



GROUNDWATER QUALITY WORKGROUP REPORT

DATE: January 10, 2017
TO: Food, Land & Water Project Steering Committee
FROM: Groundwater Quality Workgroup
Co-Chairs: Kevin Masarik and Chuck Wagner
Facilitator: Ed Odgers
SUBJECT: ***Interim Report on Workgroup Progress***

Workgroup Charter

The Steering Committee asked the Groundwater Quality Workgroup to consider statewide and regional groundwater quality issues related to agriculture. The Steering Committee asked the Workgroup to focus on nitrate and pathogen contamination of groundwater, and to consider the following (summarized) questions:

- What is the current extent of groundwater contamination?
- What are the key contamination sources?
- What are the impacts?
- Are things getting better or worse? Why?
- How do current farming practices affect contamination risks?
- Do farmers have adequate tools and incentives to prevent groundwater contamination? How could we do better?
- What are our “bottom-line” drinking water quality goals?
- What will it take to achieve our goals, and how long will it take?
- How will we measure success?
- Where do we go from here?

Workgroup Membership

Please see the attached list of workgroup members, and their record of attendance to date. The Workgroup co-chairs believe that the Workgroup membership reasonably represents stakeholder interests.

Workgroup Meetings

The Workgroup has held 2 meetings to date, on August 23 and November 10, 2016. Both meetings were well attended. There was excellent, constructive participation by all represented stakeholders.

- On August 23, Workgroup members introduced themselves, shared basic perspectives, and began to identify and address key issues and information needs.
- On November 10, the Workgroup heard expert presentations on statewide nitrate contamination, statewide nutrient management, and responses to groundwater contamination in Kewaunee County. The Workgroup then continued its discussion of key issues (see draft minutes attached).

Problem Description

The Groundwater Quality Workgroup has focused on key nitrate and pathogen contamination problems related to agriculture. The Workgroup has worked to define, with greater clarity, the nature and scope of these problems.

Nitrate Contamination

Nitrate contamination is Wisconsin's most pervasive groundwater pollution problem. There are many natural and human sources, but leaching from nitrogen-rich farm fields is the primary source. Contamination levels have increased over the years in many parts of Wisconsin. Studies suggest that recent contamination trends are variable. Contamination may be increasing in some areas, while stabilizing or decreasing in other areas. More focused groundwater testing, particularly in areas with known nitrate contamination problems, would provide a more complete picture.

Nitrogen is an essential crop nutrient. Corn and potatoes (important crops in Wisconsin) are especially heavy nitrogen users. Crop producers apply nitrogen fertilizer and manure to ensure abundant crop yields. In 2014, imported fertilizer accounted for about 64% of all nitrogen applied in Wisconsin, while manure accounted for about 36%. That ratio can vary significantly from year to year.

Farmers are applying more nitrogen than ever before. Today, U.S. farmers apply *5 times more nitrogen fertilizer* than they did in 1960.¹ Between 2004 and 2014, Wisconsin farmers *doubled* the amount of nitrogen fertilizer applied in this state (high crop prices, and a heavy shift to row crops like corn, drove much of that increase). Much of the added nitrogen was taken up by growing crops, but a significant share ended up in our groundwater.

In 2014, Wisconsin also produced about 7% more dairy manure than it did in 2004. More of our dairy manure is now produced at large confinement facilities, in dairy growth areas such as northeastern Wisconsin. Because manure is heavy, and expensive to haul, it is generally applied to nearby cropland (often under lease arrangements with other land owners). Livestock operators rely on land spreading to dispose of manure; but, in some localities, manure production may be outrunning land availability and crop nutrient needs.

¹ For background information and source citations, see Matson, "Food, Land and Water: Can Wisconsin Find Its Way?" Paper may be downloaded, free of charge, from WI Land+Water website at <http://wisconsinlandwater.org/programs/food-land-water-project>.

Nitrogen cannot be delivered to crops with 100% efficiency. Even under the best conditions, and with the most careful application methods, only part of the applied nitrogen is actually taken up by crops. A sizable portion of the “unused” nitrogen can eventually be converted to nitrate and leached to groundwater. University of Wisconsin (UW) research suggests that at least 20% of the nitrogen applied to corn on silt loam soils, at UW recommended agronomic rates, is eventually leached to groundwater as nitrate. Excessive or poorly timed nitrogen applications, heavy rainfall, spring runoff events, sandy irrigated soils, and karst geology can make matters worse.

Nitrate becomes a significant health concern when its concentration in drinking water exceeds the state health standard. Among other things, it can cause “blue baby syndrome” – a potentially fatal condition that affects infants. Nitrate concentrations currently exceed the state health standard in many places. In heavily farmed portions of south and central Wisconsin, 20-30% of private drinking wells now exceed the state health standard (a third of all Wisconsin families get their drinking water from private wells).

Nitrate contamination is costly for Wisconsin communities. In a 2012 survey, 47 Wisconsin communities reported nitrate contamination of community wells in excess of the state health standard, and another 74 communities reported rising contamination. As of 2012, Wisconsin communities had spent over \$32 million for new community wells and water treatment processes to address nitrate problems. Nitrate concentrations continue to mount in a number of municipal wells.

Nitrate contamination is also a problem for private well owners. Those with contaminated wells may face difficult choices. A new well (not guaranteed to eliminate contamination) costs about \$7,200. Bottled drinking water costs about \$190 per person per year. Water treatment devices cost about \$800 (installation) plus \$100 per year (operation). A third of all private well owners do not know whether their drinking water is contaminated, because they have never tested for nitrate.

Wisconsin has adopted nutrient management (NM) standards for all farms, partly to address nitrate contamination problems. The standards were developed with extensive input from nutrient management experts, and from farmers themselves. Current NM standards require farmers to have NM plans, test their soils, evaluate actual crop nutrient needs, credit nutrients from all sources (including fertilizer and manure), avoid nutrient applications in excess of UW agronomic recommendations, and avoid certain high-risk applications.

The standards, though legally binding, are generally implemented on a voluntary basis. For most farms, compliance obligations are contingent on an *offer* (not necessarily an *acceptance*) of cost-sharing. Livestock facilities that need a DNR permit (1,000 or more “animal units”) or a local siting permit (local option for facilities with 500 or more “animal units”) *must* have NM plans, *regardless* of cost-sharing; and the plans must cover all farms on which the operators apply manure.

To date, only about 30% of all Wisconsin farms have NM plans, and it is not clear how well the plans are being implemented. The Wisconsin Department of Agriculture, Trade and Consumer Protection has estimated that, in 2007, Wisconsin farmers applied over 200 million lbs. (100 thousand tons) of nitrogen in excess of UW recommendations. Since then, total nitrogen applications have continued to grow.

NM standards and practices continue to evolve. The State of Wisconsin is currently considering updates to current standards, to address certain problems that are not adequately covered by those standards. Various stakeholders are also experimenting with voluntary NM strategies that might be helpful. Better and more widespread compliance with existing NM standards would help to reduce nitrate contamination of groundwater. But in certain highly susceptible areas, such as sandy irrigated areas and karst areas, additional steps may be needed.

Pathogen Contamination

Pathogens are microorganisms such as bacteria, viruses, and protozoa that can cause waterborne disease. Groundwater contamination by pathogens can usually be traced to human or livestock fecal wastes that seep into the ground from sources such as septic systems, leaking sanitary sewers, or manure applications. Certain geologic conditions, such as karst or shallow carbonate rock aquifers, increase the potential for this type of contamination. Manure applications in karst regions, such as Kewaunee County, are currently a significant concern.

Manure, which is normally spread on land in untreated form, can sometimes contain pathogens that are harmful to humans (livestock pathogens are more common). Land spreading is a relatively safe form of biological treatment in most areas, provided that manure is spread in appropriate quantities and at appropriate times and places. But in karst regions, with their thin soils and fissured bedrock, there is a much higher risk of rapid, unfiltered manure runoff that can result in pathogen contamination of groundwater.

Pathogens in drinking water can cause severe, and occasionally fatal, illness. Testing for pathogens can be difficult, expensive and uncertain (partly because there are many possible pathogens). There is no legal “tolerance” for pathogens in groundwater because some pathogens, even in small concentrations, can cause illness.

Manure production is increasingly concentrated on large farms in certain parts of the state (farms with over 700 cows now produce about 30% of Wisconsin’s milk and manure). Dairy growth has been especially strong in northeastern Wisconsin, which has thin soils and fissured karst bedrock in some areas. In some fragile areas, compliance with existing NM standards may not be enough to prevent groundwater contamination. Additional practices, such as advanced manure treatment or restricted applications in fragile areas, may be needed.

Water Quality Goals

Wisconsin residents value the state’s historically potable groundwater. We aspire to prevent further degradation of groundwater (nitrates or pathogens); to restore compliance with existing nitrate standards, where those standards are currently exceeded; and to ensure safe drinking water for all Wisconsin residents.

We understand that this will not be easy, given the intensity of today’s farming operations. Significant, and potentially costly, action will be needed on several fronts. We believe that prompt action is needed; but we understand that some improvements will take time. In some places, the challenges are especially difficult. Goals should include realistic timetables and progress benchmarks.

Progress will require a systematic, statewide cooperative effort. But we recognize that there are wide local variations in land use, farming practices, soil, geology and groundwater contamination risks. So it will also be important to identify key regional problem areas and develop region-specific approaches where needed.

Key Issues

Based on discussions to date, we anticipate that the Workgroup will focus on the following general issues in our remaining 2 meetings:

- ***Can we do a better job of monitoring groundwater quality?***
 - Can we establish a more systematic statewide sampling and testing program? What will it take, and how will we get there?
 - Can we improve local sampling and testing in key areas of concern?
 - Can we encourage more private well owners to test their drinking water? How?

- ***Can we increase compliance with current nutrient management (NM) standards?***
 - Compliance with current NM standards is not a complete solution, but it can help. NM standards provide the basic “accounting system” that we need to achieve and maintain a balanced nutrient budget. They also prohibit clearly excessive and inappropriate nutrient applications.
 - Today, for a variety of reasons, only 30% of Wisconsin farms have NM plans; and some operators may not be adhering to the plans that exist.
 - Ideally, we would like to see 100% statewide compliance with current NM standards. But resources are limited, and we need to set priorities. Within each county, it makes sense to focus compliance efforts for maximum impact. But how do we do that? And how do we ensure farmer participation?
 - Can we distinguish between “voluntary” compliance and “optional” compliance?
 - Can we offer reasonable cost-share and compliance incentives, while demanding accountability?
 - Can we address key practical barriers to compliance (see key barriers listed in attached minutes)?
 - Can we encourage NM research and innovations, without delaying or avoiding basic NM compliance?
 - Can we provide more targeted NM information, education and assistance to farmers, especially in priority areas?

- ***Can we address unique regional problems?***
 - It is important to improve NM compliance statewide. But some regional problems may require special attention; and, in some places, basic NM compliance may not be enough. Problems may vary by region, and our approach must be tailored accordingly.
 - How can we bring needed focus to key regional problems, and develop appropriate regional strategies to address them?
 - What is the role of county and local governments? Can we respect their special “grassroots” role and authority, while maintaining reasonable statewide consistency of regulation?

- How do we align federal, state, county, local community, business and citizen efforts to achieve common goals?
- How can Wisconsin’s agricultural and food industries play a constructive leadership role?
- ***Do we need to take additional steps in some cases?***
 - In some cases, compliance with current NM standards may be inadequate to prevent serious groundwater contamination. Proposed updates to the statewide standards may help; but other problems will require special local or regional attention.
 - We may need to consider stronger steps, such as manure treatment or reduced production intensity in some intensely farmed but fragile areas. But these steps can be very costly, and they can pose existential challenges for some operations.
 - Do we know what practices will work? Are they cost-effective?
 - Who will bear the cost? Taxpayers? Farmers? Others?
 - When is it appropriate to provide public subsidies, tax incentives, cost-share grants, or other taxpayer-financed assistance for advanced conservation measures?
 - What is the appropriate balance between private property rights and resource protection? What is the proper mix of pollution control “carrots” and “sticks?”
 - Should we consider additional compensation or assistance to communities and private well owners that are affected by nitrate or pathogen contamination? When is assistance appropriate? What kind or level of assistance? Who should pay?
- ***How do we pay for what is needed?***
 - More public and private resources are needed for nutrient management, advanced conservation practices, groundwater monitoring, research and education. But state, local, and private funding will be a challenge in today’s economic and budget climate.
 - We need to think creatively, but soberly, about funding options.
 - We need to ask how much it will cost, and who should pay.
 - We might ask whether our food-based industries can help to ensure that their supply chains meet environmental standards.
 - We need to consider groundwater protection needs, state and local fiscal constraints, the fair allocation of pollution control costs, the fair and even-handed treatment of large and small producers, and the competitiveness of Wisconsin’s agriculture and food industries.

Next Steps

Our Workgroup plans 2 more meetings. At our next meeting, we plan to explore the above issues in greater detail. In order to use our time as efficiently as possible, we may seek Workgroup reactions to various alternative approaches. At the final meeting, we hope to arrive at some final recommendations that we can share with the Steering Committee. Given our time constraints, these are not likely to be detailed action plans or legislative proposals. But we do hope to provide a concrete, helpful sense of direction.

Groundwater Quality Workgroup Member List

First Name	Last Name	Organization	Attended Meeting 8/23/16	Attended Meeting 11/10/16
Eric	Allness	NRCS	Yes	Yes
Don	Bennett	Hartung Brothers	No	Yes
Davina	Bonness	Kewaunee County Land and Water Conservation	Yes	Yes
Mark	Borchardt	U.S. Dairy Forage Research Center	Yes	Yes
Russ	Brown	Waushara County Farmer	Yes	Yes
Kevin	Erb	UW Extension	No	No
Keith	Foye	DATCP	Yes	No
Mark	Garthwaite	Wisconsin Brewers Guild	No	No
Madeline	Gotkowitz	WI Geological & Natural History Survey	Yes	Yes
John	Holevoet	Dairy Business Association, FLW Steering Committee	Yes	Yes
Dale	Konkol	Door County Soil and Water Conservation	Yes	Yes
Dave	LaCrosse	Pagels Ponderosa	No	Yes
Kevin	Masarik	UW Stevens Point; Co-chair, Groundwater Quality Workgroup	Yes	Yes
Maureen	Muldoon	UW Oshkosh	Yes	Yes
Don	Niles	Dairy Dreams, Kewaunee County	Yes	No
Ed	Odgers	Retired WI DATCP; Facilitator, Groundwater Quality Workgroup	Yes	Yes
John	Pagel	Kewaunee County LCC	Yes	No
Russ	Rasmussen	WDNR	No	Yes
Al	Sweeney	Rock County LCC	No	No
Chuck	Wagner	Kewaunee County; Co-chair, Groundwater Quality Workgroup	Yes	Yes
Sara	Walling	DATCP	No	Yes