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Fire Season Severity Anomaly Forecast

for the Institute for Catastrophic Loss Reduction

June 12, 2025

Richard Carr

Natural Resources Canada – Canadian Forest Service

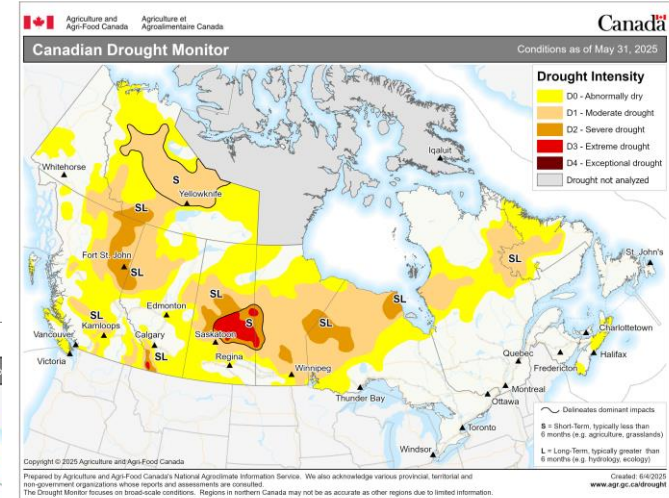
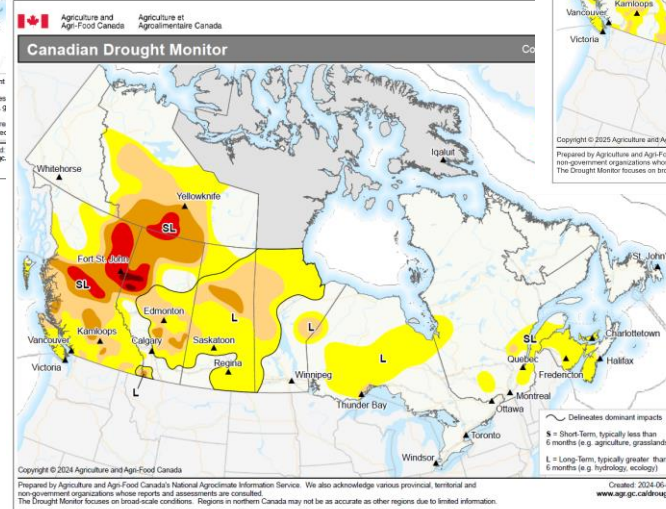
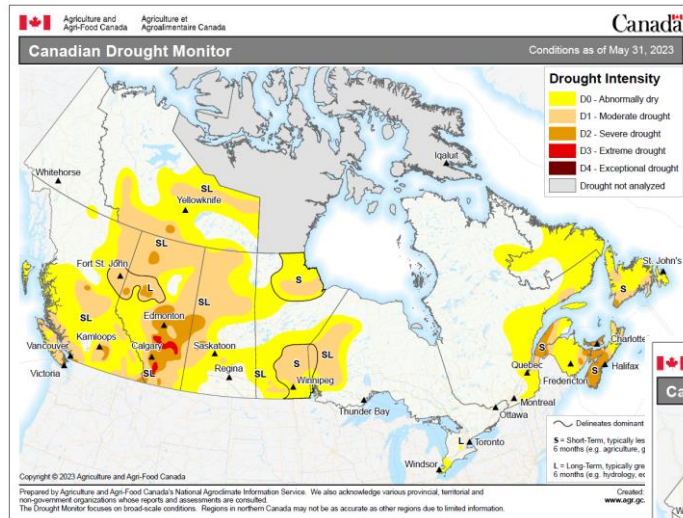
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Agenda

- **2023-25 early season factors**
- **Climate model predictions**
- **2025 CWFIS Fire Season Forecast (June 1)**

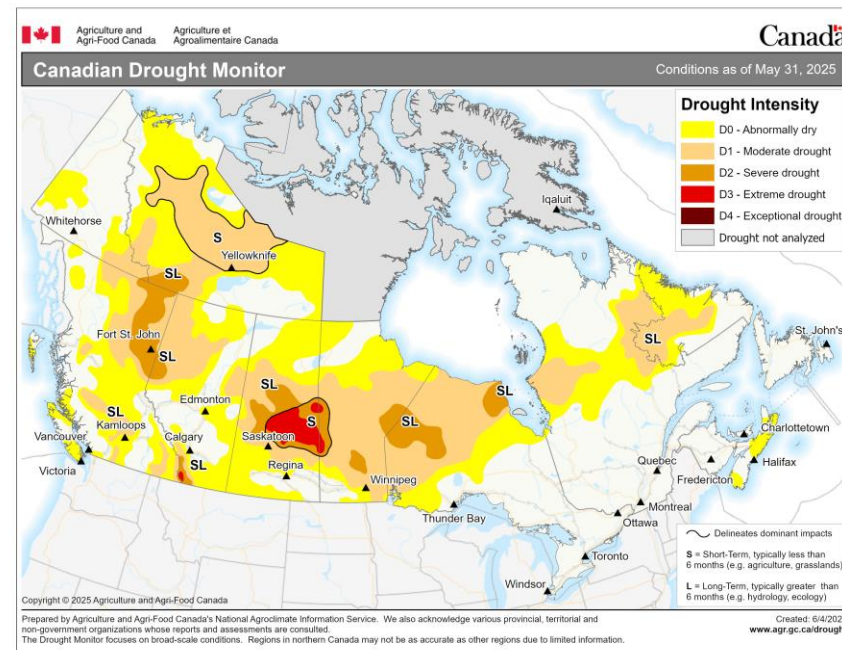
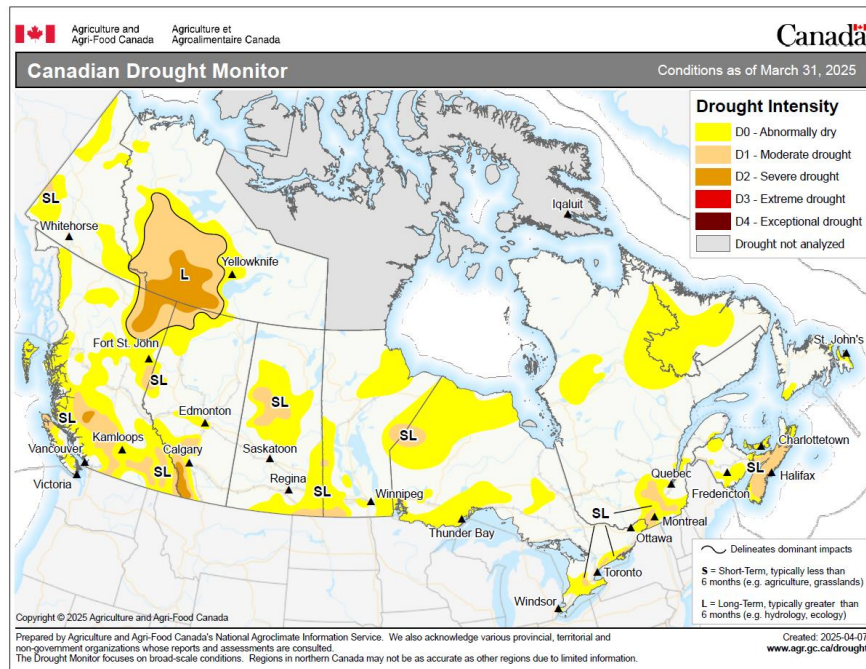


Drought Progression: May 31, 2023-25



- Drought **was** less intense than in spring 2023 and 2024
- Intensification during 2023; reduction in mid to late 2024

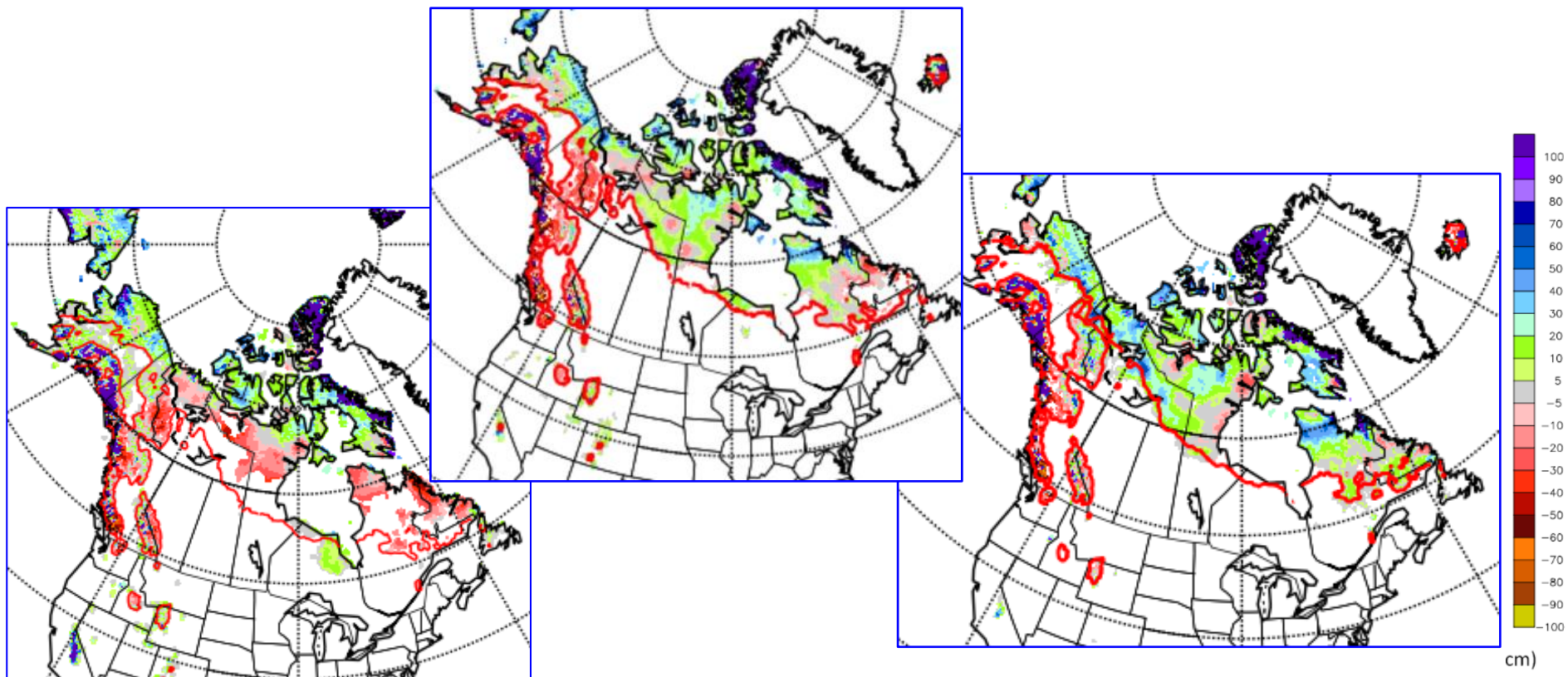
Drought Progression: Spring 2025



- Not too dramatic at March 31, April 30
- Rapid intensification during May
- Some reduction in southwestern NT, southern BC

Snow Cover

- Snow melted quickly in southern BC in February-March
- Snow loss in other regions was normal during spring



May 10, 2023

May 8, 2024

May 14, 2025



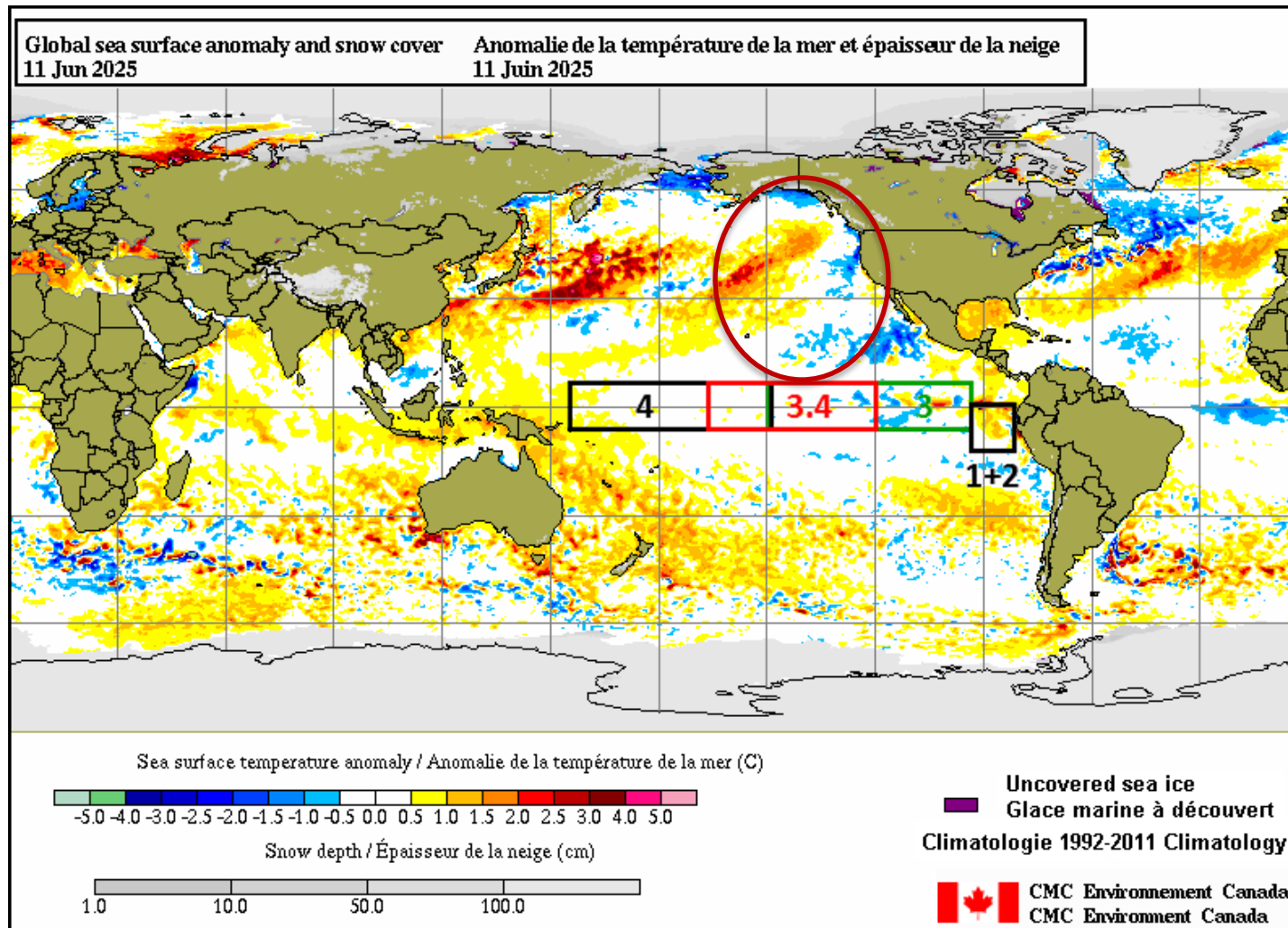
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ENSO – Current SST



North Pacific
SST (PDO)
negative;
closer to
neutral than
past few years

La Niña-ish
condition
faded ... was
winter 2024-25
ever a true La
Niña? ENSO is
neutral now.



Fire Problems in ENSO Springs

El Niño:

- Warm, windy, dry in western Canada

La Niña:

- Arctic surface highs bring dry air, strong wind around edges
- Temperature may be cool

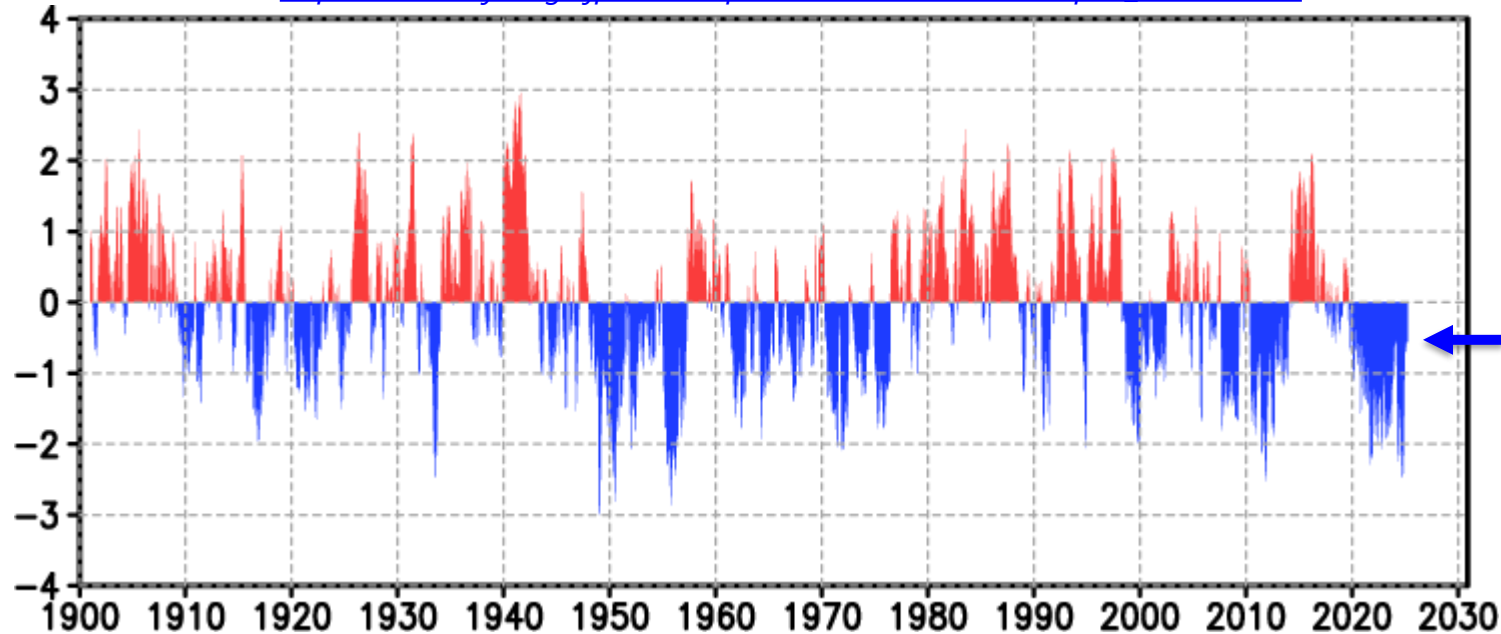
Summer fire problems may depend on other influences

	Year	DJF	JFM	FMA	MAM	AMJ	MJJ	JJA	JAS	ASO	SON	OND	NDJ
Large area burned →	1995	1.0	0.7	0.5	0.3	0.1	0.0	-0.2	-0.5	-0.8	-1.0	-1.0	-1.0
Virginia Hills, AB →	1998	2.2	1.9	1.4	1.0	0.5	-0.1	-0.8	-1.1	-1.3	-1.4	-1.5	-1.6
	1999	-1.5	-1.3	-1.1	-1.0	-1.0	-1.0	-1.1	-1.1	-1.2	-1.3	-1.5	-1.7
	2000	-1.7	-1.4	-1.1	-0.8	-0.7	-0.6	-0.6	-0.5	-0.5	-0.6	-0.7	-0.7
Chisholm, AB →	2001	-0.7	-0.5	-0.4	-0.3	-0.3	-0.1	-0.1	-0.1	-0.2	-0.3	-0.3	-0.3
	2002	-0.1	0.0	0.1	0.2	0.4	0.7	0.8	0.9	1.0	1.2	1.3	1.1
Kelowna, BC →	2003	0.9	0.6	0.4	0.0	-0.3	-0.2	0.1	0.2	0.3	0.3	0.4	0.4
	2004	0.4	0.3	0.2	0.2	0.2	0.3	0.5	0.6	0.7	0.7	0.7	0.7
	2005	0.6	0.6	0.4	0.4	0.3	0.1	-0.1	-0.1	-0.1	-0.3	-0.6	-0.8
	2006	-0.8	-0.7	-0.5	-0.3	0.0	0.0	0.1	0.3	0.5	0.7	0.9	0.9
	2007	0.7	0.3	0.0	-0.2	-0.3	-0.4	-0.5	-0.8	-1.1	-1.4	-1.5	-1.6
	2008	-1.6	-1.4	-1.2	-0.9	-0.8	-0.5	-0.4	-0.3	-0.3	-0.4	-0.6	-0.7
	2009	-0.8	-0.7	-0.5	-0.2	0.1	0.4	0.5	0.5	0.7	1.0	1.3	1.6
Slave Lake, AB →	2010	1.5	1.3	0.9	0.4	-0.1	-0.6	-1.0	-1.4	-1.6	-1.7	-1.7	-1.6
	2011	-1.4	-1.1	-0.8	-0.6	-0.5	-0.4	-0.5	-0.7	-0.9	-1.1	-1.1	-1.0
	2012	-0.8	-0.6	-0.5	-0.4	-0.2	0.1	0.3	0.3	0.3	0.2	0.0	-0.2
→	2013	-0.4	-0.3	-0.2	-0.2	-0.3	-0.3	-0.4	-0.4	-0.3	-0.2	-0.2	-0.3
PDO positive phase →	2014	-0.4	-0.4	-0.2	0.1	0.3	0.2	0.1	0.0	0.2	0.4	0.6	0.7
→	2015	0.6	0.6	0.6	0.8	1.0	1.2	1.5	1.8	2.1	2.4	2.5	2.6
Fort McMurray, AB →	2016	2.5	2.2	1.7	1.0	0.5	0.0	-0.3	-0.6	-0.7	-0.7	-0.7	-0.6
→	2017	-0.3	-0.1	0.1	0.3	0.4	0.4	0.2	-0.1	-0.4	-0.7	-0.9	-1.0
Big years in BC →	2018	-0.9	-0.8	-0.6	-0.4	-0.1	0.1	0.1	0.2	0.4	0.7	0.9	0.8
	2019	0.7	0.7	0.7	0.7	0.5	0.5	0.3	0.1	0.2	0.3	0.5	0.5
	2020	0.5	0.5	0.4	0.2	-0.1	-0.3	-0.4	-0.6	-0.9	-1.2	-1.3	-1.2
Western half →	2021	-1.0	-0.9	-0.8	-0.7	-0.5	-0.4	-0.4	-0.5	-0.7	-0.8	-1.0	-1.0
	2022	-1.0	-0.9	-1.0	-1.1	-1.0	-0.9	-0.8	-0.9	-1.0	-1.0	-0.9	-0.8
Most of Canada! →	2023	-0.7	-0.4	-0.1	0.2	0.5	0.8	1.1	1.3	1.6	1.8	1.9	2.0
Busy summer →	2024	1.8	1.5	1.1	0.7	0.4	0.2	0.0	-0.1	-0.2	-0.3	-0.4	-0.5
	2025	-0.6	-0.4	-0.2	-0.1								

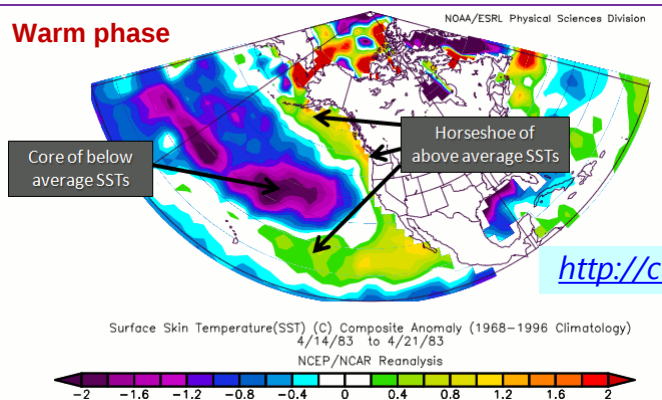


Pacific Decadal Oscillation (as of Apr 2025)

https://ds.data.jma.go.jp/tcc/tcc/products/el_nino/decadal/pdo_month.html

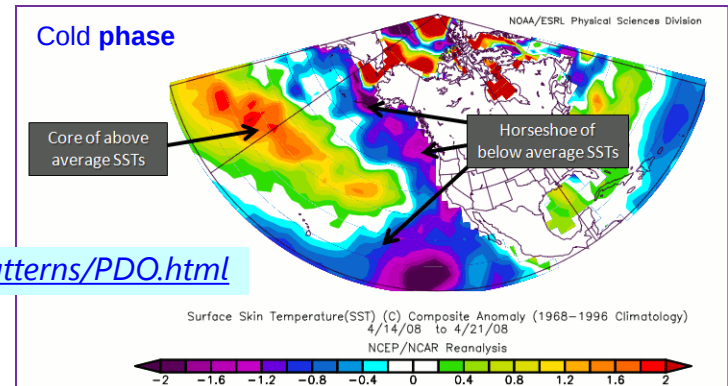


Warm phase



<http://climate.ncsu.edu/climate/patterns/PDO.html>

Cold phase



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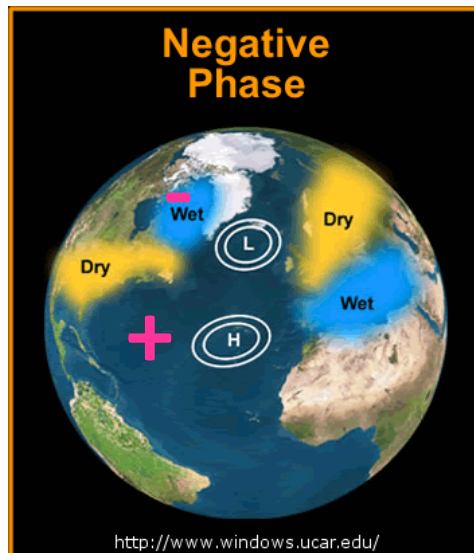
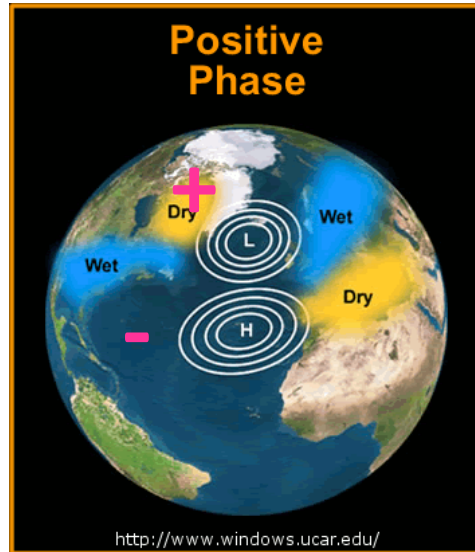
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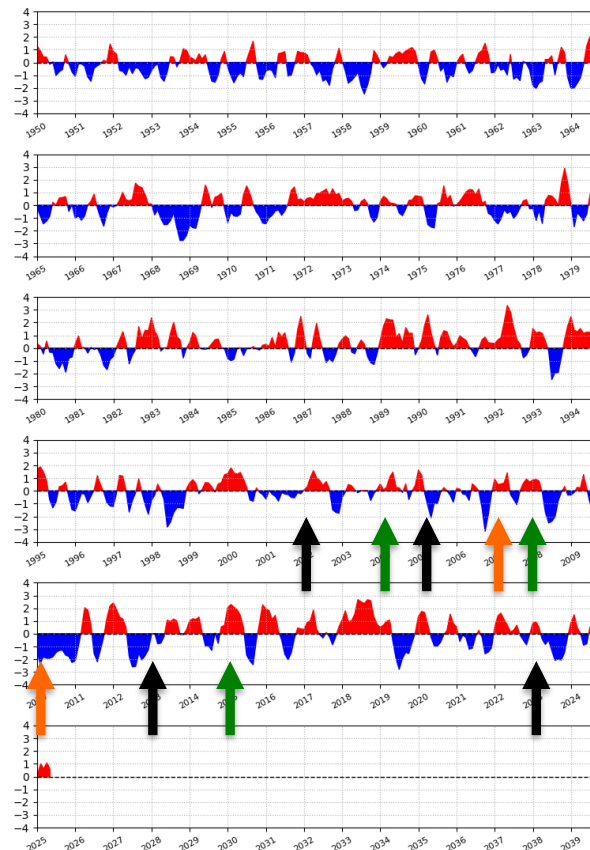
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North Atlantic Oscillation (to May 2025)

<https://www.ncei.noaa.gov/access/monitoring/nao>



Standardized 3-Month Running Mean NAO Index Through May 2025



Quebec Area Burned (NFDB, ha*1000)

2023	5000*
2015	5
2013	1900
2010	315
2008	1
2007	343
2005	800
2004	3
2002	1000

Early years may not include area burned in northern (unmanaged) region



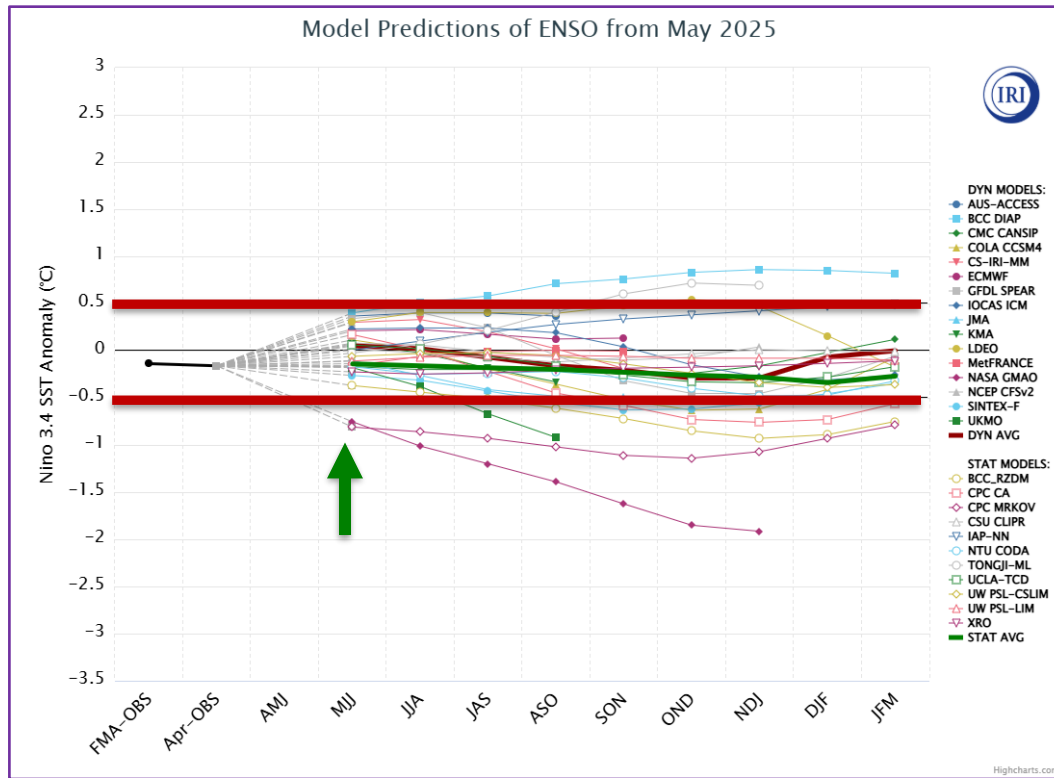
Climate Model Predictions



IRI ENSO Forecast

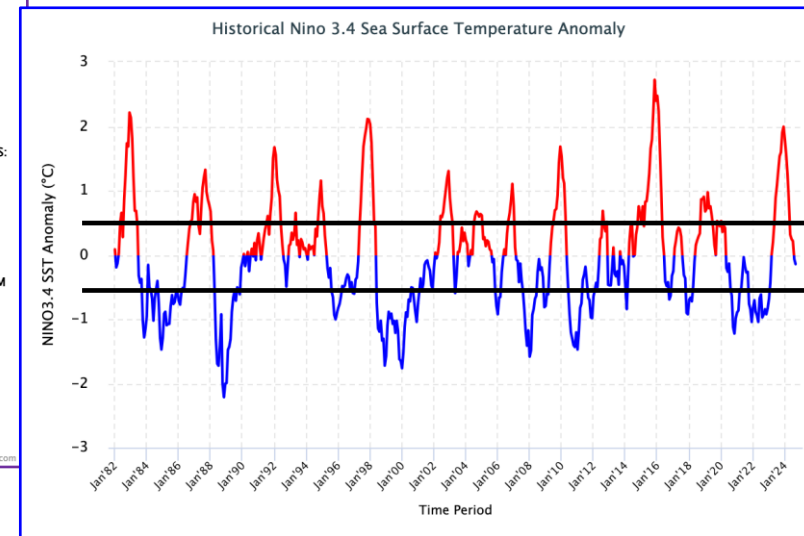
https://iri.columbia.edu/our-expertise/climate/forecasts/enso/current/?enso_tab=enso-sst_table

https://iri.columbia.edu/our-expertise/climate/forecasts/enso/2024-october-quick-look/?enso_tab=enso-sst_image



May, 2025

Neutral conditions likely continuing to winter 2025-26



Time series to October 2024



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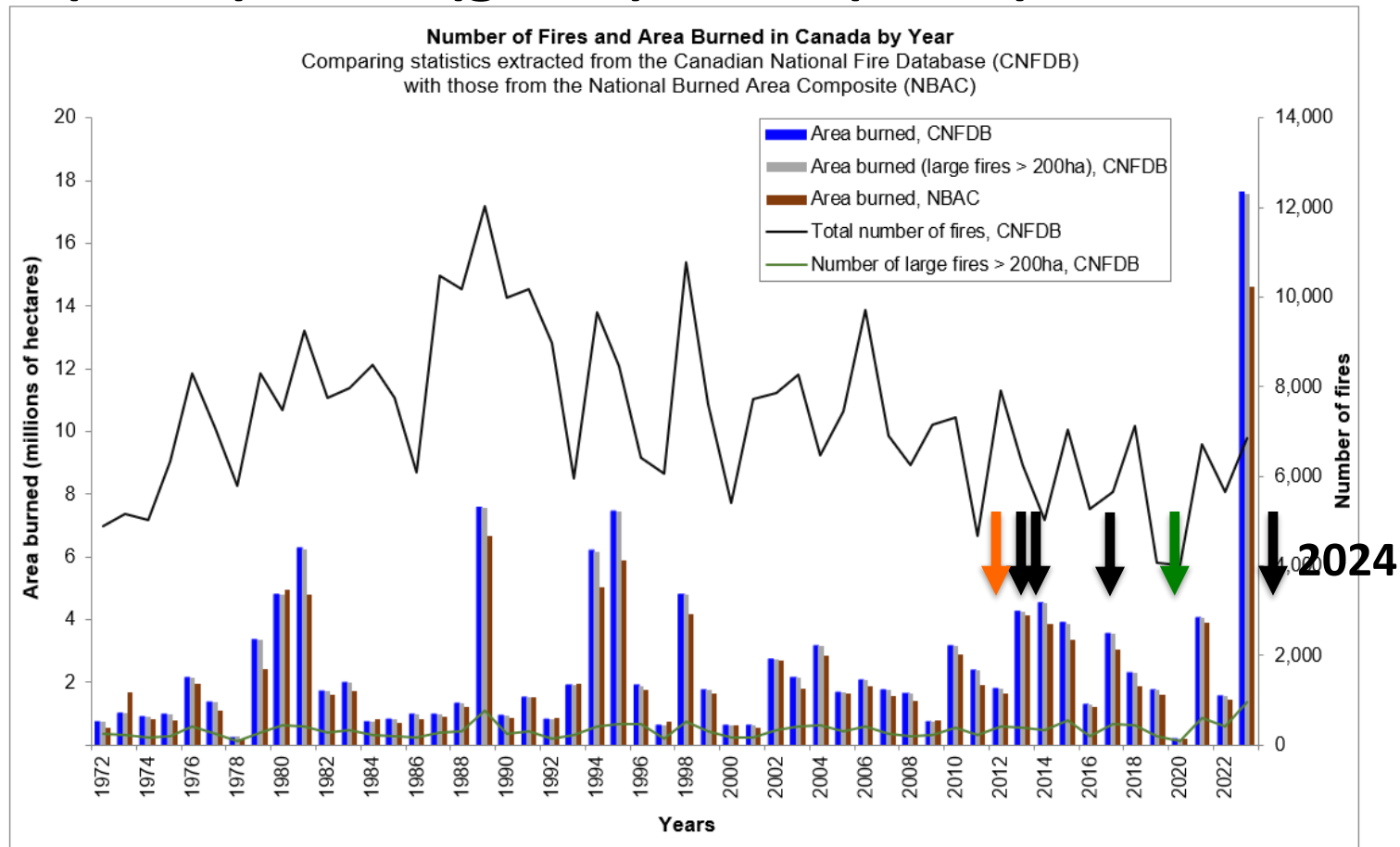
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Neutral ENSO: Recent Analog Years

- Arrows to area burned: 2012 (orange), 2013—2014, 2017 (black), 2020 (green), 2024 (black)



CanSIPS

- **Ensemble has increased from 2x10 to 2x20 members**
- **Models developed by Canadian Centre for Climate Modeling and Analysis**
 - **CanCM4i (CanESM5)**
 - **GEM5.2-NEMO: Global Environmental Multiscale – Nucleus for European Modeling of the Ocean**
- **NRCan uses temperature and precipitation data, plus fuel moisture initialization from CWFIS**
- **Skill of climate forecasts often best in coastal areas, poorer in lee of mountain ranges**



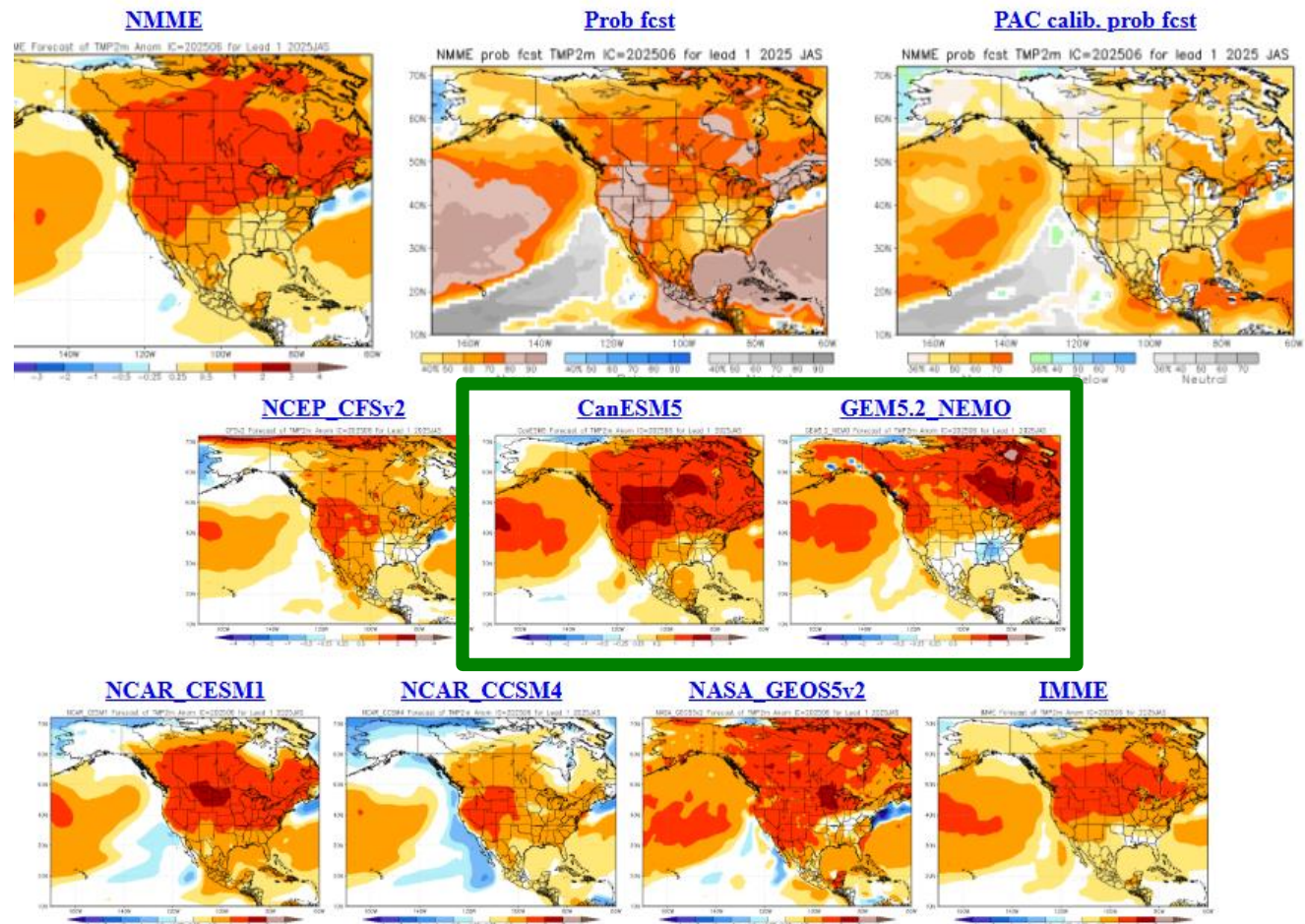
North American Multi-model Ensemble

NMME – April run

JJA Temp

Looks warm ...

*Subtract a bit of
drama to get
truer picture!*

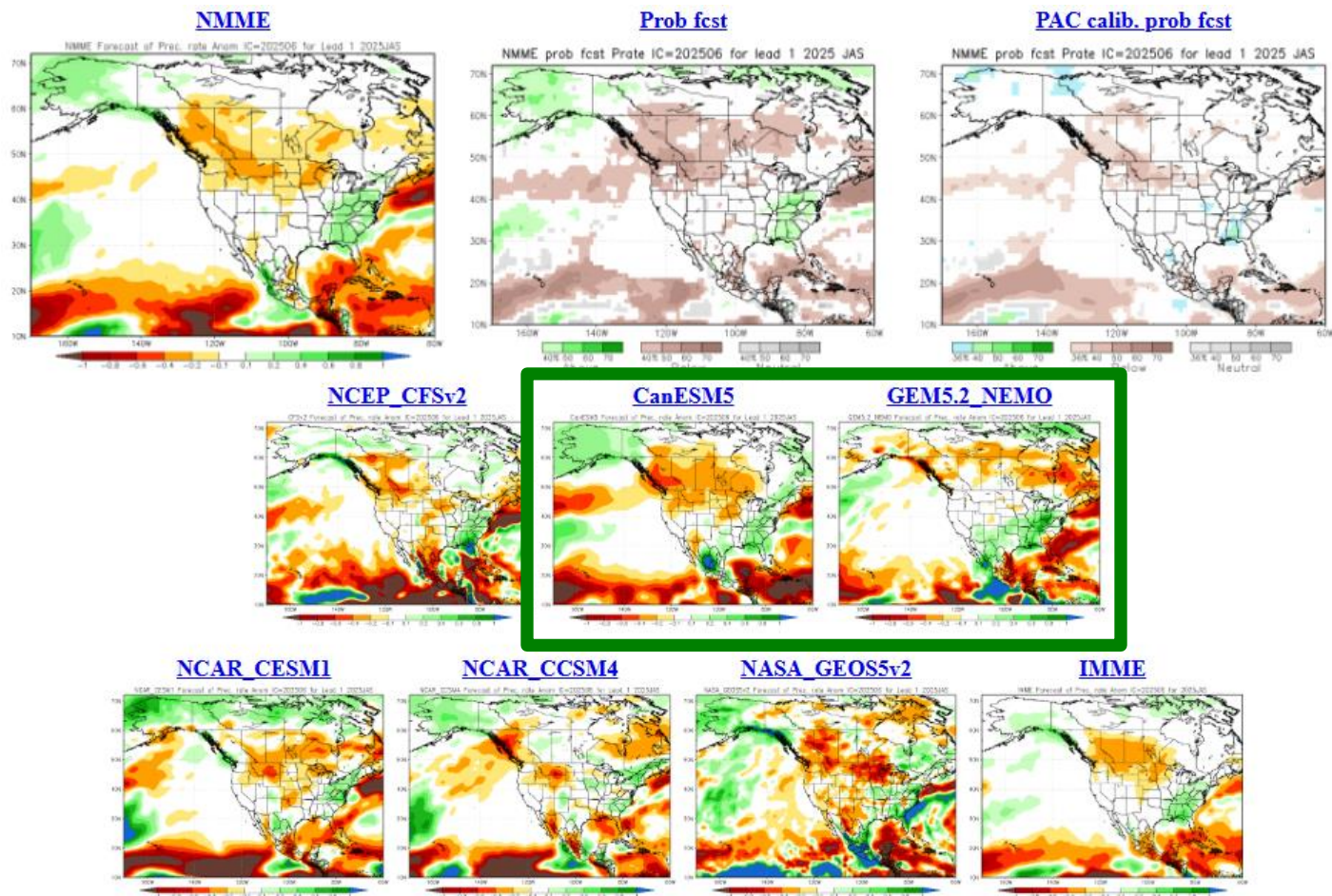


North American Multi-model Ensemble

NMME – April run

JJA Precip

Many dry regions?

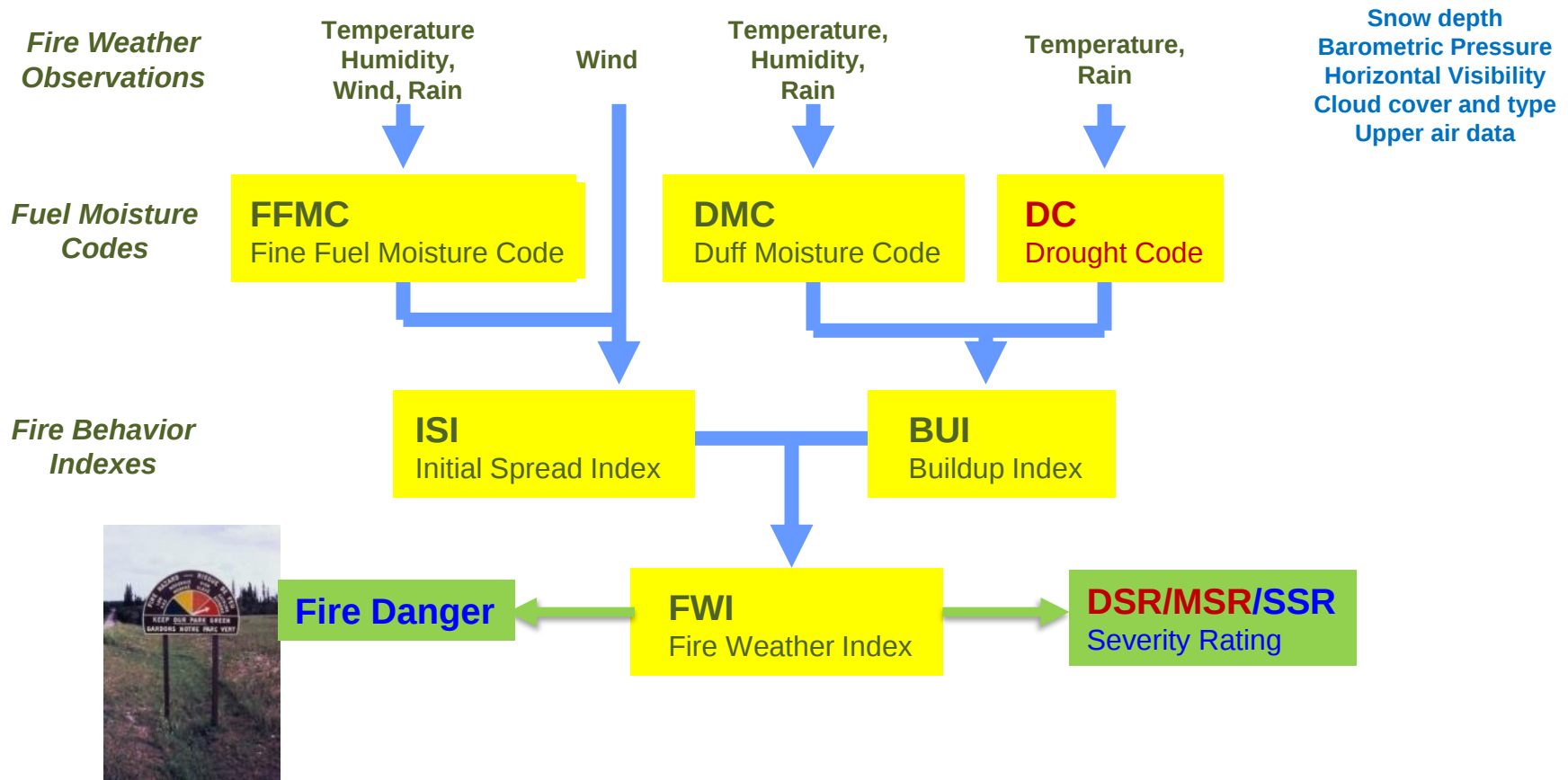


2025 NRCan-CFS Seasonal Prediction

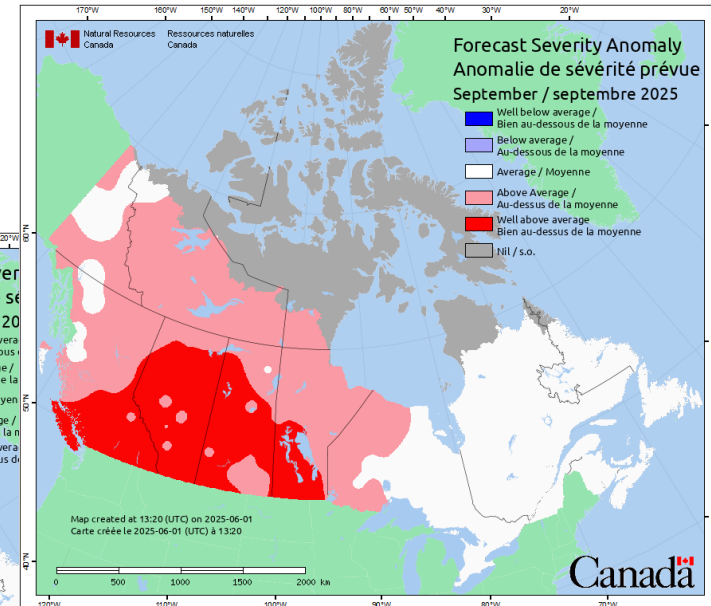
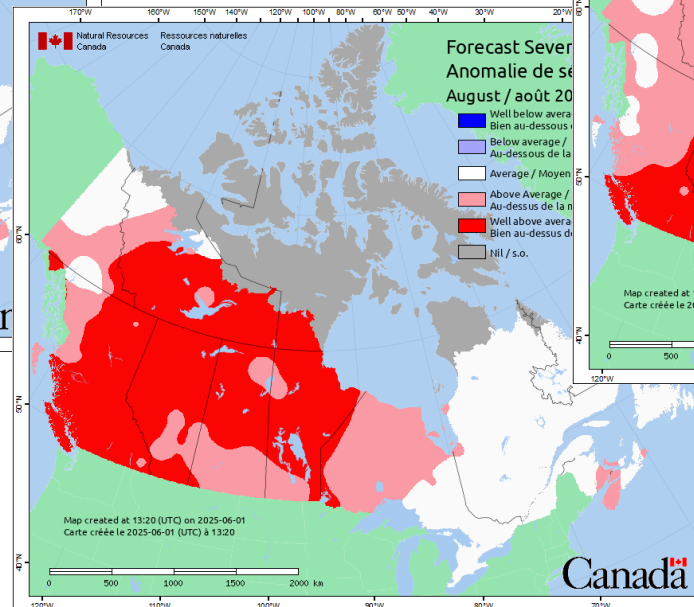
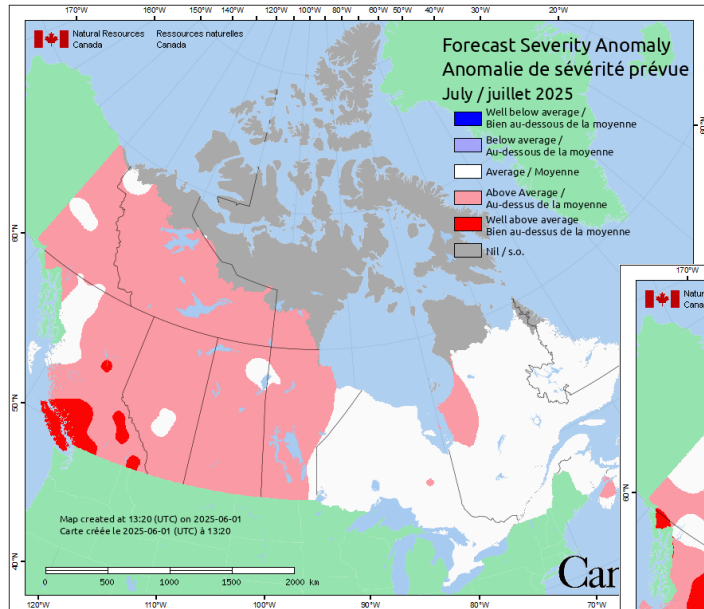


Canadian Forest Fire Weather Index (FWI) System

Seasonal forecasts use the severity rating anomaly



NRCan-CFS Prediction: *June run, for July -- Sept*



Anomaly

Predicted values normalized against average weather



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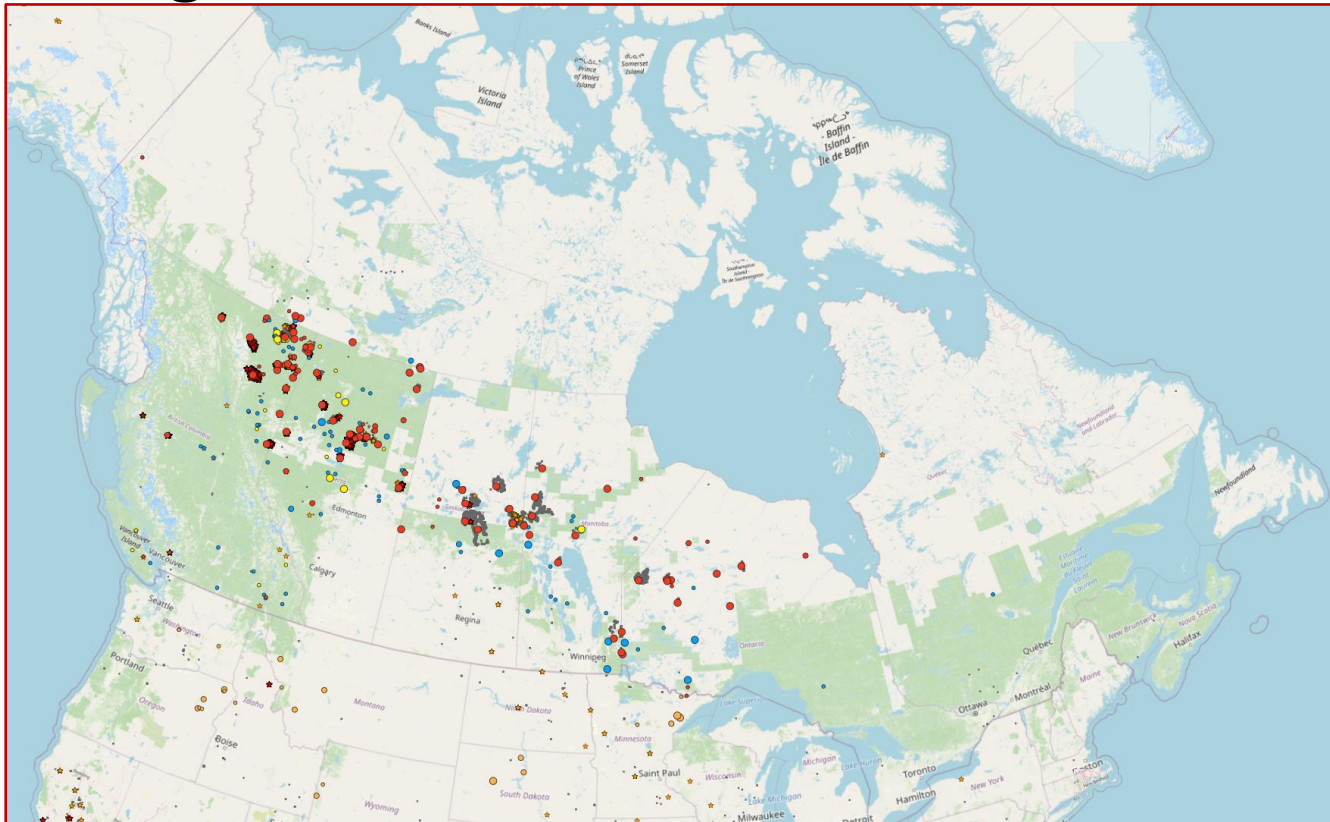
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CWFIS Current Season Snapshot

- CWFIS: Canadian Wildland Fire Information System:
<https://cwfis.cfs.nrcan.gc.ca>
- Large fires BC to western Ontario



**Largest
complexes are
25LF-SHOE,
central SK:
~650,000 ha**

**Flin Flon MB /
Creighton SK:
~500,000 ha**



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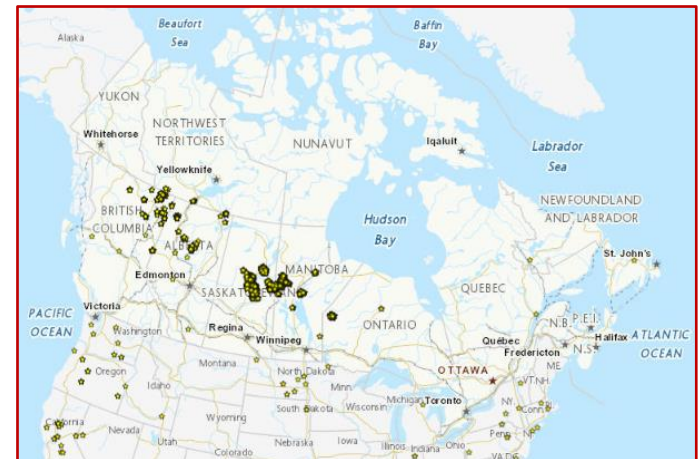
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Windy spring?

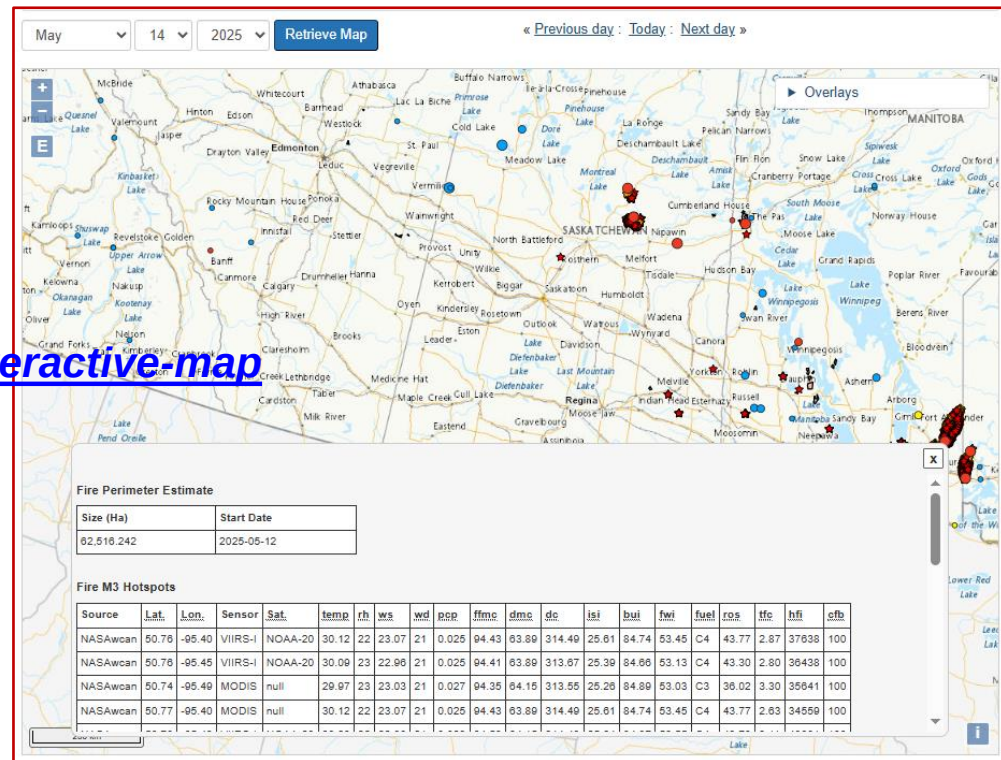
- Many periods of rapid growth
- No wind comparisons with normals, but in discussion
- Current burned area passed annual average by ~June 7
- Area burned at about 3.5 million ha as of June 11
- CIFFC National Preparedness Level at **5** since May 29,
Level **3** since May 15
 - **1** **2** **3** **4** **5**
 - Crews from USA, Australia



CWFIS Interactive Map Information

- Dates can be chosen from the drop-down menu
- On the CWFIS interactive map, click features to open an information box

<https://cwfis.cfs.nrcan.gc.ca/interactive-map>



Canadian Wildland Fire Information System (CWFIS)

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Energy Mining/Materials Forests Earth Sciences Hazards Explosives Clean Growth Climate Change

Home → Forests → Forest Topics → Fire → CWFIS

Disclaimer: The information, maps and data services available through the Canadian Wildland Fire Information System are approximations based on available data, and may not show the most current fire situation. For additional maps and information on the current conditions, please visit the fire management agency website for your region of interest (province, territory or park). [Links to these agencies are available here.](#) [Limitation of Liability](#)

Forests

CWFIS

Background Information

Maps and Reports

Interactive map

Current Conditions

Fire Danger

Weather

Fire Weather

Fire Behavior

Fire M3 Hotspots

Monthly and Seasonal Forecasts

National Wildland Fire Situation Report

Historical Analysis

Fire Weather Normals

Fire Behavior Normals

Canadian National Fire Database

CWFIS Datamart

Publications

Canadian Wildland Fire Information System

The Canadian Wildland Fire Information System (CWFIS) creates daily fire weather and fire behavior maps year-round and hot spot maps throughout the forest fire season, generally between May and September.

Fire Weather

[View the most recent Fire Danger map](#)

Fire Behavior

[View the most recent Head Fire Intensity](#)

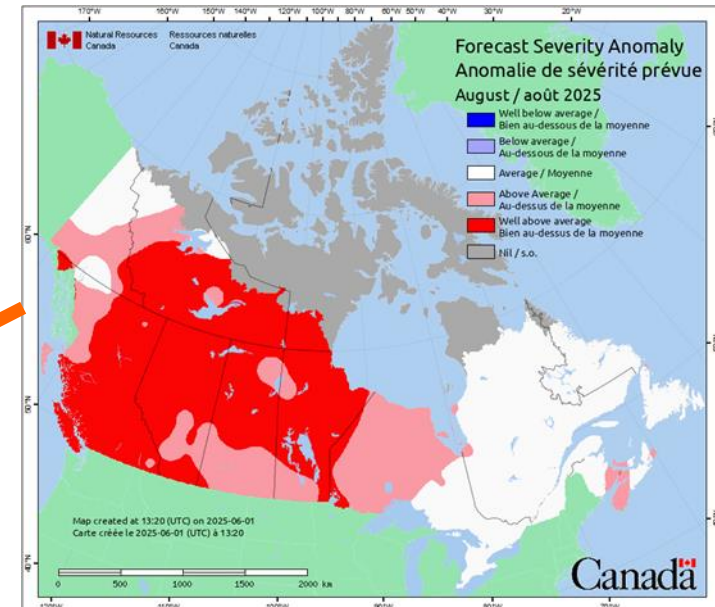
Fire M3 Hotspots

[View the most recent Daily Hotspot map](#)

The Canadian Wildland Fire Information System is a computer-based fire management information system that monitors fire danger conditions across Canada. Daily weather conditions are collected from across Canada and used to produce fire weather and fire behavior maps. In addition, satellites are used to detect fires.

This site is divided into three main sections:

- The Background Information section contains links that provide details about the CWFIS and outline the processes used to derive the data.
- The Current Conditions section presents the current fire danger in Canada.
 - Fire Weather and Fire Behavior show national maps of current and archived forest fire conditions.
 - Fire M3 Hotspots shows fires detected by remote sensing, featuring near-real time imagery.
 - Regional Satellite Images displays images of large historical fires.
 - The Weekly Fire Statistics is a weekly summary of fire activity across Canada.
- The Historical Analysis section provides a fire danger climatology for Canada.
 - Fire Weather Normals and Fire Behavior Normals display the mean values of fire weather indices and fire behavior indices over a 30-year period (from 1971 to 2000).
 - The Large Fires Data Base is a summary of fires larger than 200 ha from 1959 to 1999.



Note: updated
CWFIS web site
rollout 2025-26



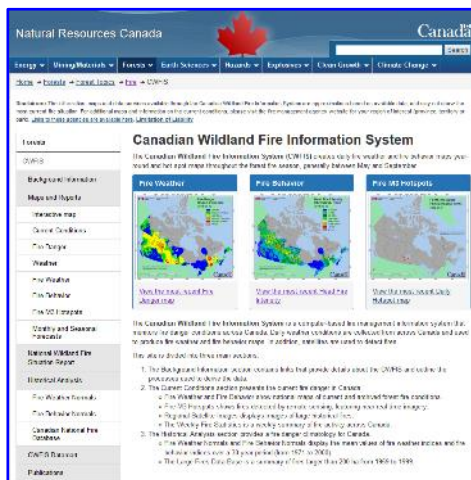
Conclusions and Reminders

- Warm summer (may be common with warming climate)
- Potentially dry, especially southern BC to central Canada
- Neutral ENSO: higher activity in west?
- Serious fires can occur in any year
- Fire activity depends on ignitions; our forecast only predicts where potential exists
- This year's forecast runs have been produced using cleaned code on Azure (thank you, Robert Jagodzinski!)
- In 2026 a new method will be introduced (Piyush Jain)



Remember to check updates ...

- Seasonal forecast: first working day each month on CWFIS: March-September
- Daily conditions: provincial and/or CWFIS web sites



Government of Ontario



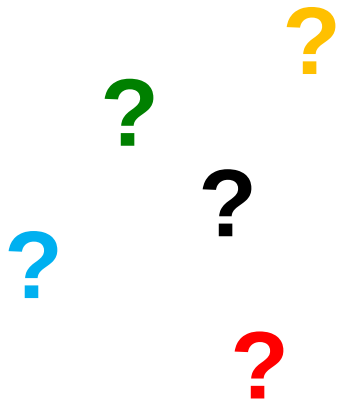
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Questions?



Contact:

Richard Carr

Fire Research Analyst

**Natural Resources Canada – Canadian
Forest Service**

Richard.Carr@NRCan-RNCan.gc.ca

**5320 122 Street NW
Edmonton, AB, Canada
T6H 3S5
825-510-1265**

