Chapter 26

Gravel Transported 500 Miles on the Southern High Plains

Not only has gravel been spread over the northern High Plains of the United States, but it also has been transported long distances over the southern and central High Plains.\(^1\) This gravel is called the Ogallala gravel and is significantly different from the characteristics of the gravel found farther north.

**Ogallala Gravel on Central and Southern High Plains**

An extensive deposit of mostly sandstone and interbedded gravel and conglomerate was deposited east of the central and southern Rockies across the High Plains of the United States.\(^2\),\(^3\),\(^4\),\(^5\) These sediments, some of which have cemented to sedimentary rocks, are called the Ogallala Group (formerly the Ogallala Formation) because the rocks are now subdivided into two or more formations (the definition of a group). A number of anomalously thick, large-grained volcanic ash beds are also found in the Ogallala Group.\(^6\) A few of these ash beds contain large vertebrate fossils.

---


The Ogallala Group is complex containing many rapid changes of sediment type. The Ogallala Group sediments first filled east-west paleovalleys that were up to 330 feet (100 m) deep, and then deposition covered the area like a blanket. Later the deposit was dissected by generally eastward-trending channels (Figure 26.1).\(^7\) The thickness of the Ogallala Group ranges from about 800 feet (240 m) to less than 3 feet (1 m).\(^2,4,5\) It is thickest in buried valleys.

**Huge Extent**

The sand and gravel extends from southern South Dakota into Texas (Figure 26.2). It originally was more extensive. A large part of it was removed by erosion, especially near the Rocky Mountain front and areas farther east into central Texas, western Oklahoma, and eastern Kansas and Nebraska. The present area is around 300,000 mi\(^2\) (768,000 km\(^2\)),\(^8\) while the inferred maximum area was around 590,000 mi\(^2\) (1.5 million km\(^2\)).\(^9\) The gravel commonly covers erosion surfaces, indicating the currents that spread the gravel also planed the land.

The Ogallala gravels are composed of a wide variety of igneous and metamorphic rocks, especially quartzite and vein quartz.\(^10,11\) Some of the quartzite rocks exhibit percussion marks, mistakenly called chattermarks by Byrd,\(^12\) or crescentic marks and chattermarks by Helland and Diffendal.\(^13\) The markings indicate a fast, turbulent flow. Figures 26.3 and 26.4 show an outcrop of Ogallala gravel from northwest Kansas.

---


\(^8\) Frye et al., Ref. 2, p. 6.

\(^9\) Heller et al., Ref. 5, p. 1,123.


Remnants of cobbles and boulders of the Ogallala gravel are found in central Texas (Figure 26.5), generally on top of higher areas, such as on inter-stream divides. This gravel has been called the Uvalde gravel but is really an eastern extension of the Ogallala gravel. It is not associated with well-developed river terraces. The gravel near Uvalde is found 400 to 1,000 feet (120 to 300 m) above the Rio Grande River. It is about 75 feet (23 m) thick at one location. The fact the gravel is above the river indicates significant channelized erosion happened after deposition. Some of it has been reworked into the river valleys and onto terraces. Based on the interfluve outcrops in central Texas, the Ogallala gravel has been transported about 500 miles (800 km) from its nearest source in central New Mexico. Byrd stated that the origin of the Uvalde (Ogallala) gravel is a major problem:

A major problem of origin and history of the Uvalde gravels exists because there is no apparent direct connection between the Uvalde gravels and existing drainage in central Texas. Transportation of gravels of such large size is beyond the competence of existing rivers. No source for such coarse siliceous gravels exists in the major basins of present central Texas streams.

Uniformitarian Conundrum

Uniformitarian geologists have a difficult time explaining the origin of the Ogallala gravel. This should not surprise us, since they have trouble explaining any long transported gravels. Some have assumed the Ogallala gravel represents the coalescence of huge

---

15 Byrd, Ref. 12, p. 9.
16 Byrd, Ref. 12, p. 7.
17 Byrd, Ref. 12, p. 6.
alluvial fans from the Rocky Mountains.\textsuperscript{18} It is not very likely,\textsuperscript{19} since the gravel was spread very far eastward from the Rocky Mountains. Furthermore, the thickness of the Ogallala Group increases away from the mountain front—unlike any alluvial fan.\textsuperscript{3}

The Ogallala sand and gravel most likely spread while the Rocky Mountains were uplifting.\textsuperscript{4} After deposition of the Ogallala Group, erosion occurred just east of the Rocky Mountains, forming east-west channels,\textsuperscript{20} and on its eastern edge. In the North Platt River valley of southeast Wyoming, 1,900 feet (575 m) of strata was removed. A lot of strata were also removed from just east of the northern Colorado Rockies. Why should so much erosion happen so close to the Rocky Mountains?

\textbf{Consistent with Flood Deposition and Erosion}

The Ogallala Group gravel is consistent with events that occurred during the Retreating Stage of the Genesis Flood. It is the most reasonable explanation for the vast spread of sand and gravel over such a massive area, the central and southern High Plains. The Ogallala Group is different than the quartzite gravel farther north and the Rim Gravel of

\begin{itemize}
\item \textsuperscript{18} Bretz and Horberg, Ref. 10, p. 478.
\item \textsuperscript{19} Frye \textit{et al.}, Ref. 2, p. 49.
\end{itemize}
Arizona in that the Ogallala gravel was deposited with abundant finer-grained sediments. The material came from the Rocky Mountains, probably as they were uplifting.

After the Ogallala Group was deposited, much of it eroded, especially the areas close to the Rocky Mountains where the uplift of the Rockies probably accelerated the eastward flow. Flood current velocities reduced as they moved away from the Rockies, and so the Ogallala Group was not eroded as much far from the Rockies. The east-west channels currently occupied by streams and rivers were most likely cut during the last phase of the Flood, the Channelized Flow Phase. Weak post-Flood river erosion would have continued the downcutting of these channels.