1996

Regional Hydrogeologic Summaries from Domestic Well-water Quality in Rural Nebraska -- Northern Panhandle Tablelands

D. C. Gosselin
University of Nebraska - Lincoln

J. Headrick

X-H. Chen

S. E. Summerside

Northern Panhandle Tablelands 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 6

Groundwater Region 6 is located north of the North Platte River and south of the Pine Ridge in the Nebraska Panhandle (fig. 1). The base of the principal groundwater-bearing units is usually considered the Brule Formation, composed of relatively impermeable siltstone. Coarser grained units of the Brule Formation are present locally and can produce significant amounts of water. Overlying the Brule Formation is the Arikaree Group, which consists of interlayered fine-grained sandstone and siltstone. It is as much as 600 feet thick and contains local occurrences of uncemented sand and gravel. Overlying the Arikaree is the Ogallala Group, which is up to 500 feet thick and consists of interbedded clays, silts, sands, sandstones, and gravel, with various degrees of cementation. The Ogallala generally occurs as channel deposits trending west to east. Overlying the Ogallala Group are river-deposited (alluvial) sands and gravel, generally less than 100 feet thick. These materials primarily underlie the valleys of major drainages such as the Niobrara River. (Geologic cross sections are available by request from the Conservation and Survey Division.*)

The Arikaree Group is heavily developed as source of groundwater for irrigation in Box Butte County and, to a lesser degree, in northern Sheridan County (table 1). The Ogallala Group is also an important source of groundwater in Box Butte County and Sheridan counties. Alluvium is developed as source of water primarily along the Niobrara River. The thickness of the primary groundwater-bearing units ranges from about 100 feet or less to about 500 feet or more. Depth to the regional water table is mostly a function of topographic location. In upland areas, depth to water may be greater than 200 feet, whereas it may be less than 50 feet in the bottomlands of the principal valleys. Total dissolved solids in the groundwater vary from 200 to 500 milligrams per liter.

***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.

Sources of Information

Swinehart, J.B., V.L. Souders, H.M. DeGraw, and R.F. Diffendal, Jr., 1985, Cenozoic Paleogeography of Western Nebraska, in Flores, R.M. and S.S. Kaplan, eds., Cenozoic Paleogeography of West-Central United States, Denver, Colorado, pp. 209-229.

Conservation and Survey Division
Institute of Agriculture and Natural Resources **University of Nebraska-Lincoln**
GIM-94

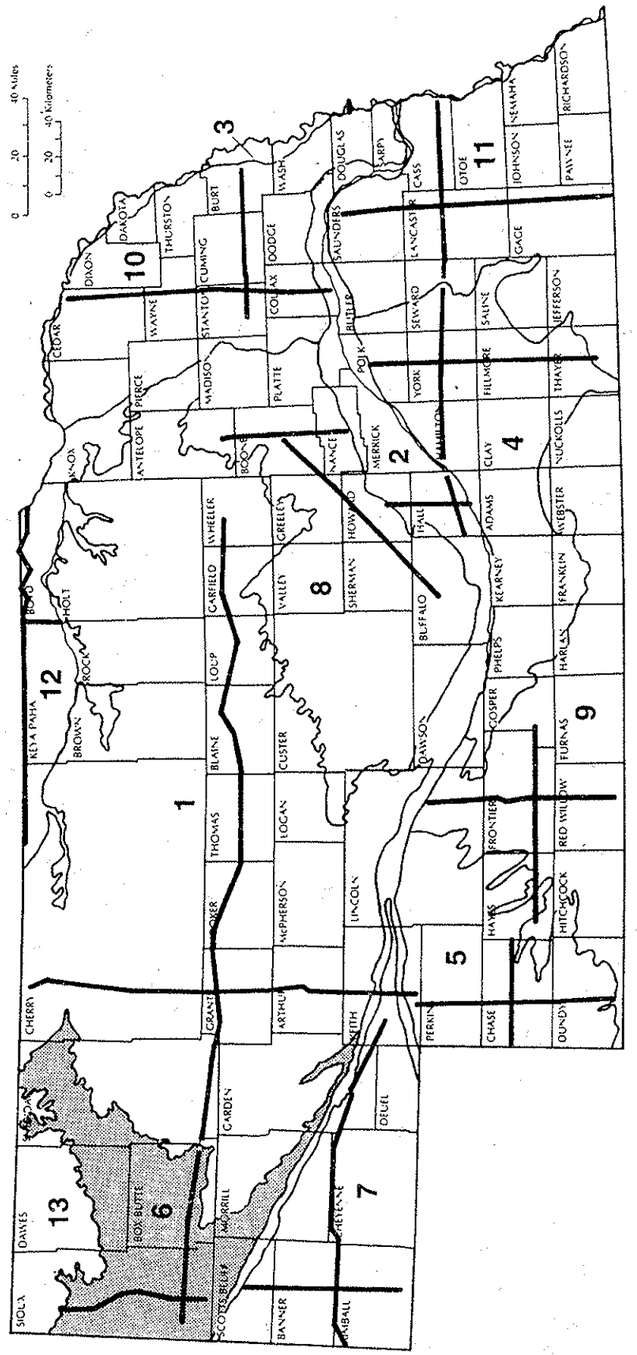


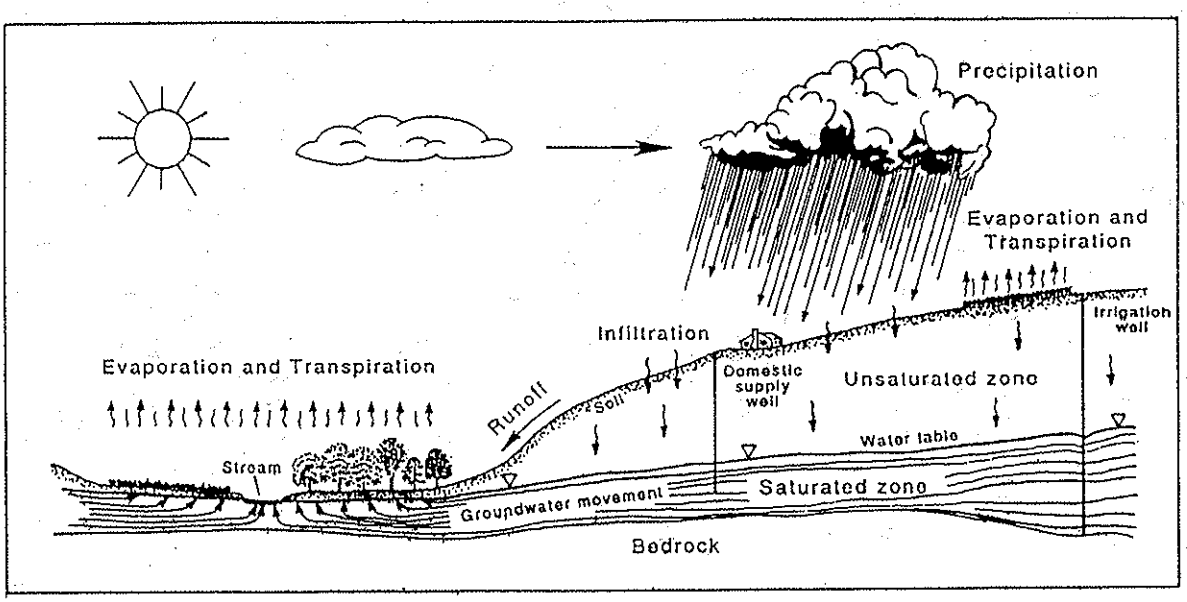
Fig. 1—*Locations of geologic cross sections* (Region 6 in gray)

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	
				Arikaree	Sandstone and siltstone	
		Oligocene	37	White River	Siltstone, sandstone and clay in lower part	Secondary aquifer in west; water may be highly mineralized.
		Eocene	58	Rocks of this age are not identified in Nebraska.		
		Paleocene	67			
Mesozoic	Cretaceous	Late Cretaceous		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.



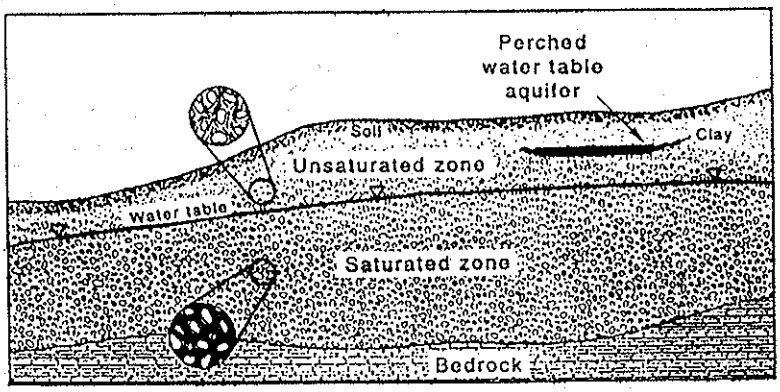


Fig. 2—*Groundwater cycle and idealized cross section*