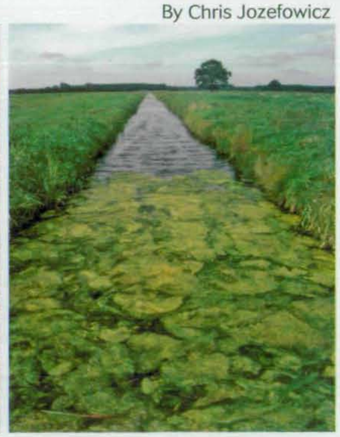
EARTH

By Chris Jozefowicz



Left: The waste from huge hog farms such as this one, when used to fertilize fields, is often washed into nearby streams. Right: a waterway overgrown with algae

Clockwise from top left: Rick Dove; Chinch Gryniewicz/Ecoscene/Corbis; Newscom; Rick Dove; Bryan Reed; Benny Sieu/MCT/Newscom

Muddy Waters

Keeping pollution down on the farm

Bryan Reed likes to see poop piling up indoors. Reed, who runs a farm in southern Iowa, used to let his herd of cows roam outdoors. But the rain liquefied their droppings into a muddy mess. Though the land could absorb a lot of that mess, the biggest rainstorms washed some of it into a nearby stream. "The grass couldn't filter out enough before it got to the stream," he says.

So Reed recently moved his 215 cows into an enormous building. "The building keeps the rainfall from getting to the manure," Reed says. "I can store it inside until I can safely apply it to the fields."

"The biggest thing for me is not being a slob," he adds. "I don't want to negatively affect people downstream."

Reed's effort is one small solution to a very big problem. Uncountable tons of soil and manure are washing off farmland into the waterways of the United States.

"Agricultural pollution is the largest source of water pollution in the nation," says Nancy Stoner, a water quality expert at the Natural Resources Defense Council. "There really isn't any question about that."

NUTRIENTS AND SOIL

Farms release two major types of pollution, says Stoner. "The first is *nutrient pollution*." Nutrients are elements, such as nitrogen and phosphorous, that promote the growth of plant life. They come from manure and synthetic fertilizer.

"The second type is *sediment pollution*," Stoner adds. Sediment is small particles of sand, clay, and other components of soil.

What's wrong with nutrients and soil? Excess nutrients promote the overgrowth of algae and plankton in rivers, lakes, and oceans. That overgrowth blocks sunlight and depletes gases and other resources in the water. In overgrown waterways, plants and small animals can find fewer places to live and predators have trouble hunting. In extreme cases, the overgrowth leads to *hypoxia*, a lack of oxygen. "Dead zones" that can't support fish and other aquatic animals appear.

The nitrogen in nutrient pollution also reacts with oxygen to form *nitrate*, a chemical that can cause health problems in people when drinking water contains too much of it. Nitrate filtration is not a standard procedure in many water treatment facilities.

Sediment pollution turns water murky, which disrupts plant growth and limits what animals can see. It also makes drinking water smell and taste bad and increases water-filtering costs.

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NONPOINT POLLUTION

Controlling farm pollution isn't as easy as capturing the emissions from cars and factories. Farm pollution is a type of *nonpoint source pollution*—pollution that has no defined source and is difficult to control. It's washed from a large area of land to a common location, such as a river, a lake, or a bay. (*Point source pollution* can be traced to specific outlets.)

Farmers have always struggled to control what runs off their fields, says Wendy Powers, a professor of animal agriculture at Michigan State University. Farms are at nature's mercy—they get hit with heavy rains and large snowmelts. "It's not like a factory that has a waste discharge pipe," she says. "Agriculture has open fields."

Some farming practices are contributing to the problem, she adds. Too many farm animals are raised in some regions of the country to give city dwellers ready access to fresh meat. The manure piling up at such farms is more than the local fields can handle. And the containment ponds where some of that manure is stored often leak.

RUNOFF CONTROL

Efforts to control farm runoff involve steps such as those Reed has taken on his Iowa farm. In addition to moving his cows indoors, he recently began *no-till farming*. He no longer prepares the soil for crops by plowing and turning it. Now the soil remains locked into the fields. He has also added an underground drainage system to parts of his field, that funnels excess water directly to his stream.

An ideal farm, says Powers, uses manure as fertilizer, prevents waste runoff, and finds a way to balance the nutrients added as fertilizer with those that come from manure. In most cases that job is too big for one farm, so groups of farms have to team up. "It's better to look at crops and animals as an integrated system," Powers says. Farmers grow crops, feed some of those crops to livestock, and use the manure to fertilize the next crops. It's a form of natural recycling.

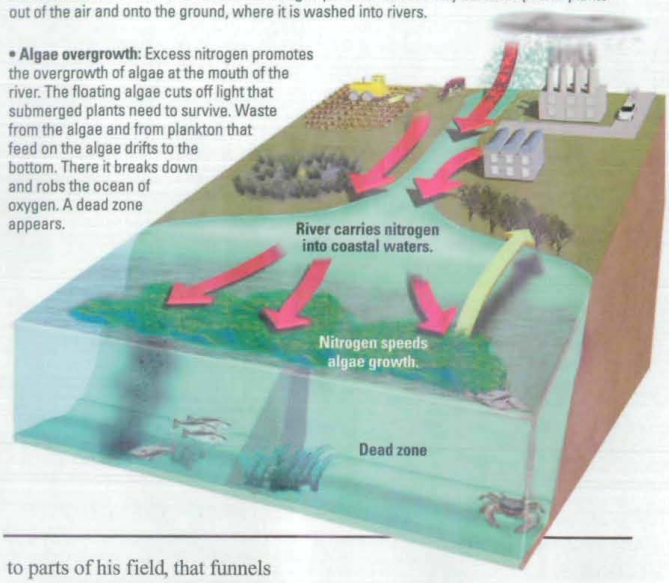
Reed admits that the improvements he has made have been expensive. But he's 35 years old and sees many years of farming in his future. Some of his older neighbors can't afford long-term, expensive investments, he explains. "It's going to take some younger people to make the commitment," he says. "I look at what my dad and my grandpa did when I grew up. What we're doing today is light-years better for the environment."

Attempts to limit farm pollution are succeeding, but the scope of the problem is still large, says Powers. "We'll never get to zero pollution," she admits. "But we already know the right things to do." **CS**

Dead in the Water

When farms, cars, and factories pollute a river with nutrient waste, a dead zone—an oxygen-free area where most marine life cannot survive—may develop at the mouth of the river. Here is the path that one nutrient—nitrogen—takes.

- **Nitrogen sources:** Rain and irrigation water carry nitrogen-based fertilizer and nitrogen-rich manure into rivers. Rain also rinses the nitrogen pollution released by cars and power plants out of the air and onto the ground, where it is washed into rivers.
- **Algae overgrowth:** Excess nitrogen promotes the overgrowth of algae at the mouth of the river. The floating algae cuts off light that submerged plants need to survive. Waste from the algae and from plankton that feed on the algae drifts to the bottom. There it breaks down and robs the ocean of oxygen. A dead zone appears.



Left: Bryan Reed's herd of cattle lives indoors. Right: fish killed by hog manure that polluted the Neuse River in North Carolina