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CEAP: Prescribed Grazing

- JD Derner, ARS, High Plains Grassland Stat.
  - Plant and livestock production
- DM Milchunas, FRWS, Colorado State Univ.
  - Game and non-game wildlife
- KW Tate, Plant Sciences, UC-Davis
  - Soil surface hydrology
- DD Briske, ESSM,Texas A&M University
  - Plant response and grazing patterns

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Writing Team Approach

- Considered anticipated benefits of NRCS Conservation Practice Guidelines hypotheses
- Evaluated benefits against experimental data
  - Many strongly supported
  - Some strongly refuted
  - Others equivocal or uninvestigated
- Vet experimental data with experiential information in the next step
- Improve conservation practice planning and assessment

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Presumed Practice Benefits

- Managing harvest of vegetation with animals
- Improve or maintain these ecosystem components:
  - Desired species composition and plant vigor
  - Forage quantity and quality for herbivores
  - Surface and subsurface water quality and quantity
  - Soil condition and conservation
  - Quantity and quality of wildlife habitat

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Information Evaluated

- Extant literature is narrowly focused
- Stocking rate and grazing systems
  - Vegetation production
  - Livestock production
  - Soil surface hydrology
  - Wildlife
  - Knowledge gaps; experimental limitations
  - Broad recommendations

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Plant & Animal Production - SR

- Stocking rate is a major determinant of vegetation and animal production.
- Plant biomass exhibits stronger relationship with stocking rate than plant cover.
- Consistent tradeoff between animal production and increasing stocking rate.
- Soil organic carbon largely unaffected by stocking rate
  - More apparent in grazed vs ungrazed

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Tiller Defoliation Pattern - SR

- Defoliation frequency increases with stocking rate (8 of 9 studies)
- Defoliation intensity increases with stocking rate, but not proportionately to frequency (4 of 5 studies)

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Plant Defoliation Response

- Seasonal effects: midseason (culm elongation) > late season > early season (vegetative) (6 of 9 studies)
- Growth suppressed by increasing frequency and intensity of defoliation at any stage (5 of 6 studies)
- Eight of 12 studies defoliation height $\leq$ 6 cm
- Questionable application to real systems

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Forage Quality

- Stocking rate
  - FQ < with SR in all 4 studies
  - FQ < with grazing time in all 3 studies
- Grazing systems
  - CG ≥ RG in 3 of 4 studies
- Grass quality
  - DMD: 40 – 66% (n = 27)
  - CP: 5 – 15% (n = 28)
  - C3 grasses higher FQ than C4

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Soil Surface Hydrology - SR

- Stocking rate is a major determinate of hydrological function
- Hydrological function decreases with increasing stocking rate

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Wildlife - SR

- Few studies conducted with multiple SR (10)
- Bird and small mammal responses both increase and decrease with SR
  - Bird diversity ↓ SR, total abundance unclear
  - Small mammal diversity ↓ SR, total abundance unclear
- Impact on vegetation structure > food sources
- Livestock diet overlap greatest with elk than deer or pronghorn antelope

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Plant & Animal Production - GS

- Primary Production
  - CG ≥ RG 87% (20/23 investigations)
- Secondary Production
  - CG > RG 92% (35/38 investigations) per head production
  - CG > RG 84% (27/32 investigations) per area production
- GS does not influence ecological function of grazed ecosystems

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Realistic Experimentation

- Attributes of most effective studies:
  - Duration: 10 studies > 10 yrs
  - Pasture size: 5 studies > 100 ha
  - Pasture number: 9 studies > 8
- Strong ecological inferences, but adaptive management removed.

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Tiller Defoliation Pattern - GS

- Defoliation frequency: CG ≥ RG in 3 studies; CG < RG in 1 study
- Intensity: CG = RG in 2 studies; CG < RG in 1 study
- Agrees with international literature (Gammon and Roberts 1978)
- Small scale experiments; RG pastures < 1 ha in 3 of 4 studies

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Defoliation Uniformity vs Frequency

- Multiple defoliations recorded in single grazing cycle; (9 of 10 studies)
- 80% ≥ tiller defoliation has been recorded in majority of studies
- Regrazing occurs early in grazing cycle; (4 of 6 studies support)
- Questions assumption of high tiller utilization with only one defoliation per grazing cycle

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Soil Surface Hydrology - GS

- Grazing system does not ameliorate negative consequences of increasing stocking rate.
- At moderate stocking, 3 studies show RG > CG and three show RG = CG.
- Range condition or state change required to improve hydrologic function.

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Wildlife - GS

- Results over all wildlife groups
  - CG ≥ RG in 25 or 30 studies
  - Sharp-tailed grouse (n=5)
  - Ducking nesting (n=3)
  - Deer use (CG > GR in 10/13 studies)
  - Sage grouse (no valid comparisons)
- Ranch operations not well represented
  - Refuges, wildlife management areas

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Knowledge Gaps

- Assessment of ecosystem functions and services
  - biodiversity, C sequestration, functional groups.
- Contribution of adaptive management decisions
  - human decisions, goals and values
- Recovery and conservation strategies
  - Season and length of deferment
- Larger scale responses
  - watersheds, landscapes, entire ranches

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Recommendations

- Stocking rate requires greater emphasis
  - drought management, forage inventory
- Rotational grazing requires reevaluation
  - assumptions unsupported; data needed
  - Symposia Wed am and Thursday am
- Monitor efficacy of conservation practices
  - beyond implementation phase
- Practice implementation vs ecosystem management and conservation
- Management-research linkages need to be strengthened