Minnesota's farmlands are being drain-tiled at a breakneck pace, prompting an often sharp debate that pits better crop yields against runoff and water-quality concerns.

To understand how quickly tile is going in, check out a small watershed district on the state's western border.

In 1999, the Bois de Sioux Watershed District approved permits for 2.9 miles of subsurface tile, an artificial way to drain water from land. In 2009, it permitted 779.3 miles of drainage tile. Last year, it signed off on 1,558.3 miles. By mid-April, the total was approaching 1,000 miles, on pace to surpass 2011.

"My teeth dropped when I saw those numbers," said Jon Roeschlein, the agency's administrator.

While tiling data aren't nearly as precise elsewhere, the surge is beyond dispute.

From southeastern Minnesota's porous karst to the fertile Red River Valley, machines and workers have been surveying the land with GPS technology, digging trench lines, unrolling flexible plastic drainage tubing and burying it -- all to maximize tillable acreage and to make farming operations more productive and profitable.

It's easy to see why.

High crop and land prices, expiring set-aside contracts, guaranteed crop-insurance programs, built-in tax advantages and dry conditions have combined to create a perfect storm of sorts. Flush with cash, hoping to pull in even more, and no longer wanting to rely on the vagaries of weather, many farmers are taking matters into their own hands.

They say they'd be silly not to.

"Times like these are when you need to maximize production out of every acre you can, and one of the ways you can do that is to improve soil health," said Doug Albin, who spent more than $40,000 this year tiling a portion of his 1,200-acre corn, soybeans and wheat operation near Clarkfield in southwestern Minnesota.

ENVIRONMENTAL IMPACT

But the implications go far beyond increased yields and bumps in farm income.

Water that once stayed on land during wet periods now increasingly filters into underground tile and then courses into ditches, streams and rivers. There, critics contend, more runoff contributes to higher flows that lead to more frequent and severe flooding, erosion of stream banks and dirtier water.

In some places, grassy areas that once harbored wildlife are being plowed under and tiled to plant corn and soybeans.

All of that can carry a hidden public cost.

State and federal governments, cities and residents pay to fight floods and to clean up after them.

As part of the federal Clean Water Act's mandated water-cleanup effort, the state plans to spend hundreds of
millions of dollars in coming years to get lakes and rivers to meet water-quality standards. Sediment from riverbanks and farm fields and agricultural pollutants are among the biggest problems.

Much of that money comes from the Clean Water, Land and Legacy Amendment, which raises almost $100 million a year through a special sales tax increase for water cleanup activities.

Last month, the Environmental Working Group said Minnesota growers converted an estimated 1.3 million acres of grassland to farmland between 2008 and 2011, primarily for corn, soybeans and wheat. While those acres are being plowed under and sometimes tiled, another section of the Legacy amendment funnels a like amount to preserving grasslands, wetlands and forests.

The nonprofit research organization said extravagant federal crop insurance subsidies encourage the trend. Others note how tiling-related tax write-offs can offset huge profits.

"Over the last 100 years or so, we've dramatically changed the hydrology of Minnesota," said state Rep. Rick Hansen, DFL-South St. Paul. "Early on, government paid for ditching or directly subsidized tiling. Now, our tax code provides an indirect subsidy, where, at the same time, direct appropriations go to water quality, wildlife habitat and flood-control measures."

WHERE TRUTH LIES

Mention tiling, and passionate feelings abound.

Advocates consider it a key to modern farming success, providing better chances for steadier incomes and improved, more consistent yields. Burying a ribbon of perforated, 3-inch diameter plastic piping every 40 paces or so may appear subtle, but the effects can be significant; installing drain tile can increase crop yields by up to 30 percent, according to industry representatives.

Others argue that the long-term damage isn't worth the extra income.

"The truth lies somewhere in between," said Shannon Fisher, director of the Water Resource Center at Minnesota State University, Mankato. "Those protesting drainage as terrible or as an unmanageable practice aren't necessarily correct. Also, I believe those who defend drainage, who say there's no impact on water quality, also are not correct."

Steve Commerford, an independent agricultural and environmental consultant from New Ulm, preaches the virtues of tiling like few others.

Farmers, he said, aren't tiling too much; they're not tiling enough. Less than a quarter of the land in Minnesota that should be tiled has been, and that means agricultural yields aren't as good as they could be or should be, he said.

"There's a lot of tiling that needs to get done and will get done," Commerford said.

Tiling, he contended, actually reduces the volume of water getting into rivers by making drainage more consistent. With subsurface tiling in place, water can filter into it, allowing the soil above it to hold additional water better, he said.

"It allows water to move into the soil rather than immediately run off it," said Commerford, who also said it increases evapotranspiration when crops are growing.

He also contended that tiling reduces sediment loss and helps wildlife by lessening the temptation to till less
productive land.

But Tom Kalahar, conservation technician for the Renville County Soil and Water Conservation District, said that's nonsense. He contended that tiling funnels more water and pollutants into the Minnesota River, which runs through the heart of the state's south and central agricultural region, undermining attempts to clean it up.

"We're really treating it like a large drainage ditch," Kalahar said. "That should be an embarrassment to all of us, but it's only an embarrassment to a few of us.

"I find it fairly alarming and hypocritical of federal and state governments to put all the emphasis on clean water and flood management and then continue to ignore the 800-pound gorilla in the room," Kalahar added, referring to tiling. "To me, it tells us we're nowhere near any serious change in water management in the state of Minnesota."

ECONOMIC SENSE

Steven Taff, an agricultural economist at the University of Minnesota, said farmers optimistic about the direction of corn, soybean and land prices have a straightforward decision: Will tiling expenses, which can run in the tens of thousands of dollars, be recouped by projected higher profits?

"If farmers are making land-management decisions, things like tiling, on the basis of how much they can earn, and they think, year in and year out, it will increase yield, they probably will" tile their land, Taff said.

Land prices, he said, have risen 5 percent to 10 percent a year and are up substantially since the 1980s. Prices for commodities such as corn and soybeans also are up markedly in recent years, putting extra money in farmers' pockets.

"It appears more farmers see prices high for some time to come," Taff said. "That's driving not just tiling but land-buying decisions as well."

Many farmers who have been paid to keep their land in grasses, under the federal Conservation Reserve Program, or CRP, are plowing them up and sometimes installing tiles to boot.

If it's a tough choice, but hard to resist.

"My choice is, as a landowner, do I re-up in CRP or do I exit my contract and plant corn, soybeans and wheat?" Taff asked. "If that decision is made strictly for financial reasons, higher prices for corn and beans, it's more likely they will not re-up."

LITTLE DATA

Despite all the tiling going on, no one knows exactly how much is taking place in new areas, how much simply replaces or upgrades old systems, how much allows grasslands to be cultivated, or how much actually destroys or degrades wetlands, potholes and sloughs.

"Is there data? No," Kalahar said. "Everybody should be shocked by that. The dead ends are intentional.

"It's one of the best-kept secrets in the world," he continued. "There is very little data being gathered. It's the hidden infrastructure that the public doesn't have a clue about. No government agency wants to regulate tiling because (regulation) is politically unpopular with the ag community."

The Bois de Sioux Watershed District imposed stricter permitting standards years ago to help keep tabs on activities that could affect flooding in the Red River Valley. Elsewhere, tiling on agricultural land is largely
unregulated.

By almost every estimate, most of it is being done on land already supporting row crops, to make it function more efficiently. And much of that farmland already has tile, some of it decades old.

But in less-developed agricultural areas, such as the Bois de Sioux Watershed District, the vast majority of new tile, which covers more ground than older systems, is being installed under land that's never been tiled before, said Roeschlein, the agency's administrator.

For two decades, Minnesota's Wetland Conservation Act has had a no-net-loss wetlands provision that limits what farmers can do with sloughs and other wet areas that filter water and shelter wildlife.

But some critics have questioned whether farmers, especially those not tied into federal farm programs that require tighter oversight, are getting rid of them anyway.

State and federal authorities said they have run across several questionable instances of tiling on and near wetlands, but those cases are pending.

"We don't have any kind of large-scale system analysis of what's going on, at least at this point," said Doug Norris, wetlands program coordinator for the Minnesota Department of Natural Resources.

An ongoing wetlands-monitoring project may be able to tie some wetlands losses to tiling, he added.

But Roeschlein said he doesn't believe wetlands, at least in his area, are being affected. In the flat landscape of the Red River Valley, he said farmers are primarily seeking to change the drainage of low-lying swales that support crops but frequently become too wet to grow healthy plants.

RIVER IMPACT

As for tiling's impact on rivers, a clearer picture may be emerging.

A recent Minnesota Pollution Control Agency report concluded that farms in the Minnesota River watershed contribute almost two-thirds of the sediment clogging Lake Pepin, the widening of the Mississippi River southeast of the Twin Cities. An extensive ditch system created over the past half-century or more contributed much of it, according to Norman Senjem, the author of that report and a retired MPCA planner.

"The effect of more intensive draining recently is a little harder to figure out," he said. "For sure, it's increasing the nitrate load into rivers because that's a water-soluble pollutant."

That, he added, contributes to an oxygen-depleted zone in the Gulf of Mexico.

Shawn Schottler is a senior scientist at the St. Croix Watershed Research Station who recently led a research project looking into the effects of artificial drainage on river flows. He said stream bank erosion and sediment levels in the Minnesota River watershed have increased.

"The rate they are eroding is not natural," Schottler said of riverbanks.

Schottler's team looked at 70 years of precipitation, water flow and crop records in 21 watersheds of the river and concluded that artificial drainage, urban or rural, is putting more water into rivers, leading to more erosion and suspended sediment.

"It's not the only driver, but it's the major driver," he said, noting that artificial drainage goes beyond tiling to
include lower levels of runoff from urban parking lots, roads and yards.

Land-use changes also have had an effect, he said.

Decades ago, he said spring rains largely were absorbed by grasses or perennial crops like alfalfa. While corn acreage has remained the same over that period, there's been a huge shift to soybeans, a row crop that, like corn, must be planted annually.

During wet springs, he said, there's less plant base to absorb water and recirculate it into the atmosphere through evapotranspiration. That water must go somewhere, and much of it is probably running off fields into rivers and streams, he said.

"Both crop conversion and artificial drainage alter evapotranspiration," he said. "Precipitation that used to evaporate is now routed to the rivers. Artificial drainage reduces the amount of time that water remains on the landscape."

Some say it doesn't have to.

Tile systems that include pumps or outflow gates can be operated to dry out after harvest in the fall but retain water in the spring before planting, said Roeschlein, the Bois de Sioux administrator.

In late August, he organized a two-day event with more than 100 people from the farm industry to sell them on the idea.

"What we're saying is when there's a flood on, shut your gate off and hold water," he said.

The higher cost of such a system appears to be prompting many farmers to pass on the idea. As an incentive, the district is allowing farmers who install such controls to install larger-diameter drain tile pipes than they could without the controls.

CORPS MAKES PITCH

Tiling soon may be done more quickly in controversial areas.

In fact, the surge has prompted at least one wetlands-regulation agency to propose loosening up the approval process when small wetlands are being drained.

The U.S. Army Corps of Engineers this summer accepted public comment on a plan to eliminate the need for a special permit to tile under some wetlands smaller than two acres, or to install drain tile under a culvert in the place of an intermittent stream shorter than 2,000 feet long.

Under the Corps’ proposal, such activities, which today must surmount several hurdles, including an environmental assessment, would be automatically approved under a statewide "general permit."

In other words, a landowner would be able to fill a 1,500-foot slough, via an underground culvert covered by dirt, with little more than a notification to the Corps attesting to compliance.

Today, such a drainage project would trigger several steps of scrutiny in a process that typically takes 60 to 100 days for approval, said Tim Smith, an official with the St. Paul district of the Corps who helped write the proposal.

Smith said the changes would amount to a faster, less-intense review of each project, but he said the goal is not to allow any project that wouldn't get a green light now to get a green light in the future.
"The goal was to improve the efficiency, not to give away stuff," Smith said. "We make a determination that this category of activity leads to minimal individual and cumulative impact on the environment, and we do it in advance, instead of on every individual permit application."

Smith was unable to provide exact figures on the increase in applications and said it's "hard to say" what the eventual impact of the Corps' proposal would be. That's because the agency doesn't accurately track drain tile projects.

"When we enter permit actions, if it falls under a certain general permit, we can usually identify the activity, but with individual permits, we often can't differentiate between building a bridge and installing drain tile," he said.

The proposed change would, for the first time, allow the Corps to track drain tile projects.

All sorts of interests, from government to agriculture to the environment, said they don't like different elements of it. And that, others say, underscores the need to find a better balance.

"As much as we may abhor drainage, it's not going away," Fisher said. "We need to find a way to manage it better."

Farmers like Albin are taking that step by installing systems that manage water better, according to Warren Formo, executive director of the Minnesota Agricultural Water Resources Center.

"We need to sort through and find out what pieces of the drainage system are good and what are weak and encourage more of the good," Formo said.

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