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# North Central 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 12

Groundwater Region 12 occupies the North Central Tableland, which includes Boyd and Keya Paha counties, as well as parts of Knox, Brown, Rock, Holt, and Cherry counties (fig. 1). Throughout most of the region, the Cretaceous Pierre shale is the base of the primary groundwater-bearing units. As a result of the long periods of erosion that have occurred since the Cretaceous, there is considerable relief on the surface of the Pierre shale and overlying isolated units of Cenozoic age that are difficult to correlate. The Tertiary White River Group is the oldest Cenozoic deposit in the western part of the region. It consists of mudstones, siltstones, and volcanic ash beds. The Arikaree Group, composed mainly of siltstone, overlies the White River Group. Overlying the Arikaree Group in the western part of the region is the Tertiary Ogallala Group, which is composed of interbedded sandstone, siltstone, silt, and sand, which is often cemented by lime (calcium carbonate). The Ogallala Group differs in thickness and composition across the region. In general, it is thicker and sandier to the west. In the central part, only isolated units of this group remain. In the eastern part, all Tertiary deposits have been eroded, leaving the Pierre shale either exposed or mantled by Quaternary deposits. The dominant Quaternary deposits are stream-deposited (alluvial) clay, silt, sand, and gravel. Quaternary wind-blown silt (loess) and fine sand are also present in the western part of the region. (Geologic cross sections are available by request from the Conservation and Survey Division.\*)

Availability of groundwater in region 12 is highly variable and depends mainly on the thickness of the Ogallala Group (fig. 2; table 1). This group is the main source of groundwater in the western part of the region. In some areas, the Ogallala Group contains coarse sediments of substantial thickness that yield substantial groundwater to large-volume public water-supply wells. In the eastern part of the region, where Tertiary deposits have been removed, the main source of groundwater is alluvial Quaternary deposits. These deposits are sporadic in their distribution and in places support only low-yielding wells. In the eastern upland areas, where younger deposits have been eroded off the Pierre, groundwater can be developed only from deposits of Cretaceous age. The shallowest Cretaceous unit that has yielded groundwater is the Codell Sandstone Member of the Carlile Shale. This unit is referred to by local drillers as "the soft-water sandstone." Low-yielding domestic and stock wells have been developed in this unit. Where the Codell Member is not capable of producing sufficient water, it contains excessive amounts of silt or shale. In some places, wells must be drilled hundreds of feet deeper into the Dakota Group. The thickness of the saturated groundwater-bearing units is generally less than 300 feet. Depth to the regional water table differs as 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 below bottomlands in the principal valleys. Because groundwater is derived from different geologic units, it has 200 to 500 milligrams per liter  
(Continued on page 4.)

\*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.

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<b>Water-bearing Properties of Major Rock Units in Nebraska</b>									
Era	From <i>The Groundwater Atlas of Nebraska</i>			Conservation and Survey Division, University of Nebraska-Lincoln					
	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							
		Pliocene	~2.0	Ogallala	Sand, gravel and silt				
		Miocene	5						
		Oligocene	24				Arikaree	Sandstone and siltstone	
			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.

(mg/L) of total dissolved solids in the west and total dissolved solids exceeding 1,000 mg/L in the east. Although the Dakota Group has a generally abundant supply of water, it is highly mineralized calcium-sulfate water.

### Sources of Information

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- Spalding, R.F., 1991, Assessment of Statewide Groundwater Quality Data from Domestic Wells in Rural Nebraska: Contract Report between University of Nebraska-Lincoln Water Center and Nebraska Health Department, 49 p.

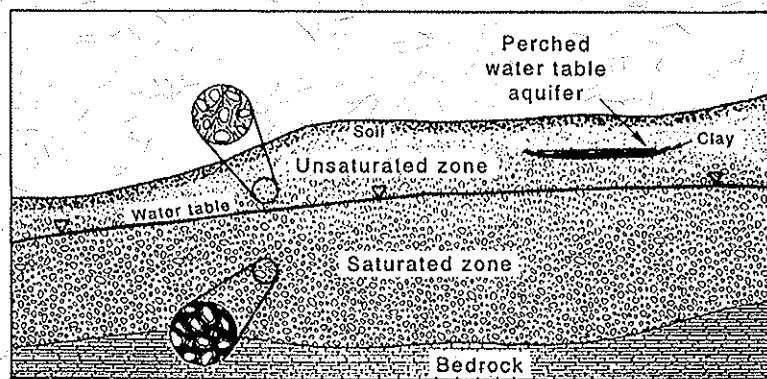
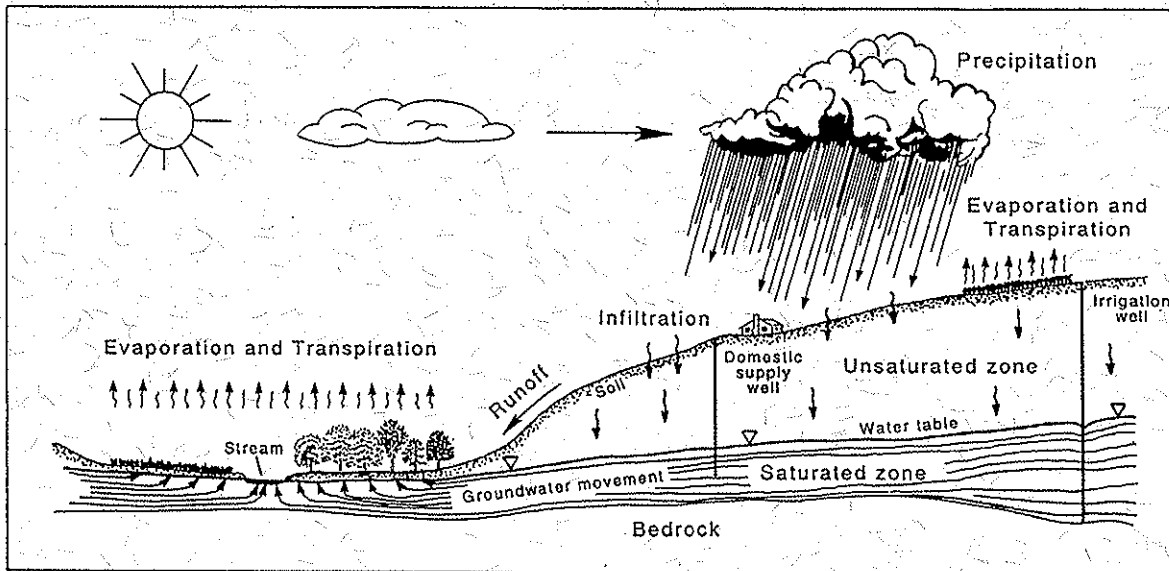


Fig. 2—Groundwater cycle and idealized cross section