Geography of the Grand Canyon

Such a large feature, it is visible from space.

Grand Canyon is on the Colorado Plateau

- Colorado Plateau
  - West of Rocky Mountains
  - Large area composed of many smaller plateaus
The Grand Canyon

- 227 river miles
- >1 mile (1.6 km) deep
- Width = 9-18 miles (14-29 km)
- Rocks exposed in the canyon span ~1.75 Ga of Earth History! (Precambrian through Permian)

Major John W. Powell

- First non-native to explore the canyon
- Rafted down with 10 men
- Assumed he wouldn’t die going over a huge fall
Grand Canyon Area in Detail:

- North rim at 8900’ is ~1200’ higher than South Rim (6900’)
- North Rim is in Canadian Ecologic Zone - Aspen, fir, blue spruce.
- South Rim is in Upper Sonaran Eco. Zone - juniper, pinon pine.
- Canyon floor and Plateaus dip to south: river flows on south side and greater erosion on the North side.

Regulation of Colorado River: Glen Canyon Dam, 1966

- This cuts-off sediment supply to Colorado River
- Prevents cold spring pulses.
- Prevents fluctuations in river levels
- These results all negatively effect the ecology of the river
  - Loss of bars and beaches, disruption of aquatic life cycles, etc.
West end of Park is Lake Mead and Hoover Dam (1935)

- Controls lower Colorado River - problems here too.

Tectonics of Colorado Plateau
Cutting of the Grand Canyon

- Processes of
  - Channel down-cutting
  - And Mass wasting

Channel Down-Cutting

- Sediment in river scours the channel
- Not the water!
- Most efficient during flood - fast, lots of sediment.
**Widening of the river valley**

- Mass wasting of the channel walls widen the valley as the river downcuts.
- Co. Plateau is Arid. So, water doesn’t play a big roll here.
- Wasting of the Canyon walls is controlled in part by joints in the rocks.

**Joints = fractures in the rock**

- Caused by expansion of rock by unloading during uplift.

Joint bounded blocks fall, widening valley and adding sediment to the stream.
Differential Weathering produces ‘stair-step’ of Canyon walls

- Thickly bedded layers have wide spacing
  - Forms few large blocks
  - Results in tall cliffs
- Thinly bedded layers have close spacing
  - Forms many small blocks
  - Result in sloped surface

- Resistant beds form cliffs: Strong Limestones and Sandstones
- Weaker beds form slopes: Shales
- Strong basement rocks (igneous and metamorphic) form the steep inner gorge

Headland Erosion results from down-cutting and widening (river cuts valley upstream)