SOUTH PLAINS
GROUNDWATER NEWS

AUGUST 2003 VOLUME 10, NUMBER 4

UNDERSTANDING THE OGALLALA

PART 1--HOW THE OGALLALA WAS FORMED

Note: This is the first in a series of articles the District will publish on "Understanding the Ogallala." Future articles will address other features of the Ogallala, including recharge, and groundwater movement.

Understanding how and when the Ogallala was formed involves researching the geology of the formation. Of the numerous geological publications and scientific studies available, there are finer areas of discrimination involving specific time sequences and events which are met with varying degrees of opposition. The information presented in this article contains the most widely accepted evidence of the events which contributed to the development of the Ogallala formation. Also, although more generalized references are included, the emphasis here involves the formation of the southern portion of the Ogallala which includes the South Plains UWCD.

This article contains information which includes an overview of what comprises the Ogallala and how it was named, the events which occurred during its development, and how the southern portion has been altered.

The Ogallala was named after the U.S. Post Office at Ogallala, Nebraska. The man credited with naming the formation is the geologist N. H. Darton. Ogallala, Nebraska was named for the Oglala band of the Dakota Sioux Indians.

The Ogallala is a vast formation that extends across much of the Great Plains. It spans parts of eight states including Texas, New Mexico, Oklahoma, Colorado, Kansas, Nebraska, Wyoming, and South Dakota. The Ogallala formation consists primarily of fragmented preexisting rocks transported and deposited by ancient rivers or streams. These weathered rock fragments form boulders, gravels, sands, silts and clays of varying mixtures which rest uncomfortably on strata of other time periods. The sands are generally tan, yellow, or reddish brown and medium to coarse-grained. At times the sands are interbedded with thin layers of clay, and occasionally sandstone. Coarse-grained erosional constituents of the formation, ranging in size from coarse sand to boulders, are commonly found in the lower zones of the formation. These deposits are generally associated with ancient stream channels and their energy-producing capability to transport these coarse-grained materials. Upper areas of the formation are commonly covered by younger wind-blown (eolian) deposits of reworked formational materials. These eolian deposits are additionally presumed to be located in lower zones of the formation as evidence of multiple cycles of deposition and erosion. Often characteristic of the Ogallala formation are layers of caliche near the surface. Caliche is formed by the leaching of carbonate and silica from surface soils and the redeposition of the dissolved minerals in lower layers.

The events that occurred during the development of the Ogallala vary in time, sequence and may differ significantly from one place to another. As a result, the geo-

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Ogallala Formation

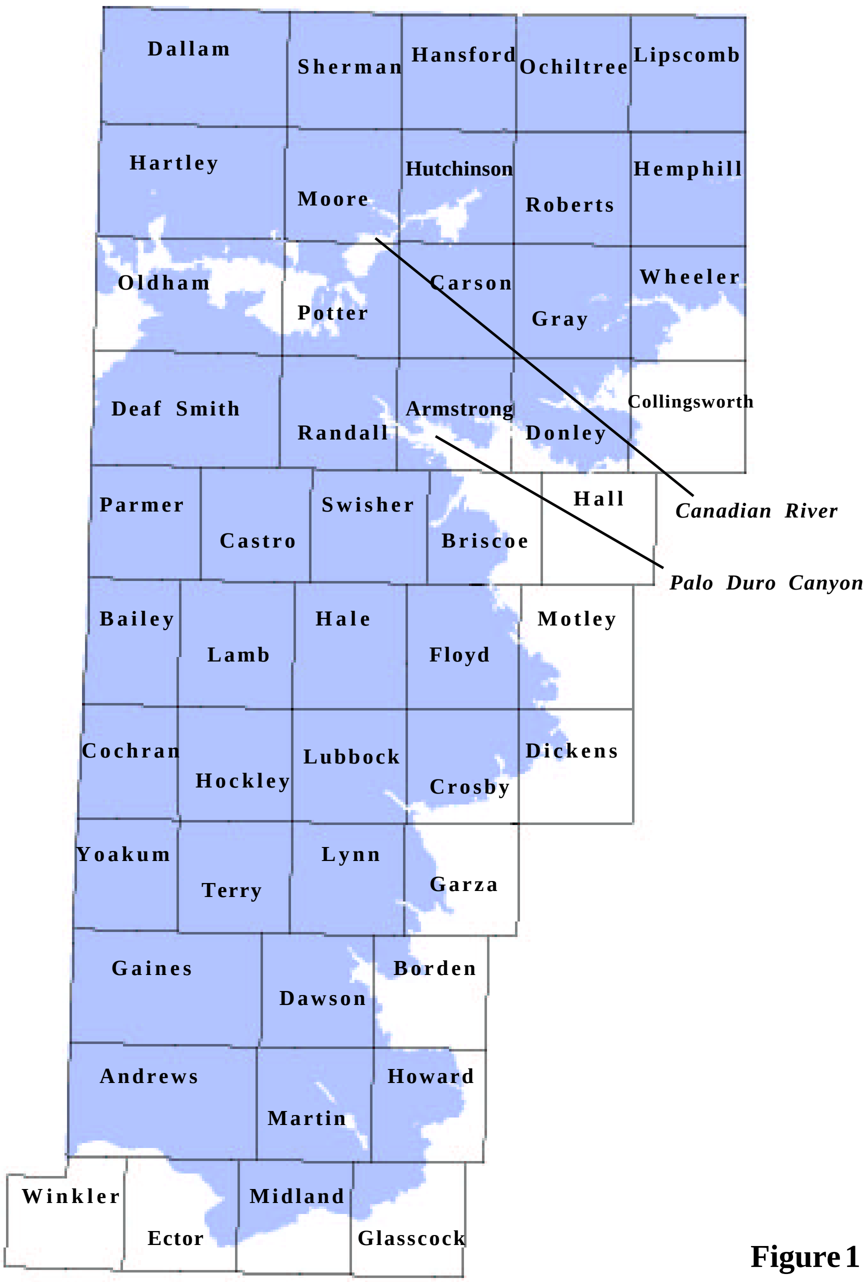

Figure 1

Ogallala...continued from page 1

logic properties and characteristics at one location may not represent the formation's properties and characteristics at another location. In fact, two such locations may be located only a short distance apart. Thus, the heterogenous makeup of the Ogallala often complicates the study of it.

Approximately 40 million years ago, an uplift of the Rocky Mountains contributed to the retreat of Cretaceous period seas covering much of the pre-Ogallala surface. The retreat of these seas left in place an erosional land surface comprised mostly of shales and clays and other materials with low permeability that provided a base on which the Ogallala formation was deposited. In areas where the previously deposited Cretaceous materials were eroded away or never existed prior to deposition of the Ogallala, Triassic deposits provide the base on which the Ogallala rests. On the Southern High Plains, an area extending from northern Lamb County to northern Gaines County still contains Cretaceous period rocks that underlie the Ogallala. This area, which includes the South Plains UWCD, generally contains a thinner Ogallala section as a result.

Afterward, beginning about 10 million years ago, the development of the Ogallala took place. Ogallala rocks originated by deposition of erosional debris from Rocky Mountain highlands. Erosional, and sometimes high-energy streams, surged eastward where they deposited Ogallala rocks. During this time, as the various streams continued their meandering, deposition of the Ogallala formation occurred. This aggradational process deposited the various gravels, sands, silts and clays that comprise the thickness of the Ogallala section. Depending on the topography of the pre-Ogallala surface, as well as the amount of aggradational fill, the surviving thickness of the Ogallala section varies from a few feet to a few hundreds of feet in this area. Overall, the deposition of the Ogallala exhibits multiple cut and fill cycles that occurred over its approximate 6 million year development.

Although the term varies with use, the Southern Ogallala described here refers to the portion south of the present-day Canadian River. The Southern Ogallala is, in fact, here defined by the dissection of the formation due to the erosional Canadian and Pecos River valleys. Additionally, the headwaters of the Red River, found along Palo Duro Canyon, have eroded the Ogallala formation on the east. Further south, the Ogallala was

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District Management Plan Renewal

A groundwater district's management plan provides the framework and goals necessary for successful operation. Within the plan, the locally elected Board identifies goals tailored for conditions specific to each district. According to Chapter 36, Texas Water Code, a district's management plan must include the following:

1. estimate of the existing total usable amount of groundwater in the district,
2. estimate of the amount of groundwater being used within the district annually,
3. estimate of annual recharge, if any, and how it may be increased,
4. estimate of the projected water supply and demand within the district.

The District's current management plan, adopted September 1998, must be renewed every 5 years. As a result, the District is currently updating the information and estimates listed above. As more information is gathered, the estimates of each item become more accurate. Our meter cooperators, for instance, have provided vital information allowing us to develop more accurate usage estimates.

Additionally, Chapter 36, TWC, requires that a management plan address the following goals, as applicable:

1. providing the most efficient use of groundwater,
2. controlling and preventing waste of groundwater,
3. controlling and preventing subsidence,
4. addressing conjunctive surface water management issues,
5. addressing natural resource issues,
6. addressing drought conditions,
7. addressing conservation.

The goals and performance standards adopted by the district's board must address these seven areas, as applicable. Three of these goals have previously been determined not applicable to the district:

1. controlling and preventing subsidence,
2. addressing conjunctive surface water management issues,
3. addressing natural resource issues.

Also, since 1998, goals (6) and (7) have been added requirements. Consequently, during this renewal, the district's management plan must also address drought conditions and conservation. The Board will develop goals and performance standards to meet these additional objectives.

Once the required changes are made, the district must submit the plan to the regional water planning group, surrounding groundwater districts, and hold a public hearing within the district. During the public hearing, the board will hear feed back from district residents. Afterward, the plan must be submitted to the Texas Water Development Board for their certification.

The process will conclude during the coming months as district staff compile the required information. If you have any questions, please contact the District office.

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also eroded where it once overlapped the Edwards Plateau.

Figure 1 (page 2) shows the extent of the Ogallala formation in Texas. As noted earlier, the dissections formed by the Canadian River and Palo Duro Canyon are quite pronounced. Also, the boundary of the formation on the southern tip is quite irregular as it approaches the Edwards Plateau in Winkler, Ector, Glasscock, Midland and Howard counties in Texas. Perhaps the most pronounced feature of the Southern Ogallala occurs along the eastern boundary. The Caprock Escarpment abruptly terminates the Ogallala section and defines its eastern limit. When traveling down the escarpment, the Caprock caliche is often visible and then gives way to the Dockum group, which is exposed at the surface. So, the southern portion of the Ogallala is essentially an "island," having been "cut off" on all sides.

In summary, the Ogallala is a vast section named after the locale of Ogallala, Nebraska. The formation was laid down as pre-Ogallala valleys were filled by erosional debris from Rocky Mountain highlands. This debris was transported by meandering streams that were interwoven across the area. Some areas of the Ogallala are underlain by Cretaceous period rocks making the Ogallala section thinner. This area includes the South Plains UWCD. The southern Ogallala, by erosion, is a plateau that is cut off on all sides from other source water.

References:
1. *Evaluating the Groundwater Resources of the High Plains of Texas*, Vol. I, Report 288, Texas Department of Water Resources
2. *The Ogallala Aquifer (of the Southern High Plains)*, Vol. I, C.C. Reeves, Jr., PhD, Judy A. Reeves, PhD

Conserving Irrigation Water

As the 2003 irrigation season nears an end, we are again plagued by a dry spell. This dry spell, similar to previous years, has occurred during July and August when we needed rain the most. The use of irrigation water has been reduced by declining water levels.

How much, though, of the irrigation water pumped has actually been applied to the crops? Some irrigation water has been pumped from the ground, but never reaches the crop because it is wasted. Even the most efficient irrigation systems can not deliver 100% of the water to a crop. Some of the water is lost to evaporation before a crop can use it beneficially. However, the District urges every irrigator to examine the possible instances of waste which are preventable:

- If you are using LDN pads, make sure they are turned to the "irrigate" side, and not the "chemigate" side for maximum efficiency. The fine mist created by a chemigate pad may result in 15-20% of the water being lost before it reaches the crop. If you are trying to apply 15 inches during an entire season, you may potentially lose up to 3 inches.
- Do you have a large sprinkler or end gun on a pivot? If so, make sure it is actually watering the crop, not the turn row or the road. Allowing irrigation water to escape your property constitutes a waste violation.
- Be sure to fix leaks around wells and on pivots. Think that leak isn't bad? **One 5 gpm leak throughout the typical irrigation season easily wastes enough water to put out .5 inches on 30 acres.**

We do know that our water supply is declining, but we must also make sure that what water is available is put to good use.

Don't waste water!

Calendar of Events

Sept. 1	*Labor Day Holiday* *Office Closed*
Sept. 9	*Board Meeting* *1:30 pm* *District office*
Oct. 7	*Board Meeting* *1:30 pm* *District office*
Nov.4	*Board Meeting* *1:30 pm* *District office*

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