



GEORGIA

DEPARTMENT OF NATURAL RESOURCES

ENVIRONMENTAL PROTECTION DIVISION

Prescribed Fire Exceptional Event Demonstration for the 2024 Annual PM_{2.5} NAAQS at Columbus, GA in 2022-2024

Prepared by:
Air Protection Branch
Environmental Protection Division

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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/m³ and 35 µg/m³, 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/m³) 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 not 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/m³).

From 2019 through July 2020, PM_{2.5} data was collected at the Columbus-Cusseta site (Air Quality System (AQS) ID: 13-215-0011) with an FRM monitor on a one-in-three-day schedule. This location was shut down at the end of July 2020, and then a new site was established in March 2021 at the Columbus-Baker site (AQS ID: 13-215-0012). The data from these two locations in Columbus (Cusseta and Baker) is linked in AQS for attainment purposes. At the Columbus-Baker location, one FRM monitor began collecting data in March 2021 on a one-in-three day sampling schedule. From 2021 through 2023, one FRM monitor operated at the Columbus-Baker site. In addition, an FEM monitor started collecting data in June 2023, with a NAAQS exclusion on the data. The Columbus, GA-AL MSA (Metropolitan Statistical Area) is in attainment of the 2012 PM_{2.5} NAAQS.

The Georgia Rules for Air Quality Control (391-3-1-.01(tt)) define open burning as any outdoor fire from which the products of combustion are emitted directly into the open air without passing through a stack, chimney, or duct. Such burning releases smoke, oxides of nitrogen, and other pollutants that may have a negative impact on Georgia’s air quality. Georgia’s Open Burning Rules (391-3-1-.02(5)) were created to improve air quality in Georgia. Prescribed fire is a type of fire that is subject to Georgia’s Open Burning Rules. It is essential to maintain a sustainable and resilient wildland ecosystem, preserve endangered and threatened species, and prevent catastrophic wildfires. In 2008, the Georgia Department of Natural Resources (DNR) Environmental Protection Division (EPD), Georgia DNR Wildlife Resources Division (WRD), and Georgia Forestry Commission (GFC) signed a Memorandum of Understanding (MOU) to implement Georgia’s Smoke Management Plan (SMP). In addition, GFC manages prescribed fires via its burn permitting system.

Despite the aforementioned coordinated efforts between DNR and GFC, exceedances of the 2024 annual PM_{2.5} NAAQS occurred at the Columbus-Baker PM_{2.5} site (AQS ID: 13-215-0012) in 2022-2024 that qualify for removal under the Exceptional Events Rule (EER). On July 30, 2025, the Georgia Environmental Protection Division (EPD) submitted an Initial Notification for these events to the U.S. Environmental Protection Agency (EPA). The request indicated that 24-hour PM_{2.5} concentrations on the ten (10) days shown in Table 1 were impacted by smoke from Canadian wildfires (2 days) and prescribed fires (8 days) and requested review of the events under the case-by-case provision at 40 CFR 50.14(a)(1)(i)(F). This demonstration will focus on the eight prescribed fire events, while a separate demonstration will focus on the two Canadian wildfire events. Table 2 shows the impact of exclusion of the data on the 2022-2024 design value (DV) for the Columbus-Baker site.

Table 1. Exceedances of the 2024 annual PM_{2.5} NAAQS occurred at the Columbus-Baker PM_{2.5} site (AQS ID: 13-215-0012) in 2022-2024 that qualify for removal under the EER.

#	Date	24-hour PM _{2.5} (µg/m ³)	Tier	Cause of Exceedance
1	02/01/22	22.1	1	Prescribed fires
2	02/10/22	32.0	1	Prescribed fires
3	03/03/22	55.1	1	Prescribed fires
4	03/01/23	21.1	1	Prescribed fires
5	03/07/23	25.0	1	Prescribed fires
6	06/29/23	20.8	1	Canadian Wildfires
7	07/17/23	25.3	1	Canadian Wildfires
8	02/03/24	34.3	1	Prescribed fires
9	02/21/24	28.5	1	Prescribed fires
10	03/13/24	35.0	1	Prescribed fires

Table 2. Columbus-Baker 2022-2024 DVs for the 2024 annual PM_{2.5} NAAQS.

Monitoring Site (AQS ID)	2022-2024 DV without EPA Concurrence (µg/m ³)	2022-2024 DV with EPA Concurrence (µg/m ³)
Columbus-Baker (13-215-0012)	9.6	9.0

EPA has outlined requirements for demonstrations for prescribed fire events in the 2016 Exceptional Events Rule (EER) and has further clarified those requirements in a guidance document, *Exceptional Events Guidance: Prescribed Fire on Wildland that May Influence Ozone and Particulate Matter Concentrations* (issued in 2019, hereafter referred to as the Prescribed Fire Guidance). The Prescribed Fire Guidance also refers to a separate EPA-issued guidance document, *Guidance on the Preparation of Exceptional Events Demonstrations for Wildfire Events that May Influence Ozone Concentrations* (issued in 2016, hereafter referred to as the Wildfire Ozone Guidance), for outlining certain requirements that apply to both prescribed fires and wildfires. This demonstration will describe how the prescribed fire events meet the requirements of the EER as described in regulation and both guidance documents, as applicable.

2. Narrative Conceptual Model

This section addresses the EER requirement at 40 CFR 50.14(c)(3)(iv)(A), which requires a narrative conceptual model that describes the event causing the exceedance and a discussion of how emissions from the event led to the exceedance at the affected site. In addition, this section includes a summary of how mitigation requirements in 40 CFR 51.930(a) were addressed.

The prescribed fires were conducted under the Georgia Smoke Management Plan (SMP). The Georgia SMP is considered a state-certified SMP for purposes of the EPA EER. The Georgia SMP, in combination with the Georgia EPD burn regulation, outlines the requirements for burn permits, burn registration and reporting, a burn authorization system, smoke management, resources, district resources, and inspection and enforcement.

The eight prescribed fire exceptional events discussed in this document were due to silviculture burns that occurred on wildlands. According the 2016 Exceptional Events Rule (81 FR 68216),

“Wildland” means an area in which human activity and development are essentially non-existent, except for roads, railroads, power lines, and similar transportation facilities.

For the eight prescribed fire exceedance days listed in Table 1, National Oceanic and Atmospheric Administration (NOAA) Hazard Mapping System (HMS) smoke plumes and fire data, Hybrid Single-Particle Lagrangian Integrated Trajectory (HYSPLIT) trajectory modeling, and location of prescribed burns are used to clearly demonstrate that smoke from the prescribed fires conducted on the day of the exceedance and/or the day before the exceedances were transported to the Columbus-Baker site causing the exceedances. In general, the prescribed fires responsible for the PM_{2.5} exceedances were in close proximity (less than 100 km) and upwind of the site, which allowed calm surface winds to transport smoke plumes during the day and overnight to the site under a stable boundary layer. Section 3 of this document contains details to support this conceptual model.

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 website¹ with an interactive wildfire and burn permit map that contains the current Air Quality Index at all monitors in Georgia with the option to add the following layers: (1) burn restrictions, (2) daily burn permits, (3) PM_{2.5}, (4) NOAA 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 website² 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 Map³, EPA’s AirNow When Smoke is in the Air⁴, EPA’s AirNow Prepare for Fire Season⁵, EPA’s Smoke-Ready Toolbox for Wildfires⁶, and Georgia DNR Wildlife Resource Division - Prescribed Fire Information⁷. 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 on the day of prescribed fire activities. In addition, the Georgia EPD Ambient Air Monitoring Program website⁸ provides the near real-time ambient air concentrations of multiple criteria pollutants (O₃, PM_{2.5}, SO₂, NO₂, and CO) across the state.

¹ <https://georgiafc.firesponse.com/public/>

² <https://epd.georgia.gov/air-protection-branch/open-burning-rules-georgia>

³ <https://fire.airnow.gov/>

⁴ <https://www.airnow.gov/wildfires/when-smoke-is-in-the-air/>

⁵ <https://www.airnow.gov/sites/default/files/2020-10/prepare-for-fire-season.pdf>

⁶ <https://www.epa.gov/air-research/smoke-ready-toolbox-wildfires>

⁷ <https://georgiawildlife.com/prescribed-fire>

⁸ <https://airgeorgia.org/>

Georgia EPD, in conjunction with the Georgia Institute of Technology, provides a daily forecast email that includes messaging concerning health advisories and smog alerts to Georgia Commute Options and the Atlanta Regional Commission for distribution. Each forecast email includes a reminder stating: “If you see or smell smoke and have respiratory concerns you may need to move indoors, close windows and doors. You can see the current air quality at <https://airgeorgia.org> or <https://airnow.gov> to help you determine when to continue outdoor activities.”

For larger fires or fires that may create a special interest from the public, additional notification is provided through the media. GFC maintains a media notification system where fires in excess of 1,000 acres are reported to the GFC Public Relations Department, which automatically issues a media alert for the affected area. GFC maintains a Memorandum of Understanding with the Georgia Department of Public Safety and the Georgia Department of Transportation whereby all prescribed fires of 100 acres or more are reported for smoke monitoring on Georgia highways. In addition, partners in the Georgia Prescribed Fire Council, such as the U.S. Forest Service (USFS), Georgia Department of Natural Resources, the Nature Conservancy, Tall Timbers, and the Jones Center, also carry out public notifications for prescribed fire throughout the busy fire season. This includes press releases, social media content, and local contacts.

The conceptual model above shows that smoke from nearby prescribed fires, needed to achieve land management objectives consistent with the requirements in the EER, led to exceedances of the 2024 annual PM_{2.5} NAAQS on multiple days. Efforts to mitigate impacts of the prescribed fire emissions on public health included public notification and education, as well as smoke mitigation measures required by the SMP. This demonstration requests concurrence that the eight exceedances of the 2024 annual PM_{2.5} NAAQS measured at the Columbus-Baker site caused by prescribed fires on the dates listed in Table 1 be excluded from regulatory decision making.

3. Clear Causal Relationship

This section addresses the EER requirements at 40 CFR 50.14(c)(3)(iv)(B) by showing 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, and at 40 CFR 50.14(c)(3)(iv)(C) by providing analyses comparing the claimed event-influenced concentrations to concentrations at the same monitoring site at other times. The Prescribed Fire Guidance and Wildfire Ozone Guidance outline the expected components of a clear causal relationship portion of a demonstration. These include a comparison of the event-related concentration to historical concentrations, evidence that the emissions from the prescribed fire were transported to the site, and evidence that the prescribed fire emissions affected the site.

The historical data analysis section of this demonstration will focus on 2020-2024 PM_{2.5} FEM data from the Columbus-Baker site. Table 3 contains a comparison of prescribed fire exceptional event concentrations to historic 2020-2024 concentrations at the Columbus-Baker PM_{2.5} site (AQS ID: 13-215-0012). Generally, the exceptional event concentrations are at least 1.6 times higher than the 5-year annual average, quarterly average, and monthly average, and in some cases can be up to 6.01 times higher.

Table 3. Comparison of exceptional event concentrations to historic 2020-2024 concentrations at the Columbus-Baker PM_{2.5} site (AQS ID: 13-215-0012).

Exceptional Event Date	Exceptional Event 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
02/01/22	22.1	9.2	11.48	10.09	2.41	1.93	2.19
02/10/22	32.0	9.2	11.48	10.09	3.49	2.79	3.17
03/03/22	55.1	9.2	11.48	13.09	6.01	4.80	4.21
03/01/23	21.1	9.2	11.48	13.09	2.30	1.84	1.61
03/07/23	25.0	9.2	11.48	13.09	2.72	2.18	1.91
02/03/24	34.3	9.2	11.48	10.09	3.74	2.99	3.40
02/21/24	28.5	9.2	11.48	10.09	3.11	2.48	2.83
03/13/24	35.0	9.2	11.48	13.09	3.81	3.05	2.67

Figure 1 plots the 24-hour PM_{2.5} concentrations for 2020-2024. The concentrations are generally below the Tier 2 value of 11.8 µg/m³, except when smoke from wildfires and prescribed burns is present. Exceedances caused by wild or prescribed fires are delineated by marker shape. All the selected exceptional events days are above the Tier 1 threshold of 17.7 µg/m³, making them 1.5 times greater than the highest 98th percentile of data over the last 5 years, per EPA’s Tiering Tool.

Columbus-Baker, 2020-2024

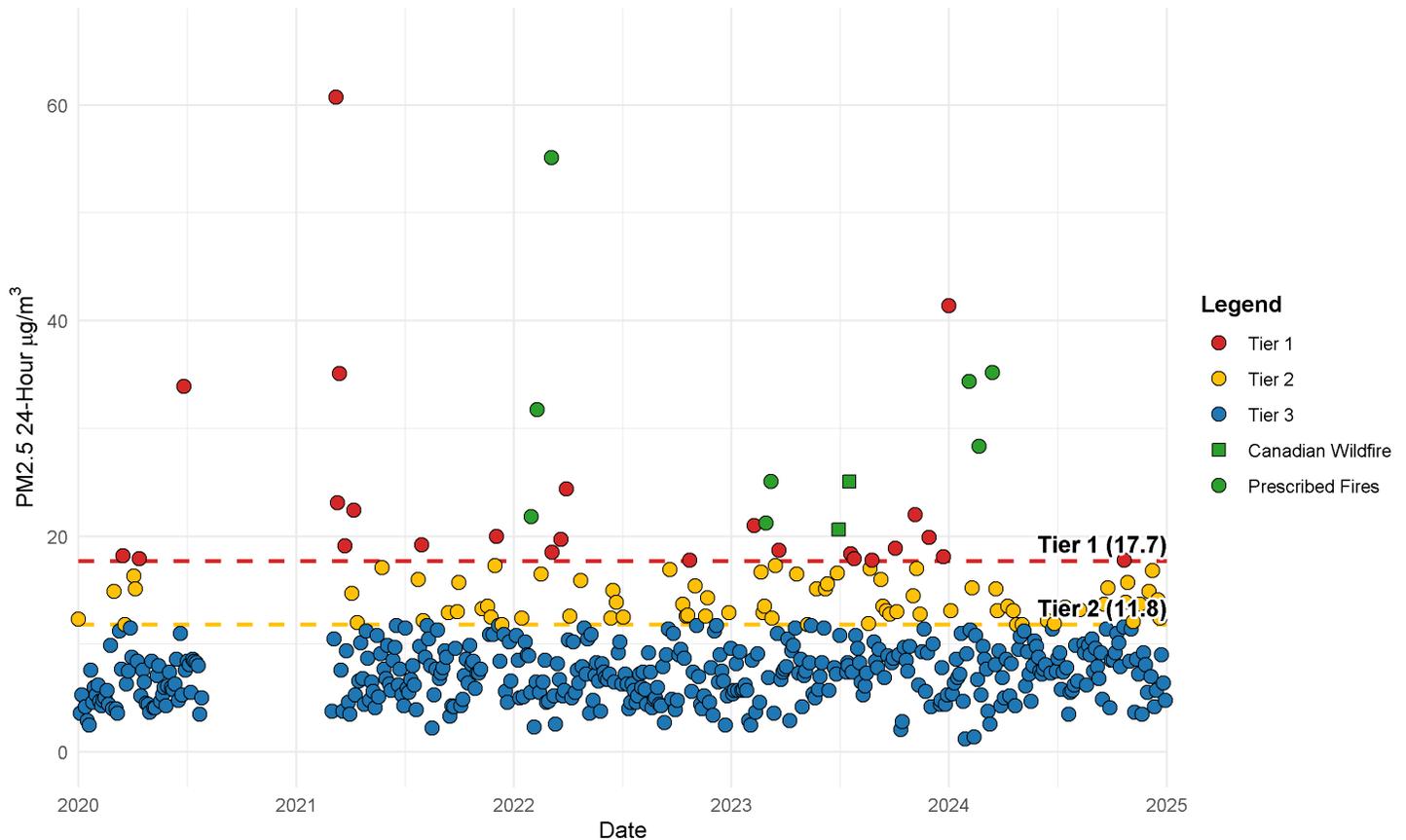


Figure 1. 24-hour $PM_{2.5}$ concentrations for 2020-2024 at the Columbus-Baker site. Wildfire exceptional events are shown in green squares and prescribed fire exceptional events are shown in green circles.

Appendix A contains integrated maps for each exceedance day (map on the right) and the day before (map on the left). The maps include silviculture burn permits issued by the GFC, NOAA Hazard Mapping System (HMS) smoke plumes (light and dark grey shaded areas), and 24-hour $PM_{2.5}$ concentrations at the Columbus-Baker $PM_{2.5}$ site and other nearby sites. Both maps contain HYSPLIT back trajectories for hourly measured $PM_{2.5}$ concentrations above $9.0 \mu\text{g}/\text{m}^3$ on the exceedance day. The left map shows the back-trajectories for 0:00 AM-9:59 AM EST on the exceedance day, and the right map shows back-trajectories for 10:00 AM-11:59 PM EST on the exceedance day. If fires that occurred on the exceedance day were responsible for the $PM_{2.5}$ exceedance, then the map on the right will likely show the causal relationship. If fires that occurred on the day before the exceedance day were responsible for the $PM_{2.5}$ exceedance, then the map on the left will likely show the causal relationship. Two versions of maps for each event are provided with trajectories released at 100-m or 500-m to show near-surface transport and potential influence from the surrounding terrain, respectively. The area around the Columbus-Baker site has relatively flat terrain with geographic features having heights between 50-175 m above sea level⁹. Also, hourly $PM_{2.5}$ time series plots are shown for the exceedance day and the day before to demonstrate the timing of fire emissions impacts on $PM_{2.5}$ concentrations at the Columbus-Baker $PM_{2.5}$ site. Appendix B1 contains the GFC burn permit information (date, latitude, longitude,

⁹ <https://ngmdb.usgs.gov/topoview/viewer/#11/32.4677/-84.9908>

county, number of acres, and purpose of the burn) within a 100 km radius of the Columbus-Baker PM_{2.5} site for the day of the exceedance and the day before.

February 01, 2022

Many silviculture fires were found in the path of the HYSPLIT back trajectories from the Columbus-Baker site before 10:00 AM (corresponding to PM_{2.5} concentrations due to fires on January 31) and after 10:00 AM (corresponding to PM_{2.5} concentrations due to fires on February 1). The exceedance was due to smoke plumes from fires on the day before (January 31) and/or on the day of (February 1) being transported to the site. A total of 88 GFC permits covering 3,340.1 acres (77.9% from silviculture) were issued in a 100-km radius on January 31, 2022, and 127 GFC permits covering 6,050.6 acres (83.6% from silviculture) were issued in a 100-km radius on February 1, 2022. The NOAA HMS smoke plumes are present around the Columbus-Baker site on both January 31 and February 1.

February 10, 2022

Many silviculture fires were found in the path of the HYSPLIT back trajectories from the Columbus-Baker site before 10:00 AM (corresponding to PM_{2.5} concentrations due to fires on February 9) and after 10:00 AM (corresponding to PM_{2.5} concentrations due to fires on February 10). The exceedance was due to smoke plumes from fires on the day before (February 9) and/or on the day of (February 10) being transported to the site. A total of 101 GFC permits covering 7,280.2 acres (78.3% from silviculture) were issued in a 100-km radius on February 9, 2022, and 129 GFC permits covering 8,980.7 acres (92.8% from silviculture) were issued in a 100-km radius on February 10, 2022. The NOAA HMS smoke plumes are present around the Columbus-Baker site on both February 9 and 10.

March 3, 2022

Many silviculture fires were found in the path of the HYSPLIT back trajectories from the Columbus-Baker site before 10:00 AM (corresponding to PM_{2.5} concentrations due to fires on March 2) and after 10:00 AM (corresponding to PM_{2.5} concentrations due to fires on March 3). The exceedance was due to smoke plumes from fires on the day before (March 2) and/or on the day of (March 3) being transported to the site. A total of 212 GFC permits covering 19,370.3 acres (94.6% from silviculture) were issued in a 100-km radius on March 2, 2022, and 209 GFC permits covering 22,701.3 acres (94.2% from silviculture) were issued in a 100-km radius on March 3, 2022. The NOAA HMS smoke plumes are present around the Columbus-Baker site on both March 2 and 3.

March 1, 2023

Many silviculture fires were found in the path of the HYSPLIT back trajectories from the Columbus-Baker site before 10:00 AM (corresponding to PM_{2.5} concentrations due to fires on February 28) and after 10:00 AM (corresponding to PM_{2.5} concentrations due to fires on March 1). The exceedance was due to smoke plumes from fires on the day before (February 28) and/or on the day of (March 1) being transported to the site. A total of 186 GFC permits covering 18,456.7 acres (89.2% from silviculture) were issued in a 100-km radius on February 28, 2023, and 147 GFC permits covering 18,906.2 acres (87.6% from silviculture) were issued in a 100-km radius on March 1, 2023. The NOAA HMS smoke plumes are present around the Columbus-Baker site on February 28.

March 7, 2023

Many silviculture fires were found in the path of the HYSPLIT back trajectories from the Columbus-Baker site before 10:00 AM (corresponding to PM_{2.5} concentrations due to fires on March 6) and after 10:00 AM (corresponding to PM_{2.5} concentrations due to fires on March 7). The exceedance was due to smoke plumes from fires on the day before (March 6) and/or the day of (March 7) being transported to the site. A total of 230 GFC permits covering 23,679.4 acres (91.0% from silviculture) were issued in a 100-km radius on March 6, 2023, and 183 GFC permits covering 21,153.8 acres (91.9% from silviculture) were issued in a 100-km radius on March 7, 2023. The NOAA HMS smoke plumes are present around the Columbus-Baker site on both March 6 and 7.

February 3, 2024

Many silviculture fires were found in the path of the HYSPLIT back trajectories from the Columbus-Baker site before 10:00 AM (corresponding to elevated PM_{2.5} concentrations due to fires on February 2) and after 10:00 AM (corresponding to elevated PM_{2.5} concentrations due to fires on February 3). The exceedance was due to smoke plumes from fires on the day before (February 2) being transported to the site in the early morning hours, and smoke plumes from fires on the day of (February 3) being transported in the early afternoon and early evening hours. A total of 170 GFC permits covering 7,663.1 acres (89.2% from silviculture) were issued in a 100-km radius on February 2, 2024, and 170 GFC permits covering 7,401.5 acres (88.2% from silviculture) were issued in a 100-km radius on February 3, 2024. The NOAA HMS smoke plumes are present around the Columbus-Baker site on both February 2 and 3.

February 21, 2024

Many silviculture fires were found in the path of the HYSPLIT back trajectories from the Columbus-Baker site before 10:00 AM (corresponding to elevated PM_{2.5} concentrations due to fires on February 20) and after 10:00 AM (corresponding to elevated PM_{2.5} concentrations due to fires on February 21). The exceedance was due to smoke plumes from fires on the day before (February 20) being transported to the site throughout the morning hours, and smoke plumes from fires on the day of (February 21) being transported to the site in the mid-afternoon and evening hours. A total of 162 GFC permits covering 16,144.3 acres (94.3% from silviculture) were issued in a 100-km radius on February 20, 2024, and 205 GFC permits covering 21,703.4 acres (91.4% from silviculture) were issued in a 100-km radius on February 21, 2024. The NOAA HMS smoke plumes are present around the Columbus-Baker site on both February 20 and 21.

March 13, 2024

Many silviculture fires were found in the path of the HYSPLIT back trajectories from the Columbus-Baker site before 10:00 AM (corresponding to elevated PM_{2.5} concentrations due to fires on March 12) and after 10:00 AM (corresponding to elevated PM_{2.5} concentrations due to fires on March 13). The exceedance was due to smoke plumes from fires on the day before (March 12) being transported to the site in the early morning hours, and smoke plumes from fires on the day of (March 13) being transported to the site in the evening hours. A total of 185 GFC permits covering 22,477.3 acres (88.9% from silviculture) were issued in a 100-km radius on March 12, 2024, and 258 GFC permits covering 28,532.7 acres (91.0% from silviculture) were issued in a 100-km radius on March 13, 2024. The NOAA HMS smoke plumes are present around the Columbus-Baker site on both March 12 and 13.

On the eight “Prescribed Fires” dates listed in Table 1, prescribed fires generated smoke plumes resulting in elevated PM_{2.5} concentrations at the Columbus-Baker monitor. The monitored PM_{2.5} concentrations were more than double the historical annual, quarterly, and monthly concentrations. In addition, the comparisons and analyses provided in Section 3 of this demonstration support our position that the prescribed fire events affected air quality in such a way that there exists a clear causal relationship between the specific events and the monitored PM_{2.5} exceedances on the eight “Prescribed Fires” dates listed in Table 1 that have been requested for exclusion, and thus satisfies the clear causal relationship criterion.

4. Human Activity Unlikely to Recur at a Particular Location

This section addresses the EER requirement at 40 CFR 50.14(c)(3)(iv)(E), which requires that the event was either a human activity that is unlikely to recur at a particular location or a natural event. The Prescribed Fire Guidance acknowledges that prescribed fires and their emissions are events caused by human activity and therefore must address the “human activity unlikely to recur at a particular location” criterion, and outlines how fire recurrence can be used to satisfy this criterion for a prescribed fire event. The demonstration must describe the actual frequency with which a burn was conducted and show that the prescribed fire was conducted consistent with either the natural fire return interval, or the prescribed fire frequency needed to establish, restore and/or maintain a sustainable and resilient wildland ecosystem. Since information was not available on the actual prescribed fire interval for specific tracts of land, Georgia EPD calculated an average fire interval for each county.

Based on the U.S. Forest Service Forest Inventory and Analysis (FIA) database, the primary stand types located within a 100km radius of the Columbus-Baker site are: (1) Longleaf/Slash at 297,395 acres (5.2% of the land mass), (2) Loblolly/Shortleaf at 2,641,729 acres (45.8% of the land mass), (3) Oak/Pine mix at 585,871 acres (10.2% of the land mass), and (4) Oak Hickory at 1,459,488 acres (25.3% of the land mass). These stand types typically burn anywhere from 1-3 years for Longleaf/Slash, 2-5 years for Loblolly/Shortleaf, 2-5 years for Oak/Pine mix, and 3-10 years for Oak Hickory. All prescribed fires in this demonstration were conducted consistently with the natural fire return interval, as further described below.

Guyette (2012)¹⁰ developed historic (1650-1850 CE) mean fire intervals (MFI) estimates for the presence of fire in all or part of an average 1.2 km² area. Mapped Physical Chemistry Fire Frequency Model (PC2FM) estimates are based on temperature, precipitation, and the partial pressure of oxygen. Classification intervals are in 2-year classes (1-30 years), 5-year classes (31-50 years), 25-year classes (50-200 years), and a single class for intervals greater than 200 years. The natural fire return interval map for the continental U.S. is shown in Figure 2. A zoomed in map for the state of Georgia and the Columbus-Baker area is shown in Figure 3.

¹⁰ Guyette R.P., Stambaugh M.C., Dey D.C., Muzika R-M (2012), Predicting Fire Frequency with Chemistry and Climate, *Ecosystems*, 15:322-335, DOI 10.1007/s10021-011-9512-0.

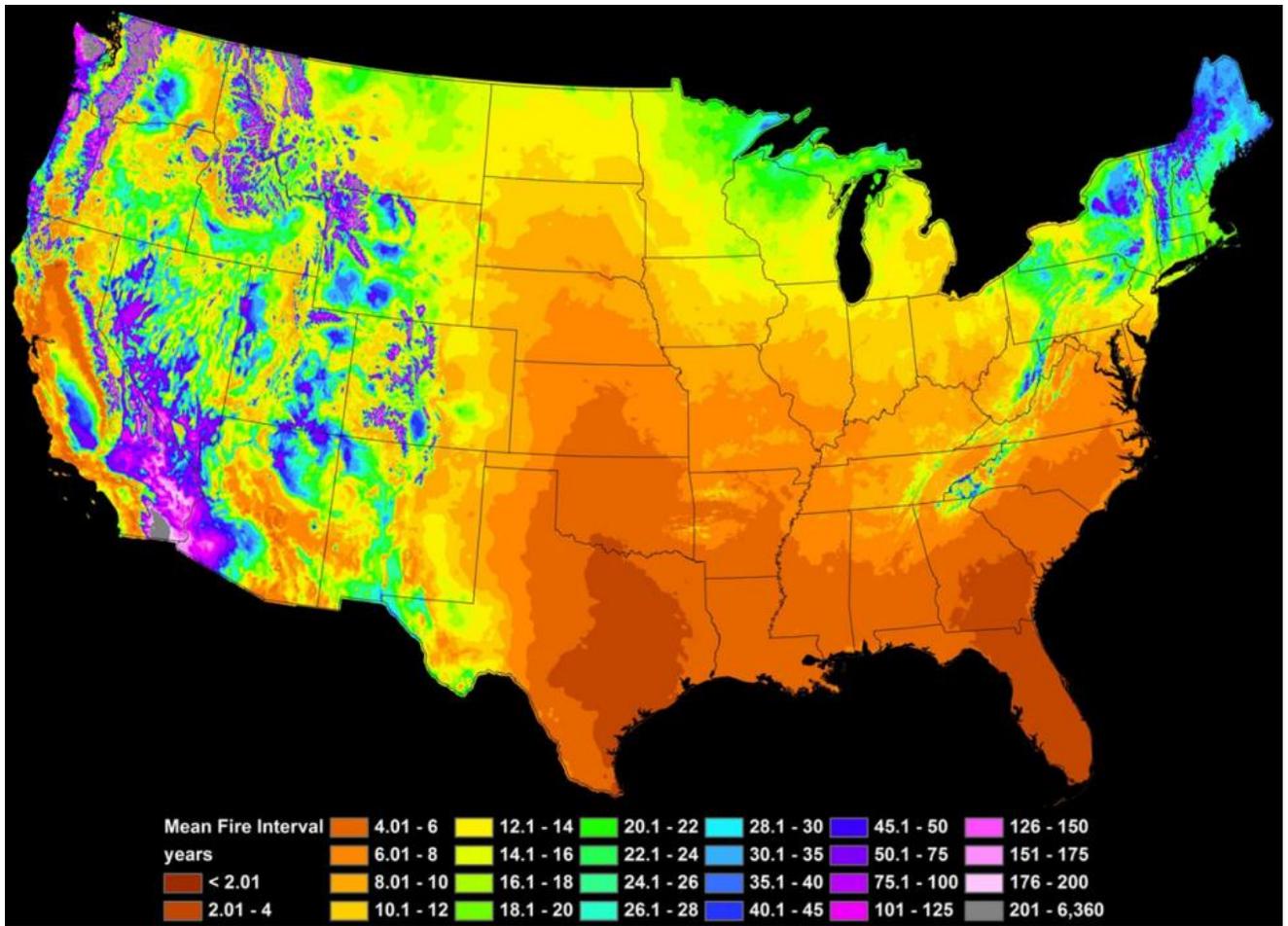
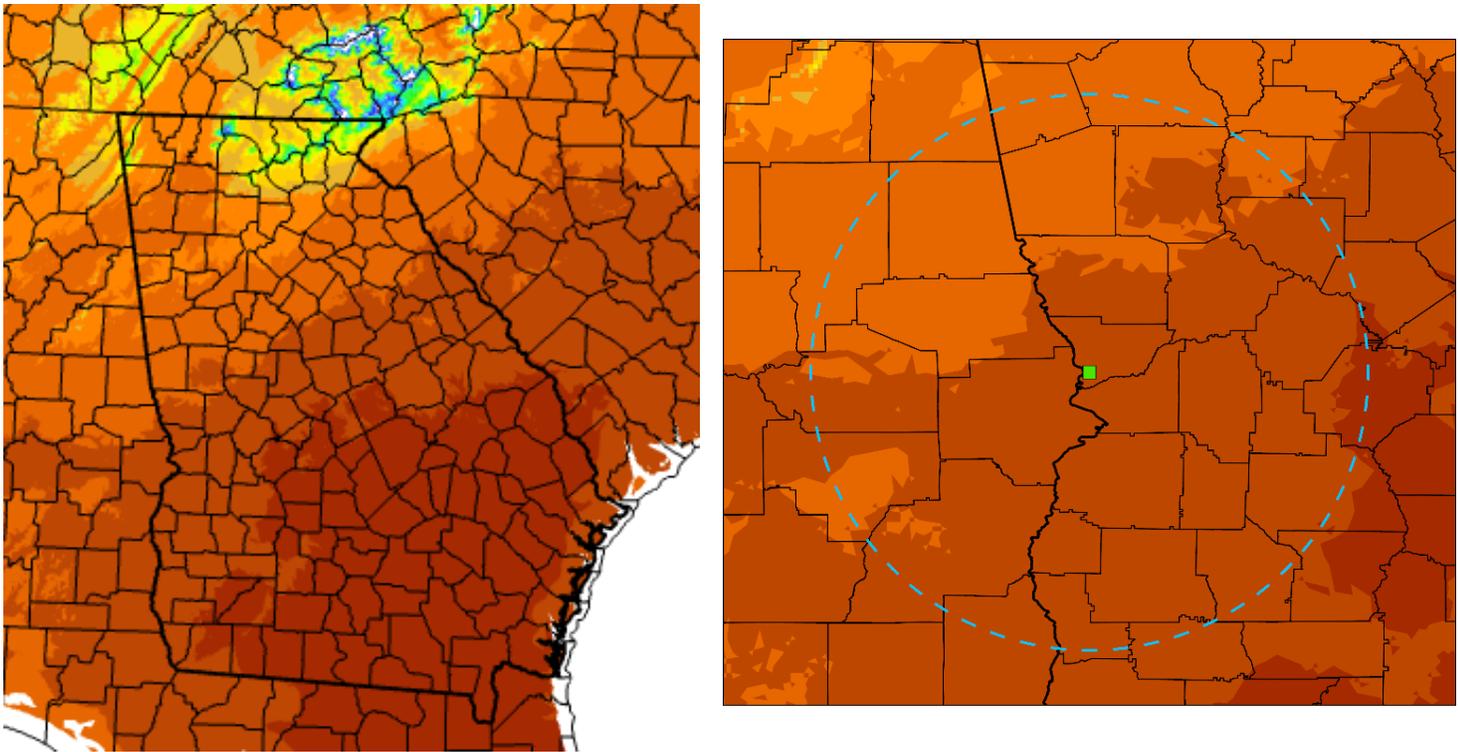


Figure 2. Natural fire return interval map for the continental U.S.



Likely Historic Fire Return Interval in Years

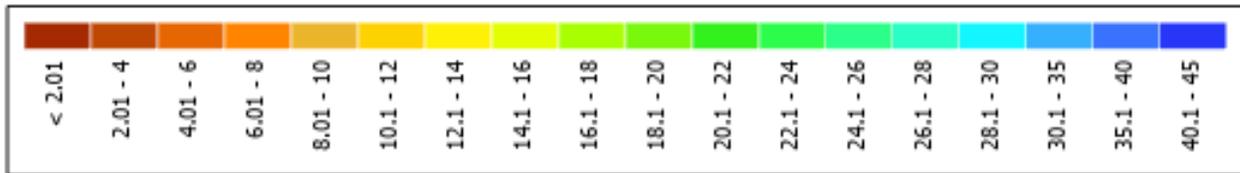


Figure 3. Natural fire return interval map for Georgia (left) and Columbus (right). The Columbus-Baker site is depicted with a green square, and the dashed line indicates a 100 km buffer around the Columbus-Baker site.

The total burn acres available, annual average burn acres for 2020-2024, and actual fire return interval (years) for all 36 counties within 100 km of the Columbus-Baker monitor are provided in Table 4. The total burn acres available for each county was determined by multiplying the individual county area (acres) by the corresponding rural percentage (%) from the 2020 U.S. Census¹¹.

The annual burn acres for 2020-2024 were provided by GFC and the military bases (Appendix B2). The actual fire return interval was calculated by dividing the total burn acres available by the annual average burn acres for 2020-2024. The overall actual fire return interval for the Columbus area is 16.6 years, which is far greater than the 2-6 years historic fire return interval. The lowest actual fire return interval was 4.3 years in Russell County, AL.

¹¹ https://www2.census.gov/geo/tiger/TIGER2023/UAC/tl_2023_us_uac20.zip

Table 4. Total burn acres available, annual average burn acres for 2020-2024, and actual fire return interval (years).

State	County	Total Burn Acres Available	Annual Average Burn Acres for 2020-2024	Actual Fire Return Interval (Years)
GA	Chattahoochee	185,320.2	37,084.8	5.0
GA	Clay	163,709.5	4,518.6	36.2
GA	Coweta	292,903.0	4,857.9	60.3
GA	Crawford	249,032.2	6,264.5	39.8
GA	Fayette	84,328.8	143.8	586.6
GA	Harris	359,949.3	10,963.5	32.8
GA	Heard	231,104.3	4,409.2	52.4
GA	Lamar	137,949.7	2,061.5	66.9
GA	Lee	264,953.6	21,058.4	12.6
GA	Macon	308,419.9	7,884.5	39.1
GA	Marion	279,207.4	16,611.4	16.8
GA	Meriwether	386,812.6	15,308.7	25.3
GA	Monroe	300,101.2	8,691.5	34.5
GA	Muscogee	99,350.5	15,556.9	6.4
GA	Pike	167,875.6	2,975.2	56.4
GA	Quitman	120,859.6	3,237.6	37.3
GA	Randolph	325,281.2	12,217.1	26.6
GA	Schley	127,402.8	5,203.5	24.5
GA	Spalding	130,548.8	855.7	152.6
GA	Stewart	351,175.0	11,240.6	31.2
GA	Sumter	364,555.7	16,411.9	22.2
GA	Talbot	301,035.2	12,440.3	24.2
GA	Taylor	289,091.9	12,711.4	22.7
GA	Terrell	254,953.2	17,875.6	14.3
GA	Troup	315,987.7	6,120.1	51.6
GA	Upson	242,380.4	6,797.9	35.7
GA	Webster	159,217.5	5,208.7	30.6
AL	Henry	427,968.8	11,646.8	36.7
AL	Barbour	678,967.5	68,689.0	9.9
AL	Bullock	473,625.5	81,592.4	5.8
AL	Macon	459,780.7	55,501.8	8.3
AL	Russell	474,841.1	110,606.3	4.3
AL	Chambers	449,076.0	30,124.9	14.9
AL	Lee	404,046.2	15,941.0	25.3
AL	Randolph	448,486.5	3,889.7	115.3
AL	Tallapoosa	577,929.8	8,723.9	66.2
TOTAL		10,888,228.8	655,426.8	16.6

The documentation provided in Section 4 of this submittal demonstrates that prescribed fire events around the Columbus-Baker site satisfy the human activity unlikely to recur at a particular location criterion by describing the actual frequency with which burns are conducted and by showing how this burn frequency mimics the natural fire return interval. Specifically, the demonstration determined the actual burn frequency as being every 16.6 years, while the natural fire return interval for this area is 2-6 years.

5. Addressing the Not Reasonably Controllable or Preventable Criterion

This section addresses the EER requirement at 40 CFR 50.14(c)(3)(iv)(D) by demonstrating that each event was both not reasonably controllable and not reasonably preventable, as further described for prescribed fires in 40 CFR 50.14(b)(3). The “not reasonably controllable” prong is satisfied by showing that the prescribed fire was conducted under an adopted and implemented certified SMP, while the “not reasonably preventable” prong is satisfied by describing the benefits that would have been foregone if the fire were not conducted.

5.1 Not Reasonably Controllable

The Prescribed Fire Guidance states that the controllability prong of the not reasonably controllable or preventable criterion can be satisfied if (1) the prescribed fire was conducted under an adopted and implemented certified SMP, or (2) the prescribed fire was conducted with appropriate basic smoke management practices. If a demonstration intends to rely on a SMP to satisfy the not reasonably controllable prong, the SMP must be certified prior to the burn being conducted. The Columbus-Baker prescribed fires were not reasonably controllable because they were conducted under Georgia’s adopted and certified SMP which was being implemented at the time of the burn. A copy of the Georgia certified SMP is contained in Appendix C1. In 2025, Georgia’s Smoke Management Plan was updated and a new MOU was signed (see Appendix C2). A copy of EPA’s SMP acknowledgement letter for the 2008 SMP is contained in Appendix D.

The Georgia certified Smoke Management Plan includes five sections: (1) Authorization for Prescribed Burning, (2) Smoke Management, (3) Public Education and Awareness, (4) Surveillance and Enforcement, and (5) Smoke Management Plan Evaluation.

Authorization for Prescribed Burning

Prescribed burning is also regulated in Georgia under the *Georgia Forest Fire Protection Act* (Ga. Code Ann. 12-6-80 to 12-6-93). Burn permits are required from GFC for all prescribed fires except agricultural burning (which is notification only) and leaf pile burning. According to the *Georgia Forest Fire Protection Act*, all forest fire protection work is under the direction of GFC. The Act gives GFC the authority to go on any land for the purpose of preventing, controlling, or suppressing any uncontrolled fire. An aggressive State wildfire suppression policy has contributed substantially to protecting air quality in Georgia.

Prescribed burning helps achieve many desired resource objectives and can be used to minimize the emissions and adverse impacts of smoke on public health and the environment by reducing fuel loads that can lead to catastrophic wildfire. The *Georgia Air Quality Act* (Ga. Code Ann. 12-9-1 to 12-9-25) is designed to preserve, protect, and improve air quality, to control emissions in order to prevent the significant deterioration of air quality, and to attain and maintain national

ambient air quality standards (NAAQS) set by EPA. This Act authorizes Georgia EPD to issue rules regarding air quality, including the authorization to regulate prescribed burning when subject to the Federal Clean Air Act.

The *Georgia Forest Fire Protection Act* requires prescribed burn practitioners to obtain a permit from GFC before initiating a fire. The size, date, type of burn, county location, weather, air quality conditions, and other relevant information are used as criteria to determine if a permit shall be issued. Permits are issued by forest rangers and dispatchers that are trained in fire, weather, and smoke management. According to GFC procedures, all burn projects of one acre or more are screened to determine if air sheds or smoke-sensitive populations are threatened. Permits are issued or denied based on smoke management and fire danger. In order for permits to be issued, all the requirements of Georgia EPD's *Rules for Air Quality Control* (Georgia Rule 391-3-1-.02(5), "Open Burning") and GFC's guidelines must be met. Areas specified by Georgia EPD as especially susceptible to violations of air quality standards will be given special attention to avoid issuance of permits during measured or expected high air pollution periods. Such attention will include a regional review of the previous day and current day ambient concentrations for ozone and particulate matter in relation to NAAQS. Although agricultural burning does not require a permit, notification to GFC is required.

Smoke Management

The goal of smoke management is to reduce the exposure of Georgia's citizens to air pollution, impaired visibility, and nuisance caused by prescribed fire smoke. Use of the basic smoke management guidelines presented in this document will reduce the impact of smoke from prescribed fires on air quality and visibility. The basic principles of smoke management include identifying and mitigating impacts to smoke sensitive areas, minimizing emissions, selecting appropriate meteorological conditions to maximize smoke dispersion, properly evaluating weather conditions prior to burning, giving public notification, and monitoring air quality.

Public Education and Awareness

The Georgia Prescribed Fire Act tasks GFC to promote public education and awareness of prescribed fires. This does not preclude other agencies or organizations from promoting prescribed fire, and they are encouraged to do so. The Georgia Prescribed Fire Council and many other natural resource organizations are strong advocates of prescribed fire and include public education as part of their mission.

GFC delivers multiple prescribed burn manager trainings each year which typically reaches at least 200 candidates of which many become certified burners. Other public outreach is delivered through school programs, public events such as landowner field days, fair exhibits, expos, Prescribed Fire Awareness Week celebration, and learn-n-burn sessions which provide hands-on assistance and training to landowners who want to conduct prescribed burns.

Surveillance and Enforcement

GFC fire patrol aircraft advise local field offices of significant smoke intrusions discovered while on routine patrol flights. GFC rangers discuss smoke intrusions with individual prescribed burn practitioners whenever problems occur. Suggestions to alter the scope of future projects are

made. GFC retains the right to void certification of Georgia certified prescribed burners if certain stipulations are not adhered to which may include smoke intrusion into a smoke-sensitive areas if investigation reveals gross negligence for basic smoke management practices. All outdoor burning is subject to enforcement through local law enforcement officers, GFC investigators, and DNR. The enforcement authority is in the *Georgia Forest Fire Protection Act*, as well as EPD's authority to enforce Federal and State air quality regulations and laws.

Smoke Management Plan Evaluation

GFC and DNR will work closely with stakeholders to evaluate this plan, as needed. GFC will provide data on outdoor burning to stakeholders, and EPD will provide pertinent air quality monitoring data. The Georgia Prescribed Fire Council was formed to enable collaboration among prescribed burn practitioners and with other interested public and private organizations to address statewide natural resource goals, including air quality. DNR and GFC, in coordination with stakeholders, will evaluate the effectiveness of this SMP at Georgia Prescribed Fire Council Steering Committee meetings and revise it as necessary.

5.2 Not Reasonably Preventable

The Prescribed Fire Guidance states that a demonstration can satisfy the not reasonably preventable prong of the not reasonably controllable or preventable criterion by describing the benefits that would have been foregone if the fire were not conducted. The EER at 40 CFR 50.14(b)(3)(ii)(C) states that this demonstration may rely upon and reference a multi-year land or resource management plan for the area with a stated objective to establish, restore, and/or maintain a sustainable and resilient wildland ecosystem, and/or to preserve endangered or threatened species through a program of prescribed fire. The available land management documentation governing this prescribed fire shows that the fire was not reasonably preventable because of the benefits that would have been foregone if the fire had not been conducted.

The Georgia General Assembly enacted the *Georgia Prescribed Burning Act* (Ga. Code Ann. 12-6-145 to 12-6-149) to authorize and promote the continued use of prescribed burning for community protection and for silvicultural, environmental, and wildlife purposes. Georgia's State Wildlife Action Plan (SWAP)¹² is a statewide strategy to conserve populations of native wildlife species and the natural habitats they need before these animals, plants, and places become rarer and more costly to conserve or restore. Georgia's SWAP lists 640 animal and plant species as high priorities for conservation. Species and habitats vary from golden-winged warblers, red-cockaded woodpeckers, and gopher tortoises to Georgia aster wildflowers and longleaf pine savannas. The SWAP uses the best available data to provide a comprehensive, adaptable assessment of conservation needs and the best ways to address them. The 150 conservation actions recommended focus efforts where they're most needed and most effective. These actions include prescribed burning. The latest version of Georgia's SWAP was revised in 2015 and approved by the U.S. Fish and Wildlife Service in September 2016.

The Biotics¹³ rare species database was used to identify the top three rare, fire-dependent animal species¹⁴ located within a 100-km radius of the Columbus-Baker site. Based on the results of the

¹² <https://georgiawildlife.com/WildlifeActionPlan>

¹³ <https://www.natureserve.org/products/biotics-5>

¹⁴ <https://www.georgiabiodiversity.org>

query, the top three species are: (1) Red-cockaded Woodpecker (*Dryobates borealis*), (2) Gopher Tortoise (*Gopherus polyphemus*), and (3) Southern Hognose Snake (*Heterodon simus*).

Without prescribed burning, the Columbus area's tree stands and underbrush would continue to become increasingly dense and homogenous. The increased density of the forest leaves it vulnerable to wildfires, insect disturbance, and tree mortality. Increased homogeneity of the forest composition further limits desired wildfire habitat, and by extension wildlife species and biodiversity. If these prescribed fires had not been conducted, a variety of benefits would be foregone, including improved tree growth and conditions for hardwood species, increased biodiversity, fuel load reduction, and overall forest resiliency to disturbances such as pests, disease, and severe wildfire.

Based on the documentation provided in Section 5 of this submittal, the prescribed fire events satisfied the not reasonably controllable or preventable criterion. The events were not reasonably controllable because they were conducted under a certified and implemented Smoke Management Plan and were not reasonably preventable because of the benefits that would have been foregone if the fire were not conducted.

6. Public Comment

Georgia EPD held a 30-day public comment period beginning August 4, 2025, to receive public input regarding the Exceptional Event Demonstration. Notification of the public comment period was posted on Georgia EPD's website and emailed to interested stakeholders. Public comments received are included in Appendix G of this demonstration, along with Georgia EPD's responses to these comments in Appendix H.

7. Conclusions and Recommendations

This Exceptional Event demonstration has shown that the PM_{2.5} monitor at Columbus-Baker was impacted by smoke from prescribed fire, causing PM_{2.5} concentrations that exceeded the 2024 annual PM_{2.5} NAAQS of 9.0 µg/m³ on the eight "Prescribed Fires" dates listed in Table 1. The demonstration further shows that the prescribed fire events meet the EPA's definition of an Exceptional Event under the 2016 EER:

- Section 2. Narrative Conceptual Model includes a narrative conceptual model for the event, as required by 40 CFR 50.14(c)(3)(iv)(A).
- Section 3. Clear Causal Relationship includes a comparison to historical data, as required by 40 CFR 50.14(c)(3)(iv)(C), that shows the event concentration is very high compared to typical values measured at the site, and further demonstrates (through analysis of NOAA HMS smoke plumes, HYSPLIT trajectory modeling, and analysis of hourly PM_{2.5} data) that emissions were transported to the site and caused the exceedance of the 2024 annual PM_{2.5} NAAQS at the Columbus-Baker site, showing a clear causal relationship between the event and exceedance as required by 40 CFR 50.14(c)(3)(iv)(B).
- Section 4. Human Activity Unlikely to Recur at a Particular Location includes evidence that the prescribed fire event meets the EER definition of a human activity that is unlikely to recur at a particular location as required by 40 CFR 50.14(c)(3)(iv)(E), by establishing that the prescribed fire was conducted consistent with the natural fire return interval.
- Section 5. Not Reasonably Controllable or Preventable includes evidence that the prescribed fire meets the EER definitions of being not reasonably controllable as required

by 40 CFR 50.14(c)(3)(iv)(D), by showing that the prescribed fire was conducted under the Georgia SMP (an adopted and implemented state-certified SMP), and describing the benefits that would have been foregone if the fire were not conducted as documented in the land management plans and prescribed fire documentation.

- Additional procedural requirements such as identifying regulatory significance with respect to 40 CFR 50.14(a)(1)(i), documenting public notification of the event as required by 40 CFR 50.14(c)(1)(i), and providing for a public comment period for this demonstration as required in 40 CFR 50.14(c)(3)(v) have also been addressed in Sections 1. Introduction, 2. Narrative Conceptual Model, and 6. Public Comment.

Therefore, Georgia EPD requests that EPA review and concur that this demonstration shows that the eight prescribed fire events in Table 1 meet the requirements of the EER, resulting in exclusion of the associated eight daily PM_{2.5} concentrations from regulatory decisions for the 2024 annual PM_{2.5} NAAQS.

Appendices

- A. Columbus-Baker Integrated Plots for Exceptional Events by Date
- B1. Columbus-Baker Exceptional Event Fires by Date
- B2. Annual Average Burn Acres for 2020-2024 Near Columbus-Baker
- C1. Georgia 2008 Memorandum of Understanding and Smoke Management Plan
- C2. Georgia 2025 Memorandum of Understanding and Smoke Management Plan
- D. EPA's SMP Acknowledgment Letter
- G. Public Comments
- H. Georgia EPD's Response to Comments