

# GRAND CANYON GUIDE no. 6

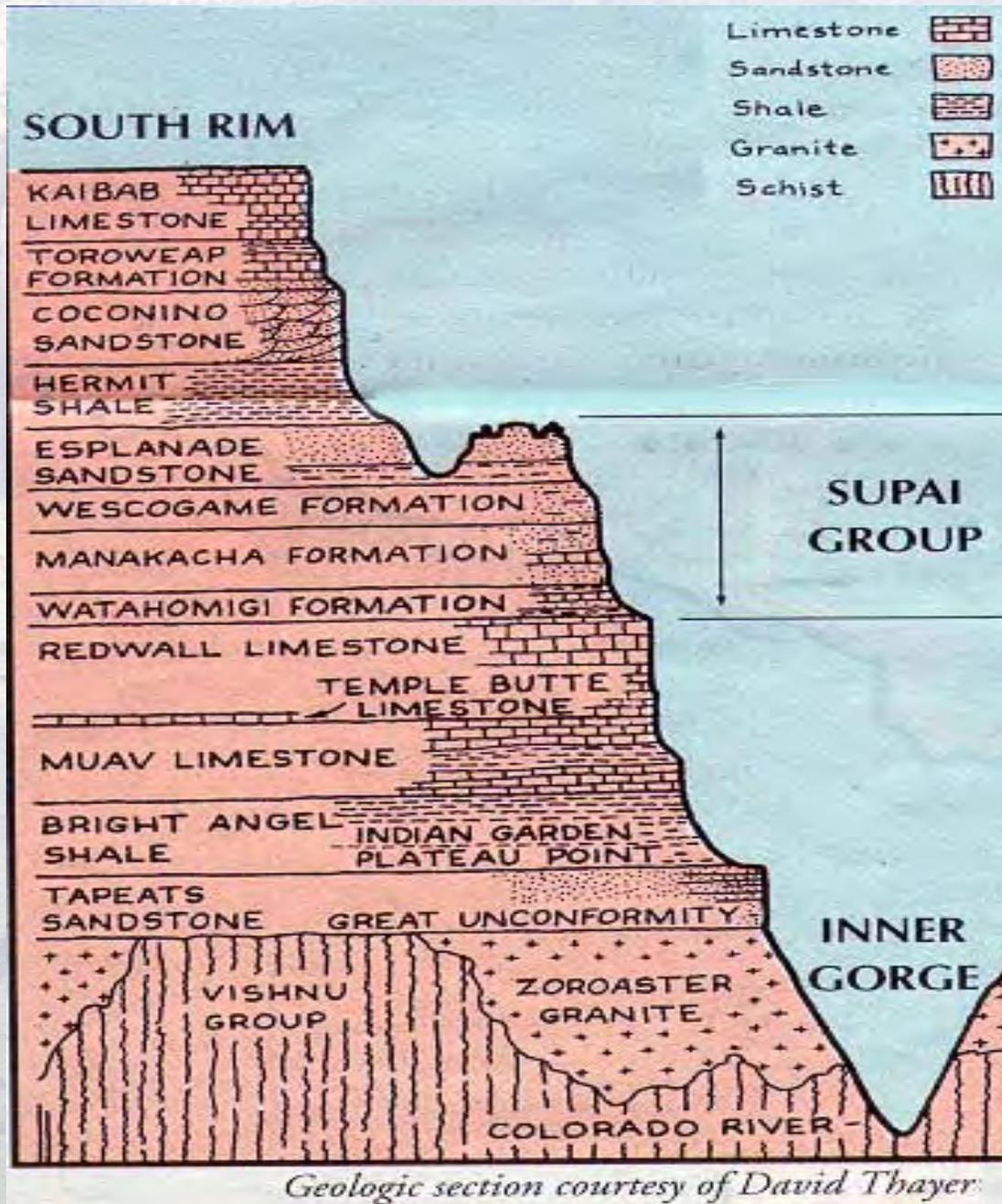
... excerpted from Grand Canyon Explorer ... Bob Ribokas

## AN AMATEUR'S REVIEW OF BACKPACKING TOPICS

FOR THE

**T254 - EXPEDITION TO THE GRAND CANYON - MARCH 2007**

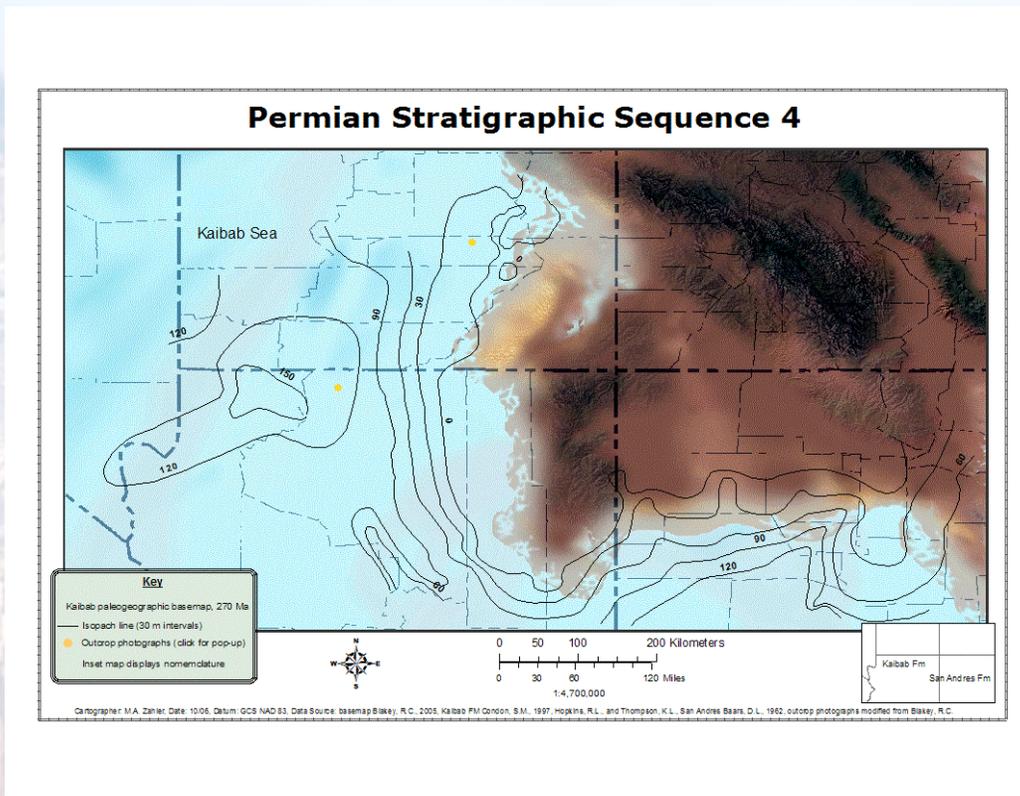
## Descriptions of Grand Canyon Layers



Grand Canyon attracts the attention of the world for many reasons, but perhaps its greatest significance lies in the geologic record that is so beautifully preserved and exposed here. The rocks at Grand Canyon are not inherently unique; similar rocks are found throughout the world. What is unique about the geologic record at Grand Canyon is the great variety of rocks present, the clarity with which they're exposed, and the complex geologic story they tell.

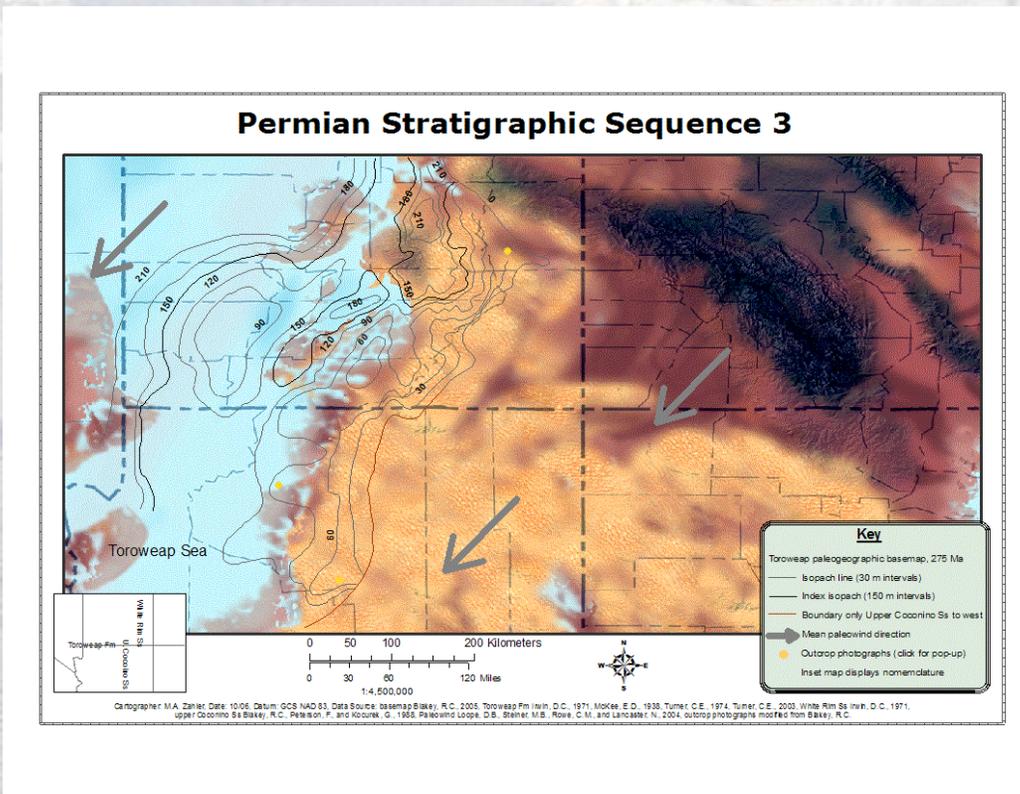
## Paleozoic Strata:

## Kaibab depositional environment:



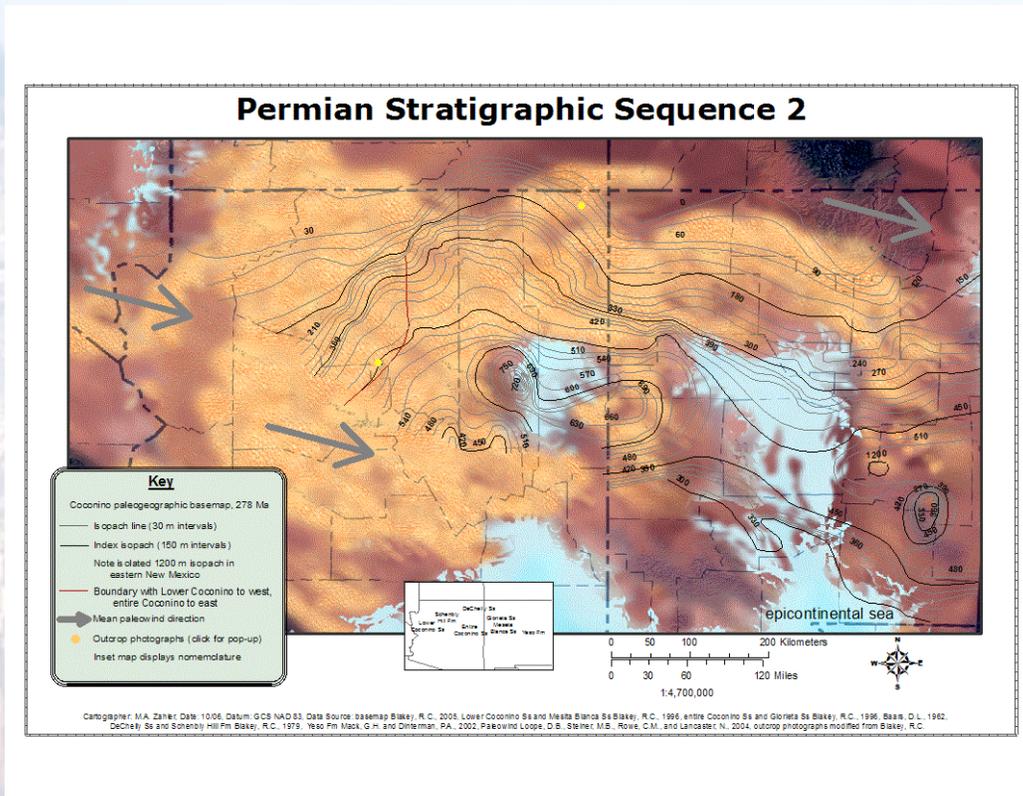
**Kaibab Limestone** - This layer forms the surface of the Kaibab and Coconino Plateaus. It is composed primarily of a sandy limestone with a layer of sandstone below it. In some places sandstone and shale also exists as its upper layer. The color ranges from cream to a greyish-white. When viewed from the rim this layer resembles a bathtub ring and is commonly referred to as the Canyon's bathtub ring. Fossils that can be found in this layer are brachiopods, coral, mollusks, sea lilies, worms and fish teeth.

## Toroweap depositional environment



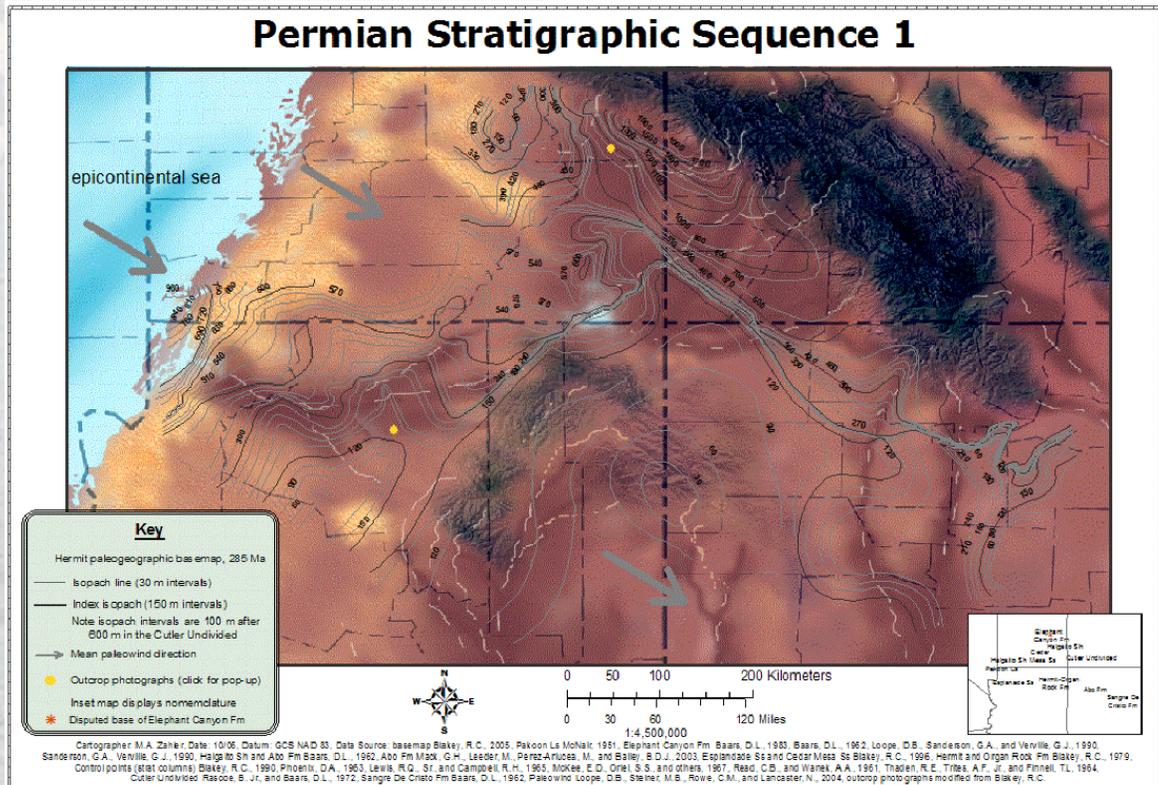
**Toroweap Formation** - This layer is composed of pretty much the same material as the Kaibab Limestone above. It is darker in color, ranging from yellow to grey, and contains a similar fossil history.

## Coconino depositional environment:



**Coconino Sandstone** - This layer is composed of pure quartz sand, which are basically petrified sand dunes. Wedge-shaped cross bedding can be seen where traverse-type dunes have been petrified. The color of this layer ranges from white to cream colored. No skeletal fossils have yet to be found but numerous invertebrate tracks and fossilized burrows do exist.

## Hermit depositional environment:



**Hermit Shale** - This layer is composed of soft, easily eroded shales which have formed a slope. As the shales erode they undermine the layers sandstone and limestone layers above which causes huge blocks to fall off and into the lower

reaches of the Canyon. Many of these blocks end up in the side drainages and down on the Tonto Platform. The color of this layer is a deep, rust-colored red. Fossils to be found in this layer consist of ferns, conifers and other plants, as well as some fossilized tracks of reptiles and amphibians.

**Supai Formation** - This layer is composed primarily of shale that is intermixed with some small amounts of limestone and capped by sandstone. The limestone features become more and more prominent in the western regions of the Canyon, leading one to believe that that region was more marine. The eastern portions where probably a muddy river delta that fed into an ancient sea. The color of this layer varies from red for the shale to tan for the sandstone caps. Numerous fossils of amphibians, reptiles and terrestrial plants exist in the eastern portion which are replaced by marine fossils as you move westward.

**Redwall Limestone** - This layer is composed of marine limestones and dolomites. This is probably the most prominent rock layer in the Canyon as it usually forms a sheer cliff ranging from 400-500 feet in height, which has become a natural barrier between the upper and lower regions of the Canyon. The only way though this barrier is in areas where the rock has faulted and broken apart to form a slope which can be climbed upon. The deep reddish color of this layer is caused by iron oxides leaching out of the layers above it and staining its outward face. Behind the reddish face the rock is a dark brownish color. Numerous marine fossils can be found in the Redwall Limestone including brachiopods, clams, snails, corals, fish and trilobites. Many caves and arches can also be seen in the Redwall.

**Temple Butte Limestone** - This layer is composed of freshwater limestone in the east and dolomite in the west. In the eastern Grand Canyon this layer occurs irregularly and only then by way of limestone lenses that fill stream beds that have been eroded into the underlying Mauv Limestone. Apart from these channels, which are quite large in places, the Redwall Limestone sits directly atop the Mauv Limestone. The Temple Butte Limestone is quite prominent, however, in the western regions and forms massive cliffs hundreds of feet high. The color of this layer ranges from purplish in the eastern regions to grey or cream colored in the west. The only fossils to be found in the eastern region are bony plates that once belonged to freshwater fish. In the western region there are numerous marine fossils.

## Tonto Group

**Mauv Limestone** - This layer is composed primarily of limestone that is separated by beds of sandstone and shale. The Mauv Limestone layer is much thicker in the western areas of the Canyon than it is in the east. Its color is grey and it does not have much in the way of fossils, some trilobites and brachiopods.

**Bright Angel Shale** - This layer is composed primarily of mudstone shale. It is also interbedded with small sections of sandstone and sandy limestone. The retreat of the Canyon rim is attributed primarily to the erosion of this layer which forms the top of the Tonto Platform. The plateau is much wider in the eastern portions of the Canyon where the Bright Angel Shale contains less sand and is more easily eroded. The color of this layer varies with its composition but it is mostly various shades of green with some grey, brown and tan thrown in here and there. Fossils to be found in this layer consist of marine animals such as trilobites and brachiopods.

**Tapeats Sandstone** - This layer is composed of medium-grained and coarse-grained sandstone. Ripple marks formed by ocean waves of an early Cambrian sea are common in the upper layer. The Tapeats is similar to the Redwall in that it forms a barrier between upper and lower reaches of the Canyon that can only be traversed where a fault has caused its collapse. The color of this layer is dark brown and it contains fossils of trilobites, brachiopods, and trilobite trails.

## Great Unconformity

This non-layer indicates an age in which no sediments can be found. It is indicative of a time when an advancing sea eroded away the sediments that should be here.

# Late Pre-Cambrian Rocks

## Chuar Group

**Sixtymile Formation** - This tan colored layer is composed primarily of sandstone with some small sections of shale.

**Kwagunt Formation** - This layer is composed primarily of shale and mudstone with some limestone. In the area of Carbon Butte the lower layer also contains a large section of reddish sandstone. The shales within this layer are black and the mudstones range from red to purple. Fossils to be found in this layer are those of stromatolites, the oldest fossils to be found anywhere in the Grand Canyon.

**Galeros Formaton** - This layer is composed of interbedded sandstone, limestone and shale. The color is primarily greenish with some of the shales ranging from red to purple. Fossil stromatolites also exist in this layer.

**Nankoweap Formation** - This layer is composed of a coarse-grained sandstone. This layer is exposed only in the eastern section of the Canyon and belongs to neither the Chuar or Unkar groups because it is bounded on both sides by unconformities.

## Unkar Group

**Cardenas Lavas** - This dark brown layer is composed of basaltic lava flows.

**Dox Sandstone** - This layer is composed of sandstone interbedded with shale, and occurs primarily in the eastern regions of the Canyon. Its color varies from red to orange and its fossil record contains stromatolites and algae.

**Shinumo Quartzite** - This layer is composed of sandstone. This layer is only exposed in a few sections in the Canyon. Its color can be deep red, brown, purple or white.

**Hakatai Shale** - This layer is composed primarily of shale with some sandstone. The color is a very bright orange-red red and is the layer that gives Red Canyon its name.

**Bass Formation** - This layer is composed primarily of limestone with some interbedded shale. It is greyish in color and its fossil record consists of stromatolites.

## Pre-Cambrian Unconformity

This non-layer represents a time where the mountains that had grown here were gradually eroded away to form a plain.

## Early Pre-Cambrian Rocks

**Vishnu Schist and Zoroaster Granite** - This layer consists of mica schist. These were originally sediments of sandstone, limestone and shale that were metamorphosed and combined with metamorphosed lava flows to form the schist. This layer along with the Zoroaster Granite were once the roots of an ancient mountain range that could have been as high as today's Rocky Mountains. The mountains were eroded away over a long period of time and new sediments were they deposited over them by advancing and retreating seas. The color of this layer is dark grey or black.