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Water on farmland
is part of a big
system where
interests conflict.
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Getting Uncomfortable



by HEIDI MARTTILA-LOSURE

① Editor Heidi Marttila-Losure can be reached at heidi@dakotafire.net.

“What if ...?”

Those two words convey a powerful idea: The willingness to consider another way of looking at the world, which is how innovation happens.

That’s the kind of shift in perspective that’s happened in the last decade or so in the Netherlands as they reconsider their approach to managing water.

The Dutch have battled back the sea throughout the country’s existence. Historically, they approached the task with massive infrastructure, including the dikes, dams and windmills for which the country is famous.

But lately, as described in an April 9 article in *The New York Times*, they are approaching the problem differently: They are letting the water in.

The impetus for their change in thinking is the rise in sea levels that climate change is likely to cause. There’s not a whole lot of room for denial when much of your country is at or even below sea level.

“With the increasing threat caused by climate change, Dutch engineers have developed strategies that go beyond trying to keep water out,” writes journalist Russell Shorto. “They city of Rotterdam, for instance, is building floating houses and office buildings and digging craters in downtown plazas that will be basketball courts most of the year but will fill up with water during high-water periods, taking the strain off surrounding streets.”

The Dutch are also looking beyond planning at the city level; they are planning in regions, because water does not respect political boundaries. The goal, Dutch planners say, is “the dawn of a 21st-century approach to living with nature,” building in ways “that take ecology, economy, infrastructure and weather uncertainty into account.”

I invite you to read the entire article, (www.nytimes.com/2014/04/13/magazine/how-to-think-like-the-dutch-in-a-post-sandy-world.html), which gives a really interesting perspective on how a nation’s citizens realized that they were all affected by the problem, and they could all be part of the solution.

If we used those criteria of those Dutch planners to measure our approach to managing water in the Prairie Pothole Region—considering ecology, economy, infrastructure and weather uncertainty—how would we rate?

We probably would do fairly well on economy. Our local economies are in large part based on the farm economy, and that does much better with the water management practices that are common now.

How about ecology? Are we considering what works for the natural system?

Are we considering infrastructure that is affected, or additional infrastructure that is needed, because of our water

management decisions?

Are we planning for increasing weather uncertainty—both downpours and droughts?

What if we added “community” to the list: Are we managing water in ways that respect and enhance the communities we are part of, or the communities downstream that are affected by our actions?

I am not going to answer these questions for you. But in researching for this issue, what I learned left me a little bit uncomfortable. I don’t think we’d get a stellar report card if this is what we are tested on.

Our world doesn’t stand still.

I hope that small feeling of discomfort finds you also. Not because it’s pleasant—it isn’t—but because without that little bit of dissatisfaction,

we aren’t going to move forward. If we think we’ve already achieved the best we can achieve, there’s no point in thinking differently or trying something new.

Our world doesn’t stand still. Yesterday’s ideas don’t always work with the information we learn today, and today’s solutions may not work in the world of tomorrow.

One idea I’d like to challenge is the idea of the inevitability of trade-offs: That if one side wins, another has to lose. John Mackey, the CEO of Whole Foods, argues

Are there ways to manage water on our

“What if ...?” ✨

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If you appreciate what Dakotafire does, please see page 46 to see how you can help us continue the effort!

Map of South Dakota showing fire protection areas. The map displays county boundaries and names. Fire protection areas are highlighted in gray and labeled with county names: Stutsman, Logan, LaMoore, Dickey, Marshall, McPherson, Edmunds, Faulk, Brown, Day, Clark, Spink, Hand, Beadle, Kingsbury, Jerauld, Sanborn, and Miner. Major cities and towns are marked with black dots. Major roads are shown in red with route numbers. Water bodies are shown in blue. The map is sourced from dakotafire.net 3.

DRAINAGE

DECISIONS

by HEIDI MARTTILA-LOSURE

additional reporting by WENDY ROYSTON

Farmers are increasingly installing drain tile to make land more farmable. Water comes from somewhere and goes somewhere, however. Here's a look at the system.

WATER ON FARMLAND

The spring of 2010, which made a name for itself in terms of water and mud, got our attention.

Then came the spring of 2011.

Many of the old folks in our towns could never remember as much standing water as they saw then. Ducks dabbled on vast ponds where corn or beans had been planted the year before. Farmers idled their tractors, waiting for drier ground, then sometimes chanced it anyway as the planting window ticked by—cursing when they got stuck. Water covered roadways, cutting off entire towns from the outside world. For a while, one Brown County farmer could only get himself and his wife out of the farmyard with the tractor, with his wife riding in the bucket.

That spring put us into action mode: What were we going to do about all this water?

Despite the drier weather that

followed in 2012 and 2013, the question remains. In Minnesota and Iowa, it was answered long ago with a drainage system that shifted water onto clay tiles, then into straight-line ditches or straightened streams, and then down the river. Without those drainage systems, much of that land could not be farmed at all—it would instead be more accurately called a swamp.

Tiling happened in the southeastern part of South Dakota many decades ago also. But the issue was not such a factor farther north; there wasn't as much precipitation, and there was more pasture, where extra water wasn't such a nuisance.

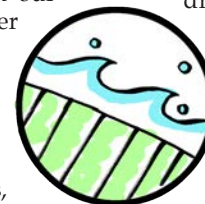
Today, northeastern South Dakota and far eastern North Dakota are facing situations more similar to Minnesota's and Iowa's early days. The question for farmers: Do we want to make our state like Iowa?

Before we decide, let's take a look at where that water came from, and where it's going.

continued on page 8



① Charlie Dahl, right, speaks to Jacob Meier as they install a tiling system for their research into how tiling affects nearby wetlands. Karissa Ramstead works in the background. Their work is being planned by Ray Finocchiaro, an ecologist at the Northern Plains Wildlife Research Center. Read more about it on p. 14.



Movin' WATER!

A system wide look at agricultural drainage

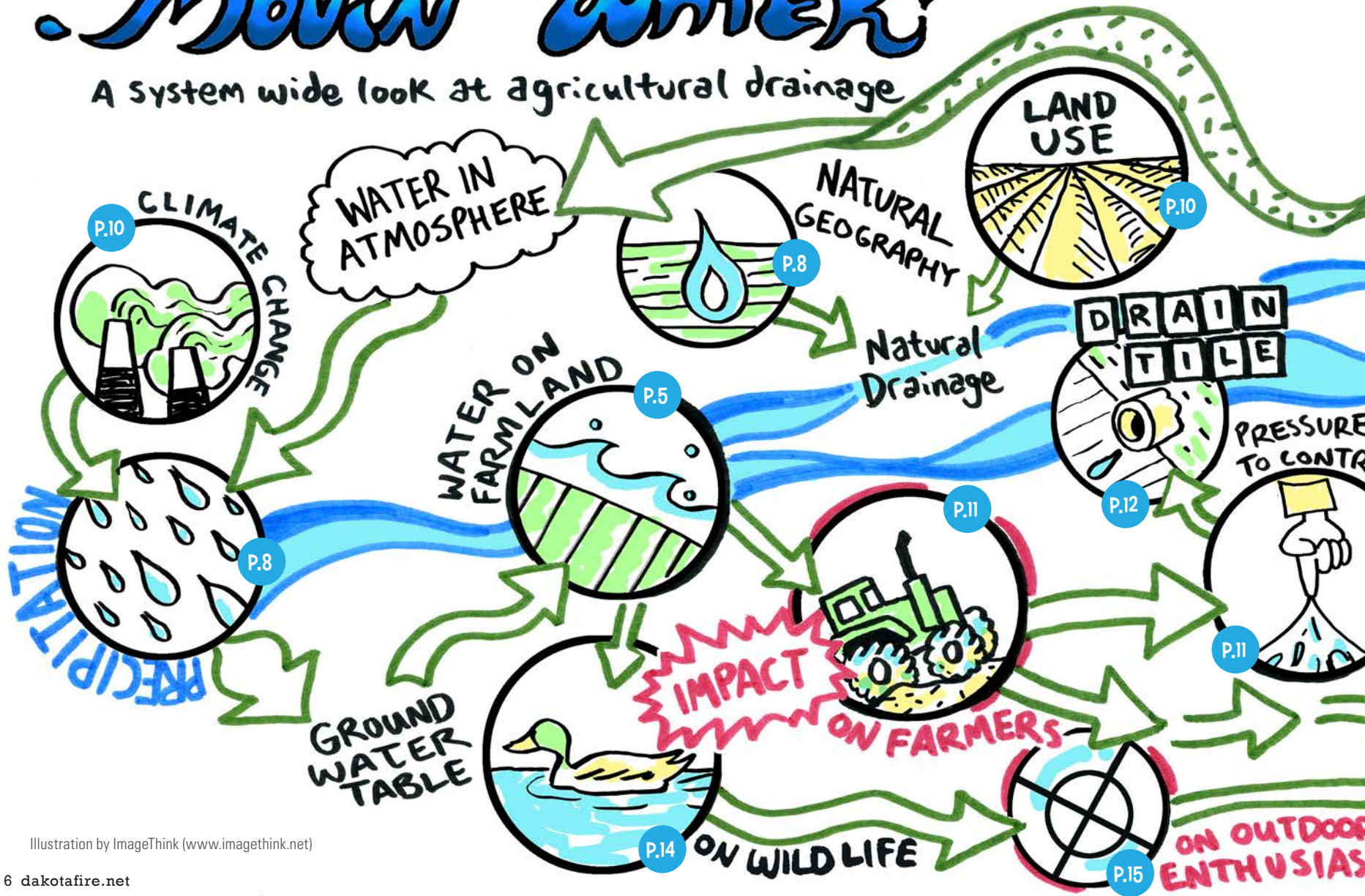


Illustration by ImageThink (www.imagethink.net)

How CAN WE SOLVE
"tragedies of the commons"
PROBLEMS?

How CAN WE SOLVE
"tragedies of the commons"
PROBLEMS?

How CAN WE SOLVE
"tragedies of the commons"
PROBLEMS?



Umm...

Maybe something else?

P.18



Umm...

Maybe something else?

P.18



P.16 There oughta be a **LAW!**



P.16 There oughta be a **LAW!**

Use the **POWER** of the market!

Use the **POWER** of the market!

WATER

WATER

WATER

WATER

WATER

WATER



Water in an Ocean



continued from page 5

NATURAL GEOGRAPHY

Some of the small pools of water that dot our landscape have been with us since woolly mammoths roamed the plains.

We live in a part of the world described as the Prairie Pothole Region, named after a landscape of scattered depressions—some smaller, some larger—that fill with water during wet times and sometimes dry out completely in other seasons. The so-called “prairie potholes” were formed after the glaciers of the Pleistocene Epoch moved through, unevenly depositing the rocks they carried and scouring the surface of the land, according to a description by the Northern Prairie Wildlife Center.

Those prairie potholes weren’t always a problem. In fact, early settlers to this part of the world appreciated the sloughs, since the pioneers tried to settle where water was available, according to Tom Tornow, a retired U.S. Fish and Wildlife manager from Madison, S.D.

The sloughs often provided water for livestock. And the settlers also viewed the sloughs as a kind of insurance: They might not be able farm the sloughs during wet years, but “those low spots helped you get you through the dry years,” Tornow said.

(Similarly, current farmers may remember getting through dry years in the 1980s on “slough hay.”)

Early settlers also had more diversified farming operations, which meant they didn’t have to try to crop every acre, as livestock could make use of more marginal land. Diversified farming is in itself a kind of insurance, since a crash in the price in one type of crop or livestock could be balanced out by decent prices in another, Tornow explained.

“Now federal crop insurance takes over that portion of it,” he said.



Farmers gave up on diversified farming for a variety of reasons, not least of which is that it’s a lot more work. And diversified farming didn’t cushion farmers from every shock of weather or market fluctuation.

But the end result is that now, instead of the farming system having its own resilience built in, farmers are instead looking to an external support system to get them through tough years—a support system significantly financed by taxpayers, as the federal government pays 60 percent of farmers’ crop insurance premiums. There is little incentive for farmers to view wet spots as a kind of insurance for handling variations in the region’s natural wet/

dry cycles—that’s now covered by crop insurance.

Instead, there’s a lot more incentive to make every acre usable.

PRECIPITATION

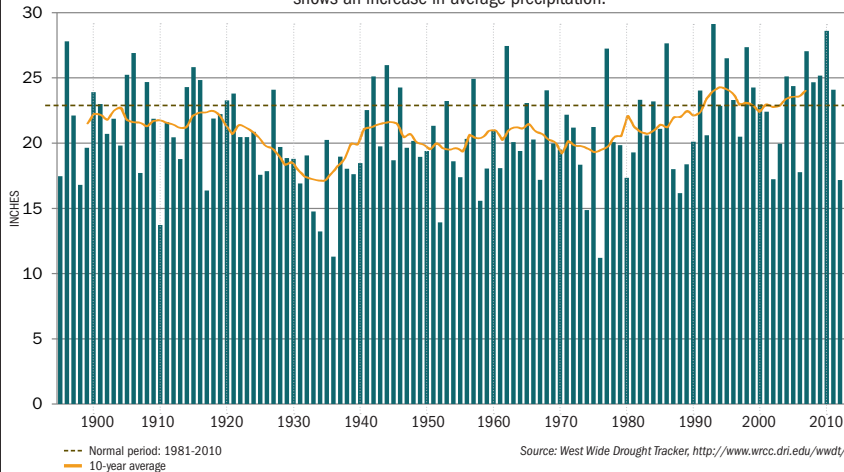
Farmers probably have the sense that they’re dealing with more water than they used to. And they are, in essence, correct.

The precipitation data for the James River Watershed over the past six or so decades shows that we rarely have what you could call an “average” year. Annual precipitation totals can swing

Precipitation in the James River Watershed

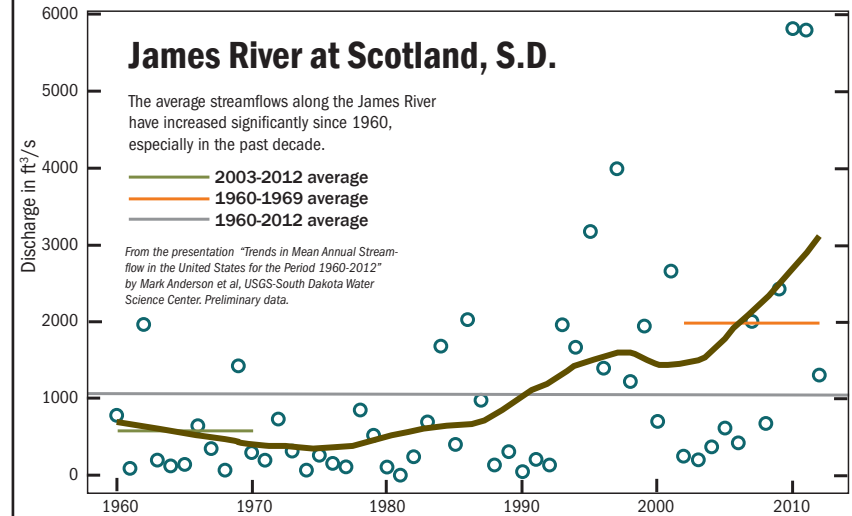
12-month totals, ending in December, from 1895 to 2013

Precipitation totals vary greatly from year to year, but a look at the trend shows an increase in average precipitation.



James River at Scotland, S.D.

The average streamflows along the James River have increased significantly since 1960, especially in the past decade.



wildly from one year to the next, according to Laura Edwards, climate field specialist in the Aberdeen Regional Extension Center. The transition from the very wet years of 2010 (28.6 inches) and 2011 (24.1 inches) to the very dry year of 2012 (17.2 inches) is a good example of this variability, she said.

But if you look at the trend line of the 10-year averages, a pattern emerges.

"There has been an increasing trend in annual precipitation across the region, really most clearly since the 1970s or so," Edwards said.

Putting a number on that increase depends on which year you pick to start measuring from. If it's from the time when records started being kept in 1895, the increase in 10-year averages for

precipitation in the James River Valley is about 24 percent. From 1960, the increase is about 11 percent. And from 1929 (which includes the dry years of the 1930s), it's up 37 percent.

The increasing lake levels of Bitter Lake or Blue Dog Lake in northeastern South Dakota are one indicator of this increasing precipitation, Edwards said.

Mark Anderson, director of the U.S. Geological Survey's S.D. Water Science Center in Rapid City, and his colleagues took a look at a different indicator: streamflows in the Missouri River Basin. While streamflows on the East and West Coasts had been studied, streamflows in the middle of the country hadn't been examined closely.

What they found surprised them.

The western part of the basin (in Montana and Wyoming) shows declining trends in streamflows. But streamflows in the eastern part of the basin, including the watersheds of the James and Big Sioux rivers, are increasing dramatically.

"These are the largest increases in streamflow anywhere in the United States," said Anderson, who cautioned that their results have not yet been peer-reviewed or published. "Some of these watersheds have an average increase of almost 500 percent. They've gone up fivefold."

Anderson says a significant part of this increase is from more precipitation.

And that increase in precipitation may be part of how climate change manifests itself in the Dakotas.



IMPACT OF CLIMATE CHANGE

A 2012 survey seeking the opinions of South Dakotans on wildlife issues included a few questions on climate change. More than half (56 percent) of the roughly 1,100 people who responded said they believed that climate change is happening. Roughly two-thirds said climate change is at least partially caused by humans.



There is very little doubt among scientists—whether international, national or local—on the basic question of whether climate change is occurring, and whether human actions are at the root of it.

“There is a human impact on climate that we’re seeing in this region,” Edwards said. “We’ve seen how climate has changed in our area already in the recent century, and certainly in the 30 to 50 years.”

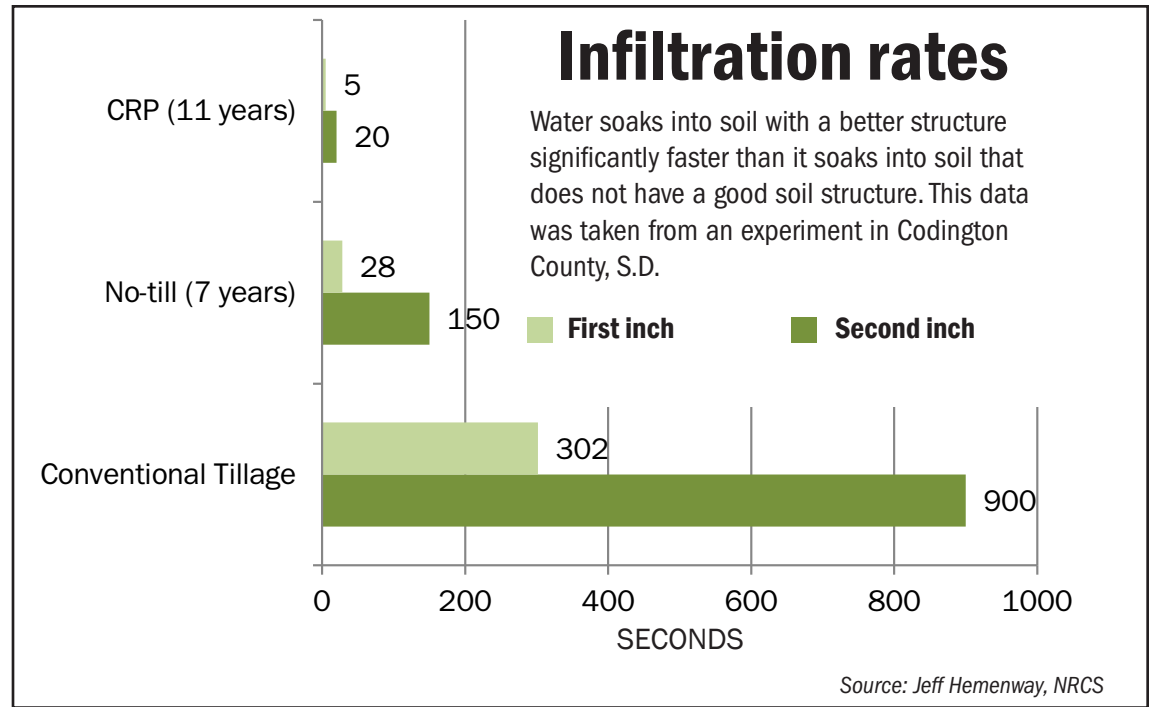
The ways it’s showing up in our climate is in more extreme events, she explained: Fewer middle-of-the-road events, and instead more extremes of hot, cold, wet or dry.

Climate change isn’t all bad news for the Dakotas, however. Warmer weather and more precipitation is in part what has moved the Corn Belt farther north and west, and recent years have produced bumper crops that farmers wouldn’t have dreamed of even a few decades ago. (New crop genetics are also responsible for that change.)

“There are some positives in this part of the country that are really are opportunities more than negative impacts,” Edwards said.

Of course, more extreme weather might wipe out an otherwise stellar season. Edwards recommends planning for a high degree of variability in the weather.

“I think it’s always best to plan and manage for extreme events,” she said.

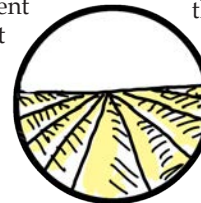


LAND USE

Precipitation is part of the reason that there’s more water to deal with—but it’s probably not the whole answer.

If the increase in precipitation in the watershed since 1960 is 11 percent, and all other factors remained the same, the streamflows should have increased roughly the same amount. Instead, streamflows are up as much as 500 percent.

“We also think that there’s a component that the watersheds are converting that rain into runoff better, so to speak, than they used to,” Anderson said. “There’s more runoff with the same amount of precipitation than there used to be.”



Precipitation is up in other parts of the country also, he added, but streamflows have not increased as dramatically as they have in the eastern Dakotas.

And that could be because of land-use change.

The grasses that are native to the Dakotas can deal with our typical wet/dry cycles, according to Jeff Hemenway, a soil scientist with the Natural Resources Conservation Service in Huron, S.D. “From a hydrology standpoint, they were very well adapted, capturing that moisture that we had at any one timeframe of the year and utilizing it such that the amount of runoff (was minimized),” Hemenway said.

Native grasses were also a mix of cool-season and warm-season plants, so that some plant was using water all through the growing season. Now, corn and soybeans are

➡ Hans Kandel, professor and Extension agronomist at North Dakota State University, gives a demonstration with salt on a sponge to show how drainage can help with salinity problems during a workshop in Wahpeton, N.D., in February. Photo by Heidi Marttila-Losure



both warm-season plants, so much of the late fall, winter and spring precipitation is not being used by plants. "It's either moving off our landscape or moving down into groundwater. It's not really being productive," he said.

Part of Hemenway's job is taking a rainfall simulator across the state, showing how rain infiltrates soil differently, depending on what's growing on it.

"It just floors people what happens," he said. "I'll put an inch and half of water on to the extensively tilled soil, and it'll only go into the soil about an inch, and the rest just runs off. They expect that tillage increases infiltration, but it doesn't. It decreases infiltration. ... It's really kind of a challenge for us to get to the point that we can turn some people around."

The rainfall simulator shows that land in the Conservation Reserve Program absorbs much more water than tilled black earth. About 38,000 acres of CRP land in North Dakota were converted to cropland last year; in South Dakota, about 128,000 acres of CRP were up for renewal, and many of those acres did not go back into the program.

"Show me a CRP contract that is expiring and isn't being converted to cropland, and I'll show you nine that are," said Lyle Perman, a rancher from Lowry and former chairman of the South Dakota Grassland Coalition, in a 2013 article by *The Daily Republic*.

It would be surprising if that level of land use change didn't have an effect on how the water moves.

IMPACT ON FARMERS

For farmers, most of the incentives move in one direction: Water on the land leads to headaches, and getting it off the land results in more income.

"I don't think anyone could dispute that properly installed drain tile benefits agricultural producers," said Keith Trego, executive director of the North Dakota



Natural Resources Trust, in an article in *North Dakota Water* in 2011. "It enhances the investment in land by making it more productive, lengthening the field season and providing more options for crops, among other things."

"Just think about the hassle factor" when faced with muddy ground in the spring, explained North Dakota State University agronomist Hans Kandel at a drainage workshop for farmers in February in Wahpeton. Getting a tractor stuck in muck during spring planting is not an unusual situation in the Prairie Pothole Region.

When drain tile is installed, farmers can get into the field a little earlier, which increases yield potential, and they can plant in areas that would otherwise be under water, which also makes the harvest bigger, Kandel explained.

Farmer Bob Nelson of Volga explained in a *Brookings Register* article that on one quarter-section, tiling allows him to plant on all acres. Before he would only have been able to plant 75 percent of those acres.

"But now we can plant 100 percent of it. And that's pretty valuable," Nelson said for the *Register* story.

Kandel also showed how increased drainage can solve one increasingly common problem for

farmers: salinity and sodicity in the soil, which manifest as those big white spots out in the fields where nothing will grow. They form when standing water evaporates, pulling the salts in the soil to the surface.

With precipitation, some of that salt will go through the soil structure and out through the tile line, Kandel said.

PRESSURE TO CONTROL DRAINAGE

Even if farmers might not be especially motivated to install drain tile otherwise, competition for land could likely pressure them into it.



Most farmers are not completely masters of their own domain. A significant percentage of farmland is rented, which means that landowners are the farmers' ultimate bosses. What the landowner values is what the farmer needs to value also, or the

landowner can find someone else eager to rent the land. And if the landowner views the land as an investment, and if his or her only involvement with that investment is the check that comes in the mail twice a year, farmers have to be able to give the landowners a good return, or someone else will. They have to aim for maximum efficiency just to stay in the game.

Nelson explained that he pays cash rent on all tillable acres, whether he's able to plant on them or not.

"It'd be like if you had a house in town and they closed off two rooms and you can't use them," he said.

When all the other inputs a farmer has to purchase are also increasing in cost, leaving land unused can feel like a waste.

All these factors have led to a dramatic increase in tiling in the eastern Dakotas in the past decade.



A first look at tiling locations in the Dakotas

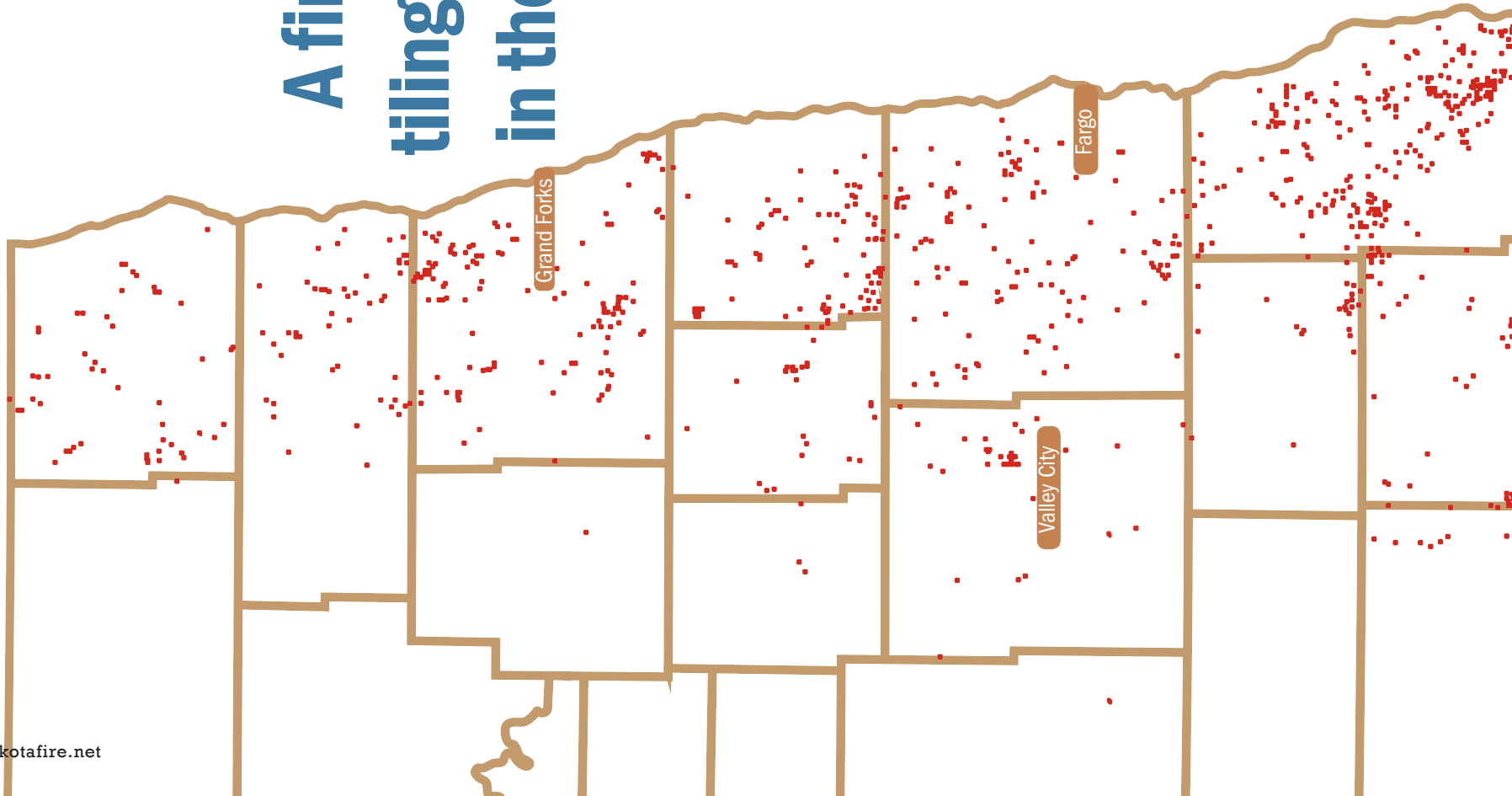
Ray Finocchiaro,
an ecologist at the
Northern Prairie
Wildlife Research
Center in Jamestown,
put together this
database of places
where tiling permits
were granted in the
eastern Dakotas by
getting digital records
when available, or
when they weren't,
traveling to county
courthouses and
copying out of their
record books.

His first count of tiling
locations, in August
2012:

North Dakota:
More than 700

South Dakota:
More than
4,300

He updated the list
in November and
December of 2013 by
requesting updated
records from the



counties that had digital records and could send him those records easily:

North Dakota:
More than 900

South Dakota:
More than 4,900

That's an increase of about 28 percent and 14 percent, respectively, in just over a year.

And it's probably a drastic underestimate.

Not all counties require permits.

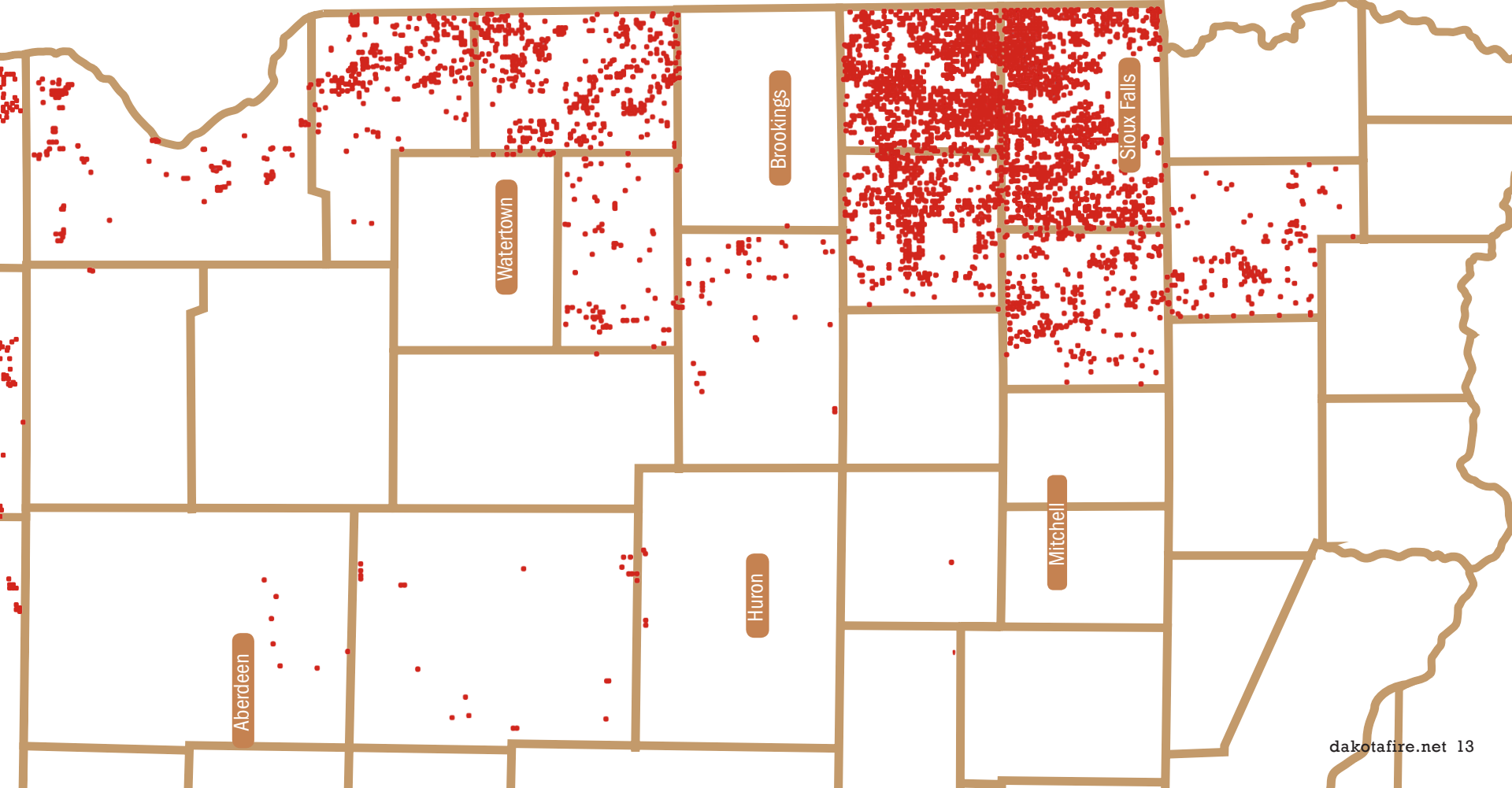
And in fact, more counties are giving up their permitting responsibilities altogether, according to a July 2013

Aberdeen American News article, because "there was nothing in state law that allowed their decisions to be enforced." A number of agriculture groups are advocating the formation of water management districts instead.

Permits are only required if a tiling project affects 80 or more acres. That

means that a project that affects 79.9 or fewer acres doesn't need a permit and so wouldn't appear on this map.

Tiling locations are approximate.



IMPACT ON WILDLIFE

Prairie potholes are important for all sorts of wildlife.

Ducks and geese perhaps rely on them the most, but amphibians also need that habitat. And even deer and pheasants do better when there are wetlands around.

Ag producers who want to be in compliance with the Swampbuster provisions put into place in 1985 can't drain wetlands. But some wet spots out on the land are considered wetlands, and some are not. Wetlands have to meet criteria in terms of hydrology, soil markers and vegetation for them to be certified wetlands—the wetlands that farmers can't drain to be in compliance with Swampbuster.

But for wildlife, wetlands that aren't certified can be just as important.

"Temporary wetlands that may only last a week or two are very productive in terms of food source," said Ray Finocchiaro, an ecologist at the Northern Prairie Wildlife Research Center in Jamestown, N.D.

Anthropods, amphibians, shore birds and waterfowl (both the birds that stay all season and those just passing through) all depend on those smaller wetland areas. They serve a different purpose than the larger ones, Finocchiaro said.

"You can consider the temporary wetlands like fast-food stopovers: your Burger Kings, and your McDonald's and your Subway restaurants," he said. "And the larger semi-permanent ones are like your fancy larger dinner and theater restaurants, where you have a piano player. ... They are two different distinct types of wetlands."

The "fancy dinner theaters" serve many varieties of waterfowl and also provide good nesting habitat. The "fast-food restaurants" provide quick "pit stops" for birds on the move.

"Those temporary wetlands that are under the greatest threat," Finocchiaro said. "Any tile system



Several varieties of waterfowl, including quite a few lesser scaup, enjoy a temporary wetland in Brown County, S.D., in 2011. Photo by Heidi Marttila-Losure

that's working properly will dewater those temporary wetlands pretty quick."

That doesn't mean certified wetlands are guaranteed to be safe, however. Even a tiling system that follows all the recommended setback distances could affect certified wetlands, "depending upon how the wetlands function with regard to water movement," according to the article in *North Dakota Water*.

Despite reams of research on how farmland is affected by tiling, no one has actually taken measurements to see how nearby wetlands are affected, Finocchiaro said.

The U.S. Fish and Wildlife Service has requested research on this topic, so Finocchiaro is leading a

team of researchers to do that work.

"They are mandated by Congress, that wetlands (protected by easements) can't be impacted in any way," he said. This puts them in a hard spot, since they have to guarantee that wetlands aren't affected, but the land is not theirs. They want to make sure that nearby tiling isn't adversely affecting the wetlands they are charged to protect.

The project will start gathering its first data this spring, but won't have a lot of data to work from for a while—even as tiling projects proliferate all along the eastern Dakotas.

"Would it have been good to start this 10 to 15 years ago? Absolutely," Finocchiaro said. "I'm hopeful that the results would still be useful."

IMPACT ON OUTDOOR ENTHUSIASTS

Hunters will go where the birds are.



For many years, the Dakotas have benefited from that idea.

At the same time, Iowa's reputation as a hunting destination has diminished because the birds aren't there in good numbers for

hunters to find.

But what happens if we make our landscape look much more like Iowa's?

A number of prominent wildlife leaders think that the Dakotas' future will look an awful lot like Iowa's present.

"Drive across southern Minnesota and northern Iowa and take a look at the amount of few acres here and there that are still in non-ag vegetation compared to what it looks like here," Dan Hubbard, a wildlife and fisheries specialist at South Dakota State University, said in a 2011 *Brookings Register* article. "I think in another 15 years or so, if this tiling keeps up, we'll look like they do. And it'll just be black dirt as far as you can see."

That means that the revenue communities receive from activities related to hunting, or the much smaller but increasing revenue from bird-watching or other wildlife watching activities, may well be reduced in years to come.

Mike Blaaid, a Pheasants Forever biologist in Mitchell, S.D., spoke to a group of business owners in Mitchell

about how the loss of habitat might affect them. He was also quoted in the *Register* article.

"It's pretty simple. The less habitat we have for wildlife and pheasants, the less wildlife we're going to have, which means, potentially, we could lose our hunters," Blaaid said. "Our nonresident hunters are very important. If we lose that revenue, what happens? What happens to Mitchell businesses? A lot of us depend on that seasonal flush of nonresident hunters who come here and spend money."

FLOODING

Does drain tile increase flooding downstream?

That does depend on several factors, including whom you ask.

Most sources agree that in the case of a huge deluge, the presence of drain tile makes little difference in downstream flooding. Water will flow off the surface of farmland whether the tile is present or not.

And it's possible, if a tiling system includes a way to control the flow, that downstream flooding could even be lessened by holding water back on the land until a pulse has passed. (Though that would require a level of coordination among many landowners that might be difficult to achieve.)

After a storm has passed, however, tiling could contribute to downstream flooding if a control structure is not used, according to Keith Schilling, a research geologist with the Iowa Department of Natural Resources.

"My own research demonstrates that flow from drainage tiles increases



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the amount of water delivered to rivers after the storm event has ended," Schilling writes in the *The Gazette*. "Water that might have been stored on the landscape in depressions or shallow soils is drained to the river ... The goal of tiling is to remove water as quickly as possible ... to avoid significant crop damage."



But, Schilling adds, most conversations about drain tile and flooding present a false choice. The more significant difference, when it comes to flooding, is not tile vs. no tile, but crops vs. grassland.

"Rainfall runoff from croplands far exceeds runoff from land with perennial vegetation, so by making the choice to crop, we contribute to enhanced runoff and flooding, with or without tile drainage," Schilling writes. "The choice is not whether to tile or not. The choice should be whether to crop or not."

Schilling also argues that government should not reward farmers for installing tile drainage systems in the hopes that the tile will help with flood mitigation. "(The practice) has little to do with flooding but everything to do with expanding crop production and increasing profits," Schilling said.

WATER QUALITY

The correlation between negative water quality and tiling is clear, according to Paul Sweeney, senior project leader for the Natural Resources Conservation Service.

"It has been proven that water quality decreases as the amount and intensity of tile drainage increases," Sweeney said in an article in *North Dakota Water*.

Water that moves off a field through drain tile carries with it at least some of whatever was put on the field, and often that is not something that downstream communities want to drink.

Pesticides are found in water from tile drains, but in fairly low concentrations, according to

the U.S. Environmental Protection Agency. The far bigger concern for downstream water quality is nitrate, which results most significantly from the nitrogen applied as fertilizer finding its way into other streams and rivers. Nitrate is a bigger problem than other potential agricultural pollutants because it dissolves easily in water and so moves off the land more easily.

The amount of nitrate in the Mississippi River has increased by 45 percent from 1980 to 2010, and more than doubled since 1950, according to the U.S. Geological Survey. The



increasing concentration of nitrate in the Raccoon and Des Moines Rivers pushed the city of Des Moines to build a massive nitrate removal facility in 1991 to get

its nitrate levels back in an acceptable range. Nitrates are most dangerous for babies under 6 months of age, causing a condition called "blue baby syndrome."

In 2013, nitrate levels in the Raccoon and Des Moines rivers were above the EPA's maximum level for 92 and 85 days, respectively. That put a great strain on the Des Moines Water Works' nitrate removal facility.

In a press release last July signaling the Des Moines Water Works return to a more normal level of operation, CEO Bill Stowe said, "Des Moines Water Works will continue to struggle with water quality in the long term if state and federal

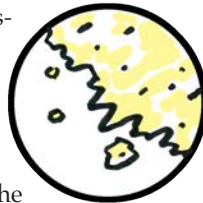
officials do not take bold action to hold land users upstream accountable for irresponsible practices that disregard the commonwealth of our state's waters."

AG RUNOFF EFFECTS

That nitrate continues down the river system to the Gulf of Mexico, where it creates massive algal blooms. And as those algal blooms die, they feed bacteria that use up all the available oxygen. Without oxygen, almost all other sealife suffocates.

This "dead zone" in the Gulf of Mexico is predicted to stretch up to 8,561 square miles this summer, according to the National Oceanic and Atmospheric Association (NOAA).

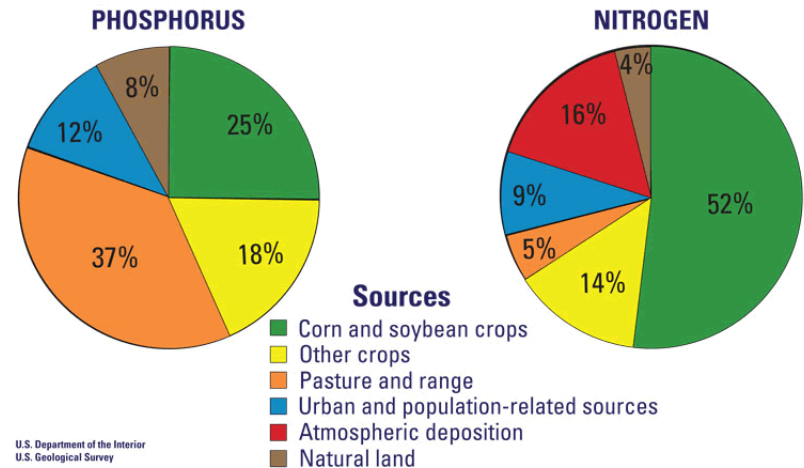
Ag runoff isn't the only source of nitrate in the rivers; manure, municipal waste, and atmospheric deposits from power plants can also add to the problem. But ag runoff is the source of more than half of the nitrate, according to the U.S. Geological Survey.



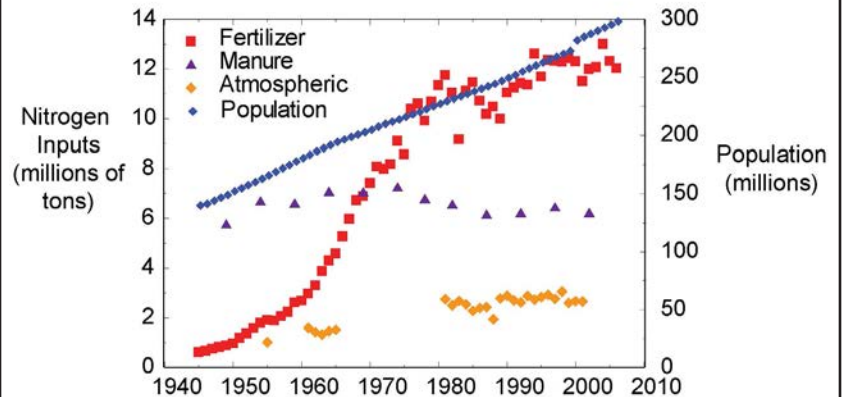
For now, most of that runoff comes from the traditional Corn Belt states of Minnesota, Iowa, Illinois and Indiana. As the Dakotas become more like those states in our farming practices, however, our land may increasingly contribute to the problem.



Sources of nutrients delivered to the Gulf of Mexico



A look back over the past century Nitrogen sources have increased



IMPACT ON COMMUNITIES

Downstream communities are spending a lot of money to deal with the problems the river water brings to them.



The nitrate removal facility in Des Moines cost \$3.7 million to build. Each day it runs costs \$7,000, “a cost that will be borne by Des Moines Water Works customers,” according to a Des Moines Water Works news release.

In the case of the dead zone in the Gulf of Mexico, farmers upstream are affecting the livelihoods of farmers downstream—fish farmers, in this case. According to the NOAA, the dead zone costs the U.S. seafood and tourism industries \$82 million a year.

Determining the cost of flooding that can be attributed to increasing releases of water from drain tiling—if any—is a difficult question. But it’s probably a fair assumption that if drain tiling is set up to remove water from the land as quickly as possible, with no control structure in place to regulate that flow, it at least has significant potential to contribute to flood events downstream. And that can be costly to downstream communities not only in terms of dollars, but also in loss of property and sometimes life.

CONFLICT

All of this points to a typical “tragedy of the commons” scenario.

Here’s how that typically works: A group of people share some resource. If everyone takes care of that common resource, everyone benefits. But if one person sees an opportunity to benefit him- or herself by overusing or abusing that resource,



it can start a chain reaction that damages that resource for everybody. That one person can feel justified in taking that action—one person can’t make that big of a difference in this big system. But the cumulative effect of a lot of “one persons” can create huge problems.

So how can you get people to take care of a common resource?

Most of the time, the solutions fall into two categories: government regulation and market-based solutions.



There already is a law that is intended to protect wetlands. Several laws, actually—though “more” doesn’t necessarily equal “more effective” when it comes to regulation.

The Swampbuster provisions of the 1985 Farm Bill made it a violation of U.S. farm programs to drain certified wetlands. Note that they didn’t make it illegal; no one will come to a farmer’s door with handcuffs if he drained something he wasn’t supposed to. The punishment for draining something that was not supposed to be drained is being kicked out of the farm programs. Sometimes, farmers had to pay back money for all the years in which they were found to be in violation, which could add up to significant dollars—but this can’t even really be called a fine, since it was money they received from the government in the first place.

In order for regulation to work as a solution to a “tragedy of the commons” problem, it has to be enforced, and enforced fairly—otherwise, other players will feel justified in working around the system.

The numbers call into question whether that’s happening. In North Dakota, the total number of producers who have lost benefits for wetland violations since 1993 (records aren’t available all the way back to 1985) is 44. In South Dakota, 35 producers lost benefits for wetland violations since 1994. An additional 135 were found to be in violation but did not lose their benefits because they restored the wetland or mitigated the damage in some way.

TOTAL NUMBER OF FARMERS
WHO HAVE **LOST BENEFITS**
DUE TO WETLAND VIOLATIONS:

44 *North Dakota
(since 1993)*

35 *South Dakota
(since 1994)*

That’s a very small percentage of the total farmers in the Dakotas during that time period—especially considering that those numbers could include the same producer in more than one year. This could be a very good thing—the vast majority of farmers are following the rules—or it could mean that enforcement efforts aren’t adequate. Determining which it is would require some further investigation.

Even this fairly mild regulation lost a lot of its deterrent effect in recent years because the traditional way in which farmers received government support is no longer as appealing to them in a time of higher crop prices. The government support that has become vitally important to farmers—subsidies for federal crop insurance—were unlinked

from conservation compliance in the 1996 Farm Bill. That link was reinstated in the 2014 Farm Bill.

But this only addresses the protection of certified wetlands. What about temporary wetlands? And does any regulation address water leaving farmland?

The Environmental Protection Agency proposed a rule in March that would affect temporary wetlands by expanding its authority through the Clean Water Act to even those streams that don't stay wet all year, and to wetlands near rivers and streams.

"We are clarifying protection for the upstream waters that are absolutely vital to downstream communities," EPA Administrator Gina McCarthy said in a press release. The release added that the rule doesn't protect any new types of waters that the Clean Water Act doesn't already cover, and that current exemptions for agriculture would continue. "Any agriculture activity that does not result in the discharge of a pollutant to the waters of the U.S. still does not require a permit," according to the press release.

Tile drains or ditches will not be covered by the new rule, and previously converted cropland won't be affected either.

Ag producers are not happy with the proposed rule, however, saying that it's likely to create "additional unnecessary agricultural burdens for the agricultural community," according to *CropLife America*.



MARKET-BASED SOLUTIONS

So, if the government approach doesn't appeal or doesn't seem effective, there's another option: Let the market sort it out.

The basic assumption here is that if people value something, they will pay for it. Or if something has too much of a cost associated with it, people won't do it.

That's sort of what wetland easements are intended to do: Farmers are paid to leave wetlands alone. The Ducks Unlimited efforts to buy land, put it under easement, and then sell it, are another example of a market-based solution.

These efforts can make a difference. But in a time of high crop prices, it takes a lot of dollars to make market-based efforts at conservation competitive.

The cost deterrent could be a very effective way to keep pollutants out of the water—but only if the costs and benefits are borne by the same person.

A farmer would be very unlikely to purposefully put nitrate into the well from which his own family drank, for example. The cost of making that

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water safe to drink would be borne by him. But if instead the nitrate goes into someone else's drinking water, and someone else has to pay to remove it, that cost is not likely to figure into his decision-making process.

"Environmental amenities, like air and water, tend to be open to enjoyment by all, (but) when individuals in the marketplace make decisions that harm these amenities, the costs do not fall entirely on them," writes Amy Sinden in a research paper at Temple University. "Accordingly, under the grim logic of the tragedy of the commons, as each individual pursues her self-interest in the market, these unaccounted-for costs eventually lead to overexploitation of resources and over-production of pollution, to the detriment of all."

There could be ways to make sure that costs are borne by the ones who cause them. Theoretically, there could be some sort of measuring apparatus wherever tile drains entered streams, and farmers would pay a certain amount for whatever pollutants entered the water from their land. That money could be used to pay for nitrate removal systems downstream, for example.

It sounds a little fanciful. OK, politically impossible. But that's the kind of thing that would have to happen if a market-based system is going to have a deterrent effect: The ones who create the problem have to pay to solve it.



IS THERE ANOTHER WAY?

The conversation about drain tile usually comes down to competing interests—farmers vs. outdoor enthusiasts vs. communities.

But viewing the situation as part of an overall system can show what parts of the system lead to problems, and what parts of the system could be changed to create solutions.

Instead of focusing just on drainage vs. no drainage, we could look at the causes that lead to increased water on farmland being a problem.

What if farmers installed drainage with more recognition of what they were sending down the river?

Farmers could do a lot to make drain tile less problematic downstream, explained Chris Hay, South Dakota State Extension engineer, at a drainage workshop in Wahpeton in February.

One option that is becoming more common in Minnesota and Iowa is the installation of control structures that allow farmers to set the water level in their fields to keep it at an optimal level for growing crops. The drains could be shut off altogether if downstream flooding is a problem.

Farmers could also drain tile into ponds on their own property, and

that water could then be pumped back onto the land when it is needed later in the season.

Hay has also done experiments with bio-reactor systems that filter the water—basically an area of woodchips that the water runs through before it reaches a ditch or stream.

"We saw really good nitrate reductions coming out of this system," Hay said.

What if we created more diverse farming systems?

Joel Salatin, a self-described "lunatic farmer" from Virginia whose unorthodox ideas have made his farm successful, suggests that the basic issue is tillage vs. non-tillage. He says focusing on a farming system that requires less or no tillage means that extra water becomes a blessing, not a problem.

"To do tillage requires a moist but not too damp soil so that it will scour, or work off implements," Salatin writes in an email. "In the native prairie situation, or in perennials, we don't have that issue so we can afford to keep the water on the land longer—and are generally happy to get it.

"The most regenerative way to hold water without the soil appearing wet is to increase soil organic matter (1 pound holds 4 pounds of water). We do that by giving the soil biomass to decompose, either with much more straw volume (grain production) or much more root volume (grass production with high-density short-term grazing)."

Or the NRCS's rainfall simulator suggests that the more modest addition of a cover crop could dramatically change the amount of water running off a field.

What if there were better incentives for diverse farming systems?

The Audubon Society, which works to preserve natural ecosystems for birds and other wildlife, is considering creating a "bird-friendly beef" label so that consumers who care

about birds could support beef that was raised in a way that benefits bird habitat. This kind of initiative could create a market in which farmers who support conservation are rewarded.

What if farmers viewed water as a key player in their farming operation?

Gabe Brown, a North Dakota farmer widely recognized for his successful conservation practices, would like more farmers to consider that way of thinking.

"I really question if we as producers understand just how critical a properly functioning water cycle is to our operations," Brown wrote in an email. "Obviously we all realize the importance of water during a drought, but what about every year? Do producers realize that all of the nutrient cycling on their operations requires water? It is critical for soil biology, as the majority lives on thin films of water. It is critical to have water available during drier times of the year.

"Take a look at any satellite photo from 30 years ago and then compare it to today. We have eliminated the majority of the seasonal wetlands on a lot of the operations. These wetlands are critical for a properly functioning water cycle, not to mention wildlife. That water cycle is critical for producers."

What if more landowners viewed themselves as stewards of the land, instead of investors?

Farmers have to follow the rules set by the person whose name is on the deed. The pressure from landowners to get a good return could just as easily be pressure to practice agriculture in a way that is good for all the stakeholders in the system.

What if we all tried to make the system better?

All right, folks: Time to give it a whirl. Start a conversation with your neighbor. *What if ...* ✨

The next Dakotafire Café will feature conversations on the water system discussed here. Join us from 11 a.m. to 1 p.m. in Webster on Thursday, May 29!



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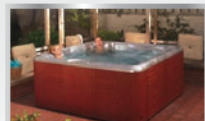
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