



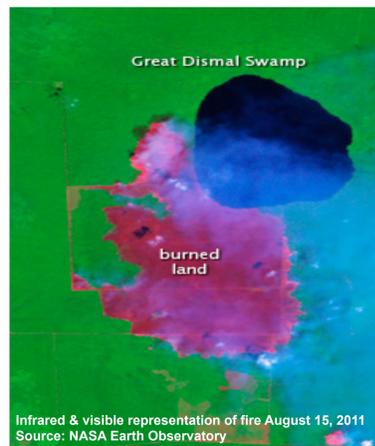
Smoke Plumes of the Lateral West Fire 2011



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Background

The Lateral West Fire of 2011 began when lightning struck the Great Dismal Swamp National Wildlife Refuge in Suffolk, Virginia on August 4, 2011 at 7pm. Media reports of smoke extended from the Hampton Roads region to 200 miles away. The duration of 111 days included a direct hit by Hurricane Irene on August 28 which dispensed 10-15 inches of rain on the site.



CO & PM_{2.5}

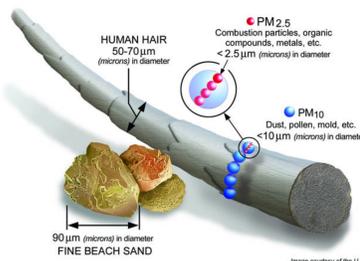
Carbon monoxide (CO) and fine particulate matter (PM_{2.5}) are commonly monitored during air quality testing. Higher CO measurements are encountered within smoke plumes in the vicinity of the wildfire. CO emissions can increase up to 4x when a fire has large amounts of peat as was the case for the Lateral West Fire. PM_{2.5} is capable of traveling vast distances due to the minute size, approximately 1/100 diameter of a human hair. Materials of this size are inhaled deeply in the lungs and can aggravate existing health issues or create new ones if exposure continues.

Air Quality Index is both color coded and numerically standardized to increase understanding.

Air Quality Index (AQI) Values	Levels of Health Concern	Colors
When the AQI is in this range:	...air quality conditions are:	...as symbolized by this color:
0 to 50	Good	Green
51 to 100	Moderate	Yellow
101 to 150	Unhealthy for Sensitive Groups	Orange
151 to 200	Unhealthy	Red
201 to 300	Very Unhealthy	Purple
301 to 500	Hazardous	Maroon

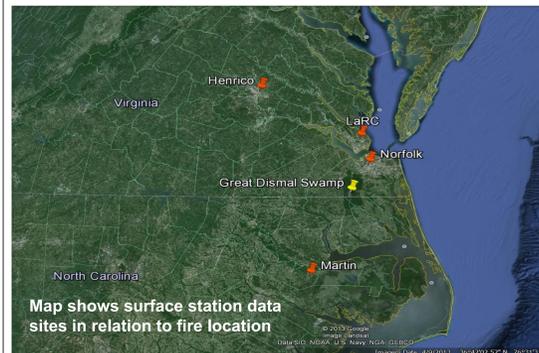
The Environmental Protection Agency (EPA) has issued definitions for major air pollutants as part of the Clean Air Act.

AQI Breakpoint Definitions		
AQI Range	8 hr CO in ppm	24hr PM-2.5 in µg/m ³ LC
0-50	0-4.4	0-12.0
51-100	4.5-9.4	12.1-35.4
101-150	9.5-12.4	35.5-55.4
151-200	12.5-15.4	55.5-150.4
201-300	15.5-30.4	150.5 - 250.4
301-400	30.5-40.4	250.5 - 350.4
401-500	40.5-50.4	350.5 - 500.4
500+	Not Defined	500.5 - 999.9



Size comparison of particulate matter to human hair

Surface Data Study



Plumes from the Great Dismal Swamp flowed out and away from the Lateral West Fire and were recorded at numerous surface air monitoring sites. Figures 1-8 contain data from four locations in the region which recorded CO or PM_{2.5} during August 2011. Figure 1 contains CO & PM_{2.5} data from Henrico, 135km northwest of the fire. Red signifies CO levels while blue indicates PM_{2.5}. Langley Research Center (LaRC) also collected data on both pollutants, graphed in figure 2. The coincidental plumes of PM_{2.5} & CO are typical patterns of wildfire. Figure 7 contains CO data for Norfolk, the closest monitoring site to the fire. Figure 8 illustrates PM_{2.5} data from Martin, NC south of the swamp.

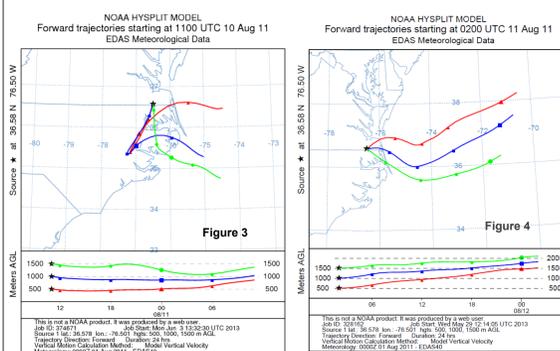
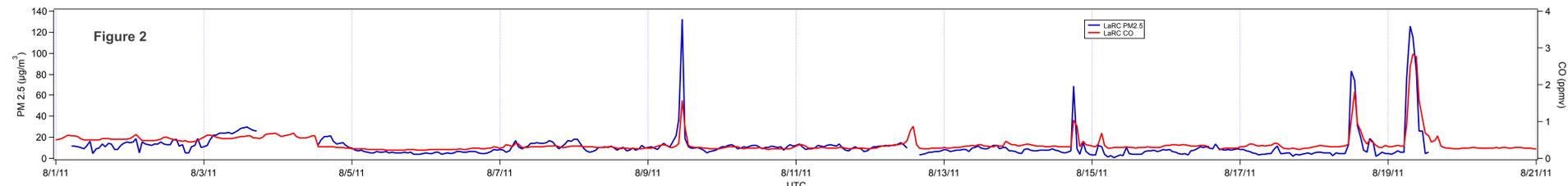
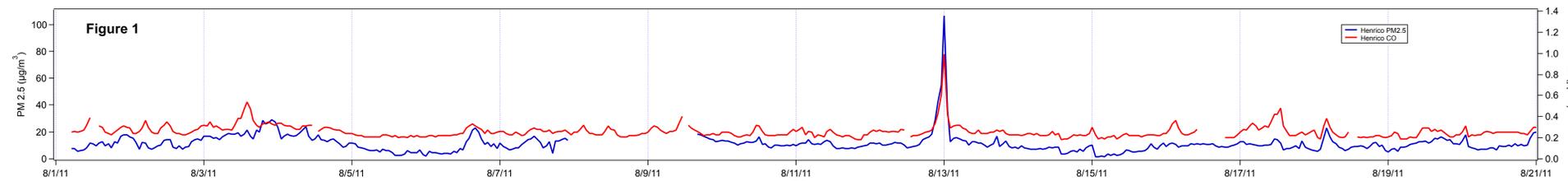
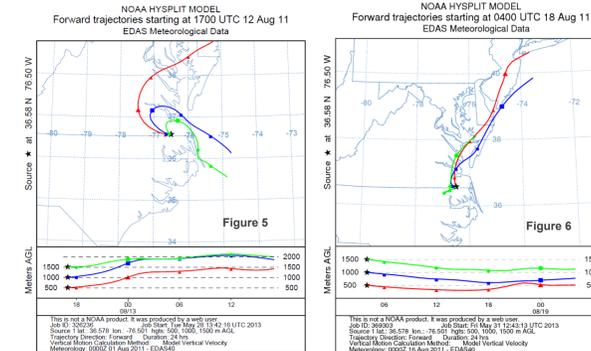
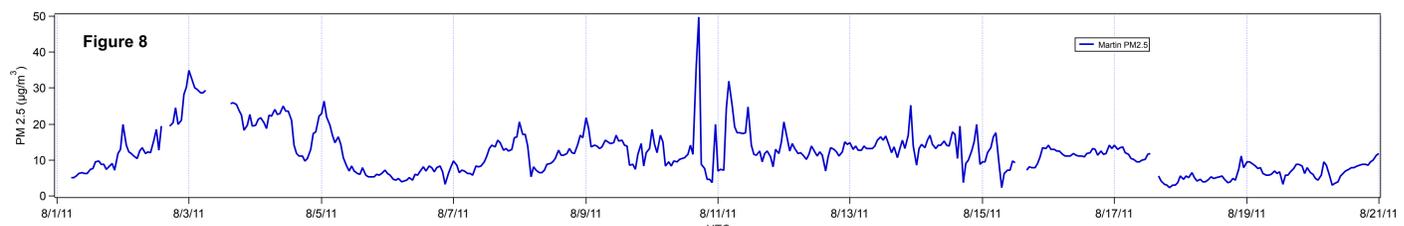
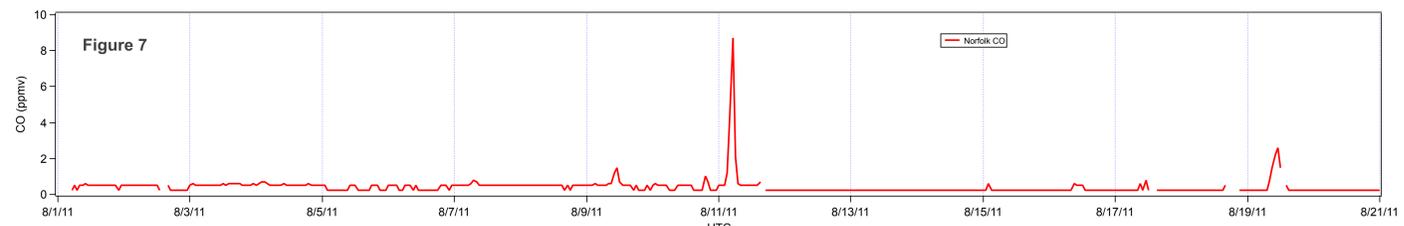


Figure 3 demonstrates that the Martin plume on August 10 originated from the Lateral West Fire. Figure 4 illustrates the August 11 Norfolk plume source as the fire.

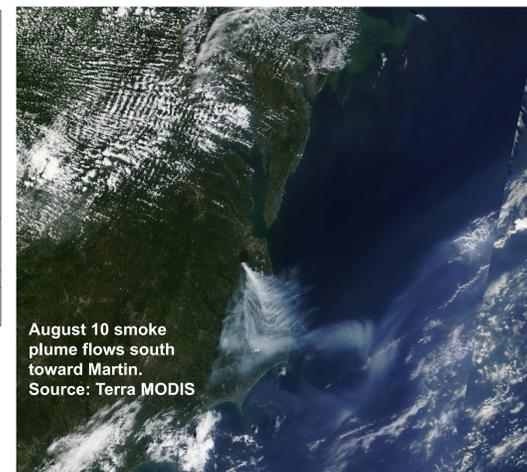


Henrico station documented a plume on August 12, shown in Figure 5. The Langley Research Center plume on August 18 can also be traced to the Lateral West Fire as plotted in Figure 6.



Wind Trajectories

Forward trajectories are used to show where air from a given location and time is heading at various altitudes. The HYSPLIT (Hybrid Single Particle Lagrangian Integrated Trajectory Model) is used to create plots; the top section tracing the altitudes horizontally, and the bottom section tracing the altitudes vertically. Atmospheric Science students at York High School created trajectories to track air flow from the Lateral West Fire to surface stations to correlate with possible smoke plume data.



August 10 smoke plume flows south toward Martin. Source: Terra MODIS

Acknowledgments

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- The Virginian-Pilot
- NASA Earth Observatory
- Virginia Department of Environmental Quality
- North Carolina Department of Environment and Natural Resources
- Environmental Protection Agency
- All other data and graphs originate from LEARN research.