

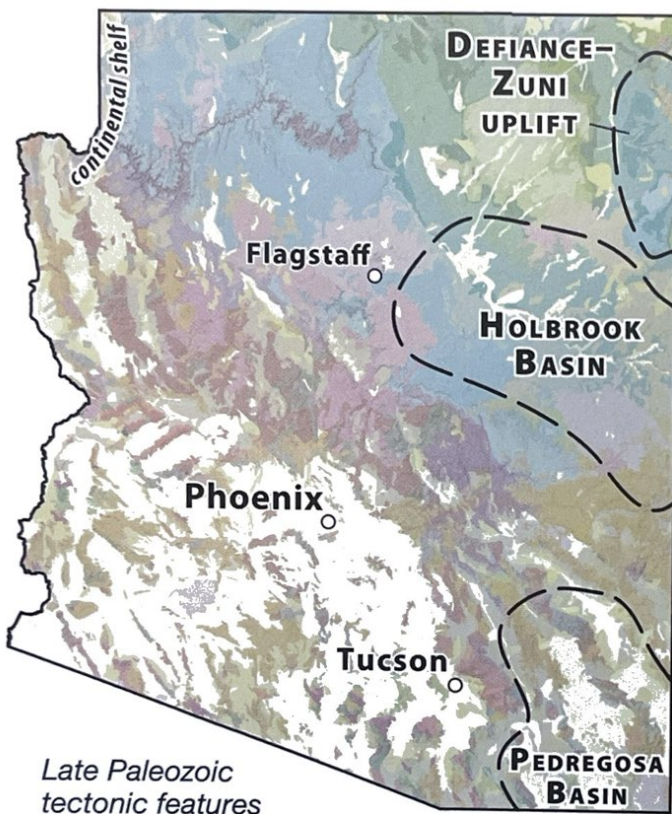
Paleozoic History

The Paleozoic in Arizona, from 541 to 252 million years ago, was mostly a time when sea level fluctuated, sometimes flooding over the land. Rising seas encroached on North America from all sides in the Cambrian Period, the earliest subdivision of the Paleozoic, but in Arizona the earliest seas advanced from west to east. West of Arizona was a passive margin that formed when another continental mass was rifted away. Rifting thinned the crust, causing the affected areas to subside and receive a thicker sequence of sedimentary rocks on a continental shelf in western Utah and eastern Nevada. Units on the shelf thin toward Arizona and were deposited on a low platform (▼), which was close to sea level and so flooded to become part of the sea at times and part of dry land at other times.

The base of the Paleozoic sequence is Cambrian in most places but is Devonian in areas that were a little too high above sea level to be flooded by the Cambrian seas. Arizona has few

rocks from the Ordovician, and no rocks from the Silurian. On top of the Devonian rocks is a widespread layer of Mississippian limestone called the Redwall Limestone in northern Arizona and the Escabrosa Limestone to the south-east. The limestones represent a time when Arizona was near the equator and covered by warm, tropical, limestone-depositing seas.

During Pennsylvanian and Permian time, diverse environments deposited a series of units, including the wind-deposited Coconino Sandstone and equatorial limestones of the Kaibab Formation of northern Arizona, as well as the Naco Group of southeastern and east-central Arizona. During this time interval, seas invaded the region from different directions at different times.



A more active tectonic setting influenced deposition of Pennsylvanian and Permian rocks, such as the butte-capping De Chelly Sandstone (▼) and underlying Organ Rock Formation of Monument Valley. At this time, a continental collision between North America with Africa and South



America caused deformation within the Four Corners region, forming mountains called the Ancestral Rockies, including the Defiance uplift in northeastern Arizona. The event also lowered areas to form the Holbrook Basin and Pedregosa Basin, which have thicker-than-normal Pennsylvanian and Permian sequences.

Permian units in Monument Valley from US 163, Arizona-Utah border

The best-known Paleozoic units in Arizona are those in the Grand Canyon, and these range in age from Cambrian to Permian. The Pennsylvanian and Early Permian Supai Group is a series of redbeds that form the middle ledges of the canyon (◄). The light-colored, rubbly cliff above the red rocks is Permian Coconino Sandstone, which was deposited by sand dunes. It is overlain by the Permian Toroweap and Kaibab Formations, the latter of which caps the top of the cliffs. Equivalent rocks in southern and central Arizona are called the Naco Group.



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Supai Group through Kaibab Formation from Mather Point

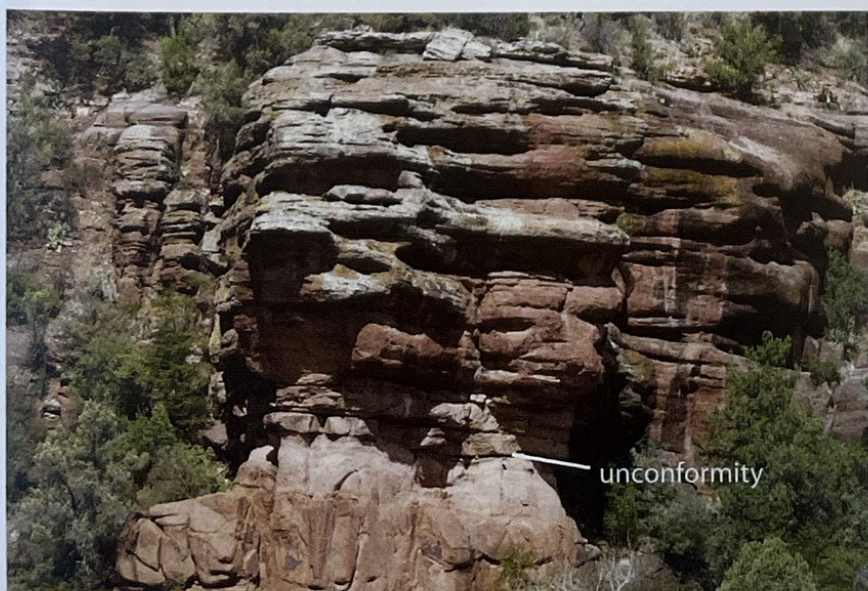
In southern and central Arizona, the Paleozoic sequence has Cambrian quartzite and related rocks at the base, overlain successively by the Devonian Martin Formation, the Mississippian Escabrosa or Redwall Limestones, and the Pennsylvanian and Permian Naco Group. The Naco Group includes mostly marine formations, such as ledge-forming limestones separated by slope-forming shales. Paleozoic units are mostly gently dipping in central Arizona but are tilted and otherwise strongly deformed in parts of southern Arizona (◄).



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Steeply tilted Paleozoic units, Ft. Bowie National Historic Site

In most of Arizona, the oldest Paleozoic unit is the Cambrian Tapeats Sandstone or its southern Arizona equivalents, the Bolsa Quartzite and Coronado Quartzite. The Tapeats forms a brownish ledge or cliff that overlies Proterozoic basement along the Great Unconformity, as shown here (◄). It was deposited mostly as a shoreline facies when Paleozoic seas first advanced across the land. The Bolsa and Coronado Quartzites are similar units but are quartzites due to fluids that deposited a quartz-rich cement binding the sand grains.



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Tapeats Sandstone over Proterozoic granite, AZ 87 milepost 258