

Bold new approaches needed to shrink Gulf of Mexico dead zone and meet elusive goals

July 31 2017



Credit: CC0 Public Domain

Shrinking the annual Gulf of Mexico "dead zone" down to the size of Delaware will require a 59-percent reduction in the amount of nitrogen runoff that flows down the Mississippi River from as far away as the Corn Belt.

That's the primary finding of a new study that used four computer models to see what it would take to reach the longstanding but elusive goal of cutting by about two-thirds the size of the Gulf of Mexico summer hypoxic zone, an area of low-to-no oxygen that can kill fish and other marine life.

In a study scheduled for online publication July 31 in *Proceedings of the National Academy of Sciences*, the researchers conclude that while the goal is still attainable, reaching it will require bold new approaches applied on a large scale in upstream agricultural areas.

In its action plan for the Gulf of Mexico hypoxic zone, an intergovernmental panel recently extended until 2035 the deadline for achieving the goal of a 1,950-square-mile (5,000-square-kilometer) dead zone, which would be roughly the size of Delaware. The most recent five-year average size of the gulf dead zone is 5,410 square miles (14,024 square kilometers).

Farmland runoff containing fertilizers and livestock waste is the main source of the [nitrogen](#) and phosphorus that cause the Gulf of Mexico hypoxic zone, which is also known as a dead zone.

"The bottom line is that we will never reach the action plan's goal of 1,950 square miles until more serious actions are taken to reduce the loss of Midwest fertilizers into the Mississippi River system," said University of Michigan aquatic ecologist Don Scavia, lead author of the PNAS paper.

Each June, Scavia and his co-authors use computer models to predict the size of the Gulf of Mexico hypoxic zone in forecasts issued by the National Oceanic and Atmospheric Administration. NOAA's 2017 Gulf of Mexico forecast predicts a dead zone of about 8,000 square miles, or about the size of New Jersey, which would be the third-largest on record.

In their study, the researchers point out that little progress has been made in reducing either the nutrient levels in the rivers that empty into the Gulf of Mexico or the size of the hypoxic zone itself.

River concentrations of the nitrogen compound nitrate have not declined since the 1980s. And the current five-year running average of the nitrate load delivered to the Gulf of Mexico is not significantly different from the 1980-96 baseline, despite the fact that U.S. Farm Bill conservation programs spent more than \$28 billion in the 20 Mississippi Basin states since 1995.

"Clearly something more or something different is needed," Scavia and his colleagues wrote in PNAS. "It matters little if the load-reduction target is 30 percent, 45 percent or 59 percent if insufficient resources are in place to make even modest reductions."

Potential paths toward reducing levels of both nitrogen and phosphorus include altering fertilizer application rates, using cover crops (fast-growing crops planted to prevent soil erosion), improving overall nutrient management, and pursuing alternatives to corn-based biofuels.

"It is time to ask what is preventing more extensive implementation of some or all of these strategies," wrote the authors, who are based at U-M, North Carolina State University, Louisiana State University and the College of William & Mary.

In February 2015, the Mississippi River/Gulf of Mexico Watershed Nutrient Task Force, a coalition of federal, state and tribal agencies, pushed to 2035 the goal of reducing the gulf's [hypoxic zone](#) to 1,950 square miles. The task force also agreed on an interim target of a 20 percent reduction in the amount of nitrogen flowing into the Gulf of Mexico by 2025.

In their modeling study, the researchers looked at the likely impacts of the 20 percent nitrogen reduction and concluded that it would produce an 18 percent drop in dead-zone size over the long term, though it may not have a measurable effect in the next five to 10 years.

Although nitrogen has historically been considered the main nutrient driver of hypoxia in the Gulf of Mexico, a "dual-nutrient strategy" of reducing both nitrogen and phosphorus appears to be the most prudent management approach, according to Scavia and his co-authors.

The 59-percent nitrogen reduction needed to shrink the dead zone to the size of Delaware is larger than the 45-percent cut called for in the gulf task force's most recent action plan. It is also higher than recommendations made for other systems suffering from high nutrient levels, including Lake Erie and the Chesapeake Bay.

Scavia and his colleagues say the new study marks the first time that multiple models have been synthesized to develop a consensus estimate of how a hypoxic system will respond to nutrient-load reductions.

Uncertainties include the potential impacts of climate change: The frequency, intensity and timing of droughts and floods are expected to change across much of the U.S., which could affect both the timing and the amount of nutrients delivered to the Gulf of Mexico.

Despite the uncertainties, the team's results show that the hypoxia zone's response to nitrogen reductions "is robust across substantially different and independent models, providing increased confidence that the load reduction proposed will achieve management goals," according to the researchers.

More information: Donald Scavia et al., "Ensemble modeling informs environmental policymaking: The case of hypoxia in the northern Gulf

of Mexico," *PNAS* (2017).

www.pnas.org/cgi/doi/10.1073/pnas.1705293114

Provided by University of Michigan

Citation: Bold new approaches needed to shrink Gulf of Mexico dead zone and meet elusive goals (2017, July 31) retrieved 25 April 2024 from <https://phys.org/news/2017-07-bold-approaches-gulf-mexico-dead.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.