

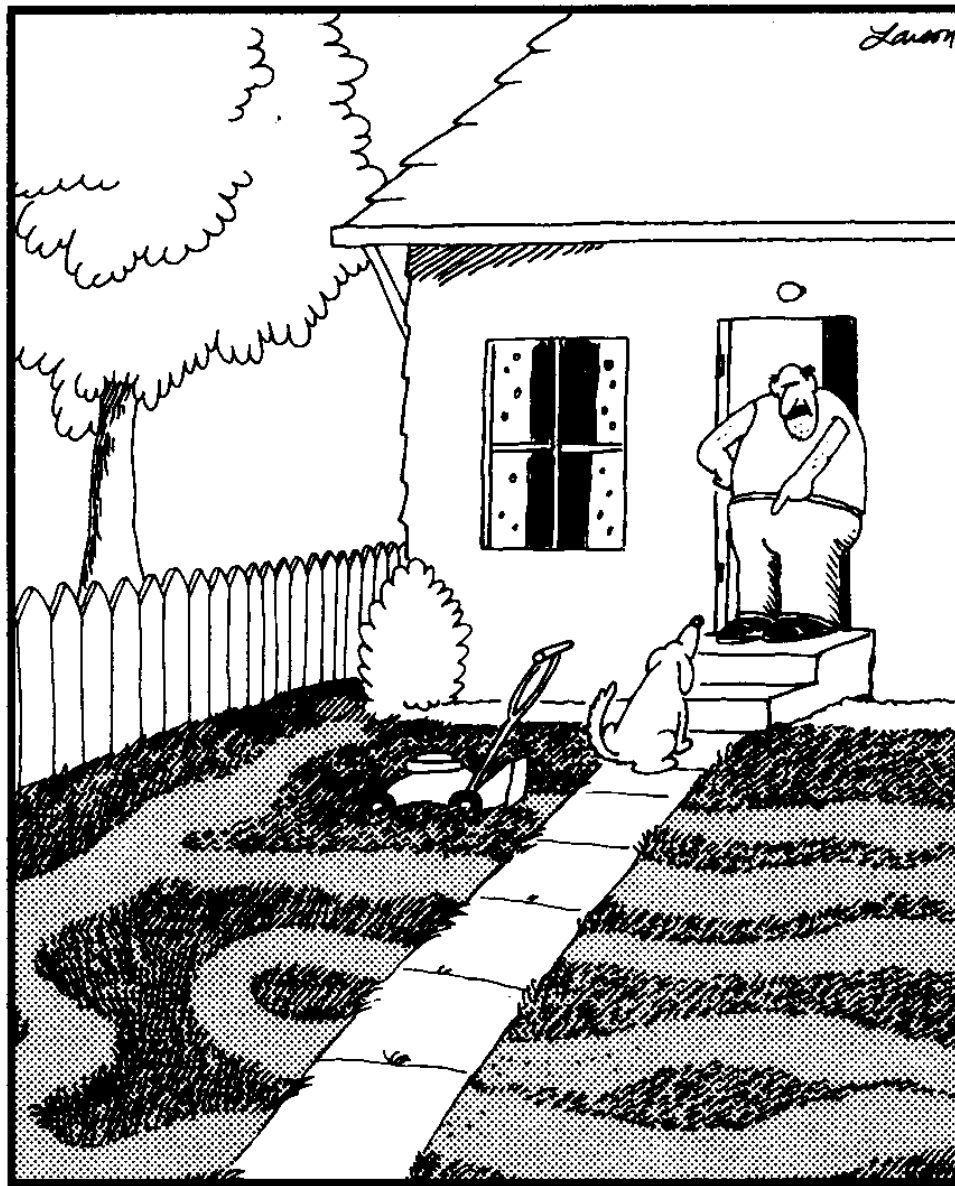
# Livestock as Ecosystem Engineers

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# The Far Side®

Parallel to  
livestock  
management?

“You call that mowin’ the lawn? ... Bad dog! ...  
No biscuit! ... Bad dog!”

# Ecosystem engineers

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**Directly or indirectly  
influence availability of  
resources to organisms  
by inducing changes in  
vegetation structure  
and/or composition**

**Jones et al. 1994**





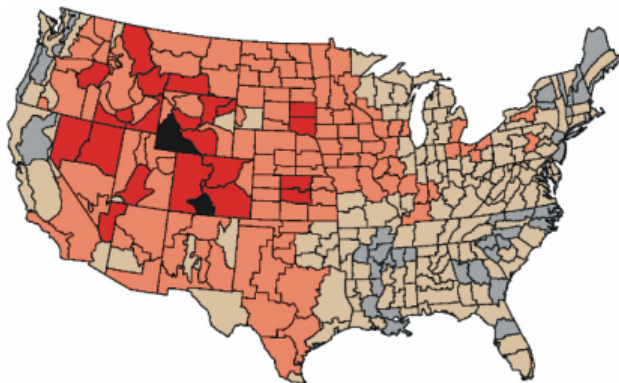
# Drivers of rangeland structure and composition



## Palmer Drought Severity Index

1895–1995

Percent of time in severe and extreme drought



% of time PDSI  $\leq$  -3

- Less than 5%
- 5% to 9.99%
- 10% to 14.9%
- 15% to 19.9%
- 20% or greater

SOURCE: McKee et al. (1993); NOAA (1990); High Plains Regional Climate Center (1996)  
Albers Equal Area Projection; Map prepared at the National Drought Mitigation Center

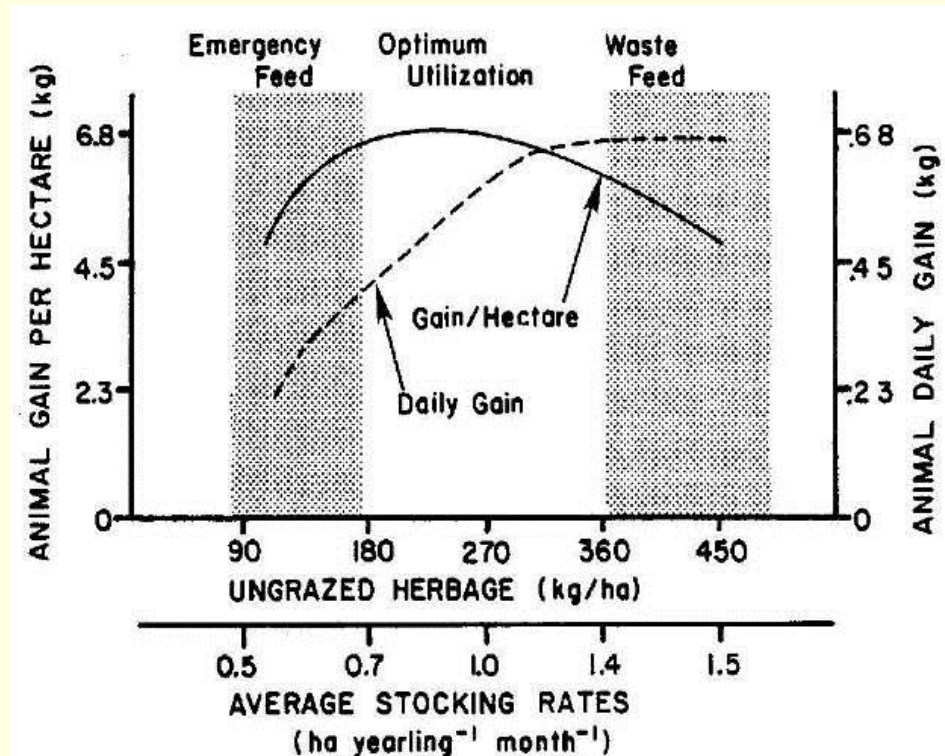


Photo by L. Savage

# Management paradigm: 20<sup>th</sup> century

Emphasized forage and livestock production with associated facilitating practices (fence, water)

Uniform use of vegetation within and across pastures



# Rangelands: 20<sup>th</sup> century

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## Forage production

- Range improvements



## Livestock production

- Weight gain
- Genetics





# Management paradigm: 21st century

## The production-conservation interface

Provision of  
multiple  
ecosystem goods  
and services

Species of  
concern and  
habitat  
considerations

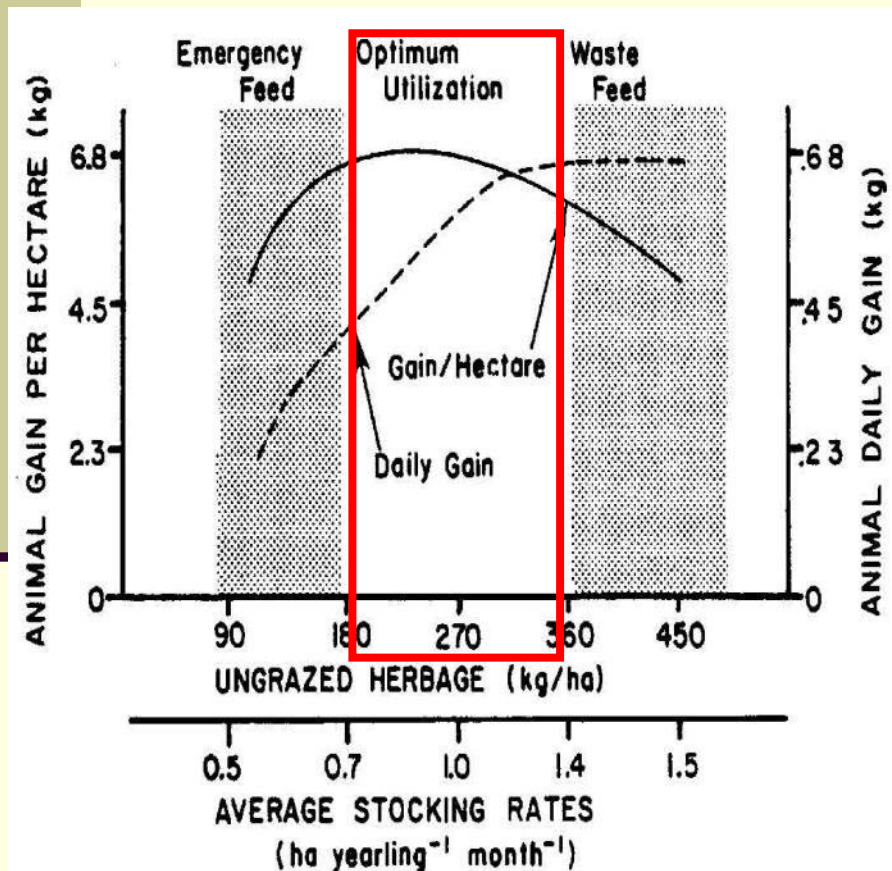


Photo credit-Mike Danzenbaker

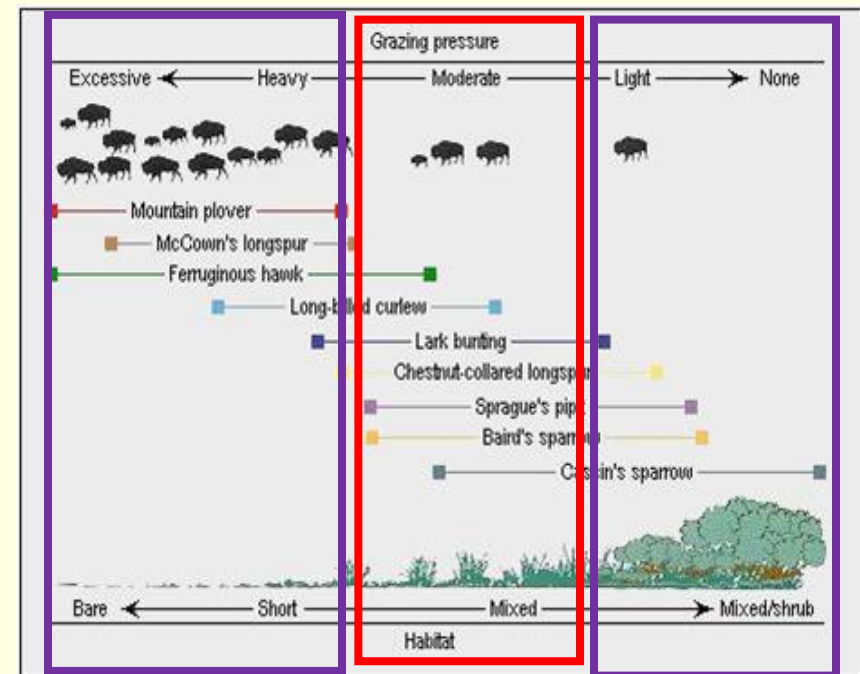


# Changing paradigms: Using livestock as ecosystem engineers

Management Paradigm → Conservation Concern



Bement 1969



Underrepresented habitats

Knopf 1996



# Grassland bird example

## Mountain Plover (*Charadrius montanus*)

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Needs short vegetation structure and substantial amount of bare ground for nesting



Photo credit-Mike Danzenbaker

# Nesting/foraging habitat conditions

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106 Sites (61 nests, 45 foraging locations)

Bare Soil Exposure: Mean + 95% CI =  $35 \pm 3\%$

Vegetation Height: Mean + 95% CI =  $3.7 \pm 0.2$  cm







**1) Prairie dogs with moderate cattle grazing**



**2) Prescribed burns with moderate cattle grazing**

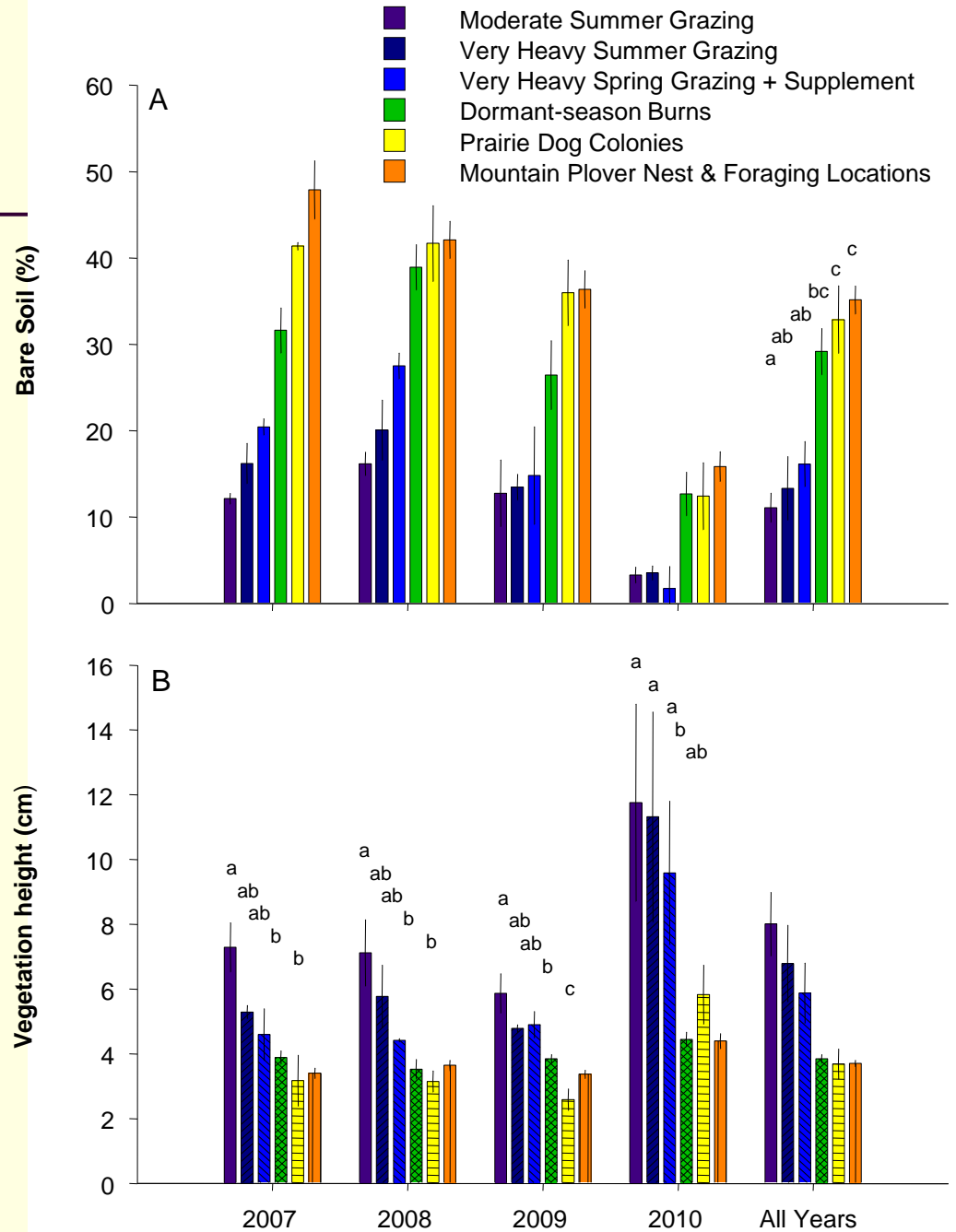


**3) Very heavy spring cattle grazing with supplemental feed**



**4) Very heavy summer cattle grazing (right of fence)**

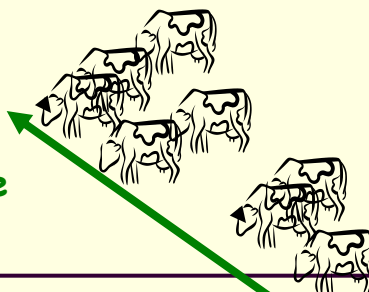






Vegetation < 5cm

Increased dominance  
of blue grama



Vegetation < 5 cm

Short-term pulse of  
bare soil

No effect on blue grama



Vegetation < 5 cm

Multiple years of  
bare soil

Loss of blue grama  
dominance

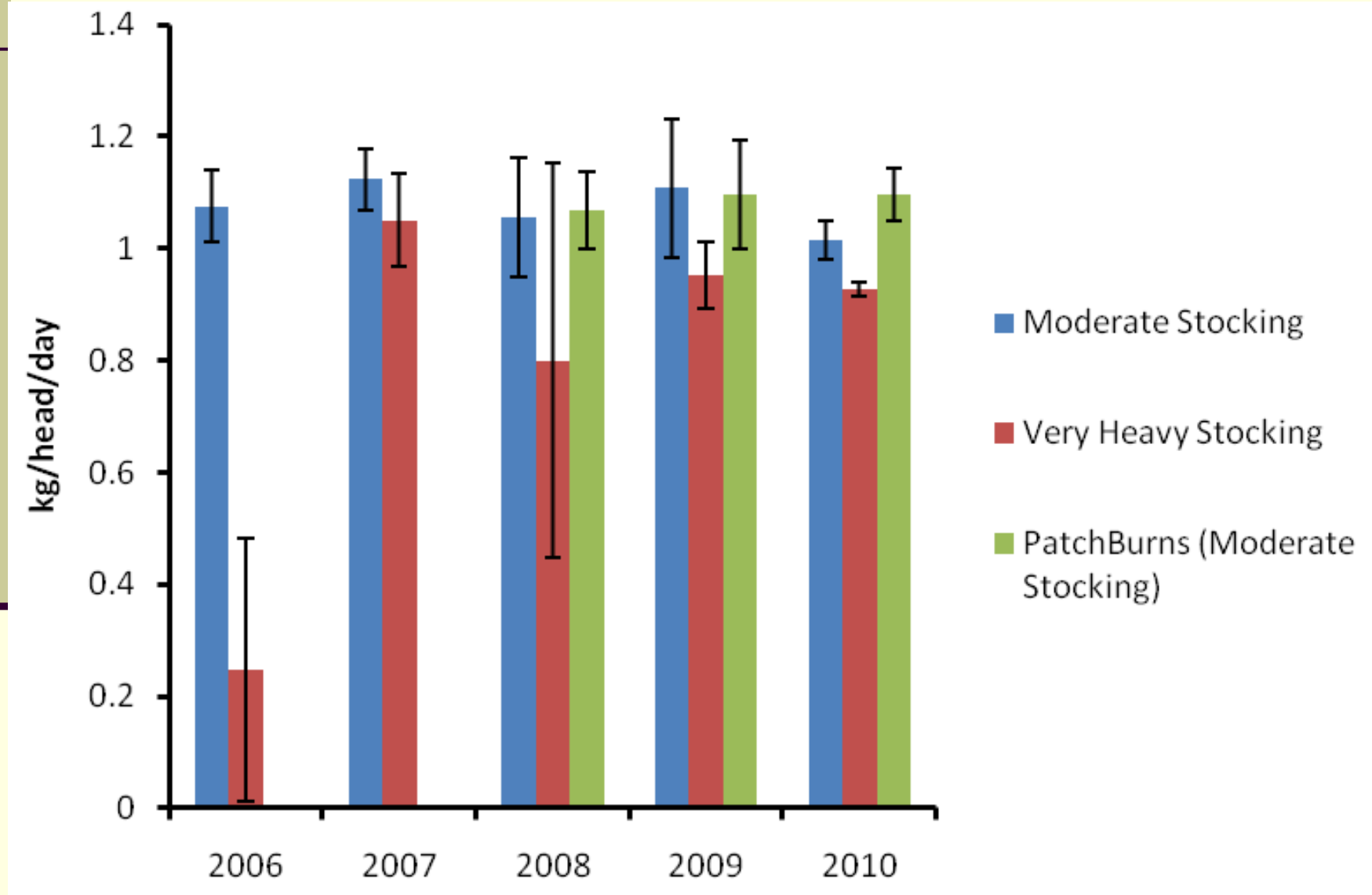


### Conclusions:

Differing effects of heavy  
grazing, prairie dogs, and fire

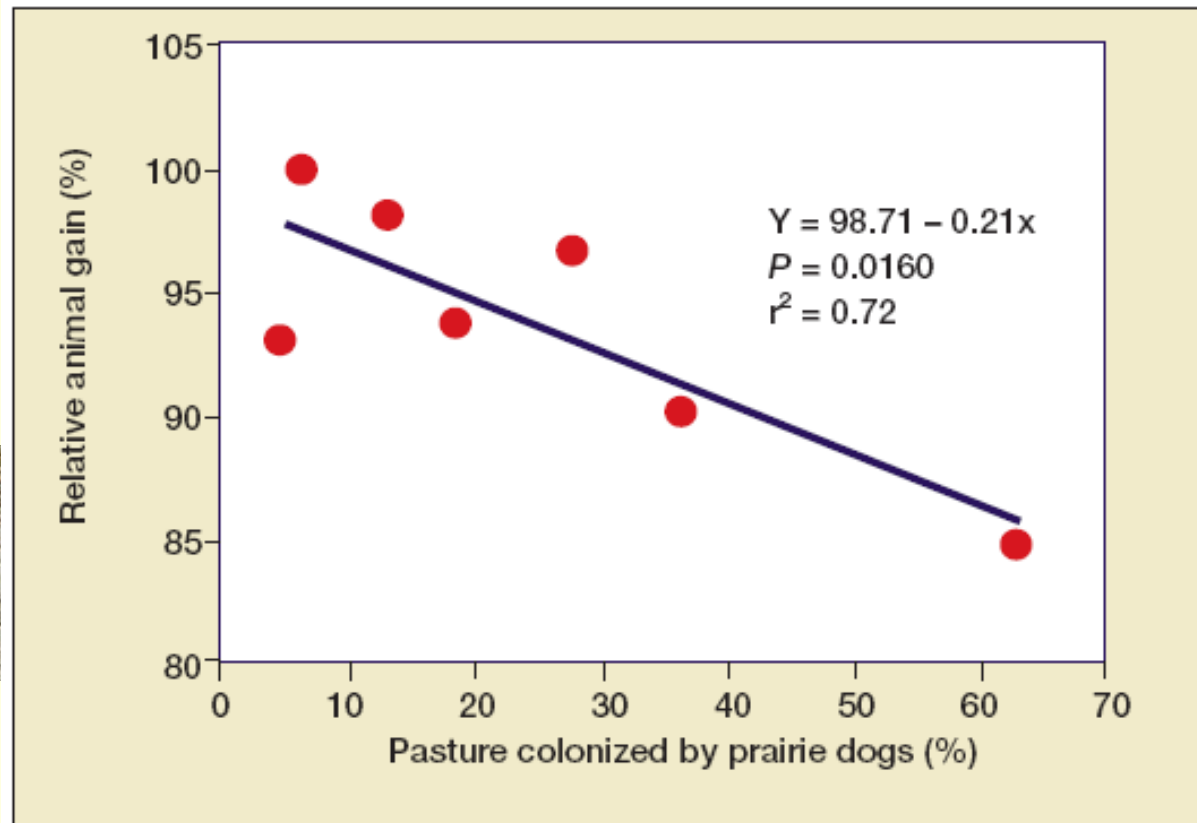
These differences are  
recognized by Mountain Plovers

# Influence on livestock performance





# Livestock performance with prairie dogs



**Derner, JD, JK Detling and MF Antolin.** 2006. Are livestock weight gains affected by black-tailed prairie dogs? *Frontiers in Ecology and the Environment* 4(9): 459-464

# Economic considerations of livestock gain<sup>1</sup>

Prairie dogs <sup>2</sup>				Prescribed burning		Very heavy spring		Very heavy summer	
<u>20% occupation</u>		<u>60% occupation</u>							
ADG	\$	ADG	\$	ADG	\$	ADG	\$	ADG	\$
-5.5%	-19.69	-14.0%	-50.13	0	0	-92.4%	*	-25.7%	-92.02

ADG: average daily gains (pounds/head/day) of yearling steers

\$: dollars of summer (May 10-Oct 1) weight gain, assuming \$1/pound selling price

<sup>1</sup>Relative to moderate stocking rates, on a per yearling steer basis

<sup>2</sup>From Derner et al. 2006

\* Different season of grazing, also costs of supplemental feed tubs for spring grazing

# Production-Conservation tradeoffs



## Prescribed burns

- Implementation costs
- No negative effects on livestock weight gain



## Prairie dogs:

- Loss of forage quantity > increase in forage quality
- Reduced livestock weight gains

## Very heavy summer grazing

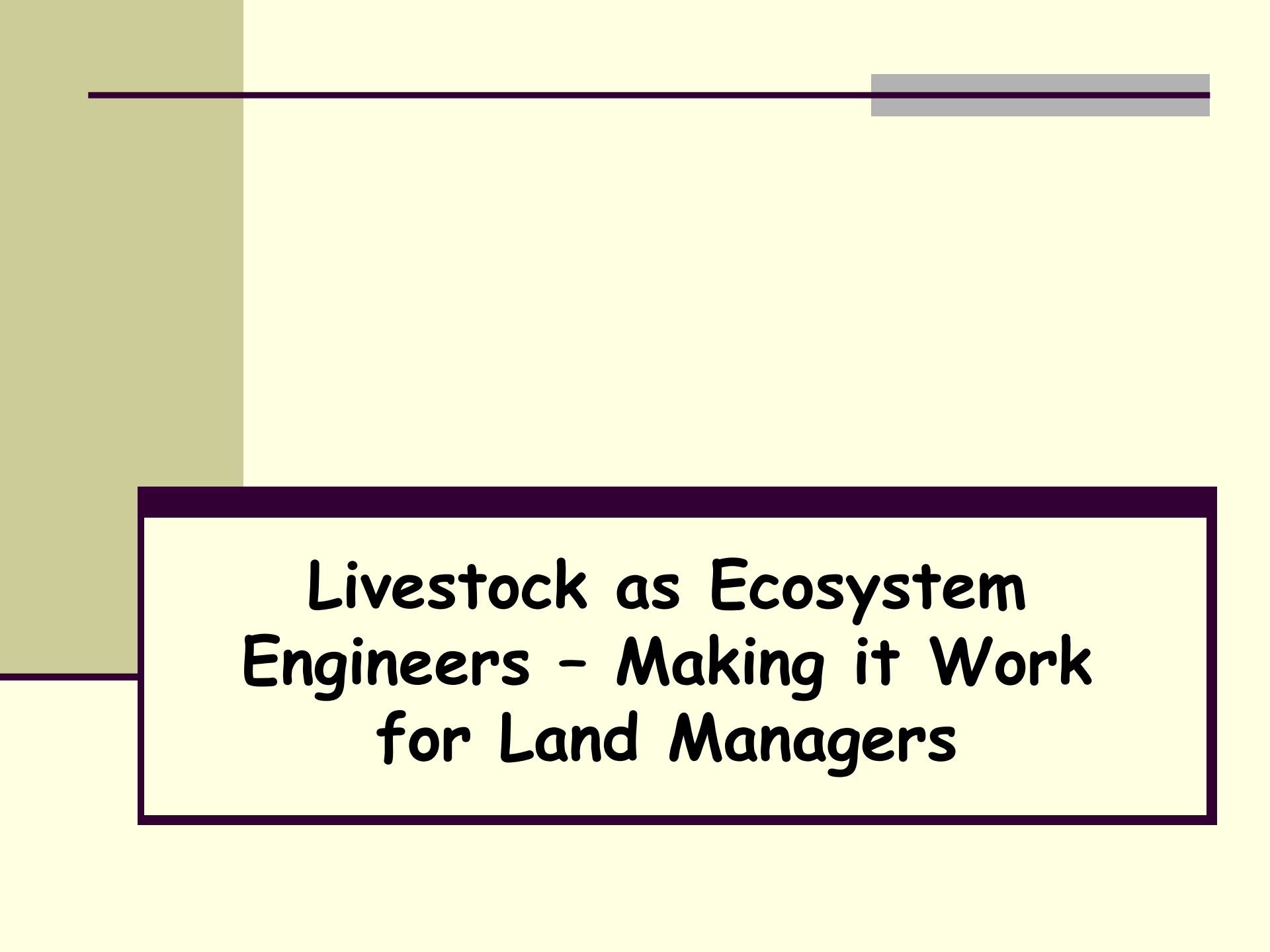
- Does not provide suitable habitat for Mountain Plover
- Reduced livestock weight gains



## Very heavy spring grazing

- Does not provide suitable habitat for Mountain Plover
- Substantially reduced livestock weight gains
- High costs of supplemental feed





# **Livestock as Ecosystem Engineers - Making it Work for Land Managers**

# Moving towards win-win solutions

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- Management for livestock at pasture and enterprise scales



Develop a flexible suite of management tools and strategies

Monitor and map pasture-scale management to:

- 'see' the larger landscape-scale picture
- spatially optimize management strategies

Increase scale of grazing management to:

- enhance livestock mobility
- minimize tradeoffs with other ecosystem services



- Management for species of conservation concern at larger scales

# Within a pasture efforts

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## Patch scale

- Localized disturbance that is shifted over time and space
- Can be difficult for land managers to implement on a consistent basis



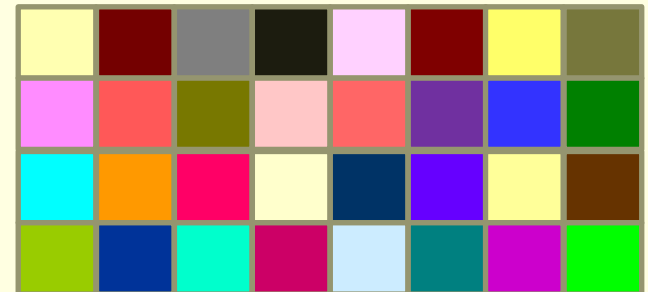
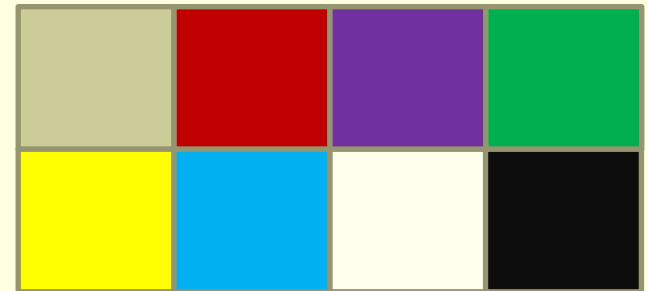
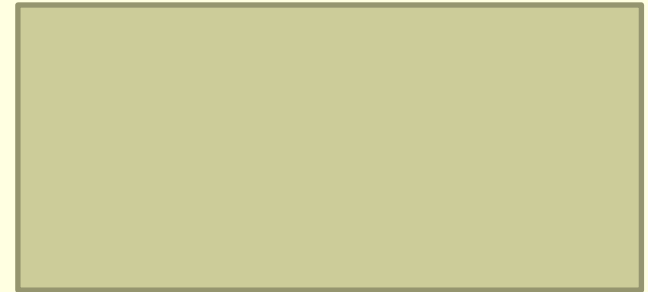


# Among pasture efforts

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## Pasture scale

- Different seasons and intensity of grazing, length of rest period across years, etc.
- Requires high level of management



# Key points

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- Conservation-Production interface is the reality of 21<sup>st</sup> century management of rangelands
- Use livestock as a tool to alter vegetation, but understand economic considerations
- “Engineer” within or among pasture differences in terms of vegetation (composition, cover, diversity, structure)



# Questions?

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