

Recommendations for Wayside Integration Strip Version 1

- ~ revise markers along the timeline so visitors don't try to establish a one-to-one correspondence with the real trail
- ~ keep "WHAT LIVED ON EARTH?" but eliminate "AGES OF GRAND CANYON ROCKS...."
- ~ eliminate "TIME: MILLIONS OF YEARS..."
- ~ add a small key, e.g.:
 - Ma = millions of years ago
 - = Grand Canyon rocks [couldn't get rid of the black line, but you get the idea]
 - = what this panel is about [my limited computer skills prevented me from making this box RED, or eliminating the black line; also not sure what this text should be; it's not just about where you are on the timeline]
- ~ keep 4 eras(?) but slightly revise/reposition text as follows:

single celled life	early mammals	dinosaurs	mammals
(Protozoic)	(Paleozoic)	(Mesozoic)	(Cenozoic)
- ~ revise markers along the timeline so visitors don't try to establish a one-to-one correspondence with the real trail, but that they recognize it as representing the trail
- ~ label 1840ma with something about oldest rock in the GC – otherwise it's not clear why it's marked along the strip. I'm assuming the 65, 248, 543 refer to the edges of the ages?
- ~ on the 6ma strip make it so the red line at the right is more noticeable
- ~ revise colors to address the color blind issue
- ~ revise/eliminate the WHERE IN THE CANYON as previously discussed.

Recommendations for Wayside Integration Strip Version 2

- ~ ditto all the above
- ~ draw strip as a uniform 3D plank (or 2-D timeline?) with no feet, rocks, or unconformities. Make the strip entirely about where you are along the timeline.

Recommendations for all 3 waysides

- ~ revise text to relate more closely to theme/big idea about time.
- ~ choose conversational action verbs, words people would actually SAY to each other, e.g. Find instead of Spot, or Imagine instead of Visualize.
- ~ eliminate unnecessary words, e.g. instead of “Use this photograph to name the layers...” it could be just “Name the layers.”
- ~ eliminate jargon/technical terms whenever possible. When it’s not possible, explain what is meant.

Recommendations for 6ma



A Young Canyon Carved into Very Old Rocks

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.

Spot the Colorado River

Over a mile below you, and still actively carving, you can catch just a glimpse of the mighty Colorado River.

Carve the Canyon

The Colorado River has carved Grand canyon 175 meters (575 feet) deeper in the last million years. This is the same as the thickness of a sheet of paper each year.

Walk six steps

The first six meters of the Trail of Time represents the 6 million years that it took the Colorado River to carve Grand Canyon. Now find those last 6 million years in red at the far right of the timeline below.

Find river-polished rocks

Find the rocks nearby that have been shaped and eroded by the powerful Colorado River.

While it may look small from where you stand, it can be a raging torrent of a river. The river uses its tools (boulders and sand) and its power to carve through rock.

Imagine the Colorado River as a saw if only carving the canyon deeper.

WHERE IN THE CANYON?

THE CANYON

- ~ revise title as we discussed.
- ~ replace SPOT with FIND; FIND with TOUCH; and CARVE with IMAGINE carving.
- ~ if there is a 6ma marker under the girl’s foot, there needs to be one on the trail itself.
- ~ Suggested rewrite of WALK paragraph: WALK six big steps. These steps represent the 6 million years it took the Colorado River to carve the Grand Canyon. Find those 6 million years at the far right of the timeline below.
- ~ Suggested rewrite of OVER A MILE paragraph: It took the Colorado River 6 million years to carve the Canyon to where it is today.
- ~ Suggested rewrite of FIND THE ROCKS paragraph: Feel rocks that were shaped and eroded by the powerful river for millions of years.
- ~ Suggested rewrite of WHILE IT MAY LOOK paragraph: The river uses boulders, sand, and its magnificent power to slowly carve through ancient rock.
- ~ another possible suggestion would be to have an image/drawing of what the area looked like 70ma, i.e. a flat plain. IMAGINE a plain. Imagine what this looked like 6 million years ago before the Colorado River started to carve the Grand Canyon. Slowly, slowly the river worked like a saw, deepening the canyon by the thickness of one sheet of paper each year.

Recommendations for 70ma

Uplift and Erosion

The Grand Canyon region was near sea level until about 70 million years ago. It is now over 1.6 km (one mile) above sea level.

70 million years ago the Colorado Plateau and the Rocky Mountains were pushed up by immense forces. This uplift set the stage for erosion and led to canyon carving.

The uplift event, called the Laramide Orogeny, occurred because of convergence between two of the Earth's plates.

Visualize the rocks that have been eroded away. Use your fingers to measure the thickness of the rock layers in the canyon walls. Now bring your fingers up and imagine an even greater thickness of rocks above the top layer. These additional layers once covered the region but were stripped back by erosion.

Trace the Course of the Colorado River. It flows from the Rocky Mountains to the Gulf of California. The elevation drop gives it power to cut through rocks. If not for the uplift, which increased the elevation drop, the Grand Canyon would not have been carved.

Visit a National Park where the "missing" layers are still preserved. Petrified Forest, Mesa Verde, Canyonlands, Arches, Capital Reef, Zion National Parks and many other National Monuments all over the Colorado Plateau preserve these "missing" layers which are Mesozoic in age. Meso-zoic means "middle life" and was the period when dinosaurs lived on Earth.

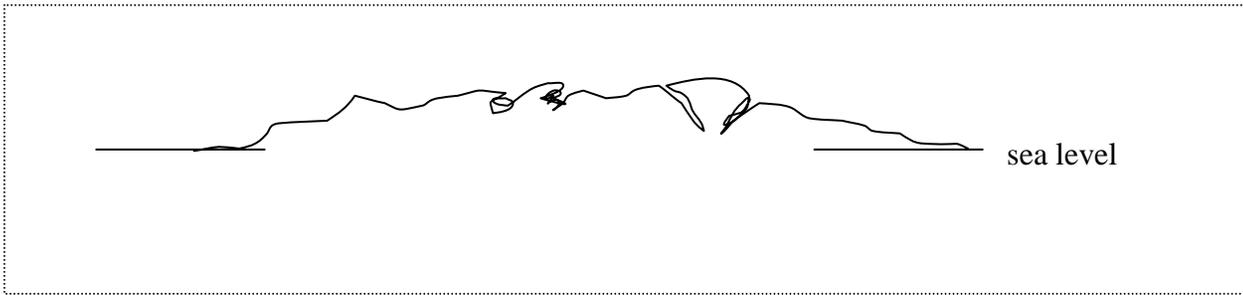
WHERE IN THE CANYON?

Off-site testing revealed great confusion between (a) erosion by the Colorado River to create the Grand Canyon; (b) erosion of the top layer of rocks; and (c) erosion of the "missing layers." Although obviously closely related, for the layperson these are three very different (and unfamiliar) concepts.

The two middle pieces of this panel (VISUALIZE and VISIT) confused and detracted from the main messages that (a) this place used to be at sea level and then 70ma uplift happened, (b) the uplift caused an increase in elevation drop, and (c) without this uplift and subsequent increase in elevation drop the Grand Canyon would not have been formed.

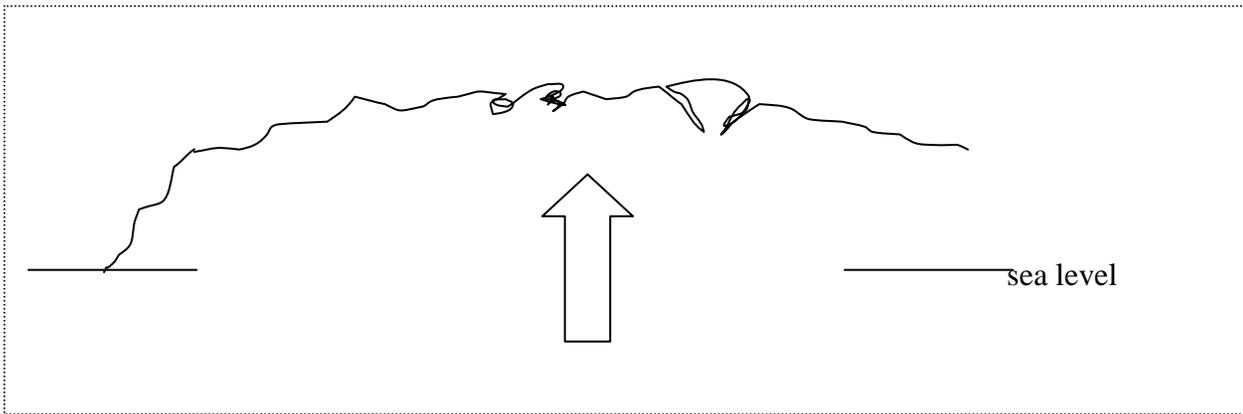
On the other hand, the two graphics (subducting oceanic plate, and the map of the four corners) did not effectively communicate the concepts of uplift, subsequent elevation gain, or the subsequent formation of the Grand Canyon.

- ~ move content about the missing layers to the Unconformity wayside, and maybe even also the eroded top layers as these two concepts seem more related to the erosion that creates unconformities than the Colorado River eroding to make the GC and this panel really is about the conditions for the eroding of the Grand Canyon.
- ~ revise the panel to deal specifically with each of the three main messages, perhaps in a series of 3 graphics. In order to capitalize on what visitors are looking at, you could still have a photograph of what they see as they look out over the canyon with a caption about IMAGINE 70 million years ago. The area was at sea level, and there was no hole in the ground.

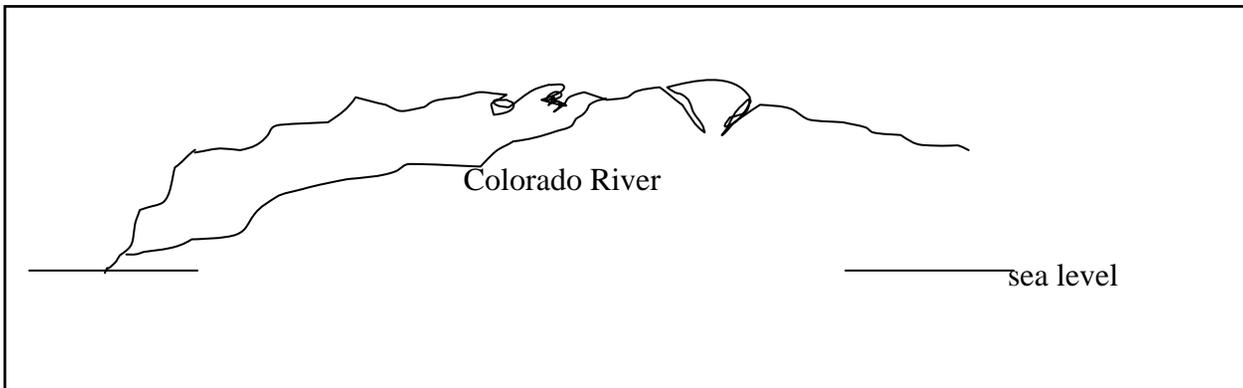


70ma; relatively flat, GC region at sea level, minimal elevation

obviously someone with better drawing capabilities needs to be brought in!



big uplift in the region, and huge gain in elevation



elevation gain made it possible for the Colorado river to slowly carve the Grand Canyon through the ancient rocks of Colorado Plateau

Recommendations for 270ma

Horizontal Rock Layers

The upper rock layers at Grand Canyon were deposited as sediments between 525 and 270 million years ago. Each layer covered the one below. Time, pressure, and burial turned these sediments into rocks.

Learn the names of the horizontal rock layers. Use this phrase to remember the names of each rock layer: **Know The Canyon's History Study Rocks That were Made By Time**

Use the viewing tubes to...

- Look across the canyon. The Kaibab forms the top layer on both canyon rims. This layer was once continuous before the canyon was cut through it.
- Find the Tapeats Sandstone. It is the lowest (and oldest) of the horizontal rock layers.

Find the Fossils
Look for Kaibab fossils in the rocks of the wayside. How many different types can you find? These shell fossils were deposited on the floor of a shallow tropical sea that was here 270 million years ago.

WHERE IN THE CANYON?

WHEN IN THE CANYON'S HISTORY?

WHAT LIVED ON EARTH?

- ~ off-site testing indicated that this panel worked pretty well, although did not achieve the TGE goal of helping visitors understand that the upper set of rocks are sedimentary or what that means. Rather it focused attention on the fact that there **are** rock layers, and that the layers have names...names that can be said out loud.
- ~ shorten the USE caption to be just NAME the top layers
- ~ replace LEARN the names with SAY the names; replace “use this phrase to remember the names of each rock layer” with “To remember: Know The...etc.”
- ~ replace USE the viewing tubes with LOOK across the canyon [This is assuming the viewing tube will be located right there at that corner.]
- ~ eliminate the word pronounced in the middle diagram.
- ~ switch the middle diagram and the photograph
- ~ eliminate the “geologist” caption under the photograph, and start the top left paragraph with something like: The rock you are standing on is 270 million years old. Geologists call it the Kaibab formation. All the upper rock layers at Grand Canyon formed between 525 and 270 million years ago.
- ~ FIND the fossils: revise to not use the term wayside [national park jargon]. Eliminate the question How many different types can you find? Something like: FIND the fossils: 270 million years ago this area was a sea. These Kaibab fossils are from animals that lived in the sea.
- ~ make sure that the fossils pictured are the same ones visitors will actually find
- ~ this mnemonic (a) is not what is used in other GC interpretation and (b) confused respondents who tried to match the W of were. It will be important for all GC interpretation to be consistent.
- ~ revise the gray connecting shading to include the supai; add a yellow line to indicate the bottom of the Supai
- ~ Find the Tapeats sandstone: In this paragraph flip oldest and lowest, so the time reference comes first, i.e. It is the oldest (and lowest) of the horizontal layers.
- ~ replace pronunciations: coco-KNEE-no (middle diagram); MOO-awv; add one for butte