

Managing Knowledge, People, and Natural Resources to Provide Ecosystem Services

David D. Briske

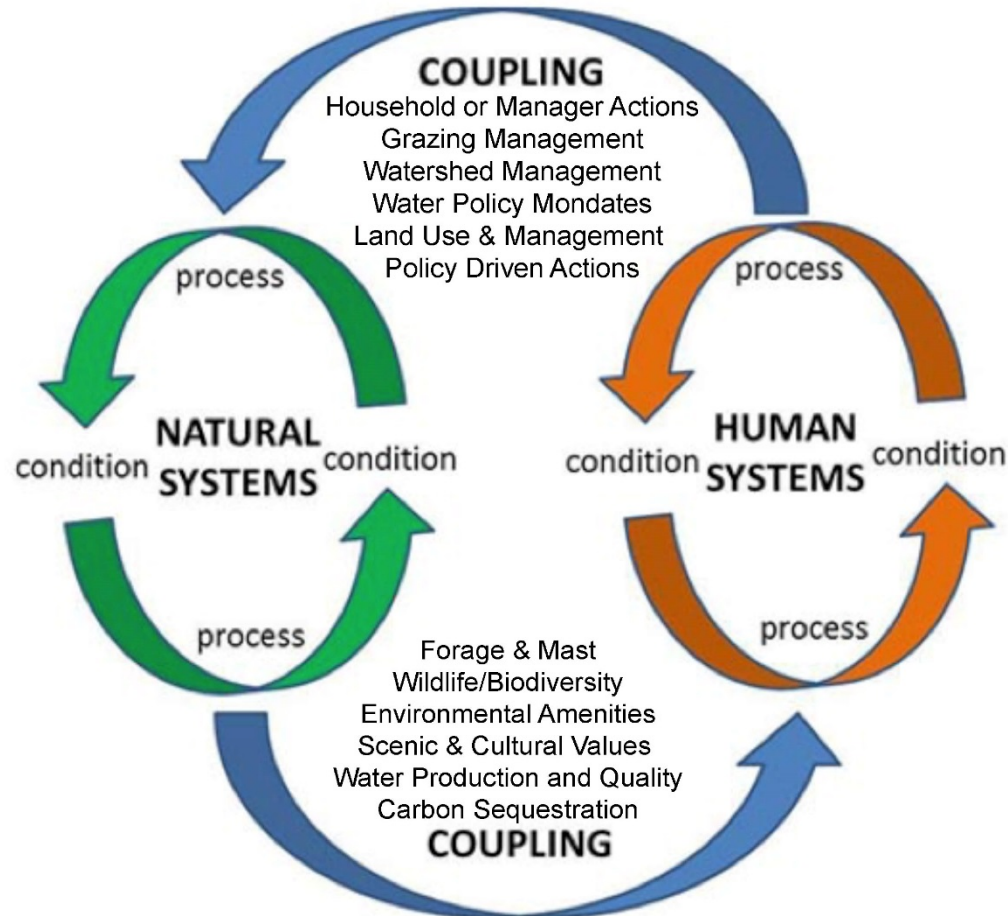
Ecosystem Science & Management

Texas A&M University

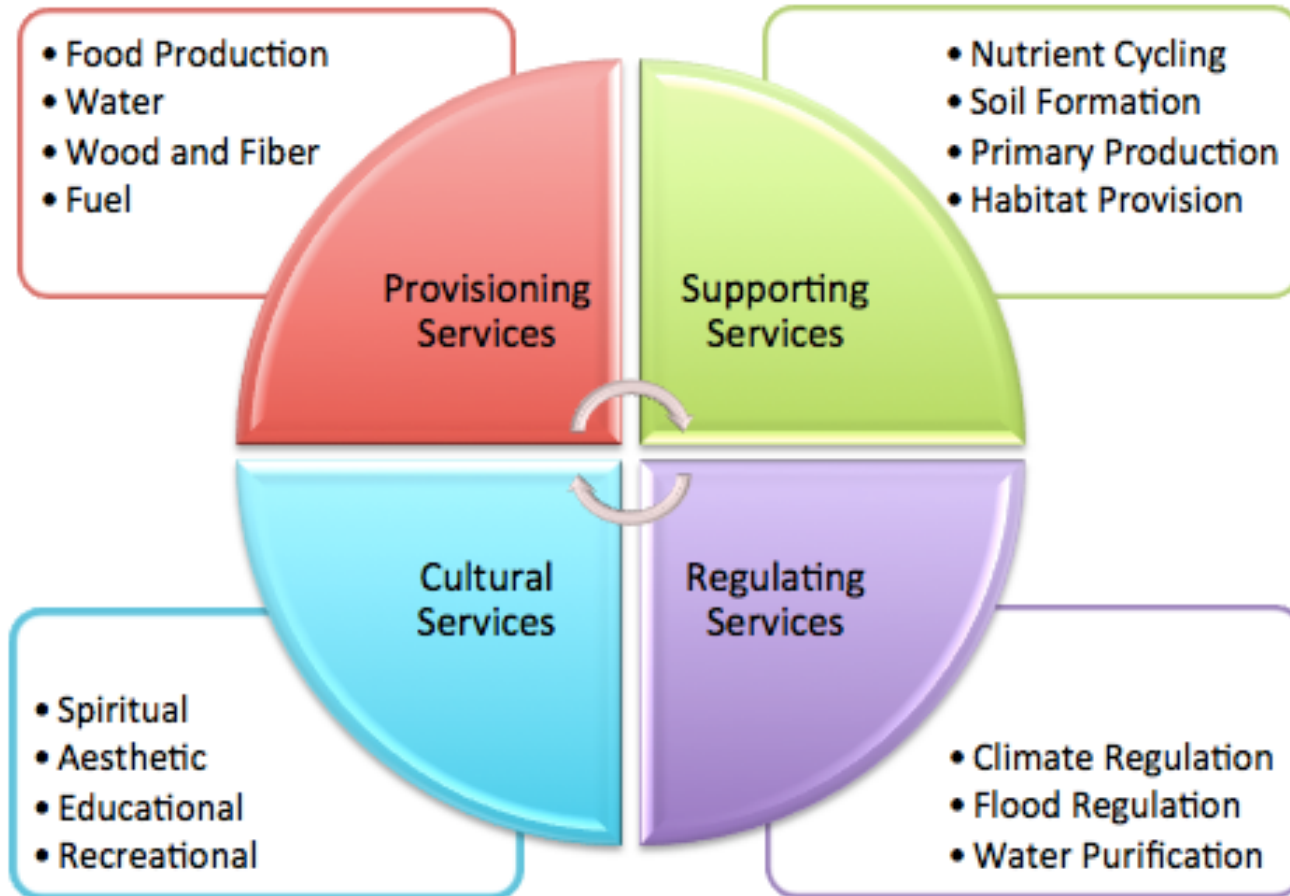
**America's Grasslands: Partnerships for
Grassland Conservation**



Social-Ecological System

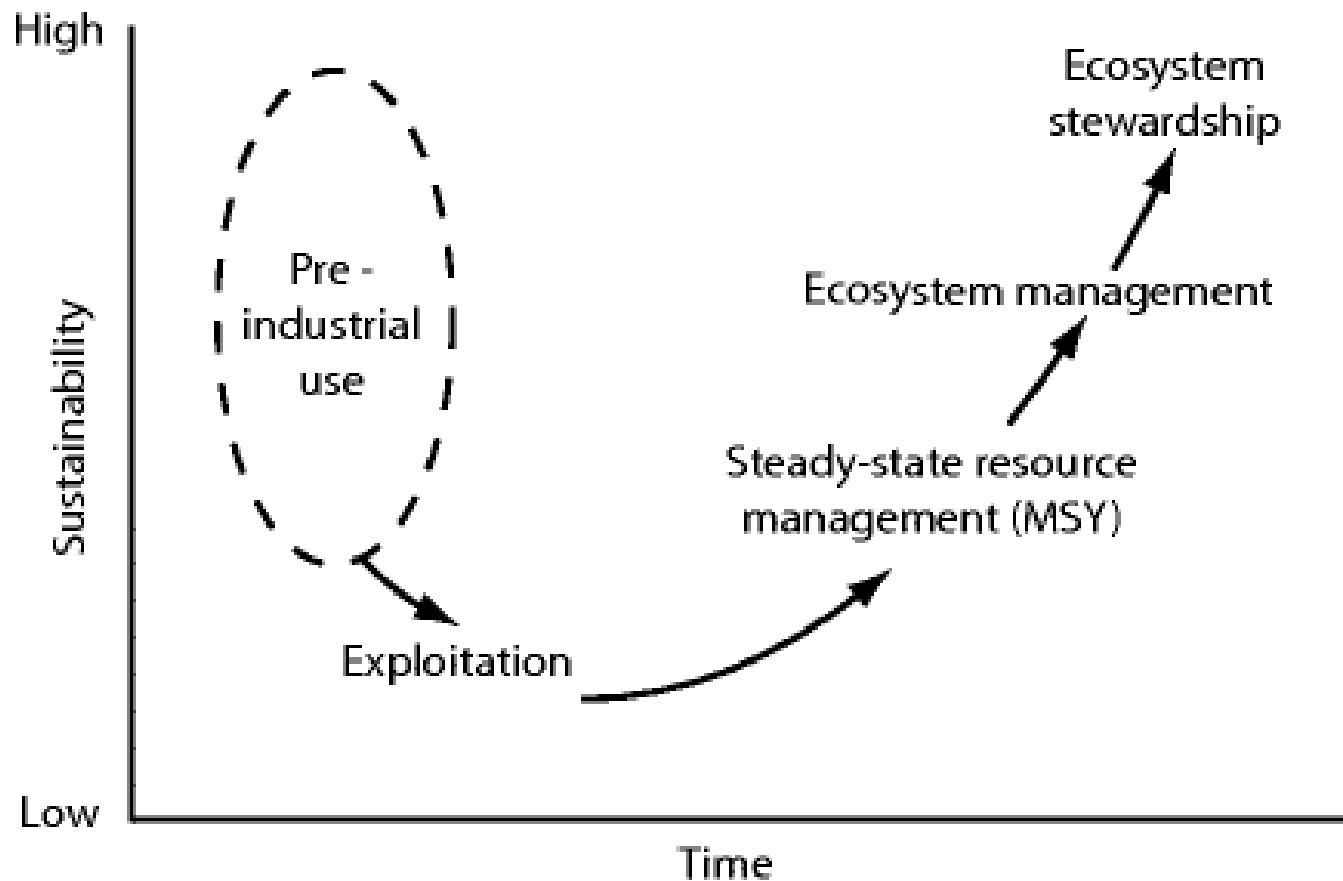


Ecosystem Service Categories



Source: Millenium Ecosystem Assessment, 2005.

NR Management Models

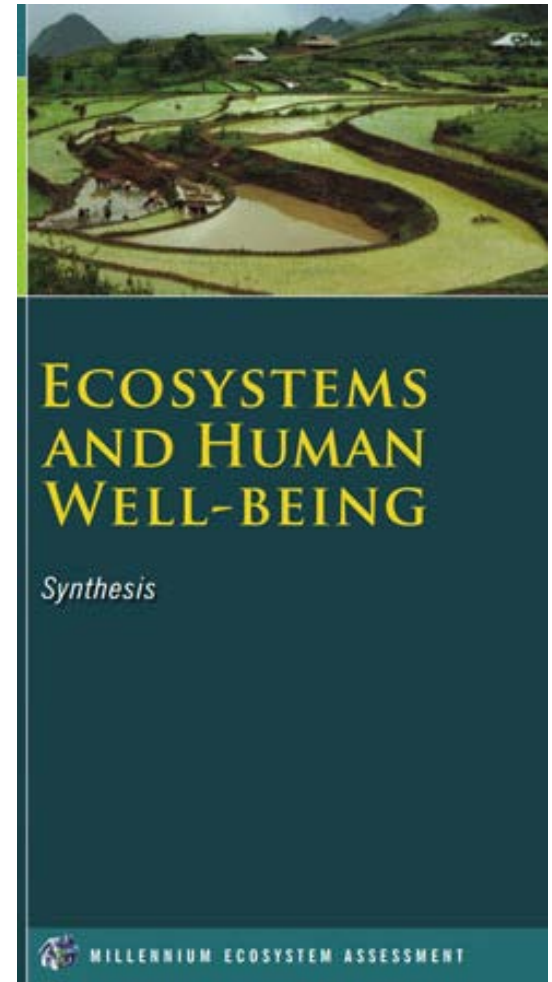


Resource Management Models

- **Steady state** - maximum sustainable yield of few provisioning services by minimizing system variability and maximizing production efficiency.
- **Ecosystem Management** - considers a greater number services and management responses to growing environmental concerns, especially on public lands.
- **Command and control management** strategy is central to both models.

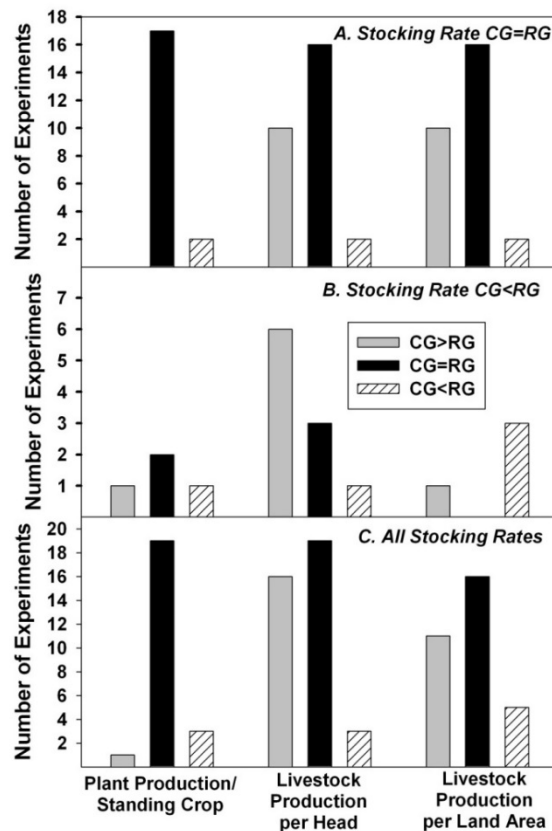
Millennium Ecosystem Assessment

- Assess Earth's ecosystems
 - ✓ 1360 scientists; 95 countries
 - ✓ 4 yr preparation; 2001 – 2005
- **20 of 24 ecosystem services degraded in past 50 years**
 - ✓ Water quality & quantity
 - ✓ Erosion regulation
 - ✓ Pest regulation
 - ✓ Natural hazards regulation



Intensive Rotational Grazing

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.

Some researchers, consultants and managers consider IRG to be of value.

Ecological processes often implicated over management effectiveness.

USDA Rangeland CEAP Assessment

- Team of 40 scientists and 30 USDA-NRCS partners over a 4 year period (2008-2011).
- Assess the intended benefits derived from USDA cost-share program for major rangeland conservation practices.
- Minimal evidence exists to support the occurrence of conservation benefits.
- Uncertain whether benefits did not occur or could not be detected.

Reflection: What Did We Learn?



Resilience-based Management

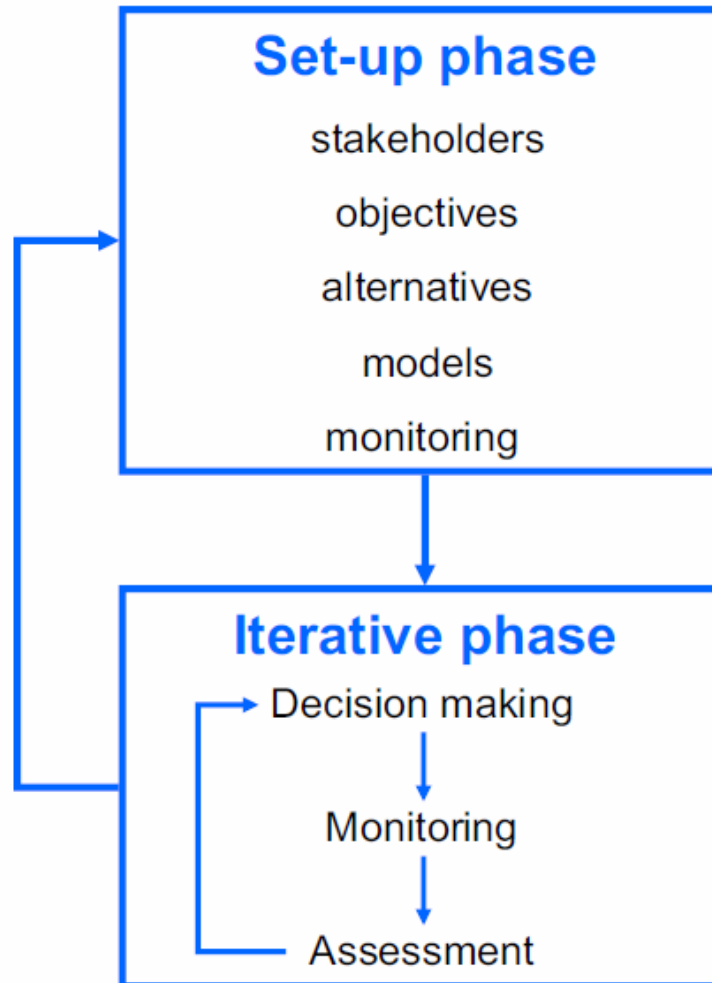
Strategies that support human well-being by maintaining provision of ecosystem services in changing conditions.

- Anticipate and guide change to benefit society
- Diverse ecosystem services acknowledged
- Sustainability valued over production efficiency
- Social-ecological systems framework emphasized
- **Implemented through adaptive management.**

Adaptive Management

- Systematic approach for improving natural resource management by learning from management outcomes.
- **Combining the need for management action with a plan for learning.**
- Management decisions treated as experiments that are monitored to increase knowledge of **both** the system and the management actions.
- Represents the implementation of ‘resilience thinking’.

Two Phase Learning



Knowledge Feedback Loops

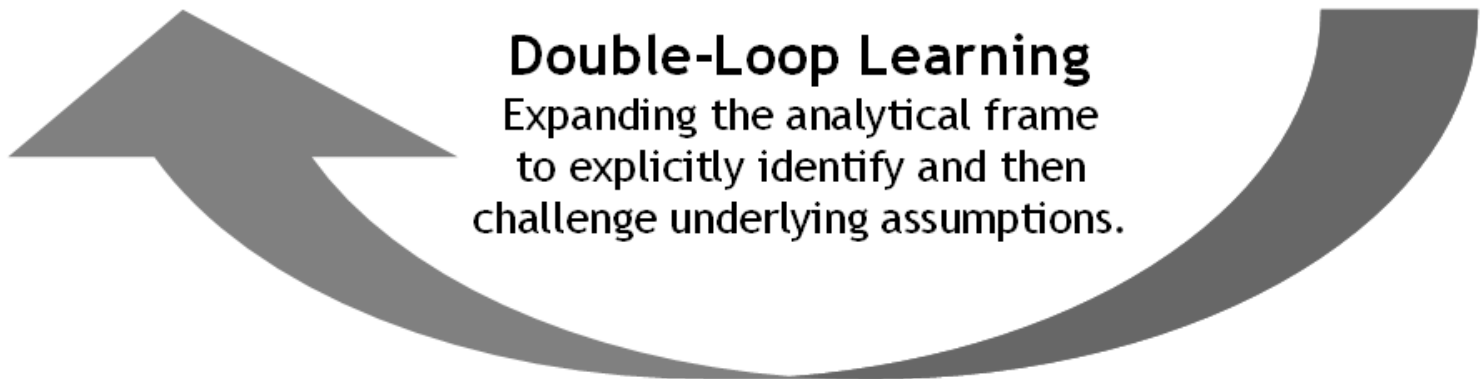
Most Learning (Single-Loop)

Improvement within an existing system that rests on unchallenged assumptions that are implicit and unchallenged.



Double-Loop Learning

Expanding the analytical frame to explicitly identify and then challenge underlying assumptions.



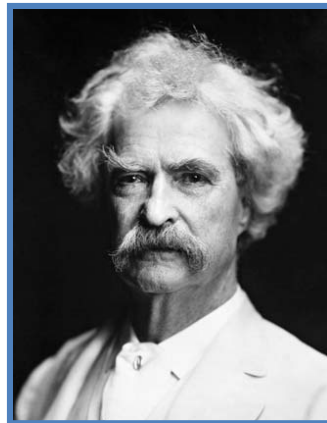
Limited Success of AM

AM viewed as **valuable** approach to NRM, but **success** have been elusive.

- Absence of effective leadership and commitment.
- Appropriate stakeholders not engaged from outset.
- Focus on planning, but actions not implemented.
- Management actions difficult to implement.
- Resource problem may be inappropriate for AM.

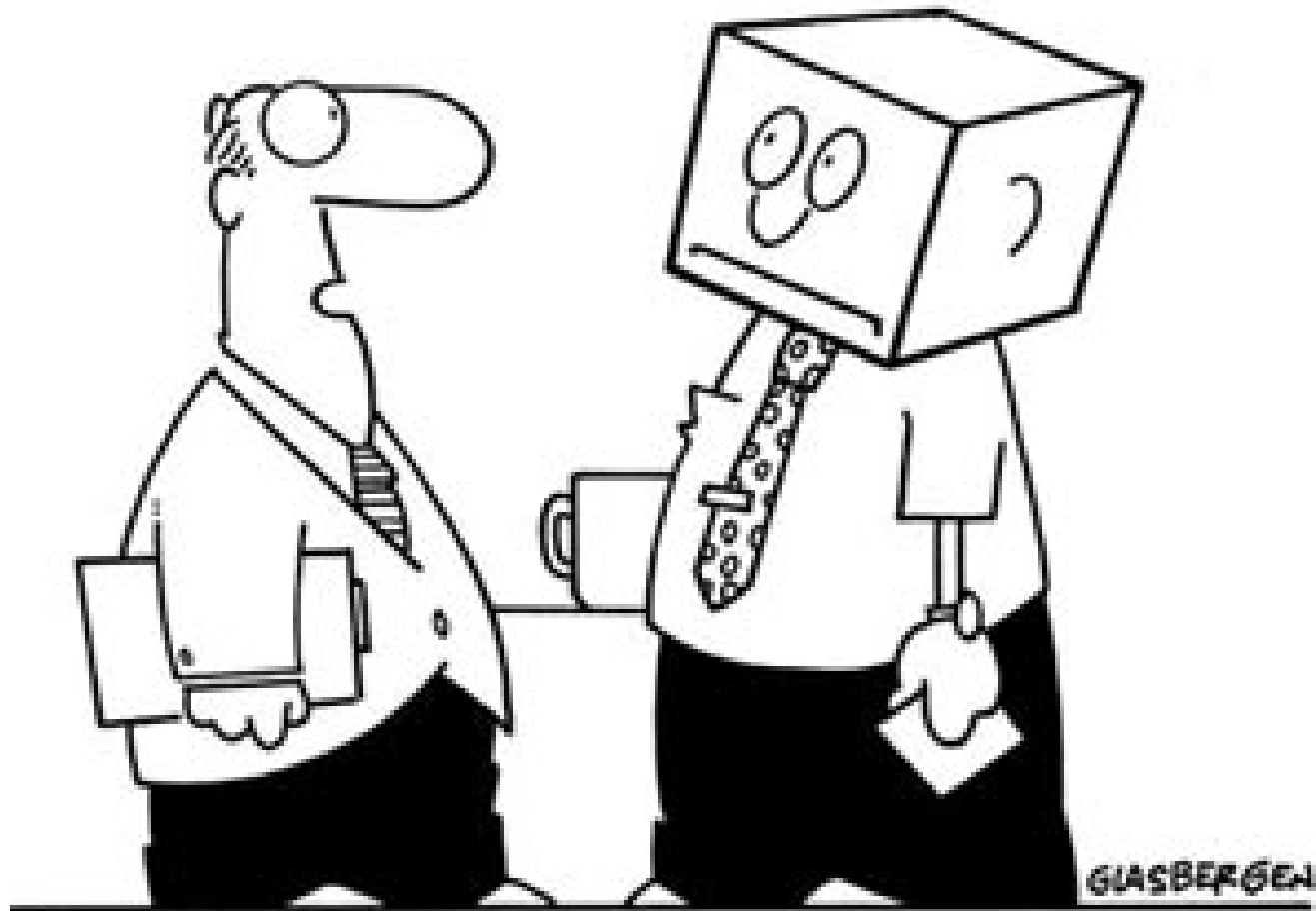
Conceptual Limitations of CAM

- Insufficient awareness of human cognition.
 - ✓ How problems are conceived
 - ✓ Learning from experience
 - ✓ Engagement in collaborative processes
- Trust-based collaboration is key to problem solving.



“It’s what we know that *ain’t so* that gets us in trouble” – *Mark Twain*

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Prolonged IRG Controversy

Inability to collectively evaluate and interpret management and scientific knowledge.

- Confusion regarding contributions of grazing management and grazing systems.
- Minimal documentation of adaptive management in grazed ecosystems.
- Scientific knowledge accurate, but incomplete.
- Limited objective dialogue and trust between managers and scientists.

Rangeland CEAP

- Minimal monitoring of management outcomes
 - ✓ Value considered self-evident
- Limited exchange of science & management knowledge
 - ✓ Scientific knowledge most visible, but both underrepresented
- Scientific research is often not management relevant
 - ✓ Improper scale or emphasis on management challenges
- Insufficient recognition of human-ecological systems
 - ✓ Decisions made with incomplete information

Strategies to Promote AM

- Co-ownership of natural resource problems among managers, scientists, and decision makers.
 - ✓ Recognize importance of these partnerships
 - ✓ Incentivize the adaptive management process
- Tools and guidelines to increase efficacy of AM.
- Conservation Practices Assessment Network
 - ✓ Enhance evidence-based management
 - ✓ Similar to the Ecological Site Information System