

# Cattle diets in tall forb communities on mountain rangelands

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## Abstract

Thirteen grazing studies have recently documented diet botanical composition of cattle in tall forb plant communities on mountain rangelands. In forb-dominated plant communities, cattle selected forbs in proportion to their availability, (46 to 83% of their diets). In grass-dominated communities, forbs comprise only 11 to 32% of diets. On a landscape scale cattle preferred and spent proportionally more time grazing in forb-dominated communities. Taken together, these studies indicate that cattle have a wide acceptability for forage classes and can effectively utilize forb-dominated high mountain rangelands.

**Key Words:** cattle grazing, forbs, tall forb plant community, diet selection

The generalized forage preferences of domestic livestock—"cattle prefer grass, sheep prefer forbs, and goats prefer shrubs" (Stoddart et al. 1975)—are ingrained deeply in the range management profession. These relative preferences are the basis by which range suitability, carrying capacity, stocking rate, and management strategies are based. When livestock do not conform to these preferences, management decisions based upon this paradigm will be in error.

Much of the high mountain rangeland is thought to be better suited for sheep grazing, due to the rough topography and prevalence of forbs in the plant communities. But what if cattle would efficiently utilize the forbs on these high mountain allotments? Perhaps administratively dictated boundaries between sheep and cattle range might be reconsidered and use of the resource would be allowed by either livestock species.

The purpose of this paper is to illustrate that cattle can efficiently use forbs on mountain rangelands. We conducted several cattle grazing studies in tall forb plant communities in the mountain big sagebrush, aspen, and subalpine vegetation zones in conjunction with research on cattle poisoning from larkspur (*Delphinium* spp.). These studies also provided an opportunity to describe cattle diets in the tall forb community in 4 widely separated localities.

## Study Areas

### Manti, Utah

Seven grazing trials were conducted at the head of Six Mile Canyon, 24 km east of Manti in central Utah in the subalpine vegetation zone at an elevation of 3,200 m. The study pastures included scattered patches of Englemann spruce (*Picea engelmannii* Parry ex Engelm) with 2 distinct vegetation types. The *Ribes montigenun*/*Agropyron trachycaulum* type consisted of open grass areas interspersed with dense currant (*Ribes* spp.) mottes. Dominant grasses were slender wheatgrass (*Agropyron trachycaulum* (Link) Malte), mountain brome (*Bromus carinatus* Hook. & Arn.), and Letterman needlegrass (*Stipa lettermanii* Vasey).

Dominant forbs were Louisiana sagebrush (*Artemisia ludoviciana* Nutt.), common dandelion (*Taraxacum officinale* Weber), western yarrow [*Achillea lanulosa* (Nutt) Piper], vetch (*Vicia* spp.), and *Aster* spp. The second type occurred on snowdrift sites and was dominated by dense concentrations of tall larkspur (*Delphinium barbeyi* L. Huth), with sparser quantities of mountain bluebell (*Mertensia ciliata* (James) G. Don), elderberry (*Sambucus racemosa* L), lupine (*Lupinus* spp.), saw groundsell (*Senecio serra* Hook), and meadow barley (*Hordeum brachyantherum* Nevski).

### Ruby, Montana

Four grazing trials were conducted in the upper Ruby River valley 93 km south of Sheridan, Mont. at 2,600 m. The habitat type was *Artemisia tridentata*/*Festuca idahoensis* with 2 phases. The first phase was a grassland site dominated by Idaho fescue (*Festuca idahoensis* Elmer) with silky lupine (*Lupinus sericeus* Pursh), sulfur, and whorled buckwheat (*Eriogonum umbellatum* Torr. and *E. heracleoides* Nutt.), common dandelion, and western yarrow. The second phase was characterized by deeper loamy soil and a higher proportion of forbs dominated by sticky geranium (*Geranium viscosissimum* Fisch. & Mey) and slender cinquefoil (*Potentilla gracilis* Dougl.). Idaho fescue, *Poa* spp. and waxy larkspur (*Delphinium glaucescens* Wats.) were abundant in both phases.

### Oakley, Idaho

One study was conducted on the South Hills of south-central Idaho, 32 km west of Oakley, Ida., at 2,500 m. Habitat type was *Artemisia vaseyana* var *spiciformis*/*Bromus carinatus*. Vegetation was dominated by duncecap larkspur (*D. occidentale* S. Wats.), slender wheatgrass, and mountain brome.

### Yampa, Colorado

A single study was conducted 15 km west of Yampa, Colo., at 3,000-m elevation. Habitat type was *Populus tremuloides*-*Abies lasiocarpa*/*Symphoricarpos oreophilus*/tall forb. This site was characterized by aspen with scattered subalpine fir overstory, snowberry dominated the shrub component, and tall forbs dominated by tall larkspur, Englemann aster (*Aster engelmannii* D.C. Eaton), saw groundsel (*Senecio serra* Hook), false hellebore (*Veratrum californicum* Durand), and cow parsnip (*Heracleum lanatum* Michx.) along with mountain brome and slender wheatgrass.

## Methods

Experimental pastures were fenced with temporary electric fence and ranged in size from 2 to 12 ha. Pasture size, grazing period, diet sampling method, and number of cattle in each study are listed in Table 1. Only diets of control cattle, or cattle whose diets would not be affected by the specific treatments of the studies, are included in this paper.

Cattle diets were estimated by bite count, scan sample, or esophageal

**Table 1. Description of the studies, diet sampling methods, and habitat types.**

Study No.	Location	Year	Number of animals	Sampling method	Grazing period	Habitat type
1 <sup>1</sup>	Manti, UT	1990	11	Scan	Aug 22–Sept 4	Ribes/Agropyron and Larkspur
2 <sup>2</sup>		1989	10	Scan	Aug 18–Sept 1	" " "
3 <sup>3</sup>		1989	10	Bite count	Aug 9–Aug 27	" " "
4 <sup>4</sup>		1987	10	Bite count	July 2–Aug 30	" " "
5 <sup>5</sup>		1986	4	Bite count	July 30–Sept 2	" " "
6 <sup>6</sup>		1987	10	Bite count	July 15–Aug 29	" " "
7 <sup>6</sup>		1986	5	Bite count	Aug. 12–Aug 25	" " "
8 <sup>7</sup>	Ruby, MT	1988	11	Bite count	July 8–25	<i>Festuca idahoensis</i> and <i>Geranium viscosissimum</i>
9 <sup>7</sup>		1987	10	Bite count	June 26–July 16	" " " "
10 <sup>8</sup>		1988	4	Esophageal cannula	July 9–12	<i>Festuca idahoensis</i>
11 <sup>8</sup>		1988	4	Esophageal cannula	July 26–29	<i>Geranium viscosissimum</i>
12 <sup>3</sup>	Oakley, ID	1988	15	Bite count	June 15–Aug. 2	<i>Artemisia spiciformis</i> / <i>Bromus carinatus</i>
13 <sup>9</sup>	Yampa, CO	1990	12	Bite count	June 19–Aug. 6	<i>Populus tremuloides</i> /Tall forb

<sup>1</sup>Ralphs, and Olsen, 1992a

<sup>2</sup>Ralphs, unpublished data

<sup>3</sup>Pfister and Manners 1991

<sup>4</sup>Pfister et al. 1988b

<sup>5</sup>Pfister et al. 1988a

<sup>6</sup>Lane et al. 1990

<sup>7</sup>Ralphs and Olsen 1992b

<sup>8</sup>Ralphs unpublished data

<sup>9</sup>Pfister, unpublished data

phageal extrusa. Bite counts estimate the percent of each plant species in the diet (Lehner 1987). Each animal was observed for 5 to 20-min periods during each day, and the number of bites of each species was recorded. The observer rotated among all animals in the group from 1 to 3 times during each major grazing period of the day.

Scan samples estimate the proportion of time spent grazing particular species (Lehner 1987). A scan of all animals was made at 2-min intervals and the plant each animal was eating at that instant was recorded. Observations were made during all major grazing periods during the day.

Diet samples were collected from esophageal cannulated steers by removing the cannula and collecting extrusa in screen bottomed bags for 30-min periods in the morning and evening grazing periods. Samples were frozen and freeze dried and plant fragments were identified and quantified by the microscope point technique (Harker et al. 1964).

The mean percentage of bites of each species, the proportion of time the species were grazed, or the percent of each species in the

diet samples are presented with pooled standard errors.

At Manti and Ruby where more than 1 habitat type occurred in the pasture, each observation was coded with the site animals were grazing, and the proportion of time spent on each site and site preference were calculated. A preference ratio of 1.0 indicates that the site was grazed in proportion to its area. A ratio greater than 1.0 indicates site preference, while a ratio less than 1.0 indicates avoidance.

Standing crop of major forage classes was estimated at the beginning of each study by clipping 10 to 30 plots (0.25-, 0.5- or 1-m plots depending on site) systematically located throughout the pastures.

### Results and Discussion

Herbaceous standing crop ranged from 1,200 to 2,500 kg/ha (Table 2). Forbs comprised over 80% of the standing crop at all locations except Ruby, where forbs comprised 60% of the standing crop on the forb site and 40% on the grass site.

Forbs dominated cattle diets at Manti, ranging from 59 to 83%

**Table 2. Standing crop of forage classes.**

Study No.	Location	Year	Grass	Forb	Shrub	Total
			(kg/ha ± standard error)			
1	Manti	1990	255	1049	52	1356
3		1989	246 ± 62	2297 ± 335	0	2543
4		1987	183 ± 27	1478 ± 61	0	1661
5		1986	232 ± 48	2190 ± 440	0	2422
6		1987	196	967	39	1202
7		1986	353	1095	0	1448
8		Ruby	1988	799 ± 85	898 ± 135	0
9	Ruby	1987	1381	762	0	2143 ± 73
10	Ruby grass	1988	744 ± 113	472 ± 112	0	1216 ± 103
11	Ruby geranium	1988	913 ± 159	1477 ± 222	0	2390 ± 212
12	Oakley	1988	246 ± 30	1177 ± 31	0	1423
13	Yampa	1990	439 ± 55	1562 ± 219		2001 ± 212

**Table 3. Cattle diets in the tall forb plant community on mountain rangelands (% of bites, % of time spent grazing species, or % of diets).**

	Manti							Ruby			Oakley	Yampa	
	1	2	3	4	5	6	7	8	9	10	11	12	13
	1990	1989	1989	1987	1986	1987	1986	1988	1987	Grass	Geranium	1988	1990
	------(%)-----												
Larkspur spp.	6 ± 1.2	4 ± 1.5	3.6	11 ± 1.9	12 ± .9	6 ± .8	9 ± .8	2 ± 1.5	2 ± .2	1 ± .2	1 ± .1	1 ± .2	
Dandelion	19 ± 1.2	16 ± .9		12 ± 1.6					1 ± .2	4 ± .5	1 ± .2		
Aster	15 ± .8	11 ± .5											
Vetch	4 ± .9	2 ± .6											
Bluebell	7 ± 1.4	5 ± 1.1		5 ± 1.1									
Saw goundsel	3 ± .2	8 ± .9											
Yarrow	2 ± .3									2 ± .3			
Lupine	2 ± .4		1 ± .03							10 ± 1.7	3 ± .7		
Geranium									8 ± .5				
Cinquefoil									8 ± .5		50 ± 7.2		
Buckwheat									5 ± .5				
Other forbs	5 ± .5	13 ± 1.4	66 ± 1.5	54 ± 2.8	71 ± .5	65 ± 2.6	63 ± 2.1	9 ± 1.0	8 ± .5	4 ± 1.5	1 ± .1	45 ± 1.2	
Total forbs	62 ± 2.1	59 ± 18	69	82	83	71	72	11	32	21 ± 1.3	56 ± 7.3	46	57 ± .9
Grass													
Slender wheat	15 ± .9	11 ± 1.6											
Mt. Brome	8 ± 1.2	6 ± 1.0											
Meadow barley	6 ± .6	17 ± 2.6											
Stipa spp.	5 ± .5	2 ± .5											
Idaho fescue										65 ± 1.5	40 ± 6.5		
Poa spp.										12 ± 1.3	4 ± 1.0		
Other grass	1 ± .2	1 ± .1								2 ± .3			
Total grass	35 ± 2.2	37 ± .8	25 ± 1.7	20 ± 1.5	16 ± .6	27 ± 2.4	27 ± 2.4	89 ± 1.6	78 ± 1.5	79 ± 1.3	44 ± 7.3	53 ± 1.2	43 ± .9
Shrub													
Elderberry	4 ± .4	4 ± .4	6 ± .9		4 ± .2	2 ± .6							
Current			2 ± .1		1 ± .1								

of the diets (Table 3). Dandelion and aster were highly preferred, and were most abundant in both the open grass and larkspur sites (Table 4). Bluebell was also highly preferred, but was restricted to the larkspur site and was relatively scarce. Saw goundsel and lupine were avidly selected later in the grazing season. Slender wheatgrass and mountain brome were dominant grasses on both sites and comprised most of the grass component in the diets.

Forbs varied in cattle diets at the Ruby site (Table 3). When cattle were confined to the tall forb site (study 11), forbs comprised 56% of diets and slender cinquefoil was the dominant forb in the diet. When cattle grazed the grass-dominated site (study 10), or the combination of sites (study 8 and 9), forbs comprised only 11 to 32% of diets. The grass standing crop on both of these sites was higher than at other locations (Table 2) and may account for the higher proportion of grass in the diet. Forbs comprised 46 and 57% of cattle diets at Oakley and Yampa, respectively.

At Manti and Ruby, where both grass and forb sites occurred in the study pastures, cattle preferred to graze in the forb sites.

Preference ratios for the forb site ranged from 1.1 to 1.4 (Table 4), compared to .52 to .95 for the grass sites.

Cook (1983) lamented the fact that many range managers still consider forbs as "weeds" or "least desirable" plants in managed plant communities. He argued that forbs may be dominant or sub-dominant life forms in the structure and function of climatic plant communities. They are also readily eaten by both cattle and sheep, and provide a substantially higher level of nutrition (i.e., higher nitrogen and lower in fiber) than grasses.

Other studies have reported high levels of forbs in cattle diets on mountain rangelands. Thilenius et al. (1975) reported that forbs comprised 40% of cattle diets on subalpine range in the Big Horn Mountains in Wyoming, while contributing 84% to the herbage production. They concluded that forbs are more important as cattle forage on summer range than previously thought.

Willms et al. (1980) reported that cattle selected forbs for 42% of their diets although forbs comprised only 17% of the ground cover on Douglas fir/pinegrass range in British Columbia. Other studies

**Table 4. Percent of time spent grazing in respective sites, the proportion of the pasture occupied by the site and the preference ratio.**

Location	Year	Forb			Grass			Shrub		
		Time	Area	Ratio	Time	Area	Ratio	Time	Area	Ratio
		-----%			-----%			-----%		
Manti	1986	39	34	1.15	42	64	.65	20	3	6.6
	1987	23	19	1.21	60	72	.83	17	9	1.88
	1990	49	45	1.10	38	40	.95	13	15	.86
Ruby	1987	42	48	1.12	58	52	.87			
	1988	75	48	1.44	25	52	.52			

reported that forbs contributed a high proportion to cattle diets in early summer but declined as the season progressed (Currie et al. 1977, Uresk and Paintner 1985). Holechek et al. (1982) concluded that cattle frequently diverge from traditional grass diets on mountain range.

### Management Implications

This compilation of studies demonstrates that forbs dominated cattle diets in tall forb communities on high mountain rangeland. Cattle are opportunistic grazers and will often select forbs at levels similar to or exceeding their proportion in the standing crop. Management decisions should not discount the use of forbs by cattle. Administrative barriers between sheep and cattle allotments should be relaxed to consider exchange of use, common use grazing, and exchange of allotments to make efficient use of the forage resource.

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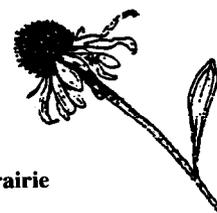
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