

# Long Term Phenology Trends of NWT/Nunavut Barren-ground Caribou

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## Background:

It has been shown that caribou (*Rangifer tarandus*) alter their diet based on the season, amount of food available, and their nutritional needs (Thomson and McCourt, 1991). Caribou are able to track the vegetation green-up and thus migrate to those areas when it is accessible (Skogland 1984, Russell et al. 1993). Caribou dispersal based on several NDVI variables differs between herds. For example when calving grounds are located on wet coastal habitats (Central Arctic, Teshekpuk Lake) the response to the rate of green-up is usually consistent (Kelleys 2001, Wolfe et al. 2000) compared to the herds that have a large area of upland habitat (Western Arctic, Porcupine, Bathurst, Kelleys 2001, Griffith et al. 2001). Determining the timing of green-up, the timing of senescence and the length of the growing season, as well as trends within land cover type is important to help determine how climate change is affecting the calving and summer ranges of the Barren-ground caribou in the Northwest Territories/Nunavut region.

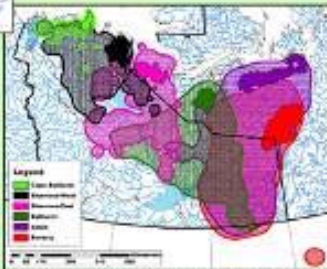


Figure 1: Approximate yearly ranges (lined polygon) and calving ranges (solid polygons) of the NWT/Nunavut Barren-ground Caribou herds mapped by John Nagel, GMWT ENR

## Methods:

- Radio collar data from the caribou were used to create shapefiles delineating their calving and summer ranges.
- A 10 day composite time series of AVHRR 1km satellite data was used as the input into a satellite-based arctic-subarctic tundra phenology analysis system (SATRAS) which approximates the start, end, length, and peak of the growing season from 1985-2006.
- Linear regression is used to calculate the phenological variables ( $y = 25.482x - 38.402$ )
- The weighted average of the timing of green-up and senescence were calculated.

## Methodology

An automated, quantitative approach was implemented in a SATRAS program to derive phenological measures from multi-spectral VI derived from satellites.

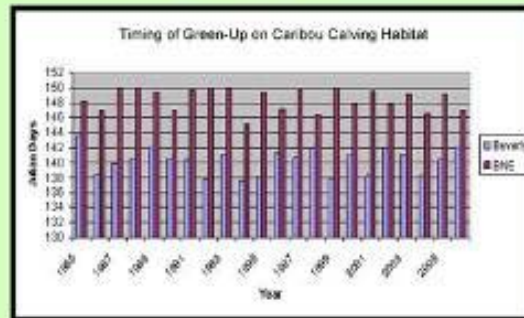
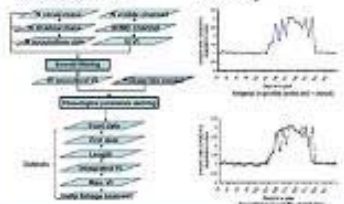


Figure 2: Timing of green-up on the calving habitat of the Bluenose East and Beverly caribou (1985-2006)

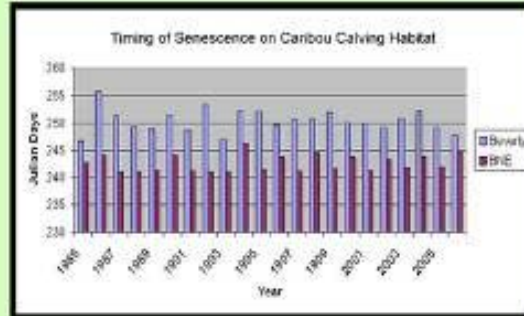


Figure 4: Timing of Senescence on the calving habitat of the Bluenose East and Beverly caribou (1985-2006)

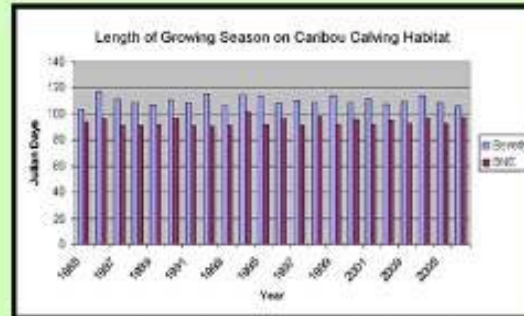


Figure 5: The length of the growing season on the calving habitat of the Bluenose East and Beverly caribou (1985-2006)

## Sample of Results:

- The timing of green-up on the Bluenose East herd calving and summer habitat was earlier for all 22 years compared to the Beverly herd.
- Similarly, the timing of senescence was earlier on the Bluenose East calving habitat for all years compared to the Beverly herd.
- The timing of senescence was noticeably later in 1987 and 1988 on the Beverly summer habitat compared to the Bluenose East herd.
- The length of the growing season was longer on the Beverly herd's calving and summer habitat for all years compared to the Bluenose East herd.

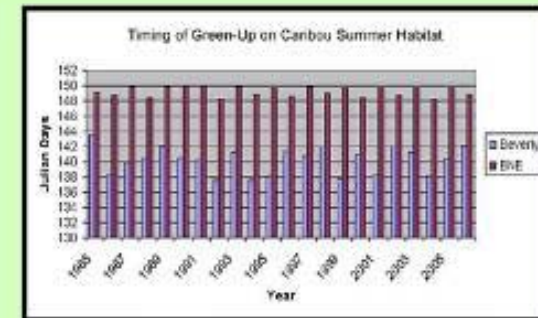


Figure 3: Timing of green-up on the summer habitat of the Bluenose East and Beverly caribou (1985-2006)

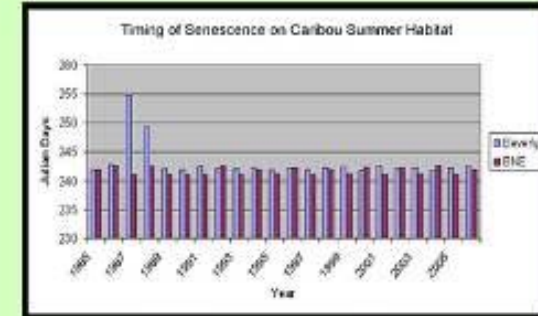


Figure 6: Timing of senescence on the summer habitat of the Bluenose East and Beverly caribou (1985-2006)

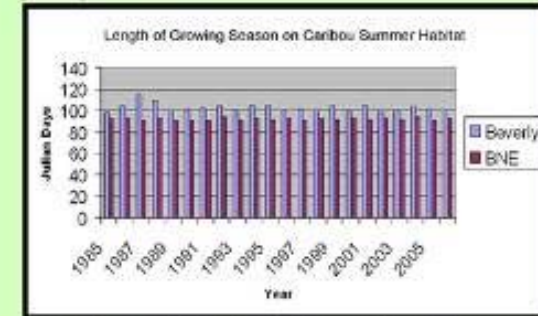


Figure 7: The length of the growing season on the summer habitat of the Bluenose East and Beverly caribou (1985-2006)

## Future Research:

- Other habitat indicators will be included: foliage biomass, peak NDVI, NDVI at peak calving, NDVI peak lactation, rate of NDVI change and insect harassment.
- All habitat indicators will be compared to climate variables (temperature and precipitation) to see if they are correlated.
- Maxent will be used to build niche models to determine how the amount of suitable habitat has changed over time.

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