



UNIVERSITY OF WISCONSIN WATER RESOURCES INSTITUTE

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Arsenic in Groundwater

ARSENIC IS AN ODORLESS AND TASTELESS ELEMENT that occurs naturally in many rock formations. Arsenic contamination is a statewide problem; tests have detected arsenic at some level in every county of Wisconsin. To date, testing has detected arsenic exceeding federal standards in groundwater in wells in 52 of the state’s 72 counties. The current federal standard for arsenic concentrations in public drinking water systems is 10 parts per billion (ppb). Long-term exposure to arsenic may lead to increased risks of certain cancers, as well as neurological damage, hypertension and other health problems.

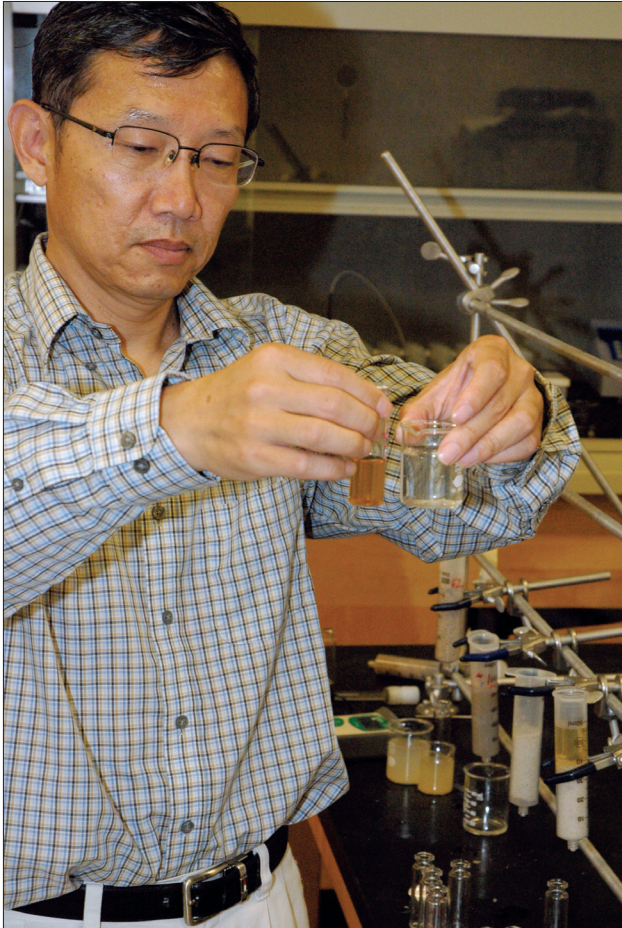
Arsenic Problem Areas

In Wisconsin, elevated arsenic levels are especially prevalent in the Lower Fox River Valley and southeastern Wisconsin. In parts of Brown, Outagamie, Shawano and Winnebago counties, 20 percent of drinking water supplies exceed the federal drinking water standard. In 2012, a notable increase

WHAT MORE NEEDS TO BE DONE

- Improve understanding of the geological occurrence of arsenic in Wisconsin.
- Improve understanding of the health effects in Wisconsin residents exposed to arsenic-contaminated drinking water.
- Maintain the current special well casing depth area and revise guidelines as better information becomes available for determining the geological extent of arsenic-containing mineral deposits.
- Develop and enhance public information campaigns to encourage testing of private wells for arsenic.
- Develop practical, cost-effective treatment and detection technologies.

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was observed in the number of wells with extraordinarily high metals levels (including arsenic above 100 ppb) in southwestern Wisconsin between Grant and La Crosse counties.

Costs and Risks of Arsenic Contamination

Standard water treatment systems do not effectively remove the more toxic forms of arsenic from drinking water. Treatments that are effective increase annual water utility costs for residents served by public water utilities, especially those in smaller systems that serve fewer than 10,000 people. The state estimates that treating water to remove arsenic costs each of these households \$38 to \$327 annually.

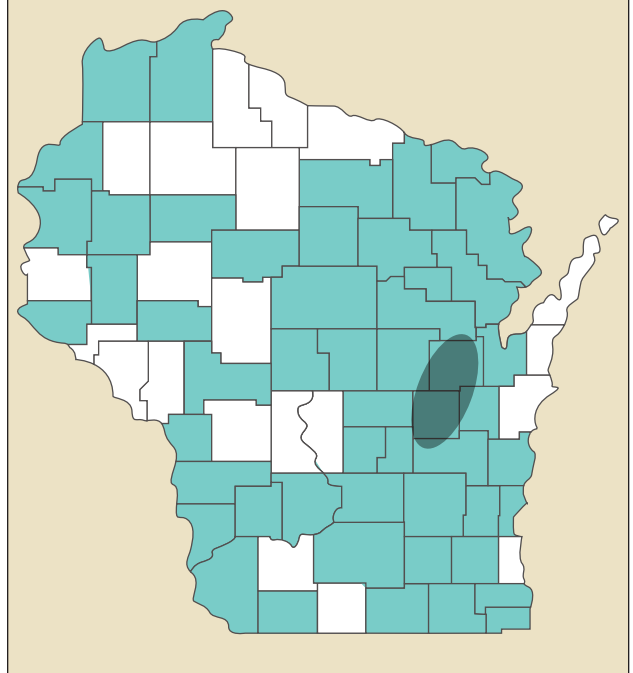
For private well owners wishing to reduce arsenic concentrations, point-of-use distillation and reverse osmosis

systems can be installed to reduce arsenic concentrations in water coming from individual faucets. The costs of these systems for homeowners range from \$500 to \$2,000. Private well owners may also install point-of-entry treatment for their homes or drill new wells that draw from aquifers with lower arsenic concentrations. However, these solutions can cost up to \$15,000 with no guarantees that new wells will remain arsenic-free over time.

The financial toll of treating for arsenic, however, must be balanced by the health risks to Wisconsin residents otherwise exposed to arsenic. These risks include higher incidences of cancers of the bladder, lungs, skin, kidneys, nasal passages, liver and prostate, as well as increased risks of cardiovascular diseases. Moreover, prenatal and childhood exposure to arsenic are of special concern, as they raise the risks of respiratory diseases in later life and have also been associated with lower IQ scores in school-aged children.

COUNTIES WITH WELLS EXCEEDING ARSENIC STANDARDS

In the past two decades, researchers have found wells in 52 of Wisconsin's 72 counties that have groundwater exceeding the federal safe drinking water standard for arsenic of 10 parts per billion. Arsenic is naturally occurring and widespread throughout the state. It is especially problematic in the Lower Fox River Valley (dark area on map) and southeastern Wisconsin.





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How the State is Responding

Given this significant threat, the state agencies that form the Wisconsin Groundwater Coordinating Council (GCC) have funded studies and monitor the origins and extent of arsenic contamination. The studies contribute to protecting public health and mitigating potential economic burdens of arsenic-contaminated water supplies. Some of the most significant GCC-supported projects include:

- Two Department of Natural Resources (DNR)-funded studies in 1992 and 1994 discovered new areas of arsenic contamination, which resulted in 72,000 households being informed of the need to reduce exposure to arsenic in their drinking water.
- A 2001 DNR-Department of Health Services (DHS) study confirmed the suspected health risks of elevated levels of arsenic in drinking water, including risks of skin cancer and cardiovascular disease.
- A 2002 DNR-Wisconsin Geological and Natural History Survey (WGNHS) study determined that a main cause of elevated arsenic levels in the Lower Fox River Valley is the drawdown of groundwater by pumping, which exposes arsenic-bearing minerals in the aquifer to oxygen that causes a chemical reaction, making the arsenic water-soluble.

The considerable expense of treating for arsenic must be balanced by the health risks to Wisconsin residents.

As a result of these studies, in 2004 the state established a special well casing depth area in portions of Outagamie and Winnebago counties. The regulations require certain well construction methods to minimize the likelihood of arsenic contamination of well water. The methods have proven effective and are now being applied successfully in other parts of Wisconsin.

In the meantime, additional GCC-sponsored research gave resource managers new tools to estimate arsenic levels when direct measurements are unavailable. These studies also helped alleviate concerns about well-water disinfection techniques that were suspected of increasing arsenic levels, and helped improve arsenic removal techniques for industrial and mining applications.

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Over the past two decades, the GCC has coordinated the use of approximately \$15.5 million in state funds, leveraged with additional local and federal monies.

What is the GCC ?

Established in 1984, Wisconsin's GCC is a multi-agency institution that has served as a model for other states. It is charged with advising and assisting state agencies on groundwater research and monitoring efforts.

The GCC consists of representatives from the departments of Agriculture, Trade and Consumer

Protection; Safety & Professional Services; Health Services; Natural Resources; and Transportation, as well as the University of Wisconsin System, Wisconsin Geological and Natural History Survey, and the Office of the Governor.

Over the past two decades, the GCC has coordinated the use of approximately \$15.5 million in state funds, leveraged with additional local and federal monies, to support more than 375 groundwater research and monitoring projects.

For More Information

Visit wri.wisc.edu.

For more information about arsenic, visit dnr.wi.gov/topic/groundwater/arsenic/.

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