NL Provincial Prediction Systems

Workshop on Flow Forecasting

21st February 2019

Mandate & Operation:

Water Resources Management Division, The Department of Municipal Affairs and Environment

The Water Resources Management Division in the Department of Municipal Affairs and Environment, is responsible for water resources management as per provisions of the Environmental Protection Act and the Water Resources Act

The Division has four sections, each headed by senior professionals with extensive expertise in water resources management. We employ engineers, scientists, water resources officers, technicians, and clerical staff.

Newfoundland Labrador

Water Resources Management Division — *What We Do:*

Water Rights, Investigations, and Modelling Section

Evaluates water use proposals and **issues water use licences** for domestic, commercial and industrial uses

Coordinates review and approval of any proposed **alterations to bodies of water**

Assesses and investigates **public complaints** and **flooding events**

Maintains on-line **Registry of Water Rights**

Conducts continuous water use **monitoring** and **reporting**

Evaluates referrals to determine water related **licences** and **permits** required for proposed activities

Develops **regulations, policies,** and **guidelines** for water planning and management

Provides **technical services -** locally, nationally, & internationally

Provides **floodplain management, permits, climate change flood studies, flood forecasting** and **flood response**

Evaluates proposals and issues permits for proposed developments in **designated floodplain areas**

Develops and implements Water Resources Management **tools, software, GIS** and **systems**

Maintains, analyzes and distributes water resources **data**

Develops **legislation, regulations, policies** & **guidelines**

Supports **Environmental Permitting System** and the **Multi-Barrier Strategic Action Plan**

Drinking Water & Wastewater Section

Oversees the province's **Multi-Barrier Strategic Action Plan** for drinking water safety

Monitors and reports on **drinking water quality**

Issues approvals for the **design, construction, operation** and **maintenance** of community water and wastewater systems

Develops **regulations, policies, and guidelines** for drinking water and wastewater

Oversees designation of **Protected Public Water Supply Areas (PPWSAs)** including regulatory permits, inspections and investigations

Provides **education seminars, hands-on training and certification** for water and wastewater operators including operation of three Mobile Training Units (MTUs) to provide on-site training

Coordinates the **Dam Safety Program** and **dam inventory**

Water Agreements Section

Coordinates and maintains activities under **Water Quality, Climate** and **Hydrometric Agreements** with federal government and industry partners

Collects, analyzes and reports on **ambient water quality data:** physical and chemical properties, benthic macroinvertebrates and blue-green algae

Operates and maintains the **Real-Time Water Quality Monitoring Network,** including station setup and maintenance, data collection, management and reporting

Reports on baseline water quality, variability and trends - tools include the **Canadian Water Quality Index, Risk Based Assessments** and **Data Trend Analysis**

Operates, assesses and maintains **hydrometric** and **climate** data collection networks

Conducts research and development into **innovative technology** for water quality monitoring and reporting

Develops **special studies** to address water quality issues

To access **real-time data** for water quality, hydrometric and climate stations:
http://www.mae.gov.nl.ca/wrmd/ADRS/v6/Graphs_List.asp

Groundwater Section

Administers groundwater resources as part of the ***Water Resources Act*** and ***Well Drilling Regulations***

Issues **well drillers' licences**

Issues permits for constructing **non-domestic wells** for public and semi-public water use

Oversees **Wellhead Protection Program,** including issuing permits

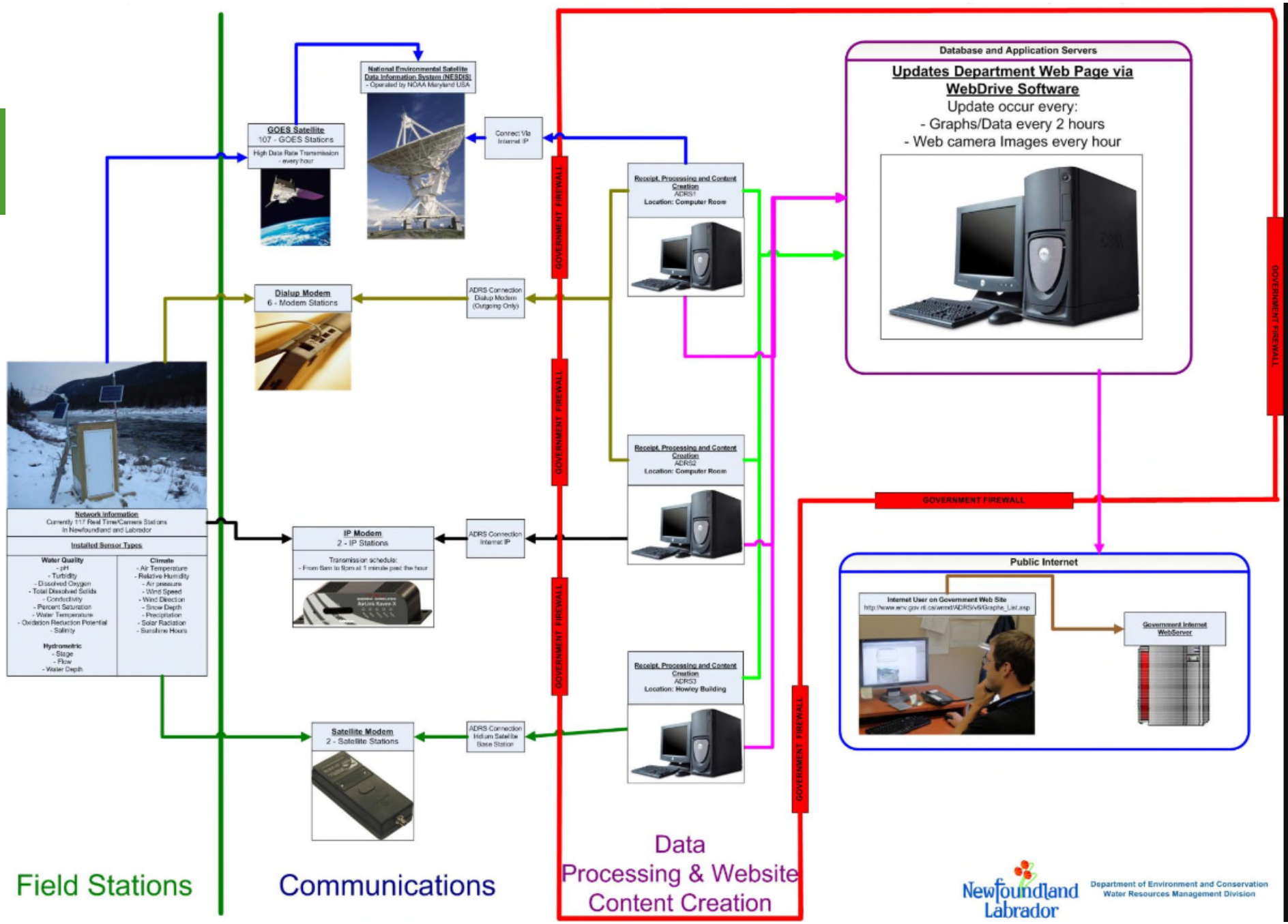
Conducts **groundwater studies**

Inspects and collects water quality samples from **public water supply wells**

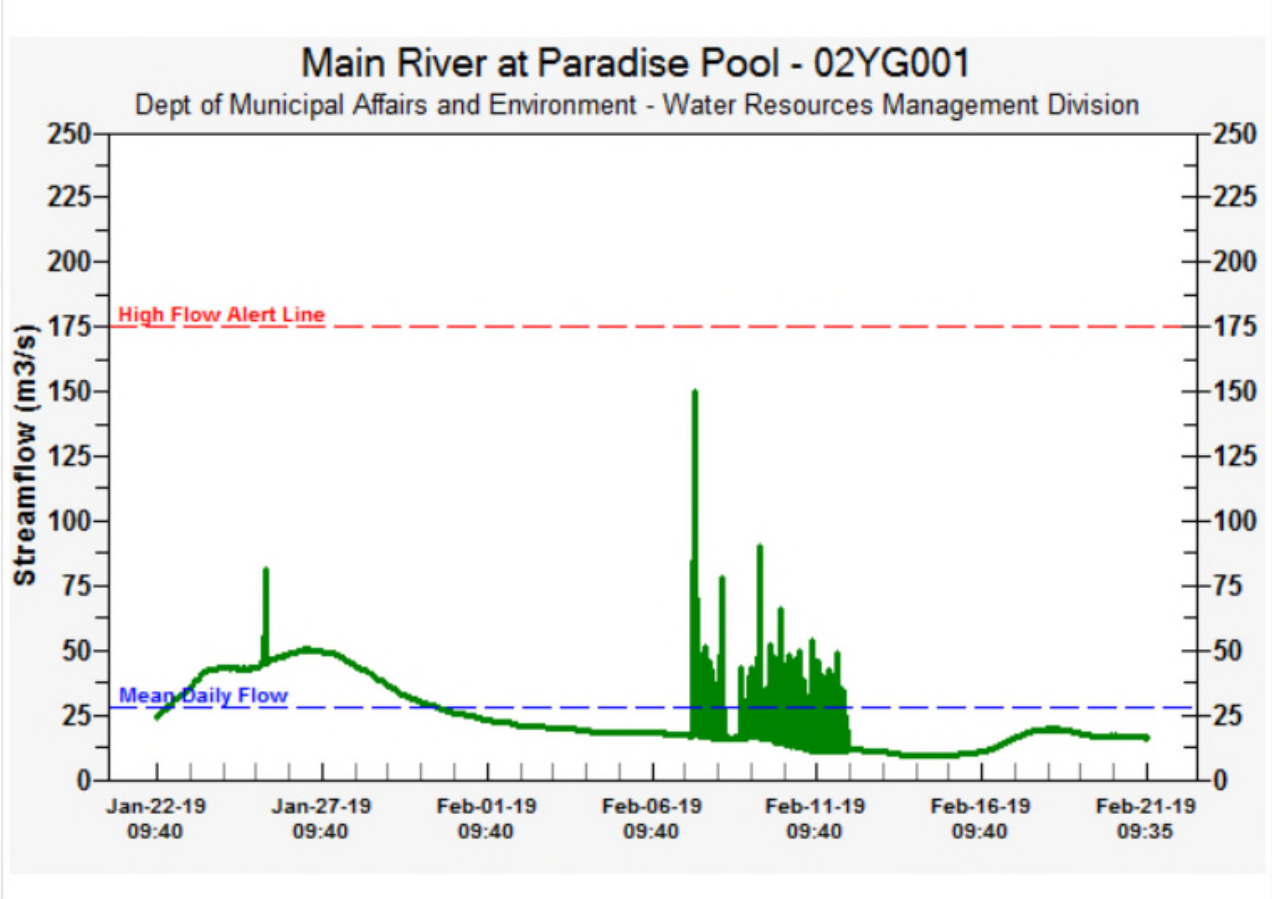
Develops **policies and guidelines** to protect groundwater resources

Reviews **Groundwater Assessment Studies** for new subdivision developments using individual groundwater wells for drinking water supplies

For **Outreach and Educational Resources,** please visit website: http://www.mae.gov.nl.ca/waterres/outreach/inde

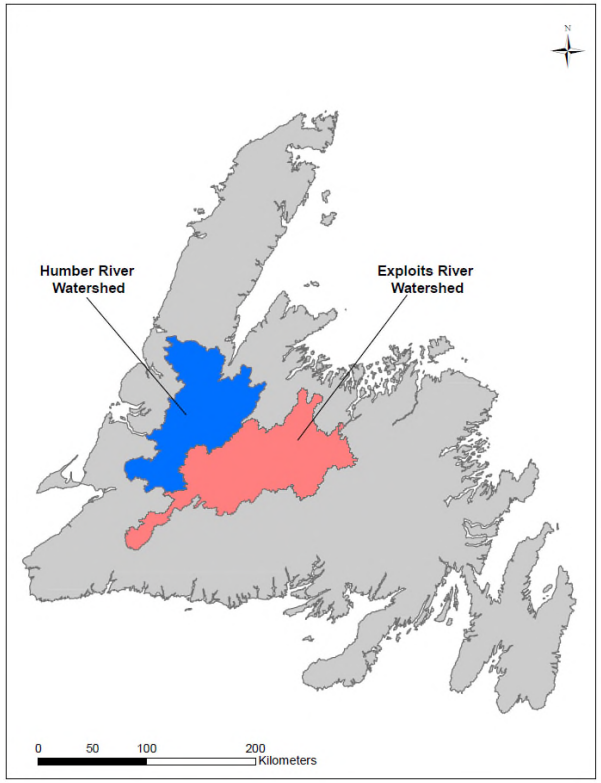

National Environmental Satellite Data Information System (NESDIS)
- Operated by NOAA Maryland USA
GOES Satellite
107 - GOES Stations
High Data Rate Transmission
- every hour
Connect Via Internet IP
Database and Application Servers
Updates Department Web Page via WebDrive Software
Update occur every:
- Graphs/Data every 2 hours
- Web camera Images every hour
Receipt, Processing and Content Creation
ADRS1
Location: Computer Room
Dialup Modem
6 - Modem Stations
ADRS Connection Dialup Modem (Outgoing Only)
GOVERNMENT FIREWALL
Network Information
Currently 117 Real Time/Camera Stations in Newfoundland and Labrador
Installed Sensor Types
Water Quality
- pH
- Turbidity
- Dissolved Oxygen
- Total Dissolved Solids
- Conductivity
- Percent Saturation
- Water Temperature
- Oxidation Reduction Potential
- Salinity
Hydrometric
- Stage
- Flow
- Water Depth
Climate
- Air Temperature
- Relative Humidity
- Air pressure
- Wind Speed
- Wind Direction
- Snow Depth
- Precipitation
- Solar Radiation
- Sunshine Hours
IP Modem
2 - IP Stations
Transmission schedule:
- From 6am to 9pm at 1 minute past the hour
ADRS Connection Internet IP
Receipt, Processing and Content Creation
ADRS2
Location: Computer Room
Satellite Modem
2 - Satellite Stations
ADRS Connection Iridium Satellite Base Station
Receipt, Processing and Content Creation
ADRS3
Location: Howley Building
Public Internet
Internet User on Government Web Site
Government Internet WebServer
Field Stations
Communications
Data Processing & Website Content Creation
Newfoundland Labrador
Department of Environment and Conservation
Water Resources Management Division
Newfoundland Labrador

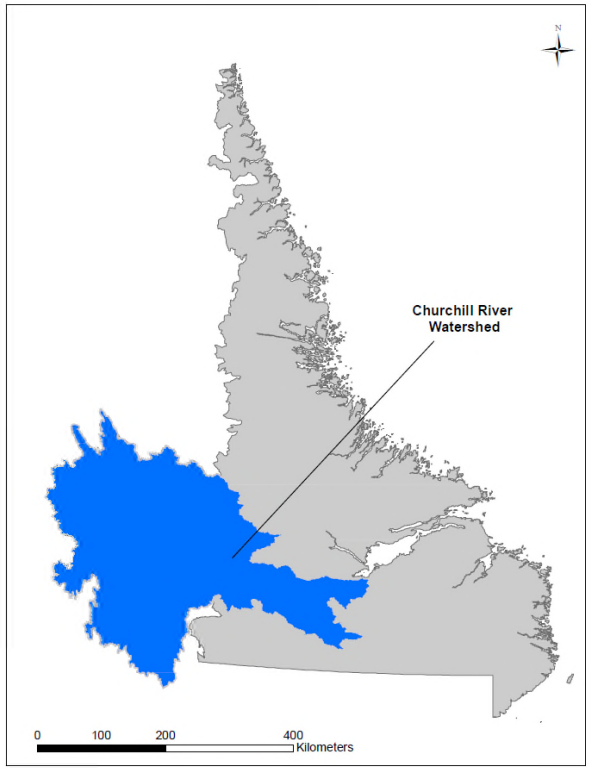
ADRS



Newfoundland Labrador

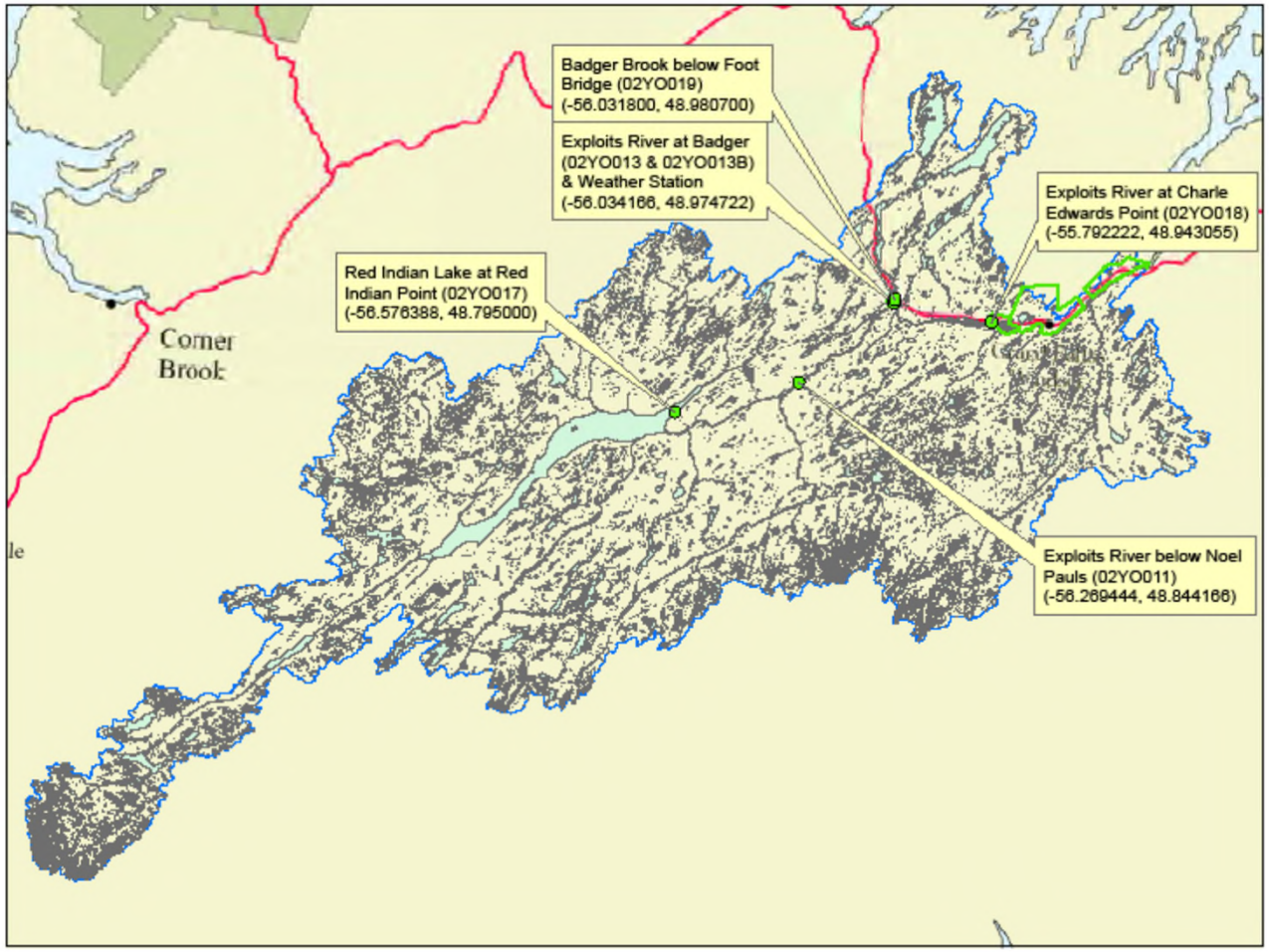
Forecasting Systems





Newfoundland Labrador

Exploits River Flood Forecasting System



- The Exploits River is the largest watershed in the island of Newfoundland located at the central part with an area of 10,255 sq-km.
- The Exploits River drains into Atlantic Ocean through the Bay of Exploits
- The river is regulated at three locations
  - Red Indian Lake at Red Indian Point
  - Good Year dam at Grand Falls – Windsor
  - At Bishop's Falls in the Town of Bishop's Falls

Newfoundland Labrador

Exploits River Flood Forecasting System

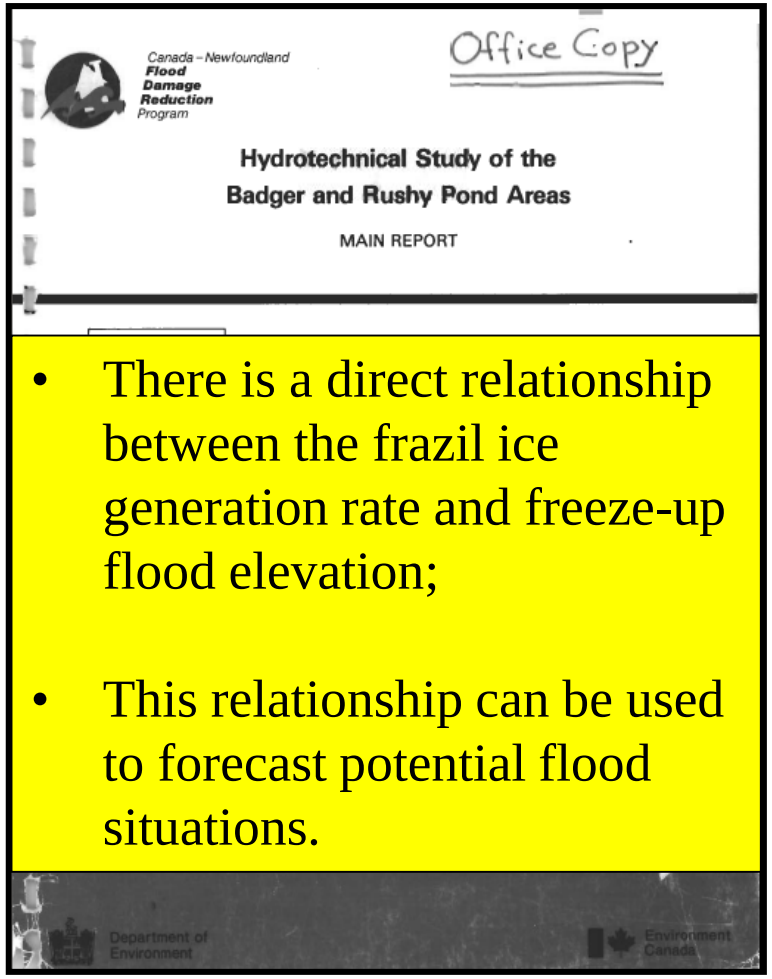






Newfoundland Labrador

Flood Forecasting for Badger



- There is a direct relationship between the frazil ice generation rate and freeze-up flood elevation;
- This relationship can be used to forecast potential flood situations.

- An "Ice Progression Model (IPM)" is used
- Specific to the Exploits River
- Specifically designed for freeze-up ice conditions.
- No melting or break-up ice conditions are included

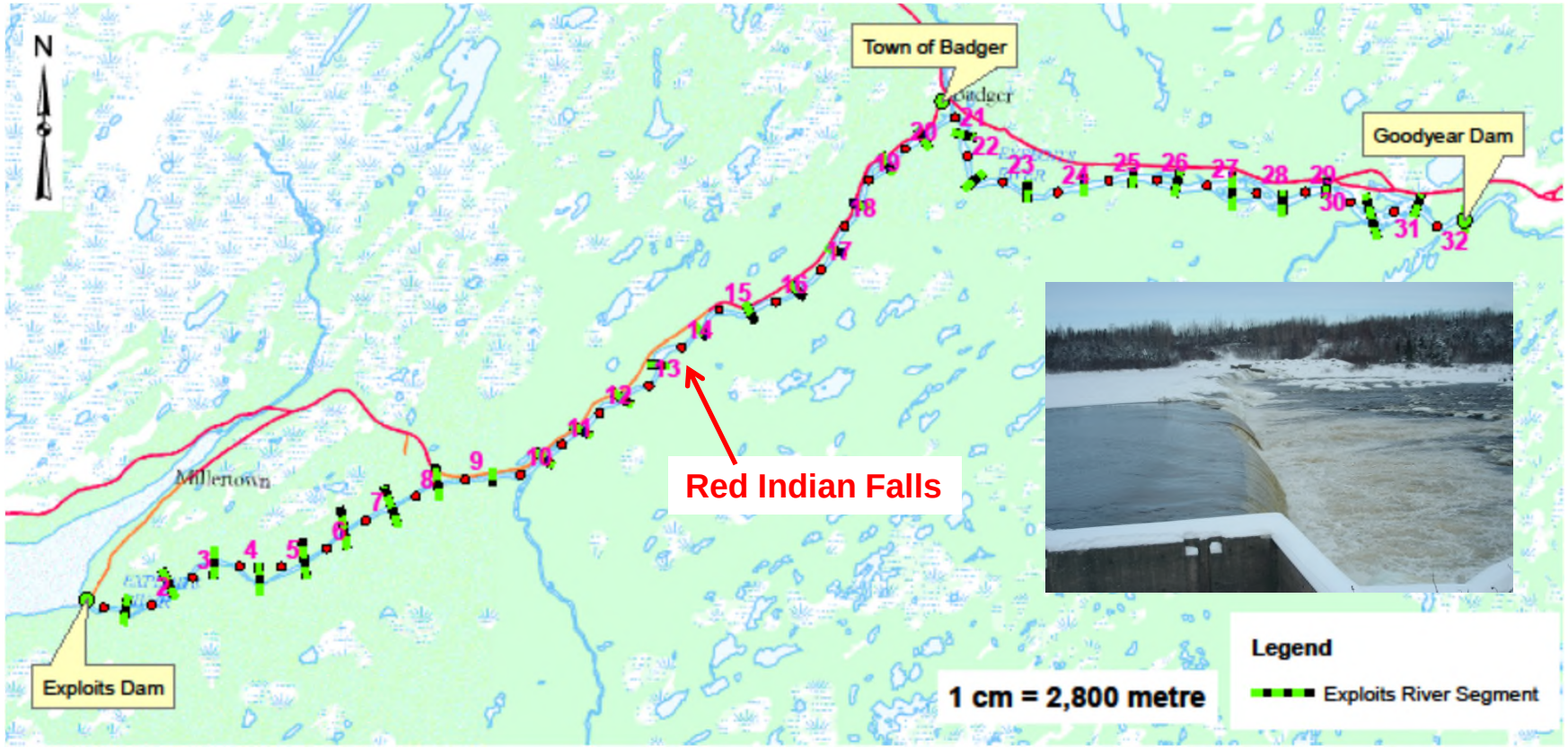
Advisories and Warnings

- An Ice Jam Advisory or a Flood Warning is issued based on past studies, the Model's ice generation forecast, and the location of the ice front.
- A flood alert, based on the 1995 study, is issued to Fire and Emergency Services and the Town of Badger, as summarized below:

Issue	Event	Water Level (m)	Ice Generated (m^3/day)
Ice Jam Advisory	River Bank	98.50	900,000
Flood Warning	1:20 year	99.48	1,920,000
Flood Warning	1:100 year	100.36	2,660,000

Newfoundland Labrador

Flood Forecasting for Badger



- The IPM divides the river into 32 segments
- Each segment is approximately 2.5 km
- When air and water temperatures in a segment fall below freezing and wind speed is high, frazil ice slush is generated in that segment
- Slush is carried downstream

Newfoundland Labrador

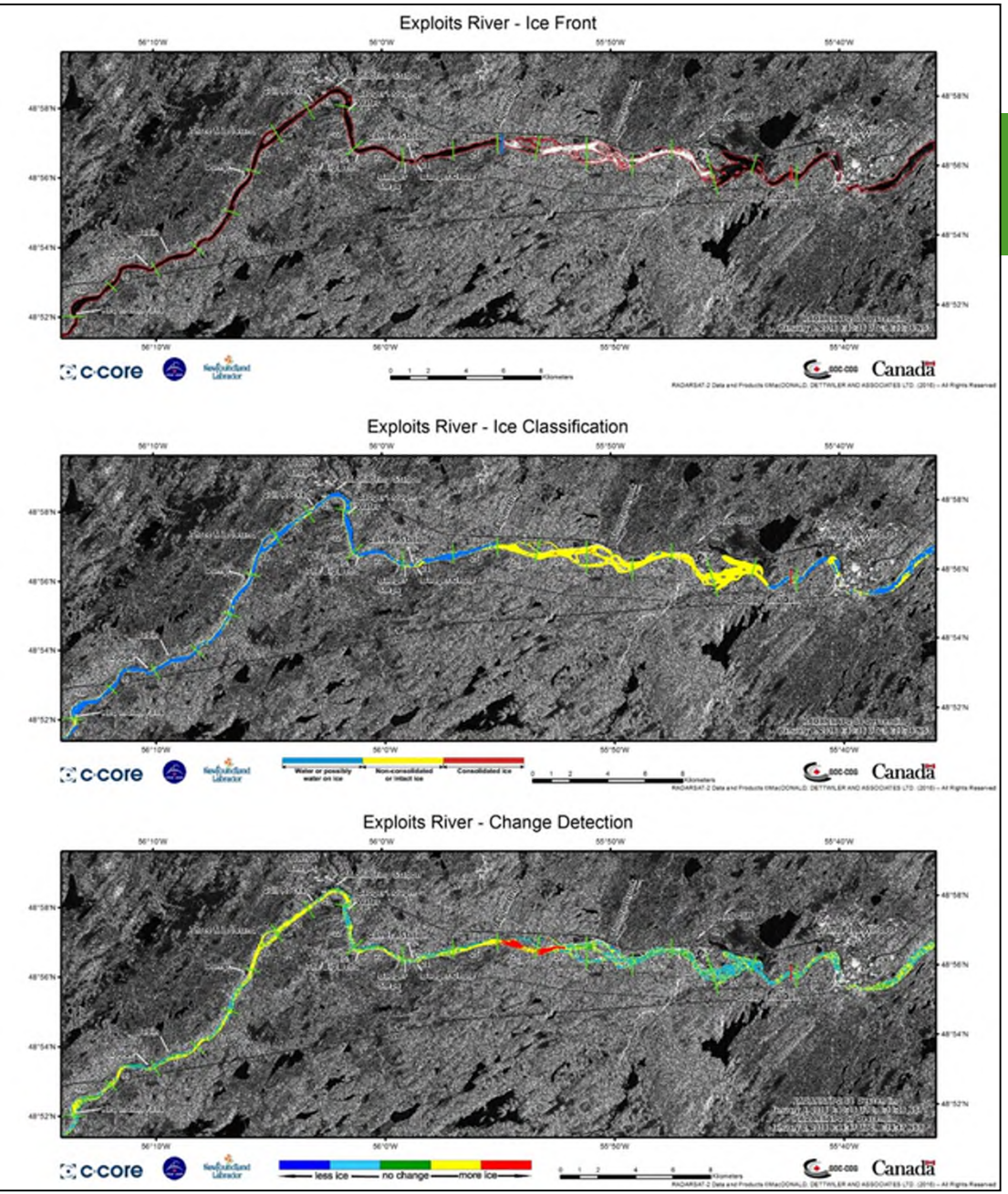
Flood Forecasting for Badger

1. Ice cover grows upstream from the Goodyear dam
2. Passes Badger
3. Moves on up to Three Mile Island
4. Next ice breakup and regression





Newfoundland Labrador



Ice Products

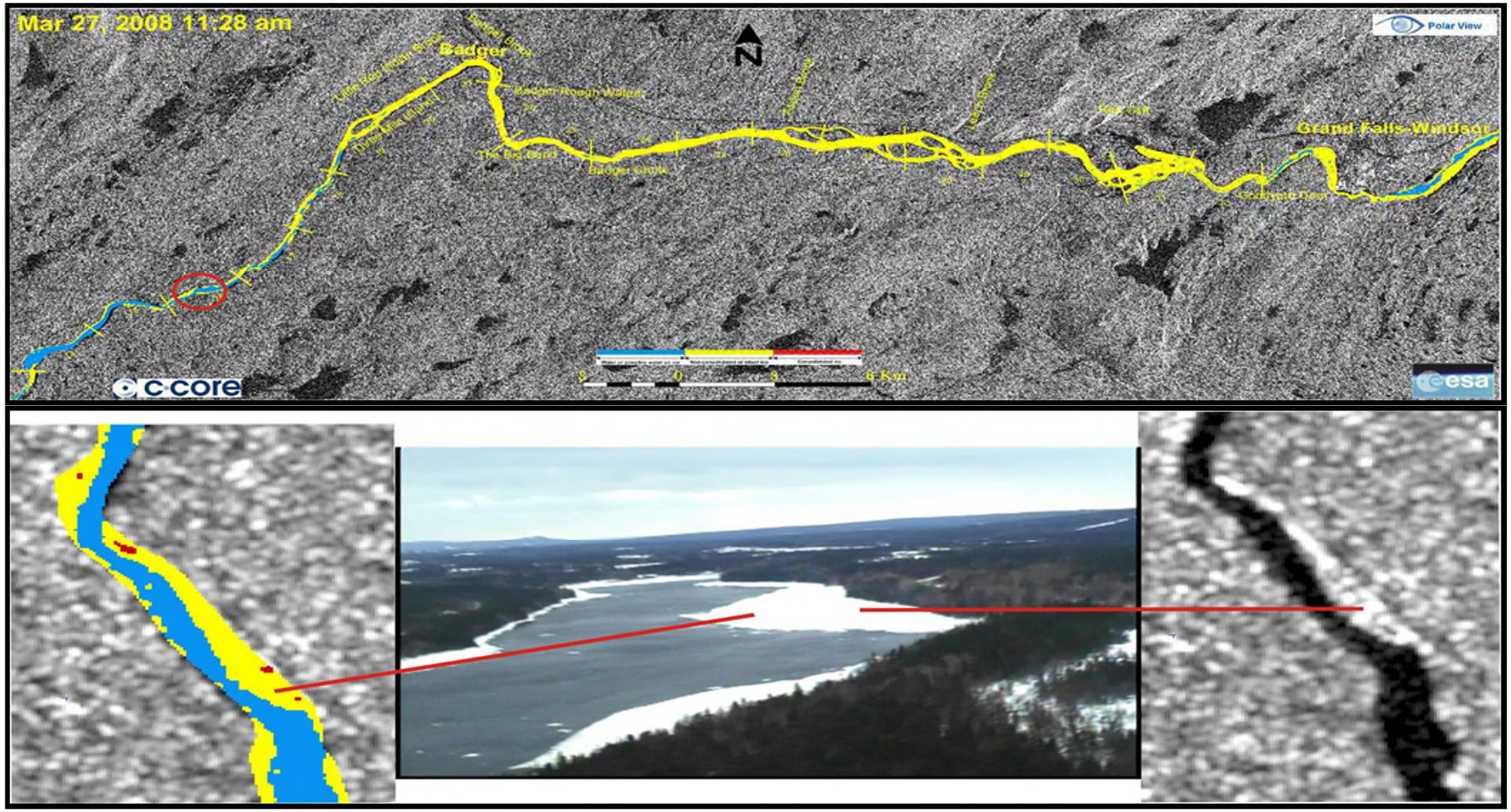
Ice front product helps to identify the location of ice front within segment 32 to 13

Ice classification product helps to determine the level of ice consolidation in different segments 32 to 13

Change detection product helps to determine how much changes occurred in ice consolidation between two successive satellite images

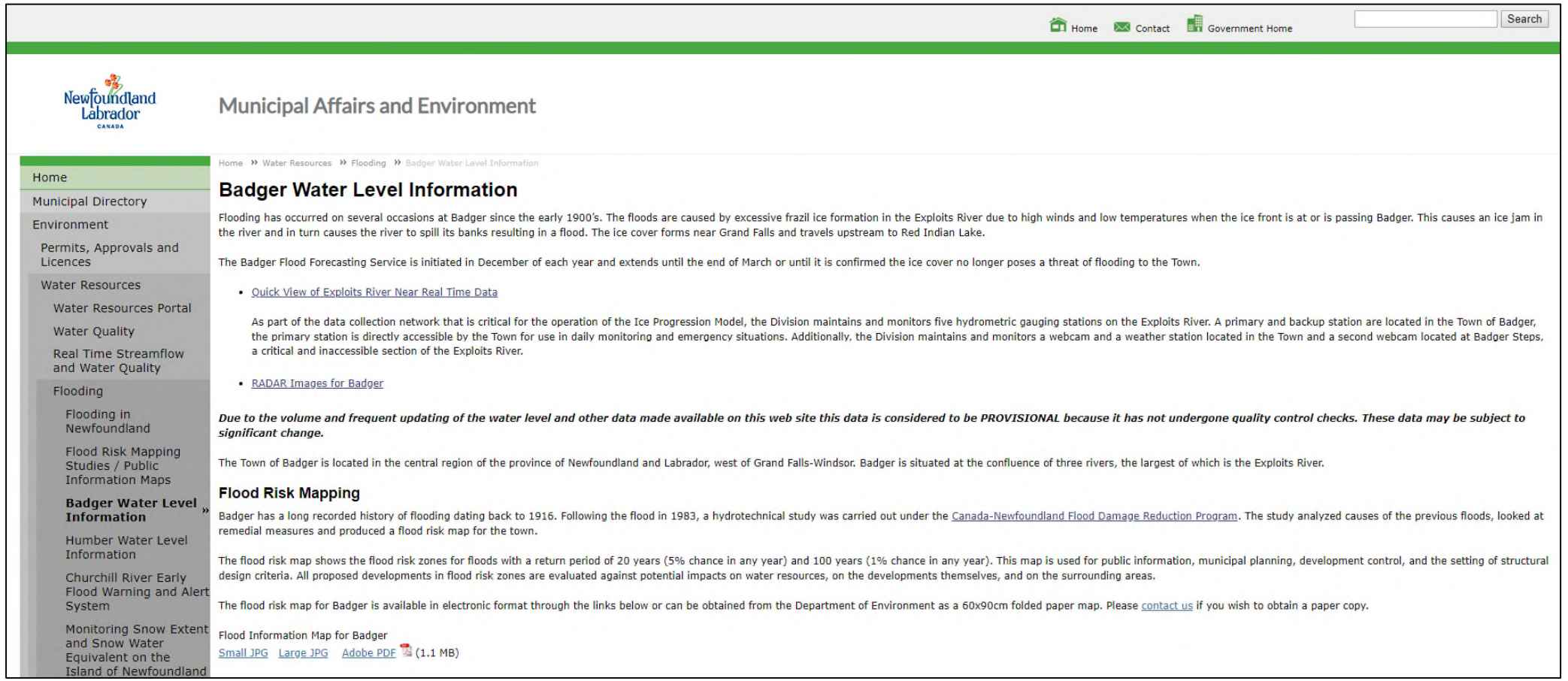
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Ice Classification



Newfoundland Labrador

Exploits River Flood Forecasting System



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Home
Municipal Directory
Environment
Permits, Approvals and Licences
Water Resources
Water Resources Portal
Water Quality
Real Time Streamflow and Water Quality
Flooding
Flooding in Newfoundland
Flood Risk Mapping Studies / Public Information Maps
Badger Water Level Information
Humber Water Level Information
Churchill River Early Flood Warning and Alert System
Monitoring Snow Extent and Snow Water Equivalent on the Island of Newfoundland

Home » Water Resources » Flooding » Badger Water Level Information

Badger Water Level Information

Flooding has occurred on several occasions at Badger since the early 1900's. The floods are caused by excessive frazil ice formation in the Exploits River due to high winds and low temperatures when the ice front is at or is passing Badger. This causes an ice jam in the river and in turn causes the river to spill its banks resulting in a flood. The ice cover forms near Grand Falls and travels upstream to Red Indian Lake.

The Badger Flood Forecasting Service is initiated in December of each year and extends until the end of March or until it is confirmed the ice cover no longer poses a threat of flooding to the Town.

- Quick View of Exploits River Near Real Time Data

  As part of the data collection network that is critical for the operation of the Ice Progression Model, the Division maintains and monitors five hydrometric gauging stations on the Exploits River. A primary and backup station are located in the Town of Badger, the primary station is directly accessible by the Town for use in daily monitoring and emergency situations. Additionally, the Division maintains and monitors a webcam and a weather station located in the Town and a second webcam located at Badger Steps, a critical and inaccessible section of the Exploits River.

- RADAR Images for Badger

Due to the volume and frequent updating of the water level and other data made available on this web site this data is considered to be PROVISIONAL because it has not undergone quality control checks. These data may be subject to significant change.

The Town of Badger is located in the central region of the province of Newfoundland and Labrador, west of Grand Falls-Windsor. Badger is situated at the confluence of three rivers, the largest of which is the Exploits River.

Flood Risk Mapping

Badger has a long recorded history of flooding dating back to 1916. Following the flood in 1983, a hydrotechnical study was carried out under the Canada-Newfoundland Flood Damage Reduction Program. The study analyzed causes of the previous floods, looked at remedial measures and produced a flood risk map for the town.

The flood risk map shows the flood risk zones for floods with a return period of 20 years (5% chance in any year) and 100 years (1% chance in any year). This map is used for public information, municipal planning, development control, and the setting of structural design criteria. All proposed developments in flood risk zones are evaluated against potential impacts on water resources, on the developments themselves, and on the surrounding areas.

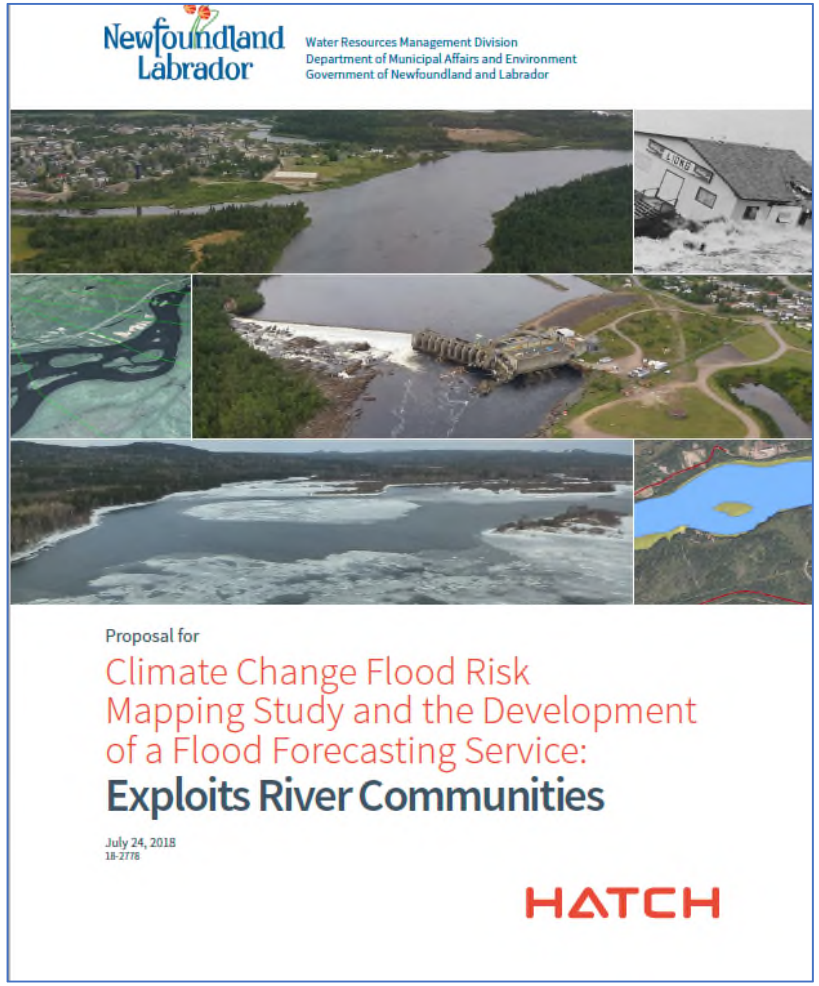
The flood risk map for Badger is available in electronic format through the links below or can be obtained from the Department of Environment as a 60x90cm folded paper map. Please contact us if you wish to obtain a paper copy.

Flood Information Map for Badger
Small JPG Large JPG Adobe PDF (1.1 MB)

https://www.mae.gov.nl.ca/waterres/flooding/badger.html

Newfoundland Labrador

NEW Exploits River Flood Forecasting System

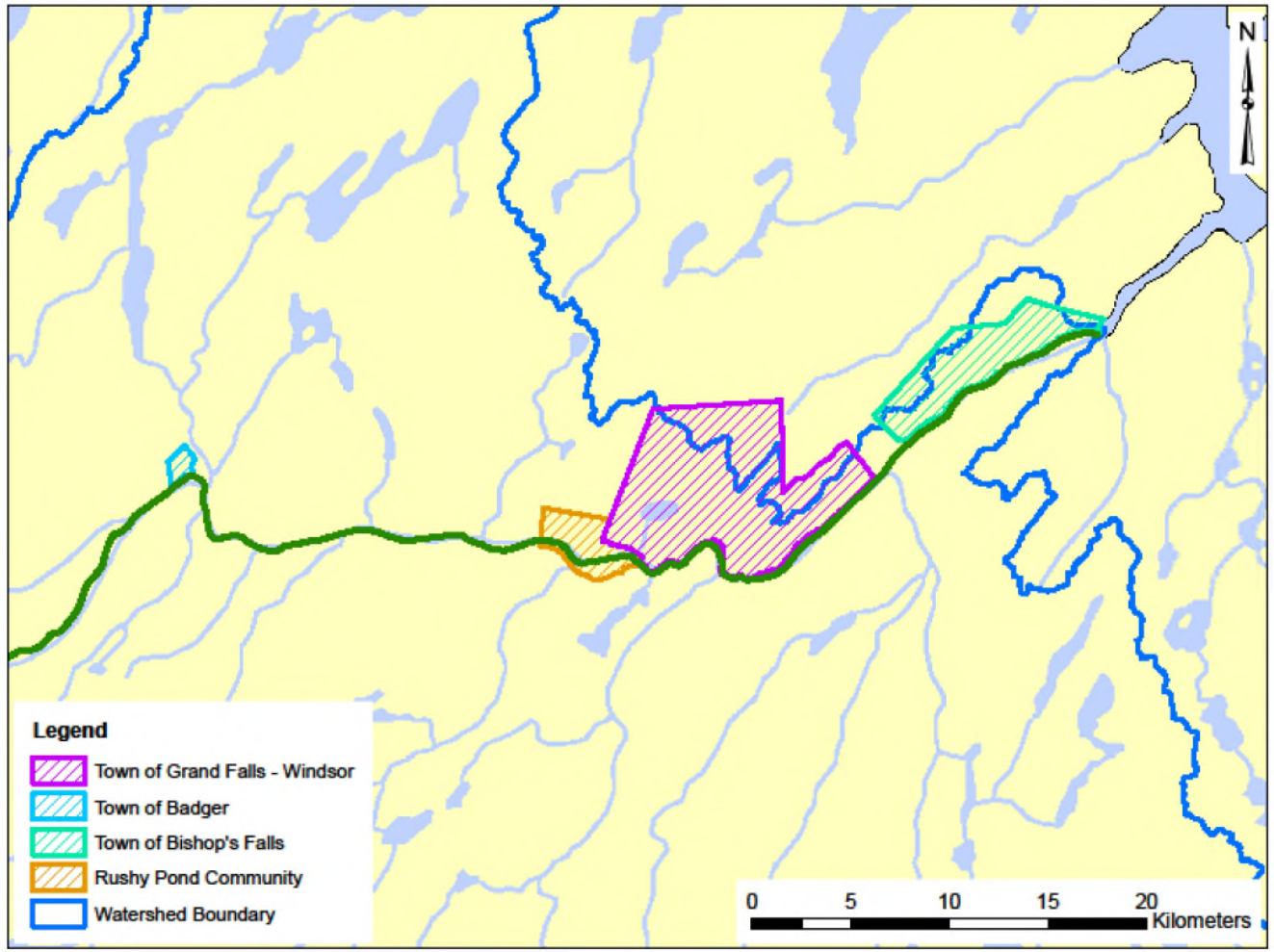


- March 2020
- HEC-RTS
  - HEC-HMS
  - HEC-RAS
  - RIVICE
- Badger Ice Progression Model

Dr. Karl-Erich Lindenschmidt, PhD, PEng
University of Saskatchewan
karl-erich.lindenschmidt@usask.ca

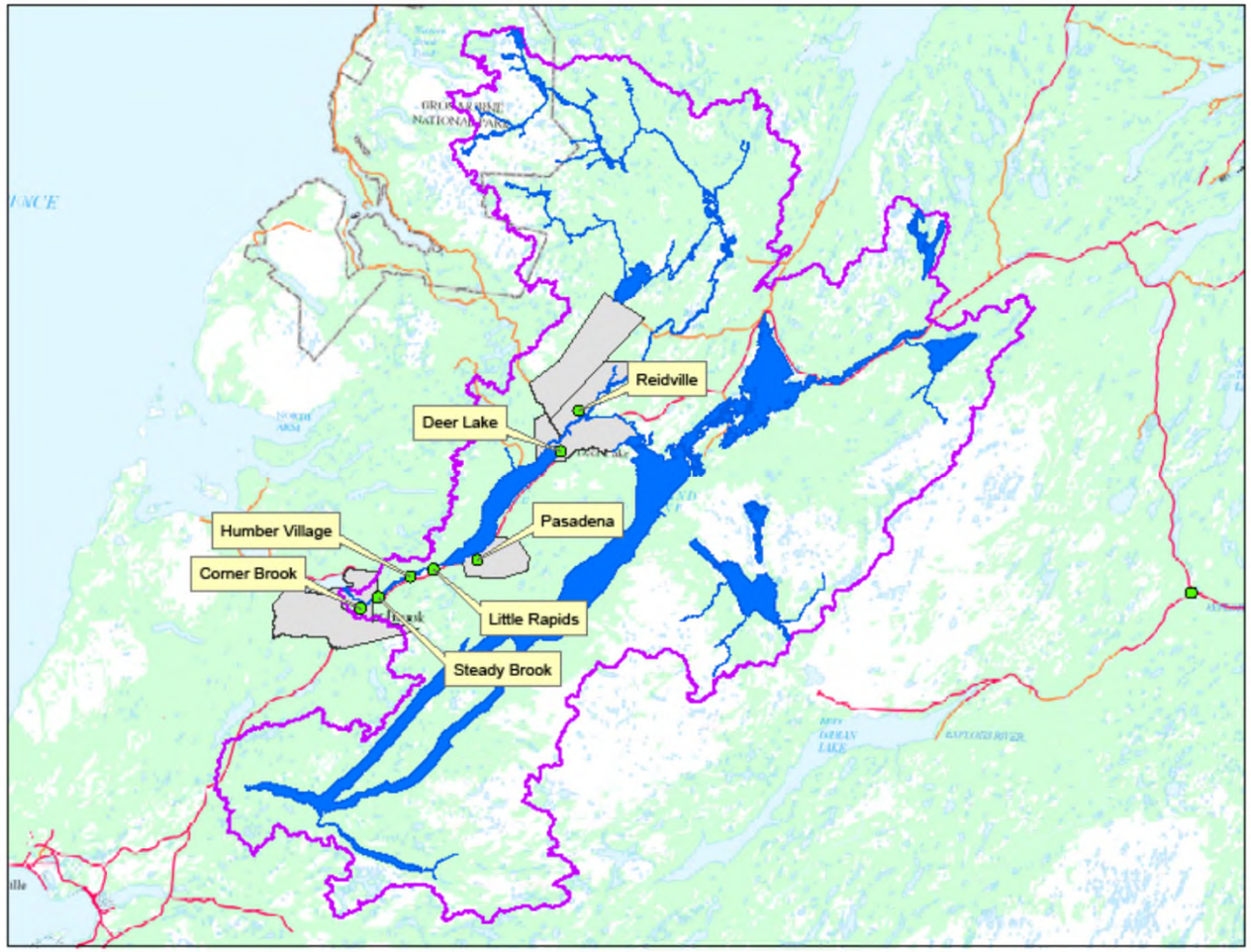
Newfoundland Labrador

NEW Exploits River Flood Forecasting System



Newfoundland Labrador

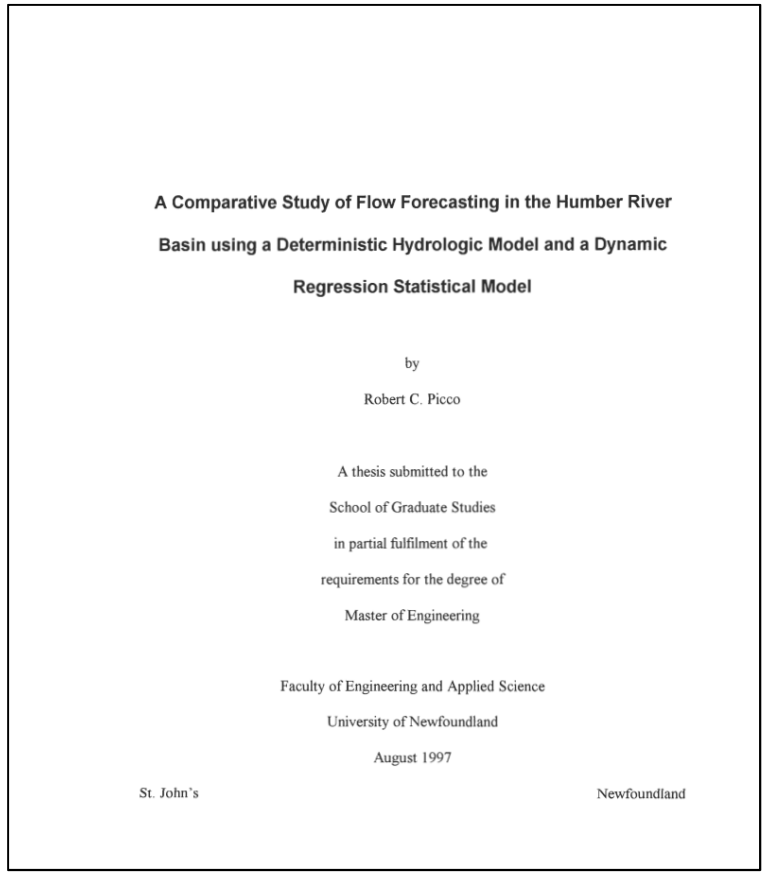
Humber River Flood Forecasting System



- The Humber River basin is the second largest watershed in the island of Newfoundland located at the western part of the island with an area of 8,011 sq-km.
- The Humber River drains into Atlantic Ocean through the Bay of Islands
- Grand Lake is regulated at Deer Lake power station before discharging into Humber River at Deer Lake

Newfoundland Labrador

Humber River Flood Forecasting System



A Comparative Study of Flow Forecasting in the Humber River Basin using a Deterministic Hydrologic Model and a Dynamic Regression Statistical Model

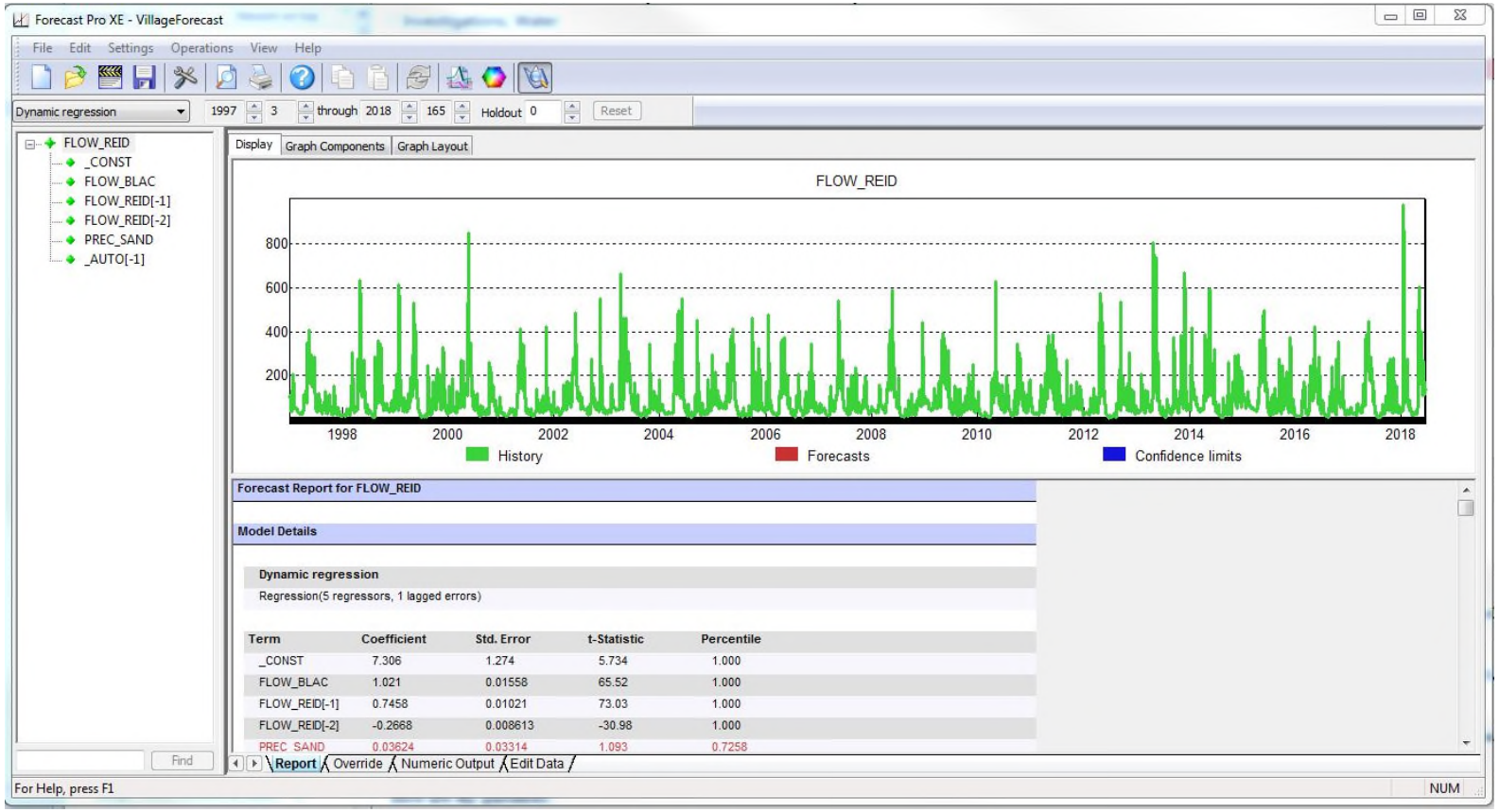
by

Robert C. Picco

A thesis submitted to the
School of Graduate Studies
in partial fulfilment of the
requirements for the degree of
Master of Engineering

Faculty of Engineering and Applied Science
University of Newfoundland
August 1997

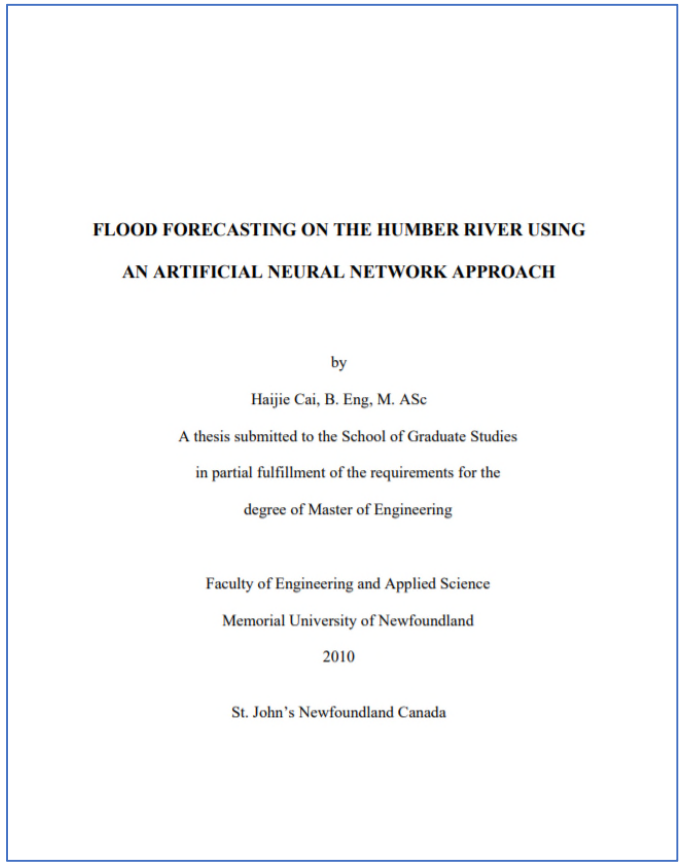
St. John's Newfoundland



https://www.mae.gov.nl.ca/waterres/flooding/Picco_1997_%20DynamicRegressionModel_Humber.pdf

Newfoundland Labrador

Humber River Flood Forecasting System



FLOOD FORECASTING ON THE HUMBER RIVER USING

AN ARTIFICIAL NEURAL NETWORK APPROACH

by

Haijie Cai, B. Eng, M. ASc

A thesis submitted to the School of Graduate Studies

in partial fulfillment of the requirements for the

degree of Master of Engineering

Faculty of Engineering and Applied Science

Memorial University of Newfoundland

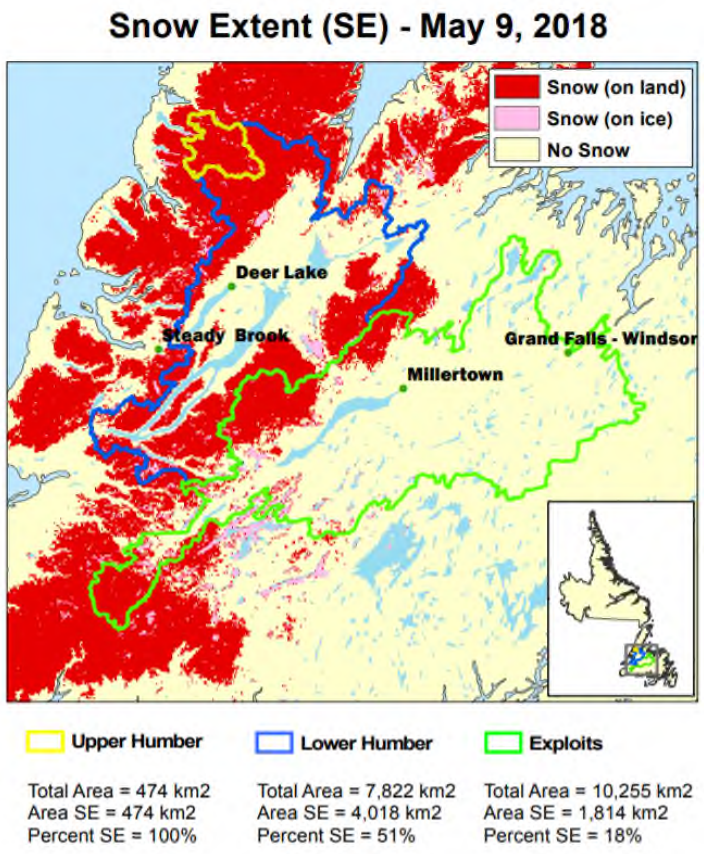
2010

St. John's Newfoundland Canada

https://www.mae.gov.nl.ca/waterres/flooding/Cai_2009_NeuralNetworkModel_Humber.pdf

Newfoundland Labrador

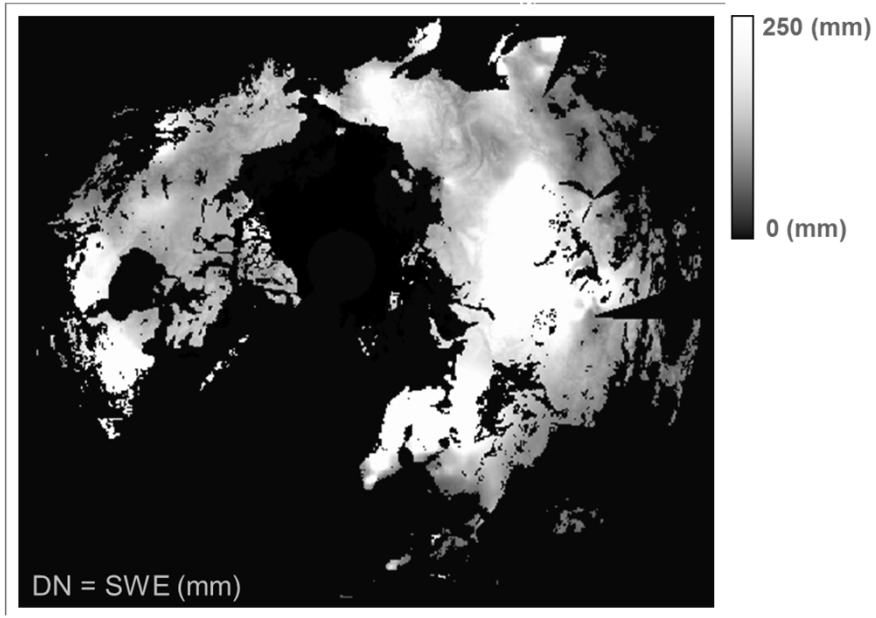
Humber River Flood Forecasting System



https://www.mae.gov.nl.ca/waterres/flooding/radar_images/2017_18/Snow/May_9_2018_Snow%20Extent%20Map.pdf

Since 2008 have been producing Snow Extent Maps using EO

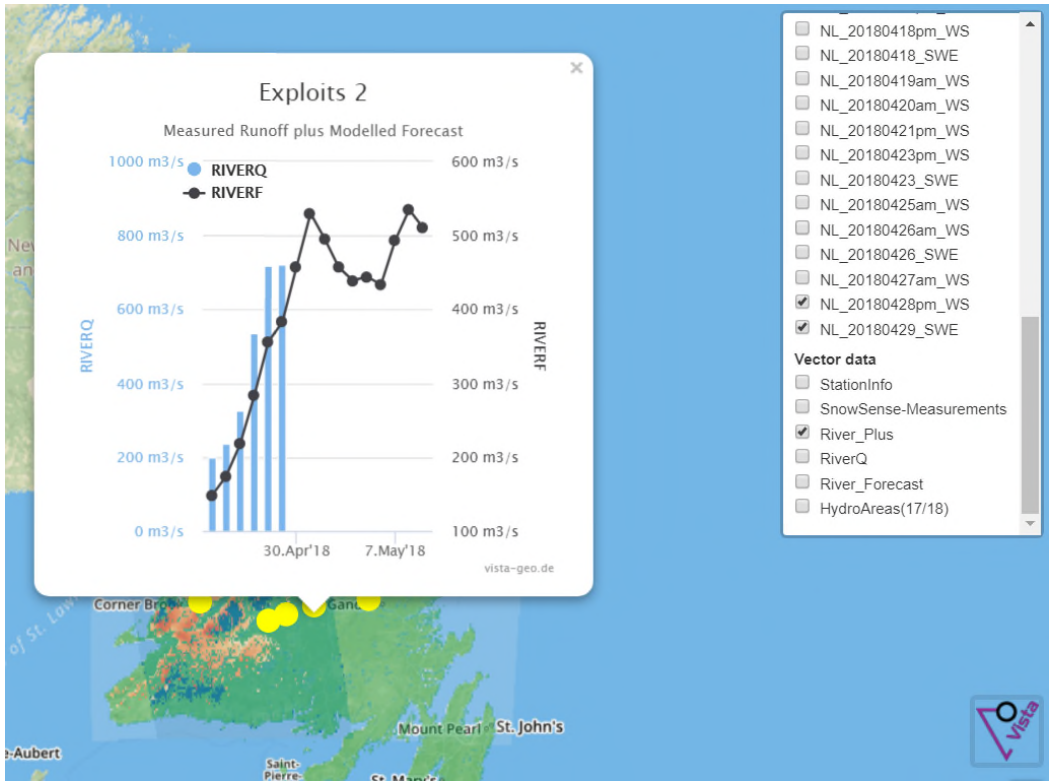
In 2009 participated in ESA GlobSnow project for SWE maps. Resolution was not ideal for operational use

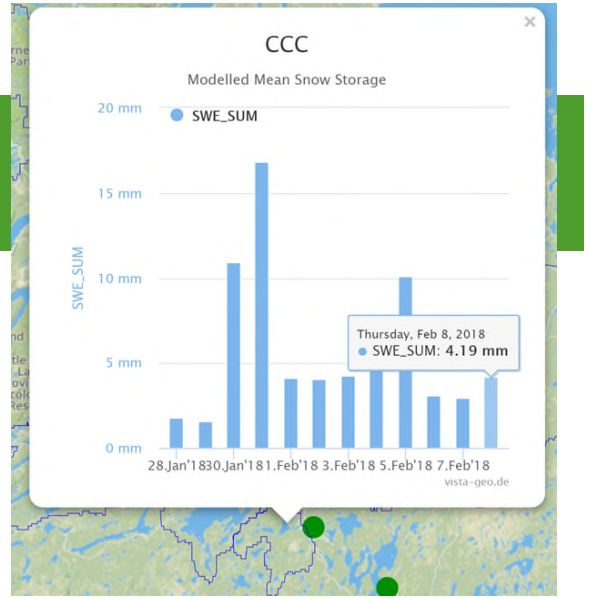


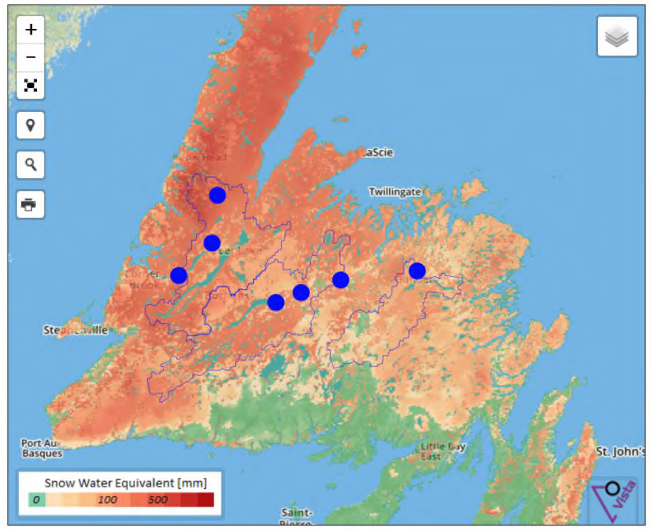
Newfoundland Labrador

ESA Snowsense

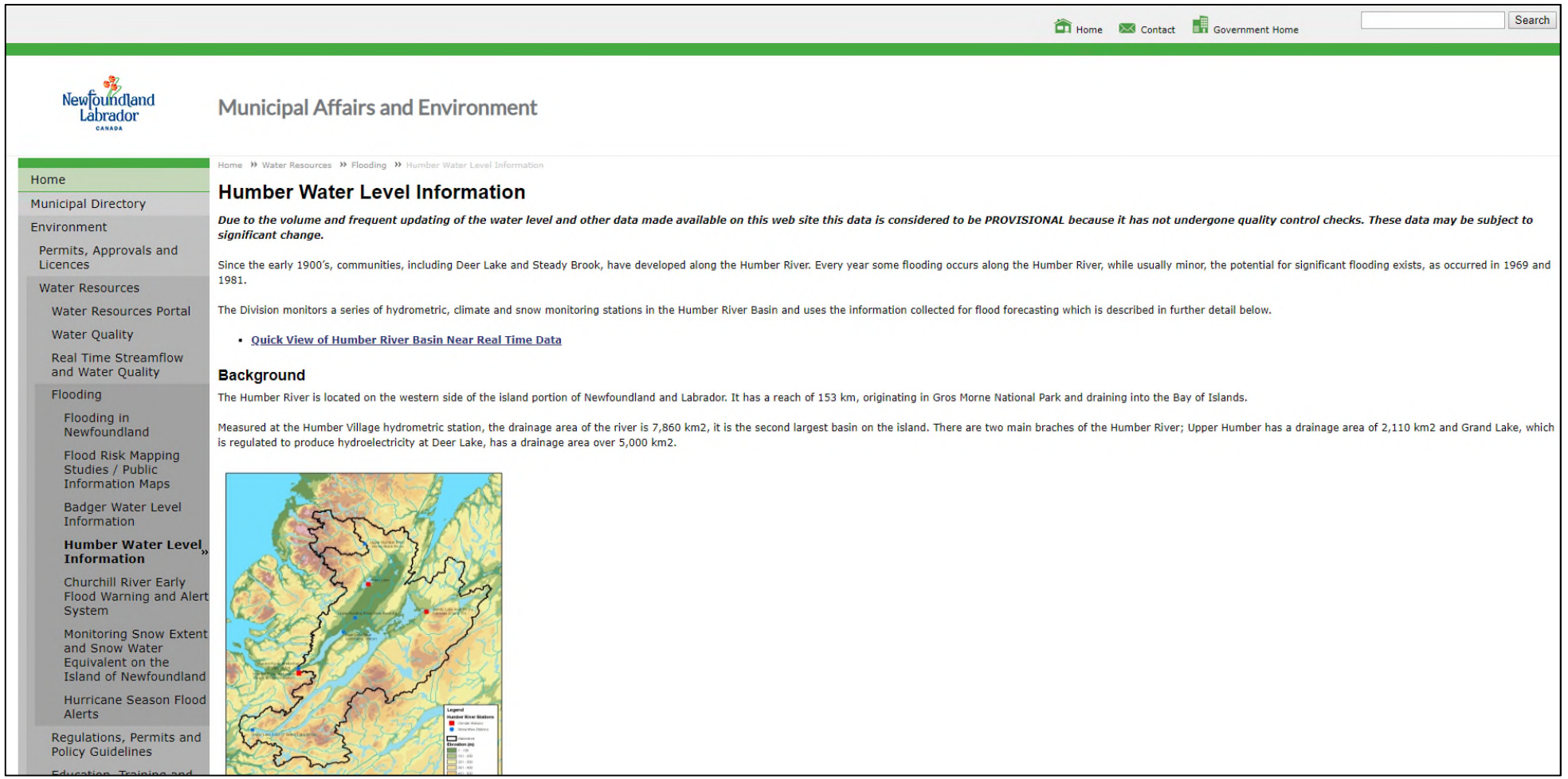
- **SWE**
- **Run-Off Forecasts**
- **Satellite Observations**
- **Snow Station measurements**





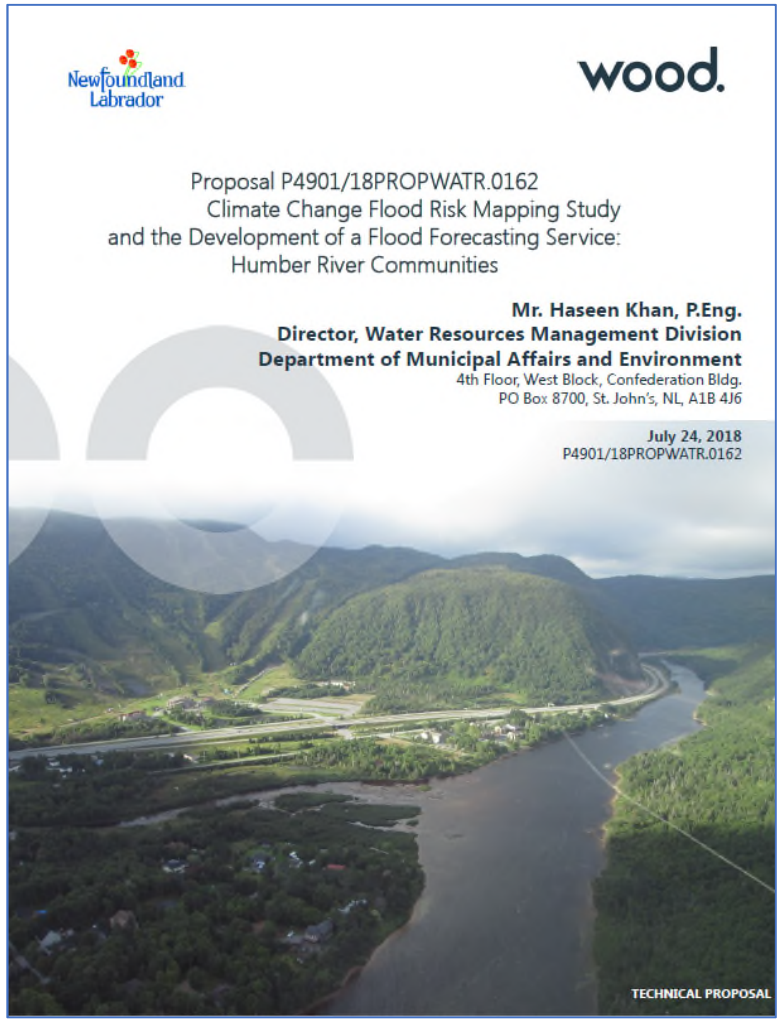


Humber River Flood Forecasting System



https://www.mae.gov.nl.ca/waterres/flooding/humber.html

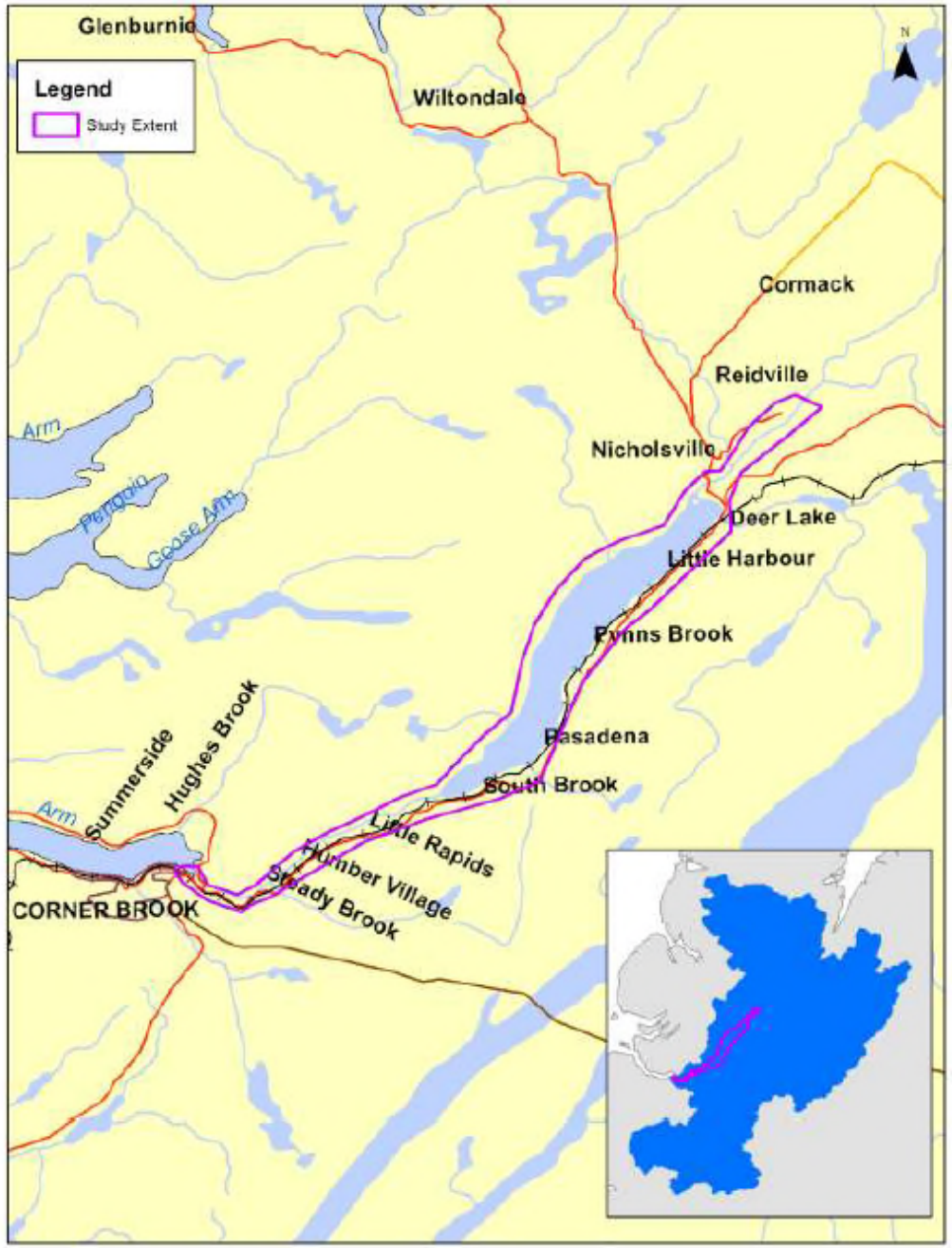
NEW Humber River Flood Forecasting System



- March 2020
- HEC-RTS
  - HEC-HMS
  - HEC-RAS
  - RIVICE

Dr. Karl-Erich Lindenschmidt, PhD, PEng
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Newfoundland Labrador


Glenburnie
Legend
Study Extent
Wiltondale
N
Cormack
Reidville
Nicholsville
Deer Lake
Little Harbour
Pynns Brook
Pasadena
South Brook
Little Rapids
Humber Village
Steady Brook
CORNER BROOK
Summerside
Hughes Brook
Arm
Goose Arm
Arm

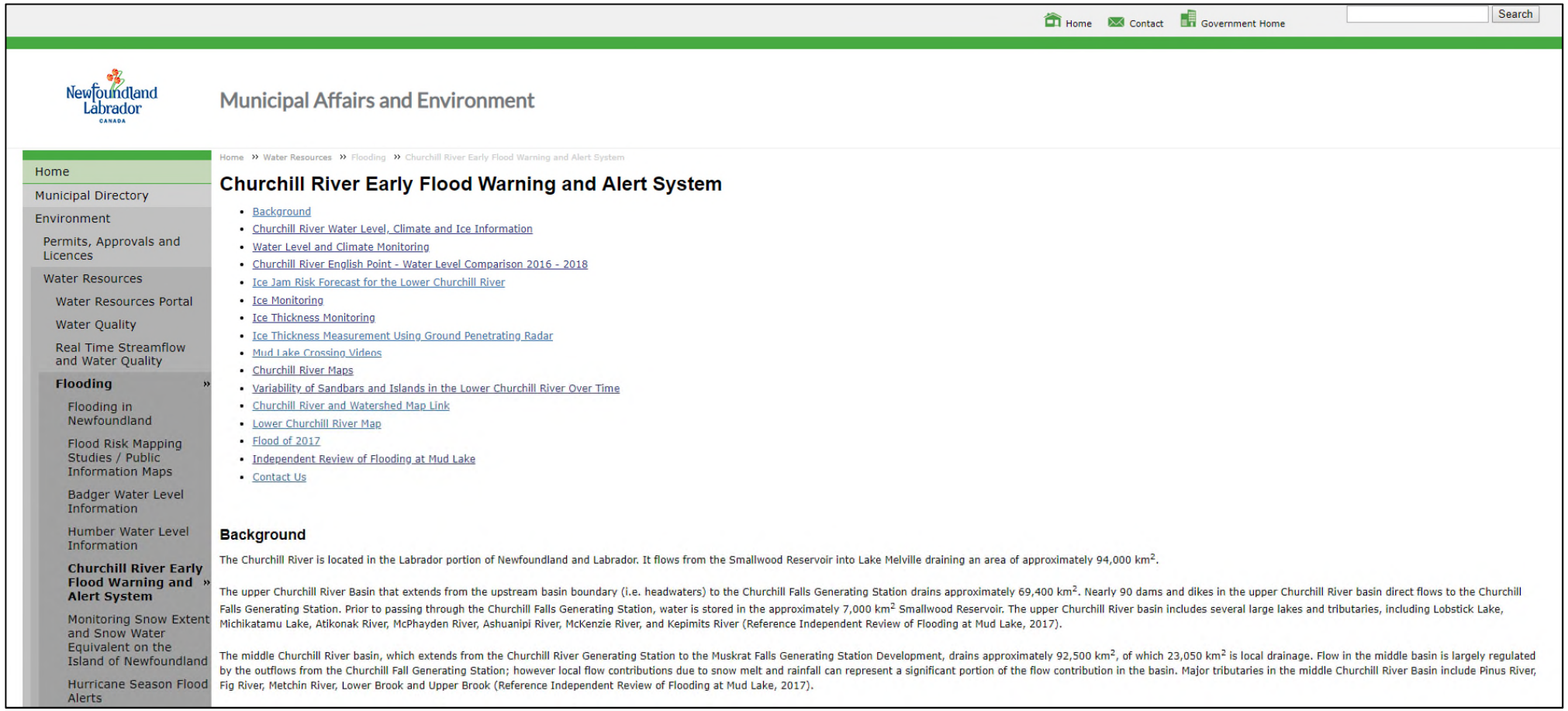
Lower Churchill River Flood Forecasting System



- The Churchill River watershed is the largest watershed with an area of 94,258 sq-km.
- The Churchill River drains into Atlantic Ocean through Lake Melville
- The river is regulated at two locations
  - Churchill Falls, 335 km upstream
  - Muskrat Falls, 45 km upstream

Newfoundland Labrador

Lower Churchill River Flood Forecasting System



Home Contact Government Home Search

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Home » Water Resources » Flooding » Churchill River Early Flood Warning and Alert System

- Home
- Municipal Directory
- Environment
- Permits, Approvals and Licences
- Water Resources
- Water Resources Portal
- Water Quality
- Real Time Streamflow and Water Quality
- **Flooding**
- Flooding in Newfoundland
- Flood Risk Mapping Studies / Public Information Maps
- Badger Water Level Information
- Humber Water Level Information
- **Churchill River Early Flood Warning and Alert System**
- Monitoring Snow Extent and Snow Water Equivalent on the Island of Newfoundland
- Hurricane Season Flood Alerts

Churchill River Early Flood Warning and Alert System

- Background
- Churchill River Water Level, Climate and Ice Information
- Water Level and Climate Monitoring
- Churchill River English Point - Water Level Comparison 2016 - 2018
- Ice Jam Risk Forecast for the Lower Churchill River
- Ice Monitoring
- Ice Thickness Monitoring
- Ice Thickness Measurement Using Ground Penetrating Radar
- Mud Lake Crossing Videos
- Churchill River Maps
- Variability of Sandbars and Islands in the Lower Churchill River Over Time
- Churchill River and Watershed Map Link
- Lower Churchill River Map
- Flood of 2017
- Independent Review of Flooding at Mud Lake
- Contact Us

Background

The Churchill River is located in the Labrador portion of Newfoundland and Labrador. It flows from the Smallwood Reservoir into Lake Melville draining an area of approximately 94,000 km^2.

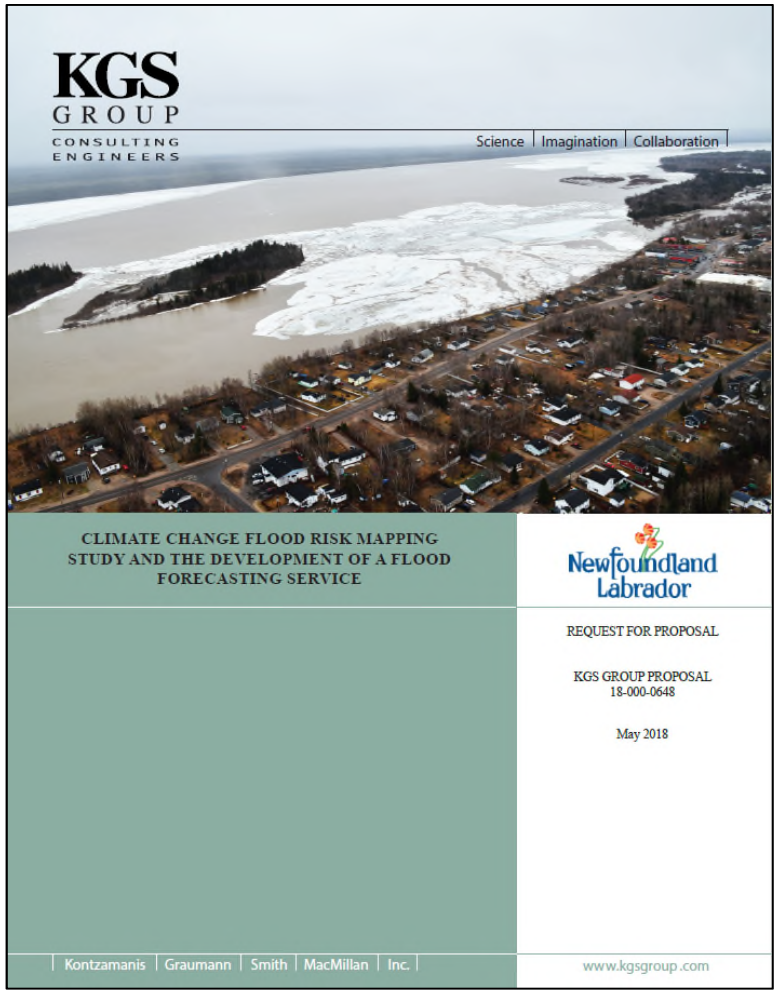
The upper Churchill River Basin that extends from the upstream basin boundary (i.e. headwaters) to the Churchill Falls Generating Station drains approximately 69,400 km^2. Nearly 90 dams and dikes in the upper Churchill River basin direct flows to the Churchill Falls Generating Station. Prior to passing through the Churchill Falls Generating Station, water is stored in the approximately 7,000 km^2 Smallwood Reservoir. The upper Churchill River basin includes several large lakes and tributaries, including Lobstick Lake, Michikatamu Lake, Atikonak River, McPhayden River, Ashuanipi River, McKenzie River, and Kepimits River (Reference Independent Review of Flooding at Mud Lake, 2017).

The middle Churchill River basin, which extends from the Churchill River Generating Station to the Muskrat Falls Generating Station Development, drains approximately 92,500 km^2, of which 23,050 km^2 is local drainage. Flow in the middle basin is largely regulated by the outflows from the Churchill Fall Generating Station; however local flow contributions due to snow melt and rainfall can represent a significant portion of the flow contribution in the basin. Major tributaries in the middle Churchill River Basin include Pinus River, Fig River, Metchin River, Lower Brook and Upper Brook (Reference Independent Review of Flooding at Mud Lake, 2017).

https://www.mae.gov.nl.ca/waterres/flooding/lc_flood_warning.html

Newfoundland Labrador

Lower Churchill River Flood Forecasting System



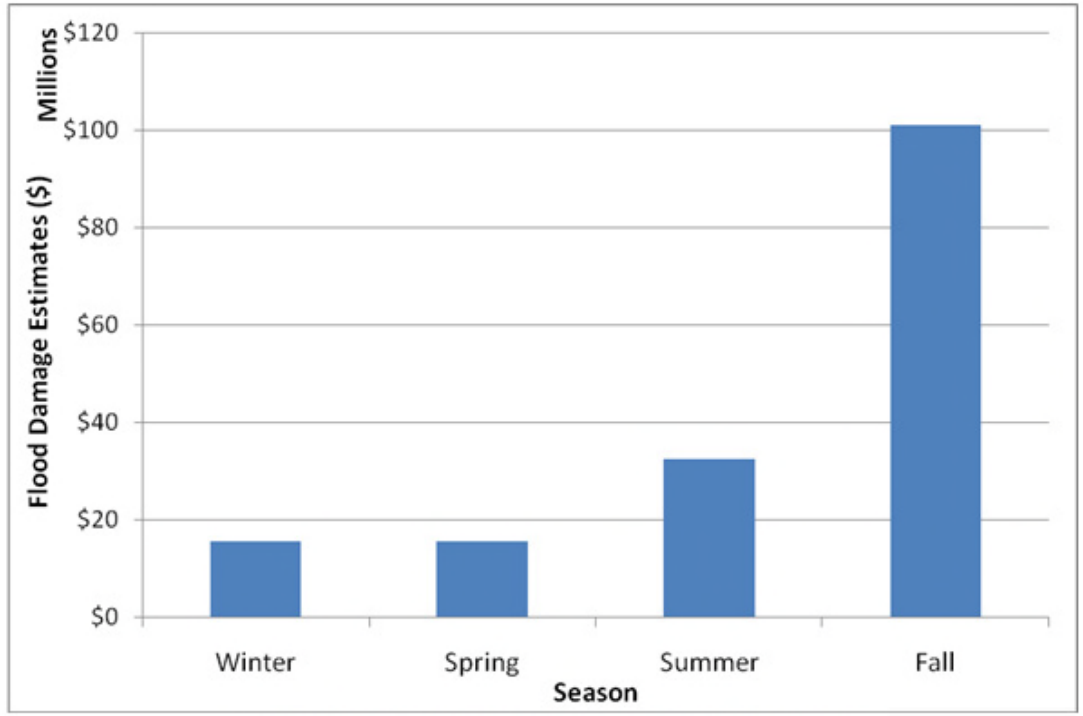
- March 2019
- Hydrologix
  - HEC-HMS
  - HEC-RAS
  - RIVICE

4DM Inc.

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Newfoundland
Labrador

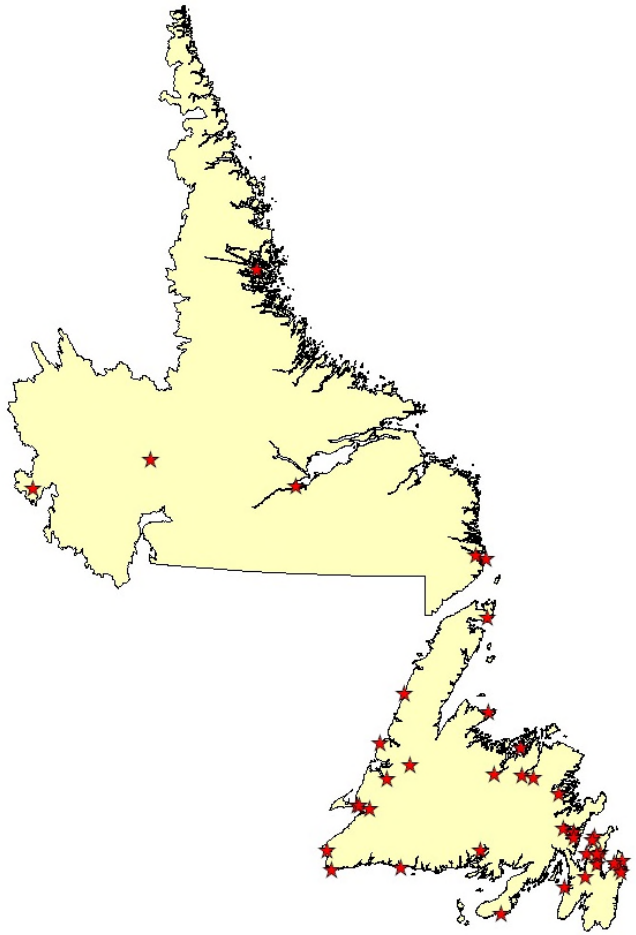
Hurricane Season Flood Alert System



Total DFAA Flood Damage Estimates from 2000-2010

Newfoundland Labrador

Hurricane Season Flood Alert System



Hurricane Season

June 1 to December 31

45 Communities/Areas

Newfoundland Labrador

Wood Hurricane Season Flood Alert - Environment and Conservation

wood.

Issued At: Sunday 21 October 2018 0900 NDT Valid Until: Wednesday 24 October 2018 0900 NDT

Community	12-Hour Precipitation			24-Hour Precipitation		
	Forecast (mm)	20-yr Limit	100-yr Limit Start Time (NDT)	Forecast (mm)	20-yr Limit	100-yr Limit Start Time (NDT)
Areas with Flood Risk Mapping and Precipitation Induced Flooding (www.env.gov.nl.ca/env/)						
Appleton/Glenwood	94	60	75 21-Oct 09:30	65	78	99 21-Oct 00:30
Bay Roberts (Shearstown)	55	76	108 21-Oct 15:30	56	90	132 21-Oct 15:30
Bishops Falls	94	60	75 21-Oct 09:30	78	78	99 21-Oct 00:30
Carbonear	55	74	95 21-Oct 15:30	56	95	117 21-Oct 15:30
Clarenville (Shoal Harbour)	70		21-Oct 15:30	83	82	115 21-Oct 03:30
Cold Brook, Kippens (Gaudon's Brook)	82	69	86 20-Oct 21:30	70		20-Oct 21:30
Corner Brook	64	54	62 20-Oct 21:30	64	66	76 20-Oct 21:30
Deer Lake, Steady Brook	66	54	66 20-Oct 21:30	67	63	78 20-Oct 21:30
Glovertown	71	60	75 21-Oct 09:30	70	78	99 21-Oct 03:30
Great Codroy (Codroy Valley)	82	98	121 20-Oct 21:30	83		20-Oct 21:30
Hant's Harbour	59	74	95 21-Oct 15:30	63	95	117 21-Oct 15:30
Heart's Delight-Islington (Heart's Delight)	67	74	95 21-Oct 15:30	70	95	117 21-Oct 03:30
Hickman's Harbour-Robinson Bight (Hickman's Harbour)	70		21-Oct 15:30	82	82	115 21-Oct 03:30
Hodges Cove	70		21-Oct 15:30	82	82	115 21-Oct 03:30
Logy Bay-Middle Cove-Outer Cove	33	96	121 21-Oct 21:30	35	110	137 21-Oct 12:30
Mount Pearl, St. John's	37	77	95 21-Oct 21:30	39	91	111 21-Oct 09:30
Petty Harbour, St. John's (Goulds)	38	96	121 21-Oct 21:30	40	110	137 21-Oct 09:30
Portugal Cove-St. Philip's	40		21-Oct 21:30	41	112	138 21-Oct 09:30
Salmon Cove	55	74	95 21-Oct 15:30	59	95	117 21-Oct 15:30
Stephenville	82	79	102 20-Oct 21:30	70	105	136 20-Oct 21:30
Stephenville Crossing, Black Duck Siding	86	79	102 20-Oct 21:30	70	105	136 20-Oct 21:30
Trout River	63	75	93 20-Oct 21:30	64	93	116 20-Oct 21:30
Victoria	55	74	95 21-Oct 15:30	59	95	117 21-Oct 15:30
Whitbourne	64	74	95 21-Oct 15:30	70	95	117 21-Oct 03:30
Winterton	59	74	95 21-Oct 15:30	63	95	117 21-Oct 03:30
Areas with EC IDFs but no Flood Risk Mapping (ftp://arcdm20.tor.ec.gc.ca/publ/dist/IDF/)						
Argentia (ARGENTIA AUT)	64	141	198 21-Oct 15:30	80	153	210 21-Oct 03:30
Battle Harbour (BATTLE HARBOUR LOR)	19	51	62 20-Oct 21:30	9	69	86 20-Oct 21:30
Burgeo (BURGEO NL)	102	85	101 20-Oct 21:30	107	102	123 20-Oct 21:30
Channel-Port aux Basques (Port Aux Basques)	76	92	133 20-Oct 21:30	76	115	145 20-Oct 21:30
Churchill Falls	9	44	55 20-Oct 21:30	10	52	64 20-Oct 21:30
Comfort Cove (COMFORT COVE)	73	62	84 21-Oct 09:30	55	72	91 21-Oct 00:30
Daniel's Harbour (DANIELS HARBOUR)	51	75	97 20-Oct 21:30	50	105	139 20-Oct 21:30
Gander (GANDER AIRPORT CS)	81	61	76 21-Oct 09:30	66	77	98 21-Oct 03:30
Happy Valley-Goose Bay (GOOSE A)	12	51	63 22-Oct 15:30	14	65	81 22-Oct 06:30
La Scie (LA SCIE)	34	66	84 21-Oct 06:30	35	78	96 20-Oct 21:30
Mary's Harbour (MARY'S HARBOUR A)	15	51	64 20-Oct 21:30	13	71	92 20-Oct 21:30
Nain (NAIN A)	18	52	64 21-Oct 03:30	27	63	78 20-Oct 21:30
St. Alban's (ST ALBANS)	105	95	116 21-Oct 06:30	116	142	163 20-Oct 21:30
St. Anthony (ST ANTHONY)	32	58	70 20-Oct 21:30	32	78	97 20-Oct 21:30
St. Lawrence (ST LAWRENCE)	104	93	114 21-Oct 06:30	96	108	134 21-Oct 00:30
Wabush (WABUSH LAKE A)	8	43	53 20-Oct 21:30	12	54	67 20-Oct 21:30

Forecasts are for a 72 hour period starting Sun Oct 21, 2018 09:00 and ending Wed Oct 24, 2018 09:00 NDT.

Exceeds 24-hourly 20-yr limit	Exceeds 12-hourly 20-yr limit
Exceeds 24-hourly 100-yr limit	Exceeds 12-hourly 100-yr limit

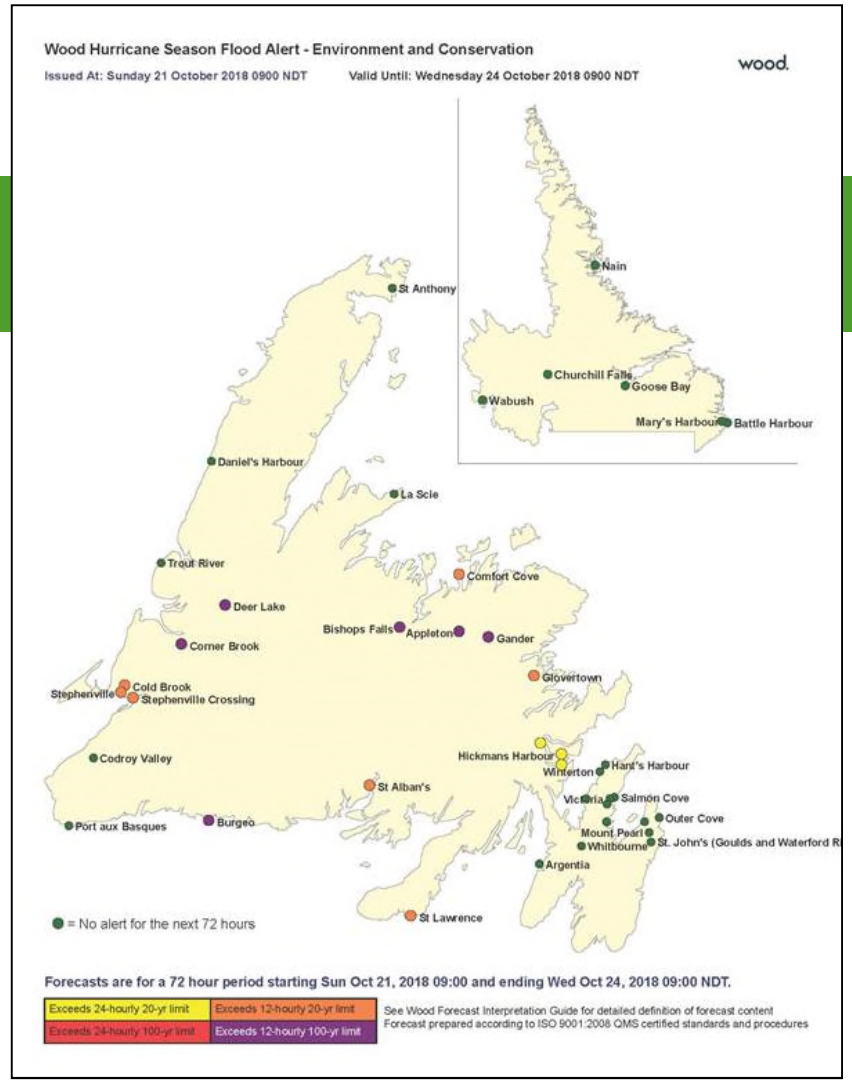
See Wood Forecast Interpretation Guide for detailed definition of forecast content
Forecast prepared according to ISO 9001:2008 QMS certified standards and procedures

The Wood Flood Forecast Product (FFP) is the result of examining many of the available models from Environment Canada, the US National Oceanic and Atmospheric Administration, and AMEC's in-house implementation of the Weather and Research Forecast model.

Wood also examines the various model precipitation outputs within a given radius of a point of interest. This allows Wood to identify potential flood situations where a particular model may have accurately modelled precipitation amount or identified a flood situation but erred in the placement of its location.

Newfoundland Labrador

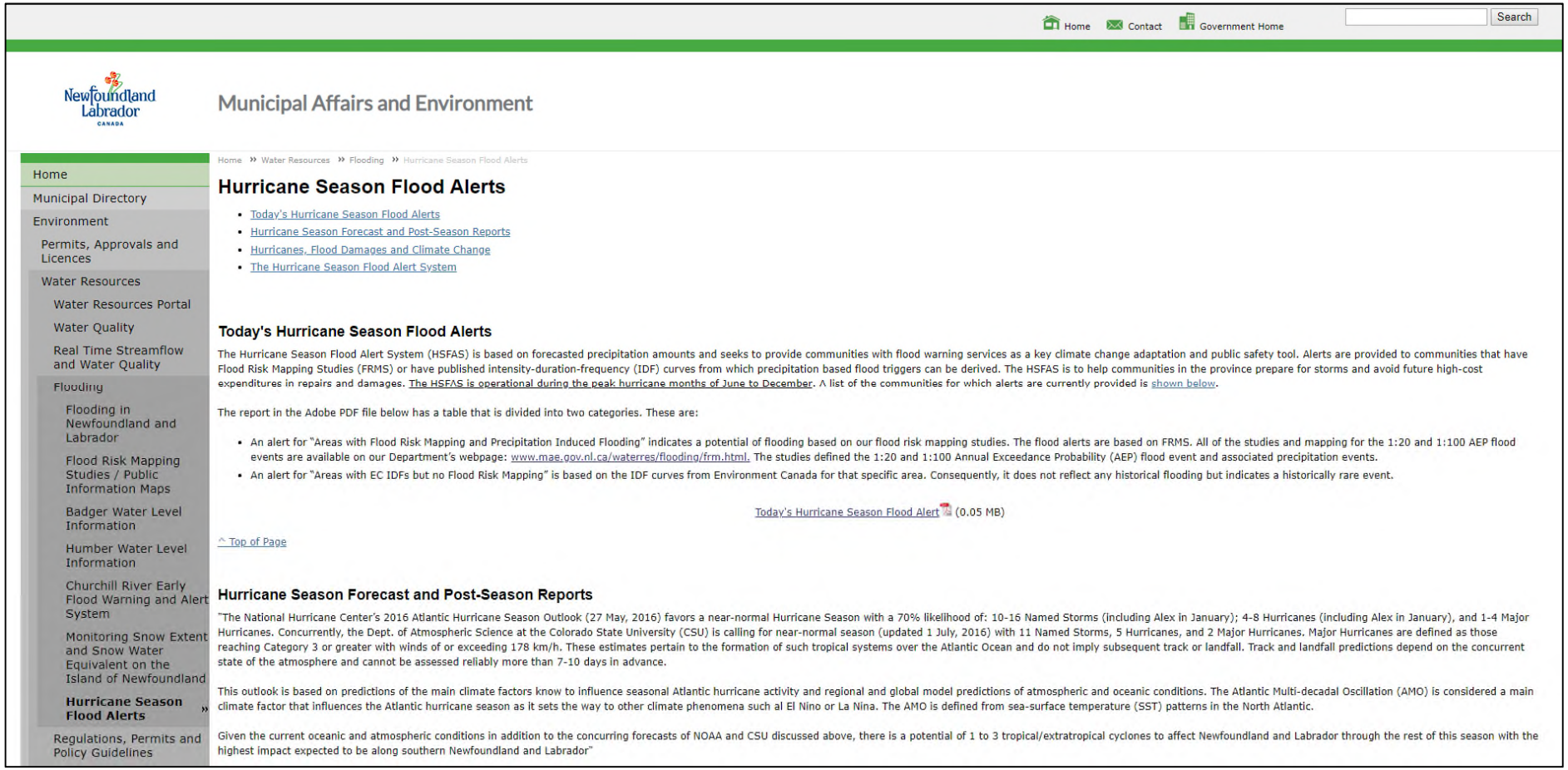




This system generated over 9630 flood forecasts for 45 communities/areas and issued 59 flood alerts in 2018.

Newfoundland Labrador

Hurricane Season Flood Alert System



Home Contact Government Home Search

Newfoundland Labrador CANADA

Municipal Affairs and Environment

Home » Water Resources » Flooding » Hurricane Season Flood Alerts

- Home
- Municipal Directory
- Environment
  - Permits, Approvals and Licences
  - Water Resources
    - Water Resources Portal
    - Water Quality
    - Real Time Streamflow and Water Quality
    - Flooding
      - Flooding in Newfoundland and Labrador
      - Flood Risk Mapping Studies / Public Information Maps
      - Badger Water Level Information
      - Humber Water Level Information
      - Churchill River Early Flood Warning and Alert System
      - Monitoring Snow Extent and Snow Water Equivalent on the Island of Newfoundland
      - **Hurricane Season Flood Alerts**
    - Regulations, Permits and Policy Guidelines

Hurricane Season Flood Alerts

- Today's Hurricane Season Flood Alerts
- Hurricane Season Forecast and Post-Season Reports
- Hurricanes, Flood Damages and Climate Change
- The Hurricane Season Flood Alert System

Today's Hurricane Season Flood Alerts

The Hurricane Season Flood Alert System (HSFAS) is based on forecasted precipitation amounts and seeks to provide communities with flood warning services as a key climate change adaptation and public safety tool. Alerts are provided to communities that have Flood Risk Mapping Studies (FRMS) or have published intensity-duration-frequency (IDF) curves from which precipitation based flood triggers can be derived. The HSFAS is to help communities in the province prepare for storms and avoid future high-cost expenditures in repairs and damages. The HSFAS is operational during the peak hurricane months of June to December. A list of the communities for which alerts are currently provided is shown below.

The report in the Adobe PDF file below has a table that is divided into two categories. These are:

- An alert for "Areas with Flood Risk Mapping and Precipitation Induced Flooding" indicates a potential of flooding based on our flood risk mapping studies. The flood alerts are based on FRMS. All of the studies and mapping for the 1:20 and 1:100 AEP flood events are available on our Department's webpage: www.mae.gov.nl.ca/waterres/flooding/frm.html. The studies defined the 1:20 and 1:100 Annual Exceedance Probability (AEP) flood event and associated precipitation events.
- An alert for "Areas with EC IDFs but no Flood Risk Mapping" is based on the IDF curves from Environment Canada for that specific area. Consequently, it does not reflect any historical flooding but indicates a historically rare event.

Today's Hurricane Season Flood Alert (0.05 MB)

^ Top of Page

Hurricane Season Forecast and Post-Season Reports

"The National Hurricane Center's 2016 Atlantic Hurricane Season Outlook (27 May, 2016) favors a near-normal Hurricane Season with a 70% likelihood of: 10-16 Named Storms (including Alex in January); 4-8 Hurricanes (including Alex in January), and 1-4 Major Hurricanes. Concurrently, the Dept. of Atmospheric Science at the Colorado State University (CSU) is calling for near-normal season (updated 1 July, 2016) with 11 Named Storms, 5 Hurricanes, and 2 Major Hurricanes. Major Hurricanes are defined as those reaching Category 3 or greater with winds of or exceeding 178 km/h. These estimates pertain to the formation of such tropical systems over the Atlantic Ocean and do not imply subsequent track or landfall. Track and landfall predictions depend on the concurrent state of the atmosphere and cannot be assessed reliably more than 7-10 days in advance.

This outlook is based on predictions of the main climate factors know to influence seasonal Atlantic hurricane activity and regional and global model predictions of atmospheric and oceanic conditions. The Atlantic Multi-decadal Oscillation (AMO) is considered a main climate factor that influences the Atlantic hurricane season as it sets the way to other climate phenomena such al El Nino or La Nina. The AMO is defined from sea-surface temperature (SST) patterns in the North Atlantic.

Given the current oceanic and atmospheric conditions in addition to the concurring forecasts of NOAA and CSU discussed above, there is a potential of 1 to 3 tropical/extratropical cyclones to affect Newfoundland and Labrador through the rest of this season with the highest impact expected to be along southern Newfoundland and Labrador"

https://www.mae.gov.nl.ca/waterres/flooding/hurricane.html

Newfoundland Labrador

Thank You!

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Web: https://www.mae.gov.nl.ca/waterres/flooding/index.html

Newfoundland Labrador