STATE OF MINNESOTA
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF WATERS

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COUNTY ATLAS SERIES
ATLAS C-9, PART B, PLATE 9 OF 9
Sensitivity of Ground-Water Systems to Pollution
Plate Supplement

SENSITIVITY TO POLLUTION OF NEAR-SURFACE GROUND-WATER SYSTEMS

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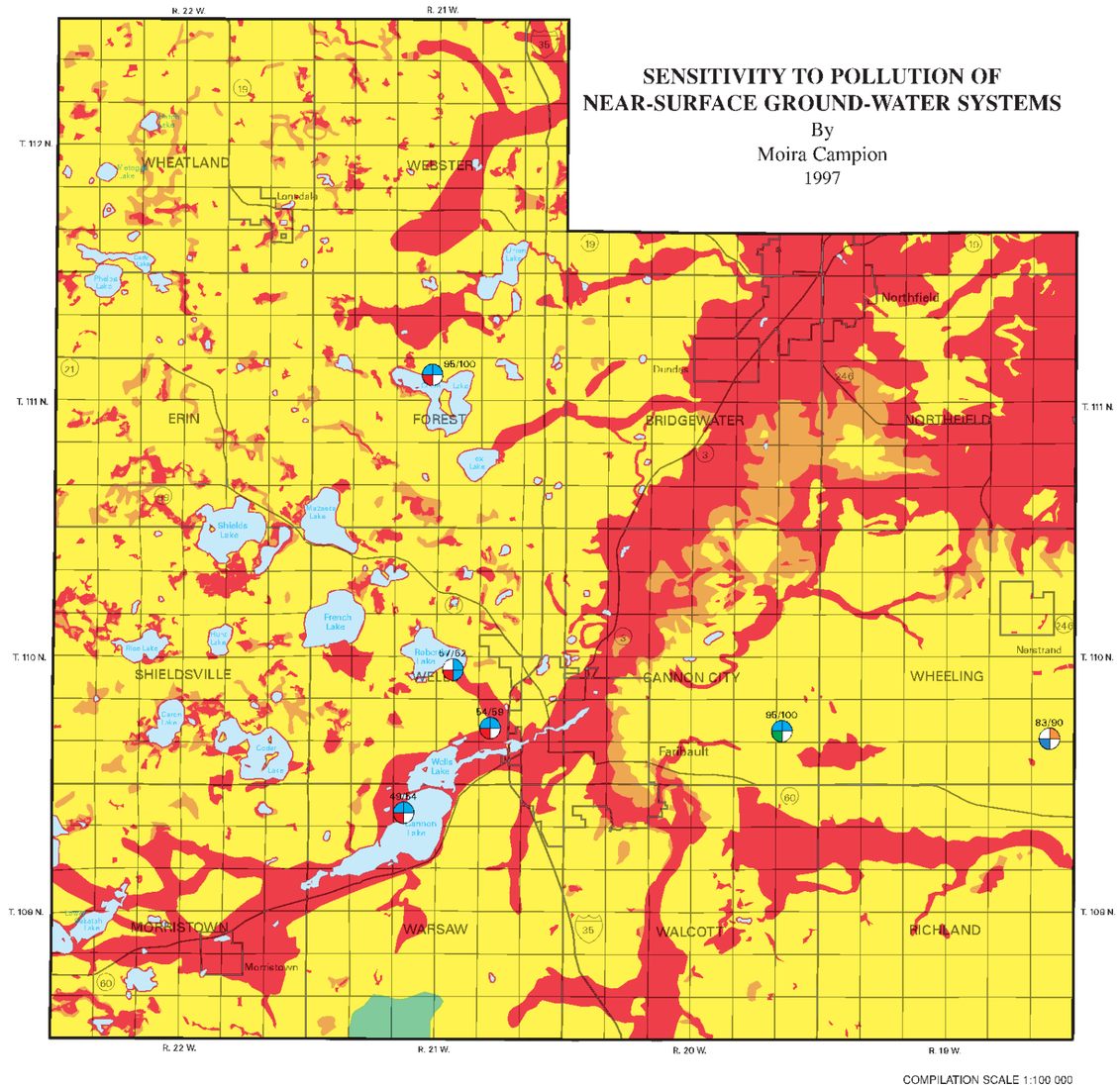
1997



COMPILATION SCALE 1:100 000

SCALE 1:200 000

2 0 2 4 6 8 MILES

2 0 2 4 6 8 KILOMETERS

EXPLANATION

Sensitivity Ratings

Estimated vertical travel time for water-borne surface contaminants to enter near-surface ground-water systems

Very High—The estimated travel time is hours to months. Includes areas where bedrock aquifers are at or near the surface, lakeshores and wetlands, and alluvium or outwash.

High—The estimated travel time is weeks to years. Includes areas near the eroded edge of the Decorah-Platteville-Glenwood confining unit and areas of organic deposits.

Moderate—The estimated travel time is years to decades. Includes areas of undifferentiated till.

Low—The estimated travel time is decades to a century or more. Includes areas of glacial lake deposits.

Description of Map Symbols

83/90 **Well measured for water level**
Depth in feet to bottom of well screen or open hole
Depth in feet to top of well screen or open hole

Well sampled for general chemistry

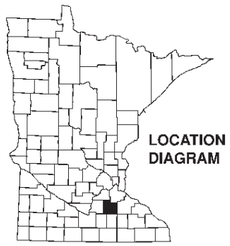
Well sampled for tritium—Color indicates age as shown below

Well sampled for ^{2}H or ^{18}O

Aquifers [1]	*Tritium age of water samples* [2]
Quaternary	Recent
Galena	Mixed
	Vintage

[1] *No color indicates no data*

[2] *See Figure 1, Plate 8, for definition*



SENSITIVITY INTERPRETATION AND TRITIUM RESULTS

This plate shows the sensitivity to pollution of the near-surface ground-water systems in Rice County, defined here as the ground-water systems within 30 to 50 feet below the water table. These systems occur in Quaternary deposits of till and sand and gravel, the Galena Group, and parts of the St. Peter Sandstone. Pollution sensitivity of bedrock aquifers is presented on Plate 9. Shown on the map are the locations of samples collected from six wells completed at depths of less than 100 feet.

Estimating the time for water to move from the land surface into and throughout the near-surface ground-water systems is complicated by many factors. Some of these factors are short and long-term fluctuations in precipitation and depth to the water table; potential for focused recharge in depressions, wetlands and along lakeshores in times of high precipitation; hydrologic complications from many, small, local ground-water systems; and complexity of flow in the unsaturated zone. Therefore, the interpretation of sensitivity to pollution of near-surface ground water was based primarily on what is known about the rocks, soils and sediments at or near the surface and the potential interaction between surface water and shallow ground water.

The sensitivity interpretation of the near-surface ground-water systems assumes that areas are relatively more sensitive if there is coarse material at the surface and/or if a surface water body is present, and are relatively less sensitive if the surficial material is fine-grained. The factors considered and the corresponding ratings are listed below.

Bedrock aquifer at or near surface (Very High)—Precipitation and surface water infiltrate from the land surface directly into a bedrock aquifer through pore spaces between sediment grains and in fractures.

Alluvium or outwash at or near the land surface (Very High)—Coarse, unconsolidated sands and gravels deposited by streams create potential for quick entry of water into an aquifer. The water table in these materials fluctuates both seasonally and from year to year. Streams usually act as discharge areas for the near-surface ground-water systems, but might recharge those systems under drier climatic conditions.

Lakeshores and wetlands (Very High)—These areas have potential for focused recharge from surface waters to underlying aquifers. Recharge is also likely to be cyclical, varying with the seasons as well as with longer-term climatic cycles.

Eroded edge of the Decorah-Platteville-Glenwood confining unit (High)—The edge of this important confining unit has been reported to have high potential for large volumes of recharge to underlying aquifers. The position of this hydrologic boundary is somewhat uncertain.

Areas with organic deposits (High)—Typically associated with wetlands, organic deposits indicate that the water table occurs commonly at or near the land surface, providing a potential source of infiltration to the subsurface.

Till (undifferentiated) (Moderate)—Till is the most hydrologically complicated confining material in the study area. The heterogeneous texture typical of many tills is responsible for the variable and unpredictable hydrologic characteristics observed in these sediments. Also, till may be weathered, oxidized, and jointed, resulting in greater porosity and permeability than would be predicted by its textural composition. Till is further discussed in the recharge conditions section on Plate 9.

Glacial lake sediment over till (Low)—This sediment is a clayey silt, probably less than 20 feet thick. This sediment typically has very low hydraulic conductivity and in the shallow subsurface can be a significant confining unit.

Of the six ground-water samples from wells less than 100 feet deep, five have detectable tritium and are from Quaternary wells. The sample with vintage water is from a well completed in the Galena aquifer. The four samples collected from wells near lakes contain higher tritium concentrations than the sample from a Quaternary well in eastern Rice County. This may reflect the slower recharge through the pre-Wisconsinan till in eastern Rice County relative to recharge through the lakes and hummocky, supraglacial deposits of western Rice County. It may be noted that the Galena aquifer well is shallower than the above-mentioned Quaternary well in eastern Rice County, yet it has no detectable tritium. The tritium results of these two samples in eastern Rice County, obtained from near-surface aquifers that are covered only by pre-Wisconsinan till, provide some indication that this till may have better characteristics for protecting underlying aquifers than the more recent till in western Rice County.

WARNING: This map provides an overview of ground-water contamination potential as interpreted from 1:100,000-scale geologic map information. THIS MAP SHOULD NOT BE THE BASIS FOR EVALUATION OF SPECIFIC SITES.

Minnesota
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GEOLOGIC ATLAS OF RICE COUNTY, MINNESOTA