

Changing Landscapes: Foodscapes

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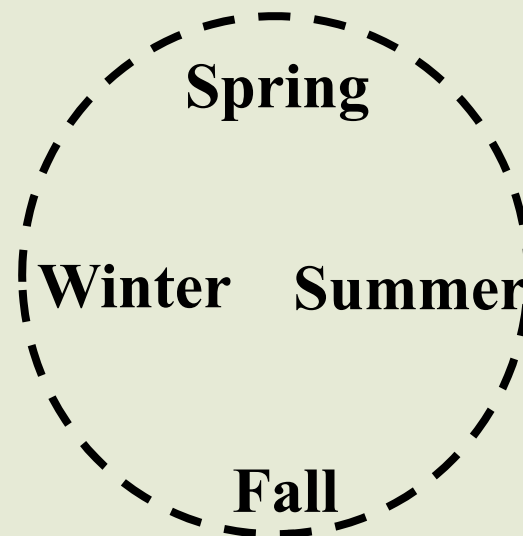
CARMA 9, Whitehorse, Yukon March 2018



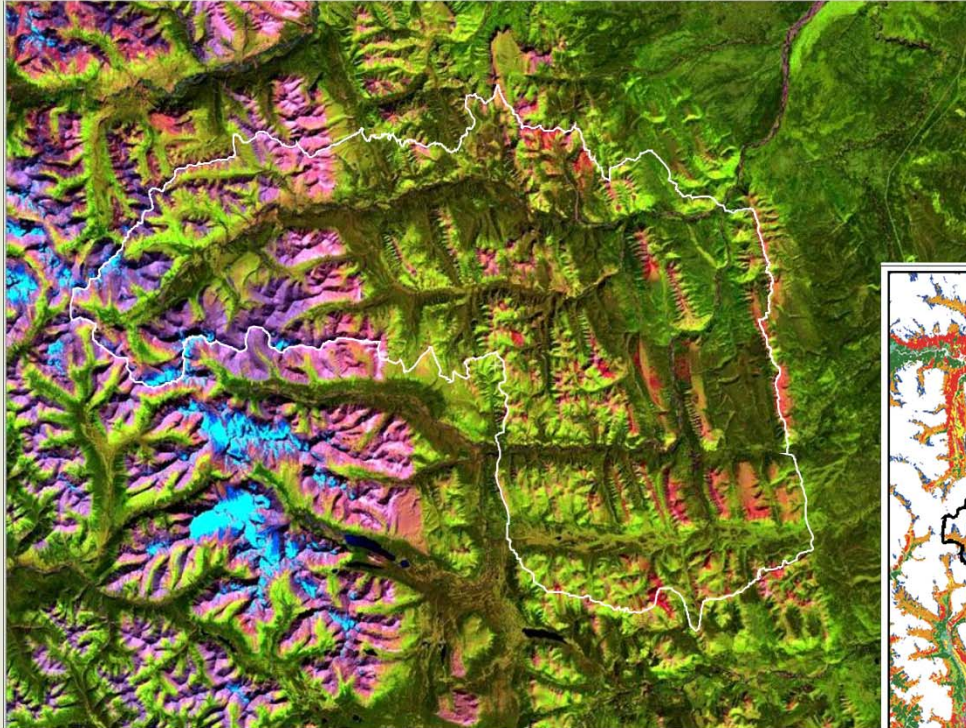
- Landscapes are changing.
- Many caribou populations are declining.
- Which habitats are important to caribou, why, when, and how might they change?

The role of food and nutrition

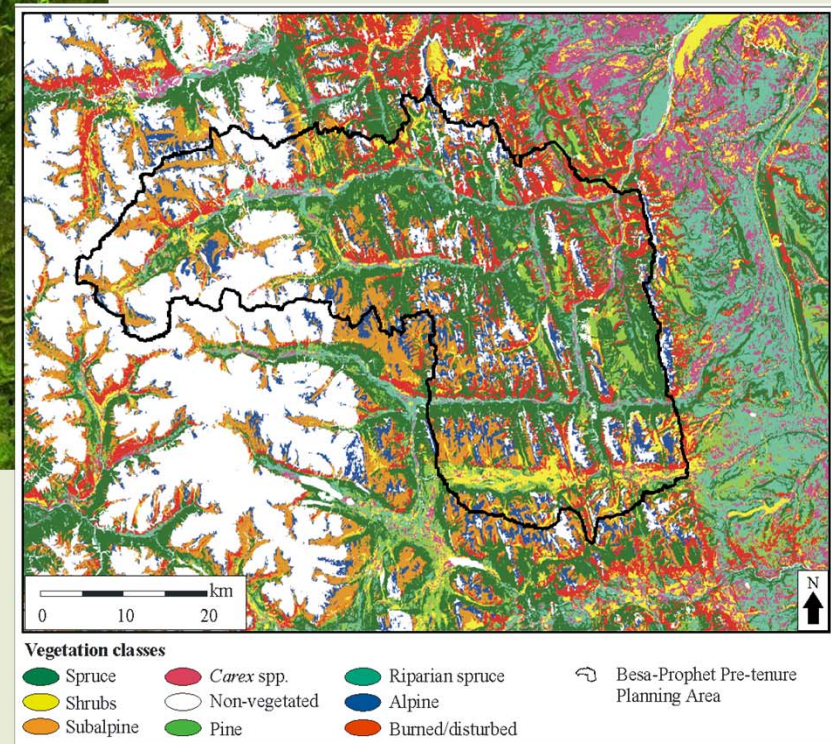
- Nutrition is the basis for survival and reproduction.
- Nutritional needs and foods change with season.
- Food matters on an annual continuum.



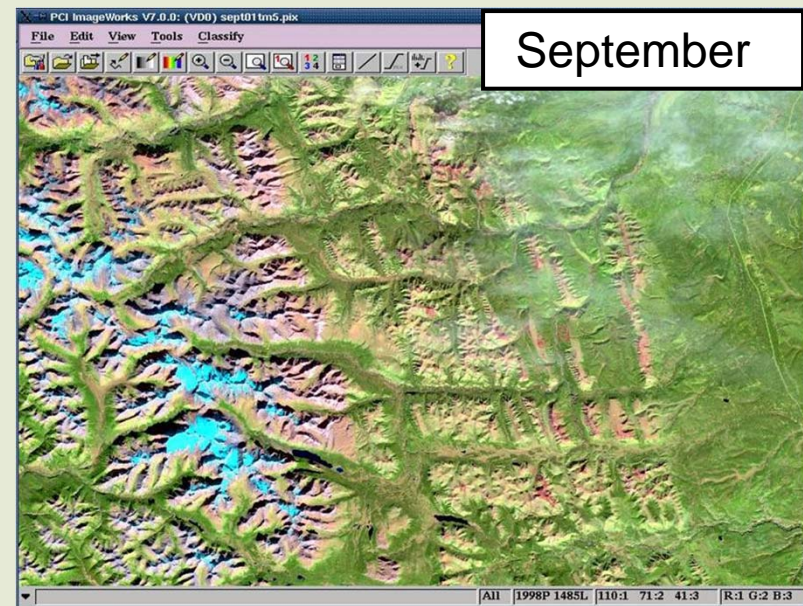
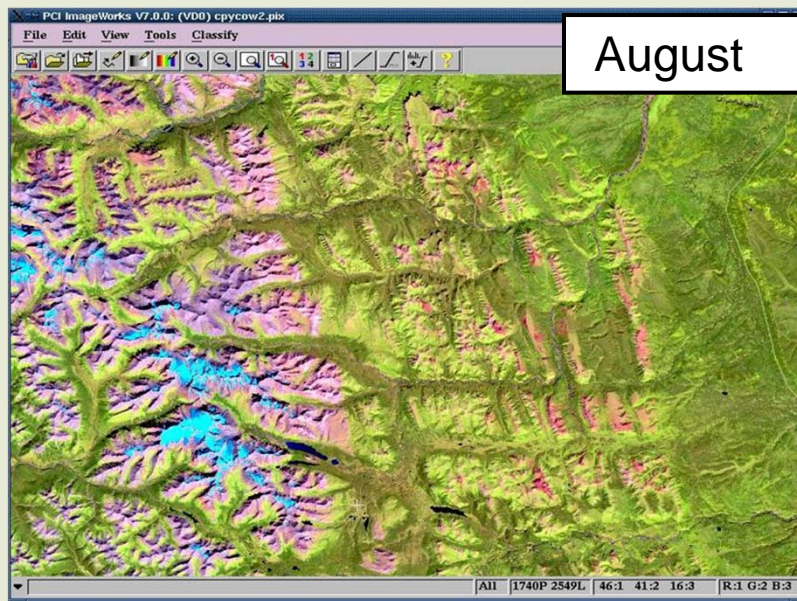
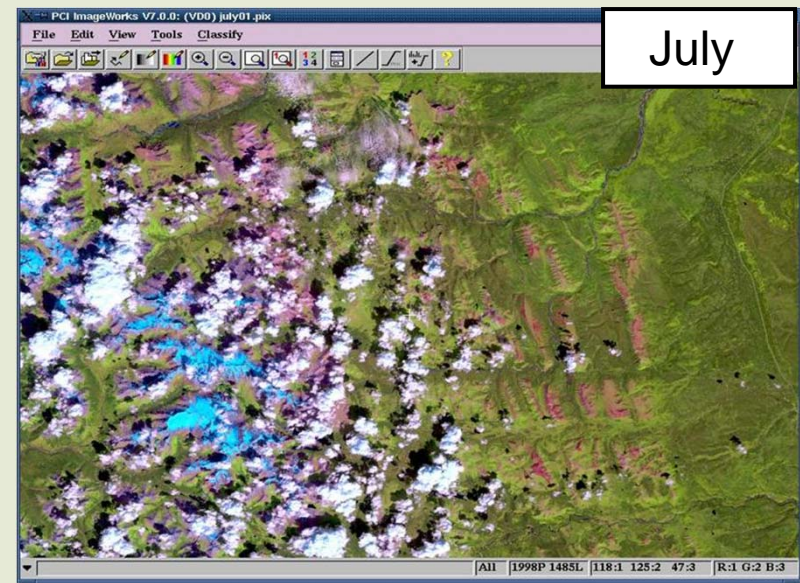
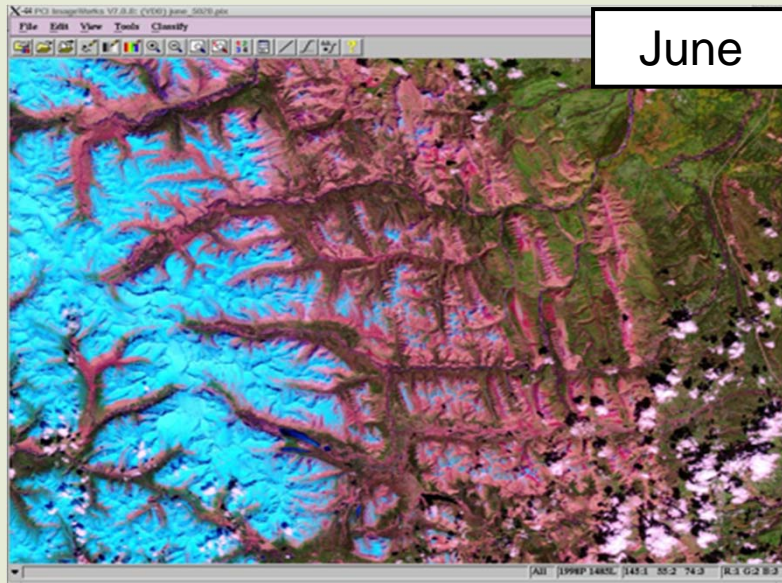
Vegetation classification from satellite imagery



Besa-Prophet Area, northern British Columbia

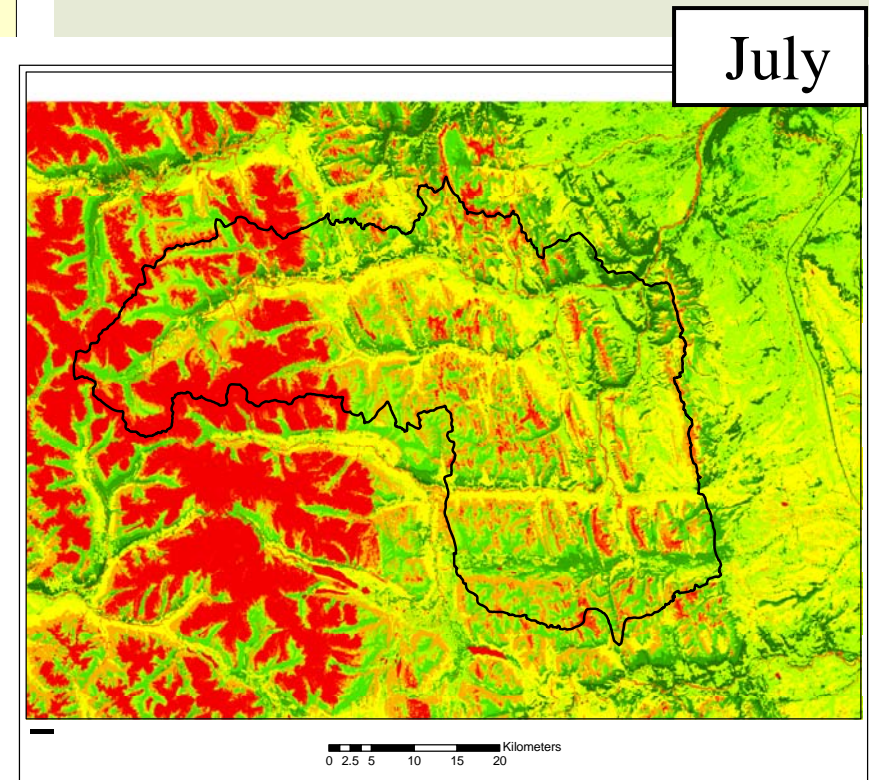
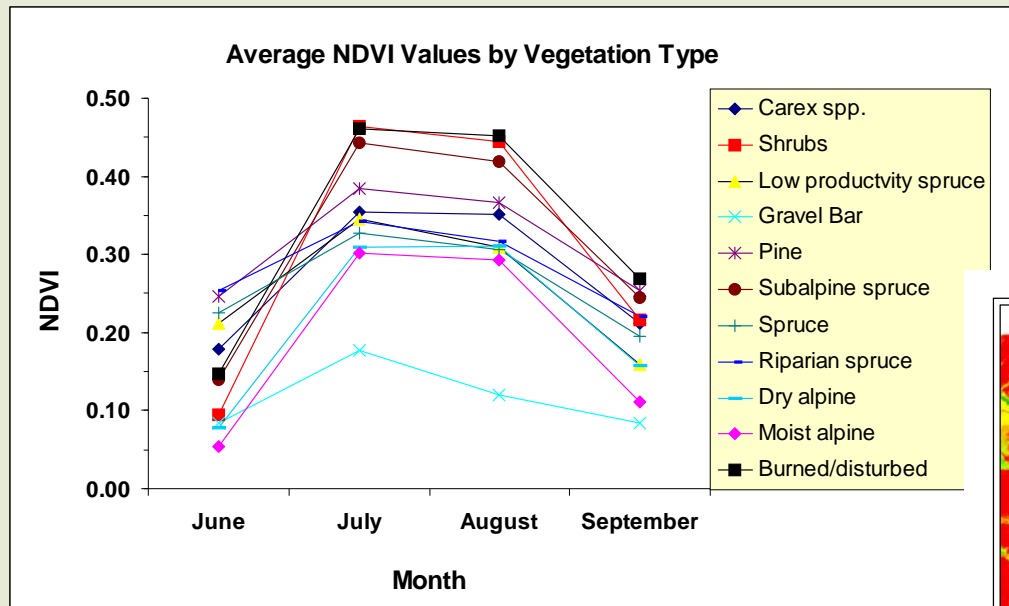


Roberta Lay 2002 MSc Thesis
Gustine et al. 2006 Wildlife Monograph

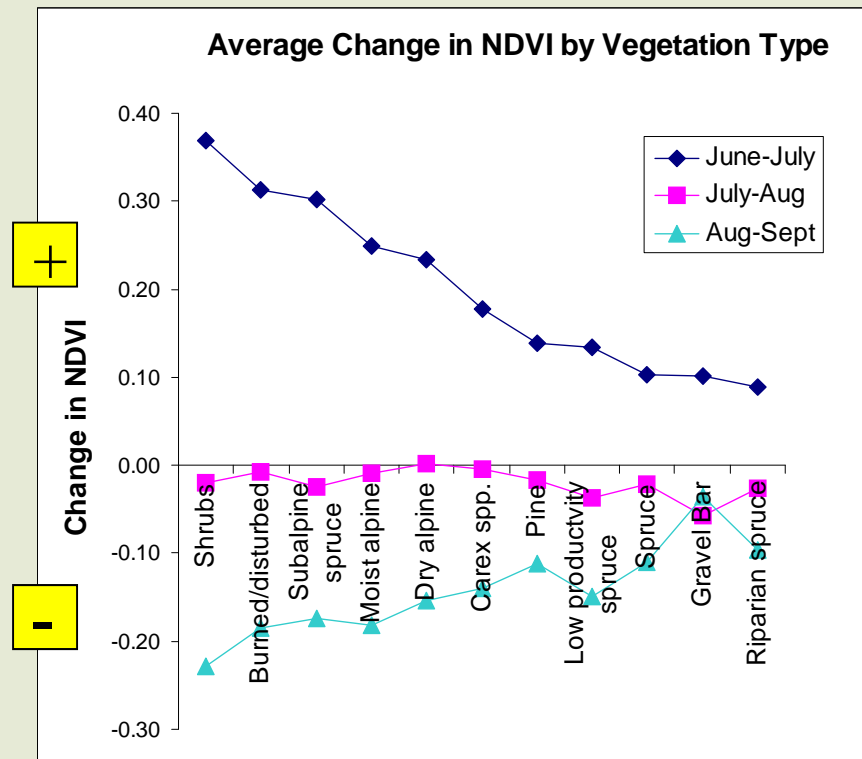


Besa-Prophet Area, BC

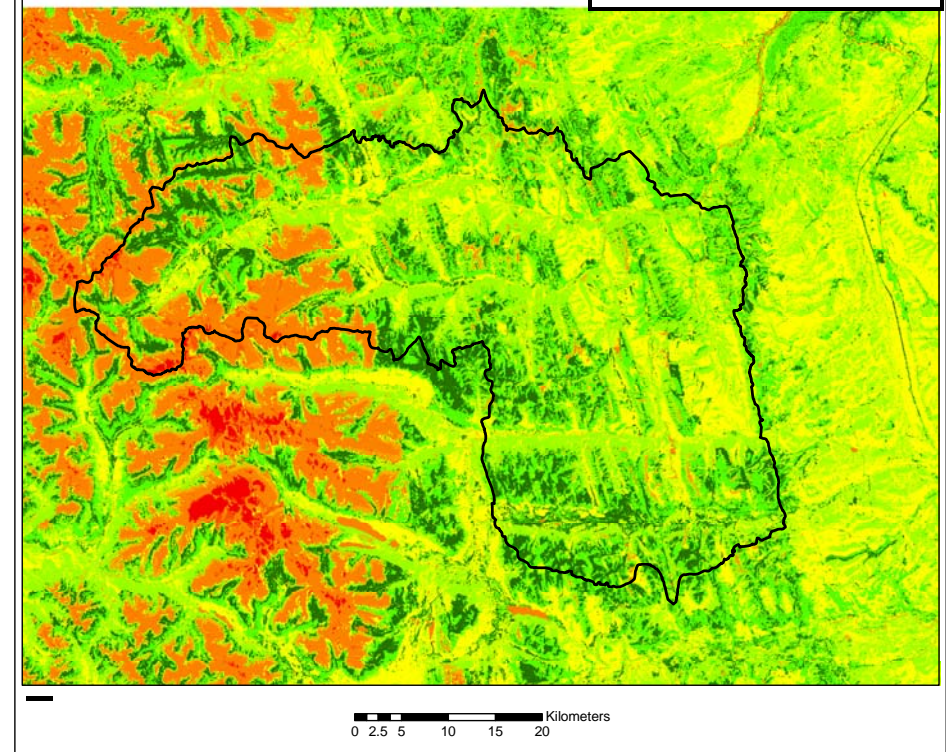
Index of vegetation biomass (NDVI)



Index of forage quality (change in NDVI)



June - July



Resource selection strategies by caribou

- Food quality:
Caribou select high-quality areas in spring
- Food quantity:
Caribou move to areas with higher biomass in summer
- Trade-offs with other factors
- Food values are not explicit in selection models



Use of tame caribou as a habitat assessment tool

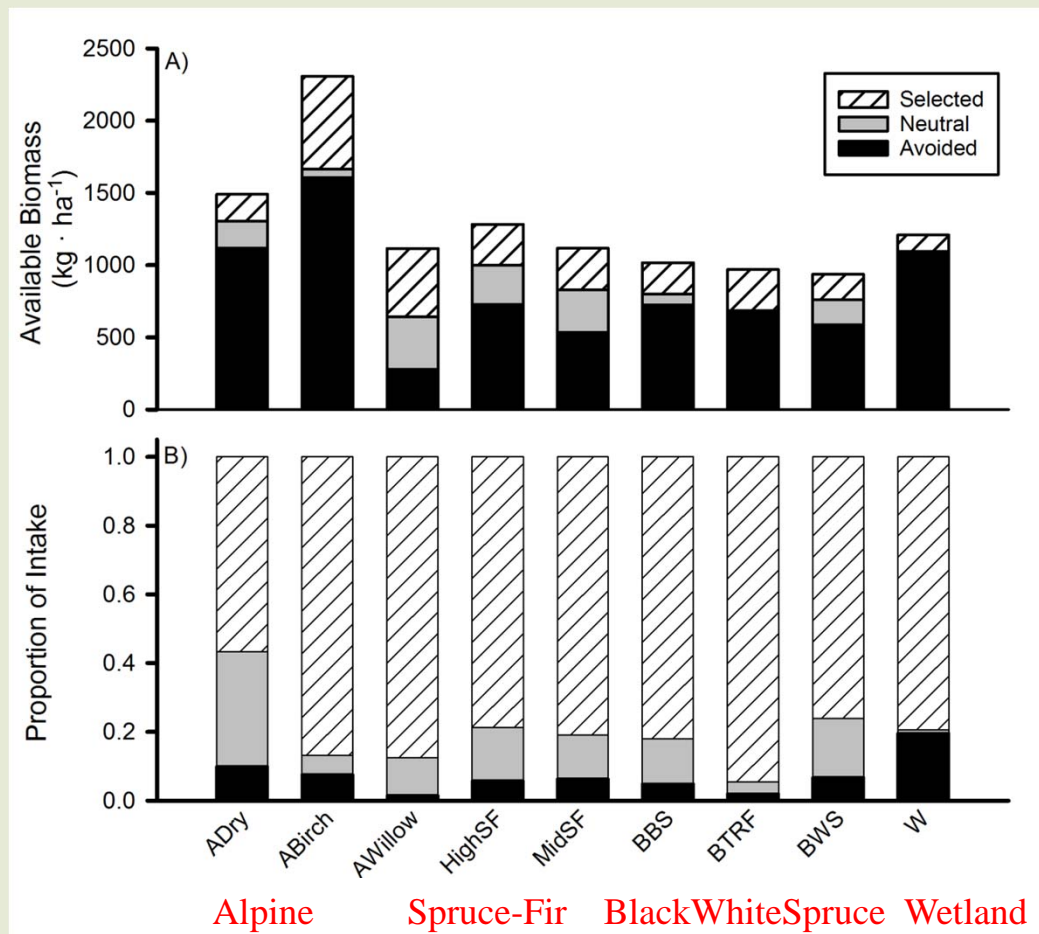


Bite rate, bite size
Diet composition
Foraging time
Diet quality – energy, protein



Denryter 2017 PhD Thesis
Denryter et al. 2017 Canadian Journal of Zoology

All biomass is not food for caribou



**<50% of all understory biomass
in northern BC is accepted food
(selected + neutral species)**

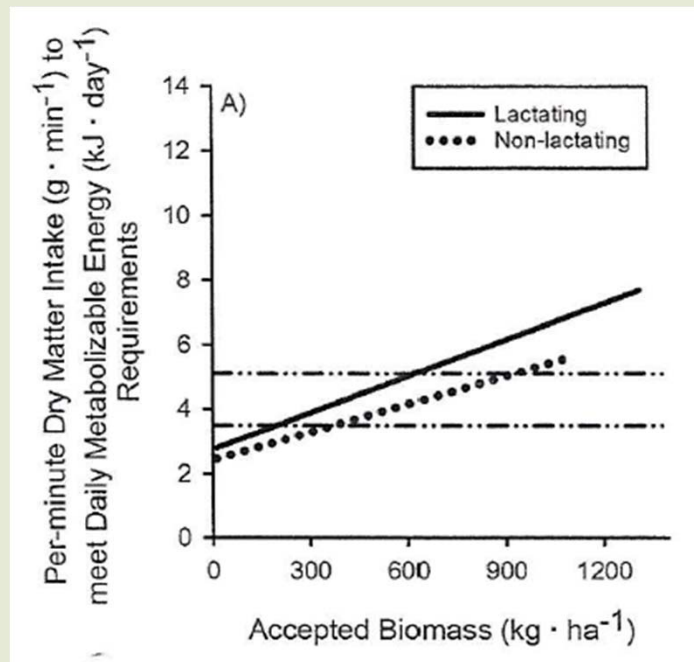
**Selected forage: 78% of intake
28 species**

How caribou make a living

- Highly selective foragers
- Forage in habitats with relatively **high quantities of accepted food** (deciduous shrubs, forbs, lichens) in summer
- Achieve higher intake rates on **species with large bite masses**
- Allocate substantial time to foraging

Selected habitats and vegetation types improve both intake rate and and quality of food

- Forage biomass can control food intake rate
- Selective foraging can increase digestibility by 15-35%



Denryter 2017 PhD Thesis

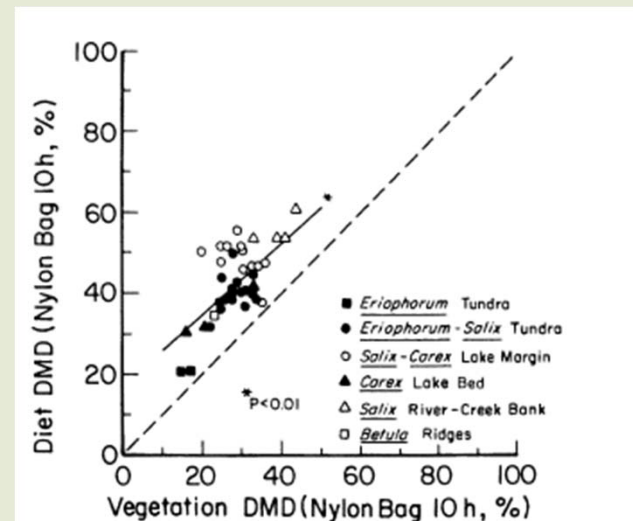
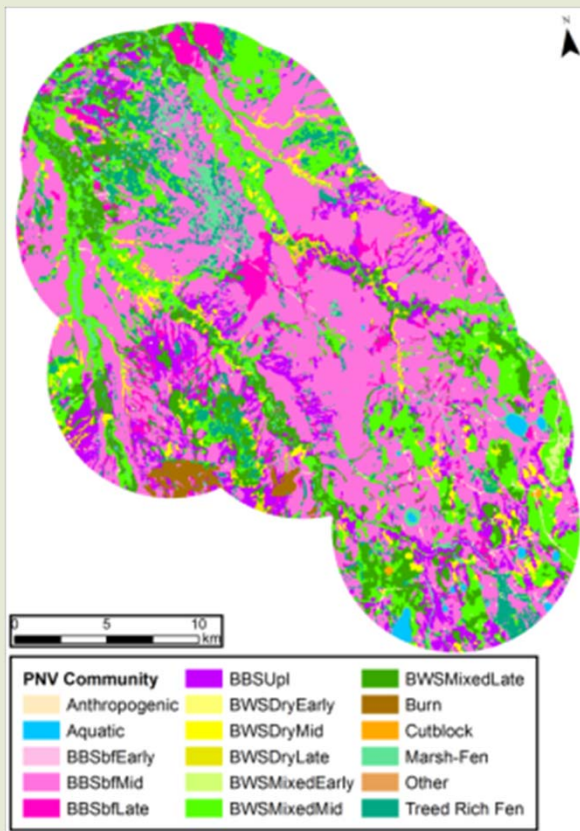


FIGURE 4. Comparison of the digestibility of reindeer diet with the estimate for the available vegetation in several habitats. Dashed line indicates no selection. Regression equation for solid line is $Y = 17.3 (\pm 4.8)^* + 0.88 x (\pm 0.16)^*$; $N = 41$, $*P < 0.01$.

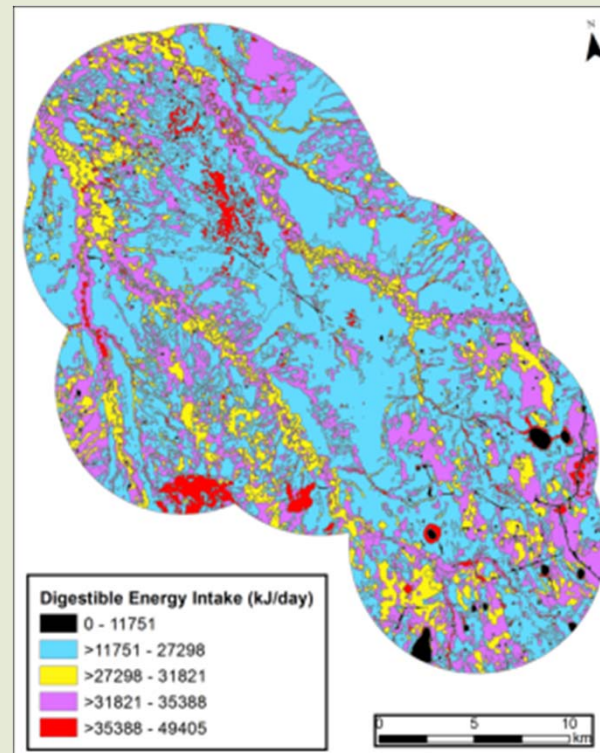
White and Trudell 1980

Foodscapes of digestible energy and protein intake

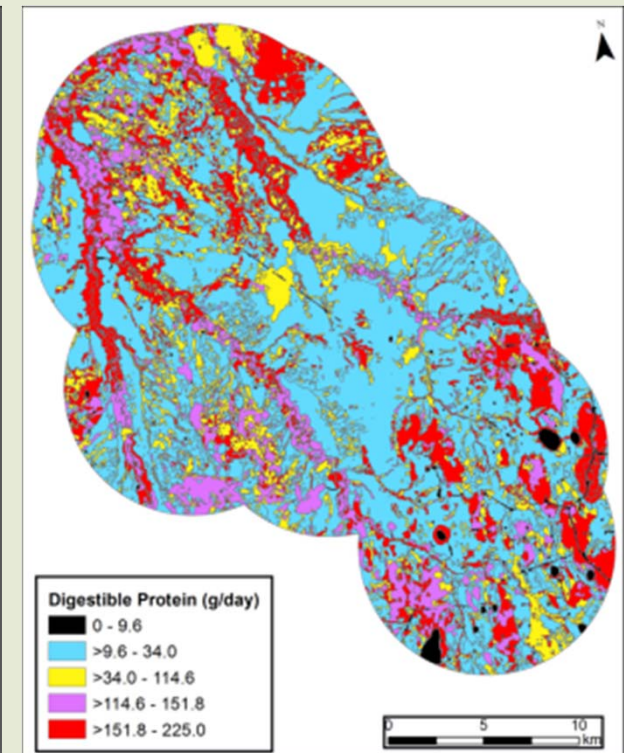
Example caribou summer range (Denryter 2017 PhD Thesis)



Vegetation cover classes

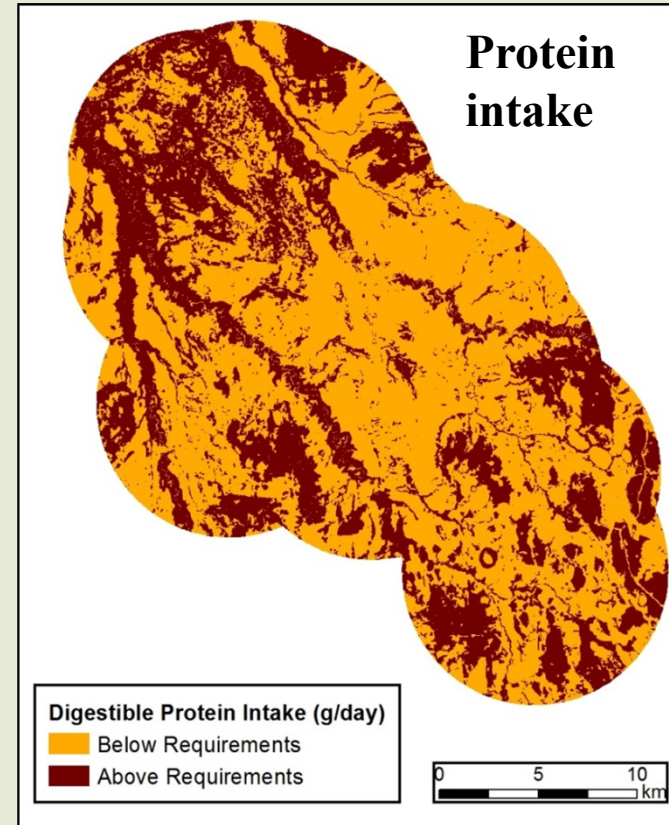
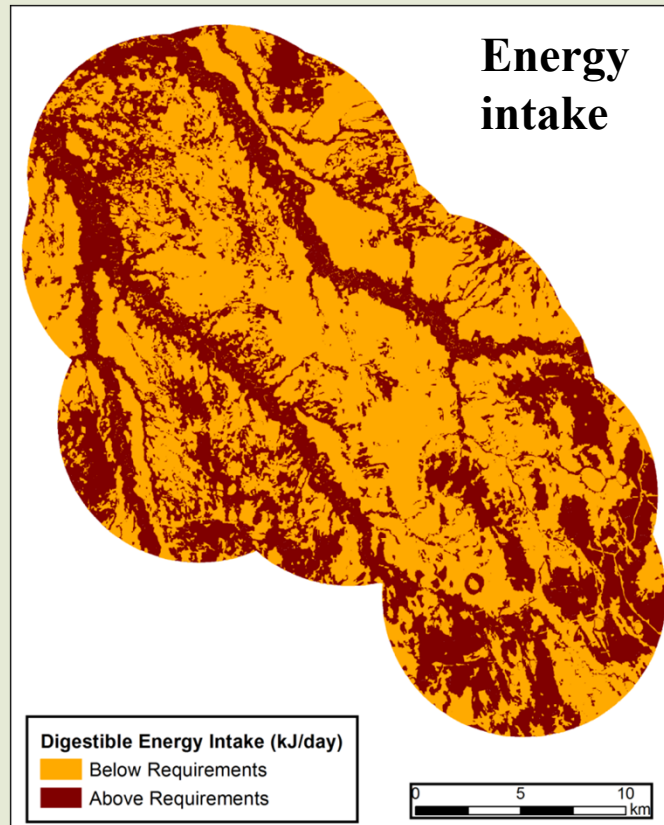


Energy foodscape



Protein foodscape

Caribou must **move** across the landscape
and **high-grade** when foraging



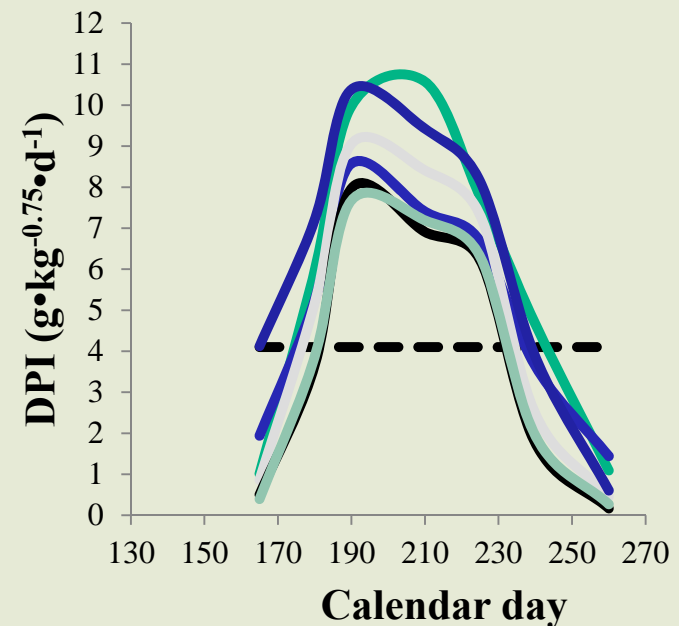
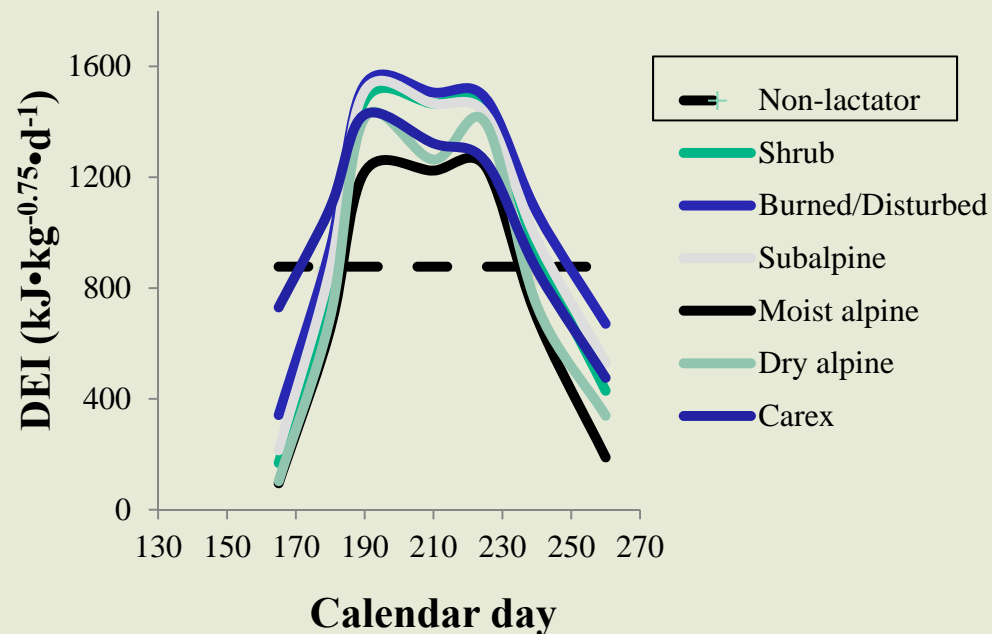
Maintenance for Non-lactating Caribou
30,104 kJ DE/day
94 g DP/day

Estimating food value on the landscape

- Consideration of spatial accuracy and scale
- Habitat mapping
 - high-resolution and frequent satellite images
 - need to validate community composition
- Food value of mapped habitats
 - index of quantity: accepted biomass
 - index of quality: digestible energy and protein
- Example: Combining NDVI of known communities with adjustments for accepted foods and food quality to index changes in foodscape value

Combining satellite imagery (NDVI) with intakes of digestible energy (DEI) and protein (DPI)

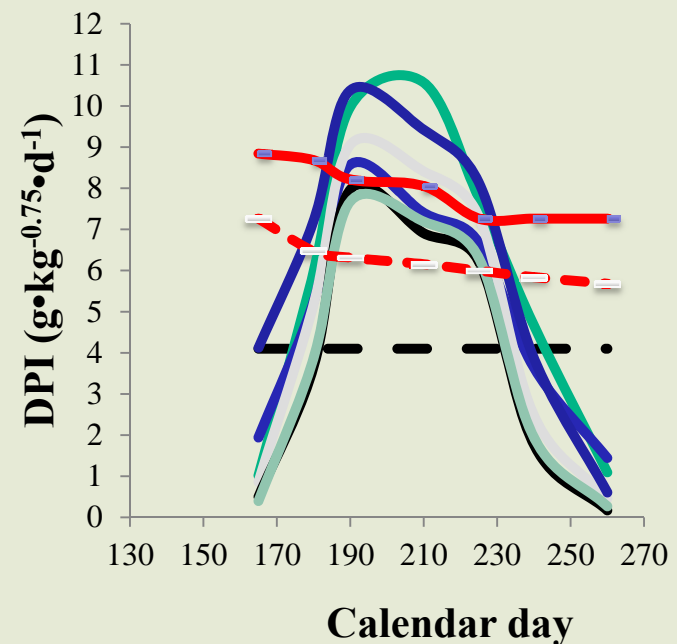
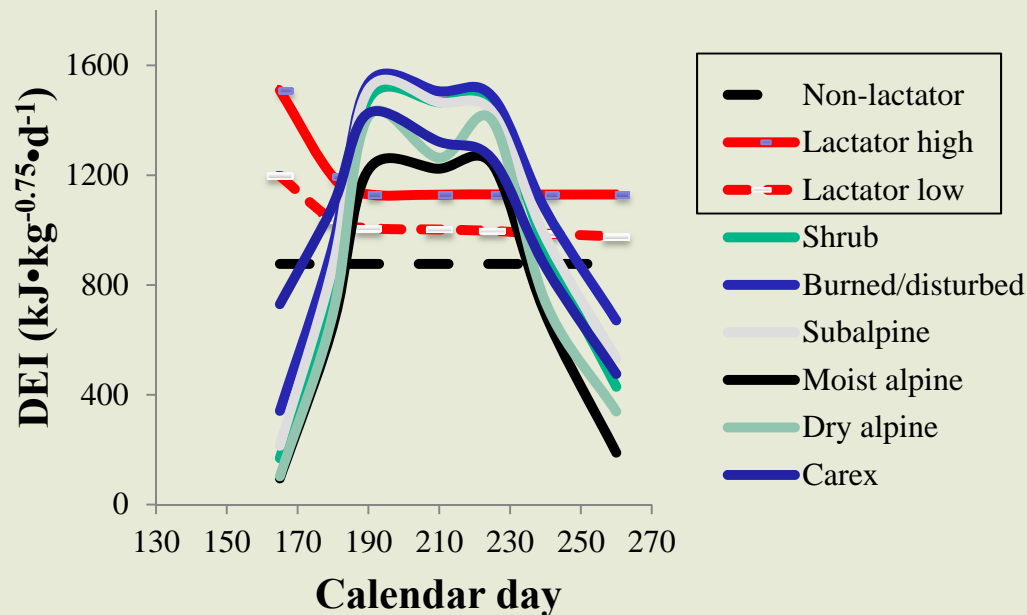
- Seasonal trend in potential digestible **energy intake**
- Seasonal trend in potential digestible **protein intake**



Example not corrected for accepted biomass

Potential intakes compared to requirements for lactating caribou

- Potential digestible **energy intake** relative to high and low milk production
- Potential digestible **protein intake** relative to high and low milk production



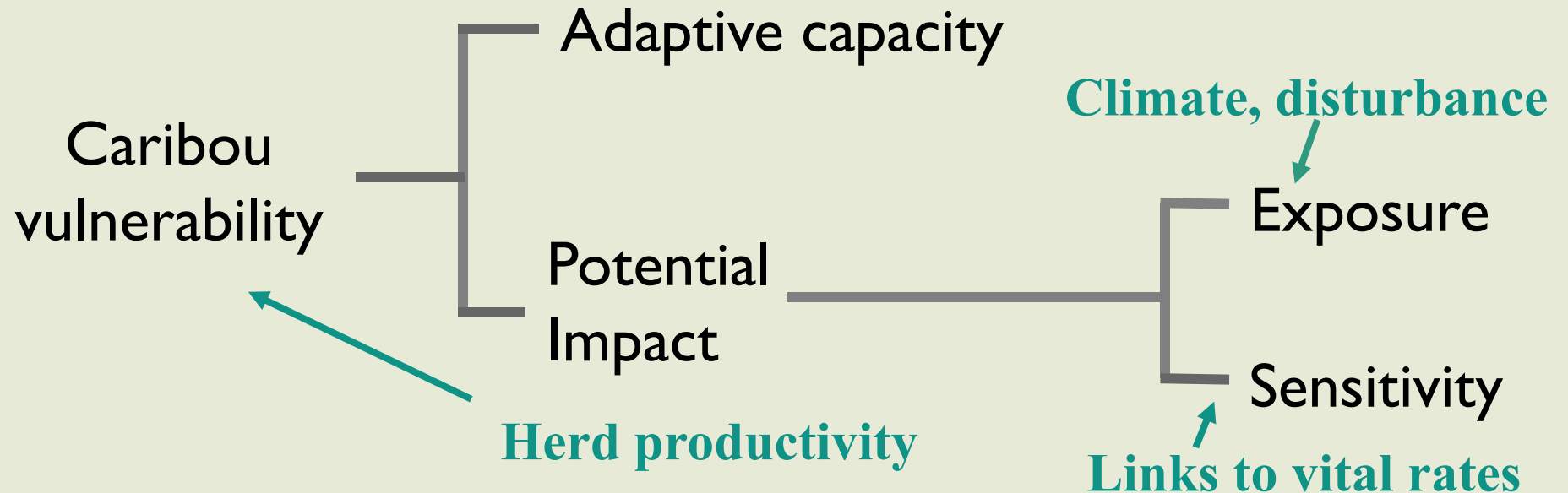
Example not corrected for accepted biomass

Foodscapes change as landscapes change.

Why do they matter?

- Influence movements and distribution of caribou
- Linked to the ability of caribou to be productive
- Changing landscapes begin to limit choices.
 - Climate and fires
 - Disturbance and developments (with access)
 - Pathogens

Foodscapes: a tool to better understand the effects of changing landscapes





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