

# Annotated Bibliography: Cattle, Elk And Deer



## Annotated Bibliography: Effect of Livestock Grazing on Diet Quality and Habitat Use by Elk and Deer

### Effect of Livestock Grazing on Forage Quality for Elk or Deer

**Ganskopp, D.,L. Aguilera and M. Vavra. 2007. Livestock Forage Conditioning Among Six Northern Great Basin Grasses. *Range. Ecol. Manage.* 60:71–78.**

**Objectives:** Objectives were: 1) to evaluate late summer/early fall forage quality of crested wheatgrass, bluebunch wheatgrass, Idaho fescue, bottlebrush squirreltail, Thurber's needlegrass, and basin wildrye from ungrazed paddocks and paddocks grazed at vegetative, boot, and flowering; and 2) test hypotheses that post-grazing regrowth yields were correlated with soil moisture content when grazing occurred.

**Background:** Crop-year precipitation for 1997 and 1998 was 134% and 205% of average.

**Results:** Cattle grazing during vegetative, boot, or flowering improved late summer/early fall forage nutritional quality compared to ungrazed pastures. Youngest regrowth had the highest levels of protein and digestibility. In 1997, protein and digestibility means were 9.0% and 55% for regrowth of grasses following grazing after flowering, but no regrowth occurred after grazing at flowering in 1998. Also in 1998, protein and digestibility means from boot stage treatments were 5.5% and 47%, respectively. Grazing in vegetative, boot, and flowering in 1997 reduced late summer/early fall standing crop by 34%, 42%, and 58%; and 34%, 54%, and 100% in 1998. Effects of grazing were less for bluebunch wheatgrass

and crested wheatgrass than other grasses. Soil moisture content was a poor predictor of regrowth yields.

**Conclusion:** Managed cattle grazing can successfully enhance late season forage quality for wildlife.

**Ganskopp, D. T. Svejcar and M. Vavra. 2004. Livestock forage conditioning: Bluebunch wheatgrass, Idaho fescue, and bottlebrush squirreltail. *J. Range Manage.* 57:384-392.**

**Objectives:** Our objectives were: 1) to evaluate fall/winter nutritional indices of bluebunch wheatgrass, Idaho fescue, and bottlebrush squirreltail in ungrazed, lightly grazed (33% utilization), or heavily grazed (69% utilization) pastures stocked with cattle at the boot stage of growth; and 2) to quantify opportunity costs of applying those treatments on fall standing crop.

**Results:** Light and heavy spring grazing decreased September standing crop by 32 and 67% compared with ungrazed plots. Fall/winter crude protein (CP) content of heavily grazed grasses was an average of 3% higher than ungrazed controls for 11 of 12 comparisons. CP of lightly grazed grasses was higher than ungrazed controls for 6 of 12 comparisons. In fall/winter, herbage was most digestible in heavily grazed paddocks (59%), intermediate in lightly grazed paddocks (53%), and least digestible in ungrazed areas (49%). **Conclusion:** Light and heavy spring cattle grazing can augment fall/winter forage quality of bluebunch wheatgrass, Idaho fescue, and bottlebrush squirreltail. Spring grazing reduces forage biomass in fall/winter, but remaining forage will be nutritionally superior to plants in ungrazed stands.

**Short, J.J. and J.E. Knight. 2003. Fall grazing affects big game forage on rough fescue grasslands. *J. Range Manage.* 56: 213-217.**

**Objective:** Cattle grazing can enhance wildlife habitat. This study examined the effects of fall cattle grazing intensity on elk and deer forage the following spring and summer.

**Methods:** The study was located on rough fescue range. Cattle grazed pastures in the fall. Grazing levels were 0% removal, 50% removal, 70% removal, and 90% removal of grasses and forbs. To evaluate elk and deer forage quantity and biodiversity, measurements were obtained in spring and summer on green grass standing crop, green forb standing crop, percent green vegetation, species richness, and plant species composition.

**Results:** There were no differences among grazing levels for plant species composition based on canopy coverage, species richness, and green forb standing crop. The 50% and 90% treatments reduced green standing crop in spring but not in summer. Grazing treatments increased percent green vegetation.

**Conclusions:** Fall cattle grazing can be used as a wildlife habitat improvement tool to reduce unpalatable standing dead material. The 70% removal treatment was the most favorable for habitat improvement without degrading the range.

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**Clark, P.E., W.C. Kruger, L.D. Bryant and D.R. Thomas. 2000. Livestock grazing effects on forage quality of elk winter range. J. Range Manage. 53:97-105.**

**Objective:** The study examined the effects of sheep grazing in late-spring on: 1) winter standing dead, 2) crude protein, 3) digestibility, and 4) standing crop responses of bluebunch wheatgrass, Idaho fescue, and elk sedge. Grazing (50% utilization during boot stage) and exclusion treatments were applied to 50-acre plots at 3 sites on the study area.

**Results:** Grazing did not influence amount of dead material in bluebunch wheatgrass plants in winter. In grazed plots, crude protein and digestibility of bluebunch wheatgrass increased by 1.0 and 4.3 percentage points over ungrazed plots. Grazing reduced the standing crop of bluebunch wheatgrass by 104 lbs/acre DM. Grazing decreased standing dead of Idaho fescue decreased by 0.7 stems/plant. Crude protein of Idaho fescue in grazed plots was 1.3 percent greater than in ungrazed plots. Digestibility and crude protein responses of elk sedge were not consistent. Sheep grazing improved forage quality improvement in bluebunch wheatgrass and Idaho fescue and may benefit the nutritional status of wintering Rocky Mountain elk.

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**Wambolt, C.L., M.R. Frisina, K. S. Douglass, and H.W. Sherwood. 1997. Grazing effects on nutritional quality of bluebunch wheatgrass for elk. J. Range Manage. 50:503-506.**

**Objective:** Researchers studied how: 1) cattle grazing in the spring, 2) rest from cattle grazing for a full year, or 3) long-term rest affected the nutrient content of bluebunch wheatgrass.

**Study Site:** The bluebunch wheatgrass samples were collected from elk winter range on a three-pasture rest-

rotation grazing system and a pasture that was not grazed. The study was conducted 3 years over 4 seasons.

**Results:** Nitrogen (N) and phosphorus contents were generally greater in spring grazed regrowth pastures. However, spring grazing bluebunch wheatgrass did not improve its nutrient content for wildlife the following winter compared to nongrazed treatments.

**Conclusions:** During winter when elk were present, N, TDN, and digestibility were not different among the 3 treatments. Elk did not eat enough bluebunch wheatgrass to meet maintenance requirements for protein during the winter.

### **Effect of Cattle Grazing on Elk and Deer Use**

**Halstead, L.E., L.D. Howery, G.B. Ruyle, P.R. Krausman, and R. J. Steidl. 2002. Elk and cattle forage use under a specialized grazing system. J. Range Manage. 55: 360-366.**

**Background:** The Walker Basin Allotment grazing system in central Arizona is designed to allocate resource use under elk and cattle grazing. The grazing system was designed to promote acceptable levels of forage use by cattle on the half of the allotment and to rest the other half by attracting elk to pastures recently grazed by cattle.

**Objectives:** The objectives of our 2-year study were to determine whether the grazing system facilitated proper forage use as defined by recent forage use and residual stubble height guidelines (i.e., 30 to 40% use and an 8- to 10-cm stubble height) and whether the system rested one half of the allotment from elk and cattle grazing.

**Results:** Total elk and cattle forage use for western wheatgrass, the key forage species, was 32 and 61% in 1997 and 1998 and stubble heights were 11 and 10 cm. Cattle and elk forage use in 1998 was 61% exceeding the 30 to 40% use guidelines. However, mean end-of-year stubble height was never below 10 cm.

**Conclusions:** The grazing system did not provide half the allotment with complete rest; elk used all study pastures. Elk use was higher in pastures with heavier tree cover and steeper terrain in both years, regardless of where cattle grazing occurred. Elk grazing patterns were apparently more dependent on tree cover and topography than any changes in forage caused by grazing system.

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**Frisina, M.R. 1992. Elk Habitat Use within a Rest-Rotation Grazing System. Rangelands 14:93-96**

**Objective:** The goal of the study was to design a grazing system that resolves conflicts between domestic livestock and wildlife on summer ranges with specific emphasis on providing abundant, high quality habitat for wildlife, principally elk. The Montana Department of Fish, Wildlife and Parks implemented the system. It was fully operational in 1984. This paper is a status report on project findings to date.

**Results:** This study found:

1. A well-designed grazing system incorporating the principles of rest-rotation can actually improve rangeland over time and thus improve the quantity and quality of habitat available for both wildlife and cattle.
2. Conflict between wildlife and cattle use of summer range can be eliminated by designing and implementing grazing systems that take into consideration habitat preferences of both cattle and wildlife in combination with proven grazing principles.
3. By taking advantage of elk spring preference for pastures grazed by livestock the previous year, elk can be directed to public game ranges and away from adjacent private lands, thus reducing depredation conflicts.

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**Jourdonnais, C.S. and D.J. Bedunah. 1990. Prescribed Fire and Cattle Grazing on an Elk Winter Range in Montana. Wildl. Soc. Bull. 18:232-240.**

**Objective:** Prescribed fire and fall cattle-grazing treatments were applied during fall 1983 and spring 1984 on a rough fescue community to reduce litter accumulations and increase elk use.

**Results:** Rough fescue was the preferred winter elk forage for the area. Burn and cattle-grazing treatments reduced rough fescue standing crop during the initial growing season. By the second growing season, the rough fescue standing crop was similar to the control in all treatments. Total forb, shrub, and grass standing crops were similar for all treatments in the second and third growing seasons after treatment. Elk used the study area in late fall, winter, and early spring. Elk use was greater in the burn and cattle-grazed treatments compared with the control. Elk preferred of rough fescue plants without heavy litter. Idaho fescue received significant use by elk only after it was burned or heavily graze. Bluebunch wheatgrass and other native species received little or no use. Cattle grazing was not as effective in reducing the accumulated plant litter as the burning treatments; however, cattle grazing created a

mosaic of heavy to lightly grazed areas while maintaining litter cover on the soil surface.

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**Anderson, E.W., D.L. Franzen, and J.E. Melland. 1990. RxGrazing to Benefit Watershed-Wildlife-Livestock. Rangelands 12:105-111.**

This paper overviews two long-term wildlife-watershed projects using cattle grazing.

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**Grover, K.E. and M.J. Thompson. 1986. Factors influencing spring feeding site selection by elk in the Elkhorn Mountains, Montana. J. Wildl. Manage. 50:466-470.**

**Background:** Since the mid-1960s, about 200 elk were counted each year on the study area during winter and early spring. Most of those elk remained on the study area until summer ranges were snow free sometime in June.

**Study Site:** The study site was located on a 3-pasture deferred grazing system. This grazing system was imposed in 1970. In 1983, the cattle grazing season was June 11<sup>th</sup> to October 15<sup>th</sup> and the pastures contained 2,517 AUM's. A total of 614 cattle (cows and calves) grazed in one of the pastures during June-July 1983, they grazed a second pasture in August-September 1983, and the third pasture was rested from grazing.

**Objective:** Researchers studied elk use in the following spring from April 1 until May 31 and locations where elk chose to graze were correlated to 12 environmental variables.

They were:

1. previous summer grazing by cattle
2. % rough fescue
3. % Idaho fescue
4. % bluebunch wheatgrass
5. bunchgrass density
6. distance to cover
7. distance to road
8. distance to visible road
9. aspect
10. elevation
11. % slope
12. % Upslope (where a point was located on a slope)

**Results:** Researchers accounted for 68% of the variation in site selection by elk in spring. Elk selected feeding sites that were (in order of importance): 1) previously grazed

by cattle, 2) had relatively high densities of bunchgrass plants, 3) located near cover and 4) located away from visible roads. Researchers suggested that moderate cattle grazing may be a tool land managers can use to improve spring elk foraging but only within the limits imposed by distance to cover, distance to nearest visible road, and forage density.

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**Skovlin, J.M., P.J. Edgerton and B.R. McConnell. 1983. Elk Use of Winter Range as Affected by Cattle Grazing, Fertilizing, and Burning in Southeastern Washington. J. Range Manage. 36:184-189.**

**Objective:** To increase winter use by elk of Pacific bunchgrass foothill range in southeastern Washington using fertilizer and rangeland burning, with and without spring cattle grazing.

**Results:** The first-year response of elk to fertilizer applied in fall was an increase in use by 49%, but no carry-over effect occurred in subsequent years. Fall burning to remove dead standing litter and enhance forage palatability provided no increase in elk use in winter. Intensive cattle grazing in spring to promote regrowth also did not increase elk use. In fact, cattle grazing decreased winter elk use by 28% in 1 of the 3 years studied. The cost effectiveness of increasing elk use by fertilizing was marginal. A discussion of forage allocation to both elk and cattle is presented.

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**Willms, W., and A. Mclean. 1978. Spring forage selection by tame mule deer on big sagebrush range, British Columbia. J. Range Manage. 31:192-199.**

**Objective:** This study examined diet preferences of deer in spring from mid-February to the end of May.

**Results:** Generally, deer preferred the most immature grass and forb species. Of the grass species, Sandberg bluegrass constituted the most bites in the diet but bluebunch wheatgrass was also preferred. Deer selected bluebunch and crested wheatgrass only from plants where the mature stalks had been removed prior to spring growth. The most common method for removing stalks in this area was with fall grazing by cattle. During the study period, the diets selected by deer changed from shrub to grass to shrub-forb. There was no significant competition between deer and cattle for springtime forage.

Considerable variation occurred in the diets among the deer. One deer preferred shrubs while the other two preferred grass. Note: Only three deer were used in this study.

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**Anderson, E.W. and R. J. Scherzinger. 1975. Improving Quality of Winter Forage for Elk by Cattle Grazing. J. Range Manage. 28:120-125.**

**Background:** A study was conducted in northeastern Oregon on prime winter range for Rocky Mountain elk. On average, about 120 head of elk used the study site each winter from 1948 to 1960. Cattle also grazed the area but without a planned grazing plan. A wildlife area was established on the study site in 1961 and cattle were excluded. Over the next three years, elk numbers increased to about 320 head but forage became increasingly rank and of low quality.

A resource management plan was put into effect in 1964, which involved various range improvements and a cattle-grazing system designed to increase forage quality for wintering elk. Range improvements included: 1) Development of water (21 new ponds and a spring). 2) Relocating fences to create five properly designed pastures. 3) Seeding 120 acres of old farmland to adapted grasses and forbs. 4) Salt placement to improve cattle distribution. 5) One canyon set aside as a pasture for wildlife only and permanently closing about 10 miles of regular roads and all old logging roads on the area.

**Methods:** The grazing system allowed forage to recover from elk grazing in the spring prior to cattle grazing. In late spring or early summer, cattle were moved to fresh pasture soon enough to allow regrowth on key grasses to reach the early seedstalk stage by the end of the growing season. The nutritional value and physiology of forages were manipulated by controlling the season, length of time, and grazing intensity in each pasture grazed during the growing season.

**Results:** By 1974, the average elk count in winter reached 1,191 head. The estimated number of elk-days on the area increased from 15,980 in 1963 to 168,957. Elk also increased the length of time they used the study site during winter by 78%. From 1964 to 1974, the ecological condition of the range improved and animal unit months of cattle grazing increased by 2.6. Success of the project is primarily attributable to improved quality of winter forage. Also during this same time period, populations of mountain bluebird increased from "seldom" observed to "common" and western bluebirds from "never" to "occasional." This was aided by the installation of 122 cavity-type nesting boxes, of which 83% were being used regularly within 3 years. Blue grouse were rarely seen in the grasslands before the program started but became a common sight on the study area.

## Livestock-Elk and Deer Habitat Overlap

**Yeo, J.J., J. M. Peek, W.T. Wittinger, and C.T. Kvale. 1993. Influence of rest-rotation cattle grazing on mule deer and elk habitat use in east-central Idaho. J. Range Manage. 46:245-250.**

**Objective:** The distribution of elk, mule deer, and cattle were determined year round from 1975-1979 on a rest-rotation grazing system located in steep mountainous terrain.

**Results:** After the initiation of the grazing system, cattle progressively used higher elevations and steeper slopes each succeeding year. Elk preferred rested pastures during the grazing season (June-October) and avoided habitat frequently used by cattle by grazing at higher elevations and on steeper slopes. Few mule deer used the allotment during summer, but during the winter, deer selected habitats grazed previously by cattle. Elk appeared to adjust to the grazing system by making greater use of pastures when cattle were present, although preference for pastures without cattle continued.

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**Loft, E.R., J.W. Menke and J.G. Kie. 1991. Habitat shifts by mule deer: The influence of grazing cattle. J. Wildl. Manage. 55:16-26.**

**Objective:** This study looked at how the presence of grazing cattle affected selection of home ranges and habitats by female mule deer on summer range in the Sierra Nevada of California.

**Methods:** Three grazing levels (no grazing, moderate grazing, and heavy grazing) were imposed on 3 fenced range units over 3 years. Habitat selection by 13 radio-collared female mule deer was estimated each summer. Habitat selection by radio-collared cattle was also estimated at the 2 grazing levels.

**Results:** In the absence of cattle, deer home ranges included a higher proportion of meadow-riparian habitat compared to areas where cattle grazed. During moderate and heavy grazing, deer tended to use a greater proportion of montane shrub habitat compared to sites without cattle.

Within deer home ranges, deer preferred meadow-riparian habitat regardless of grazing levels, whereas aspen habitat was preferred only where cattle grazing was excluded. The greatest effect of cattle on habitat selection by female mule deer occurred during late summer with heavy grazing, when forage and cover were at a minimum in preferred

habitats. Female mule deer shifted habitat use by reducing their use of habitats preferred by cattle and increasing their use of habitats avoided by cattle. Deer preference for meadow-riparian habitat declined over the summer, more so with cattle grazing. Like deer, cattle preferred meadow-riparian and aspen habitats.

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**Hart, R.H., K.W. Hepworth, M.A. Smith, AND J.W. Waggoner, Jr. 1991. Cattle grazing behavior on a foothill elk winter range in southeastern Wyoming. J. Range Manage. 44:262-266.**

**Background:** Cattle at light stocking rates (0.18 AUM/ha) over a 35-day grazing season in summer preferred to graze on lowland range sites, while elk in winter preferred upland range sites.

**Objective:** Researchers examined how changing cattle stocking rates to a moderate rate (0.28 AUM/ha) and a very light rate (0.034 AUM/ha) would influence cattle preference for range sites and habitat overlap between cattle and elk.

**Results:** At all stocking rates, cattle spent more time grazing on loamy range sites and less time on other sites than would be expected by random chance. When stocking rate was increased from light to moderate, the amount of time cattle spent grazing on loamy sites increased. When stocking rate decreased from light to very light, cattle only grazed loamy and shallow sites to the complete exclusion of other sites. Cattle grazed farther from water and on steeper slopes as stocking rate increased and as the grazing season progressed.

**Conclusion:** Even at the highest stocking rate studied, there was little habitat overlap between cattle and elk.

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**Wallace, M.C. and P.R. Krausman. 1987. Elk, Mule Deer, and Cattle Habitats in Central Arizona. J Range Manage 40:80-83.**

**Background:** The study examined elk and mule deer distribution and use of habitats shared with cattle on a ponderosa pine-bunchgrass range. Cattle were removed from the range in 1961 and reintroduced in 1980.

**Methods:** Location and number of cattle, elk and deer were recorded along a 30-mile route through pastures with and without cattle during the summers of 1981 and 1982. Locations of animals were used as sites to measure habitat variables: forest overstory, plant species

composition, elevation, slope, exposure, and distance to water, fencing, meadow, cover, and draws

**Results:** Distribution of elk and mule deer changed when cattle were introduced to rangeland, as did habitat use by elk. Fewer elk and mule deer were seen on pastures grazed by cattle than on pastures not grazed by cattle. After cattle were introduced, use of habitats by elk shifted from areas that were open, moist and had been logged to areas containing closed forest. Use of habitats by deer was not altered by the presence of cattle.

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**Stevens, D.R. 1966. Range Relationships of Elk and Livestock, Crow Creek Drainage, Montana. J. Wildl. Manage. 30:349-363**

**Objective:** A study of range relationships between elk, cattle, and sheep was made in 1963-64 on 100,000 acres of the Crow Creek drainage, Elkhorn Mountains, Montana.

**Results:** Use by elk in the habitat types: 1) fescue-wheatgrass, 2) Douglas fir, and 3) spruce-fir was determined from 4,939 observations of elk. The fescue-wheatgrass received almost 100 percent of the elk use from January through March and about 90 percent in April and May. All habitats received considerable use in June and spruce-fir received the most use in July and August. Cattle used all three zones while sheep used only the spruce-fir zone.

Examining 94 feeding sites and analyzing the contents of eight elk rumens were used to determine food habits of elk. The spring diet consisted of 77 percent grasses and 23 percent forbs, while the summer diet consisted of 76 percent forbs and only 16 percent grasses. Rumen samples indicated a progressive shift to grasses during fall.

Examining 69 feeding sites determined food habits of cattle. Grasses made up 75 percent and forbs 24 percent of the summer diet. Examination of 28 feeding sites indicated that forbs provided most of the summer diet of sheep. The percentage of forbs in the diet decreased as grazing intensity increased.

**Conclusions:** Heavily used areas were considered as areas of possible competition for forage among the grazing animals. In spruce-fir and Douglas fir habitats grazed in spring, summer, and fall by elk and in summer and fall by cattle, competition between livestock and elk was not considered significant. In the fescue-wheatgrass habitat grazed in spring, fall, and winter by elk and summer and fall by cattle, competition was not considered serious, but

the data indicated a potential for conflict on areas used by elk in winter. A potential for competition in summer was indicated between sheep and elk, but the degree existing on the study area was not considered excessive.

## On This Page

- [Effect of Livestock Grazing on Forage Quality for Elk or Deer](#)
- [Effect of Cattle Grazing on Elk and Deer Use](#)
- [Livestock-Elk and Deer Habitat Overlap](#)