GEORGIA
DEPARTMENT OF NATURAL RESOURCES
ENVIRONMENTAL PROTECTION DIVISION

DRAFT Canadian Wildfire Exceptional Event Demonstration for the 2024 Annual $PM_{2.5}$ NAAQS at Sandersville, GA in 2022-2024

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1. Introduction

The current annual and 24-hour $PM_{2.5}$ National Ambient Air Quality Standards (NAAQS) are 9.0 µg/m^3 and 35 µg/m^3, respectively. Federal Reference Method (FRM) monitors collect $PM_{2.5}$ samples for 24 hours on filters while Federal Equivalent Method (FEM) monitors measure hourly $PM_{2.5}$ concentrations continuously. For the purpose of this document, an "exceedance" is defined as a measured 24-hour $PM_{2.5}$ concentration that is greater than the level (9.0 µg/m^3) of the 2024 annual $PM_{2.5}$ NAAQS. Please note that "exceedance" as defined in this document (based on an averaging time of 24-hours) is <u>not</u> an actual exceedance of the 2024 annual $PM_{2.5}$ NAAQS since an exceedance of a NAAQS must be based on the averaging time for the NAAQS (in this case, annual) in addition to the level of the NAAQS (in this case, 9.0 µg/m^3).

At the Sandersville site (Air Quality System (AQS) ID: 12-313-0001), an FRM monitor collected data on a one-in-three day schedule until August 2019, and an FEM monitor started collecting data in August 2019. The FEM monitor continued to collect data through 2023, and an additional collocated FEM monitor started collecting data in March 2023 and was shut down in July 2024. An FRM monitor was redeployed as the primary monitor in July 2024 on a daily sampling schedule. The Washington County area is in attainment with the 2012 $PM_{2.5}$ NAAQS.

This document discusses 51 different days from 2022-2024 that qualify for exceptional event demonstrations (Table 1) for the Sandersville air monitoring site (AQS: ID: 13-303-0001) located in Sandersville (Washington County) in the state of Georgia. Of these events, 16 were due to Canadian wildfires. These 16 exceedances resulted from the transport of wildfire smoke that originated in Canada; therefore, they qualify for removal under the Exceptional Events Rule (EER). Design values (DVs) of the Sandersville monitor with and without U.S. Environmental Protection Agency (EPA) concurrence are shown in Table 2. DVs are calculated using 24-hour $PM_{2.5}$ measurements from 2022-2024. 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 9.8 µg/m^3, which violates the new 2024 $PM_{2.5}$ annual NAAQS; however, exclusion reduces the DV to 9.0 µg/m^3.

On July 30, 2025, the Georgia Environmental Protection Division (EPD) submitted an Initial Notification for these events to EPA. The request indicated that 16 days in Table 1 were 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). Georgia EPD formally requests that the EPA concur with the exclusion of these events.

Table 1. Exceedances observed at the Sandersville site in Sandersville, GA in 2022-2024 that qualify for removal under the EER.

#	Date	24-hour $PM_{2.5}$ ($\mu g/m^3$)	Tier	Cause of Exceedance
1	01/15/22	22.3	1	Prescribed fires
2	01/31/22	38.2	1	Prescribed fires
3	02/01/22	37.7	1	Prescribed fires
4	02/11/22	18.9	1	Prescribed fires
5	02/12/22	27.2	1	Prescribed fires
6	02/14/22	32.7	1	Prescribed fires
7	02/15/22	37.0	1	Prescribed fires
8	03/03/22	20.9	1	Prescribed fires
9	03/04/22	27.1	1	Prescribed fires
10	03/29/22	21.3	1	Prescribed fires
11	11/18/22	22.9	1	Prescribed fires
12	11/19/22	31.4	1	Prescribed fires
13	11/21/22	31.9	1	Prescribed fires
14	12/28/22	32.3	1	Prescribed fires
15	12/29/22	22.9	1	Prescribed fires
16	01/08/23	18.8	1	Prescribed fires
17	01/29/23	22.7	1	Prescribed fires
18	02/07/23	18.8	1	Prescribed fires
19	02/24/23	18.5	1	Prescribed fires
20	02/28/23	23.1	1	Prescribed fires
21	03/01/23	28.8	1	Prescribed fires
22	03/05/23	19.4	1	Prescribed fires
23	03/07/23	27.6	1	Prescribed fires
24	03/08/23	69.1	1	Prescribed fires
25	03/09/23	45.2	1	Prescribed fires
26	03/21/23	29.6	1	Prescribed fires
27	06/06/23	18.9	1	Canadian Wildfires
28	06/09/23	23.6	1	Canadian Wildfires
29	06/10/23	24.1	1	Canadian Wildfires
30	06/18/23	20.3	1	Canadian Wildfires
31	06/27/23	19.9	1	Canadian Wildfires
32	06/28/23	19.2	1	Canadian Wildfires
33	06/29/23	25.0	1	Canadian Wildfires
34	06/30/23	29.5	1	Canadian Wildfires
35	07/01/23	23.1	1	Canadian Wildfires
36	07/17/23	28.4	1	Canadian Wildfires
37	07/18/23	37.1	1	Canadian Wildfires
38	07/19/23	32.7	1	Canadian Wildfires
39	07/20/23	19.9	1	Canadian Wildfires
40	07/26/23	19.9	1	Canadian Wildfires
41	08/23/23	25.4	1	Canadian Wildfires
42	08/25/23	19.8	1	Canadian Wildfires

#	Date	24-hour $PM_{2.5}$ ($\mu g/m^3$)	Tier	Cause of Exceedance
43	02/02/24	20.6	1	Prescribed fires
44	02/16/24	20.4	1	Prescribed fires
45	02/20/24	18.7	1	Prescribed fires
46	02/21/24	21.2	1	Prescribed fires
47	02/22/24	30.2	1	Prescribed fires
48	03/13/24	29.0	1	Prescribed fires
49	03/14/24	35.6	1	Prescribed fires
50	03/20/24	24.5	1	Prescribed fires
51	03/21/24	29.7	1	Prescribed fires

Table 2. DVs at the Sandersville site for the 2024 annual $PM_{2.5}$ NAAQS.

Monitor Site (AQS ID)	2022-2024 DV without EPA Concurrence ($\mu g/m^3$)	2022-2024 DV with EPA Concurrence ($\mu g/m^3$)
Sandersville (13-303-0001)	9.8	9.0

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 *$PM_{2.5}$ 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 Canadian wildfires that impacted air quality monitors in Sandersville, GA. Estimates from the National Oceanic and Atmospheric Administration (NOAA) Hybrid Single-Particle Lagrangian Integrated Trajectory model (HYSPLIT) model are used to describe the transport of wildfire smoke to the area and around the state which ultimately led to enhancements of $PM_{2.5}$ 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 are usually from May – September)[1]. Temperatures and land aridity across Canada were unusually high and resulted in the burning of a record-breaking amount of land area (≥156,000 km^2)[2]. The land area burned during this season far exceeded the average[3] of 21,000 km^2, with the most active burns situated in the eastern province of Quebec in June and July.

[1] https://doi.org/10.1038/s41467-024-51154-7
[2] https://doi.org/10.1007/s00376-023-3241-0
[3] https://cwfis.cfs.nrcan.gc.ca/ha/nfdb

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[4]. On dates listed in Table 1 (Figures A1-A16), when the exceedances were recorded at the relevant site, 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 $PM_{2.5}$ 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 events were emitted from fires in the Canadian provinces of British Columbia, Alberta, Saskatchewan, and Quebec. They then traveled along multiple routes either originating in Canada or by circulating smoke from Canadian wildfires from other (western and/or midwestern) regions of the United States.

This conceptual model describes how emissions from wildfires in Canada and environmental conditions contributed to the events dated in Table 1. Smoke emissions transported to the Sandersville site enhanced observed $PM_{2.5}$ concentrations and caused an exceedance. Georgia EPD requests EPA's concurrence on for the dates listed in Table 1 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[5] with an interactive wildfire and burn permit map that contains the current Air Quality Index at all sites in Georgia with the option to add the following layers: (1) burn restrictions, (2) daily burn permits, (3) $PM_{2.5}$, (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[6] 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[7], EPA's AirNow When Smoke is in the Air[8], EPA's AirNow Prepare for Fire Season[9], and the

[4] https://cwfis.cfs.nrcan.gc.ca/interactive-map
[5] https://georgiafc.firesponse.com/public/
[6] https://epd.georgia.gov/air-protection-branch/open-burning-rules-georgia
[7] https://fire.airnow.gov/
[8] https://www.airnow.gov/wildfires/when-smoke-is-in-the-air/
[9] https://www.airnow.gov/sites/default/files/2020-10/prepare-for-fire-season.pdf

EPA's Smoke-Ready Toolbox for Wildfires[10]. 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[11] provides near real-time ambient air concentrations of multiple criteria pollutants (O_3, $PM_{2.5}$, SO_2, NO_2, and CO) across the state.

Outside Georgia EPD and GFC, there was additional notification provided by various news outlets to the public about the potential for elevated air quality impacts from Canadian Wildfires. Some examples include:

- https://www.wsbtv.com/news/local/atlanta/expect-flight-delays-into-atlanta-thanks-canada-wildfire-smoke/RX2WTAWHTBGEVGQAMWFRLYCEJU/ (North Georgia/Metro Atlanta, 6/7/2023)
- https://www.13wmaz.com/article/weather/smoke-from-wildfire-to-central-georgia/93-87f7b552-98fd-4b86-8f99-94140c76d38d (Macon/Central Georgia, 6/7/2023)
- https://www.youtube.com/watch?v=sZkxex_jpQw (Central Georgia, 6/7/2023)
- https://www.wsbradio.com/weather/wildfire-smoke-drifting-south-canada-into-north-georgia/OKNENTCA6JGGJPYQ76VCO6LF5Q/ (Metro Atlanta/Birmingham, Alabama, 6/7/2023)
- https://www.gpb.org/news/the-picture-show/2023/06/07/photos-extreme-canadian-wildfire-smoke-shrouds-parts-of-us (North and South Carolina, 6/7/2023)
- https://www.atlantanewsfirst.com/2023/06/08/air-quality-georgia-will-smoke-wildfires-reach-us/ (Greater Metro Atlanta, 6/8/2023)
- https://patch.com/georgia/atlanta/code-orange-alert-what-know-air-quality-ga (Atlanta, 6/8/2023)
- https://www.walb.com/2023/06/08/canadian-wildfire-smoke-arrives-south-ga-effects-are-minimal/ (Albany/South Georgia, 6/8/2023)
- https://abcnews.go.com/US/canadian-wildfire-dangers-prompt-proactive-mitigation-government-experts/story?id=100478859 (Predicts plume will migrate to Georgia, 7/1/2023)
- https://www.11alive.com/article/weather/stormtracker/wildfire-smoke-north-georgia/85-b4670fee-4608-4f99-9904-bbdbcf924375 (North Georgia, 7/17/2023)
- https://foxchattanooga.com/weather/stormtrack-9-blog/canadian-wildfire-smoke-impacts-tennessee-georgia-air-quality-once-again (Chattanooga, 7/17/2023)
- https://www.nytimes.com/2023/07/18/us/smoke-wildfires-nc-georgia.html (Georgia, 7/18/2023)
- https://www.fox5atlanta.com/news/code-orange-alert-metro-atlanta-canadian-wildfire-smoke (Georgia, 7/18/2023)
- https://www.atlantanewsfirst.com/2023/07/18/canadian-wildfires-bring-poor-air-quality-north-georgia/ (Metro Atlanta/North Georgia, 7/18/2023)
- https://www.cnn.com/2023/07/17/weather/canada-wildfires-shatter-burning-records/index.html (North Georgia, 7/18/2023)
- https://www.iqair.com/us/newsroom/atlanta-air-quality-alert (Atlanta 7/18/2023)

[10] https://www.epa.gov/air-research/smoke-ready-toolbox-wildfires
[11] https://airgeorgia.org/

- https://www.houstonchronicle.com/news/houston-texas/environment/article/houston-pollution-canadian-wildfire-saharan-dust-18206844.php (Atlanta/Georgia, 7/18/2023)
- https://www.wsfa.com/2023/07/18/details-behind-canadian-wildfire-smoke-alabamas-sky/ (Montgomery/Alabama, 7/18/2023)
- https://news.gatech.edu/news/2023/07/19/canadian-wildfire-smoke-affects-atlanta-2 (Atlanta, 7/19/2023)
- https://www.gpb.org/news/2023/07/26/macon-had-georgias-worst-air-quality-last-week-thanks-canadian-wildfires-heat-dome (Macon, 7/26/2023)
- https://www.savannahnow.com/story/weather/2023/10/03/savannah-ga-air-quality-canadian-wildfire-smoke-moves-down-u-s-coast/71045920007/ (Savannah, 10/3/2023)
- https://www.gpb.org/news/2023/10/04/have-you-noticed-haze-in-the-air-heres-why-georgia-dealing-smoke (South/Middle Georgia, 10/4/2023)

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 site at other times. The *Guidance on the Preparation of Exceptional Events Demonstrations for Wildfire Events that May Influence Ozone Concentrations* and *$PM_{2.5}$ Wildland Fire Exceptional Events Tiering Document* outline the expected components of a clear causal relationship portion of a demonstration. These include evidence that emissions from wildfires were transported to the site, evidence that wildfire emissions affected the monitor, and a comparison of the event-related concentration to historical concentrations.

Figures B1-B16 (Appendix B) show smoke from the NOAA Hazard Mapping System (HMS), plotted via the AirNow Navigator[12]. Active fires and smoke are shown for the day the event was registered as well as up to three days beforehand. During the exceptional events, 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 2020-2024 $PM_{2.5}$ data at the Sandersville site. Table 3 contains a comparison of exceptional event concentrations to historic 2020-2024 concentrations for the site. Generally, the exceptional event concentrations are at least double the 5-year annual average, quarterly average, and monthly average, and in some cases can be more than four times greater.

[12] https://airnowtech.org/navigator/

Table 3. Comparison of exceptional event concentrations to historic 2020-2024 concentrations at the Sandersville site.

EE Date	EE Concentration (µg/m^3)	5-Year Annual Average (µg/m^3)	5-Year Quarterly Average (µg/m^3)	5-Year Monthly Average (µg/m^3)	Ratio EE to 5-Year Annual Average	Ratio EE to 5-Year Quarterly Average	Ratio EE to 5-Year Monthly Average
06/06/2023	18.9	9.3	9.28	10.55	2.0	2.0	1.8
06/09/2023	23.6	9.3	9.28	10.55	2.5	2.5	2.2
06/10/2023	24.1	9.3	9.28	10.55	2.6	2.6	2.3
06/18/2023	20.3	9.3	9.28	10.55	2.2	2.2	1.9
06/27/2023	19.9	9.3	9.28	10.55	2.1	2.1	1.9
06/28/2023	19.2	9.3	9.28	10.55	2.1	2.1	1.8
06/29/2023	25.0	9.3	9.28	10.55	2.7	2.7	2.4
06/30/2023	29.5	9.3	9.28	10.55	3.2	3.2	2.8
07/01/2023	23.1	9.3	9.17	9.28	2.5	2.5	2.5
07/17/2023	28.4	9.3	9.17	9.28	3.1	3.1	3.1
07/18/2023	37.1	9.3	9.17	9.28	4.0	4.0	4.0
07/19/2023	32.7	9.3	9.17	9.28	3.5	3.6	3.5
07/20/2023	19.9	9.3	9.17	9.28	2.1	2.2	2.1
07/26/2023	19.9	9.3	9.17	9.28	2.1	2.2	2.2
08/23/2023	25.4	9.3	9.17	9.42	2.7	2.8	2.7
08/25/2023	19.8	9.3	9.17	9.42	2.1	2.2	2.1

Figure 1 plots the 24-hour $PM_{2.5}$ concentrations for 2020-2024. Exceedances caused by wild or prescribed fires are delineated by marker shape. All of the selected exceptional events are above the Tier 1 threshold of 17.85 µg/m^3. Tier 1 events are 1.5 times greater than the highest 98th percentile of data over the last 5 years, per the EPA's Tiering Tool.

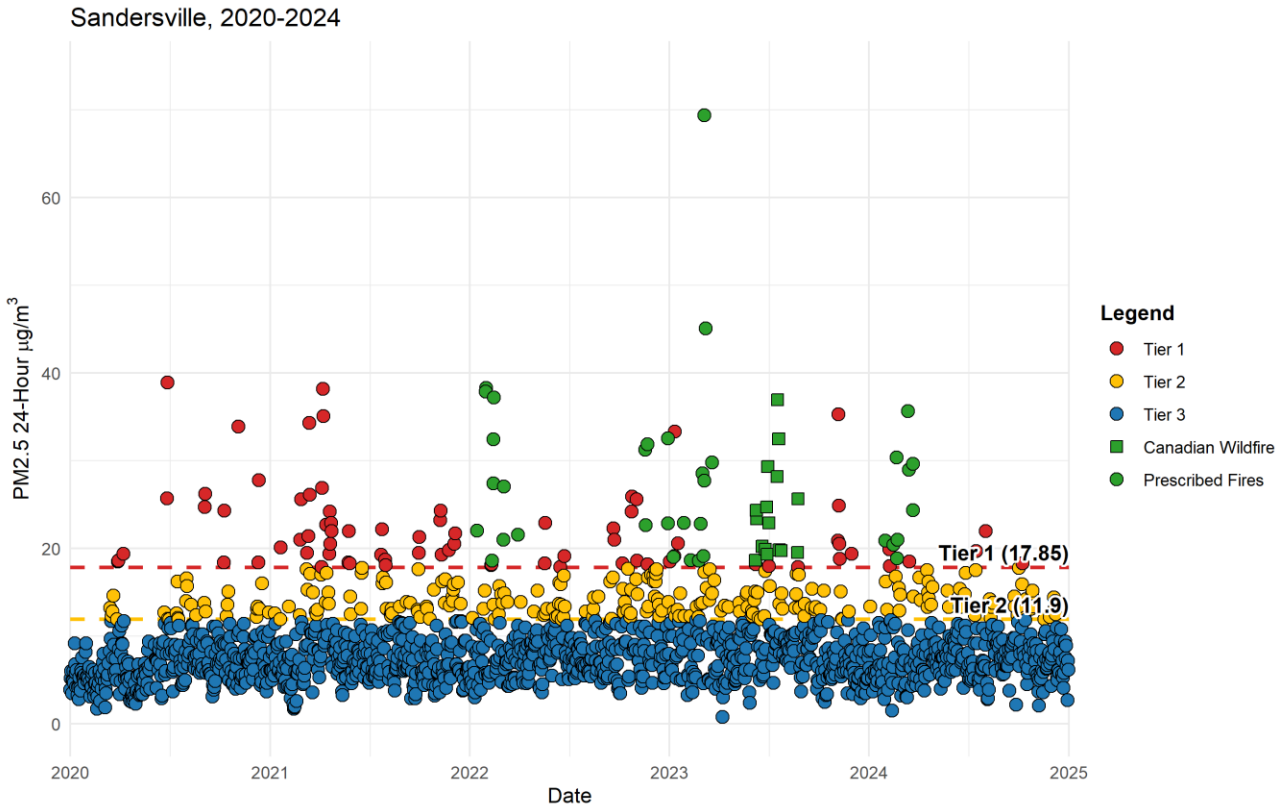


Figure 1. 24-hour $PM_{2.5}$ concentrations for 2020-2024 observed at the Sandersville site. Exceedances not related to fires are demarcated by color with Tier 1 in red, Tier 2 in yellow, and Tier 3 in blue. Canadian wildfires (green squares) and prescribed burns (green circles) are additionally differentiated.

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 rolling average $PM_{2.5}$ concentrations (including the time shown in the figure panel and the 23 hours following it) across the United States, and HYSPLIT back-trajectories. These trajectories originate at the Sandersville site's geographic location and extend 72 hours back in time. Three different starting times were modeled with HYSPLIT for each day: (1) midnight at the start of the exceedance day, (2) noon of the exceedance day, and (3) midnight at the end of the exceedance day. Each trajectory starts at a different elevation above ground level (100 m, 1500 m, and 3000 m). The 1500 m and 3000 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 $PM_{2.5}$ concentrations, and air quality indices (AQIs) in the southeast of the United States. Figures in Appendix E show $PM_{2.5}$ concentration time series for both the event day and the day before. Figures in Appendix F show upper air maps from the Storm Prediction Center[13] for July 17-21, 2023. Maps are displayed at pressures of either 850

[13] https://www.spc.noaa.gov/obswx/maps/

millibar (mb), equivalent to 1170-1590 m above mean sea level (MSL), or 700 mb, equivalent to 2350-3150 m MSL[14], at 00 and 12 Coordinated Universal Time (UTC) for each day. These pressure values are chosen to correspond with the 1500-m and 3000-m heights of the HYSPLIT trajectories. A specific pressure value is determined on a case-by-case basis depending on how clearly the corresponding upper air maps explain the sequence of events that led to the relevant exceedance.

June 6, 2023

Fires in Canada had been on-going for months at the time the exceedance was measured, and their emissions were likely mixed throughout the air column. From Figure E1, $PM_{2.5}$ concentrations were elevated above the 9.0 $\mu g/m^3$ standard throughout the event day and the day prior. Shown in Figure C1, back-trajectories indicate that the smoke plume traveled through eastern region of the United States. As a result, the plume detected at the site is a mixture of emissions from fires in the province of Quebec. Daily $PM_{2.5}$ concentrations increased to 18.93 $\mu g/m^3$. Figure D1 shows that similar enhancements occurred synchronously at other sites across the southeast, which follows from the large blanket of smoke over this region (Figure B1).

June 9, 2023

Fires in Canada had been on-going for months at the time the exceedance was measured, and their emissions were likely mixed throughout the air column. From Figure E2, $PM_{2.5}$ concentrations were elevated above the 9.0 $\mu g/m^3$ standard throughout the event day and the day prior. Shown in Figure C2, back-trajectories indicate that the smoke plume traveled through the Midwest of the United States. As a result, the plume detected at the site is a mixture of emissions from fires in the provinces of British Columbia, Alberta, Saskatchewan, and Quebec. Daily $PM_{2.5}$ concentrations increased to 23.65 $\mu g/m^3$. Figure D2 shows that similar enhancements occurred synchronously at other sites across the southeast, which follows from the large blanket of smoke over this region (Figure B2).

June 10, 2023

Fires in Canada had been on-going for months at the time the exceedance was measured, and their emissions were likely mixed throughout the air column. From Figure E3, $PM_{2.5}$ concentrations were elevated above the 9.0 $\mu g/m^3$ standard throughout the event day and the day prior. Shown in Figure C3, back-trajectories indicate that the smoke plume traveled through eastern portion of the United States. As a result, the plume detected at the site is dominantly a mixture of emissions from fires in the province of Quebec. Daily $PM_{2.5}$ concentrations increased to 24.12 $\mu g/m^3$. Figure D3 shows that similar enhancements occurred synchronously at other sites across the southeast, which follows from the large blanket of smoke over this region (Figure B3).

June 18, 2023

Fires in Canada had been on-going for months at the time the exceedance was measured, and their emissions were likely mixed throughout the air column. From Figure E4, $PM_{2.5}$ concentrations were elevated above the 9.0 $\mu g/m^3$ standard throughout the event day and the day prior. Shown in Figure C4, back-trajectories indicate that the smoke plume traveled through the Midwest of the United States. As a result, the plume detected at the site is a mixture of

[14] https://www.noaa.gov/jetstream/upper-air-charts

emissions from fires in the provinces of Alberta and Saskatchewan. Daily $PM_{2.5}$ concentrations increased to 20.3 $\mu g/m^3$. Figure D4 shows that similar enhancements occurred synchronously at other sites across the southeast, which follows from the large blanket of smoke over this region (Figure B4).

June 27, 2023

Fires in Canada had been on-going for months at the time the exceedance was measured, and their emissions were likely mixed throughout the air column. From Figure E5, $PM_{2.5}$ concentrations were slightly elevated above the 9.0 $\mu g/m^3$ standard throughout June 26 and were significantly enhanced after 10:00 AM EST on the event day. Shown in Figure C5, back-trajectories indicate that the smoke plume traveled through the Midwest and southern regions of the United States. As a result, the plume detected at the site is a mixture of emissions from fires in the provinces of British Columbia, Alberta, and Saskatchewan. Daily $PM_{2.5}$ concentrations increased to 19.91 $\mu g/m^3$. Figure D5 shows that similar enhancements occurred synchronously at other sites across the southeast, which follows from the large blanket of smoke over this region (Figure B5).

June 28, 2023

Fires in Canada had been on-going for months at the time the exceedance was measured, and their emissions were likely mixed throughout the air column. From Figure E6, $PM_{2.5}$ concentrations were elevated above the 9.0 $\mu g/m^3$ standard after 1:00 AM EST on June 27 and throughout the event day. From Figure E1, $PM_{2.5}$ concentrations were elevated above the 9.0 $\mu g/m^3$ standard throughout the event day and the day prior. Shown in Figure C6, back-trajectories indicate that the smoke plume traveled through the Midwest of the United States. As a result, the plume detected at the site is a mixture of emissions from fires in the provinces of Ontario and Quebec. The back-trajectories converge approximately 18 hours before descending to near-surface level where observed, daily $PM_{2.5}$ concentrations increased to 19.22 $\mu g/m^3$. Figure D6 shows that similar enhancements occurred synchronously at other sites across the southeast, which follows from the large blanket of smoke over this region (Figure B6).

June 29, 2023

Fires in Canada had been on-going for months at the time the exceedance was measured, and their emissions were likely mixed throughout the air column. From Figure E7, $PM_{2.5}$ concentrations were elevated above the 9.0 $\mu g/m^3$ standard throughout the event day and the day prior. From Figure E1, $PM_{2.5}$ concentrations were elevated above the 9.0 $\mu g/m^3$ standard throughout the event day and the day prior. Shown in Figure C7, back-trajectories indicate that the smoke plume traveled through the Midwest of the United States. As a result, the plume detected at the site is dominantly a mixture of emissions from fires in the province of Quebec. The back-trajectories converge approximately 12 hours before descending to near-surface level where observed, daily $PM_{2.5}$ concentrations increased to 25.08 $\mu g/m^3$. Figure D7 shows that similar enhancements occurred synchronously at other sites across the southeast, which follows from the large blanket of smoke over this region (Figure B7).

June 30, 2023

Fires in Canada had been on-going for months at the time the exceedance was measured, and their emissions were likely mixed throughout the air column. From Figure E8, $PM_{2.5}$

concentrations were elevated above the 9.0 $\mu g/m^3$ standard throughout the event day and the day prior. Shown in Figure C8, back-trajectories indicate that the smoke plume traveled through the Midwest and southern regions of the United States. As a result, the plume detected at the site is a mixture of emissions from fires in the provinces of British Columbia, Alberta, and Quebec. The back-trajectories converge approximately 24 hours before descending to near-surface level where observed, daily $PM_{2.5}$ concentrations increased to 29.52 $\mu g/m^3$. Figure D8 shows that similar enhancements occurred synchronously at other sites across the southeast, which follows from the large blanket of smoke over this region (Figure B8).

July 1, 2023

Fires in Canada had been on-going for months at the time the exceedance was measured, and their emissions were likely mixed throughout the air column. From Figure E9, $PM_{2.5}$ concentrations were elevated above the 9.0 $\mu g/m^3$ standard throughout the event day and the day prior. Shown in Figure C9, back-trajectories indicate that the smoke plume traveled through the Midwest and southern regions of the United States. As a result, the plume detected at the site is a mixture of emissions from fires in the provinces of British Columbia, Alberta, and Quebec. The back-trajectories converge approximately 12 hours before descending to near-surface level where observed, daily $PM_{2.5}$ concentrations increased to 23.1 $\mu g/m^3$. Figure D9 shows that similar enhancements occurred synchronously at other sites across the southeast, which follows from the large blanket of smoke over this region (Figure B9).

July 17, 2023

Fires in Canada had been on-going for months at the time the exceedance was measured, and their emissions were likely mixed throughout the air column. From Figure E10, $PM_{2.5}$ concentrations were sporadically elevated above the 9.0 $\mu g/m^3$ standard on July 16 until 7:00 PM EST when the site reported significant enhancements that lasted through the night and throughout the event day. Shown in Figure C10, back-trajectories indicate that the smoke plume traveled through the northwest and Midwest regions of the United States. As a result, the plume detected at the site is dominantly a mixture of emissions from fires in the provinces of British Columbia and Alberta. The back-trajectories converge approximately 18 hours before descending to near-surface level where observed, daily $PM_{2.5}$ concentrations increased to 28.49 $\mu g/m^3$. Figure D10 shows that similar enhancements occurred synchronously at other sites across the southeast, which follows from the large blanket of smoke over this region (Figure B10).

July 18, 2023

Fires in Canada had been on-going for months at the time the exceedance was measured, and their emissions were likely mixed throughout the air column. From Figure E11, $PM_{2.5}$ concentrations were elevated above the 9.0 $\mu g/m^3$ standard throughout the event day and the day prior. Shown in Figure C11, back-trajectories indicate that the smoke plume traveled through the Midwest of the United States. As a result, the plume detected at the site is a mixture of emissions from fires in the provinces of British Columbia and Alberta. The back-trajectories converge approximately 18 hours before descending to near-surface level where observed, daily $PM_{2.5}$ concentrations increased to 37.1 $\mu g/m^3$. Figure D11 shows that similar enhancements occurred synchronously at other sites across the southeast, which follows from the large blanket of smoke over this region (Figure B11).

July 19, 2023

Fires in Canada had been on-going for months at the time the exceedance was measured, and their emissions were likely mixed throughout the air column. From Figure E12, $PM_{2.5}$ concentrations were elevated above the 9.0 $\mu g/m^3$ standard throughout the event day and the day prior. Shown in Figure C12, back-trajectories indicate that the smoke plume traveled through northwest and the Midwest regions of the United States. As a result, the plume detected at the site is a mixture of emissions from fires in the provinces of British Columbia and Alberta. The back-trajectories converge approximately 18 hours before descending to near-surface level where observed, daily $PM_{2.5}$ concentrations increased to 32.73 $\mu g/m^3$. Figure D12 shows that similar enhancements occurred synchronously at other sites across the southeast, which follows from the large blanket of smoke over this region (Figure B12).

July 20, 2023

Fires in Canada had been on-going for months at the time the exceedance was measured, and their emissions were likely mixed throughout the air column. From Figure E13, $PM_{2.5}$ concentrations were elevated well above the 9.0 $\mu g/m^3$ standard throughout July 19 and until 8:00 PM EST on the event day. Shown in Figure C13, back-trajectories indicate that the smoke plume traveled from southern states to the west of Georgia. Wildfires were active largely in western Canada at this time. Wind barbs from Figures F1-F5 (spanning a timeframe of July 17-21) show a large-scale, southeastward transport of air masses from the northwest coast to the southeast coast, indicating emissions from these fires were directed along this path. Throughout July 18, 19, and 20 (Figures F2-F4), wind barbs detail a clockwise vortex that covered parts of the southwest and southeast, which corroborates the back-trajectory of the 3000-m HYSPLIT tail. Therefore, wildfire smoke traveled from western Canada, was circulated over the south of the country, and ultimately arrived at the site. As a result, the plume detected at the site is a mixture of emissions from fires in the provinces of British Columbia and Alberta. Daily $PM_{2.5}$ concentrations increased to 19.9 $\mu g/m^3$. Figure D13 shows that similar enhancements occurred synchronously at other sites across the southeast, which follows from the large blanket of smoke over this region (Figure B13).

July 26, 2023

Fires in Canada had been on-going for months at the time the exceedance was measured, and their emissions were likely mixed throughout the air column. From Figure E14, $PM_{2.5}$ concentrations were elevated above the 9.0 $\mu g/m^3$ standard throughout the event day and the day prior. Shown in Figure C14, back-trajectories indicate that the smoke plume traveled through the Midwest of the United States. As a result, the plume detected at the site is a mixture of emissions from fires in the province of Alberta. Daily $PM_{2.5}$ concentrations increased to 19.99 $\mu g/m^3$. Figure D14 shows that similar enhancements occurred synchronously at other sites across the southeast, which follows from the large blanket of smoke over this region (Figure B14).

August 23, 2023

Fires in Canada had been on-going for months at the time the exceedance was measured, and their emissions were likely mixed throughout the air column. From Figure E15, $PM_{2.5}$ concentrations were elevated above the 9.0 $\mu g/m^3$ standard throughout the event day and the day prior. Shown in Figure C15, back-trajectories indicate that the smoke plume traveled through the

Midwest and eastern regions of the United States. As a result, the plume detected at the site is a mixture of emissions from fires in the provinces of British Columbia and Alberta. The back-trajectories converge approximately 18 hours before descending to near-surface level where observed, daily $PM_{2.5}$ concentrations increased to 25.44 µg/m^3. Figure D15 shows that similar enhancements occurred synchronously at other sites across the southeast, which follows from the large blanket of smoke over this region (Figure B15).

August 25, 2023

Fires in Canada had been on-going for months at the time the exceedance was measured, and their emissions were likely mixed throughout the air column. From Figure E16, $PM_{2.5}$ concentrations were elevated above the 9.0 µg/m^3 standard throughout the event day and the day prior. Shown in Figure C16, back-trajectories indicate that the smoke plume traveled through the Midwest and southern regions of the United States. As a result, the plume detected at the site is a mixture of emissions from fires in the provinces of British Columbia and Alberta. Daily $PM_{2.5}$ concentrations increased to 19.88 µg/m^3. Figure D16 shows that similar enhancements occurred synchronously at other sites across the southeast, which follows from the large blanket of smoke over this region (Figure B16).

The comparisons and analyses provided in this demonstration support 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 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: "…any fire started by an unplanned ignition caused by lightning; accidental, human causes actions, or a prescribed fire that has developed into a wildfire. A wildfire that predominately occurs on wildland is a natural event." As stated in sections 2 and 4, the origin and evolution of the wildfires described in this demonstration occurred in 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

noted that many of the Canadian fires were ignited by summer lightning storms and largely burned in deeply wooded areas[15]. EPA generally considers the emissions of $PM_{2.5}$ 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 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

Georgia EPD will hold a public comment period to receive public input regarding the Exceptional Event Demonstration. Notification of the public comment period will be posted on the Georgia EPD website and emailed to interested stakeholders. Public comments received will be included in Appendix G of this demonstration, along with Georgia EPD's responses to these comments in Appendix H.

[15] https://earthobservatory.nasa.gov/images/151985/tracking-canadas-extreme-2023-fire-season

Appendix A: Active Wildfires in Canada

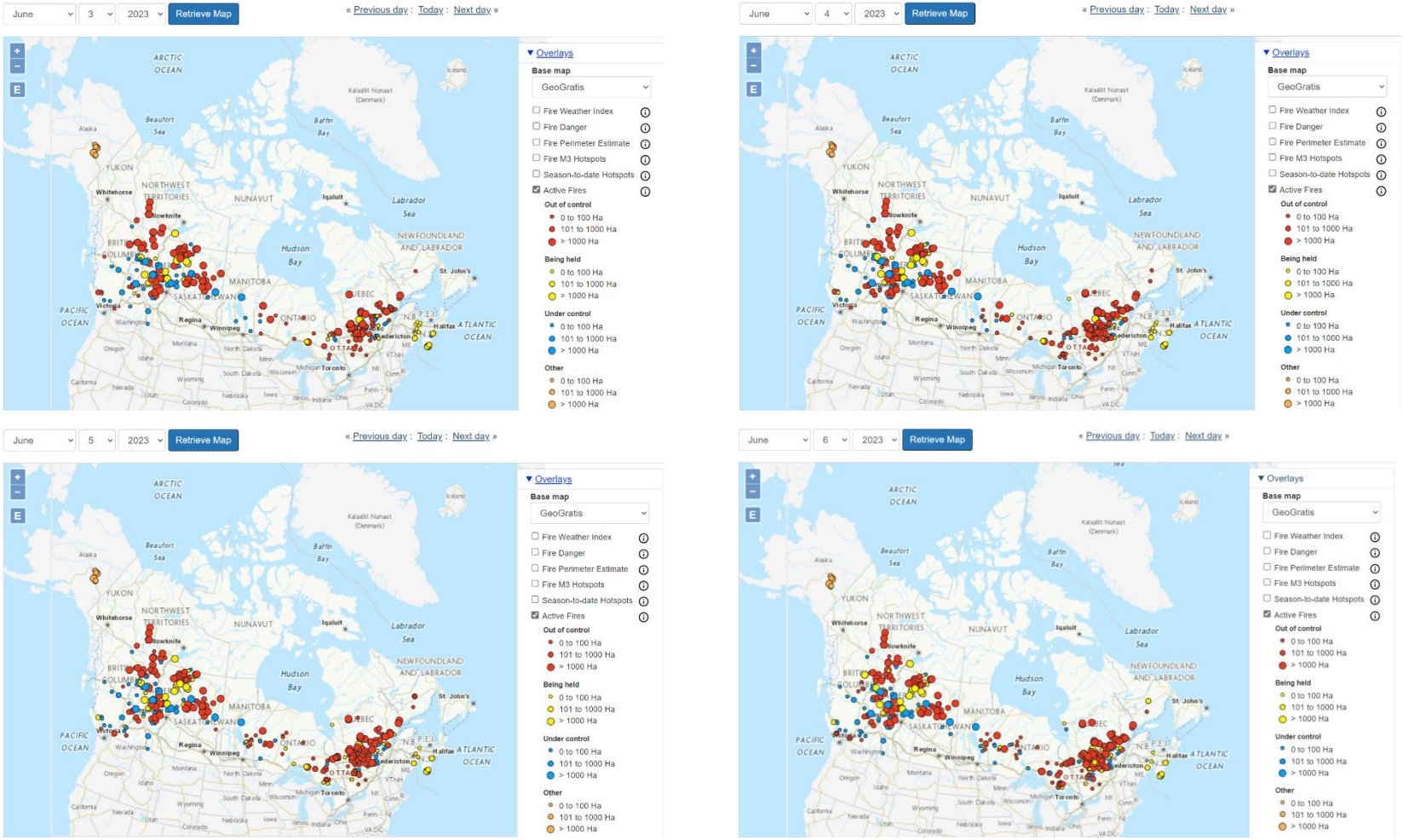


Figure A1. Active wildfires in Canada on June 3-6, 2023.

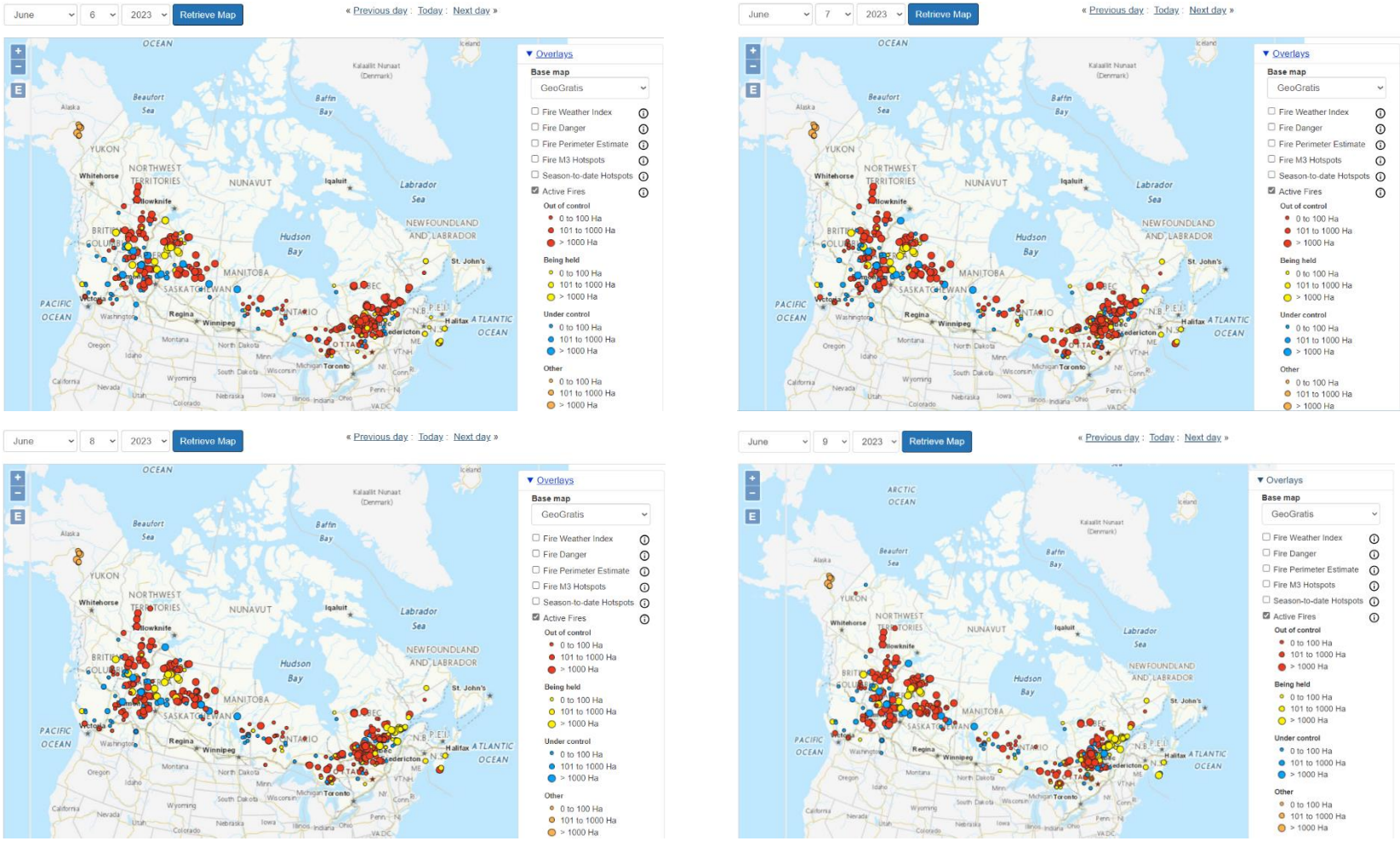


Figure A2. Active wildfires in Canada on June 6-9, 2023.

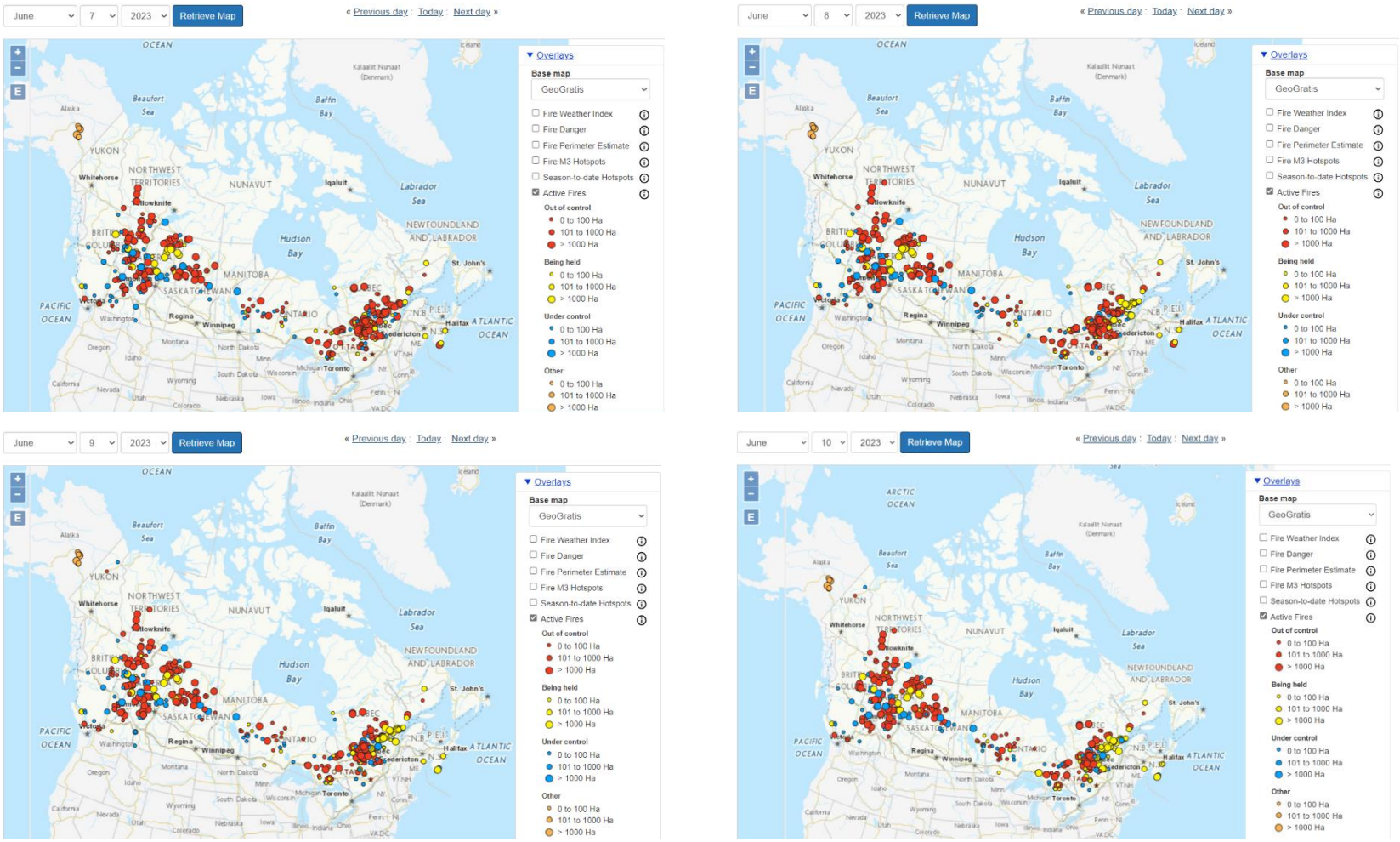


Figure A3. Active wildfires in Canada on June 7-10, 2023.

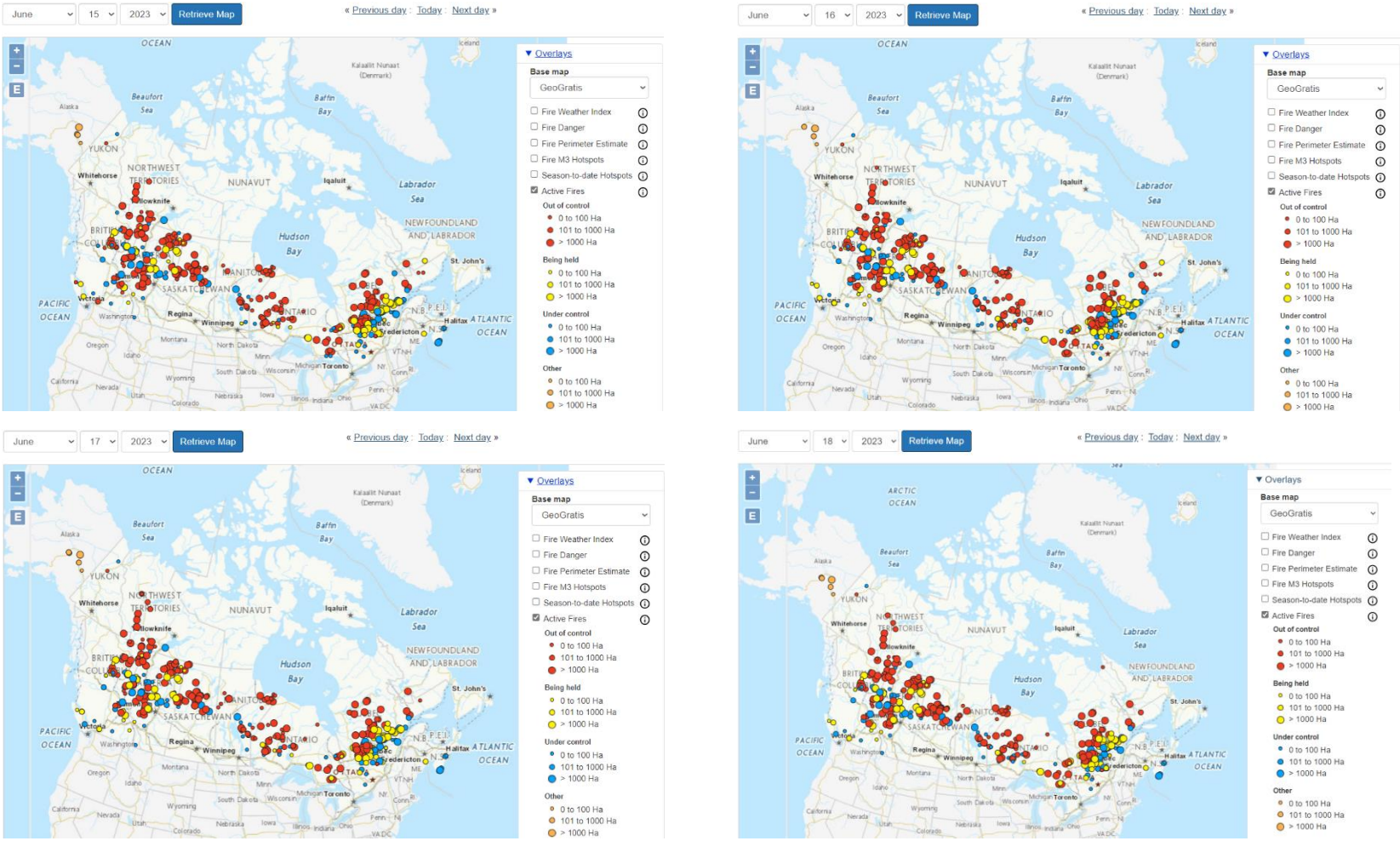


Figure A4. Active wildfires in Canada on June 15-18, 2023.

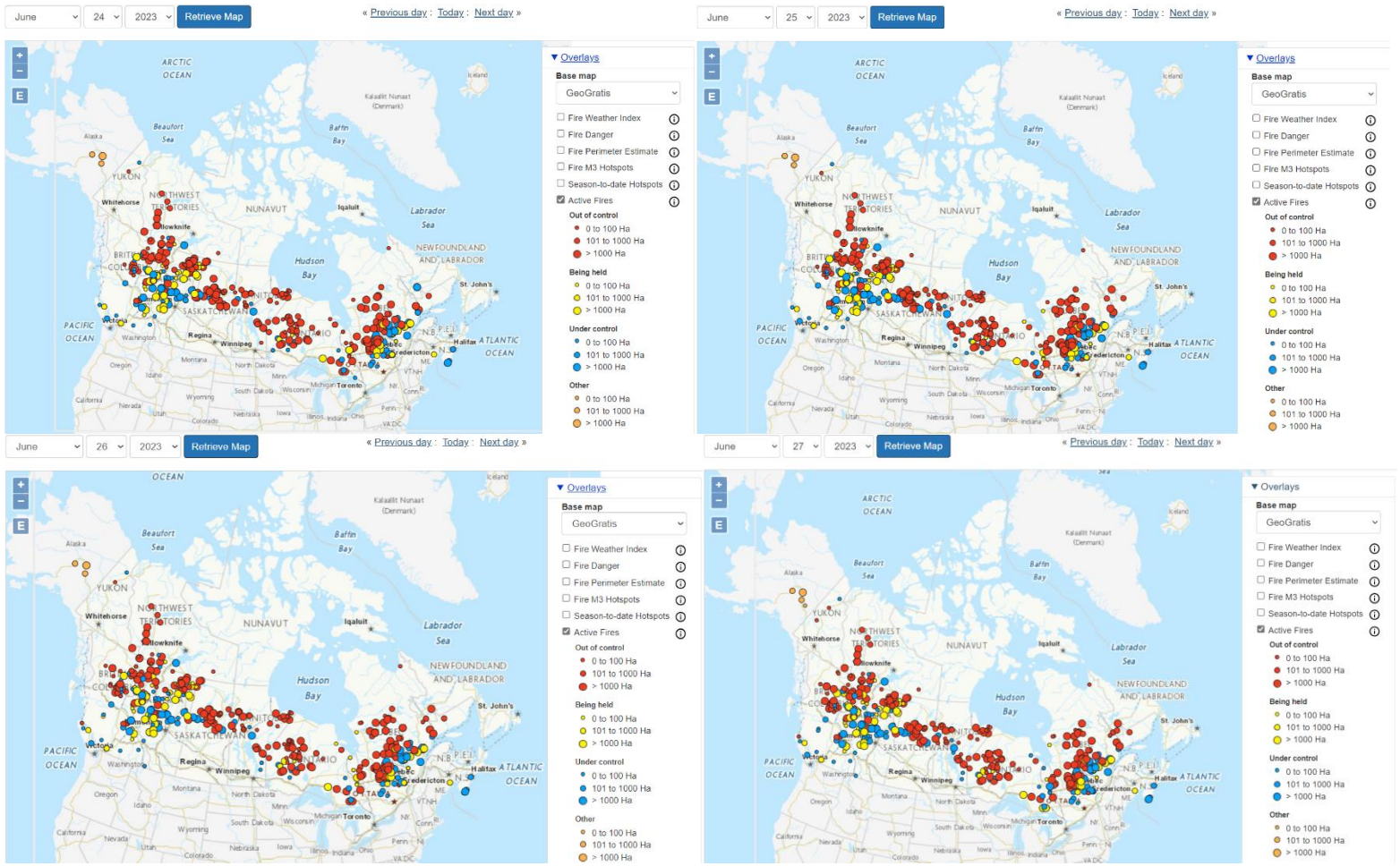


Figure A5. Active wildfires in Canada on June 24-27, 2023.

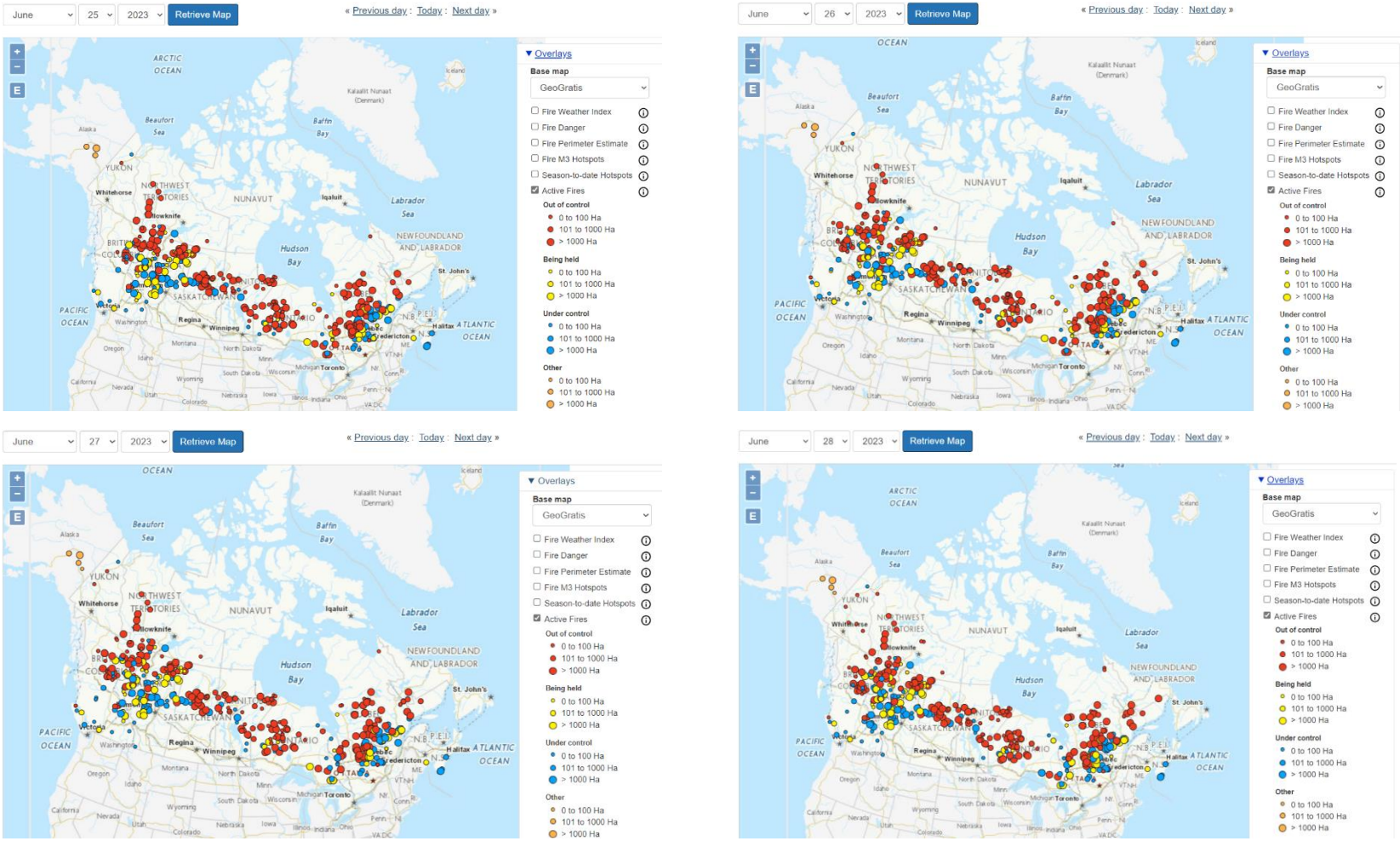


Figure A6. Active wildfires in Canada on June 25-28, 2023.

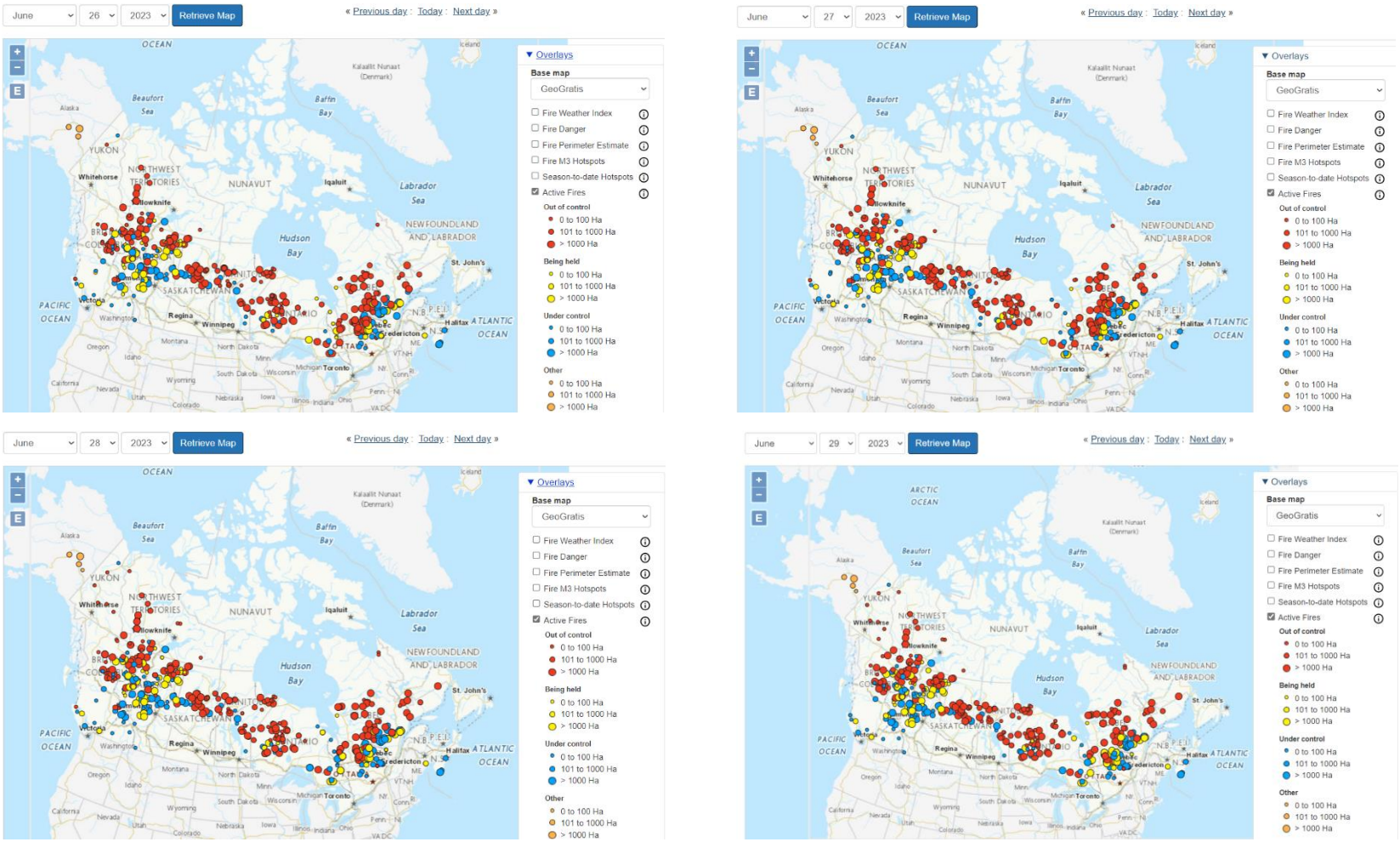


Figure A7. Active wildfires in Canada on June 26-29, 2023.

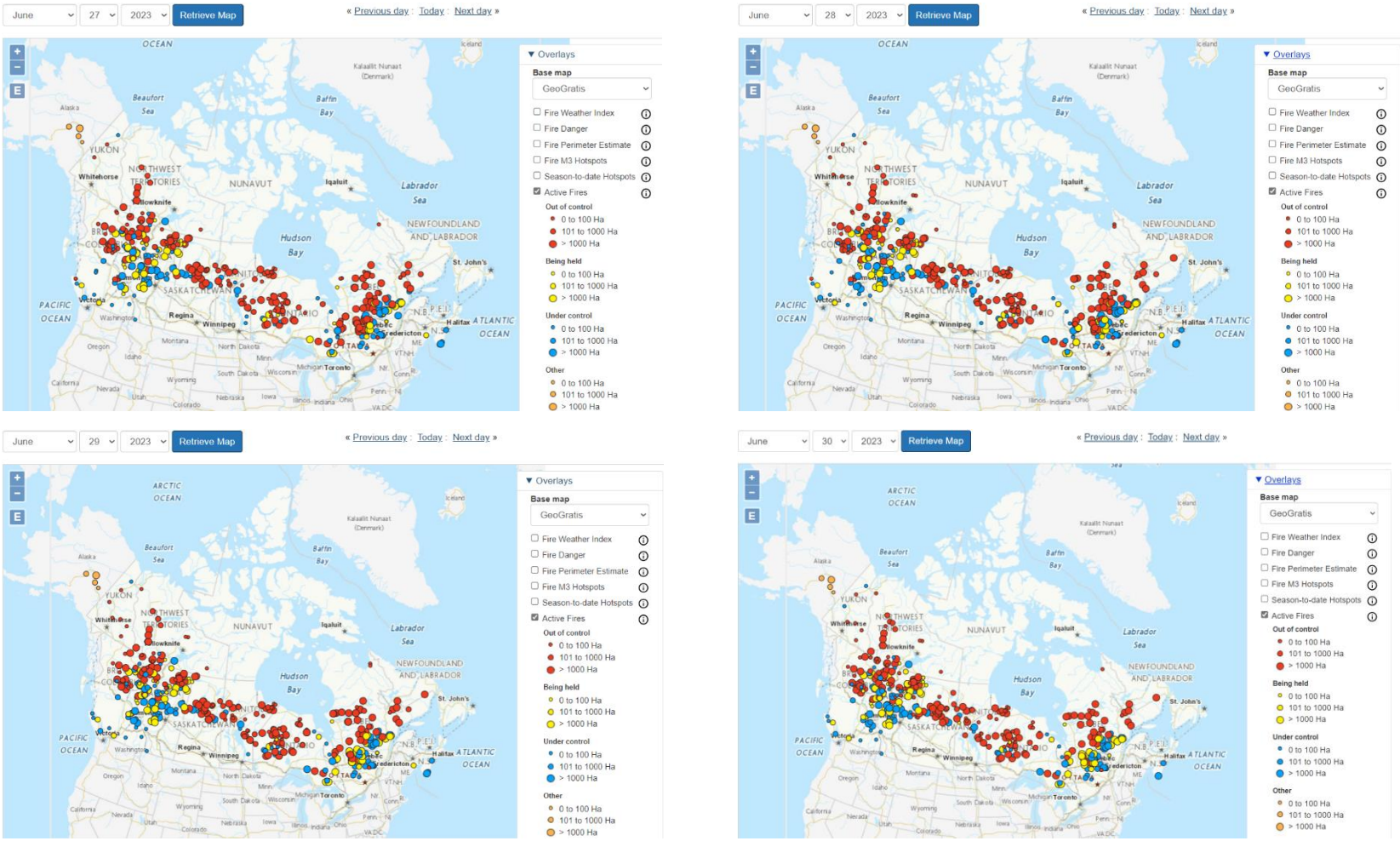


Figure A8. Active wildfires in Canada on June 27-30, 2023.

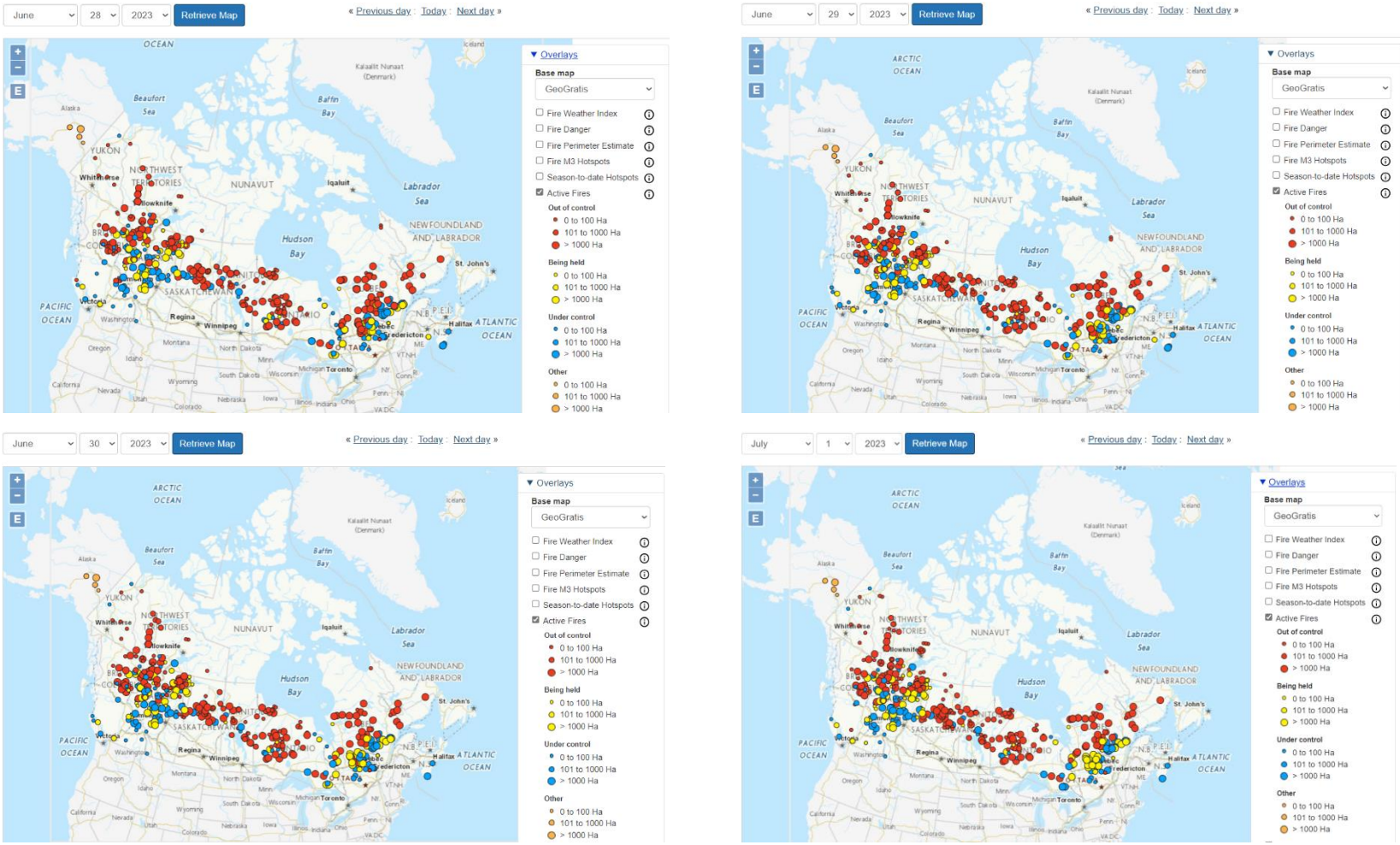


Figure A9. Active wildfires in Canada on June 28 – July 1, 2023.

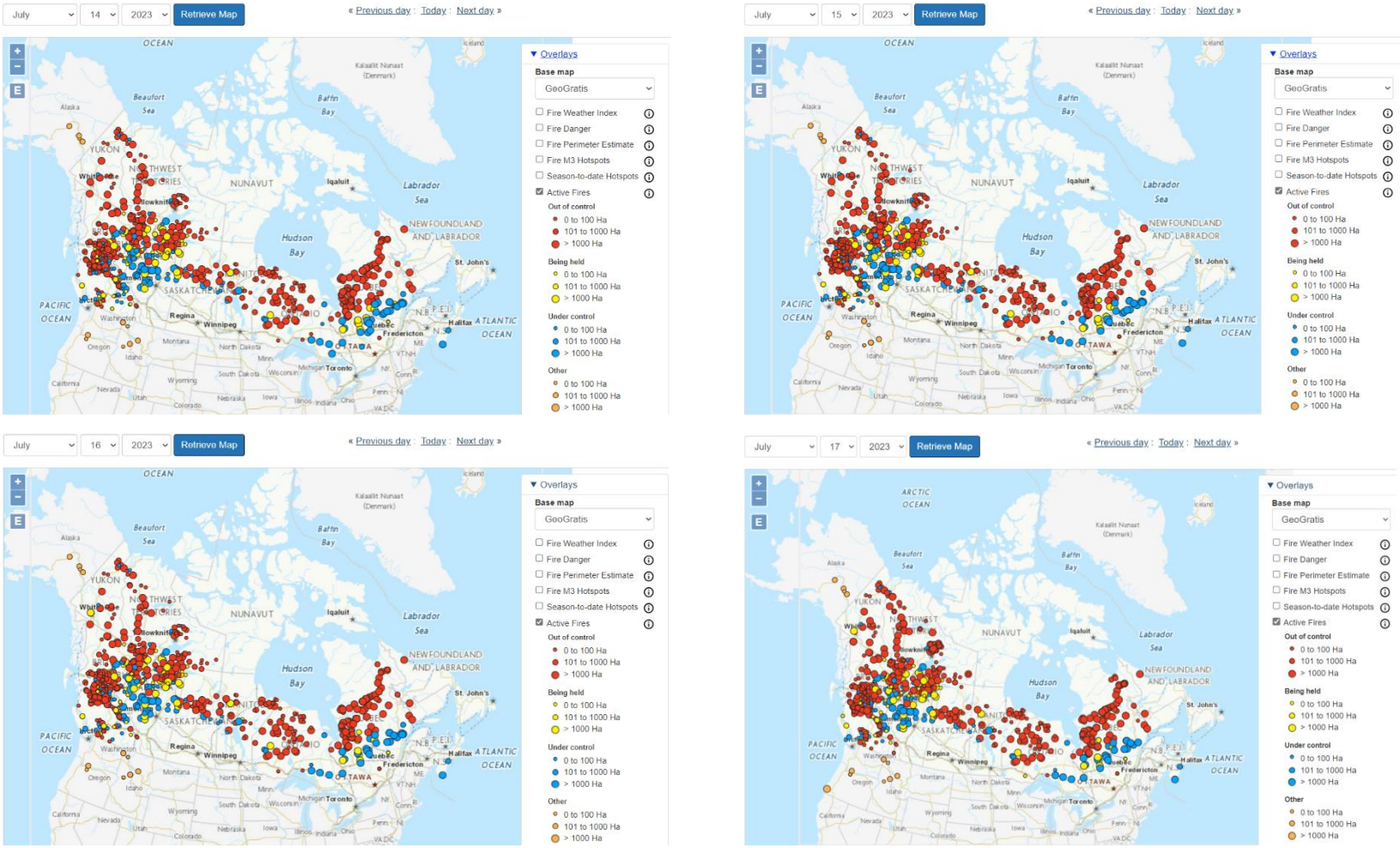


Figure A10. Active wildfires in Canada on July 14-17, 2023.

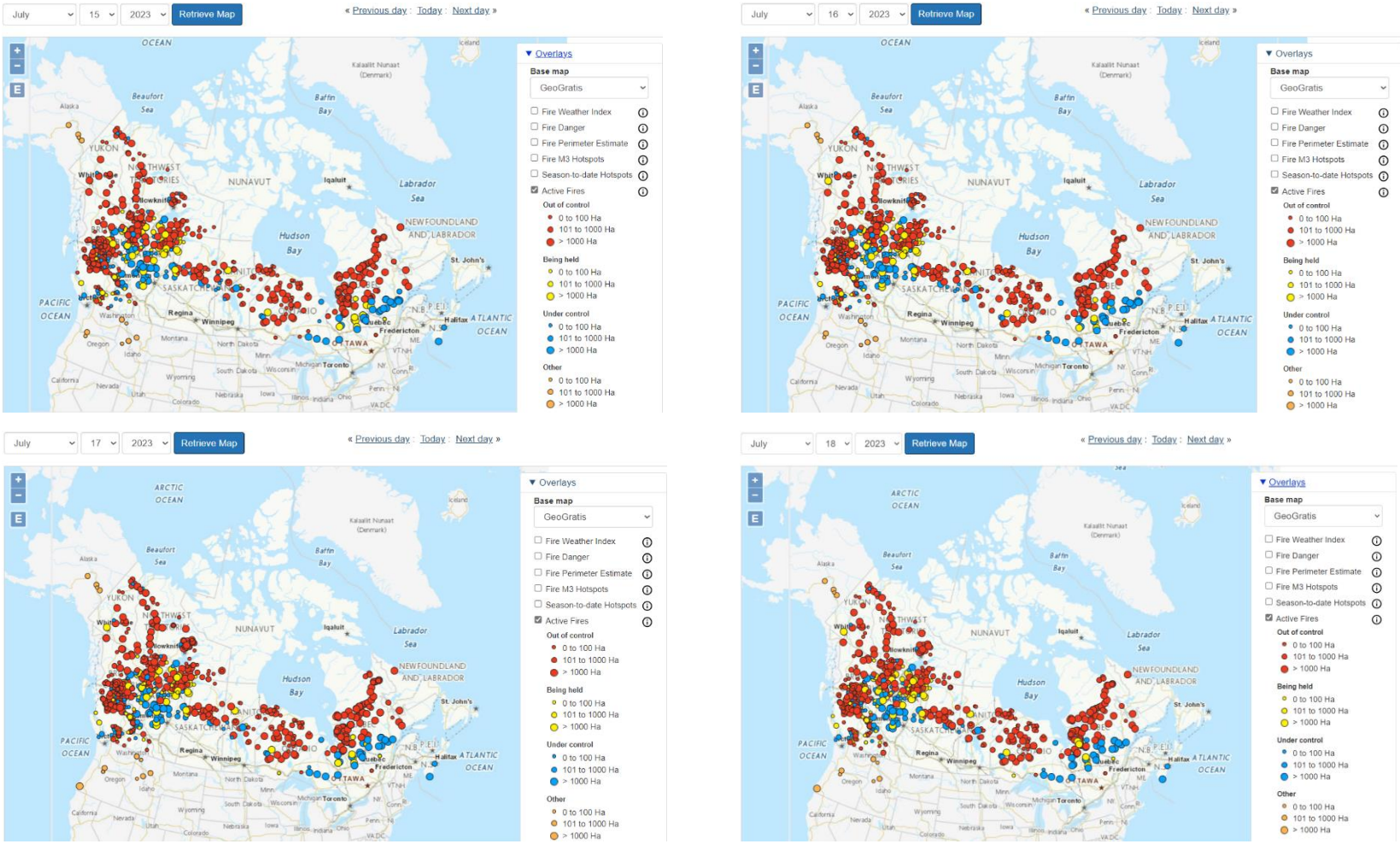


Figure A11. Active wildfires in Canada on July 15-18, 2023.

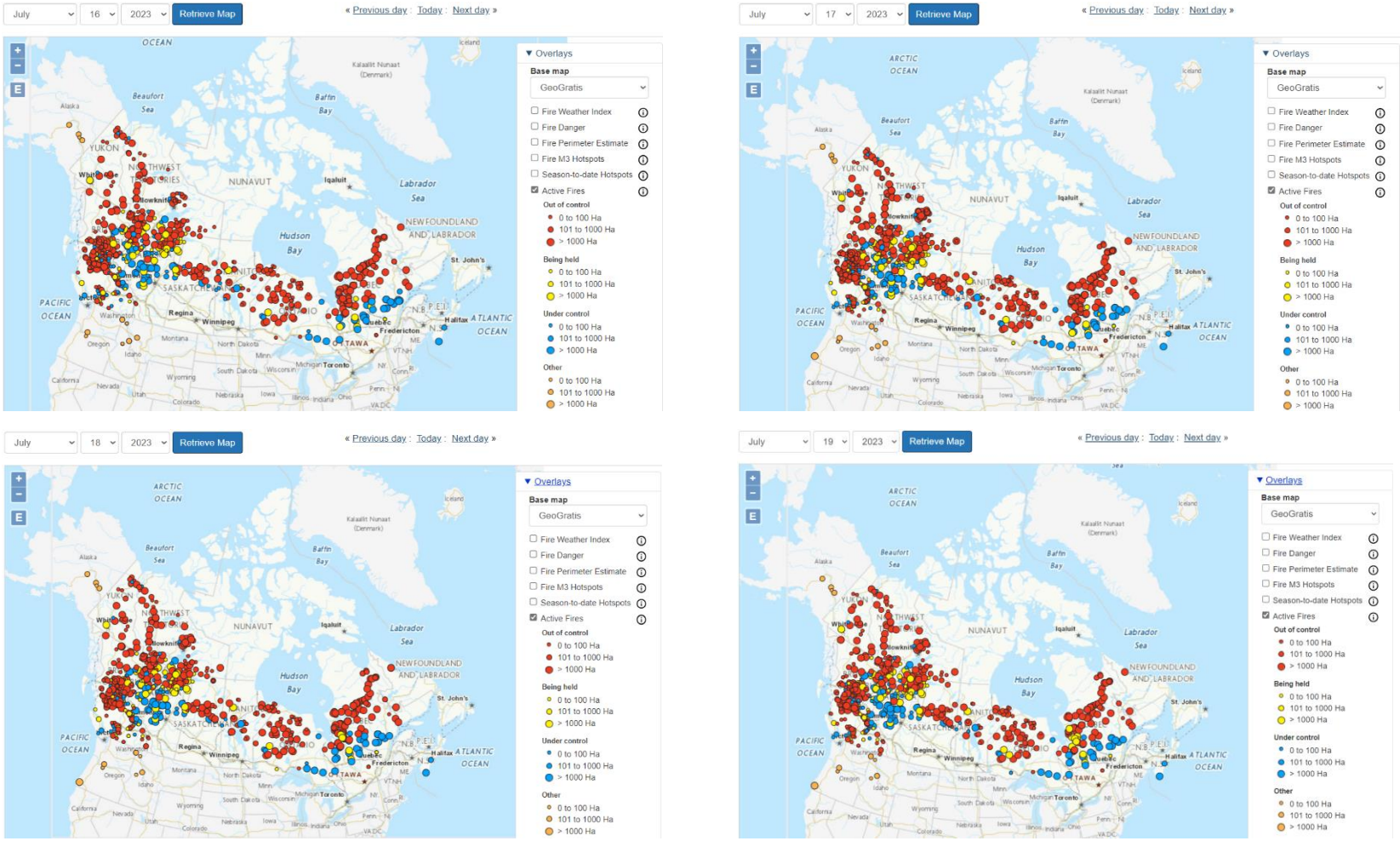


Figure A12. Active wildfires in Canada on July 16-19, 2023.

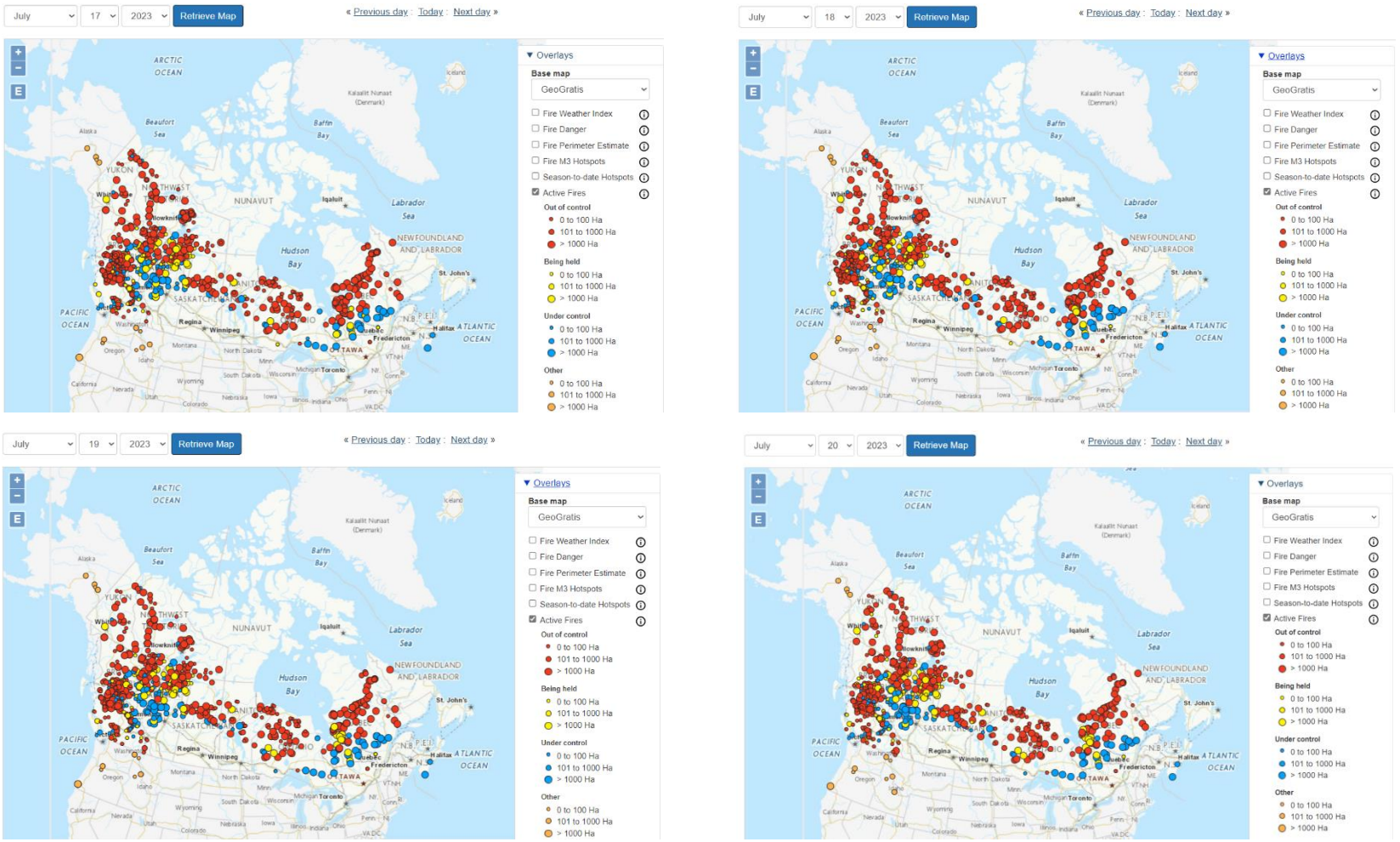


Figure A13. Active wildfires in Canada on July 17-20, 2023.

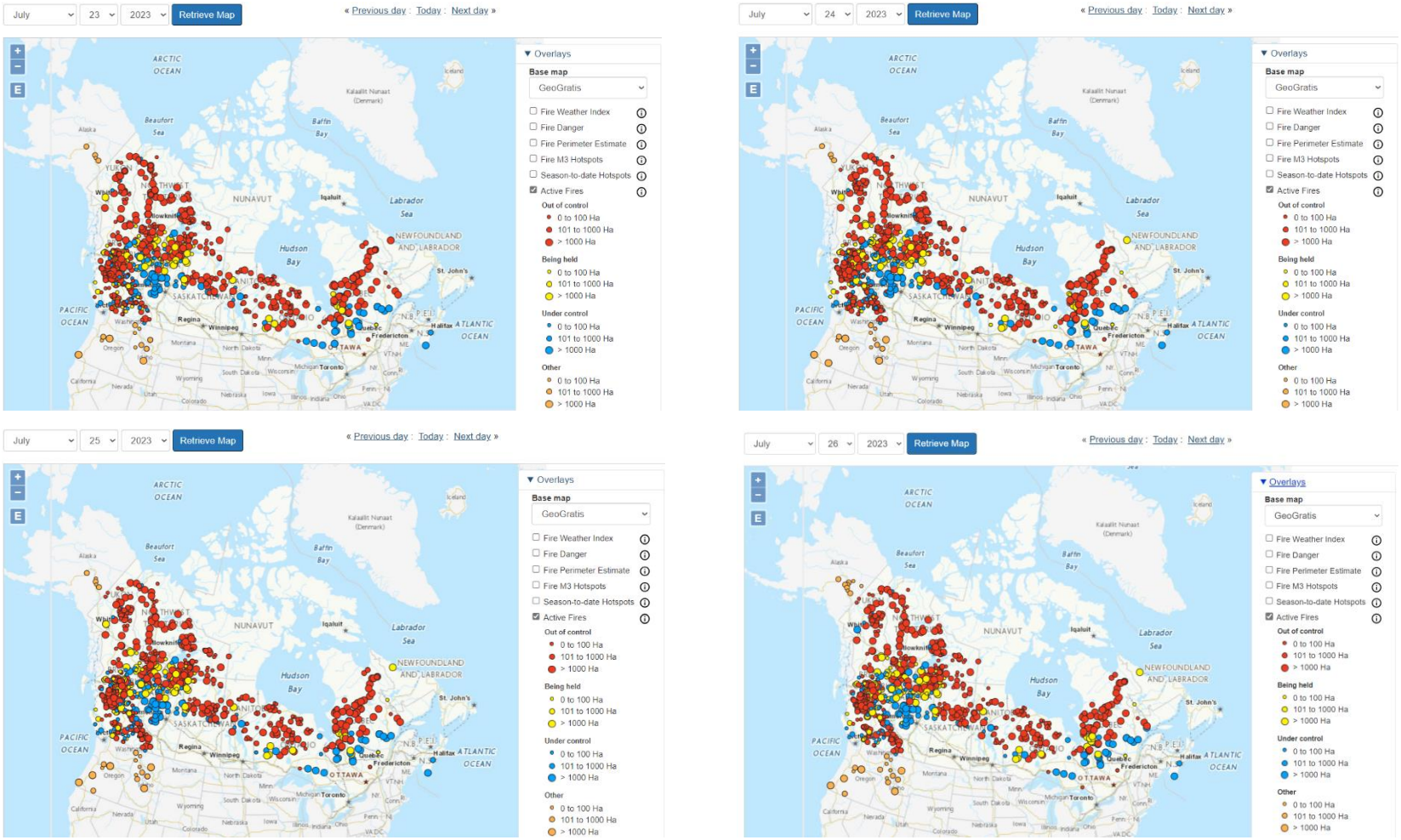


Figure A14. Active wildfires in Canada on July 23-26, 2023.

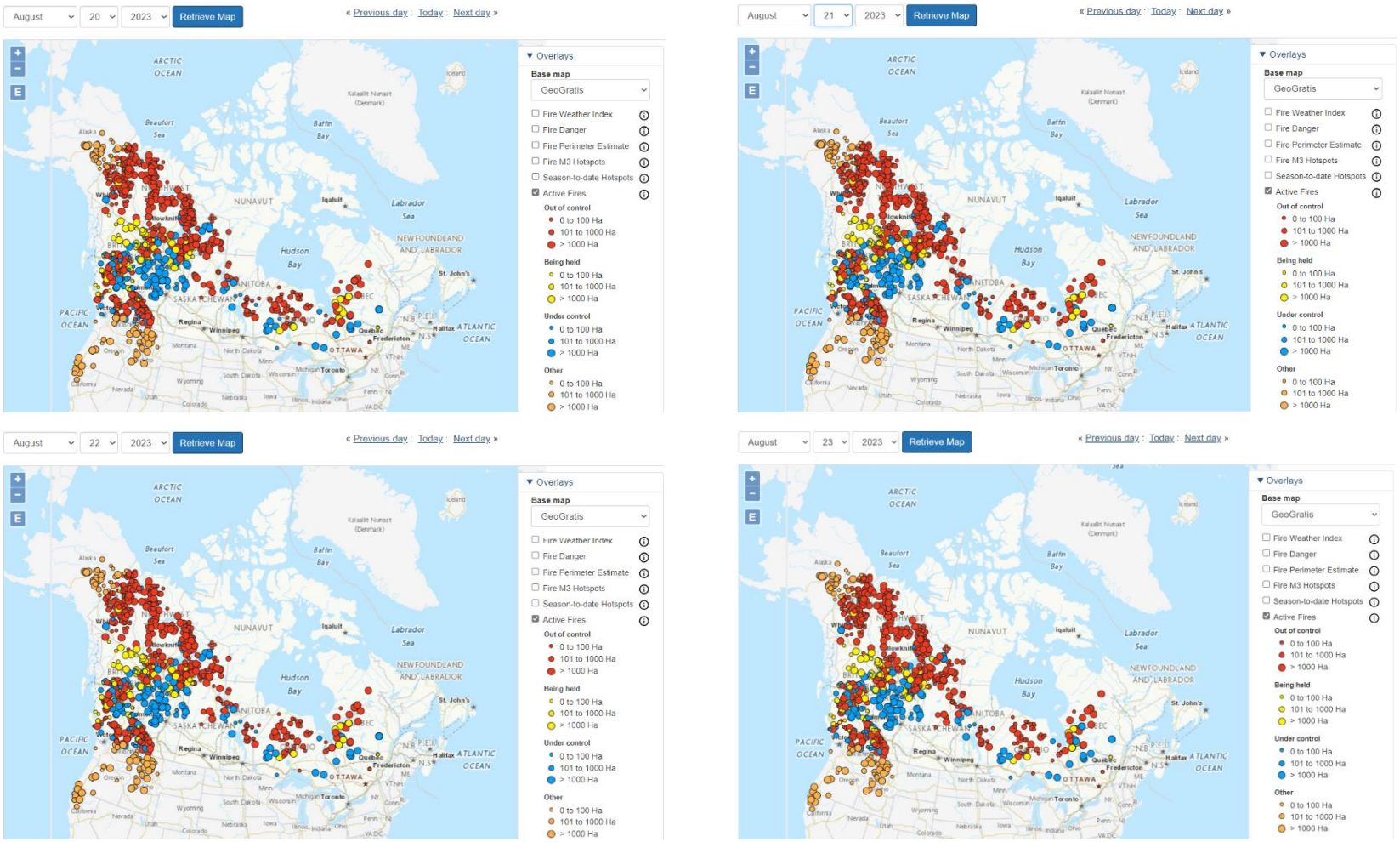


Figure A15. Active wildfires in Canada on August 20-23, 2023.

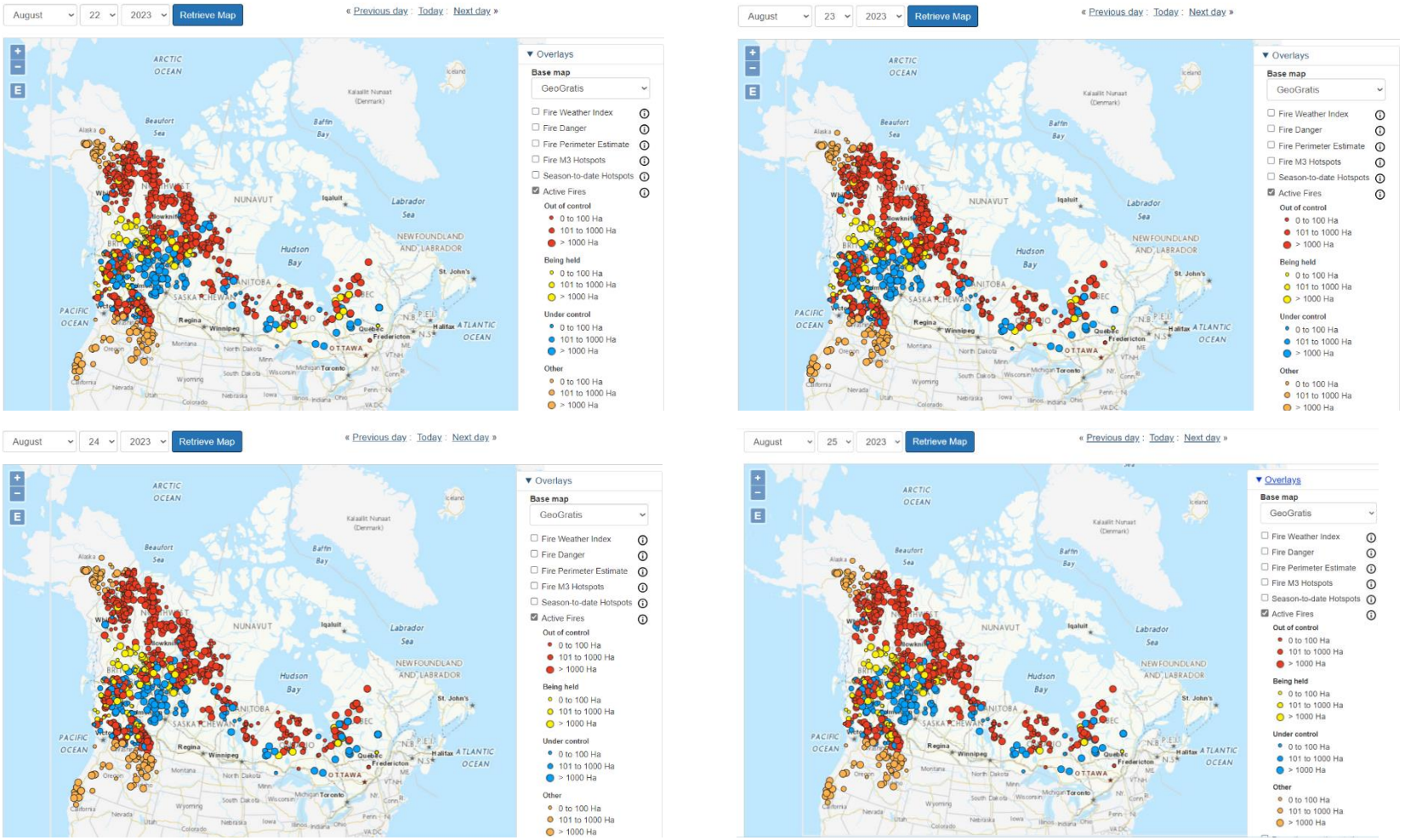


Figure A16. Active wildfires in Canada on August 22-25, 2023.

Appendix B: HMS Smoke and Active Fires

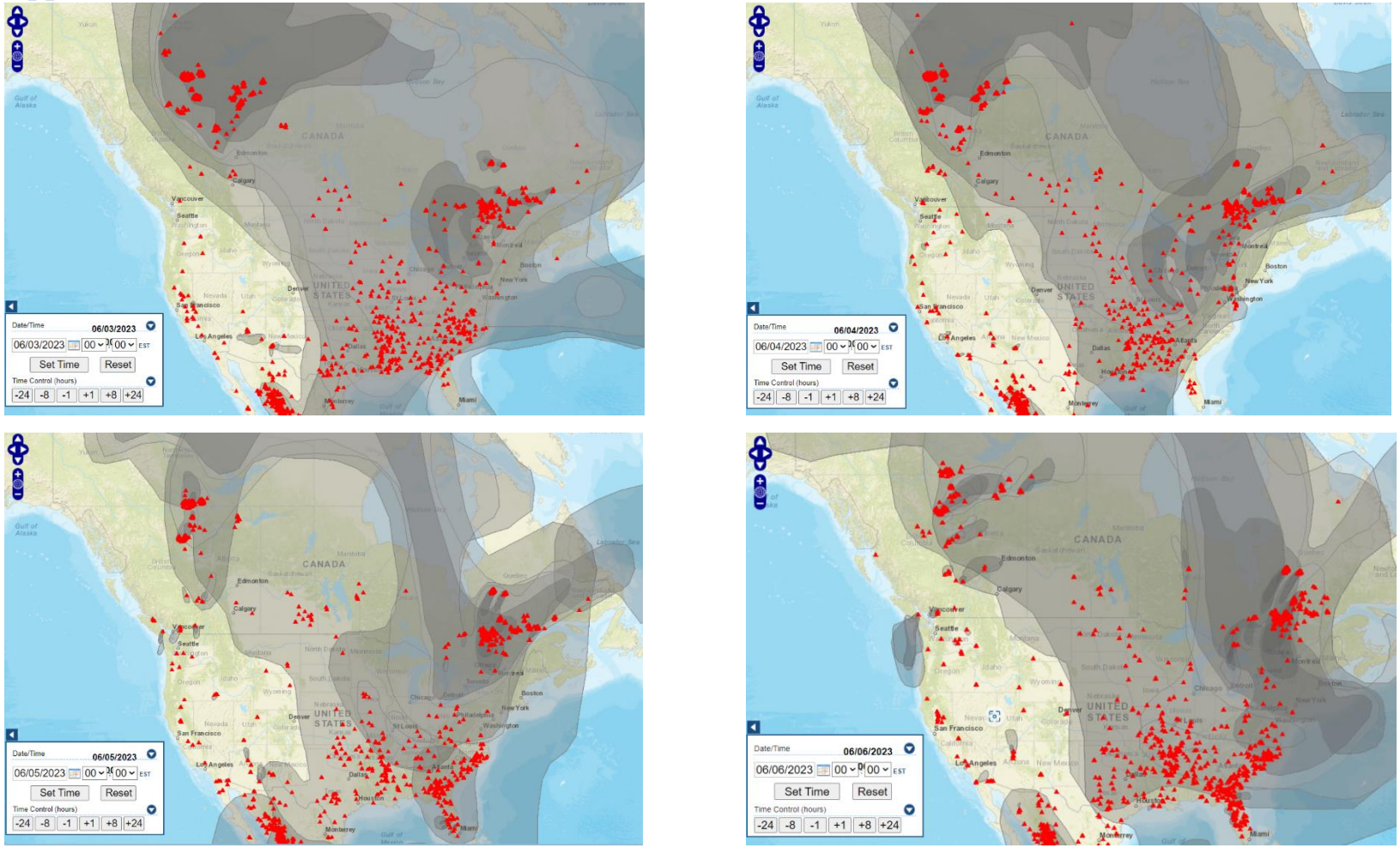


Figure B1. Map from the AirNow Navigator showing active fires (red) and smoke (grey) on June 3-6, 2023, plotted using the NOAA HMS over North America.

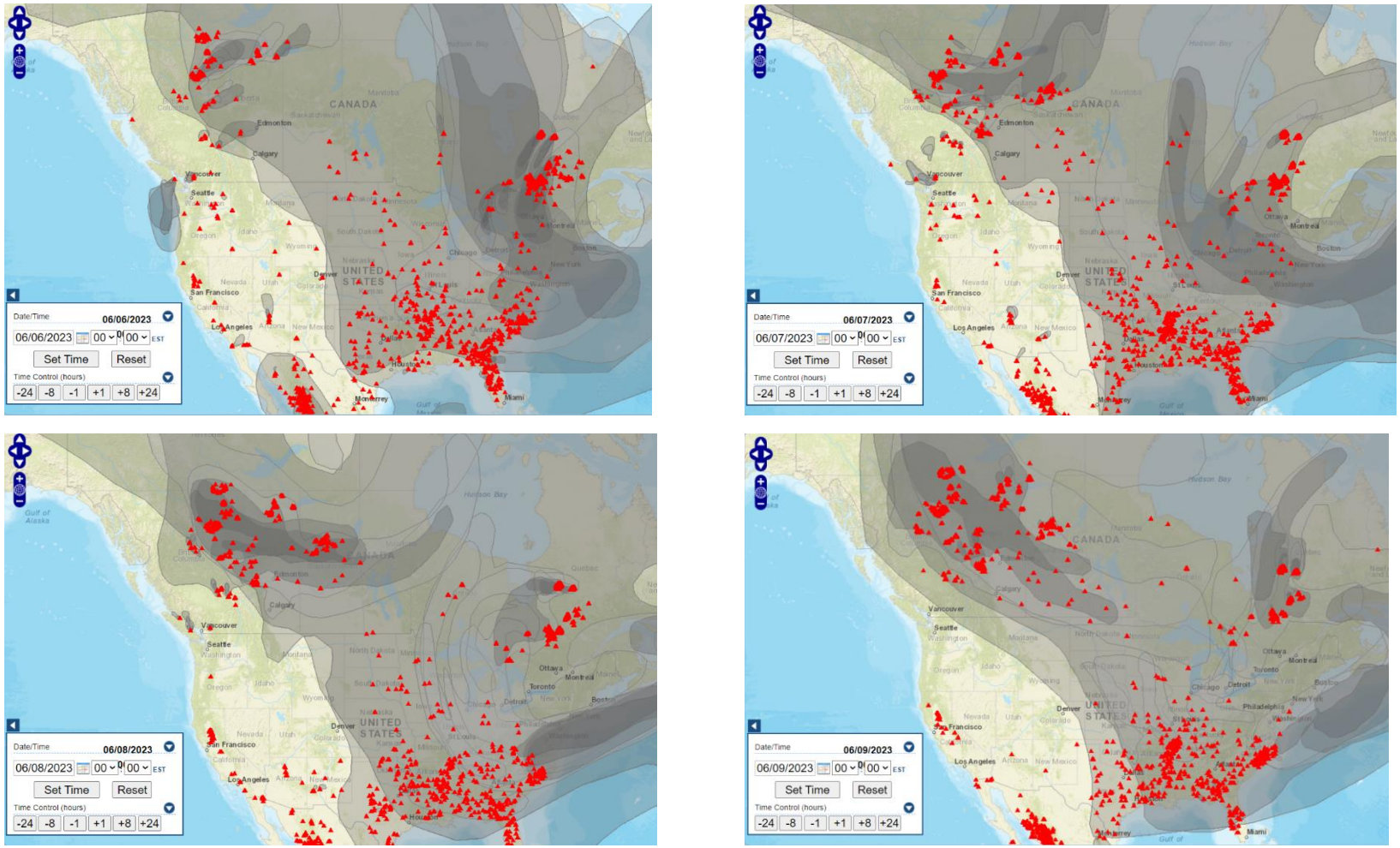


Figure B2. Map from the AirNow Navigator showing active fires (red) and smoke (grey) on June 6-9, 2023, plotted using the NOAA HMS over North America.

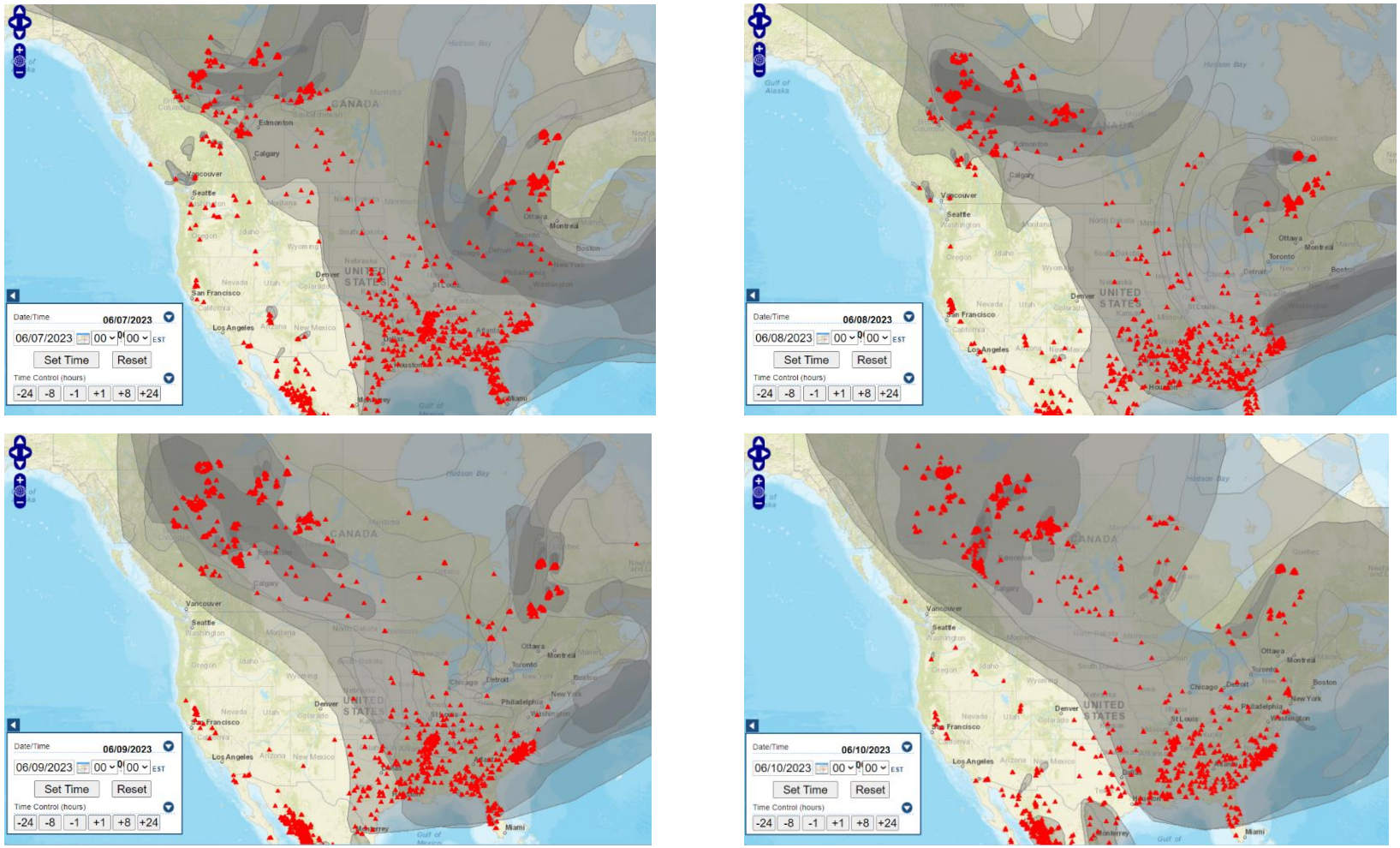


Figure B3. Map from the AirNow Navigator showing active fires (red) and smoke (grey) on June 7-10, 2023, plotted using the NOAA HMS over North America.

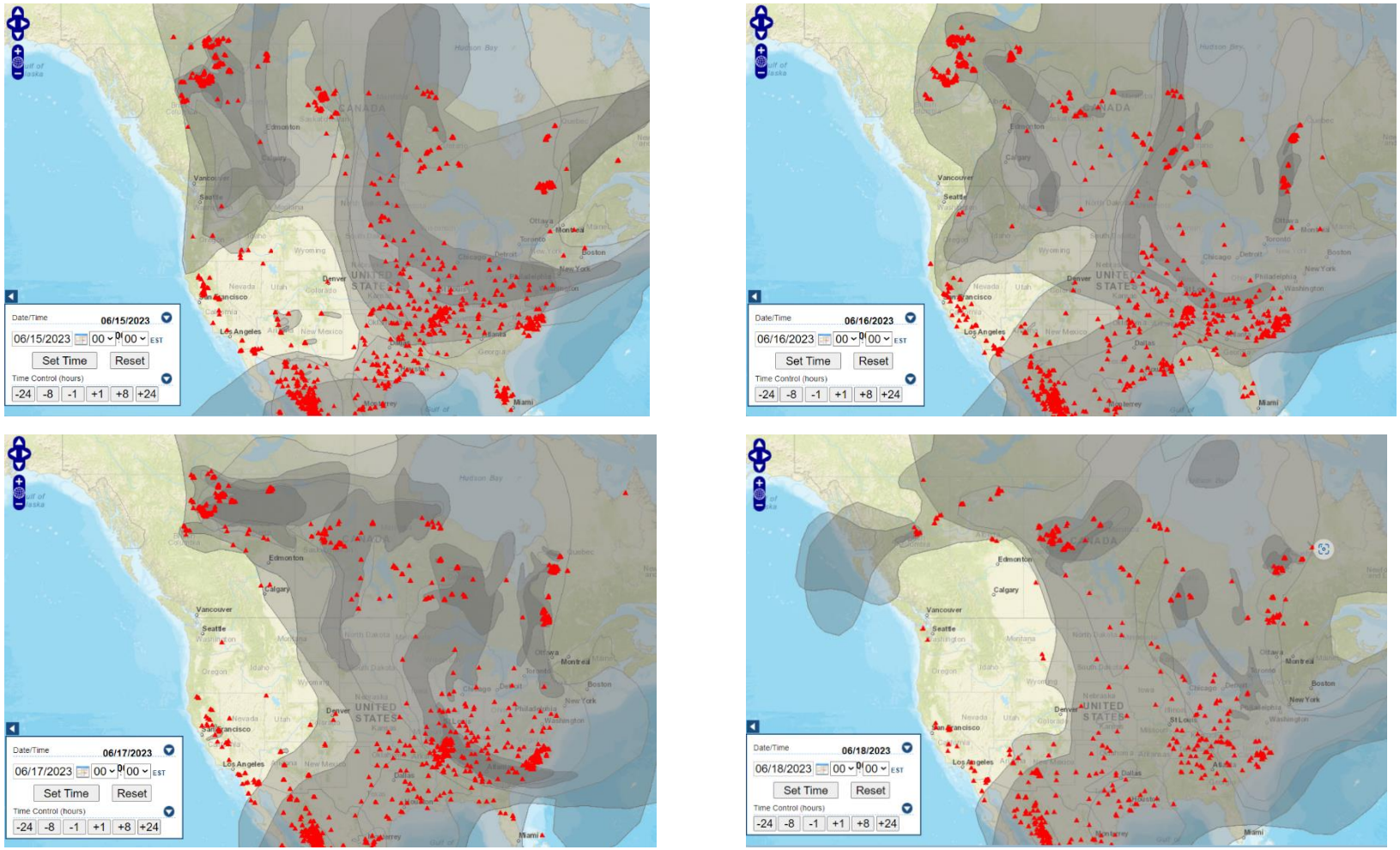


Figure B4. Map from the AirNow Navigator showing active fires (red) and smoke (grey) on June 15-18, 2023, plotted using the NOAA HMS over North America.

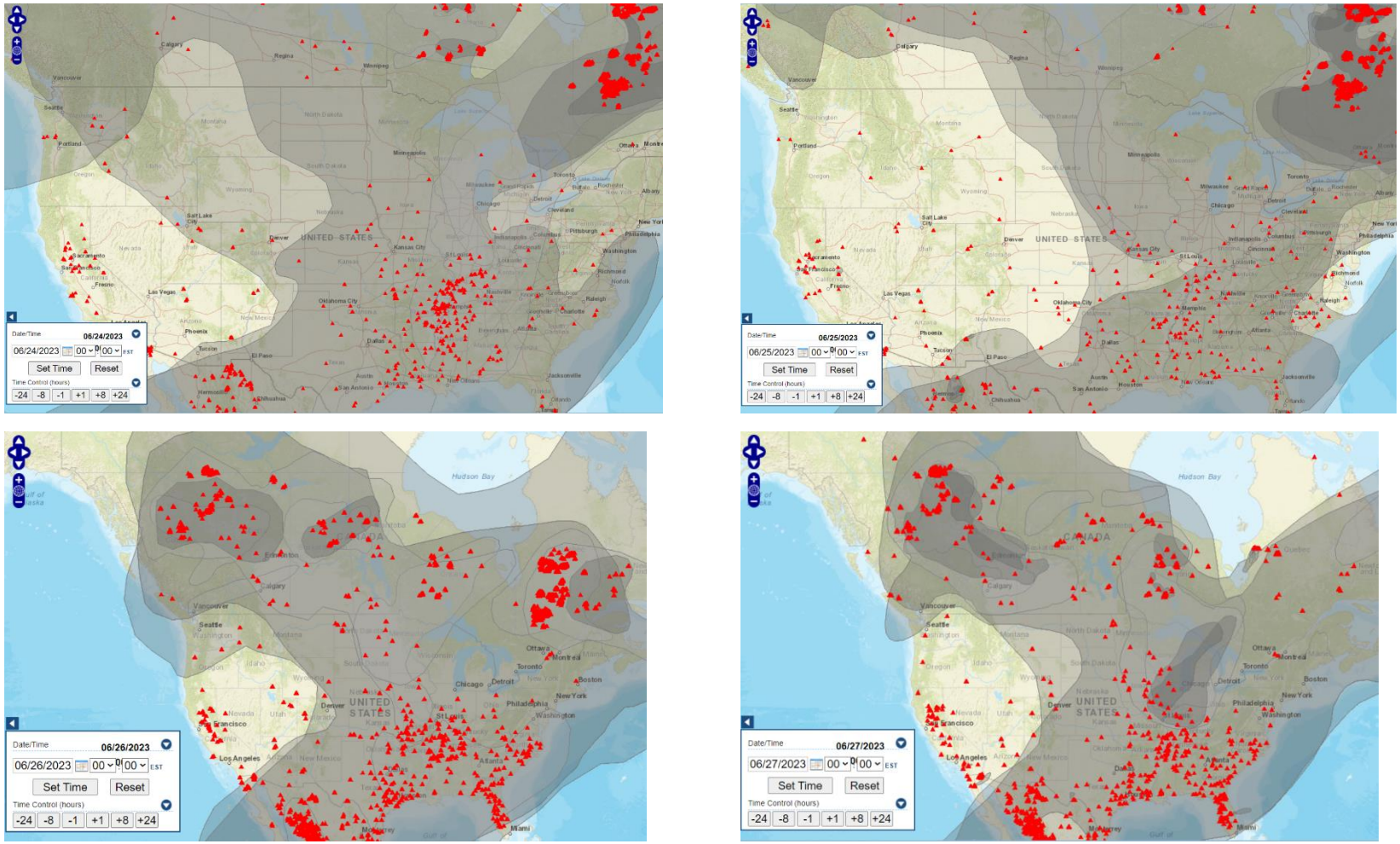


Figure B5. Map from the AirNow Navigator showing active fires (red) and smoke (grey) on June 24-27, 2023, plotted using the NOAA HMS over North America.

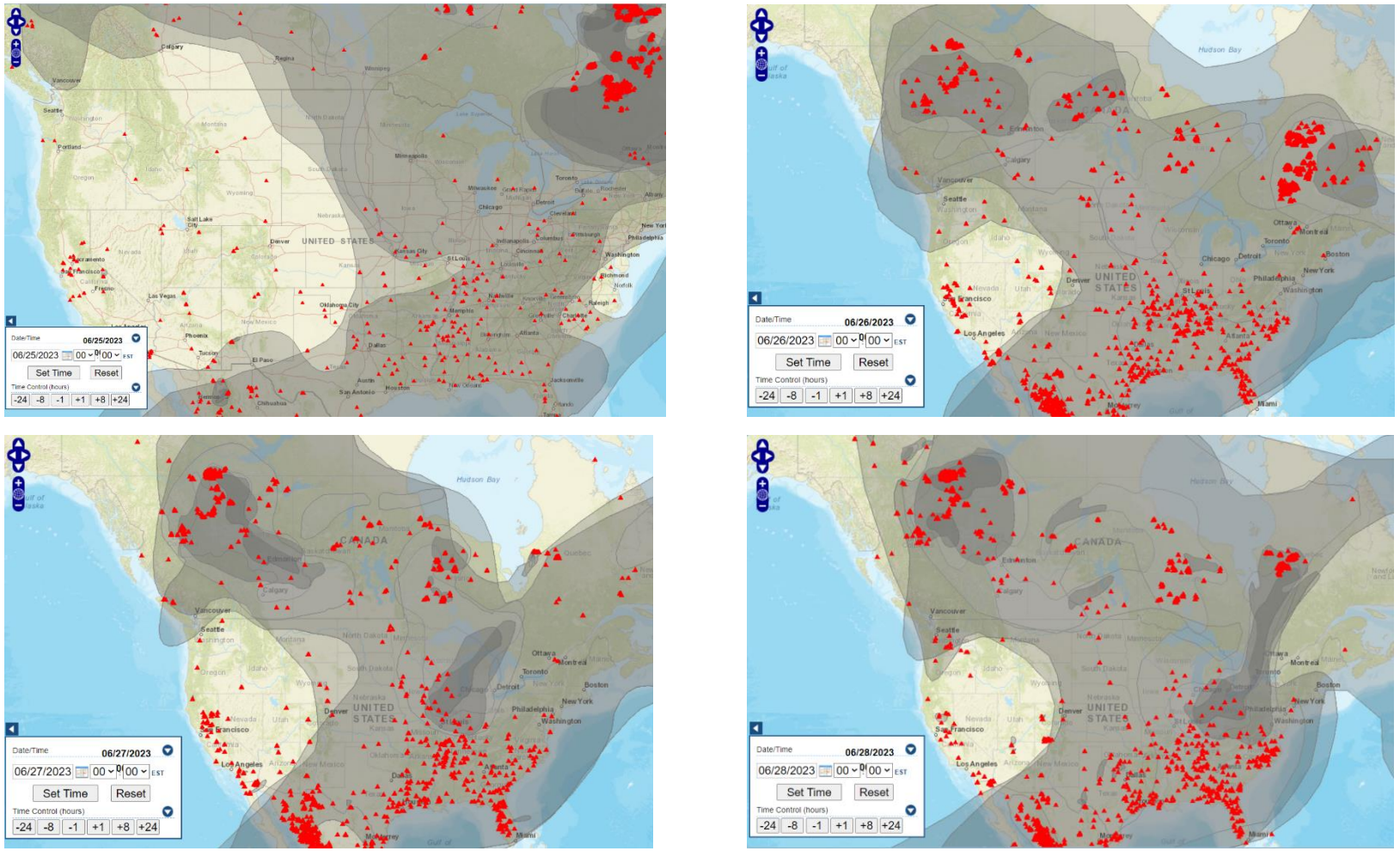


Figure B6. Map from the AirNow Navigator showing active fires (red) and smoke (grey) on June 25-28, 2023, plotted using the NOAA HMS over North America.

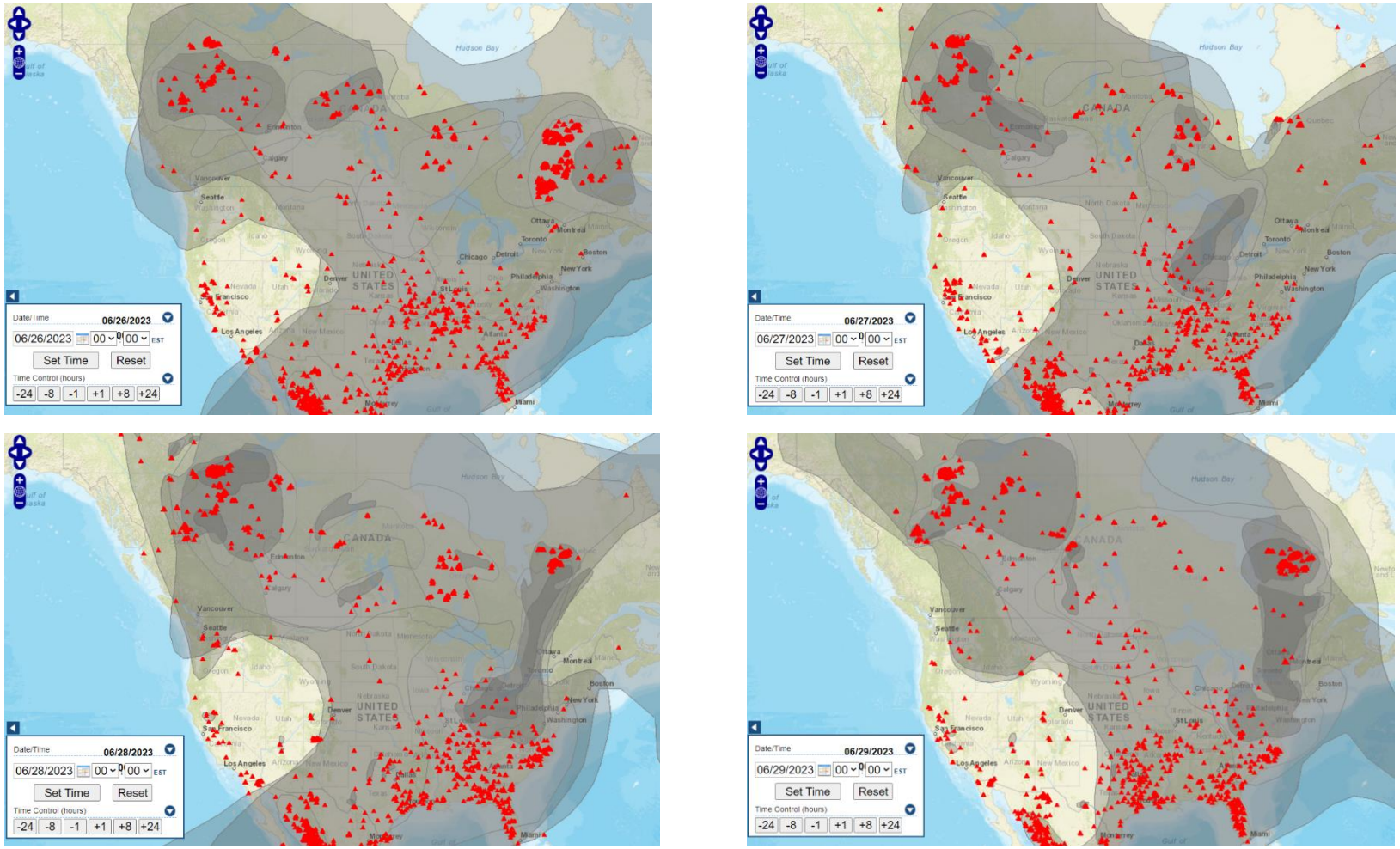


Figure B7. Map from the AirNow Navigator showing active fires (red) and smoke (grey) on June 26-29, 2023, plotted using the NOAA HMS over North America.

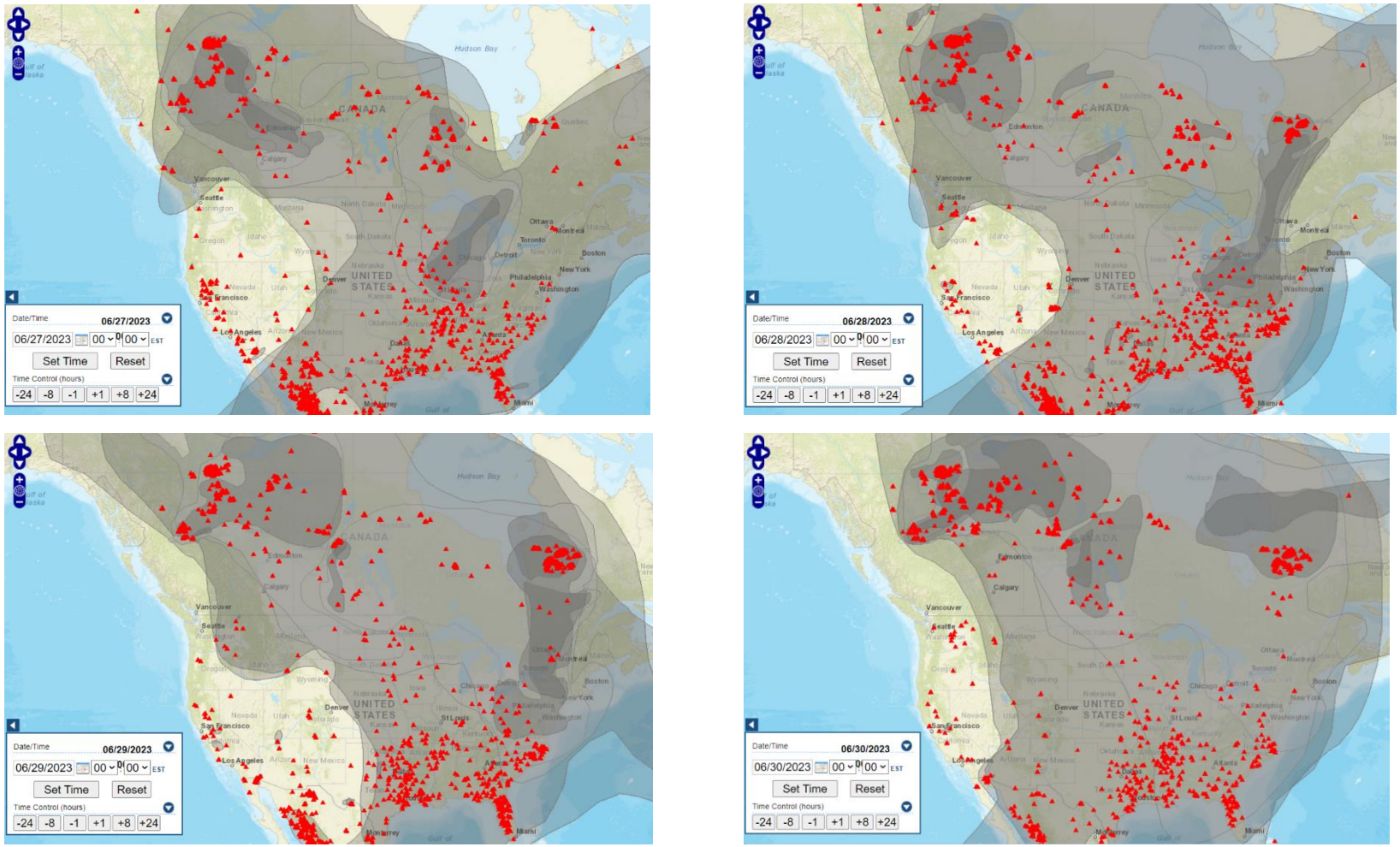


Figure B8. Map from the AirNow Navigator showing active fires (red) and smoke (grey) on June 27-30, 2023, plotted using the NOAA HMS over North America.

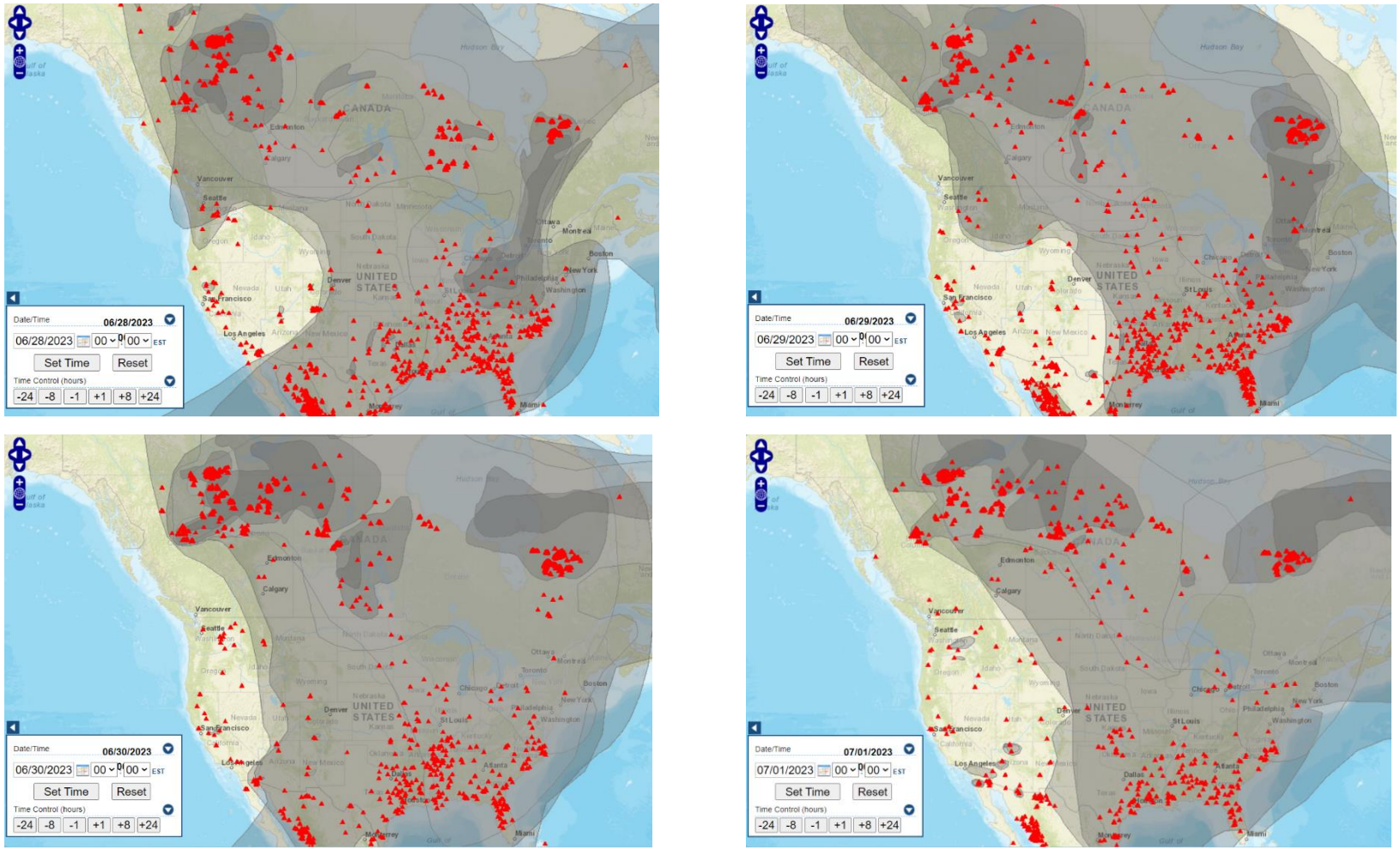


Figure B9. Map from the AirNow Navigator showing active fires (red) and smoke (grey) on June 28 – July 1, 2023, plotted using the NOAA HMS over North America.

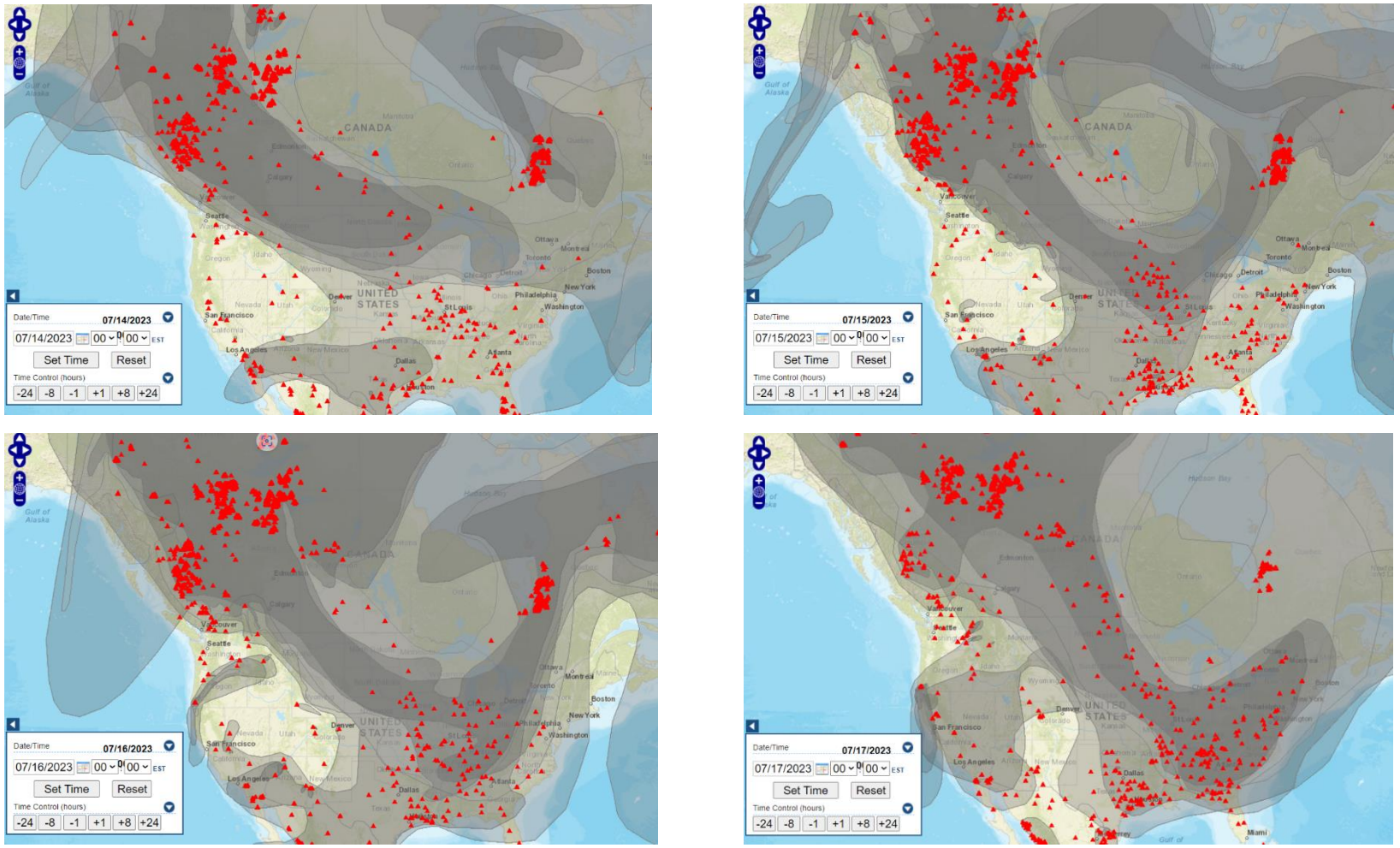


Figure B10. Map from the AirNow Navigator showing active fires (red) and smoke (grey) on July 14-17, 2023, plotted using the NOAA HMS over North America.

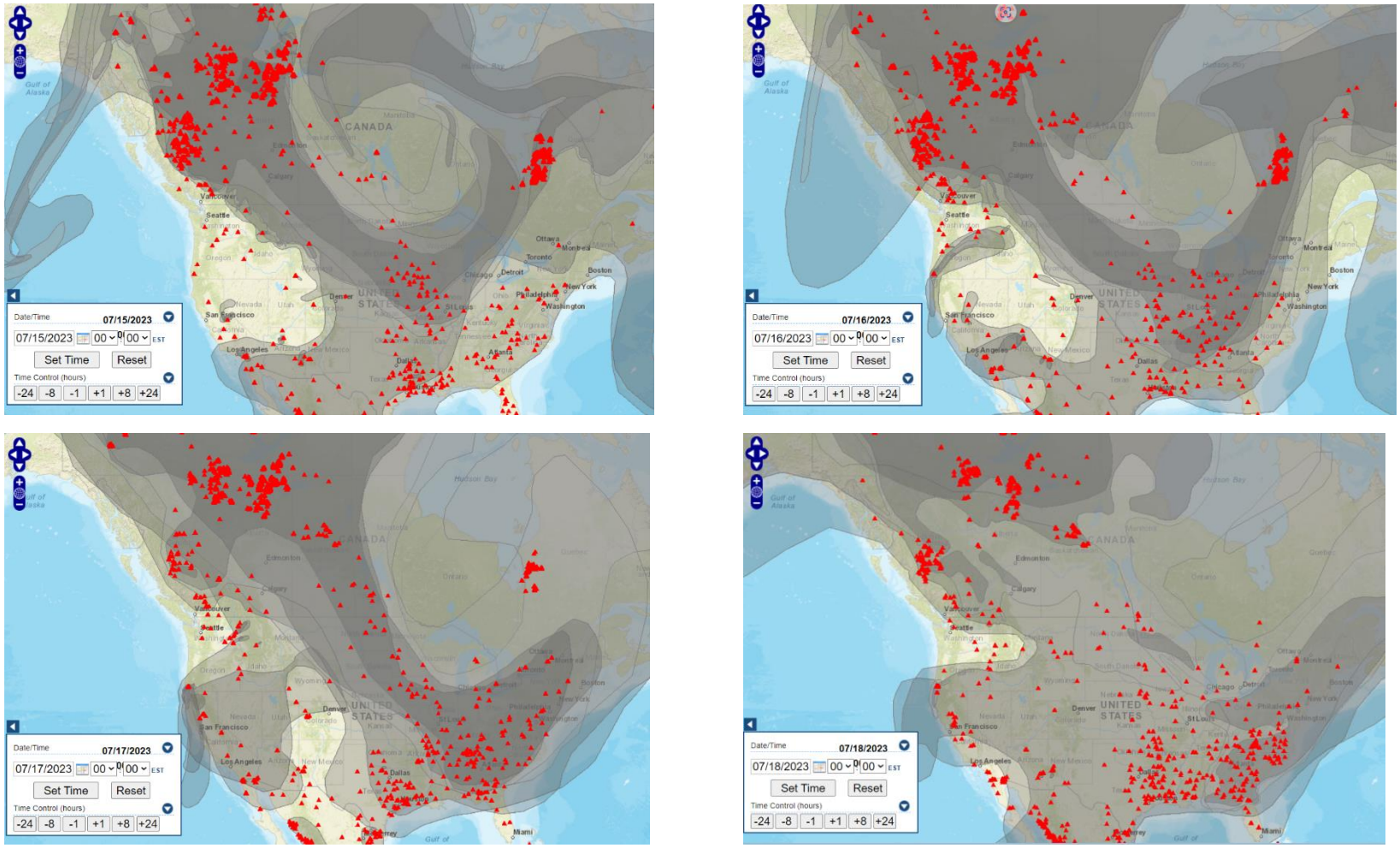


Figure B11. Map from the AirNow Navigator showing active fires (red) and smoke (grey) on July 15-18, 2023, plotted using the NOAA HMS over North America.

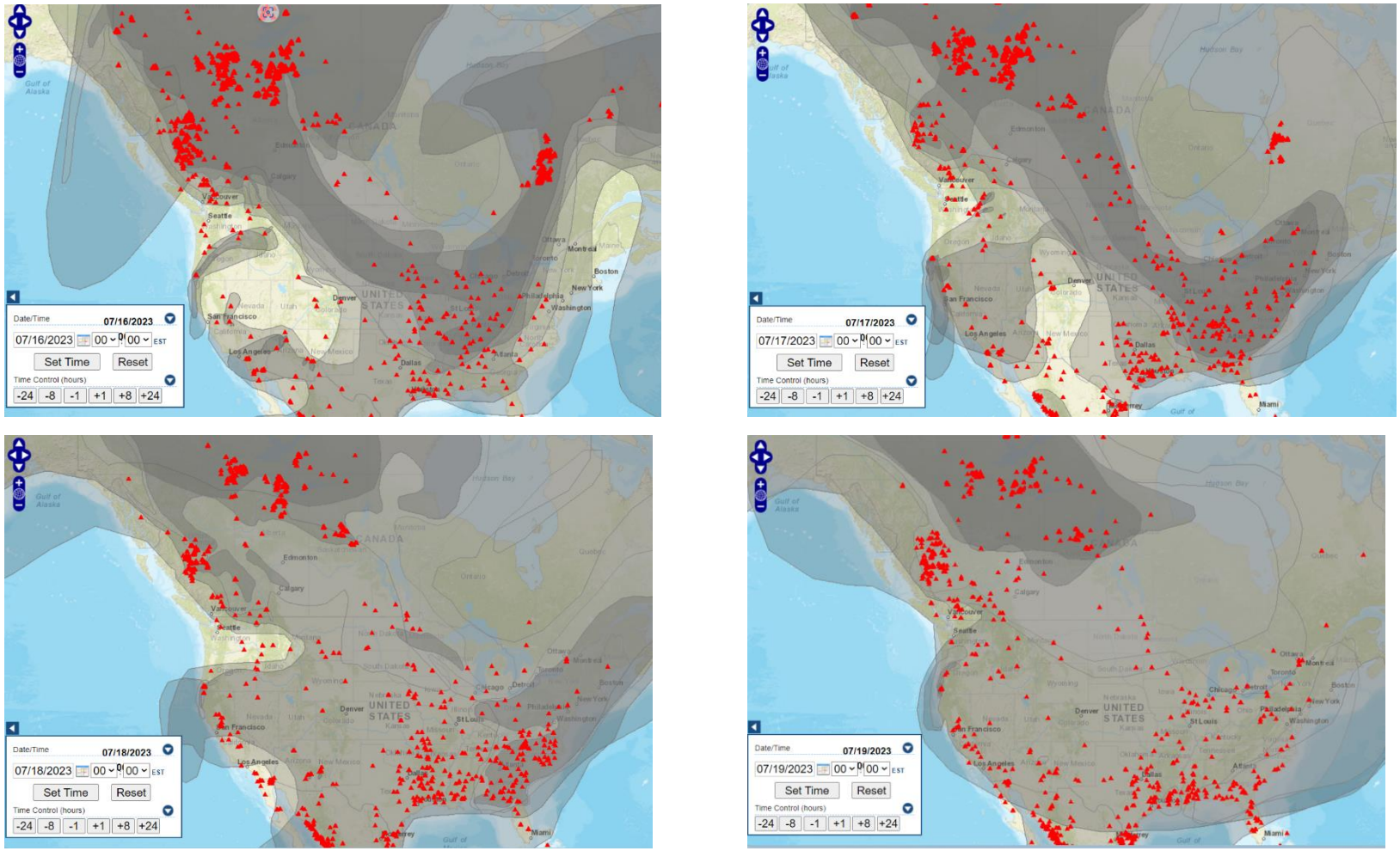


Figure B12. Map from the AirNow Navigator showing active fires (red) and smoke (grey) on July 16-19, 2023, plotted using the NOAA HMS over North America.

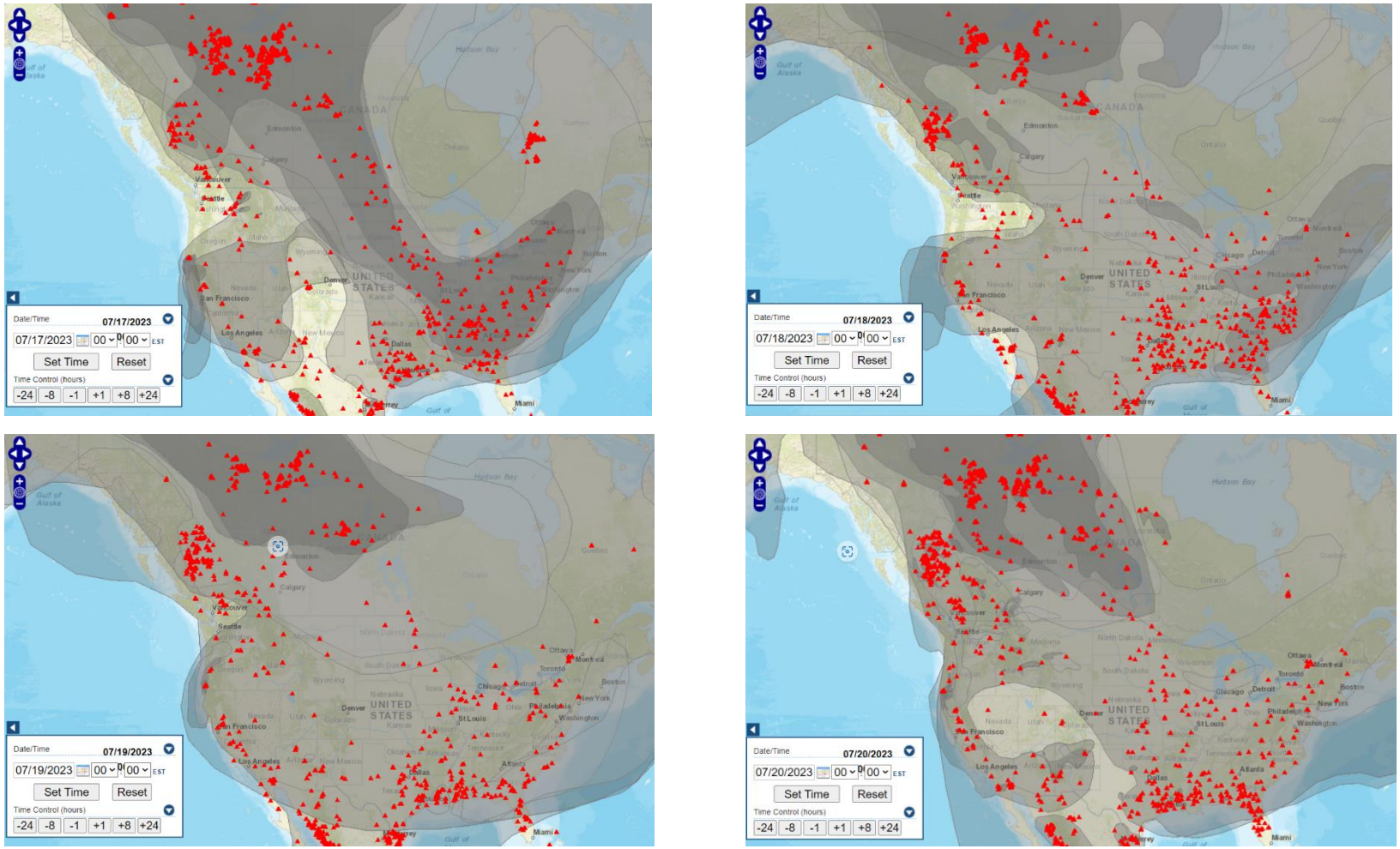


Figure B13. Map from the AirNow Navigator showing active fires (red) and smoke (grey) on July 17-20, 2023, plotted using the NOAA HMS over North America.

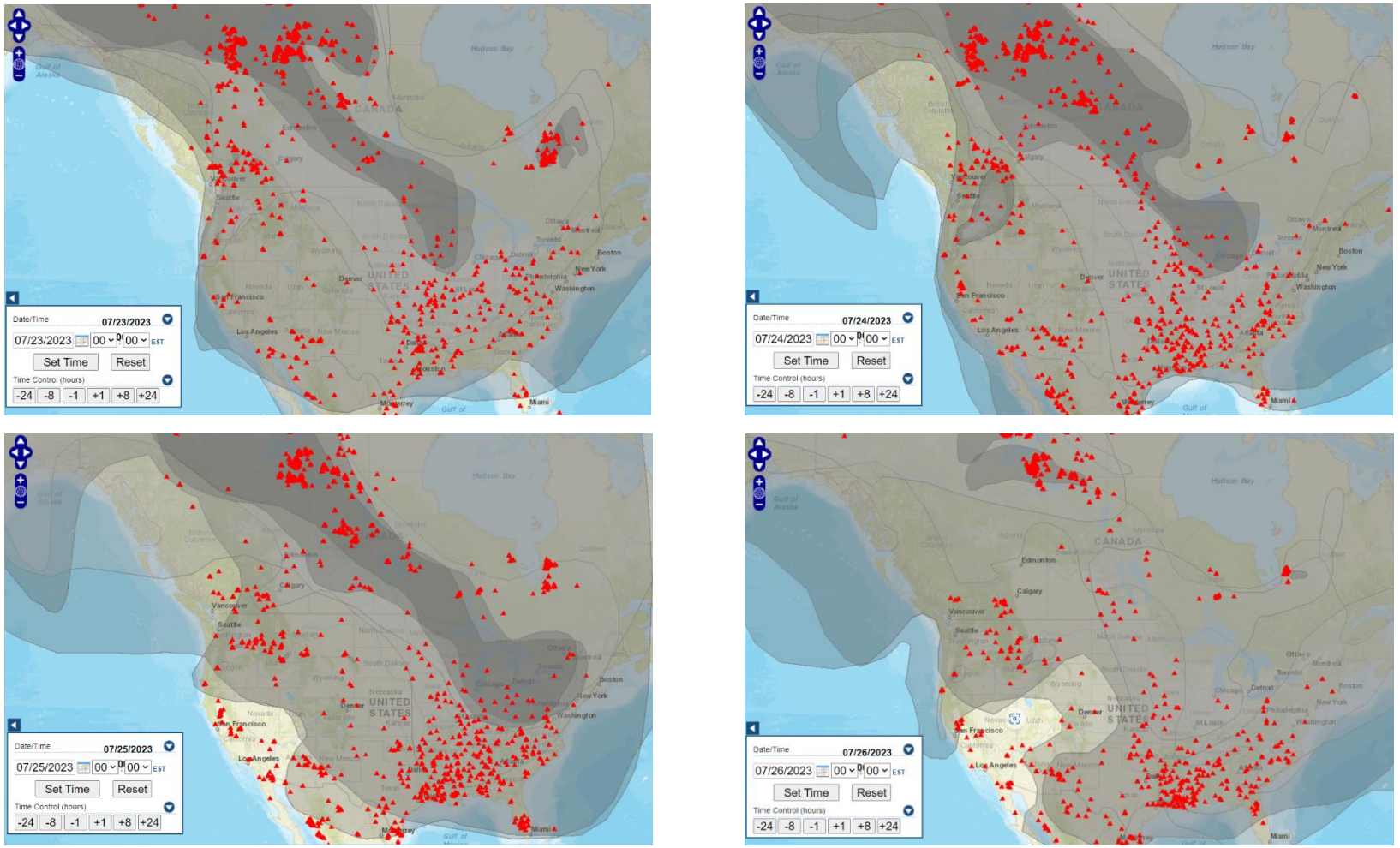


Figure B14. Map from the AirNow Navigator showing active fires (red) and smoke (grey) on July 23-26, 2023, plotted using the NOAA HMS over North America.

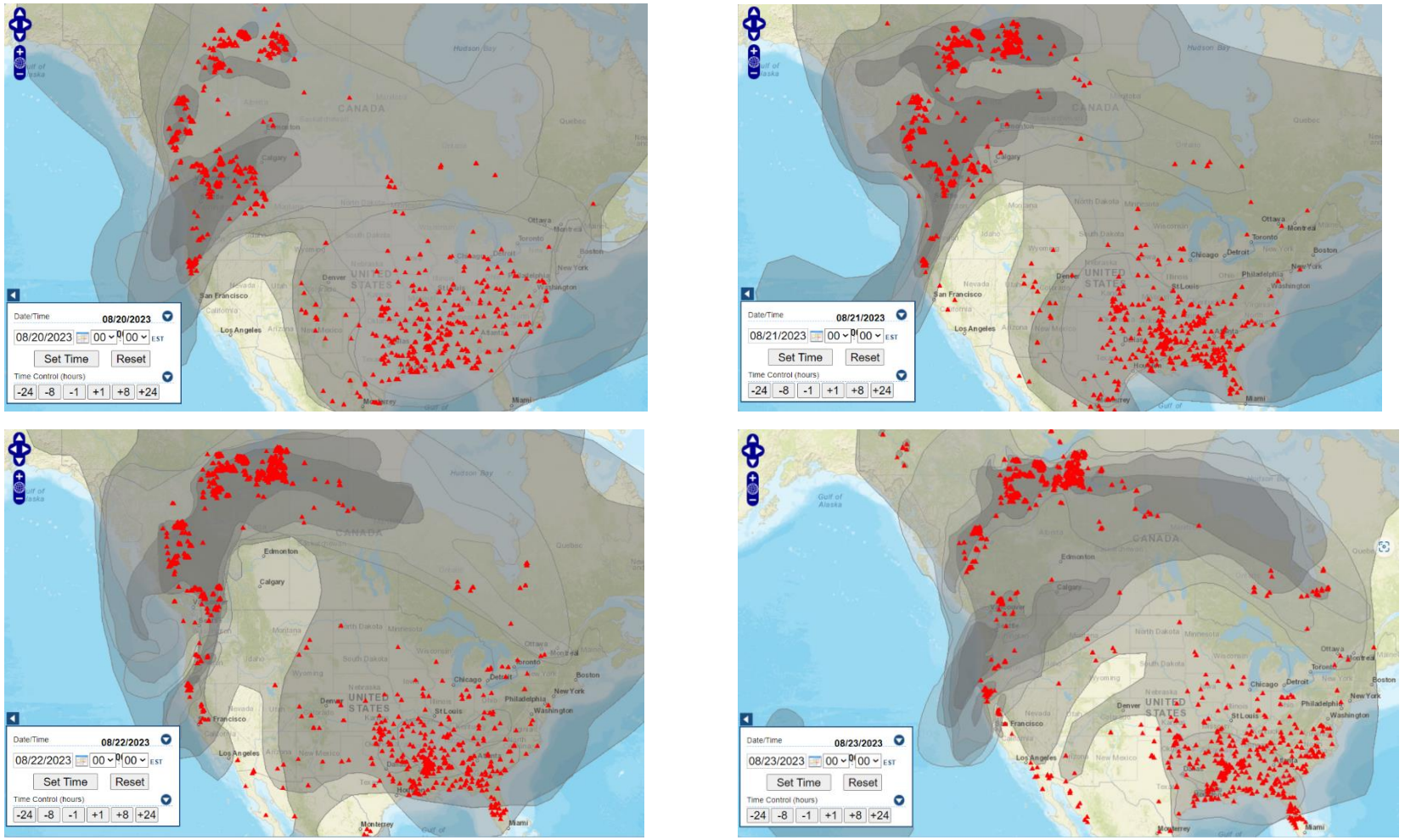


Figure B15. Map from the AirNow Navigator showing active fires (red) and smoke (grey) on August 20-23, 2023, plotted using the NOAA HMS over North America.

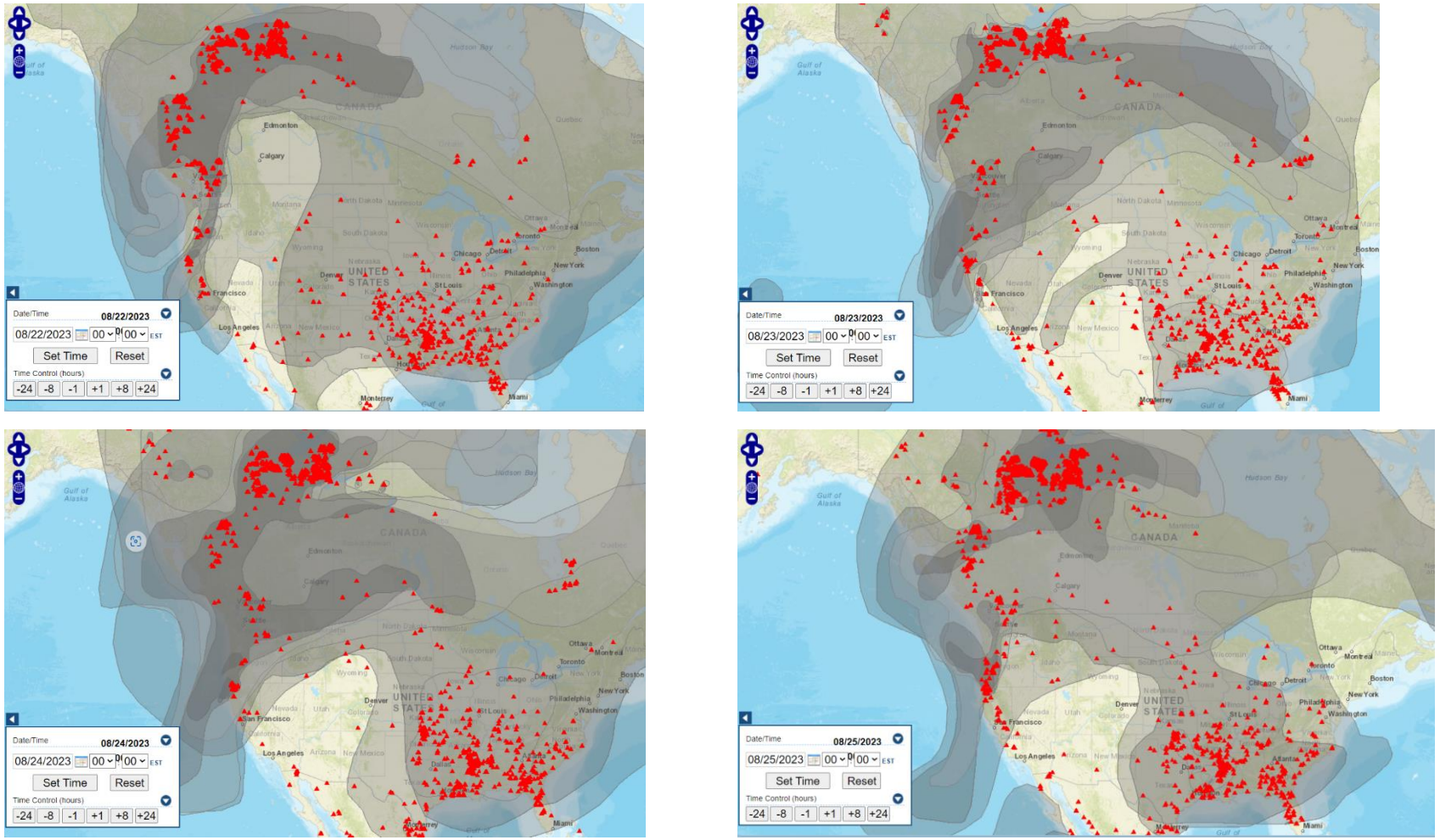


Figure B16. Map from the AirNow Navigator showing active fires (red) and smoke (grey) on August 22-25, 2023, plotted using the NOAA HMS over North America.

Appendix C: HYSPLIT Back-Trajectory Maps

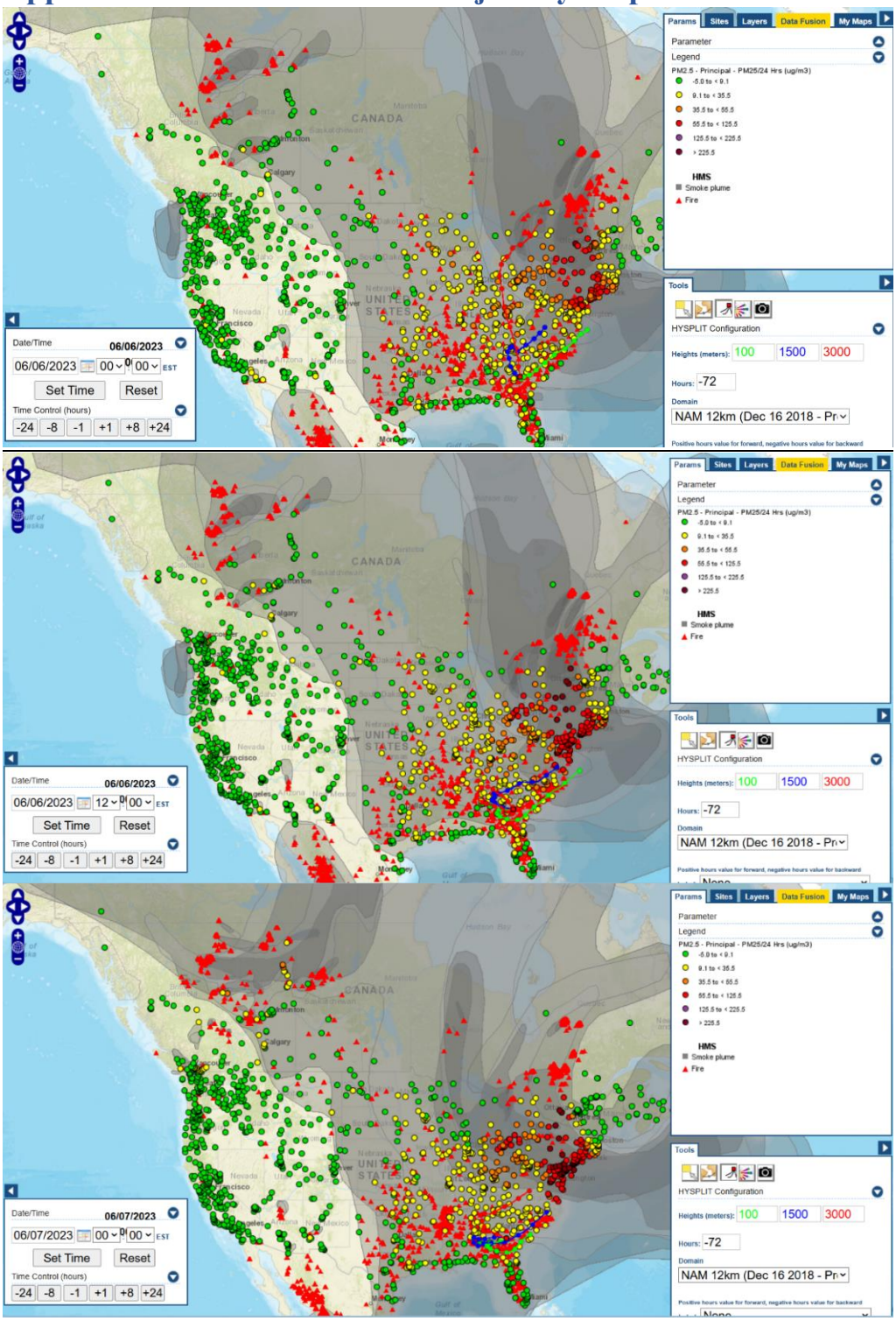


Figure C1. Map of HMS smoke plumes (grey polygons) and fires (red triangles), 24-hour rolling average $PM_{2.5}$ concentrations (circles), and HYSPLIT back-trajectories of release heights at 100 m (green lines), 1500 m (blue lines), and 3000 m (red lines) for 0 AM EST on June 6, 2023 (top), 12 PM EST on June 6, 2023 (middle), and 0 AM EST on June 7, 2023 (bottom).

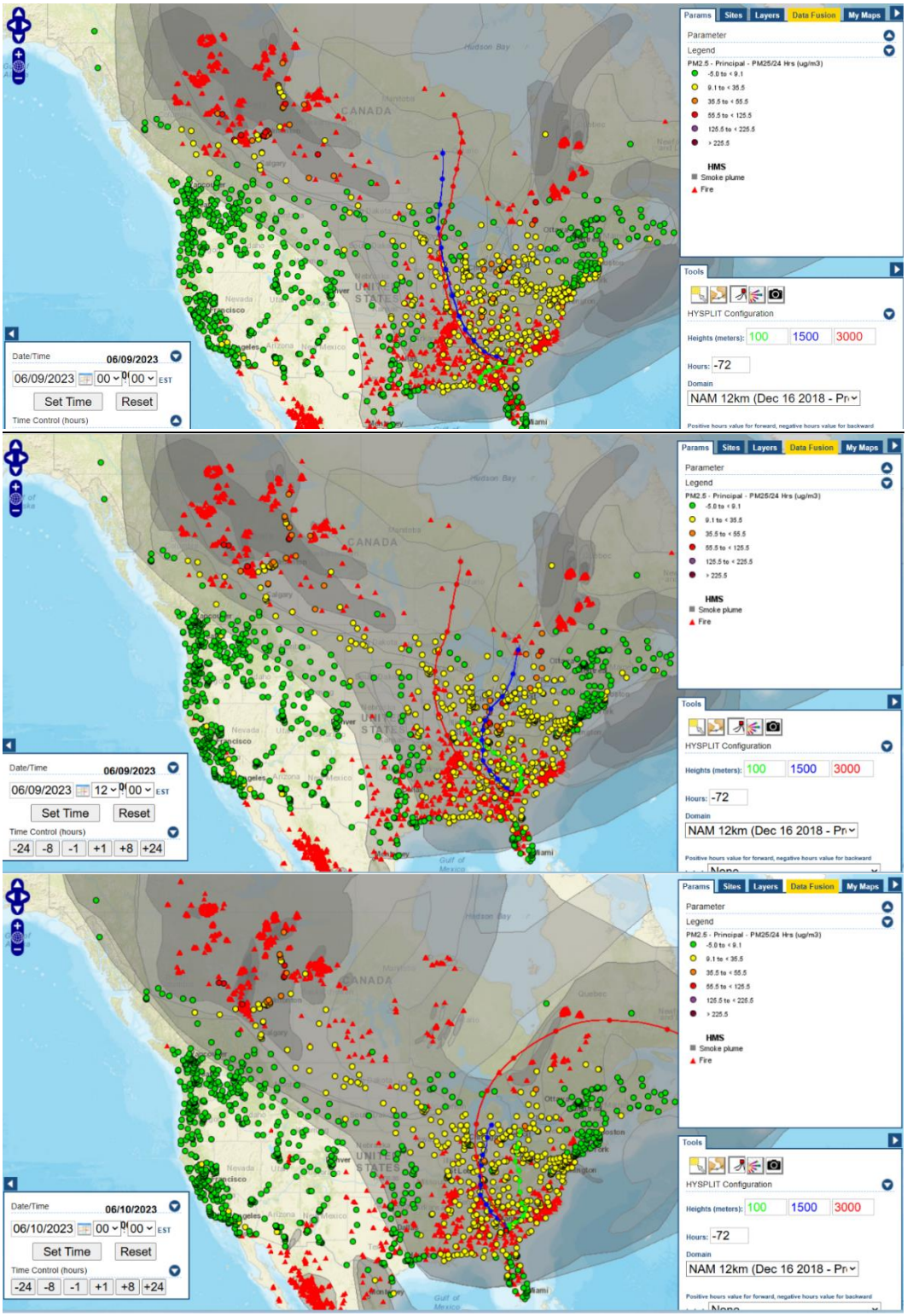


Figure C2. Map of HMS smoke plumes (grey polygons) and fires (red triangles), 24-hour rolling average $PM_{2.5}$ concentrations (circles), and HYSPLIT back-trajectories of release heights at 100 m (green lines), 1500 m (blue lines), and 3000 m (red lines) for 0 AM EST on June 9, 2023 (top), 12 PM EST on June 9, 2023 (middle), and 0 AM EST on June 10, 2023 (bottom).

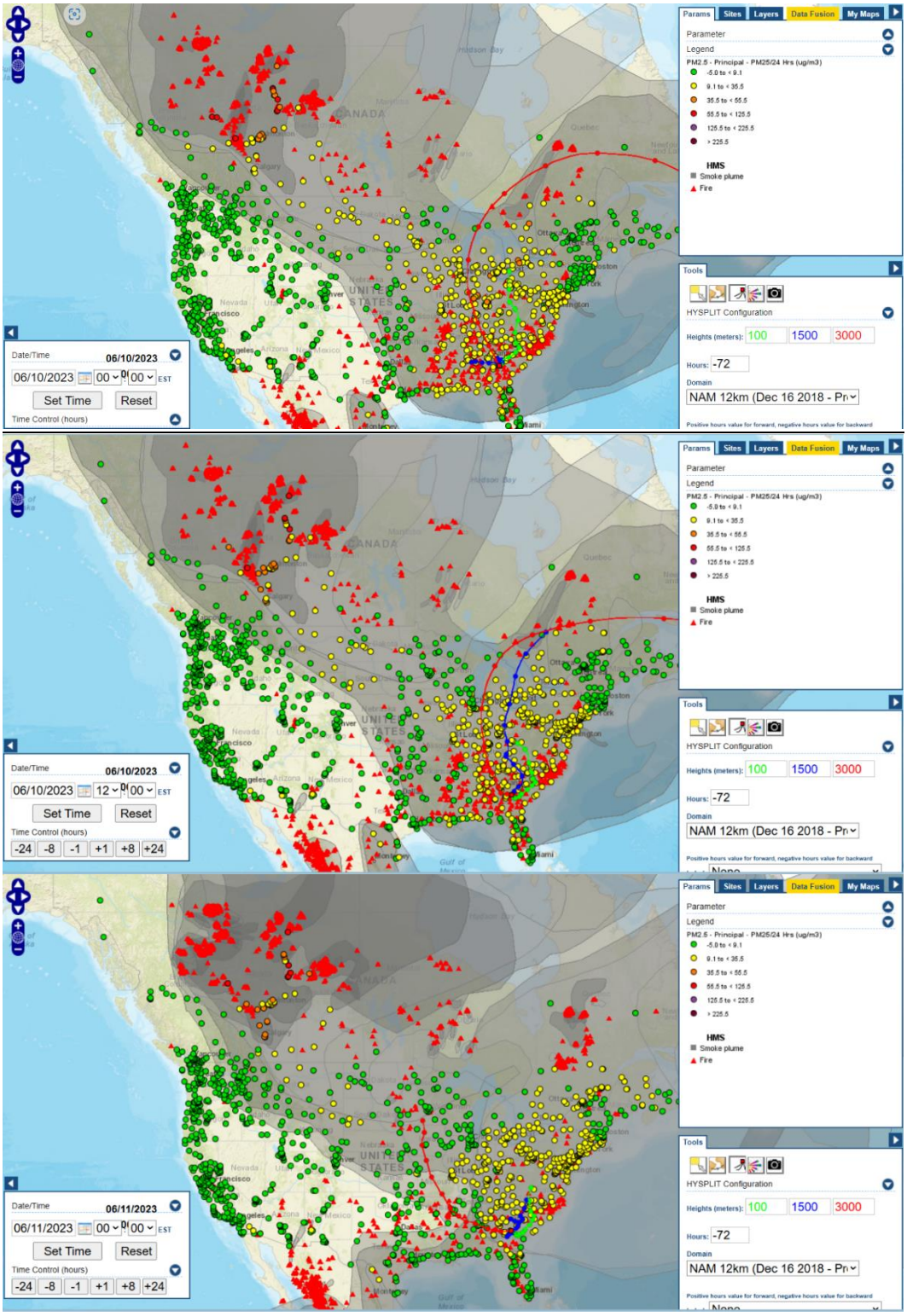


Figure C3. Map of HMS smoke plumes (grey polygons) and fires (red triangles), 24-hour rolling average $PM_{2.5}$ concentrations (circles), and HYSPLIT back-trajectories of release heights at 100 m (green lines), 1500 m (blue lines), and 3000 m (red lines) for 0 AM EST on June 10, 2023 (top), 12 PM EST on June 10, 2023 (middle), and 0 AM EST on June 11, 2023 (bottom).

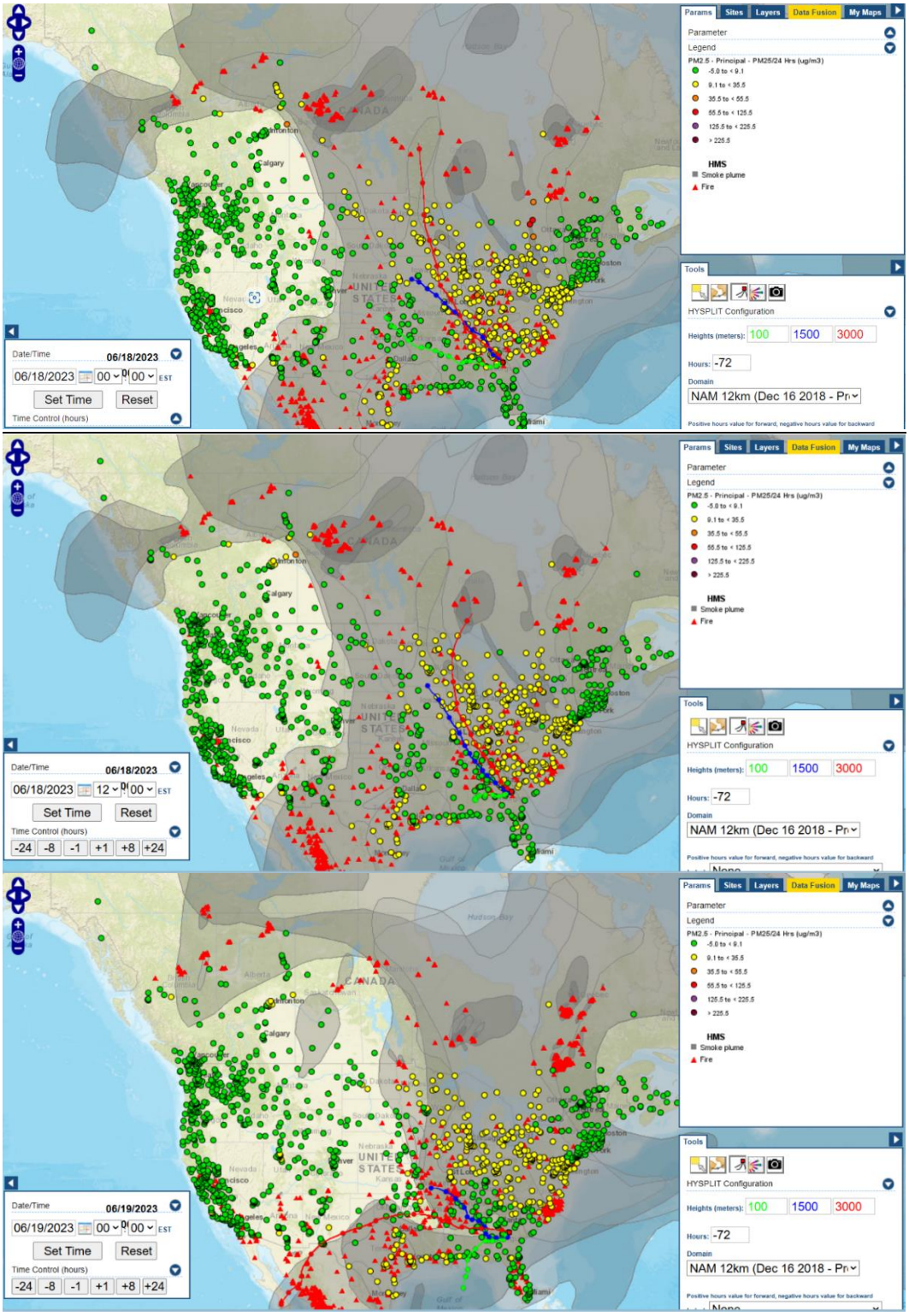


Figure C4. Map of HMS smoke plumes (grey polygons) and fires (red triangles), 24-hour rolling average $PM_{2.5}$ concentrations (circles), and HYSPLIT back-trajectories of release heights at 100 m (green lines), 1500 m (blue lines), and 3000 m (red lines) for 0 AM EST on June 18, 2023 (top), 12 PM EST on June 18, 2023 (middle), and 0 AM EST on June 19, 2023 (bottom).

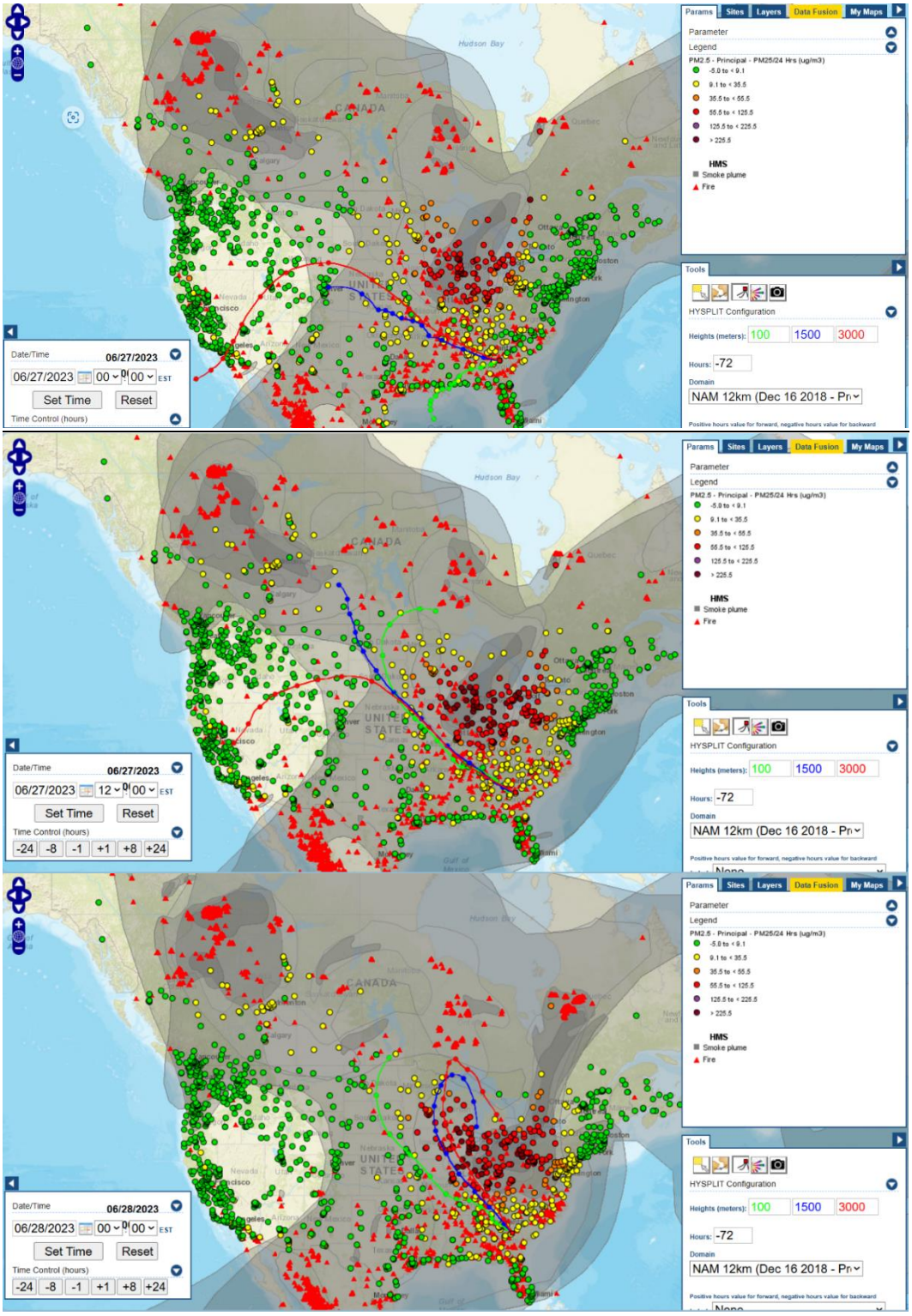


Figure C5. Map of HMS smoke plumes (grey polygons) and fires (red triangles), 24-hour rolling average $PM_{2.5}$ concentrations (circles), and HYSPLIT back-trajectories of release heights at 100 m (green lines), 1500 m (blue lines), and 3000 m (red lines) for 0 AM EST on June 27, 2023 (top), 12 PM EST on June 27, 2023 (middle), and 0 AM EST on June 28, 2023 (bottom).

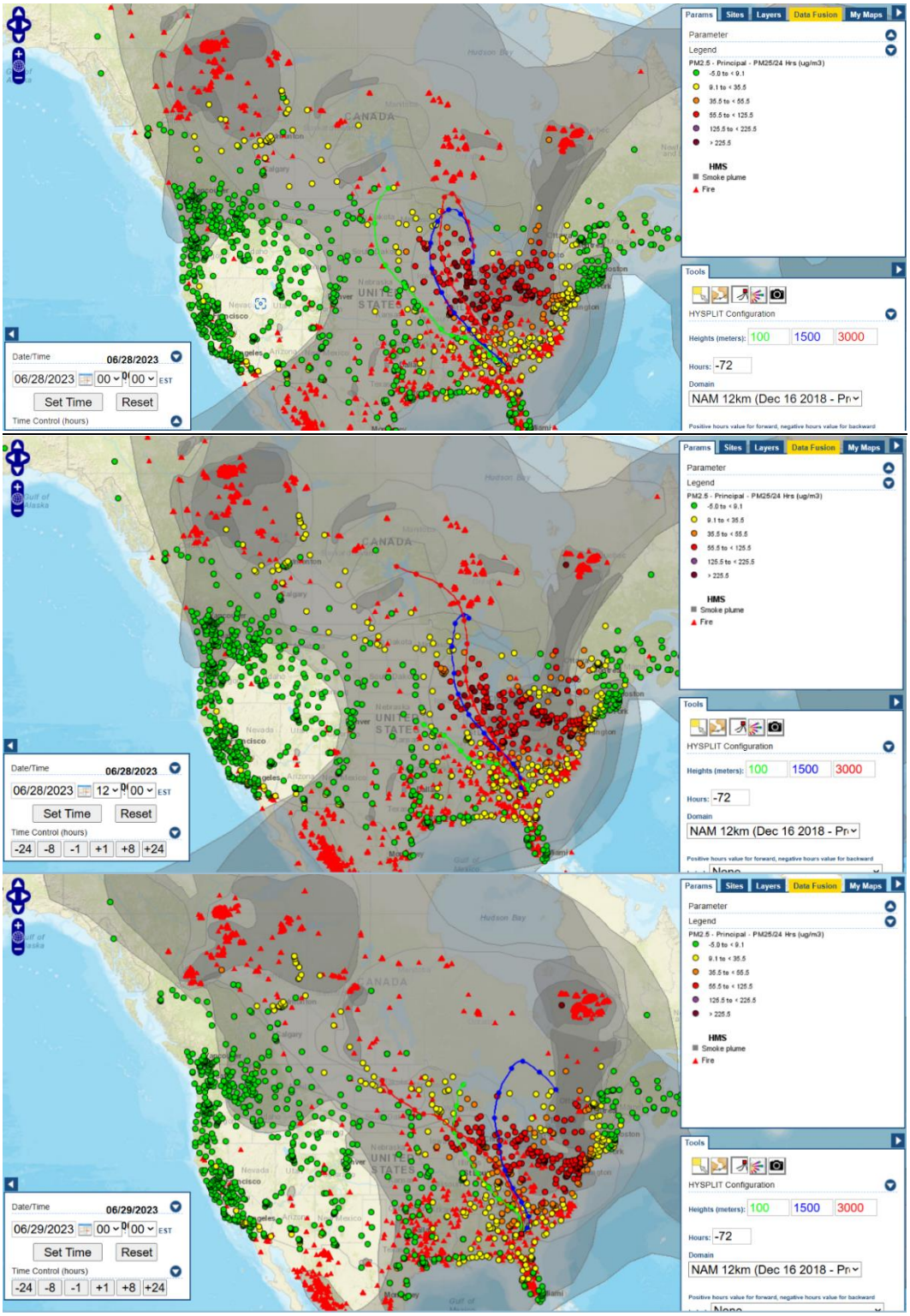


Figure C6. Map of HMS smoke plumes (grey polygons) and fires (red triangles), 24-hour rolling average $PM_{2.5}$ concentrations (circles), and HYSPLIT back-trajectories of release heights at 100 m (green lines), 1500 m (blue lines), and 3000 m (red lines) for 0 AM EST on June 28, 2023 (top), 12 PM EST on June 28, 2023 (middle), and 0 AM EST on June 29, 2023 (bottom).

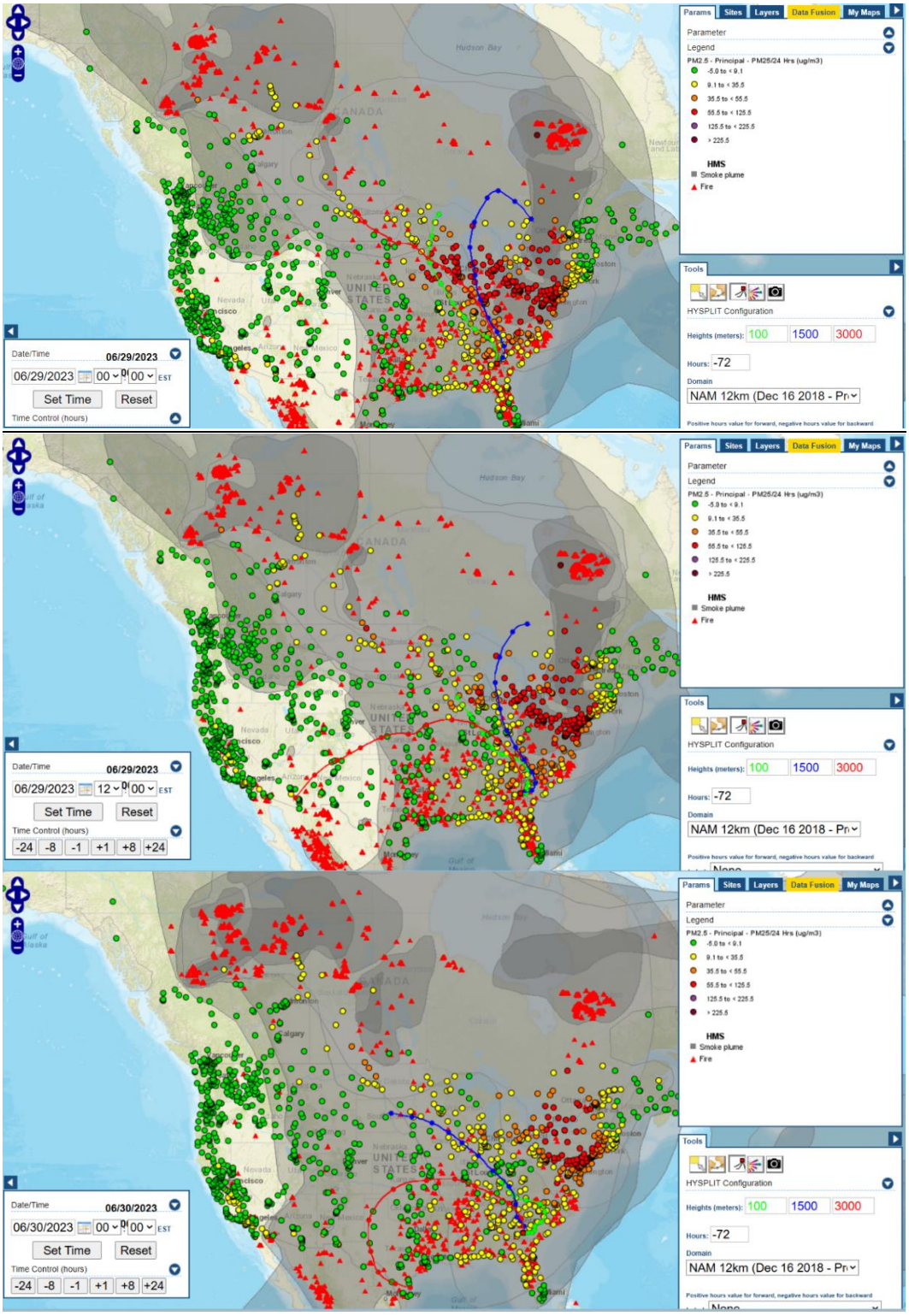


Figure C7. Map of HMS smoke plumes (grey polygons) and fires (red triangles), 24-hour rolling average $PM_{2.5}$ concentrations (circles), and HYSPLIT back-trajectories of release heights at 100 m (green lines), 1500 m (blue lines), and 3000 m (red lines) for 0 AM EST on June 29, 2023 (top), 12 PM EST on June 29, 2023 (middle), and 0 AM EST on June 30, 2023 (bottom).

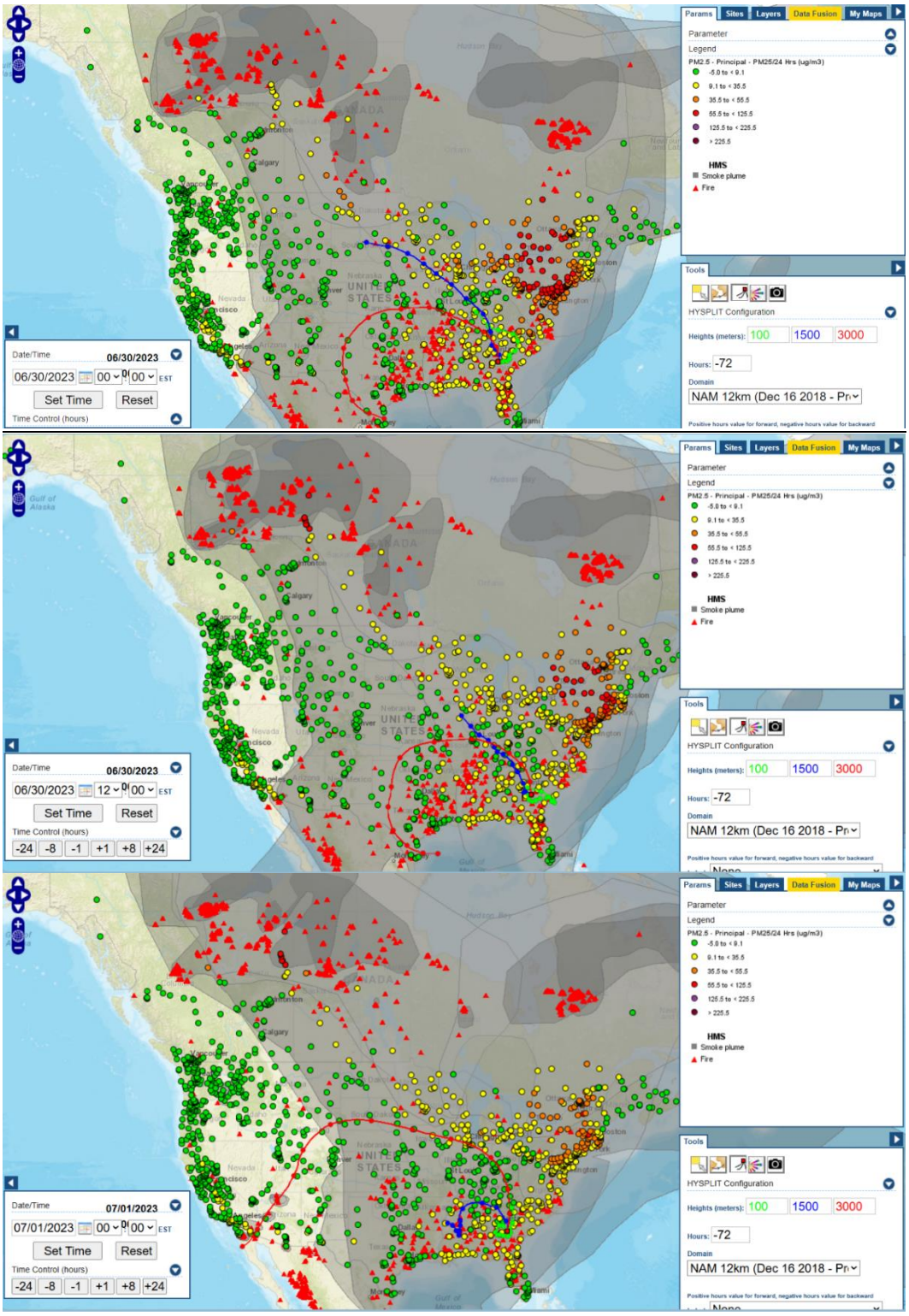


Figure C8. Map of HMS smoke plumes (grey polygons) and fires (red triangles), 24-hour rolling average $PM_{2.5}$ concentrations (circles), and HYSPLIT back-trajectories of release heights at 100 m (green lines), 1500 m (blue lines), and 3000 m (red lines) for 0 AM EST on June 30, 2023 (top), 12 PM EST on June 30, 2023 (middle), and 0 AM EST on July 1, 2023 (bottom).

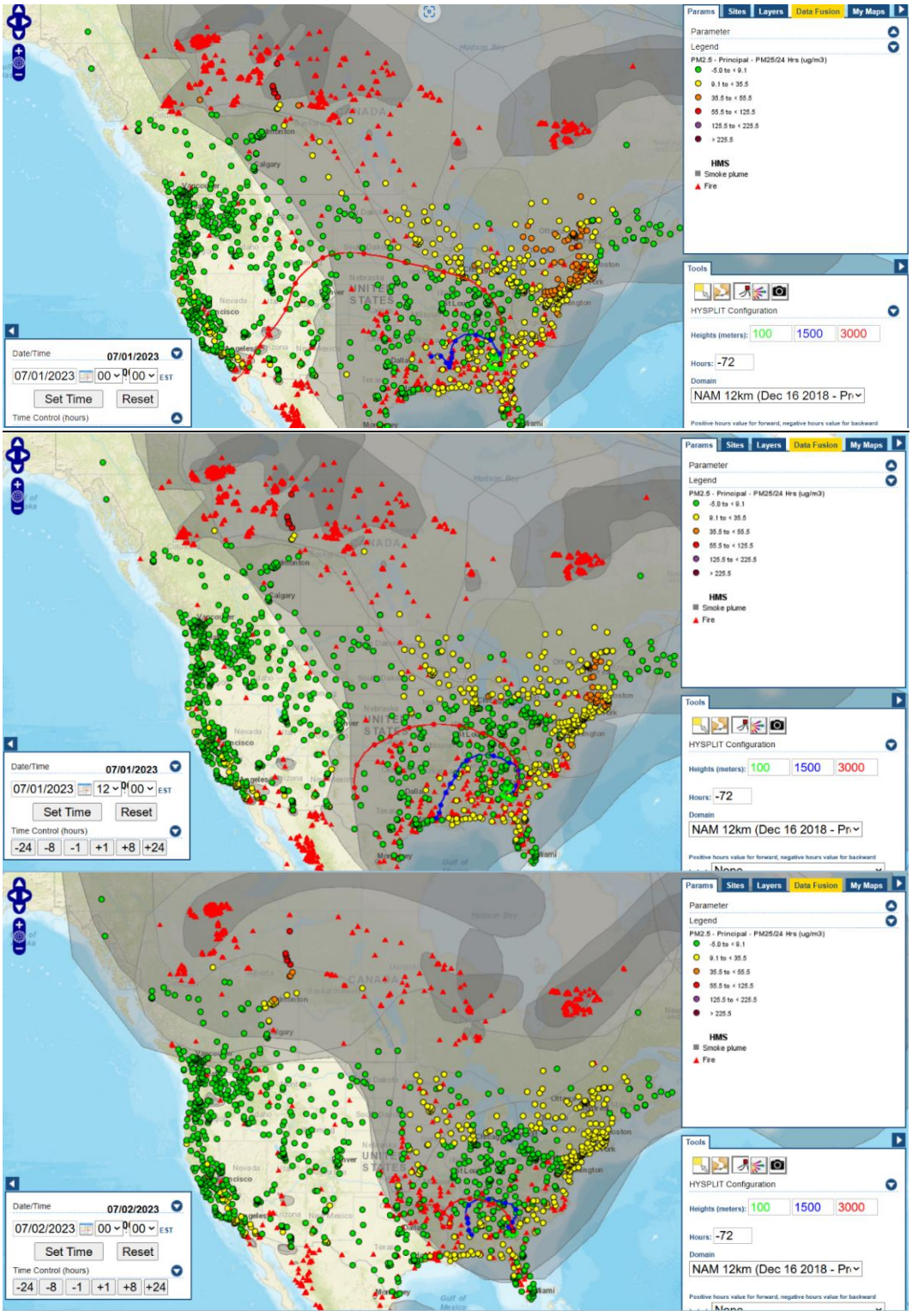


Figure C9. Map of HMS smoke plumes (grey polygons) and fires (red triangles), 24-hour rolling average $PM_{2.5}$ concentrations (circles), and HYSPLIT back-trajectories of release heights at 100 m (green lines), 1500 m (blue lines), and 3000 m (red lines) for 0 AM EST on July 1, 2023 (top), 12 PM EST on July 1, 2023 (middle), and 0 AM EST on July 2, 2023 (bottom).

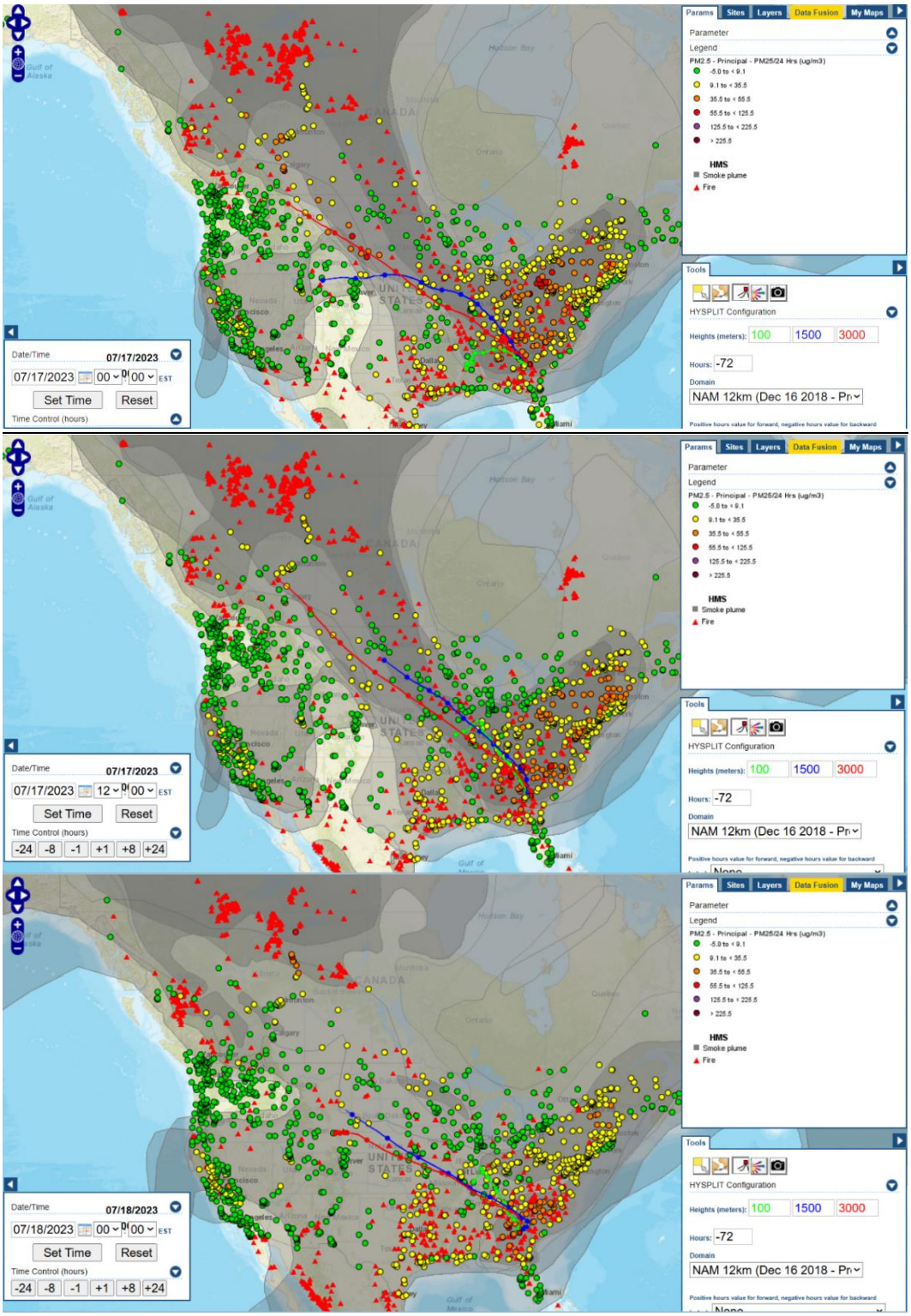


Figure C10. Map of HMS smoke plumes (grey polygons) and fires (red triangles), 24-hour rolling average $PM_{2.5}$ concentrations (circles), and HYSPLIT back-trajectories of release heights at 100 m (green lines), 1500 m (blue lines), and 3000 m (red lines) for 0 AM EST on July 17, 2023 (top), 12 PM EST on July 17, 2023 (middle), and 0 AM EST on July 18, 2023 (bottom).

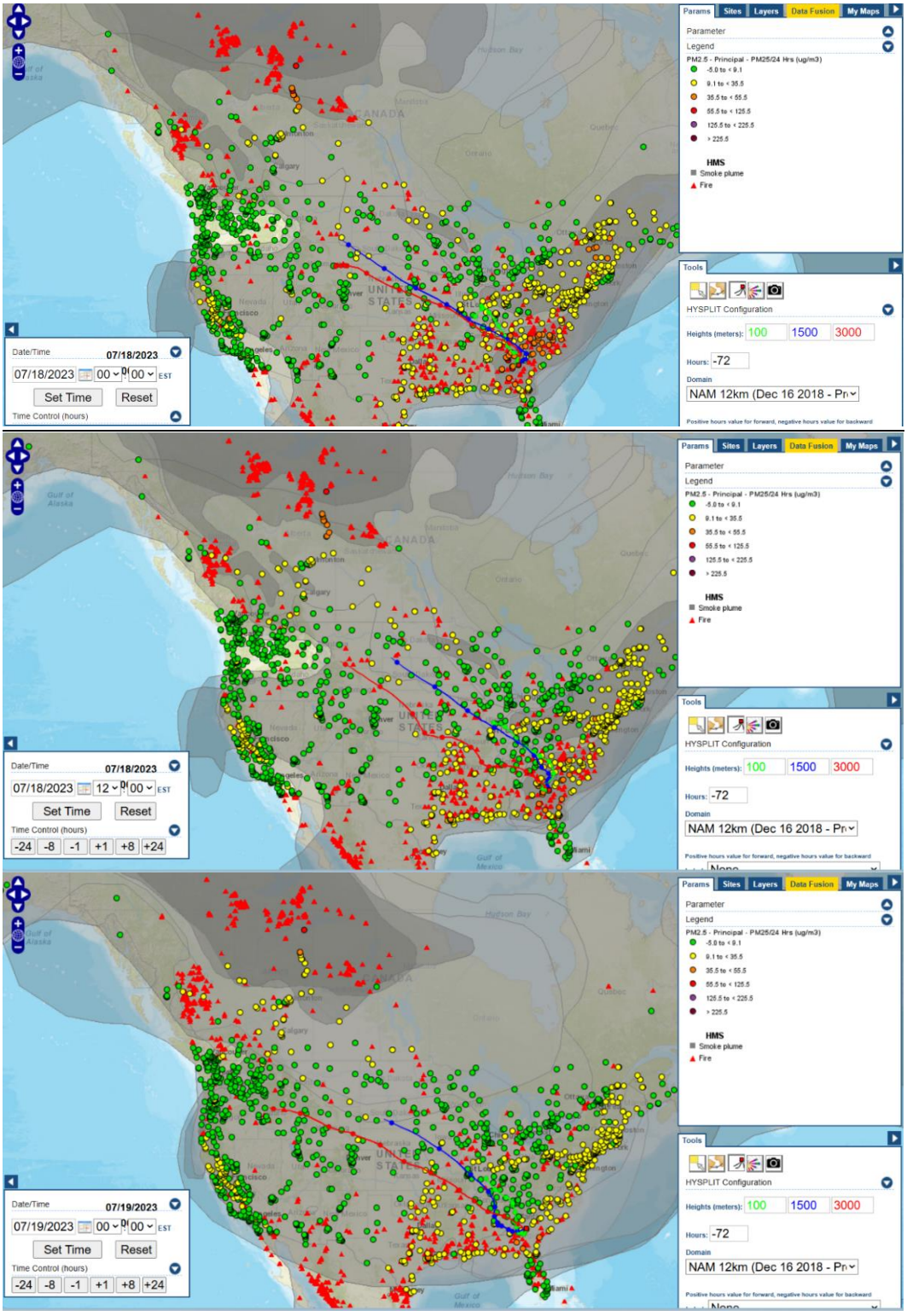


Figure C11. Map of HMS smoke plumes (grey polygons) and fires (red triangles), 24-hour rolling average $PM_{2.5}$ concentrations (circles), and HYSPLIT back-trajectories of release heights at 100 m (green lines), 1500 m (blue lines), and 3000 m (red lines) for 0 AM EST on July 18, 2023 (top), 12 PM EST on July 18, 2023 (middle), and 0 AM EST on July 19, 2023 (bottom).

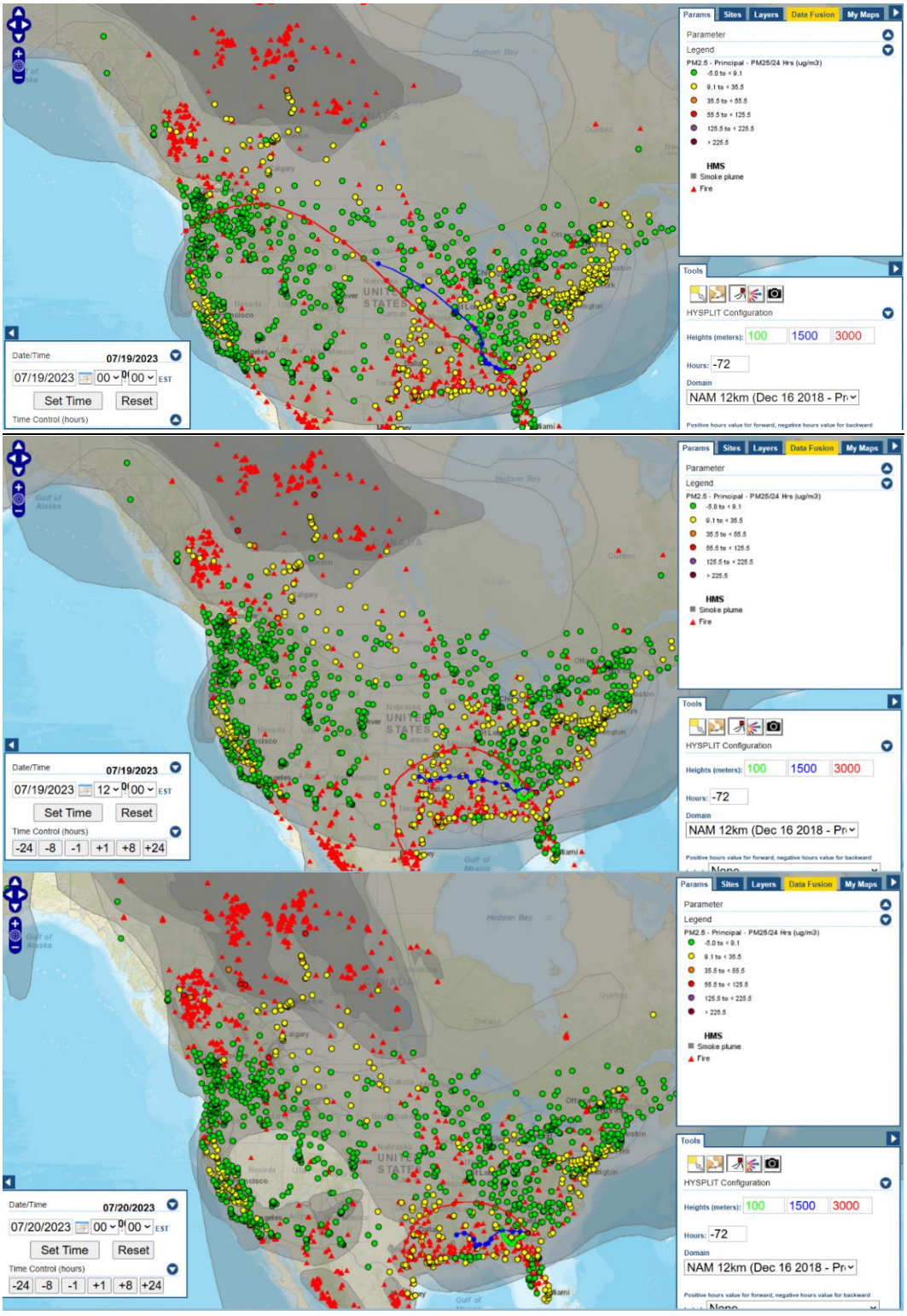


Figure C12. Map of HMS smoke plumes (grey polygons) and fires (red triangles), 24-hour rolling average $PM_{2.5}$ concentrations (circles), and HYSPLIT back-trajectories of release heights at 100 m (green lines), 1500 m (blue lines), and 3000 m (red lines) for 0 AM EST on July 19, 2023 (top), 12 PM EST on July 19, 2023 (middle), and 0 AM EST on July 20, 2023 (bottom).

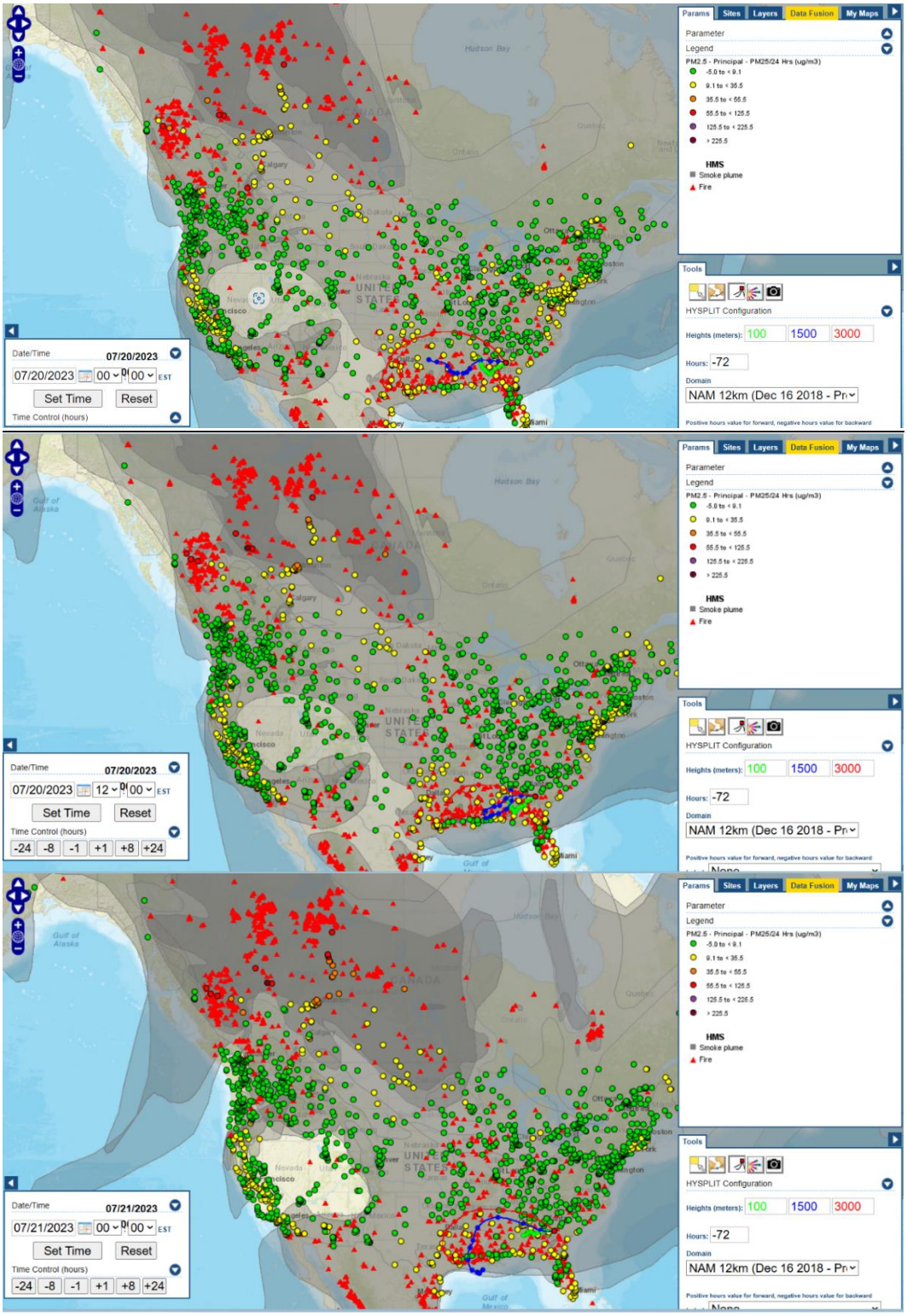


Figure C13. Map of HMS smoke plumes (grey polygons) and fires (red triangles), 24-hour rolling average $PM_{2.5}$ concentrations (circles), and HYSPLIT back-trajectories of release heights at 100 m (green lines), 1500 m (blue lines), and 3000 m (red lines) for 0 AM EST on July 20, 2023 (top), 12 PM EST on July 20, 2023 (middle), and 0 AM EST on July 21, 2023 (bottom).

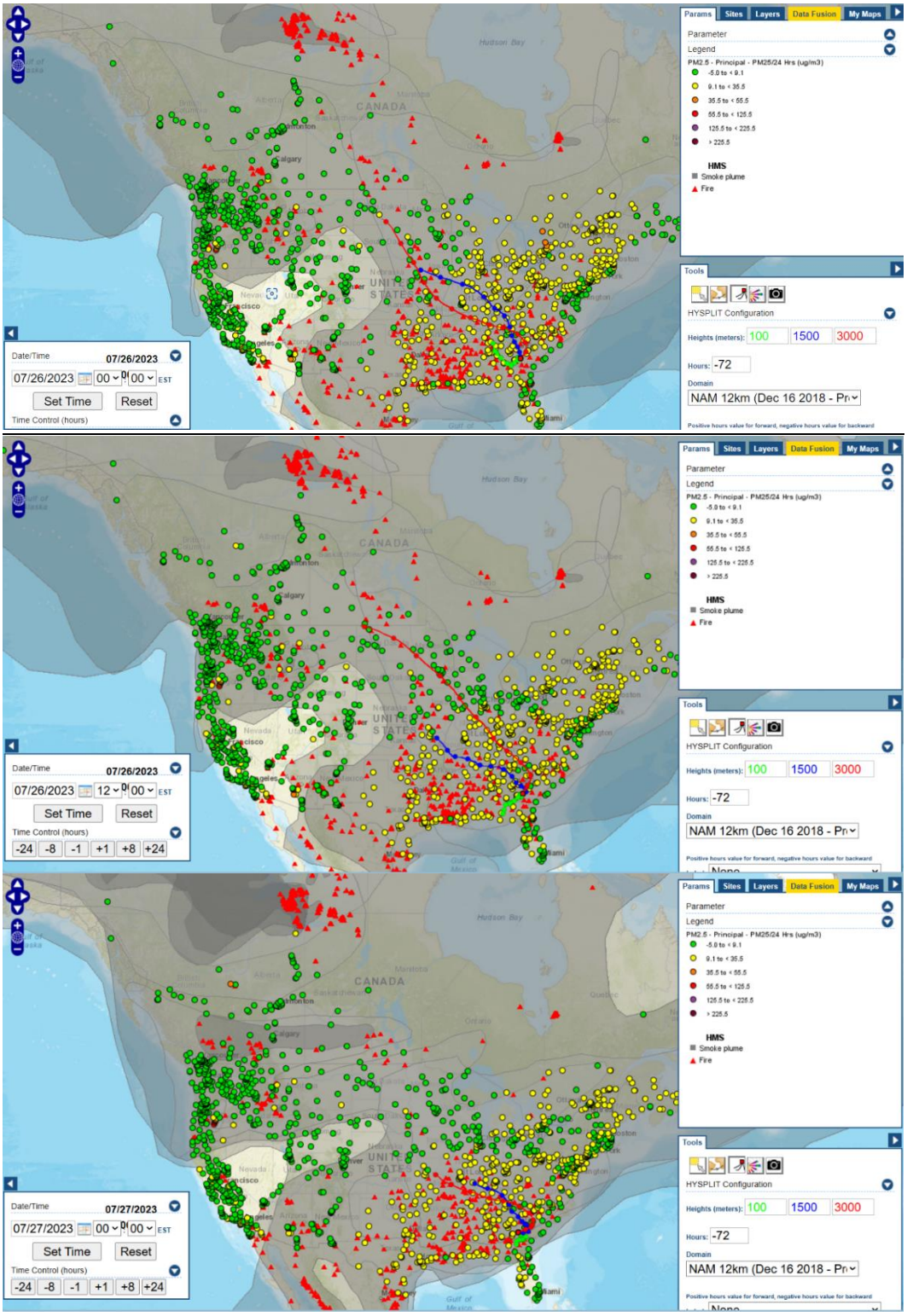


Figure C14. Map of HMS smoke plumes (grey polygons) and fires (red triangles), 24-hour rolling average $PM_{2.5}$ concentrations (circles), and HYSPLIT back-trajectories of release heights at 100 m (green lines), 1500 m (blue lines), and 3000 m (red lines) for 0 AM EST on July 26, 2023 (top), 12 PM EST on July 26, 2023 (middle), and 0 AM EST on July 27, 2023 (bottom).

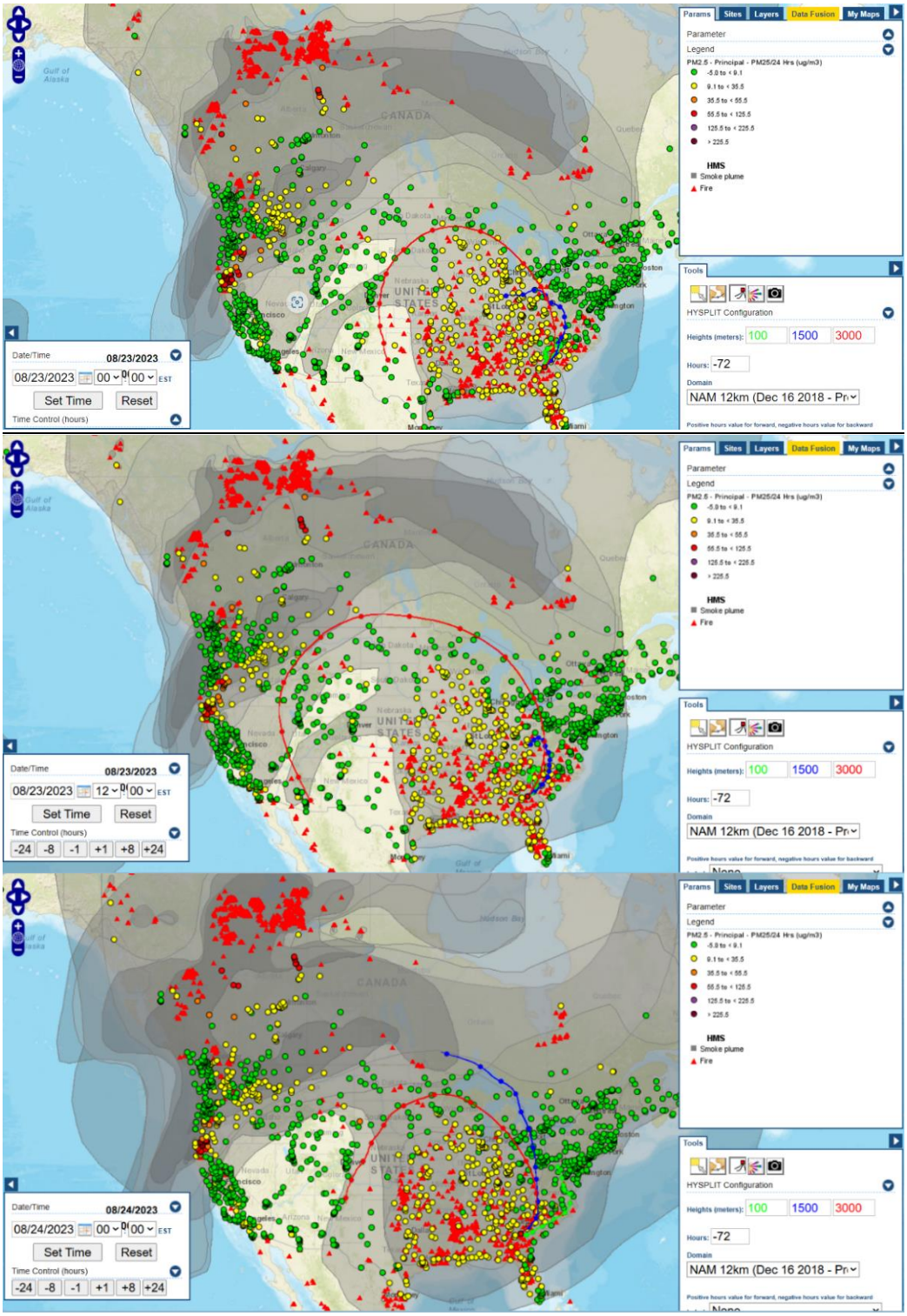


Figure C15. Map of HMS smoke plumes (grey polygons) and fires (red triangles), 24-hour rolling average $PM_{2.5}$ concentrations (circles), and HYSPLIT back-trajectories of release heights at 100 m (green lines), 1500 m (blue lines), and 3000 m (red lines) for 0 AM EST on August 23, 2023 (top), 12 PM EST on August 23, 2023 (middle), and 0 AM EST on August 24, 2023 (bottom).

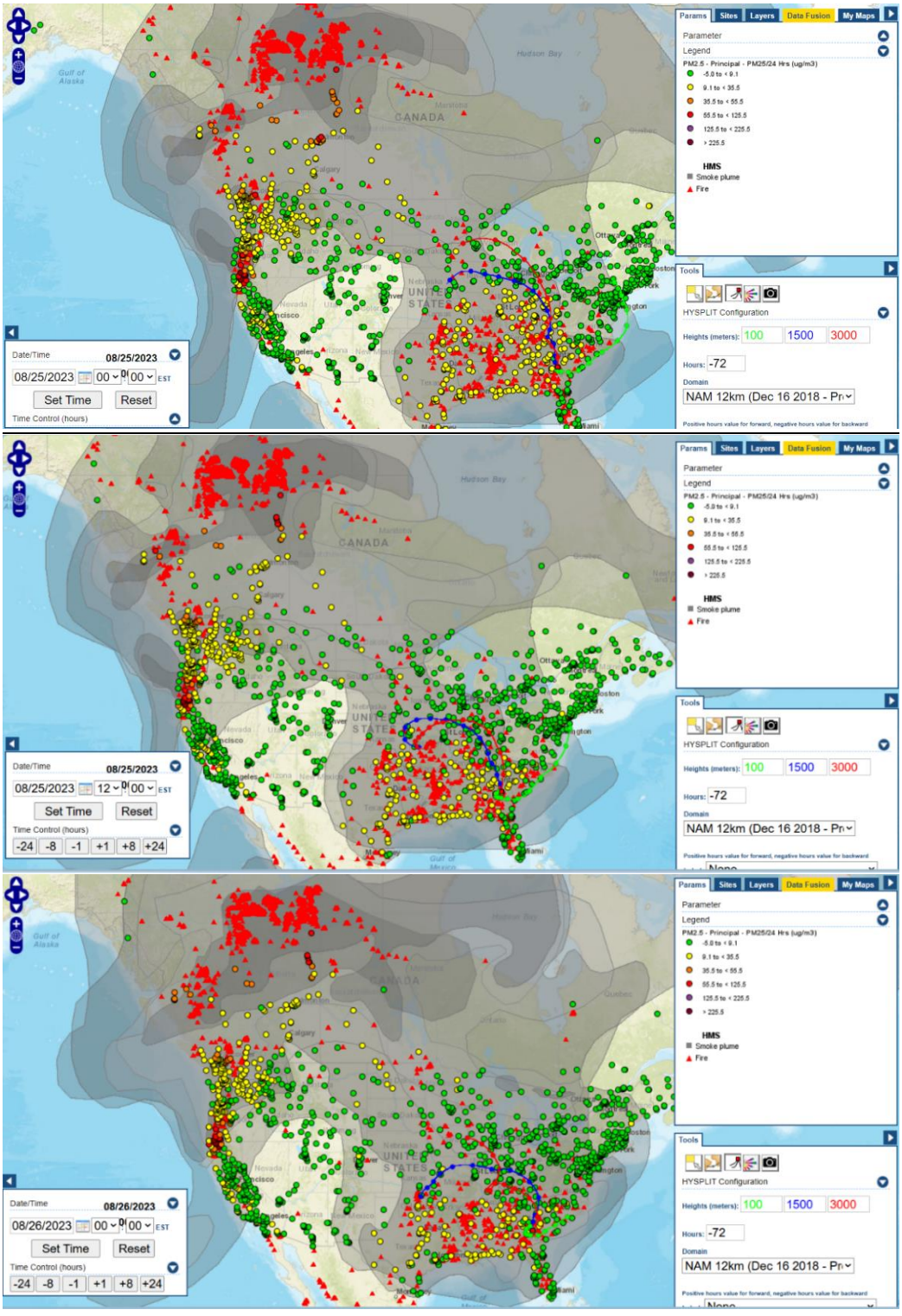


Figure C16. Map of HMS smoke plumes (grey polygons) and fires (red triangles), 24-hour rolling average $PM_{2.5}$ concentrations (circles), and HYSPLIT back-trajectories of release heights at 100 m (green lines), 1500 m (blue lines), and 3000 m (red lines) for 0 AM EST on August 25, 2023 (top), 12 PM EST on August 25, 2023 (middle), and 0 AM EST on August 26, 2023 (bottom).

Appendix D: $PM_{2.5}$ Surface Concentrations in the Southeast

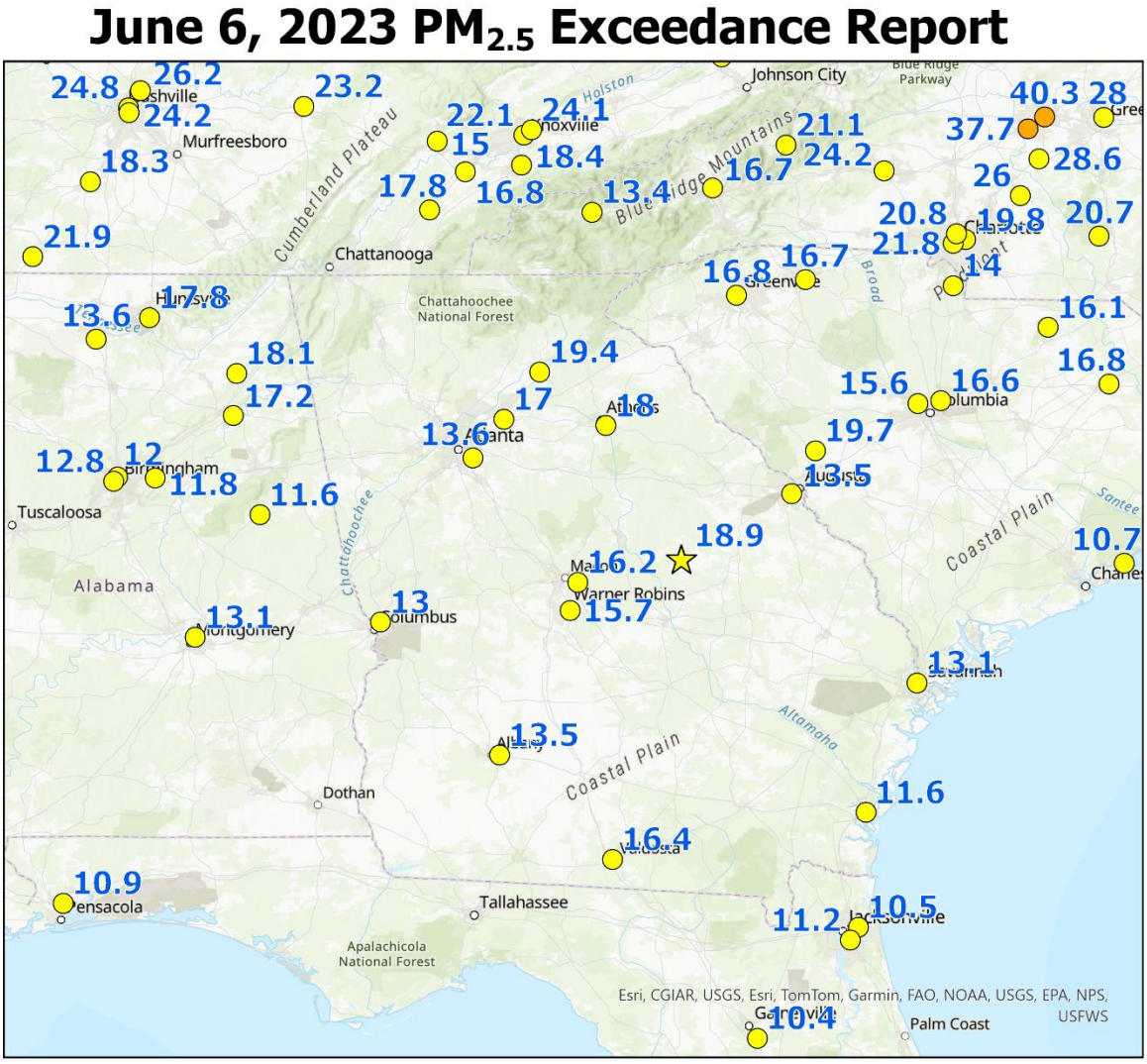
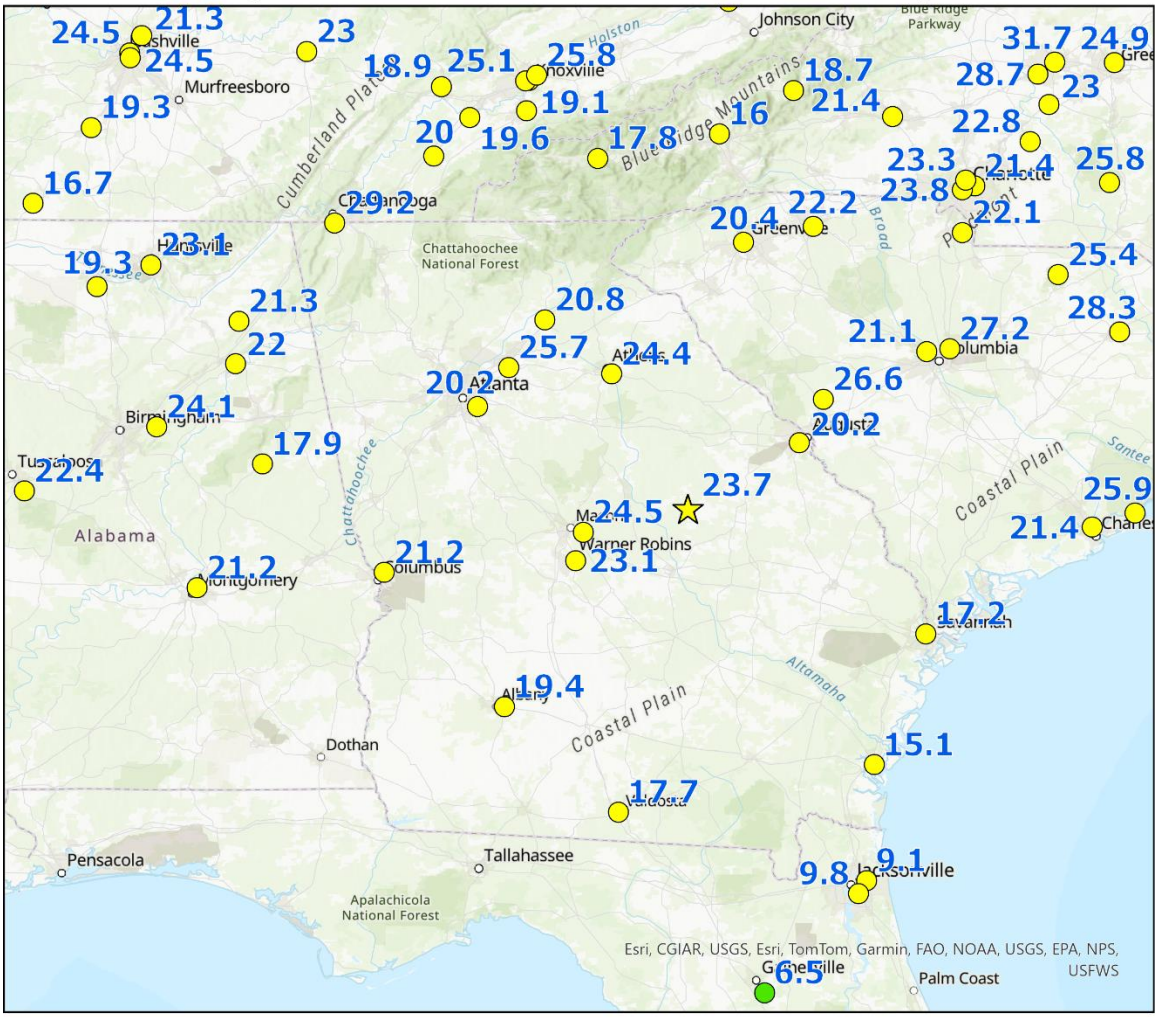


Figure D1. Surface level, daily $PM_{2.5}$ concentrations on June 6, 2023, across the southeast. The Sandersville site is represented by a star. Numerous sites measured concentrations that exceeded the level of annual $PM_{2.5}$ NAAQS.

June 9, 2023 $PM_{2.5}$ Exceedance Report



AQI category - 24-hr average $PM_{2.5}$

- Good (0-9 ug/m^3)
- Moderate (9.1-35.4 ug/m^3)
- Unhealthy for sensitive (35.5-55.4 ug/m^3)
- Unhealthy (55.5-150.4 ug/m^3)
- Very unhealthy (150.4-250.4 ug/m^3)
- Hazardous (>250.4 ug/m^3)

Figure D2. Surface level, daily $PM_{2.5}$ concentrations on June 9, 2023, across the southeast. The Sandersville site is represented by a star. Numerous sites measured concentrations that exceeded the level of annual $PM_{2.5}$ NAAQS.

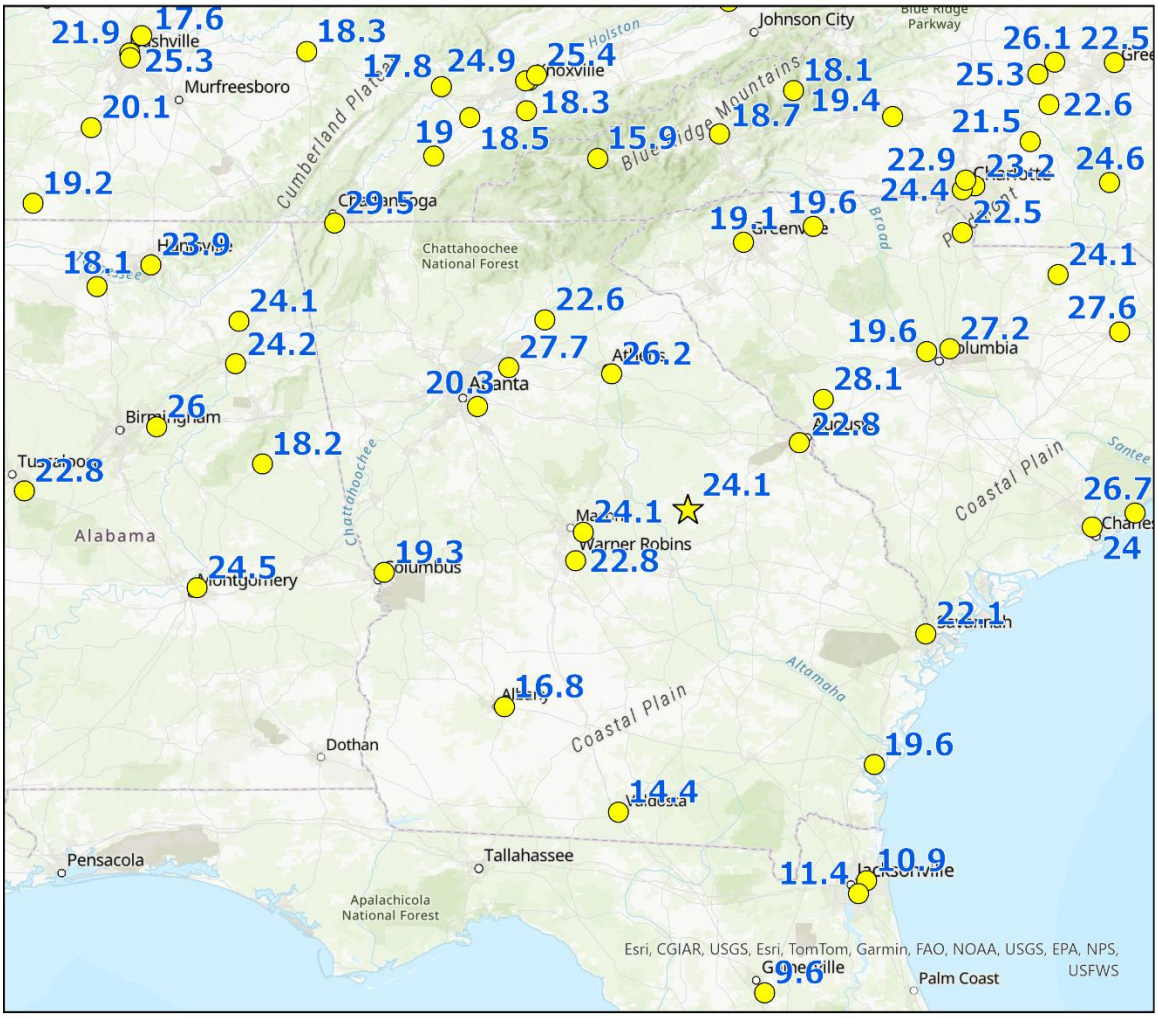


Figure D3. Surface level, daily $PM_{2.5}$ concentrations on June 10, 2023, across the southeast. The Sandersville site is represented by a star. Numerous sites measured concentrations that exceeded the level of annual $PM_{2.5}$ NAAQS.

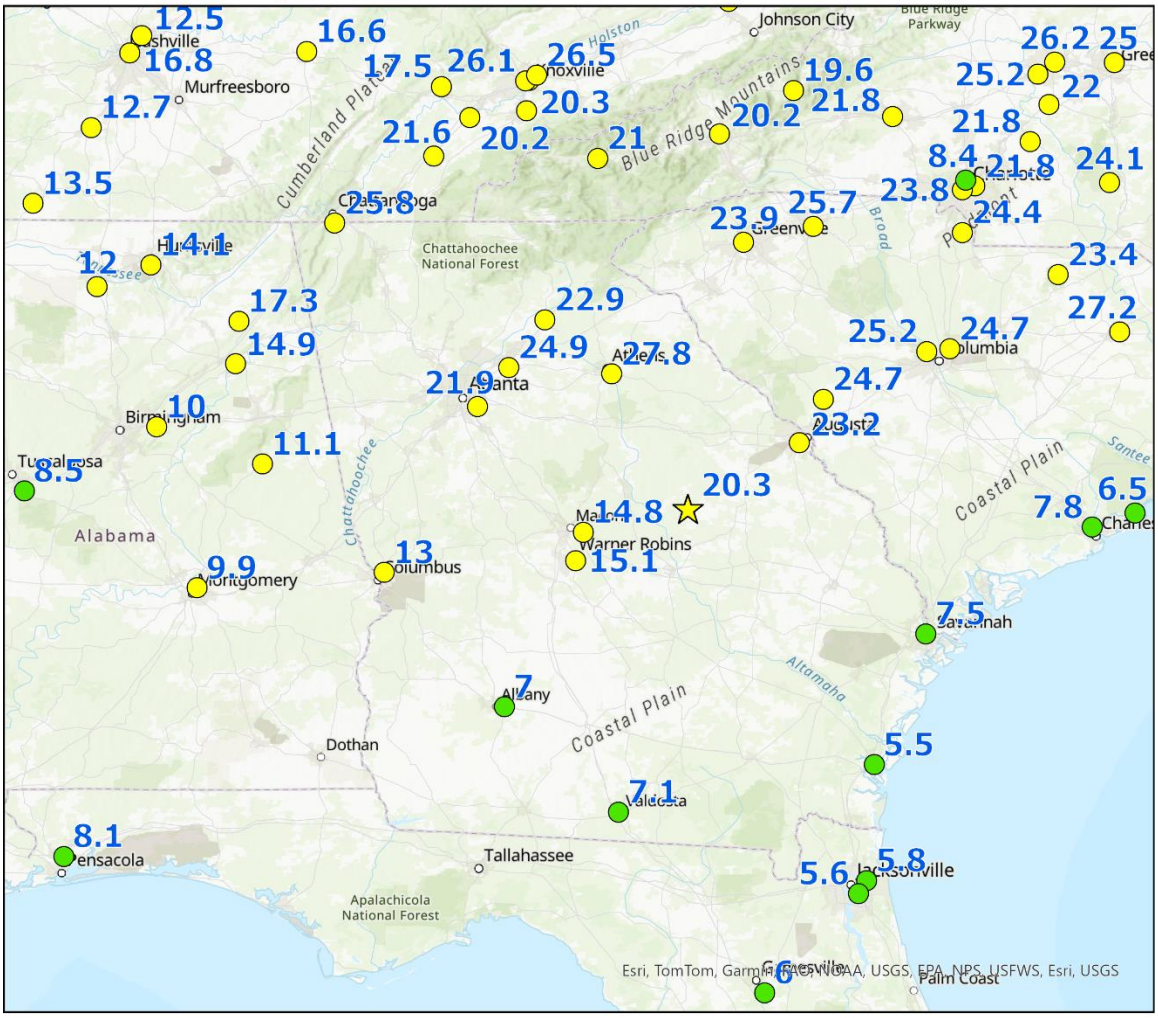
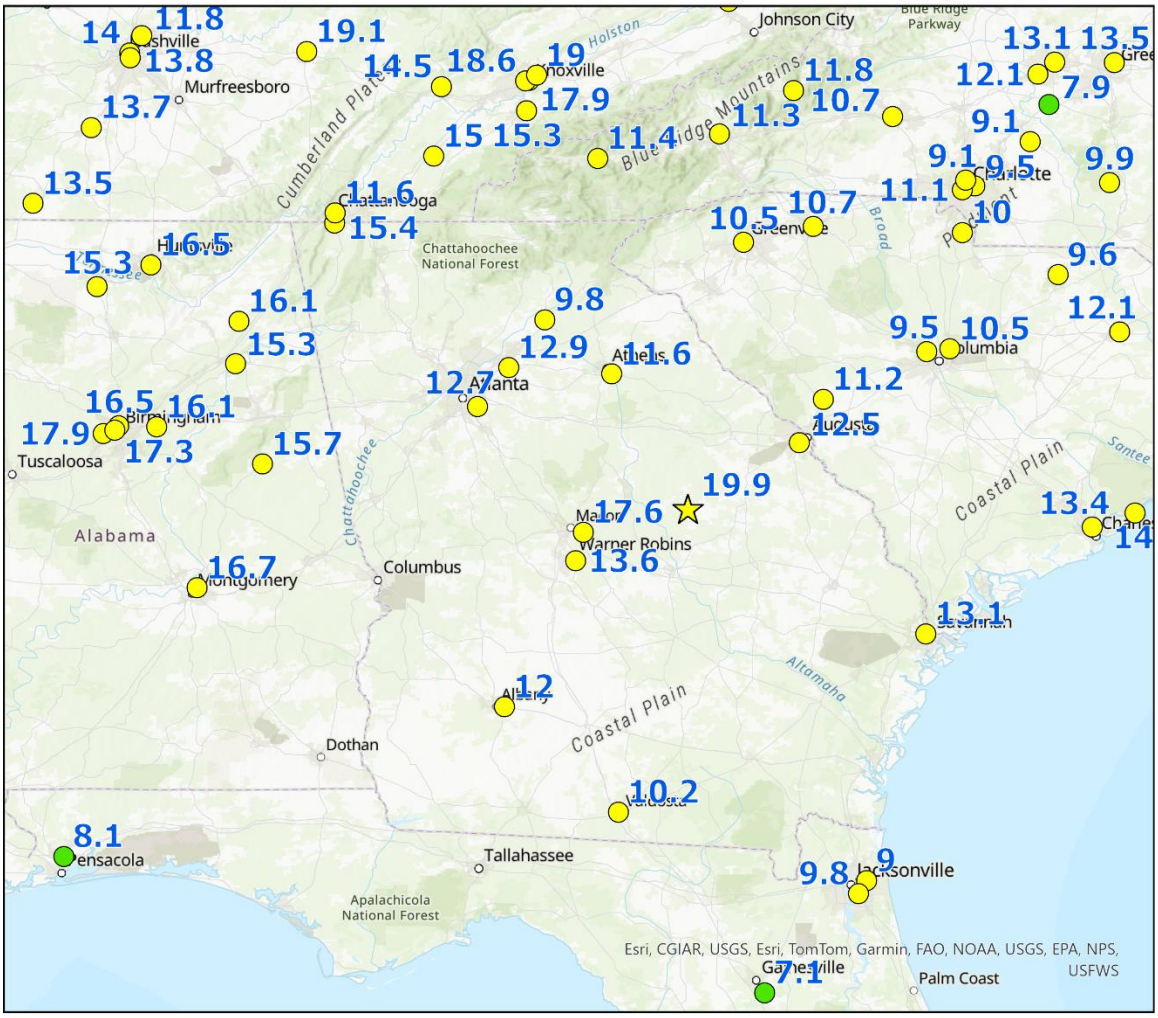


Figure D4. Surface level, daily $PM_{2.5}$ concentrations on June 18, 2023, across the southeast. The Sandersville site is represented by a star. Numerous sites measured concentrations that exceeded the level of annual $PM_{2.5}$ NAAQS.

June 27, 2023 $PM_{2.5}$ Exceedance Report



AQI category - 24-hr average $PM_{2.5}$

- Good (0-9 ug/m^3)
- Moderate (9.1-35.4 ug/m^3)
- Unhealthy for sensitive (35.5-55.4 ug/m^3)
- Unhealthy (55.5-150.4 ug/m^3)
- Very unhealthy (150.4-250.4 ug/m^3)
- Hazardous (>250.4 ug/m^3)

Figure D5. Surface level, daily $PM_{2.5}$ concentrations on June 27, 2023, across the southeast. The Sandersville site is represented by a star. Numerous sites measured concentrations that exceeded the level of annual $PM_{2.5}$ NAAQS.

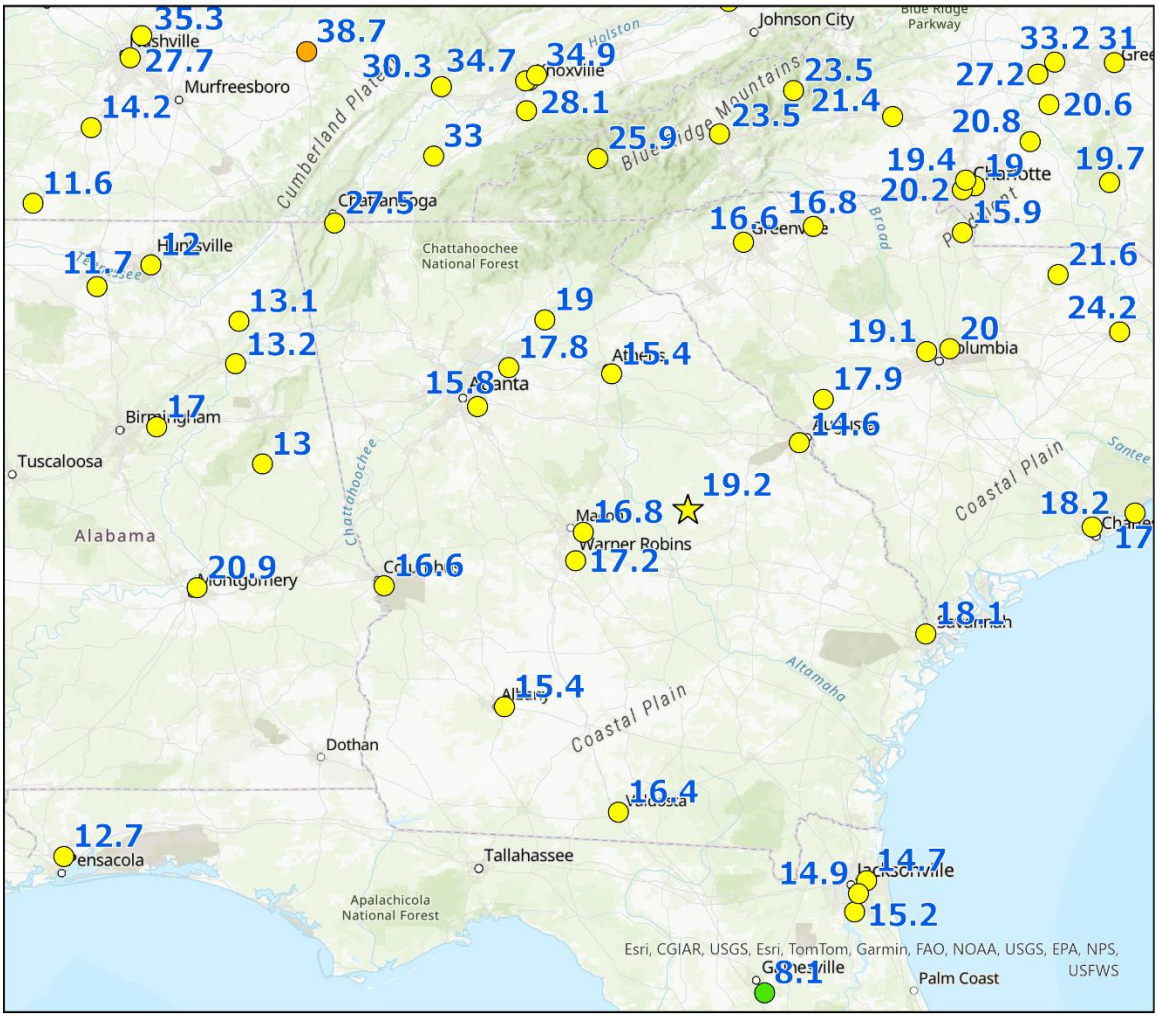


Figure D6. Surface level, daily $PM_{2.5}$ concentrations on June 28, 2023, across the southeast. The Sandersville site is represented by a star. Numerous sites measured concentrations that exceeded the level of annual $PM_{2.5}$ NAAQS.

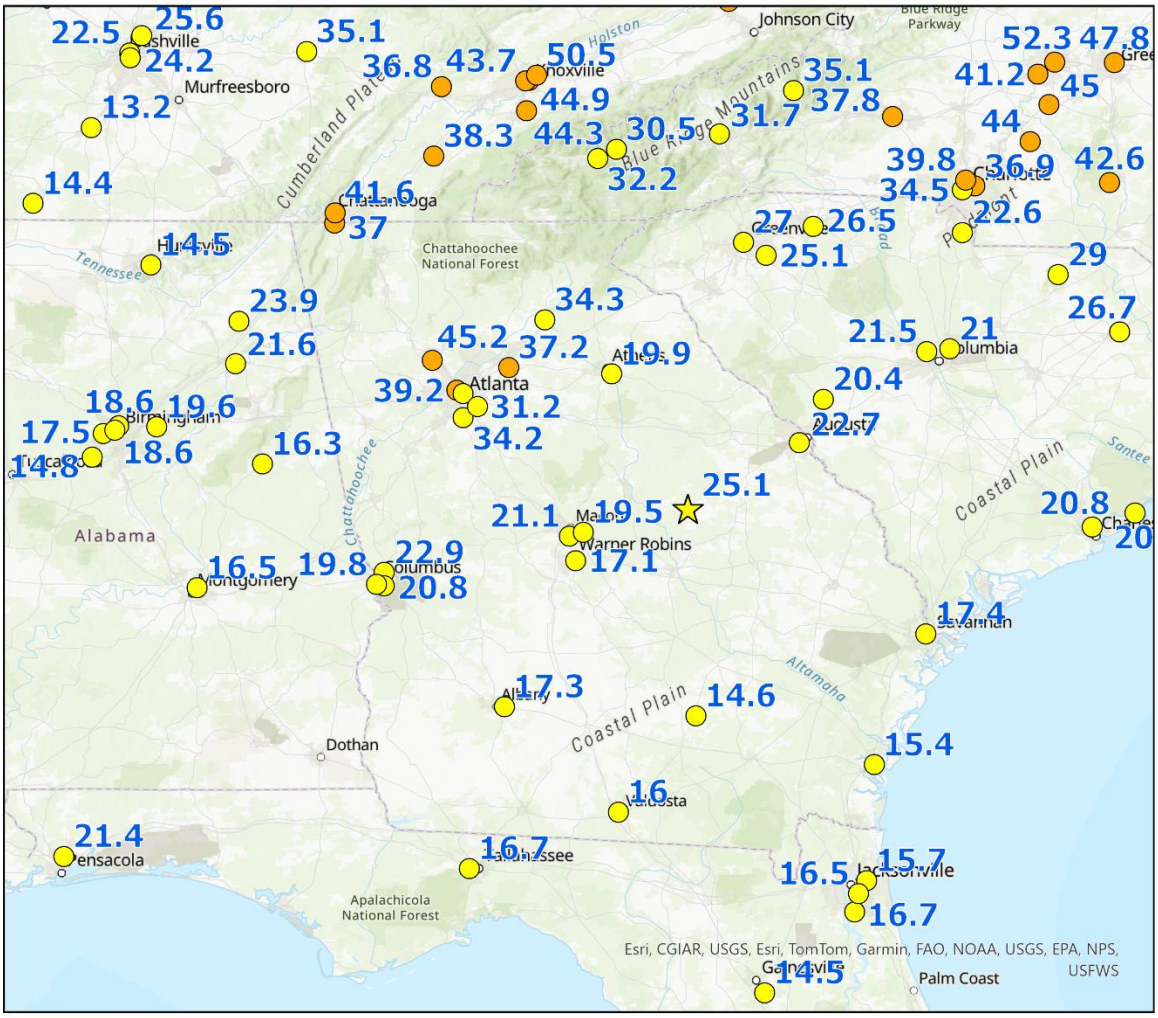


Figure D7. Surface level, daily $PM_{2.5}$ concentrations on June 29, 2023, across the southeast. The Sandersville site is represented by a star. Numerous sites measured concentrations that exceeded the level of annual $PM_{2.5}$ NAAQS.

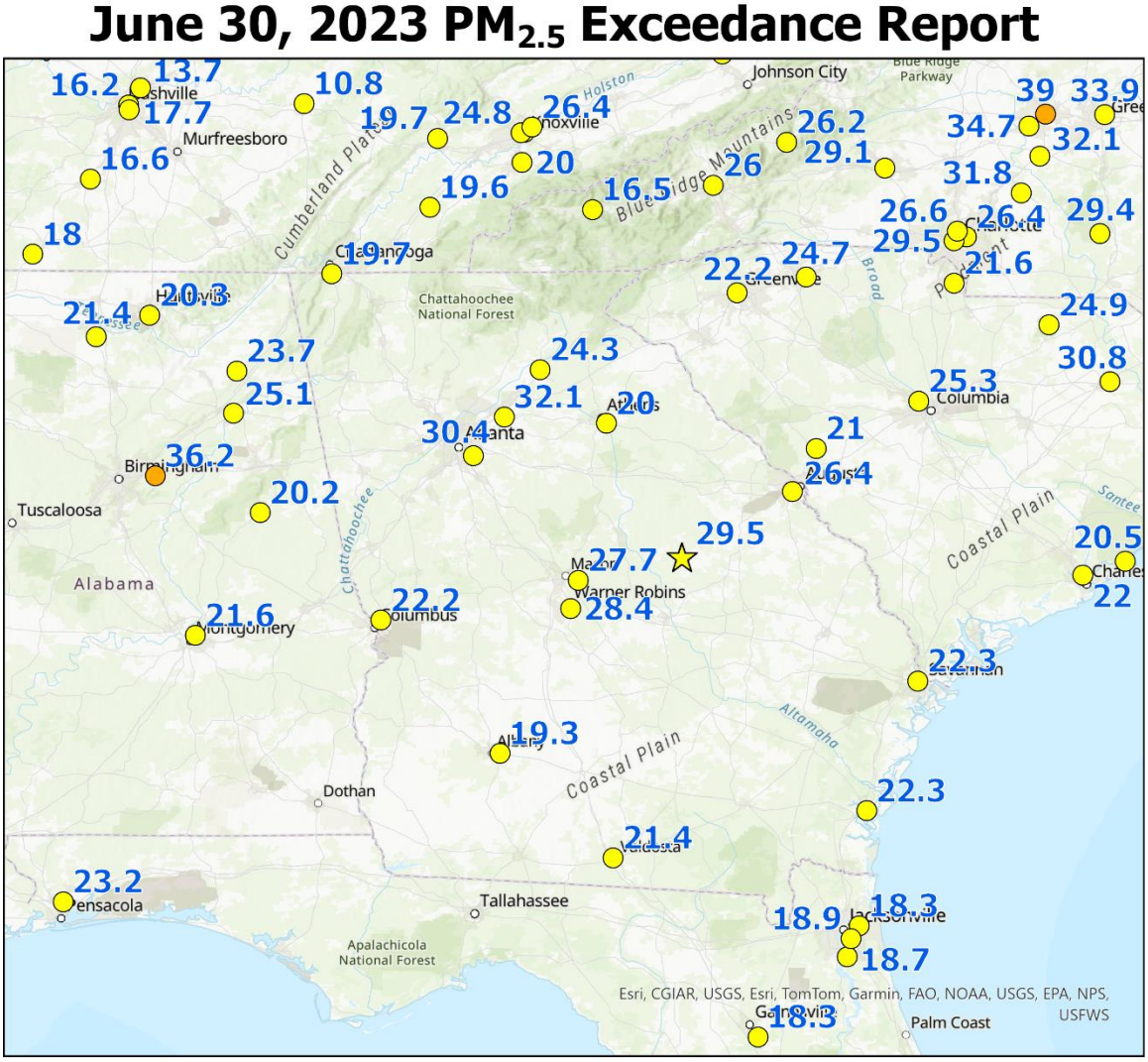


Figure D8. Surface level, daily $PM_{2.5}$ concentrations on June 30, 2023, across the southeast. The Sandersville site is represented by a star. Numerous sites measured concentrations that exceeded the level of annual $PM_{2.5}$ NAAQS.

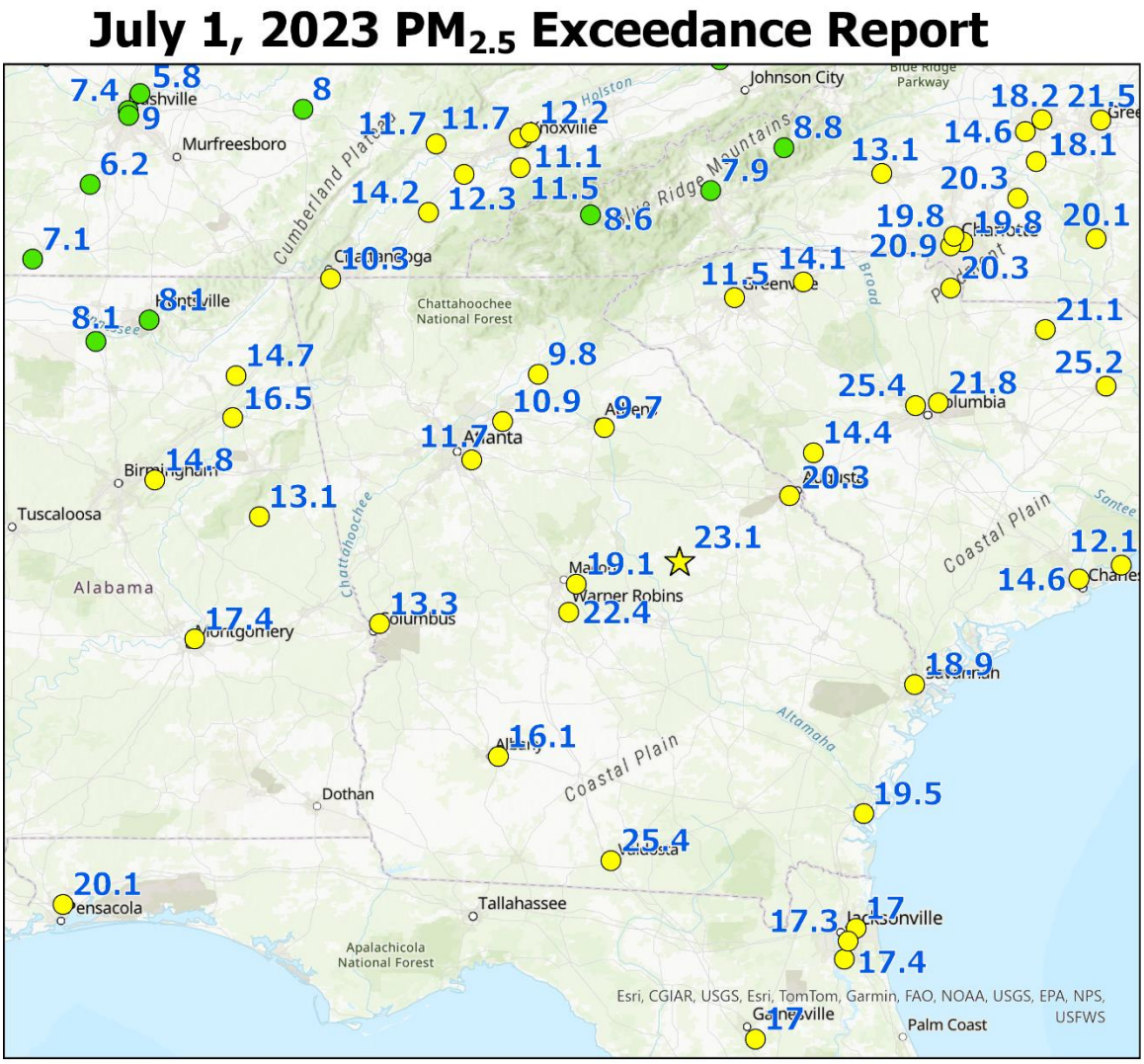
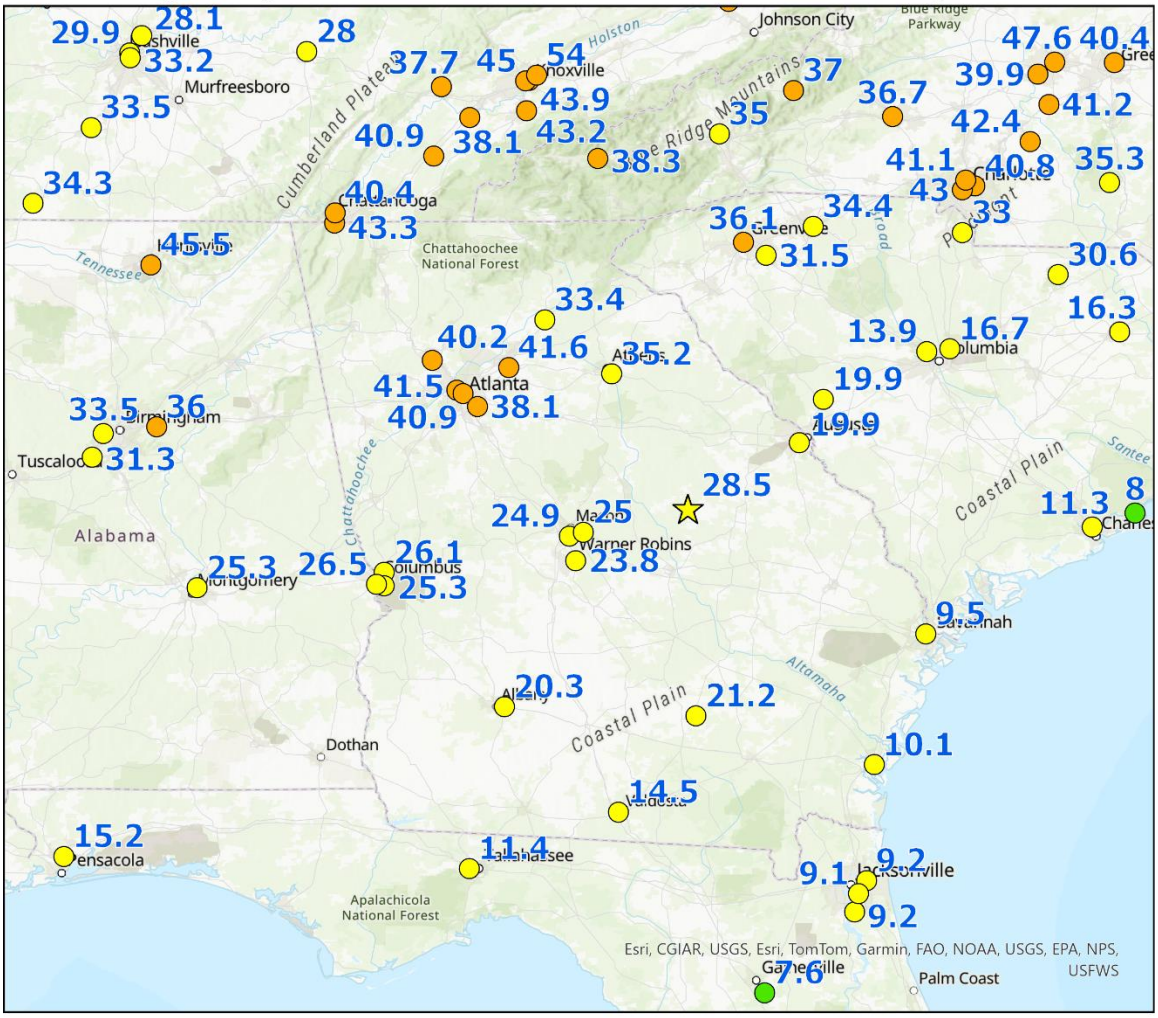


Figure D9. Surface level, daily $PM_{2.5}$ concentrations on July 1, 2023, across the southeast. The Sandersville site is represented by a star. Numerous sites measured concentrations that exceeded the level of annual $PM_{2.5}$ NAAQS.

July 17, 2023 $PM_{2.5}$ Exceedance Report

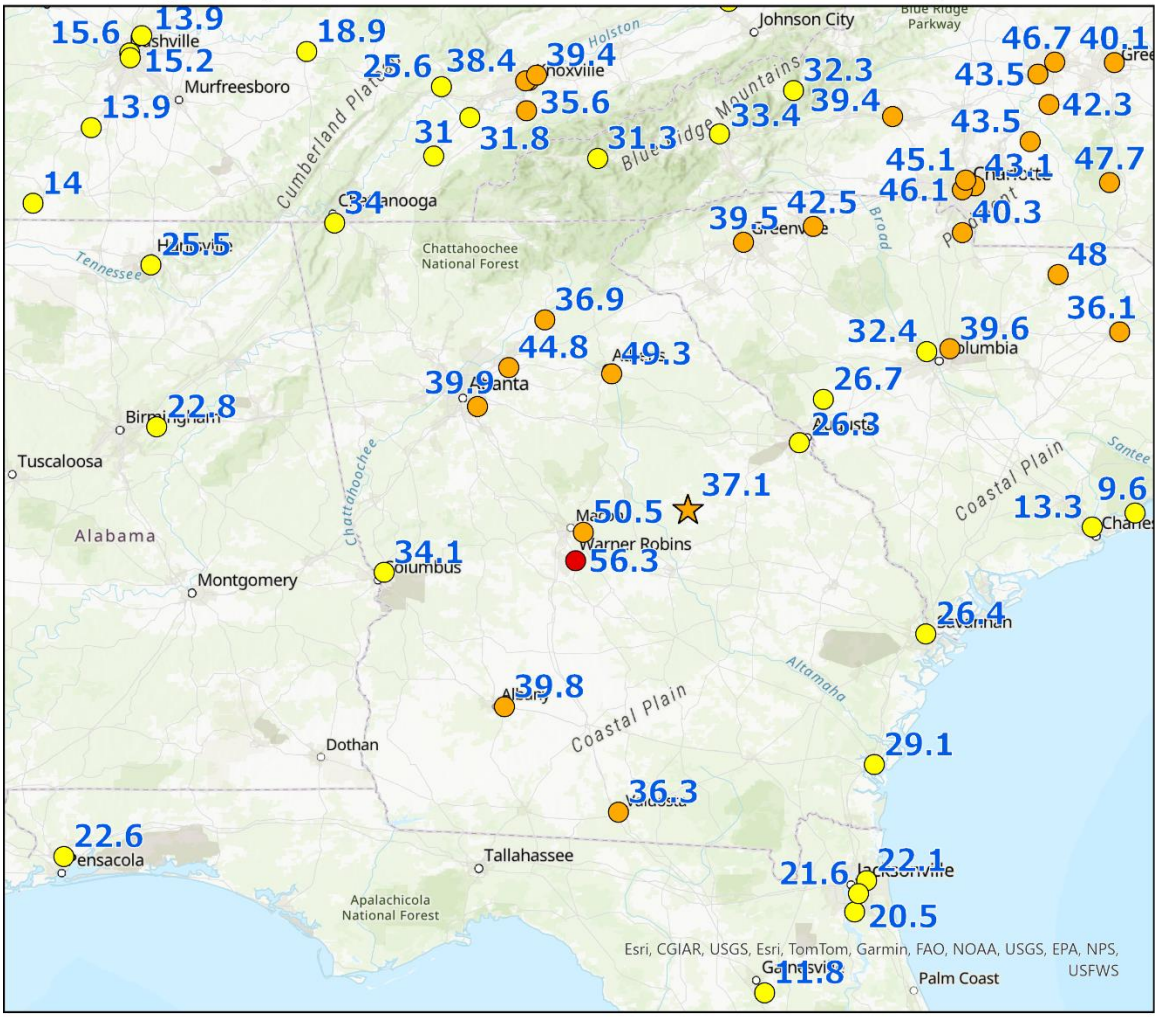


AQI category - 24-hr average $PM_{2.5}$

- Good (0-9 ug/m^3)
- Moderate (9.1-35.4 ug/m^3)
- Unhealthy for sensitive (35.5-55.4 ug/m^3)
- Unhealthy (55.5-150.4 ug/m^3)
- Very unhealthy (150.4-250.4 ug/m^3)
- Hazardous (>250.4 ug/m^3)

Figure D10. Surface level, daily $PM_{2.5}$ concentrations on July 17, 2023, across the southeast. The Sandersville site is represented by a star. Numerous sites measured concentrations that exceeded the level of annual $PM_{2.5}$ NAAQS.

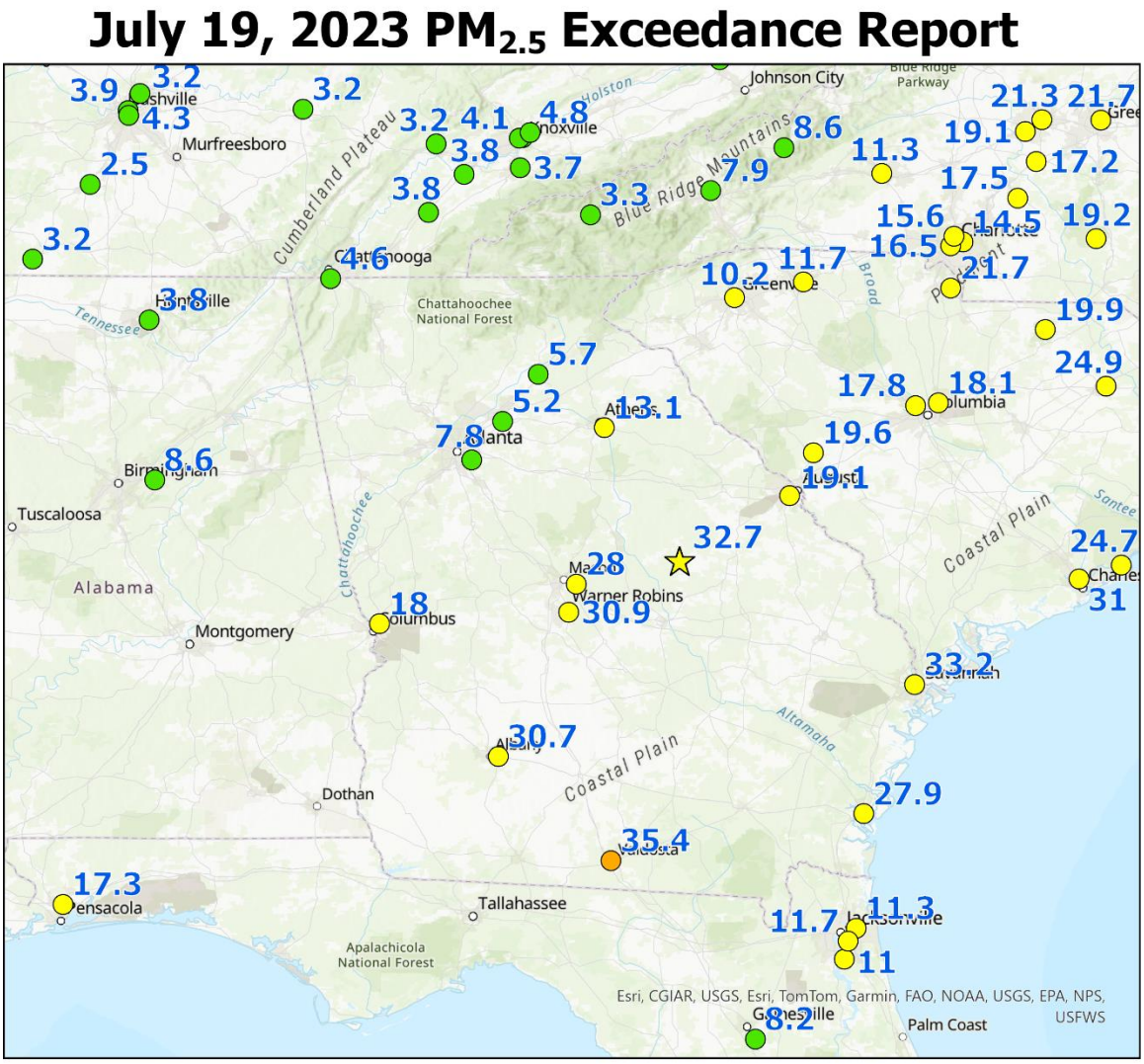
July 18, 2023 $PM_{2.5}$ Exceedance Report



AQI category - 24-hr average $PM_{2.5}$

- Good (0-9 ug/m^3)
- Moderate (9.1-35.4 ug/m^3)
- Unhealthy for sensitive (35.5-55.4 ug/m^3)
- Unhealthy (55.5-150.4 ug/m^3)
- Very unhealthy (150.4-250.4 ug/m^3)
- Hazardous (>250.4 ug/m^3)

Figure D11. Surface level, daily $PM_{2.5}$ concentrations on July 18, 2023, across the southeast. The Sandersville site is represented by a star. Numerous sites measured concentrations that exceeded the level of annual $PM_{2.5}$ NAAQS.

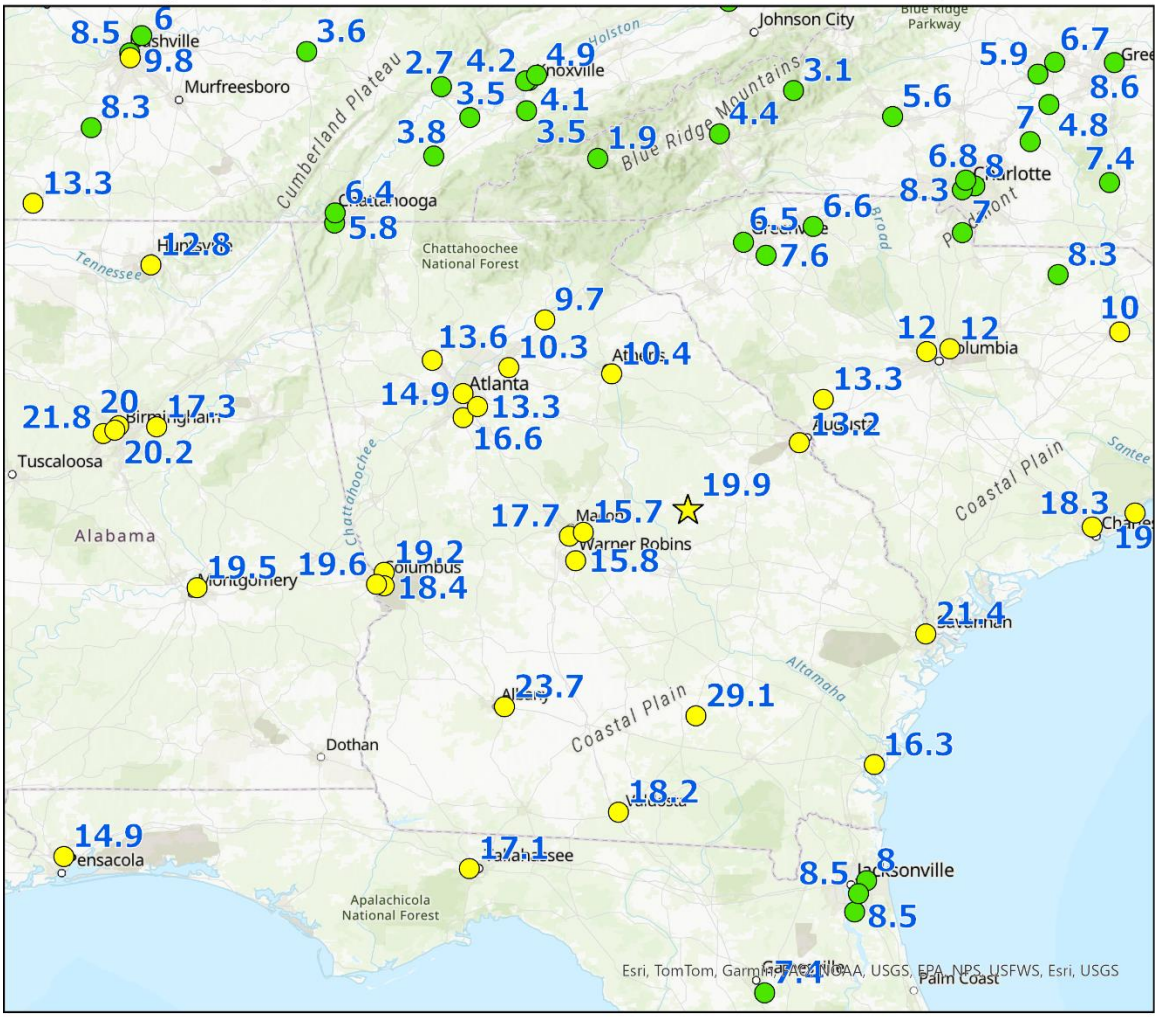


AQI category - 24-hr average $PM_{2.5}$

- Good (0-9 ug/m^3)
- Moderate (9.1-35.4 ug/m^3)
- Unhealthy for sensitive (35.5-55.4 ug/m^3)
- Unhealthy (55.5-150.4 ug/m^3)
- Very unhealthy (150.4-250.4 ug/m^3)
- Hazardous (>250.4 ug/m^3)

Figure D12. Surface level, daily $PM_{2.5}$ concentrations on July 19, 2023, across the southeast. The Sandersville site is represented by a star. Numerous sites measured concentrations that exceeded the level of annual $PM_{2.5}$ NAAQS.

July 20, 2023 $PM_{2.5}$ Exceedance Report

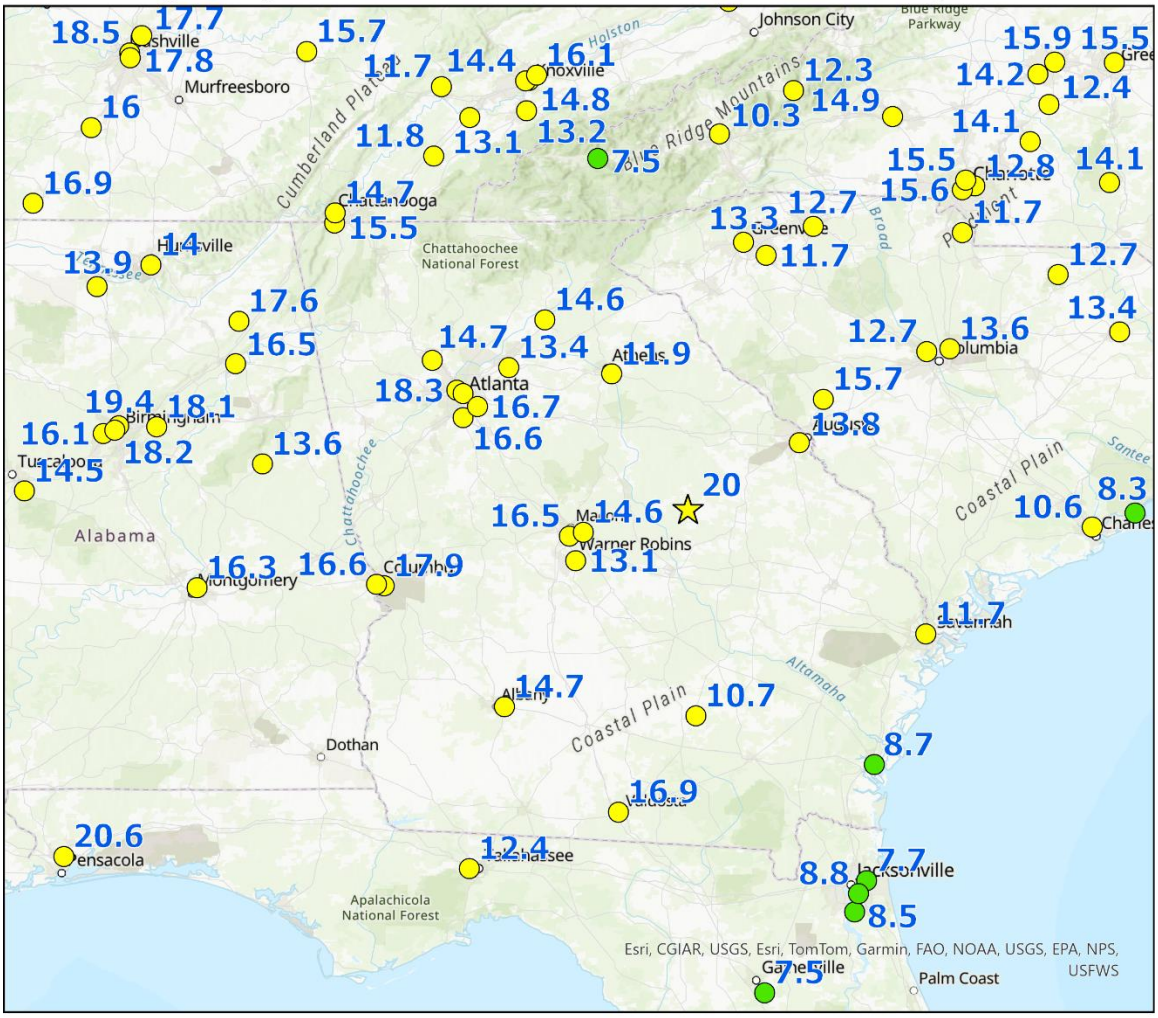


AQI category - 24-hr average $PM_{2.5}$

- Good (0-9 ug/m^3)
- Moderate (9.1-35.4 ug/m^3)
- Unhealthy for sensitive (35.5-55.4 ug/m^3)
- Unhealthy (55.5-150.4 ug/m^3)
- Very unhealthy (150.4-250.4 ug/m^3)
- Hazardous (>250.4 ug/m^3)

Figure D13. Surface level, daily $PM_{2.5}$ concentrations on July 20, 2023, across the southeast. The Sandersville site is represented by a star. Numerous sites measured concentrations that exceeded the level of annual $PM_{2.5}$ NAAQS.

July 26, 2023 $PM_{2.5}$ Exceedance Report



AQI category - 24-hr average $PM_{2.5}$

- Good (0-9 ug/m^3)
- Moderate (9.1-35.4 ug/m^3)
- Unhealthy for sensitive (35.5-55.4 ug/m^3)
- Unhealthy (55.5-150.4 ug/m^3)
- Very unhealthy (150.4-250.4 ug/m^3)
- Hazardous (>250.4 ug/m^3)

Figure D14. Surface level, daily $PM_{2.5}$ concentrations on July 26, 2023, across the southeast. The Sandersville site is represented by a star. Numerous sites measured concentrations that exceeded the level of annual $PM_{2.5}$ NAAQS.

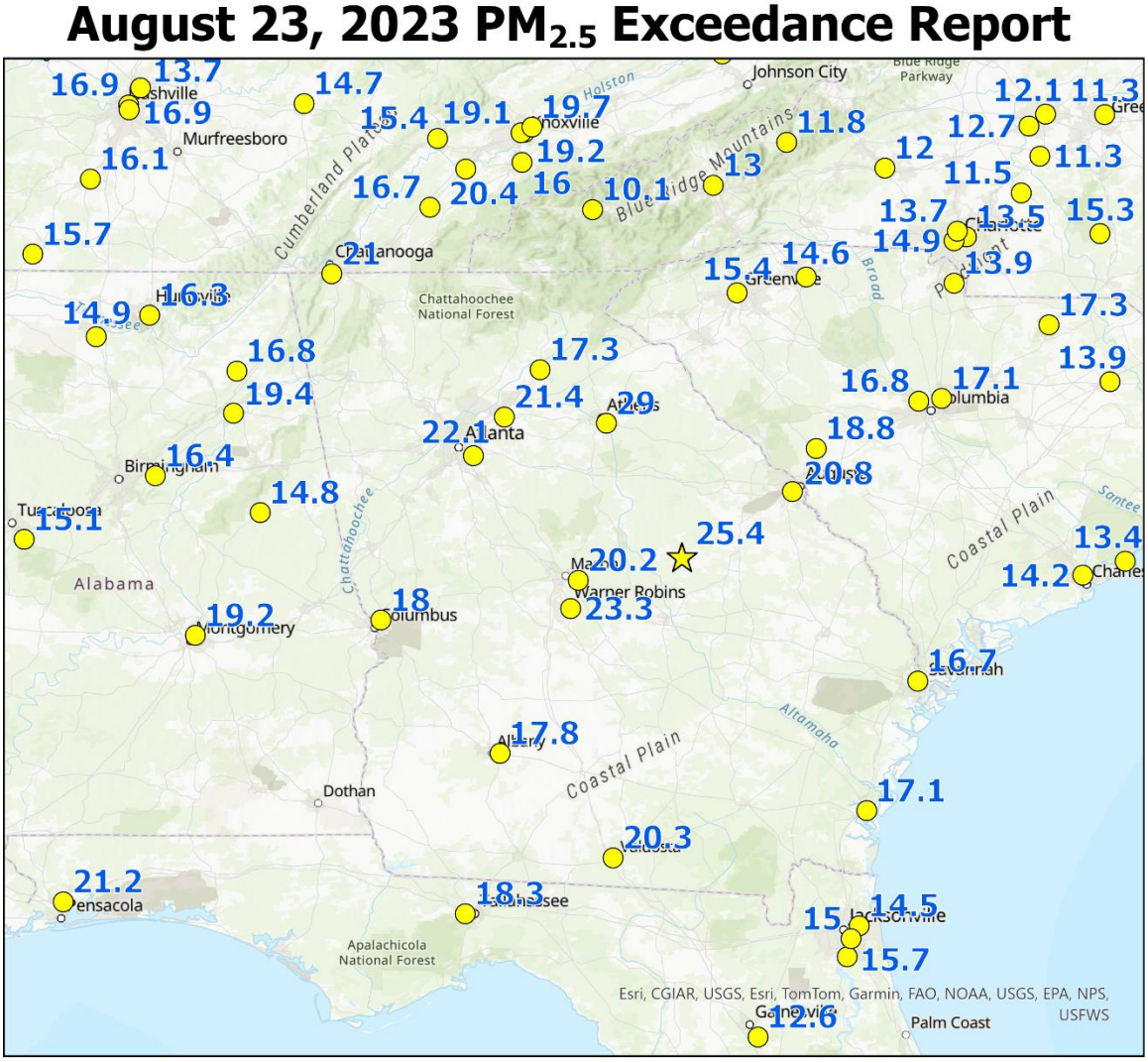


Figure D15. Surface level, daily $PM_{2.5}$ concentrations on August 23, 2023, across the southeast. The Sandersville site is represented by a star. Numerous sites measured concentrations that exceeded the level of annual $PM_{2.5}$ NAAQS.

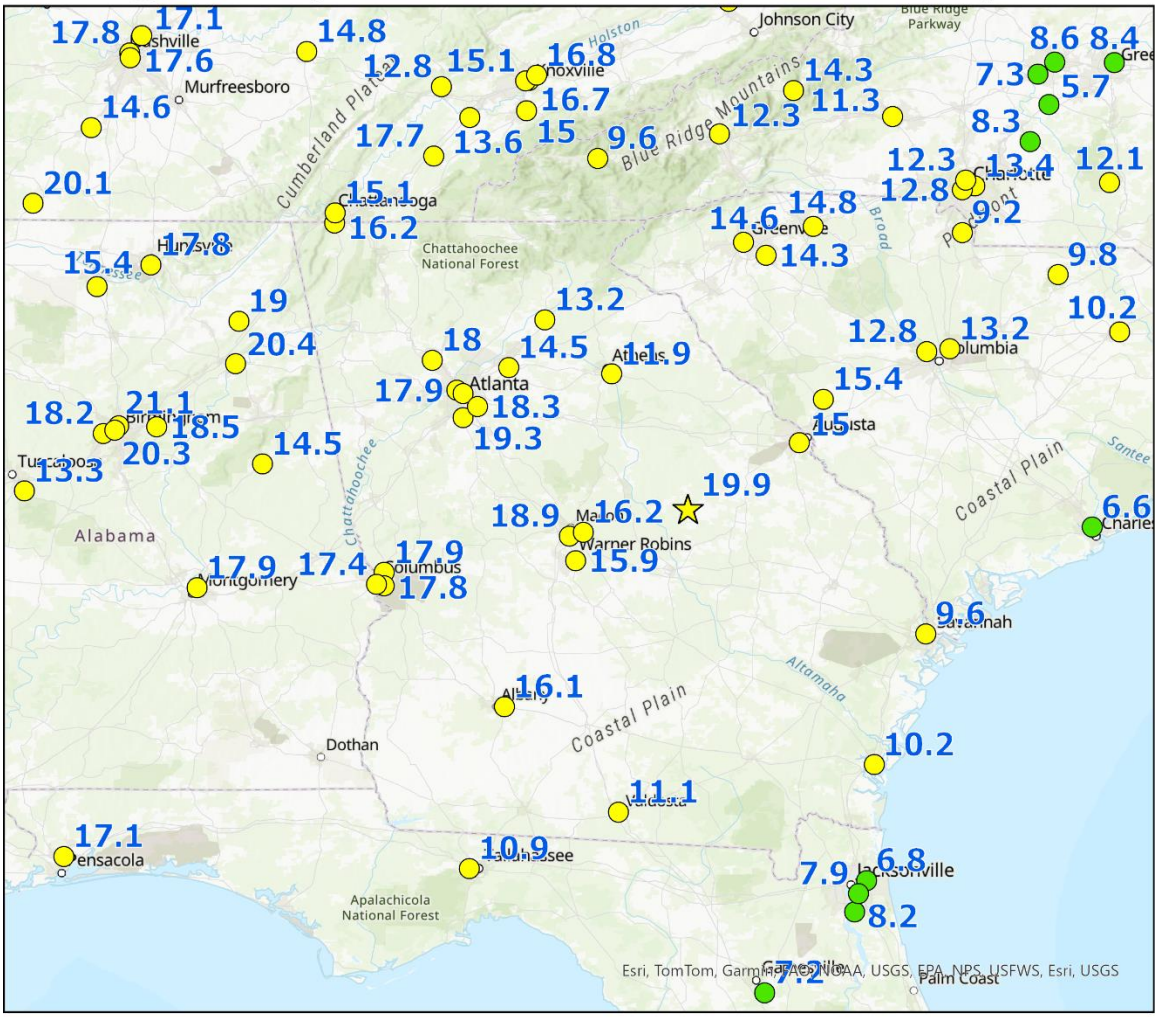


Figure D16. Surface level, daily $PM_{2.5}$ concentrations on August 25, 2023, across the southeast. The Sandersville site is represented by a star. Numerous sites measured concentrations that exceeded the level of annual $PM_{2.5}$ NAAQS.

Appendix E: Hourly $PM_{2.5}$ Time Series

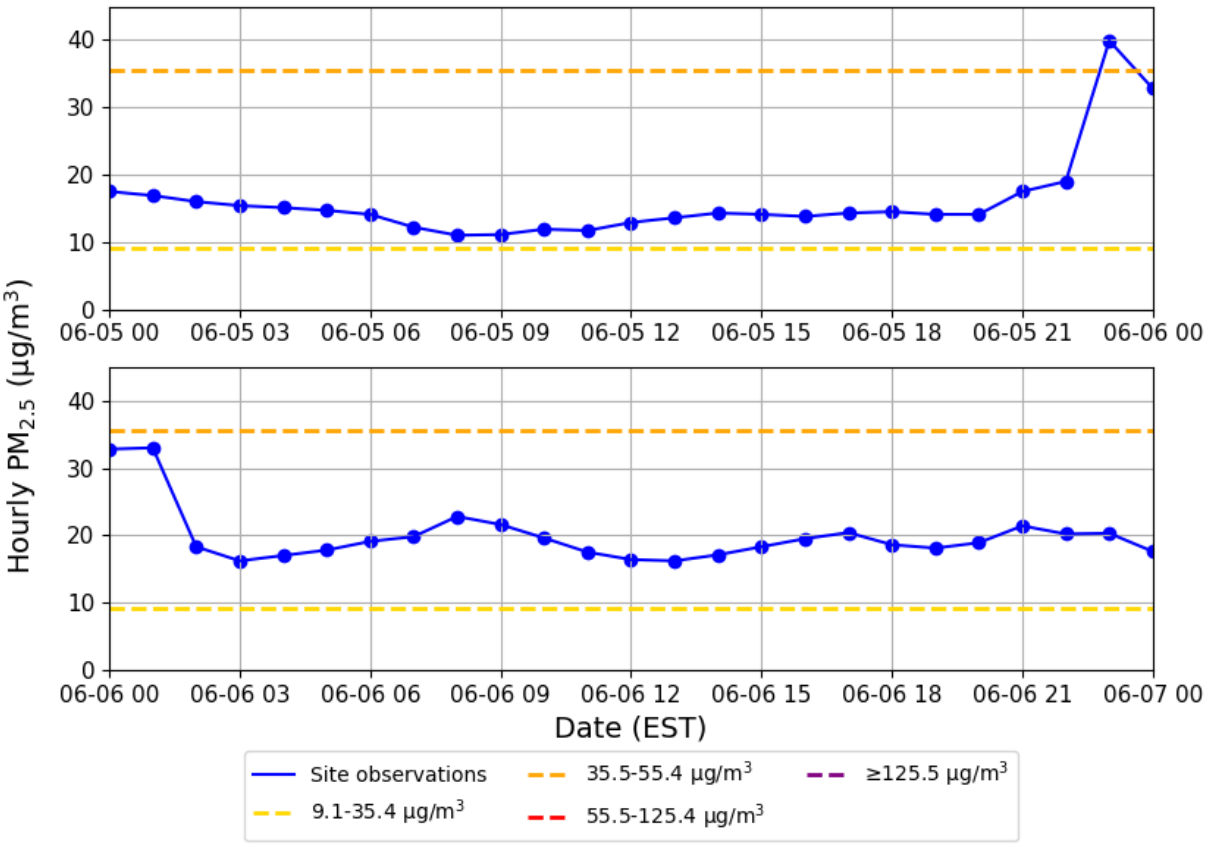


Figure E1. $PM_{2.5}$ concentrations at the Sandersville site on June 5 and 6, 2023. The solid lines with dots show observations, and the dashed lines show AQI tiers adjusted for the 2024 $PM_{2.5}$ NAAQS.

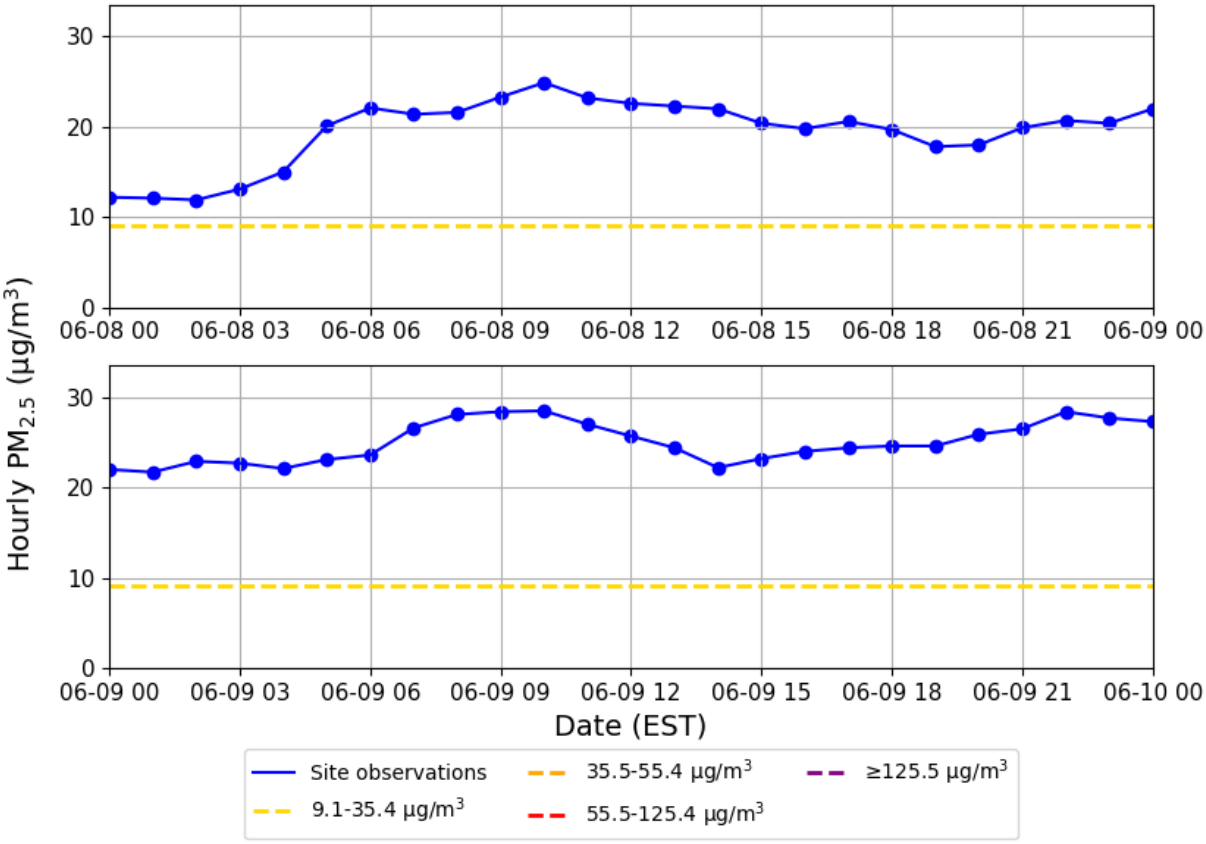


Figure E2. $PM_{2.5}$ concentrations at the Sandersville site on June 8 and 9, 2023. The solid lines with dots show observations, and the dashed lines show AQI tiers adjusted for the 2024 $PM_{2.5}$ NAAQS.

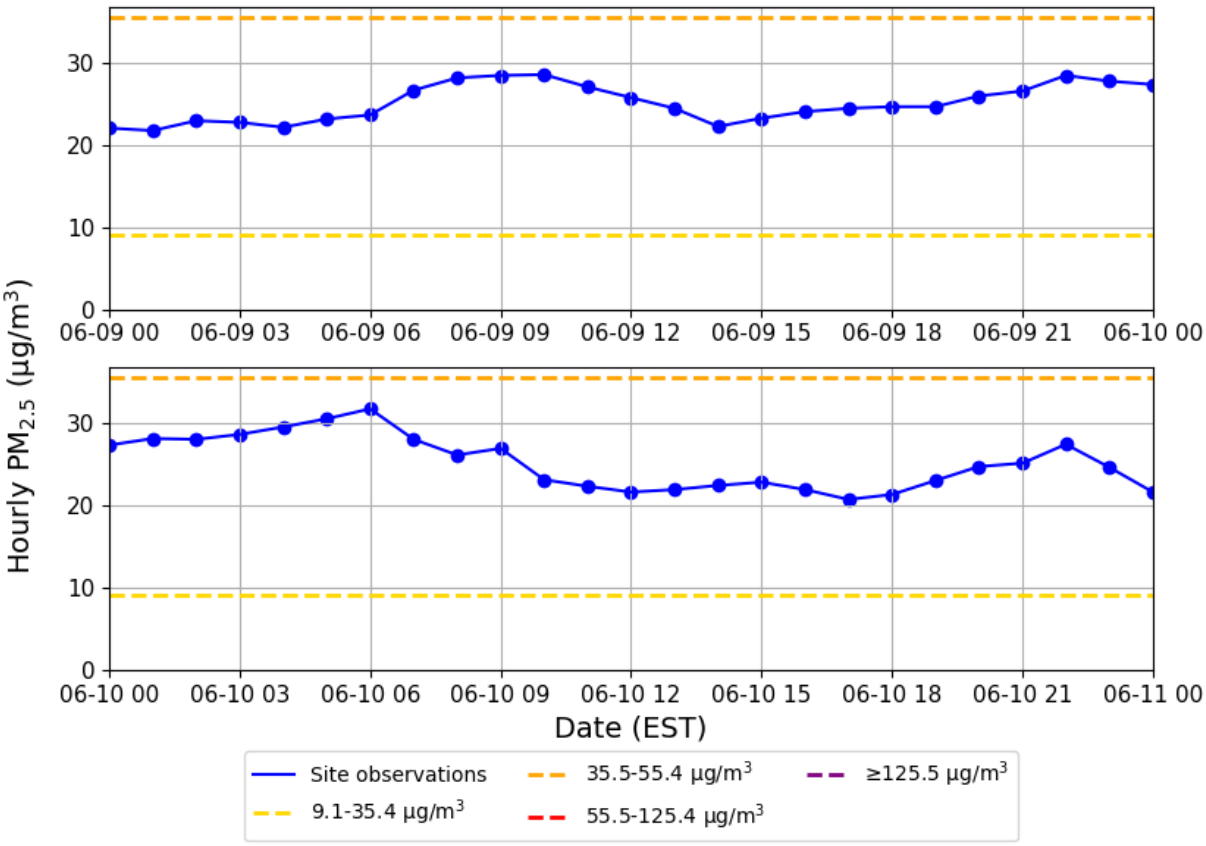


Figure E3. $PM_{2.5}$ concentrations at the Sandersville site on June 9 and 10, 2023. The solid lines with dots show observations, and the dashed lines show AQI tiers adjusted for the 2024 $PM_{2.5}$ NAAQS.

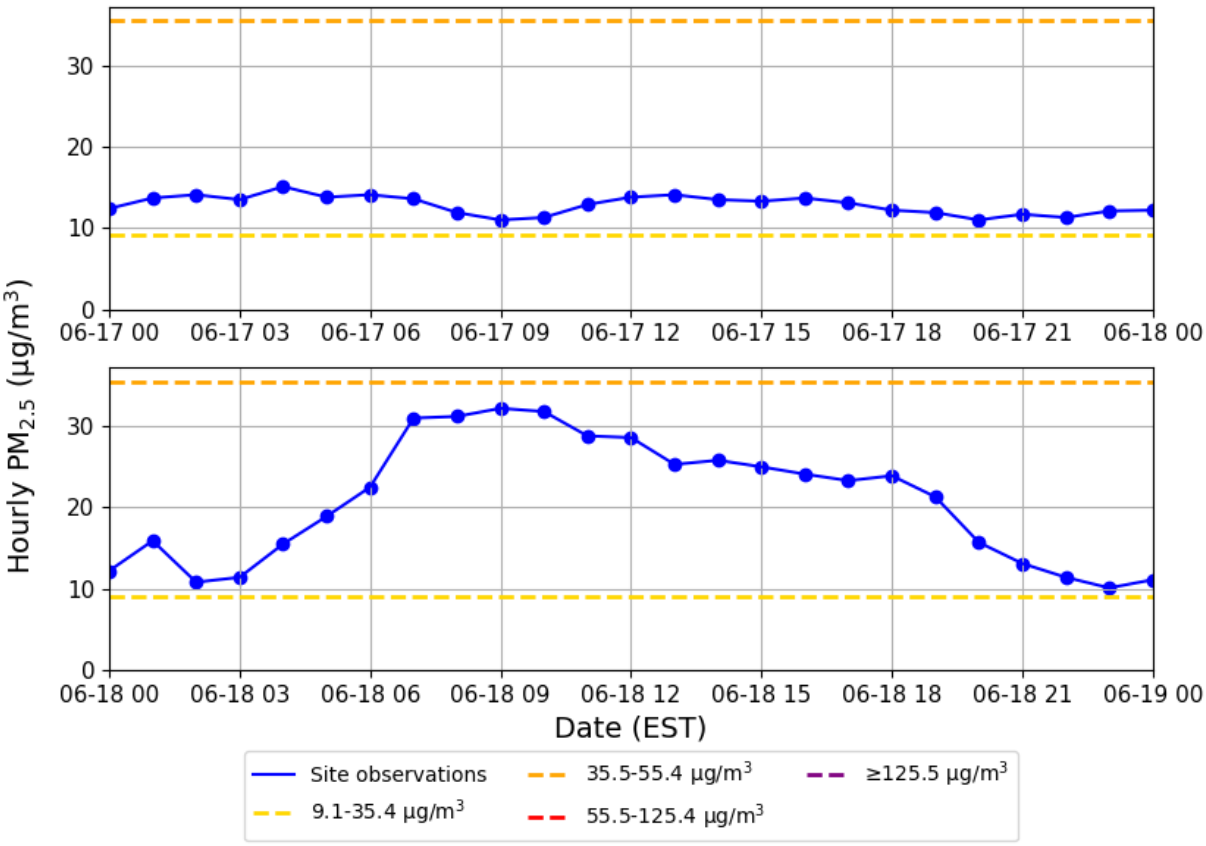


Figure E4. $PM_{2.5}$ concentrations at the Sandersville site on June 17 and 18, 2023. The solid lines with dots show observations, and the dashed lines show AQI tiers adjusted for the 2024 $PM_{2.5}$ NAAQS.

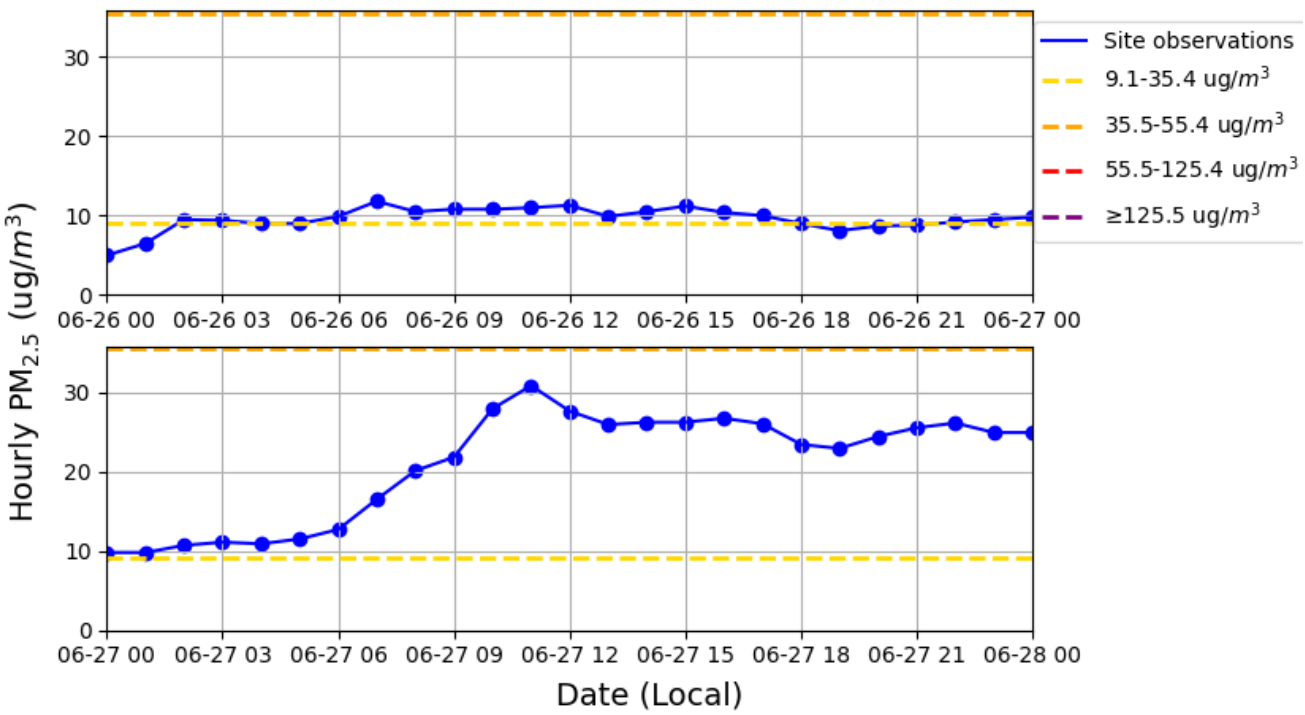


Figure E5. $PM_{2.5}$ concentrations at the Sandersville site on June 26 and 27, 2023. The solid lines with dots show shows observations, and the dashed lines show AQI tiers adjusted for the 2024 $PM_{2.5}$ NAAQS.

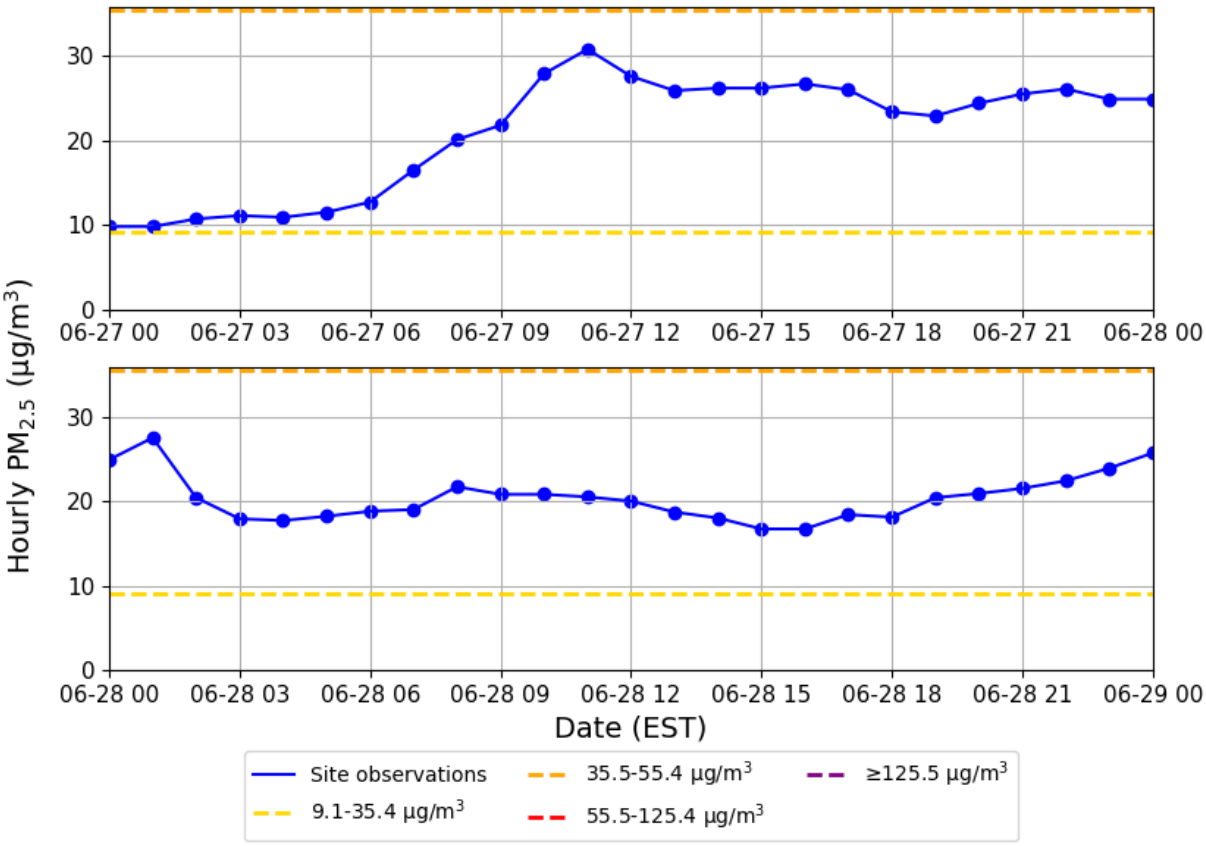


Figure E6. $PM_{2.5}$ concentrations at the Sandersville site on June 27 and 28, 2023. The solid lines with dots show observations, and the dashed lines show AQI tiers adjusted for the 2024 $PM_{2.5}$ NAAQS.

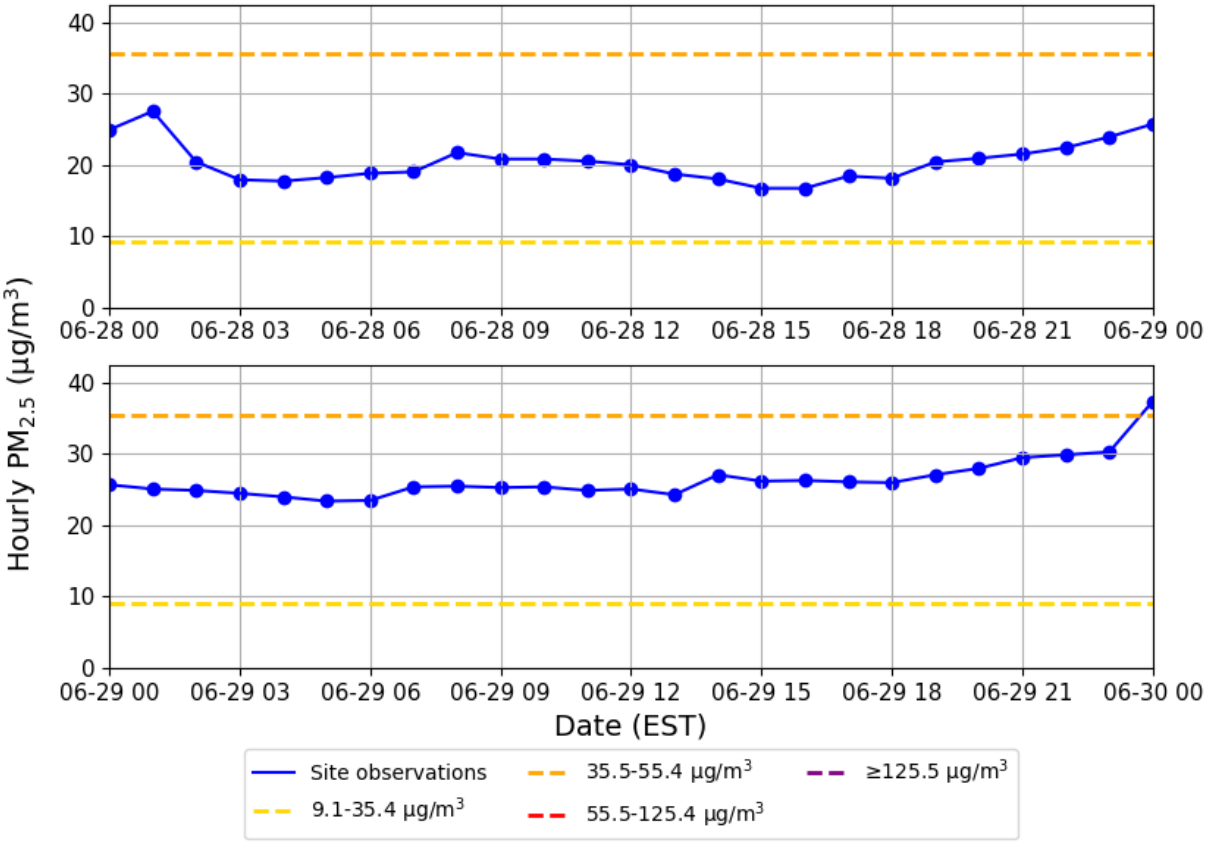


Figure E7. $PM_{2.5}$ concentrations at the Sandersville site on June 28 and 29, 2023. The solid lines with dots show observations, and the dashed lines show AQI tiers adjusted for the 2024 $PM_{2.5}$ NAAQS.

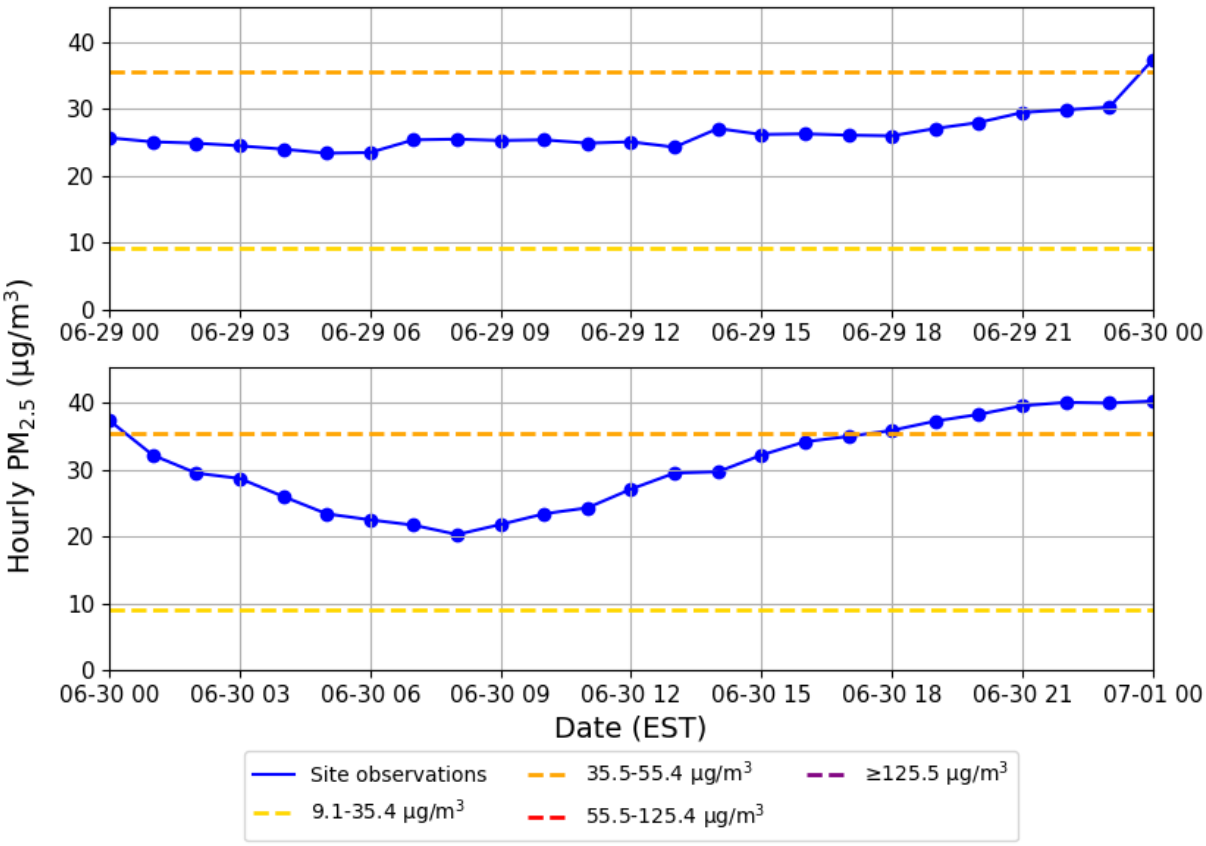


Figure E8. $PM_{2.5}$ concentrations at the Sandersville site on June 29 and 30, 2023. The solid lines with dots show observations, and the dashed lines show AQI tiers adjusted for the 2024 $PM_{2.5}$ NAAQS.

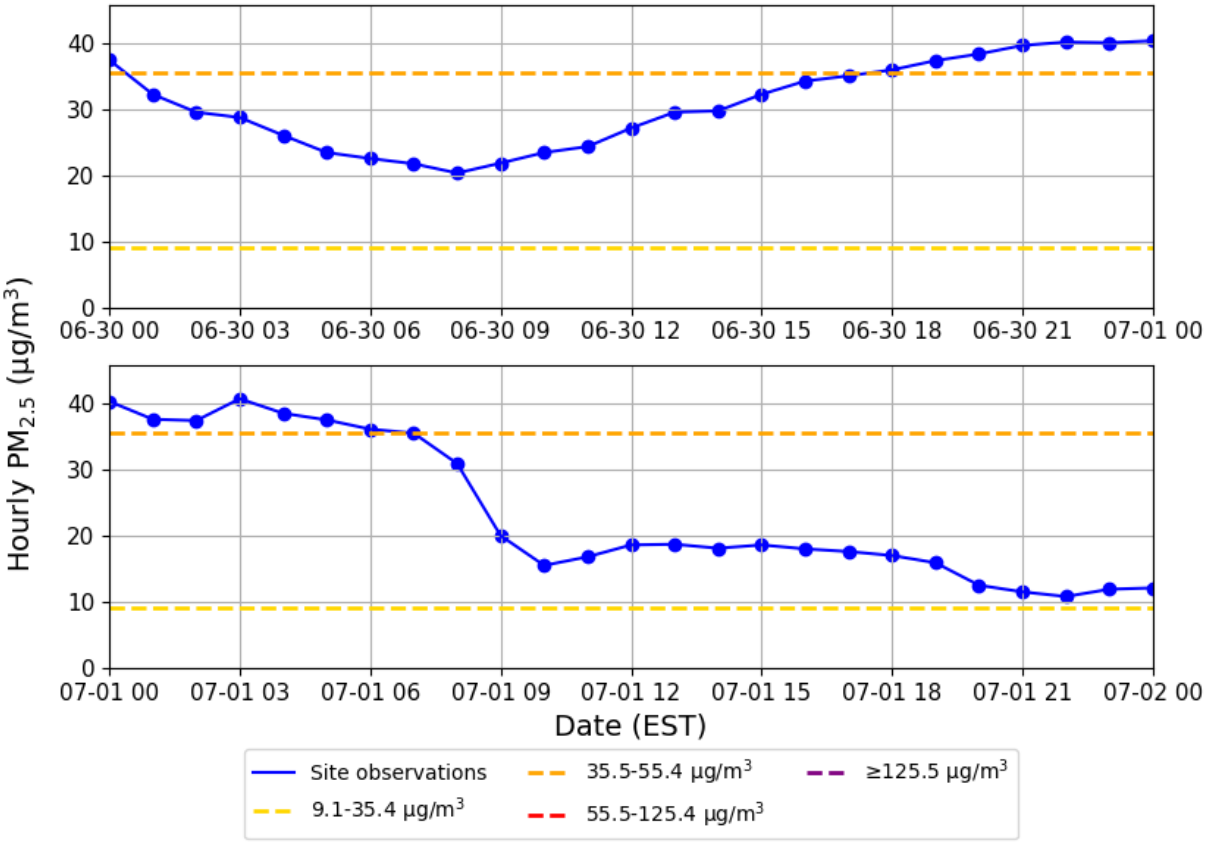


Figure E9. $PM_{2.5}$ concentrations at the Sandersville site on June 30 and July 1, 2023. The solid lines with dots show observations, and the dashed lines show AQI tiers adjusted for the 2024 $PM_{2.5}$ NAAQS.

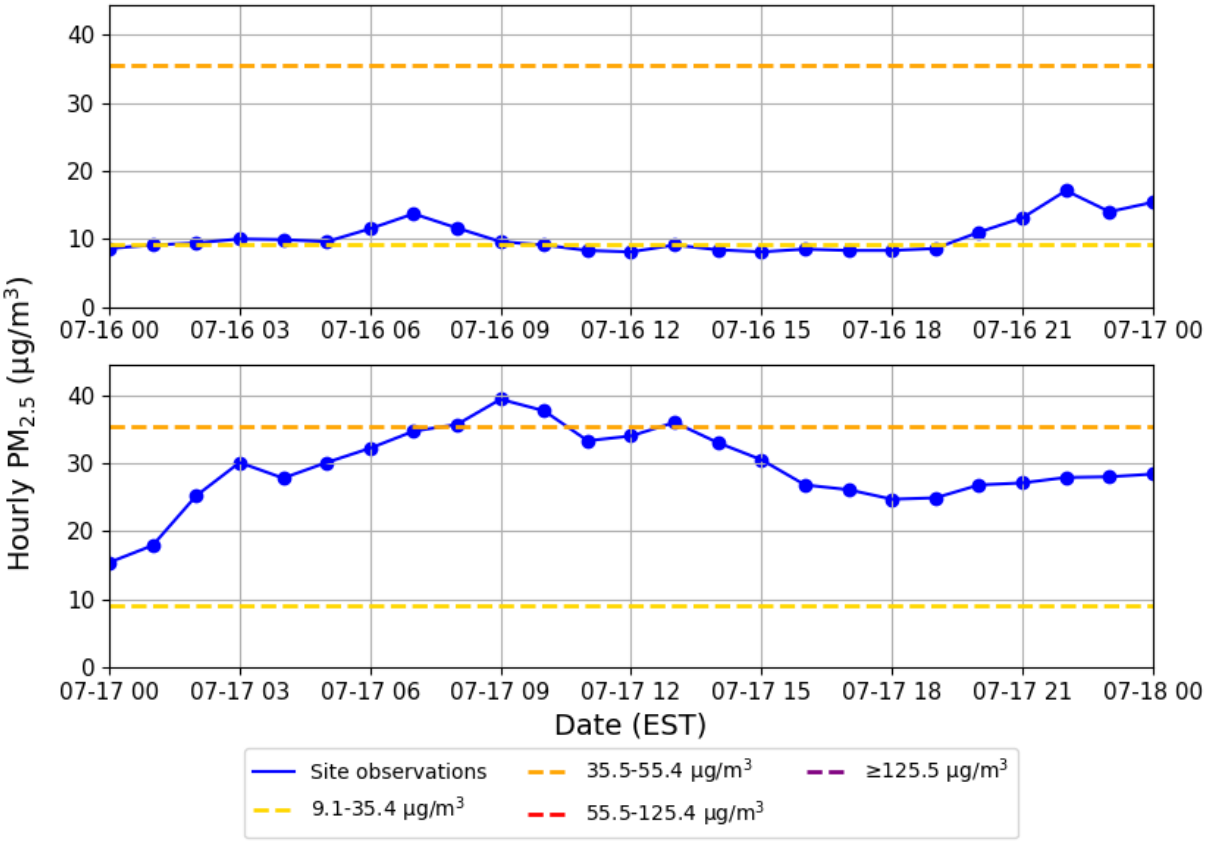


Figure E10. $PM_{2.5}$ concentrations at the Sandersville site on July 16 and 17, 2023. The solid lines with dots show observations, and the dashed lines show AQI tiers adjusted for the 2024 $PM_{2.5}$ NAAQS.

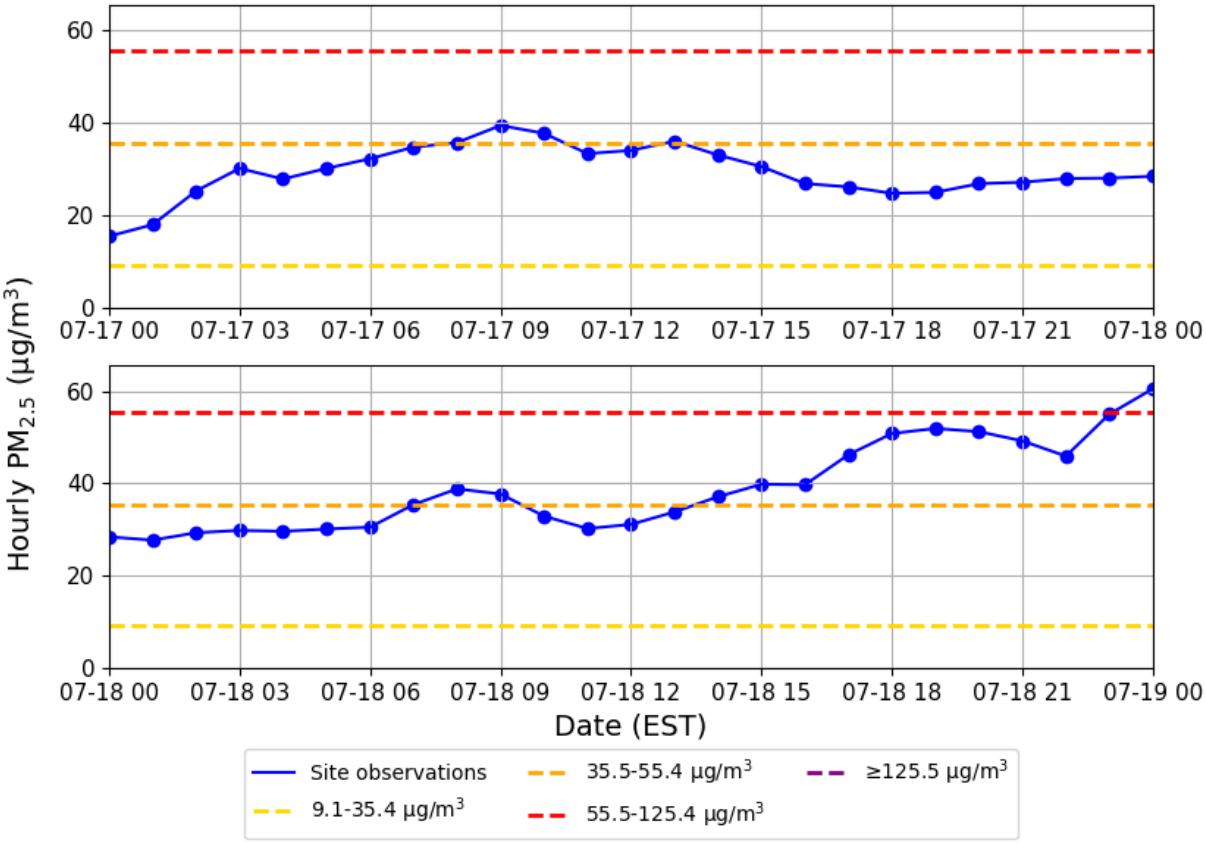


Figure E11. $PM_{2.5}$ concentrations at the Sandersville site on July 17 and 18, 2023. The solid lines with dots show observations, and the dashed lines show AQI tiers adjusted for the 2024 $PM_{2.5}$ NAAQS.

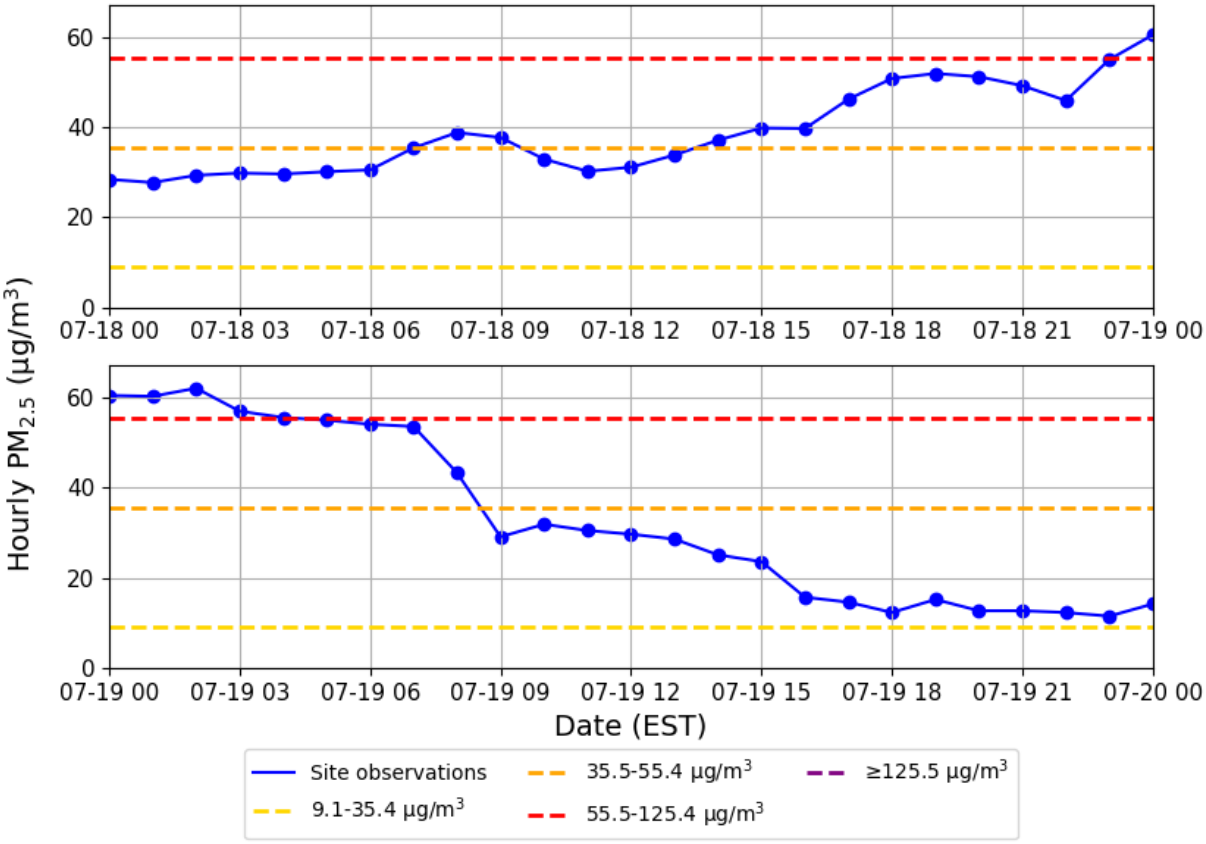


Figure E12. $PM_{2.5}$ concentrations at the Sandersville site on July 18 and 19, 2023. The solid lines with dots show observations, and the dashed lines show AQI tiers adjusted for the 2024 $PM_{2.5}$ NAAQS.

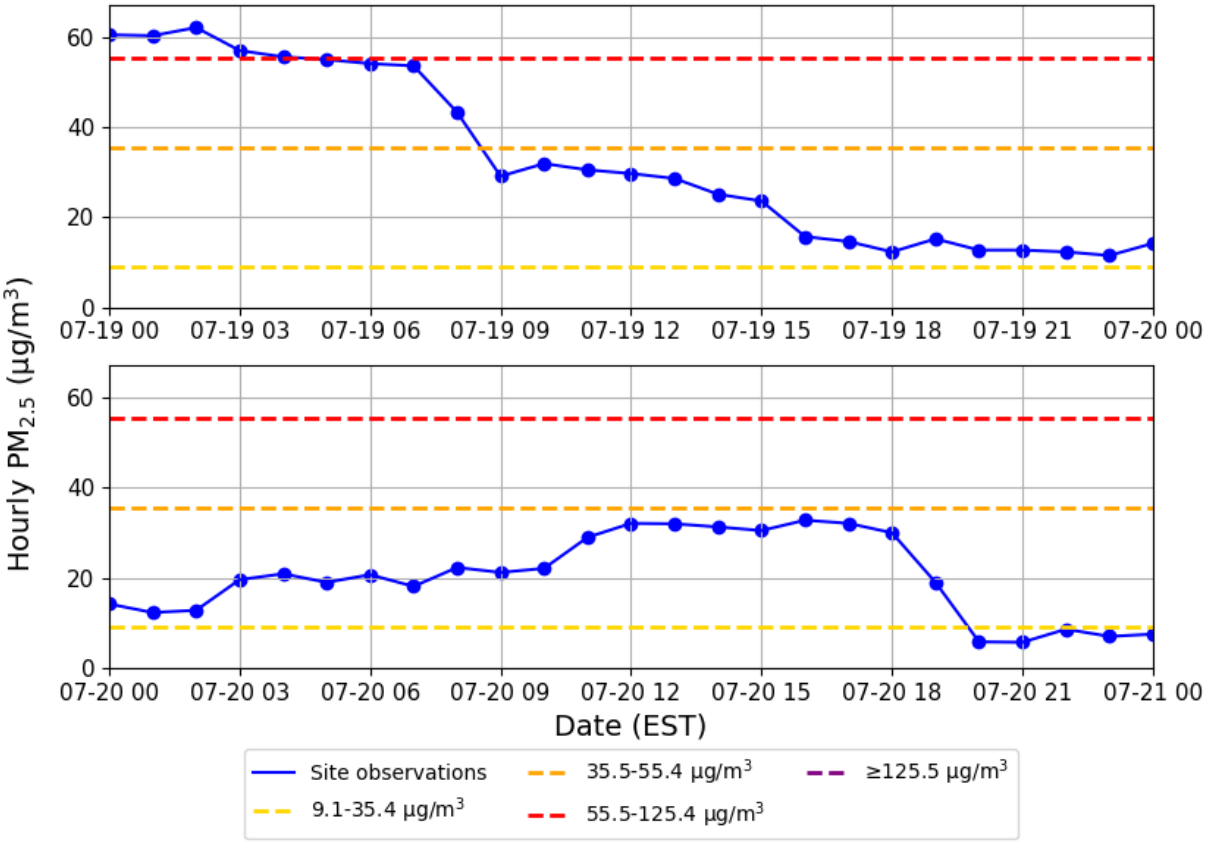


Figure E13. $PM_{2.5}$ concentrations at the Sandersville site on July 19 and 20, 2023. The solid lines with dots show observations, and the dashed lines show AQI tiers adjusted for the 2024 $PM_{2.5}$ NAAQS.

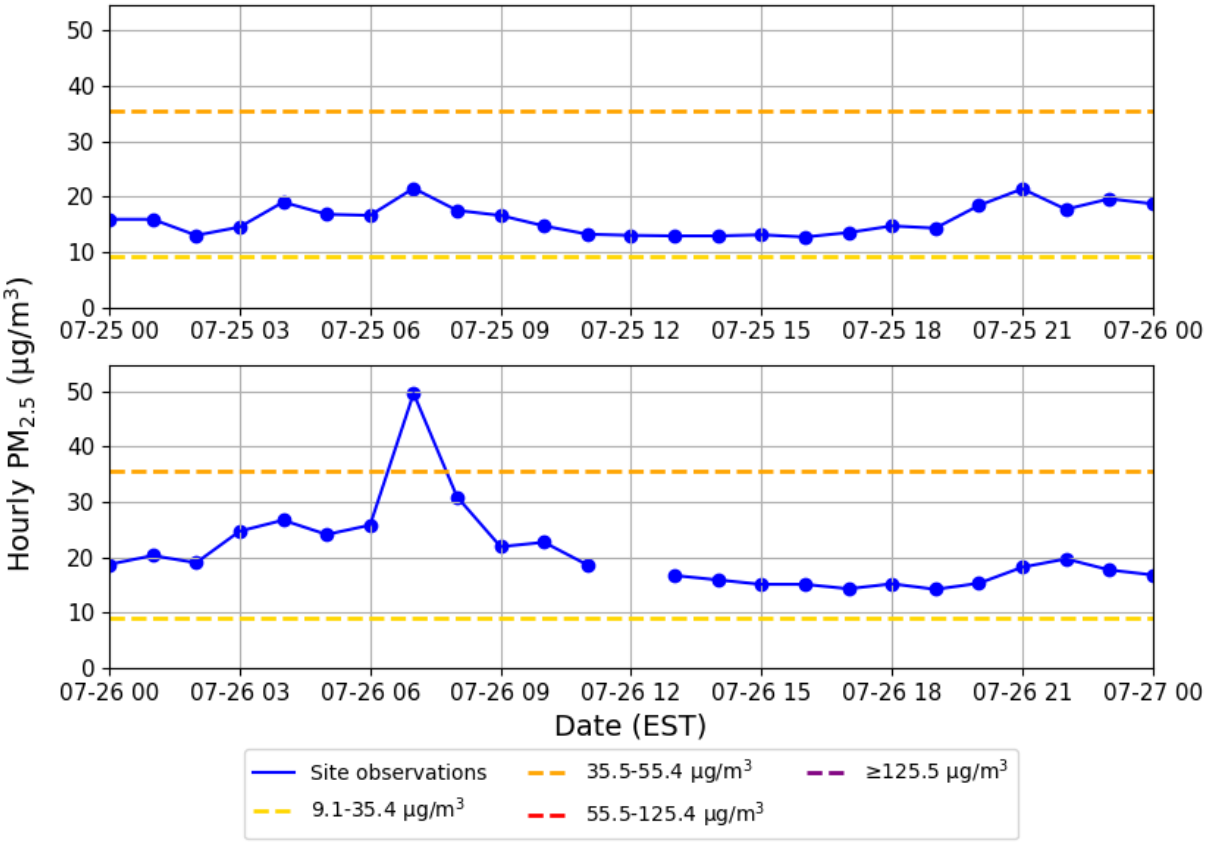


Figure E14. $PM_{2.5}$ concentrations at the Sandersville site on July 25 and 26, 2023. The solid lines with dots show observations, and the dashed lines show AQI tiers adjusted for the 2024 $PM_{2.5}$ NAAQS.

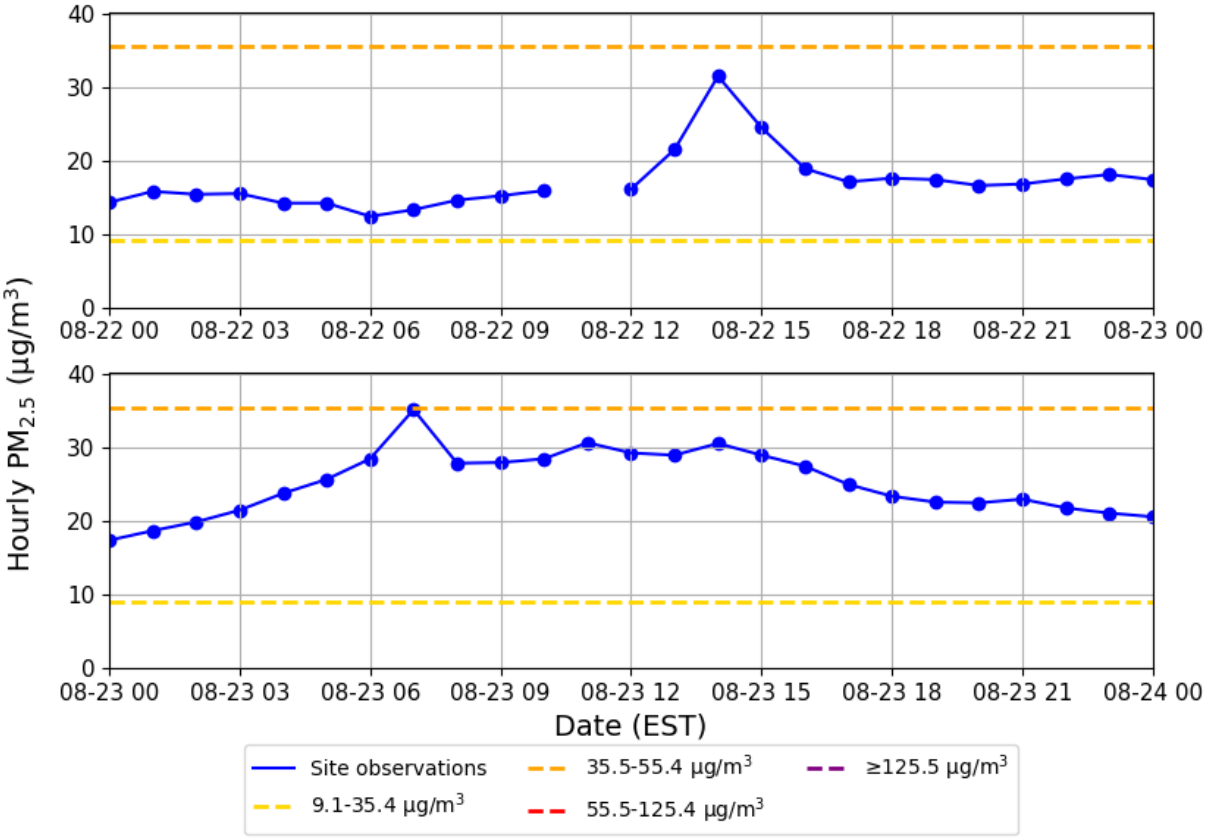


Figure E15. $PM_{2.5}$ concentrations at the Sandersville site on August 22 and 23, 2023. The solid lines with dots show observations, and the dashed lines show AQI tiers adjusted for the 2024 $PM_{2.5}$ NAAQS.

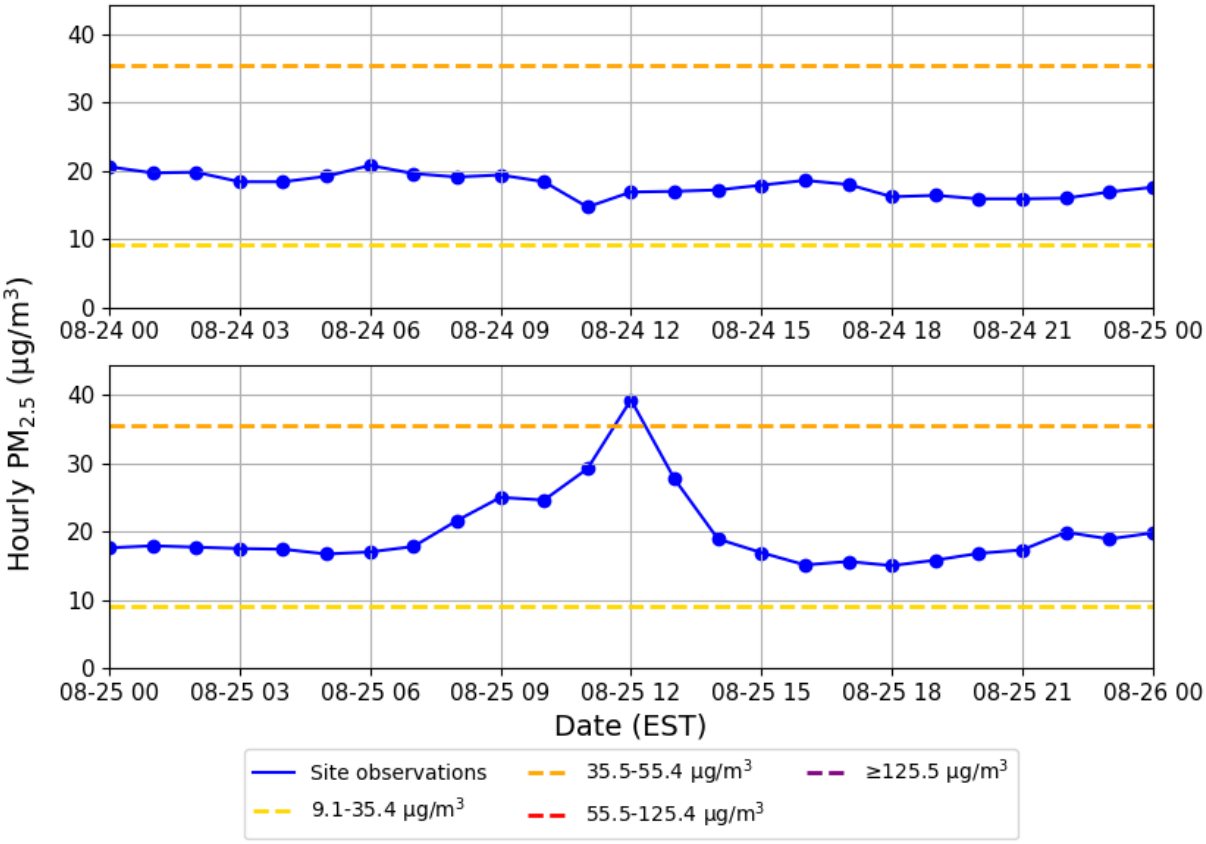


Figure E16. $PM_{2.5}$ concentrations at the Sandersville site on August 24 and 25, 2023. The solid lines with dots show observations, and the dashed lines show AQI tiers adjusted for the 2024 $PM_{2.5}$ NAAQS.

Appendix F: Upper air maps

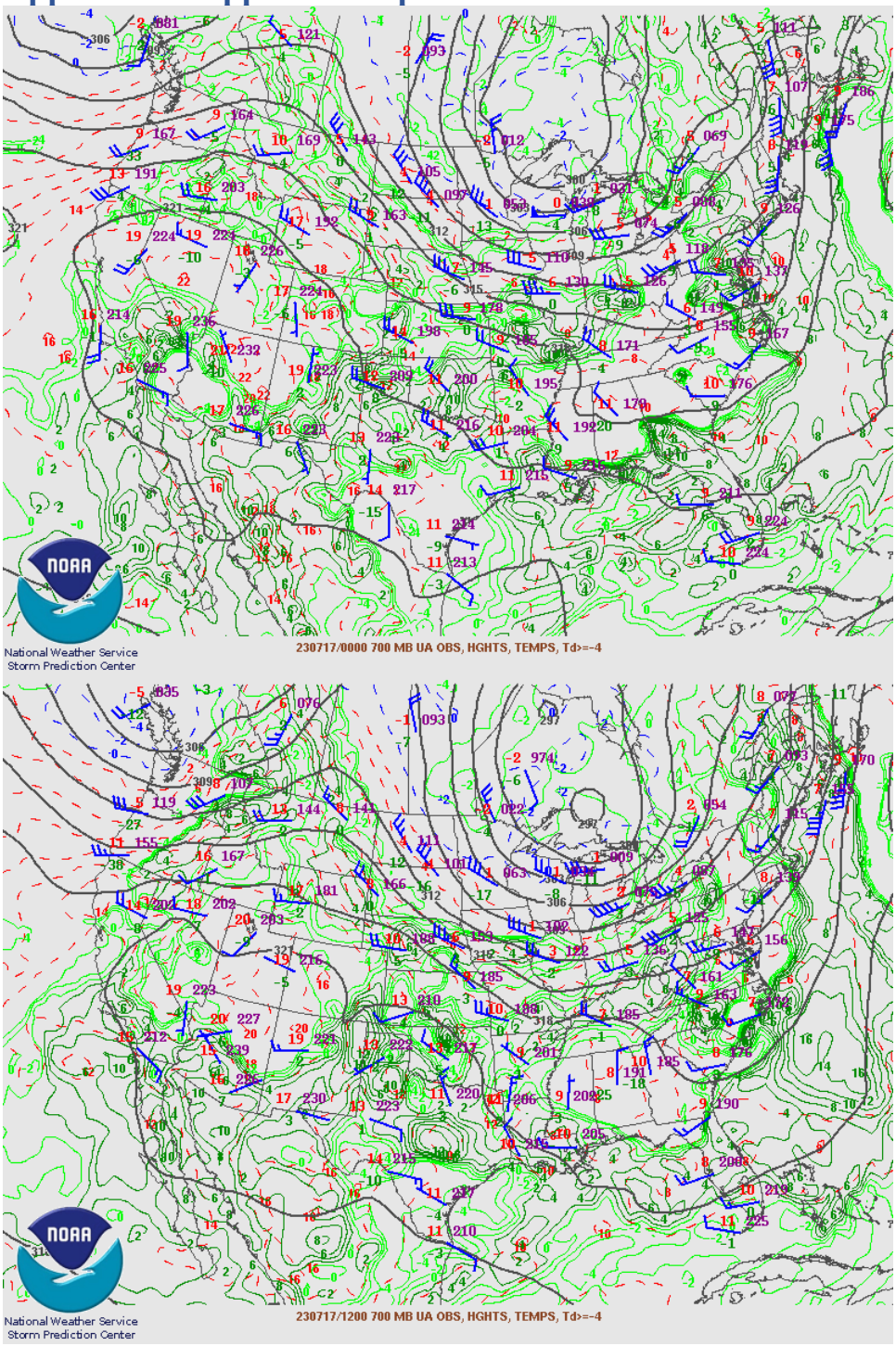


Figure F1. Storm Prediction Center upper air maps for July 17, 2023, at 00 UTC (top) and at 12 UTC (bottom). Maps are generated at a pressure of 700 mb (altitude of 1170-1590 MSL). Wind barbs (degrees from north, knots) are plotted in blue, isotherms (°C) in red, isodrosotherms (degrees Celsius (°C)) in green contours, and isoheights (m MSL) in dark grey.

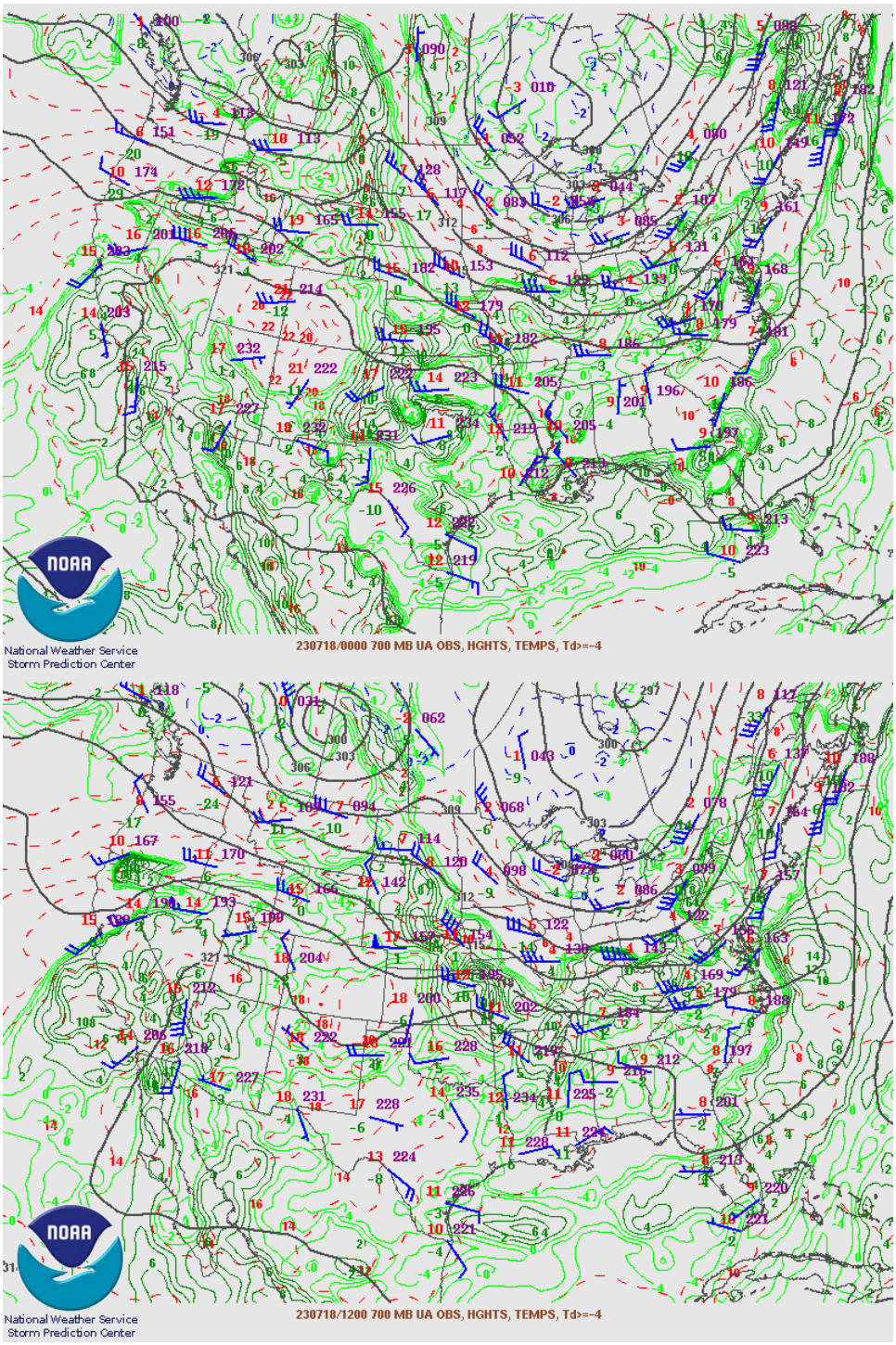


Figure F2. Storm Prediction Center upper air maps for July 18, 2023, at 00 UTC (top) and at 12 UTC (bottom). Maps are generated at a pressure of 700 mb (altitude of 1170-1590 MSL). Wind barbs (degrees from north, knots) are plotted in blue, isotherms (°C) in red, isodrosotherms (°C) in green contours, and isoheights (m MSL) in dark grey.

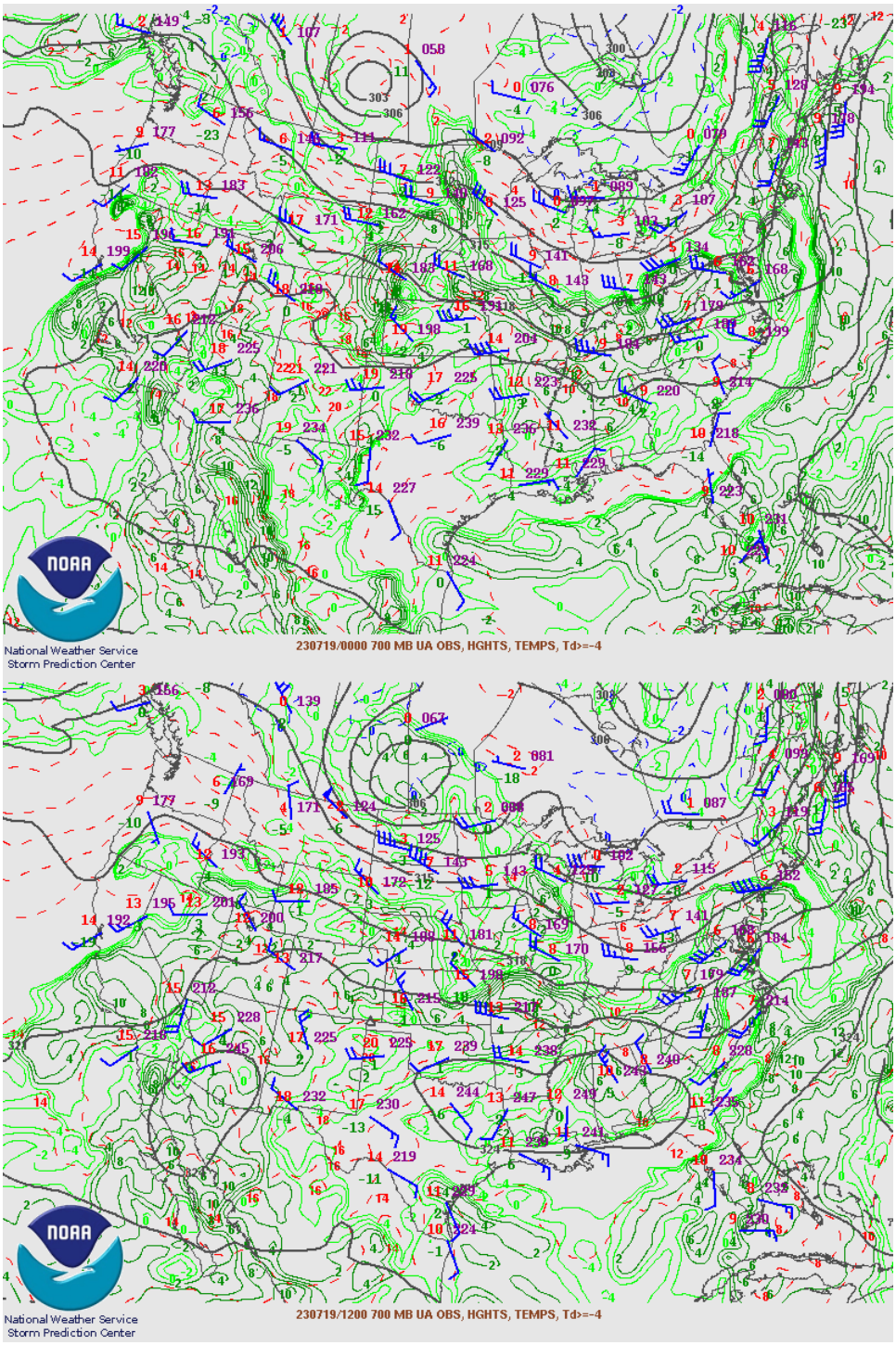


Figure F3. Storm Prediction Center upper air maps for July 19, 2023, at 00 UTC (top) and at 12 UTC (bottom). Maps are generated at a pressure of 700 mb (altitude of 1170-1590 MSL). Wind barbs (degrees from north, knots) are plotted in blue, isotherms (°C) in red, isodrosotherms (°C) in green contours, and isoheights (m MSL) in dark grey.

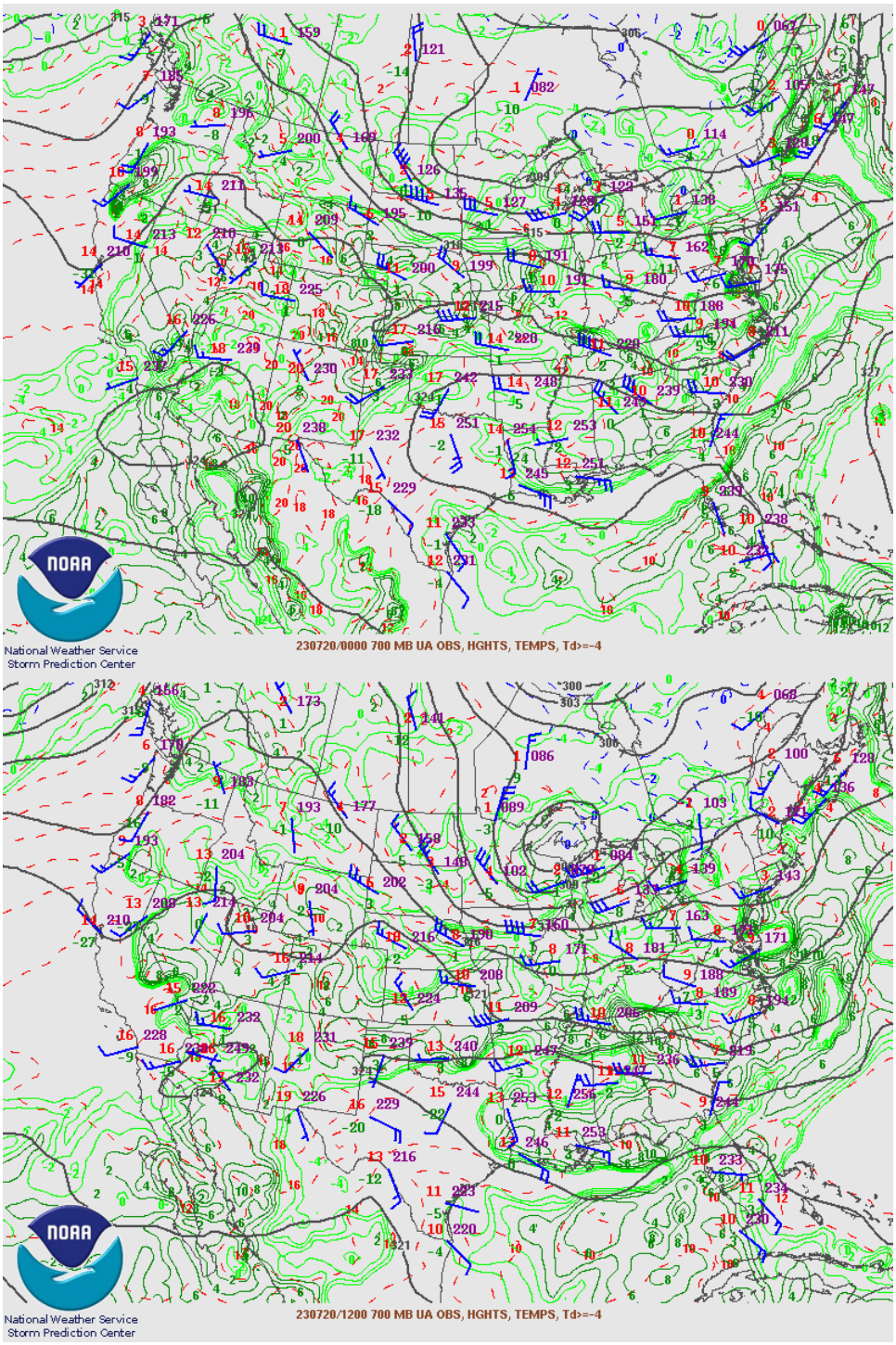


Figure F4. Storm Prediction Center upper air maps for July 20, 2023, at 00 UTC (top) and at 12 UTC (bottom). Maps are generated at a pressure of 700 mb (altitude of 1170-1590 MSL). Wind barbs (degrees from north, knots) are plotted in blue, isotherms (°C) in red, isodrosotherms (°C) in green contours, and isoheights (m MSL) in dark grey.

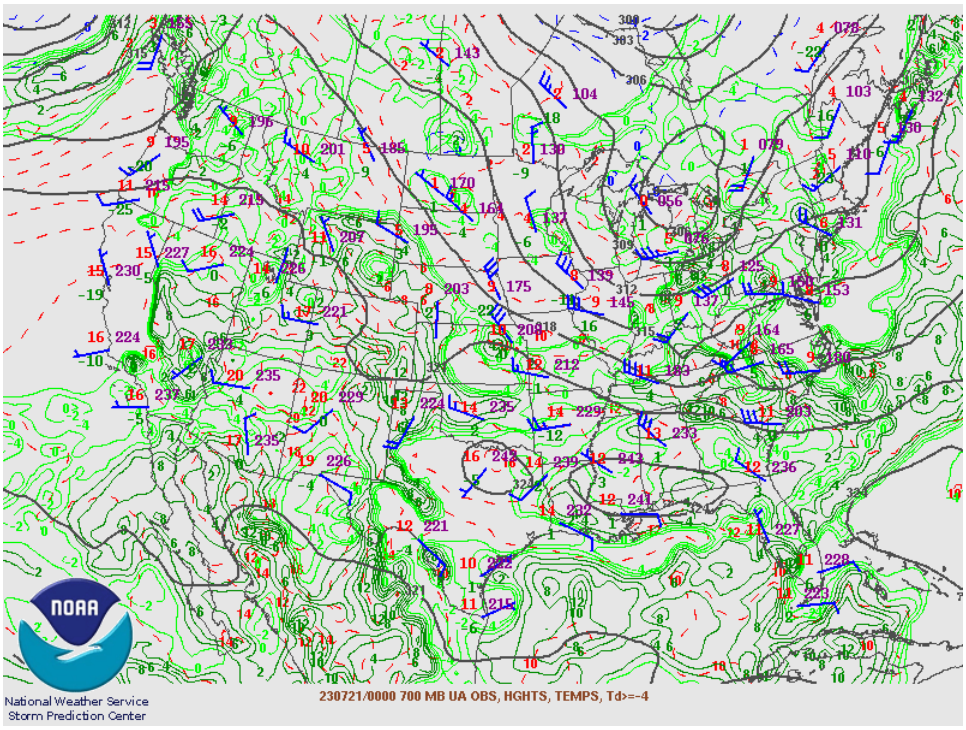


Figure F5. Storm Prediction Center upper air maps for July 21, 2023, at 00 UTC. The map is generated at a pressure of 700 mb (altitude of 1170-1590 MSL). Wind barbs (degrees from north, knots) are plotted in blue, isotherms (°C) in red, isodrosotherms (°C) in green contours, and isoheights (m MSL) in dark grey.

Appendix G: Public Comments

Appendix H: Responses to Public Comments