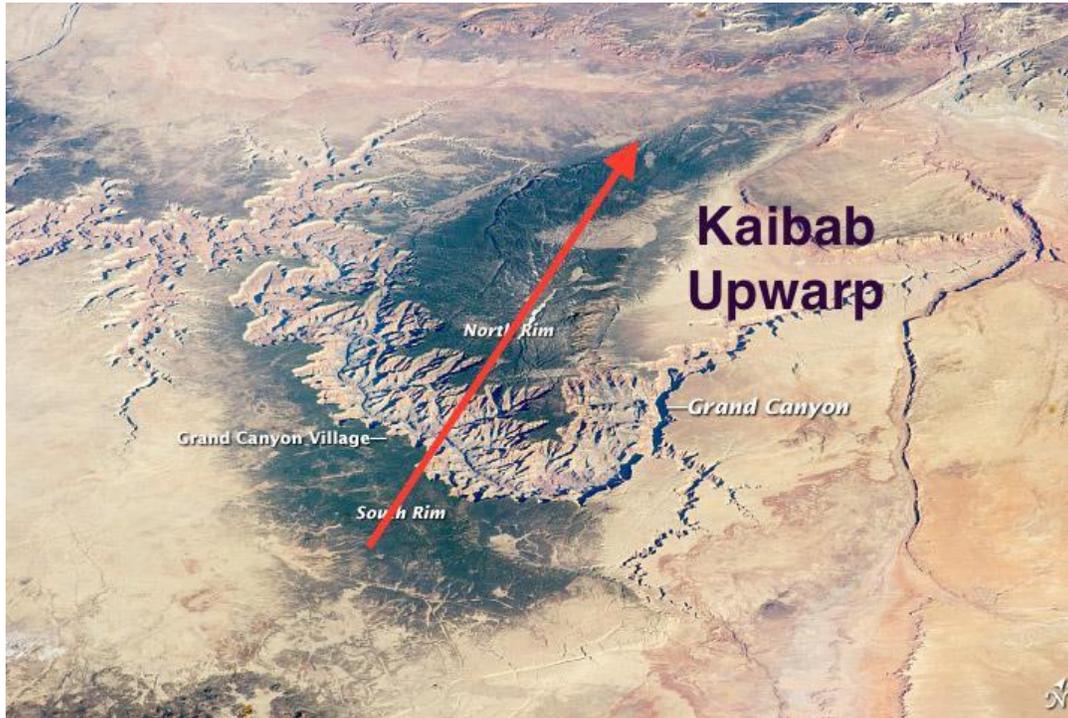


# Grand Canyon Geomorphology: Origin of the Grand Canyon

⚠ This is a preview of the published version of the quiz

Started: May 18 at 4:43pm

## Quiz Instructions



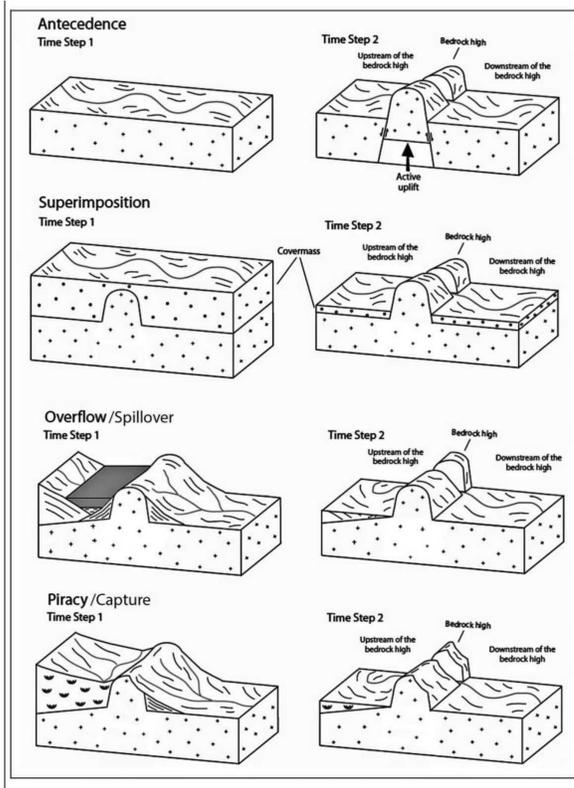
**How did the Colorado River start (come into existence in the Grand Canyon area and start to erode downward)?**

The answer to this question has to explain how the Colorado River was able to cut through a mountain. The image above from the International Space Station shows a forested region of higher elevation topography that the Grand Canyon splits into two parts. The darker green forest identifies the location of a geological feature that formed about 50 to 80 million years ago in the “Laramide Revolution” when the entire Colorado Plateau was uplifted. This “Kaibab Upwarp” is a very large mountain, and the Colorado River cuts right through this mountain in the core of the Grand Canyon between the North Rim and the South Rim.

There are only four ways that rivers can cross geological uplifts (mountains) like the Kaibab Upwarp.

- John Wesley Powell thought that the Colorado River was **antecedent**, in that it predated the uplift that took place between 50 and 80 million years ago (Laramide Revolution).
- Arthur Strahler suggested that some aspects of **superimposition** could apply in the Grand Canyon, although not getting across the Kaibab Upwarp. Superimposition requires that the river be older (predate) the laying down (superimposition) event.

- Newberry, Blackwelder, and then John Douglass and Norman Meek all think **lake overflow** caused the Colorado River to be born.
- Many different investigators favor **piracy** by headward incision or groundwater sapping.



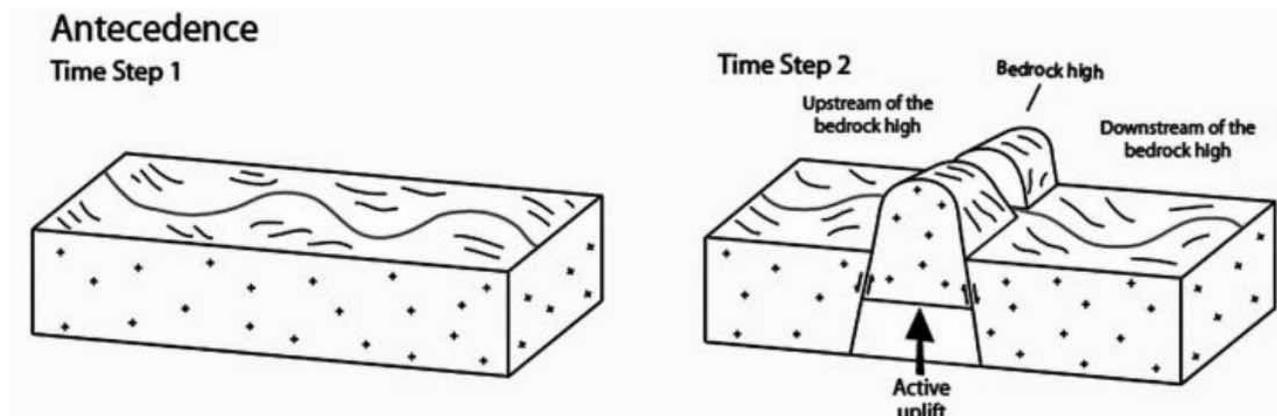
The GPH 211 class that has an assignment that goes into detail on the subject of this lab. This lab does oversimplify things a lot, but hopefully gets you more interested.

Recent research conducted by the Arizona Geological Survey and colleagues have done award-winning research in establishing when the **Colorado River came into existence (about 4.8 million years ago)**. In brief, before the Colorado River came into existence, there were a series of closed depressions between present-day Arizona and Nevada-California sometimes forming lakes with deposits at the bottom. The first influx of river water into these lakes started about 4.8 million years ago. As Dr. Jon Spencer concludes in this article: "Rapid incision of the Grand Canyon began at this time."

The following 3 questions should be easy. That is if you read them carefully and watch the video fully associated with the third question.

### Question 1

1 pts



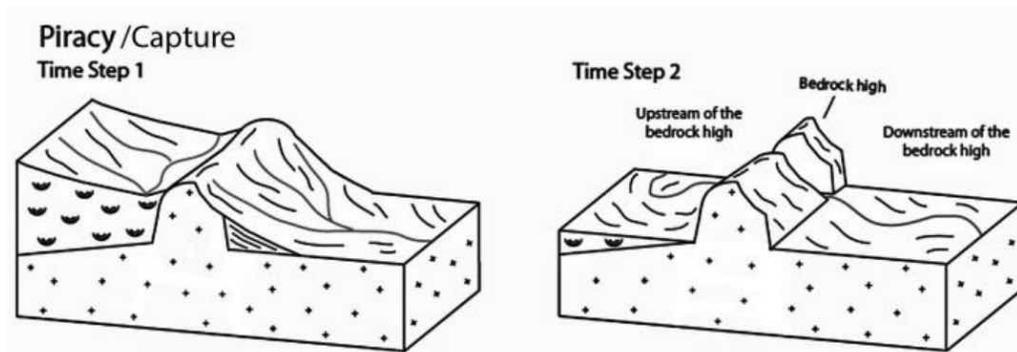
John Wesley Powell's idea of antecedence (that the Colorado River existed before the uplift of the Kaibab Upwarp) and simply cut the Grand Canyon as the uplift occurred requires that the river be \_\_\_\_\_ than the mountain it cuts

through. However, the age of the Kaibab Upwarp is \_\_\_\_\_ older than the 4.8 million year age origin for the Colorado River. Select the best answer

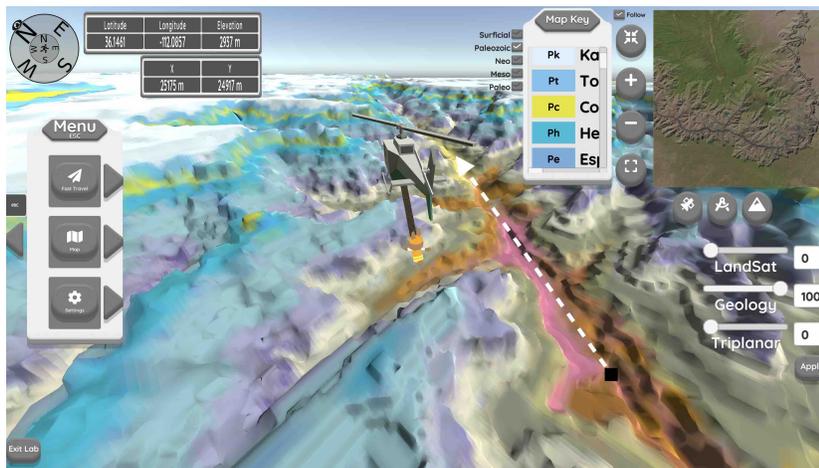
- older; much
- younger; not
- about the same age; much
- older; not

**Question 2**

1 pts

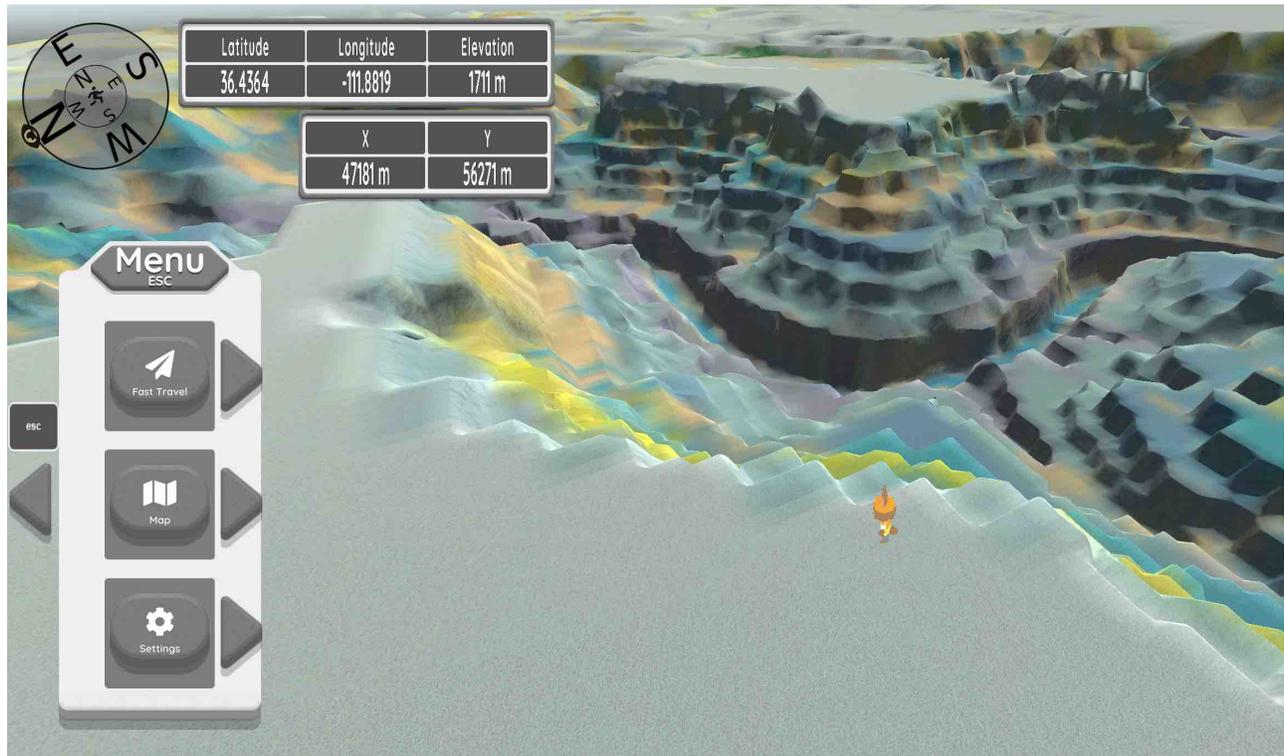


The idea of piracy by headward erosion of a stream back up into the highlands is an idea that many people propose. However, this lab covered exactly how headward erosion works in the Grand Canyon area by exploring Bright Angel Canyon. Bright Angel Creek did practice headward extension, but headward extension always uses whatever weaknesses are available. In the case shown below, there was a pre-existing fault -- the Bright Angel fault. The river simply went up the fault.



In contrast, the Colorado River did not "go up" the Bright Angel fault or any other faults. It ignored all the faults when its course was established. In fact, there are several sections with nice meanders (e.g. Marble Canyon below) that are more typical of a big floodplain that was "laid down" in place (as the river incised). Headward erosion streams do not

cut meandering canyons.



QUESTION: What 2 characteristics of the Colorado River's pathway through the Grand Canyon make it unlikely that headward erosion via piracy was involved in the formation of the Grand Canyon?

- not using fault weaknesses; meandering river pattern
- Don't select this answer

### Question 3

1 pts

Please watch this video on the origin of the Grand Canyon. It helps introduce the reality that we still do not know very much about the canyon, despite over 100 years of study! Dr. John Douglass is a graduate of Arizona State University and is now a professor at Paradise Community College. He is a world expert on the origin of the Grand Canyon. He does a nice job of trying to simplify one of the hypotheses for how the Grand Canyon formed.

Lake Bidahochi Spillover Theory for Grand Canyon Formati...



QUESTION: What experimental method does Dr. Douglass use to advocate for his hypothesis of lake overflow?

- physical modeling experiment
- computer modeling experiment
- numerical modeling experiment
- chemical modeling experiment

Not saved

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