

4th Grade – Digging Into Fossils

Change over Time/Fossils

Students will try their hand at unearthing “fossils” and during a ranger-guided walk students will look at fossil evidence from the rock layers to investigate past environments of the Monument.

Location: Canyon Rim Trail

Duration: 1 ½ hours, 1 mile roundtrip

Colorado Standards Addressed

Science 2.2 – *Comparing fossils to each other or to living organisms reveals features of prehistoric environments and provides information about organisms.*

Enduring Understandings/Essential Questions

How does fossil evidence help me understand how a specific environment has changed over time?

Vocabulary Addressed

Climate

Fossil

Trace Fossil

Body Fossil

Colorado

Geography

Stratigraphic Column

Theme, etc.

Theme:

The rock layers and fossils they contain preserve a record of changing environments and climates.

Objectives:

- Students will be able to describe 2 past environments of the Monument.
- Students will be able to distinguish between a trace fossil and a body fossil, and give an example of each.
- Students will be able to explain how fossils teach us about past environments.
- Students will gain an appreciation of the immensity of geologic time

Major Concepts:

- what a fossil is, trace vs. body fossils
- how fossils form
- what fossils and rocks can tell us about past environments

Sample Class Outline

Fossil Activities – 20-30 minutes (@ picnic area by VC or by the Stonehouse)

Introduction: What are fossils, take a closer look at different fossils (use magnifying glasses), discuss how they think fossils form, describe difference between trace fossils and body fossils (*sometimes body parts of dinosaurs/animals are preserved, but sometimes just their footprints or burrows are preserved*), fossils can be of animals or plants (show a few plant fossils for examples)

Fossil Dig Activity:

Supplies (each group will get):

mini quarry

blank map

pencil

brush

shovel (spoon)

Explain that **paleontologists** are scientists who study fossils. Where do you think they find these fossils? Underground! (in the rocks) So paleontologists have to do a lot of digging, so that they can get the fossils out to study them. Today, we are paleontologists and our job is to dig for fossils. A site where a paleontologist digs for fossils is called a **quarry**. In a minute you are each going to get your own mini quarry and some very special tools to help you dig and clean off your fossils. Before we start digging we have to talk about a very important part of digging for fossils...Making a map of our findings. It's very important that every time a paleontologist finds a new fossil he/she makes a map of exactly where he/she found the fossil. (hold up a mini-quarry) So each of your mini-quarries is broken into 9 squares, we call this a grid. Each square in your grid corresponds to a square on your "quarry map". So if you find a fossil in square A3 in your mini quarry, you need to draw a picture of that fossil in square A3 on your quarry map. Ok, let's get digging...

Follow-up/Closing: Discuss the types of fossils you found, fossils tell us what this area was like a long time ago, if we found shark teeth, what do you think this area was like at one time? (show ocean photo) What about pieces of petrified wood? (show swamp photo)... ...on our hike we are going to be paleontologists and look at fossils and the rock layers to decide if the Monument was always a desert like it is today.

Canyon Rim Hike – 1 hr.

Stop 1 (at the overlook behind the visitor center)

Theme: Sandstone Rock Cycle/Weathering & erosion

Props: Sandstone Rock cycle, flash flood photo

Tips: Have students give you a quick review of how sandstone forms & breaks down (they learned this in 3rd grade). Explain how our canyons are unique because they were formed by flash floods washing the rocks away, not rivers, like most canyons. Have students look down into the canyons and see if they can pick out layers of rocks that are different colors...dark grey at the bottom, dark red above it, and then orange rocks on the canyon walls just below the overlook.

Transition: *On our hike we will be looking at the different rock layers in the Monument and talking about how the types of rocks and the fossils that are found in them can teach us about what the environment was like in this area a long time ago.*

Stop 2 (at the boulder spot after the first fence along the trail)

Theme: Chinle Mudstone

Props: Swampy Mudstone photos, phytosaur photos, petrified wood

Tips: Have students pick up a piece of chindle to examine. This rock came from near the bottoms of the canyon. Tell them what types of fossils we find in it, have them guess what environment it was. What do you think rock is made of?...right, mud, mud piled up in the bottom of a swamp and turned into mudstone

Transition: *Now we can see how geologists and paleontologists use the types of rocks and the fossils we find in them to learn about what the environment was like. At our next stop we will be doing the same thing with a different rock layer.*

Stop 3 (at the fenced overlook)

Theme: Wingate Sandstone & Kayenta Sandstone

Props: Desert Sandstone/Prosauropods, Grallator Tracks – model & photos, River Sandstone/Tritylodont

Tips: Have students look at wall below and guess what it is made of...right sand. Where could we find lots & lots of sand?...desert. What types of animals would you find in a desert?...lizards, so we find the tracks of lizard like dinosaurs (show grallator track), but also tracks from small prehistoric lizards – much like the lizards we find here today. Have them look at the rocks they are sitting on and compare to the sandstone they were just looking at, darker, more sparkles – formed in rivers - quartz brought in by water – makes this rock stronger than the rock below it so it can protect the rock formations like the monoliths kind of like a roof on a house. We find mammal like dinosaurs that kind of look like river otters (tritylodont).

Transition: *At our next stop we are going to review the layers we learned about and talk about the youngest rocks in the park, this layer is famous for fossils. On the way, see if you can guess where we would find the youngest layer in the park.*

Stop 4 (above the tunnel on the rocks overlooking the canyon)

Theme: Strat columns & Morrison Formation

Props: Rock layers photo w/ labels, turtle/tracks photo, Morrison/floodplains photo, brachiosaurus/allosaurus photo, allosaurus claw model, ripple mark sandstone rock (optional)

Tips: If time allows use stratigraphic column models, otherwise explain what a strat column is and show the diagram that shows the rock layers we talked about in the canyon. Ask where they thought youngest would be...on top, oldest on bottom. Go over fossils & environments again. Even though we find fossils in all of the layers, except the very bottom metamorphic rocks, the youngest layer (point it out, where the hills meet the sky) has lots and lots of fossils in it, why this area is famous for fossils. It is called the Morrison formation. Show turtle photo, where would you find turtles, wet places. Show photo of what artist thought area looked like, then floodplain photo. Lots of plants for big plant eaters like brachiosaurus, lots of meat for meat eaters like allosaurus (show claw).

Conclusion: *We have seen a lot of rocks and fossils today, and you all did a great job studying the rocks like paleontologists. Before we head back, let's have everyone explain to a neighbor how one fossil or rock type we talked about can teach us about past environments. ***

If time allows, have students crawl through the tunnel in the rock for fun before returning to the visitor center.

Fossil Activities – 20-30 Minutes

(@ picnic area by VC or Stonehouse)

Introduction: What are fossils, take a closer look at different fossils (use magnifying glasses), discuss how they think fossils form, describe difference between trace fossils and body fossils (sometimes body parts of dinosaurs/animals are preserved, but sometimes just their footprints or burrows are preserved), fossils can be of animals or plants (show a few plant fossils for examples)

Fossil Dig Activity:

Supplies (each group will get)-

Mini Quarry (with tools & pencil inside)

Quarry Grid Sheet (on a clipboard)

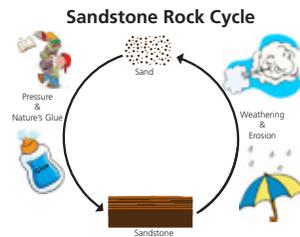
Explain that **paleontologists** are scientists who study fossils. Where do you think they find these fossils? Underground! (in the rocks) So paleontologists have to do a lot of digging, so that they can get the fossils out to study them. Today, we are paleontologists and our job is to dig for fossils. A site where a paleontologist digs for fossils is called a quarry. In a minute you are each going to get your own mini quarry and some very special tools to help you dig and clean off your fossils. Before we start digging we have to talk about a very important part of digging for fossils...Making a map of our findings. It's very important that every time a paleontologist finds a new fossil he/she makes a map of exactly where he/she found the fossil. (hold up a mini-quarry)So each of your mini-quarries is broken into 9 squares, we call this a grid. Each square in your grid corresponds to a square on your "quarry map". So if you find a fossil in square A3 in your mini quarry, you need to draw a picture of that fossil in square A3 on your quarry map. Ok, let's get digging...

Follow-up/Closing: Discuss the types of fossils you found, fossils tell us what this area was like a long time ago, if we found shark teeth, what do you think this area was like at one time? (show ocean photo) What about pieces of petrified wood? (show swamp photo)... ...on our hike we are going be paleontologists and look at fossils and the rock layers to decide if the Monument was always a desert like it is today.

4th Grade - Digging into Fossils Props & Stops

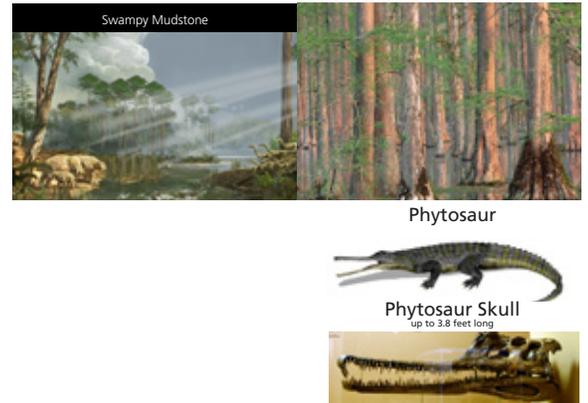
Stop #1 Overlook behind the VC

Sandstone Rock Cycle - Quick overview of how sandstone forms, breaks down back into sand...flash floods carved our canyons



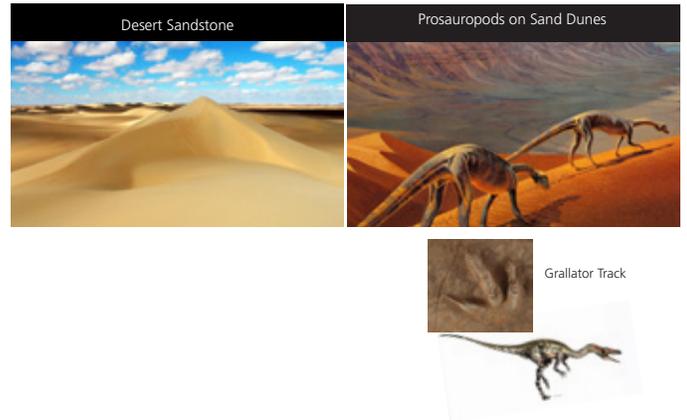
Stop #2 Bouldery spot after the 1st fence *-have kids grab a chinle sample from the pile*

Chinle - we find a lot of petrified wood as well as alligator-like dinosaurs (phytosaur)... what type of environment? right...swamp...look at your rock, what do you think it is made of, right mud...layers of mud were piling up in the bottom of the swamp, turned into mudstone.



Stop #3 Fenced overlook, then wall of Kayenta behind

Wingate - Sandstone, Where would we find tons of sand? right...desert, what type of dinosaurs/animals would you expect to find in a desert? Right, lizards... we find tracks of lizard like dinosaurs (show grallator track), but also tracks from small prehistoric lizards that weren't very different from the lizards we see here today.

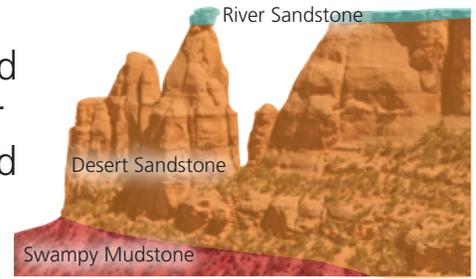


Kayenta- on top of the cliffs is a sandstone formed in rivers, you are sitting on it right now, look at quartz, more water brought stronger glue, protects monoliths like a roof on a house...mammal like dinosaurs like tritylodont



Stop #4 Above the Tunnel

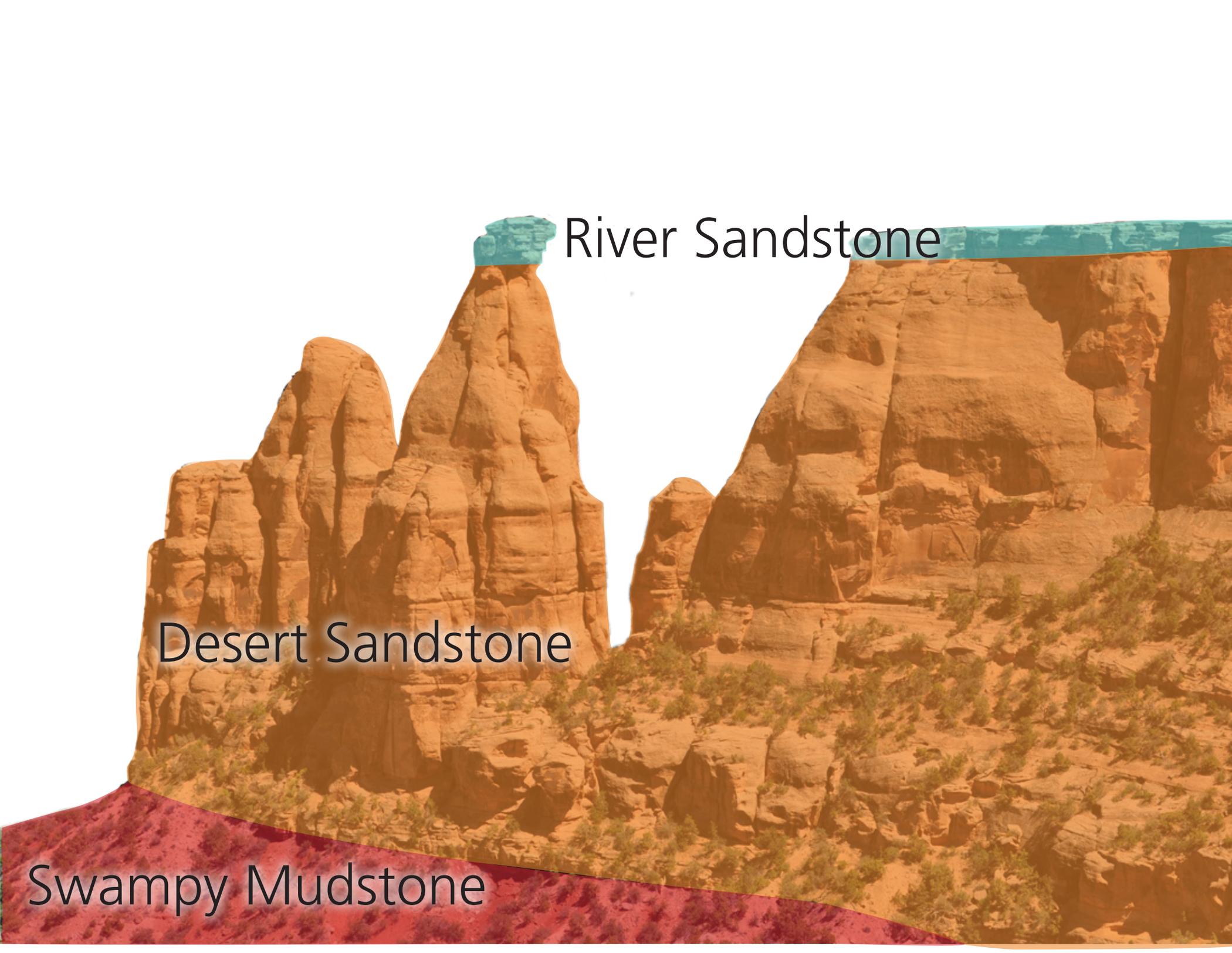
Review rock layers - If time allows use stackable strat columns to review the rock layers in the canyon, really old rocks in bottom no fossils, swampy mudstone (phytosaur & petrified wood), desert sandstone (grallator track, lizard tracks), then you are sitting on top of the river sandstone....have kids look at rock samples and rocks in canyon, have them stack their rocks in order, oldest to youngest to make their own strat column (explain that a strat column is a model geologists use to show rock layers)



Morrison - last rock layer we are going to talk about is the youngest rock layer in the Monument, where would we find that, at the top of the canyons or the bottom? right, at the top, point out Morrison hills...The Morrison Formation was the land of the dinosaurs, we find most of our fossils in Fruita and Grand Junction in this layer, it is why this area is famous for fossils...we found bones and tracks from huge plant eating dinosaurs like brachiosaurus, and from huge meat eating dinosaurs like Allosaurus (show claw)... But some fossils in the morrison were from turtles (show turtle and track photo), a woman from Fruita found these tracks several years ago on a big slab of sandstone, what type of area would turtles live in? Good in ponds and rivers, (show Morrison environment photos) These rocks and fossils show us it was a wetter environment with many streams and lakes, and plenty of plants for dinosaurs to eat.



4th Grade Digging into Fossils Props

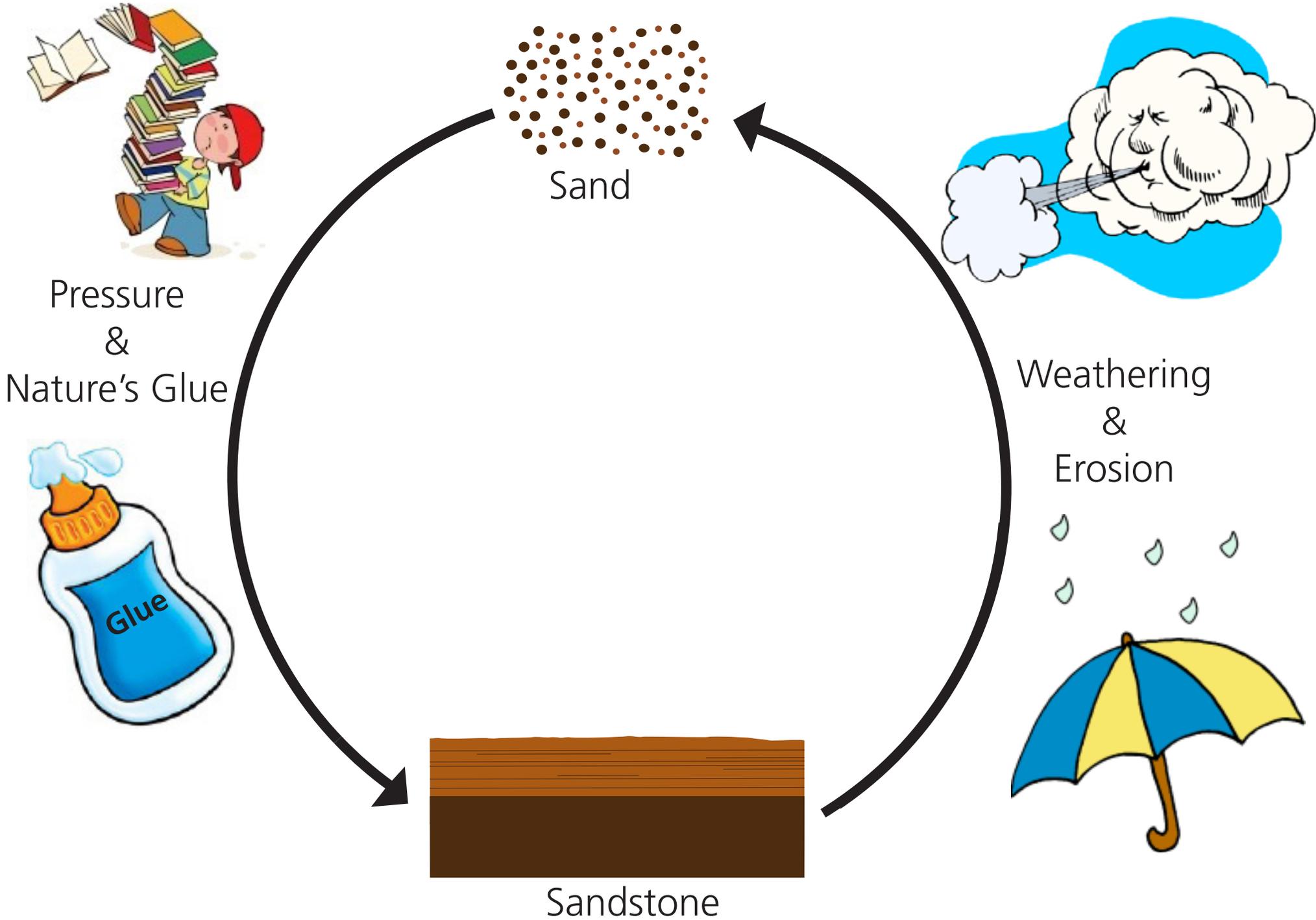


River Sandstone

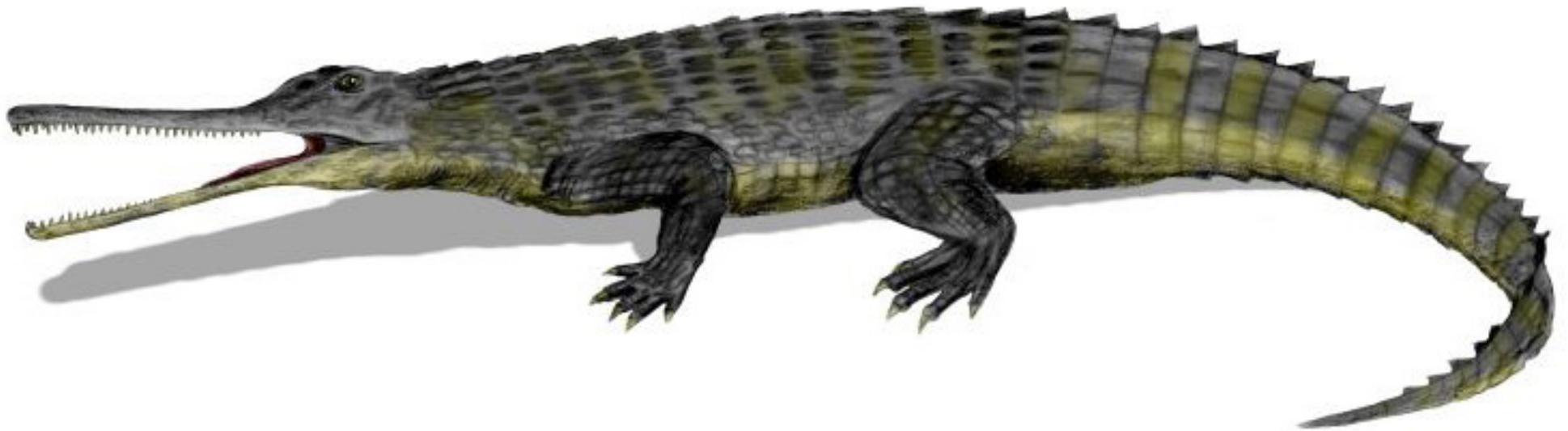
Desert Sandstone

Swampy Mudstone

Sandstone Rock Cycle



Phytosaur



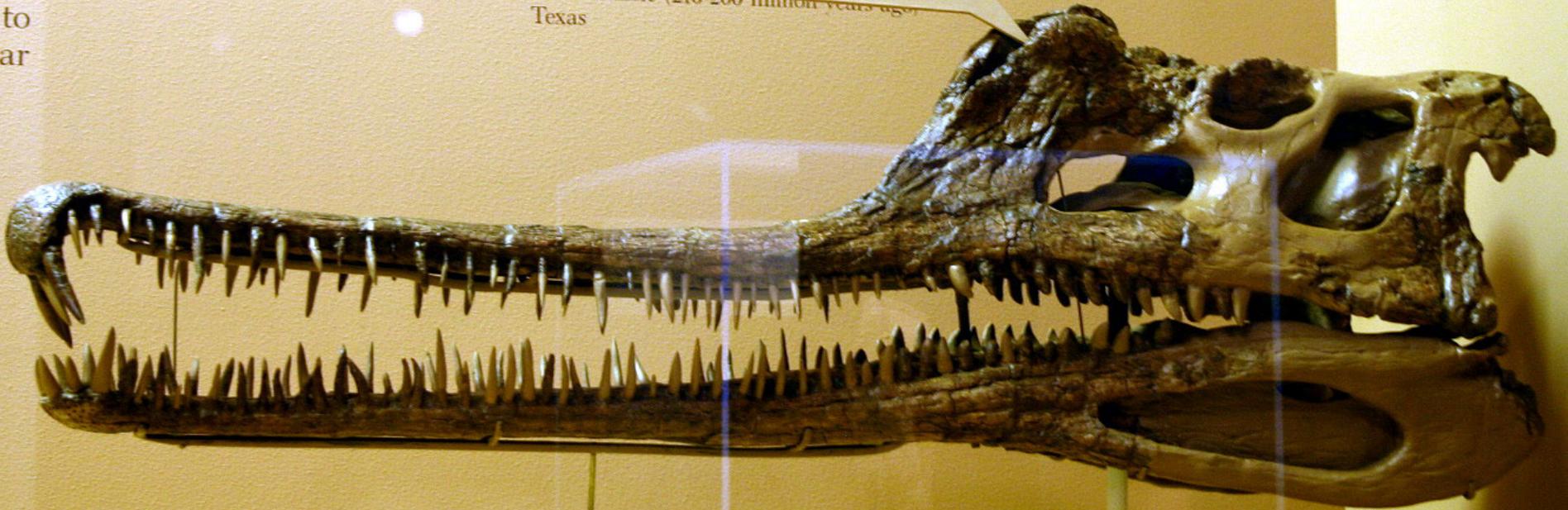
Phytosaur Skull

up to 3.8 feet long

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Phytosaur skull
Late Triassic (210-200 million years ago)
Texas

External nostrils



Swampy Mudstone



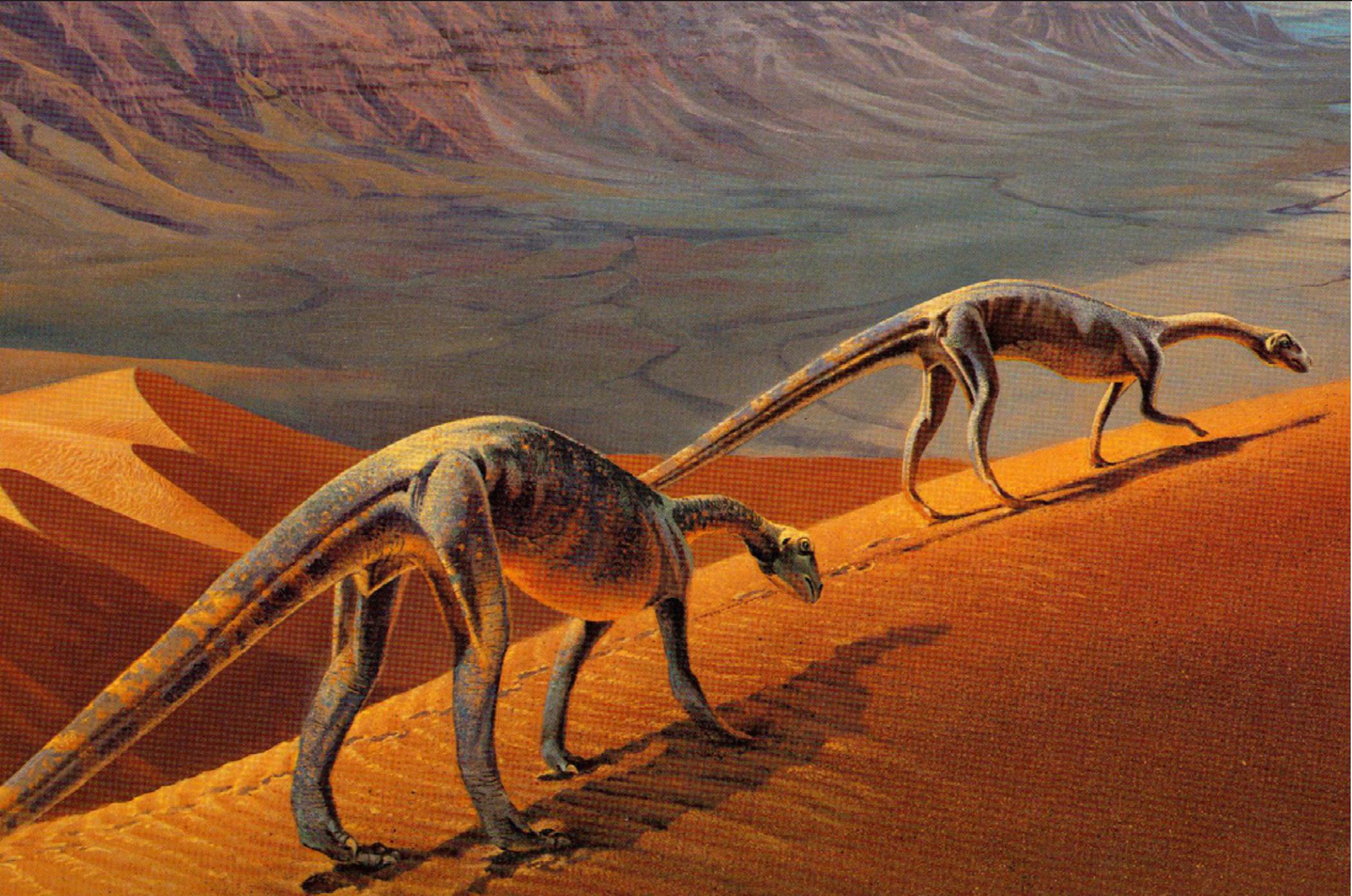
Swampy Mudstone



Desert Sandstone



Prosauropods on Sand Dunes

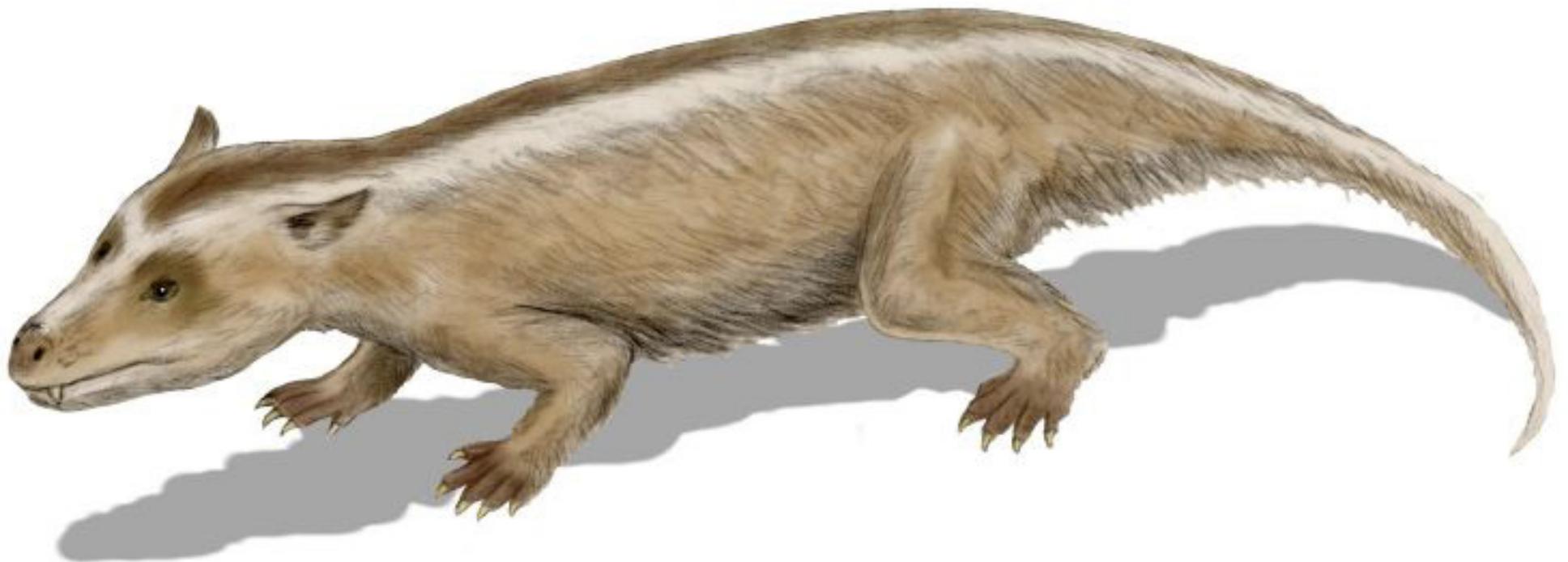




Grallator Track



Tritylodont



River Sandstone



Morrison

(Land of the Dinosaurs)







Allosaurus

Brachiosaurus



