

# The 2012 Chesapeake Bay summer *Dead Zone*

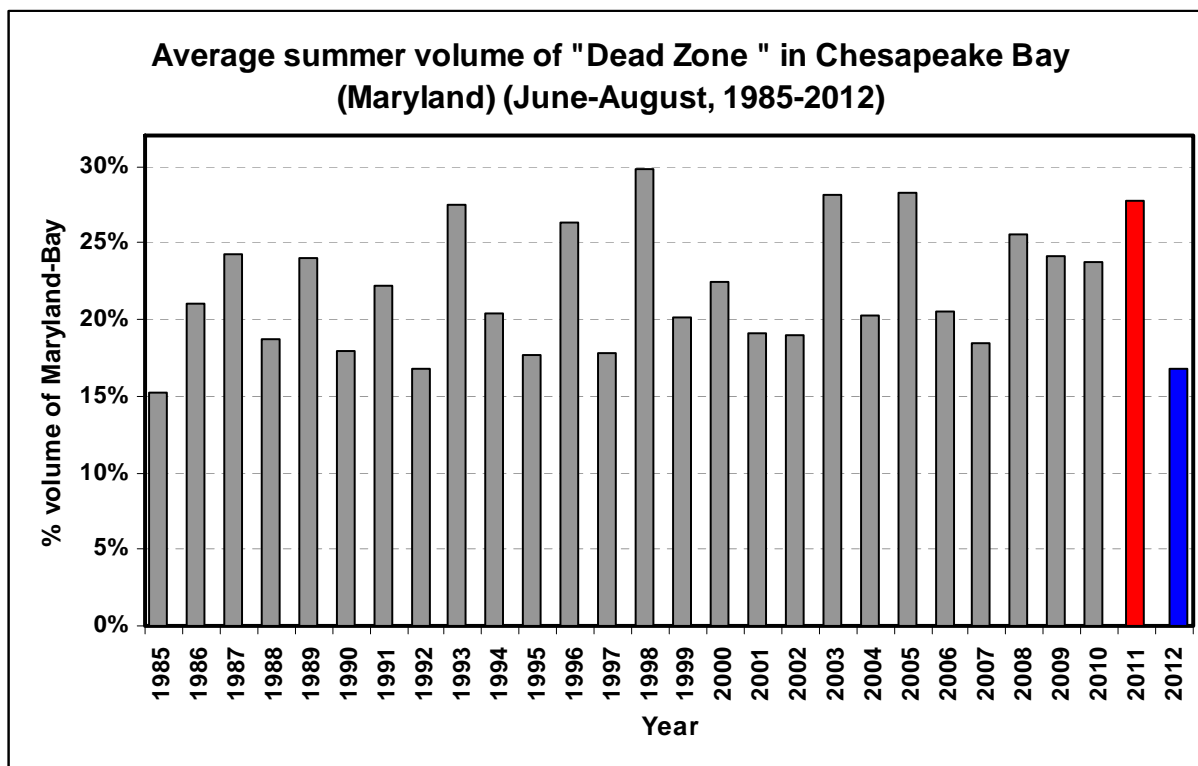
Summer volume of the Chesapeake Bay's *Dead Zone* in 2012 is smallest since 1985

**SUMMARY:** Throughout the summer of 2012, the average size of the Chesapeake Bay “Dead Zone” in Maryland, was about one-sixth (16.7 percent) of the entire volume of water in the Bay where fish, crabs and oysters might otherwise live, thrive and reproduce. The summer hypoxic volume in 2012 is a considerable improvement over the long-term (1985-2011) summer average *Dead Zone* volume of 22.1 percent. It is also much lower than the record high summer volume that was observed in 2011 until late August when strong winds from the Hurricane Irene mixed the Bay’s waters. The better-than-average oxygen levels observed this year confirms that there is little carryover impact from the high flows to the Bay in 2011.

**BACKGROUND** During the summer (June through August), the Maryland Department of Natural Resources’ Chesapeake Bay Monitoring Program records data and collects samples every two weeks from its network of mainstem Chesapeake Bay sites while tidal tributary river sites during this period are sampled monthly. These data have been used to help define the amount of water in the the Bay where oxygen levels are too low to support fish, crabs and oysters (oxygen concentrations less than 2 parts per million - “hypoxia”). This fluctuating deep layer of hypoxic water is popularly called the Bay’s “Dead Zone”.

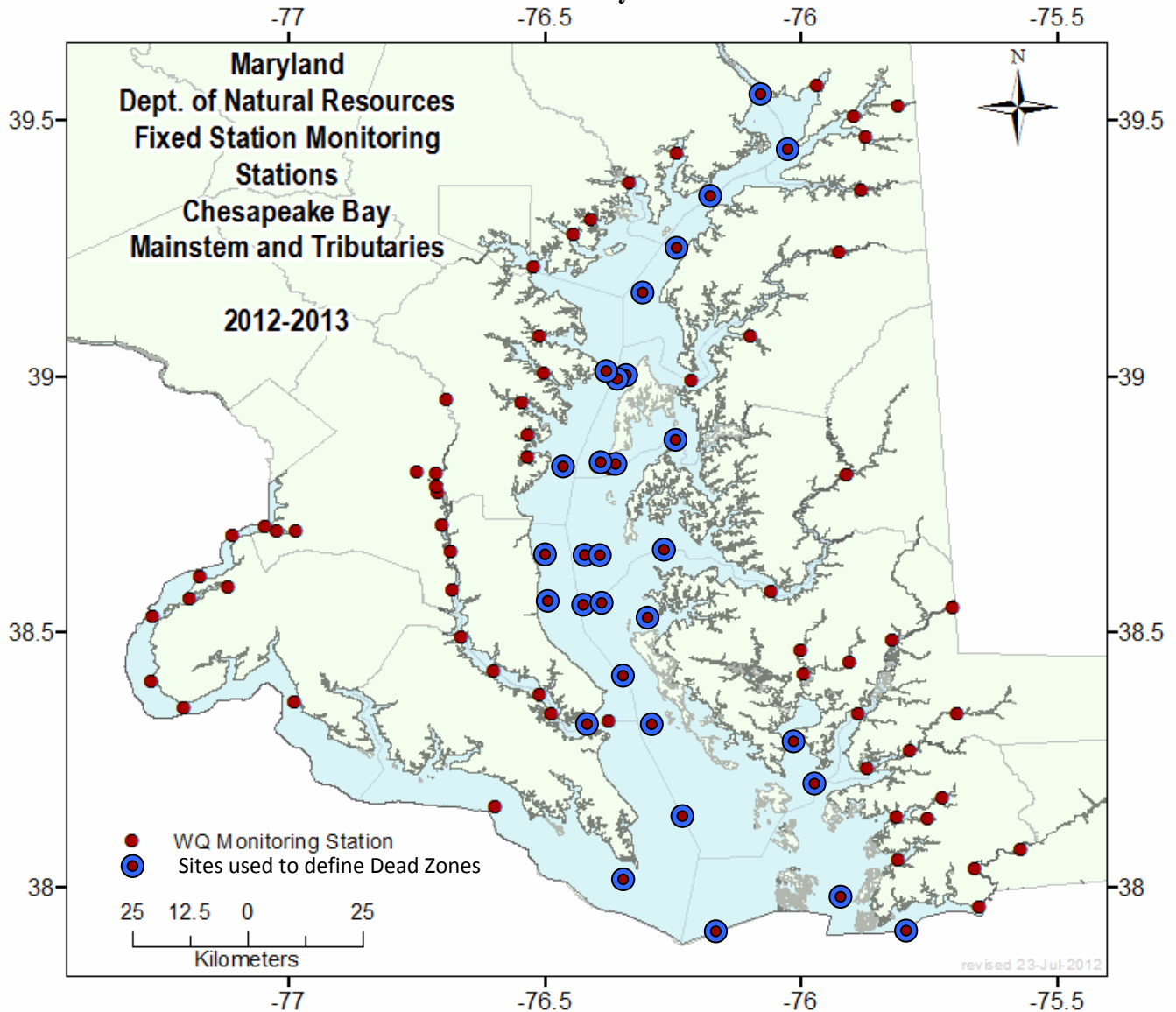
The size of the *Dead Zone* represents a significant loss of living space for the Bay’s animals, but the 2012 volume is the 2nd smallest observed since the State began monitoring its Bay waters in 1985 (*Figure 1*). The improved oxygen condition in the deep portions of the Bay is directly attributed to low winter and spring flows which carried lower loads of nutrients to the Bay. Reductions in nutrient loads due to continuing implementation of nutrient reduction strategies such as upgrades to wastewater treatment plants, stormwater management controls, the implementation of agriculture management practices such as cover crops and reductions in atmospheric deposition through point source air emissions reductions from cars and trucks helps to further reduce available nutrients that may be carried to the Bay.

Figure 1.



The Maryland Department of Natural Resources' Chesapeake Bay Monitoring Program has an extensive network of tidal monitoring sites (*Figure 2*) from which water quality data are recorded and samples are collected for water quality analysis. To assess the volume of the low dissolved oxygen during the summer, data from 30 of the highlighted stations in the mainstem of the Bay and its main tidal rivers/embayments in Maryland (*Figure 2*) are used along with data from 6 additional mainstem and embayment sites in Virginia with results provided by the Virginia Department of Environmental Quality.

**Figure 2. Location of Maryland's Chesapeake Bay monitoring locations with sites used to calculate the volume of the seasonal Dead Zone in Maryland**

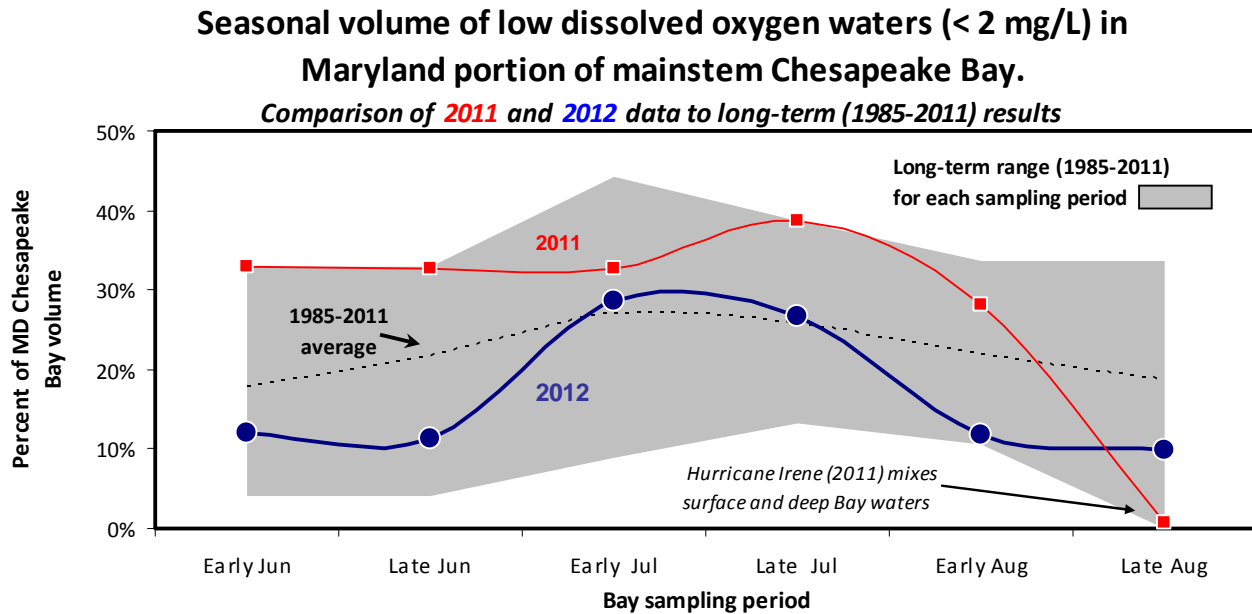


**SUMMER 2012 RESULTS:** Data collected during this summer's bi-weekly sampling trips were used in a modified NOAA-Chesapeake Bay Office INTERPOLATOR model to calculate the hypoxic volume of the Bay for each sampling period. In 2012, the monthly volume of the Dead Zone in the Maryland-Bay varied from:

Month	Dead Zone volume - %	Notes
June	11.3 to 12.0%	below the long-term (1985-2011) June average of 17.1 to 21.2%
July	26.8 to 28.6%	just above the long-term July average of 25.2 to 26.6%
August	9.9 to 11.8%	well below the long-term August average of 18.5 to 21.6%

Following a sharp decline in low oxygen conditions in July, low oxygen conditions in August 2012 sharply declined from July 2012 observations and were about half of the long term August conditions (*Figure 3*).

**Figure 3.**



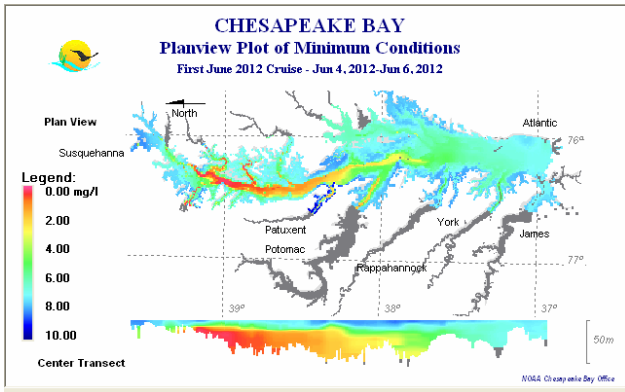
The modified NOAA-Chesapeake Bay Office INTERPOLATOR model that used to calculate the hypoxic volume of the Bay also produces images of oxygen conditions in the Bay - both in plan (representing bottom conditions) and in profile (along the main, deep channels in the Bay). These images show the dynamic seasonal variations in the approximate northern and southern limits of the Dead Zone and how low oxygen conditions change with depth through the summer (*Figures 4a-f*).

As described earlier, the summer's average volume of the Dead Zone ranked as the second lowest since 1985 (*Figure 1*), which was even lower than the 2012 summer forecast 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/2012/>). That forecast was based on lower than average nitrogen levels flowing into Chesapeake Bay from the Susquehanna River earlier this winter and spring. The forecast for 2012 was that low oxygen volume in the Bay would be slightly below average for the summer. There was concern that the near-record high flows and nutrient and sediment loads in 2011 would have a carryover impact into 2012. The fact that this did not occur indicates that the Chesapeake Bay's water quality will respond fairly quickly to our accelerated nutrient reduction strategies associated with the Chesapeake Bay TMDL. It should be noted that the forecast volume encompasses portions of the Bay in Virginia that are not included in DNR's assessment.

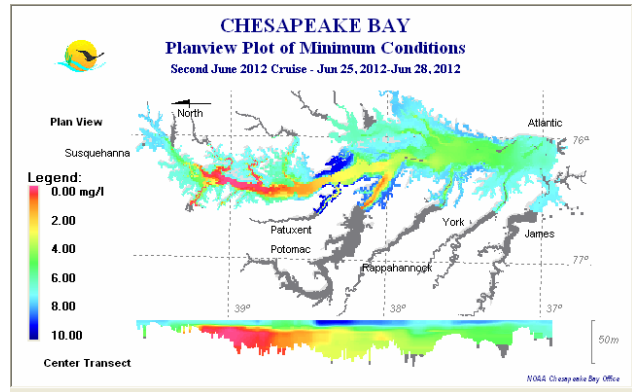
For more information about DNR's Chesapeake Bay monitoring program or results, check out:

- Real-time Maryland Tidal Water Quality Conditions: [www.eyesonthebay.net](http://www.eyesonthebay.net) Twitter: @eyesonthebay
- Restoring the Chesapeake Bay: Maryland's Actions & Progress: [www.baystat.maryland.gov/](http://www.baystat.maryland.gov/), and
- What You Can Do to Help the Bay: [www.baystat.maryland.gov/what\\_you\\_can\\_do.html](http://www.baystat.maryland.gov/what_you_can_do.html)

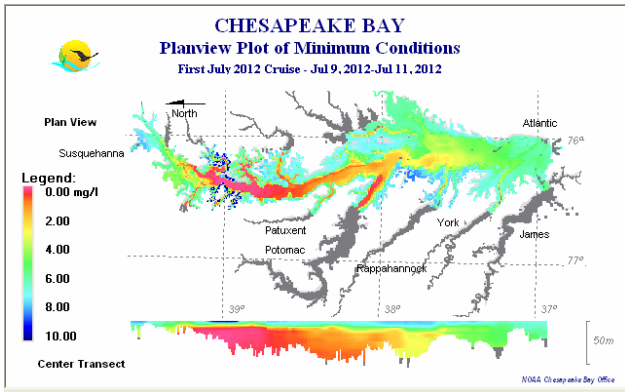
**Figure 4 - Approximations of dissolved oxygen conditions in the Maryland-Chesapeake Bay, Summer 2012 based on modified NOAA INTERPOLATOR output**



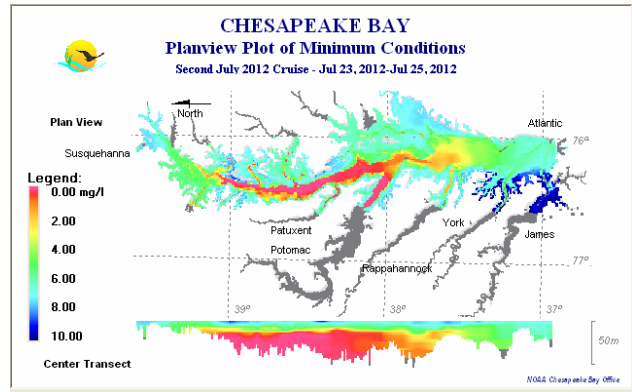
**Early June 2012** - The Dead Zone (oxygen below 2 mg/L - orange to red) extends in the Bay from Tolchester south as far as the Patuxent River with the lowest levels in the Bay between Baltimore Harbor and Herring Bay.



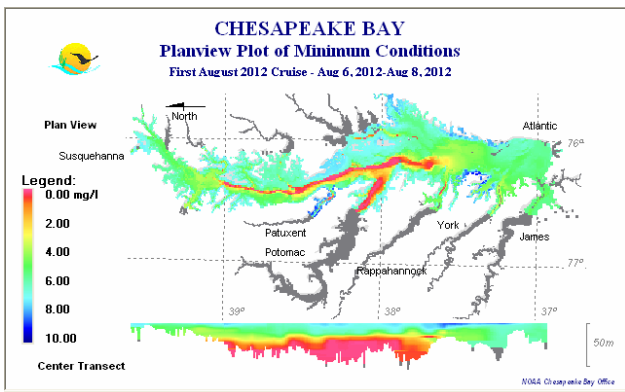
**Late June 2012** - The Dead Zone retreats slightly from Baltimore Harbor to the Little Choptank River. Very low oxygen levels (near 0 - bright pink) are found between Baltimore Harbor and the Bay Bridge.



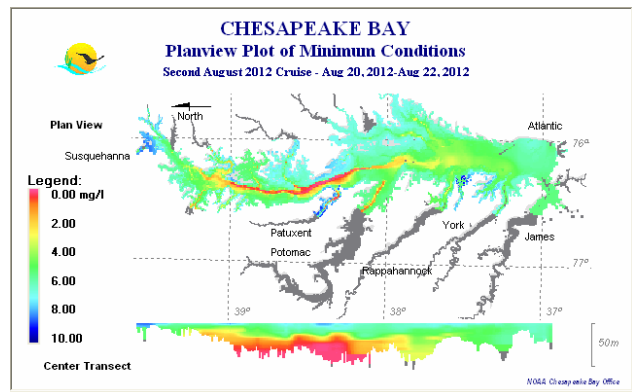
**Early July 2012** - The Dead Zone extends from Tolchester to VA waters (near Rappahannock River). The oxygen-rich surface layer thins as the Dead Zone expands. Very low oxygen extends to Herring Bay.



**Late July 2012** - The extent of the Dead Zone persists with very low oxygen levels extending down to the Patuxent River. The width along the bottom increases. The oxygen-rich surface layer thickens.



**Early August 2012** - The Dead Zone volume (depth and width) shrinks with lowest oxygen levels in the Bay's deep areas between the Bay Bridge to below the Potomac.



**Late August 2012** - The volume of the Dead Zone (depth and width) continues to decline as the southern extent retreats above the Potomac River.