PROVIDENCE CANYON, STEWART COUNTY, GEORGIA — EVIDENCE OF RECENT RAPID EROSION

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Abstract

In 10 years of observing the erosion of unconsolidated sediments at Providence Canyon State Park in southwestern Georgia, it is concluded that catastrophic events are more devastating or ruinous than slow, gradual processes. More erosional work was accomplished during a catastrophe than that observed in previous and later years of "normal" erosion. Also the evidence of a catastrophic erosional and depositional event can be obscured by later "normal" erosional processes.

Introduction

Acceptance of a recent Creation and Flood model of earth history implies that many natural events such as canyon formation are assumed to have occurred quickly. Involved in rapid canyon formation is rapid erosion, a topic often discussed in the Quarterly. For instance, three articles (Williams, Meyer and Wolfrom, 1991, 1992a, 1992b) presented various views on the formation of the Grand Canyon of the Colorado River. Also see Oard, 1993; Williams 1993 and Austin 1994a. An introductory study on the erosion of Pine Creek Gorge in Pennsylvania has been published (Williams, Chaffin, Goette and Meyer, 1994).

This paper deals with the recent erosion of Providence Canyon in southwestern Georgia. Based on the field observations at this site, various suggestions are offered on possible catastrophic events and gradual processes that could have occurred after the Flood and their effect on unconsolidated sediments.

History of Canyon Name

The Canyon is named for Providence United Methodist Church (Figure 1) which is adjacent to Providence Canyon State Park. A Georgia Historical Commission marker on state highway 39C at the church reads as follows:

> Providence Church, when first organized, 1832-33, was a log building on the south side of the road. Two acres were donated by David Lowe for a church and school (Providence Academy). This land is now between two of the canyons. The present building was built in 1859 on the north side of the old Lumpkin-Florence road. . . .

Location

Providence Canyon in the state park system is within the coastal plain physiographic province** (Figure 2) and is referred to as Georgia's Little Grand Canyon (Joyce, 1985, p. 1). Giving an exact location, Donovan and Reinhardt (1986, p. 359) state:

> Providence Canyons (sic) State Park is located in Stewart County, Georgia, in the Lumpkin SW 7½ minute quadrangle. The park entrance . . . is located 0.15 mi . . . west of the intersection of Stewart County Road 23 and Georgia Road 39C.

Figure 1. Providence Methodist Church for which the canyons are named.

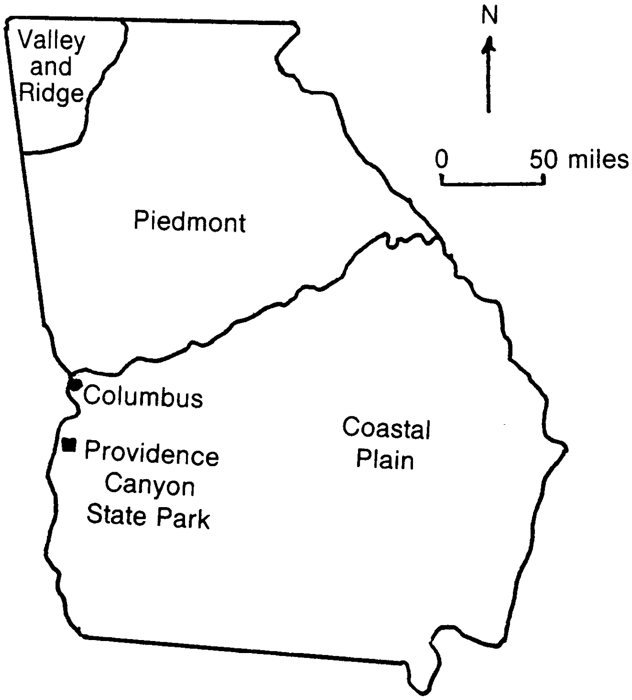

Figure 2. General physiographic provinces of Georgia and the location of Providence Canyon State Park (after Joyce, 1985, p. 2).

Fact and Folklore

As one drives south from Columbus on US Highway 27 and turns west onto Georgia 39C in the town of Lumpkin, the county seat of Stewart County, a Georgia Historical Commission marker about the Canyon reads as follows:

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**The canyon is actually in the Fall Line Hills region of the Coastal Plain. See McVety (1971, p. 3).

> Providence Canyons
> —— 8 mi ——→
>
> Trickles of water running down old Indian paths to springs formed the Providence Canyons, natural wonders of the Southeast.
>
> These canyons, named for an old church that had to be moved out of their path, are often called "Little Grand canyons" because of brilliant color effects of the 43 different soils revealed in the walls. These vari-colored walls and sharp pinnacles make the view awe-inspiring.
>
> The canyons cover several hundred acres. The largest is a half mile long, 300 feet wide and 150 feet deep.

Daniels wrote about his visit to Providence Canyons or caves in 1938 (pp. 299, 302). He had been told by the Chief of the Soil Conservation Service to be sure to

> . . . see the famous Providence Cave in Stewart County, Georgia near the town of Lumpkin. This is a celebrated gully probably more than 150 feet deep at the head, yet formed in soil within the past half century. It is but one of the numerous similar gullies which have ruined a large area of good land in Stewart and two adjacent counties (p. 299).

Daniels waxed eloquently about his visit (p. 302).

> They are, of course, not caves at all. They are ditches. But ditches of the same genus as the grand canyon of the Colorado. Down through the red soil to almost pure white clays the chasms run in the midst of cultivated Georgia farms. They come perilously close to the highway and seem ready to engulf road and farm-house and church. They run beside the road for what seems to be miles. . . .

Arnall (1946, p. 63), a former governor of Georgia, expressed an extremely negative view of the erosion at the site:

> One day, in Southwest Georgia . . . I looked into the deep chasm of Providence Canyon. I saw the perverse beauty of the great cut across the face of nature: the mosaic of colors, as one layer after another of clay was revealed. Where once there were fields of cotton and corn, was this great chasm. Within a generation, the unprotected land had been despoiled of its richness, then swept away, until there was a nothingness panelled in red and yellow and cream and a score of variations of these colors.
>
> The United States Parks Service has called the canyon the most remarkable and most beautiful natural phenomenon east of the Mississippi. It may be. Certainly the colors are striking enough and the gorge is big enough.
>
> To me it was almost the ultimate in horror. . . .

One wonders how Arnall would have described the erosion at the Grand Canyon in Arizona!

Sisk (1935, p. 12) claimed that the Providence caves or canyons were initiated by the run-off from a barn built by one of the Pattersons in 1855. He opened his essay with an expansive, vivid science fiction statement: "Providence Cave, like some Gargantuan monster, has devoured everything that stood in its path" (p. 12).

Donovan and Reinhardt (1980, p. 415) attempted to quantify the accelerated erosion that had occurred in Stewart County:

> The Coastal Plain section of western Georgia consists of sediments middle Cretaceous and younger in age. Most of the units are unconsolidated elastic deposits. . . . Natural erosional processes have formed a . . . 20 mi.-long northwest-facing cuesta. . . . Formation of the cuesta is clearly related to downcutting by streams draining into the Chattahoochee River. Before settlement of this region, the cuesta margin had a relatively stable, steeply sloping undulatory surface densely covered by pine and some hardwoods. After settlement in the 1820's, much of the primary forest was removed for farming, and gullies began to form locally near the top of the cuesta margin, apparently along natural swales in the topography that concentrated surface runoff. . . . Today many large gullies and dendritic gully systems can be seen along the cuesta margin. In an 81-acre area encompassing Providence Canyon State Park, a single drainage system formed since 1850 has produced severe distinct gullies as much as. . . 1300 ft. long, . . . 600 ft. wide and . . . 160 ft. deep. Between 1850 and 1930, accelerated erosion removed an estimated . . . 6×10^7 ft^3 of sediment from the gullied areas. Using this figure, we calculated an average downcutting rate of 21 cm/yr for the gully system known as Providence Canyon.

Anyone familiar with the southern United States is aware of the large number of gullying and sheet erosion problems within the region. Morris (1937, pp. 364-365) suggested several reasons for this erosion of unconsolidated sediments. These are listed below with appropriate comments. Also see McVety (1971).

1. The presence or absence of a vegetative cover. Even with a forest, shrub or grass cover, erosion of unconsolidated material will occur in the South but the process is inhibited by a cover of vegetation. As soon as the cover is removed, rapid erosion can and normally does take place.
2. The character of the agriculture. Generally this is the most likely suggested reason for rapid erosion, poor farming techniques.
3. The intensity of the rainfall. The South receives an abundance of rainfall and much of it is in the form of downpours or cloudbursts which increase the probability of severe erosion.
4. The degree of slope. The rolling topography of the region leads to erosion.
5. The character of the soil and the soil profile. The ample thicknesses of unconsolidated sediments near or just under the surface of the ground encourages erosional damage.

Most of the hand-wringing in the scientific and popular literature is done over no. 2, poor farming methods, because erosion possibly can be prevented if proper care is taken during cultivation. Obviously once land is cleared for agriculture, then reasons 3-5 become of paramount importance. However I have seen evidence in the Southeast of fresh gully development in forests where there is ample vegetative cover.

3a

3b

Figure 3. The rolling topography of the region about six miles south of Providence Canyon State Park at the Stewart-Quitman county line (1984).
a. View east along Georgia highway 27.
b. View west along Georgia highway 27.

Also the degree of slope or rolling topography in the South indicates that likely considerable erosion likely has occurred in the past. Vast post-Flood erosion was possible before a stable vegetative cover was achieved on the unconsolidated sediments which were themselves a product of Flood and post-Flood erosion processes. The rolling topography of the region slightly southwest of Providence Canyon is illustrated in Figure 3. Is this evidence of an earlier erosion cycle before settlement of the area?

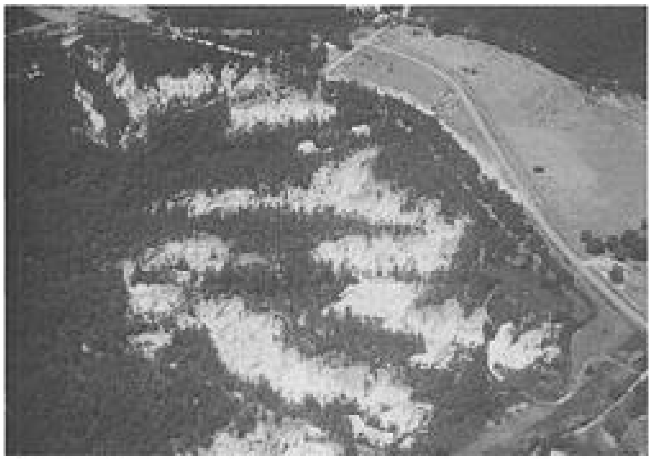
The erosion resulting from rain storms in the southern United States has been recorded previously in the Quarterly: Virginia (Williams, 1986); Tennessee (Williams, 1991); Oklahoma and Texas (Williams, et al., 1991, pp. 96-97).

Appearance of the Canyon

Aerial views of Providence Canyon, taken in 1977, are shown in Figure 4. A diagram of the Park is given in Figure 5. The series of canyons is numbered and often referred to as "fingers" (1-9). Some erosional features in the Canyon can be seen in Figure 6.

Stratigraphy

Providence Canyon is cut mainly through the Upper Cretaceous Providence Formation. This unit is capped by the Paleocene Clayton formation (Figure 7) and at the base of the Providence Formation is the Upper Cretaceous Ripley Formation (Figure 8). Table I contains a brief description of the formations.



4a

4b

Figure 4. Aerial photographs of Providence Canyon State Park (1977) by Robert Baxter.
a. Overview of the Park with Georgia highway 39C seen skirting the canyon.
b. A closer view of some of the canyons.

Note the crossbedding in the Providence sands (Figure 9). Table I was derived using Eargle's stratigraphic designations (1955, p. 77). Recently Donovan has proposed a change in the stratigraphy of the Providence Formation eliminating the Perote member. Table II shows a comparison of these stratigraphic differences,

One may wonder why there is a difference in opinion over the stratigraphy at the canyon. Possibly Eargle's comment in 1953 (p. 3) will explain this quandary,

> In hardly any other part of the country may a geologist find such an accumulation of weathered debris to confuse geologic detail as in the sandhills of the Coastal Plain.

For readers interested in studying the Cretaceous formations in the southeastern United States, a selected bibliography is given in Appendix I.

How do these formations fit into a creationist framework? Suggestions are given in Table III. For an example of a creationist geologic timetable, see Austin (1994a, p. 58).

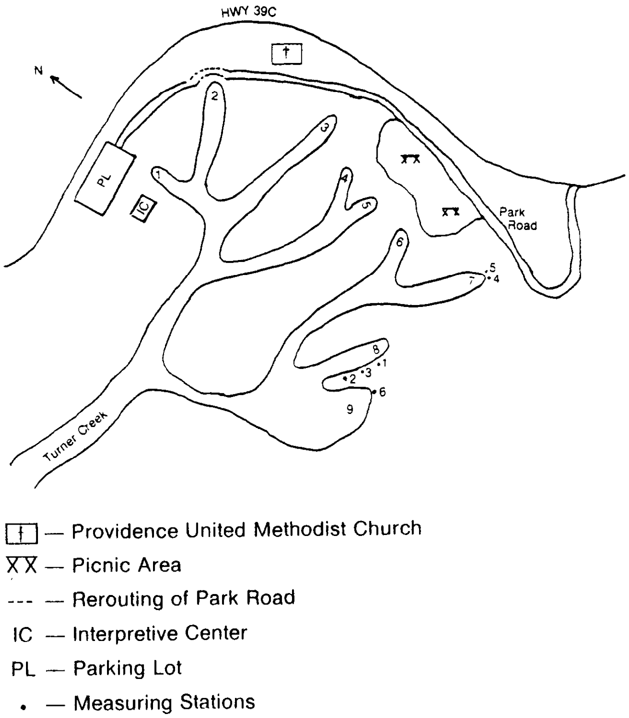


Figure 5. A diagram of the canyons (1-9) in Providence Canyon State Park (not to scale).

Table I. Description of Formations in Providence Canyon.

Formation		Lithology
Clayton		Red ferruginous clayey sand (residuum) with iron ore at base of formation
Providence	(upper member)	Massively cross-bedded micaceous sands with kaolin lenses; varicolored sands—tan, red, yellow, white, pink, lavender; clay balls, *Ophiomorpha* ichnogenus
	(Perote member)	Brownish-gray to dark-gray, micaceous, carbonaceous sand with silt and yellow clay
Ripley		Dark gray to black fine micaceous carbonaceous clayey sand with yellowish-orange staining, highly fossiliferous

Interestingly, the Providence and Ripley formations have been correlated with the Aguja and Javelina formations in west Texas (Stephenson, King, Monroe and Imlay, 1942). Petrified and charcoalified woods from the Aguja formation recently have been studied (Williams and Howe, 1993; Williams, Matzko, Howe, White and Stark, 1993). A penetrating creationist commentary on geologic formation correlation was given by Froede (1994). Could it be that many of the Cretaceous formations in North America, supposedly deposited in the "Cretaceous" or "Mesozoic" Sea (see Figure 3, Williams and Howe, 1993, p. 51) were actually deposited in the final phases of the Deluge? Was this "sea" in reality the final stages of the Flood in North America as the water withdrew from the continent?

6a

6b

Figure 6a. A pinnacle is all that remains of a 160 ft. canyon wall after years of lateral erosion (1984).

b. Talus cones photographed in late evening at Providence Canyon State Park yielding an eerie but beautiful effect (1984).

Figure 7. The Clayton formation lies unconformably over the Providence sands. Measuring station 2 is to the left of the eroded portion of the Clayton formation (1991).

Table II. Measured Stratigraphic Sections on Providence Canyon.

Donovan*			Eargle (1955, p. 77)**		
Formation		Thickness (feet)	Formation		Thickness (feet)
Clayton		19	Clayton		19
Providence	Upper	60	Providence	Upper	99
	Lower	39		Perote Member	32
Ripley		42	Ripley		10

*See Reinhardt (1986, p. 33).
**Eargle's measured section has been adjusted to conform to the 160 feet height of Donovan's measured section.

Table III. Timetable of Formation Deposition—Providence Canyon.

Formation	Series	Flood Sequence
Clayton	Paleocene	Post-Flood?
Providence	Upper Cretaceous	Late Stages of Flood?
Ripley		

Figure 8. An exposure of the Ripley formation (1992) near the bottom of Providence Canyon.

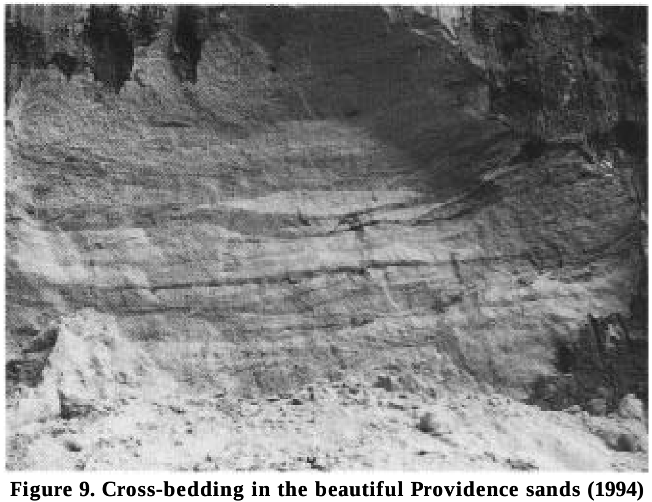


Figure 9. Cross-bedding in the beautiful Providence sands (1994) by Carl Froede, Jr.

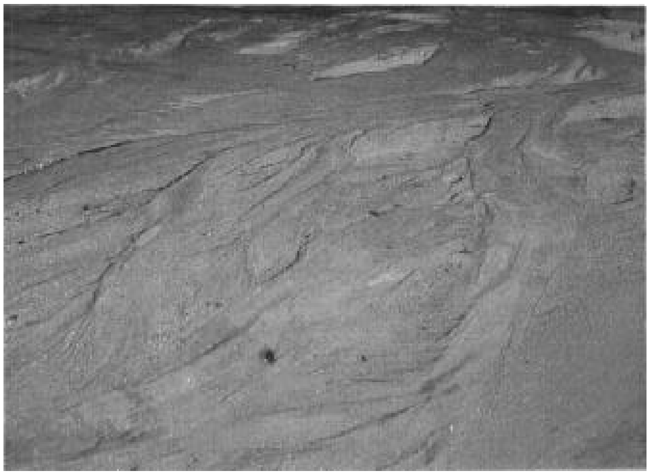


Figure 10. Braided stream pattern of Turner Creek choked with sediments from the canyons (1984).

Figure 11. "Hanging on for dear life." Undercutting and sediment slumping have placed this pine in a precarious position. Its tap root is exposed and the lateral roots hold it in position (1988).

Geomorphic Studies

Braided Stream Pattern

As mentioned earlier, the consensus among geologists and soil conservationists is that once the land was cleared of vegetation in the 1800's for farming, and modern soil management practices had not been developed, the steep-sided gullies of Providence Canyon began to form (Joyce, 1985, pp. 8, 9). The capping Clayton formation is fairly stable, but the Providence sands erode readily. Providence Canyon is at the headwaters of Turner Creek and the wet weather stream is choked with the eroded sediments from the Providence sands during periods of rainfall, forming a braided stream pattern (Figure 10). As Joyce (1985, p. 9) noted: "A tremendous volume of sediment is carried by runoff and transferred to the stream, . . ."

Undercutting, Sapping, Slumping and Mass Wasting

Joyce (1985, pp. 10-12) claimed that as rainwater permeates the Providence sands, it continues downward until it reaches a lens of kaolin which is impermeable to water penetration. There the groundwater moves laterally toward the canyon wall carrying sediment with it which weakens the wall. The overlying sediments, being undercut (Figure 11), often slump downward (Figure 12) forming a talus cone (Figure 6b). This mass wasting process* causes the canyon to widen.

Downcutting, Headward and Lateral Erosion

As the canyons began to form, it is thought that the major erosional process was downcutting, tending to make the canyons deeper. Joyce (1985, pp. 13-14) stated:

> The average rate of downcutting for the years 1820-1930 was calculated to be approximately 8 inches per year and was based on an estimation of the total volume of sediments removed by erosion.

The higher clay content of the Ripley formation renders it more difficult to erode. Thus the downcutting process is slowed when this formation becomes exposed. Figure 13 shows pictures of Providence Canyon taken in the 1920's, 1940's and early 1970's.

As the downcutting developed, headward erosion made the canyons longer. Estimates of headward erosion between 1955 and 1968 were determined to be approximately six feet per year. Yet between 1968 and 1976 headward erosion rates decreased to about two feet per year likely because of vegetative stabilization of the canyon walls reducing the erosion rate (Joyce, 1985, pp. 14-15).

Canyon widening by the process of lateral erosion (generally by slumping) sometimes leaves isolated "islands" of vegetation (Figure 14) and barren pinnacles. Joyce (1985, p. 16) claimed:

> Between 1955 and 1968, lateral erosion operated at an average rate of about 2 feet per year, but between 1968 and 1976, calculations indicate that this rate had increased to an average of approximately 6 feet per year.

12a

12b

Figure 12a. Recent collapse or slumping of canyon wall caused a tree to fall into the canyon after the sediments below it were undercut (1984).
b. Slumping of canyon wall sent sediment and tree down into the canyon (1990).

Joyce thought that the impact of man on the canyon has increased the lateral erosion process. She stated (1985, p. 18):

> The area around the park has undergone substantial development in the past few years, which has eliminated more of the area's natural vegetation, thus exposing the land to increased amounts of runoff. This excess runoff could cause erosion to occur at a faster rate. Another possible cause of accelerated widening of the canyon is the increased use of the area since its establishment as a park in 1971. Many visitors have been unable to resist climbing the canyon walls or carving on them. Besides defacing the canyon walls, this disrespect has helped to accelerate the rate of lateral erosion.

See Figure 15 for examples of the impact of man's activities on the canyon.

The slowing of the erosional processes in Stewart County is probably due to the planting of vegetation on abandoned farmland. Loblolly and shortleaf pine forests deter erosion. Also McVety (1971, p. 19) explained that:

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*This process is similar to sapping discussed by Austin (1994, pp. 99-100) in relation to the formation of amphitheaters in the Grand Canyon of the Colorado River.

13a

13b

13c

Figure 13a. **Providence Canyon in 1922, a cornfield can be seen at the head of the gully. Photograph by S. W. McCallie from Furcron (1956, p. 120).**

b. Providence Canyon in 1940, this section is barren of vegetation (from McVety, 1971, p. 51).

c. Providence Canyon in 1970, this section shows more vegetation cover than a. and b. (from McVety, 1971, p. 51).

Figure 14. Lateral erosive forces have isolated this island of sediment stabilized at the top by vegetation. Note the bank overhang held in place by tree roots in spite of undercutting by slumping sediments. A talus cone can be seen at the corner of the island (1988).

> The planting of cover crops and grasses has also been effective. Bermuda grass has been widely employed, and of the shrubs and vines kudzu, sericea, and Japanese honeysuckle have been used more widely and successfully . . .

However kudzu grows so rapidly in Georgia (can grow up to 50 ft/year), it can cover everything in its path including trees, little-used roads and abandoned houses so that it is often considered more of a problem than a solution unless it is kept in check.

Measurements

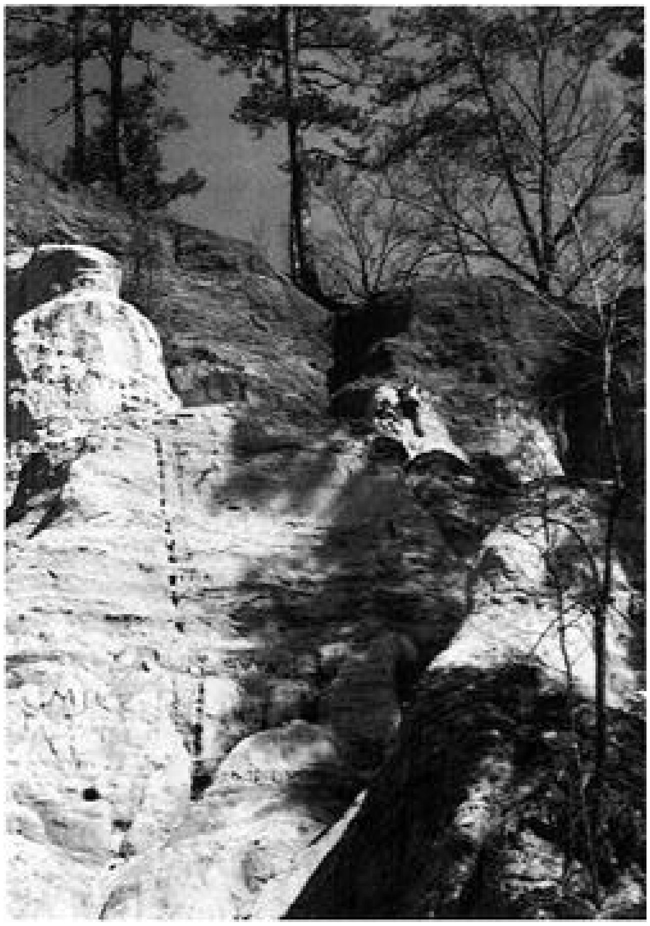
In 1984 I initiated a series of measurements to quantitatively determine the advance of the upper edge of a canyon wall by either lateral or headward erosion. The measurements were conducted in a more remote area of the Park to eliminate as much as possible any effects caused by man's activities. (See Figure 5 for location of measuring stations.) The distance from a tree trunk or fence post to the upper edge of a canyon wall constituted a measurement. As erosion processes cause the advance of a canyon wall, a shorter measured distance is recorded each succeeding year.

No bank undercutting was measured so as not to disturb the canyon wall at the measuring stations. Likewise no volume of sediment lost during erosion was measured. Since canyon wall advance often means the loss of much or all of the 160 ft. gully depth, this translates into considerable mass wastage. Table IV contains measurements of the advance of the upper canyon wall caused by lateral erosion.

The lateral erosion along the same canyon wall is not uniform. One particular location (station 2) obviously was more susceptible to erosive forces. This particular position is adjacent to a collapsed section of the canyon wall (Figure 7).

Table V contains upper canyon wall advance measurements caused by headward erosion. Also the loss of material during headward erosion is not uniform along the same advancing canyon wall.

15a



15b

Figure 15a. In the center of the photograph, writing can be seen in the cross-bedded Providence sands (1984).
b. Notice the two boys in the center of the photograph who have climbed up the Providence sands and are positioned at the Providence/Clayton contact. Steps dug into the sediment can be seen.

Table IV. Lateral Erosion of Canyon Wall.

Date of Measurement	Distance to stable object (inches)*		
	Measuring Station		
	1	2	3
2/26/84	84	132	—**
3/9/85	79	128	89
3/16/86	77.5	128	89
5/2/87	77	126	87
3/5/88	76.5	124	85.5
3/25/89	75	122.5	82
3/24/90	75	87	82
5/8/91	75	85	82
5/3/92	70.5	85	82
2/18/94	65.5	74	80
Total wall advance (inches)	18.5	58.0	9.0

*accuracy of measurement ± 1.0 in.
**measurements at station 3 initiated in 1985.

Table V. Headward Erosion of Canyon Wall.

Date of Measurement	Distance to stable object (inches)*		
	Measuring Station		
	4	5	6
3/10/85	255.75	—	146
3/16/86	255	—	144
5/2/87	240	203	139
3/5/88	234	201	136
3/25/89	209	198.5	133
3/24/90	209	195	132
5/8/91	208	195	132
5/3/92**	—	193	132
2/18/94	—	188	132
Total wall advance (inches)	47.75	15	14

*accuracy of measurements ± 1.0 in
**measurements at station 4 abandoned in 1992 due to removal of fence post by Park personnel.

Catastrophic Erosion

About 0.3 mile east of the entrance to Providence Canyon State Park on Georgia Highway 39C, another canyon had been forming along the northeast side of the road. Collapse of a section of this growing canyon was noted adjacent to the highway in March of 1988 (Figure 16). Undercutting in this portion of the canyon had been effective in undermining the upper strata resulting in the collapse of a sizeable section of sediment. The perimeter of the half circle of collapsed material was 55 ft. The depth of the one-half cylindrical section was 18 ft. and using these approximate measurements, it was found that 8660 ft^3 of sediment slumped from the wall into the growing canyon. By March of 1990 continued lateral erosion had caused the wall advance to encompass approximately a half circle of 96 ft (perimeter) and the downcutting had increased the depth of the section to 24 ft for a total removal of 35,300 ft^3 of sediment (Figure 17).

On March 24, 1990 I made my annual visit to the canyons to obtain the series of measurements of canyon wall advance. It was evident that recent erosion on a vast scale had occurred. I asked the Park Superintendent what had happened. He told me that exactly one

16a

16b

Figure 16. Collapsed section of steep-sided gully adjacent to Georgia highway 39C (1988).
a. View from highway.
b. View looking toward highway 39C in the background.

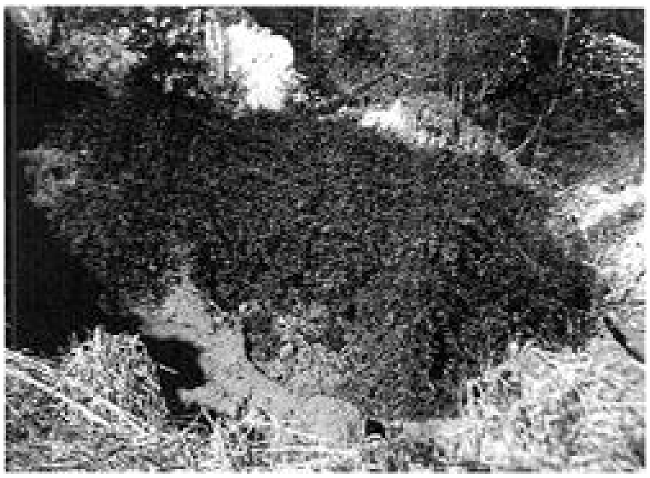


Figure 17. A large section of sediment with honeysuckle cover has slumped about 18 feet from the bank surface into the steep-sided gully continuing to enlarge the encroaching canyon (1990).

week before I arrived, the region had received a 13.5-inch rain on March 17.* His vivid description was that "It was raining so hard, it looked like a stream of water running out of a fire hose." He had come from his home during the downpour to ascertain the extent of damage to the canyon and he experienced the driving rainfall firsthand.

After recording the wall advance measurements, I walked into the canyons to survey the erosional damage. The first noticeable effect was the enormous amount of sediment deposited along Turner Creek (Figure 18). Evidences of slumping (Figure 19), debris slides (Figure 20) and small alluvial fans (Figure 21) were seen. Severe erosion of the canyon walls occurred during the cloudburst. Compare Figure 22 with Figure 15b. A portion of the wall that the young men used to climb to the top of the canyon was eroded badly during the rainstorm of March 1990.

Fences often have to be relocated at Providence Canyon State Park because of continuing erosion processes. Figure 23 shows an old fence that collapsed into the canyon in 1990 and the new fence that was placed to prevent visitors from venturing too near the edge of the canyon. Figure 24 is a photograph taken in 1992 of a section of the Park road, from the entrance to the Interpretive Center, that had been damaged by erosive forces in spite of a dense kudzu and honeysuckle cover. By 1994 this road had to be rerouted (Figure 25) to safely avoid the collapsed section. One does not relish the job of the Providence Canyon State Park personnel who must stay a step ahead of an ever-enlarging canyon.

Destruction of Evidence of a Catastrophe

Often one creationist may propose a catastrophic origin of a particular geologic feature. Then another creationist may claim that there should be some evidence remaining that the catastrophe indeed did occur. Concerning the 1990 catastrophic erosion of Providence Canyon, much of the evidence of the extreme erosion

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*The amount of rainfall was reported to me by the Superintendent of Providence Canyon State Park. Unfortunately no precipitation data are available from the National Climatic Data Center for the Lumpkin Georgia 2 SE Station for the month of March 1990.

18a

18b

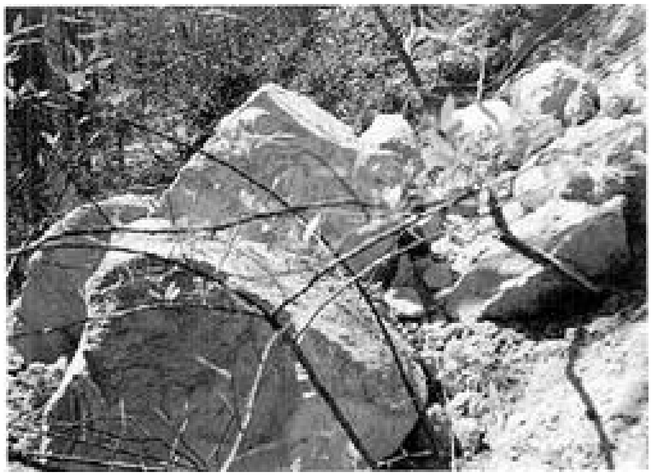
18c

Figure 18a. Turner Creek in 1988 near a Park trail that crosses it. Generally the water flows over a broad relatively level bed of sediment and this view is typical of what had been observed in previous visits.

b. Same area of Turner Creek in March, 1990 as seen in 18a. Note the bank of deposited sediment (up to 6 ft in height). The opposite bank of the Creek is shown in Figure 26a.

c. Deposited sediment upstream from views shown in 18a. and b. All of the headwaters of Turner Creek were choked with loosely packed sediments making walking treacherous. I sank up to my knees in many places when walking to survey the damage (1990).

19a



19b

Figure 19a. Fresh canyon wall is revealed after sediments slumped from it. Note talus below the fresh exposure (1990).

b. Large blocks of sediments that slumped from the canyon wall during the cloudburst (1990).

is not present now. Normal erosive forces have removed much, if not all, of the evidence of the 1990 catastrophe. Likewise vegetative growth has obscured some evidence of the catastrophe. Of the six feet of deposited sediment along the bank of Turner Creek in the canyon bottom in 1990, only small isolated de-

Figure 20. Debris slide containing slump blocks and smaller sections of sedimentary material from freshly-eroded canyon wall (1990).

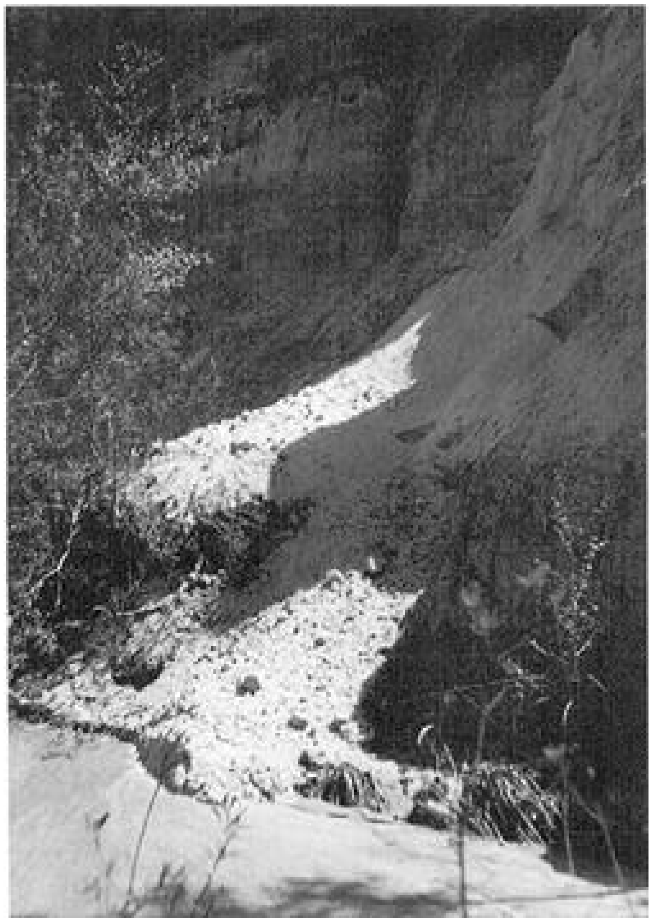


Figure 21. Small alluvial fan formed on canyon floor during the March 1990 cloudburst.

posits remain (Figure 26). Is it possible that evidence of many such catastrophes as this one have been destroyed by later natural events in a short period of time? The possibility of such a sequence of events could have obscured many catastrophic geologic events and easily misled many scientists into adopting a uniformitarian philosophy.

Figure 22. Extensive canyon wall erosion due to 1990 rainstorm. Compare with Figure 15b.

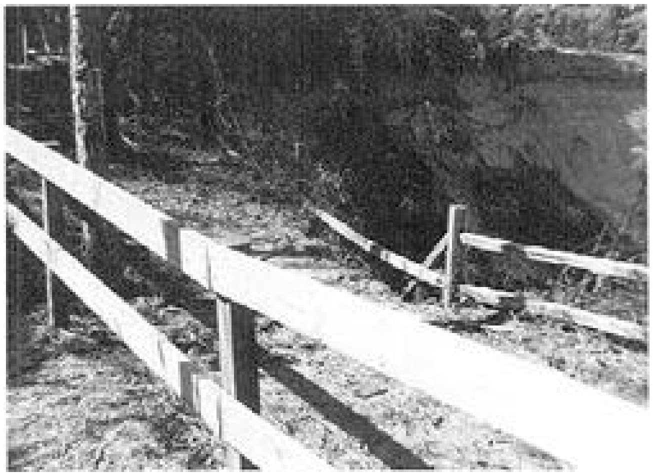


Figure 23. The erosion in one of the canyons in 1990 engulfed an old fence which was replaced by another one several feet away from the edge of the canyon.

Conclusions and Speculations

It would appear from 10 years of observation at Providence Canyon that catastrophic events are more effective in causing extensive erosion and deposition than gradual slow processes. Both types do occur but catastrophic events are more devastating. Considering

Figure 24. One of the canyon fingers (2) has eroded headward during the 1990 rainstorm until it encroached upon the Park road (1992).

Figure 25, Construction to reroute Park road to avoid continually eroding canyon (1994).

measuring stations 1, 2 and 3, on the same canyon wall, erosion at 1 and 3 was less. These positions have been stabilized by vegetation, i.e., tree roots. Wall advance at station 2 sharply increased from 1989 to 1990, likely because of the torrential downpour in March, 1990. The wall advance during that year was over 35 inches, a major loss of sediment.

The headward erosion at stations 4, 5 and 6 was greater than the lateral erosion at stations 1, 2 and 3. The erosional loss at stations 5 and 6 was more gradual than at station 4. A wall advance of 25 inches between 1988 and 1989 resulted from the collapse of a sizeable amount of sediment during that year at station 4. Vegetative stabilization at stations 5 and 6 slowed the headward erosion at those sites.

A sudden slumping of material east of the State Park was noted. Possibly runoff from the highway accelerated the erosion at this site, but again catastrophic collapse occurred suddenly. Also the rainstorm of March, 1990 caused major damage at the Park. As shown in Figures 18b-23, the amount of erosion and subsequent deposition seen in that year was not duplicated during any of the other years of my study.

Another important observation is the disappearance of the evidence of catastrophic erosion at the Park after 1990. An observer would not realize that a single catastrophe had caused much mass wastage upon viewing the canyon walls and the deposition of sediments on the canyon floor and along the headwaters of Turner Creek four years later. Is it possible for natural processes to eventually obscure erosional evidence in a temperate climate zone a few years after a catastrophe? If the climate after the Flood was as postulated by Oard (1990, 1993), the amount of rainfall then would have been considerable. Much prior evidence of catastrophic erosion during and immediately after the Flood could have been destroyed. Thus catastrophic erosional processes could have been more active in the past than we can imagine and finding evidence for such events may be impossible. Such possible conditions make the job of catastrophists more difficult when speculating about past occurrences. This would be particularly true in the southeastern United States where unconsolidated sediments are often exposed and susceptible to rapid erosion by rainstorms.

Extrapolate the above postulations back to a hypothesized post-Flood wet climate. Assume that some of the sediments deposited by the Flood had not completely lithified, extensive erosion of the deposits would have been possible, particularly before any vegetative growth or subsequent lithification would have stabilized them. Thus early post-Flood canyon formation, as well as the development of a rolling topography in fairly flat regions (coastal plains), could have occurred. The greater the rainfall, the greater the chance for these circumstances to exist.

All of these conclusions are tentative and limited in scope. The speculations are offered to encourage more discussion on the subject of erosion in the years after the Flood. However the present is definitely not the key to the past. In more realistic terms, the present may obscure the past! Also a more recent catastrophe may destroy the evidence of an earlier one!

Appendix I

Selected Bibliography for Cretaceous Formations in Southeastern United States, Particularly Georgia and Alabama

References concerning stratigraphy that are given in the bibliography of this article will not be repeated in this Appendix but should be consulted.

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26a

26b

26c

Figure 26a. Sedimentary deposit, six feet in height, along Turner Creek one week after catastrophic erosion of canyons during March, 1990 rainstorm.

b. The same view as a., one year later (1991). The sedimentary deposit is 4.5 feet in height.

c. The same view as a. and b. four years after the catastrophic rainstorm of March 1990. A small sedimentary deposit, one foot in height remains (1994) where a considerably larger deposit existed. Turner Creek has the same appearance as it did in 1988.

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Appendix II
Rapid Gully Erosion at Other Locations

In 1846 Charles Lyell observed an eroding gully near Milledgeville, Georgia in the Piedmont physiographic province. Ireland (1939) studied the continuing steep sided gully erosion at the same site almost 100 years later. This “Lyell” gully has many features similar to the Providence canyons.

Gully erosion in San Mateo County, California by soil piping and tunneling was examined by Swanson, Kondolf and Boison (1989). This type of erosional action could be quite common in unconsolidated sediments.

The rapid erosion that occurred at Mount St. Helens in 1980 was recorded by Steve Austin (1984a, 1986). Likewise the Catastrophe Reference Database collected by Austin (1994b) contains over 50 references concerning instances of rapid erosion. Also see Austin, 1984b.

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Glossary

Braided Stream — a stream that divides into an interlacing network of branching and reuniting shallow channels. Possibly the stream is unable to transport its sediment load.
Clastic — pertaining to a rock or sediment composed primarily of fragments (clasts) derived from preexisting rocks or minerals and transported some distance from their place of origin
Cuesta — An asymmetrical ridge with a long, gentle slope on one side and a steep or cliff like face on the other side.
Downcutting — Stream erosion in which the cutting action is directed in a downward direction.
Ferruginous — pertaining to or containing iron.
Headward erosion — The lengthening of a valley or gully by erosion at the source of a stream.
Lateral Erosion — The erosion of a canyon or gully walls by water action and gravitational forces causing the canyon to widen.
Lithification — The conversion of newly deposited sediments into a solid rock.
Mass Wasting — A general term for the downslope movement of large amounts of soil and rock material caused by gravitational forces.
Ophiomorpha — Trace fossil genus* generally “. . . restricted to the littoral or shallow sublittoral zone and normally to occur in neither fresh nor deeper marine water” (Crimes, 1975, p. 117). However Bishop and Brannen (1993, p. 23) claim: “The presence of *Ophiomorpha* usually indicates the presence of a thalassinoid burrowing shrimp but does not necessarily indicate a nearshore environment because many thalassinoids range to the edge of the continental shelf.”
Residuum — What remains of a soil or rock after a process such as weathering.
Sheet Erosion — The removal of thin layers of surface material from an area of gently sloping land by broad continuous sheets of running water.
Slumping — The downward movement of a mass of rock or unconsolidated material moving as a unit parallel to the cliff or slope from which it descends.
Talus Cone — A small cone-shaped or apron-like landform at the base of a cliff, consisting of poorly sorted debris that has accumulated episodically by mass wasting.
Unconformity — The general name given to a surface of erosion that has been buried within the earth under sediments or strata.
Unconsolidated — A sediment that is loosely arranged or unstratified or whose particles are not cemented together (not lithified).
Undercutting — To cut away material from a bank or wall of soil or rock leaving a portion overhanging.

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*(See Cowart and Froede, 1994).

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BOOK REVIEWS

Creation and Time: A Biblical and Scientific Perspective on The Creation-Date Controversy by Hugh Ross. 1994. Navpress. Colorado Springs. 187 pages. $10.00.

Reviewed by Danny R. Faulkner*

In his previous two books Hugh Ross put forth his ideas on creation. His views are probably familiar to most readers: he accepts the Big Bang cosmogony as well as the 4.6 billion year age of the earth. He accepts the uniformitarian interpretation of the fossil record, though he rejects the concept of evolution, preferring a type of progressive creation instead. He accepts the Genesis creation account, interpreting it with the day-age theory. In short, he accepts nearly all, if not all, of what modern science has to say about origins, while trying to hold on to biblical theology. Ross's main appeal in his writings and his organization, Reasons to Believe, is to intellectual people who would normally have difficulty accepting Christianity because of (as he would have it) a misconception many have about the date of creation implied by scripture. Ross firmly believes that the proper rendering of Genesis one has been confirmed by modern science and that recent cosmological discoveries (the anthropic principle, the origin of the universe as a singularity) strongly lead one to theistic ideas.

This teaching is obviously opposed to the position of the Creation Research Society. This latest book by Hugh Ross is wholly dedicated to this difference, with ICR particularly coming in for criticism. The author thinks that a literal six day creation week is intellectually indefensible and that such a position does great harm to the cause of Christ. He rejects the notion that anything but a recent creation undermines Christianity and ultimately leads to atheism and immorality or at least a lack of evangelism. His counter example is his own ministry and associates who otherwise appear to be orthodox and are involved in evangelistic endeavors.

I do not wish to dispute this latter point occurring at this time, but will it be true in the future for the people that Ross is affecting? While giving much ground to modern ideas, Ross does hold to the correct position on some important issues, such as the literal historicity of Adam and the Garden of Eden not that long ago. I fear that many of those influenced by him may reject these doctrines at a later time.

In Chapter 10 several indicators for a young earth or universe are discussed. On pp. 107-108 gravitational contraction powering the sun is discussed. Such a possibility caused quite a stir in recent creationist circles 10 or 15 years ago, but most opinion turned against this suggestion with the culmination of a good paper by DeYoung and Rush (1989). Ross states quite correctly, I believe, that the computed temperature and density at the sun's center should ignite nuclear fusion. However he grossly overstates the case when he wrote that

> . . . that various measured characteristics of the sun—including its effective temperature, luminosity, spectra, radius, outflow of neutrinos, and mass—all guarantee that the sun is burning by nuclear fusion and that this fusion has been proceeding for about 5 billion years.

This is wrong on both counts. The gross properties of the sun are consistent with both nuclear fusion and gravitational contraction. The chlorine based neutrino experiment is consistent with no solar neutrinos, and the gallium experiments thus far have yielded results below those predicted by nuclear fusion. Furthermore there is simply no evidence from the sun itself that

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