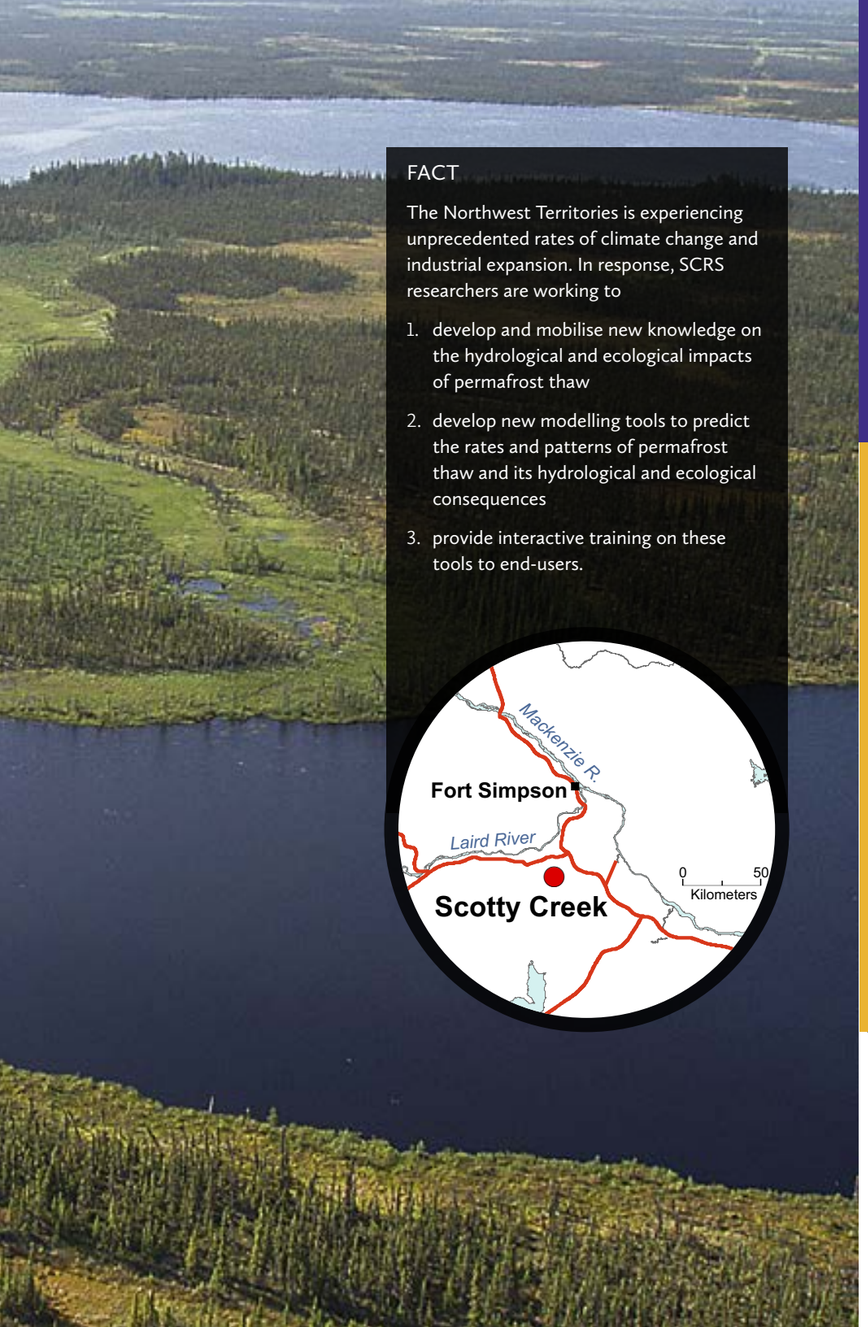


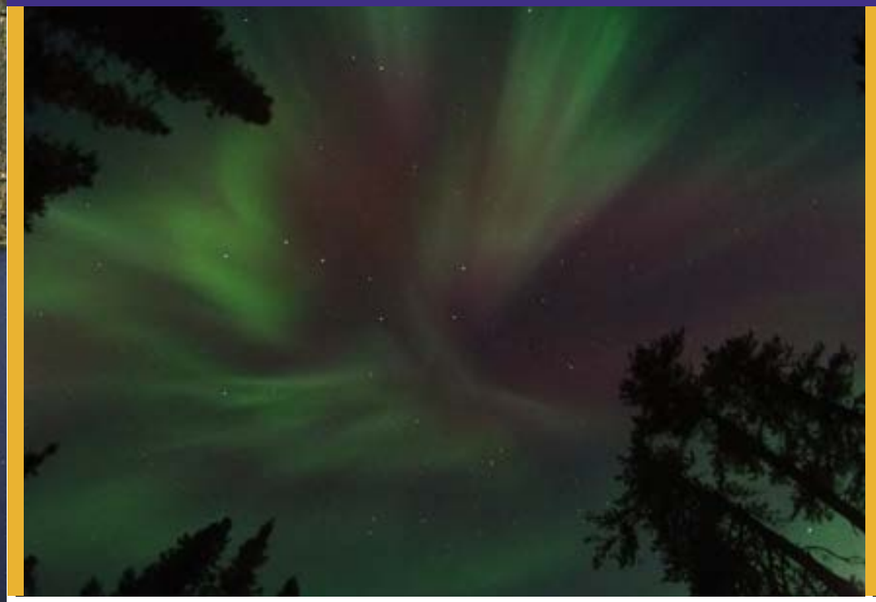
FACT

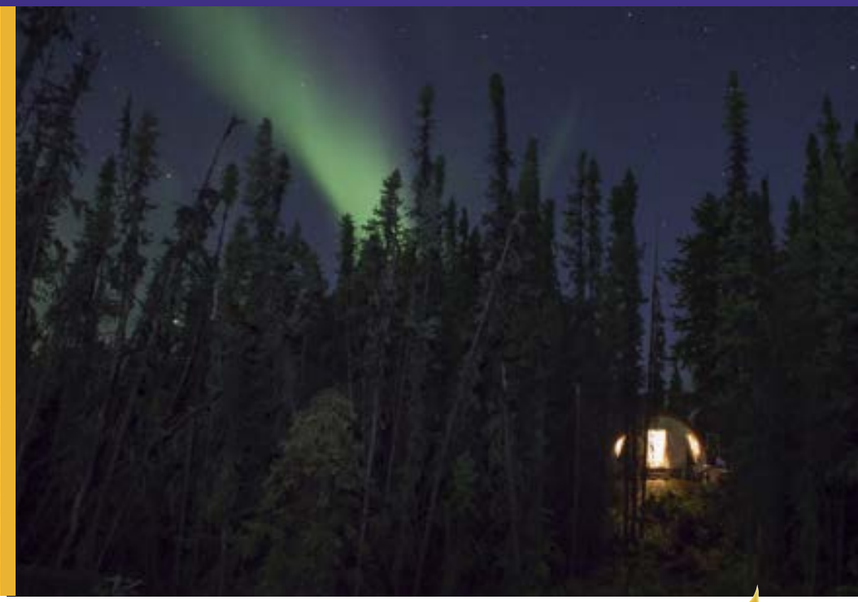
The Northwest Territories is experiencing unprecedented rates of climate change and industrial expansion. In response, SCRS researchers are working to

1. develop and mobilise new knowledge on the hydrological and ecological impacts of permafrost thaw
2. develop new modelling tools to predict the rates and patterns of permafrost thaw and its hydrological and ecological consequences
3. provide interactive training on these tools to end-users.

COLD REGIONS RESEARCH CENTRE

Scotty Creek Research Station





For more information on Scotty Creek, contact:

William Quinton, Associate Professor
& Co-Director, Cold Regions Research Centre
wquinton@scottycreek.com | 519.884.0710 x3281

75 University Avenue West, Waterloo, ON N2L 3C5

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MONITORING ENVIRONMENTAL CHANGE

The Scotty Creek Research Station is located in the Northwest Territories, Canada, approximately 50 km south of Fort Simpson. The station was founded in 1999 and operates each year between mid-March and early September. Scotty Creek drains a 152 km^2 area of high Boreal forest containing discontinuous, permafrost, and a high concentration of wetlands. Scotty Creek is situated in one of the most rapidly warming regions on Earth, and because its permafrost is relatively warm, thin and discontinuous, permafrost thaw is widespread and often leads to the transformation of forested permafrost terrains to permafrost-free, tree-less wetlands. There is an urgent need on the part of provincial, territorial and federal government agencies, NGOs, Aboriginal communities and industry to understand how this land-cover change affects their shared water resources and ecosystems now and in the future.

Researchers at Scotty Creek examine and monitor the impacts of warming on the environment. Activities include:

FOREST MONITORING

Scotty Creek contains the Smithsonian Institute's most northern forest monitoring plot. A forest inventory was completed in 2014 and will be repeated every 5 years to monitor the impact of climate warming on the forest ecosystem.

FOREST FIRE

Climate warming is known to increase the number of extreme events, including forest fires. There was a forest fire at Scotty Creek in June 2014. Since that time, we have monitored the impact of this fire on vegetation communities, ground temperatures, snow depth, snowmelt, and on the quality of the water draining from the burn into Scotty Creek.

GREENHOUSE GASES

Areas of muskeg such as Scotty Creek (and much of the southern NWT) contain vast amounts of carbon in the form of peat. It is not clear how this amount of carbon will interact with the atmosphere as the climate warms. To help answer this question, the flow of carbon dioxide and methane between muskeg and the atmosphere has been monitored at Scotty Creek since 2012.

PERMAFROST THAW

The rate and pattern of permafrost thaw is being monitored from historical aerial photographs and satellite images, and from measurements on the ground.

LANDCOVER AND ECOSYSTEM CHANGE

Permafrost thaw often causes the ground surface to subside and become flooded, causing a dramatic ecosystem change from forest to wetland. We are monitoring this change so we can better understand the impacts of warming and disturbance on ecosystems and water resources.

SEISMIC EXPLORATION

Seismic lines were introduced to Scotty Creek between 1969 and 1985. Our monitoring has found that the ground below the lines does not completely freeze during winter, and that the underlying permafrost has degraded. This allows seismic lines to conduct water below the ground throughout the year. We are monitoring the impact of this drainage process on the ecology and water resources of Scotty Creek.

STREAM FLOWS

We monitor stream flows at the outlets of Scotty as well as other gauged rivers in the region. We also work upstream in the headwaters so we can better understand how stream flow is generated. By removing permafrost barriers, permafrost thaw is allowing more of the land to drain into river systems. We believe that in recent years this has caused stream flows to rise in the lower Liard River valley.

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