



Implementing a Revised PM2.5 Standard in NC

Division of Air Quality Update

Environmental Stewardship Initiative (ESI) Conference

October 29, 2024

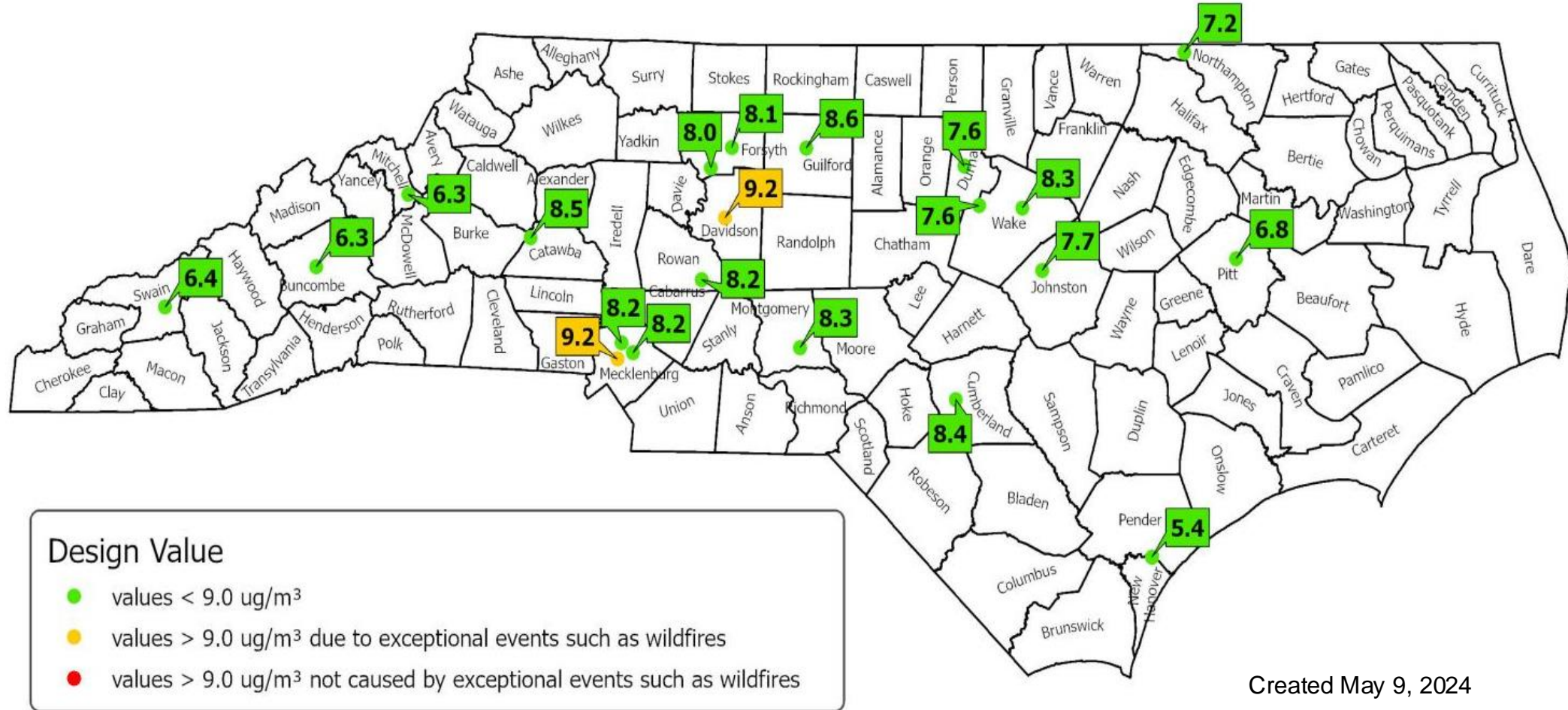


Revised PM_{2.5} Air Quality Standard

- **In May 2024, EPA tightened the annual health-based National Ambient Air Quality Standard for fine particulate matter (PM_{2.5}) from 12.0 µg/m³ to 9.0 µg/m³.**
- **This change was made after a review of the available scientific evidence, technical information, and advice of an independent scientific panel.**
- **EPA says will result in significant public health benefits, advance the economy and improve quality of life.**



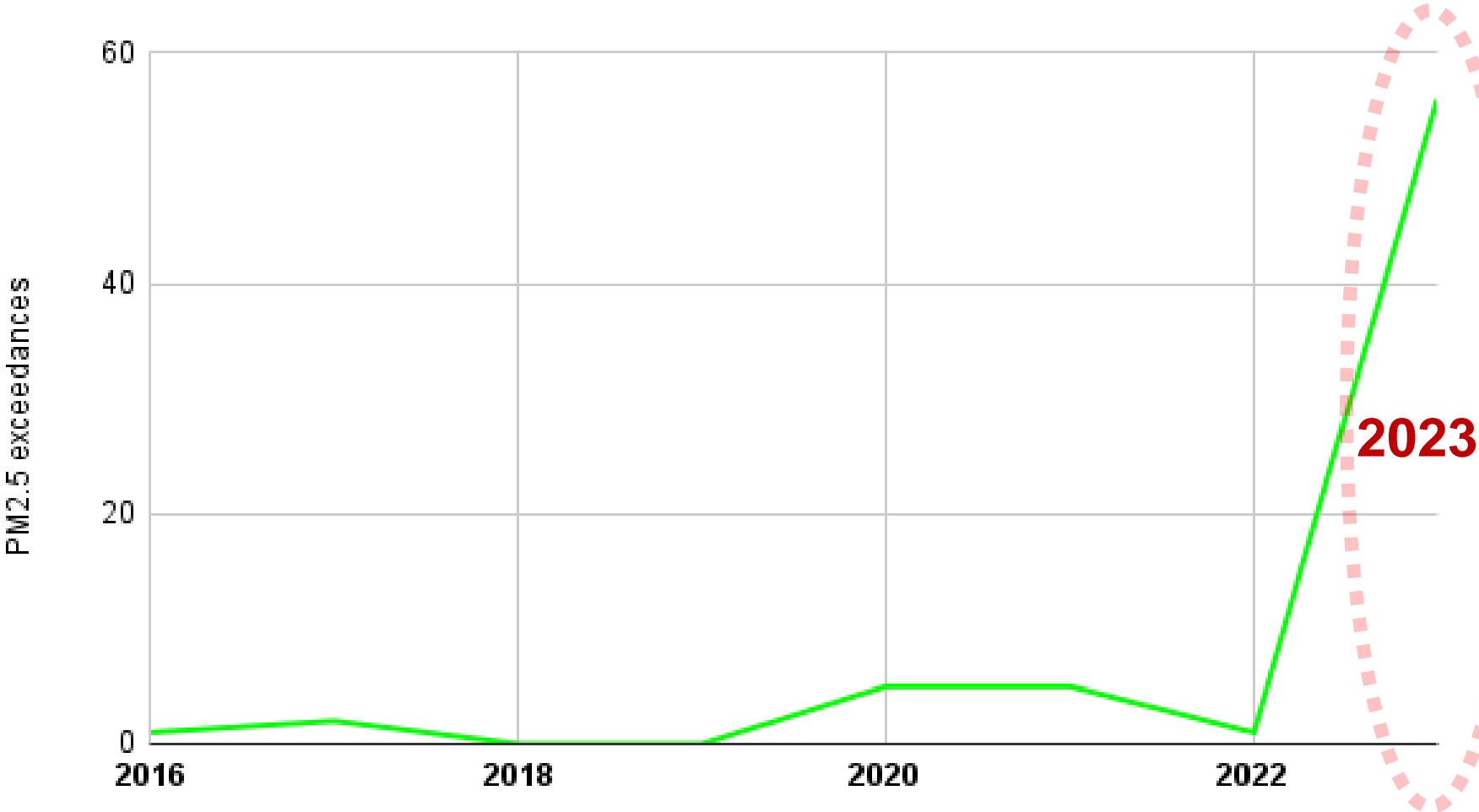
NC PM2.5 Annual Design Values (2021-2023)*



Created May 9, 2024

* Based on certified monitoring data for 2021-2023.

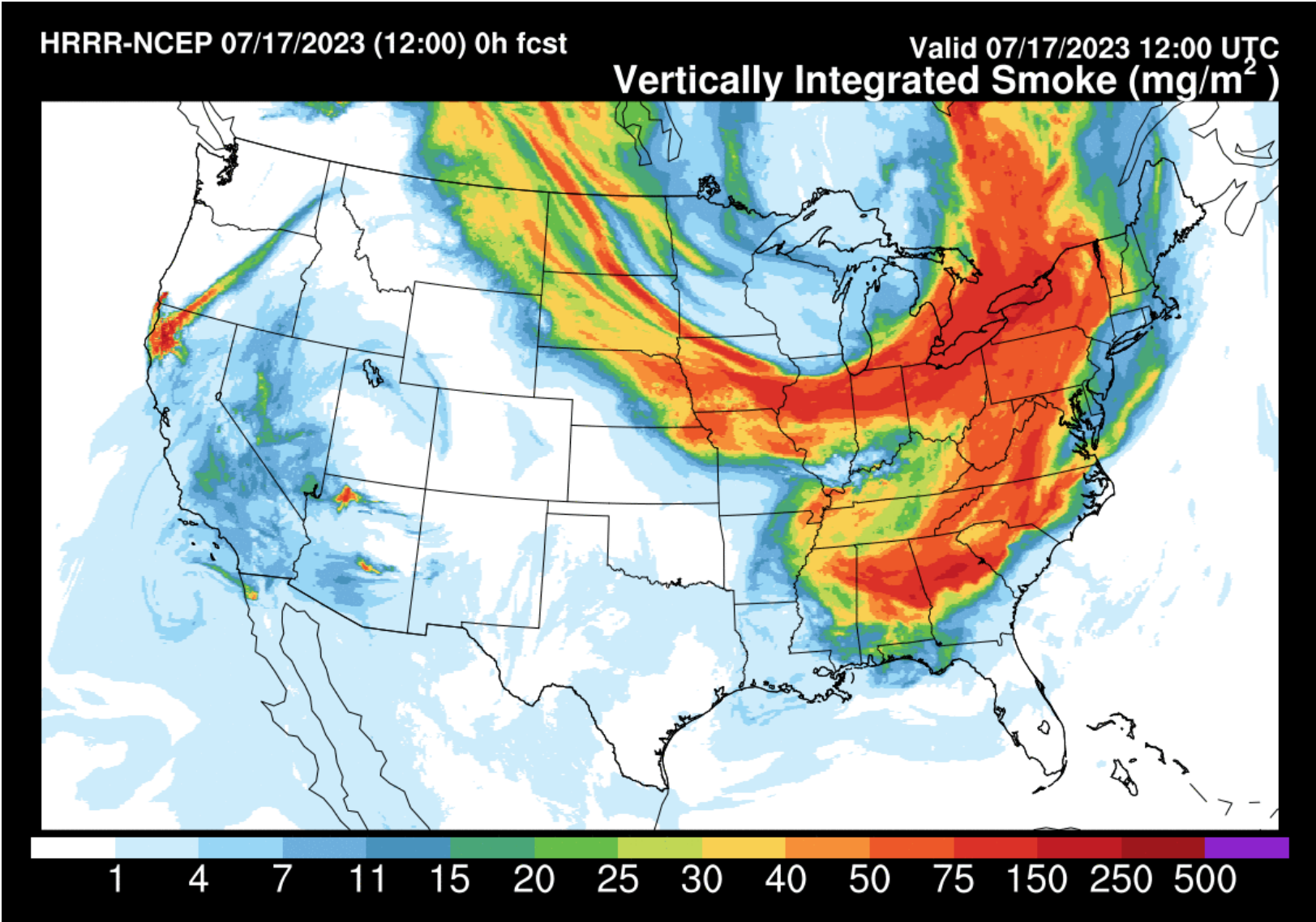
Canadian Wildfires Influence NC Air Quality



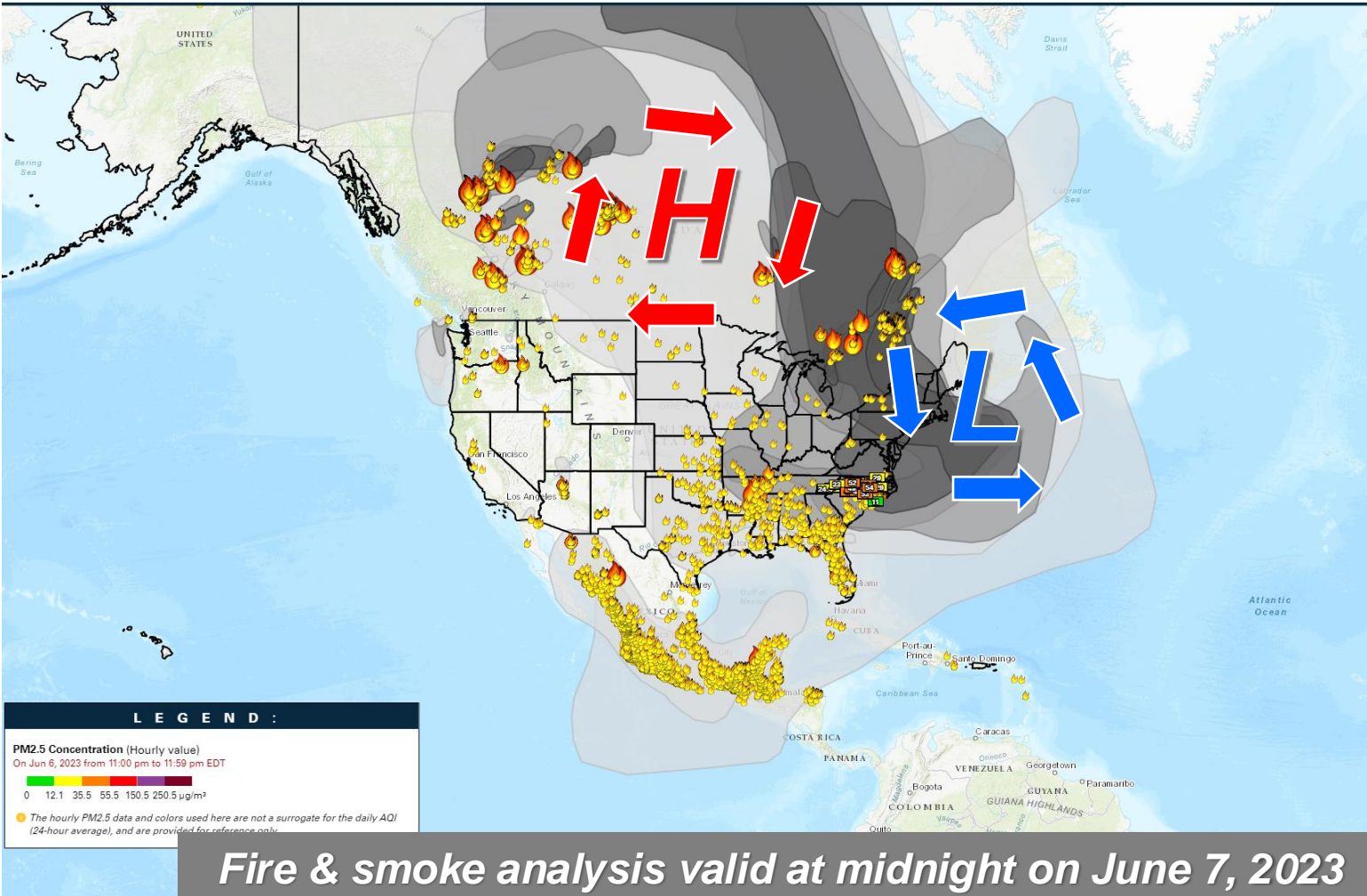
**NC PM2.5 Exceedances (24-hr.)
2016-2023**



Canadian Wildfires Influence NC Air Quality



Canadian Wildfires Influence NC Air Quality



- Anomalous June pattern that featured **strong northerly transport** of Canadian air led to **well-below normal temperatures** across the eastern U.S.
- Unfortunately, this **simultaneously** led to the intrusion of heavy Canadian wildfire smoke into the eastern U.S., including North Carolina.

What are Exceptional Events?

- Defined as an event(s) and its resulting emissions that affect air quality in such a way that:
 - There exists a **clear causal relationship** between the specific event(s) and the monitored exceedance(s) or violation(s),
 - **Is not reasonably controllable or preventable,**
 - Is an event **caused by human activity that is unlikely to recur at a particular location or a natural event(s),** and
 - is determined by the **Administrator...to be an exceptional event.**" (40 CFR 50.1(j))

Exceptional Events (EE) Demonstration

- **DAQ has developed an EE demonstration.**
- **It will ask EPA to remove certain days strongly influenced by Canadian wildfire smoke when calculating the design value for the two monitors above the level of the standard.**
- **Notify EPA of intent to submit an EE demonstration**
 - **Submitted to EPA September 11, 2024 (deadline is January 1, 2025).**
- **Pre-Draft EE demonstration submitted to EPA September 25, 2024, for comments/feedback**
- **The EE demonstration will serve as the basis to recommend the entire state be designated as attaining the revised PM_{2.5} standard.**

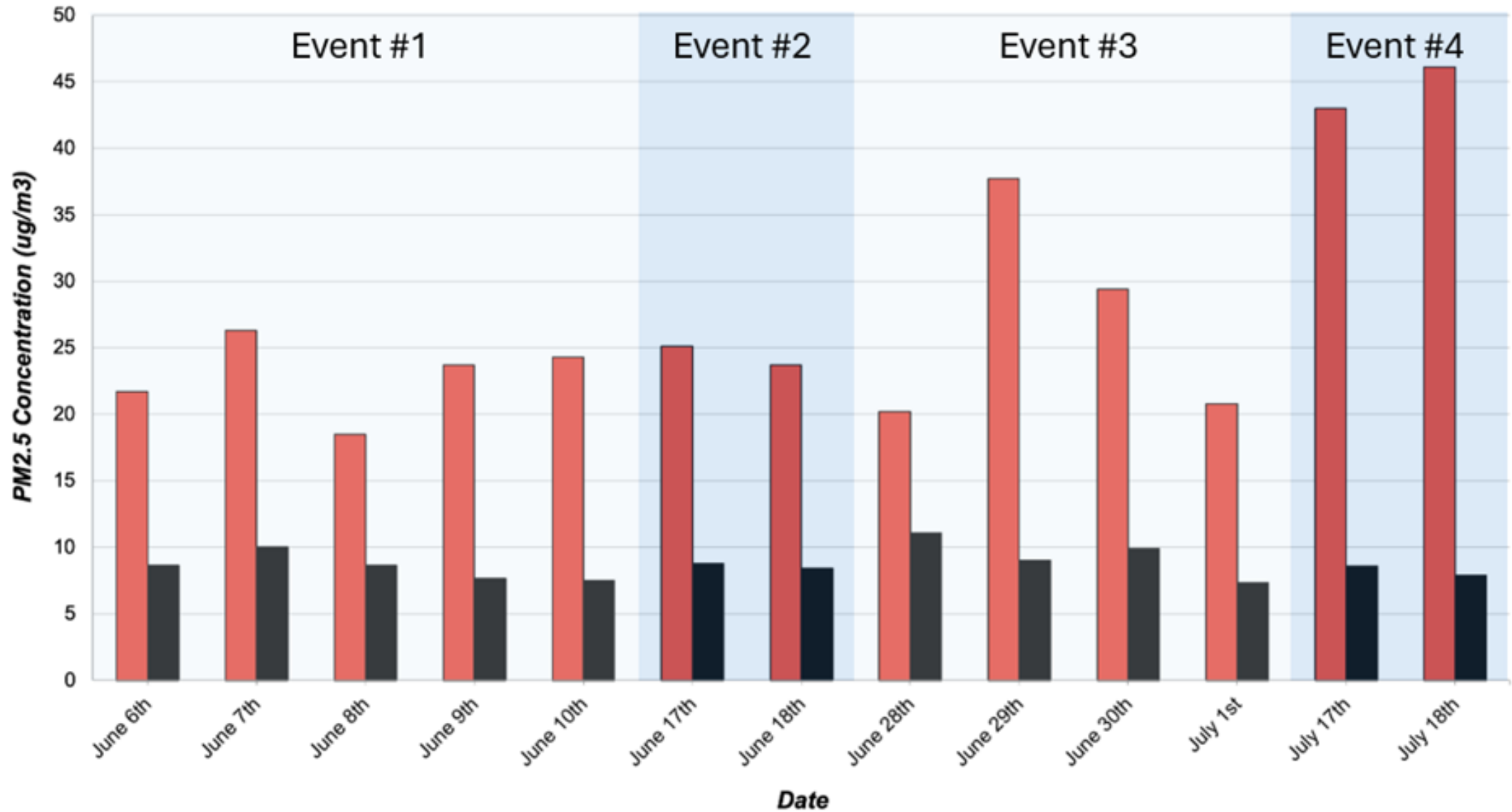
Exceptional Events Demonstration

- **Public Comment Period and opportunity to request a public hearing**
 - **Comment period to begin ~November 1, 2024**

Learn more about these events here: www.deq.nc.gov/pm2.5updates

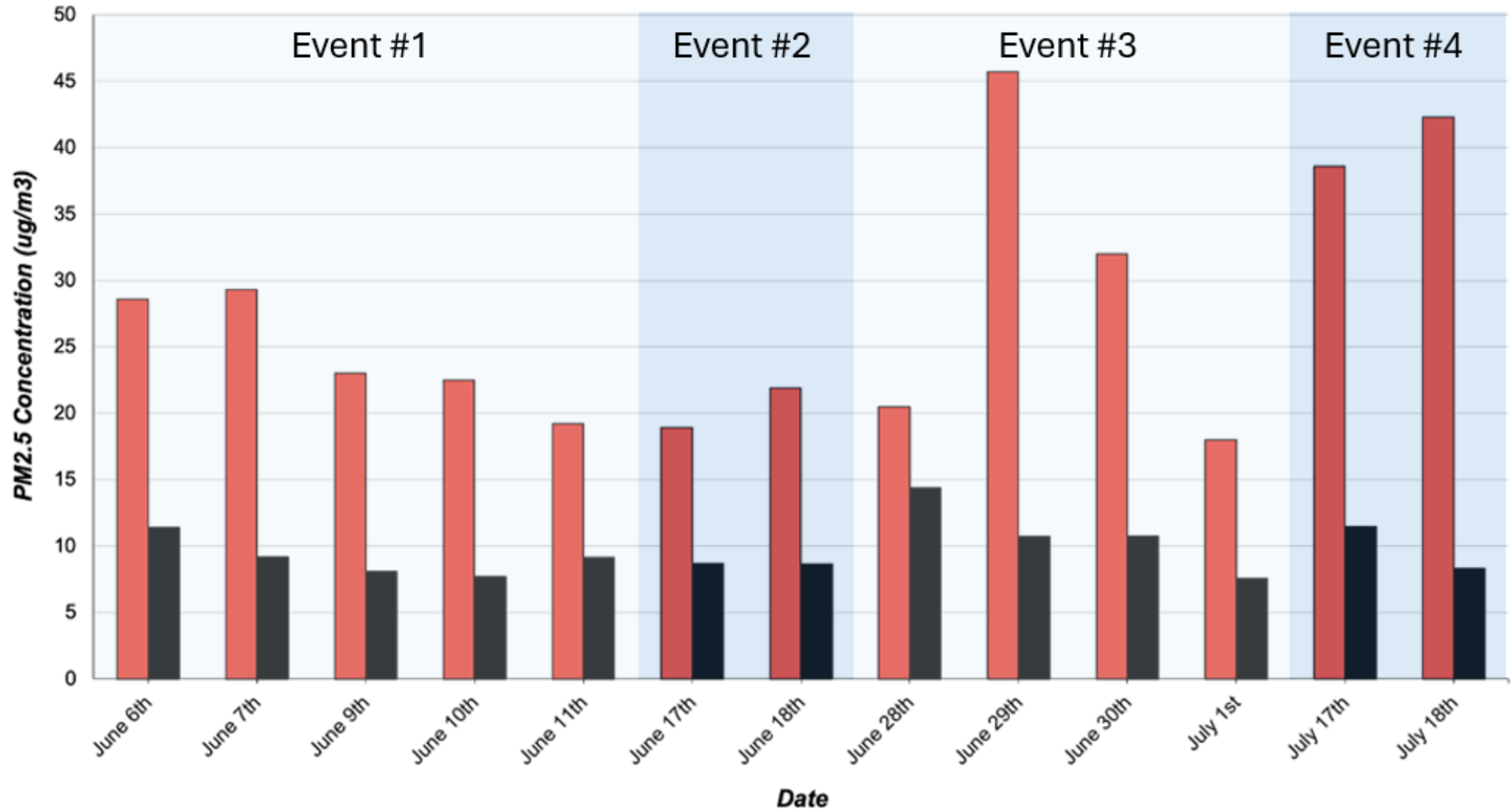
Remount (371190045) PM2.5 Analysis

■ 2023 Daily Conc. ■ 2018-2022 Avg. Daily Conc.



Lexington (370570002) PM2.5 Analysis

■ 2023 Daily Conc. ■ 2018-2022 Avg. Daily Conc.



Exceptional Events Analysis

NC Exceptional Event demo content

2.1 Record Setting 2023 Canadian Wildfire Season

The 2023 Canadian wildfire season - the result of intensifying, widespread spring drought across almost all of the Canadian provinces - was unprecedented and record-shattering. Prolonged and widespread drought conditions set the stage, while a combination of human and natural (lightning strike) activity initiated more than 7,131 fires that burned 17.2 million hectares of land. This doubled the previous record for acres burned, according to the [Canadian Interagency Forest Fire Centre](#).

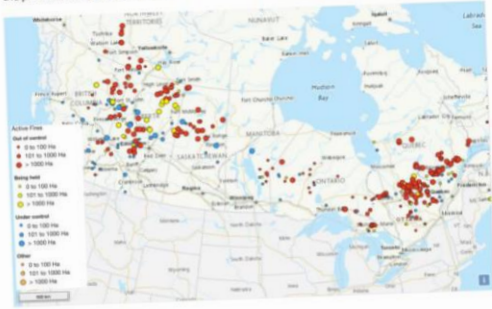


Figure 1: Reported active fire locations across Canada, valid on June 6th, 2023. Source: [CWFIS interactive Map](#)

The historic Canadian wildfire season and resulting intrusion of massive amounts of Canadian wildfire smoke into the contiguous United States was the culmination of several months of anomalous synoptic meteorological conditions across North America. A succession of atmospheric patterns first served as the catalyst for the [intensifying drought](#) that resulted in the growing number of wildfires across Canada and then [directly led to the large-scale transport of smoke into the eastern U.S.](#), which first began impacting North Carolina in early June, as shown in [Figure 2](#). This resulted in a series of unprecedented air quality events from Maine to Florida, including [North Carolina](#), during the months of June and July.

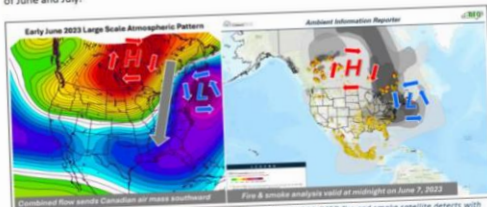


Figure 2: Early June 2023 500 mb geopotential height anomalies (left) and NOAA OSPO fire and smoke satellite detects with 500 mb circulations overlaid for illustration (right)

It is not hard to prove that Canadian air masses were ever-present in the eastern U.S. during June 2023. As seen in [Figure 3](#), many states recorded [well below-normal temperatures for the month](#) due to the anomalous nature of the atmospheric regime that resulted in a persistent fetch of cooler-than-normal, but smoky, Canadian air into the region. This included North Carolina, which recorded its [13th-coldest June](#) in the past 129 years.

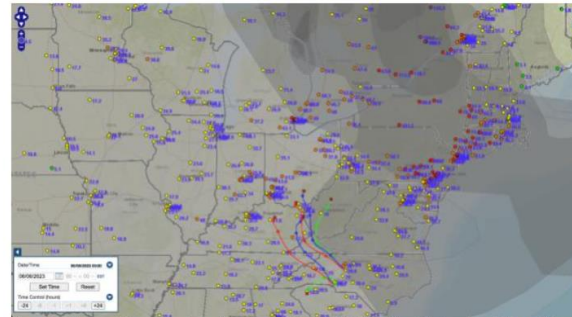


Figure 24: 24-hr avg. $PM_{2.5}$ concentrations valid on June 6th, 2023. NOAA OSPO satellite-derived smoke analysis and 24-hr backward trajectories at 100 m (green line), 750 m (blue line) and 1500 m (red line) ending on June 7th, 2023. Red squares indicate air parcel location along back trajectory path on June 6th, 2023.

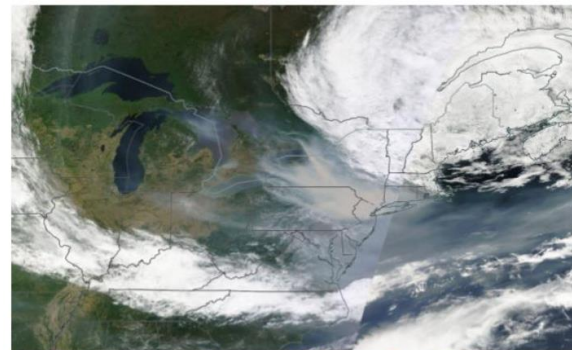


Figure 25: Visible satellite imagery showing smoke over the Mid-Atlantic, including NC, on June 7th, 2023.

- Extensive analysis of all aspects of the Canadian wildfire impacts on NC monitors completed.
- Analyzed wide-variety of data...
 - Smoke plumes
 - Satellite imagery
 - Trajectories
 - Upper-air & Surface
 - Webcams
 - AQ & Weather Surface Observations



PM_{2.5} Designation Timeline

February

EPA
announces
new PM_{2.5}
standard

May

New
PM_{2.5}
standard
in effect

June

DAQ
begins
additional
analysis &
state
designatio
n work

August

DAQ
public
outreach
to share
info with
NC

Aug-Sept

Revise
State
PM_{2.5}
NAAQS
Rule

Sept-Dec.

Exceptional
Events
Demonstration
–
Public
comment
period

Jan-Feb. 2025

NC
Submits
recommendation
to EPA

Development of a Representative PM_{2.5} Background Dataset for Modeling

Independent Determinations and Analyses Covered by other Regulatory Programs (not Exceptional Events)

- EPA recognizes there are determinations and analyses not covered by the Exceptional Events Rule that also rely on ambient air quality monitoring data that may have been influenced by **atypical, extreme, or unrepresentative events.**
- Monitoring data exclusion, selection, or adjustment may be considered for the following types of determinations and analyses:
 - Certain Modeling Analyses under EPA's Guideline on Air Quality Models ("Guideline"; see 40 CFR Part 51, Appendix W)
 - Preparing required air quality analyses for demonstrating compliance under Prevention of Significant Deterioration (PSD) permitting program.

Representative PM2.5 Background Dataset for Modeling

- **Criteria**

- Monitor specific
- Follow EPA 2019 guidance memo
- Exclusion of PM2.5 daily concentration defensible (per memo)

- **Methodology**

- Identify top 20 days with highest PM2.5 daily average concentration (2021-2023)
- Individually analyze top 20 days ... why were concentrations elevated?
 - Examine data (weather, smoke plumes, air quality, trajectories...etc)
 - Determine if concentrations were influenced by “atypical, extreme, or unrepresentative events”



Representative PM2.5 Background Dataset for Modeling Next Steps

- **Complete analysis of data for NC's 21 PM2.5 monitors based on 2021-2023 certified monitoring data**
- **Make adjusted background concentrations and documentation available to permit applicants**
- **Going forward, develop methods to automate data collection and analysis supporting justification of removing data consistent with EPA guidance**



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