

Targeted Cattle Grazing to Enhance Sage-Grouse Brood-Rearing Habitat

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INTRODUCTION

Suboptimal brood-rearing habitat often limits greater sage-grouse (*Centrocercus urophasianus*) populations in western North America. In many mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) brood-rearing habitats, sagebrush is too dense (>10-25% canopy cover) and limits the understory forbs and arthropods that sage-grouse eat during summer. We investigated whether protein supplementation could concentrate cattle grazing or trampling during late fall to reduce mountain big sagebrush canopy cover and increase the diversity and abundance of forbs and arthropods.

METHODS

Study Area

Location: Beaverhead Mountains of southwestern Montana

- Habitat type: Mountain big sagebrush/Idaho fescue (*Festuca idahoensis*)
- Ecological site: Loamy (38-48 cm annual precipitation)
- Elevation: ~ 2100 m
- Slope: 4-10%
- Aspect: NE

Study Design

Randomized Complete Block in a Split-Split Plot Design

- Three, contiguous ~ 715-ha pastures (Fig. 1)
- One, 4-ha macroplot (i.e., block) per pasture; each macroplot with ≥ 30% canopy cover of mountain big sagebrush
- Eight, 78.5-m² circular microsites (5-m radius) per macroplot; 2 untreated microsites and 4 microsites treated with protein supplement (Fig. 2)

Grazing Application Fall 2015

- Three pastures grazed simultaneously for 14 days in mid-October
- 190-210 cows per pasture
 - Light stocking rate (0.12 AUM/ha)
- 14 supplement tubs per macroplot (Fig. 3)
 - Supplement tubs ~200lbs, 30% CP Crystalyx Biobarrels
- Cattle introduced to supplement upon entering pastures, thereafter no herding (Fig. 4)

Objectives

Evaluate Cattle Response

- Cattle diet composition (Bite Count Method and fecal microhistology)
- Perennial bunchgrass utilization (Grazed Class Method)
- Supplement intake (before and after tub weights; Fig. 5)

Evaluate Vegetation Response

- Herbaceous canopy cover and composition (Daubenmire Canopy Coverage Method; Fig. 6)
- Herbaceous diversity (species richness and Shannon Index)
- Shrub canopy cover (Line-Intercept Method)
- Ground cover (Point-Intercept Method)

Evaluate Arthropod Response

- Arthropod density (vacuum sampling and pitfall traps; Fig. 7)

Statistical Analysis

Analysis of Covariance

- Covariate = distance to nearest biobarrel
- Differences considered significant at $P \leq 0.10$

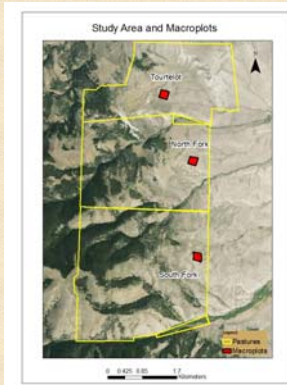


Figure 1. Study area.

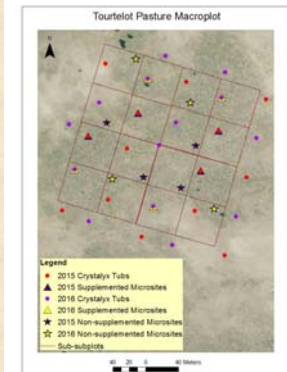


Figure 2. Microsite and biobarrel locations.



Figure 3. Macroplot and biobarrel pre-grazing.



Figure 4. Cattle introduced to supplement locations.



Figure 5. Treated microsite immediately after grazing in fall 2015.

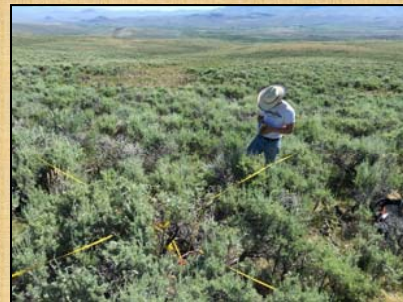


Figure 6. Vegetation sampling at non-treated microsite early summer 2016.



Figure 7. Arthropod sampling at treated microsite early summer 2016.

RESULTS

Cattle Response

- Supplement intake = 0.24 kg/day/cow
 - Similar to previous supplement studies (Fig. 8)
- Perennial bunchgrass utilization in macroplots: 12%
- Sagebrush canopy cover reduced by trampling, not browsing (Fig. 9)



Figure 8. Cattle consuming supplement.

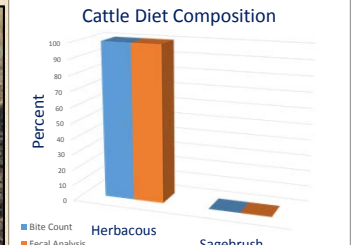


Figure 9. Cattle diet composition.

Vegetation Response

Response Variables	Supplement (mean ± SE)	No Supplement (mean ± SE)	P Value
Sagebrush Canopy Cover (%)	10.9 (2.5)	37.7 (3.0)	< 0.001
Forb Canopy Cover (%)	11.8 (1.2)	10.5 (1.5)	0.386
Forb Composition (%)	45.7 (4.6)	37.3 (4.6)	0.106
Forb Species Diversity	0.9 (0.1)	0.8 (0.1)	0.094
Forb Species Richness	3.6 (0.2)	3.1 (0.3)	0.044
Grass Canopy Cover (%)	13.7 (1.1)	17.3 (1.3)	0.049
Bare Ground (%)	18.6 (3.2)	5.9 (0.8)	0.007

- Mountain big sagebrush 71% less in supplement sites
- Forb species diversity 13% greater in supplement sites
- Forb species richness 16% greater in supplement sites
- Forb composition trended greater in supplement sites (45% vs. 32%)

Arthropod Response

Response Variables	Supplement (mean ± SE)	No Supplement (mean ± SE)	P Value
Arthropod Diversity (by Order)	1.1 (0.1)	1.2 (0.1)	0.437
Arthropod Richness (by Order)	6.3 (0.2)	6.3 (0.3)	0.162
Arthropod Total Density	59.5 (11.2)	63.8 (11.9)	0.317
Coleoptera Density	1.3 (0.3)	1.6 (0.3)	0.913
Hymenoptera Density	38.4 (10.5)	36.3 (11.2)	0.197
Lepidoptera Density	0.7 (0.1)	0.6 (0.1)	0.133
Orthoptera Density	0.1 (0.1)	0.1 (0.1)	0.586

- Lepidoptera density trended 18% greater in supplement sites

CONCLUSIONS

First-year results indicate that protein supplementation can concentrate cattle trampling and enhance sage-grouse brood-rearing habitat. Sagebrush canopy cover was reduced to brood-rearing requirement, while forb diversity, richness, and composition improved. First-year arthropod response was more limited than vegetation response. However, the density of Lepidoptera, which are important for sage-grouse chick survival, trended greater in supplement sites.