# Grand Canyon Microclimatology: Biomes

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

Started: May 18 at 4:39pm

# Quiz Instructions

**Mixed Conifer Forest** (above 2400m): Located only on the North Rim, this community is the highest and coolest in the park. Life here adapts to an extreme winter climate.

- Summer temperatures: 75°F (24°C)–44°F (7°C)
- Winter temperatures: 39°F (4°C)–17°F (-8°C)
- Precipitation: Averages 25 inches (64 cm) per year, including 11 feet (3.5 m) of snow

**Ponderosa Pine Forest** (2100-2400m): These forests thrive on the North Rim and South Rim, acting as a transition zone between the mixed conifer forest and pinyon-juniper woodland. Air temperatures are slightly cooler and precipitation is slightly greater than the pinyon-juniper woodland.

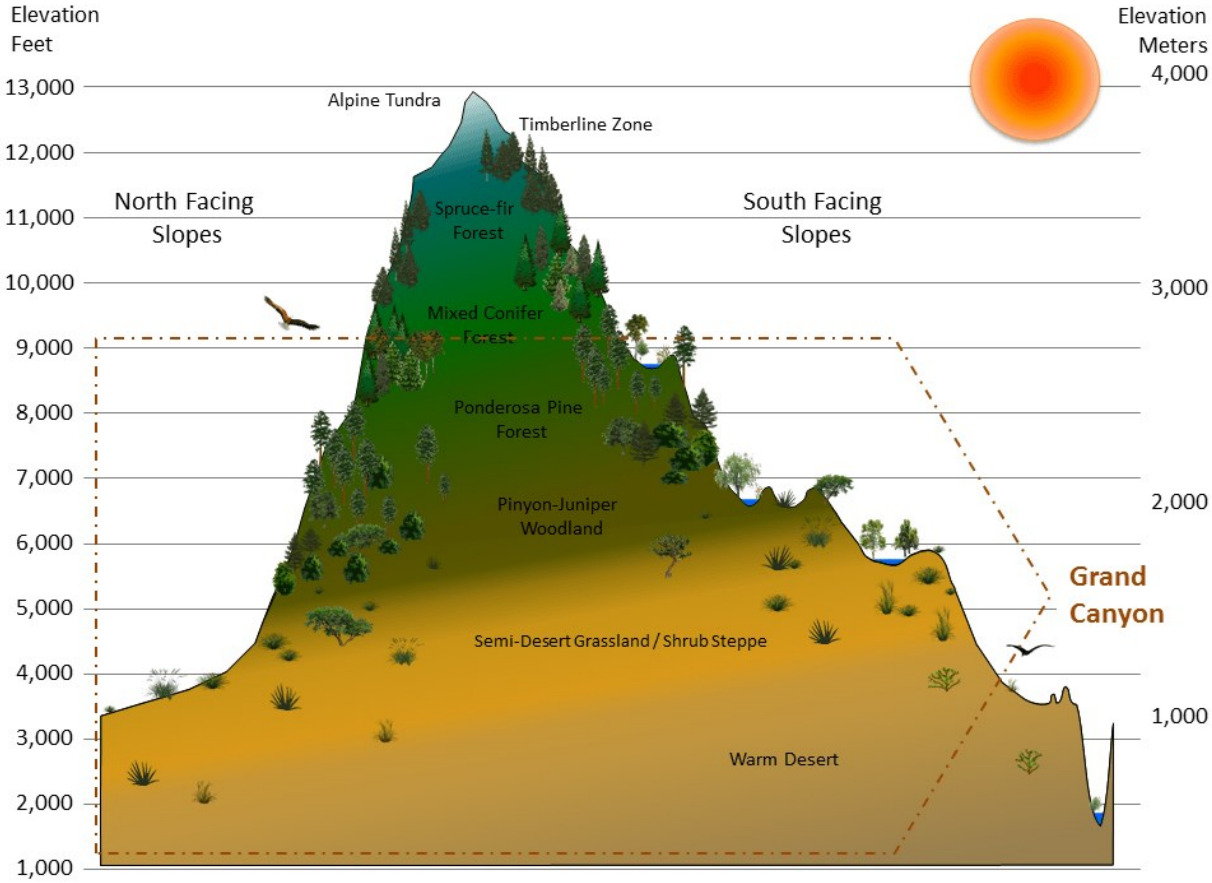
**Pinyon-Juniper Woodland** (1500-2100m): Thin soils here hold little water, and with less precipitation (between 10 and 15 inches annually) and warmer temperatures than along the canyon rim, the pinyon and juniper trees here grow short and gnarled.

- Summer temperatures: 82°F (28°C)–50°F (10°C)
- Winter temperatures: 44°F (7°C)–20°F (-7°C)
- Precipitation: Averages 15 inches (38 cm) per year, including 5 feet (1.5 m) of snow

**Desert Scrub** (700-1500m): Found down inside Grand Canyon, this is the hottest and driest community. Life here adapts to extreme heat and a very dry climate.

- Summer temperatures: 103°F (39°C)–74°F (23°C)
- Winter temperatures: 58°F (14°C)–32°F (-0°C)
- Precipitation: Averages 9 inches (23 cm) per year, including 2 inches (5 cm) of snow

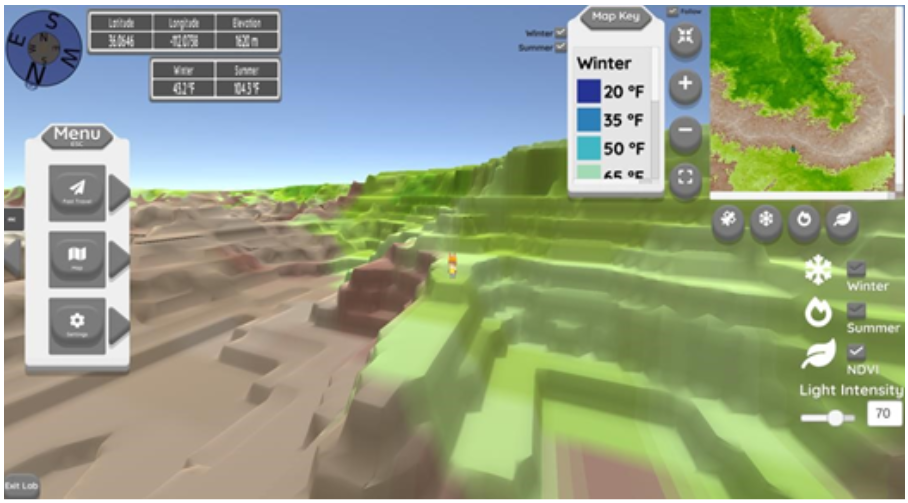
Remember, it's a bit more complicated than that though. These habitat zones cover a wide elevation gradient, a result of the north/south facing slopes of the canyon walls. Locations on the south facing walls receive more direct sunlight and encounter higher temperatures and greater evaporation than north facing locations. This allows for cooler habitat zones to exist lower in elevation on north facing walls of the canyon, while habitat zones on the south face exist at a higher elevation. For example, on the south facing side of the canyon, the pinyon-juniper woodland's range is between roughly 1800 – 2100 meters (6800-6000 feet), while on the north face, this habitat zone extends from roughly 1500 – 1900 meters (6200-5000 feet).

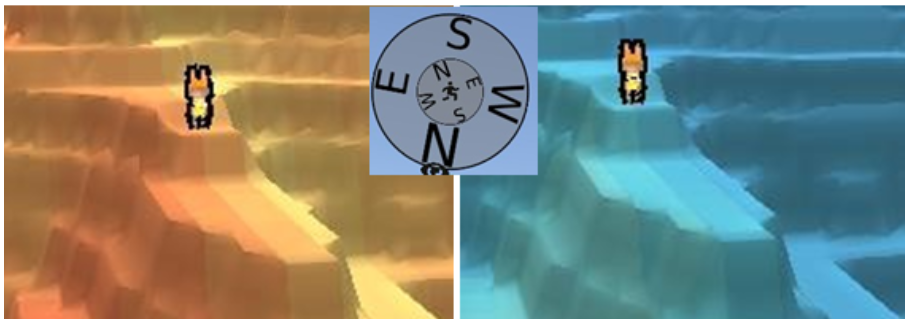



For this quiz, we will look at hypothetical meteorological stations in and just above the Grand Canyon used in this lab. Some of the information will come from the geovisualization (bold font in table below). Some will come from information supplied to you in a question. You will be tasked with analyzing the data at these locations, as well as determining the biomes and their major bioclimatic attributes and stresses.

**EXAMPLE QUESTION:**

What is the basic climate-vegetation relationship that you can observe at the Cedar Ridge station from the geovisualization and information supplied in the question? Select answer that best matches the available information.

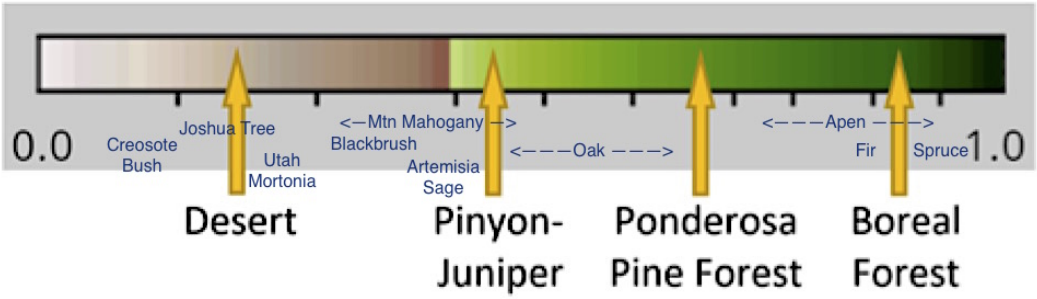


*CEDAR RIDGE*
Location: 36.0646° -112.0738°

Elevation as determined in the geovisualization: 1620m

NDVI: The biomass scale (NDVI) in the game screenshot below matches the vegetation survey information. The color is not a dark green of a dense forest. Neither is it a brown of no trees. The site is near the lower elevation where you would find trees on the south rim, in the pinyon-juniper NDVI category.



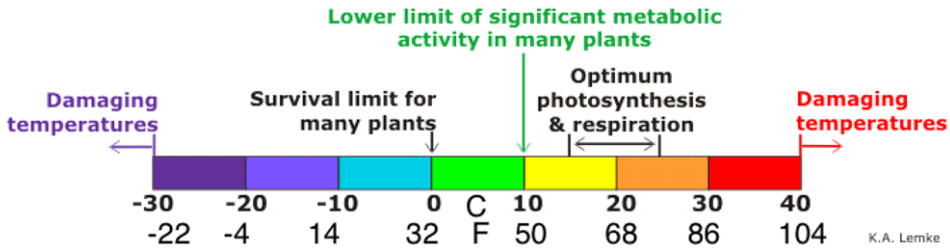

Surface Temperature as determined in the geovisualization:
104.3F SUMMER / 43.2F WINTER

Cedar Ridge Climate variables:

| CEDAR RIDGE | Jan | Feb | Mar | Apr | Ma y | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Temperature Max | 46. 8 | 50. 4 | 57. 8 | 65. 9 | 76.4 | 86. 9 | 90. 3 | 86. 8 | 80. 0 | 68. 0 | 55. 6 | 46. 2 |
| Temperature Min | 26. 0 | 28. 3 | 33. 2 | 39. 4 | 47.3 | 54. 9 | 60. 6 | 58. 7 | 52. 3 | 42. 5 | 32. 9 | 26. 0 |
| Precipitation | 1.3 | 1.3 | 1.5 | 0.9 | 0.5 | 0.3 | 1.5 | 2.1 | 1.3 | 1.2 | 1.0 | 1.1 |

The graphic below from Professor Karen Lemke indicates that the freezing temperatures experienced in December through February can limit many plants, but that the maximum temperatures typically do not exceed damaging

temperatures However, surface temperatures might be different, and damaging temperatures might occur near the surface depending on the time of year.




## Question 1

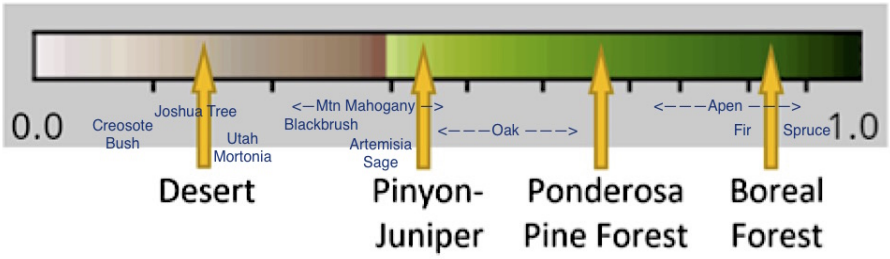
4 pts

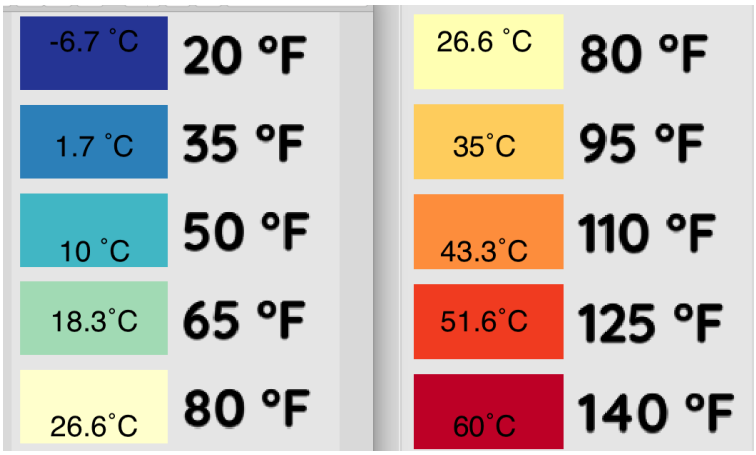
Fast travel to **36.2047° -112.0245°**. The image on the right is a representation of what you might see in-person at this location.

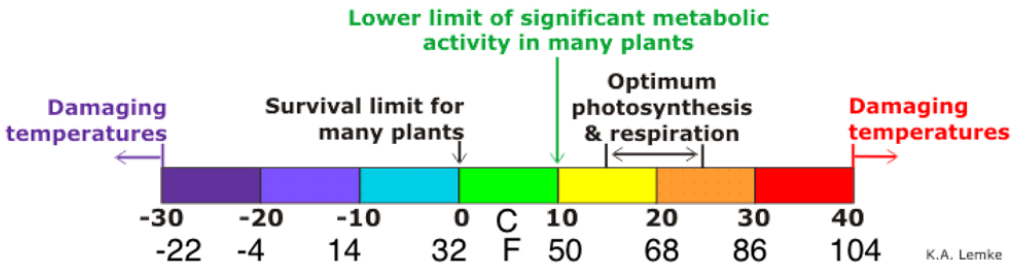
Using the data presented in the game and below, what biome are you visiting, and what are the basic climate-vegetation relationships that you can observe?

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Temperature Max | 48.0 | 51.6 | 59.0 | 67.1 | 77.6 | 88.1 | 91.5 | 88.0 | 81.2 | 69.2 | 56.8 | 47.4 |
| Temperature Min | 27.2 | 29.5 | 34.4 | 40.6 | 48.5 | 56.1 | 61.8 | 59.9 | 53.5 | 43.7 | 34.1 | 27.2 |
| Precipitation | 1.2 | 1.2 | 1.4 | 0.8 | 0.4 | 0.2 | 1.4 | 2.0 | 1.2 | 1.1 | 0.9 | 1.0 |

Remember to use the NDVI and temperature keys below to interpret the vegetation and temperature layers seen in the geovisualization, as well as the heat stress key to understand the stresses on plants from the air temperature in the climate data, as well as the surface temperature from the geovisualization.






**Fill in the paragraph below based on your observations and assessment of the climate and surface data.**

The site had an elevation of [ Select ] m has an NDVI biomass biome signal of [ Select ]. The mean annual precipitation is [ Select ] inches with about [ Select ] coming during the monsoon months of July through September. During winter, snow [ Select ]. The seasonal air temperature (from the climate table) extreme stresses endured by plants here are found during [ Select ]. The seasonal surface temperature extreme stresses (from the geovisualization) are found during [ Select ].

## Question 2

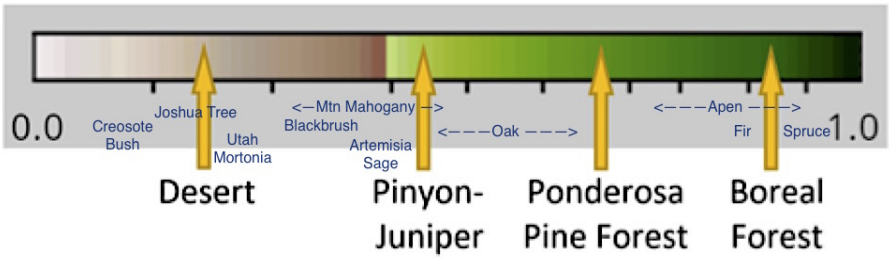
4 pts

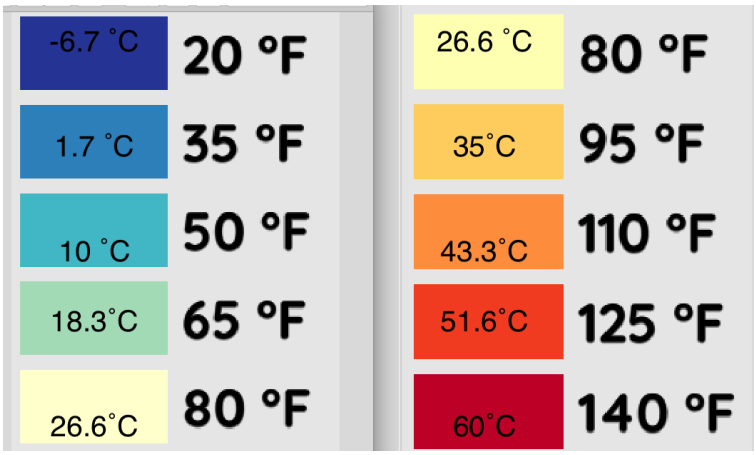
Fast travel to **36.1023° -112.0930°**. The image on the right is a representation of what you might see in-person at this location.

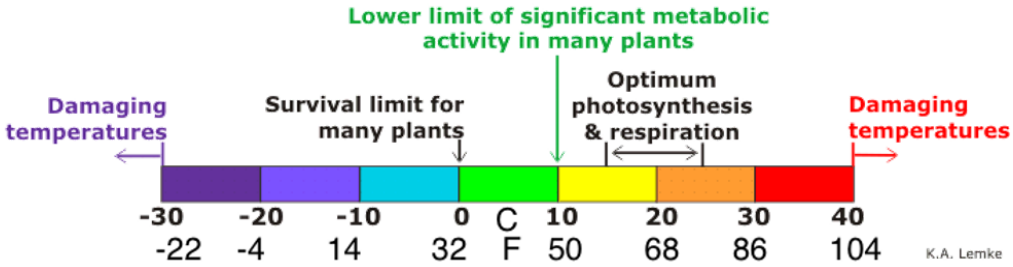
Using the data presented in the game and below, what biome are you visiting, and what are the basic climate-vegetation relationships that you can observe?

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Temperature Max | 57.7 | 64.1 | 73.3 | 82.4 | 92.7 | 102.8 | 105.7 | 101.9 | 95.2 | 82.1 | 67.8 | 56.6 |
| Temperature Min | 36.2 | 40.2 | 46.1 | 52.9 | 61.7 | 69.9 | 74.8 | 72.3 | 65.7 | 54.9 | 44.0 | 36.6 |
| Precipitation | 0.9 | 1.0 | 0.9 | 0.6 | 0.4 | 0.2 | 0.8 | 0.8 | 1.0 | 1.0 | 0.8 | 0.8 |

Remember to use the NDVI and temperature keys below to interpret the vegetation and temperature layers seen in the geovisualization, as well as the heat stress key to understand the stresses on plants from the air temperature in the climate data, as well as the surface temperature from the geovisualization.

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plants here are found during [ Select ] . The seasonal surface temperature extreme stresses (from the geovisualization) are found during [ Select ] .

Not saved Submit Quiz