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Expanded abstract

Characteristics of caribou feeding craters in burned and unburned habitat on the Selawik flats, Alaska.

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There has been debate over whether fire has a negative effect on caribou winter range. In June and July 1988, a wildfire burned 84,615 ha of the Selawik National Wildlife Refuge, located in northwest Alaska. Portions of the burned area have been used historically as a migration corridor by the Western Arctic Caribou Herd. The objective of this study was to assess possible effects of the fire on caribou use of vegetation in early spring. To accomplish this, the following variables were measured inside and outside of the burn perimeter: 1) density of feeding areas, 2) snow depth and hardness at feeding craters and at random undisturbed points, 3) presence-absence of representative plant species, and 4) above ground plant biomass.

Replicate plots (30 x 30 m), each containing cratered and undisturbed snow, were established in April 1990 (n=20 burned, 20 unburned) and 1991 (n=16 burned, 16 unburned). Ten points were randomly located at undisturbed areas within each plot; these are referred to as "random points". Random points, and the least disturbed crater edges ("cratered points") were sampled for snow depth and hardness using a Rammsonde Penetrometer. Four transects, each 50 km in length and consisting of both burned and unburned habitat, were flown in late April of both years to estimate feeding area density. Feeding areas (one large or numerous smaller craters) were counted and a t-test was performed to compare density in burned and unburned habitat.

Each following summer, 0.25 x 0.25 m quadrats were established on the 10 random points and on 10 points located within former craters. Species lists were compiled for each quadrat and all vegetation except for moss and liverworts was clipped in five of the random quadrats to estimate biomass. Vegetation was sorted into current and previous years growth, dried, and weighed.

Snow data were analyzed using ANOVA. These data were then combined with relative frequency of plant species and analyzed using MANOVA to test for overall differences due to burning and use (crateres vs random). Step-wise regression and discriminant analysis were used to select key variables prior to performing the MANOVA.

Snow was shallower and harder in 1991 than in 1990. Burned plots had shallower snow than unburned plots only in 1990, but this may be an artifact due to caribou foraging on exposed *Eriophorum vaginatum* tussocks on windswept ridges in the burn. There were no other differences in snow cover due to fire history. In both years, snow near craters was softer and

shallower than at random points. Flight transect data suggested that there were more feeding areas in unburned than in burned habitat in 1990 ($p<0.05$). There may have been more feeding areas in unburned habitat in 1991 as well, but sample size ($n=4$) was insufficient for statistical testing.

Stepwise discriminant analysis selected snow depth and hardness, and the relative frequencies of *Cetraria* spp., *E. vaginatum*, and bryophytes as to be entered in the MANOVA for 1990 data. *Cladonia/Cladina* spp. were not included due to multicolinearity with *Cetraria* spp., but these genera include important winter forage species. The overall MANOVA was significant for the burn effect ($p<0.0001$) and the use effect ($p<0.0019$). In the absence of snow variables, *E. vaginatum* and lichens were found significantly more often in unburned quadrats, while bryophytes were more common in burned, random quadrats ($p<0.05$, ANOVA). Lichens and *E. vaginatum* had greater biomass in unburned plots ($p<0.05$, ANOVA).

Caribou appear to select sites to crater based on a combination of the following: the presence of soft, shallow snow, the presence of lichens and *E. vaginatum*, and a minimal amount of bryophytes. Observations suggest that caribou may detect and crater for burned lichens. Fire history has little or no effect on snow cover, but it reduces the occurrence and biomass of early spring forage species and lichens, and increases the occurrence of bryophytes and other species that are not used by caribou in spring.

Keywords: Caribou, barren ground, grazing, snow, cratering, fires

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