

## Short communication

## Body weight changes and subsequent lambing rates of western whiteface ewes grazing winter range

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## ABSTRACT

The objective was to describe body weight change (BWC) and subsequent lambing performance of Columbia, Polypay, Rambouillet, and Targhee ewes that grazed shrub-dominated range in winter of 1989, 1990, and 1991. In December (winter), after breeding each year (yr; October to December), ewes were moved to range. Depending upon severity of climatic conditions and vegetation accessibility, ewes grazed winter range for 30 to 60 days (d). Body weights were measured 2 d before grazing commenced (initial) and 2 to 7 d after ewes were transported off range (exit). Total BWC was calculated by subtracting final BW from initial BW. All data were analyzed within each breed, as repeated measures using mixed models with age and year included in the model. For all breeds, 2-yr-old ewes were lightest going on to winter range and had the lowest lambing rate. Ewes lost weight while grazing winter range, but mature BW, once achieved, was restored annually with the exception of the 7-yr-old Columbia and Targhee ewes. Regardless of breed or age, ewes were able to achieve lambing rates >1.5 lambs following early- and mid-pregnancy weight loss. Lambing rates were greater in older ewes, which generally experienced substantial negative BWC during winter grazing.

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## 1. Introduction

The USDA, Agricultural Research Service, U. S. Sheep Experiment Station (USSES; Dubois, Idaho) sheep flock includes Columbia, Polypay, Rambouillet, and Targhee breeds (Ercanbrack and Knight, 1998). USSES ewes graze various shrub-dominated ranges throughout the year (yr), except during breeding (35 days [d] in October and November) and lambing (~60 d; peak lambing occurs early April). Generally, nutrient availability is not limiting except during winter grazing when depth and condition of the snow pack impedes grazing activity. USSES ewes graze shrub-dominated winter range for 30 to 60 d depending upon severity of climatic conditions and vegetation accessibility. Based on apparent loss of body condition during winter grazing, producers and researchers have expressed concern about potential productivity losses of ewes that may have experienced negative body weight change during early pregnancy. However, Chittenden

et al. (1936) reported that ewes that grazed winter range that was dominated with diverse and palatable shrubs were able to maintain productivity at lambing without supplemental feeds. Nevertheless, these concerns seem to persist among producers (producer communications).

In management yr 1989, 1990, and 1991, body weights (BW) were measured on USSES ewes at the beginning and end of the winter grazing season. These data provide a unique opportunity to describe the productivity of modern western whiteface ewes managed in seemingly harsh climatic regions. With these data, the specific objective was to describe BW change (BWC) and subsequent lambing performance of Columbia, Polypay, Rambouillet, and Targhee ewes that grazed shrub-dominated range in winter.

## 2. Materials and methods

## 2.1. Ewes, body weight measurement, and ewe management

Columbia, Polypay, Rambouillet, and Targhee ewe BW and lambing records for yr 1989, 1990, and 1991 were extracted

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**Table 1**

Number of ewe records, according to breed and age, that were used in the analyses to describe body weight changes and subsequent lambing rates of ewes grazing winter range

Breed	Age						Total
	2	3	4	5	6	7	
Columbia	336	286	228	163	110	59	1182
Polypay	368	230	117	96	68	45	924
Rambouillet	385	302	237	187	119	61	1291
Targhee	264	212	153	111	79	61	880

from the USSES breed database. For each breed, age of ewes ranged from 20 months (2 yr) to 7 yr; the count by breed and age are reported in Table 1. As age increased, the number of ewes represented within each age group decreased for all breeds. Ewes were removed for support of other research goals (i.e., some Polypay ewes were used for fall lambing experiments) or because of inadequate production performance, disease and death, or flock size limitations. Except for Polypays, attrition within Columbia, Rambouillet, and Targhee breeds for the study period was similar to long-term rates reported elsewhere (Ercanbrack and Knight, 1993). Each yr, ewes were managed as two separate bands (mean band size =  $890 \pm 130$  ewes). Band breed composition is reported in Table 2. Once breeding was accomplished, bands were transported to winter range. Body weights were measured 2 d before winter grazing commenced (initial BW) and 2 to 7 d after ewes were transported off winter range (exit BW). After winter grazing, both bands were transported to a feedlot facility and managed as contemporaries until lambing. In the feedlot, ewes were fed diets consisting of long-stemmed alfalfa hay and supplemental grain to meet nutrient requirements of ewes during mid- and late pregnancy. At lambing, lambs were weighed.

## 2.2. Grazing unit description and vegetation

Winter grazing occurred approximately 43 to 72 km southwest of Dubois, ID. The winter grazing units (approximate locations) were Snakey Canyon (112.7° W, 44.1° N; elevation  $\approx 1800$  m), Kelly Canyon (112.7° W, 44.3° N; elevation  $\approx 1800$  m), and Bernice (113.0° W, 43.9° N; elevation  $\approx 1600$  m). Dates when units were grazed and corresponding mean precipitation and temperatures for each unit are reported in Table 2. A variety of grasses, forbs, and browse were present in all grazing units. However, because of the snowfall depth, shrub species are usually the most available vegetation for consumption in winter. Shrubs common to the Snakey Canyon and Kelly Canyon units were *Artemisia nova* A. Nels., *Heterotheca villosa* (Pursh) Shinnery, *Phlox* L. sp., and *Symphoricarpos* Duham. sp. Shrubs common to the Bernice unit were *A. nova*, *Atriplex confertifolia* (Torr. & Frém.) S. Wats., *Atriplex gardneri* (Moq.) D. Dietr., *Krascheninnikovia lanata* (Pursh) A.D.J. Meeuse & Smit, and *Gutierrezia sarothrae* (Pursh) Britt. & Rusby.

## 2.3. Calculations and statistical analyses

Data from litters with at least one lamb (dead or alive) were included in these analyses. Within each breed, entry BW,

BWC, and litter size, and litter weight from all yr were analyzed as repeated measures on ewes using the mixed model procedures of SAS (SAS Institute, Inc., Cary, NC). The model included age, yr, and their interaction as fixed effects. Errors were modeled using a first-order autoregressive covariance structure with heterogeneous variances across ages. All fixed effects were retained in the model regardless of significance level, and the age effect was considered significant when the probability of a greater  $F$  was  $< 0.01$ . Mean separations were performed between ages using planned pairwise  $t$ -tests ( $\alpha = 0.05$ ) when the  $F$ -tests were significant.

## 3. Results

Our objective for this research was to describe winter BWC and subsequent lambing performance within western white-face breeds, and not to contrast breeds. Only significant ( $\alpha = 0.05$ ) differences are discussed. Initial BW, BWC, and subsequent litter size, and litter weight of ewes grazing winter range during early pregnancy varied according to age ( $P < 0.001$ ) and are reported in Fig. 1, Panels A, B, C, and D for Columbia, Polypay, Rambouillet, and Targhee breeds, respectively.

Columbia ewe BW increased with age through age 4 yr. The 3 to 5-yr-old ewes were more apt to maintain BW during winter grazing than were 2, 6, and 7-yr-old ewes. Ewes replenished BW throughout the yr and returned to winter range with greater or equal BW, except for 7-yr-old ewes. Litter size and weight increased with age through age 6 yr.

Polypay ewe BW increased with age through age 5 yr. The 5 to 7-yr-old ewes were not able to maintain BW as well as 2 to 4-yr-old ewes while grazing winter range. Ewes were able to replenish BW annually and maintained high lambing rates through age 7 yr. Litter size and weight were greater for 3 to 7-yr-old than for 2-yr-old ewes. Characteristic of the Polypay breed (Okut et al., 1999; Notter, 2000), lambing rates exceeded 2.0 at ages  $> 2$  yr.

**Table 2**

Entry and exit dates for bands of ewes grazing winter range units and climatic data for each unit corresponding to the approximate days grazed

Year	Band	Grazing unit <sup>a</sup>	Entry date (month/day)	Exit date (month/day)	Days grazed	Precip <sup>b</sup> (mm)	Min <sup>c</sup> temp (C)	Max <sup>c</sup> temp (C)
1988	1 <sup>d,e</sup>	S	11/23	12/26	30	30.0	-14.4	-3.0
	2 <sup>e</sup>	K	12/07	12/27	20	31.1	-13.9	-3.1
1989–90	1 <sup>f</sup>	S	11/29	01/18	50	12.1	-12.4	0.1
	2 <sup>f</sup>	K and B	12/06	02/01	57			
		B	12/06	01/03		12.5	-12.1	0.0
		B	01/03	02/01		9.4	-10.6	0.1
1990–91	1 <sup>e</sup>	S	11/21	01/17	57	11.6	-17.3	-4.9
	2 <sup>e</sup>	K and B	12/05	02/03	60			
		K	12/05	01/02		11.6	-19.7	-4.9
		B	01/02	02/03		5.7	-15.6	-5.4

<sup>a</sup> Grazing units: S = Snakey Canyon, K = Kelly Canyon, and B = Bernice.

<sup>b</sup> Water-equivalent precipitation during the grazing periods.

<sup>c</sup> Minimum and maximum temperatures during the grazing periods.

<sup>d</sup> Because of severe climatic conditions, ewes received supplemental alfalfa hay on December 23, 1988.

<sup>e</sup> Band 1 breeds were Columbia and Rambouillet, and Band 2 breeds were Polypay and Targhee.

<sup>f</sup> Band 1 breeds were Rambouillet, and Band 2 breeds were Columbia, Polypay, and Targhee.

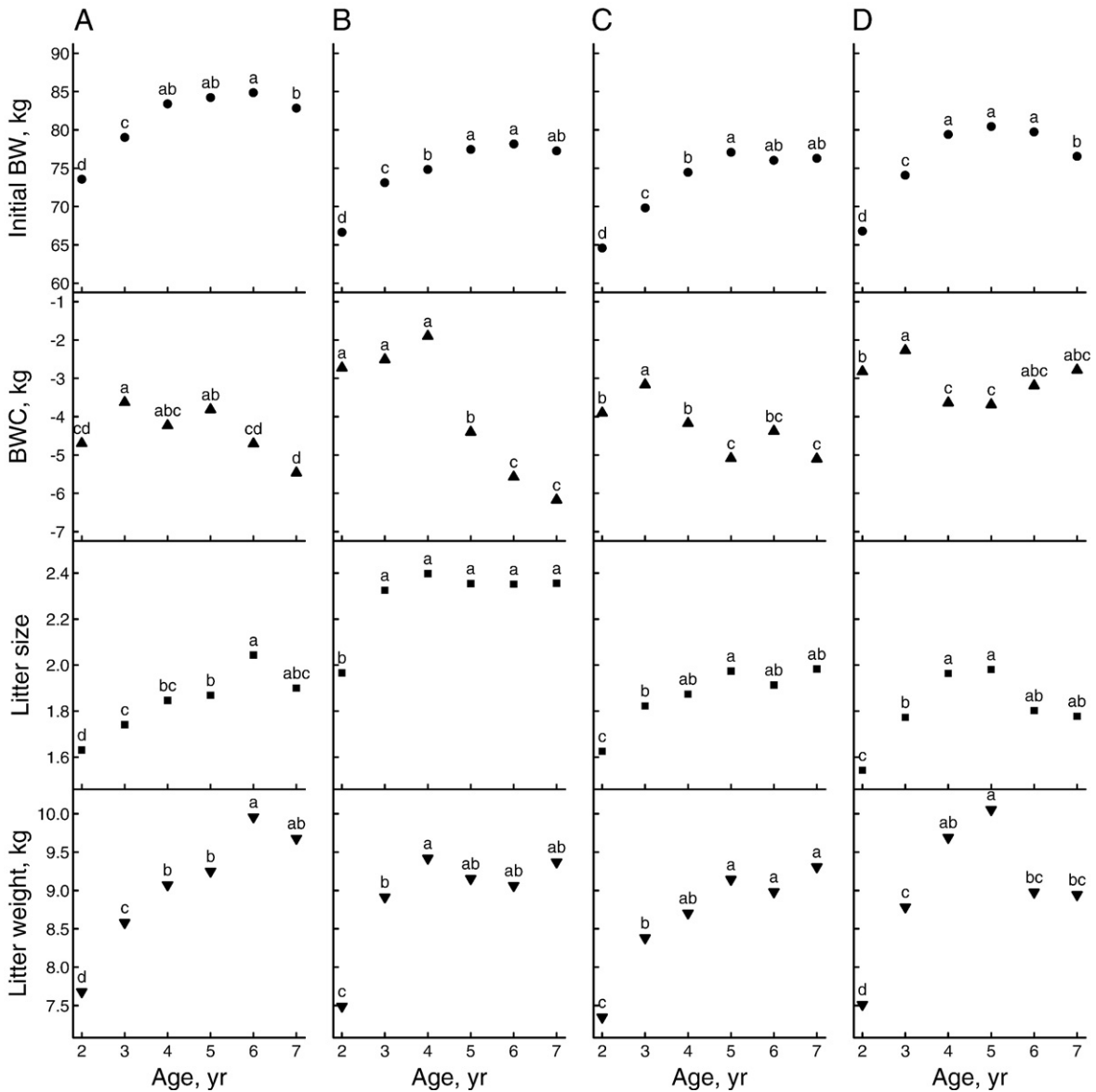


Fig. 1. From top to bottom, initial body weight (BW; kg), body weight change (BWC; kg), litter size, and litter weight (kg) of Columbia (Panel A), Polypay (Panel B), Rambouillet (Panel C), and Targhee (Panel D) ewes that grazed winter range. For each graph within breed, unlike superscripts indicate difference ( $\alpha=0.05$ ).

Rambouillet ewe BW increased with age through age 5 yr. Three-yr-old ewes maintained more BW during winter grazing than all other ewes. Ewes were able to replenish BW throughout the yr and returned to winter range with greater or equal BW. Litter size and weight increased with age through age 4 yr.

Targhee ewe BW increased with age through age 4 yr. At age 7 yr, BW decreased, compared with 4, 5, and 6-yr-old ewes. Compared with 4 and 5-yr-old ewes, 2 and 3-yr-old ewes were more apt to maintain BW during winter grazing. Except for 7-yr-old ewes, BW was replenished annually, regardless of winter BWC, and ewes returned to winter range with greater or equal BW. Litter size and weight increased with age through age 4 yr, but at age 6 yr, litter weight decreased.

#### 4. Conclusion

Regardless of breed, 2-yr-old ewes were lightest going on to winter range and had least number of lambs born. Overall, ewes lost weight while grazing winter range, but mature body weight, once achieved, was restored annually, with the exception of the 7-yr-old Columbia and Targhee ewes. Regardless of breed or age, ewes were able to achieve lambing rates >1.5 lambs after early- to mid-pregnancy weight loss. Lambing rates were greater in older ewes, which generally lost the greatest amount of body weight during winter grazing, except for 7-yr-old Targhee ewes. Despite evident BW loss demonstrated from this data set, early- to mid-pregnant western whiteface ewes, placed on shrub-dominated range for winter grazing, maintained productivity without supplemental feeds.

As relevant in the Targhee breed and reported elsewhere (Chittenden et al., 1936), this seems to be somewhat contingent upon the ewe's ability to replenish their previous BW annually.

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