Consortium for Permafrost Ecosystems in Transition (CPET)

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Background:

Northeastern British Columbia and the adjacent southern Northwest Territories are among the most rapidly warming regions on Earth, and are experiencing unprecedented industrial expansion. Climate warming and human disturbance in the NEBC-NWT border region has led to widespread permafrost thaw and landcover change that has disrupted the hydrological cycle and the ecosystems and human activities that depend on it. The hydrological implications of this land-cover transformation remain poorly understood. As a result, there is an urgent need for an improved understanding of, and ability to predict, permafrost thaw and its hydrological consequences. In response to this need, the Consortium for Permafrost Ecosystems in Transition (CPET) has been formed. CPET combines university researchers with partners from industry, local communities in NEBC and NWT, and government. CPET will investigate hydrological and ecological changes resulting from permafrost thaw in the border region, develop and mobilise knowledge of these changes, develop predictive modelling tools, and provide interactive training on these tools to our partners in industry, government and communities, including First Nations.

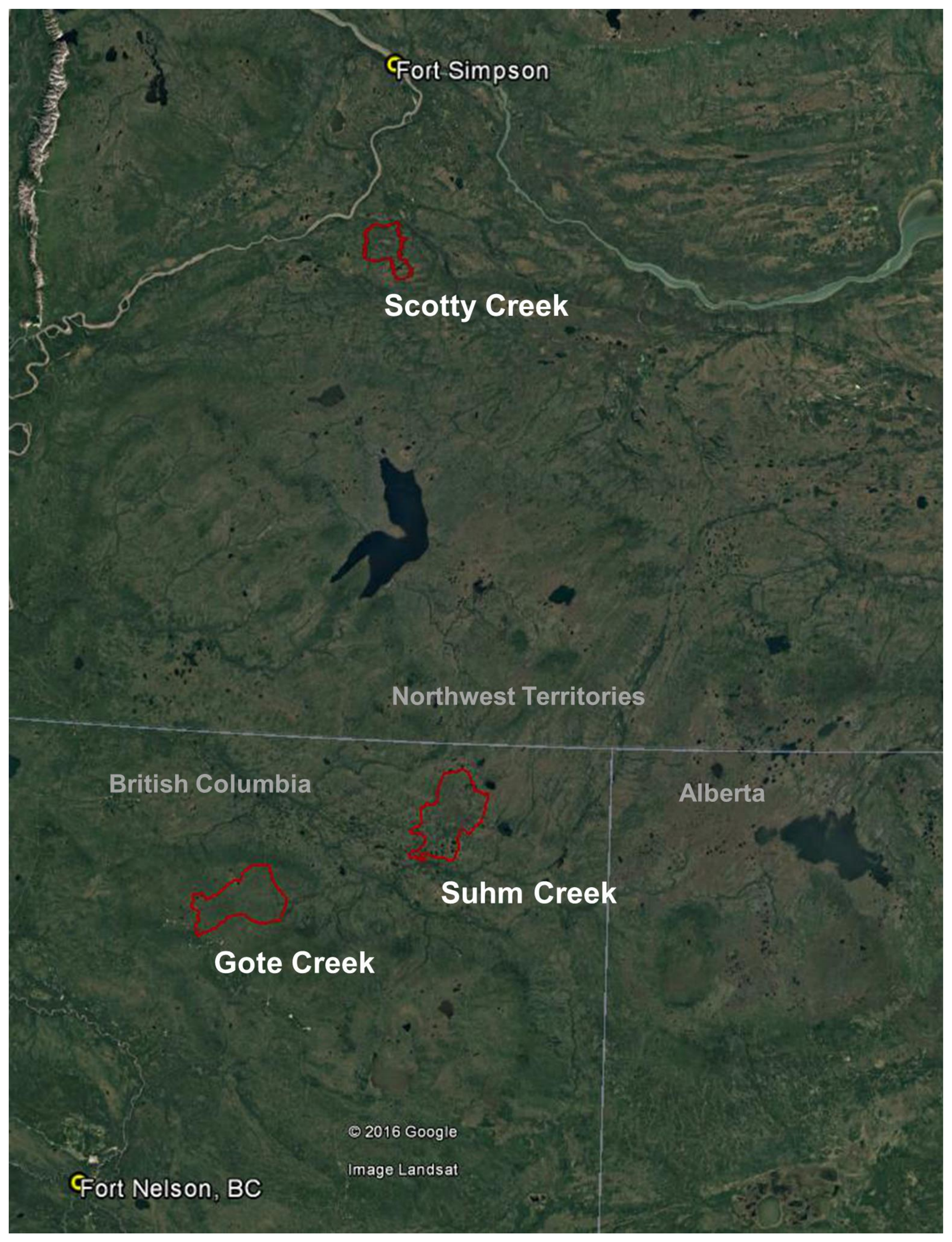


Figure 1. CPET research is being conducted over a north-south study region between Fort Simpson, NT and Fort Nelson, BC.

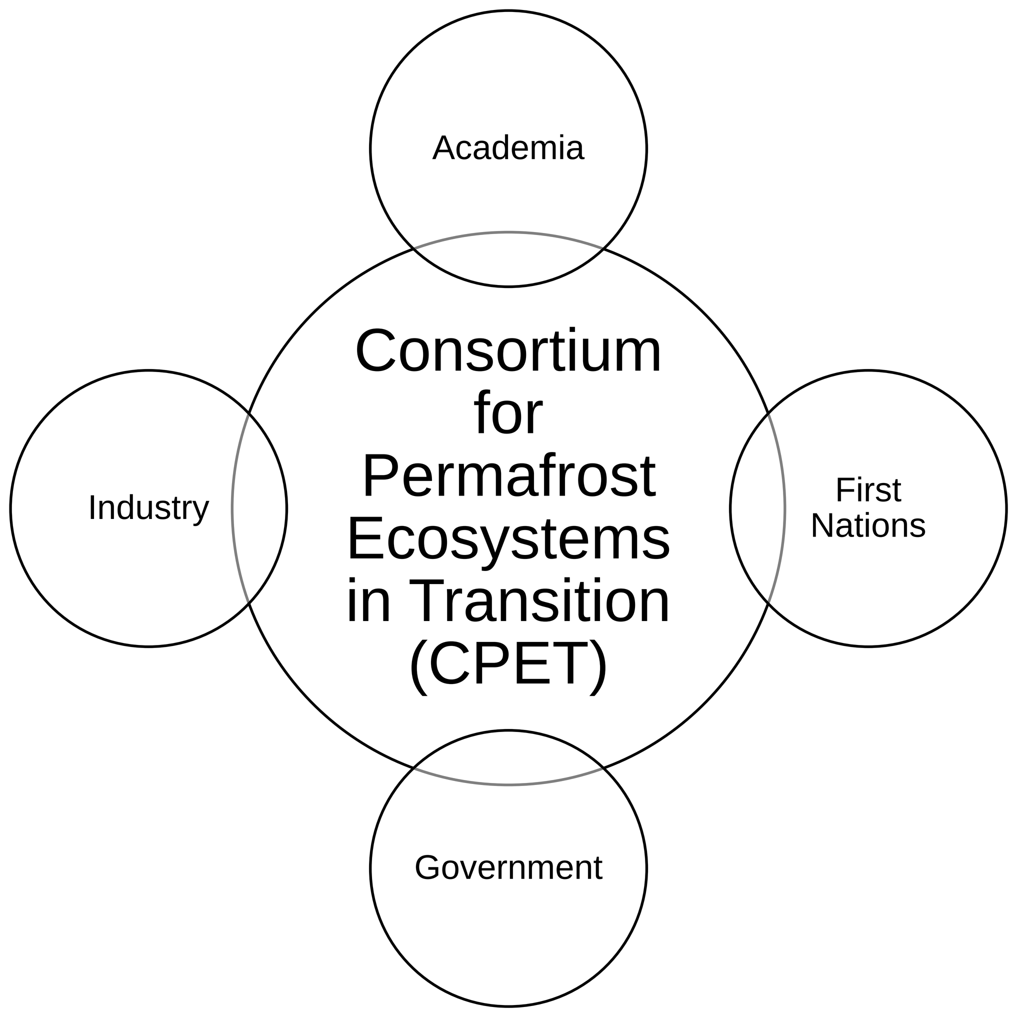
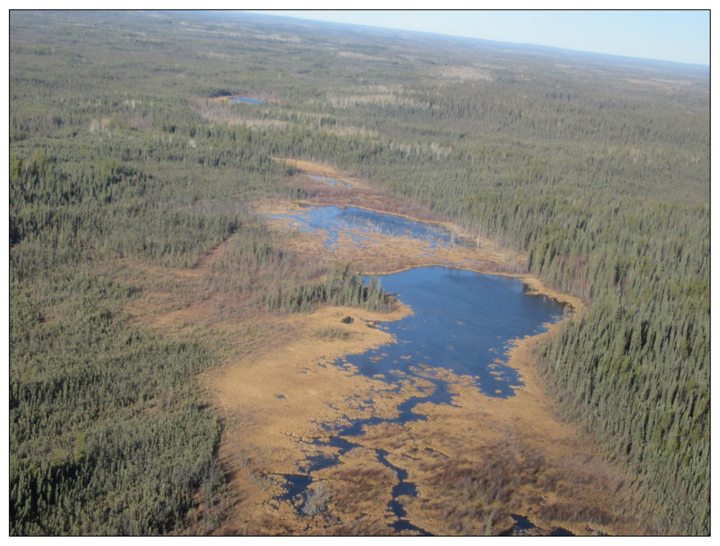
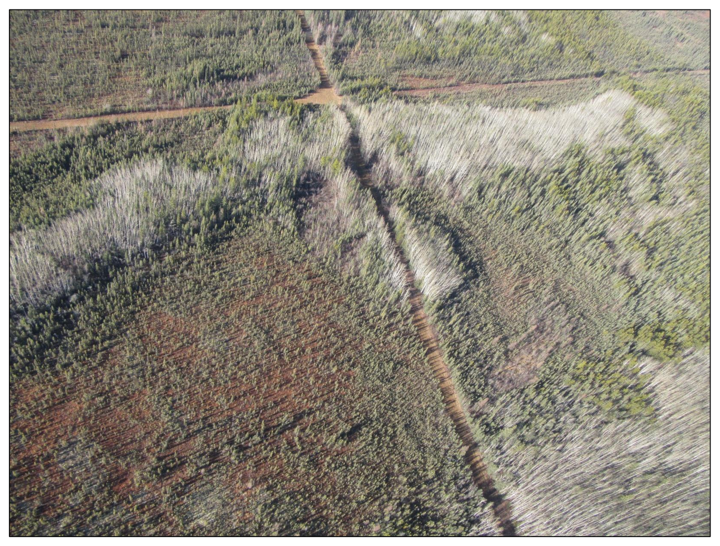


Figure 2. CPET represents a collaboration between stakeholders in the study region.

Figure 3. (right) examples of characteristic landscape patterns over the southern extent of the study region (in northeast BC).





CPET science objectives:

1. Map the changing spatial distribution of permafrost, wetland and forest coverage over the past 60 years using aerial photography, satellite images and LiDAR.

2. For different ground thaw and moisture conditions, conduct field studies to improve the understanding of the volume and timing of runoff from (a) peat plateau-bog complexes; and b) the adjacent channel fens that convey to streams and rivers the runoff that they receive from plateau-bog complexes. For each setting, the water flux and storage processes that control runoff will be examined.

3. Simulate the major water flux and storage processes controlling runoff from the plateau-bog complexes using the Cold Regions Hydrological Model (CRHM) and the Raven hydrological modelling framework, and, where needed, make improvements to both models based on the improved process understanding arising from (2).

4. Improve our ability to characterize permafrost impacts at larger scales through field investigation and subsequent adaptation of the Northern Ecosystem Soil Temperature (*NEST*) regional-scale permafrost model to handle the unique thaw response of bogs, fens, and plateaus.

5. Use information generated from the improved hydrological models (3) and the permafrost model (4) to estimate future quantities of runoff and surface water storage within Boreal and subarctic landscapes with discontinuous permafrost under possible scenarios of climate warming and human disturbance.

Field photos:

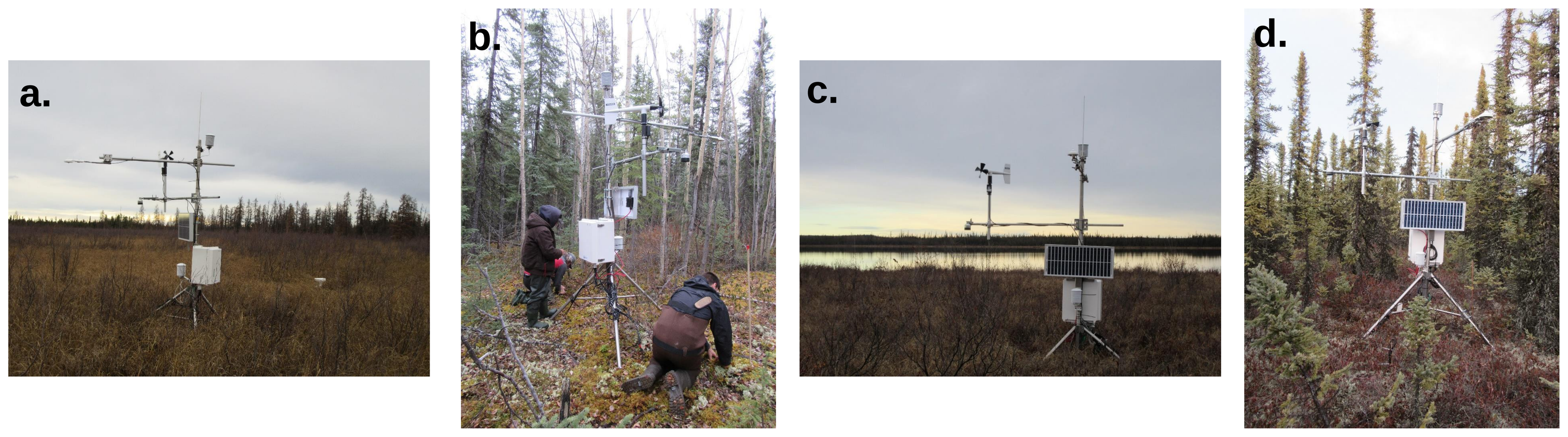


Figure 4. Hydro-met stations installed in October, 2015 at wetland (a,c) and forest (b,d) environments (locations shown in Figure 1: a,b are at Gote Creek and c,d are at Suhm Creek).

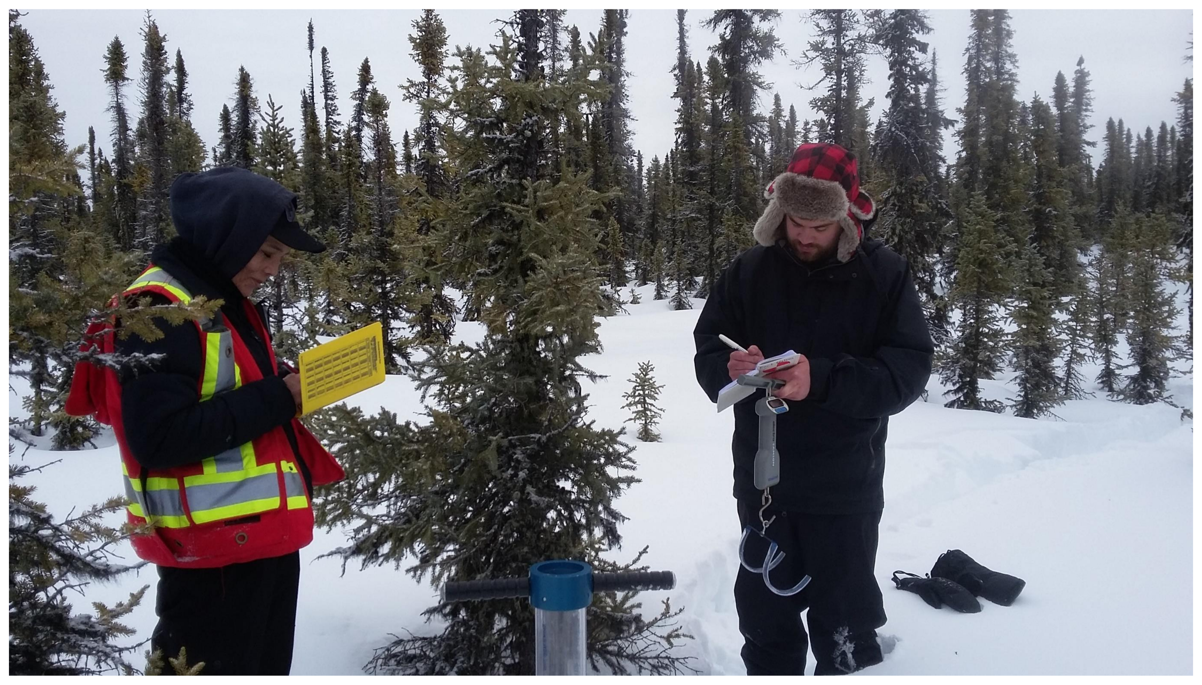


Figure 5. Completing snow surveys at Suhm Creek in March 2015

For more information:

www.coldregions.ca

www.ScottyCreek.com

A Geoscience BC article was published by Drs. Quinton, Adams, Baltzer, Berg, Craig and Johnson describing CPET in the 2015 Summary of Activities section. This can be found here http://www.geosciencebc.com/s/SummaryofActivities.asp