

Data on nitrates lacking

It's 'one of the biggest problems we have'

BY BRIAN TODD
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Taking a drink, for rural residents across Southeast Minnesota, has become a problematic endeavor.

For the thousands of households per county that get their water pumped through private wells rather than municipal water supplies, there is growing evidence the water coming from the tap is full of at least one specific health hazard. Even more likely, that water is swimming with chemicals that can poison people or animals.

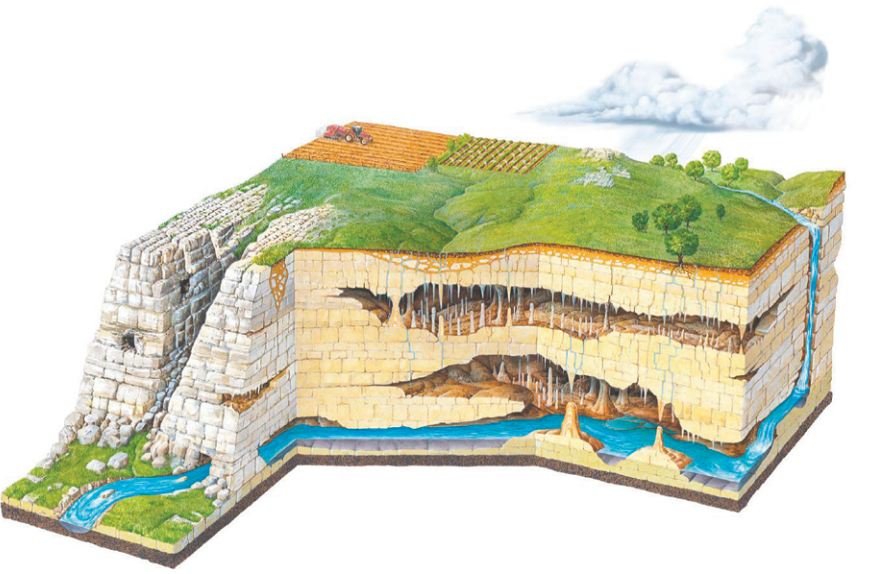
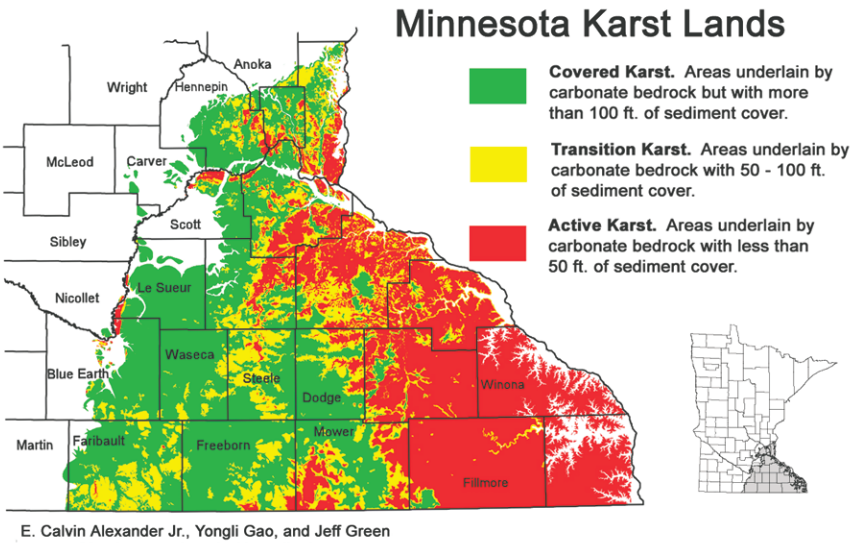
This link between well water and health — and their connection to agriculture — is why former MPCA Commissioner John Linc Stine asked for a study of nitrates in the groundwater of the karst region of Southeast Minnesota.

While his successor, Commissioner Laura Bishop, said she was looking “forward to participating in a full discussion of this proposal” with the Environmental Quality Board, she has not considered the scope or funding that would be required for such a broad study, or how such a study would improve the way the MPCA does its job.

The MPCA's call to action duplicates two current wide-ranging studies of groundwater and nitrates that include Southeast Minnesota. Still, there is plenty we need to learn about groundwater, nitrates and just how widespread the problem might be.

PARTS PER MILLION

According to the Minnesota Department of Health, drinking water with more than 10 milligrams of nitrates per liter — or 10 parts per million (ppm) — can negatively affect human health, specifically infants under the age of six months.



Water flows across fields and ends up in aquifers through absorption or conduits such as sink holes.

Drinking water above the 10 ppm standard is most commonly found in aquifers that are vulnerable to contamination from the land surface, such as sand and gravel aquifers and fractured bedrock aquifers, the MDH states.

In Southeast Minnesota, this means the karst region that dominates the region's geology with sinkholes. Porous rock delivers water and contaminants to flowing aquifers. The karst geology, combined with the region's row crop agriculture, puts groundwater at risk.

There are two major studies now looking into groundwater in the karst region. The first is the Southeast Minnesota Volunteer Nitrate Monitoring Network, which has been taking samples from wells across nine karst region counties since 2006.

Douglas Eayrs, whose family has owned the same farm in northeastern Dodge County since 1863, has taken part in the VNMN since 2007. Since then, he's seen well water nitrates rise from roughly the 10 ppm limit to more than 25 ppm.

“As a child, we took for granted the safety of the water on the farm” Eayrs said.

Dean Schrandt, water program manager for Dodge County Environmental Services, said there are about 125 wells being tested in Dodge County as part of the VNMN.

“Overall, the research has seen a slow rise in nitrate levels,” Schrandt said. “While the sources are somewhat known, about how much each is supplying to the problem hasn't been determined yet.”

Crop fertilizer — either as manure or commercial fertilizer — is the likely top culprit, several experts agree. Other sources include human waste from septic systems and wastewater treatment. Open feedlots or fields where animals graze can be another source.

“We know enough to know which are more local problems and which are regional problems,” said Jennifer Ronneberg, a principal planner for the Minnesota Department of Health, which works with public water suppliers and wellhead protection. “Wastewater is a localized problem. Agricultural fertilizer is a regional problem.”

TOWNSHIP STUDY

While the volunteer study has been

happening since 2006. The Minnesota Department of Agriculture has been systematically conducting the Township Testing Program since 2013. In Southeast Minnesota, townships have been tested in Dodge County (seven townships), Fillmore County (24), Goodhue County (22), Olmsted County (11), Wabasha County (14) and Winona County (13).

The difference between the two studies, Schrandt said, is the VNMN study has attempted to look at the same wells over a period of time, creating nodes of data. The Township Testing Program, however, is more of a snapshot.

One of the problems with the township program, Ronneberg said, is despite the amount of data collected, it's hard to draw serious conclusions from what we currently know.

For example, in Winona County's Utica Township, the MDA estimated there were 202 households with private wells, but only 86 returned samples for the study. Of those 86, 35 wells were eliminated from the study

because a non-fertilizer source of the nitrates was identified.

Of the 51 remaining wells in Utica Township in the survey, 10 wells, or 19.6 percent, were above the 10 ppm health limit. As Ronneberg noted, that means only 10 wells out of about 200 showed a problem with nitrates due to fertilizer.

So, is the problem in Utica Township 19.6 percent of wells, 5 percent (10 out of 200) or the 46.5 percent (40 wells out of 86 tested) from the initial data set?

All of this, Ronneberg said, shows that despite the years of data from testing wells in the region, all researchers have learned thus far is that there's still much unknown.

“One of the biggest problems we have is lack of data for nitrates in groundwater,” Ronneberg said. “We don't have enough monitoring wells for the DNR or the Department of Health. We don't have enough private well data.”

Township testing program

In Southeast Minnesota, six counties have seen a total of 91 townships tested. Only Olmsted and Winona counties have final results.

The other four counties — Dodge, Fillmore, Goodhue and Wabasha — only have initial results. Further analysis is pending, and results will likely change.

Below are the results so far, initial or final, for all six counties:

Olmsted County (final)
Wells in the data set: 923
Number of townships tested: 11 (of 18)
Percentage of wells ≥ 10 ppm nitrate: 1.7
Townships with ≥ 10 percent of wells over health risk limit: 1 (Farmington)

Winona County (final)
Wells in the data set: 940
Number of townships tested: 13 (of 19)
Percentage of wells ≥ 10 ppm nitrate: 7.1
Townships with ≥ 10 percent of wells over health risk limit: 4 (St. Charles, Utica, Warren, Fremont)

Fillmore County (initial)
Wells in the data set: 1,477
Number of townships tested: 24 (including Rushford Village of 24)
Percentage of wells ≥ 10 ppm nitrate: 16.9
Townships with ≥ 10 percent of wells over health risk limit: 19 (All but Rushford Village, Jordan, Carrolton, Preston, Rushford and Beaver)

Goodhue County (initial)
Wells in the data set: 2,071
Number of townships tested: 22 (including the city of Red Wing of 22)
Percentage of wells ≥ 10 ppm nitrate: 10.4
Townships with ≥ 10 percent of wells over health risk limit: 9 (Welch, Vasa, Featherstone, Cannon Falls, Leon, Goodhue, Belvidere, Zumbrota, Cherry Grove)

Wabasha County (initial)
Wells in the data set: 1,087
Number of townships tested: 14 (of 17)
Percentage of wells ≥ 10 ppm nitrate: 16.0
Townships with ≥ 10 percent of wells over health risk limit: 13 (Chester, Elgin, Gillford, Glasgow, Greenfield, Highland, Hyde Park, Lake, Mount Pleasant, Oakwood, Plainview, West Albany, Zumbrota).

Dodge County (initial)
Wells in the data set: 654
Number of townships tested: 7 (of 12)
Percentage of wells ≥ 10 ppm nitrate: 7.0
Townships with ≥ 10 percent of wells over health risk limit: 3 (Canis- teo, Concord, Milton)

Canary in the coal mine and other concerns

BY BRIAN TODD
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When former MPCA Commissioner John Linc Stine asked for further study of nitrates in the groundwater of Southeast Minnesota's karst region, it was a call for a better understanding of a very complex issue.

How complex?
While most experts working in the field — everyone from water experts at several state agencies to University of Minnesota professors and regional water authorities — would like to see more studies, what should be studied and what the results mean might be hard to pin down.

Here are several issues that need consideration as the Minnesota Environmental Quality Board considers taking up a general environmental impact statement on nitrates in the karst region.

A LITTLE BIRD TOLD ME

Jennifer Ronneberg, a principal planner for the Minnesota Department of Health who works with public water suppliers and wellhead protection, said that while the state's 10 parts per million standard for nitrates is its own indicator of unhealthy drinking water. When nitrate amounts rise above the natural background of about 3 ppm, that means water-soluble contaminants are entering the aquifer.

Essentially, she said, nitrates are like the canary in the coal mine. Their presence is really an indicator of likely bigger issues of pesticides, herbicides and bacteria entering the aquifer. “It means you have a pathway for whatever is up there to reach your well,” Ronneberg said.

A TOXIN CLEANSE

Calvin Alexander, a University of Minnesota Department of Earth Sciences professor, said aquifers that have been contaminated with nitrates and other toxins can be cleaned if the source of those toxins is shut off. An example of this occurred in Rochester near East Circle Drive where the Stonehenge Estates neighborhood replaced fields of row crop farming.

Once the farming — and fertilizing — stopped, the nitrate concentration in the groundwater downstream began to fall.

“It took about 10 years, but now it's flattening off,” Alexander said, adding that the nitrate readings are now about 1 or 2 ppm. “That's how long it takes to clean out the primary nitrate from crop fields.”

STACKS OF WATER

Everything from private wells to municipal wells in Southeast Minnesota get their water from underground aquifers. However, there isn't just one aquifer, Alexander said, there are about a dozen in the region.

“There is a whole stack of aquifers going down about 1,500 feet,” Alexander said.

Most municipal wells in Southeast Minnesota are drilled into the Prairie du Chien-Jordan Aquifer, Alexander said, but private wells are usually dug to lesser depths depending on where and when they were drilled. For example most older wells were drilled into the upper-level Galena Aquifer.



An example of the karst geology in rural Dodge County. The porous rock can create a path for contaminated water to reach underground aquifers.

The Galena, however, has taken the brunt of the contamination through the years. Today, well drilling firms are no longer allowed to drill into the Galena, said Dean Schrandt, water program manager for Dodge County Environmental Services.

“When most of these wells were drilled, most people had shallow wells,” Alexander said. “As those became contaminated, now wells are generally drilled 300 to 500 feet deep.”

And while those lower aquifers are generally cleaner, they get their water from the surface as well. “It's just taking longer,” he said.

AS ALWAYS, WATER FLOWS

Like with surface rivers and streams, the water in aquifers flows downhill, eventually heading to the Mississippi River, Alexander said. In the karst region, the water moves through a matrix of underground systems that are analogous to the roads on which we drive.

Water, like cars, he said, spends most of its time in a complex matrix that can be thought of like a neighborhood or even a city. There, it moves slowly around that localized area among the fractured limestone and sandstone. But eventually, that water, like cars, hits the highway, moving more quickly.

But how the water flows from a source to a well can be tricky to gauge, Alexander said. And, as the water changes the underground topography, what we know today might change in the near future.

BROTHER, CAN YOU SPARE A SAMPLE?

While the Township Testing Program and Volunteer Nitrate Monitoring Network have taken

samples from thousands of wells across Southeast Minnesota, a new study — as called for by Stine — would likely need to gather new, and more, data.

The problem, Ronneberg said, is most well owners don't want their wells tested as part of a state program.

“I've talked to these people who say, ‘I've been drinking from this well for 50 years,’” she said. “Well, you haven't been drinking this concentration of nitrates for 50 years.”

Despite the testing that's already underway, Ronneberg said to get a truly clear picture of contaminated groundwater many more wells will need to be sampled, and preferably over a period of time.

New MPCA Commissioner Laura Bishop said that while she looks forward to discussing the merits of the general environmental impact statement her agency has proposed, she hasn't thought about the cost of all that testing, the role existing data has to play in it, or what goals a GEIS should have that would make her agency's role of environmental review work better.

SINKHOLES AND OTHER PROBLEMS

Ronneberg said one of the biggest issues with the infiltration of contaminants into the groundwater is sinkholes or old, damaged wells that essentially act as sinkholes.

Schrandt said the number of known wells in Dodge County is around 2,000, but the number of actual wells — including those not registered and ones no longer in use but not properly sealed — could be double that.

“Old wells not being used are conduits to the aquifers,” Ronneberg said. “Locating old wells is one of the primary jobs we do.”