

Bryophytes as Climate Change Guardians: Unraveling Their Impact on Belowground Carbon Dynamics

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1. Why boreal Ecosystem for the Study of Climate Change and Carbon dynamics?

- Northern boreal forest >> black spruce dominates the canopy >> *Sphagnum* and *Pleurozium* moss cover the ground.
- Extensive carbon reservoir
- Sensitive to climate change
- Temperature increasing and Snow cover decrease



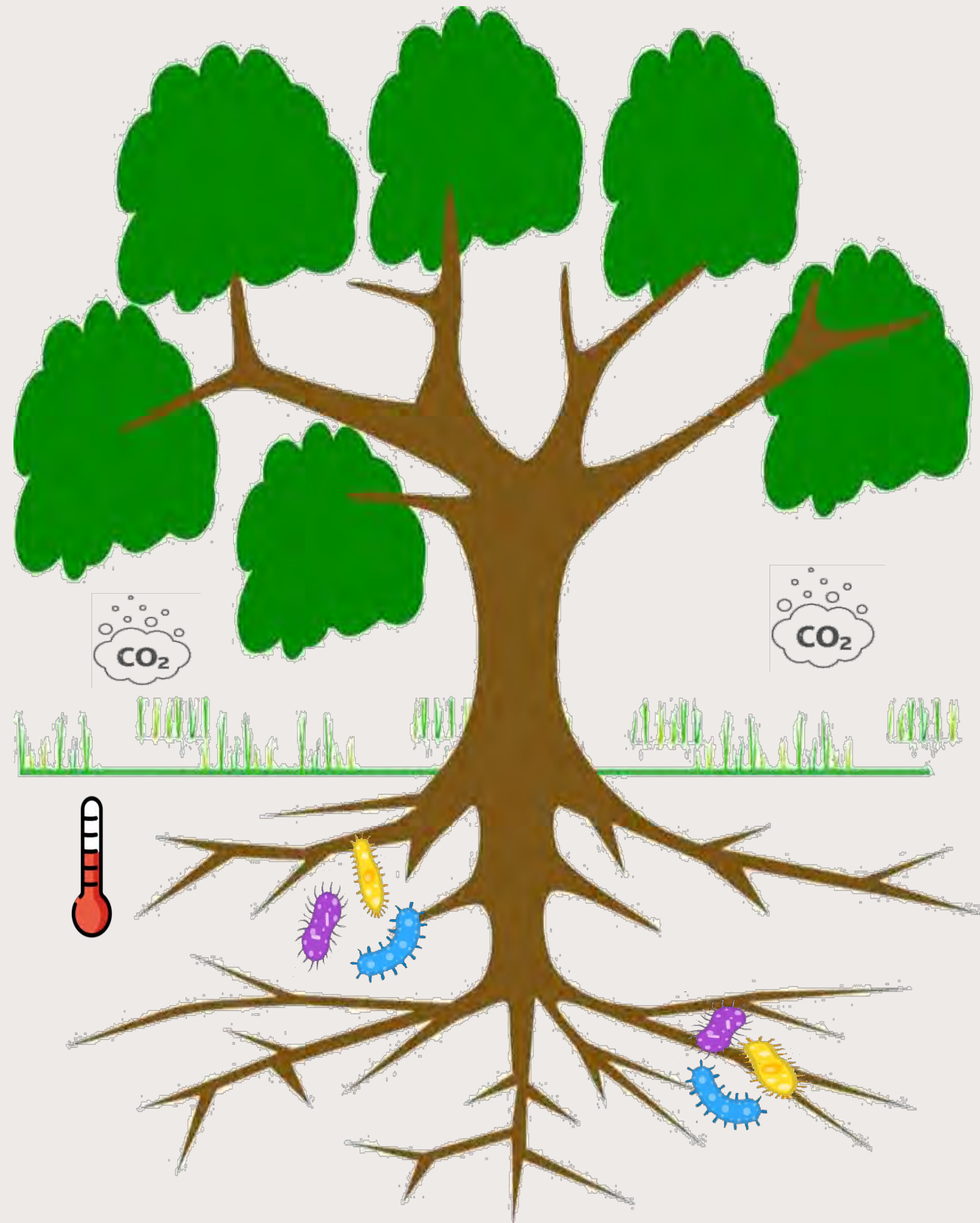
Boreal forest with moss carpet



Pleurozium



Sphagnum



2. Snow loss, Mosses and Below-carbon Dynamics

The loss of snow >> soil to freeze-thaw >> accelerated microbial decomposition in early spring >> affects the boreal carbon budget.

3. Can moss carpets with *Sphagnum* and *Pleurozium* mitigate the negative impacts of snow loss in the boreal forest?

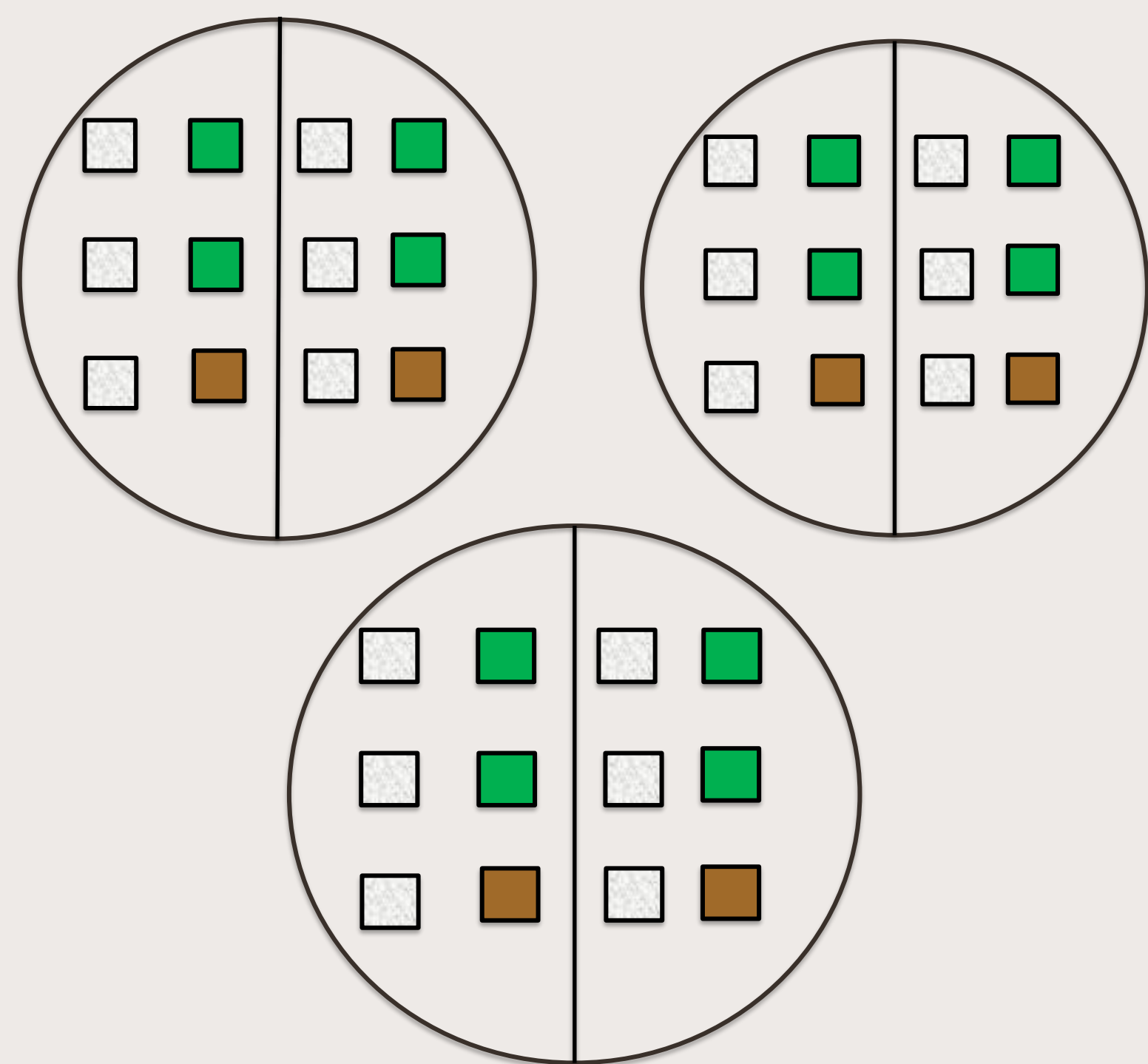
IF YES!!

What are their unique traits?

4. Hypothesis

1. The *Sphagnum* moss has higher colonial density, superior moisture retaining capacity, and an elevated C & N fixation rate when compared to *Pleurozium*.
2. *Sphagnum* exhibits a more buffering effect on sub-surface soil temperature, lower microbial biomass, and minimal to no effect on root mortality when compared to *Pleurozium* and no moss plots, under both ambient and removed snow cover conditions.

5. Methodology



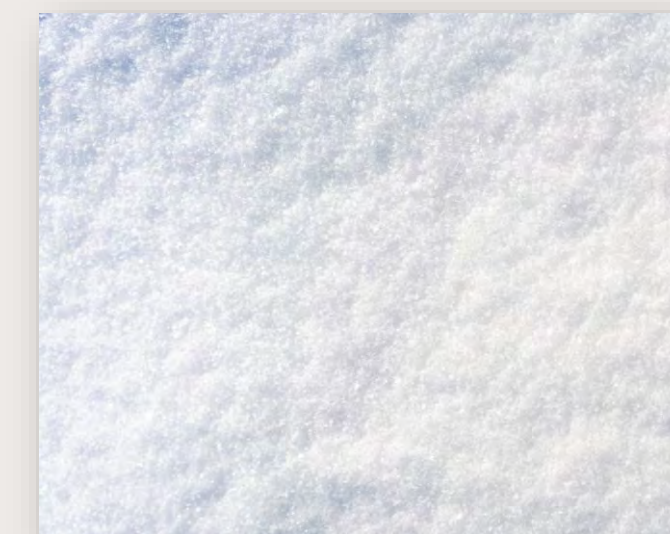
3 sites, 2 blocks each with 6 experimental plots



Sphagnum with snow



Pleurozium with snow



No moss with snow



Sphagnum without snow



Pleurozium without snow



No moss without snow

Is it possible to make plots snow-free?



Soil temp. measurement



Functional traits

- Water content/Water holding capacity
- Nutrient Cycling (C, N)
- Colonial density

Root dynamics and microbial biomass



Significance of the study

If mosses mitigate the impacts of the loss of snow in carbon dynamics of boreal forests, then:

- Inform the climate impact projections and management plans for stabilizing boreal soil carbon through the conservation of functionally important moss diversity.