

### OVERVIEW

2013 was the cleanest year on record since ozone measurements began in 1980. Surface ozone is typically at its highest between May and September, frequently becoming the lead pollutant for the Mid-Atlantic, causing health concerns for Maryland residents. The increase in ozone occurs as warm temperatures, intense sunlight and light winds of the warm season increase surface ozone production. However, 2013 remained exceptionally clean throughout the warm season despite a near-average summer.

Ozone is monitored and forecasted to protect the public from high ozone concentrations which can adversely affect the human respiratory system and also significantly weaken plants. The Air Quality Index (AQI, see legend at bottom) was developed to easily evaluate air quality. When ozone has an AQI value in excess of 100 the air quality is unhealthy. Days that have an 8-hour average concentration that exceeds 100 AQI are classified as exceedance days. The total number of exceedance days in a particular year provides a measure of the severity of an ozone season. With only 9 exceedance days, the 2013 season had some of the cleanest air Maryland has ever experienced (see table below, left)\*\*.

### Maryland 2013 Ozone Exceedance Days

Date	No. of Monitors Exceeding 100 AQI	Highest AQI Monitor	8-hr Average Ozone AQI
15-May	1	Piney Run	104
29-May	1	Fairhill	111
31-May	1	Padonia	101
5-Jun	1	Frederick	101
25-Jun	1	Beltsville	109
26-Jun	1	Fairhill	101
17-Jul	1	Davidsonville	101
18-Jul	2	Edgewood	111
19-Jul	3	Fairhill	119

### SEASONAL HIGHLIGHTS & QUICK STATS

#### Maryland Summer Temperature:

- Above normal (27<sup>th</sup> warmest)
- Days at or above 90°F: 26 (on average Maryland has 24.5 days)

#### Maryland Summer Precipitation:

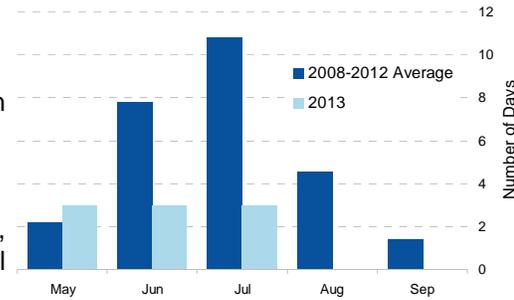
- Well above normal (11<sup>th</sup> wettest)
- 3<sup>rd</sup> wettest June on record, but July, Aug., and Sept. observed rainfall was 3" below normal

#### Country-wide Summer Temperature: Above normal (15<sup>th</sup> warmest)

#### Country-wide Summer Precipitation: Well above normal (8<sup>th</sup> wettest)

- Much of the Midwest and West were dry or average, but areas along and east of the Appalachian Mountains experienced well above normal rainfall.

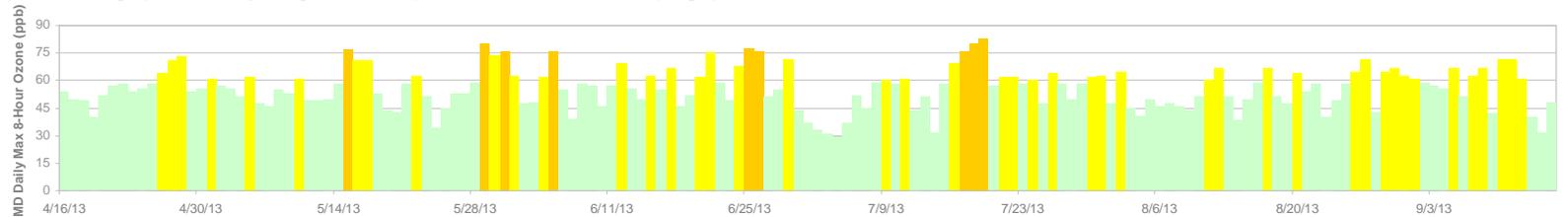
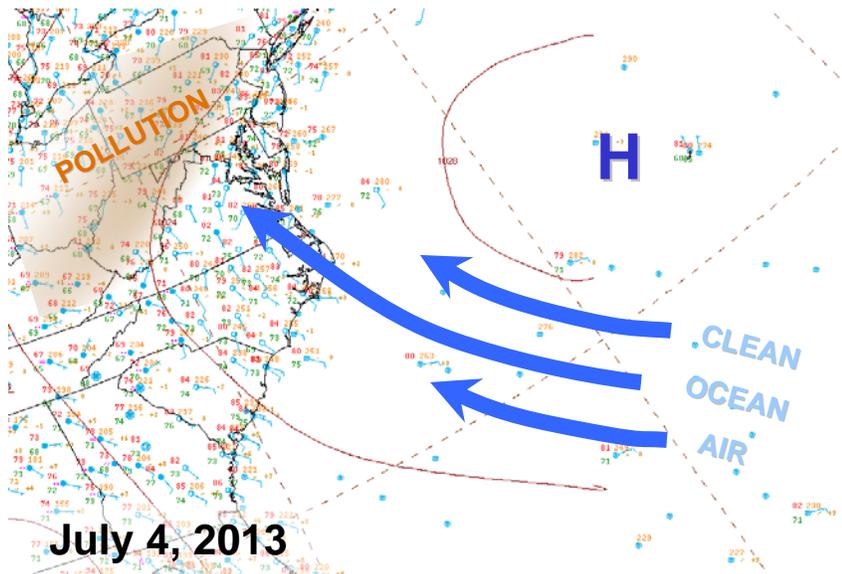
Seasonal Comparison of Days > AQI 100  
2013 and the Recent 5-Year Average



**Ozone:** A noticeably low number of ozone exceedance days occurred across the country. Maryland often experiences more exceedance days than anywhere in the country, but there was minimal ozone production in 2013 compared to normal conditions (see maps on top of page 2). Increased precipitation in June explains some decrease in ozone, but does not explain low ozone recorded in July and August (see bar chart, bottom of page), months that in 2013 were conducive to ozone (below average rainfall, above average temperature) and typically have several ozone exceedance days (bar chart above right).

### WEATHER & AIR QUALITY

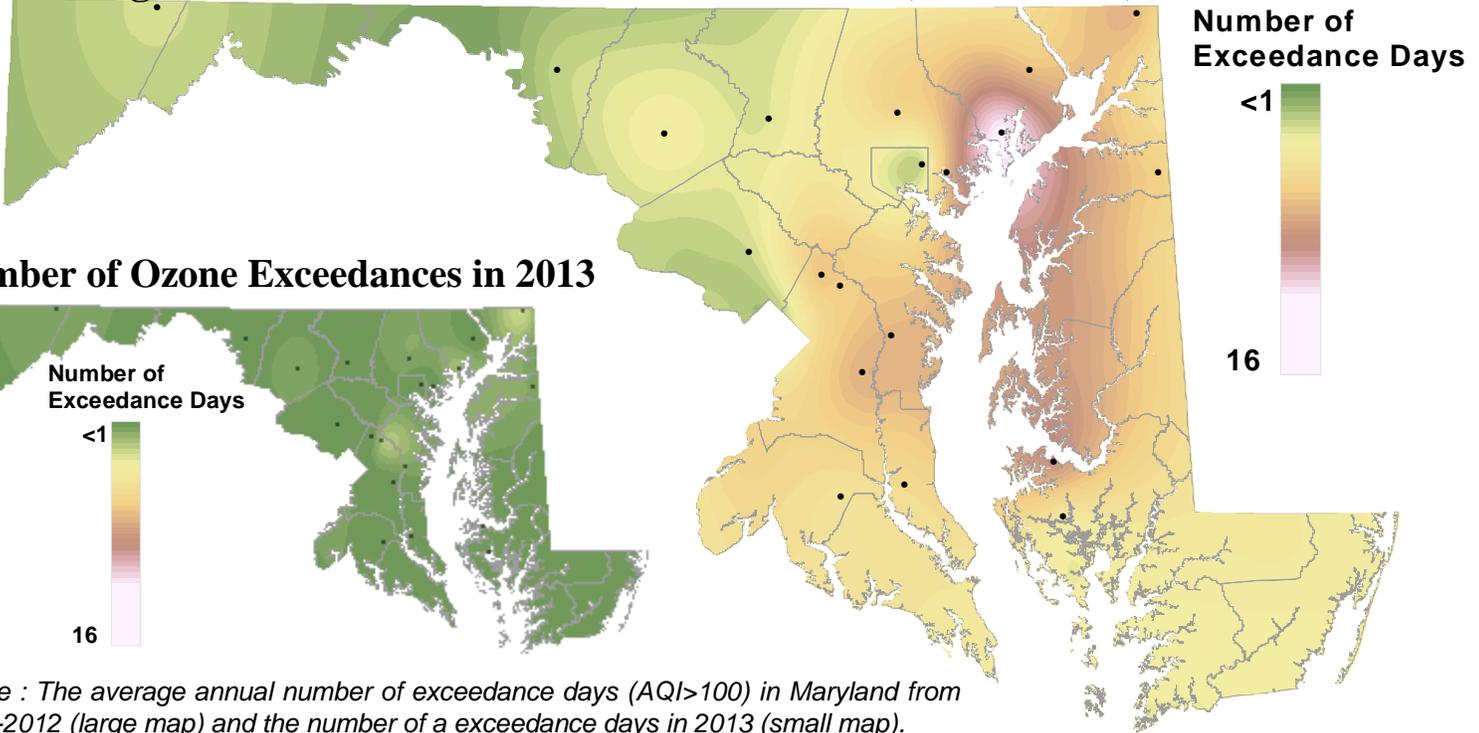
The Bermuda High, a semi-permanent high pressure system typically centered near Bermuda in the Atlantic Ocean, dramatically affects summer air quality in Maryland. By late spring, the Bermuda High normally meanders westward, often as far as the southeastern United States. When this happens, the clock-wise flow of winds around the high pressure center cause westerly winds to blow pollution from upwind states, which compounds Maryland's air quality issues. While there were several periods where this occurred in 2013, the Bermuda High did not remain over the southeastern United States for prolonged periods of time, preventing potentially significant (continued on next page)



\*Unhealthy for Sensitive Groups  
Based on 2008 8-hour ozone NAAQS

\*\*2013 data is considered preliminary

### Average Annual Number of Ozone Exceedances (2009 – 2012)\*\*\*



### Number of Ozone Exceedances in 2013

Above : The average annual number of exceedance days (AQI>100) in Maryland from 2009-2012 (large map) and the number of a exceedance days in 2013 (small map).

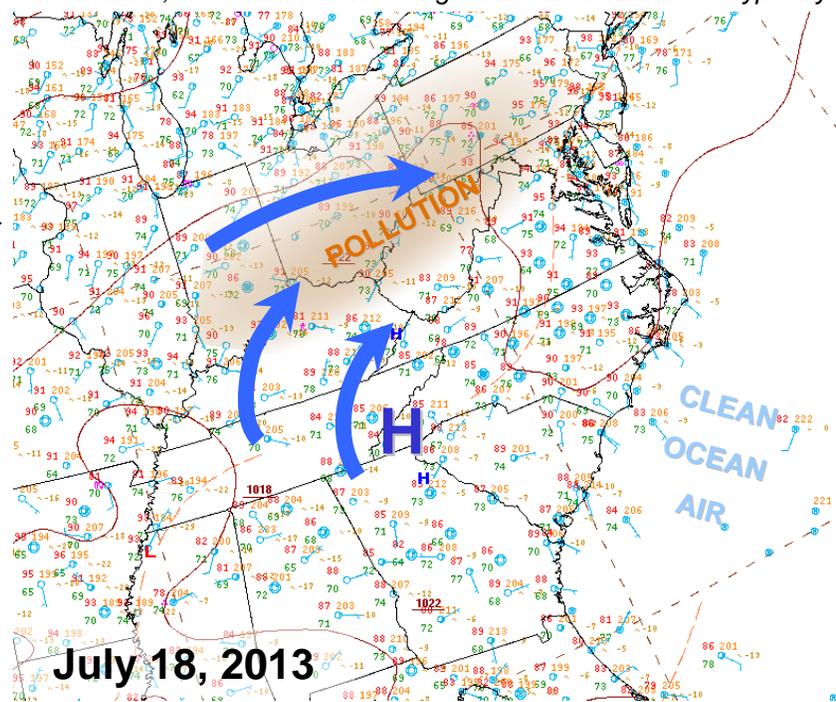
Color displays the number of exceedance days across Maryland with dark green representing near zero days and white representing near 16 days. Black dots are ozone monitor locations. Grey lines are political boundaries. Much of Maryland is dark green in 2013, indicating less than 1 exceedance day across much of the state. In contrast, areas east of Washington D.C. and Baltimore typically observe 7 or more exceedance days per year.

### WEATHER & AIR QUALITY (cont.)

(continued from previous page), poor air quality episodes.

July is the warmest month of the year for Maryland, and historically has the greatest ozone concentrations. However, in late June and early July of 2013, the lowest ozone concentrations of entire ozone season were observed! (bar graph bottom of page 1). Looking at an analyzed surface chart explains why this occurred. From approximately June 30 through July 6, the Bermuda High was situated well off the East Coast. Air originating from nearly the center of the Atlantic Ocean was being transported towards the East Coast (bottom right figure, page 1). Each passing day during this period, cleaner air than the day before from further out in the Atlantic was brought in to Maryland. It was 10 days between Moderate AQI days before the pattern finally broke down and the Bermuda High moved westward.

In contrast to early July, as the high moved westward three consecutive exceedance days occurred on July 17- July 19 (see table on page 1). Winds turned from the west during these three days because the Bermuda High shifted westward, causing air to move in to the state from the Mid-West (see figure, right). The worst air quality of the year occurred on July 19. However, clouds and rain showers on July 20 put a quick halt on the worst poor air quality episode of the clean 2013 season.



Bottom Right: Surface wind setup on July 18, 2013. The center of the Bermuda High ("H") moved westward, causing Maryland to receive winds (arrows) from the west. This more typical poor air quality setup resulted in three consecutive exceedance days.

<b>AQI</b> 0-50 Good	51-100 Moderate	101-150 USG*	151-200 Unhealthy	201-300 Very Unhealthy	301-500 Hazardous
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\*\*\*Only one complete year of data was available for Horn Point