The Ecology of Conservation Grazing

Ecological Concepts and Management Practices for Grazing for Conservation Outcomes

WSU EXTENSION
Thurston County

ECOSTUDIES INSTITUTE

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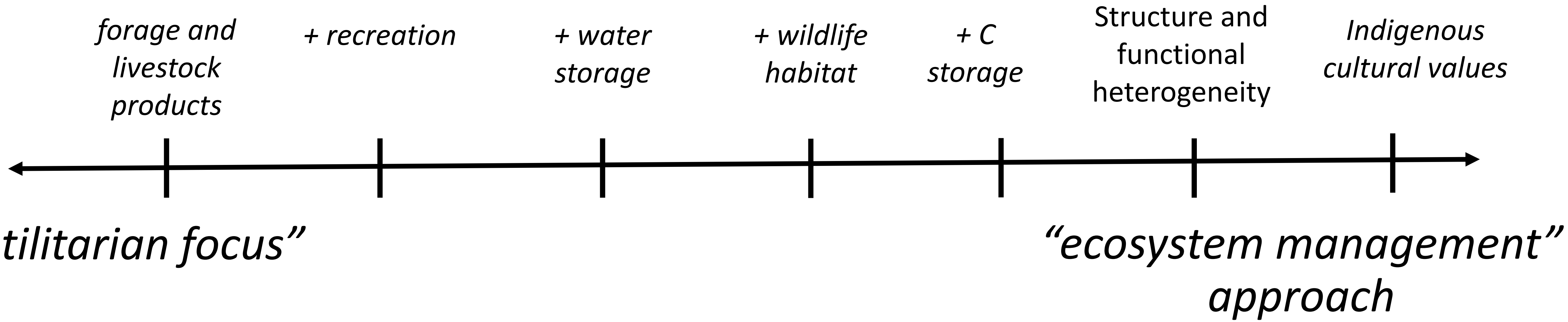
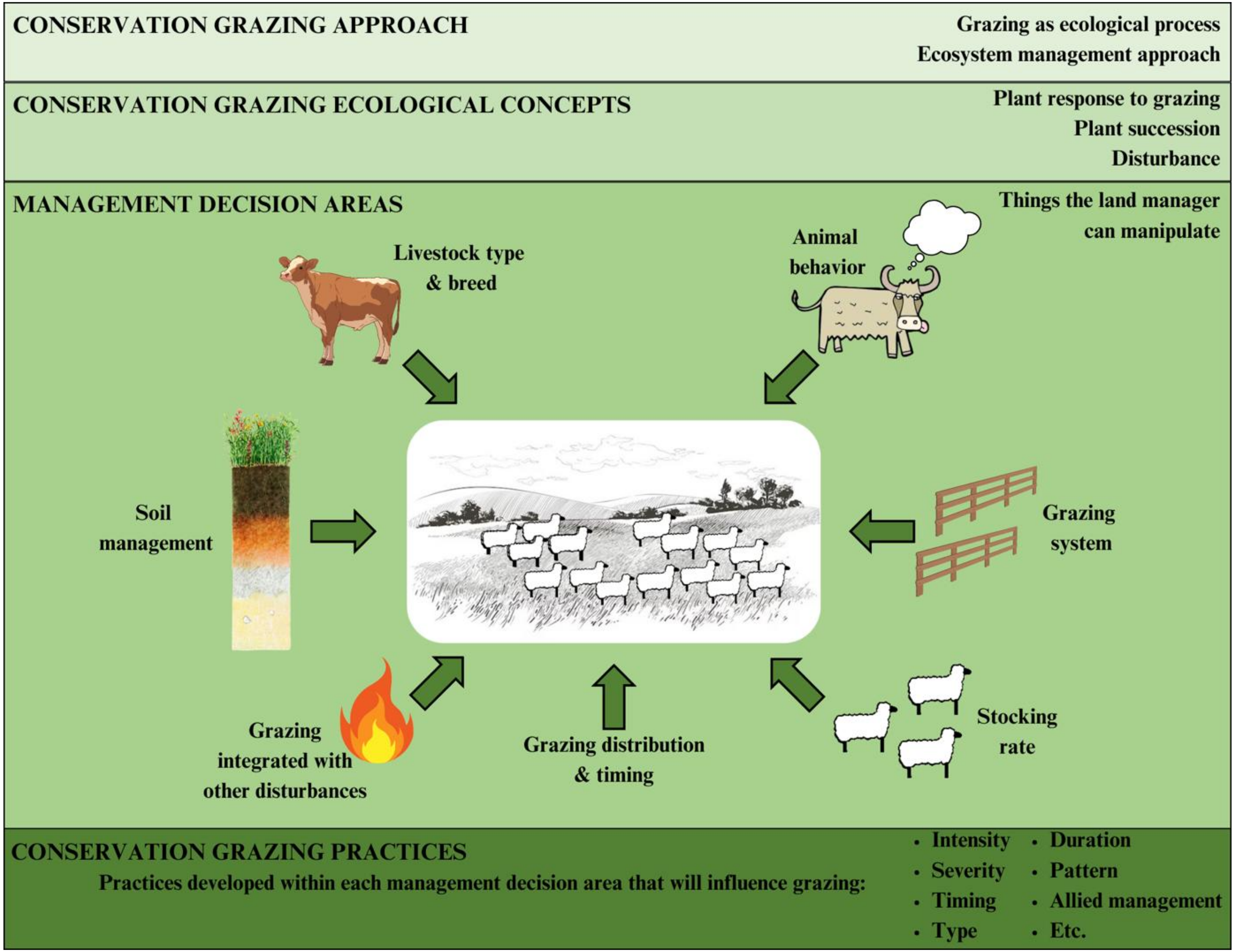
Conservation Grazing Planning:

Oxymoron, Redundant, Paradigm Shift, or…
More Support for an Existing Approach?

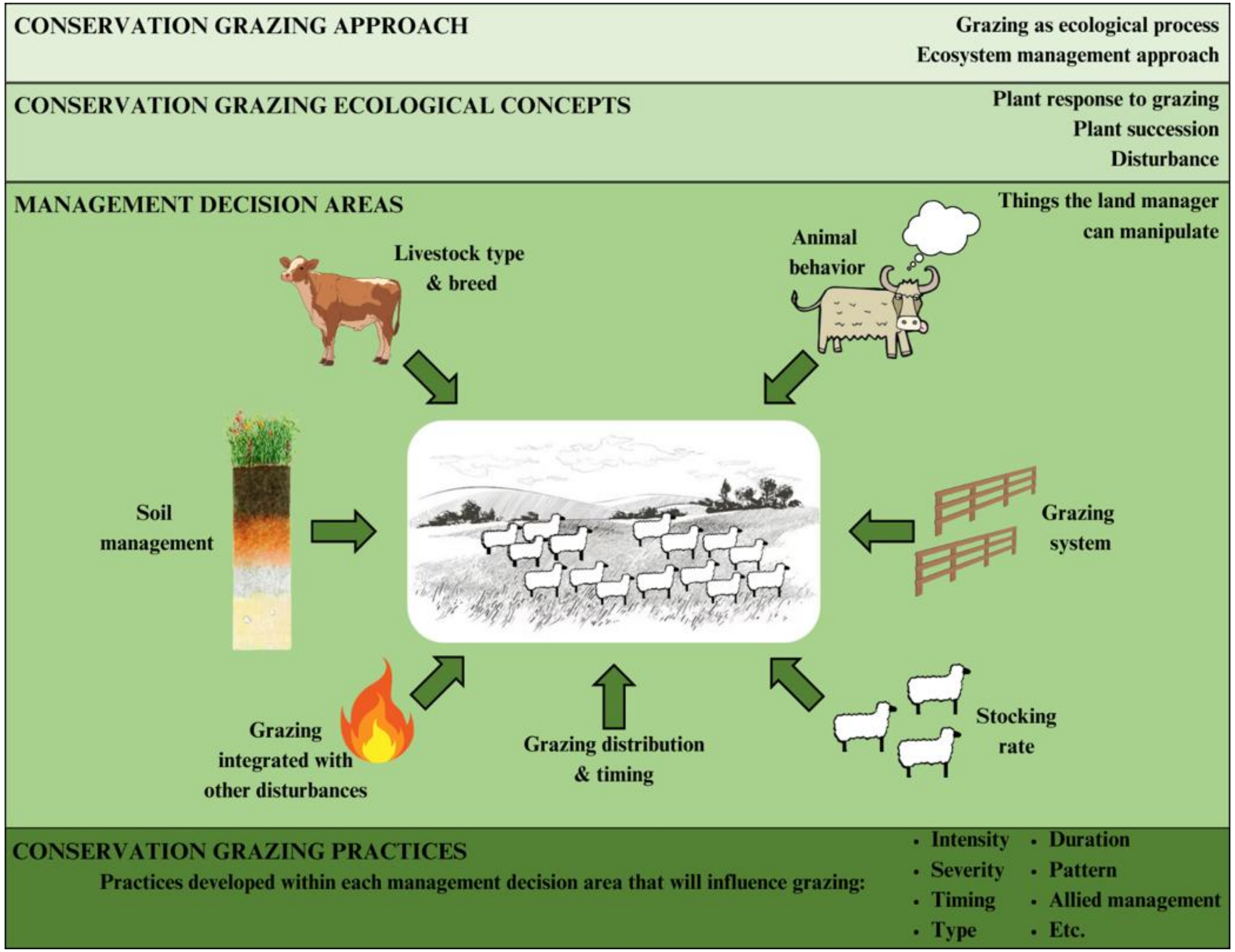


…all grazing is an ecological process, but how complex of an ecology is it supporting?

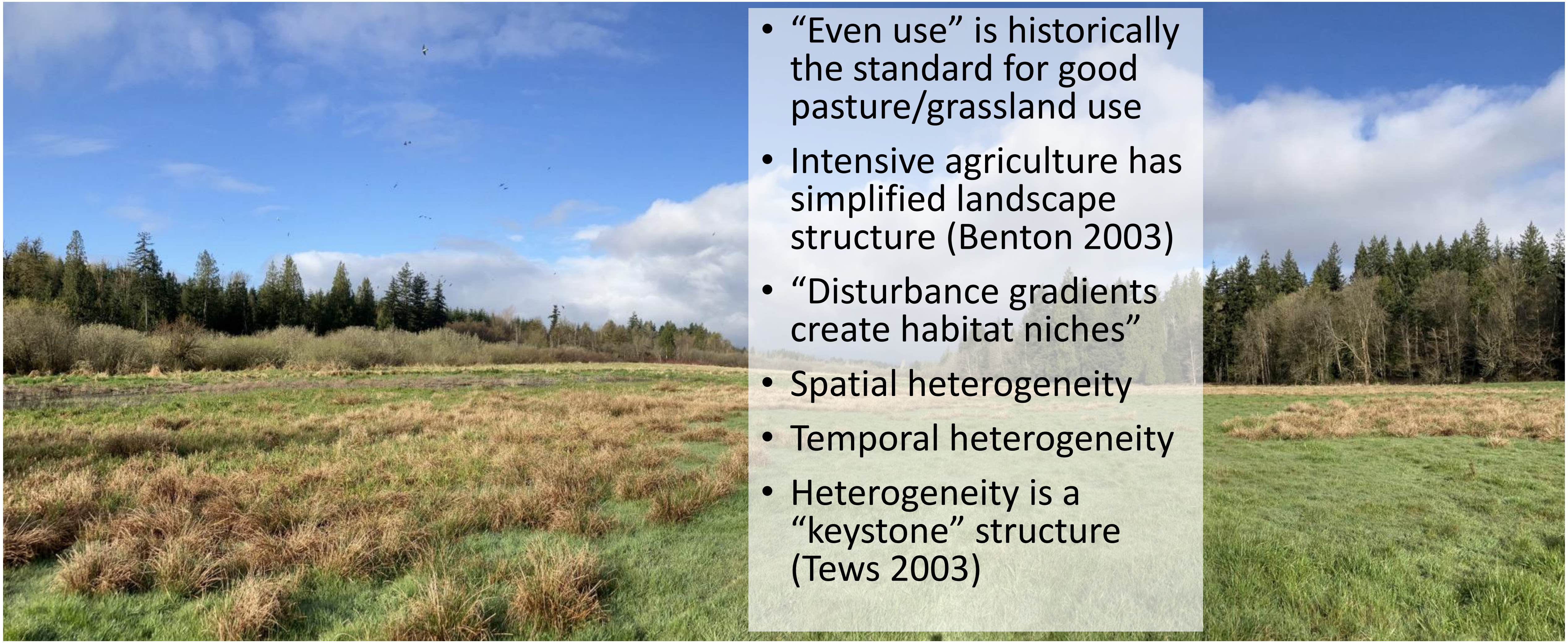

CONSERVATION GRAZING APPROACH
Grazing as ecological process
Ecosystem management approach
CONSERVATION GRAZING ECOLOGICAL CONCEPTS
Plant response to grazing
Plant succession
Disturbance
MANAGEMENT DECISION AREAS
Things the land manager can manipulate
Livestock type & breed
Animal behavior
Soil management
Grazing system
Grazing integrated with other disturbances
Grazing distribution & timing
Stocking rate
CONSERVATION GRAZING PRACTICES
Practices developed within each management decision area that will influence grazing:
• Intensity
• Severity
• Timing
• Type
• Duration
• Pattern
• Allied management
• Etc.

Ecological Concepts for Conservation Grazing

- Niche diversification. Managing for heterogeneity
- Grazing Resistance. Plant response to grazing
- Community Change. Species succession and transitions
- Grazing and Fire. Essential ecological disturbance processes



Niche diversification: Managing for heterogeneity



- “Even use” is historically the standard for good pasture/grassland use
- Intensive agriculture has simplified landscape structure (Benton 2003)
- “Disturbance gradients create habitat niches”
- Spatial heterogeneity
- Temporal heterogeneity
- Heterogeneity is a “keystone” structure (Tews 2003)

Niche Heterogeneity Small Spatial Scale

Grazing Resistance; Plant response to grazing

Syn. Resilience

Resistance = avoidance + tolerance

- Grazing avoidance: morphological adaptations or biochemical defenses

…plant secondary compounds (alkaloids, glycosides, etc)

- Grazing tolerance: ***plant form*** (low regrowth points) or ***plant function*** (fast leaf replacement, photosynthate allocation)

Community Change; Species succession and transitions

- Succession model, change:
  - Is linear
  - Is reversible
  - Proceeds predictably to native climax community with greater precipitation or reduced disturbance (hands-off)
- State and transition model, change:
  - Not linear
  - Not necessarily reversible
  - Leads to multiple desirable/ undesirable steady states
  - Can take lots of catalyzing input (hands-on?)

Grazing and Fire; Essential ecological disturbance processes

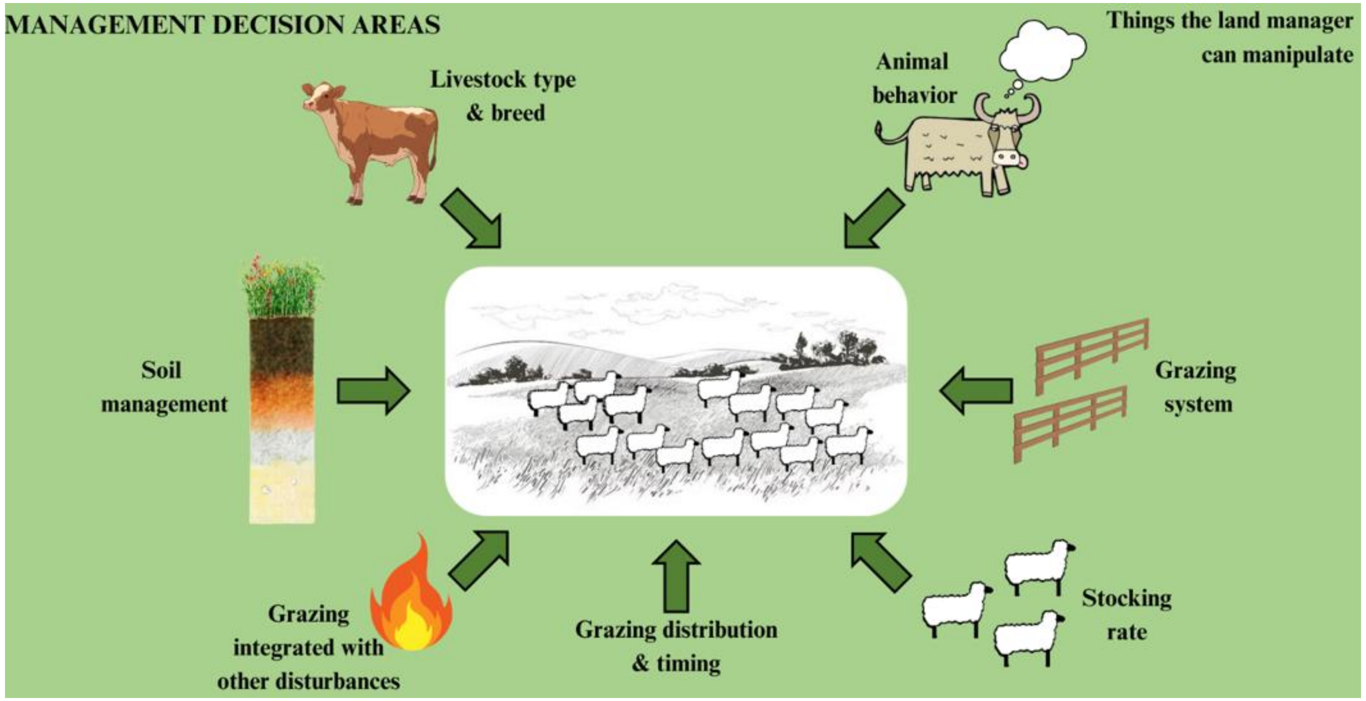
- Grasslands require disturbance
  - Abiotic or biotic
- **Why?**

Example: linked disturbance

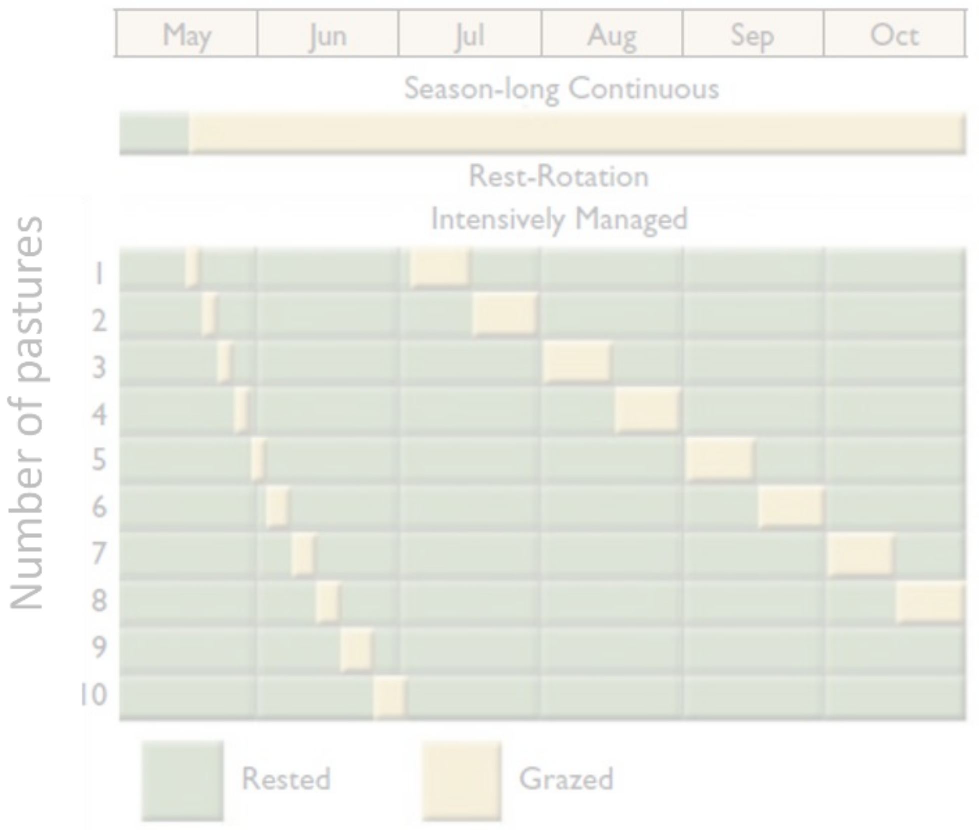
- Pyric herbivory: a single disturbance sequence; fire used to draw grazing

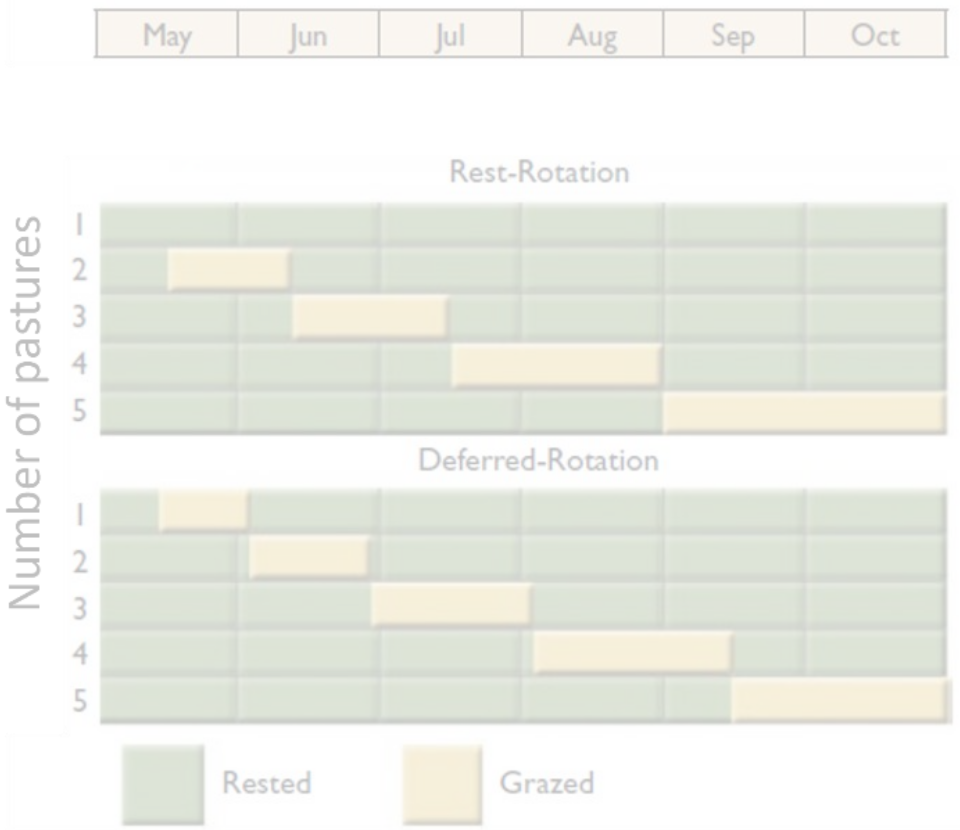
Management Decision Areas

- Grazing Systems
- Stocking Rate
- Grazing Distribution and Timing
- Soil Management
- Livestock Type and Breed
- Animal Behavior
- Restoration



Grazing Systems



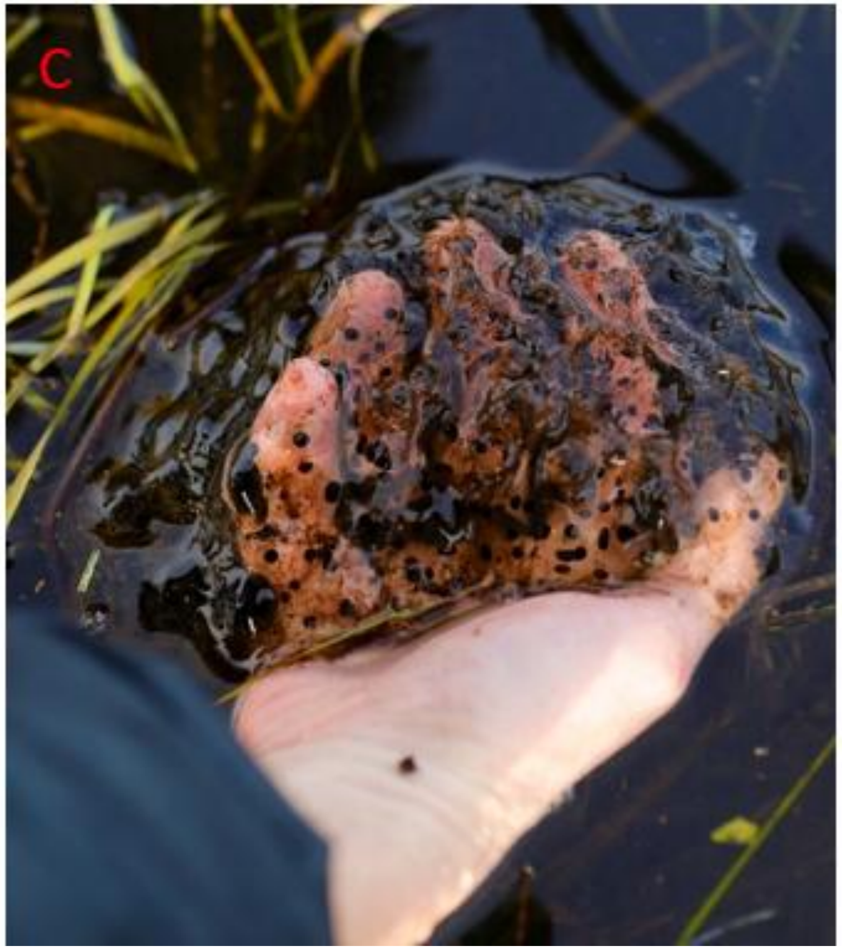


Comparison Index Values based on observation and studies in Nebraska Sand Hills

	Continuous	Rest Rotation	Deferred Rotation	Intensively Managed
Provide nesting cover	3	5	3	1
Improve grazing distribution	1	3	3	5
Minimize fence and water expense	5	3	3	1
Facilitate livestock management	1	4	4	5

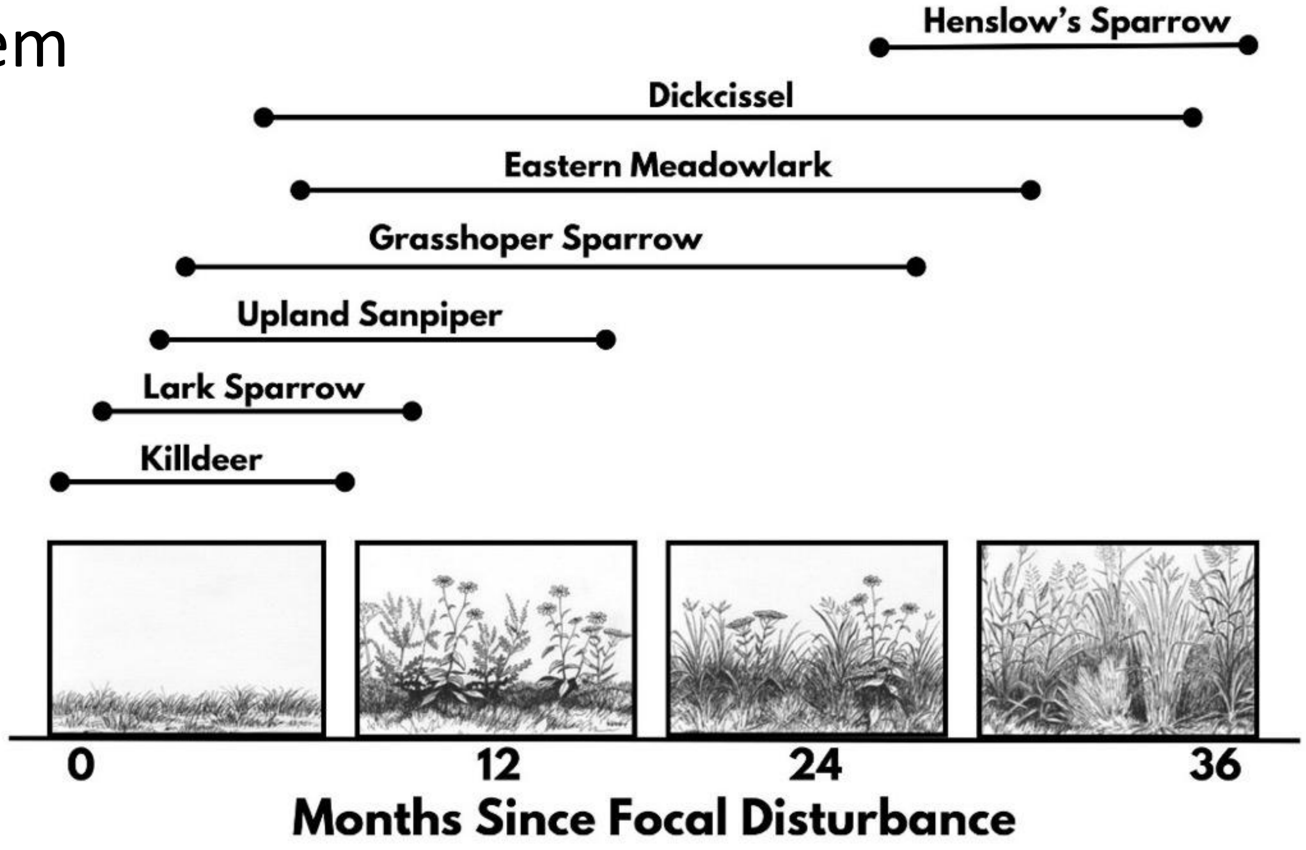
Reece et al. 2008

Grazing Systems



Grazing Systems

- Vary disturbance with a grazing system
- A paddock system of some kind is needed
- Management options:
  - Low-SR continuous grazing for overall patchiness
  - Defer 1 field per year
  - Rest at key phenological times
  - Rotate grazing seasonally
  - Rotate a multi-year rest paddock



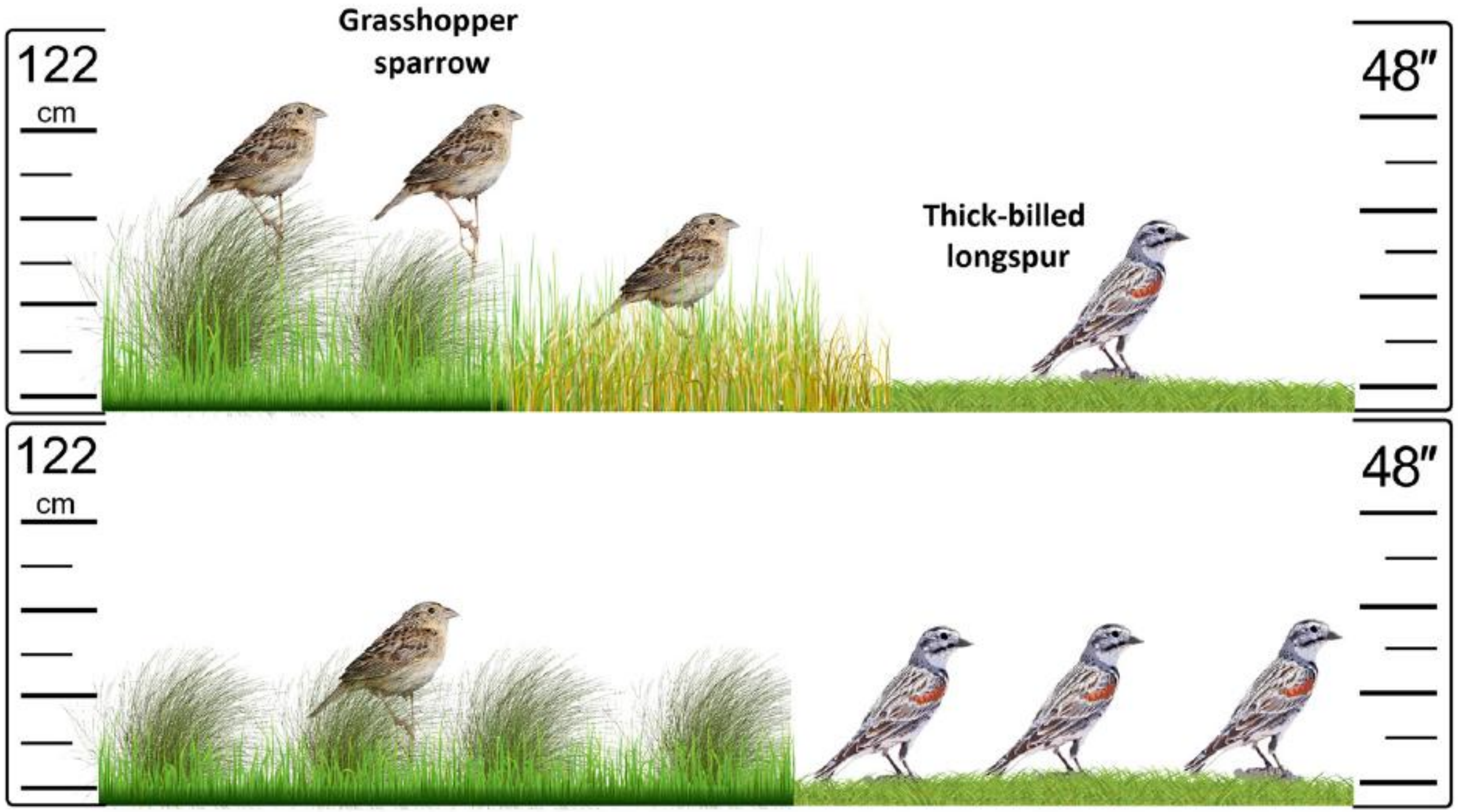
Grazing Systems - Multiple

managing for different vegetation structure

Adaptive multi-paddock

managing for uniform vegetation structure

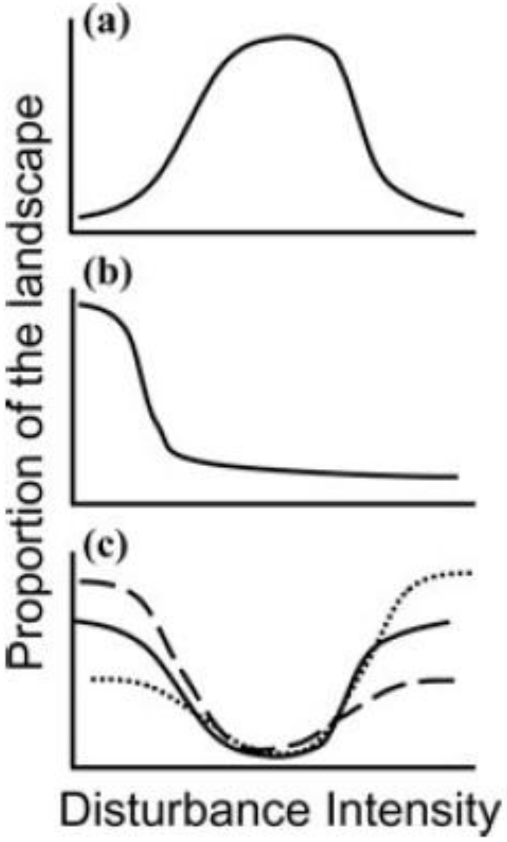
Season-long



Grazing Systems

Even use may not always be the goal

- a) represents the agricultural land-management model and the intermediate-disturbance hypothesis
- b) represents a protectionist model in which disturbance is minimized across the entire landscape
- c) represents the landscape disturbance pattern expected from a fire and grazing interaction that creates a shifting-mosaic landscape



Oregon Vesper Sparrow

Klamathbird.org

Streaked horned lark

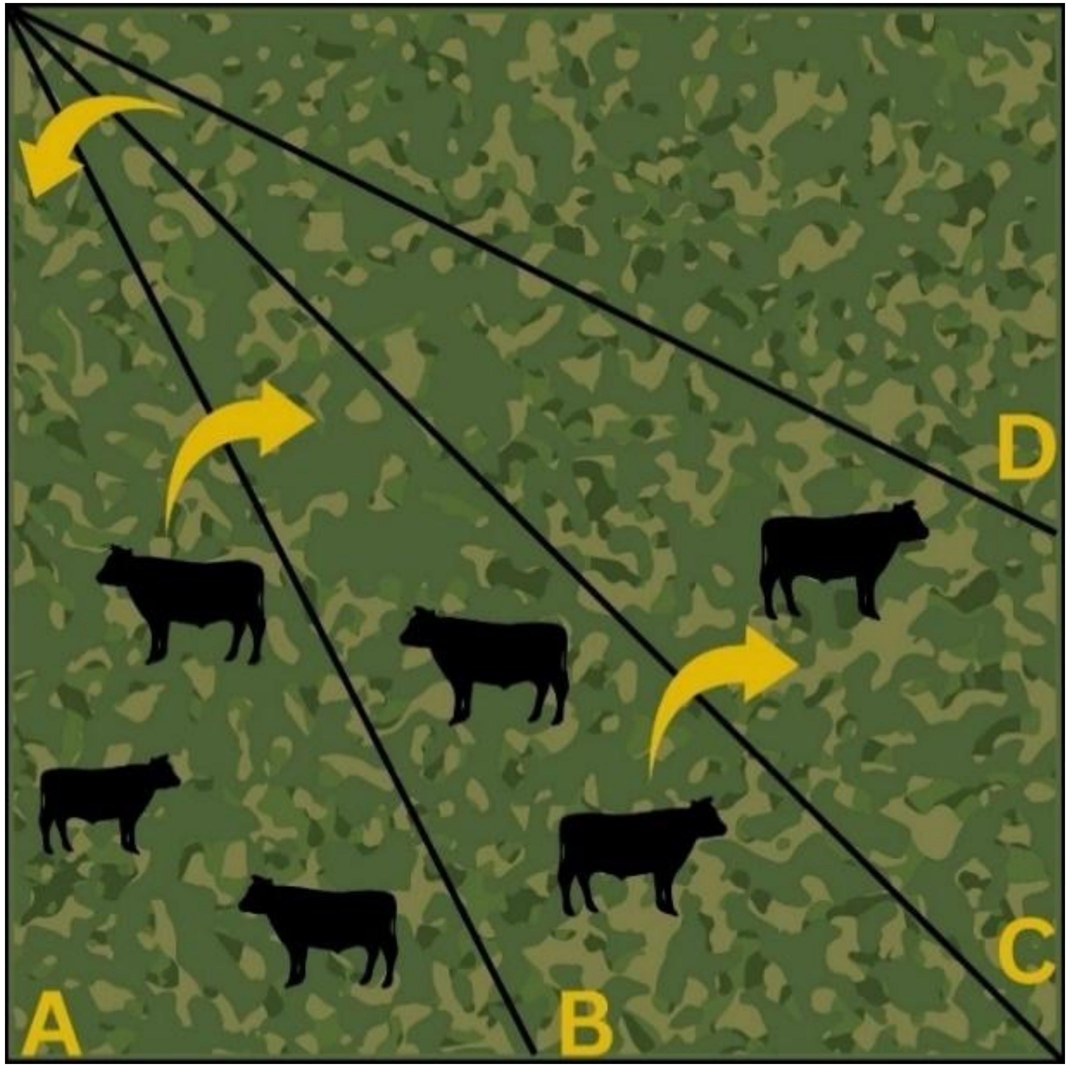
WDFW

Grazing Systems

Stocking Rate

- Calculate and apply low, medium, and high SR to achieve varying utilization rates. Apply low to medium SRs for high grazing selectivity, and the opposite for low grazing selectivity

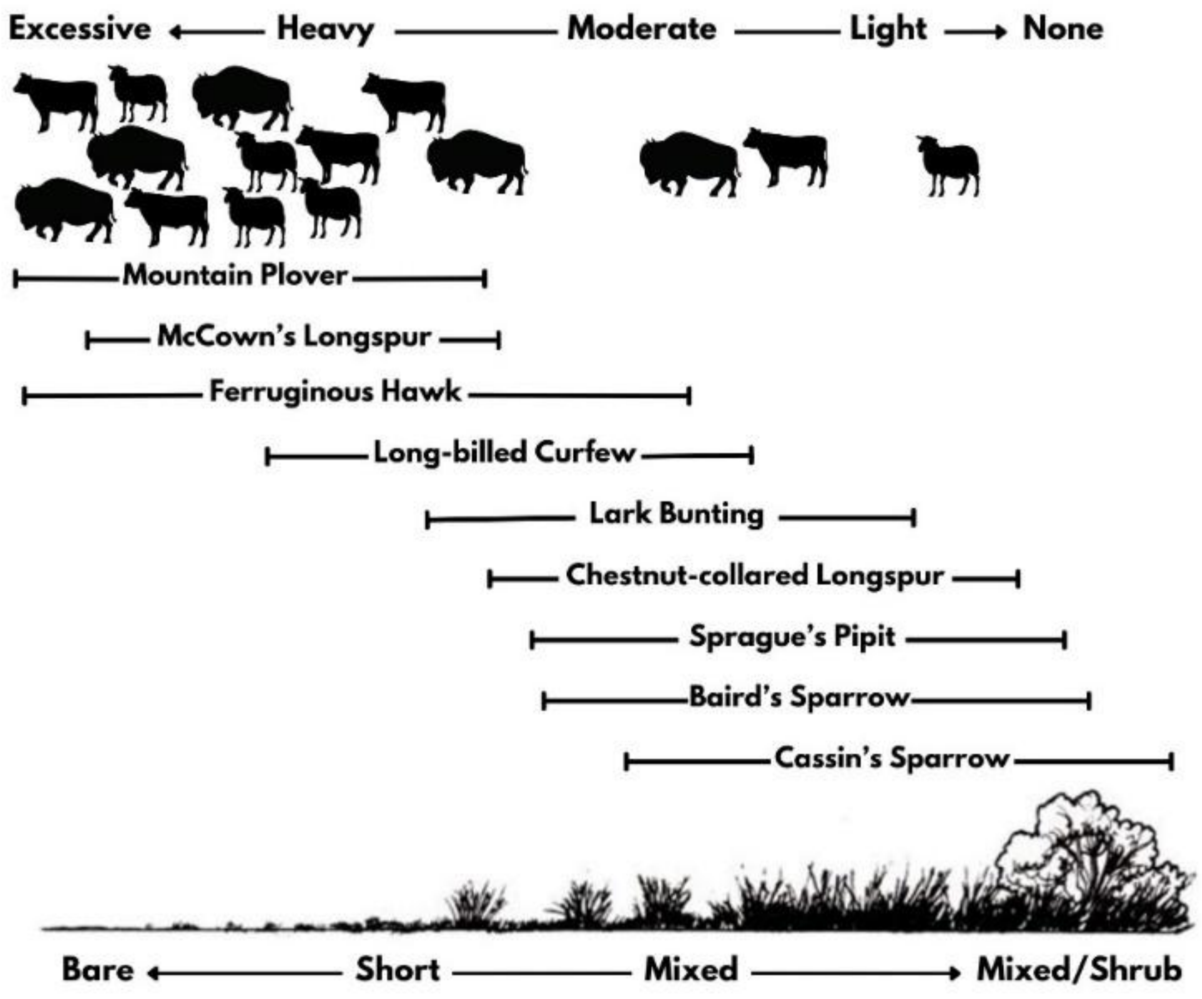
- Full (complete removal), minimal (nearly no removal), and selective use of forage is achieved strategically; different SRs support a combination of heterogenous and homogenous grazing pressures.



Grazing Distribution and Timing

- Tools: fencing, paddock layout, watering points, rotation schedule

- Create patches along a disturbance gradient so that suitable habitat is available for grassland birds with varying vegetation structure preferences



Sample Western WA Vegetation Gradient Structure for Grassland Birds

eBird

Encyclopedia Puget Sound

Klamath bird observatory

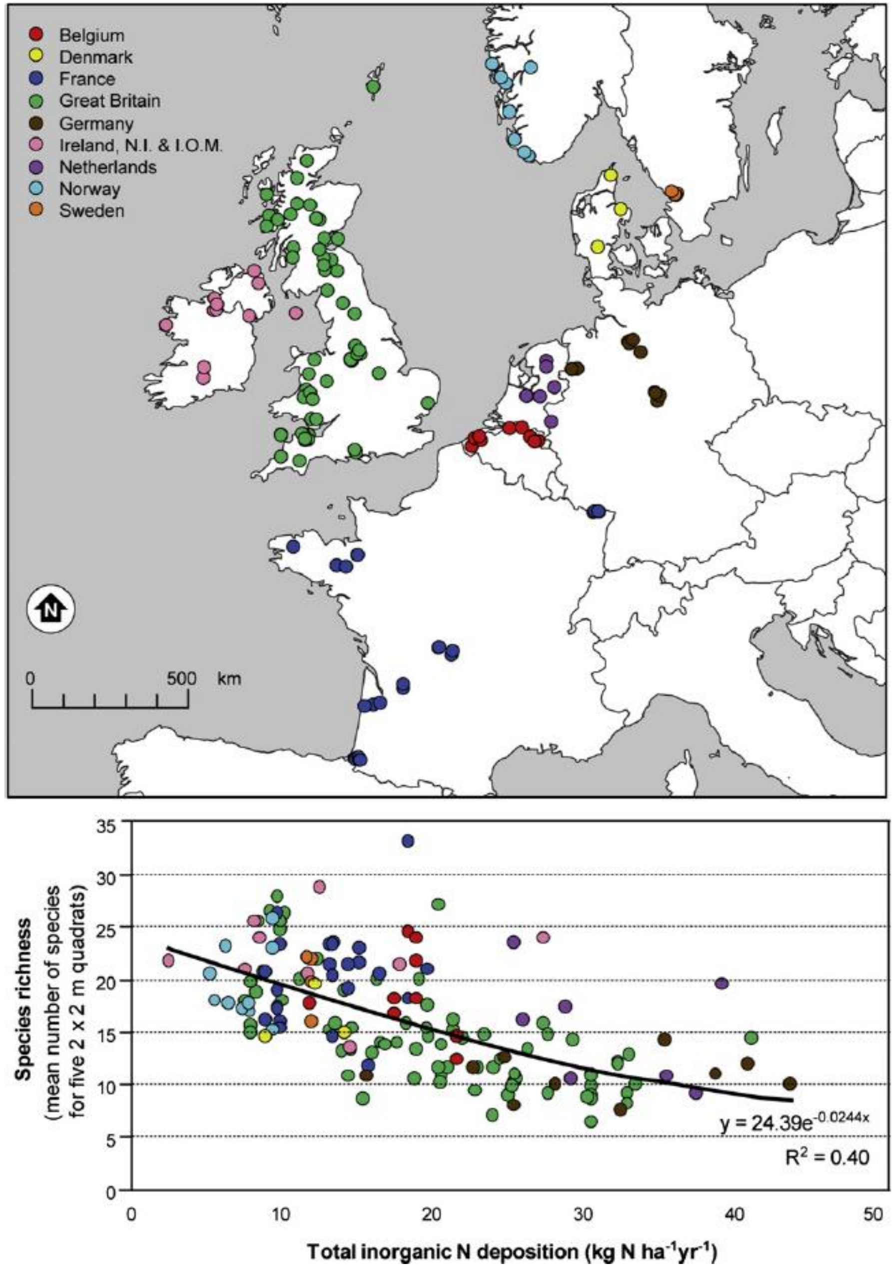
eBird

Streaked horned lark	Western meadowlark	Oregon Vesper Sparrow	Western bluebird
150-300 ac patches	7-15 ac patches	10-20 ac patches	10-20 ac patches
Low-stature vegetation	Low-stature vegetation	Tall-stature vegetation > 25 cm	Moderate disturbance to maintain open woods savanna
>60% bare ground	3-6% bare ground	Grassy edge habitat	Fruiting shrubs, snags for nesting

Soil Management

- Nutrient enrichment decreases species richness
- N+P+K, and N+P additions decrease species richness more than individual nutrients
- Nutrient enrichment suppresses soil AM fungi
- AM fungi are likely essential to re-establish certain forbs

Species Richness



N deposition

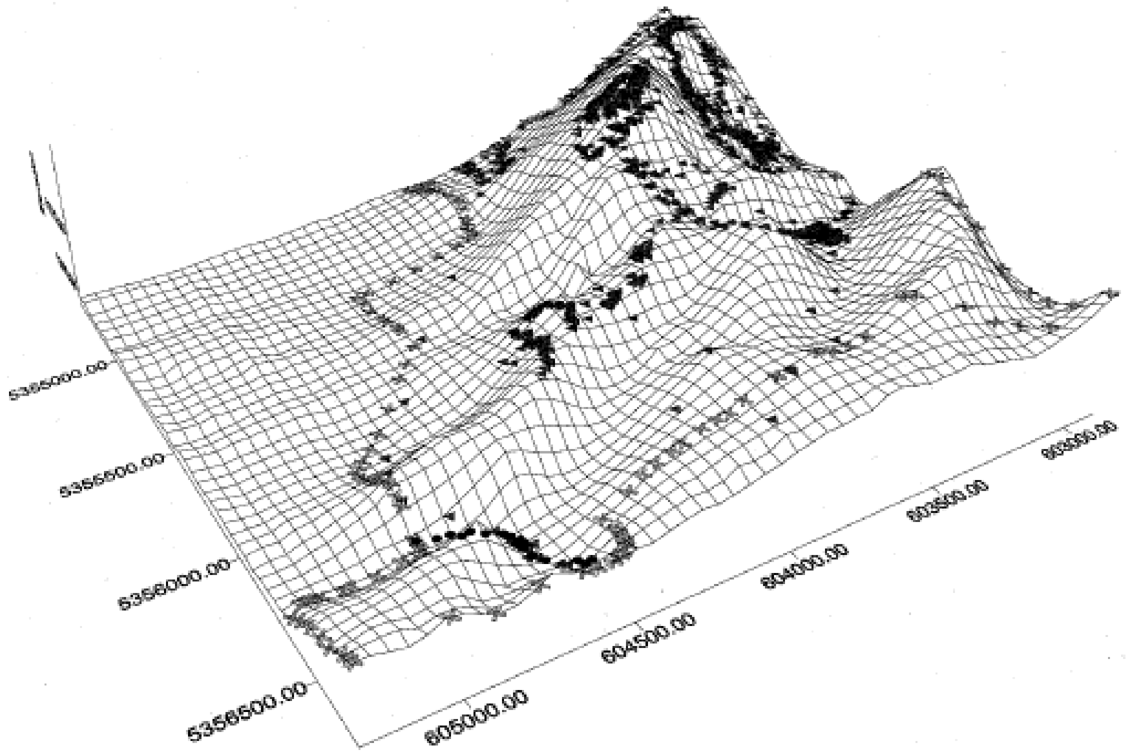
Stevens et al. 2010

Livestock Type and Breed

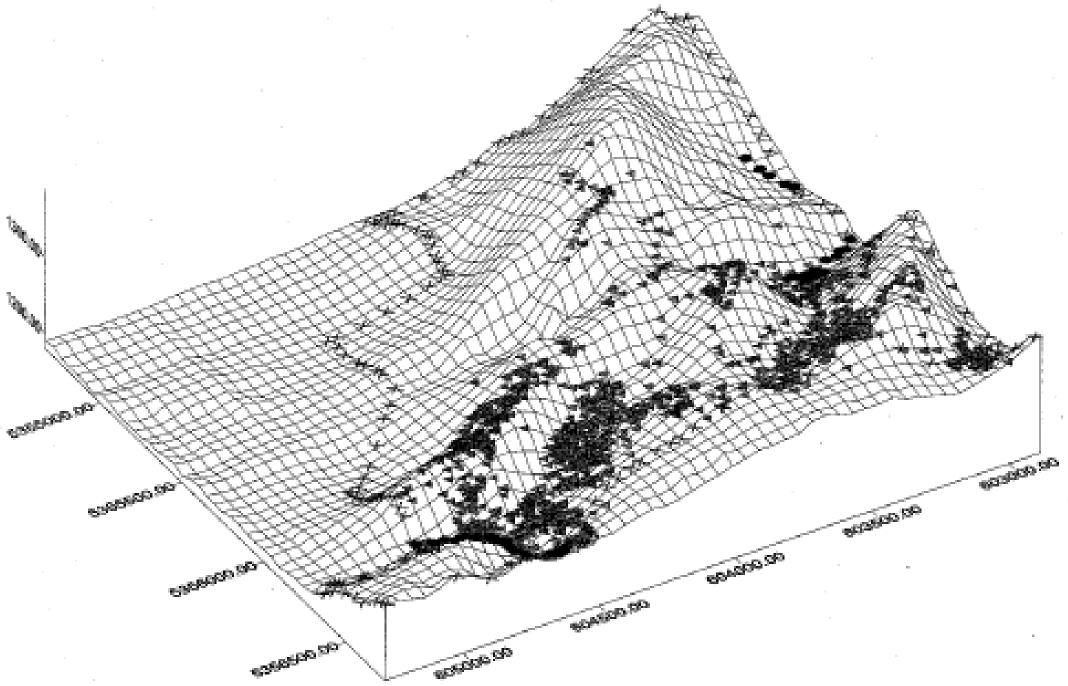
Hungarian grey cattle, predisposition (or capability) to eat more reed species in wet grasslands

- Digestive physiology (learned or breed-specific)
- Foraging capacity
- Feed utilization
    - Rate of gain on best forage
    - Rate of gain on available forage

Livestock Type and Breed



¾ Tarentaise, ¼ Hereford



¼ Tarentaise, ¾ Hereford

Animal Behavior

Goats reared from 1 to 4 mo of age on rangeland dominated by blackbrush (Coleogyne ramosissima) ate twice as much blackbrush as did goats unfamiliar with blackbrush (Distel and Provenza, 1991)

Even after 1 mo with both groups of goats grazing blackbrush, experienced goats still consumed 27% more blackbrush than did naive goats. These deeply held foraging habits could explain why livestock producers often experience production losses when animals are transported to unfamiliar rangelands.

Launchbaugh and Hunt 2000

Restoration Actions

- Invasive species removal and native enhancement (seeding and planting) can both improve forage quality and increase habitat diversity

Useful Papers on the Topic

- Bengtsson, J., J. M. Bullock, B. Egoh, C. Everson, T. Everson, T. O'Connor, P. J. O'Farrell, H. G. Smith, and R. Lindborg. 2019. **Grasslands—more important for ecosystem services than you might think**. Ecosphere 10(2): 1-20.
- Freese, C. H. S. D. Fuhlendorf, and K. Kunkel. 2014. **A transition framework for the transition from livestock production toward biodiversity conservation on Great Plains Rangelands**. Ecological Restoration 32(4):358-268.
- Fuhlendorf, S. D., Engle, D. M., Elmore, R. D., Limb, R. F., and Bidwell, T. G. 2012. **Conservation of pattern and process: developing an alternative paradigm of rangeland management**. Rangeland Ecology and Management 65(6):579-589.
- Havstad, K. M., D. P.C. Peters, R. Skaggs, J. Brown, B. Bestelmeyer, E. Fredrickson, J. Herrick, and J. Wright. 2007. **Ecological services to and from rangelands of the United States**. Ecological Economics 64:261-268.
- Derner, J. D., W.K. Laurenroth, P. Stapp, and D. J. Augustine. 2009. **Livestock as ecosystem engineers for grassland bird habitat in the western Great Plains of North America**. Rangeland Ecology and Management 62:111-118.
- Westoby, M. B. Walker, and E. Noy-Meir. 1989. **Opportunistic Management for Rangelands Not at Equilibrium**. Journal of Range Management 42(4): 266-274.
- Fuhlendorf, S. D., W. C. Harrell, D. M. Engle, R. G. Hamilton, C. A. Davis, and D. M. Leslie. 2006. **Should Heterogeneity Be the Basis for Conservation? Grassland Bird Response to Fire and Grazing**. Ecological Applications 16(5): 1706-1716.