

Average-sized 'dead zone' forecast for Gulf of Mexico

June 4 2021, by Jim Erickson



The Mississippi River near Vicksburg, looking Northeast at the Interstate 20 bridge, the confluence of the Yazoo River is in the foreground. The photo was taken by a drone flown by Jim Alvis and Mike Manning of the U.S. Geological Survey in the summer of 2016. Credit: USGS

A team of scientists including a University of Michigan aquatic ecologist is forecasting this summer's Gulf of Mexico hypoxic area or "dead zone," an area of low to no oxygen that can kill fish and other marine life, to be approximately 4,880 square miles, a bit smaller than the state of Connecticut.

The 2021 forecasted area is smaller than, but close to, the five-year-average measured size of 5,400 square miles. However, this year's predicted dead zone would still be more than double the long-term goal set by the Interagency Mississippi River and Gulf of Mexico Hypoxia Task Force, which set a goal of reducing the size of the hypoxic zone to a five-year average measured size of 1,900 square miles.

"Each year, the forecasts are reported to be bigger or smaller than some long-term average, when in fact the long-term average is not acceptable," said Don Scavia, professor emeritus at the U-M School for Environment and Sustainability.

"Large reductions are called for in the federal-state action plans that have been in place for almost 20 years. Clearly, something different needs to be done in the watershed to actually reduce the nutrient loads and reduce the size of the dead zone," said Scavia, who leads one of several research teams partnering with the federal government on the annual forecasts.

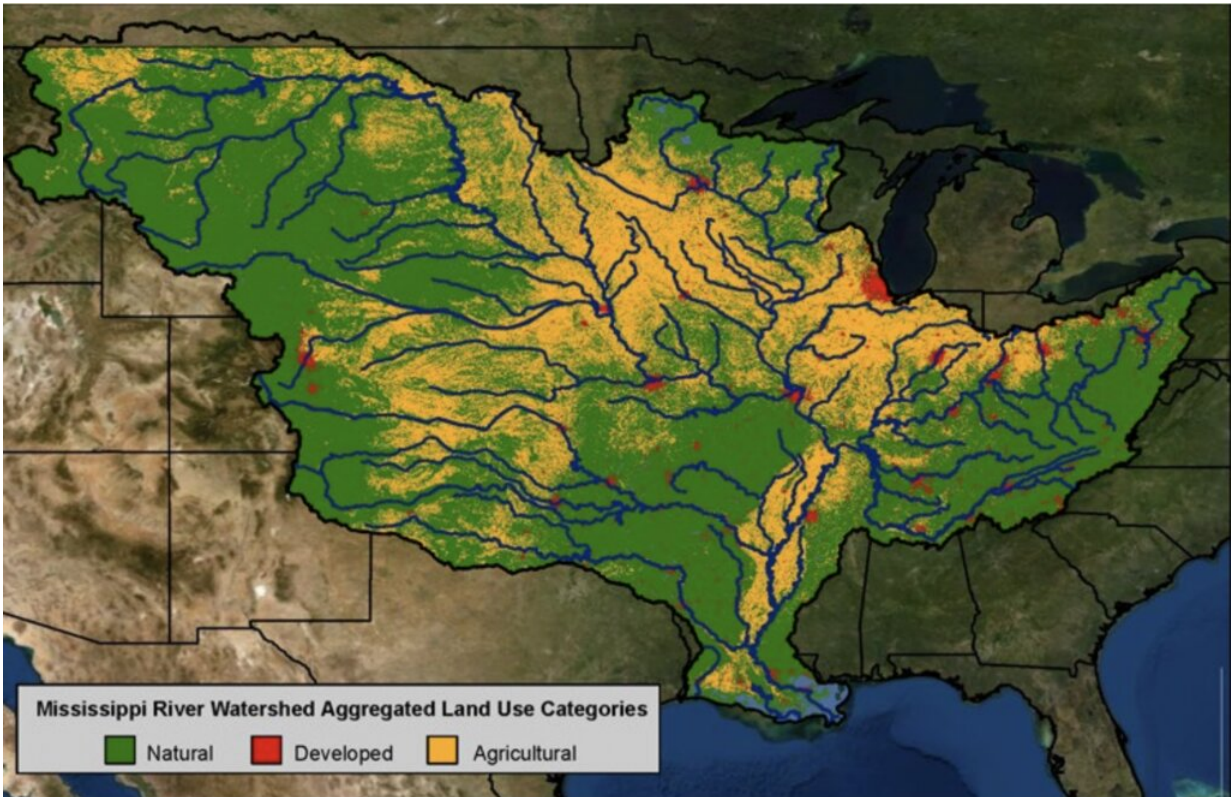
The [2021 U-M Gulf of Mexico hypoxia forecast](#) was released today by the National Oceanic and Atmospheric Administration, which funds the work. This year's forecasted dead zone is substantially less than the 8,776-square-mile 2017 Gulf hypoxic zone, which was the largest zone measured since mapping began in 1985.

The predictions are based on a suite of models that incorporate U.S. Geological Survey river flow and nutrient data.

"Understanding the effects of hypoxia on valuable Gulf of Mexico resources has been a long-term focus of NOAA's research," said Nicole LeBoeuf, acting director of NOAA's National Ocean Service. "These forecasting models inform us of the potential magnitude of the Gulf of Mexico hypoxic zone that might impact living marine resources and coastal economies."

The annual Gulf of Mexico dead zone is primarily caused by excess nutrient pollution from human activities in urban and agricultural areas throughout the Mississippi River watershed. When the excess nutrients reach the Gulf, they stimulate an overgrowth of algae, which eventually die and decompose, depleting oxygen as they sink to the bottom.

The resulting low oxygen levels near the bottom of the Gulf cannot support most marine life. Fish, shrimp and crabs often swim out of the area, but animals that are unable to swim or move away are stressed or killed by the low oxygen. The Gulf of Mexico dead zone occurs every summer.



The Mississippi River watershed encompasses more than 40% of the continental United States and crosses 22 state boundaries. Nitrogen and phosphorus pollution in runoff and discharges from agricultural and urban areas are the major contributors to the annual summer hypoxic zone in the Gulf of Mexico. Image Credit: Adapted from the USGS National Land Cover Dataset

River discharge in May and the associated nutrient load to the Gulf of Mexico has been shown to be a major contributing factor to the size of the dead zone. In May 2021, discharge in the Mississippi and Atchafalaya rivers was about 2% below the long-term average between 1980 and 2020.

The U.S. Geological Survey estimates that this smaller-than-average river discharge carried 90,500 metric tons of nitrate and 15,600 metric

tons of phosphorus into the Gulf of Mexico in May alone. These nitrate loads were about 32% below the long-term average, and phosphorus loads were about 9% below the long-term average.

The USGS operates more than 3,000 real-time stream gauges, 60 real-time nitrate sensors and 38 long-term monitoring sites to measure nutrients in rivers throughout the Mississippi-Atchafalaya watershed. Data from these networks are used to track long-term changes in nutrient inputs to the Gulf and to help build models of nutrient sources and hotspots within the watershed.

"Recent results from USGS models show that agricultural sources together are the largest nutrient sources to the Gulf, and that much of that originates in the Upper Midwest and areas along the Mississippi River. But urban areas, human waste treatment, precipitation and atmospheric dust, and natural sources also contribute large amounts," said Don Cline, associate director for the USGS Water Resources Mission Area.

While the hypoxic zone forecast assumes typical coastal weather conditions, the measured dead zone size could be disrupted and its size changed by major weather events, such as hurricanes and tropical storms, which mix ocean waters, as occurred in 2018, 2019 and 2020. A NOAA-supported monitoring survey, scheduled for later this summer, will confirm the size of the 2021 dead zone and is a key test of the accuracy of NOAA's models.

This year's predicted dead zone would be larger than the long-term goal set by the Interagency Mississippi River and Gulf of Mexico Hypoxia Task Force. The task force strives to reduce the Gulf dead zone by identifying and implementing collaborative nutrient reduction strategies across the Mississippi River watershed, and has set a goal of reducing the size of the hypoxic zone to a five-year average measured size of 1,900

square miles.

NOAA's hypoxia forecast models, together with the USGS's monitoring of nutrients in rivers, help predict how hypoxia in the Gulf of Mexico is linked to nutrients coming from throughout the Mississippi River Basin. The task force uses them to help inform nitrogen and phosphorus reduction targets across the watershed.

"The Hypoxia Task Force plays a critical role in managing [nutrient loads](#) in the Mississippi River Basin to reduce over time the size of the hypoxic zone," said John Goodin, director of U.S. Environmental Protection Agency's Office of Wetlands, Oceans and Watersheds.

"Through state leadership in implementing nutrient reduction strategies, support from EPA and other federal agencies, and partnerships with basin organizations and research partners, we will continue to tackle the challenge of Gulf hypoxia. This annual forecast will continue to inform our collective efforts."

More information: 2021 U-M Gulf of Mexico hypoxia forecast: scavia.seas.umich.edu/hypoxia-forecasts/

Provided by University of Michigan

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