



Environmental Protection Agency

**Ohio's
Exceptional Events Demonstration for 2023 Wildfire
Smoke-Driven PM_{2.5} Episodes in the Toledo, OH
Metropolitan Statistical Area**

**Prepared by:
The Ohio Environmental Protection Agency
Division of Air Pollution Control**

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1. Introduction

1.1. Overview

On February 7, 2024, the United States Environmental Protection Agency (U.S. EPA) promulgated a revised National Ambient Air Quality Standard (NAAQS) for fine particulate matter (PM_{2.5}), with an effective date of May 6, 2024 (89 FR 16202). The level of the new annual PM_{2.5} NAAQS was set to 9.0 µg/m³. In advance of the February 7, 2025 deadline for nonattainment area designation recommendations, U.S. EPA asked state and local air agencies to submit demonstrations to exclude days impacted by exceptional events from consideration in the designations process.

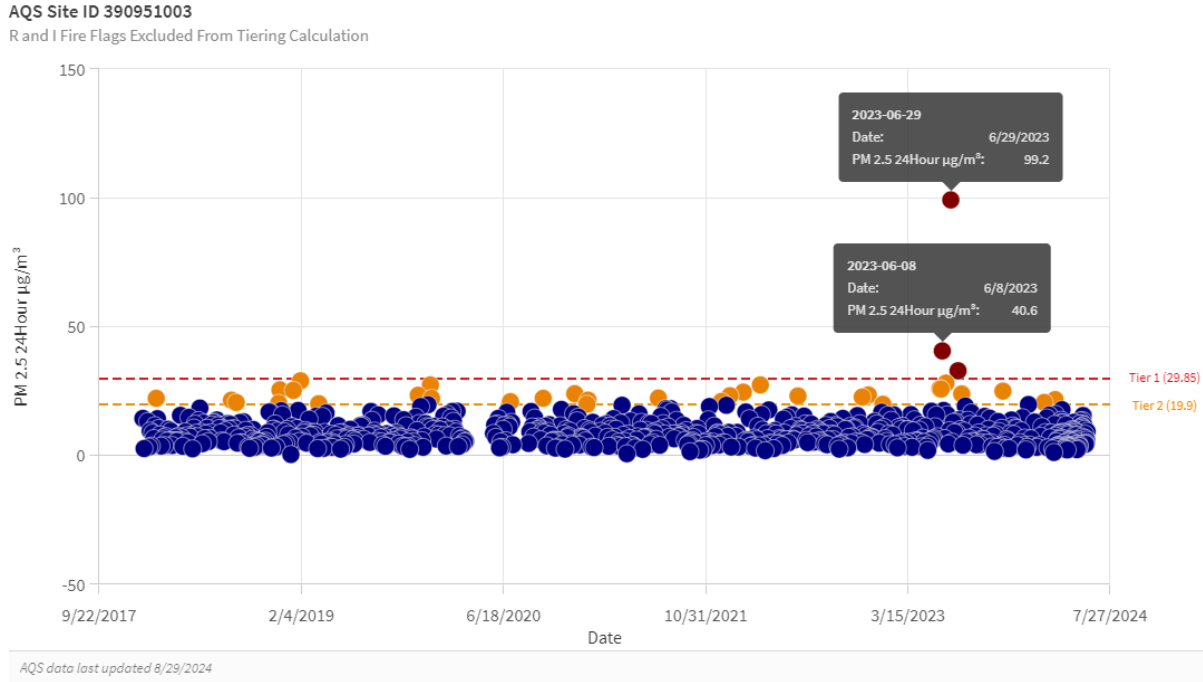
In the Toledo, OH Metropolitan Statistical Area (MSA), consisting of Fulton, Lucas, and Wood Counties in Ohio, air quality was impacted from June to August 2023 by smoke entering the region from wildfires in Canada. Wildfires across Canada during this period produced smoke plumes that impacted surface air quality throughout the Great Lakes region. The smoke from these fires produced PM_{2.5} pollution episodes across the region that had significant health and regulatory implications. One of the regulatory impacts of the fire smoke was the effect on air quality design values in the Great Lakes region.

Table 1 shows the two days in 2023 that, if excluded from the three-year (2021-2023) PM_{2.5} design value calculation, would result in a design value for the Toledo, OH MSA below the 2024 PM_{2.5} NAAQS. Both days are PM_{2.5} Tier 1 category days according to the online U.S. EPA PM_{2.5} Tiering Tool, and they rank as the first and second highest observed concentration days at this monitor in the 2019-2023 period. Figure 1 was generated by the online U.S. EPA PM_{2.5} Tiering Tool for the Eastside Pump St (39-095-1003) monitoring site in Lucas County within the Toledo, OH MSA. This figure identifies June 8, 2023 and June 29, 2023 as Tier 1 category days.

Table 1. Data requested for exclusion at the Eastside Pump St (39-095-1003) monitoring site due to wildfire smoke-driven PM_{2.5} episodes.

Date of Event	U.S. EPA PM _{2.5} Tier	24-Hour Average PM _{2.5} Concentration (µg/m ³)	5-Year Percentile	5-Year Rank
June 8, 2023	Tier 1	40.6	99.82	2
June 29, 2023	Tier 1	99.2	100.00	1

Figure 1. Time series plot of PM_{2.5} daily combined site data for the Eastside Pump St (39-095-1003) monitoring site in the Toledo, OH MSA from 2018-2024. The tier thresholds, shown for the month of June, are based on 2019-2023, the most recent 5-year period of certified data at the time of publication of this document¹.



The Ohio Environmental Protection Agency (Ohio EPA) requests that U.S. EPA exclude the ambient PM_{2.5} concentrations measured at the Eastside Pump St (39-095-1003) monitoring site on June 8, 2023 and June 29, 2023 from regulatory determinations, including calculations of annual PM_{2.5} design values, due to the influence of Canadian wildfire smoke on the monitored concentrations during those days. When the 24-hour average PM_{2.5} concentrations measured at the Eastside Pump St monitoring site on these dates are included, the valid 2021-2023 annual PM_{2.5} design value is 9.4 µg/m³, above the 2024 revised annual PM_{2.5} NAAQS value of 9.0 µg/m³. However, if these two 24-hour average PM_{2.5} concentrations were excluded, the Eastside Pump St monitoring site in the Toledo, OH MSA would have a valid 2021-2023 annual PM_{2.5} design value of 9.0 µg/m³, which represents attainment of the 2024 revised annual PM_{2.5} NAAQS. Excluding the observed PM_{2.5} data from the two identified dates has regulatory significance because it reduces the 2021-2023 annual PM_{2.5} design value for the

¹ This figure was created on September 3, 2024, from the online U.S. EPA PM_{2.5} Tiering Tool available at <https://www.epa.gov/air-quality-analysis/pm25-tiering-tool-exceptional-events-analysis>

Toledo, OH MSA to a value that is at or below the 2024 revised annual PM_{2.5} NAAQS value of 9.0 µg/m³ and will preclude the Toledo, OH MSA from being designated a nonattainment area for the 2024 revised annual PM_{2.5} NAAQS.

It should be noted that two additional PM_{2.5} monitoring sites, Erie (39-095-0024) and RAPS (39-095-0026), also operate within Lucas County in the Toledo, OH MSA. These sites were each similarly affected by the regulatorily significant wildfire smoke-driven PM_{2.5} episodes in the Toledo, OH MSA on June 8, 2023 and June 29, 2023. The Erie monitoring site currently has a 2021-2023 annual PM_{2.5} design value of 8.3 µg/m³, although this design value is considered invalid due to a data capture rate of less than 50% during the first quarter of calendar year 2022. The RAPS monitoring site currently has a valid 2021-2023 annual PM_{2.5} design value of 8.1 µg/m³, which attains the 2024 revised annual PM_{2.5} NAAQS. Since the PM_{2.5} data from June 8, 2023 and June 29, 2023 at the Erie and RAPS monitoring sites were also affected by the regulatorily significant wildfire smoke-driven PM_{2.5} episodes in the Toledo, OH MSA on those dates, Ohio EPA is also requesting the exclusion of these data from regulatory determinations, including calculations of annual PM_{2.5} design values, for the Erie and RAPS monitoring sites.

Table 2 shows the two days in 2023 on which wildfire smoke-driven PM_{2.5} episodes affected the Erie (39-095-0024) monitoring site. Both days are PM_{2.5} Tier 1 category days according to the online U.S. EPA PM_{2.5} Tiering Tool, and they rank as the first and third highest observed concentration days at this monitor in the 2019-2023 period. Figure 2 was generated by the online U.S. EPA PM_{2.5} Tiering Tool for the Erie (39-095-0024) monitoring site in Lucas County within the Toledo, OH MSA. This figure identifies June 8, 2023 and June 29, 2023 as Tier 1 category days.

Table 2. Data requested for exclusion at the Erie (39-095-0024) monitoring site due to wildfire smoke-driven PM_{2.5} episodes.

Date of Event	U.S. EPA PM _{2.5} Tier	24-Hour Average PM _{2.5} Concentration (µg/m ³)	5-Year Percentile	5-Year Rank
June 8, 2023	Tier 1	32.7	99.65	3
June 29, 2023	Tier 1	98.1	100.00	1

Figure 2. Time series plot of PM_{2.5} daily combined site data for the Erie (39-095-0024) monitoring site in the Toledo, OH MSA from 2018-2024. The tier thresholds, shown for the month of June, are based on 2019-2023, the most recent 5-year period of certified data at the time of publication of this document².

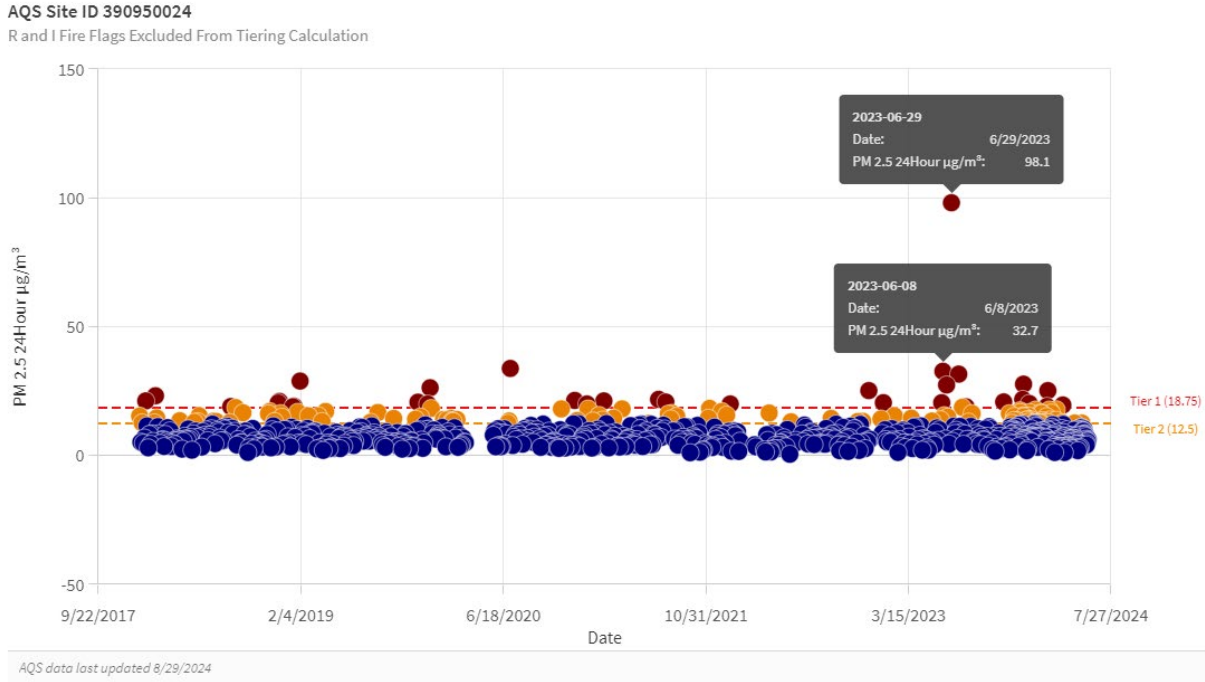


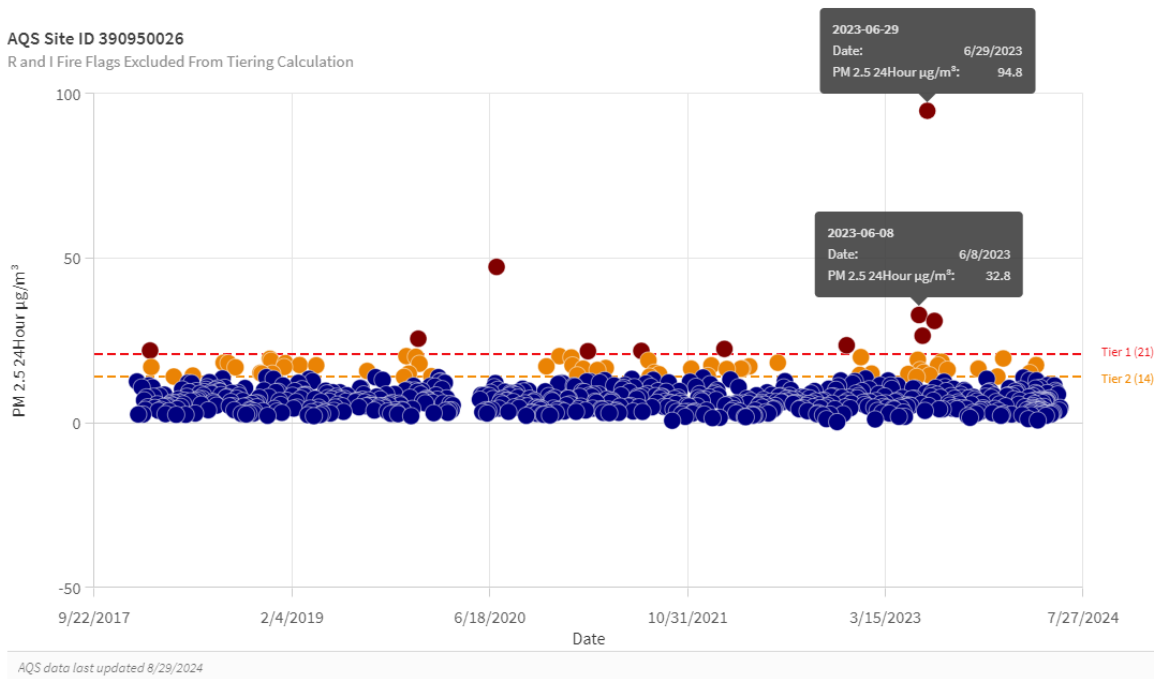
Table 3 shows the two days in 2023 on which wildfire smoke-driven PM_{2.5} episodes affected the RAPS (39-095-0026) monitoring site. Both days are PM_{2.5} Tier 1 category days according to the online U.S. EPA PM_{2.5} Tiering Tool, and they rank as the first and third highest observed concentration days at this monitor in the 2019-2023 period. Figure 3 was generated by the online U.S. EPA PM_{2.5} Tiering Tool for the RAPS (39-095-0026) monitoring site in Lucas County within the Toledo, OH MSA. This figure identifies June 8, 2023 and June 29, 2023 as Tier 1 category days.

² This figure was created on September 3, 2024, from the online U.S. EPA PM_{2.5} Tiering Tool available at <https://www.epa.gov/air-quality-analysis/pm25-tiering-tool-exceptional-events-analysis>

Table 3. Data requested for exclusion at the RAPS (39-095-0026) monitoring site due to wildfire smoke-driven PM_{2.5} episodes.

Date of Event	U.S. EPA PM _{2.5} Tier	24-Hour Average PM _{2.5} Concentration (µg/m ³)	5-Year Percentile	5-Year Rank
June 8, 2023	Tier 1	32.8	99.64	3
June 29, 2023	Tier 1	94.8	100.00	1

Figure 3. Time series plot of PM_{2.5} daily combined site data for the RAPS (39-095-0026) monitoring site in the Toledo, OH MSA from 2018-2024. The tier thresholds, shown for the month of June, are based on 2019-2023, the most recent 5-year period of certified data at the time of publication of this document³.



³ This figure was created on September 3, 2024, from the online U.S. EPA PM_{2.5} Tiering Tool available at <https://www.epa.gov/air-quality-analysis/pm25-tiering-tool-exceptional-events-analysis>

1.2. Exceptional Events Rule Requirements

U.S. EPA's Treatment of Data Influenced by Exceptional Events ("Exceptional Events Rule", 81 FR 68216) provides the requirements that air agencies must meet when requesting U.S. EPA to exclude exceptional event-related concentrations from regulatory determinations. All of the required elements under 40 CFR 50.14(c)(1)(i), 40 CFR 50.14(c)(3)(iv)(A-E), and 40 CFR 50.14(c)(3)(v)(A-C) are included in this demonstration.

- A narrative conceptual model that describes the event(s) causing the exceedance or violation and a discussion of how emissions from the event(s) led to the exceedance or violation at the affected monitor(s) is presented in Section 2 of this document.
- A demonstration that the 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, including analyses comparing the event-influenced concentrations to concentrations at the same monitoring site at other times, is presented in Section 3 of this document.
- A demonstration that the event was both not reasonably controllable and not reasonably preventable is presented in Section 4 of this document.
- A demonstration that the event was a human activity that is unlikely to recur at a location or was a natural event is presented in Section 5 of this document.
- A demonstration that the public was promptly notified of the occurrence of the event(s) that may result in the exceedance of an applicable air quality standard is presented in Section 6 of this document.
- A demonstration that Ohio followed the public comment process for the submission of this document, including a copy of all public comments received and Ohio's responses to those comments received, is presented in Section 7 of this document.

2. Narrative Conceptual Model

The narrative conceptual models for the June 8, 2023 and June 29, 2023 wildfire smoke-driven $PM_{2.5}$ episodes are presented in this section. Narrative conceptual models are presented separately for each episode.

2.1. June 8, 2023 Wildfire Smoke-Driven $PM_{2.5}$ Episode

2.1.1. Episode Description

Air quality in the Toledo, OH MSA was impacted in June 2023 by wildfire smoke entering the region from Quebec, Canada. Smoke plumes impacted the Toledo, OH MSA during three episodes in June 2023. Figure 4, Figure 5, and Figure 6 show the daily average $PM_{2.5}$ concentrations for the years 2019-2023 at the Eastside Pump St, Erie, and RAPS monitoring sites in the Toledo, OH MSA. These figures illustrate the severity of the June 2023 wildfire smoke-driven $PM_{2.5}$ episodes relative to other periods of the year and compared to the same period in the past five years. The June 8, 2023 wildfire smoke-driven $PM_{2.5}$ episode is labeled in each figure.

Figure 4. 2019-2023 daily average $PM_{2.5}$ concentrations at the Eastside Pump St (39-095-1003) monitoring site in the Toledo, OH MSA.

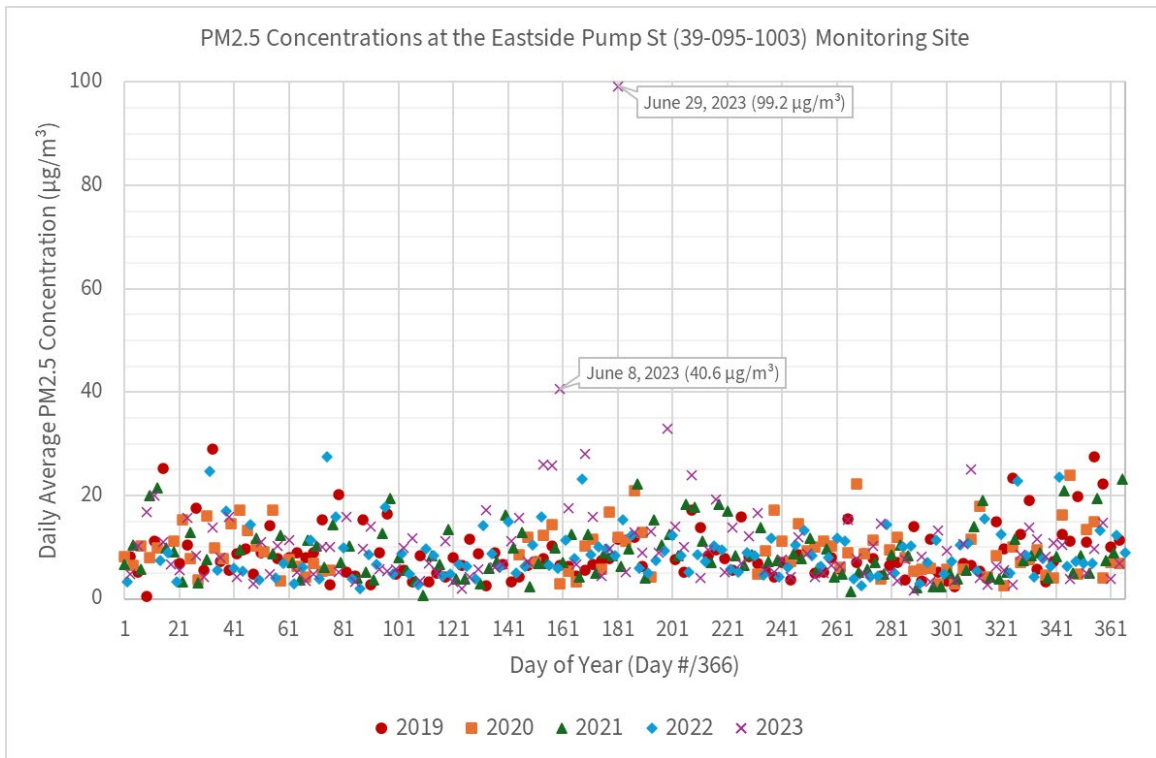


Figure 5. 2019-2023 daily average PM_{2.5} concentrations at the Erie (39-095-0024) monitoring site in the Toledo, OH MSA.

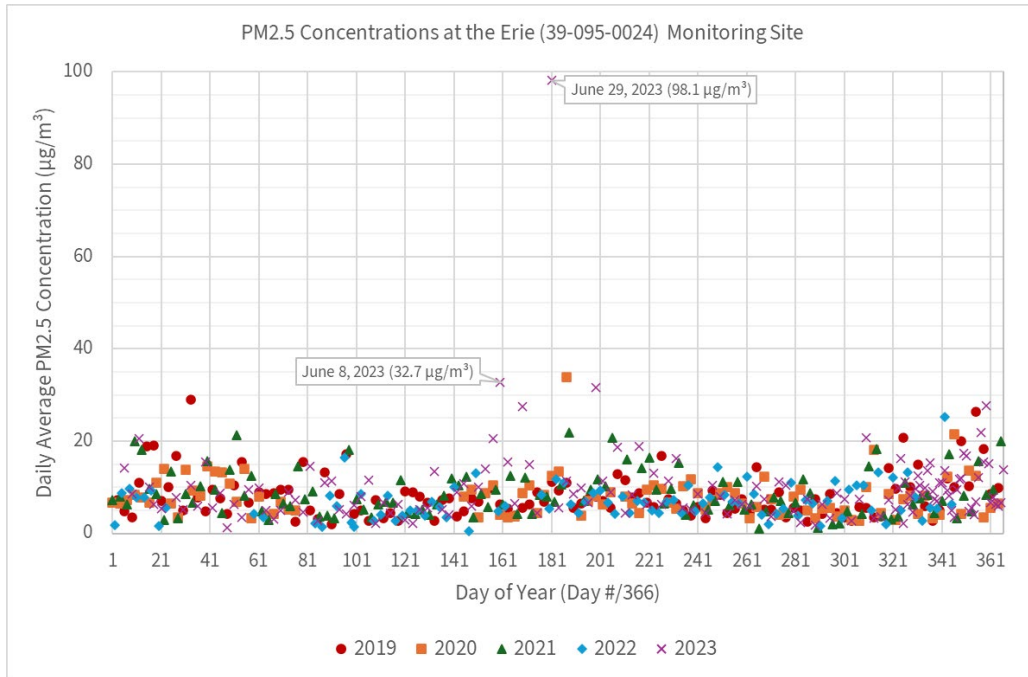
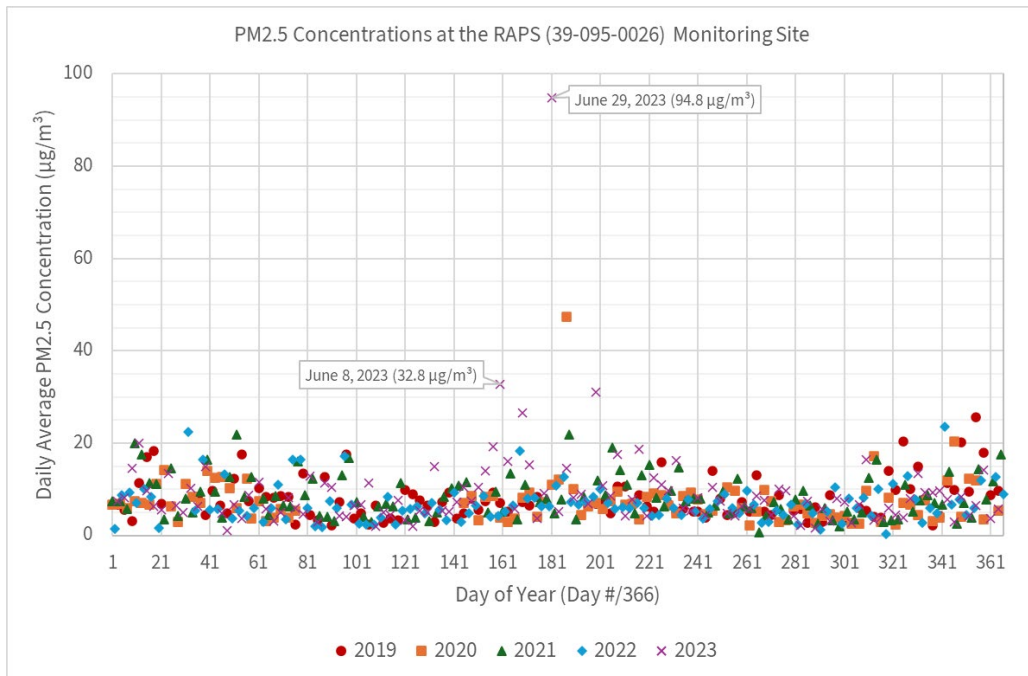


Figure 6. 2019-2023 daily average PM_{2.5} concentrations at the RAPS (39-095-0026) monitoring site in the Toledo, OH MSA.

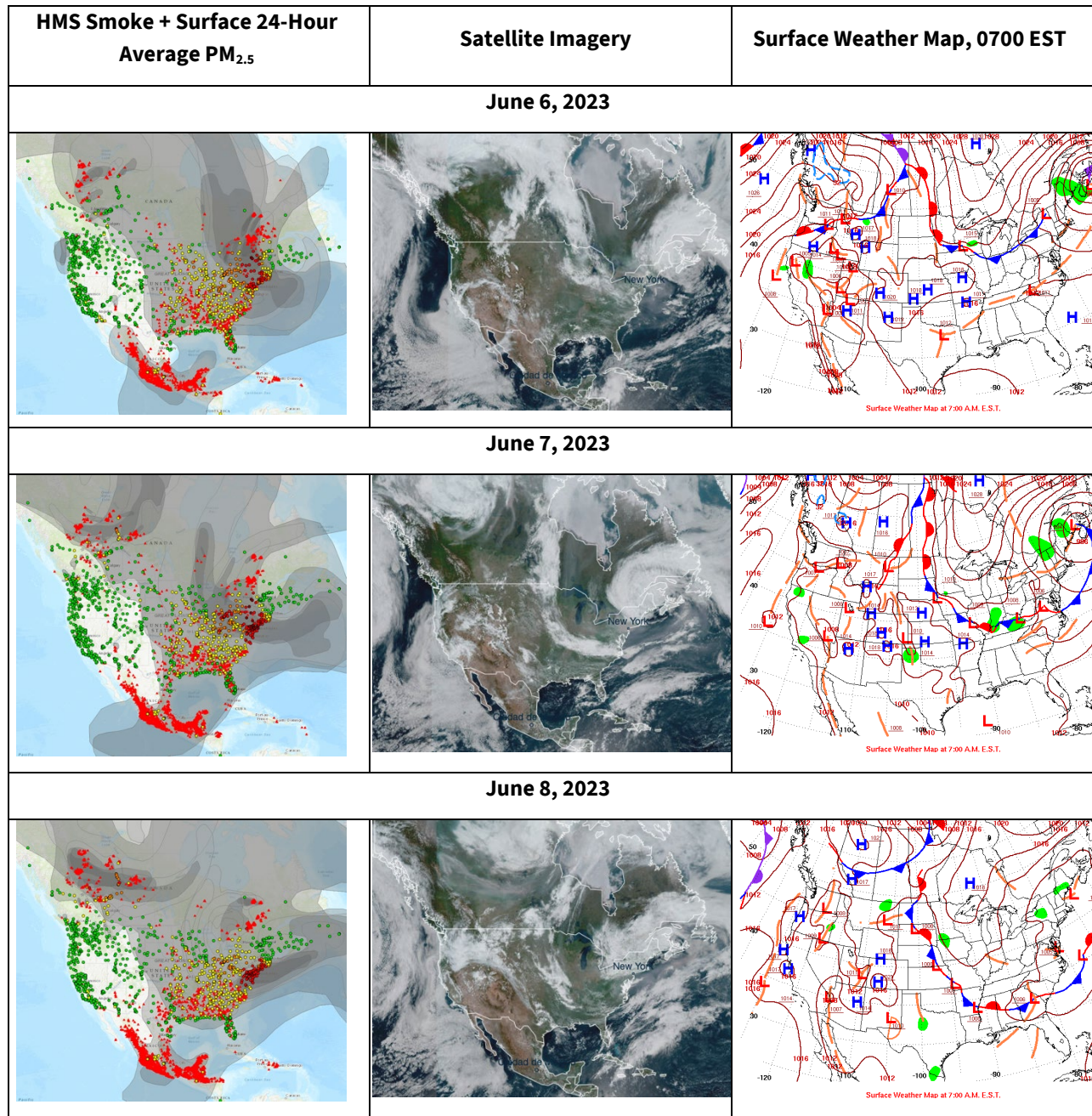


2.1.2. Meteorology

From June 2 to June 9, 2023, two distinct weather patterns connected the upper Midwest with Canada and brought wildfire smoke into the Great Lakes Basin. Early in the episode (June 2-4), a cold front moved across southern Canada and the trailing high-pressure system brought with it smoke from wildfires burning in southeastern Quebec south into the Great Lakes region. Starting on June 5, an area of low-pressure formed along the southeastern coast of Canada near Maine, and an area of high-pressure formed over Hudson Bay in Canada. These features remained in place until June 7 and were the primary physical drivers of the smoke transport into the Great Lakes Basin that impacted air quality in the Toledo, OH MSA on June 8, 2023.

Figure 7 shows Hazard Mapping System (HMS) smoke maps, daily average PM_{2.5} concentrations, satellite imagery, and surface weather maps for June 6-8, 2023. All three days show an area of high pressure with clear skies connecting Hudson Bay to the Great Lakes. The strong low-pressure system off to the east produced cyclonic (counterclockwise) flow, which created a northerly wind transport corridor along its western edge. Combined with the stationary front along the Ohio River Valley, the synoptic conditions were ideal for smoke transport and buildup in northern Ohio. The western edge of the low-pressure system created northerly flow and a descending air mass with accompanying high pressure. This flow pattern brought smoke south from the wildfires burning near the southern end of James Bay in Quebec and carried it to the surface in the Great Lakes Basin. The stationary front along the southern edge of the Great Lakes region caused the air mass to stall, allowing the smoke to build up, resulting in high concentrations of PM_{2.5} at the surface.

Figure 7. Daily average PM_{2.5} concentrations overlapped with NOAA's Hazard Mapping System (HMS) smoke layers (left), daily snapshot of the GOES-16 satellite imagery of cloud cover, and the surface weather map (right) during June 6-8, 2023.



2.1.3. Canadian Wildfires

Starting on May 27, 2023, the Canadian Wildfire Information System (CWIFS)⁴ began to report extreme fire danger conditions from the southwest border of Ontario northeast across Quebec to the Gulf of St. Lawrence. The area of Quebec centered around the southern end of James Bay remained almost continuously under high to extreme fire danger through most of the month. On June 2, the Quebec provincial fire-management authority, Société de Protection des Forêts Contre le Feu (SOPFEU⁵), reported to the Canadian Interagency Forest Fire Center (CIFFC) a fire preparedness level 5 for the province, which is the highest alert level in Canada for mobilizing resources to fight wildfires and protect life and structures⁶. The province remained at a level 5 alert continuously until it was lowered to level 4 on July 17.

Figure 8 is a CWIFS map showing the active fires and fire hotspots in Quebec on June 6, 2023. On June 6 there were 154 active fires burning 651,405 acres in the province⁷. Most of these fires were in the area of Quebec located east of Lebel-sur-Quévillon and the area of Quebec located southeast of Sakami. These fires were located in the source region intersected by the June 8, 2023 HYSPLIT back-trajectories shown in Figure 11 in Section 3 of this document.

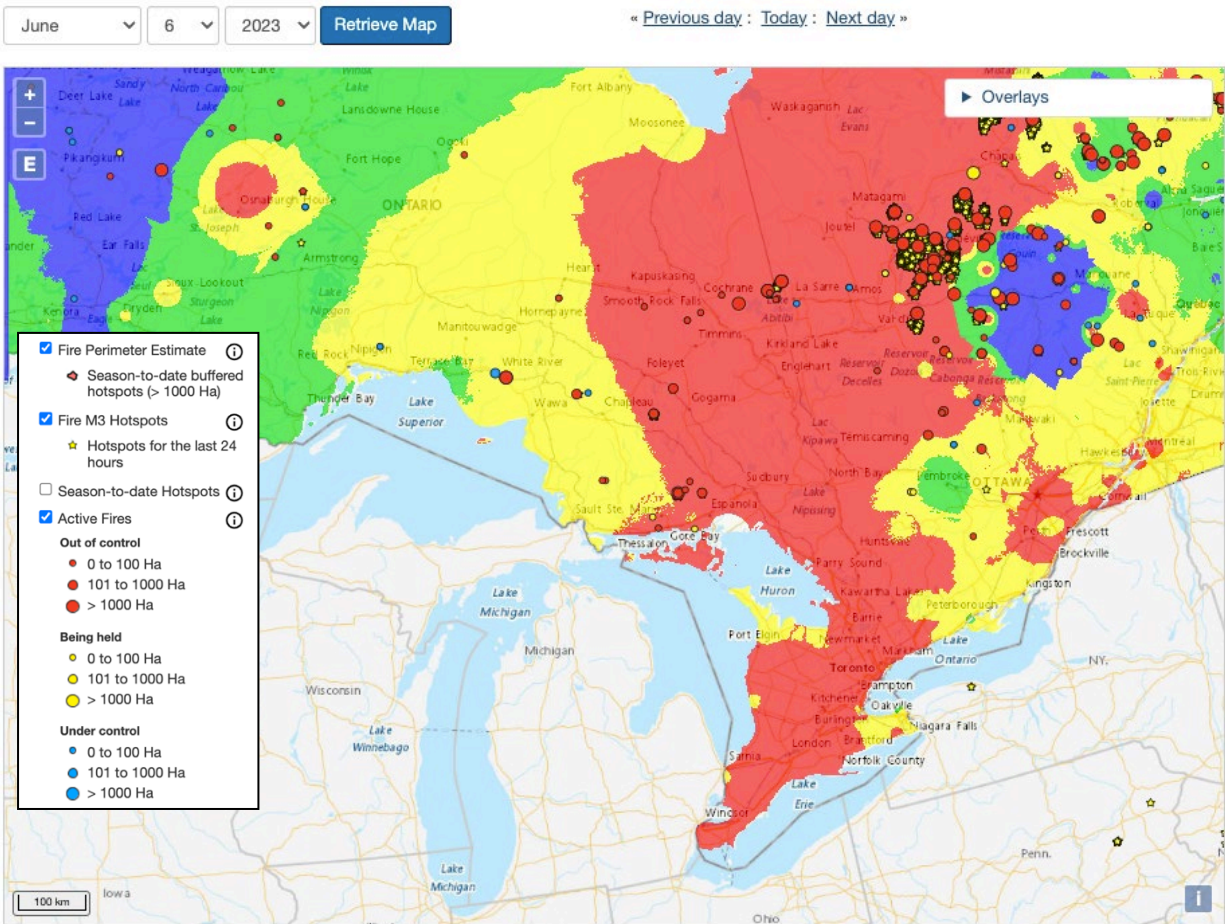
⁴ <https://cwfis.cfs.nrcan.gc.ca/home>

⁵ <https://sopfeu.qc.ca/>

⁶ <https://ciffc.net/situation/2023-06-02>

⁷ <https://ciffc.net/situation/2023-06-06>

Figure 8. Map from CWIFS of active fires in Quebec on June 6, 2023.



2.1.4. Media Coverage

News media across the country reported on the wildfire smoke in the Great Lakes region during June 2023. The coverage of the smoke impacts, particularly by media outlets that typically only report on extreme weather and air quality events, indicated the historic nature of the Canadian wildfire smoke impacts on surface air quality in the Great Lakes region, including the Toledo, OH MSA. While the list of news stories in Table 4 is not exhaustive, it illustrates the severe nature of the June 8, 2023 PM_{2.5} pollution episode in the Great Lakes region and northern Ohio in particular, and serves as further evidence that the June 8, 2023 episode was not local in nature but driven by transported wildfire smoke from Canada that blanketed the region.

Table 4. News media reporting of early June 2023 Canadian wildfire smoke episodes in the Great Lakes region.

Date	Source	Headline
June 7, 2023	CNN	June 7, 2023 Canada wildfire smoke and US air quality news ⁸
June 8, 2023	Toledo Blade	Caution extended on outdoor air in Toledo area ⁹
June 8, 2023	WJR 760 AM Detroit	Detroit air quality dips to “Unhealthy” levels as Canadian wildfire smoke pushes closer to Michigan ¹⁰
June 8, 2023	NBC News	U.S. sees reprieve from smoky haze, but Canadian wildfires are still raging ¹¹
June 8, 2023	Reuters	US East Coast blanketed in veil of smoke from Canadian fires ¹²

⁸ <https://www.cnn.com/us/live-news/us-air-quality-canadian-wildfires-06-07-23/index.html>

⁹ <https://www.toledoblade.com/local/environment/2023/06/08/caution-extended-outdoor-air/stories/20230608123>

¹⁰ <https://www.wjr.com/2023/06/08/detroit-air-quality-dips-to-unhealthy-levels-as-canadian-wildfire-smoke-pushes-closer-to-michigan>

¹¹ <https://www.nbcnews.com/news/us-news/another-day-unhealthy-air-forecast-due-canada-wildfire-smoke-rcna88500>

¹² <https://www.reuters.com/business/environment/us-states-under-air-quality-alerts-canadian-smoke-drifts-south-2023-06-07>

2.2. June 29, 2023 Wildfire Smoke-Driven PM_{2.5} Episode

2.2.1. Episode Description

As with the June 8, 2023 smoke episode, Figures 4, 5, and 6 illustrate the severity of the June 2023 wildfire smoke-driven PM_{2.5} episodes relative to other periods of the year and compared to the same period in the past five years. The June 29, 2023 wildfire smoke-driven PM_{2.5} episode is labeled in each of the plots in Figures 4, 5, and 6.

2.2.2. Meteorology

From June 25 through June 30, 2023, distinct airmass transport patterns connected the upper Midwest with Canada and brought smoke into the Great Lakes Basin. Figure 9 shows Hazard Mapping System (HMS) smoke maps, daily average PM_{2.5} concentrations, satellite imagery, and surface weather maps for the days of the most severe wildfire smoke-driven PM_{2.5} episode in the Great Lakes Basin during this period. During June 25-27, a cyclonic (e.g., counterclockwise) circulation around a large low-pressure system centered on the Great Lakes carried smoke into the upper Midwest from source regions in Ontario and Quebec, Canada. Thick smoke from the Canadian wildfires was transported along the trailing edge of the low-pressure system as it moved east through the Great Lakes Basin. Stable air featured during this period with a consistent northerly to northwesterly wind of 7-15 m/s (16-34 mph).

A blocking ‘omega’ pattern formed in the upper air during June 25-27, which featured two strong low-pressure systems sitting over the Pacific Northwest and the northern Great Lakes blocked by a ridge of high pressure over the Great Plains. This feature allowed smoke from Canada to transport into the Great Lake region and build up at the surface across the region.

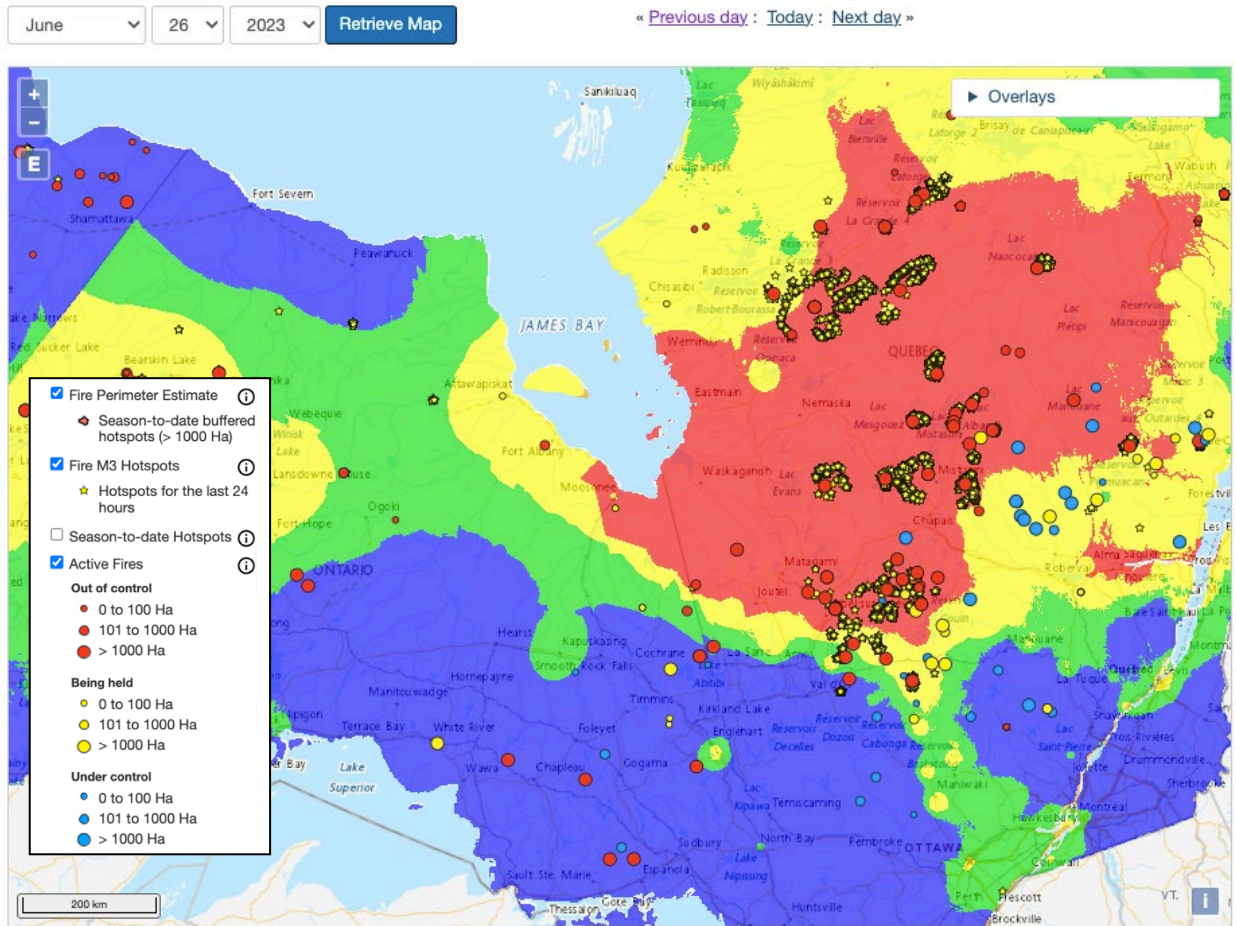
Starting on June 28, 2023, the low-pressure system aloft weakened and moved towards eastern Canada. As a result, a long, weak ridge of high-pressure centered in the Midwest covered most of the eastern U.S. This weak high-pressure system that persisted until the evening of June 29 produced a dry, stagnant air mass in the Great Lakes region that trapped the smoke from the Canadian fires over the region and caused high surface PM_{2.5} conditions at the surface. On June 28, a large low-pressure system formed east of Lake Winnipeg in Manitoba, Canada. At the same time, two well-established meso-scale convective systems that formed in Nebraska and Kansas moved into Illinois on the morning of June 29. Between these two features, a smoke transport corridor formed across the central Great Lakes Basin that brought smoke from Quebec, Canada along with a smoke-enriched airmass from the central Canadian provinces into the region. This corridor persisted until June 30 when the smoke started to clear out of the region to the east.

2.2.3. Canadian Wildfires

Quebec continued to be in state of fire preparedness level 5 for the province in late June 2023. Figure 10 is a CWIFS map showing the active fires and fire hotspots in Quebec Canada on June 26, 2023. On June 26 there were 81 active fires burning 3,013,844 acres in the province¹³. The fires were clustered in three areas of western Quebec near James Bay. These fires were located in the source regions intersected by the June 29, 2023 HYSPLIT trajectories shown in Figure 14 in Section 3 of this document.

¹³ <https://ciffc.net/situation/2023-06-26>

Figure 10. Map from CWIFS of active fires in Quebec on June 26, 2023.



2.1.4. Media Coverage

Similar to the media and messaging coverage shown for the June 8, 2023 wildfire smoke-driven PM_{2.5} episode, Table 5 illustrates the severe nature of the June 29, 2023 PM_{2.5} pollution episode in the Great Lakes region and northern Ohio in particular, and serves as further evidence that the June 29, 2023 episode was not local in nature but driven by transported wildfire smoke from Canada that blanketed the region.

Table 5. News media reporting of late June 2023 Canadian wildfire smoke episodes in the Great Lakes region.

Date	Source	Headline
June 28, 2023	NPR	Detroit, Chicago and the Midwest blanketed by wildfire haze from Canada ¹⁴
June 28, 2023	Cleveland Magazine	Clevelanders urged to stay indoors as smoke from Canadian wildfires hits Cleveland ¹⁵
June 28, 2023	Columbus Dispatch	Canadian wildfire haze drifts into Columbus. See photos ¹⁶
June 28, 2023	Detroit Free Press	Detroit air quality alert extended through Thursday with more wildfire smoke expected ¹⁷
June 29, 2023	Toledo Blade	Toledo air quality hits “Very Unhealthy” range, ranks among worst in U.S. ¹⁸

¹⁴ <https://www.npr.org/2023/06/28/1184746530/why-haze-wildfire-canada-midwest>

¹⁵ <https://clevelandmagazine.com/in-the-cle/news/articles/clevelanders-urged-to-stay-indoors-as-smoke-from-canadian-wildfires-hits-cleveland>

¹⁶ <https://www.dispatch.com/picture-gallery/news/2023/06/28/canadian-wildfire-haze-drifts-into-columbus-see-photos/12177063002>

¹⁷ <https://www.freep.com/story/news/local/michigan/2023/06/28/michigan-detroit-air-quality-canada-wildfire-smoke-forecast/70363422007>

¹⁸ <https://www.toledoblade.com/local/environment/2023/06/29/toledo-air-quality-hits-very-unhealthy-ranks-among-worst-in-u-s/stories/20230629107>

3. Clear Causal Relationship

While the regional wildfire smoke episodes spanned multiple days in June 2023, the Toledo, OH MSA experienced some of the worst smoke impacts on June 8 and June 29, 2023. The smoke episodes for both days are seen clearly in satellite imagery, remote sensing products, and in the surface PM_{2.5} monitors. The figures in this section that are used to establish the clear and causal relationship between the Canadian wildfires and the PM_{2.5} pollution episodes in Toledo show data from AirNowTech.gov and include the following information:

- Hazard Mapping System (HMS) smoke layers
- Air Quality System (AQS) 24-hour average PM_{2.5} surface concentrations
- 48-hour forward and backward HYSPLIT trajectories released at 50, 250, and 1000 meters

NASA Worldview¹⁹ data are also used in this section, and include the following information:

- Aerosol optical depth (AOD) from the MODIS combined Terra and Aqua Multi-Angle Implementation of Atmospheric Correction (MAIAC) Land Aerosol Optical Depth level 2 product (left plot)
- Moderate Resolution Imaging Spectroradiometer (MODIS) Terra corrected reflectance (true color) and Visible Infrared Imaging Radiometer Suite (VIIRS) Fire and Thermal Anomalies (day and night, 375m) layer showing active fire detections and thermal anomalies (right plot)

The clear causal relationship between the Canadian wildfires and PM_{2.5} concentrations in the Toledo, OH MSA for the June 8, 2023 and June 29, 2023 episodes are presented in this section. Clear causal relationship descriptions are presented separately for each episode.

3.1. June 8, 2023 Wildfire Smoke-Driven PM_{2.5} Episode

The HYSPLIT 48-hour trajectory map in Figure 11 shows the origin, transport, and fate of the smoke plumes that caused the high surface PM_{2.5} concentrations in the Toledo, OH MSA on June 8, 2023. The forward trajectories were released on June 6 to correspond with the backward trajectories that were released on June 8. The HYSPLIT trajectory plot for June 8 is accompanied by a second AirNow plot to show the fire and smoke conditions at the

¹⁹ <https://worldview.earthdata.nasa.gov>

beginning of the trajectory analysis period. Figure 11 shows the 48-hour back trajectory from the Toledo, OH MSA for June 8, 2023. Figure 12 shows the fires and HMS smoke polygons 48 hours before on June 6, and includes the same trajectories shown in Figure 11. The upwind fire and smoke conditions, and the coincidence of the forward and backward trajectories for the high-concentration day is clear evidence that the smoke from the wildfires in Quebec caused the high PM_{2.5} concentrations in the Toledo, OH MSA on this day. The accompanying AOD and imagery maps in Figure 13 provide further evidence that dense smoke from the Canadian wildfires was present in the Toledo, OH MSA on June 8, 2023, and that this smoke was the cause of the high concentrations of PM_{2.5} at the monitoring sites.

Figure 11. 48-hour forward and backward trajectories between the Toledo, OH MSA and wildfire smoke sources in Quebec, Canada on June 8, 2023.

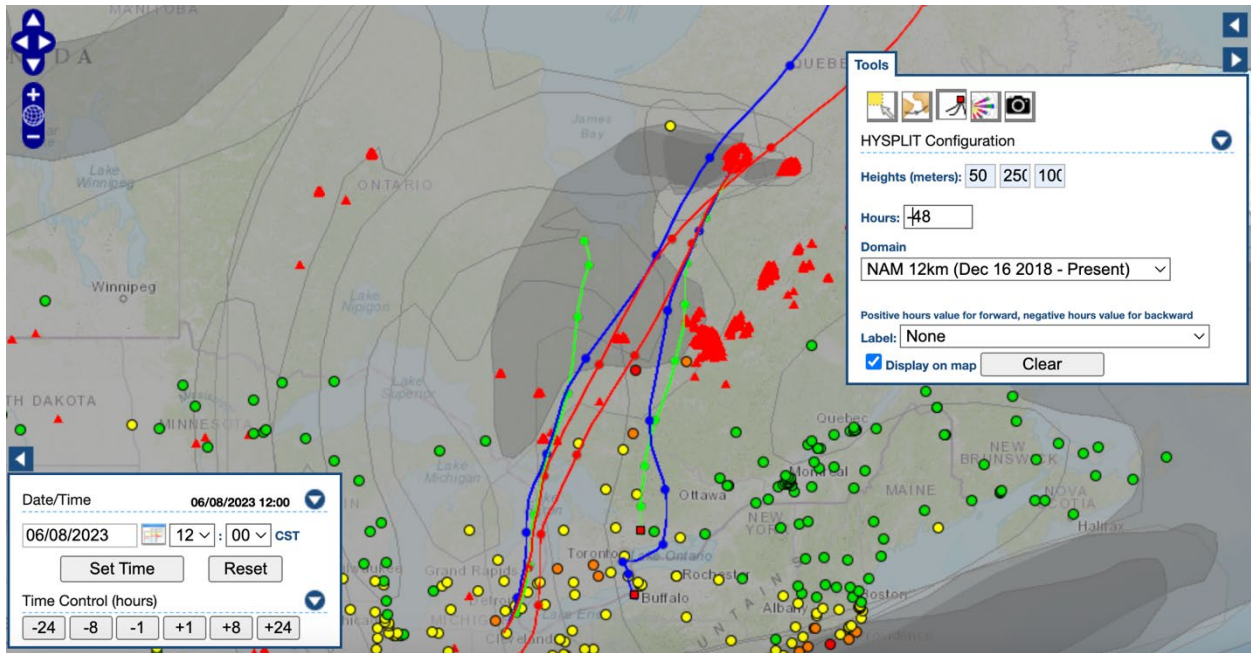


Figure 12. June 6, 2023 fire and smoke conditions with 48-hour forward and back trajectories for June 8, 2023.

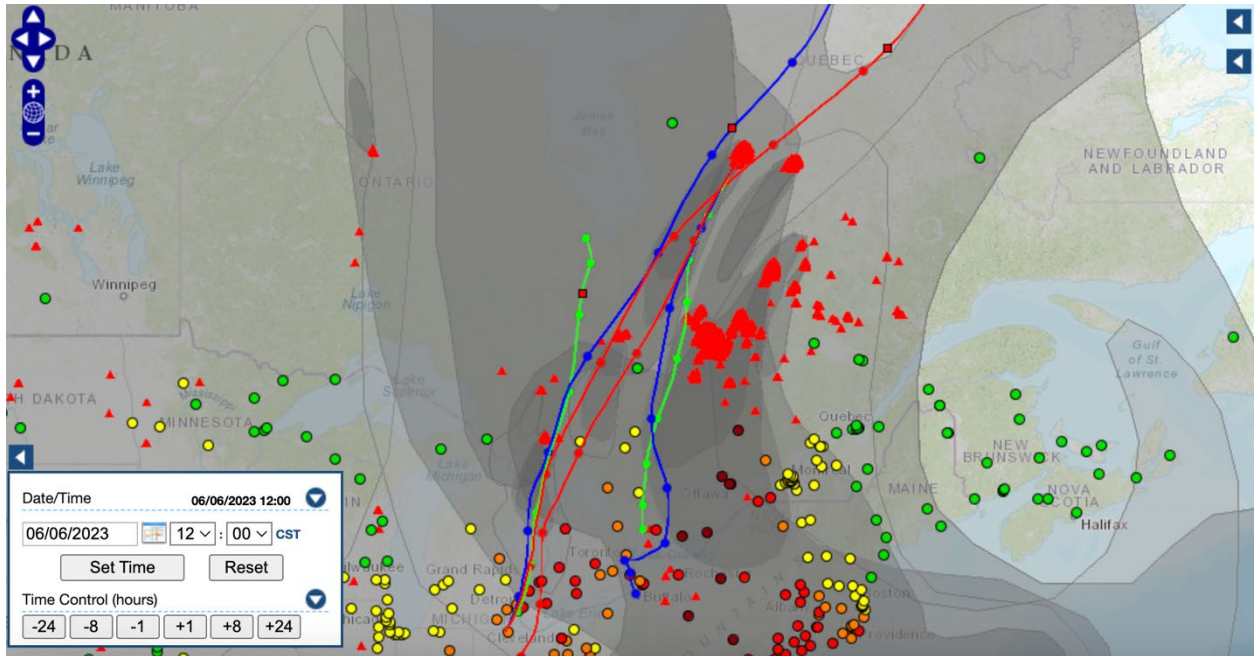
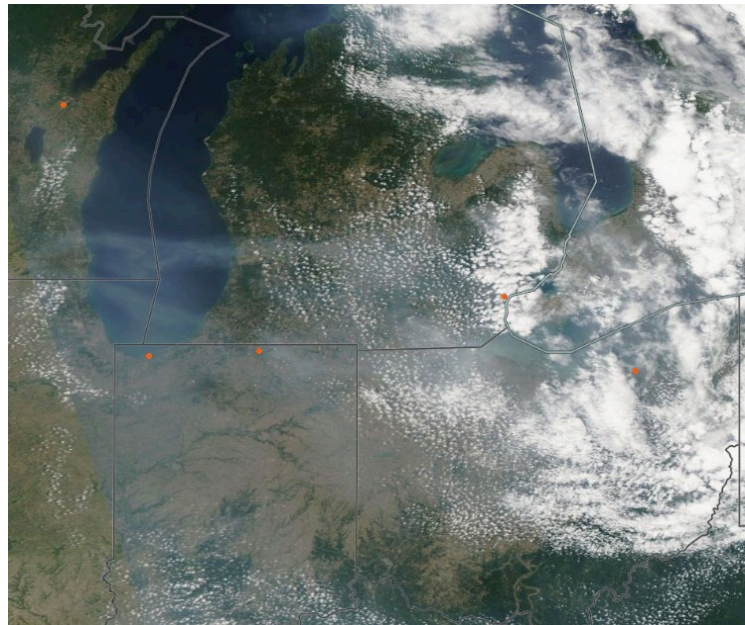
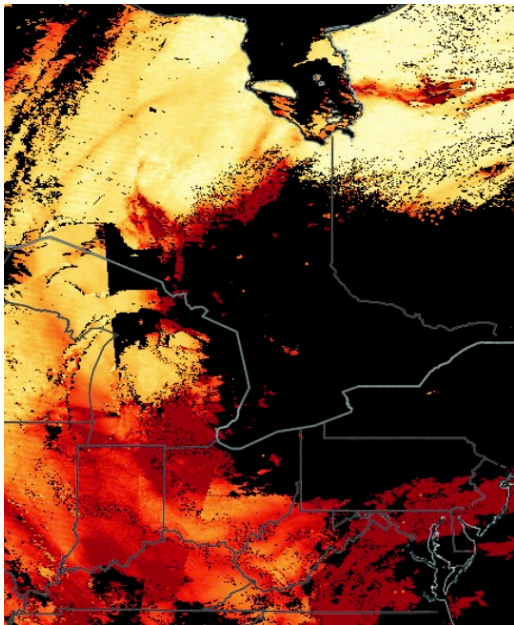


Figure 13. June 8, 2023 MAIAC AOD (left) and satellite true color imagery (right)



3.2. June 29, 2023 Wildfire Smoke-Driven PM_{2.5} Episode

The HYSPLIT 48-hour trajectory map in Figure 14 shows the origin, transport, and fate of the smoke plumes that caused the high surface PM_{2.5} concentrations in the Toledo, OH MSA on June 29, 2023. The forward trajectories were released on June 27 to correspond with the backward trajectories that were released on June 29. The HYSPLIT trajectory plot for June 29 is accompanied by a second AirNow plot to show the fire and smoke conditions at the beginning of the trajectory analysis period. Figure 14 shows the 48-hour back trajectory from the Toledo, OH MSA for June 29, 2023. Figure 15 shows the fires and HMS smoke polygons 48 hours before on June 27, and includes the same trajectories shown in Figure 14. The upwind fire and smoke conditions and the coincidence of the forward and backward trajectories for the high-concentration day are clear evidence that the smoke from the wildfires in Quebec caused the high PM_{2.5} concentrations in the Toledo, OH MSA on this day. The accompanying AOD and imagery maps in Figure 16 provide further evidence that dense smoke from the Canadian fires was present in the Toledo, OH MSA on June 29, 2023, and that this smoke was the cause of the high concentrations of PM_{2.5} at the surface monitors.

Figure 14. 48-hour forward and backward trajectories between the Toledo, OH MSA and wildfire smoke sources in Quebec, Canada on June 29, 2023.

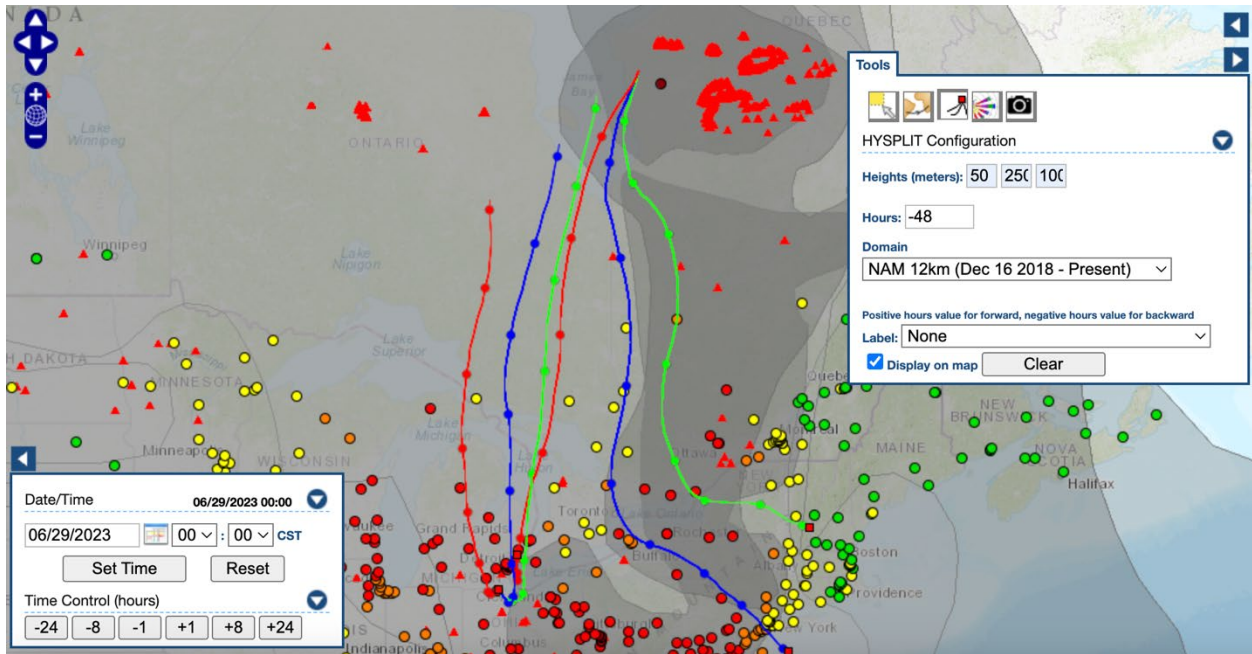


Figure 15. June 27, 2023 fire and smoke conditions with 48-hour forward and back trajectories for June 29, 2023.

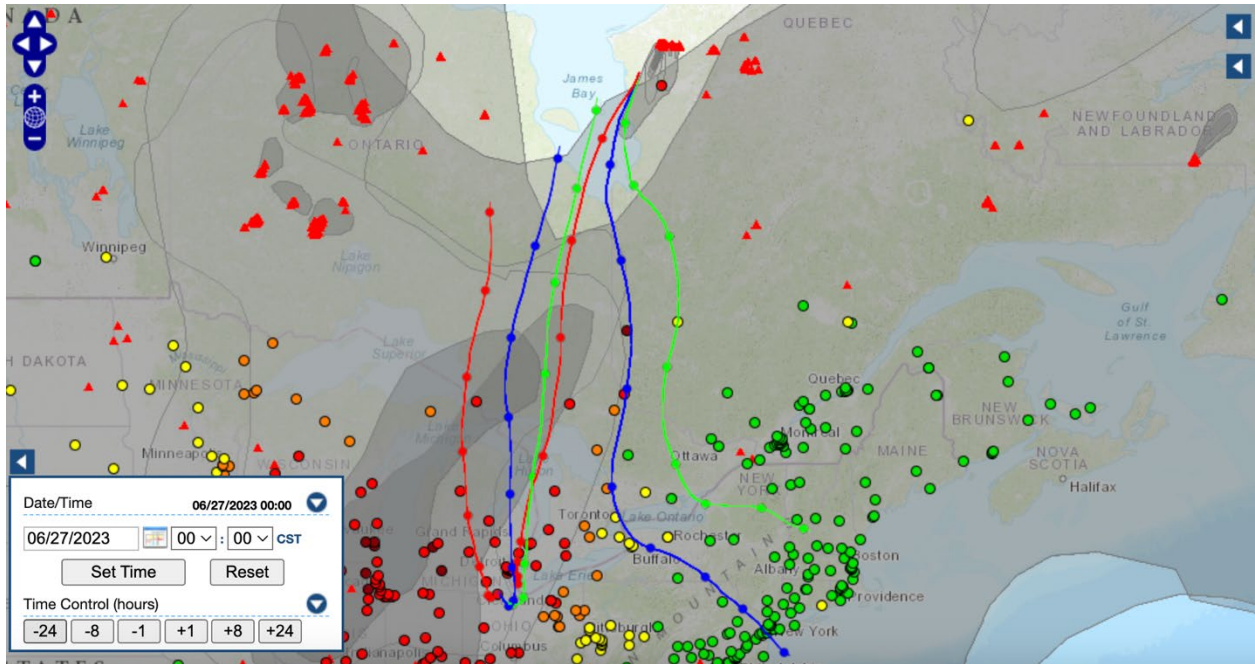
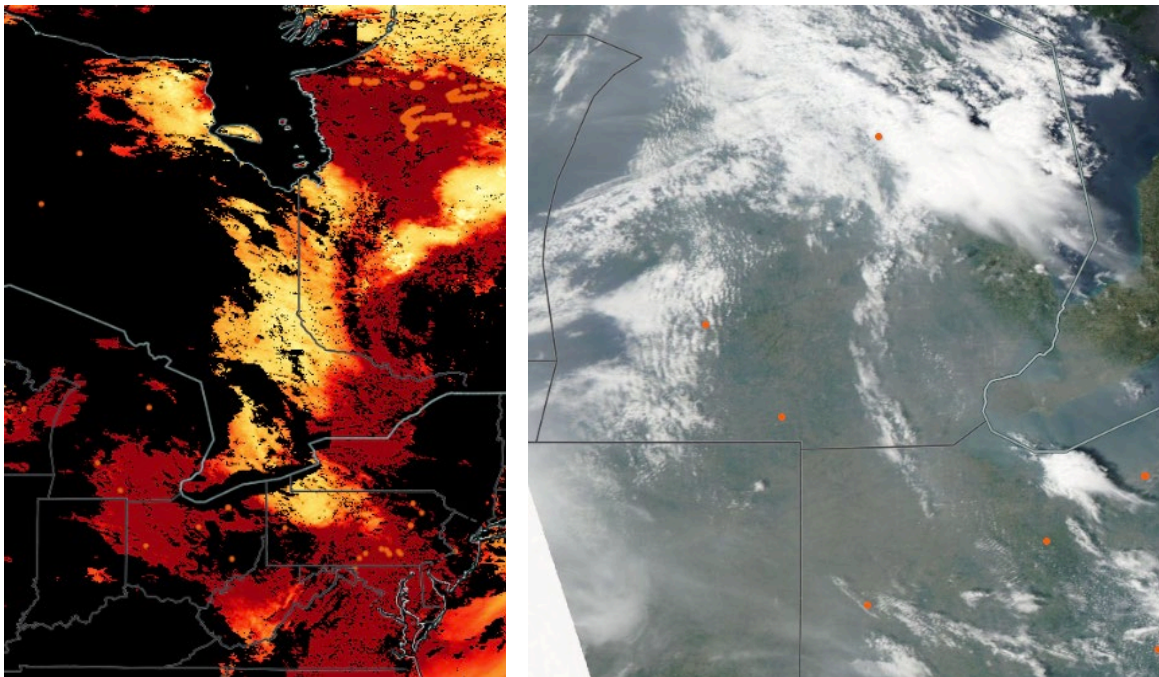


Figure 16. June 29, 2023 MAIAC AOD (left) and satellite true color imagery (right).



4. Not Reasonably Controllable or Not Reasonably Preventable

40 CFR 50.14 (c)(3)(iv)(D) requires a demonstration that the event was both not reasonably controllable and not reasonably preventable. For wildfires, it is presumed according to 40 CFR 50.14(b)(4) that wildfires on wildland will satisfy both factors of the not reasonably controllable or not reasonably preventable unless there is evidence that demonstrates otherwise. 40 CFR 50.1(n) defines a wildfire as “any fire started by an unplanned ignition caused by lightning; volcanoes; other acts of nature; unauthorized activity; or accidental, human-caused actions, or a prescribed fire that has developed into a wildfire”. 40 CFR 50.1(o) defines wildland as “an area in which human activity and development are essentially non-existent, except for roads, railroads, power lines, and similar transportation facilities. Structures, if any, are widely scattered”. As seen from the satellite imagery shown in Figure 17, the areas in which the June 2023 fires occurred, namely the area east of Lebel-sur-Quévillon and the area southeast of Sakami, are wildlands.

Figure 17. Satellite imagery of the wildland areas east of Lebel-sur-Quévillon (left) and the wildland areas southeast of Sakami (right).



Extensive wildfire activity occurred on wildlands across Canada during the late spring and summer of 2023. The Canadian government estimates that on average 67% of the area burned in Canada from wildfires is due to lightning-caused fires²⁰. CIFCC²¹ reported that on June 1, 2023, “a major lightning strike hit Quebec, igniting 182 forest fires in a single day”.

²⁰ <https://natural-resources.canada.ca/our-natural-resources/forests/wildland-fires-insects-disturbances/forest-fires/fire-behaviour/13145>

As the June 2023 fires in Canada were reported to have been started by unplanned ignitions caused by lightning, they are considered wildfires as defined in 40 CFR 50.1(n). Since these wildfires occurred predominantly on wildlands, they meet the not reasonably controllable and not reasonably preventable criterion in the Exceptional Events Rule. The wildfires burning in June 2023 could not have been prevented and could not have been controlled by state or federal natural resources managers in the U.S. The excessive wildfire smoke emissions that contributed to monitored violations of the 2024 revised annual PM_{2.5} NAAQS in the Toledo, OH MSA on June 8, 2023, and June 29, 2023, were caused by the wildfires and not the result of emissions from anthropogenic sources.

²¹ https://ciffc.ca/sites/default/files/2024-03/03.07.24_CIFFC_2023CanadaReport%20%281%29.pdf

5. Human Activity Unlikely to Recur at a Particular Location or Natural Event

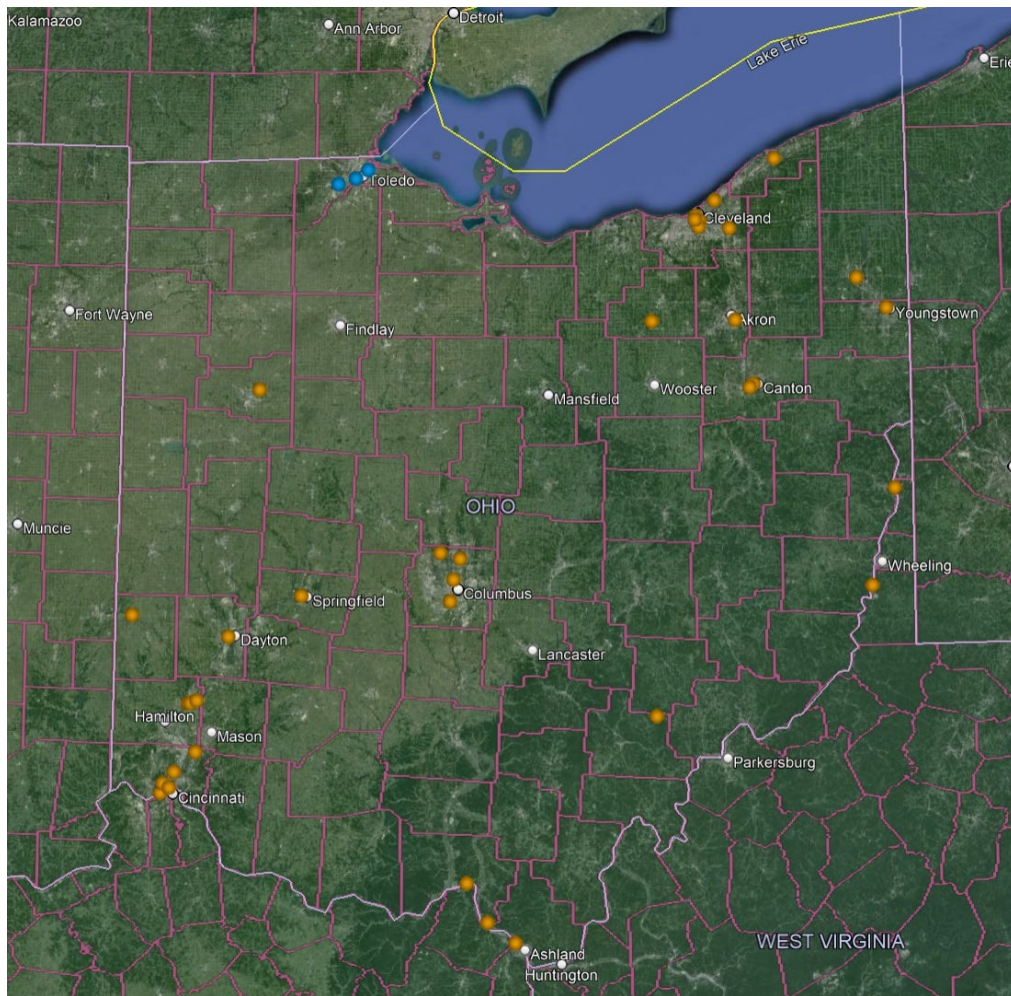
40 CFR 50.14(c)(3)(iv)(E) requires a demonstration that the event was a human activity that is unlikely to recur at a particular location or was a natural event. 40 CFR 50.1(k) defines a natural event as “an event and its resulting emissions, which may recur at the same location, in which human activity plays little or no direct causal role”, and further states that for purposes of this definition, “anthropogenic sources that are reasonably controlled shall be considered to not play a direct role in causing emissions”. Additionally, 40 CFR 50.1(n) states that a “wildfire that predominantly occurs on wildland is a natural event”. As described in this document, the origin and evolution of the June 2023 wildfires occurred predominantly across wildlands in Quebec, Canada.

Based on the documentation provided in this demonstration, the June 2023 events qualify as wildfires because lightning most likely caused the unplanned wildfire events. As the wildfire events that are subject of this demonstration occurred on wildlands and were caused by lightning, they were natural and should be considered for treatment as exceptional events.

6. Public Notification

Ohio EPA maintains a public alert system as well as publicly available information via the Ohio EPA website²² to keep residents informed of potential wildfire smoke impacts. As required by 40 CFR Part 58, Appendix D, Ohio EPA and partner public health and air pollution control agencies in the state install, operate, and maintain a network of instruments to measure ambient air quality at monitoring sites across the state. Figure 18, Figure 19, and Figure 20 show the locations of active PM_{2.5} monitoring sites in the state of Ohio, in the Toledo, OH MSA, and in the city of Toledo, respectively.

Figure 18. Map of active PM_{2.5} monitoring sites in the state of Ohio.



²² <https://epa.ohio.gov>

Figure 19. Map of active PM_{2.5} monitoring sites in the Toledo, OH MSA.

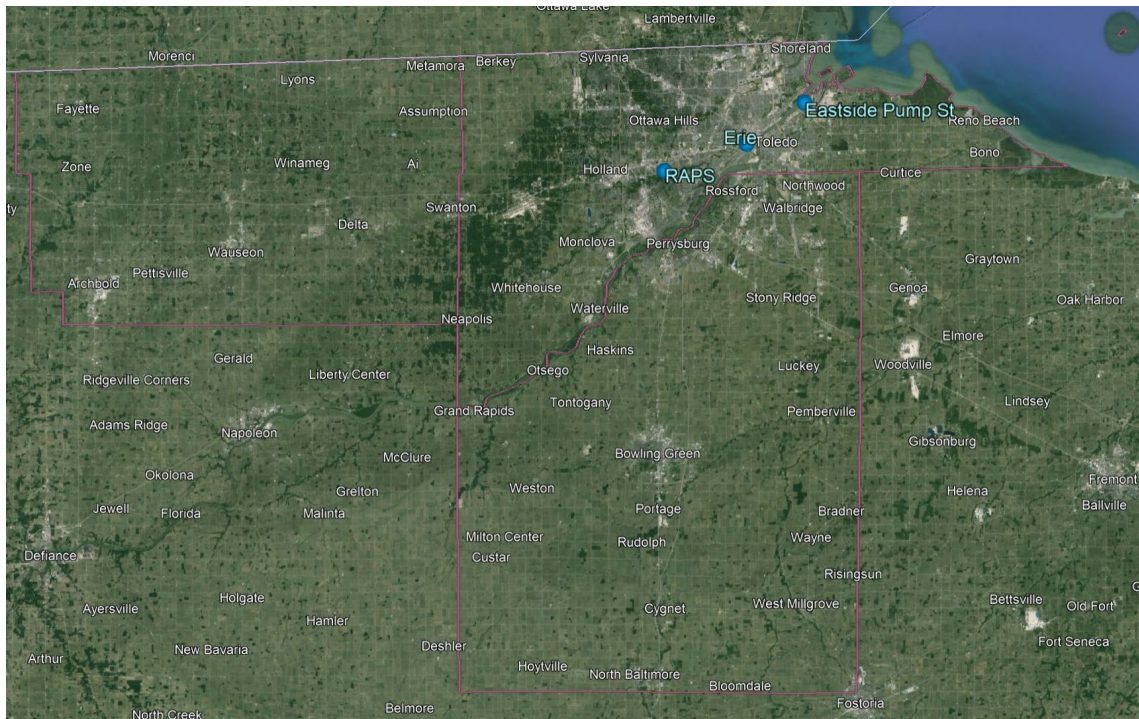
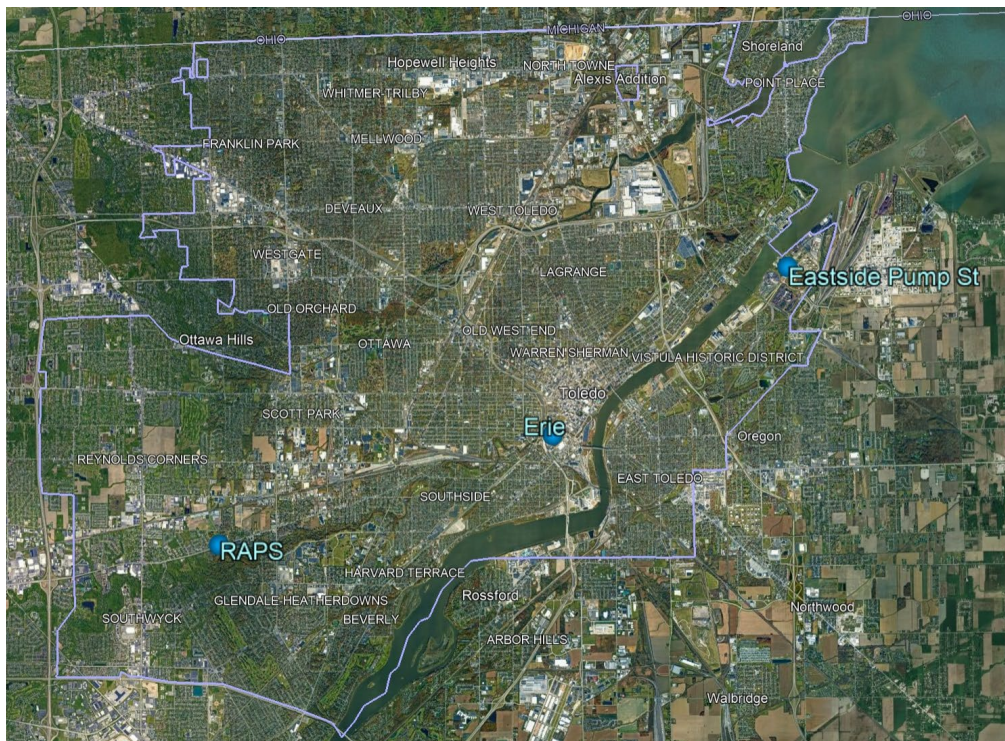


Figure 20. Map of active PM_{2.5} monitoring sites in the city of Toledo, OH.



The Eastside Pump St, Erie, and RAPS monitoring sites in the Toledo, OH MSA were each fully operational and collected continuous, hourly ambient PM_{2.5} measurements during 2023, including during the June 8, 2023 and June 29, 2023 wildfire smoke-driven PM_{2.5} episodes. Ohio EPA reported these data in real time to U.S. EPA for inclusion in the AirNow system. The ambient PM_{2.5} data from the Eastside Pump St, Erie, and RAPS monitoring sites were also publicly accessible through the Ohio EPA Division of Air Pollution Control website²³.

Data collected from the network of monitoring sites are used by Ohio EPA and partner agencies, such as public health departments, local air pollution control agencies, and metropolitan planning organizations, to notify the public when air pollution may reach levels that are potentially harmful to public health. Table 6 lists the public notices and outreach messages issued by Ohio EPA and other agencies regarding the early and late June 2023 wildfire smoke-driven PM_{2.5} episodes.

²³ <https://epa.ohio.gov/divisions-and-offices/air-pollution-control/reports-and-data/airohio-air-monitoring-data>

Table 6. Public notices issued regarding the early and late June 2023 wildfire smoke-driven PM_{2.5} episodes.

Date Issued	Date(s) Covered	Issued By	Counties Covered	Type of Notice
June 7, 2023	June 7, 2023	Ohio EPA	ALL (Statewide)	Statewide Air Quality Advisory ²⁴
June 7, 2023	June 7, 2023; June 8, 2023	Toledo-Lucas County Health Department	Lucas	Social Media Outreach ²⁵
June 8, 2023	June 8, 2023	Ohio EPA	ALL (Statewide)	Statewide Air Quality Advisory ²⁶
June 28, 2023	June 28, 2023	Ohio EPA	ALL (Statewide)	Statewide Air Quality Advisory ²⁷
June 28, 2023	June 28, 2023	Toledo-Lucas County Health Department	Lucas	Social Media Outreach ²⁸
June 29, 2023	June 29, 2023	Ohio EPA	ALL (Statewide)	Statewide Air Quality Advisory ²⁹
June 29, 2023	June 29, 2023	Toledo-Lucas County Health Department	Lucas	Social Media Outreach ³⁰

²⁴ <https://epa.ohio.gov/about/media-center/news/statewide-air-quality-advisory>

²⁵ <https://www.facebook.com/100064422949951/posts/638122781678481>

²⁶ <https://epa.ohio.gov/about/media-center/news/statewide-air-quality-advisory-june-8>

²⁷ <https://epa.ohio.gov/about/media-center/news/statewide-air-quality-advisory-june-28>

²⁸ <https://www.facebook.com/100064422949951/posts/651048807052545>

²⁹ <https://epa.ohio.gov/about/media-center/news/statewide-air-quality-advisory-june-29>

³⁰ <https://www.facebook.com/100064422949951/posts/651819506975475>

7. Public Participation

In accordance with the requirements of 40 CFR 50.14(c)(2)(i), on September 10, 2024, Ohio formally notified U.S. EPA of its intent to request the exclusion of data due to exceptional events. A copy of the initial notification form submitted to U.S. EPA regarding exceptional events in the Toledo, OH MSA is included as Appendix A. Ohio published solicitation for public comment concerning the draft Exceptional Events Demonstration for 2023 Wildfire Smoke-Driven PM_{2.5} Episodes in the Toledo, OH Metropolitan Statistical Area on September 13, 2024. The public comment period closed on October 15, 2024. Appendix B includes a copy of the public notice, a copy of the public comments received, and a copy of Ohio's responses to the public comments received.

8. Summary

This exceptional events demonstration shows that wildfires in Canada adversely affected ambient PM_{2.5} concentrations measured by the Eastside Pump St (39-095-1003), Erie (39-095-0024), and RAPS (39-095-0026) monitoring sites in the Toledo, OH MSA on June 8, 2023 and June 29, 2023. The ambient PM_{2.5} concentrations measured by the Eastside Pump St monitoring site on these dates have been shown to have contributed to a monitored violation of the 2024 revised annual PM_{2.5} NAAQS, and it has been demonstrated that the exclusion of the ambient PM_{2.5} concentrations measured by the Eastside Pump St monitoring site on these dates would result in a valid 2021-2023 annual PM_{2.5} design value that is at or below the 2024 revised annual PM_{2.5} NAAQS value of 9.0 µg/m³, proving regulatory significance. Ohio EPA therefore requests the exclusion of the ambient PM_{2.5} concentrations measured at the Eastside Pump St monitoring site on June 8, 2023 and June 29, 2023 from regulatory determinations, including calculations of annual PM_{2.5} design values. Additionally, since the ambient PM_{2.5} concentrations measured at the Erie and RAPS monitoring sites on June 8, 2023 and June 29, 2023 were also affected by the same regulatorily significant wildfire smoke-driven PM_{2.5} episodes, Ohio EPA is also requesting the exclusion of these data from regulatory determinations, including calculations of annual PM_{2.5} design values for the Erie and RAPS monitoring sites.

This exceptional events demonstration includes all the required elements of wildfire smoke-driven PM_{2.5} exceptional events demonstrations as described in the Exceptional Events Rule. These elements meet all applicable requirements of the Exceptional Events Rule and clearly demonstrate that wildfire smoke from Canada had unprecedented impacts on ambient PM_{2.5} concentrations in the Toledo, OH MSA on June 8, 2023 and June 29, 2023.