

The image is a split-screen aerial photograph. The left side shows a lush green forest with some brown patches, while the right side shows a large, dark brown, charred area, likely the result of a wildfire. The text is overlaid on this background.

# Scotty Creek wildfire (October 2022): an update

Canada Research Chair in Atmospheric Biogeosciences in High Latitudes

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with input from Jennifer Baltzer, William Quinton (both Wilfrid Laurier University), Étienne Laliberté (Université de Montréal), Kyle Arndt, Brendan Rogers, Sue Natali (all Woodwell Climate Research Center)



# Acknowledgements



**SCOTTY CREEK**  
Research Station



Northwest  
Territories



Université   
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**LAURIER**   
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AMERIFLUX



**ForestGEO**  
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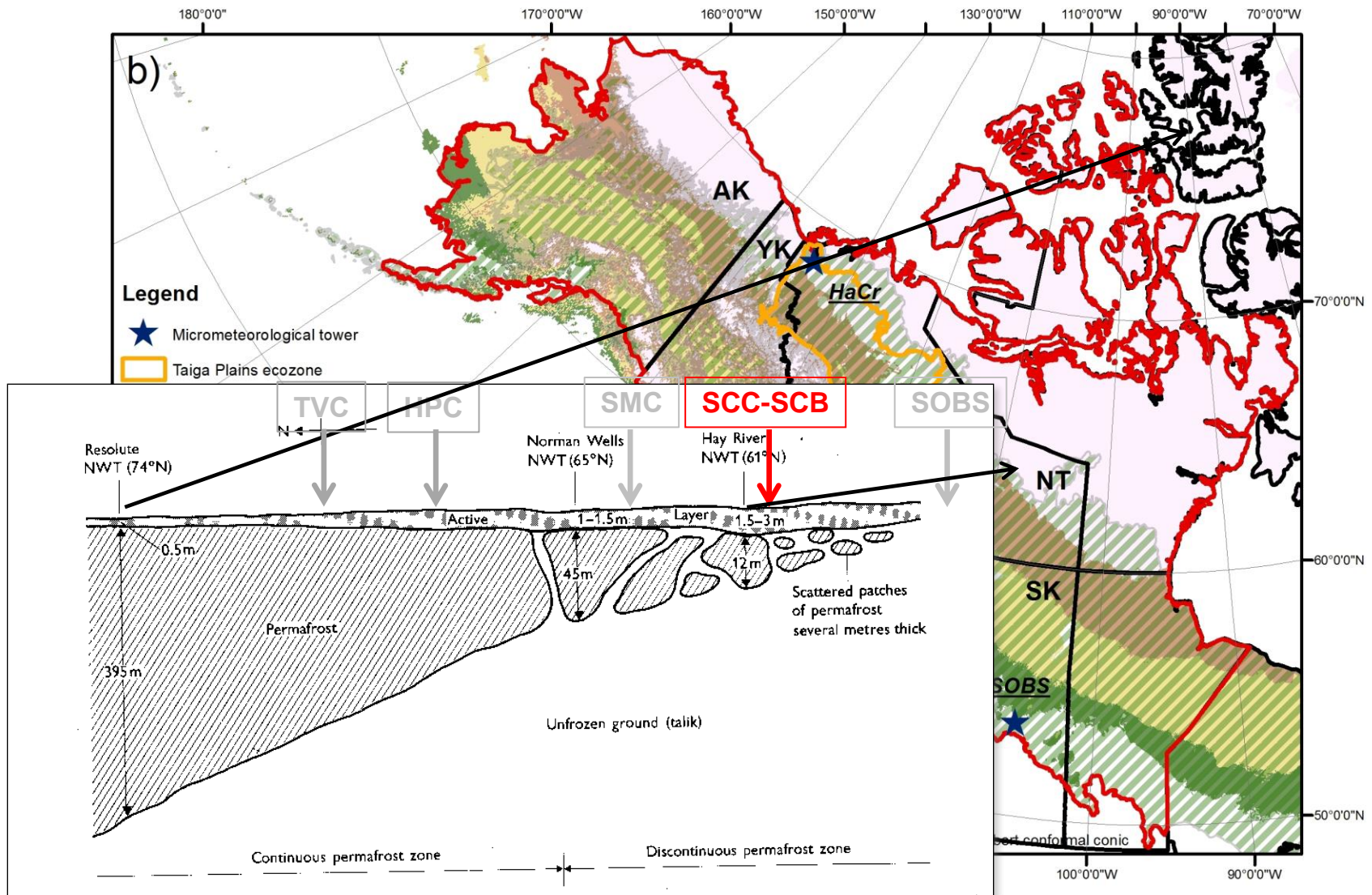
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CHAIRS INSIGNIA**

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**Québec**

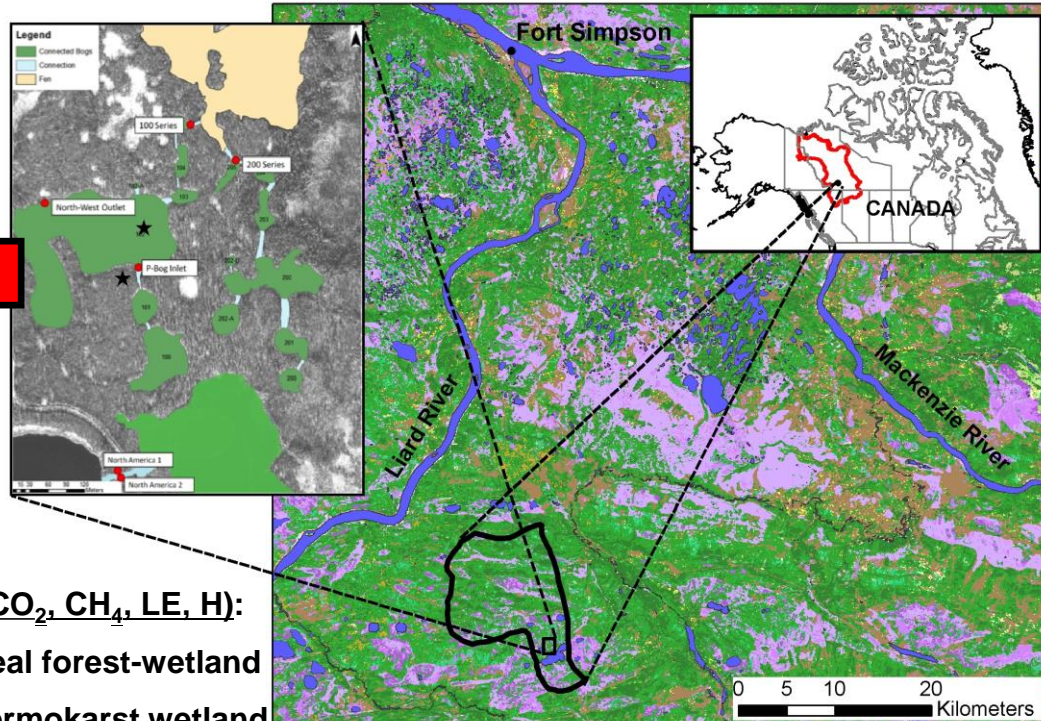




(Williams and Smith, 1989)



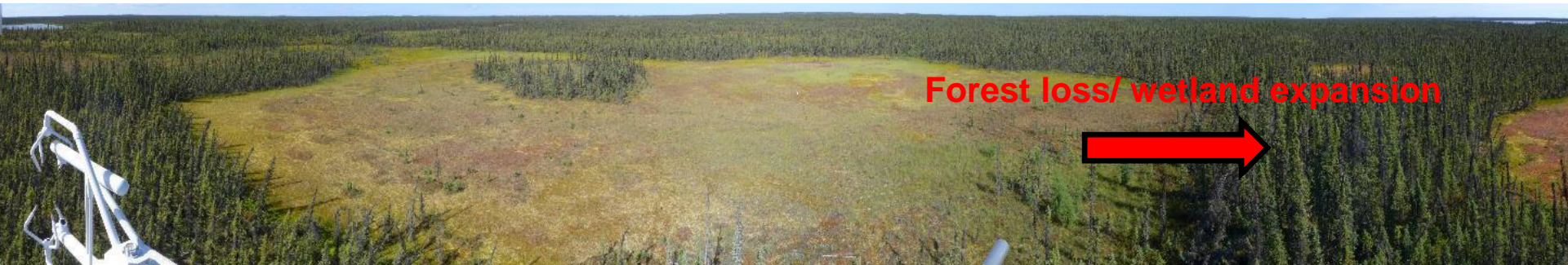
# 4 Scotty Creek basin



NAD83 UTM Zone 10N; Natural Resources Canada - Centre for Topographic Information (2009)

**"Nested" eddy covariance systems (CO<sub>2</sub>, CH<sub>4</sub>, LE, H):**  
15 m (landscape-scale, SCC): boreal forest-wetland  
1.9 m (ecosystem-scale, SCB): thermokarst wetland

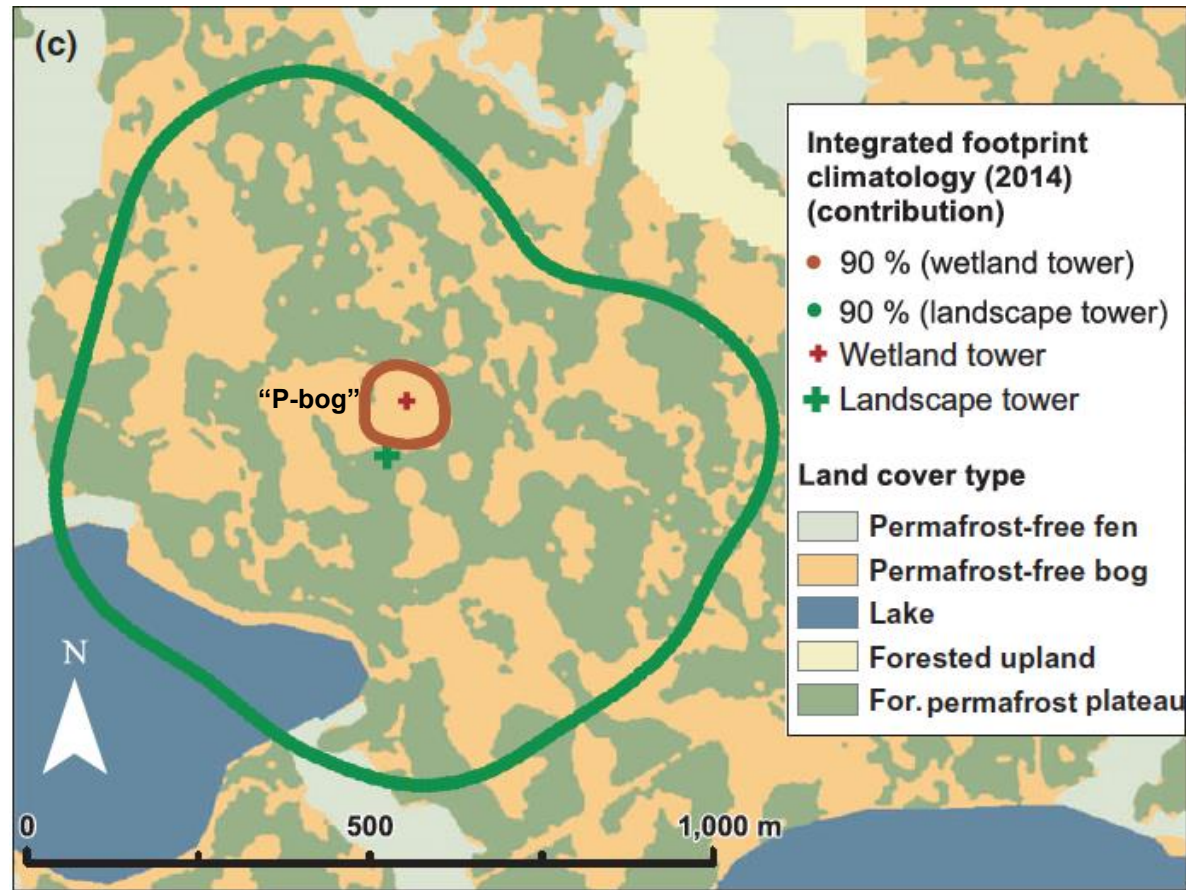
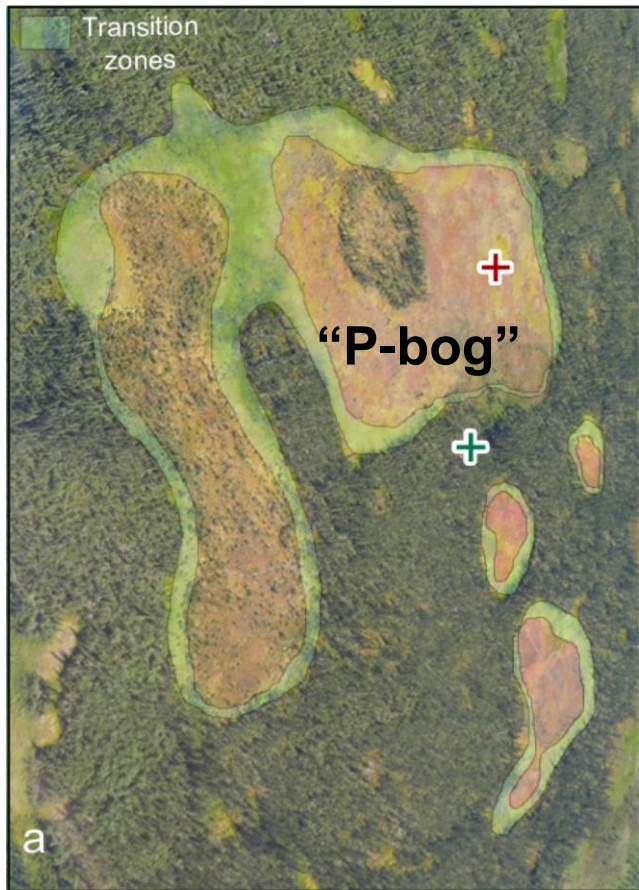
**Headwater portion of ca. 150 km<sup>2</sup>-basin: forested permafrost peat plateaus (38%), and permafrost-free wetlands (bogs [27%] & fens [26%]) and lakes (9%)**



**Forest loss/ wetland expansion**



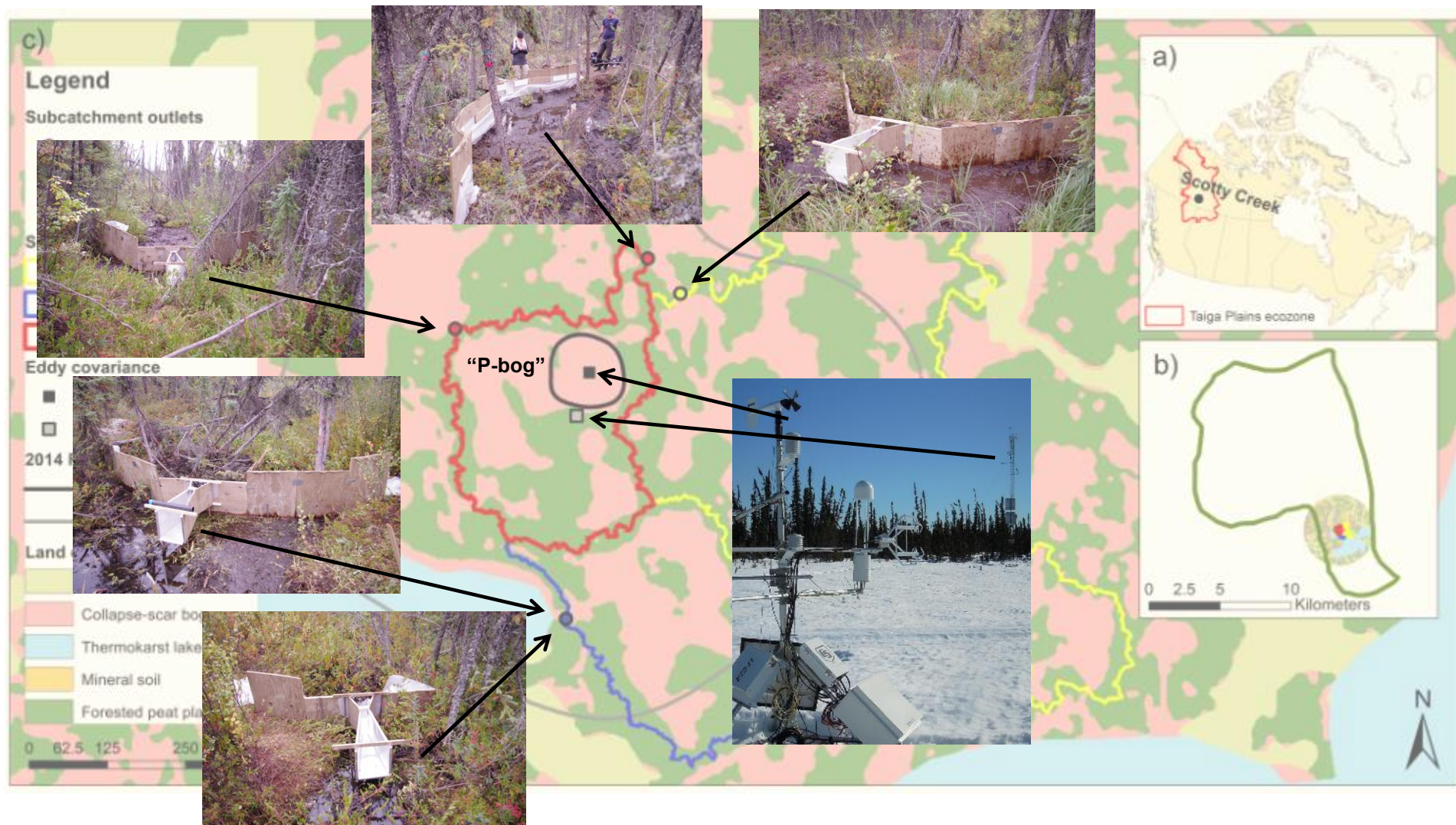




- Thermokarst wetland (wetland footprint)
- Landscape (boreal forest-wetland footprint)

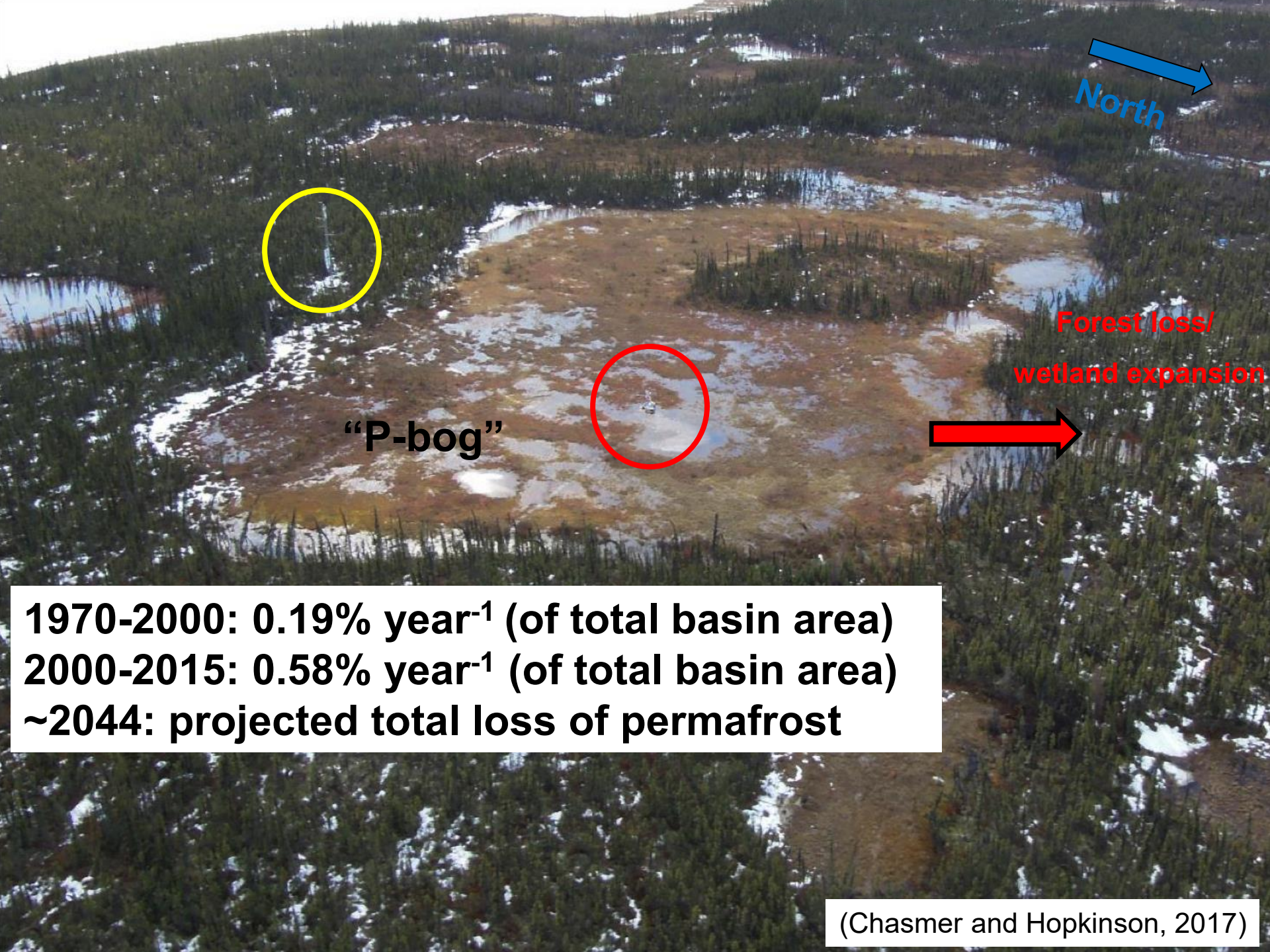


# 6 Runoff, permafrost, water chemistry, etc.



"Nested" eddy covariance and ancillary measurements (since 2013), discharge (2014–2016) and water sampling (2015 & 2016) from three gauged catchments (0.1–0.3 km<sup>2</sup>) draining the eddy covariance footprints.





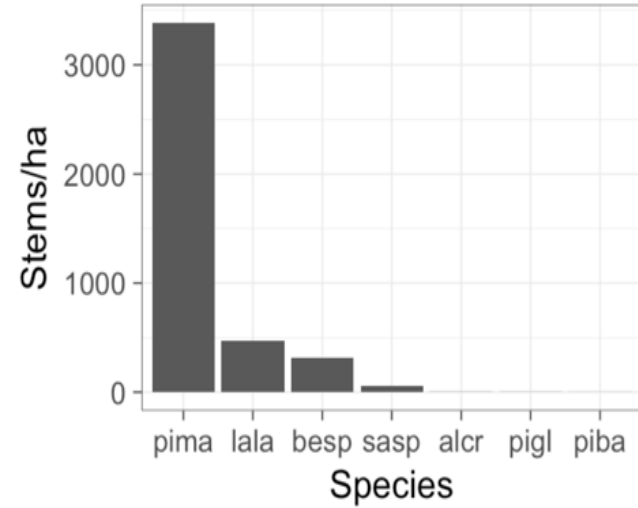
“P-bog”

Forest loss/  
wetland expansion

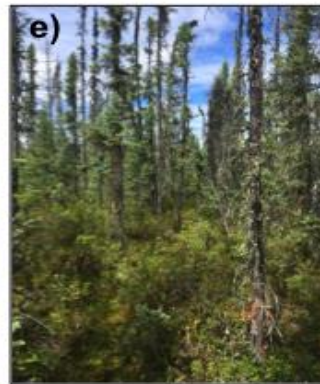
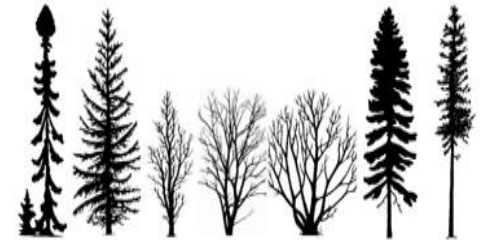
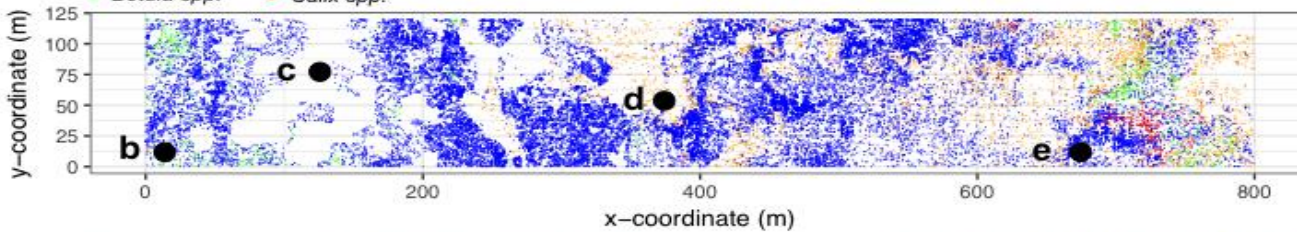
**1970-2000: 0.19% year<sup>-1</sup> (of total basin area)**  
**2000-2015: 0.58% year<sup>-1</sup> (of total basin area)**  
**~2044: projected total loss of permafrost**



# 8 Scotty Creek ForestGEO plot



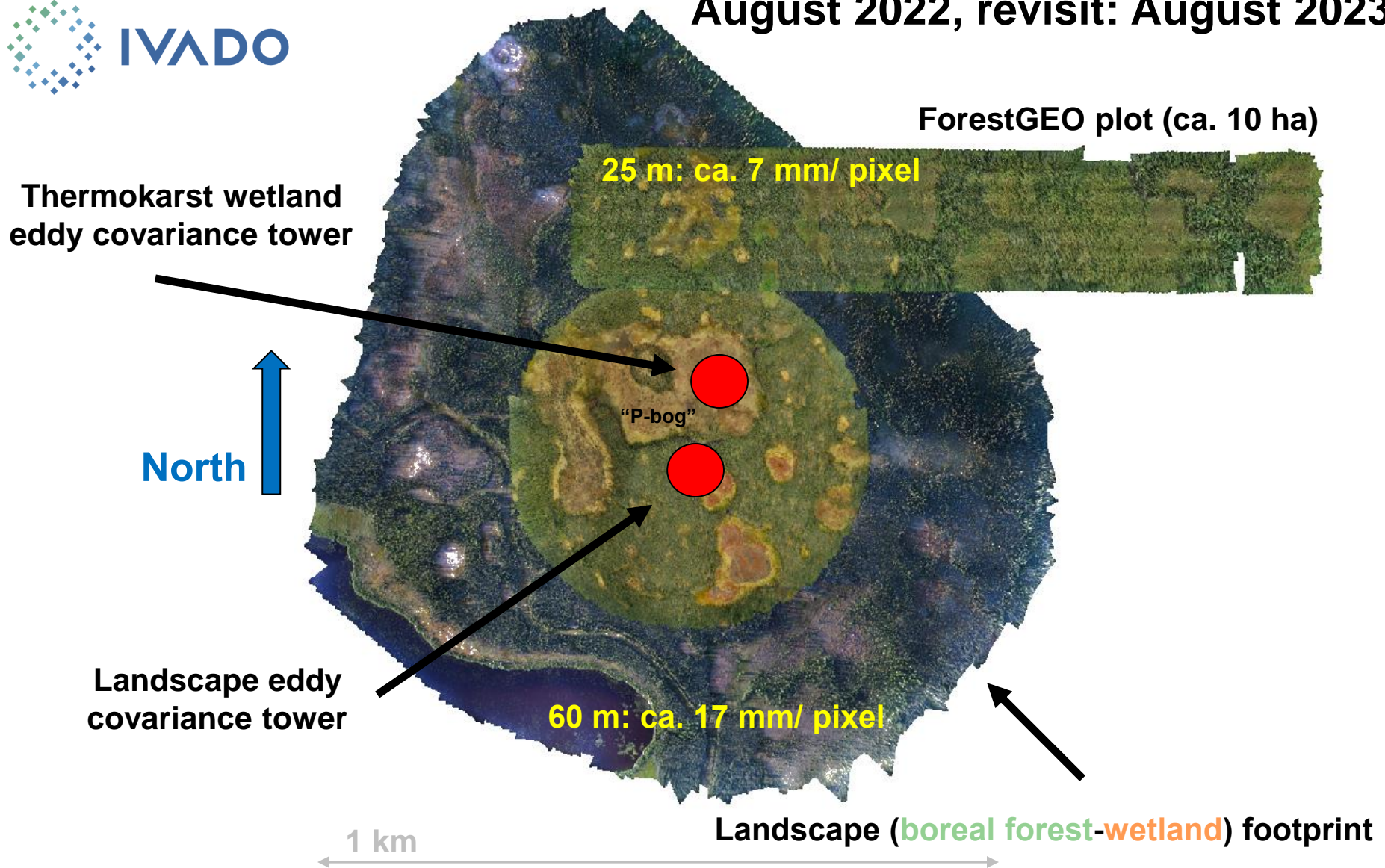
- a) Legend
- *Picea glauca*
  - *Picea mariana*
  - *Larix laricina*
  - *Betula spp.*
  - *Alnus crispa*
  - *Pinus banksiana*
  - *Salix spp.*







August 2022, revisit: August 2023





# 10 First Nation leadership at Scotty Creek



August 2022: Łíídlıı Kúę First Nation takes over leadership of the Scotty Creek Research Station (SCRS).



See poster on our training efforts: Bruno Lecavalier



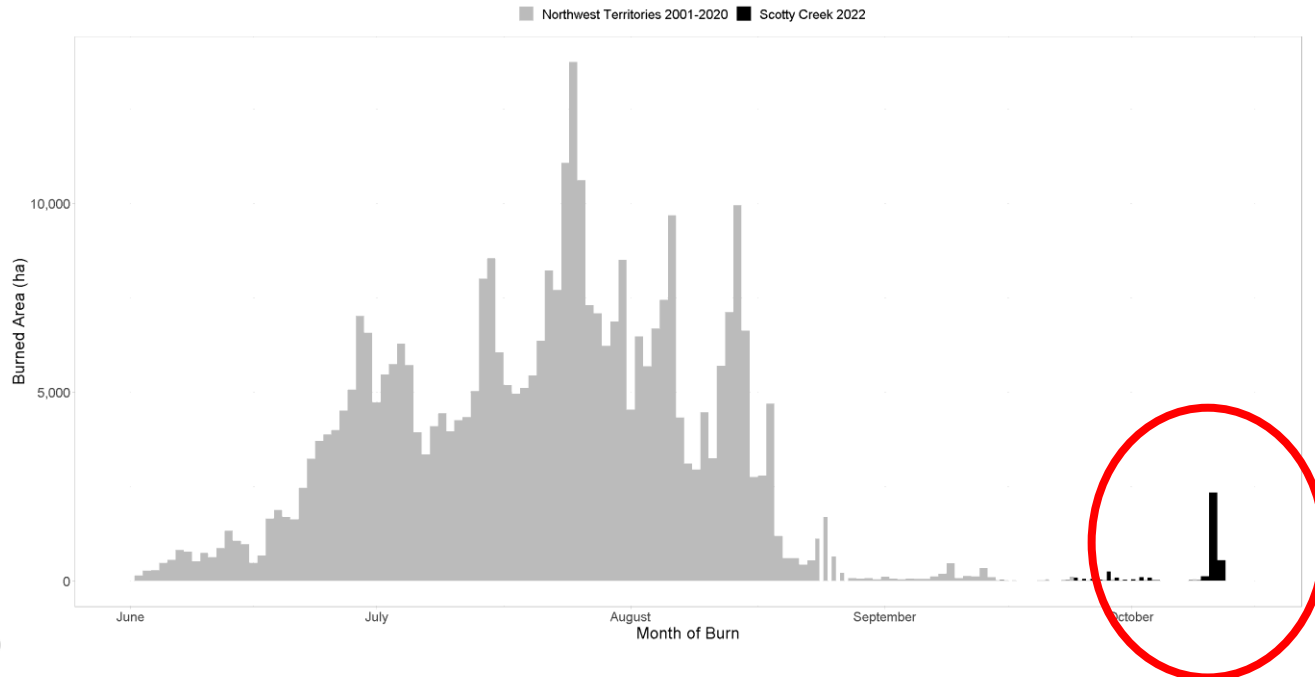
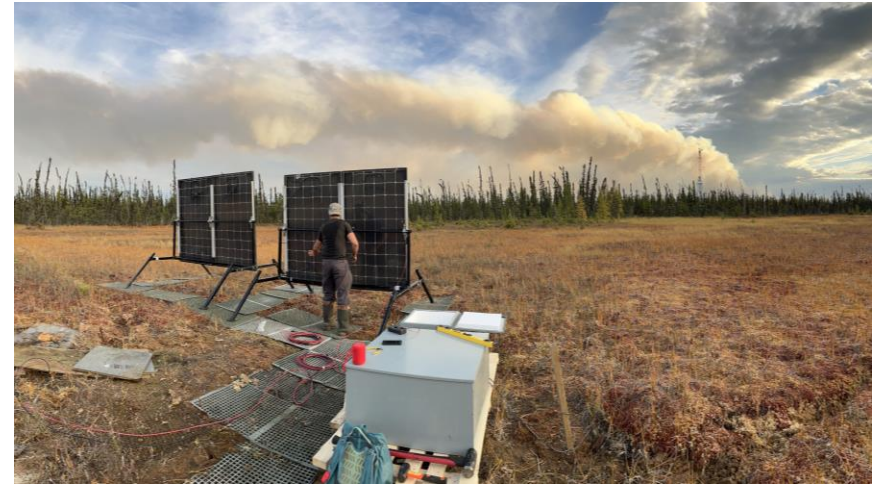
# 11 Scotty Creek: research summary

- A well-studied research basin near the southern limit of permafrost in northwestern Canada
- Research activities focused on headwater portion near the SCRS
- Land surface-atmosphere interactions, hydrology, biogeochemistry, limnology, forest ecology/ wildfire, groundwater, hydrological/ permafrost modelling, remote sensing, etc.: >100 publications
- **Data-rich:** AmeriFlux/FLUXNET, ForestGEO, NASA ABoVE, etc.



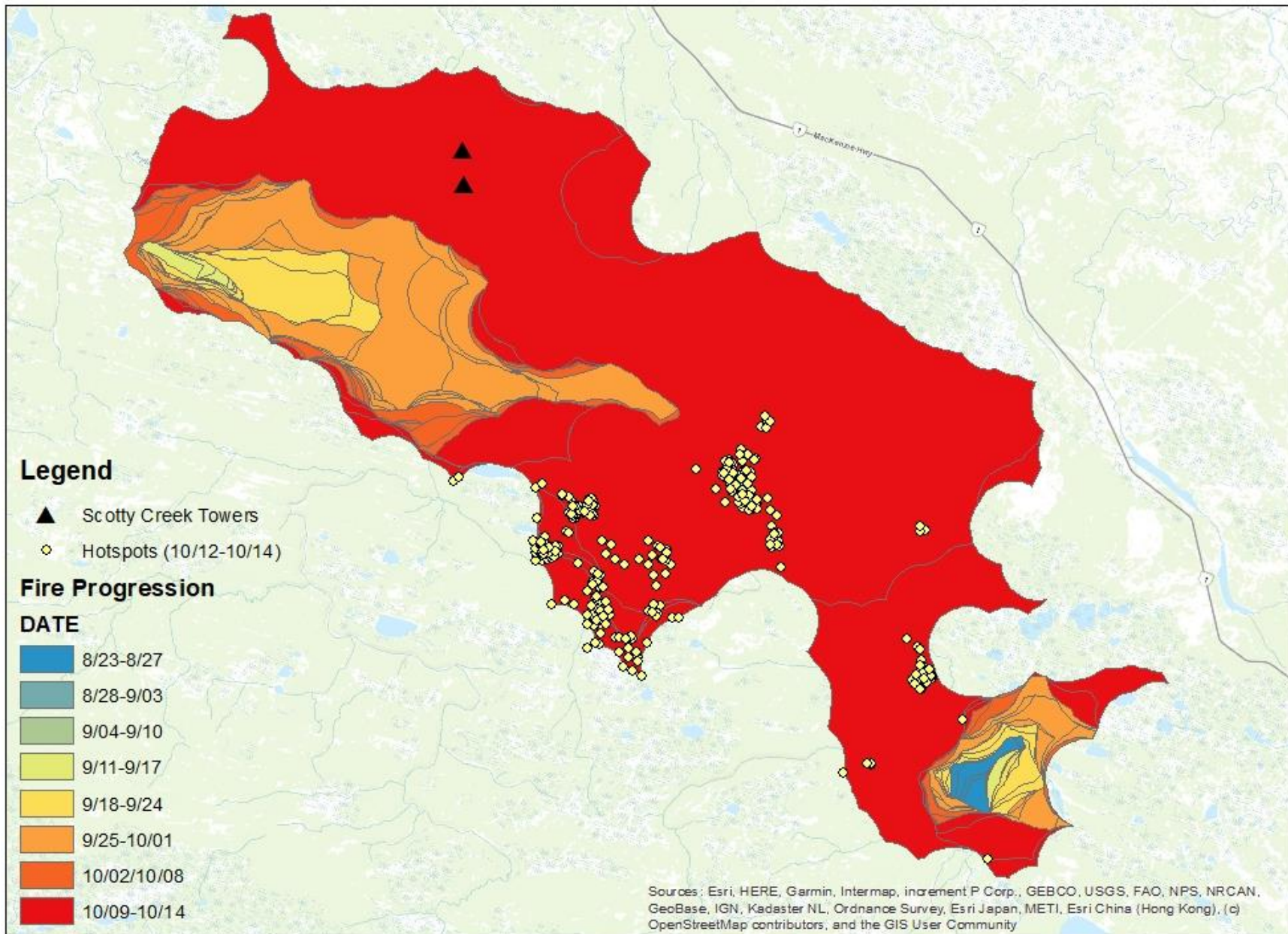


# 12 October 2022: a late-season wildfire



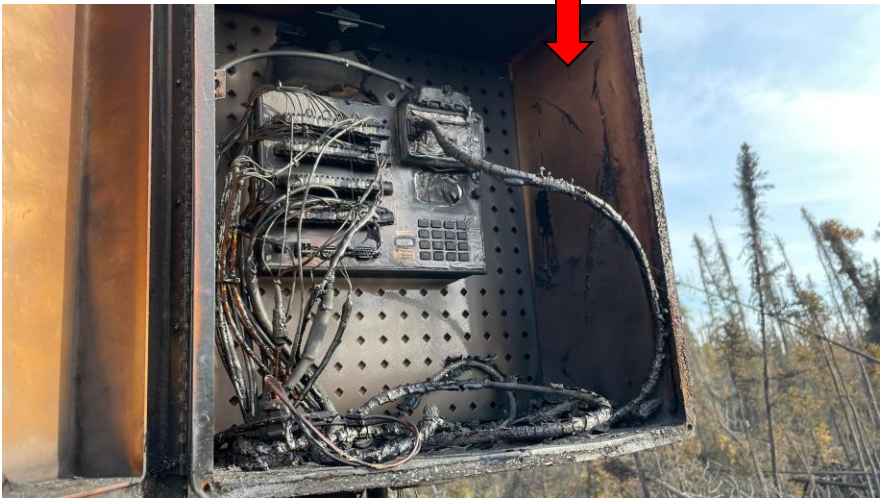
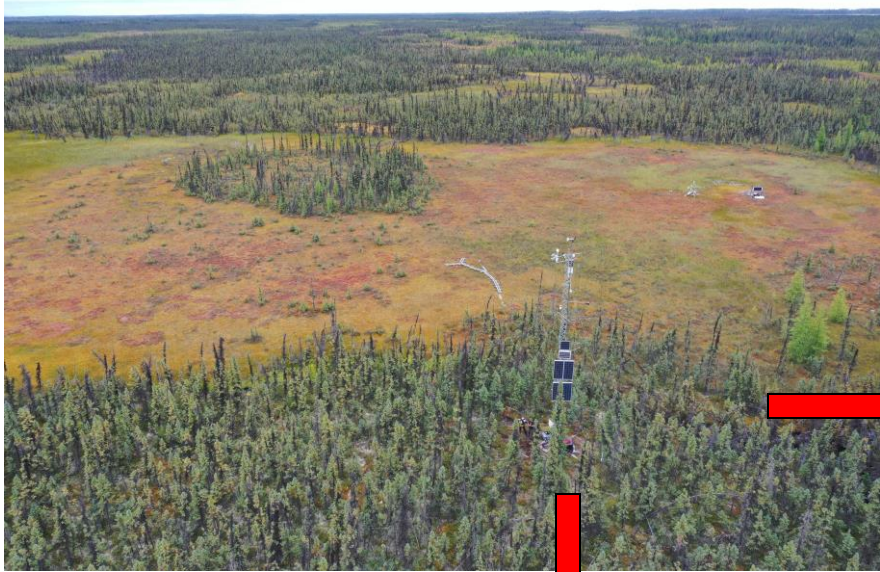
(WCRC, 2022)







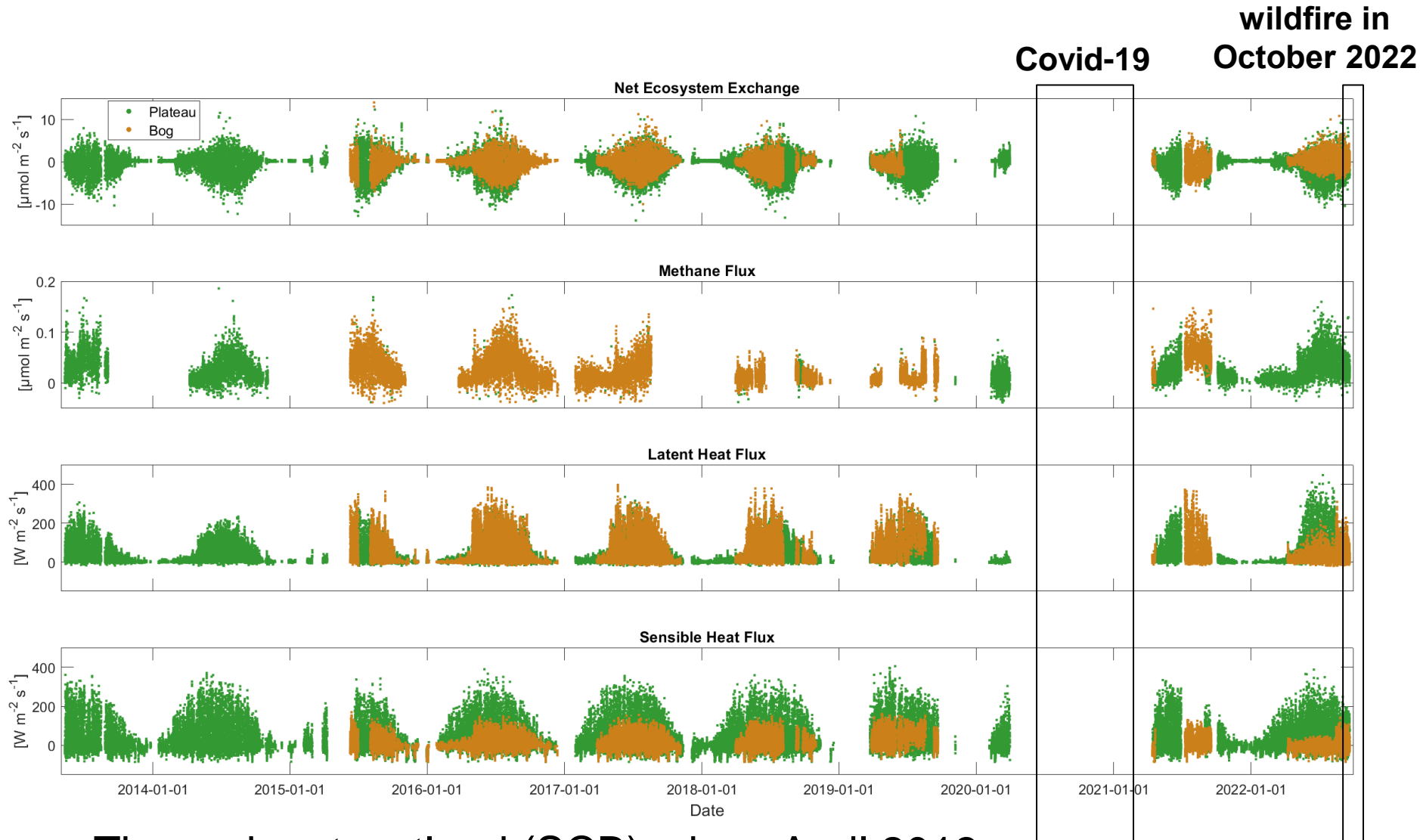
# 14 Wildfire aftermath



North



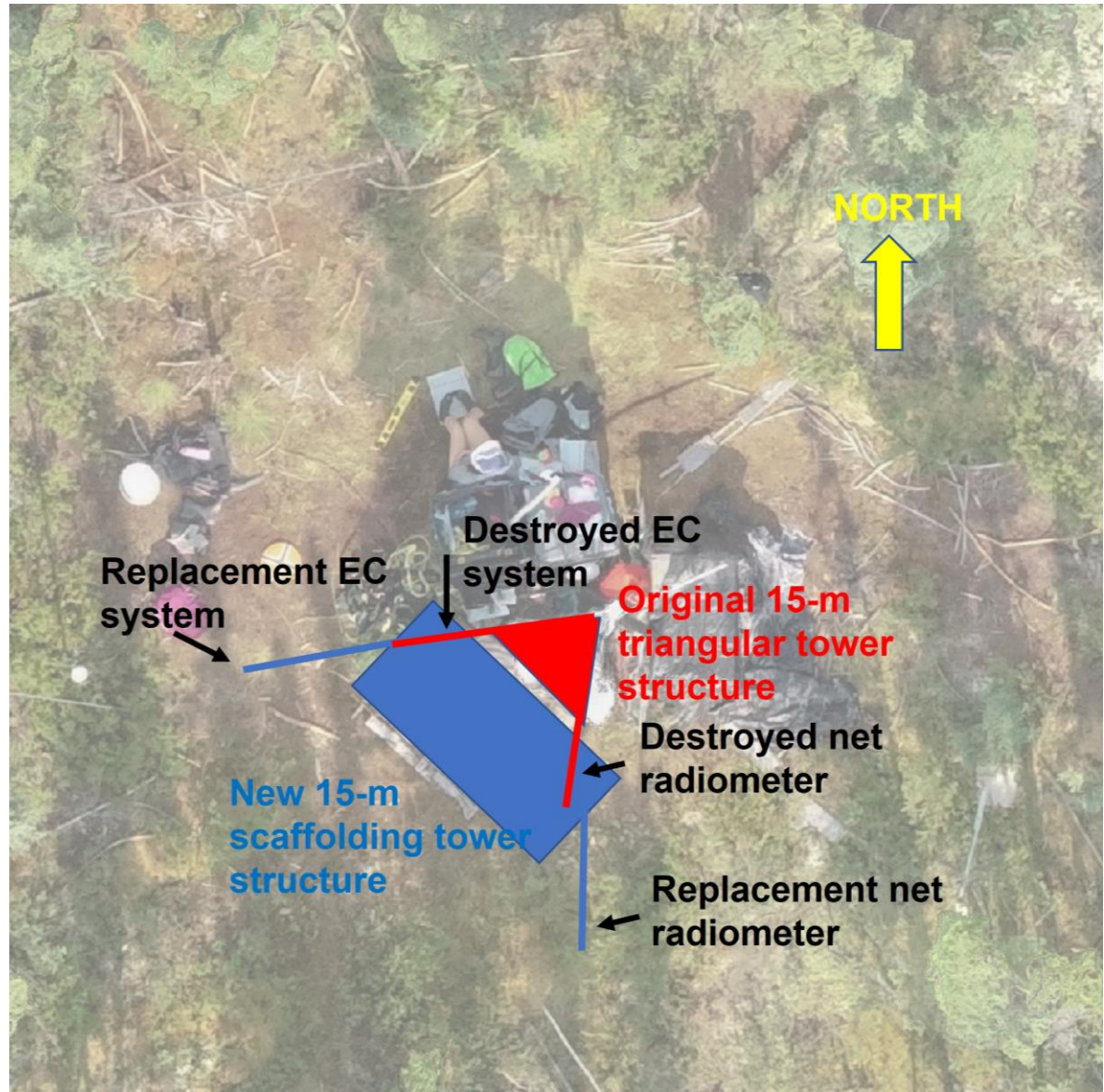
# 15 Long-term “nested” eddy covariance measurements



- Thermokarst wetland (SCB): since April 2013
- Landscape (SCC): since June 2015



# 16 Scotty Creek "2.0": starting March 2023



# 17 Scotty Creek “2.0”: summary



- January 2023: focus is on SCRS and “nested” eddy covariance measurements
- SCRS: led by Łíídlıı Kúę First Nation, scheduled for summer 2023
- “Nested” eddy covariance measurements: led by Université de Montréal, scheduled for March 2023
- So far financed through:

**PERMAFROST  
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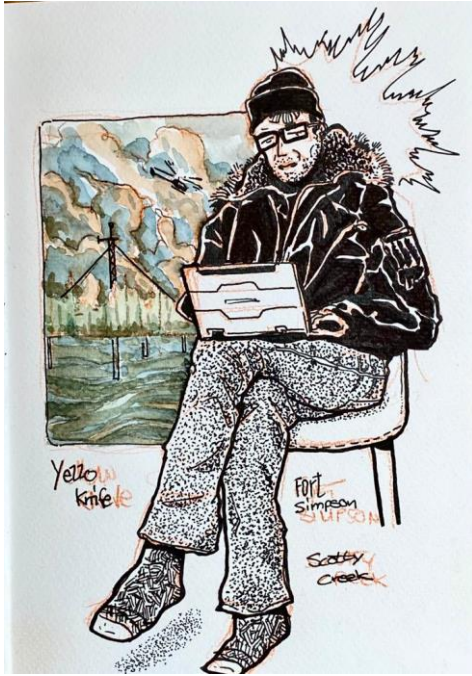


<https://permafrost.woodwellclimate.org/>

- **NSF Rapid Response Research (RAPID):** “Immediate Post-Fire Carbon Balance of Boreal Peat-Wetland Mosaics” (in review), Arndt, Rogers, Natali (all Woodwell Climate Research Center), Sonnentag (Université de Montréal)
- Many opportunities for post-fire research!



# 18 Scotty Creek → Scotty Creek “2.0”





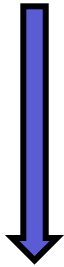
# Impacts of wildfire examined by specific research modules

Land surface-atmosphere interactions



**O. Sonnentag**  
(U. Montréal)

Hydrology



**W. Quinton**  
(Wilfrid Laurier)

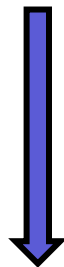
**R. Connon**  
(Government of NWT)

Biogeochemistry



**D. Olefeldt**  
(U. Alberta)

Limnology



**J. Korosi**  
(York U.)

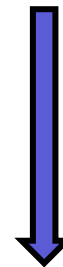
Forest Ecology/ Wildfire



**C. Hopkinson**  
**L. Chasmer**  
(U. Lethbridge)

**J. Baltzer**  
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Groundwater



**S. Wright**  
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Hydrological & Permafrost Modelling



**É. Devoie**  
(Queen's U.)  
**J. Craig**  
(U. Waterloo)





# 20 Research license requirements for Scotty Creek



## 1. Overview

**PREAMBLE:** In accordance with Article 26 of the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP), and in recognition that UNDRIP was granted royal assent by the Government of Canada (21 June, 2021), the Líidljí Kúé First Nation has introduced a number of new initiatives to exercise our Indigenous rights to manage our traditional lands and resources therein. The introduction of this research license, passed into law by Band Council Resolution (7 February, 2022), is one such initiative.

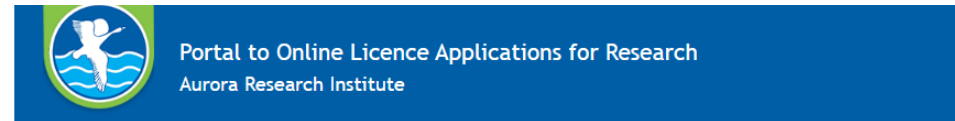
Note: One application per person. An application on behalf of two or more people will not be accepted.

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### 1.1. Indicate where you plan to conduct your activity

1.2. If "Other" was selected, provide the latitude and longitude. If a place name exists, please provide it, otherwise briefly describe where the site is located with reference to a well-known location (e.g. 5 km south of junction of highways 1 and 7). If "Other" was not selected, enter "N/A".

<https://www.scottycreek.com>



## COVID-19

In response to the COVID-19 pandemic, the Aurora Research Institute will continue to accept research licence applications. We request that all researchers adhere by the most current COVID-19 directions of the Chief Public Health Officer of the Northwest Territories.

The NWT CPHO advisories for updated COVID-19 information and travel directives can be found at <https://www.gov.nt.ca/covid-19/>

If you have any questions about this message or about the NWT research licensing process, please contact us at [licence@nwtresearch.com](mailto:licence@nwtresearch.com)

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The Portal to Online Licence Applications for Research (POLAR) is our licensing system for researchers and Northwest Territories (NWT) community reviewers to apply for and provide feedback on NWT Scientific Research Licenses. Please register and log in to access these services.

The Aurora Research Institute promotes effective communication between researchers and NWT communities and POLAR is our means to facilitate this communication. For further information on the licensing process for the NWT, please review our [Guide to doing research in the Northwest Territories](#)

For further information contact:

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<https://polar.nwtresearch.com/>





**Fully-funded PhD position available to work on pre- vs post-fire Scotty Creek land surface-atmosphere interactions!**

<https://atmosbios.com>

**Merci!**

[oliver.sonntag@umontreal.ca](mailto:oliver.sonntag@umontreal.ca)

**ATMOSBIOS** 