2025 Chesapeake Bay Dead Zone Report
December 2025

Hypoxia Background

The "dead zone" of the Chesapeake Bay refers to a volume of deep water that is characterized by oxygen concentrations less than 2 milligrams per liter (mg/L), which is too low for aquatic organisms such as fish and blue crabs to thrive. The Bay experiences such hypoxic conditions every year, with the severity varying from year to year, depending on nutrient and freshwater inputs, wind, and temperature. Multiple metrics are used to relate the severity of hypoxia between different years:

- ***Daily Maximum Hypoxic Volume*** (cubic kilometers [km^3]): The greatest volume of Chesapeake Bay water experiencing hypoxic conditions on any day of the year[1]
- ***Duration of Hypoxia*** (days): The number of days in a given year between the first and last day of hypoxic volume exceeding 2 km^3 in volume
- ***Total Annual Hypoxic Volume*** (km^3 days): The total amount of hypoxia in the Chesapeake Bay for a given year, calculated by summing the hypoxic volume on each day

2025 Chesapeake Bay Hypoxia Score

William & Mary's Batten School of Coastal & Marine Sciences & VIMS[2] and Anchor QEA operate a real-time, three-dimensional Chesapeake Bay Environmental Forecast System (CBEFS) that predicts daily oxygen concentrations in the water throughout the Bay. The metrics listed above were estimated for 2025 from this forecast model; for reference, the same metrics have also been generated for the historical years of 1985 through 2024.[3]

In 2025:

- **Daily maximum hypoxic volume was near the average of historical years**
- **Duration of hypoxia was less than the majority of historical years**
- **Total annual hypoxic volume was within the normal range of historical years**

Hypoxia in summer 2025 increased throughout June and peaked in July, with a relatively large amount of hypoxia throughout July (**Figure 1**). Elevated winds and cool air temperatures in early August likely resulted in a decrease in hypoxia from the late-July peak. The consistently large amount of hypoxia throughout July was notable compared to past years when hypoxia was considerably more variable over the month. Hypoxia decreased following the passage of Hurricane Erin offshore of the Chesapeake Bay in the middle of August, 2025, but did not end for the year; a relatively low amount of hypoxia persisted through September, when winds and cooling temperatures contributed to hypoxia ending for the year. Overall, even though the duration of hypoxia was less than the long-term (40-year) average, the daily maximum amount of hypoxia and total annual amount of hypoxia were within the normal range and hypoxia overall was near the long-term average (**Table 1**).

The information presented here is in general agreement with: 1) Maryland's hypoxia summary based on long-term water quality monitoring program measurements[4]; and 2) water quality monitoring measurements from biweekly cruises that show elevated hypoxia throughout July and a large reduction in hypoxia following the passage of Hurricane Erin.

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[1] 1 km^3 equals about 400,000 Olympic-sized swimming pools of water.

[2] Contact Marjorie Friedrichs (marjy@vims.edu) for more information.

[3] These estimates are based on computer models that continue to be improved; therefore, past estimates may be updated as improvements are made.

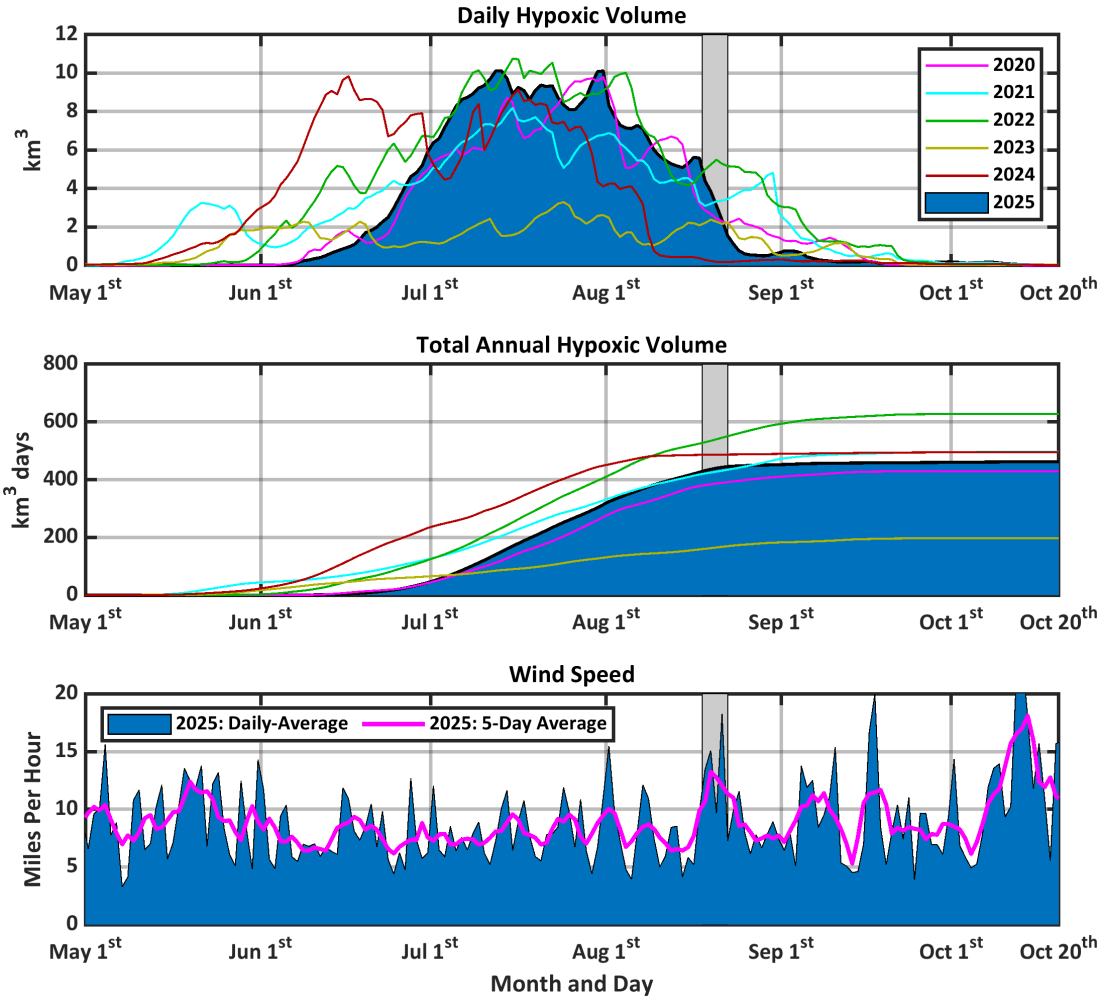
[4] See Maryland Department of Natural Resources summary here: https://news.maryland.gov/dnr/2025/12/03/chesapeake-bay-monitoring-shows-hypoxia-conditions-near-average-for-2025/

Table 1. Severity of hypoxia estimated using the forecast model. Note that 2025 values were within the historically normal and recent past (2020-to-2025) ranges for the total annual hypoxic volume, daily maximum, and average summer hypoxic volume. For more detailed information, see www.vims.edu/cbefs.

Year	Duration of Hypoxia (days)	Total Annual Hypoxic Volume (summed over each day; km^3 days)	Daily Maximum Hypoxic Volume (km^3)
Historical*	78 to 116	317 to 1,015	5.6 to 15.8
2020	64	429	9.8 (12%)
2021	107	498	8.2 (10%)
2022	92	629	10.7 (13%)
2023	77	199	3.3 (4%)
2024	70	496	9.8 (12%)
2025	60	462	10.1 (12%)

*Historical values are based on long-term model simulations of 1985 to 2024. Values within the ranges listed can be considered relatively normal based on the 1985-to-2024 values. The range is the long-term median (97 days, 667 km^3 days, 10.7 km^3) plus and minus one standard deviation. The median is the value where half the historical yearly values are lower and half are higher. The standard deviation represents year-to-year variability. Percentages (%) represent the percent of the volume of the Chesapeake Bay that was hypoxic.[5]

Figure 1. Hypoxic volumes for 2020 to 2025 and wind speed over Chesapeake Bay for 2025. Hurricane Erin passed offshore of the Chesapeake Bay in the middle of August 2025 (vertical shading).



[5] The Chesapeake Bay water volume was based on the volume in the forecast model.