



UNIVERSITY OF ALASKA FAIRBANKS

WWU MUNSTER

University of Colorado Boulder

Vegetation Response to a Climate Gradient in the Eastern Canadian Arctic

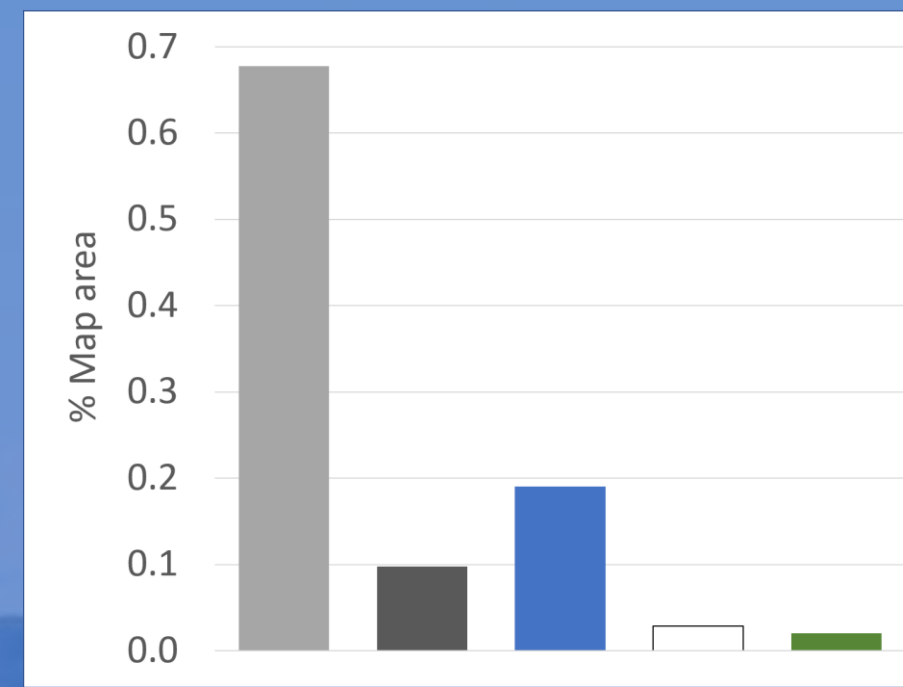
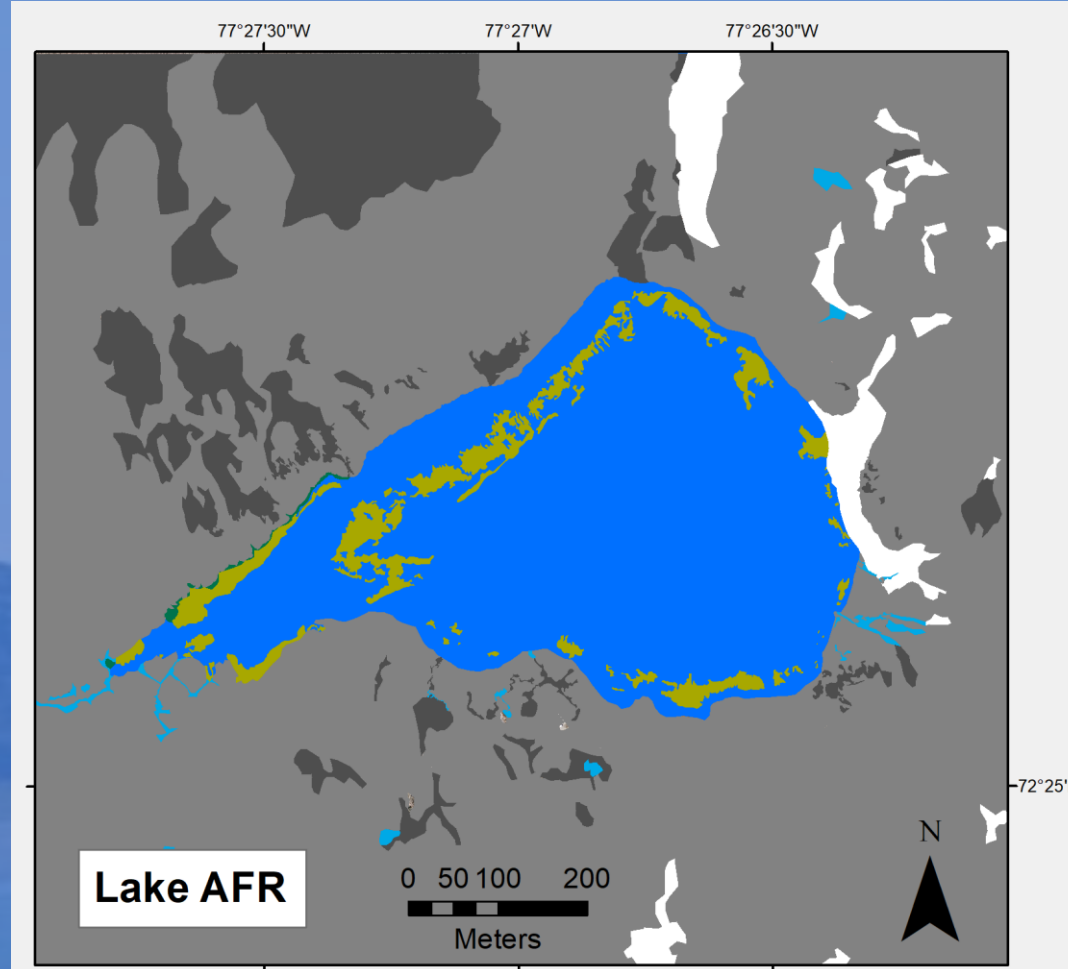
Martha Raynolds¹, Helga Bültmann², Shawnee Kasanke³, Jonathan Raberg⁴, Gifford Miller⁴

¹University of Alaska Fairbanks, ²University of Münster, ³Washington State University, ⁴University of Colorado Boulder



LAKE AFR - NEAR POND INLET, N BAFFIN ISLAND

0.6 °C mean July temperature



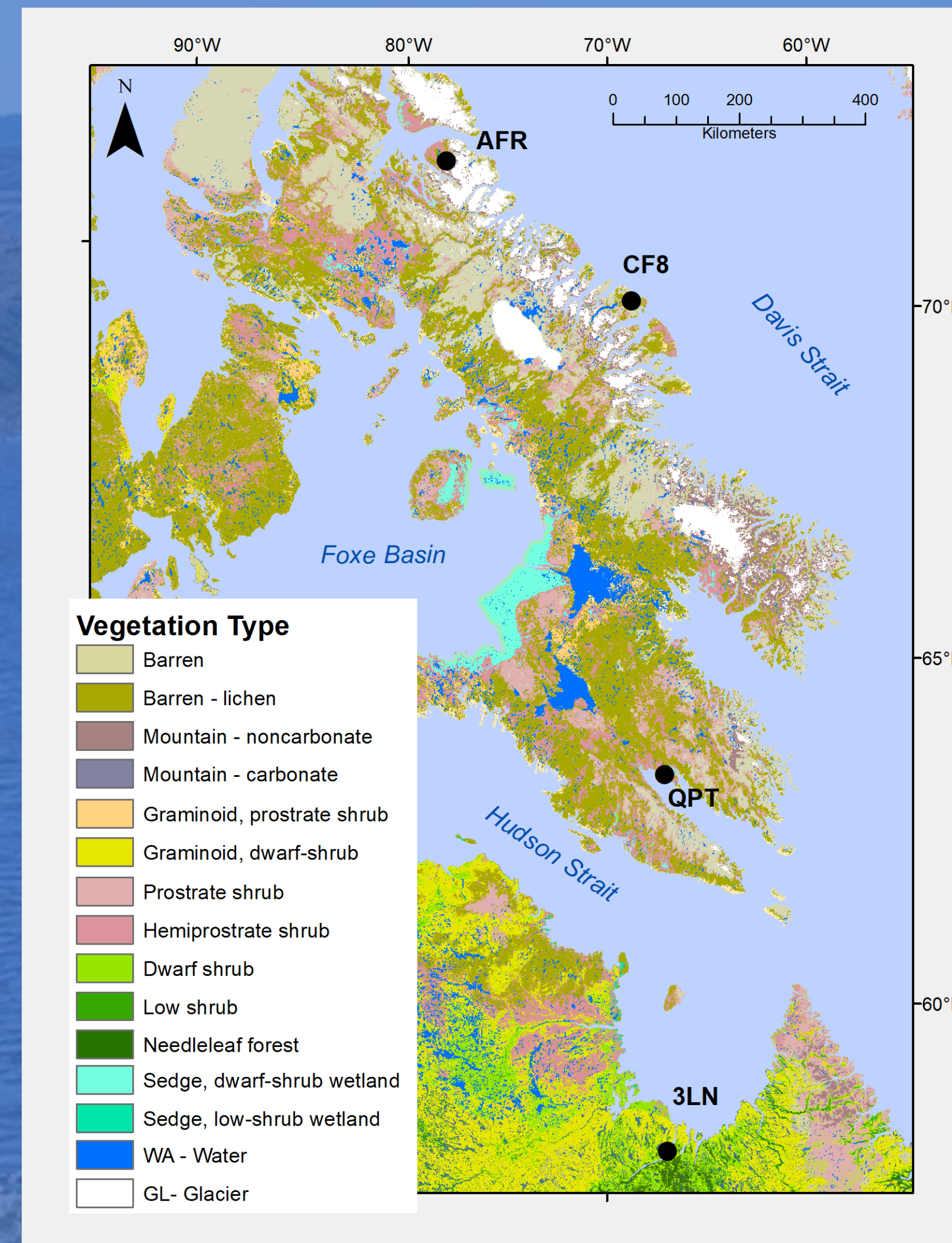
This lake recently became ice free in the brief summers. The vegetation is primarily foliose and crustose lichens on rocks. Areas that have more recently emerged from under the ice have fewer lichens than areas on ridges that have been exposed for longer time. The biomass of the aquatic mosses in the lake exceeds the biomass of the terrestrial plants in the lake catchment



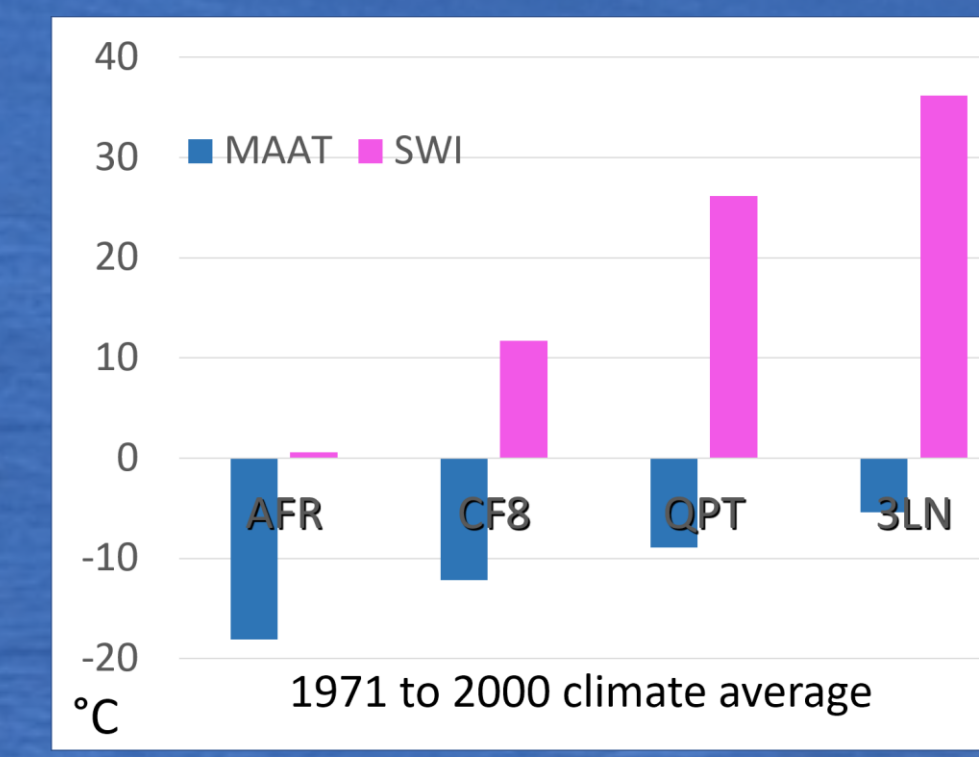
WHAT CAN VEGETATION MAPPING AROUND 4 LAKES TELL US ABOUT THE FUTURE?

This project examines the current variation in vegetation along a climate gradient. As the climate warms, vegetation will gradually change, to resemble that found around lakes in warmer locations.

Acknowledgement – Nakurmiik (Thank you) to the people of Pond Inlet, Clyde River, Qikiqtarjuaq, Iqaluit, and Kuujuaq in Nunavut and Nunavik.



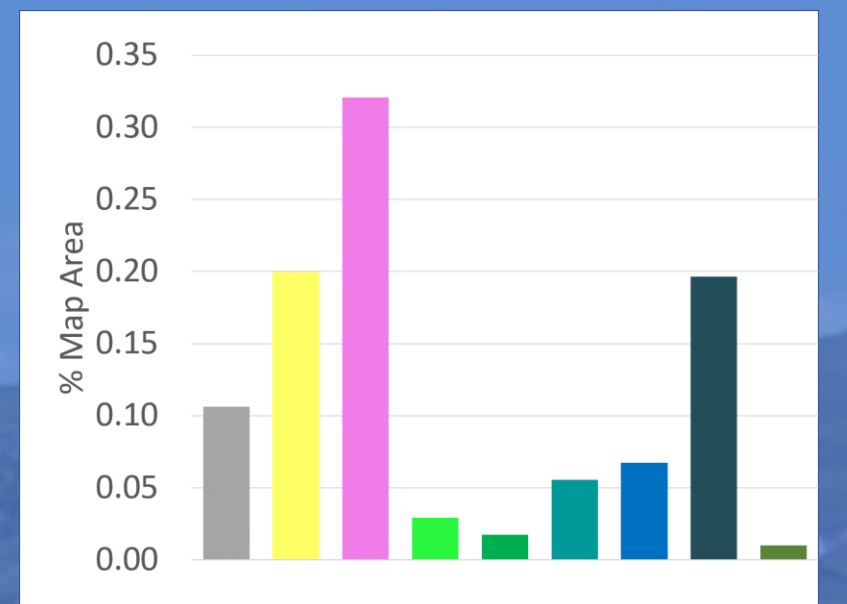
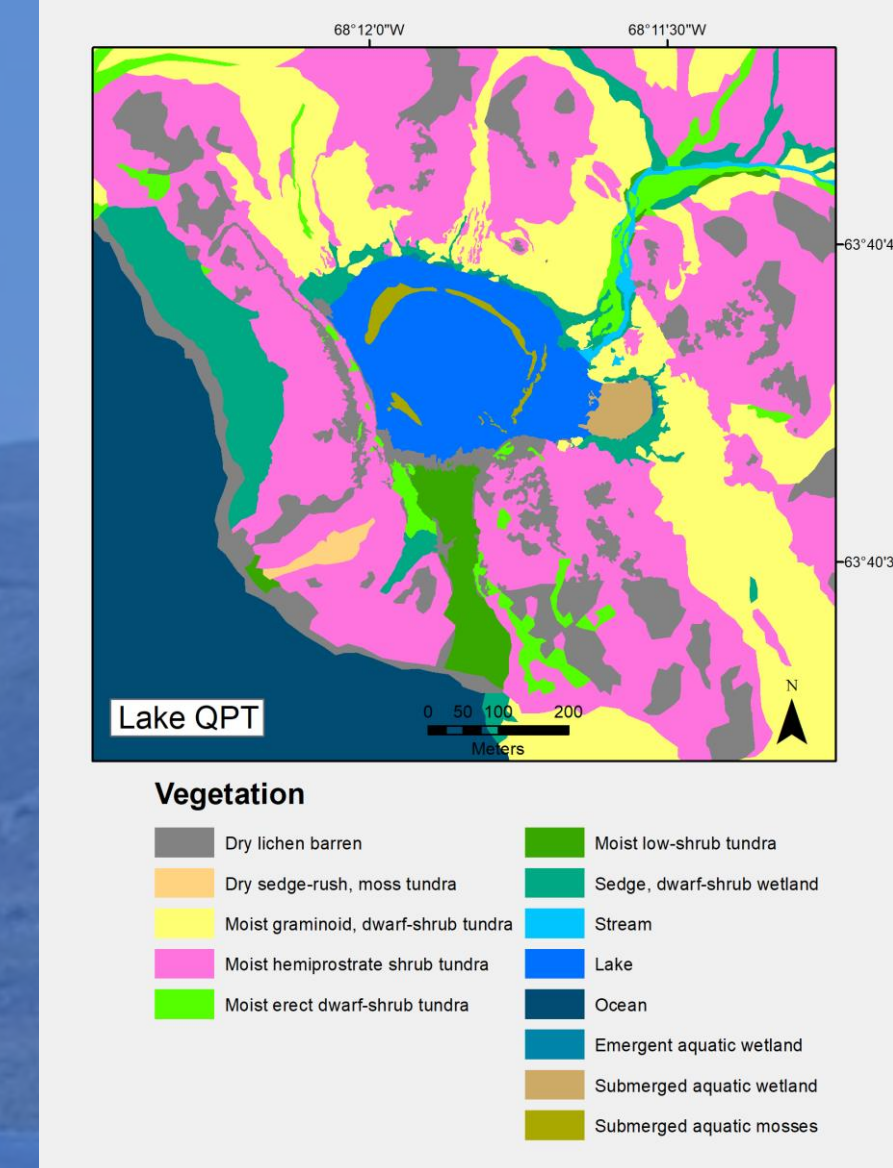
We sampled vegetation in 2018 and 2019 around four lakes along a climate gradient in the eastern Canadian Arctic. Here we present and analyze maps of the vegetation in a 1 by 1 km area around the lakes using the sampled ground data and satellite and drone imagery.



The Mean Annual Air Temperature (MAAT) at the lakes ranged from -18.2 to -5.4 °C and Summer Warmth Index (SWI, the sum of mean monthly temperature > 0 °C), ranged from 0.6 to 36.2 °C.

LAKE QPT NEAR IQALUIT, BAFFIN ISLAND

9.8 °C mean July temperature

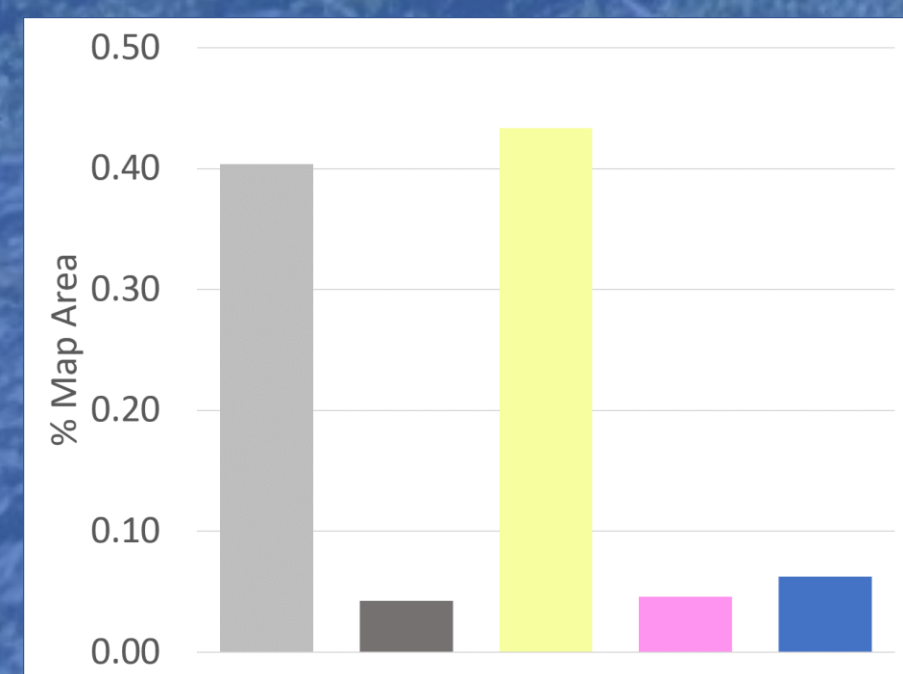
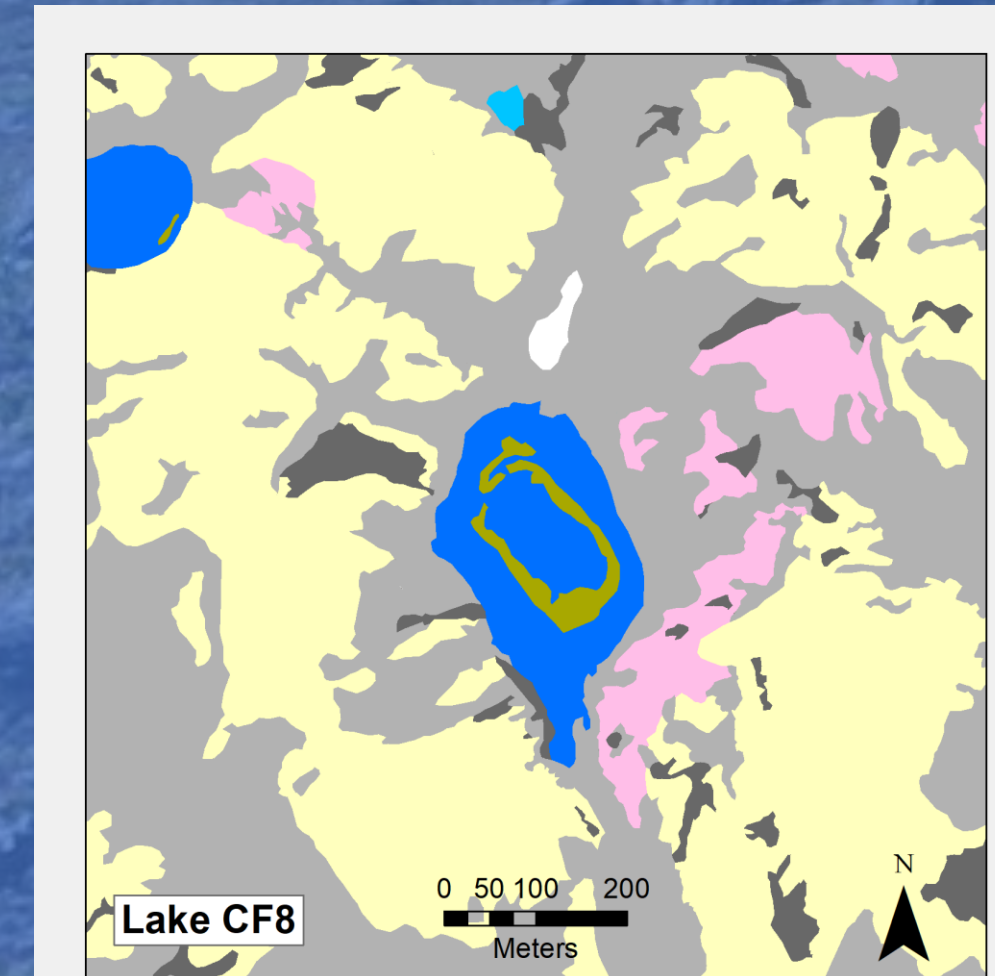


The landscape around Lake QPT is almost completely vegetated, with barren areas only on ridges. The vegetation types are a mix of vascular and nonvascular species. In some areas the vegetation reaches over one meter in height. Aquatic species include mosses and vascular submerged and emergent plants. The aquatic biomass is outweighed by the biomass of the terrestrial plants in the lake catchment.



LAKE CF8 NEAR CLYDE RIVER

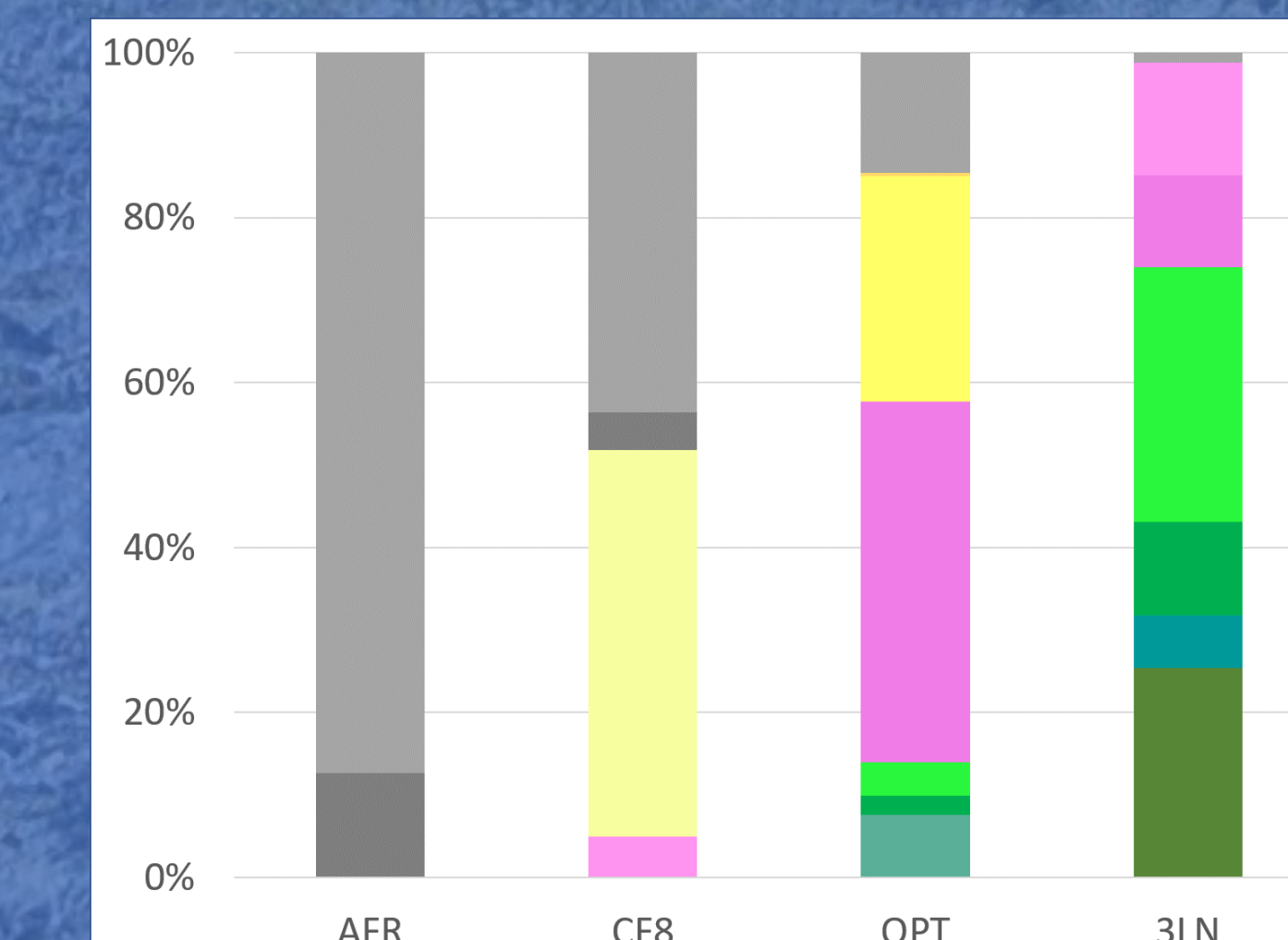
6.0 °C mean July temperature



The catchment around Lake CF8 is a mix of barren and vegetated areas. Vegetation is under 10 cm tall, and nonvascular plants (lichens, liverworts and mosses) dominate. Aquatic mosses are a relatively important component of the catchment biomass.



The vegetation around the northernmost lake was dominated by barren rock, with crustose lichens. The vegetation around the southernmost lake was dominated by dwarf-shrub tundra and open needleleaf forest. This north-south gradient is an analog for the change over time that occurred after these lakes emerged from under the ice and warmed after glacial periods.



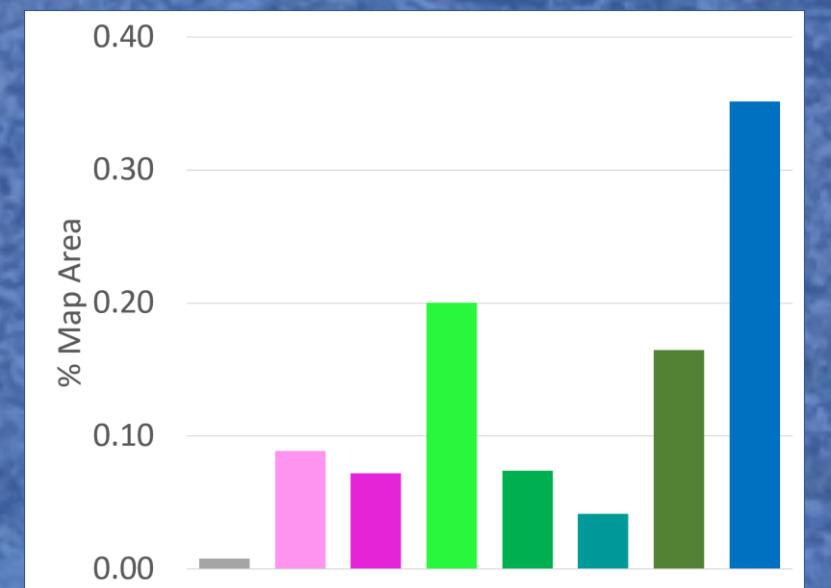
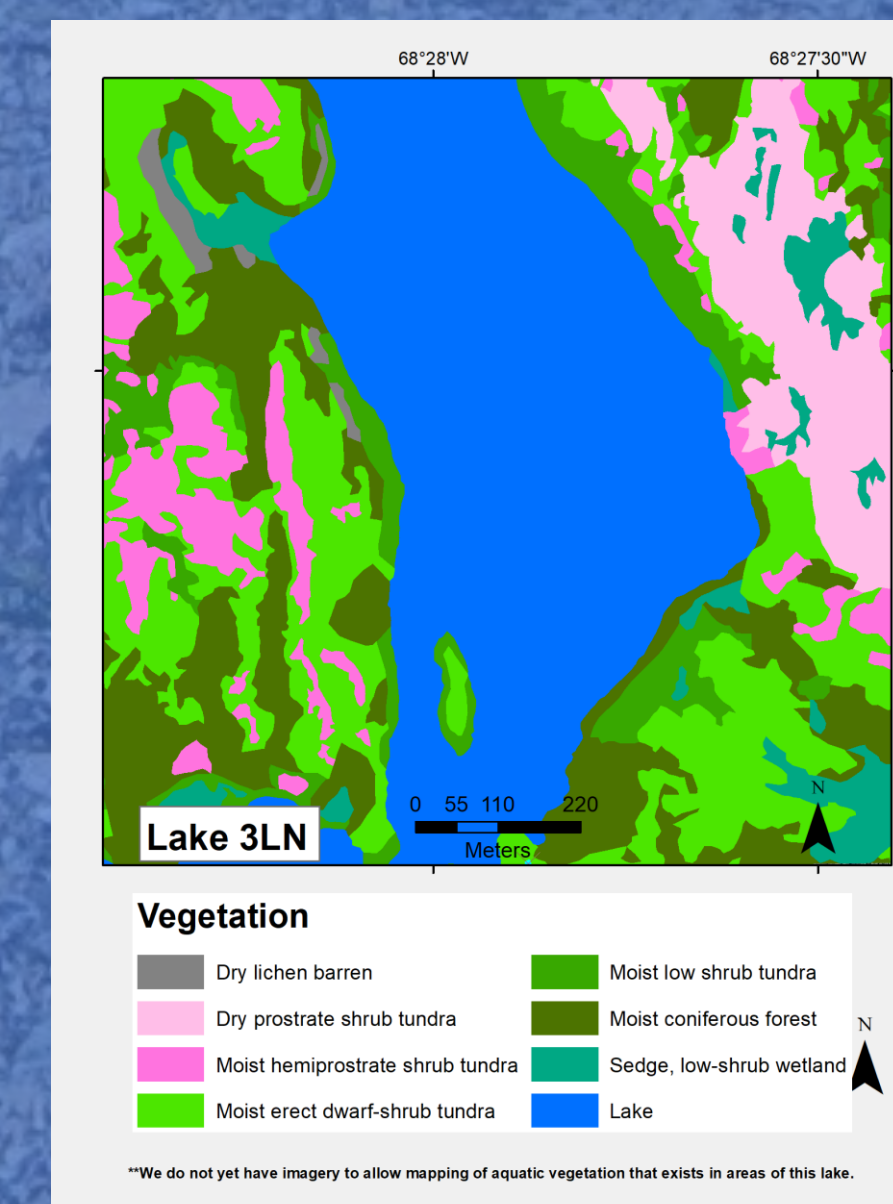
The change over time has been captured in sediments that accumulate at the bottom of lakes, including pollen and plant fragments. Colleagues from the University of Colorado, including Sarah Crump and Greg de Wet, pictured at left, have cored these lakes. Here they are holding a tube of muddy lake deposits, cored from the lake bottom below them.

When combined with the current vegetation mapping, this gives us some idea of how quickly the vegetation changed at these lakes in the past, and where the vegetation at these lakes might be headed as the climate changes.

This research was funded by NSF OPP #1737750

LAKE 3LN, KUJJUAQ, NUNAVIK, N QUEBEC

11.9 °C mean July temperature



Lake 3LN is near treeline, and is surrounded by open spruce/larch forest. Gravelly ridges are vegetated with prostrate shrubs and lichens, while rocky ridges are lichen-covered.

