

Geol 104 Geology of National Parks
Stratigraphy of the Grand Canyon

I. Introduction:

A. Stratigraphy = study of rock units (layers) to determine geologic history of a region.

1. rock types give 'environment'
2. Structures such as faults, and unconformities along with rock types indicate events in time.
3. Ages (absolute and relative) provide timing of events
 - more on history of Grand Canyon region below

B. Recall: Rocks exposed on the walls of Grand Canyon span immense amount of time

1. Precambrian (~1.75 Ga) Through Permian (~250 Ma)
2. That is ~ 1.5 Ga of geologic history recorded in the walls of the Grand Canyon

II. Stratigraphic Profile of Grand Canyon

A. Precambrian Basement

1. Vishnu Schist intruded by Zoroaster Granite (~1.75 Ga)
2. Unconformably overlain (in places, not everywhere) by Grand Canyon Super Group
 - Sedimentary sandstones and mudstones (~800 Ma)
3. Precambrian normal faults expose the GC Super Group

B. Paleozoic Succession

1. Cambrian Tonto Group
 - a. Tapeats Sandstone unconformably overlies the basement
 - i. 550 Ma sandstone forms cliff above the Basement rocks
 - ii. Great unconformity represents ~1.2 to 250 Ma of non-deposition
 - duration depends on whether or not the GC Super Group is present.
 - b. Bright Angel Shale – easily eroded forms a sloped plain
 - c. Muav Limestone on top – forms cliffs.
2. Temple Butte Limestone - Devonian period (~400 Ma)
 - a. Unconformably over the Tonto Group
 - b. Major cliff forming rock

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3. Redwall Limestone – Mississippian period (330 Ma)
 - a. major cliff former averaging 500 feet thick
 - b. stained red from rainwater flowing from overlying shales
 - c. erosion and caves forming on top surface
4. Supai Group – Pennsylvanian to Permian period (~320 to 290 Ma)
 - a. 6-700' thick sandstones and interbedded siltstones
 - b. Forms distinctive 'stair-stepped' cliffs and ledges
5. Hermit Shale Permian
 - red, slope forming
6. Coconino Sandstone – Permian
 - 400' thick, cross-bedded
7. Toroweap Formation – Permian
 - 200' thick interbedded limestone, sandstone and gypsum
8. Kaibab Plateau – Permian
 - a. Massively bedded – cliff forming
 - b. 300' thick
9. Quaternary (~1 Ma) basaltic Lavas flow over the plateau and some into the western part of the canyon.