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A Preliminary Assessment of Moose (*Alces alces*) Winter Diets in the Aleza Lake Research Forest in North-Central British Columbia

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Introduction

Winter diets of Moose (*Alces alces*) in north-central British Columbia have been determined primarily through the use of spring browse surveys. Fecal fragment analysis of Moose pellets is more accurate than browse surveys for determining diet, but has rarely been conducted in northern British Columbia (Baker 1990, Hodder et al. 2013) and does not appear to have been done at all in the interior wet belt, where Moose are an important component of the forested ecosystem (Schwab and Pitt 1991). As a result, our understanding is limited of what species of plants Moose in the wet belt consume in winter and in what proportions. The primary objective of this study was to collect and analyze Moose winter fecal pellets immediately following snow melt to determine what Moose inhabiting the Aleza Lake Research Forest consumed during the previous winter (2012/2013).

Methods

This study was conducted in the Aleza Lake Research Forest (54.086583, -122.084885) (Figure 1) northeast of Prince George, British Columbia and approximately 100 km west of the Rocky Mountains near the Great Continental Divide on BC's Interior Plateau. Mature forests are dominated by hybrid white spruce (*Picea glauca x engelmannii*) and subalpine fir (Abies lasiocarpa) with paper birch (*Betula papyrifera*) dominant in deciduous stands. Understory shrubs that dominate the research forest where collections were made are willow (*Salix* spp.), alders (*Alnus* spp.) and hazel (*Corylus cornuta*). Soils in these upland sites are a mix of silty clam loam to clays on which Luvisolic and Luvic Gleysolic soils have formed (Fredeen et al. 2005).

Moose fecal pellets were collected opportunistically during and after snow melt along roads and trails and within clearcuts from four areas within the Research Forest between 13 and 30 May 2013. Because we did not do fecal DNA analyses, whether or not pellets came from the same individual Moose is unknown. Areas of collection included the proposed Field Education Center site and its access road, the South Knolls Trail, the East Branch Road and the Bear Road Intersection. A total of 32 samples was bagged and frozen in a conventional freezer at -20^{0}C until sample preparation and analysis.

All samples were air dried and then oven dried at 40ºC for 24 hours to a constant weight. Pellet groups from each of the four areas were organized by collection site and combined for analysis, so that there was one combined sample for the proposed Field Education Center site, one for the road to the proposed Center, two combined samples for the South Knolls site, two combined samples for the East Branch Road site, and three combined samples for the Bear Road intersection area. After samples were combined, homogenized and labeled, they were sent to the Wildlife Habitat Laboratory, Washington State University, Pullman, WA for fecal fragment (micro-histological) analysis.

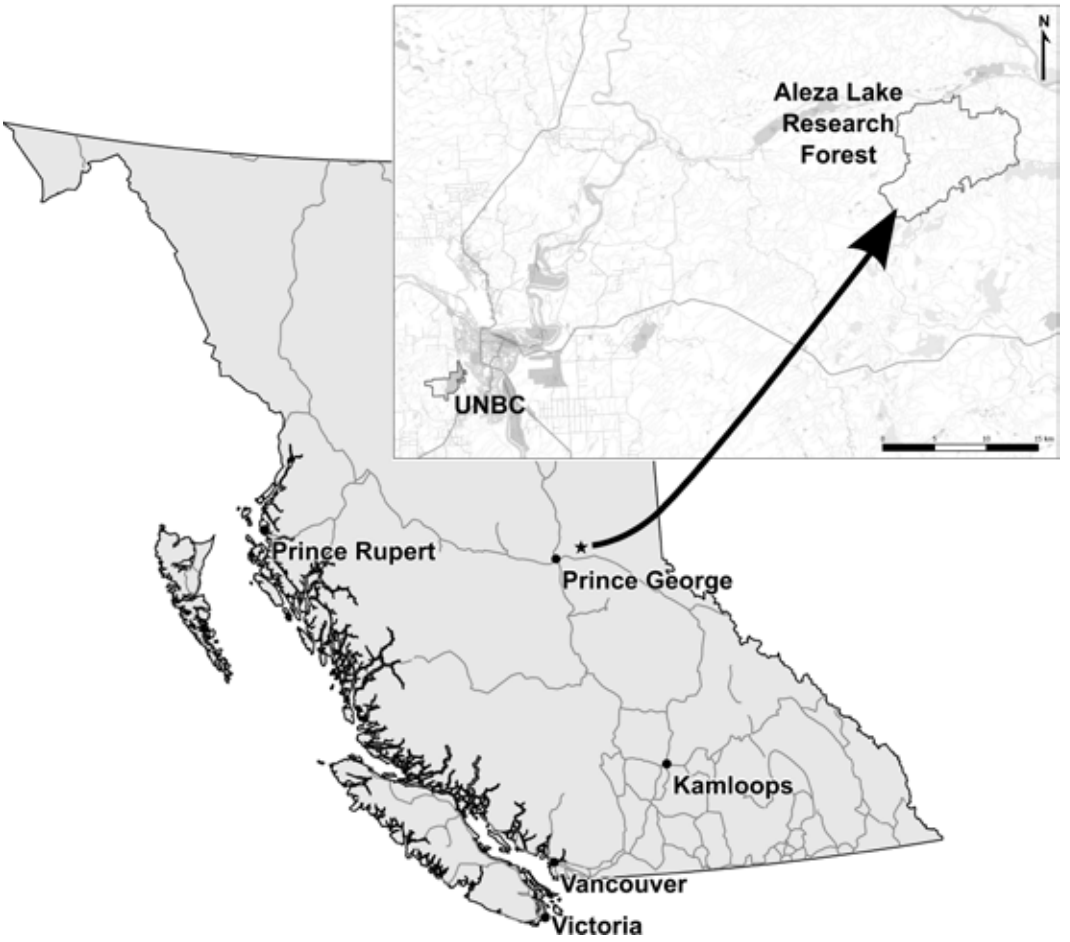

Figure 1. Location of the Aleza Lake Research Forest, northeast of Prince George, British Columbia from which Moose winter fecal pellet groups were collected for fecal fragment analysis. Map: Aleza Lake Research Forest Society.

Results

Analysis revealed that winter diets of Moose in the Aleza Lake Research Forest were on average comprised of 42% Conifer, 51% Shrubs, and 7% Lichen (Table 1). Specifically, diets on average were predominantly comprised of subalpine fir (42%), 21% willow stems, 13% birch stems, 8% aspen stems, and 7% lichen with a mix of other stem and leaf materials.

Discussion

Winter diets of Moose in western North America are predominantly composed of willow and birch, but may vary significantly by region (Renecker and Schwartz 1998). Two studies conducted in northern BC based on browse surveys suggest that Moose eat predominantly willow and birch in winter, but species such as twinberry (*Lonicera involucrata*) are also important (Eastman 1977, Schwab 1985).

Table 1. Mean (±SD) proportion of various species of plants and plant parts found in the winter pellets of Moose in the ALRF as determined through fecal fragment analysis.

Species/Group	No. combined pellet groups containing species	Mean (± SD) Proportion of Diet
Abies lasiocarpa	9	42.7 ± 2.7
TOTAL CONIFER	-	42.7 ± 2.7
Betula papyrifera leaf	6	3.0 ± 0.8
Betual papyrifera stem	8	12.8 ± 0.9
Cornus stolonifera stem	1	2.4
Corylus cornuta leaf	1	5.7
Corylus cornuta stem	6	4.1 ± 1.6
Ledum sp. leaf	2	3.0
Populus tremuloides leaf	1	3.4
Populus tremuloides stem	9	8.5 ± 4.7
Salix spp. leaf	3	1.7
Salix spp. stem	9	20.8 ± 5.6
Unknown shrub stem	2	2.9
TOTAL SHRUBS	-	50.8 ± 9.5
Lichen	7	6.5 ± 4.9

Findings from the Aleza Lake Research Forest indicate that moose ate willow and birch, but that the diet consisted primarily of subalpine fir. These findings appear to align well with reported winter diets of Moose inhabiting Mule Deer (*Odocoileus hemionus*) winter ranges in the John Prince Research Forest (interior dry belt; 45% subalpine fir; 13% willow; 4% birch; and 3% aspen; Hodder et al. 2013), but with Moose in ALRF consuming considerably more lichen (less than 1 % in the JPRF), but no Douglas fir (17% in the JPRF; but Douglas fir is much rarer in ALRF – see Fredeen et al. 2005). Hazel stem and leaves together comprised over 8% of the diet at ALRF, but is absent from the diet of Moose in the JPRF, likely reflecting the lack of hazel in the drier JPRF.

Winter diets of Moose in the ALRF differ considerably from those reported from the southwest Chilcotin area during the 1980s that were also assessed using fecal analysis (Baker 1990). Diets there were 10-30% lodgepole pine (such consumption of lodgepole pine has gone unreported elsewhere in North American Moose, but see late fall conifer consumption by Moose in Colorado [Dungan and Wright 2005]), 28-35% bog birch, and 7-19% willow with a mix of other species and only trace amounts of lichen. Because more digestible and some rarely used aquatic and forb species are not easily detected using fecal pellet analysis (Dungan and Wright 2005), results (especially from summer diet assessments) must be interpreted as diet proportions of somewhat less digestible materials.

Management Implications

Field observations confirm the importance of birch, willow and hazel in the diets of Moose in the ALRF. This first-time fecal fragment analysis of Moose winter pellets from the interior wet belt, however, suggests that subalpine fir is the most important winter diet item and that lichen is also more important than might have been previously considered. With this baseline now established, managers may make more informed decisions about what species to include in forest vegetation management (e.g., stand tending) operations and the types of crop seedlings Moose might target as forage. Importantly, these findings allow managers to have a slightly broader understanding of Moose-plant interactions in general and specifically upon which species of plants Moose depend in the interior wet belt in winter.

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Roy Rea works as a Senior Laboratory Instructor in the Ecosystem Science and Management Program at the University of Northern British Columbia in Prince George, where he teaches Introductory Biology, labs in Plant Systematics, and Field Applications in Resource Management. Roy has studied Moose-plant interactions in northern BC for 20 years.