SNOW MONITORING IN NEWFOUNDLAND & LABRADOR

GlobSnow – First User Workshop

January 12-13, 2010

Amir Ali Khan Ph.D. & Keith Abbott

Government of Newfoundland & Labrador
Department of Environment & Conservation
Water Resources Management Division
Hydrologic Modelling Section
www.env.gov.nl.ca

Newfoundland Labrador

Overview

- Who We Are
- Why Monitor Snow?
- Product Review
- Path Forward

Newfoundland Labrador

WHO WE ARE

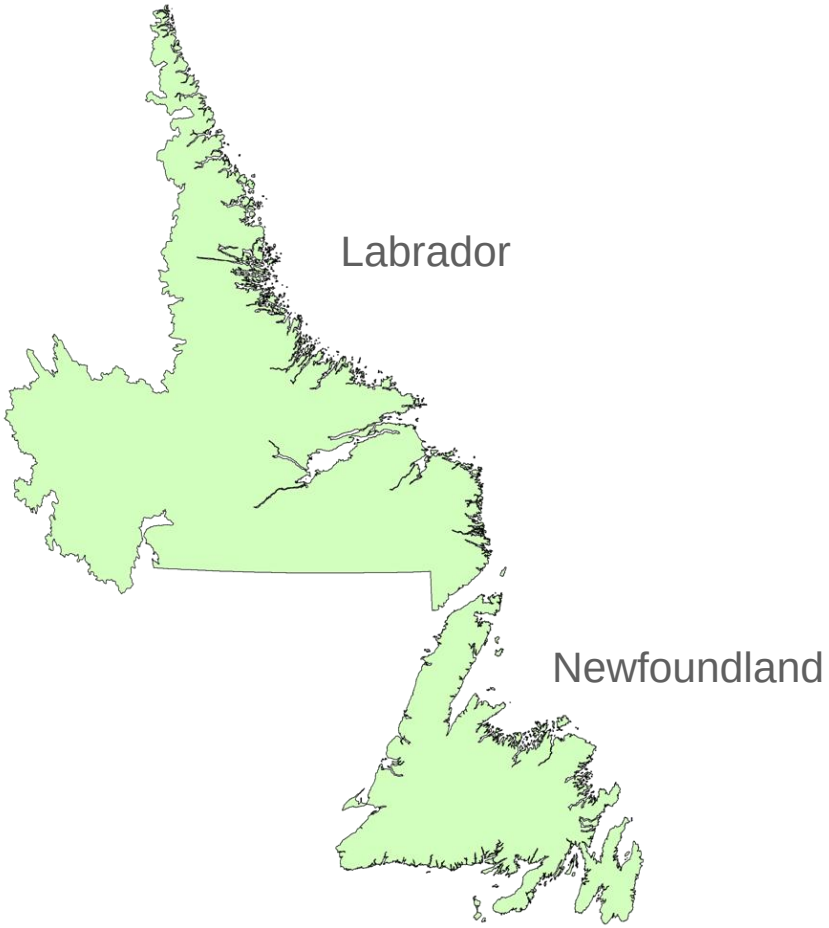
Newfoundland Labrador

Newfoundland & Labrador

Newfoundland Labrador

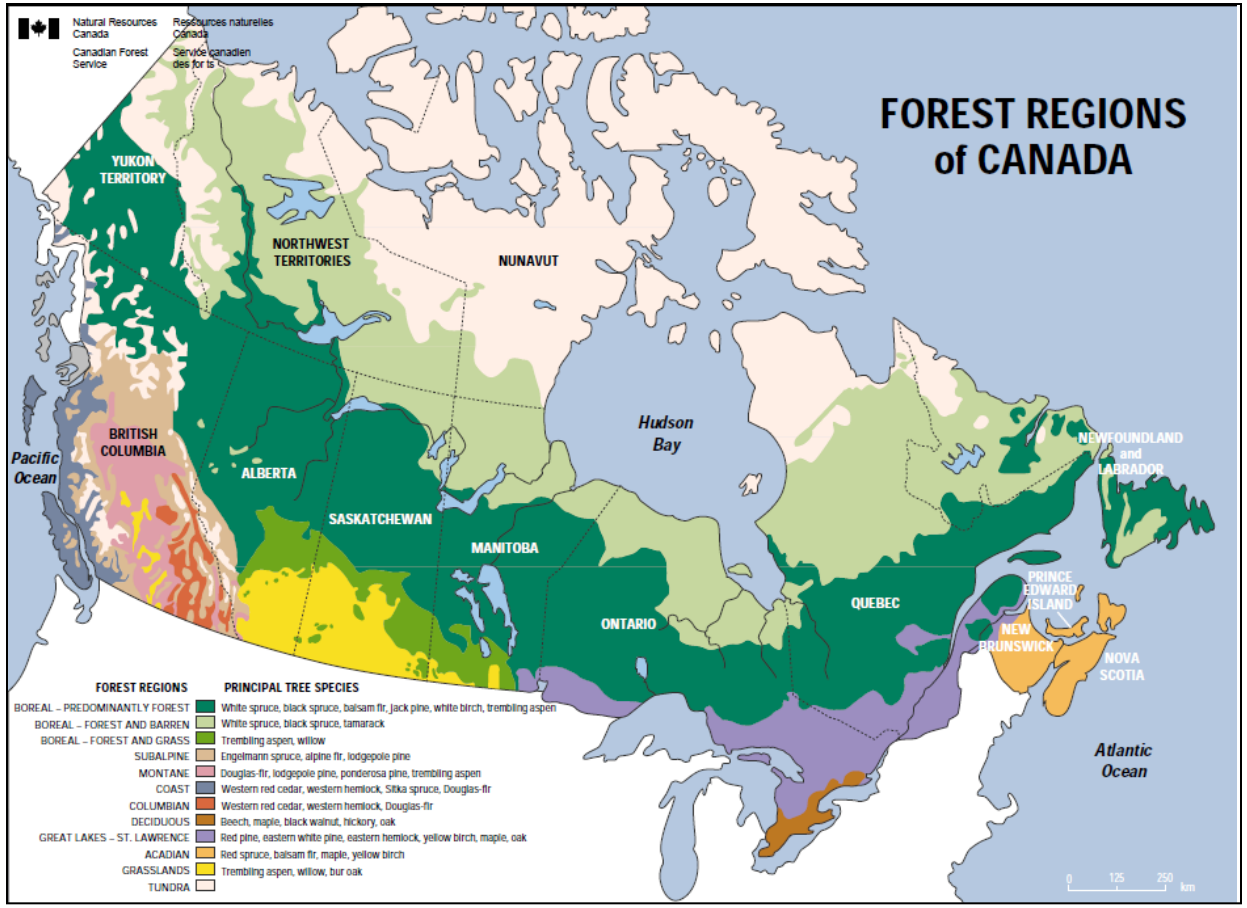
Newfoundland & Labrador

- Land mass 405,720 km^2
  - Newfoundland 111,390 km^2
  - Labrador 294,330 km^2
- ~ 1.2 times the size of Finland.
- ~ 1.8 times the size of Great Britain.



Newfoundland Labrador

Newfoundland & Labrador



- Boreal forest & barren
- Boreal forest
- Tundra

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WHY MONITOR SNOW?

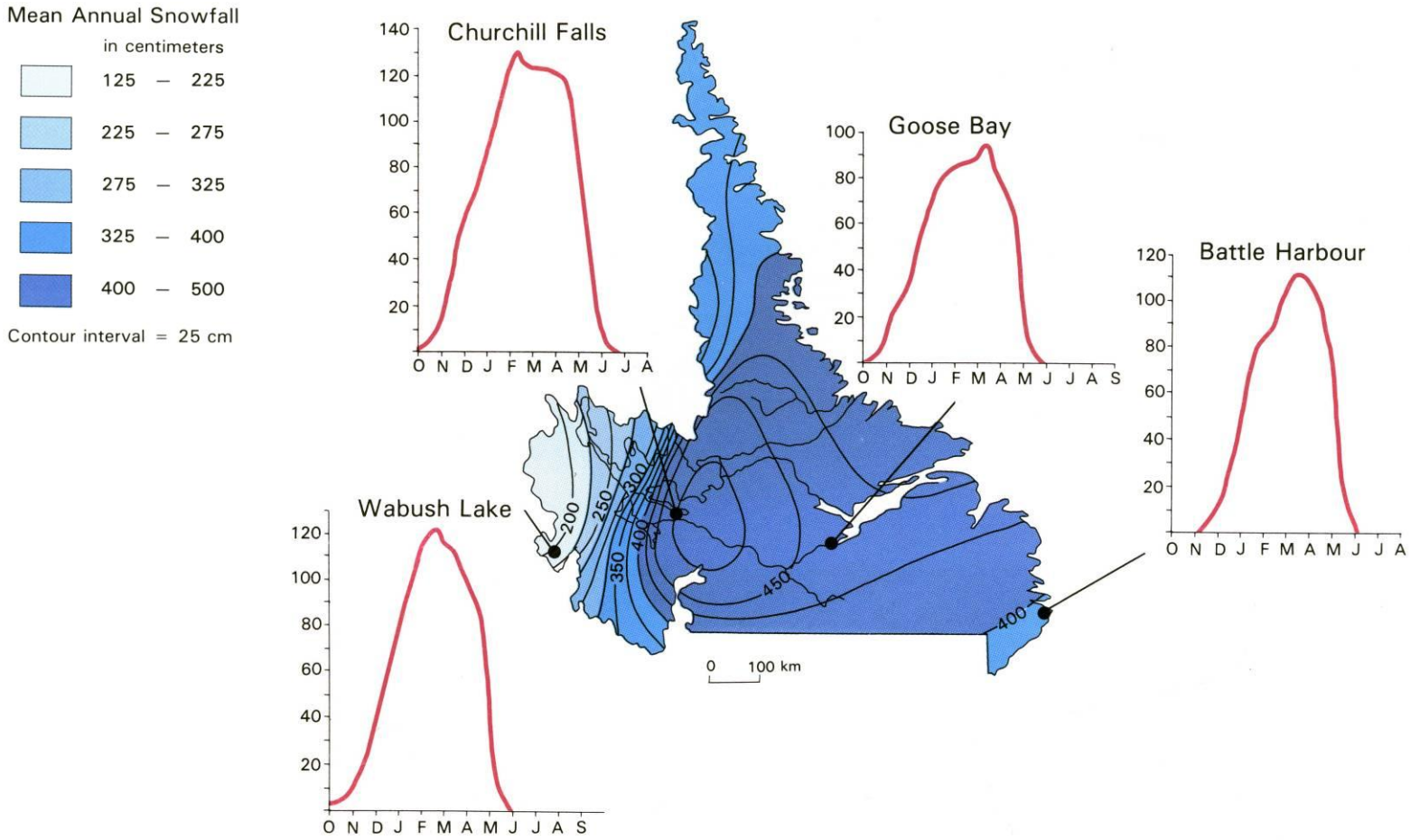
Newfoundland Labrador

Snowfall Amounts

Trans-Labrador Highway (2003)

Newfoundland Labrador

Snowfall Amounts



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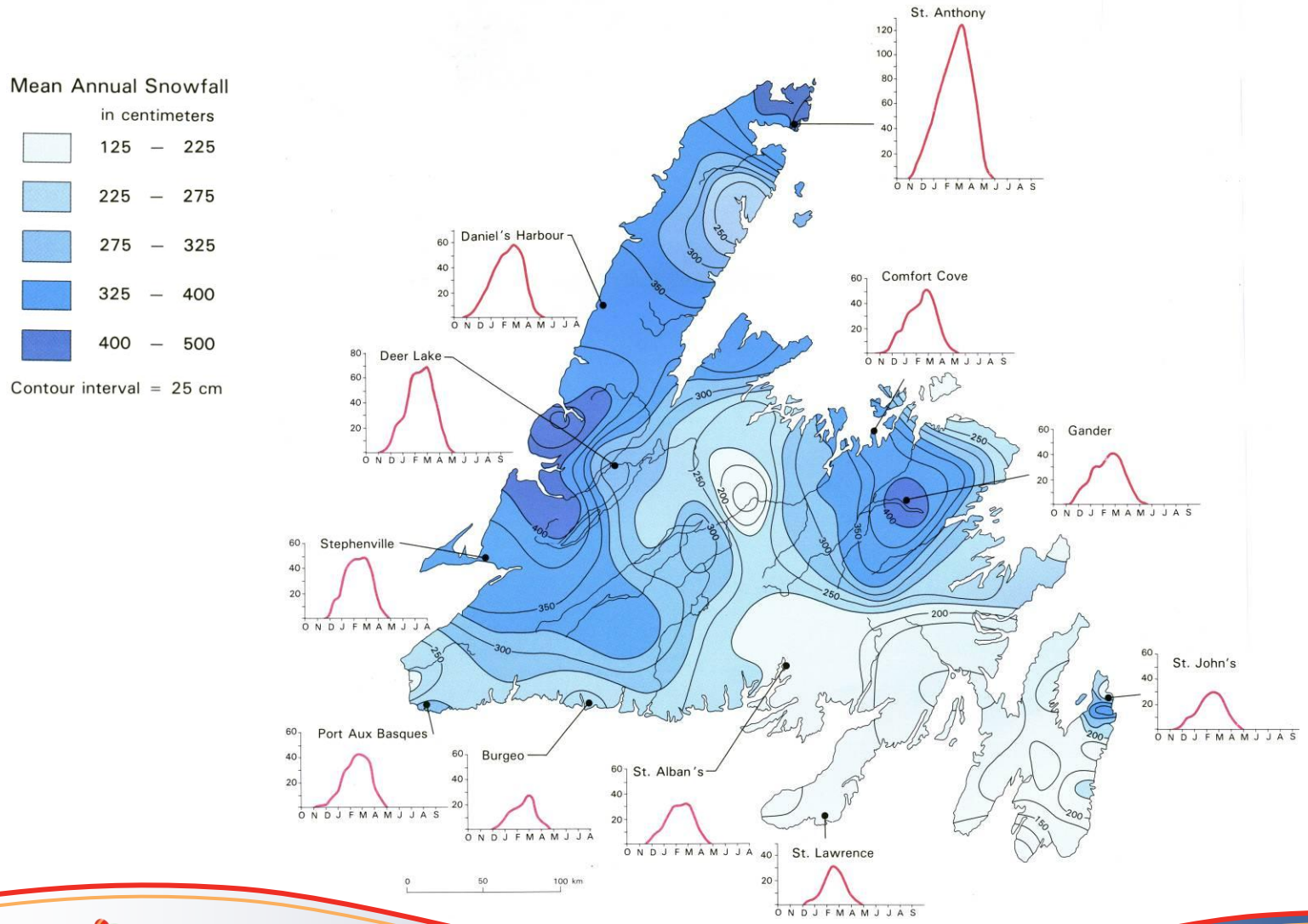
Snowfall Amounts



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Climate Change Adaptation

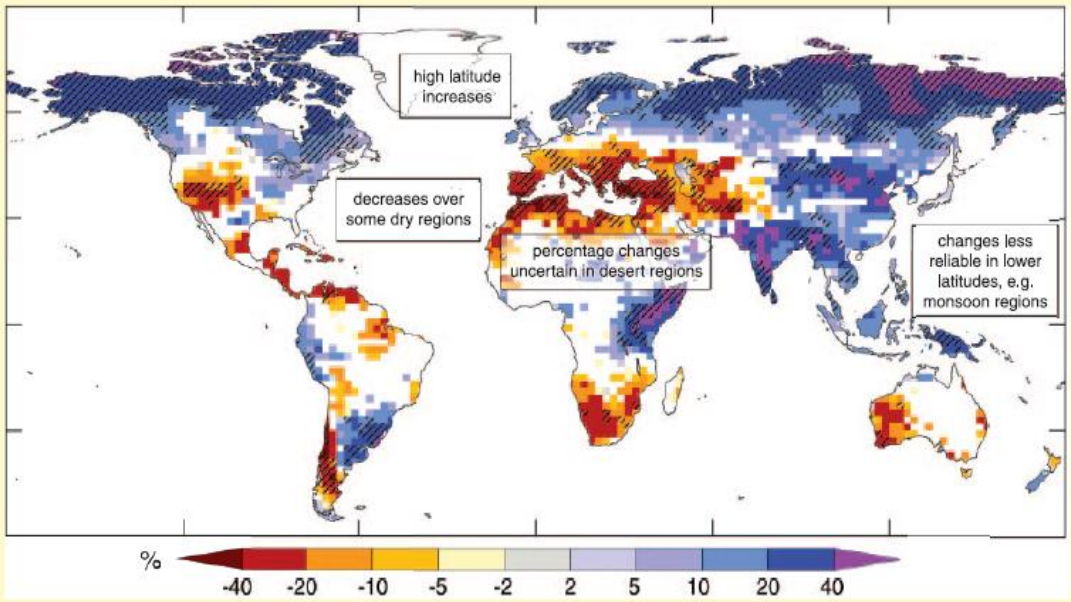

Figure 3.5. Large-scale relative changes in annual runoff (water availability, in percent) for the period 2090-2099, relative to 1980-1999. Values represent the median of 12 climate models using the SRES A1B scenario. White areas are where less than 66% of the 12 models agree on the sign of change and hatched areas are where more than 90% of models agree on the sign of change. The quality of the simulation of the observed large-scale 20th century runoff is used as a basis for selecting the 12 models from the multi-model ensemble. The global map of annual runoff illustrates a large scale and is not intended to refer to smaller temporal and spatial scales. In areas where rainfall and runoff is very low (e.g. desert areas), small changes in runoff can lead to large percentage changes. In some regions, the sign of projected changes in runoff differs from recently observed trends. In some areas with projected increases in runoff, different seasonal effects are expected, such as increased wet season runoff and decreased dry season runoff. Studies using results from few climate models can be considerably different from the results presented here. {WGII Figure 3.4, adjusted to match the assumptions of Figure SYR 3.3; WGII 3.3.1, 3.4.1, 3.5.1}

Taken from Synthesis Report, IPCC Fourth Assessment Report April 2007

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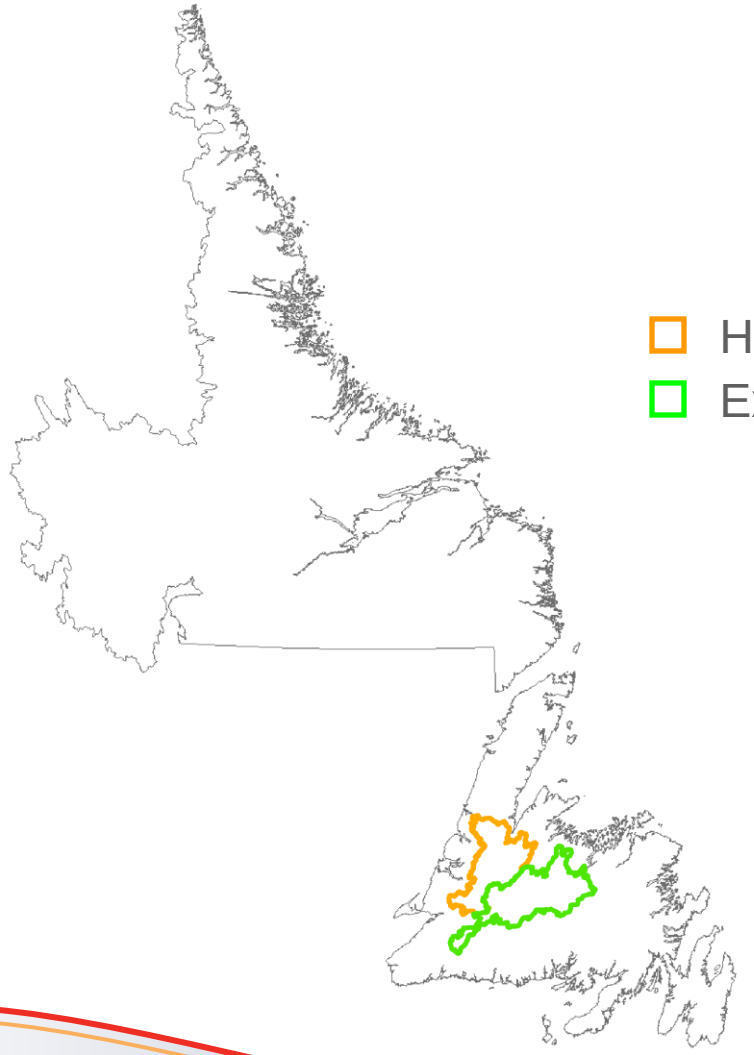
Flood Forecasting



- Humber River Watershed
- Exploits River Watershed

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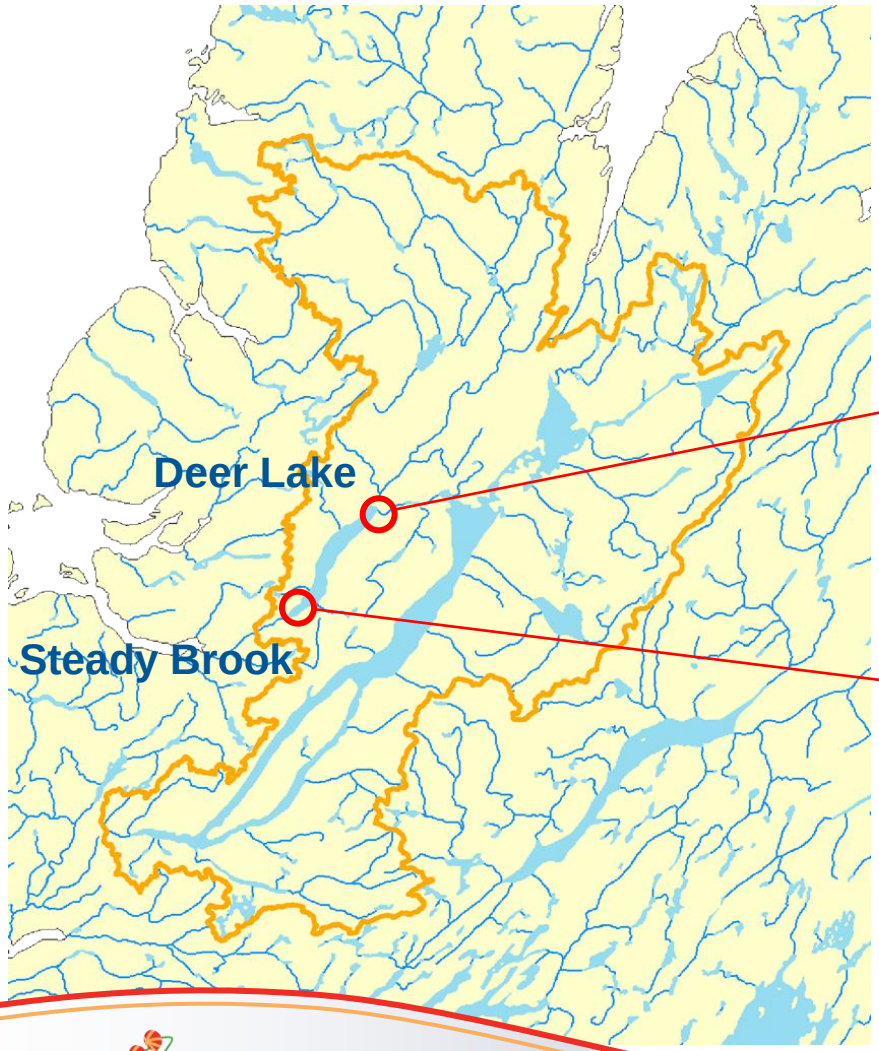
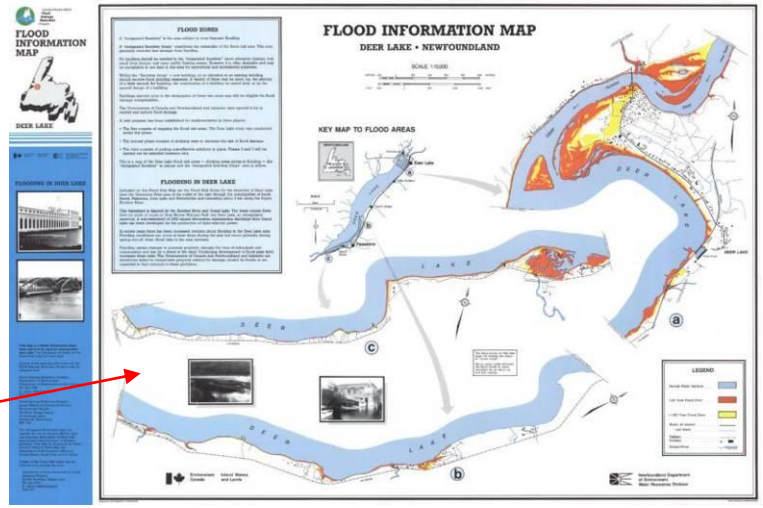
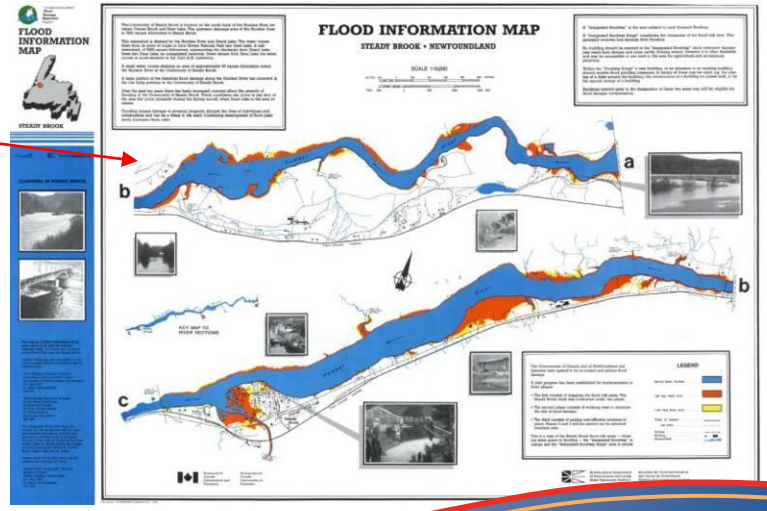
Flood Forecasting







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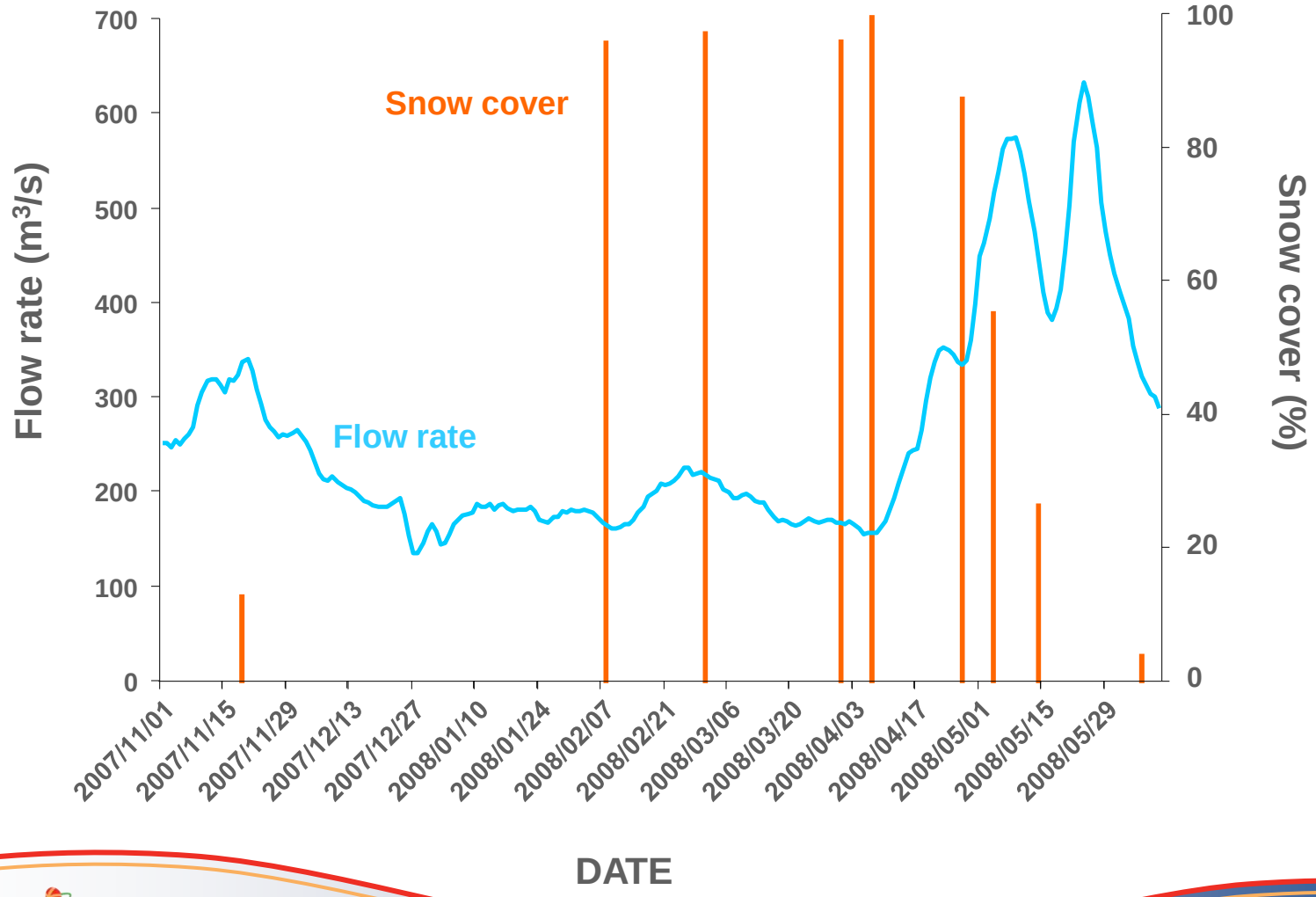
Flood Forecasting



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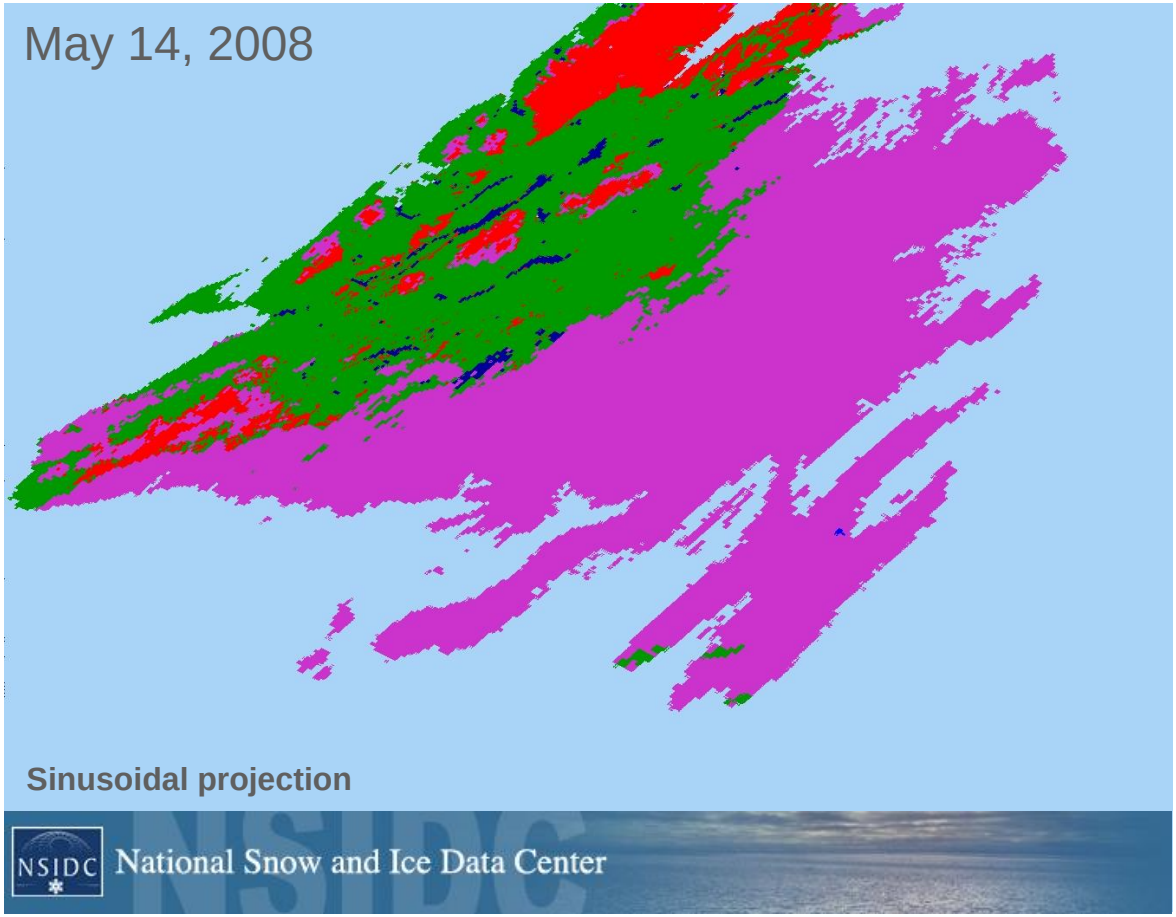
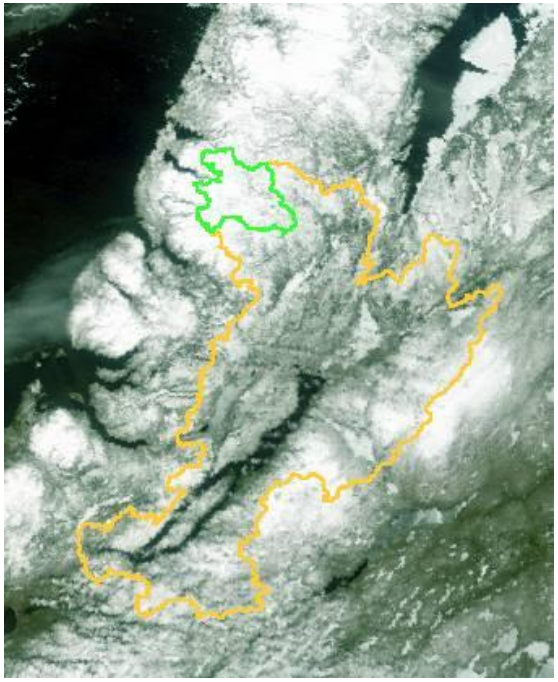
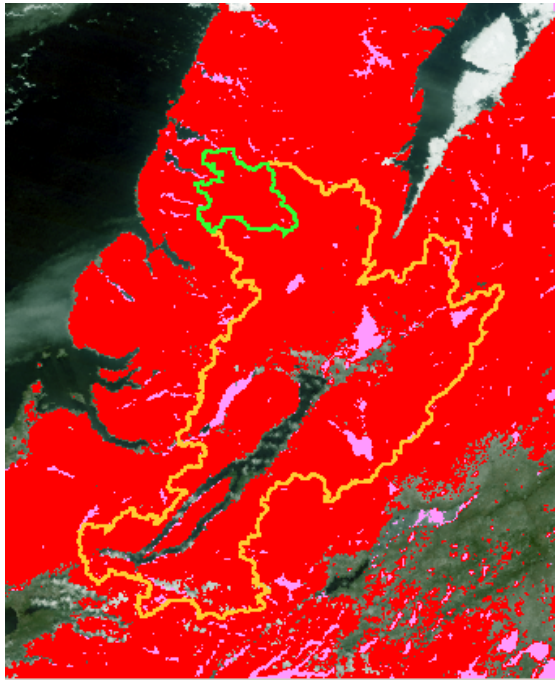
NSIDC – Snow Extent



- No Snow (DN = 25)
- Lake (DN = 37)
- Ocean (DN = 39)
- Cloud (DN = 50)
- Lake ice (DN = 100)
- Snow (DN = 200)

WRMD – Snow Extent





Upper Humber River Watershed

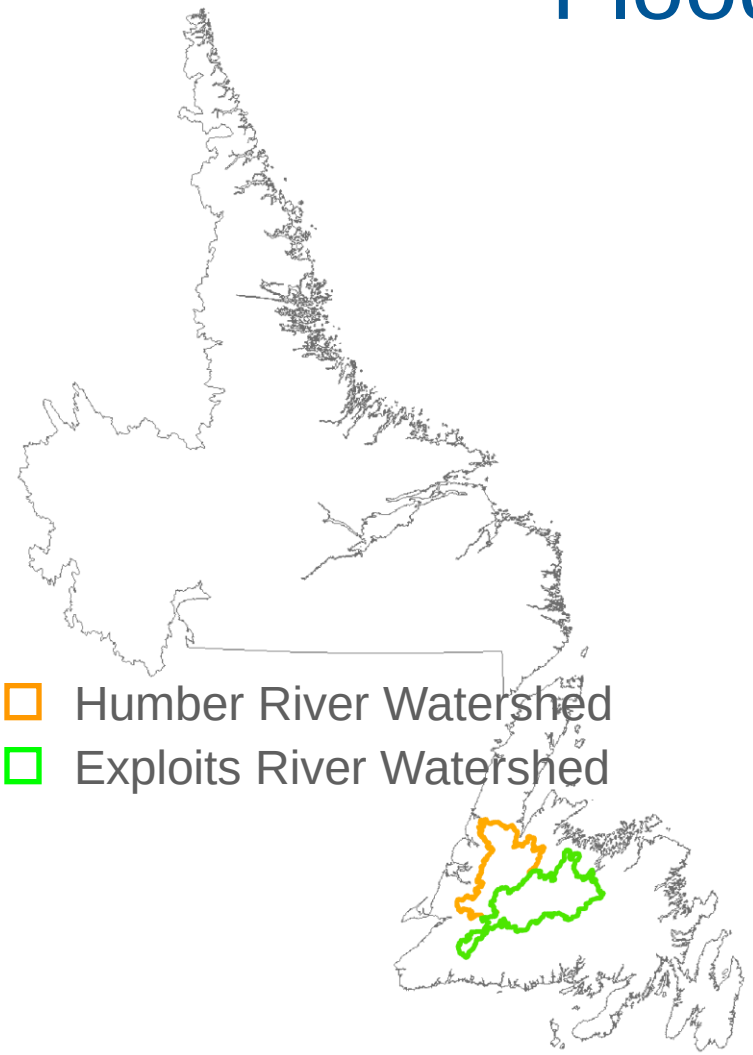
Greater Humber River Watershed

Snow on land

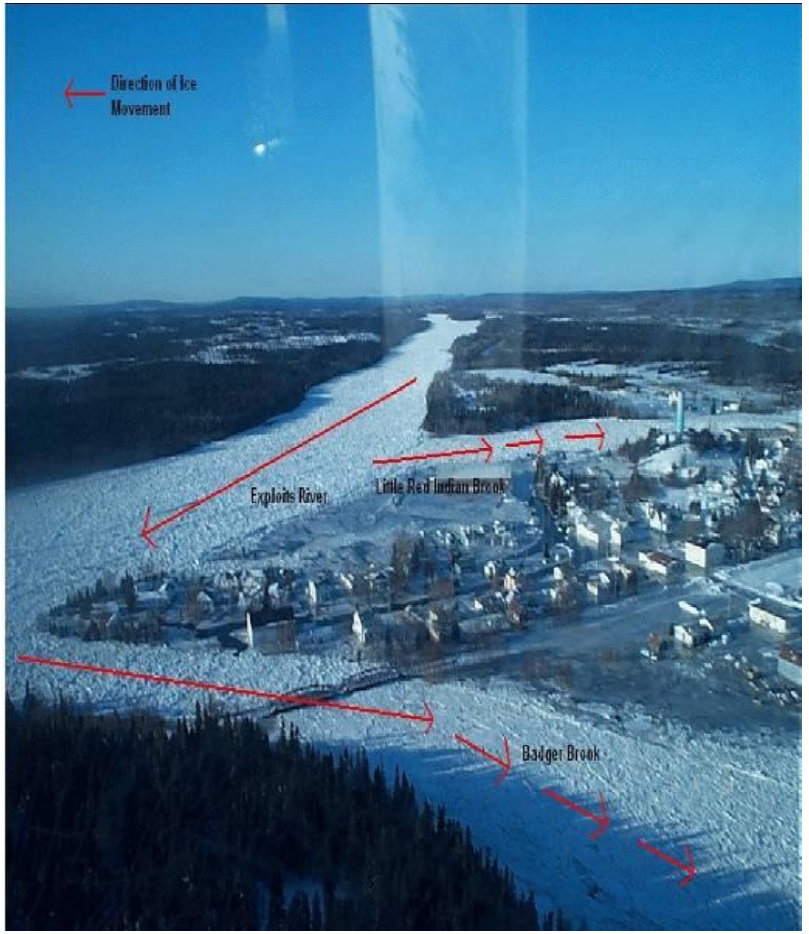
Snow on ice

Newfoundland Labrador

Flood Forecasting



- Humber River Watershed
- Exploits River Watershed



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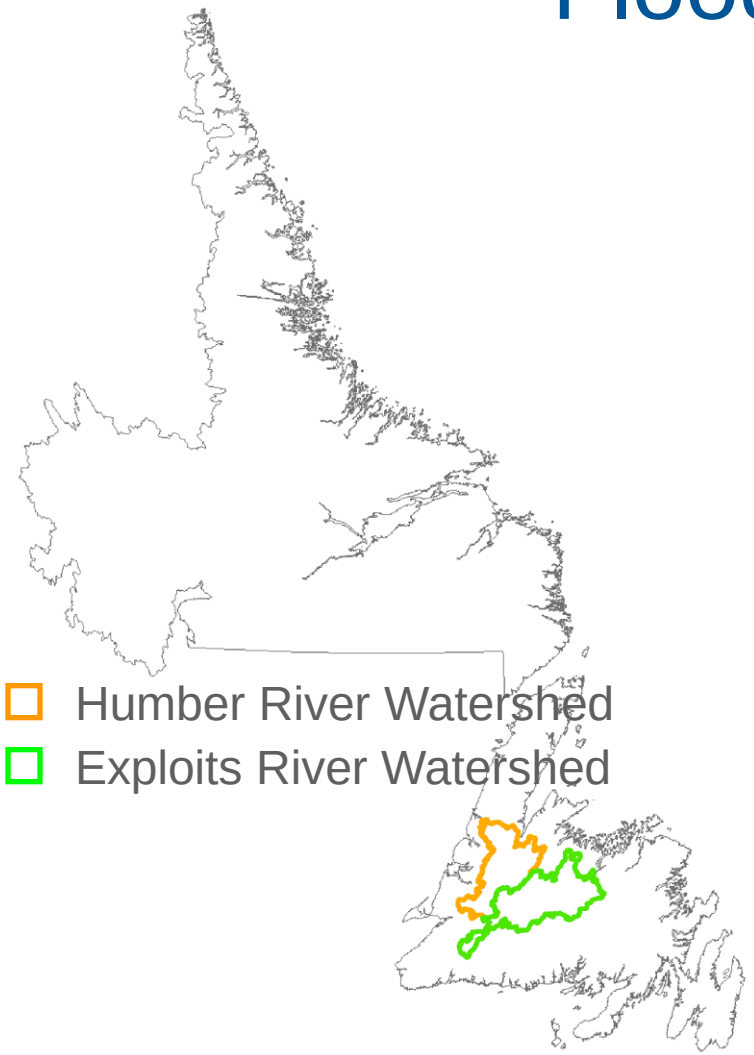
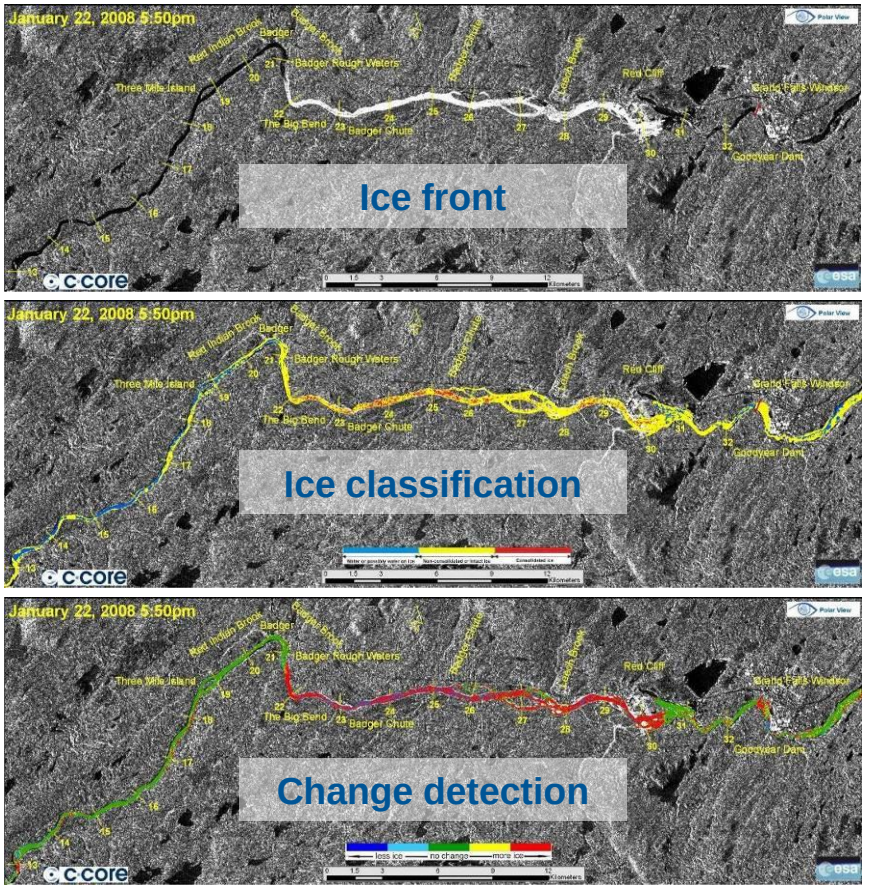
Flood Forecasting



- Humber River Watershed
- Exploits River Watershed

ESA-GMES/POLARVIEW



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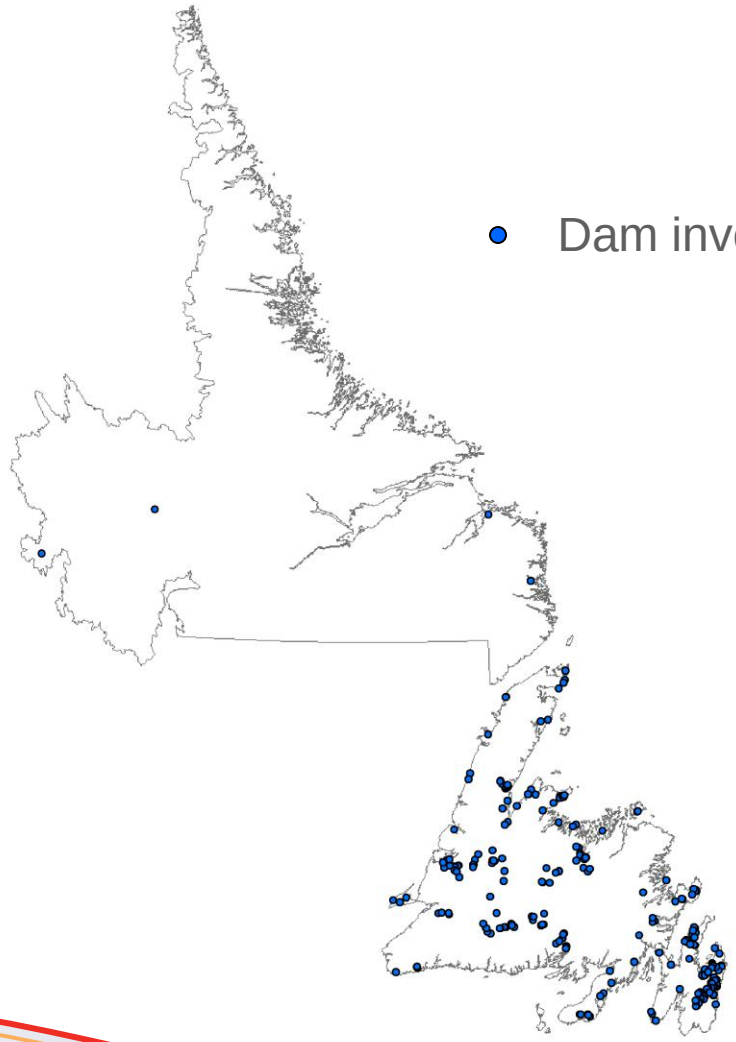
Hydropower Generation



- Dam inventory

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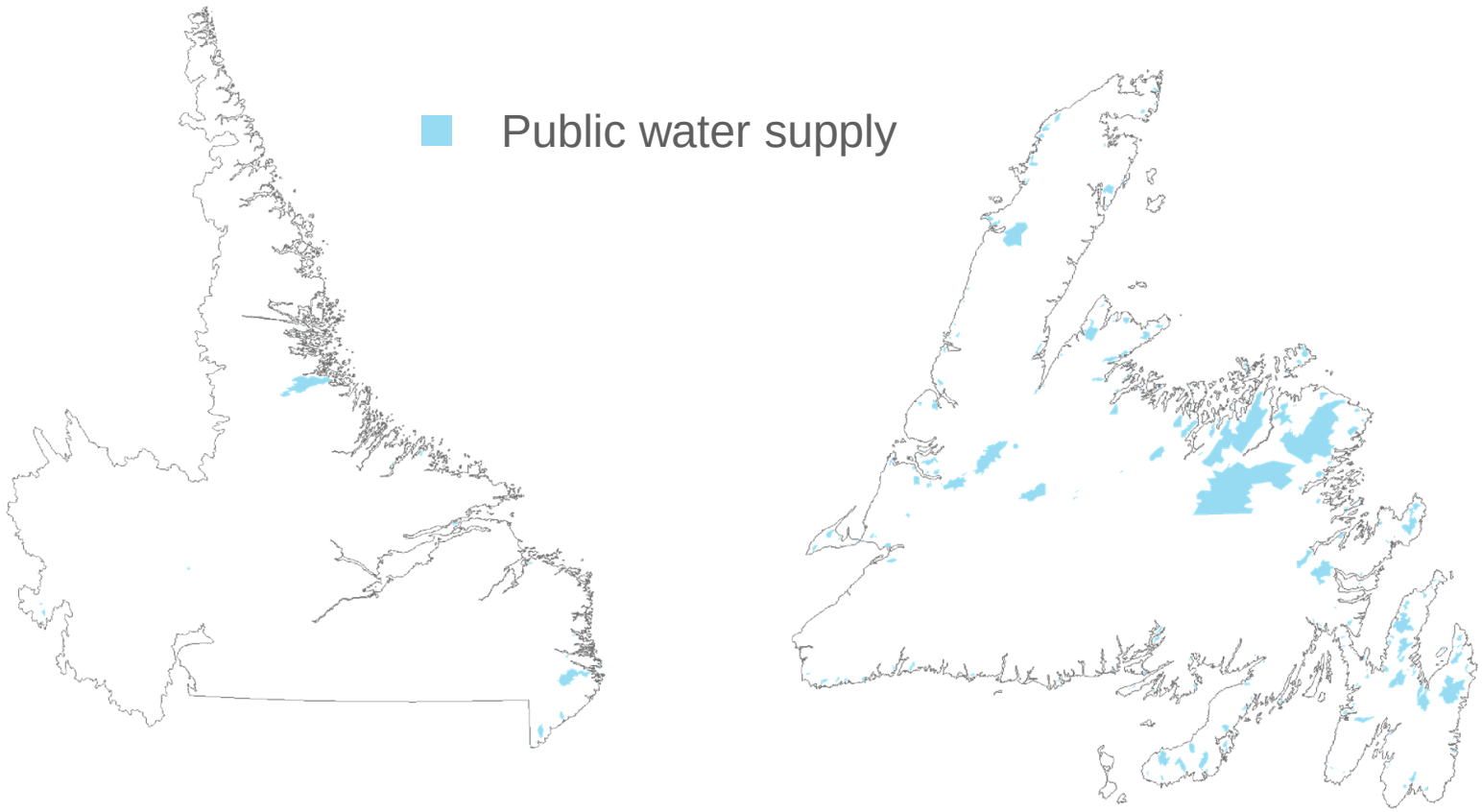
Drinking Water Supply Management



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Wildlife Management

CBC News

Plan drafted for dwindling Newfoundland caribou

Friday, February 8, 2008

The population of woodland caribou on Newfoundland has dropped by almost two-thirds in just over a decade, prompting a government program to figure out why.

About 90,000 caribou roamed the bogs and forests on the island in the mid-1990s. That number is now down to 37,000, with the Grey River herd on the south coast nearly wiped out, with only one in every 10 animals now left.

Newfoundland Labrador

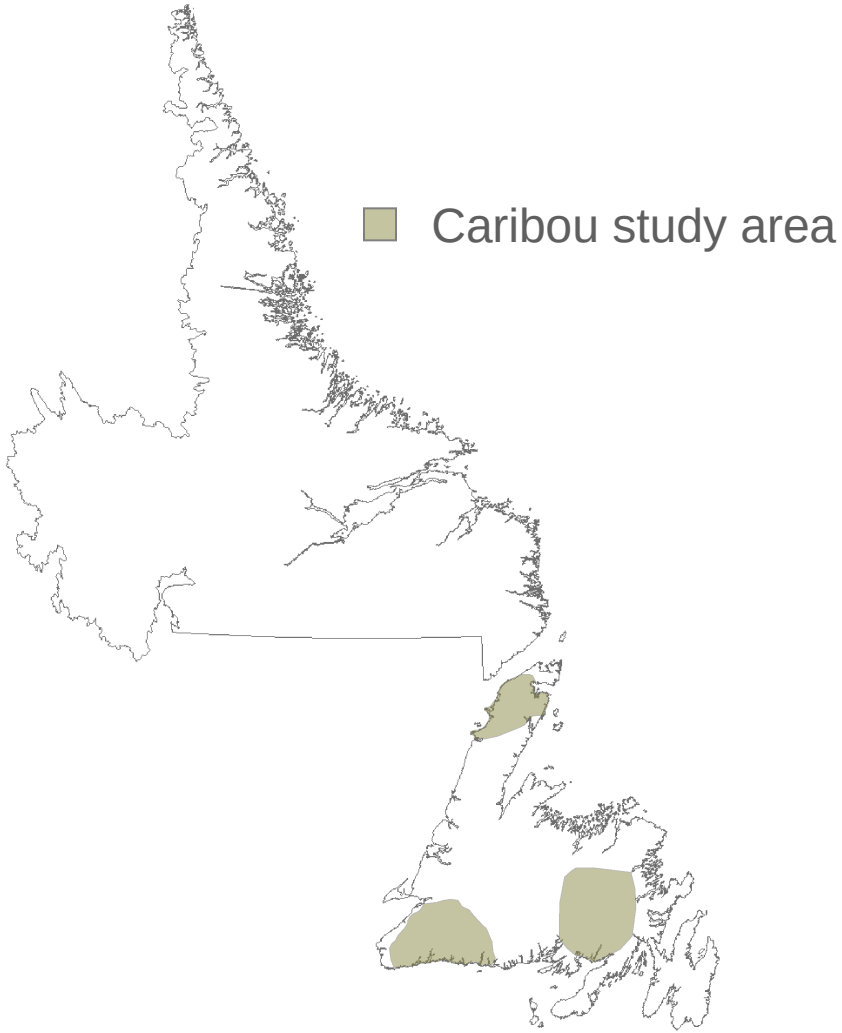
Wildlife Management

CBC News

Plan drafted for dwindling Newfoundland caribou

Friday, February 8, 2008

The Newfoundland and Labrador government on Thursday announced a $15.3-million program to better manage the herds, and to develop better scientific knowledge…



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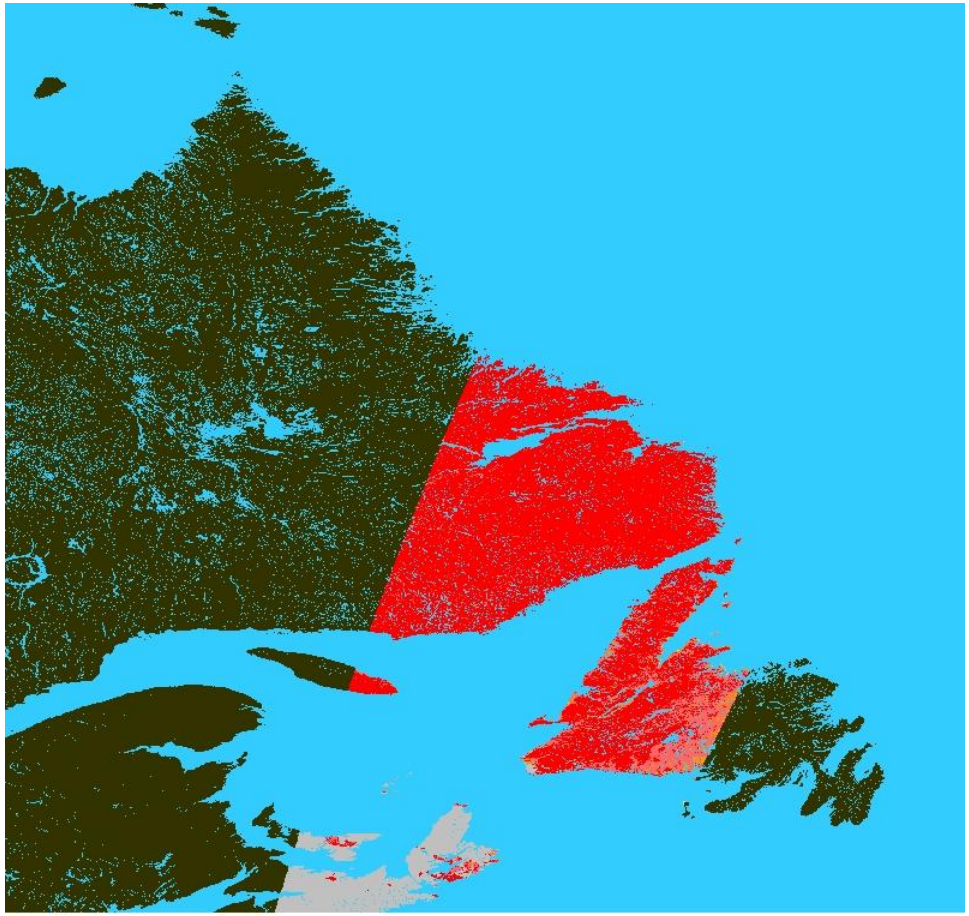
GLOBSNOW PRODUCT REVIEW

Newfoundland Labrador

GlobSnow – Snow Extent



- 10% < FSC ≤ 50% (DN = 7)
- 50% < FSC ≤ 90% (DN = 8)
- 90% < FSC ≤ 100% (DN = 9)
- Cloud (DN = 20)
- Water body (DN = 40)
- Not mapped (DN = 53)

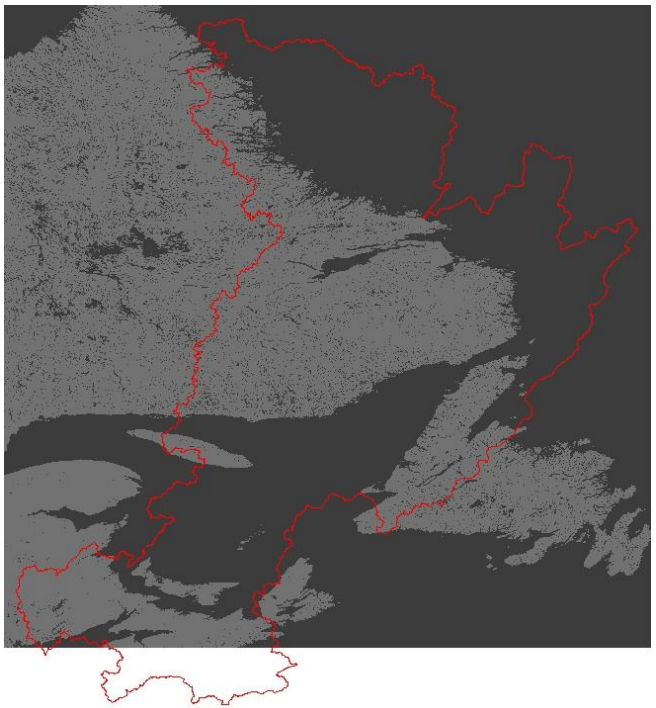
Newfoundland Labrador

Snow Products

Parameter	GLOBSNOW	NSIDC	WRMD
Product type	Snow Extent (SE) Snow Water Equivalent (SWE)	SE SWE	SE
Coverage	Global (SE) N. Hemisphere (SWE)	Global (SE) N. Hemisphere (SWE)	Local
Temporal resolution	3 – 7 days (SE) 1-2 days (SWE)	1 day (SE) 1-2 days (SWE)	≤ 1 day (SE)
Ground resolution	1100m x 660m (SE) 25km x 25km (SWE)	500m x 500m (SE) 25km x 25km (SWE)	500m x 500m (SE)
Sensor	ERS-2/ATSR-2 (SE) ENVISAT/AATSR (SE) AMSR-E (SWE)	MODIS-Terra (SE) AMSR-E (SWE)	MODIS-Terra (SE)
Processing time	< 1 minute	< 1 minute	~ 10 minutes

Product Review

- HDF files lack georeferencing info



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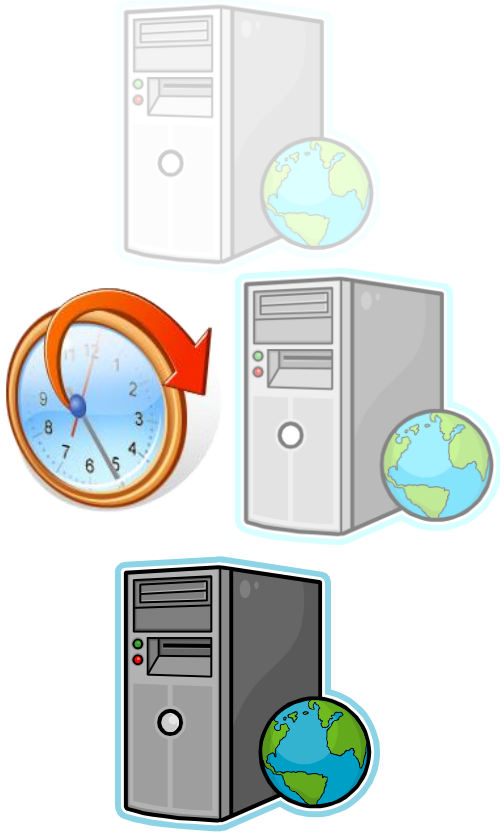
Product Review

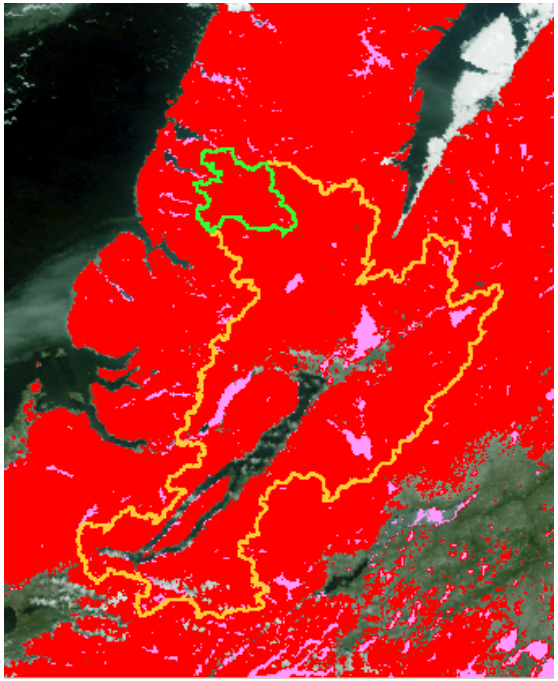
- HDF files lack georeferencing info
- Near-real time data in 2010-2011



Newfoundland Labrador

Product Review

- HDF files lack georeferencing info
- Near-real time data in 2010-2011
- SE product lacks snow over water bodies



Newfoundland Labrador

Product Review

- HDF files lack georeferencing info
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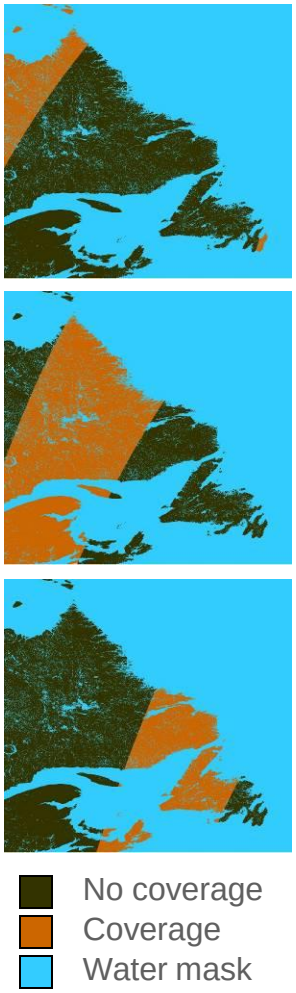
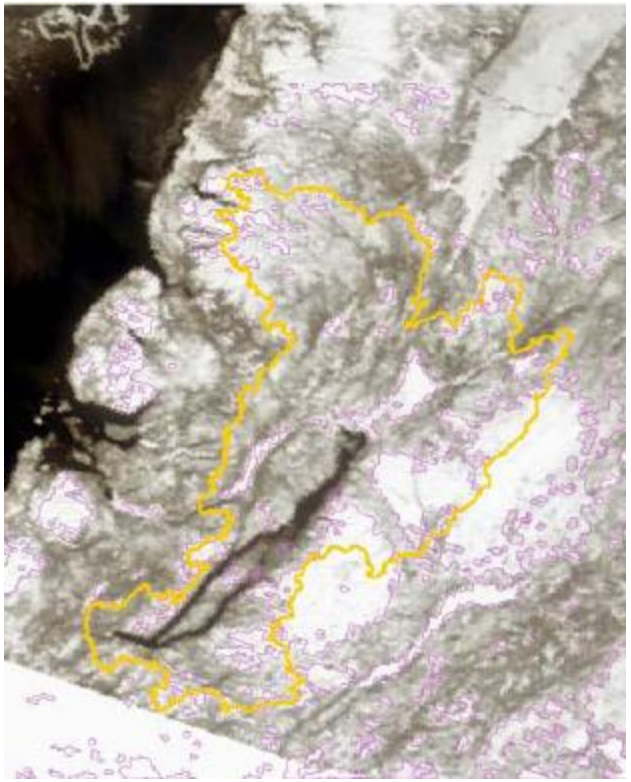
- SE product lacks snow over water bodies
- No current aggregated SE product for Newfoundland & Labrador



Newfoundland Labrador

Product Review

- HDF files lack georeferencing info
- Near-real time data in 2010-2011
- SE product lacks snow over water bodies
- No current aggregated SE product for Newfoundland & Labrador
- SE Coverage Frequency
  - Limited cloud free conditions



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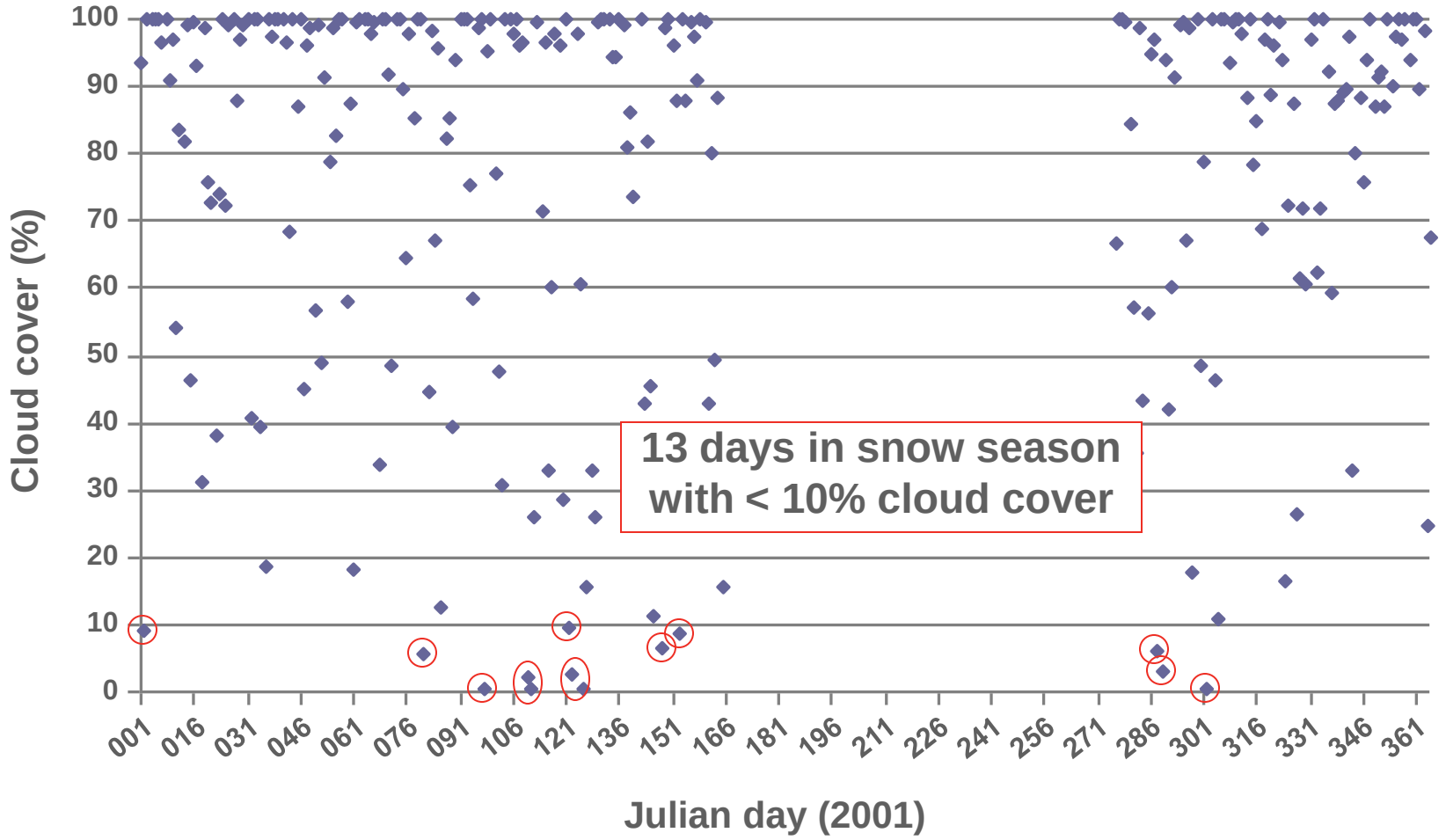
Cloud Cover



Newfoundland Labrador

PATH FORWARD

Newfoundland Labrador

Path Forward

- Examine coverage frequency
  - Limited cloud free conditions
- Compare SE & SWE products to snow survey data
- Install automated snow monitoring stations
- Compare all three snow extent products
- SWE examination

Newfoundland Labrador

Path Forward

- Examine coverage frequency
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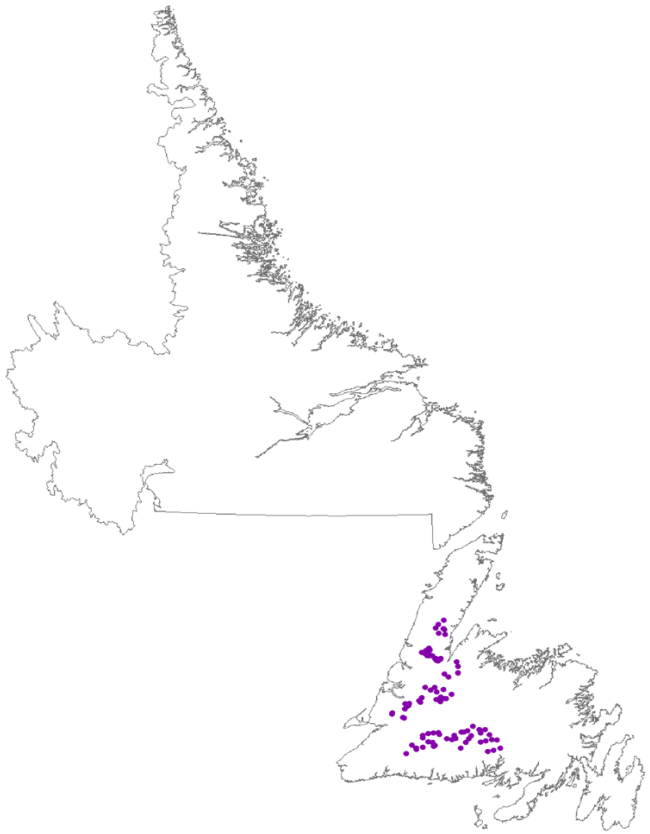

- Snow course survey ~100 sites

Newfoundland Labrador

Path Forward

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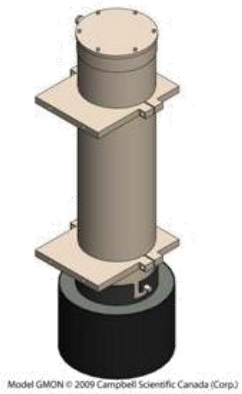

Newfoundland Labrador

Path Forward

- Examine coverage frequency
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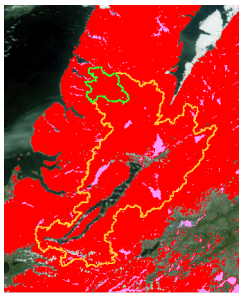
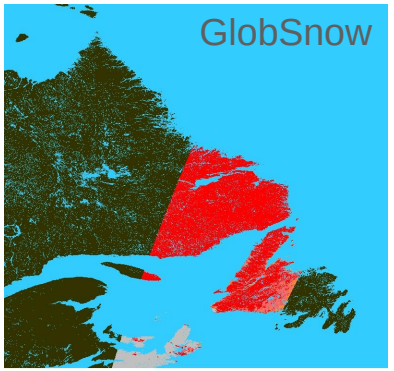
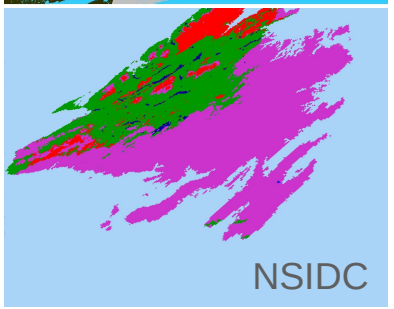
- SWE examination



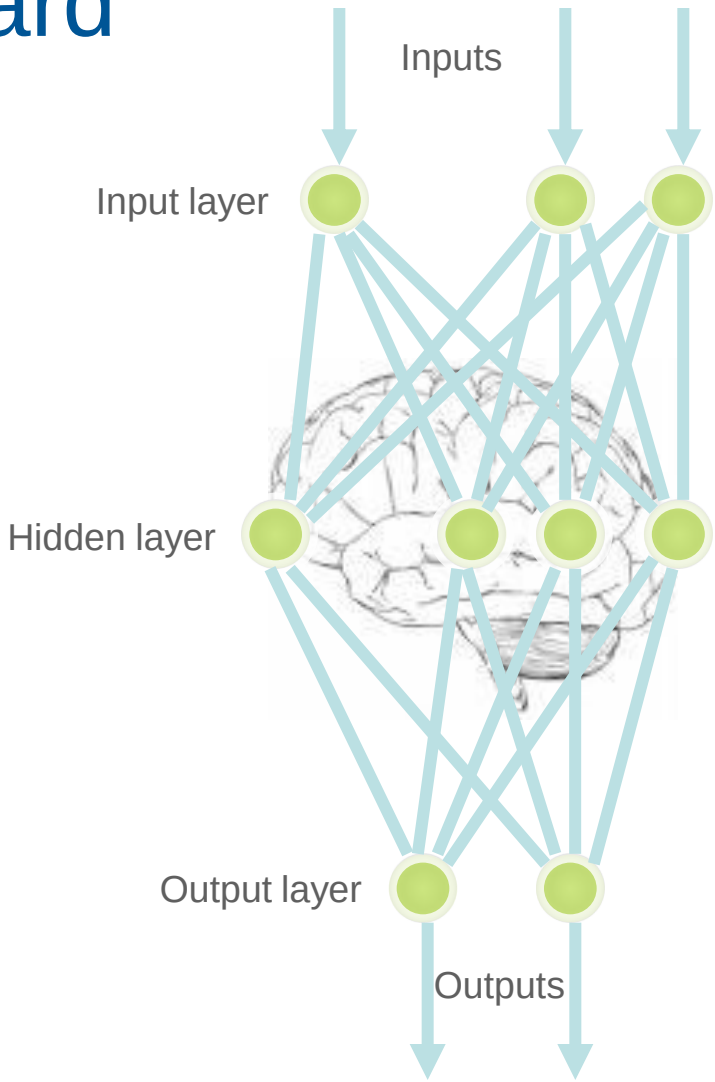




Newfoundland Labrador

Path Forward

- Examine coverage frequency
  - Limited cloud free conditions
- Compare SE & SWE products to snow survey data
- Install automated snow monitoring stations
- Compare all three snow extent products
- SWE examination through ANN



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THANK YOU

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