Part X

Special Challenges to the Late Cenozoic Boundary Model

I am finished with the main body of the book, strongly showing that the Flood/post-Flood boundary is in the Late Cenozoic, often in the very late Cenozoic. Over the years, however, there have been several challenges to the Late Cenozoic boundary developed by creation scientists, who have claimed a post-Flood interpretation, instead. I will deal with these special cases in this part, which are: (1) the Green River Formation in the central Rocky Mountains, (2) the Columbia River Basalts in the northwest United States, (3) the Grand Canyon carved by a post-Flood dam breach, and (4) mammal distributions today and as fossils.

Chapter 36

The Green River Formation in the Central Rockies

One of the special cases is the Green River Formation in the central Rockies. Some creation geologists think the Green River Formation was deposited by a post-Flood lake.[1,2,3,4,5,6,7,8] It outcrops in basins of the central Rocky Mountains (Figure 36.1 also see Figure 3.2) and is dated within in the uniformitarian framework as Eocene, which is the middle Early Cenozoic. The formation has a number of features that can apparently fit within a post-Flood lake environment. Further analysis paints a different picture.

Uniformitarian Difficulties

Uniformitarians predictably envision the Green River Formation is a result of large lake deposition with periodic dry spells. They argue that there are about 6.5 million years' worth of varves which they assume to be annual layers of sediment. One of the most obvious difficulties with the uniformitarian answer is the "varves" are not really varves. A more correct term would be rhythmites, which are any repeating unit of sedimentation that can be caused by a variety of mechanisms.[9] It is unlikely the layers are varves because of the well preserved fossils, especially the fossil fish, found within the formation. Fossils indicate the thin laminae, usually less than the thickness of a dime, are *not* varves since fish will rot within only a few weeks, even in the anaerobic bottom of a deep, cold lake.[10]

Another problem with assuming the Green River rhythmites are varves is their regularity. It is unlike anything observed in Ice Age varves.[11] Anti-creationist, Arthur Strahler, questioned the number and regularity of the Green River "varves." This is a good question given the proposed fluctuations in the lake level:

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[1] Austin, S.A., 2003. Communication from *Creation 2003* presentation, Harrison, IN.
[2] Brand, L., 2007. Wholistic geology: geology before, during, and after the biblical flood. *Origins* 61:7–34.
[3] Whitmore, J.H., 2006. The Green River Formation: a large post-Flood lake system. *Journal of Creation* 20(1):55–63.
[4] Whitmore, J.H., 2006. The geologic setting of the Green River Formation. *Journal of Creation* 20(1):72–78.
[5] Whitmore, J.H., 2006. Difficulties with a Flood model for the Green River Formation. *Journal of Creation* 20(1):81–85.
[6] Whitmore J.H. and Garner, P., 2008. Using suites of criteria to recognize pre-Flood, Flood, and post-Flood strata in the rock record with application to Wyoming (USA); in: Snelling, A. A. (editor), *Proceedings of the Sixth International Conference on Creationism*. Creation Science Fellowship and Institute for Creation Research, Pittsburgh, PA, and Dallas, TX, pp. 425–448.
[7] Whitmore, J.H. and Wise, K.P., 2008. Rapid and early post-Flood mammalian diversification evidences in the Green River Formation; in:, Snelling, A. A. (editor), *Proceedings of the Sixth International Conference on Creationism*. Creation Science Fellowship and Institute for Creation Research, Pittsburgh, PA, and Dallas, TX, pp. 449–557.
[8] Wise, K.P., 2002. *Faith, Form and Time*. Broadman & Holman, Nashville, TN.
[9] Oard, M.J., 1997. *Ancient Ice Ages or Gigantic Submarine Landslides?* Creation Research Society Books, Chino Valley, AZ.
[10] Whitmore, J.H., 2003. Experimental fish taphonomy with a comparision to fossil fishes. PhD dissertation, Loma Linda University, Loma Linda, CA.
[11] Oard, M.J., 2009. Do varves contradict biblical history? In: Oard, M.J. and Reed J.K. (editors), *Rock Solid Answers: The Biblical Truth Behind 14 Geological Questions*. Master Books, Green Forest, AR, pp. 125–148.

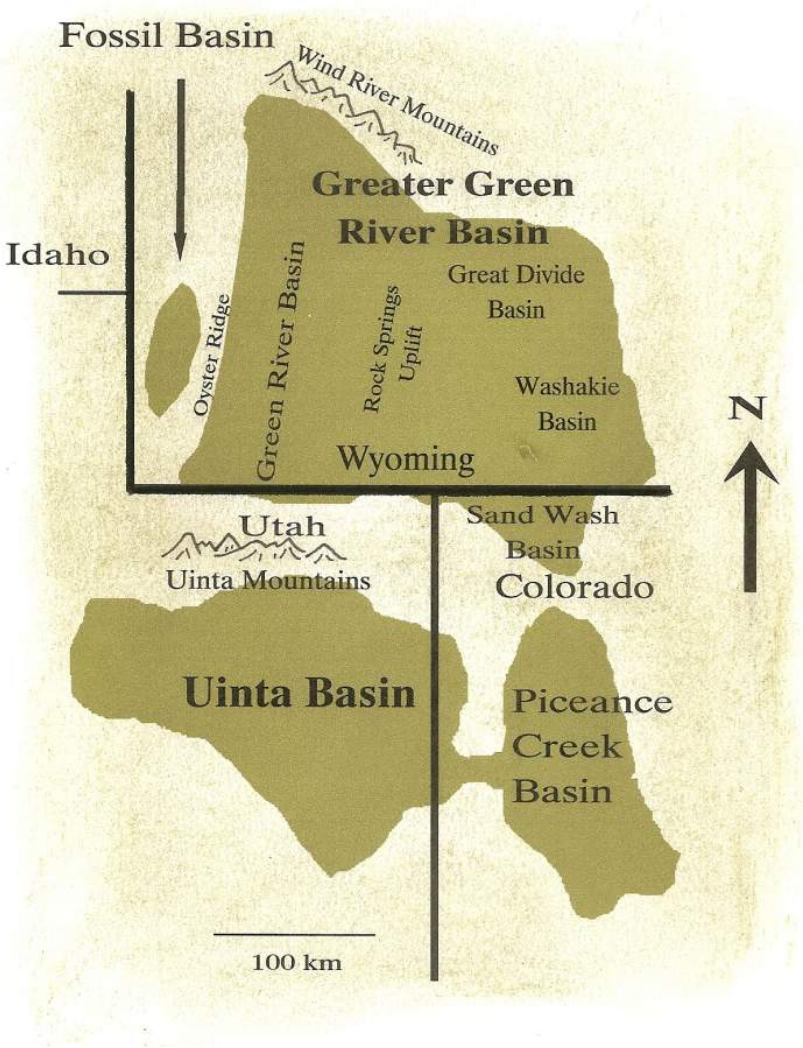

Figure 36.1 Locations of the Green River Formation (dark green) in Colorado, Wyoming, and Utah (drawn by Mrs. Melanie Richard).

> The Green River couplets are indeed a remarkable accumulation; their regularity and vast numbers are mind-boggling. How could such uniform deposition continue for 5 to 8 million years?[12]

This kind of regularity is indicative of rapid deposition.

A third indication of the non-annual character of the Green River rhythmites is the variable number of couplets between two ash beds. The ash beds are time markers, assuming they have been accurately identified. The thickness between the two ash layers varies from 3.2 inches to 8.9 inches (8.1 to 22.6 cm), and the rhythmites vary in number between 1,238 couplets at the edge of one of the basins to 1,661 couplets in basin center. These are found between localities that are spaced up to 9.4 miles (15 km) apart from each other.[13]

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[12] Strahler, A.N., 1987. *Science and Earth History—The Evolution/Creation Controversy*. Prometheus Books, Buffalo, NY, p. 233.

[13] Church, M. and Buchheim, P.H., 2002. Varves and varve-derived climate cycles? evidence from Eocene fossil lake, Green River Formation. *GSA Abstracts with Programs* 34(6):555.

The Green River Formation Deposited during the Flood

Despite evidences for a post-Flood lake, there are at least four *major, large-scale* features that overwhelmingly indicate the Green River Formations and its associated formations, the Wasatch, Bridger, and Washakie Formations, were deposited in the Flood.[14,15] These features include the size of the formation, the amount of oil in the shale, tropical and subtropical fossils, and the massive erosion of the formation. Three of the four features are listed as Flood signatures in Table 34.1, namely criterion 1, 13, and 17.

The Huge Size

During and after the Rocky Mountains rose and the basins sank (Psalm 104:8), the basins containing the Green River Formation, and the other Rocky Mountain basins filled with sediments which turned into sedimentary rock. The Greater Green River Basin covers an area of 19,900 mi^2 (51,000 km^2) and probably averages a depth of 3,000 feet (1,000 m) with a maximum basin fill thickness over 10,000 feet (3,000 m).[16] The Uinta-Piceance Creek basins cover a smaller area, but with a maximum depth of 22,300 feet (6,800 m) adjacent to the southern Uinta Mountains![17] The average depth in the Uinta-Piceance Creek Basins is probably around 10,000 feet (3,000 m) with a volume of around 31,000 mi^2 (130,000 km^3).

The Green River Formation covers a total area of about 30,000 mi^2 (77,000 km^2) and has a volume over 32,700 mi^3 (175,000 km^3). At one time there must have been even more basin fill since a significant amount of the top of the formation has been eroded off (see below).The present volume is significantly larger than the 10,000 mi^3 (41,000 km^3) volume of the Coconino Sandstones and its equivalent formations that are detected as far east as Texas and Kansas.[18] Very few creationists doubt the Coconino Sandstone was deposited during the Flood. But the volume of the Green River Formation is more than three times greater than the Coconino Sandstones.

Without the catastrophe of a global Flood it is difficult to account for the tremendous size of the Green River Formation. A post Flood explanation would allow only a few hundred years for erosion and deposition of the formation. Although mountain erosion and basin sedimentation would have been heavy for the first several hundred years after the Flood due to the Ice Age, it would be insignificant compared to what is needed. It appears only a global flood could account for the total amount of sedimentation needed for the Green River Formation and deposits of similar size.

Most of the sediments seem to have been deposited as horizontal layers with little erosion between the layers. If sedimentation were from post-Flood erosion of the surrounding mountains, the layers should instead be immense, thick alluvial fans and landslide debris that taper basinward. They should slope down from the mountains and have evidence of massive erosion

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[14] Oard, M.J., and Klevberg, P., 2008. Green River Formation very likely did not form in a postdiluvial lake. *Answers Research Journal* 1:99–107.

[15] Oard M.J., 2006. The case for Flood deposition of the Green River Formation. *Journal of Creation* 20(1):50–54.

[16] Roehler, H.W., 1992. Introduction to Greater Green River Basin geology, physiography, and history of investigations. *U. S. Geological Survey Professional paper 1506-A*, U. S. Government Printing Office, Washington, D. C., p. A1.

[17] Johnson, R.C., 1985. Early Cenozoic history of the Uinta and Piceance Creek Basins, Utah and Colorado, with special reference to the development of Eocene lake Uinta; in: Flores, R.M. and Kaplan S.S. (editors), *Cenozoic Paleogeography of West-Central United States*, Rocky Mountain Section of the S. E. P. M., Denver, CO, p. 254.

[18] Austin, S.A., 1994. Interpreting strata of Grand Canyon; in: Austin, S.A. (editor), *Grand Canyon – Monument to Catastrophism*, Institute for Creation Research, Dallas, TX, p. 36.

between and within layers. Many mass movements should have reached the center of the basins, since it is well known they can travel great distances on low slopes.[9] Abundant conglomerate or breccia should be found in the centers of the basins with a chaotic mixture of breccia and debris flow material. This mix should be especially evident at the edge of the basins and contain rounded rocks from fluvial action, numerous cut and fill structures, and numerous channels. This is not what we see nor is there any indication of significant mass flow.

Enough Oil for the United States for 100 Years

Second, the amount of oil in the oil shale is huge.[19] The estimated oil in the Green River Formation in Colorado, Utah, and Wyoming is 1.2 to 1.8 trillion barrels, but only 800 billion is considered recoverable. The recoverable oil is three times the proven oil reserves of Saudi Arabia. In 2005, it would satisfy the oil needs of the United States for 100 years! Other than the Flood, how could this much oil be deposited in a lake? It fits well with criterion 17 in Table 34.1 as evidence for the Flood.

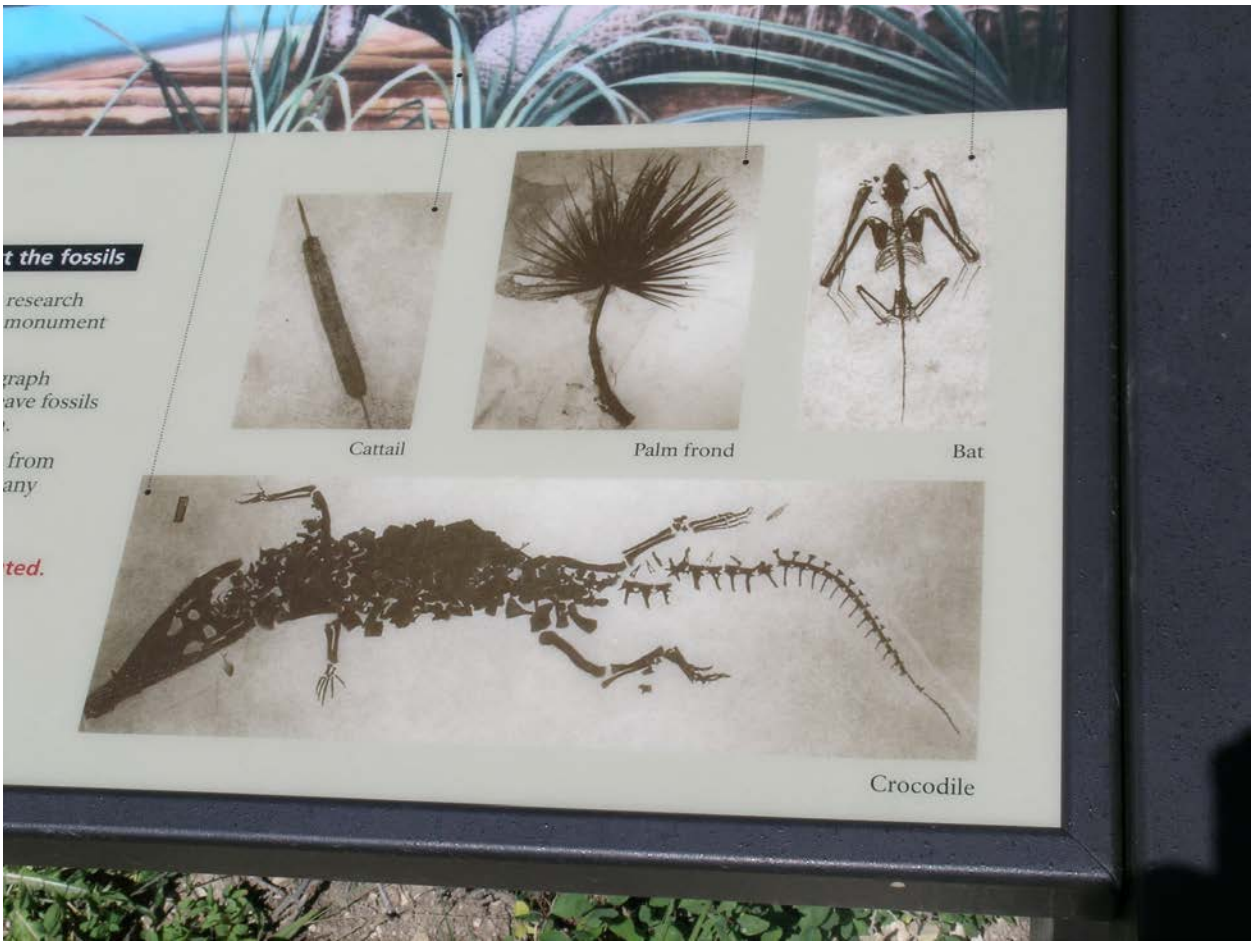

Figure 36.2. Kiosk showing the palm and crocodile fossils found in the Green River Formation.

[19] Bartis, J.T., LaTourrette, T., Dixon, L., Peterson, D.J., and Cecchine, G., 2005. *RAND Corporation Oil Shale Development in the United States Prospects and Policy Issues*. MG-414-NETL.

Tropical and Subtropical Fossils

The third indication that the Green River Formation is a result of the global Flood is tropical and subtropical fossils, including the palms and crocodiles (Figure 36.2), that are found in the formation. If the Green River Formation was deposited soon after the Flood, the Ice Age would have already begun. It is highly unlikely warm weather plants and animals would thrive in its high altitude, inland location. Even if we delay the Ice Age as advocates of post-Flood catastrophism suggest, the inland location and altitude would still bring winters too cold for palms and crocodiles to survive. If we hypothesize a temporary, much lower altitude, the winters would also be too cold for tropical and subtropical organisms. Winter temperatures are mainly caused by the angle of the sun and less upon the altitude. This has not changed since the end of the Flood. It is the lack of winter sunshine that is the major contributor to cold winter temperatures. Although winter cold can be moderated by a marine climate or nearness to the equator this is not the case here. The area of the Green River Formation is in a *continental climate* zone. Clearly, tropical and subtropical organisms could not have survived in Utah, Wyoming, and Colorado after the Flood.

Figure 36.3. Erosional remnants in Fossil Basin indicating over 2,000 feet (600 m) of erosion.

Massive Erosion of the Green River Formation

One of the most impressive evidences that the Green River Formation and its associated formations were deposited during the Flood is after vast sedimentation, the top of the basin fills

was deeply eroded. This pattern is similar to other basins in the Rocky Mountains of the western United States.[20] A minimum of 2,000 feet (600 m) of the Green River Formation has been eroded, according to erosional remnants found in Fossil Basin (Figure 36.3). This amount of erosion pales in comparison to the San Rafael Swell, of which the top formation is the Green River Formation.[14] The San Rafael Swell and Uinta Basin are located in the northwestern Colorado Plateau. The San Rafael Swell is about 78 miles (125 km) long and 31 miles (50 km) wide covering an area of 2,400 mi^2 (6,250 km^2). Its north limb is represented by the Roan and Book Cliffs in which the sedimentary rocks dip down to the north at 6 to 8° (Figures 36.4 and 36.5) Trigonometry was used to calculate the amount of erosion that took place over the cities of Helper or Price. It was calculated using the distance from the pass to the north over the Roan and Book Cliffs on Highway 191 to Helper and the angle of the dipping sedimentary layers. The result was14,000 to 17,000 feet (4,200 to 5,100 m) of sediment is missing (see Figure 36.8)! The details of the calculation are given in the in-depth section at the end of the chapter.

Figures 36.4 The approximate 8° northward dip of the strata around Helper, Utah.

If the Green River Formation were the result of a post-Flood lake, 10,000 feet (3,000 m) average deposition must first occur in a subsiding Uinta Basin and over at least the northern area of the current San Rafael Swell. Second, the San Rafael Swell must upwarp thousands of feet. Third, around 14,000 to 17,000 (4.2 to 5.1 km) of sedimentary rocks (with the Green River Formation being the first to erode from the Swell) has to be removed from an area of about 2,400 mi^2 (6,250 km^2). Fourth, the eroded debris from the San Rafael Swell, as well as the Colorado Plateau, must be swept off the continent, since the eroded debris is not found in a massive flood

[20] Oard, M.J., 2013. Surficial continental erosion places the Flood/post-Flood bundary in the late Cenozoic. *Journal of Creation* 27(2):62–70.

plain nearby. It is inconceivable that this much geological activity could have taken place after the Genesis Flood. Any unspecified postdiluvian catastrophic event or even series of events lacked the muscle to accomplish such an amazing feat.

Figure 36.5. Northward dipping strata at the top of the pass on Highway 191 between Helper and Duchesne, Utah. View is south toward the San Rafael Swell showing how the strata have been greatly eroded to form the Roan Cliff.

Summary

Many geological and paleontological features point to the Flood.[15] The above four are major, large-scale features. Although there are indications of a post-Flood environment, from the big picture it is impossible to conclude anything other than the Genesis Flood could have deposited and eroded the Green River Formation. The size of the formation, the amount of oil within the shale, the tropical and subtropical fossils, and the erosion of the San Rafael Swell are on a scale that makes a post-Flood lake scenario highly unlikely.

What about the Evidence for Post-Flood Lakes?

Although the evidence for large-scale deposition and erosion of the Green River Formation strongly supports a Flood origin, I recognize there are other data that are less easily explained. These features include stromatolites (Figure 36.6), caddis fly cases (Figure 36.7), tracks of birds and mammals, bird nests, raindrop impressions, desiccation cracks, and a bullseye pattern of

sedimentation. Difficult issues are nothing new in Flood geology. The above features can be explained by different interpretations.[21]

Figure 36.6. Stromatolites from the Green River Formation.

I believe that stromatolites could be non-biogenic.[22] Caddis fly cases, bird and mammal tracks, bird nests, desiccation cracks, raindrop impressions, burrows, and other trace fossils can be explained using a model similar to the BEDS (Briefly Exposed Diluvial Sediments) hypothesis. This was used to explain the unique features of dinosaur bonebeds, tracks, and eggs with their associated features.[23]

Apparently only the small Fossil Basin has a bullseye sedimentation pattern while the other much larger basins that contain the Green River Formation, do not. A bullseye sedimentation pattern for Fossil Basin could be explained if the surrounding mountain ranges were established or partly established under the Floodwater, isolating the future Fossil Basin. A relative lowering

[21] Oard, M.J., 2006. Response to the post-Flood lake model for the Green River Formation. *Journal of Creation* 20(1): 64–71.
[22] Oard, M.J. and Froede Jr., C., 2008. Where is the pre-Flood/Flood boundary? *Creation Research Society Quarterly* 45(1):24–39.
[23] Oard, M.J., 2011.*Dinosaur Challenges and Mysteries: How the Genesis Flood Makes Sense of Dinosaur Evidence—Including Tracks, Nests, Eggs, and Scavenged Bonebeds*. Creation book Publishers, Powder Springs, GA.

of sea level, exposing the edges of the basin, could then produce a basinward fining of sediments from the erosion of the surrounding high areas and moving toward the center of the basin.

Figure 36.7. Fossil caddis fly cases located at one level within the Greater Green River Basin, Wyoming. The cases are grouped together by the thousands.

The Difficult Observations Tell Us More about the Flood

If one is used to thinking of the Green River Formation in terms of a post-Flood lake, it will be difficult to shift gears and think of the formation as deposited in the Flood. That person may think that there is no way "such and such" observation can fit into the Flood. But do we really know that much about the details of the Flood to have such definitive thoughts? It seems like the erosion of the Green River Formation, especially over the San Rafael Swell, is providing us with a big hint. It seems clear that the geomorphology of the area can best be explained by Flood runoff.[24] We should run with that idea, which will help us understand Flood processes better.

Philosophers of science frequently remind us there is always more than one interpretive framework in which to place a set of observations. In Thomas Kuhn's famous analysis of a paradigm shift in science, *The Structure of Scientific Revolutions*, he states:

[24] Oard, M.J., 2006. Geomorphology indicates the GRF was deposited in the Flood. *Journal of Creation* 20(1):79–80.

> Philosophers of science have repeatedly demonstrated that more than one theoretical construction can always be placed upon a given collection of data.[25]

He goes on to add:

> One perceptive historian, viewing a classic case of a science's reorientation by paradigm change, recently described it as 'picking up the other end of the stick,' a process that involves 'handling the same bundle of date as before, but placing them in a new system of relations with one another by giving them a different framework.'[26]

Calculating Erosion over the North Limb of the San Rafael Swell (in-depth)

The Roan and Book Cliffs, north of Price, Utah, form the northern limb of the eroded San Rafael Swell. The formations starting from the top are the Green River, Flagstaff, North Horn, and Price River Formations. The sedimentary rock layers consistently dip northward about 8° along Highway 191 from Helper (just north of Price) up to a pass a little over 9,000 feet (2,750 m) above msl (Figures 36.4 and 36.5). To the north of the pass, the dip of the bedding plane (the dip slope) can still be seen from the top of the pass with a relief of 2,000 feet (600 m) in the cliff to the north above the bedding plane. All of the measurements were made using a Brunton compass.

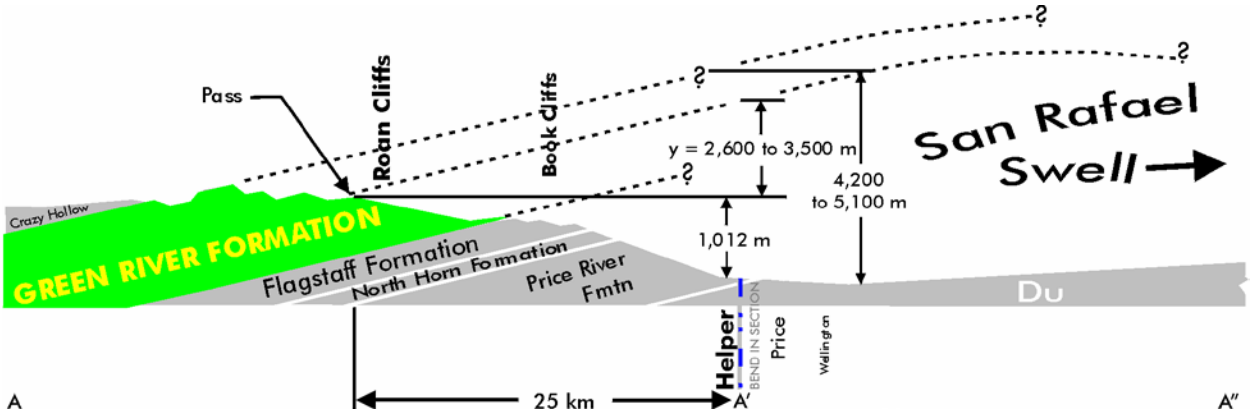

Figure 36.8. The eroded north limb of the San Rafael Swell showing 4,200 to 5,100 m of erosion over Price, Utah, USA. The dashed lines with question marks represent the extrapolation of the sedimentary rock up the San Rafael Swell assuming no change in thickness (drawn by Peter Klevberg).

I calculated the minimum amount of erosion over the northern San Rafael Swell, which should be representative of the entire Swell. I chose Helper, Utah, as the point where the erosional thickness calculation was made because the dip of the strata decreases between Helper and southward to Price. A cross section of the area is shown in Figure 36.8. Although the dip of the strata was uniform, I put question marks on Figure 36.8 to show that the eroded thicknesses are an extrapolation from the north rim of the San Rafael Swell.

I first calculated y (the erosional thickness) by using the formula for the tangent of an angle with the dip of the strata and the approximate distance by air between Helper and the top of the pass, which is about 15.5 miles (25 km). Although the dip of the sedimentary rocks is close to 8°, I was conservative in also calculating y for a dip of the sedimentary rocks of 6°, therefore y

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[25] Kuhn, T.S., 1970. *The Structure of Scientific Revolutions*, 2nd edition. University of Chicago Press, Chicago, IL, p. 76.

[26] Kuhn, Ref. 25, p. 85.

ranges from 8,500 to 11,500 feet (2,600 to 3,500 m). I also need to add the height of the pass above Helper, a little over 0.6 mile (1 km), and the height of the cliff just to the north of the pass, which is about 2,000 feet (600 m). Adding these together, the minimum amount of erosion over Helper ranges from 14,000 to 17,000 feet (4.2 to 5.1 km). Since the San Rafael Swell is about 78 miles (125 km) long and 31 miles (50 km) wide, 5 km of erosion represents a little over 7,300 mi^3 (30,000 km^3) of erosion of this area of the Colorado Plateau.

My calculations agree with the upper estimate of the 2.5 to 5.0 km *average* erosion of the Colorado Plateau, which includes the Uinta Basin and the San Rafael Swell, based on geological clues.[27] Since the Colorado Plateau represents an area of 132,000 mi^2 (337,000 km^2), the amount of erosion for the Colorado Plateau is 204,000 to 415,000 mi^3 (842,000 to 1,700,000 km^3).

The estimate for the San Rafael Swell also agrees with the amount of erosion over the Grand Canyon area on the southwest Colorado Plateau that formed the Grand Staircase north of Grand Canyon. Austin believes this latter erosion took place during the sheet flow of the Genesis Flood, of which I agree:

> An enormous, fairly flat erosion surface occurs above most Grand Canyon formations…The physical evidence for extensive post-Chinle erosion in northern Arizona is best regarded as the product of sheet-flood erosion, as the waters of the Flood retreated off Arizona.[28]

According to the uniformitarian timescale most of the erosion of the Colorado Plateau, including the San Rafael Swell, took place in the Cenozoic. This was determined by the strata remaining after scouring. Schmidt stated:

> What erosional mechanism has been capable of removing such an amount of material [2500 to 5000 m] since the period of denudation began in a geologically brief timespan, i.e. since the beginning of the Tertiary in the anticlinal uplifts and since the end of the Eocene in the basins?[29]

Cenozoic erosion is consistent with the massive continental erosion that took place during the Retreating Stage of the Flood.[30,31] This amount of erosion does not fit at all with a post-Flood scenario.

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[27] Schmidt, K.-H., 1989. The significance of scarp retreat for Cenozoic landform evolution on the Colorado Plateau, U.S.A. *Earth Surface Processes and Landforms* 14:93-105.

[28] Austin, S.A., 1994. A creationist view of Grand Canyon strata; in: Austin, S.A. (editor), *Grand Canyon – Monument to Catastrophism*, Institute for Creation Research, Dallas, TX, p. 79.

[29] Schmidt, Ref. 27, p. 93.

[30] Walker, T., 1994. A Biblical geological model; in: Walsh, R.E. (editor), *Proceedings of the Third International Conference on Creationism*, technical symposium sessions, Creation Science Fellowship, Pittsburgh, PA, pp. 581-592.

[31] Oard, M.J., 2008. *Flood by Design: Receding Water Shapes the Earth's Surface*. Master Books, Green Forest, AR.