

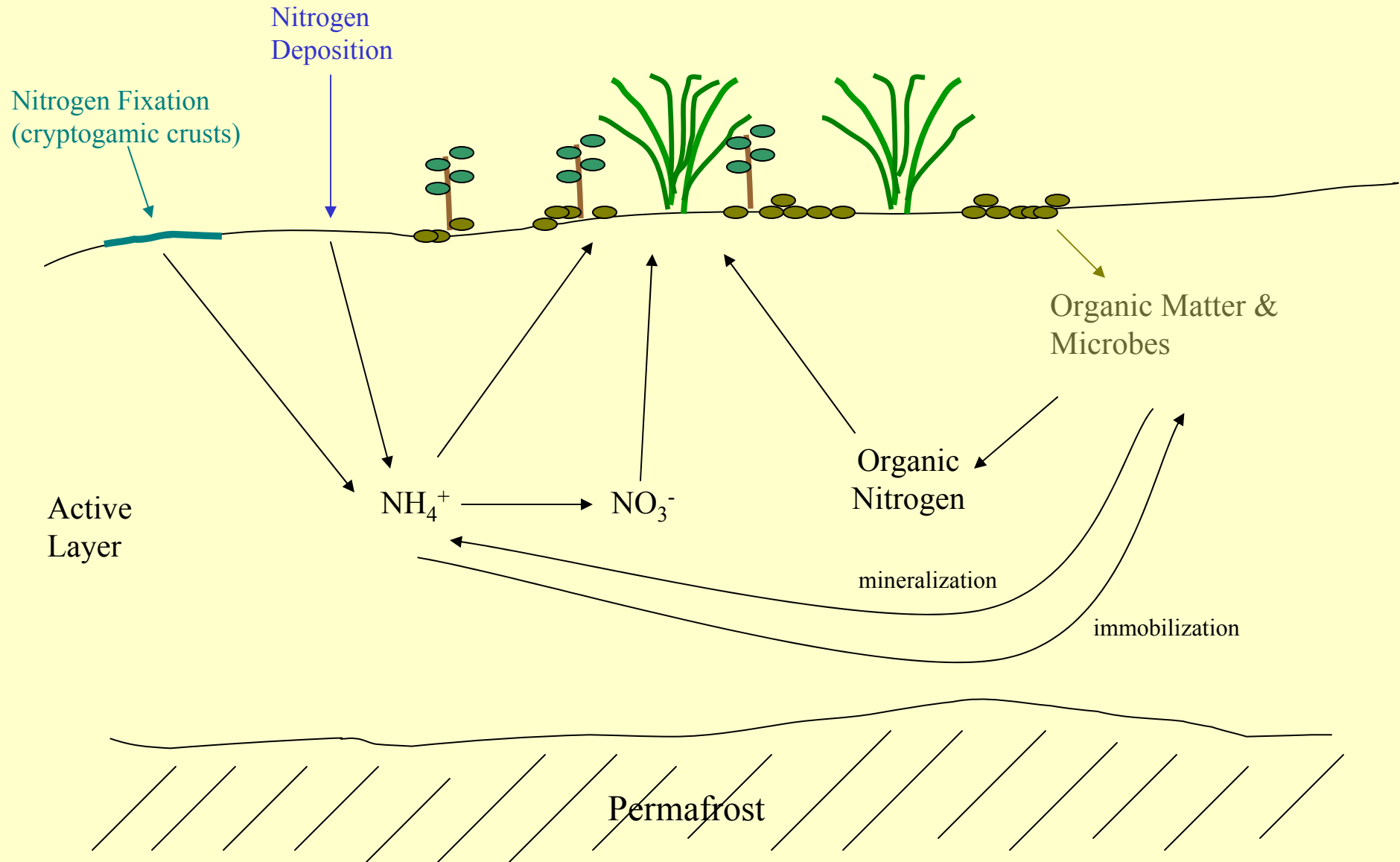
Plant Community and Nitrogen Cycling in Arctic Frost-Boil Ecosystems

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Objectives

- We want to understand how cryoturbation and nitrogen cycling interact in frost boil ecosystems, and how this in turn affects the plant communities present in these areas.
- In order to understand the role of temperature in these processes, we want to examine the interactions among cryoturbation, nitrogen cycling, and plant communities across a climatic gradient in arctic tundra.

VERY Generalized Arctic Nitrogen Cycle



How does the nitrogen cycle in frost boils differ from inter-boil areas?

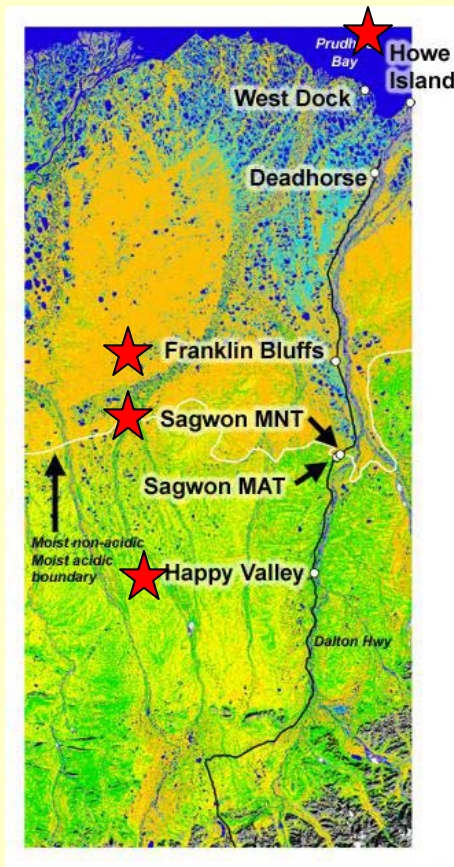
Inter-boil Areas

- Soils contain more organic matter
 - More plant available nitrogen
 - Mineralization of nitrogen
 - Organic nitrogen

Frost Boils

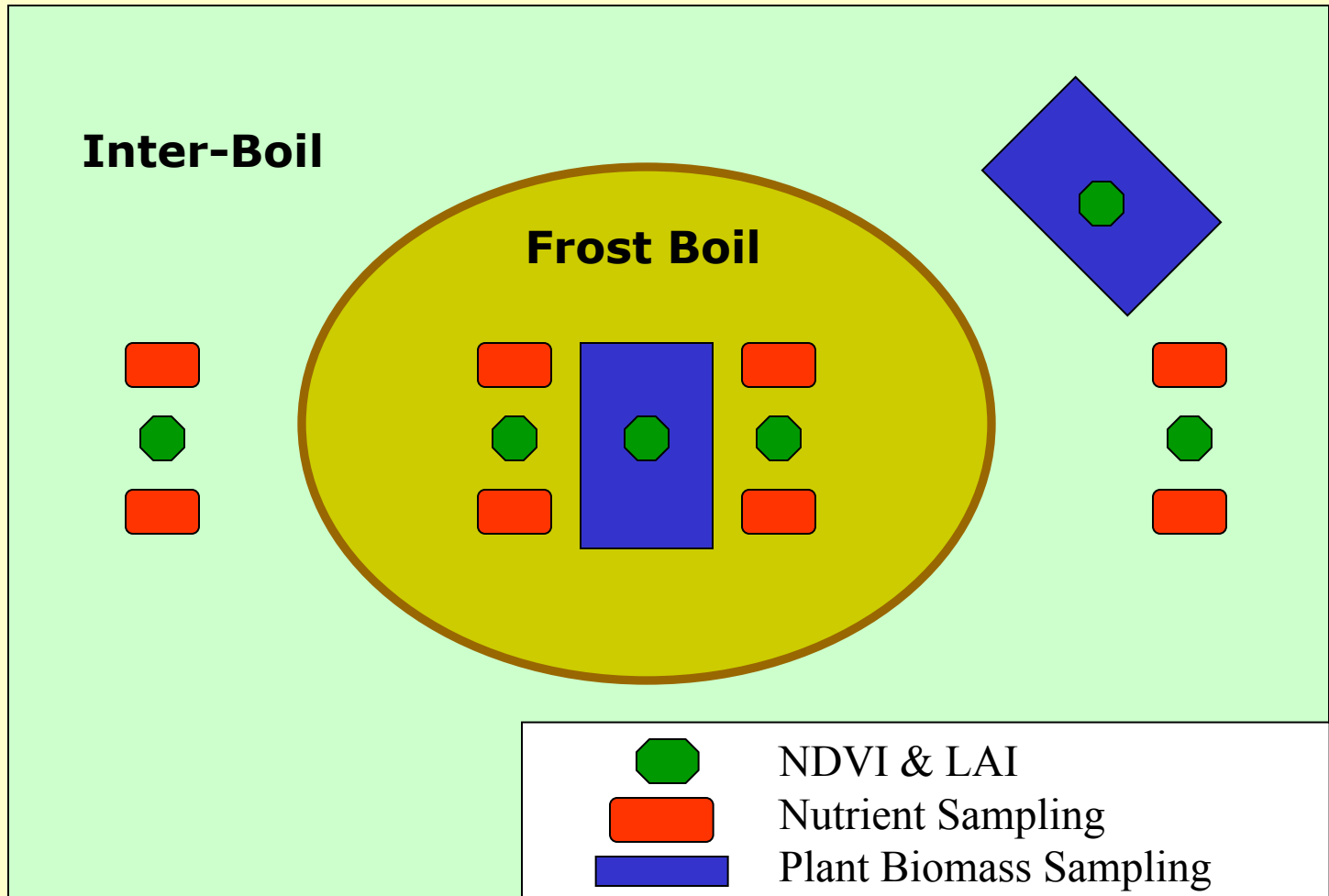
- Mineral soil that contain less organic matter
 - Less plant available nitrogen
 - Nitrogen fixation is more important

Summer 2002



- Total Nitrogen and Carbon
- Rates of net Nitrogen mineralization every two week periods for a six-week period during the growing season and over the winter season
- Normalized Difference Vegetation Index (NDVI)
- Leaf Area Index (LAI)
- Aboveground plant biomass by plant functional type
- Thaw Depth
- Soil Moisture and Temperature

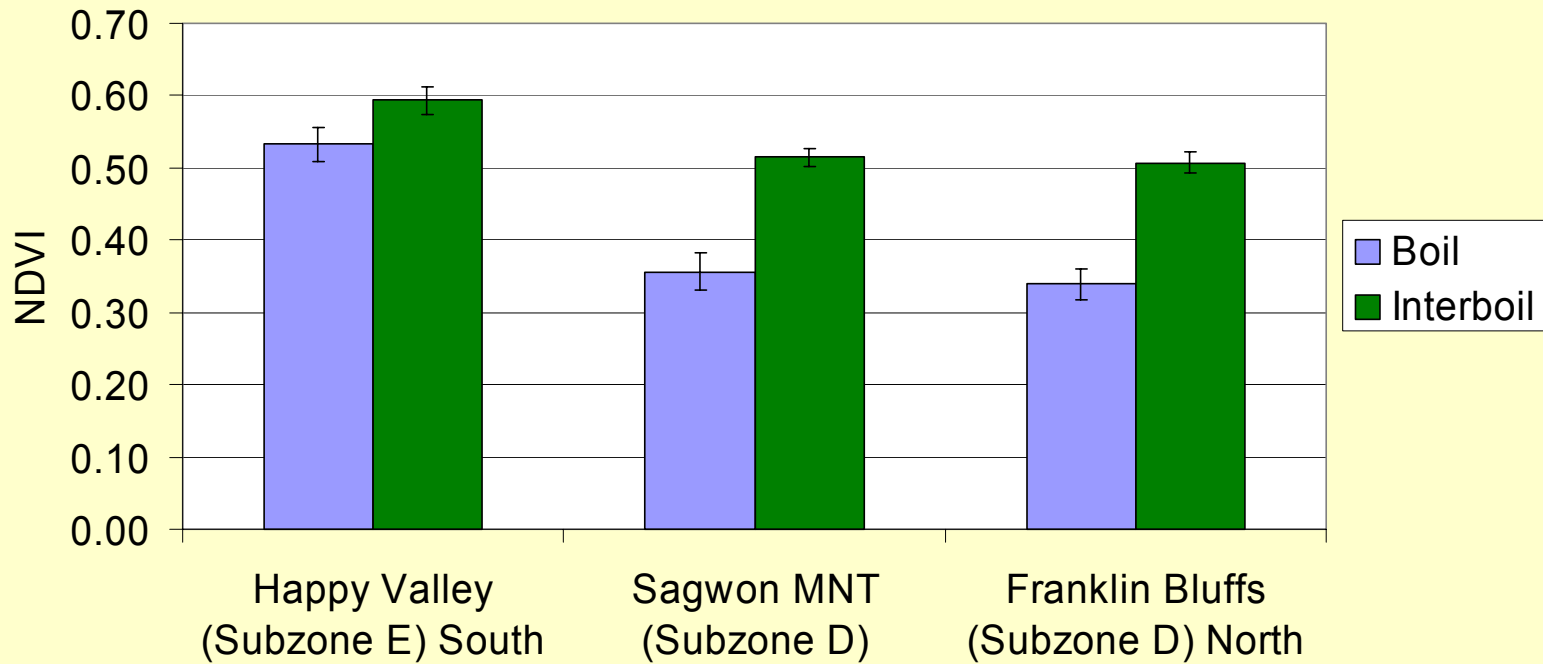
Field Set-up



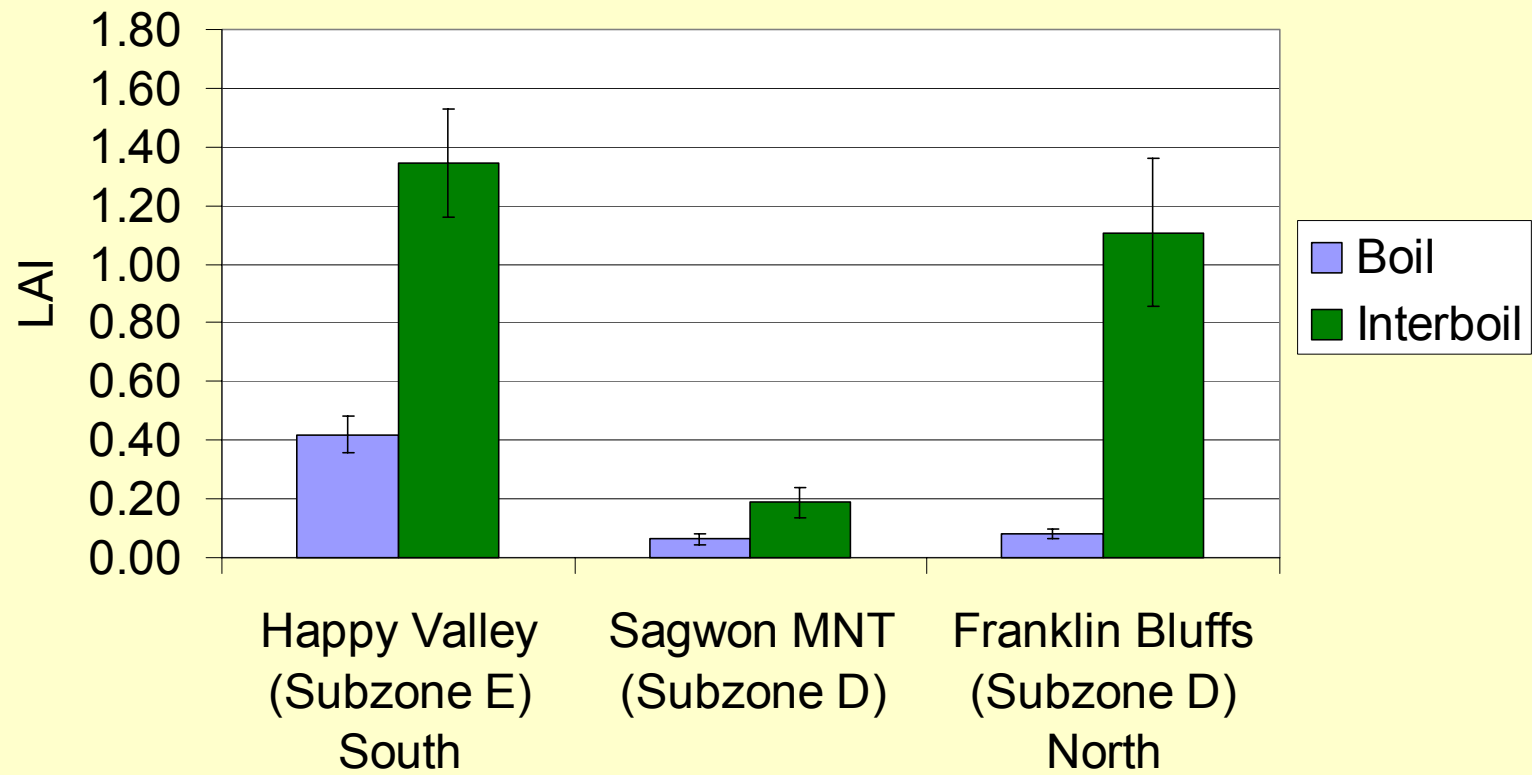
Additional Plans

- Nitrogen fixation (via the acetylene reduction assay)
- Organic Nitrogen (Free amino acids)
- Soil respiration
- Carbon and Nitrogen content of plant tissue

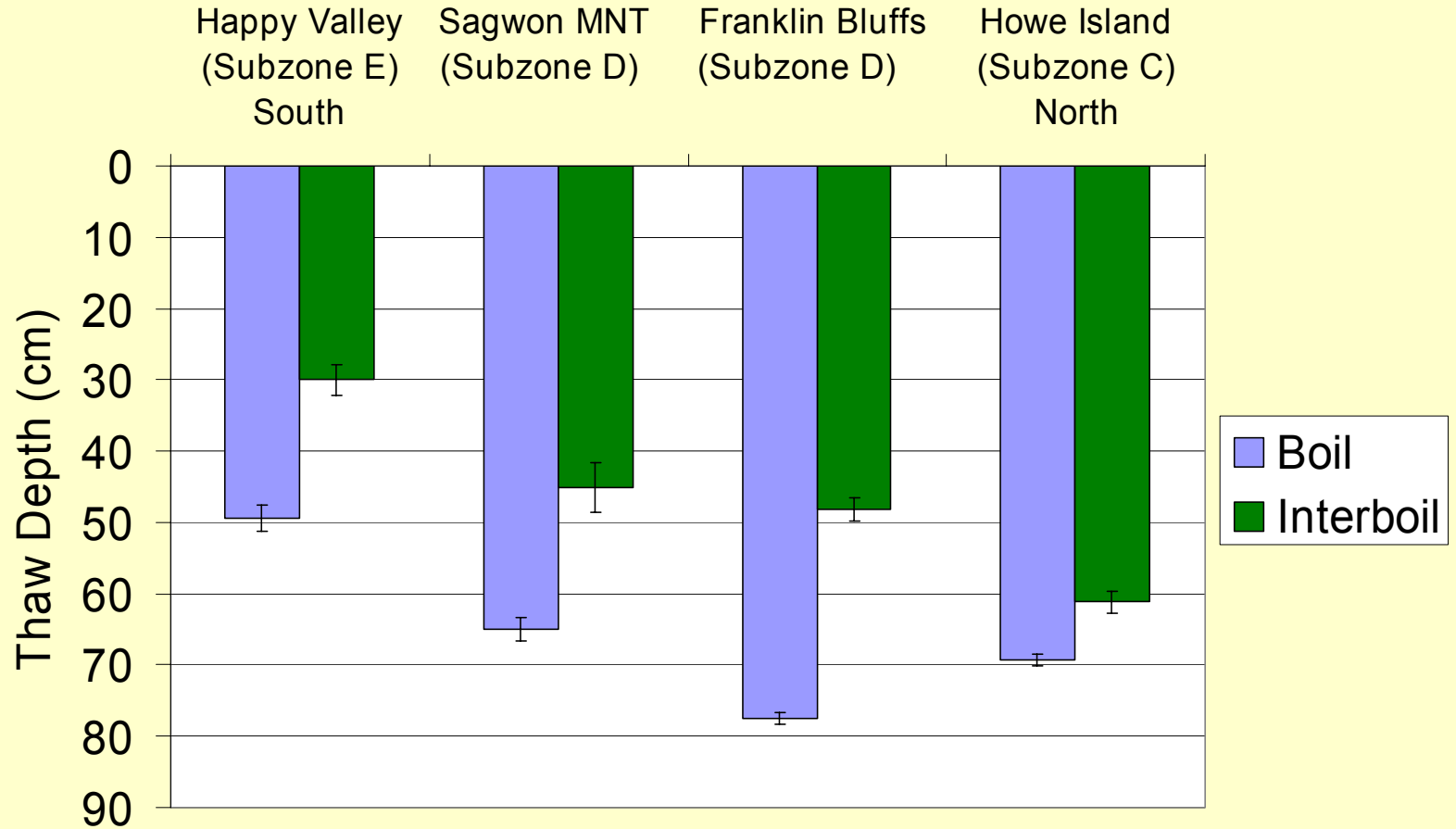
NDVI



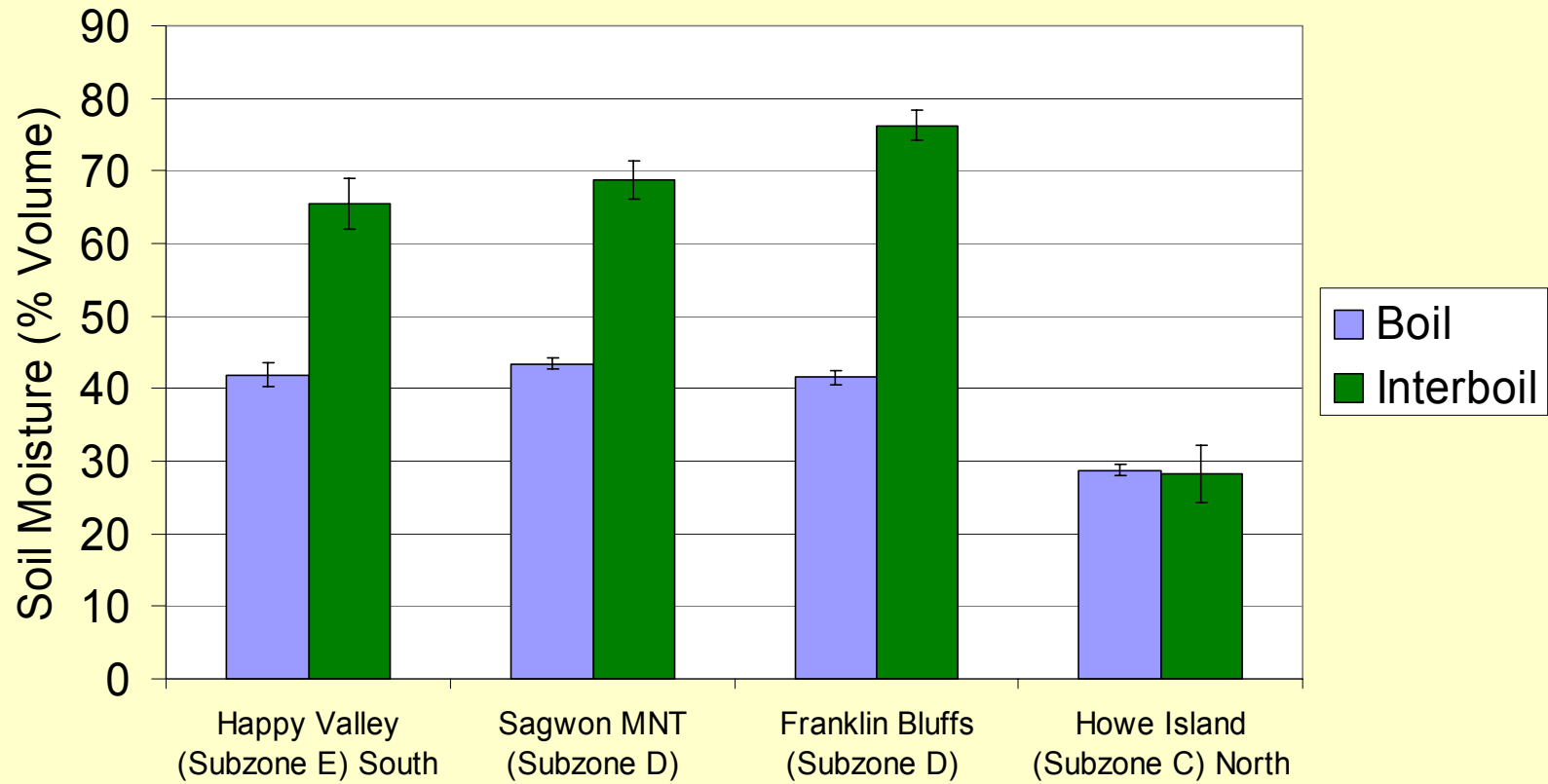
LAI



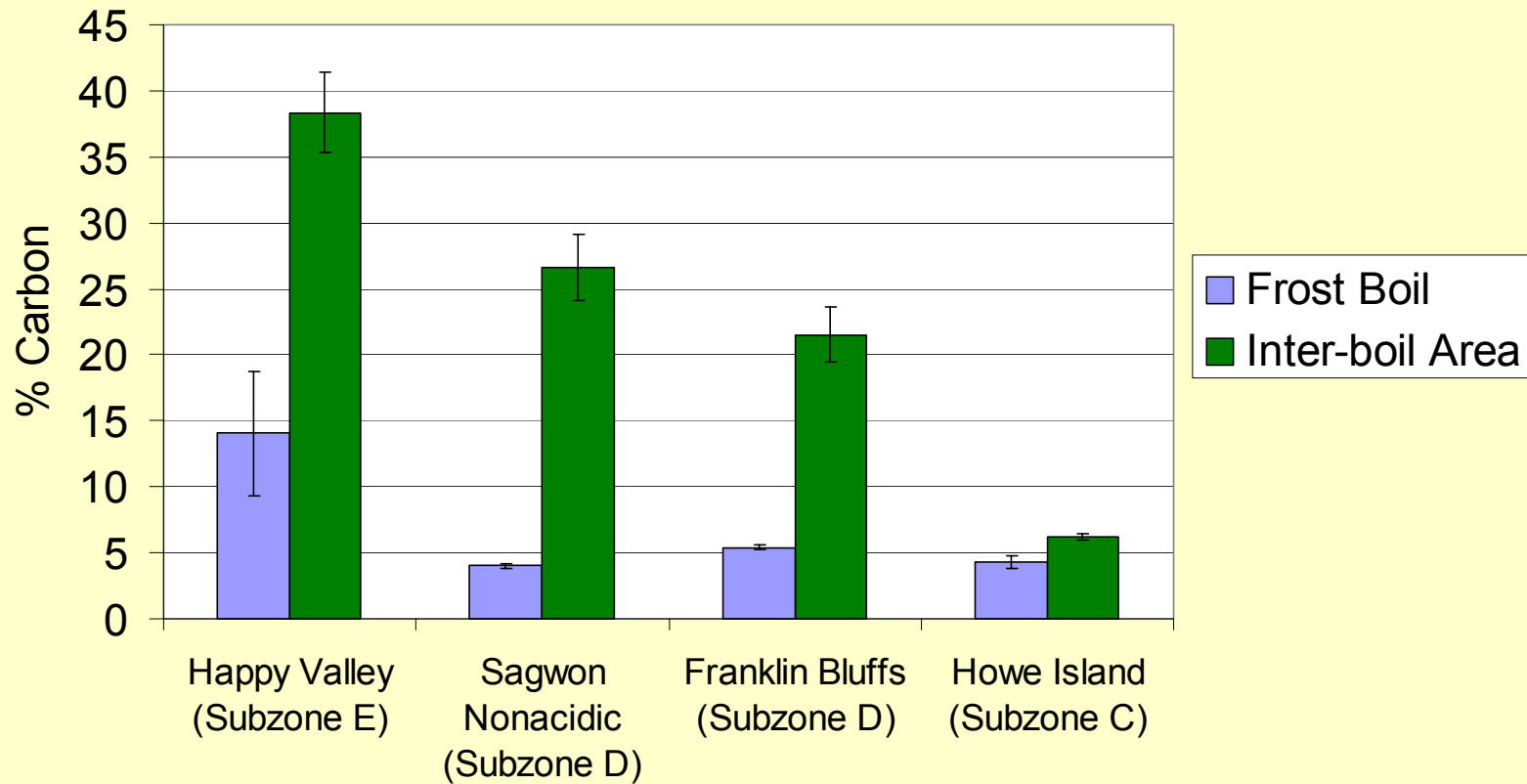
Thaw Depth



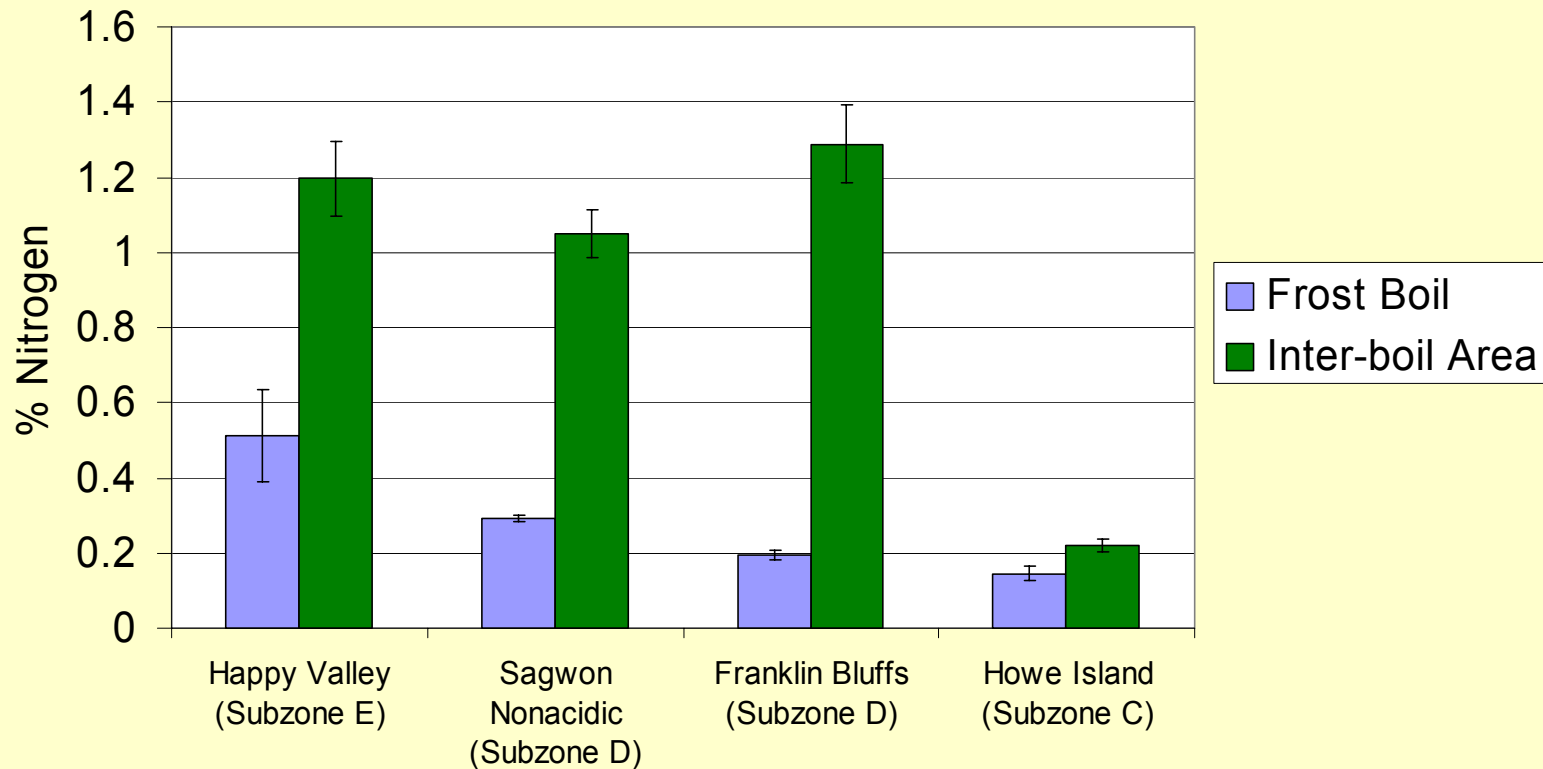
Soil Moisture



Soil Carbon Content (top 5 cm)



Soil Nitrogen Content (top 5 cm)



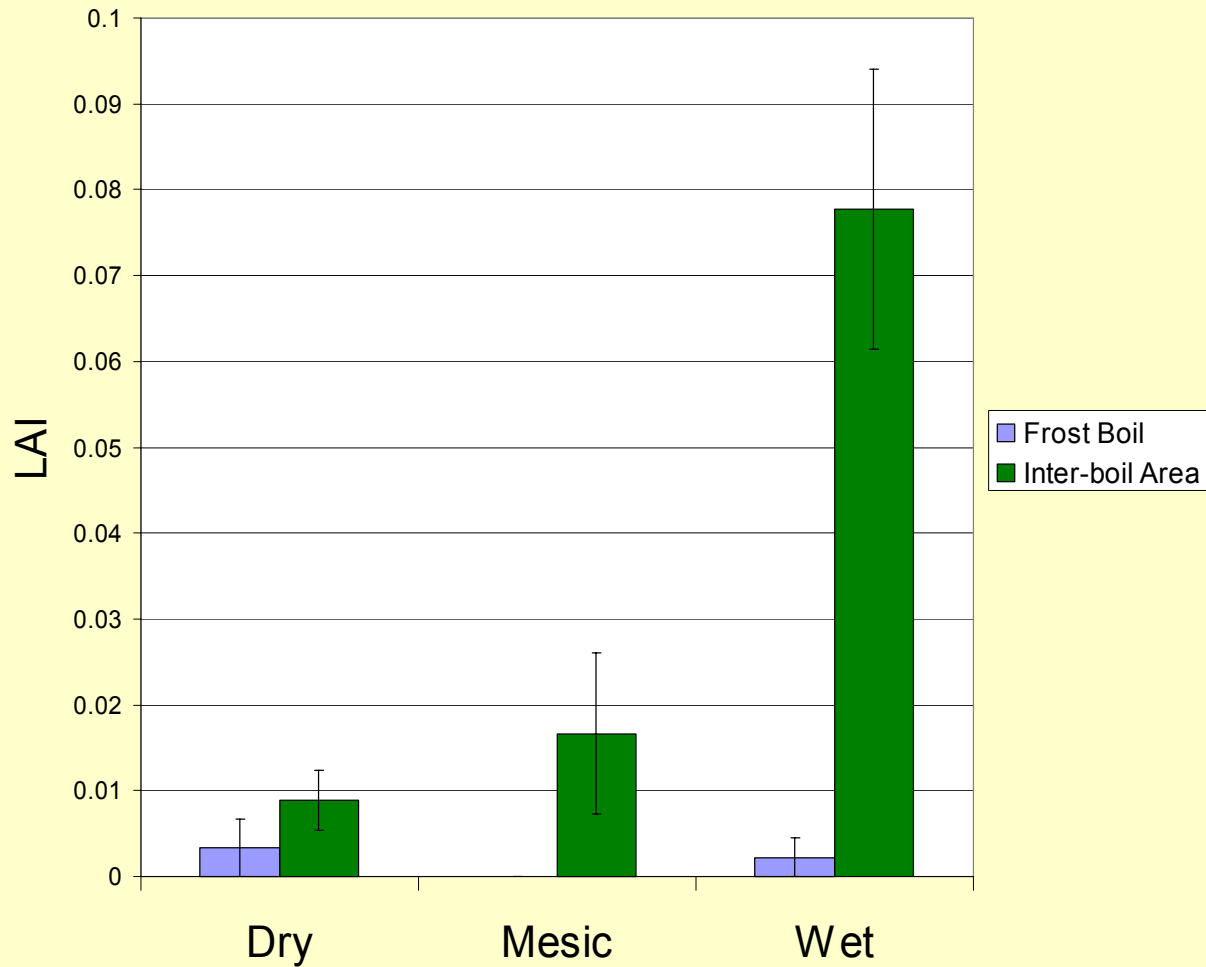
Analysis to come...

- Inorganic nitrogen, including net nitrogen mineralization
- Aboveground biomass by plant functional group
- Nitrogen Fixation (acetylene reduction)

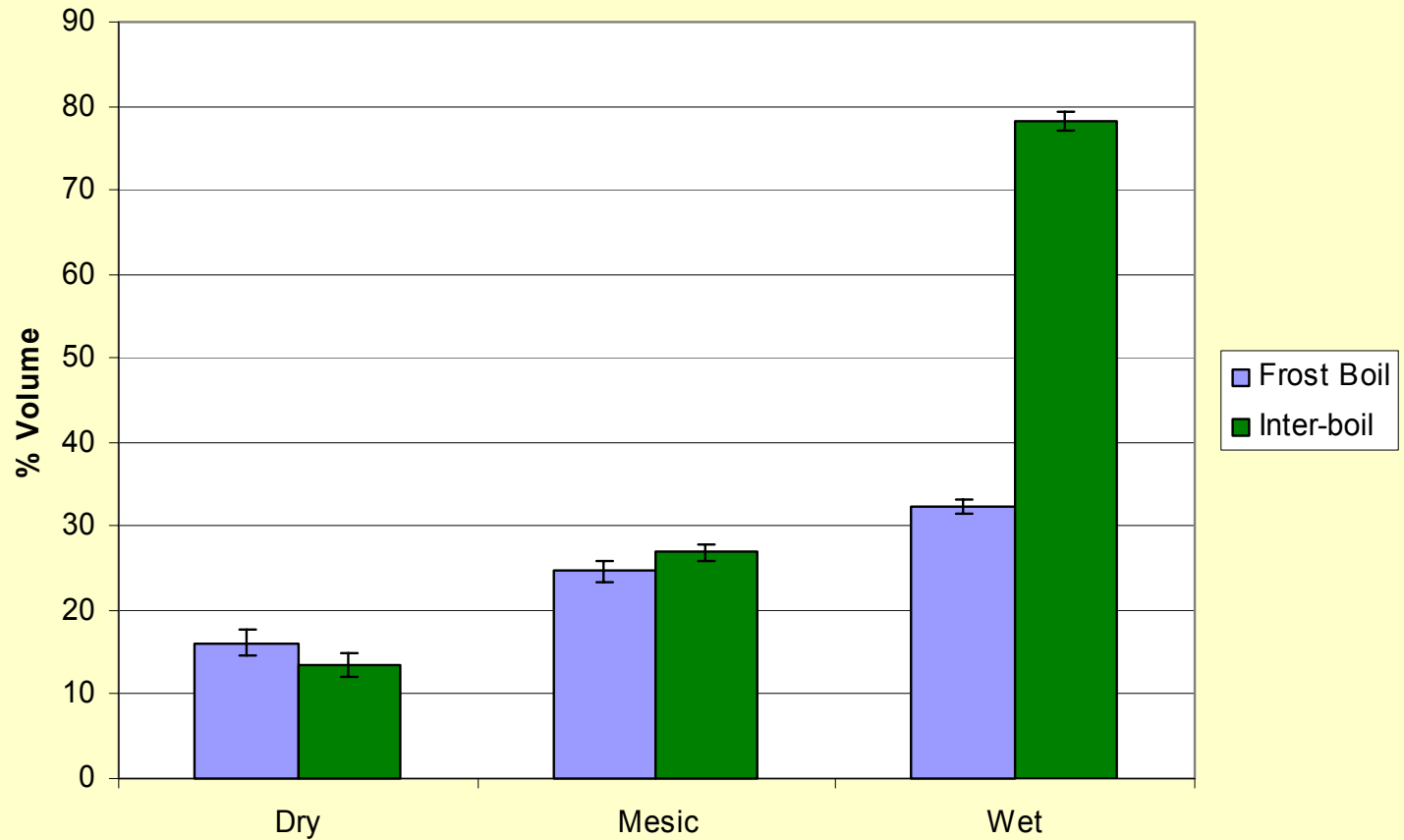
Canada!

- Similar study along a toposequence in Subzone C

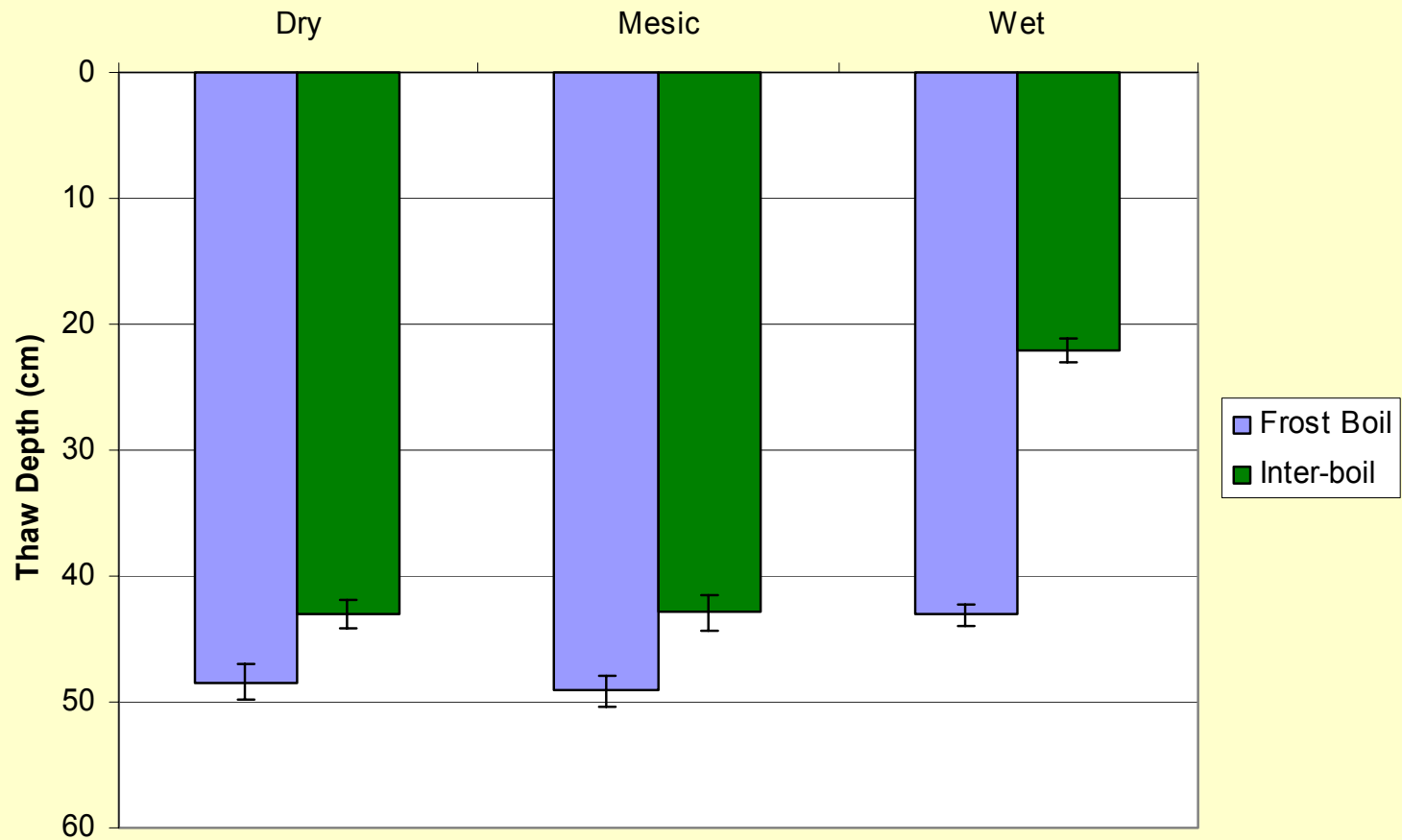
Green Cabin LAI



Green Cabin – Soil Moisture



Green Cabin – Thaw Depth



What's next?

- The role of nitrogen availability in plant succession on frost boils – Nitrogen addition experiment
- Remote sensing of patterned ground cover across an arctic temperature gradient
- Incorporating frost boils into a vegetation dynamics model – ArcVeg (Epstein *et al.* 2000)