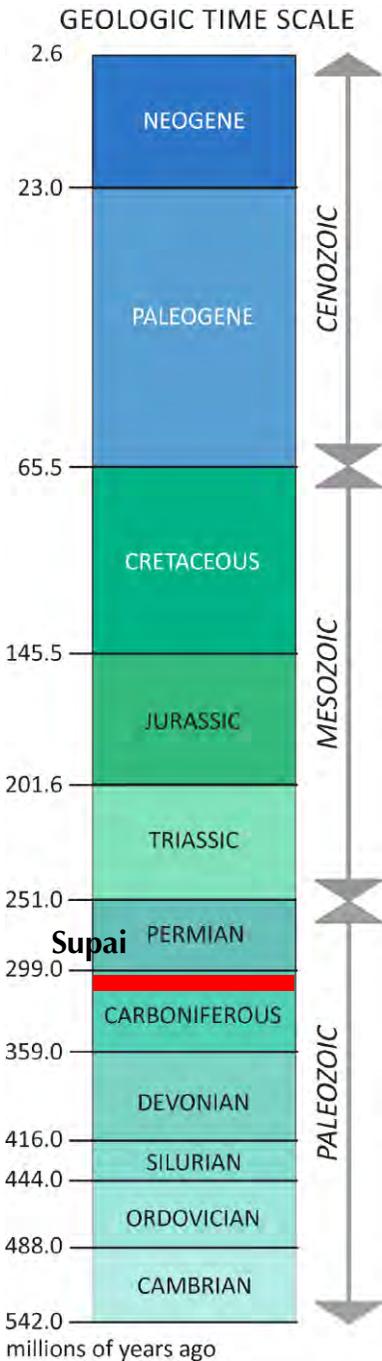


# SUPAI FORMATION

**EARLY PERMIAN (Leonardian)**  
290 to 280  
Million Years Ago



(Based on Geological Society of America timescale, 2009)

**LITHOLOGY:**  
Sandstone, mudstone, shale, dark red to brown; limestone, medium gray. Evaporites including gypsum, anhydrite, halite, and potash

**FOSSILS:**  
Land plants, amphibian/reptile tracks. Echinoids and other marine invertebrates in the Fort Apache Member

**SEDIMENTARY STRUCTURES:**  
Horizontal bedding, cross-bedding, ripple marks

**DEPOSITIONAL ENVIRONMENT:**  
River channels, flood plains, arid coastal plain where evaporate minerals (salts) are deposited; restricted marine carbonates

**PALEOGEOGRAPHY/TECTONIC SETTING:**  
Coastal plain with subsiding basin accommodating evaporate sediments; shallow marine, on a continental shelf

**MISCELLANEOUS:**  
Thick evaporate deposits in Supai Formation below shallow marine Fort Apache Limestone

The Permian Period witnessed the convergence of the Earth's continents to form the supercontinent Pangaea, with the Colorado Plateau on the western edge, just above the equator. Although fossils in the Supai Formation indicate areas of forest, particularly toward the east, the overall climate on the Colorado Plateau was becoming arid or semi-arid. The area was also subsiding, which resulted in increased preservation of sediments. Major rivers traversed the land in a southwesterly direction from mountains that had arisen to the northeast (called the Ancestral Rocky Mountains and situated where the current Rocky Mountains are located in Colorado). These rivers left behind iron oxide-stained deposits of sand and mud, which formed the red mudstone and sandstone of the Supai Formation. The sea also continued to fluctuate in and out of the area, leaving behind shallow marine deposits such as the Fort Apache limestone, and evaporite minerals, such as halite, gypsum, and potash.

### Linking Sea and Land

The early Permian environment on the Colorado Plateau was conducive to amphibians and reptiles, many species of which had been in ascendance since the Devonian period.

One of the evolutionary bridges between fish and amphibians can be found in transitional species of fish with lobed fins. These consisted of two pairs of fleshy projections with a rayed fin at the ends. The bones and muscles in each lobe allowed the fin to be moved in such a way that the fish could propel itself along a pond or river bottom.

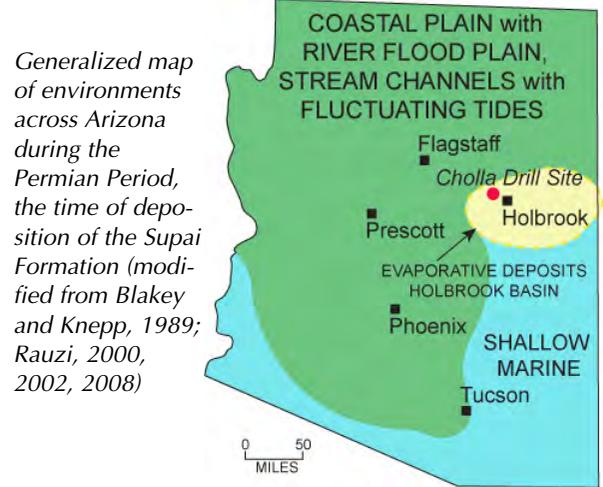
Lobed fins were one of the many adaptations that enabled certain fish species to become the evolutionary ancestors of amphibians. (image courtesy of the Lunar and Planetary Institute)



Fossil leaves of ferns that lived in the forests of the Supai environment



Outcrop of the Supai formation on Highway 60, south of Carrizo, Arizona



Reconstruction of a late Paleozoic forest environment like that which existed in the Cholla area

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