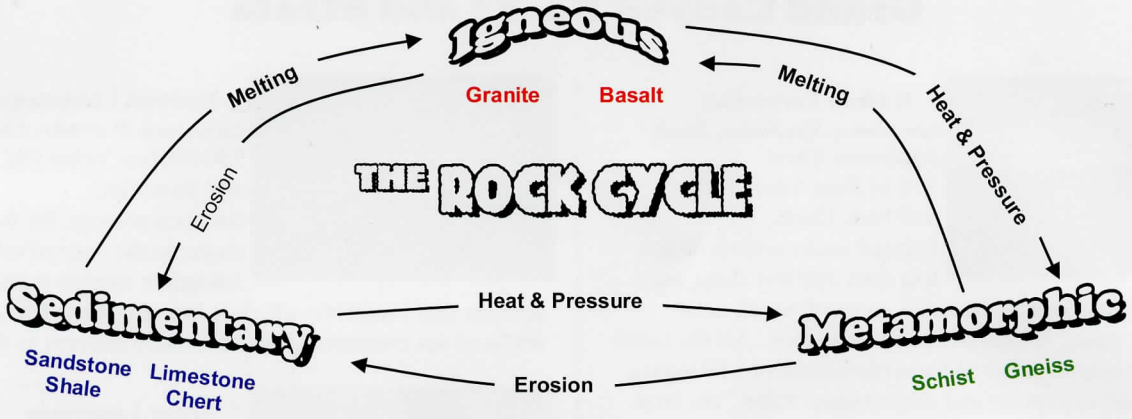
Grand Canyon Rocks and Layers

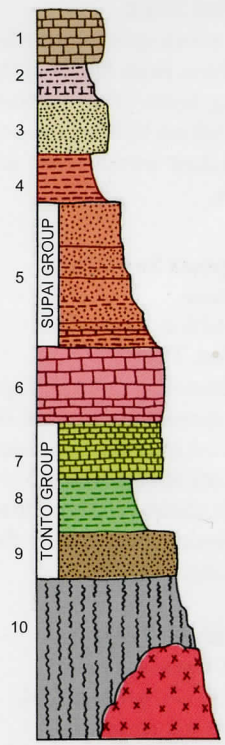


All About Rocks

There are only three types of rocks on earth: igneous, sedimentary and metamorphic. Igneous rocks form when molten rock (lava or magma) cools and hardens. Examples are basalt and granite. Geologically recent lava flows occurred in western Grand Canyon.

Sedimentary rocks result from erosion of any rock, followed by depositing the resulting sediment into a natural basin, and finally cementing the sediment into stone. Examples are sandstone, shale, limestone, and chert. All the Grand Canyon layers below, except the bottom one, are sedimentary.

Metamorphic rocks form when any rock is subjected to great heat and pressure, but not enough heat to melt the rock. Examples are schist and gneiss (pronounced 'nice'), and both occur, with granite, in the bottom of the canyon, sometimes called the Vishnu Complex.



Formations and Rocks

"**K**now **T**he **C**anyon's **H**istory. **S**tudy **R**ocks **M**ade **B**y **T**ime **V**ictorious."

Formation Name	Rocks in Formation
1. **K**aibab Formation	Chert (many colors), Tan Limestone
2. **T**oroweap Formation	Pink Siltstone, Gray Limestone
3. **C**oconino Sandstone	Light Tan fine-grained Sandstone
4. **H**ermit Shale	Red Shale, Red Sandstone
5. **S**upai Group	Red Sandstone, Siltstone, Shale
6. **R**edwall Limestone	Gray Limestone with red stain, Chert
7. **M**uav Limestone	Gnarly, lumpy gray Limestone
8. **B**right Angel Shale	Green to Yellow Shale
9. **T**apeats Sandstone	Brown Sandstone
10. **V**ishnu Complex	Black Mica Schist, White to pink Granite

Four Main Events Formed the Grand Canyon

(This is greatly simplified and numbers are rounded off)

1.7 billion years ago island mountain ranges formed here. Then the mountains eroded to sea level, leaving the Vishnu Complex (schist and granite) at the canyon bottom.

About **1 billion years ago**, two miles of rock called the Grand Canyon Supergroup formed on top of the schist and granite. These rocks were mostly eroded away before the next stage.

About **500 to 250 million years ago** rock layers 1 to 9 formed on top of the Vishnu Complex. *All* these layers were deposited very close to sea level as the land sank.

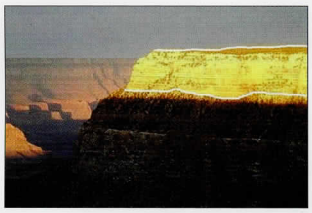
Between **250 and 50 million years ago**, about a mile of dinosaur age and mammal age rocks formed on top of the Kaibab Formation, but were mostly eroded away before the next stage.

About **50 million years ago** (70-40) plate tectonic processes lifted the Grand Canyon region to its present altitude.

About **5 million years ago** the Colorado River took its present course through Grand Canyon.

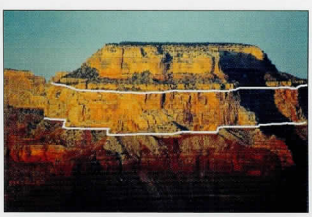
Canyon Dave's Natural Science Info-sheets

Grand Canyon Rocks and Strata

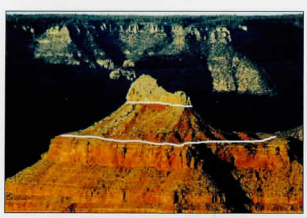


1. Kaibab Formation
Limestone, Sandstone, Sandy Limestone, Chert
270 Million Years Old,
350 Feet Thick.
Formed under a shallow sea less than 300 feet deep, as shown by the presence of corals, most of which need sunlight to grow. A time of abundant sea life. All the continents had come together to form the continent of Pangaea, where primitive reptiles and amphibians "ruled" the land.

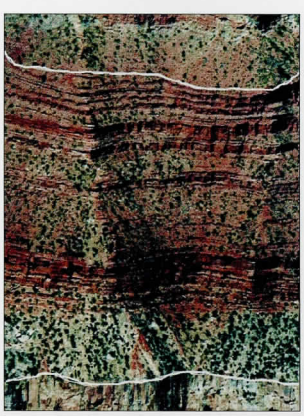
2. Toroweap Formation
Sandstone, Limestone, Shale
275 Million Years Old,
250 Feet Thick.
Similar to the Kaibab, but shallower water. Pink or tan sandstone and shale, with salt and gypsum beds. Forms a slope below the Kaibab cliff but there is a 50 foot limestone ledge near the bottom. Fossils similar to Kaibab but sparser.



3. Coconino Sandstone
Desert Sandstone
280 Million Years,
350 Feet Thick.
Three million years of shifting sand dunes near a coastline. Abundant small reptiles, spiders, and scorpions are known only from their tracks.

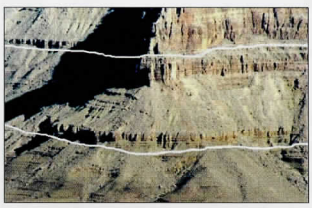


4. Hermit Formation
Siltstone, Shale, Sandstone
285 Million Years Old,
300 Feet Thick.
A time of delta sands and muds, ferns and conifer trees. Abundant reptile or amphibian tracks, and insects including dragonflies.

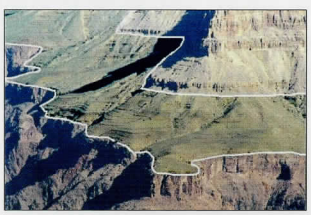


5. Supai Group
Sandstone, Siltstone, Shale, Limestone
285-320 Million Years Old,
900 Feet Thick.
Similar to Hermit Shale but contains more desert sand. The Supai consists of the Esplanade Sandstone and the Wescogame, Manakacha, and Watahomigi Formations. Each contains both terrestrial and undersea sediments. There is beautiful red jasper in limestone beds of the Manakacha.

6. Redwall Limestone
Limestone, Dolomite, Chert
340 Million Years Old,
450 Feet Thick.
An open seaway, far from shore, in the "age of crinoids." Abundant marine fossils characterize this limestone which is literally made from the shells of sea creatures. There are many caverns in the cliff.



7. Muav Limestone
Limestone, Dolomite, Siltstone
505 Million Years Old,
375 Feet Thick.
This limestone formed relatively far from shore in the Tonto Sea of Cambrian age. Fossils are similar to those in the Bright Angel Shale but less numerous.



8. Bright Angel Shale
Shale, Sandstone
510 Million Years Old,
325 Feet Thick.
Forty seven species of trilobites have been found in this sloping layer—they resembled small horseshoe crabs. After four billion blind years on this planet, the trilobites could see their world—they are the first known creatures with eyes.

9. Tapeats Sandstone
Sandstone
515 Million Years Old,
300 Feet Thick.
The chocolate-colored Tapeats cliff represents a sea that encroached over the worn-down Vishnu mountains. Since the Tapeats is only about 515 million years old and the Vishnu is about 1,700 million, there are 1,200 million years of missing strata below the Tapeats. This is called the Great Unconformity.

10. Vishnu Complex
Schist, Granite, Gneiss
1,700 Million Years Old,
unknown thickness.
Island mountains existed here, as shown by the metamorphic rocks and granites of the Vishnu. Over hundreds of millions of years, the mountains eroded down to sea level. Next, sediments of the Grand Canyon Supergroup were deposited and mostly eroded away. Finally, the sea rolled in and deposited the Tapeats Sandstone.