

5th Grade –Earth Changes

Earth Changes in No Thoroughfare Canyon

Class Description

Students will go on a ranger-guided hike to the first big waterfall in No Thoroughfare Canyon to look for evidence of weathering and erosion and other processes that change the surface of the Earth.

Location: No Thoroughfare Canyon

Duration: 4.5 hours, 4 miles (roundtrip)

Standards Addressed

Science 3.2 *Earth's surface changes constantly through a variety of processes and forces.*

Enduring Understandings/Essential Questions

How do Earth's surfaces change?

What types of energy sources exist on Earth?

What resources does the earth provide?

Vocabulary Addressed

Plate Tectonics

Erosion

Deposition

Fault

Weathering

Theme, etc.

Theme:

The forces of weathering, erosion, uplift, etc. are constantly changing the surface of the earth.

Objectives:

-Students will be able to identify evidence of uplift.

-Students will be able to list three forces of weathering and erosion

-Students will be able to explain how uplift, weathering and erosion have created No Thoroughfare canyon based on evidence they saw along the hike.

Major Concepts:

-Uplift and faulting

-Forces of weathering and erosion

-Metamorphic, Igneous and Sedimentary rock formation

-Plate tectonics and continental drift

Class Outline

Introduction: We will be hiking to a large waterfall in No Thoroughfare Canyon. Along the way, we will talk about and look for evidence of how the forces of uplift, weathering and erosion are constantly changing the surface of the earth.

Stop #1: (at DKPA or at a spot along the trail where you can see the Redlands Fault, just past the Echo Canyon junction works well)

Theme: Plate Tectonics: uplift/faulting

Props: Earth's tectonic plates (photo), Redlands Fault (photo), Faulted rock layers on the monument (diagram)

Tips: Point out the tilted rocks...we know something has happened here, any ideas what? The rocks were lifted/tilted up, you are standing at a fault line. The earth's plates are constantly moving, and changing the surface of the earth. In this spot, the land under the Monument was lifted up in relation to the valley, this caused the rocks here to tilt down.

Transition: Long before this area was uplifted, forces of tectonic movements helped create the rocks that make up this region. At our next stop we will talk about how the environment here underwent some pretty major changes as the rocks here formed.

Stop #2 (At Chinle Outcrop in stream bed)

Theme: Sedimentary Rock Formation, erosion/deposition/contrast of sedimentary

Props: chinle swamp photo, wingate sandstone, SS rock cycle diagram

Tips: Explain how the earth's plates are in constant motion, at one time this area was near the equator, swamps covered the land, in the bottom of the swamps, mud piled up creating this rock. Go over sandstone rock cycle. Have students feel the rock, try to break it, note the color, what it's made of etc. Walk up the canyon a bit to the big sandstone boulder & have students feel it/compare it to the mudstone. Do you think this was formed in a swamp? ...desert. So the movement of the Earth's tectonic plates has influenced what types of rocks formed here millions of years ago.

Transition: At our next stop we will be looking at very different rocks. Unlike sandstone and mudstone...these rocks form way below the surface of the Earth. Along the way, think about what types of rocks we might find at the next stop.

Stop #3 (At a good outcrop of metamorphic and igneous rocks)

Theme: Metamorphic and Igneous rock formation

Props: 3 rock types poster

Tips: So what types of rocks are mudstone and sandstone?...sedimentary. Feel these rocks, do you think they are sedimentary rocks as well? Make some observations and share them with a neighbor. Talk about this type of rock, explain how it formed from sedimentary rocks being buried below mountain range and changed by extreme heat and pressure. Metamorphic rocks like these can form from any type of rock that is buried. So far, we have looked at and talked about metamorphic & sedimentary.. what's the third type of rock?...igneous, point out an example have students feel it/look at it and explain how it forms from magma (under ground) or from lava (above ground).

Transition: So all of our rocks formed, were buried below the earth under lots of other

rocks... then they were uplifted and now they are at the surface where we can look at them and study them. But...they are also constantly exposed to the weather. What do you think is happening to the rocks today?...breaking down, we call that weathering, along the way think of things and look for examples of forces that might break rocks.

Stop #4 (At an example of weathering – roots in rocks, cracks, holes, etc.)

Theme: Weathering

Props: weathering/erosion poster, ice on canyon/solution pits

Tips: Have students share what they think breaks rocks down. Point out evidence of weathering, explain the forces of weathering in this environment. Show poster and photos of ice/holes. Water –holes in rocks, ice (freeze/thaw) – cracks in rocks, wind – polishes rocks, roots – crack rocks, lichen – acid & tiny threads break rocks down, humans – wear down rocks as we walk/drive, etc....

Transition: After the rocks are broken apart, they have to be moved. We use the word erosion to talk about the forces that move rocks. At our next stop we will look at evidence of weathered rocks being moved.

Stop #5 (At flood deposits in the canyon walls)

Theme: Erosion

Props: weathering/erosion poster, flash flood images

Tips: Point out the graded flood deposits in the canyon walls and explain how a series of flash floods deposited these rocks, explain how the size shows us the speed of the water, age of the deposits, oldest to youngest, etc. Last major flash flood was in 1978, show photo. In some parts of the canyons, rock deposits like these have been under enough pressure & have been glued together to form sedimentary rocks. Have the students look around them and see if they can find other evidence of flash floods.

Transition: We will stop at a pool of water to have a snack, please remember how we can help protect water in the desert. We will talk about it when we get there.

Stop #6 (At pool)

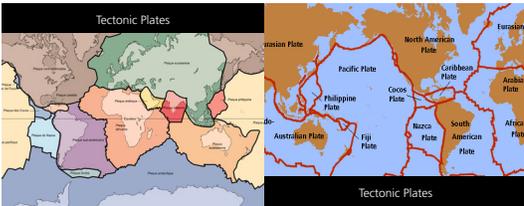
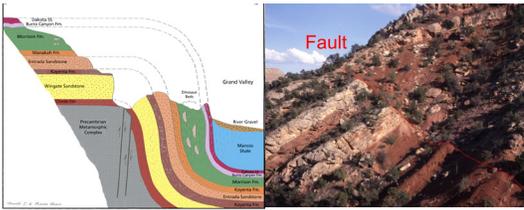
Theme: Desert plunge pool

Props: flood at the pool photo, amphibian photos

Tips: Have students stand around look for signs of animals living here, show photo of flood at pool & explain how floods have carved out this pool creating an important habitat for toads, frogs, insects, etc. & an important watering hole for bigger animals. Look for tracks. Make sure students understand how to behave around the water in order to protect this delicate area.

Transition: As we continue up the canyon to the big waterfall, we won't be making many stops to chat, but I want you to continue to look for evidence of how this canyon is constantly being changed by the forces we learned about today. Also, come up with a story of how this canyon was formed, using what we learned today, and we will discuss it at the waterfall while we eat lunch.

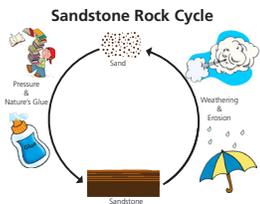
5th Grade - Earth Changes Props & Stops



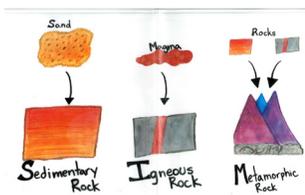
**Stop #1 Plate Tectonics/
faulting**
(Fault Viewpoint)



Stop #2 Sed Rocks
(Chinle Outcrop)



Stop #3 Met & Ig Rocks
(Metamorphic & Igneous Outcrop)

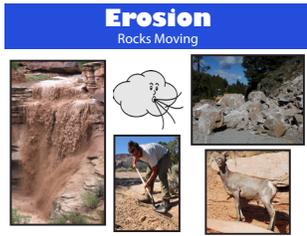


Weathering Rocks Breaking



Stop #4 Weathering
(Examples of weathering)





Stop #5 Flash Floods
(Graded flood deposits)

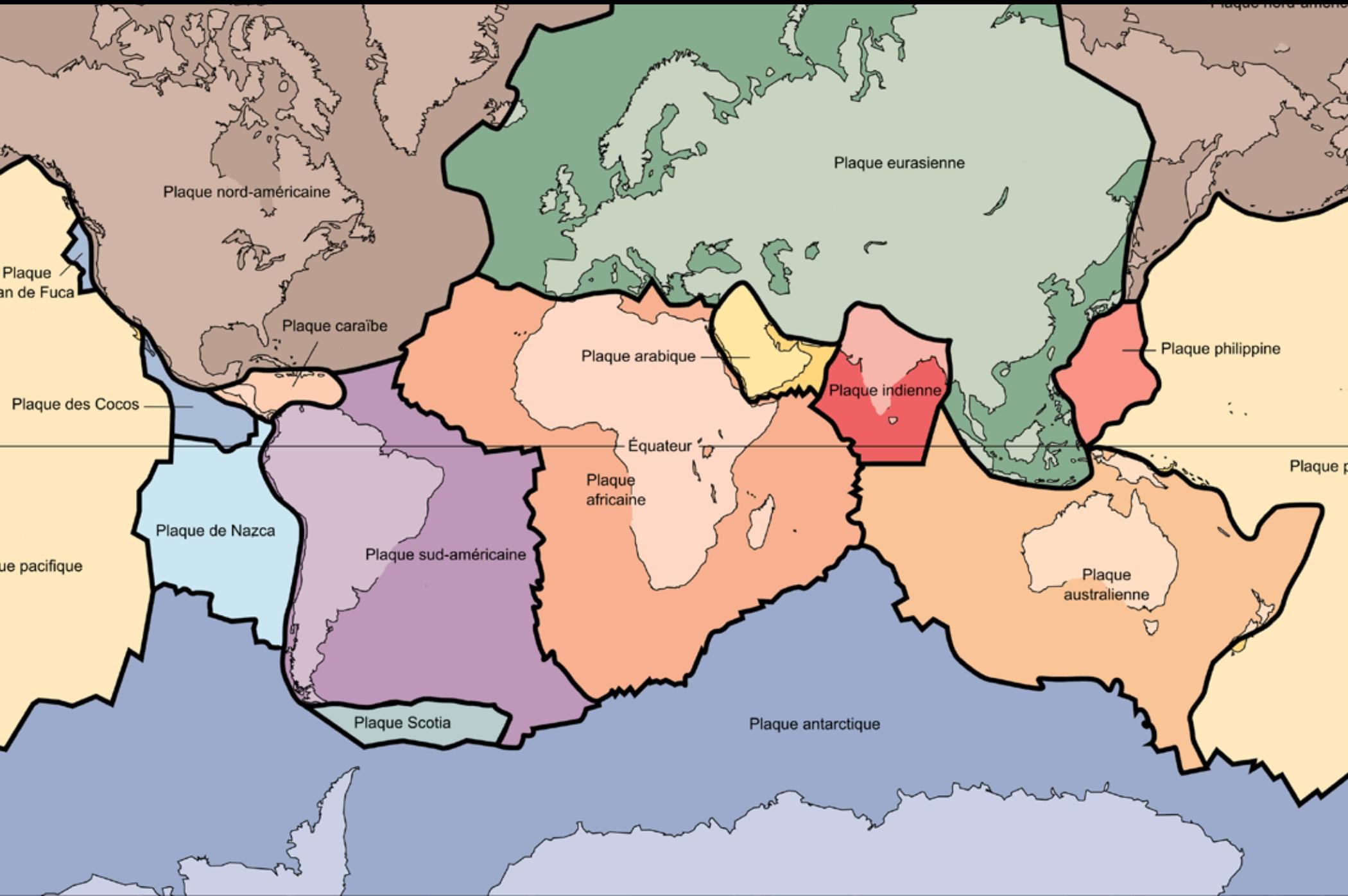


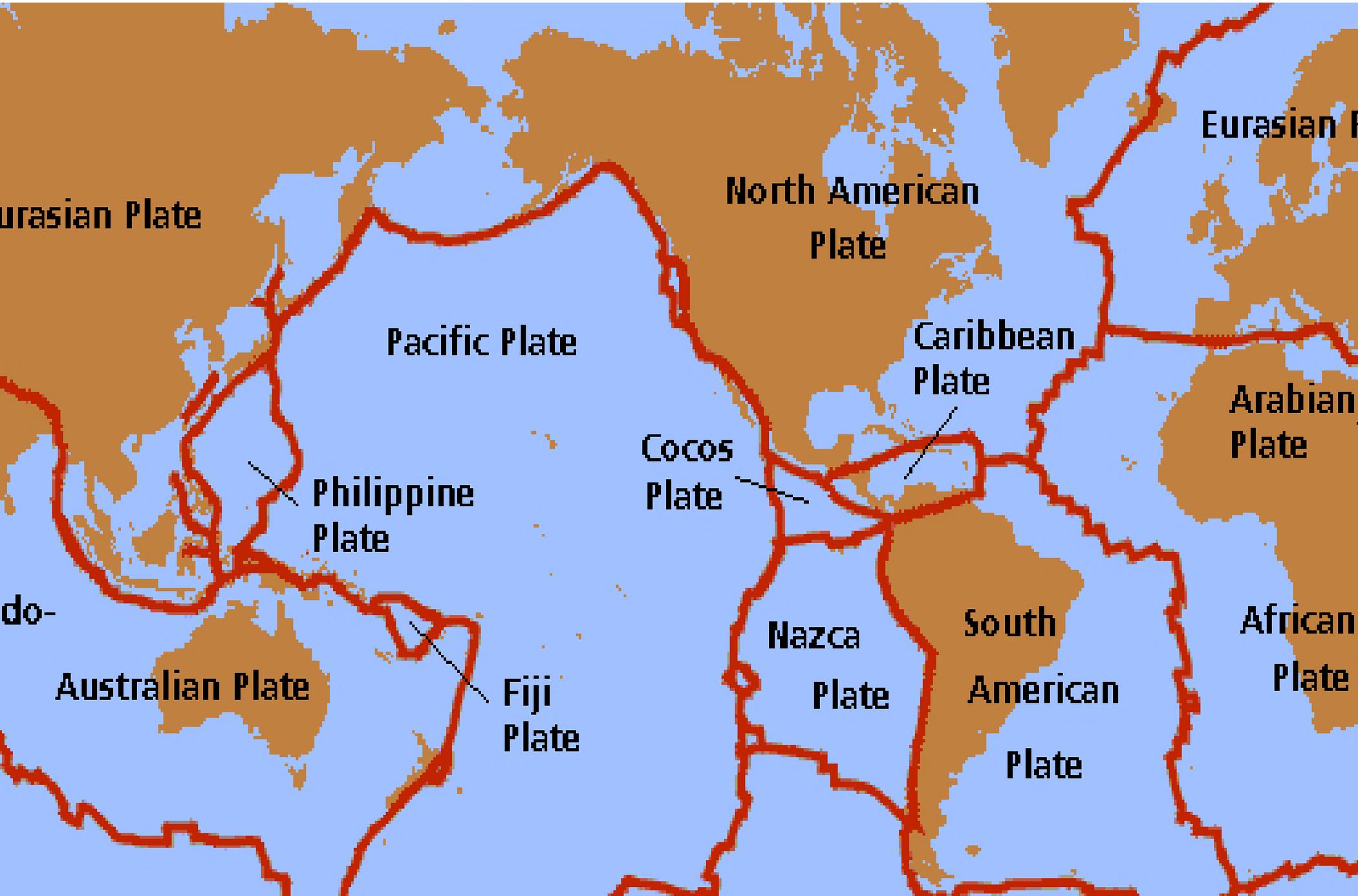
Stop #6
(Amphibians & Pool)



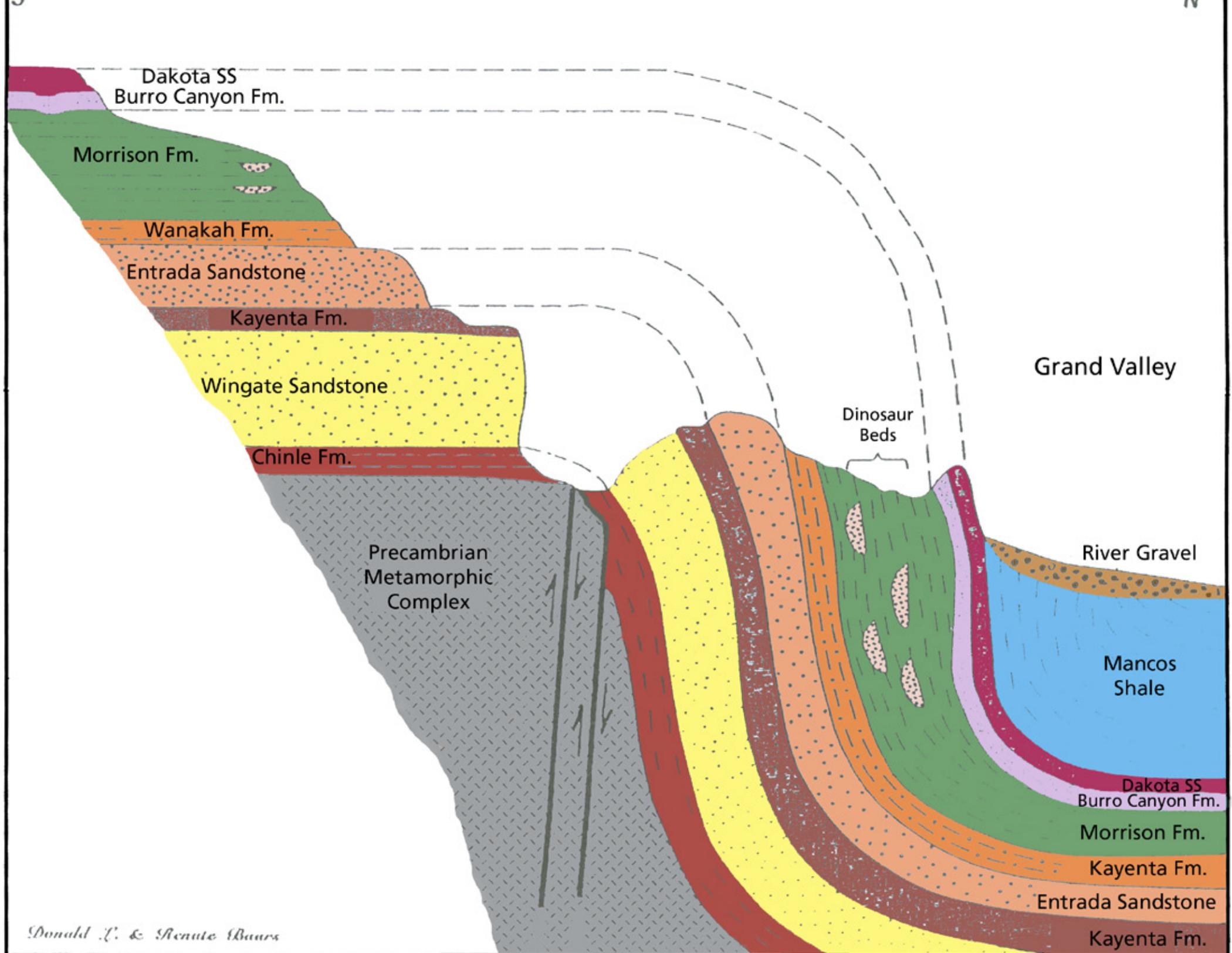
5th Grade Earth Changes Props

Tectonic Plates





Tectonic Plates



Fault



Wingate

Desert Sandstone

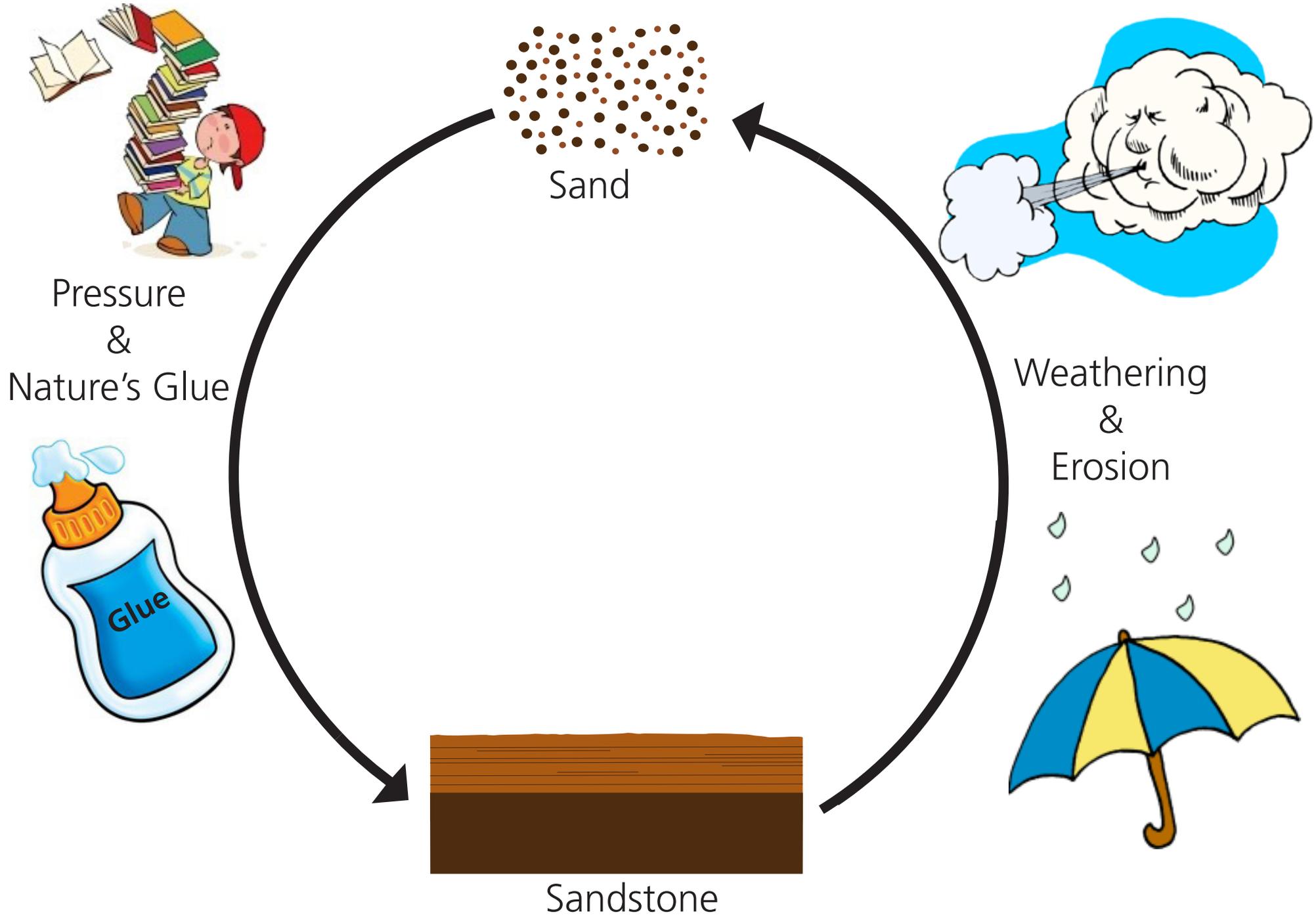


Chinle

Swampy Mudstone



Sandstone Rock Cycle



Sand



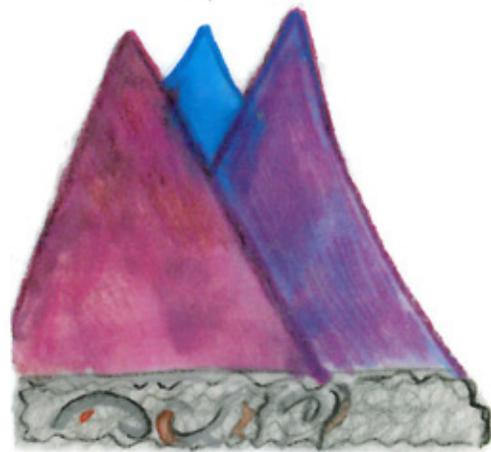
Sedimentary
Rock

Magma



Igneous
Rock

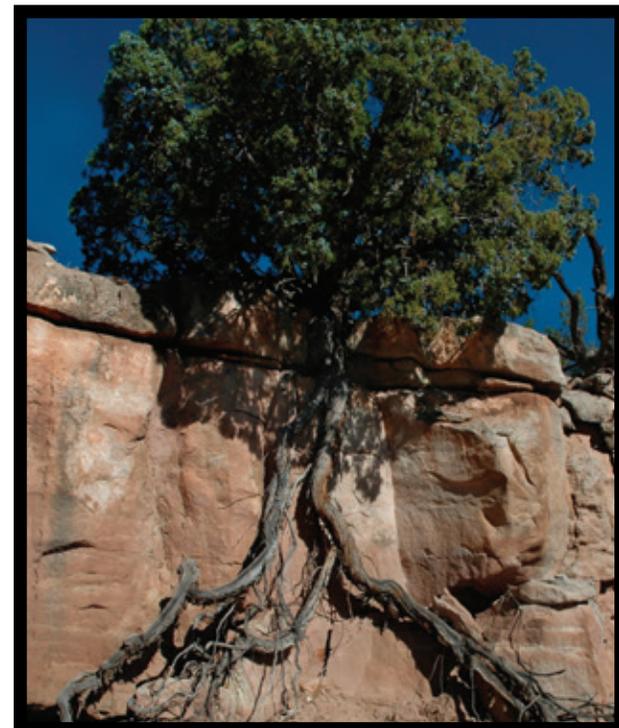
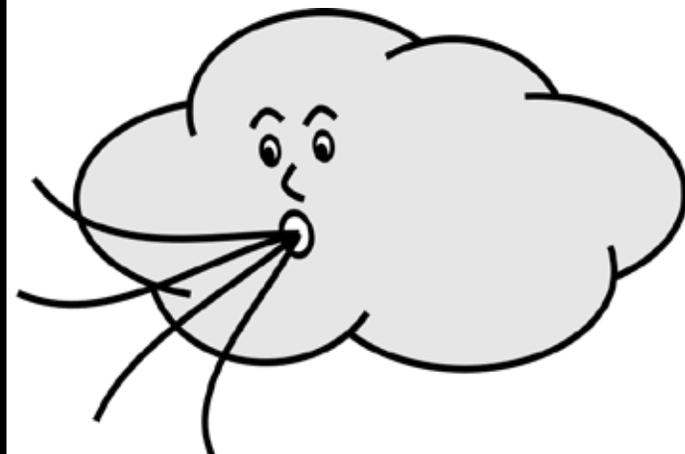
Rocks



Metamorphic
Rock

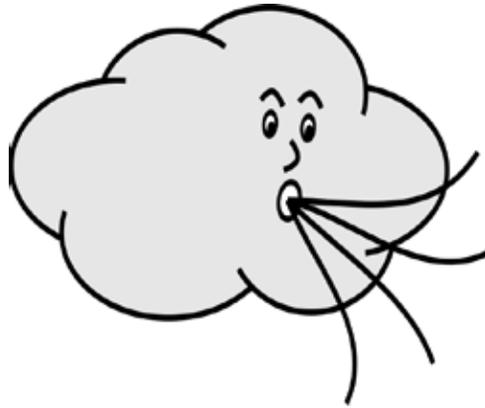
Weathering

Rocks Breaking



Erosion

Rocks Moving





Freezing and Thawing



Water



Flash Floods



July 26, 2011

1978 Flood Damage







July 26, 2011



Canyon Tree Frog

Red-spotted Toad

