Hydrology update from Omineca Ministry of Forests Research

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British Columbia

B.C.'s spring snowpack is the lowest on record

Relatively dry conditions continued across most of the province through March, report says

Karin Larsen · CBC News · Posted: Apr 10, 2024 12:20 PM PDT | Last Updated: April 10

Extended drought has resulted in extremely low water levels at the confluence of the Fraser and Nechako Rivers near Prince George, B.C. (Andrew Kurjata/CBC)

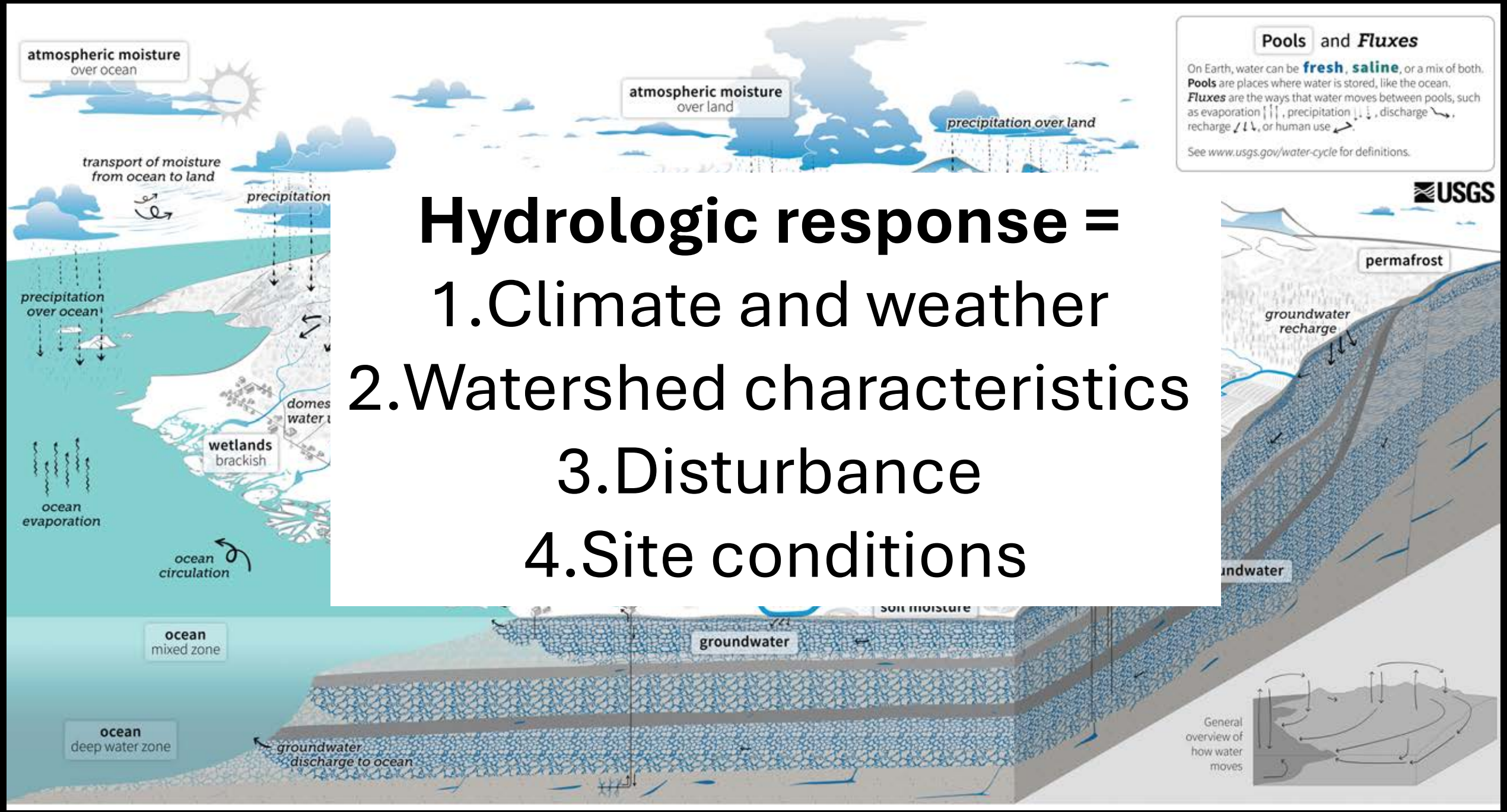
British Columbia

B.C. officials warn of early, 'challenging' wildfire season

Rainfall could avert worst-case scenarios but it's 'unlikely' enough will fall: BCWS

Moira Wyton · CBC News · Posted: Mar 18, 2024 4:24 PM PDT | Last Updated: March 18

A firefighter from an Alaskan unit uses a drip torch to set a planned ignition on a fire burning near a highway in northern British Columbia on July 11, 2023. B.C. officials say the province could see a 'very challenging' wildfire season in 2024 depending on how much rain falls in the coming months. (Jesse Winter)



Hydrologic response =

1. Climate and weather
2. Watershed characteristics
3. Disturbance
4. Site conditions

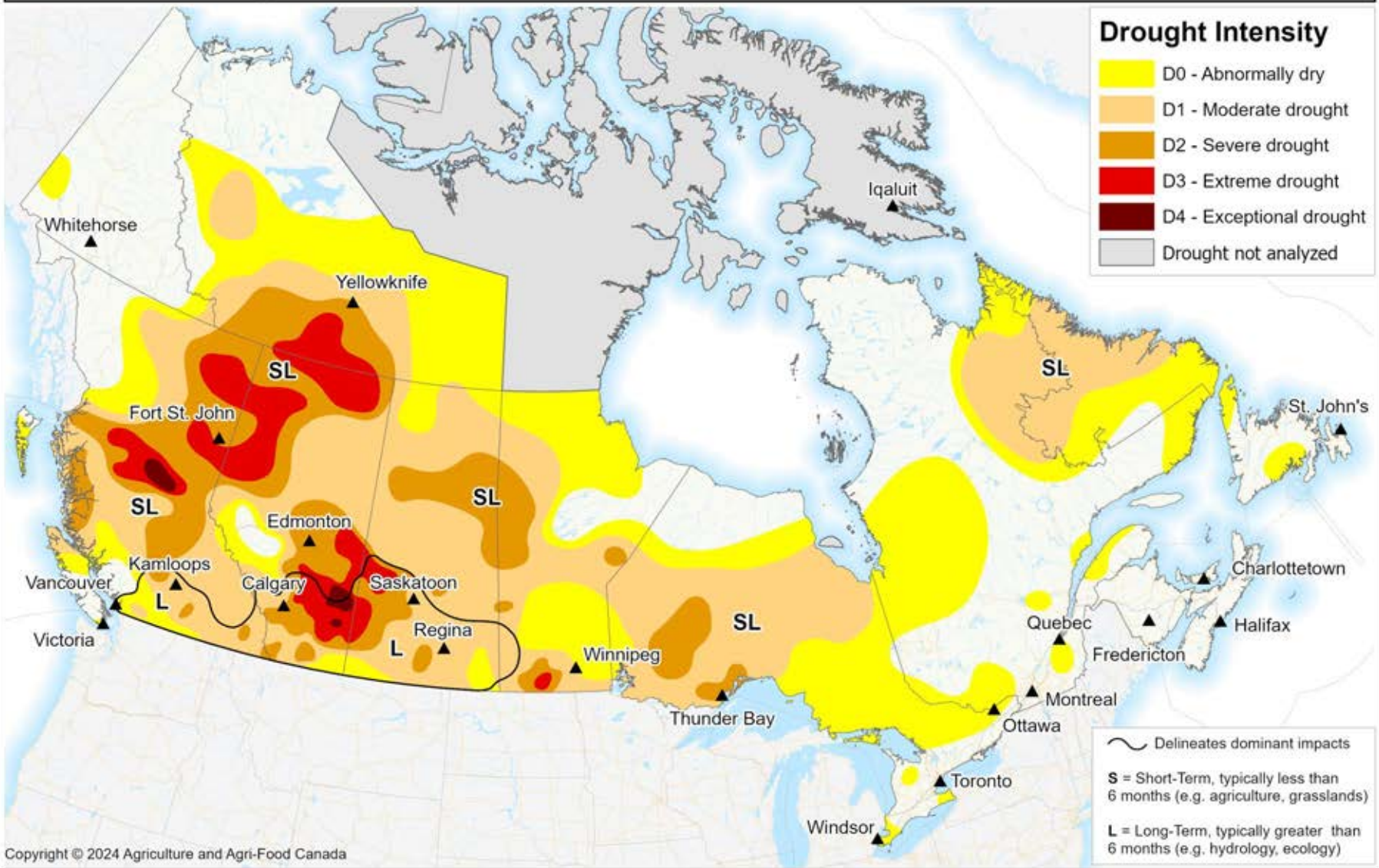

1985
1995
2005
2015
2020
2022

Agriculture and Agri-Food Canada | Agriculture et Agroalimentaire Canada

Canada

Canadian Drought Monitor

Conditions as of March 31, 2024



Prepared by Agriculture and Agri-Food Canada's National Agroclimate Information Service. We also acknowledge various provincial, territorial and non-government organizations whose reports and assessments are consulted.
The Drought Monitor focuses on broad-scale conditions. Regions in northern Canada may not be as accurate as other regions due to limited information.

Created: 2024-04-05
www.agr.gc.ca/drought

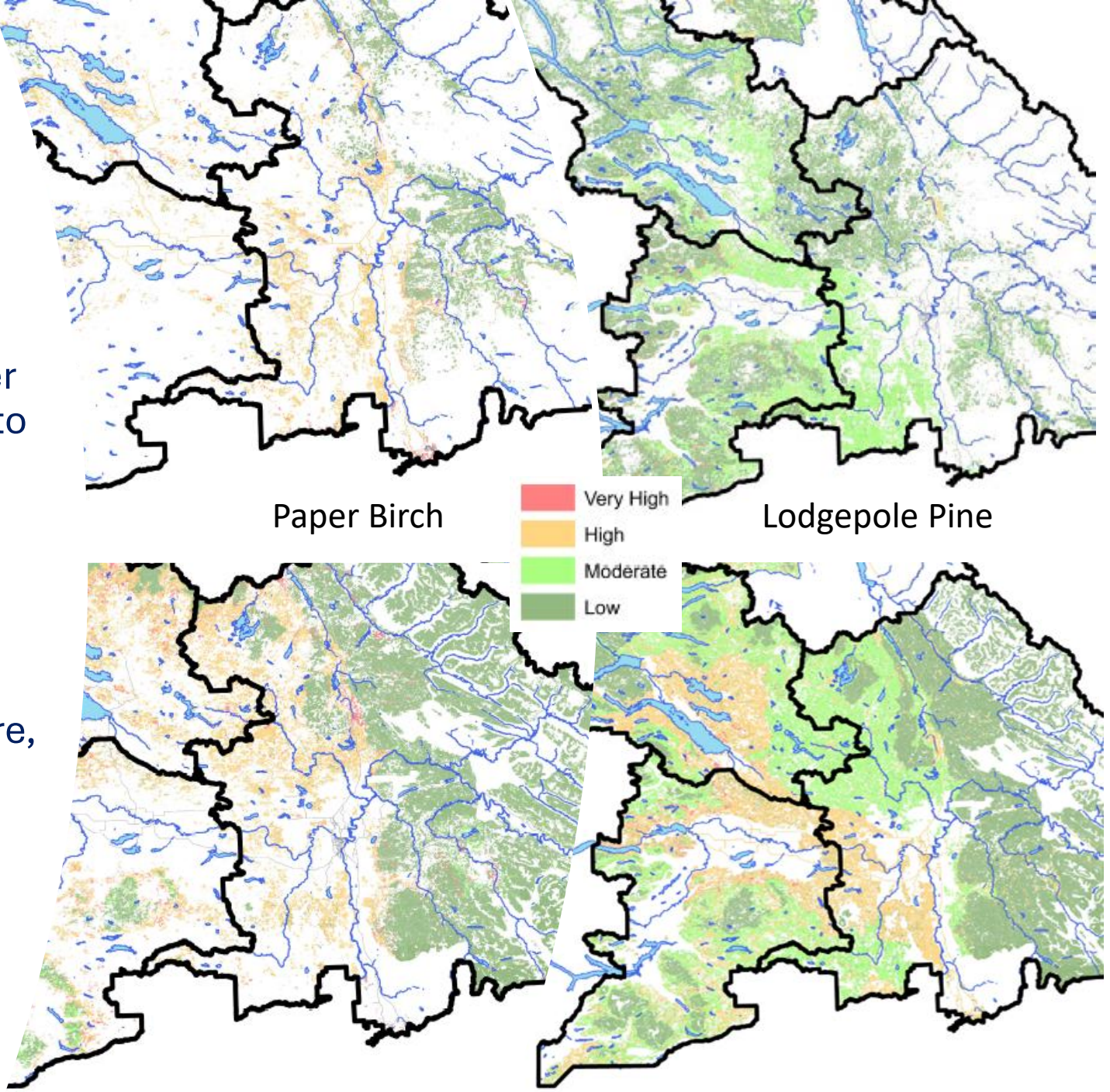
Hydrology and wildfires

- Drought and Wildfire are related
  - **Meteorological**: below-average precipitation (rain/snow)
  - **Hydrological**: streamflow, lake, groundwater, and reservoir
  - **Ecological**: ecosystem is impaired due to a lack of water
- Wildfire impacts
  - Runoff, peak flow, and low flow
  - Stream temperature increase
  - Erosion, sediment transport, and debris flows
  - Water chemistry

Modelled tree drought risk

(V. Foord)

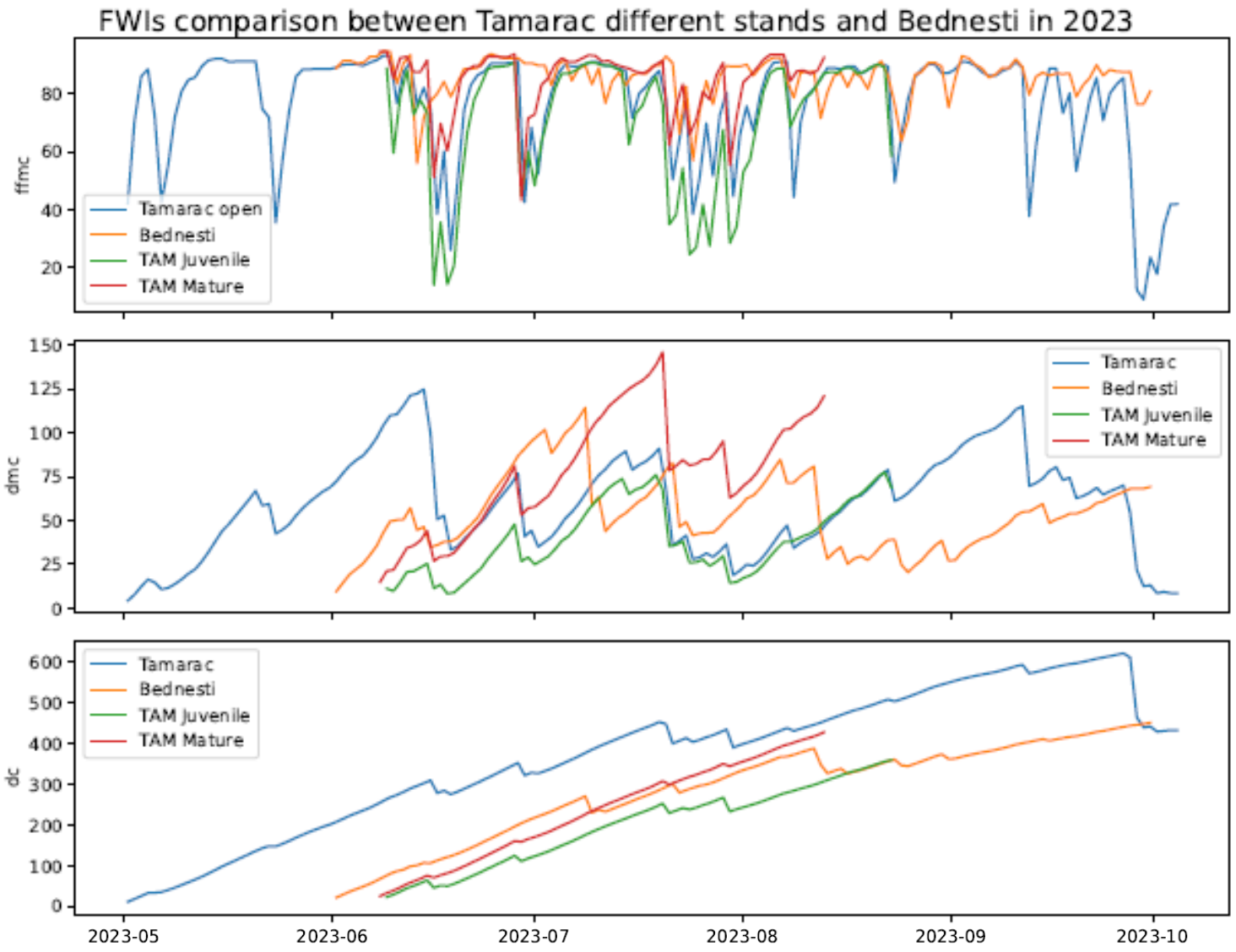
- Climate change may cause drier site conditions that could lead to tree mortality
- 2041-2070 Projections: Prince George, Vanderhoof, Fort St James areas
- Drought stress can lead to secondary disturbances: wildfire, windthrow, pest outbreaks, hydrological change



Wildfire risk in different stand types (V. Foord)

- Clearcut
- Juvenile pine stands
- Mature forest

Wind speed, direction, air temp, surface temp, soil temp, relative humidity, vapour pressure deficit, soil moisture, rain

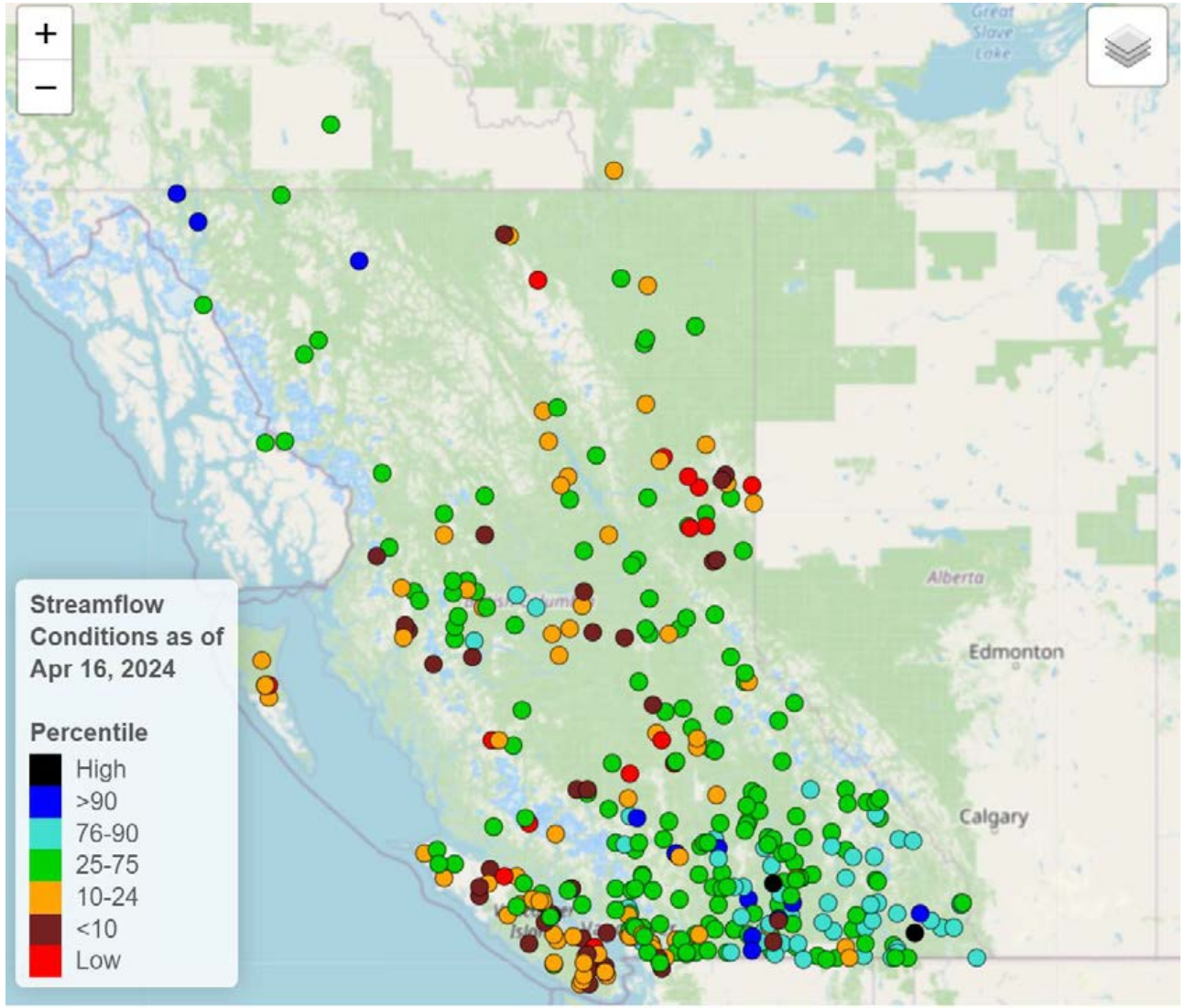


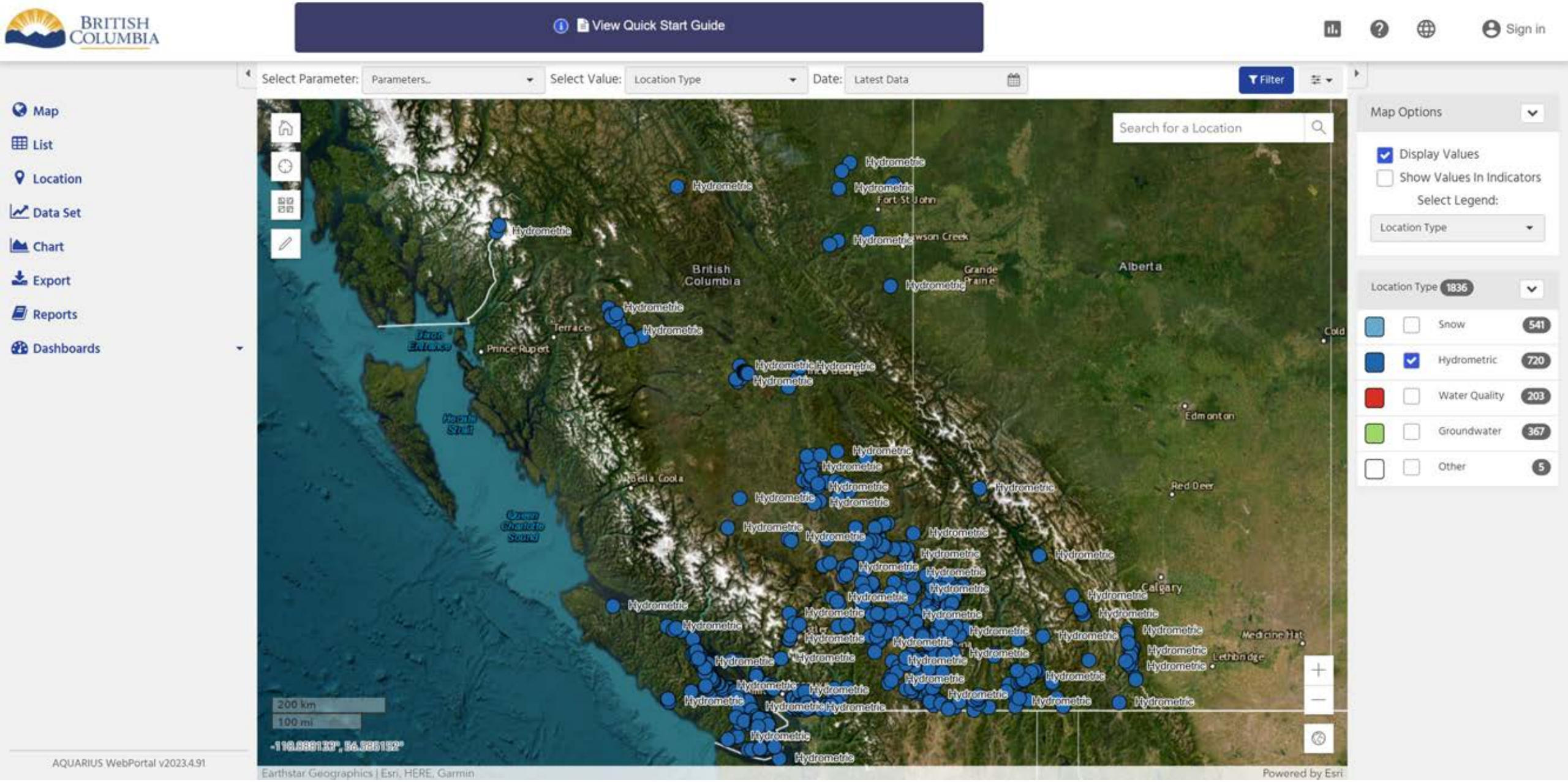
How we measure rivers

- Measure
  - Water level (pressure)
  - Streamflow (velocity/area)
  - Temperature
  - Quality (Turbidity, pH, DO..)

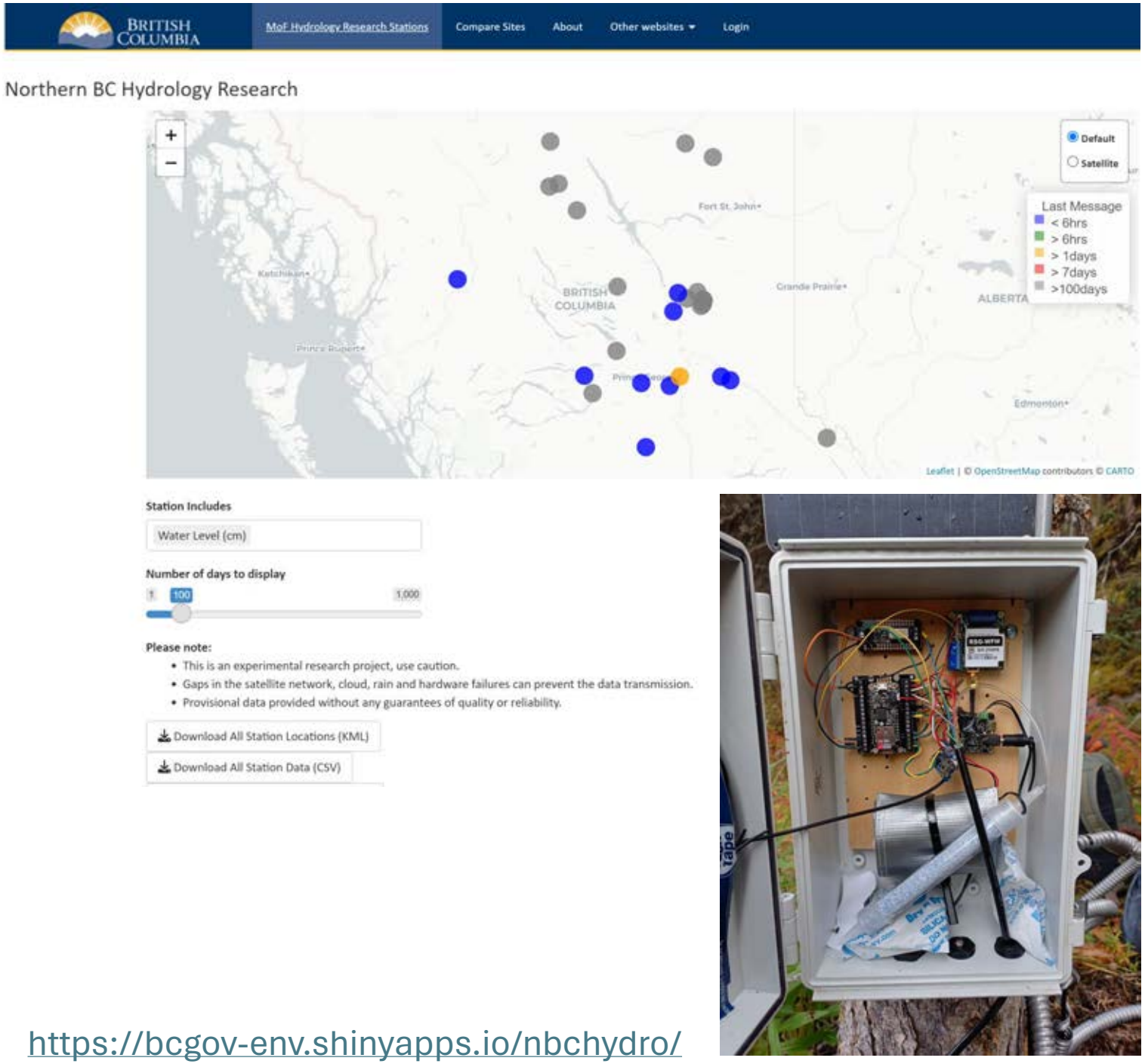
Where do we measure rivers

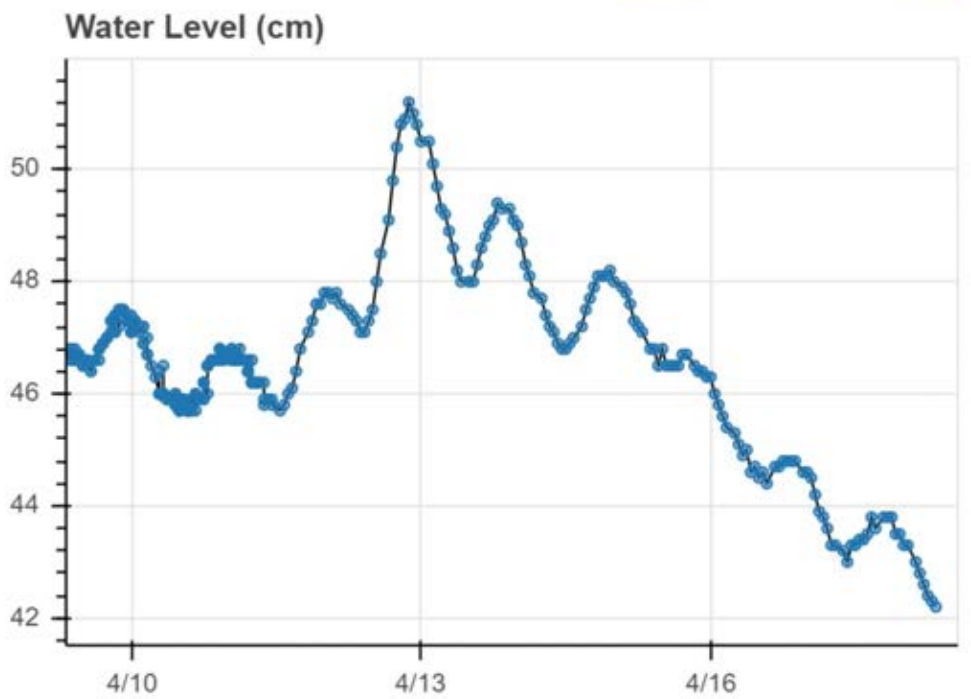
- Water Survey of Canada
- Third party data
  - Aquarius
  - MoF Research

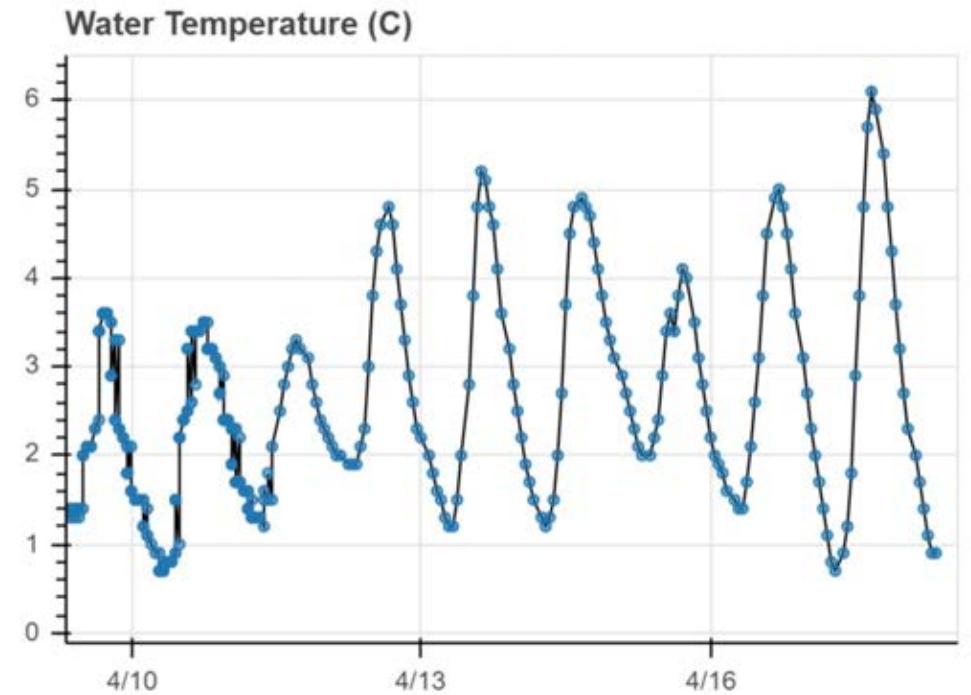




https://bcmoe-prod.aquaticinformatics.net/AQUARIUS/







https://bcgov-env.shinyapps.io/nbchydro/

Watershed Indicators

118 **Extension Note**

JANUARY 2007

Equivalent Clearcut Area as an Indicator of Hydrologic Change in Snow-dominated Watersheds of Southern British Columbia

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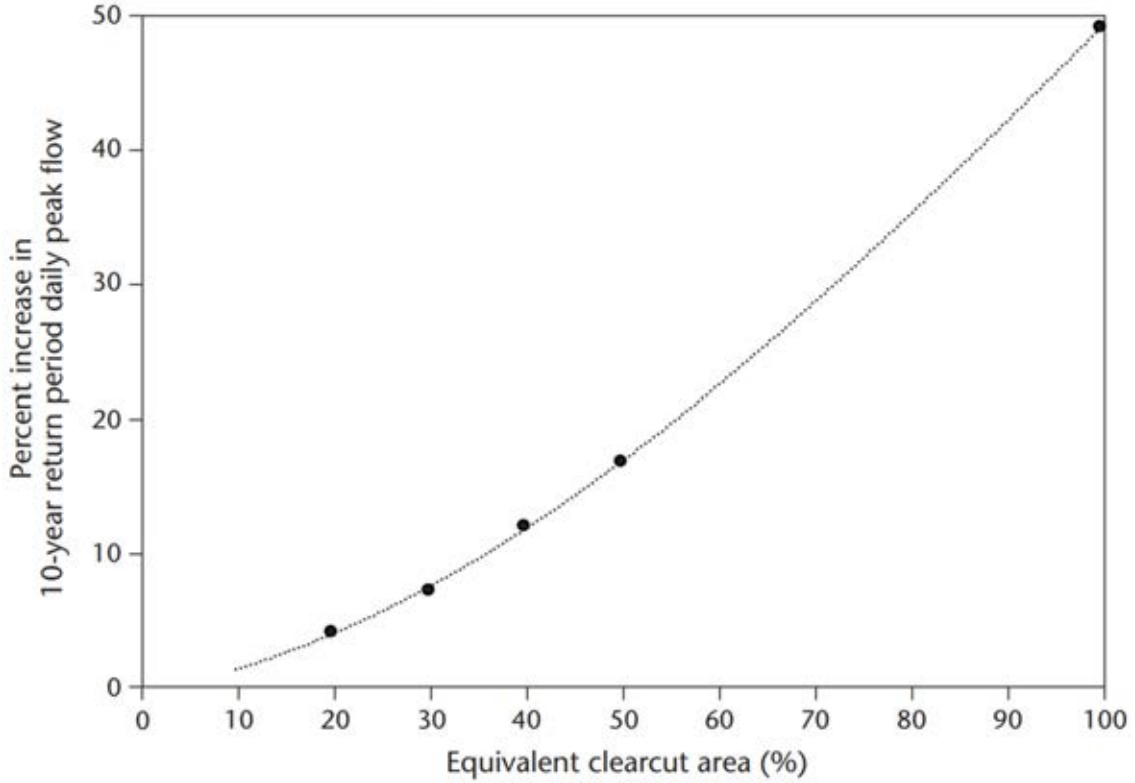
Kamloops, B.C.

S. Boon
Creekside Communication
Cobble Hill, B.C.



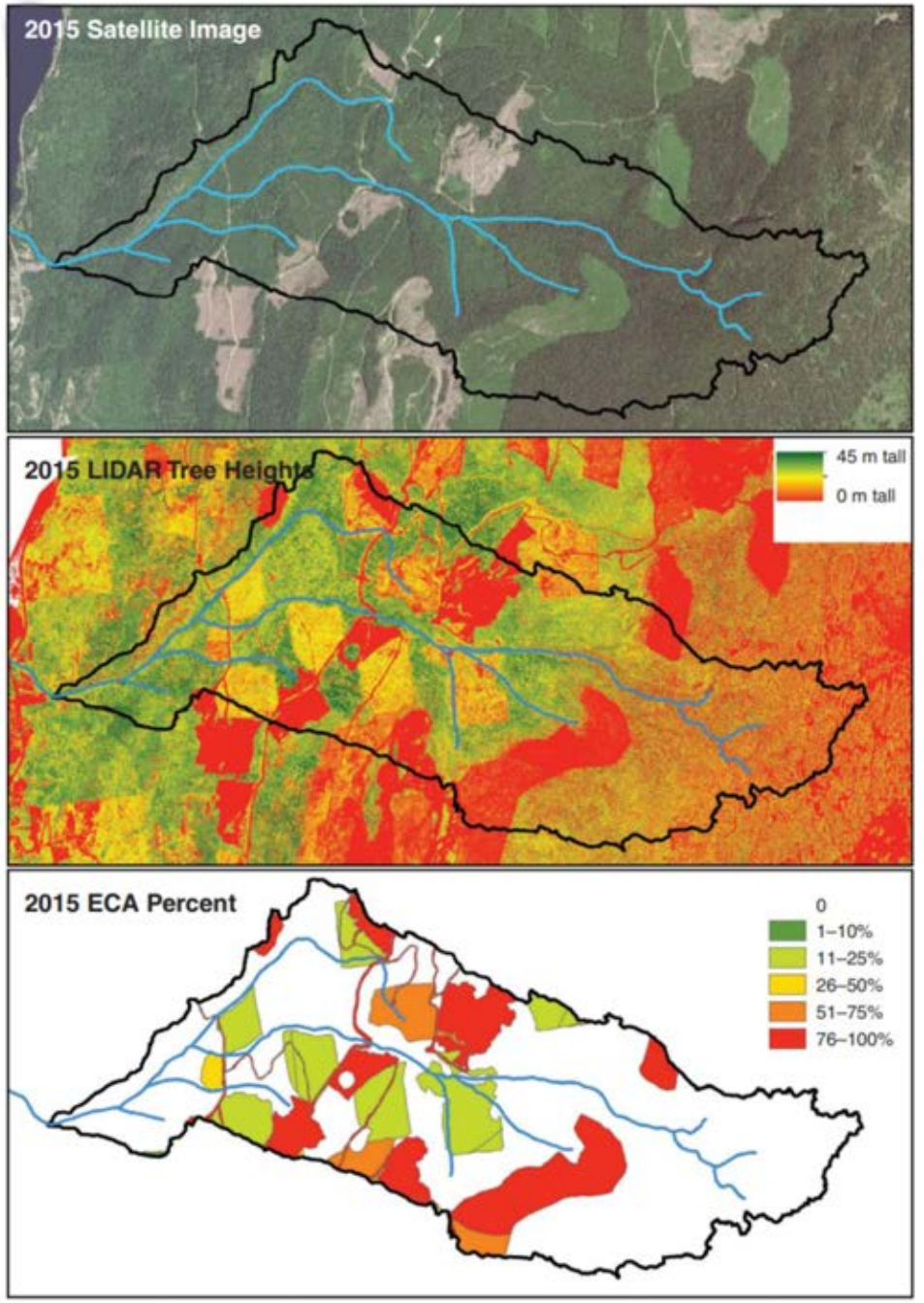
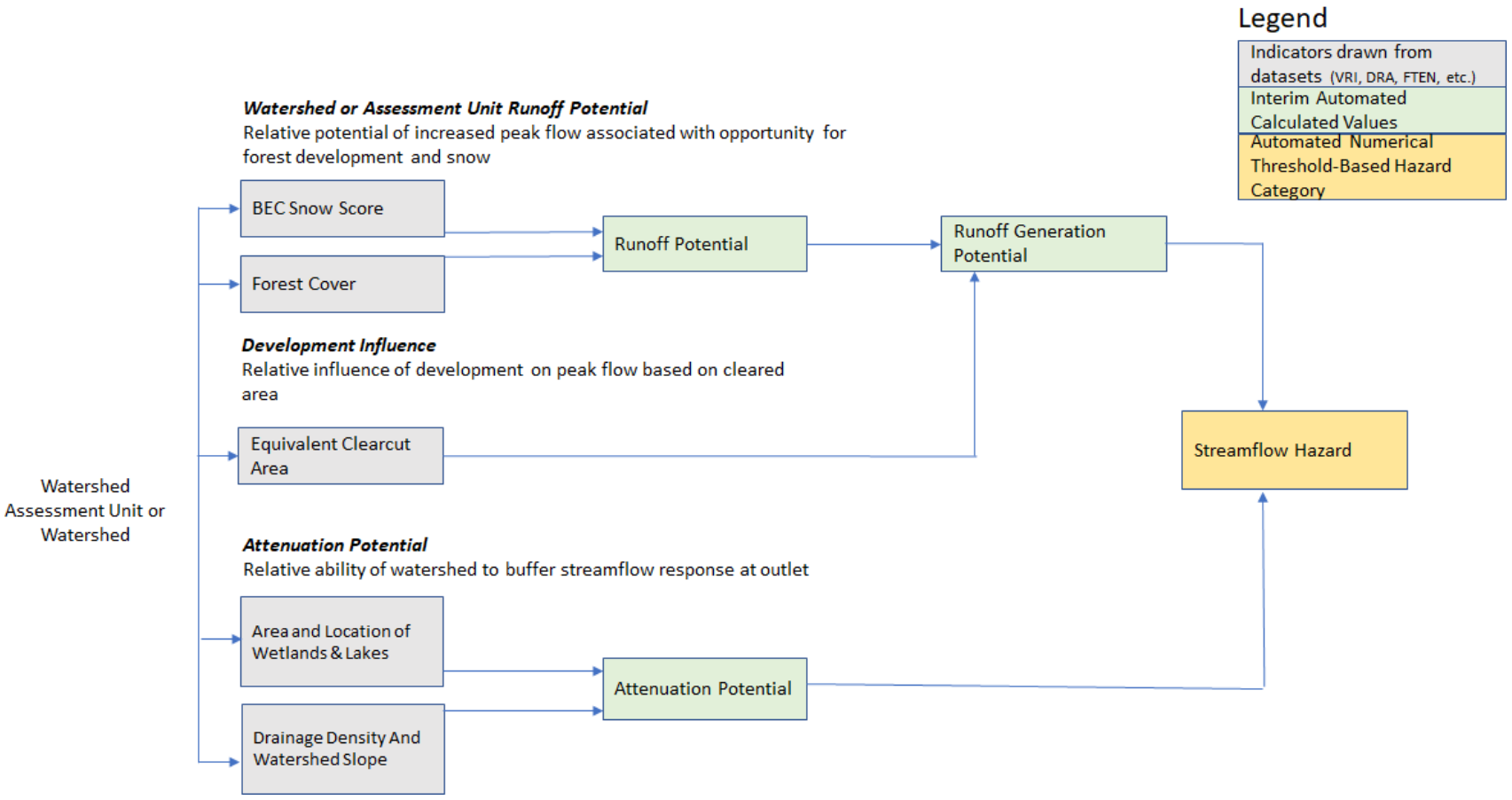
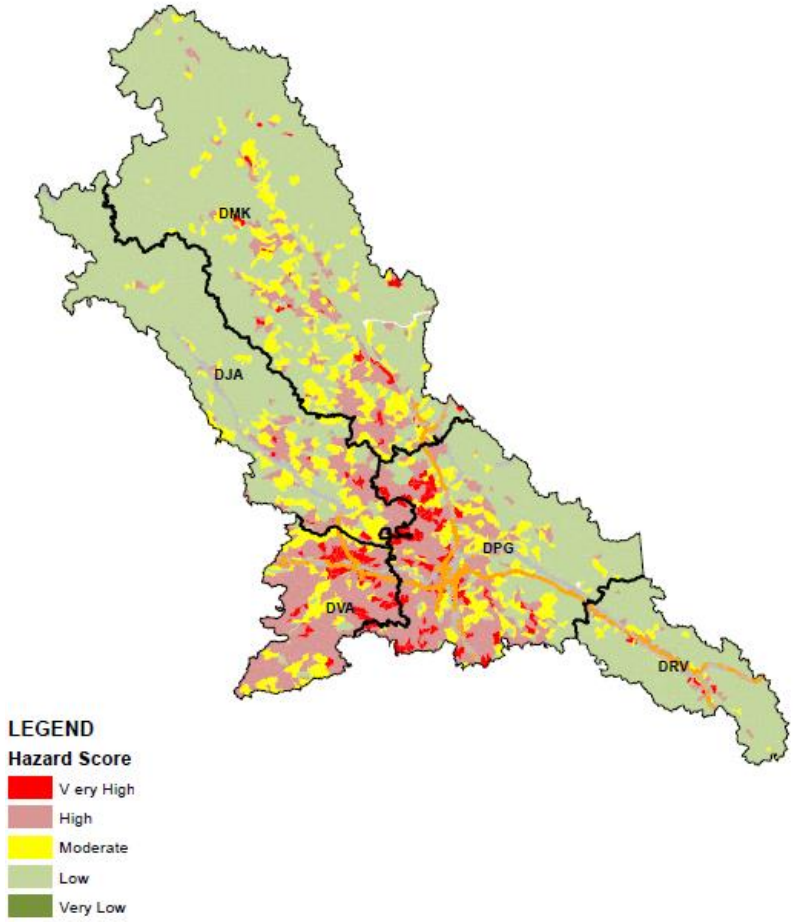


FIGURE 1 *A typical southern interior watershed over which equivalent clearcut area has been determined for each cutblock and disturbance.*

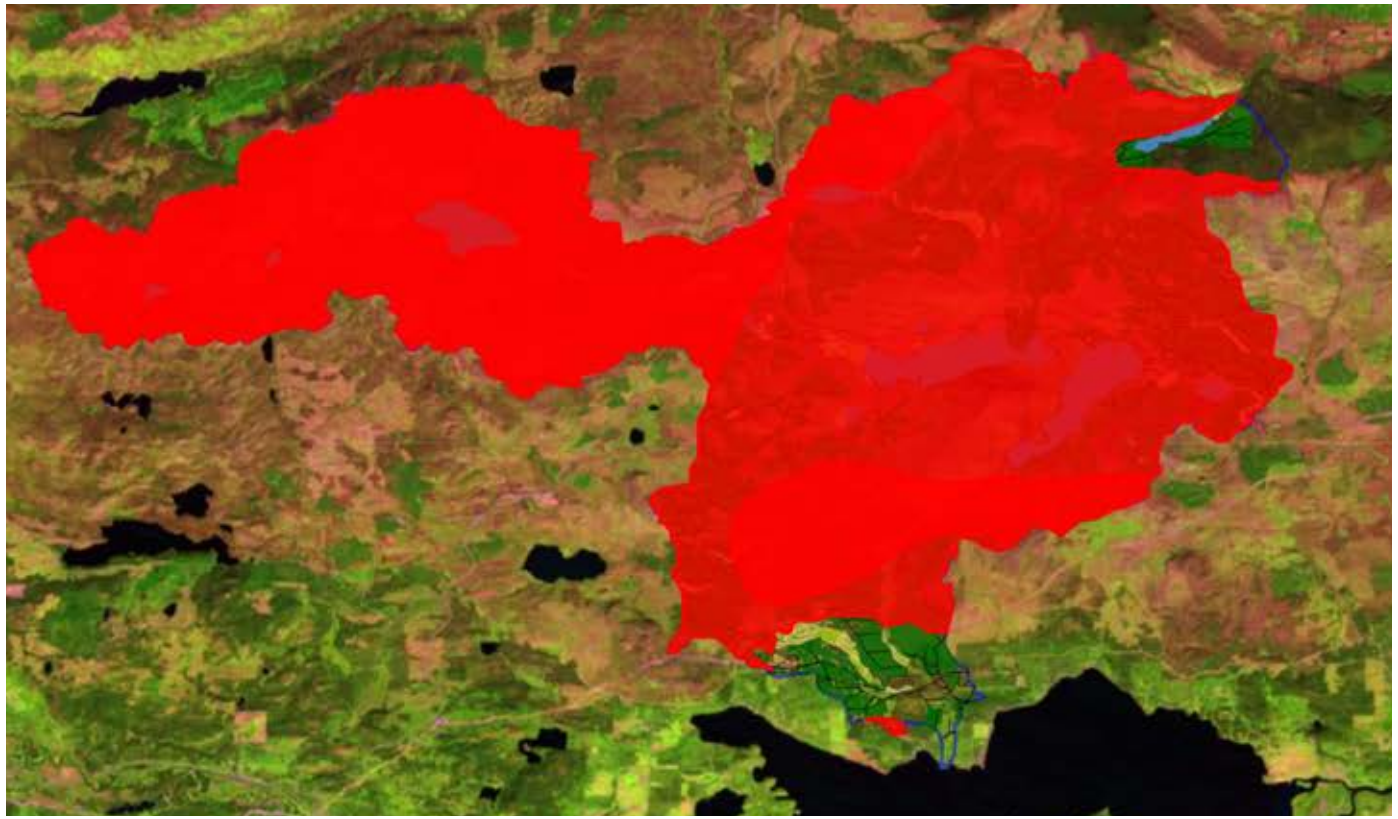
Watershed Health Omineca Project

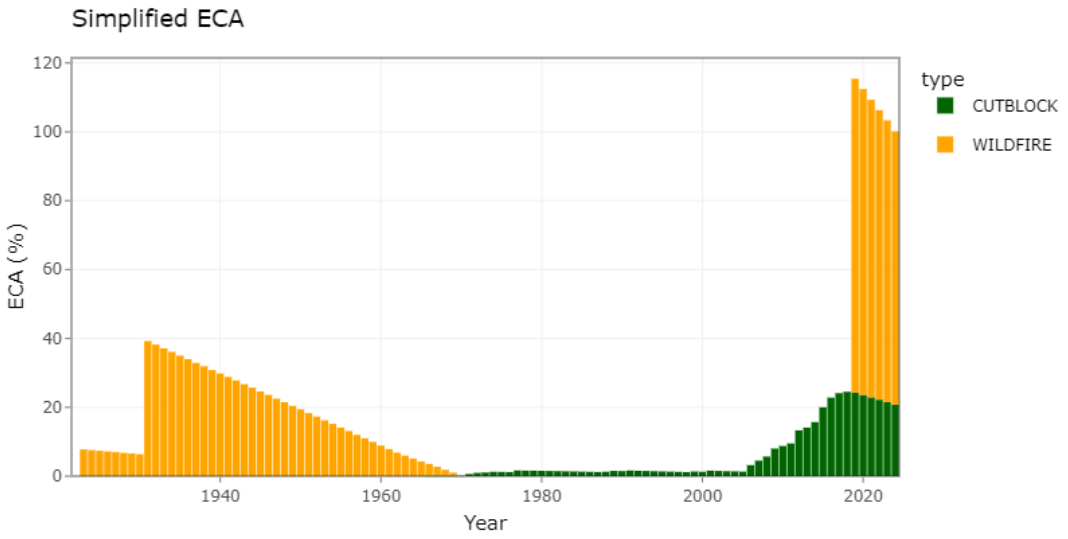
(John Rex)





watershedBC





https://bcgov-env.shinyapps.io/watershedBC/

Physical Watershed Modelling

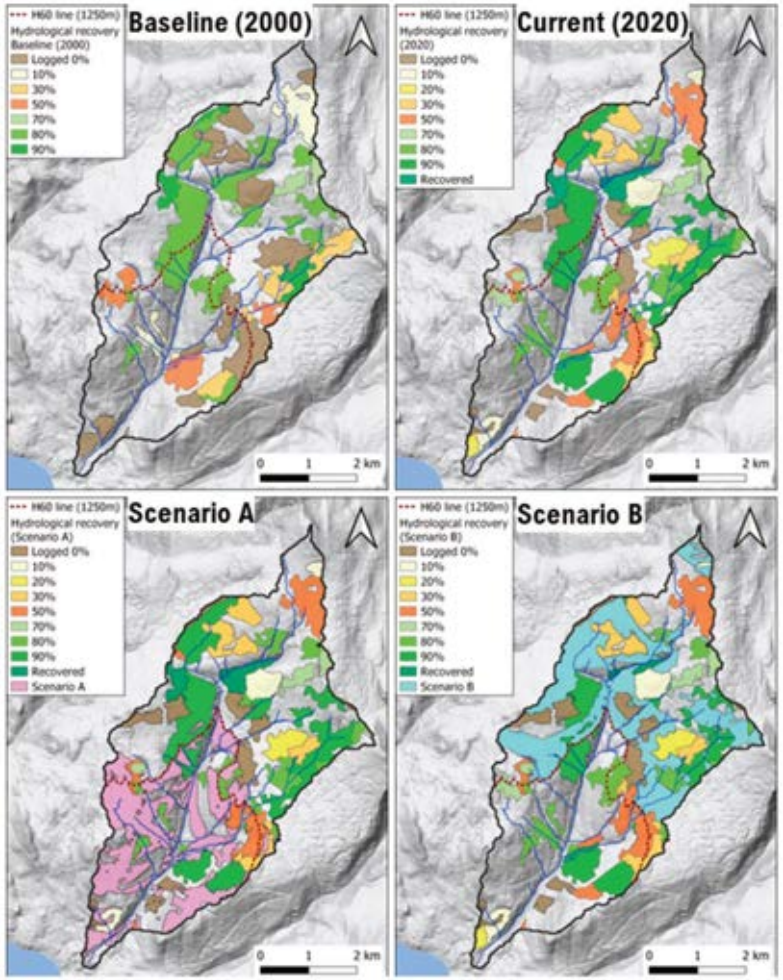


Figure 5. Graphical representation of hydrological recovery in Little Cayuse Creek for the land cover conditions investigated in this study.

Hydrological Modelling as an Improvement on ECA-Based Methods for Informing Risk-Based Forest Management

Matthew Chernos, *MacDonald Hydrology Consultants Ltd.*
Kim Green, *Selkirk College*
Ryan MacDonald, *MacDonald Hydrology Consultants Ltd.*

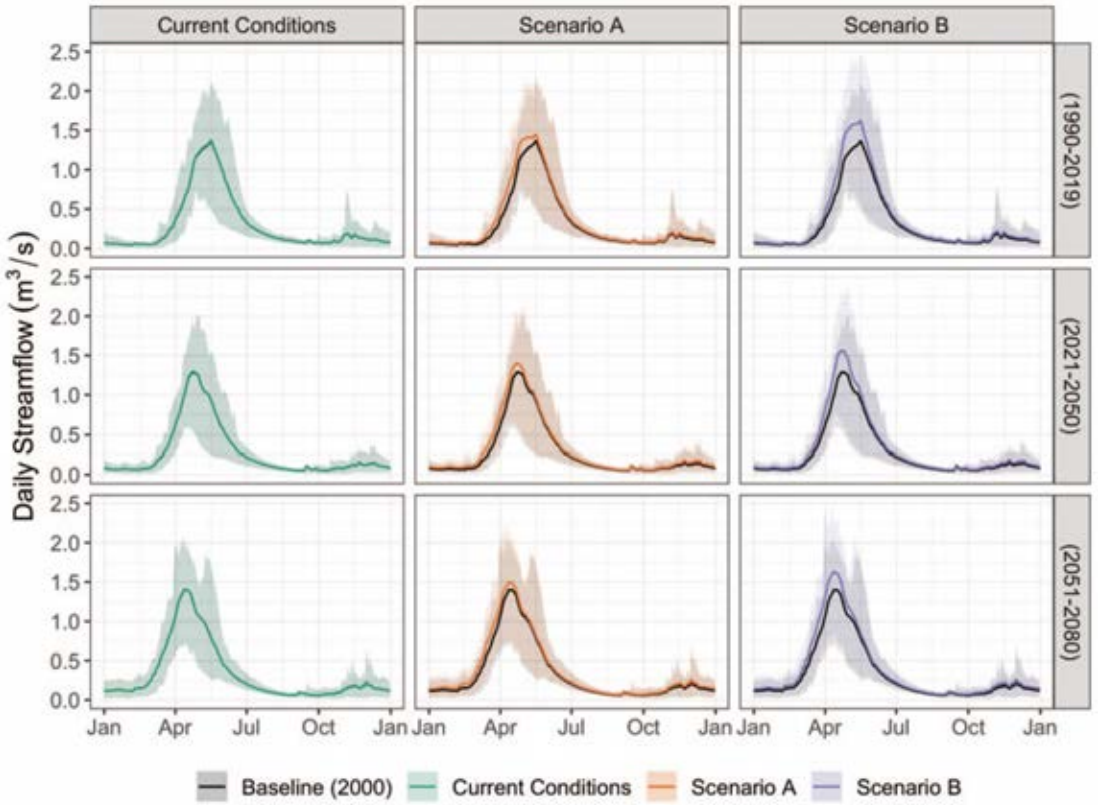
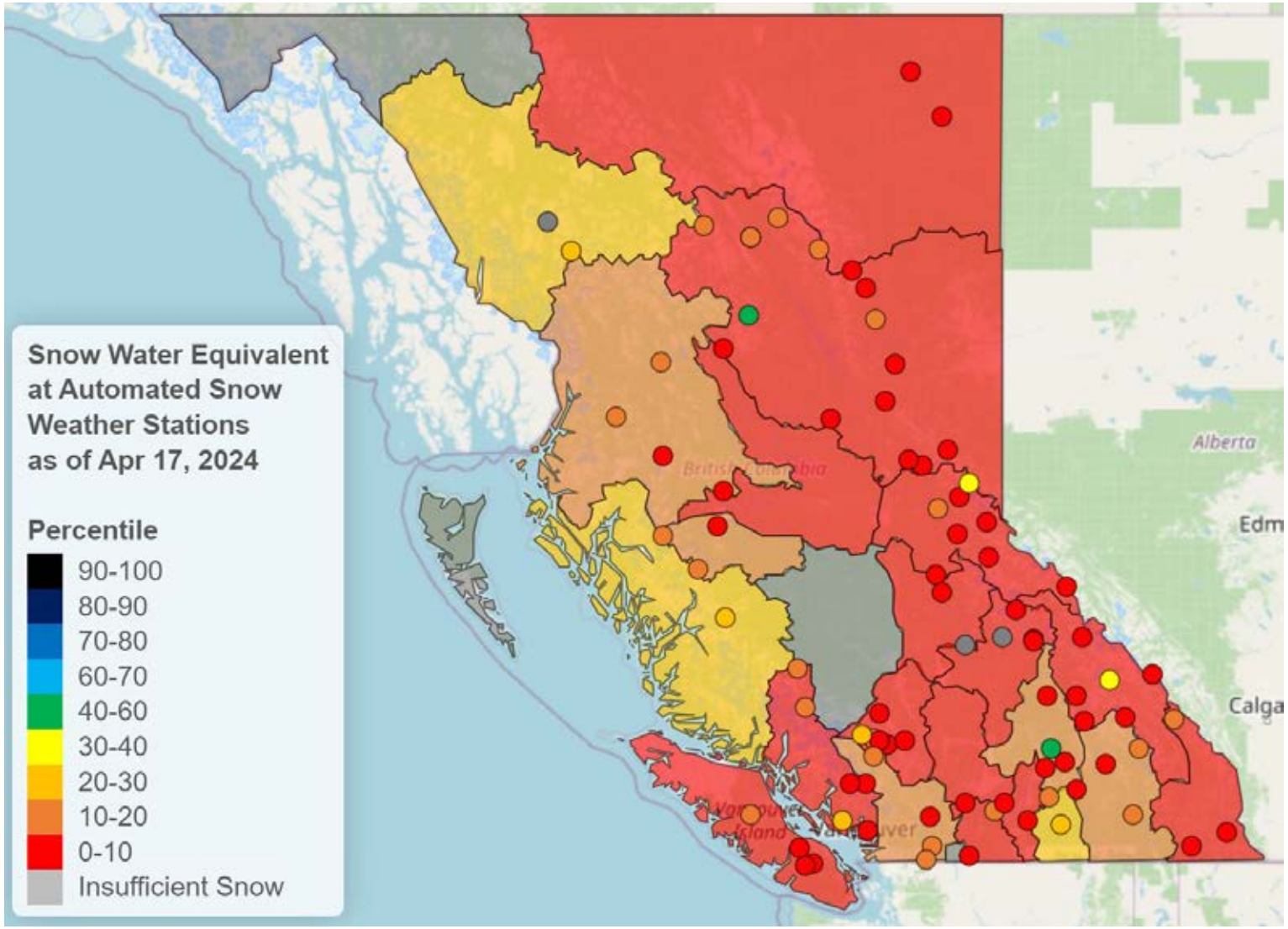


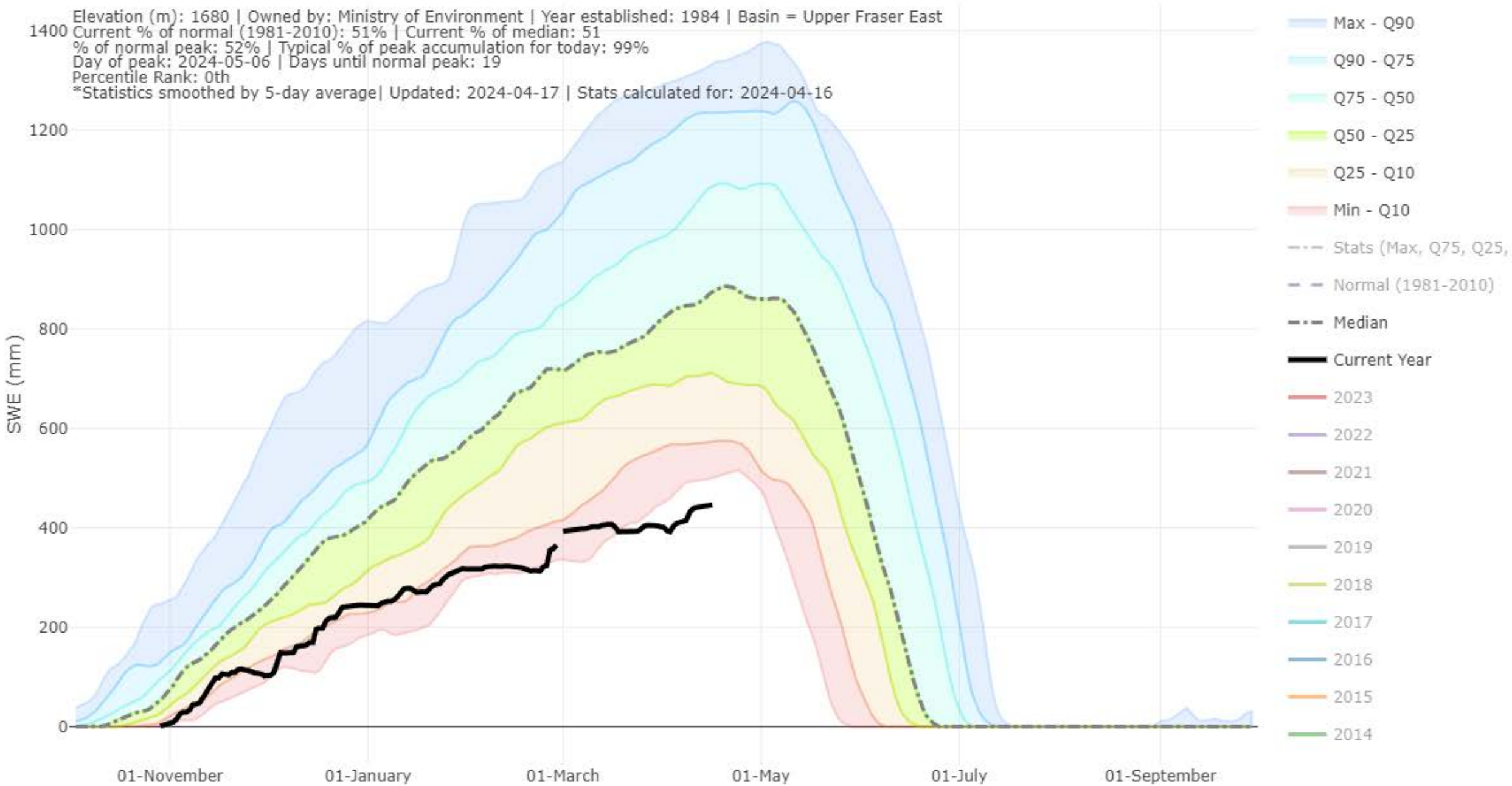
Figure 8. Mean daily streamflow in Little Cayuse Creek under all land cover scenarios and historical and future periods.

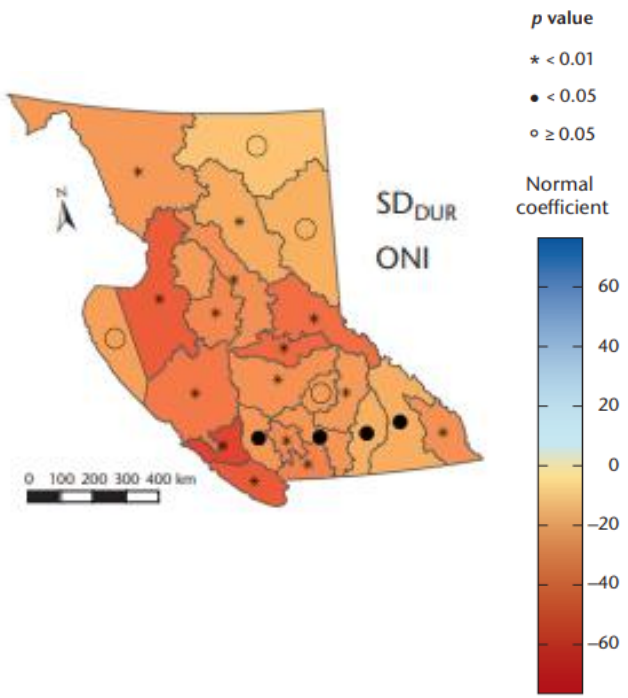
Current Conditions



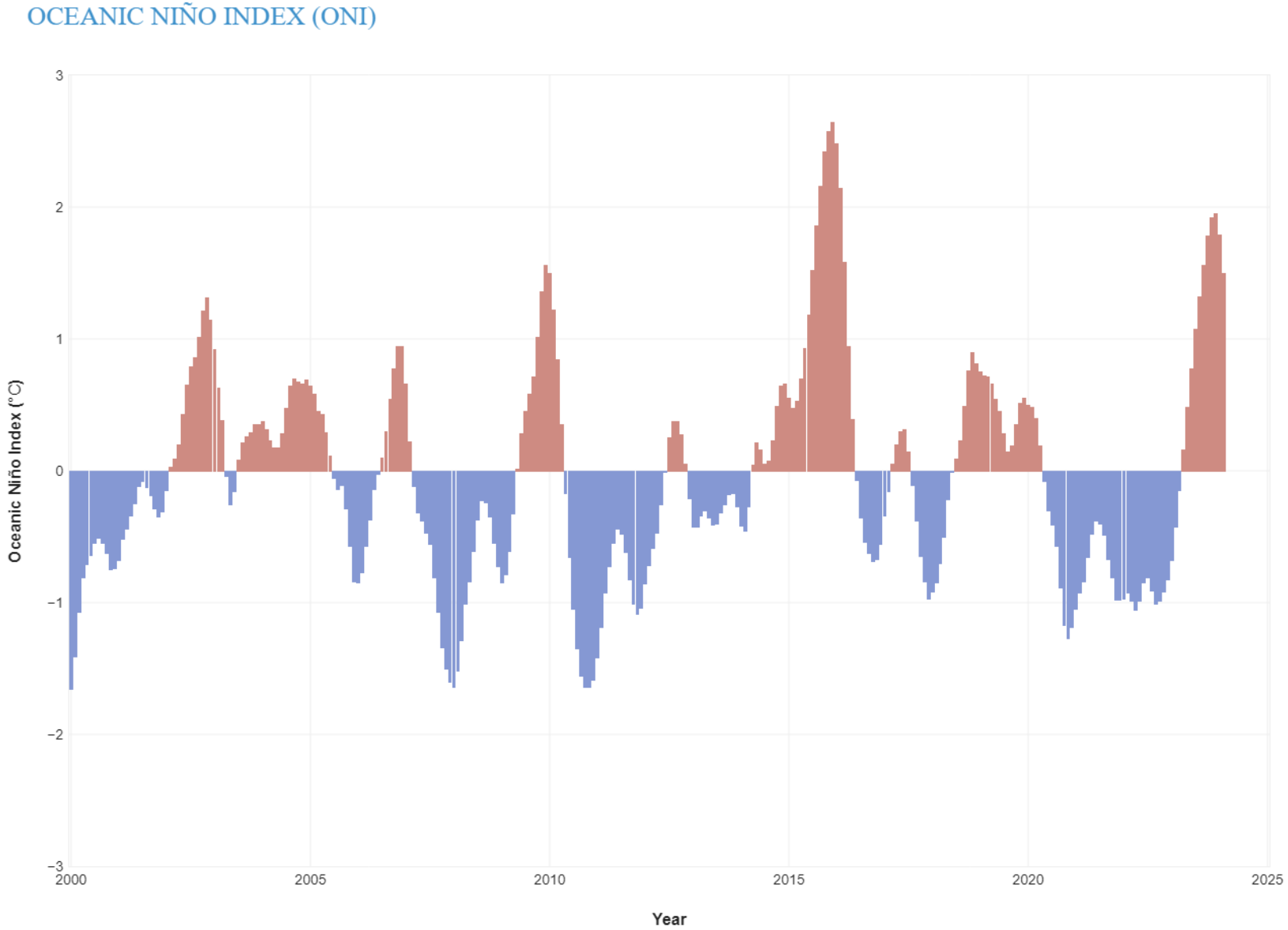
SWE (mm) for Revolution Creek, 1A17P

Elevation (m): 1680 | Owned by: Ministry of Environment | Year established: 1984 | Basin = Upper Fraser East
Current % of normal (1981-2010): 51% | Current % of median: 51
% of normal peak: 52% | Typical % of peak accumulation for today: 99%
Day of peak: 2024-05-06 | Days until normal peak: 19
Percentile Rank: 0th
*Statistics smoothed by 5-day average| Updated: 2024-04-17 | Stats calculated for: 2024-04-16

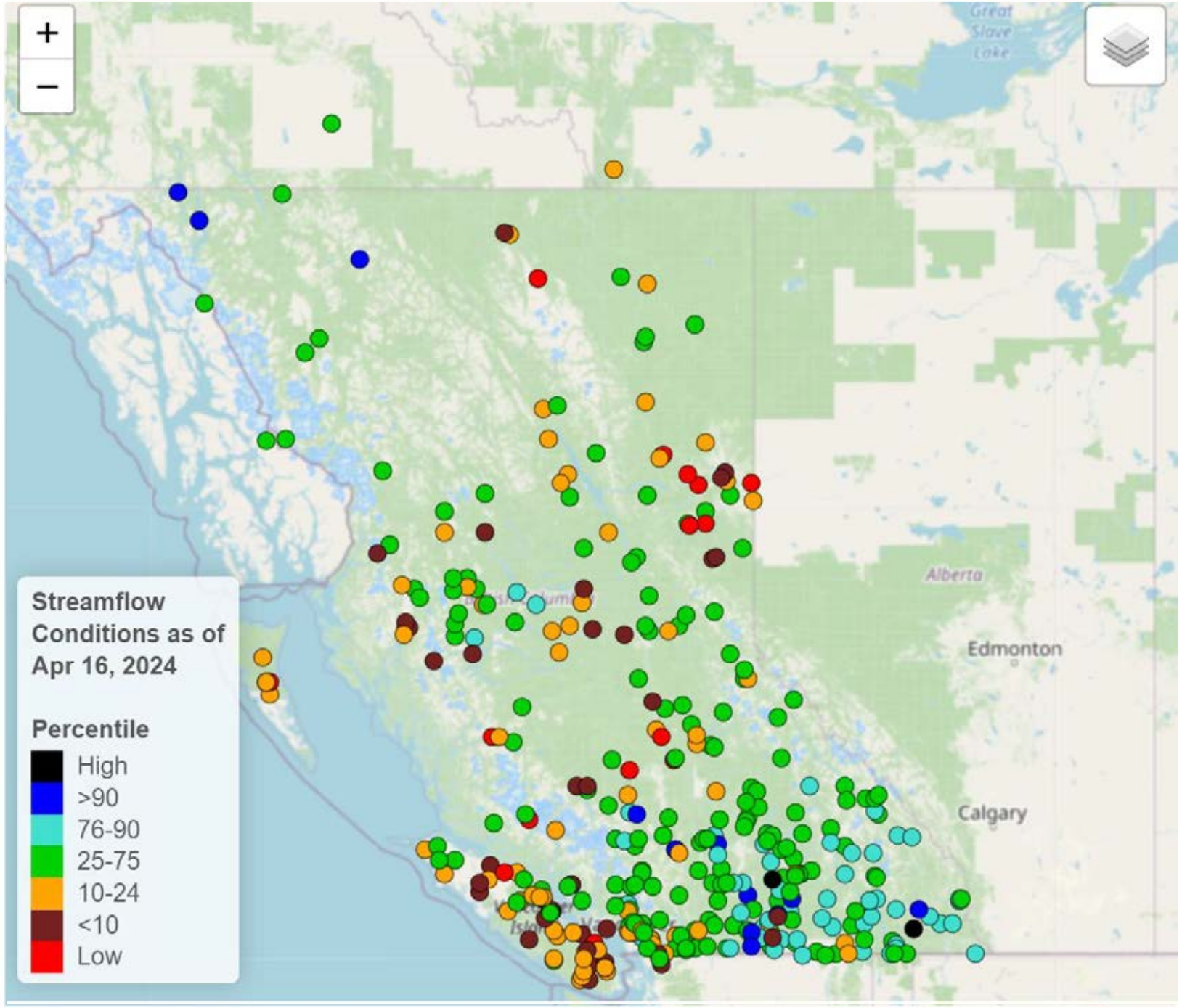




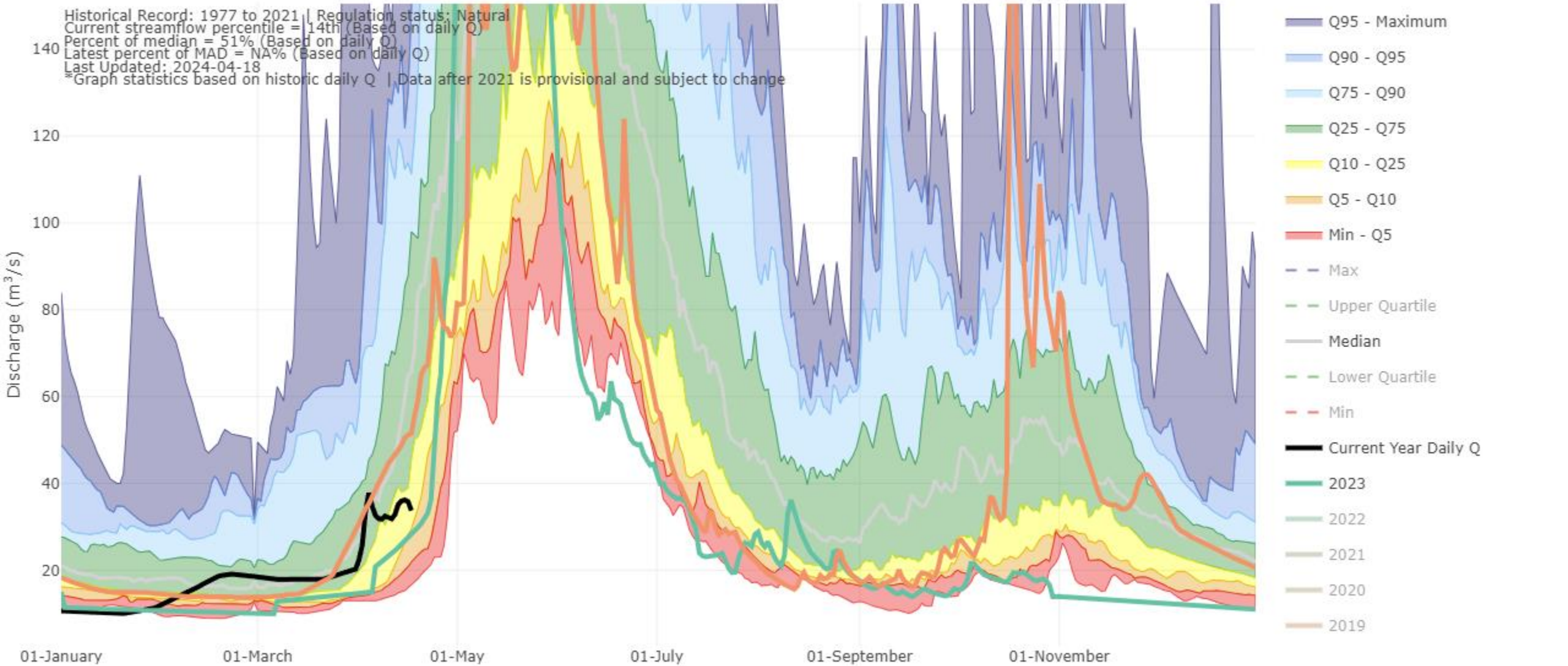
BC Technical Report 129 (2020) Snow Cover Timing from Satellite Imagery Opportunities for Near-real-time Mapping and Seasonal Forecasting



https://www.climate.gov/news-features/understanding-climate/climate-variability-oceanic-nino-index


Great Slave Lake
Alberta
Edmonton
Calgary
Streamflow Conditions as of Apr 16, 2024
Percentile
High
>90
76-90
25-75
10-24
<10
Low

Daily Streamflow for 08KD007 BOWRON RIVER BELOW BOX CANYON



Closing remarks

- Hard to monitor pre/post wildfire conditions. Often need to compare between sites and over time.
- Simple watershed indicators are very helpful for general watershed conditions.
- Physical modelling is needed to better estimate future conditions (climate and land cover change, etc.)
- Real-time tools becoming much more powerful, and useful.