

**Deployment of environmental instrumentation in Greiner Lake
watershed, Cambridge Bay, Victoria Island
(NRI Licence #: 04 015 18R-M; NIRB File No: 15YN032)**

Annual Report for 2018

Donald McLennan
Senior Program Officer, Monitoring Science
Polar Knowledge Canada (POLAR)
170 Laurier Avenue West, 2nd floor, suite 200,
Ottawa, ON K1P 5V5
Email: donald.mclennan@polar.gc.ca
Phone: 613-295-6135

Johann Wagner
Science Officer
Polar Knowledge Canada (POLAR)
CHARS Campus
1 Uvajuq Road
PO Box 2150
Cambridge Bay, NU X0B 0C0
Email: johann.wagner@polar.gc.ca
Phone: 613-295-8424

Ian Hogg, POLAR, ian.hogg@polar.gc.ca

Alexandre Langlois, Université de Sherbrooke, Alexandre.Langlois2@USherbrooke.ca

Daniel Kramer, Université de Sherbrooke, Daniel.Kramer@USherbrooke.ca

In 2018, the following activities related to scientific field instrumentation were performed:

- An additional sensor was installed on the Université de Sherbrooke weather station near Fourth Lake, and maintenance work was performed on this station in April 2018.
- The POLAR weather station on the northern shore of Cambridge Bay was restarted in May 2018, by replacing all the cables with armoured ones and reinstalling most of the sensors on it.
- An attempt was made in July 2018 to start the upland eddy covariance tower, by fixing, replacing and armouring the damaged cables. Logistical difficulties with installing the solar panel arrays for the eddy covariance system, however, precluded finishing the deployment process, an activity which will be continued in 2019

The ADAPT permafrost station was still not functional in 2018. The deployment of the wetland eddy covariance tower was not continued in 2018. The sensors of the two river gauging stations were not deployed anymore, and the stations were not brought online in 2018. Similarly, the deployment of the automated soil gas flux chamber system was not attempted (Figure 1).

Université de Sherbrooke weather station

The Université de Sherbrooke group conducted snow research in the vicinity of the station (licence # 04 010 15R-M) in order to analyze the impact of weather on snow conditions. The work was conducted in April 2018 with the installation of a disdrometer that measures precipitation phase and rate (Figure 2). The data has been linked and archived to our website and available to the public at <https://grimp.ca/>. The data from the station also allowed a good model parameterization for snow simulations that can now account for wind slab formation. At the same time the station was maintained, and minor cable damage due to arctic foxes (Figure 3) was repaired.

In October 2018 the Université de Sherbrooke weather station stopped transmitting remotely due to a faulty Iridium satellite modem. An unsuccessful attempt of fixing the issue was attempted. The modem will be replaced in 2019. In the meantime, the data collection on the station continued.

POLAR weather station

In May 2018, all the cables damaged by arctic foxes in the previous years have been replaced with cables encased in metallic conduits, obtained from Campbell Scientific. The remaining undamaged cables were placed in metallic armour that has been sealed at both ends with duct seal, with additional drainage holes drilled in the metallic conduit (Figure 4). Most of the sensors have been reinstalled on the station, and the station has been started up (Figure 5). The snow depth sensor was not installed, one of the temperature sensors proved to be faulty, and the two digital cameras installed on the station are not transmitting images. The rest of the sensors of the station are operating normally, and Campbell Scientific is able to access remotely the station every day for data download and maintenance.

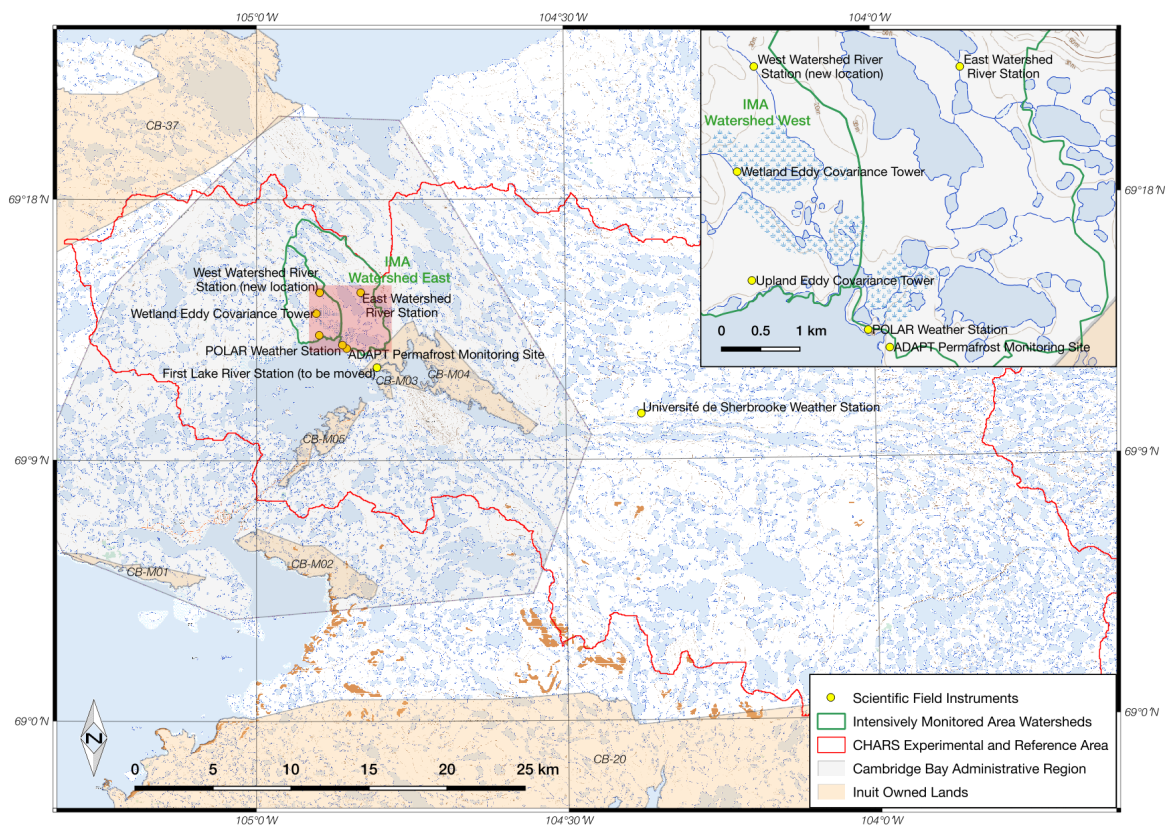


Figure 1. Scientific Field Instruments in the CHARS ERA and IMA



Figure 2. Disdrometer (background centre) and its solar panel array (foreground) installed in April 2018 as part of the Université de Sherbrooke weather station (background left).



Figure 3. Cable damage caused by arctic foxes on the Université de Sherbrook weather station in April 2018



Figure 4. Armoured cables on the POLAR weather station in May 2018

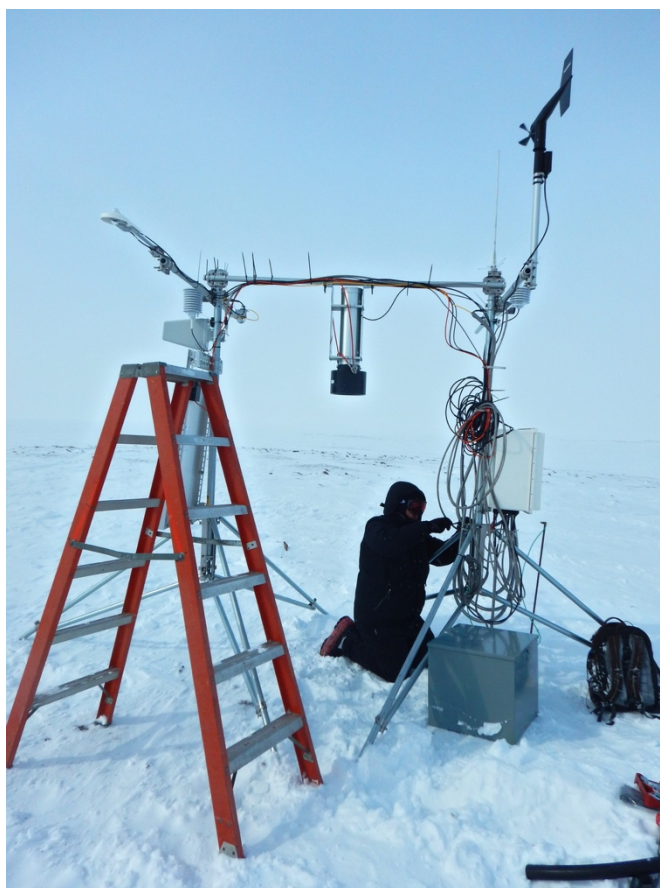


Figure 5. The POLAR weather station in May 2018

Plans for 2019

The following installation and maintenance activities are proposed for the field season 2019:

- In March 2019, the Université de Sherbrook group will visit their station and replace the faulty modem. In April-May the station will be revisited for further snow measurements. Snow transects near the station will be conducted and snow measurements will be performed with microwave instruments. This will allow the development of remote sensing methods to retrieve snow depth values from space.
- Maintenance will be performed on the POLAR weather station starting May 2019. The remaining issues with the faulty and unresponsive sensors and cameras will be fixed. An attempt will be made for redeploying the soil TDR and heat flux sensors, which have been not operational since 2016 due to massive arctic fox damage.
- Redeployment of the sensor of the east watershed river gauging station, and bringing this station online shortly after ice melt. The sensor cables have been armoured by Campbell Scientific, in order to avoid the severe cable damage that occurred at other instrument systems in the IMA.
- Moving the First Lake river gauging station from its present location to the new site proposed in 2017, in the west watershed (69.203492, -104.805418), along a small stream similar the one in the east watershed (Figure 1). This work will be performed as early as possible after ice melt. The cables of this river gauging station too will be replaced with armoured ones.
- Continuation of the work on the upland eddy covariance tower. The solar panel array for this station will be installed, and the damaged cables will be fixed and replaced. An attempt will be made to make this eddy covariance tower fully functional.
- Continuation of the installation of the wetland eddy covariance tower after protecting all its cables by metallic armour, in order to avoid the extensive damage that occurred at the upland eddy covariance tower. Making this eddy covariance tower fully functional.
- Repairing the damage of the ADAPT permafrost monitoring station, and continuing operating it.
- Installation and operation of the automated soil CO₂ chamber system in the IMA.