
It's about time
To humans a million years seems unimaginably long, more than 10,000 lifetimes.
The Million Year Trail helps you make the shift from human to geologic time scales.
Find your birthday
As you walk the trail, think of all that happened before your time.
Talk about time as you walk the trail
• Decades - Your birthday is probably less than ten decades ago.
• Centuries - John Wesley Powell explored the Grand Canyon about 150 years ago.
• Millenia - Ancient peoples farmed the river bottom here about 1,000 years ago.
• 10,000s - It was much colder and wetter here twenty thousand years ago.
• 100,000s - Volcanoes erupted here hundreds of thousands of years ago.
• Millions! - The Grand Canyon is about 6 million years old.
The Million Year Trail
We stretch out time at the beginning so you can find your birthday. We squeeze time down at the end so you can see what happened without walking a million steps.
Imagine the number one million
A stack of 1 million quarters would be as high as the canyon is deep.
Grand Canyon Village
Deep Time Trail
You Are Here
Parking
Today
10
30
40
50
60
200
2,000
20,000
200,000
Million Year Trail
Yavapai Museum


People have lived here for 10,000 years
Today at least 12 different tribes call the Grand Canyon part of their homelands.
Over 5 million people visit each year.
150
John Wesley Powell
This early geologist first floated through Grand Canyon in 1869.
1,000
Ancestral Puebloans farmed the river bottom
These granaries were used to store corn, a staple crop of early Americans.
4,000
Paleo-Indians made split-twig figures
These 4,000 year old figures have been found in caves. They are some of the oldest human-made artifacts in the Grand Canyon.
10,000
Drawing of native people's hunting
10,000 year-old hunters
Nomadic peoples hunted large mammals that went extinct about 10,000 years ago.
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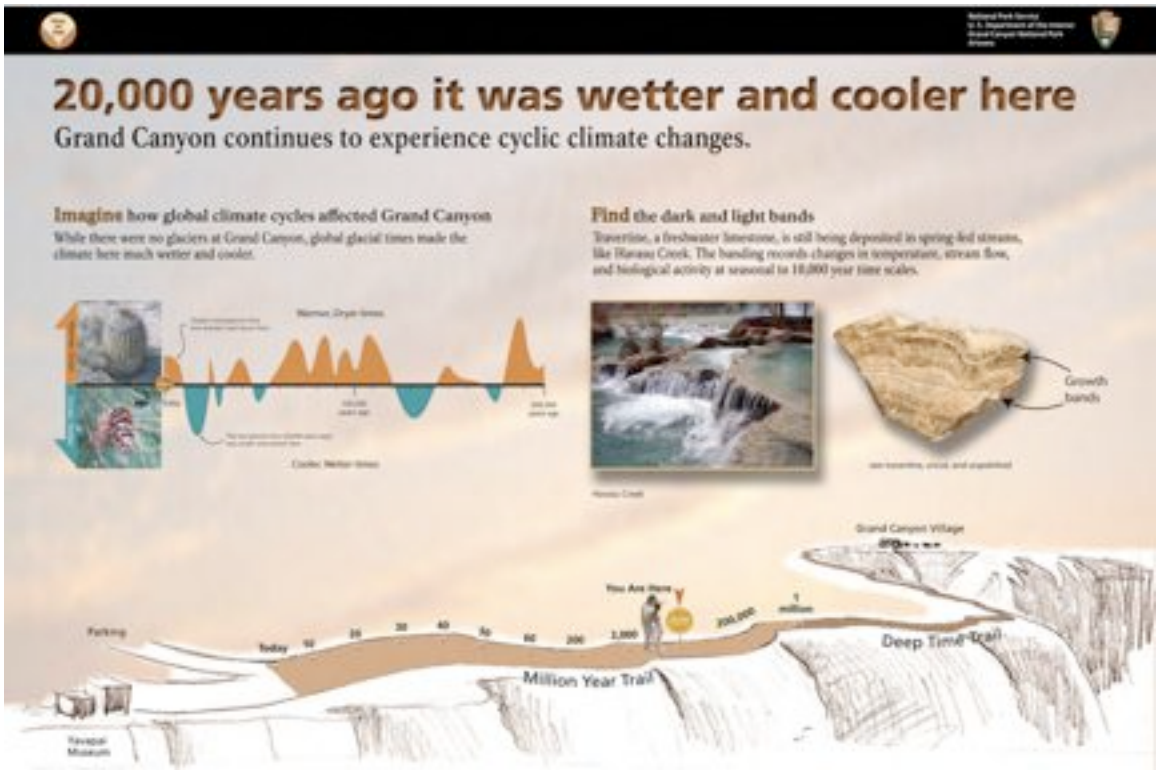
20,000 years ago it was wetter and cooler here
Grand Canyon continues to experience cyclic climate changes.
Imagine how global climate cycles affected Grand Canyon
While there were no glaciers at Grand Canyon, global glacial times made the climate here much wetter and cooler.
Find the dark and light bands
Travertine, a freshwater limestone, is still being deposited in spring-fed streams, like Havasu Creek. The banding records changes in temperature, stream flow, and biological activity at seasonal to 10,000 year time scales.
Growth bands
Grand Canyon Village
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200,000
1 million
Deep Time Trail
Million Year Trail
Yavapai Museum


Eruptions and earthquakes could happen here again
In the last million years, and continuing today, volcanoes, earthquakes, and erosion work together to shape this spectacular landscape.
Lava dams at Grand Canyon
Volcanoes erupted into Grand Canyon 100 kilometers (60 miles) west of here and temporarily dammed the river.
A timeline of volcanism
900-650 thousand years ago
200-350 thousand years ago
1-100 million years ago
Imagine viewing an eruption!
Pottery fragments have been found in1,000 year old lava flows suggesting that people witnessed these eruptions.
Pottery shard
Find the location of recent Grand Canyon earthquakes
Earthquakes have rattled the region repeatedly and continue to do so.
You Are Here
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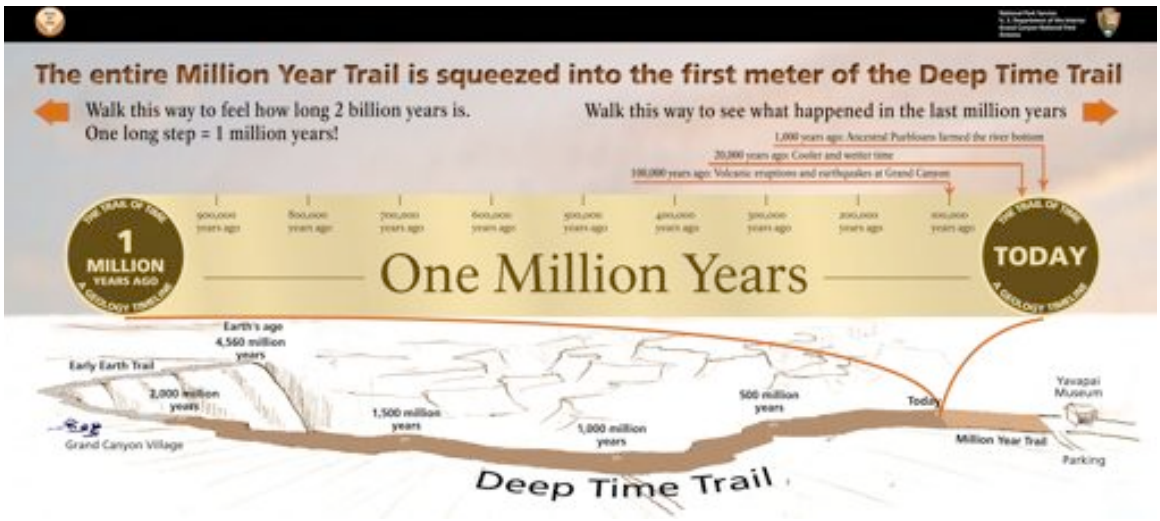
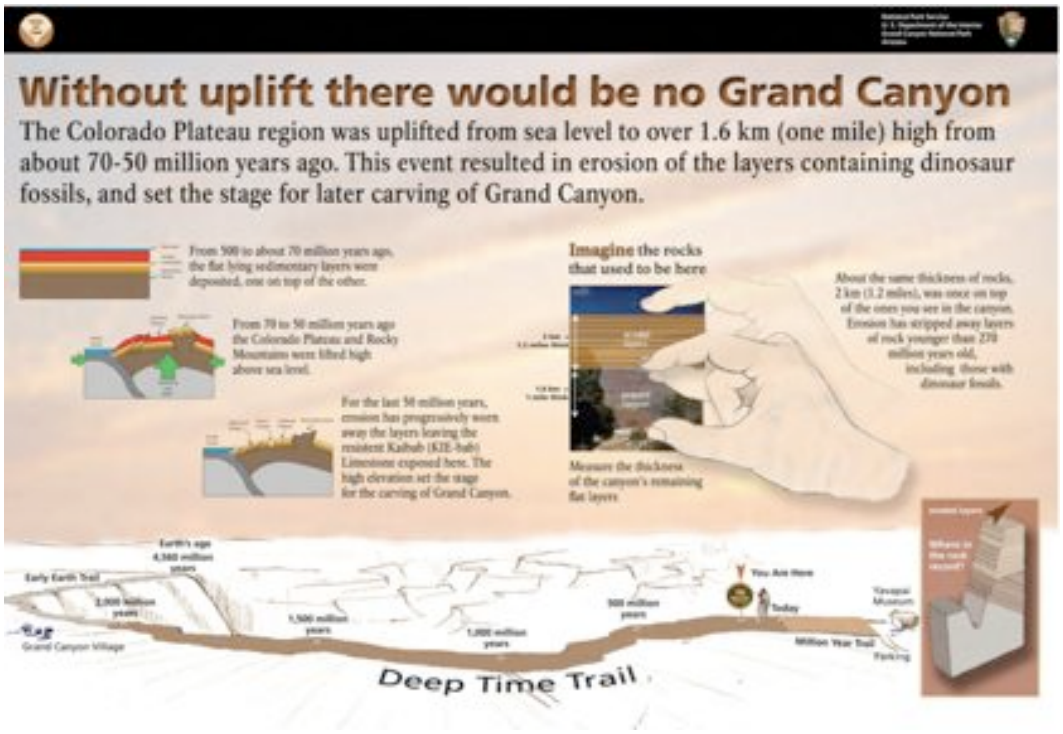
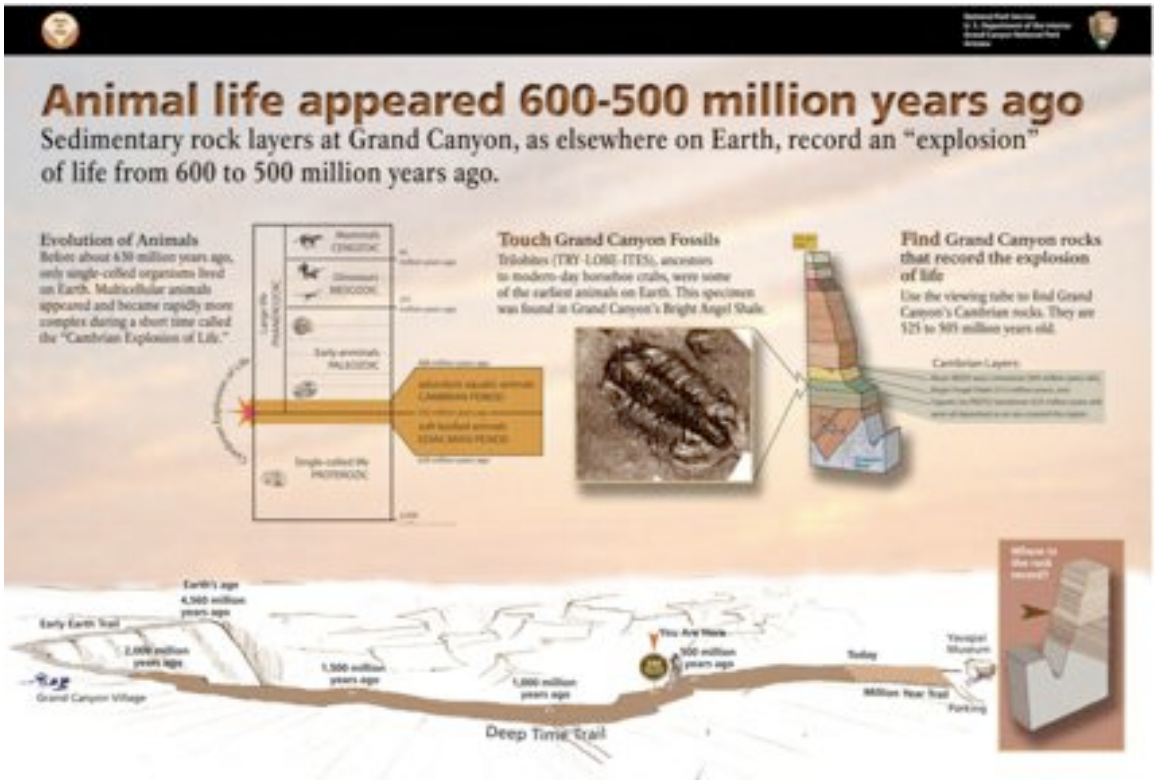
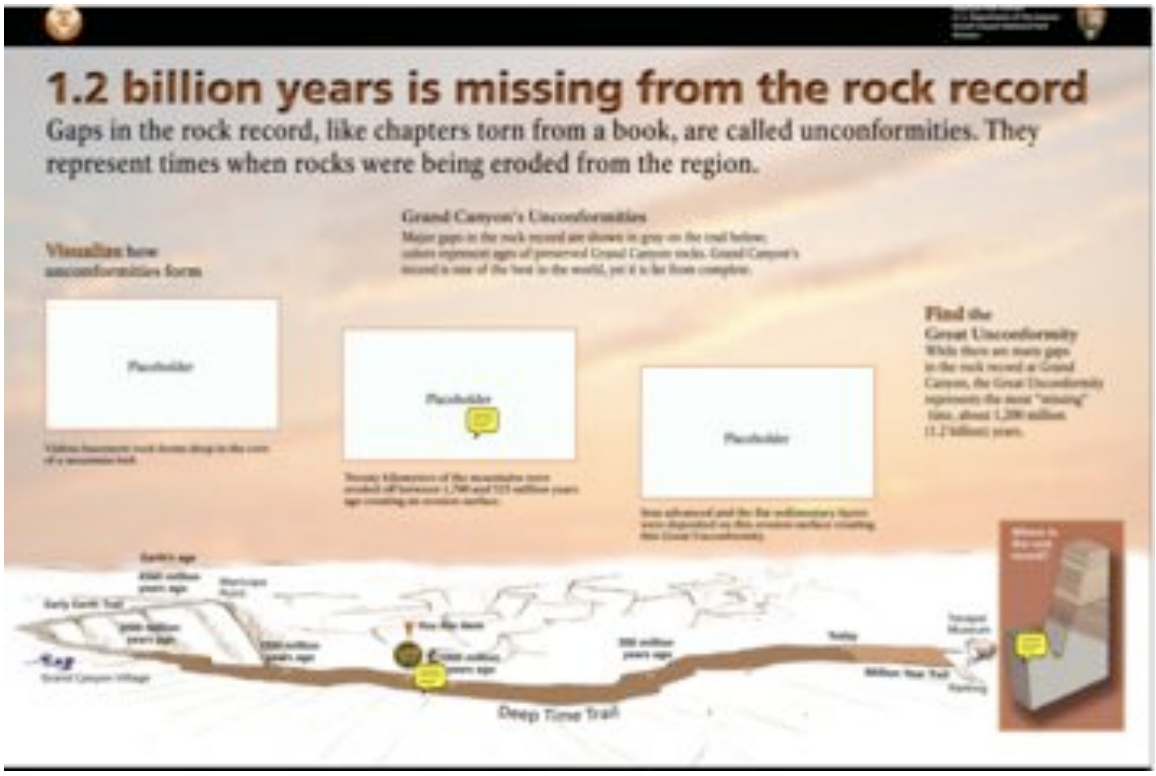

The entire Million Year Trail is squeezed into the first meter of the Deep Time Trail
Walk this way to feel how long 2 billion years is.
One long step = 1 million years!
Walk this way to see what happened in the last million years
1,000 years ago: Ancestral Puebloans farmed the river bottom
20,000 years ago: Cooler and wetter time
100,000 years ago: Volcanic eruptions and earthquakes at Grand Canyon
1 MILLION YEARS AGO
One Million Years
TODAY
Earth's age 4,560 million years
Early Earth Trail
2,000 million years
1,500 million years
1,000 million years
500 million years
Today
Yavapai Museum
Grand Canyon Village
Million Year Trail
Parking
Deep Time Trail

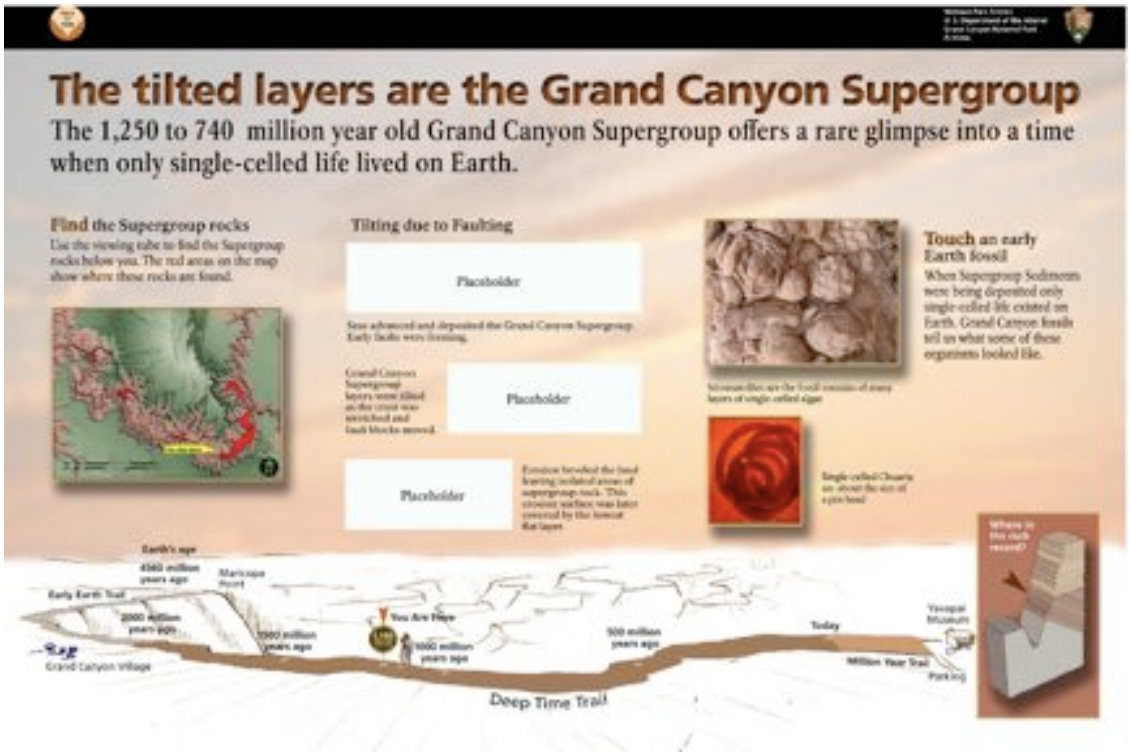

The Grand Canyon is 6 million years old
The Colorado River carved Grand Canyon in "only" the last six million years.
This is a short time period compared to the age of the rocks in the canyon walls.
Touch a river polished rock
Imagine carving the canyon
Deep Time Trail


Without uplift there would be no Grand Canyon
The Colorado Plateau region was uplifted from sea level to over 1.6 km (one mile) high from about 70-50 million years ago. This event resulted in erosion of the layers containing dinosaur fossils, and set the stage for later carving of Grand Canyon.
From 500 to about 70 million years ago, the flat lying sedimentary layers were deposited, one on top of the other.
From 70 to 50 million years ago the Colorado Plateau and Rocky Mountains were lifted high above sea level.
For the last 50 million years, erosion has progressively worn away the layers leaving the resistent Kaibab (KIE-bab) Limestone exposed here. The high elevation set the stage for the carving of Grand Canyon.
Imagine the rocks that used to be here
About the same thickness of rocks, 2 km (1.2 miles), was once on top of the ones you see in the canyon. Erosion has stripped away layers of rock younger than 270 million years old, including those with dinosaur fossils.
Measure the thickness of the canyon's remaining flat layers
Deep Time Trail

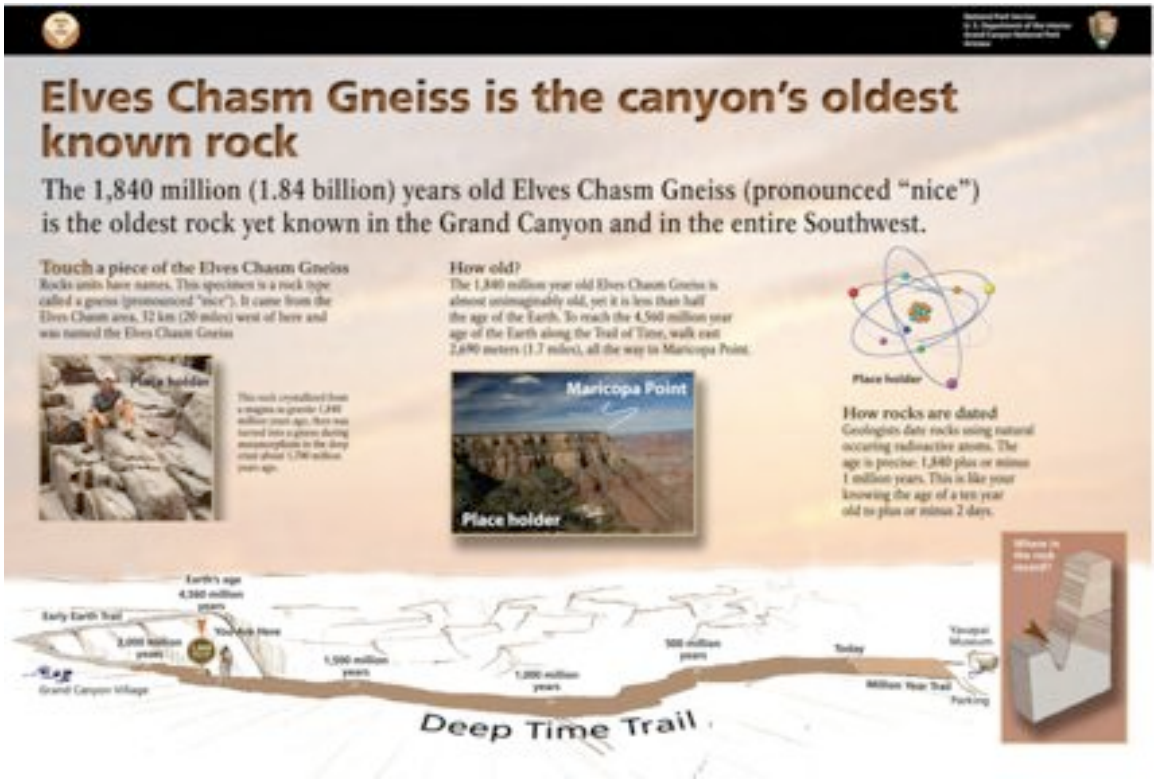

The top layer is 270 million years old
Between 280 and 270 million years ago the top four rock layers were deposited as sediments. Each layer covered the one below. Time, pressure, and burial turned them into sedimentary rocks.
Look across the canyon
You are standing on the Kaibab formation. It is the top layer on the North Rim too. All the rock layers were continuous before the canyon was carved through them.
Find the top four layers
Find the fossils
270 million years ago, this region was a tropical sea. These fossils are the remains of animals that lived in the sea and became entombed in the Kaibab limestone.
Deep Time Trail


Animal life appeared 600-500 million years ago
Sedimentary rock layers at Grand Canyon, as elsewhere on Earth, record an "explosion" of life from 600 to 500 million years ago.
Evolution of Animals
Before about 630 million years ago, only single-celled organisms lived on Earth. Multicellular animals appeared and became rapidly more complex during a short time called the "Cambrian Explosion of Life."
Touch Grand Canyon Fossils
Trilobites (TRY-LOBE-ITES), ancestors to modern-day horseshoe crabs, were some of the earliest animals on Earth. This specimen was found in Grand Canyon's Bright Angel Shale.
Find Grand Canyon rocks that record the explosion of life
Use the viewing tube to find Grand Canyon's Cambrian rocks. They are 525 to 505 million years old.
Cambrian Layers
Deep Time Trail


1.2 billion years is missing from the rock record
Gaps in the rock record, like chapters torn from a book, are called unconformities. They represent times when rocks were being eroded from the region.
Visualize how unconformities form
Grand Canyon's Unconformities
Find the Great Unconformity
Deep Time Trail


The tilted layers are the Grand Canyon Supergroup
The 1,250 to 740 million year old Grand Canyon Supergroup offers a rare glimpse into a time when only single-celled life lived on Earth.
Find the Supergroup rocks
Tilting due to Faulting
Placeholder
Placeholder
Placeholder
Touch an early Earth fossil
Deep Time Trail


Vishnu basement rocks are near the canyon's bottom
The 1,750 - 1,660 million year old Vishnu basement rocks record the formation of the continental crust of the Southwest
Use the viewing tube
Imagine how continents form
Touch the basement rocks
Sedimentary Rocks
Igneous Rocks
Metamorphic Rocks
BASEMENT ROCKS
Deep Time Trail


Elves Chasm Gneiss is the canyon's oldest known rock
The 1,840 million (1.84 billion) years old Elves Chasm Gneiss (pronounced "nice") is the oldest rock yet known in the Grand Canyon and in the entire Southwest.
Touch a piece of the Elves Chasm Gneiss
Rocks units have names. This specimen is a rock type called a gneiss (pronounced "nice"). It came from the Elves Chasm area, 32 km (20 miles) west of here and was named the Elves Chasm Gneiss
Place holder
How old?
The 1,840 million year old Elves Chasm Gneiss is almost unimaginably old, yet it is less than half the age of the Earth. To reach the 4,560 million year age of the Earth along the Trail of Time, walk east 2,690 meters (1.7 miles), all the way to Maricopa Point.
Maricopa Point
Place holder
Place holder
How rocks are dated
Geologists date rocks using natural occuring radioactive atoms. The age is precise: 1,840 plus or minus 1 million years. This is like your knowing the age of a ten year old to plus or minus 2 days.
Earth's age 4,560 million years
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