

FOOD HABITS OF DALL SHEEP ON REVEGETATED COAL STRIPMINE SPOILS IN ALASKA

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ABSTRACT

The food habits of Dall's sheep (Ovis dalli dalli) grazing on revegetated coal stripmine spoils in Alaska were examined from 1980-82. Red fescue (Festuca rubra) and bluejoint (Calamagrostis canadensis), seeded native grasses, comprised 49 percent and 10 percent of the summer diet, and 40 percent and 15 percent of the winter diet, respectively. The presence of escape terrain, benches, and windblown areas in winter may encourage Dall sheep use of these reclaimed areas.

INTRODUCTION

The value of stripmined lands as wildlife habitat in the contiguous United States has been studied for many years (Yeager 1942, Riley 1954 Samuel 1979). Characteristics of surface mined lands that are considered attributes of good wildlife habitat may be: topographic diversity, diversity of vegetation, interspersed microhabitats and open water areas (Sucheckí and Evans 1978). If wildlife management options involving reclamation are to be promoted, their value and feasibility must be established. It must be demonstrated that creation of good wildlife habitat is an attainable product of reclamation, can be economically feasible, and is a viable land use alternative. These attributes have been demonstrated for surface mined lands in the coal areas of eastern and western portions of the United States but such information for Alaska is scarce. The purpose of this study was to provide baseline data concerning wildlife responses to, and use of, revegetated stripmine lands in Alaska. The specific objective was to document the food habits of Dall's sheep utilizing revegetated stripmine spoils on the Usibelli Coal Mine, Inc., in Interior Alaska.

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DIET REVIEW

To understand how the food items ingested by Dall's sheep on reclaimed coal mine spoils compare with items consumed on native ranges, a review of Dall's food habits in Alaska was necessary. Viereck (1963) observed Dall's sheep in the Tonzona River and Mt. Hayes area of Alaska. The forage species taken were quantified as 'occasionally, commonly, or abundantly utilized'. Most of the 47 food plants listed were summer forages and included: Epilobium latifolium, Artemisia arctica, Anemone parviflora, Poa alpina, Achillea borealis, Trisetum spicatum, Salix reticulata, Festuca altaica, and Kobresia myosuroides.

Whitten (1975) studied the habitat relationships of Dall's sheep in Denali National Park and Preserve. He observed feeding sheep and recorded plant species consumed. During summer, Salix glauca, S. arctica, S. planifolia, Boykinia richardsonii, Arnica alpina, Artemisia alaskana, Dodecatheon frigidum, Saxifraga davurica, and Oxyria digyna were eaten. Winter foods were determined by examining feeding craters. Within the craters, bunchgrass (mostly alpine fescue (Festuca altaica)) seemed to be the item most often grazed. Winters (1980) reported grasses and sedges comprised the bulk of items identified in the rumens of two sheep collected in winter near Sheep Creek in the Tanana River drainage.

The most detailed account of Dall's sheep diets within Alaska is that of Nichols and Heimer (1972). They used the microhistological technique to determine the seasonal food habits of three sheep herds located along the Kenai River drainage. Sedges, alpine fescue and other grasses made up most of the summer diets on all areas. The use of sedge decreased markedly by midwinter, while the use of alpine fescue increased. Consumption of other grasses, including red fescue (Festuca rubra), alpine sweetgrass (Hierochloa alpina), and Poa spp., was fairly constant throughout the year. Shrubs, mainly willows, made up a small portion of the diet throughout the year, with somewhat decreased use in spring. Mosses and lichens were evident in the winter diets.

Heimer (1983) determined the botanical composition of spring and winter rumen contents for two sheep populations in the Alaska Range. The Dry Creek Herd (located 40 km east of the Usibelli Mine) consumed mainly graminoids. Grasses and sedges comprised 69 percent and 74 percent of rumen contents in spring and winter, respectively. The diet of the Robertson River population (located 300 km east of Dry Creek) was similar to the Dry Creek herd in its consumption of grasses and sedges in winter (56%), but the Robertson River herd supplemented their spring diet of graminoids (50%) by ingesting the basal portions of oxytropes (24%).

STUDY AREA

The study area was the Usibelli Coal Mine, Inc., located near Healy, Alaska, within the northern foothills of the Alaska Range (Figure 1). Elevations in the region range from 396-914 m. The region is dissected by a number of streams, the largest being Healy Creek (Figure 2).

Much of the vegetation existing on the study area is within five broadly defined vegetation associations that correspond to the Level II classification of Viereck and Dyrness (1980) (Figure 3). The conifer forest cover type is a combination of open and closed spruce forest. The open spruce forest is located on upland terraces and consists of sparsely distributed low-growing spruce and low-to-prostrate shrubs. Principal trees and shrubs include black and white spruce (*Picea mariana* and *P. glauca*), quaking aspen (*Populus tremuloides*), mountain cranberry (*Vaccinium vitis-idaea*), willow (*Salix* spp.), birch (*Betula* spp.), blueberry (*Vaccinium* spp.) and alpine bearberry (*Arctostaphylos alpina*). The closed spruce forest is characterized by dense stands of mature spruce occurring along drainages, ridges, terraces, and south-facing slopes.

The tall-shrub cover type consists of an alder (*Alnus crispa*) - willow (*Salix alaxensis*) association. This habitat occurs most frequently at the bases of north-facing terraces and along creek drainages and floodplains. The tall-shrub cover type was also prevalent on the sites disturbed by mine-related activities (e.g. road building, active mining) that were never reclaimed but allowed to revegetate via natural succession.

The disturbed, revegetated cover type represents the sites on the mine that have been seeded with graminoids and forbs (Table 1). A reclamation

Table 1. Seed mixture applied to revegetated area used as range by Dall's sheep on the Usibelli Coal Mine, Healy, Alaska. Area seeded in 1972.

Plant Species Seeded (Common Name)

Alopecurus pratensis (Meadow Foxtail)
Agropyron cristatum (Crested Wheatgrass)
Bromus inermis (Manchar Bromegrass)^a
Calamagrostis canadensis (Bluejoint)^a
Festuca elatior (Meadow Fescue)
Festuca ovina var. *duriuscula* (Hard Fescue)
Festuca rubra (Boreal Red Fescue)^a
Lolium perenne (Tetraploid Perennial Ryegrass)
Lolium temulentum (Common Annual Ryegrass)
Medicago sativa (Alfalfa)
Phalaris arundinacea (Reed Canarygrass)
Phleum pratense (Climax Timothy)^a
Poa pratensis (Kentucky Bluegrass)^a
Trifolium hybridum (Alsike Clover)
Trifolium repens (White Dutch Clover)

a: indicates species still present in 1980.



Fig. 1. Location of Healy study region, southcentral Alaska.

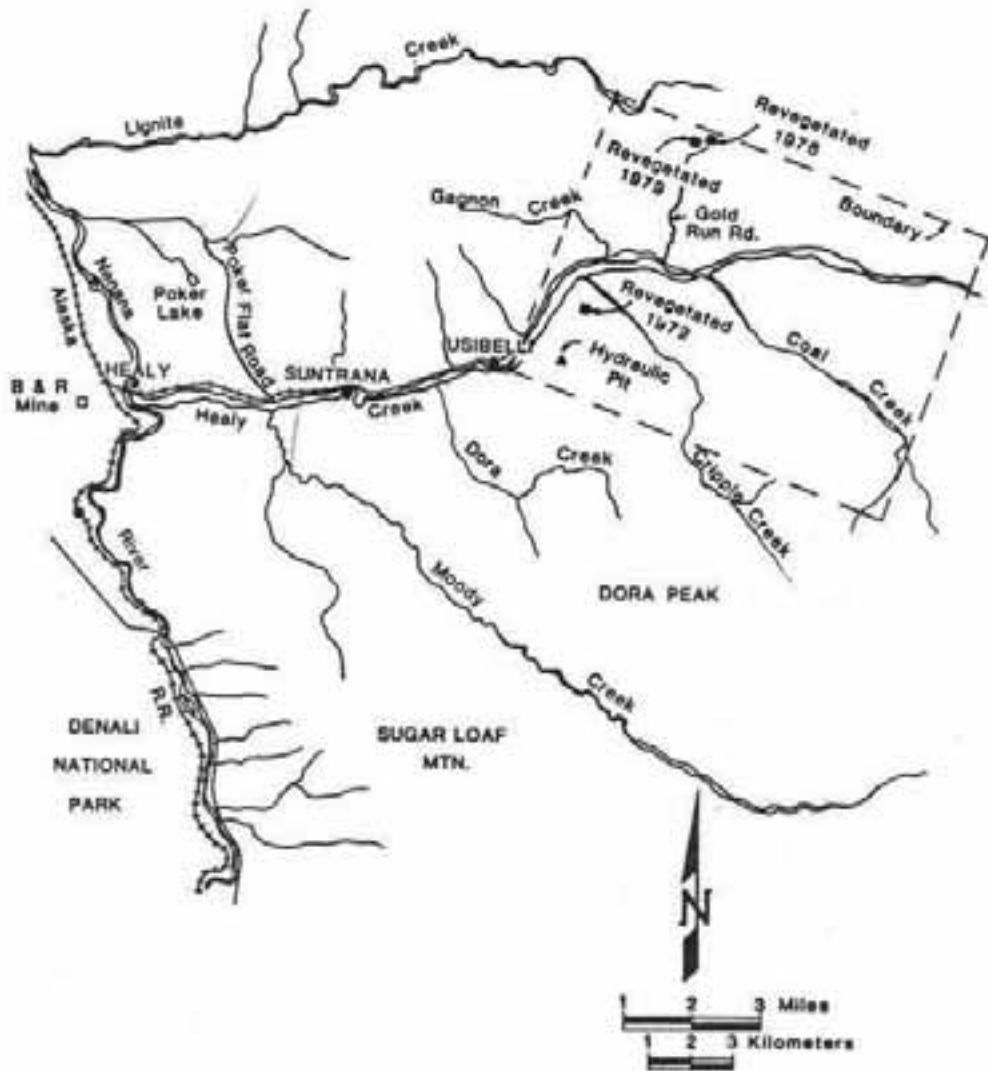
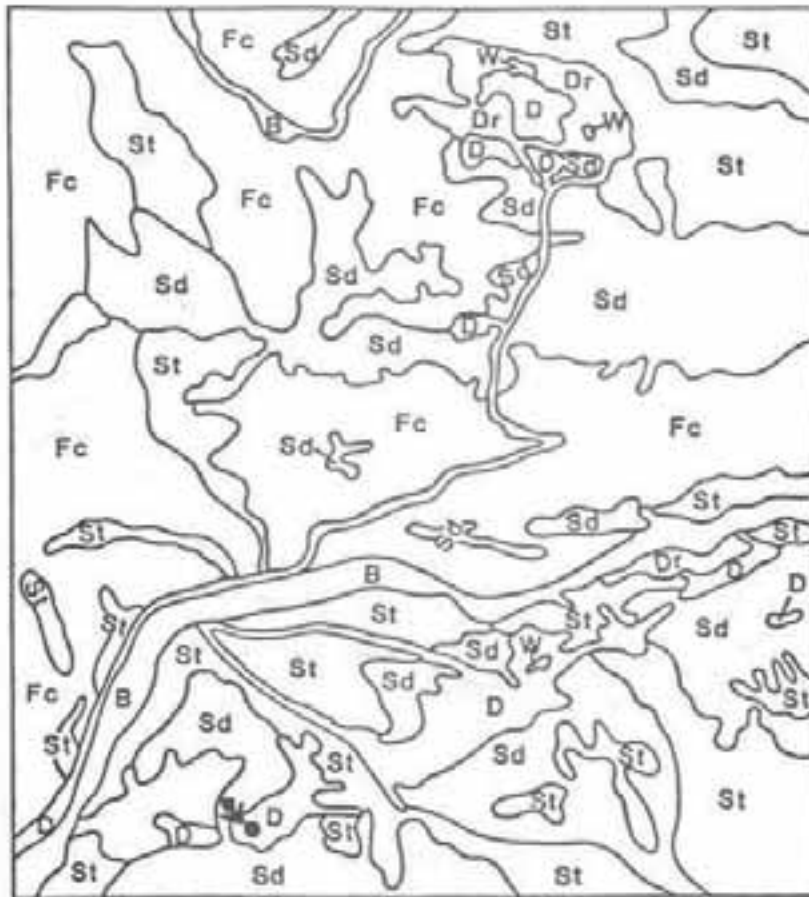


Fig. 2. Location of Usibelli Coal Mine, Inc.



LAND COVER TYPES

- Fc Conifer Forest
- St Tall Shrub
- Sd Shrub Tundra
- D Disturbed - unreclaimed
- Dr Disturbed - revegetated
- B Barren Flood Plain
- W Water

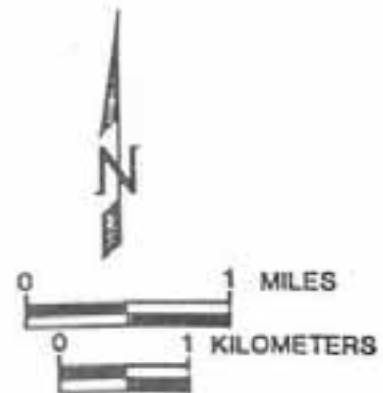


Fig. 3. Cover type classification of principal study area. Region outlined by dashed line on Fig. 2 represents the area depicted in this figure. Arrow indicates the Hydraulic Pit area.

program was instituted in 1972 on the Usibelli Mine. At present there are approximately 1000 ha of reclaimed land. The disturbed, unreclaimed cover type represents areas which have been disturbed by mining but are not yet reclaimed. The areas support little to no vegetation.

The shrub tundra cover type was typified by the glandular birch (Betula glandulosa) and ericaceous shrub-sedge association.

The region on the Usibelli Mine used to the greatest extent by Dall's sheep is an area known as the 'Hydraulic Pit'. Revegetated in 1972, the Hydraulic Pit area resembles a 'stair step' configuration; a large, flat expanse of revegetated grasses that terminates in a 30-50 m highwall. At the base of the highwall is another flat area of seeded grasses.

METHODS

Botanical composition of the diet of Dall's sheep was determined by the microhistological examination of fecal material (Hansen and Flinders 1969). Holechek et al. (1982) reviewed the advantages and disadvantages of using fecal analysis for diet determination.

Two alterations were made in the procedure of Hansen and Flinders (1969). Diet slides were prepared using Naphrax high resolution diatom mounting medium instead of Hertwig's and Hoyer's solution. Five slides per fecal sample, and 20 locations per slide were examined to estimate the major species in the diet (Holechek and Vavra 1981).

Fecal pellets for diet analysis of Dall's sheep were collected in two ways. In winter, bands of sheep on the mine area were located twice a month. The locations of fresh fecal pellets were noted and the pellets collected after the animals moved to another area. This process was repeated until 20 fresh fecal samples per month were collected. During summer, sheep use of the Usibelli Mine was low, the number of animals sighted per observation on the area during this time ranged from 1-9. Trying to find and follow sheep for pellet collection in summer proved impractical. To acquire feces for diet analysis, 30, 4 m² circular plots were located in areas frequented by sheep during the summer of 1980. These plots were marked with painted wooden stakes and cleared of pellets on 11 May, 1981, and cleared again on 29 August, 1981. The 13 pellet groups collected were used to represent the summer diet.

The percent composition of each plant species identified in the diet was determined following the method outlined by Holechek and Gross (1982). The frequency of each plant species identified was divided by the total number of observations for all species. This number multiplied by 100 estimates the percent, by weight, composition of the diet.

RESULTS AND DISCUSSION

FOOD HABITS

Dall's sheep used the Hydraulic Pit area of the Usibelli Mine primarily as winter range. Winter and summer diets of sheep on the mine were primarily

composed of grasses (Table 2). Seeded red fescue and bluejoint (*Calamagrostis canadensis*) were the most important items in the diet, comprising 49 and 10 percent of summer diets, and 40 and 15 percent of winter diets respectively. This consumption of grasses parallels reported winter use of graminoids by sheep on the Kenai Peninsula (Nichols and Heimer 1972) and in interior Alaska (Murie 1944, Whitten 1975).

Table 2. Food habits (estimated percent dry weight of the diet) of Dall's sheep utilizing the revegetated Hydraulic Pit area, Usibelli Coal Mine, Healy, Alaska. Number of fecal pellet groups examined are given in parentheses.

Food Item	Summer Diet May-August, 1981-82 (N=13)	Winter Diet Sept.-April, 1981 (N=160)
<i>Festuca rubra</i>	49	40
<i>Calamagrostis canadensis</i>	10	15
<i>Melilotus</i> spp.	T	5
<i>Vaccinium</i> spp.	T	1
<i>Chenopodium album</i>		1
<i>Rubus chamaemorus</i>	2	1
<i>Salix</i> spp.	3	3
<i>Medicago falcata</i>	T	3
<i>Brassica campestris</i>	2	T
<i>Descurainia sophioïdes</i>		T
<i>Pedicularis capitata</i>	2	
<i>Lepidium densiflorum</i>		T
<i>Arctagrostis latifolia</i>	T	T
<i>Parnassia palustris</i>		T
<i>Valeriana capitata</i>	T	
<i>Artemisia tiliifolia</i>		T
<i>Betula glandulosa</i>		T
Moss/Lichen	18	8
Unknown Forbs	11	23
Unknown Graminoids	2	2

T: indicates trace amount, less than 1%.

Sheep foraged on the reseeded Hydraulic Pit area for varying lengths of time. Bands were identified by noting individuals with distinctive characteristics such as the length of broken horns or body scars. Groups of sheep were observed foraging on the seeded area for 2-5 days and then sighted 3-15 kms away feeding in windblown areas. Well-used trails leading from the Hydraulic Pit to cratered sites near Healy Creek and along the ridge between Cripple and Dora Creeks were additional evidence of foraging outside reclaimed

areas. The large portions of both summer and winter diets composed of unknown forbs (Table 2) was felt to result from feeding outside the study area.

Dall's sheep are not noted for their use of lichens and mosses. The high occurrence of mosses and lichens (Table 2) in the sheep diets at Usibelli was considered to have resulted from the accidental ingestion of these materials while feeding and a bias in the technique. Mosses are easily overestimated by the microhistological technique because they fragment more than other plants; even tiny moss particles are easy to identify. Dearden et al. (1975) reported high numbers of moss fragments can cause the underestimation of other forages. Dearden et al. (1975) found that mosses were completely indigestible, and thus of insignificant nutritional importance in digestion trials with reindeer (Rangifer tarandus), cattle (Bos spp.) and bison (Bison bison).

HABITAT USE

The attractiveness of the reclaimed areas as sheep winter range was documented during this study. Dall's sheep normally migrate to high elevation ranges in summer (Murie 1944, Hoefs and Cowan 1979). Dall's sheep at Usibelli exhibited similar habits. They left the mine in spring and summer, and returned in the autumn and winter to graze on the reclaimed areas near the Hydraulic Pit and on adjacent native range.

In their study of Dall's sheep in the Yukon Territory, Canada, Hoefs and Cowan (1979) observed that the intensity with which wintering areas were used depended on the proximity of the areas to escape terrain. Almost all low elevation winter ranges they examined had escape terrain nearby. Exceptions were mineral licks or large open areas where approaching predators could be easily detected. They also noted the importance of preferred bedding sites, areas along canyons or on elevated spots which allowed surveillance of the surrounding area. The Hydraulic Pit area conforms to Hoefs' and Cowan's description of a desirable winter range. The flat revegetated areas are adjacent to steep walled terrain that is readily used by the sheep to escape predators (personal observation). Additionally, the presence of narrow bench-like areas provides ideal bedding sites which the sheep predictably use. These bedding sites, with their view of the surrounding area, further exemplify similarities between the Hydraulic Pit and native winter range.

The proximity of the wintering area to human activity, which may deter predator (e.g. wolf) activity, vertical topography for bedding sites and escape routes, and the tendency for the area to be kept snowfree by wind, have all served to enhance the attractiveness of the mine site to the local sheep population.

Of the graminoids used for revegetation in Alaska, red fescue and bluejoint were the species most consumed by Dall's sheep. However, the presence of desirable habitat characteristics and the availability of nearby native range for supplemental feeding may be greater factors governing Dall's sheep use of reclaimed mine spoils on the Usibelli Mine than are the plant species seeded for reclamation.

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