Flow Forecasting in Nova Scotia

FEBRUARY 2019 WORKSHOP

NOVA SCOTIA

Presentation Outline

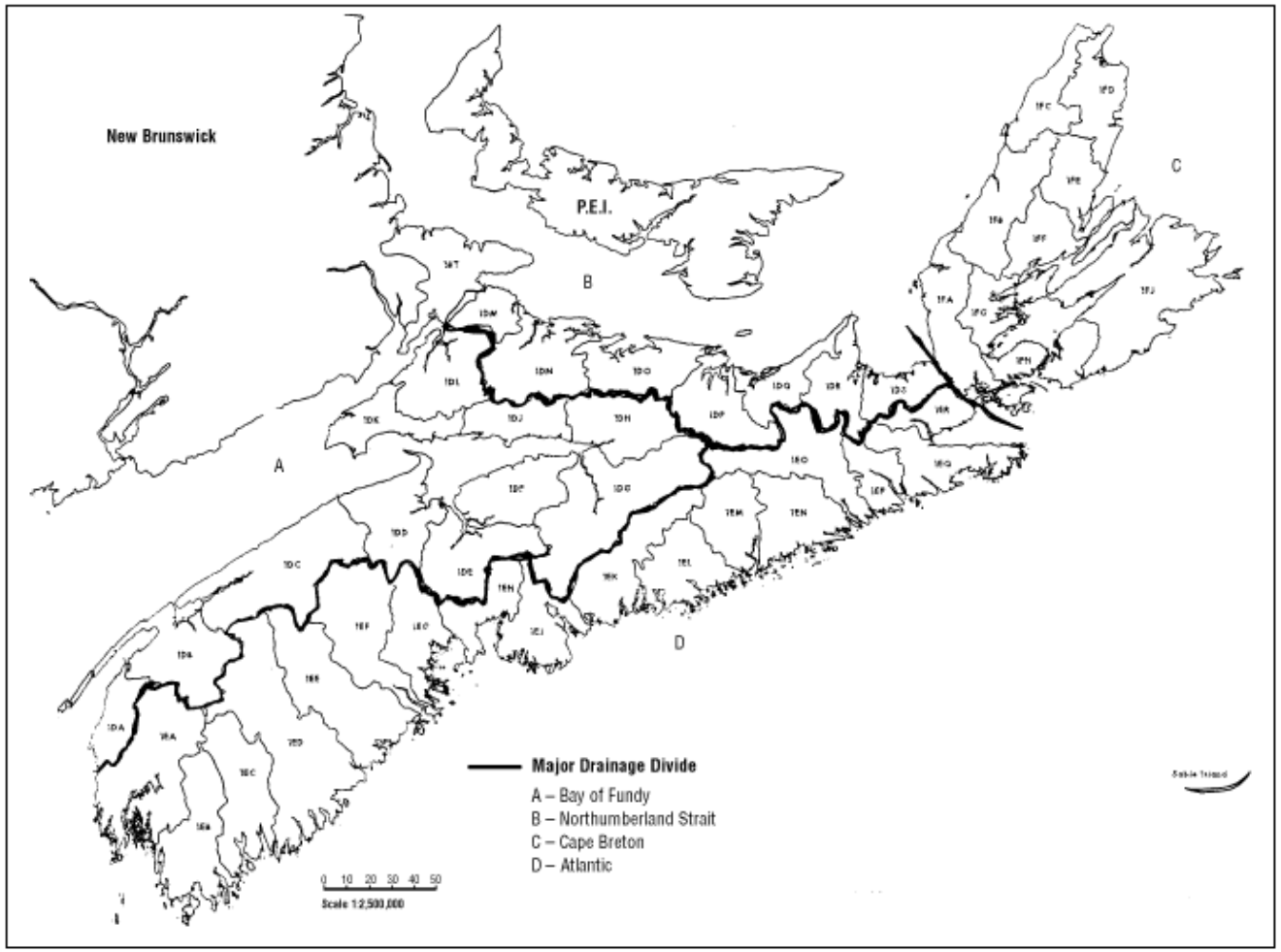
Objective: Provide overview of flow forecasting considerations in Nova Scotia

- Background
  - Nova Scotia Hydrology
  - Flooding and Drought in NS
  - Legislation and Authority

- Flow Forecasting in NS
  - Current approaches
  - Current projects
  - Next steps

NS Hydrology

- High annual precip.
  - ~1,150 – 1,950 mm/year
- Water isolated
  - Bay of Fundy
  - Northumberland Strait
  - Atlantic Ocean
  - Cape Breton



NS Hydrology

T8.1 Freshwater Hydrology

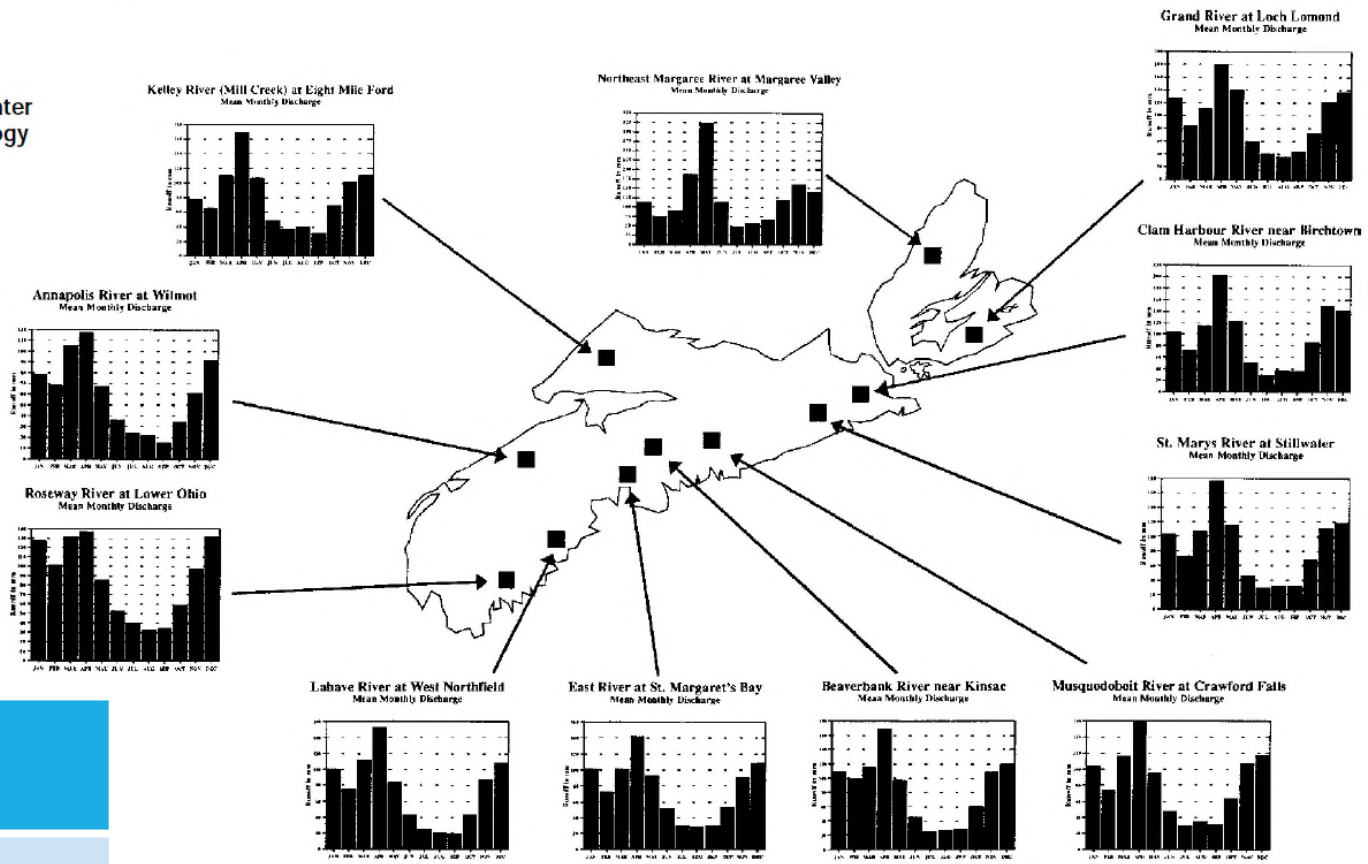


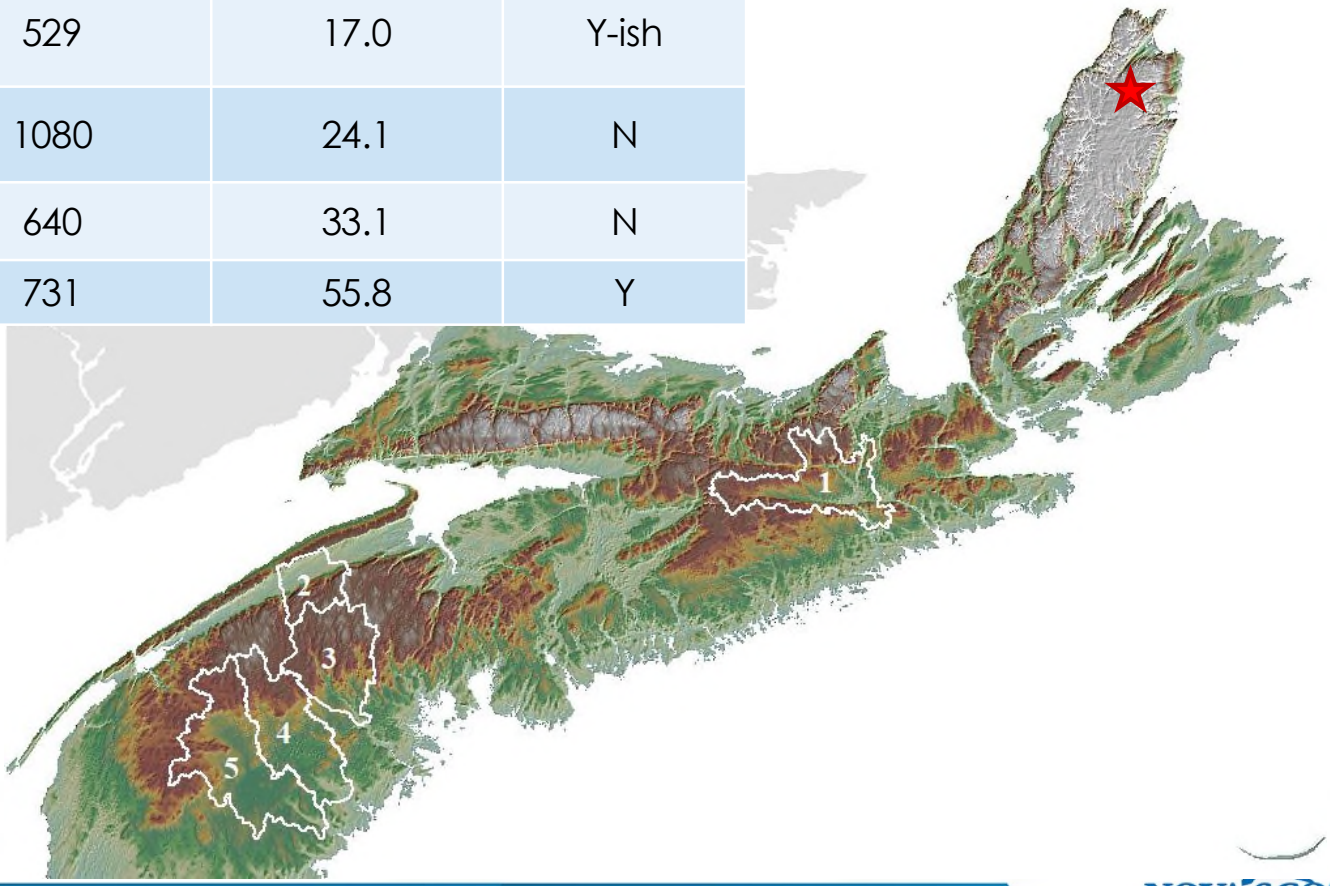
Figure T8.1.4: Mean monthly discharge pattern at selected monitoring sites.[5]

Typical Conditions	Timing
High flow	Nov – May
Low flow	July – Sept
Variable	June, Mid Sept – Oct*

* - Hurricane/Tropical storm season

NS Hydrology

Station Name	Drainage Area (km^2)	Inst. Peak Flow (m^3/s)	Median Flow (m^3/s)	Regulated? (Y/N)
ST. MARYS RIVER AT STILLWATER	1350	976	26.3	N
ANNAPOLIS RIVER AT LAWRENCETOWN	1020	529	17.0	Y-ish
LAHAVE RIVER AT WEST NORTHFIELD	1250	1080	24.1	N
MEDWAY RIVER AT CHARLESTON	1390	640	33.1	N
MERSEY RIVER AT MILTON	1960	731	55.8	Y



NS Hydrology

- 16 Hydro systems
- ~700 water control structures
- Many of largest watercourses regulated

Inland Flooding

- Historically, inland flooding in NS is caused by one or a combination of:
  - Rain on snow/snowmelt events
  - Ice jams
  - Significant convectional storms
  - Cyclonic storms

- Significant coastal influence on the severity of these flood events
  - 17 m tidal range in Bay of Fundy
  - Storm surges typically associated w/ large storm events

Inland Flooding

- Cyclonic storms
  - 1971- Hurricane Beth (>250 mm)
  - 2016 - Hurricane Matthew (~220 mm)
- Matthew resulted in significant flooding in Sydney, NS





Image Sources: The Weather Network, CBC News/Island Aerial Media

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Dry conditions

- Significant dry conditions observed in 2016 and 2018
- Currently working on projects to better define and respond to dry conditions
- Potential for collaboration w/ Ag-Food Canada

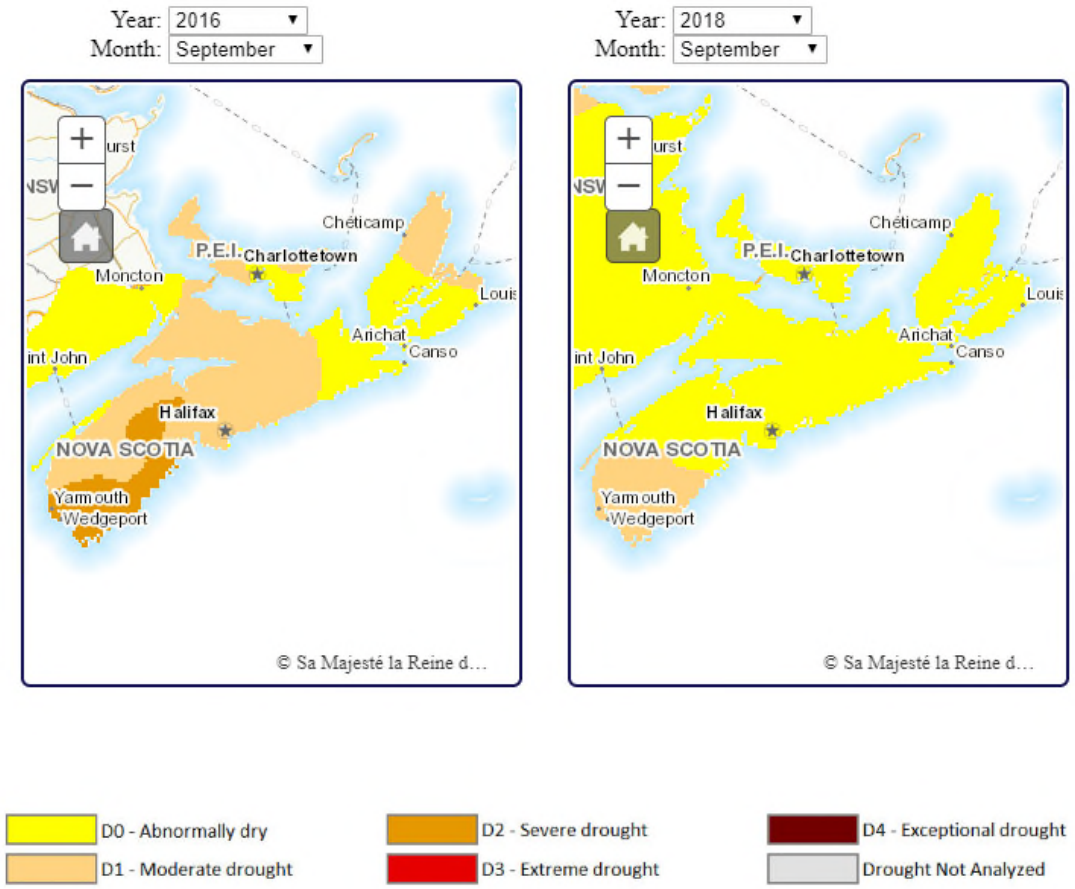


Image Sources: Ag-Food Canada Canadian Drought Monitor

Legislation and Authority

- A number of provincial departments play a role in managing and responding to flood and drought
- Large recent provincial flood initiative involved 6 provincial departments
- Acts with flood related responsibilities include:
  - Municipal Government Act
  - Environment Act
  - Agricultural Marshland Conservation Act

Flow Forecasting

- No formal flow forecasting program in the province
- Currently use information from past events with weather predictions to inform responses
- Currently examining use of R to support more effective assessment of current conditions

Current projects underway

- Creating tools to support development of floodplain maps across province
  - Technical standards and guidance for floodplain mapping in NS
  - Selection of appropriate climate change scenario to be used in NS for floodplain mapping
- Collecting LIDAR for entire province
  - Examining bathymetric LIDAR (Chiroptera II sensor available in NS)
- Coastal Flooding
  - Web-based tool using LIDAR to visualize flood extents under different scenarios
  - Coastal Protection legislation currently in development

Challenges

- Information to support forecasting and resources to complete work
  - Making progress in tools, but resources on-going challenge
- Data gaps
  - Potential hydrometric network gaps
  - Meteorological network
  - Others
- Coastal influence on flooding
  - Most effective approaches to including downstream boundary condition in modelling/predictions

Next steps

- Lay the foundation for flow forecasting in the future
- Understand where to focus efforts so that we can be successful when we move forward
- Work to address data gaps
  - Network review