

SCIENCE

Miles of Algae and a Multitude of Hazards

By LES NEUHAUS JULY 18, 2016



Greg Lovett/The Palm Beach Post, via Associated Press

The stench of decaying algae began rising from coastal waterways in southeastern Florida early this month, shutting down businesses and beaches during a critical tourism season. Officials arrived, surveyed the toxic muck and declared states of emergency in four counties. Residents shook their heads, then their fists, organizing rallies and haranguing local officials.

In truth, there was little they could do: The disaster that engulfed the St. Lucie River and its estuary had been building for weeks. In May, a 33-square-mile algal bloom crept over Lake Okeechobee, the vast headwaters of the [Everglades](#). After an unseasonably wet winter, the Army Corps of Engineers was forced to discharge water from the lake to lower water levels, flushing the ooze along channels to the west until it coagulated along the shores of the famed Treasure Coast.

The mess in Florida is only the latest in a string of algal blooms that some experts believe are increasing in frequency and in severity. An immense plume of blue-green algae last September [covered a 636-mile stretch of the Ohio River](#). A month earlier, the city of Toledo, Ohio, warned more than 400,000 residents to avoid [drinking tap water](#) after toxic algae spread over an intake in Lake Erie. (Indeed, the Lake Erie bloom is now an annual event.)



Clockwise from left: Lawrence Williams, center with his grandson, fishing in Canal Point, Fla., despite the bloom; a fish killed by algae; algae coats water near Central Marine in Stuart, Fla.; the St. Lucie river covered in blue-green algae; water run through a filtration system is added to the marina.

Clockwise from left: Ryan Stone for The New York Times; Cristobal Herrera/European Pressphoto Agency; Ryan Stone for The New York Times; Rhona Wise/Agence France-Presse -- Getty Images; Rhona Wise/Agence France-Presse -- Getty Images

Almost exactly a year before the Florida bloom, another stretching 7,500 square miles [washed ashore in Qingdao, China](#), a popular beach destination. Government officials called in hundreds of boats and bulldozers to remove it. The green blob appeared again earlier this month.

The largest and most dangerous algal bloom ever recorded, which ranged from Central California to British Columbia, produced high levels of a toxin that last year closed crab and clam fisheries along the West Coast.

“The season didn’t open for four and a half months, which meant slip rents went unpaid, house payments went unpaid, guys were having trouble getting groceries to feed their families,” said Tim Sloane, the executive director of the Pacific Coast Federation of Fishermen’s Associations.



Thick algae coats the water at Central Marine, in Stuart, Fl. Ryan Stone for The New York Times

Algae is a catchall term referring to a wide variety of aquatic organisms that generally rely on photosynthesis for energy and reproduction. Blue-green algae are cyanobacteria, for instance, while red tide is composed of tiny dinoflagellates. Seaweed is a sophisticated alga, as is kelp.

Blooms are a natural occurrence. According to Dr. William Cochlan, a senior research scientist at San Francisco State University, Native Americans for centuries knew to avoid bioluminescent water. Scientists would later discover that the glow was caused by dinoflagellates that also produce a hazardous neurotoxin.

Many algal species produce similar toxins. When vast blooms occur, these poisons may spread through the environment and up the food chain to fish and animals that feed on them. Cyanobacteria produce microcystins, for example, which can affect the liver and can be deadly to humans — one reason Toledo banned the drinking water.



A sign saying "Stop the Discharge" lays on the ground near one of the areas affected by the invasion of algae on Saturday July 9, 2016 in Stuart, Florida. Ryan Stone for The New York Times

Although they occur naturally, algal blooms are being intensified by human

activity in ways that scientists are still trying to quantify. Chief among the culprits: runoff from farms, feedlots and municipal sewer systems.

“The bloom itself is the visual manifestation of nutrient overenrichment in lakes,” said Tim Davis, an ecologist at the National Oceanic and Atmospheric Agency’s Great Lakes Environmental Research Laboratory in Ann Arbor, Mich. “In freshwater systems, both nitrogen and phosphorus are the main nutrients.”

In Florida and the Great Lakes, nitrogen and phosphorus come mainly from fertilizers used in large farming operations, along with septic tanks, manure and storm water. Scientists have been aware of the nutrient problem for decades: It’s partly why phosphorus was removed from laundry detergents.



Boats sit unused due to the thick coat of algae on top of the water at Central Marine in Stuart, Fl.
Ryan Stone for The New York Times

The vast algal bloom in the Pacific last year was also fed in part by El Niño, the mass of warm water that forms periodically off the West Coast. But longer-term [climate change](#) may also be playing a role, some experts say.

Warming atmospheric temperatures and wetter weather in some parts of the country increase the nutrient-laden runoff into streams, lakes and the ocean. And as ice melts in the Arctic, sea temperatures are rising and more sunlight is filtering into the ocean.

“Some of the features of climate change, such as warmer ocean temperatures and increased light availability through the loss of sea ice in the Arctic, are making conditions more favorable for phytoplankton growth — both toxic and nontoxic algae — in more regions and farther north,” Kathi Lefebvre, a biologist at NOAA’s Northwest Fisheries Science Center in Seattle, wrote in an email.

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“It is likely that toxic blooms will continue to increase and expand as these features of climate change continue,” she added.

Dr. Davis said he also believed that climate change was working against efforts to prevent algal blooms.

“I certainly believe as a scientist that climate change will influence the size and intensity of these blooms,” he said. “If nothing changes — the increase of rainfall, the increase nutrient loads, warmer water — all of this could lead to larger blooms that last longer and are more toxic.”

Florida’s crisis is only the most recent example, Dr. Cochlan of San Francisco State University said — yet no new funds have been appropriated at the federal or state levels to study the growth and toxicity in these blooms, despite their increasing impact throughout the country. In a letter to President Obama on July 12, Florida legislators asked for federal funding to avert further disaster.

Back in 2014, Florida voters approved [Amendment 1](#), setting aside an estimated \$650 million in the program’s first year for the state to buy

agricultural land south of Lake Okeechobee as a new pathway for discharge into the Everglades.

The hope was that the ecosystem would provide a natural filter for algae and other contaminants, as it once did. But in the end, the state decided not to buy the land, instead sparring with Environmental Protection Agency over its efforts to enforce the federal Clean Water Act.

“A lot of this has to do with legislation, all the way from the watershed down into the lake,” Dr. Davis said. “It needs to be a mutual effort on all sides. The more we understand about the blooms, the more we can do to reduce their impact.”

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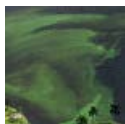
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