– Hydrosecurity of the Yukon River Watershed –
A collaborative research project with Yukon Energy Corporation

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The Northern Climate ExChange partnered with Yukon Energy Corporation in order to improve hydrometeorologic monitoring and advance research in the headwaters of the Yukon River. The overarching goal is to learn more about glacier contributions to river flow, and potential climate change impacts on the timing and volume of flow in the upper Yukon River Basin. Objectives have been achieved through a coordinated multidisciplinary field and modelling program. Funding has been provided by NSERC and Yukon Energy Corporation as part of an Applied Research and Development project.

Securing Energy Supply

Yukon Energy Corporation produces power using hydroelectric generators at three locations. The largest dam, on the Yukon River, is located in a basin with limited observational data and a complex morphology that includes mountainous topography, glaciers, large lakes and permafrost.

Yukon Energy is seeking improved monitoring and an enhanced ability to model future flows.

Improving Monitoring

Automated weather stations have been deployed in five locations to record a basic suite of meteorologic variables in addition to snow depth, snow water equivalent, and radiation. Spring snow surveys and synoptic water sampling for stable isotope analysis help constrain the results.

Combined, the data are providing new insight in fundamental spatial and temporal patterns of water distribution.

Glacial Contributions

Ice-penetrating radar and ablation wires on the Llewellyn Glacier have been used to help quantify the basal geometry and to directly measure dynamics and mass balance of the glacier.

When combined with climate projections in the Cold Regions Hydrologic Model, these data will help determine future contributions of glacial ice to river flow in Whitehorse.

Placing the present in context

Dating of subfossil wood found in with lateral and end moraines indicates that Llewellyn Glacier has fluctuated several times over the past two millennia. The north lobe advanced between AD 260 and AD 505, and reached to within 70 m of its Little Ice Age maximum extent as early as the 17th century. The main lobe advanced into its forefield as early as AD 1035.

Findings to date:

- Ice thickness currently exceeds 450m.
- Negative mass balance is changing glacier geometry.
- Glacier wastage contributes to flow, particularly in fall, but this contribution will decrease in decades to come.
- Yukon Energy Corporation will receive plain-language reports and practical training in a series of workshops.

"Water is a precious resource and key to helping us keep the lights on. This research is critical to Yukon Energy in terms of allowing us to plan for climate change and the implications for future hydro power generation."

Andrew Hall, President
Yukon Energy Corporation

FIND OUT MORE...

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