Wildfire Season Forecast

Richard Carr, Wildland Fire Research Analyst, Canadian Forest Service, Natural Resources Canada

Forecast 2022
May 17, 2022
Wildland fire in Canada

• Fire numbers and areas burned are highly variable
• Fire counts decreasing; area burned increasing

• Better detection and suppression

• Better fire awareness?

• Changes in reporting?
Past Seven Years

Cumulative area burned in Canada by year estimated from satellite hotspots
Estimation de la superficie cumulative brûlée au Canada par année réalisée par points chauds

- Avg 2003-2014
- 2015
- 2016
- 2017
- 2018
- 2019
- 2020
- 2021

- 2015 SK fires
- 2016 Fort McMurray fire
- 2017 BC fires
- 2018 BC fires
- 2019 AB fires
- 2020

May, June, July, Aug, Sept
2021 Predictions – May and July runs

June

July

August

May run

July run
2021 National Statistics

Red line is 10-year mean
Blue bars are 2021 data

~6225 / 5616 = 116%

~4.2 / 2.6 (million ha) = 161%
2021 Season

PC, NT, QC, Atlantic had less fires than normal

BC, SK, MB, and ON had higher than normal area burned
**Fire problems in ENSO Springs**

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**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**
Pacific Decadal Oscillation


Warm phase

Cold phase

http://climate.ncsu.edu/climate/patterns/PDO.html
North Atlantic Oscillation

http://www.cpc.ncep.noaa.gov/products/precip/CWlink/pna/nao.timeseries.gif

Quebec Area Burned (NFDB, ha*1000)

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2022 Seasonal Prediction

Starting Conditions
2022 Spring start-up conditions

Snow depths
• Affects spring, not summer
• Delayed greenup?

Drought less extensive than in 2021

Canadian Cryospheric Information Network, May 16, 2022
ENSO, PDO – Current SST

SST still showing La Nina signature

Westward extent fluctuating; pattern narrowing

North Pacific along BC coast cooling
2022 Seasonal Prediction

Climate Forecasts
ENSO Forecasts

ENSO is likely to remain negative through 2022.
Climate Ensemble Data: CanSIPS

• Models developed by Canadian Centre for Climate modeling and analysis

• Models:
  • CanCM4i
  • GEM-NEMO: Global Environmental Multiscale – Nucleus for European Modeling of the Ocean

• 10-member ensembles producing 12-month forecasts

• NRCan uses temperature and precipitation data
North American Multi-model Ensemble
NMME

June Precip

Dry southern regions continue?
North American Multi-model Ensemble (NMME)

July Precipitation

Majority of models show dry south
North American Multi-model Ensemble (NMME)

August Precip

Warm and dry late summer?
2022 NRCan-CFS Seasonal Prediction
Canadian Forest Fire Weather Index (FWI) System

Seasonal forecasts use the severity rating anomaly
**Seasonal Forecast Methodology**

1. Use fall conditions to help assess spring start-up

2. Calculate average daily weather (once per year)

3. Do seasonal predictions (MSR)

4. Calculate severity rating anomaly
NRCan-CFS NASFAO and BN Maps

Visual assessment of other data sources used in Briefing Notes (BN) and North American Seasonal Forecast Outlook Assessment (NASFAO)

Example only

Figure 2. May 2018 forecast: Areas with expected increased fire risk in July and August 2018.

Include on CWFIS?
NRCan-CFS Prediction: May run, for May

Daily Severity Rating (DSR) calculations performed on the CanSIPS climate model outputs are summed into monthly values (MSR) and compared to historical values from the same month.

Anomaly

*Predicted values normalized against average weather*
NRCan-CFS Prediction: May run, for June and July

Anomaly

Predicted values normalized against average weather
NRCan-CFS Prediction: May run, for August and September

Anomaly
Predicted values normalized against average weather
Kamloops, BC

CM4i: too warm in May; likely warm temperature forecast overpowers higher rainfall
The Pas, MB

CM4i temperature high, GEM-NEMO warmer late in summer
Precipitation low in both GEM-NEMO and CM4i
Sudbury, ON

CM4i temperature trend better for May than GEM-NEMO
Both models have some elements suggesting dry summer
Canadian Wildland Fire Information System (CWFIS)

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

The CWFIS 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.

Number of fires by province

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Future of forecasts?

• Drivers
  • Canadian Wildland Fire Information Framework (CWFIF)
  • Data Integration Process (DIP)

• More models and data ... wind!

• Imagination running ...
  • Location-specific model weighting
  • Community-based system using P/T forecasts
Caveats and Notes

• Climate model limitations
  • “Spring Predictability Barrier”: Atmospheric/oceanic indexes may fade/change phase in spring
  • Weather often changes partway through a month
  • CanCM4i, GEM-NEMO models often disagree
    • GEM-NEMO cold bias improved over 2021
  • Precipitation trends are hard to predict
• Serious fires can occur in any year
• Fire activity depends on ignitions
Conclusions …

• Spring is arriving later than in 2021
  • Snow depths
  • Cool spring with double-dipping La Nina (do we get a 3rd dip?)
  • Similar to the 1999-2002 or 2011-12 periods?

• Fluctuating climatic drivers: fluctuating weather

• Model consensus points to warm summer with many dry areas
Remember to check updates ...

• Seasonal forecast: first few days each month on CWFIS
• Daily conditions: provincial and/or CWFIS web sites
Questions?

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