

Grand Canyon Geomorphology: Rates of Change Part 1

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

Started: May 18 at 4:43pm

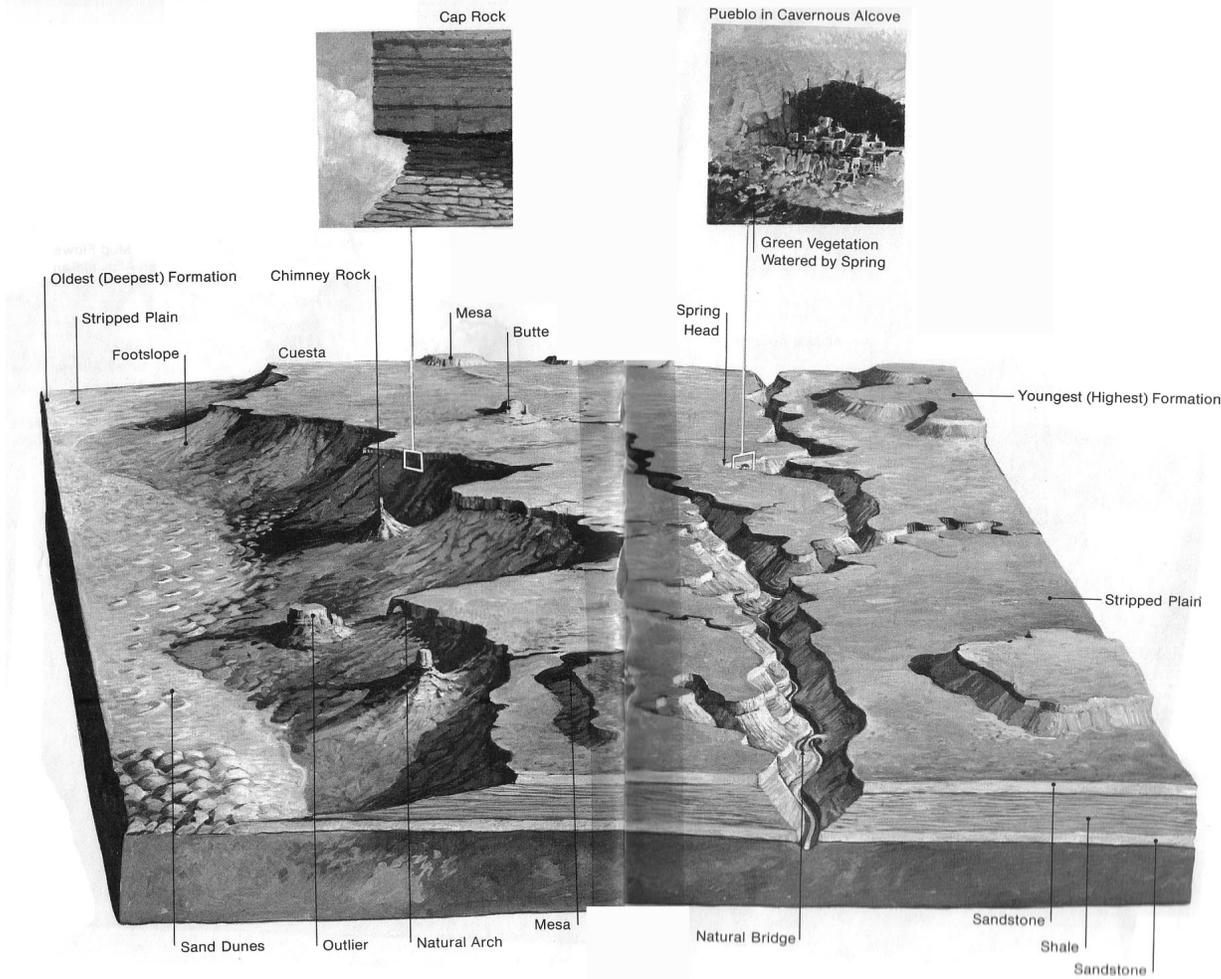
Quiz Instructions

VIDEO OVERVIEW OF RATES OF CHANGE PART 1 AND 2:

Rates of Change 1 and 2: Overview of these Grand Canyon Geomorp...



Desert Landscape Formed by Erosion of Sedimentary Rock



The landscape of the Colorado Plateau (Four Corner's region) is a wonder and well worth exploring in person. This graphic by T.M. Oberlander is a nice visualization for you to think about when considering the idea of this lab: how the balance between three types physical geography processes impact the type of landscape that develops.

Specifically, this lab tasks you to predict what sort of landscape would occur if one type of erosion or another was fast or slow. The questions will be based on the Grand Canyon geovisualization. This is a "part 1 lab" that is qualitative/conceptual in nature. Then, the next "part 2 lab" will be where you actually test your prediction by measuring rates of erosion.

So what are the 3 categories/types of geomorphic processes that you will be analyzing? They are presented by way of example below.

| Type of erosion | Example | What if this was the fastest process? |
|--|---|--|
| 1) Erosion of the plateau landscape - in a downward direction, reducing the elevation of the plateau |  | Weak rock (like shale) will erode very fast (e.g. Painted Desert). No deep canyons could exist here. Everything is eroding too fast for canyon formation. You see fast eroding small hills called badlands topography. |
| 2) Incision of a river downward - cutting a | | The landscape to the left in Marble Canyon is what happens |

canyon



when river incision is faster than the other types of processes. You get a deep and narrow canyon.

3) Widening of a canyon
- by landsliding and development of tributary canyons

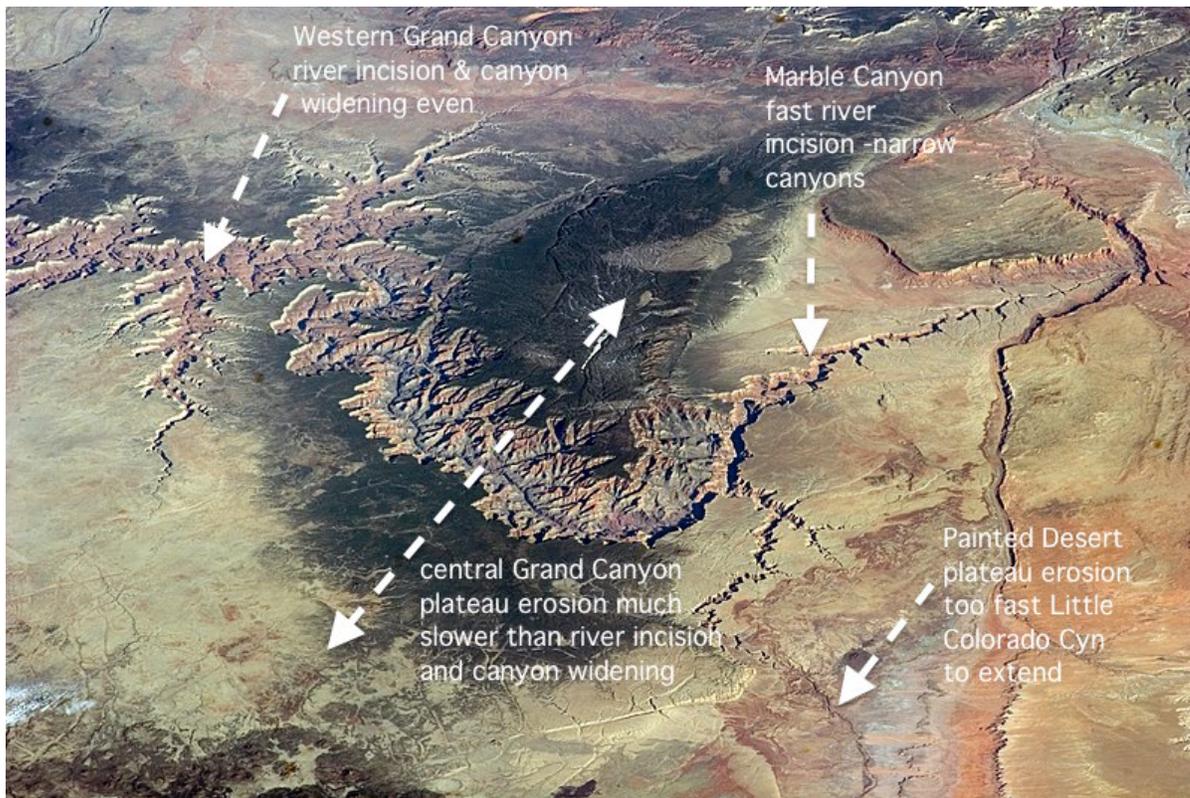


Where the speed of canyon widening is faster than incision, a broad and wide canyon exists. But the speed of widening can slow down. Both conditions happened at Marble Canyon.



In the western Grand Canyon to the left, rates of incision and widening are similar, as canyon depth is similar to canyon width

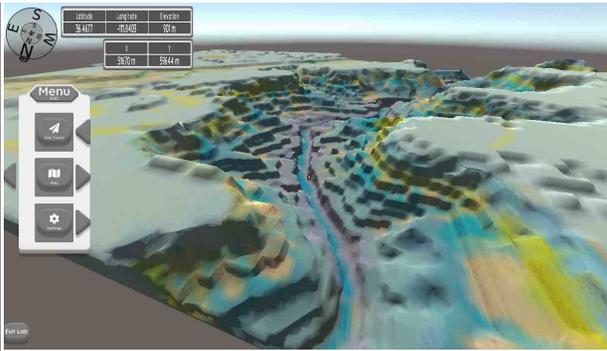
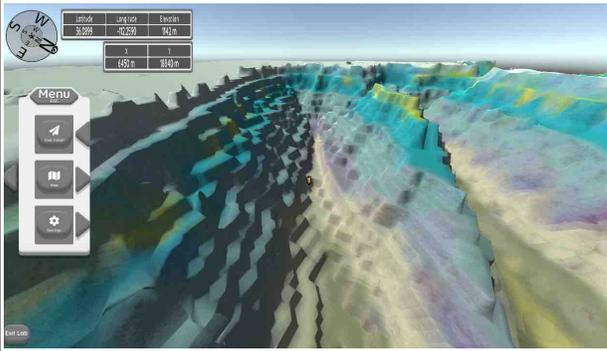
This idea of this lab is for you to interpret landscapes of the Grand Canyon seen in the geovisualization, using the above thinking (called a conceptual model). The view below taken from the International Space Station is the setting for the Grand Canyon geovisualization; in the annotations, you can see different model scenarios highlighted.



The format of the questions are all the same. You Fast Travel to a particular location. You change the in game camera to look around. You move the avatar to look around, and you interpret the scene with the following options illustrated by the following examples.

The fact that the plateau is everywhere surrounding the Grand Canyon suggests that the rate of plateau lowering (downward erosion and sometimes called denudation) is MUCH lower than the rate of canyon incision (or widening). If it was eroding faster, there would be no canyon! But you will test this interpretation in the next lab.

| Coordinates for Fast Travel | In game screenshot | Answer & explanation |
|-----------------------------|--------------------|--|
| 36.3095 -112.3053 | | If you look to the left (west) and to the right (east) of the avatar up at the top of the plateau (light blue Kaibab Limestone), you can estimate that the canyon width is about the same as the canyon depth. ANSWER: rate of widening and incision about the same, and rate of plateau erosion much lower |
| 36.4677 -111.8403 | | If you look to the left (east) and to the right (west) of the avatar up at the top of the plateau (light blue Kaibab Limestone), you can estimate that the canyon width is a bit wider than the depth ANSWER: rate of widening is slightly more than rate of incision, and much |

| | | |
|----------------------|---|---|
| |  | more than the rate of plateau erosion |
| 36.0899 -112.2590 |  | <p>If you look to the left (south) and to the right (west) north the avatar up at the top of the plateau (light blue Kaibab Limestone), you can estimate that the canyon depth is a bit more than the canyon width</p> <p>ANSWER: rate of widening is slightly less than rate of incision, but still much more than the rate of plateau erosion</p> |

Question 1

2 pts

Travel to these coordinates: 36.1028 and -112.2667

Zoom the camera away from the avatar to get a good look around at the landscape.

Then, determine whether plateau erosion downward, river incision downward, or canyon widening is faster or slower (or similar to) the other processes.

- Canyon depth is appears to be more than canyon width, and so the rate of incision is faster than the rate of widening. However, the rate of plateau lowering is much much less than canyon incision or widening.
- Canyon depth is roughly similar to canyon width, and so rates of widening and incision are similar. However, the rate of plateau lowering is much much lower than canyon incision or widening.
- Canyon depth is much bigger than canyon width, and so rates of widening is faster than incision However, the rate of plateau lowering is much much more than canyon incision or widening.
- The other choices just don't feel right. So I am going to pick this one because its different. I always pick the "odd person out" answer, even if the choice doesn't usually work for me.

Question 2

2 pts

Travel to these coordinates: 36.1545 and -111.9733

Zoom the camera away from the avatar to get a good look around at the landscape.

Then, determine whether plateau erosion downward, river incision downward, or canyon widening is faster or slower (or similar to) the other processes.

- Canyon depth is appears to be more than canyon width, and so the rate of incision is faster than the rate of widening. However, the rate of plateau lowering is much much less than canyon incision or widening.
- Canyon depth is much bigger than canyon width, and so rates of widening is faster than incision However, the rate of plateau lowering is much much more than canyon incision or widening.
- Canyon depth is much less than canyon width, and so rates of widening is faster than incision However, the rate of plateau lowering is much much more than canyon incision or widening.
- Canyon depth is about the same as canyon width, and so rates of widening is faster than incision. However, the rate of plateau lowering is much much more than canyon incision or widening.

Question 3**2 pts**

Travel to these coordinates: 36.1960 and -111.7665

Zoom the camera away from the avatar to get a good luck around at the landscape.

Then, determine whether plateau erosion downward, river incision downward, or canyon widening is faster or slower (or similar to) the other processes.

- Canyon depth is roughly similar to canyon width, and so rates of widening and incision are similar. However, the rate of plateau lowering is much much lower than canyon incision or widening.
- Canyon depth is much bigger than canyon width, and so rates of widening and incision are similar. However, the rate of plateau lowering is much much lower than canyon incision or widening.
- Canyon depth is much less than canyon width, and so rates of widening and incision are similar. However, the rate of plateau lowering is much much lower than canyon incision or widening.
- Canyon depth is much bigger than canyon width, and so rates of widening is faster than incision However, the rate of plateau lowering is much much more than canyon incision or widening.

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