1996

Regional Hydrogeologic Summaries from Domestic Well-water Quality in Rural Nebraska -- Southeastern Glacial Drift Area

D. C. Gosselin
University of Nebraska - Lincoln

Southeastern Glacial Drift Area Hydrogeologic Summary from *Domestic Well-water Quality in Rural Nebraska*

(A data-analysis report for the Nebraska Department of Health compiled by D. C. Gosselin and others, 1996)

Groundwater Region 11

Groundwater Region 11 occupies the glacial drift area of southeastern Nebraska (fig. 1). The base of the principal groundwater-bearing units in the northern and western parts of the region is the Dakota Group. The Dakota Group consists of variable amounts of interbedded sandstone and shale. In the extreme western part of the region, Cretaceous shales and limestone of the Greenhorn-Graneros and Carlile formations form the base of the principal groundwater-bearing units. In the southeastern part of the region, the base of the primary groundwater system is the relatively impermeable Pennsylvanian and Permian limestone and shale. Overlying these bedrock units are Pleistocene deposits consisting of the debris from glacial ice sheets, streams, and wind deposition. Erosion created numerous ancient valleys (paleovalleys) that were usually filled with relatively coarse Pleistocene sand and gravel. In areas where valleys did not exist, they were filled with fine-grained materials, primarily glacial tills over which wind-blown silts or loess was deposited. (Geologic cross sections are available by request from the Conservation and Survey Division.*)

The primary units from which groundwater is obtained are sand and gravel deposits associated with paleovalleys and along some modern stream valleys; these are usually of limited extent (table 1). Nearly all major water supplies in this region come from the paleovalleys. The Dakota Group serves as a secondary source of groundwater where the primary Pleistocene sources are insufficient to meet water-supply needs. Because of its geologic variability, the Dakota Group's capacity to yield groundwater can differ over short distances; consequently, well yields can be difficult to predict. The thickness of the saturated groundwater-bearing units is generally less than 300 feet. Depth to the regional water table varies as a function of topographic location. In upland areas, depth to water may be greater than 200 feet, while it may be less than 50 feet in the bottomlands of the principal valleys. Depending on groundwater-bearing unit and its location, total dissolved solids may differ from 200 to more than 1,000 milligrams per liter (mg/L). In some areas, the Dakota Group may have total dissolved solids exceeding 5,000 mg/L. In many locations where these units are not available, perched groundwater is used. Perched water conditions occur in areas underlain by glacial till. Water from precipitation or applied from irrigation moves readily through the loess and/or isolated lenses of sand and gravel, but not through glacial till. As a result, water saturates the sediments above the till and a perched water table forms. Many domestic farm and stock wells have been developed in these perched water bodies. Because of the variability in water quality and in the limited distribution of groundwater-bearing units, rural water districts are common.

***Cross sections for this or other regions of the state (fig. 1—*Locations of geologic cross sections*) are available from the Conservation and Survey Division for a small fee. The report *Domestic Well-water quality in Rural Nebraska* is available from the Nebraska Department of Health and Human Services.** Photocopies are available at CSD; write: Map and Publications Sales/Conservation and Survey Division/113 Nebraska Hall/University of Nebraska-Lincoln/68588-0517; or call: (402) 472-7523.

Conservation and Survey Division
Institute of Agriculture and Natural Resources **University of Nebraska-Lincoln**
GIM-99

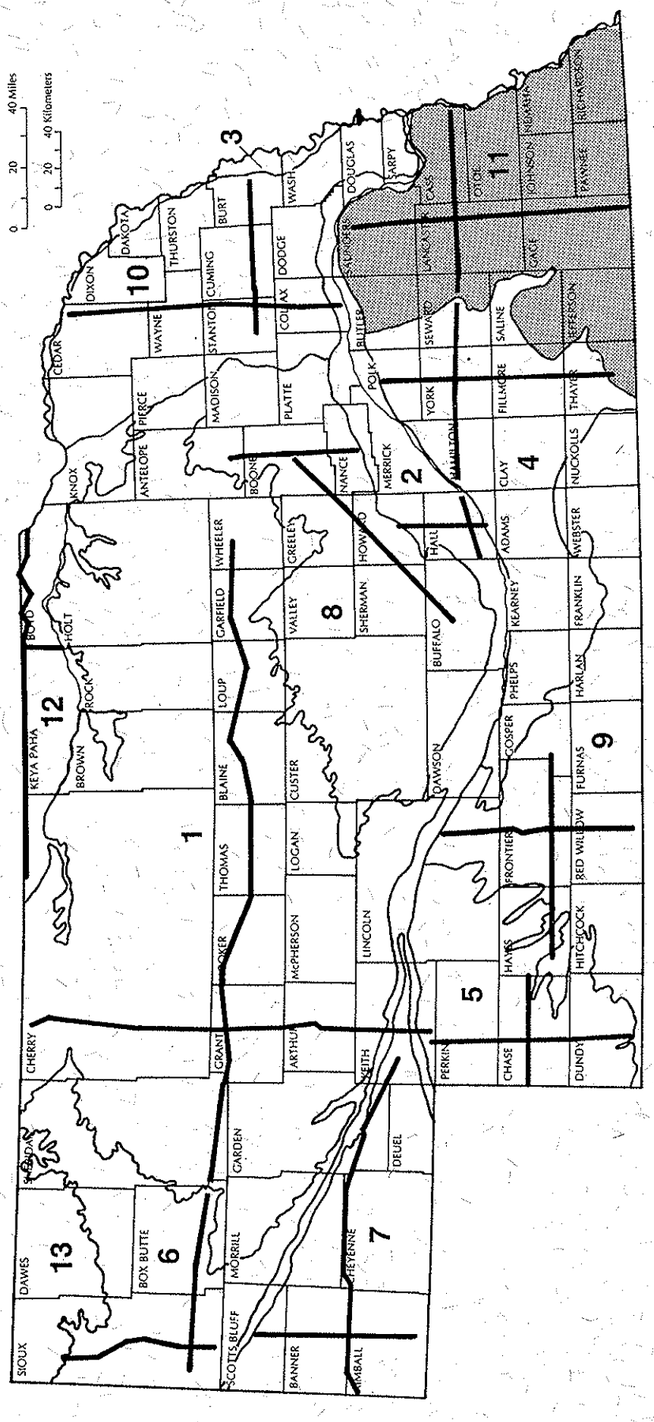


Fig. 1—*Locations of geologic cross sections* (Region 11 in gray)

Water-bearing Properties of Major Rock Units in Nebraska

From *The Groundwater Atlas of Nebraska* — Conservation and Survey Division, University of Nebraska-Lincoln

Era	Period	Epoch	Millions of years	Group or Formation	Lithology	Water-bearing Properties
Cenozoic	Quaternary	Holocene	0.01		Sand, silt, gravel and clay	Principal groundwater reservoir; Ogallala is absent in east and northwest. Arikaree is present primarily in west.
		Pleistocene	~2.0			
		Pliocene	5		Sand, gravel and silt	
		Miocene	24	Ogallala	Sand, sandstone, siltstone and some gravel	
		Oligocene		Arikaree	Sandstone and siltstone	
				White River	Siltstone, sandstone and clay in lower part	Secondary aquifer in west; water may be highly mineralized.
		Eocene	37	Rocks of this age are not identified in Nebraska.		
		Paleocene	58			
Mesozoic	Cretaceous	Late Cretaceous	67	Lance	Sandstone and siltstone	Generally not an aquifer; yields water to few wells in west.
				Fox Hills		
				Pierre	Shale and some sandstone in west	Generally not an aquifer; sandstones in west yield highly mineralized water to few industrial wells.
				Niobrara	Shaly chalk and limestone	Secondary aquifer where fractured and at shallow depths, primarily in east.
				Carlile	Shale; in some areas contains sandstones in upper part	Generally not an aquifer; sandstones yield water to few wells in northeast.
				Greenhorn-Graneros	Limestone and shale	Generally not an aquifer, yields water to few wells in east.
		Early Cretaceous	98	Dakota	Sandstone and shale	Secondary aquifer, primarily in east; water may be highly mineralized.
	Jurassic		144		Siltstone and some sandstone	Not an aquifer
	Triassic		208		Siltstone	Not an aquifer
Paleozoic	Permian		245		Limestone, dolomites, shales and sandstone.	Some sandstone, limestone and dolomites are secondary aquifers in east. Water may be highly mineralized.
	Pennsylvanian		286			
	Mississippian		320			
	Devonian		360			
	Silurian		408			
	Ordovician		438			
	Cambrian		505			
	Precambrian		570			

Table 1—Hydrostratigraphic chart (showing water-bearing rock units) of Nebraska
Time divisions are not to scale.

Sources of Information

Burchett, R.R., and E.C. Reed, 1967, Centennial Guidebook to the Geology of Southeastern Nebraska: University of Nebraska, Conservation and Survey Division, 83 p.

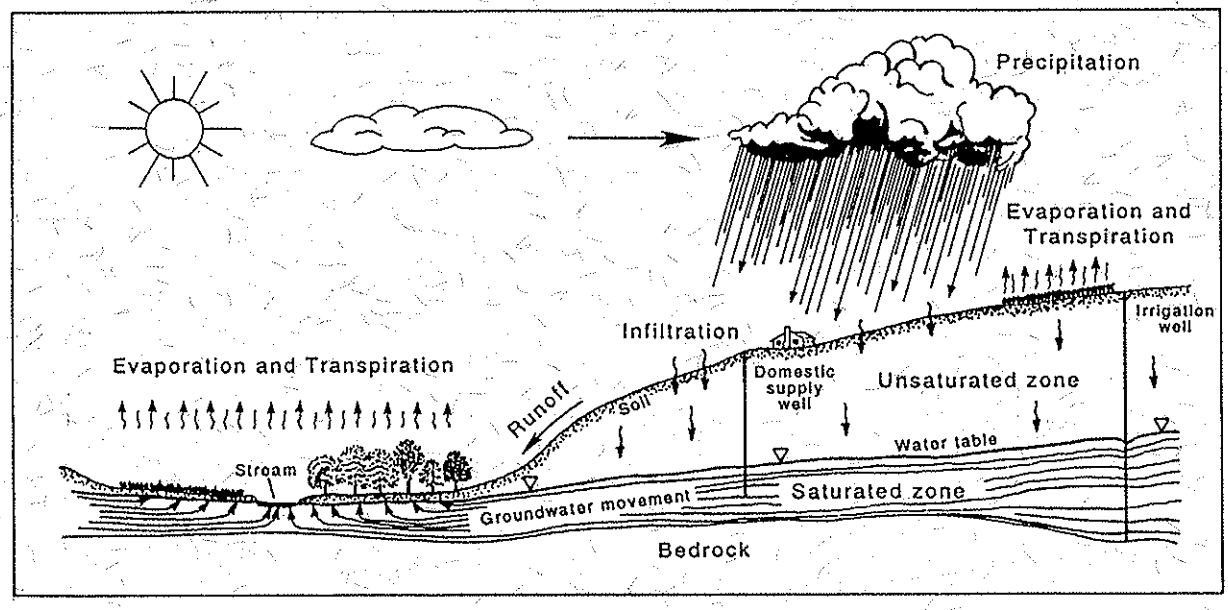
Dreeszen, V.H., and E.C. Reed, 1956, Preliminary Groundwater Study - Gage County, Nebraska: University of Nebraska - Lincoln, Conservation and Survey Division, 5 figures.

Exner, M.E., and R.F. Spalding, 1985, Ground-Water Contamination and Well Construction in Southeast Nebraska: Groundwater, Vol. 23, pp. 26-34.

Keech, C.F., 1978, Water Resources of Seward County, Nebraska: University of Nebraska - Lincoln, Conservation and Survey Division, Nebraska Water Survey Paper 46, 88 p.

Soil Conservation Service, 1985, Soil Survey of Nemaha County, Nebraska, U.S. Department of Agriculture, 176 p.

Souders, V.L., 1967, Availability of Water in Eastern Saunders County, Nebraska: U.S. Geological Survey, Hydrologic Investigations Atlas HA-266.



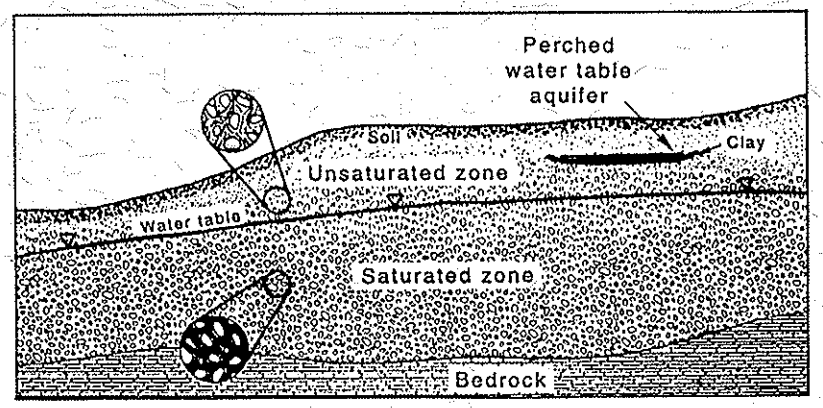


Fig. 2—*Groundwater cycle and idealized cross section*