



### Environmental Challenge

Issues with year-round, continuous monitoring of the hydro-ecology of Arctic freshwater lake systems:

- ▶ Remote Locations create logistical problems
  - Difficulty visiting sites frequently
  - High operational costs
  - Occupational health and safety considerations
  - Extreme weather conditions



### The AXYS Solution

In cooperation with Environment Canada/Water & Climate Impacts Research Centre located at the Department of Geography, University of Victoria, AXYS designed and built a fully-automated Ice Buoy and Subsurface Smart Mooring System for continuous unattended year-round monitoring of:

- Meteorological Conditions
- Lake Ice Cover (Fall initiation, Winter growth, Spring breakup)
- Light Penetration into the Lake (through ice in Winter)
- Lake Water Quality (chemistry, temperature, oxygen levels)

#### Ice Buoy

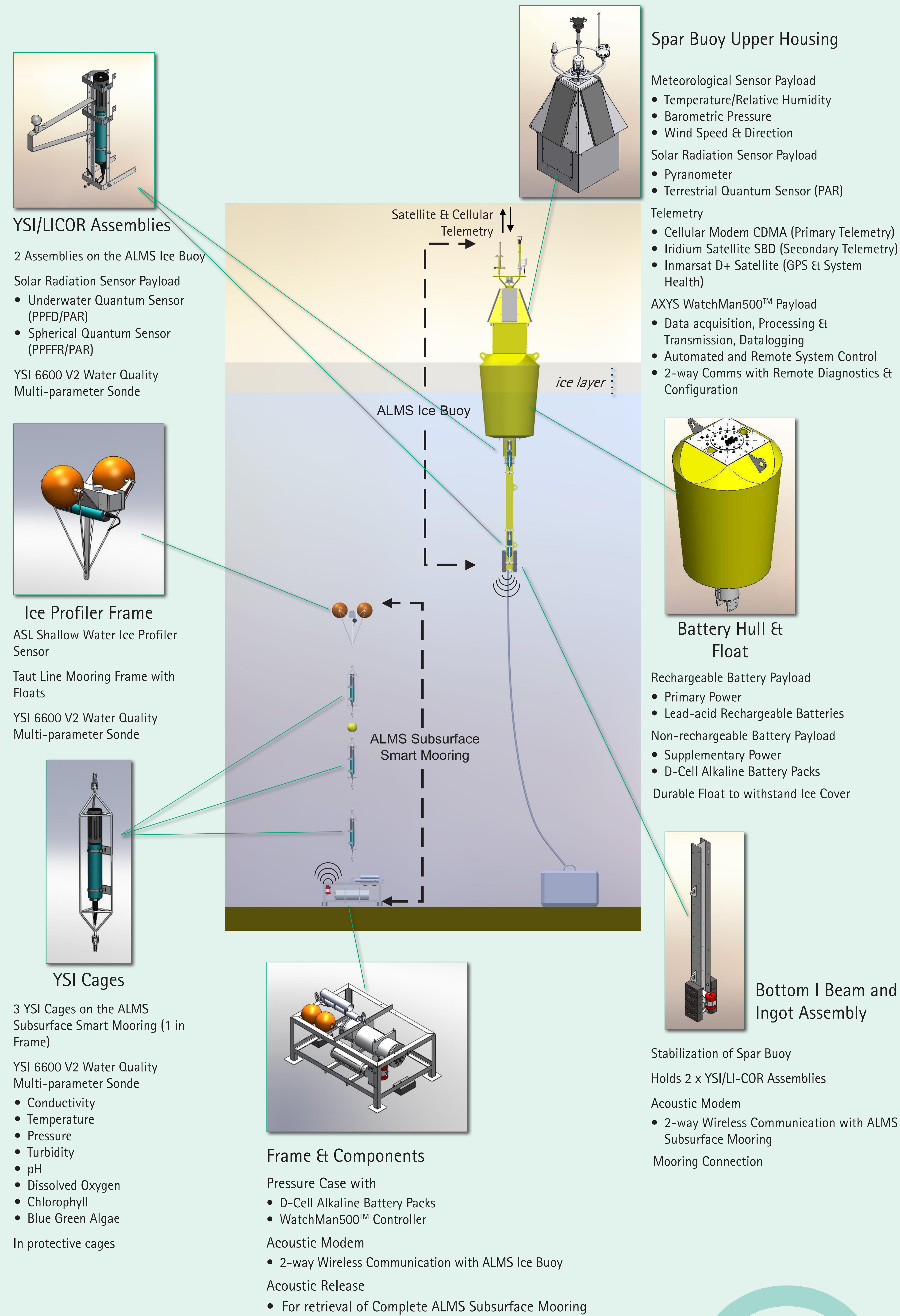
- ▶ Measures weather conditions, incoming solar radiation & light penetration, as well as water quality in the lake at multiple depths
- ▶ Complements and relays information deeper in the lake from the subsurface mooring

#### Subsurface Smart Mooring

- ▶ Measures water quality at multiple depths
- ▶ Ice Profiler Sensor measures the development, growth and decay of the lake ice cover
- ▶ Collected data is transmitted to Ice Buoy via acoustic modem

## Arctic Lake Monitoring System Development

### System Design: Sensors & Components



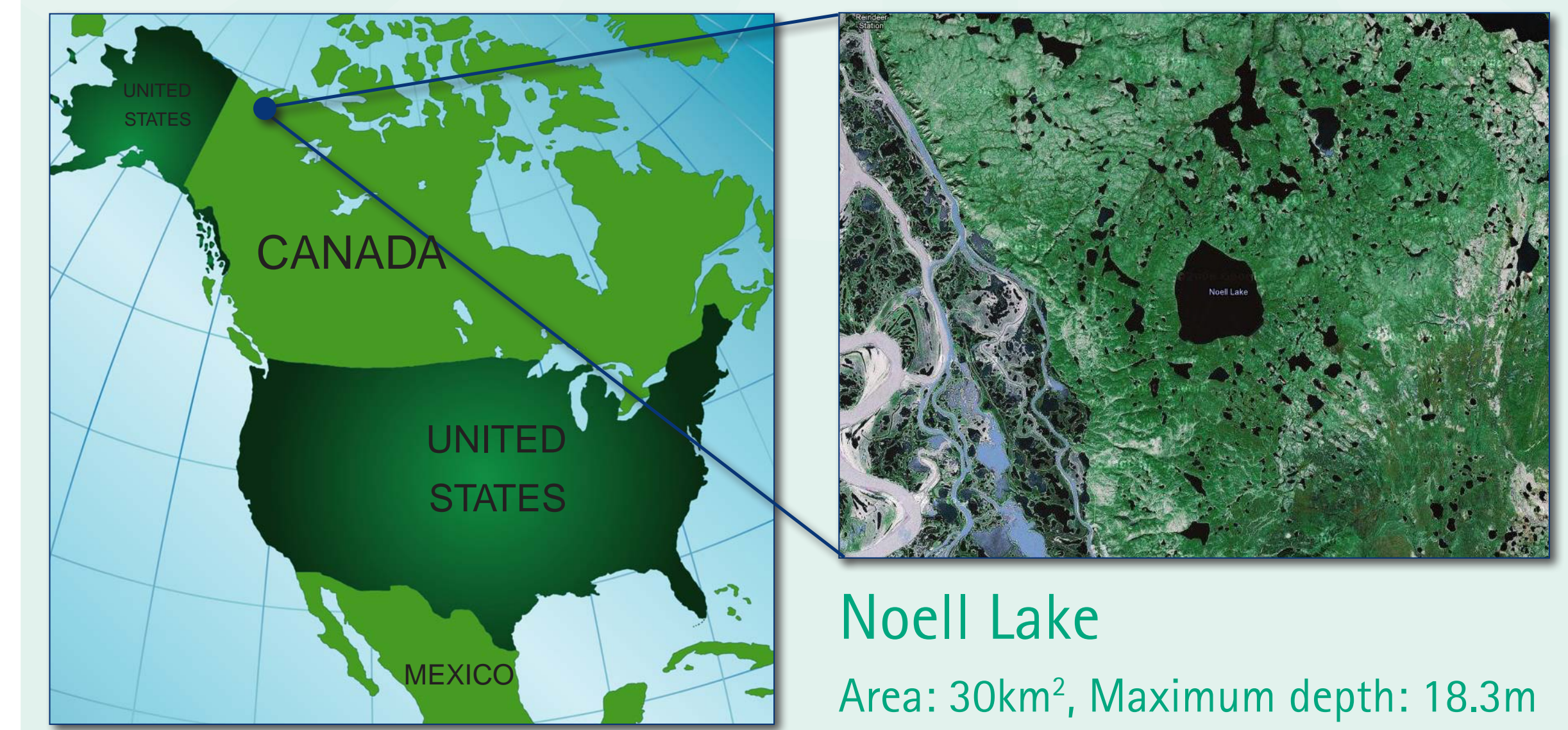
For more information visit [www.axystechnologies.com](http://www.axystechnologies.com)



**Arctic Lake Monitoring System**



### The Arctic Lake Deployment



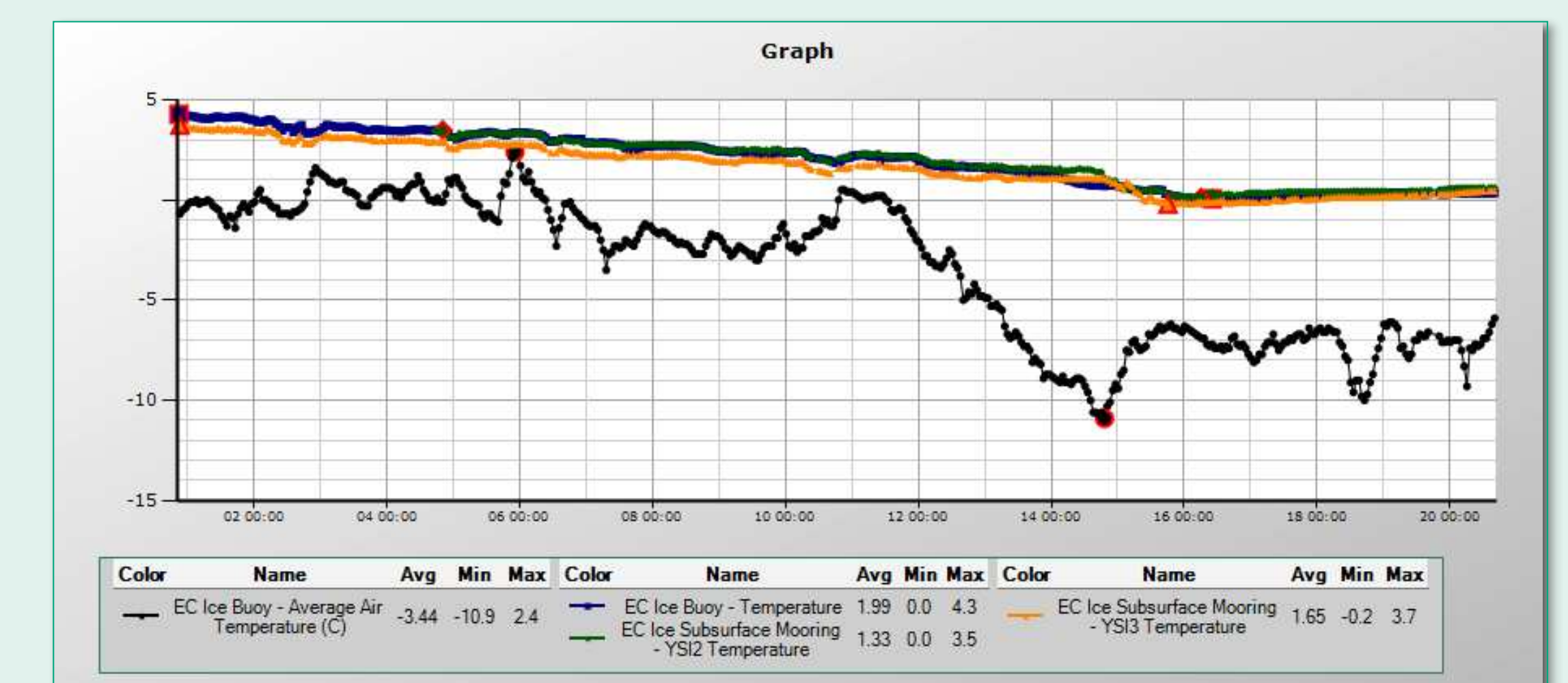
**Noell Lake**  
Area: 30km<sup>2</sup>, Maximum depth: 18.3m

ALMS deployed by helicopter in Noell Lake, Inuvik in September 2010



#### Data Management

Full data sets from the ice buoy & subsurface mooring system are transmitted in near real-time to a base station located at the Water & Climate Impacts Research Centre via Cellular or Satellite telemetry.



24-hour Air and Water Temperature data set that graphically illustrates the Noell Lake freeze-over.

#### ALMS Data -> Arctic Lake Ecosystem Research

ALMS time-series data provides a temporal understanding of Arctic lake ecosystems and assists in the development of hydro-ecological models for cold regions freshwater systems lakes in the following research areas:

- Landscape Hydrology and Geochemistry
- Lake-Ice Modeling
- Aquatic Productivity and Carbon Dynamics

These models will be used to assess the vulnerability of Arctic lake ecosystems to disturbance, such as climate variability/change and those related to Canada's northern regions.



The AXYS Team with the Ice Buoy: (from left to right) George Puritch, Chris Ng, Tony Ethier