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Another Problem with Biofuels?

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Shoulder-high stalks are seen in a corn field.

Tim Boyle / Getty

It's called the dead zone. Agricultural fertilizer byproducts like nitrogen are running off farms and into the Mississippi River, which then spills out into the Gulf of Mexico. Those chemicals help feed crops on land, but as they build up in the still, warm waters of the Gulf, they in turn feed excess growth of algae. When algae dies and decomposes, the process sucks much of the oxygen out of the water. A sea without oxygen is little different from the surface of the moon — nothing can live there. Fish and other sea life flee, or suffocate. That's the Gulf's dead zone, and last year it reached 7,915 sq. mi (20,500 sq. km) — nearly the size of the New Jersey. Worse, the dead zone is getting bigger, with last year's bloom the third largest in history.

## More Going Green

It could be much worse. That's one of the implications of a new study published Wednesday in *Nature* that tracks the ability of streams and rivers to absorb nitrogen runoff before it pollutes the seas. A team of 31 scientists led by the Oak Ridge National Laboratory in Tennessee studied 72 streams in eight regions across the U.S. and Puerto Rico, and found that only about a quarter of the nitrogen that spills into rivers makes it to open water, with most of the rest managed by bacteria that live in the waterways. In a process called denitrification, the microbes convert nitrates in the water into nitrogen gas, which is released into

the atmosphere. It's an excellent example of a biological service: one of the many free processes performed for us by our environment, without which life as we know it might not be possible. (Think how expensive it would be if we had to pay to remove hundreds of thousands of tons of nitrogen from our waterways every year.) "These streams are the first line of defense," says Patrick Mulholland, an aquatic ecologist at Oak Ridge and the lead author of the study.

That line of defense, however, is weakening. Mulholland and his collaborators found that the filtering ability of streams couldn't keep pace with the flow of nitrogen pollution. So, as runoff from fertilizer increased, the natural denitrification system slowed, and more nitrogen survived untouched to the open ocean — worsening the dead zones. That's cause for concern as American farmers plant increasing amounts of corn, a crop that requires heavy fertilizer, to meet the growing global demand for grain and to supply America's corn-hungry ethanol makers. According to a separate study published by University of British Columbia and University of Wisconsin researchers this week in the *Proceedings of the National Journal of Sciences*, ethanol is directly linked to the Gulf of Mexico dead zone. If farmers produced enough corn to meet the congressional goal of producing 15 billion gallons of ethanol by 2022, nitrogen runoff into the Gulf would increase by 10% to 19%, the study's authors reported, and shrinking the dead zone would be "practically impossible."

Mulholland backs that conclusion. Our inland waterways can barely handle the nitrogen fertilizer we're already using in order to grow record yields of corn and other crops. Truly ramping up biofuel production — unless it can be done in a way that uses much less fertilizer, perhaps with experimental techniques that harness plant waste matter instead of food crops — might overwhelm that system. "We have to be very careful about biofuels in terms of what kind of crops we grow and where we grow them," says Mulholland. "The great expansion of corn could be a real problem." It would be a poor tradeoff if we killed the seas to fuel our cars.