

Bay Journal

Bioreactors taking a bite out of pollution on Eastern Shore

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Pits use wood chips to remove nutrients from ag runoff before it reaches streams

Rona Kobell | December 22, 2015

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Drew Koslow stands atop a dam in Turkey Creek that diverts water into a bioreactor full of wood chips. The farm is owned by the Hutchinson Brothers of Talbot County. (Dave Harp)

Drew Koslow spent nearly two decades working with federal and state governments, as well as nonprofit agencies, to improve water quality in the Chesapeake Bay. He patrolled rivers, filed lawsuits against polluters, worked with landowners to put in practices that would treat stormwater and helped farmers control their runoff.

But in recent years, Koslow began to notice that while a lot of agencies talked about cleaning up the watershed, not a lot of people were helping to install the practices that would actually do the job. So he began doing that himself, securing state and federal funds to put in structures on farms that would reduce nitrogen and phosphorus flowing into waterways.

Over the last two years, Koslow installed six bioreactors on farms in the Choptank River watershed, where he served as riverkeeper. Bioreactors are a relatively new technology. Researchers at the Iowa State University lab in Ames, IA, began developing them just six years ago, though they were in New Zealand and Canada in the 1990s.

Typically, farmers apply nitrogen, phosphorus and potash to their soil to grow crops — either using commercial fertilizer or animal manure. When it rains, that fertilizer runs into streams and rivers, fueling algae blooms and other pollution problems. The goal is to keep pollution out of the stream by using buffers that will soak up the nutrients, and helpful bacteria that will help to clean, or denitrify, it before it proceeds to the stream.

In a bioreactor, pipes funnel water to a pit filled with buried wood chips. The wood chips are a substrate for bacteria that thrive in that environment and convert the nitrate from the fertilizer or manure into nitrogen gas, which dissipates into the atmosphere. By the time the water flows out the other side of the wood chips, the nitrogen content is about 50 percent lower, and in some cases, even lower.

Bioreactors help to mimic the natural process that would have occurred on land that is more suited to be a fallow wetland, but has been engineered for agriculture. The denitrification process at sewage treatment plants works much in the same way, though it tends to be more expensive.

Koslow was convinced enough in the power of the bioreactor to reduce nitrates that he decided to devote his professional life to constructing them. His company, Ridges to Reefs, employs three people. He is based on the Eastern Shore and is planning to install his seventh bioreactor this year.

"I just feel like the technology is so basic for the bioreactors, and it's a practice that can play an important role in reducing pollution," Koslow said. "By myself, I'm not going to be able to make a difference statewide, but I'm hoping I can get other people to do them, too."

Richard Edwards let Koslow put a bioreactor on his 700-cow, Caroline County dairy farm two years ago. He gave up an acre of land for the practice and has to do very little to

maintain it. Edwards said that he had good relationships with the soil district, Koslow and environmental groups, and wanted to do his part to improve water quality.

"I guess it's kind of a brownie point with the folks that feel they need to regulate all this stuff," Edwards said. "There was a feeling in me that I should help out."

The technology is slowly making its way out of the laboratories and onto more farms in the Chesapeake Bay as well as in the Midwest. The Eastern Shore has 12 bioreactors, according to Jason Keppler, program manager for the watershed implementation program at the Maryland Department of Agriculture. The department helped to pay for them through a conservation innovation grant, but Keppler said he hopes the bioreactors and the filters that attach to them to reduce phosphorus will be part of the state cost-share assistance program by early 2016.

The U.S. Department of Agriculture has helped fund six bioreactors in New York State in the Upper Susquehanna and Finger Lakes watersheds. In those, the bioreactors removed 57 percent of the nitrogen being discharged into the stream. The bioreactors cost \$10,000 –\$30,000 to install, depending on location.

In Iowa, Nick Meier has installed one of two bioreactors in the Miller Creek watershed, which encompasses 42,000 acres and includes 137 farmers. The watershed, between Waterloo and Cedar Rapids, is part of a partnership between the city of Cedar Rapids and the local conservation district to reduce nitrate coming from north of Cedar Rapids. Researchers hope bioreactors, saturated buffers and cover crops will help clean the waterway so Cedar Rapids doesn't have to follow in Des Moines' footsteps and pay for expensive denitrification techniques to clean its drinking water. Nitrate in the water is increasing, said Cedar Rapids utility manager Steve Hershner, but it hasn't reached alarming levels yet.

Shane Wulf, the watershed coordinator for the Blackhawk Soil and Water Conservation District, acknowledged that bioreactors are a harder sell than cover crops. Farmers have to pay a portion of the cost — Meier kicked in \$6,500 for his \$16,000 reactor — and installation involves a detailed plan and significant construction process. But Wulf said the nearly 90 percent nitrate reduction on the two that have been installed so far is convincing — to him, and he hopes, to other farmers like Meier.

"We're hoping to see more numbers like that over the course of a year," Wulf said. "It's going to take a lot (to make a difference). Really, we're just at the beginning."

Category: **Conservation + Land Use** Pollution



About Rona Kobell

Rona Kobell is a former writer for the Baltimore Sun. [Send Rona an e-mail](#).

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Comments

thomas on December 26, 2015:

We need more Bioreactors and less talk! Talk produces nothing but more Hot air!

Patrick roddy on December 31, 2015:

I am unsure from the article what happens to the phosphorous contained in the water run through the bioreactor. Does that remain in the runoff and still flows into the Tributaries and the Bay?

Ruiqiang Liu on January 11, 2016:

these woodchips would rot any anyways and the P would go with these chips.

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