



The Little-Known and Unlikely Former Life of Sandstone Ranch as a Tropical Beach

Standing here at Sandstone Ranch, a mile above sea level, in the middle of the North American continent, it is difficult to imagine that the sandstone we see in the cliffs here started out as dunes and beaches along the shore of a warm shallow sea. More surprising, those beaches were laid down comparatively recently and represent but a few pages in the latest chapter of the long geological history of our area.

From the overlook we can look to the west and see the peaks of the nearby Rocky Mountains. Those rocks represent chapter 1 and are very ancient indeed. They are more than a third the age of our planet, dating back 1.7 billion years. Few places on the earth's surface allow us to see rocks that old. It is important to point out here that while the mountains we see today are not nearly that old, the rocks the mountains are made of are. By comparison, those rocks are about 25 times as old as the 70 million year old sandstones we see here at Sandstone Ranch. There are many chapters in between. Most of them have been lost to erosion over time in our area. The remaining chapters tell a fascinating story of continental collisions, subduction, and newer mountains that were thrust upward from this material. The story continues with the eventual wearing away of those mountains until they were completely buried under their own debris. Then the invasion of a sea that covered this area for 30 million years followed by the rise of the Rocky Mountains and how that sea was forced to retreat to the east as the land to the west continued to rise. The final chapters tell of the uplift of the entire region from near sea level to present levels, and the recent gnawing away of the Rockies by glaciers and streams to produce the stunning scenery we enjoy today.

Sandstone Ranch rocks were deposited late in this sequence of events, shortly after the Rocky Mountains began to rise about 65 million years ago. Erosion immediately started to remove the rising land and washing some of the debris eastward to the shoreline of the sea. Wave action worked these sediments, washing the finer material out to sea and concentrating the more resistant, gritty sand into beach sands and coastal dunes. This marked the beginning of the Fox Hills Sandstone we see here at Sandstone Ranch. The original shoreline was farther west, but over time fresh sediments from the rising Rockies pushed the shoreline ever eastward, burying beaches and dunes as the shoreline moved to the east. By about 70 million years ago the shoreline was here at Sandstone Ranch. Eventually the sands here were buried under fresh lagoonal and swampy lowland deposits that would become the overlying shales, oyster reefs, and coal seams of the Laramie formation.

Since that time, any rock layers that may have been laid down on top of the Laramie in our area have been eroded away. Within the last million years or so, glaciation in the high mountains and vigorous outwash from the many streams draining them buried much of the existing landscape under layer upon layer of sand, gravel, and large cobbles washed out of the mountains out onto the plains. The many flat-topped mesas coming off of the mountain front reflect just how much material was deposited and show us that the surface of the great plains where it meets the mountains used to be a good bit higher than today. Recent erosion over the past 100,000 years or so has cut deeply into that original surface and excavated the land surface upon which we live today. Erosion by the St. Vrain has cut down deeply enough here at Sandstone Ranch to once again reveal the beaches and dunes, now hardened into the Fox Hills Sandstone, that once defined the tropical shoreline from 70 million years ago. Did you remember to bring your beach umbrella?

"In the presence of eternity the mountains are as transient as the clouds" *

• from a verse in the Qur'an written in the 7th century A.D.

Sedimentary Rocks of the Boulder Area

