

No easy answer to stopping nitrate runoff

TILE drainage in the Mississippi River basin is one of the great advances of the 19th and 20th centuries, allowing highly productive agriculture in what was once land too wet to farm.

However, a recent study shows the most heavily tile-drained areas of North America are also the largest contributing source of nitrate to the Gulf of Mexico, leading to seasonal hypoxia. In the summer

Key Points

- Study says tile-drained areas may contribute most to nitrate runoff.
- Farmers are producing more corn with the same amount of fertilizer.
- Researcher believes an incentive program would help mitigate runoff issues.

of 2010, this dead zone in the Gulf spanned 7,000 square miles.

Scientists from the University of Illinois and Cornell University compiled information on each county in the Mississippi River basin, including crop acreage and yields, fertilizer inputs, atmospheric deposition, number of people, and livestock to calculate all nitrogen inputs and outputs from 1997 to 2006.

For 153 watersheds in the basin, they also used measurements of nitrate concentration and flow in streams, which allowed them to develop a statistical model that explained 83% of the variation in springtime nitrate flow in the monitored streams.

The greatest nitrate loss to streams corresponded to the highly productive, tile-drained Corn Belt from southwest Minnesota across Iowa, Illinois, Indiana and Ohio. This area of the basin has extensive row cropping of fertilized corn and soybeans, a flat landscape with tile drainage, and channelized ditches and streams to facilitate drainage.

"Farmers are not to blame," says University of Illinois researcher Mark David. "They are using the same amount of nitrogen as they were 30 years ago and getting much higher corn yields, but we have created a very leaky agricultural system. This allows nitrate to move quickly from fields into ditches and on to the Gulf of Mexico. We need policies that reward farmers to help correct the problem."

No easy fix

David is a biogeochemist who has been studying the issue since 1993. He says a new study includes data from the entire Mississippi River basin. It shows clearly where the sources of nitrate are across the entire basin.

David says ripping out all of the drainage tiles is not a viable option. "Creating wetlands and reservoirs such as Lake Shelbyville can remove nitrate by holding the water back and letting natural processes remove it, but that's not a solution. It's expensive, and we can't flood everyone's land to stop nitrate. That's not going to happen.

"The problem is correctable but will take a concerted effort to change the outcome, with some of the solutions expensive. Installing small wetlands or bioreactors at the end of tile lines that remove nitrates before they flow into the ditch do work, but would cost thousands of dollars per drain. Who's going to pay for that?" he asks.

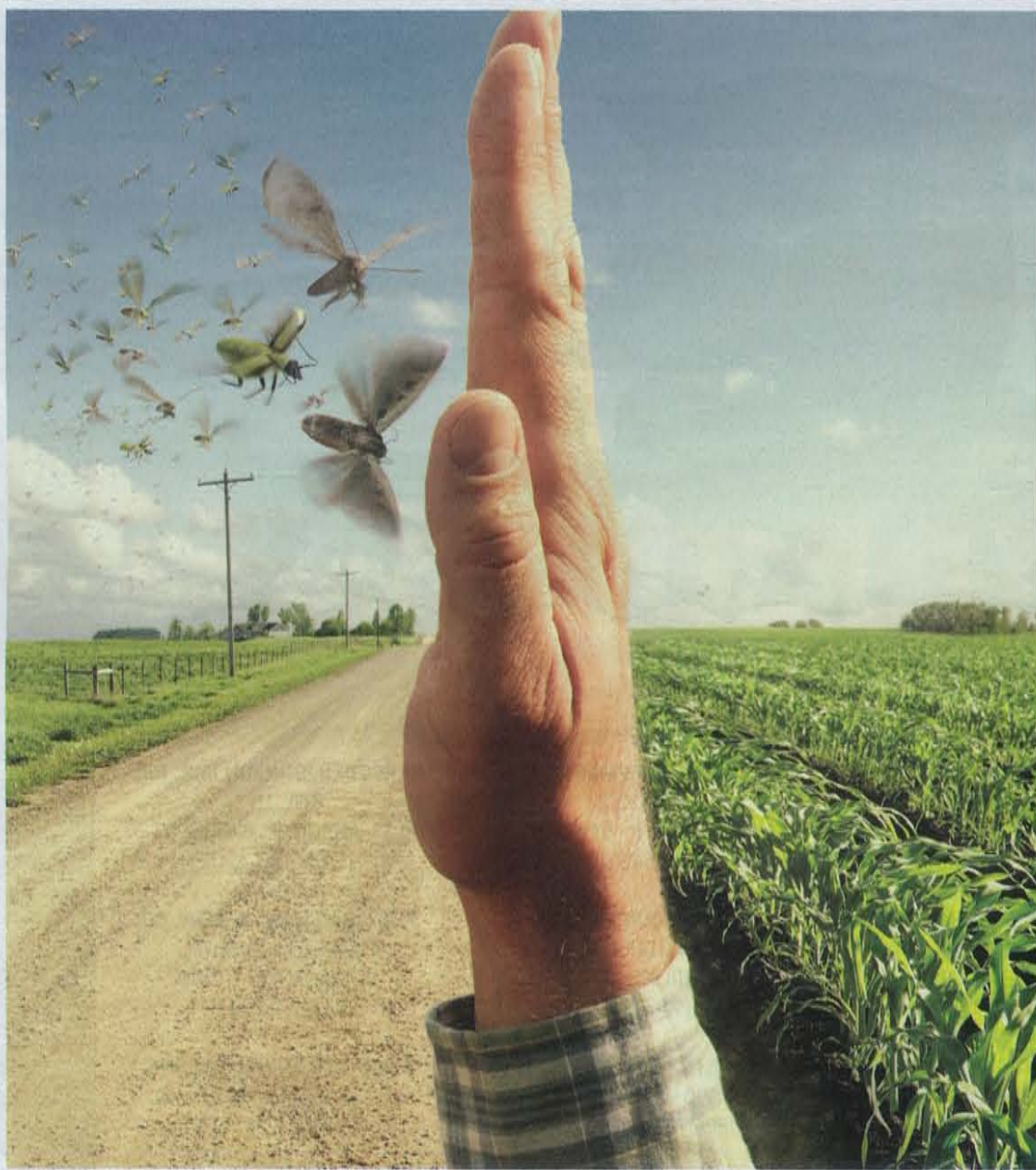
Cover crops can hold the nutrients so they are available in the spring. They are reasonably cheap, but they can increase the farmer's risk for the following crop. "So if a farmer plants a cover crop and his neighbor doesn't, he may be at a disadvantage," David says.

Incentive program

David believes the system can be improved by focusing conservation efforts on the areas of the country that are contributing the most nitrate runoff and establishing an incentive program for farmers to utilize one or more practices known to reduce nitrate losses from tile lines.

Encouraging farmers to apply the right amount of nitrogen in the spring rather than the fall (or to sidedress); establishing a more complex cropping system that incorporates cover crops or even biofuel crops such as miscanthus or switchgrass when there are markets; and installing end-of-pipe solutions such as controlled drainage, bioreactors or wetlands are some of the efforts David suggests would help reduce nitrate loss.

Source: University of Illinois



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