

## **Illinois Rural Well Survey Feasibility Analysis**

### **Summary**

Drinking water contamination from nutrient pollution is a serious concern for Illinois farmers and rural residents. One quarter of Illinois residents depend on a private well for drinking water, yet information on nitrate levels in Illinois rural wells is limited and sparse. Currently available evidence indicates that nitrate levels are rising in many of the state's towns and cities, forcing those communities to purchase expensive nitrate treatment facilities. If Illinois is to make progress on the problem of nutrient pollution, impacted residents must be engaged and activated, and that requires much more robust data on how, where, and to what extent nitrates are contaminating wells.

While available nitrate data suggests low overall nitrate levels in Illinois, the state has hotspots with some of the highest nitrate levels in the country. A statewide survey identifying hotspot locations and calling attention to local water quality presents an opportunity to engage farmers and other rural residents on the issue of nutrient pollution.

To assess the feasibility of Illinois performing a statewide rural well survey of nitrate contamination, Prairie Rivers Network interviewed state agency and nonprofit staff from neighboring states that have completed similar projects. The surveys provided detailed insight into the financial and staffing resources necessary to accomplish this kind of survey. This information was subsequently shared with Illinois agency staff. While Illinois state agencies have been understaffed and underfunded in recent years, local agency staff do have the necessary technical expertise for this project. Prairie Rivers Network's research into grant programs in Illinois indicates that, while Illinois agencies cannot directly access available grant funds, a third party could act as the grantee and then contract the agency to perform the work. Prairie Rivers Network is eligible for these government grants, or there may be other parties able and interested in taking on that role.

### **Illinois Needs a Statewide Rural Well Survey**

The Illinois Nutrient Loss Reduction Strategy is failing to live up to its name. Illinois' riverine loads of nitrate and phosphorus are increasing. Focusing primarily on how local nutrient loading eventually contributes to the hypoxic zone in the Gulf of Mexico has not succeeded in recruiting enough farmers to adopt practices that protect water quality. Directly connecting local drinking water quality to the farming practices used on the landscape may convince more farmers to take action.

All of the data on nitrate levels in Illinois' rural domestic wells are decades-old and incomplete. Limited testing of private wells was done in the 1980s after passage of the Illinois Groundwater Protection Act. In subsequent years, multiple national reports have found Illinois to have exceedingly high levels of nitrate in some areas. Unfortunately none of these studies have covered the entire state.

When polled, the impact on drinking water is voters' top concern around nutrient pollution. With robust, statewide data on the location and severity of nitrate contamination, advocates can

better leverage that concern into on-the-ground actions taken to reduce nutrient pollution. Better data would create new opportunities to engage farmers in conservation measures and direct local watershed and source water protection efforts to maximize the benefit to local water quality.

Old research reports have identified areas with very high nitrate levels in Illinois. Other states have used agricultural intensity and soil type to identify vulnerable areas. However, there are other areas, not identified on the maps of vulnerable groundwater, where exceptionally high nitrate levels have also been found. This is likely due to the high level of mixing between old and new ground water as well as the locations of dug wells. Illinois needs an in-depth, statewide survey to identify these unpredictable high nitrate areas.

It is particularly crucial that the state survey rural wells due to their unique vulnerabilities which are not captured by other available data. Public water wells tend to be deeper, which decreases their vulnerability to nitrate contamination. The Illinois Department of Agriculture's Pesticide (and nitrate) Monitoring Network uses drilled wells, whereas many of the most vulnerable wells are old, wide bore, dug wells. Previous reports have found 60% of dug wells in Illinois to be over the safe drinking water standard for nitrate. An accurate portrayal of Illinois shallow groundwater quality is only possible by surveying the water that rural well owners are actually drawing. Geological maps are not a substitute for direct testing.

## Examples from Neighboring States

Private well testing programs in neighboring states can give insight into the resources and technical support available and necessary to accomplish a statewide rural well survey. However, it is apparent that states that have made drinking water quality a focus of their nutrient loss reduction efforts—including Wisconsin and Minnesota—are in a better position to fund these projects. This is due, in part, to better budgeting and better access to information on the extent of nitrate contamination of their drinking water. Here is a summary of the resources that other states have used to design and fund a statewide water survey.

### *Iowa*<sup>11,12</sup>

Agency:	Iowa State Geological Survey
# Wells Tested:	686
Cost:	Unknown
Year:	1988-1989

Iowa passed a Groundwater Protection Act in 1990 and did their first survey of private wells for nitrate from 1988-89. Since then they have had additional surveys in 1990-91, 1994, 2002, and 2006-08. Sample sizes have ranged from 103-686 wells. They found approximately 20% of private rural wells were over the safe drinking water standard. The survey was not designed to identify hot spots, however.

Unfortunately, many of the staff who worked on these reports have retired and the funding

mechanisms and partnerships that existed at that time (when water monitoring was part of the Iowa Geological Survey) have changed considerably. Current staff believe that these well testing projects were paid for mainly by the Center for Health Effects of Environmental Contamination (CHEEC) at the University of Iowa. In-kind planning and technical support came from CHEEC and others at the University. It is unclear whether CHEEC was funded through a grant or through state appropriations. DNR water monitoring also made a substantial contribution. This may have included the state environmental lab, the State Department of Health, and a variety of DNR staff from the Iowa Geological Survey, Water Monitoring programs, the Water Supply programs, and Private Well programs. State grants to counties may have added some dollars from the Groundwater Protection Fund. It is clear that this was a project for a large team, not just one or two agencies.

The Iowa Department of Natural Resources also has a Private Well Tracking System to collect and publish county level results of private well testing. Well testing is available at county Department of Public Health offices. The Iowa Bureau of Environmental Health Services provides financial assistance so that testing of nitrate, coliform bacteria, and arsenic is free to residents.

### *Minnesota*<sup>1,10</sup>

Minnesota has one of the best rural well testing programs in their Township Testing Program, which ran from 2013-2019. Over 70,000 private well owners were offered free well testing, with 1/3 choosing to participate. Drinking water quality has been a top priority of Minnesota's nutrient pollution work. The Minnesota Department of Agriculture (MDOA) uses the information gathered by this program to inform their watershed based projects with the specific goal of addressing local water quality. They developed drinking water management areas that prioritize conservation in the area surrounding public drinking water wells

Agency:	Minnesota Department of Agriculture
# Wells Tested:	~21,000
Cost:	\$1,400,000
Year:	2013-2019

This program started as a pilot program which focused on counties known to have the highest levels of nitrates. MDOA loaned portable nitrate spectrophotometers to a few Soil and Water Conservation Districts (SWCD) and provided standard calibration training. The nitrate meters were rotated between different SWCDs to get more coverage -- a fairly inexpensive outreach program that raised awareness of the issues. After the pilot program, the legislature passed a new tax to cover clean water, arts, and parks projects, including the Township Testing Program.

In the full Township Testing Program, the MDOA identified areas prone to nitrate contamination based on soil type and the intensity of agricultural production. Eligibility for the program required a township to have at least 70% coarse soils as well as 70% of its area in corn and soybean production. Vulnerable townships were offered free nitrate water testing for a year.

SWCD staff were contracted to create well owner lists based on county parcel information. Any property worth more than \$20,000 was assumed to have a dwelling with a well. The first mailing was a letter containing a returnable postcard to indicate interest in receiving a nitrate testing kit. Later the agency sent test kits directly and those interested in participating could simply mail back their test results. After seeing the results of these efforts, legislators asked MDOA to offer pesticide testing for anyone whose water had elevated levels of nitrate. The program cost about \$200,000 per year, with each kit costing about \$8-10 at the time, though prices may have increased since then.

### *Wisconsin*<sup>4</sup>

Agency:	Wisconsin Department of Agriculture, Trade, and Consumer Protection
# Wells Tested:	401
Cost:	\$228,731
Year:	2022

The Wisconsin Department of Agriculture, Trade, and Consumer Protection (DATCP) has been able to use a small, but statistically significant well survey to assess the level of nitrate contamination in areas of different agricultural density. This study used both federal funds from a US Environmental Protection Agency (US EPA) supplementary grant, and in-kind work provided by their local National Agricultural Statistics Service (NASS) office. They also have several dedicated DATCP staff funded to work on this issue. The survey has been repeated several times, with the most recent survey costing \$228,731 to test 401 private rural wells. Having local agency staff, such as NASS field staff and statisticians, with enough funding to take on projects like this is a clear asset.

Another lesson to be learned from their project is how to most efficiently distribute well samples across the state. Agricultural activities are concentrated in certain parts of Wisconsin. Therefore, the DATCP stratified their samples to focus on areas with more concentrated agricultural production. Through the selection of wells to be tested, they were able to make this study statistically significant despite the small sample size. The latest study will combine new and previously sampled wells to increase the strength of their results.

### **Previous Studies in Illinois**

In 1992, the Illinois State Water Survey designed and undertook a pilot study, testing a rigorous methodology for completing a statewide rural well survey of nitrate and other agrichemicals. They recommended that a full study be completed, which, if the same methodology were to be used, would cost \$3.4 million. However, the subsequent statewide survey did not use the recommended methodology and in fact tested even fewer wells than the pilot. This incomplete survey makes clear that Illinois agencies would benefit from investigating how neighboring states have completed more thorough surveys at lower costs.

## Potential Resources in Illinois

After talking with Illinois agency staff, it appears that Illinois does not have access to the same financial resources as the other states included in this paper. However, Illinois does have staff with the technical expertise for this project, and there are other funding opportunities available. Reductions in agency staffing in Illinois have resulted in higher workloads for remaining staff, who may not be able to offer their time as in-kind contributions. With additional funding to cover their time, agency staff could be able to participate. Here are alternative avenues to fund this project:

### *Agricultural Laboratory Testing Association*<sup>8,9</sup>

The Agricultural Laboratory Testing Association may be able to give a discounted rate for nitrate testing across the state. Bringing a nitrate probe directly door to door would be another option, with a cost of \$2,000 for the nitrate probe. This would give instant results, but the probe could only be used in one location at a time. Nitrate in groundwater fluctuates over the year, so it would be important to collect samples over a season.

### *Illinois Environmental Protection Agency*<sup>2,3</sup>

Unlike Wisconsin, Illinois has more restrictive grant rules which limit its ability to ask the US EPA Region 5 office for supplemental funds for well testing. Illinois is bound by particularly restrictive rules on how funds can be applied or moved since implementation of Illinois' Grant Accountability and Transparency Act (GATA). This law was put in place after multiple corruption cases in which state funds were used inappropriately.

While the Illinois Environmental Protection Agency (IEPA) cannot access additional funds from the US EPA for the project, they may be able to access funding in the form of the 604(b) and 319 grant programs. These programs are intended for nonprofits or technical assistance providers, but are open to any entity that can receive Illinois state funds, including the ISWS, but not NASS. These grants would allow a nonprofit, such as Prairie Rivers Network (PRN), to apply for the grant and then contract out much of the work to state agencies, such as NASS and the ISWS. This allows state agency staff to bring their expertise to a project for which they cannot receive direct funding.

While either grant program could be used towards monitoring projects, the 604(b) program is particularly promising because, unlike the 319 program, it does not require matching funds. It has previously funded similar projects, such as the Greenville University rural well study. This project tested rural residents' wells for nitrate and other contaminants in five counties in southern Illinois.

The 604b program receives \$375,000 per cycle which can be divided among two to three grants, each lasting two years. This should be sufficient funding for this project based on the cost of the Wisconsin survey. One of the challenges of this grant is the extensive application and GATA reporting process. One way to overcome this burden would be to partner with another organization already receiving grants through the GATA system, such as a university or SWCD, which would have already completed many of the GATA requirements.

### *Illinois Nutrient Research and Education Council*<sup>13</sup>

The Illinois Nutrient Research and Education Council (NREC) is a major source of funding for research on nutrient pollution in Illinois. They receive funding from a small tax on fertilizer sales. Most of their funded projects are related to agricultural best management practices. NREC stated that this project would be eligible to apply to their Request for Proposals, which go out every spring. They can also help make connections with University staff who may be interested in collaborating on this survey or using the results in their research.

### *Illinois State Water Survey*<sup>6,7</sup>

The Illinois State Water Survey's scientists conduct water quality research, manage state water resource archives, and provide technical assistance to residents. Their expertise will be important in determining how to stratify samples to have the best chance of finding all of the areas with high nitrate in the groundwater. Their hydrologists expressed interest in participating in this project. Like NASS, however, they will require a new funding source to cover their time.

The ISWS lab or county Departments of Public Health are other locations where nitrate samples could be tested at a cost of approximately \$30 per sample. It is possible that bulk testing at the ISWS lab could reduce the cost to \$10 per sample.

### *National Agricultural Statistics Service*<sup>5</sup>

Illinois' National Agricultural Statistical Service (NASS) offices have less funding than some of the other states and would not be able to assist in this project without additional funding. However, the local NASS office does have both the statistical staff and the field staff to design a rigorous survey and sampling methodology to collect the samples across the state. Working with NASS has the advantages of providing very high quality statistics and trained field staff, but contracting with them is more expensive than other options.

According to NASS, there is no current list of rural addresses, but following Minnesota's example in developing such a list could significantly reduce costs. With a list of addresses that may have a rural well, NASS could design a statistically significant sampling of rural wells to target with mailed testing kits.

### *University of Illinois Statistics Department*

The University of Illinois Statistics Department also offers lower cost statistical consulting through one of their courses. Determining the actual cost would require a formal consultation; however, it is likely to be much less than NASS.

## **The Path Forward**

While Illinois does not have the same financial resources as some of its neighboring states to undertake a statewide survey of nitrate in rural wells, Illinois' agency staff do have the expertise needed, and there are alternative opportunities for funding. The hydrologists, statisticians, and field staff at the Illinois State Water Survey and the local National Agricultural Statistical Service

office will be key partners for accomplishing this project. Unlike in some other states, these agencies do not have enough funding to cover their time on this project, but with additional external funding, they would be able to take on this additional work.

Choosing how to best stratify the well samples will be a challenge, and the hydrologists at ISWS should be consulted. Other states have focused their sampling in areas with coarse soils and high intensity agricultural production. However, some of the highest nitrate samples have come from wells outside these areas. It is important to design a study that will not miss these areas.

The most promising funding source found was the 604(b) grant from the Illinois Environmental Protection Agency (IEPA). Having one grant simplifies funding. The amount of paperwork involved in the GATA system application and reporting does present a challenge, however.

A rural well survey is a large undertaking and new connections and partnerships are still being explored for this project. It remains critical that we connect with and bring in university researchers. University staff may provide additional expertise as well as potential funding from other grants such as the Nutrient Research and Education Council. University partnership also offers additional opportunities to communicate the results, particularly if the researchers seek to publish.

While most states used survey designs that resulted in statistically significant results, Minnesota used a non-statistical approach. Minnesota was able to use this alternate approach because they had funding to test a much higher number of wells, and they have significant public support for protecting water quality. Using a more targeted approach as done in Wisconsin will be more financially feasible in Illinois. Additionally, having concise and statistically significant results will be easier to communicate and incorporate into Illinois existing policy mechanisms, such as the Illinois Nutrient Loss Reduction Strategy Biennial Report and State Water Plan.

#### List of Interviews

1. Aaron Meyers. Minnesota Rural Water Association
2. Christine Davis. Illinois Environmental Protection Agency, Manager, Watershed Management Section
3. Anthony Dulka. Illinois Environmental Protection Agency, Groundwater Section
4. Stan Senger. Wisconsin Division of Agricultural Resource Management, Department of Agriculture, Trade and Consumer Protection
5. Mark Schlousiner. Illinois State Statistician, US Department of Agriculture's National Agricultural Statistics Service Illinois Field Office
6. Walter Kelly. Head of Groundwater Science Section, Illinois State Water Survey
7. Steven Wilson. Head of Environmental Public Health, Information and Data Services Section, Illinois State Water Survey
8. Corey Lacey. President, Agricultural Laboratory Testing Association
9. Kent Cox. Clean Water Act Training & Technical Assistance, previous Sourcewater Protection Specialist, Illinois Rural Water Association
10. Kimberly Kaiser. Fertilizer Management Unit, Minnesota Department of Agriculture
11. Claire Hruby. Land Quality Bureau/GIS Section, Iowa Department of Natural Resources
12. Bob Libra. Emeritus State Geologist of Iowa
13. Julie Hewitt. Nutrient Research and Education Council