

COCONINO FORMATION

EARLY PERMIAN (Leonardian)
280 to 275
Million Years Ago

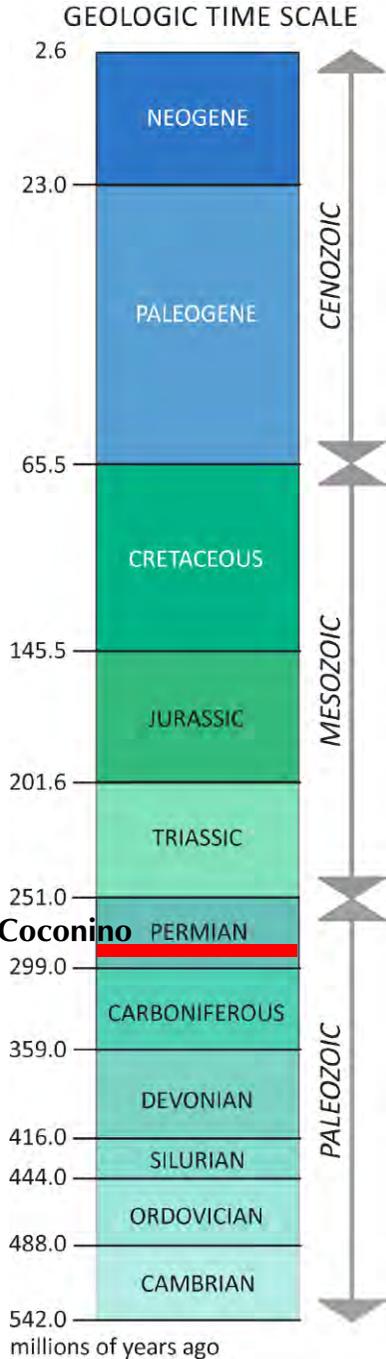
LITHOLOGY:
Quartz arenite sandstone, fine- to medium-grained, well-rounded, well-sorted, white to pink

FOSSILS:
Reptile tracks, insect burrows

SEDIMENTARY STRUCTURES:
Large scale cross-bedding, ripple marks, slump structures

DEPOSITIONAL ENVIRONMENT:
Wind-blown sand dunes in arid desert

PALEOGEOGRAPHY/TECTONIC SETTING:
Eolian sand sea (dunes) on a coastal plain along coastal shorelines



Sands carried by northerly winds were deposited across the Arizona landscape in the early Permian Period, creating vast dunes that today form the Coconino Sandstone and other similar contemporaneous formations. The only fossils found in the Coconino are footprints of extinct animals, for which no evidence of skeletal remains has been found. By the end of the Permian Period (251 million years ago), the greatest mass extinction of all time occurred, resulting in the disappearance of up to 50 percent of all marine invertebrate families, and 75 percent of terrestrial vertebrate families. Possible causes of the extinction include a worldwide loss of shallow marine environments during the convergence of continents into Pangaea and/or climatic changes triggered by volcanic eruptions, which released concentrations of CO₂ and SO₂ into the atmosphere. Multiple causes may have been at work.

Reptile Tracks Provide Clues to Vanished Species



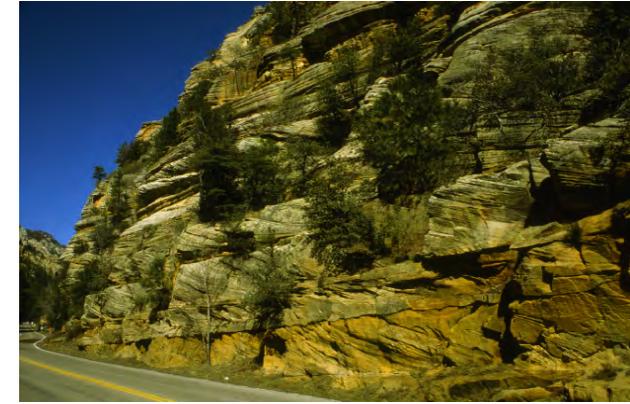
Referred to as the "Great Dying," the Permian mass extinction impacted both marine and land species and may have lasted a few thousand years (image courtesy of the Lunar and Planetary Institute)



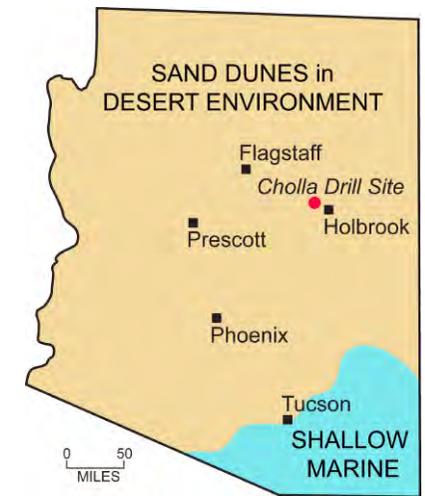
Tracks of the reptile *Laoporus*, preserved on a bedding plane of ripple-marked Coconino Sandstone



Trackway of small reptile that was left on the sloping surface of a sand dune in the Coconino Sandstone



Coconino Sandstone outcrop along U.S. Highway 89, Oak Creek Canyon, near Sedona, Arizona. Note prominent large-scale cross-bedding that is typical of wind-blown sand dunes.



Generalized map of environments across Arizona during the early Permian, the time of deposition of the Coconino Sandstone (modified from Blakey and Ranney, 2008)

(Based on Geological Society of America timescale, 2009)

All images courtesy of Dale Nations, unless otherwise noted. Information provided by WESTCARB at www.westcarb.org