

ENVIRONMENT

Humans make red tide worse, nitrogen flows 'systematically intensify blooms' study says



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Just as it took decades before smoking was recognized as a cancer trigger, it's taken until recently for science to firmly link nitrogen pollution to the persistence of red tide.

But a new University of Florida study with two nonprofit research partners shows clear ties between nitrogen from human activities and the longevity and severity of the saltwater harmful algal blooms.

Published in the academic journal *Science of the Total Environment*, the report's mouthful of a name is: "Nitrogen-enriched discharges from a highly managed watershed intensify red tide (*Karenia brevis*) blooms in southwest Florida."

Two of its key findings:

"Caloosahatchee River discharges and nitrogen inputs systematically intensify blooms" and

"Anthropogenic influence extends upstream to Lake Okeechobee and the Kissimmee basin."

Exposed to red tide? Scientists seek volunteers to learn long-term health effects

Previously: Congressman Byron Donalds champions bill to help those affected by harmful algal blooms

In plain talk, that means what comes from the land all the way up to Lake O can make things worse downstream and on the coast when there's a bloom.

For years there was an ideological tug of war: Some argued that red tide is a natural phenomenon for which people aren't responsible. After all, they said, mariners in the 1700s documented the toxic overgrowth, long before the state was densely populated.

That may be, said others, but dense population definitely makes it worse.

“Just ask anyone who spends more days on the water than on land,” says Daniel Andrews, one of the founders of the nonprofit Captains for Clean Water “They would say of course that's the case.”

He likens it to cigarette companies spending years denying their product caused cancer until science definitively shut their propaganda down. “It's kind of sad there had to be a study to combat misinformation,” he said. Now, he says, science has caught up with commonsense knowledge, and widely held theories are being proven out.

Even though the blooms can develop naturally, “We took a long view and found evidence that human activity has helped fuel coastal blooms in this estuary to varying extents between 2012 and 2021,” said Miles Medina, lead author of the study and a research scientist at the university's Center for Coastal Solutions.

\Finding a cause-and-effect link between human activity and red tide blooms has been challenging because of the many complex factors that contribute to them, researchers say.

The study analyzed data from the Caloosahatchee estuary, Charlotte Harbor, surrounding coastal areas and parts of the area's watershed, which are dominated by urban, residential and agricultural land. It found nitrogen inputs from coastal and inland parts of the watershed – starting with the Kissimmee River, flowing down Lake Okeechobee, then into the Caloosahatchee River and finally into the estuary – consistently intensified the blooms in the harbor.

Eric Milbrandt, who directs the Sanibel-Captiva Conservation Foundation's marine lab, provided input and a geographical perspective for the study.

"There has been an assumption that nutrient runoff from agriculture, fertilizer, and septic systems are used by the dinoflagellate that causes red tide blooms. There is now another piece of evidence linking red tide bloom intensity to these human activities and nitrogen sources specifically,” he said.

Red tide can devastate wildlife, killing birds, fish, dolphin and manatees, while triggering short- and long-term human health problems. Exposure to red tide-tainted air can cause

breathing and neurologic problems as well as gastrointestinal distress.

As of Thursday evening, Southwest Florida was clear of red tide blooms. But the area has been hit hard in recent years.

In 2018, a lingering bloom fouled beaches for months. The event was detailed in a Centers for Disease Control and Prevention report last year that noted: “A total of 321 harmful algal bloom-associated (emergency room) visits were identified during January 1, 2017–December 31, 2019 ... A notable peak occurred in October 2018, corresponding with a large-scale red tide event in the Gulf of Mexico during August–November 2018.”

That bloom, the area’s worst on record, also had the worst-ever Respiratory Irritation Index numbers in Manatee and Sarasota counties as measured by a newly developed scale published in the scientific journal PloS One.

Similar to the National Weather Service’s Heat Index, the metric allows scientists to compare bloom severity from year to year, said lead author Richard Stumpf, an oceanographer with the National Oceanic and Atmospheric Administration’s National Centers for Coastal Ocean Science, in a release.

2018’s bloom also damaged the tourist-focused economy, with losses from that event totaling some \$184 million, tallied by another University of Florida study.

Armed with this knowledge, what’s the best way to respond? Environmental restoration and policy fixes should be top priorities, say water advocates like Andrews with Captains and Calusa Waterkeeper John Cassani.

“(This) should accelerate policy reform on the Florida Department of Environmental Protection’s Basin Management Action Plans, which have been criticized as being largely ineffective,” Cassani said.

Andrews points out that “The science has been settled for decades on how to alleviate the damaging discharges from Lake Okeechobee. By restoring the Everglades and optimizing lake operations to flow more water south during the dry season, we can significantly reduce the amount of nitrogen discharges to Florida’s Gulf coast that fuels red tide blooms that devastate our communities and economy.”

After all, said Dave Tomasko, study coauthor and director of the Sarasota Bay Estuary Program, Florida has acknowledged for more than a decade that nitrogen loads from the Caloosahatchee are too high.

“Our paper simply indicates that there are additional benefits to reducing nitrogen loads such as a reduced enhancement of red tides that arrive on our coast. ...

"Basically, if we do the things that the state has already determined need to be done, we would not only benefit oxygen and water clarity and seagrass meadows in this estuary, but also likely help to reduce the impacts of future red tides."