When poll is active, respond at **PollEv.com/climatepcic543** Text **CLIMATEPCIC543** to **37607** once to join

Wildfire
what's climate change got to do with it?

15 August 2018
Wildlife Preparedness and Prevention Town Hall Meeting
Sidney, BC

PACIFIC CLIMATE IMPACTS CONSORTIUM
University of Victoria

Trevor Murdock
Climate Scientist
Pacific Climate Impacts Consortium

Source: Tammy Murdock https://www.instagram.com/embellishstudios

Pacific Climate Impacts Consortium

- Regional climate services provider
- Independent, not-for-profit corporation owned by UVic; founded in 2005
- Sister organization to Pacific Institute for Climate Solutions

Regional Climate Impacts

- developing, providing, interpreting future projections of regional climate change
- statistical downscaling, indices of extremes

Hydrologic Impacts

- hydrologic impacts of climate change and variability; streamflow projections

Climate Analysis and Monitoring

- historical climate data and interpretation, seasonal climate predictions

Climate change

is happening

has likely increased wildfire risk in Western Canada

could mean more frequent and severe wildfires in future

Nutrition Facts

Serving Size 1 presentation

Amount Per Serving	
Slides 28	Minutes 25
	% Daily Value*
Maps 11	1100%
Plots 7	350%
Photos 10	50%
Cartoons 0	0%
Humour	5% ?

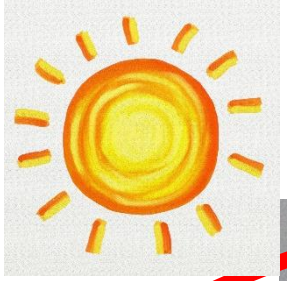
* Percent Daily Values are based on a diet of one town hall meeting.

Weather: conditions at a specific location & time

December 2nd 2005

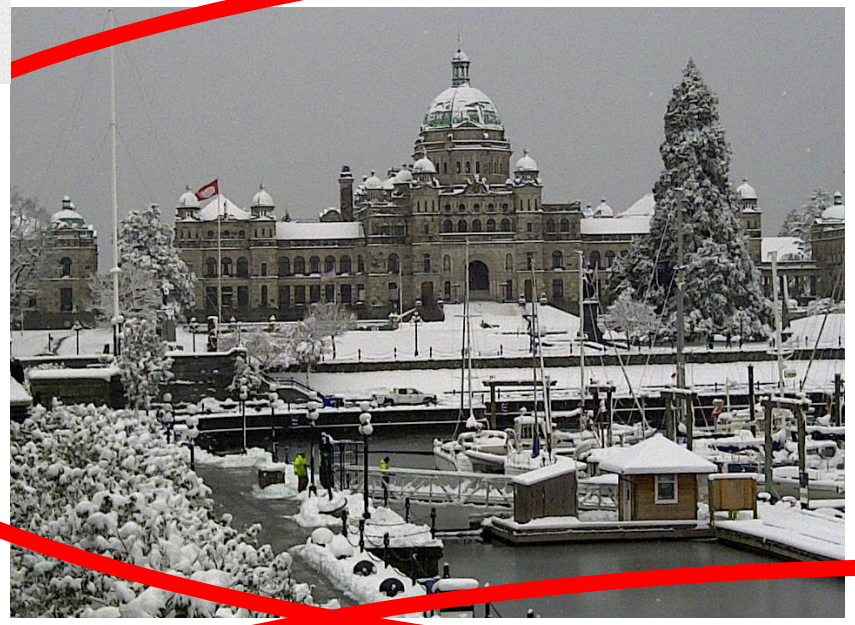
- 6°C snowing in _____
- 19°C sunny in _____

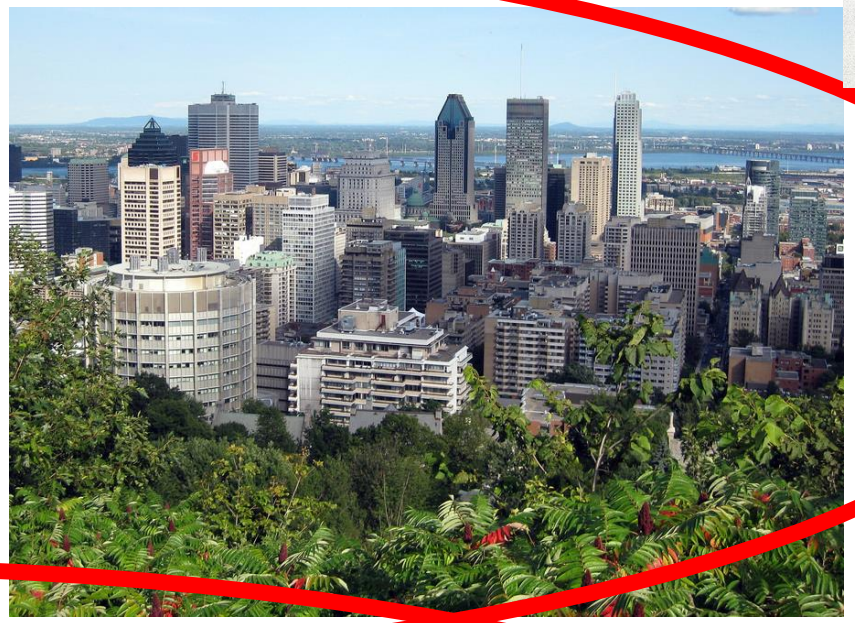
Climate: long term statistics of weather

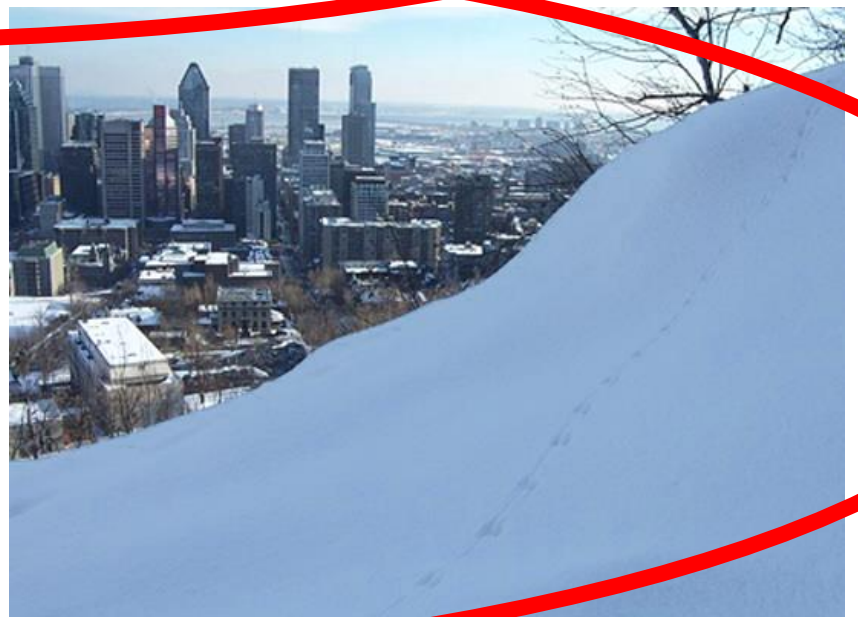


Victoria

Montreal



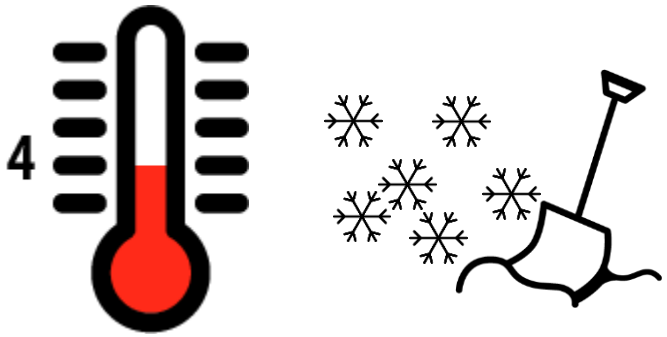


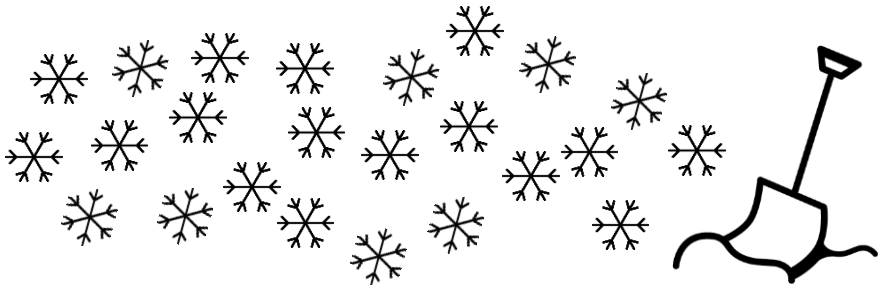


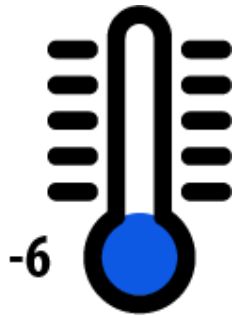
Climate: long term statistics of weather

- Weather: conditions at a specific location and time
  - December 2nd 2005
    - 6°C snowing in Victoria
    - 19°C sunny in Montreal

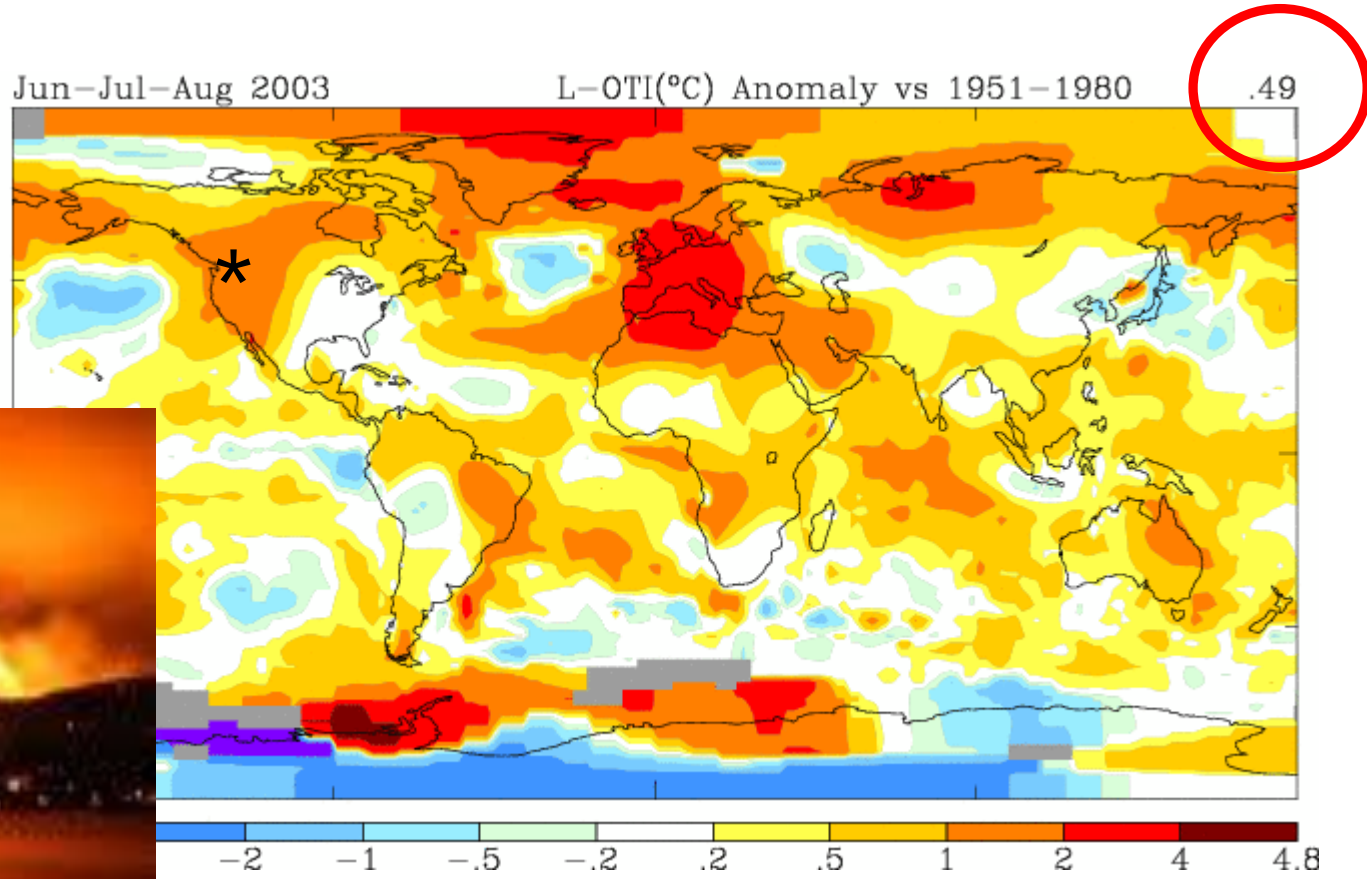
- Climate: long term statistics of weather
  - 1971-2000 average December







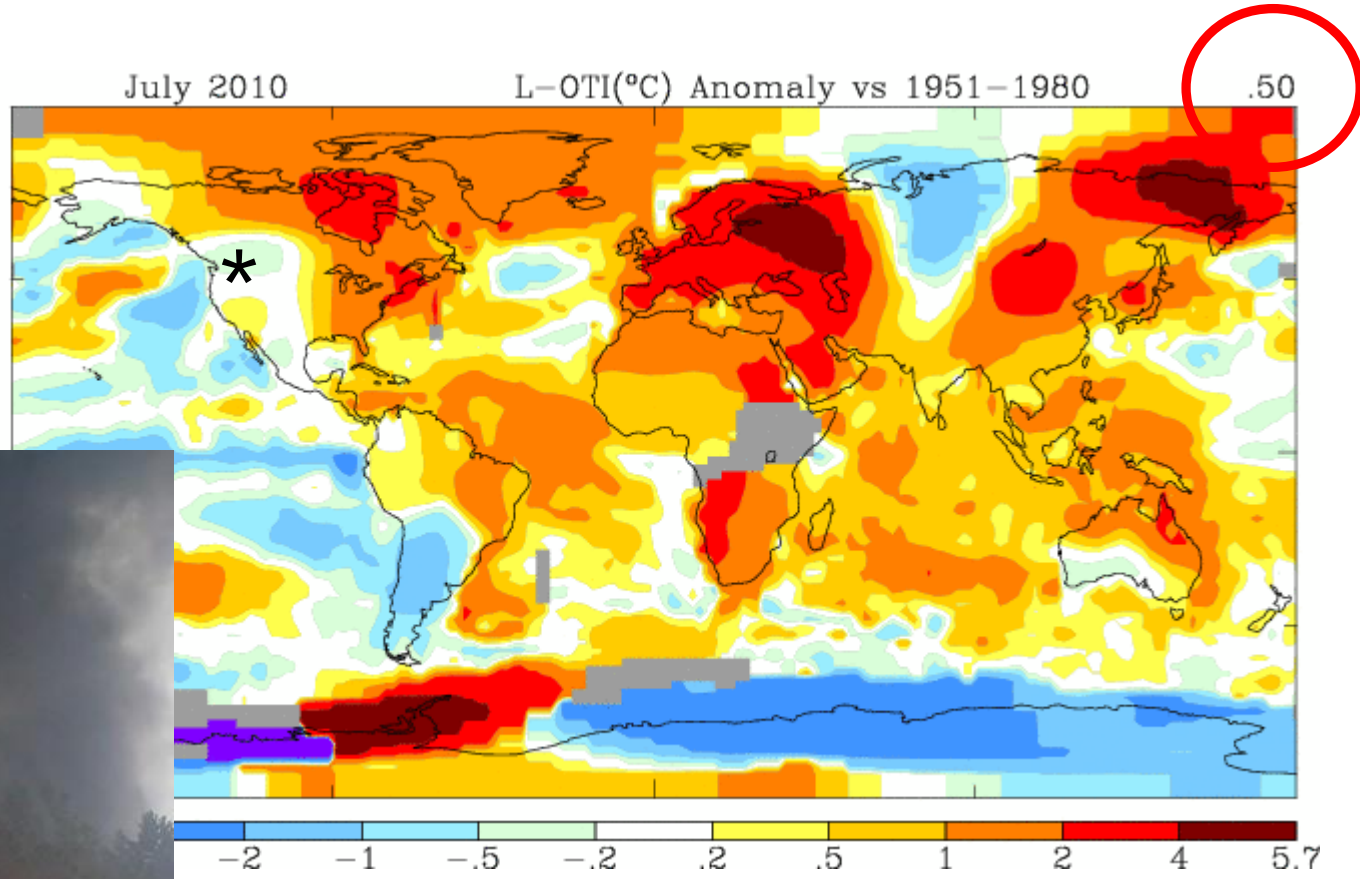
Climate varies by location & with time



Temperature Anomaly °C

Goddard Institute for Space Studies
New York, N.Y.

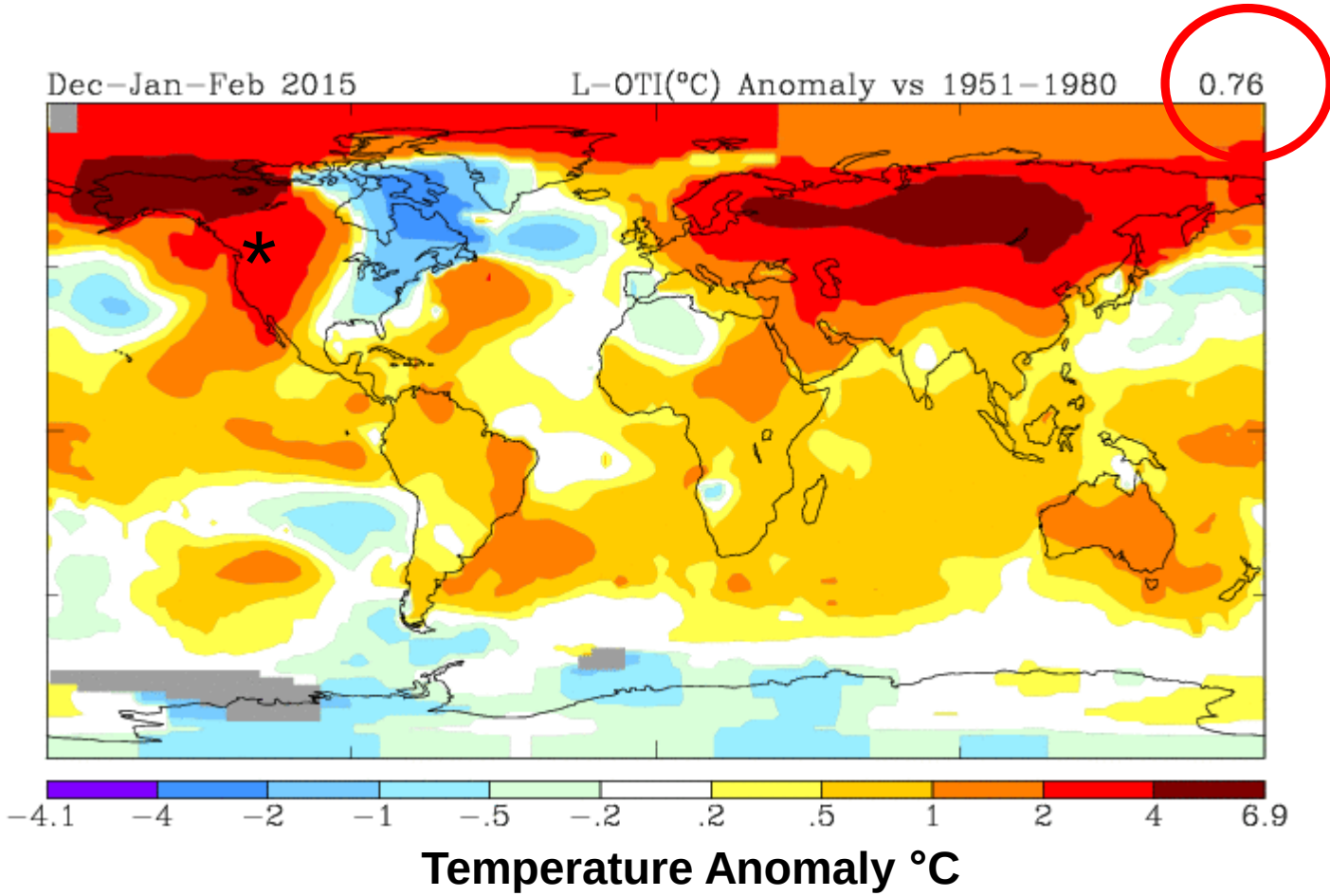
Climate varies by location & with time



Temperature Anomaly °C

Goddard Institute for Space Studies
New York, N.Y.

Climate varies by location & with time



Temperature Anomaly °C

Goddard Institute for Space Studies
New York, N.Y.

Climate change is

is happening

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could mean more frequent and severe wildfires in future

Fort McMurray Fire

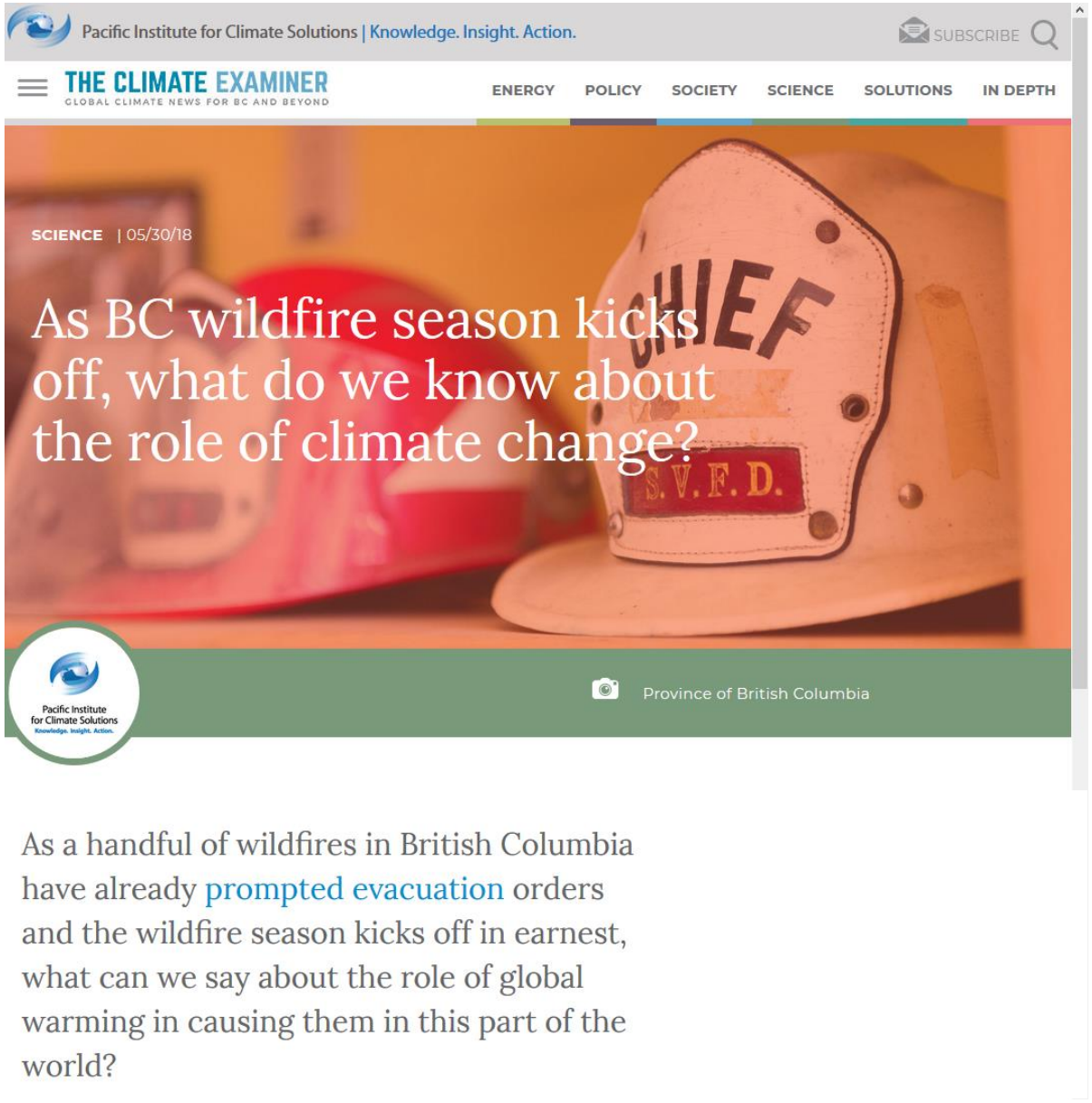
- 590,000 ha burnt
- 88,000 people displaced
- 2 fatalities (indirect)
- 2400 homes and 665 work camp units destroyed
- $3.6 B CDN insured losses

Mandatory evacuation. Photo, Jason Franson/CP

Avian escape. Photo, Mark Blinch/Reuters

Edmonton Expo Centre at Northlands. Photo, Chris Bolin

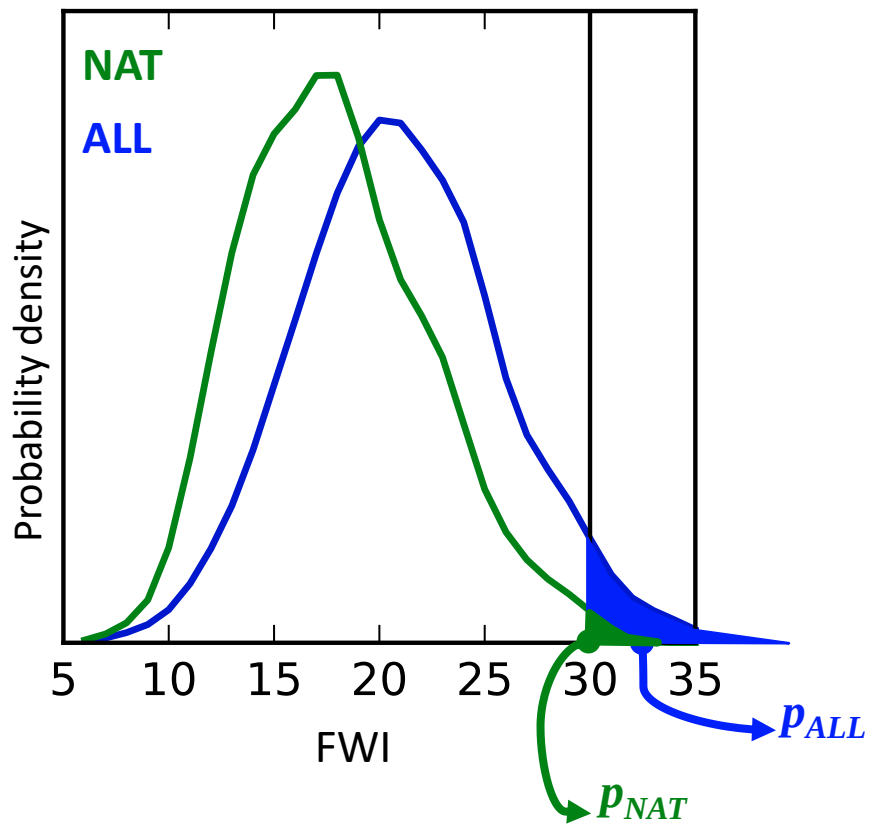
Timberlea. Photo, Chris Bolin



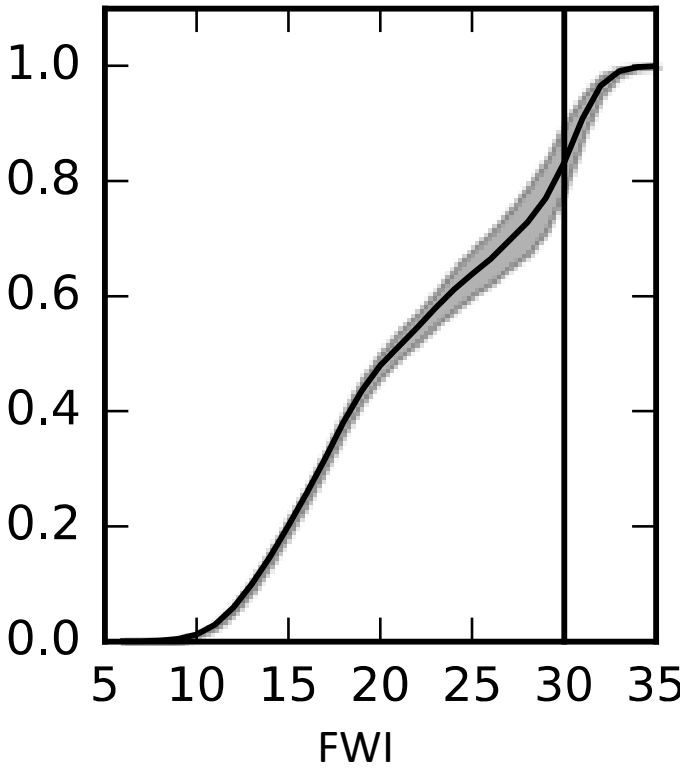
As a handful of wildfires in British Columbia have already prompted evacuation orders and the wildfire season kicks off in earnest, what can we say about the role of global warming in causing them in this part of the world?

http://theclimateexaminer.ca/2018/05/30/as-bc-wildfire-season-kicks-off-what-do-we-know-about-the-role-of-climate-change/

Human contribution to climate change already responsible for much of the current risk of extreme fire years



$$FAR = \frac{p_{ALL} - p_{NAT}}{p_{ALL}}$$



CFWIS “Extreme” FWI level in Southern Prairies = 30

Observed FWI level in Fort Mac area ≈ 40

Climate change is

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has likely increased wildfire risk in Western Canada

could mean more frequent and severe wildfires in future

2015: A case study in the new normal?

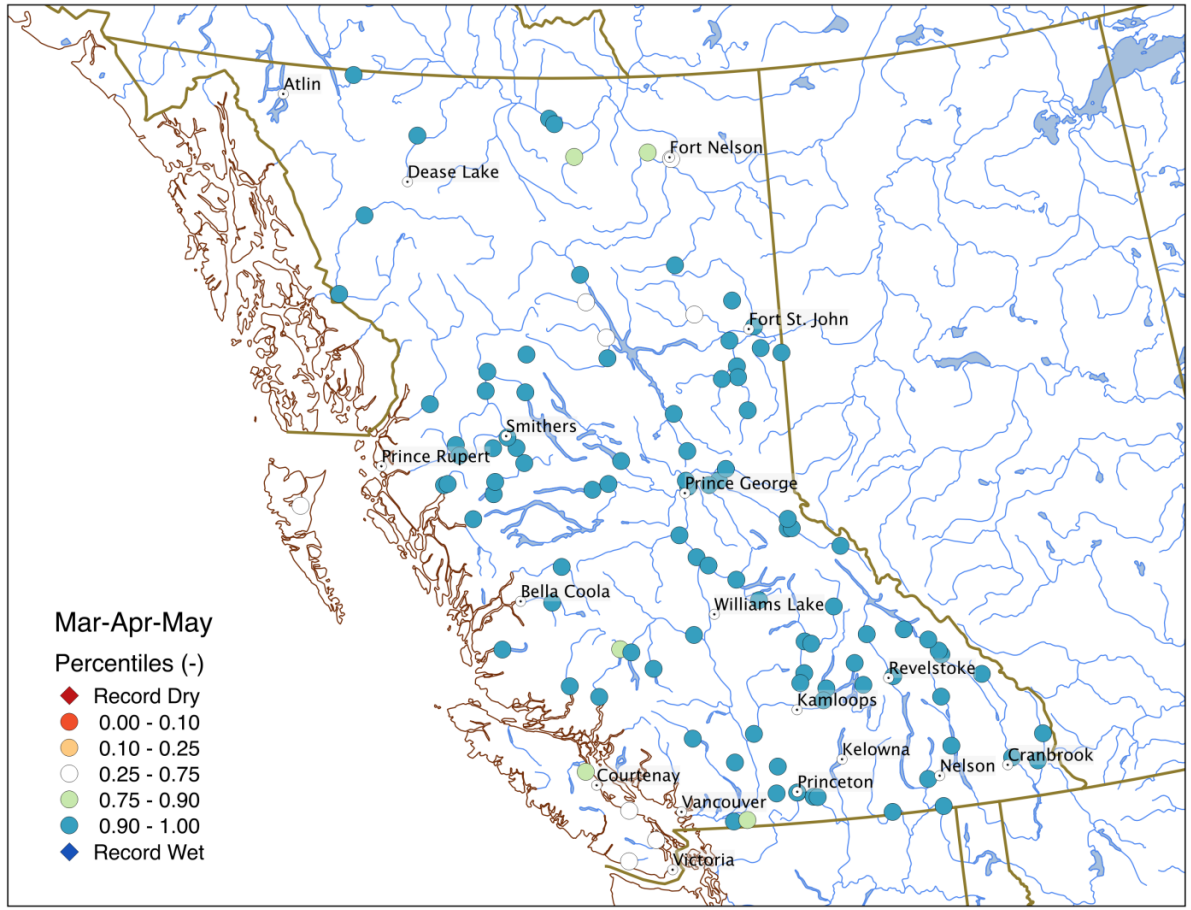
Hydrological Impacts

- Rivers saw near record flows – high and low
- Soil moisture all-time low
- Evaporation all-time high

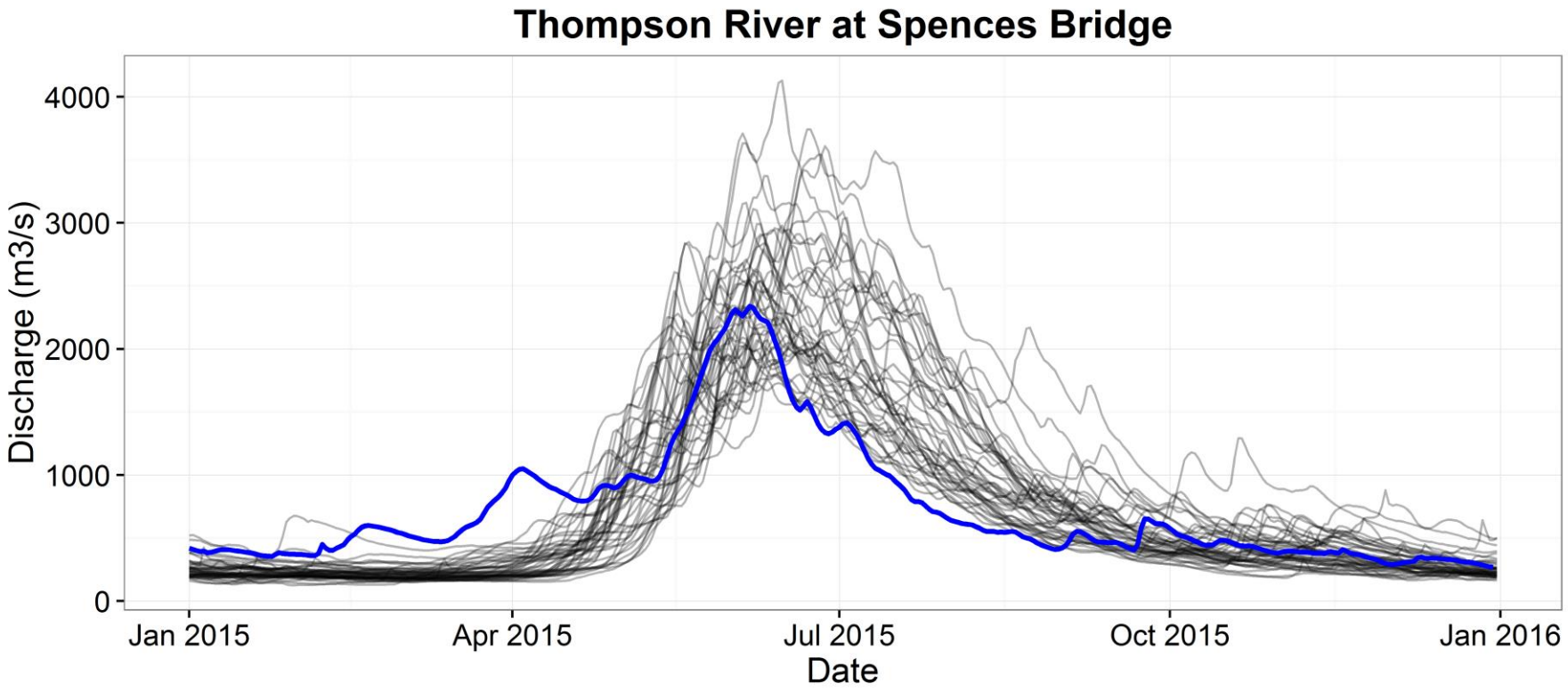
High spring to low summer streamflow

Very high spring flows

Very low summer flows

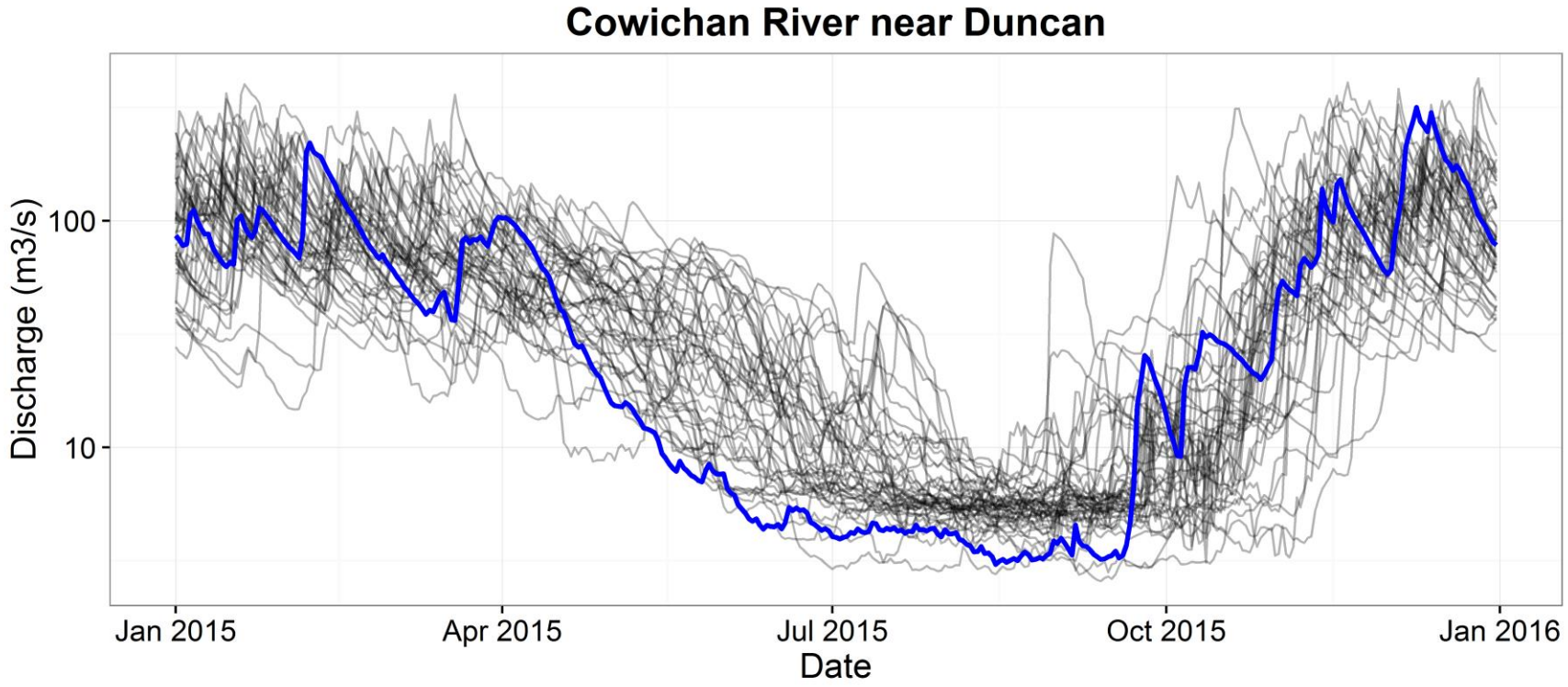


Record high and low flows



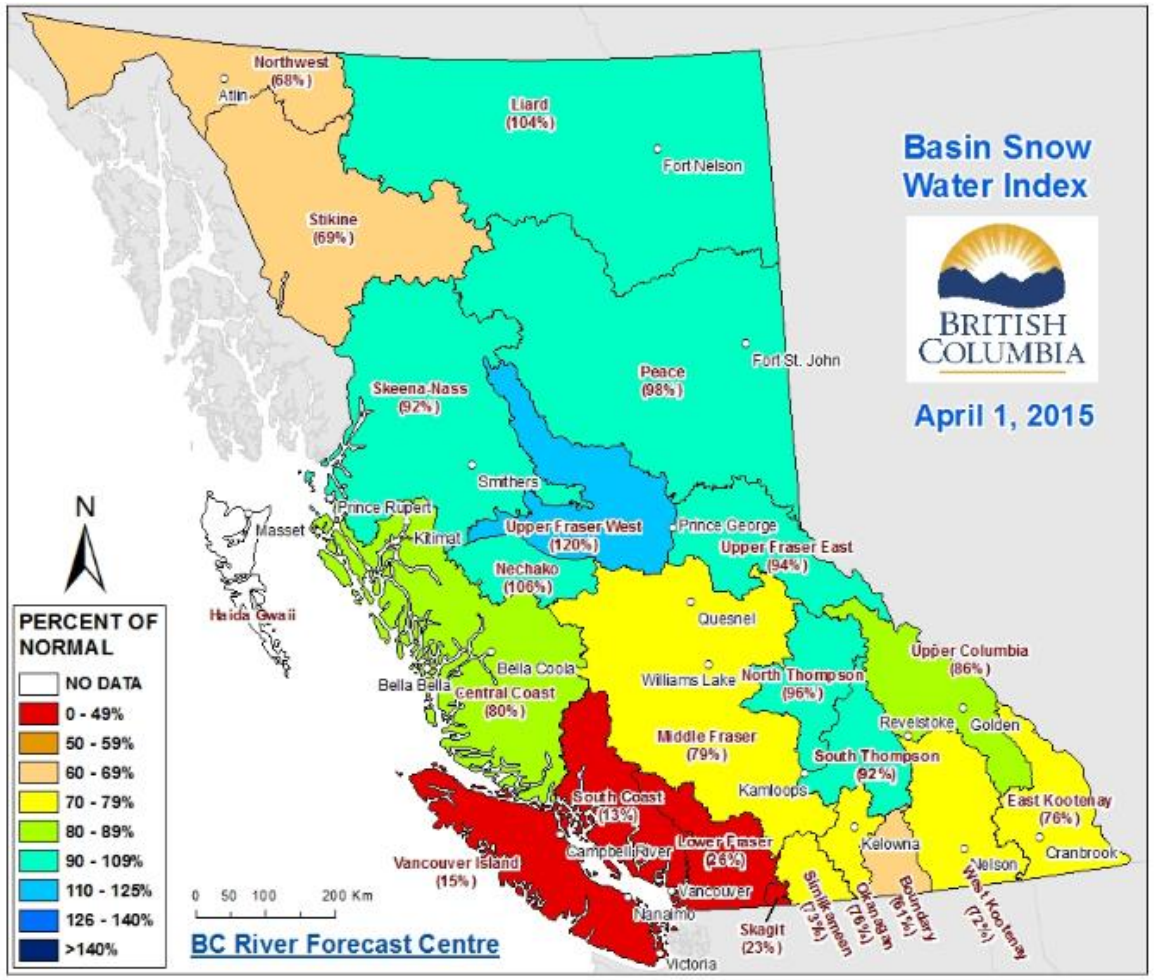
PACIFIC CLIMATE IMPACTS CONSORTIUM

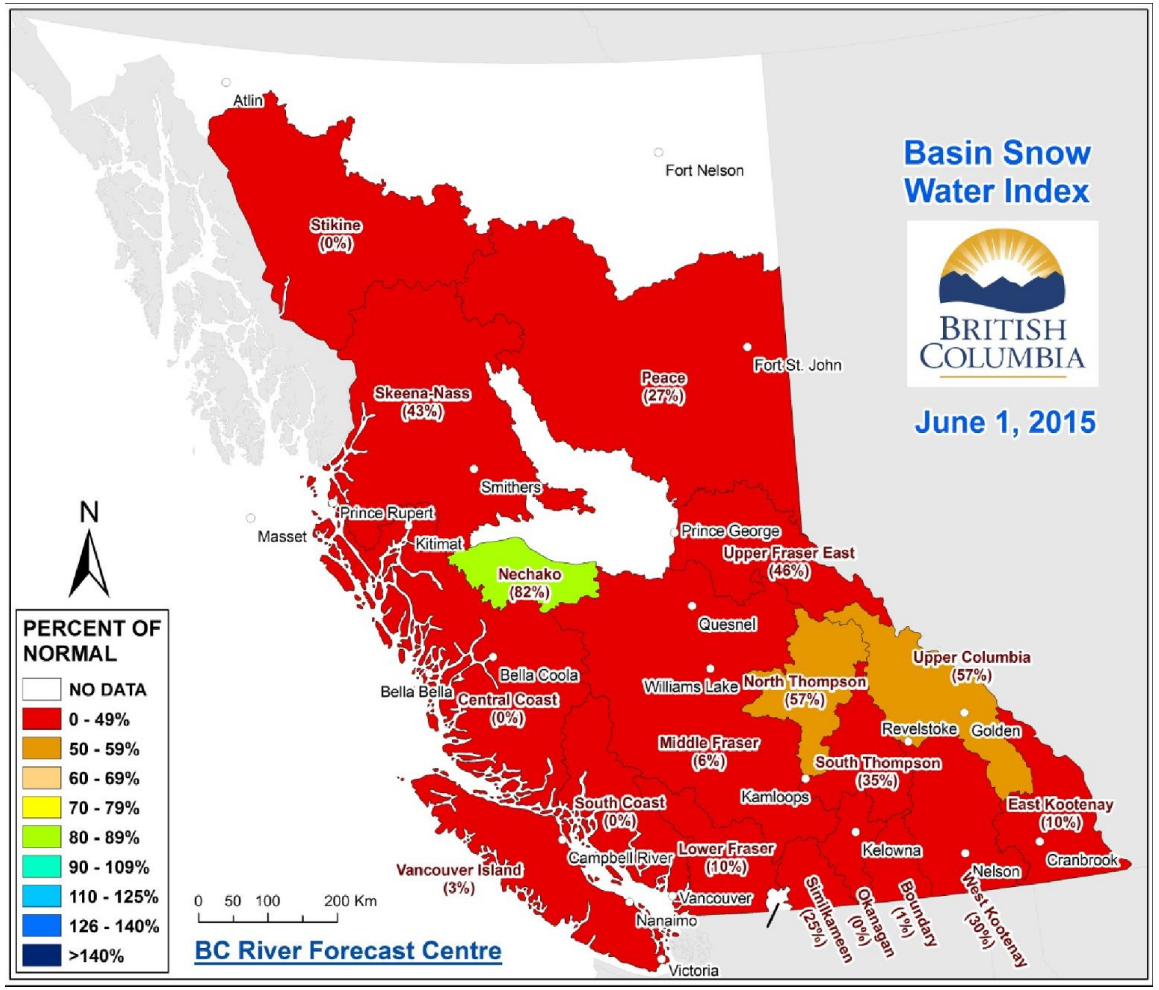
Near record low flows



PACIFIC CLIMATE IMPACTS CONSORTIUM

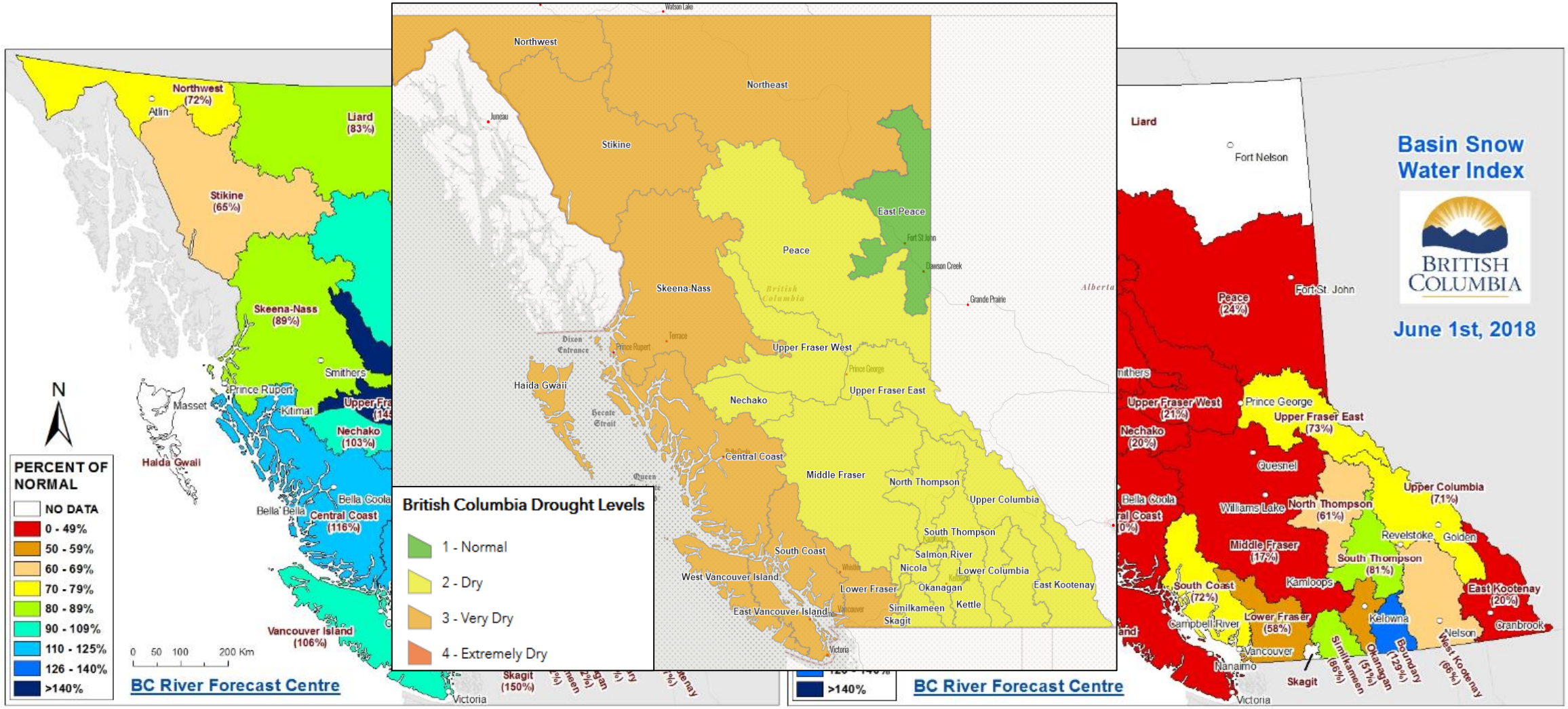
2015 snowpack Apr 1 → June 1





Source: BC River Forecast Centre

2018 snowpack Apr 1 → June 1

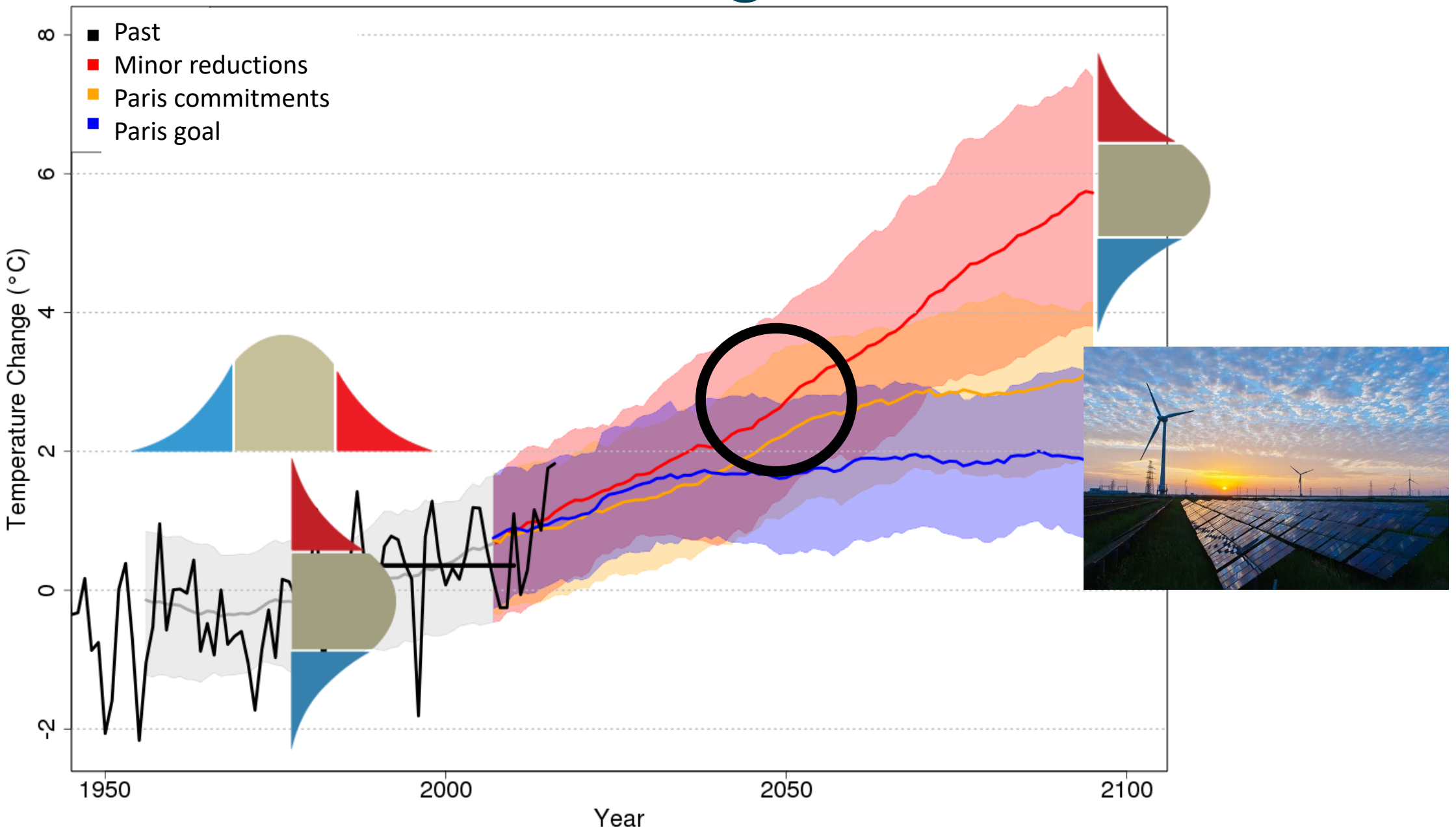


Source: BC River Forecast Centre

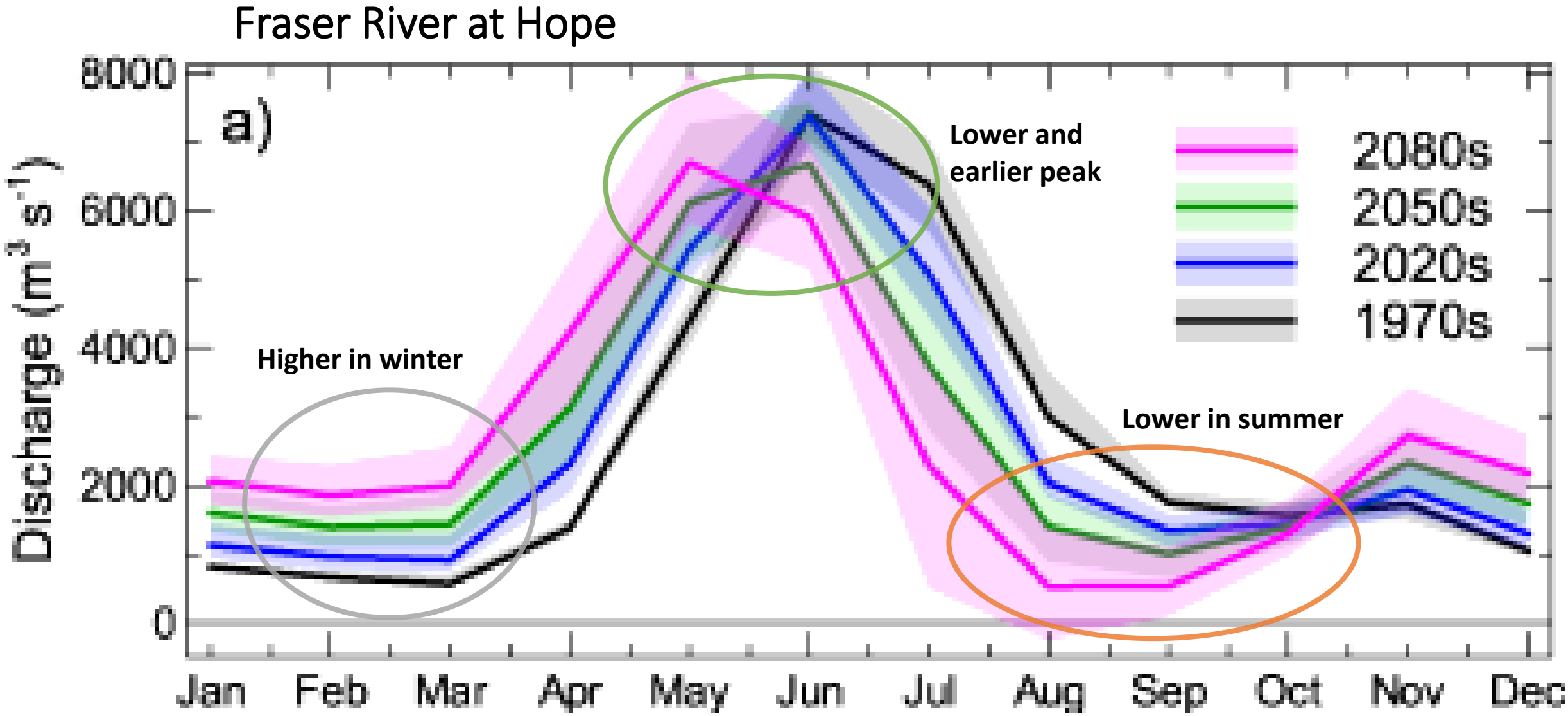
“Prediction is hard, especially about the future”

a) Albert Einstein
b) Mark Twain
c) Winston Churchill
d) George Bernard Shaw
e) Niels Bohr
f) Will Rogers
g) Enrico Fermi
h) Yogi Berra
i) Dan Quayle
j) Woody Allen
k) Confucius

Future warming in BC



Future streamflow

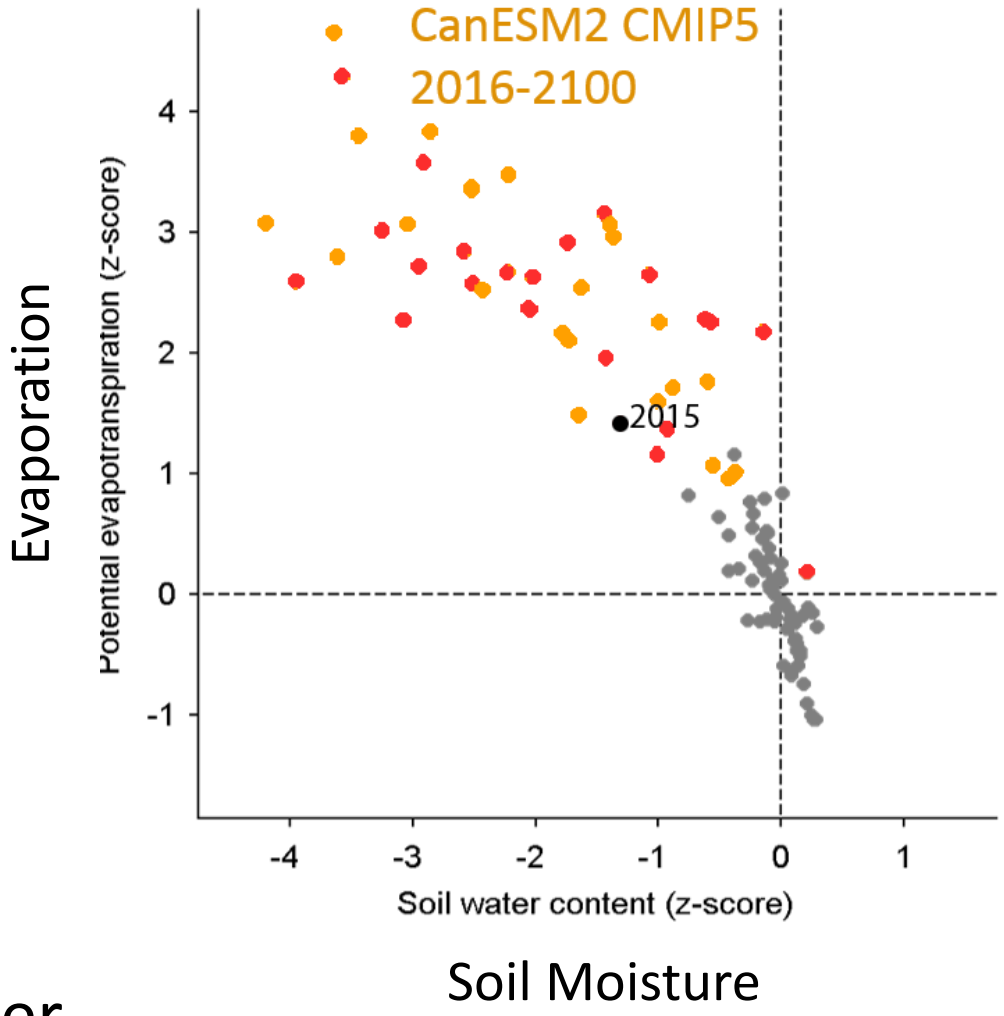


Statistical emulation of streamflow projections from a distributed hydrological model: Application to CMIP3 and CMIP5 climate projections for British Columbia

Water Resources Research
Volume 50, Issue 11, pages 8907-8926, 19 NOV 2014 DOI: 10.1002/2014WR015279
http://onlinelibrary.wiley.com/doi/10.1002/2014WR015279/full#wrcr21222-fig-0010

Soil moisture and evaporation

2015 record dry but on wet side in future

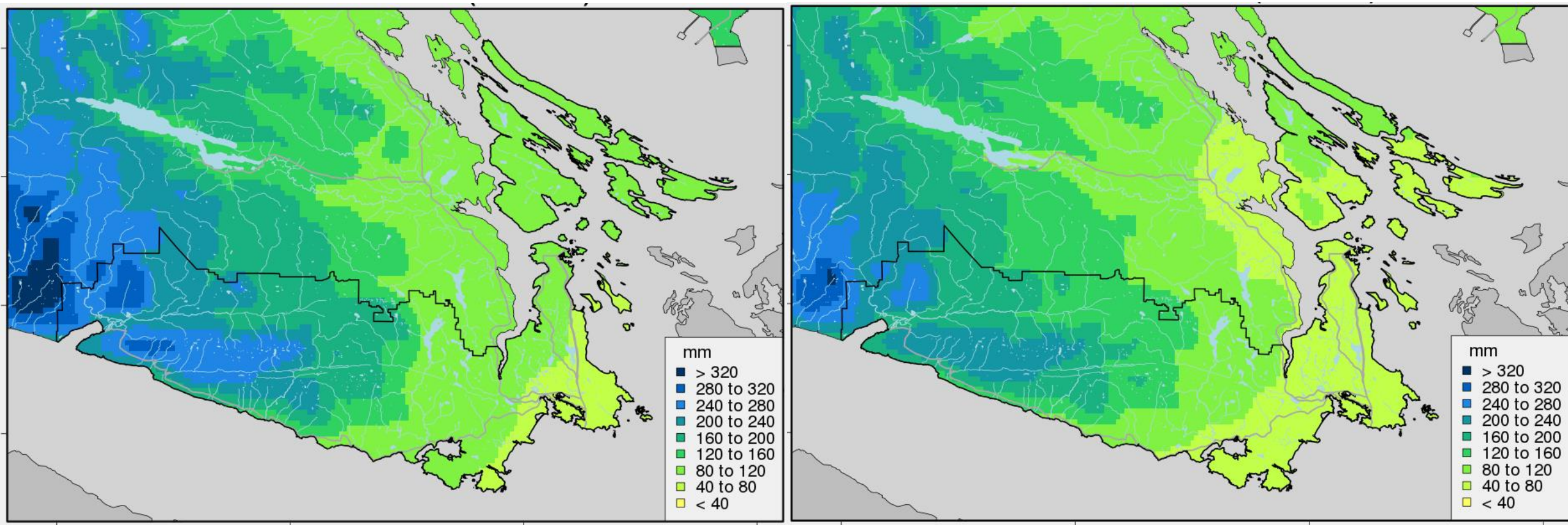


Evaporation

Soil Moisture

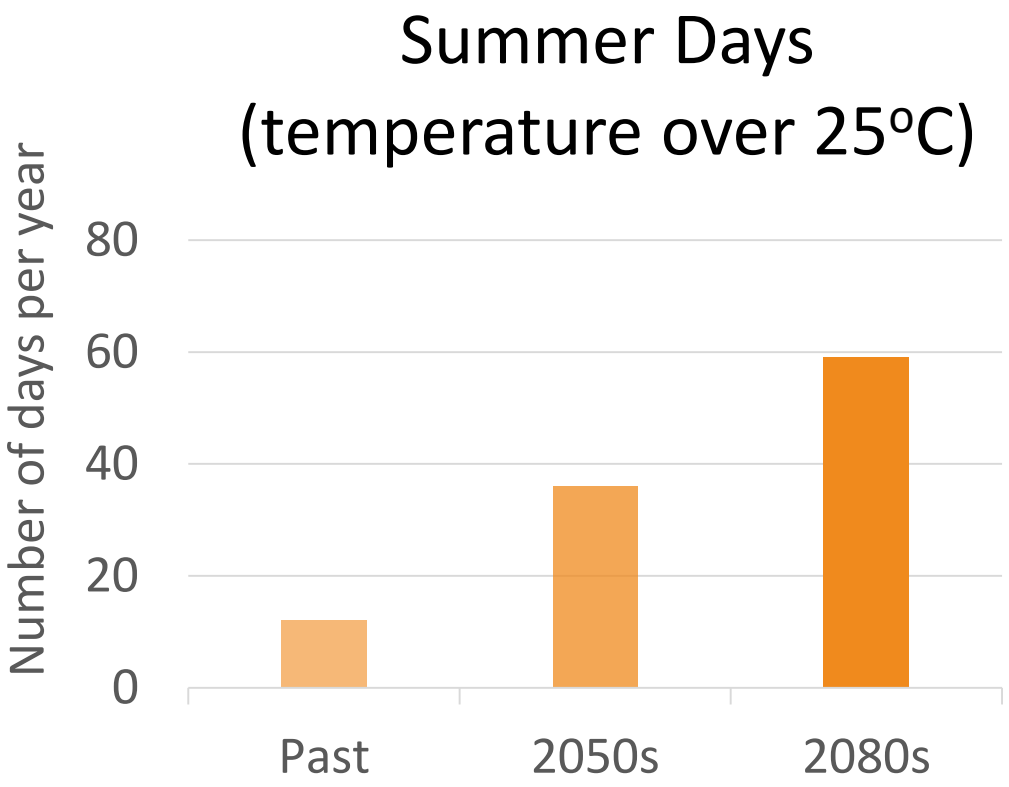
Source: Robbie Hember

Drier summers



June-July-August precipitation: 1971-2000 baseline: ~125 mm 2050s: ~20% decrease

Hotter summers



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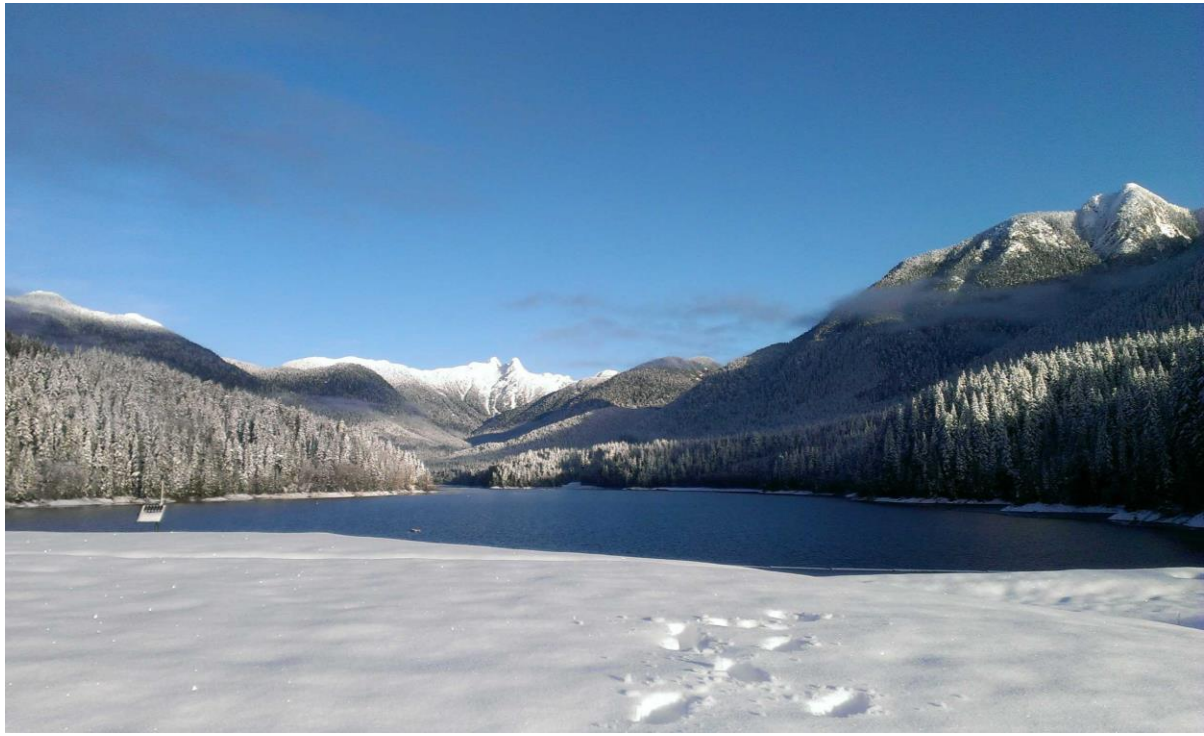
Resilience or projections?



Drinking water supply reservoir: rain vs. snow dominated

Online adaptation tools webinar

https://www.youtube.com/watch?v=jxj-3gPkDW4

Resources to accompany BC Regional Adaptation Collaborative webinar
30 November 2016

Plan2Adapt http://pacificclimate.org/analysis-tools/plan2adapt

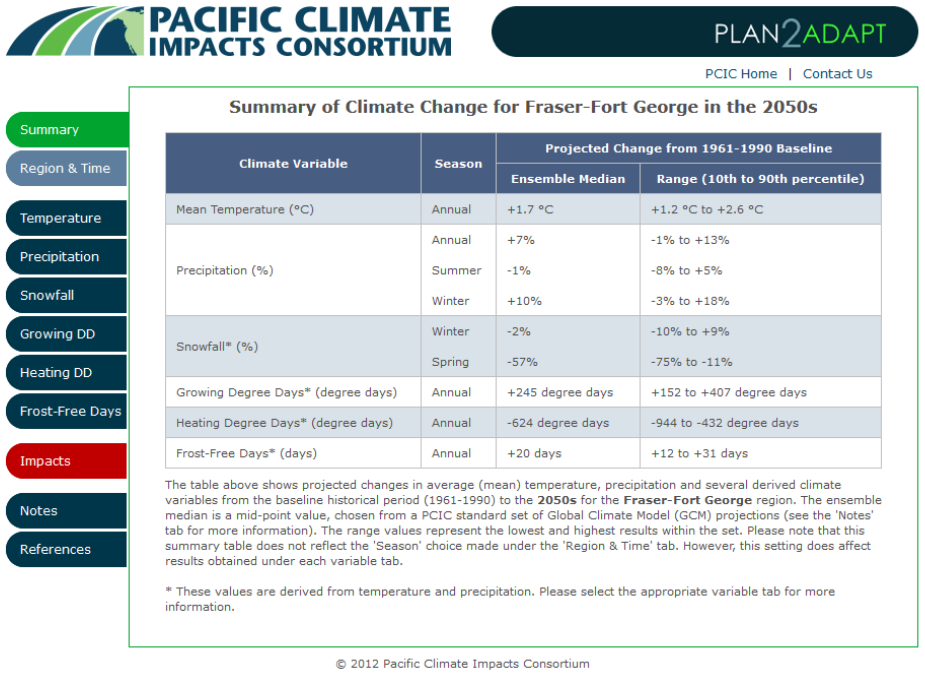
PICS short course http://pics.uvic.ca/education/climate-insights-101#quicktabs-climate_insights_101=1

ClimateBC

- **HectaresBC** http://www.hectaresbc.org
- **ClimateWNA** http://genetics.forestry.ubc.ca/cfgc/ClimateWNA/ClimateWNA.html
- **ClimateBC Online** http://www.genetics.forestry.ubc.ca/cfcg/ClimateBC40/Default.aspx
- **BC Climate Explorer** http://www.bc-climate-explorer.org/

PCIC Data Portals https://pacificclimate.org/data

Data Basin
https://nplcc.databasin.org/galleries/5a3a424b36ba4b63b10b8170ea0c915e#expand=105363%2C106698%2C106712%2C110010%2C105359%2C105364



More resources

- Climate change in health care / buildings
  - Safe haven in the storm
  - Canadian coalition for green health care
  - PICS adaptation in buildings infographic

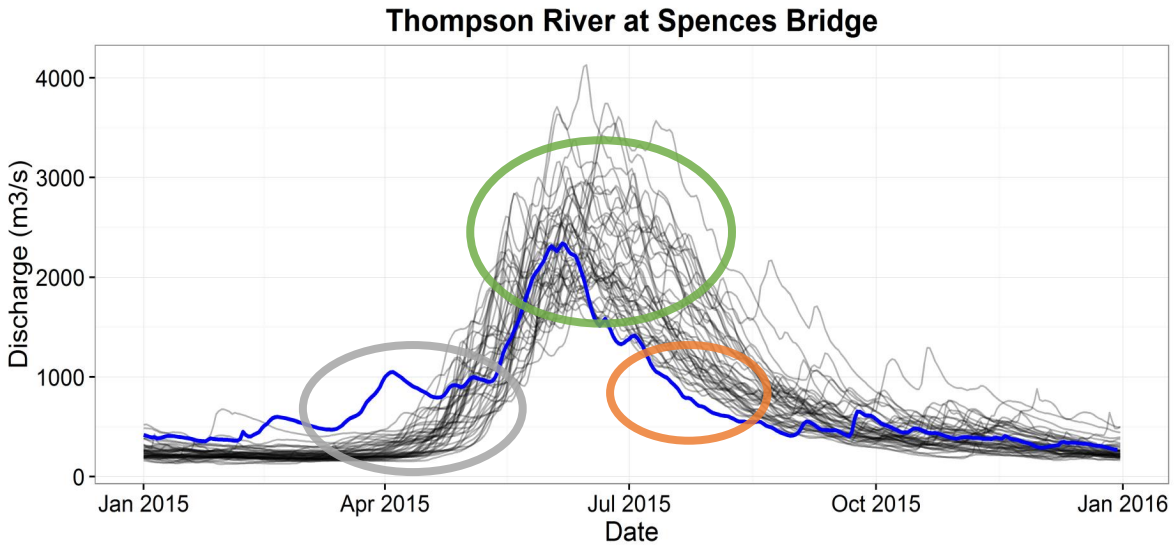
- Adaptation guidance
  - Infrastructure Canada Climate Lens
  - BC Ministry of Transportation and Infrastructure Technical Circular
  - EGBC guidance document
  - Climate / engineering language primer
  - National guidebook on climate scenarios

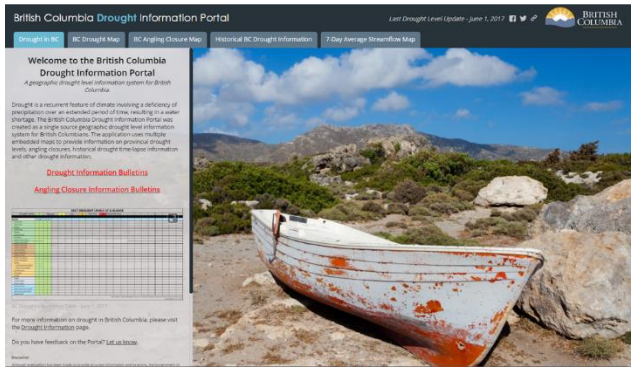
And even more resources

- Educational/background
  - CBC podcast mini series
  - Pacific Institute for Climate Solutions (PICS): Climate Insights 101
  - What if climate change is real? – Katherine Hayhoe Ted Talk

- Climate Projections Reports released by regional districts
  - Climate Projections for the Cowichan Valley Regional District
  - Climate Projections for the Capital Region
  - Climate Projections for Metro Vancouver
    - Climate Projections for Whistler
    - City of Vancouver Climate Impacts Summary

2015 / 2016 /2017 weather events, seasons





2015 *https://www.pacificclimate.org/sites/default/files/publications/2015_Year_in_Review-Final.pdf*

2016 *https://www.pacificclimate.org/news-and-events/news/2016/bc-track-set-new-temperature-record-2016* *and* *https://www.pacificclimate.org/news-and-events/news/2017/climate-variability-hot-cold-winter-%E2%80%9916-%E2%80%9817*

2017 *https://www.pacificclimate.org/sites/default/files/publications/PCIC_Update_Mar_2018.pdf*

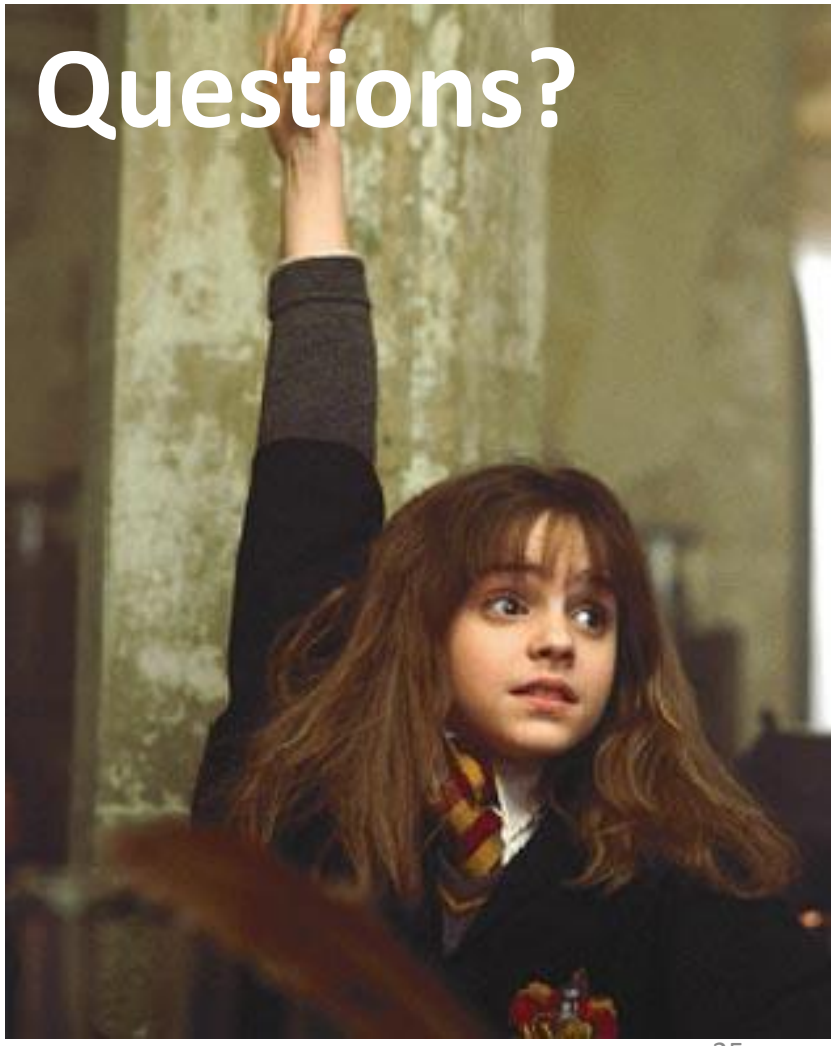
Thank you

For more information:

www.PacificClimate.org

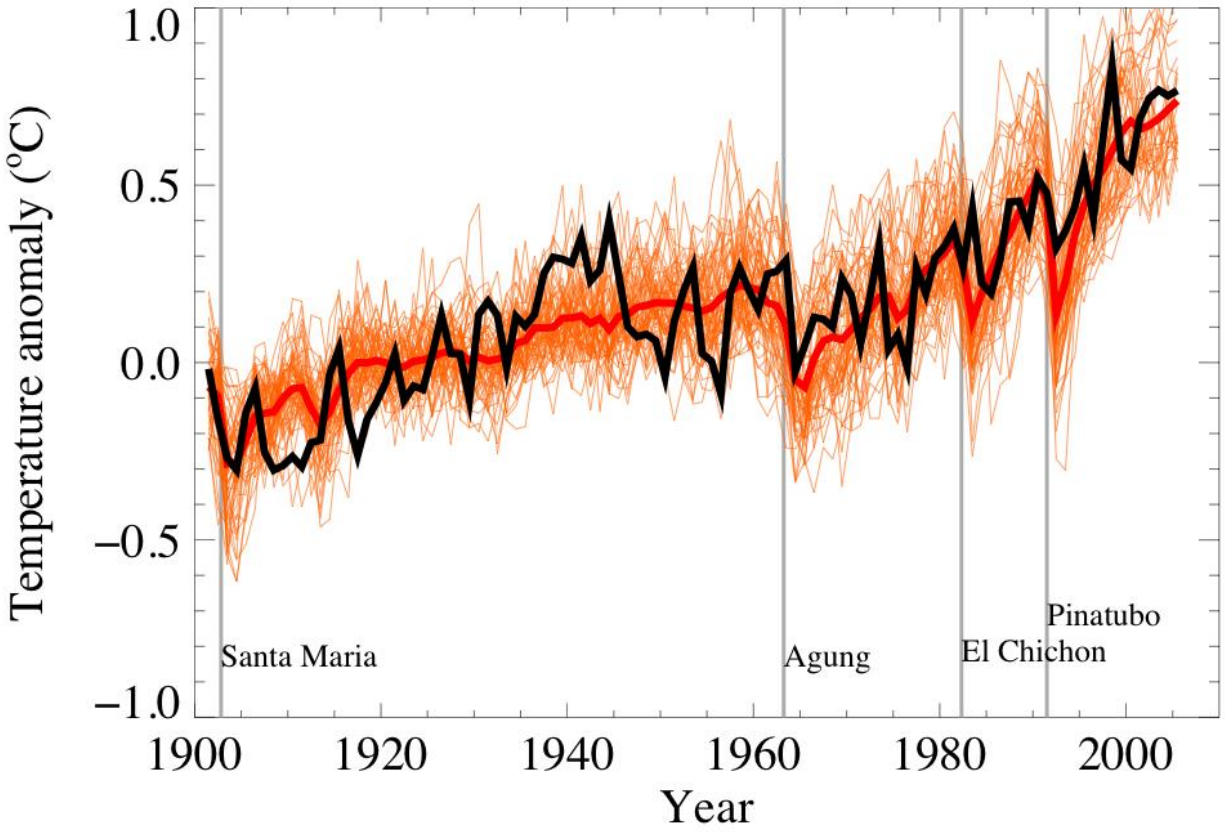
and

http://pics.uvic.ca/education/climate-insights-101#quicktabs-climate_insights_101=1



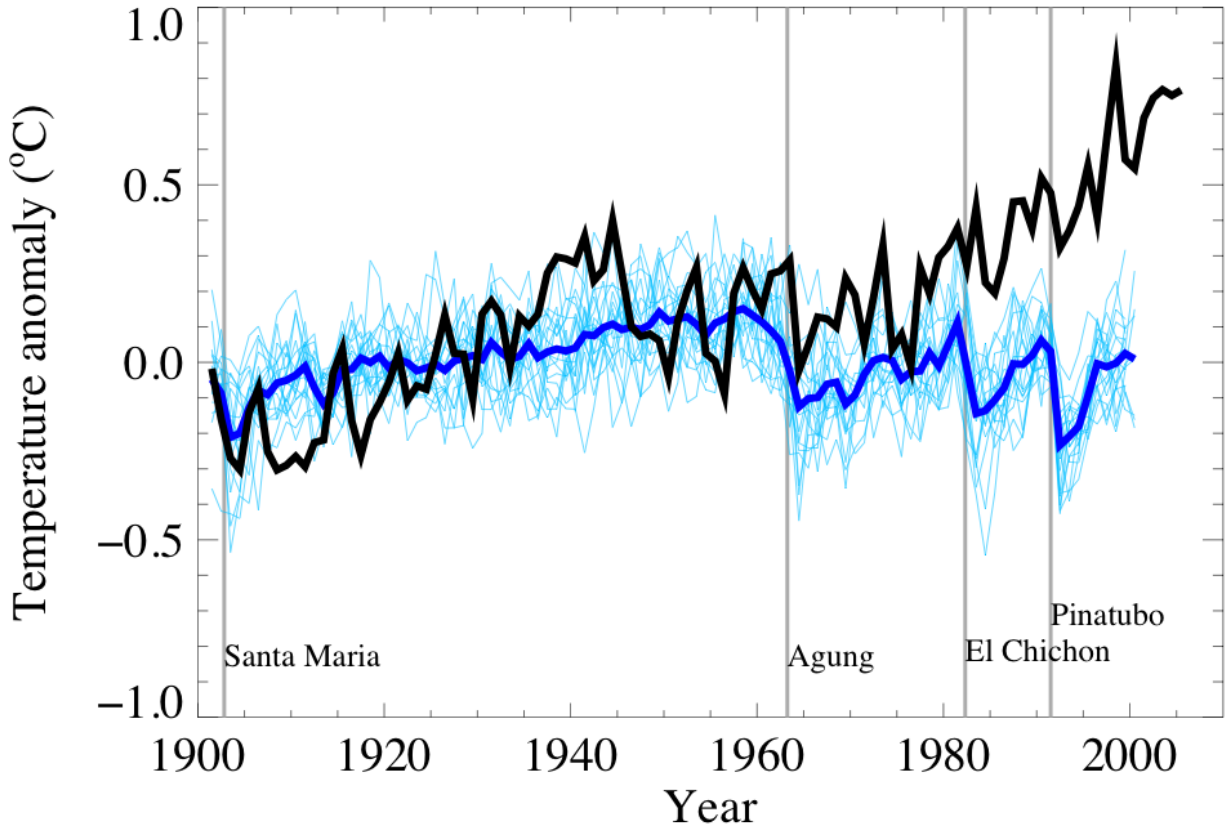
Observations

All known climate forcing



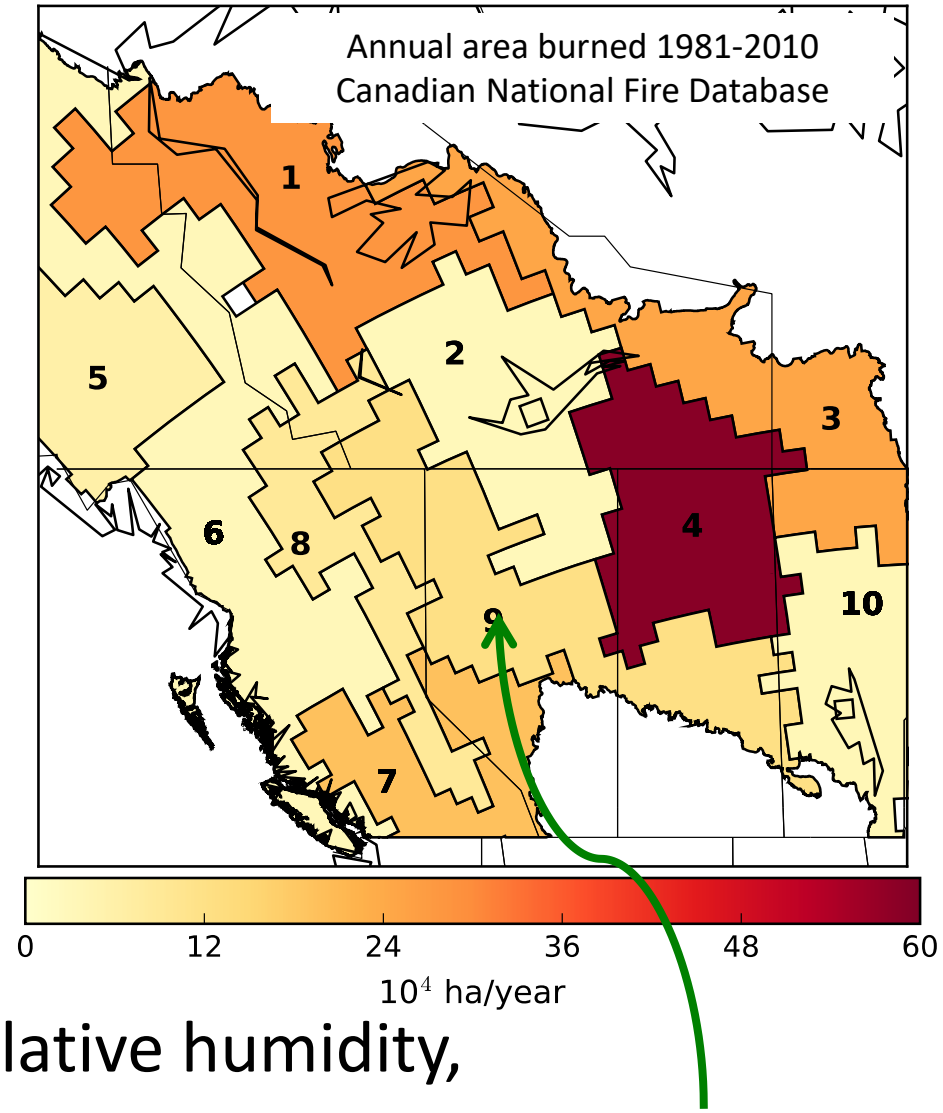
Observations

Without greenhouse gas forcing



Fire risk (Kirchmeier-Young et al, 2017)

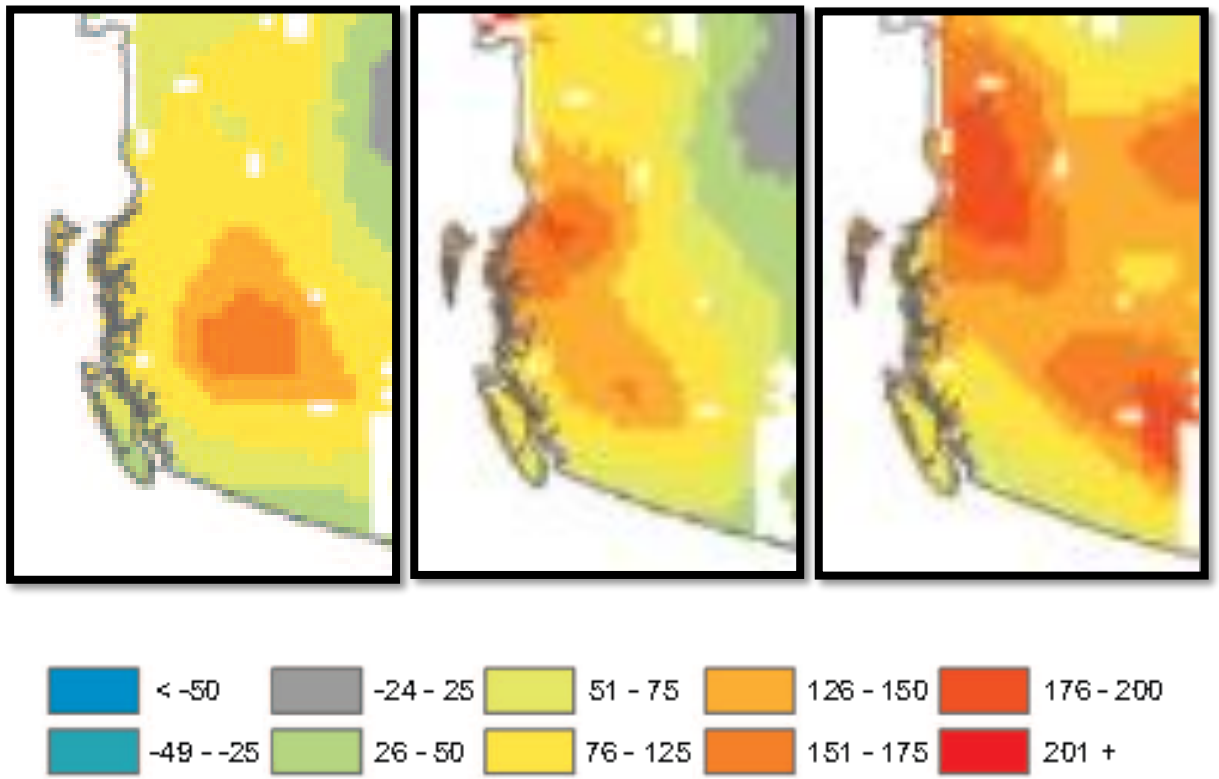
- We ask whether human induced climate change has affected fire risk in the“Southern Prairie” Homogeneous Fire Regime zone
- Measure fire risk using “CWFIS” system indicators
  - Fire Weather Index
  - Fine Fuels Moisture Code
  - Duff Moisture Code
  - Drought Code



- These indices depend on temperature, relative humidity, wind speed, and precipitation

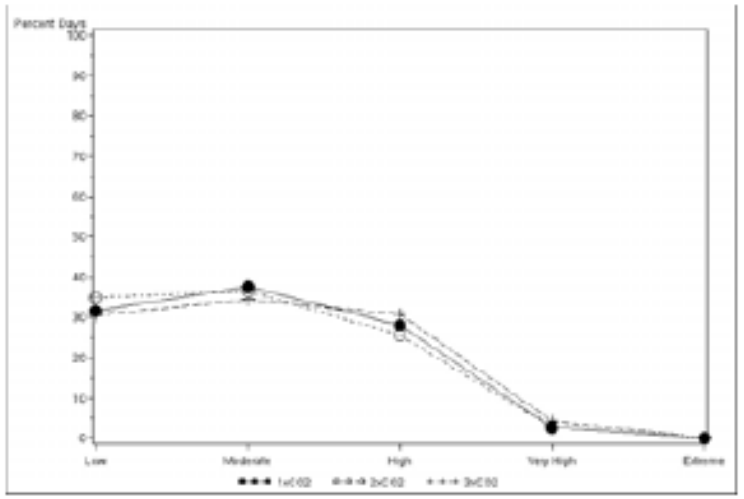
Future wildfire risk in BC?

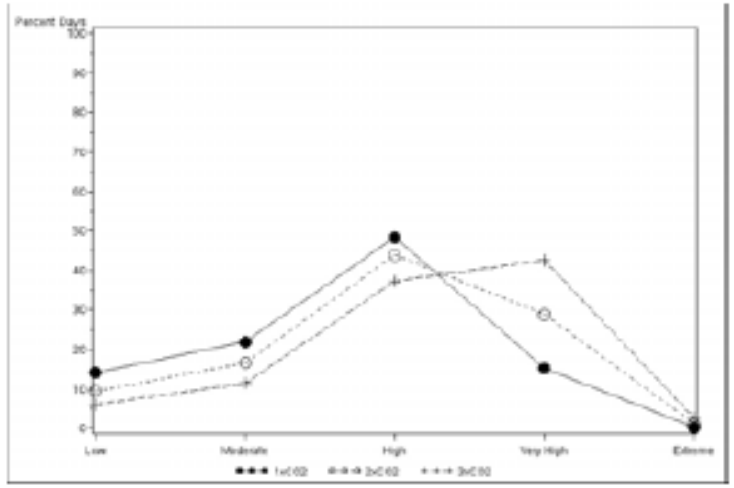
Percent change in number of days per fire season with ***active fire growth potential***



Source: Wotton et al. 2017 (Env Res Lett)

Hotter, drier summers → increased Fire Weather Index

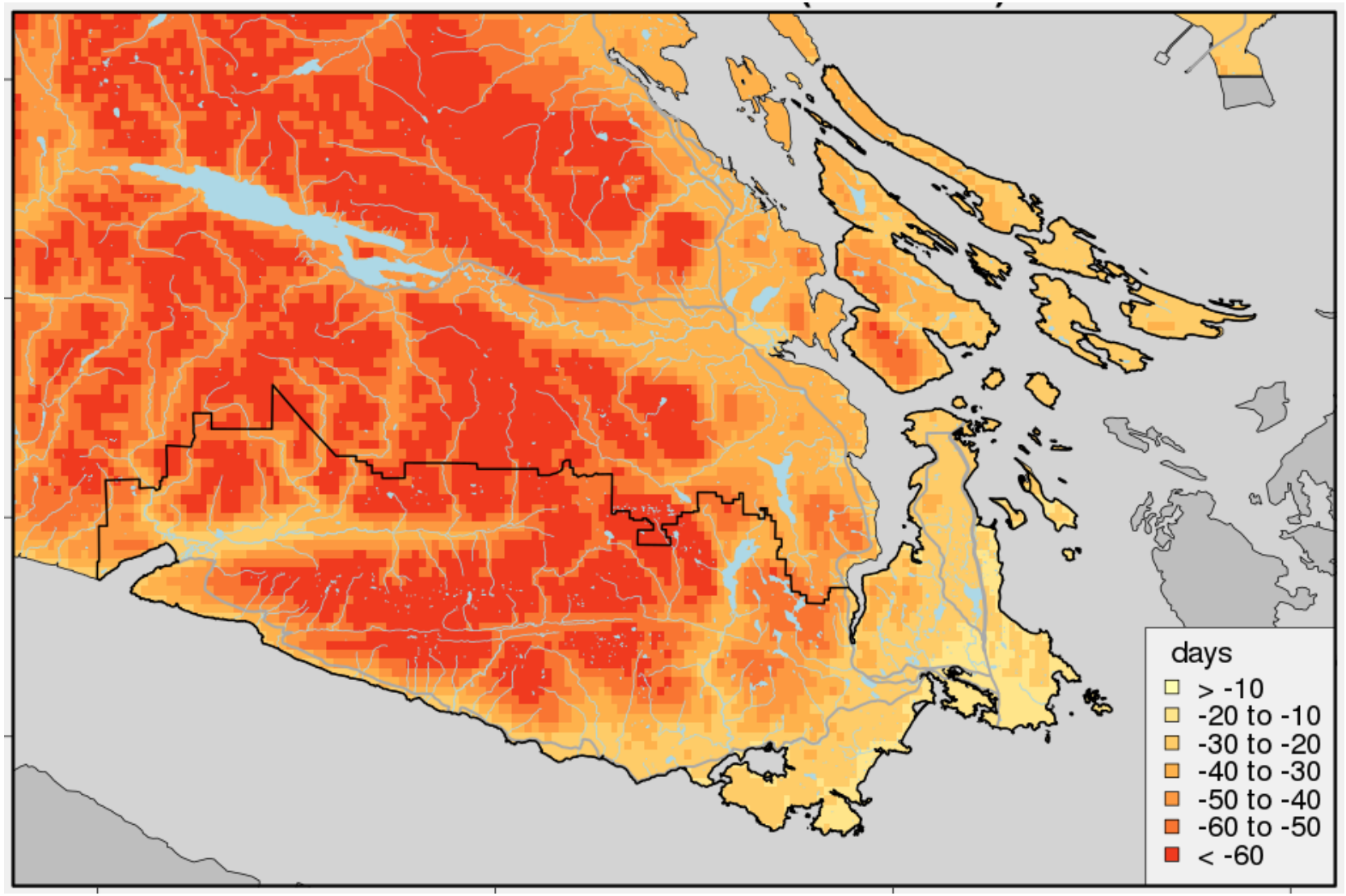




Future ***occurrence of wildfires*** on southern Vancouver Island & Gulf Islands would depend highly on ***lightning occurrence*** and ***wind*** for which projections are less readily available and less certain than temperature and precipitation

Source: Steve Taylor, Pacific Forestry Centre

Fewer days with frost



Days below 0°C: 2050s: ~70% decrease / ~80% Greater Victoria