

# Grand Canyon Microclimatology: Helicopter Data Tour

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

Started: May 18 at 4:38pm

## Quiz Instructions

Your task for this section is to make a transect up around the Grand Canyon and observe the distribution of plant cover (NDVI), temperatures, and seasonal changes using the helicopter feature. A traditional way of gathering data in physical geography is to make observations along a line between two places, called a transect.

### Question 1

2 pts

Fast travel to 36.1795 , -111.8014. Take a helicopter ride west to 36.0359, -111.8373. Along the path, observe the summer temperature variations along the bottom of the canyon. What major observations can you see, and why do you think the temperature variability looks the way it does?

- The bottom of the canyon (the river) is much cooler than the surrounding cliffs and platforms - this is likely due to the evaporative cooling and the cool temperature of the river itself.
- The bottom of the canyon (the river) is much warmer than the surrounding cliffs and platforms - this is likely due to the evaporative cooling and the cool temperature of the river itself.
- The bottom of the canyon (the river) is much warmer than the surrounding cliffs and platforms - this is likely due the significant tree canopy that exists at the bottom of the canyon here.
- The bottom of the canyon (the river) is much cooler than the surrounding cliffs and platforms - this is likely due to ice forming along the top of the river.

### Question 2

2 pts

You hopefully have made some good observations on the orientation of slopes and how the shape of the topography influences temperature. Sometimes though, seasonal changes and topography can make for some interesting observations.

Fast travel to 36.3408 , -112.1180 and take a helicopter tour along a shallow valley along the North Rim towards 36.4454, -112.1410. Toggle between winter and summer temperatures as you fly across the North Rim

What summer and winter temperature observations can you make along this shallow valley?

- The valley is typically warmer in the summer but cooler in the winter compared to surrounding hills
- The valley is typically warmer for both seasons compared to surrounding hills
- The valley is typically cooler for both seasons compared to surrounding hills
- The valley is typically cooler in the summer but warmer in the winter compared to surrounding hills

### Question 3

2 pts

The data for the winter and summer temperature layers come from a Landsat satellite image taken during a specific time of day.

Fast travel to 36.0230, -112.0635 and toggle between winter and summer as you take a helicopter ride to 35.9991, -111.9302. Based on the location of the sun throughout the day (as it travels from east to west across the canyon), what time of day best explains the temperature differences you see along the cliffs of the South Rim?

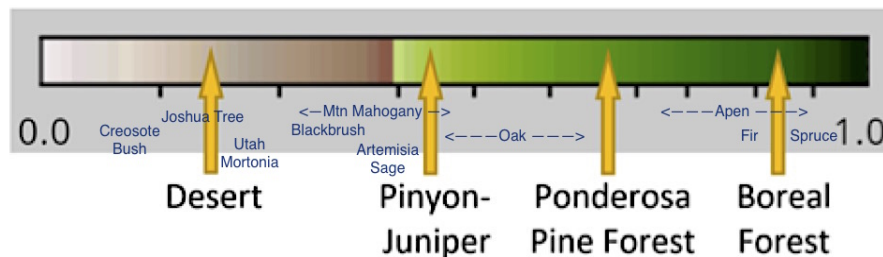
- Morning (10am)
- Night (2am)
- Afternoon (4pm)
- Night (11pm)

#### Question 4

2 pts

Change the data layer to show NDVI (vegetation).

The NDVI vegetation layer is displaying information called Normalized Difference Vegetation Index (NDVI) quantifies vegetation by measuring the difference between near-infrared (which vegetation strongly reflects) and red light (which vegetation absorbs). On land, NDVI typically ranges from 0 to 1. When you are playing the video game, and you click on the NDVI to show biomass, this scale will be useful in interpreting the plants that are growing:



The lower limit of trees in mid-latitude settings like mountainous terrain of the western USA is typically controlled by a combination of the amount of precipitation, the seasonality of the precipitation, and how hot it gets in the summer. Also important is aspect (the direction a slope faces).

Fast travel to x. Then, take a helicopter ride across the canyon to the North Rim. Along the way, observe the differences in the location of the NDVI layer, with respect to the depth of green vegetation found along the ride. How do north facing slopes compare to south facing slopes regarding the treeline into the canyon?

- North facing slopes (like those found along the South Rim) have treelines deeper into the canyon compared to south facing slopes (like those along the North Rim)
- South facing slopes (like those found along the North Rim) have treelines deeper into the canyon compared to north facing slopes (like those along the South Rim)
- There is no real difference between north and south facing slopes with respect to treelines into the canyon
- The main difference is found at the bottom of the canyon, with both north and south facing slopes along the river having the highest NDVI values

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