Smoky Start to June, 2023 as Canadian Wildfires Burn

BTV Warm Season Workshop 2023
Matthew Clay

Overview

- Synopsis of the event
- Antecedent Conditions
- Quebec and Ontario Thunderstorms
- Air Quality Impacts Across the North Country

Synopsis of the Event

- It was unusually quiet in terms of convection and thunderstorms through the spring across the region as of early June.
- This led to unusual, and in some places unprecedented, dryness to portions of Quebec and Ontario.
- Over 30 wildfires developed across western Quebec as a cluster of thunderstorms developed along a weak frontal boundary on June 1st.
- These thunderstorms were classified as “dry thunderstorms” by Environment Canada and Climate Center (ECCC) given low precipitation amounts and very high cloud bases.
- Extremely active fire activity accompanied the newly formed wildfires given pre green-up conditions north of the border with anomalously low rainfall.

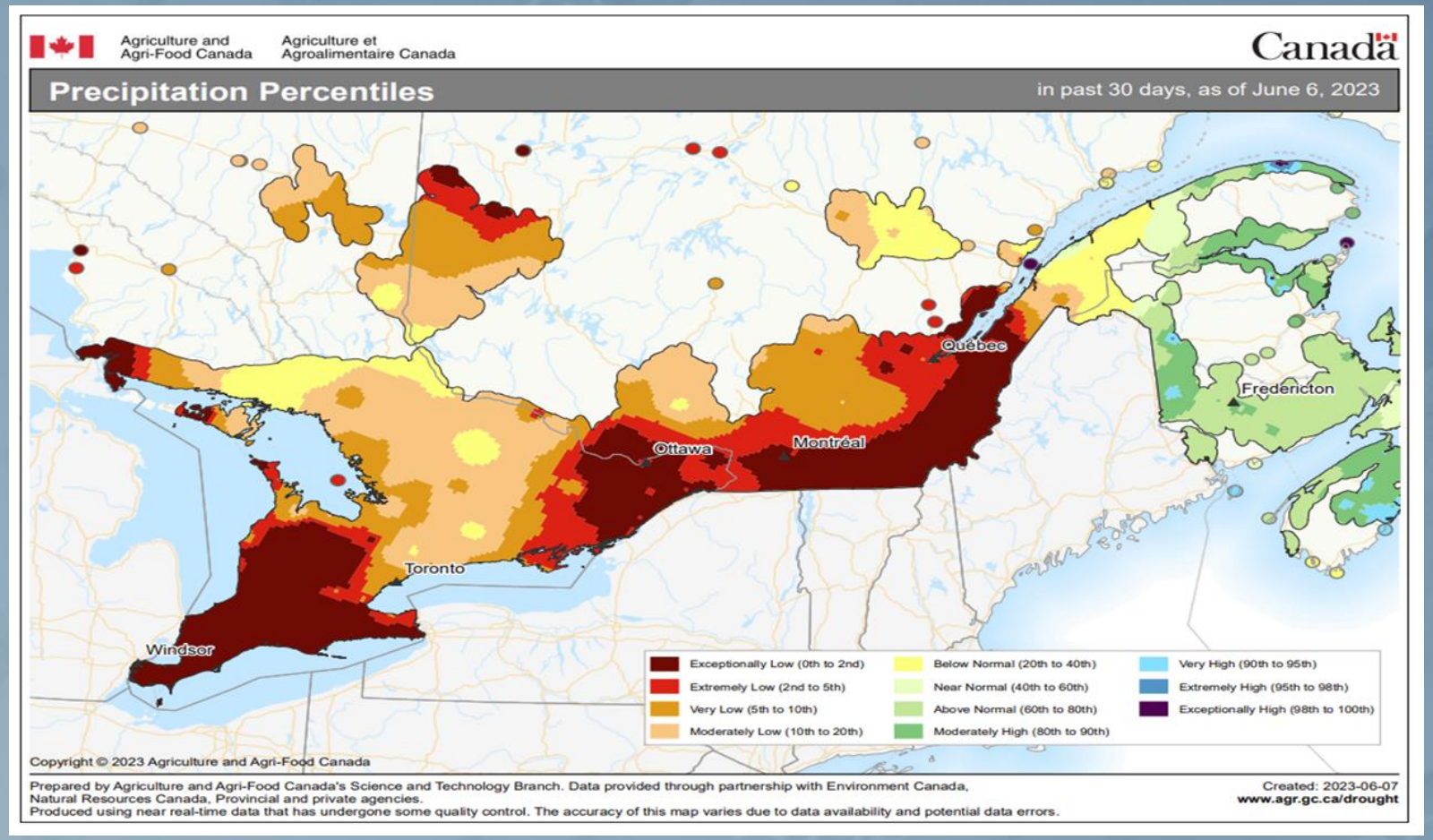
Video of Wildfires Across Quebec and Ontario

Antecedent Conditions – Record Dryness

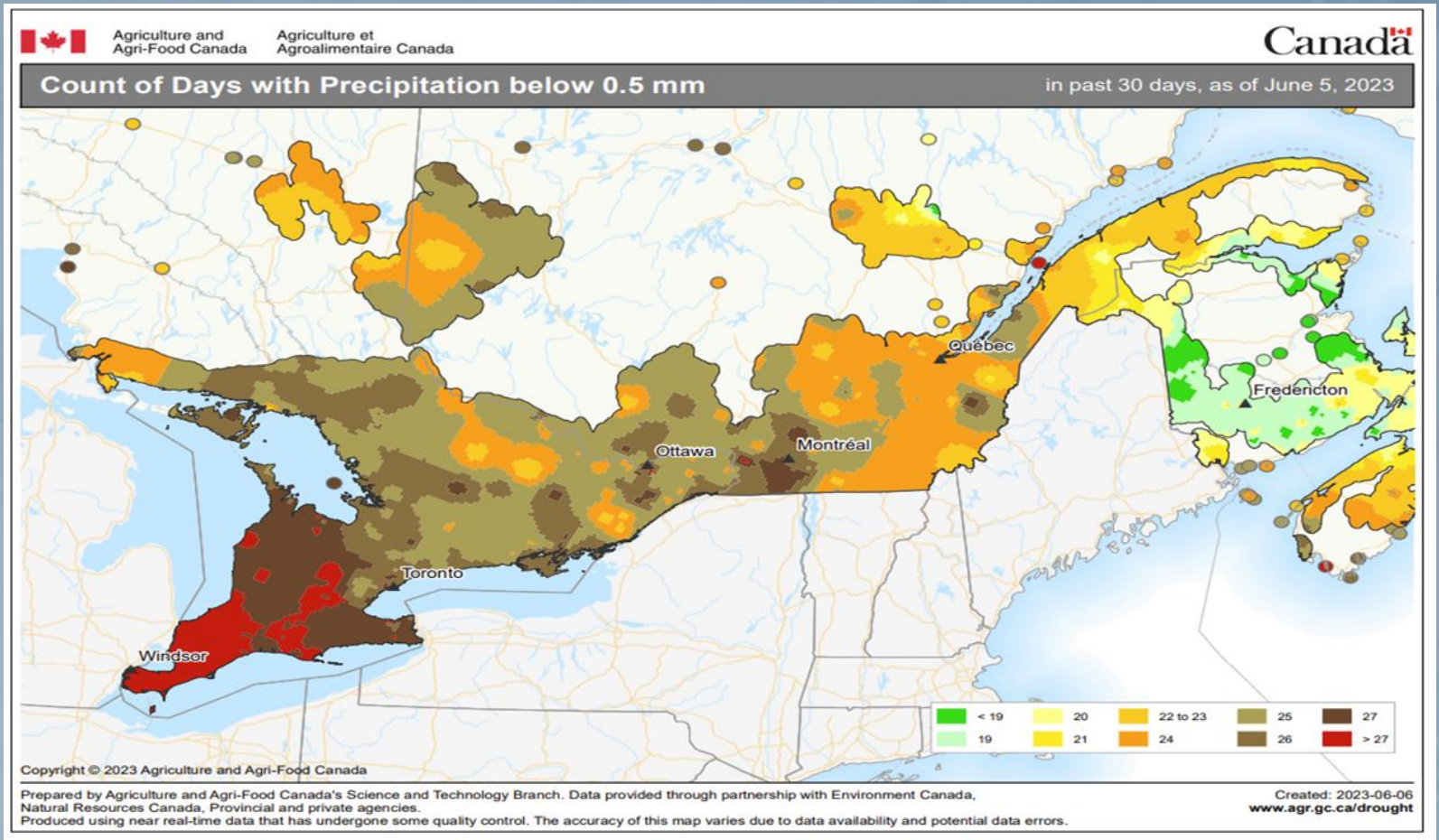
To say May was a dry month across Quebec and Ontario would be an understatement.

Near record dryness was experienced across the region over a 30 day period ending on June 6th, 2023.

The image on the right, provided by Agriculture and Agri-Food Canada in collaboration with Environment Canada, shows much of the area in very low (5th to 10th percentile) to exceptionally low (0th to 2nd percentile).



Antecedent Conditions – Record Dryness



The highest temperature recorded in Quebec City in 2023 occurred on June 1st. The high temperature was 33.9° (93° F)

This map, also produced by Agriculture and Agri-Food Canada in collaboration with Environment Canada, shows the number of days with less than 0.5 mm (~0.02" or the equivalent of measureable rainfall)

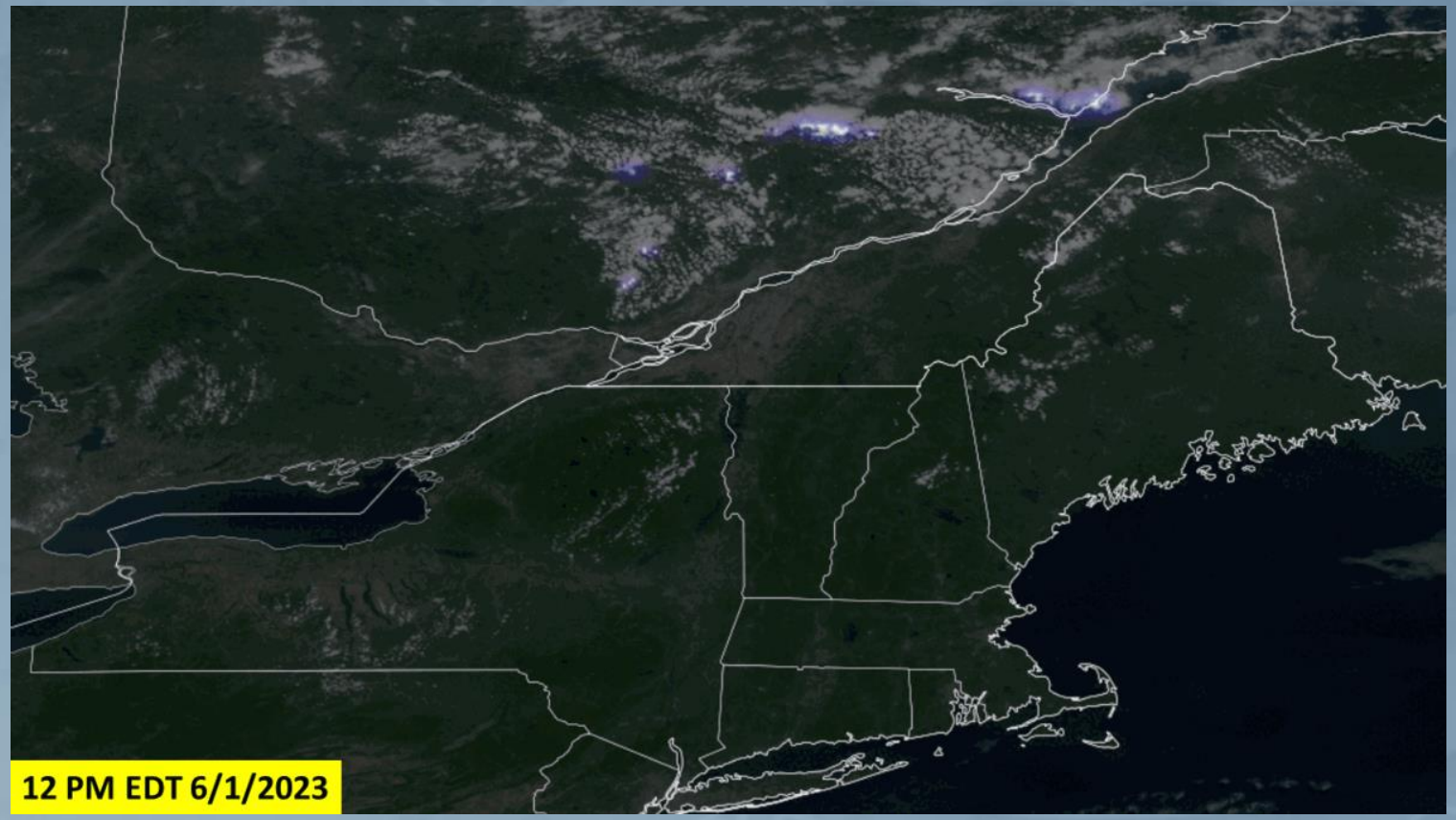
Much of Quebec and Ontario experienced 24-26 days on virtually no measureable precipitation in a 30 day period ending June 5th, 2023.

The combination of extremely dry weather coupled with near record high temperatures significantly dried fuels across the region prior to green-up.

Quebec and Ontario Thunderstorms

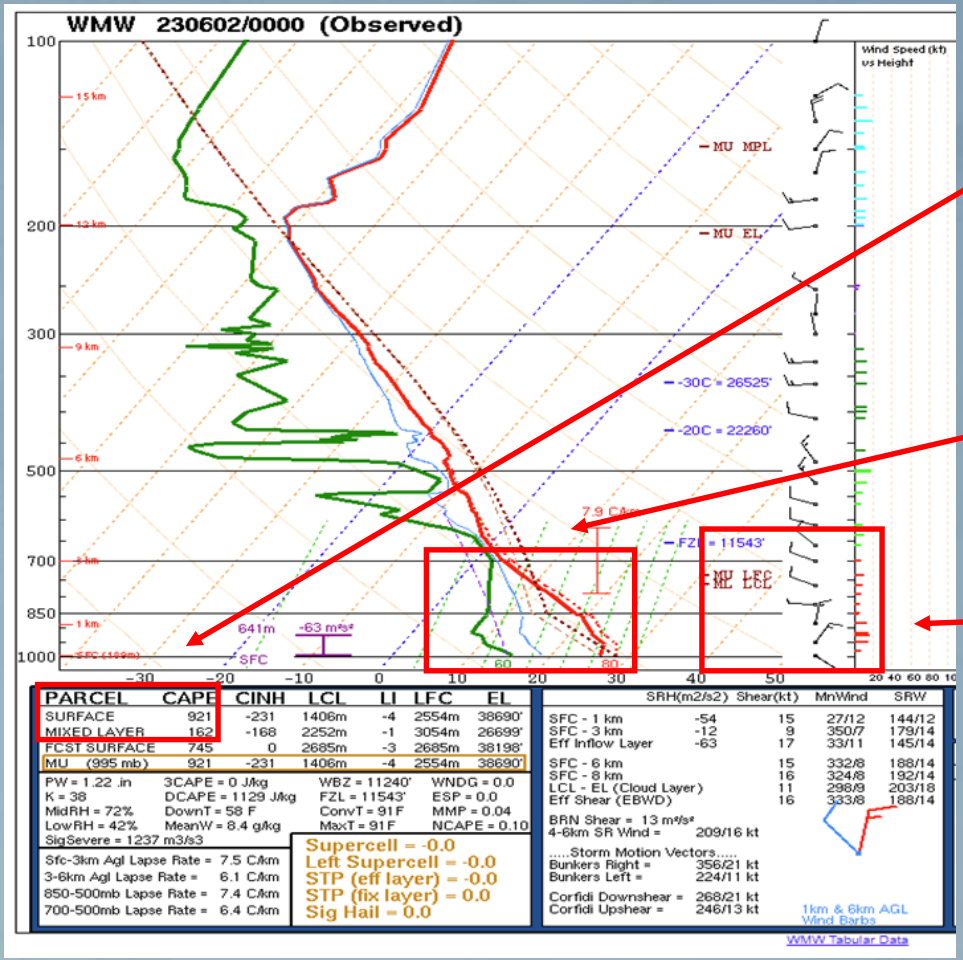
A cluster of thunderstorms developed the afternoon of June 1st across southern Quebec and Ontario in response to a cold front heading south toward the International Border.

These thunderstorms were the catalyst for widespread new wildfire starts across Quebec and Ontario that continued to burn all through last summer and fall.



A loop of thunderstorm activity using the CIRA Group Energy Density to highlight where thunderstorm activity occurred on June 1st.

Thunderstorm Set-up



Around 1000 J/kg of CAPE (aka instability). This is a favorable value for thunderstorms in VT and eastern Canada.

Very dry air in the low levels led to much of the rain evaporating prior to hitting surface. Observations reported under a tenth of an inch of rain in thunderstorms on June 1st.

Light winds caused for slow moving thunderstorms. This led to many lightning strikes over the same area, likely increasing the threat for wildfire starts.

8 PM RAOB 06/01/2023 sounding from Maniwaki, Quebec

Observations in Vicinity of Thunderstorms

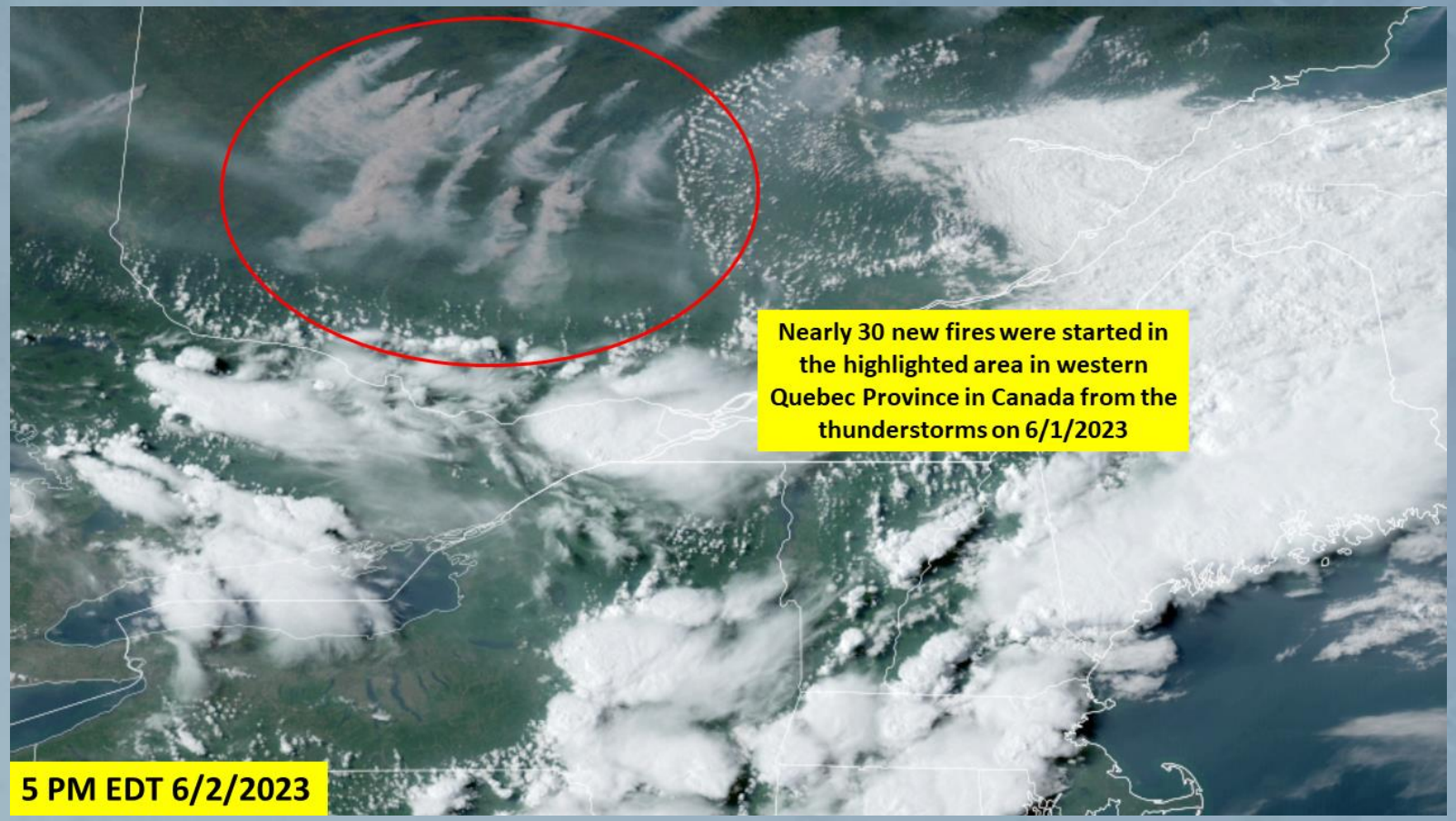
Critically low RH values coupled with gusty winds upwards of 25 knots were reported at several sites in the vicinity of the thunderstorms.

You can see a sample of two sites in Quebec before, during, and after the thunderstorms.

These critical fire conditions allowed for the new fire starts to grow quickly.

Val-'Or Airport June 2nd		
3 PM	RH – 23%	Winds 14 knots with gusts to 18 knots
4 PM	RH – 23%	Winds 14 knots with gusts to 20 knots
5 PM	RH – 22%	Winds 12 knots
6 PM	RH – 18%	Winds 14 knots with gusts to 19 knots.
Chibougamau-Chapsi June 2nd		
3 PM	RH – 23%	Winds 9 knots with gusts to 16 knots
4 PM	RH – 23%	Winds 9 knots with gusts to 15 knots
5 PM	RH – 22%	Winds 9 knots with gusts to 17 knots
6 PM	RH – 19%	Winds 13 knots with gusts to 21 knots.

Numerous Wildfire Starts



Near-critical fire conditions continued on June 2nd which led to rapid development of wildfires in response to the lightning activity on the 1st.

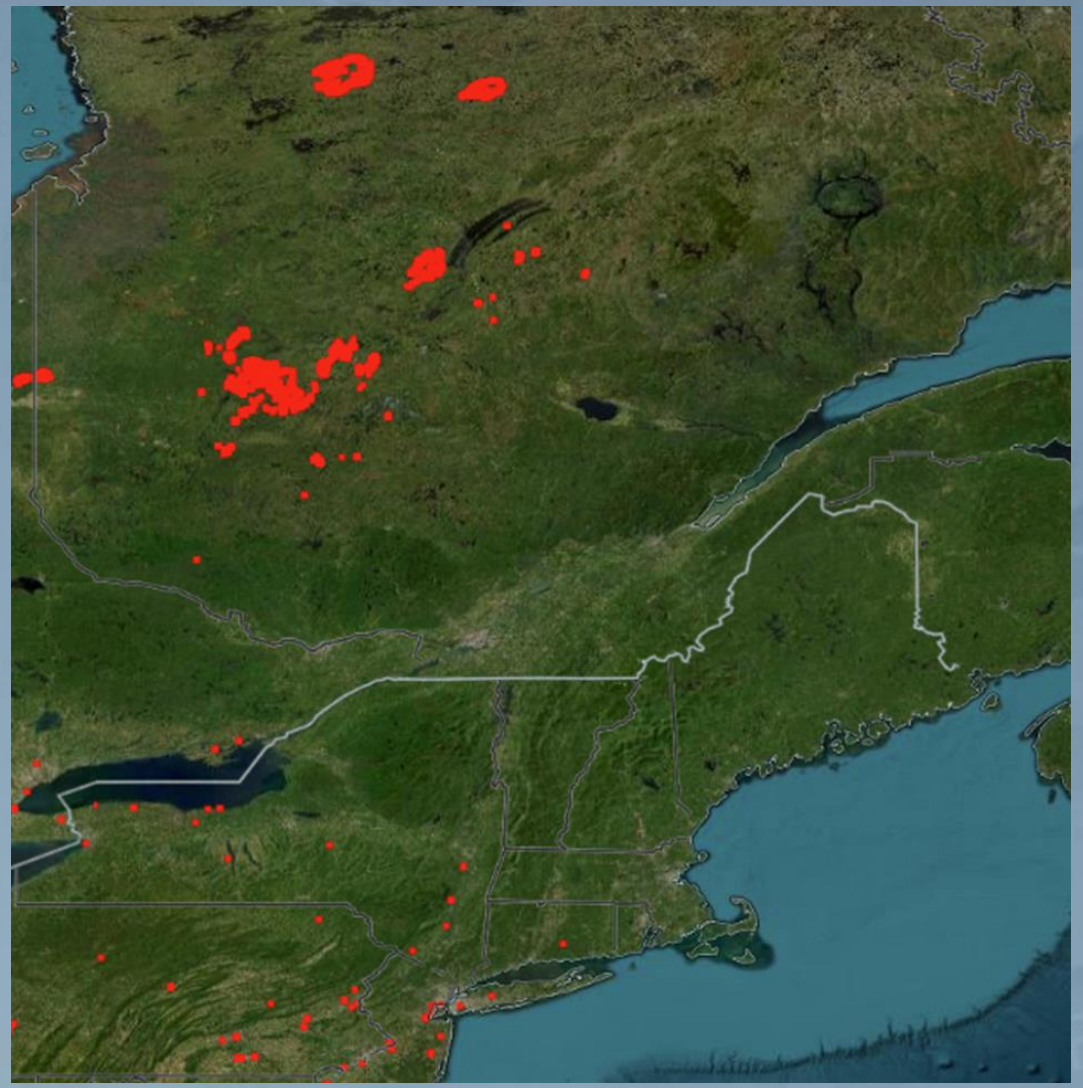
The circled area on the left snows the greatest clustering of new wildfire starts.

Numerous Wildfire Starts

This image, created jointly by NASA and the US Forest Service, shows the hot sports associated with the new wildfire starts.

Each pixel doesn't represent an individual fire but rather where the MODIS constellation detects ongoing fire activity.

Resolution is 250 meters.



Air Quality Impacts Across the North Country

A stalled frontal boundary across the Canadian Maritimes created northerly winds across the fires in western Quebec which were perfect to usher wildfire smoke into the North Country and much of New England.

Forecasting this smoke was very challenging as a slight change in wind direction (10°-20°) would shift where the thickest smoke would track.

For us, luckily, the wind direction kept the thickest smoke to our south and west with Ontario and western New York experiencing the worst air quality.

Wildfire smoke is particularly concerning from an air quality perspective because it contains particulate matter (PM) 2.5. Objects of this size can easily reduce visibility but can also get deep into the lings and may even get into the bloodstream which can have significant effects on people.

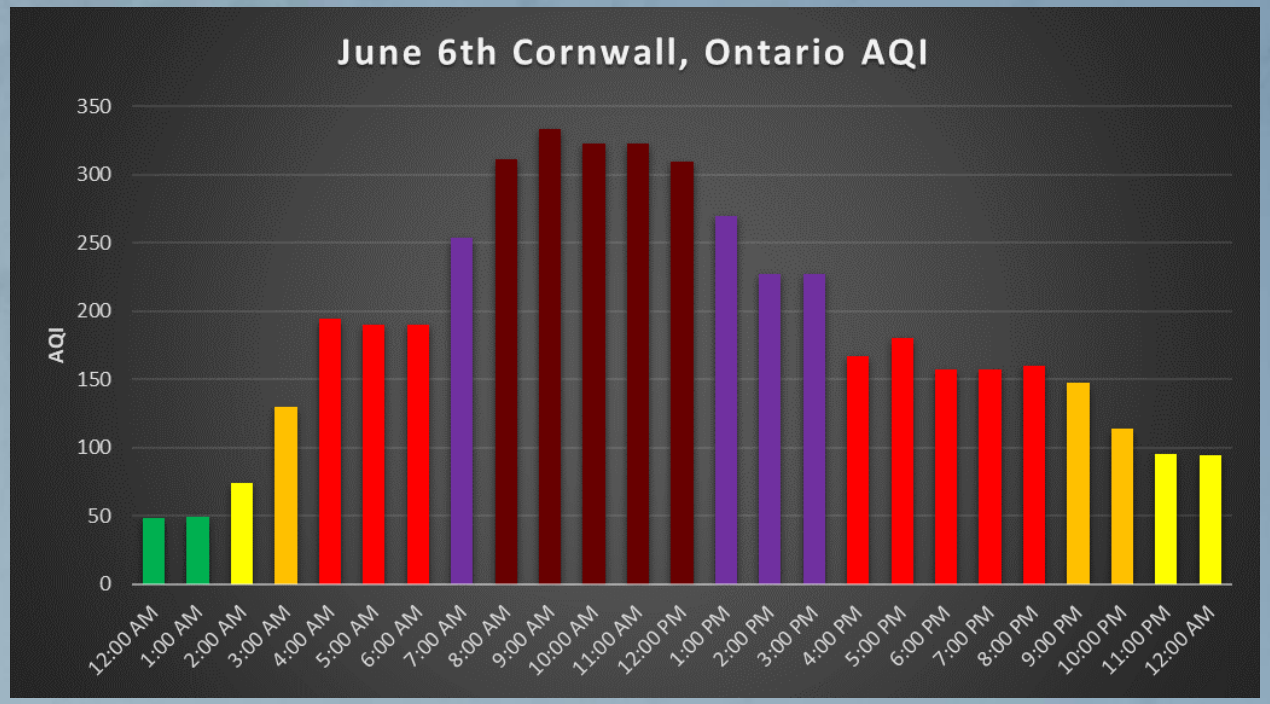
Air Quality Impacts Across the North Country

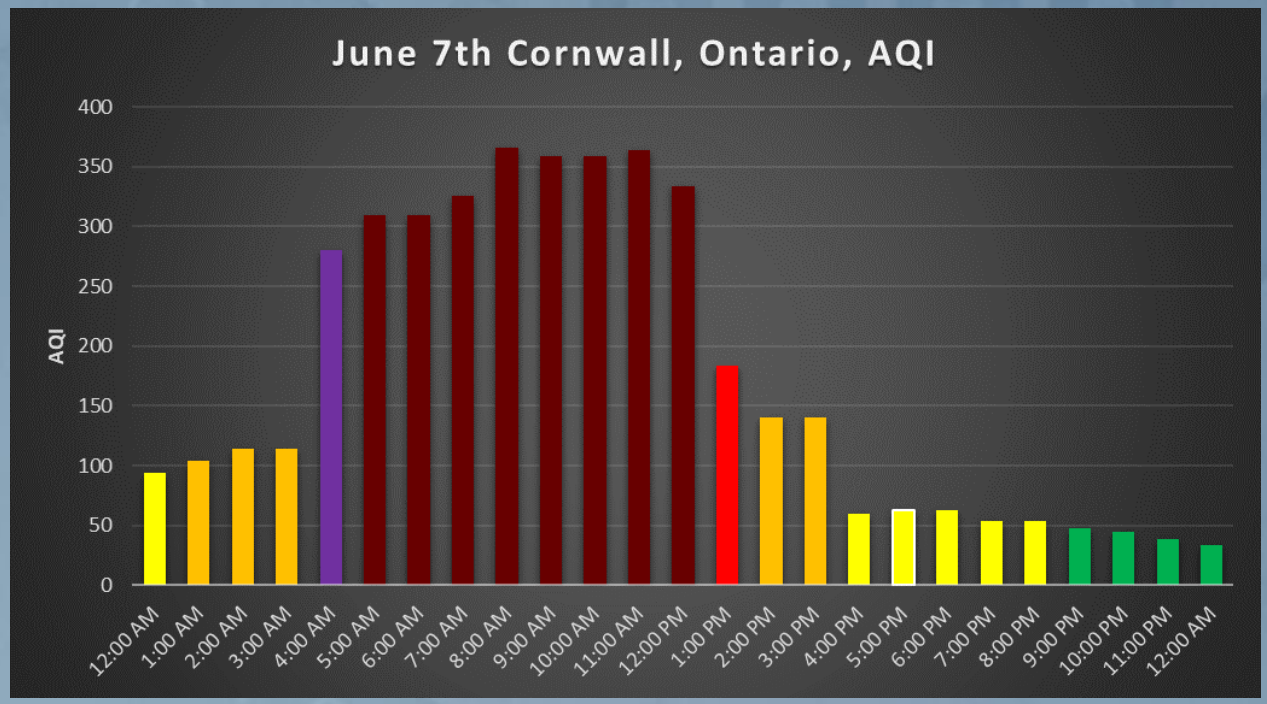
Air Quality Index	Who Needs to be Concerned?	What Should I Do?
Good 0-50	It's a great day to be active outside.	
Moderate 51-100	Some people who may be unusually sensitive to particle pollution.	**Unusually sensitive people:** *Consider reducing* prolonged or heavy exertion. Watch for symptoms such as coughing or shortness of breath. These are signs to take it easier. **Everyone else:** It's a good day to be active outside.
Unhealthy for Sensitive Groups 101-150	Sensitive groups include **people with heart or lung disease, older adults, children and teenagers.**	**Sensitive groups:** *Reduce* prolonged or heavy exertion. It's OK to be active outside, but take more breaks and do less intense activities. Watch for symptoms such as coughing or shortness of breath. **People with asthma** should follow their asthma action plans and keep quick relief medicine handy. **If you have heart disease:** Symptoms such as palpitations, shortness of breath, or unusual fatigue may indicate a serious problem. If you have any of these, contact your heath care provider.
Unhealthy 151 to 200	**Everyone**	**Sensitive groups:** *Avoid* prolonged or heavy exertion. Move activities indoors or reschedule to a time when the air quality is better. **Everyone else:** *Reduce* prolonged or heavy exertion. Take more breaks during all outdoor activities.
Very Unhealthy 201-300	**Everyone**	**Sensitive groups:** *Avoid all* physical activity outdoors. Move activities indoors or reschedule to a time when air quality is better. **Everyone else:** *Avoid* prolonged or heavy exertion. Consider moving activities indoors or rescheduling to a time when air quality is better.
Hazardous 301-500	**Everyone**	**Everyone**: *Avoid all* physical activity outdoors. **Sensitive groups:** Remain indoors and keep activity levels low. Follow tips for keeping particle levels low indoors.

State environmental agencies coordinated closely with the NWS to issue Air Quality Alerts (AQA) for much of New England and the Northeast on June 6th, 7th, and 8th.

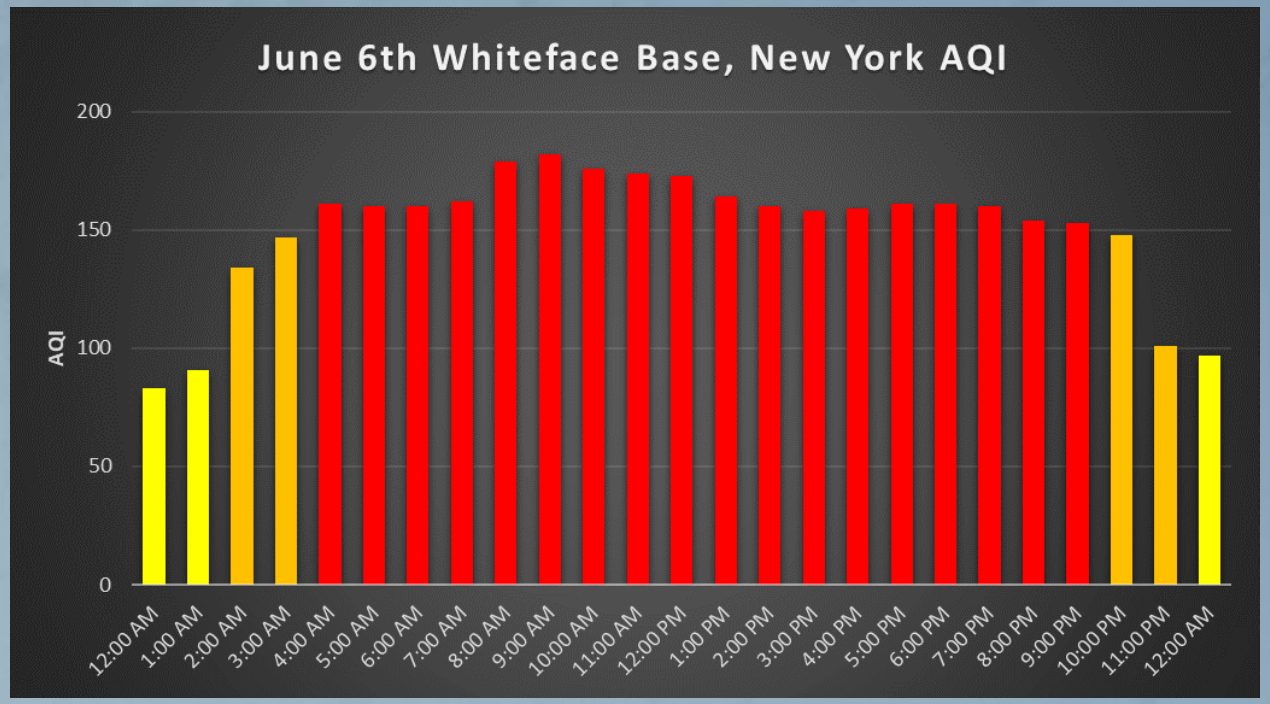
The table on the left shows the air quality index set by the Environmental Protection Agency and corresponding impacts.

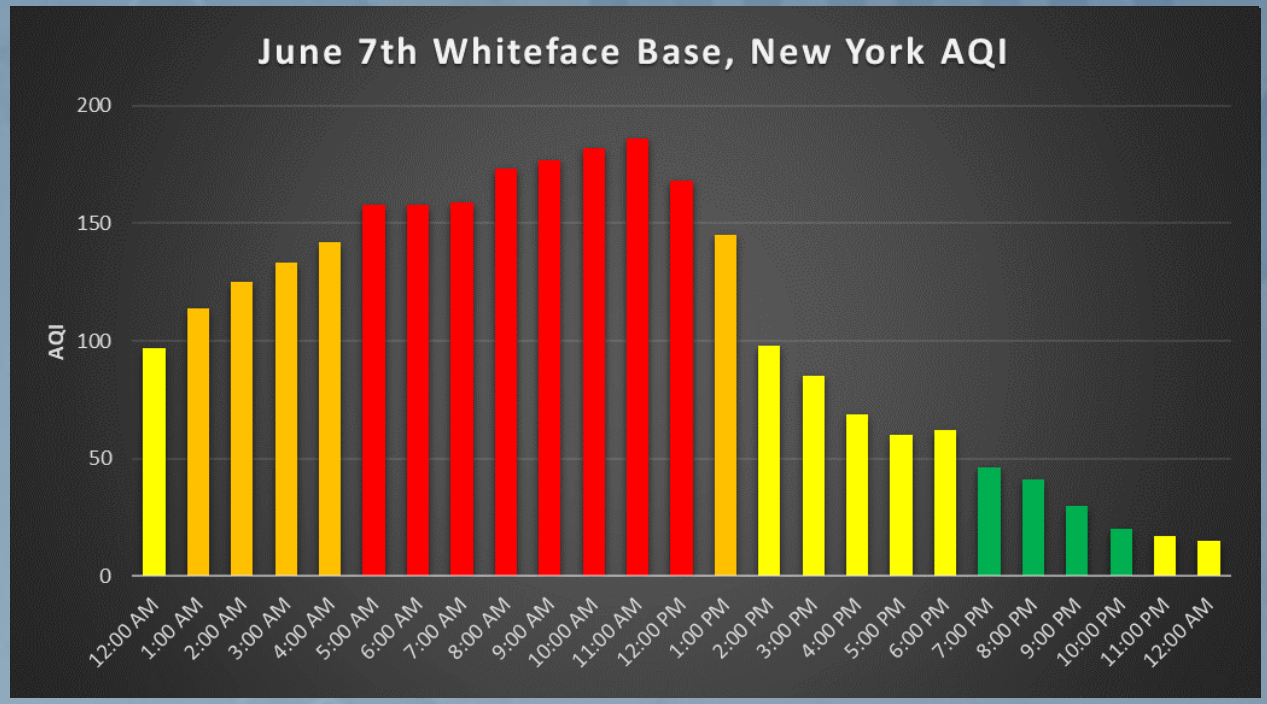
Air Quality Impacts at Cornwall, Ontario





Air Quality Impacts at Whiteface Base, NY

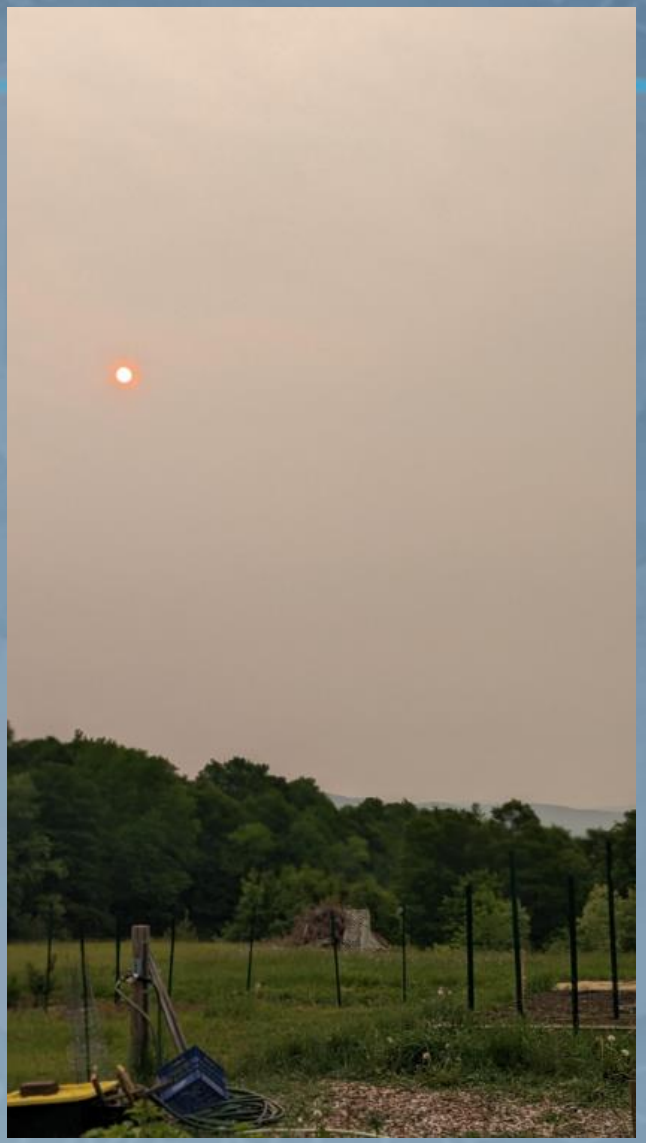




Pictures

Duxbury, MA

Plattsburgh, NY
via @MyNBC5



Colchester, VT

Conclusion

Air Quality is something we usually take for granted in the North Country with one or fewer Air Quality Alerts in most years according to the EPA.

Pre-existing very dry conditions set the stage for these wildfires to rapidly grow.

Good collaboration between the EPA, the National Weather Service and state agencies allowed for effective messaging highlighting the unsafe air conditions, which caused cancellation of pro sporting events in the New York City area.

Any Questions?