K'ÉCHĮZHIAH
Ahsíı K'eats'enehta K'é

Scotty Creek Research Station:
A brief history and plans for its future

Scotty Creek (61º18' N; 121º18' W) is located 50 km south of Fort Simpson, the largest community in the Dehcho region of the Northwest Territories, Canada. Scotty Creek drains a 152 km^2 area dominated by boreal forest, wetland and discontinuous permafrost, a terrain type representative of much of the lower Liard River valley and surrounding region. In the 1990s, Scotty Creek was one of several river basins studied by the Mackenzie GEWEX (Global Energy and Water Exchange) Study (MAGS) which aimed to improve the understanding of and ability to predict the flow and storage of water within and from the major biophysical land cover types of the Mackenzie River basin. Most research at Scotty Creek during MAGS was conducted remotely (e.g. analysis of satellite imagery, hydrometric and climatic records), but in 1999, as MAGS was coming to an end, a small group of affiliated researchers decided to shift the emphasis of research at Scotty Creek toward field-intensive studies, and in that year, the first multi-year instrumentation was installed for long-term monitoring. A seasonal camp was then established in 2001, and in 2003 it was upgraded to an all-season camp. In 2007, this was replaced with a new camp at First Lake which remained in operation until 2012 when it was decommissioned and replaced by the present camp at Goose Lake, about 1 km to the south. By this time, the Scotty Creek Research Station (SCRS) as it came to be known, was one of the major research stations in Canada's north based on annual usage.

Located in the heart of one of the most rapidly warming regions on Earth, the SCRS is uniquely positioned for research, education and outreach/engagement opportunities focussed on the impacts of climate warming on northern environments and communities. Even over the relatively short period from 1999 until the installation of the station at Goose Lake, permafrost thaw had transformed large areas of the Scotty Creek watershed from forested permafrost terrains to permafrost-free, tree-less wetlands. For example, it was this permafrost thaw induced land cover change that forced the camp relocations of 2007 and 2012 (see Figure 1).

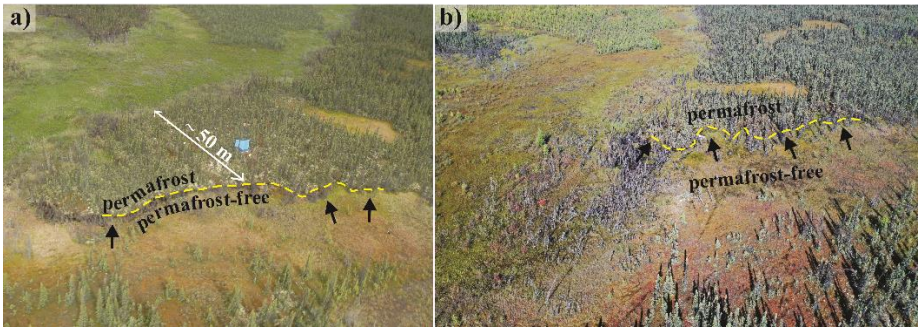

Figure 1: Arial photographs taken at Scotty Creek over the site of the initial camp ("Old Camp") on 14 June, 2003 (a) and 30 August, 2020 (b).

Land cover change has brought with it hydrological and ecological change, and as a result, researchers and educators from a wide spectrum of environmental disciplines have been drawn to the SCRS. Over the years, the station has accumulated state-of-art research infrastructure, and facilities that include several kilometres of boardwalk with signage, heated structures, reliable

and stable AC power, satellite internet, docks for floats planes and boats, vehicles, and other features required of a fully functioning and year-round station offering unique opportunities for high-quality research, training and education (see Figure 2). The SCRS is unique among such stations in that it has consistently hosted groups of researchers and students in every year since its inception in 1999.

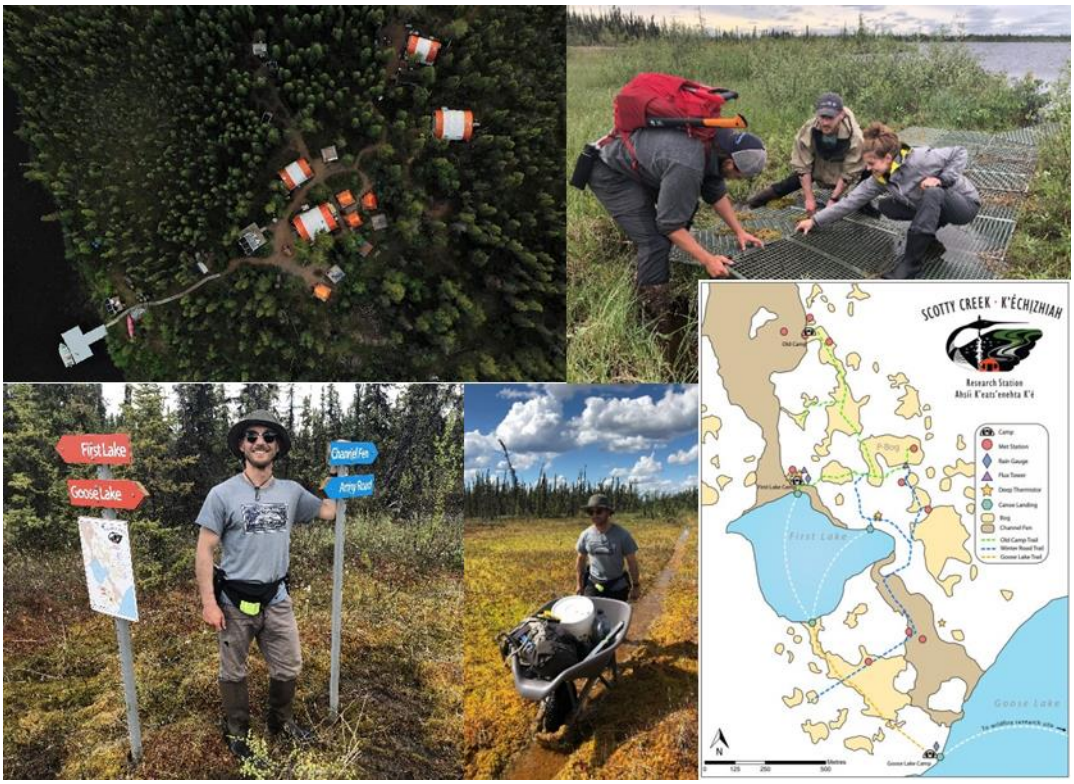

Figure 2: Aerial and ground-based images of the SCRS including sections of the georunner trails, as well as map showing the colour-coded network of trails and locations of infrastructure near the station.

Convergence with Indigenous Community Needs

The steady growth of knowledge on permafrost thaw processes and impacts at the SCRS coincided with the growing need of Indigenous communities throughout the Dehcho to understand how permafrost thaw will change the land and water over the coming decades. As a result, there was a natural convergence of knowledge producers (SCRS) and knowledge users (local and regional Indigenous communities). The new knowledge developing at the SCRS on permafrost thaw rates, controls, patterns, processes and impacts was seen as potentially fundamental to the development of new knowledge-based, community-informed strategies for permafrost thaw monitoring, adaptation, process understanding, and prediction. However, community leaders recognised that this new knowledge would be far more impactful if it was co-developed and co-applied. This led to a deliberate change in practise of SCRS researchers whereby research questions were increasingly co-developed, research grant applications were co-proposed with Indigenous community members, and research teams included both university-

based and Indigenous community-based members (see Figure 3). The overall objective of this new approach was to fuse Indigenous and scientific knowledges to better address the unprecedented challenges of climate warming.

Figure 3: Photographs showing community engagement activities in local communities as well as at the SCRS. The meetings focussed on codeveloping research questions and co-application of research outcomes.

Experiential Learning

A key element of the growing collaboration between the SCRS and Dehcho communities focuses on experiential learning opportunities for youth. In 2017, the SCRS and the Dehcho First Nations (DFN) piloted a one-week field course at Scotty Creek on permafrost and related topics customised for the Dehcho. This course has been offered each year since 2017 and includes a mixture of 8 to 10 Dehcho high school students (Gr. 10-12) and an equal number of undergraduates and graduate university students. The field courses provide Dehcho students with unique on-the-land experiential learning opportunities and a voice in creating new knowledge alongside researchers, university students, Elders and other community members. This approach places Indigenous community youth at the forefront of scientific research on subjects of importance to their communities. As a culminating task, the Dehcho students present their work to their high school peers, and to community members and researchers at one of the regular co-

hosted (SCRS-DFN) community workshops where research results are presented and discussed. The new friendships and respect that quickly developed between the university students (predominantly from urban, southern Canada) and the Dehcho high school students, has been one of the most rewarding outcomes of this initiative.

Figure 4: A mosaic of images showing both in-door and outdoor experiential learning activities of field courses and on-the-land camps at the Scotty Creek Research Station.

The annual field course described above serves as a model for other knowledge mobilisation initiatives. For example, the SCRS and DFN have also developed new on-the-land courses targeted for community members training to be Dehcho Guardians, with each course contributing to their certification. This includes specific courses that provide training on the use of new research tools and methods for application on the land (*e.g.* use of aerial drones for data acquisition) and in the office/laboratory (*e.g.* application of image analysis software). Guardians also partake in the field courses described and shown above which provides them with mentoring opportunities. Aside from the direct benefit to the trainees, these experiential learning initiatives also facilitate the transfer of knowledge to the larger communities by placing trainees into leading roles as trainers in their communities. This "*train-the-trainers*" approach helps generate an enduring pool of permafrost expertise, and ensures that the knowledge and predictive capacity produced is integrated into Dehcho community workplaces and applied by decision makers. Over the long term, this approach aims to support the implementation of the Dehcho's management plans and policies by providing a resource of trained-in-the-Dehcho expertise.

Indigenous-led Research Park

Since 1999, the SCRS has served the Dehcho as an "*outdoor classroom/laboratory*" for the observation and study of warming-induced change for a land cover type that dominates much of the Dehcho. Presently, the SCRS is in the process of transforming into an Indigenous-led "*Research Park*", a flagship for scientific-Indigenous collaboration in Canada's North. The new park will be a locus for inclusion of Indigenous Canadians in research, empowering Indigenous youth (students/Guardians) through education/training initiatives, and facilitating engagement between Indigenous community members and researchers/students through respectful sharing of knowledge and experiences. As such, the research park initiative will help to build positive and enduring collaborations between Indigenous and non-Indigenous Canadians. The new park will be led by a consortium of Dehcho Indigenous communities in partnership with other entities (*e.g.* universities, government agencies) of their choosing and will remain a state-of-the-art, inter-disciplinary scientific observatory. This process has been supported by the Dehcho Guardians who have taken on leadership positions in key areas of SCRS operations, and by the Łíídlıı Kųę́ First Nation (the DFN member nation on whose land the SCRS resides) who introduced a new licensing system for the SCRS (http://www.scottycreek.com/site/info?p=LKFNResearchLicense) and who, in collaboration with researchers, are developing a new research compendium and comprehensive public data archive. The Park will also serve as a centre of community engagement for researchers and community members to come together as "*partners in learning*" to exchange experiences and ideas, to co-develop new knowledge, and to nurture the next generation of collaborations between western scientists and Indigenous knowledge holders. Co-development of new knowledge is empowering to communities and solidifies researcher-community collaboration and is consistent with the desire of communities for co-development and co-application of knowledge.

Figure 5: Dehcho Guardians operating at the Scotty Creek Research Station.

Making the SCRS a place for researcher-community collaboration brings community decision makers closer into the process of generating new knowledge and knowledge-based predictive tools and provides them with a deeper understanding of their meaning, application and limitations. This will increase community inclusion and the likelihood that management and policy decisions will be well-informed and confidently applied, while reducing the levels of uncertainty and risk. Dehcho community participation and leadership at the SCRS is an investment in the Dehcho's knowledge economy, which ultimately benefits the NWT and Canada. This collaborative approach also helps to advance the goals of international environmental organisations and initiatives in regards to sustainable development (UNSDG, UNESCO), sustainable land use (IUCN), and Indigenous rights to their lands and resources (UNDRIP).

More information on the Scotty Creek Research Station can be found at:

- **Scotty Creek website**: http://www.scottycreek.com/
- **Dehcho Collaborative on Permafrost (DCoP) website**: http://scottycreek.com/DCoP/
- **Short film Scotty Creek**: https://www.youtube.com/watch?v=Niy7R0sXeZg&t=10s
- **Scotty Creek Twitter**: @ScottyResearch

For additional information, please contact:

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