

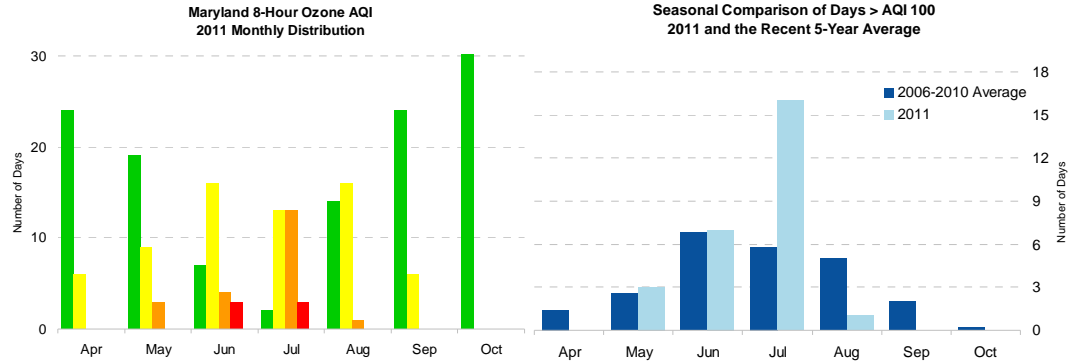
### OVERVIEW

Ozone is a pollutant of concern for the Mid-Atlantic region from May through September. Warming temperatures, increased sunlight and lighter winds during the ozone season (May – September) all contribute to increased levels of surface ozone, which has known health impacts to the respiratory system. The severity of an ozone season is measured by the number of days the Air Quality Index (AQI, see legend at bottom) exceeds 100, the AQI value where health consequences become evident. Daily AQI values are set as the maximum 8-hour average ozone concentration observed on a particular day.

The 2011 ozone season had an above average number of ozone exceedance days and was dominated by four prolonged episodes of poor air quality, one in June and three in July. While the June ozone episode was the strongest with three of four days reaching Unhealthy AQI levels between June 7 and June 10, the numerous episodes in July of 2011 stand out (see graph below). There were 29 exceedance days between May and September 2011, which was higher than the recent five year average of 24 but much lower than 2010, which experienced 43 days of USG or above. No significant air quality concerns developed after September 2011.

### Maryland 2011 Ozone Exceedance Days

Date	No. of Monitors	Highest AQI Monitor	8-hr Average Ozone AQI
26-May	1	Padonia	101
30-May	1	Calvert Co	101
31-May	8	Beltsville	124
1-Jun	4	Fairhill	142
2-Jun	1	Blackwater NWR	104
7-Jun	8	Edgewood/Fairhill	135
8-Jun	17	Edgewood	197
9-Jun	15	Edgewood	177
10-Jun	13	S. Maryland	156
18-Jun	2	PG Eqs. Cntr	101
28-Jun	1	PG Eqs. Cntr	101
1-Jul	5	Edgewood	114
2-Jul	15	Edgewood	179
3-Jul	2	Aldino	122
5-Jul	5	Edgewood	156
6-Jul	2	Aldino	137
7-Jul	12	HU-Beltsville	147
12-Jul	1	Blackwater NWR	109
18-Jul	5	Aldino	132
19-Jul	1	Davidsonville	101
20-Jul	5	Padonia	127
21-Jul	2	Aldino	119
22-Jul	8	Edgewood	154
23-Jul	6	Edgewood	140
26-Jul	1	Aldino	106
28-Jul	1	Rockville	109
29-Jul	6	Millington	132
31-Jul	2	Essex	106
1-Aug	8	Edgewood	147



### SEASONAL HIGHLIGHTS

The Edgewood ozone monitor (*image below, red circle*) maintained its reputation as a troublesome monitor and continued to have the highest ozone concentrations in the state. Considering all days where any Maryland monitor measured USG or greater ozone during the 2011 season, Edgewood reached USG or higher 17 of 29 days (59% of the time). Of those 17 days, Edgewood observed the highest ozone concentration in the state 9 days, making it the “leading monitor” for the state. Studies have shown Edgewood has observed the highest levels of ozone among Maryland monitors for the past few decades and Edgewood continues to keep Maryland from achieving health based standards for ozone pollution.

An extensive NASA research project took place during the summer of 2011 that studied Maryland air quality issues. The “Deriving Information on Surface Conditions from Column and Vertically Resolved Observations Relevant to Air Quality” study, or simply “DISCOVER-AQ”, was a multifaceted study using balloons, aircraft, satellite and surface observations to study ozone concentrations in the atmosphere. With this study an in-depth look at the air quality issues Maryland faces was possible to a degree unlike ever before. The data will be analyzed and used to improve Maryland air quality.

### WEATHER & AIR QUALITY

Maryland experienced the second warmest summer on record in 2011 along with well above average rainfall. BWI experienced 40 days above 90°F (normal is 26) with 24 days occurring in July. This led to a drier than normal July, despite above average rainfall for the season. Observed rainfall at BWI was only 2.77” in July (normal is 4.07”) with only 7 days recording rainfall. The combination of very warm temperatures and below average rainfall for the month (no weather to clean the air) resulted in an above average July for ozone production (*chart pg 1*). Though August temperatures remained above normal, rainfall at BWI was 7” (*continued on next page*)



AQI 0-50 Good	51-100 Moderate	101-150 USG*	151-200 Unhealthy	201-300 Very Unhealthy	301-500 Hazardous
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Source: [AirNow](#), [Hysplit](#)

MARYLAND DEPARTMENT OF THE ENVIRONMENT

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





(continued from previous page) greater than typical, with increased rainfall frequency, resulting in lower than average ozone production (chart pg 1). In combination with an average June, the 2011 ozone season ended slightly above the recent 5 year average.

### FEATURED EPISODE: June 7 – June 10

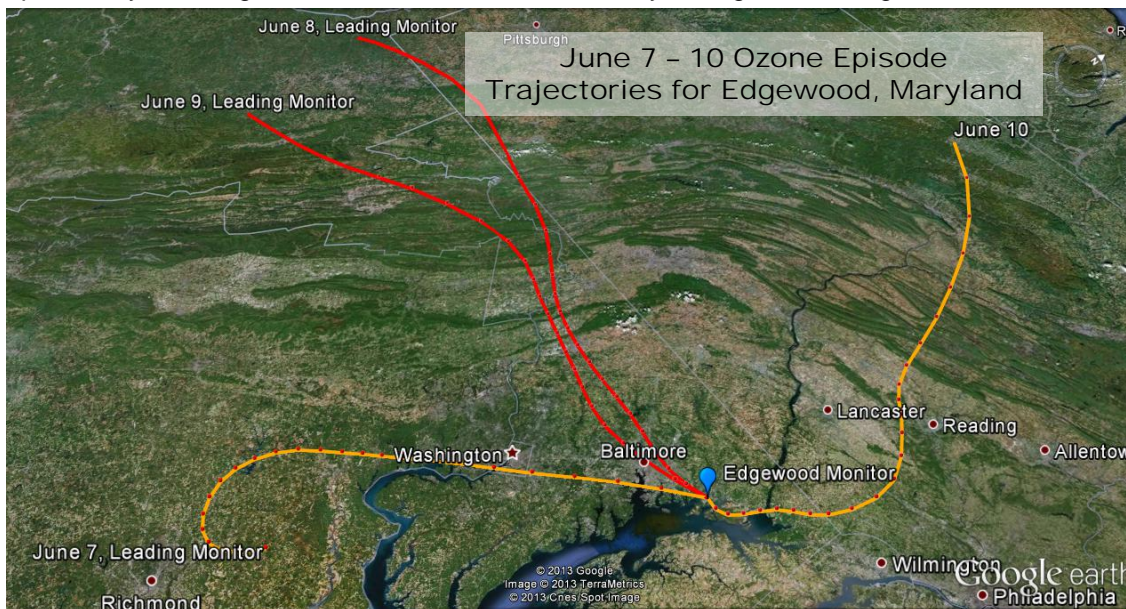
A classic Maryland poor air quality weather pattern developed in early June. As a result, a four day ozone episode occurred between June 7 and June 10. Three out of the four days recorded Unhealthy levels of ozone. On June 8 in particular, the Edgewood monitor nearly reached the Very Unhealthy ozone level (201 AQI) attaining the peak AQI of the episode at 197. Surface high pressure caused near-stagnant surface winds and pollutant build-up. Widespread USG conditions developed on June 8 with 15 of 19 monitors reporting at least USG levels. Essex and Edgewood were immediately downwind of Baltimore where pollutants were concentrated by a Chesapeake Bay Breeze. The build-up of pollution was easily visible over the area. The images at the bottom of the page compare visibility on a Good AQI day with visibility on the Unhealthy AQI day of June 8. On June 8 Baltimore, approximately 10 miles away in the image, is nearly completely obscured and the horizon is indistinguishable.

Surface winds varied significantly during this episode and determined the location of poorest air quality. The image below displays 24-hour trajectories. These lines show the path air traveled to Edgewood starting from the previous day for each of the four days of the episode. Air on June 7 originated from the southwest, but came from the north by June 10. On the three days when Edgewood was the leading monitor (June 7-9) air trajectories passed by Washington DC and/or Baltimore on its way to Edgewood. Edgewood was no longer the leading monitor by June 10.

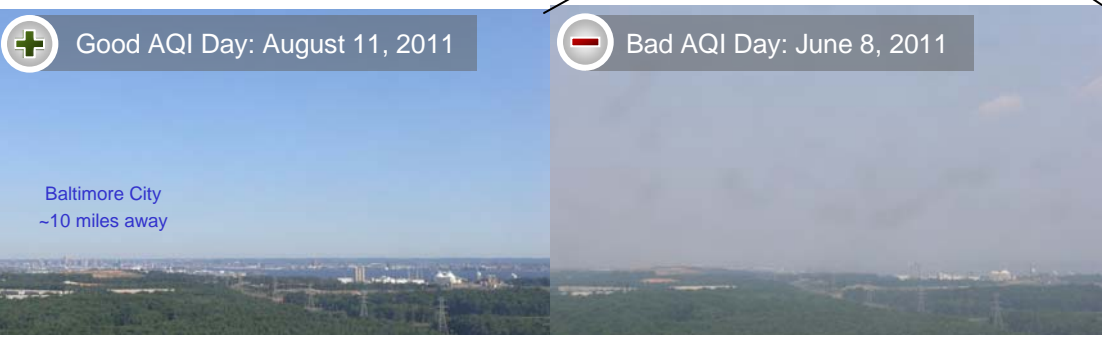
Instead, north winds caused areas of southern Maryland to reach Unhealthy AQI levels. In fact, regional observations of the air quality during this episode (smaller images below) show the poorest air quality downwind of the DC/Baltimore metropolitan areas, with surface winds pointing through DC/Baltimore to the poorest air quality.

Warm temperatures, light winds, and abundant sunlight in combination with ozone precursors (typically car exhaust and power plant emissions) produce ozone. Temperatures during this episode topped 100°F at Baltimore-Washington International Airport (BWI). Thunderstorms

influenced the area by the afternoon of June 10, but otherwise sunshine dominated. The weather conditions in combination with out-of-state and local emissions (precursors), supported an extended poor air quality episode.



Above: 24-hr backward trajectories for the June 7 - 10 ozone episode. Trajectories begin 10m above ground at Edgewood (blue marker) and are color coded to match the AQI category Edgewood attained each of the four days (see AQI legend). Red dots are hourly trajectory positions. Labels at trajectory origins list the date and if Edgewood was the leading monitor. Smaller images show the regional AQI for each day of the episode. Black arrows show the surface wind flow.



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