

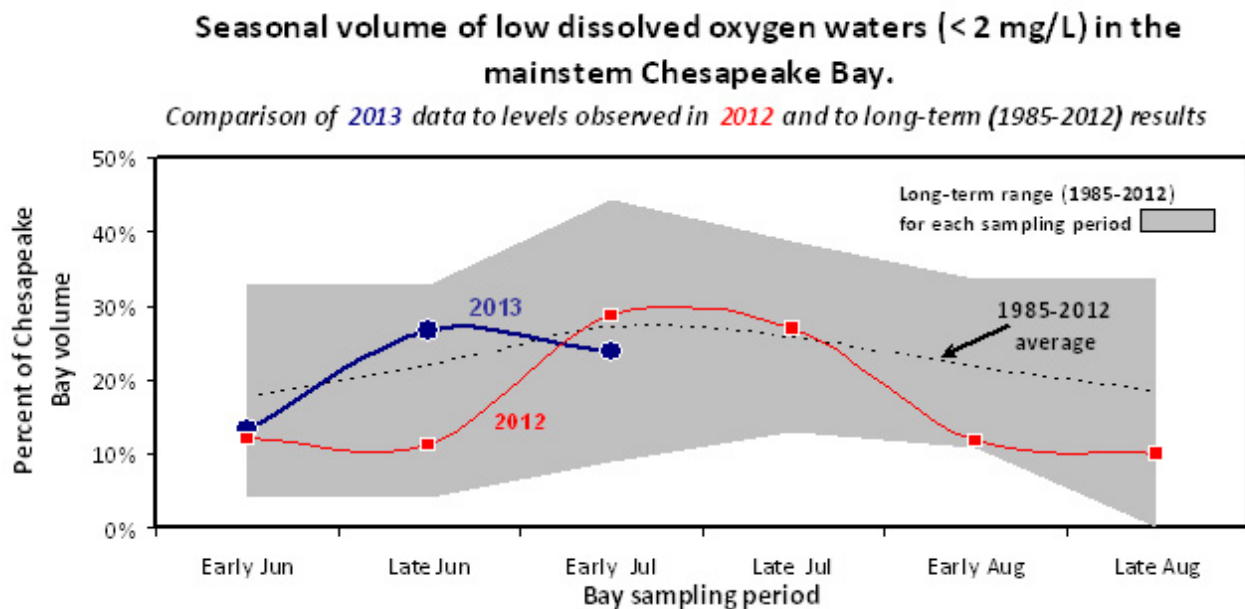
Tracking status of Chesapeake Bay's summer "DEAD ZONE"

Early July 2013 report

During June 2013, the volume of water with poor oxygen concentrations (< 2 milligrams per liter (mg/L)) in the deep portions of Chesapeake Bay in Maryland increased from below to above the long term (1985-2012) average. By early July, however, the volume of water with low oxygen levels declined. At present, this volume is lower than those recorded in early July 2012 and is slightly lower than the 29-year average for the same summer period. While water quality improved slightly over June conditions, oxygen levels in nearly a quarter of the Chesapeake Bay's waters are too low for fish, shellfish and crabs to survive.

Water quality data collected each summer by the Maryland Department of Natural Resources' (DNR) Chesapeake Bay Monitoring program are analyzed to define how much of the Bay has dissolved oxygen levels that are too low (less than 2 milligrams oxygen/liter of water) for fish, shellfish and crabs to survive. Data collected in early July showed that 23.8 percent of the volume of the Chesapeake Bay in Maryland had low oxygen conditions ranging from 0 to 2 mg/L. At this point in the season, oxygen conditions in the Bay are slightly better than the long-term, 29-year average for early July (26.9 percent) (Figure 1). While the early July volume of low oxygen waters in the Bay is 11th best among the past 29 years of monitoring, nearly a quarter of the Bay still has oxygen levels too low to support the Bay's aquatic life.

Figure 1.



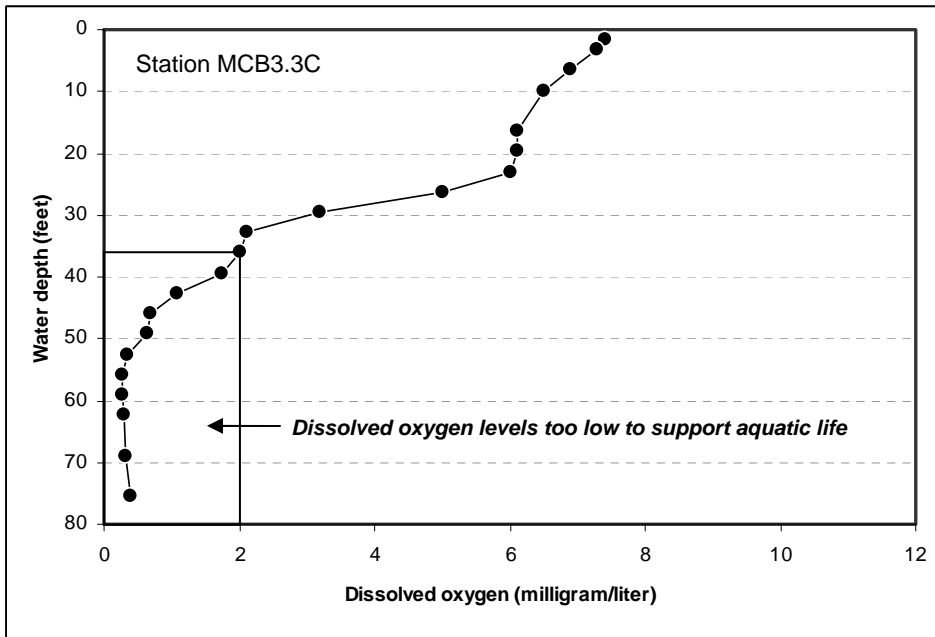
The volume of low oxygen observed in early July (5.08 cubic kilometers) is within the 2013 summer forecast range that was released in June by the University of Maryland-NOAA EcoCheck partnership in collaboration with researchers from the University of Michigan (<http://ian.umces.edu/ecocheck/forecast/chesapeake-bay/2013/>). This forecast is based on lower than average nitrogen levels flowing into Chesapeake Bay from the Susquehanna River this past winter and spring.

What are Dead Zones?

In the Chesapeake Bay, surface and deep waters are naturally separated each summer as warmer and less salty surface waters float on top of cooler, more salty waters deeper in the Bay. Algae and plants in deeper waters can't create oxygen by photosynthesis so oxygen here is gradually consumed through respiration by animals, plants and bacteria. Oxygen in deeper waters of the Bay begins to decline in the late spring, sometimes to the point where there is no oxygen (anoxia) and only anaerobic bacteria can survive. As the summer progresses, long-term data show that the volume of low oxygen waters in the Bay will increase to a peak in July (Figure 1).

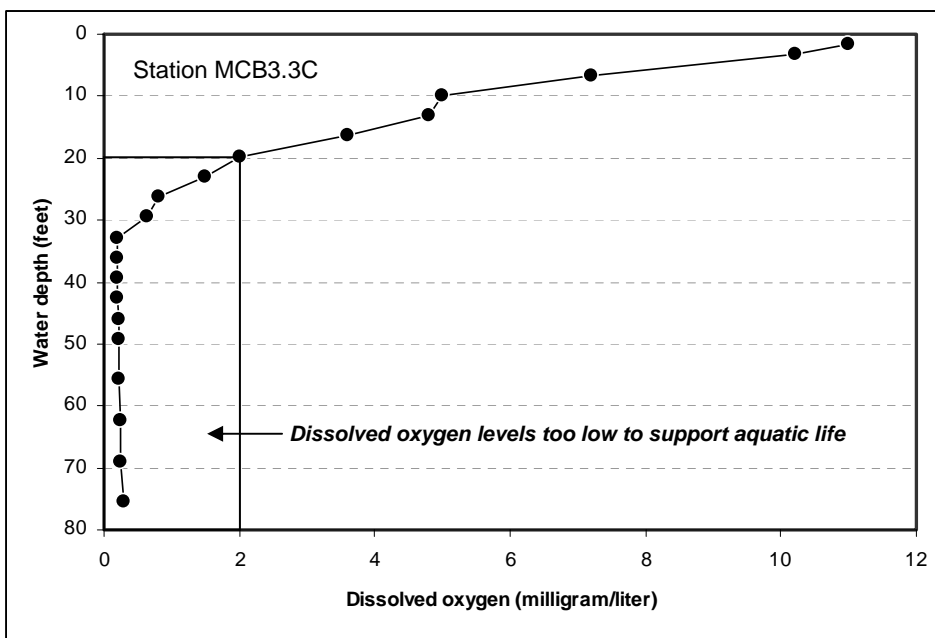
The dissolved oxygen profile in early June at the mid-Bay station near the Bay Bridge (MCB3.3C) shows highest oxygen levels near the surface but declining rapidly below 23 feet. From a depth of 37 feet to the bottom, low dissolved oxygen levels (hypoxia from 0.2 to 2.0 mg/L) were found. At this time and place, oxygen levels too low to support aquatic life comprised 52% of the water column. Anoxic conditions (0 to 0.2 mg/L) were not observed (Figure 2a).

Figure 2a. Mid-Bay dissolved oxygen profile at the Chesapeake Bay Bridge (4 June 2013)



Six weeks later (early July 2013) at the same site, high oxygen levels near the surface immediately began to decline. From a depth of 19 feet to the bottom, low dissolved oxygen levels (0.2 to 2.0 mg/L) were found. At this time and place, oxygen levels too low to support aquatic life now comprise 74% of the water column. Very low oxygen levels, just above 0.2 mg/L, were observed at depths from 32 feet to the bottom (Figure 2b).

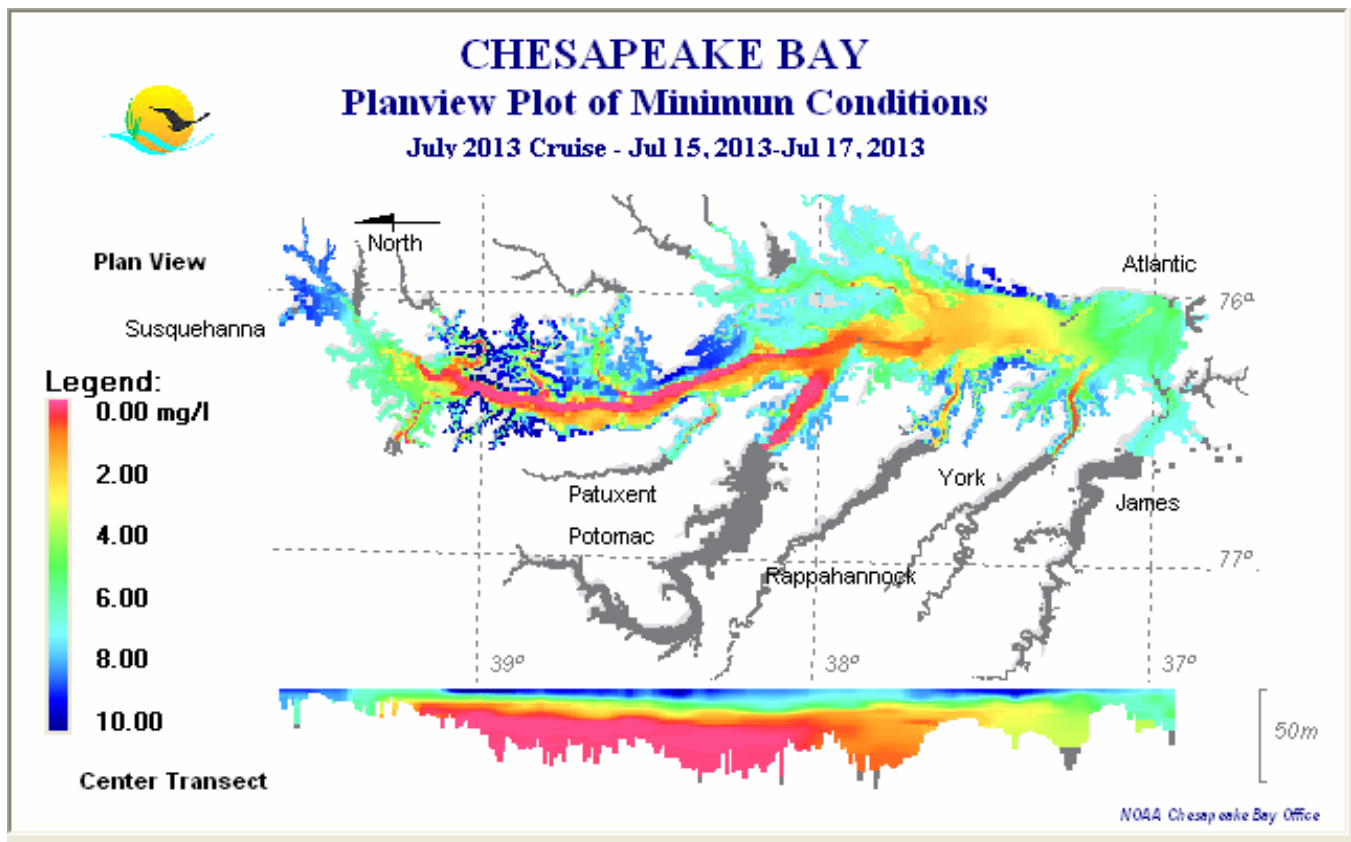
Figure 2b. Mid-Bay dissolved oxygen profile at the Chesapeake Bay Bridge (16 July 2013)



These conditions can continue into the early fall, when cooler temperatures and fall storms mix surface and deep waters. Examining both 2013 graphs show that surface layer oxygen levels are much higher in mid-July (11.0 mg/L) than in mid-June (7.4 mg/L), which is likely due to increased algal production as water temperatures are warmer (from 72.7 to 83.5 degrees F) and pH is higher (7.9 to 8.8 pH units) indicating carbon dioxide uptake by algae. Since early June, salinity near the Bay Bridge has declined (7.6 to 4.2 salinity units) due to June rainfall.

Combining Maryland’s Bay data with lower Bay data collected by the VA Department of Environmental Quality for the same period can provide a more complete picture of oxygen conditions throughout the Bay. With the NOAA - Chesapeake Bay Program Office’s INTERPOLATOR program and these mainstem Bay datasets, a snapshot of dissolved oxygen conditions and distribution throughout the main Bay is developed. The distribution of oxygen across the Bay’s bottom waters and as a vertical profile from the Susquehanna Flats to the Bay mouth are shown for early July 2013 (**Figure 3**).

Figure 3



Colors from orange to pink indicate low oxygen levels. Since late June, anoxic conditions (less than 0.2 mg/L - bright pink color) narrowed considerably but extended upstream of Baltimore to Tolchester. Low oxygen (2 to 0.2 mg/L - red to dark yellow color) were deeper in the mid-Bay region between Eastern Bay and Patuxent River.

Maryland DNR will continue to monitor the oxygen conditions of the Bay and lower tidal rivers every two weeks this summer and will provide updates of oxygen conditions on the Eyes On The Bay website. Implementation of the Baywide TMDL commits Maryland and the other Bay watershed States to accelerate their nutrient and sediment reduction strategies which should reduce the size and duration of the Bay’s ‘dead zone’.

For more information:

- Real-time Maryland Tidal Water Quality Conditions: www.eyesonthebay.net
- Restoring the Chesapeake Bay: Maryland’s Actions & Progress: www.baystat.maryland.gov/
- What You Can Do to Help the Bay: www.baystat.maryland.gov/what_you_can_do.html