UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA FEDERAL CENTER
61 FORSYTH STREET
ATLANTA, GEORGIA 30303-8960

August 19, 2008

The Honorable Phil Bredesen
Governor of Tennessee
State Capitol, First Floor
Nashville, Tennessee 37243

Dear Governor Bredesen:

As you are aware, reducing fine particle pollution ($PM_{2.5}$) represents one of the most significant challenges to improving air quality in our nation today. Health studies link these tiny particles – about $1/30^{th}$ the diameter of a human hair – to serious human health problems, including aggravated asthma, increased respiratory symptoms like coughing and difficult or painful breathing, chronic bronchitis, decreased lung function, and even premature death in people with heart and lung disease. Fine particle pollution can remain suspended in the air for long periods of time and create public health problems far away from emission sources. Reducing levels of $PM_{2.5}$ is an important part of our nation's commitment to clean, healthy air.

We have reviewed the December 13, 2007, letter from James H. Fyke, Commissioner of the Tennessee Department of Environment and Conservation (TDEC), and the June 10, 2008, letter from Barry R. Stephens, P.E., Director of TDEC's Division of Air Pollution Control, submitting Tennessee's recommendations on air quality designations for the 2006 24-Hour $PM_{2.5}$ standards. We have also reviewed the technical information submitted to support Tennessee's recommendations. In accordance with the Clean Air Act, I write to inform you that the U.S. Environmental Protection Agency (EPA) intends to modify Tennessee's recommended designations and boundaries. Enclosed please find a detailed description of areas where EPA intends to modify TDEC's recommendations, and the basis for such modification. In addition, we are enclosing the results of our review of Tennessee's requests for consideration of data under the Exceptional Events rule for the Chattanooga and Clarksville areas. We understand that TDEC has concerns about the monitoring data in the Clarksville area, and that TDEC has installed an additional monitoring site in the area and intends to submit information from the new study to EPA as it becomes available. Additionally, we understand that TDEC made recommendations based on the 2004 – 2006 period, and because the data were not yet quality assured as of its June 10, 2008, submission, TDEC did not include data from any monitor in the Knoxville area which were above the standard for 2005 – 2007. If you have additional information that should be considered by EPA in this process, please provide it to us by October 20, 2008. In the near future, EPA will publish a notice in the Federal Register to solicit public comments on our intended designation decisions. We intend to make final designation decisions for the 2006 24-Hour $PM_{2.5}$ standards by December 18, 2008.

EPA has taken steps to reduce fine particle pollution across the country, such as implementing the Clean Diesel Program to dramatically reduce emissions from highway, nonroad and stationary diesel engines. In addition to on-going initiatives, state programs to attain the 1997 $PM_{2.5}$ standards will also help to reduce unhealthy levels of fine particle pollution.

I appreciate the leadership and attention provided by you and the management and staff of TDEC in protecting air quality. If you have any questions, please do not hesitate to contact me at (404) 562-8357. We look forward to continuing to work with you and TDEC officials in implementing the $PM_{2.5}$ standards.

Sincerely,

J. I. Palmer, Jr.
Regional Administrator

Enclosures

cc: James H. Fyke, Commissioner, TDEC
Paul Sloan, Deputy Commissioner, TDEC

Enclosure 1

Tennessee
Area Designations For the
24-Hour Fine Particle National Ambient Air Quality Standard

The table below identifies the counties in Tennessee that EPA intends to designate as not attaining the 2006 24-hour fine particle (PM2.5) standard.[1] A county will be designated as nonattainment if it has an air quality monitor that is violating the standard or if the county is determined to be contributing to the violation of the standard.

Area	Tennessee Recommended Nonattainment Counties	EPA's Intended Nonattainment Counties
Clarksville, TN-KY	Deferred or unclassifiable	Montgomery, Stewart, Humphreys, TN
Knoxville, TN	Attainment	Knox, Anderson, Blount, Loudon, Roane (partial)

EPA Technical Analysis for Clarksville, TN-KY

Discussion

Pursuant to section 107(d) of the Clean Air Act, EPA must designate as nonattainment those areas that violate the NAAQS and those areas that contribute to violations. This technical analysis for the Clarksville, TN-KY area identifies the counties with monitors that violate the 24-hour PM2.5 standard and evaluates the counties that potentially contribute to fine particle concentrations in the area. EPA has evaluated these counties based on the weight of evidence of the following nine factors recommended in EPA guidance and any other relevant information:

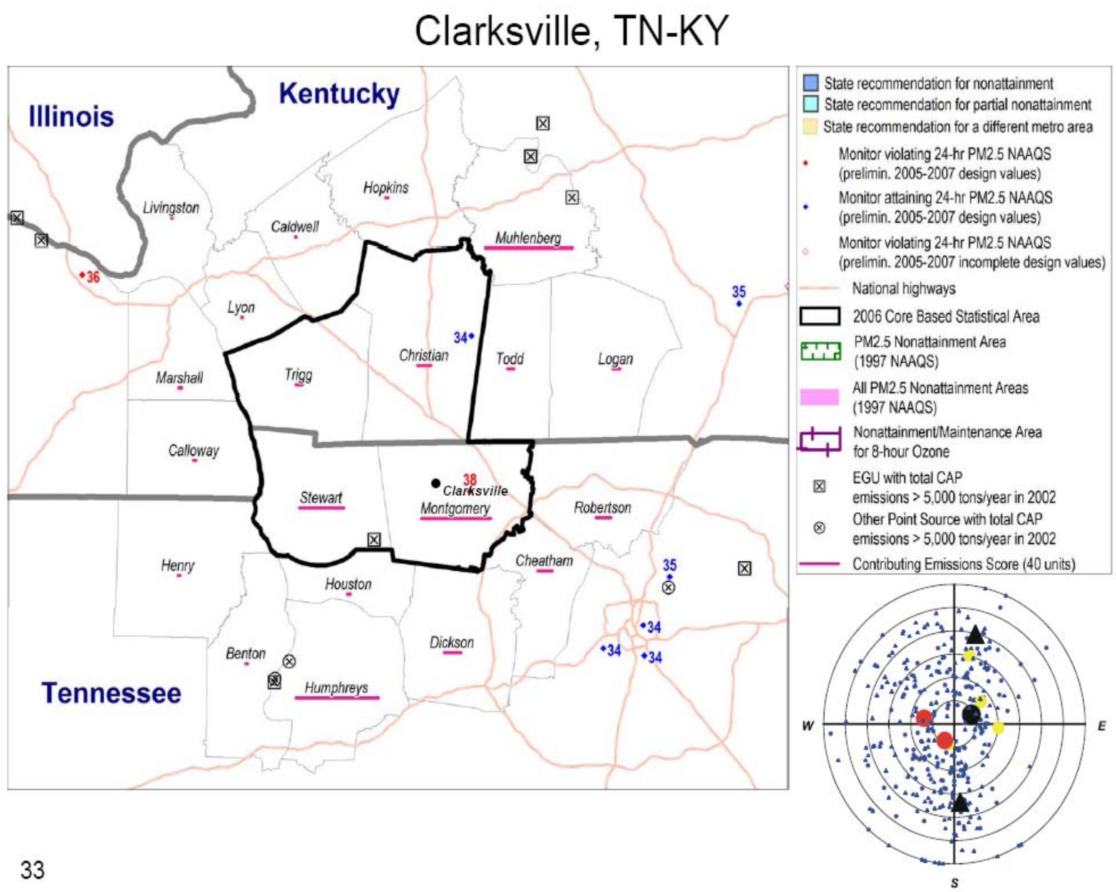
- pollutant emissions
- air quality data
- population density and degree of urbanization
- traffic and commuting patterns
- growth
- meteorology
- geography and topography

[1] EPA designated nonattainment areas for the 1997 fine particle standards in 2005. In 2006, the 24-hour PM2.5 standard was revised from 65 micrograms per cubic meter (average of 98th percentile values for 3 consecutive years) to 35 micrograms per cubic meter; the level of the annual standard for PM2.5 remained unchanged at 15 micrograms per cubic meter (average of annual averages for 3 consecutive years).

- jurisdictional boundaries
- level of control of emissions sources

Figure 1 is a map of the counties in the area and other relevant information such as the locations and design values of air quality monitors, the metropolitan area boundary, and counties recommended as nonattainment by the State.

Figure 1. Clarksville, TN-KY MSA



In June 2008, Tennessee recommended that the designation for the Clarksville area be deferred or that Montgomery County be designated as “unclassifiable” for the 2006 24-hour $PM_{2.5}$ standard based on air quality data from 2005-2007. These data are from Federal Reference Method (FRM) and Federal Equivalent Method (FEM) monitors located in the state. [June 10, 2008, letter from Barry R. Stephens, Tennessee Department of Environment and Conservation to Beverly Banister, EPA Region 4, received June 19, 2008.]

Based on speciation data from the area, Clarksville experiences elevated sulfate levels during the warm season, with a carbon-based urban increment during both cold and warm seasons. This pattern is typical of many areas throughout the southeastern United States.

Based on EPA's 9-factor analysis described below, EPA believes that Montgomery, Stewart, and Humphreys Counties, Tennessee and Muhlenberg County, Kentucky should be designated nonattainment for the 24-hour $PM_{2.5}$ air-quality standard as part of the Clarksville, TN-KY nonattainment area, based upon currently available information. These counties are listed in the table below.

	State-Recommended Nonattainment Counties	EPA-Recommended Nonattainment Counties
Clarksville, TN-KY	Deferred or unclassifiable	Montgomery, Stewart, Humphreys

The following is a summary of the 9-factor analysis for the Tennessee portion of the Clarksville, TN-KY area.

In general, the Clarksville, TN-KY area is a small metropolitan statistical area (MSA) with one county, Montgomery, containing a monitor that is violating the PM2.5 standard. Three other nearby counties are intended for inclusion in the nonattainment area on the basis of contributing emissions. Stewart county, also in the MSA, contains a power plant that has NO_X and SO_2 controls, yet still emits 35,000 tons of NO_X and 20,000 tons of SO_2 annually (based on 2006 emissions.) In addition, two non-MSA counties, Humphreys, TN, and Muhlenberg, KY, also have power plants. Humphreys' 2006 power plant emissions were approximately 20,000 tons of NO_X and 97,000 tons of SO_2, while Muhlenberg's 2006 power plant emissions were approximately 44,000 tons of NO_X and 98,000 tons of SO_2. (Note that these 2006 emissions levels vary to some degree from the 2005 emissions data presented in table 1.)

Factor 1: Emissions data

For this factor, EPA evaluated county level emission data for the following $PM_{2.5}$ components and precursor pollutants: "$PM_{2.5}$ emissions total," "$PM_{2.5}$ emissions carbon," "$PM_{2.5}$ emissions other," "SO_2," "NO_x," "VOCs," and "NH_3." "$PM_{2.5}$ emissions total" represents direct emissions of $PM_{2.5}$ and includes: "$PM_{2.5}$ emissions carbon," "$PM_{2.5}$ emissions other", primary sulfate (SO_4), and primary nitrate. (Although primary sulfate and primary nitrate, which are emitted directly from stacks rather than forming in atmospheric reactions with SO_2 and NO_x, are part of "$PM_{2.5}$ emissions total," they are not shown in Table 1 as separate items). "$PM_{2.5}$ emissions carbon" represents the sum of organic carbon (OC) and elemental carbon (EC) emissions, and "$PM_{2.5}$ emissions other" represents other inorganic particles (crustal). Emissions of SO_2 and NO_x, which are precursors of the secondary $PM_{2.5}$ components sulfate and nitrate, are also considered. VOCs (volatile organic compounds) and NH_3 (ammonia) are also potential $PM_{2.5}$ precursors and are included for consideration.

Emissions data were derived from the 2005 National Emissions Inventory (NEI), version 1. See http://www.epa.gov/ttn/naaqs/pm/pm25_2006_techinfo.html.

EPA also considered the Contributing Emissions Score (CES) for each county. The CES is a metric that takes into consideration emissions data, meteorological data, and air quality monitoring information to provide a relative ranking of counties in and near an area. Note that this metric is not the exclusive way for consideration of data for these factors. A summary of the CES is included in Enclosure 2, and a more detailed description can be found at http://www.epa.gov/ttn/naaqs/pm/pm25_2006_techinfo.html#C.]

Table 1 shows emissions of $PM_{2.5}$ and precursor pollutants components (given in tons per year) and the CES for violating and potentially contributing counties in the Clarksville area. Counties are listed in descending order by CES.

Table 1. $PM_{2.5}$ Related Emissions and Contributing Emissions Score

County	State Recom-mended Non-attain ment	CES	$PM_{2.5}$ emissions total (tpy)	$PM_{2.5}$ emissions carbon (tpy)	$PM_{2.5}$ emissions other (tpy)	SO_2 (tpy)	NOx (tpy)	VOCs (tpy)	NH_3 (tpy)
Muhlenberg Co	No	100	3,769	226	110	100,828	39,096	1,741	787
Humphreys Co	No	92	6,359	368	249	77,765	23,238	5,458	730
Montgomery Co	No	76	1,424	331	152	2,156	5,555	6,438	485
Stewart Co	No	47	2,614	159	93	17,755	28,776	1,689	154
Dickson Co	No	19	909	219	83	432	3,212	4,375	268
Robertson Co	No	17	703	186	102	560	3,870	3,363	806
Cheatham Co	No	16	484	159	75	325	2,172	3,201	100
Christian Co	No	14	728	140	102	854	3,947	3,833	1,639
Trigg Co	No	7	537	184	67	222	1,332	1,815	451

Based on emission levels and CES values, Montgomery, Stewart, and Humphreys Counties, Tennessee and Muhlenberg County, Kentucky are candidates for a 24-hour $PM_{2.5}$ nonattainment designation.

In the designation process for the 1997 $PM_{2.5}$ standards, in some cases EPA identified a nearby county as contributing to a violating monitor, and it was determined that a very high percentage of the county's emissions came from a large power plant. In certain cases, EPA concluded that only the portion of the county including the source with the contributing emissions needed to be designated as nonattainment. If Tennessee believes that a similar situation exists for Humphreys or Stewart Counties, the State should provide EPA the necessary information to demonstrate that the source dominates the overall county emissions and to identify a reasonable partial county boundary.

Factor 2: Air quality data

This factor considers the 24-hour $PM_{2.5}$ design values (in µg/m^3) for air quality monitors in counties in the Clarksville area based on data for the 2005-2007 period. A monitor's design value indicates whether that monitor attains a specified air quality standard. The 24-hour $PM_{2.5}$ standards are met when the 3-year average of a monitor's 98th percentile values are 35 µg/m^3 or less. A design value is only valid if minimum data completeness criteria are met.

The 24-hour $PM_{2.5}$ design values for counties in the Clarksville area are shown in Table 2.

Table 2. Air Quality Data

County	State Recommended Nonattainment	24-hr PM2.5 Design Values, 2004-2006 (µg/m^3)	24-hr PM2.5 Design Values, 2005-2007 (µg/m^3)
Montgomery	No	34	37
Christian	No	30	33

Montgomery County shows a violation of the 24-hour $PM_{2.5}$ standard. Therefore, this county is included in the Clarksville nonattainment area. However, the absence of a violating monitor alone is not a sufficient reason to eliminate counties as candidates for nonattainment status. Each county has been evaluated based on the weight of evidence of the nine factors and other relevant information.

[Note: Eligible monitors for providing design value data generally include State and Local Air Monitoring Stations (SLAMS) at population-oriented locations with a FRM or FEM monitor. All data from Special Purpose Monitors (SPM) using an FRM, FEM, or Alternative Reference Method (ARM) which has operated for more than 24 months is eligible for comparison to the relevant NAAQS, subject to the requirements given in the October 17, 2006 Revision to Ambient Air Monitoring Regulations (71 FR 61236). All monitors used to provide data must meet the monitor siting and eligibility requirements given in 71 FR 61236 to 61328 in order to be acceptable for comparison to the 24-hr PM2.5 NAAQS for designation purposes.]

Factor 3: Population density and degree of urbanization (including commercial development)

Table 4 shows the 2005 population for each county in the Clarksville area, as well as the population density for each county in that area. Population data gives an indication of whether it is likely that population-based emissions might contribute to violations of the 24-hour $PM_{2.5}$ standards.

Based on this factor, Montgomery County, TN dominates the Clarksville area in terms of population and population density. Christian County, KY has the next highest population and density; however, Christian County has a monitor which shows attainment with the 24-hour $PM_{2.5}$ standards. Nearly 90 percent of the Clarksville MSA resides in Montgomery County, Tennessee and Christian County, Kentucky.

Table 4. Population

County	State Recommended Nonattainment	2005 Population	2005 Population Density (pop/sq mi)
Montgomery	No	146,845	270
Christian	No	69,735	96
Muhlenberg	No	31,562	66
Humphreys	No	18,208	33
Trigg	No	13,329	28
Stewart	No	12,975	26

Factor 4: Traffic and commuting patterns

This factor considers the number of commuters in each county who drive to another county within the Clarksville area, the percent of total commuters in each county who commute to other counties within the Clarksville area, as well as the total Vehicle Miles Traveled (VMT) for each county in thousands of miles (see Table 5). A county with numerous commuters is generally an integral part of an urban area and is likely contributing to fine particle concentrations in the area.

Table 5. Traffic and Commuting Patterns

County	State Recommended Non-attainment	2005 VMT (1000s mi)	Number Commuting to any violating counties	Percent Commuting to any violating counties	Number Commuting into statistical area	Percent Commuting into statistical area
Montgomery	No	1,343	40,570	62	56,550	87
Christian	No	1,002	2,080	6	31,190	95
Stewart	No	122	1,480	30	4,180	84
Trigg	No	262	140	3	5,010	93
Humphreys	No	341	50	1	120	2
Muhlenberg	No	311	20	0	230	2

The listing of counties on Table 5 reflects a ranking based on the number of people commuting to other counties. Montgomery County is a NAA candidate based on other Factors (1, 2, and 3) and the CES.

Note: The 2005 VMT data used for table 5 and 6 of the 9-factor analysis has been derived using methodology similar to that described in “Documentation for the final 2002 Mobile National Emissions Inventory, Version 3, September 2007, prepared for the Emission Inventory Group, U.S. EPA. This document may be found at:

atftp://ftp.epa.gov/EmisInventory/2002finalnei/documentation/mobile/2002_mobile_nei_version_3_report_092807.pdf
The 2005 VMT data were taken from documentation which is still draft, but which should be released in 2008.

Factor 5: Growth rates and patterns

This factor considers population growth for 2000-2005 and growth in vehicle miles traveled for 1996-2005 for counties in the Clarksville area, as well as patterns of population and VMT growth. A county with rapid population or VMT growth is generally an integral part of an urban area and likely to be contributing to fine particle concentrations in the area.

Table 6 below shows population, population growth, VMT and VMT growth for counties that are included in the Clarksville area. Counties are listed in descending order based on VMT growth between 1996 and 2005.

Table 6. Population and VMT Values and Percent Change.

Location	Population (2005)	Population Density (2005)	Population % change (2000 - 2005)	2005 VMT (1000s mi)	VMT % change (1996 to 2005)
Montgomery	146,845	270	9	1,343	20
Christian	69,735	96	(4)	1,002	18
Muhlenberg	31,562	66	(1)	311	29
Humphreys	18,208	33	2	341	43
Trigg	13,329	28	5	262	11
Stewart	12,975	26	4	122	21

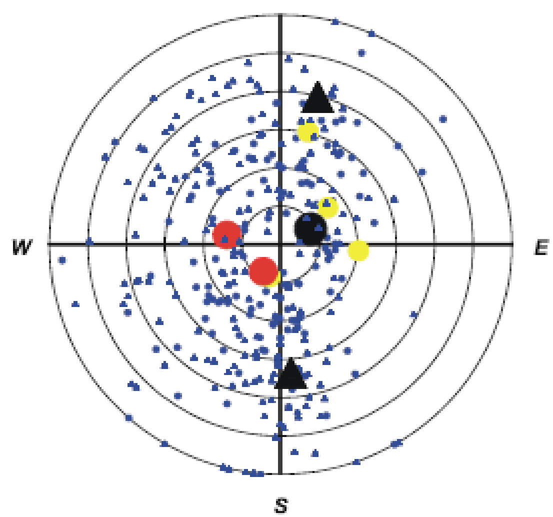
Montgomery County had relatively high population growth between 2000 and 2005, and is a NAA candidate based on other Factors (1, 2, 3, and 4) and the CES.

Factor 6: Meteorology (weather/transport patterns)

For this factor, EPA considered data from National Weather Service instruments in the area. Wind direction and wind speed data for 2004-2006 were analyzed, with an emphasis on "high $PM_{2.5}$ days" for each of two seasons (an October-April "cold" season and a May-September "warm" season). These high days are defined as days where any FRM or FEM air quality monitors had 24-hour $PM_{2.5}$ concentrations above 95% on a frequency distribution curve of $PM_{2.5}$ 24-hour values.

For each air quality monitoring site, EPA developed a "pollution rose" to understand the prevailing wind direction and wind speed on the days with highest fine particle concentrations. The figure identifies 24-hour PM2.5 values by color; days exceeding 35 ug/m3 are denoted with a red or black icon. A dot indicates the day occurred in the warm season; a triangle indicates the day occurred in the cool season. The center of the figure indicates the location of the air quality monitoring site, and the location of the icon in relation to the center indicates the direction from which the wind was blowing on that day. An icon that is close to the center indicates a low average wind speed on that day. Higher wind speeds are indicated when the icon is further away from the center.

Figure 2. Pollution rose for the Clarksville area.



As shown in the pollution rose in Figure 2, the average prevailing surface wind direction for high $PM_{2.5}$ days in Montgomery County are from the north and south. The pollution roses show that 24-hour $PM_{2.5}$ concentrations are influenced by emissions from any direction at various times, but these data also suggest that emissions from some directions relative to the violation are more likely to contribute to the violation than emissions from other directions.

Note: the meteorology factor is also considered in each county's Contributing Emissions Score because the method for deriving this metric included an analysis of trajectories of air masses for high $PM_{2.5}$ days.

Factor 7: Geography/topography (mountain ranges or other air basin boundaries)

The geography/topography analysis looks at physical features of the land that might have an effect on the air shed and, therefore, on the distribution of $PM_{2.5}$ over the Clarksville area.

The Clarksville area does not have any geographical or topographical barriers significantly limiting air-pollution transport within its air shed. Therefore, this factor did not play a significant role in the decision-making process.

Factor 8: Jurisdictional boundaries (e.g., existing PM and ozone areas)

In evaluating the jurisdictional boundary factor, consideration should be given to existing boundaries and organizations that may facilitate air quality planning and the implementation of control measures to attain the standard. Areas designated as nonattainment (e.g. for PM2.5 or 8-hour ozone standard) represent important boundaries for state air quality planning. The major jurisdictional boundary in the Clarksville area is the Clarksville MSA, which consists of Christian and Trigg Counties, KY, and Montgomery and Stewart Counties, TN. The Clarksville area was designated as an 8-hour ozone nonattainment area, which included Christian and Montgomery Counties.

Factor 9: Level of control of emission sources

This factor considers emission controls currently implemented for major sources in the Clarksville area.

The emission estimates on Table 1 (under Factor 1) include any control strategies implemented by the states in the Clarksville area before 2005 that may influence emissions of any component of $PM_{2.5}$ emissions (i.e., total carbon, SO_2, NOx, and crustal $PM_{2.5}$).

In considering county-level emissions, EPA considered 2005 emissions data from the National Emissions Inventory. EPA recognizes that certain power plants or large sources of emissions in this potential nonattainment area may have installed emission controls or otherwise significantly reduced emissions since 2005 and that this information may not be reflected in this analysis. EPA will consider additional information on emission controls in making final designation decisions. In cases where specific plants already have installed emission controls or plan to install such controls in the near future, EPA requests additional information on:

- the plant name, city, county, and township/tax district
- identification of emission units at the plant, fuel use, and megawatt capacity
- identification of emission units on which controls will be installed, and units on which controls will not be installed
- identification of the type of emission control that has been or will be installed on each unit, the date on which the control device became / will become operational, and the emission reduction efficiency of the control device
- the estimated pollutant emissions for each unit before and after implementation of emission controls
- whether the requirement to operate the emission control device will be federally enforceable by December 2008, and the instrument by which federal enforceability will be ensured (e.g. through source-specific SIP revision, operating permit requirement, consent decree)

It should be noted that there are several electric generating units (EGU) within the area. Specifically, they reside in Muhlenberg, Humphreys, and Stewart Counties. The control levels on these power plants can be seen in the table below, and represent moderate to heavy control on emissions from these plants.

Pre-2008 Control Measures

County	Plant	Unit ID	NOX Controls	SO2 Controls	PM 10 Controls
Muhlenberg	Green River	4	LNB	---	ESP 1973
Muhlenberg	Green River	5	LNB	---	ESP 1975
Muhlenberg	Paradise	1	OFA/SCR 2001	FGD – Venturi Scrubber 1982	Venturi Scrubber 1982
Muhlenberg	Paradise	2	OFA/SCR 2001	FGD – Venturi Scrubber 1982	Venturi Scrubber 1982
Muhlenberg	Paradise	3	OFA/SCR 2003	FGD – Venturi Scrubber 2006	Venturi Scrubber 1970's
Stewart	Cumberland	1	LNB	Limestone Scrubber	Lime Injection
Stewart	Cumberland	2	LNB	Limestone Scrubber	Lime Injection
Humphreys	Johnsonville	7, 8, 9, 10	LNB	Low Sulfur Coal	---
Humphreys	Johnsonville	1, 2, 3, 4, 5	CO	Low Sulfur Coal	---

Legend	
LNB	Low NOx Burner
OFA	Over Fired Air
SCR	Selective Catalytic Reduction
FGD	Flue gas desulfurization

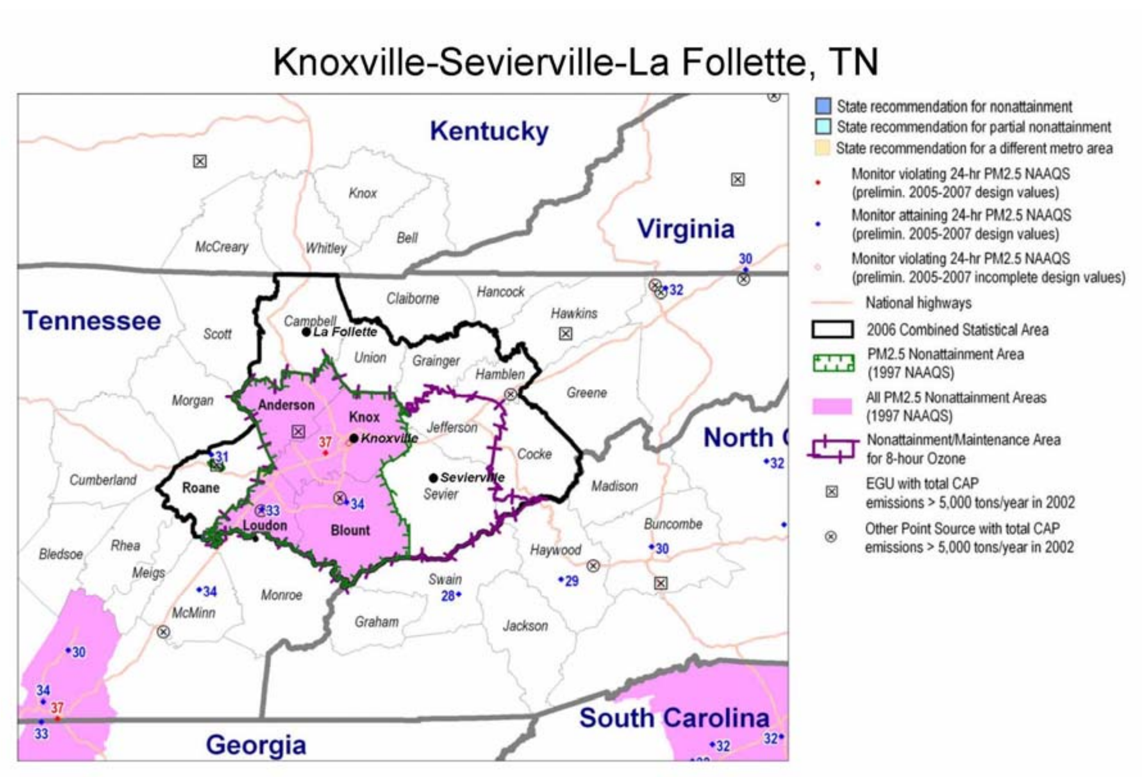
EPA Technical Analysis for Knoxville

Pursuant to section 107(d) of the Clean Air Act, EPA must designate as nonattainment those areas that violate the NAAQS and those areas that contribute to violations. This technical analysis for the Knoxville area identifies the counties with monitors that violate the 24-hour PM2.5 standard and evaluates the counties that potentially contribute to fine particle concentrations in the area. EPA has evaluated these counties based on the weight of evidence of the following nine factors recommended in EPA guidance and any other relevant information:

- pollutant emissions
- air quality data
- population density and degree of urbanization
- traffic and commuting patterns
- growth
- meteorology
- geography and topography
- jurisdictional boundaries
- level of control of emissions sources

Figure 1 is a map of the counties in the area and other relevant information such as the locations and design values of air quality monitors, the metropolitan area boundary, and counties recommended as nonattainment by the State.

Figure 1. Knoxville-Sevierville-La Follette, TN CBSA



For this area, EPA previously established PM2.5 nonattainment boundaries for the 1997 $PM_{2.5}$ NAAQS that included 5 full and partial counties (Knox, Blount, Loudon, Anderson, and part of Roane), with all being located in Tennessee. Data from 2005-2007 indicate that air quality monitors in Loudon and Knox counties continue to violate the annual PM2.5 standard with design values of 15.7 ug/m3.

In December, 2007, Tennessee did not recommend that Knoxville be designated as "nonattainment" for the 2006 24-hour $PM_{2.5}$ standard based on air quality data from 2004-2006. These data are from Federal Reference Method (FRM) and Federal Equivalent Method (FEM) monitors located in the state. (December 13, 2007, letter from Barry R. Stephens, Tennessee Department of Environment and Conservation to Jimmy Palmer, EPA Region 4, received December 18, 2007). However, data for 2005-2007 indicate that a monitor in Knox county violates the 24-hour PM2.5 standard with a value of 37 ug/m3.

Based on speciation data from the area, the typical chemical composition of fine particle mass on the highest PM2.5 days in Knoxville is 60-70% sulfate and 20-30% carbonaceous PM2.5. Analysis of annual average fine particle levels also shows that sulfate and carbonaceous PM2.5 are the primary components. This pattern is typical of many areas throughout the southeastern United States.

Based on EPA's 9-factor analysis described below, EPA believes that the counties of Knox, Blount, Anderson, Loudon, and part of Roane should be designated nonattainment for the 24-hour $PM_{2.5}$ air-quality standard as part of the Knoxville nonattainment area, based upon currently available information. We have included in our recommended nonattainment area Roane County that is adjacent to the Knoxville MSA with a violating monitor, that is generally rural in character, and that contains an identifiable large emitting facility or facilities (e.g., power plants) which we believe contributes to the nearby nonattainment problem. We have included this county in our initial recommendations in order to ensure that a sufficient portion of the county, including such large facilities, is included within the boundaries of the nonattainment area as part of the final designations. These counties are listed in the table below.

	State-Recommended Nonattainment Counties	EPA-Recommended Nonattainment Counties
Knoxville, TN	None	Knox County, TN Blount County, TN Anderson County, TN Loudon County, TN Roane County, TN (partial)

The following is a summary of the 9-factor analysis for the EPA Region 4 portion of the Knoxville Area.

For the 24-hour PM2.5 standard, EPA recommends designating the same counties as those that were designated nonattainment for the annual standard in 2005. The analysis of nine factors below indicates that the same five counties have the highest contributing emission scores in the area. The violating monitor is located in Knox county, the central county in the metropolitan area and the largest in terms of population and commuting. Roane and Anderson counties have large point sources and the highest emissions of SO2 in the area, and they are identified as contributors to the high sulfate levels in the area. Loudon county and Blount county, both of which border Knox county, have moderate levels of SO2 emissions and direct carbonaceous PM2.5. Loudon and Blount also show some of the highest rates of population growth in the area.

Factor 1: Emissions data

For this factor, EPA evaluated county level emission data for the following $PM_{2.5}$ components and precursor pollutants: "$PM_{2.5}$ emissions total," "$PM_{2.5}$ emissions carbon," "$PM_{2.5}$ emissions other," "SO_2," "NO_x," "VOCs," and "NH_3." "$PM_{2.5}$ emissions total" represents direct emissions of $PM_{2.5}$ and includes: "$PM_{2.5}$ emissions carbon," "$PM_{2.5}$ emissions other", primary sulfate (SO_4), and primary nitrate. (Although primary sulfate and primary nitrate, which are emitted directly from stacks rather than forming in atmospheric reactions with SO_2 and NO_x, are part of "$PM_{2.5}$ emissions total," they are not shown in Table 1 as separate items). "$PM_{2.5}$ emissions carbon" represents the sum of organic carbon (OC) and elemental carbon (EC) emissions, and "$PM_{2.5}$ emissions other" represents other inorganic particles (crustal). Emissions of SO_2 and NO_x, which are precursors of the secondary $PM_{2.5}$ components sulfate and nitrate, are also considered. VOCs (volatile organic compounds) and NH_3 (ammonia) are also potential $PM_{2.5}$ precursors and are included for consideration.

Emissions data were derived from the 2005 National Emissions Inventory (NEI), version 1. See http://www.epa.gov/ttn/naaqs/pm/pm25_2006_techinfo.html

EPA also considered the Contributing Emissions Score (CES) for each county. The CES is a metric that takes into consideration emissions data, meteorological data, and air quality monitoring information to provide a relative ranking of counties in and near an area. Note that this metric is not the exclusive way for consideration of data for these factors. A summary of the CES is included in Enclosure 2, and a more detailed description can be found at
http://www.epa.gov/ttn/naaqs/pm/pm25_2006_techinfo.html#C

Table 1 shows emissions of $PM_{2.5}$ and precursor pollutants components (given in tons per year) and the CES for violating and potentially contributing counties in the Knoxville area. Counties that are part of the Knoxville nonattainment area for the 1997 $PM_{2.5}$ NAAQS are shown in boldface

Table 1. $PM_{2.5}$ Related Emissions and Contributing Emissions Score

County	State	State Recommended Nonattainment	CES Score	NOX	SO2	PM2_5	OC	EC
Roane Co	**TN**	**No**	**24**	**17759**	**56838**	**3447**	**196**	**131**
Anderson Co	**TN**	**No**	**41**	**16765**	**40905**	**2549**	**240**	**134**
Blount Co	**TN**	**No**	**35**	**4412**	**5126**	**2113**	**314**	**144**
Knox Co	**TN**	**No**	**100**	**21460**	**3289**	**1696**	**363**	**353**
Jefferson Co	TN	No	17	3787	375	1117	411	112
Rhea Co	TN	No	8	2299	570	932	361	91
Loudon Co	**TN**	**No**	**22**	**6358**	**4647**	**809**	**198**	**100**
Sevier Co	TN	No	15	2877	294	716	309	90
Hamblen Co	TN	No	3	4947	6555	665	170	75
Monroe Co	TN	No	9	2385	490	650	228	86
Union Co	TN	No	4	909	188	281	73	23
Grainger Co	TN	No	2	762	145	233	79	26
Morgan Co	TN	No	2	858	98	201	69	27

Table 1 indicates that Knox has the highest contributing emissions score, followed by Anderson, Blount, Roane and Loudon counties. These are the same five counties that were designated as part of the Knoxville nonattainment area for violating the 1997 PM2.5 standards. Roane and Anderson counties have large point sources and the highest emissions of SO2 in the area, and they are identified as contributors to the high sulfate levels in the area. Direct carbonaceous PM2.5 contributing counties include Roane, Anderson, Blount, and Knox County. Jefferson and Sevier Counties have low emissions relative to the MSA.

Factor 2: Air quality data

This factor considers the 24-hour $PM_{2.5}$ design values (in µg/m^3) for air quality monitors in counties in the Knoxville based on data for the 2004-2006 period. A monitor's design value indicates whether that monitor attains a specified air quality standard. The 24-hour $PM_{2.5}$ standards are met when the 3-year average of a monitor's 98th percentile values are 35 µg/m^3 or less. A design value is only valid if minimum data completeness criteria are met.

The 24-hour $PM_{2.5}$ design values for counties in the Knoxville Area are shown in Table 2.

Table 2. Air Quality Data

County	State	State Recommended Nonattainment	2004-2006 24-hr PM2.5 Design Value (μg/m3)	2005-2007 24-hr PM2.5 Design Value (μg/m3)
Blount	TN	No	30	34
Knox	TN	No	33	37
Loudon	TN	No	31	33
Roane	TN	No	30	31

Knox County shows a violation of the 24-hour $PM_{2.5}$ standard based on 2005-2007 data. Therefore, this county is included in the Knoxville nonattainment area. It should also be noted that Loudon county currently has a monitor that continues to violate the annual standard for PM2.5. However, the absence of a violating monitor alone is not a sufficient reason to eliminate counties as candidates for nonattainment status. Each county has been evaluated based on the weight of evidence of the nine factors and other relevant information.

Note: Eligible monitors for providing design value data generally include State and Local Air Monitoring Stations (SLAMS) at population-oriented locations with a FRM or FEM monitor. All data from Special Purpose Monitors (SPM) using an FRM, FEM, or Alternative Reference Method (ARM) which has operated for more than 24 months is eligible for comparison to the relevant NAAQS, subject to the requirements given in the October 17, 2006 Revision to Ambient Air Monitoring Regulations (71 FR 61236). All monitors used to provide data must meet the monitor siting and eligibility requirements given in 71 FR 61236 to 61328 in order to be acceptable for comparison to the 24-hr PM2.5 NAAQS for designation purposes.

Factor 3: Population density and degree of urbanization (including commercial development)

Table 3 shows the 2005 population for each county in the area being evaluated, as well as the population density for each county in that area. Population data gives an indication of whether it is likely that population-based emissions might contribute to violations of the 24-hour $PM_{2.5}$ standards.

From Table 3, it is shown that Knox County has the highest population and is the most densely populated county in the area. As such, Knox County is the largest contributor from a population perspective to the high levels of PM2.5 in the Knoxville area. Blount, Sevier (which has low emissions relative to the MSA), and Anderson are moderately sized counties, with populations ranging from 70,000 to 115,000.

Table 3. Population

County	State	2000 Population	2005 Population	2000-2005 Population Growth	2005 Population Density (person/sq mi)
Knox Co	TN	382032	409116	6	778
Blount Co	TN	105823	115261	9	203
Sevier Co	TN	71170	79593	11	133
Anderson Co	TN	71330	71801	2	208
Hamblen Co	TN	58128	60017	3	341
Roane Co	TN	51910	52624	2	133
Jefferson Co	TN	44294	47913	8	152
Loudon Co	TN	39086	43242	11	174
Monroe Co	TN	38961	42898	10	65
Rhea Co	TN	28400	29724	5	88
Grainger Co	TN	20659	22109	7	73
Morgan Co	TN	19757	20070	2	38
Union Co	TN	17808	18660	6	75

Factor 4: Traffic and commuting patterns

This factor considers the number of commuters in each county who drive to another county within the Knoxville area, the percent of total commuters in each county who commute to other counties within the Knoxville area, as well as the total Vehicle Miles Traveled (VMT) for each county in thousands of miles (see Table 4). A county with numerous commuters is generally an integral part of an urban area and is likely contributing to fine particle concentrations in the area.

Table 4. Traffic and Commuting Patterns

County	State	2005 Population	2005 VMT	Number of Commuting to Violating Monitor County	Percent Commuting to Violating Monitor County	Number Commuting within MSA	Percent Commuting within MSA
Knox Co	**TN**	**409116**	**6138.785**	**158292**	**85.64%**	**176660**	**95.6%**
Blount Co	**TN**	**115261**	**1235.91**	**13611**	**27.64%**	**46485**	**94.4%**
Sevier Co	TN	79593	1054.363	6522	18.96%	7591	22.1%
Anderson Co	**TN**	**71801**	**774.2704**	**8115**	**26.44%**	**28646**	**93.3%**
Hamblen Co	TN	60017	623.8665	889	3.29%	1008	3.7%
Roane Co	**TN**	**52624**	**577.2391**	**3180**	**14.24%**	**9467**	**42.4%**
Jefferson Co	TN	47913	776.5622	4381	21.68%	4628	22.9%
Loudon Co	**TN**	**43242**	**738.0855**	**4580**	**25.92%**	**15411**	**87.2%**
Monroe Co	TN	42898	482.2714	790	4.90%	2877	18.1%
Rhea Co	TN	29724	261.6422	141	1.15%	243	2.0%
Grainger Co	TN	22109	222.79	2065	23.51%	2293	26.1%
Morgan Co	TN	20070	143.525	775	10.70%	2454	33.7%
Union Co	TN	18660	125.7728	3873	53.04%	6870	94.1%

The listing of counties on Table 4 reflects a ranking based on the number of people commuting to other counties. The counties that are in the nonattainment area for the 1997 $PM_{2.5}$ NAAQS are shown in boldface.

From Table 4, Knox County has the highest number of commuters and highest VMT of any county in the area. Most Knox County commuters stay in the county. The other counties with the highest number of commuters into Knox County are Blount, Sevier (which has low emissions relative to the MSA), Anderson, and Loudon. For all of these counties plus Union county, 80% or more of their commuters travel to other counties within the Knoxville metropolitan area.

Note: The 2005 VMT data used for table 4 and 5 of the 9-factor analysis has been derived using methodology similar to that described in "Documentation for the final 2002 Mobile National Emissions Inventory, Version 3, September 2007, prepared for the Emission Inventory Group, U.S. EPA. This document may be found at: ftp://ftp.epa.gov/EmisInventory/2002finalnei/documentation/mobile/2002_mobile_nei_version_3_report_092807.pdf
The 2005 VMT data were taken from documentation which is still draft, but which should be released in 2008.

Factor 5: Growth rates and patterns

This factor considers population growth for 2000-2005 and growth in vehicle miles traveled for 1996-2005 for counties in the Knoxville area, as well as patterns of population and VMT growth. A county with rapid population or VMT growth is generally an integral part of an urban area and likely to be contributing to fine particle concentrations in the area.

Table 5 below shows population, population growth, VMT and VMT growth for counties that are included in the Knoxville area. Counties are listed in descending order based on VMT growth between 1996 and 2005.

Table 5. Population and VMT Values and Percent Change.

County	State	2005 Population	2005 Population Density (person/sq mi)	2005 VMT (1000s Miles)	Percent VMT Growth (1996-2005)
Sevier Co	TN	79593	133.15878	1054.363	74.36%
Knox Co	TN	409116	778.11252	6138.785	46.07%
Jefferson Co	TN	47913	152.42898	776.5622	31.60%
Monroe Co	TN	42898	65.736002	482.2714	28.61%
Grainger Co	TN	22109	73.102103	222.79	28.24%
Blount Co	TN	115261	203.40775	1235.91	25.65%
Union Co	TN	18660	75.506818	125.7728	24.79%
Loudon Co	TN	43242	174.84938	738.0855	22.41%
Hamblen Co	TN	60017	341.4519	623.8665	13.21%
Rhea Co	TN	29724	88.361723	261.6422	11.43%
Anderson Co	TN	71801	208.22748	774.2704	4.79%
Morgan Co	TN	20070	38.418836	143.525	-10.35%
Roane Co	TN	52624	133.23206	577.2391	-11.78%

From Table 5, it is shown that Knox County dominates the area with respect to VMT. Additionally, the county has demonstrated a 46% increase in VMT over the 10 year period spanning from 1996 to 2005. Sevier County (which has low emissions relative to the MSA), is also a county identified through this factor, due to its high VMT growth rate, of 74%. Additionally, Sevier County has the second highest VMT in the area, although this number only represents about 17% of Knox County's VMT.

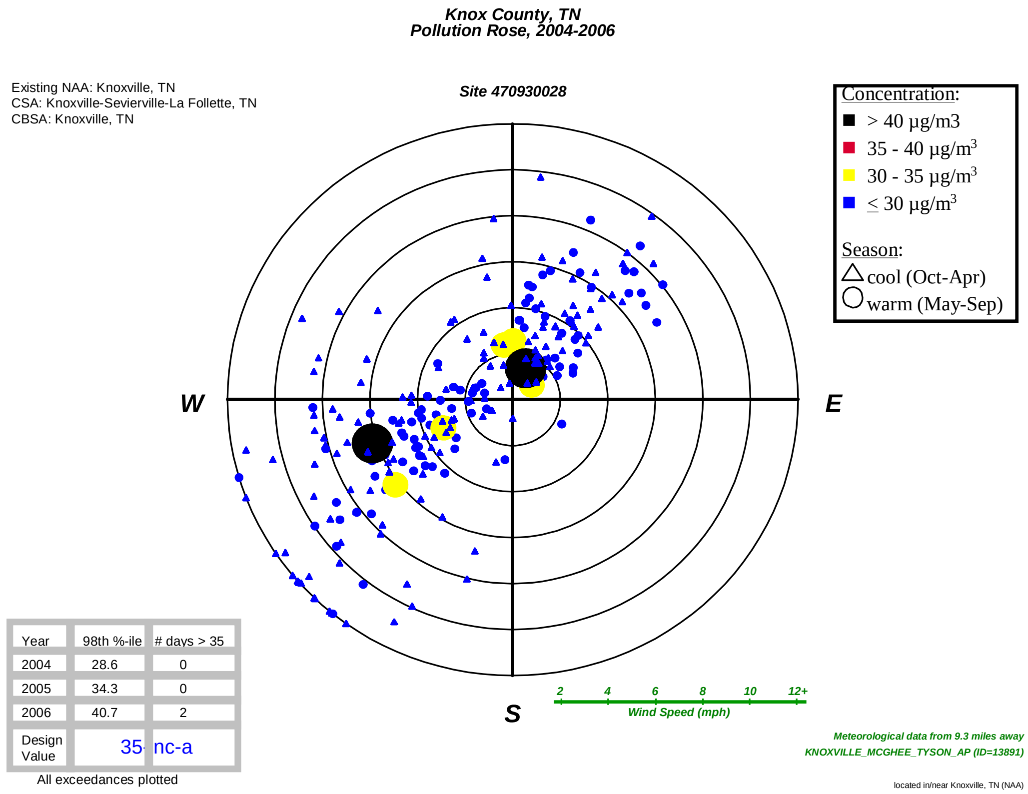
The counties with the highest rates of population growth from 2000-2005 (see table 3) are Loudon (11%), Sevier (11%), Monroe (10%) and Blount (9%).

Factor 6: Meteorology (weather/transport patterns)

For this factor, EPA considered data from National Weather Service instruments in the area. Wind direction and wind speed data for 2004-2006 were analyzed, with an emphasis on "high $PM_{2.5}$ days" for each of two seasons (an October-April "cold" season and a May-September "warm" season). These high days are defined as days where any FRM or FEM air quality monitors had 24-hour $PM_{2.5}$ concentrations above 95% on a frequency distribution curve of $PM_{2.5}$ 24-hour values.

For each air quality monitoring site, EPA developed a "pollution rose" to understand the prevailing wind direction and wind speed on the days with highest fine particle concentrations. The figure identifies 24-hour PM2.5 values by color; days exceeding 35 ug/m3 are denoted with a red or black icon. A dot indicates the day occurred in the warm season; a triangle indicates the day occurred in the cool season. The center of the figure indicates the location of the air quality monitoring site, and the location of the icon in relation to the center indicates the direction from which the wind was blowing on that day. An icon that is close to the center indicates a low average wind speed on that day. Higher wind speeds are indicated when the icon is further away from the center.

Figure 2. Pollution Rose for Knox County, TN



As shown in the pollution rose in Figure 2, the average prevailing surface wind direction for high $PM_{2.5}$ days in Knox County are from the northeast and the south west The pollution roses show that 24-hour $PM_{2.5}$ concentrations are influenced by emissions from any direction at various times, but these data also suggest that emissions from some directions relative to the violation are more likely to contribute to the violation than emissions from other directions.

Note: the meteorology factor is also considered in each county's Contributing Emissions Score because the method for deriving this metric included an analysis of trajectories of air masses for high $PM_{2.5}$ days.

Factor 7: Geography/topography (mountain ranges or other air basin boundaries)

The geography/topography analysis looks at physical features of the land that might have an effect on the air shed and, therefore, on the distribution of $PM_{2.5}$ over the Knoxville area.

The Knoxville area does not have any geographical or topographical barriers significantly limiting air-pollution transport within its air shed. Therefore, this factor did not play a significant role in the decision-making process.

Factor 8: Jurisdictional boundaries (e.g., existing PM and ozone areas)

In evaluating the jurisdictional boundary factor, consideration should be given to existing boundaries and organizations that may facilitate air quality planning and the implementation of control measures to attain the standard. Areas designated as nonattainment (e.g. for PM2.5 or 8-hour ozone standard) represent important boundaries for state air quality planning.

From a EPA Region 4 perspective, the major jurisdictional boundary in the Knoxville Area is the Knoxville MSA. This includes Anderson, Blount, Knox, Loudon, and Union County, Tennessee. Knox County is the only county with air-quality monitors that violate the 1997 $PM_{2.5}$ NAAQS.

Other jurisdictional boundaries, for the Knoxville Area, that should be considered are the 8-hour ozone nonattainment area, and the annual PM2.5 nonattainment area. These Boundaries are defined below:

8-hour Ozone Nonattainment Area:
Anderson, Blount, Knox, Loudon, Sevier, Jefferson, and Cocke County, Tennessee

Annual PM2.5 Nonattainment Area:
Anderson, Blount, Knox, Loudon, and Roane County, Tennessee

Factor 9: Level of control of emission sources

This factor considers emission controls currently implemented for major sources in the Knoxville area.

The emission estimates on Table 1 (under Factor 1) include any control strategies implemented by the states in the Knoxville area before 2005 that may influence emissions of any component of $PM_{2.5}$ emissions (i.e., total carbon, SO_2, NOx, and crustal $PM_{2.5}$). Anderson, Blount, Jefferson, Loudon, and Sevier County, are all subject to Prevention of Significant Deterioration (PSD) requirements, Reasonably Available Control Technology, Maximum Achievable Control Technology for Hazardous Air Pollutants, and New Source Performance Standards.

In considering county-level emissions, EPA considered 2005 emissions data from the National Emissions Inventory. EPA recognizes that certain power plants or large sources of emissions in this potential nonattainment area may have installed emission controls or otherwise significantly reduced emissions since 2005 and that this information may not be reflected in this analysis. EPA will consider additional information on emission controls in making final designation decisions. In cases where specific plants already have installed emission controls or plan to install such controls in the near future, EPA requests additional information on:

- the plant name, city, county, and township/tax district
- identification of emission units at the plant, fuel use, and megawatt capacity
- identification of emission units on which controls will be installed, and units on which controls will not be installed
- identification of the type of emission control that has been or will be installed on each unit, the date on which the control device became / will become operational, and the emission reduction efficiency of the control device
- the estimated pollutant emissions for each unit before and after implementation of emission controls
- whether the requirement to operate the emission control device will be federally enforceable by December 2008, and the instrument by which federal enforceability will be ensured (e.g. through source-specific SIP revision, operating permit requirement, consent decree)

Enclosure 2

Description of the Contributing Emissions Score

The CES is a metric that takes into consideration emissions data, meteorological data, and air quality monitoring information to provide a relative ranking of counties in and near an area. Using this methodology, scores were developed for each county in and around the relevant metro area. The county with the highest contribution potential was assigned a score of 100, and other county scores were adjusted in relation to the highest county. The CES represents the relative maximum influence that emissions in that county have on a violating county. The CES, which reflects consideration of multiple factors, should be considered in evaluating the weight of evidence supporting designation decisions for each area.

The CES for each county was derived by incorporating the following significant information and variables that impact $PM_{2.5}$ transport:

- Major $PM_{2.5}$ components: total carbon (organic carbon (OC) and elemental carbon (EC)), SO_2, NO_x, and inorganic particles (crustal).
- $PM_{2.5}$ emissions for the highest (generally top 5%) $PM_{2.5}$ emission days (herein called "high days") for each of two seasons, cold (Oct-Apr) and warm (May-Sept)
- Meteorology on high days using the NOAA HYSPLIT model for determining trajectories of air masses for specified days
- The "urban increment" of a violating monitor, which is the urban $PM_{2.5}$ concentration that is in addition to a regional background $PM_{2.5}$ concentration, determined for each $PM_{2.5}$ component
- Distance from each potentially contributing county to a violating county or counties

A more detailed description of the CES can be found at http://www.epa.gov/ttn/naaqs/pm/pm25_2006_techinfo.html#C.

Enclosure 3

$PM_{2.5}$ Exceptional Events
Technical Support Document

U.S. Environmental Protection Agency
Region 4

State of Tennessee

2007

2008 Technical Support Document for the State of Tennessee
Fine Particulate Matter Exceptional Event Demonstration

I. Introduction

A technical support document (TSD) has been prepared to discuss the rationale for concurrence or non-concurrence with requests to apply data flags on fine particulate matter ($PM_{2.5}$) concentrations that may have been impacted by exceptional events and that may have exceeded the National Ambient Air Quality Standards (NAAQS). The State of Tennessee (Tennessee) has identified several $PM_{2.5}$ concentrations that may have been impacted by wildfires that originated in southern Georgia and northern Florida during the 2007 monitoring cycle. Tennessee has prepared and submitted documentation to support requests for concurrence with exceptional event data flags in accordance with current federal regulations regarding exceptional events. Key excerpts from *Part 50 National Primary and Secondary Ambient Air Quality Standards* are provided in Section II. Any exceptional event flags that EPA Region 4 concurs with will be excluded from use in determinations of exceedances and National Ambient Air Quality Standards (NAAQS) violations.

II. Excerpts from Exceptional Event Regulations

A. Definition of an Exception Event: *According to §50.1(j): "Exceptional event means an event that affects air quality, is not reasonably controllable or preventable, is an event caused by human activity that is unlikely to recur at a particular location or a natural event, and is determined by the Administrator in accordance with 40 CFR 50.14 to be an exceptional event. It does not include stagnation of air masses or meteorological inversions, a meteorological event involving high temperatures or lack of precipitation, or air pollution relating to source noncompliance."*

B. Definition of an Exceedance: *Exceedance with respect to a national ambient air quality standard means one occurrence of a measured or modeled concentration that exceeds the specified concentration level of such standard for the averaging period specified by the standard.*

C. Exclusion of Data: *EPA shall exclude data from use in determinations of exceedances and NAAQS violations where a State demonstrates to EPA's satisfaction that emissions from fireworks displays caused a specific air pollution concentration in excess of one or more national ambient air quality standards at a particular air quality monitoring location and otherwise satisfies the requirements of this section. Such data will be treated in the same manner as exceptional events under this rule, provided a State demonstrates that such use of fireworks is significantly integral to traditional national, ethnic, or other cultural events including, but not limited to July Fourth celebrations which satisfy the requirements of this section."*

D. Criteria for Exclusion: *The demonstration to justify data exclusion shall provide evidence that*

(1) The event satisfies the criteria set forth in 40 CFR 50.1(j);
(2) There is a clear causal relationship between the measurement under consideration and the event that is claimed to have affected the air quality in the area;
(3) The event is associated with a measured concentration in excess of normal historical fluctuations, including background; and
(4) There would have been no exceedance or violation but for the event.

III. Evaluation of $PM_{2.5}$ Concentrations and Supporting Documentation

In order to meet criteria 1 and 2 listed in Section II of this document, Tennessee provided supporting documentation which included $PM_{2.5}$ speciation data, wind trajectories, meteorological data (including graphs, charts, and various satellite images), and statistical data. Each $PM_{2.5}$ 24-hr average concentration requested for exclusion was first evaluated against these criteria using a two-step analysis. This analysis was designed to compare the requested value to historical values observed at the site and determine whether the concentration was an exceedance of the 24-hr $PM_{2.5}$ NAAQS and whether any exceedances could have been caused by the flagged event.

Step 1: Monthly Average Comparison

Using 24-hr $PM_{2.5}$ data from AQS for 2004-2007, a comparison three-year monthly average was calculated. The three-year monthly average concentration was calculated excluding data from the year in which the data in question was collected. For example, a requested value in May 2006 was compared to the average of all the samples collected at the site during May 2004, May 2005, and May 2007. If the three-year average was greater than the annual $PM_{2.5}$ NAAQS (15.0 $\mu g/m^3$) and the requested value was less than the 24-hr $PM_{2.5}$ NAAQS (35 $\mu g/m^3$), then EPA concurrence was not given to the requested value. This is because in EPA's judgment there is insufficient evidence that "there would have been no exceedance or violation but for the event" as required by §50.14(c)(3)(iii)(D) because the normally expected concentration at the site (the three-year monthly mean concentration) is in excess of the NAAQS.

Step 2: Monthly 84th Percentile Comparison

Using 24-hr $PM_{2.5}$ data from AQS for 2004-2007, a comparison three-year upper 84th percentile was calculated for the month in which the requested value was collected. The three-year monthly 84th percentile was calculated excluding data from the year in which the data in question was collected. For example, a requested value in May 2006 was compared to the upper 84th percentile calculated from of all the samples collected at the site during May 2004, May 2005, and May 2007. The calculated three-year monthly upper 84th percentile was considered to represent the range of normally expected high values at that site due to normal local and background sources If the requested value was below the calculated three-year monthly upper 84th percentile, EPA concurrence was not given to the requested value. This is because in EPA's judgment that there is insufficient evidence to demonstrate that the NAAQS exceedance was caused by the suspected event as required by §50.14(c)(3)(iii)(D) and not by normal local and background sources at the site.

If a requested value did not meet the requirements described in one or more of the above steps and Tennessee did not submit compelling evidence to demonstrate that the event satisfied the exceptional event criteria, then EPA concurrence was not given to the exceptional event flag on the requested value. The values that did meet all of the conditions described above were then evaluated against the requirements of §50.14(c)(3)(iii).

Summary of maps and graphs used

Additional maps and graphs were generated by EPA to provide assistance in completing the review of the Tennessee submittal. The graphics provided in this document were not included in Tennessee's submittal. The additional maps and graphs have been included in this TSD as appropriate. Unless otherwise noted, these products were obtained from the DATAFED Data Views Catalog, which can be accessed at http://datafedwiki.wustl.edu/index.php/Data_Views_Catalog. This may include maps using data from AQS, the National Aeronautics and Space Administration (NASA), and the Navy Aerosol Analysis and Prediction System (NAAPS). Also, unless otherwise noted, all ambient air monitoring data used in this analysis was obtained from the EPA AQS database.

IV. Data Evaluation

The State of Tennessee identified forty-eight concentrations that were potentially impacted by wildfire smoke. In Tables 1 and 2, the observed concentrations, monthly averages, 84th and 95th percentiles, and results of the two-step analysis are provided, along with EPA's preliminary response to the submittal. Documentation submitted by Tennessee claims that smoke from wildfires in South Georgia and North Florida caused NAAQS exceedances at the sites listed in the tables.

Table 1 lists the concentrations that passed both steps of the initial analysis. Further analysis of available data and documentation was determined necessary for completing the review. The discussions that follow will demonstrate that the 24-hr average $PM_{2.5}$ concentrations listed in Table 1 meet or fail to meet the criteria described in the Exceptional Events Rule, §50.14.

Table 2, which is located in the Appendix, lists values that failed to pass both steps of the initial analysis. Also, the documentation submitted by Tennessee did not demonstrate a clear causal relationship between the measured concentration and the event, and did not demonstrate that there would have been no exceedance or violation but for the event. Due to these reasons, no further analysis of the data is Table 2 was deemed necessary. EPA concurrence was not given to these exceptional event flags.

Table 1. Concentrations that passed Steps 1 and 2.

Date	AQS ID	County	MSA	Observed Conc.	Monthly Average	84th Percentile	95th Percentile	Step 1	Step 2	EPA Concur
5/19/07	47-125-1009	Montgomery	Clarksville	52.6	12.1	15.3	21.1	PASS	PASS	NO
5/22/07	47-125-1009	Montgomery	Clarksville	20	12.1	15.3	21.1	PASS	PASS	NO
5/25/07	47-125-1009	Montgomery	Clarksville	17.5	12.1	15.3	21.1	PASS	PASS	NO
5/26/07	47-125-1009	Montgomery	Clarksville	20.2	12.1	15.3	21.1	PASS	PASS	NO
5/27/07	47-125-1009	Montgomery	Clarksville	32.4	12.1	15.3	21.1	PASS	PASS	NO
5/28/07	47-125-1009	Montgomery	Clarksville	35.3	12.1	15.3	21.1	PASS	PASS	NO
5/29/07	47-125-1009	Montgomery	Clarksville	22.4	12.1	15.3	21.1	PASS	PASS	NO
5/30/07	47-125-1009	Montgomery	Clarksville	35.7	12.1	15.3	21.1	PASS	PASS	YES
6/17/07	47-099-0002	Lawrence	Not in an MSA	24	14.9	21.5	25.3	PASS	PASS	NO
7/31/07	47-125-1009	Montgomery	Clarksville	39.1	19.2	24.5	32.3	PASS	PASS	NO
8/1/07	47-125-1009	Montgomery	Clarksville	38.7	19.3	27.8	35.4	PASS	PASS	NO
8/3/07	47-125-1009	Montgomery	Clarksville	38.4	19.3	27.8	31.6	PASS	PASS	NO
8/4/07	47-125-1009	Montgomery	Clarksville	43	19.3	27.8	35.4	PASS	PASS	NO

V. Discussion of Evidence

A. Event Description: Southern Georgia and North Florida Wildfires

The Bugaboo Scrub Fire (Figure 1a) was a wildfire that raged from April to June in 2007 and ultimately became the largest fire in the history of both Georgia and Florida. The Bugaboo Scrub Fire, which was not actually named until it had blazed for nearly a month, started in the Okefenokee Swamp, most of which is located in Georgia. It was previously known as the Sweat Farm Road Fire, which merged with the Big Turnaround Complex Fire shown in Figure 1b. Due to the amount of acreage consumed by these wildfires, large amounts of smoke persisted in the air from May through the first week of June. Wind transported much of this smoke throughout the southeastern region. The presence of particulate matter, a large constituent of smoke, was observed at many monitoring sites and in many cases caused very large increases in the measured 24-hour $PM_{2.5}$ mass concentrations.

Figure 1a. Bugaboo Scrub Fire, April 29, 2007.

Figure 1b. Sweat Farm Road Fire, April 28, 2007.

B. Causal Relationship between the Event and Air Quality

To evaluate the possible causal relationship of the wildfires on air quality in Montgomery (Clarksville) and Lawrence Counties, maps and wind trajectories were analyzed to assess the probability of smoke transport from the wildfires. Figure 3 illustrates spatially averaged $PM_{2.5}$ concentrations that were used to assess the possible impacts of smoke on air quality. Figure 4 illustrates backwards wind trajectories that passed through the suspected source region on each of the days under consideration. These trajectories support the possible transport of smoke through Lawrence County and Clarksville on some of these days. Figure 5 depicts the NASA OMI aerosol index observed on each of the days in question that exceeded the NAAQS 24 hr standard (35 ug/m^3).

Speciation data was collected at the Clarksville site (AQS ID 47-125-1009) on a 1 in 6 day sampling schedule. Because of this schedule, speciation data was limited and only available for May 30 and August 4. Federal reference method (FRM) mass, organic carbon, and sulfate mass are shown in the graph in Figure 10.

C. Comparison to Historical Levels

In order to further assess the impacts of the Georgia and Florida fires, the data in question was compared to historical levels observed at each site. Table 1 shows that all of the values that passed both steps of the initial analysis vary in terms of the levels above the 95th percentile calculated from data collected during the respective months for 2004-2006. May 19 and August 4 are considerably higher than the 95th percentiles, which strongly suggest that the data were influenced by an exceptional event. Figure 3 shows the spatially averaged 24-hr average $PM_{2.5}$ concentrations observed on each of the days in question. Figures 1 and 2 show the excess $PM_{2.5}$ concentrations observed above the 84th and 95th percentiles, respectively, on each of the days. These maps show 24-hr average $PM_{2.5}$ concentrations above the normal range of values observed in the Clarksville area historically during the respective months.

D. Demonstration of No Exceedance "But For" the Event

The values reported for May 22, 25, 26, 27, 29, and June 17 passed the initial screening tests, however, they do not exceed the 24-hour standard (35 ug/m3). Further, Table 1 shows that several values do not exceed the 95th percentiles. Without $PM_{2.5}$ speciation data available for any of these values, it is EPA's judgment that there is insufficient evidence to determine that "there would have been no exceedance or violation but for the event." Further, the information provided in Tennessee's submittal was inconclusive in demonstrating a causal relationship. EPA concurrence was not given for any of these days.

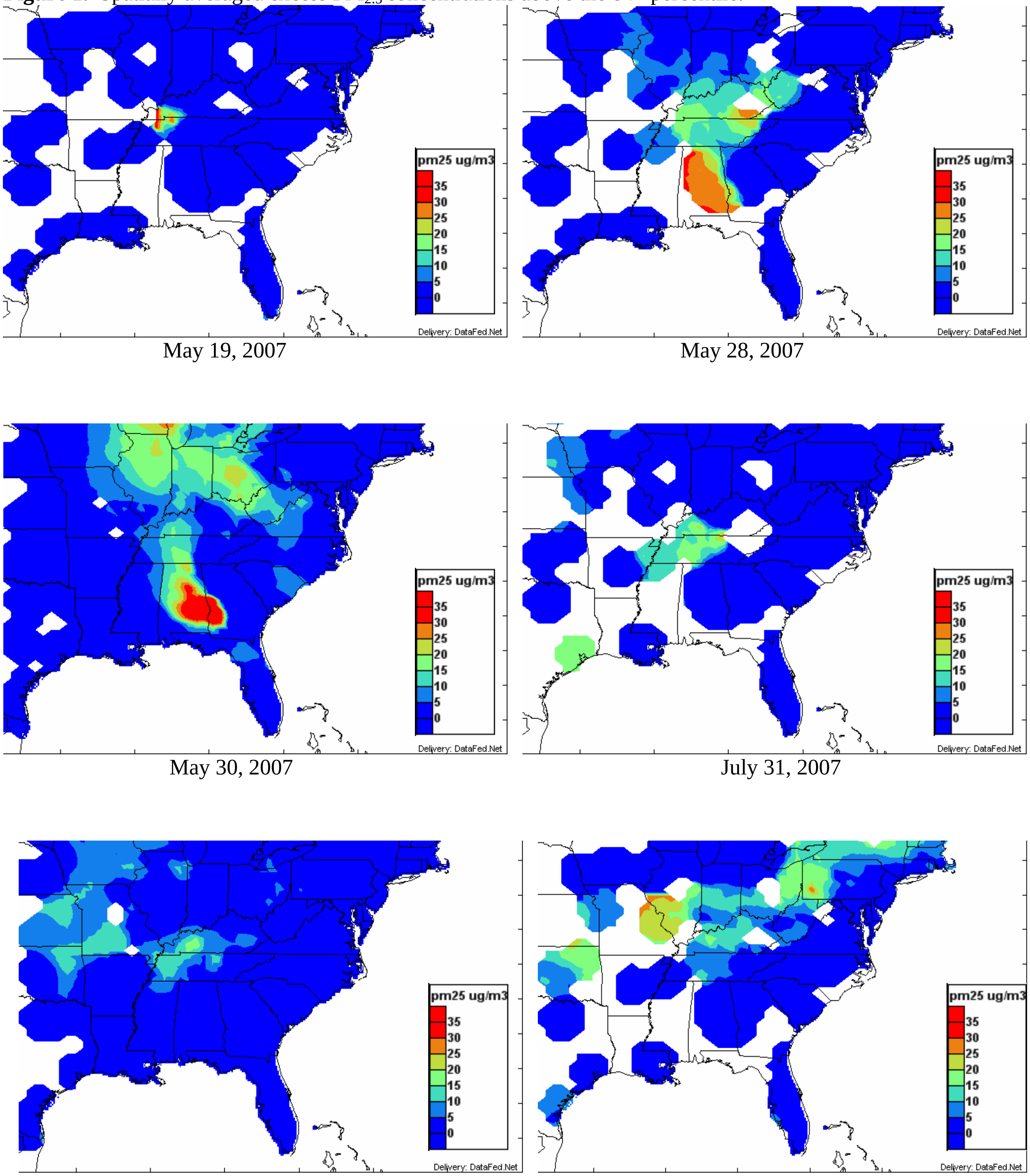
The values reported for May 19, 28, July 31, August 1, and August 3 exceed the 24-hour standard (35 ug/m^3); however, $PM_{2.5}$ speciation data was not available for these specific days. Without these data, determining an organic mass apportionment was not possible. A significantly high PM value was observed in Clarksville on May 19 of 56.2 ug/m^3. Although the value is significantly higher than the 95th percentile value (21.1 ug/m^3), an evaluation of the maps in Figures 3 and 4 suggests that the high value was not due to air mass movement from the wildfires but from a localized event or source. The lack of wind trajectories approaching and leaving the Clarksville area from the southern Georgia and north Florida areas on this day suggests possible stagnation of air in the area. For the other days, figures 3 and 4 also indicate high PM concentrations in the Clarksville area, although figure 5 indicates low aerosol levels in both source and impact areas. As with May 19, the lack of wind trajectories suggest localized sources. Without $PM_{2.5}$ speciation data, there is insufficient evidence to determine that "there would have been no exceedance or violation but for the event." EPA concurrence was not given for any of these days.

May 30 and August 4 both reported concentrations that were exceedances of the 24-hr $PM_{2.5}$ standard (35µg/m^3). The values for May 30 and August 4 were, respectively, in excess of the historical 95th percentile by 14.6 µg/m^3 and 7.6µg/m^3 for the Clarksville site in the months of May and August. This is an indication that these monitors may have been impacted by an exceptional event. $PM_{2.5}$ speciation data was available for both days which allowed for a more critical analysis of the components of the PM mass. Figures 6a through 9b show varying images of the national levels of organic carbon and sulfates measured on May 30 and August 4. While these images are helpful in providing an overall view, they are somewhat inconclusive for assessing specific areas.

Figure 10 shows the levels of $PM_{2.5}$ organic carbon and sulfate compounds compared to the total PM mass. For May 30, the graph shows that the organic carbon level is higher than sulfate, and may represent a greater portion of the PM mass. Figure 11 shows the adjusted $PM_{2.5}$ mass in relation to the NAAQS standards. Typically, these estimations would be made based on several years of historical data. Clarksville's calculations are based on one year of available speciation data from 2007. The data shows the impact that would be made on the PM mass if organic carbon and sulfates were removed from the mass. For May 30, the graph suggests that the removal of the organic carbon would reduce the PM mass significantly and well below the daily standard. The PM mass would remain high if sulfates were removed. Combined with other evidence that has been reviewed, the concentration for May 30 is likely to have been significantly impacted by wildfire smoke. EPA concurs with the data flag applied to this concentration.

For August 4, the removal of organic carbon from the PM mass does not appear to reduce the level of the PM mass significantly and suggests a greater impact from sulfates on this day. Additionally, there was not other significant evidence to suggest that August 4 may have been impacted by local wildfires but rather a potential localized sulfate event or other sulfate source. Thus, EPA does not concur with flagging the concentration measured on this day.

Figure 1. Spatially averaged excess $PM_{2.5}$ concentrations above the 84th percentile.



May 19, 2007

May 28, 2007

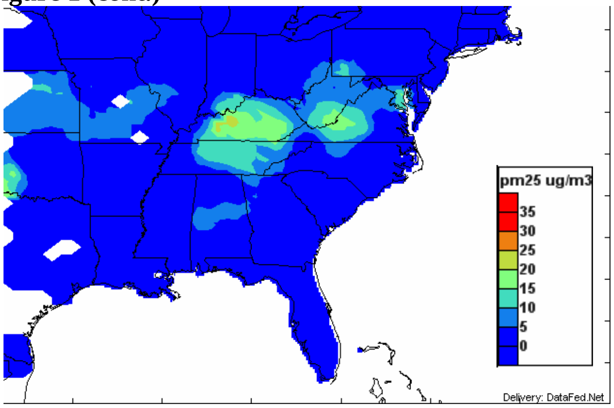
May 30, 2007

July 31, 2007

August 1, 2007

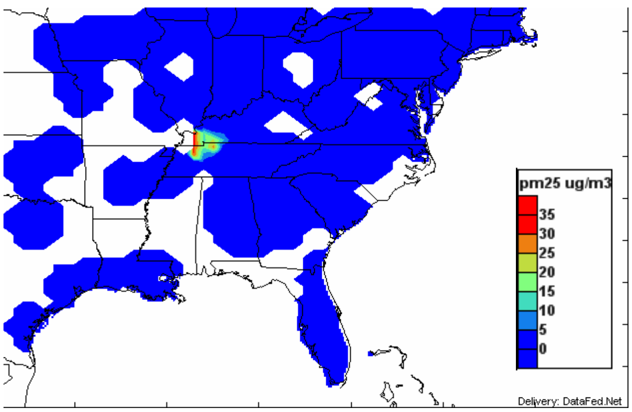
August 3, 2007

Figure 1 (cont.)

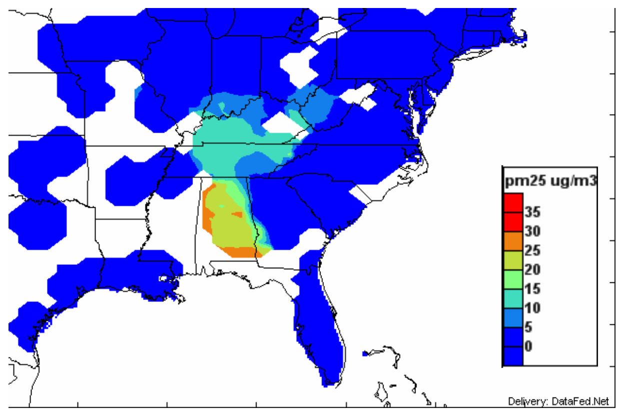


August 4, 2007

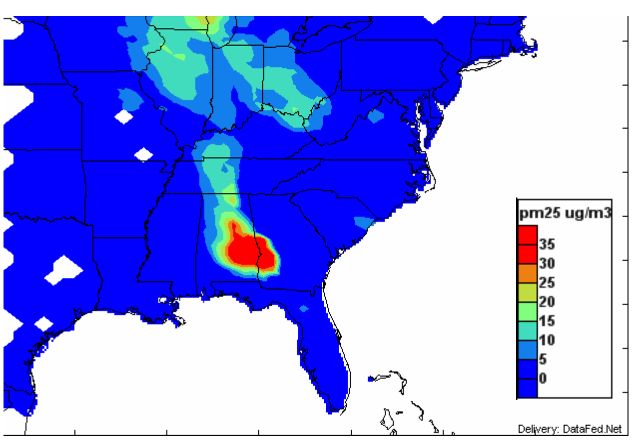
Figure 2. Spatially averaged excess $PM_{2.5}$ concentrations above the 95th percentile.



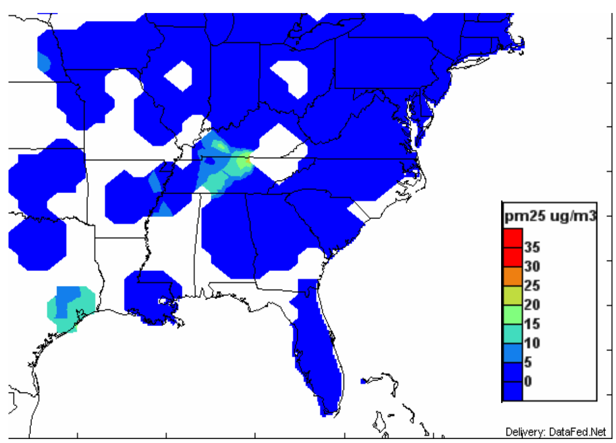
May 19, 2008



May 28, 2007

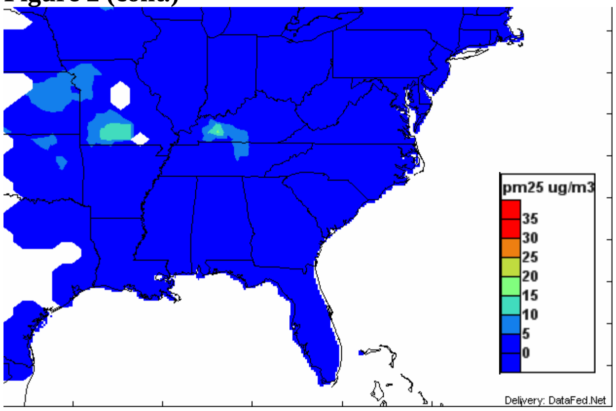


May 30, 2007

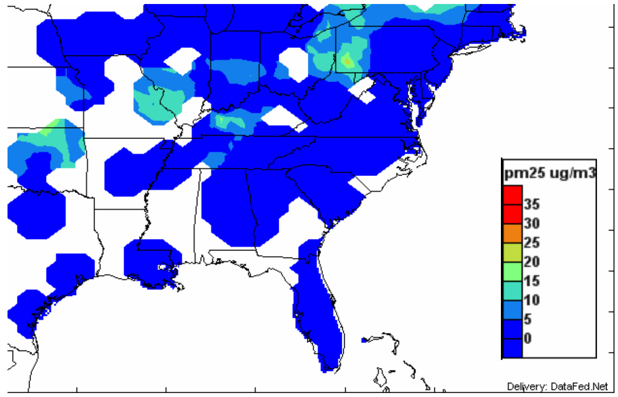


July 31, 2007

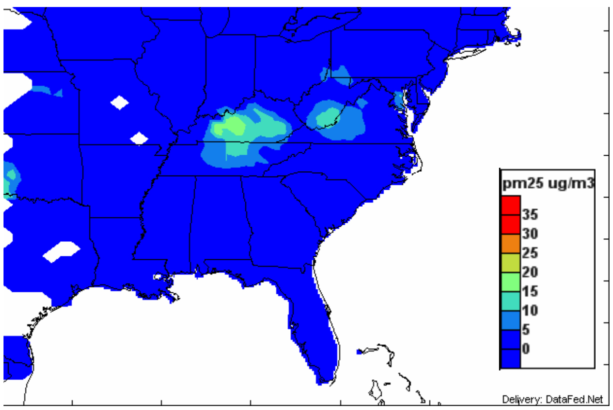
Figure 2 (cont.)



August 1, 2007

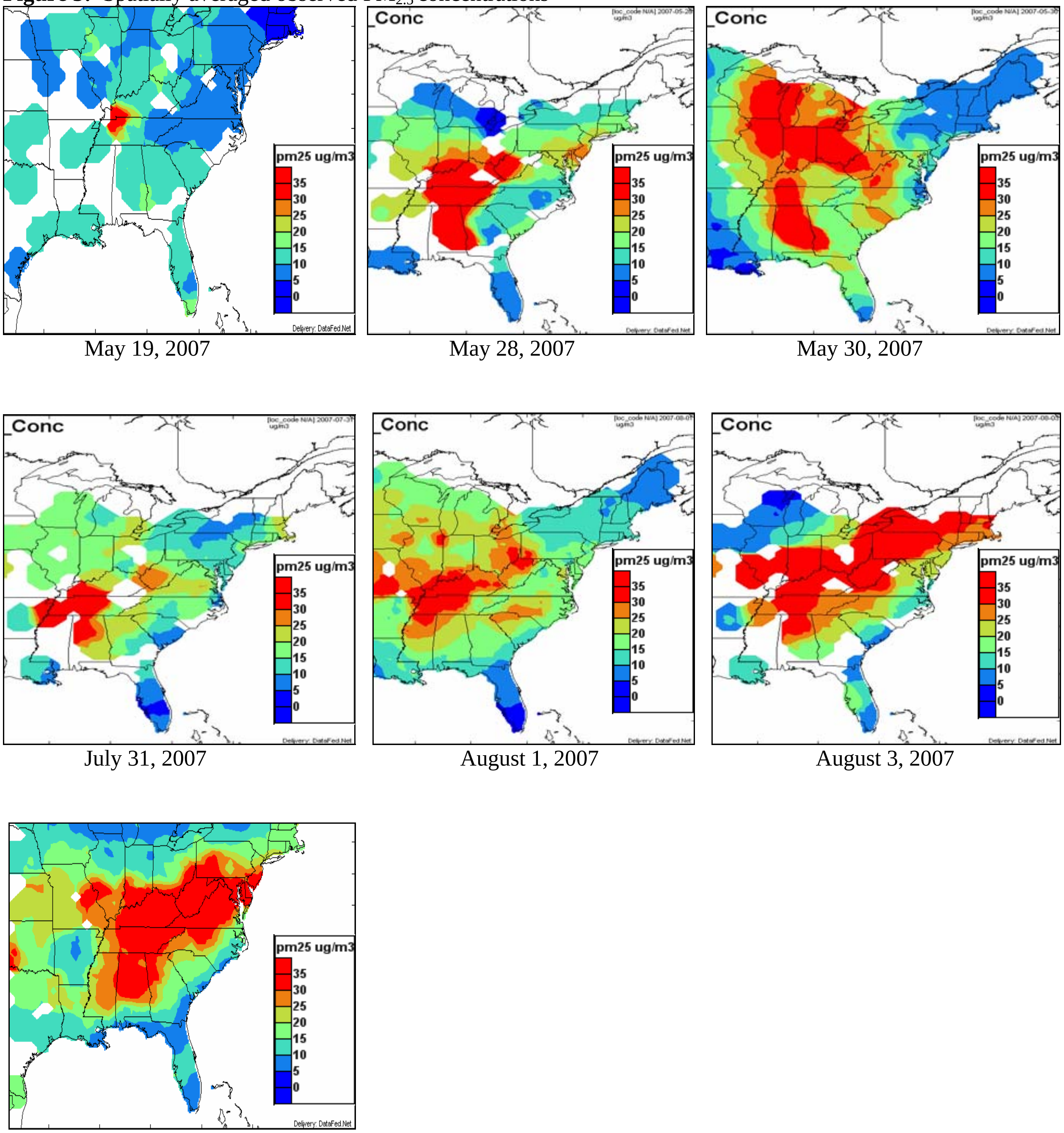


August 3, 2007



August 4, 2007

Figure 3: Spatially averaged observed $PM_{2.5}$ concentrations



May 19, 2007

May 28, 2007

May 30, 2007

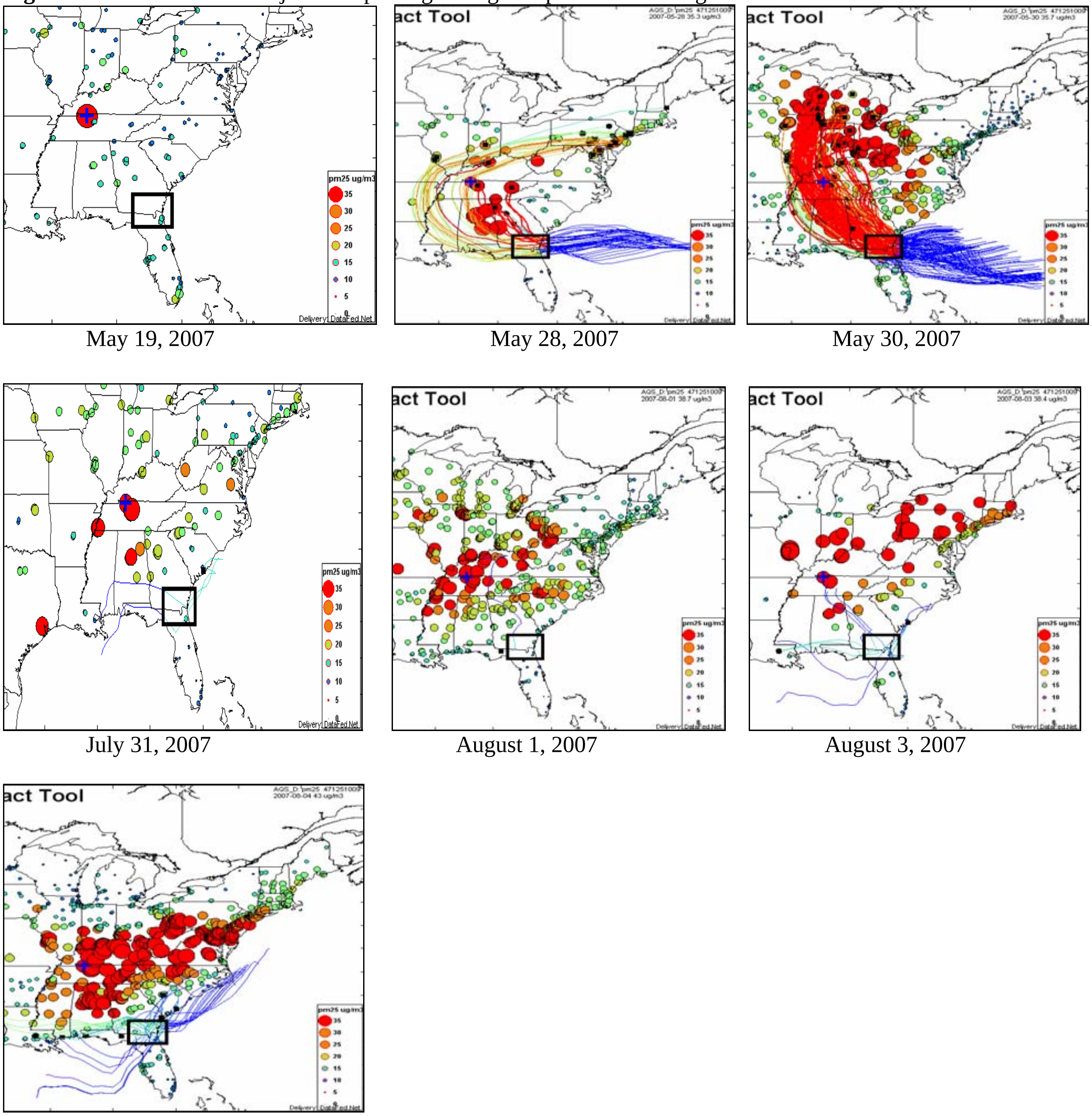
July 31, 2007

August 1, 2007

August 3, 2007

August 4, 2007

Figure 4: Backward wind trajectories passing through suspected source region.

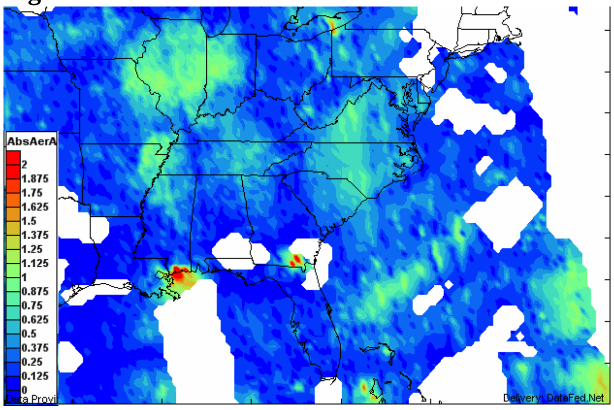


May 19, 2007 | May 28, 2007 | May 30, 2007

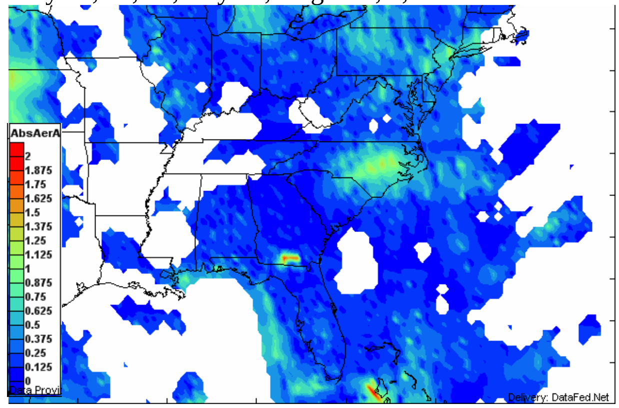
July 31, 2007 | August 1, 2007 | August 3, 2007

August 4, 2007

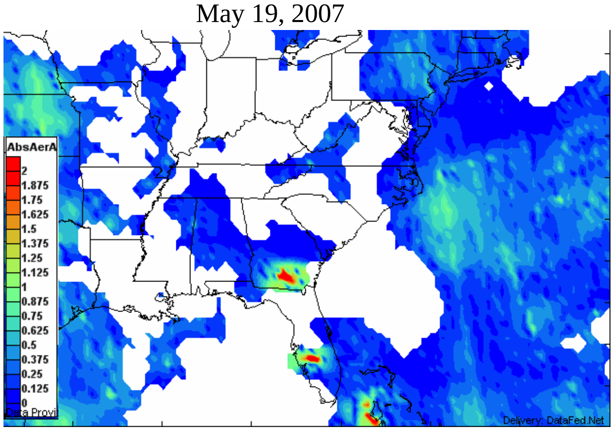
Figure 5. NASA OMI satellite aerosol concentrations for May 19, 28, 30; July 31; August 1, 3, and 4



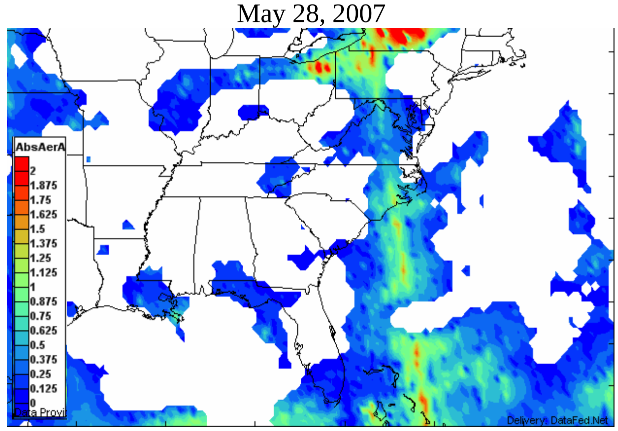
May 19, 2007



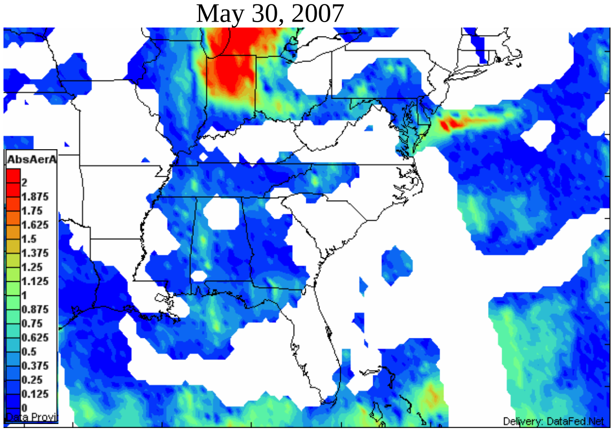
May 28, 2007



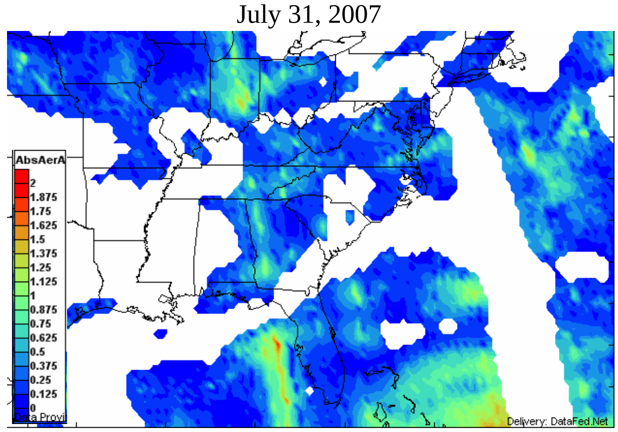
May 30, 2007



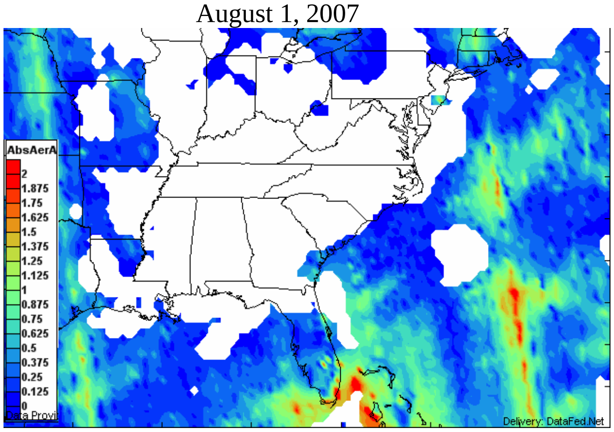
July 31, 2007



August 1, 2007



August 3, 2007



August 4, 2007

Figure 6a. National Sulfate Levels for May 30, 2007

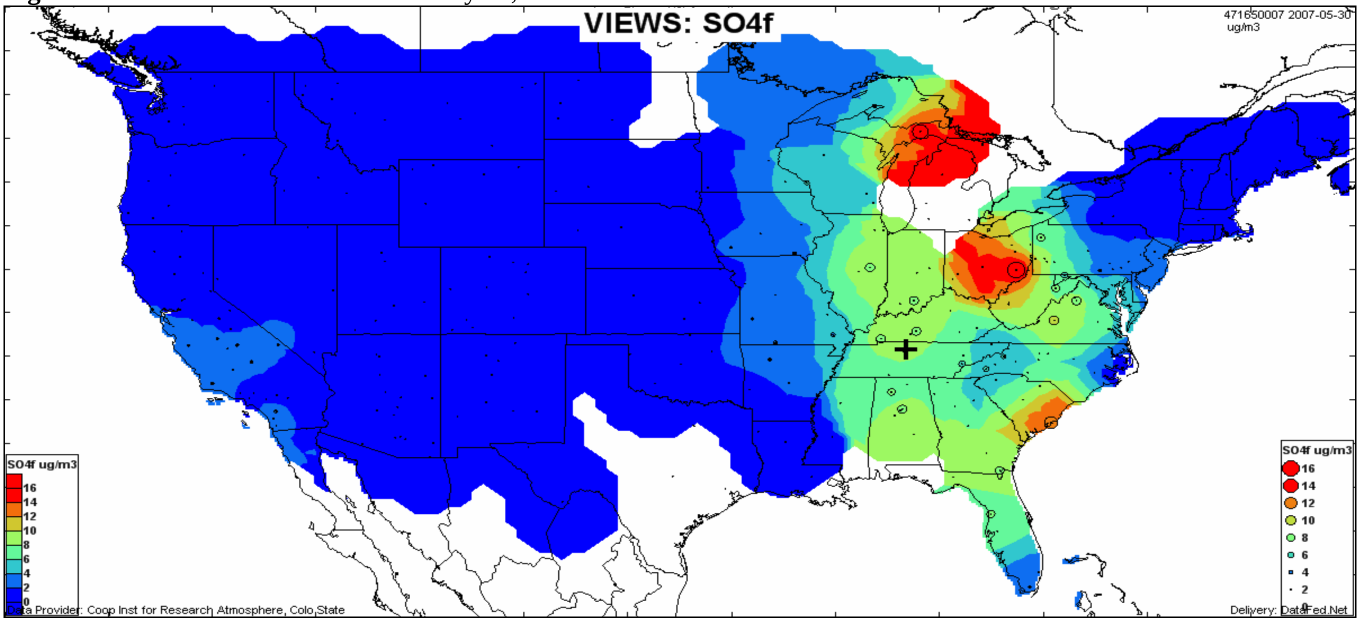


Figure 6b. National Organic Carbon Levels for May 30, 2007

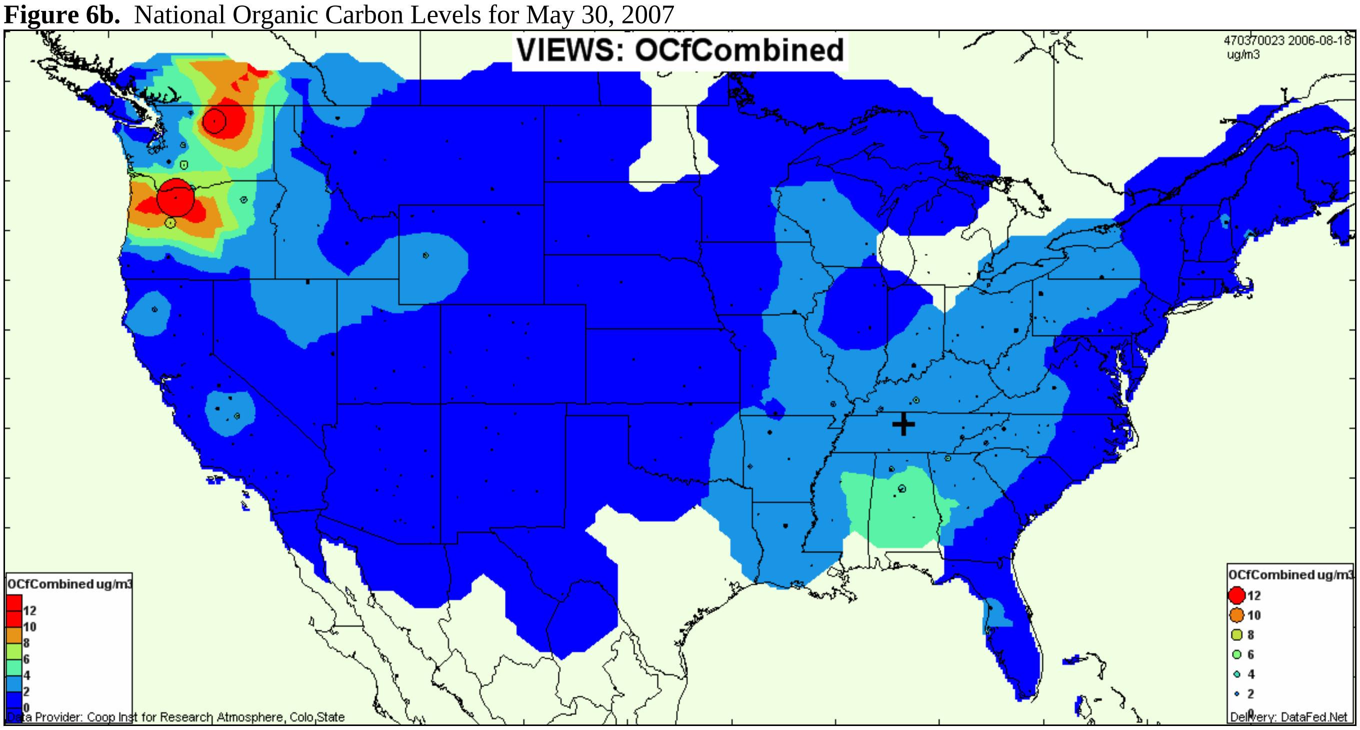


Figure 7a. National Sulfate Levels for August 4, 2007

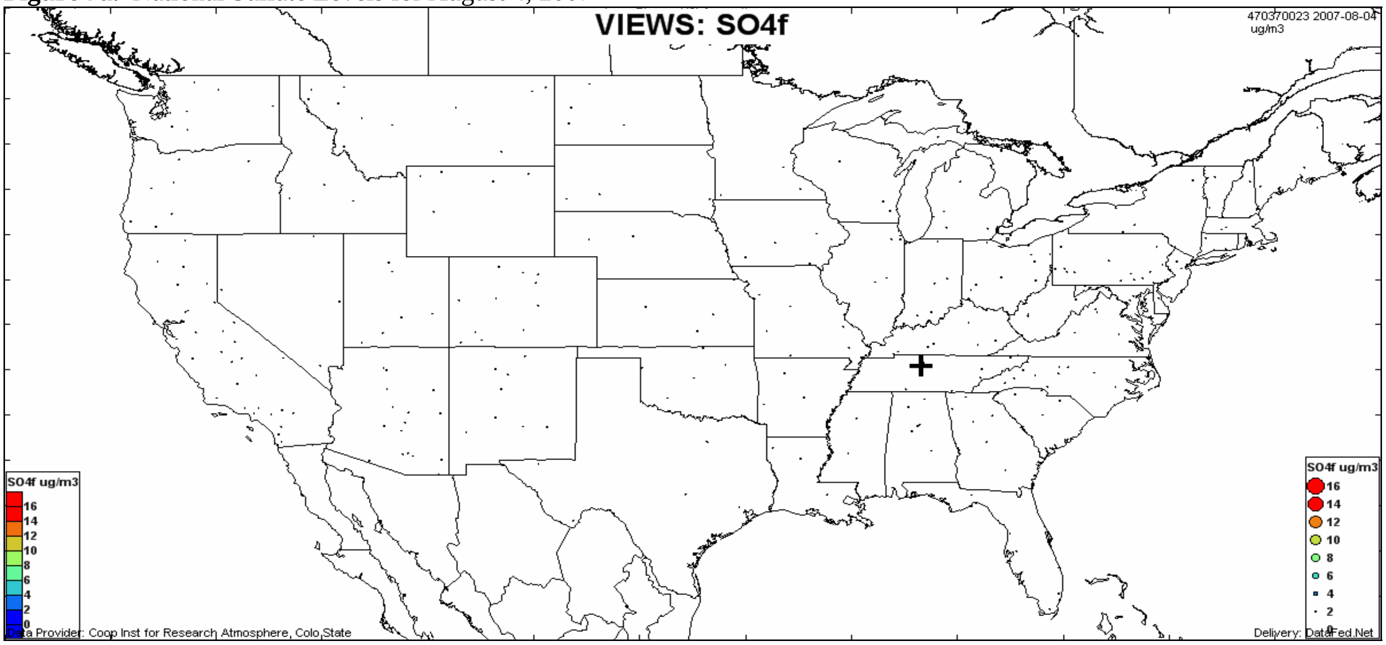


Figure 7b. National Organic Carbon Levels for August 4, 2007

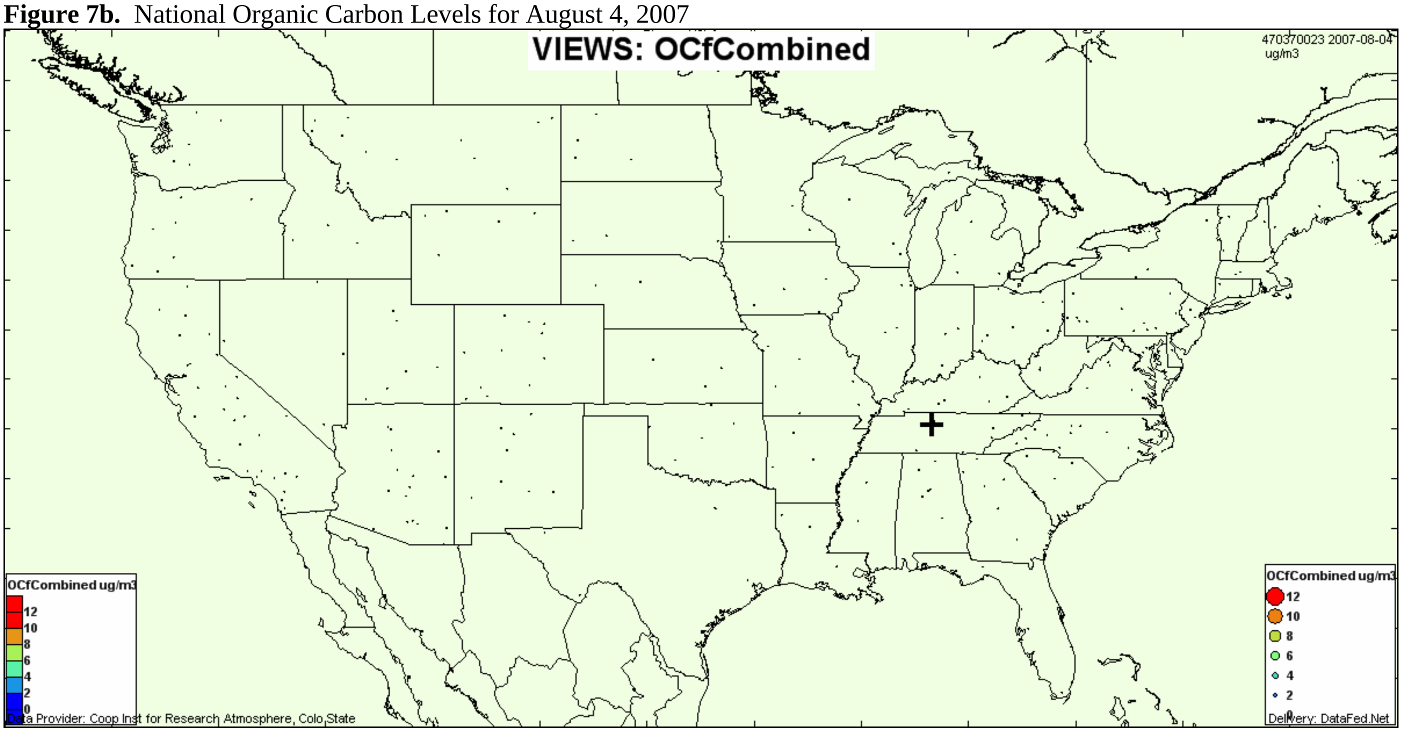


Figure 8a. NAAPS Sulfate Aerosol Maps for May 30, 2007

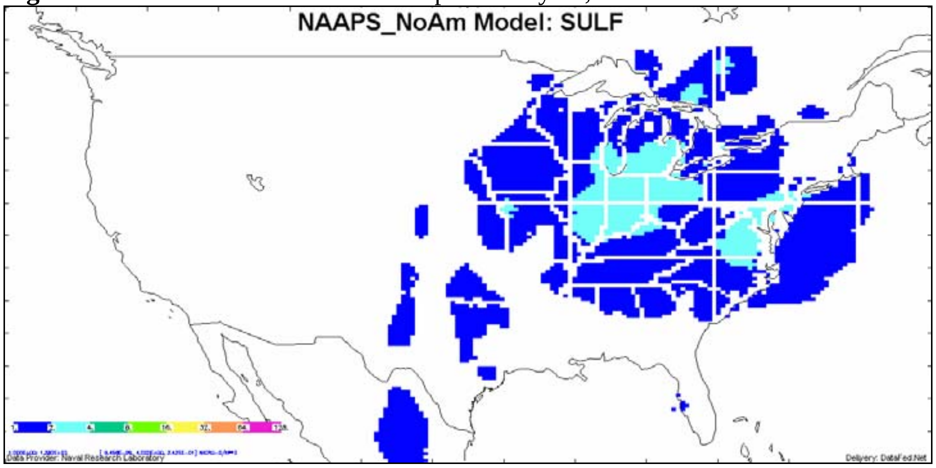


Figure 8b. NAAPS Organic Carbon Aerosol Maps for May 30, 2007

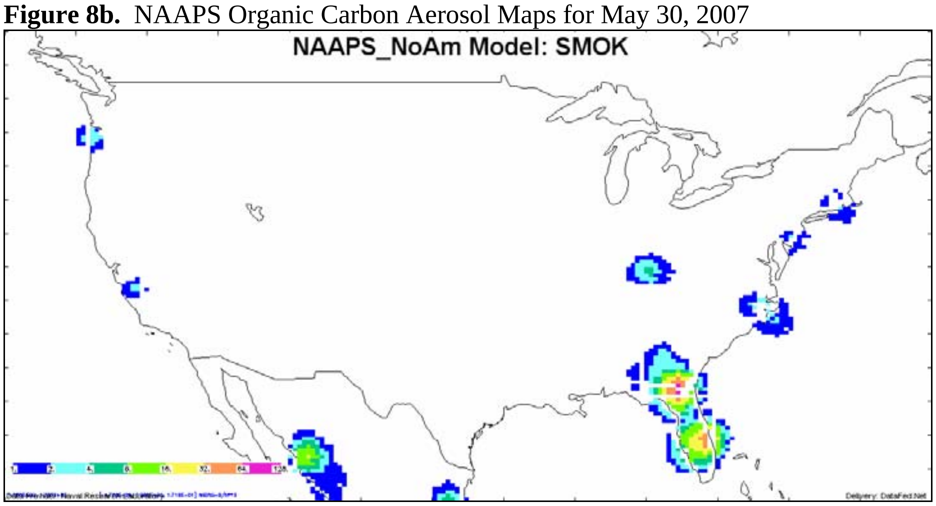


Figure 9a: NAAPS Sulfate Aerosol Maps for August 4, 2007

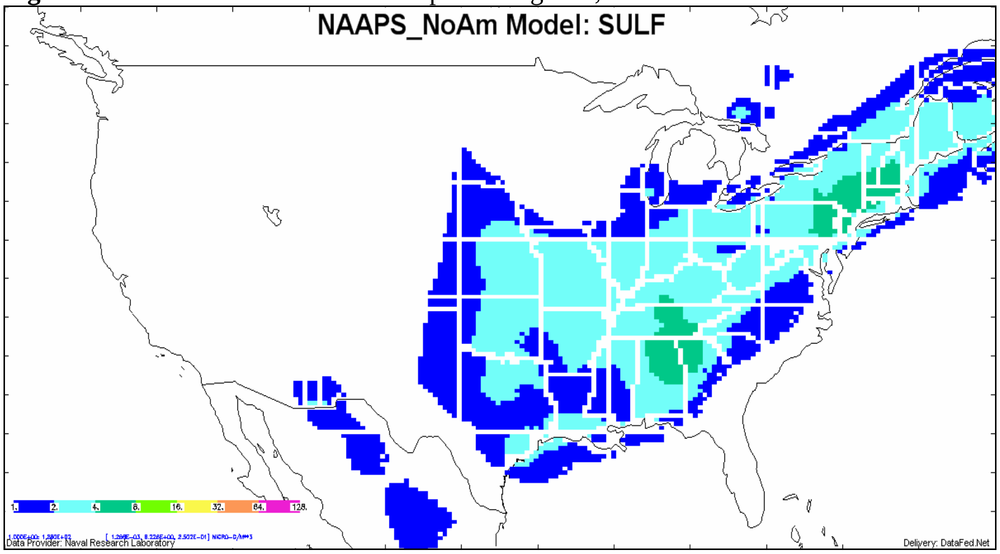


Figure 9b. NAAPS Organic Carbon Aerosol Maps for August 4, 2007

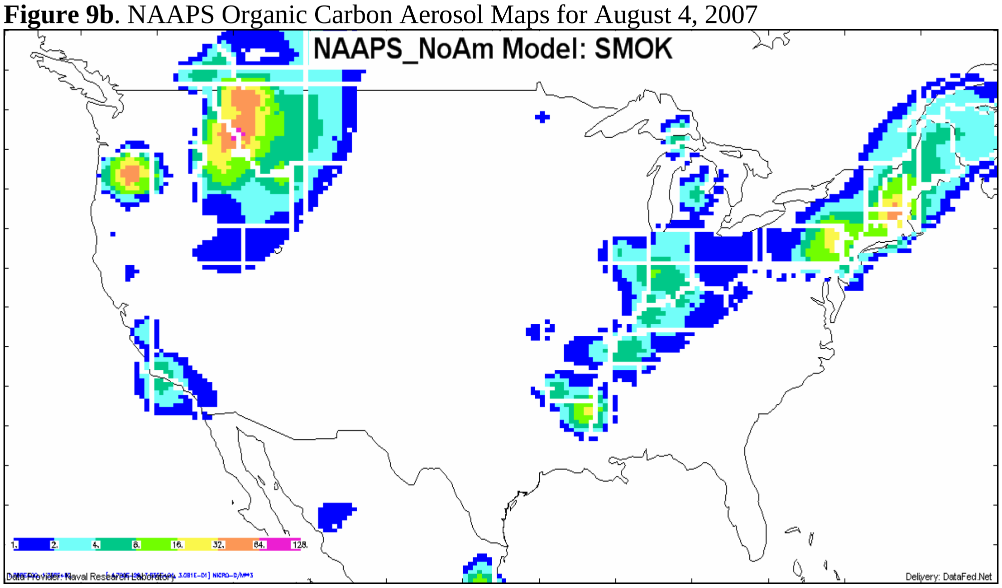


Figure 10. Clarksville $PM_{2.5}$ Organic Carbon and Sulfate Compared to Total $PM_{2.5}$

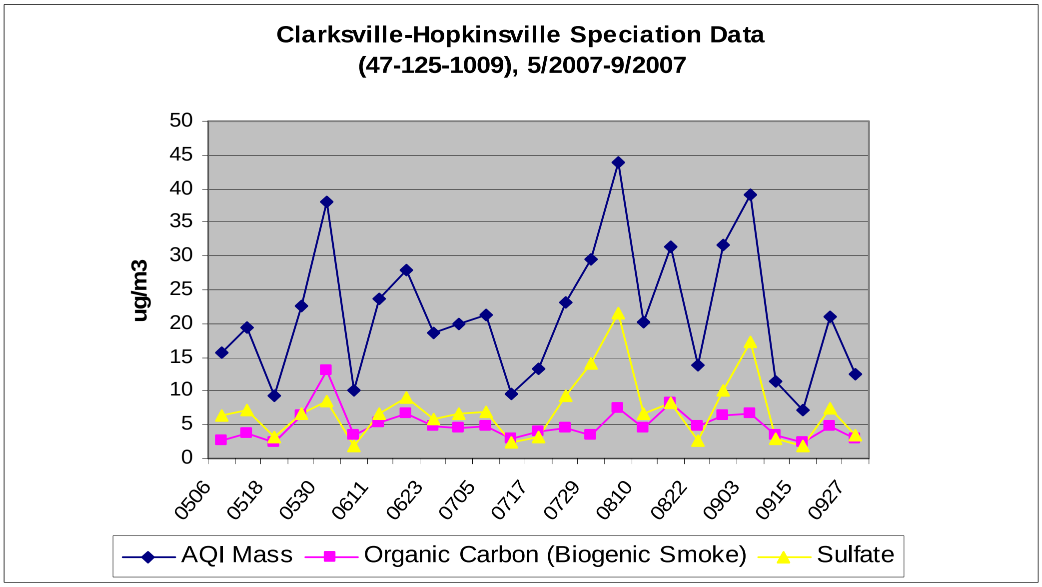
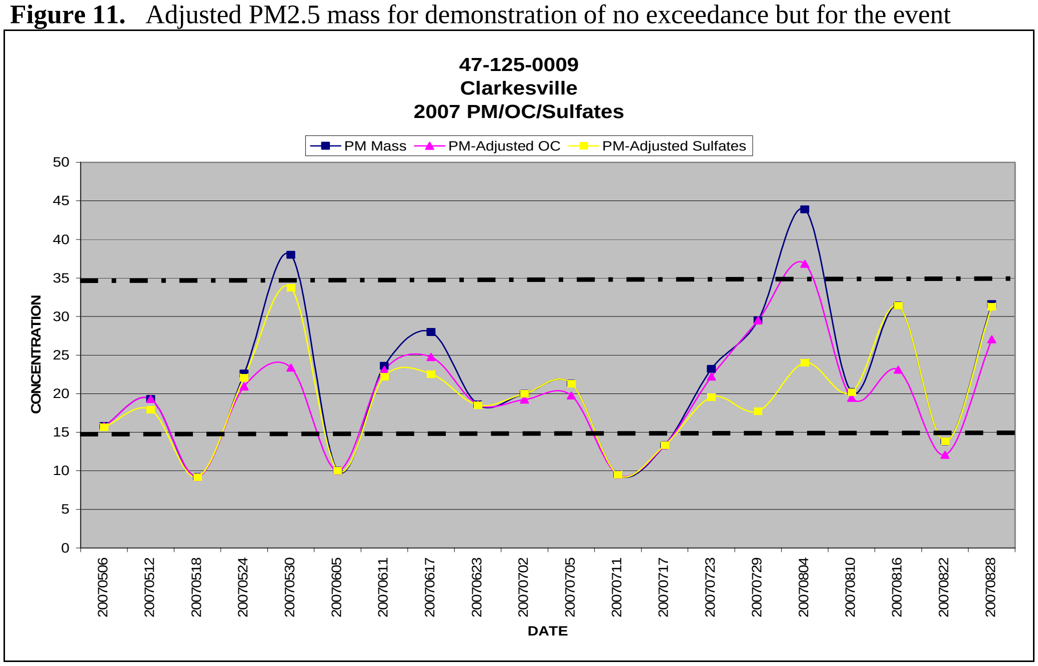


Figure 11. Adjusted PM2.5 mass for demonstration of no exceedance but for the event



APPENDIX

Table 2. Concentrations that failed Steps 1 and 2.

Date	AQS ID	County	MSA	Observed Conc.	Monthly Average	84th Percentile	95th Percentile	Step 1	Step 2	EPA Concur
5/20/07	47-125-1009	Montgomery	Clarksville	14.5	12.1	15.3	21.1	PASS	FAIL	NO
5/21/07	47-105-0108	Loudon	Knoxville	16.1	16.9	22.4	31.2	FAIL	FAIL	NO
5/21/07	47-125-1009	Montgomery	Clarksville	12.8	12.1	15.3	21.1	PASS	FAIL	NO
5/21/07	47-163-1007	Sullivan	Johnson City	15.2	14.9	20.0	25.2	PASS	FAIL	NO
6/1/07	47-125-1009	Montgomery	Clarksville	21	16.5	22.0	31.1	FAIL	FAIL	NO
6/2/07	47-125-1009	Montgomery	Clarksville	30.7	16.5	22.0	31.1	FAIL	PASS	NO
6/12/07	47-125-1009	Montgomery	Clarksville	22.6	16.5	22.0	31.1	FAIL	PASS	NO
6/13/07	47-125-1009	Montgomery	Clarksville	25.3	16.5	22.0	31.1	FAIL	PASS	NO
6/17/07	47-105-0108	Loudon	Knoxville	32.1	19.7	25.3	27.7	FAIL	PASS	NO
6/17/07	47-107-1002	McMinn	Not in an MSA	31.2	19.3	24.9	28.1	FAIL	PASS	NO
6/17/07	47-119-2007	Maury	Not in an MSA	24	16.2	20.5	28.2	FAIL	PASS	NO
6/17/07	47-125-1009	Montgomery	Clarksville	24.1	16.5	22.0	31.1	FAIL	PASS	NO
6/17/07	47-145-0004	Roane	Knoxville	25.6	18.2	22.7	25.4	FAIL	PASS	NO
6/17/07	47-163-1007	Sullivan	Johnson City	27.9	17.4	24.1	26.9	FAIL	PASS	NO
6/17/07	47-165-0007	Sumner	Nashville	23.6	17.4	25.5	30.4	FAIL	FAIL	NO
6/18/07	47-125-1009	Montgomery	Clarksville	18	16.5	22.0	31.1	FAIL	FAIL	NO
6/21/07	47-125-1009	Montgomery	Clarksville	17.6	16.5	22.0	31.1	FAIL	FAIL	NO
6/22/07	47-125-1009	Montgomery	Clarksville	18.3	16.5	22.0	31.1	FAIL	FAIL	NO
7/27/07	47-125-1009	Montgomery	Clarksville	26.2	19.2	24.5	32.3	FAIL	PASS	NO
7/28/07	47-125-1009	Montgomery	Clarksville	18.2	19.2	24.5	32.3	FAIL	FAIL	NO
7/29/07	47-125-1009	Montgomery	Clarksville	25.8	19.2	24.5	32.3	FAIL	PASS	NO
7/30/07	47-125-1009	Montgomery	Clarksville	30.8	19.2	24.5	32.3	FAIL	PASS	NO
8/2/07	47-125-1009	Montgomery	Clarksville	31.7	19.3	27.8	35.4	FAIL	PASS	NO
8/5/07	47-125-1009	Montgomery	Clarksville	33.2	19.3	27.8	35.4	FAIL	PASS	NO
8/6/07	47-125-1009	Montgomery	Clarksville	25.7	19.3	27.8	35.4	FAIL	FAIL	NO
8/7/07	47-125-1009	Montgomery	Clarksville	15.3	19.3	27.8	35.4	FAIL	FAIL	NO
8/8/07	47-125-1009	Montgomery	Clarksville	14.9	19.3	27.8	35.4	FAIL	FAIL	NO
8/31/07	47-125-1009	Montgomery	Clarksville	15.2	19.3	27.8	35.4	FAIL	FAIL	NO
9/1/07	47-125-1009	Montgomery	Clarksville	22.2	19.3	25.8	37.3	FAIL	FAIL	NO
9/2/07	47-125-1009	Montgomery	Clarksville	31.7	19.3	25.8	37.3	FAIL	PASS	NO
9/3/07	47-125-1009	Montgomery	Clarksville	35.1	19.3	25.8	37.3	FAIL	PASS	NO
9/4/07	47-125-1009	Montgomery	Clarksville	34.6	19.3	25.8	37.3	FAIL	PASS	NO
9/5/07	47-125-1009	Montgomery	Clarksville	33.2	19.3	25.8	37.3	FAIL	PASS	NO
9/6/07	47-125-1009	Montgomery	Clarksville	34.3	19.3	25.8	37.3	FAIL	PASS	NO
9/7/07	47-125-1009	Montgomery	Clarksville	13.8	19.3	25.8	37.3	FAIL	FAIL	NO

$PM_{2.5}$ Exceptional Events Technical Support Document

U.S. Environmental Protection Agency
Region 4

Chattanooga, TN-GA Metropolitan Statistical Area

2005-2007

Introduction

This document provides U.S Environmental Protection Agency (EPA) Region 4 rationale for concurrence or non-concurrence with exceptional event flags on the 24-hr average $PM_{2.5}$ concentrations recorded at various Air Quality System (AQS) sites within the Chattanooga-Hamilton County Air Pollution Control Bureau Ambient Air Monitoring Network. The exceptional event flags that EPA Region 4 has concurred with will be excluded from use in determinations of exceedances and National Ambient Air Quality Standards (NAAQS) violations.

According to 40 CFR 50.1(j):

> "*Exceptional event* means an event that affects air quality, is not reasonably controllable or preventable, is an event caused by human activity that is unlikely to recur at a particular location or a natural event, and is determined by the Administrator in accordance with 40 CFR 50.14 to be an exceptional event. It does not include stagnation of air masses or meteorological inversions, a meteorological event involving high temperatures or lack of precipitation, or air pollution relating to source noncompliance."

§50.14(b)(2) also states:

> "EPA shall exclude data from use in determinations of exceedances and NAAQS violations where a State demonstrates to EPA's satisfaction that emissions from fireworks displays caused a specific air pollution concentration in excess of one or more national ambient air quality standards at a particular air quality monitoring location and otherwise satisfies the requirements of this section. Such data will be treated in the same manner as exceptional events under this rule, provided a State demonstrates that such use of fireworks is significantly integral to traditional national, ethnic, or other cultural events including, but not limited to July Fourth celebrations which satisfy the requirements of this section."

Finally, §50.14(c)(3)(iii) states:

> "The demonstration to justify data exclusion shall provide evidence that:
> (A) The event satisfies the criteria set forth in 40 CFR 50.1(j);
> (B) There is a clear causal relationship between the measurement under consideration and the event that is claimed to have affected the air quality in the area;
> (C) The event is associated with a measured concentration in excess of normal historical fluctuations, including background; and
> (D) There would have been no exceedance or violation but for the event.

Each $PM_{2.5}$ 24-hr average concentration requested for exclusion was first evaluated against these criteria using a two-step analysis. This analysis was designed to compare the requested value to historical values observed at the site and determine whether any exceedances could have been caused by the claimed event.

Step 1: Monthly Average Comparison

Using 24-hr $PM_{2.5}$ data from AQS for 2004-2007, a comparison three-year monthly average was calculated. The three-year monthly average concentration was calculated excluding data from the year in which the data in question was collected. For example, a requested value in May

2006 was compared to the average of all the samples collected at the site during May 2004, May 2005, and May 2007. If the three-year average was greater than the annual $PM_{2.5}$ NAAQS (15.0 $\mu g/m^3$) and the requested value was less than the 24-hr $PM_{2.5}$ NAAQS (35 $\mu g/m^3$), then EPA concurrence was not given to the requested value. This is because in EPA's judgment there is insufficient evidence that "there would have been no exceedance or violation but for the event" as required by §50.14(c)(3)(iii)(D) because the normally expected concentration at the site (the three-year monthly mean concentration) is in excess of the NAAQS.

Step 2: Monthly 84th Percentile Comparison

Using 24-hr $PM_{2.5}$ data from AQS for 2004-2007, a comparison three-year upper 84th percentile was calculated for the month in which the requested value was collected. The three-year monthly 84th percentile was calculated excluding data from the year in which the data in question was collected. For example, a requested value in May 2006 was compared to the upper 84th percentile calculated from of all the samples collected at the site during May 2004, May 2005, and May 2007. The calculated three-year monthly upper 84th percentile was considered to represent the range of normally expected high values at that site due to normal local and background sources If the requested value was below the calculated three-year monthly upper 84th percentile, EPA concurrence was not given to the requested value. This is because in EPA's judgment that there is insufficient evidence to demonstrate that the NAAQS exceedance was caused by the claimed event as required by §50.14(c)(3)(iii)(D) and not by normal local and background sources at the site.

If a requested value did not meet the requirements described in one or more of the above steps and the State did not submit compelling evidence to demonstrate that the event satisfied the exceptional event criteria, then EPA concurrence was not given to the exceptional event flag on the requested value. The values that did meet all of the conditions described above were then evaluated against the requirements of §50.14(c)(3)(iii). A summary of the approval or disapproval of all flagged data can be found in Appendix A.

Summary of Maps and Graphs Used

A variety of maps and graphs were used in this document. Unless otherwise noted, these products were obtained from the DATAFED Data Views Catalog, which can be accessed at http://datafedwiki.wustl.edu/index.php/Data_Views_Catalog. This includes maps using data from AQS, the National Aeronautics and Space Administration (NASA), and the Navy Aerosol Analysis and Prediction System (NAAPS). Some of the wind trajectories used in this document were obtained using the National Oceanic and Atmospheric Administration (NOAA) Hybrid Single-Particle Lagrangian Integrated Trajectory (HYSPLIT) utility, which can be accessed at http://www.arl.noaa.gov/ready/hysplit4.html. Also, unless otherwise noted, all ambient air monitoring data used in this analysis was obtained from the EPA AQS database. A summary of AQS site and parameter codes used in this document can be found in Appendix B.

The following discussion will demonstrate that the 24-hr average $PM_{2.5}$ concentrations observed at various Chattanooga-Hamilton County Air Pollution Control Bureau network monitoring sites on the following dates meet or fail to meet the criteria laid out in the Exceptional Events Rule, §50.14.

EXCEEDANCE EVENT: Mexican Wildfires

Exceedance Date: 5/19/2005
MSA: Chattanooga, TN-GA
Event Description: Transport of smoke from Mexican wildfires.

Table 1: Site-specific information used in analysis, concentrations in $\mu g/m^3$

AQS ID	Date	Observed Concentration	Monthly Average	84th Percentile	95th Percentile	EPA Concurrence
47-065-4002-1	5/19/2005	32.6	16.0	21.3	26.5	NO[1]
47-065-4002-2	5/19/2005	33.8	15.9	21.3	26.5	NO[1]

Notes: [1]Three-year monthly average above 15.0$\mu g/m^3$

Detailed Discussion of Evidence

A) Event Description

Documentation submitted by the Chattanooga-Hamilton County Air Pollution Control Bureau claims that smoke from wildfires in Mexico caused NAAQS exceedances at the site listed above. None of the requested values, however, passed both steps of the initial two-step analysis. Also, the documentation submitted by Chattanooga-Hamilton County did not demonstrate a clear causal relationship between the measured concentration and the event, and did not demonstrate that there would have been no exceedance or violation but for the event. Due to these reasons, no further analysis of these events is necessary. EPA concurrence was not given to these exceptional event flags.

Exceedance Dates:	6/21/2005, 6/24/2005, 6/27/2005, 6/30/2005, 7/3/2005
MSA:	Chattanooga, TN-GA
Event Description:	Long-range transport of smoke from Canadian and Alaskan wildfires.

Table 2: Site-specific information used in analysis, concentrations in $\mu g/m^3$

AQS ID	Date	Observed Concentration	Monthly Average	84th Percentile	95th Percentile	EPA Concurrence
47-065-4002-1	5/19/2005	32.6	16.0	21.3	26.5	NO[1]
47-065-4002-2	5/19/2005	33.8	15.9	21.3	26.5	NO[1]
47-065-0031-1	6/21/2005	26.2	18.9	25.6	31.5	NO[1]
47-065-1011-1	6/21/2005	24.2	19.3	24.4	26.2	NO[1]
47-065-4002-1	6/21/2005	27	19.4	26.8	30.5	NO[1]
47-065-4002-2	6/21/2005	28.1	19.0	26.8	29.9	NO[1]
47-065-4002-1	6/24/2005	35	19.4	26.8	30.5	NO[1]
47-065-4002-2	6/24/2005	34.9	19.0	26.8	29.9	NO[1]
47-065-0031-1	6/27/2005	24.3	18.9	25.6	31.5	NO[1]
47-065-1011-1	6/27/2005	25.9	19.3	24.4	26.2	NO[1]
47-065-4002-1	6/27/2005	26.4	19.4	26.8	30.5	NO[1]
47-065-4002-1	6/30/2005	22.4	19.4	26.8	30.5	NO[1]
47-065-4002-2	6/30/2005	25.1	19.0	26.8	29.9	NO[1]
47-065-0031-1	7/3/2005	29.5	17.2	22.2	30.6	NO[1]
47-065-1011-1	7/3/2005	21.5	15.8	22.3	28.3	NO[1]
47-065-4002-1	7/3/2005	25.5	17.7	26.4	30.6	NO[1]
47-065-4002-2	7/3/2005	22.5	17.7	26.3	30.9	NO[1]

Notes: [1]Three-year monthly average above $15.0 \mu g/m^3$

Detailed Discussion of Evidence

A) Event Description

Documentation submitted by the Chattanooga-Hamilton County Air Pollution Control Bureau claims that smoke from Canadian wildfires north of the Great Lakes in Quebec and Ontario, combined with smoke from wildfires in Alaska caused NAAQS exceedances at the sites listed above. None of the requested values, however, passed both steps of the initial two-step analysis. Also, the documentation submitted by Chattanooga-Hamilton County did not demonstrate a clear causal relationship between the measured concentration and the event, and did not demonstrate that there would have been no exceedance or violation but for the event. Due to these reasons, no further analysis of these events is necessary. EPA concurrence was not given to these exceptional event flags.

EXCEEDANCE EVENT: Saharan Dust

Exceedance Dates:	7/24/05, 7/27/05
MSA:	Chattanooga, TN-GA
Event Description:	Long-range transport of dust from the Sahara Desert in Africa.

Table 3: Site-specific information used in analysis, concentrations in $\mu g/m^3$

AQS ID	Date	Observed Concentration	Monthly Average	84^{th} Percentile	95^{th} Percentile	EPA Concurrence
47-065-0031-1	7/24/2005	27.6	17.2	22.2	30.6	NO[1]
47-065-4002-1	7/24/2005	27.4	17.7	26.4	30.6	NO[1]
47-065-1011-1	7/27/2005	32.9	15.8	22.3	28.3	NO[1]
47-065-0031-1	7/27/2005	36.9	17.2	22.2	30.6	NO (sulfate)

Notes: [1]Three-year monthly average above 15.0$\mu g/m^3$

Detailed Discussion of Evidence

A) Event Description

Documentation submitted by the Chattanooga-Hamilton County Air Pollution Control Bureau claims that long range transport of fine particulate dust from the Sahara Desert caused NAAQS exceedances at the sites listed above. The only requested value that passed both steps of the initial two-step analysis was the 36.9 $\mu g/m^3$ collected at the East Ridge site (AQS ID: 47-065-0031-1) on July 27, 2005. Figure 1 shows the National Aeronautics and Space Administration (NASA) Ozone Mapping Instrument (OMI) Satellite aerosol index observations for July 24th – 27th, 2005. These images do show evidence of long-range aerosol particulate transport across the Atlantic Ocean from Saharan Africa.

B) Causal Relationship Between the Event and Air Quality

In order to evaluate the impact of the event on air quality in Chattanooga, aerosol and $PM_{2.5}$ concentrations of soil-specific compounds were analyzed for July 27, 2005. Figures 2 and 3 show this analysis. Figure 2 shows the observed $PM_{2.5}$ concentration of soil particles. This map uses data from the $PM_{2.5}$ speciation network. Figure 3 uses data from the Navy Aerosol Analysis and Prediction System (NAAPS) and estimates the aerosol concentrations of dust present in the atmosphere. Neither figure indicates significant $PM_{2.5}$ concentrations from dust in the Chattanooga area.

Figure 4 shows $PM_{2.5}$ speciation data collected at the nearby Riverside (AQS ID: 47-065-4002) site collected during July and August, 2005. Speciation data collected on July 27, 2005 indicates elevated sulfate concentrations, which is indicative of $PM_{2.5}$ emissions from local stationary and mobile sources. Conversely, a large component of crustal material is not evident on this day, which does not support the claimed dust event. Figure 5 shows the spatially-averaged $PM_{2.5}$ sulfate concentrations on July 27. This map also shows a large sulfate event in the Chattanooga area on this day.

The lack of evidence of significant dust impact, combined with evidence of elevated sulfate levels, shows\ the elevated $PM_{2.5}$ levels observed at the East Ridge site on July 27, 2005 were not caused by a Saharan dust event. Therefore, EPA concurrence was not given to any of these exceptional event flags.

Figure 1: Aerosol dust transport, July 24-27, 2005.

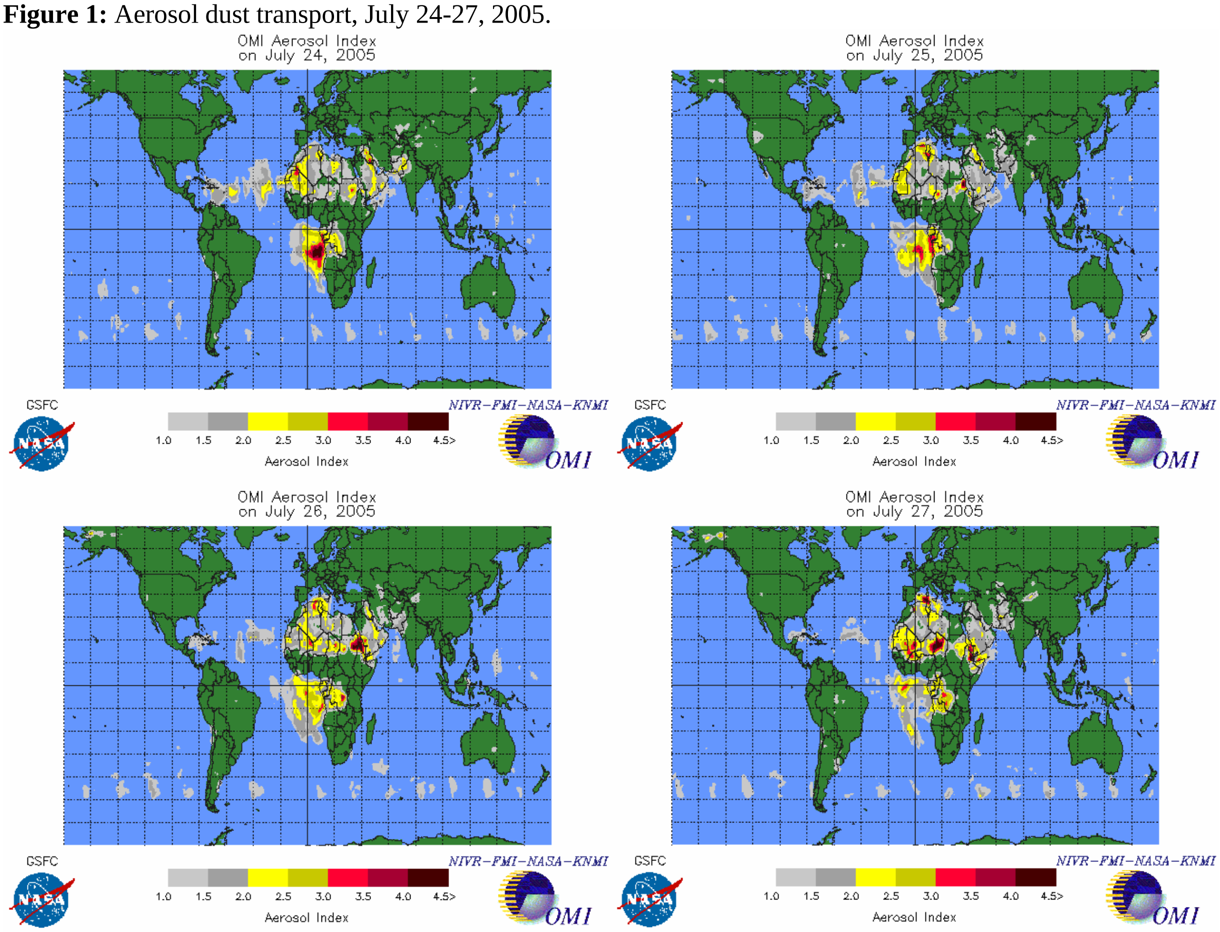


Figure 2: $PM_{2.5}$ soil concentrations, July 27, 2005.

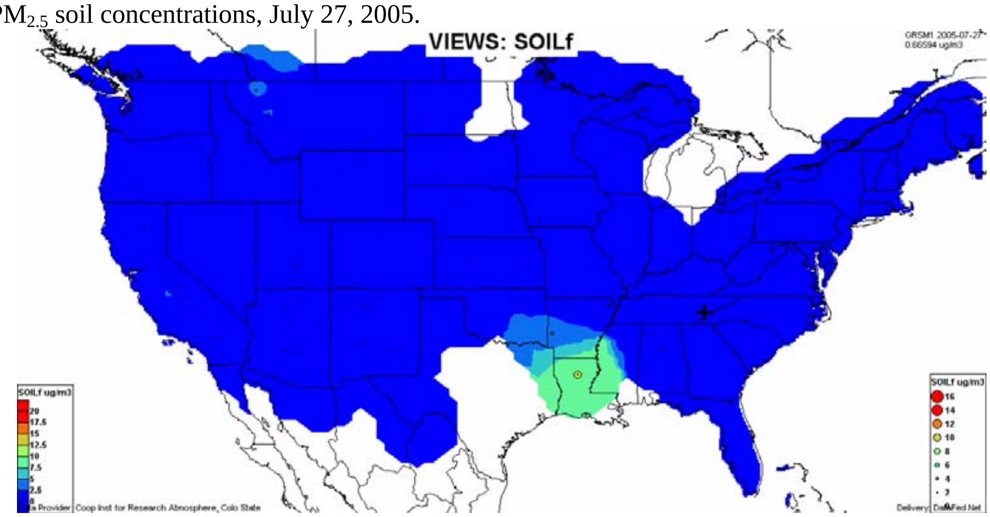


Figure 3: Aerosol dust concentrations from NAAPS satellite, July 27, 2005.

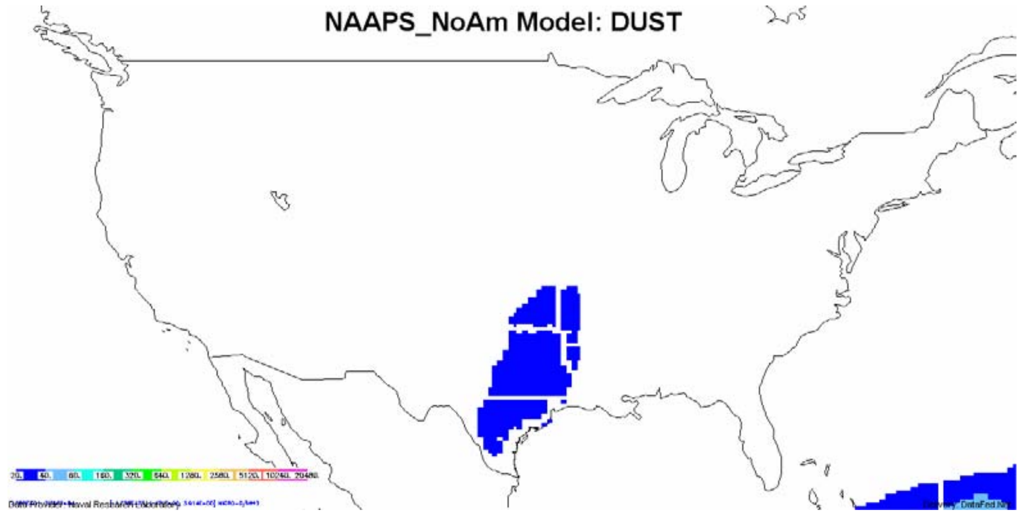
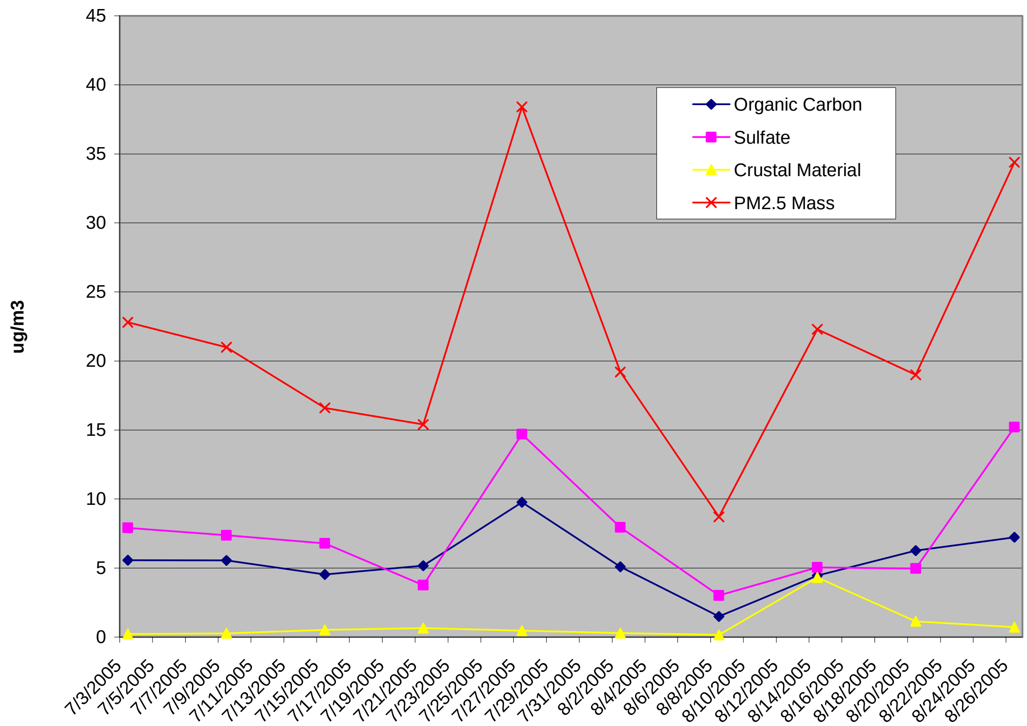


Figure 4: $PM_{2.5}$ speciation concentrations at the Riverside site, July – August 2005.



Exceedance Dates:	8/5/05, 8/26/05
MSA:	Chattanooga, TN-GA
Event Description:	Long-range transport of smoke from wildfires in Alaska and Canada

Table 4: Site-specific information used in analysis, concentrations in $\mu g/m^3$

AQS ID	Date	Observed Concentration	Monthly Average	84th Percentile	95th Percentile	EPA Concurrence
47-065-4002-2	8/5/2005	36.4	22.5	31.7	35.9	NO (sulfate)
47-065-4002-1	8/5/2005	36	22.6	32.7	36.2	NO (sulfate)
47-065-4002-1	8/26/2005	33.4	22.6	32.7	36.2	NO[1]
47-065-4002-2	8/26/2005	33.1	22.5	31.7	35.9	NO[1]
47-065-1011-1	8/26/2005	29.7	18.8	25.3	34.2	NO[1]
47-065-0031-1	8/26/2005	28.2	21.7	29.1	33.0	NO[1]

Notes: [1]Three-year monthly average above 15.0$\mu g/m^3$

Detailed Discussion of Evidence

A) Event Description

Documentation submitted by the Chattanooga-Hamilton County Air Pollution Control Bureau claims that long range transport of smoke from wildfires in Alaska and northwestern Canada caused NAAQS exceedances at the sites listed above. The only requested concentrations that passed both steps of the initial two-step analysis were the 36.4 $\mu g/m^3$ and 36 $\mu g/m^3$ collected at the Riverside primary and collocated monitors on August 5, 2005.

B) Causal Relationship Between the Event and Air Quality

In order to evaluate the impact of the event on air quality in Chattanooga, wind trajectories were analyzed to assess the probability of smoke transport from the wildfires. Figure 5 shows a 48-hr backward trajectory for Chattanooga on August 5, 2005. This trajectory indicates air movement from the northeast down to Chattanooga, which does not support the claimed transport from the northwest.

To further analyze the possibility of impact from the fires, organic carbon (OC) concentrations were considered. $PM_{2.5}$ speciation data was not collected in the Chattanooga area on August 5, but Figure 6 shows the spatially averaged $PM_{2.5}$ organic carbon concentrations for the day. This map, however, does not indicate significant OC concentrations in the Chattanooga area.

Figure 7 shows spatially averaged $PM_{2.5}$ sulfate values for August 5, 2005. A widespread sulfate event is evident across the southeast U.S. on this day. This evidence shows that the elevated $PM_{2.5}$ levels observed at the Riverside site on July 27, 2005 were not caused by a Saharan dust event. Therefore, EPA concurrence was not given to any of these exceptional event flags.

Figure 5: 48-hr Backward trajectory, Chattanooga, TN, August 5, 2005

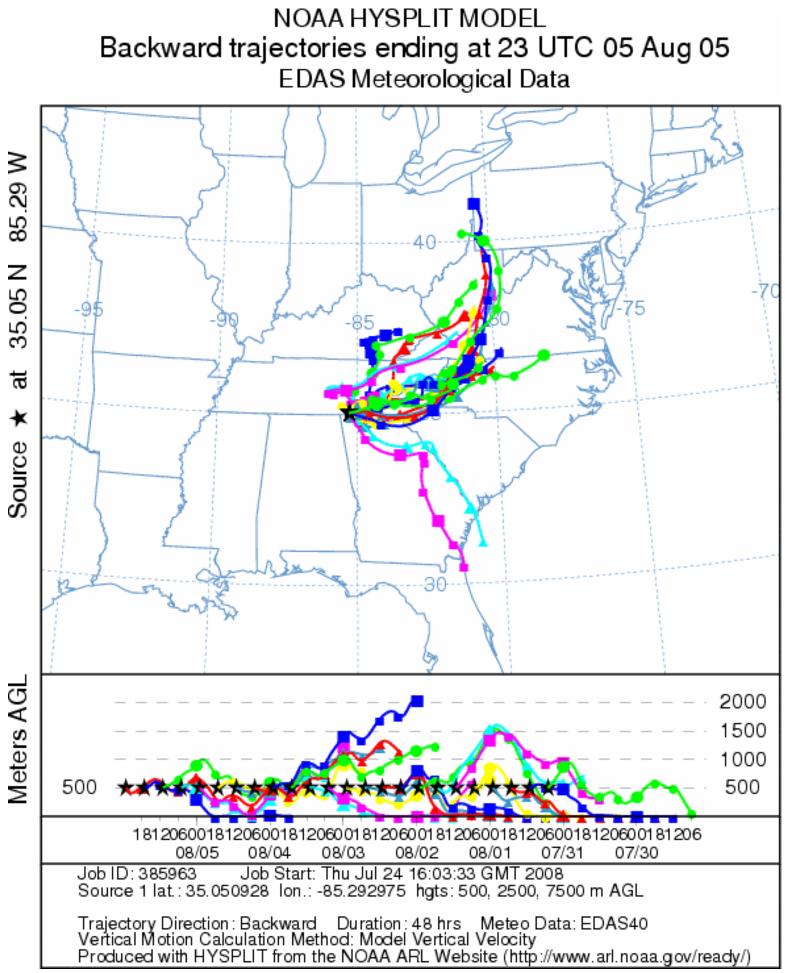


Figure 6: Spatially averaged $PM_{2.5}$ organic carbon concentrations, August 5, 2005.

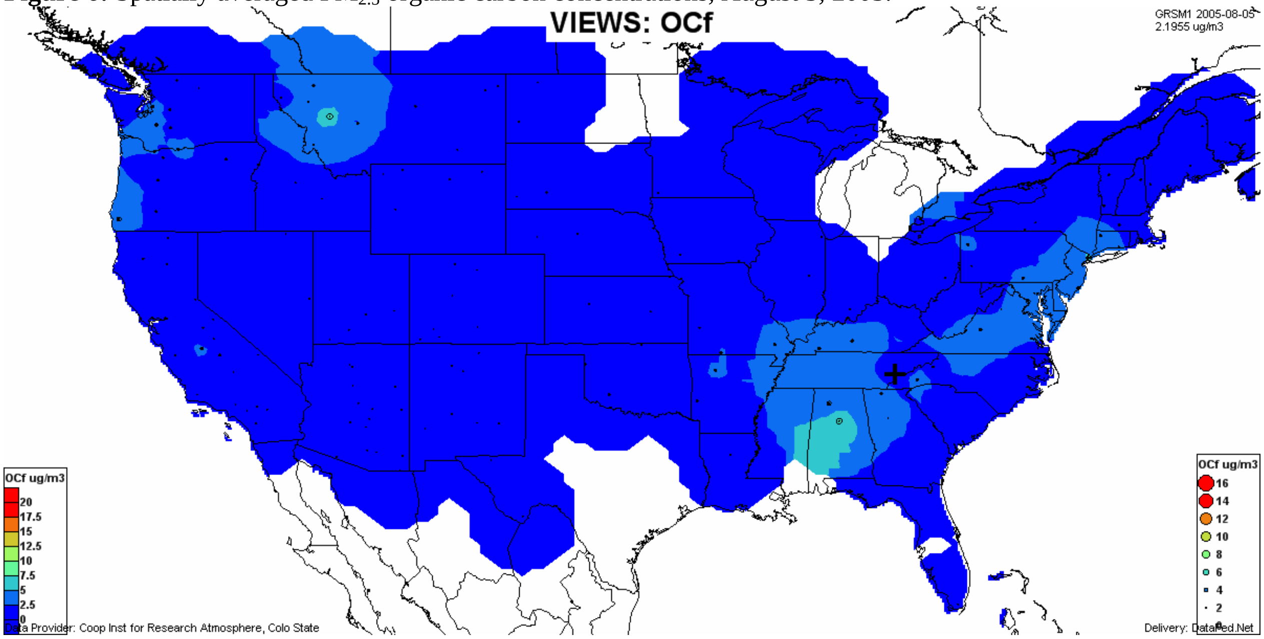
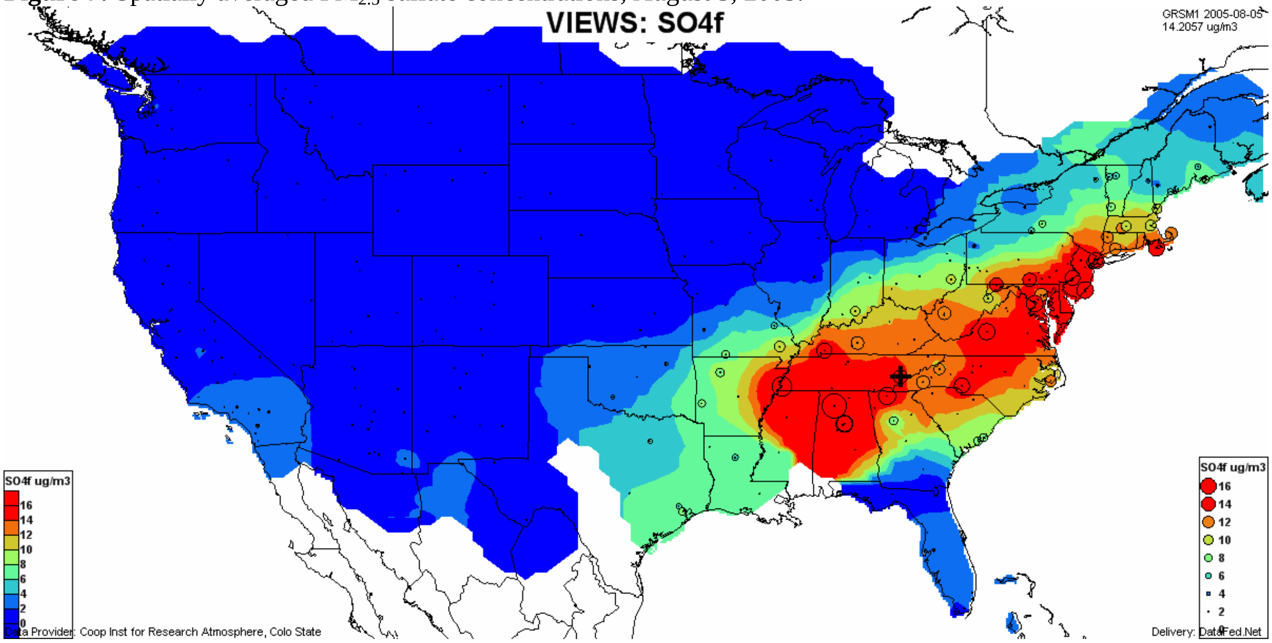


Figure 7: Spatially averaged $PM_{2.5}$ sulfate concentrations, August 5, 2005.



Exceedance Dates:	9/7/05, 9/10/05, 9/13/05
MSA:	Chattanooga, TN-GA
Event Description:	Long-range transport of smoke from wildfires in Idaho and Montana

Table 5: Site-specific information used in analysis, concentrations in μg/m^3

AQS ID	Date	Observed Concentration	Monthly Average	84th Percentile	95th Percentile	EPA Concurrence
47-065-4002-1	9/7/2005	15.9	17.1	26.0	28.7	NO[1]
47-065-4002-2	9/10/2005	29.8	17.1	26.2	28.1	NO[1]
47-065-4002-1	9/10/2005	30.1	17.1	26.0	28.7	NO[1]
47-065-1011-1	9/13/2005	36.1	15.3	25.7	26.8	NO (sulfate)
47-065-4002-2	9/13/2005	36.2	17.1	26.2	28.1	NO (sulfate)
47-065-4002-1	9/13/2005	36.3	17.1	26.0	28.7	NO (sulfate)
47-065-0031-1	9/13/2005	35.8	17.8	25.6	31.2	NO (sulfate)

Notes: [1]Three-year monthly average above 15.0μg/m^3

Detailed Discussion of Evidence

A) Event Description

According to documentation submitted by the Chattanooga-Hamilton County Air Pollution Control Bureau, long range transport of smoke from wildfires in Idaho and Montana caused NAAQS exceedances at the sites listed above. The only requested concentrations that passed both steps of the initial two-step analysis were the values collected on September 13, 2005 at the Riverside, East Ridge, and Soddy Daisy (AQS ID: 47-065-1011) sites.

B) Causal Relationship Between the Event and Air Quality

To evaluate the possible causal relationship of the event on air quality in Chattanooga, wind trajectories were analyzed to assess the probability of smoke transport from the wildfires. Figure 8 shows a 48-hr backward trajectory for Chattanooga on September 13, 2005. These trajectories do indicate some air movement from the northwestern U.S. to Chattanooga, which supports the claimed transport from the northwest.

$PM_{2.5}$ speciation data collected on September 13, 2005, however, does not support the supposed smoke impact. High sulfate concentrations are evident on September 13th, as illustrated in Figure 9. This graph also indicates that organic carbon levels were not significantly above the normally expected range. Figure 10 shows very low $PM_{2.5}$ organic carbon concentrations across the southeast on this day, and does not even indicate elevated high OC levels in the claimed source region. Conversely, Figure 11 illustrates a widespread sulfate event across the eastern U.S. on this day. These observations show that the elevated $PM_{2.5}$ concentrations observed in Chattanooga on September 13, 2005 were most likely caused by emissions from local stationary and mobile sources, and that the air quality was not significantly influenced by wildfires in the northwest. EPA concurrence was not given to any of the exceptional event flags related to this event.

Figure 8: 48-hr Backward trajectory, Chattanooga, TN, September 13, 2005

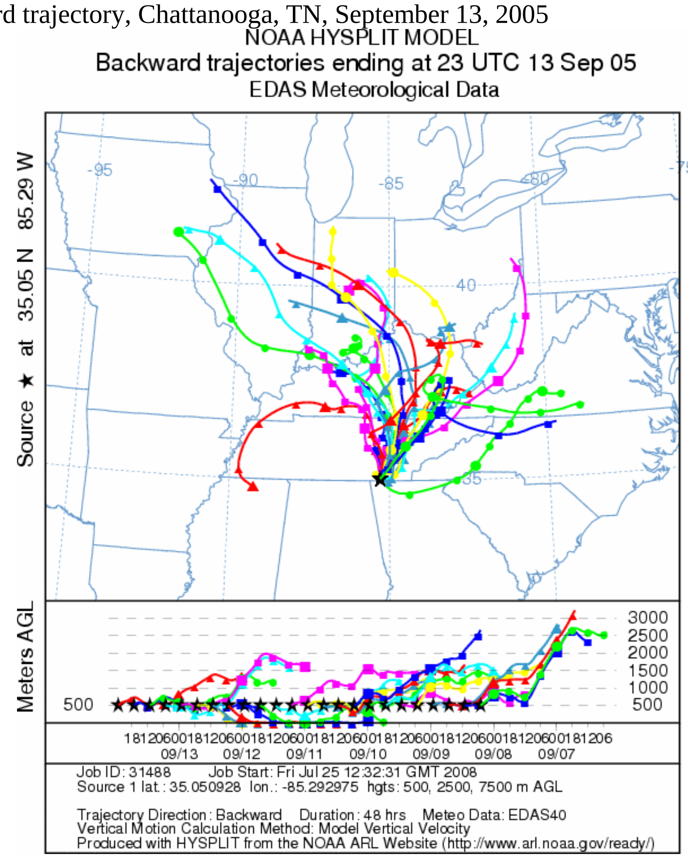


Figure 9: $PM_{2.5}$ speciation data, Riverside and Rossville sites during the month of September, 2004-2007

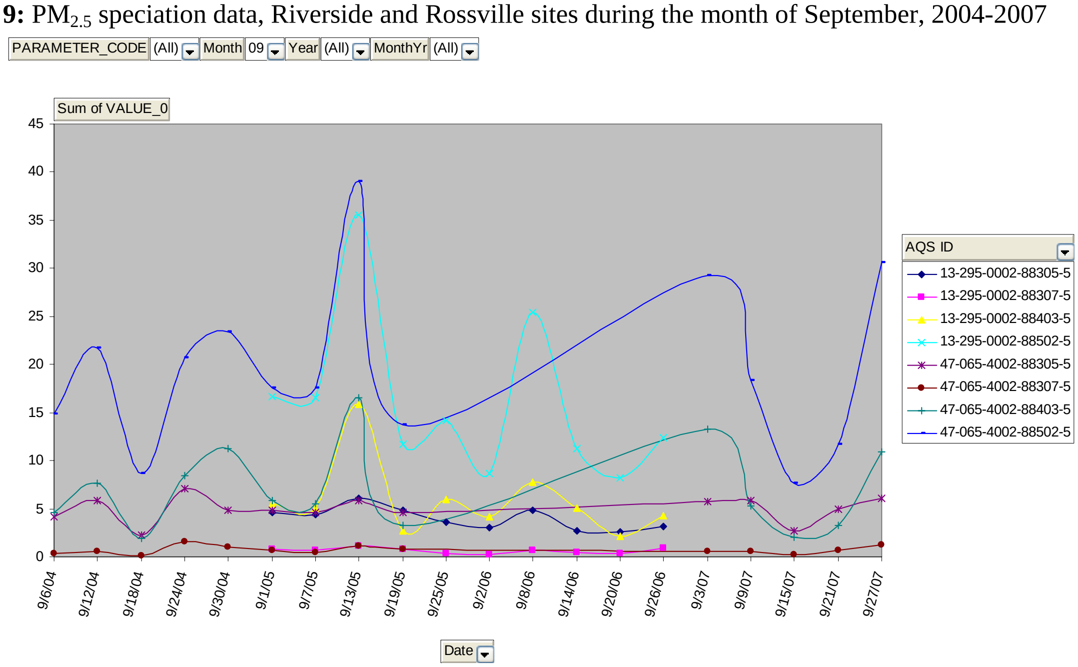


Figure 10: Spatially averaged $PM_{2.5}$ organic carbon concentrations, September 13, 2005.

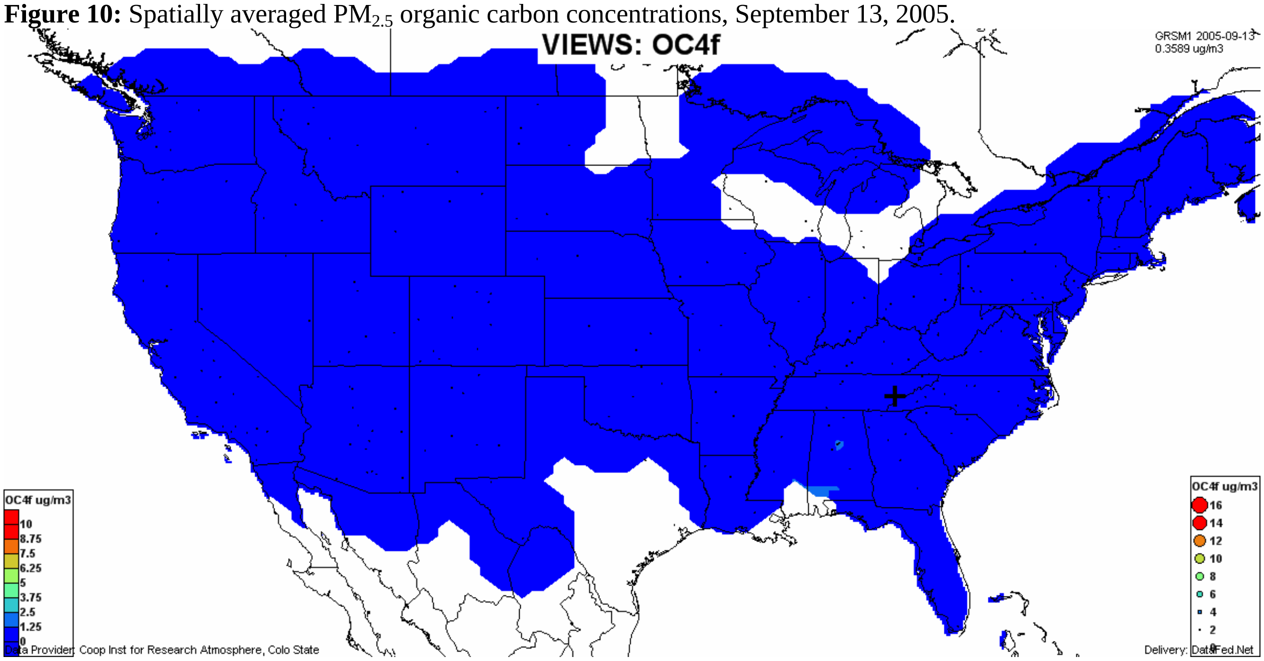
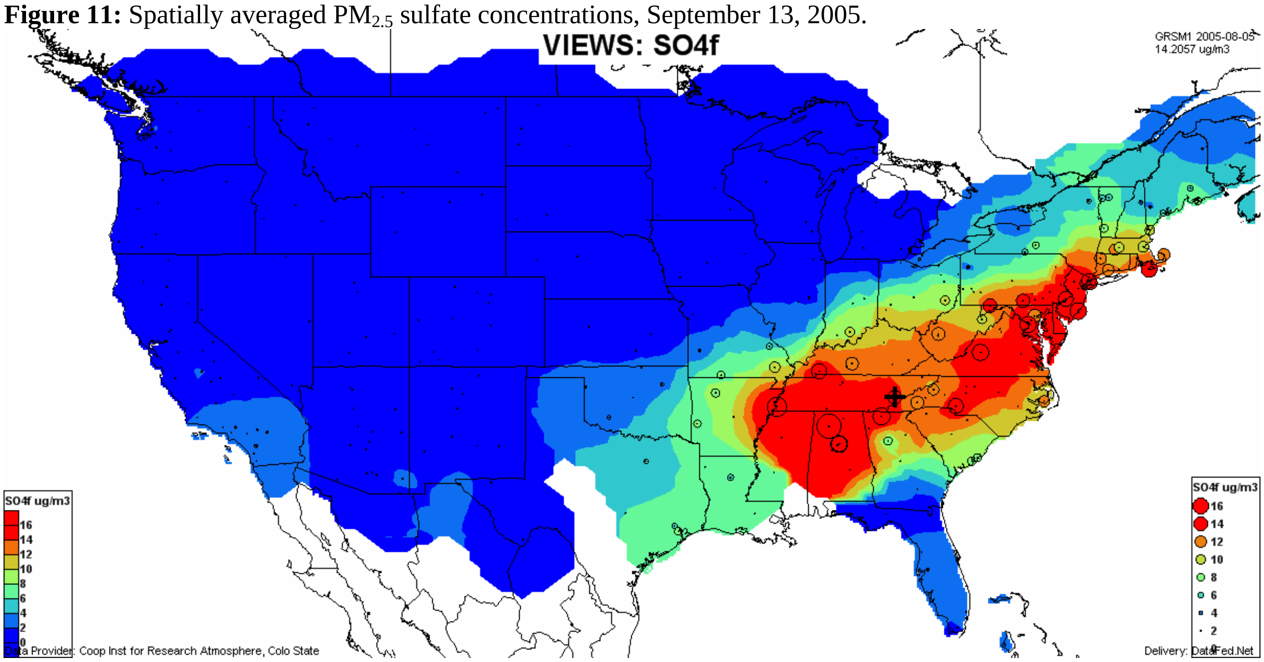


Figure 11: Spatially averaged $PM_{2.5}$ sulfate concentrations, September 13, 2005.



EXCEEDANCE EVENT: Canadian Fires

Exceedance Dates:	6/16/2006, 6/19/2006, 7/16/06, 7/19/06
MSA:	Chattanooga, TN-GA
Event Description:	Long-range transport of smoke from wildfires in central Canada

Table 6: Site-specific information used in analysis, concentrations in $\mu g/m^3$

AQS ID	Date	Observed Concentration	Monthly Average	84^{th} Percentile	95^{th} Percentile	EPA Concurrence
47-065-4002-2	6/16/2006	30.4	18.7	27.3	29.9	NO[1]
47-065-4002-1	6/16/2006	30.8	19.2	27.0	30.5	NO[1]
47-065-1011-1	6/16/2006	25.5	19.0	24.9	26.7	NO[1]
47-065-4002-2	6/19/2006	17.1	18.7	27.3	29.9	NO[1]
47-065-4002-1	6/19/2006	17	19.2	27.0	30.5	NO[1]
47-065-4002-1	7/16/2006	23	16.4	24.3	27.2	NO[1]
47-065-4002-2	7/16/2006	22.3	16.0	22.1	26.9	NO[1]
47-065-1011-1	7/16/2006	21.6	16.2	22.2	27.2	NO[1]
47-065-0031-1	7/16/2006	23.2	17.0	22.3	30.4	NO[1]
47-065-4002-2	7/19/2006	32.3	16.0	22.1	26.9	NO[1]
47-065-4002-1	7/19/2006	31.7	16.4	24.3	27.2	NO[1]

Notes: [1]Three-year monthly average above 15.0$\mu g/m^3$

Detailed Discussion of Evidence

A) Event Description

Documentation submitted by the Chattanooga-Hamilton County Air Pollution Control Bureau claims that long range transport of smoke from wildfires in central Canada caused NAAQS exceedances at the sites listed above. None of the requested values, however, passed both steps of the initial two-step analysis. Also, the documentation submitted by Chattanooga-Hamilton County did not demonstrate a clear causal relationship between the measured concentration and the event, and did not demonstrate that there would have been no exceedance or violation but for the event. Due to these reasons, no further analysis of these events is necessary. EPA concurrence was not given to any of these exceptional event flags.

EXCEEDANCE EVENT: Independence Day Fireworks Displays

Exceedance Date:	7/4/2006
MSA:	Chattanooga, TN-GA
Event Description:	Local fireworks displays in celebration of Independence Day holiday.

Table 7: Site-specific information used in analysis, concentrations in μg/m^3

AQS ID	Date	Observed Concentration	Monthly Average	84th Percentile	95th Percentile	EPA Concurrence
47-065-0031-1	7/4/2006	49.2	17.0	22.3	30.4	YES
47-065-4002-2	7/4/2006	38.6	16.0	22.1	26.9	YES
47-065-4002-1	7/4/2006	38.5	16.4	24.3	27.2	YES
47-065-1011-1	7/4/2006	37.1	16.2	22.2	27.2	YES

Detailed Discussion of Evidence

A) Event Description

Documentation submitted by the Chattanooga-Hamilton County Air Pollution Control Bureau claims that fireworks displays around the Chattanooga area caused NAAQS exceedances at the above sites. 24-hr NAAQS exceedances were observed at the East Ridge, Riverside, and Soddy Daisy sites. All four values passed both steps of the initial two-step analysis. $PM_{2.5}$ speciation data collected on July 4, 2006 at the Riverside and Rossville sites showed significantly elevated levels of $PM_{2.5}$ Strontium and Potassium, which according to Perry (1999) and Vecchi et al. (2008), is correlated with particulate matter emissions from fireworks. Figure 12 shows a map of the Chattanooga area, including monitoring sites and permitted fireworks displays on July 4, 2006. Permits issued for each of these fireworks displays can be found in Appendix C. Figure 13 shows 24-hour average $PM_{2.5}$ concentrations for the East Ridge site for June – August 2006. A peak can be seen in this figure on July 4th. Figure 14 shows the AIRNOW 24-hr average $PM_{2.5}$ concentrations measured across the southeastern United States on July 4, 2006.

Figure 12: Chattanooga, TN monitoring sites and fireworks displays, July 4, 2006.

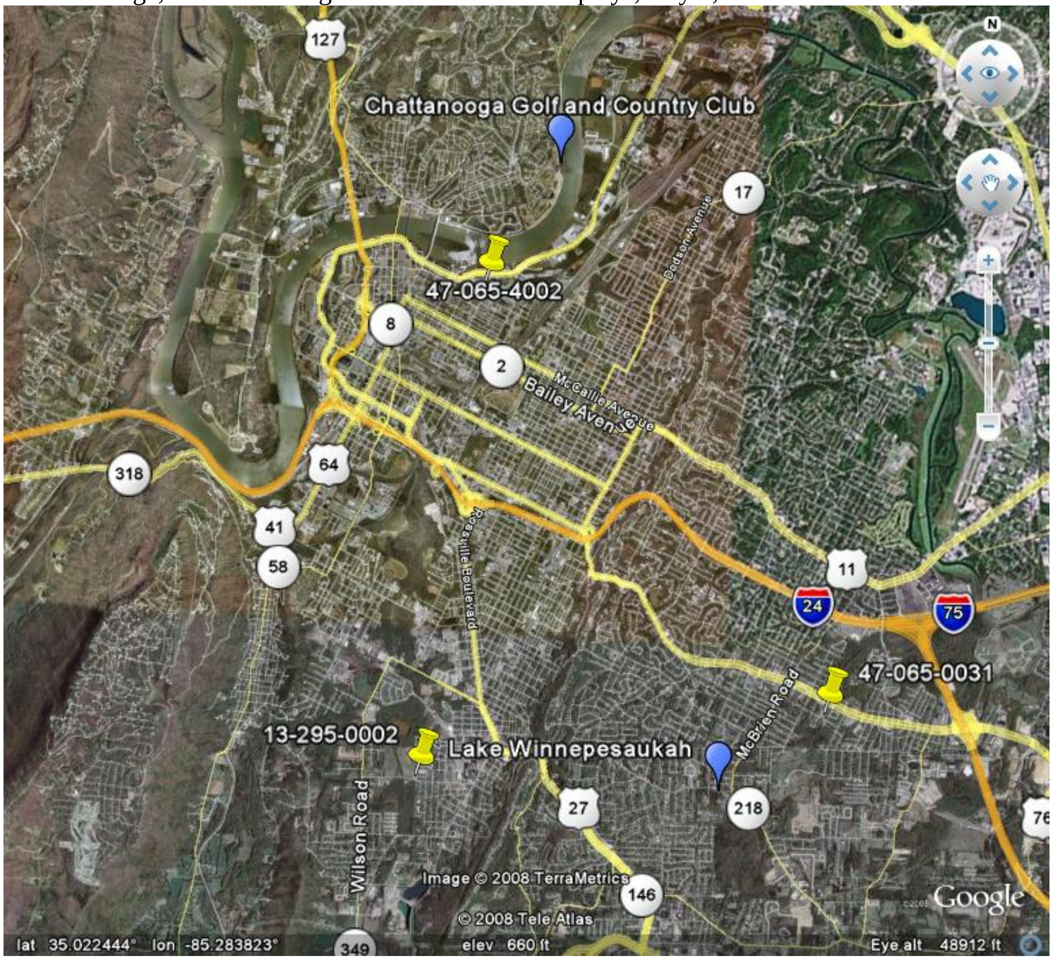


Figure 13: 24-hour average $PM_{2.5}$ concentrations collected by Federal Reference Method (FRM) at the East Ridge site during June – August 2006.

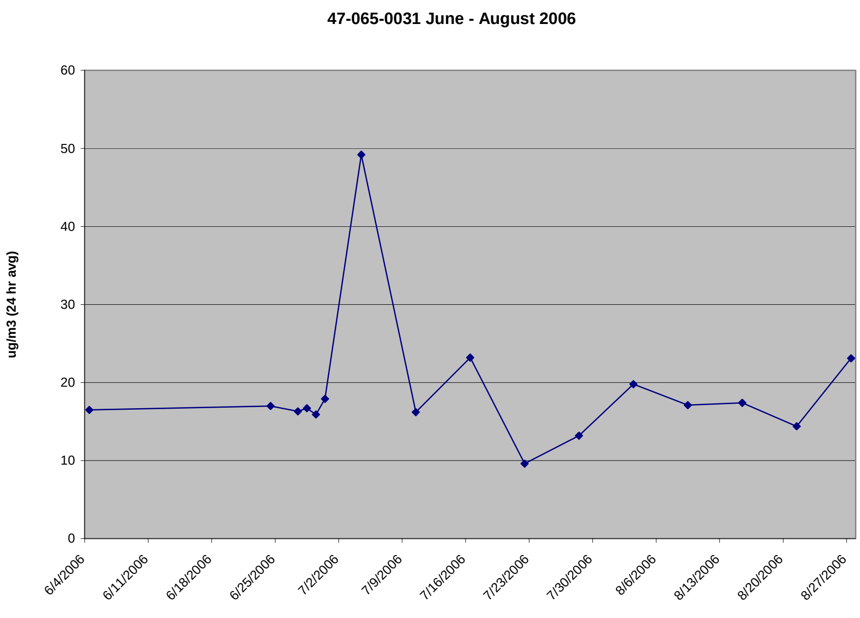
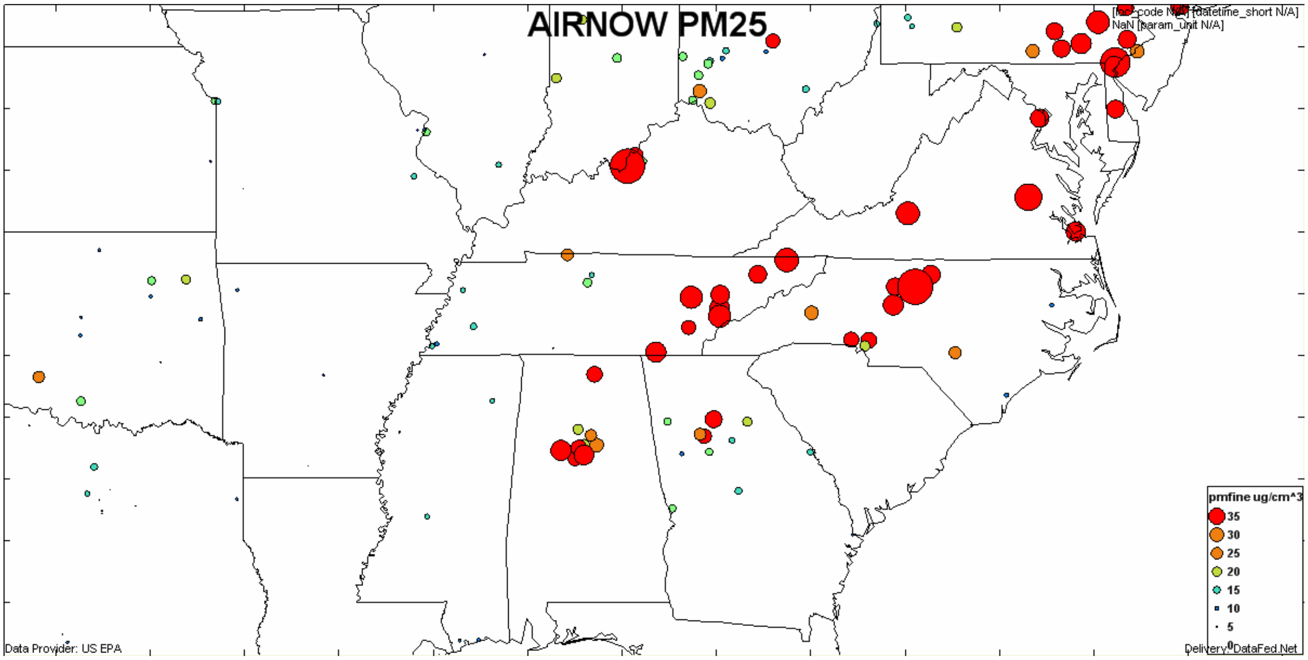


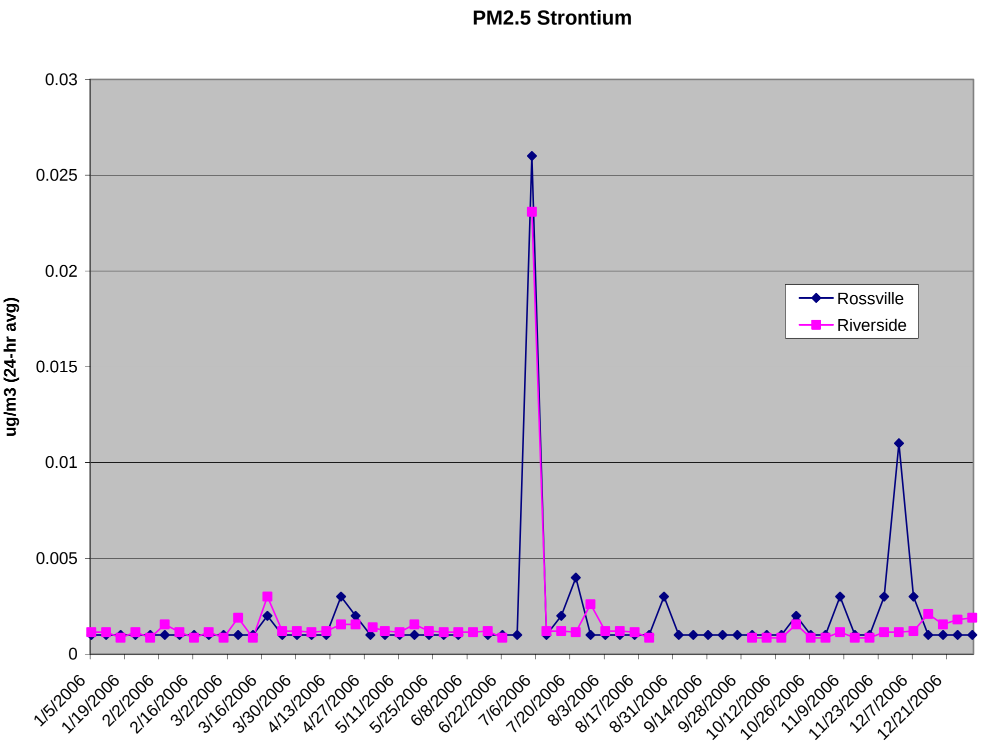
Figure 14: 24-hr average $PM_{2.5}$ concentrations reported to AIRNOW across the southeastern US on July 4, 2006.



B) Causal Connection Between the Event and Air Quality

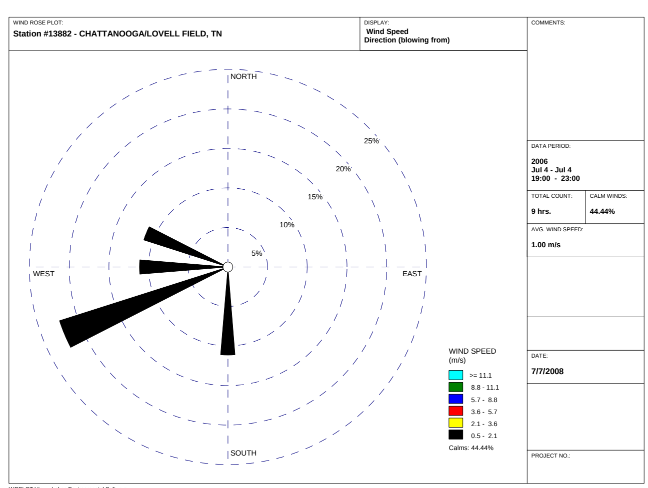
A causal connection between the fireworks displays and the observed exceedance of the $PM_{2.5}$ NAAQS is demonstrated by using $PM_{2.5}$ speciation data collected on July 4th in the Chattanooga area, and by comparing the value observed on July 4, 2006 to the historical values measured at the site. Figure 15 shows the $PM_{2.5}$ strontium values collected at the nearby Riverside and Rossville sites during 2006. Both sites observed a spike of $PM_{2.5}$ strontium concentrations on July 4, 2006. According to Perry (1999) and Vecchi et al. (2008), strontium is widely used in fireworks to create red coloring, and is normally present in the atmosphere at very low levels. According to Vecchi et al. (2008), "Sr was recognized as the best fireworks tracer because its concentration was very high during the [fireworks] event and lower than, or comparable with, minimum detection limits during other time intervals, indicating that it was mainly due to pyrotechnic displays."

Figure 15: $PM_{2.5}$ strontium concentrations observed at Riverside and Rossville sites during 2006.



The causal relationship between fireworks displays and the elevated $PM_{2.5}$ levels at the East Ridge site is strengthened upon consideration of local meteorological conditions on July 4, 2006. Figure 16 displays a wind rose for July 4th based on measurements taken at Lovell Field in Chattanooga. The wind rose shows that the prevailing wind on the night of July 4, 2006 was from the southwest. This indicates that the East Ridge site was directly downwind of the permitted fireworks display at Lake Winnepesaukah (See Figure 12 and Appendix C).

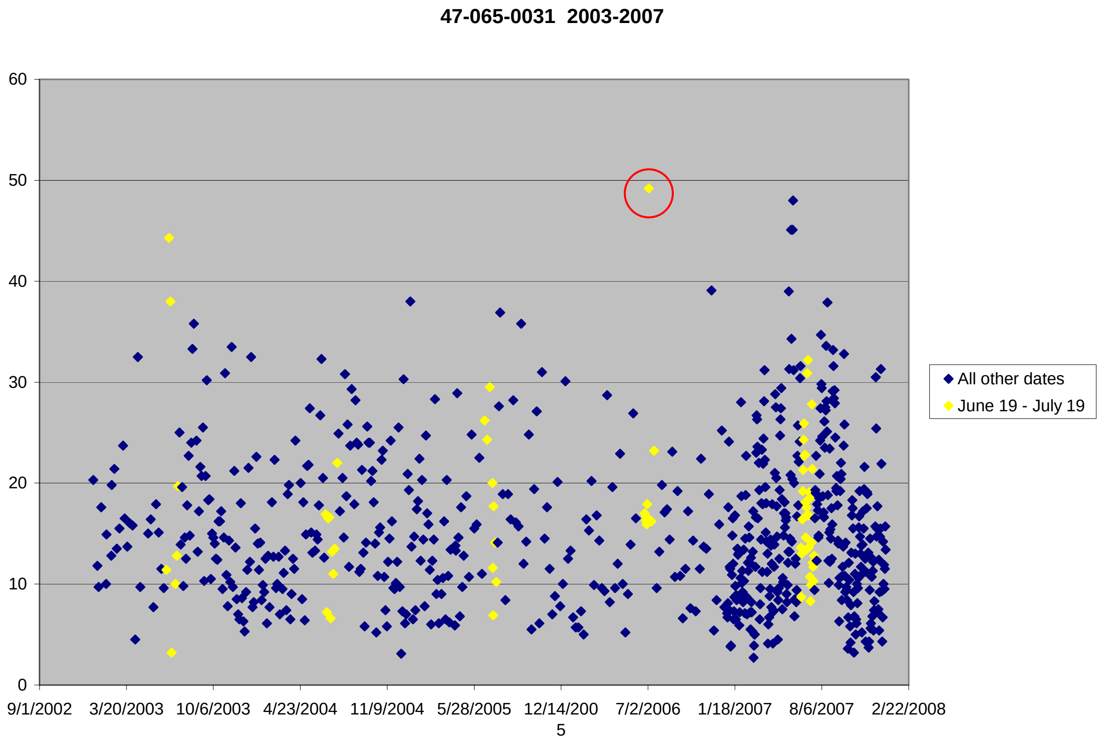
Figure 16: Wind rose from Lovell Field in Chattanooga for 7:00 PM to 12:00 AM on July 4, 2006.



C) Comparison to Historical Levels

The next step in determining whether the data collected at the East Ridge site on July 4, 2006 is to determine how unusual the measured $PM_{2.5}$ concentration was. Figure 17 shows all 24-hr average $PM_{2.5}$ measurements collected at the East Ridge site from 2003-2006. Values collected each year from June 19 – July 19 each year (the 30-day period centered around the event) are shown in yellow. As the figure illustrates, not only is this value the maximum value observed at this site over the three year period, it is also well above the normal range of values observed during this time period each year.

Figure 17: 24-hr $PM_{2.5}$ values collected during 2003-2006 at the East Ridge Site



Figures 18, 19, and 20 show the spatially averaged normal high values for 24-hour $PM_{2.5}$ concentrations across the southeastern US, and how the observed values on July 4, 2006 compare to these normal high values. Figure 18 shows the 84th percentile 24-hour $PM_{2.5}$ concentrations observed across the southeast during 2004-2006. These values were interpreted to represent the high end of normally observed values. Figure 19 shows the difference between 24-hour $PM_{2.5}$ concentrations observed on July 4, 2006 and the 84th percentile concentrations for 2004-2006. This map shows values about 20μg/m^3 above the normal high values in the Chattanooga area. Figure 20 shows a similar comparison as Figure 19, except Figure 20 shows the difference between observed concentrations and the 95th percentile concentrations for 2004-2006. Again, this map shows values about 10μg/m^3 above the 95th percentile values for 2004-2006. These figures demonstrate that the 24-hour average $PM_{2.5}$ concentrations measured at the East Ridge site on this day were in fact unusual and well above background or normal high levels. This conclusion is also supported by the elevated $PM_{2.5}$ strontium levels observed on July 4th (see Figure 15), which are also above background or normal high levels.

Figure 18: 84th percentile "normal high" 24-hr $PM_{2.5}$ values, 2004-2006

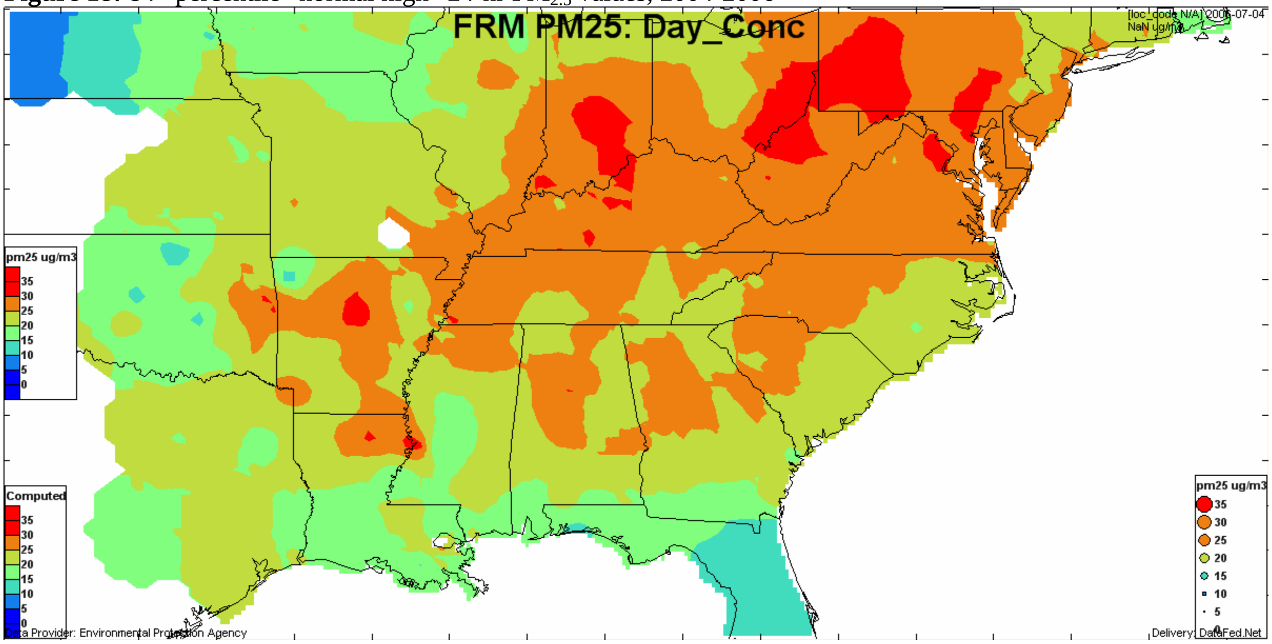


Figure 19: Values above 84th percentile 24-hr $PM_{2.5}$ values on July 4, 2006

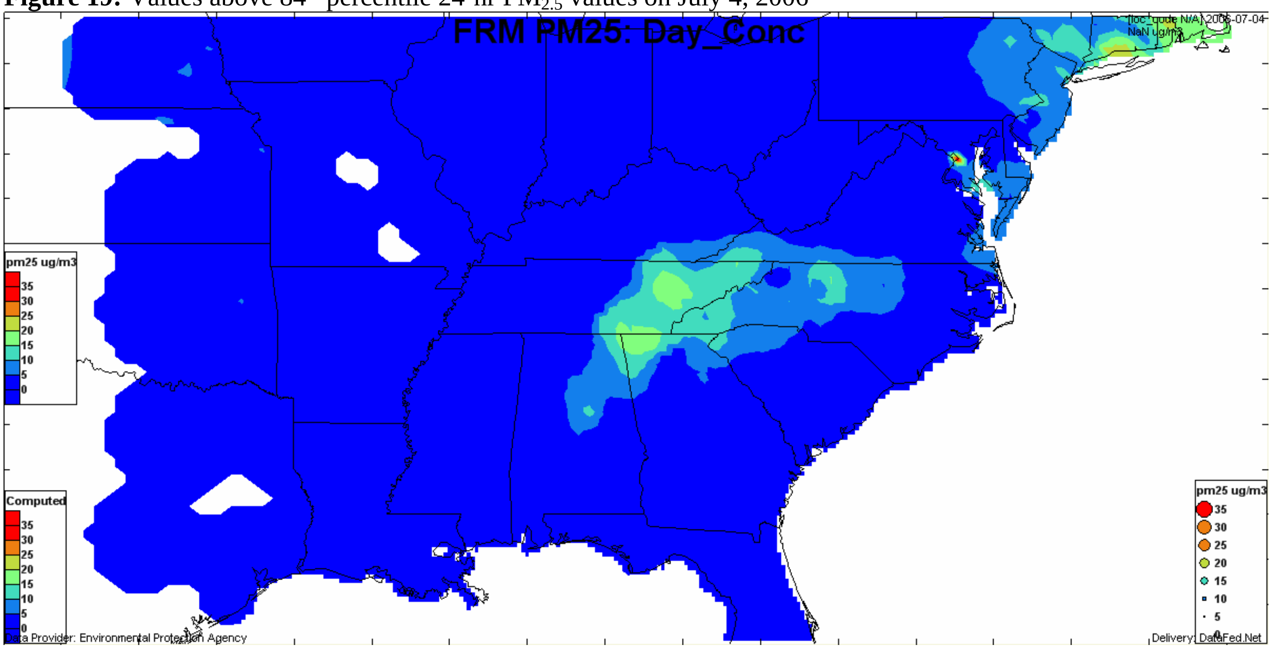
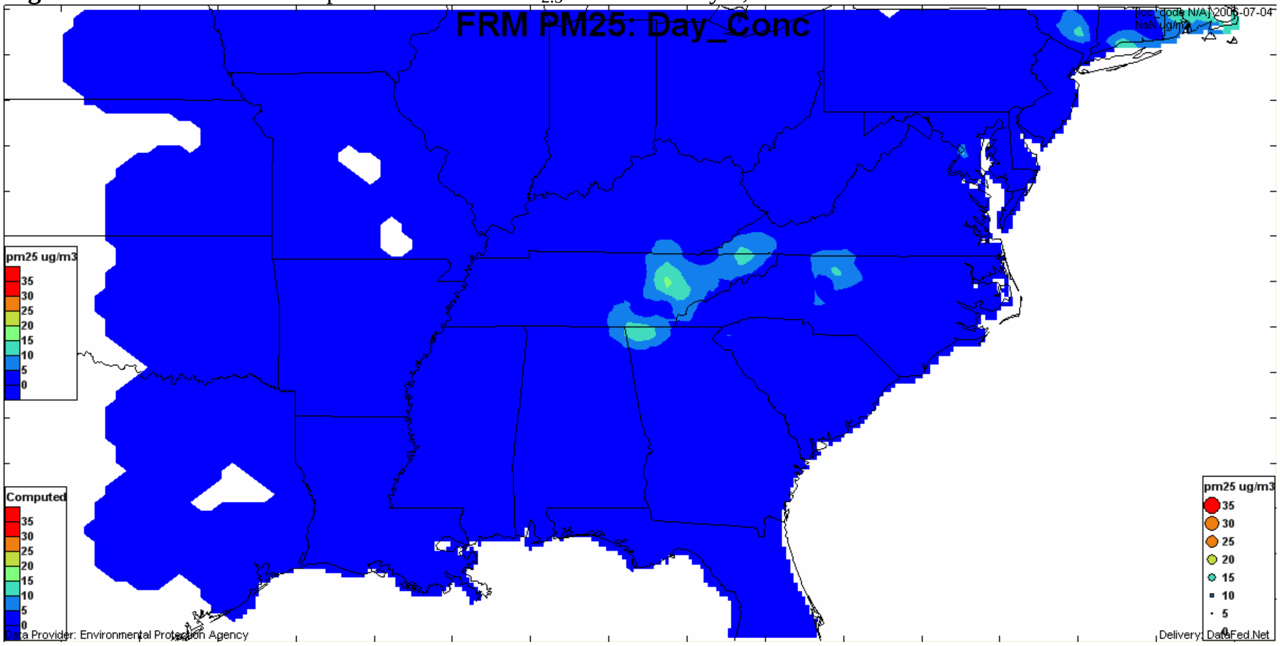


Figure 20: Values above 95th percentile 24-hr $PM_{2.5}$ values on July 4, 2006



D) Demonstration of No Exceedance "But For" the Event

In order to corroborate the estimated 10-20 μg/m^3 increment over historically high values, a $PM_{2.5}$ source apportionment analysis was conducted using $PM_{2.5}$ speciation data collected on July 4, 2006 at the nearby Riverside and Rossville sites, and using fireworks source apportionment data collected by Perry (1999).

First, $PM_{2.5}$ Speciation data for the Riverside site was collected for June 22 – July 19, 2006 from EPA's Air Explorer website, which uses data from the EPA Air Quality System (AQS) database. Data for the Rossville site was not available on Air Explorer, and so was obtained directly from AQS. Speciation data collected at the Rossville site on June 22, 2006 was not used due to QA concerns (the $PM_{2.5}$ mass measured by the $PM_{2.5}$ speciation sampler was 28.4 μg/m^3 higher than the value measured by the FRM sampler at the site). Next, data collected by Perry (1999) on the percent variance in $PM_{2.5}$ mass explained by each of three source categories (fireworks, wind-blown soil, and other sources) for each of 18 $PM_{2.5}$ speciated parameters (Al, Ba, Br, Ca, Cu, Fe, K, Mg, Mn, Na, Pb, S, Si, Sr, Ti, V, Zn, and Soot) was identified. This data was based on $PM_{2.5}$ speciation data collected from July 1 – 7, 1990 across western Washington State. The application of data collected in a different region of the country to data collected in the southeast is a potential source of uncertainty. For purposes of this analysis, however, it was assumed that the total aerosol mixture observed by Perry (1999) was of similar composition to the mixture observed in Chattanooga during this event.

Next, for each day that $PM_{2.5}$ speciation data was collected during June 19 – July 19, 2006, a $PM_{2.5}$ strontium ratio was calculated by dividing the measured $PM_{2.5}$ strontium mass on a given day by the measured $PM_{2.5}$ strontium mass at that site on July 4th. The purpose of this calculation was to quantify the relative impact of $PM_{2.5}$ from fireworks on different days. Next, a $PM_{2.5}$ mass apportionment was conducted for each measured speciation component for each day that speciation data was available. This was accomplished using the following equation:

$$M_{source} = \%V_{source} \times M_{measured} \qquad \textit{(Eq. 1)}$$

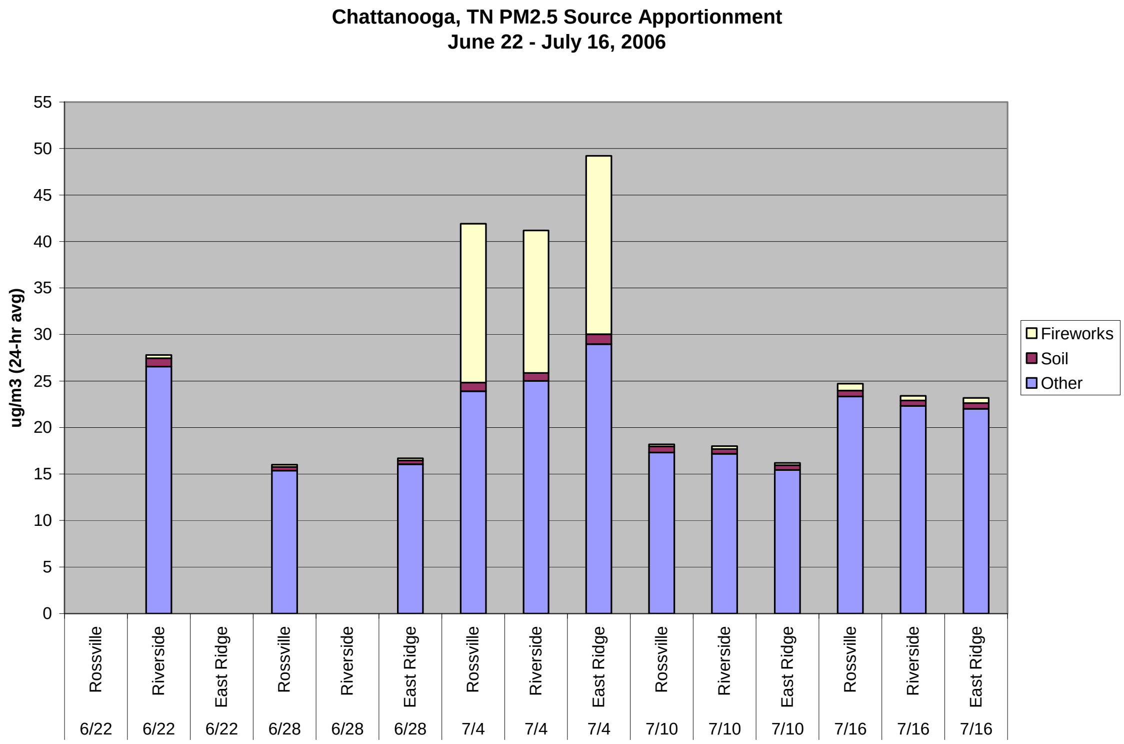
Where M_{source} is the mass of a specific $PM_{2.5}$ speciated component attributed to a source (i.e. fireworks, wind-blown soil, or other), $\%V_{source}$ is the percent variance that is explained by the source, obtained from Perry (1999), and $M_{measured}$ is the measured $PM_{2.5}$ mass of the speciated component. This analysis was conducted for each of the 18 speciated components discussed in Perry (1999). Because no data was available for the $\%V_{source}$ values for sulfate mass, the $\%V_{source}$ values for elemental sulfur were used, assuming that sulfur mass and sulfate mass are directly proportional. Also, the $\%V_{source}$ values calculated by Perry (1999) for soot were used for both elemental and organic carbon. For all other speciated parameters for which no $\%V_{source}$ values were available, the mass was assumed to be entirely r from “other sources.”

One limitation of this analysis method is that the $\%V_{source}$ values for each of the three source categories do not add up to 100%. As a result, the entire $PM_{2.5}$ mass observed could not be directly accounted for (mean unaccounted mass fraction = 30.3%). To compensate for this problem, the percentage of the accounted mass was calculated for each of the three sources. The unaccounted mass (observed $PM_{2.5}$ mass – accounted mass) was then apportioned according to these percentages.

The final step in the source apportionment calculations was to account for day to day variability of source categories. Due to the fact that fireworks were only a documented source on July 4th, the $M_{fireworks}$ calculated for each day was multiplied by the $PM_{2.5}$ strontium ratio described above, in order to quantify the relative significance of fireworks as an emissions source on different days. The resulting value for each sample was considered the final $PM_{2.5}$ mass attributed to fireworks. A leftover mass was then calculated by subtracting the final mass attributed to fireworks from the $M_{fireworks}$. This leftover mass was then added to the “other sources” category. In order to estimate the source apportionment for the East Ridge site, the mass percentages calculated for the Riverside and Rossville sites were averaged for each day and applied to the $PM_{2.5}$ mass measured at the East Ridge site. The resulting source apportionment analysis is shown in Figure 21. This figure demonstrates that this event satisfies the requirement of §50.14(c)(3)(iii)(D) that “there would have been no exceedance or violation but for the event.”

EPA concurrence was given to all four of the requested values on this day. The above discussion and documentation provides sufficient evidence that each of these four values satisfies all of the criteria required by the exceptional events rule, and may be excluded from use in determinations of exceedances and NAAQS violations

Figure 21: $PM_{2.5}$ Source apportionment for June 22 – July 16, 2006. $PM_{2.5}$ mass data for the Riverside and Rossville sites is from the $PM_{2.5}$ speciation sampler. $PM_{2.5}$ mass data for the East Ridge site is from the Federal Reference Method (FRM) sampler.



Exceedance Date:	8/18/06, 8/24/06, 9/11/06
MSA:	Chattanooga, TN-GA
Event Description:	Long-range transport of smoke from wildfires in the northwestern U.S. and Canada

Table 8: Site-specific information used in analysis, concentrations in $\mu g/m^3$

AQS ID	Date	Observed Concentration	Monthly Average	84th Percentile	95th Percentile	EPA Concurrence
47-065-4002-1	8/18/2006	38.5	22.4	33.2	35.7	NO (sulfate)
47-065-4002-2	8/18/2006	38.4	22.4	31.7	35.6	NO (sulfate)
47-065-4002-1	8/24/2006	32.9	22.4	33.2	35.7	NO[1]
47-065-4002-2	8/24/2006	32.6	22.4	31.7	35.6	NO[1]
47-065-4002-2	9/11/2006	32.9	18.2	26.5	29.2	NO[1]
47-065-4002-1	9/11/2006	32.7	18.3	26.2	29.7	NO[1]

Notes: [1]Three-year monthly average above 15.0$\mu g/m^3$

Detailed Discussion of Evidence

A) Event Description

Documentation submitted by the Chattanooga-Hamilton County Air Pollution Control Bureau claims that long range transport of smoke from wildfires in western Canada and the northwestern U.S. caused NAAQS exceedances at the sites listed above. The only requested concentrations that passed both steps of the initial two-step analysis were the values collected on August 18, 2006 at the Riverside site.

B) Causal Relationship Between the Event and Air Quality

To evaluate the possible causal relationship of the event on air quality in Chattanooga, wind trajectories were analyzed to assess the probability of smoke transport from the wildfires. Figures 22a and 22b show backward trajectories for Chattanooga on August 18, 2006. 48-hr trajectories are shown in Figure 22a, while 96-hr trajectories are shown in Figure 22b. These trajectories indicate air movement from the northeastern U.S. to Chattanooga, which does not support the claimed transport of smoke from the northwest U.S. and Canada.

In order to more accurately assess the possible impact of smoke on this day, however, $PM_{2.5}$ organic carbon and sulfate levels were considered. No $PM_{2.5}$ speciation was collected in the Chattanooga area on August 18, 2006, so spatially averaged maps were used to assess the possible impacts of smoke on air quality. Figure 23 shows the observed $PM_{2.5}$ organic carbon levels on August 18th, and Figure 24 shows the observed $PM_{2.5}$ sulfate levels. These figures show high levels of organic carbon in the claimed source area, but relatively low levels near Chattanooga. Also, high sulfate levels are evident across the eastern U.S., which shows that these NAAQS exceedances are due to local and regional stationary and mobile sources, and were not caused by wildfires. EPA concurrence was not given to any of the exceptional event flags related to this event.

Figure 22a: 48-hr Backward trajectories, Chattanooga, TN, August 18, 2006

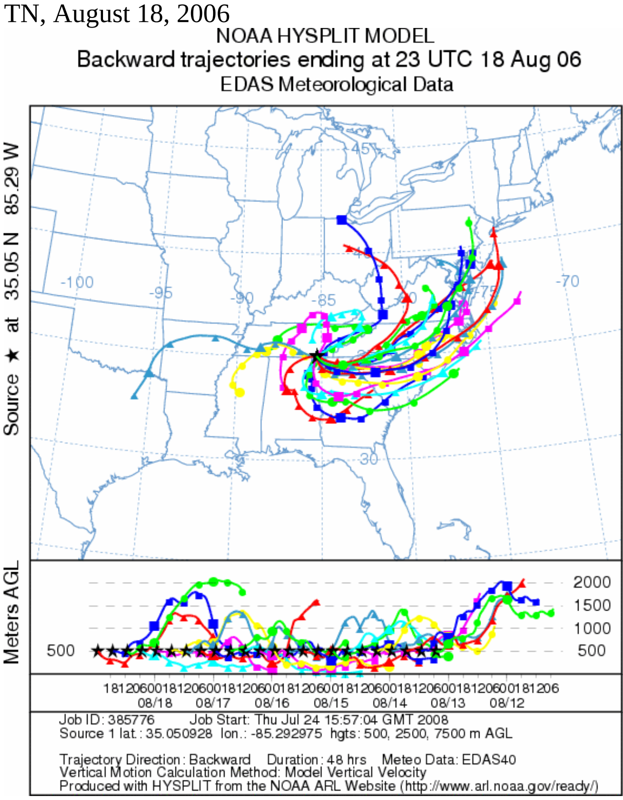


Figure 22b: 96-hr Backward trajectories, Chattanooga, TN, August 18, 2006

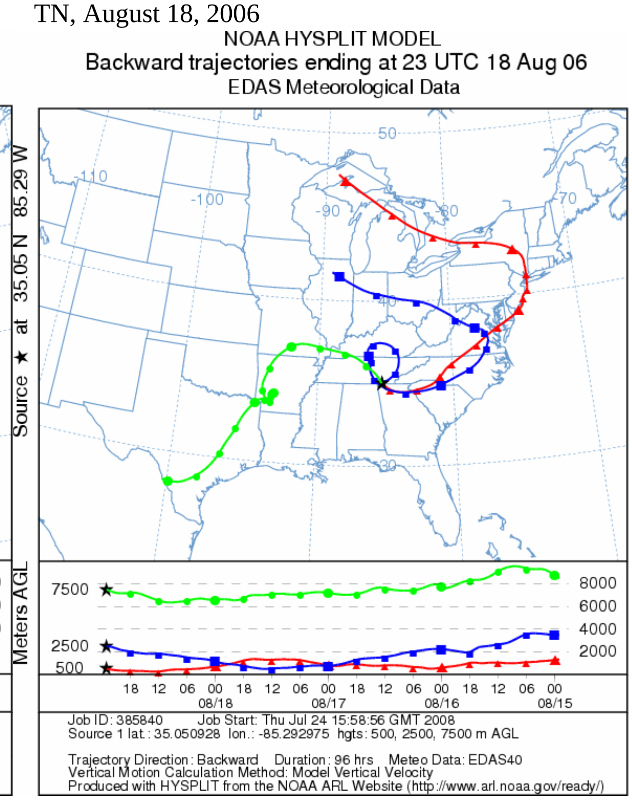


Figure 23: Spatially averaged $PM_{2.5}$ sulfate concentrations, August 18, 2006.

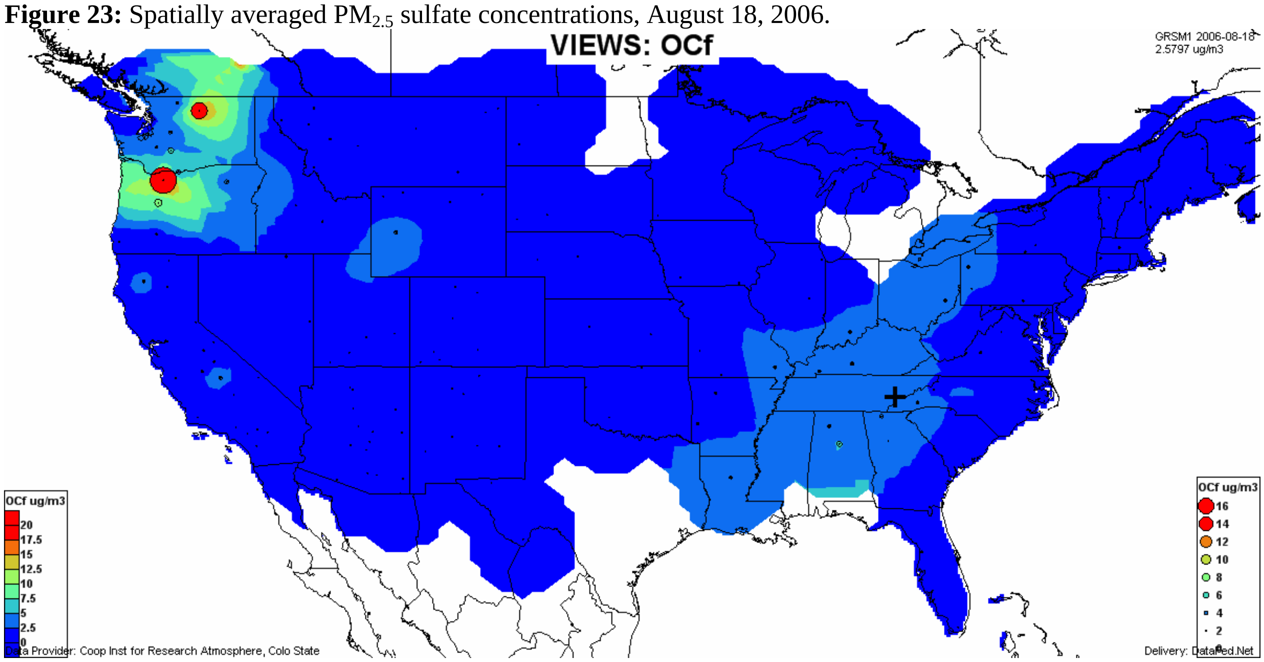
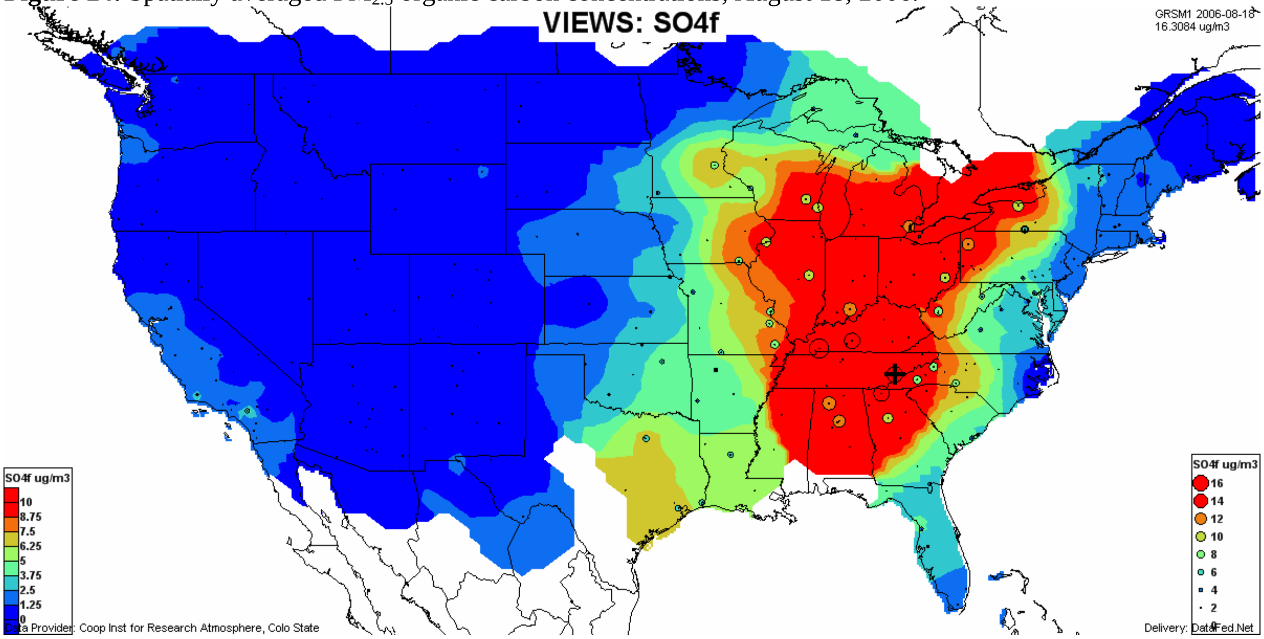


Figure 24: Spatially averaged $PM_{2.5}$ organic carbon concentrations, August 18, 2006.



EXCEEDANCE EVENT: Local and Southeastern U.S. Fires

Exceedance Date:	3/8/07, 3/9/07, 3/10/07, 3/11/07
MSA:	Chattanooga, TN-GA
Event Description:	Smoke from local wildfires and wildfires around the southeast

Table 9: Site-specific information used in analysis, concentrations in $\mu g/m^3$

AQS ID	Date	Observed Concentration	Monthly Average	84^{th} Percentile	95^{th} Percentile	EPA Concurrence
47-065-0031-1	3/8/2007	23	12.2	17.5	20.2	NO
47-065-0031-1	3/9/2007	26.7	12.2	17.5	20.2	NO
47-065-0031-1	3/10/2007	26.3	12.2	17.5	20.2	NO
47-065-4002-1	3/10/2007	24.4	11.1	15.1	19.3	NO
47-065-4002-2	3/10/2007	23.5	11.3	14.9	18.8	NO
47-065-0031-1	3/11/2007	23.6	12.2	17.5	20.2	NO

Detailed Discussion of Evidence

A) Event Description

Documentation submitted by the Chattanooga-Hamilton County Air Pollution Control Bureau claims that smoke from wildfires in the counties surrounding Chattanooga and from wildfires around the southeast U.S. caused NAAQS exceedances at the sites listed above. All of the requested values passed both steps of the initial two-step analysis.

B) Causal Relationship Between the Event and Air Quality

$PM_{2.5}$ speciation data was not collected in the Chattanooga area during the claimed event, from March 8 – 11, 2007. Figure 25 shows speciation data collected during the month of March for 2004-2007. Slightly higher than normal levels of organic carbon were observed on other days of March 2007, suggesting possible impacts from fires.

Next, aerosol smoke and sulfate maps from the NAAPS satellite were analyzed for the time period in question. Some aerosol smoke was observed in the southeast on these days, although none is evident in the Chattanooga area, as illustrated by figure 26. Figure 27 shows aerosol sulfate maps for the same time period. These maps show moderate sulfate levels in the Chattanooga area.

C) Comparison to Historical Levels

In order to further evaluate the impacts due to fires, data collected from March 8 -11 was compared to background levels. Figure 28 displays all of the 24-hr $PM_{2.5}$ concentrations collected in the Chattanooga area during 2004-2007. Samples collected during the month of March are shown in light blue, and samples collected during the rest of the year are shown in dark blue. The values requested to be excluded due to the local and southeast are shown in red.

As this figure illustrates, these values are in the high end of values collected in March, but appear to be within the range of normally observed values.

Figures 29, 30, and 31 show the spatially averaged normal high values for 24-hour $PM_{2.5}$ concentrations across the southeastern US, and how the observed values on March 8-11, 2007 compare to these normal high values. Figure 29 shows the observed 24-hour $PM_{2.5}$ concentrations across the southeast during March 8-11. Figure 30 shows the difference between 24-hour $PM_{2.5}$ concentrations observed on March 8-11 and the 84th percentile concentrations observed during the month of March for 2004-2006. These maps show concentrations about 5-10μg/m^3 above the 84th percentile. Figure 31 shows a similar comparison as Figure 30, except Figure 31 shows the difference between observed concentrations and the 95th percentile concentrations for 2004-2006. These maps show values slightly above the 95th percentile in the Chattanooga area on March 9-10.

Although the 24-hr average $PM_{2.5}$ concentrations observed during March 8-11 were slightly elevated, there is no definitive evidence that these NAAQS violations were caused by smoke impacts. $PM_{2.5}$ speciation data was not collected on these days (see figure 25), and NAAPS aerosol smoke maps do not show significant concentrations on any of the days in question (see figure 26). Also, the documentation submitted by Chattanooga-Hamilton County did not demonstrate a clear causal relationship between the measured concentration and the event, and did not demonstrate that there would have been no exceedance or violation but for the event. Due to these reasons, EPA concurrence was not given to any exceptional event flags during this event.

Figure 25: $PM_{2.5}$ speciation data, Riverside and Rossville sites during the month of March, 2004-2007

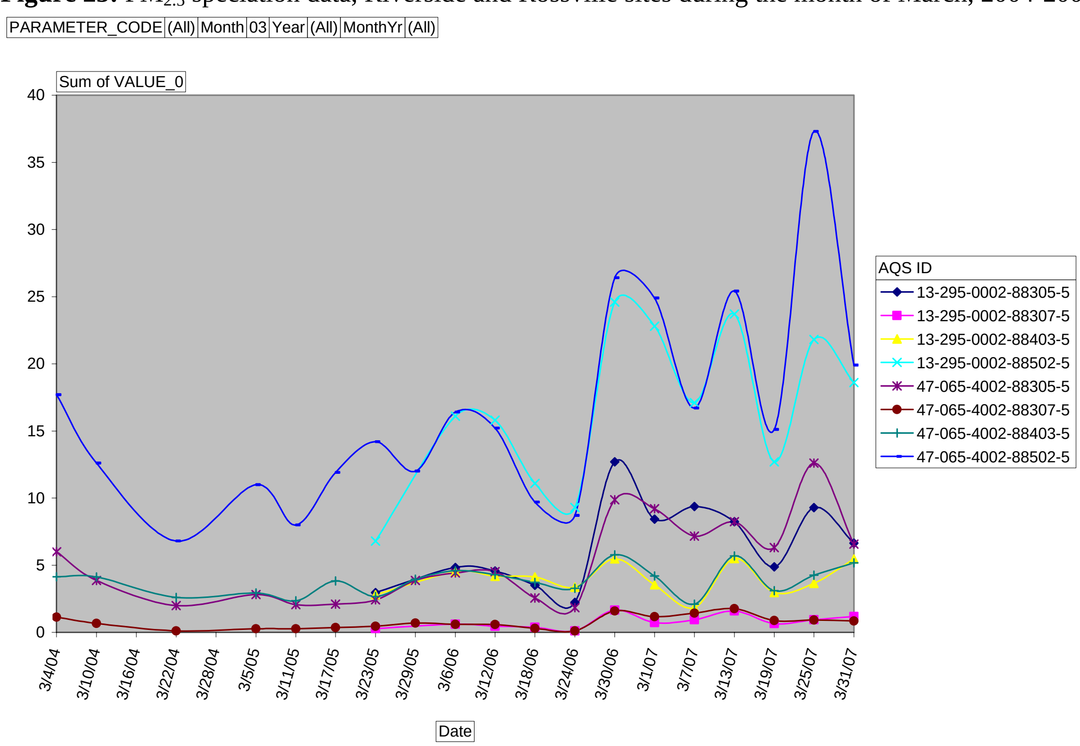
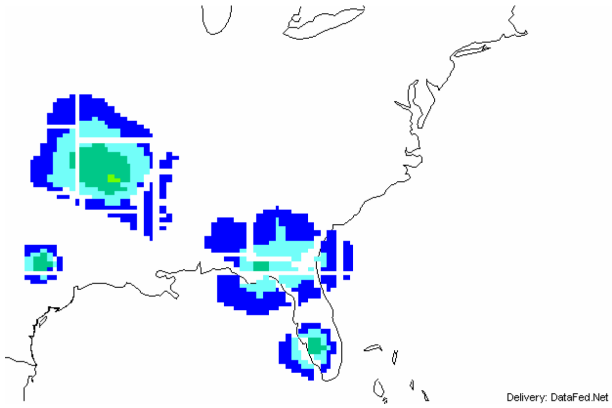
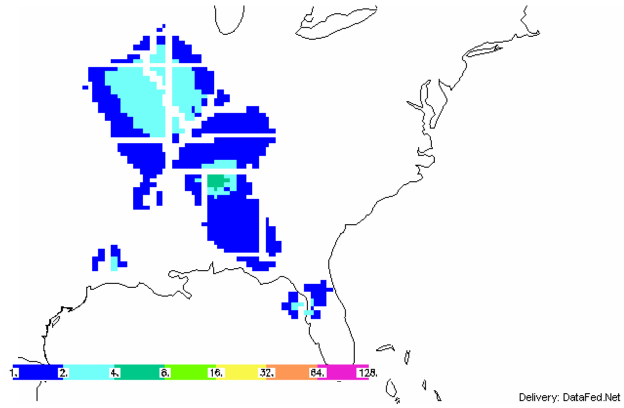


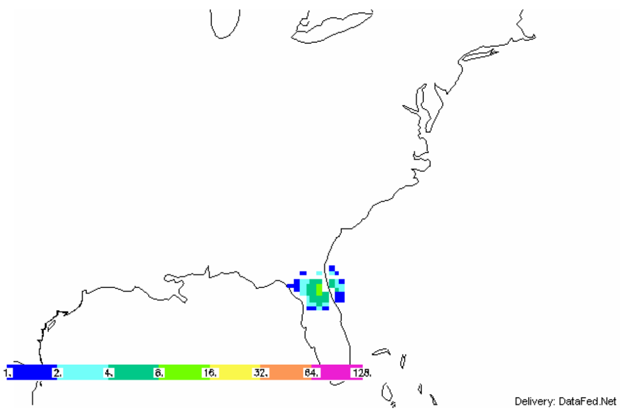
Figure 26: Aerosol smoke concentrations from NAAPS satellite, March 8 – 11, 2007.



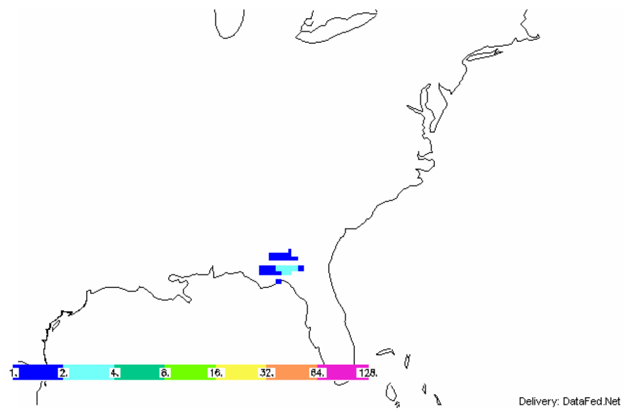
March 8, 2007



March 9, 2007

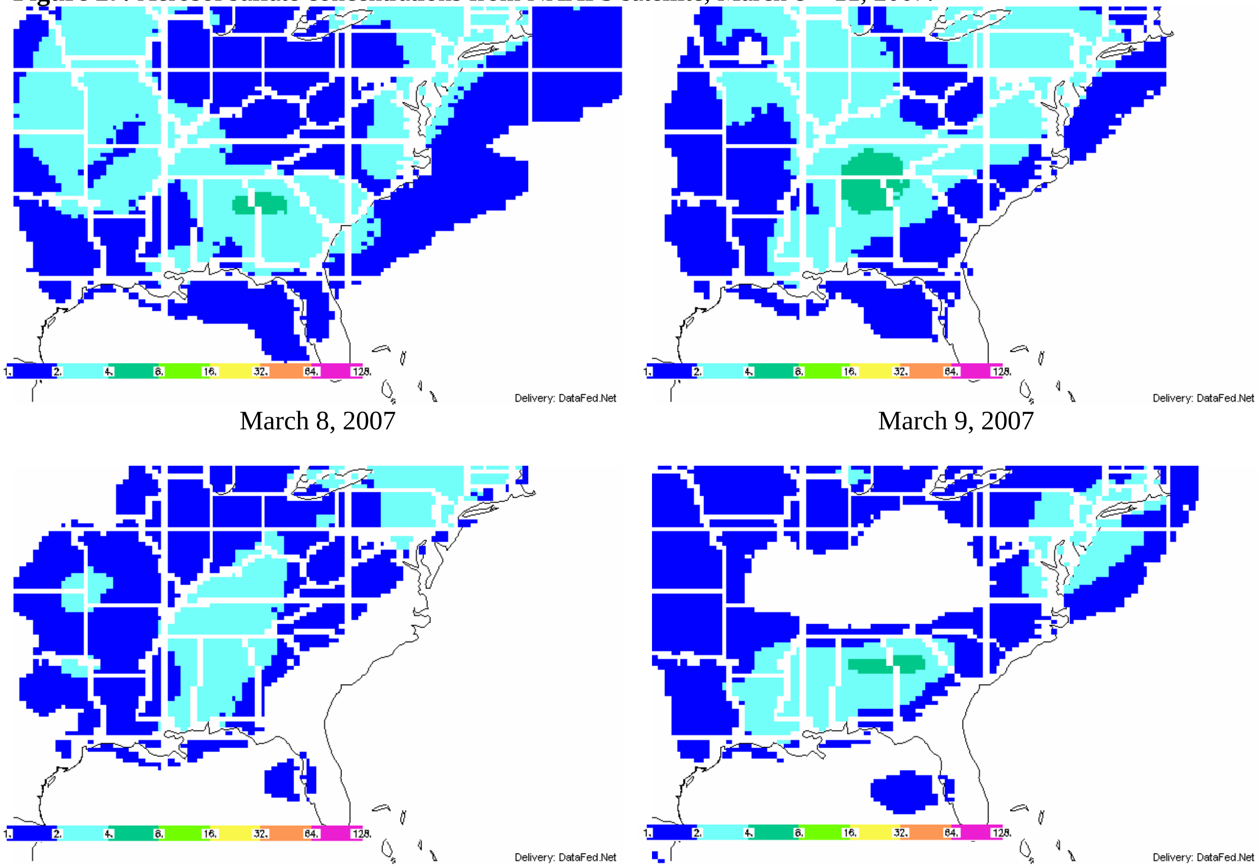


March 10, 2007



March 11, 2007

Figure 27: Aerosol sulfate concentrations from NAAPS satellite, March 8 – 11, 2007.



March 8, 2007

March 9, 2007

March 10, 2007

March 11, 2007

Figure 28: All 24-hr $PM_{2.5}$ measurements collected in the Chattanooga area, 2004-2007.

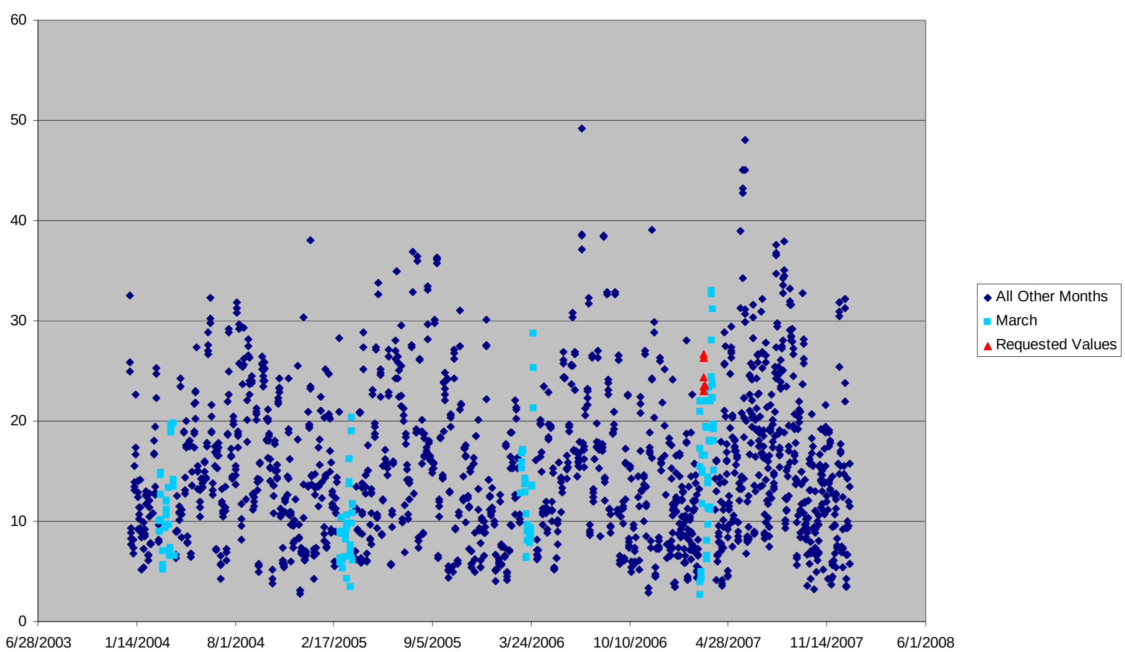
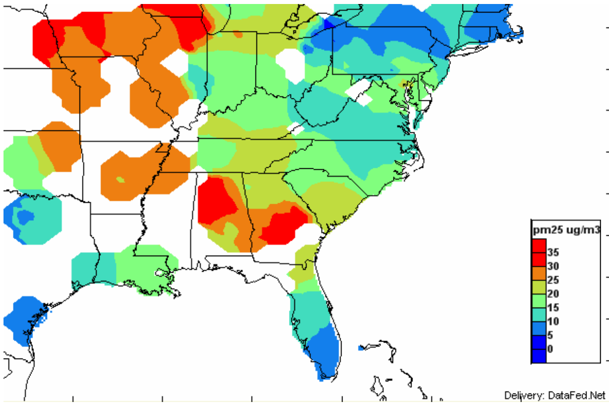
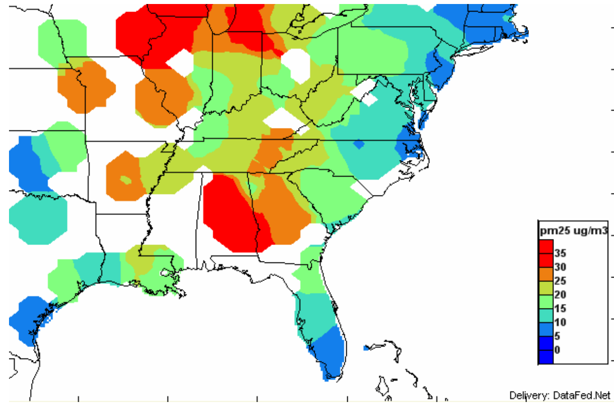


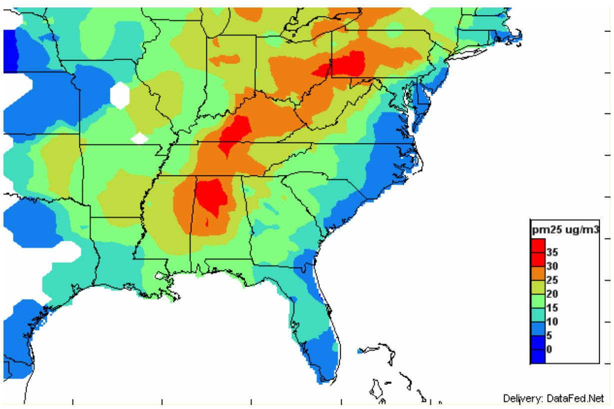
Figure 29: Spatially averaged $PM_{2.5}$ concentrations, March 8 – 11, 2007.



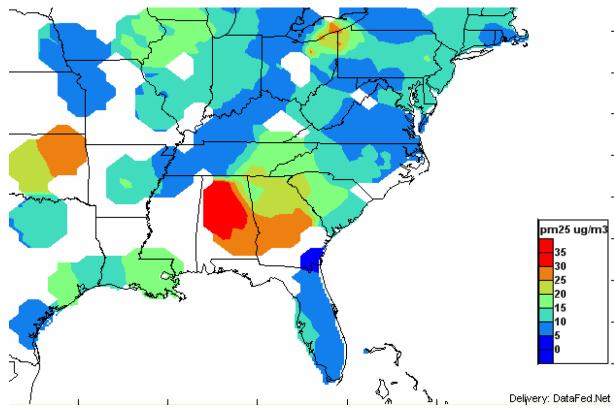
March 8, 2007



March 9, 2007

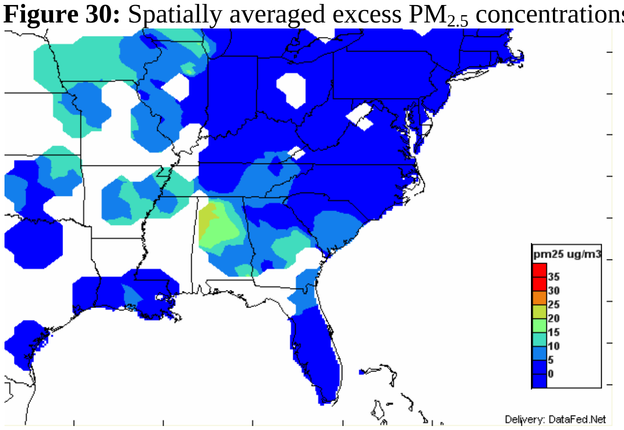


March 10, 2007

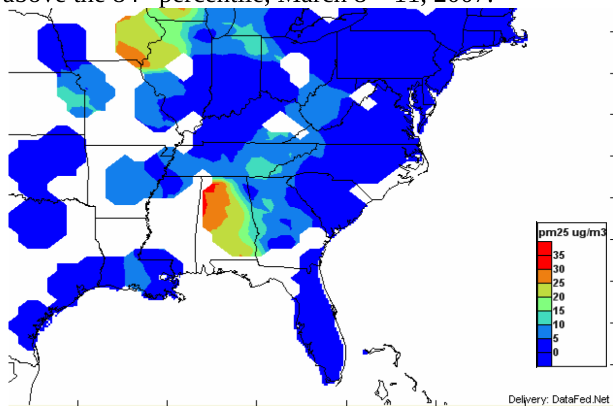


March 11, 2007

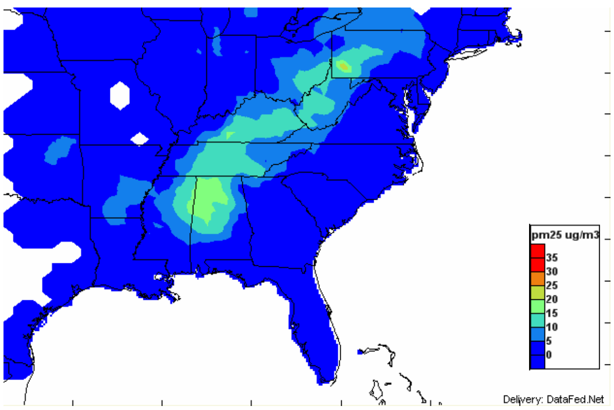
Figure 30: Spatially averaged excess $PM_{2.5}$ concentrations above the 84th percentile, March 8 – 11, 2007.



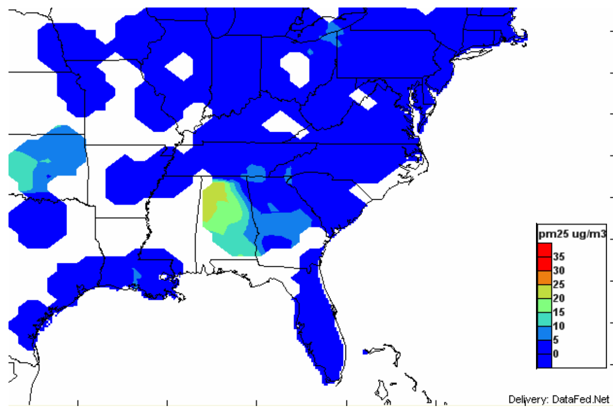
March 8, 2007



March 9, 2007

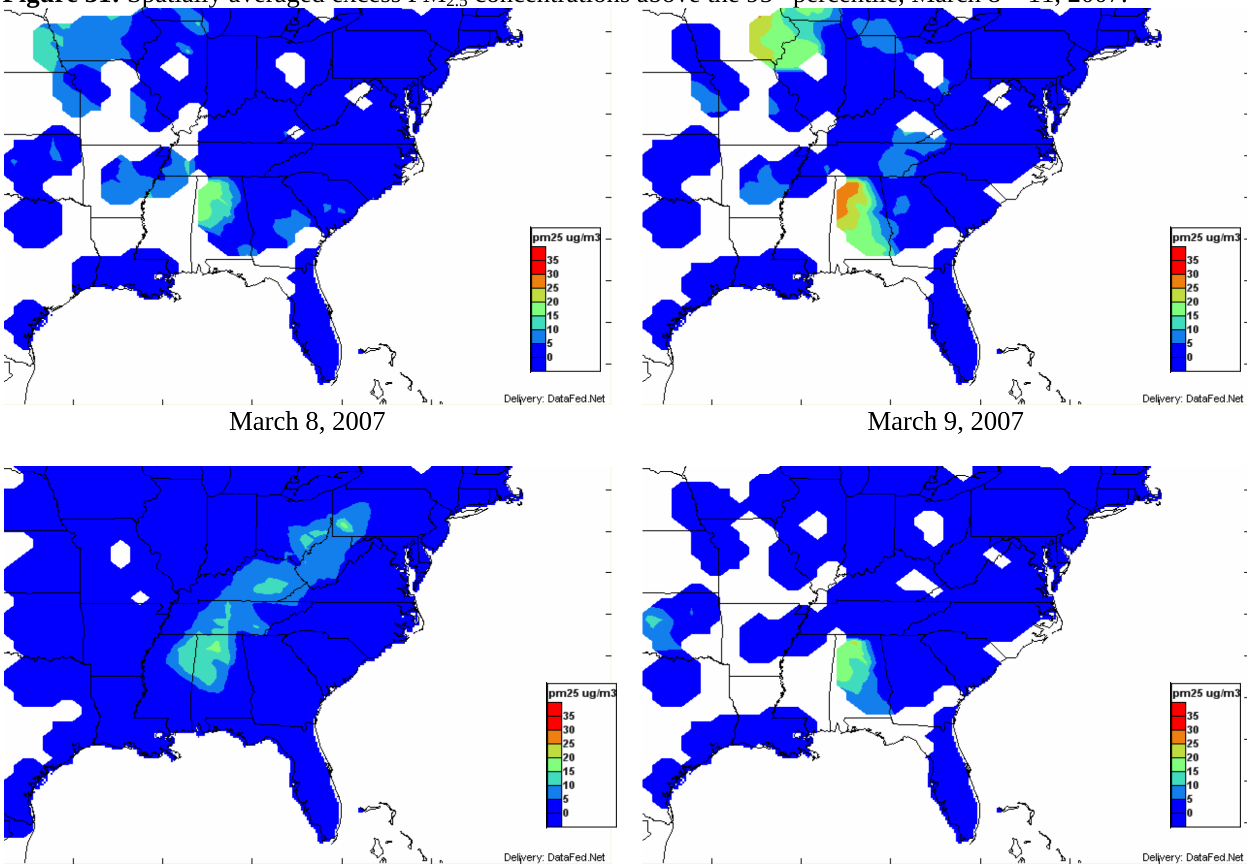


March 10, 2007



March 11, 2007

Figure 31: Spatially averaged excess $PM_{2.5}$ concentrations above the 95th percentile, March 8 – 11, 2007.



March 8, 2007

March 9, 2007

March 10, 2007

March 11, 2007

EXCEEDANCE EVENT: Signal Mountain Fires

Exceedance Date:	3/24/07, 3/25/07, 3/26/07, 3/27/07, 3/28/07, 3/29/07
MSA:	Chattanooga, TN-GA
Event Description:	Wildfire on Signal Mountain northwest of Chattanooga

Table 10: Site-specific information used in analysis, concentrations in μg/m^3

AQS ID	Date	Observed Concentration	Monthly Average	84th Percentile	95th Percentile	EPA Concurrence
47-065-0031-1	3/24/2007	21.9	12.2	17.5	20.2	YES
47-065-4002-2	3/25/2007	33	11.3	14.9	18.8	YES
47-065-4002-1	3/25/2007	32.7	11.1	15.1	19.3	YES
47-065-0031-1	3/25/2007	24.4	12.2	17.5	20.2	YES
47-065-1011-1	3/25/2007	22.3	9.4	12.3	17.3	YES
47-065-0031-1	3/26/2007	28.1	12.2	17.5	20.2	YES
47-065-0031-1	3/27/2007	31.2	12.2	17.5	20.2	YES
47-065-4002-2	3/28/2007	23.7	11.3	14.9	18.8	YES
47-065-4002-1	3/28/2007	23.6	11.1	15.1	19.3	YES
47-065-0031-1	3/28/2007	22.3	12.2	17.5	20.2	YES
47-065-0031-1	3/29/2007	19.6	12.2	17.5	20.2	YES

Notes: [1]Three-year monthly average above 15.0μg/m^3

Detailed Discussion of Evidence

A) Event Description

Documentation submitted by the Chattanooga-Hamilton County Air Pollution Control Bureau claims that smoke from a local wildfire on Signal Mountain northwest of Chattanooga caused NAAQS exceedances at the sites listed above. All of these values passed both steps of the initial two-step analysis. The fire was well documented in the *Chattanooga Times Free Press*, and articles submitted to EPA by Chattanooga-Hamilton County are contained in Appendix D. Figure 32 shows a map of the location of the Signal Mountain fire relative to the affected monitoring sites. The fire was approximately 8 miles northwest of the Riverside site, which measured the highest concentration during the event.

B) Causal Relationship Between the Event and Air Quality

$PM_{2.5}$ speciation data was collected at the Riverside and Rossville sites on March 25, 2007, the day that the highest concentration was recorded during the event. Figure 33 shows speciation data collected during the month of March for 2004-2007. A peak of organic carbon is shown on March 25th, indicating impact from the fire. Also, documentation of the fire in the Chattanooga Times Free Press helps establish the causal link.

Next, spatially averaged $PM_{2.5}$ organic carbon and sulfate maps were analyzed for March 25, 2007. Figure 34 shows the spatially averaged $PM_{2.5}$ organic carbon concentrations, and Figure

35 shows the $PM_{2.5}$ sulfate levels. These maps do not indicate significant levels of organic carbon or sulfates in the region surrounding Chattanooga. This is consistent, however, with the small scale of the event in question.

C) Comparison to Historical Levels

In order to further assess the impacts of the Signal Mountain fire, the data in question was compared to historical levels observed at each site. Table 10 shows that all of the values flagged except the concentration at the East Ridge site on March 29th are greater than the 95th percentile calculated from data collected during the month of March for 2004-2006. This is good evidence that the data were influenced by an exceptional event. Figure 36 shows the spatially averaged 24-hr average $PM_{2.5}$ concentrations observed on March 25, 2007, and the excess $PM_{2.5}$ levels above the historical 84th and 95th percentiles. These maps show that the observed $PM_{2.5}$ concentrations in Chattanooga were significantly above the historical 84th percentile and slightly above the historical 95th percentile.

D) Demonstration of No Exceedance "But For" the Event

In order to quantify the impacts of the fire on observed $PM_{2.5}$ concentrations, speciation data collected at the Riverside site on March 25, 2007 was used to approximate the organic mass increment of the observed $PM_{2.5}$ mass that was caused by the wildfire. The organic mass increment was calculated using the following equation, adapted from Turpin and Lim (2001).

$$OMI = (OC_{observed} - OC_{average}) \times 2.0 \qquad \textit{(Eq. 2)}$$

Where OMI is the organic mass increment due to smoke from the wildfire, $OC_{observed}$ is the observed organic carbon mass, and $OC_{average}$ is the average organic carbon mass observed at the site during the month of March for 2004-2006. A multiplier of 2.0 is used to approximate the total $PM_{2.5}$ mass associated with smoke from wildfires (Turpin and Lim 2001). In order to approximate the $PM_{2.5}$ concentration that would have been observed but for the fire, the OMI was subtracted from the observed 24-hr average $PM_{2.5}$ concentration. This procedure was then repeated for each day that $PM_{2.5}$ speciation data was collected during March 2007 to compare impacts of smoke on different days. The results of this analysis are shown in Figure 37. This figure shows the calculated OMI and the adjusted $PM_{2.5}$ mass (Observed $PM_{2.5}$ – OMI). The graph demonstrates that without the $PM_{2.5}$ mass emitted by the fire on March 25, 2007, the 24-hr average $PM_{2.5}$ concentration would have been approximately 14.9µg/m^3, and thus that there would have been no exceedance but for the wildfire.

Since the highest recorded value during the event (32.7 µg/m^3 at the Riverside site on 3/25) met all of the requirements for exclusion from NAAQS calculations under the exceptional events rule, it can be assumed that the other requested values were similarly impacted by the wildfire, even though speciation data was not collected on these days. The overall body of evidence shows that there would have been no NAAQS exceedances during this period but for the Signal Mountain wildfire. EPA concurrence was given to all of the values requested during this event.

Figure 32: Map of monitoring sites in relation to the Signal Mountain Fire

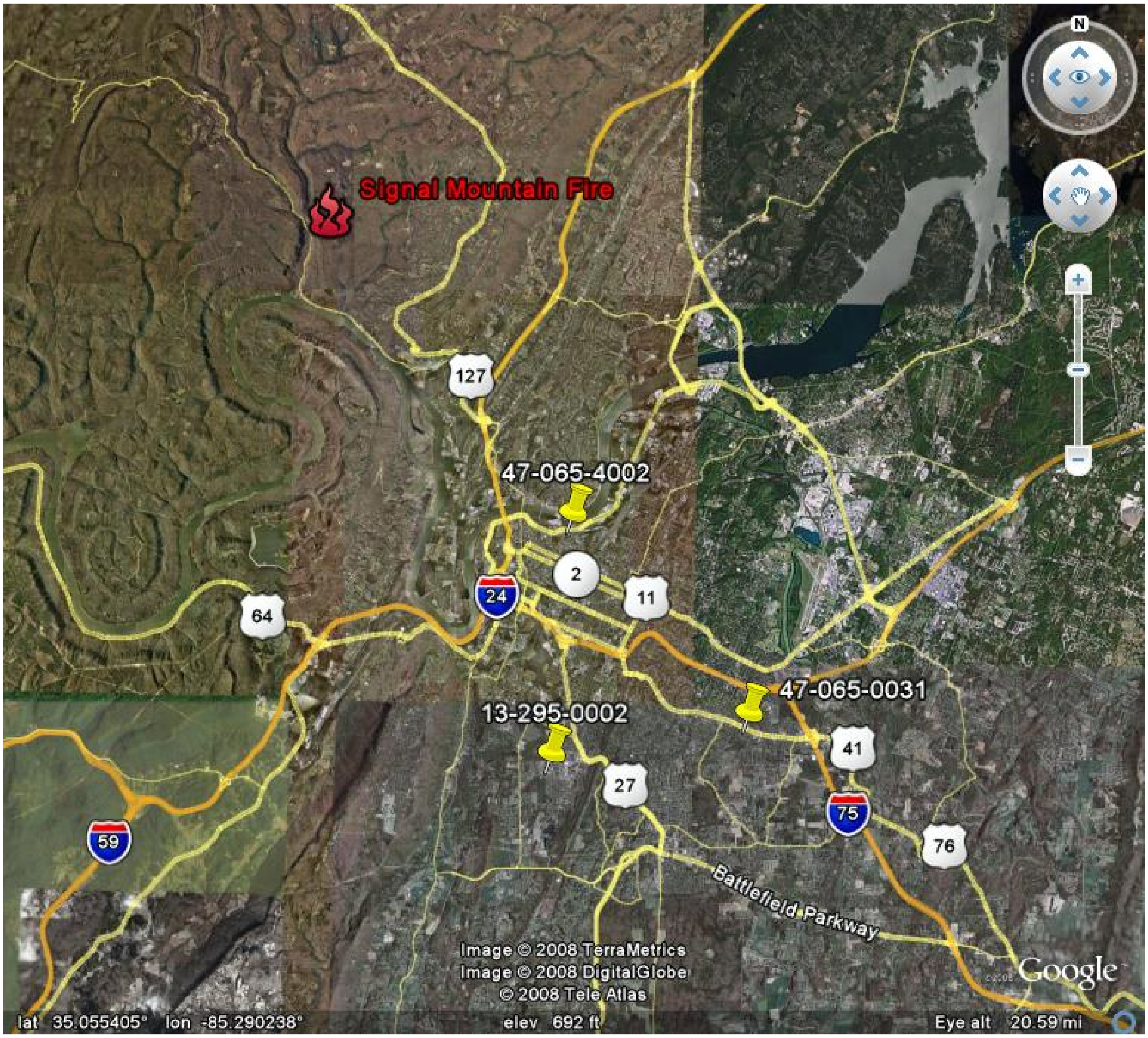

Signal Mountain Fire
127
47-065-4002
2
24
11
64
47-065-0031
13-295-0002
41
27
75
59
76
Battlefield Parkway
Image © 2008 TerraMetrics
Image © 2008 DigitalGlobe
© 2008 Tele Atlas
Google
lat 35.055405° lon -85.290238°
elev 692 ft
Eye alt 20.59 mi

Figure 33: $PM_{2.5}$ speciation data, Riverside and Rossville sites during the month of March, 2004-2007

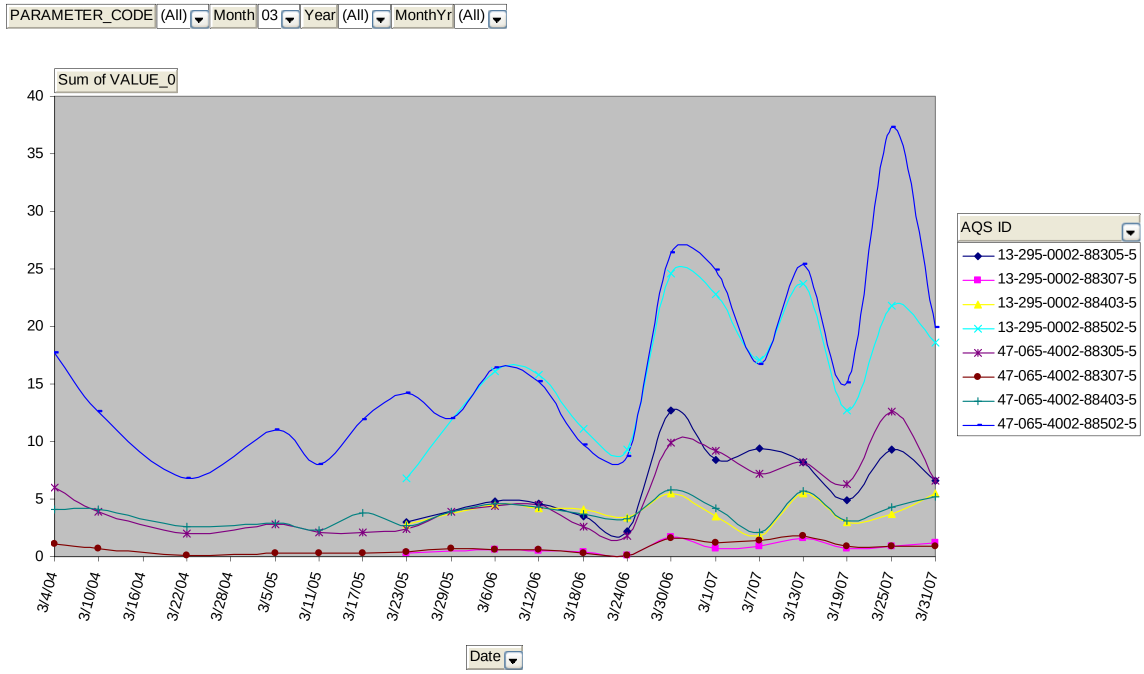


Figure 34: Spatially averaged $PM_{2.5}$ organic carbon concentrations, March 25, 2007

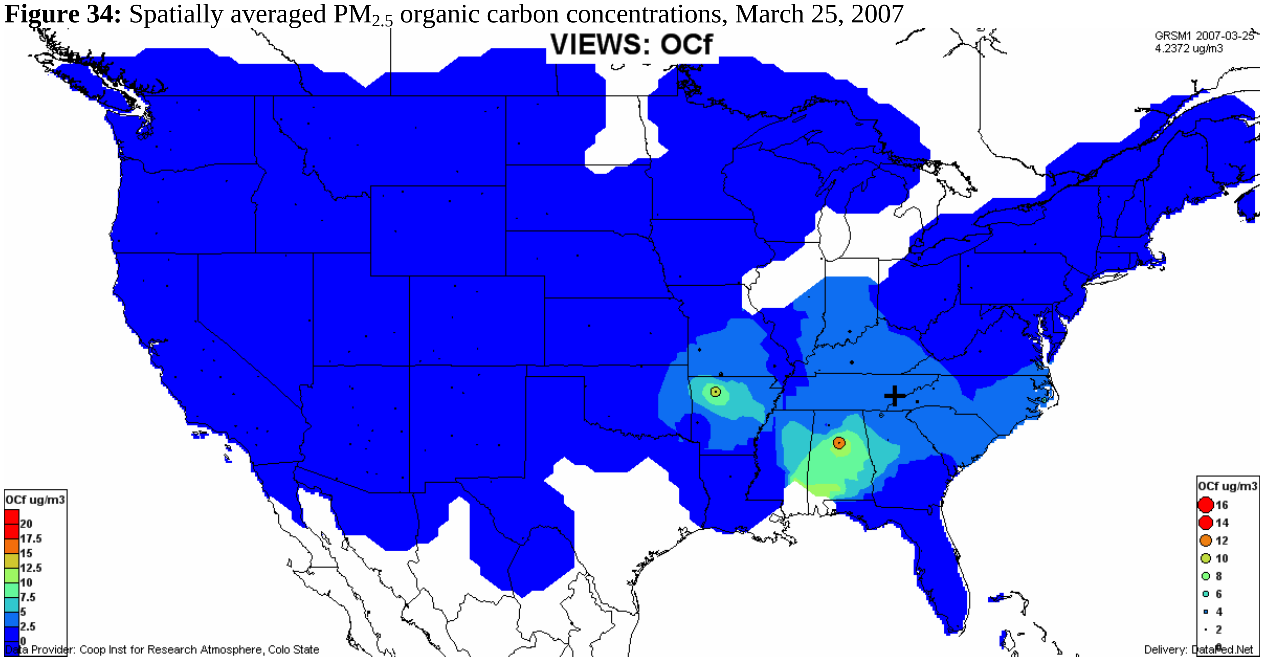


Figure 35: Spatially averaged $PM_{2.5}$ sulfate concentrations, March 25, 2007

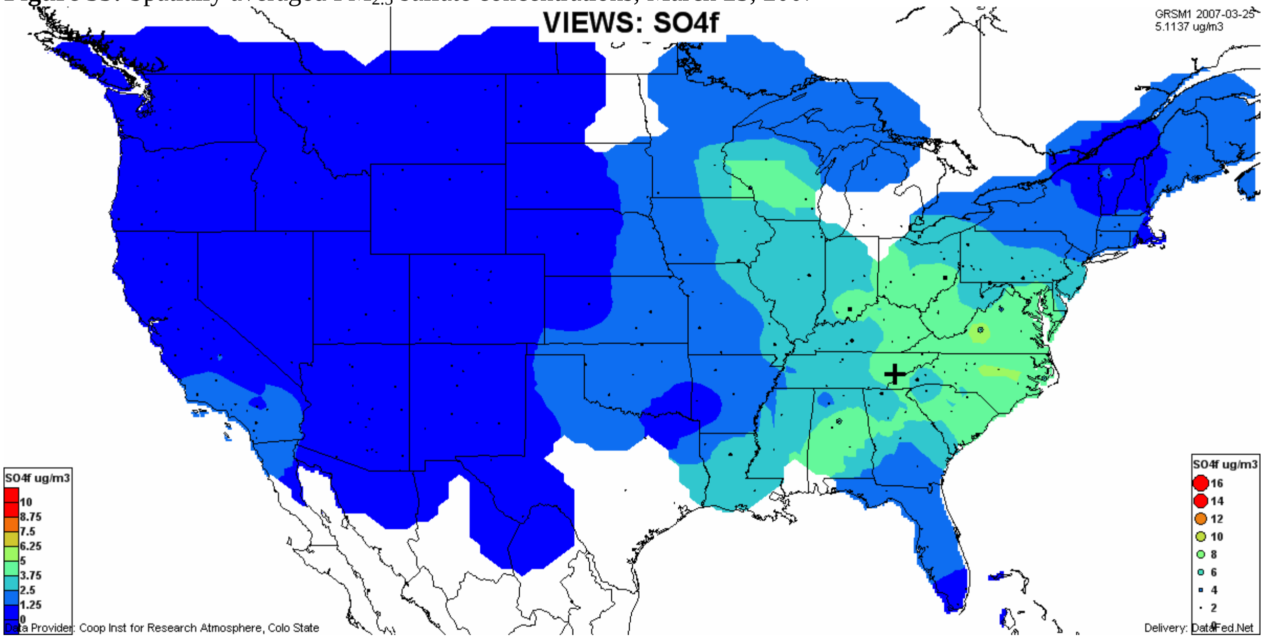
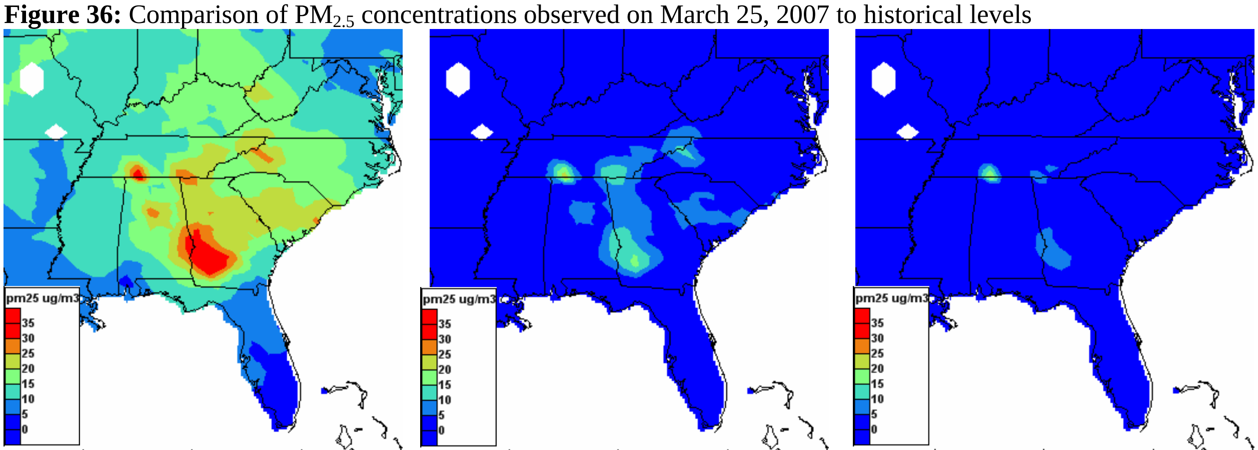
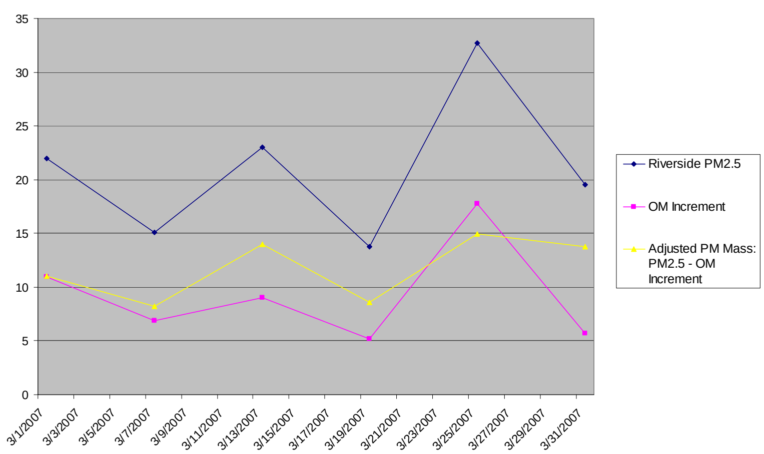


Figure 36: Comparison of $PM_{2.5}$ concentrations observed on March 25, 2007 to historical levels



Observed $PM_{2.5}$ | Excess $PM_{2.5}$ over 84th Percentile | Excess $PM_{2.5}$ over 95th Percentile

Figure 37: Adjusted $PM_{2.5}$ mass for demonstration of no exceedance but for the event.



Exceedance Date:	5/2/07, 5/3/07, 5/4/07, 5/5/07, 5/22/07, 5/23/07, 5/27/07, 5/28/07, 5/31/07, 6/1/07, 6/2/07
MSA:	Chattanooga, TN-GA
Event Description:	Transport of smoke from wildfires in southern Georgia and northern Florida.

Table 11: Site-specific information used in analysis, concentrations in µg/m^3

AQS ID	Date	Observed Concentration	Monthly Average	84th Percentile	95th Percentile	EPA Concurrence
47-065-0031-1	5/2/2007	24.7	15.3	21.8	26.9	NO[1]
47-065-4002-2	5/3/2007	27	15.6	23.0	26.6	NO[1]
47-065-4002-1	5/3/2007	26.8	15.5	22.7	26.7	NO[1]
47-065-0031-1	5/3/2007	26.3	15.3	21.8	26.9	NO[1]
47-065-0031-1	5/4/2007	27.4	15.3	21.8	26.9	NO[1]
47-065-0031-1	5/5/2007	29.4	15.3	21.8	26.9	NO[1]
47-065-0031-1	5/22/2007	39	15.3	21.8	26.9	YES
47-065-0031-1	5/23/2007	31.3	15.3	21.8	26.9	NO[1]
47-065-0031-1	5/27/2007	45.1	15.3	21.8	26.9	YES
47-065-4002-1	5/27/2007	43.2	15.5	22.7	26.7	YES
47-065-4002-2	5/27/2007	42.8	15.6	23.0	26.6	YES
47-065-0031-1	5/28/2007	34.3	15.3	21.8	26.9	NO[1]
47-065-0031-1	5/31/2007	45.1	15.3	21.8	26.9	YES
47-065-0031-1	6/1/2007	48	18.2	23.9	26.7	YES
47-065-0031-1	6/2/2007	31.2	18.2	23.9	26.7	NO[1]
47-065-4002-1	6/2/2007	30.7	19.6	27.0	30.5	NO[1]
47-065-4002-2	6/2/2007	29.9	19.4	27.3	30.2	NO[1]

Notes: [1]Three-year monthly average above 15.0µg/m^3

Detailed Discussion of Evidence

A) Event Description

Documentation submitted by the Chattanooga-Hamilton County Air Pollution Control Bureau claims that smoke from wildfires in Georgia and Florida caused NAAQS exceedances at the sites listed above. The values that passed both steps of the initial two-step analysis were the concentrations collected at the East Ridge site on May 22, 27, 28, 31, and June 1, and the Riverside site on May 27.

The Bugaboo Scrub Fire (Figure 38a) was a wildfire that occurred from April to June in 2007 and ultimately became the largest fire in the history of both Georgia and Florida. The Bugaboo, which was not actually named until it had burned for nearly a month, started in the Okefenokee Swamp, most of which is located in Georgia. It was previously known as the Sweat Farm Road Fire, which merged with the Big Turnaround Complex fire (Figure 38b). Due to the amount of acreage consumed from these wildfires, copious smoke impacted sites around Region 4 from

May through the first week of June, in many cases causing very large increases in the 24 hour $PM_{2.5}$ mass.

B) Causal Relationship Between the Event and Air Quality

$PM_{2.5}$ speciation data was not collected in the Chattanooga area on any of the days under consideration. Other sites in Region 4, however, were able to definitively demonstrate a causal relationships between the wildfires and regional air quality for the same time period.

In order to more accurately assess the possible impact of smoke on this day, however, wind trajectories were analyzed for each of the requested days. Figure 39 illustrates 48-hr backward wind trajectories for each of the days under consideration. Figure 40 shows wind trajectories that passed through the claimed source region in southern Georgia and northern Florida on each day. These trajectories support the possible transport of smoke to Chattanooga on these days. Figure 41 depicts the NASA OMI aerosol index observed on each of the days in question, and confirms high aerosol particulate concentrations in southern Georgia and northern Florida.

Next, $PM_{2.5}$ organic carbon and sulfate levels were analyzed. Spatially averaged maps were used to assess the possible impacts of smoke on air quality since $PM_{2.5}$ speciation data was not available. Figure 42 shows the observed $PM_{2.5}$ organic carbon levels for each of the days in question, and Figure 43 shows the observed $PM_{2.5}$ sulfate levels. Though these maps are somewhat inconclusive, they do show some smoke impact, particularly on May 22.

C) Comparison to Historical Levels

In order to further assess the impacts of the Georgia and Florida fires, the data in question was compared to historical levels observed at each site. Table 11 shows that all of the values that passed both steps of the initial two-step analysis are significantly greater than the 95^{th} percentile calculated from data collected during the month of May for 2004-2006. This evidence shows that the data were influenced by an exceptional event. Figure 44 shows the spatially averaged 24-hr average $PM_{2.5}$ concentrations observed on each of the days in question. Figures 45 and 46 show the excess $PM_{2.5}$ concentrations observed above the 84^{th} and 95^{th} percentiles, respectively, on each of the days. These maps show 24-hr average $PM_{2.5}$ concentrations above the normal range of values observed in the Chattanooga area during the month of May in the past.

D) Demonstration of No Exceedance "But For" the Event

Since no $PM_{2.5}$ speciation data was collected on any of the days in question, an organic mass apportionment was not possible. For the violations of the 24-hr $PM_{2.5}$ standard ($35 \mu g/m^3$), however, each value was between $12.1 \mu g/m^3$ and $21.3 \mu g/m^3$ in excess of the historical 95^{th} percentile for the respective site in the month of May. This is an indication that these monitors were significantly impacted by the fires, and that there would have been no exceedance of the 24-hr standard but for the event. EPA concurrence was given to all of the flagged values during the event that exceeded the 24-hr NAAQS of $35 \mu g/m^3$.

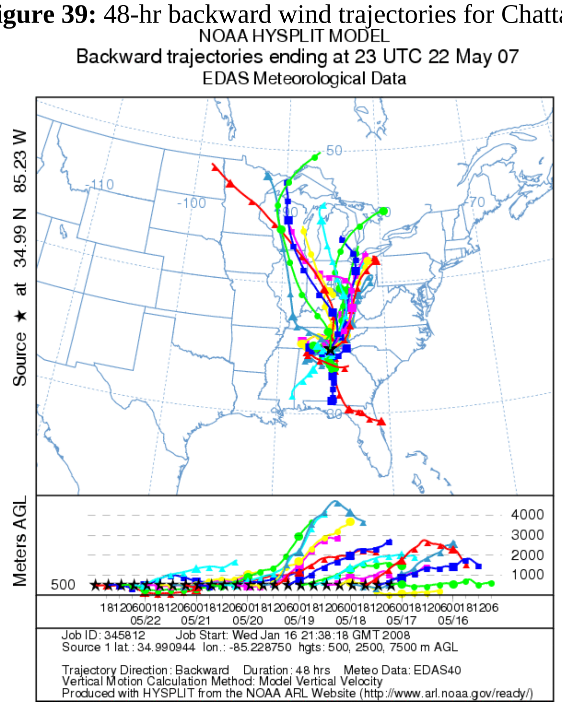
Without $PM_{2.5}$ speciation data for any of the requested values below the 24-hr standard, there is not enough evidence that there would have been no exceedance (of the annual NAAQS of $15.0 \mu g/m^3$) but for the fires. Also, because all of the historical three-year monthly averages for

May in Chattanooga, none of these values passed both steps of the initial two-step analysis. Therefore, EPA concurrence was not given to any of the flagged values during the event that did not exceed the 24-hr NAAQS of 35 µg/m^3.

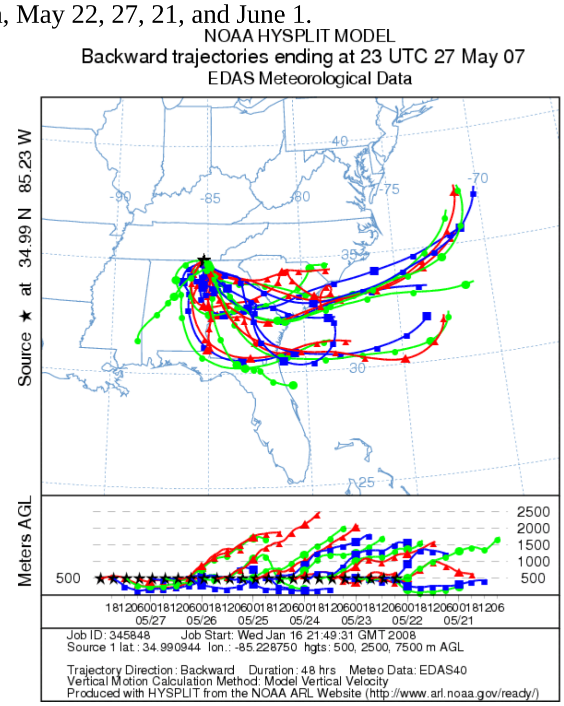
Figure 38a: Big Turnaround fire April 29, 2007 Blaine Eckberg, USFWS

Figure 38b: Georgia Forestry Commission - Aerial View of Sweat Farm Road Fire on April 28, 2007.

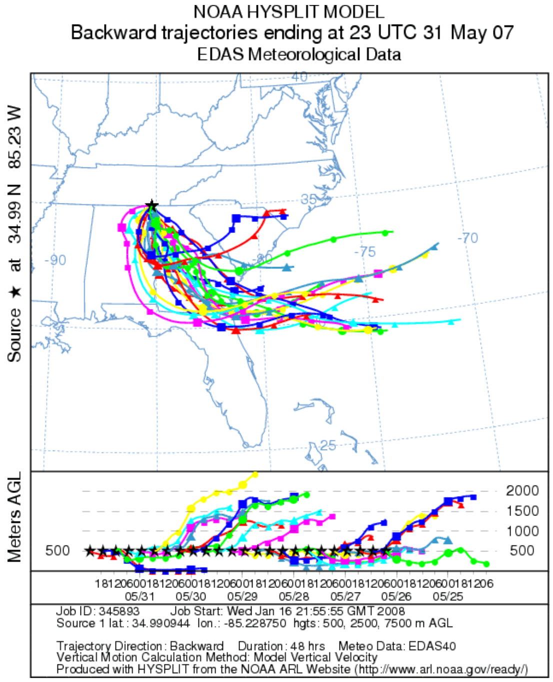
Figure 39: 48-hr backward wind trajectories for Chattanooga, May 22, 27, 21, and June 1.



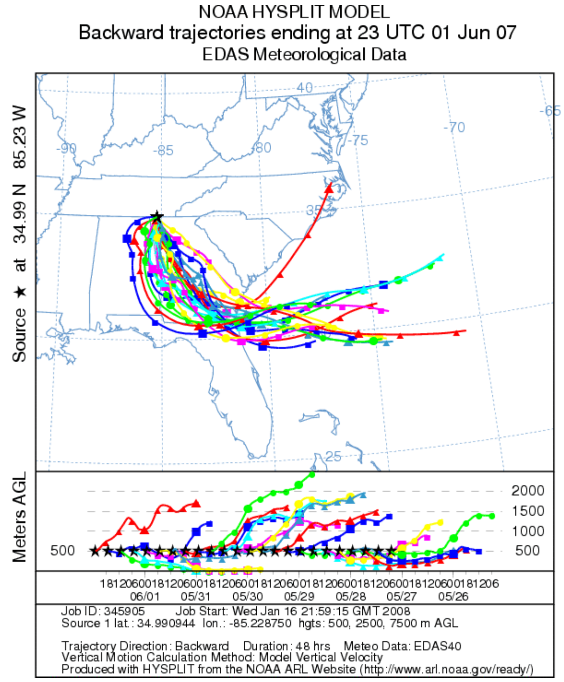
May 22, 2007



May 27, 2007

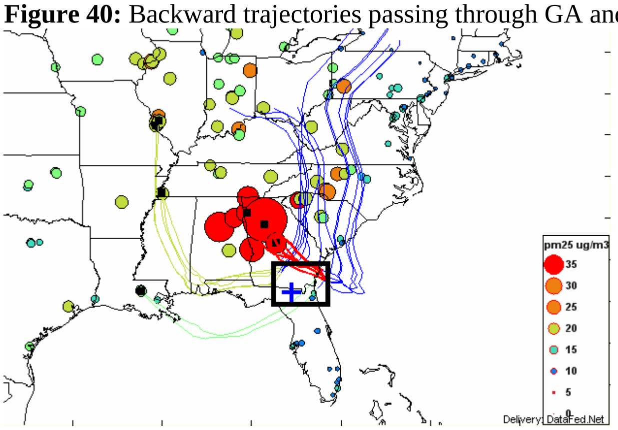


May 31, 2007

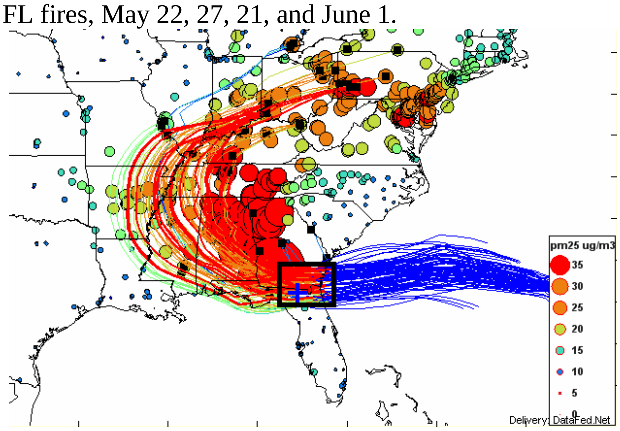


June 1, 2007

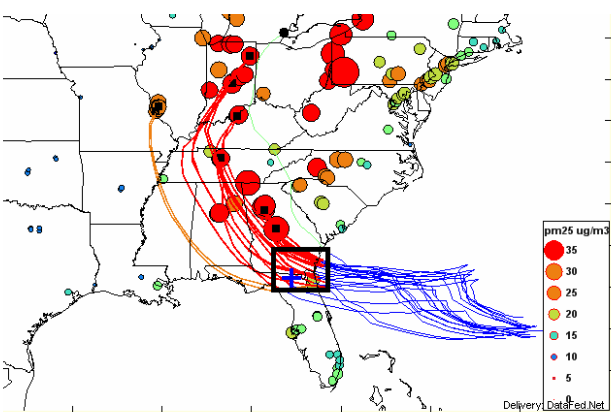
Figure 40: Backward trajectories passing through GA and FL fires, May 22, 27, 21, and June 1.



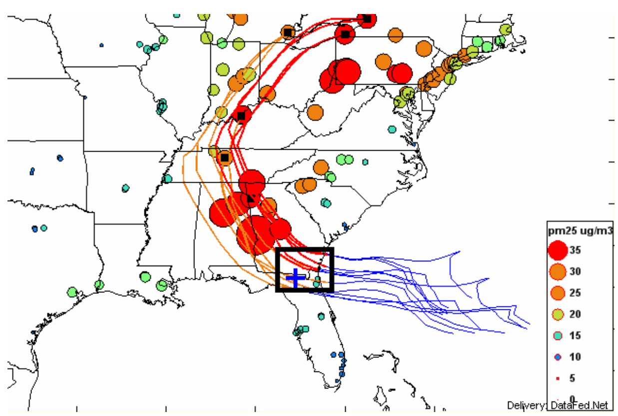
May 22, 2007



May 27, 2007

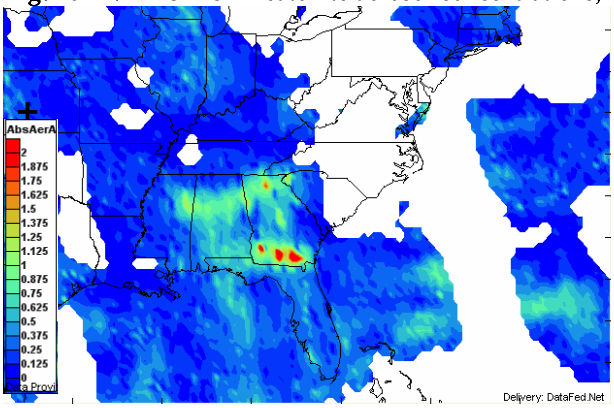


May 31, 2007

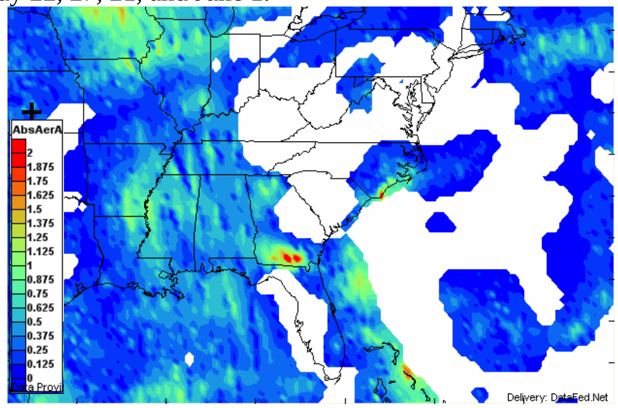


June 1, 2007

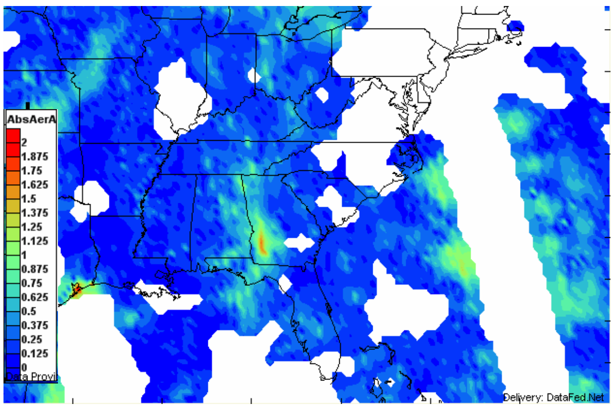
Figure 41: NASA OMI satellite aerosol concentrations, May 22, 27, 21, and June 1.



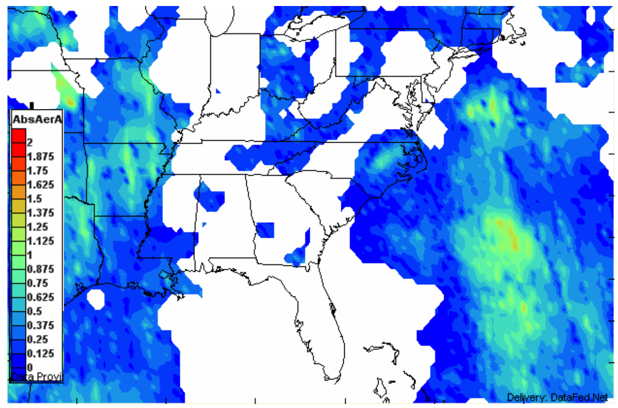
May 22, 2007



May 27, 2007

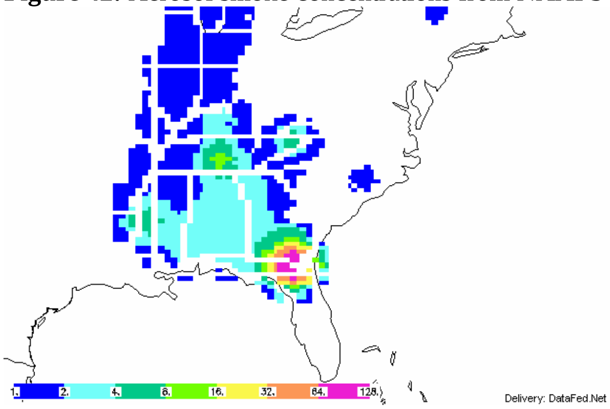


May 31, 2007

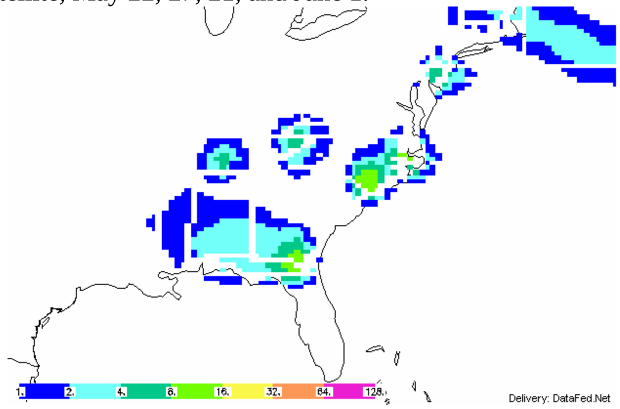


June 1, 2007

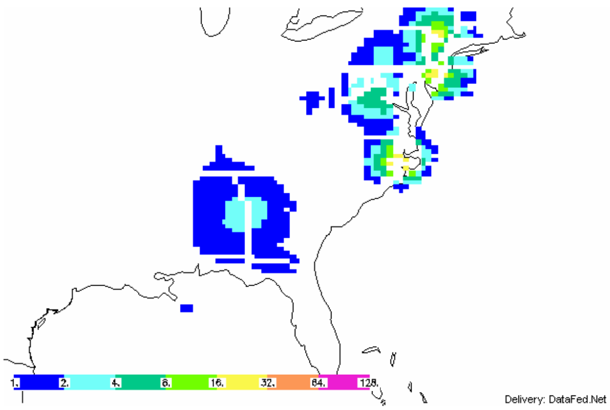
Figure 42: Aerosol smoke concentrations from NAAPS satellite, May 22, 27, 21, and June 1.



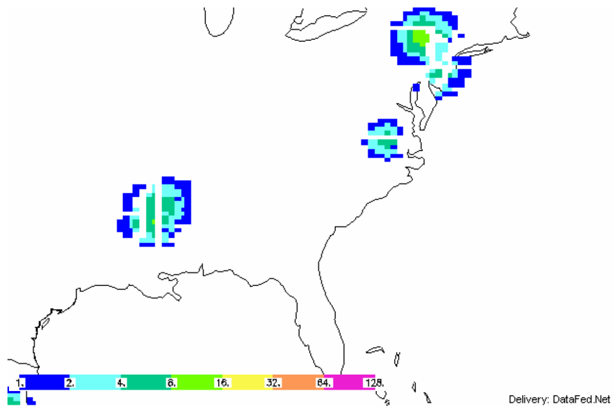
May 22, 2007



May 27, 2007

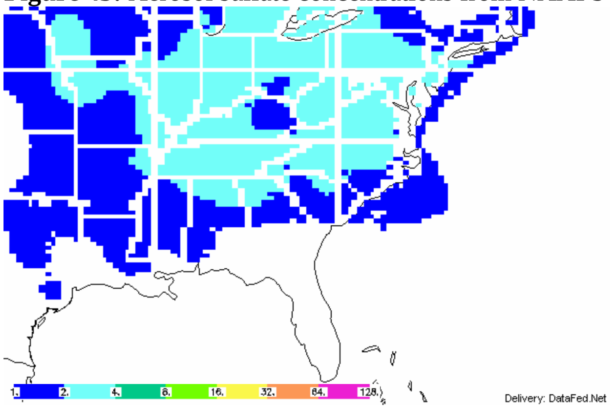


May 31, 2007

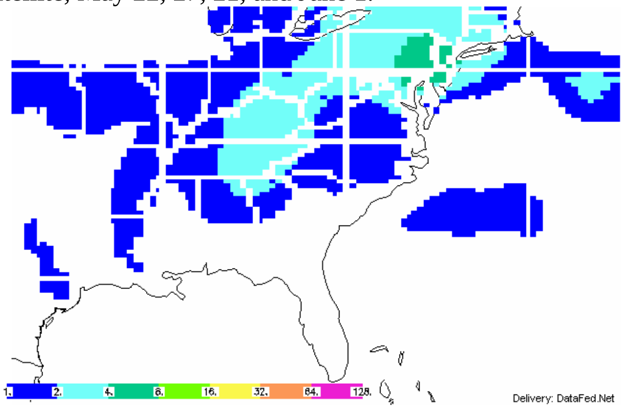


June 1, 2007

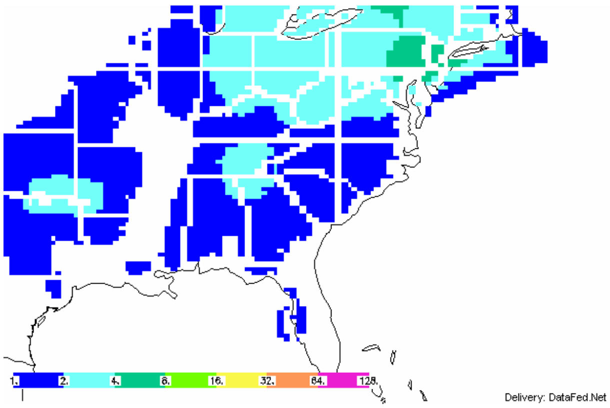
Figure 43: Aerosol sulfate concentrations from NAAPS satellite, May 22, 27, 21, and June 1.



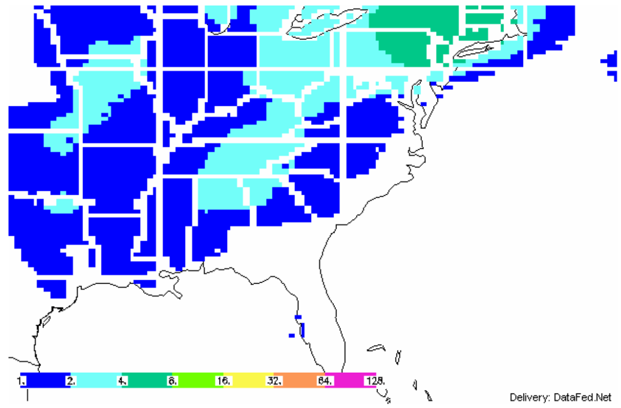
May 22, 2007



May 27, 2007



May 31, 2007



June 1, 2007

Figure 44: Spatially averaged $PM_{2.5}$ concentrations, May 22, 27, 21, and June 1..

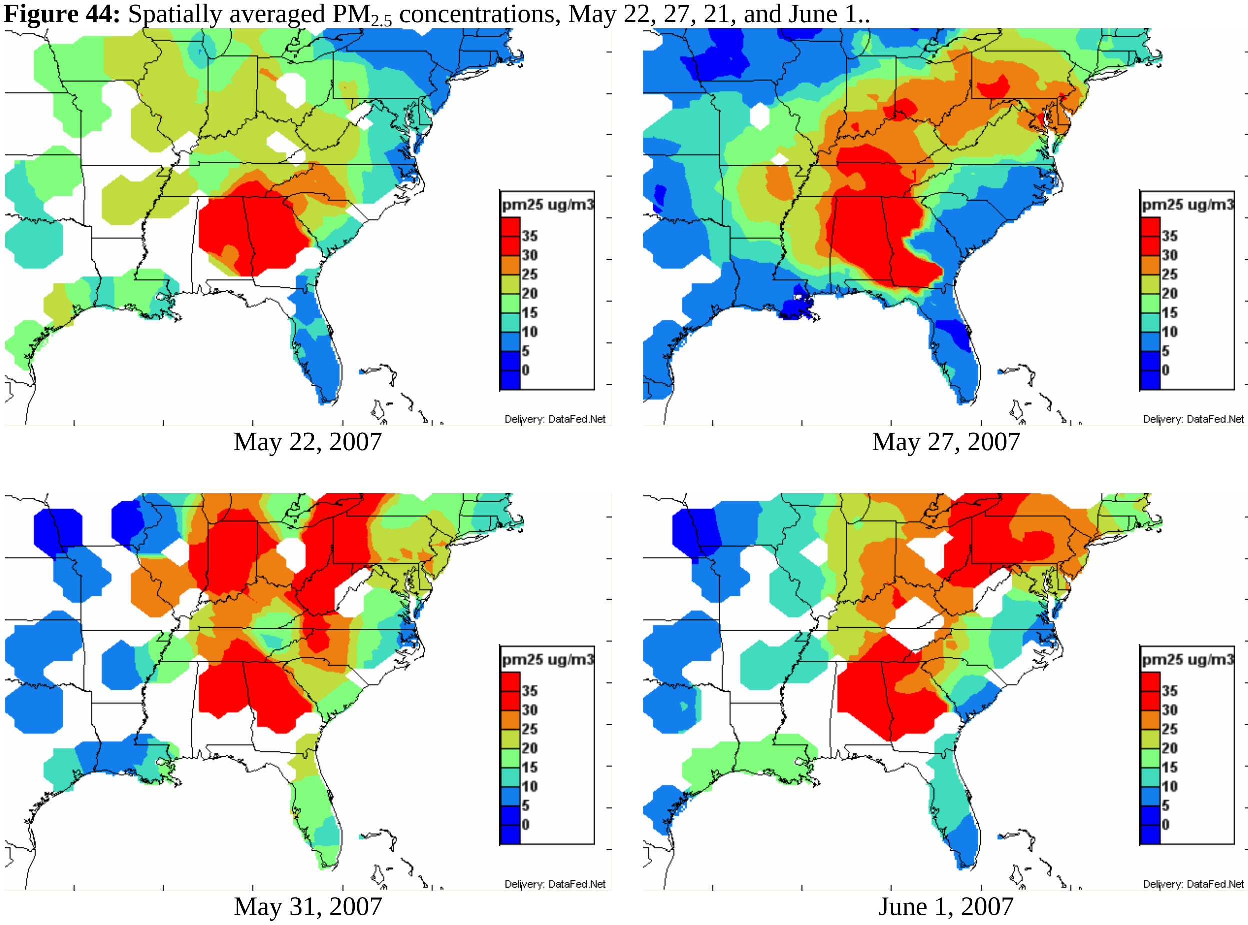
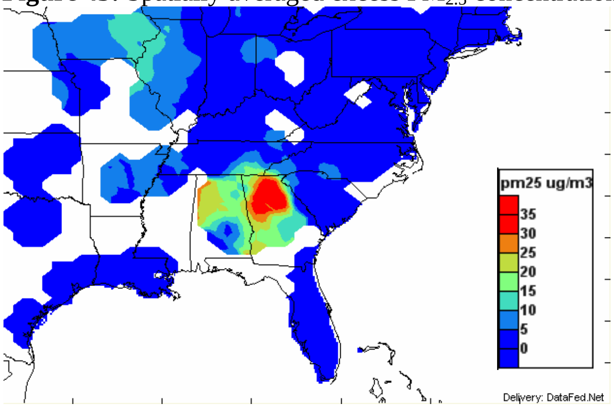
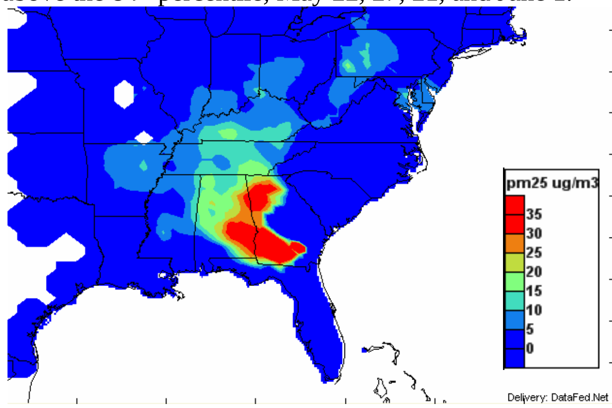


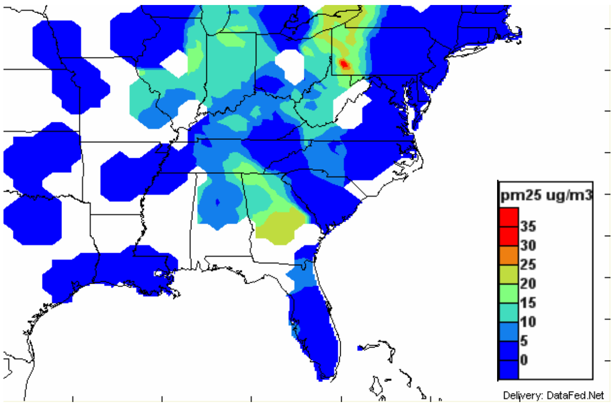
Figure 45: Spatially averaged excess $PM_{2.5}$ concentrations above the 84th percentile, May 22, 27, 21, and June 1.



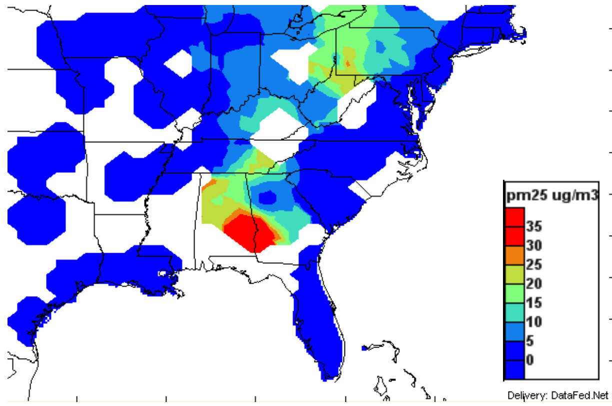
May 22, 2007



May 27, 2007

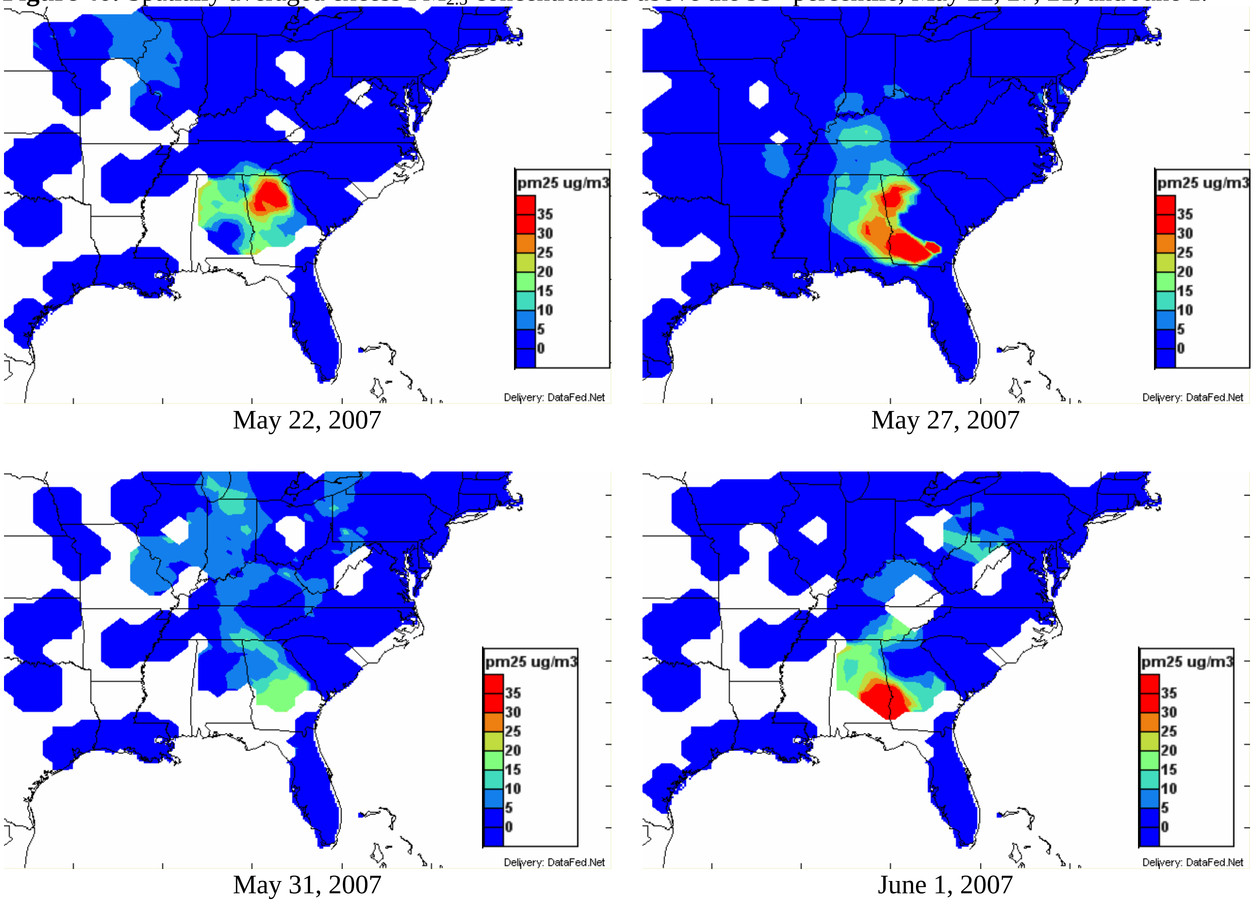


May 31, 2007



June 1, 2007

Figure 46: Spatially averaged excess $PM_{2.5}$ concentrations above the 95th percentile, May 22, 27, 21, and June 1.



EXCEEDANCE EVENT: Canadian Fires

Exceedance Dates:	6/12/07, 6/17/07, 6/18/07
MSA:	Chattanooga, TN-GA
Event Description:	Long-range transport of smoke from wildfires in northeast Canada

Table 12: Site-specific information used in analysis, concentrations in μg/m^3

AQS ID	Date	Observed Concentration	Monthly Average	84th Percentile	95th Percentile	EPA Concurrence
47-065-0031-1	6/12/2007	25.7	18.2	23.9	26.7	NO[1]
47-065-0031-1	6/17/2007	30.4	18.2	23.9	26.7	NO[1]
47-065-1011-1	6/17/2007	25.4	19.7	25.0	26.7	NO[1]
47-065-4002-1	6/17/2007	28.3	19.6	27.0	30.5	NO[1]
47-065-0031-1	6/18/2007	31.6	18.2	23.9	26.7	NO[1]

Notes: [1]Three-year monthly average above 15.0μg/m^3

Detailed Discussion of Evidence

A) Event Description

Documentation submitted by the Chattanooga-Hamilton County Air Pollution Control Bureau claims that long range transport of smoke from wildfires in northeast Canada caused NAAQS exceedances at the sites listed above. None of the requested values, however, passed both steps of the initial two-step analysis. Also, the documentation submitted by Chattanooga-Hamilton County did not demonstrate a clear causal relationship between the measured concentration and the event, and did not demonstrate that there would have been no exceedance or violation but for the event. Due to these reasons, no further analysis of these events is necessary. EPA concurrence was not given to any of these exceptional event flags.

EXCEEDANCE EVENT: Saharan Dust

Exceedance Dates: 6/24/07, 6/25/07, 6/26/07
MSA: Chattanooga, TN-GA
Event Description: Long-range transport of dust from the Sahara Desert in Africa

Table 13: Site-specific information used in analysis, concentrations in μg/m^3

AQS ID	Date	Observed Concentration	Monthly Average	84th Percentile	95th Percentile	EPA Concurrence
47-065-0031-1	6/24/2007	21.3	18.2	23.9	26.7	NO[1]
47-065-0031-1	6/25/2007	24.3	18.2	23.9	26.7	NO[1]
47-065-0031-1	6/26/2007	25.9	18.2	23.9	26.7	NO[1]
47-065-4002-2	6/26/2007	26.7	19.4	27.3	30.2	NO[1]
47-065-4002-1	6/26/2007	26.6	19.6	27.0	30.5	NO[1]

Notes: [1]Three-year monthly average above 15.0μg/m^3

Detailed Discussion of Evidence

A) Event Description

Documentation submitted by the Chattanooga-Hamilton County Air Pollution Control Bureau claims that long range transport of dust from the Sahara Desert in Africa caused NAAQS exceedances at the sites listed above. None of the requested values, however, passed both steps of the initial two-step analysis. Also, the documentation submitted by Chattanooga-Hamilton County did not demonstrate a clear causal relationship between the measured concentration and the event, and did not demonstrate that there would have been no exceedance or violation but for the event. Due to these reasons, no further analysis of these events is necessary. EPA concurrence was not given to any of these exceptional event flags.

EXCEEDANCE EVENT: Canadian Fires

Exceedance Dates:	7/4/07, 7/5/07
MSA:	Chattanooga, TN-GA
Event Description:	Long-range transport of smoke from wildfires in northeast Canada

Table 14: Site-specific information used in analysis, concentrations in μg/m^3

AQS ID	Date	Observed Concentration	Monthly Average	84th Percentile	95th Percentile	EPA Concurrence
47-065-0031-1	7/4/2007	30.9	18.6	26.2	36.2	NO[1]
47-065-4002-1	7/5/2007	26.8	17.7	25.8	30.6	NO[1]
47-065-0031-1	7/5/2007	32.2	18.6	26.2	36.2	NO[1]
47-065-4002-2	7/5/2007	26.9	17.8	23.8	31.8	NO[1]
47-065-1011-1	7/5/2007	25.3	16.9	22.4	34.2	NO[2]

Notes: [1]Three-year monthly average above 15.0μg/m^3

Detailed Discussion of Evidence

A) Event Description

Documentation submitted by the Chattanooga-Hamilton County Air Pollution Control Bureau claims that long range transport of smoke from wildfires in northeast Canada caused NAAQS exceedances at the sites listed above. None of the requested values, however, passed both steps of the initial two-step analysis. Also, the documentation submitted by Chattanooga-Hamilton County did not demonstrate a clear causal relationship between the measured concentration and the event, and did not demonstrate that there would have been no exceedance or violation but for the event. Due to these reasons, no further analysis of these events is necessary. EPA concurrence was not given to any of these exceptional event flags.

EXCEEDANCE EVENT: Northwestern U.S. Fires

Exceedance Dates:	8/3/07 – 9/6/07
MSA:	Chattanooga, TN-GA
Event Description:	Long-range transport of smoke from wildfires in Idaho and Montana

Table 15: Site-specific information used in analysis, concentrations in μg/m^3

AQS ID	Date	Observed Concentration	Monthly Average	84th Percentile	95th Percentile	EPA Concurrence
47-065-0031-1	8/3/2007	27.4	20.2	28.2	29.5	NO[1]
47-065-0031-1	8/4/2007	34.7	20.2	28.2	29.5	NO[1]
47-065-1011-1	8/4/2007	37.6	17.2	22.0	27.3	NO (sulfate)
47-065-4002-2	8/4/2007	36.8	21.0	30.5	34.9	NO (sulfate)
47-065-4002-1	8/4/2007	36.6	20.9	31.3	35.4	NO (sulfate)
47-065-0031-1	8/5/2007	29.8	20.2	28.2	29.5	NO[1]
47-065-0031-1	8/6/2007	29.4	20.2	28.2	29.5	NO[1]
47-065-0031-1	8/7/2007	24.6	20.2	28.2	29.5	NO[1]
47-065-4002-1	8/7/2007	25.4	20.9	31.3	35.4	NO[1]
47-065-4002-2	8/7/2007	24.7	21.0	30.5	34.9	NO[1]
47-065-0031-1	8/13/2007	23.5	20.2	28.2	29.5	NO[1]
47-065-4002-1	8/13/2007	23.9	20.9	31.3	35.4	NO[1]
47-065-4002-2	8/13/2007	23.2	21.0	30.5	34.9	NO[1]
47-065-0031-1	8/14/2007	27.5	20.2	28.2	29.5	NO[1]
47-065-0031-1	8/15/2007	27.2	20.2	28.2	29.5	NO[1]
47-065-1011-1	8/16/2007	32.8	17.2	22.0	27.3	NO[2]
47-065-0031-1	8/16/2007	33.6	20.2	28.2	29.5	NO[1]
47-065-4002-1	8/16/2007	34.3	20.9	31.3	35.4	NO[1]
47-065-0031-1	8/17/2007	28.1	20.2	28.2	29.5	NO[1]
47-065-0031-1	8/18/2007	25.1	20.2	28.2	29.5	NO[1]
47-065-4002-2	8/19/2007	34.5	21.0	30.5	34.9	NO[1]
47-065-0031-1	8/19/2007	37.9	20.2	28.2	29.5	NO
47-065-4002-1	8/19/2007	35.1	20.9	31.3	35.4	NO
47-065-0031-1	8/20/2007	18.8	20.2	28.2	29.5	NO[1]
47-065-0031-1	8/24/2007	23.4	20.2	28.2	29.5	NO[1]
47-065-0031-1	8/31/2007	29.1	20.2	28.2	29.5	NO[1]
47-065-4002-2	8/31/2007	31.6	21.0	30.5	34.9	NO[1]
47-065-4002-1	8/31/2007	31.9	20.9	31.3	35.4	NO[1]
47-065-0031-1	9/1/2007	33.2	16.4	24.0	26.1	NO[1]
47-065-0031-1	9/2/2007	31.6	16.4	24.0	26.1	NO[1]
47-065-0031-1	9/3/2007	28.4	16.4	24.0	26.1	NO[1]
47-065-1011-1	9/3/2007	28.1	16.2	24.1	29.0	NO[2]
47-065-4002-1	9/3/2007	29.1	17.4	25.4	31.5	NO[1]
47-065-4002-2	9/3/2007	28.5	17.4	25.6	31.5	NO[1]
47-065-0031-1	9/4/2007	29.2	16.4	24.0	26.1	NO[1]
47-065-0031-1	9/5/2007	27.9	16.4	24.0	26.1	NO[1]
47-065-0031-1	9/6/2007	24.5	16.4	24.0	26.1	NO[1]
47-065-4002-1	9/6/2007	27.2	17.4	25.4	31.5	NO[1]
47-065-4002-2	9/6/2007	26.7	17.4	25.6	31.5	NO[1]

Notes: [1]Three-year monthly average above 15.0μg/m^3

Detailed Discussion of Evidence

A) Event Description

Documentation submitted by the Chattanooga-Hamilton County Air Pollution Control Bureau claims that long range transport of smoke from wildfires in Idaho and Montana caused NAAQS exceedances at the sites listed above. The only requested concentrations that passed both steps of the initial two-step analysis, however, were the values collected on August 4, 2007 and August 19, 2007.

B) Causal Relationship Between the Event and Air Quality

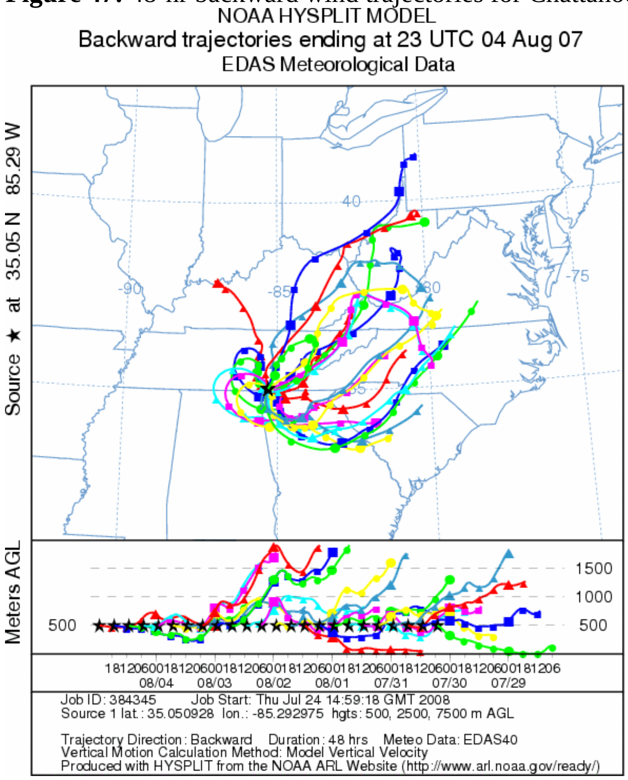
To evaluate the possible causal relationship of the event on air quality in Chattanooga, wind trajectories were analyzed to assess the probability of smoke transport from the wildfires. Figure 47 shows 48-hr backward trajectories for Chattanooga on August 4th and 19th. These trajectories, however, do not support significant air transport from the northwest. Figure 48 shows the NASA OMI aerosol concentrations observed on each day. This figure does confirm high aerosol concentrations in the claimed source region.

$PM_{2.5}$ speciation data collected on August 4, 2007 does not support the supposed smoke impact. High sulfate concentrations are evident on August 4th, as illustrated in Figure 49. This graph also indicates that organic carbon levels were not significantly above the normally expected range. No $PM_{2.5}$ speciation data was collected on August 19th.

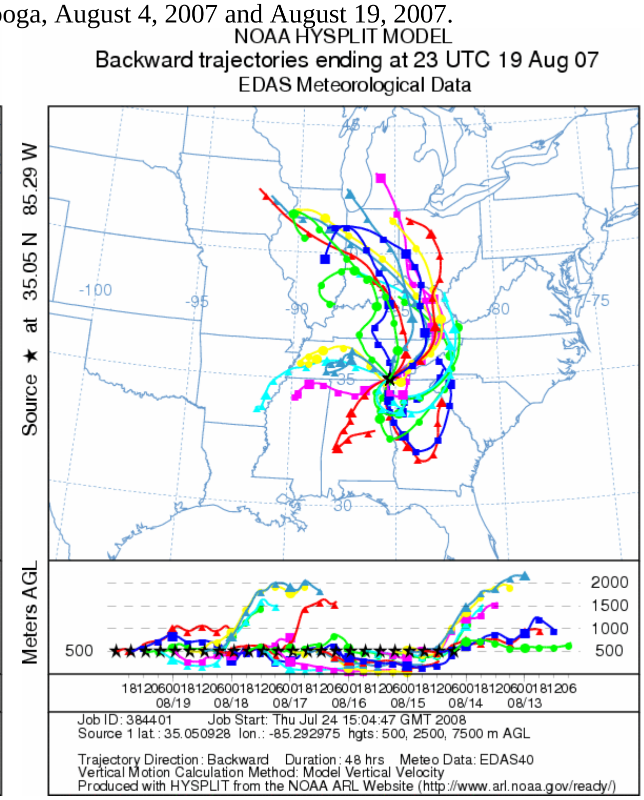
Since speciation data was not available for August 19, 2007, NAAPS aerosol smoke and sulfate maps were used instead as an indicator of possible smoke impact (Figures 50 and 51). Figure 50 shows aerosol smoke levels on August 19th, and does not indicate significant levels in the Chattanooga area. Figure 51, however, does show a moderate sulfate event on this day centered around the Chattanooga area.

The evidence discussed above shows that on both August 4, 2007, and August 19, 2007, the Chattanooga area was not significantly impacted by smoke from the northwestern wildfires. Speciation and satellite aerosol data show, rather, that these NAAQS exceedances were more likely driven by elevated $PM_{2.5}$ sulfate levels, indicating impact from local stationary and mobile sources. Also, the documentation submitted by Chattanooga-Hamilton County did not demonstrate a clear causal relationship between the measured concentration and the event, and did not demonstrate that there would have been no exceedance or violation but for the event. Therefore, EPA concurrence was not given to any of the values flagged during this event.

Figure 47: 48-hr backward wind trajectories for Chattanooga, August 4, 2007 and August 19, 2007.

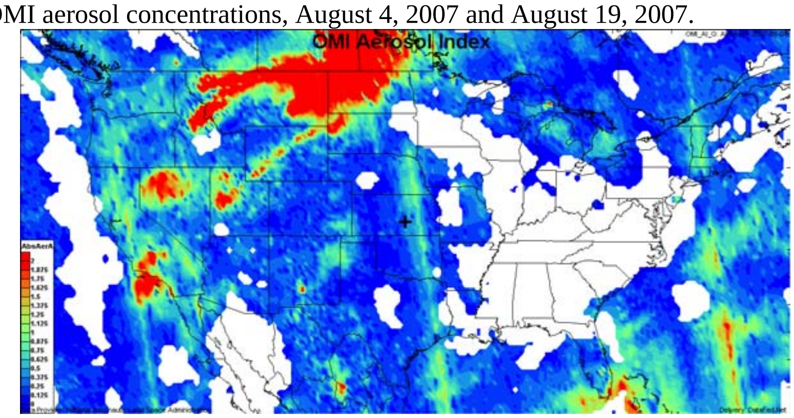


August 4, 2007

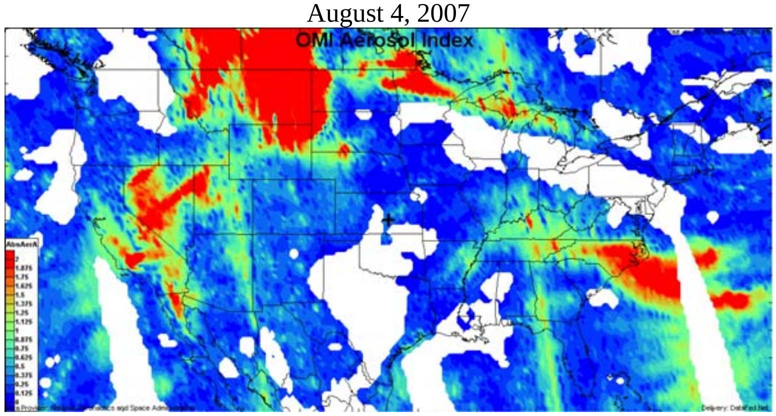


August 19, 2007

Figure 48: NASA OMI aerosol concentrations, August 4, 2007 and August 19, 2007.



August 4, 2007



August 19, 2007

Figure 49: $PM_{2.5}$ speciation data collected at the Rossville and Riverside sites during the month of August, 2004-2007

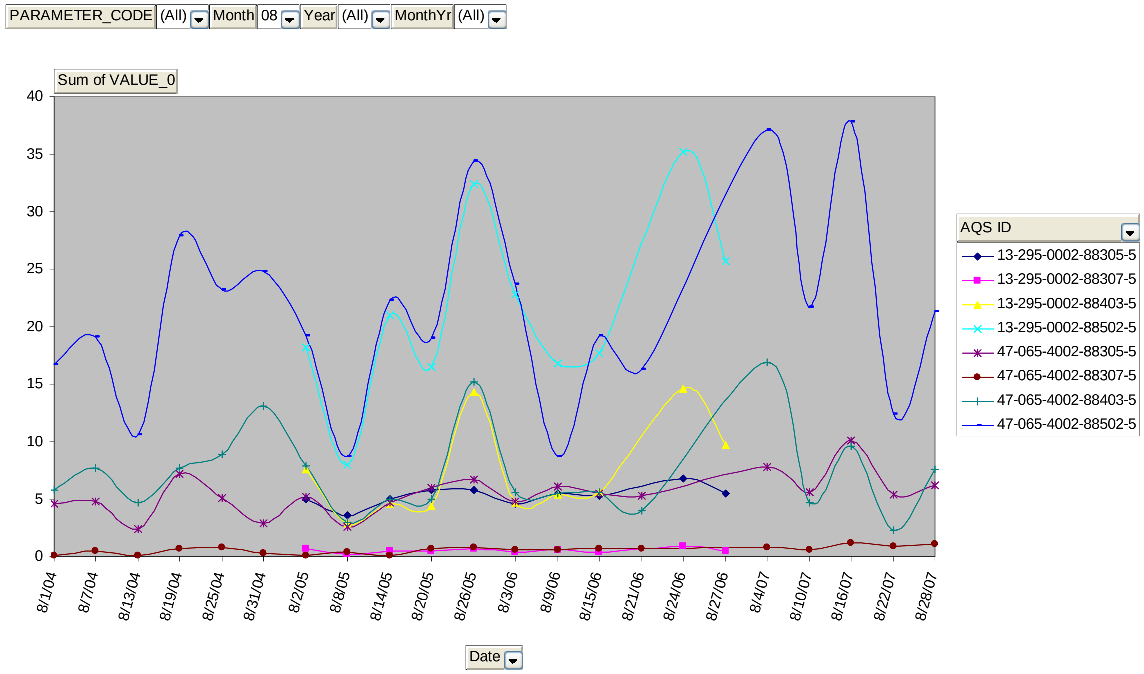


Figure 50: Aerosol smoke concentrations from NAAPS satellite, August 19, 2007.

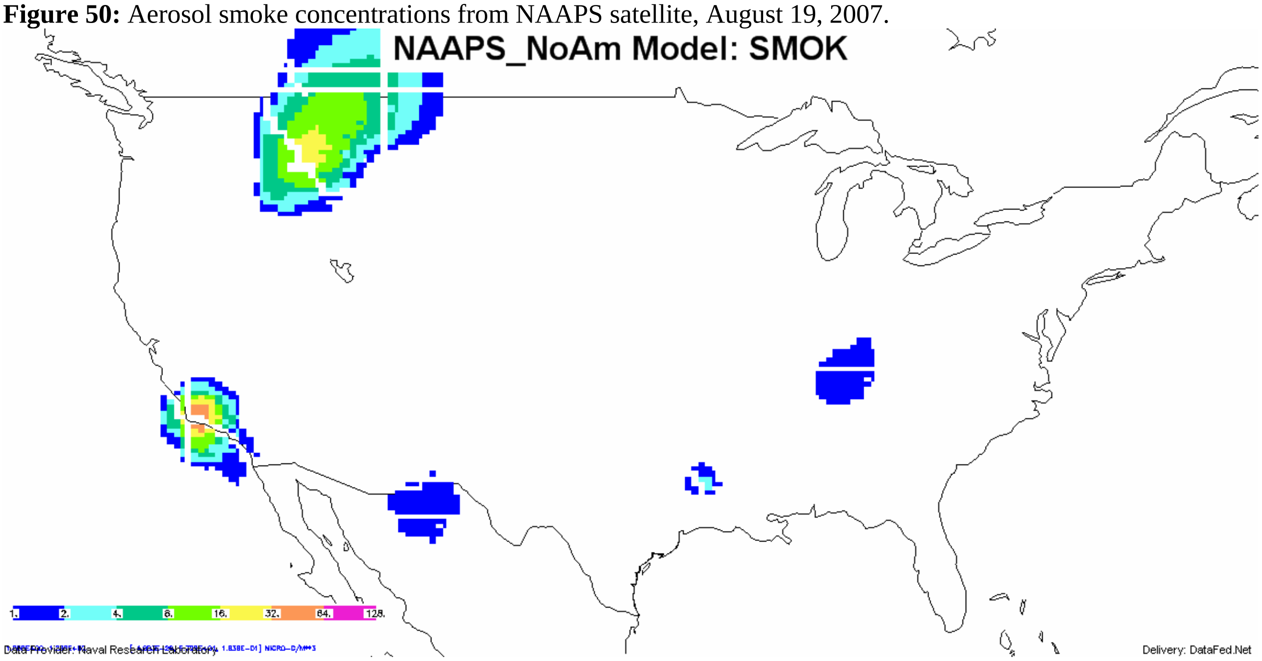
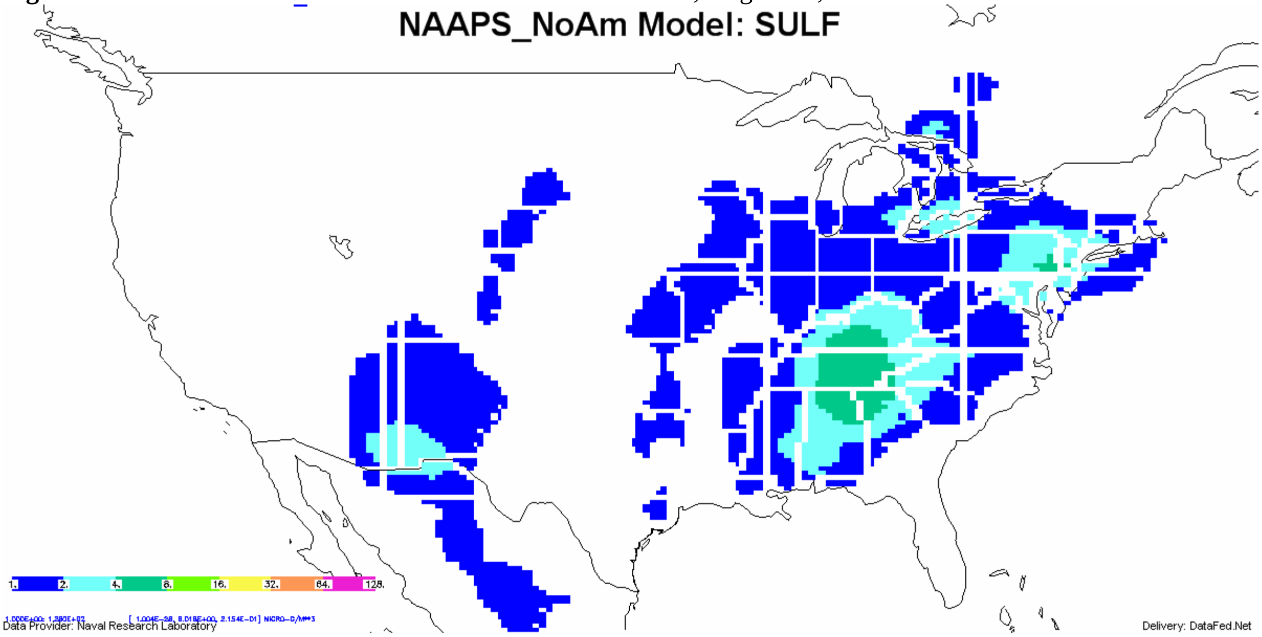


Figure 51: Aerosol sulfate concentrations from NAAPS satellite, August 19, 2007.



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Perry, K.D., 1999. Effects of outdoor pyrotechnic displays on the regional air quality of Western Washington State. *Journal of Air & Waste Management Association* Volume 49, Pages 146-155.

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Appendix A

Summary of All Flagged Data

AQS ID	Date	Value	Monthly Avg	84th Perc	95th Perc	µg Over 95th	Approved?	Event
47-065-4002-1	5/19/2005	32.6	16.0	21.3	26.5	**6.1**	NO (Mo Avg)	Mexican Fires
47-065-4002-2	5/19/2005	33.8	15.9	21.3	26.5	**7.3**	NO (Mo Avg)	Mexican Fires
47-065-0031-1	6/21/2005	26.2	18.9	25.6	31.5	**-5.3**	NO (Mo Avg)	Can, AK, US Fires
47-065-1011-1	6/21/2005	24.2	19.3	24.4	26.2	**-2.0**	NO (Mo Avg)	Can, AK, US Fires
47-065-4002-1	6/21/2005	27	19.4	26.8	30.5	**-3.5**	NO (Mo Avg)	Can, AK, US Fires
47-065-4002-2	6/21/2005	28.1	19.0	26.8	29.9	**-1.8**	NO (Mo Avg)	Can, AK, US Fires
47-065-4002-1	6/24/2005	35	19.4	26.8	30.5	**4.5**	NO (Mo Avg)	Can, AK, US Fires
47-065-4002-2	6/24/2005	34.9	19.0	26.8	29.9	**5.0**	NO (Mo Avg)	Can, AK, US Fires
47-065-0031-1	6/27/2005	24.3	18.9	25.6	31.5	**-7.2**	NO (Mo Avg)	Can, AK, US Fires
47-065-1011-1	6/27/2005	25.9	19.3	24.4	26.2	**-0.3**	NO (Mo Avg)	Can, AK, US Fires
47-065-4002-1	6/27/2005	26.4	19.4	26.8	30.5	**-4.1**	NO (Mo Avg)	Can, AK, US Fires
47-065-4002-1	6/30/2005	22.4	19.4	26.8	30.5	**-8.1**	NO (Mo Avg)	Can, AK, US Fires
47-065-4002-2	6/30/2005	25.1	19.0	26.8	29.9	**-4.8**	NO (Mo Avg)	Can, AK, US Fires
47-065-0031-1	7/3/2005	29.5	17.2	22.2	30.6	**-1.1**	NO (Mo Avg)	Can, AK, US Fires
47-065-1011-1	7/3/2005	21.5	15.8	22.3	28.3	**-6.8**	NO (Mo Avg)	Can, AK, US Fires
47-065-4002-1	7/3/2005	25.5	17.7	26.4	30.6	**-5.1**	NO (Mo Avg)	Can, AK, US Fires
47-065-4002-2	7/3/2005	22.5	17.7	26.3	30.9	**-8.4**	NO (Mo Avg)	Can, AK, US Fires
47-065-0031-1	7/24/2005	27.6	17.2	22.2	30.6	**-3.0**	NO (Mo Avg)	Saharan Dust
47-065-4002-1	7/24/2005	27.4	17.7	26.4	30.6	**-3.2**	NO (Mo Avg)	Saharan Dust
47-065-1011-1	7/27/2005	32.9	15.8	22.3	28.3	**4.7**	NO (Mo Avg)	Saharan Dust
47-065-0031-1	7/27/2005	36.9	17.2	22.2	30.6	**6.3**	NO (sulfate)	Saharan Dust
47-065-4002-1	8/5/2005	36	22.6	32.7	36.2	**-0.1**	NO (sulfate)	AK, Can fires
47-065-4002-2	8/5/2005	36.4	22.5	31.7	35.9	**0.5**	NO (sulfate)	AK, Can fires
47-065-0031-1	8/26/2005	28.2	21.7	29.1	33.0	**-4.8**	NO (Mo Avg)	AK, Can fires
47-065-1011-1	8/26/2005	29.7	18.8	25.3	34.2	**-4.5**	NO (Mo Avg)	AK, Can fires
47-065-4002-1	8/26/2005	33.4	22.6	32.7	36.2	**-2.8**	NO (Mo Avg)	AK, Can fires
47-065-4002-2	8/26/2005	33.1	22.5	31.7	35.9	**-2.8**	NO (Mo Avg)	AK, Can fires
47-065-4002-1	9/7/2005	15.9	17.1	26.0	28.7	**-12.8**	NO (Mo Avg)	NW Fires
47-065-4002-1	9/10/2005	30.1	17.1	26.0	28.7	**1.4**	NO (Mo Avg)	NW Fires
47-065-4002-2	9/10/2005	29.8	17.1	26.2	28.1	**1.7**	NO (Mo Avg)	NW Fires
47-065-0031-1	9/13/2005	35.8	17.8	25.6	31.2	**4.6**	NO (sulfate)	NW Fires
47-065-1011-1	9/13/2005	36.1	15.3	25.7	26.8	**9.3**	NO (sulfate)	NW Fires
47-065-4002-1	9/13/2005	36.3	17.1	26.0	28.7	**7.6**	NO (sulfate)	NW Fires
47-065-4002-2	9/13/2005	36.2	17.1	26.2	28.1	**8.1**	NO (sulfate)	NW Fires
47-065-0031-1	3/30/2006	28.7	14.8	22.5	26.5	**2.2**	NO (Mo Avg)	No Event Claimed

AQS ID	Date	Value	Monthly Avg	84th Perc	95th Perc	µg Over 95th	Approved?	Event
47-065-4002-1	3/30/2006	25.3	12.9	20.1	24.0	1.3	NO (Mo Avg)	No Event Claimed
47-065-1011-1	3/30/2006	21.3	10.8	17.7	20.1	1.2	NO (no event)	No Event Claimed
47-065-4002-1	6/16/2006	30.8	19.2	27.0	30.5	0.3	NO (Mo Avg)	Can fires
47-065-4002-2	6/16/2006	30.4	18.7	27.3	29.9	0.5	NO (Mo Avg)	Can fires
47-065-1011-1	6/16/2006	25.5	19.0	24.9	26.7	-1.2	NO (Mo Avg)	Can fires
47-065-4002-1	6/19/2006	17	19.2	27.0	30.5	-13.5	NO (Mo Avg)	Can fires
47-065-4002-2	6/19/2006	17.1	18.7	27.3	29.9	-12.8	NO (Mo Avg)	Can fires
47-065-0031-1	7/4/2006	49.2	17.0	22.3	30.4	18.8	YES	fireworks
47-065-1011-1	7/4/2006	37.1	16.2	22.2	27.2	9.9	YES	fireworks
47-065-4002-1	7/4/2006	38.5	16.4	24.3	27.2	11.3	YES	fireworks
47-065-4002-2	7/4/2006	38.6	16.0	22.1	26.9	11.7	YES	fireworks
47-065-0031-1	7/16/2006	23.2	17.0	22.3	30.4	-7.2	NO (Mo Avg)	Can fires
47-065-4002-1	7/16/2006	23	16.4	24.3	27.2	-4.2	NO (Mo Avg)	Can fires
47-065-4002-2	7/16/2006	22.3	16.0	22.1	26.9	-4.6	NO (Mo Avg)	Can fires
47-065-1011-1	7/16/2006	21.6	16.2	22.2	27.2	-5.6	NO (Mo Avg)	Can fires
47-065-4002-1	7/19/2006	31.7	16.4	24.3	27.2	4.5	NO (Mo Avg)	Can fires
47-065-4002-2	7/19/2006	32.3	16.0	22.1	26.9	5.4	NO (Mo Avg)	Can fires
47-065-4002-1	8/18/2006	38.5	22.4	33.2	35.7	2.8	NO (sulfate)	Can fires
47-065-4002-2	8/18/2006	38.4	22.4	31.7	35.6	2.8	NO (sulfate)	Can fires
47-065-4002-1	8/24/2006	32.9	22.4	33.2	35.7	-2.8	NO (Mo Avg)	Can fires
47-065-4002-2	8/24/2006	32.6	22.4	31.7	35.6	-3.0	NO (Mo Avg)	Can fires
47-065-4002-1	9/11/2006	32.7	18.3	26.2	29.7	3.1	NO (Mo Avg)	NW, Can Fires
47-065-4002-2	9/11/2006	32.9	18.2	26.5	29.2	3.7	NO (Mo Avg)	NW, Can Fires
47-065-0031-1	3/8/2007	23	12.2	17.5	20.2	2.8	NO (Insuf Evidence)	Local / SE fires
47-065-0031-1	3/9/2007	26.7	12.2	17.5	20.2	6.5	NO (Insuf Evidence)	Local / SE fires
47-065-0031-1	3/10/2007	26.3	12.2	17.5	20.2	6.1	NO (Insuf Evidence)	Local / SE fires
47-065-4002-1	3/10/2007	24.4	11.1	15.1	19.3	5.1	NO (Insuf Evidence)	Local / SE fires
47-065-4002-2	3/10/2007	23.5	11.3	14.9	18.8	4.7	NO (Insuf Evidence)	Local / SE fires
47-065-0031-1	3/11/2007	23.6	12.2	17.5	20.2	3.4	NO (Insuf Evidence)	Local / SE fires
47-065-0031-1	3/24/2007	21.9	12.2	17.5	20.2	1.7	YES	Signal Mt.
47-065-0031-1	3/25/2007	24.4	12.2	17.5	20.2	4.2	YES	Signal Mt.
47-065-4002-1	3/25/2007	32.7	11.1	15.1	19.3	13.4	YES	Signal Mt.
47-065-4002-2	3/25/2007	33	11.3	14.9	18.8	14.2	YES	Signal Mt.
47-065-1011-1	3/25/2007	22.3	9.4	12.3	17.3	5.1	YES	Signal Mt.
47-065-0031-1	3/26/2007	28.1	12.2	17.5	20.2	7.9	YES	Signal Mt.

AQS ID	Date	Value	Monthly Avg	84th Perc	95th Perc	µg Over 95th	Approved?	Event
47-065-0031-1	3/27/2007	31.2	12.2	17.5	20.2	11.0	YES	Signal Mt.
47-065-0031-1	3/28/2007	22.3	12.2	17.5	20.2	2.1	YES	Signal Mt.
47-065-4002-1	3/28/2007	23.6	11.1	15.1	19.3	4.3	YES	Signal Mt.
47-065-4002-2	3/28/2007	23.7	11.3	14.9	18.8	4.9	YES	Signal Mt.
47-065-0031-1	3/29/2007	19.6	12.2	17.5	20.2	-0.6	YES	Signal Mt.
47-065-0031-1	4/22/2007	27.5	13.8	19.9	24.1	3.4	NO (Mo Avg)	GA fire
47-065-0031-1	4/23/2007	20.5	13.8	19.9	24.1	-3.6	NO (Mo Avg)	GA fire
47-065-0031-1	5/2/2007	24.7	15.3	21.8	26.9	-2.2	NO (Mo Avg)	GA fire
47-065-0031-1	5/3/2007	26.3	15.3	21.8	26.9	-0.6	NO (Mo Avg)	GA fire
47-065-4002-1	5/3/2007	26.8	15.5	22.7	26.7	0.2	NO (Mo Avg)	GA fire
47-065-4002-2	5/3/2007	27	15.6	23.0	26.6	0.4	NO (Mo Avg)	GA fire
47-065-0031-1	5/4/2007	27.4	15.3	21.8	26.9	0.5	NO (Mo Avg)	GA fire
47-065-0031-1	5/5/2007	29.4	15.3	21.8	26.9	2.5	NO (Mo Avg)	GA fire
47-065-0031-1	5/22/2007	39	15.3	21.8	26.9	12.1	YES	GA fire
47-065-0031-1	5/23/2007	31.3	15.3	21.8	26.9	4.4	NO (Mo Avg)	GA fire
47-065-0031-1	5/27/2007	45.1	15.3	21.8	26.9	18.2	YES	GA fire
47-065-4002-1	5/27/2007	43.2	15.5	22.7	26.7	16.6	YES	GA fire
47-065-4002-2	5/27/2007	42.8	15.6	23.0	26.6	16.2	YES	GA fire
47-065-0031-1	5/28/2007	34.3	15.3	21.8	26.9	7.4	NO (Mo Avg)	GA fire
47-065-0031-1	5/31/2007	45.1	15.3	21.8	26.9	18.2	YES	GA fire
47-065-0031-1	6/1/2007	48	18.2	23.9	26.7	21.3	YES	GA fire
47-065-0031-1	6/2/2007	31.2	18.2	23.9	26.7	4.5	NO (Mo Avg)	GA fire
47-065-4002-1	6/2/2007	30.7	19.6	27.0	30.5	0.2	NO (Mo Avg)	GA fire
47-065-4002-2	6/2/2007	29.9	19.4	27.3	30.2	-0.3	NO (Mo Avg)	GA fire
47-065-0031-1	6/12/2007	25.7	18.2	23.9	26.7	-1.0	NO (Mo Avg)	Can fires
47-065-0031-1	6/17/2007	30.4	18.2	23.9	26.7	3.7	NO (Mo Avg)	Can fires
47-065-4002-1	6/17/2007	28.3	19.6	27.0	30.5	-2.2	NO (Mo Avg)	Can fires
47-065-1011-1	6/17/2007	25.4	19.7	25.0	26.7	-1.3	NO (Mo Avg)	Can fires
47-065-0031-1	6/18/2007	31.6	18.2	23.9	26.7	4.9	NO (Mo Avg)	Can fires
47-065-0031-1	6/24/2007	21.3	18.2	23.9	26.7	-5.4	NO (Mo Avg)	Saharan Dust
47-065-0031-1	6/25/2007	24.3	18.2	23.9	26.7	-2.4	NO (Mo Avg)	Saharan Dust
47-065-0031-1	6/26/2007	25.9	18.2	23.9	26.7	-0.8	NO (Mo Avg)	Saharan Dust
47-065-4002-1	6/26/2007	26.6	19.6	27.0	30.5	-3.9	NO (Mo Avg)	Saharan Dust
47-065-4002-2	6/26/2007	26.7	19.4	27.3	30.2	-3.5	NO (Mo Avg)	Saharan Dust
47-065-0031-1	7/4/2007	30.9	18.6	26.2	36.2	-5.3	NO (Mo Avg)	Can fires

AQS ID	Date	Value	Monthly Avg	84th Perc	95th Perc	µg Over 95th	Approved?	Event
47-065-0031-1	7/5/2007	32.2	18.6	26.2	36.2	-4.0	NO (Mo Avg)	Can fires
47-065-4002-1	7/5/2007	26.8	17.7	25.8	30.6	-3.8	NO (Mo Avg)	Can fires
47-065-4002-2	7/5/2007	26.9	17.8	23.8	31.8	-4.9	NO (Mo Avg)	Can fires
47-065-1011-1	7/5/2007	25.3	16.9	22.4	34.2	-8.9	NO (Mo Avg)	Can fires
47-065-0031-1	8/3/2007	27.4	20.2	28.2	29.5	-2.1	NO (Mo Avg)	NW fires
47-065-0031-1	8/4/2007	34.7	20.2	28.2	29.5	5.3	NO (Mo Avg)	NW fires
47-065-1011-1	8/4/2007	37.6	17.2	22.0	27.3	10.4	NO (sulfate)	NW fires
47-065-4002-1	8/4/2007	36.6	20.9	31.3	35.4	1.3	NO (sulfate)	NW fires
47-065-4002-2	8/4/2007	36.8	21.0	30.5	34.9	1.9	NO (sulfate)	NW fires
47-065-0031-1	8/5/2007	29.8	20.2	28.2	29.5	0.4	NO (Mo Avg)	NW fires
47-065-0031-1	8/6/2007	29.4	20.2	28.2	29.5	0.0	NO (Mo Avg)	NW fires
47-065-0031-1	8/7/2007	24.6	20.2	28.2	29.5	-4.8	NO (Mo Avg)	NW fires
47-065-4002-1	8/7/2007	25.4	20.9	31.3	35.4	-10.0	NO (Mo Avg)	NW fires
47-065-4002-2	8/7/2007	24.7	21.0	30.5	34.9	-10.2	NO (Mo Avg)	NW fires
47-065-0031-1	8/13/2007	23.5	20.2	28.2	29.5	-6.0	NO (Mo Avg)	NW fires
47-065-4002-1	8/13/2007	23.9	20.9	31.3	35.4	-11.5	NO (Mo Avg)	NW fires
47-065-4002-2	8/13/2007	23.2	21.0	30.5	34.9	-11.7	NO (Mo Avg)	NW fires
47-065-0031-1	8/14/2007	27.5	20.2	28.2	29.5	-2.0	NO (Mo Avg)	NW fires
47-065-0031-1	8/15/2007	27.2	20.2	28.2	29.5	-2.3	NO (Mo Avg)	NW fires
47-065-0031-1	8/16/2007	33.6	20.2	28.2	29.5	4.2	NO (Mo Avg)	NW fires
47-065-4002-1	8/16/2007	34.3	20.9	31.3	35.4	-1.1	NO (Mo Avg)	NW fires
47-065-1011-1	8/16/2007	32.8	17.2	22.0	27.3	5.6	NO (Mo Avg)	NW fires
47-065-0031-1	8/17/2007	28.1	20.2	28.2	29.5	-1.3	NO (Mo Avg)	NW fires
47-065-0031-1	8/18/2007	25.1	20.2	28.2	29.5	-4.3	NO (Mo Avg)	NW fires
47-065-4002-2	8/19/2007	34.5	21.0	30.5	34.9	-0.4	NO (Mo Avg)	NW fires
47-065-0031-1	8/19/2007	37.9	20.2	28.2	29.5	8.5	NO (Insuf Evidence)	NW fires
47-065-4002-1	8/19/2007	35.1	20.9	31.3	35.4	-0.3	NO (Insuf Evidence)	NW fires
47-065-0031-1	8/20/2007	18.8	20.2	28.2	29.5	-10.7	NO (Mo Avg)	NW fires
47-065-0031-1	8/24/2007	23.4	20.2	28.2	29.5	-6.1	NO (Mo Avg)	NW fires
47-065-0031-1	8/31/2007	29.1	20.2	28.2	29.5	-0.3	NO (Mo Avg)	NW fires
47-065-4002-1	8/31/2007	31.9	20.9	31.3	35.4	-3.5	NO (Mo Avg)	NW fires
47-065-4002-2	8/31/2007	31.6	21.0	30.5	34.9	-3.3	NO (Mo Avg)	NW fires
47-065-0031-1	9/1/2007	33.2	16.4	24.0	26.1	7.1	NO (Mo Avg)	NW fires
47-065-0031-1	9/2/2007	31.6	16.4	24.0	26.1	5.5	NO (Mo Avg)	NW fires
47-065-0031-1	9/3/2007	28.4	16.4	24.0	26.1	2.3	NO (Mo Avg)	NW fires

AQS ID	Date	Value	Monthly Avg	84th Perc	95th Perc	µg Over 95th	Approved?	Event
47-065-4002-1	9/3/2007	29.1	17.4	25.4	31.5	-2.4	NO (Mo Avg)	NW fires
47-065-4002-2	9/3/2007	28.5	17.4	25.6	31.5	-3.0	NO (Mo Avg)	NW fires
47-065-1011-1	9/3/2007	28.1	16.2	24.1	29.0	-0.9	NO (Mo Avg)	NW fires
47-065-0031-1	9/4/2007	29.2	16.4	24.0	26.1	3.1	NO (Mo Avg)	NW fires
47-065-0031-1	9/5/2007	27.9	16.4	24.0	26.1	1.8	NO (Mo Avg)	NW fires
47-065-0031-1	9/6/2007	24.5	16.4	24.0	26.1	-1.6	NO (Mo Avg)	NW fires
47-065-4002-1	9/6/2007	27.2	17.4	25.4	31.5	-4.3	NO (Mo Avg)	NW fires
47-065-4002-2	9/6/2007	26.7	17.4	25.6	31.5	-4.8	NO (Mo Avg)	NW fires
47-065-0031-1	12/8/2007	30.5	13.9	24.3	30.1	0.4	NO (Mo Avg)	Local Fires
47-065-4002-1	12/8/2007	31.8	11.8	17.9	25.0	6.8	NO (Mo Avg)	Local Fires
47-065-4002-2	12/8/2007	30.9	12.8	19.5	25.2	5.7	NO (Mo Avg)	Local Fires
47-065-1011-1	12/8/2007	31.8	10.1	16.2	19.4	12.4	NO (no event)	Local Fires
47-065-0031-1	12/9/2007	25.4	13.9	24.3	30.1	-4.7	NO (Mo Avg)	Local Fires
47-065-0031-1	12/20/2007	31.3	13.9	24.3	30.1	1.2	NO (Mo Avg)	Local Fires
47-065-4002-1	12/20/2007	32.2	11.8	17.9	25.0	7.2	NO (Mo Avg)	Local Fires
47-065-4002-2	12/20/2007	32.2	12.8	19.5	25.2	7.0	NO (Mo Avg)	Local Fires
47-065-1011-1	12/20/2007	23.8	10.1	16.2	19.4	4.4	NO (no event)	Local Fires
47-065-0031-1	12/21/2007	21.9	13.9	24.3	30.1	-8.2	NO (Mo Avg)	Local Fires

Appendix B

AQS Site and Parameter Codes

AQS Site ID	Site Name	Address	Latitude	Longitude
13-295-0002	Rossville	601 Maple St, Rossville GA	+34.978900^{o}	-85.300900^{o}
47-065-0031	East Ridge	1510 Maxwell Road, East Ridge	+34.990944^{o}	-85.228750^{o}
47-065-1011	Soddy Daisy	Soddy Daisy H.S. 00620 Sequoyah Rd.	+35.233527^{o}	-85.181806^{o}
47-065-4002	Riverside	Riverside Substation 911 Siskin Dr.	+35.050928^{o}	-85.292975^{o}

AQS Parameter Code	Description
88101	$PM_{2.5}$ - Local Conditions (Federal Reference Method)
88502	$PM_{2.5}$ Speciation Sampler Total Mass
88301	Ammonium Ion $Pm_{2.5}$ (Local Conditions)
88305	Organic Carbon, Unadjusted $PM_{2.5}$ (Local Conditions)
88307	Elemental Carbon $PM_{2.5}$ (Local Conditions)
88403	Sulfate $PM_{2.5}$ (Local Conditions)

Appendix C

Fireworks Display Permits: July 4, 2006

State of Tennessee

CHATTANOOGA GOLF & COUNTRY CLUB
P.O. BOX 4049
CHATTANOOGA, TN 37405

FIREWORKS DISPLAY PERMIT

Having complied with the safety measures, as set out in Tennessee Code Annotated, Title 68, Chapter 22 and applicable rules and regulations governing the sale, storage and use of fireworks and having paid the required fee, the holder Tony Lamacchia of CHATTANOOGA GOLF & COUNTRY CLUB is hereby granted a permit to engage in the **DISPLAY OF FIREWORKS** as a PERMIT HOLDER at Chattanooga Golf & Country Club for the following date(s):

July 4, 2006 35.04551
-85.23638

The permit is issued subject to any valid private act or municipal ordinance which prohibits or restricts the sale or use of fireworks.

IN WITNESS WHEREOF, I have hereunto set my hand caused the seal of my office to be affixed at the City of Nashville, Tennessee this 30th day of June, 2006.

Paula A. Flowers
COMMISSIONER

IN THE PROBATE COURT OF Catoosa COUNTY

FIREWORKS DISPLAY PERMIT

APPLICANT: Talley Green/Lake Winnepesaukah
1730 Lakeview Drive
Rossville, GA 30741

TELEPHONE: 706-866-5681

FAX: 706-858-0497

Your request is hereby approved for the above applicant to conduct a Fireworks Display. The display will be of such character as will not be hazardous to person or property.

SPONSOR: Lake Winnepesaukah

DATE OF DISPLAY: July 4, 2006 (rain date July 6, 2006)

TIME: 10:00 p.m.

LOCATION OF DISPLAY: Lake Winnepesaukah
1730 Lakeview Drive
Rossville, GA 30741

The display will be conducted by Pyrotecnico

Permission has been granted for Thomas Huff to conduct a fireworks display in accordance with the above. (This permit is Non-Transferable.)

[signature]
Judge of the Probate Court

(SEAL)

6/20/06
Date Approved

6.

Appendix D

Newspaper Articles Documenting Signal Mountain Wildfire: March 24 – 29, 2007

Chattanooga Times Free Press

1…sday, March 27, 2007 • Vol. 138, No. 103 • To Give the News Impartially, Without Fear or Favor 40 PAGES 6 SECTIONS • • • 50¢

Firefighters battle 4-day blaze

Foresters are 'busting it' to contain Signal Mountain wildfire

By Lauren Gregory
Staff Writer

Members of an exhausted team of local foresters said they are grateful to receive help today from Tennessee and fe-eral outfits as they work to …guish a wildfire estimated t… …ave spread over more than 300 acres on Signal Mountain since Friday night.

INSIDE
■ County on track for clean air, Metro

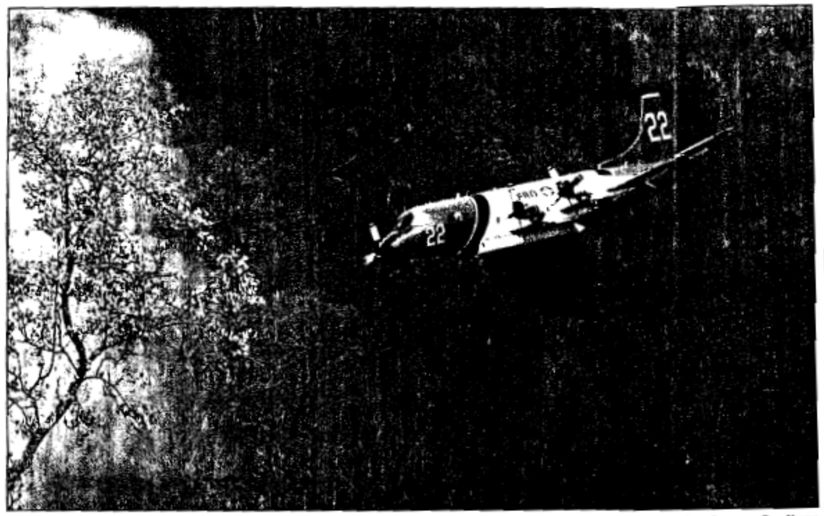
"We've got some pretty tired puppies," said Jim Lane of the Tennessee Department of Agriculture's Division of Forestry, who was supervising a Hixson-based crew of 24 he said had just finished fighting a fire in the North Chickamauga Creek area last week when they were called to this fire.

"These guys have been busting it for four or five days," Mr. Lane said Monday, estimating the effort would continue "at least a couple more days, if everything goes well."

The fire had not required any evacuations as of Monday and had resulted in just one injury: minor burns on a forester from McMinn County, officials said.

…ames jumped across to the … …al Mountain side of Middle Creek on Sunday, threatening a residential area in which the retirement community Alexian

See FIRE, Page A4



Staff Photos by Dan Henry

A P-3 airplane from Knoxville drops the second part of a 2,550 gallon load of fire retardant on an area near Alexian Village on Signal Mountain after a forest fire threatened homes in the area Monday.

Staff Graphic by Beck Towery

BY THE NUMBERS

- ■ 310 — acres in estimated burn area
- ■ 24 — members of the Hixson-based state forestry crew fighting the blaze
- ■ 20 — members of the USDA Forest Service unit sent to assist
- ■ 6 — members of the state forestry crew from Greeneville, Tenn., sent to assist
- ■ $6,000 — estimated cost for one aerial chemical retardant drop

Tennessee Forestry technician Johnny Dunn studies a map of the area while at the trailhead to Edwards Point.

ON THE WEB: For video and audio with this story, go to www.timesfreepress.com.

Fire

• Continued from Page A1

Village is situated. However, forestry officials said firefighters managed to control that outbreak.

They were working Monday to ensure the rest of the area across the creek was not at risk, according to Robert Rhinehart, assistant district forester for Southeast Tennessee.

A 20-person USDA Forest Service unit and a six-person unit from the Tennessee Forestry Division office in Greeneville, Tenn., were called in to help on the "tremendously difficult terrain" and will extend their efforts into today, Mr. Rhinehart said. The Walden's Ridge terrain contains a rock face, is extremely steep and is difficult for firefighters to get to on foot.

CONTAINING THE BLAZE

Manpower has been in great demand since the fire — which may have originated with a campfire on Edwards Point — was sparked Friday, according to Mr. Lane.

"We've got resources from all over Southeast Tennessee, and we really don't have enough people," he said, explaining that foresters and support personnel from surrounding counties have had to concentrate on preventing a spread across Middle Creek while the fire also is moving into the Suck Creek area.

The Suck Creek portion of the fire, which is not as close to residential areas, has had to go "on the back burner" to prevent the fire from crossing Middle Creek, Mr. Lane said.

"Once we get this east flank taken care of, we can deal with that," he said.

Efforts on Monday included the use of an air tanker, which arrived from Knoxville to drop two separate 2,550-gallon loads of chemical retardant along Middle Creek to create a barrier for the fire.

Staff Photo by Dan Henry

A Black Hawk helicopter hauls a bucket of water that it drew from the Tennessee River to aid with extinguishing a fire Monday on Signal Mountain.

The "red slurry" included an amount of fertilizer that would help the retardant stick to trees and other surfaces below, Mr. Rhinehart said.

"It works better than water because water, it just hits and it vaporizes and it's gone, whereas the retardant, it sticks to everything," explained Johnny Dunn, a Hixson-based forestry technician.

Before Sunday night, local foresters had not used the costly aerial drop technique since 2001, said Mr. Rhinehart, who estimated that each load costs about $6,000.

Several area residents gathered Monday at Alexian Village to watch the plane descend into the gorge and release its spray, a phenomenon Jean Anderson likened to "something out of a science fiction movie."

Richard Van Scoy, another area resident, brought a camera to record the action.

"We go to stock car races to watch the wreck," he said. "It certainly holds true (here), this kind of morbid fascination."

A Black Hawk helicopter provided additional assistance, dumping up to 600 gallons of Tennessee River water onto the fire at one time. The helicopter likely will be used again today, Mr. Rhinehart said.

The extra assistance has been a necessity during the area's recent hot, dry weather, Mr. Lane said, citing drought conditions as "a major factor" in the spread of the fire.

"The fuels are extremely dry, and it doesn't take but a spark to get it going," he said.

WARM AND WINDY

After a record-breaking 88 degrees on Sunday, temperatures had reached 83 degrees by Monday afternoon, just shy of an 84-degree record set in 1991, said Mary Black, a meteorologist with the National Weather Service in Morristown, Tenn.

The mercury is expected to reach the lower 80s today, Ms. Black said, with just a 20 percent chance of scattered showers and thunderstorms predicted for the late afternoon. South winds are expected to blow between 10 and 15 mph, which she said is slightly above the normal five to seven mph in the area.

Without enough rain, said Amber McCorvie, spokeswoman for the Chattanooga-Hamilton County Air Pollution Control Bureau, air quality problems reported Monday likely will not clear today.

"It doesn't look like we're going to be able to get any relief anytime soon," Ms. McCorvie said. "Rain would help, but it would have to be a pretty significant rain."

The Air Pollution Control Bureau issued a "code red" health notice Monday afternoon, indicating air quality was "in the unhealthy range for the general population" because of increased levels of particulate matter. The alert was reduced to a "code orange" for today, meaning that air quality still is unhealthy for sensitive groups including people with heart or lung disease, older adults and children.

Officials advise at-risk residents to stay indoors or reduce "prolonged or heavy exertion."

The bureau will ask the U.S. Environmental Protection Agency to attribute Monday's air quality readings to "an unusual and exceptional event," which prevents the readings from factoring into the region's attainment status for particulate matter, officials said.

Staff writers Emily Berry and Ian Berry contributed to this story.

E-mail Lauren Gregory at lgregory@timesfreepress.com

CODE ORANGE

Air quality was "unhealthy" in Chattanooga on Monday, and officials have declared a "Code Orange" alert for today. On "Code Orange" days, 50 percent of the population could be at risk, but members of the following groups may experience more serious health effects:

- Children who are active outdoors
- Adults exercising or working outdoors
- People with asthma or other respiratory conditions
- People with unusual susceptibility to air pollution

You can reduce your exposure to pollution by:

- Planning strenuous activity when pollution levels are forecast to be lower
- Reducing time spent at vigorous activity
- Choosing a less strenuous activity (going for a walk instead of a jog)

Source: Chattanooga-Hamilton County Air Pollution Control Bureau

Wildfires' smoke clouds area skyline

BY MIKE O'NEAL
STAFF WRITER

The sight and smell of smoke continued to mar the skies above Walden's Ridge on Saturday, the result of a third day of wildfires.

No sooner had firefighters contained a blaze on the slopes of the North Chickamauga Creek Gorge than fire flared near Edwards Point, according to Tom Hudlow, district forester with the Tennessee Division of Forestry.

"Crews reported there was no smoke; it's under control," Mr. Hudlow said concerning the fire that burned the north facing slope of bluffs along North Chickamauga Creek.

Foresters believe an arsonist on Thursday evening set the fire that burned 150 to 200 acres from the Blue Hole area near Soddy-Daisy upstream to a point below Boston Branch. As many as 19 firefighters were involved in containing that wildfire, Mr. Hudlow said.

A careless smoker caused a fire Saturday on the slopes and atop bluffs in Prentice Cooper State Forest, said Hamilton County Emergency Services spokeswoman Amy Maxwell.

Dry conditions and an ample supply of fuel helped the new fire spread faster than crews using rakes could clear combustible material from its path. Firefighters could be heard using radios to call for four-wheelers and leaf blowers to blast fire breaks ahead of the spreading flames.

In addition to the fires along Walden's Ridge, a forestry service bulldozer was dispatched to assist in containing a small wildfire near Sequoyah Road in northern Hamilton County, officials said.

The potential for wildfire increases as drought continues across the tri-state region, and meteorologists say chances of significant rainfall are slight for about a week.

Even so, no fires in the "100-acre range" had been reported Saturday in Northwest Georgia, according to communications dispatchers for the Georgia Forestry Commission.

But that was not the case in nearby counties of Alabama.

"One is burning near Low Gap Mountain near Stevenson," said Linda Reaves, radio operator for the Alabama Forestry Commission.

The fire near Stevenson burned about 1,000 acres, and a fire in Cherokee County, Ala., charred about 500 acres this weekend, Ms. Reaves said. In addition, she said an arsonist had been seen setting a series of fires along county roads 91 and 93 in the Hog Jaw Valley/Bryant area.

"We are working long hours, and there doesn't seem to be any relief in sight," Ms. Reaves said.

E-mail Mike O'Neal at moneal@timesfreepress.com

3/29/07 Chattanooga Times Free Press

Crews monitor 'contained' wildfire

B4 • Thursday, March 29, 2007 • •

By Beverly A. Carroll
Staff Writer

Forestry crews spent Wednesday walking the firebreaks around the site of a wildfire on Walden's Ridge that burned for five days and charred more than 500 acres of woody, mountainous terrain.

"We still have some of our folks up there, and we have the six-person crew from Greeneville, Tenn., up there," said Robert Rhinehart, assistant forester for the Southeast Tennessee district office. "Crews are also watching it from the air."

Nearly 50 people manned state and federal forestry crews to fight a fire that officials believe started Friday at Edwards Point, a scenic overlook on Walden's Ridge. Lack of rain aggravated efforts to contain the fire and contributed to its spread to Suck Creek Mountain, forestry officials said.

The Tennessee Army National Guard sent a helicopter to drop water, and an air tanker dropped two separate 2,550-gallon loads of a chemical retardant on the area, officials said.

The fire was declared contained Tuesday but is not extinguished, Mr. Rhinehart said.


Robert Rhinehart

"When we leave the fire, we'll call it out," he said. "I'm not sure when that will be, but I know (crews) will look at it from the air for a few days since we haven't gotten any rain."

Mr. Rhinehart said people may see smoke or hot spots in the area and think the fire still is a threat. But those spots usually are behind fire breaks, or ditches where crews have cleared or burned combustible materials, he said.

"When the main fire gets there, it doesn't have any place to go but out," he said. "In a fire (this size) we are only concerned about the perimeter. What people see is interior burns."

Mr. Rhinehart said officials do not want to fight those areas and "put our personnel at risk."

Derek Osborne, crew boss of a team from Oregon, said foresters go back around the perimeter once the line is established.

"We mop up afterward, making sure there isn't anything else that could be lit up," said Mr. Osborne, whose crew joined the effort Tuesday.

At one point the fire crossed Middle Creek and came near the Alexian Village retirement community in the town of Signal Mountain. Crews doused that fire, forestry officials said.

They said no one was evacuated, and only one minor injury was reported.

E-mail Beverly A. Carroll at bcarroll@timesfreepress.com