

## Society for American Archaeology

---

Nankoweap to Unkar: An Archaeological Survey of the Upper Grand Canyon

Author(s): Douglas W. Schwartz

Reviewed work(s):

Source: *American Antiquity*, Vol. 30, No. 3 (Jan., 1965), pp. 278-296

Published by: [Society for American Archaeology](#)

Stable URL: <http://www.jstor.org/stable/278809>

Accessed: 01/03/2013 00:27

---

Your use of the JSTOR archive indicates your acceptance of the Terms & Conditions of Use, available at <http://www.jstor.org/page/info/about/policies/terms.jsp>

JSTOR is a not-for-profit service that helps scholars, researchers, and students discover, use, and build upon a wide range of content in a trusted digital archive. We use information technology and tools to increase productivity and facilitate new forms of scholarship. For more information about JSTOR, please contact support@jstor.org.



*Society for American Archaeology* is collaborating with JSTOR to digitize, preserve and extend access to *American Antiquity*.

<http://www.jstor.org>

# NANKOWEAP TO UNKAR: AN ARCHAEOLOGICAL SURVEY OF THE UPPER GRAND CANYON

DOUGLAS W. SCHWARTZ

## ABSTRACT

An archaeological survey of the areas along the river and the side canyons in upper Grand Canyon led to the location of 18 sites, five isolated and 13 in four clusters. The age of these sites is consistent with others found in the Grand Canyon north of the Colorado River and ranges generally around the period A.D. 1050-1150. It would appear that the occupants of these sites were struggling agriculturalists of the Anasazi pattern who were unable to adjust to this rigorous environment and abandoned the area. Evidence for a more or less continuous use of the Grand Canyon was found in the Little Colorado River Canyon, where the original Hopi sipapu was located. While prehistoric occupation may once have occurred to a minor degree near the mouth of the Little Colorado, its major function has been as a passageway between the Hopi pueblos and the Hopi salt mine, with an intermediate stop at the sipapu (a geological formation). This paper is one of a series that attempts to outline archaeological developments in the Grand Canyon region.

**T**HE FIRST REPORT of prehistoric material from the banks of the Colorado River within Grand Canyon was made in 1869 by John Wesley Powell. Since that time archaeologists have accompanied river parties and noted the presence of additional prehistoric material in Grand Canyon, but no systematic archaeological survey of the Grand Canyon along the Colorado River has resulted. As part of a continuing study of Grand Canyon culture history, I undertook such a survey of the upper section of the Canyon during June of 1961. This survey covered the banks of the Colorado River from the mouth of Nankoweap Creek to the mouth of Unkar Creek and the adjacent side canyons (Fig. 1). Several objectives determined the nature of the work: (1) to record archaeological material in this virtually unknown region, (2) to determine the ecological factors that affected life in the canyon bottom, (3) to compare aboriginal occupations on the quite different north and south sides of the river, (4) to compare sites near the river with those in upper Canyon locations, and (5) to ascertain the relevance of all this material to the general development of Grand Canyon culture history.

This paper, which is taken from a somewhat more comprehensive report presented to the National Park Service, is an attempt to meet these objectives. It will begin with a description

of the area itself. As additional background, a general discussion of the history and archaeological work previously done in the survey area will be presented. The body of the report will be a description of the information collected, which will be analyzed for temporal distributional clues. Finally, some observations will be made on prehistoric ecology and the kind of life these canyon-bottom Indians may have led.

## ARCHAEOLOGICAL BACKGROUND

John Wesley Powell, the first American to travel through the area of the present survey, made two boat trips through the Grand Canyon, one in 1869 and the other in 1871. Prior to this time "practically nothing was known of the Colorado River from its source to where it emerges into the valley of the Grand Wash, except what could be observed from look-out points at the tops of the canyons, or from the few places where descents had been made to the bottom" (Powell, 1915: 6). On May 24, 1869, Major Powell and nine companions began their initial survey of the Colorado at Green River City, Wyoming. Nearly two and a half months later they entered the Grand Canyon and by August 9 were in the area under consideration in this report. Except for the Little Colorado River, few definite landmarks can be recognized in their journals; however, they probably passed Hance Rapids and out of the area on or about August 12. On the second trip they reached the mouth of Nankoweap about August 21 and passed Hance Rapids about August 28. The extra time on the second trip was taken by intensive observations made at and just below the Little Colorado River.

In the journals (Major Powell, George Y. Bradley, and J. C. Sumner cover the first trip and Powell, F. M. Bishop, and Frederick Dellenbaugh cover the second trip), there are several indications that archaeological material was seen in this area. These observations are given below, along with the observer, the date of observation, and known or presumed location.

Bradley (Darrah 1947), August 10, 1869, mouth of Little Colorado: "There are signs of Indians here but quite old. Cannot tell whether they are Moquis or Apaches, I

think more likely the latter for the Moquis keep close to their villages."

J. W. Powell (1915), August 11, 1869, mouth of Little Colorado: "I walk down the gorge to the left at the foot of the cliff, climb to a bench, and discover a trail, deeply worn in the rock. Where it crosses the side gulches, in some places, steps have been cut. I can see no evidence of its having been traveled for a long time. It was doubtless a path used by the people who inhabited this country anterior to the present Indian races — the people who built the communal houses, of which mention has been made. I return to camp about three o'clock, and find that some of the men have discovered ruins, and many fragments of pottery: also, etchings and hieroglyphics on the rocks."

W. C. Powell (Kelly 1948-49), August 23, 1871, mouth of Little Colorado River: "An old fire-place on Indian trail found near camp." W. C. Powell (Kelly 1948-49), August 27, 1871, probably mouth of Basalt Creek: "Found an old stone house evidently built by the Sto-ce nee nas."

Although not a major contribution to archaeology, the Powell trips did provide the first indication that prehistoric Indian material was present in the depths of the Grand Canyon. After Powell's initial trail-blazing, others began making the river trip. In the surviving records ten additional comments have been found that pertain to archaeological material in this area. All but the last were found in the compilation of Grand Canyon river journals by Otis Marston (n.d., Vols. 1 and 2). These will be noted below in chronological order.

J. G. Brown with Stranton Survey in 1890: Jan. 17, reached Nankoweap "an old thoroughfare of the Indians." Jan. 18, "several of the party went up the side canyon and found some cliff dweller's houses. In wandering about found a lot of human bones and pottery, a few perfect arrowheads and some shells." Jan. 23, "found more arrowheads" (this may have been near Lava Canyon).

W. H. Edwards with Stranton party in 1890: Jan. 18 (mouth of Nankoweap), "found cliff dwellings fine arrowheads, etc." Jan. 22 (mouth of Little Colorado River), "found pottery and saw 'good many signs of Indian camp' including a few arrowheads." Jan. 24, Tanner Trail (probably at foot of trail near river) "hunted arrowheads and pottery."

Henry E. Blake with Birdseye party (U.S. Geological Survey) in 1923: Aug. 12 (mouth of Nankoweap), "checked and photographed cliff dwellings with Emery Kolb."

O. A. Leager on Eddy trip in 1927: June 20 (at mouth of Little Colorado), "climbed up soft talus slopes to the canyon walls and found pottery and arrowheads."

Robert Sharp in 1937: Oct. 15, "found potsherds on ridge north of Nankoweap Creek."

Neville expedition in 1938: July 17 (mouth of Nankoweap) "found mounds with sherds and white arrowheads. Also saw cliff dwellings."

Doris Neville in 1940: Aug. 9 (mouth of Nankoweap) "interesting ruins, small white arrowhead found here in 1938."

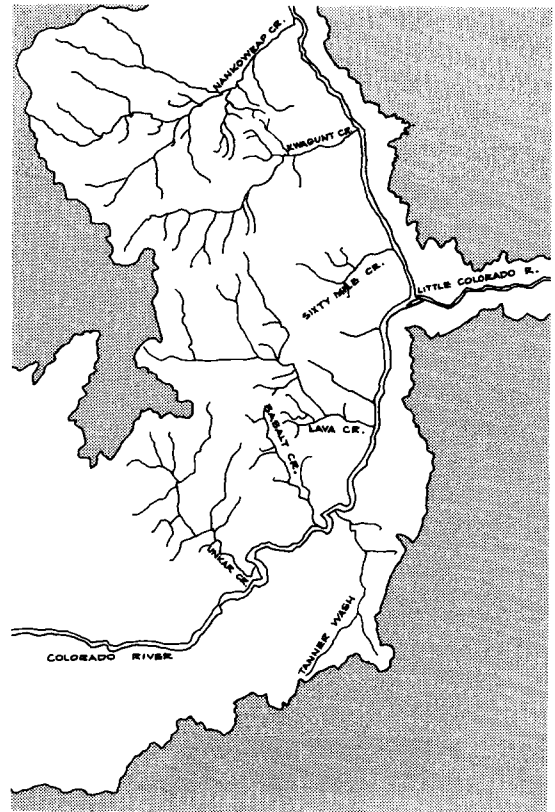


FIG. 1. Map of survey area showing eastern section of the Grand Canyon.

Rose DeRoss (1958) on a Georgie White trip: pottery "in large quantities" noted at mouth of Nankoweap (p. 32); "a cliff dwelling type of ruins" noted in Kwagunt (p. 32); "the largest amount of Indian pottery ever found on the Colorado, including a stone ax" found at Unkar rapid (p. 39).

In nearly a century of river running, if the existent journals can be used as a sample of casual observations, seven possible archaeological locations were noted in the area between the mouth of Nankoweap and the mouth of Unkar. The Nankoweap cliff dwellings and delta sites were by far the most frequently noticed and visited, while the Little Colorado area was noted more in the earlier reports than later. The other five locations were noted only in one journal and reflect the infrequency of their discovery by the river runners. The fact that the sites have been recorded, however, does suggest that in the future even more collecting will be done. As sites are so rare, every attempt should be made to inhibit this collecting activity by river runners.

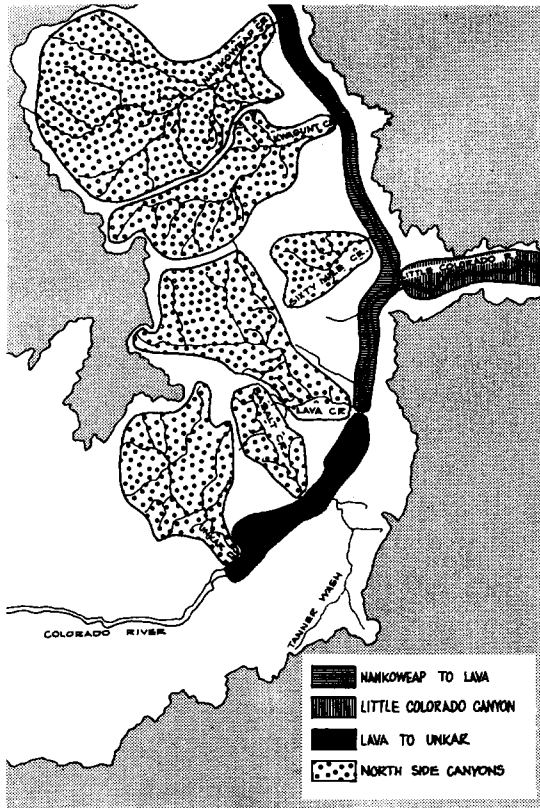


FIG. 2. Map of eastern section of the Grand Canyon showing regions referred to in the text.

In November, 1928, two rangers and a naturalist from the staff of Grand Canyon National Park made the first official reconnaissance in the northeastern section of the Canyon by foot (Anonymous 1928). They traveled down Tanner Trail, crossed the river at the Old Tanner Crossing at the mouth of Chuar (Lava) Creek, hiked up Chuar Creek, across to Kwagunt and to the ridge overlooking Nankoweap Creek. In three areas archaeological sites were recorded. The first evidence of prehistoric remains was seen somewhere between the middle and river end of the Tanner Trail on the south side of the river. The exact location cannot be determined from the report. A second large area approximately 4 mi. up Chuar Creek is described as follows:

Broken pieces of pottery near the banks of the stream indicated the presence of a former race. Search in the vicinity revealed the existence of thirteen ruins and one well-preserved food cache. The largest ruin was about twenty feet by thirty feet and contained two inner compartments. Near the head of the stream and about a mile above occurred the best ruins found. Here was an Indian

fort and five dwellings under a cliff. The Indian fort, made of stone with mud mortar, was in an excellent state of preservation. On one side there was a stone door twenty by twenty-four inches with an opening over the top. On the side facing the stream were seven openings three by four inches. It appeared that the fort evidently commanded a one-time Indian trail from the Kaibab down Chuar Creek.

In Kwagunt Creek, sites were also seen by the rangers:

When we reached camp Ranger Brown announced the discovery of a "lost city" containing at least twenty-five ruins. He discovered several pictographs under a ledge and collected a flint skinning knife, several arrowheads and pieces of pottery. Along each permanent stream within the park one will invariably find traces of a bygone race.

The areas reported above were not visited during the present survey because they were further up the side canyons than could be effectively covered. They therefore remain as unrecorded occupation areas for the Canyon.

Prior to the present trip the only serious archaeological recording in this northeastern section of Grand Canyon was done by Walter W. Taylor. In 1953 Taylor was one of a group of ten individuals who were running the river for a number of purposes. With regard to possibilities for doing archaeological work, he wrote that "opportunities to make special stops or lengthy reconnaissance were not available . . ." (Taylor 1958: 18). Nevertheless he did report four localities: at the mouth of Nankoweap Creek, a tentative location for the famed Hopi salt mine at mile 56, and a site on the delta of Unkar Creek. He presented the first good site descriptions and an analysis of the pottery found. His conclusions are best stated in his own words:

From this brief and hurried survey, it is concluded that there was very little aboriginal occupation of the near reaches of the Colorado River in the stretch between Lees Ferry and Lake Mead. What little there was shows a relationship with the occupation of the north rim which, in turn, is closely related to the culture of the Kayenta-Monument Valley region. There seems to have been little or no cultural relation with peoples living north, west, or south and apparently very little contact at all. The occupation of the bottom of the Canyon evidently started later than that of the rim and certainly was less intense. But it is very possible that it lasted longer and that the refuge offered by the Canyon, slight as it might have been, was utilized in the retreat which Hall has postulated for the north-rim Anasazi in the face of increasing pressure from the west (1942). Hall's view that this abandonment occurred around 1150 A.D. is well supported by the data from our sites (Taylor 1958: 29).



It took nearly 100 years, from the river trips of Powell to the short survey of Taylor, for the conception of Grand Canyon culture history to be refined from a simple knowledge of the presence of prehistoric people to at least some understanding of the time of the occupation and its cultural affinities.

#### DESCRIPTION OF SURVEY AREA

Grand Canyon may logically be divided into north and south sections by using the Colorado River as a demarcation line. However, an equally important factor in the topographic differentiation of the Canyon is the north-to-south slope of the surrounding Colorado Plateau. This slope produces a drainage toward the Canyon on the north and away from it on the south. The drainage toward the Canyon on the north results in deep-cut canyons that enter the river from that direction (Fig. 2). As the plateau south of the river drains south, the Canyon south

of the river is characterized by steep cliff faces and small, short, and dry side canyons. Only the Little Colorado River and Havasupai Creek have cut large or deep canyons on the south side. North of the river, the side canyons are low, wide, and characterized by spring-fed streams that flow into the Colorado River. It is therefore not surprising to find that most aboriginal occupation in the Canyon occurred north of the river.

On the basis of these topographic differences the survey area can be divided into four regions (Fig. 2); (1) the canyon immediately adjacent to the river from the mouth of Nankoweap to the mouth of Lava Creek, (2) the Little Colorado River Canyon, (3) the canyon immediately adjacent to the river from Lava Creek to the lower end of Unkar delta, and (4) the side canyons north of the river. Each of these will be described below.



Fig. 3. Nature of Grand Canyon above Nankoweap Creek.



FIG. 4. Salt stalactites in the Hopi salt mine area.

#### *River Canyon from Nankoweap to Lava Canyon*

The stretch of Grand Canyon from the broad delta of Nankoweap Creek to the mouth of Lava Canyon is essentially the lower end of Marble Gorge. Here cliffs tower high and straight close to the river on both north and south sides. The south walls are characterized by extremely high cliffs that rise almost directly from the river to the plateau above, with only an occasional barren sandbank near the river or a narrow band of mesquite and cactus growing on the rocky talus at the base of the cliffs (Fig. 3). The cliffs which make up the south wall are so spectacular that they have been specifically named. From Nankoweap to the Little Colorado they are called the Desert Facade, while from the mouth of the Little Colorado to Lava Creek they are named Palisades of the Desert. Only the deep valley of the Little Colorado River, to be discussed below, breaks this line of cliffs, but even here there is no delta of the type found at the mouths of drainages that enter from the north. Below the mouth of the Little Colorado River on the north side of the Canyon are shallow rock shelters that contain stalactites and thick wall and roof deposits of salt (Fig. 4). This is the area of the famed Hopi salt mine.

The only other major breaks in this narrow canyon topography are found at the deltas of the larger streams on the north side of the river. Nankoweap Creek delta is by far the largest of these. The Nankoweap delta and the Unkar delta (in the next region south) are the largest along the river inside the Grand Canyon National Park. Smaller deltas are present at Kwa-

gunt, Carbon, 60-Mile, and Lava canyons. Other streams come in from the north side in this area, but these do not have deltas large enough to be important. It is not surprising to find that the only occupation found along the river in this area was at these delta locations.

#### *Canyon of the Little Colorado River*

The major break on the south side of the upper canyon is made by the spectacular narrow canyon of the Little Colorado River. At the mouth of the Little Colorado River one is struck immediately, at least in late June, with the clear, deep-blue water and the heavy white mineral deposits on the large rocks above and below the surface. Both the white of the river boulders and blue of the water contrast sharply with the brown muddiness of the Colorado River. Next to the color of the water, perhaps the most distinctive feature of the Little Colorado Canyon is its extreme depth (3500 ft.) and its narrow gorge, about 1 mi. in width at the top. This leaves little canyon bottomland for occupation. Two other geographical factors also mitigate against extensive prehistoric use of the Little Colorado River Canyon. The river water has a high salt content and probably would not be conducive to domestic plant growth. Furthermore, the Little Colorado drains a large area, and its lower section must carry tremendous quantities of water after the spring thaw. In such a narrow canyon floods would hinder and discourage occupation.

Carp and catfish in significant numbers were seen in the Little Colorado River, and evidences of heron, cat, and deer were also observed. The main plant types in the canyon of the Little Colorado are reeds and willow near the river, mesquite and cactus away from it.

#### *River Canyon from Lava Canyon to Unkar Delta*

The Grand Canyon takes on a new character below the mouth of Lava Creek. The south wall drops back some 3 mi. from the river. Several wide side canyons cut deeply into the north side, producing a highly sculptured effect. The south side of the river is completely dry; there are no running streams and only sandy knolls separate the beaches from the cliffs behind them. On the other hand, the cliffs near the river on the north side are much lower and provide long vistas to the North Rim (Fig. 5).

In its upper section the Canyon is characterized largely by straight stretches of river, but between the mouths of Lava and Unkar creeks it not only widens but also takes on a marked winding nature. Here the river is wider, and the two large deltas of Basalt and Unkar creeks increase the amount of low-lying land immediately adjacent to the river (Fig. 6). Perhaps the largest site in the Canyon lies on the delta of Unkar Creek.

Below Unkar delta the canyon walls once again close in to begin the straight and narrow Granite Gorge. Through the remainder of its course in the Park area the Canyon is no longer wide or conducive to extensive occupation.

#### *Upper Side Canyons*

In addition to Nankoweap, which was surveyed and reported previously (Schwartz 1963), four side canyons seemed large enough to justify a search for aboriginal occupation. Each of these — Kwagunt, Lava, Basalt, and Unkar — has its own distinct characteristics.

Upper Kwagunt Canyon is separated from the Colorado River by a narrow lower section dotted by large boulders. The creek flows in the lower section during the morning, but by afternoon evaporation removes more water than is provided by the springs that feed it. Above

lower Kwagunt the canyon opens up somewhat, but not nearly so much as at Nankoweap, its neighbor to the north. Instead of the wide, flat terraces of Nankoweap, Kwagunt has numerous ridges that offered less land to the aboriginal farmer. Only above the approximate midpoint of Kwagunt are there enough flat surfaces to encourage settlement.

The flora and fauna of all the side canyons are about the same. Sage or its relatives, cactus, and bunch grass predominate on the terraces and ridges; cottonwood, willow, and mesquite are found near the creeks. In Kwagunt Canyon the fauna observed or inferred from tracks were toads, tadpoles, coyotes, deer, mountain lions, black-headed humming birds, and mourning doves. Observations of the physical environment suggests that Kwagunt Canyon could not have supported so large a population as Nankoweap.

Lava, the next large side canyon downstream from Kwagunt, is also separated from the river by a narrow lower canyon, but .75 mi. from the river it broadens out to the widest side canyon in the survey area. Its low, rolling terrain allows a clear view of the Walhalla Plateau. The water in the creek is good and supports a fairly dense growth of willow and cottonwood, as well as many species of birds. Doves were seen in great



Fig. 5. View southwest along Colorado River from the mouth of Tanner Creek. Notice great width of Canyon as compared with Fig. 3, which is upstream from this area.





FIG. 6. Upper part of Unkar delta with Colorado River in background.

numbers; sparrow, hawk, red-tailed hawk, fly-catcher (crested?), mockingbird, and several kinds of sparrows were also observed.

Below the junction of Lava and Chuar creeks, Lava Canyon does not appear suitable for aboriginal farming, since neither flat, wide areas near the creek nor flat benches above the creek were observed. Above the junction with Chuar, several benches have occupied areas, and additional sites are likely to be found above the area surveyed.

The broad delta of Basalt Creek suggested that the upper drainage may have supported early occupation sites, but the survey indicated that this was not the case. We found only a broad, steeply sloping, roadlike creekbed fed by numerous salt springs.

Unkar Creek has a large, broad, and flat delta but, like Basalt Creek, the steep slopes in its upper canyon negated the possibility of level areas for cultivation or living sites. Although the creek was not flowing at the mouth of the canyon, three seep springs in the upper canyon watered large areas of swamp grass and many cottonwoods were found along the stream bed.

#### FIELD TECHNIQUES

The general plan of the field work was to cover as intensively as possible both the river and side-canyon areas between the mouths of Nankoweap and Unkar creeks. To save the expense of large boats and having to run the river, personnel and equipment were flown by helicopter to the Nankoweap delta. A helicopter was also used for pickup purposes at the end of the survey at Unkar delta. Three small inflatable boats were used for the river work (Fig. 7). The survey was conducted by examining the riverbanks when traveling down the river by boat and by examining on foot the major drainages leading into the river (Fig. 8). The schedule of survey coverage is given below:

June 15—in by helicopter, survey of Nankoweap cliffs (by boat) to Kwagunt Canyon.

June 16—foot survey up Kwagunt Creek, covering about half its area.

June 17—to Awatubi Canyon by boat (riverbanks along the way too steep for occupation).

June 18—to 60-Mile Rapid by boat and survey of delta area; then to Little Colorado by boat.



- June 19—by foot 5 mi. up Little Colorado River to sipapu site; no sites found along the way.
- June 20—survey of area at mouth of Little Colorado River, by boat to Lava Canyon, checking "Airplane Canyon," Hopi salt mine area, and Carbon Canyon delta along the way.
- June 21—up Lava Canyon by foot to just beyond fork of Lava and Chuar creeks.
- June 22—surveyed delta of Lava Creek, checked mouth of Espejo Creek, picked up food cache across from Basalt Cliffs, and up Basalt Canyon by foot.
- June 23—surveyed delta of Unkar Creek, making detailed drawings and site plans.
- June 25—survey up Unkar Canyon by foot.
- June 26—out by helicopter.

The river section of the survey was made by tying the three boats together abreast and using canoe paddles on the two outside boats. A few of the major rapids and all of the smaller ones could be run in this way, but most of the larger rapids had to be lined. This meant that food and equipment were always in danger of dunking. The heat of the canyon bottom and the time and supplies available restricted the distances up the side canyons that could be traveled. Near the river evaporation made the temperature bearable, but away from the river from 10 o'clock in the morning until sunset the temperatures were 115° or more, making hikes to the extreme upper ends of the side canyon impractical. Therefore, all the up-canyon side trips were made to just above the middle of each drainage. Previous experience (Schwartz 1963) indicated that a sampling of sites to this point would provide a reasonably accurate picture of prehistoric occupation. Other sites will certainly be found further up these canyons, but the objective of this project was to obtain a sample of the material in these up-canyon locations, not to conduct a complete survey as was attempted previously in Nankoweap Canyon.



FIG. 7. Inflatable boats used during survey.

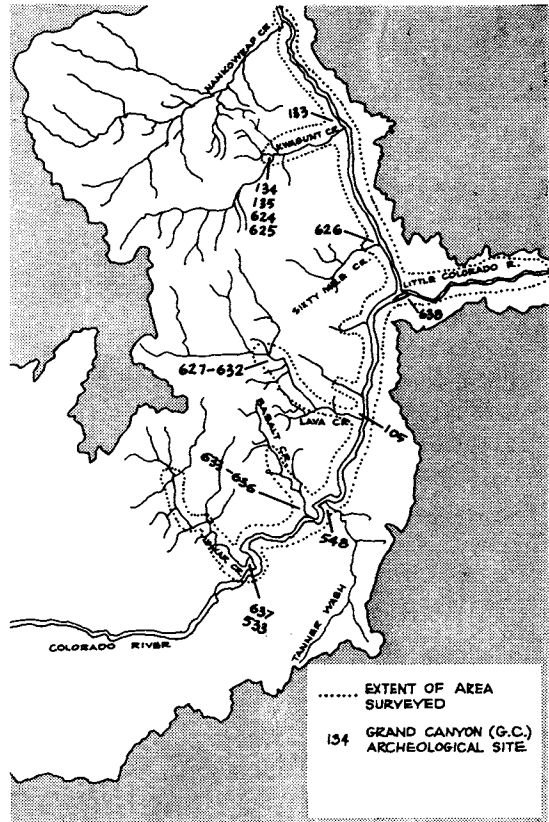


FIG. 8. Map showing extent of survey area and the sites recorded.

#### DESCRIPTION OF SITES

The 18 sites found can be divided into two broad categories, isolates and site clusters. This distinction is made on the basis of relationships to other sites. Only five sites are completely isolated, but four clusters contain a total of 14 sites (Fig. 8). Within these two categories the site descriptions are presented by geographical area proceeding downstream. This form of presentation was chosen because the temporal range is so limited that the sites cannot be presented by chronological groups.

The location and description of each site is given first and is followed by general remarks. The ceramic affiliation of the utility ware from each site is noted. In this discussion a gross distinction has been made between what is called an eastern and a western affinity. Eastern refers to the Tsegi and Kayenta pottery series, and western refers to the Virgin and Johnson series as well as to Shinarump Gray and White wares. The only significance attached to differences in

TABLE 1. FREQUENCY OF POTTERY TYPES REPRESENTED IN SHERD SAMPLES COLLECTED AT GRAND CANYON (GC) SITES

Type	105	133	134	135	533	548	624	625	626	627
San Juan Red ware	-	-	25	5	37	-	-	6	1	5
Deadman's Black-on-red	-	-	-	-	-	1	-	-	3	-
Middletown Black-on-red	-	-	7	6	25	-	-	6	3	-
Medicine Black-on-red	-	-	1	-	-	-	-	-	-	-
Cameron Polychrome	-	-	-	-	1	-	-	-	-	-
Tusayan White ware	1	-	18	-	-	-	-	1	2	1
Black Mesa Black-on-white	-	-	1	1	5	-	-	-	2	-
Dogoszhi Black-on-white	-	-	1	7	1	-	-	-	-	-
Sosi Black-on-white	-	1	10	10	7	3	1	4	3	-
Flagstaff Black-on-white	-	-	-	1	-	-	-	-	1	-
Tusayan Gray ware	3	1	-	4	5	3	-	1	15	4
Tusayan Corrugated	1	1	26	36	52	26	-	24	21	-
Moenkopi Corrugated	9	6	17	39	66	99	-	39	26	-
Shinarump Brown	-	-	-	1	-	-	-	-	-	-
Shinarump Corrugated	-	-	-	-	3	-	-	-	2	-
Johnson Black-on-gray	-	-	-	-	-	-	-	-	-	-
Virgin Black-on-white (Sosi style)	1	-	-	-	1	-	-	-	-	-
Unknown corrugated	-	-	-	1	-	-	-	-	-	-
Unknown plain	-	-	-	-	-	-	-	2	-	-
Shinarump Gray	1	-	-	3	-	-	-	-	-	-
Unknown black-on-white	-	-	-	1	-	10	-	-	-	-

the occurrence of these wares is that they suggest the direction of cultural influence. Before more refined conclusions can be drawn, much additional analysis will have to be undertaken. Finally, a temporal range is applied to each site based on an analysis of decorated pottery and dates assigned to these types by Colton (1953). Complete sherd counts are presented in Tables 1 and 2.

#### Isolated Sites

G.C. 133. This small sherd area is on the upstream side of Kwagunt Creek above the Colorado River level. The scattered sherds (Table 1) were found in a dry grassy area behind a line of mesquite trees. The nine sherds appear to be of eastern affinity. One decorated sherd suggests a date between A.D. 1070 and 1150.

G.C. 626. A second sherd area was found at the upstream junction of 60-Mile Canyon and the Colorado River. The site is on a bench approximately 80 ft. above the riverbank; as the bank rises abruptly just behind the sandy beach, this sherd area was no more than 500 ft. from the river. The site has a thin vegetative cover

of short grass and scattered cactus and commands a perfect view of 60-Mile Rapid below. The roar of the river can be heard continually from the site. This area has to be reached either by way of the river or from along the steep riverbank, as the upper drainage of 60-Mile Canyon is blocked from the river by a cliff. An adequate sample of sherds (Table 1) shows a 98% eastern affinity. The 12 datable sherds suggest a time range between A.D. 1050 and 1150.

G.C. 105. At the junction of Lava Creek and the Colorado River on the upstream side of Lava Creek is a sherd area that is approximately 30 ft. square. It is on the first bench away from the river and is separated from it by the beach and a mesquite grove. Presumably large areas of mesquite had to be cleared in order to farm here. The small sample of sherds (Table 1) found on the surface indicates an 88% affinity with the east, and the suggested date of A.D. 1000 rests on only one Virgin Black-on-white sherd.

G.C. 638. A tentative site was found on the west bank of the Little Colorado near its junction with the Colorado River where Powell re-

TABLE 2. FREQUENCY OF POTTERY TYPES REPRESENTED IN SHERD SAMPLES COLLECTED AT GRAND CANYON (GC) SITES

Type	628	629	630	631	632	Sites 633	634	635	636	637	638
San Juan Red ware . . . . .	4	20	12	1	-	2	1	4	8	16	-
Deadman's Black-on-red . . . . .	-	3	2	-	-	-	-	-	-	-	-
Middletown Black-on-red . . . . .	-	5	1	1	3	-	1	1	2	1	-
Medicine Black-on-red . . . . .	1	2	-	-	-	-	-	-	-	-	-
Cameron Polychrome . . . . .	-	-	1	-	-	2	-	-	-	-	-
Tusayan White ware . . . . .	2	5	-	1	-	3	2	-	2	3	-
Black Mesa Black-on-white . . . . .	2	5	-	-	-	-	-	-	-	-	-
Dogoszhi Black-on-white . . . . .	1	3	-	-	1	-	1	2	-	-	-
Sosi Black-on-white . . . . .	7	18	-	4	1	3	1	4	1	-	-
Flagstaff Black-on-white . . . . .	-	-	-	-	-	1	2	2	-	-	1
Tusayan Gray ware . . . . .	1	10	13	4	-	6	-	6	6	4	-
Tusayan Corrugated . . . . .	5	26	10	-	2	5	6	6	21	61	-
Moenkopi Corrugated . . . . .	2	28	13	31	22	36	8	31	45	85	1
Shinarump Brown . . . . .	-	-	-	-	-	1	-	-	-	-	-
Shinarump Corrugated . . . . .	-	-	6	-	1	19	2	2	8	5	-
Johnson Black-on-gray . . . . .	-	-	-	-	-	1	-	-	3	-	-
Virgin Black-on-white (Sosi style) . . . . .	-	-	1	-	-	2	1	-	-	2	-
Unknown corrugated . . . . .	-	-	-	-	-	-	-	-	2	4	-
Unknown plain . . . . .	1	-	1	-	-	-	-	-	3	1	-
Shinarump Gray . . . . .	-	-	-	-	-	-	3	-	-	-	-
Unknown black-on-white . . . . .	-	-	2	-	-	2	1	-	3	-	-

ported evidences of occupation. In an overhang about 200 ft. above river level, a cabin (now the property of the National Park Service) has been constructed on top of what may have been the site referred to by Powell. Only three sherds (Table 2) were found during the survey, but earlier Robert Euler collected eight sherds from the site. Euler (personal communication) has identified these as San Juan Red ware (1), Hopi utility ware (5), and Tusayan Corrugated (2). The one decorated sherd found by me suggests occupation of the site near the end of the 11th century. The Hopi utility ware sherds reported by Euler suggest a much later period and a wider range of time than anything seen thus far in the eastern section of the Grand Canyon. Five miles up the Little Colorado River I visited what has been referred to as the geological model of the Hopi sipapu (Fig. 9). Downstream from the mouth of the Little Colorado is the famous Hopi salt mine (Eiseman 1959). Hence Hopi sherds are expectable in this area.

G.C. 548. The only isolated site with a definite structure occurs at the far downstream side of the delta near the junction of the Colorado River and Tanner Canyon. So far as is now

known, this is the only well-preserved site south of and immediately adjacent to the river within the Park boundaries.

This site, which is in a dry wash about 300 ft. from the river and about 75 ft. above the river level, consists of two room outlines. One is 10 by 13 ft. and the other is 3 by 5 ft. The construction is entirely different from any seen on the north side of the river. The walls are slabs of Hakatai shale set on end and aligned. However, a section of wall connecting the two rooms is a boulder alignment, similar to the arrangement regularly found in structures on the north side of the river. Little rubble was seen around these rooms. If these structures were originally roofed, perishable material must have been used. The only land available for farming is the sand bar near the river in front of the site. When tested, this soil showed surprising fertility.

Since this site is unique, a thorough search for sherds was made. All of the 158 sherds (Table 1) collected show affiliations to the east. The decorated sherds suggest a time range between A.D. 1050 and 1130.

*Ariz. c:9:1E(ASC)*. One isolated site was not found during the survey but should be re-





FIG. 9. View of the geological model of the Hopi sipapu in the Little Colorado River Canyon, looking upstream. Two men on formation provide scale.

ported because of its pertinence to the culture history of this area. On June 14, 1960, Robert Euler (personal communication) discovered what he thinks was a sherd area eroding from the edge of a floodplain sand dune near the mouth of Nankoweap Creek. He revisited the area in 1962 and found that it had completely eroded away. The sherds collected suggest that it was a Paiute site: 1 Tusayan Gray ware, 9 Southern Paiute utility ware, and 1 Jeddito Black-on-yellow. Archaeologically, Paiute material has not been reported in this area, although widespread use of this region by the Paiute, noted by such early observers as Powell, indicates that this site is not out of place. The real problem is finding more such sites, since the Paiute way of life did not create midden deposits like those of the sedentary groups.

*Discussion of Isolated Sites.* The three isolated sites on the north side of the river share a number of traits. All are sherd areas with no

evidence of heavy or extended occupation. All are on the upstream side of a major tributary where the greatest amount of land is available and are on an elevated bench or knoll some distance from the river. The sherds are largely eastern in origin, with a slight but noticeable increase in western types farther downstream. The sherd samples from these sites are too small for determination of accurate dates, but the available data suggest that all of these sites were occupied between A.D. 1070 and 1150.

In the area south of the river it is evident that use was made of the area at the mouth of the Little Colorado River. The extent of this use and the exact affinities of its users must await further work.

The site near the mouth of Tanner Creek presents some interesting problems, especially since it is located in what might be considered a poor agricultural area with little fresh water and only a sand bar for planting. Nevertheless, it was the

only isolated site found that had surface evidence of structures. It also had the heaviest sherd concentration found at any isolated site. Both factors suggest a much greater use for this site than any of the others. Also worthy of note is the date assigned to the site, A.D. 1050 to 1130, nearly the same as that for the isolated sites on the north side of the river. If future work in this area suggests that the opposite sides of the river had mutually exclusive culture histories, this coincidence of dates suggests that two groups reacted separately to the same stimuli and, to some extent at least, created the same results.

#### *Site Clusters*

Four clusters of sites were found in the survey area. All are north of the river, two in delta areas near the river and two in side canyons away from the river. Such sites, perhaps better than the isolated sites described above, suggest concentrations of occupation. These clusters are described below.

#### *Upper Kwagunt Cluster*

Just above the narrow Kwagunt Canyon, which separates the upper drainages of Kwagunt Creek from the Colorado River, a group of four sites was found on the slopes and peak of a small hill overlooking the creek. Here four smaller arms of the creek converge to pour water into the narrow canyon that leads to the river. A ready source of water is quite evident. It is perhaps significant that all of these sites are at least 50 ft. above the stream level. All four sites show house outlines, but one (G.C. 625) is much more elaborate than the others.

These sites are at the first suitable occupational area away from the river on Kwagunt Creek. Additional flat areas suitable for habitation undoubtedly occur further upstream in this side canyon, but shortage of time and difficult travel prevented investigation.

G.C. 134. An L-shaped structure of rock (10 by 14 ft.) was found near the point of a ridge about 50 ft. above the creek bottom. The wall is made of a single line of rock. The absence of rubble suggests a perishable superstructure, assuming that this was a structure and not a terrace outline. The excellent sherd sample (Table 1) indicates 100% eastern affiliation, and the decorated sherds suggest a good date between A.D. 1070 and 1130, with a plus-or-minus factor of about 20 years.

G.C. 135. Thirty feet west of G.C. 134, two lines of rock may be seen on the edge of the same ridge, which at this point drops 70 to 80 ft. to the creekbed below. One line, about 3 ft. from the edge, parallels the edge for about 30 ft.; there is at least one enclosing line of rocks to the south, and one rock at the northern end suggests an attempt at closure. No wall occurs along the creek side; if there was one, it may have eroded away. There is no certain indication that a fourth wall ever existed on the creek side.

About 25 ft. downstream, slightly back from the edge of the ridge and at a slight angle to it, is the second rock line, which is about 14 ft. in length. Side walls or outlines of a house are not indicated by any other alignments.

G.C. 134 and 135 may have been part of the same site, but they have been separated for the sake of analysis. The dates of the sites (see Table 1 for sherd samples) are consistent, A.D. 1070 to 1130, although G.C. 135 may date slightly later.

G.C. 624. This is a rubble-filled rock-house outline that measures 11 by 16 ft. It is at a slightly higher elevation than G.C. 134 and 135, and the completeness of its construction gives one an impression of more permanence. This was not borne out by the surface collection, which consists of a single sherd of Sosi Black-on-white. A date between A.D. 1070 and 1150 may be assigned, but this can hardly be called reliable.

G.C. 625. The fourth site in this area is on the first high knoll upstream from the other sites and at a distance of no more than 400 ft. It is a complex of units that covers an area about 60 ft. square. The six units command the knoll and an excellent view of this section of the valley. The site includes an 8-by-10-ft. rock-house outline, a large area of rock rubble, a 40-ft. rock wall along one edge of the knoll, a small rock-house outline (4 by 6 ft.), and two or three outlines less definite in nature.

The moderate amount of surface pottery (Table 1) showed 100% eastern affiliation. On the basis of only four datable sherds, a time range of A.D. 1070 to 1150 can be weakly postulated.

*Discussion of Upper Kwagunt Cluster.* The greater number of sherds at most of the sites in this cluster, as compared with isolated sites, suggests a more-or-less permanent occupation in

the upper Kwagunt area. Judging from the range of dates derived from sherds (A.D. 1070 to 1150), this was not a long occupation. Whether or not the area was occupied permanently or intermittently and, if intermittently, during which season or time periods, cannot yet be determined.

#### *Upper Lava Cluster*

Approximately 4 mi. upstream from the Colorado River at the junction of Lava and Chuar creeks six sites were found, five on one terrace slope and one just upstream and across Chuar Creek. The appearance of the terrain further up Lava Creek suggests that it would have supported other sites of this type, but the time restrictions of the survey prevented additional investigation. As in upper Kwagunt, these sites include house outlines, rock alignments that appear to be terrace lines, and areas of sherd concentration.

G.C. 627. This site is set apart from the others, although by a distance of only .12 mi. The two locations are within sight of one another. The site has a boulder outline of two joined rooms built on the edge of the ridge overlooking Lava Creek. One room measures 16 ft. square and the other is 16 by 5 ft. The walls closest to the creek are of rubble-filled construction. The small sample of sherds (Table 1) indicates 100% eastern affiliation. As no decorated sherds were found, dates could not be obtained.

G.C. 628–G.C. 632. Before these five sites are described separately, their relationships must be made clear. They are on three different levels of a stepped hill in the northeastern corner of a rectangular area at the junction of Lava and Chuar creeks. At 20 ft. above the creek level are G.C. 628 and 629, a house outline and a terrace alignment. On a terrace 40 ft. above the creek is G.C. 630, which appears to be a house with adjacent terraces. At the top of the hill, 75 ft. above the creek, are G.C. 631 and 632, each of which has a room outline.

G.C. 628. This is a single room outline (5 by 6 ft.) that is open on one side. Its three walls are marked by intermittent boulders. The 30 sherds (Table 2) found were all of eastern affiliation and the 11 datable sherds suggest a time range between A.D. 1070 and 1150.

G.C. 629. At the south end of the natural bench near G.C. 628 and extending about 75

ft. up the slope toward the next level is a series of five rock alignments that run across an area approximately 40 ft. wide. These appear to be agricultural terraces, not only because of the lack of any definite room outlines but also because of their position on the slope of a rather steep hill. The large number of sherds (Table 2) found could have been washed down from site G.C. 630 on the level above. If this was an agricultural terrace, little pottery would be expected unless pots were used to transport water for the crops. As at the previous site, all pottery is of eastern affiliation. Most of the datable sherds indicate a time range of A.D. 1070 to 1150.

G.C. 630. This two-part site includes a rectangular room outline (3 by 7 ft.) and a series of four approximately parallel rows of rock alignments from 7 to 14 ft. long on the gentle slope below. However, these rock lines were not as well-demarcated as those at G.C. 629; unless there was more rock in the lines at one time, they would not have been very efficient agricultural terraces. Only 10% of the moderate sample of pottery (Table 2) indicated western affiliation, in sharp contrast to the other sites in this cluster. The painted sherds that might have been used for dating the site could not be identified positively. One sherd of Cameron Polychrome and one Virgin Black-on-white sherd permit a tentative temporal assignment between A.D. 1000 and 1100.

G.C. 631. This multiroomed house on the upper level of the hill measures 15 by 18 ft. but has only one clearly discernible wall; the others are spottily outlined by rock. The outline is roughly L-shaped, and a section of rubble suggests that one of the walls was once higher. A possible terrace line was found at the side of the house, but this too is barely visible. The pottery (Table 2) is all of eastern affiliation and a tentative date of A.D. 1070 to 1130 may be assigned.

G.C. 632. As it is on the point of the highest bench of the slope, this incompletely outlined one-room structure commands a view of lower Lava Creek valley. The outline is small (5 by 8 ft.); there is no rubble and little pottery (Table 2). Only one sherd (3%) is not of eastern affiliation, and two datable sherds suggest a time range between A.D. 1070 and 1150. This site and G.C. 631 are only 30 ft. apart and may be considered parts of the same site.



*Discussion of Lava Creek Cluster.* The descriptions above may give a false impression that this cluster of sites is separated from other sites further up the valley. The area covered by the survey was limited. While no sites were found below this area, the terrain upstream is of the type that would support occupation. The sites reported merely represent a sample of what occurs in the valleys. However, judging from the Nankoweap data, it may be assumed that these samples are representative of the rest of the valley. The only major difference that might later come to light through intensive survey in the extreme upper reaches of the valleys would be the discovery of different types of sites, such as rock shelters or cliff structures.

The traits which characterize the Lava Creek cluster are: presence of structures at all sites, poor grade of construction, absence of sherd areas, predominance of an eastern affiliation in pottery, relatively small numbers of sherds and, with only one exception, the clustering of dates between A.D. 1070 and 1150. In summary, it would appear that the occupation of Lava Creek in this area took place over a short period of time. Judging from the amount of construction and the number of sherds found on the surface, the period of occupation may have been much shorter than is indicated by the datable types. The poorly made terraces suggest an attempt at agriculture, but this could not have been very successful.

#### *Basalt Creek Delta Cluster*

Three structures were found on the side of a hill near the delta of Basalt Creek at its junction with the Colorado River. The sites are separated from the sandy beach of the river by a 40-ft. dune partially covered with mesquite. On the slope below the sites and between the two hills is a sherd area that has been designated as a site, but this may be the result of wash from the sites above.

G.C. 633. From this sherd area, which is in the saddle between two hills as described above, 89 sherds (Table 2) were collected. No signs of structures were seen. Sherds suggestive of western affiliation constitute 31% of the total. Although datable sherds are too few for a reliable time estimate, the suggested time range is A.D. 1070 to 1150, with the possibility of a slightly later ending date.

G.C. 634. A one-room structure (6 ft. square) was found on the slope of the hill above the sherd area. One corner is partitioned by a rock outline that covers one-quarter of the room. As in almost all house outlines, the delimiting rocks are only one row high. The modest sherd collection (Table 2) again shows a significant percentage of sherds (21%) with western affiliation, and the few datable sherds suggest a date between A.D. 1120 and 1150.

G.C. 635. This partial room outline (125 ft. north of G.C. 634) is marked by a wall 7 ft. in length with rubble on the outside. Traces of walls project at each end, one running for a distance of 6.5 feet, the other no more than 2 ft. Of the 59 sherds collected, only 5% have a western affiliation. The small number of datable sherds (Table 2) suggests a time range between A.D. 1070 and 1150, with emphasis on the older end of the range.

G.C. 636. This single-room outline is about 150 ft. north of G.C. 635 and measures 6 by 6.5 feet. This site yielded the largest number of surface sherds (108) in the cluster (Table 2). Of these sherds 14% were of western origin. Three datable sherds indicate a general time range of A.D. 1070 to 1130.

*Discussion of Basalt Creek Delta Cluster.* The material from these four sites gives the impression of a short-term, nonintensive occupation. Although the dating of each site is handicapped by the small number of sherds found, the consistency of the dates lends substantiation. The indicated time range is A.D. 1070 to 1150. However, the scarcity of surface material suggests that the occupation was not even that long and perhaps covered only part of one generation. The pattern of room arrangement in clusters separated by 150 ft. or so suggests a settlement pattern stressing individual families or representatives of families. This differs markedly from the usual pattern of Pueblo-like settlements with a large number of contiguous rooms. The high average of western affiliated pottery (18%) from these sites may be an important clue to the understanding of this settlement pattern, especially when these scattered units are compared with the large multiroomed, Pueblo-like structure just down the river on the Unkar delta.

### *Unkar Delta Cluster*

This area is somewhat unique in that, although here called a cluster, it contains only two sites. Furthermore, one of the sites is the largest thus far seen anywhere in the Grand Canyon, and nearby are a number of isolated rock alignments. These features give the impression of a whole site complex in the delta.

G.C. 533. This large site is on the ridge that outlines the north edge of the Unkar Creek delta and has previously been reported by Taylor (1958: 21) as N.A. 5599. It has at least 18 rooms that are laid out in a straight line with a one-room projection in front at each end, similar to Anasazi houses of the Developmental period. The rooms are arranged in two rows with a series of three parallel lines of rock in front that do not appear to be room outlines. These seem to be demarcation lines. The whole structure is approximately 84 ft. long and 42 ft. wide, including the lines of rock in the front. If the main structure alone is considered, the width is about 24 ft. The only room measured has dimensions of approximately 6 by 12 ft. Ten feet in front of the approximate midpoint of the structure is a circular depression 29 ft. in diameter and about 1 ft. in depth at the center. It has the surface appearance of a filled or collapsed kiva.

Below and on each side of the site are terraced rock alignments, which Taylor (1958: 21) refers to as an "extensive and quite intricate system of agricultural terraces and wing dams, the latter constructed to conduct, from garden plot to garden plot, the runoff from the higher elevations of the ridge."

Only 2% of the sherds (Table 1) from this large site are of western affiliation, a significant difference from the 18% found in the small Basalt Creek sites just 3 mi. upstream. The datable sherds suggest a time range of A.D. 1050 to 1150. While these dates agree with dates of other sites found during this and other surveys in Grand Canyon, they contrast sharply with the dates of sherds collected by Taylor (1958: 25) at this same site. His collection indicates a time range of A.D. 900 to 1225.

Several points should be made about this temporal problem. Our collection contains about 50 sherds more than that of Taylor, but his sample has a higher number of datable decorated sherds. The large number of utility sherds still present at the site does not suggest that Taylor

took all the sherds. It would seem more reasonable that in the intervening nine years boat parties have simply carried away all of the "pretty pieces of Indian pottery." On the other hand, this difference between the two sherd samples should not just be explained away. A difference in temporal placement between this site and all the others found thus far in the Canyon might well exist. Certainly its size and architecture are different. It is possible that the temporal difference may be the result of differences in pottery identification. Taylor may have been using different criteria for classifying his types. As significant differences did not occur at any other site, pottery identification does not seem to be involved. Additional work at this site is needed.

G.C. 637. This site, which is much smaller than G.C. 533, is on the upper end of the ridge above Unkar delta and overlooks the bed of Unkar Creek. One of its two parts is composed of three rooms that form an L with outside measurements of 15 and 30 ft. The second part, separated from it by 10 ft., is a single room (15 by 20 ft.). Rubble near the walls in both sections suggests higher stone construction than is now present. Excellent stonework may be seen on the bank below, which has been carefully built up with rock to prevent erosion or slippage.

Although a large sample of sherds (183) was found at this site (Table 2), only one sherd is decorated. Again the collection of sherds by boat parties most easily explains this situation. The single decorated sherd, Middletown Black-on-red, suggests a time range of A.D. 1050 to 1130. The percentage of western sherds is low (4%) which is relatively consistent with the 2% from G.C. 533.

*Discussion of the Unkar Delta Cluster.* These two sites present an almost unique picture when compared with sites thus far described from the upper Grand Canyon. The size of G.C. 533, its time range (if the sherds from Taylor's collection are taken as representative), and the complexity of its irrigation and habitation structures all suggest a major occupation. Obviously the site is different from all others in the Canyon. This seems to be the case even though it falls within the same general time range and contains roughly the same percentage of eastern and western affiliated sherds. Its differences must result from other causes. Harvey Butchert

(1962, personal communication) has reported "a very well defined trail connecting the ruins at the fork of the north and south arms (of Lava Creek) with the ruins at the mouth of Unkar . . ." It is possible that this site was a center, that its large habitation site and kiva were not just related to the presence of plentiful farmland, but that the site served a wider area of canyon-bottom country as a ceremonial or trade center. One wonders if the concentration of people alone would intensify this.

Below Unkar delta the granite gorge closes in, and no large deltas are to be found. Such a large area of canyon-bottom agricultural land may have attracted a large population. This center may then have prompted ties to the Unkar, such as ceremonial and trade, which the smaller site clusters could not have supported.

It is of special interest to note that there is no evidence of building stages or any earlier occupation. G.C. 533 suggests a well-conceived plan that was executed in a short time. If this hypothesis is correct, a shorter time span for the site might be expected; furthermore, it implies a rather well-planned movement into the delta area from some other region, probably the plateau to the north, since this is the only large population pool that might have been drawn upon.

#### TEMPORAL POSITION OF SITES

There is one dominant theme regarding the temporal position of the sites located. With only one or two possible exceptions, all sites were occupied during the relatively short period between A.D. 1050 and 1150. Furthermore, there is evidence which suggests that for many of the sites this postulated 100-year range is a maximum. Judging from the paucity of sherds at many sites and the meager evidence of permanency revealed by site outlines, it seems likely that many sites were occupied only one to two generations.

Before discussing exceptions to the general trend of site dating noted above, something should be said about the limitations of the dating technique used. All dates are derived from decorated pottery types whose chronological position has been assigned mainly by Colton (1953) on the basis of dendrochronology at sites some 100 mi. to the south and east. Time lag or differential diffusion of designs from the dated area to the Canyon interior could therefore easily throw the dating off. The technique used

here for determining time range — the period of greatest overlap of all datable decorated types found at a site — might also compound the error. However, it seems acceptable to assume that, whether or not the absolute dates are off, the order of magnitude of the temporal position is reasonable. One site at the mouth of the Little Colorado River and the large site complex at the mouth of Unkar Creek constitute two possible exceptions to the otherwise consistent short occupation of the area around the beginning of the 12th century.

Different problems of dating are encountered at each of these locations. The pottery found near the mouth of the Little Colorado River was undoubtedly used around the beginning of the 12th century. Historical accounts also demonstrate that the sipapu site and the salt-mine sites were used by the Hopi as late as the early 20th century. The limited amount of arable land in the immediate vicinity as well as the small amount of pottery found at the mouth of the river suggest that this early use was not in the form of actual occupation. It may have been an overnight stop on the Hopi salt route. The area at the mouth of the Little Colorado River could have at least two possible histories of use: (1) early occupation around the 12th century, followed by a hiatus, then sometime before the beginning of the historic period the initiation of usage by the Hopi as an overnight stop on the salt route, or (2) continuous use by the Hopi and their ancestors as a stopover on the way to the salt mine from the 12th century to the present. Although the second alternative seems more reasonable, it must be realized that there is only a slight possibility of validation because this type of stopover activity would not lead to the accumulation of material remains.

The Unkar delta site presents a slightly more complex picture. As has been noted in the general discussion of this site, the dating from sherds collected during the survey and those reported by Taylor do not lead to the same conclusions about temporal position. The Taylor collection suggests a range from A.D. 900 to 1225 and makes this site area both the earliest and longest occupation found, a reasonable assumption in light of the site size, the number of sherds seen on the surface, and its uniqueness. If this area did have a longer occupation, the following questions are raised: if a successful adaptation was made in this area, why was it not also



made in other areas along the river; what was the relationship between the people of this early settlement and the later groups who moved into the Canyon; did the same factors which allowed them to move into the Unkar delta earlier also account for their ability to stay longer than groups in the other areas; is there a relationship between the large size of the site and its temporal success? These are questions which can only be answered by excavation at this site.

#### CULTURAL AFFILIATION

Over 90% of all the sherds collected during the survey can be affiliated with types made to the north and east of the Canyon. It is not surprising that there are slightly higher percentages of sherds of western affiliation in the downstream sites. The highest percentage of these sherds is found in the mouths of Lava and Basalt creeks. On the other hand, the site complex furthest downstream, Unkar, again has a very low percentage of western affiliation sherds. At the western end of the Grand Canyon National Park (Shinumo Canyon) a significantly higher number of sherds of western affiliation has previously been reported (Schwartz 1960). The following rather obvious relationship seems to be validated: generally, the farther west in Grand Canyon a site is located, the more likely it is to have sherds relating to the western pottery traditions. In the transition areas, such as Basalt Creek, the question then is the nature of the mixture. Is there a crossing of pottery traditions as a result of diffusion? This may be a less-defensible hypothesis. If the first alternative is accepted, what other traits in addition to pottery were influenced? Hall's (1942) observation concerning the Walhalla Glades on the plateau above the survey area should be noted. He found that the number of Utah-influenced pottery types increased through time, being nonexistent at the beginning of the period of occupation, but by A.D. 1000 constituting 20% of the total number of Kayenta Branch types. Although the categories are not comparable with those used in the present study, it is worthy of note that both time and space are factors to be considered in a final analysis of influences on the cultural development of this area.

#### CULTURAL FOCUS

From the number of sites found, the short period of occupancy indicated, the several suggestions of terracing, plus the general orientation

of early Pueblo culture as it is known in other areas, it is possible to draw certain conclusions about the culture represented at sites described in this report. First, these people seem to have been struggling agriculturalists. The paucity of animal life in the canyons would not have permitted extensive hunting, but native plant foods probably played an important role in adjustment to the new environment.

These farmers must have fought hard to make a living in this arid canyon land. Cutler's (1963) observations on the poor quality of corn from the upper end of the survey area certainly bear this out. Preliminary results of a series of soil tests are also pertinent here. Twenty samples of soil were taken from site areas (inside as well as outside) and from nonsite areas. A striking observation by the soil analyst may be quoted: "The soils appear to be calcareous sands and it would appear that a rather high level of fertility is indicated — the limiting production factor would have been water . . ." (Harrison, personal communication, 1962). Technically these soils are not acid; they have a pH factor that ranges from 7.95 to 8.89. Effervescence indicates a very high degree of  $\text{CaCO}_3$ . While phosphorus ranged as low as 12 in the tests, the average was 166, and the upper testable limits with the techniques used were 300 plus. Available potassium averaged 195, ranging from 100 to 480. The one important factor which has not yet been worked out and which may have important bearing on the potential productivity of the land is the amount of salts. If there is a high percentage of exchangeable sodium, the otherwise fertile land would be useless.

The fact that the Canyon occupants came from an agrarian tradition, plus the apparent high fertility of the soil, argues strongly for agricultural use of the land, the one important limiting factor being water. The terraces or rock alignments for slowing the flow of surface runoff is an indication that there was an attempt to overcome this limitation. Furthermore, in the Pueblo tradition water was transported in jugs to the plants (Forde 1931: 366). At all known sites water of some kind is readily available. In the delta areas the river is an unending source. In the upper canyon areas, on the other hand, the streams with less constant flow and with a noticeable salt content are certainly not as reliable and might even be detrimental. Streams like Nankoweap, which is not salty, could easily

have provided good water for the fields. It is of interest to note that Forde's illustrations of irrigated gardens at Sikyatki (Forde 1931, Plate XLIV, Figs. 1-3) are quite similar to sites called house outlines in this report. The excavation of one room of a house at Nankoweap in 1960, which revealed a burned clay floor, leaves no doubt that some of these outlines are rooms, but others may be garden outlines. If so, it may be assumed that (1) the population was smaller than might be assumed from the number of sites, and (2) that the rock-outlined plots were watered by jars of water carried from the river or creek below. These hypotheses might be testable in the field. On the other hand, the excavated appearance of little-used rooms and irrigated-garden outlines may be quite similar.

#### CULTURAL RECONSTRUCTION AND SUMMARY

In the period that may have begun as early as A.D. 900 but definitely between A.D. 1050 to 1150, the first permanent occupants moved into the upper section of Grand Canyon between Nankoweap and Unkar creeks. They occupied most of the habitable deltas on the north side of the river and, with few exceptions, did not occupy the south side of the river. These people were farmers who supplemented their diet with gathered food. Water was their most important problem; terraces and carried water were the main techniques used to overcome this limiting factor to Grand Canyon occupation. Their habitation sites varied in size from one-room outlines to large multiroom structures with adjacent kivas. All of these were apparently covered by jacal superstructures, as evidenced by the small amount of rock rubble found near the sites. Surface pottery and architectural styles indicate strong cultural affiliation with the occupants of the north rim of the Grand Canyon. Some influence from the area further west is seen, but this is not of major importance this far east in Grand Canyon. The limited period of occupation at most sites and the structures and rock terraces built in this region show no significant deviation from the pattern observed elsewhere in the Grand Canyon north of the Colorado River. It would now appear that the main occupation of most of the Canyon was relatively short and its depopulation coincided significantly with the first period of abandonment in the northern Southwest.

#### RECOMMENDATIONS FOR FUTURE WORK

Except for work in the Havasupai area (Schwartz 1956, 1957, 1959), the several surveys made in Grand Canyon point to a rather straightforward sequence of prehistoric use of the Canyon. There appears to have been early ritual use of some caves by hunters around 1500 B.C. (Schwartz and others 1958), but not until after A.D. 1000 did regular use of the Canyon begin again, this time by people trying to farm. Whether or not they were successful cannot yet be determined, but at least they left by A.D. 1200. This sequence has been revealed on both sides of the river and at both eastern (Schwartz 1963) and western (Schwartz 1960) ends of the Canyon. The work reported here further confirms at least the later part of the sequence.

Additional survey seems to be called for only in the middle section of the Canyon as a last check on the universality of the hypothesis. A general survey should be completed in an area like Haunted Canyon, off Bright Angel Canyon, where archaeological material has been reported. The area around Indian Gardens should also be examined to recover what is left in an area that has been intensively used by tourists for so many years. If work in these two areas reveals the same sequence as elsewhere, this phase of archaeological work in the Canyon will have reached a point of diminishing returns, even though there are still many areas that have not been intensively surveyed.

After what presumably would be the last survey work, excavation should begin. This excavation might have as its main objective the recovery of as much of the culture of the Canyon occupants as possible. Validation of hypotheses concerning temporal placement and cultural affiliation will be important in this excavation. Every effort should be made to obtain radiocarbon samples from excavated sites to check the pottery dating that has been depended on so heavily in the survey work. However, the important questions to ask are: How similar was the culture of the Canyon immigrants to that of their relatives on the rim, that is, how much adjustment had to be made to the new environment? Was enough adjustment made and if more had been made, could they have stayed longer? What was the nature of their community structure? How many families were living in one valley at the same time? As revealed in kivas, how similar was the ritual to that of

the modern Pueblo Indians to the east? What evidence is there for seasonal or permanent occupation?

The initial sequence of excavation might be as follows:

- (1) Unkar — the large site, G. C. 533, illustrating the climax of canyon living in the northeast end of the Canyon.
- (2) Shinumo — two or more of the small sites there illustrating typical occupation of the northwest part of the Canyon.
- (3) Tanner Creek — G.C. 548, unique site on south side of river, to add to our understanding of the relationships across the river.
- (4) Nankoweap — an average-size site in the north-eastern section of the Canyon.

With this work completed, it would once again be possible to re-evaluate and synthesize the total picture of Grand Canyon archaeology.

*Acknowledgments.* As is the case with any venture, the success of this project was due to many people. The trip was made possible through generous grants from the University of Kentucky Faculty Research Committee and the National Park Service. Berle Clay and Robert Wiggs endured with me the rigors of Grand Canyon archaeology. In addition, many other individuals contributed directly or indirectly to the project, particularly Merrill Beal, Al Hudgin, Erik Reed, Frank Essene, Bill Hall, John McLaughlin, Pat Reilly, and Otis Marston. I owe a deep debt of gratitude to all these organizations and individuals.

#### ANONYMOUS

- 1928 *Nature Notes of Grand Canyon*, Vol. 3, No. 6. National Park Service, Grand Canyon National Park.

#### COLTON, HAROLD S.

- 1953 *Potsherds: An Introduction to the Study of Prehistoric Southwestern Ceramics and Their Use in Historic Reconstruction*. *Bulletin of the Museum of Northern Arizona*, No. 25. Flagstaff.

#### CUTLER, HUGH

- 1963 Plant Remains from a Grand Canyon Rock Shelter Granary, Appendix B, in D. W. Schwartz, *An Archaeological Survey of Nankoweap Canyon, Grand Canyon National Park*. *American Antiquity*, Vol. 28, No. 3, p. 301. Salt Lake City.

#### DARRAH, WILLIAM CULP (EDITOR)

- 1947 George Y. Bradley's Journal, May 24–Aug. 30, 1869. *Utah Historical Quarterly*, Vol. 15, pp. 17–72. Salt Lake City.

#### DEROSS, ROSE MARIE

- 1958 *Adventures of Georgie White, TV's "Woman of the Rivers."* Desert Magazine Press, Palm Desert, California.

#### EISEMAN, FRED B., JR.

- 1959 The Hopi Salt Trail. *Plateau*, Vol. 32, No. 2, pp. 25–32. Flagstaff.

#### FORDE, C. DARYLL

- 1931 Hopi Agriculture and Land Ownership. *Journal of the Royal Anthropological Institute of Great Britain and Ireland*, Vol. 41, pp. 357–406. London.

#### HALL, EDWARD T., JR.

- 1942 Archaeological Survey of the Walhalla Glades. *Bulletin of the Museum of Northern Arizona*, No. 20. Flagstaff.

#### KELLY, CHARLES (EDITOR)

- 1948–49 Journal of W. C. Powell, April 21, 1871–December 7, 1872. *Utah Historical Quarterly*, Vols. 16–17, pp. 257–478. Salt Lake City.

#### MARSTON, OTIS

- n.d. Some Colorado River Journals and Diaries. Mimeographed copy in Grand Canyon National Park Library.

#### POWELL, JOHN WESLEY

- 1915 *First through the Grand Canyon*. Edited by Horace Kephart. Outing Adventure Library, Nelson Doubleday, Oyster Bay.

#### SCHWARTZ, DOUGLAS W.

- 1956 The Havasupai, 600 A.D.–1955 A.D.: A Short Culture History. *Plateau*, Vol. 28, No. 4, pp. 77–85. Flagstaff.

- 1957 Climate Change and Culture History in the Grand Canyon Region. *American Antiquity*, Vol. 22, No. 4, pp. 372–77. Salt Lake City.

- 1959 Culture Area and Time Depth: The Four Worlds of the Havasupai. *American Anthropologist*, Vol. 61, No. 6, pp. 1060–70. Menasha.

- 1960 Archaeological Investigations in the Shinumo Area of Grand Canyon, Arizona. *Plateau*, Vol. 32, No. 3, p. 61. Flagstaff.

- 1963 An Archaeological Survey of Nankoweap Canyon, Grand Canyon National Park. *American Antiquity*, Vol. 28, No. 3, pp. 289–302. Salt Lake City.

#### SCHWARTZ, DOUGLAS W., ARTHUR L. LANGE, AND RAYMOND DE SAUSSURE

- 1958 Split-twig Figurines in the Grand Canyon. *American Antiquity*, Vol. 23, No. 3, pp. 264–74. Salt Lake City.

#### TAYLOR, W. W.

- 1958 A Brief Survey through the Grand Canyon of the Colorado River. *Bulletin of the Museum of Northern Arizona*, No. 30. Flagstaff.

UNIVERSITY OF KENTUCKY  
Lexington, Kentucky  
January, 1964