From:	Steve Commerford
To:	Gunderson, Larry (MDA)
Subject:	MDA Nitrogen Rule Comment letter
Date:	Wednesday, January 27, 2016 10:42:54 AM
Attachments:	MDA Nitrogen Rule Comment letter.pdf MN Groundwater study SE MN 2010-3 (2).pdf

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Larry

Attached are my comments on the proposed MDA nitrogen rule and a copy of the SE Minnesota groundwater study that I referenced.

Steve

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January 27, 2016

Larry Gunderson
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RE: Comments on the proposed MDA Nitrogen Fertilizer Rule.

I appreciate the opportunity to comment on the Minnesota Department of Agriculture (MDA) proposed Nitrogen Fertilizer Rule. After reviewing the Nitrogen Fertilizer Management Plan (NFMP) which is proposed to be put into rule, I have some serious concerns regarding the proposed rule. One concern is the need for such a rule. Nitrogen fertilizer use in Minnesota has been flat for the last 25 years, while yields have increased significantly because of improved management practices. Nitrogen fertilizer use efficiency today is as high as scientific processes and technology allows. Minnesota farmers are not interested in using more nitrogen fertilizer than is needed to optimize economic yields for the crops they produce. Competitive pressures prevent them from doing otherwise.

Farmers in Minnesota use lower rates of nitrogen per acre than farmers in any of the surrounding states with similar yield levels. This is due to the soil and climatic conditions that exist in Minnesota, as well as, the need to maximize economic returns. Both over and under application of nitrogen have negative impact on yields and quality of crops grown in Minnesota; and therefore, there is no economic incentive to over apply nitrogen. In addition, there is no evidence provided in the 2013 NFMP to indicate that groundwater nitrate problems are increasing due to the use of nitrogen fertilizers.

A second concern, with the proposed rule, is that nitrate-nitrogen tests from domestic wells will trigger a phrased regulatory approach to nitrogen fertilizer regulation. The MDA assumes a positive correlation of well nitrate levels to nitrogen fertilizer use without providing scientific evidence to support this assumption. It is common knowledge that most elevated nitrate levels are associated with site-specific well issues. Cracks or holes in the casing and lack of grouting allow near surface water to easily enter a well, causing elevated nitrate levels.

The attached study of 434 randomly selected wells in SE Minnesota documented that grouting prevented wells from exceeding the 10 ppm drinking water standard 100% of the time, with only 5% elevated above 3 ppm. To the contrary, wells without grouting exceeded the 10 ppm standard 17% of the time with an additional 31% elevated above 3 ppm. Grouting is now required as part of the Minnesota well code. This study is evidence that elevated nitrate levels are predominately due to site-specific well issues and not to the general use of nitrogen fertilizer.

There are many sources of nitrate in surface soils that can move into wells, other than nitrogen fertilizer. The largest source, by far, is the mineralization of soil organic matter. Nitrate produced by this source is just as susceptible to leaching and moving into wells, as any other source.

The use of domestic wells to trigger the phased approach to regulation is without foundation and should not be used to trigger nitrogen fertilizer regulations. The scientific evidence contradicts such an approach. **Only**

properly constructed dedicated monitoring wells should be used to trigger the regulatory process. The Nebraska regulatory program was referenced as the model for the Minnesota program. Nebraska only uses dedicated monitoring wells in their program. They found that domestic and even irrigation wells were not reliable indicators of groundwater aquifer nitrate levels. Trying to relate domestic well nitrates levels to nitrogen fertilizer use is a flawed concept. The proposed regulatory process is likely to impose management restrictions on nitrogen fertilizer when groundwater nitrate levels are not being impacted by nitrogen fertilizer use. Instead, other factors are likely to be the cause of higher nitrates in the wells.

A third concern of the proposed rule is the fact that the University of Minnesota nitrogen fertilizer guidelines would be mandated. These guidelines essentially produce a single nitrogen rate for all fields of a given crop with the same previous crop. One rate for all corn or wheat acres in the state with the same previous crop is not improving nitrogen management. Farmers and Ag Professionals understand the site-specific nature of nitrogen fertilizer management. Regressing to a one size fits all approach degrades the existing management abilities that farmers and Ag professional bring to the table in establishing site-specific nitrogen management for a given field or area within a field. Someone sitting in St Paul is much less capable of determining the best nitrogen management approach versus a local Ag professional and farmer that are aware of all the factors that impact the management of a given field.

A recent five year MDA study demonstrated that existing U of Minnesota nitrogen guidelines were inadequate in producing the highest economic returns. The study demonstrated that higher economic corn yields were obtained from rates that were 30-40 lbs/acre higher than the existing University of Minnesota nitrogen fertilizer guidelines. Many of the farmers that participated in this study were working with local Ag professionals. In this case the study showed the need for higher rates. In other situations, the U of Minnesota guidelines exceed the optimum rates. Clearly, the MDA regulatory process needs to account for the expertise of local Ag professionals and more site-specific nitrogen management research needs to be done by the University of Minnesota.

In summary, the proposed MDA nitrogen rule should not proceed as published. There are serious questions as to whether a rule would improve on existing management practices. Clearly, the proposed township well testing program which would trigger regulation is seriously flawed. If groundwater nitrate levels are monitored, it should be done using only, properly installed, dedicated monitoring wells. Changes in nitrate levels in the monitoring wells should be verified as being due to nitrogen fertilizer use and not due to some other cause.

If you have any questions, please contact me at the address below.

Sincerely

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Volunteer Nitrate Monitoring Network, Southeastern Minnesota: Preliminary Data Assessment

By Jim Lundy, Hydrogeologist, Minnesota Department of Health, Source Water Protection and Linda Dahl, Executive Director, Southeastern Minnesota Water Resources Board

Introduction

This article summarizes results from the Volunteer Nitrate Monitoring Network (VNMN), a project that has yielded water quality data in domestic wells in southeastern Minnesota since 2008. Nitrate in drinking water has been concern at least since Kingston (1943) first described connections between geologic sensitivity and water quality in the karst of Fillmore County. The past two decades produced several additional important studies of nitrate in domestic drinking water supply wells of southeastern Minnesota. In 1994, the MPCA sampled a network of 55 (primarily domestic) wells in west-central Winona County (Wall and Regan, 1994). While there was great variability in nitrate concentration, the study found hydrogeologic setting and well construction to be important controls on the occurrence of elevated nitrate concentrations.

Simultaneously, the Southeast Minnesota Water Resources Board (Board) received a baseline study of ground water quality across the nine counties under the board's jurisdiction. Using MPCA Ground Water Monitoring and Assessment Program (GWMAP) data, MGS determined that "positive correlations of low nitrate levels with vintage waters and elevated nitrate levels with recent water indicate that sources of nitrate contamination in the ground water of the region result from activities at the land surface" (Tipping, 1994). Though the baseline study is useful, county water planners recognized that only wells were sampled that complied with the Minnesota Water Well Construction Code. Consequently, water quality data were skewed toward properly constructed wells and lower nitrate concentrations, even though numerous southeastern Minnesota domestic wells pre-date the Minnesota Water Well Construction Code. Thus the baseline study may exclude domestic drinking water wells with the greatest nitrate concentrations.

In 2004, the Board received federal 319 demonstration/education/research funding to measure nitrate in domestic wells across the region. The VNMN study goal was to determine whether a volunteer drinking water supply well monitoring network, using low-cost, non-certified nitrate analyses, provided worthwhile information and could be sustained inexpensively. Ultimately, the complex study goal simplified to: What is the nitrate concentration of the drinking water?

Methods

The VNMN developed three well networks: 1) a "grid" network of randomly selected wells, comprising the majority of wells sampled in the study, and described further below; 2) a "baseline" network, consisting of available wells originally sampled in Tipping (1994); and 3) "targeted" networks initiated in Dodge and Winona counties to address specific problems these counties identified. This project summary focuses on the grid and baseline networks.

To support a statistically defensible regional evaluation of well water quality, the grid monitoring network well selection procedure potentially included wells of all types, even if construction, geologic record, or exact location was initially unknown. Six-hundred and seventy-five uniformly spaced nodes were superimposed over the nine-county study area, and a circular search area (or "buffer") approximately two miles in diameter circumscribed each node. County representatives recruited a randomly selected well owner within each buffer as a study volunteer. If the initially approached well owner was unable or unwilling to volunteer, a second randomly selected owner was solicited, and the process repeated until a volunteer was identified. In 15% of buffers, ultimately no volunteer was identified. During the site visits county representatives also interviewed well owners to determine age and well depth, and recorded well location, diameter, and nearby potential nitrate sources.

Grant budget and timeline allowed for two sampling events per year (February and August) during 2008-2009. County staff mailed each participating volunteer a sample container with instructions to collect untreated aquifer water after running the pump for several minutes until the water temperature stabilized. No field measurements were recorded. After labeling and freezing the samples, volunteers returned them by pre-paid postage to the county offices.

County staff received and stored frozen samples while awaiting batch analysis. Thawed samples were analyzed for nitrate using a table-top Hach 4000 spectrophotometer provided by MDA. Properly maintained and operated, these instruments have minimal deviations from laboratory nitrate measurements and minimal operator-operator variability (R^2= 0.98 and R^2 = 0.9587, respectively; MDA unpublished information).

County staff transmitted well information and nitrate data to

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MDH staff as available. MDH staff reviewed the well data, checked locations, assigned unique numbers where necessary, and updated County Well Index (CWI) as appropriate. MDH staff also determined and tabulated the following well attributes:

1. Matrix of the open interval (clastic bedrock, soluble bedrock, both clastic and soluble bedrock, low permeability material, quaternary material, or unknown);

2. Aquifer designation, either by confirming existing CWI information, or by comparison to nearby wells with defined geologic intervals;

3. Presence or absence of overlying protective geologic layers (DNR, 1991);

4. The documented presence or absence of casing grout, as required by the Minnesota Water Well Construction Code; and

5. Ground surface slope toward or away from the well casing.

Results and Discussion

Over the four sampling rounds, county staff received and analyzed nitrate samples for 553 of the 675 buffers in the original network. Failure to receive samples from the remaining buffers is due either to a failure to enroll a well in the study, or a lack of participation by the volunteer. Round 1 nitrate distribution is shown in Figure 1.

Mean nitrate concentration varied by aquifer (Table 1). The greatest average nitrate concentrations occurred in wells completed in the Prairie du Chien aquifer (5.0 mg/L, round 4), and the least average nitrate concentrations occurred in the Franconia Aquifer (0.4 mg/L, all rounds). The result reflects the fact that over much of southeastern Minnesota the Franconia Aquifer is overlain by younger, protective geologic layers (sufficiently thick shale or clay). In contrast, aquifers from the Jordan upwards through the Quaternary sometimes lack such overlying protective layers.

Table 1: Mean Nitrate Concentration by Major Aquifer, mg/L

Aquifer	Round 1*	Round 2	Round 3	Round 4
Quaternary	2.4 (*46*)	2.9 (*45*)	2.7 (*43*)	3.0 (*40*)
Spillville	3.5 (*18*)	3.1 (*17*)	2.8 (*17*)	1.9 (*16*)
Galena	4.8 (*33*)	4.4 (*33*)	3.2 (*31*)	3.6 (*30*)
St. Peter	2.1 (*27*)	2.2 (*30*)	1.8 (*30*)	2.1 (*28*)
Prairie du Chien	4.2 (*23*)	4.3 (*24*)	3.6 (*21*)	5.0 (*22*)
Jordan	3.6 (*65*)	3.4 (*66*)	3.3 (*68*)	2.9 (*64*)
Franconia	0.4 (*46*)	0.4 (*47*)	0.4 (*44*)	0.4 (*42*)

* Number of samples indicated in italics

Alternatively, we can classify by hydrogeologic setting, recognizing that from the standpoint of nitrate, an aquifer's geologic identity (St. Peter sandstone, or Jordan sandstone, for instance) matters less than whether an overlying protective geologic layer prevents easy recharge. Because the study tracked overlying geologically protective layers and casing grout for each well, we can assess their importance in nitrate occurrence. The horizontal axis of Figure 2 contains four groups:

1. Wells possessing both overlying geologic protective layers and casing grout;

2. Wells possessing geologic protection but no casing grout;

3. Wells lacking geologic protection but possessing casing grout; and

4. Wells lacking both geologic protection and casing grout.

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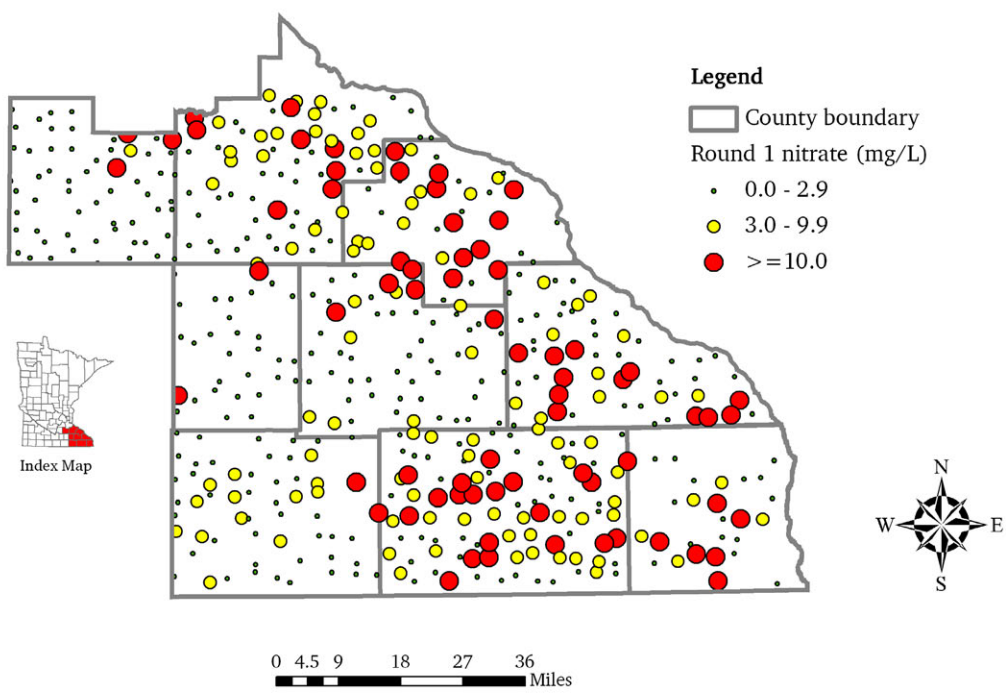
Figure 1: Southeast Minnesota Volunteer Nitrate Monitoring Network Round 1 Nitrate Distribution February 2008



The vertical axis indicates the number of wells in each of three nitrate concentration categories:

1. Low (green), where nitrate concentrations are less than 3 mg/L;

2. Moderate (gray), where nitrate concentrations are greater than or equal to 3 mg/L but less than 10 mg/L; and

3. High (red), where nitrate concentrations are greater than or equal to 10 mg/L.

In the first well group (possessing both geologic protection and casing grout), 118 wells (100%) fall into the low nitrate range. In the second and third well groups (lacking either geologic protection or casing grout), 116 wells (77%) are in the low nitrate range, and 35 wells (23%) in the moderate or high nitrate ranges. In the fourth well group (lacking both geologic protection and casing grout), wells are evenly distributed (25-38%) in low, medium and high nitrate ranges. Eighty-seven percent of all high nitrate concentrations during round 2 occurred in wells lacking both geologic protective layers and casing grout. Because well owners seldom have control over the presence of geologic protective layers, the result underscores the importance of effective casing grout in maintaining water quality.

During the study, changes in nitrate concentration appeared to be minimal, but a complete statistical analysis is not presented here. Such an analysis must account for changes to the network over time (at least six wells from the original network were replaced) because such changes may produce false indications of changes in nitrate concentration. For instance, after an early sampling round a volunteer with unexpectedly high nitrate may drill a new well that meets the Minnesota Water Well Construction Code, effectively excluding nitrate in subsequent sampling rounds. Inadvertent incorporation of the new well into the network thus contributes to an apparent decrease in nitrate, but it is only an artifact of improved well construction.

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Figure 2: VNMN Round 2 Nitrate Concentration vs. Geologic Protection and Grouting

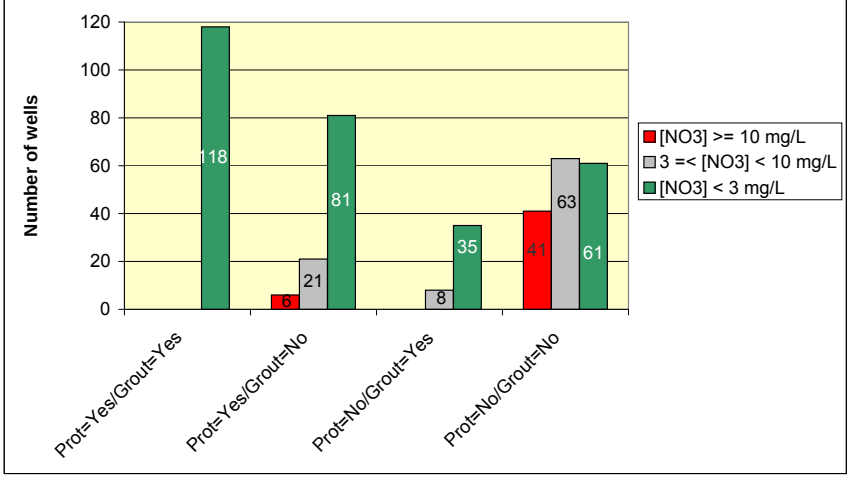
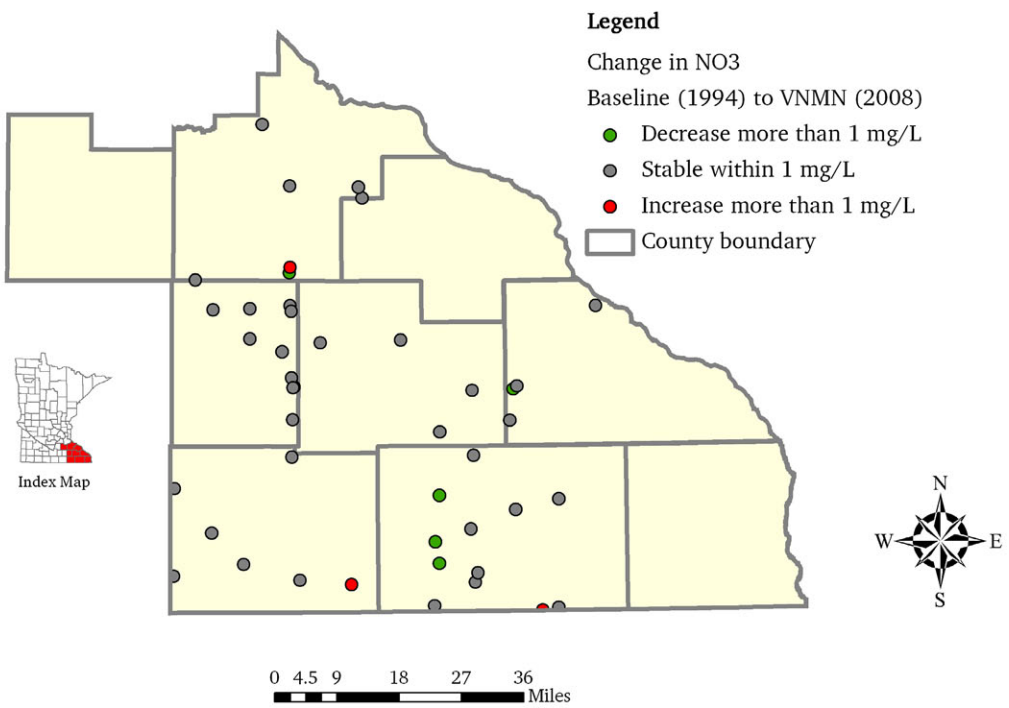


Figure 3: Southeast Minnesota Volunteer Nitrate Monitoring Network Change in Nitrate, 1994-2008



The maximum number of baseline wells resampled during this study occurred in Round 2 (August 2008; 44 wells). Figure 3 shows the change in nitrate concentration for these wells over the time interval of 1994 to 2008. Thirty-six wells (82%) shown in grey did not change by more than 1 mg/L. Nitrate concentrations decreased by more than 1 mg/L in five wells, with a maximum decrease in one well of 7.2 mg/L. Two of these wells, including the well with the maximum decrease, remained in the high nitrate (equal to or greater than 10 mg/L) category. Nitrate concentrations increased in three wells by more than 1 mg/L, including a maximum increase in one well of 14 mg/L (0 mg/L in 1994, 14 mg/L in 2008). This well lacks both protective geologic layering and casing grout, so the increase could be due to intensification of the nitrate source at the ground surface. It could also be due to sampling or analytical error.

Study Benefits

The study provides drinking water quality information to the well owners in the study, and county and MDH staff are available to discuss results with individual well owners. A broader benefit is realized by recognizing the usefulness of this data for other related studies, for example as a check layer in a county nitrate probability mapping project. It may be possible to use the nitrate results at individual wells, along with available geological maps and other information, to define priority map areas where hydrogeologic setting and measured nitrate concentrations indicate a significant risk of elevated nitrate. County staff could use this information to prioritize the most urgent delivery of outreach and technical assistance to help assure high quality drinking water for all domestic well owners, even those not a part of this study.

Future Work

One project goal was to sustain the volunteer monitoring network over time, and the original grant has been extended for three years, enabling annual sampling to continue at least through 2012. The grant extension includes additional special projects to be conducted by five counties. If additional funding can be obtained, network wells could be sampled for analytes other than nitrate, including: major ions, trace metals, tritium, carbon-14, arsenic, radio*f* nuclides, pesticides, and perhaps others.

References

Kingston, S.P., 1943, *Contamination of water supplies in limestone formation*, Journal of the American Water Works Association, vol. 35, no. 11, pp. 1450-1456, November 1943.

Minnesota Department of Agriculture (report reference and date unavailable)

Minnesota Department of Natural Resources, 1991, *Criteria and guidelines for assessing geologic sensitivity of ground water resources in Minnesota,* prepared for the Legislative Commission on Minnesota Resources by the Geologic Sensitivity Project Workgroup, June 1991.

Southeast Minnesota Water Resources Board, 2009, *Section 319 Nonpoint Source Pollution program: Volunteer Nitrate Monitoring Network Final Report*.

Tipping, Robert G., 1994, *Southeastern Minnesota regional ground water monitoring study: a report to the Southeast Minnesota Water Resources Board*, Minnesota Geological Survey Open-File Report 94-1, University of Minnesota, St. Paul, April 29, 1994.

Wall, David B., and Regan, Charles P., 1994, *Water quality and sensitivity of the Prairie du Chien-Jordan aquifer in west-central Winona County*, Minnesota Pollution Control Agency, Water Quality Division, April 1994.

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