

Can caribou control their resources ?

Simulating herbivory on a key summer food resource, the American dwarf birch

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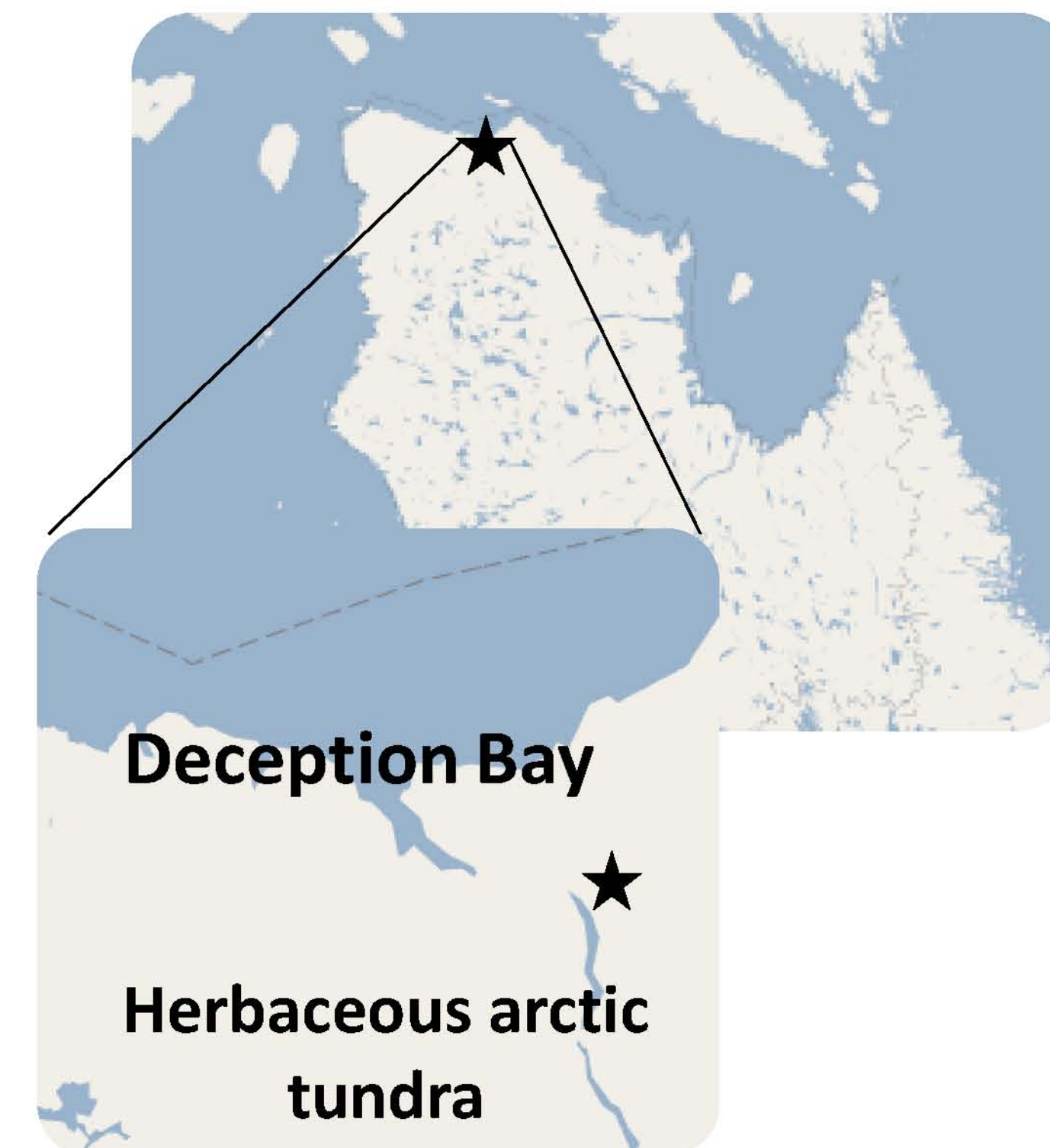


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1. What are the retroactive feedbacks between caribou and their summer forage?

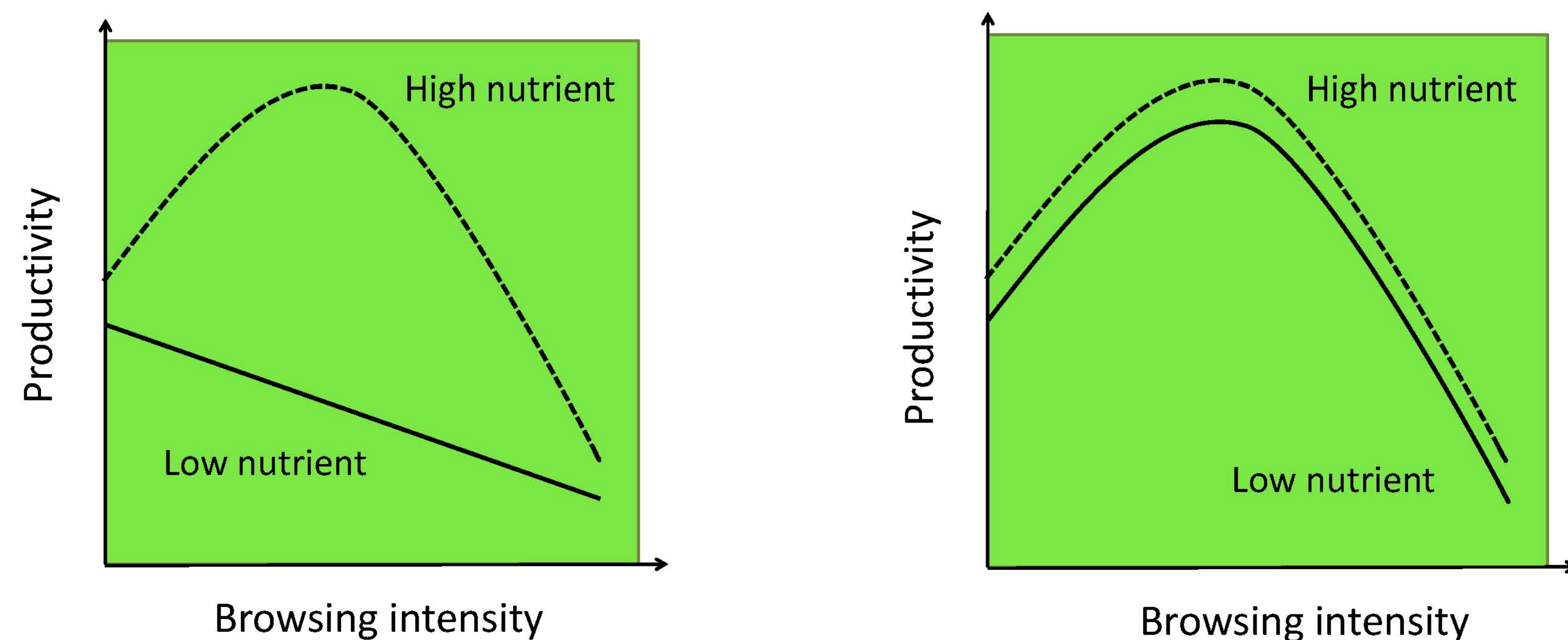
In the last few decades, large populations of migratory caribou (*Rangifer tarandus*) occurred in Nunavik and Nunatsiavut, maintaining a high browsing pressure and affecting their environment.

The American dwarf birch (*Betula glandulosa*) is a major summer forage that could buffer the decline of caribou herds, following overuse of lichens¹. Some deciduous shrubs can tolerate browsing by reallocating resources to compensate for the loss of tissue². One of these resources, nitrogen, is limiting growth in the arctic tundra.



Our objective : Evaluate the effect of browsing and nitrogen excretion by caribou on the above-ground primary productivity of American dwarf birch

2. Alternative hypotheses on compensatory growth predict different tolerance responses

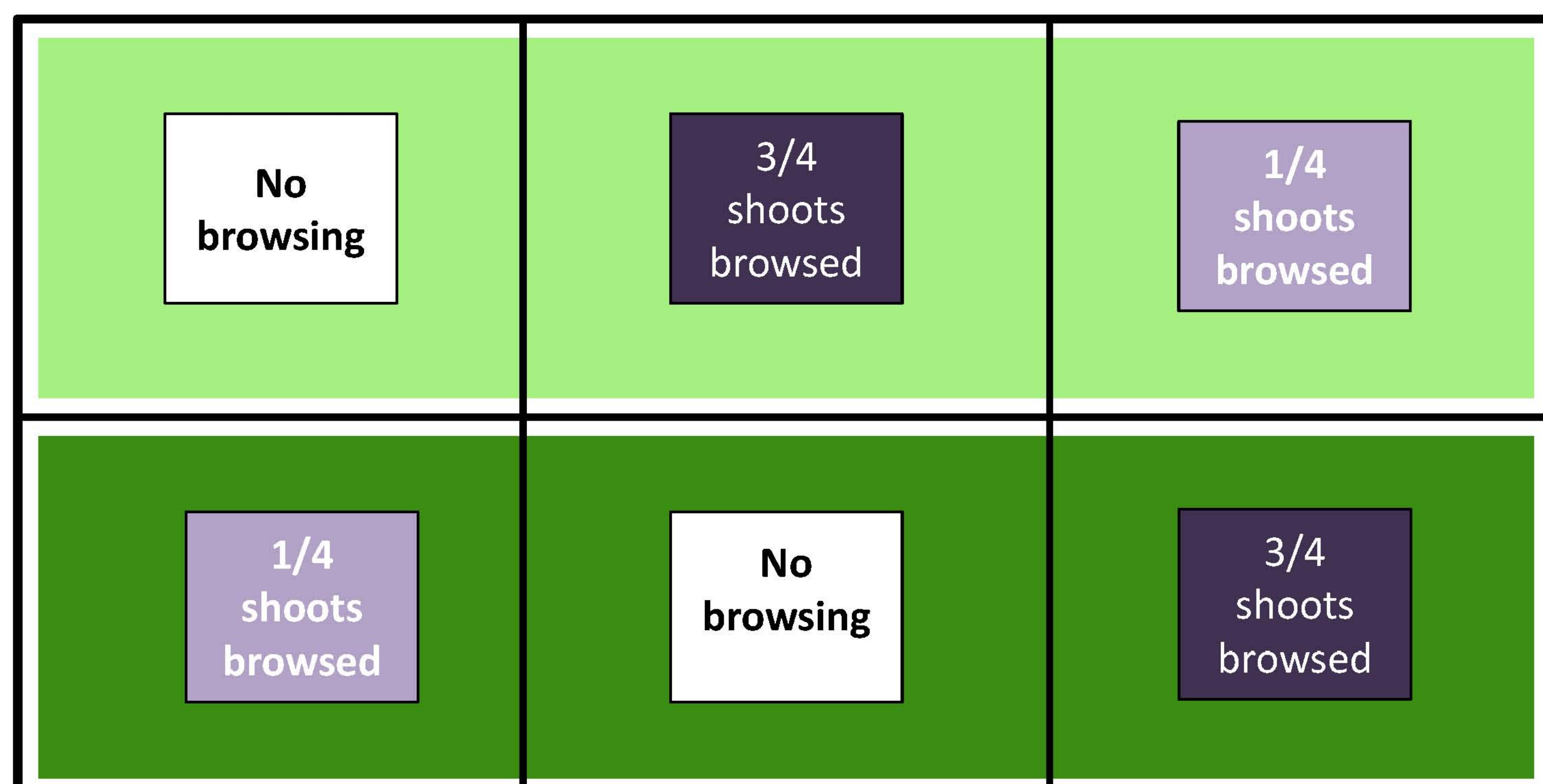


According to the **Compensatory Continuum Hypothesis**³, tolerance is a function of nutrient availability.

In the **Limiting Resource Model**⁴ tolerance depends on nutrient availability (e.g. N) vs. resources affected by browsing

3. Methods: Simulation of browsing on American dwarf birch and increasing of resource availability

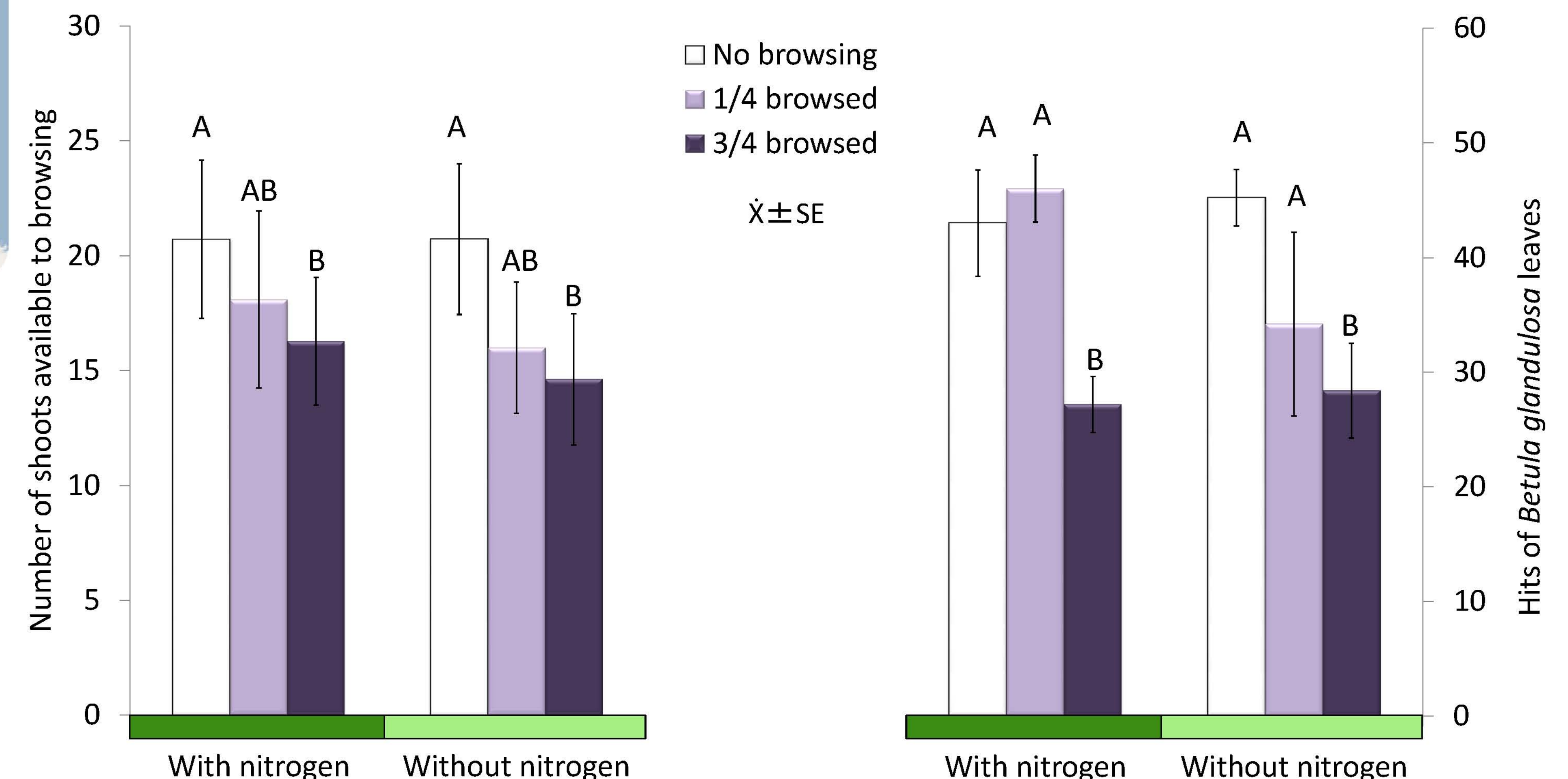
- Randomized split-block design with 5 replicates (exclosures) on 2 years
- Factorial experiment



No nitrogen addition
10g N/m² added



4. Results support predictions from the LRM : compensatory growth at intermediate browsing level independent from N



Individual branch monitoring
GLMM : Nitrogen $F_{1,4} = 0.73$ $P = 0.44$
Browsing $F_{2,8} = 4.79$ $P = 0.04$

Point intercept method (25 points/0.56 m² plot)
GLMM : Nitrogen $F_{1,4} = 0.78$ $P = 0.43$
Browsing $F_{2,8} = 5.72$ $P = 0.03$

5. In conclusion, dwarf birch can compensate for a moderate tissue loss because browsing does not affect the acquisition of the limiting resource (N)

- Browsing mainly removes C, not N, the limiting resource in arctic tundra.
- As predicted by the LRM, it implies that the tolerance to browsing will be equal in a rich and a poor N environment.
- The birch's ability to compensate implies **steady level of forage abundance** for caribou under moderate browsing.
- But birch cannot compensate under heavy browsing, leading to **reduction** in the availability of forage.
- Our results could be influenced by changes in the structure of birch (short and long shoots). We will investigate this in the near future.



References

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