

Rangeland CEAP Literature Synthesis: Conclusions and Recommendations

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Goals of Rangeland CEAP

- Evaluate **effectiveness** of NRCS rangeland conservation practices
- Provide **recommendations** to improve conservation practices
- Identifying critical **knowledge gaps** in research supporting conservation practices
- Inform **policy decisions** based on status of current experimental knowledge

Conservation Practice Matrix

CONSERVATION SYSTEMS	Natural Resource Topics							
	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)								

Prescribed Grazing Purposes

Improve or maintain the health and **vigor of plant communities**.

Improve or maintain quantity and **quality of forage** for livestock health and productivity.

Improve or maintain **water quality and quantity**.

Reduce accelerated **soil erosion**, and maintain or improve soil condition.

Improve or maintain the quantity and quality of food and/or cover available for **wildlife**.

Promote **economic stability** through grazing land sustainability.

Prescribed Grazing Assessment

- All NRCS conservation purposes can effectively be realized with current practices.
- Reprioritization of conservation planning recommended to convey greater benefits
 - Greater emphasis on management effectiveness i.e., guidelines, tools, and incentives
 - Regular and frequent monitoring to assess short and long-term benefits of these practices



Stocking Rate Important

- Stocking rate single most important management variable
- Forage inventory procedures to ensure that stocking rate tracks sustainable grazing intensities.
 - Estimation of residual biomass
 - Develop forage production curves
 - Short and long-term drought forecasts
- Contribution of adaptive management to forage inventory unknown.
 - Effectiveness
 - Procedures
 - Limitations

Role of Grazing Systems

- **Secondary importance** to stocking rate and weather variation.
- Supported by plant and animal production, species community composition, soil surface hydrological, and wildlife habitat evaluations of grazing systems.
- Evidence indicates that **ecological processes** are not directly modified by grazing systems.
- Role of grazing systems on management are unknown; likely that benefits can be realized from improved management.
- **Effective management appears to trump grazing systems.**
- **These experimental results remain controversial.**

Unfortunate Misunderstanding

- We **talk past** each other without learning.
- Debate about grazing **systems vs management**.
- Researchers **minimizes** management in experiments while ranchers **maximize** it to achieve goals.
- Experimental evidence indicates minimal **ecological value** of grazing systems when management input is excluded.
- **Conclusion**: Effective management is more important than grazing system.

Rangeland Seeding Purposes

Restore natural plant community balance.

Create desired plant communities.

Restore desired vegetative cover to **protect soils**, control erosion, reduce sediment, improve water quality and quantity, and enhance stream flow.

Maintain or enhance **wildlife habitat** including that associated with threatened and endangered species.

Improve forage accessibility, quality and quantity for livestock.

Protect life and property from wildfire hazards.

Rangeland Seeding Assessment

- Range planting **purposes were consistent** with the experimental data.
- **Drilled-seed** better than broadcast seed (73% of studies)
- **Mulch** improved establishment (62% of studies)
- **High seeding rate** improved establishment (79% of studies)
- **Weed control** valuable for establishment (95% of studies)
- **Fall superior** to spring planting in Great Basin (73% of studies)

Favorable Rainfall Essential

- Major conclusions that climatic must be favorable in establishment year.
- 90% of studies reported one successful planting treatment.
- 89% with average or above-average precipitation in establishment year.
- 50% of studies reported favorable rainfall during establishment phase of dry year.
- Seedbed preparation, planting-depth, planting-season and seeding-rate recommendations **unimportant in very dry**, and perhaps very wet years.

Restoration Strategies

- Restoration objectives may require multiple-year strategies.
 - Initially establish non-native species for soil stabilization.
 - Complete restoration goals on stabilized site.
- Environmental quality benefits only poorly documented; emphasis placed on first-year establishment success.



Prescribed Burning Purposes

Control **undesirable** vegetation.

Prepare sites for harvesting, planting or seeding.

Control plant disease.

Reduce **wildfire hazards**.

Improve **wildlife habitat**.

Improve **plant production** quantity and/or quality.

Remove slash and debris.

Enhance seed and seedling production.

Facilitate **distribution of grazing** and browsing animals.

Restore and maintain ecological sites.

Prescribed Burning Assessment

- Conservation purposes only **partially supported** by experimental data.
- Management of **woody plant invasion** is a consistent effect of burning, but fire does not reverse all invasions.
- Burning effective in influencing **livestock distribution**.
- Negative effects on some herbaceous species year of fire, but **recover in 2-3 yrs** regardless of season of burning.
- **Conclusions consistent** in Great Plains, Intermountain West and Desert Southwest.

Fire Applications Data Limited

- Application limited by **size and duration of burn** studies; small plots (<1ha), short-term (< 3 yrs), and a single burn (87% studies).
- Time since **previous fire** (4% studies).
- **Insufficient description** of conditions pre-, post- and during the fire.
- Minimal interaction with **other disturbances** i.e., grazing in 13.3 % of fire studies.
- Limited application to **management decisions** on complex landscapes.

Invasive Plants Purposes

- Enhance quantity and quality of commodities.
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- Minimize **negative impacts** of pest control on soil resources, water resources, air resources, plant resources, animal resources and/or humans.
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Invasive Plant Assessment

- Conservation purposes **weakly supported**.
- Invasive plant management encumbered by:
 - Lack of **early detection** techniques
 - **Ineffective eradication** efforts once new infestations are identified.
 - Herbicides provided **short-term control** for many species, but rapidly return without additional management.
 - Minimal success of **biological control**.
 - Timing, intensity and frequency of **grazing** known for only few invasive weed species.

Post-Control Restoration

- Restoration of invasive plant communities successful about 20% of time
 - when non-native plant material is seeded
 - less where native species are seeded
- Most management strategies have a high risk of failure in the long-term.
- Long-term invasive plant management information is lacking.

Needs to Fulfill CEAP

- **Greater monitoring** of environmental effects of conservation practices to determine success and improve effectiveness.
 - Research
 - Agencies
 - Managers
- Greater knowledge of the contribution of **adaptive management** to conservation success.
 - Manager participation required
 - Shared decision making process
 - Implement unfamiliar management practices
- **Solution: Manager-agency-research partnerships.**

CEAP Implications

- **Improve conservation** practice standards and planning based on best available experimental data.
- Incorporate greater **environmental quality** concerns into conservation planning as requested by CEAP.
- Develop effective **management-science partnerships** to promote effective conservation programs.
- Direct research to focus on more **relevant management** concerns.
- **Managers and society are the ultimate benefactors!**

Knowledge Gaps-Rangeland Seeding

- Technologies to apply weather forecasts for planting decisions.
 - Long-range weather forecast
 - Historical weather and seeding data
 - Probability of favorable-establishment years

Knowledge Gaps - Prescribed Grazing

- Effects on more ecosystem processes and services.
- Ecosystem restoration and conservation strategies.
- Contributions of adaptive management decisions.
- Evaluation of larger scale ecosystem responses.
- Integration of information within complex ecosystems.

Knowledge Gaps-Prescribed Burning

- Long-term effects of burning and successive fires.
- Interaction with associated disturbances.
- Large scale ecosystem effects.
- Greater emphasis on fire as an integrated part of managed ecosystems.



Knowledge Gaps-Invasive Plants

- Effective **early detection** and eradication procedures
- Ability of **grazing** to suppress invasive species
- Information to minimize **negative effects** of control strategies on non-target species and resources
- Assessment of **costs and benefits** achieved by invasive plant management.