Chesapeake Bay's dead zone predicted to be 33% smaller than long-term average

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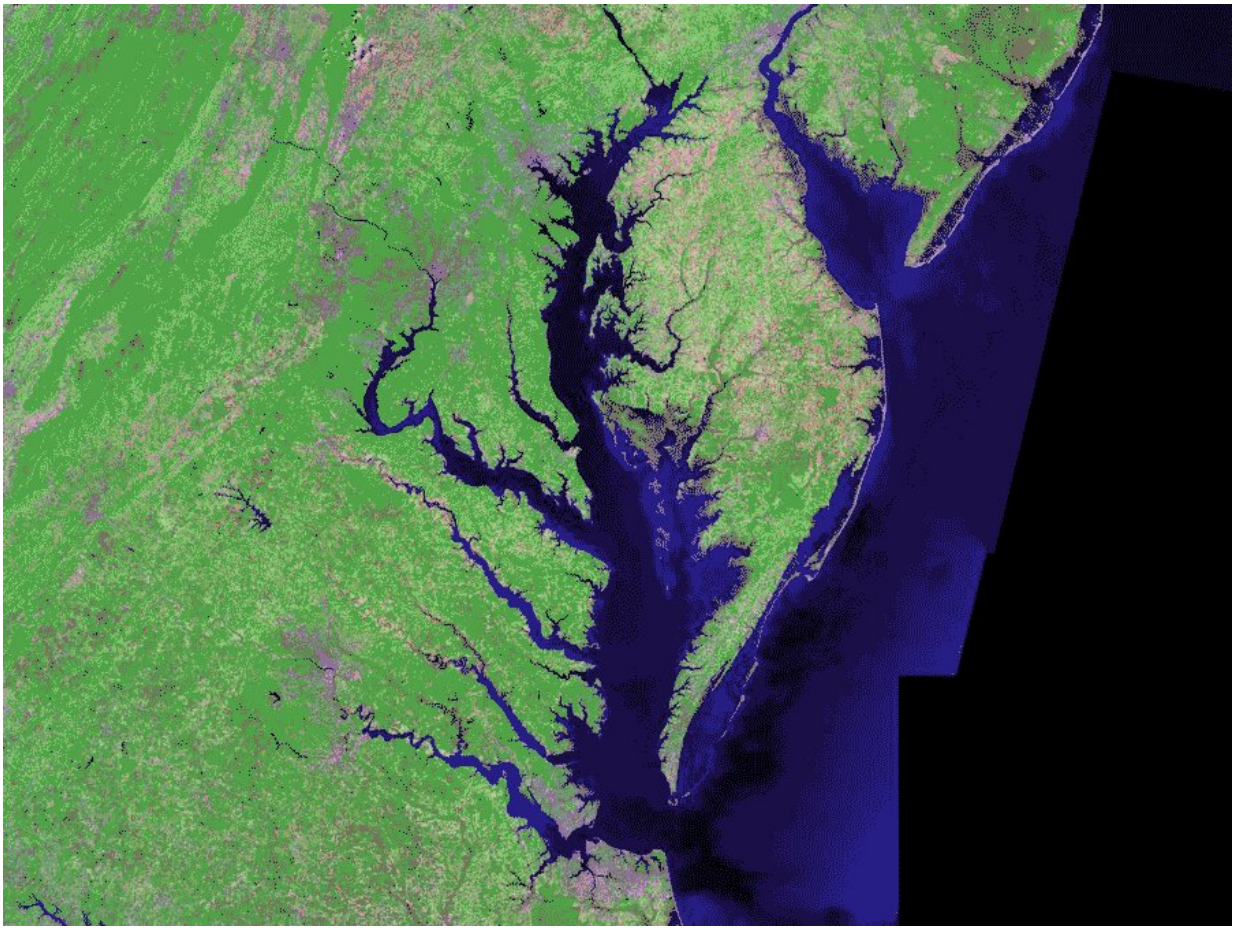

Satellite (Landsat) picture of Chesapeake Bay (center) and Delaware Bay (upper right) – and Atlantic coast of the central-eastern United States. Image credit: Landsat/NASA, Public Domain, via Wikimedia Commons. Credit: University of Michigan

This summer's Chesapeake Bay "dead zone" is expected to be significantly smaller than the long-term average, according to a forecast released today by researchers from the University of Michigan, Chesapeake Bay Program, University of Maryland and U.S. Geological Survey.

During spring and summer, nutrient pollution spurs the growth of algae blooms, which remove oxygen from the water when they die. These low-oxygen sections of the bay, known as hypoxic areas or "dead zones," can suffocate marine life and shrink the habitat available to fish, crabs and other creatures.

But in 2023, the dead zone is predicted to be 33% smaller than the long-term average taken between 1985 and 2022. If the forecast proves accurate, this summer's Chesapeake Bay dead zone would be the smallest on record.

The significantly-smaller-than-average forecast size is due largely to a lack of rainfall in spring 2023. Researchers working on the forecast calculated that from November 2022 to May 2023, river flows were 20% lower than the average. Less rainfall generally means there is a lower amount of nutrients being washed off the land and into the water.

As a result, the amount of nitrogen pollution flowing into the bay from its watershed was 42% lower than the long-term average during January through May 2023. Scientists calculated 74 million pounds of nitrogen at nine river input monitoring stations, and 5.2 million pounds were tracked from wastewater treatment plants. This is a decrease from last year, when researchers noted 102 million pounds from monitoring stations and 5.7 million pounds from wastewater treatment plants.

While rainfall plays a major role in the size of the dead zone, efforts to limit nutrient pollution in the watershed are also a factor. Maryland,

Virginia, Pennsylvania, New York, Delaware, West Virginia and Washington, D.C., all implement best management practices to reduce nutrient runoff that enters the bay from sources such as wastewater, agriculture and stormwater.

"The measured dead zone has been below the long-term average in eight of the past 11 years," said University of Michigan aquatic ecologist Don Scavia, who leads one of several research teams partnering with the federal government on the annual forecast.

"This is also the first time the forecast volume is below what's expected if the long-term Chesapeake Bay nutrient-reduction goals were met. While progress has been frustratingly slow, these trends suggest the nutrient-reduction efforts of the bay program may be moving us in the right direction," said Scavia, a professor emeritus at Michigan's School for Environment and Sustainability.

This year, hypoxic conditions began forming in the bay in mid-May, which is typical. Warm weather increases the likelihood of hypoxic areas forming, which is why dead zones tend to last from late May to early fall. In the fall, researchers will follow up on the forecast with a baywide assessment of the 2023 dead zone size and duration.

"We are pleased to see that the hypoxic dead zone is predicted to diminish again this year, and hope this continues to be a trend," said Dave Campbell, acting director of the Chesapeake Bay Program. "While the changing climate impacts the dissolved oxygen and water temperatures observed in the bay, so does nutrient pollution. We will continue to support the hard work happening across the partnership to sustain this positive trend for below-average dead zones in the Chesapeake Bay."

Throughout the year, researchers measure oxygen and nutrient levels as

part of the Chesapeake Bay Monitoring Program, a baywide cooperative effort involving watershed jurisdictions, several federal agencies, 10 academic institutions and more than 30 scientists.

The Maryland Department of Natural Resources and Virginia Department of Environmental Quality conduct eight to 10 cruises between May and October, depending on weather conditions, to track summer hypoxia in the bay. Results from each monitoring cruise can be accessed through the Eyes on the Bay website for the Maryland portion of the bay and the VECOS website for the Virginia portion.

The U.S. Geological Survey monitors river flow, nutrients and sediment entering the bay at the nine river input monitoring stations.

A model developed by the University of Michigan has been used since 2007 to forecast the volume of summer hypoxia for the main stem of the Chesapeake, based on the amount of nitrogen pollution flowing into the bay from nine river monitoring stations and the wastewater treatment plants that are located downstream of them.

"Forecasts have been within 20% of the measured dead zone in 12 out of the past 15 years," said U-M's Scavia.

The hypoxia forecast model, enhanced in 2020, allows for projections of average July, average summer and total annual hypoxic volume. Those projections are based on the monitoring of nitrogen pollution and river flow at nine river input monitoring stations along the Appomattox, Choptank, James, Mattaponi, Pamunkey, Patuxent, Potomac, Rappahannock and Susquehanna rivers.

The U.S. Geological Survey, in partnership with Maryland and Virginia, monitors nitrogen pollution and other important pollutants flowing into the bay from 78% of the watershed. In the area not monitored by these

stations, additional pollution reported from wastewater treatment plants are also included in the model.

Each of these models and forecasts are supported by the most up-to-date river flow and nutrient inputs from the U.S. Geological Survey. Scientists at the Virginia Institute of Marine Science, in collaboration with Anchor QEA, use a computer model to produce daily real-time estimates of hypoxia volume that show levels beginning in mid-May 2023, consistent with monitoring data.

"The fact that the forecast shows another low hypoxia year in spite of globally increasing temperatures is a very good sign for the state of the bay and its critical habitats," said Marjorie Friedrichs, a research professor at Virginia Institute of Marine Science, William & Mary.

Pollution-reducing practices used in backyards and cities and on farms can reduce the flow of nutrients into waterways. Management actions taken to decrease loads from point sources (e.g., wastewater treatment plants) may immediately show detectable pollution changes, but the implementation of best management practices for nonpoint sources often results in a lag before their impact on improving water quality can be detected.

Weather conditions also play a role in the size and duration of the annual dead zone. Heavy rainfall can lead to strong river flows entering the bay, which carries along increased amounts of nutrient and sediment pollution. Above average spring freshwater flows to the bay, along with hot temperatures and weak winds in the summer, provide the ideal conditions for the dead zone to grow larger and last longer.

"This spring we've experienced below-average rainfall. Less water moving through the watershed means less nitrogen was carried by the tributaries to the bay," said John Wolf, acting coordinator of USGS

Chesapeake Bay Studies.

More information: Hypoxia forecast page: scavia.seas.umich.edu/harmful- … d-hypoxia-forecasts/

Provided by University of Michigan