Can the Current Rangeland Research Agenda Resolve Future Challenges?

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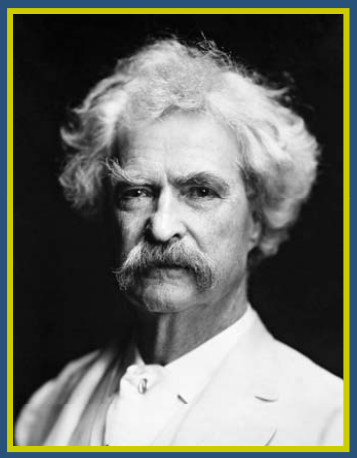
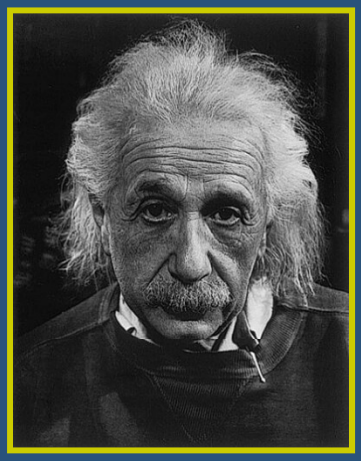
Reflections on Human Nature

- "It's what we know that *ain't so* that gets us in trouble"

  - *Mark Twain*

- "Insanity is doing the same thing over and over again and expecting different results"
  – *Albert Einstein*





Presentation Objectives

- Future research environment
  - Increasing complexity and uncertainty
- Limits of current research agenda
  - Experimental grazing research
  - Lessons from USDA NRCS CEAP
- Future research agenda
  - Navigate greater complexity and uncertainty
  - Inform management and policy on ‘big questions’
- Participant discussion welcomed!

Future Research Environment

- Major change drivers
  - Climate change
  - Woody and invasive species
  - Land fragmentation
  - Human population growth
- Tradeoffs between goods and services
- Increased collaborative research
- Greater accountability to society

Current Research Agenda

- *Researcher driven*
  - Define problem, design and conduct experiments, publish results, compute ‘h index’.
  - Necessary to establish ecological benchmarks, processes and relationships.
- Insufficient when addressing complex rather than simple problems
  - Unable to address the ‘big questions’
  - Limits scientific impact and advocacy

Simple vs Complex Problems

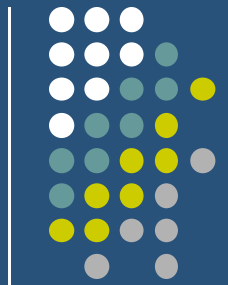
- Simple problems – predictable linear relationships between management and ecological outcomes
- Narrowly focused technical prescriptions are characteristic of rangeland management
  - Learning has been severely constrained
  - Collaborative management restricted

Boyd & Svejcar REM 2009

Needs for a New Agenda

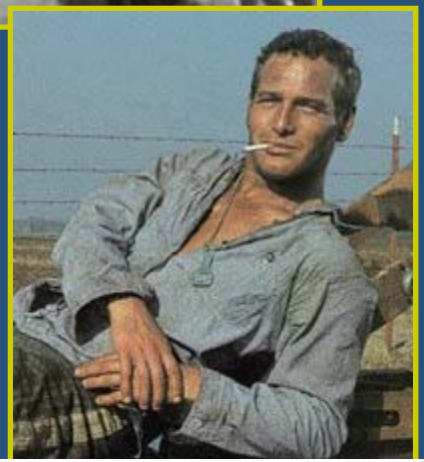
- Capacity to produce more relevant knowledge to support rangeland stewardship.
  - Candid assessment of the nature and limits of scientific knowledge
  - Agenda more inclusive of human dimensions
  - Reevaluation of the relationships between management, science and policy
  - Promote social capacity for learning and adaptation

Limits of Current Research



- Experimental grazing research
  - Research inconsistent with management perception
  - Rigorously investigated topic with consistent data
  - Ecological benefits of rotational grazing minimal
- Why has the debate persisted?
  - Simple problem – does rotational grazing work?
  - Ecological variables and processes emphasized
  - Human dimensions largely excluded
- Human-ecological relations knowledge gap

“A Failure to Communicate”



- Grazing debate *intractable* when formulated as a simple problem.
- Evidence supporting and refuting rotational grazing is *complementary*, *not contradictory in broader view.*
- Grazing systems may support management decisions without effecting ecological processes.
  - Management vs ecological function
  - Role of human perceptions

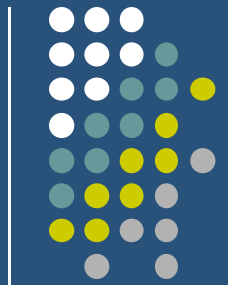
USDA-NRCS CEAP INITIATIVE

Conservation Systems	Resource concerns by Region							
	Soil	Plants	Animals wild	Animals domestic	Water	Air	Landscape	Economic and Social (Ecosystem Services)
Prescribed Grazing								
Prescribed Burning								
Brush Management								
Rangeland planting								
Riparian herbaceous cover								
Upland Wildlife Habitat Management								
Pest Management (plants, insects)								

Lessons from CEAP Synthesis

- Conservation based on sound science, but can not determine magnitude or trend of benefits realized.
- Why can't we unequivocally address this issue?
  - Insufficient monitoring of conservation outcomes
  - Science and management are unique endeavors making integration difficult
  - Research emphasizes ecological components but significant social and economic gaps exists
  - Inability to estimate costs of averting degradation and ecosystem services realized

CEAP Cross Cutting Issues

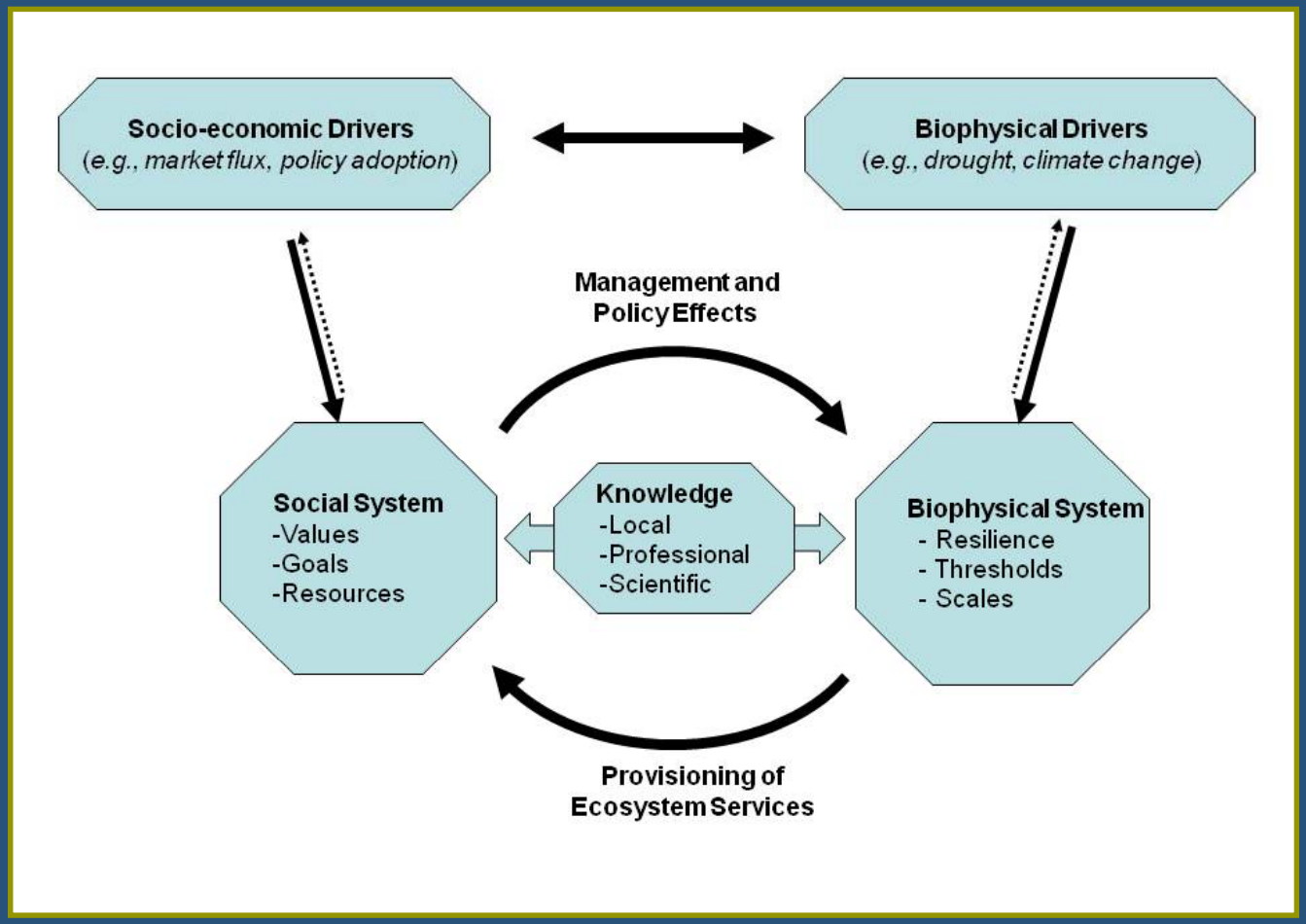


- Socioeconomics
  - Valuation of non-market services reqiured
  - Conservation undervalued without them
  - Social metrics and indicators required
- Landscape Analysis
  - Link conservation to existing national data bases
  - Support assessment at relevant scales
  - Target sites with greatest probability for success

Future Research Agenda

- Envision rangelands as complex adaptive systems
  - Complex rather than simple problems
- Promote adaptive management
  - Monitoring and collaborative learning are essential
- Management-Research-Policy partnerships
  - Most relevant knowledge source
- Leverage federal, private and academic sectors to develop a more integrated research agenda

Complex Adaptive Systems

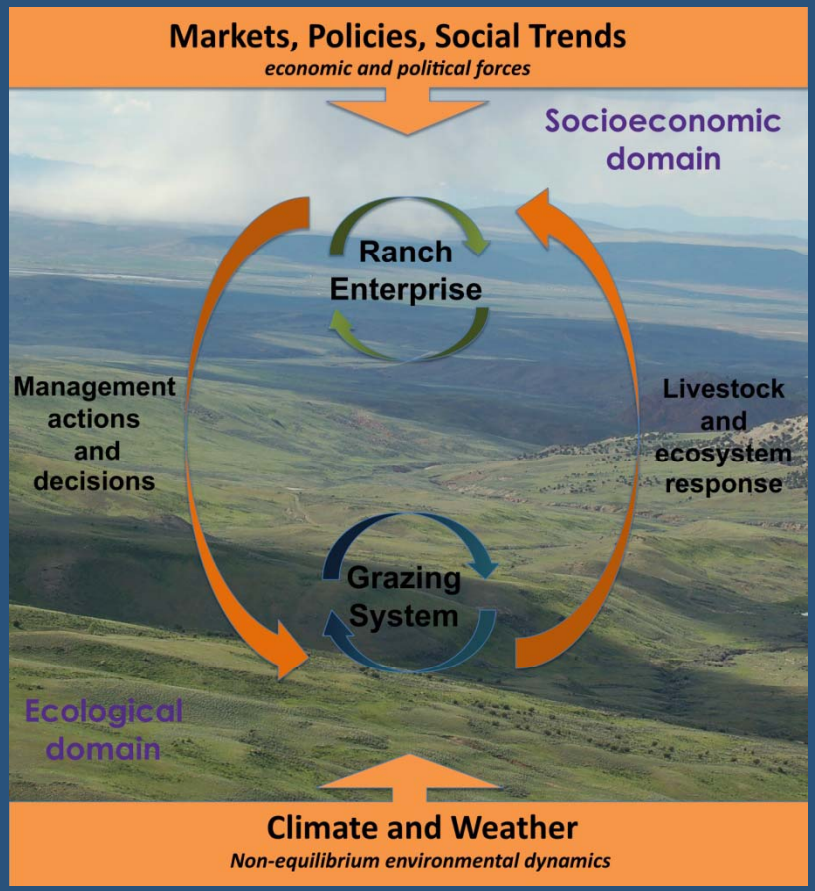


Adaptive Management

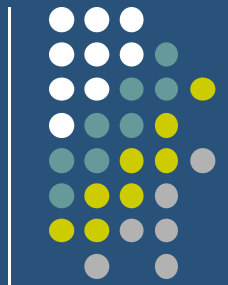
- May support more rapid development of relevant knowledge than traditional research.
  - Shared management objectives and research questions
  - Design practical and scientifically robust management plans
  - Collaboratively interpret monitoring results and outcomes
  - Modify current management to effectively achieve goals

Evidence for “Zen of Change”

- Transdisciplinary RFPs NSF and NIFA – 2000
- Millennium Ecosystem Assessment 2005
- Intergovernmental Panel Climate Change – 2007
- New Biology for 21st Century – NRC 2009



Agenda Implementation



- Recognize limitations and consequences
  - Cost of doing business as usual
- Establish priority programs for ‘big questions’
  - Integration within and among programs
  - Solicit trans-disciplinary expertise
- Formalize and reward management- research-policy partnerships
  - Design research relevant to society
  - Provide incentives for diverse partnerships

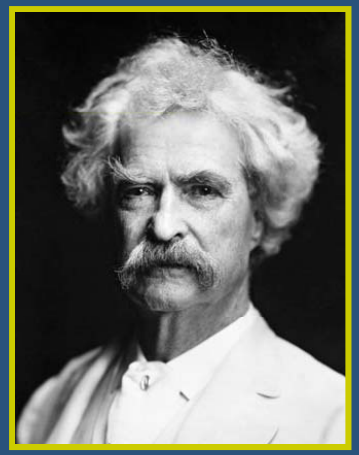
Constraints to A New Agenda

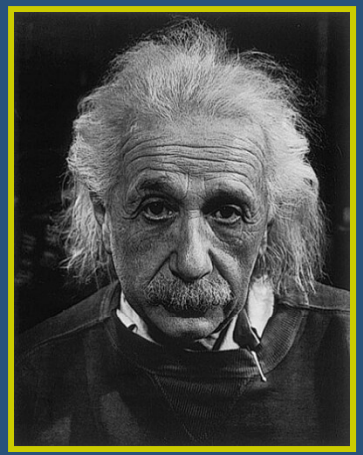
- Few incentives to build coherent scientific constructs at management relevant scales
- Research emphasizes precision and not functional realism
- Controlled, replicated experiments limited in complex adaptive systems
- 'Boundary positions' are difficult to maintain

Ludwig et. al. 1993 Science 260:17
Baskerville 1997 Cons. Ecol. 1:9

Discussion Points

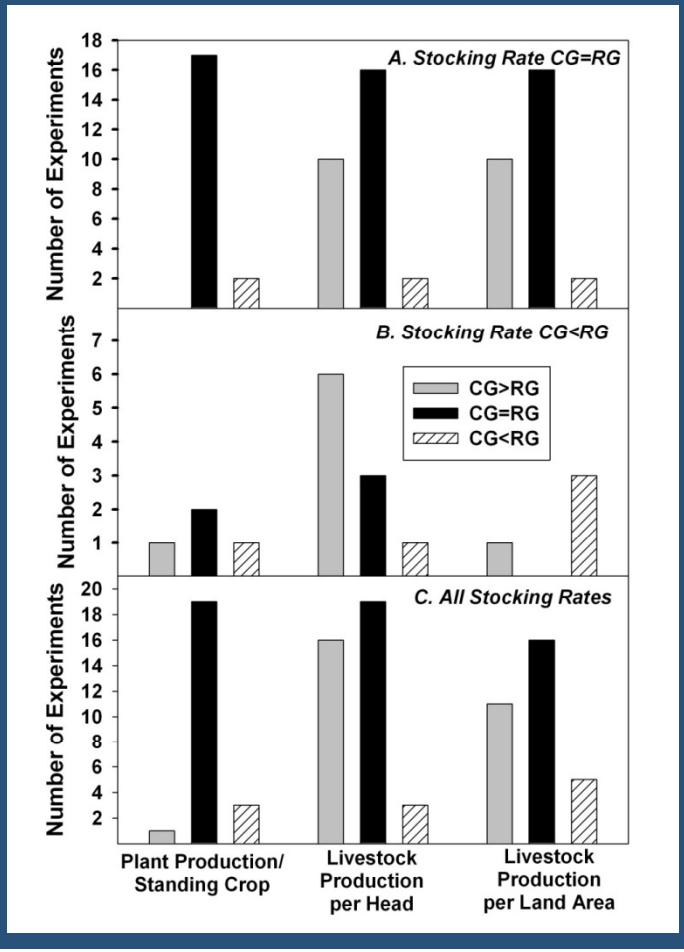
- Research agenda at it's limits?
- What modifications are required?
- Road map for implementation?
- Research community sufficiently engaged?





Experimental Data

Majority (84-92%) of experiments show no advantage of rotational grazing for plant and animal production.



Suggests ecological processes are minimally effected by grazing systems.

Briske et al. 2008