

Title: Evaluation of NURE Hydrogeochemical Groundwater Data for use in Wisconsin Groundwater Studies

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Investigators: Michael G. Mudrey Jr., Associate Professor, WGNHS, UWEX
Kenneth R. Bradbury, Associate Professor, WGNHS, UWEX
Kathy Shrawder, WGNHS, UWEX

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Background/Need: Knowledge of the natural distribution of trace constituents (arsenic, lead, cadmium, etc.) in Wisconsin groundwater is currently poor, yet information on the "background" concentrations of such constituents is frequently needed for many different types of groundwater investigations. A large data set (the National Uranium Resources Evaluation—NURE data) exists, containing thousands of geochemical analyses for groundwater in Wisconsin, but these data were not in useable form prior to this project.

Objectives: Convert and evaluate the U.S. Department of Energy National Uranium Resources Evaluation hydrogeochemical data for Wisconsin into a PC-based dataset and incorporate that dataset into the U.S. Geological Survey WATSTORE database. Prepare statistical summaries of each constituent, plot maps showing the concentration distribution of various water quality parameters, determine the accuracy and adequacy of the data for incorporation into a Wisconsin groundwater database, and make appropriate recommendations thereto.

Methods: Seven magnetic data tapes were acquired from the U.S. Geological Survey or the Oak Ridge National Laboratory. A combination of U.S. Geological Survey and University of Wisconsin-Madison Computer Center equipment was used to convert the original data tapes to ASCII files. These files were loaded onto IBM-compatible microcomputers, and by a combination of software routines and database manipulations, converted into a microcomputer database. The files were cleaned where possible, and compared to the microfilm copy of the original dataset.

Results: Over 70 percent of the individual groundwater samples were below individual detection limits for about one-half of the 34 geochemical constituents reported by NURE. Some, such as arsenic, show a clearly defined hydrogeochemical anomaly along the Cambrian-Ordovician boundary in eastern Wisconsin. Other constituents, such as copper, do not show clearly defined regions, in part because of copper contamination from plumbing. In these cases, filtering the data to evaluate samples not having copper plumbing might define geochemical provinces. The extensive report briefly discusses each constituent.

Conclusions: Hydrogeochemical parameters within the NURE groundwater dataset have mixed utility because in many cases the detection limit was too large to show much variation. Elements that appear to have broad utility with the NURE detection limit include: arsenic, barium, boron, calcium, copper, lithium, magnesium, manganese, sodium, selenium, sulfate, strontium, uranium, yttrium, zinc. Constituents whose detection limit is clearly inadequate include: silver, aluminum, beryllium, cobalt, chromium, iron, molybdenum, niobium, nickel, phosphorus, scandium, thorium, titanium, vanadium, and zirconium. In some areas of Wisconsin evaluation of these constituents may prove useful as that region may have elevated concentrations well above detection limits.

Recommendations/Implications: At the time the NURE program was cancelled, the Wisconsin Geological and Natural History Survey had developed a field protocol to continue the 3-mile sample grid into southern Wisconsin. Consideration should be given to extending the regional geochemical sampling concept of the NURE program. The present survey covers about the northern one-half of Wisconsin; similar data are lacking for southern Wisconsin.

Hydrogeochemical analysis should continue in order to understand and explain the regional variation of the chemical parameters.

During interrogation of the NURE data tapes, the stream and sediment data were also converted; however evaluation and analyses was not undertaken. A report similar to this, but using the surface water and stream sediment data could be undertaken at minimal cost.

Final Report: A final report containing more detailed information on this project is available for loan from Wisconsin's Water Library, University of Wisconsin - Madison, 1975 Willow Drive, Madison, Wisconsin 53706 (608) 262-3069. A copy of the final report including 5 1/4-inch compute diskette of the data is WGNHS Open-file Report 93-2, and is available from the Map and Publications Sales Office, Wisconsin Geological and Natural History Survey, 3817 Mineral Point Road, Madison, WI 53705.

Related Publications: Mudrey, M.G., Jr., Bradbury, K.R., and Kammerer, P., 1992, Progress towards rapid retrieval of hydrogeochemical data from Wisconsin's NURE dataset (abs.): 16th Annual Meeting, American Water Resources Association (LaCrosse), Wisconsin Section, Abstracts, p. 26.

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