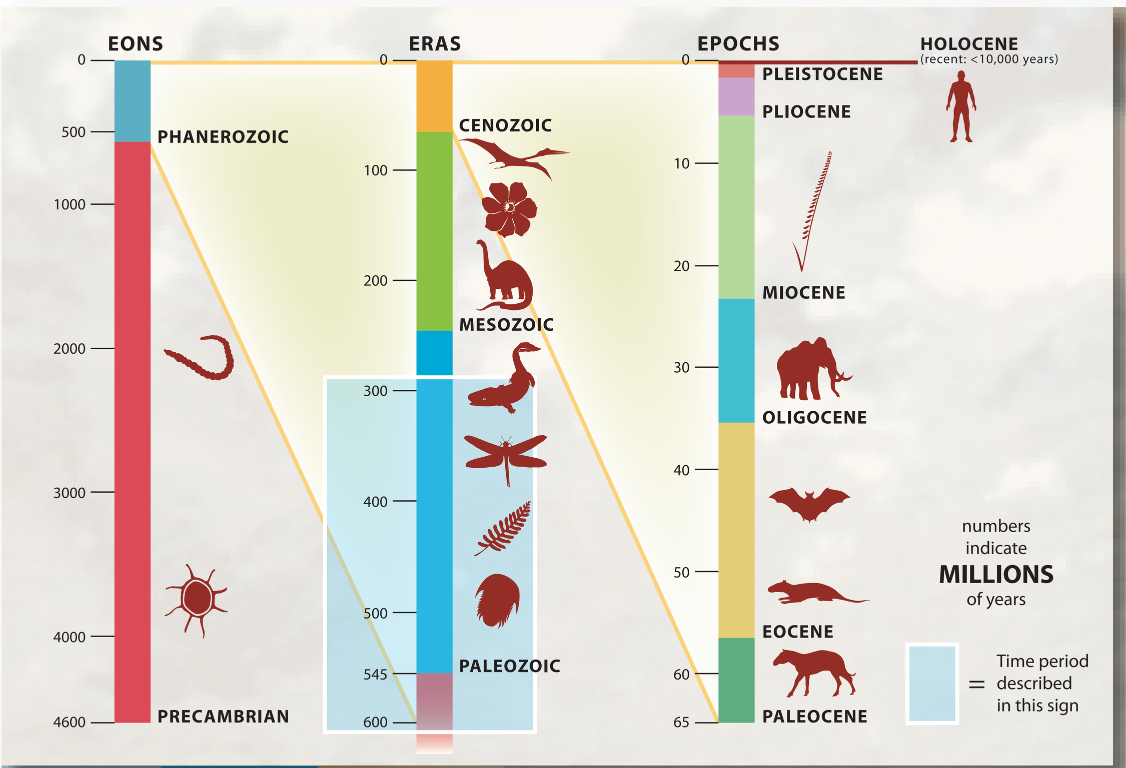

BIG BEND SNAPSHOT

GEOLOGY *of the* MARATHON BASIN

EON | ERA | PERIOD

PERMIAN

300 MILLION YEARS AGO

PENNSYLVANIAN (Late Carboniferous)

MISSISSIPPIAN (Early Carboniferous)

400

DEVONIAN

PHANEROZOIC

PALEOZOIC

SILURIAN

500

ORDOVICIAN

CAMBRIAN

PRECAMBRIAN

NEOPROTEROZOIC

600

EDIACARAN

5 The irresistible forces of colliding continents push vast sheets of rock hundreds of miles inland while local sections are complexly folded repeatedly over themselves.

4 Continued pressure causes softer rock layers to break along fold crests while harder layers begin to slide over softer layers and thrust faulting begins.

3 Intense pressure deforms the weakest rocks into overturned asymmetrical folds while harder, more resistant rocks are pushed over and under them.

2 Lateral compression squeezes sediments into folds as ancestral North and South American continental plates begin to collide, three hundred million years ago.

1 Sediments begin to collect in a geosynclinal marine trough on a subsiding sea floor along continental margins, starting about 550 million of years ago.

During the Paleozoic era, as vertebrates appeared and life moved inland, the earth's tectonic plates converged to form the supercontinent Pangae, surrounded by one single global ocean, Panthalassa. Shortly after the opening of the Atlantic Ocean, during the Cambrian Period, an undersea valley known to geologists as the Marathon Trough began to form where the Gulf of Mexico is today. For 300 million years, the sinking basin collected thick layers of sediments that were slowly transformed into limestone, sandstone, shale, novaculite, chert and other minerals.

Beginning in the late Pennsylvanian Period, these compacted, lithified marine sediments were deformed, folded and thrust north and west as the South American tectonic plate shoved what is now the Yucatan peninsula to the north and west, pushing the adjacent seabed ashore onto the North American plate. Spectacular evidence of this process is visible throughout the Marathon Basin.

This active mountain building era is known as the Ouachita Orogeny. The same complex forces simultaneously uplifted the Sierra Madre Oriental of Mexico along with the Ouachita Mountains of Arkansas and Oklahoma. This is among the earliest chapters in the history of how Big Bend came to look the way it does today.

This map shows the distribution of land and water areas as they may have existed roughly 300 million years ago in this region when North and South America collided. As the continents came together, ancestral versions of the Sierra Nevada, Rocky Mountains and Appalachian Chain were formed.
At essentially the same time the Ouachita Orogeny shoved the Marathon Basin into what is now West Texas. Resistant structures from previous continental uplifts deflected the incoming thrust sheets and caused them to break and slide along the indicated transform faults.

In the foreground of this photograph an outcrop of erosionally resistant Caballos Novaculite shows tight folds and fault lines. The same hard as flint rock layer also forms ridges on the hills in the middle ground, and was a favorite tool-making stone of early Indians in this region. Santiago Peak, the exposed remains of a much younger 35 million year old shallow igneous intrusion, rises in the background.

Overthrust map after Charles A. and June R. P. Ross, and W. A. Thomas, West Texas Geological Society, Midland.

Fold sequence diagram after Ross A. Maxwell, University of Texas Bureau of Economic Geology, Austin.

Geological history: Patricia W. Dickerson, Ross A. Maxwell, William R. Muehlberger, University of Texas Department of Geology, Austin, and Kevin Urbanczyk, Sul Ross State University Department of Earth and Physical Sciences, Alpine, Texas. Compiled by Jim Bones.

Geologic map: William R. Muehlberger, W. D. DeMis, and J. O. Leason, Geological Society of America, Boulder, Colorado.

Geologic time scale after Roche Macrae, University of Calgary Department of Geology, and Geophysics, Alberta, Canada.

Earth orbit photograph by NASA space shuttle astronauts.

Caballos Novaculite photograph by Jim Bones.

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