

Health and Air Quality Forecast Program- MSC, ECCC

Wildfire Smoke Forecast and Outreach



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Photos: M. Seaboyer, NT July 2014



Environment and
Climate Change Canada

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Changement climatique Canada

Canada

AQHI - A Communication Tool

What is the scale for the AQHI?

The AQHI is measured on a scale ranging from 1-10+. The AQHI index values are grouped into health risk categories as shown below. These categories help you to easily and quickly identify your level of risk.



- 1-3 Low health risk
- 4-6 Moderate health risk
- 7-10 High health risk
- 10 + Very high health risk

AQHI = Rolling 3hr Weighted average pollutants NO_2 , O_3 and $\text{PM}_{2.5/10}$

$$\text{AQHI} = (1000 \times [(e^{0.000871 \times \text{NO}_2} - 1) + (e^{0.000537 \times \text{O}_3} - 1) + (e^{0.000487 \times \text{PM}_{2.5}} - 1)]) / 10.4$$



AQHI+ PM2.5 - single pollutant for extreme events to protect human health

Based on BC Pilot, PM2.5 maximum hourly data calculated in parallel
 PM2.5 AQHI+ = maximum[1.0, ceiling(*concentration* / 10.0)]

The highest of the two is reported on the Weather Office web pages.

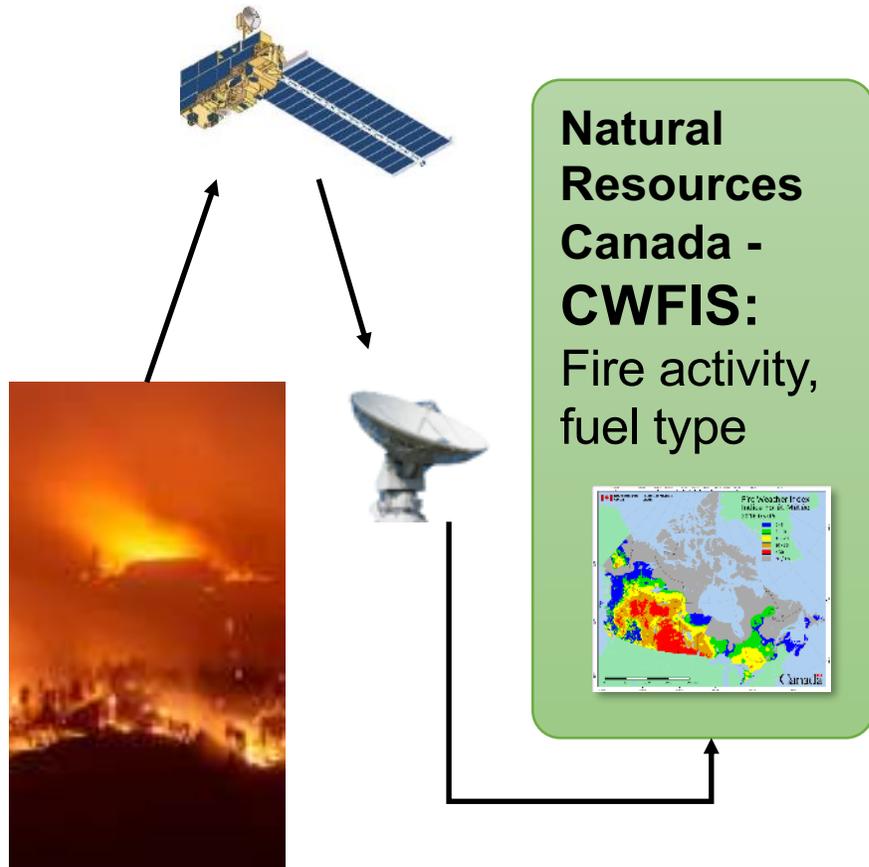
1-hour PM _{2.5} (µg/m ³)	Provincial AQHI	AQHI Risk Category	Health Message for People at Higher Risk	Health Message for General Population	Actions to Reduce Wildfire Smoke Exposure
0 – 10	1	Low	Enjoy your usual outdoor activities.	Ideal air quality for outdoor activities.	Normal air quality in British Columbia
11 – 20	2				
21 – 30	3				
31 – 40	4	Moderate	Consider reducing or rescheduling strenuous activities outdoors if you experience symptoms.	No need to modify your usual outdoor activities unless you experience symptoms.	<ul style="list-style-type: none"> Use a portable air cleaner to reduce smoke in your home Stay inside with doors and windows closed, but keep cool – being too hot is more risky than breathing smoke for most people Visit places with cleaner and cooler air, such as libraries, community centres, and shopping malls
41 – 50	5				
51 – 60	6				
61 – 70	7	High	Reduce or reschedule strenuous activity outdoors.	Consider reducing or rescheduling strenuous activities outdoors if you experience symptoms.	<ul style="list-style-type: none"> Consider relocating to an area with less smoke If you cannot access cleaner air, consider using a well-fitted N95 respirator
71 – 80	8				
81 – 90	9				
91 – 100	10				
101+	10+	Very High	Avoid strenuous activities outdoors.	Reduce or reschedule strenuous activity outdoors, especially if you experience symptoms.	

Values of the provincial AQHI when it is calculated using the fine particulate matter (PM_{2.5}) levels alone. PM_{2.5} is measured in micrograms per cubic meter of air (µg/m³). The table shows the health messages provided by Health Canada, and actions recommended to reduce wildfire smoke exposure. Source: <http://www.bccdc.ca/health-info/prevention-public-health/wildfire-smoke>

Yao, J., Stieb, D. M., Taylor, E., & Henderson, S. B. (2019). Assessment of the Air Quality Health Index (AQHI) and four alternate AQHI-Plus amendments for wildfire seasons in British Columbia. *Canadian Journal of Public Health*. <https://doi.org/10.17269/s41997-019-00237-w>



ECCE smoke forecast: 2 approaches



Smoke dispersion (MLDPn)

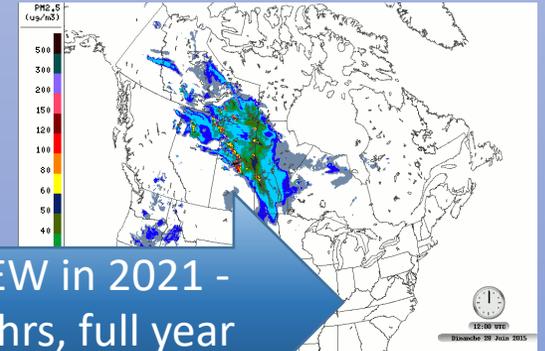
- Simulation of passive pollutant trajectories (lagrangian model)
- Low computational cost
- No chemistry
- For: emergency response



Lead: Alain Malo

Air quality forecast system (FireWork)

- Explicit simulation of chemical and physical interactions (eulerian grid model)
- High computational cost
- Complex emission/removal
- For: Air Quality

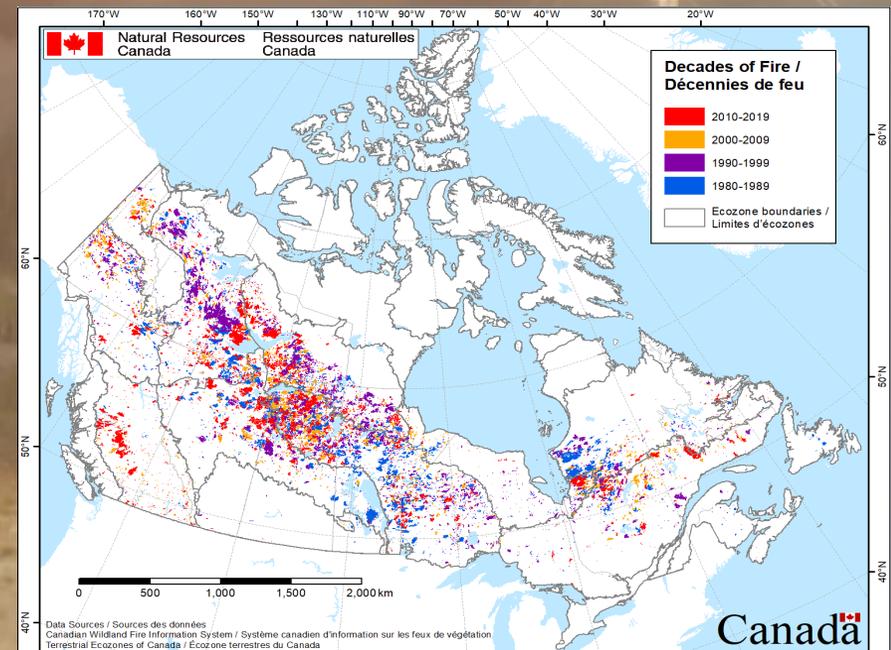
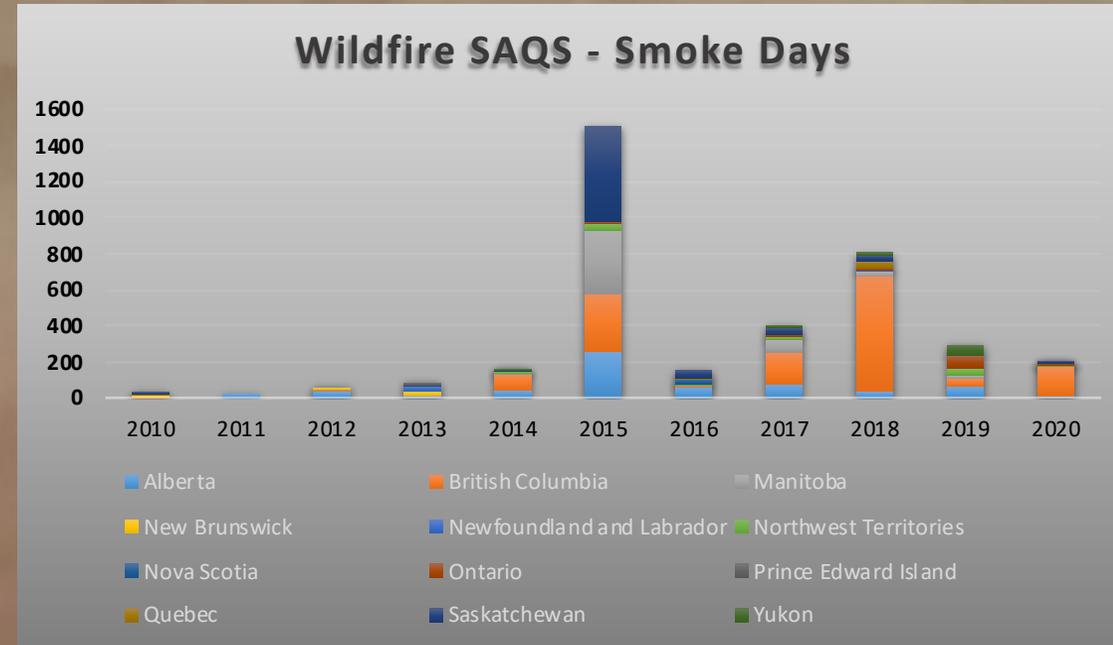


Lead: Jack Chen

CWFIS = Canadian Wildland Fire Information System

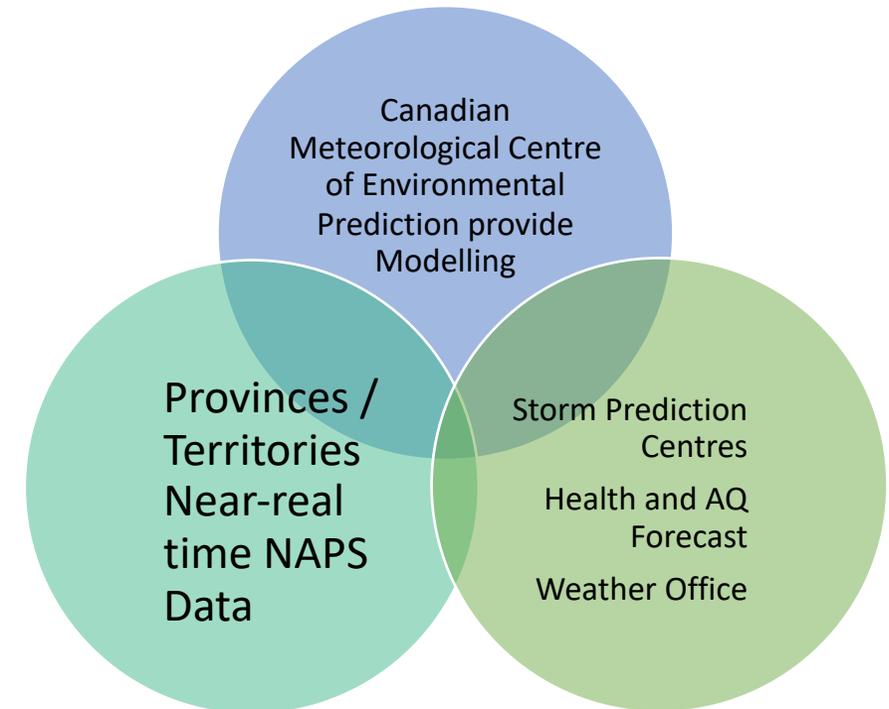
A decade of Fire-seasons

- Increasing worst fire-season records
- Canadian average 2.5 Million ha/yr
- Areas burned in 2019 and 2020 were below average
- Prolonged Smoke Events and Poor Air Quality, issue Special Air Quality Forecast
- Database updates - NWT 2014, only 9 advisory days, however 3 months of prolonged smoke



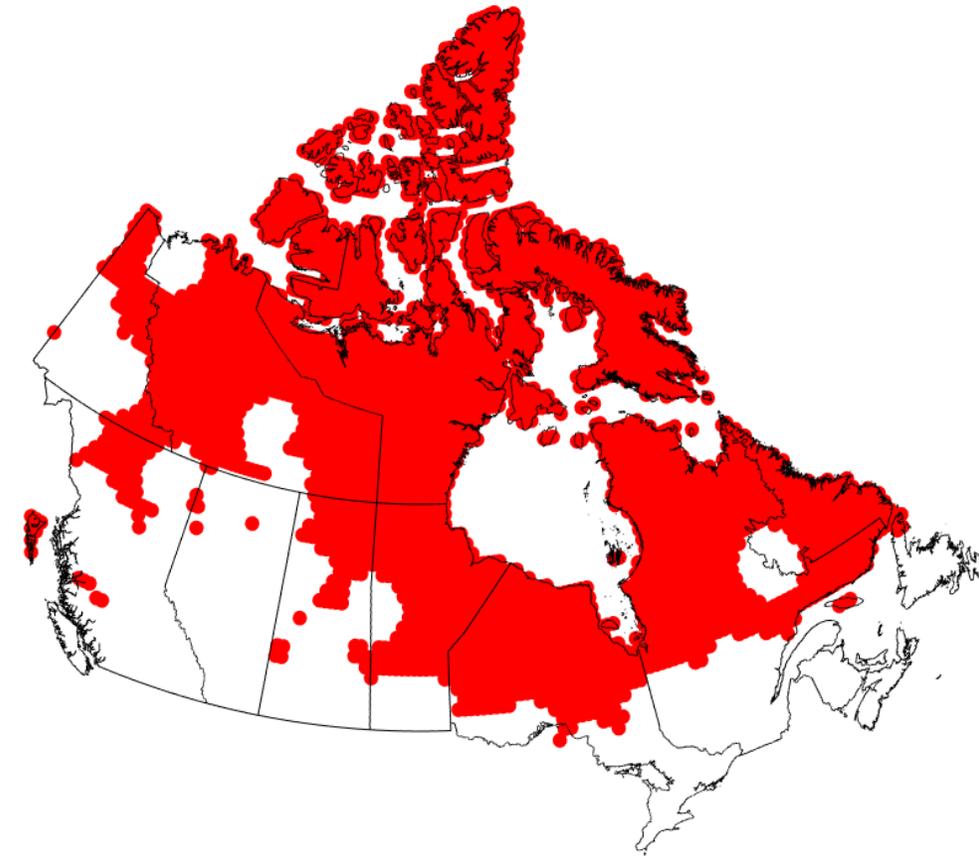
Collaborations for AQHI Observations and Forecasts

- MSC Storm Prediction Centre (SPC) operational meteorologist are responsible for AQHI forecasts
- Canadian Meteorological Centre (CMC) is responsible for AQ observation (obs) processing and forecast modelling
- Coordination with P/T partners:
 - AQ data and related issues (NAPS)
 - Forecast/pollutant inquiries
 - Service delivery and forecast/obs dissemination
 - Alert protocols and wildfire events



Small Sensor PM2.5 Pilot - Help us fill in the GAPS! How can Indigenous communities be engaged?

- Working with Indigenous Services Canada (ISC) and the Regional Health and Environment Managers (RHEM)
- Indigenous communities will be contacted to participate in the citizen science network - ECCC Purple Air Sensor Pilot (3 years) MSC is looking for 15-20 communities to install sensors
- Some communities such as Lytton, Saulteaux and Mi'kmaq First Nations contacted MSC directly for sensors and collaboration.
- Sensors providing real-time PM2.5 data in communities for early notification of wildfire smoke
- Data to be used for health messaging, educate communities of health risks due to wildfire smoke exposure
- Capacity building in remote communities, provide incentive for students to engage in science and technology careers



Wildfire Smoke and Air Quality Outreach

[Wildfire smoke and your health - Canada.ca](https://www.canada.ca/en/environment-climate-change/services/wildfire-smoke-and-air-quality-outreach.html)



Stay informed during smoke events

Air quality alerts, forecasts, wildfire information



Wildfire smoke and your health

Protecting your health from wildfire smoke



Air quality and weather

Learn about wildfire smoke and weather



Air quality: frequently asked questions

Learn more about air quality

[WeatherCan](https://www.weather.gc.ca) -

Enhancements to WeatherCan app to include AQHI notifications and forecasts



Clean Air Day 2021

[Clean Air Day 2021 - Canada.ca](https://www.canada.ca/en/clean-air-day)



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