

Working Lands

Balance, Collaboration, Adaptation

K.W. Tate, L.M. Roche , E.R. Atwill, D.J. Lewis, D.J. Eastburn ,
R.A. Dahlgren, and T.L. Saitone - *University of California, Davis*

UCRANGELANDS
Supporting Working Landscapes



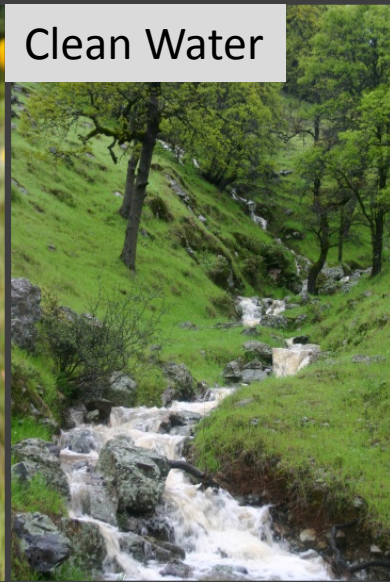
Working Lands

- What are some of the issues and challenges in sustaining working landscapes?
- How do science and management co-engage to address these challenges?
- What do we know, and what can we do better – together?



Working lands provide critical ecosystem services

Sustaining these benefits requires balance, collaboration, adaptation



Working Lands: Balance

- Strong cultural, economic, and ecological connections.

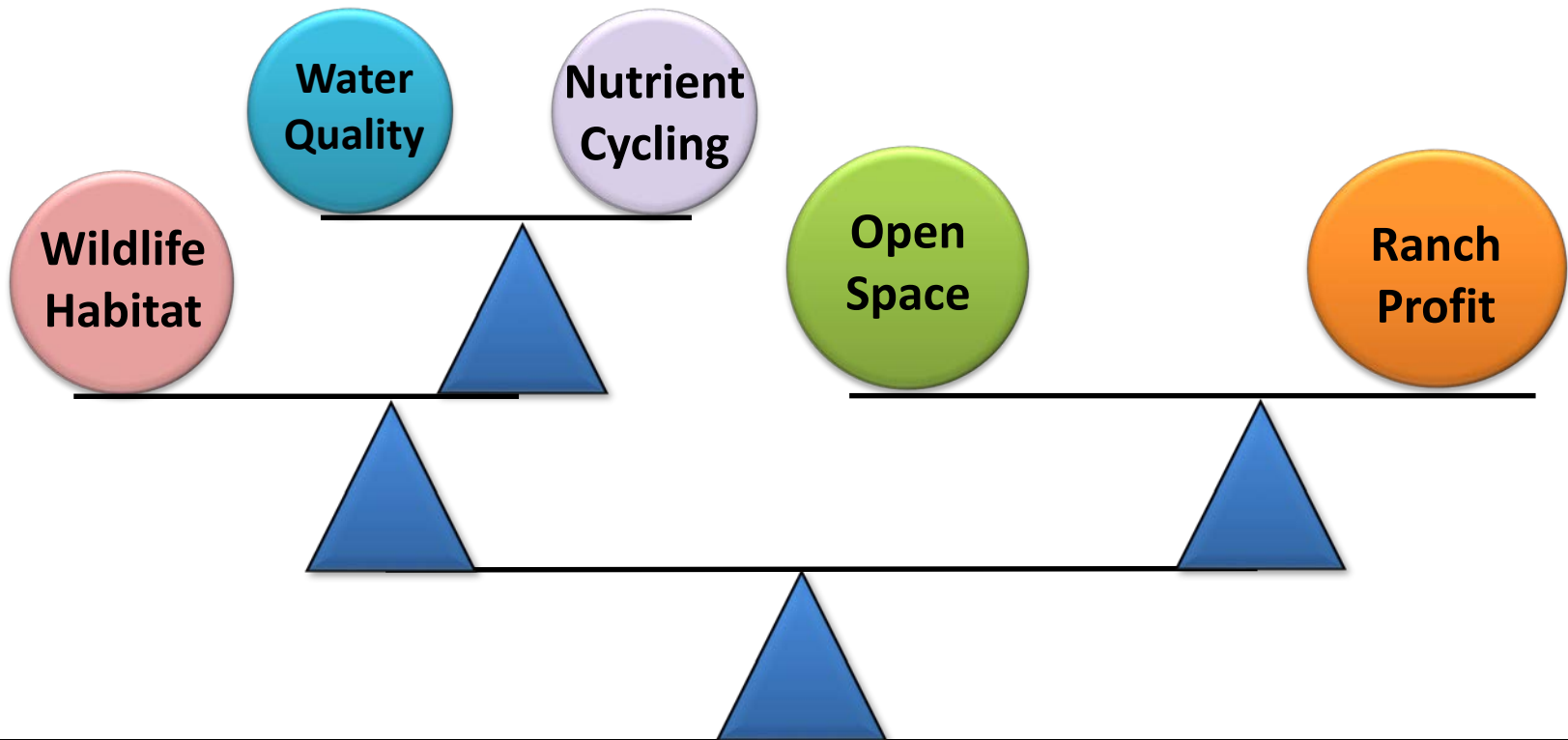


Working Lands: Balance

- Strong cultural, economic, and ecological connections.
- Livelihoods are at stake, and are they are dependent upon ecological function and resulting services.

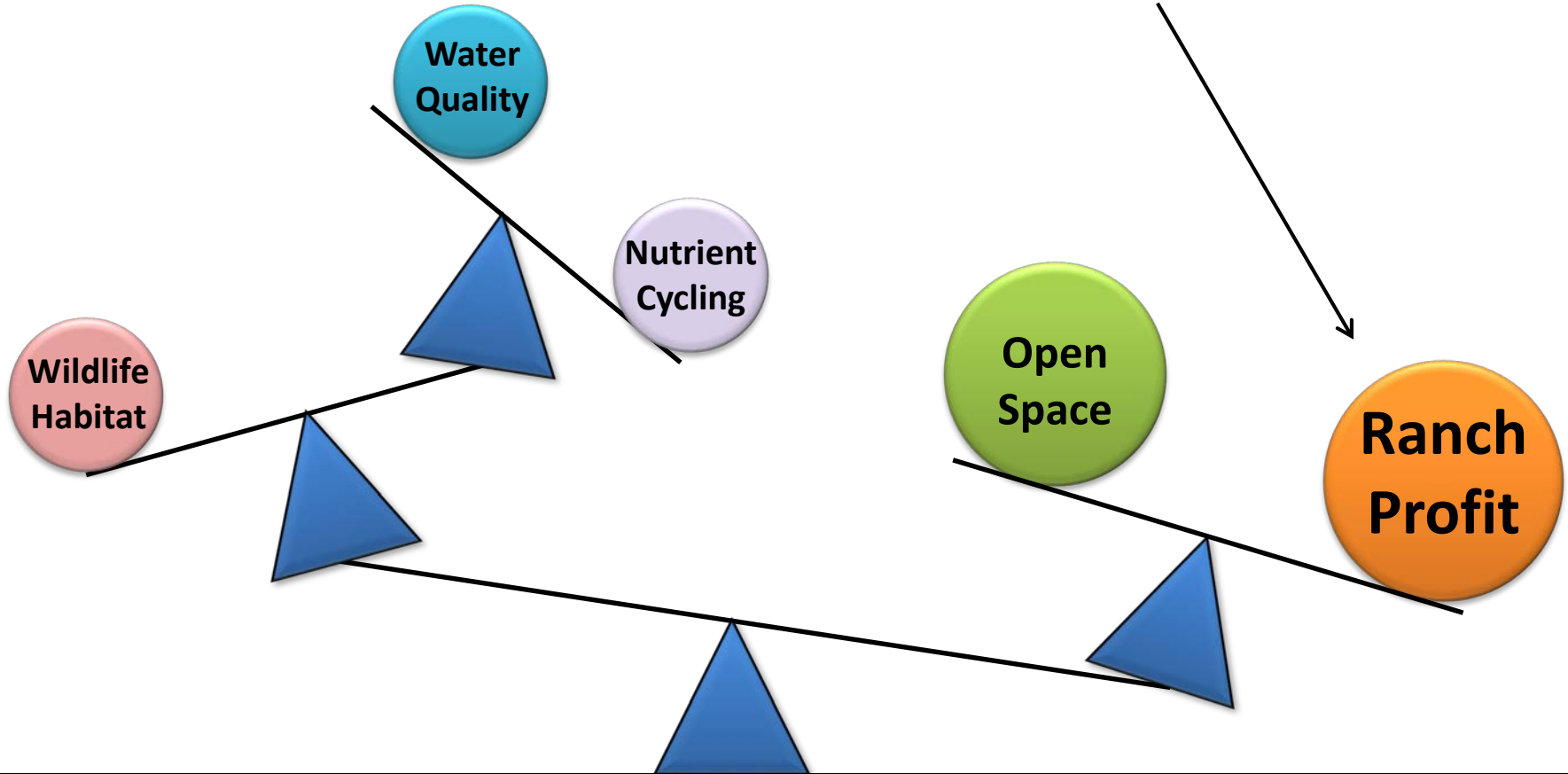


Working Lands: Balance



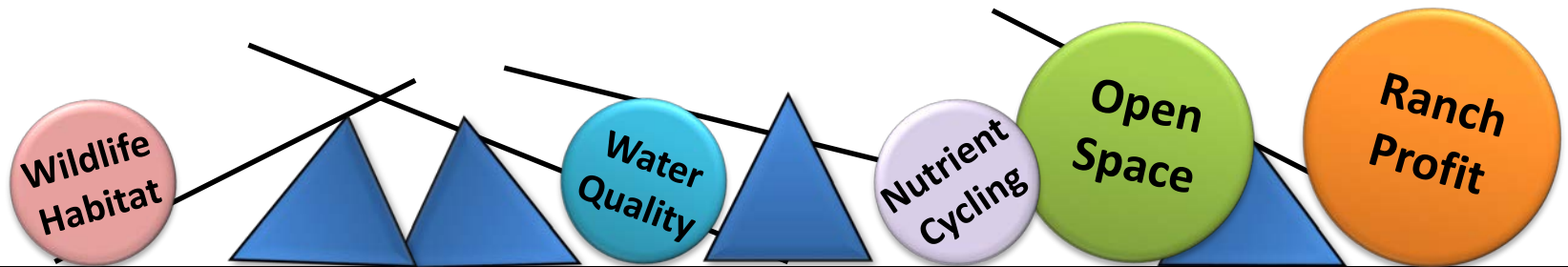
Working Lands: Balance

Singular focus can lead to at tipping point.

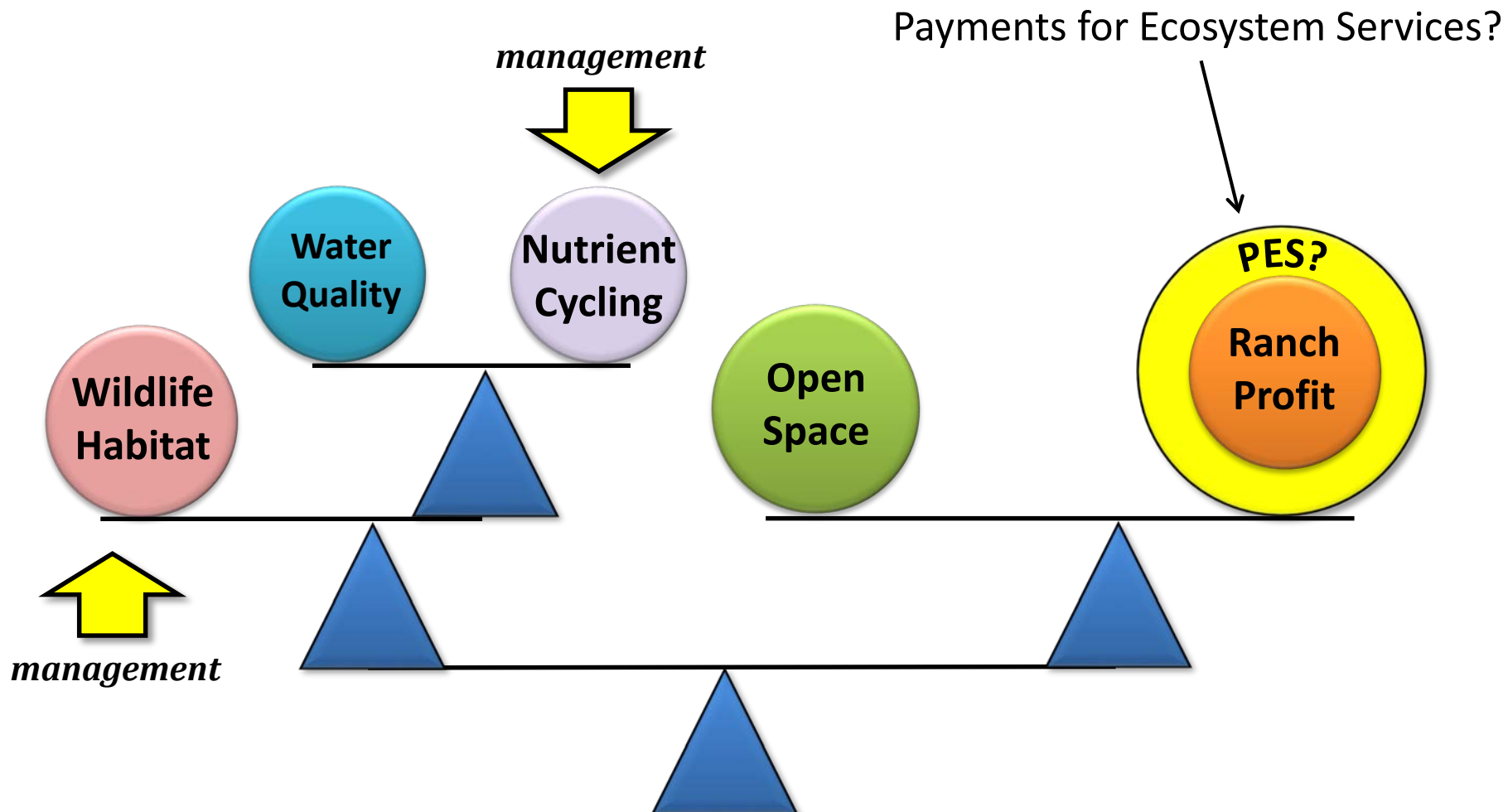


Working Lands: Balance

Singular focus can cause an unraveling of the system



Working Lands: Balance



Working Lands: Collaboration

- Sustainable management directly benefits the cultural, economic, and ecological facets of the community.

col·lab·o·ra·tion

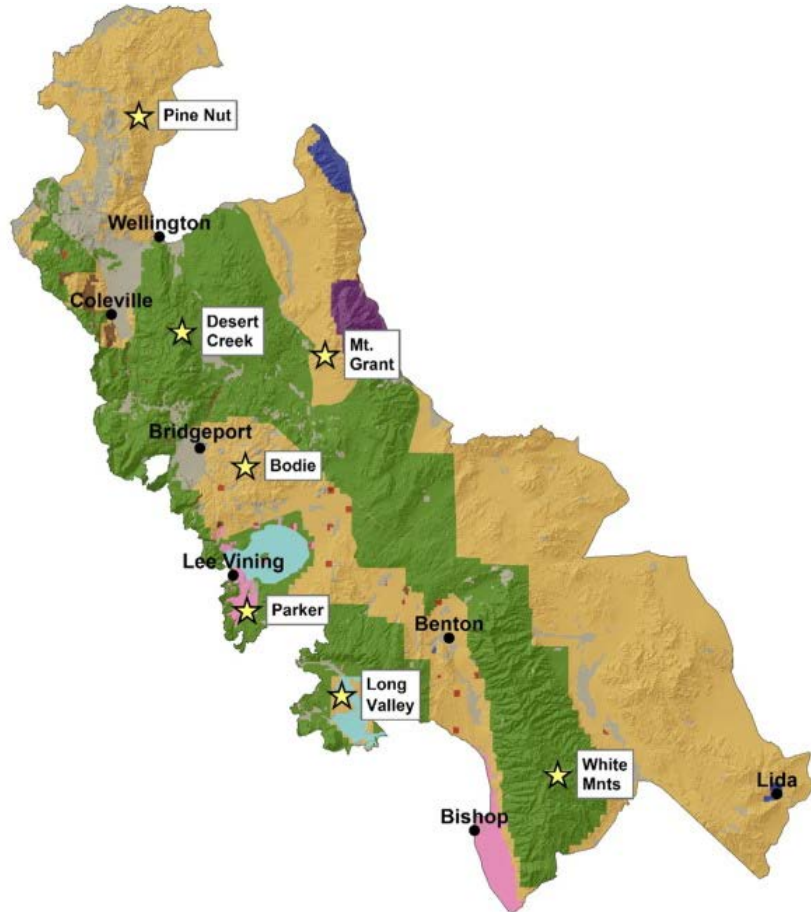
noun

Two or more people working together
towards shared goals



A LARGE CROWD GATHERED IN BURNS, ORE., JAN. 6 TO DISCUSS A PROPOSED ENVIRONMENTAL IMPACT

“Bi-State” sage grouse conservation case study



A landscape-scale, collaborative conservation effort

- 1) Pending ESA listing action was transformed into opportunity for conservation partnership
- 2) A locally based partnership anchored collaboration and engagement in conservation
- 3) Best-available science plus local knowledge led to “certainty of effectiveness and implementation” — the criteria used by the US Fish and Wildlife Service to evaluate conservation efforts when making listing decisions.
- 4) Precluded the need for an ESA listing of the Bi-State population of sage grouse.



Land Ownership

BIA	1%	Local Gov.	2%
BLM	48%	Private/Other	8%
DOD	1%	State	<1%
FS	38%	Water	2%
FWS	<1%		

Features

●	Cities
★	Sage-grouse Populations
□	Bi-state Extent



<http://www.sciencedirect.com/science/article/pii/S1550742416300604>

Working Lands: Collaboration?

- Fundamental values differences and disagreements on appropriate goals and land uses.

Cattle Free by '93!

vs.

Cattle Galore by '94!



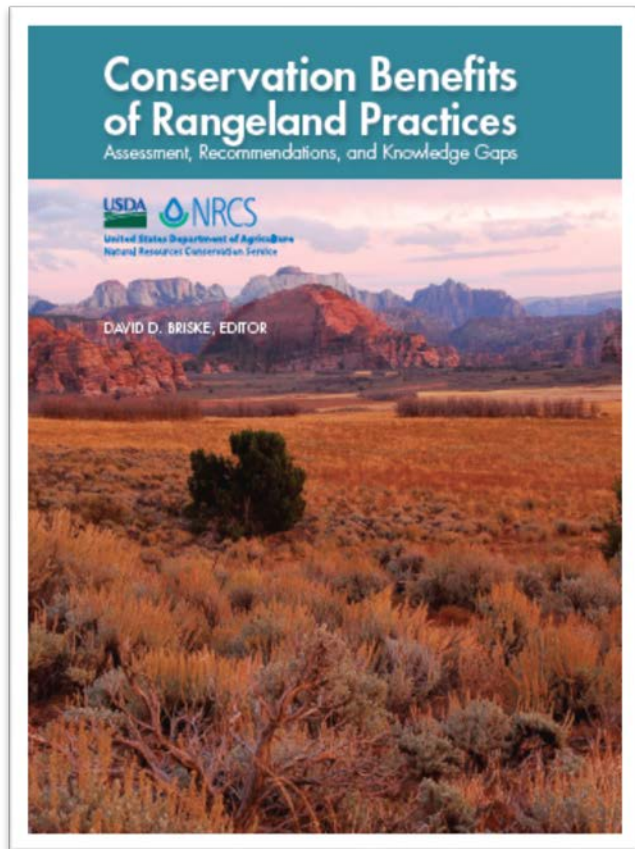
Ammon Bundy, Rancher's Rights Protesters Occupy Malheur National Wildlife Refuge in Oregon

Working Lands: Adaptation

- The only certainty is constant environmental, cultural, and economic change.

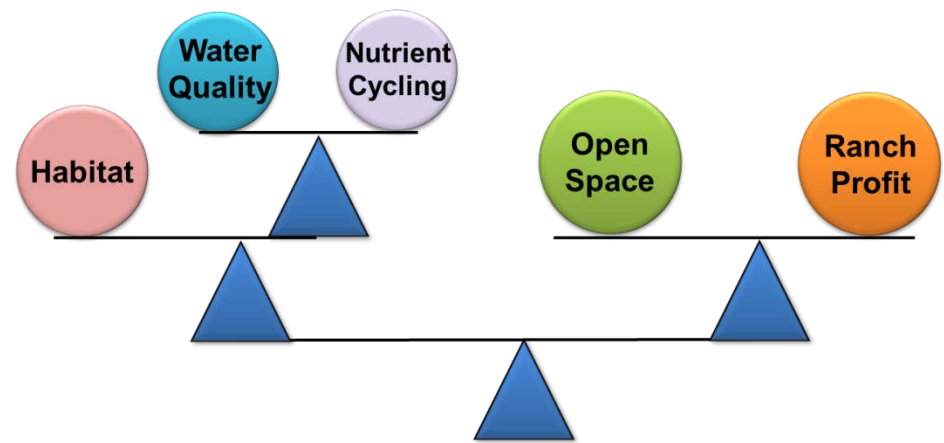


Science – Management Syntheses



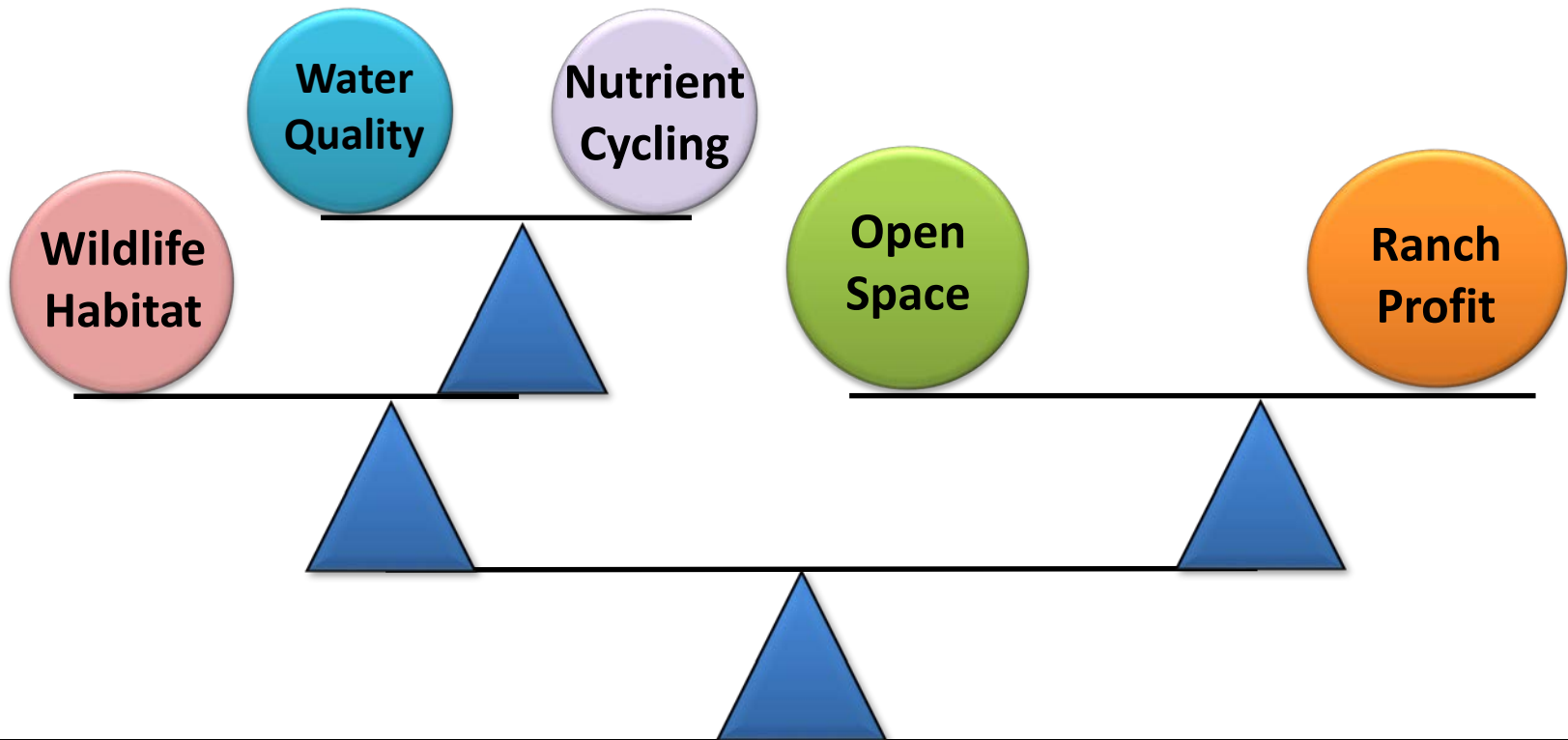
Key Recommendations

- 1) Expand collaborations between scientists and land managers.
- 2) Integrate socio-economic and ecological factors in examining outcomes.
- 3) Evaluate roles of adaptive management in meeting multiple goals.

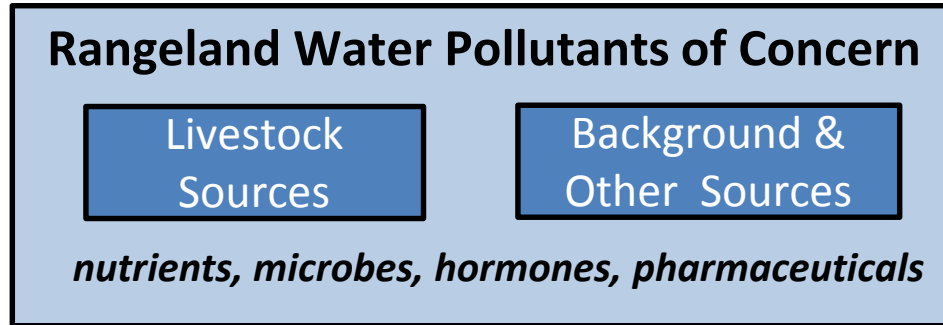


Working Lands: Science

- Substantial evidence that we can manage to balance conservation and production biophysical outcomes.



Science: Grazing & Water Quality



- **A toolbox of effective WQ protection practices**



- **With good management – clean water and grazing are compatible**

Pt. Reyes National Seashore

Working Lands Case Study



Olema Creek Riparian Restoration

Pt. Reyes National Seashore

- Elevated microbial pollution.
- Impairment aquatic habitat and stream health.
- Unmanaged livestock access to stream.



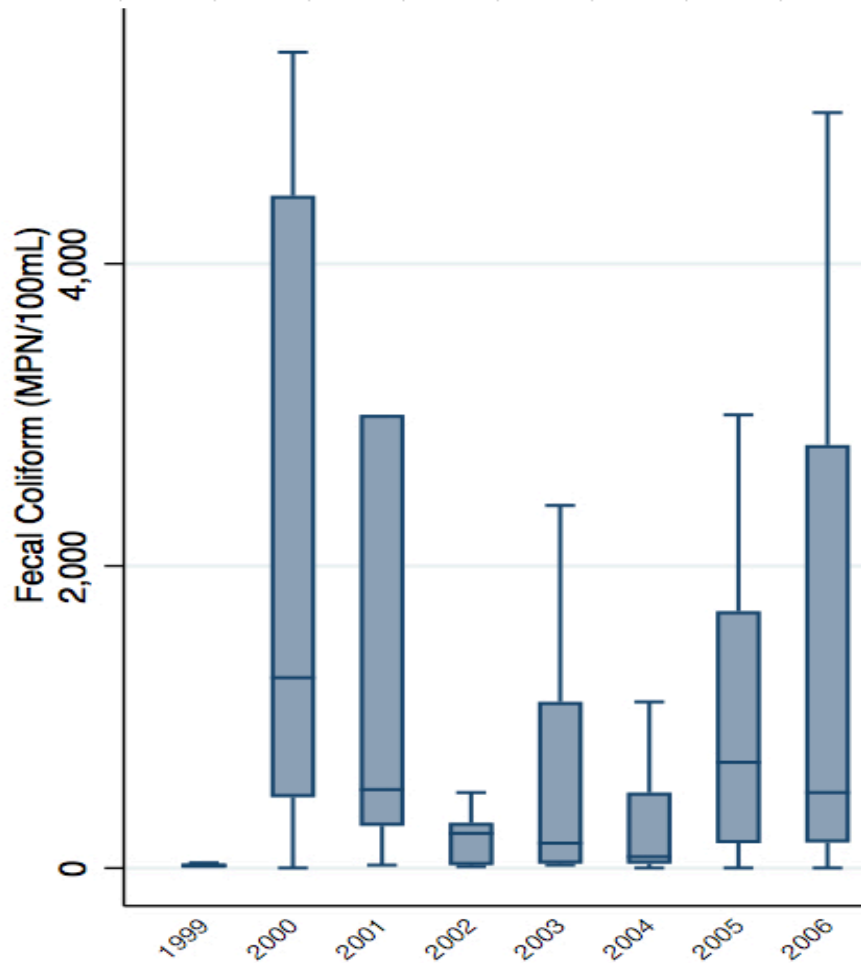
Olema Creek Riparian Restoration

Pt. Reyes National Seashore

1999 → 2006

9 Conservation Practices
4.16 Stream KM Influenced

Sites	3	3	4	4	5	5	5	5
Samples	7	12	17	12	27	77	100	88



Olema Creek Riparian Restoration

Pt. Reyes National Seashore

- A campaign of management improvements
- NPS, ranchers, EPA & water boards, NRCS, RCDs, UCCE, etc
- Planning, permitting, funding, implementation, monitoring.

riparian fencing, crossings

planting, stabilization

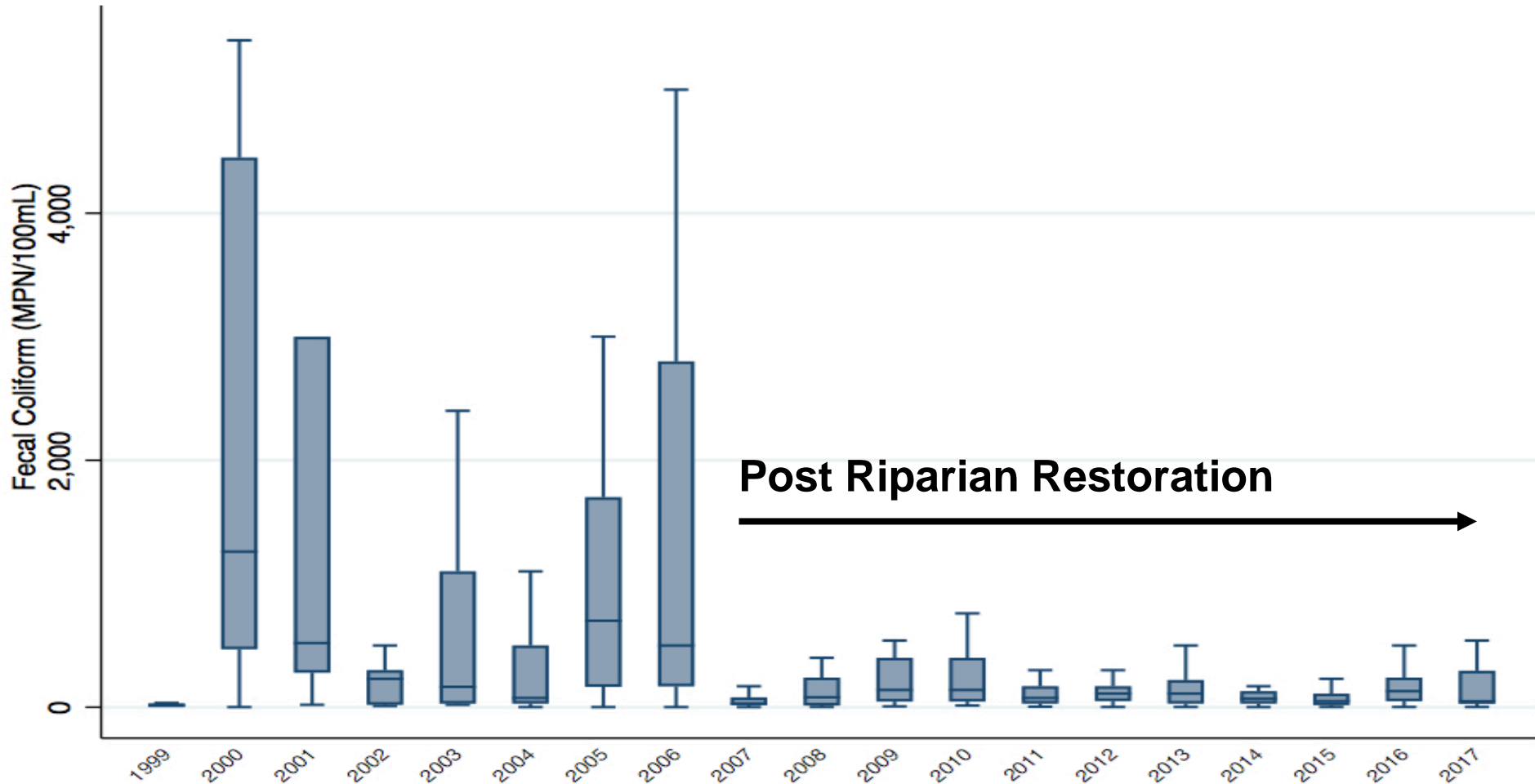
off-stream drinking



Olema Creek Riparian Restoration

Pt. Reyes National Seashore

	1999 → 2006							2007 → 2011					2012 → 2017						
	9 Conservation Practices 4.16 Stream KM Influenced							21 Conservation Practices 15.64 Stream KM Influenced					16 Conservation Practices 8.56 Stream KM Influenced						
Sites	3	3	4	4	5	5	5	5	5	5	5	5	5	5	5	5	5		
Samples	7	12	17	12	27	77	100	88	50	25	82	70	70	87	60	25	74	79	91





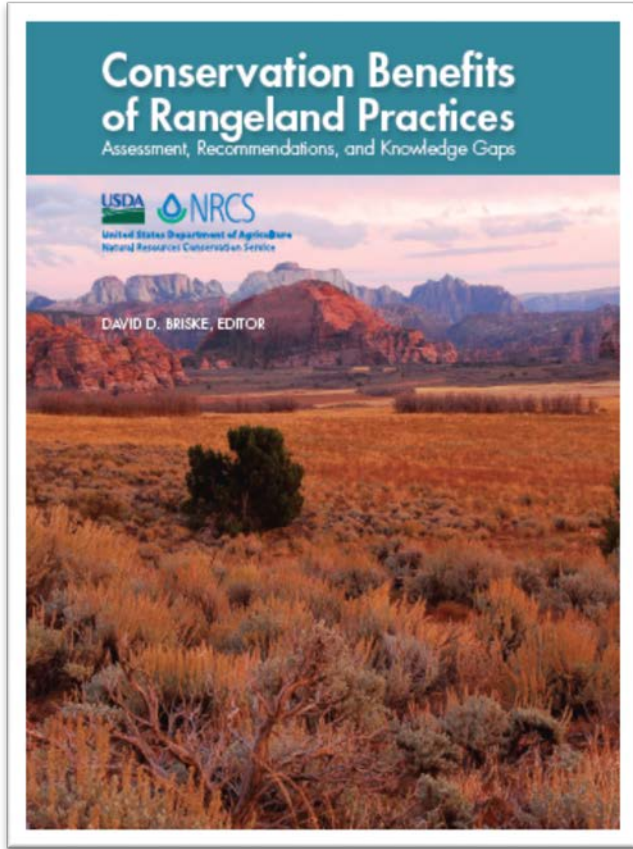
For Immediate Release, November 21, 2017

Cattle Waste Puts California's Point Reyes on 'Crappiest Places in America' List

POINT REYES, Calif.— The livestock-polluted waters of Point Reyes National Seashore rank in the top 10 percent of U.S. locations most contaminated by feces indicated by *E. coli* bacteria, according to a new [report](#) published on the investigative journalism website *The Revelator*.

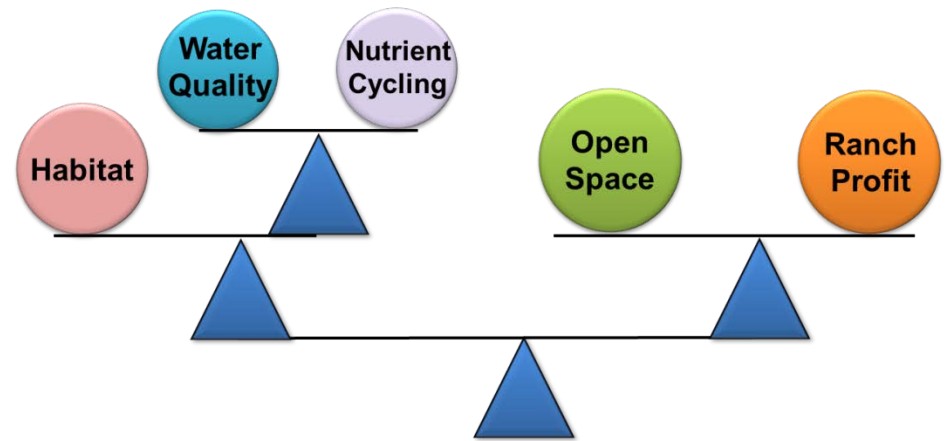


Science – Management Syntheses



Key Recommendations

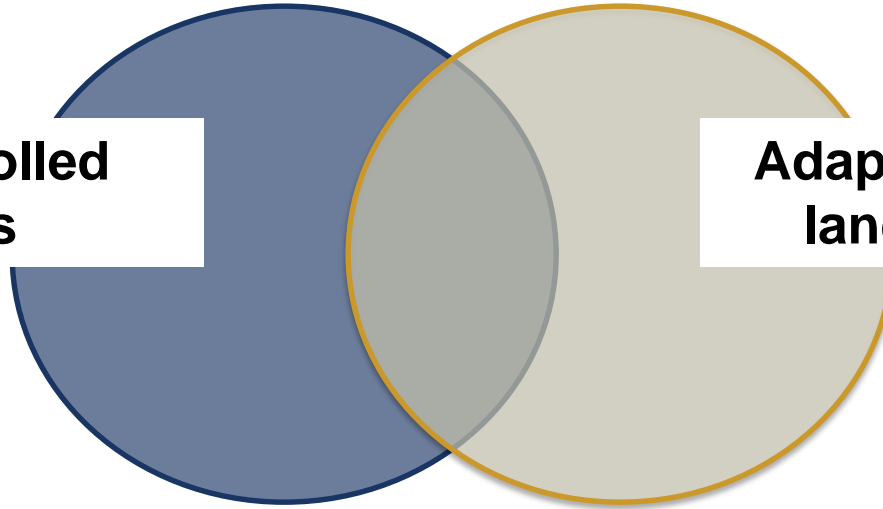
- 1) Expand collaborations between scientists and land managers.
- 2) Integrate socio-economic and ecological factors in examining outcomes.
- 3) Evaluate roles of adaptive management in meeting multiple goals.



Integrating Management & Science

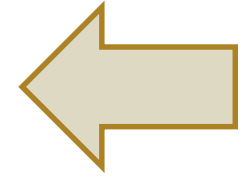
Research

**Artificial, controlled
experiments**



Management

**Adaptively implemented,
landscape strategies**



Classic Example = Grazing Systems Dilemma

- No ecological, agricultural, economic benefit to rotational over continuous grazing strategies...
- Rotational grazing improves soil health, forage production, economics, makes happy cows...

Conservation Benefits of Rangeland Practices
Assessment, Recommendations, and Knowledge Gaps

USDA NRCS

CHAPTER 1

An Evidence-Based Assessment of Prescribed Grazing Practices

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Reference to any commercial product or service is made with the understanding that no endorsement is intended and no endorsement by USDA is implied

21

Rangelands 2015, 33(1):1-11 January 2015

Synthesis Paper

Rotational Grazing on Rangelands: Reconciliation of Perception and Experimental Evidence

D. D. Briske,¹ J. D. Derner,² J. R. Beeson,³ S. D. Hubbell,⁴ W. R. Teague,⁵ K. M. Havstad,⁶ R. L. Gillen,⁷ A. J. Ash,⁸ and W. D. Willms⁹

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Letter to the Editor

Is Holistic Management Really Saving Patagonian Rangelands From Degradation? A Response to Teague

Andrés F. Cibils, Raül J. Lira Fernández, Gabriel E. Oliva, and Juan M. Escobar

The application of the holistic management (HM) method in Patagonia was highlighted in Teague's editorial of the *Rangelands* of 1 June 2014. Shortly thereafter, published in *Rangelands*, Teague's letter reiterated Allan Savory's pictorial situation in the Patagonian story in his now widely viewed TED talk. Since reference to the Patagonian case in Teague's was not supported by peer-reviewed evidence, and since we are familiar with many of these cases, we wish to provide a science-based perspective (complemented with local knowledge) on Teague's and Savory's claims that HM grazing prescriptions are saving Patagonian rangelands from continued degradation. Teague states that,

...range conditions have remained in decline for over 20 years, are continuously grazed rangelands in these dry rangelands. Every year the range condition was worse, as measured by the scaling rate over 500m from autumn to late winter. This did not stop, even in good years (p. 17).

We found this statement particularly puzzling because it entirely ignores decades-worth of data from controlled grazing experiments¹⁰ conducted at two sites, each located a few miles away from ranches commonly applying HM prescriptions. Both studies¹⁰ showed that range condition did not deteriorate under modern continuous grazing. On the contrary, at one site, vegetation cover increased significantly (decade years of drought) and plant species diversity remained unchanged over the 10-year period of the study. At the second (dryer) site, 3 years of detailed vegetation measurements showed that patches that had been grazed continuously for over 20 years exhibited no change in cover of both vegetation or forage species, and no increase in bare soil. Teague's statement further contradicts a recently published long-term case study conducted on a continuous grazing ranch that adjusts stocking rates annually, tracking year-to-year fluctuations in forage availability.¹¹ This study

concluded that herbage production, stable height of a key grass species, as well as sheep production indicators remained stable after 20 years of applying adaptive management based on modern continuous grazing with flexible stocking rates.¹¹ Teague also states that,

*Five years ago they [Los Agostinos] resulting from their advanced HM method had this landscape continuously grazing? If you are not succeeding, in using the example of someone [in Argentina and other countries], they must be dishonest. Planned Grazing on some of ranches in the region, after just three years, one of which was a drought year, [did] some measured improvements in key ecological indicators, and an improvement in animal performance, allowing for an increase in stock numbers [after five fields] (p. 17).*¹²

There is no mention here of which specific key indicators were measured and no details are provided about how these were determined. But most importantly, to offer 3 years of alleged data records (which often consist of disconnected photographs) as proof that HM grazing prescriptions are averting degradation of Patagonian rangelands is at least misleading. Restoration of degraded rangelands in southern Patagonia requires the establishment of a landscape mosaic species, a demographic process that has been shown to be extremely slow.¹³ Forest recolonization events via seed establishment are rare¹⁴ and management-induced local extinction of the species can take 37 to 64 years to fully unfold.¹⁵ Because of this, measures to highly reduce or remove 3 years as claimed by Teague¹² but more importantly, the legacies of ill-thought grazing strategies could influence this ecosystem's dynamics for decades if not centuries to come.

Grazing regimes similar to those promoted by the HM system, which homogenize both landscape and rangeland local gene capture systems, have been shown to lead to less stable ranching systems that become more vulnerable to climate

26

SRM

Deficiencies in the Briske et al. Rebuttal of the Savory Method

By Richard Teague

Journal of Environmental Management 139 (2015) 690-702

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Journal of Environmental Management

Journal homepage: www.elsevier.com/locate/jenvman

Review

Multi-paddock grazing on rangelands: Why the perceptual dichotomy between research results and rancher experience?

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ARTICLE INFO

ABSTRACT

Debating or enhancing the productive capacity and resilience of rangeland ecosystems is critical for the economic support of people who depend on them for their livelihoods, especially in the face of climate change. This is also true for the potential ability of rangelands to store carbon from rangelands for the benefit of societies around the world. Multi-paddock grazing management has been recommended over the last 20 years as an important tool to adaptively manage rangelands ecosystems to sustain productivity and improve animal management. However, there is much anecdotal evidence from producers that, if applied appropriately, multi-paddock grazing can improve range and livestock production. By contrast, many reviews of published controlled grazing experiments and field studies have concluded that, in general, field trials show no superiority of rotational or multi-paddock grazing relative to continuous grazing, or even that multi-paddock grazing reduces the productivity and carrying capacity of rangelands and thus to identify why different perceptions exist among rangeland managers who have effectively used multi-paddock grazing systems and ranchers who have not. In this review, we discuss the ecology of grass rangelands under fluctuating herbivory and under multi-paddock based conditions, we identify the principles underlying the adaptive management actions used by successful grazing managers and the ecological, physiological, and behavioral mechanisms they use to achieve desired conservation, production, and financial goals. Then, we examine adaptive management processes needed to successfully manage rangelands subjected to varying environmental conditions. Finally, we describe the differences between the generation of results of grazing systems research reported in the scientific literature and the results reported by successful grazing managers; we highlight the characteristics of most of the generally published grazing systems research for providing information relevant for rangeland managers who aim to achieve desired environmental and economic goals. Finally, we outline knowledge gaps and present testable hypotheses to improve our understanding of how planned multi-paddock grazing management can be used as the leading edge strategy to facilitate the adaptive management of rangelands under dynamic environmental conditions.

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1. Introduction

Rangelands are diverse ecosystems and landscapes that cover about half of the world's terrestrial area, including Antarctica and Greenland, and that are essential for numerous agricultural and other uses. Such systems include the maintenance of stable and productive soils, the delivery of clean water, the maintenance of plants, animals and other organisms that support human health, and other characteristics that support aesthetic and cultural values (Dunin-Kopec et al., 2005). People in many rural and urban populations depend on them for their livelihoods, often through livestock production, and for the ecosystem services that affect human well-being. Such services include the maintenance of stable and productive soils, the delivery of clean water, the maintenance of plants, animals and other organisms that support human health, and other characteristics that support aesthetic and cultural values (Dunin-Kopec et al., 2005).

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http://dx.doi.org/10.1016/j.jenvman.2015.03.044

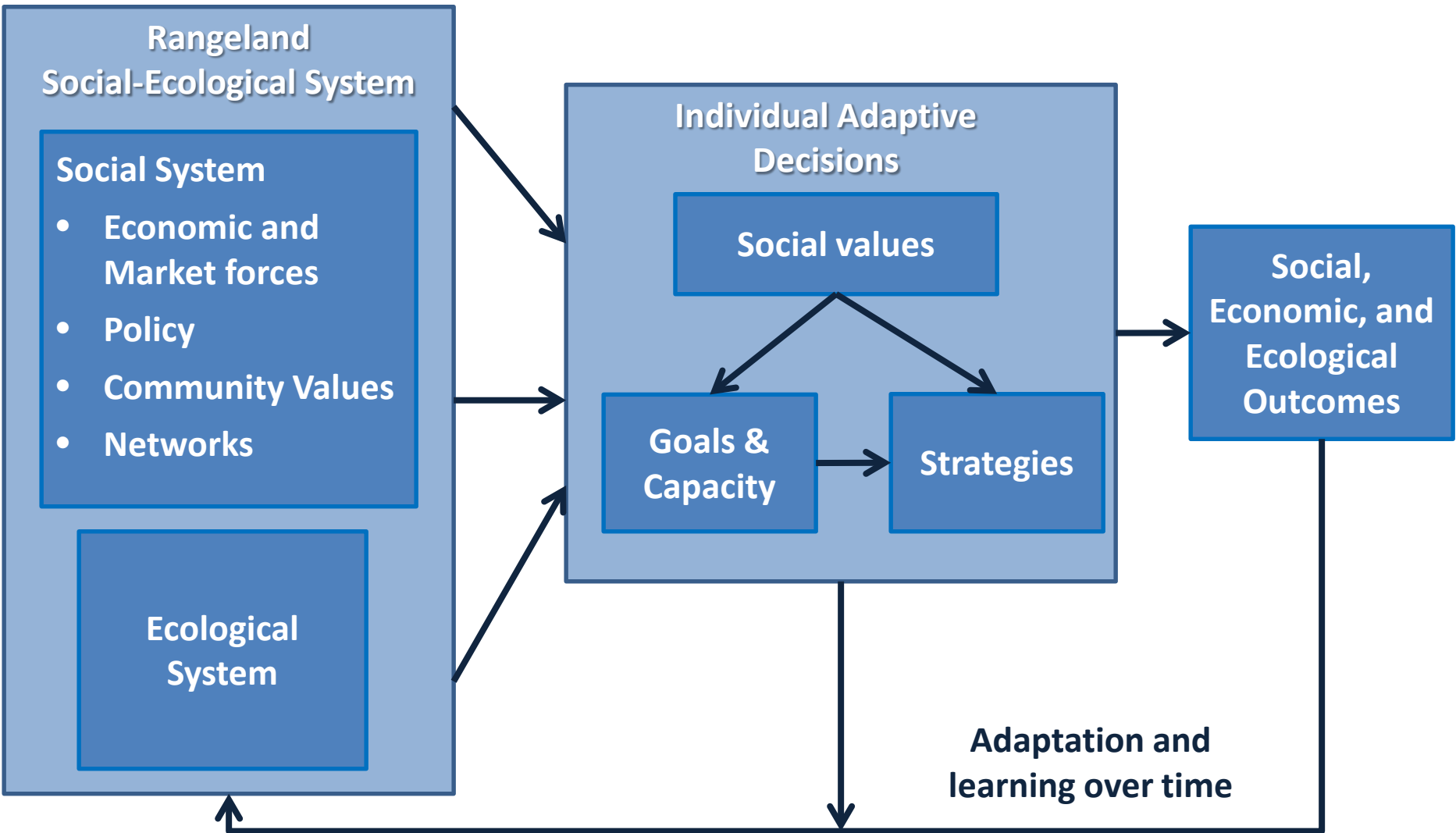
WY & CA On-Ranch Grazing Strategies



- 67% of 765 ranchers employ rotational grazing strategies.
- > 93% of all ‘rotational’ grazers use *extensive* intra-growing season rotation—moderate grazing periods, moderate livestock densities.
- Limited on-ranch adoption of intensive rotational strategies (5%).

Factors Driving On-Ranch Grazing Adoption

Differential Goal Setting • Risk Tolerance • Experimentation • Information Networks • Number of Livestock • Land Ownership • Eco-region



Relative Spatial Scale of Grazing Systems Research and On-Ranch Adaptive Grazing Management

Research

Artificial, controlled experiments

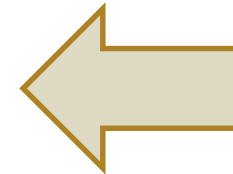


140 ac



Management

Adaptively implemented, landscape strategies



6,360 ha



Warning: Objects are to Scale

Grazing Management for Healthy Soils and Climate Change Mitigation?

The screenshot shows the website for the California Department of Food and Agriculture (CDFA). At the top left is the CA.GOV logo. The main header reads "CALIFORNIA DEPARTMENT OF FOOD AND AGRICULTURE". To the right is a search bar with a magnifying glass icon and radio buttons for "This Site" (selected) and "California". Below the header is a navigation menu with buttons for Home, Divisions, Customer Service, Meetings, News, Jobs, Laws/Regs, Statistics, and Publications. A secondary navigation bar includes links for Find Subject, Programs & Services, Public Meetings, Site Map, FAQs, Contact Us, About CDFA, and Español. The main content area features a background image of a green field with trees in the distance. Overlaid on this image is the text "THE OFFICE OF ENVIRONMENTAL FARMING & INNOVATION" and a large logo for the "healthy soils program" which consists of a stylized plant growing from a hand. Below the main content, there is a breadcrumb trail: "CDFA Home > Office of Environmental Farming and Innovation > Healthy Soils Program". On the right side, there is a yellow button labeled "EMAIL SUBSCRIPTIONS" and a light blue box containing the text "Sign up for email notification". At the bottom left, the text "HEALTHY SOILS PROGRAM" is displayed in a dark blue, serif font.

CA.GOV

CALIFORNIA DEPARTMENT OF FOOD AND AGRICULTURE

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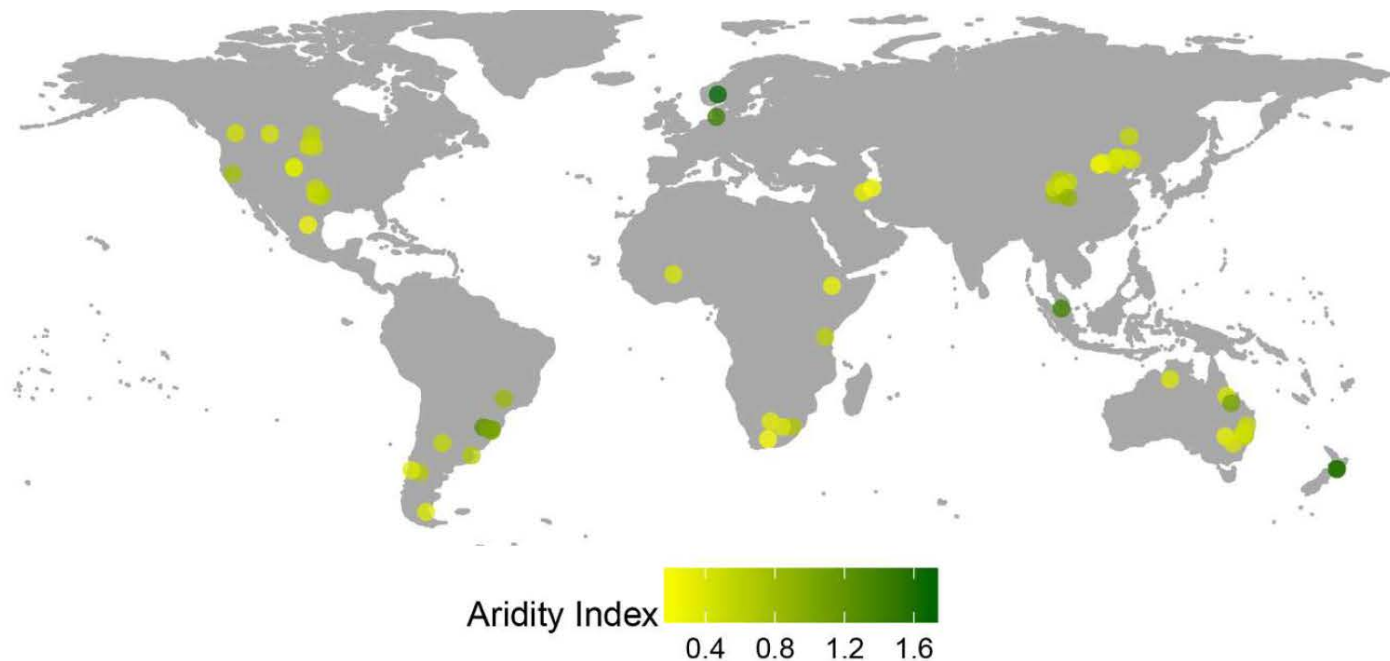
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HEALTHY SOILS PROGRAM

What do we know about how grazing management impacts soil health?

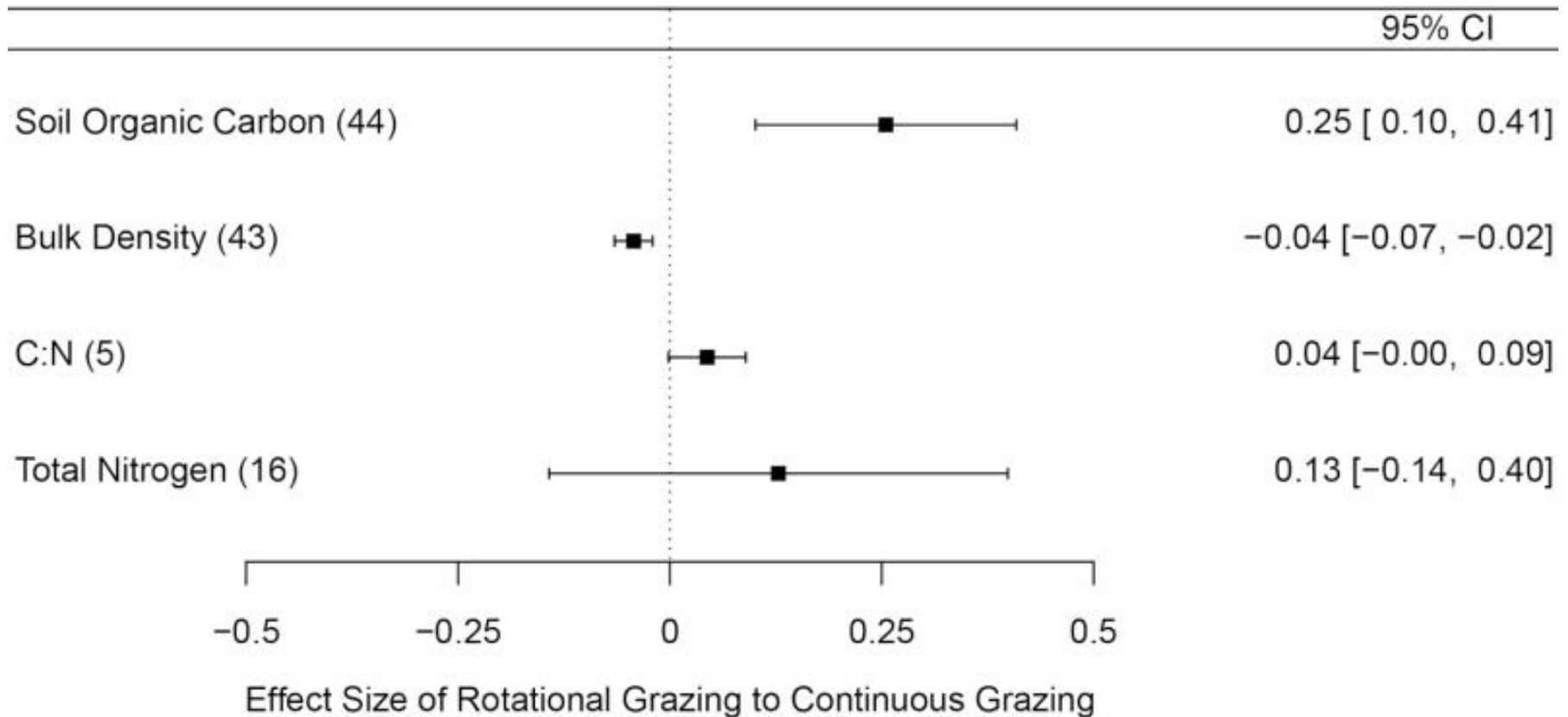
Byrnes, R.C., D.J. Eastburn, K.W. Tate, and L.M. Roche. 2018. *A Global Meta-Analysis of Grazing Impacts on Soil Health Indicators*. *J. Environmental Quality*.



Does Rotation Improve Soil Health over Continuous Grazing?

Compared to continuous grazing, rotational grazing results in:

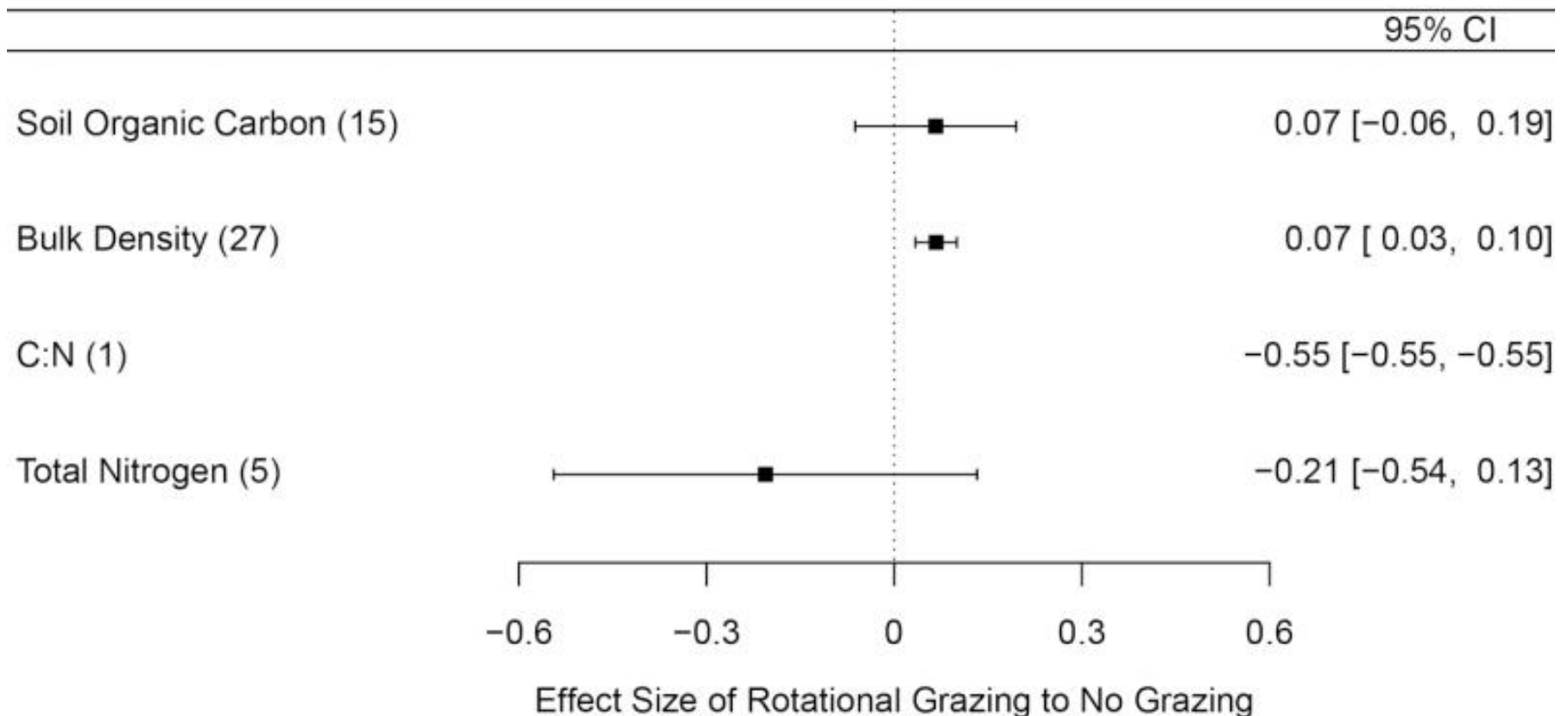
- Increased SOC, C:N, and apparent increased TN (n.s.).
- Decreased soil compaction.



Does Rotation Improve Soil Health over No Grazing?

Compared to no grazing, rotational grazing results in:

- No change in SOC or TN.
- Increased soil compaction.



Research Gaps

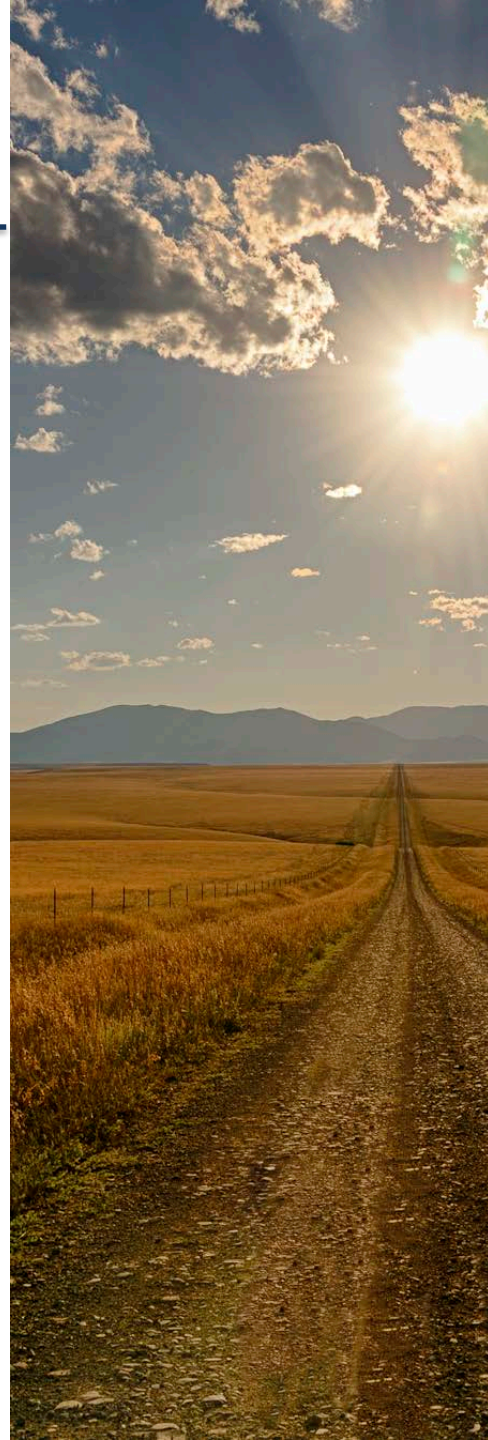
- Only 64 of 275 papers (23%) adequately reported stocking rate and grazing strategy.
- Could not differentiate intensive from extensive rotation.
- Limited capacity to assess how site factors such as climate, soil, and plant community interact with grazing.



Working Lands

We need to work on:

- Shared goals – good outcomes are interconnected.
- Increased collaboration.
- Embedding on-the-ground research at appropriate scales, on social-economic-ecological outcomes.
- Flexibility, adaptation, and innovation to achieve shared goals in a changing world.



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