



# READING BETWEEN THE RINGS



## DOES COMPETITION AFFECT THE CLIMATE SENSITIVITY OF SHRUB GROWTH?

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### The shrubification of the tundra

The Arctic is greening - plant productivity is increasing across the tundra biome<sup>1,2</sup>.

Increased growth in woody plants is associated with warming, but is also spatially variable<sup>3</sup>.

In the tundra, up to 90% of the biomass is found **below ground**<sup>4</sup>,



so that **competition** for scarce resources could be a local constraint to climate-driven shrub expansion

OUR RESEARCH QUESTIONS ARE:

HOW DOES **COMPETITION** AFFECT

- 1- THE **GROWTH**; AND
- 2- THE **CLIMATE SENSITIVITY**

OF TUNDRA SHRUBS?

We predicted that shrubs with **closer neighbours** would show **lesser growth** and **weaker links** between climate and growth over time.

### Methods

Location: four sites across Northern Canada, varying in environmental severity and shrub density.

Mapping of all **tall shrubs** in 6 plots at each site

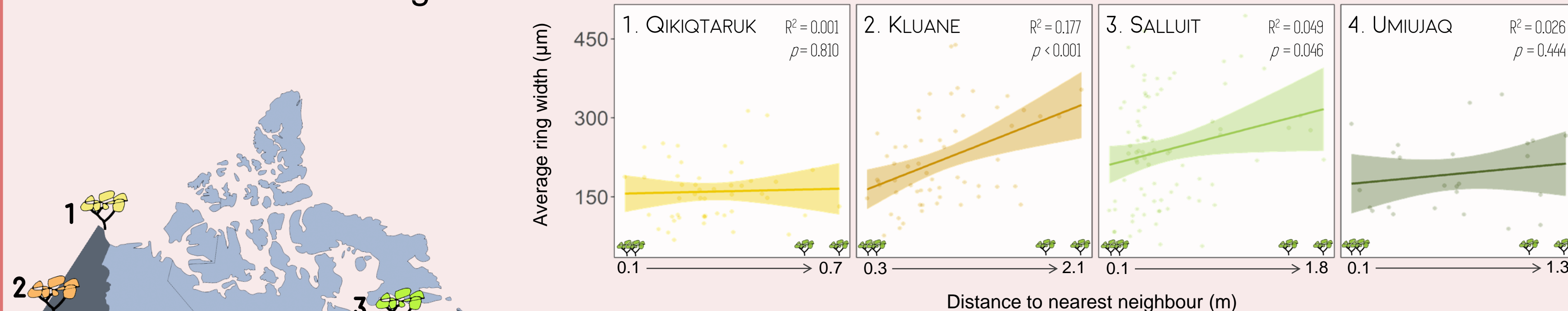


*Betula glandulosa* *Salix pulchra* *Salix planifolia* *Salix richardsonii*

All shrubs (ca. 800) sampled at the root collar to measure **ring width**

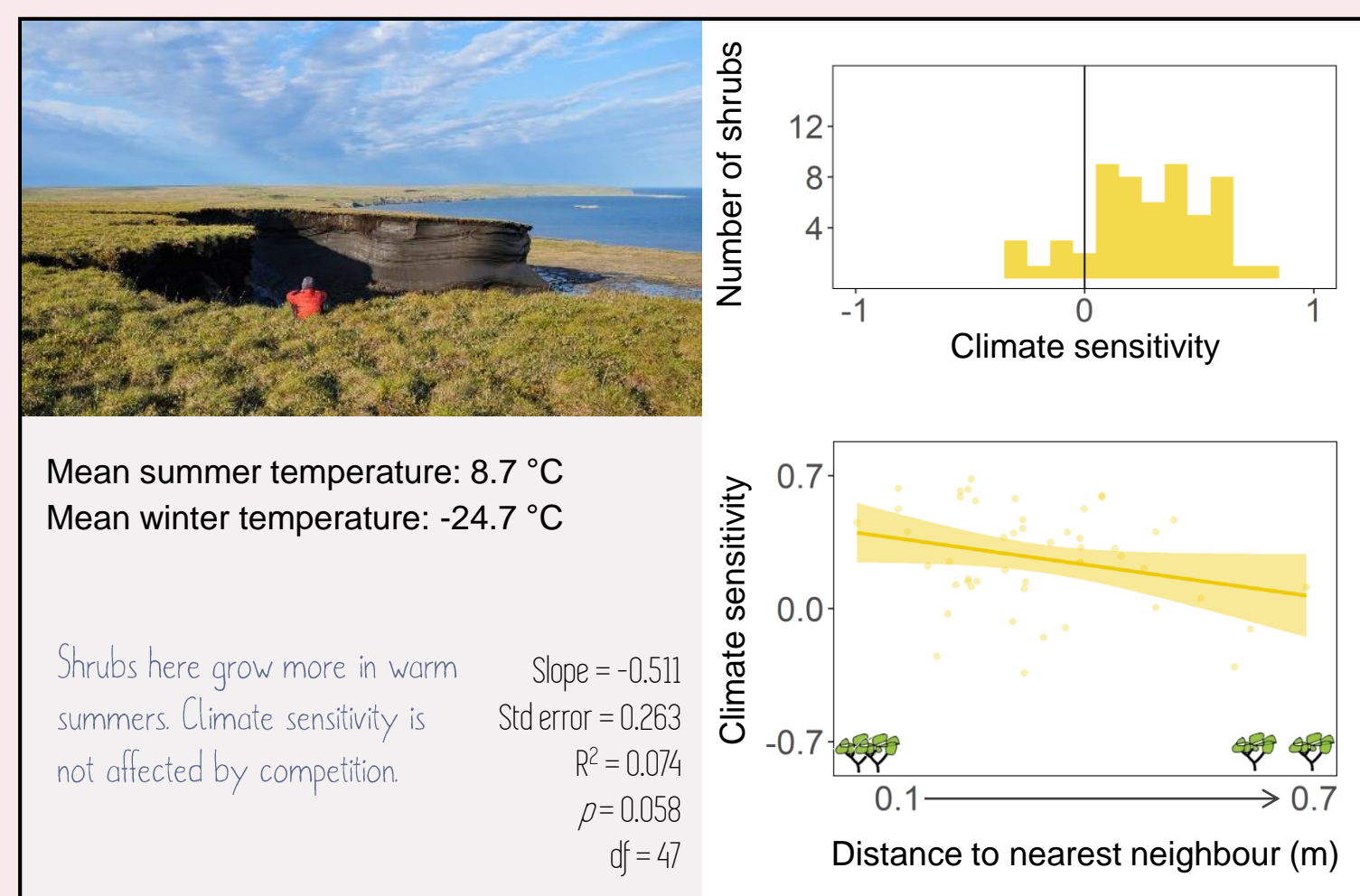
**Climate sensitivity** measured as the Spearman correlation between normalised ring width and mean July temperature for the period 2000-14 (Climate data: CRU 3.24.01)

**Living in close quarters** – At some sites (2 & 3), having neighbours close by had a negative effect on mean annual growth

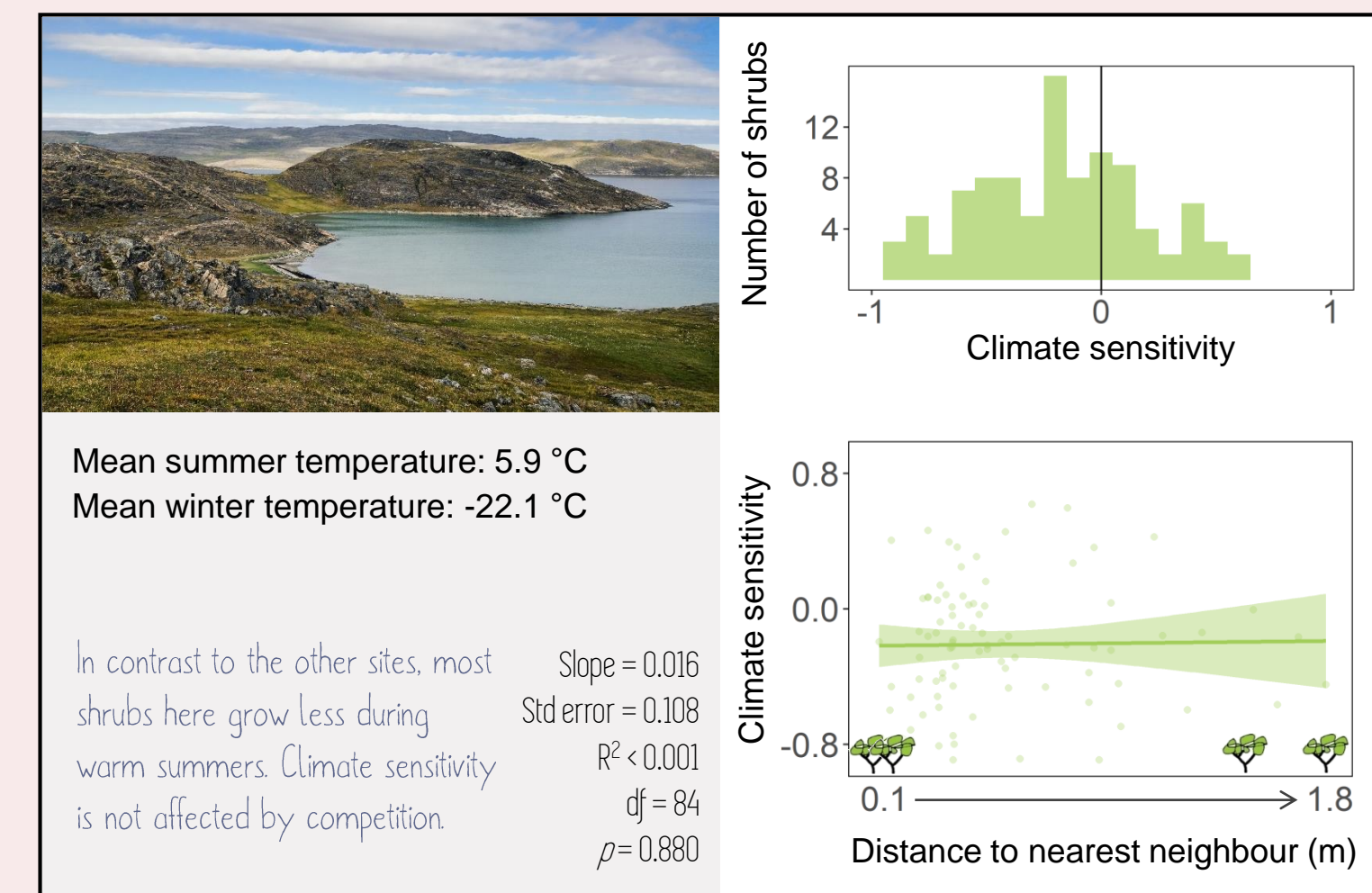


**To be or not to be (climate sensitive)** – Shrubs varied in their response to July temperatures, with higher sensitivity at the Western sites. Only **site 2** supported our hypothesis that more competition weakens the climate response of shrubs.

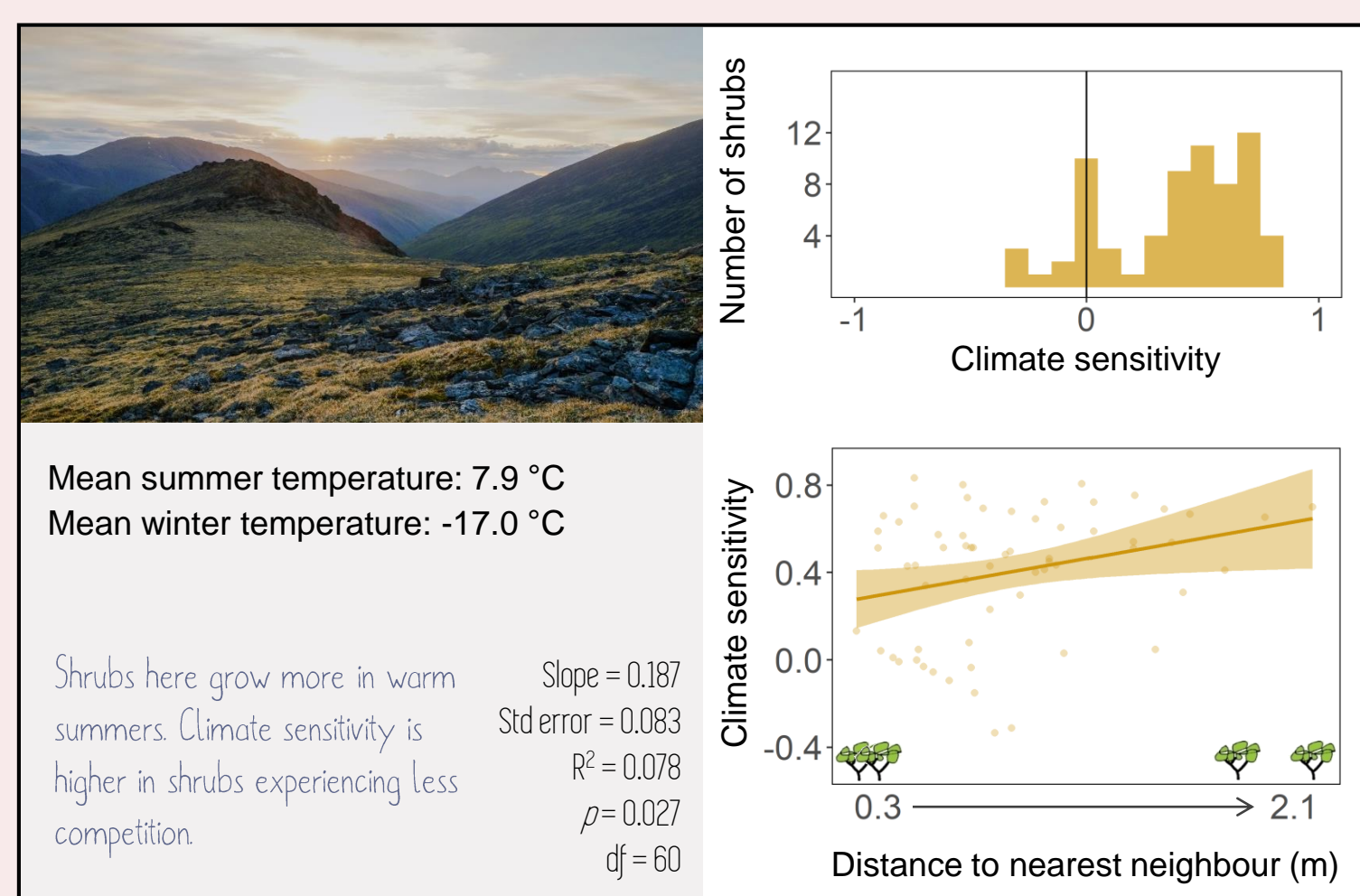
### 1. QIKIQTARUK



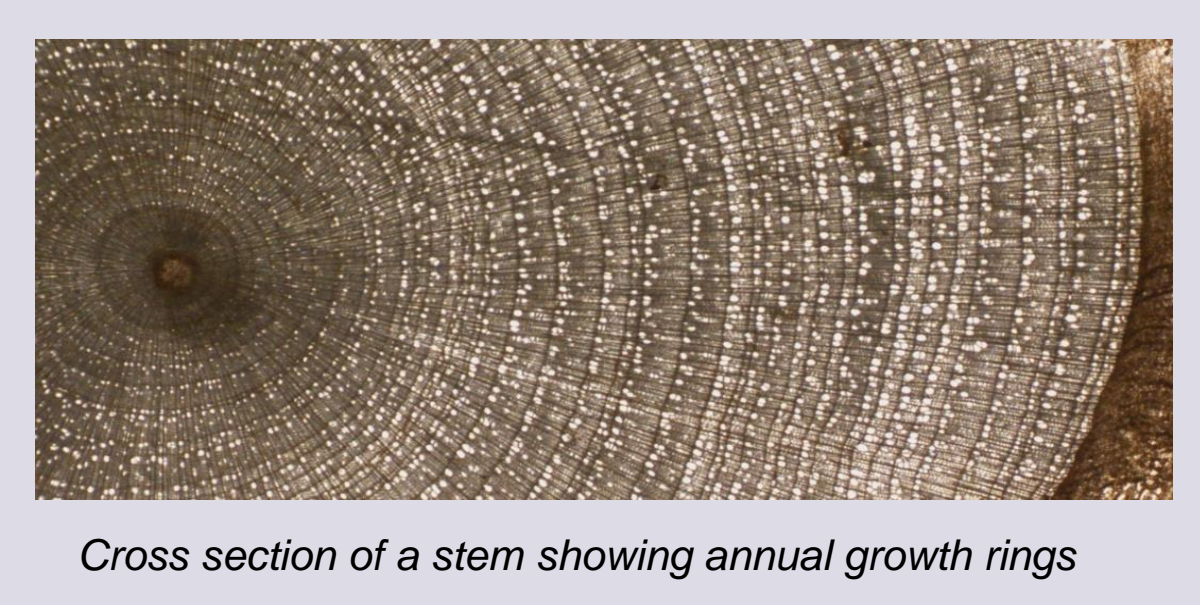
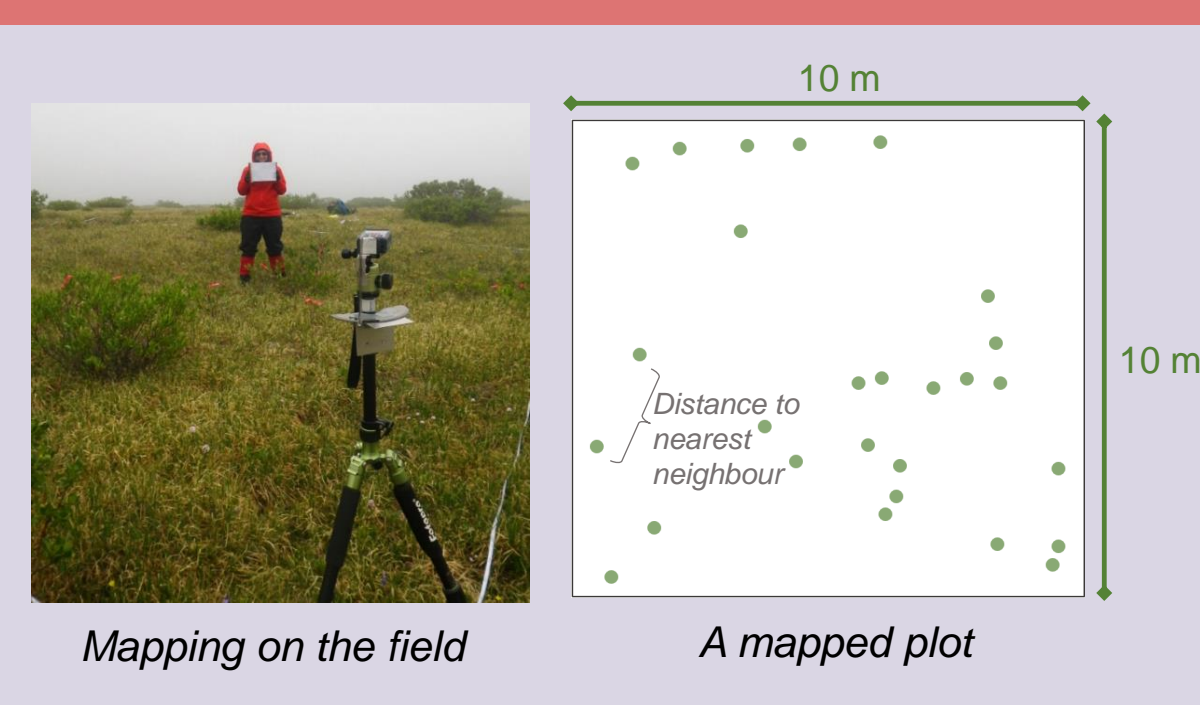
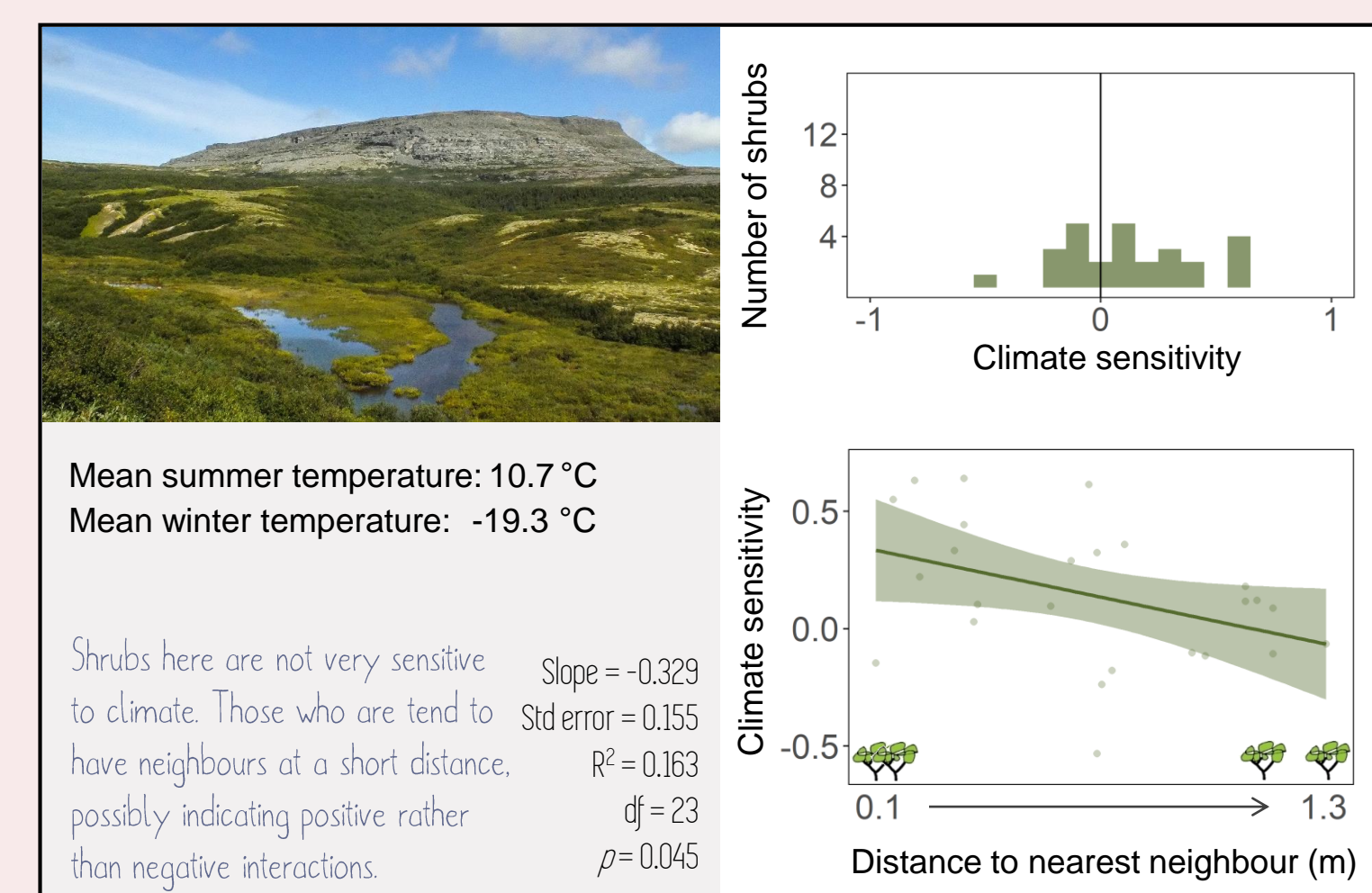
### 3. SALLUIT



### 2. KLUANE



### 4. UMIUJAJ



Cross section of a stem showing annual growth rings

REFERENCES  
 1- Myers-Smith et al. 2011 ERL 6(4)  
 2- Elmendorf et al. 2012 NCC 2(6)  
 3- Myers-Smith et al. 2015 NCC 5(9)  
 4- Iversen et al. 2014 New Phytol 205(1)

### COMPETITION CAN LIMIT THE GROWTH OF TUNDRA SHRUBS - BUT NOT NECESSARILY THEIR RESPONSE TO CLIMATE

The importance of competition varied spatially: genetic diversity, community composition and biogeographic factors could also be controlling growth responses to warming.

Even if competition does not yet play a major role at all sites, this could change as climate-driven shrub expansion continues.

