



# GEORGIA

DEPARTMENT OF NATURAL RESOURCES

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ENVIRONMENTAL PROTECTION DIVISION

## **Draft Canadian Wildfire Exceptional Event Demonstration for Exceedances of the 2024 Annual PM<sub>2.5</sub> NAAQS at Atlanta, GA in 2023**

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## 1. Introduction

The current annual and 24-hour PM<sub>2.5</sub> National Ambient Air Quality Standards (NAAQS) are 9.0 µg/m<sup>3</sup> and 35 µg/m<sup>3</sup>, respectively. Federal Reference Method (FRM) monitors collect PM<sub>2.5</sub> samples for 24 hours on filters while Federal Equivalent Method (FEM) monitors measure hourly PM<sub>2.5</sub> concentrations continuously. An exceedance of the 2024 annual PM<sub>2.5</sub> NAAQS occurs when the measured 24-hour PM<sub>2.5</sub> concentration is greater than 9.0 µg/m<sup>3</sup>.

From 2019 through 2023, one FRM monitor operated at the Fire Station #8 (FS8) air monitoring site. The monitor collected data on a one in three-day schedule. The Atlanta-Sandy Springs-Roswell MSA is in attainment of the 2012 PM<sub>2.5</sub> NAAQS.

This exceptional event demonstration shows that the FS8 air monitoring site located in Atlanta (Fulton County) in the state of Georgia (AQS ID: 13-121-0039) reported exceedances of the 2024 annual PM<sub>2.5</sub> NAAQS due to Canadian wildfires on two different days in 2023 that qualify for exceptional events demonstrations (Table 1). These exceedances resulted from the transport of wildfire smoke that originated in Canada; therefore, qualifying them for removal under the Exceptional Events Rule (EER). Design values (DVs) of the FS8 monitor with and without U.S. Environmental Protection Agency (EPA) concurrence are shown in Table 2. DVs are calculated using 24-hour PM<sub>2.5</sub> measurements from 2021-2023. For each year, these measurements are first averaged into quarterly values, then to a yearly value. The average of these yearly values is reported as the DV. Inclusion of these events produces a DV of 9.1 µg/m<sup>3</sup>, which is above the new 2024 PM<sub>2.5</sub> annual NAAQS; however, exclusion reduces the DV to 9.0 µg/m<sup>3</sup>.

On December 20, 2024, the Georgia Environmental Protection Division (Georgia EPD) submitted an Initial Notification for these events to the EPA. The request indicated that the data identified in Table 1 was impacted by smoke from Canadian wildfires and requested review of the events under the case-by-case provision at 40 CFR 50.14(a)(1)(i)(F). The Georgia EPD formally requests that the EPA concur with the exclusion of these events so as not to influence regulatory decisions resulting from the state's attainment of the NAAQS.

**Table 1.** Exceedances of the 2024 annual PM<sub>2.5</sub> NAAQS observed by monitors stationed in Atlanta, GA at the Fire Station #8 site in 2023 that qualify for removal under the Exceptional Events Rule.

#	Date	24-hour concentration (µg/m <sup>3</sup> )	Cause of exceedance	Tier
1	06/29/23	39.2	Canadian wildfire	1
2	07/17/23	41.5	Canadian wildfire	1

**Table 2.** Design values (DV) for monitors at the Fire Station #8 site for the 2024 annual PM<sub>2.5</sub> NAAQS.

Monitor Site (AQS ID)	2021-2023 DV without EPA Concurrence (µg/m <sup>3</sup> )	2021-2023 DV with EPA Concurrence (µg/m <sup>3</sup> )
Fire Station #8 (13-121-0039)	9.1	9.0

The EPA has outlined requirements for demonstrations of wildfire events in the 2016 document *Guidance on the Preparation of Exceptional Events Demonstrations for Wildfire Events that*

*May Influence Ozone Concentrations* and, pertinent to this demonstration, the 2024 supplementary document *PM<sub>2.5</sub> Wildland Fire Exceptional Events Tiering Document*. This demonstration will describe how the proposed wildfire events meet the requirements of the EER as described in regulation and the guidance documents, as applicable.

## 2. Narrative Conceptual Model

The EER requires that demonstrations include a narrative conceptual model describing the events. This section describes the 2023 wildfires that affected public health and impacted air quality monitors in Atlanta, GA. Estimates from the National Oceanic and Atmospheric Administration (NOAA) Hybrid Single-Particle Lagrangian Integrated Trajectory model (HYSPLIT) model are used to describe the transportation of wildfire smoke to the area and around the state which ultimately led to enhancements of PM<sub>2.5</sub> concentrations that exceeded the NAAQS level.

Canadian wildfires during the 2023 wildfire season were well documented and impacted much of the geography of the United States. This season started ahead of the typical Canadian wildfire season, lasting from mid-April to late October (seasons usually are from May – September)<sup>1</sup>. Temperatures and land aridity across Canada were unusually high and resulted in the burning of a record-breaking amount of land area ( $\geq 156,000 \text{ km}^2$ )<sup>2</sup>. The land area burned during this season far exceeded the average of  $21,000 \text{ km}^2$ <sup>3</sup>, with the most active burns situated in the eastern province of Quebec in June and July.

Figures in Appendix A are provided to show active Canadian wildfires on the days of the exceedances and for three days beforehand via the Natural Resources Canada Interactive Map<sup>4</sup>. On June 29 and July 17, 2023 (Figures A1 and A2), when the exceedance was recorded by the relevant monitor, Canadian wildfires were on-going across the country, the majority of which had each consumed  $>1,000$  hectares. These fires were similarly as intense up to three days prior to the recorded exceptional events.

Shown in Section 4, these wildfires resulted in the United States being blanketed in smoke and impacted PM<sub>2.5</sub> surface level concentrations across the country. Pertinent to this demonstration, concentrations were impacted across the southeast of the country, often simultaneously and in conjunction with the arrival of air masses either from Canada or circulated from smoke-laden areas within the United States. Air mass back-trajectories from NOAA's HYSPLIT model indicate that the plumes responsible for the summertime exceedances were emitted either from fires in Quebec or fires in the western provinces (British Columbia, Alberta, and Saskatchewan), and were generally transported across the Midwest of the United States.

The conceptual model describes how emissions from wildfires in Canada and environmental conditions contributed to the wildfire events dated in Table 1. Smoke emissions enhanced PM<sub>2.5</sub> concentrations observed by the monitor as they were transported to the FS8 site and caused an exceedance of the annual PM<sub>2.5</sub> NAAQS. Georgia EPD requests EPA's concurrence on June 29

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<sup>1</sup> <https://doi.org/10.1038/s41467-024-51154-7>

<sup>2</sup> <https://doi.org/10.1007/s00376-023-3241-0>

<sup>3</sup> <https://cwfis.cfs.nrcan.gc.ca/ha/nfdb>

<sup>4</sup> <https://cwfis.cfs.nrcan.gc.ca/interactive-map>

and July 17, 2023, for exclusion from regulatory decision making, specifically state attainment determinations.

### 3. Public Notification

As described in 40 CFR 51.930(a), states requesting to exclude data due to exceptional events must take appropriate and reasonable actions to protect public health from exceedances or violations of the NAAQS. These include providing for, at a minimum, prompt public notification whenever concentrations are expected to exceed a NAAQS, public education on actions individuals may take to reduce exposures to unhealthy air quality during events, and implementation of appropriate measures to protect public health from event-caused exceedances or violations of the NAAQS.

With respect to public notification and public education, the Georgia Forestry Commission (GFC) has a public website<sup>5</sup> with an interactive wildfire and burn permit map that contains the current Air Quality Index at all monitors in Georgia with the option to add the following layers: (1) burn restrictions, (2) daily burn permits, (3) PM<sub>2.5</sub>, (4) NOAA Hazard Mapping System (HMS) smoke plumes, (5) wind vectors, and (6) smoke forecast. The public can zoom in to see if smoke may impact their location. The Georgia EPD website<sup>6</sup> has a link to the GFC interactive burn permit map. Also, the Georgia EPD website has a link to EPA's AirNow Fire and Smoke Map<sup>7</sup>, EPA's AirNow When Smoke is in the Air<sup>8</sup>, EPA's AirNow Prepare for Fire Season<sup>9</sup>, and the EPA's Smoke-Ready Toolbox for Wildfires<sup>10</sup>. These websites identify several protective measures that individuals should take to reduce smoke exposure as needed, including limiting outdoor activities, avoiding strenuous outdoor activity and remaining indoors, and considering temporarily relocating or closing all doors and windows during smoke events. In addition, the Georgia EPD Ambient Air Monitoring Program website<sup>11</sup> provides near real-time ambient air concentrations of multiple criteria pollutants (O<sub>3</sub>, PM<sub>2.5</sub>, SO<sub>2</sub>, NO<sub>2</sub>, and CO) across the state.

### 4. Clear Causal Relationship and Supporting Analyses

This section addresses the EER requirements at 40 CFR 50.14(c)(3)(iv)(B) by showing that the events affected air quality in such a way that there exists a clear, causal relationship between the specific events and the monitored exceedance, and at 40 CFR 50.14(c)(3)(iv)(C) by providing analyses comparing the claimed event-influenced concentrations to concentrations at the same monitoring site at other times. The *Guidance on the Preparation of Exceptional Events Demonstrations for Wildfire Events that May Influence Ozone Concentrations and PM<sub>2.5</sub> Wildland Fire Exceptional Events Tiering Document* outline the expected components of a clear causal relationship portion of a demonstration. These include a comparison of the event-related concentration to historical concentrations, evidence that the emissions from wildfires were transported to the monitor, and evidence that the prescribed fire emissions affected the monitor.

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<sup>5</sup> <https://georgiafc.firesponse.com/public/>

<sup>6</sup> <https://epd.georgia.gov/air-protection-branch/open-burning-rules-georgia>

<sup>7</sup> <https://fire.airnow.gov/>

<sup>8</sup> <https://www.airnow.gov/wildfires/when-smoke-is-in-the-air/>

<sup>9</sup> <https://www.airnow.gov/sites/default/files/2020-10/prepare-for-fire-season.pdf>

<sup>10</sup> <https://www.epa.gov/air-research/smoke-ready-toolbox-wildfires>

<sup>11</sup> <https://airgeorgia.org/>

Figures B1 and B2 (Appendix B) show smoke from the NOAA HMS, plotted via the AirNow Navigator<sup>12</sup>. Active fires and smoke are shown for the dates the event was registered as well as up to three days beforehand. For each exceptional event, smoke pervaded the air throughout much of the eastern half of the United States, if not the entire country.

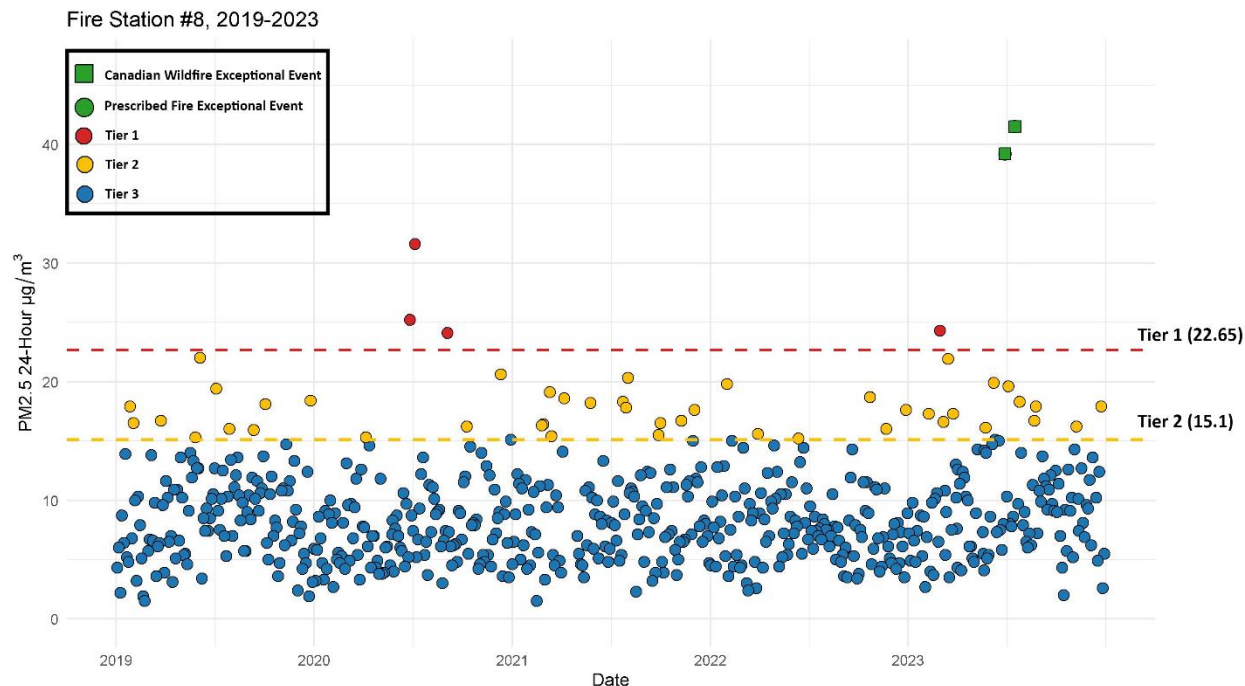
The historical data analysis section of this demonstration focuses on 2019-2023 PM<sub>2.5</sub> FRM data at the FS8 site monitor. Table 3 contains a comparison of exceptional event concentrations to historic 2019-2023 concentrations for the monitor. Generally, the exceptional event concentrations are at least quadruple the 5-year annual average, quarterly average, and monthly average, and in some cases can more than 4.5 times higher.

**Table 3.** Comparison of exceptional event concentrations to historic 2019-2023 concentrations at the Fire Station #8 site monitor (AQS ID: 13-121-0039).

EE Date	EE Concentration (µg/m <sup>3</sup> )	5-Year Annual Average (µg/m <sup>3</sup> )	5-Year Quarterly Average (µg/m <sup>3</sup> )	5-Year Monthly Average (µg/m <sup>3</sup> )	Ratio EE to 5-Year Annual Average	Ratio EE to 5-Year Quarterly Average	Ratio EE to 5-Year Monthly Average
6/29/2023	39.2	8.9	9.04	10.26	4.4	4.3	3.8
7/17/2023	41.5	8.9	9.62	10.79	4.7	4.3	3.8

Figure 1 plots the 24-hour PM<sub>2.5</sub> concentrations for 2019-2023. Exceedances caused by wildfires or prescribed burns are delineated by marker shape. Concentrations generally fall within the Tier 3 range, below 15.1 µg/m<sup>3</sup>, except when smoke from wildfires is present. All the selected exceptional events days are above the Tier 1 threshold of 22.65 µg/m<sup>3</sup>, making them 1.5 times greater than the highest 98<sup>th</sup> percentile of data over the last 5 years per the EPA’s Tiering Tool.

<sup>12</sup> <https://airnowtech.org/navigator/>



**Figure 1.** 24-hour PM<sub>2.5</sub> concentrations for 2019-2023 observed at the Fire Station #8 site.

Maps from the AirNow Navigator are provided in Appendix C for each exceedance event in Table 3. The maps include NOAA HMS satellite detected fires, HMS smoke plumes, 24-hour PM<sub>2.5</sub> concentrations across the United States, and HYSPLIT back-trajectories. These trajectories originate at the FS8 monitor’s geographic location, begin at the time the exceedance was observed, and extend 72 hours back in time. Each trajectory starts at a different elevation above ground level (100 m, 1,500 m, and 3,000 m). The 1,500 m and 3,000 m tails are used to estimate the trajectories of smoke transported over a long range. The 100 m tail, nearer to the surface, is used to show local transport. Additionally, these values are chosen to estimate vertical transport near-surface and up to several hundred meters above the planetary boundary layer. Figures in Appendix D are provided to show ground level, daily PM<sub>2.5</sub> concentrations and air quality indices (AQIs) in the southeast of the United States.

#### June 29, 2023

Shown in Figure C1, back-trajectories indicate that the smoke plume traveled through the Midwest of the United States. Fires in Canada had been on-going for months at the time the exceedance was registered, and their emissions were likely mixed throughout the air column. As a result, the plume detected by the monitor is a mixture of emissions from fires in provinces of British Columbia, Alberta, Saskatchewan, Ontario, and Quebec. The back-trajectories converge in space approximately 18-24 hours before descending to near-surface level where observed, the daily PM<sub>2.5</sub> concentration at the FS8 site on June 29, 2023, increased to 39.2 µg/m<sup>3</sup>. Figure D1 shows that this enhancement occurred synchronously with elevated concentrations reported by monitors across the southeast, which follows from the large blanket of smoke over this region (Figure B1). Exceedances worsen the AQIs at southeastern sites from “Good” to either “Moderate” or “Unhealthy for Sensitive Groups.”

July 17, 2023

Shown in Figure C2, back-trajectories indicate that the smoke plume traveled through the Midwest of the United States. Fires in Canada had been on-going for months at the time the exceedance was registered, and their emissions were likely mixed throughout the air column. As a result, the plume detected by the monitor is most likely a mixture of emissions from fires in provinces of British Columbia, Alberta, and Saskatchewan. The back-trajectories converge in space approximately 12 hours before descending to near-surface level where observed, the daily PM<sub>2.5</sub> concentration at the FS8 site on July 17, 2023, increased to 41.5 µg/m<sup>3</sup>. Figure D2 shows that this enhancement occurred synchronously with elevated concentrations reported by monitors across the southeast, which follows from the large blanket of smoke over this region (Figure B2). Exceedances worsen the AQIs at southeastern sites from “Good” to either “Moderate” or “Unhealthy for Sensitive Groups.”

The comparisons and analyses, provided here in this demonstration support the Georgia EPD’s position that the fire event affected air quality in such a way that there exists a clear causal relationship between the specific event and the monitored exceedance or violation for the dates described in Table 1 and thus satisfies the clear causal relationship criterion.

### **5. Not reasonably Controllable or Preventable**

This section satisfies the EER requirements at 40 CFR 50.14(c)(3)(iv)(A), CFR 50.1(j), 40 CFR 50.14(c)(3)(iv)(D), and 40 CFR 50.14(b)(4): The event was caused by a natural event; an exceptional event is one that is not reasonably controllable or preventable. Stated in section 40 CFR 50.14 (a)(8)(vii), the Administrator shall not require a State to provide case-specific justification to support the not reasonably controllable or preventable criterion for emissions-generating activity that occurs outside of the State's jurisdictional boundaries within which the concentration at issue was monitored.

### **6. Human Activity Unlikely to Recur at a Particular Location or Natural Event**

This section satisfies the EER requirement at 40 CFR 50.14(c)(3)(iv)(E): A demonstration that the event was a human activity that is unlikely to recur at a particular location or was a natural event. The definition of wildfire in the EER is: “...is any fire started by an unplanned ignition caused by lightning; ... A wildfire that predominately occurs on wildland is a natural event.” As stated in sections 2 and 4, the origin and evolution of the 2023 Canadian wildfires occurred across Canada.

Based on the documentation provided in sections 2 and 4 of this demonstration, these events qualify as natural events as they spread uncontrolled through remote, natural (i.e. non-agricultural or silvicultural) lands. The National Aeronautics and Space Administration (NASA) noted that many of the Canadian fires were ignited by summer lightning storms and largely burned in deeply wooded areas. The EPA generally considers the emissions of PM<sub>2.5</sub> from wildfires to meet the regulatory definition of a natural event, defined as one ‘in which human activity plays little or no direct causal role’ (40 CFR 50.1(k)). As the Georgia EPD has shown that the demonstrated exceedances resulted from natural events, they should be considered for treatment as exceptional events.



## **7. Public Comment Period**

The Georgia EPD will hold a 30-day public comment period starting on December 20, 2024, to receive public input regarding the Exceptional Event Demonstration. Notification of the public comment period was posted on the Georgia EPD website and emailed to interested stakeholders. Public comments received will be included in Appendix E of this demonstration, along with Georgia EPD's responses to these comments in Appendix F.

# Appendix A: Active wildfires in Canada

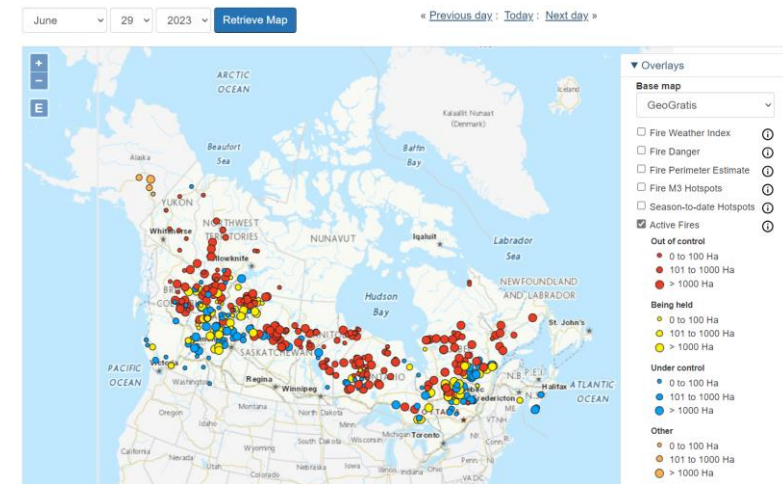
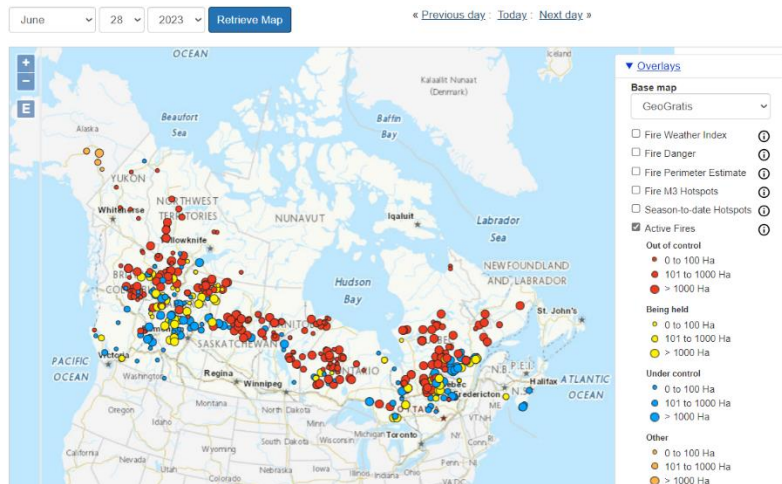
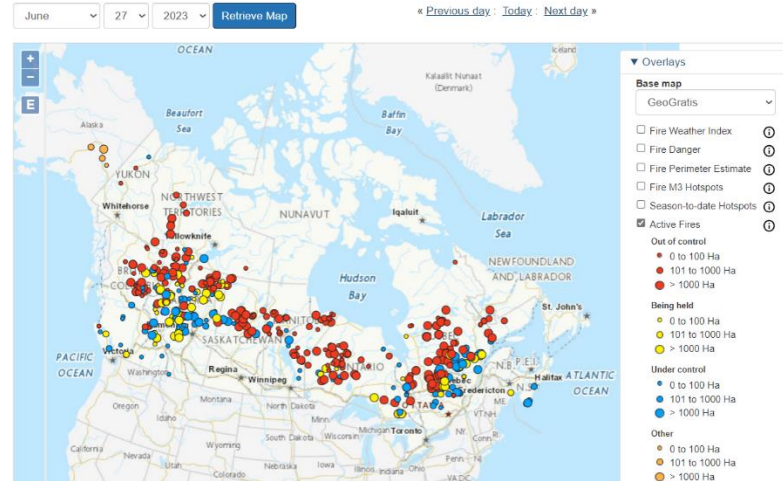
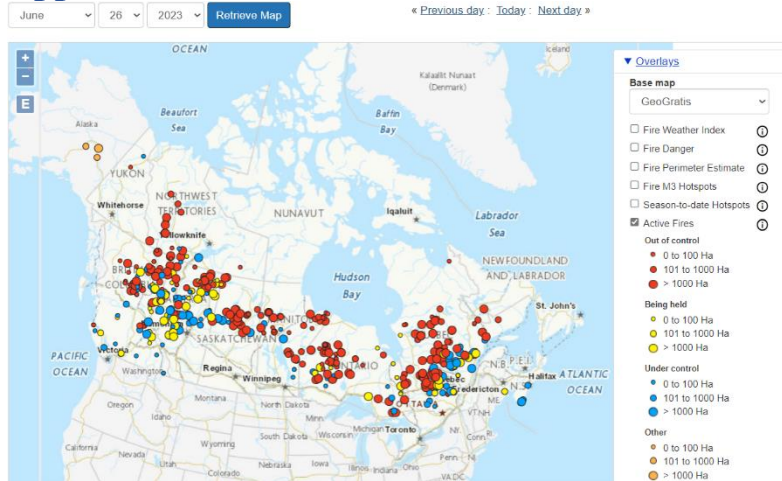
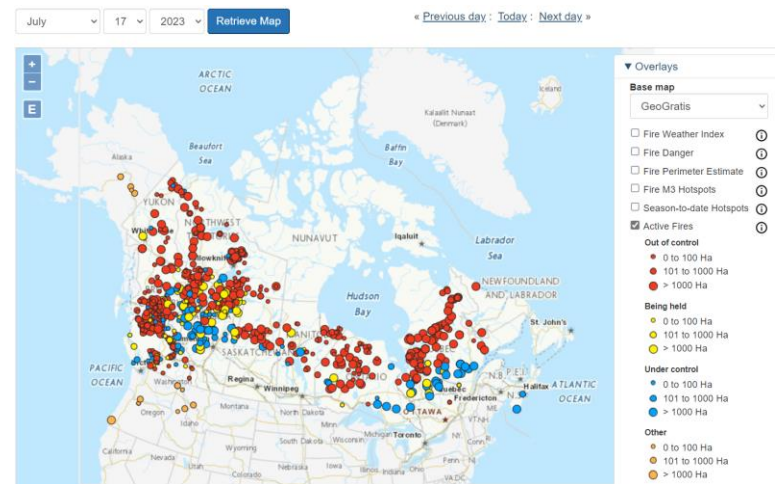
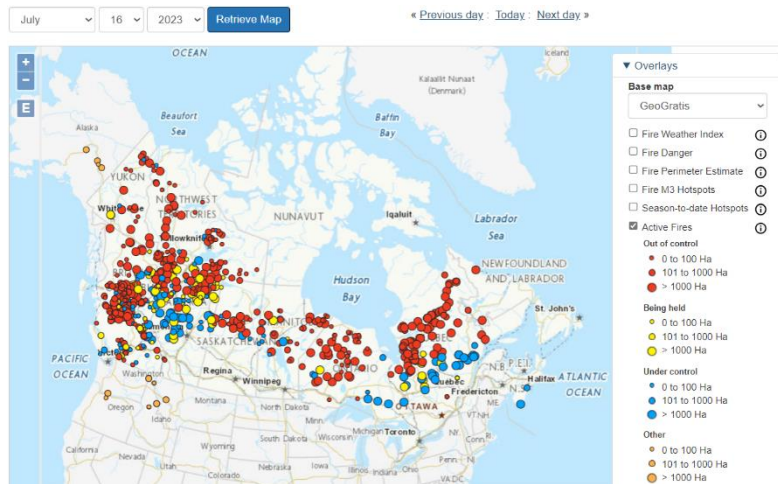
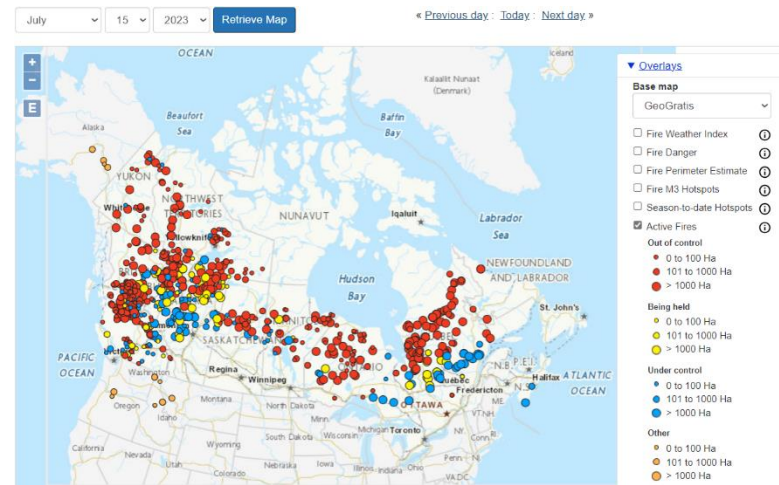
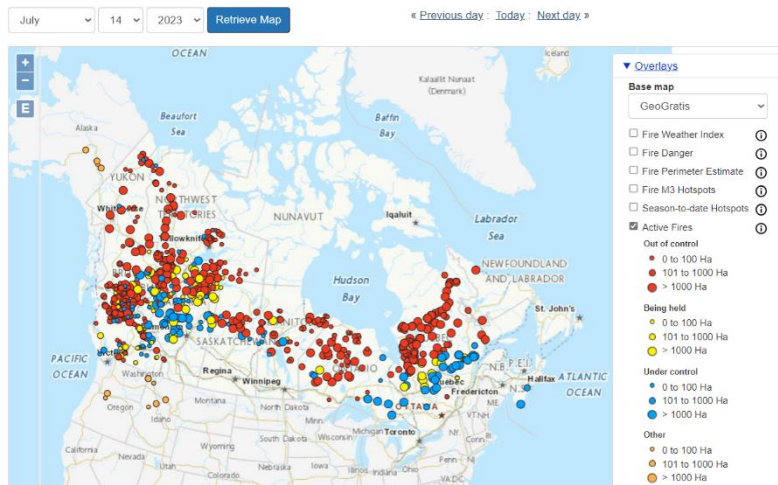
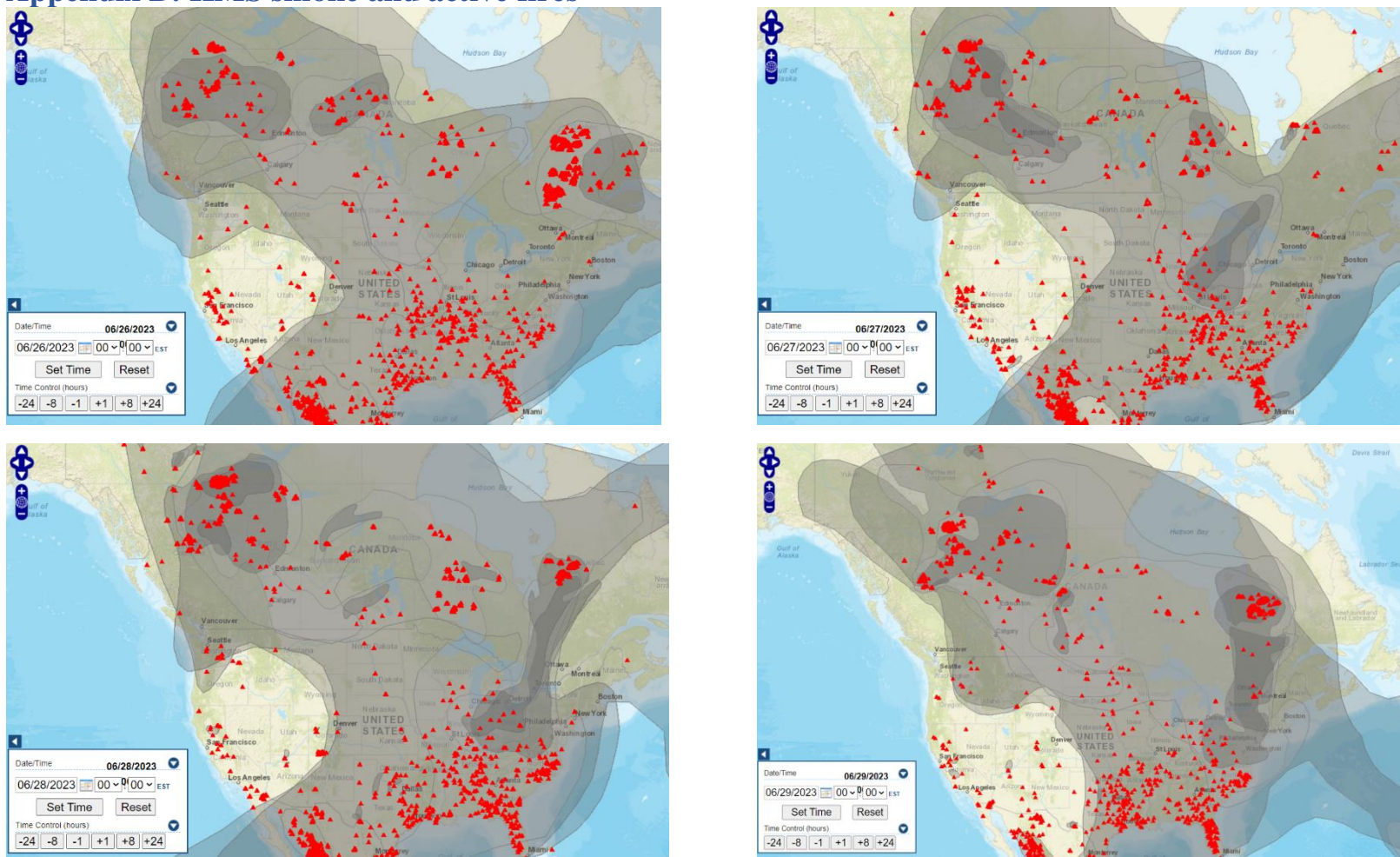


Figure A1. Active wildfires in Canada on June 26-29, 2023.

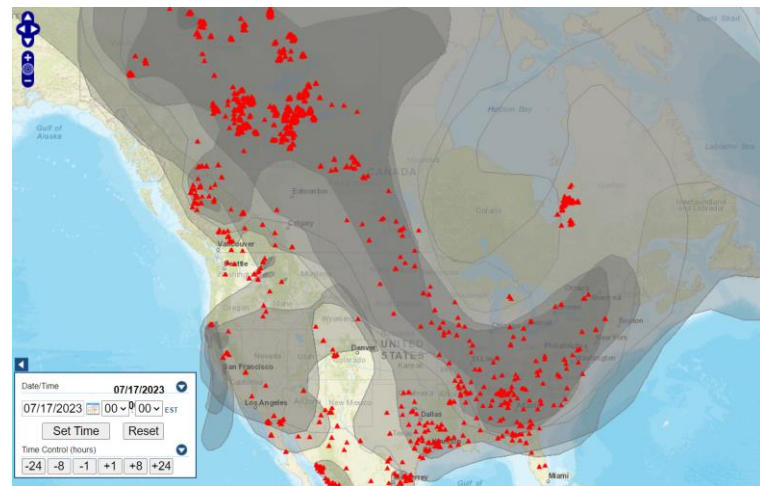
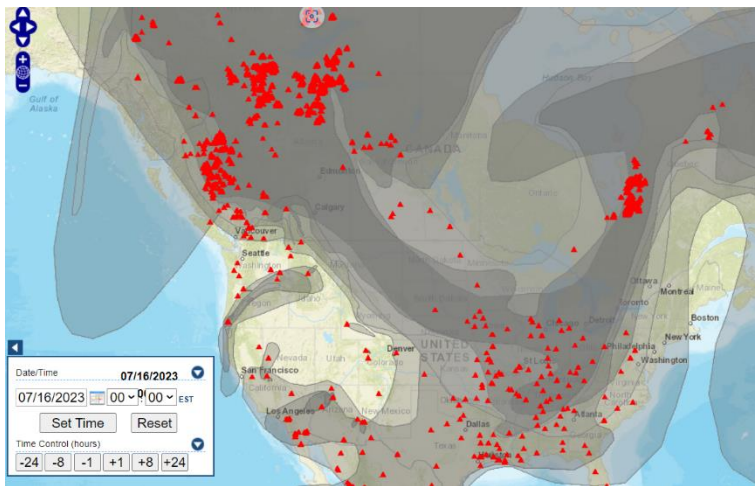
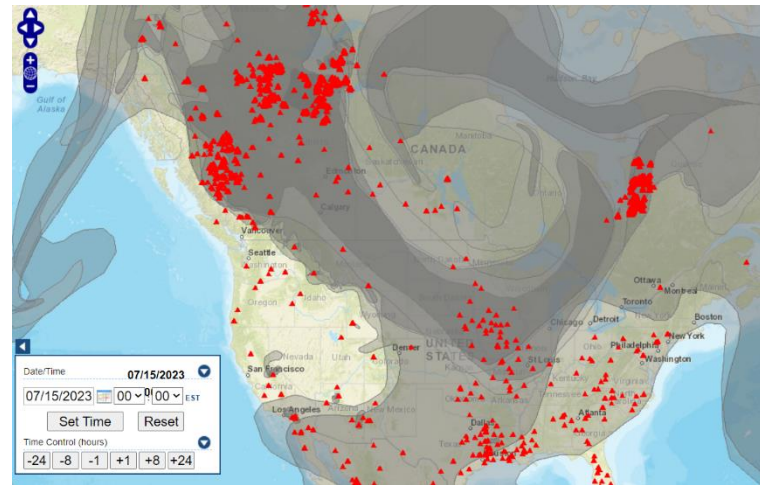
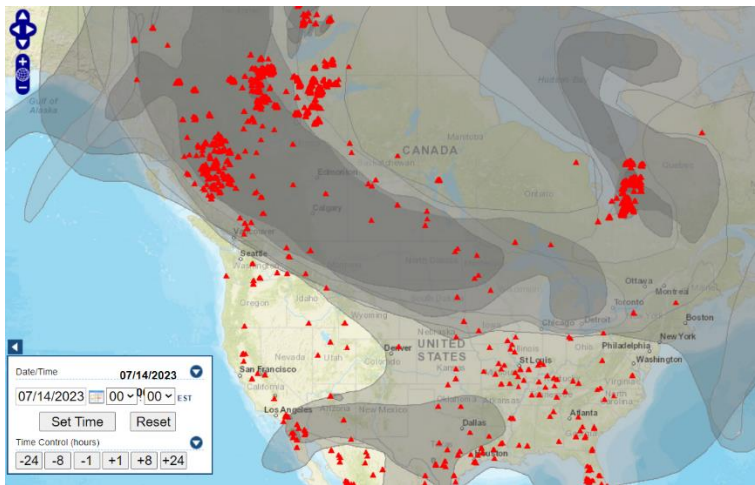


**Figure A2.** Active wildfires in Canada on July 14-17, 2023.

## Appendix B: HMS smoke and active fires

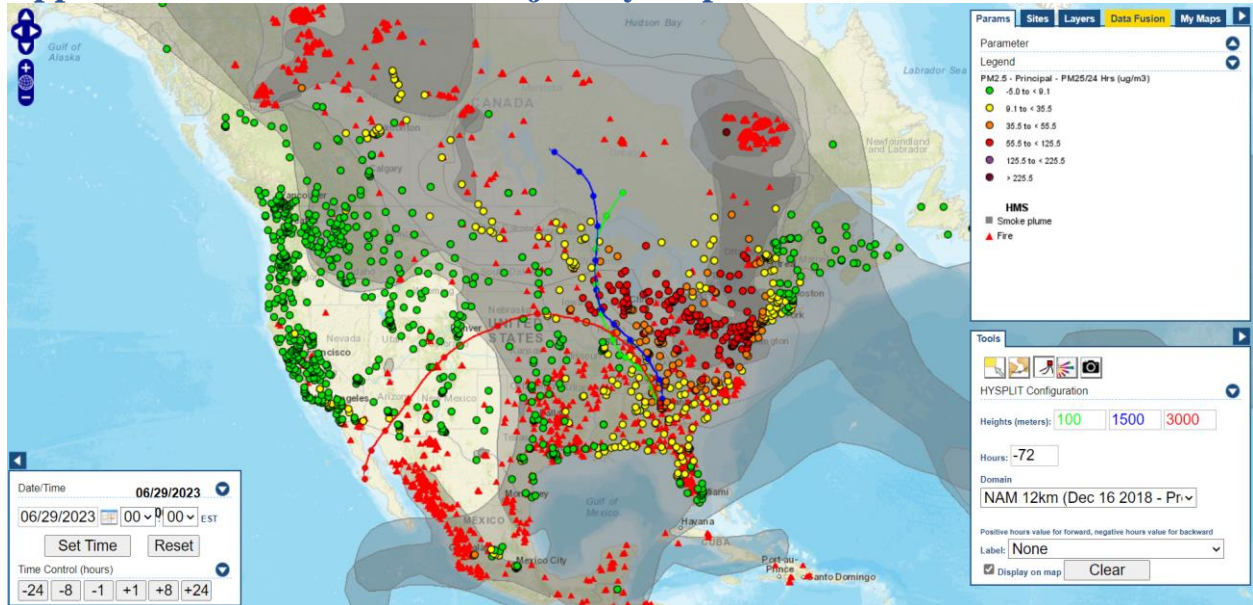


**Figure B1.** Map from the AirNow Navigator showing active fires (red) and smoke (grey) on June 26-29, 2023 over North America.

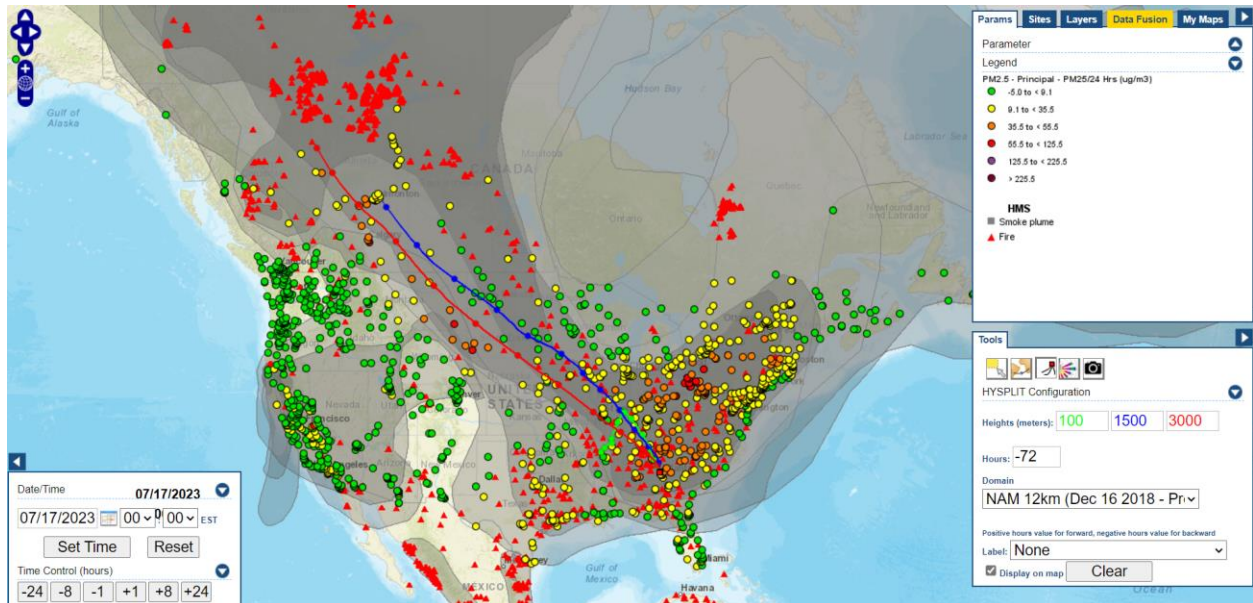


**Figure B2.** Map from the AirNow Navigator showing active fires (red) and smoke (grey) on July 14-17, 2023 over North America.

## Appendix C: HYSPLIT back-trajectory maps

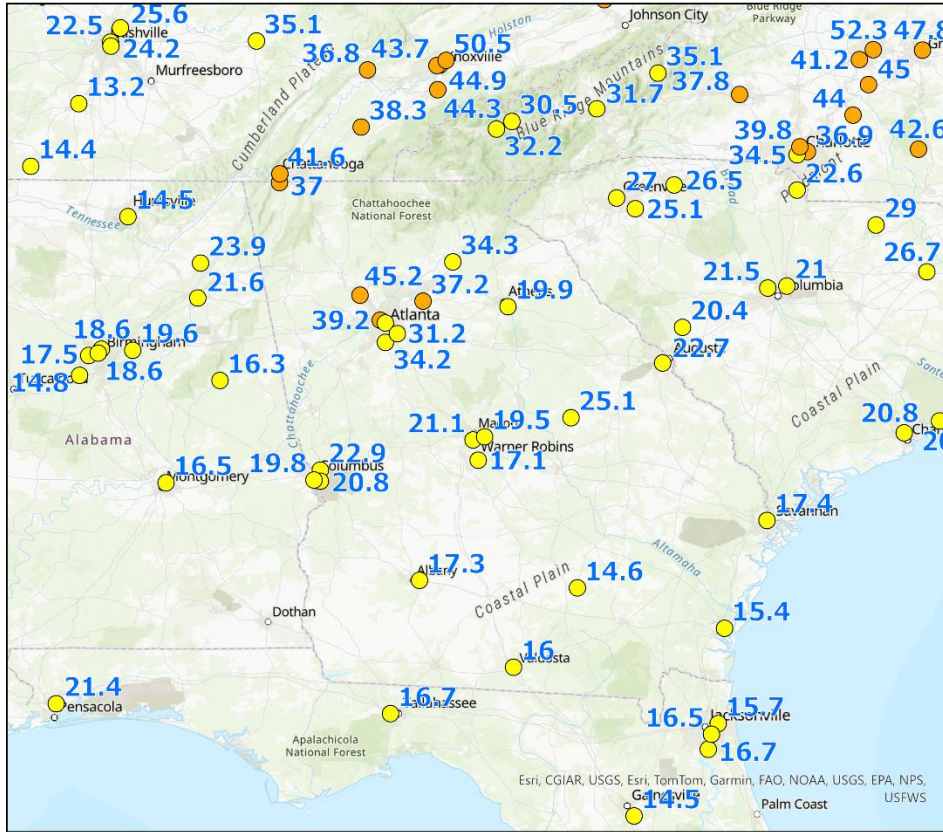


**Figure C1.** Exceptional event map from the AirNow Navigator for June 29, 2023.



**Figure C2.** Exceptional event map from the AirNow Navigator for July 17, 2023.

## Appendix D: PM<sub>2.5</sub> surface concentrations in the southeast June 29, 2023 PM<sub>2.5</sub> Exceedance Report



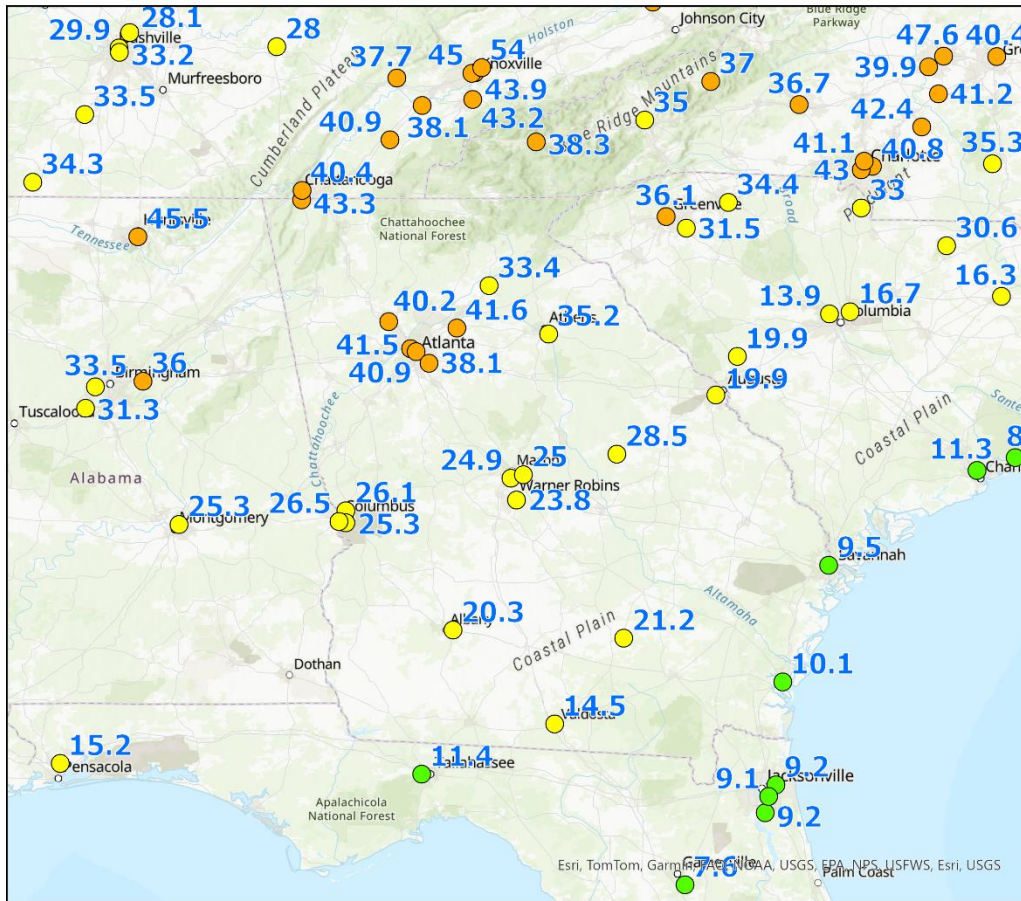
### AQI category - 24-hr average PM<sub>2.5</sub>

FINAL

- Good (0-12 ug/m<sup>3</sup>)
- Moderate (12.1-35.4 ug/m<sup>3</sup>)
- Unhealthy for sensitive groups (35.5-55.4 ug/m<sup>3</sup>)
- Unhealthy (55.5-150.4 ug/m<sup>3</sup>)
- Very unhealthy (150.5-250.4 ug/m<sup>3</sup>)
- Hazardous (>250 ug/m<sup>3</sup>)

**Figure D1.** Surface level, daily PM<sub>2.5</sub> concentrations on June 29, 2023, across the southeast.

# July 17, 2023 PM<sub>2.5</sub> Exceedance Report



## AQI category - 24-hr average PM<sub>2.5</sub>

FINAL

- Good (0-12 ug/m<sup>3</sup>)
- Moderate (12.1-35.4 ug/m<sup>3</sup>)
- Unhealthy for sensitive groups (35.5-55.4 ug/m<sup>3</sup>)
- Unhealthy (55.5-150.4 ug/m<sup>3</sup>)
- Very unhealthy (150.5-250.4 ug/m<sup>3</sup>)
- Hazardous (>250 ug/m<sup>3</sup>)

**Figure D2.** Surface level, daily PM<sub>2.5</sub> concentrations on July 17, 2023, across the southeast.



**Appendix E: Public comments**

**Appendix F: Responses to public comments**