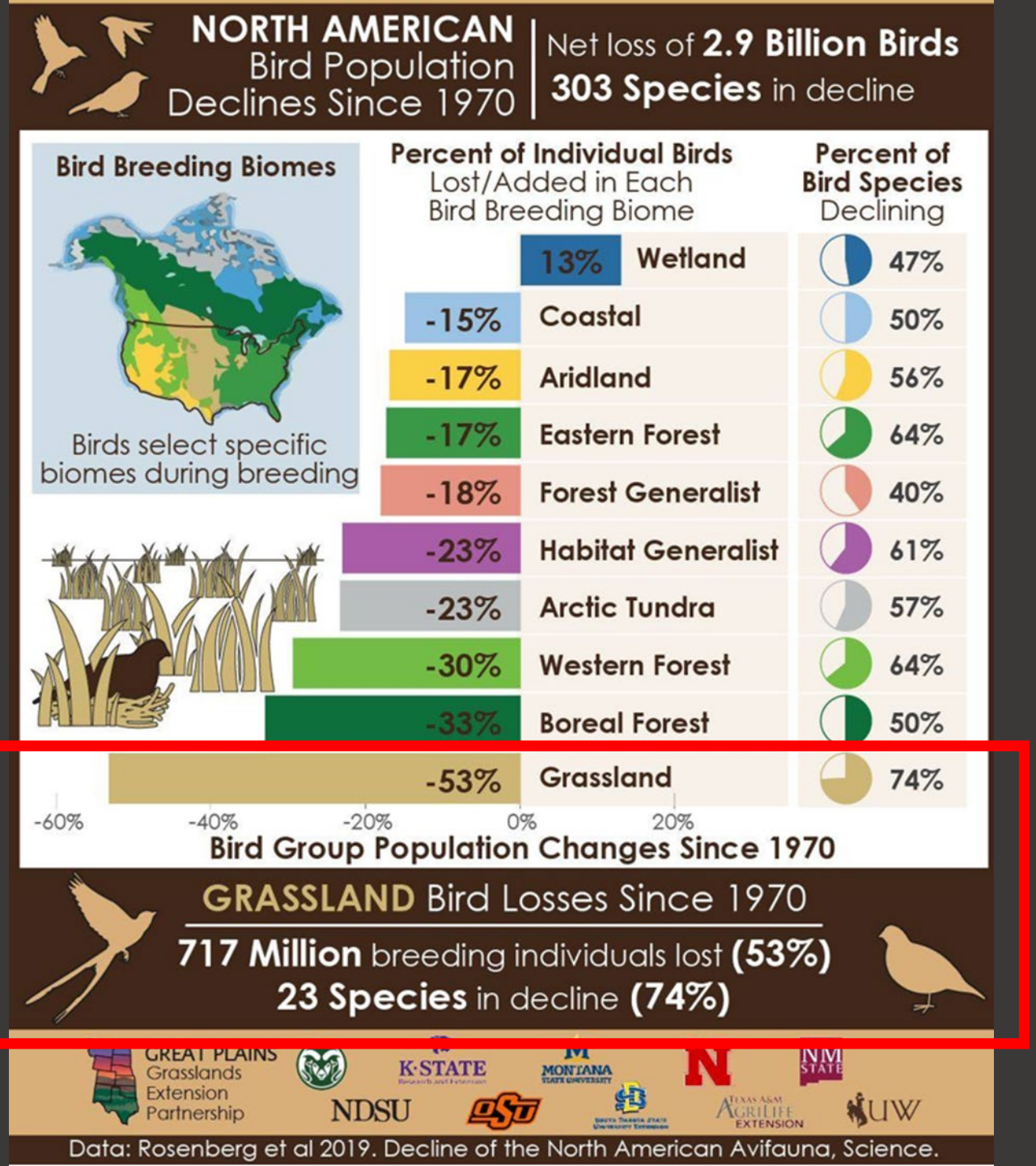
Simplified rangelands results in biodiversity loss

- Relatively few ESA listed species
- Species with large home ranges and complex life histories
- Common species becoming less common



* In North Dakota Western Meadowlarks have declined > 60% over the last 50 yrs

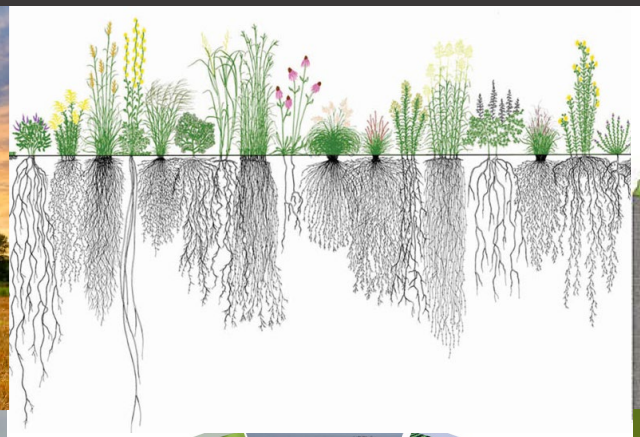
Grassland bird declines are particularly concerning



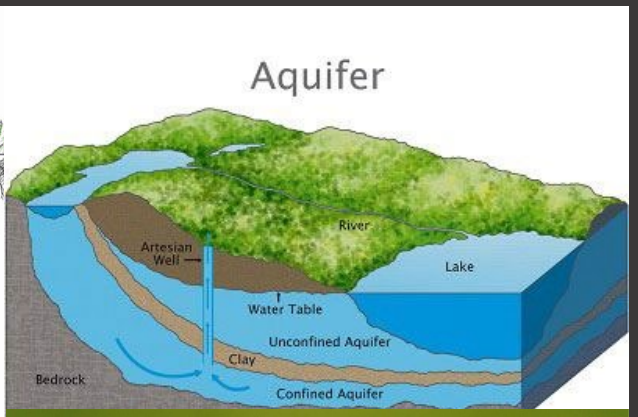
Why we should care: Services and opportunities

Recreational opportunities and wildlife habitat

Food and income for over 1 billion people

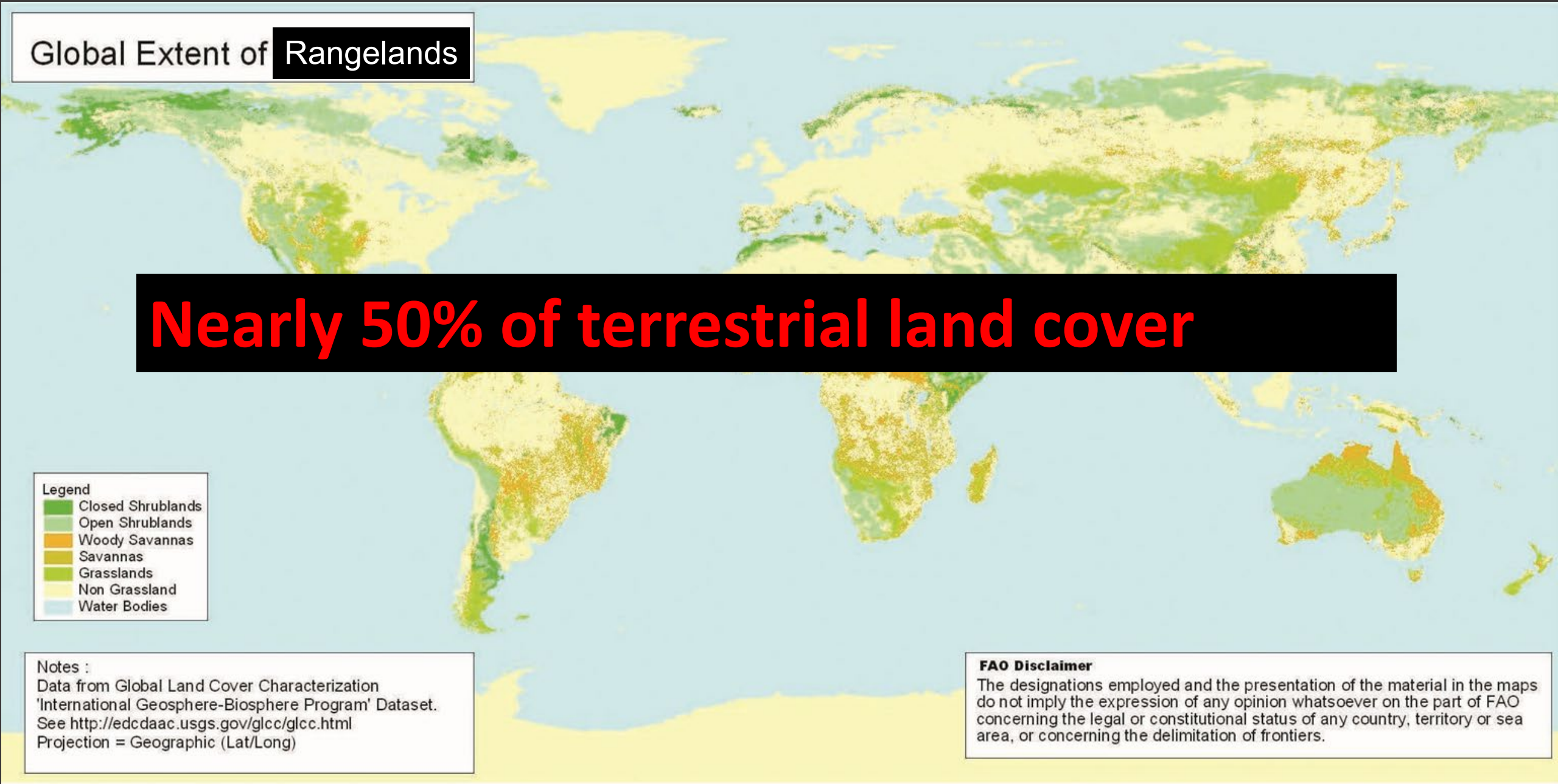


Climate stability and storing over 30% of global carbon

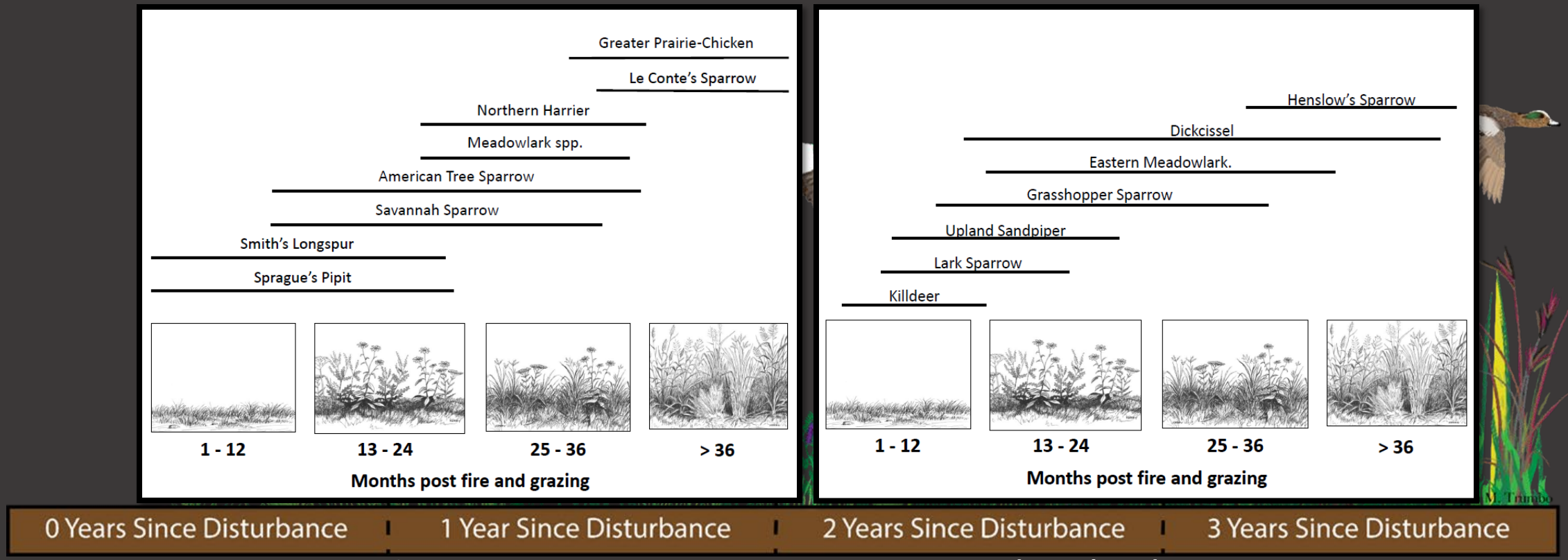


Freshwater regulation, soil preservation, and pollination

Rangelands also present opportunities…



Promoting heterogeneity is part of the solution

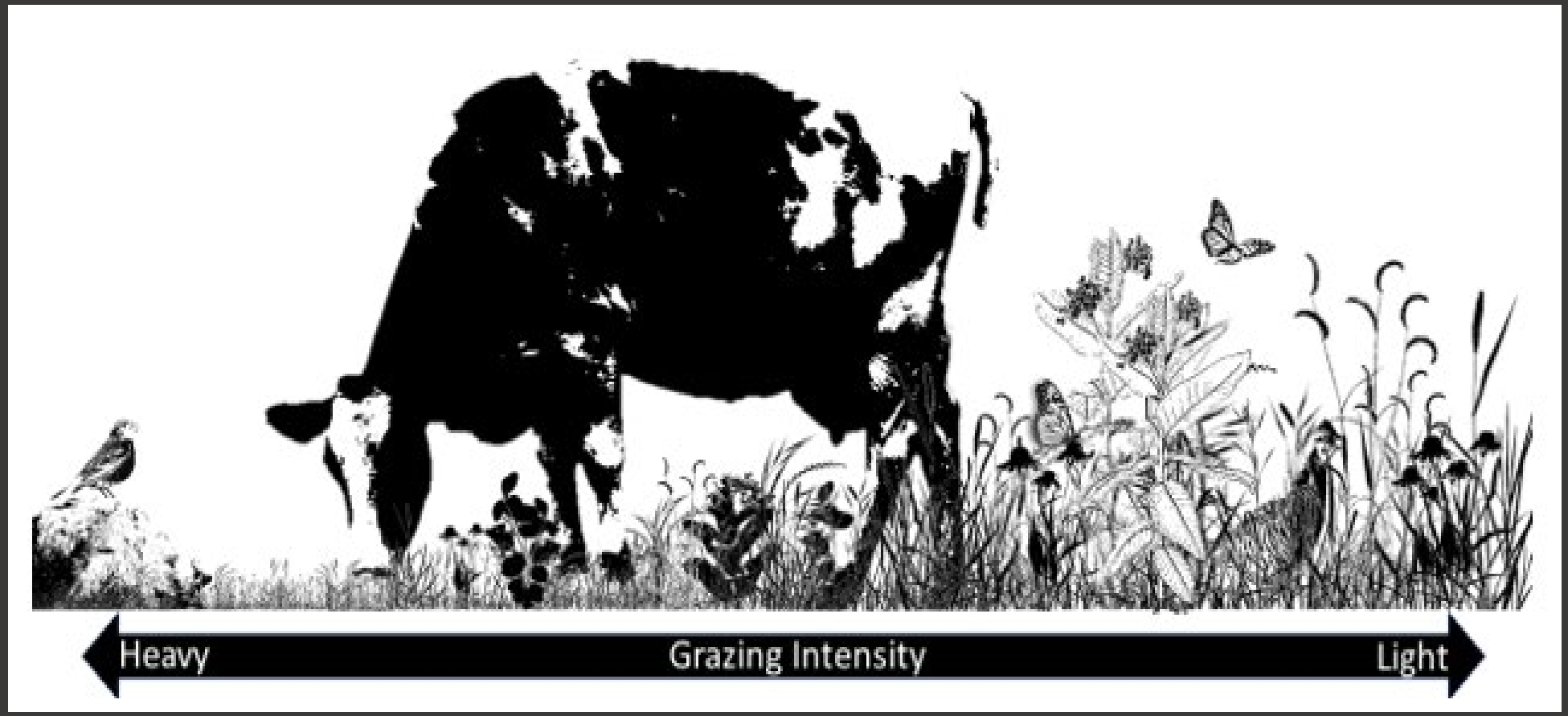


Winter bird community

Breeding bird community

Patch-burn grazing promotes diversity

But…promoting active fire regimes on private lands is not always easy or appropriate



Restoring complexity to rangelands through heterogeneity management

- *Our **long-term goal** is to create sustainable rangelands that maintain livestock performance and promote floral and faunal biodiversity by promoting management actions that create heterogeneity*

1) Livestock performance

2) Plant-pollinator interactions

Study Site

NDSU-Central Grasslands Research Extension Center

Mixed grass prairie

12, 65 ha pastures

Moderately stocked cow-calf pairs

Kevin Sedivec

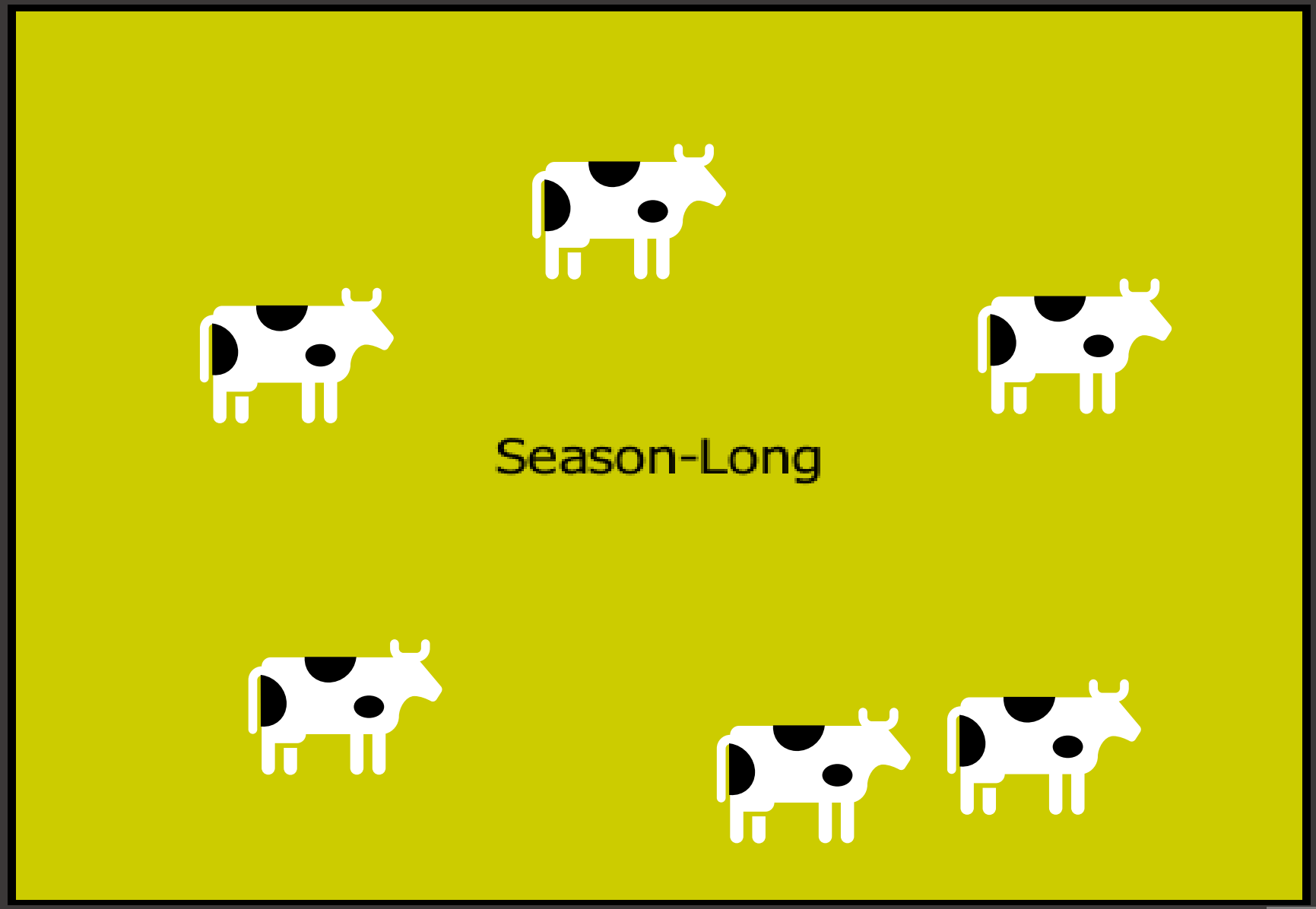
Pasture Design

Status-quo treatment “control”

4 reps

Exterior fencing

Season-Long Grazing (SLG)



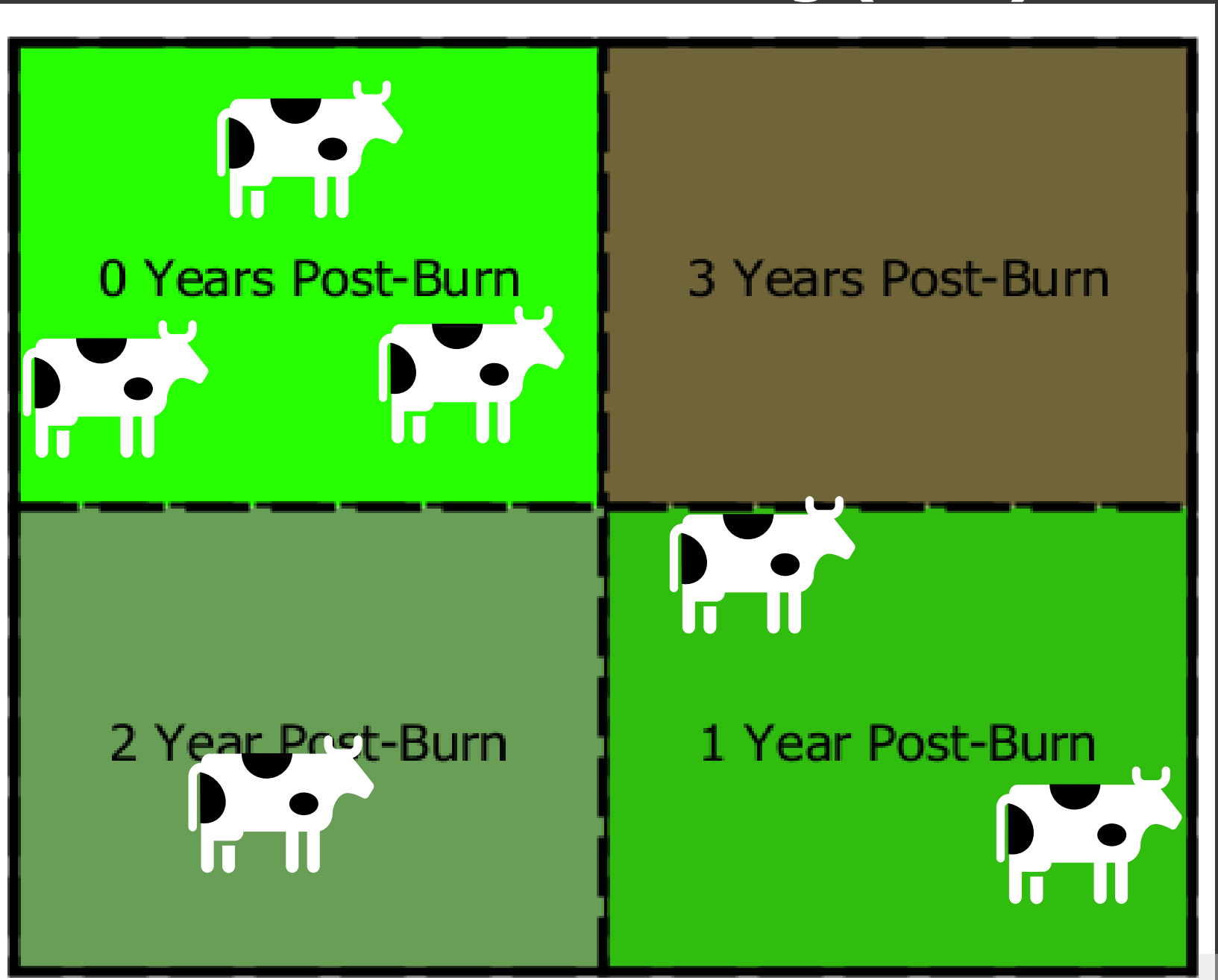
Pasture Design

Heterogeneity focus—fire

4 reps

Exterior fencing

Patch-burn Grazing (PBG)



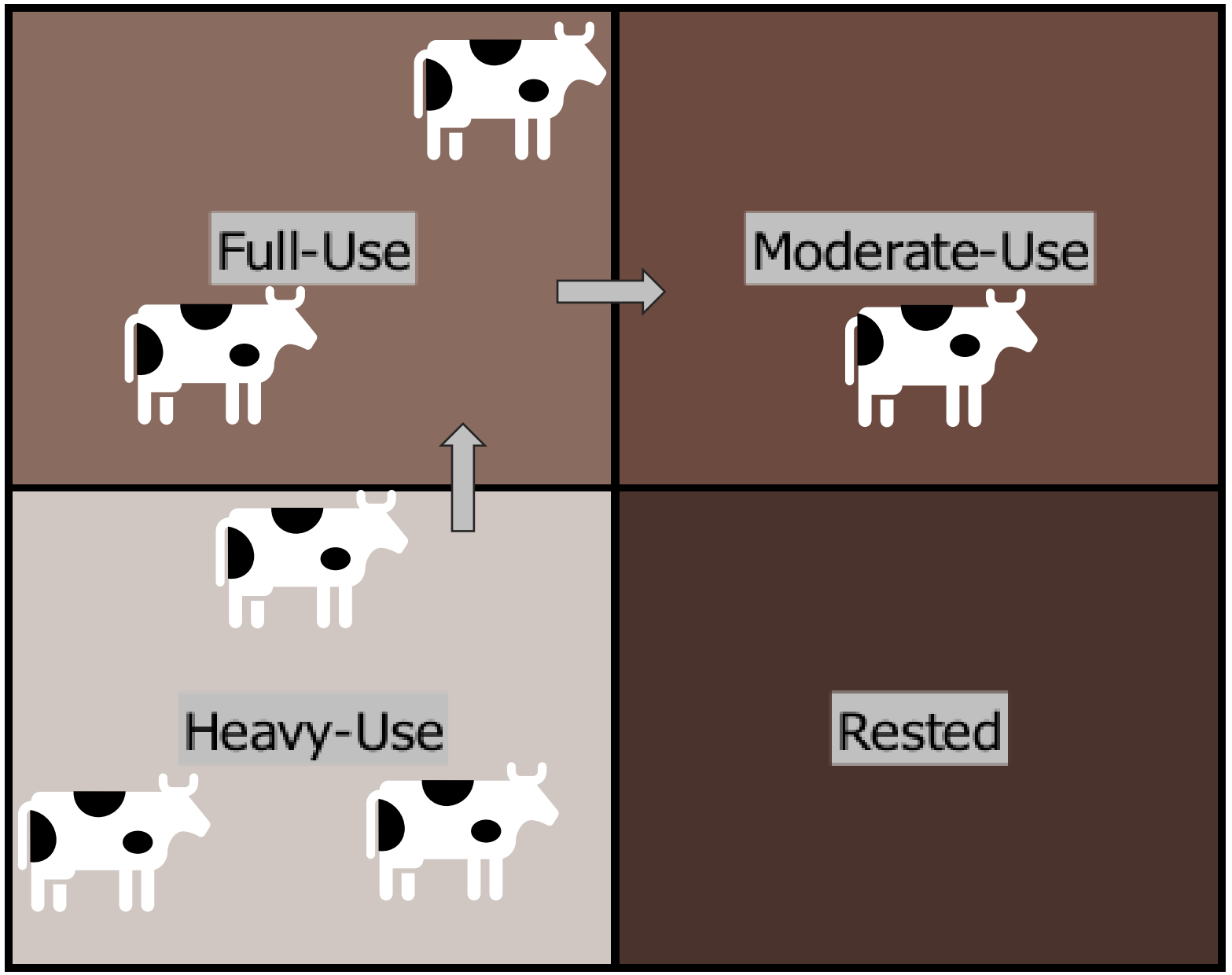
Pasture Design

Heterogeneity focus—no fire

4 reps

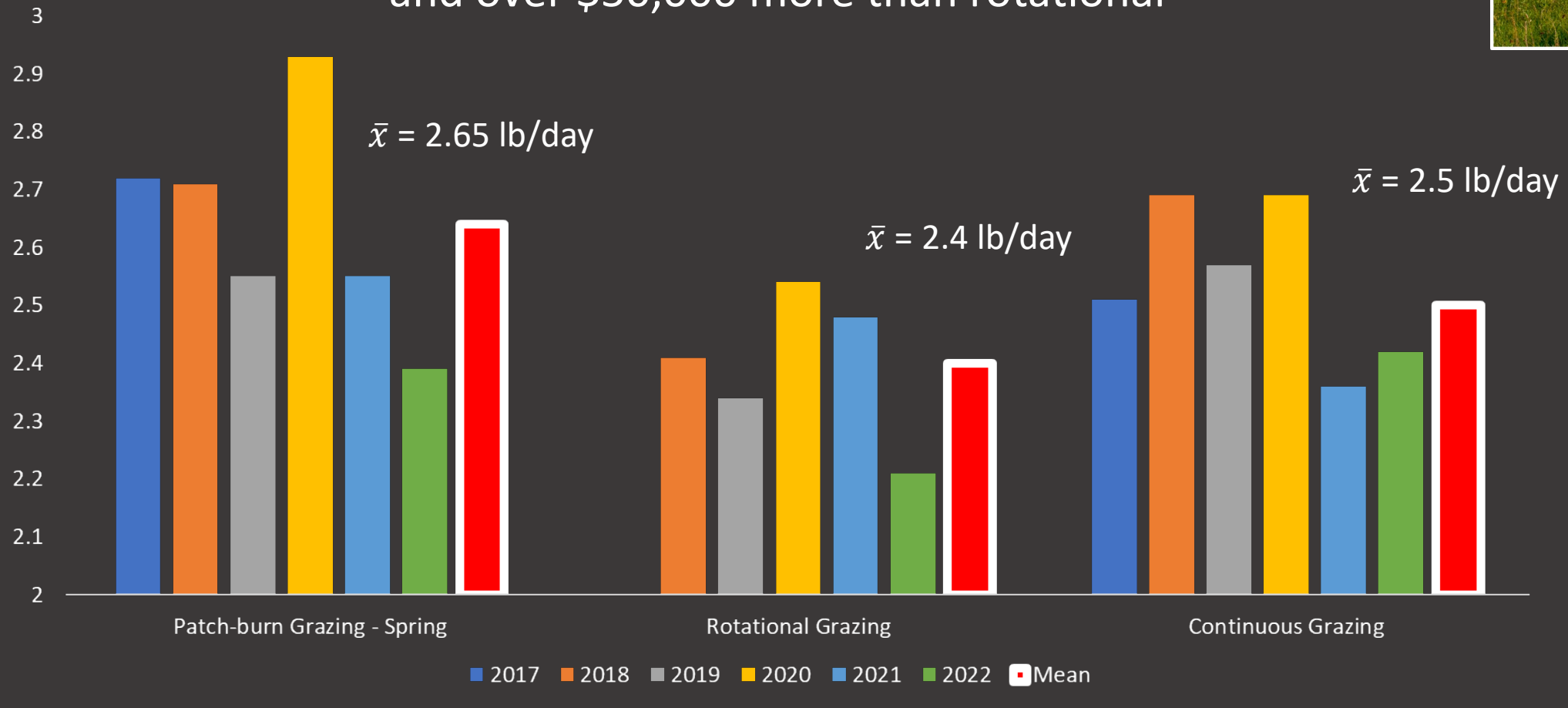
Interior fencing

Modified Twice-over Rest-rotation Grazing (MTORG)

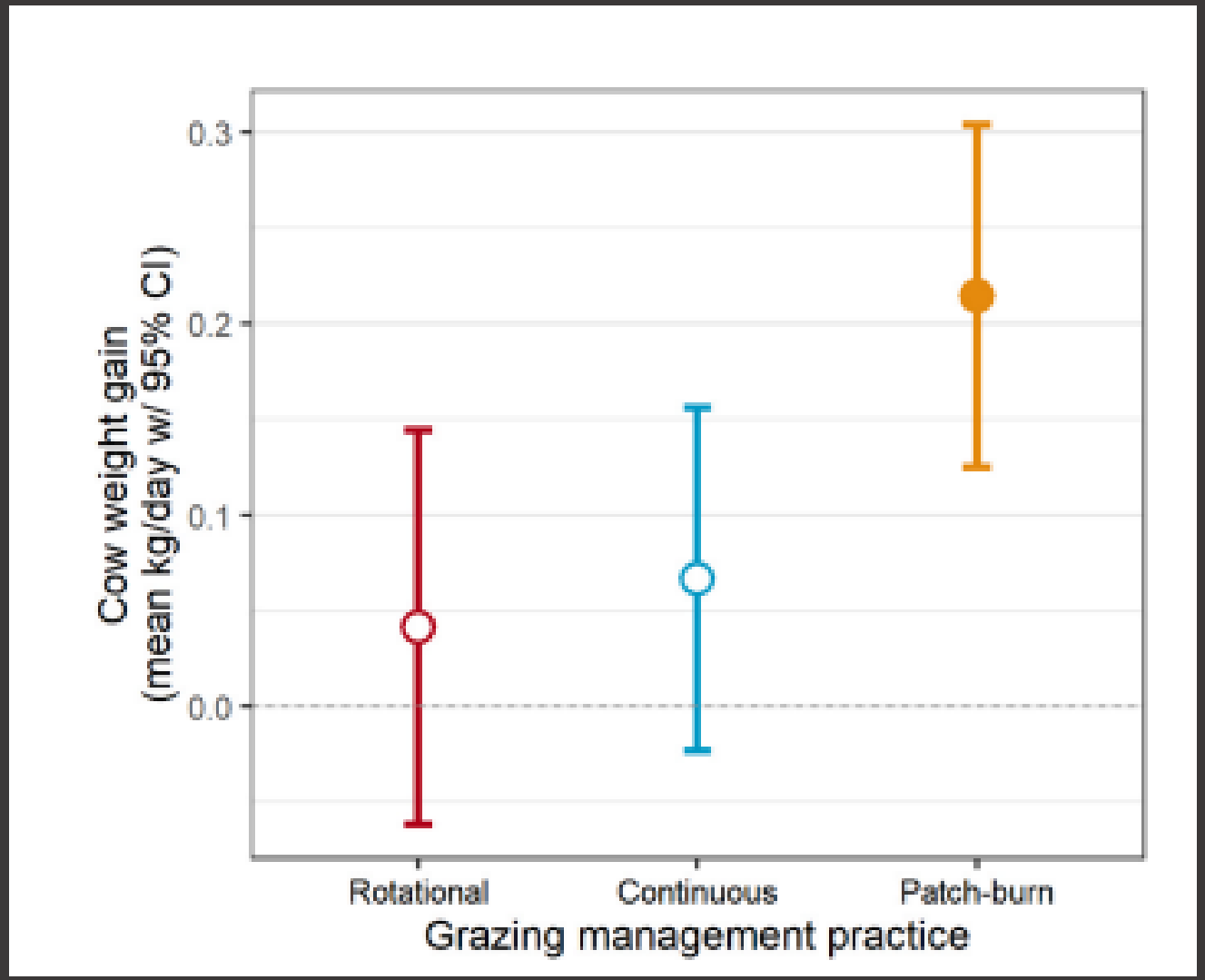


Livestock outcomes: calf daily gains

* A rancher grazing 500 calves for 150 days would net over $30,000 more with PBG than continuous and over $50,000 more than rotational



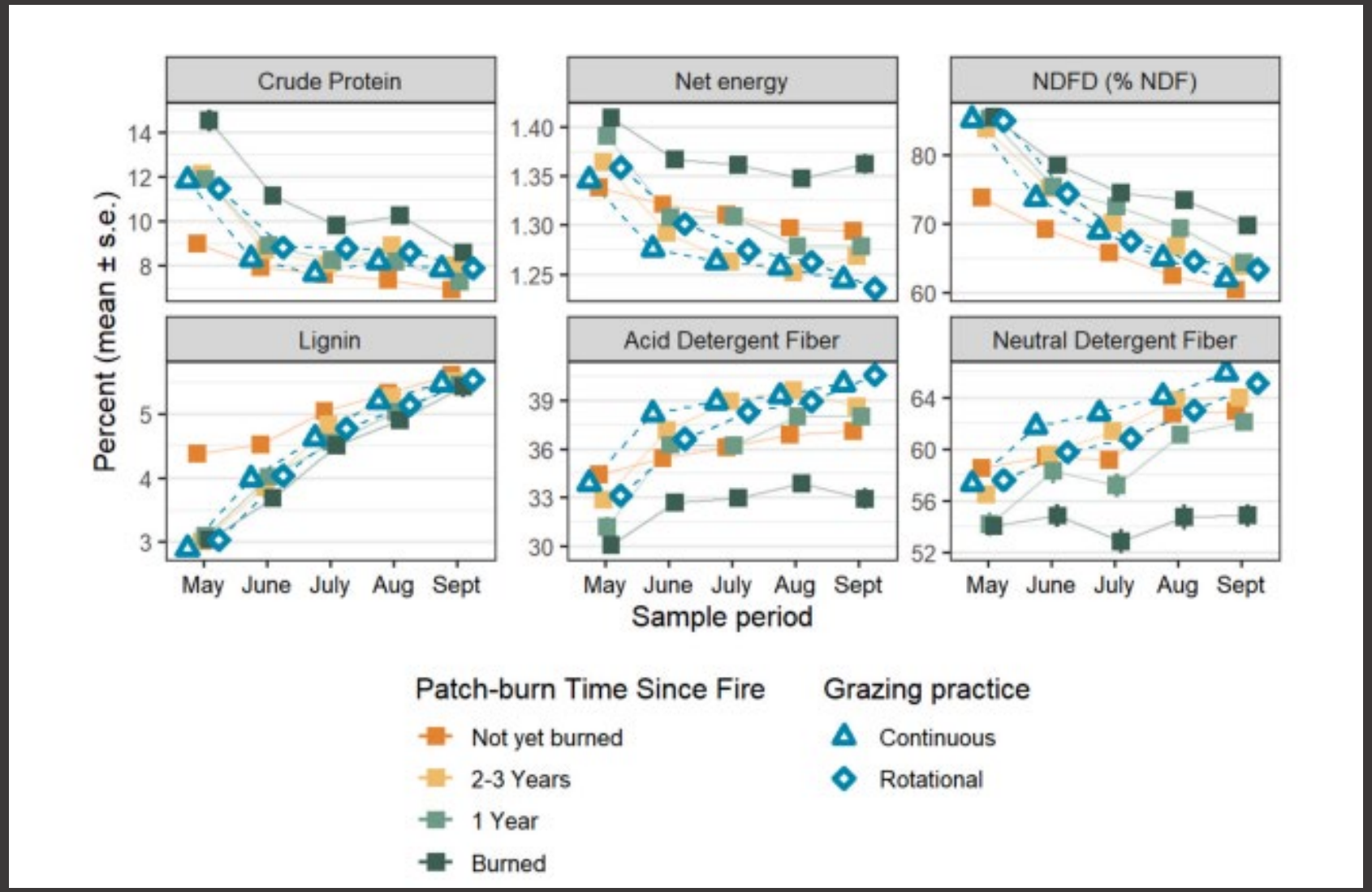
Livestock outcomes: cow gains



Takeaway:

PBG consistently shows the greatest cow weight gains over 7 years

Livestock outcomes: nutritional quality

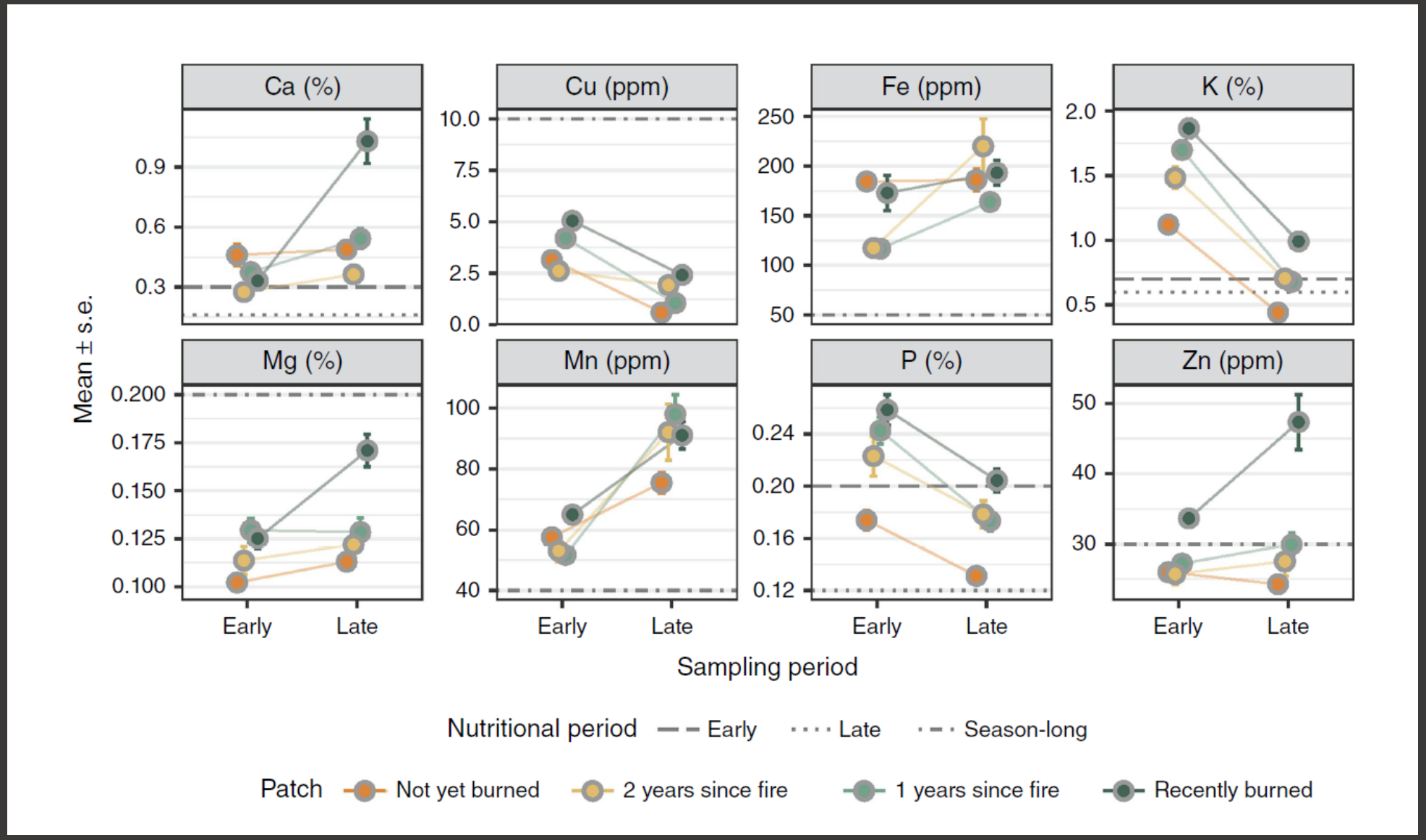


Takeaways:

1) Inclusion of fire results in higher quantities of positive forage attributes

2) Absence of fire results in higher quantities of negative forage attributes

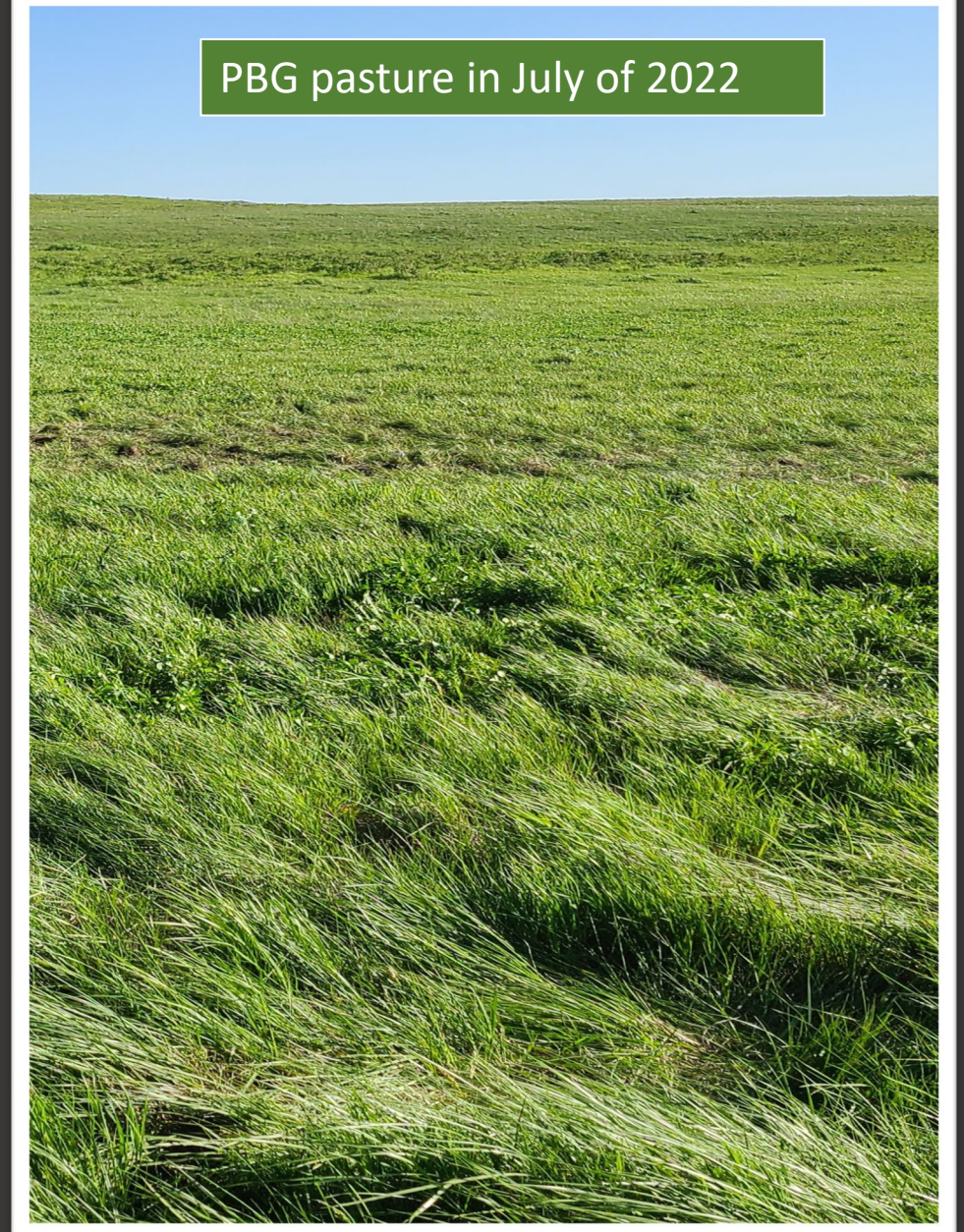
Livestock outcomes: nutritional composition



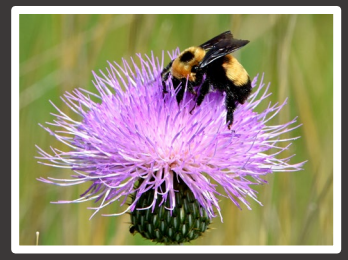
Takeaway:

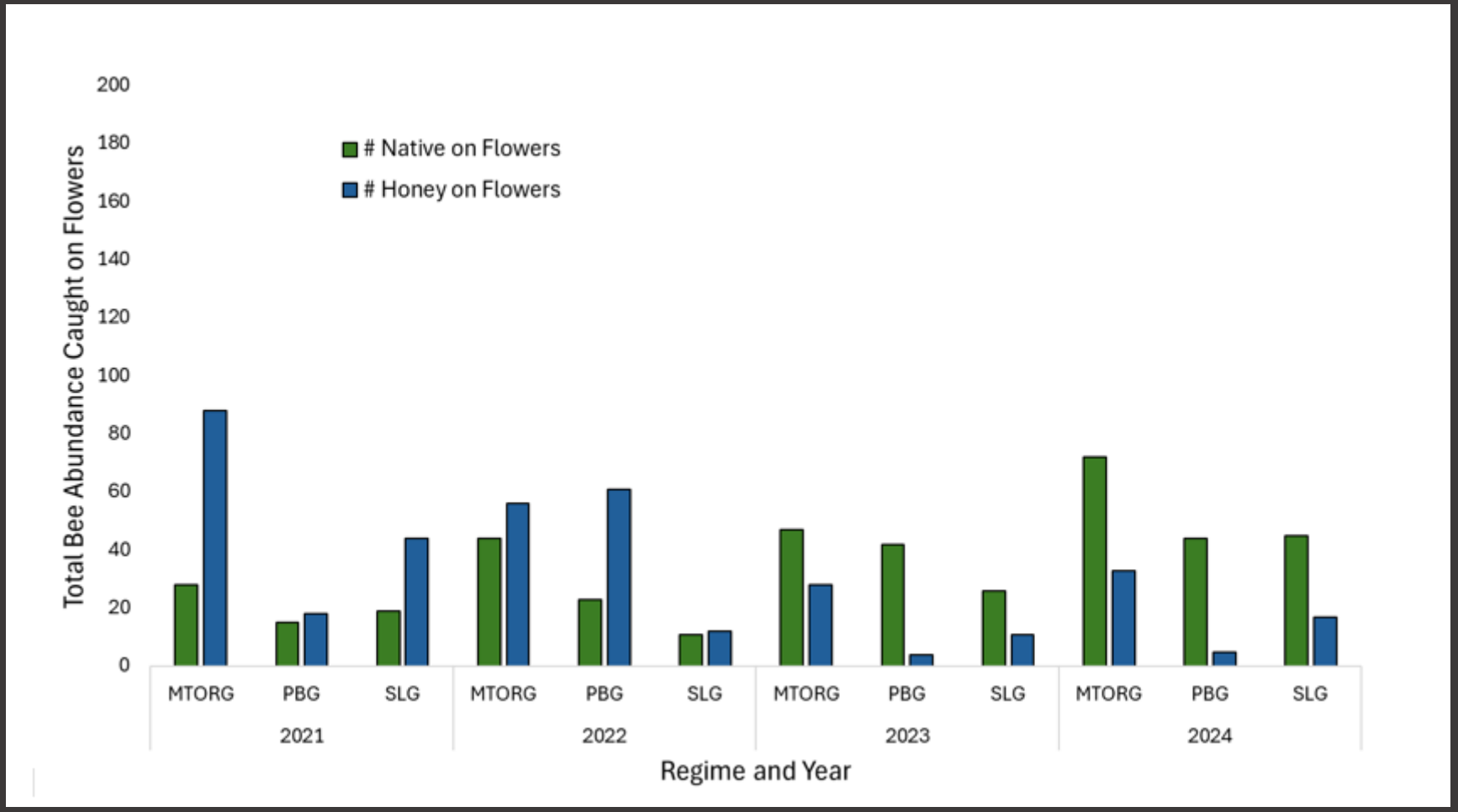
Within PBG units, the recently burned patch has the greatest amount of key forage nutrients

Pollinator outcomes: summer 2021 drought



Plant-pollinator outcomes: overview bees



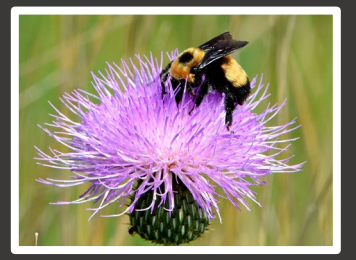


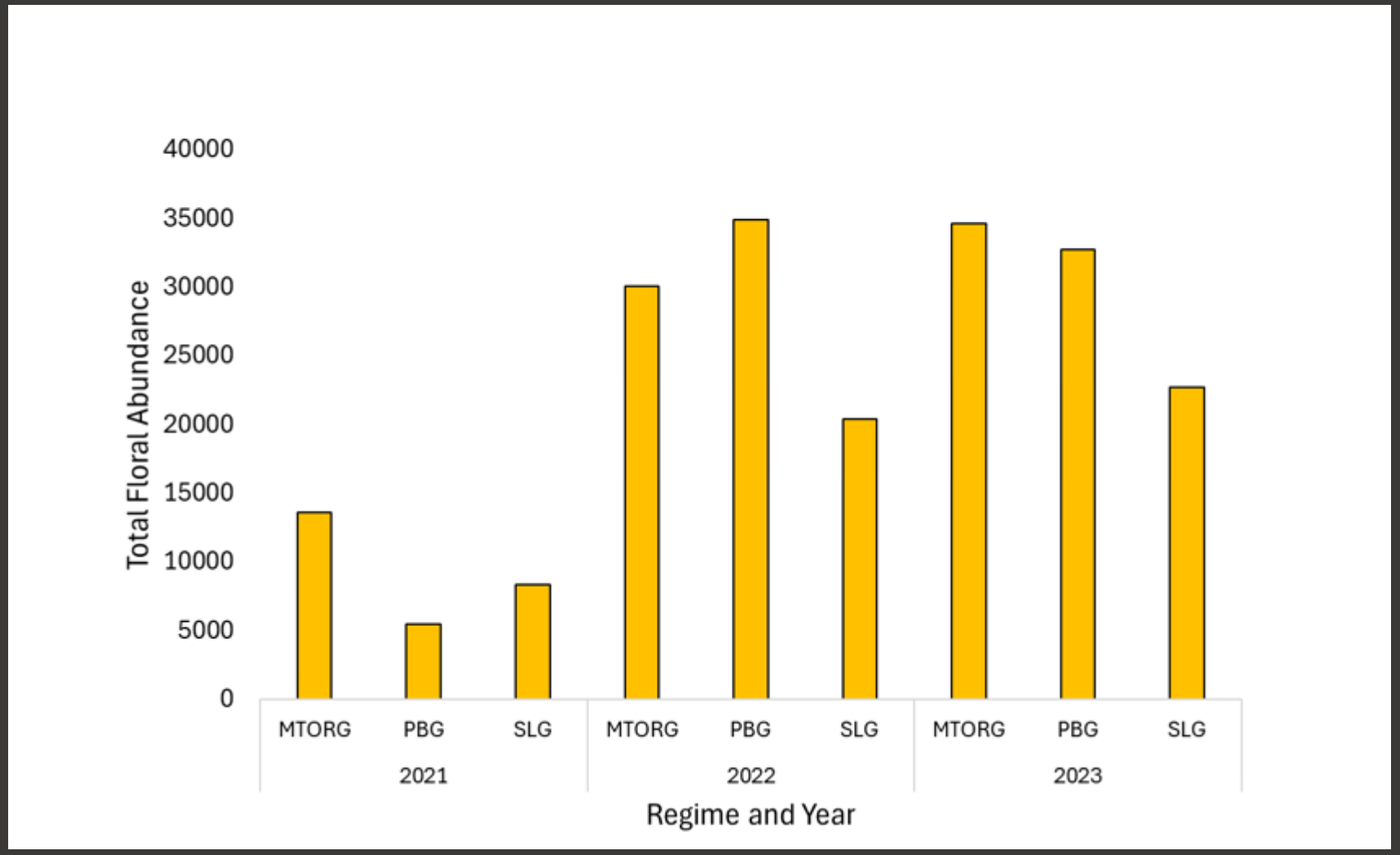
Takeaways:

1) All treatments are still recovering from the low abundances resulting from drought

2) MTORG consistently had greater abundances followed by PBG and then SLG

Plant-pollinator outcomes: overview flowers



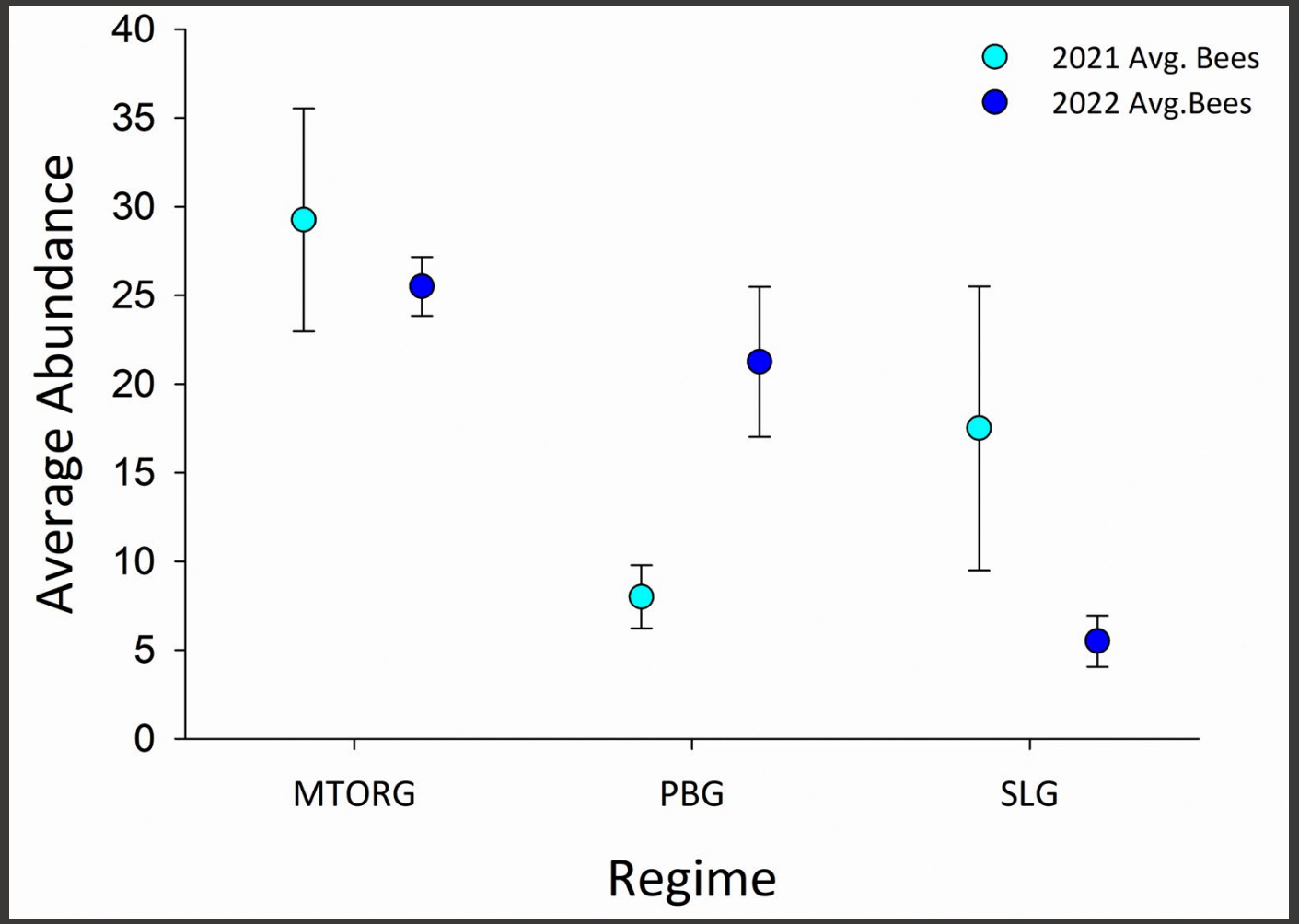


Takeaways:

1) Flower numbers, like bees, showed a rebound post drought

2) PBG and MTORG have the greatest floral resources post drought while SLG consistently has the fewest

Pollinator outcomes: bees early analysis

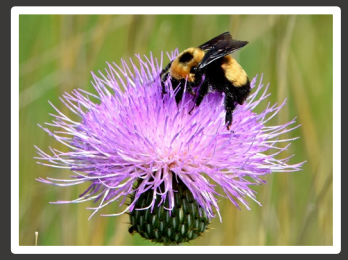


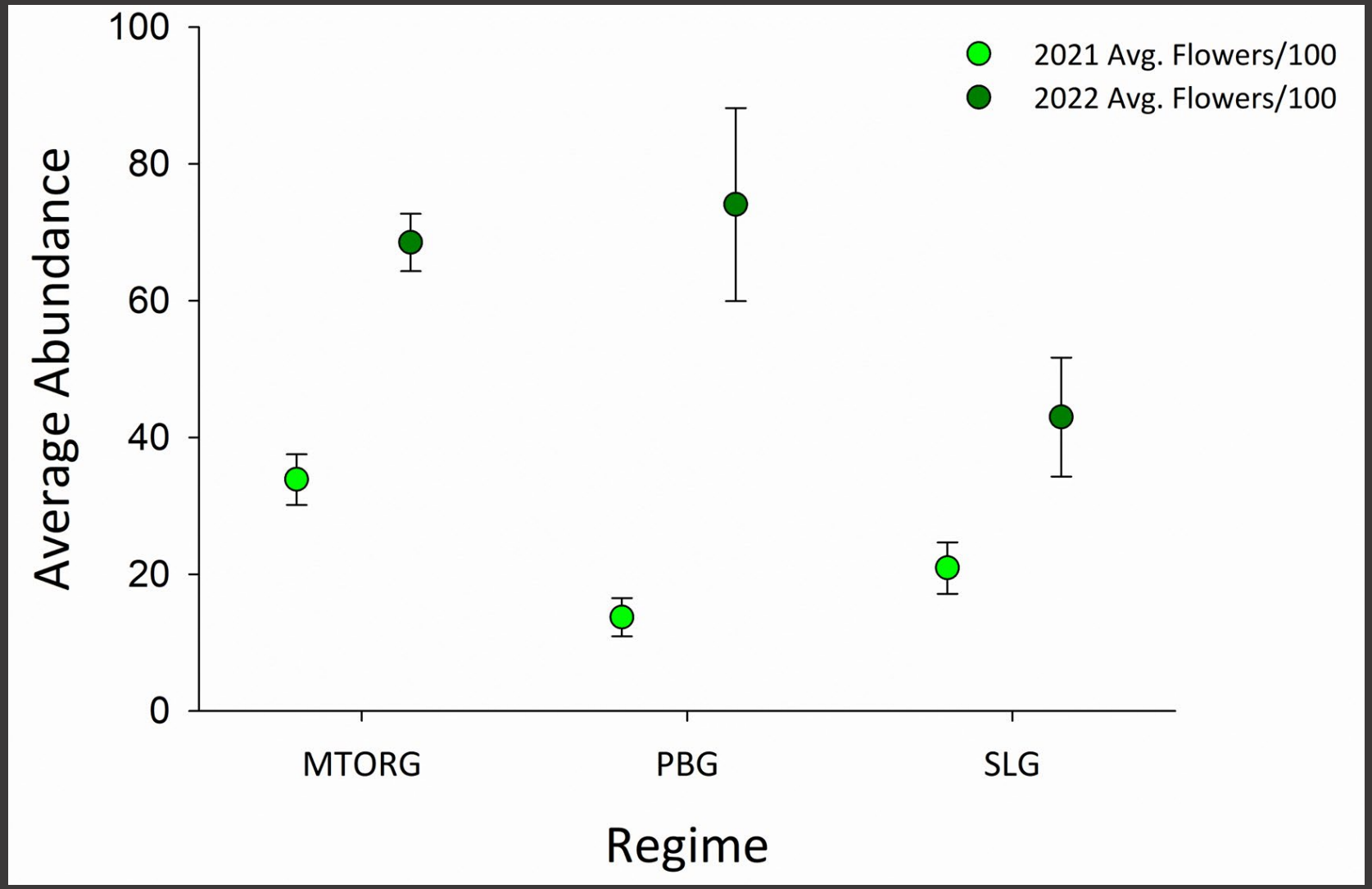
Takeaways:

1) Average bee numbers are greater in MTORG

2) PBG showed the greatest recovery post drought

Pollinator outcomes: flowers early analysis



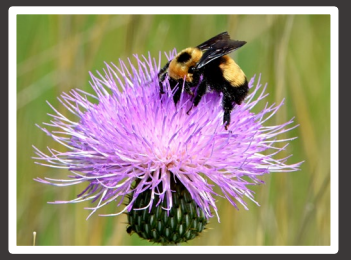


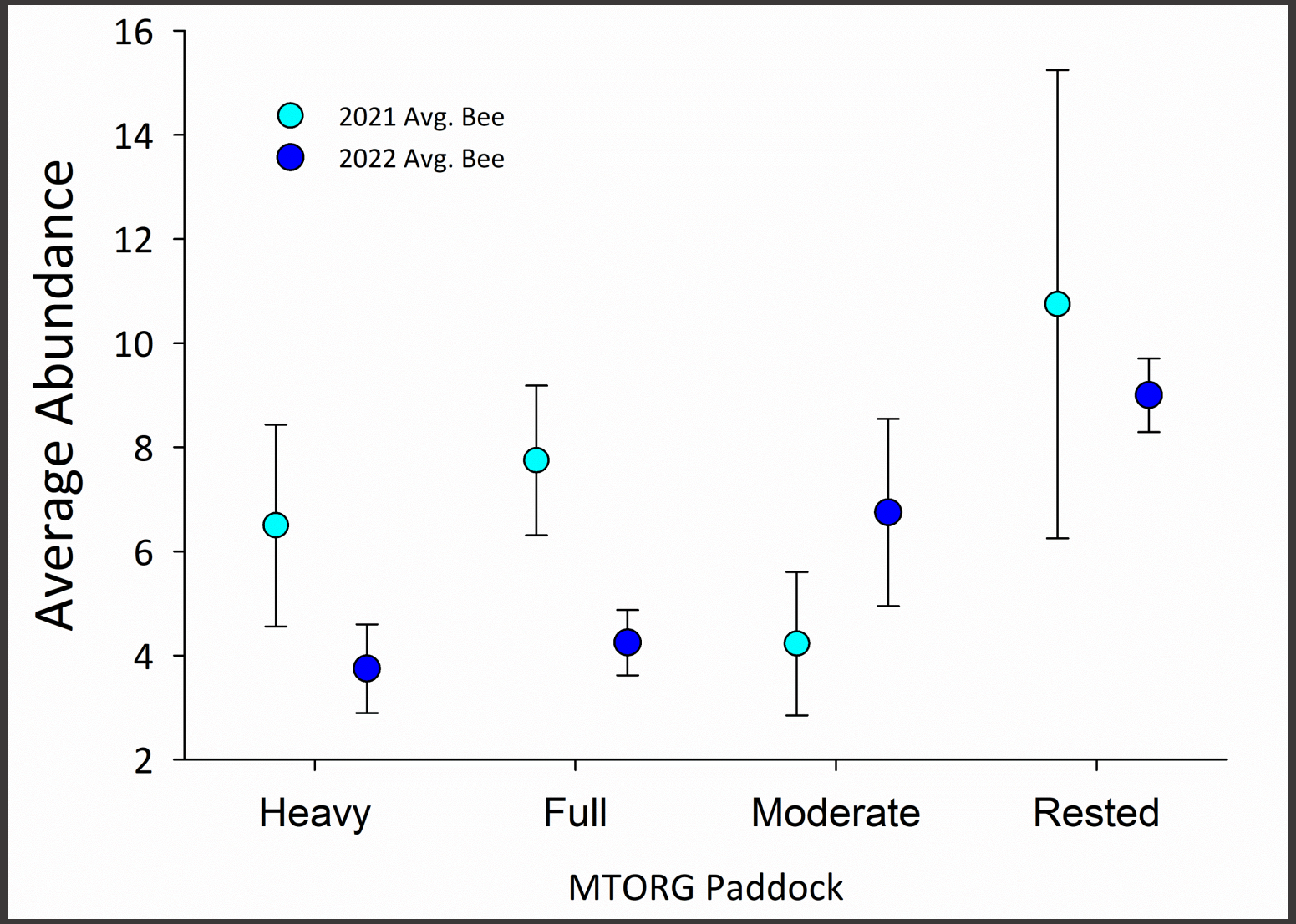
Takeaways:

1) All treatments had greater flower numbers post drought

2) PBG showed the greatest floral resource recovery

Pollinator outcomes: MTORG bees



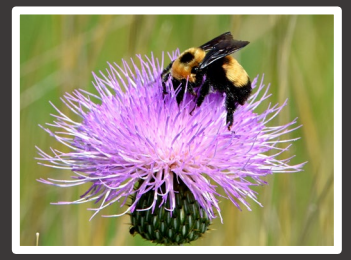


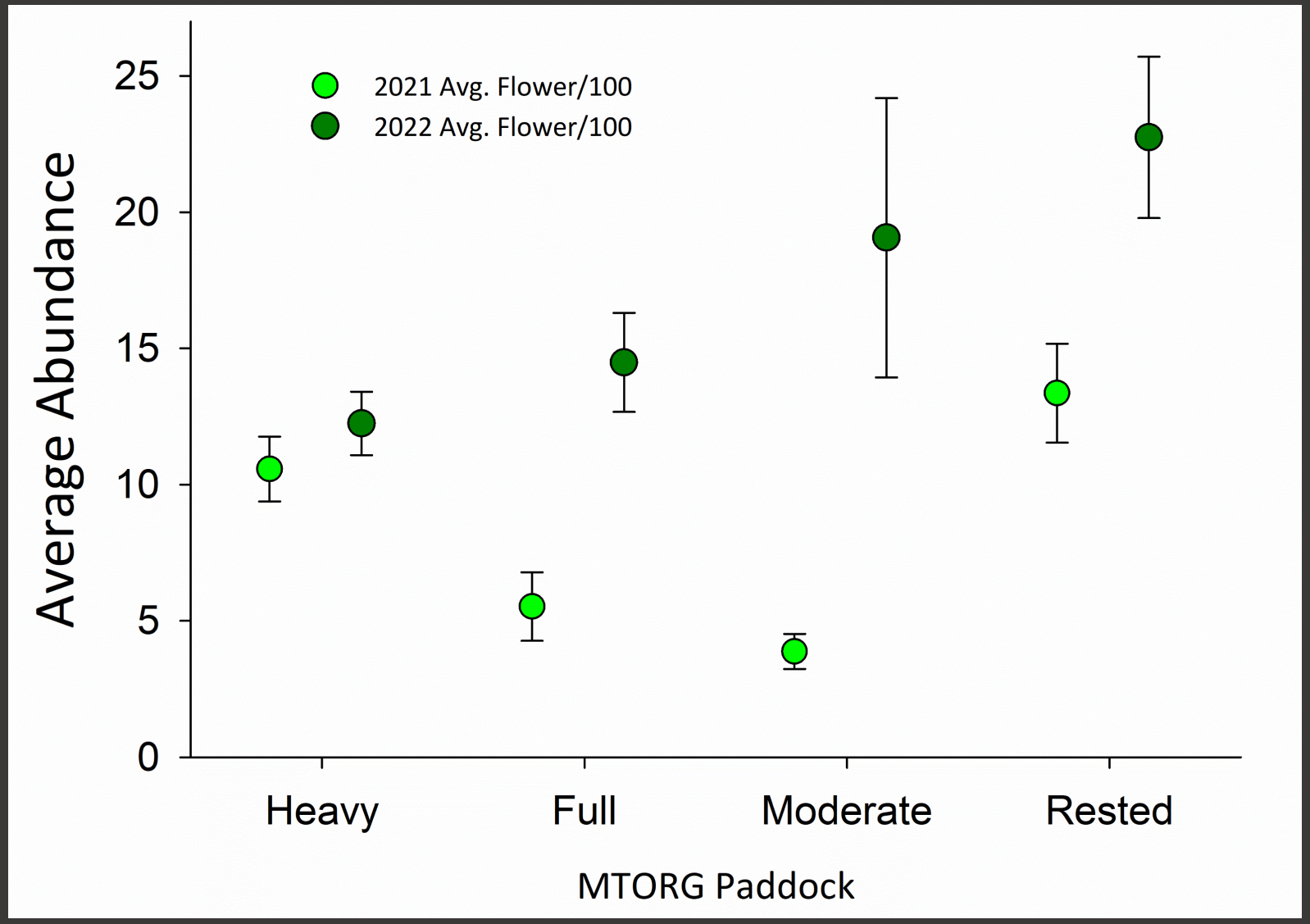
Takeaways:

1) Increased grazing intensity results in relatively fewer bees

2) Rested areas promote bees, especially during drought

Pollinator outcomes: MTORG flowers





Takeaways:

1) All intensities showed increased flowers post drought

2) Increased grazing intensity results in fewer flowers

Conclusions

Livestock

- FIRE!!!
- Greater calf gains, cattle gains, nutrient quality

Pollinators

- Environmental factors may override management
- Fire may create more resilient landscapes for flowers
- Rested areas seem critical to bees and flowers

Acknowledgements

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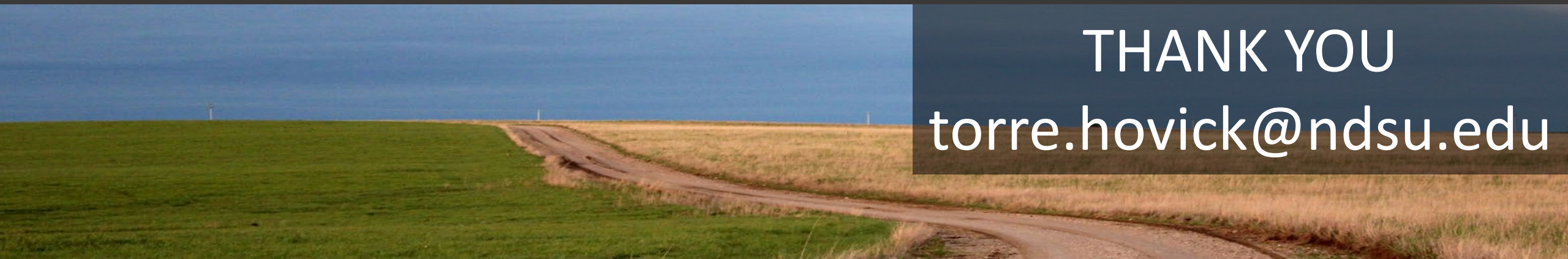

THANK YOU

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