

# INTRODUCTION TO THE LOCAL GEOLOGY

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## Goals

- Introduce the geological column in SW Utah
- Illustrate some basic geological concepts as seen in Utah

Awesome  
geology!





# Theories of earth history

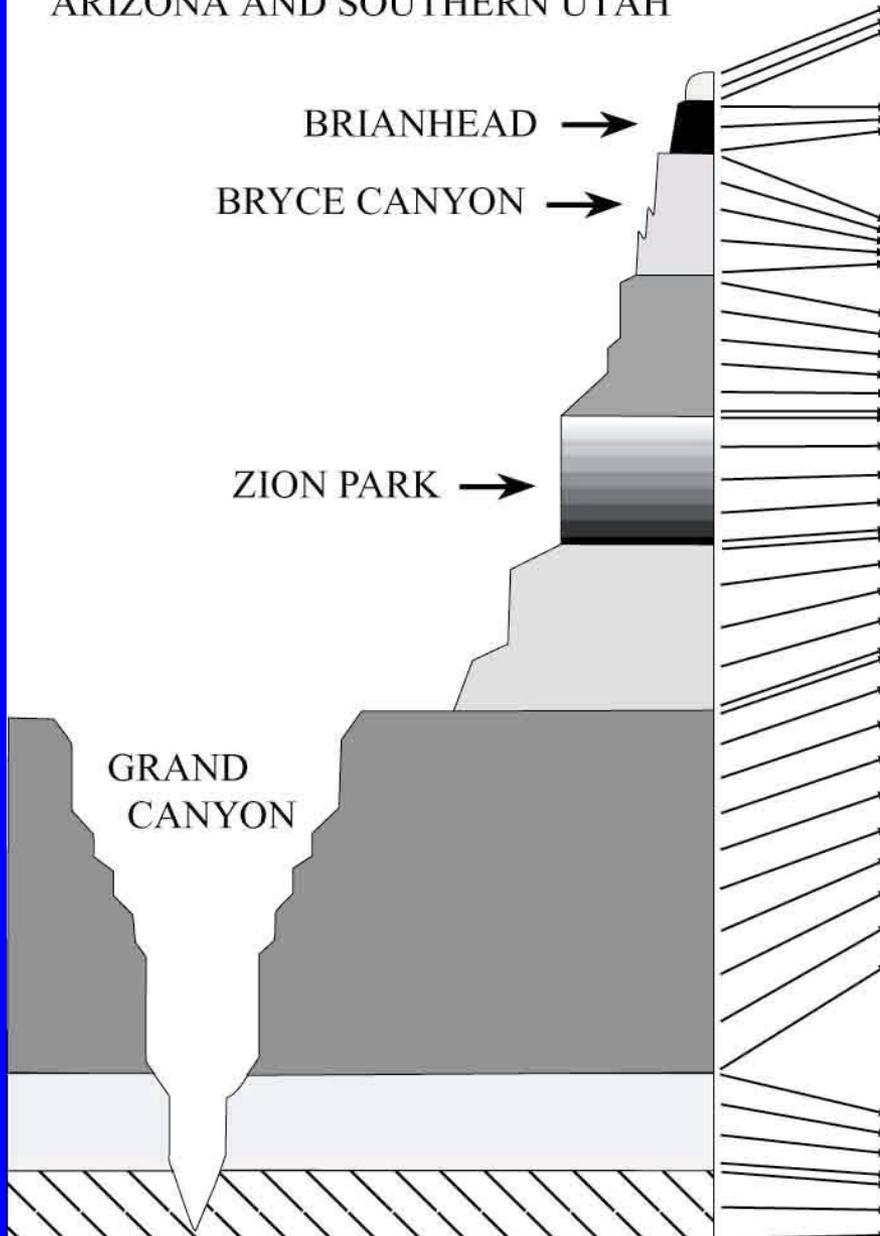
## 1. Conventional geology

Geological column (Cambrian-Recent) formed during 541 million years of evolution

## 2. Creation and flood geology (short-age geology)

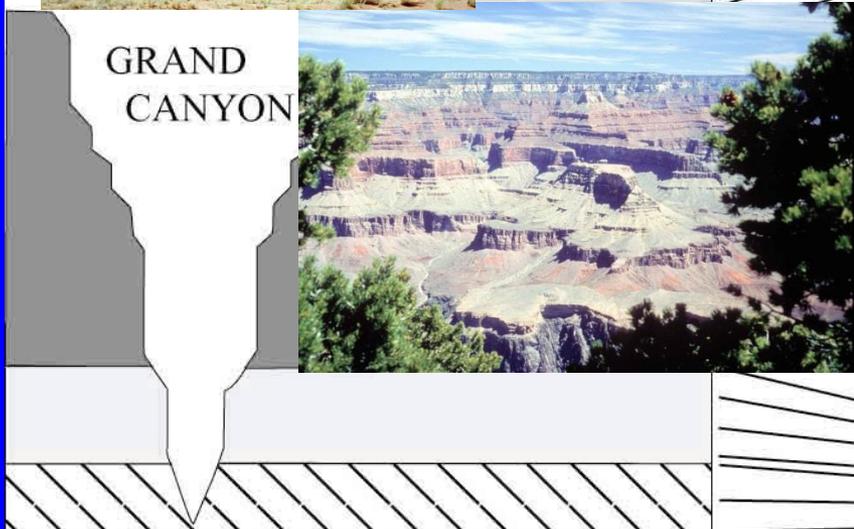
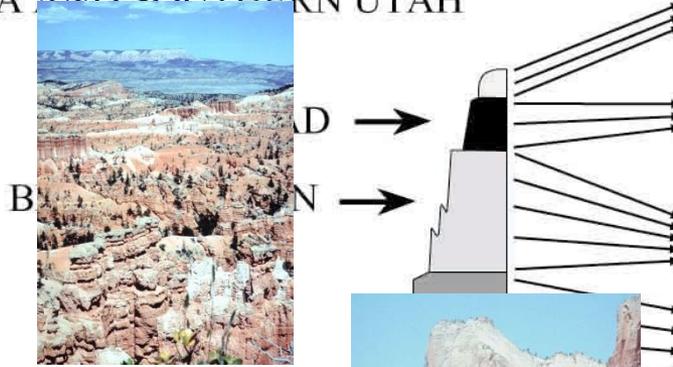
Geological column formed since creation week; thousands of years

# GEOLOGICAL COLUMN IN NORTHERN ARIZONA AND SOUTHERN UTAH



ERA	PERIOD	EPOCH	EVENTS	TYPICAL FOSSILS
CENOZOIC	Quaternary	Holocene	* Human fossils Western USA Mts	
		Pleistocene		
	Tertiary	Pliocene	*	
		Miocene	*	
		Oligocene	*	
		Eocene	*	
MESOZOIC	Cretaceous	Paleocene	* 66 my	
		Cretaceous		
	Jurassic	*		
	Triassic	*		
	Permian	* 252 my		
PALEOZOIC	Pennsylvanian	* Abundant coal Appalachian Mts		
	Mississippian			
	Devonian	*		
	Silurian	*		
	Ordovician	*		
	Cambrian	* Trilobites		
PRECAMBRIAN		541 my	Major modern animal phyla	

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	Tertiary	Pliocene	*		
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		Oligocene	*		
		Eocene	*		
Paleocene		*			
MESOZOIC	Cretaceous	66 my	* Abundant coal Rocky Mts		
		Jurassic	*		
	Triassic	252 my	*		
			Permian		*
PALEOZOIC	Pennsylvanian	Abundant coal Appalachian Mts			
	Mississippian				
	Devonian				
	Silurian	*			
	Ordovician				
	Cambrian				
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# Stratigraphy – the geological column

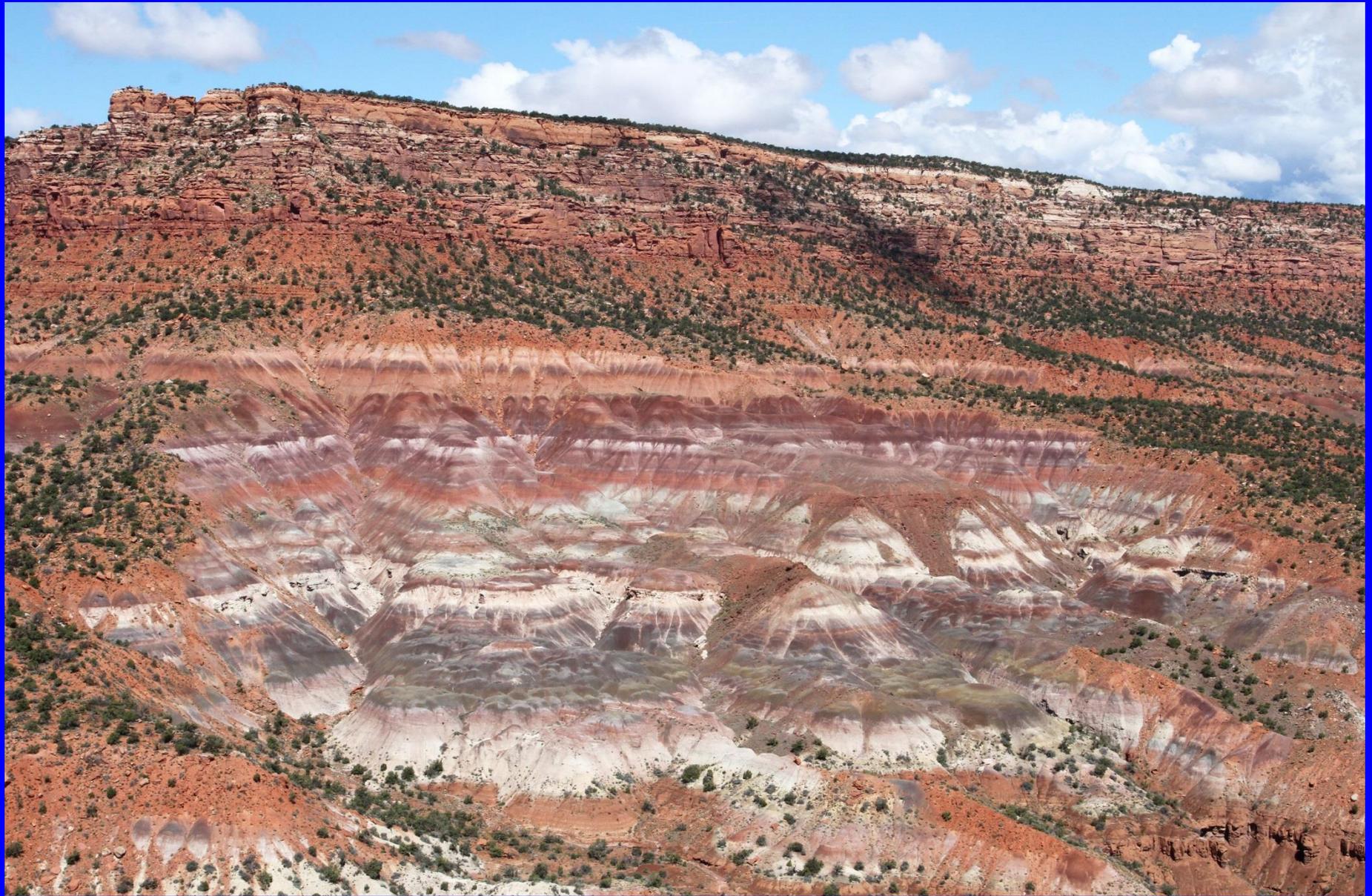
Paleozoic





# Triassic (Early Mesozoic)





# Jurassic (Middle Mesozoic)



**Cenozoic**

**Bryce Canyon**



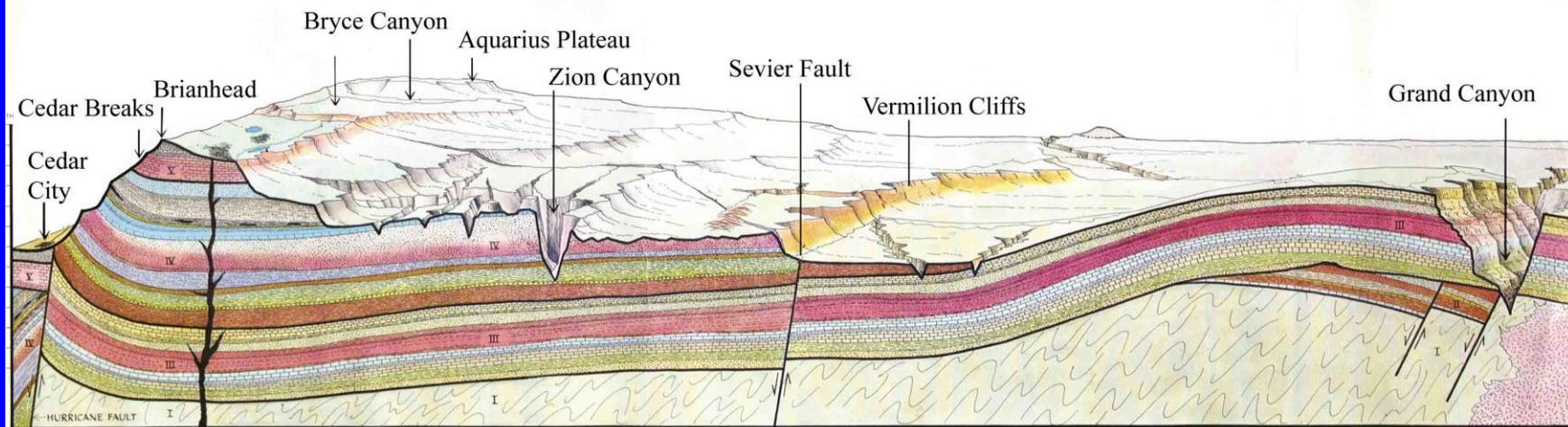


Cenozoic

Mesozoic

Paleozoic

### GEOLOGIC CROSS SECTION OF THE CEDAR BREAKS - ZION - GRAND CANYON REGION





## PROCESS:

### Sedimentary rock

From weathering and fracturing of other rock

### 1. Erosion



**2. Transport of  
sediment to a basin;  
Deposit in layers**

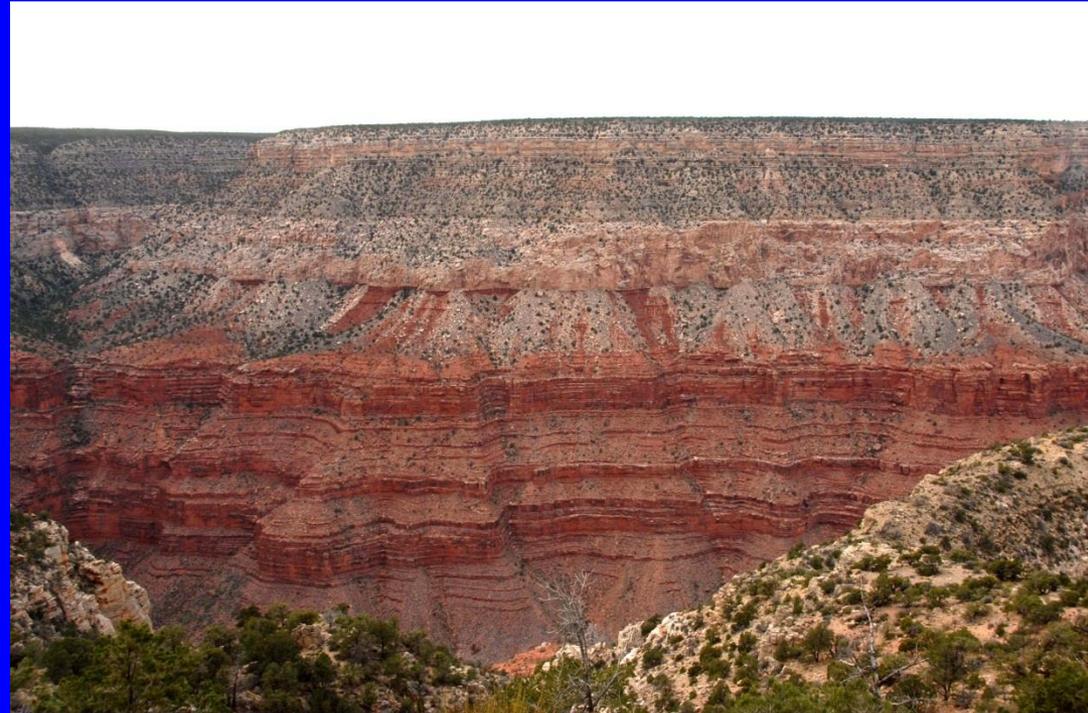


# Sedimentary layers, or beds

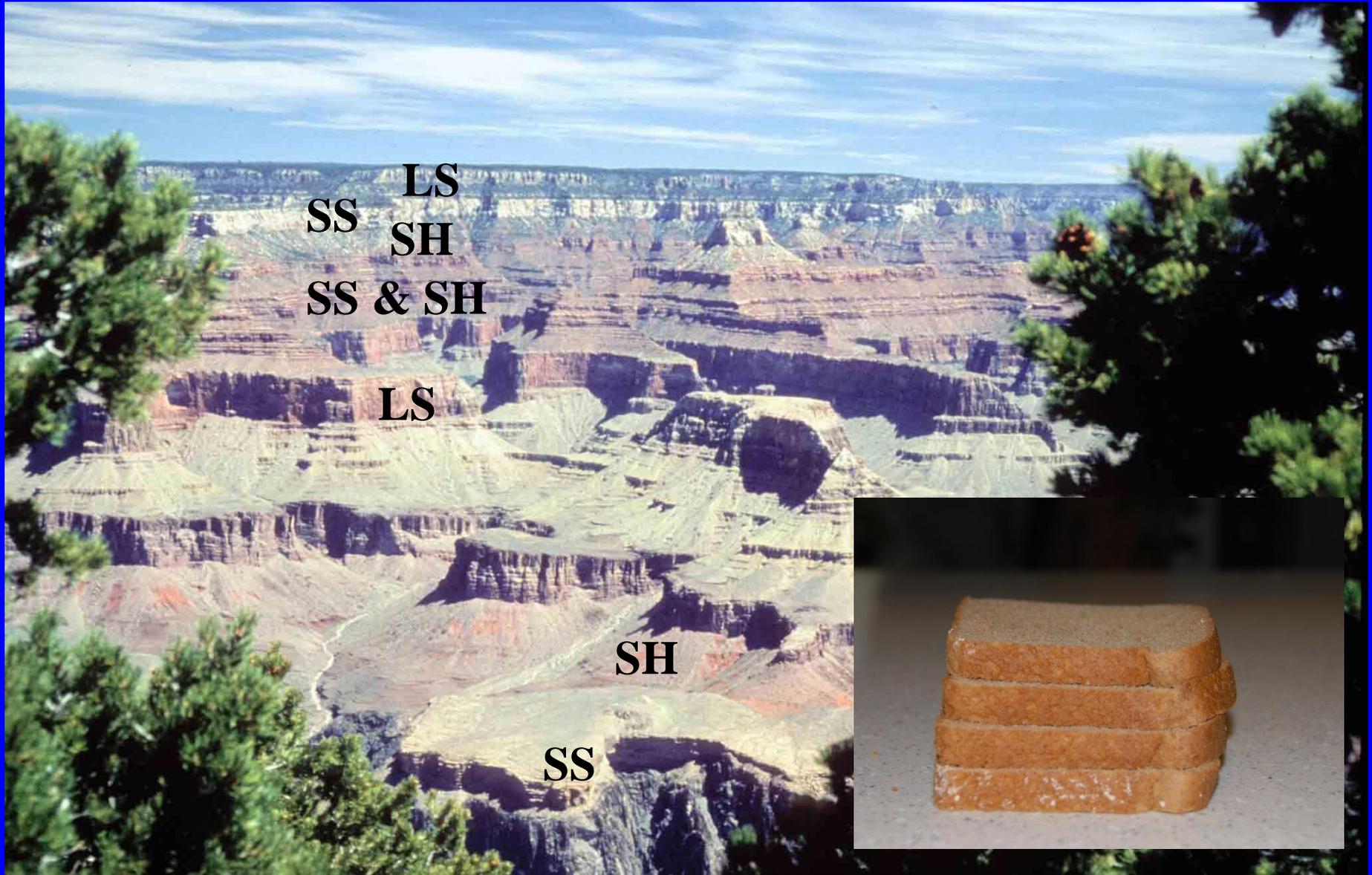




The layers seen on the surface continue into the rock, sometimes for hundreds of miles

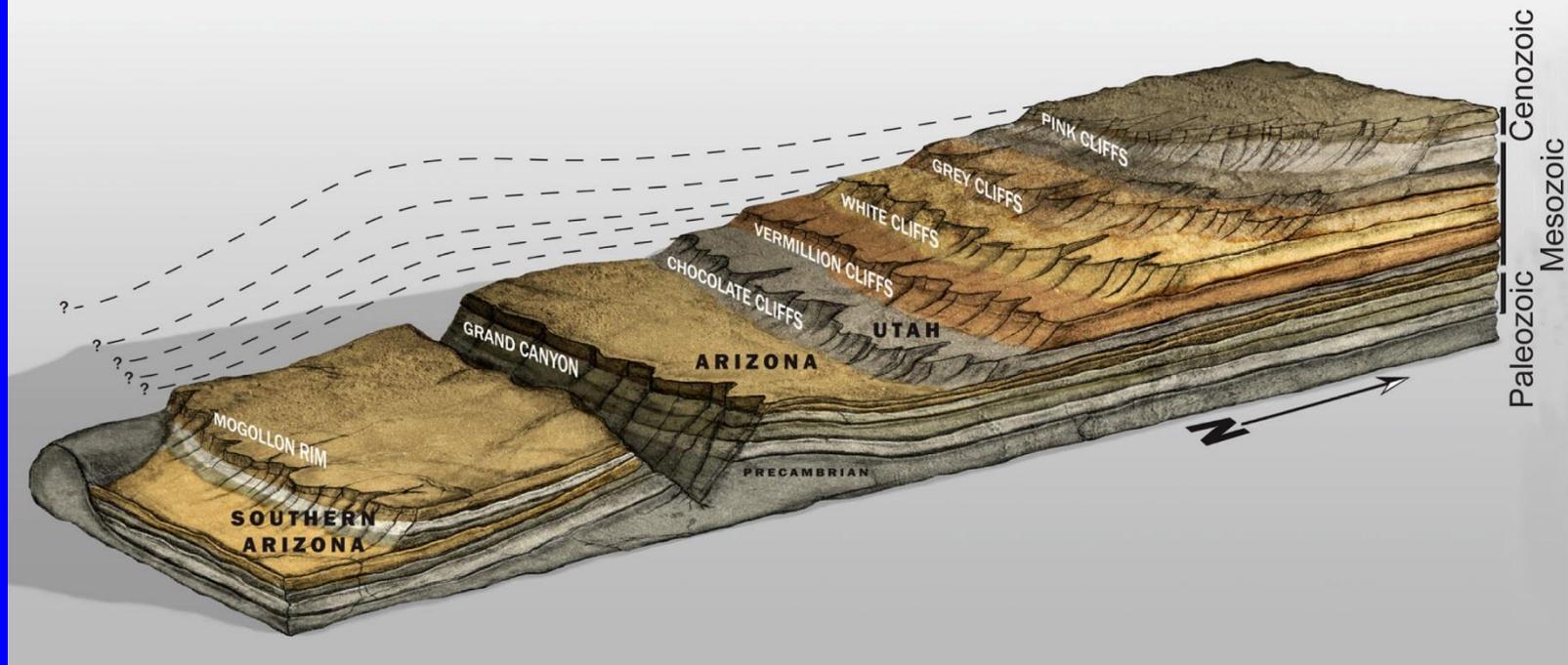


# Sediments in the Grand Canyon

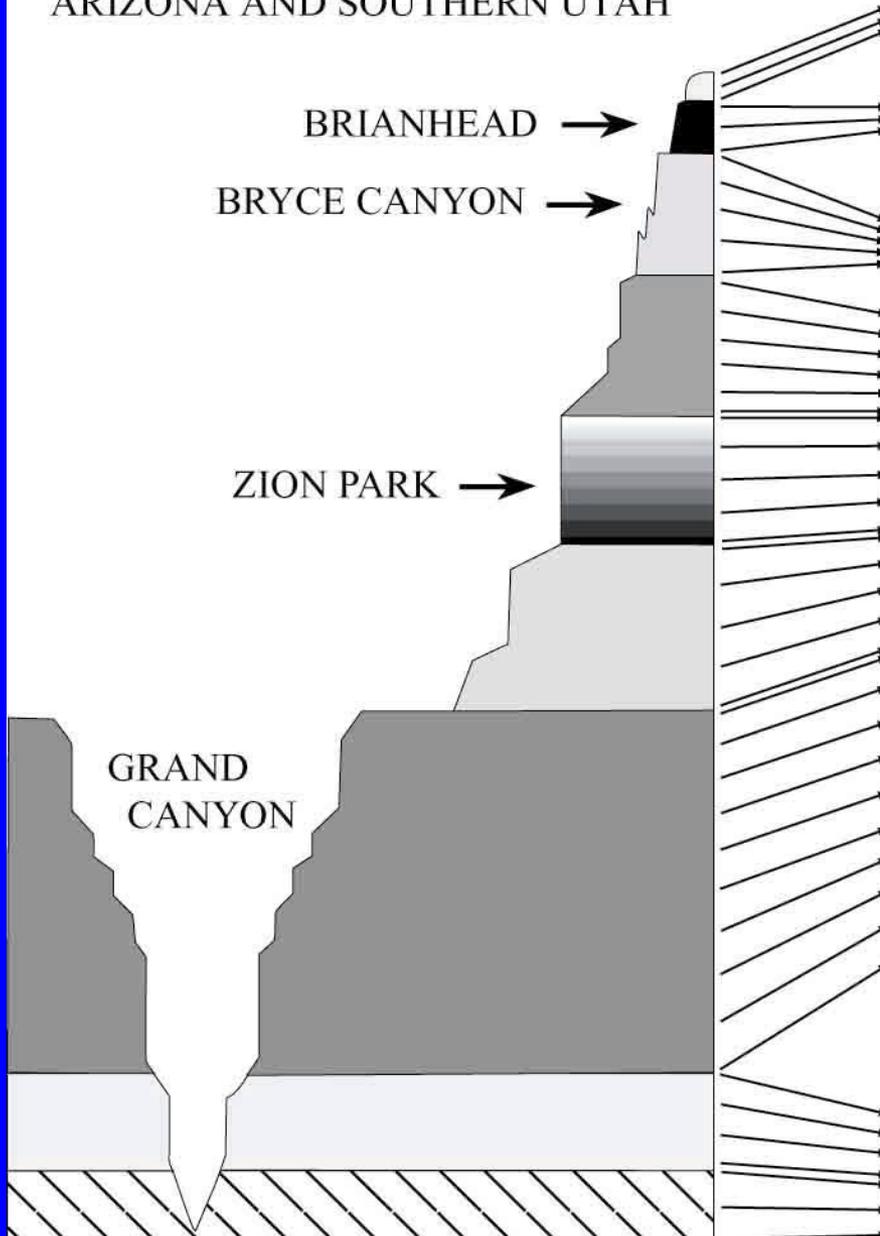


# Is the local geological column complete?

## The Grand Staircase of Utah and Arizona



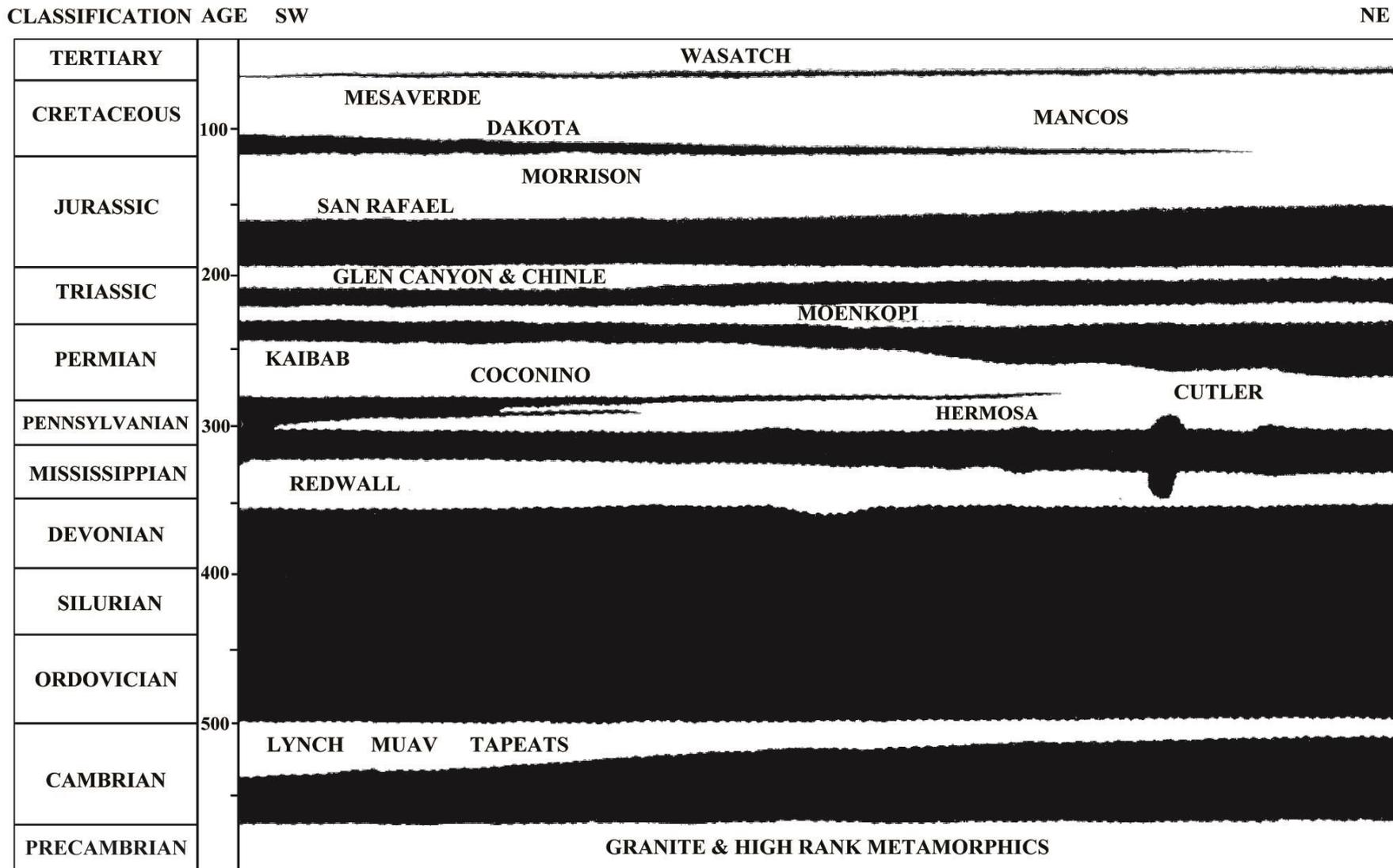
# GEOLOGICAL COLUMN IN NORTHERN ARIZONA AND SOUTHERN UTAH



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		Cretaceous					
	Jurassic	* 252 my	* Dinosaurs	* Reptiles	* Mammals	* Birds	
	Triassic						
PALEOZOIC	Permian					* Amphibians	
	Pennsylvanian						Abundant coal Appalachian Mts
	Mississippian						
	Devonian					*	
	Silurian						
	Ordovician					*	
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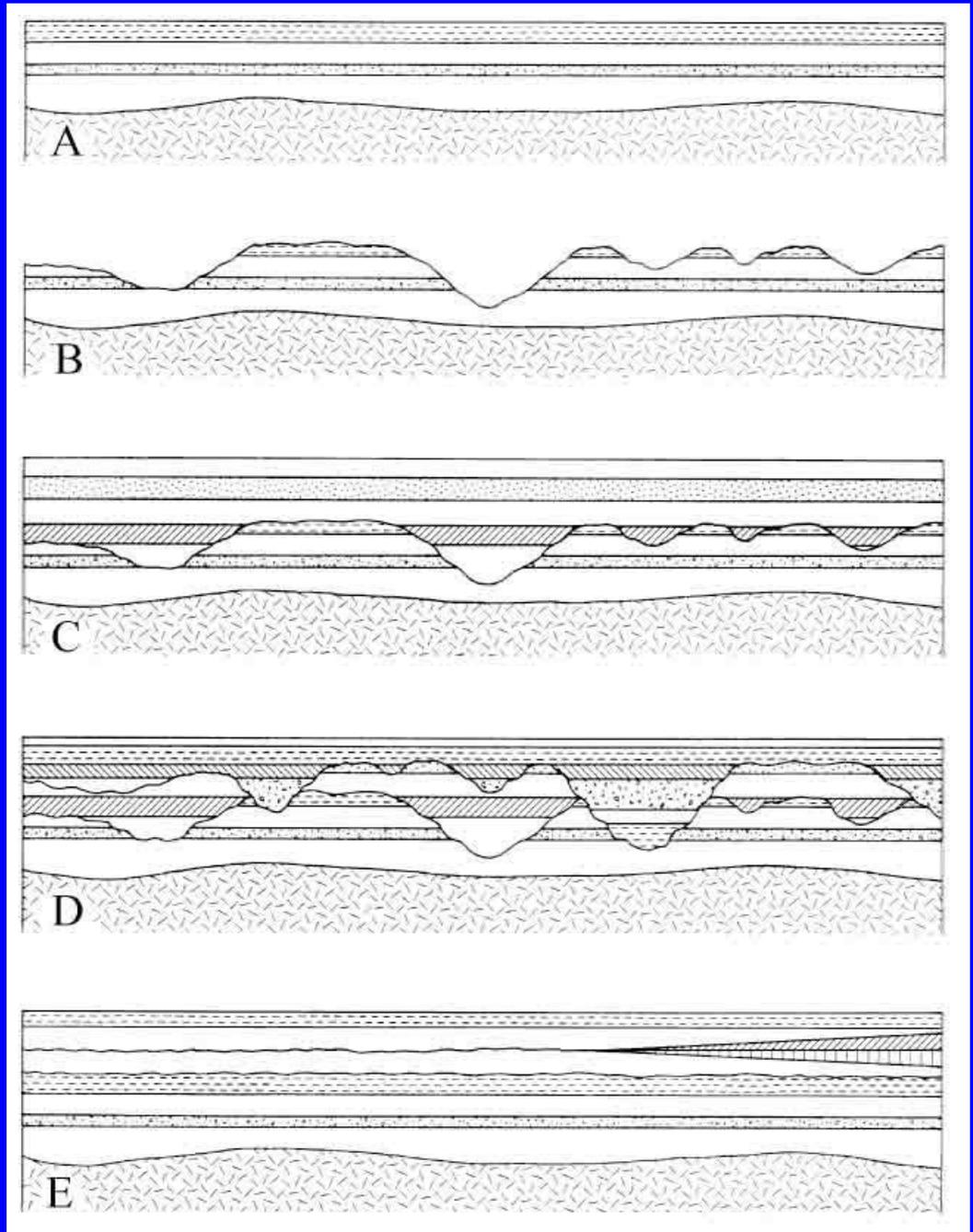
White = rock Black = presumed time that is not represented by rock

### STRATIGRAPHIC HIATUSES IN SOUTHEASTERN UTAH

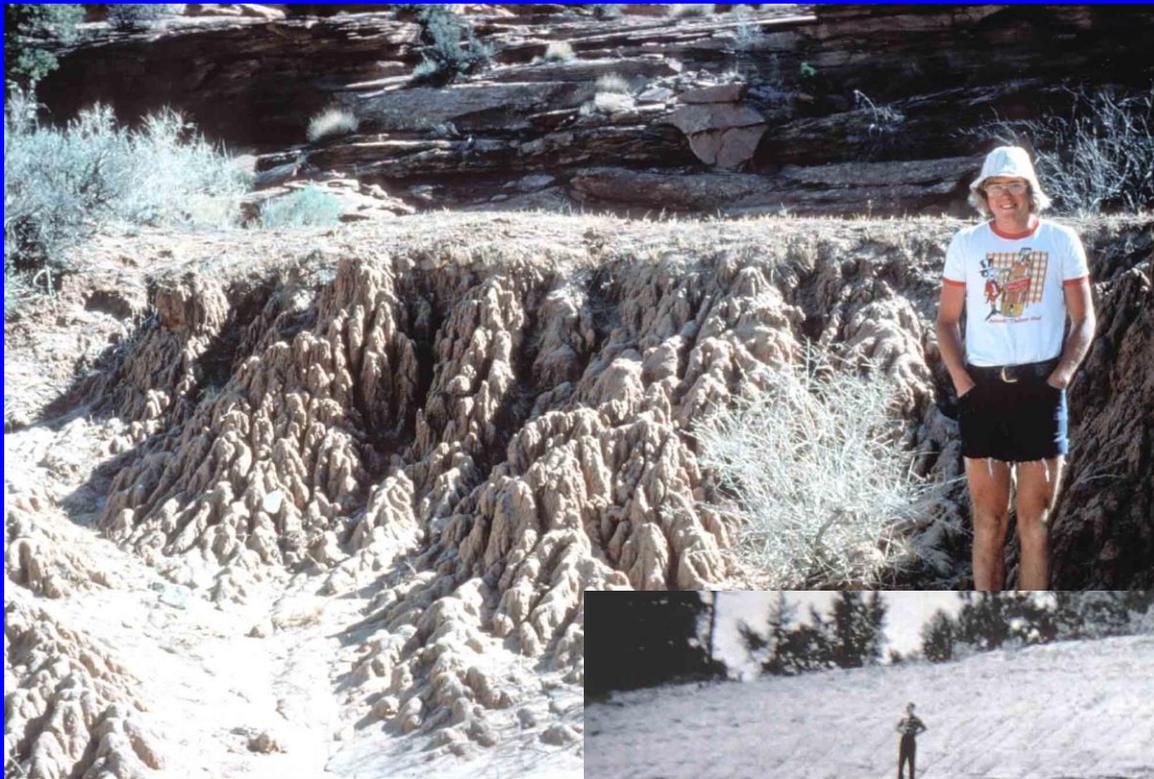


A-D is the sequence of events expected in conventional model; erosion occurs between episodes of sediment deposition

E is what actually exists



**EROSION** of rocks into  
landforms – landscape  
development





**Erosion on different scales; almost all erosion is caused by water**



# Time needed for eroding canyons and other landforms:



30,000 – 49,000 years to erode the canyon

Based on size of canyon, and estimate of amount of sediment removed each year

# Time needed for eroding canyons and other landforms:



Problem: I walk this path several times a week.  
This canyon did not exist 7 years ago

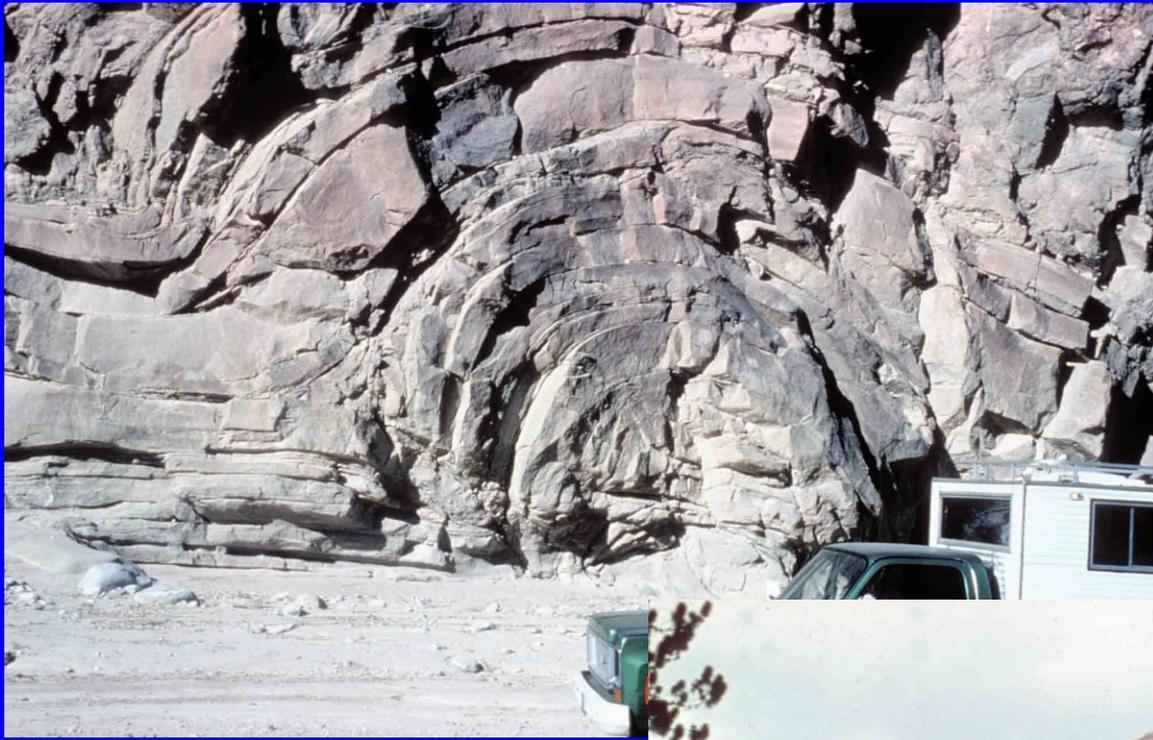
# Time needed for eroding canyons and other landforms:



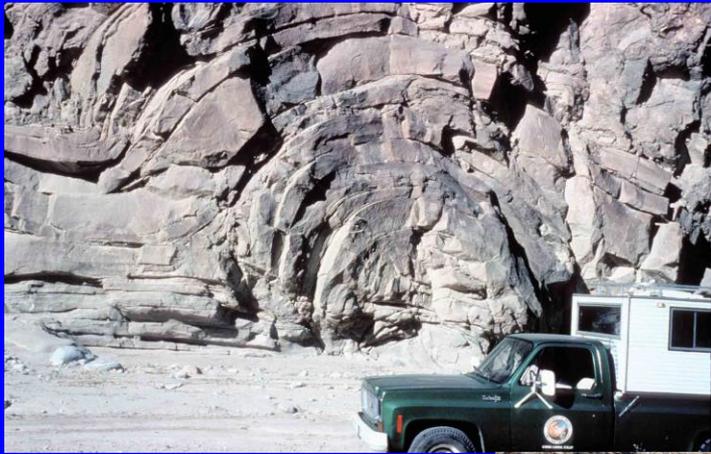
~~30,000 – 49,000 years to erode the canyon~~

**One rainy season**

# FOLDING

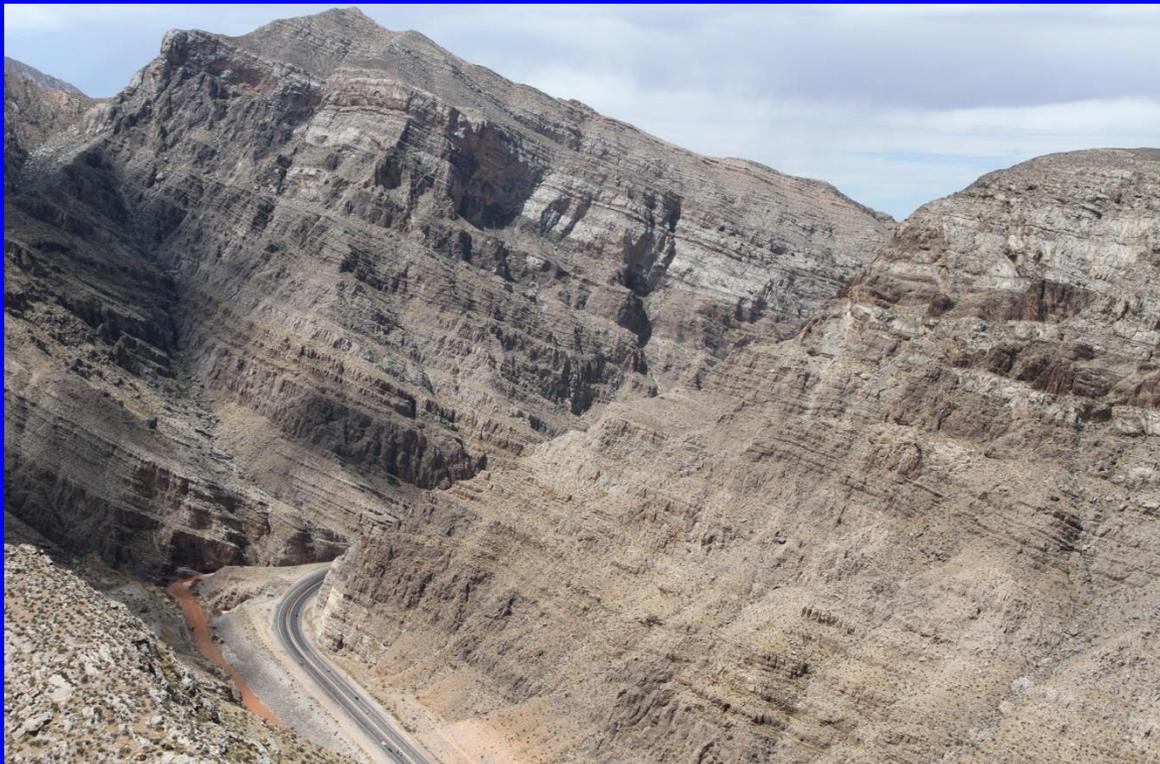


# Folding



Virgin River  
Gorge – cuts  
through an  
anticline

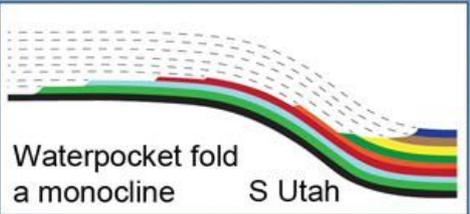




# Folding

Virgin River Gorge  
and anticline





Triassic

Jurassic

Cretaceous

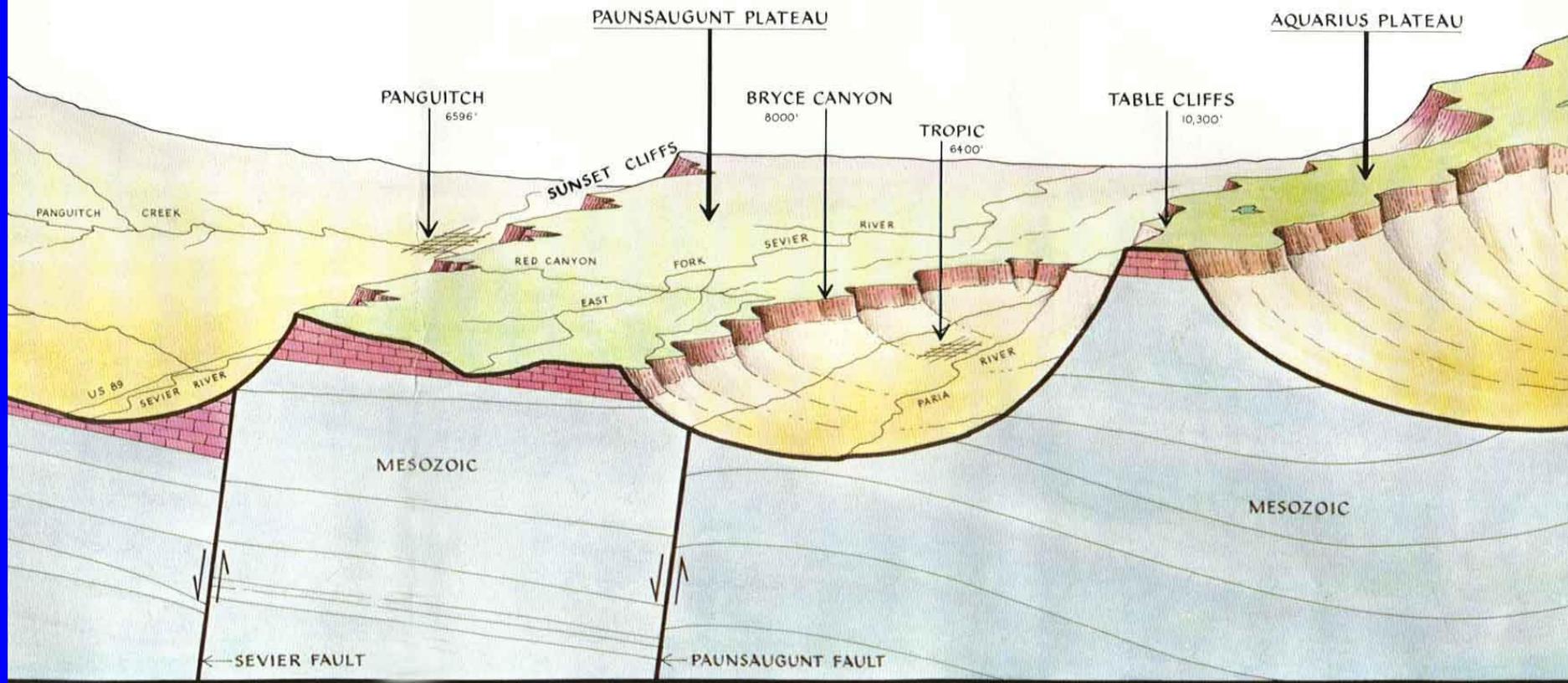


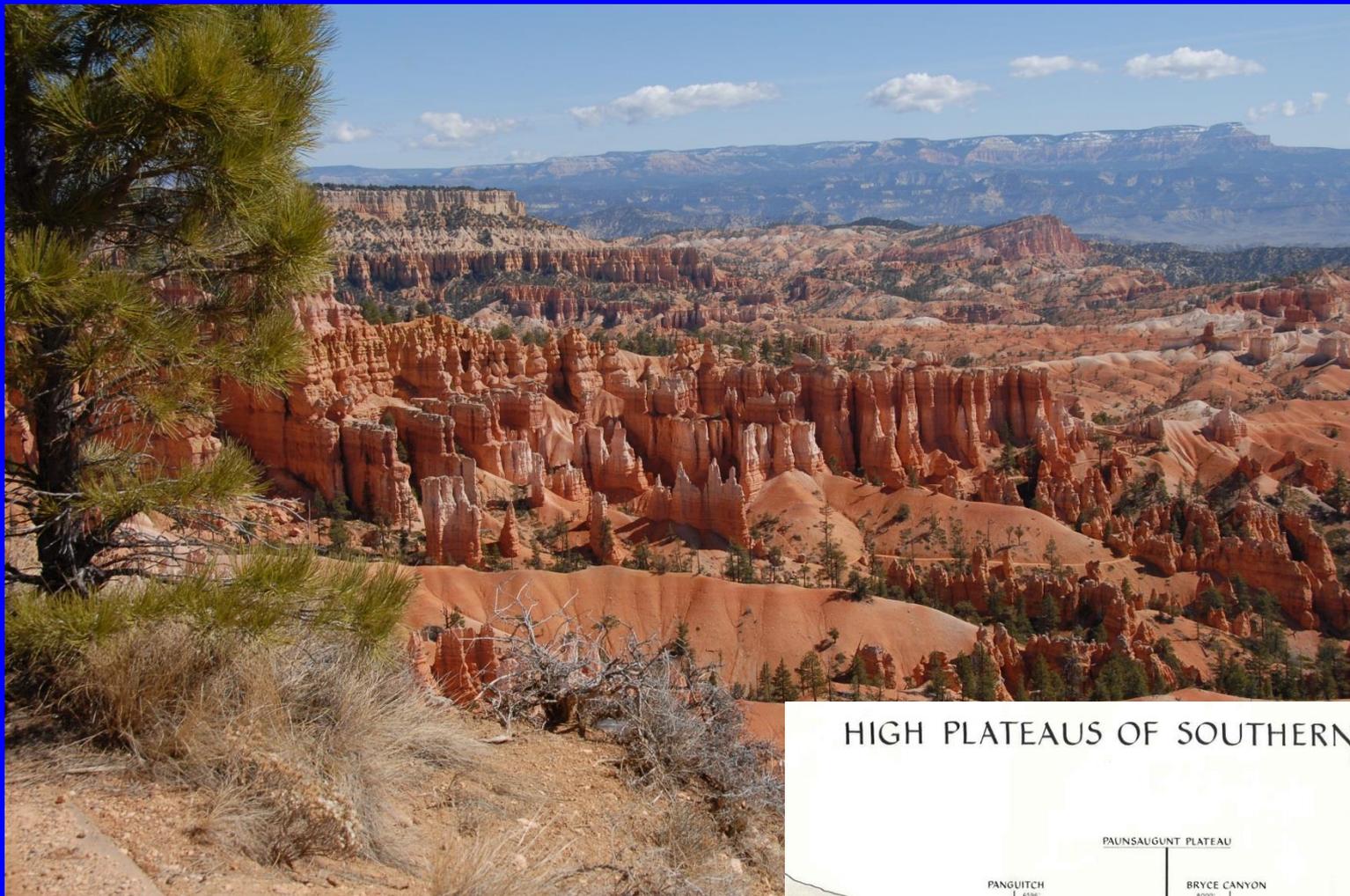
# FAULTS



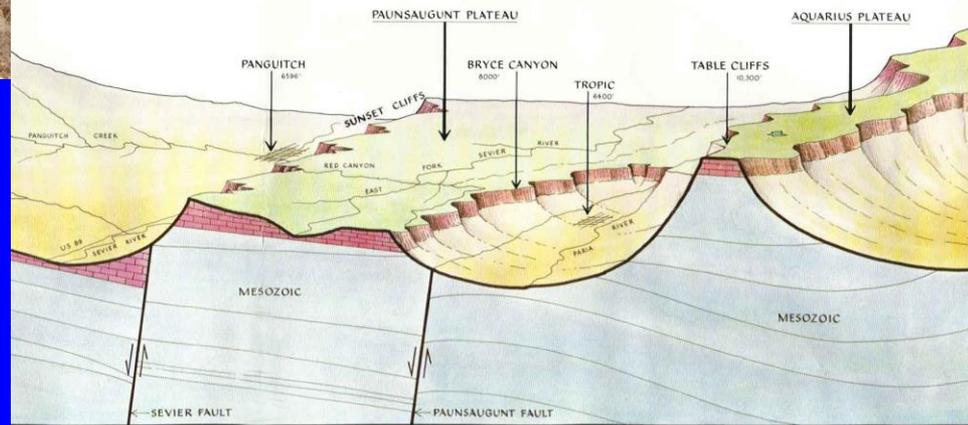
# Several major north-south faults in Utah

## HIGH PLATEAUS OF SOUTHERN UTAH

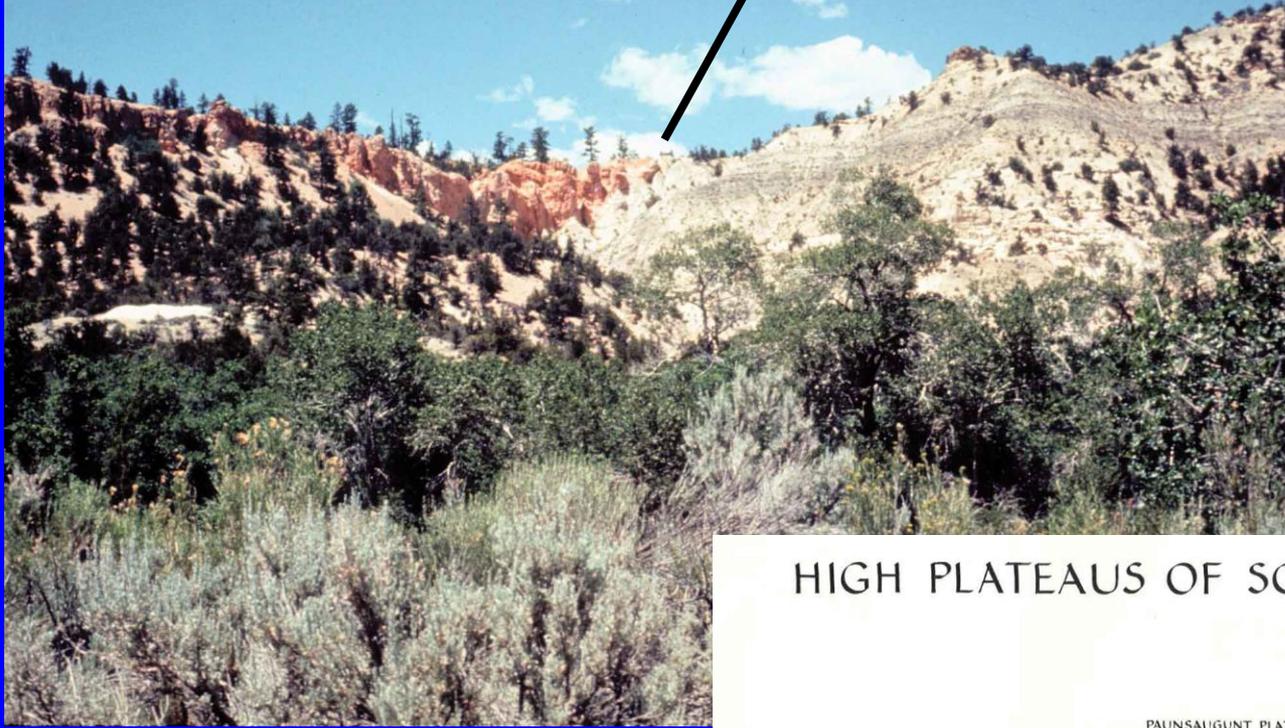




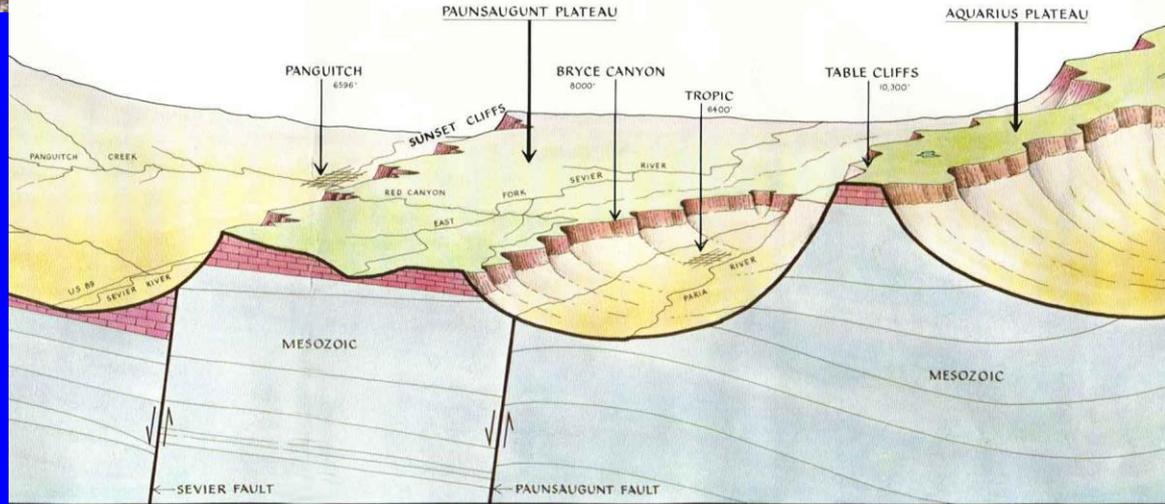
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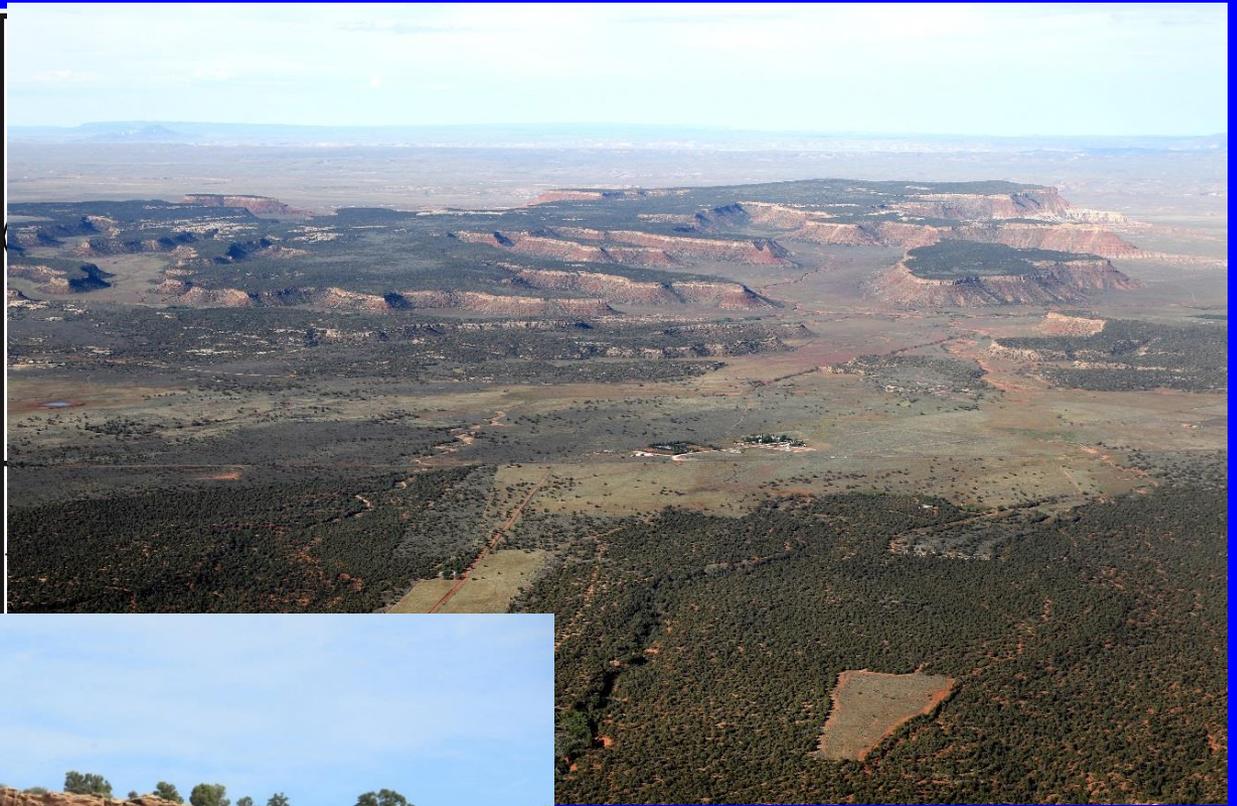
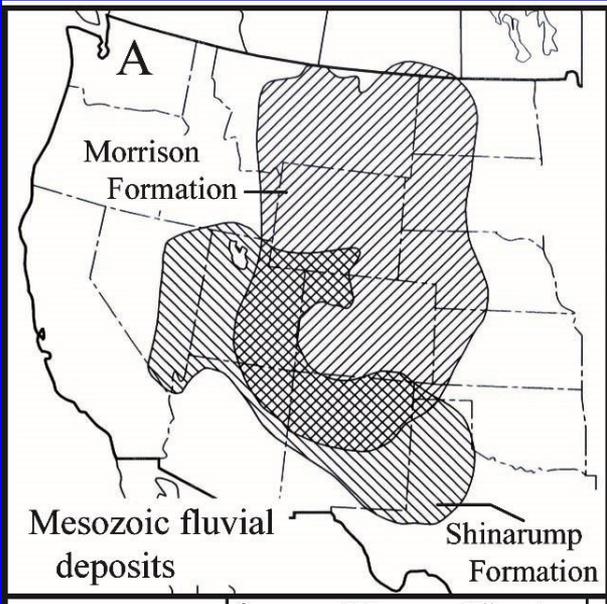


# Paunsaugunt fault



## HIGH PLATEAUS OF SOUTHERN UTAH





**WIDESPREAD  
FORMATIONS**

# Conclusions

- Southern Utah has examples of:
  - The geological column
  - Processes that help us understand catastrophic geology concepts
- Most basic processes of physical geology are part of any geological theory.
- The main differences are in how long they took, and how long ago