Chapter 82

Stream Piracy Hypothesis—The Final Fallback Position

The third main hypothesis to account for transverse or anomalous drainage is called stream piracy or stream capture (the stream can also be a river). Summerfield explained: "River capture occurs when one stream erodes more aggressively than an adjacent stream and captures its discharge by intersecting its channel."[1] Stream piracy is probably the most popular "default" mechanism used today to explain transverse drainage.[2] Figure 82.1 shows a block diagram of the process of river capture. The higher rate of erosion of the tributary of the capturing stream has been attributed to: (1) a steeper gradient of flow, (2) greater discharge, (3) less resistant rocks, and (4) higher precipitation.

The "Evidence" for Stream Piracy

There are a number of so-called evidences or even "proofs" of river capture.[3] One of these is the "elbow of capture," which is a sharp change in channel direction on the order of 90° or more.

Another is a misfit stream, which is one where there is either too much water or too little water relative to the channel features. Underfit streams, in which the stream is too small for its channel or valley, are very common (see Chapter 62). Overfit streams are ones in which the stream is too large for its channel or valley, a very rare situation today. The reason a stream is underfit is supposedly due to decreased discharge upstream of the "captured stream" and overfit supposedly because of increased discharge from the extra water "stolen" by the pirating stream.

A third piece of evidence is the existence of a wind gap, sometimes known as a col, thought to be the abandoned portion of a stream captured long ago.

Fourth, river profiles show a significant knickpoint, a sudden change to a steeper gradient of a river or valley. A waterfall is an extreme example of a knickpoint, a series of rapids in a generally slow stream is a more typical example. Geologists assume that a stream that has captured more water from a nearby stream will experience a sudden change in slope, resulting in increased erosion along that reach.

The fifth and last evidence used to infer stream capture is the existence of exotic gravels within a wind gap. These five evidences are summarized in Table 82.1.

1. Elbow of capture
2. Misfit stream
3. Knickpoint in the river profile
4. Wind gaps
5. Exotic gravels within wind gaps

Table 82.1. Claimed evidence for stream piracy (after Small, 1978, pp. 230-238).

[1] Summerfield, M.A. 1991. *Global Geomorphology*, Longman Scientific & Technical, New York, NY, p. 410.
[2] Douglass, J.C., 2005. *Criterion Approach to Transverse Drainages*. PhD thesis, Arizona State University, Tucson, AZ, p. 12.
[3] Small, R.J., 1978. *The Study of Landforms: A Textbook of Geomorphology*, second edition, Cambridge University Press, London, U.K., pp. 226-238.

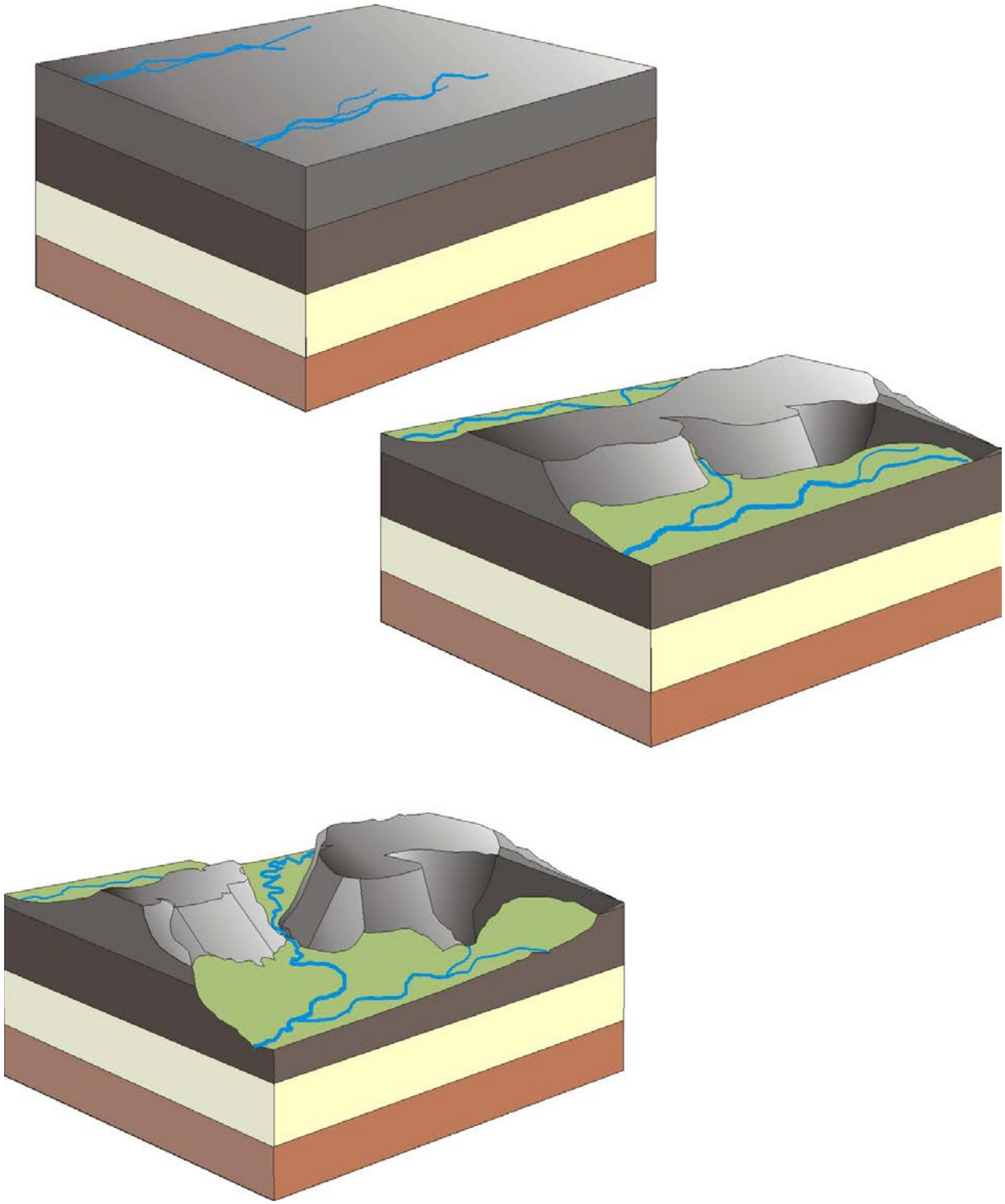

Figure 82.1. Block diagram of river capture (drawn by Peter Klevberg). Two streams are flowing parallel to each other, and the tributary of one stream erodes through the ridge between the streams and captures the water.

The Origin of Grand Canyon by Stream Piracy?

Stream piracy is the main uniformitarian hypothesis for the origin of the transverse drainage of the Colorado River through the Grand Canyon—the most renowned transverse gorge in the

world.[4] But, stream piracy runs into a number of problems explaining the Grand Canyon.[5,6] It requires a stream, plunging from the rising Colorado Plateau into the Lake Mead area, eroding headward (eastward) *100 to 200 miles* (160 to 320 km), and capturing the *ancient* Colorado River, which was then flowing either just west of or east of the Kaibab Plateau. The inability to pin down the exact course of the ancient Colorado River creates a problem: was it east or west of the Kaibab Plateau? If west, the Colorado River had *already breached* the highest point of the rising plateau, neatly solving *by assumption* the most difficult problem of the present river's course. The stream piracy hypothesis is strangely silent about this problem. If the ancient Colorado was to the east, then it was the pirating stream that must have eroded all the way through the rising plateaus before reaching and breaching the highest plateau, the Kaibab Plateau. This of course would be immensely difficult, even in theory.

The stream piracy model also fails to explain how the ancestral Colorado River east of the Kaibab Plateau could have existed for 60 or 70 million years without leaving a trace since its uplift.[5] Within the uniformitarian paradigm, the first trace of the ancestral Colorado River is set at only 10 million years ago.[7] Where was this massive drainage system for the previous 60 or so million years (the Kaibab Plateau is supposedly 70 million years old) and why did it not leave some trace in the rock record? After all, the present day river supposedly carved a giant canyon in the western Grand Canyon within a tenth of the time. In the absence of evidence, geological speculation runs rife. At least three paths for the ancient Colorado River have been suggested before the western Grand Canyon was carved, supposedly about six million years ago.[8,9,10] There is no evidence for any of these paths.

Given what we know today, the headward erosion of a river of up to 200 miles (320 km) is extreme. If a riverbed was incised over this distance across the Colorado Plateau, why is there no evidence of headward erosion of this scale for other streams on the western plateaus? Since the climate is arid to semi-arid, rainfall would be less and so would the erosion.

Furthermore, the slope of the plateaus is not generally westward. The pirating stream would have to have eroded often perpendicular to the presumed streamflow as predicted by topography. As a result many consider western and central Grand Canyon as the proposed ancestral path of the pirating stream to be untenable.[11,12]

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[4] Douglas, Ref. 2, p. 18.

[5] Austin, S.A., 1994. How was Grand Canyon eroded? In, Austin, S.A. (editor), *Grand Canyon – Monument to Catastrophism*, Institute for Creation Research, Dallas, TX, pp. 83-110.

[6] Williams, E.L., J.R. Meyer, and G.W. Wolfrom, 1992. Erosion of Grand Canyon Part II—Review of river capture, piping and ancestral river hypotheses and the possible formation of vast lakes, *Creation Research Society Quarterly* 28:138-145.

[7] Larson, E.E., M. Ozima, and W.C. Bradley, Late Cenozoic basic volcanism in Northwestern Colorado and its implications concerning tectonism and the origin of the Colorado River system. In: Curtis, B.F. (editor), *Cenozoic History of the Southern Rocky Mountains*, pp. 155-178, Geological Society of America Memoir 144, Boulder, CO, 1975.

[8] Hunt, C.B., 1976. Grand Canyon and the Colorado River, their geologic history. In, Breed, W.J. and E. Roat (editors), *Geology of the Grand Canyon*, Museum of Northern Arizona, Flagstaff, AZ, pp. 129-141.

[9] Lucchitta, I., 1990. History of the Grand Canyon and of the Colorado River in Arizona. In, Beus, S.S. and M. Morales (editors), *Grand Canyon Geology*, Oxford University Press, New York, NY, pp. 311-332.

[10] Ranney, W., 2005. *Carving Grand Canyon: Evidence, Theories, and Mystery*, Grand Canyon Association, Grand Canyon, AZ, p. 130.

[11] Dallegge, T.A., M.H. Ort, and W.C. McIntosh, Mid-Pliocene chronostratigraphy, basin morphology and paleodrainage relations derived from the Bidahochi Formation, Hopi and Navajo Nations, Northeastern Arizona, *The Mountain Geologist* **40**(3):55-82, 2003.

In short, all the current ideas proposed to explain the Grand Canyon forming by slow erosion of the Colorado River or some hypothetical pirating stream are highly speculative and unsupported by key evidence.[13] When mainstream geologists resort to a phantom stream eroding from the Grand Wash Cliffs to the head of the canyon (up to 200 miles!), when no other adjacent stream hardly eroded eastward at all, then clearly this hypothesis has reached the point of desperation.

Equivocal Evidence

The so-called evidence for stream capture listed in Table 82.1 makes it seem like stream piracy is testable and viable. Let's evaluate this evidence.

A sharp change in a river's course, or an "elbow of capture," may be caused by geological factors such as faulting or changes in lithology. Not all sharp changes, even those in front of water gaps, are necessarily attributed to stream capture, such as the Yar River on the Isle of Wight.[14] John Douglas states:

> However, coincidental circumstances can generate the same feature [elbow of capture] in non-pirated transverse drainages, and not all pirated transverse drainages develop elbows…[15]

Similarly, other phenomena can result in misfit streams. First, there is little or no evidence for overfit streams, which *should be observed* for any recent capture events. If stream piracy has happened in the recent past, for example the past 100,000 years of geological time, then we should see many examples of overfit streams. Dury demonstrated that virtually *all* streams in an area, whether assumed captured or not, are *underfit*.[16] All of these streams give evidence of a much higher flow of water in the past (see Chapter 62). Does this mean that practically all rivers and streams in the world are the small remnants of stream capture events? Dury considered the underfit streams in a large region as strong evidence *against* the stream piracy hypothesis.

River profiles with knickpoints are also equivocal unless accompanied by other evidence. Knickpoints can easily be caused by other processes, such as renewed regional uplift or a "young" stream that is still eroding headward. In the Grand Canyon (Figure 82.2), the rapids are usually caused by flash floods from tributary canyons into the Grand Canyon.[17,18]

Likewise, wind gaps or cols are equivocal because other processes can also form these features.[19] The most reliable evidence for past streamflow is the presence of exotic water-worn gravels in wind gaps, the fifth piece of evidence. Whether the past stream was captured, diverted, or simply dried up cannot be determined by gravels alone, but it is an indication that water once eroded the wind gap. A more straightforward hypothesis will be given in Chapter 84.

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[12] Young, R.A. and E.E. Spamer (editors), 2001. *Colorado River Origin and Evolution: Proceedings of a Symposium Held at Grand Canyon National Park in June, 2000*, Grand Canyon Association, Grand Canyon, AZ.
[13] Oard, M.J. 2014 (ebook). A Grand Origin for Grand Canyon. Creation Research Society, Chino Valley, AZ.
[14] Small, Ref. 3, pp. 230, 232.
[15] Douglas, Ref. 2, p. 39.
[16] Dury, G.H., 1964. Principles of Underfit Streams—General Theory of Meandering Valleys. *U.S. Geological Survey Professional Paper 452-A*, Washington, D.C.
[17] Vail, T. (editor), 2003. *Grand Canyon: A Different View*. Master Books, Green Forest, AR.
[18] Vail, T, Oard, M., Bokovoy, D., and Hergenrather, J., 2008. *Your Guide to the Grand Canyon: A Different Perspective*. Master Books, Green Forest, AR.
[19] Small, Ref. 3, pp. 232-234.

Figure 82.2. A series of rapids, a knickpoint, in western Grand Canyon.

Little Real Evidence for Stream Piracy

The idea of stream capture seems like a simple, reasonable process given millions of years of denudation, yet the reality is often more complicated and controversial. Many supposed incidents of stream capture have ignited disputes among geomorphologists.[20] If nothing else, the mechanism has been applied too liberally.[20] The origin of the transverse drainage of the Zambezi River in Africa was assumed to have been caused by river capture, but this deduction was largely speculative.[21] It has been suggested that this instance of river capture was caused by a catastrophic flood from a breached paleolake. This is a reasonable mechanism if a deep paleolake really existed and the paleolake was actually breached. A paleolake has been suggested to explain the origin of Grand Canyon.[22,23]

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[20] Small, Ref. 3, p. 226.

[21] Thomas, D.S.G. and P.A. Shaw, 1992. The Zambezi River: tectonics, climatic change and drainage evolution—is there really evidence for a catastrophic flood? a discussion. *Palaeogeography, Palaeoclimatology, Palaeoecology* 91:175-178.

[22] Austin, S.A., 1994. How was Grand Canyon eroded? In, Austin, S.A. (editor), *Grand Canyon: Monument to Catastrophe*, Institute for Creation Research, Dallas, TX, pp. 83-110.

[23] Brown, W., 2008. *In the Beginning: Compelling Evidence for Creation and the Flood*, 8th edition, Center for Scientific Creation, Phoenix, AZ.

In order to demonstrate stream piracy, it must be shown that the pirating stream was incised to a significantly lower level than its victim. Past erosion is not easy to demonstrate because of ongoing active erosion.

R.J. Small stated that there rarely is direct evidence for stream piracy; it is an inference from more general features: "It must be apparent from this discussion that the phenomenon of river capture cannot be 'taken on trust.'"[24] John Douglas concludes:

> The *paucity of definitive evidence of piracy transverse drainages* suggests that this mechanism does not occur commonly, especially in regions dominated by extensional tectonics (emphasis mine).[25]

It seems impossible for stream piracy to account for aligned water gaps. Table 82.2 summarizes the difficulties with the stream capture hypothesis.

1. Other processes can cause an "elbow of capture"
2. Overfit streams rare to nonexistent
3. Most or all streams underfit
4. Other processes form wind gaps
5. Other mechanisms cause knickpoints
6. Difficult to demonstrate greater erosion by the supposed pirating stream
7. Little or no evidence
8. Aligned water gaps should be impossible by stream piracy

Table 82.2. Problems with the stream piracy hypothesis.

Given the "bandwagon effect," there may be frequent indiscriminant deductions of river capture. Moreover, if antecendence and superimposition do not seem likely, then stream piracy seems to be the only fall back. Uniformitarian scientists do not like a theoretical vacuum. They need at least one hypothesis to give the origin of water gaps plausibility within their paradigm. The same can be said for a host of other evolutionary, uniformitarian hypotheses. So much of their interpretations are simply storytelling.

[24] Small, Ref. 3, p. 229.
[25] Douglas, Ref. 2, p. 81.