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Lewis and Clark State Park Signs

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Bob Diffendal wrote text, Les Howard created map, for new Lewis and Clark sign at Ponca State Park.

The new Lewis and Clark sign is on the right.

Image courtesy of Jeff Fields, Superintendent, Ponca State Park, Ponca, Nebraska.

The text from the sign follows . . .

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The Corps of Discovery led by Meriwether Lewis and William Clark reached what is now southeastern Nebraska on July 10, 1804. It arrived at the point on the Missouri River adjacent to what is now Ponca State Park on August 22, 1804; and entered fully into South Dakota on September 8, 1804. Over this span of nearly two months members of the expedition saw and described many geologic features. The locations of some of the more prominent ones that were noted by William Clark are shown on the perspective view.

In the Ponca State Park area, Clark wrote about the limestone strata that cropped out along the side of the Missouri River valley, and also about the blowing sand eroded by strong winds off of sandbars in the river and from the sand on its banks. These features can still be seen in the park today.

At the time of the expedition, no one knew that central North America had been covered by the sea many times in the past. Nor did they know that subsequently during the Ice Ages much of the continent was blanketed several times by vast ice sheets originating in Canada, and that these ice sheets changed the courses of major rivers. Not for decades would these occurrences be recognized. However, Lewis and Clark noted geologic features that were later used as part of the evidence to confirm these events.

from R. F. Diffendal, Jr. and Anne P. Diffendal, Lewis and Clark and the Geology of Nebraska and Parts of Adjacent States. Educational Circular 18. Lincoln: Conservation and Survey Division/School of Natural Resources, University of Nebraska-Lincoln, 2003. Perspective view by L. M. Howard.

The Geology of Ponca State Park

Two wells drilled near Ponca State Park's Missouri National Recreational River Resource and Education Center have revealed information about the rock formations in this area.

Cretaceous Formations

The oldest rocks found in both wells are part of the Cretaceous System, the youngest part of the Mesozoic (informally called the Age of Reptiles). The Cretaceous units that were penetrated during the well-drilling are (from oldest to youngest) the Dakota Group, the Graneros Shale, the Greenhorn Limestone, and the Carlile Shale.

The Dakota Group is composed mostly of sandstones, shales, and thin layers of lignite coal. These rocks are similar to deposits that are being laid down today by rivers on coastal plains, beaches, and in shallow parts of seas. Fossils found in the Dakota include pollen and spores; impressions of leaves, stems, seeds, flowers, and trunks of trees; and clam shells and impressions of shells whose modern forms live in the same environments today. Dinosaur footprints have been found in the Dakota in southern Nebraska.

The Graneros Shale is gray to black shale with some thin limestone layers and white, altered volcanic ash (bentonite) beds in the upper part. Graneros fossils include pollen; carbonized wood debris; shells of ocean dwelling protozoans; clams and other invertebrates; fish bones, scales, and teeth; and bones and teeth of the marine reptiles, plesiosaurs and mosasaurs. These shale beds were deposited initially as clays offshore in the sea, probably in deeper water than the Dakota Group deposits; and were later hardened into rock.

The Greenhorn Limestone is mostly light gray in fresh exposures, but weathers to a cream color when exposed to the atmosphere. It includes small masses of iron sulfide minerals (marcasite and pyrite), which decompose and form brown to red iron oxides (rust), colors that were noted by William Clark. Greenhorn fossils include skeletal debris from marine algae and protozoans, making up most of the limestone; many large clam shells; ammonite cephalopod shells and impressions; and fish skeletal debris. The Greenhorn was deposed in the sea, far from shore, or in shallow water far from the influence of rivers that deposit sediments from land at their mouths.

The Carlile Shale is gray in color. It has interbedded limestone layers in the lower part, which contain fossils similar to those in the Graneros Shale. The Carlile was deposited in the sea close to shore.

These rock formations (Dakota to Carlile) were deposited during one of the many cycles of the rise and fall of sea level in central North America. The waters of the seas rose relative to the land and flowed onto this part of the continent, coming from the Gulf of Mexico to the south and from the Arctic Ocean to the north. They reached their maximum coverage as the sediments of the Greenhorn Limestone were deposited; after this sea level fell (Greenhorn to Carlile).

Quaternary Sediments

Above the Cretaceous rocks are sediments of the Pleistocene Series, Quaternary System, the youngest system of the Cenozoic (informally called the Age of Mammals). The lowest and oldest Pleistocene deposits are sands and gravels filling a channel eroded into the Carlile Shale. These sands and gravels are probably river deposits laid down by water running off melting ice sheets at the end of one of the several ice ages that occurred during the Pleistocene. Above the sands and gravels are brown and gray clays that are probably glacial till deposits.

Toward the end of the last Ice Age of the Pleistocene, the Missouri River began to erode into the older Pleistocene deposits and the Cretaceous bedrock to form the present valley. From time to time, silts and sandy silts were blown off the flood plain of this valley and deposited on the valley sides and uplands as the tan to yellow Peoria Loess. This wind-deposited loess covers the glacial deposits somewhat like a blanket. Coarser grained river deposits, called alluvium, form a fill over the valley floor beneath the floodplain and the river channel. Along the valley sides, landslide deposits, called talus, accumulate at the bases of steep slopes.

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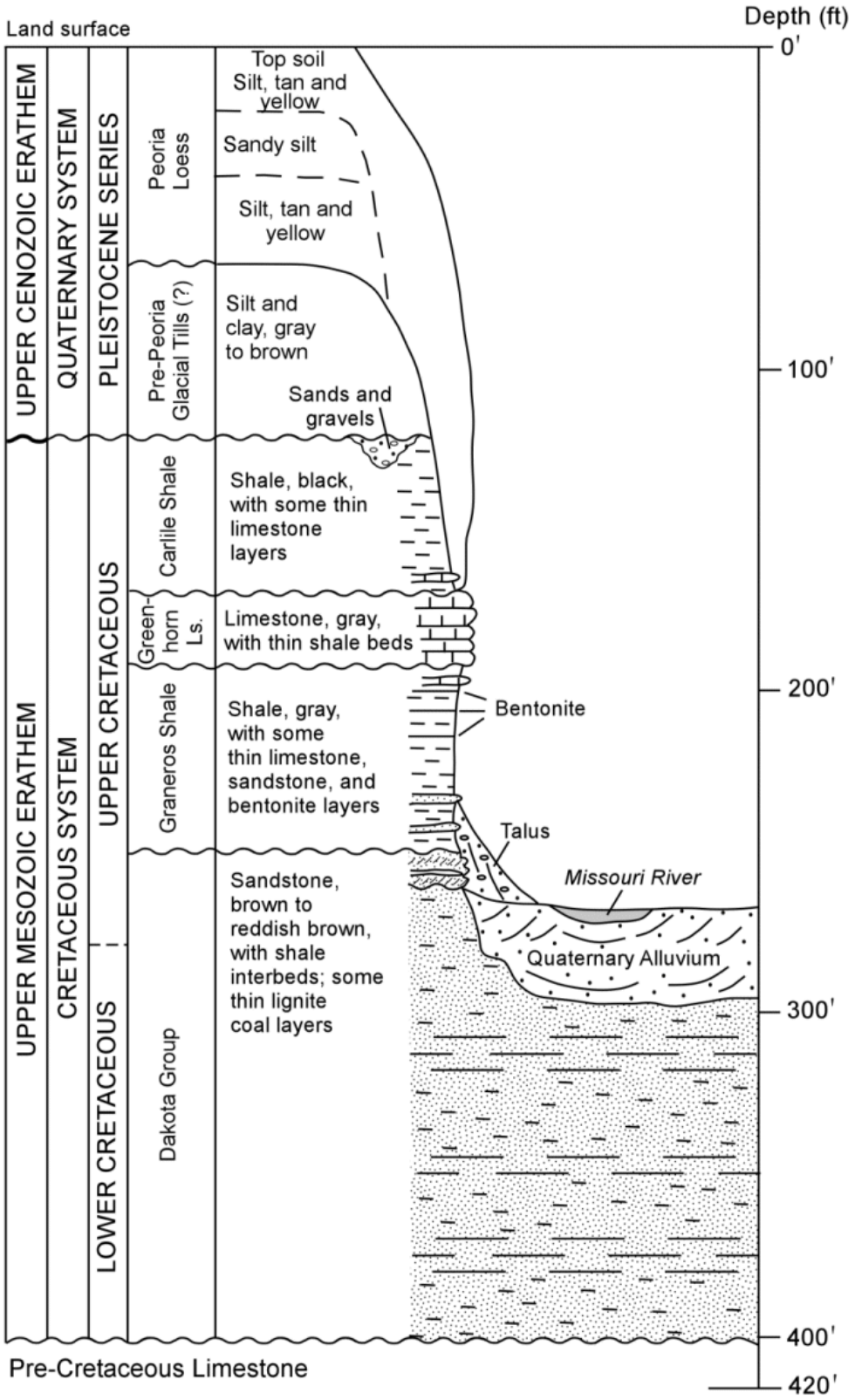
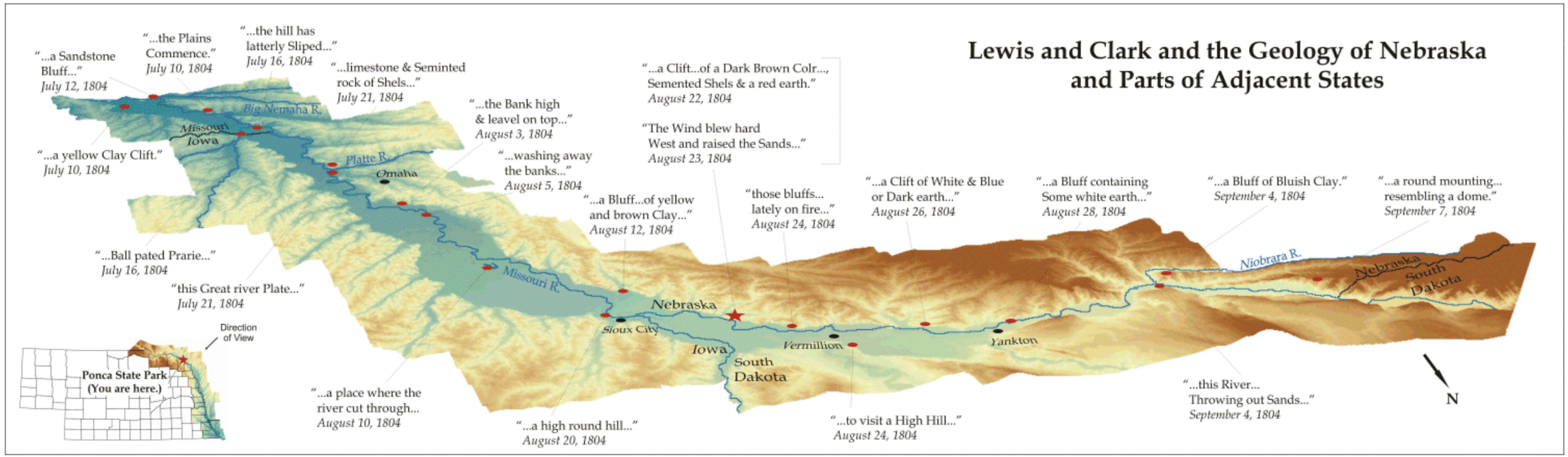


General Geologic Section From Ponca State Park Resource and Education Center To The Missouri River Boat Ramp


Lewis and Clark and the Geology of Nebraska and Parts of Adjacent States
"...a Sandstone Bluff..." July 12, 1804
"...the Plains Commence." July 10, 1804
"...the hill has latterly Sliped..." July 16, 1804
"...limestone & Seminted rock of Shels..." July 21, 1804
"...the Bank high & leavel on top..." August 3, 1804
"...a Clift...of a Dark Brown Colr..., Semented Shels & a red earth." August 22, 1804
"The Wind blew hard West and raised the Sands..." August 23, 1804
"...a yellow Clay Clift." July 10, 1804
"...washing away the banks..." August 5, 1804
"...a Bluff...of yellow and brown Clay..." August 12, 1804
"those bluffs... lately on fire..." August 24, 1804
"...a Clift of White & Blue or Dark earth..." August 26, 1804
"...a Bluff containing Some white earth..." August 28, 1804
"...a Bluff of Bluish Clay." September 4, 1804
"...a round mounting... resembling a dome." September 7, 1804
"...Ball pated Prarie..." July 16, 1804
"this Great river Plate..." July 21, 1804
"...a place where the river cut through..." August 10, 1804
"...a high round hill..." August 20, 1804
"...to visit a High Hill..." August 24, 1804
"...this River... Throwing out Sands..." September 4, 1804
Big Nemaha R.
Missouri
Iowa
Platte R.
Omaha
Missouri R.
Nebraska
Sioux City
Iowa
South Dakota
Vermillion
Yankton
Niobrara R.
Nebraska
South Dakota
N
Direction of View
Ponca State Park (You are here.)