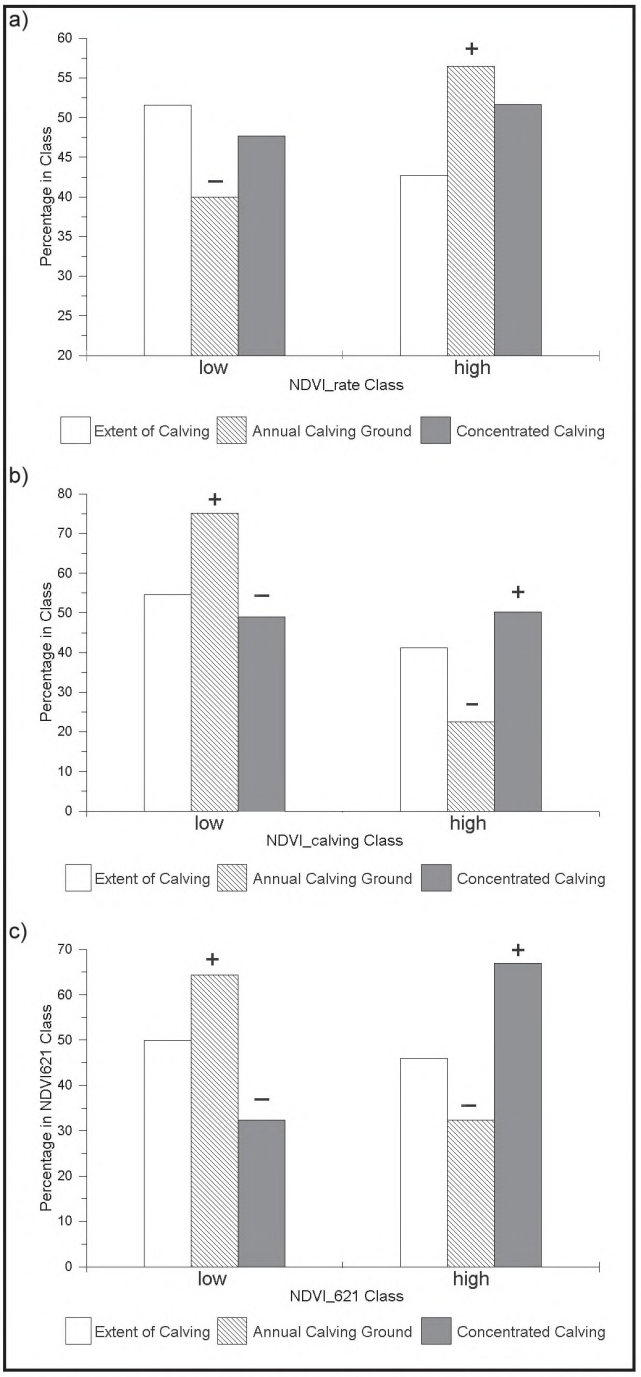

Figure 3.19. Azrage percent of area in low (≤ median) or high (>z median) classes of *a*) daily rate of increase in the Normalizedz Difference Vegetation Index (NDVI_rate) *b*) NDVI at calvingz (NDVI_calving), and z) NDVI on 21 June (NDVI_621) for the aggregatez extent of calving, annual calving grounds, and concentrated calvingz areas of the Porcupine caribou herd, Alaska, 1985-2001. Statisticallyz significant selection or avoidance ($P < 0.05$, overall experiment) inz comparison with the category to the left is indicated by "+" or "-" abovez the bars. For example, female caribou on the annual calving groundz avoided low NDVI_rate and selected high NDVI_rate in comparisonz with availability in the aggregate extent of calving. No significantz selection of NDVI_rate for the concentrated calving area whenz compared with the annual calving ground was detected.z

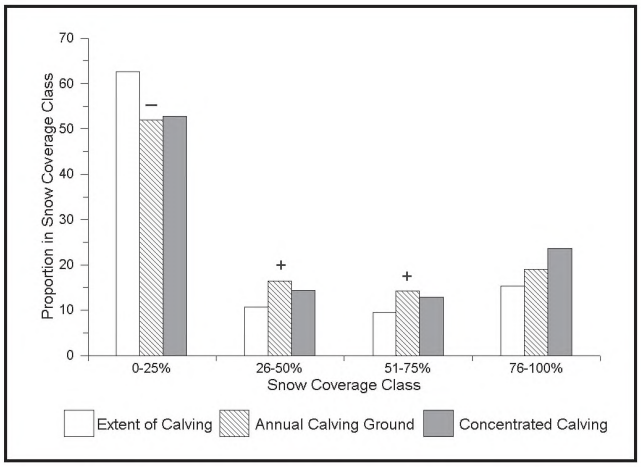

Figure 3.20. Azrage percent of area in 4 exclusive snowcoverz classes for the aggregate extent of calving, annual calving grounds,z and concentrated calving areas of the Porcupine caribou herd, 1985-z 2001. Statistically significant selection or avoidance ($P < 0.05$, overallz xperiment) in comparison with the category to the left is indicated byz "+" or "-" above the bars. For example, female caribou on the annualz calving ground avoided areas of 0-25% snowcover and selected areasz of 26-50% and 51-75% snowcover when compared with availability inz the aggregate extent of calving. No significant selection of anyz snowcover class was detected for the concentrated calving area whenz compared with availability in the annual calving ground.z

(1.68x, $P = 0.001$), avoided alpine vegetation (0.34x, $P < 0.001$), and were non-responsive ($P > 0.18$) to the remaining vegetation types (Fig. 3.21).

Although selection of vegetation types was scale-independent, there was scale dependency in the selection of forage quantity (NDVI_calving, NDVI_621) and quality (NDVI_rate). Parturient Porcupine caribou herd females selected annual calving grounds with a high proportion of easily digestible forage (NDVI_rate), then selected concentrated calving areas with relatively high plant biomass at calving (NDVI_calving) and on 21 June (NDVI_621).

The basis of habitat selection shifted from forage quality to forage quantity between the fifth (ACG/EC) and sixth (CCA/ACG) orders. The work of White et al. (1975) and White and Trudell (1980) at the levels of microhabitats (~seventh order, selection for biomass) and plant species within microhabitats (~eighth order, selection for digestibility) suggests that the basis of selection continues to be dynamic across successively smaller scales.

Forage quality appears to be the basis of selection at both relatively large (fifth order) and relatively small (eighth order) scales. Forage quantity appears to be the basis of selection at intermediate scales of analysis within this range. Specification of the scale of analysis is critical to developing an understanding of the basis of forage selection by ungulates, and Porcupine herd caribou demonstrated a variable functional response to forage (NDVI estimates) within the extent of calving.

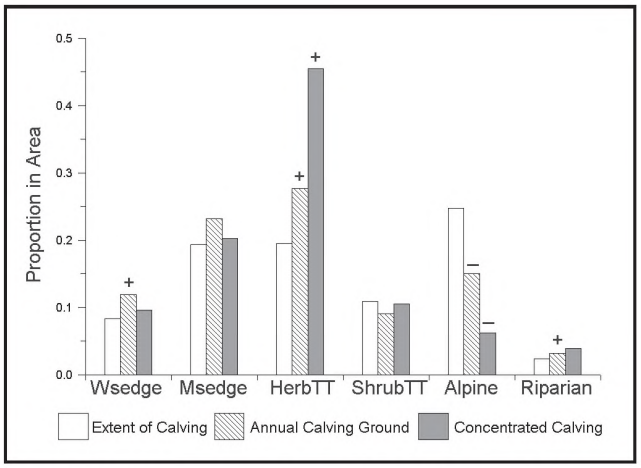

Figure 3.21. Azrage percent of area in 6 vetetation types for thez aggregate extent of calving, annual calving grounds, and concentratedz calving areas of the Porcupine caribou herd, 1985-2001. Vzgetationz types: Wsedge = wet sedge; Msedge = moist sedge; HerbTT =z herbaceous tussock tundra; ShrubTT = shrub tussock tundra, Alpine,z and Riparian. Statistically significant selection or avoidance ($P < 0.05$,z overall experiment) in comparison with the category to the left isz indicated by "+" or "-" above the bars. For example, the female caribouz on the annual calving ground avoided the Alpine vegetation type andz selected the HerbTT vegetation type when compared with availabilityz in the aggregate extent of calving, and on the concentrated calvingz area the caribou showed similar selection when compared withz availability in the annual calving ground.z

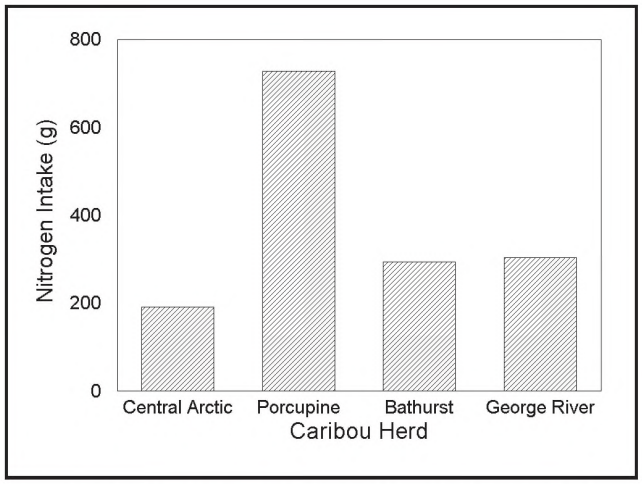

Figure 3.22. Estimated total intake of dietary nitrogen (g) from thez calving ground (25 May - 14 June) for 4 North American caribou herds.z Forage composition of diet and nutritional composition of forages werez stimated from locally collected samples. Intake rates were estimatedz from White et al. (1975).z

There fwere fno fclear fdifferences fin fpatterns fof fselection of any types of habitats between the increasef and fdecrease fphases fof fthe fherd. fThis fobservation fsf tempered by the fact that habitat selection was assessed for fonly fthe fast f5 fyears f(1985-1989) fof fthe fincreasef phase, fbut fhas fbeen fassessed for fall f12 fyears fof fthef current fdecline f(1990-2001).f

The shifting location of annual calving grounds withinf the extent of calving was apparently a functional responsef to annually variable landscape patterns in the quantity of easily fdigestible forage f(NDVI_rate). fThe flocation fof concentrated calving areas within annual calving groundsf was fin fapparent functional fresponse fto forage fbiomassf (NDVI_calving, fNDVI_621).f

This functional fresponse fto fhabitats fallowedf Porcupine fcaribou fherd females fto fattain fsubstantialf intakes of nitrogen (Fig. 3.22) based on estimated dietf composition (Figs. 3.16*a*, 3.17*a*), festimated fnitrogenf content fof fconsumed forages, fand fconsumption fatesf presented by fWhite et al (1975), fWhite and fTrudellf (1980*a,b*), fand Trudell fand White f(1981). fThus, fthef Porcupine caribou herd calving ground was clearlyf important to the annual nitrogen budget of lactating females fand fwas flikely fimportant fto fthe fannual fenergyf budget.f

The adjacent Central fArctic fherd fobtained fonly faboutf one-quarter fas fmuch fdietary fnitrogen from fits fcalvingf ground fas fdid fthe fPorcupine fcaribou fherd f(Fig. f3.22). fIt fisf likely that the proportion of the annual nitrogen budgetf obtained from a calving fground is positively correlatedf with the relative value of fthe calving ground to thef nutrition of a herd fwithin its annual range.f

Effects fof Insect Harassment fon Habitat Usey

Mosquitoes f(*Culicidae*) fand flies fof fthe familyf *Oestridae*fare fknown fto fharass fcaribou, falthoughf harassment fby fOestrid flies fmay foccur fprimarily fafterf Porcupine herd caribou leave the calving ground.f Lactating females fthat fare fdisturbed fby finsects fmayf experience a negative energy balance due to increasedf movement fates fwhen frying fto fescape fharassment fbyf insects f(White fet fal. f975, Russell fet fal. f993). fWhenf harassment causes lactating emales to substantiallyf reduce foraging time, calf growth may be reduced (Hellef and fTarvainen f984, Fancy fand fWhite f987, Russell fet fal.f 1993).f

During fwarm fand fcalm fdays f(mean femperature f<13°Cf and mean wind speed f<6m/sec) when conditions weref such that caribou were likely harassed by insects (Nixonf 1990), Porcupine fherd fcaribou fpreferred fdry fprostratef shrub vegetation types on ridge tops in the foothills andf mountains of the Brooks Range, elevated sites on thef coastal fplain, fand fareas fadjacent fto fthe Beaufort feaf coast, apparently to gain relief from mosquitoes (Walsh etf al. f992).f

Porcupine fherd fcaribou fdid fnot fdisplay fas fstrong fif tendency to move to the fcoastline during potential insectf harassment fas fhas fbeen fseen for fthe fadjacent fCentralf Arctic fherd. fObservations fof fmovements fof funmarkedf animals fduring fsurvey flights, fhowever, findicate fthatf