
THE GRAND CANYON
AND THE GENESIS FLOOD
PART 2: Carving the Chasm
Ariel A. Roth
www.sciencesandscriptures.com

1. INTRODUCTION

THE TWO POWERPOINT DISCUSSIONS OF THIS SERIES ABOUT THE GRAND CANYON

In the first discussion of the Grand Canyon (Laying Down the Layers), we dealt with features associated with the deposition of the extremely widespread sedimentary layers exposed in the Grand Canyon, and how these relate to the long geologic ages or the Genesis Flood.

In this discussion (Carving the Chasm), we consider how the Grand Canyon was eroded.

1. INTRODUCTION

OUTLINE OF PART 2: CARVING THE CHASM

1. INTRODUCTION
2. BRIEF OVERVIEW
3. GRAND CANYON PLATEAU
4. THE GREAT DENUDATION
5. IMPORTANT CONCEPTS
6. LONG AGE MODELS FOR CARVING GRAND CANYON
7. SHORT AGE MODELS FOR CARVING GRAND CANYON
8. DATING THE CANYON
9. EVIDENCE THE CANYON WAS CARVED BY A FLOOD
10. CONCLUSIONS

1. INTRODUCTION
THE QUESTION

Was the Grand Canyon carved by slow erosive processes operating over millions of years, or was it carved by the rapidly receding waters of the astonishing worldwide Genesis Flood?

The scientific community overwhelmingly favors a model of slow erosive processes over many millions of years, but thus far has been unable to come up with an acceptable model. There are many different opinions about when and how much time was involved in these erosive events.

The Bible, which is by far the world's most popular book, suggests a rapid catastrophic Flood, just a few thousand years ago. Pertinent verses from Genesis were quoted in Part 1. While some consider the first part of Genesis to be allegorical, in the New Testament, Christ very much authenticates the Genesis Flood. A quote from Him follows.

MATTHEW 24:37-42

Christ authenticates the Flood as he warns:

37. "But as the days of Noe [Noah] were, so shall also the coming of the Son of man be.

38. "For as in the days that were before the flood they were eating and drinking, marrying and giving in marriage, until the day that Noe entered into the ark.

39. "And knew not until the flood came, and took them away; so shall the coming of the Son of man be.

40. "Then shall two be in the field; the one shall be taken, and the other left.

41. "Two women shall be grinding at the mill; the one shall be taken, and the other left.

42. "Watch therefore, for ye know not what hour your Lord doth come."

1. INTRODUCTION
THE ENIGMA OF THE GRAND CANYON

From the geological literature:

"The grand debate"

"It's a puzzle with too many pieces missing"

"The Canyon conundrum"

"A mystery unsolved"

How the Grand Canyon came to be has become a leading icon of geological enigmas. At present, there is no consensus whatsoever. Part of the problem is that a lot of the desired evidence has been eroded away, but significant factors remain. Another part of the problem is that the geological community allows only a restrictive view and does not consider the biblical model of a Flood as plausible and as part of the equation.

1. INTRODUCTION
SOME OTHER SECULAR VIEWS

It is not only the Bible that considers the Flood a major agent in earth history. Stories of a worldwide flood dominate folk literature. Note the following quotation about the Colorado River:

"The Navajo, the Hualapai and the Havasupai still believe that the river is the runoff from a great flood that once covered the earth."

From: Wallace, Robert. 1973. The Grand Canyon. The American Wilderness Series. Time-Life Books, Alexandria, VA p 99.

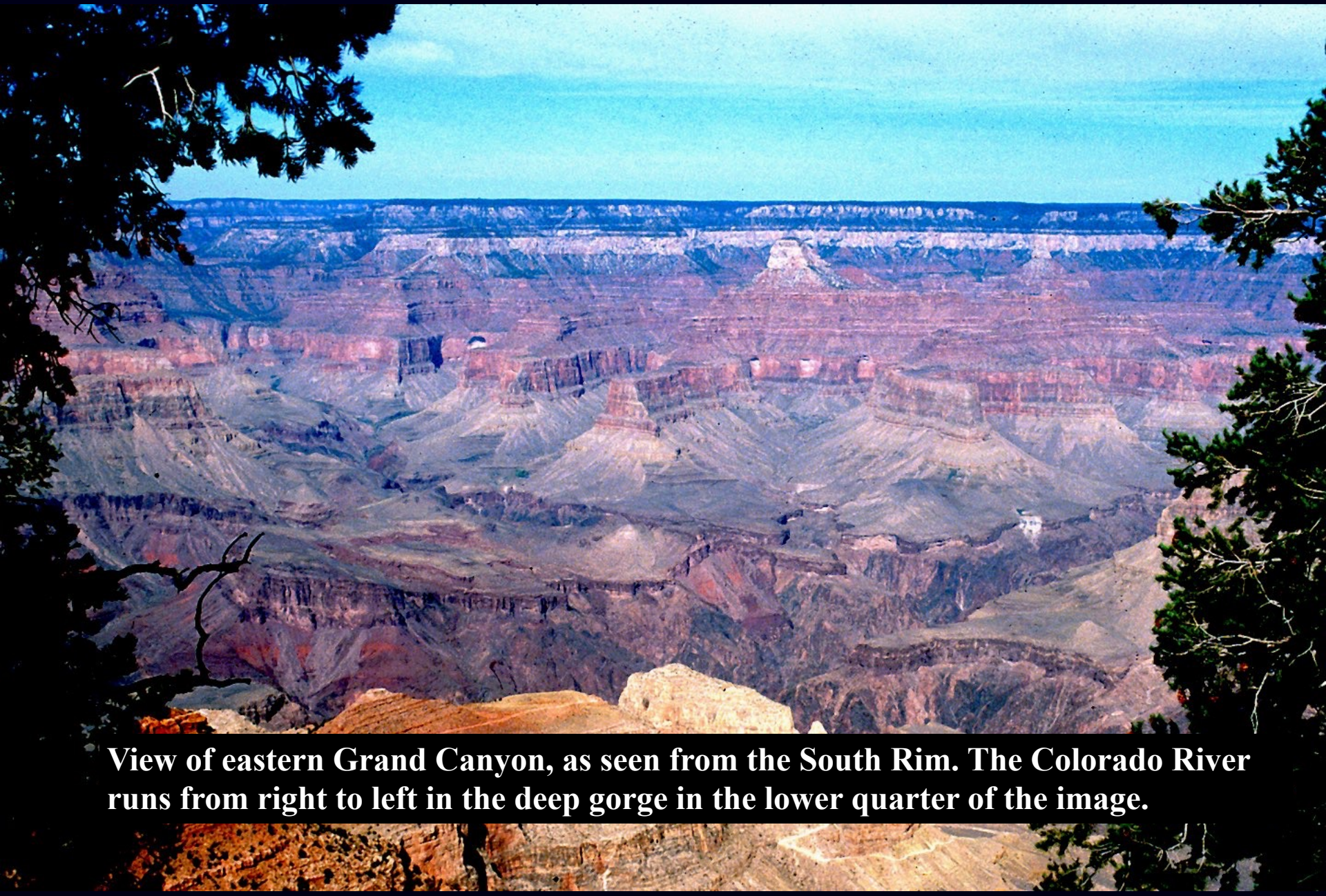
2. BRIEF OVERVIEW

The Grand Canyon is where the Colorado River cuts through an uplifted area called the Grand Canyon Plateau. It is the pale grayish area of the map on the next slide.

The river winds in a deep canyon for hundreds of kilometers through this Plateau.

Three illustrations of this geological wonder follow the map.

COLORADO RIVER



View of eastern Grand Canyon, as seen from the South Rim. The Colorado River runs from right to left in the deep gorge in the lower quarter of the image.

The Colorado River, deep in the Inner Gorge of the Grand Canyon

Western part of Grand Canyon at Guano Point

2. BRIEF OVERVIEW
THE GEOLOGIC SETTING

The Grand Canyon is cut through only a small portion of the geologic layers of the region where it is found. There is some Precambrian at the bottom, but most of the layers you see in the Grand Canyon are Paleozoic. Above the layers of the rim, especially to the north and east of the Canyon region, thicker layers of Mesozoic and Cenozoic deposits are found.

The next slide gives you the general order of the geologic column. We will be dealing especially with the left part of the chart. Note especially the Paleozoic, Mesozoic and Cenozoic eras.

MAIN DIVISIONS OF THE GEOLOGIC COLUMN

EON	ERA	PERIOD	EPOCH	Putative age in Ma*
Phanerozoic	Cenozoic	Quaternary	Holocene	0.01
			Pleistocene	1.6
		Tertiary	Pliocene	5.3
			Miocene	24
			Oligocene	34
			Eocene	55
			Paleocene	65
	Mesozoic	Cretaceous		144
		Jurassic		206
		Triassic		248
	Paleozoic	Permian		290
		Carboniferous		354
		Devonian		417
		Silurian		443
		Ordovician		490
		Cambrian		540
PRECAMBRIAN Proterozoic Eon				2500
Archaean Eon				4600

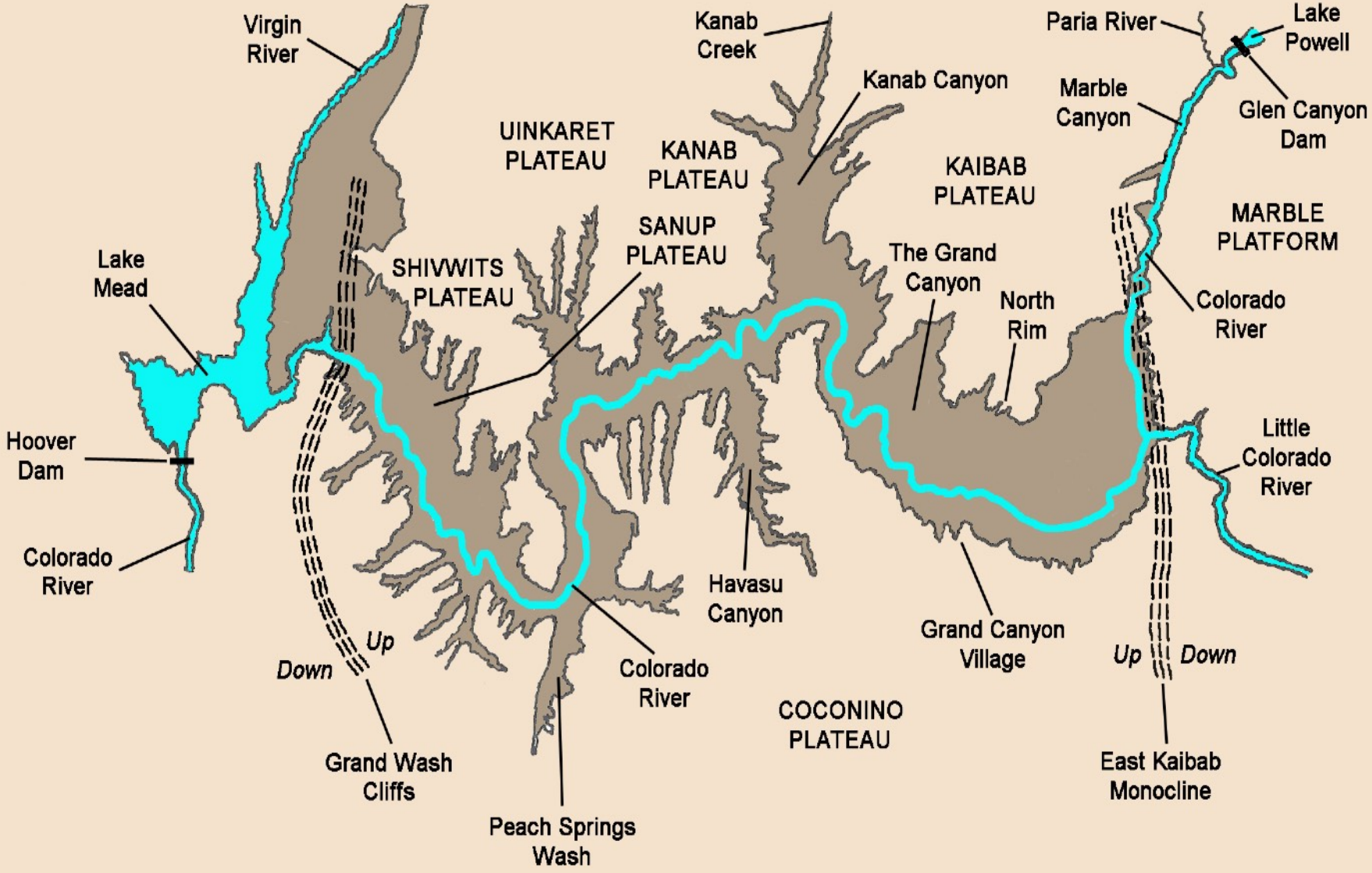
*Ages given represent beginning of time period in millions of years (Ma).
Dates not endorsed by author.

3. THE GRAND CANYON PLATEAU

One of the leading puzzles about the Grand Canyon is that the Colorado River cuts through the Grand Canyon Plateau. Any "intelligent" river would have gone on either side of the Plateau, both of which are at present over half a kilometer lower. Furthermore, why did the river cut through almost the highest region of the Plateau?

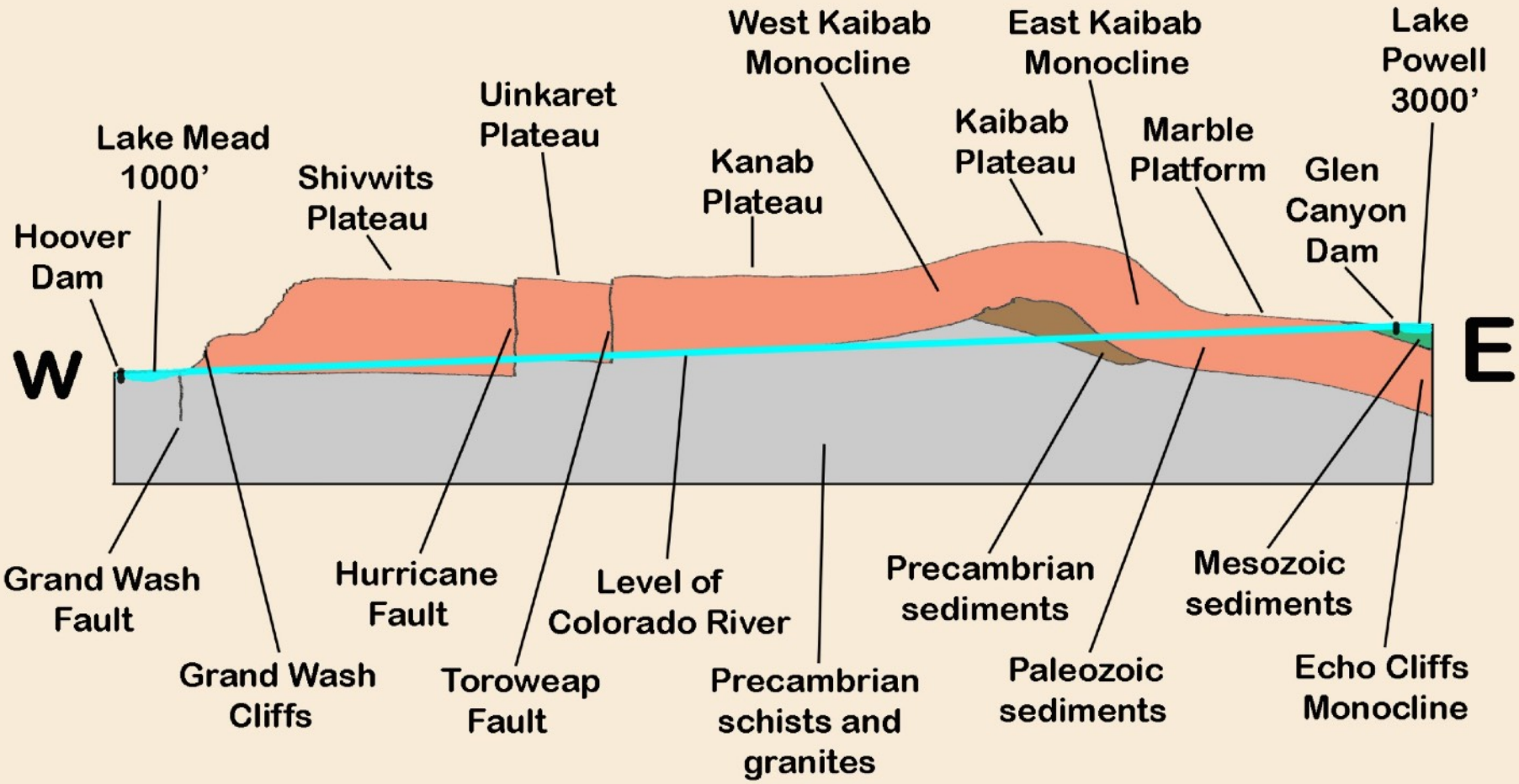
The next slide is a map of the Grand Canyon. The Plateau covers most of the region. Specifically it is the elevated part located between the triple sets of dashed lines on either side, designated as Grand Wash Cliffs and East Kaibab Monocline. The next two slides give you E-W and N-S cross-sections of the region. Note the level of the Colorado River.

GRAND CANYON REGION



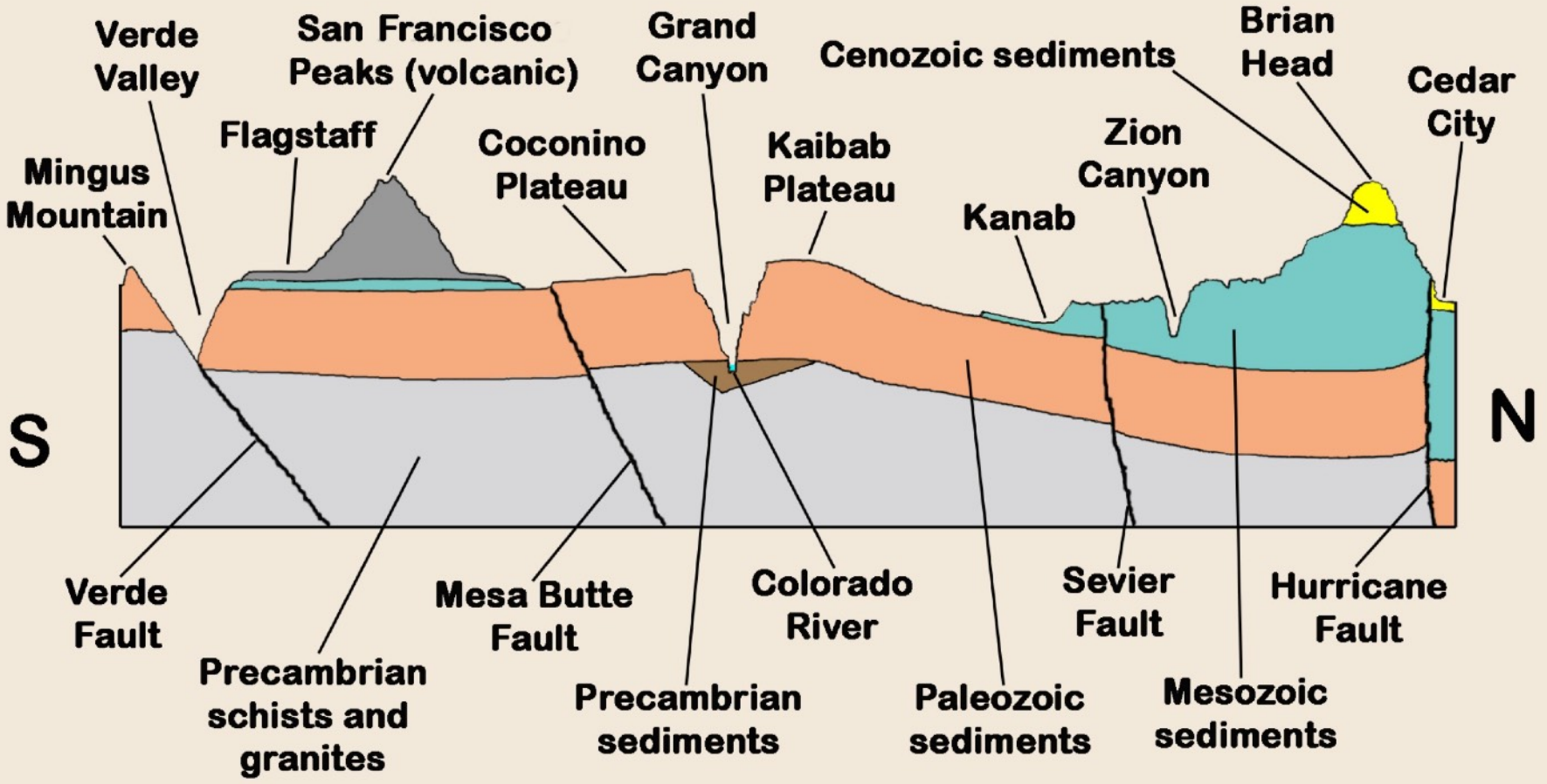
GRAND CANYON

East-West Cross Section. Vertical Exaggeration 18 X



GRAND CANYON REGION

North-South Cross Section. Vertical Exaggeration 15 X



5. THE GRAND CANYON PLATEAU
A REALITY CHECK

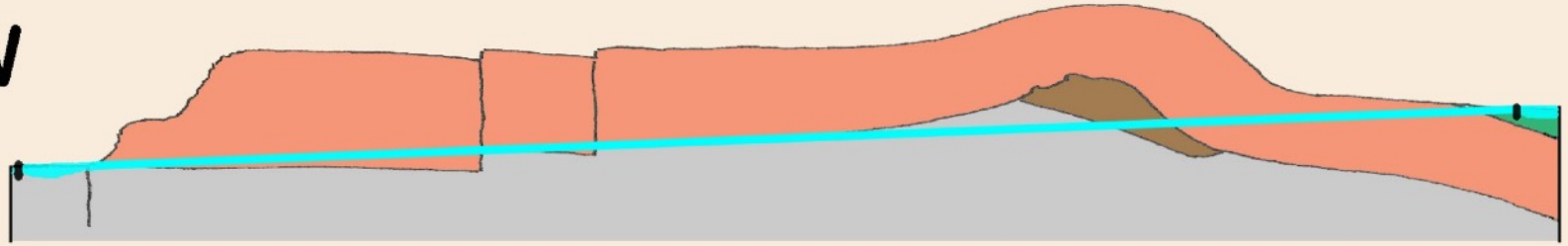
The two slides above use considerable vertical exaggeration in order to visualize vertical details. As you consider the Plateau, keep the actual elevation differences in mind. On the next slide a comparison with no vertical exaggeration is illustrated. Keep this major difference in perspective as you consider different models of how the Grand Canyon and the surrounding regions were eroded. The activity had to be widespread.

GRAND CANYON

West-East Section

Vertical exaggeration X 15

W



E

No vertical exaggeration

W

E

3. GRAND CANYON PLATEAU

The next few slides illustrate a few leading features of the Grand Canyon Plateau

The East Kaibab Monocline which is the eastern edge of the uplifted Plateau. Note the layers rising to the left (arrow).

Colorado River going into the Marble Plateau. This is where the Grand Canyon Begins at Lee's Ferry


The Grand Wash Cliffs that form the western edge of the Plateau

Where the Colorado River comes out (arrow) of the Grand Wash Cliffs into Lake Mead. This is where the Grand Canyon ends.

East part of Grand Canyon. Very few rivers join the Colorado River as it goes through the Plateau. A notable exception is the Little Colorado River from the east. The arrows point to its gorge that cuts through the East Kaibab Monocline

Gorge of the Little Colorado River. It is an ephemeral stream.

4. THE "GREAT DENUDATION"

Dutton CE. 1882. Tertiary history of the Grand Canyon district. U. S. Geological Survey Monograph, Vol. 2.

4. THE GREAT DENUDATION

Clarence Dutton, a leading geologist with the U.S. Geological Survey was aware that the carving of the Grand Canyon was only a minor erosional feature of the Grand Canyon region. There is good evidence that above the Canyon, Mesozoic and Cenozoic layers, whose total thickness approaches twice that of those of the Paleozoic of the Canyon itself, have been eroded away over a much wider area than the Canyon. Dutton called this major erosion the "Great Denudation."

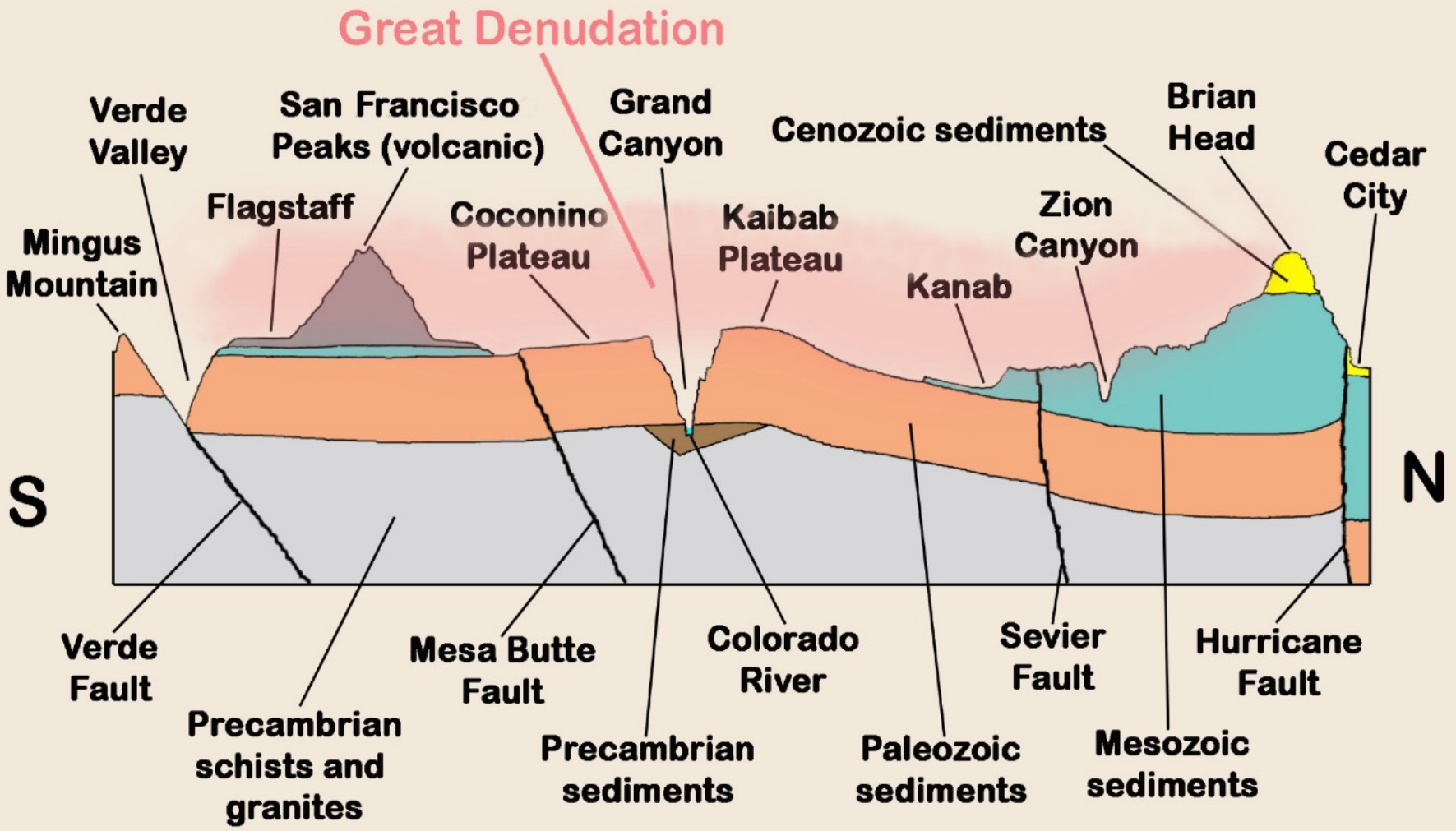
The volume of the Canyon itself, up to the top of its rim, is estimated as some 4000 cubic kilometers (1000 cubic miles). Estimates for the volume of the Great Denudation are 15 to 30 times larger. No one knows exactly how far the Mesozoic and Cenozoic layers extended originally. They are well represented to the north and east of the Canyon, but only sparsely represented to the west and south.

The assumed area of the Great Denudation is just a little larger than the grey Grand Canyon Plateau area in the next slide. The following slide highlights in pink the "Great Denudation" in a cross section perspective. At the time of the Great Denudation there was likely no Grand Canyon nor any San Francisco Peaks.

COLORADO RIVER

GRAND CANYON REGION

North-South Cross Section. Vertical Exaggeration 15 X

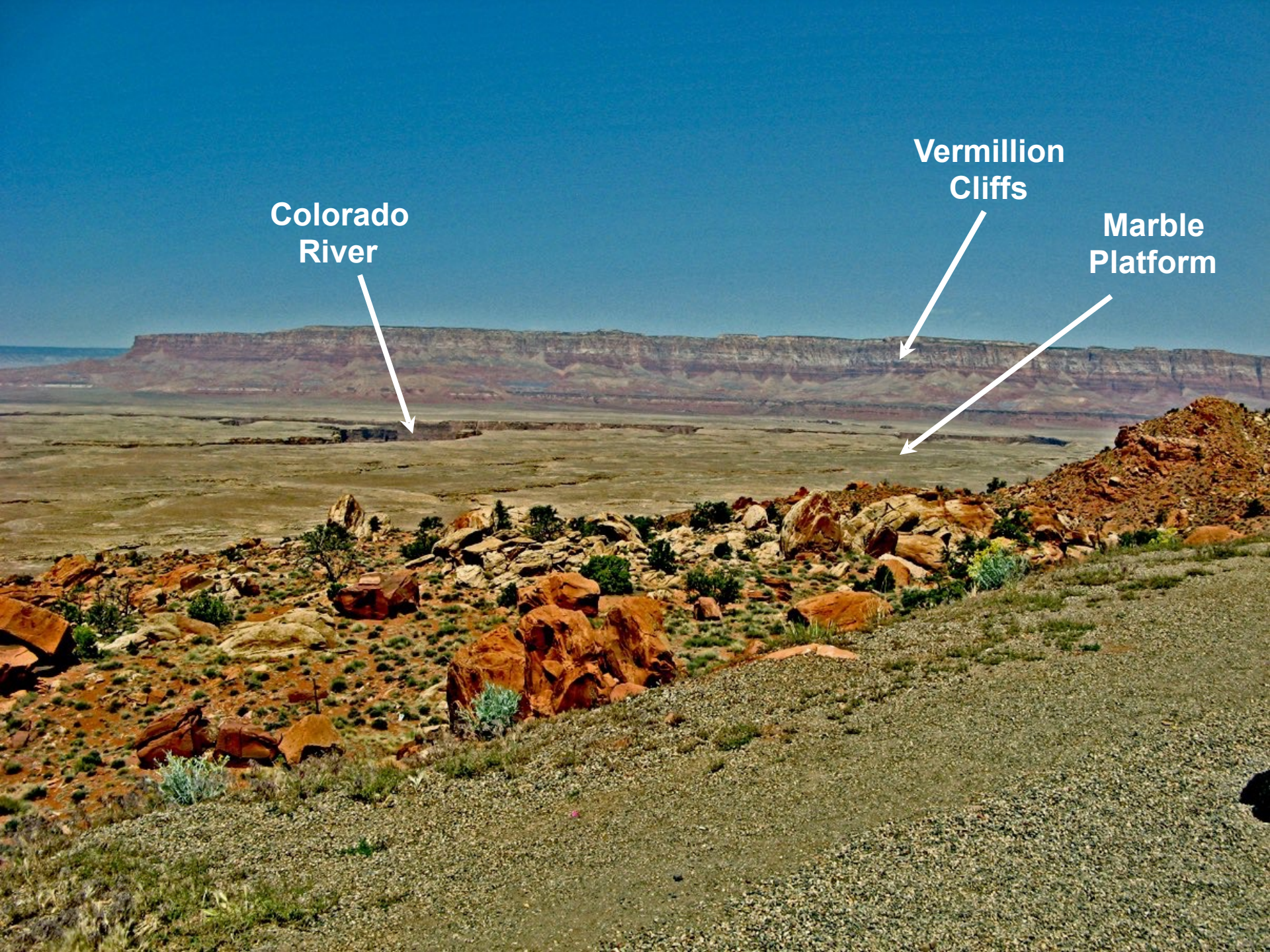


4. GREAT DENUDATION

The next slide of the famous Grand Staircase illustrates the northen edge of the Great Denudation. This is a view to the north from the elevated edge of the Grand Canyon Plateau. The Mesozoic and Cenozoic layers that form the giant steps in the Staircase likely originally continued as layers over the Plateau region, but have been washed out, leaving the Staircase as evidence.

The slide after the next shows the Great Denudation down to the Marble Platform that is the surface of the Kaibab Limestone Formation. This is in the northwest region of Grand Canyon Plateau. Note the nearly clean scarp of the uneroded Mesozoic cliffs (Vermillion Cliffs) beyond the Marble Platform.

THE GRAND STAIRCASE


Colorado River
Vermillion Cliffs
Marble Platform

5. IMPORTANT CONCEPTS

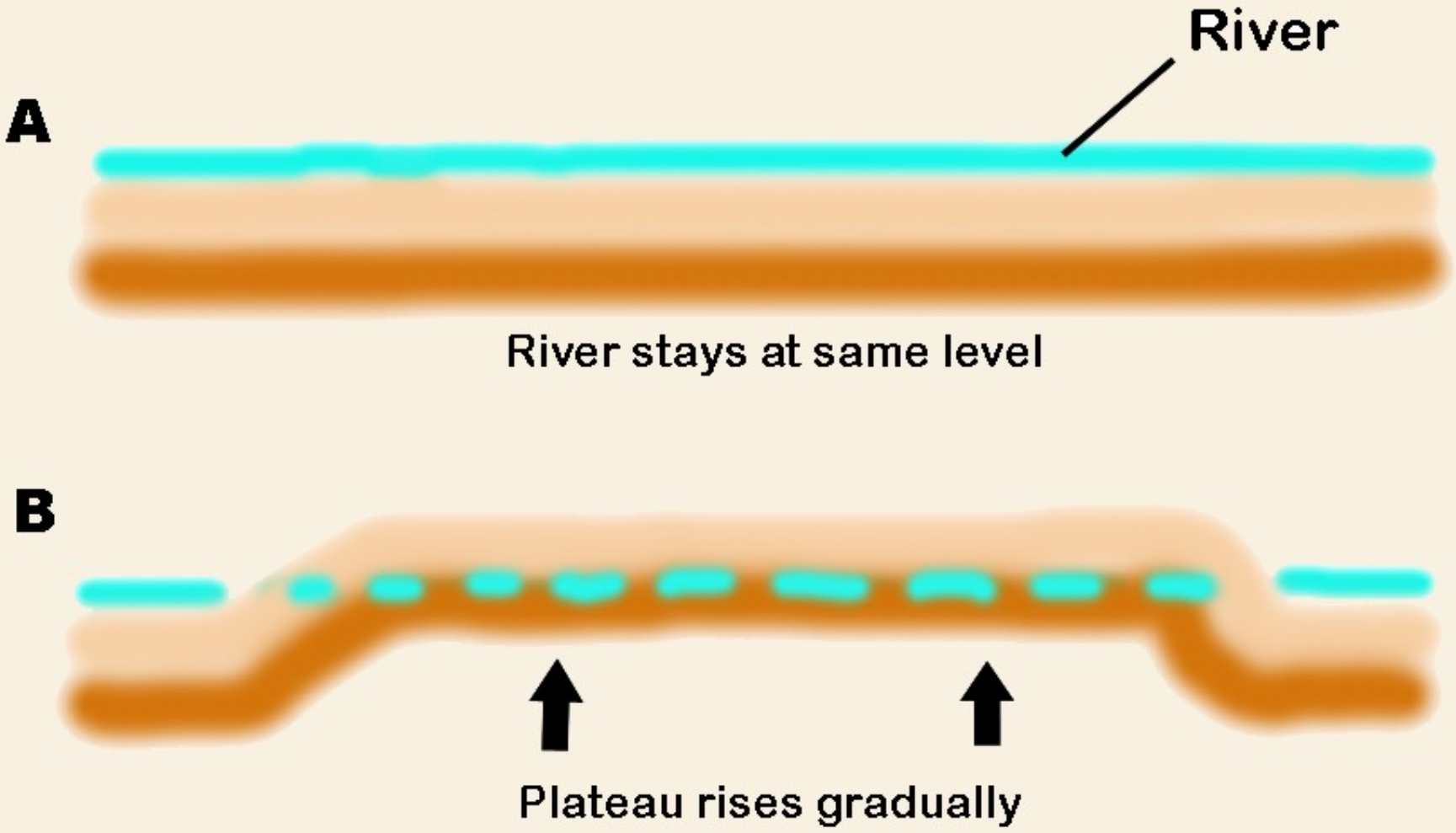
NOTE: In the next few slides, we will be discussing (1) A few basic geological concepts related to Grand Canyon carving; (2) eight long ages models of how the Canyon was cut; and (3) two short age models.

While these topics are important to understanding the Canyon problem, they are more technical and some readers may choose to skip down to Section 8, titled "DATING THE CANYON." This will be followed by the last section that presents evidence favoring the erosion of the Canyon region by the Genesis Flood

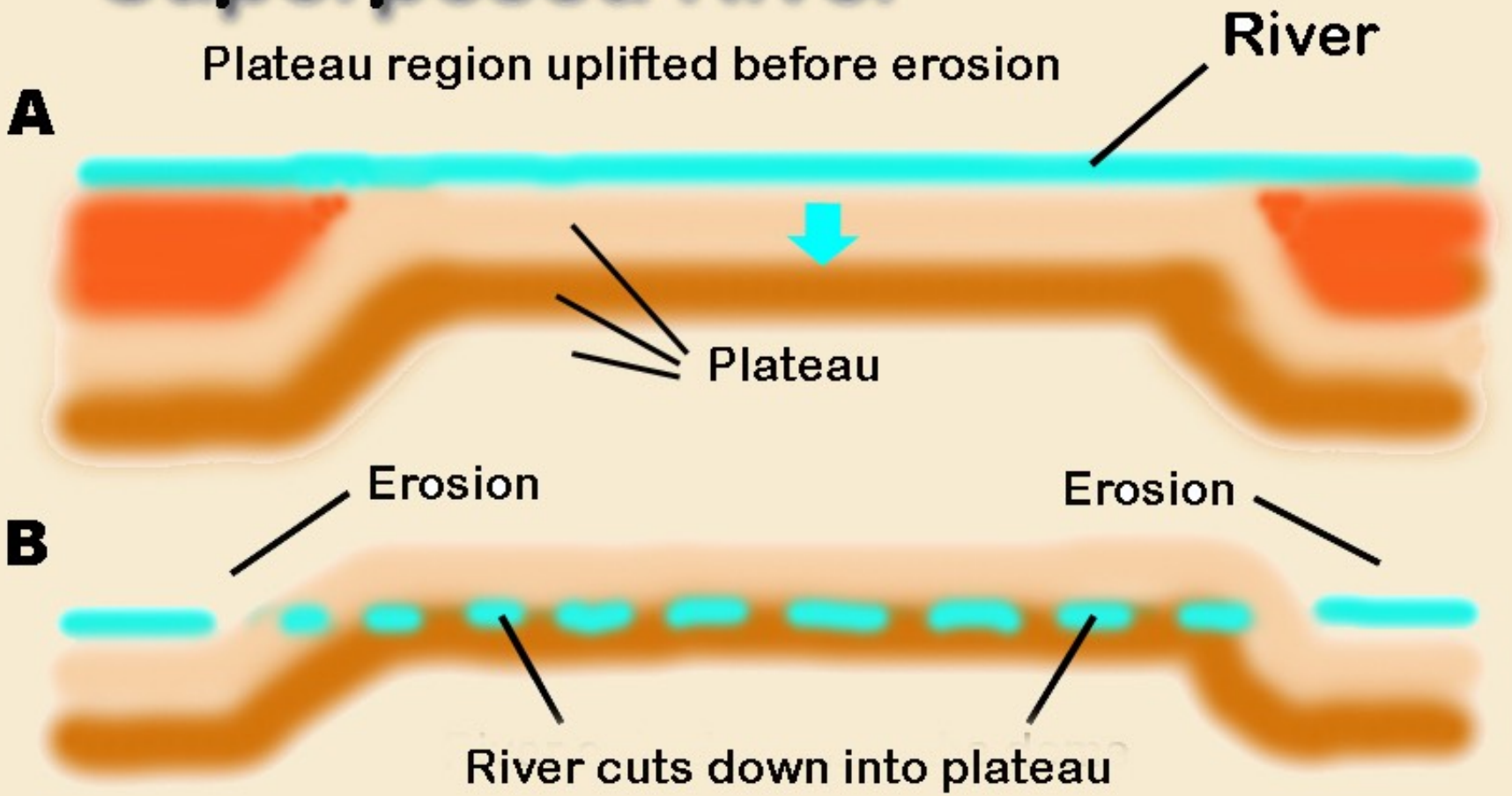
5. IMPORTANT CONCEPTS

One of the questions about the Canyon is whether the Grand Canyon Plateau uplift preceded or followed the carving of the Canyon by the Colorado River. The next two slides present the two different views.

Antecedent River



Superposed River



5. IMPORTANT CONCEPTS: TWO SMALL BUT IMPORTANT FORMATIONS

Muddy Creek Formation

Lies in the way of the Colorado River. Considered fairly recent (5-6 Ma +, Ma means: millions of years) by geologists who believe in long geological ages. It is called the "immovable object" that lies in the way of the "irresistible force," i.e. the Colorado River. Most geologists agree that the Muddy Creek means that there was no Colorado River, at least in that locality, while the Muddy Creek was gradually laid down. Since you find Muddy Creek both north and south of the Colorado River, the sediments forming it could not have been transported across a moving river, so there must not have been a Colorado River when the Muddy Creek was laid down.

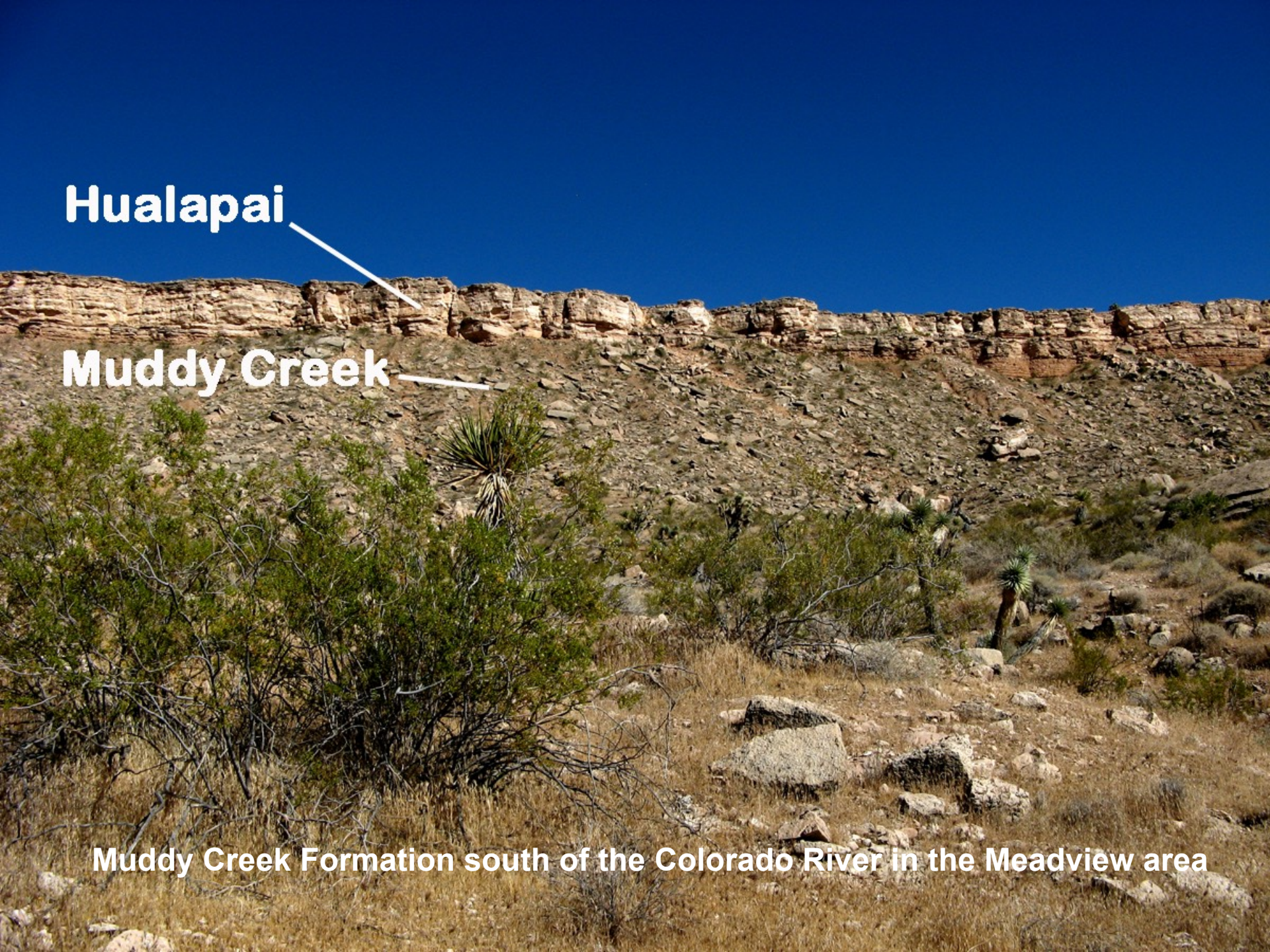
Bidahochi Formation

Considered recent (4-9 Ma). Kind of lies in the way of the Little Colorado River suggesting it and the old Colorado River are relatively young. Was there a Colorado River before that?

The map on the next slide identifies the general area of these two formations. Illustrations follow.

COLORADO RIVER

Muddy Creek Formation north of the Colorado River in the Lake Mead Area



Muddy Creek Formation south of the Colorado River in the Meadview area

Bidahochi Formation (gray) in
Petrified Forest National Park

6. LONG AGES MODELS FOR CARVING THE CANYON

a. ANTECEDENCE

John Wesley Powell (1869): Favored the antecedent model, but it looks like Kaibab up-warp preceded the river since the river follows it on the east side.

b. SUPERPOSED (SUPERIMPOSED)

Davis (1901): Favored the superposed model, but how do you get a Colorado River to be elevated from its source to at least as high as the Grand Canyon Plateau. Lack of evidence for ancient river and Muddy Creek problem in Pliocene are also problems.

6. LONG AGES MODELS FOR CARVING THE CANYON

c. ANTEPOSITION

Hunt (1956). Proposed anteposition: Ancient river in Miocene, then uplift and ponding of river. River then erodes again in Pliocene, following about same course. To get around Muddy Creek problem proposed infiltration of Colorado River waters through rocks in western Grand Canyon. But the abundant Colorado River sediments would quickly plug up infiltration passages.

6. LONG AGES MODELS FOR CARVING THE CANYON

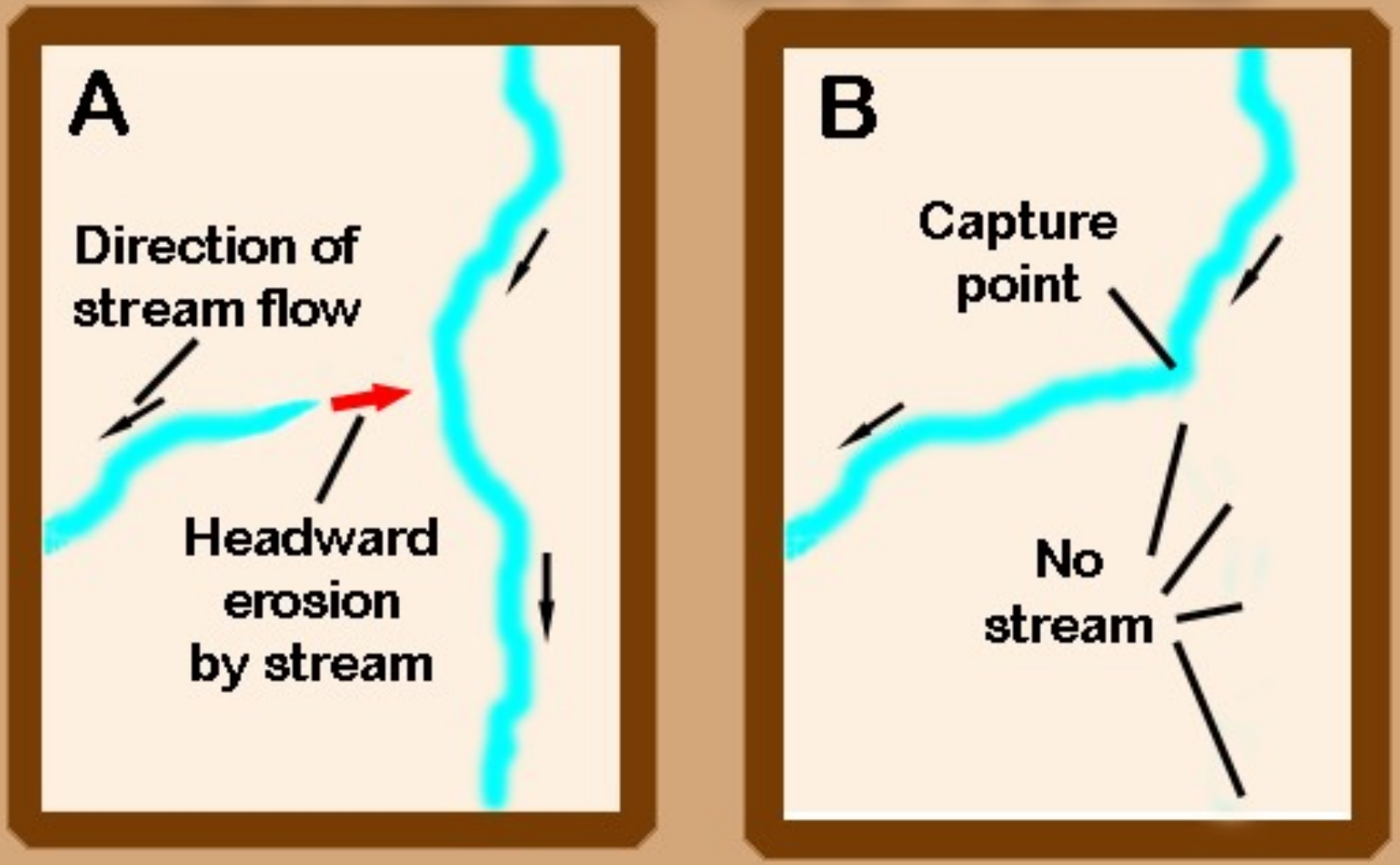
d. STREAM CAPTURE

In 1964 there was an important conference about the origin of the Grand Canyon. Its purpose was to develop a hypothesis that would not disagree with any known facts.

The consensus of the meeting proposed that there were two drainage systems lying east and west of the Kaibab uplift, i.e. the highest part of the Grand Canyon Plateau. Eventually the western stream system captured the eastern one.

The process of stream capture is illustrated in the next slide which is oriented to illustrate the proposed Grand Canyon stream capture process. On the A side, the river to the right is the old Colorado River running south along the east side of the Plateau and eventually into the Gulf of Mexico and Atlantic Ocean. Headward erosion of what has been called a "precocious gully" across the Plateau towards the east reached the Colorado River and captured it (B side) so that the new Colorado River then flowed west across the Plateau and into the Gulf of California and Pacific Ocean as it does now.

STREAM CAPTURE



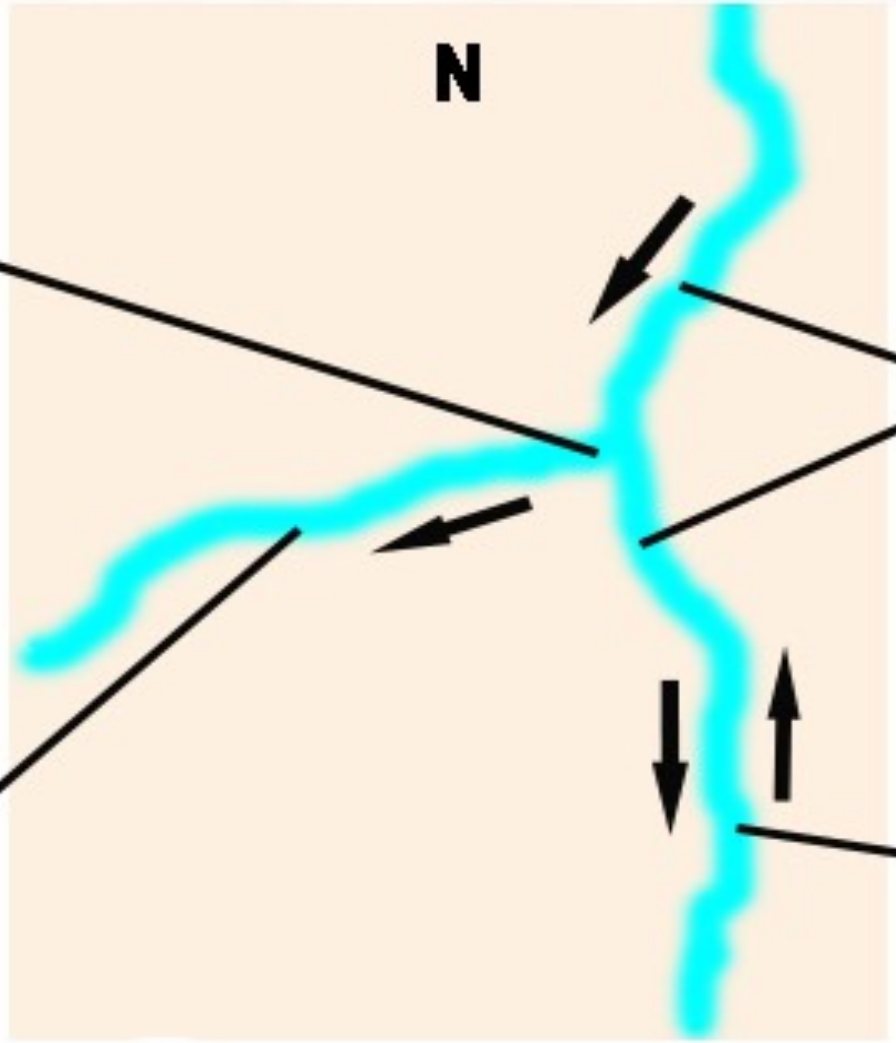
6. LONG AGES MODELS FOR CARVING THE CANYON

d. STREAM CAPTURE (Continued)

The part of the old Colorado River bed labeled "No stream" on the B side, of the previous slide, is postulated to have changed topography (was uplifted) and became the Little Colorado River flowing in the opposite direction into the main Colorado river as it does now.

The next slide reviews stages of what is suggested. The numbers in the squares identify the order of sequence of events, i.e. 1, 2, 3.

CAPTURE BY NEW COLORADO



Capture point

1 Old Colorado that flowed south

2 New Colorado that flows west

3 Little Colorado that now flows north

6. LONG AGES MODELS FOR CARVING THE CANYON

d. STREAM CAPTURE (continued).

This popular model postulates over 300 kilometers (200 miles) of headward erosion of a deep canyon (a "precocious gully") across a plateau, without a good source of water to erode it. There is no river, since this had to occur before the capture of the old (ancestral) Colorado River. You are dealing in part with a cut through the highest part of the Plateau where the drainage is towards other regions and would not provide a significant eroding supply of water. Why would a long canyon form without a source of water?

6. LONG AGES MODELS FOR CARVING THE CANYON

d. STREAM CAPTURE (continued).

Furthermore, there are no other significant eroded valleys or canyons in the vicinity of the one "precocious gully," across the Grand Canyon Plateau. Hence, there was no significant water supply or other eroding agents in the region. To capture the old (ancestral) Colorado river postulates eroding a deep winding canyon clear across the Grand Canyon Plateau going from west to east to capture the old Colorado. This would be extensive, deep and highly selective local erosion, for a great distance, without a cause. It is not a realistic model.

6. LONG AGES MODELS FOR CARVING THE CANYON

d. STREAM CAPTURE (continued).

In order to capture a stream you have to come in with erosion that is lower than the stream being captured, or capture will not take place, so the "precocious gully" would have to be lower than the level of the old Colorado that was captured. The old Colorado at the proposed capture point has at present an elevation of one half kilometer above sea level, while the Plateau often reaches above two kilometers in height. Depending on various models of the past, it would seem that the "precocious gully" would have to have a depth at least in the one-half kilometer to even the one-and-a-half kilometers depth range.

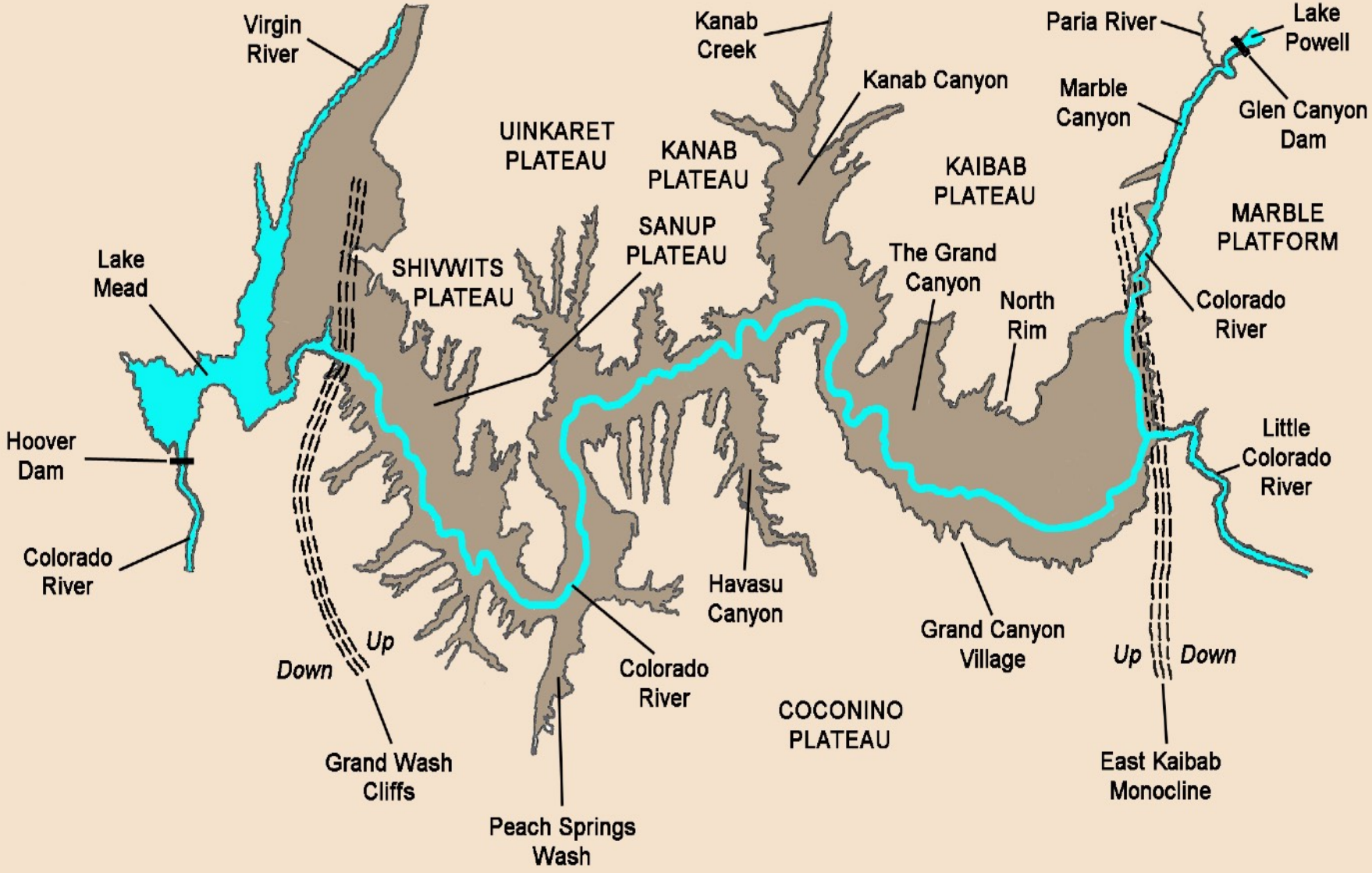
6. LONG AGES MODELS FOR CARVING THE CANYON

d. STREAM CAPTURE (continued).

A copy of the detailed map of the Grand Canyon Plateau is repeated below to help visualize the problem. Note that in order to capture the old Colorado River in the east, you need to wind around with the "precocious gully" through the Grand Canyon Plateau from Lake Mead at the left to the confluence of the Little Colorado with the Colorado on the right, where it is suggested that the capture took place.

Follow the blue line across the map.

GRAND CANYON REGION



6. LONG AGES MODELS FOR CARVING THE CANYON

d. STREAM CAPTURE (continued).

A recent publication (Hill CA, Polyak VJ. 2014. Geosphere 10:627-640) proposes that a 22 kilometer passage (karst, cave), running underground under the highest part of the Plateau (eastern Grand Canyon) captured the ancestral Colorado. This is largely speculation. Any remains left for this old passage in the Grand Canyon is not expected, since the passage would have been eroded away by later erosion carving the larger Grand Canyon. Furthermore, 22 kilometers does not help very much towards the more than 300 kilometers of headward erosion of the "precocious gully" that courses across the Grand Canyon Plateau. The erosion of this huge gully, without a significant source of water to do this, remains a major problem for the stream capture model.

6. LONG AGES MODELS FOR CARVING THE CANYON

e. NORTHWEST PASSAGE

Lucchitta (1990) proposed that earlier (middle Cenozoic) the Colorado river exited to the northwest in the Kanab Creek region, going into the huge Basin and Range Province in Utah and Nevada thus avoiding the Muddy Creek problem.

But there is no evidence of a northwest river.

LONG AGES MODELS FOR CARVING THE CANYON

f. LAKE SPILLOVER

In the year 2000 there was another major conference about the Grand Canyon. New ideas were introduced, including rapid cutting (in a few Ma or less), and cutting all of the Canyon in the last 6 Ma.

There was a novel proposal of lake-spillover water coming from lakes on the east-side of the Plateau that cut the whole Canyon quite rapidly from east to west. Slower erosion was also a possibility for the model. The suggestion resolves problems: where the ancestral Colorado River was; the many stream capture problems; a northwest escape that left no traces; and stream infiltration through rocks in the western Plateau to get around the Muddy Creek Formation barrier.

LONG AGES MODELS FOR CARVING THE CANYON

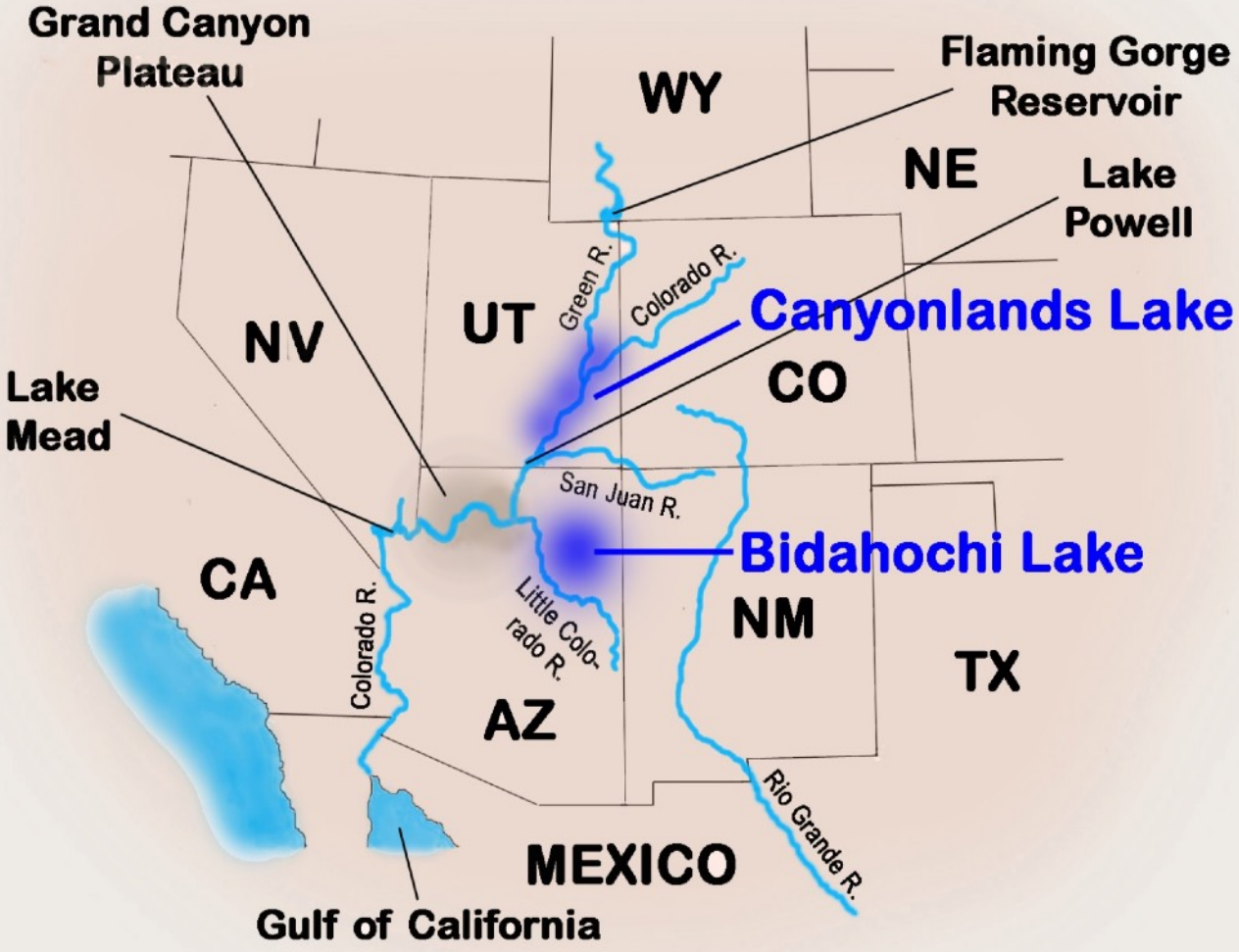
f. LAKE SPILLOVER

At the meeting, proponents advocating lake spillover pointed out the classic problems stating: "All the arm-waving you can do can't produce one shred of evidence that thing [Colorado River] was there, and the mechanics of headward erosion and stream capture don't work."

This new idea of lake spillover was rejected by the old guard and no consensus was reached at this conference. Reports for these new ideas were published in *Colorado River Origin and Evolution* (2001) in a section titled "Selected Theories and Speculation." The idea is not being accepted.

The next slide illustrates the proposed lakes.

COLORADO RIVER



6. LONG AGES MODELS FOR CARVING THE CANYON

g. A CANADIAN CONNECTION

Sears (2013). proposes on the basis of microfossils and other data that an ancient Colorado River drainage turned north in the Lake Mead area to Canada, and then northeast towards Greenland into the North Atlantic. However, there is no good evidence of a river going north.

h. OLDER CANYON IN THE MIDDLE OF THE PLATEAU

Karlstrom et al. (2014), using several physical tests for past temperatures of the rocks, conclude that segments of the Canyon in the middle of the Plateau are much older than those on either end. Integration of the whole Canyon was late. This is a strange sequence of river activity when the middle of the Canyon is carved earlier than the ends. Where did the water needed for the early erosion of the midsection come from?

7. SHORT AGE MODELS FOR CARVING THE CANYON

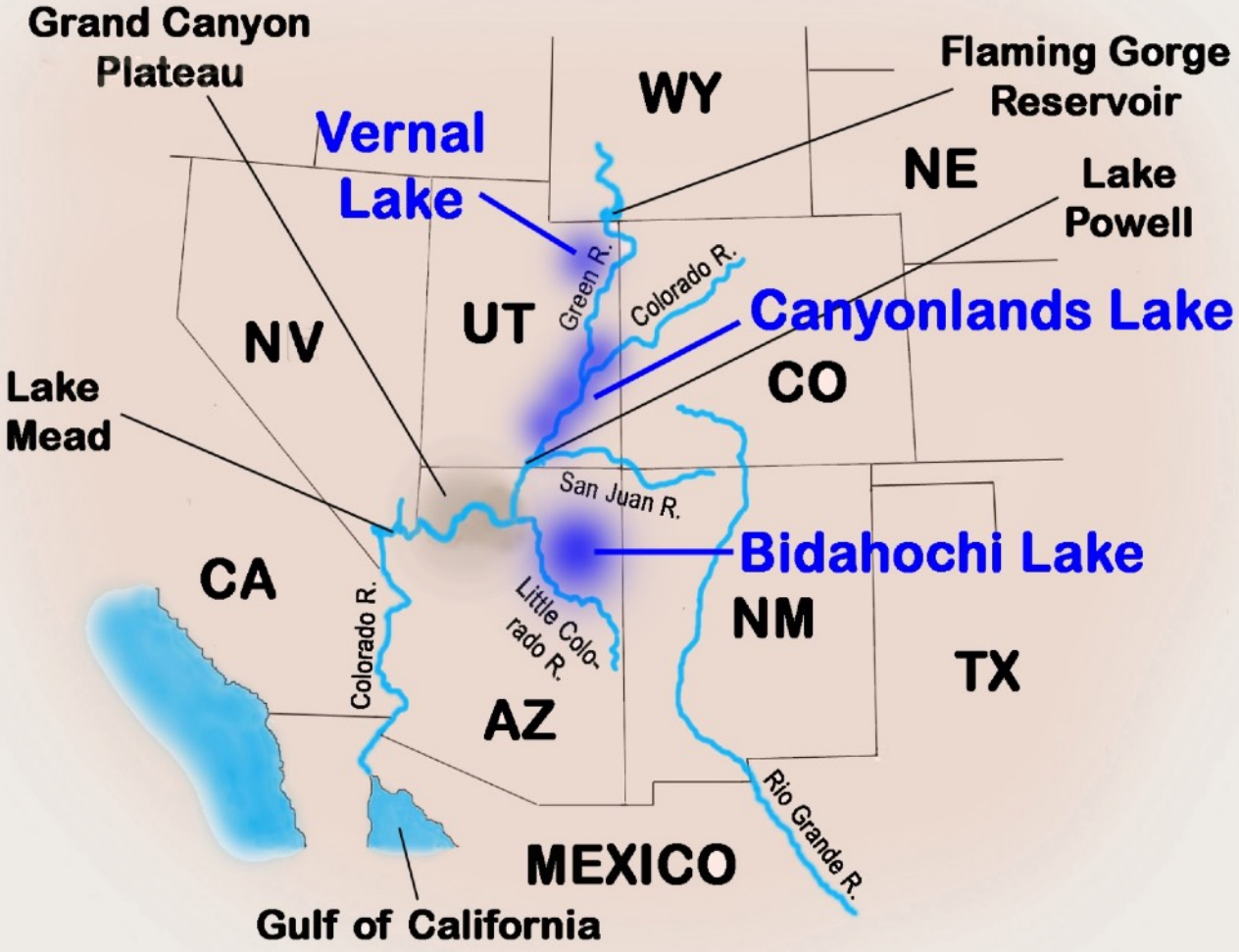
(The Creation Side)

a. BREACHED ANTICLINE

Austin (1994) proposes that the Grand Canyon was cut a few centuries after the Flood, when the East Kaibab Monocline was breached from the east and water from lakes to the east and northeast of the Grand Canyon Plateau catastrophically carved the Canyon. This model has similarities to the lake spillover model discussed above, and was proposed 14 years earlier. A challenge to this model is that it does not seem that the limited waters from these lakes could cut the 4,000 cubic kilometers, (1000 cubic miles) of sediment that had to be removed to carve the Grand Canyon?

Proposed lakes are illustrated on the next slide.

COLORADO RIVER



7. SHORT AGE MODELS FOR CARVING THE CANYON

b. RECEDING FLOOD WATERS

Oard (2011), among many, summarizes evidence that the Grand Canyon is the result of erosion by the receding waters of the great Genesis Flood.

A common question is: Would the sediments be hard enough to avoid collapse of the walls of the Canyon? However, there may have been nearly three kilometers (two miles) of sediment in the region before the Great Denudation, and pressure facilitates rapid hardening. Carbonates and silica can cement rocks in minutes to months under high pressure and temperature (E.g. Shinn EA. 1977. Limestone compaction: An enigma. Geology 5:21-24; Oehler JH, Schopf WJ. 1971. Artificial microfossils: Experimental studies… . Science 174:1229-1231).

7. SHORT AGE MODELS FOR CARVING THE CANYON

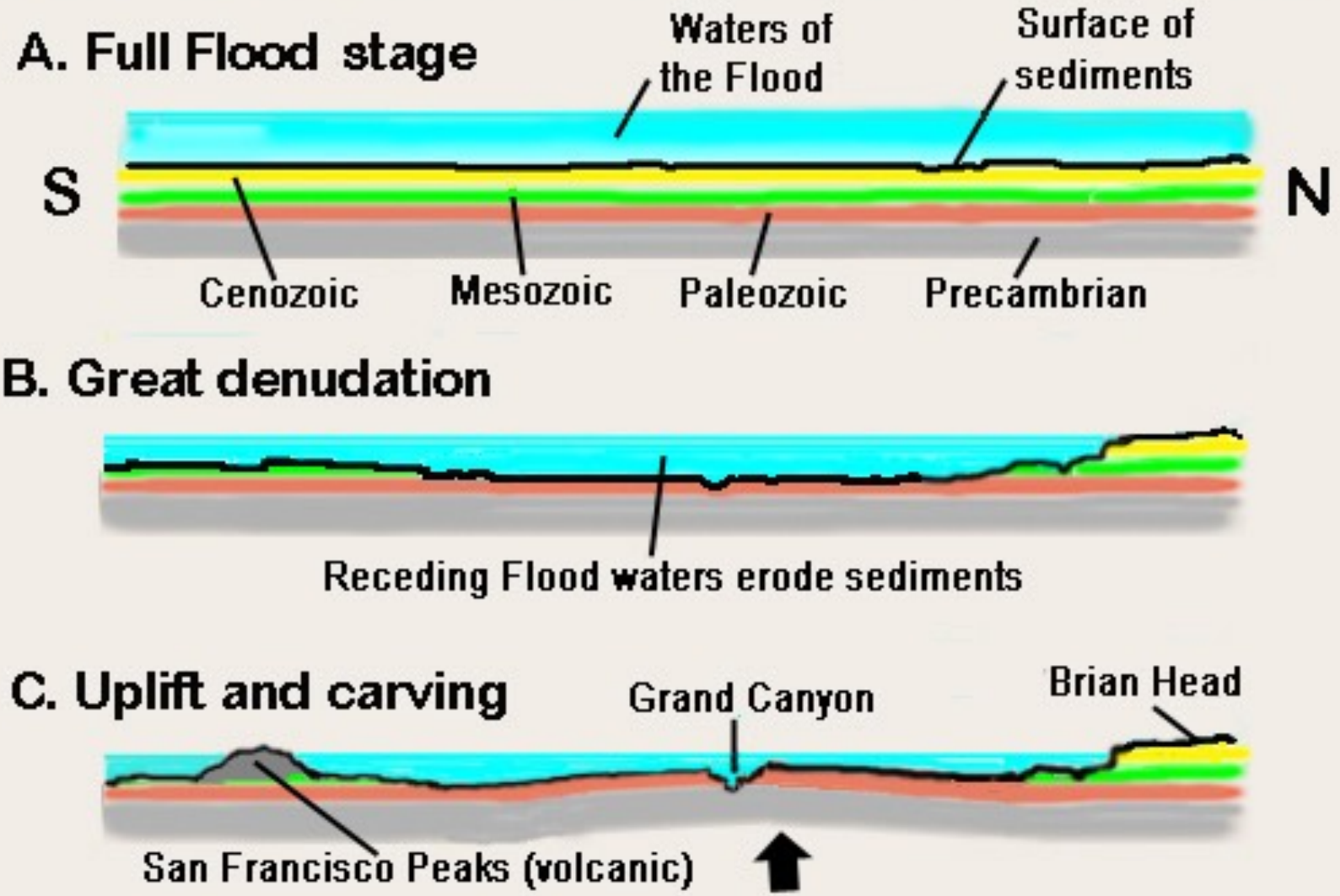
b. RECEDING FLOOD WATERS (continued)

A suggestion is that the rapidly receding Flood waters caused the Great Denudation while the Plateau was still underwater. As flow subsided the Muddy Creek was rapidly deposited. Water and denser sediment laden waters, flowing from east to west, carved an underwater "river" channel across the whole Plateau region. Underwater erosion, by sediment laden waters is a common feature in our present deep oceans and continental shelves.

As the flow of receding Flood waters abated side canyons were also cut underwater by erosion and sapping (undermining), as the plateau rose because of isostatic compensation of the region. This uplift was facilitated by sediment unloading during the Great Denudation, thus contributing to the rise of the Grand Canyon Plateau.

A model is illustrated in the next slide.

A FLOOD MODEL FOR THE GRAND CANYON



8. DATING THE CANYON

The short age creation model is that the Grand Canyon was carved just a few thousand years ago. The long age evolutionary model is that the age of the Canyon is dominantly in the millions of years. For these long ages, geologists often rely on radiometric dates. An evaluation for these dates follows.

Radiometric dates for the Grand Canyon have often given conflicting results. A part of the problem is that the different models for the carving of the Canyon would be expected to give different accepted dates according to different interpretations of when a particular part was thought to have been deposited or eroded. However, the variety of dates published in the scientific literature for the age of the Canyon is commonly inconsistent.

8. DATING THE CANYON

A less controversial reference time factor for the Grand Canyon is obtained from carbon-14 dates that are based on the younger and more reliable region for carbon-14 dating. Some split-twig figurines, left by ancient humans, have been found in some of the caves in the wall of the Canyon. These figurines date around 3,500 to 4,000 years and as such give a minimum age for the Canyon. This indicates that not much change has taken place in the Canyon in the last few thousand years, and in a biblical context this would imply that the Canyon was most likely carved rapidly by the receding waters of the Genesis Flood, with little change since then.

8. DATING THE CANYON

Researcher Sean Pitman (www.detectingdesign.com) has summarized some of the trends in dating the age of the Grand Canyon by radiometric methods. In the first half of the last century it was generally believed that the Canyon was some 70 Ma (million years) old, and some radiometric dates supported that date. This was followed by a trend to significantly reduce the age, and towards the end of the century there were suggestions of younger and younger dates especially for the western part of the Canyon. In 2007 some publications suggested that older radiometric dates of 1.2 Ma were too old, with some results even proposing as little as 102 Ka (thousand years). However, the next year, radiometric dates from the bottom of the Canyon suggested dates as old as 40-50 Ma. But that same year, other researchers, dating cave speleothems, proposed dates in the 16-17 Ma range.

8. DATING THE CANYON

Later references suggest some consensus on a 5-6 Ma Canyon. However, recently (2012) an estimate of 70 Ma has been proposed based in part on the helium content of the mineral apatite found in the western part of the Grand Canyon. However, a leading Grand Canyon geologist points out that the geology of the area including the famous Muddy Creek barrier--considered to be only 5-6 Ma--disagrees with such older dates (Lucchitta I. 2013. Comment on "Apatite $^{4}He/^{3}He$ and (U-Th/He Evidence for an Ancient Grand Canyon. Science 340:143; DOI:10.1126/science.1234567).

While many radiometric dates for the Grand Canyon give old dates, the results are not consistent. The next section provides evidence that the receding waters of the Genesis Flood carved Grand Canyon.

For a discussion of data that challenges the long geologic ages see: THE BIBLE AND SCIENCE SERIES, DISCUSSION 9: THE GREAT TIME QUESTIONS: Part 3, Data Favoring a Recent Creation, on the author's webpage: www.sciencesandscriptures.com.

9. EVIDENCE THAT THE GRAND CANYON WAS CARVED BY THE RECEDING WATERS OF THE GENESIS FLOOD

9. EVIDENCE CANYON CARVED BY GENESIS FLOOD

a. The "Great Denudation" of 60,000-120,000 cubic kilometers of rock. Why so wide, deep, and well cleaned out?

Dutton and other pioneer geologists believe that the Great Denudation was a slow process of erosion over millions of years, but it appears more like a great washout by the receding waters of the Flood.

If the denudation was caused by slow weathering and stream activity, why did weathering and erosion stop abruptly at the scarp of the Grand Staircase, leaving it intact? Why did the streams and rivers over the Grand Staircase not also erode it down over the millions of years? If the denudation was by slow weathering and local stream and river activity, what caused such a complete cleanout of the Mesozoic and Cenozoic layers, likely over the 40,000 square kilometers of the Great Denudation?

9. EVIDENCE CANYON CARVED BY GENESIS FLOOD

a. **The "Great Denudation" of 60,000-120,000 cubic kilometers of rock. Why so wide, deep, and well cleaned out?**

Another question is that in order to clear out 40,000 square kilometers of Mesozoic and Cenozoic layers you have to have pronounced horizontal (lateral) erosion, not vertical (downward) erosion. Erosion is a complicated process. The primary direction for normal local erosion, like that of stream or rivers, is down, because gravity tends to pull water and sediments down. For widespread horizontal erosion, like the Great Denudation, you need strong horizontal forces, and this is what would be expected by the receding waters of the worldwide Genesis Flood flowing down off the continents.

9. EVIDENCE CANYON CARVED BY GENESIS FLOOD

a. **The "Great Denudation" of 60,000-120,000 cubic kilometers of rock. Why so wide, deep, and well cleaned out?**

Geologists, in the context of long geologic ages, suggest that the horizontal erosion of the rock layers of the Grand Staircase (Chocolate Cliffs) proceeded at a rate of 6-7 kilometers per million years (Schmidt K. 1989. The significance of scarp retreat for Cenozoic landform evolution on the Colorado Plateau, USA. Earth Surface Processes and Landforms 14(2):93-105). However, slow local erosional activity by weathering streams and rivers, is not expected to produce such rapid rates, even in a vertical direction that has the help of gravity. This proposed rate for the horizontal erosion of the Grand Staircase is 100 times faster than the 61 meters per million years for the present average downward (vertical) erosion of the surface of our world continents (For references see: Roth AA. 1998. Origins: Linking science and Scripture, p 263-267). Erosion by the receding Flood waters seems like a more likely cause for the Great Denudation than slow local erosion. Horizontal scarp retreat is a significant problem in geomorphology and will be commented on later.

9. EVIDENCE CANYON CARVED BY GENESIS FLOOD

a. **The "Great Denudation" of 60,000-120,000 cubic kilometers of rock. Why so wide, deep, and well cleaned out?**

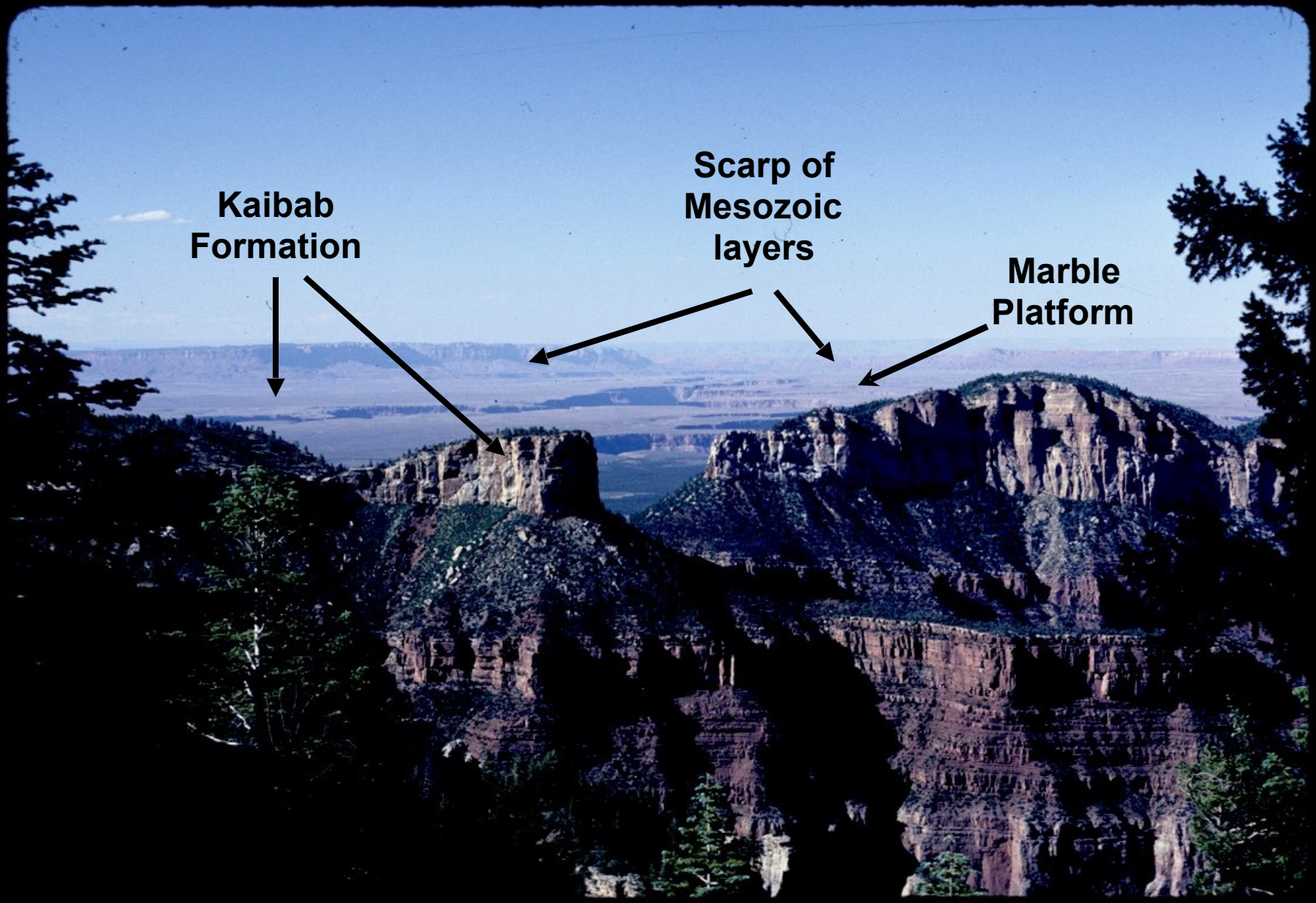
The next slide is another view of the Grand Staircase. You are looking north from the north edge of the Grand Canyon Plateau. The same layers you see in the Staircase were likely covering the area where the picture was taken from. Some of those layers can be found 100 kilometers to the south, on the other side of the Grand Canyon, and even in California. Note that there is not very much talus or rubble (i.e. the accumulation of rock fragments at the base of a cliff) at the base of the staircase steps, which is as expected for a cleanout by a recent Flood. In the picture, flow direction would have been from right to left.


THE GRAND STAIRCASE

9. EVIDENCE CANYON CARVED BY GENESIS FLOOD

a. The "Great Denudation" (continued)

The next slide is another view of Marble Platform, looking northeast from the east edge of the Grand Canyon Plateau (see detailed map of Grand Canyon above). The Platform is the distant flat plane seen across in mid view. The Denudation cleaned out the Mesozoic layers represented in the cliffs seen all across the view below the skyline at the far edge of the Platform. Erosion was down to the harder Kaibab Limestone that now forms the flat floor of the Platform. Those washed out layers were also over the eroded layers in the foreground. The top layer of the hills in the foreground is the same (Kaibab) layer that forms the floor of the Marble Platform . That layer was uplifted when the Grand Canyon Plateau was formed. Note how cleaned out the Platform is. The prominent clean scarps at the north and east edge of the Plateau again suggest a clean widespread washout that would require a lot of water as expected for the receding waters of the Genesis Flood . Flow direction would be towards the lower right of the picture.


Kaibab Formation
Scarp of Mesozoic layers
Marble Platform

9. EVIDENCE CANYON CARVED BY GENESIS FLOOD

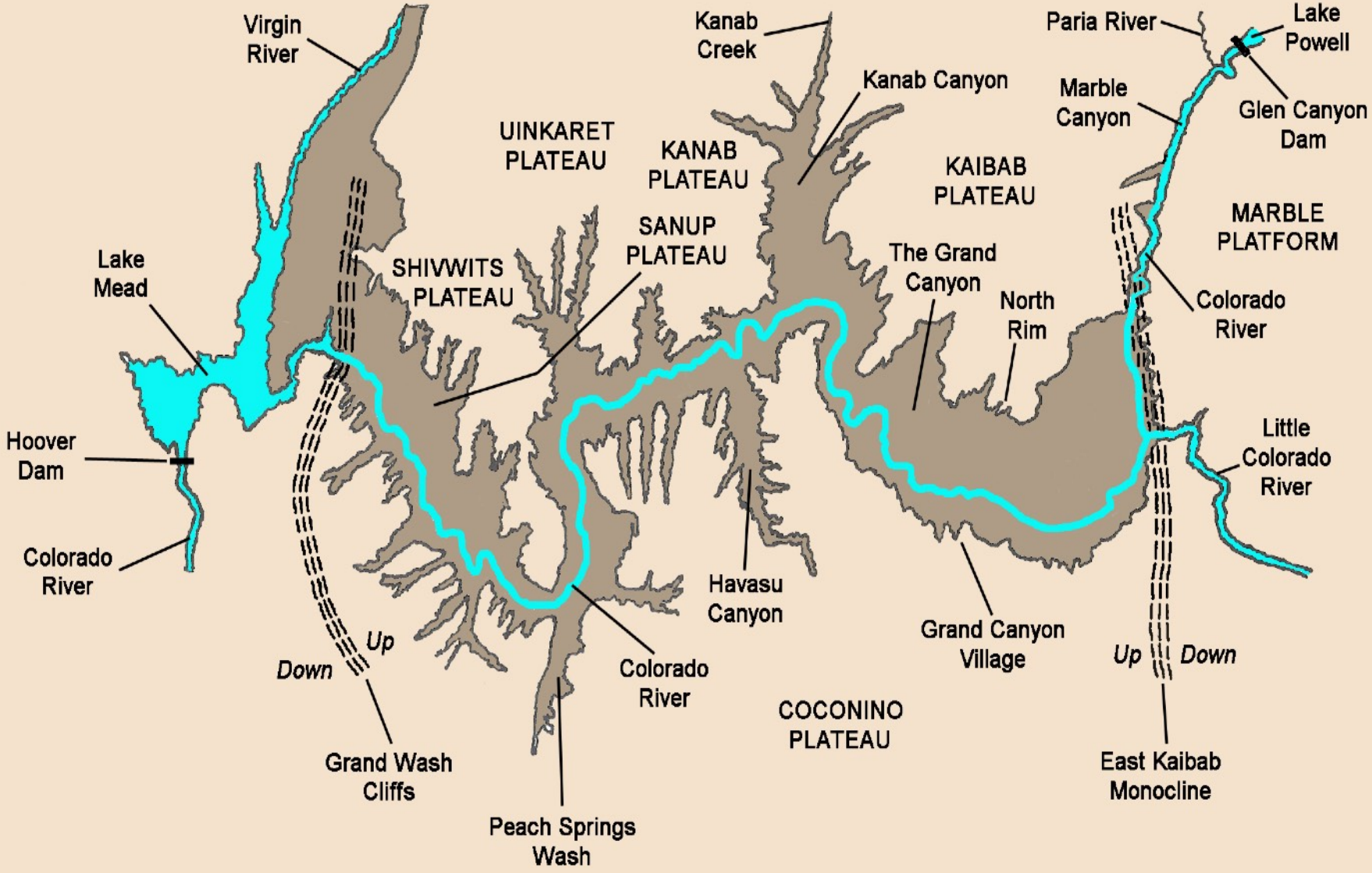
b. Why are there so many side canyons without a source of water to erode them?

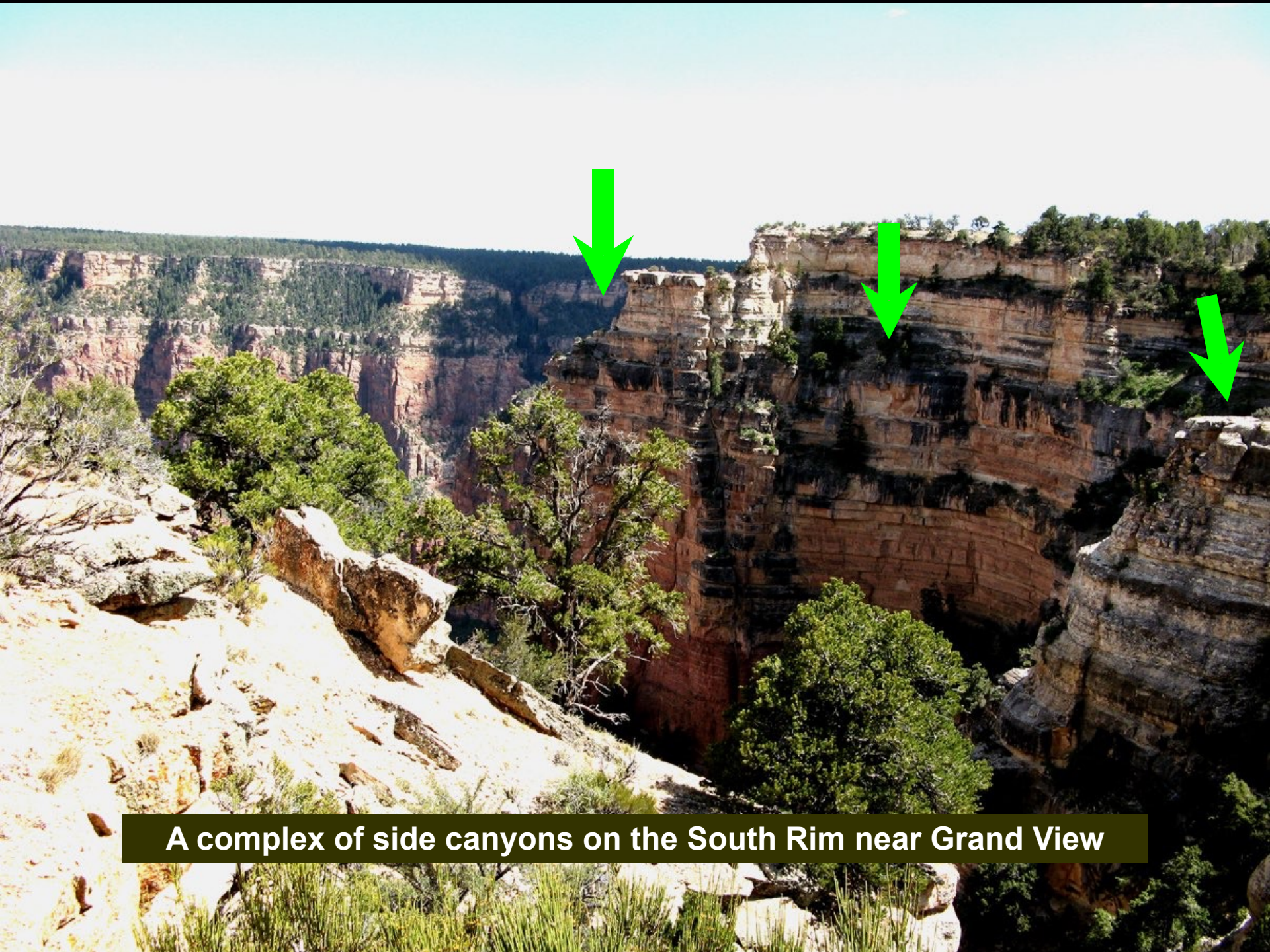
There are hundreds of side canyons ranging from small to huge, leading to the main Grand Canyon, but only a very few have stream sources that would have eroded them. The Little Colorado, Havasupai, and Kanab Creek are among the rare exceptions.

The receding waters of the Genesis Flood, as they flowed into the main channel of the Grand Canyon, could easily have eroded these hundreds of side canyons that do not have an external stream to carve them. Sapping (undermining) may also be a factor.

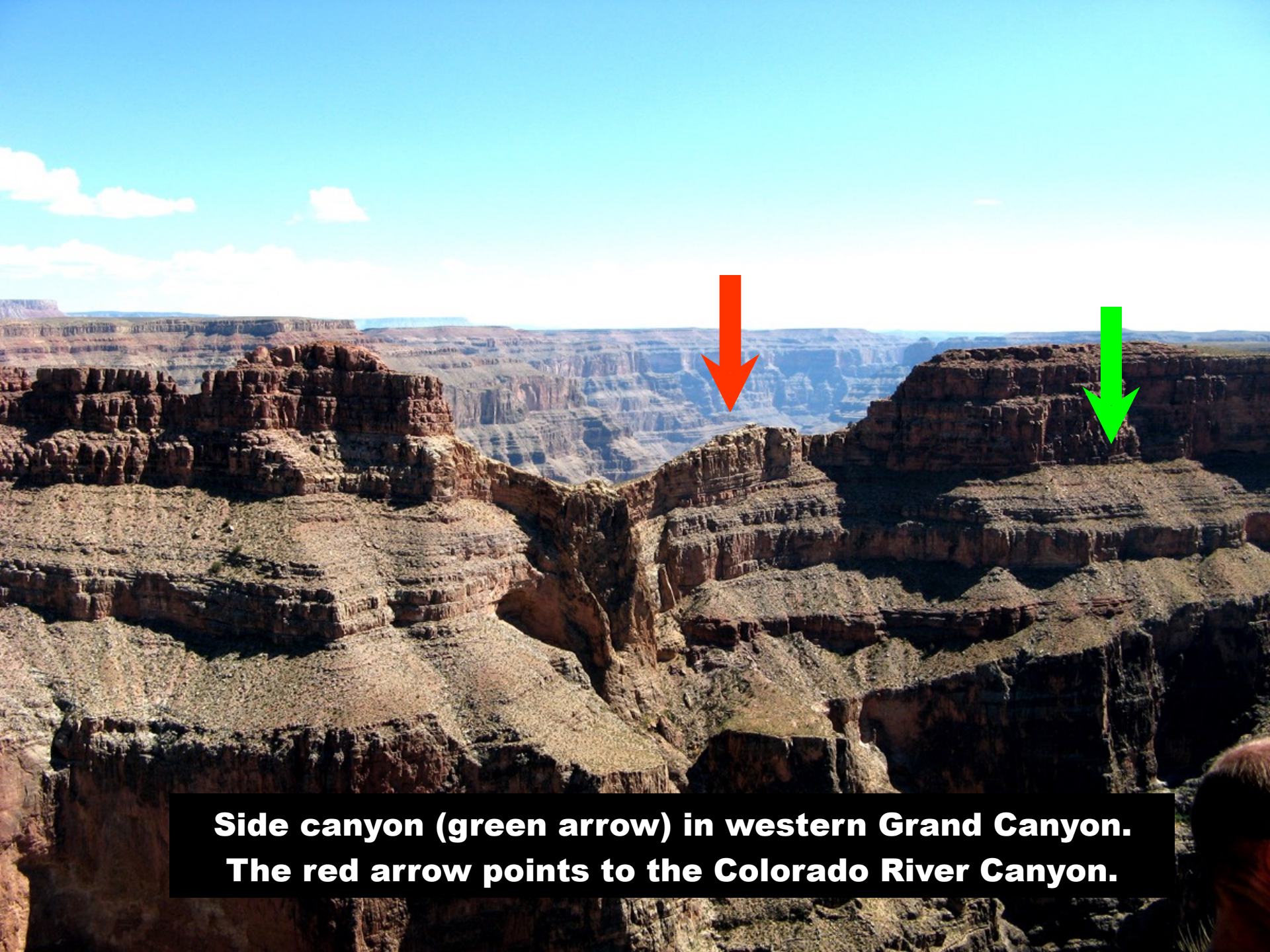
Note the many side canyons on the next slide. Following are more examples.

GRAND CANYON REGION



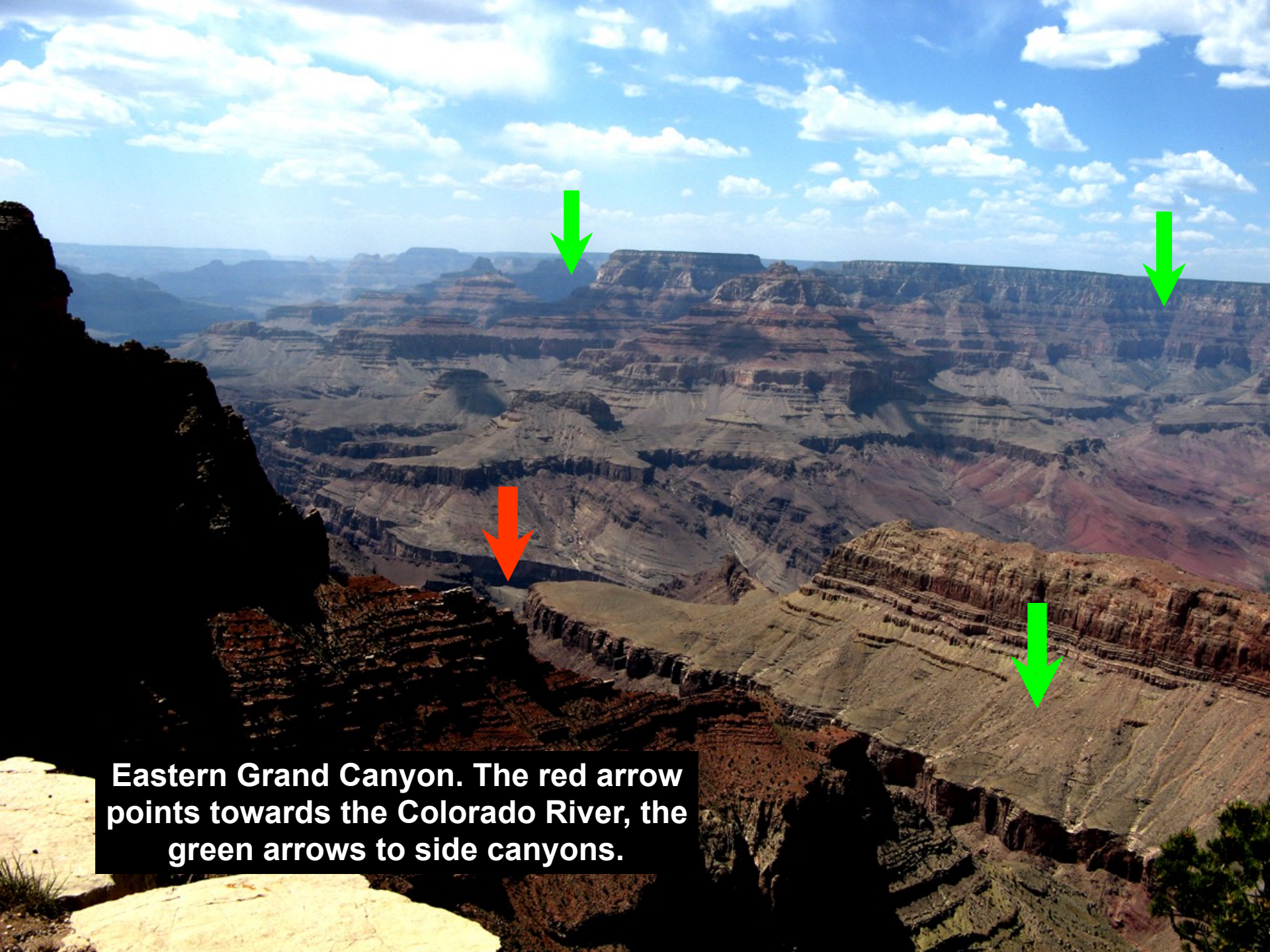


A complex of side canyons on the South Rim near Grand View



Side canyon (green arrow) in western Grand Canyon.
The red arrow points to the Colorado River Canyon.

Western Grand Canyon. The arrows point to side canyons. Note the Colorado River to the lower left.



Eastern Grand Canyon. The red arrow points towards the Colorado River, the green arrows to side canyons.

9. EVIDENCE CANYON CARVED BY GENESIS FLOOD

c. The Canyon is clean.

Why so little talus at the base of scarps and slopes in the Canyon if they were formed by slow gradual weathering. Talus accumulates at the base of scarps unless removed. What cleaned out all the sediments from a Canyon that is some 10 times wider than deep; and especially what removed the expected talus and sediments from wide flat areas such as the Tonto platforms in the east Grand Canyon, and Esplanade platforms in the west, that are sometimes over a kilometer wide? The Canyon looks more like a major cleanout by receding Flood waters.

The next slide illustrates a talus slope deposit (red arrow) in California, that came from the irregular steeper scarp (hill) above. The talus accumulates there unless there is a means of removal.

9. EVIDENCE CANYON CARVED BY GENESIS FLOOD

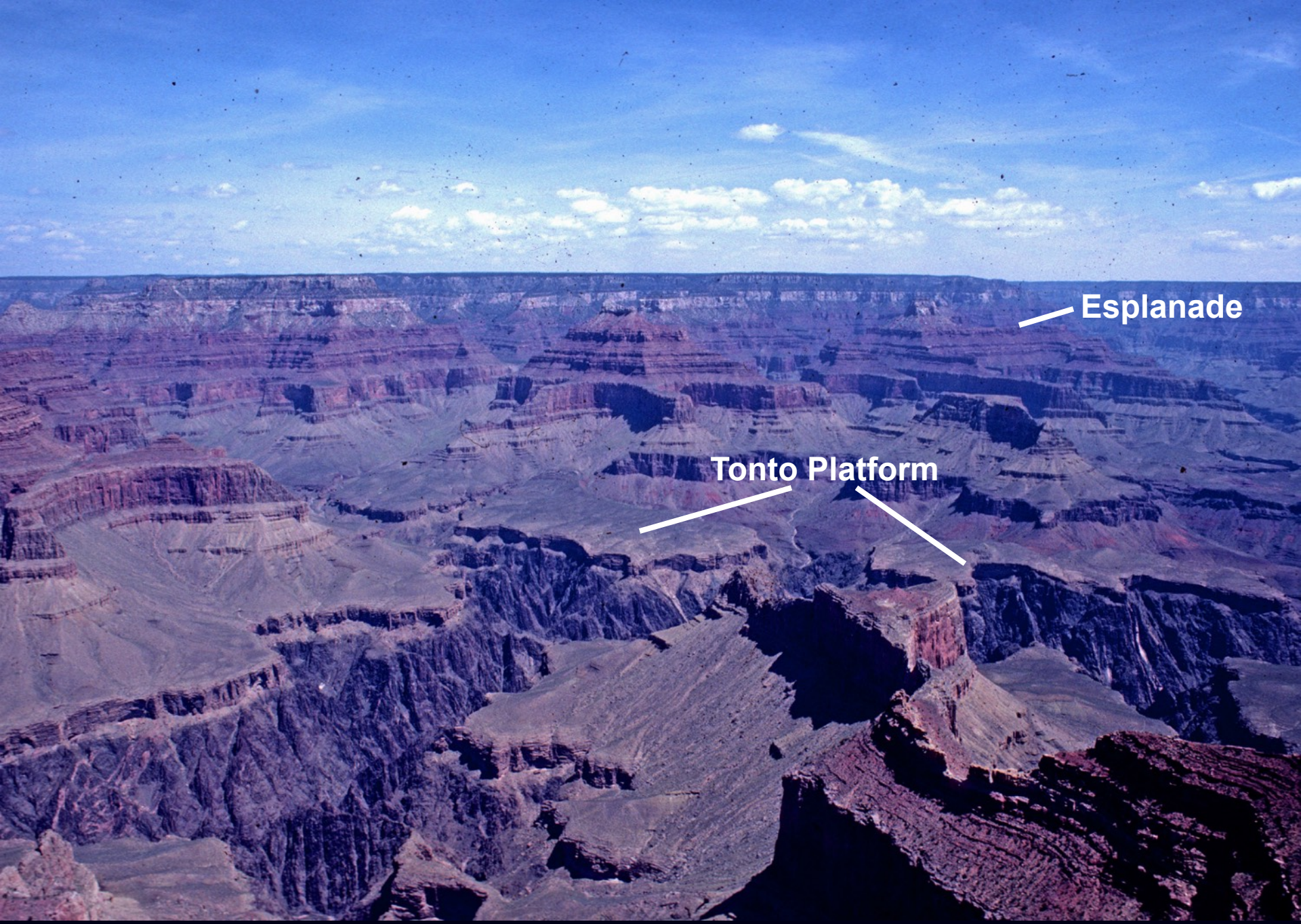
c. The Canyon is clean (continued)

Horizontal scarp retreat is sometimes proposed to explain clean flat planes found at the foot of high cliffs (scarps). Some suggest that moisture accumulates at the base of a scarp causing rocks to disintegrate there, and the overlying scarp then breaks down thus favoring horizontal scarp retreat. However, it is going to take much more than moisture to clean out the talus, that usually includes blocks, at the base of a scarp. And much more would be required for the huge scarp of the Grand Canyon. Also, burial at the base of a scarp can protect rocks from the detrimental effects of freezing and ultraviolet rays, thus slowing disintegration. This is not a convincing proposal.

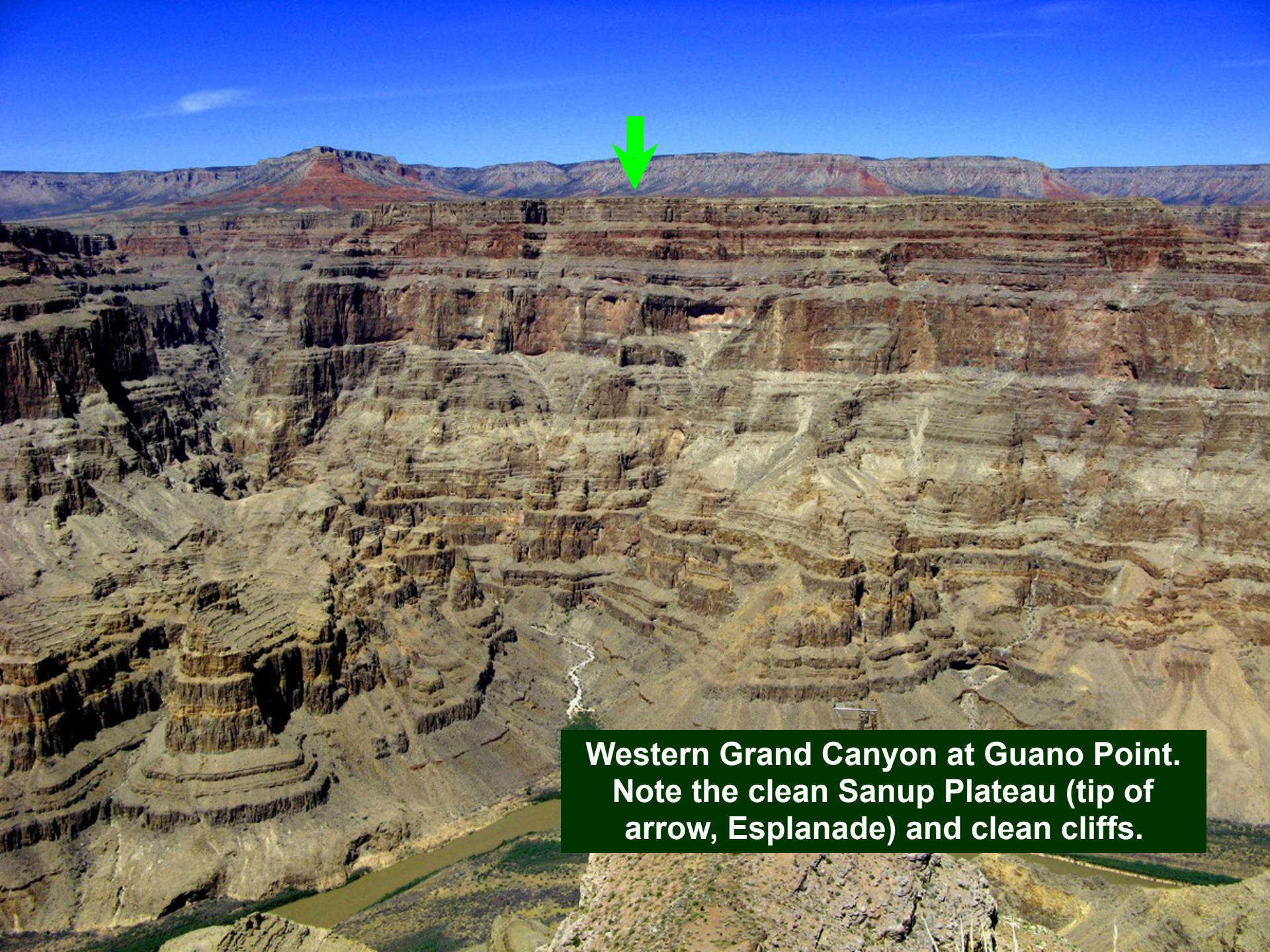
9. EVIDENCE CANYON CARVED BY GENESIS FLOOD

c. The Canyon is clean (continued)

The next few slides illustrate how clean the Canyon tends to be. There are a few streams in the Canyon that move some sediments, mainly locally. The Colorado River is also very small compared to the Canyon and often entrenched in its Inner Gorge, thus mainly of local erosional significance. On the other hand, the whole Canyon is remarkably wide and clean as though it had been washed out.


Esplanade
Tonto Platform

View to the northeast from Grand Canyon Village. In the lower middle of the image note the trail across part of the Tonto Platform.



Western Grand Canyon at Guano Point. Note the clean Sanup Plateau (tip of arrow, Esplanade) and clean cliffs.


Clean side canyon, eastern Grand Canyon

9. EVIDENCE CANYON CARVED BY GENESIS FLOOD

d. Complex topography: Pinnacles and buttes.

The Canyon is wide and its erosion complex, leaving many pinnacles and buttes and mesas. You cannot form these by ordinary lateral migration of a river. For some configurations, several rivers would likely be necessary to carve deep canyons on different sides that appear to have different sources. Receding waters of the Flood would seem a more likely cause than a single little Colorado River.

In the next slide, note the different drainage sources on either side of Chuar Butte (green arrow). The Colorado River drainage from the northeast is to the right of the Butte while there is another extensive drainage from the north to the left of the Butte. Also look at the castellated topography of the Canyon in the succeeding slide.

Grand Canyon viewed from Desert View. The arrow points to Chuar Butte

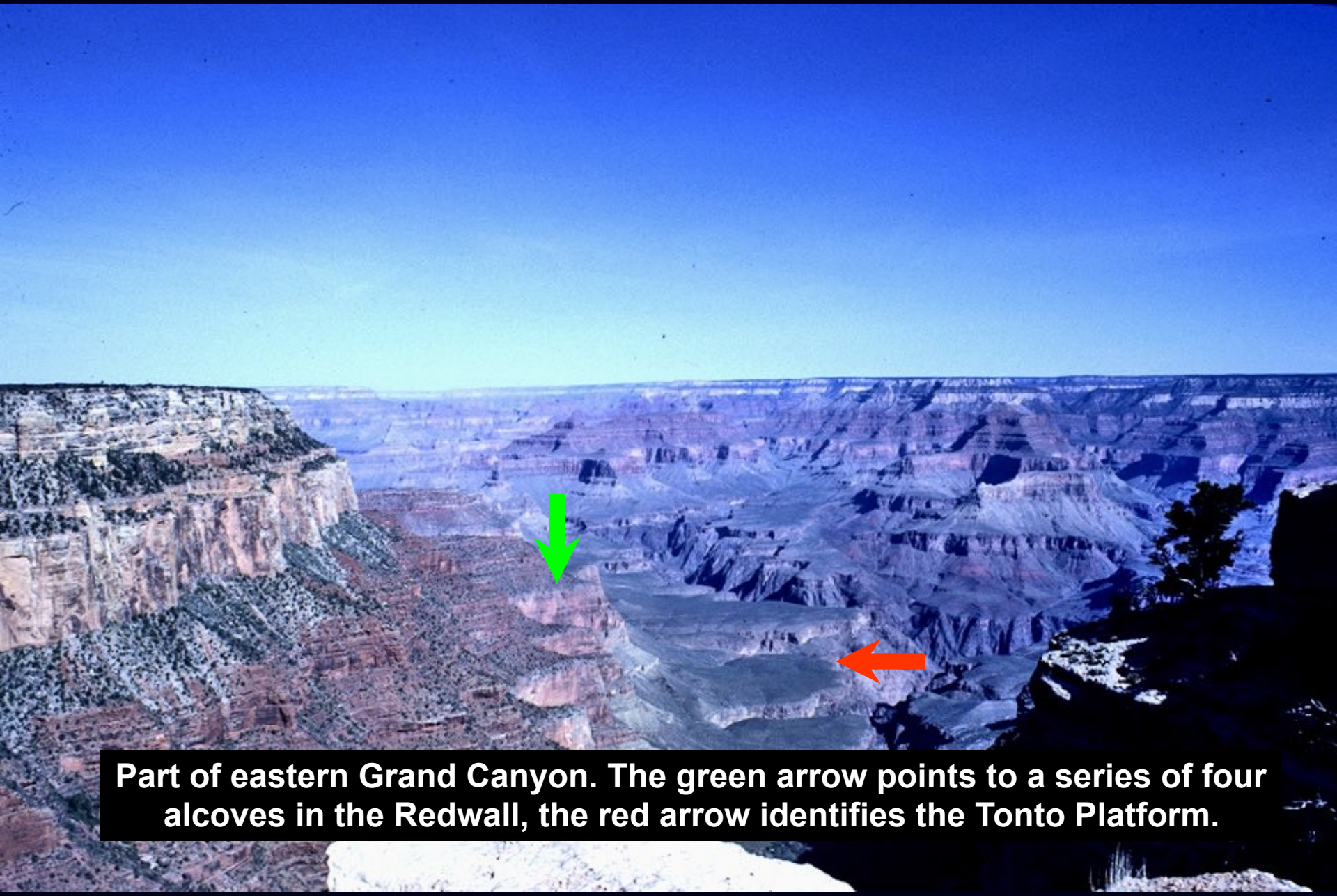
Buttes, pinnacles, and mesas of the eastern Grand Canyon.
Note major drainages at both the extreme left and right sides.

9. EVIDENCE CANYON CARVED BY GENESIS FLOOD

e. Alcoves (pockets) as evidence of major water flow.

Violent, swirling, circular vortexes, also called eddies, in rapidly moving waters can erode circular depressions in rocks that are called kolks. Huge circular alcoves found in the walls of the Grand Canyon may reflect this kind of activity as expected for turbulent receding waters of the Flood.

The next slide shows a row of four of these in the Redwall of the eastern Grand Canyon. Also note the darker green Tonto Platform below the Redwall that has been cleanly washed. The succeeding slide shows a complex of rounded alcoves, again in the Redwall along the North Kaibab Trail. These large alcoves seem to reflect powerful Flood activity.



Part of eastern Grand Canyon. The green arrow points to a series of four alcoves in the Redwall, the red arrow identifies the Tonto Platform.


Alcoves in the Redwall along the North Kaibab trail.

10. CONCLUSIONS

There is no consensus for a long ages model for the carving of the Grand Canyon. Eight proposed models all have significant problems.

It would seem advantageous for the geological community to expand its explanatory menu and consider the Genesis Flood as a possible valid causal agent. That Flood is extremely dominant in folk literature, and is also well authenticated many times in the Bible.

10. CONCLUSIONS

Data that favors receding Flood waters interpretation.

a. A Great Denudation over 40,000 square kilometers

b. Hundreds of side canyons of Grand Canyon without external sources of water

c. Paucity of talus, wide platforms; the Canyon is generally cleanly cut

d. Broad complex erosion of a castellated Grand Canyon is unlikely by a small river

e. Alcoves in the wall suggest powerful water eddies as expected for a Flood

There is significant geological data that favors the carving of the Grand Canyon by the receding waters of the Genesis Flood.

ADDITIONAL REFERENCES

For further discussions by the author (Ariel A. Roth) and many additional references, see the author's books titled:

1. ORIGINS: LINKING SCIENCE AND SCRIPTURE. Hagerstown, MD. Review and Herald Publishing Association.
2. SCIENCE DISCOVERS GOD: Seven Convincing Lines of Evidence for His Existence. Hagerstown, MD. Autumn House Publishing, an imprint of Review and Herald Publishing Association.

Additional information is available on the author's Web Page: Sciences and Scriptures. www.sciencesandscriptures.com. Also see many articles published by the author and others in the journal ORIGINS which the author edited for 23 years. For access see the Web Page of the Geoscience Research Institute www.grisda.org.

Highly Recommended URLs are:

Earth History Research Center http://origins.swau.edu

Theological Crossroads www.theox.org

Sean Pitman www.detectingdesign.com

Scientific Theology www.scientifictheology.com

Geoscience Research Institute www.grisda.org

Sciences and Scriptures www.sciencesandscriptures.com

Other Web Pages providing a variety of related answers are: Creation-Evolution Headlines, Creation Ministries International, Institute for Creation Research, and Answers in Genesis.

USE PERMIT