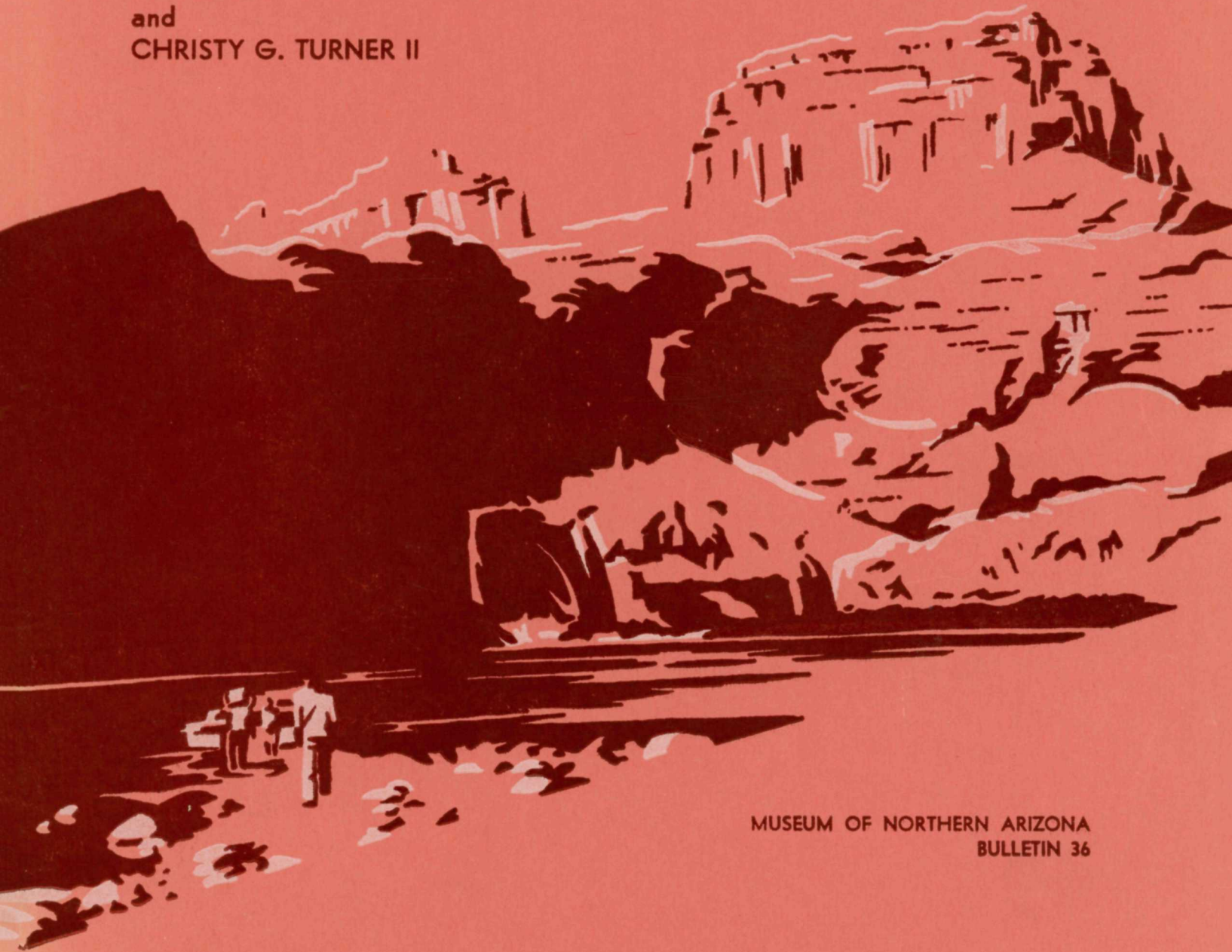


# SURVEY AND EXCAVATIONS IN LOWER GLEN CANYON, 1952-1958

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and  
CHRISTY G. TURNER II



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**Survey and Excavations in Lower Glen Canyon  
1952-1958**

By

**William Y. Adams, Alexander J. Lindsay Jr. and Christy G. Turner II**



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Upper Colorado River Basin

SURVEY AND EXCAVATIONS IN LOWER GLEN CANYON, 1952-1958

by

William Y. Adams, Alexander J. Lindsay, Jr., Christy G. Turner II

as a part of the

Upper Colorado River Basin Salvage Program

in accordance with the

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U. S. National Park Service and the Museum of Northern Arizona

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EDITOR: Alan P. Olson

## FOREWORD

This report is the third Museum of Northern Arizona bulletin resulting from a program of salvage archaeology in the upper Colorado River Basin, in the region of the Glen Canyon. The salvage operation has been done by the staff and associates of the Museum of Northern Arizona under contract agreements with the National Park Service. The various aspects of the Museum's work have resulted in geological, botanical, and anthropological contributions to the study of Glen Canyon.

This report deals with the surveys and excavations made from 1952 to 1958 along the Colorado River and three of its southern tributaries and its publication completes the archaeological survey of those sections of the Colorado and San Juan Rivers assigned to the Museum by the National Park Service. Excavation reports are now in process covering additional work in the Glen Canyon and all of the excavated sites in the San Juan River area.

As this is being written the waters behind Glen Canyon Dam are rising slowly. Behind the dirt coffer dam a small lake has already covered many sites in the lower section of Lake Powell, and many more will soon be covered. As the water rises, not only will the sites occupied by historic man disappear, but also the petroglyphs left by the prehistoric and historic peoples will disappear forever; The small side canyons with their lush vegetation will gradually fill and much of the unusual botany of this area will be gone.

Without these government-sponsored salvage

projects invaluable information on this particular and little known area of the Southwest would have been lost forever. Today, thanks to the studies of the University of Utah and the Museum of Northern Arizona, we have a firm knowledge of the geology, biology, prehistoric art, and the use of this arid and fantastically beautiful land by prehistoric and historic man.

In the next few years, hundreds of thousands of visitors from throughout the world will travel by various means up the newly formed lake. They will marvel at the beauties of the landscape with the ever-changing rock colors, the unusual wind and water sculptured stone, and the serene tributary canyons. Perhaps they will see an occasional prehistoric site in these side canyons. All these things will stir their interest and inquisitiveness. They will want to know more about this weirdly beautiful land and there will be many questions asked about the country as it was prior to the building of the Dam.

Thanks to the wisdom and generosity of Congress and the policy of the National Park Service, future generations will be able to answer their questions as a result of these studies. It is good that we in America have the wisdom to have a salvage program, for without it, future Americans would have been robbed of part of their national heritage, for Glen Canyon will never again be as it was before man came to change and control the Colorado River.

Edward B. Danson

## CREDITS AND ACKNOWLEDGEMENTS

The entire staff of the Museum of Northern Arizona has contributed to this report in all phases of its preparation. Drs. Harold S. Colton and Edward B. Danson, respectively, dealt with administrative procedures as Project Director; Miss Katharine Bartlett, Librarian, supplied oft-sought and difficult to locate information; Mr. Milton A. Wetherill identified the faunal material; Dr. Walter B. McDougall identified prehistoric floral remains as well as plants now living in the canyons.

The survey section was developed from a considerable portion of the raw data collected by Miss Gene Foster and her associates, especially Miss Bartlett and Mr. David A. Brugge.

Immeasurable assistance in the field was given by Mr. J. Frank Wright, Mrs. Christy G. Turner II, and Mrs. William Y. Adams. Laboratory procedures

were ably handled by the latter two between field seasons. Mr. Maurice E. Cooley aided in geological considerations of the environmental section.

Several questions concerning Glen Canyon prehistory were resolved at the November 1958, Glen Canyon Project meeting at Santa Fe, New Mexico. Here a round table presentation and discussion brought to bear on problems of Glen Canyon archaeology the efforts of Dr. Jesse D. Jennings, University of Utah Anthropology Department, and his staff: Mr. James H. Gunnerson, Dr. Robert H. Lister, Mr. William D. Lipe, Mr. Thomas W. Matthews, Mr. James L. Nichols, and Miss Dee Ann Suhm. Dr. Alfred E. Dittert, Jr., added information on the upper San Juan River. Representatives of the National Park Service, Mr. Charles R. Steen and Dr. Eric K. Reed, and Museum of Northern Arizona personnel, Mr. Da-

vid Breternitz, Mr. Maurice E. Cooley, and the authors met to discuss some of the multifaceted salvage problems.

Dr. Hugh C. Cutler and Dr. John W. Bower of the Missouri Botanical Garden examined the plant remains collected from the survey and excavations; their report is appended.

Personnel of the National Park Service, Merritt Chapman and Scott, and the Bureau of Reclamation stationed at the damsite were uniformly helpful.

Photographic credits are: Mr. Christy G. Turner II; Mr. J. Frank Wright, Fig. 38; Miss Gene Foster, Fig. 46. Maps and line drawings are by Mr. Alexander J. Lindsay, Jr.

Writing of this report is the combined efforts of all the authors, although Dr. Adams left the project

seven months before its completion; errors resulting from acts of commission are thus the responsibility of the junior authors.

Dr. Angus M. Woodbury, Mr. Maurice E. Cooley, and Mr. and Mrs. Paul V. Long, Jr., contributed many hours to editorial proof-reading.

To all the people mentioned the authors are sincerely appreciative of their assistance and would like to single out Mr. J. Frank Wright as contributor outstanding in appreciation of his generosity and assistance both in and out of the field.

William Y. Adams  
Alexander J. Lindsay, Jr.  
Christy G. Turner II  
April 1960

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## ABSTRACT

This report is the third lake salvage archaeological bulletin of the *Glen Canyon Series* issued by the Museum of Northern Arizona in cooperation with the U.S. Department of Interior-National Park Service. It contains the results of two anthropological research programs on aboriginal occupation in lower Glen Canyon (southeastern Utah and northern Arizona), concerned mainly with prehistoric Pueblo II-III (A.D. 1050-1200) Kayenta Anasazi and historic Navajo-Paiute. First considered are the surveys along the Colorado River between the confluence of the San Juan River and the Glen Canyon Dam, a distance of 63 river miles, conducted by Miss Gene Foster and associates from 1952 to 1958, and additional surveys in 1958 by the authors. Second are the authors tests and full scale excavations in 1958 that were conducted along the Colorado River between Kane Creek and Oak Canyon and in the southern tributary canyons of Face, West, and Catfish.

Within lower Glen Canyon and the immediate southern tributaries four types of prehistoric sites are recognized: open, talus, shelter, and cliff. Habitation areas lack large refuse deposits and do not display signs of long continual occupation. Stone working is a major industry for the entire lower Glen Canyon area, perhaps one of the major reasons for prehistoric occupation. The area provides an exceptionally good source location for all types of siliceous stone. The majority of pottery sherds, found in nearly all the ceramic sites, are classifiable as: Tusayan White Ware, Tusayan Gray Ware, Tsegi Orange Ware; wares made between A.D. 1050 and 1200, and an insignificant number belonging to Jeddito and Awatobi Wares. A complex system of trails exists and is receiving further study, as are petroglyphs; both will be reported on later.

Cutler and Bower, in the appendix, describe and discuss the archaeological plant remains from survey and excavation.

# INTRODUCTION

This report contains the result of two anthropological research programs on the aboriginal occupation in Lower Glen Canyon, mainly prehistoric Pueblo II-III (A.D. 1050-1200) Kayenta Anasazi and historic Navajo-Paiute. First considered are the surveys along the Colorado River between the confluence of the San Juan River and the Glen Canyon Dam conducted by Miss Gene Foster and associates from 1952 to 1958 as well as additional surveys in 1958 by the authors. Secondly, the tests and excavations in 1958 that were conducted along the Colorado River between Kane Creek and Oak Canyon and in the southern tributary canyons of Face, West, and Catfish. Miss Foster's 1957 survey and ours were sponsored by the National Park Service, the agency responsible for salvaging paleontological and archaeological remains that will be inundated by Lake Powell on completion of Glen Canyon Dam.

Travel within Glen Canyon is limited mainly to boats although the river can be reached by difficult overland stock trails. Sites discussed in this report were

reached by boat except those in the tributary canyons that were hiked to after beaching the boat near the mouth of the canyon. Float boat traffic in the San Juan is restricted to travel downstream only, while no such limit is imposed on power boats in Lower Glen Canyon.

During the survey, site characteristics were recorded on a two page surface survey form (Fig. 1) as well as being located on the USGS topographic sheets: Leche-e Rock, Gunsight Butte, Cummings Mesa, Navajo Creek, and Navajo Mountain. Photographs were taken in black and white and color and representative surface materials were collected. Excavations were not a procedure of survey and were conducted during field trips expressly planned and equipped to cope with the special problems dictated by site locations and topography. Almost all excavated cultural deposits were screened to maintain the highest possible yield of artifacts for the amount of earth handled. Mapping, field notation, photography, and other supplementary data collecting procedures were done concurrently with the excavations. Sites were not backfilled after the excavations were completed.

SITE SURVEY FORM 1

Recom. for Excav. \_\_\_\_\_  
Excav. or test \_\_\_\_\_

Drainage: Colorado 6 \_\_\_\_\_ bank      Site: NA \_\_\_\_\_  
San Juan I \_\_\_\_\_      Grid: \_\_\_\_\_  
Highlands \_\_\_\_\_

Secondary drainage: \_\_\_\_\_

Location: \_\_\_\_\_  
Bank of \_\_\_\_\_ drainage at mile \_\_\_\_\_ Elevation \_\_\_\_\_ ft.

USGS \_\_\_\_\_ Quad. T. \_\_\_\_\_ S. R. \_\_\_\_\_ E. Sec. \_\_\_\_\_, \_\_\_\_\_

Terrain reference points \_\_\_\_\_

Nearest road: \_\_\_\_\_

Nearest Trail: \_\_\_\_\_

Add. data: \_\_\_\_\_

Classification: Branch: \_\_\_\_\_ Stage: \_\_\_\_\_ Est. Dates: \_\_\_\_\_

Description: \_\_\_\_\_  
Type of Site: \_\_\_\_\_

Elements: Non-Anasazi \_\_\_\_\_ Sherd \_\_\_\_\_ Trails \_\_\_\_\_  
Masonry \_\_\_\_\_ Stone \_\_\_\_\_ Perishables \_\_\_\_\_  
Terraces \_\_\_\_\_ Petroglyph \_\_\_\_\_ Other \_\_\_\_\_

Dimensions: \_\_\_\_\_

Depth: \_\_\_\_\_

Condition: \_\_\_\_\_

Add. Comments: \_\_\_\_\_

Sketch of Site: \_\_\_\_\_

SITE SURVEY FORM 2

NA \_\_\_\_\_

Environment: \_\_\_\_\_  
Sub-Ecol. Zone: \_\_\_\_\_ Geology: \_\_\_\_\_

Flora: \_\_\_\_\_

Topography: \_\_\_\_\_

Nearest water: \_\_\_\_\_

Permanent water: \_\_\_\_\_

Arable land: \_\_\_\_\_

Add. description: \_\_\_\_\_

Records: \_\_\_\_\_  
Collections: Sherds \_\_\_\_\_ Stone \_\_\_\_\_ Other \_\_\_\_\_

Photos: \_\_\_\_\_

Add. records: \_\_\_\_\_

Site markers: \_\_\_\_\_ Placed \_\_\_\_\_

Recorded: \_\_\_\_\_ by \_\_\_\_\_

Other previous designations: \_\_\_\_\_ in \_\_\_\_\_  
(name or number)

\_\_\_\_\_ by \_\_\_\_\_  
(references)

Fig. 1. Site Survey Forms used by the Museum of Northern Arizona — Glen Canyon Project.

# ENVIRONMENT

## PHYSIOGRAPHY

The Colorado River passes through an angular landscape composed of the bright, sunny, canyon and mesa country of the Colorado Plateau. In Glen Canyon the river flows placidly, although at a rate faster than a man can walk. At locations where the channel widens the river can be crossed on foot in low water. These fords were known and are marked by prehistoric occupational debris left by travelers crossing the river over 700 years ago.

The river through Glen Canyon is contained in the Navajo sandstone, a pink-orange homogeneous rock that forms vertical cliffs and rounded domes termed slickrock or baldrock. Away from the canyon rim the barren Navajo sandstone erodes into angular ledges and skewed slopes whereon shifting sands congregate in pastel shaded drifts; within the canyon great piles of cobbles and gravels stand as monuments to the Pleistocene activities of the Colorado River.

Glen Canyon between Cummings Mesa and the Kaiparowits Plateau has an inner and outer gorge cut through alternating resistant and weak beds of Jurassic rock. The inner gorge of incised meanders,



Fig. 2. The vertical cliffs enclosing the Colorado River are Navajo sandstone; the platform, in the distance above the eroded Navajo sandstone, is the remnant of the Carmel formation; and the distant cliffs are composed of Entrada, Summerville, and Morrison formations. The distant termination of the shadowed cliffs along the river locates Spring Canyon, and the break in the shadow at the extreme right is caused by the entrance of Face Canyon. The luxurious stream-side vegetation is evident in this view. The Colorado River, in low water, can be crossed without danger in this vicinity.

200 to 1400 ft. deep, is cut from the Navajo sandstone (Fig. 2). Overlying the Navajo sandstone is the Carmel formation (Fig. 3), softest of the Jurassic beds, which forms a comparatively broad and irregularly bordered platform between the inner and outer gorges. Rising above the Carmel-capped platform are mesas, buttes, and monuments of the Entrada, Summerville, and Morrison (Salt Wash member) formations. The largest remnant of these blocks south of the river is Cummings Mesa whose most northern extension terminates abruptly at the edge of the inner gorge. The topographic and stratigraphic relationships of these formations in Lower Glen Canyon are shown on Fig. 4.

## SURFICIAL DEPOSITS

Overlying the bedrock formations occur deposits, located along the river, in the side canyons, on the Navajo baldrock, and on the Carmel-capped platform. These are composed of alluvial silts and sands, sand dunes, Pleistocene gravel terraces, talus, rock falls, and minor amounts of soils.



Fig. 3. The outside arc of most meanders of the Colorado River in lower Glen Canyon strike against vertical precipices, while the inside arc borders alluvial terraces at the base of gently sloping bald rock. It is at these meanders that prehistoric Anasazi access routes occur most frequently. In the distance are erosional remnants of Entrada and Summerville formations. Tower Butte is at the extreme right.

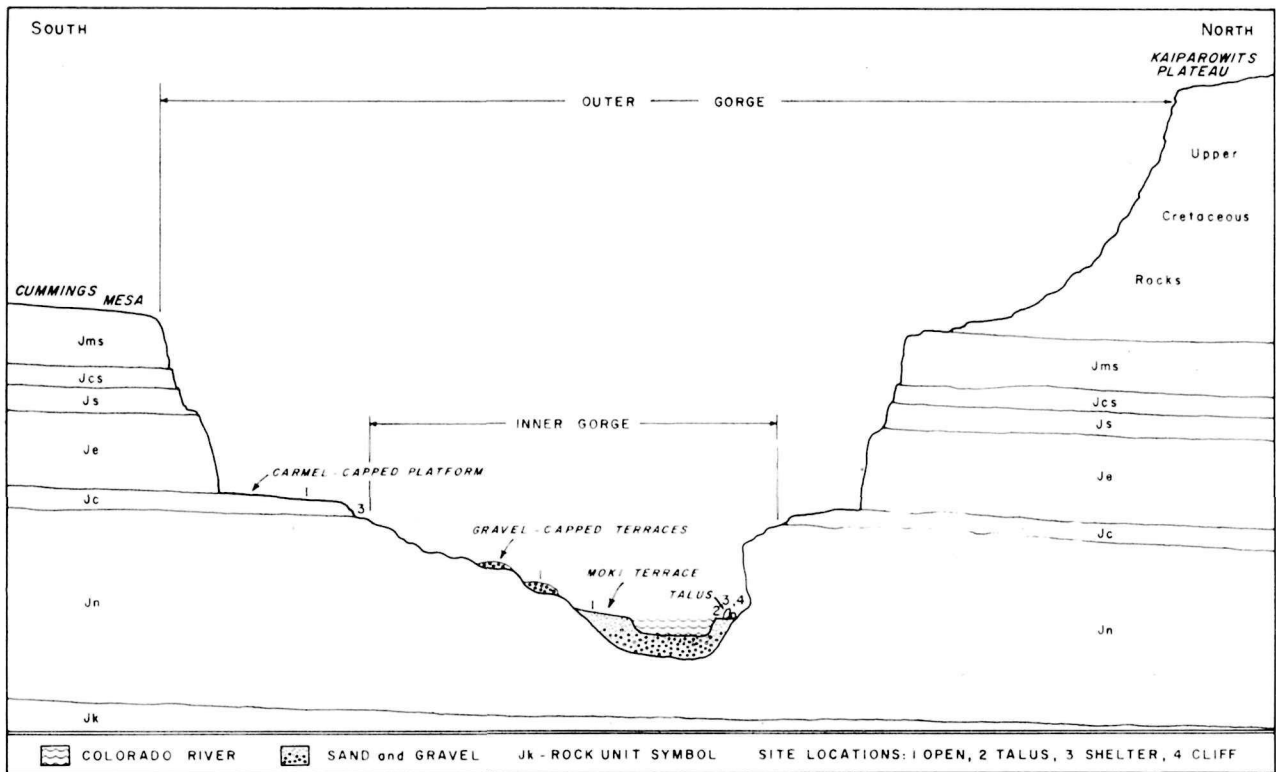


Fig. 4. Cross-section of Glen Canyon between Cummings Mesa and the Kaiparowits Plateau showing the physiographic relationships of the types of sites.

Rock Units	Symbol	Lithology	Topographic Expression
Morrison formation	Jms	Sandstone	Irregular ledges; caprock on low mesas; stripped slopes
Salt Wash member			
Cowsprings (Bluff) sandstone	Jcs	Sandstone	Vertical, rounded and irregular cliffs
San Rafael group			
Summerville formation	Js	Sandstone and Siltstone	Irregular cliffs
Entrada sandstone	Je	Sandstone	Rounded and smooth cliffs; irregular ledges; buttes
Carmel formation	Jc	Siltstone and Sandstone	Broad-irregular slopes
Glen Canyon group			
Navajo sandstone	Jn	Sandstone	Large, vertical, rounded and irregular cliffs; deep canyons; stripped surfaces
Kayenta formation	Jk	Sandstone	Vertical and irregular cliffs and ledges

The millions of tons of silt brought into the canyon by spring and summer floods add to or replace mud bars and sand banks at the mouths of tributary canyons along the sides of the river banks, and in the main stream channel. These change the surface configurations slightly with the yearly surge of snow-melt water from the Rocky Mountains (Fig. 2). Older stranded alluvial terraces, now about 25 ft. above the river, termed Moki terraces by Cooley (in preparation), have been cut from a lower fluvial deposit composed of material laid down by the river and tributary streams. These are capped by a thin horizon principally derived from local fluvial deposits and wind-blown sand.

Sand, weathered from the stark faces of cliffs, the stripped surfaces, and from the river deposits, is

blown, shifted, and deposited as dunes in the canyons during the afternoon breeze or during regional storms (Fig. 5). The larger dunes, holding moisture for relatively long periods of time, offer the most promising and potentially rewarding locations for dry-land farming.

Cherty, porphyritic, and quartzitic gravels deposited by the Colorado River remain as terraces chiefly on the stripped Navajo sandstone surface up to 1,000 ft. above the river (Fig. 6). Gravels washed down from the higher terraces lodged in depressions and blow-outs near the river and would have offered a plentiful source of material for the prehistoric lithic industry. Weathering of the canyon walls produces talus slopes upward of 500 ft. in height. Talus slopes within an alcove often are capped with Anasazi habi-

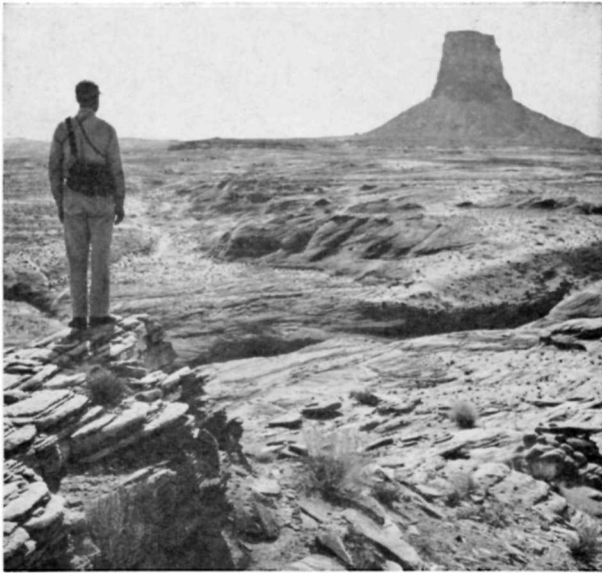


Fig. 5. View west overlooking Labyrinth Canyon with falling dunes on east slope. Tower Butte in distance at right.

tation areas. Soil, the least conspicuous surface condition, is found in alluvial terraces, on hillsides in the inner canyon, and upon the remnant Carmel-capped platform away from the river precipice (Fig. 2). It is shallow, mildly alkaline, and lacks developmental horizons (Cooley, in preparation).

#### HYDROGRAPHY

Colorado River water flowing through Lower Glen Canyon comes principally from the Rocky Mountains. During the months of April, May, June, and July, runoff is high and the Colorado River is at maximum flood stage; about 70 per cent of the annual runoff occurs in these four months. December, January, and February register relatively low monthly discharges. Over a period of 45 years (1911-1956) the average amount of water passing through the gaging station at Lees Ferry, Arizona, was 13,120,000 acre-feet per year (U. S. Geological Survey 1958).

Even during high water the river is potable although very silty. Better tasting water can be found in



Fig. 6. Oak Canyon, draining the northern slope of Navajo Mountain, spews gravels and boulders into the streambed of the Colorado River. Pleistocene gravels capping both rims of the canyon were used by the Anasazi occupants of the slump boulder room (NA7136), located against the large rock in the distant left, for manufacturing points, blades, and choppers.



Fig. 7. This view, looking upstream in West Canyon, is near its confluence with the Colorado River. Access into this canyon is limited because of vertical walls. A set of pecked steps, out of sight to the left, is the only place of descent from the canyon rim near to the canyon mouth. Another set of pecked steps, about three miles up canyon, have been enlarged by the Navajos in order that they could bring their sheep down to water—which runs year around.

about half the tributaries draining into Glen Canyon which have perennial streams (Fig. 7). This water is clear and comes from springs and seeps in the Navajo sandstone. The quantity varies in most tributaries from less than one gallon to over 100 gallons per minute (Cooley, in preparation). Regional storms can turn dry sandy stream courses into violently flooded channels, which return to their arid state in a few hours except for brim-full potholes along the water courses. Many of these potholes (Fig. 8), especially in the baldrock, have prehistoric pecked steps leading to them—evidence of their usefulness.

## FLORA

Within the canyon region, marked changes in vegetation are recognizable and reflect differences in available moisture, aspects of exposure, altitude, soil differences, topography, and temperatures. The region is characterized as the Upper Sonoran Life Zone (Anderson 1958, Fig. 1). In the canyon the distribution of plants “. . . is ultimately more or less regulated by the availability of water and the adaptations of plants that fit them to make use of the quantity available at any particular site.” (Woodbury, Durrant, and Flowers 1959:37.) Plant life is sparse and most are of a xerophytic nature except for the narrow band of green riparian vegetation along the river and in the tributaries. Three habitat types, streamside or river bank, terrace, and hillside, generally occur in an ideal cross-section of plant distribution in the inner canyon (Woodbury, Durrant, and Flowers 1959, Figs. 16, 32).

Streamside vegetation of phreatophytes, which use large amounts of water, is found on alluvial deposits bordering terraces, along water courses, ponds, seeps, and springs. This community of tall shrubs and small trees ranges from 10 to 60 ft. in width and occasionally is as much as 200 yds. wide.

The dominant species at the streamside community are the sandbar willow, *Salix exigua*; Gooding willow, *Salix gooddingi*; baccharis, *Baccharis emoryi*; tamarix or salt cedar, *Taxarix pentandra*; and arrowweed, *Pluchea sericea*. Associated with these five major species are others which are occasionally found mixed with them. Local stands of the Gamble oak, *Quercus gambelli*; hackberry, *Celtus douglasii*; and rarely the Fremont cottonwood, *Populus fremontii* are found with this community on narrow alluvial terraces, steep slopes near the river, and in glens. Other shrubs, herbs, and grasses are found either scattered or in local dense stands (Flowers 1959:31-2).

Terrace vegetation ranges from 10 to 300 ft. in width. It includes xerophytic perennial herbs or desert shrubs growing on dry surface soil which use intermediate supplies of water beyond precipitation, usually receiving it by capillary action from a subterra-



Fig. 8. In lower Glen Canyon only the Navajo sandstone forms potholes that can be relied upon to contain water. Prehistoric trails often pass and terminate at these basins. These shown are along a route (marked by pecked steps not visible) leading away from the Colorado River onto the Carmel platform, near Catfish Canyon.



near water source (Flowers 1959:37). The terrace community grows primarily on old flood plains and includes arrowweed, *Pluchea sericea*; grease wood, *Sarcobatus vermiculatus*; rabbit-brush, *Chrysothamnus viscidiflorus*; four-winged saltbush, *Atriplex canescens*; squawbush, *Rhus trilobata*; narrow-leaved yucca, *Yucca angustissima*; shadscale, *Atriplex confertifolia*; and other shrubs. Trees including Fremont cottonwood, hackberry, and Gambel oak, occur with grasses, vines, and other trees, shrubs, and herbs to make up the community in the main and side canyons (Flowers 1959:37-51).

Hillside vegetation of xerophytic plants adapted to the sparing amounts of water provided by precipitation is found on hillsides, ledges, talus slopes and cliffs, sand dunes, and on higher terraces and mesas above the canyon rim. In this zone the low desert shrub vegetation includes shadscale, *Atriplex confertifolia*; and saltbush, *Atriplex cuneata* with Garrett salt bush, *Atriplex garrettii* locally abundant. Other plants including joint firs, *Ephedra*, sp.; dropseed, *Sporobolus*, sp.; bottle-stopper, *Eriogonum inflatum*; and cacti, *Opuntia* spp. Blackbrush, *Celeogyne ramosissimum*; are conspicuous at the higher elevations. In general, this community varies in numbers and distribution by locality, with the herbaceous plants being quite abundant in species but few in number (Flowers 1959:51-7).

An assortment of plants ranging from larger trees to mosses is found in the stream channels. Cottonwood; Gambel oak; hackberry; red bud, *Cercis occidentalis*; reed cane, *Phragmites communis*; cattail, *Typha latifolia*; willow; and secondary phreatophytes occur along the stream courses not scoured by flash floods. They are mixed with streamside and hillside vegetation or both. Monkey flower, *Mimulus eastwoodiae*; cardinal flower, *Lobelia cardinalis*; ferns, and mosses along with other semi-aquatic plants, and grasses cling to the wet seeps, aquifers, moist sand, and some talus slopes. Lichens and mosses are found on bare northerly-facing cliffs in patches or coats varying in thickness and coverage.

The vegetation of the region can be characterized by arbitrary altitudinal zones (see climate) ranging from the river's edge to the summit of Navajo Mountain. In general, vegetation below 5,000 ft. is sparse except along the Colorado River and its watered tributaries. Between 5,000 to 7,500 ft. occur pinyon, pine, and juniper. Above 7,500 ft. a spruce-fir forest mixed with aspen flanks the upper slopes and summit of Navajo mountain.

## FAUNA

In Glen Canyon, as in the tributary canyons and along the San Juan River, large game animals are scarce owing to the limited food supply. The numbers of larger animals south of the rivers are being appreciatively reduced with the continued introduction of sheep, goats, and horses belonging to Navajos and Paiutes. Today the Indians are doing more hunting north of the rivers than on the south side. Water and grass, sparse and difficult to reach, are taken over in the spring by the domesticated animals, forcing the larger game to seek out other sources upon the remnant Carmel-capped platform. Here, more deer, rabbit, and coyote spoor occurs than in the canyons, although this condition may not have been appreciatively different in Pueblo II-III times to judges from the number of prehistoric kill-sites found on the grass-covered sand dunes.

The conspicuous animals in the deep canyons are bats, mice, pack rats, lizards, water fowl, and beaver. Insects, including ants, flies, spiders, gnats, and mosquitoes dominate the phreatophytic vegetation. The Colorado River supports a few fish, mainly suckers, minnows, and catfish. In the spring and early summer animal life is more apparent than at any other time of the year. For a complete listing of animals known to live year around or temporarily in the canyons see Woodbury and others (1959:73-103).

Our primary interest is in those animals which might have been residents in the canyons during prehistoric times and would have been of economic importance to the Anasazi. The animals living in the canyons today that were associated with the prehistoric Pueblo II-III occupation include mule deer, *Odocoileus hemionus*; big horn sheep, *Ovis canadensis*; jack rabbit, *Lepus californicus*; pack rat, *Neotoma* sp.; deer mouse, *Peromyscus maniculatus*; kit fox, *Vulpes macrotis*; porcupine, *Erethizon* sp.; prairie dog, *Cynomys* sp.; quail, *Lophortyx gambellii*; rock squirrel, *Citellus* sp.; lizard, *Holbrookia maculata approximans*; common loon, *Gavia immer*; bull snake, *Pituophis catenifer*; and cottontail, *Sylvilagus* sp.

Only four animals found represented in prehistoric sites have not been observed today: kit fox, prairie dog, quail, and common loon. One turkey feather has been found, but it is possible that it was brought into the canyon as feathering on an arrow. No turkey bones have been found. Thus the faunal assemblage (on the generic level) of today was present 700-900 years ago.

## CLIMATE

The southern central portion of the Colorado River Basin considered in this report presents three grading climatological zones. Most of the region is *Desert* ranging in altitude from 3,000 to 5,000 ft. and characteristically has the Upper Sonoran floral and faunal assemblage. The intermediate mesas and high plains, here considered as *Transitional*, range in altitude from 5,000 to 7,000 ft. The area includes the slopes of Navajo Mountain, the summit of Cummings Mesa, and most of the Rainbow Plateau. Plant life is dominated by scrub oak, juniper, and grasses. The third zone, the cool-humid *Alpine*, occurs only on Navajo Mountain from 7,000 ft. to its summit, near 10,000 ft. The *Transitional* zone is found at 7,000 feet on the Kaiparowits Plateau, north of the river.

The evaporation rate in this region is high, owing to the low humidity, high temperatures, dry winds, and sunny skies. The precipitation deficiency of the region below 7,000 ft. results from its inland location far from the Gulf of Mexico and from the mountain barriers along the Pacific Coast. Summer rainfall occurs primarily in July and August and is associated with moist air from the Gulf of Mexico. These are the months of maximum precipitation; April, May, and June are the driest months. Winter rains are sometimes a slow drizzle accompanied by snow flurries. The average annual precipitation for the plateau country is near 10 in. per year with a range of 6.5 to 13 or more in. (Harsbarger, Repenning, and Callahan 1953:112). The amount of precipitation increases with elevation, but is governed to some degree in this increase above the canyon by exposure, prevailing winds, and the proximity to mountains.

Short thunder showers in the summer, lasting less than an hour, can cause heavy runoff often resulting in flash floods in the tributary canyons. These storms may bring down in one rain most of the monthly average. Gentle soaking rains are less common; when they do occur they are associated with a Nevada low pressure area. The cool humid zone receives more than 16 in. of precipitation annually, one-third of the total being snow (Harsbarger, Repenning, and Callahan 1953:113). Snowfalls in the higher elevations occur primarily between September and May. At the lower elevations snowfalls are scattered and melt soon after reaching the ground. Lees Ferry, Arizona, receives less than four in. of snow annually and this is concentrated in the months of November, December, and January (Smith 1956:80).

Temperature changes between day and night are varied particularly above 5,000 ft. During the summer months hot days, often exceeding 100° F., are accompanied by relatively cool nights at the lower

elevations. "The average annual temperature in the bottom of Glen Canyon is about 59° F. at elevations between 3,200 and 3,480 feet, while in the upland at about 4,000 feet the averages taken at several stations in the vicinity of Glen Canyon range from 51.0° to 54.7° F." (Woodbury and others 1959:29.) A diurnal range of 40° F. is not unusual for the region (Gregory 1916:50). Freezing temperatures in the canyons generally occur from November to March.

Frost-free periods in Glen Canyon are relatively long. The average length of the growing season at Lees Ferry (elevation 3,141 ft.) is 229 days with average dates for the last spring frost and first fall frost being March 24 and November 8 respectively (Smith 1956:53).

Sunny days in the canyon lands range from 70 to 80 per cent of the year (Smith 1956:88). Direct sunlight in the canyon coupled with high reflectivity from the smooth canyon walls results in searing intensity to the novice's eyes and exposed skin.

Dry moderate surface winds are generally westerly in the winter and southwesterly in the summer months of June, July, and August. These winds begin about noon, reach their maximum intensity about three, and generally subside by nightfall. Strong winds, usually occurring in a succession of gusts, are not uncommon. These high winds carry blowsand throughout the canyons and over the rock terraces and occasionally scatter pebbles from the canyon rim (Cooley 1959:78).

## SUMMARY

The Colorado River, master stream of the Colorado Plateau, has fashioned an acutely dissected system of cliff faces and slopes, primarily from the Navajo sandstone. This forms near Cummings Mesa, in Lower Glen Canyon, an inner and outer gorge. In the inner gorge surficial deposits of high alluvial terraces, dunes, gravel terraces, and talus slopes have influenced the past and present human occupation of the canyon lands. Water resources in the canyon vary considerably by season. Permanent water supplies can be found in many of the tributary canyons and the Colorado River. Flora throughout the canyon basin, characterized by the Upper Sonoran Life Zone, forms a sparse cover on the meager soil. Along the watered canyon bottoms a band of green riparian vegetation abounds. This grades, with increasing lack of moisture, to xerophytic herbs, shrubs, low xerophytic desert shrub vegetation, and thinly scattered grasses which are dependent on precipitation alone. Mesa highlands rising above and surrounding the canyons have stands of juniper, sage, and generally denser grass cover. Large game animals are insignificant due to the sparse food reserve, while smaller ani-

mals, like beaver, coyote, squirrel, and mice are fairly numerous. Other populous members of the faunal assemblage include birds, fishes, and insects—the last especially represented by swarms of mosquitoes and gnats. Climatically the basin varies from *Desert* and *Transitional* to *Alpine* on the summit of Navajo

Mountain. Evaporation throughout the region is rapid, and precipitation is characterized by short localized thunder storms which run off rapidly. Temperature changes are considerable, like most arid regions. In Glen Canyon the first and last frosts take place in the winter months, which allow for a relatively long growing season.

## DESCRIPTION AND DISTRIBUTION OF SURVEYED SITES-- LOWER GLEN CANYON

Between 1952 and 1958 Miss Gene Foster and her associates recorded 118 sites in the Lower Glen Canyon region, including 28 sites located north of the Colorado River and 90 sites south of the river. The present writers continued the survey in this region in the latter half of 1958, and recorded an additional 20 sites during the year. The total of MNA, Glen Canyon Project sites in the Lower Glen Canyon region thus stands at 138. (For a comprehensive listing of sites and surveys, see Table 1). Unexcavated sites form the subject of this section.

Year	Expedition	Sites Recorded*
1933	Rainbow Bridge - Monument Valley Expedition	NA 2686-2692
1952	Gene Foster	NA 5369-5372
1952	" "	NA 5504
1953	" "	NA 3731-3744
1955	" "	(none)
1956	" "	NA 5983-5985
1956	" "	NA 5247-5253
1956	" "	NA 6415-6424
1956	" "	NA 6426-6429
1957	Gene Foster**	NA 6442-6512
1957	" " **	NA 6892-6893
1958	" " **	(none)
1958	Glen Canyon Project	NA 6874
		NA 7136-7145
		NA 7226-7235

\* In Lower Glen Canyon only.  
\*\* Under Glen Canyon Project contract.

Table 1. Chronology of Museum of Northern Arizona surveys in Lower Glen Canyon.

### SITE DISTRIBUTION

#### Evaluation of Survey

The survey map of Lower Glen Canyon reveals a somewhat uneven distribution of prehistoric sites, particularly in the tributary drainages and areas away from the river (Map 1). This situation, however, does not necessarily reflect the true distribution of sites. The entire survey of Lower Glen Canyon was undertaken by river-based parties and this approach has imposed inevitable limitations upon the extent of the work in side canyons and uplands. There can be no question that the main canyon of the Colorado has been investigated exhaustively between the mouth of the San Juan River and the Glen Canyon Dam-site; the material observed and collected in this area

may be accepted with confidence as representative. Investigation of the tributary canyons and particularly of the highlands beyond the canyon rims has depended largely upon their accessibility from the Colorado, whereas canyon utilization by prehistoric peoples presumably depended upon their accessibility from the highlands.

In discussing the overall occurrence of prehistoric and historic remains, it is convenient to distinguish between sites in the main Glen Canyon, sites in the tributary canyons, and sites on the terraces and mesas adjoining the canyon rims. These areas seem to represent somewhat distinct environmental types, each with its own special advantages and disadvantages to human habitation. For the entire Lower Glen Canyon region, the distribution of prehistoric sites in the three areas is as follows:

Sites in Glen Canyon proper (inner gorge)	55
Sites in tributary canyons	43
Sites on terraces and mesas	40

Total Lower Glen Canyon sites 138

#### Sites in Glen Canyon Proper

Alluvial terraces suitable for habitation occur frequently along the banks of the Colorado River, occupying perhaps one-third of the total area along each river bank in Lower Glen Canyon (Figs. 9, 10). The meandering nature of the canyon itself commonly results in a succession of rather short sandbars on opposite sides of the river. Individual bars are separated by stretches in which the river flows at the foot of a steep talus or directly against the vertical canyon wall, thus rendering travel along the river bank from sandbar to sandbar difficult at times of maximum flood. Habitation remains have been found on or adjacent to all the larger alluvial terraces in Lower Glen Canyon. Clusters of five or more sites are found at and near the mouths of a few tributary canyons, such as Rock Creek and Forbidding Canyon, which form important access routes to the highlands above the canyon. By

contrast, the scarcity of sites along the south bank of the Colorado between Forbidding Canyon and West Canyon Creek is undoubtedly due to the fact that this portion of the canyon is closely flanked by the towering scarp of Cummings Mesa, a formidable barrier to access. Farther downstream, the heaviest concentration of sites in Lower Glen Canyon is found between West and Labyrinth Canyons, where the low-dipping canyon wall has been breached by foothold and stock trails leading to nearly every alluvial terrace. It is of interest that modern Navajo-Paiute utilization follows closely the pattern established by the prehistoric inhabitants.



Fig. 9. Excavations (lower right; NA6445, Test 1) were spotted along this alluvial terrace below Cathedral Canyon to determine the depth of lithic industry (profuse chips and stone artifacts) showing on the modern surface.

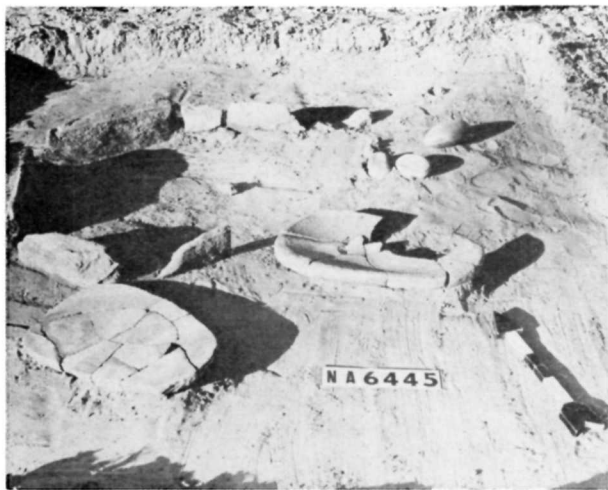


Fig. 10. This slab-lined hearth, with accompanying metates and manos, is the only architectural feature found amidst scores of acres scattered with chipped artifacts and broken stone on the alluvial terrace below Cathedral Canyon; NA6445. Metates were restored, and placed in their present position for the photograph (see text NA6445, Test 2).

### Sites in Tributary Canyons

A total of 43 sites has been recorded in the various tributaries of Lower Glen Canyon. Of these, 35 are located in Forbidding Canyon, West Canyon Creek, and Face Canyon—the only three side canyons which have been surveyed thoroughly to date. A few additional sites have been located in Oak Creek, Catfish Canyon, Rock Creek, and Wahweap Creek.

This list does not comprehend all of the known sites in the tributary canyons. Streams entering from the north, including Rock and Wahweap Creeks, were not investigated for any distance because of concurrent work by the University of Utah in that area (Lister 1958).

Prehistoric utilization of the side canyons, like the main Glen Canyon, was undoubtedly governed in part by their accessibility from above. In many cases there is a definite association between sites and existing trails. In both, West Canyon Creek and Face Canyon, sites are clustered where the canyons are crossed by modern stock trails which themselves are built upon earlier routes (Fig. 11).

Side canyons between Forbidding Canyon and West Canyon Creek cannot be entered except at or near the mouth. All of these drainages rise on the northern scarp of Cummings Mesa, a nearly unbroken wall towering some 2,000 ft. above the Colorado River. Difficulty of overland access thus accounts for the general absence of sites in the canyons between Forbidding and West. The presence of small clusters of sites near the mouths of Catfish and False Entrance Canyons is accounted for by overland routes that parallel the rim of Glen Canyon.

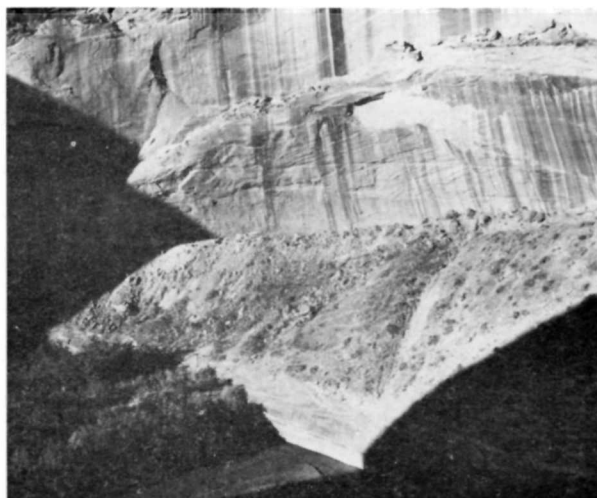


Fig. 11. Distant view of NA6456. The Anasazi occupants lived on the flat-topped talus slope. The overhanging stained cliffs form a protective roof. West Canyon Creek flows in the foreground.

Toward the lower portion of Glen Canyon, prehistoric sites (not covered in the present report) are known to occur in Navajo Canyon, which, like Forbidding Canyon, offers a through route to the Colorado River from the adjoining highlands to the east. Sites on Terraces and Mesas.

In the vicinity of Navajo Mountain and Cummings Mesa, the hinterlands adjacent to Glen Canyon and its tributaries are currently being surveyed. From the confluence of the San Juan to Forbidding Canyon, the Colorado is flanked on either side by a wilderness of bald rock, extending to the lower slopes of Navajo Mountain and the Kaiparowits Plateau. Except for a few isolated remnant surfaces this area is devoid both of level land and of soil.

Below Forbidding Canyon, for a distance of some 15 mi., the river is closely confined between Cummings Mesa on the south and the outlying butresses of the Kaiparowits Plateau on the north. Here the inner and outer gorges are separated, at most, by a narrow platform intersected at numerous points by deep transverse drainages. There are few known accesses from the canyon floor to the platform, and it has not been examined except at the extreme west end.

Westward from the mouth of West Canyon Creek, the higher geologic formations have been largely stripped away from the immediate vicinity of the river canyon, surviving only in such isolated remnants as Tse Tonte and Tower Butte. In most areas the inner canyon is flanked by a broad, level or undulating terrace capped by the Carmel formation, extending for many miles on either side. Travel to and from the river via the platform is easy in a score of places, although travel parallel to the river, at or near the rim of Glen Canyon, is impeded by a succession of deeply incised side canyons.

Because of its ready accessibility from below and the ease of travel across it, the Carmel remnant from Cummings Mesa, west, is the only hinterland south of Glen Canyon which has been intensively surveyed, and all of the sites which have so far been recorded outside of the canyons are located here. Similarly, the only known indications of Navajo-Paiute occupation above the canyon rims are found in the open terrace area west of Cummings Mesa (Fig. 12). Of the prehistoric terrace sites, the great majority are lithic workshops without evidence of habitation, and are associated with the available Pleistocene gravel deposits found as terraces (see Surficial Deposits).

#### SITE LOCATIONS

Habitation and workshop sites in Lower Glen Canyon may be classified as: open sites, situated on alluvium or terraces; talus sites, situated in broken



Fig. 12. NA3741 is a long abandoned sub-rectangular structure with a corner fireplace located upon the Navajo sandstone platform. It was built by Navajos or Paiutes.

slump material below cliffs; shelter sites, situated in protected areas at the foot of cliffs; and cliff sites, situated on ledges or in caves and canyon walls. Frequency of occurrence of the different site types is shown in Table 2.

<u>Location Types</u>	<u>Main Canyons</u>	<u>Side Canyons</u>	<u>Carmel Terrace</u>	<u>Total Sites</u>
Open Sites	19	11	39	69
Talus Sites	3	1		4
Shelter Sites	10	9		19
Cliff Sites	23	22	1	45
TOTAL SITES	55	43	40	138

Table 2. Distribution of sites by location and environment.

#### Open Sites

Open sites comprise slightly over half the total or recorded sites from the Lower Glen Canyon, including nearly all of the lithic workshop remains. For the most part they are concentrations of lithic, ceramic refuse, or both, occurring in the sand dunes and gravel deposits which cap the terraces in many places. Open sites are also found on alluvial terraces adjacent to the Colorado River (Fig. 9). A second important group of open sites are Navajo Camps, found both in the canyon and on the rim above it, in the area west of Cummings Mesa. This group includes nearly all of the structural remains found in open locations; prehistoric structures have been found in the open in only two instances.

#### Talus Sites

Sites built among the slump boulders below canyon walls (Fig. 6), appear to be very uncommon in



Fig. 13. After making camp near the Colorado River on this representative bar, recently burnt off by a careless river party, reconnaissance surveying located a Pueblo II-III Kayenta Anasazi occupation along the base of the vertical cliffs adjacent to the bar at the extreme right. Running water and easy access from the rim have made this an ideal pasture for Navajo livestock.

Glen Canyon, although they are found repeatedly in the neighboring San Juan drainage (Adams and Adams 1959:12). Talus slopes are comparatively rare in the canyons, which are cut chiefly into the resistant Navajo and Kayenta sandstones. Apparently they did not afford as desirable a location for habitations as did the cliffs above them. Only four talus sites have been reported from Glen Canyon proper, and one more is known from Forbidding Canyon.

#### Shelter Sites

Alcoves, ledges, and small overhangs at the base of canyon walls were utilized by prehistoric inhabitants in many parts of Glen Canyons. Shelter sites (Fig. 13) are commonly found where a considerable alluvial deposit abuts against the canyon wall. This group of sites includes Anasazi habitations as well as lithic workshops without habitation or structural features.

#### Cliff Sites

The Navajo sandstone cliffs which enclose Lower Glen Canyon and most of its principal tributaries afford numerous caves and large alcoves at varying heights above the canyon floors (Fig. 11). They were utilized by prehistoric inhabitants in many parts of

Glen Canyon and in the major side canyons. Half of the total of sites recorded in the tributary canyons and the majority of prehistoric structures are found in cliff locations. Also included in this group, for convenience, are petroglyphs and foothold trails which have been given survey numbers.

### CULTURAL COMPONENTS OF GLEN CANYON

Cultural remains which were observed and recorded by the Museum surveys in Glen Canyon include prehistoric and historic structures, lithic and ceramic artifacts and refuse, petroglyphs, and foothold trails. These components, singly or in combination, make up the 138 recorded sites in the region. Table 9 includes a checklist of elements found at each site.

#### Structures

Prehistoric structural remains were found in 33 Glen Canyon sites, including 17 sites in the main canyon, 14 sites in tributary canyons, and two sites on the Carmel terrace adjoining the lower canyon. Nine of the 14 sites located in tributary canyons were found in the lowermost four miles of Forbidding Canyon. Rooms, cists, retaining walls, and windbreaks make up this group.

Prehistoric room architecture is reported from 23 sites, but in most cases specific data is scant. Masonry is crude and usually dry-laid, seldom if ever exceeding 1 m. in height at the present time. Walls of upright slabs set in mortar are also reported in a few instances. Rectangular, contiguous rooms are apparently uncommon; in most cases rooms are built individually against cliff walls or boulders. The largest number of rooms reported for any site is 12, at NA5369 (Talus ruin). Mean number of rooms for sites where size is reported is 3.7. Nearly all sites are in a poor state of preservation, and many have been disturbed by river travelers in recent years. No remains of roofs have been reported, and in general the knowledge of prehistoric structures in Lower Glen Canyon is far from complete.

Cists are reported from six Glen Canyon sites. Circular cists lined by upright slabs set in clay were found at three sites. "Bottle-shaped" cists and one wattle-and-daub lined cist are reported. Dimensions are not given. The maximum number of cists found at any one site was ten, at NA5249. Windbreaks and retaining walls are reported from three sites.

Twenty-six Glen Canyon sites are historic Navajo-Paiute habitations (Figs. 14, 15). Structures range from haphazard temporary brush shelters to well-constructed hogans with walls of upright poles or stone. The latter are rare, and it seems probable that the great majority of Navajo sites in Glen Canyon constitute outlying "sheep camps" rather than regular residences. This conviction is reinforced by the fact that Navajo-Paiute families have not been encountered in the area surveyed except for very brief periods during the summer months. Most sites include a corral as well as some form of shelter, and there is frequently a sweathouse in the immediate vicinity.

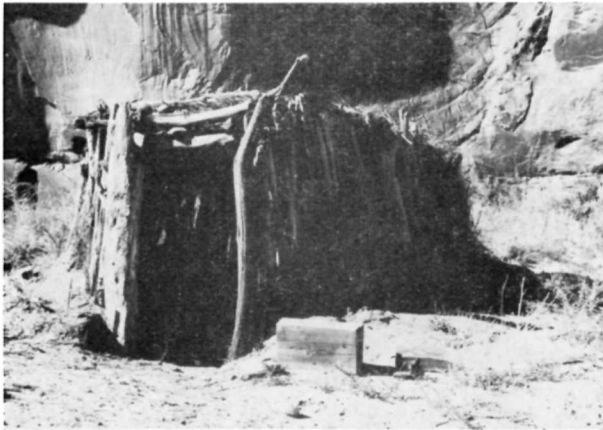


Fig. 14. NA6429 is a temporary Navajo hogan built of driftwood gathered along the river. The driftwood frame is covered with brush and earth.



Fig. 15. Stone hogan on Padre Bar. This hogan may date from 1940 as this date is incised at the base of a stock trail that ascends onto the remnant Carmel platform in the background.

Navajo sites show a great variation in preservation. In some cases structures are complete while in others the former presence of a habitation is indicated only by a ring of mounded earth or low masonry wall or perhaps a burned foundation and a small accumulation of camp debris. It should be noted that few sites have shown conclusive evidence of very recent occupation, but also that few show evidence of any great antiquity. The quantity of remains would seem to suggest that Navajo-Paiute occupation in the Lower Glen Canyon region was somewhat more intensive in the recent past than is true at present. However, it is difficult to say with any certainty how many of the sites are completely abandoned.

### Pottery

Potsherds were found at 46 Lower Glen Canyon sites, exclusive of those which were excavated. (Pottery from the latter is separately described in succeeding sections.) Surface collections are generally small, although in nearly every case all visible sherds were collected. The mean number of sherds collected per site was 19, and 20 sites yielded fewer than ten sherds apiece. The wares and types represented, and their distribution by sites, are shown in Table 3.

Tusayan White Ware is the only white ware so far found in Lower Glen Canyon, and has been recovered from 20 sites. The types chiefly represented are those which were manufactured in the 12th and 13th centuries A.D., notably Sosi Black-on-white and Flagstaff Black-on-white. At the present time the earliest (Kana-a Black-on-white) and latest (Kayenta Black-on-white) types of Tusayan White Ware have not been encountered. In addition to the predominant Kayenta series, a few sherds which fit the descriptions of St. George Black-on-gray and North

Site Number NA.	Tusayan White Ware Kayenta Ser.						Tus. Gray W. Tsegi Ser.		Shin. Gray Ware		Tsegi Orange Ware					P IV Hopi Wares			Paiute ?					
	Black Mesa B/w	Shato B/w	Sosi B/w	Dogozshi B/w	Flagstaff B/w	Wupatki B/w (unidentified)	North Cr. B/g	Virg. Ser. (unidentified)	Tusayan Cor.	Moenkopi Cor. (plain gray) (unidentified)	North Cr.Gray	No. Cr. Cor.	Shinarump Br.	Shinarump C.	Tusayan B/r	Citadel Poly.	Tusayan Poly.	Tsegi Orange		Tsegi R/o	Tsegi Cor. (unidentified)	Jeddito B/y	Jeddito Plain	Awatobi Rough (unidentified)
2689	-	-	-	-	-	X	-	X	X	-	X	-	-	-	X	-	-	-	-	X	-	-	X	-
2690	-	-	-	-	-	X	-	X	X	-	X	-	-	-	-	-	X	-	-	-	-	-	-	-
2691	-	-	-	X	-	-	-	X	X	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-
2692	-	-	-	-	-	X	-	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3731	-	-	X	-	-	X	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-
3740	-	-	-	-	-	-	-	X	X	-	X	X	-	-	-	-	-	-	-	-	-	-	-	-
3742	-	-	X	-	-	X	-	X	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5247	-	-	X	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-
5248	-	-	X	-	-	-	-	-	-	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-
5251	-	-	-	-	X	X	-	-	X	-	X	-	-	-	X	X	-	-	-	X	-	-	-	-
5252	-	-	-	-	-	-	-	X	X	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-
5369	-	-	-	X	X	X	X	X	X	X	X	-	-	-	X	-	-	-	-	X	-	-	-	-
5370	-	-	X	-	-	-	X	X	X	X	-	-	-	-	X	-	-	-	-	-	-	-	-	-
5977	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	X
5983	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6418	-	-	-	-	-	-	-	X	X	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-
6419	-	-	-	-	-	-	-	X	X	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-
6423	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-
6424	-	-	-	X	-	X	-	X	X	X	-	X	-	-	X	-	-	-	-	-	-	X	-	-
6443	-	-	-	-	-	-	-	-	X	-	-	-	X	X	-	-	-	-	-	X	-	-	-	-
6446	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-
6449	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	X	-	-	-	-
6451	-	-	-	-	-	-	-	X	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6457	-	-	X	-	-	-	-	X	-	-	-	-	-	-	X	-	-	-	-	-	-	-	X	-
6458	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-
6466	X	-	X	-	-	-	-	X	X	-	X	-	X	-	-	-	X	X	-	X	-	-	X	-
6467	-	-	-	-	-	-	-	-	X	-	X	-	-	-	-	-	-	-	-	X	-	-	-	-
6470	-	-	-	-	-	-	-	-	-	X	-	-	-	-	X	X	-	-	-	X	-	-	-	-
6482	-	-	-	-	-	-	-	-	-	-	-	-	X	-	X	-	-	-	-	-	-	-	-	-
6483	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-
6484	-	-	X	-	-	X	-	-	X	-	-	-	-	-	-	-	-	-	-	-	X	-	X	-
6486	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6490	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6498	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6505	-	-	-	-	-	-	-	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6508	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6511	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7136	-	-	-	-	-	X	-	X	X	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-
7137	-	X	-	-	-	-	-	X	X	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-
7140	-	X	-	X	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-
7141	X	-	X	X	X	-	X	X	X	X	X	-	-	-	X	-	-	-	-	-	-	-	-	-
7142	-	-	-	-	-	-	-	X	X	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-
7227	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7228	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7233	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-

Table 3. Distribution of pottery types by sites.



Creek Black-on-gray are present in the collections. These are localized Tusayan White Ware types whose center of manufacture was apparently west of the Colorado River, and which have been assigned to the Virgin Series of Tusayan White Ware by Colton (1952:39-47). Among the unexcavated sites these latter types have been encountered only near the mouth of Rock Creek.

Tusayan Gray Ware is the dominant utility ware of Lower Glen Canyon, and has been found in 38 sites. The principal types are Tusayan and Moenkopi Corrugated. A rather thin-walled plain gray type, as yet unnamed, has also been found in a number of sites. In the Rock Creek area have been found a few sherds of North Creek Gray and North Creek Corrugated—members of the Virgin Series of Tusayan Gray Ware which is a companion to the Virgin Series of Tusayan White Ware, and was likewise manufactured west of the Colorado River (Colton 1952:19-24).

Shinarump Gray Ware is probably a western peripheral version of Tusayan Gray Ware (Colton 1952:55-60). It is commonly associated with the Virgin Series of both Tusayan White Ware and Tusayan Gray Ware. The two types included, Shinarump Brown and Shinarump Corrugated, have been identified at four Lower Glen Canyon sites.

Tsegi Orange Ware is widely distributed through lower Glen Canyon, and has been found at 20 sites. By far the most common type is Tusayan Black-on-red. Citadel and Tusayan Polychromes, Tsegi Orange, and Tsegi Red-on-orange are also present. The white-edged polychromes (Kayenta and Kiet Siel) of the 13th century have not as yet been encountered.

Pueblo IV Hopi pottery, dating from the 14th century and later, has been found on the surface of eight Glen Canyon sites, generally not in direct association with the earlier wares described in preceding paragraphs. Included are Jeddito Black-on-yellow (three sites), Jeddito Plain (one site), and Awatobi Rough (four sites). Sikyatki polychrome of Colton's group 12 (1953:67) has not been found in the region.

### Stone

In many parts of Glen Canyon the most conspicuous cultural remains to be seen are masses of worked lithic material, scattered thickly over alluvial and gravel terraces. Stone artifacts, rejects, and chips were collected in the course of survey; but the logistics of transportation often imposed severe limitations on the extent of such collections, although photographs were made of some tools left behind. Material present in the surface collections therefore, comprises only a small and not necessarily representative

<u>Tusayan White Ware</u> (all types)	20	sites
<u>Kayenta Series:</u>		
Black Mesa B/w	2	"
Shato B/w	2	"
Sosi B/w	9	"
Dogoszhi B/w	2	"
Flagstaff B/w	5	"
Wupatki B/w	1	"
<u>Virgin Series:</u>		
North Creek B/g	2	"
St. George B/g	1	"
<u>Tusayan Gray Ware</u> (all types)	38	"
<u>Tsegi Series:</u>		
Tusayan Corrugated	27	"
Moenkopi Corrugated	23	"
(Plain gray)*	7	"
<u>Virgin Series:</u>		
North Creek Gray	4	"
North Creek Corrugated	2	"
<u>Shinarump Gray Ware</u> (all types)	4	"
Shinarump Brown	2	"
Shinarump Corrugated	3	"
<u>Tsegi Orange Ware</u> (all types)	22	"
Tusayan B/r	10	"
Citadel Polychrome	2	"
Tusayan Polychrome	2	"
Tsegi Orange	3	"
Tsegi R/o	1	"
Tsegi Corrugated	1	"
<u>Pueblo IV Hopi Wares</u> (all types)	8	"
Jeddito B/y	3	"
Jeddito Plain	1	"
Awatobi Rough*	4	"
<u>Paiute (?)</u>	1	"
* Undescribed types		

Table 4. Summary of pottery type distribution (number of sites where each type is found).

sample of the total range of lithic remains to be found in Lower Glen Canyon.

Approximately 300 stone artifacts were collected and catalogued from the surface of Glen Canyon sites, exclusive of those which were excavated. A much larger number of chips, reject material, and other lithic debris was also collected, but was not catalogued. In all, collections of lithic material were made from 84 of the total of 138 recorded sites (Table 9). Of these, 53 yielded recognizable artifact types which are included in the following discussion (Table 5).

*Taxonomy.* A large number of taxonomic schemes have been developed for the analysis of stone implements, and almost any of them could probably be applied to the Glen Canyon collections. Such detailed analysis is not warranted at the present time, since the collections will be greatly augmented, and the range of variation better defined, by additional field work. For the present the entire complex of lithic material is discussed in terms of a limited number of general formal categories shown in Fig. 16.

*Implement types.* Material collected from the surface of Glen Canyon sites, other than pottery, consists almost entirely of articles of chipped stone, plus a few grinding tools. The group of chipped implements is comprised overwhelmingly of bifacial im-

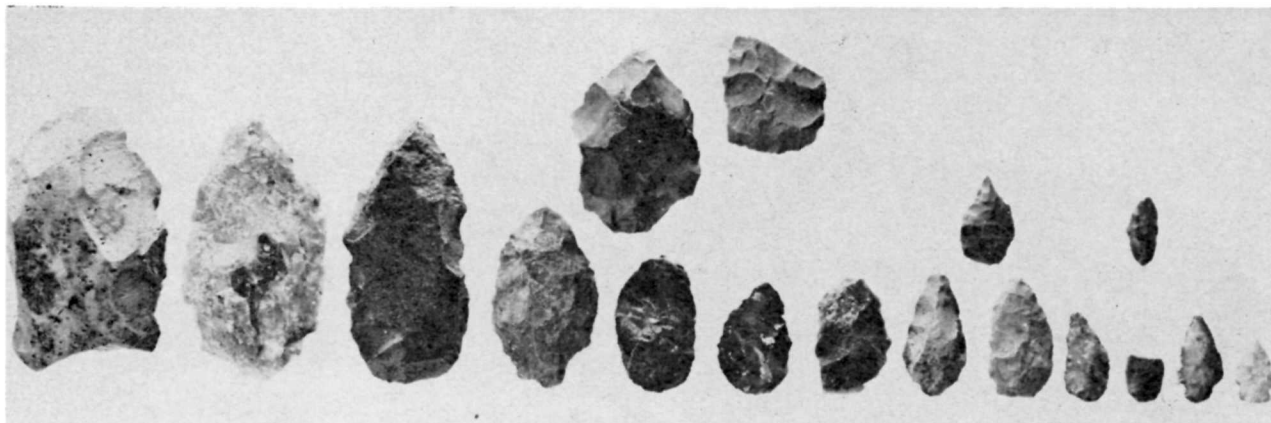


Fig. 16. Synoptic series: Oval, biface stone implements flaked all the way around the circumference. Length of left artifact, 12.8 cm.

plements—projectile points, drills, knives, and various kinds of chopping tools. Unifacial implements are represented by a limited number of scraper types. Distribution of the major implement types by sites is shown in Table 5.

*Projectile points.* The Glen Canyon collections include 75 whole and fragmentary artifacts which were either projectile points or small knives, intended for hafting. In the group are a number of readily distinguishable types, whose overall distribution is shown in Table 6, and Fig. 17.

Small triangular projectile points (Type I), with and without notches, stand out clearly as a distinct group of implements. Their size is considerably smaller than that of any of the other point groups (average length 17 mm.), and they show a consistently finer and more careful finish. Sides and bases are straight, with sharp points and corners. Deep side notches, which are found in 11 of 14 specimens, are situated about one-third of the way between base and tip. Nine triangular points also have a deep base notch. Triangular points are made chiefly from chalcidony and dark-colored cherts. There are two obsidian specimens.

Oval and leaf-shaped specimens (Type II) comprise the largest group of projectile points, although they may have been hafted for small knives. Their size is nearly twice that of the triangular points (average length 33 mm.), and they are consistently inferior in workmanship. Sides are usually highly convex, with points often rounded and blunt. Most specimens have very shallow side notches at the corners or in the sides close to the base. It is probable that notching was intended only to facilitate hafting, since the resulting tang and spur are in no case sufficient to serve as

Site Number	Points	Drills	Knives	Choppers	Scrapers	Hammerstones	Manos	Axes	Site Number	Points	Drills	Knives	Choppers	Scrapers	Hammerstones	Manos	Axes
NA:									NA:								
3736	-	-	-	-	-	-	-	3	6486	1	-	-	-	-	-	-	-
3741	-	-	-	-	-	-	-	6487	2	1	1	2	-	3	-	-	
5276	-	-	-	-	-	-	-	6491	-	-	-	-	-	-	-	-	
5371	-	2	1	-	-	-	-	6494	2	-	-	-	-	-	-	-	
5504	-	-	-	-	-	-	-	6495	-	6	1	-	-	-	-	-	
6419	3	-	3	1	-	-	-	6499	7	-	4	-	-	-	-	-	
6422	-	7	-	-	-	-	-	6501	-	-	2	-	-	-	-	-	
6426	-	2	1	-	-	-	-	6503	3	-	7	4	-	2	-	-	
6442	-	2	-	-	-	-	-	6504	2	-	2	3	-	-	-	-	
6446	1	-	-	-	-	-	-	6506	3	-	4	2	-	2	-	1	
6447	1	-	-	-	-	-	-	6507	5	-	4	-	-	-	-	-	
6449	-	-	-	-	-	-	-	6509	-	1	1	-	-	-	-	-	
6451	-	2	1	-	3	-	-	6510	-	-	2	1	-	-	-	-	
6452	1	-	-	-	-	-	-	6511	1	-	-	-	-	-	-	-	
6453	9	-	6	6	-	-	-	7139	1	-	1	1	-	-	-	1	
6457	9	-	-	-	-	-	-	7140	1	-	-	-	-	-	-	-	
6460	-	2	4	-	2	-	-	7141	3	-	4	8	-	4	3	2	
6463	4	-	7	6	-	-	-	7142	3	-	1	2	-	2	1	-	
6464	-	-	-	2	-	-	-	7144	-	-	-	-	-	-	-	-	
6472	-	-	-	-	-	2	-	7226	-	-	4	3	-	7	-	-	
6473	1	-	-	-	-	-	-	7227	-	-	-	2	-	2	1	-	
6474	-	-	-	-	2	-	-	7228	1	-	-	1	-	-	-	-	
6478	1	-	-	-	-	-	-	7229	1	-	-	-	-	-	-	-	
6482	1	-	-	-	-	-	-	7230	1	-	1	3	-	-	-	-	
6483	-	-	-	-	-	-	-	7231	-	-	1	1	-	-	-	-	
6484	5	-	-	-	-	-	-	7233	-	-	-	-	-	1	-	-	
								7234	2	-	2	-	-	-	2	-	
								7235	1	-	-	1	-	-	-	-	
								TOTALS	76	2	87	62	1	38	10	12	3

Table 5. Distribution of principal stone implement types by sites.

Point Type	Number of Specimens	Number of Sites
Small triangular points	14	6
Not notched	3	1
Side-notched	2	2
Side- and base-notched	9	6
Rounded and leaf-shaped points	27	16
Not notched	8	5
Side notched	19	13
Convex base	10	10
Straight base	6	6
Concave base (Pinto-like)	3	2
Stemmed points	13	10
Square tang	6	5
Sharp tang (barbed)	7	7
Expanding stem	5	5
Tapering stem	2	2
Unidentifiable fragments	22	16
TOTALS	76 Specimens	30 Sites

Table 6. Distribution of Glen Canyon projectile points by types.

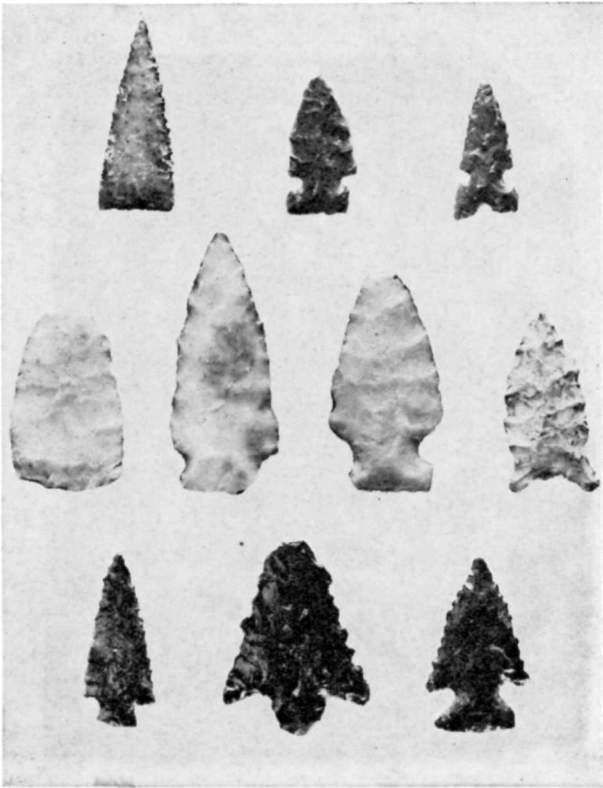


Fig. 17. Point type specimens. Length of lower left point, 2.9 cm.

barbs. Six notched specimens also show secondary thinning to form a straight base. Three exceptionally small points have thinned, concave bases, and bear a distinct resemblance to certain Pinto points (Campbell and Campbell 1935, Pl. 13; Rogers 1939, Pl. 13; Haury 1950, Fig. 58, Fig. 62, Pl. 22). Materials commonly employed in the manufacture of oval and leaf-shaped points were jasper, chalcedony, light-colored cherts, and quartzite.

True stemmed points (Type III) have deep corner notches which serve to equip them with sharp barbs or tangs, and were almost certainly used as projectiles. They are comparable in size to the oval points (average length 30 mm.) and in workmanship to the triangular points. Sides are straight to slightly rounded, with tips and barbs sharp. Two specimens which have tapering stems are further distinguished by slightly serrate edges. Stemmed points are made of chalcedony and dark chert.

*Drills.* The Glen Canyon collections include only two drills (Fig. 18). One is a complete specimen of the "large flanged" type (Haury 1950, Fig. 67); the other is a fragmentary example of the "flanged, straight base" type (Haury 1950, Fig. 67).

*Large knives.* The most common and characteristic stone artifacts found in Glen Canyon are large,

rather crude knives, the majority of which are leaf-shaped (Fig. 19). In the surface collections alone are 87 such implements from 34 sites.

Knives have been collected in all conditions and degrees of completion; probably more than half of the implements are unfinished or rejected. This situation makes it difficult to recognize legitimate typological distinctions within the group. There appear to be at least two distinct implement forms present, and the remaining mass of less specialized material falls into three additional "modal" types. Overall distribution of the five types is shown in Table 7.

Knife Type	Number of Specimens	Number of Sites
Squared base	16	12
Straight base and sides	10	9
Slightly rounded base and sides	6	4
Round Base (leaf-shaped)	44	22
Elongate	9	8
Intermediate	17	12
Broad	18	14
Unidentifiable fragments	27	19
TOTALS	87 Specimens	34 Sites

Table 7. Distribution of Glen Canyon knives by types.

Among the group of knives, an initial classification can be made between those with somewhat squared bases and distinct basal corners (Type I), and those which are leaf-shaped (Type II). In the former class are a number of implements which stand out both in form and in degree of finish as constituting a specialized tool type. These implements have rectangular bases. Sides are parallel or slightly tapering, so that the maximum width is attained at or near the base. There is consistent all-over thinning and careful retouch of the edges, which are straight and sharp enough to serve for actual cutting as opposed to chopping. None of the specimens was complete, and

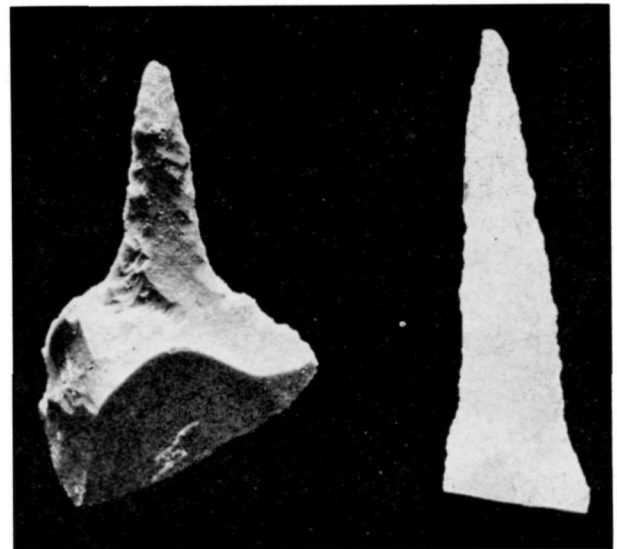


Fig. 18. Drills from NA6456, West Canyon. Length of left drill, 4.2 cm.

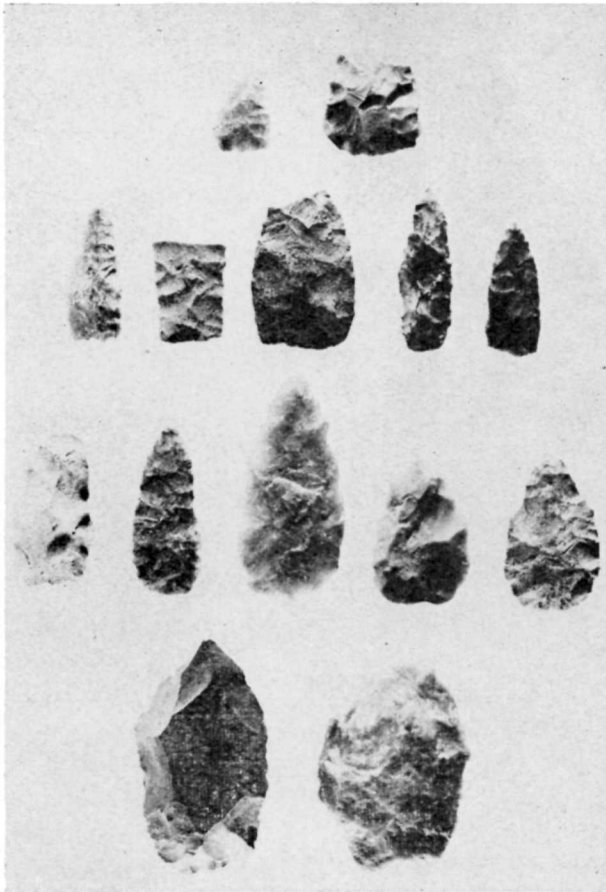


Fig. 19. Knife and knife-chopper types. Artifact length, lower left; 9.3 cm.

the full size range is not known. Widths for 11 specimens range from 23 to 33 mm., with an average of 29 mm. Average length would almost certainly be half again as great.

In addition to the well finished square-based knives, there are a number of implements which exhibit somewhat more rounded bases and sides, but still have definite corners. These implements are characterized by crude manufacture, with blunt points and no consistent retouch of the edge. It is unlikely that they constitute an intentional form as distinct from the less specialized round-based knives. Because of the consistently low quality of finish they seem to be clearly allied to the latter rather than to the well finished square-based points.

Leaf-shaped, round-based knives comprise the common form found in Glen Canyon. A few of the especially narrow examples, designated at the elongate type, stand out as a second distinct group. They are comparable in workmanship and finish to the finely made square-based points, but differ from them in having round bases and convex sides, with the maximum width at or near the midpoint of the

implement. The group as a whole shows a remarkable uniformity in size (average length 56 mm.) and shape.

Intermediate and broad leaf-shaped knives are consistently crude and lack intensive thinning and retouch. Working edges are commonly somewhat irregular and even zigzag, suitable more for chopping than for actual cutting. Some specimens show definite evidence of percussive use of the edges. Many of the implements may be rejects.

The intermediate and broad types intergrade to a considerable extent, and there is probably no valid functional distinction between them. The broad knives have an average width (38 mm.) equal to approximately two-thirds of their length (average 61 mm.), while in the intermediate specimens the width (29 mm.) is more nearly equal to half the length (average 53 mm.). The broad knives are commonly widest near the base, while the intermediate group is consistently widest near the midpoint, tapering toward the base and point. In both groups the points are usually blunt.

*Choppers and chopping tools.* In addition to projectile points and knives, Glen Canyon sites have yielded large numbers of other bifacial implements which may be conveniently classed as chopping tools. Represented are ovoids, knife-choppers, nodular choppers, and axes. Their overall distribution is shown in Table 8.

Implement Type	Number of Specimens	Number of Sites
Choppers and chopping tools	65	28
Ovoids	29	17
Knife choppers	23	13
Nodular choppers	10	8
Axes	3	1
Scrapers and scraping tools	38	19
Working edge all around	21	14
Large hemispherical (planes)	6	5
Small hemispherical (ovoid scrapers)	11	9
Elongate	4	4
Limited working edge	17	12
Nodular	5	4
Rough flake	4	4
Worked cobble	8	7

Table 8. Distribution of choppers and scrapers by types.

Ovoids (Fig. 20) constitute a special type of small chopping tool which was originally recognized at Ventana Cave (Haury 1950:256-7). They have many points of resemblance with the less specialized leaf-shaped knives, being distinguished from them chiefly in having no recognizable tip or point. They are bifacial, oval in outline, and have a rough working edge extending all the way around the implement. The edges, like those of larger choppers, consistently show extensive percussive use. Average size is comparable to that of the leaf-shaped knives (average length 47 mm.; average width 36 mm.), and many



Fig. 20. Percussion and pressure flaked ovoids. Artifact length, left; 4.7 cm.

specimens are quite probably knives which were broken in manufacture or use and converted to a secondary function. Materials employed in their manufacture are the same as those used in knives—principally jasper, chalcedony, and chert.

Knife-choppers (Fig. 19, bottom row) comprise a distinctive group of stone implements which are found throughout Glen Canyon. In form they are closely similar to the broad leaf-shaped knives, but their average size is over twice as great (average length 89 mm.; average width 58 mm.). Most specimens have a definite rounded base at one end and a blunt point at the other, although a few are rounded at both ends and thus resemble oversized ovoids rather than knives. Many knife-choppers have been made from rather flattened stream cobbles by bifacial flaking all the way around, leaving much of the original water-worn surface remaining on the two flat faces. None of the implements show any significant dressing of the edges, which, as in other choppers, are frequently battered. Despite the similarity in form there is no appreciable intergradation between the knife-choppers and leaf-shaped knives; there is, on the contrary, a consistent difference in the material selected for their manufacture. The great majority of knife choppers are made from quartzite, basalt, and metamorphic rocks rather than from the cryptocrystalline materials which were preferred for smaller implements.

Nodular choppers (Fig. 21) of the rounded type are considerably less common in Glen Canyon than are knife-choppers. They are small, roughly spherical stones having a crude, bifacially sharpened edge extending about halfway around their circumference. The angle of the working edge, even when not battered, is seldom sharp. Many seem to have been made from thick, nearly spherical stream cobbles in distinction to the flattened cobbles used for knife-choppers. On most nodular choppers a portion of the original patina remains on the surface opposite the working edge. The sharpened edge is often zigzag—the result of striking large primary flakes alternately from opposite sides.

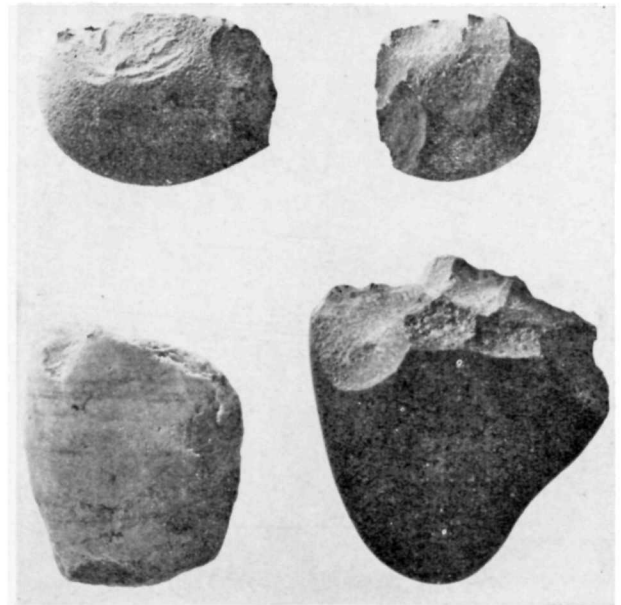


Fig. 21. Nodular choppers. Artifact length, lower left; 11.2 cm.

*Axes.* This form of chopping tool is scarce in Glen Canyon and only three specimens have been found. They are made by flaking and are notched for hafting, but lack ground surfaces (Fig. 22).

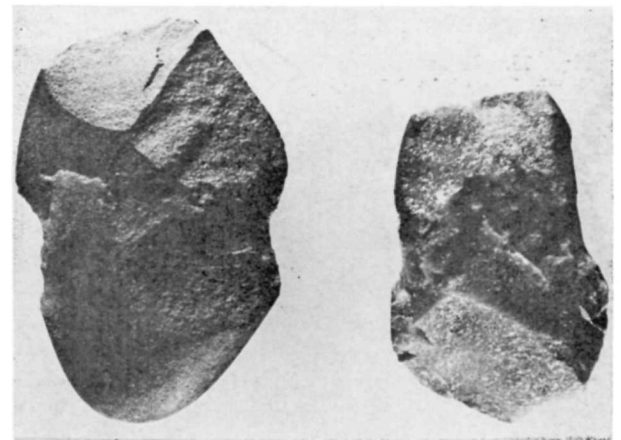


Fig. 22. Axes. Length of left artifact; 11.5 cm.

*Hammerstones.* Glen Canyon hammerstones are of two types, deliberately shaped nodules, and river cobbles which have been put to use without preliminary modification (Fig. 23). Implements in the former group are distinguished from nodular choppers only by the condition of their edges, which have apparently been battered away until they became unsuitable for their original purpose. Unshaped hammerstones are rather small, disk-shaped cobbles which show evidence of pounding around the perimeter.

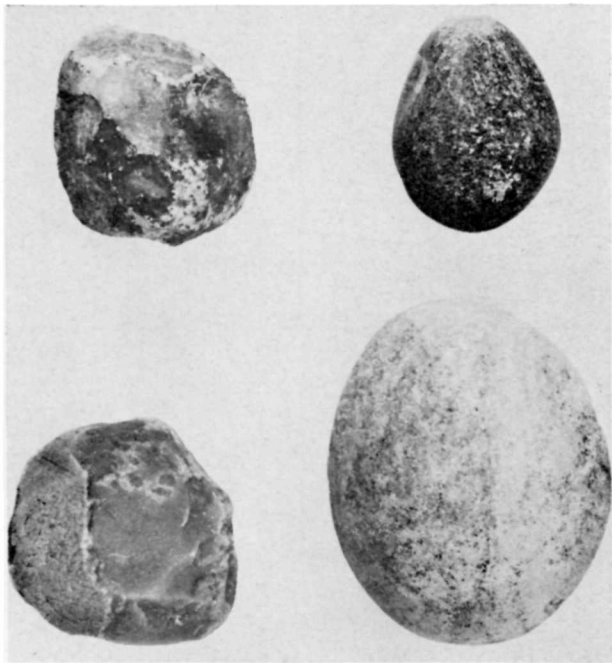


Fig. 23. Hammerstones, modified on left; right, natural hammerstones. Length of lower left artifact, 7.6 cm.

*Scrapers and scraping tools.* With the exception of a single graver, all of the uniface chipped implements in the Glen Canyon surface collections are classed as scrapers of one kind or another (Fig. 24). Such implements are comparatively rare in proportion to cutting and chopping tools, comprising less than one-sixth of the total assemblage of chipped stone artifacts. A basic distinction may be made between scrapers which have a working edge encircling the implement (Type I), and scrapers with a limited working edge (Type II). Within each of these groups are several variant types which may or may not have been designed for different specific purposes. Overall distribution of scraper types is shown in Table 8.

Most scrapers with a working edge all the way around are essentially hemispherical in form. Two distinct groups are represented. There are a number of large implements which might be called small planes (average length 74 mm.; average width 68 mm.). A group of much smaller scrapers correspond to Haury's (1950:232-4) "domed discoidal" scraper type. These latter bear a close resemblance in size (average length 42 mm., average width 33 mm.), outline, and material to the group of ovoid chopping tools. They are differentiated in being unifacial and hemispherical in cross-section, with much more steeply angled working edges which do not show evidence of percussive use. Allied to the small hemispherical scrapers are a few specimens which are generally similar but are greatly elongated and have a long oval outline instead of a round one. In these implements the

average length (64 mm.) is nearly double the average width (34 mm.).

Scrapers with limited working edges include "nodular" specimens, rough flake scrapers, and worked cobbles. Implements in the first group are somewhat akin to planes which have been partially broken away. They have the same large flat nether surface and high back (average length 70 mm.; average width 55 mm.; average thickness 31 mm.), but the usable edge extends only about halfway around the nether surface. In most cases the face opposite the chipped surface is vertical or slightly undercut. Viewed from above, nodular scrapers vary from semicircular to roughly rectangular in outline.

Rough flake scrapers have been made from heavy, somewhat elongated flakes by dressing down one or both of the long edges. There is no other deliberate modification. These implements do not intergrade with other tool types, and probably represent a secondary usage of fortuitous flakes.

Frequently encountered in Glen Canyon sites are large, somewhat flattened stream cobbles (average length 103 mm.; average width 78 mm.; average thickness 39 mm.) which have had a few large flakes removed from one end or side to produce a uniface working edge. These objects, which are nearly all of quartzite, show no definite signs of wear, and it may be questioned whether they constitute finished tools. The consistently unifacial character of the chipped edge suggests that they were intended for scraping rather than percussive use. An alternative is that the craftsmen were testing the stone for quality.

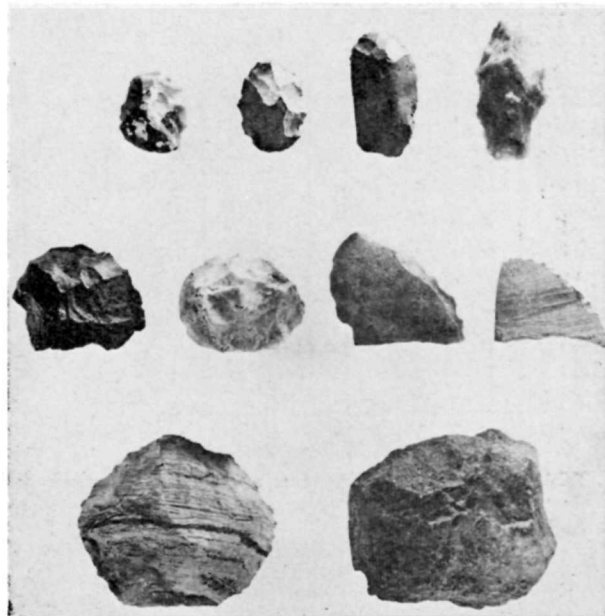


Fig. 24. Scraper types. Artifact diameter, lower left; 10 cm.

Site Number	Components				Horizon			Site Number	Components				Horizon																				
	Structure	Pottery	Lithic	Petroglyph	Trail	Anasazi	Navajo-Paiute		Lithic	Petroglyph	Trail	Unknown	Structure	Pottery	Lithic	Petroglyph	Trail	Anasazi	Navajo-Paiute	Lithic	Petroglyph	Trail	Unknown										
2689	X	X	X	X	X	X	-	-	-	-	6423	X	-	-	X	X	X	X	-	-	-	6423N	X	-	-	X	X	X	X	-	-	-	
2690	X	X	X	-	-	X	-	-	-	-	6424	X	X	X	X	X	X	X	-	-	-	6426	-	X	X	X	-	X	-	X	-	-	
2691	X	X	-	-	-	X	-	-	-	-	6426N	X	-	-	-	-	-	X	-	-	-	6428	X	-	-	X	X	-	X	-	-	-	
2692	-	X	X	X	-	X	-	-	-	-	6429	X	-	-	-	X	-	X	-	-	-	6442	-	-	X	-	X	-	-	X	-	X	
3731	X	X	-	-	-	X	-	-	-	-	6443	-	X	X	-	-	X	-	-	-	-	6444	(see excavation section)				6445	(see excavation section)					
3732	(see excavation section)										6446	-	X	X	-	-	X	-	-	-	-	6447	-	-	X	-	-	-	-	X	-	-	
3733	X	-	X	-	-	X	-	-	-	-	6448	X	-	X	-	-	X	-	-	-	-	6449	-	X	X	-	-	X	-	-	-	-	
3734	X	-	-	-	-	?	-	-	-	-	6450	(see excavation section)				6451	-	X	X	-	-	X	-	-	-								
3735	(see excavation section)										6452	X	-	X	-	-	-	X	-	X	-	6453	-	-	X	-	-	-	-	X	-	-	
3736	X	-	X	X	-	?	-	-	-	-	6454	X	-	-	-	-	-	X	-	-	-	6455	X	-	-	-	-	-	X	-	-	-	
3737	X	-	-	-	-	?	?	-	-	-	6456	(see excavation section)				6457	X	X	X	X	-	X	-	-	-								
3738	X	-	X	-	-	X	-	-	-	-	6458	X	X	-	-	X	X	X	-	-	-	6459	-	-	-	-	X	-	-	-	-	X	
3739	X	X	X	-	-	X	-	-	-	-	6460	-	-	X	X	-	-	-	-	X	-	6461	X	-	-	-	-	-	X	-	-	-	
3740	-	X	X	X	X	X	-	-	-	-	6462	X	-	-	-	-	-	X	-	-	-	6463	-	-	X	-	-	-	-	X	-	-	
3741	X	-	X	-	X	-	X	-	-	-	6464	-	-	X	-	X	-	-	-	X	-	X	6465	X	-	-	-	-	-	X	-	-	-
3742	-	X	-	X	-	X	-	-	-	-	6466	X	X	X	-	-	X	-	-	-	-	6467	-	X	X	-	-	X	-	-	-	-	
3743	X	-	X	-	-	?	-	-	-	-	6468	X	-	-	-	-	-	X	-	-	-	6469	-	-	-	X	-	-	X	-	-	-	
3744	-	-	-	X	-	-	-	-	X	-	6470	X	X	X	-	X	X	-	-	-	-	6471	-	-	-	-	X	-	-	-	-	X	
5247	X	X	-	-	-	X	-	-	-	-																							
5248	-	X	X	X	-	X	-	-	-	-																							
5249	X	-	-	-	-	X	-	-	-	-																							
5250	X	-	-	-	-	X	-	-	-	-																							
5251	-	X	-	-	-	X	-	-	-	-																							
5252	X	X	X	-	X	X	X	X	-	-																							
5253	X	X	X	-	X	X	X	-	-	-																							
5369	X	X	X	X	-	X	-	-	-	-																							
5370	X	X	X	-	X	X	-	-	-	-																							
5504	X	-	X	-	-	?	-	-	-	-																							
5977	-	X	-	-	-	?	-	-	-	-																							
5983	X	X	X	-	-	X	-	-	-	-																							
5984	-	X	X	X	X	X	-	-	-	-																							
5985	X	-	-	-	-	?	-	-	-	-																							
6415	-	-	X	X	-	-	-	X	X	-																							
6416	-	-	X	-	-	-	-	X	-	-																							
6417	X	-	-	-	-	?	-	-	-	-																							
6418	-	X	X	-	-	X	-	-	-	-																							
6419	-	X	X	X	-	X	-	-	-	-																							

Table 9. Cultural components and cultural horizons of Lower Glen Canyon sites.

Site Number NA:	Components				Horizon				Site Number NA:	Components				Horizon								
	Structure	Pottery	Lithic	Petroglyph	Trail	Anasazi	Navajo-Paiute	Lithic		Petroglyph	Trail	Unknown	Structure	Pottery	Lithic	Petroglyph	Trail	Anasazi	Navajo-Paiute	Lithic	Petroglyph	Trail
6420	-	-	-	X	-	-	-	-	X	-	-	X	-	X	-	X	-	X	-	X	-	-
6421	X	-	X	X	-	?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6422	-	-	X	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6475	X	-	-	-	X	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6476	-	-	-	-	X	-	-	-	-	-	-	-	X	-	-	-	-	-	-	X	-	-
6477	-	-	-	-	X	-	-	-	-	-	-	-	X	-	-	-	-	-	-	X	-	-
6478	-	-	X	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6479	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-
6480	X	-	-	X	X	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6481	-	-	-	-	X	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-
6482	-	X	X	X	-	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6483	-	X	X	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6484	-	X	X	X	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6485	X	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6486	-	X	X	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6487	-	-	X	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6488	X	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6489	X	X	X	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6490	X	X	X	-	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6491	-	-	X	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6492	-	-	X	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6493	(see excavation section)																					
6494	X	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6495	-	-	X	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6496	X	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6498	-	X	X	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6499	-	-	X	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6501	-	-	X	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6502	X	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6503	-	-	X	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6504	-	-	X	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6472	X	-	X	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6473	-	-	X	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6474	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6505	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6506	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6507	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6508	-	X	X	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6509	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6510	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6511	-	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6512	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6874	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6892	X	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6893	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7136	X	X	X	X	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7137	-	X	X	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7139	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7140	X	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7141	-	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7142	X	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7143	-	-	X	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7144	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7145	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7226	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7227	-	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7228	-	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7229	-	-	X	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7230	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7231	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7232	X	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7233	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7234	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7235	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TOTALS	61	49	84	25	32	55	33	39	4	10												

Table 9 (cont.). Cultural components and cultural horizons of Lower Glen Canyon sites.

*Manos*. *Manos* make up nearly the entire collection of ground stone from the surface of Glen Canyon sites. All specimens are of the one-hand variety, and all but one are bifacial. In size and other character-

istics they vary considerably. Both outlines and cross-sections range from nearly round to rounded rectangular. Grinding faces are only slightly convex, with distinct shoulders in most specimens. Eight of 12



manos are made from a hard white sandstone probably derived from the Dakota formation. Examples of mano forms are shown in Fig. 34.

*Metates.* Slab metates are reported from several sites. They are thin slabs of sandstone with an irregular rectangular outline. A very shallow oval depression in one of the flat faces constitutes the grinding surface. Metate types other than the slab variety are rare in Lower Glen Canyon (Fig. 25).

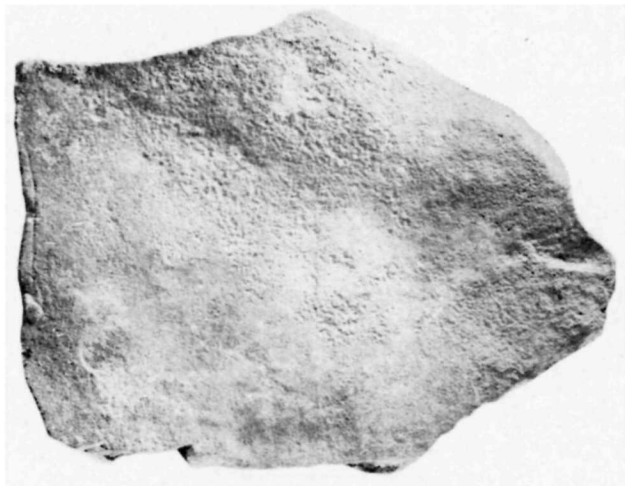


Fig. 25. Slab metate used in side of fire hearth at bottom of Trench 1, NA6444. Length is 41.5 cm.

*Miscellaneous ground stone.* Several natural waterworn pebbles whose flat surfaces show evidence of abrasion were collected from a Lower Glen Canyon site. They also show battering of the ends. A number of fragments of incised sandstone were also collected.

*Workshop debris.* Recognizable and finished artifacts, as describes in preceding paragraphs, actually make up less than one-third of the total collection of lithic material from Lower Glen Canyon. The remainder of the material consists of an infinite variety of chips, cores, broken or rejected implements, and other workshop debris. Much of this material, although not catalogued, was collected for study wherever practicable. No fewer than 84 sites yielded lithic collections of one kind or another.

*Summary.* The very large masses of lithic debris encountered, indicate clearly that the manufacture of stone tools was one of the major industries of Lower Glen Canyon. Workshop refuse is found both in association with habitation sites and in isolated assemblages. The materials encountered are, almost uniformly, those which may be found among the stream cobbles or on gravel terraces throughout the canyon. (One Glen Canyon site yielded four artifacts and numerous chips of obsidian, a material which may have been imported.) There is an overwhelming preponderance of chert, chalcedony, and jasper. The

chip collections seem to indicate that in their use of these materials the prehistoric inhabitants of the region had a preference for red implements. In the case of jasper, however, there seems to be an even more pronounced selection in favor of yellow.

Fragmentary and rejected implements among the lithic debris conform closely to the tool types which are found in the region. Particularly prevalent are fragments of the broad leaf-shaped knife which is so characteristic of Lower Glen Canyon. The preponderance of rather small flakes is in keeping with the very high percentages of knives and projectile points, as compared with larger implements, which are found in association. The lithic collections contain numerous examples of unmodified flakes and chips which show sign of accidental or incidental use.

### Petrographs

Among the prominent prehistoric remains in Glen Canyon are a number of extensive and spectacular petroglyph panels. In particular, sites NA3742, NA5369, and NA6419 have received repeated attention from canyon visitors, and have been described in a paper by Foster (1954). In all, 25 petroglyph and pictograph locations have been recorded in Lower Glen Canyon. About half were found in association with other cultural remains.

Pecked and incised figures, found at 20 locations, are distinguished by extreme variability both in size and form (Foster 1954:16-7). Anthropomorphs range from miniatures 10 cm. high to figures approaching life-size, and include numerous rectilinear and curvilinear stylizations as well as a few naturalistic forms. Zoomorphs occur in equal variety, the most common form being the bighorn sheep shown in profile. Geometric figures range from simple circles and spirals to highly complex rectilinear patterns, some of which verge on the abstract (Foster 1954:16, Fig. 14). The data which have been collected concerning Lower Glen Canyon petroglyphs will constitute a separate report (Turner, in preparation).

Painted figures in red, white, purple, and blues have been reported from only three locations in the whole of Lower Glen Canyon. They are primarily curvilinear geometric figures, but include also some very large square-shouldered anthropomorphs (Foster 1954:15, Fig. 13). The latter occur in association with petroglyphs at NA2689.

### Footholds and Trails

A final group of cultural remains commonly found in Glen Canyon, and which were recorded by the MNA surveys, are pecked footholds or "Moki steps" (Fig. 26). They are found in many parts of the region, but are especially common in lowermost Glen Canyon and its tributaries, where low-dipping strata

make access to the canyon bottoms comparatively easier than is true further upstream. From the San Juan River to Navajo Creek foothold trails can be found leading from the canyon rim to nearly every alluvial terrace along the river. There are also numerous trails leading into, and in some cases across, the principal side canyons in this region. Over 30 trails have been located in the Lower Glen Canyon region, the majority of which are clearly associated with historic or prehistoric habitations.

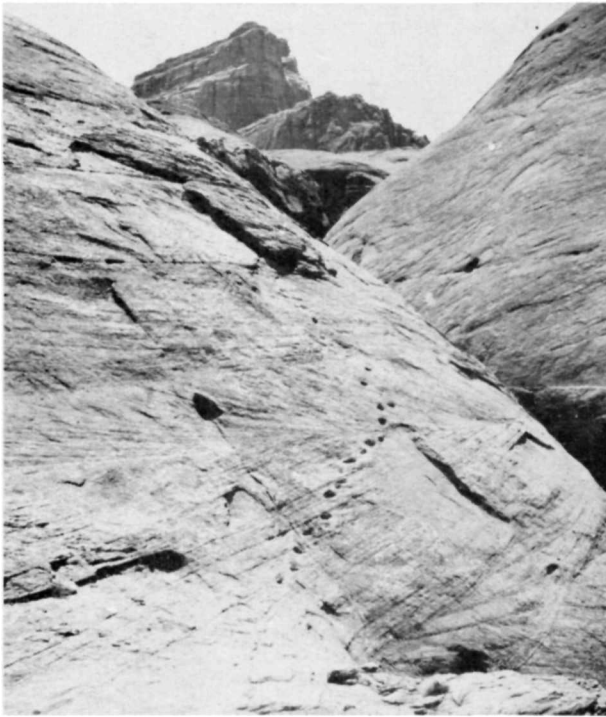


Fig. 26. Prehistoric trails cut into rock are typically circular cup-shaped hand-and-toe holds. The distance between holds, their raised marginal shelf, weathered surfaces, and location, often on precipitous inclines, clearly show their intended singular use by man—livestock cannot possibly use them. These steps are at Spring Canyon.

Foothold trails can be divided into two general groups, those which have been made by modern Navajos, and those which are of prehistoric origin. Navajo footholds are readily distinguished by the marks of sharp-pointed tools used in cutting them, and by the fact that the individual steps are often 50 cm. and more wide, in order to facilitate their use by domestic livestock. In addition, they are frequently accompanied by other examples of trail architecture such as built-up stone ramps, log cribbing, and drift fences (Fig. 27). Some Navajo trails entering main Glen Canyon do not give access to habitations, but have been developed to permit sheep, goats, and horses to graze and water on the alluvial flats beside the Colorado River.



Fig. 27. Navajo-Paiute stock trails are characterized by platform steps and low outer rails to keep animals toward the uphill side. Platform steps are often pecked where they are unnecessary for a man to climb, but have been built to prevent strays from rimming-out and to keep the flock together in dangerous places. This trail is at the downstream end of West Canyon Bar.

Prehistoric trails remain in the form of series of small, pecked cup-shaped holes which are rarely more than 10 cm. wide and 5 cm. deep. In most cases there is a distinct line of steps for each foot, the two lines being approximately 25 cm. apart. Prehistoric and Navajo-made steps are very often found side by side, suggesting that the modern inhabitants may have deliberately sought out prehistoric trails as a guide in developing their own routes through the canyon region.

## CULTURAL HORIZONS IN LOWER GLEN CANYON

### Discussion

Many of the aboriginal culture elements found in Lower Glen Canyon are easier to describe than to interpret. Of the total range of material found, only a small portion can be considered as diagnostic of any given time period or culture type. Such relatively specialized culture products as habitation structures, pottery, and modern manufactured goods afford the the best clues as to when and by whom the canyon

area was occupied (see Table 9). Unspecialized stone tools, pecked footholds, and other products narrowly limited by functional considerations do not reveal the identity of their makers with the same clarity.

On the basis of present knowledge only two aboriginal culture horizons can be definitely identified in Lower Glen Canyon: An Anasazi occupation centering probably in the 12th and 13th centuries A.D., and a Navajo-Paiute occupation confined, largely if not exclusively, to the past century and continuing into the present. Approximately two-thirds of the surveyed sites can be assigned to one or the other of these horizons. There remain a large number of sites which lack diagnostic culture elements and cannot, at the present time, be assigned with certainty to any culture or time period. Although probably prehistoric, they may be remains either of the Anasazi or of other, as yet unrecognized, inhabitants who preceded or followed them. A few Navajo sites clearly represent reoccupations of prehistoric localities and have been assigned to more than one culture horizon. In addition, a few prehistoric sites contain elements which are not clearly in association. These also have been tentatively assigned to more than one culture horizon.

#### Anasazi Sites

Anasazi sites in Glen Canyon are clearly identified by distinctive ceramic remains and, to a lesser extent, by masonry structures. On the basis of the pottery types so far identified (Table 4) there can be no doubt that the occupation was largely by people of the Kayenta Branch during the 12th and early 13th centuries A.D., although it may have begun slightly earlier. Not all Anasazi sites are definitely assignable to this period and branch, but at the present time none can be attributed to any other Puebloan branch or period. The great majority of the pottery types present are those which are presumed to have been made in the nuclear Kayenta area, south and east of Glen Canyon. Western peripheral types (Virgin Series, Tusayan White Ware and Virgin Series, Tusayan Gray Ware) reflect social relations with peoples west of the Colorado as well.

Occasional fragments of Jeddito Yellow Ware and Awatobi Yellow Ware have been found at several locations in Lower Glen Canyon on or near the present day surfaces of prehistoric and Navajo sites.

About half the Pueblo II-III Anasazi sites in Glen Canyon are marked by masonry structures and cists. A few of these sites lack pottery, and for this reason can only be tentatively identified as to cultural affiliation and time period. Cists, in a number of sites, have been attributed to a Basket Maker horizon by earlier visitors in Glen Canyon. However, cists are a

definite feature of many Pueblo III sites and they cannot themselves be regarded as a Basket Maker diagnostic. Anasazi sites also yielded considerable quantities of lithic material and many have, in addition, petroglyphs and foothold trails in association.

Fifty-five Lower Glen Canyon sites have been definitely or tentatively assigned to the Anasazi culture horizon. The great majority are shelter and cliff sites. They are found in all parts of the main canyon and in most of the major tributary canyons. Anasazi sites on the Carmel terrace, away from water and soil resources, are widely scattered.

#### Navajo-Paiute Sites

Navajo-Paiute sites in Glen Canyon are marked by the presence of such historic products as tin cans, bottles, and iron tools, and by the general absence of their prehistoric counterparts. Fragments of chipped stone are frequently found around Navajo camps, and were probably made or at least used by their inhabitants. Lithic as well as ceramic debris in any quantity must usually be attributed to a previous occupation.

All but half a dozen Navajo sites include some form of shelter, sometimes a stone or log-walled hogan but more often a small ramada or brush shade. Sites including more than one habitation are rare. The structures, the total absence of agricultural arrangements, and meager trash deposits indicate that the sites constitute outlying and infrequently occupied family sheep camps rather than permanent Navajo residences (Kluckhohn and Leighton 1946:45). Corrals, lamb pens, and domestic livestock droppings are common features of these sites and Navajo-made trails are frequently found nearby.

In Lower Glen Canyon, 33 sites have been assigned to the Navajo-Paiute horizon. These sites are found primarily in the area south of the Colorado River and west of Cummings Mesa—the portion of the Glen Canyon Basin which is most readily accessible overland. Navajo sites are about equally distributed between the main canyon, the major tributary canyons, and the Carmel terrace above them.

#### Sites of Unknown Horizons

Over one-third of the aboriginal sites in Glen Canyon cannot at the present time be placed in any known culture horizon; they may be attributable to the Anasazi, the Navajo-Paiute, or to other occupants yet unidentified. Such sites are, in general, those which are limited to a single type of culture product: lithic material, petroglyphs, pecked foothold trails, or lithic workshops.

*Lithic Sites.* The most common and certainly the most intriguing of the unclassified sites are those which consist exclusively of lithic artifacts and debris.

The quantities of chips, cores, and rejects, and the relative scarcity of finished implements, make it obvious that the majority of these sites constituted workshop areas. They are widely scattered over alluvial and gravel terraces in all parts of Glen Canyon and the adjoining platforms wherever extensive deposits of Pleistocene gravels are found. Altogether 39 purely lithic sites have been recorded, of which virtually all are open sites. Some of the largest of the workshop areas extend over several acres.

A distinct possibility exists that the lithic sites may belong to the same culture horizon as the ceramic sites—that they are specialized workshop areas where the Anasazi people made the tools which they subsequently used in their homes. Many of the tool types found at lithic and habitation sites are identical. On the other hand, a comparative study of present collections suggests both quantitative and qualitative differences between the lithic complex of the workshop sites and that of the Anasazi habitations. For this reason the possibility must be retained that the lithic remains mark an entirely separate occupation of the

Glen Canyon area, which could be anything from pre-Basket Maker at the one extreme to proto-historic Paiute at the other.

*Petroglyph Sites.* Four Lower Glen Canyon sites consist exclusively of petroglyphs and over a dozen petroglyph panels have associated ceramic refuse or habitation structures. Five developmental style horizons are currently recognized and two have definite time associations—the Pueblo II-III petroglyph-ceramic association, and the Navajo-Paiute picture writing (Turner, in preparation).

*Prehistoric Trails.* Foothold trails and steps not directly associated with other material culture items are a final class of items whose origin cannot be specifically determined. Like the isolated petroglyph sites they are of questionable cultural affiliation; trails of the small, rounded toe-holds are found in many parts of Glen Canyon, and are likely attributable to the Anasazi. However, it would have been equally necessary for any other prehistoric people to make footholds in gaining access to some parts of Glen Canyon, and it cannot therefore be taken for granted that all prehistoric trails are of Anasazi manufacture.

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## EXCAVATIONS, 1958

Excavations at selected sites began in the late summer of 1958 after the gross characteristics of the prehistoric occupation, along the river in Lower Glen Canyon, was ascertained by surface survey. Sites discussed here do not represent the total range of site locations and types, as they are only the ones excavated to 1958. Work done in 1959 and 1960 will complete the immediate excavation program of salvaging those critical sites threatened by the diversion dam. Sites to be inundated by the completed Glen Canyon Dam will constitute still later reports.

Each excavated site was chosen for intensive study because of its potential contribution. This was determined by its location, the nature and quantity of occupation debris, and its position in the site pattern and distribution. The excavated sites, classified in terms of site type and location are: Open, main canyon, NA6445, NA6493; Shelter, main canyon, NA6444; Shelter, tributary canyon, NA3732, NA6450; Cliff, tributary canyon, NA6456.

### NA3732

#### History

This site, from appearances, has probably been visited by more people than any other in the Glen

Canyon. The cliff walls near the terminus of the Rainbow Bridge Trail bear signatures witness to the frequent visitation by tourists and explorers and their use of this shelter as a camping ground (Freeman 1924: 155-6). Recent visitors have caused many of the features of the site, reported in the 1930's by the Rainbow-Bridge—Monument Valley Expedition, to be ruined or obliterated.

Archaeologically the site is known from several surveys, including Steward's, Site 16 (Steward 1941: 343), and the Rainbow Bridge—Monument Valley Expedition, Site 705 (Rinaldo 1935:2).

#### Location and Physical Description

NA3732 is situated about 10 m. above and north of Aztec Creek at the mouth of Forbidding Canyon, a meter or so below elevation 3263.55 ft. (Bureau of Reclamation Bench Mark.)

Vertical cliffs of Navajo sandstone, varying between 40 to 60 m. high and 50 to 100 m. apart, enclose Aztec Creek. At the site the cliff wall has formed a protective, crescent-shaped shelter over a ledge of Kayenta formation 2 to 5 m. wide. It is upon this ledge that the prehistoric remains rest (Fig. 28).



Fig. 28. This overall view of NA3732, located at the mouth of Forbidding Canyon, shows Glen Canyon Project personnel engaged at work near the standing masonry; running water of Aztec Creek; the seep at the contact zone of the Navajo sandstone and Kayenta formation. The foremost masonry column has been dismantled to ascertain some clue to its function.

Aztec Creek, a perennial stream passing immediately below the site, rises on the southern slopes of Navajo Mountain in southern Utah and northern Arizona and flows north in Forbidding Canyon for ten or more miles to its confluence with the Colorado River. During flood season, silt laden water from the Colorado River enters the mouth of Aztec and rises to within a few meters of the site. At other times of the year the stream flows past the site shallow and clear, at the rate of several hundred gallons per minute. Seeps and one spring are found at the site, flowing from the contact zone of the Kayenta formation and Navajo sandstone.

Flora in this canyon has been described by Flowers (1959:50). Plants cover the front slopes of the shelter; yucca and grasses are especially numerous.

Direct sunlight plays over the site from morning to early afternoon. The high broad arch of the site

allows rain to dampen the front portions of the shelter, but precipitation seldom reaches the rearmost deposits. Gusty winds carry dust and sand from nearby Colorado River sandbars into the mouth of Forbidding Canyon and powder the site.

The Kayenta shelf, upon which the ruins and trash deposits rest, is approximately 30 m. in length and 2 to 5 m. in width. A sharp drop off occurs at the streamside and a low angled ledge of sandstone rises above the Kayenta surface to afford a shelter less than 1.5 m. high.

At the extreme western end of the site is a prehistoric hand and foot trail which ascends from the same level as the site to a point of access onto the stripped Navajo sandstone slope. East of the steps are the remnants of two masonry rooms, north of which stand three masonry columns. Roughly east of these features lies the larger portion of the crescent-shaped

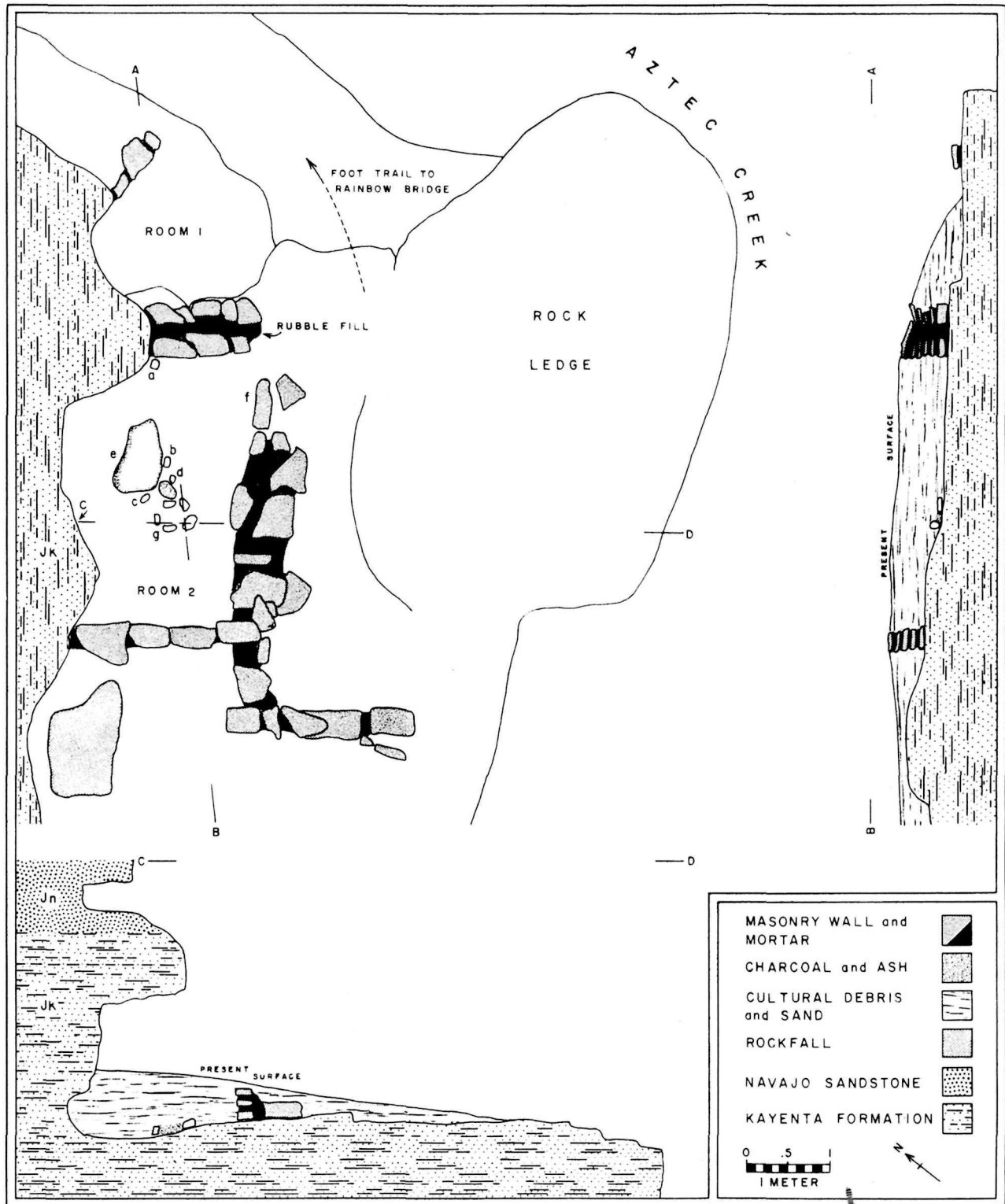


Fig. 29. NA3732. Plan and cross-sections of Room 1 and 2. a, chopper; b, mano; c, mano; d, chopper; e, metate; f, door sill; g, hearth.

shelter. Rooms known to exist at the center of the shelter in the 1930's are now obliterated. Dry and moist trash deposits occupy the eastern half of the shelter. Dried leaves and other perishable materials are scattered over the site.

#### Surface Indications

Sherds, lithic debris, stone tools, and vegetal matter were abundant around the architectural unit on the west, while scant lithic chips, perishables, and charcoal lenses were seen in the eastern section. Tin cans, film wrappers, hearths, and sleeping places of 20th century campers were common everywhere.

#### Problem

Salvage work was undertaken to gather information about the architectural remains, cultural affinities, differences in trash deposits, and reasons for the construction of the masonry columns.

Archaeological investigations consisted of: Excavating two masonry rooms; dismantling one masonry column; testing the debris behind a masonry wall; and testing a portion of the dry midden.

#### Rooms 1 and 2

Unplastered walls of two rooms at the western end of the site are partially sheltered by a shallow rock overhang of Navajo sandstone, which rises above the Navajo-Kayenta contact some 15 m. (Fig. 29).

*Room 1.* This architectural unit, almost 2 m. square, occupies the narrowest portion of the undercut ledge with the cliff face to the north acting as both rear wall and ceiling for the room. Because of the vertical drop off of 1.5 m. to a lower ledge, no refuse or living space lay outside of the structure. Three sandstone blocks in alignment, abutting against the cliff wall and resting on the sandstone ledge, comprised the north wall. The west wall was built of sandstone slabs of variable thickness, laid up in courses which were not level or evenly matched. Although Rooms 1 and 2 adjoin, the west wall of Room 1 is structurally independent of the east wall of Room 2. From a common abutment against the cliff wall, the two walls diverge slightly to the south, the gap between these two being filled with rubble of spalls and mortar. The front wall of Room 1 is missing, but a low ridge of adobe indicates the wall's position. The shallow, disturbed, room fill contained fragments of string, paper, and macaroni mixed with sherds, lithic chips, and stone tools, at floor level. Small patches of a level, hard-packed clay floor, 10 cm. thick adhered to the sandstone adjacent to the rear wall. No other features were observed for this room.

*Room 2.* Beneath a maximum point of overhang at the extreme western end of the site lay an accumu-

lation of refuse and fallen masonry. This rested on a broader portion of the ledge than Room 1, being about 5 m. wider at its maximum extension. Beyond this ledge is a vertical drop of about 4 m. to the streambed of Aztec Creek. Room 2 was built to the rear (north) of the ledge, adjacent to the cliff overhang which formed the back wall and partial ceiling (Fig. 30).

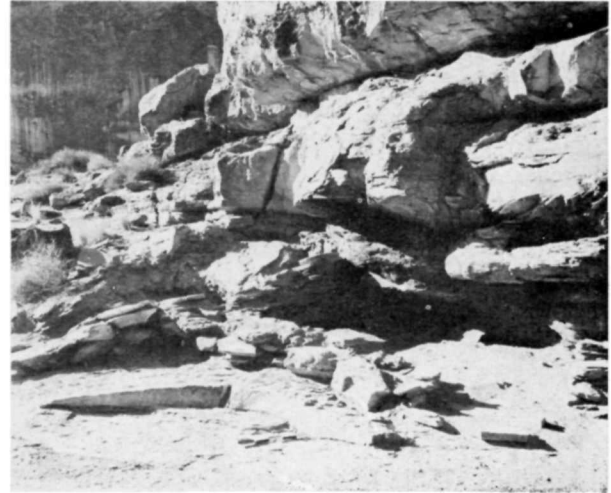


Fig. 30. NA3732, Room 2.

Of the three walls that form this structure only the west wall is well preserved. It is well built, constructed of thin, long slabs of sandstone laid up on even and nearly level courses. Next to the cliff the present wall height is about 1 m. The east wall was of similar construction but in poorer condition, as was the front wall. Numerous slabs, similar to those used in the standing masonry, were found in the room fill indicating wall heights greater than those found upon excavation. Small amounts of mortar and numerous sandstone spalls were used for construction. The masonry at the southeast corner of the room was gone.

The unplastered wall stones were faced on the room interior only, leaving the exteriors of the wall rough and ragged. The doorway to Room 2 was marked by a sandstone slab sill 60 cm. wide resting on bedrock, in the outside (south) wall.

The fill of Room 2 consisted of fine, soft wind-blown sand mixed with fallen masonry and considerable amounts of exfoliation spallage from the overhanging ceiling. The fill, removed as a block because of the obvious disturbance within the deposits, contained sherds, lithic chips and flakes, occasional bits of paper, and string. Also found were one mano and five unmodified stream cobbles of light colored sandstone—perhaps once intended for manos. Beyond the

outside wall was an accumulation of refuse and a large quantity of charcoal almost 40 cm. deep against the wall.

The floor was found only adjacent to the outside wall. Elsewhere soft, unconsolidated sand took the place of the hard-packed floor surface.

Between the floor level and bedrock the following items were found: Accumulation of ash and charcoal bordered by bits of fire-blackened sandstone; two manos, two choppers; a thick sandstone slab, (Kayenta formation), which may have been a metate; and fragments of corrugated and black-on-white vessels. Fragments of the same corrugated jar were found scattered through the room fill, on the present day surface, and in Room 1.

For the major portion of the floor space the overhanging cliff formed a natural roof, about 1.5 m. above the "floor." The unprotected portion of the room projected beyond the overhang and must have had a constructed roof. A mass of heterogeneous charcoal overlaying the floor in the southern half of the room is considered to be roofing material. No pattern could be determined from the burned materials except that no remains of large beams were seen. Other features in Rooms 1 and 2, such as postholes, vigas, subfloor pits, and mealing bins, were conspicuous by their absence.

A westward extension of the outside wall of Room 2 abuts at a right angle to another section of wall. This structural remnant may have served as a wall for another room to the west of Room 2 or as a windbreak against wind and blowing sand from the river. Evidence for additional rooms lying south and west was destroyed by a large rock fall less than a meter from Room 2.

*Summary.* Room 1 was small in floor space, lacked ample headroom, and produced very little trash. Because of these factors, and its proximity to Room 2, it is believed to have been a granary or storage unit. Room 2 is large enough for sleeping, has standing height, and had much trash inside and out. Also, artifactual material was found on or near the floor level. For these reasons it is likely that Room 2 was a habitation-dwelling unit.

### Masonry Columns

About 2 m. north and "just around the corner" from Room 1 are three unique masonry columns, which for many years have been the main attraction of this site (Fig. 31). A brief description of the masonry units appears in Steward (1941:343). They are solid rectangular blocks built up of coursed sandstone slab masonry, and bear no resemblance to other masonry structures here or elsewhere in the Glen Canyon Region.



Fig. 31. Construction details of the three masonry columns located at NA3732, Forbidding Canyon.

These structures were built on the same ledge of the Kayenta formation as Rooms 1 and 2, but at a slightly lower level. The ledge at the site of the columns is roughly the width of the masonry units, ranging from 1.2 m. at its narrowest point to 2 m. at its widest. Above the ledge the sandstone cliff rises 15 to 20 m. high to an overhang of 2 m. depth.

The columns were devoid of any exterior features with the exception of one rectangular opening, 12 by 20 by 40 cm. in the east face of the northernmost structure. The identically constructed columns are all about the same height, 1 to 1.5 m., and are equidistantly spaced. None of the units displayed evidence of a finished top or surfacing cap of sandstone or mortar.

Dismantling of the eastern column was begun at the top working progressively downward, thus revealing the construction details in reverse. The average weight of each slab was 25 lbs.; several slabs weighed more than 100 lbs. and would have required more than one person to lift them into position. Slabs were placed in a rectangular form and were built upward in a counter-clockwise direction. This formed a continuous series of interlocking stones that made an almost solid rectangular column abutting the cliff wall. The slabs did not meet in the center of the structure; the hollow core which was left was filled with loose rubble and small rocks. Mixed with the rubble were stone chips, one eight row corn cob, a peach seed, modern cotton string, paper, and other presumed pack-rat materials.

A sandy clay mortar was used sparingly between courses. Due to the varied thickness of the slabs the courses were not uniform and even, but some attempt was made to keep them level. The inner ends of the exterior surfaces were well faced and aligned vertically but the building blocks were not faced. Bonding at each corner occurred as the natural result of the method of construction.



Artifacts were not found within or beneath the dismantled column. An irregularly shaped hearth of gray ash, plus several lithic chips, lay at its base. A small mountain sheep petroglyph is present on the cliff face between the southern and middle columns.

Steward (1941:343) mentions "A large, tumbled block of masonry . . ." lying to the north of the dismantled structure. The tumbled masonry may well have formed a fourth column to the triad standing today, although nothing remained of this rubble in 1958.

*Summary.* The columns constructed in the Kayenta masonry style are assumed to have been built at the same time as Rooms 1 and 2, which contained Kayenta pottery types. The purpose for which the columns were intended could not be determined. The possibility that the columns were built during historic times should not be entirely discounted.

### Test 1

Approximately 15 m. northeast of the masonry columns are the remains of ". . . a crude masonry retaining wall" (Steward 1941:343). This wall, built at the mid-portion of the shelter against the cliff, is beneath the maximum point of overhang formed by the Navajo sandstone cliff and directly above the only producing spring at the site.

In this eastern section of the shelter the relatively level and high ledges of the western end give way to a sloping ledge composed of many narrow steps weathered from the Kayenta formation (Fig. 32). Here the sandstone is coated with a limy deposit from the seep zone to the stream level. Knee high vegetation, watered by the seeps, forms a dense tangle on the sandy surface which covers the sandstone ledge.



Fig. 32. Construction detail of the retaining wall at NA3732, Forbidding Canyon.

A masonry wall constructed of unfaced sandstone slabs laid up in uneven layers rests upon the Kayenta formation. The wall was not supported by cross walls perpendicular to the cliff. Small amounts of mortar and spalls were used for internal support. From a structural viewpoint, this wall is similar to the wall section excavated at NA3735.

The fill retained behind the wall was composed of a mixture of detritus, windblown sand, and large and small roof spalls. Artifacts or cultural debris were not encountered in the fill which was removed as one level.

*Summary.* Temporal placement and cultural affiliation of this structure are questionable, although we believe the wall was built at the same time as the other structures at this site. Its function may have been an occupation or habitation surface, a house platform, a built-up horse trail, or an agricultural terrace.

### Trench 1

Blow sand, rock fall, and detritus form a platform several meters wide over the stripped ledge previously described for Test 1. This platform extends across the eastern portion of the shelter protected by the high overhang. A few plants were growing on the midden at the time of excavation. The scant cultural debris showing on the surface of the midden was marked by a few lithic flakes and chips and trash-stained sand; this spot is favored by tourists for camping and as an access to the Rainbow Bridge Trail.

A trench, 1 m. wide and 4 m. long was dug in the broader and dryer portion of the midden deposit. In cross-section the midden becomes shallow, (15 cm.) next to the cliff wall, and relatively deep, (70 cm.) at the terminus, against a large slump boulder. Sterile, orange, aeolian sand and the Kayenta formation sandstone formed the basal limits of the excavation. The deposits which lie above were divided into two horizons, a dry upper midden and a wet lower midden. This arrangement was arbitrary, as the degree of wetness varies throughout the year.

From the point of natural stratification both zones were a homogenous deposit of light orange wind-blown sand and detritus, broken near the center of the trench by a pocket of charcoal and lithic material.

The upper dry horizon was most productive. Bone fragments, including a splinter awl, more than 100 yucca quids, pinyon nut shells, yucca fibers, cottonwood bark, a pine cone, lithic chips, and several stone tools were found. The perishable material was mostly mixed or ingrown with plant roots which extended downward into the moist sand. The numbers

of bone, vegetal items, lithic chips, flakes, and tools decreased with increasing depth.

The pocket of highly charcoal-flecked sand and lithic flakes in the lower horizon suggested a concentration of hearth material; however, no well defined limits or hearth zone could be found. The sediments surrounding this feature were nearly sterile except for occasional lithic chips.

*Summary.* The nature of the materials recovered makes interpretation difficult. It is most probable that the artifacts were left by the Pueblo II-III occupants of the shelter to the west.

### Lithic Material

NA3732 produced only 39 recognizable stone artifacts from the surface and excavations. The almost total absence of artifacts from the surface—in sharp contrast to most Glen Canyon sites—is undoubtedly the result of constant transversal of the area by the visitors on the way to Rainbow Bridge. Distribution of stone artifacts through the site is shown in Table 10.

	Room 1	Room 2	Refuse	Trench 1 & Test 1	Totals
<b>Projectile Points:</b>					
Triangular					1
Not notched	1				1
Side notched					
Side & base notched					
Leaf Shaped					
Not notched		1			1
Notched					
Stemmed					
Square tang		1			1
Sharp tang					
Expanding stem					
Straight stem		1			1
Tapering stem					
Unidentifiable fragments				1	1
<b>Total Projectile Points</b>	<b>1</b>	<b>2</b>	<b>0</b>	<b>1</b>	<b>4</b>
<b>Knives:</b>					
Squared base					
Straight base				1	1
Rounded base					
Leaf Shaped					
Elongate	1			1	2
Intermediate				1	1
Broad				3	3
Unidentifiable fragments				1	1
<b>Total Knives</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>7</b>	<b>8</b>
<b>Choppers:</b>					
Ovoids	1				1
Knife-choppers			1	1	2
Nodular choppers	1	3	2		6
<b>Total Choppers</b>	<b>2</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>8</b>
<b>Scrapers:</b>					
Edge all around					
Limited edge					
Nodular	1	2	1		4
Rough flake	1	1	1		3
Cobble			3		3
<b>Total Scrapers</b>	<b>2</b>	<b>3</b>	<b>5</b>	<b>0</b>	<b>10</b>
<b>Hammerstones:</b>					
Shaped		1			1
Natural					
<b>Manos:</b>					
		4	1	1	6

Table 10. NA3732, types and distribution of stone tools.

Projectile points and knives are not as numerous as at many Glen Canyon sites. Except for one surface specimen, knives were found only in the cave excavations (Trench 1) well to the east of the habitation structures. All of the knives and projectile points (Fig. 33) in the collection are somewhat small and considerably better finished than is true in many other sites in the region. The larger chipped implements are distinguished by the fact that scraping (uni-

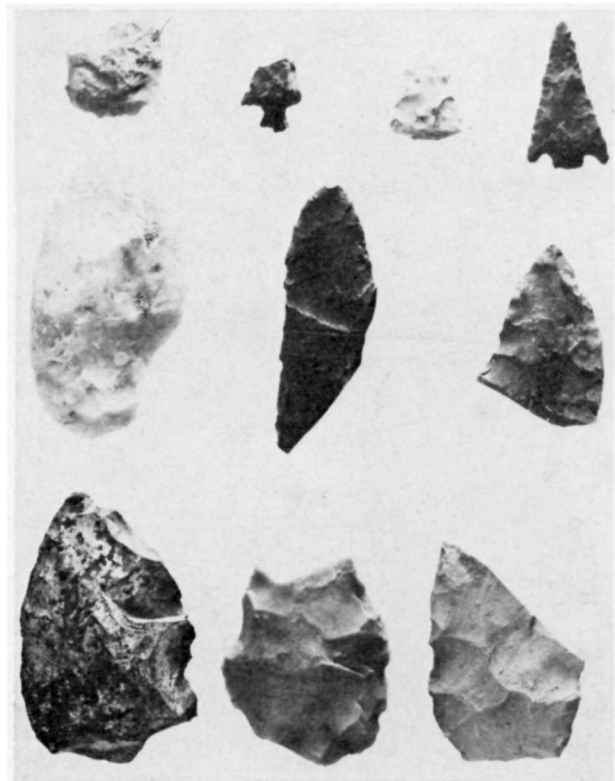


Fig. 33. Representative pressure flaked points and knives from NA3732, Forbidding Canyon. Length of lower left blade, 5.6 cm.

face) tools somewhat outnumber chopping (biface) tools—a situation unique among excavated sites in Lower Glen Canyon. Of the manos found at NA3732 on the floor of Room 2, two specimens are closely similar in size and shape and had been made with much greater care than the others. They have an elongate oval outline and a “loaf” shaped or plano-convex cross section, even though both upper and lower surfaces appear to have been used for grinding (Fig. 34). One has pecked grooves along the sides. All of the remaining manos are small uniface one-hand specimens. They are somewhat irregular in shape and were made from sandstone stream pebbles with little deliberate shaping.

NA3732 produced the usual concentration of lithic debris. Small chips were concentrated in refuse areas adjacent to the domestic structures as well as in the shelter to the east. They were also found to a lesser extent in the rooms themselves. The manufacture of stone implements was undoubtedly carried out as a regular activity of the occupation at the site.

Distribution of artifacts and debris through the site was rather uneven. Uniface implements—scrapers of various types—were found only in the structures at the west end of the site and in their immediate vicinity. On the other hand large knives of the type

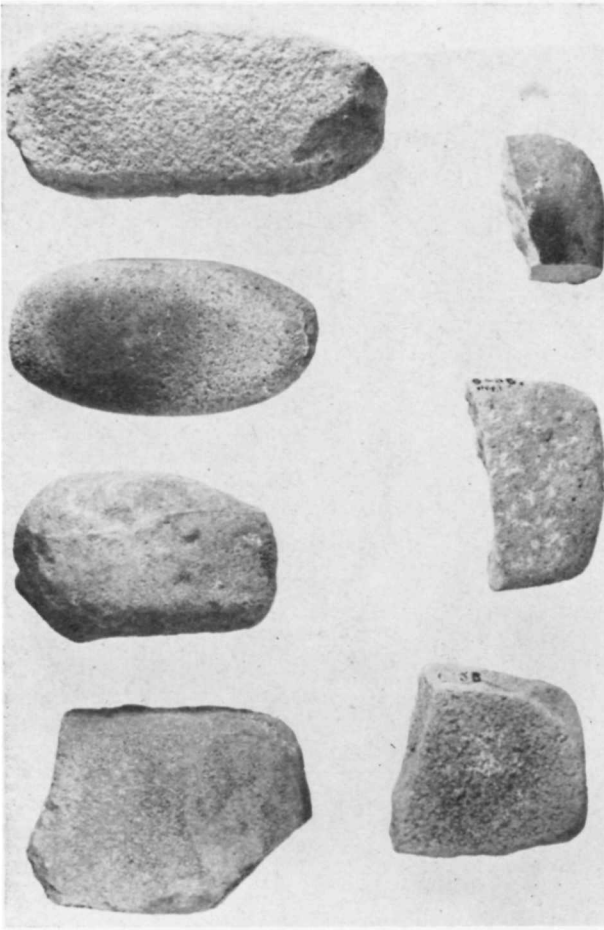


Fig. 34. Grinding stones from NA3732, Forbidding Canyon, and NA6456, West Canyon. NA6456, right, top to bottom; Strip 1, Strip 1; Strip 2. Length of lower left stone, 14.7 cm.

usually found in the area were, with one exception, found only in Trench 1. Choppers (Fig. 35) were found throughout the site. This differentiation in the stone artifact complex is similar to the difference found between ceramic and lithic sites in Glen Canyon.

### Pottery

Excavations in and around the masonry structures at the west end of NA3732 yielded 248 potsherds and five partially restorable vessels (Table 11). Nearly half the total collection came from the refuse area immediately south of Room 2. No sherds were found in the excavations made in the shelter at the east end of the site, Test 1 and Trench 1.

The pottery complex from NA3732 belongs primarily to the latter half of the 12th century. Most of the sherds are typical Kayenta specimens of the types widely distributed through the country to the east of Glen Canyon (Fig. 36). However, the utility complex also includes large numbers of western peri-

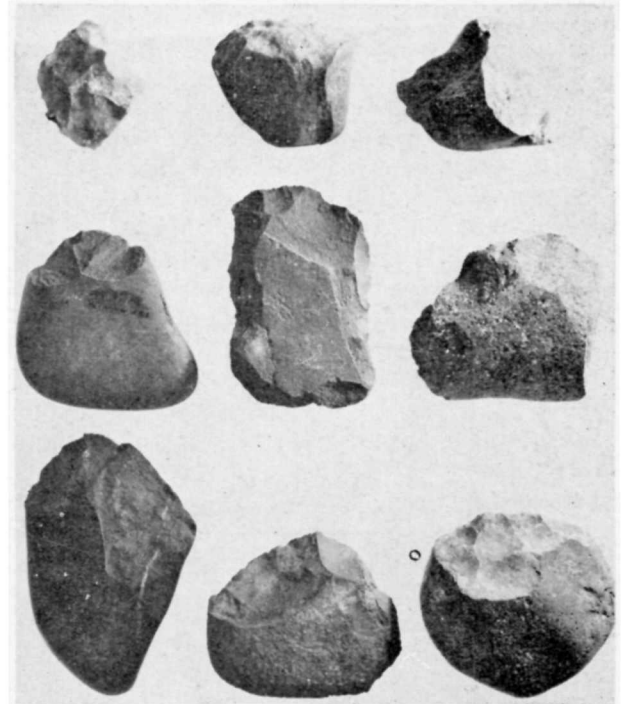


Fig. 35. Choppers from NA3732, Forbidding Canyon. Length of lower left chopper, 14.5 cm.

<u>Tusayan White Ware:</u>	
Sosi B/w	3
Shato B/w	3
Flagstaff B/w	7
Tusayan B/w	2
(Unclassified)	8
<u>Tusayan Gray Ware:</u>	
Tsegi Series:	
Tusayan Corrugated	14
Moenkopi Corrugated	55
Plain gray*	49
Virgin Series:	
North Creek Gray	28
North Creek Fugitive Red	1
North Creek Corrugated	22
Washington Corrugated	4
Johnson Series:	
Johnson Gray	2
Johnson Corrugated	1
<u>Tsegi Orange Ware:</u>	
Medicine B/r	1
Tusayan B/r	23
Citadel Polychrome	1
Tusayan Polychrome	2
Tsegi Red-on-orange	3
(Unclassified)	18
Unidentified Redware*	1
Total sherd count	248
<u>Partial restorable jars:</u>	
Wupatki B/w	1
Tusayan Corrugated	1
Shinarump Corrugated	1
North Creek Gray	2

\* Undescribed types

Table 11. NA3732, pottery types.

pheral types belonging to the Virgin and Johnson Series. These may either have been made locally or traded from the neighboring Kaiparowits Plateau, where they are widely distributed (Gunnerson 1959: 360). NA3732 thus seems to have had contacts both east and west, perhaps indicating that it was situated on an important trade route. The site is contemporaneous with most of the other ceramic sites in Lower Glen Canyon.

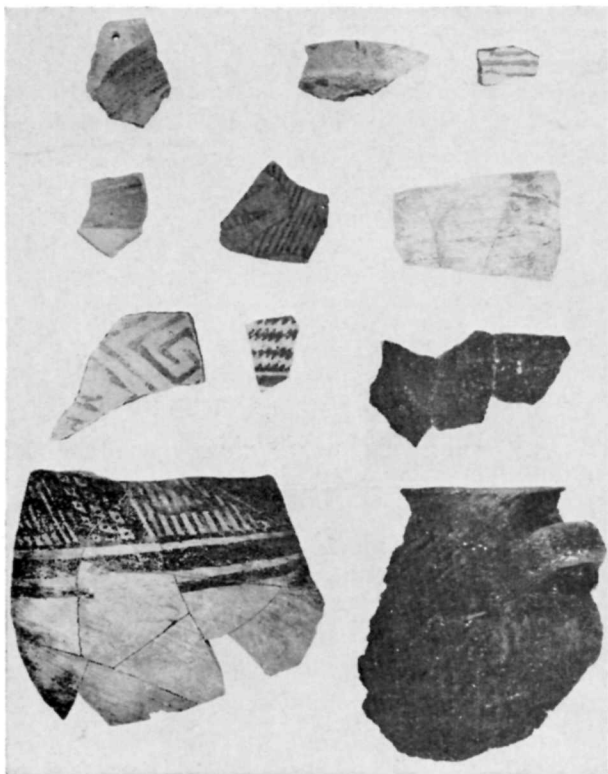


Fig. 36. Pottery excavated at NA3732. Top row, left to right, Tusayan Polychrome; Tusayan Corrugated; Shato Black-on-white. Second row; Citadel Polychrome; Tusayan Black-on-red; plain gray. Third row; Sosi Black-on-white; Tusayan Black-on-white; Moencopi Corrugated. Bottom row; Wupatki Black-on-white; Shinarump Corrugated. Upper right sherd 5 cm. in length.

#### Perishable Material

The site did not produce any large quantity of perishable artifactual material other than the scores of yucca quids (Fig. 37). The quids are in varying degrees of pulp reduction; mastication has reduced some to unrecognizable fiber. Most are constructed by folding the yucca leaf into a compact bundle to fit within the mouth. Other artifacts include a horn bead, a strip of hide, an arrowshaft feather, a cane cigarette, and 25 yucca knots. (See Table 12 for complete listing.)



Fig. 37. Yucca quids from NA3732, Trench one, level one, showing the degree of reduction. Construction is by folding as shown in extreme left. This quid is 5 cm. length.

The analysis of non-artifactual plant material is found in the Appendix. The animal bone recovered (Table 13) displayed sharp and jagged fractures. Carpals, tarsals, and even the heavy long bones are highly fractured. All seem to have been smashed and crushed on purpose—to obtain the marrow? Deer and sheep bone predominated but rodents are also represented.

In recent times, this site has accumulated commercial cotton thread and fibers, tin cans and can keys, paper, apricot seeds, peach seeds, and macaroni which has been churned even into the Anasazi occupation levels. This obvious disturbance of the Anasazi encampment prevents elaboration on perishable items that could be modern Anglo or Navajo manufacture.

#### Discussion

That such an advantageous shelter as NA3732 should lack numerous structures is perhaps indicative of the unfolding pattern that is discernable for the Anasazi occupation in the Lower Glen Canyon region. Masonry dwelling units at this site are small in size and have still smaller associated storage units. Unique among the architectural remains at the site, and in the Kayenta Anasazi area as well, are the three masonry columns which defy naming as to their function. These features were most likely constructed at the time of the other building activity. Another interesting feature at the site is the low masonry wall (Test 1) which is similar to the structures at NA3735.

The absence of sherds and masonry dwellings in the eastern portion of the site as well as the rather distinct complex of stone tools found here, raises the possibility that the eastern material belongs to a different horizon than the western section. It may, however, reflect a specialization of living and working areas similar to that proposed at NA6456.

#### NA3735

##### Location and Physical Description

This site was recorded in 1953 by Gene Foster. It consists of a series of low, standing masonry walls which have the suggestion of retaining walls (Fig. 38).

Material	Artifact	Function	Frequency	NA 3732	NA 6450	NA 6456
Yucca	Quid	Cordage/food	Over 100	x	x	x
	Knot (square)	tying, wrapping	25	x	x	x
	cord	" "	2			x
	Net or sack	Container	1			x
	cord(fibers)	Tying, wrapping	7			x
Cottonwood	brush	painting/cleaning	2		x	x
	mat	*	1			x
	billet	?	6			x
	disc	?	1			x
	side notched					
	chip	?	1			x
	flattened and					
	shaped billets with					
	fragments of thin					
	hide (rabbit?) and					
dark gray cotton						
cloth adhering	ceremonial?	1			x	
flat stick carved						
with suggestion of						
head	doll?	1			x	
Hardwoods	billets	?	2			x
	arrow foreshaft	projectile point	1			x
	curved stick	bottom of carrying basket	1			x
Giant reed	bow	bow	1			x
	arrowshaft	projectile	3			x
Cotton	reed billets	?	5			x
	cordage	wrapping, tying,				
Squash	cloth	weaving	6		x	x
	rind with edge	clothing	1			x
Corn	worked	scraper	1			x
	husk quids	food/cordage	10			x
Grass	knot of husks	cordage	1			x
	folded husks	?	2			x
	twisted cord	tying, wrapping	1			x
Sticks/twigs	basketry foundations	basket fragments	3			x
	nests	storage/burial	4			x
Horn	bead	jewelry	1	x		
	curved worn horn	sickle	1			x
Sinew	hexagonal shaped					
	wooden object wrapped					
	with sinew		1			x
Deer/sheep	hide strip	wrapping, tying	1			x
	metapodial and long					
Turkey	bone awls	piercing	3	x		x
	longitudinally	arrowshaft				
Cane or giant reed	split feather	feathering	1		x	
	cane cigarette	smoking	1		x	
	brush	painting	1	x		

\* Denotes the yucca matting found was not woven but was fastened in the corners and formed a lid for nest 1 at NA 6456.

Table 12. Excavated perishable artifacts from several sites.

The walls are situated at 3300 ft. elevation on the east side of Aztec Creek in a relatively straight portion of Forbidding Canyon approximately three-quarters of a mile southeast of the Colorado River. The canyon sides are formed by vertical Navajo sandstone cliffs, 70 m. high and 60 m. apart. These cliffs rest on the Kayenta formation which forms a bench or shelf 200 m. long, 3 to 6 m. in width, and 10 m. above Aztec Creek. Large piles of talus from the Navajo sandstone cliff have come to rest on the Kayenta bench, perhaps eradicating portions of what may once have been a continuous wall. Sand dunes lie on the opposite side of the creek. Due to the sheltering effect of the cliffs and the numerous small seeps, which occur at the contact zone of the Kayenta formation and Navajo sandstone, numerous plants crowd the sheltered edge. Sunshine does not reach the site until noon and fades about mid-afternoon. Rainwater reaches the site by natural fall and runoff from the cliff wall. Stock trails, following the ledge, pass near the tumbling walls.

### Surface Indications

Five sections of standing masonry wall about 1 m. high are located on the stream side of the Kayenta ledge. These wall sections are straight, varying in length from remnants to 10 m. They are the sole cultural components of the site.

The walls were built of roughly rectangular and tabular slabs of Kayenta sandstone, laid with little or no mortar, in level courses and chinked with sandstone spalls. Only the exposed streamside faces of the walls were roughly dressed.

	NA 3732	NA 6450	NA 6456
Mammal:			
Mule deer ( <i>Odocoileus hemionus</i> )	x	x	x
Bighorn sheep ( <i>Ovis canadensis</i> )	x	x	x
Domestic sheep ( <i>Ovis domesticus</i> )*		x	x
Cottontail rabbit ( <i>Sylvilagus sp.</i> )		x	x
Jackrabbit ( <i>Lepus californicus</i> )	x		
Kit fox ( <i>Vulpes macrotis</i> )		x	
Prairie dog ( <i>Cynomys sp.</i> )			x
Rock squirrel ( <i>Citellus sp.</i> )		x	x
Porcupine ( <i>Erethizon sp.</i> )	x		
Deer mouse ( <i>Peromyscus maniculatus</i> )	x		x
Pack rat ( <i>Neotoma sp.</i> )			x
Bird:			
Turkey ( <i>Meleagris gallopavo</i> )		x	
Owl (regurgitated mass)			x
Common loon ( <i>Gavia immer</i> )	x		x
Quail ( <i>Lophortyx gambelli</i> )			
Unidentified		x	
Reptile:			
Speckled earless lizard ( <i>Holbrookia maculata approximans</i> )		x	x
Insect:			
Locust** (sp.)		x	
June beetle** ( <i>Polyphyllia crinita</i> )			x
Bee larvae** (sp.)			

\* Navajo occupation  
 \*\* Denotes possible intrusion. Insect not necessarily associated with prehistoric occupation of site.

Table 13. Excavated non-artifactual faunal remains from several sites.



Fig. 38. In Forbidding Canyon near NA3732 the contact between the Navajo sandstone and Kayenta formation is exposed. Soil, impounded by this Anasazi built wall, utilized this source of moisture. These prehistoric agricultural terraces extend almost one-half mile along the contact zone. J. F. Wright photo.

### Problem

One wall section, at the southern end of the site, was chosen for testing to determine the nature of its construction and the possible use of the structure.

### Excavations

A trench 1 by 4 m. was cut into the fill behind the wall, exposing the Kayenta formation bedrock varying from 20 to 90 cm. below the surface. The loose fill retained by the wall was composed of spalls, soil, and detritus without stratification, except next to the wall. Here evidence of construction could be seen in the form of sandstone spalls and small slabs placed against the wall for support of the overlying fill (Fig. 39). Excavation failed to produce any artifacts.

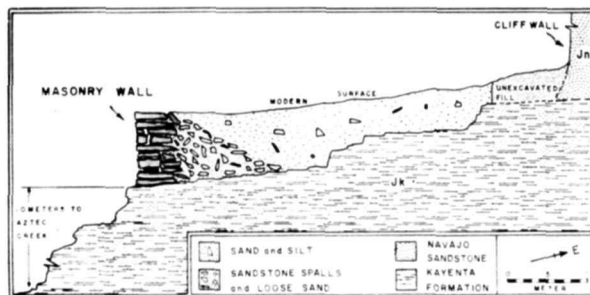


Fig. 39. NA3735, Cross-section of Test Trench.

## Summary and Discussion

This type of wall has been observed at several sites at the southeast side of Navajo Mountain; however, they are known for only two sites in the Glen Canyon proper—NA3732 and NA3735.

This site appears to be a terrace intended for retention of agricultural soil, in order to supplement the meager natural alluvial resources of Forbidding Canyon. This conclusion is drawn from the following evidence. The masonry walls impound soil, moisture seeps from the Navajo and Kayenta contact zone through the impounded sediments, and the site has a relatively sheltered location which might reduce evaporation and transpiration. Corn cobs and squash rind are present in several of the ruins near the site and the number of natural locations in Forbidding Canyon for growing domesticated plants are relatively few.

## NA6444

### History

This site was first surveyed in 1935 by the Rainbow Bridge—Monument Valley Expedition, and given the number of RB-MV 707. It later became a camping spot for river travelers and was not again recognized until 1957, when it was numbered NA6444 by the Foster survey.

### Location and Physical Description

NA6444, a sheltered campsite and workshop, is situated at 3260 ft. elevation on a broad alluvial terrace overlooking the Colorado River 400 m. to the west. It lies about one-half mile north of NA3732. Most of the site is sheltered by an arch-shaped rock overhang formed from a low cliff wall of Navajo sandstone (Fig. 40).

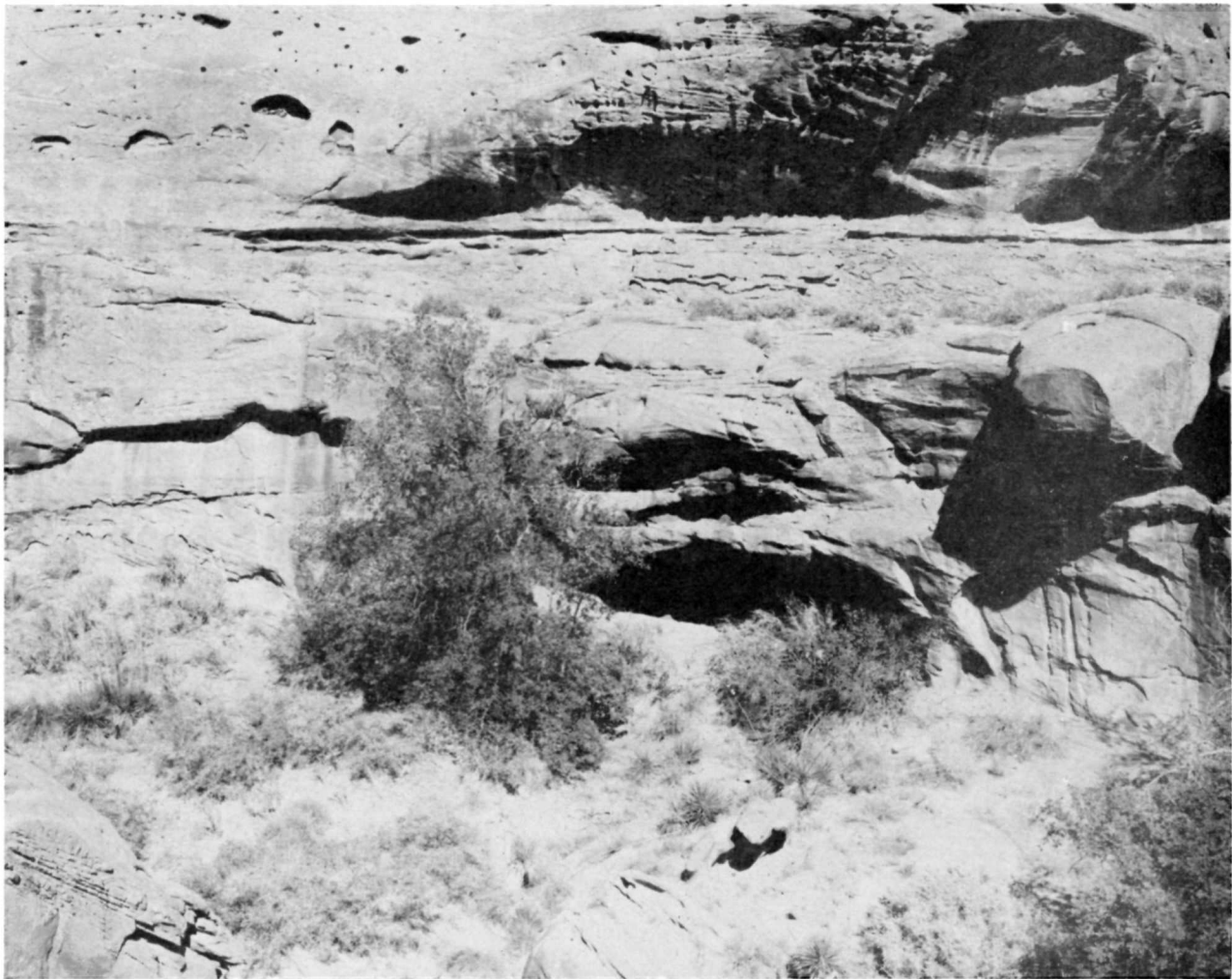


Fig. 40. The setting at NA6444, enclosed by near-vertical cliffs, is mainly dry as evidenced by the hackberry, yucca, saltbush, arrowweed, and dry grasses. Trench 2 was dug in the clearing at the base of the cliff to the right.

Intermittent stream courses have cut the alluvium at the front of the site to a depth just under 2 m. Water can be obtained from nearby potholes.

Vegetation on the alluvial terrace consists of plants from the streamside and terrace communities. Gamble oak and redbud grow in a small glen at the southern end of the site.

The sun's rays strike the shelter in the late morning and by early afternoon the cliff wall and surrounding ground are heated to wilting temperatures. However, temperatures are pleasant here during the chillier fall days. The surface of the site is only partially protected from rain, and not at all when a strong up-river wind is blowing.

### Surface Indications

Surface surveys disclosed cultural debris over an area of about 10 by 75 m. At the western portion of the site lithic debris and stone tools were found mixed over a level surface with sand and gravels. Several sherds of North Creek Gray were found here also. At the southern end similar lithic debris was scattered over a trash midden a meter high. Masonry architecture was not seen anywhere on the site.

Plants were growing on the site at the time of excavation, indicating moist subsurface deposits. Many cobbles were scattered over the terrace near the site, having apparently washed down from the gravel deposits above the shelter.

### Problem

The purpose of excavation was to conduct stratigraphic tests in the southern and western ends of the site to determine the depth and composition of the cultural debris.

### Excavations

Two trenches, both 1 m. wide by about 5 m. long, were laid out and excavated. Each was placed at a right angle to the cliff over heavy concentrations of cultural debris.

*Trench 1.* The northern half of Trench 1 was excavated only to the base of Level 3 (Fig. 41), at a depth slightly exceeding 1 m. The remaining portion was excavated to a sterile subsoil deposit having an average depth of 1.8 m. and a maximum depth of 2 m.

Six stratigraphic units were encountered in the excavation of Trench 1, and were given consecutive level numbers. Level 1 consisted of the surface and immediate subsurface deposits, extending to an average depth of 20 cm. In it were found numerous partially worked cores, spalls, chips, and a few tools mostly of silicious stone. Three sherds of Tusayan White

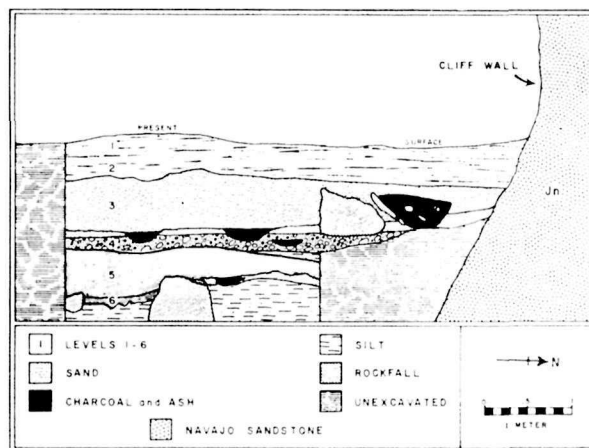


Fig. 41. NA6444, Profile View of Trench 1.

Ware were found on the surface. The matrix was a light gray soil containing random flecks of charcoal and considerable plant humus.

Level 2, separated from Level 1 for stratigraphic control, extended on the average from 20 to 40 cm. below the surface and was a continuation of the deposits found in Level 1. It was composed of a nearly sterile deposit of fine aeolian sand. It yielded a few tools and chips and no charcoal.

Level 3, at an average depth of 50 cm., comprised a distinct occupation surface and associated cultural and natural deposits.

The matrix, a dark heavy soil mixed with large quantities of charcoal, was underlain below the occupation surface by sterile gray sand. The juncture between the two deposits contained a continuous scattering of lithic debris and tools. Two cup-shaped fire pits 25 cm. wide and 15 cm. deep, filled with charcoal and ash, were sunk into the sterile sand below the occupation surface.

Near the north end of Trench 1, about 50 cm. from the sandstone cliff, was an oval-shaped slab-lined hearth, apparently associated with Level 3. The slabs lining the hearth, which were set at roughly a 45° angle, projected considerably above the occupation surface, while the base of the pit was about 15 cm. below it on silt. The hearth was filled with charcoal and thermal-fractured stream cobbles. One hearth stone was a sandstone slab metate, and is described with the other artifacts from Level 3. The hearth had a maximum diameter of 85 cm., a minimum diameter of 65 cm., and a depth from rim to base of 35 cm.

Level 4 was encountered 10 to 25 cm. below the sterile sand which underlay the occupation surface in Level 3. Its upper surface was 90 cm. below ground level near the center of the trench and sloped down to



1 m. below ground level at the south end of the trench. This and the underlying deposits were excavated only in the southern half of the trench.

Level 4 was essentially a gravel bed, varying in thickness from 10 to 30 cm. It consisted of a dense concentration of stream-washed stone material mixed with a great quantity of workshop debris and a large number of stone tools. Small pockets of dark, carbonized soil and charcoal were found among the pebbles and cobbles, but the principal matrix consisted of very coarse white sand.

Level 4 was underlain in part by a thin lens of sterile, dense brown silt which was identical in character to the subsoil 25 cm. below.

Level 5 was encountered at an average depth of 1.2 m. and extended downward to approximately 1.7 m. below the ground surface. In part it directly underlay Level 4, and in part was separated from it by the sterile silt lens. Level 5 was comprised of a bed of dark, sandy soil containing appreciable quantities of charcoal. About half a dozen stone tools and a small number of chips were scattered through the deposit.

Extending from 1.5 to 1.9 m. below the present ground surface was Level 6, the lowest occupation level found in Trench 1. The deposit was essentially similar to that of Level 5, but contained a heavy concentration of flakes and charcoal as well as a considerable quantity of stone tools. This apparent occupation horizon rested directly upon a stratum of dense brownish silt which proved to be continuous for a depth of at least 50 cm. The river deposited silt contained quantities of sandstone rubble—apparently slumpage from the cliff directly above.

*Summary.* The stratigraphy of Trench 1 tells a complex story, involving at least four strata of human occupation, as revealed in Levels 1, 3, 4, and 6. In each case the site apparently served chiefly as a stone workshop, although the raw material itself is present only in Levels 1 and 4. Quantities of charcoal also gave evidence of habitation in each of the periods of occupation, and definite hearths were present in Level 3. The different occupation levels are separated by both wind and water-borne deposits.

The history of occupation would appear to be generally as follows. The site served first as a stone workshop and perhaps a campsite (Level 6), utilizing lithic resources which are present in the vicinity. Later the remains of this first occupation were covered with 50 cm. of windblown sand (Level 5), containing enough charcoal to suggest occasional camping during the period of its deposition. The sand in turn was partially covered by a layer of water-borne silt and then by gravels, resulting either from a major flood of the Colorado River or a local flood which carried

in quantities of gravel from above the site. This deposition apparently set the stage for the second stone industry (Level 4); subsequent human activity left a large quantity of workshop debris scattered among the gravels. Later a shallow deposit of aeolian sand accumulated over the lithic remains, and upon this stratum a third occupation, (Level 3) occurred, remains of which include both lithic refuse and hearths. The third occupation level was again covered by an accumulation of wind-blown sand (Level 2) extending to the gray surficial deposits (Level 1) in which occurs the fourth and last occupation.

*Trench 2.* At the southwest end of the shelter, under the maximum extension of the rock overhang, a stratigraphic test trench was excavated through the midden deposit to a sterile stratum. After the natural stratigraphy was recognized, the trench was widened 1 m. and dug to the same depth as the original excavation.

Testing began near the cliff wall at the present surface, which dips 20 cm. over the length of the trench. Levels 1 and 2, 0-30 cm., include several strata. Over the surface of the midden was a thin layer of orange wind-blown sand which produced some lithic chips and flakes. Below this stratum was a lens of plant humus mixed with wind-blown sand and inclusions of similar workshop debris. At 30 cm. depth an older surface was found. The surface was marked by dead plants which had been buried by the overlying sand and humus. The two strata above this surface are modern deposits which have become mixed by rodents, with the main body of the midden. This was Level 3 a deposit of homogeneous trash and hearth material, which varied somewhat in depth. The basal deposit (Level 4) generally ranged from 30 to 40 cm. below the surface, but was much closer to it at the edge of the midden. This sterile deposit, which underlay Level 3, was a gray water-laid silt. It varied in depth, as it rested on an irregular surface of sandstone slumpage.

Near the cliff wall was found a hemispherical hole put down into the silt some 50 cm. In this feature was a hearth liner of sandstone rubble and water-worn cobbles 1.5 m. in diameter and 40 cm. deep. All the material in the liner showed heavy fire-blackening and thermal-fracturing. The hearth contained a large amount of charcoal mixed with sand; the portion of the hearth next to the cliff wall was poorly preserved, possibly destroyed by flood waters or surface runoff. Whatever the cause, the charcoal spilled toward the cliff wall which shows no signs of blackening or intense heat. Cultural debris lay mostly above and to the sides of the hearth. A definite break is lacking between the trashy deposit and the hearth material. Mixed with the trash deposits surrounding

the hearth were leaf-shaped and stemmed points, several knives, choppers, and a graver. Many of the tools are broken and show evidence of having been heated. These trash deposits also contained sherds of Moenkopi and Tusayan Corrugated, Citadel Polychrome, and Tsegi Red-on-orange. Because of much rodent activity, there is some question as to whether the ceramics can legitimately be used to date either the hearth itself or the stone tools.

Other than charcoal, vegetal products were absent from Trench 2. At the cliff wall, in the gray silt, unidentifiable bone fragments were found which were in the process of fossilization. These objects appear to be fragments of long bones, none of which have any anatomical landmarks or cross sections present.

*Summary.* The first cultural event known to take place in the locality of Trench 2 was the building and use of a large stone-lined hearth. Large fragments of charcoal show that the fire was covered before complete combustion of the fuel. Lithic material and several sherds were found mixed with the deposits over the hearth. These were in turn buried beneath nearly sterile aeolian sands and plant humus.

#### Lithic Material

Excavations and surface collections at NA6444 yielded 136 recognizable stone implements, plus a much larger quantity of lithic debris. The artifact complex is made up principally of heavy, percussion-flaked implements, with the addition of a few more carefully retouched knives and projectile points. Ground stone is represented only by a few manos, abrading stones, and a single slab metate. Distribution of stone artifacts through the various trenches and levels of the site is shown in Table 14.

#### Chipped Stone

*Projectile Points.* Implements identified as projectile points or small knives were found in both trenches and at several different levels at NA6444 (Table 14). Only nine specimens were sufficiently complete to permit classification; these varied in size and shape. As is common in the region, the triangular specimens are considerably smaller and more finely finished than the leaf-shaped and stemmed points. Projectile points were made from jasper, chalcedony, and chert (Fig. 17).

*Large Knives.* Large, unhafted knives make up over one-third of the total collection of stone implements from NA6444. Whole and fragmentary examples were found in both trenches and at nearly all levels. Only a few of the implements show careful finish and sharp straight edges (Fig. 19). These are, with one exception, long, slender knives having either

round or square bases. Broad and intermediate leaf-shaped specimens, which make up the bulk of the collection, are consistently thicker and have somewhat irregular edges and blunt tips. Many of the implements in these groups are undoubtedly rejects and blanks. The most popular materials used in the manufacture of large knives were red and yellow jasper. Other examples were made of chert, chalcedony, or quartzite.

*Choppers.* Bifacial chopping tools from NA6444 include the same types found repeatedly in other Glen Canyon sites: ovoids, knife-choppers, and nodular choppers (Fig. 21). There are also two additional implement types which have been designated "cobble" and "rough flake" choppers. The former have been made from natural, somewhat flattened stream cobbles by removing a few large flakes from one end or side to produce a biface working edge. Rough flake choppers are made from heavy primary flakes by a similar process.

Choppers were found principally in Trench 1, where they occurred in all but the lowest excavation units. Ovoids and knife-choppers were made chiefly from chalcedony and chert and virtually all of the large choppers from quartzite.

*Scrapers.* With the exception of a single graver, unifacially chipped implements from NA6444 were confined entirely to Trench 1. These artifacts are all roughly classifiable as scrapers of one type or another (Table 14, Fig. 24). They appear to be among the least specialized implements found in the site, and no consistent forms can be recognized.

*Hammerstones.* The only hammerstones found at NA6444 were natural stream cobbles which show evidence of battering on the ends or sides (Fig. 23). They occur in all sizes, ranging in length from 60 to 152 mm.

*Lithic Refuse.* In addition to classifiable implements, the excavations at NA6444 yielded nearly 2,000 chips, cores, rejects, and fragmentary artifacts. They were found in every excavation unit and at all levels. The overwhelming majority of this material consists of relatively small flakes of cryptocrystalline rock—chert, chalcedony and jasper. Quartzite, felsite, diorite, and basalt are represented by a much smaller number of rather large, heavy flakes. This proportion of lithic debris is closely consistent with the character of the artifact complex which accompanies it, with its heavy preponderance of points and knives as compared with the large implements. The materials represented are those which are available in Pleistocene gravel deposits in the vicinity of the site.

Trench Section	1						Total Surface	2					Total Grand Total	
	Level	3						4						
		1	2	3	4	5	6	1	2	1	2	3		
<u>Projectile Points:</u>														
Triangular														
Not notched		1					1						1	
Side notched	1						1						1	
Side & base notched														
Leaf shaped														
Not notched		1					1	1					2	
Side notched														
Convex base											1		1	
Straight base					1		1				1		2	
Concave base														
Stemmed														
Square tang														
Sharp tang														
Expanding stem	1						1			1			2	
Tapering stem														
Unident. fragments	$\frac{1}{3}$	$\frac{3}{5}$	-	-	-	$\frac{1}{2}$	$\frac{5}{10}$	-	$\frac{3}{3}$	$\frac{1}{1}$	$\frac{1}{2}$	$-\frac{1}{4}$	$-\frac{6}{10}$	$\frac{11}{20}$
<u>Totals</u>	$\frac{1}{3}$	$\frac{3}{5}$	-	-	-	$\frac{1}{2}$	$\frac{5}{10}$	-	$\frac{3}{3}$	$\frac{1}{1}$	$\frac{1}{2}$	$-\frac{1}{4}$	$-\frac{6}{10}$	$\frac{11}{20}$
<u>Knives:</u>														
Squared base														
Straight base	1						1			1			2	
Rounded base	2	1		1		1	5	3					8	
Leaf shaped														
Elongate				1	2		3						3	
Intermediate					3	1	5	2	2			1	10	
Broad		1		1	2	1	7	2		1	1	1	12	
Unident. fragments	$\frac{1}{3}$	$\frac{2}{2}$	-	$\frac{3}{3}$	$\frac{4}{1}$	$\frac{1}{4}$	$\frac{6}{27}$	-	$\frac{6}{13}$	$\frac{3}{2}$	$\frac{1}{5}$	$\frac{1}{2}$	$\frac{11}{25}$	$\frac{17}{52}$
<u>Totals</u>	$\frac{1}{3}$	$\frac{2}{2}$	-	$\frac{3}{3}$	$\frac{4}{1}$	$\frac{1}{4}$	$\frac{6}{27}$	-	$\frac{6}{13}$	$\frac{3}{2}$	$\frac{1}{5}$	$\frac{1}{2}$	$\frac{11}{25}$	$\frac{17}{52}$
<u>Choppers:</u>														
Ovoids		2			1		3			1			4	
Knife-choppers				1			1	1		1		2	5	
Nodular choppers	4	1	2	1	3		11	1			1		13	
Rough flake choppers			1	1	2		4						4	
Cobble choppers	$\frac{1}{5}$	$\frac{3}{3}$	$\frac{3}{3}$	$\frac{3}{3}$	$\frac{2}{8}$	-	$\frac{3}{22}$	-	-	-	-	-	$\frac{3}{29}$	
<u>Totals</u>	$\frac{1}{5}$	$\frac{3}{3}$	$\frac{3}{3}$	$\frac{3}{3}$	$\frac{2}{8}$	-	$\frac{3}{22}$	-	-	-	-	-	$\frac{3}{29}$	
<u>Gravers</u>														
<u>Scrapers:</u>														
Edge all around														
Large hemisphere	1				1		2						2	
Small hemisphere	1				1	1	3						3	
Elongate		1					1						1	
Limited edge														
Nodular	1				3		4						4	
Rough flake	1				1		2						2	
Cobble					$\frac{2}{8}$		$\frac{2}{14}$						$\frac{2}{14}$	
<u>Totals</u>	$\frac{1}{4}$	$\frac{1}{1}$	-	-	$\frac{2}{8}$	$\frac{1}{1}$	$\frac{2}{14}$	-	-	-	-	-	$\frac{2}{14}$	
<u>Hammerstones:</u>														
Shaped														
Natural	$\frac{3}{3}$				$\frac{2}{2}$		$\frac{5}{5}$	$\frac{1}{1}$	$\frac{1}{1}$			$\frac{1}{1}$	$\frac{3}{3}$	$\frac{8}{8}$
<u>Totals</u>	$\frac{3}{3}$				$\frac{2}{2}$		$\frac{5}{5}$	$\frac{1}{1}$	$\frac{1}{1}$			$\frac{1}{1}$	$\frac{3}{3}$	$\frac{8}{8}$
Manos		1	1		1		3	1				1	5	
Rubbing Stones		2	1	1	1		5	1					6	
Metates				1			1						1	

Table 14. NA6444, distribution of stone tools by provenience and type.

## Ground Stone

*Metate.* In Trench 1, a slab metate had been incorporated as part of a slab-lined hearth at Level 3. It is made from a thick piece of tabular-shaped sandstone, very roughly dressed to a rectangular shape (Fig. 25). There has been no effort at careful shaping of the edges or bottom. Evidence of grinding on the upper surface is confined to a shallow oval depression in the center.

*Manos.* NA6444 yielded five one-hand manos of white sandstone. All but one appear to have been made from natural stream cobbles, and are somewhat irregular, although generally oval, in outline. Grinding faces are slightly convex, and all show deep pecking marks on the grinding surfaces.

*Rubbing Stones.* Several stream cobbles were found whose flat faces show definite evidence of abrasion, but have not been ground down to true grinding facets. These implements are further distinguished from manos in being consistently battered on the ends. They were made from quartzite and diorite.

## Pottery

Ceramic remains were not a conspicuous feature of NA6444. A few small sherds were found on the surface, and some decorated and utility fragments came from Trench 2. No pottery was found in association with the large quantities of lithic material in Trench 1. Table 15 presents the distribution of sherds from NA6444.

Tusayan White Ware: (unclassified)	3
Tusayan Gray Ware:	
Tusayan corrugated	2
Moenkopi corrugated	1
North Creek gray (unclassified)	5 1
Tsegi Orange Ware:	
Citadel polychrome	11
Tsegi red-on-orange	<u>3</u>
Total sherd count	26

Table 15. NA6444, pottery types.

Among the pottery types present, the best indicators of age and cultural affinity are Citadel Polychrome and Tsegi Red-on-orange. These, in conjunction with the utility wares, would seem to place the Anasazi occupation, found in Trench 2, in the late 12th or early 13th century. Even though pottery was not found in Trench 1, there is no reason to believe that the occupation horizons are not contemporaneous.

## Summary

Lithic material, including artifacts and refuse, comprises the bulk of the cultural remains found at NA6444. Whatever other functions it may have served, it is clear that the site was an important stone workshop during prehistoric times.

The complex of artifacts runs nearly the entire gamut of implement types known from Glen Canyon, and this diversity is general throughout the site. In spite of the size of the collection, the stone industry is of little value in reconstructing the history of human occupation at the site. In Trench 1, there is no appreciable difference between the material from the uppermost and lowermost levels, and therefore no suggestion as to how much of a time lapse may be involved. Moreover, there is not clear evidence either of contemporaneity or lack of it between any of the levels in Trench 1 and the ceramic horizon occupation found in Trench 2. The same types of knives and projectile points were found in both units, whereas the larger core tools were confined almost entirely to Trench 1.

In sum, the only definitely identifiable time-culture horizon present at NA6444 is the ceramic one. It is impossible to determine, on the basis of stone implements and their distribution, whether or not one or more additional, non-ceramic horizons may also be present.

## Discussion

At the present time the summaries for each excavation must suffice without further elaboration on the culture history represented here. Analysis indicates no significant differences in the lithic material and artifacts from Trench 1 and 2 even though stratigraphic correspondences are lacking. Both portions of the site have been used as workshops and perhaps for habitation. Some of the occupation is known to have taken place during the late 12th or early 13th century.

## NA6445

### Location and Physical Description

Although this site is quite conspicuous, because of its position on a high alluvial terrace, it was not recorded until 1957 by Foster.

NA6445 is composed of many open lithic workshops, distributed over a Moki type terrace which lies adjacent to the inner cliff wall of Glen Canyon and forms the southeast bank of the Colorado (Fig. 9) one mile below Cathedral Canyon. The relatively level surface of the terrace is about 100 m. across at its widest point and three-quarters of a mile in length. This surface is 10 to 30 m. above the river, where the

elevation is 3225 ft. above sea level. Intermittent streams flowing off the Navajo sandstone have resulted in small arroyos across the terrace, particularly at the upstream (northeast) end. Here the terrace alluvium has formed against the Navajo sandstone cliffs, which slope gently upward to the canyon rim, allowing access from the terrace to the Carmel platform. Further to the southwest the terrace adjoins a vertical cliff wall of Navajo sandstone. Large numbers of cobbles and pebbles are scattered over the sandstone slope, some of which have been washed down to the terrace surface below. The entire area of the site is exposed to wind, sun, and rain.

No fresh water sources other than the Colorado River are found in the immediate vicinity of the site; a small canyon, one mile to the southwest, has a perennial water supply.

Adjacent to the river the terrace sediments are covered with shrubs and trees of the streamside community. These low plants form nearly impenetrable thickets in the dissected portions of the terrace. The higher and more level surfaces are covered with terrace and primarily hillside flora which are commonly seen on the alluvial Moki terrace.

#### Surface Indications

Lithic workshop debris is exposed over many acres of terrace surface, being partially covered in places by wind-blown sand and semi-fixed dunes. Broken and whole tools are quite readily picked up from the concentrations of lithic debris. Several hearth are weathering from the arroyo banks at the northeast end of the site. Navajo-Paiute Indian occupation has not been found on the alluvial terrace.

#### Problem

The purpose of excavation at this site was to test the depth of the workshop material and also determine whether underlying cultural deposits exist.

#### Excavations

Excavations were undertaken at three portions of the site, all of which displayed concentrations of workshop debris and tools. A slab-lined hearth and two metates were found at one location.

*Test 1.* This excavation unit consisted of a trench 1 m. wide by 2 m. long dug to a depth of 1 m.

Lithic material was found only on, and immediately below, the surface mixed with a wind-laid deposit of fine brown sand which extended from the surface to a depth of 20 cm. Below this stratum were alternating deposits of sands and silts extending to a stratum of white water-laid sand which was devoid of cultural debris.

*Test 2.* This was the clearing of a 2 by 2 m. hearth area which lay buried in blow sand (Fig. 10). An occupation surface was found 20 cm. below the present ground level with an associated hearth consisting of six thin sandstone slabs set upright, in a polygonal form, in sterile orange blow sand. Ash and charcoal in the center of the hearth were shallow. Charcoal was found scattered eastward from the hearth through a gap in the hearth's slab outline. Thermo-fractured rock lay on the occupation surface around the hearth. Fragments of two metates (a slab and one basin), both broken into more than ten pieces, were found strewn over the surface adjacent to the hearth, being primarily concentrated at the south side. The basin metate appears to have been "killed" prior to or at the time of final breakage. The deliberate shattering of metates is not known for locations elsewhere in the Lower Glen Canyon. Lithic debris of chips, flakes, and broken tools, as well as several Moenkopi sherds were collected from the present day surface immediately over the hearth.

*Trench 1.* A trench 1 m. wide by 12 m. long was excavated to a depth of 20 cm., removing a stratum of cultural debris mixed with a light gray-brown colored soil. The refuse, all lithic, consisted mainly of chips and flakes.

The culture-bearing stratum was uniformly underlain by a sterile deposit of orange colored water-laid sand. Soil auger tests to 1.5 m. revealed no additional information.

#### Lithic Material

The lithic collection from NA6445 is essentially a surface collection, augmented by a very few implements recovered from immediately below the surface. Tools and refuse were collected from an area over 100 acres in extent, as well as from the test excavations. Sixty-seven recognizable artifacts, and a large quantity of reject material and debris were recovered.

NA6445 yielded mainly chipped stone implements, mostly of the smaller types. (See Table 16 for distribution of implement types.) Three-quarters of the collection is made up of whole and fragmentary unhafted knives, including all of the recognized Glen Canyon types. Only a few of the specimens are thin and well finished; nearly all of these have square bases (Fig. 19). Much more common are the crude leaf-shaped knives having irregular edges and blunt tips. Pink chalcedony was apparently the preferred material and was employed in the manufacture of over half the knives. There are also specimens of red jasper, light colored cherts, and quartzite.

	NA 6445	NA 6450	NA 6456
<b>Projectile Points:</b>			
Triangular			
Not notched		2	2
Side notched			
Side and base notched		1	
Leaf shaped			
Not notched	2	2	4
Side notched			
Convex base		2	
Straight base			
Concave base			
Stemmed			
Square tang		4	1
Sharp tang			
Expanding stem	1	1	1
Straight stem	1		
Tapering stem			
Unidentifiable fragments	4	3	4
<b>Total Projectile Points</b>	<b>8</b>	<b>15</b>	<b>12</b>
<b>Knives:</b>			
Squared base			
Straight base	2	1	1
Rounded base	7	2	1
Leaf shaped			
Elongate	5		
Intermediate	8	1	
Broad	11	1	
Unidentifiable fragments	16	7	4
<b>Total knives</b>	<b>49</b>	<b>12</b>	<b>6</b>
<b>Drills:</b>			
		1	2
<b>Choppers:</b>			
Ovoids			
Knife-choppers	4		1
Nodular choppers	3	2	
Rough flake choppers			1
Cobble choppers			
<b>Total choppers</b>	<b>7</b>	<b>2</b>	<b>2</b>
<b>Scrapers:</b>			
Edge all around			
Large hemispherical			
Small hemispherical	3		
Elongate			
Limited edge			
Nodular		1	
Rough flake			1
Cobble			1
<b>Total Scrapers</b>	<b>3</b>	<b>1</b>	<b>2</b>
<b>Hammerstones:</b>			
Shaped			
Natural			1
<b>Total hammerstones</b>	<b>0</b>	<b>0</b>	<b>1</b>
<b>Manos:</b>			
		1	3

Table 16. NA6445, 6450, and 6456, stone tool types.

Projectile points are represented by eight fragmentary examples, of which only four are classifiable. One large, well made specimen is barbed and seems to have been intended for projectile use; all of the remaining implements in the group could easily have been small hafted knives.

Stone tools other than knives and points included four ovoids, three knife-choppers, and three small hemispherical scrapers (Fig. 24) of the type that resemble ovoids in many characteristics. These scrapers are the only unifacial implements recovered from NA6445.

Lithic debris in the surface collection is confined almost entirely to small chips of chert, chalcedony, and jasper.

NA6445 was clearly an extensive stone workshop. The production of small implements and especially knives was important. All of the tools collected are of types which have a working edge all the way around the perimeter, and all but three are biface. The very limited range of tool types (Table 16), the small number of finished specimens, and the total absence of larger implements suggests that the site was primarily a workshop and not a habitation area. Abundant Pleistocene gravel deposits containing cryptocrystalline materials are available immediately above the sandbar on which the site is located.

### Pottery

A number of small sherds were collected from the surface of NA6445 (for type distribution see Table 17). They belong to the 12th and 13th century Kayenta types which are common throughout Glen Canyon. However, they were not found in any well defined context with the abundant lithic remains which are the principal feature of the site, and hence do not reliably indicate the cultural affinities of the lithic horizon.

### Summary and Discussion

Excavations showed the workshop stratum, which is similar over the entire site to be generally less than 10 cm. deep. The evidence from NA6445 clearly reveals that the manufacture of stone tools was one of the major activities at this site. Whether part or all of this workshop activity was the product of the 12th and 13th century Anasazi occupants is not known.

### NA6450

#### History

Located in 1936 by the Rainbow Bridge—Monument Valley Expedition (RB-MV 677), NA6450 lay practically unvisited until resurveyed by Foster in 1957. Additional surveys in 1958 brought about the decision to excavate a portion of the midden.

#### Location and Physical Description

NA6450 is a sheltered campsite located in Catfish Canyon, about one-quarter mile upstream from its mouth. It is situated on the outside bank at the upstream end of an S-shaped meander. The ephemeral stream which drains Catfish Canyon passes the site and then flows westward for 200 m. or so, cutting through an alluvial terrace, to its confluence with the Colorado River. The site is approximately 3210 ft. above sea level.

At the site the occupation area is sheltered by a crescent-shaped rock overhang of Navajo sandstone (Fig. 42) which forms a cliff 10 to 15 m. high, lean-



Fig. 42. NA6450, at the mouth of Catfish Canyon, prior to excavation, had scattered chips, points, sherds, vegetal material, and hearth stones on the surface.

ing outward about 5 m. Beneath the shelter, cultural debris rests on a low alluvial terrace, 3 m. high and 20 m. wide, which rises from the stream channel and abuts against the cliff at the north side of the canyon. A continuation of the alluvial terrace, overlain by talus, lies against the south canyon wall opposite the site. The canyon at this vicinity is approximately 60 m. in width.

	NA 6445	NA 6450	NA 6456
<u>Tusayan White Ware:</u>			
Black Mesa B/w	2		
Sosi B/w		2	
Dogoszhi B/w		1	
Flagstaff B/w		6	8
(unclassified)		2	
<u>Tusayan Gray Ware:</u>			
Tusayan Corrugated	2	30	
Moenkopi Corrugated	1	24	15
Plain Gray*		22	
North Creek Gray		3	
Washington Corrugated		9	
(unclassified)	2	16	
<u>Tsegi Orange Ware:</u>			
Tusayan Polychrome		2	
Dogoszhi Polychrome			C**
(Unclassified)		6	
Total sherd count	7	123	23

\* Undescribed type  
\*\* Complete vessel

Table 17. NA6445, 6450, and 6456, pottery types.

Seeps emanating from the Navajo sandstone appear near the site at about stream level.

Both streamside and terrace vegetation occur at the site with several plants from the hillside community occupying the dry sand inside the shelter. All three habitat types are telescoped within the width of the terrace. Trees growing at the site are cottonwood, hackberry, and Gamble oak.

The shelter opens to the south, which permits the sunlight to play within for most of the day. Rains seldom dampen the midden between the front dripline and the cliff wall. Buttresses on either end of the shelter give protection from the winds which blow up the canyon.

## Surface Indications

Much of the site is hidden from view by a band of vegetation at the streamside of the shelter. Between this line and the cliff wall a 5 by 10 m. bare surface occurred. It was covered with hearth remnants, stone tools, split bone, several sherds, sheep dung, dried vegetal material, and many lithic chips. A larger brush-covered area, 10 by 50 m. also produced a lithic and ceramic surface collection. No architecture was observed.

## Problem

Excavations were undertaken on two separate occasions during the 1958 field season. On the first, Trenches 1 and 2 were dug to test the midden for cultural and natural stratification. The second investigation, Strip 1, dealt primarily with the stratification of the culture-bearing deposits.

## Excavations

In plan view the two test trenches formed a T across the drier portion of the midden. The subsequent operation lead to the removal of the deposits north of the T in Strip 1.

*Trench 1.* A 1 by 6 m. trench was laid out at a right angle to the cliff wall over a concentration of organic debris.

Excavation revealed five natural levels (Fig. 43). The uppermost, Level 1, 0-10 cm., was composed of a thin layer of near sterile blow sand and humus laid down by various deciduous plants growing near the cave wall. Level 2 was the culture-bearing stratum, which contained loose light gray sands and silts mixed with cotton bolls and seeds, dog dung, twine, sherds, lithic tools and chips, gourd rind, acorns, sandburrs,

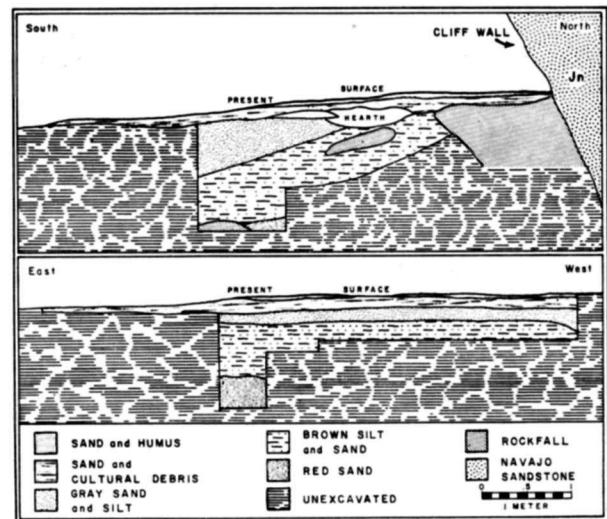


Fig. 43. NA6450, Cross-section view of Trenches 1 and 2.

yucca leaves, and broken sticks. This level, ranging from 10 to 20 cm., tapered out at both ends of the trench. The base of the level, 20 cm. below the present surface, was in part underlain by slumpage from the cliff wall. Near the center of the trench was a large, unlined saucer-shaped hearth, 1 m. in diameter by 25 cm. deep, which contained only charcoal and sand. A lens of burnt soil divided the hearth horizontally into two sections. Vertically the hearth extended upward into Level 2 and downward into Level 3. Level 3, a sterile deposit of wet, stream-laid gray sands, was marked at its upper limit by a thin band of gray ash extending southward from the hearth. The depth of this stratum sloped away from the cliff wall to a depth of 70 cm. Level 4 consisted of charcoal-flecked brownish silts and sands, which were devoid of cultural debris. Underlying the brown sand was red sand and

*Trench 2.* A second trench, 1 m. by 6 m. was laid out at a right angle to Trench 1 and parallel to the cliff wall, across a concentration of lithic workshop debris. Here excavation revealed five natural levels (Fig. 43), of which only three correspond to those found in Trench 1. Level 1 was only a veneer here, but where recognized it was the same stratum as Level 1 in Trench 1 and Strip 1. Very few artifacts were found in this stratum although much stone wastage was caught in the screens. Level 2, 2 to 20 cm., produced some stone tools, many chips, and small quantities of bone fragments and perishables—yucca, acorns, and gourd seeds mixed with graying sand. Level 3, 20-30 cm., and Level 4, 30-80 cm., were deposits composed of gray sand and brownish sands and silts respectively. At these depths Level 3 contained several stone chips mixed with the wet deposit of sand and silt. Level 4 contained some lithic chipping debris. Most likely the workshop debris in Levels 3 and 4 was subsidence from Level 2. Level 5, below 80 cm. in Trench 2, is the same sterile stratum of red sand, possibly a correlative of the basal deposit in Trench 1.

*Strip 1.* A broadside operation, rectangular in shape, was extended north from the northern border of Trench 2, bounded on the east by Trench 1 and the west by the terminal end of Trench 2. Several occupation layers were found.

Level 1, 0-15 cm., was a mat of dried leaves and blow-sand from which stone tools and many bone fragments were recovered. Two hearths, circular in shape, both unlined, one ringed by stones, were built on the leaf mat and had charred the humus down to the top of Level 2. Level 2, 15-25 cm., was composed of gray and orange wind-blown sands, intermittently wetted, which contained lithic and ceramic materials. On the surface of Level 2 and dug into it were many small

unlined lens-shaped hearths of charcoal and ash in which were found sherds and lithic material. Below the cultural horizons lies a deposit of sterile wet gray silt similar to Level 3 in Trenches 1 and 2. In several places the strata became so compressed that no interpretations could be made. Varigation has taken place in the dry deposits.

#### Lithic Material

Excavations at NA6450 yielded 32 stone tools and about 500 chips, cores, and rejects. Distribution of identifiable implements is shown in Table 16.

All but five of the stone implements from NA6450 are projectile points and knives (Fig. 44). Points are primarily of the notched or stemmed types, but vary considerably in size and finish. Knives fall into four of the five common Glen Canyon types. The remainder of the stone collection consists of two small knife-choppers, a small hemispherical scraper, a fragment of a drill shaft, and a thin, oval one-hand mano. Illustrated in Fig. 45 are the two knife-choppers and the one-hand mano.

Lithic refuse consists almost exclusively of small chips of cryptocrystalline material. The site was certainly a workshop as well as a habitation. As in many ceramic sites there is a preponderance of small implements with a general absence of the large, unspecialized core tools. With the exception of small triangular projectile points, however, the tool types present are not particularly suggestive of any specific temporal or cultural affinity.



Fig. 44. Representative pressure flaked knives and points excavated from NA6450. Artifact length lower left, 3 cm.



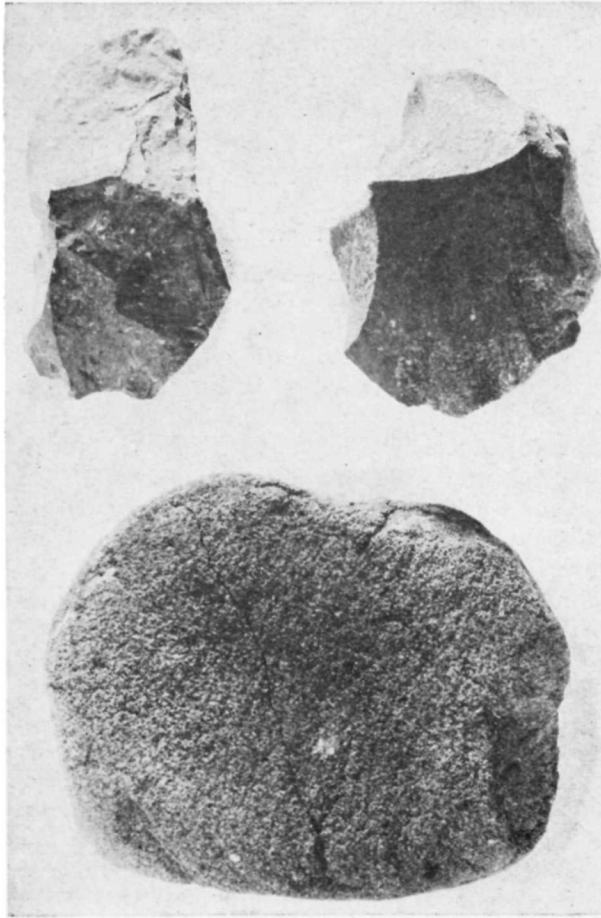


Fig. 45. NA6450 scrapers and biface one-hand mano. Length 9.7 cm.

### Pottery

Potsherds were widely scattered through the various excavations and a total of 123 sherds was collected. Distribution by types is shown in Table 17.

Decorated wares, as in most Lower Glen Canyon sites, point to an occupation by Kayenta people sometime between A.D. 1150 and 1250. Small quantities of utility pottery of the Virgin Series (North Creek Gray and Washington Corrugated) reflect the close proximity, across the Colorado River, of the Kaiparowits Plateau. This was apparently a center for the manufacture of these somewhat aberrant Kayenta types (Gunnerson 1959:360).

### Perishable Material

NA6450 produced a considerable quantity of perishable material but not many perishable artifacts. Tables 12 and 13 present an itemized accounting.

Highest in number of recovered items were cotton fibers, waste, and bolls which were found in the upper levels (0-25 cm.). As has been previously mentioned squash, gourd, and corn were also found. Ad-

ditional subsistence items are acorns, yucca, and meat represented by kit fox, rabbit, deer, and sheep bones. The large animal bones are highly fractured.

The disturbance of the deposits by livestock precludes associating sheep horn, prickly pear, cockle burrs, sheep dung, sheep bones, wood scraps, dehydrated lens of an eye, resin, oak bark, and unidentified seeds with the prehistoric occupation. Several of these items were caught in sheep and goat wool and were evidence of Navajo-Paiute encampment.

Perishable artifacts are almost entirely lacking except for the ever-present yucca quids and knots. The cane cigarette and yucca brush are not distinctive. The arrow shaft feather of turkey is suggestive of hunting but the dearth of animal bone and preponderance of cotton indicates more successful agricultural endeavors. The arrow feather does not look like the fletching depicted in petroglyphs seen in the canyons to date.

### Summary and Discussion

Five levels of natural stratification are found at this site. Only two of these horizons were culturally significant, and these were, in places, mixed together by domestic sheep. However, the lower cultural stratum in all three excavations is considered prehistoric, despite certain obvious intrusions, because of the nature of the lithic and ceramic remains associated with it. This shelter served as a campsite and workshop to which the Kayenta Anasazi came to raise crops and collect plant products and perhaps secondarily to make stone tools. Plants raised for subsistence were corn, cotton, squash, and gourd, while those collected include yucca, acorn, and woody plants. Little meat appears to have been eaten at the site, as attested by the dearth of bone in the prehistoric stratum, this despite the many points and knives. The prehistoric period of occupation was probably less than a decade. A long hiatus followed the Anasazi occupation until the site was reoccupied by Navajo or Paiute Indians. They again used the shelter for a camp. Very little evidence is left of their occupation, which was most likely after 1900. Their camp debris includes sheep wool and dung, and broken bone which may represent a sheep butchered for meat. Navajo hearths appeared to have been built on the Anasazi trash. Finally the site was again abandoned and covered by a leaf mat, not to be used again except perhaps by an occasional river traveler.

### NA6456

#### Location and Physical Description

NA6456 is located approximately 3300 ft. above sea level on the southwest side of West Canyon Creek, 3 air miles upstream from the confluence of the creek

and the Colorado River. It is a sheltered campsite protected by the overhanging roof of a large alcove which was weathered from the Navajo sandstone cliff wall (Fig. 11). The site was first recorded by the Foster survey in 1957.

West Canyon Creek, a perennial stream, has incised a narrow meandering canyon through the Navajo sandstone leaving high vertical canyon walls standing 300 to 400 ft. above the stream channel. In the canyon bottom, narrow passages alternate with wider sections which have small dunes, steep rocky slopes, undercut ledges, and alluvial terraces along the stream channel. The terraces range upward to a meter above the stream bed and are less than 20 m. in width.

Alcoves and rock overhangs above the stream channel are rarely seen in the lower eight miles of the canyon, nor are there many trails into the canyon, for in most cases the cliff walls rise perpendicular to the stream bed. For these reasons the alcove at NA6456 is one of the few suitable habitation sites in the canyon. In the vicinity of the site there are several

broad alluvial terraces onto which a stock trail descends. This trail terminates at an abandoned and collapsed Navajo-Paiute lean-to (NA6423).

The floor of the alcove is situated at the top of a talus slope some 25 m. above the canyon bottom. The occupation midden is crescent-shaped, being 80 m. in length and 10 m. at its greatest width (Fig. 46). The surface is fairly level at the east end, but rises sharply toward the west, having an overall rise of 10 m. Several slump boulders rest on the midden surface and rockfall borders the edge of the talus slope.

Seeps, covered with moss and fern, are quite common along the shaded southern side of the canyon. Plants from the streamside, terrace, and hillside habitat types are represented on the terraces and talus slopes. Vegetation growing on the terraces below the site includes willow, cottonwood, redbud, arrow weed, joint grass, and other grasses. On the talus slope ephedra, prickly pear, yucca, and rabbit brush are present.

Because the alcove faces roughly north, sunshine warms the shelter only during the early morning



Fig. 46. The alcove which forms the protected site NA6456 has considerable overhang. The people in the distance are standing in the main area of occupation refuse. G. Foster photo.

hours. Rain does not fall directly on the midden. Strong winds bring blow-sand and occasionally rain into the shelter.

### Surface Indications

The midden is soft and dry, and gray in color except where covered by a veneer of orange blow-sand. The scarcity of occupational trash resulted in only a small surface collection of lithic tools and sherds.

Several ephedra and datura plants, now dead, once grew on the midden next to a water run which came down the cliff wall. The debris carried by other water runs has been deposited in mounds at the junction of the midden and cliff wall.

Two crudely built wall segments were observed at either end of this alcove.

### Problem

Excavations were initiated in anticipation of discovering cultural stratigraphy and a broader range of artifacts than had been found at other sites, because of the undisturbed nature of the midden and the especially favored situation of the site.

### Excavations

Three portions of the shelter were intensively investigated. These were the middens associated with the two masonry walls, and the lower or eastern end of the site. The western end of the shelter was merely tested.

*Unit 1.* At the eastern end of the shelter a crude wall of irregularly-shaped sandstone blocks has been piled across the midden floor, resting on the talus slope to the north and against the cave wall at the terminus. Two strata were found, the uppermost being 25 cm. of mixed trash resting on a second of undisturbed talus. (The mixed trash consisted of wood and cane, cotton cloth and string, points, bone fragments, rabbit skin and fur, and horn.) Mixed with the sands and cultural debris were human, dog, and pack rat feces.

No evidence could be gained to explain the construction of the wall except perhaps for a windbreak or a modern "drift" fence.

*Unit 2.* Located at the extreme north end of the shelter, the unit is similar to Unit 1, involving another crude wall 2 m. in length built at a right angle to the cliff. Wind-blown sand with sheep droppings lay over the surface. Three natural levels were discernable in the 2 by 2 m. test, adjacent to the wall. Level 1, 0-15 cm., was composed of brown wind-blown sand mixed with sheep pellets, detritus, and charcoal. Level 2, 15-25 cm., was a dry sandy deposit of charcoal, lithic chips and flakes, fragments of knives, gourd rinds, stems, and seeds, burned corn cobs, several sherds of

Moenkopi Corrugated, and lenses of hearth charcoal. Below Level 2 was a mixed deposit of several centimeters, underlain by Level 3, a stratum of sterile orange sand of unknown depth. The middle horizon was most likely a prehistoric occupation surface. It was not directly associated with the wall, which was built on Level 1. Here again as at Unit 1, there may be represented a wind-break or modern "drift" fence at the entry to the shelter.

*Eastern Section.* Several trenches were dug into the deposits at the lower portion of the shelter. These were followed by a series of stripping operations which removed culture-bearing deposits. Roughly 25 m. west of Unit 1 the stratigraphic sequence described for Trench 2 changes slightly. Levels 1 (the cultural bearing horizon) and 2 continue; however, laminations similar to Level 3 in Trench 2 are only occasionally represented. A rock fall which lies below the surface, dividing the shelter into distinct eastern and western sections, presumably influenced the deposits.

Trench 2 was designed to test the depth of the deposits and was laid out at a right angle abutting the cliff wall and terminating at the talus slope. Excavations were carried downward through 2 m. of stratified deposits. The stratigraphy found in this trench was representative of the site in general (Fig. 47). Below a veneer of wind-blown sand lies a stratum, Level 1, 0 to 15-25 cm., of cultural debris mixed with sand, detritus, and sheep pellets. Generally, the lower limits of this level were marked by an irregular compacted surface. Level 2 varied in depth, ranging from 15 to 70 cm. below the surface. Sterile orange sands predominated except where stained gray by decaying organic matter. Sheep and rat pellets, and decomposing sandstone spalls were frequently encountered. Level 3, consisted of culturally sterile, alternating, and cross-bedded laminae composed of mud, silt, detritus, sand, and finely divided organic material. Tests throughout the midden confirmed this stratigraphy. Ceiling spallage increased with depth, and below 1.5 m. lime-coated spalls occurred. Large slump

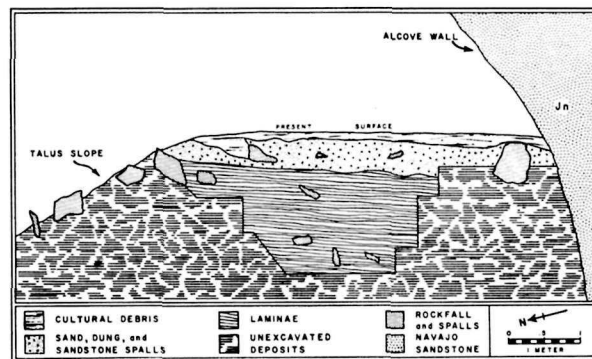


Fig. 47. NA6456, Cross-section view of Trench 2.

boulders appeared at the 2 m. mark at the east end of the shelter, but were found noticeably closer to the surface toward the center of the alcove.

The irregular occupation surface which lies below Level 1 was used as a guide for the stripping-off of the culture-bearing stratum. Mixed with the loose sand of Level 1 was the debris of prehistoric inhabitants. It included yucca fibers and knots; twigs; corn cobs, husks and silk; worked wood; arrow shaft fragments painted red, blue, and brown; corn husk quids; lithic workshop debris; stone artifacts; bone fragments; cottonwood leaves; and scattered sherds of Moenkopi Corrugated and Flagstaff Black-on-white.

*Stripped areas.* Recovered from a portion of the stripped area were other perishables. Lying near the cliff wall slightly below the occupation surface was a square-shaped "nest" roughly 60 cm. in width, formed with clumps of grass and two bunches of yucca leaves laid into a hollowed-out spot in the sand. This was overlain in part by a yucca net fashioned into a sack. Conjecturally, the nest and sack were accompaniments for a burial that has been robbed. To the north 10 cm. and near the modern surface was a large circular nest (Fig. 48) 75 cm. in diameter constructed of wil-

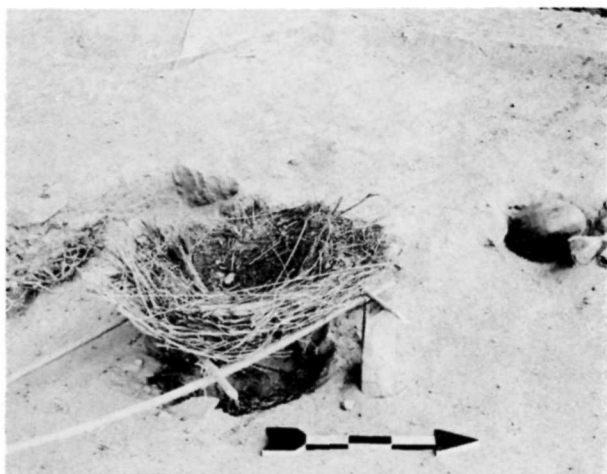


Fig. 48. NA6456 from left to right; yucca sack; Nests 1 (above) and 2 (below); Dogozshi polychrome jar. Test trench 2 in rear. Scale, 50 cm., points north.

lows; four-wing salt bush; galleta; wild rice; and other grasses laid down in a circular manner over a basin formed of sandstone spalls. Below, 25 cm. lay another nest 30 cm. in diameter made primarily from grasses. The lowest portion of this feature rested on sand 60 cm. below the modern surface. Two other grass nests, less than 20 cm. in diameter, were found in this area. All of the nests were empty, except for loose sand fill. The nests could have been used for storage containers, crude baskets, burial paraphernalia, or beds for infants.

A Dogozshi polychrome jar was encountered, intact but empty, 1 m. west of the larger nests (Fig. 48). Resting in an inverted position, its bottom was even with the occupation surface. The vessel was partly circled with pieces of sandstone, although no artifacts were found adjacent to the jar. Also in this area near the cliff wall was a small trash-filled pocket in the sand containing a crescent-shaped piece of mountain sheep horn (Fig. 49) similar to the horn sickles described by Steward (1941:317).



Fig. 49. Sheep horn sickle from NA6456, West Canyon. Length, 22.8 cm. thickness, 8 mm.

*Western Section.* Other excavations throughout the alcove midden produced additional fragmented perishable materials; however, nothing that would indicate as intensive an occupation as in the lower portion of the shelter. The western portion of the alcove had more hearths and corn products than the eastern side. One test produced a univalve shell, unique for the Glen Canyon region.

#### Lithic Material

The collection of lithic material from NA6456 includes 28 implements and a considerable quantity of debris. The artifact complex is comparable to that at NA6450 (Table 16), consisting primarily of points and small knives (Fig. 51). As in most sites in the region, the implements vary greatly in size, shape, and quality of workmanship. In addition to points and knives NA6456 produced two recognizable drills (Fig. 18), one complete specimen of the large flanged type, and one very long and well-made shaft from which the head is missing. Larger chipped implements are represented by two rough scrapers and a hammerstone (Fig. 23).

NA6456 yielded three fragmentary sandstone manos of the one-hand type (Fig. 34). All are bifacial and have very broad, flat grinding surfaces, giving them a nearly rectangular cross-section. Other ground and natural stone includes three lumps of hematite, one of which has a polished facet, and a small ground disc of sandstone having the general appearance of a coat button (Fig. 52).

Like most prehistoric sites in Glen Canyon, NA6456 was obviously the scene of a considerable stone industry, yielding several hundred stone chips.

These, like the artifacts, are mostly small and of fine-grained stone, reflecting the preponderance of knives and points at the site.

### Pottery

NA6456 produced eight sherds of Flagstaff Black-on-white, 15 sherds of Moenkopi Corrugated, and a complete jar of Dogozshi Polychrome (Fig. 50). The latter is indistinguishable from Tusayan black-on-red save that the exterior slip does not extend over a small area around the base which retains its natural orange color.

The three pottery types found at NA6456 (Table 17) are all diagnostic of the 12th and 13th century Kayenta Anasazi. Evidence is lacking for the manufacture of ceramics at this site.

### Perishable Material

Analysis of the excavated perishable and ceramic remains clearly shows that the artificial divisions of NA6456 into various levels, strips, areas, trenches, and

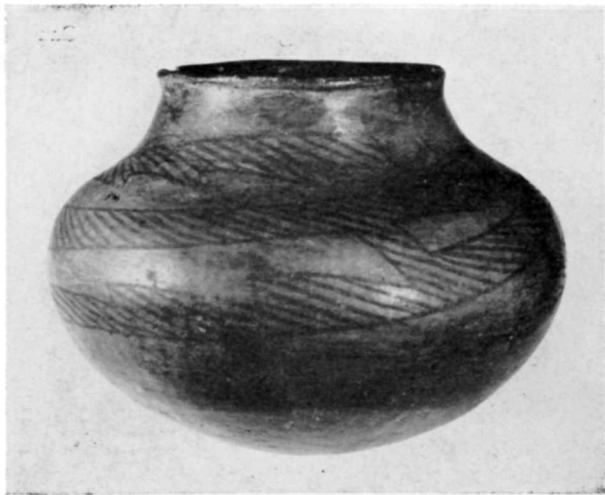


Fig. 50. Dogozshi Polychrome jar from NA6456, West Canyon. Height, 19 cm.; width, 27.3 cm.; diameter mouth, 13.5 cm.

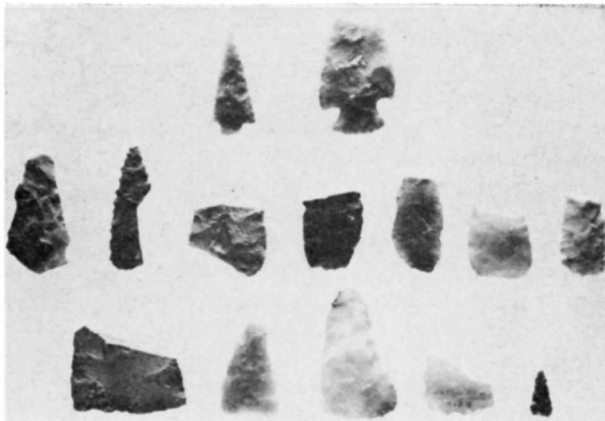


Fig. 51. Representative pressure flaked points and knives from NA6456, West Canyon. Artifact length, lower left; 3 cm.

tests was insignificant. The occupation layer and its accompanying refuse were uniform throughout the site. Aside from the historic Navajo occupation of this site, there is none other than the Pueblo II-III Kayenta Anasazi. For this reason the following discussion will not be organized on the basis of the 25 assigned field designations. It should be borne in mind that all of the cultural refuse was concentrated in the upper (0-25 cm.) level of the alcove floor. While mountain sheep fecal matter was found continuously to a depth of over 2 m., no material made or utilized by man was found much below 25 cm. other than the nests which have their origin from this level.

Subsistence and livelihood, derived from inferences from the excavated remains, included hunting, catching, gathering, and farming. Protein was added to the diet in small amounts from deer and sheep (Table 13), rodents including pack-rat and ground squirrel, rabbits, and perhaps an occasional bird. Insect wing cases found may indicate that this source of food was not ignored. Lizard bones were also present. Fats were probably obtained from the same source as protein.

Carbohydrates were obtained from corn (probably the main source of caloric intake to judge from the preponderance of corn cobs); squash rinds, stems, and seeds; grasses; maple seeds; pinon shells; yucca seeds; prickly pear pads; and fruit.

It should be noted that the occupants at NA6456 were few in number—at least this is the inference derived from the quantity of food remains. The argument that all of the food was not prepared within the alcove can be reduced because freshly eaten (during Pueblo II-III times) cobs plus shelled cobs pre-

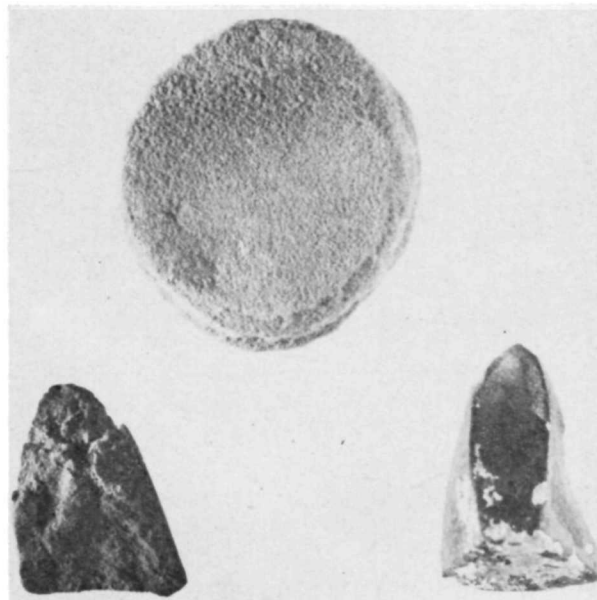


Fig. 52. Ground stone disc and hematite chunks from excavations at NA6456, West Canyon. Artifact length, lower left 3 cm.

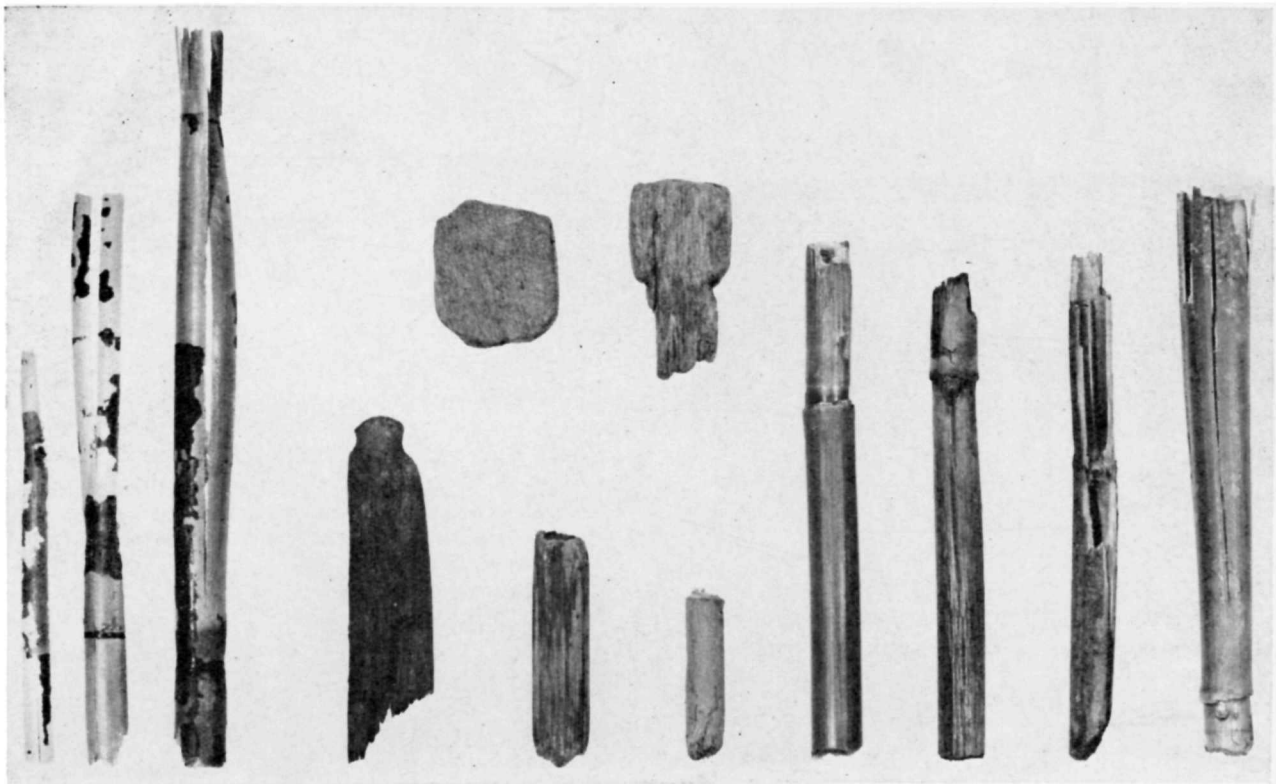


Fig. 53. NA6456, West Canyon, wooden artifacts. Length of left arrowshaft fragment; 6.4 cm.

dominate within the alcove. The quantity of food-stuffs outnumbers the other perishable remains; all told there are over 250 items of a perishable nature.

Bound inexorably with subsistence are the tools and weapons used (Fig. 53). Artifacts of a utilitarian nature found include a tip of a bow (Red bud wood?); arrow shaft fragments (giant reeds painted in ochre, turquoise, and brown mineral pigments, having the nock re-enforced with sinew wrapping); arrow foreshafts of a hard wood; yucca and cotton cordage; split feathers for arrow shafts; carrying basket inferred from a race-track shaped, bent and curved stick, with the two ends tied together); awls of metapodials; and a sheep horn sickle.

Cotton waste, string, and patches of cotton cloth represent another facet of farming not concerned with subsistence. The cotton cloth is currently being analyzed—no description is available at this time.

Derived secondarily from subsistence of hunting are the hides and fur, horn and bone, gut and ligament (Fig. 54), clothing, wrapping, beads, scrapers, and other functional enigmas such as a sinew wrapped hexagonal stick. Three cottonwood billets, flattened and shaped, to which adhere fragments of thin rabbit fur and hide, plus dark charcoal gray cotton cloth cannot be identified. Several other bits of shaped and worked wood were recovered. Their use is unknown (Fig. 53).

Yucca and corn husk quids (Fig. 55) were found along with 3, 9, 10, 12, and 14 row corn cobs. These

quids, like those found at NA3732, were processed by folding and then chewing.

Yucca knots were plentiful and most were square knots. One large yucca sack was found adjacent to a nest of twigs and sticks (Fig. 56).

#### Summary and Discussion

Two time periods of occupation represented at NA6456 are the 12th and 13th century Kayenta Anasazi and the Navajo-Paiute who could have been utilizing the protection of the alcove as early as the latter part of the late 19th century. The Anasazi used the alcove for shelter in which they could camp for perhaps a portion or all of the year. They raised corn nearby; evidence from the cobs found suggests that corn was eaten both green and cooked. That meat also formed part of the diet is evidenced by the many fragmented animal bones in the midden. Game was hunted with bow and arrow (Fig. 57).

Vegetal nests were made and carrying bags were used, both indicating the use of a wide variety of plant products from the surrounding environment. Pottery was certainly a part of the household culinary equipment.

There is some indication of a dual use of the shelter, with distinct living and cooking areas. Hearths in the western section were usually small and seldom had much ash deposit, indicating the fires were smothered after they were used.

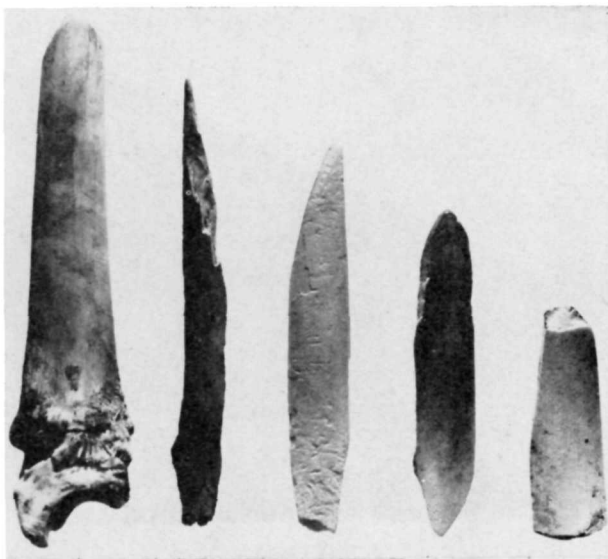


Fig. 54. NA6456 bone tools from occupation area. Length of left tool 11.7 cm.

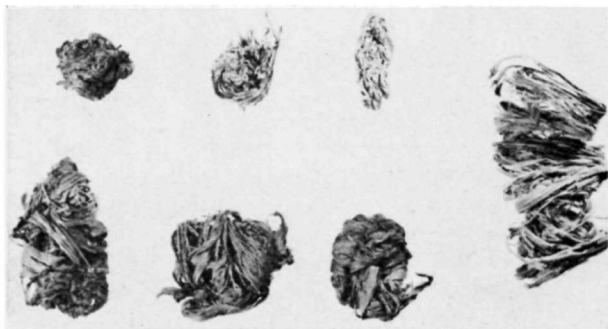


Fig. 55. Corn husk quids from NA6456, West Canyon. Artifact length, lower left; 5.4 cm.

Subsequent to the abandonment of the shelter by the Anasazi, rodent activity mixed the cultural remains with the accumulating wind and water-laid deposits.

In modern times it appears the Navajo-Paiute Indians have run sheep into the alcove, using the shelter as a natural holding pen. Possibly the "drift" fences are a product of this occupation. The Indians may have used the higher portion of the shelter, around Unit 2, for a temporary camp. A temporary Navajo-Paiute camp, NA6423, is located one quarter mile downstream from the site.

The length of the Anasazi occupation probably did not exceed several decades, while that of the Navajo-Paiute did not exceed a few visits. Both occupations at this site are similar to those at NA6450.

### NA6493

#### History

NA6493, an open lithic workshop, and other similar sites in the vicinity became known through the

Foster survey of 1957. The site in many ways corresponds to descriptions of other lithic workshops made by various river travelers (Birney 1932:18).

#### Location and Physical Description

NA6493 is located about 70 m. above and 100 m. southwest of the south bank of the Colorado River, on the low-dipping surface of the stripped Navajo sandstone which flanks the inner gorge of Glen Canyon, near its terminus. The site is 1.5 mi. downstream from the mouth of Face Canyon, at an elevation of 3360 ft. above sea level.

The inner canyon at this locality is formed by high vertical walls of Navajo sandstone, which at various places are eroded to steep slopes. The slopes allow ascent, especially along joints, from the alluvial terraces at streamside to the higher elevations on the gently sloping Navajo sandstone above the river. Extending roughly southeast from the rim of the inner



Fig. 56. NA6456, West Canyon. Detail of yucca sack and basin formed with unwoven yucca leaves. Scale, pointing north, is 50 cm.



Fig. 57. Petroglyphs in the Pueblo III style depicting the hunting of mountain sheep with bow and arrow.



Fig. 58. Atop the bald rock, that proceeds away from the rim of the inner gorge of the Colorado River, are gravels contained by shallow depressions. The gravels, derived from terraces and deposited in Pleistocene times by the river, are the source-material for the prehistoric lithic industry that characterizes the lower Glen Canyon as at this site NA6493.

gorge, the Navajo sandstone surface is overlain in places by scattered blow-sand and semi-fixed sand dunes. The dunes extend southward to the Carmel Platform.

Near the inner canyon rim, gravels are exposed on the bald rock surface, either resting on a nearly level sandstone surface or collected in weathered-out depressions (Fig. 58). NA6493 is situated upon a deposit of the latter type.

Running water is not available at the site, but can be found nearly in Face Canyon and the Colorado River. Hillside vegetation grows upon the sandy deposits, while the Navajo sandstone is barren, except for scattered patches of lichen and dry moss. The site is exposed to the elements at all times.

#### Surface Indications

Surface surveys have revealed lithic workshop materials to be scattered over a 30 by 75 m. area. Because similar gravel deposits occur generally along the canyon rim, it is difficult to say where one workshop locality begins and another ends. Other pockets of gravel in this vicinity may well be parts of the same general site locality, separated only by the gaps in the spacial distribution of the gravels.

Within the gravels many cobbles have been fractured by natural causes; others show evidence, however, of the characteristic manipulation of human activity which results in workshop debris of stone tools, rejected cobbles, cores, spalls, flakes, and chips.

Architectural remains, pottery, and grinding implements are not present at this site.

#### Problem

Excavations were undertaken to determine the stratigraphic relationship of the workshop debris to the sandy deposits, and to ascertain if more than one horizon of lithic materials could be found.

#### Excavations

A trench, 1 m. wide by 14.3 m. long was excavated into the sandy deposits, gravels, and into a semi-fixed dune. The deposits were removed by successive natural levels, of which there were two. The overall depth of the trench averaged 20 cm. Navajo sandstone formed the bottom of the trench.

Lithic debris and tools were found resting on bedrock in approximately the lower (northwestern) two-thirds of the trench. This deposit was buried in part under a stratum of slightly compacted wind-blown sand which is generally orange-pink in color. The remaining third of the trench (southeast) running into the semi-fixed dune was devoid of workshop debris, but contained scattered gravels and dune sand resting on bedrock.

#### Lithic Material

NA6493 yielded 33 stone objects (Table 18) which would appear to be implements, although the majority are apparently incomplete or rejected. While the general appearance of the site is indistinguishable from many other workshops in the region, the complex of stone implements differs strikingly from the Glen Canyon norm. There is a conspicuous absence not only of projectile points and (with a single exception) of knives, but of the common cryptocrystalline materials from which these artifacts are usually made. Instead, the implement group is about equally divided between choppers and scrapers with the addition of two hammerstones. Implements of both types are in general so crudely made as to be difficult to cast into recognized subtypes. They have been manufactured chiefly from dense basalts, quartzite, and

#### Knives:

Broad, leaf-shaped	1
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#### Choppers:

Ovoids	3
Knife-choppers	6
Nodular choppers	4
Rough flake choppers	4
Total choppers	17

#### Scrapers:

Complete working edge	
Large hemispherical	1
Small hemispherical	2
Elongate	1
Limited working edge	
Nodular scrapers	4
Rough flake scrapers	5
Total Scrapers	13

#### Hammerstones:

Shaped	1
Natural	1
Total Hammerstones	2

Table 18. NA6493, stone tool types.



metamorphic clay. Chips and flakes were not abundant at the site. Those recovered are principally large, heavy flakes of the same materials from which most of the artifacts were made.

### Summary and Discussion

Limited excavations at NA6493 indicate that the gravel deposits were exploited by man as they lay exposed, in their present position, on the Navajo sandstone. Many of the gravels excavated seem to exhibit

the same degree of polish as those found in the open on the bedrock surface. Subsequent to utilization of the materials, the gravels and rejected workshop material have been covered in part by blowing sand.

No evidence for cultural stratification was found through excavation. Lithic debris and tools were the only evidence of human occupation found at the site, which precludes any definite inference of cultural or temporal affinity for the materials recovered by survey and excavation.

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## DISCUSSION

These concluding remarks, a concentrate of our present understanding of Glen Canyon prehistory, are subject to the revision and supplementation that will result from the analysis of field data collected during 1959 and field work scheduled for the future. All comments to follow should be considered as representative of the material culture in use during the time period A.D. 1050-1300. Except for obvious Navajo-Paiute and Anglo-American structural and mining remains, no other cultural horizons are convincingly represented.

Four types of sites are currently recognized: open, talus, shelter, and cliff. They are classified further by their topographic location, of which there are three; main canyon, side canyon, and remnant Carmel platform. The majority are open and cliff sites located upon the three topographical divisions in equal distribution. Navajo and Paiute camp refuse often forms a capping over the occupation remains of the prehistoric habitation sites. The density of this occupation, along the river, is proportional to stock trail access leading from the remnant Carmel platform to the river-side alluvial terraces.

Habitation sites are restricted to clusters of single rooms at favorable agricultural locations, or living areas in alcoves. Large cliff dwellings, court yards and extra-wall features, defensive positioning, and extramural kivas are not a phenomena of Lower Glen Canyon or of the lower ends of the tributary canyons. Most dwelling-structure is limited to low walls, less than 1 m. high, and without indication of original height or method of roofing. Within the rooms circular bell-shaped cists are occasionally found, genuinely associated with Pueblo II-III ceramic refuse, which precludes their being considered solely as a diagnostic Basket Maker trait. Hearths are generally built against one of the walls within the room. Hearth shapes vary, but a six-sided slab-lined hearth occurs most frequently. Several hearths of the slab-lined variety have been found on alluvium in open areas without associated structure or refuse. Loom anchors, built-in mealings bins, and other subsidiary floor features are unknown.

Stone agricultural terraces occur in Forbidding Canyon. Masonry columns, at Forbidding Canyon, have an unknown function although they are considered to have served some ceremonial end. Masonry, in general, is unfaced, rough, unplastered, bonded with sandy mortar, and displays a hurried appearance in construction.

Habitation areas lack large refuse deposits and do not display signs of long use. What does seem to be the pattern in Lower Glen Canyon is repeated short term occupations, perhaps over a number of seasons or alternating years. Prehistoric and historic habitations sites are most often built near water and soil resources and secondarily selected with a thought in mind for the existing water table, possibility of inundation, and shade.

Stone working was a major industry for the entire Glen Canyon area, perhaps one of the major reasons for prehistoric occupation. The area provides an exceptionally good source location for all types of cryptocrystalline rock. Lithic remains (cores, flakes, chips) are found at more sites than any other kind of cultural debris. Many sites are obviously just stone workshops. However, a comparison with the San Juan River survey reveals a paucity for this canyon with respect to the number of stone workshops recorded in Glen Canyon. This type of site is similarly not a distinctive characteristic of the Tsegi and Navajo canyon drainage areas (both systems are homeland to the Kayenta-Anasazi).

The Glen Canyon lithic complex is distinctive. It consists of nearly 75 per cent oval or leaf-shaped bifacial implements with a chipped edge all the way around. These implements range from small points to large knife-choppers, and include knives and ovoids. Most implements are fairly small. Conspicuously rare are large, very crude core tools; small, finely chipped implements; and ground stone, other than crude to well formed manos and metates.

The lithic complex appears closely comparable to the Tsegi-Navajo drainage area. The limited range

of tools, absence of specialized scrapers, and common all-around chipping is quite distinct from Amargosa, Chiricahua, Pinto, or other lithic manifestations.

The problem of cultural affinities of non-ceramic

lithic sites remains to be solved. Some lithic material is clearly in association with ceramic remains and can be assigned accordingly, but lithic sites without pottery cannot readily be placed in the same category. There seems to be some quantitative and qualitative differences between chipped stone artifacts found with and without pottery context as follows:

Pottery Sites	Non-pottery Sites
Small, well-made triangular points characteristic	Small, well-made triangular points rare
Crude, leaf-shaped side-notched points rare	Crude, leaf-shaped, side-notched points characteristic
Knife-choppers absent	Knife-choppers common
Crude, leaf-shaped knives very rare	Crude, leaf-shaped knives characteristic
Uniface implements occasional	Uniface implements rare

Pottery making was not a major industry during Pueblo II-III times in Glen Canyon. The number of sherds per site is quite small and most culinary vessels were poorly made. The whole and fragmented vessels found are thought to have been made in the canyon lands (locally), or traded into the region and brought in from the highland areas.

The pottery wares, found in nearly all ceramic sites, are Tusayan White Ware, Tusayan Gray Ware, and Tsegi Orange Ware; all made between A.D. 1050 and 1200. There is no ceramic evidence of a long continuous occupation in Lower Glen Canyon.

Tusayan White and Gray wares both fall into "eastern" and "western" groups. Eastern types consist of vessels which could have been either made locally or traded in from the upland regions of Navajo Mountain and the Tsegi-Marsh Pass. The Western group, less numerous, consists of members of the Johnson and Paria series, which could also have been made locally or traded in from north and west of the Colorado River. Kaiparowits Plateau was the center of manufacture for the western types (Gunnerson 1959; Lister 1959), these having been found in the canyon at NA3732 and at sites near the mouth of Rock Creek.

Mesa Verde and Fremont pottery wares are lacking from sites along the south bank. Jeddito and Awatobi Yellow Wares occur infrequently in Lower Glen Canyon, and when found, they are on or near the present surface, often in association with Pueblo

II-III sites. This is indicative of Hopi visitation after the general abandonment of the area in the 13th century.

Prehistoric trails and foothold trails can be found almost everywhere in the canyon lands and five consistent patterns have been discerned. (1) Access from the remnant Carmel platform to the river's edge. These trails coming down to the river occur at almost every Moki terrace remnant below the San Juan River. (2) Access from the remnant Carmel bench to the main tributary canyons, such as Face and West. (3) Continuous travel along the Carmel platform parallel to the river, made possible by crossing at intersected canyons. Crossings are now known from Navajo, Labyrinth, Spring, Face, West, and Oak Canyons. (4) River crossings are marked, at locations where the Colorado River widens, by prehistoric camp debris. (5) Navajo-Paiute stock trails closely follow prehistoric routes except at very steep portions where livestock cannot traverse.

Five developmental styles of petroglyphs have been recognized in Lower Glen Canyon. Two of the styles have definite time-cultural associations; Pueblo II-III Kayenta-Anasazi, and Navajo-Paiute. Other styles, Basket Maker-Pueblo I, late Pueblo III, and Hopi, are under study at the time of this writing and all will be treated in a separate paper.

Of the more than 250 different species of plants collected from the Glen Canyon Basin that are in the herbarium of the Museum of Northern Arizona (McDougall 1959) not more than 15 species are represented in the artifactual assemblage manufactured by the Pueblo II-III Anasazi. Woodbury, Durrant, and Flowers (1959:22) list about 50 plants as dominant species. Allowing 25 per cent loss for non-representation through decay, 55 per cent of the dominant species remain that were not utilized, in the manufacture of artifacts.

Agricultural products, squash, corn, and cotton, are represented in the material remains (see Table 12) and can be expected to replace some portion of the non-utilized 55 per cent. Several species can be considered to be utilized, such as plants used for dyes and stains, that are not represented as items in the collection to date.

All of the plants used in the manufacture of artifacts are in the dominant group except yucca. Flowers (1959:39) considers yucca to be "frequent" though not dominant. It seems, therefore, that the plants utilized for tools and household items were present in the canyons during Pueblo II-III times much as they are today. That there has been no major change in

the environment for the last 700-900 years is certain through floral representation in the artifactual assemblage (see environmental section).

Of the faunal remains present in the Glen Canyon archaeological record all are to be found in the Upper Sonoran Life Zone and are associated with the floral assemblage found also. With the exception of *Vulpes macrotis* (kit fox), *Cynomys* sp. (prairie dog), and *Gavia immer* (common loon) all are to be found in Glen Canyon today (Durrant 1959).

The ecological distribution of the various dominant plants disperses the types over a relatively wide area. The Anasazi were collecting these plants from various ecological zones and not just the plants that were available in the immediate vicinity of any specific site location. Within the lateral drainages of the Colorado River the ecological distribution is either compressed or breaks down to such a degree that plants normally found on the hillside are located adjacent to flowing streams. This condition in the side canyons during Pueblo II-III times could have allowed the prehistoric inhabitants to collect their di-

verse materials from a very limited area and thus reflect the ecological situations at that time.

Native plants were collected and gathered for food and artifact manufacture. Prickly pear, yucca, grasses, and willow were the main plants utilized. Hunting of deer, mountain sheep, rodents, lagomorphs, reptiles, and birds provided food and hide, bone, and sinew for the manufacture of tools, clothing, and miscellaneous small artifacts such as dice and buttons.

Subsistence, in general, was probably derived from three terrain provinces which lie between the Colorado River and the outer gorge. Agricultural, streamside, and terrace vegetation zone plant products were grown and collected from the riverine province. Between the river and the outer gorge there are many locations which are hospitable to collecting and gathering activities and very possibly sand dune agriculture. Hunting of large game animals probably took place among the buttes and monuments on the Carmel platform between the boundaries of the inner and outer gorges.

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# APPENDIX

## PLANT MATERIALS FROM SEVERAL GLEN CANYON SITES

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*Authors Comment.* The following appendix contains the analysis of plant materials excavated from three sites near the San Juan River as well as Glen Canyon sites studied during the period 1952-1958. The main body of data on these three San Juan sites (NA6812, 13, 14) will be found in a forthcoming Museum of Northern Arizona Glen Canyon Project Bulletin on the excavations of the San Juan River now in preparation. The material incorporated herein from the three San Juan sites was submitted with the Glen Canyon material for analysis and reporting.

All of the wild materials found in these sites will grow in Glen Canyon, often right at the site. One of the plants, jimson weed (*Datura meteloides*), is a recognized "camp follower" which is rarely found except on disturbed areas. It usually indicates, like wild tobacco, calabacilla or wild gourd, Mexican poppy, and certain weedy mallows, that the soil was changed by activities of man, other animals, or by flood. No attempt was made to determine which of the materials (Table I) was brought in by man at the time the site was occupied or by natural means at the same time or later. Wood fragments were not identified. Six fiber masses from NA3732 were mashed yucca fibers, probably *Y. angustissima*, the narrow-leaved yucca or soapweed, the roots of which are used by many Indians for washing, especially for washing hair. All of the starchy material between the fibers had been removed and only the network of vascular strands remained. There also were six small fragments of leaf bases of the same species.

Cotton probably was grown in the area for fragments of bolls and unworked fibers were found at NA6450. Some of the canyons have more protected fields than those of the Hopi which have produced cotton crops. A number of cotton strings and small fragments of cotton cloth were found in NA6456 and the irregularity of the cloth suggests it probably belongs to the period of occupation.

Some of the sites in Glen Canyon have been visited frequently, disturbed, pot-hunted, and used for camp-sites. Evidence for this was found in seeds

of the European-introduced plum and peach. While both are grown by Navajo and Hopi, it is more likely they were the remains of some river traveler's lunch.

Fragments of the bottle gourd (*Lagenaria siceraria*) were found in four sites. All of the fragments were of medium thickness and probably came from medium-sized gourds. The bottle gourd is an old plant in the Southwest and appears with the earliest agriculture. Most varieties require so long a growing season that among the Pueblos, especially at Taos, species of *Cucurbita*, the squashes and pumpkins, are often grown for containers and *Lagenaria* is less commonly used.

Two species of *Cucurbita* are commonly found in sites of Glen Canyon and the nearby region. The oldest and most common is *C. pepo*. Seeds were found in NA6450 and 6456. *C. mixta*, the green-striped cushaw, is a late-comer to the Glen Canyon region, arriving after A.D. 1000. (Cutler and Kaplan 1956; Cutler and Whitaker 1956) and became very popular, perhaps because the shell could be used as a container after the flesh was carefully removed through a hole in the side or top. No specimens of *C. moschata* were identified although some rind fragments could be of this species or of the other two.

Missing, too, were fragments of the wild gourd, *C. foetidissima*, which is so common in site further south and east. It is very rarely found growing today in the lower San Juan River canyons and in Glen Canyon, although it is abundant on the upper San Juan near Aztec and Farmington. A few wild gourd fragments have been found in other MNA collections made in Glen Canyon. A careful study of sites with extensive vegetal remains might indicate whether the wild gourd was used frequently. If the roots were used for washing or as food, as has been reported, it would not take long to practically exterminate the plant in an area.

The corn was surprisingly variable and since the number of specimens was not large, the collections have been grouped by area in Table II. The amount of variability suggests that this was not a single ref-

SITE NO.	PERIOD	CORN		
NA 3732	P II-III	3 cobs	1 <u>C. mixta</u> seed, 2 <u>Lagenaria</u> rind fragments	Pinon seed, sego bulb, large-leaved yucca seed and leaf, salt grass, reed grass, 5 "wads" of rounded (?) <u>Yucca</u> sp. leaf fibers, 9 fragments of rounded soapweed roots. Old World plum stone.
NA 3736	?	3 cobs		
NA 6424	?	3 cobs	1 <u>Cucurbita</u> rind fragment 4 <u>Lagenaria</u> rind fragments	Juniper bark, reed grass, <u>Yucca</u> sp. leaf and root, cottonwood bark 4 <u>Opuntia</u> fragments.
NA 6426N	Recent Navajo	200 corn kernels		
NA 6450	P II-III		1 <u>Cucurbita</u> rind fragment 1 <u>C. pepo</u> seed 3 seeds and 3 rind fragments of <u>C. mixta</u> 1 <u>Lagenaria</u> rind fragment Cotton bolls and seeds	Pinon nut, Indian rice grass seed, unidentified grass seed, reed grass stem, wild onion bulbs, 4 Segó lily bulbs, <u>Yucca</u> sp. leaves, acorn, hackberry seed, unidentified bast fibers, saltbrush seed, <u>Opuntia</u> and <u>Echinocereus</u> fragment, cocklebur.
NA 6456	P II-III	48 cobs 11 kernels	1 <u>C. pepo</u> seed, 1 <u>C. mixta</u> seed 5 <u>C. mixta</u> (?) rind fragment 1 <u>Lagenaria</u> rind fragment cotton string and cloth fragments	Pinon seed, juniper bark, salt grass fragment, reed grass stems and leaf sheaths, unidentified grass stems and seeds, large-leaved yucca leaf fragment, cottonwood bark, alder bark, acorns, hackberry seed, <u>Opuntia</u> seeds, bast fiber string, jimson weed fruit.
NA 6812	P II-III			Pinon nut, yucca baccata pod, unidentified bast fibers, <u>Echinocereus</u> fragment.
NA 6813	P II-III	6 cobs		2 Pinon cones, juniper bark, Mormon tea seed and bracts, 2 Indian rice grass seeds, unidentified grass, loco weed pod, <u>Opuntia</u> fragment.
NA 6814	P II-III	1 cob		Pinon cone and seeds, yucca fiber cordage, acorn, 2 peach stones.
NA 7143	?			14" of yucca fiber cordage
Navajo Canyon	Modern Navajo	19 cobs		

Table 1. Plant remains from various Glen Canyon sites.

ugee group carrying only a few kinds of corn. Most of the cobs belong to the race called Pima-Papago (Anderson and Cutler 1942; Carter and Anderson 1945), to which belongs most of corn of the Basket-makers and pre-1300 Pueblos and the historic Papago, Pima, Maricopa, Yuma, and Cocopa. The Hopi and Zuni still grow a light-yellow flour corn which is very much like the Glen Canyon corn. Two characteristics, the number of rows of grains and the width of the cupule (Fig. 1) on which a pair of grains is borne, are useful in making comparisons of corn. Both of these characters are relatively stable, although there is a slight tendency for ears with smaller cu-

pules and fewer rows of grains to be more common in years of difficult growing weather or on fields which are not so fertile or are weedy. This method was used in a study of corn from the Heltagito site (Breternitz 1957). A small cupule width usually is found on a small cob with a small shank.

A few of the cobs from a single site, NA6456, had brownish, leathery-flexible and relatively long glumes. The cobs approached the Mexican varieties Chapalote and Reventador (Anderson 1944; Wellhausen and others 1957) which were sometimes grown by the Papago and have been recovered from sites in central Arizona (Cutler, MS).

NA	No. of cobs measured	Site	Rows of Grains Per cent					Median Cupule Width
			8	10	12	14	16	
6814, 6813	7	Nakai Canyon San Juan River	29	29	29	14	16	7.7
3736, 3732	6	Forbidding Canyon Mile 68.6 Colorado River	33	50	17			8.
6424, 6456	46	West Canyon Creek, Mile 50.8 Colorado River	24	28	33	11	4	7.
5507	12	Antelope Cave, 1000-1150 A.D. Northern Arizona	34	37	14	3		approx. 8.
6380	15	Heltagito (Plateau V.30, No. 1) Northern Arizona	26	26	48			6.
6440	245	(only 30 of 245 were measured for cupule width) Moqui Canyon Mile 125. along Lee's Ferry	17	35	40	5	3	8.1
	421	San Francisco Phase of Tularosa Cave, West Central N. M. 700-900 A.D.	75	18	3			7.
	337	Georgetown Phase of Tularosa Cave, West Central N.M. 500-700 A.C.	20	29	33	11	3	7.5
	77	Walapai 1275-1300	28	35	32	5		7.6

Table 2. A comparison of corn from several sites in the Southwest.

None of the pyramidal cobs with relatively high row numbers and enlarged butts typical of certain varieties which appear to be associated with the Fremont Culture were distinguished, although a few were found in collections made, at NA3723 on the west bank at mile 111.4 by Miss Gene Foster, in 1956.

One cob, the only one from NA6814, appeared to belong to the Pueblo race of corn, a later race than the Pima-Papago, with larger kernels, usually slightly dented, and much larger cobs.

Most American Indians grew several kinds of corn which often differed so greatly that valid comparisons should only be made by comparing similar and related varieties, and by comparing the relative amounts of each variety grown. Corn from a single cache or a single area in a room is apt to consist of a single variety and if this happened to be an unusual kind, like pop or sweet corn, it would have little relationship to the common corn which was grown at the site. Fortunately the most common kinds of corn in a region are usually very much alike and the extremes like pop corn and sweet corn are not only uncommon but easily recognized and not included in comparisons. Collections taken from various parts of a site or from rubbish heaps are apt to be so well mixed that a large collection probably represents the corn of the community.

The averages of the number of rows of grain and the median for cupule width are like those for other sites of the same age. The cobs show more variability than a far larger collection from Antelope Cave, a site

in the northern Arizona Strip, but it has not been possible to separate the cobs into varieties with enough precision to make valid comparisons with the varieties grown by the Hopi.

The grains have been removed from most of the cobs by scraping or cutting them away from the cobs while still moist. Fragments of the bases of the kernels still remained attached to the spikelets and the upper tips of the glumes were gone. While there are a number of foods which are prepared by scraping green corn, it is also possible that these ears were harvested after a frost and the grains removed so they could be dried more rapidly for storage. Very few of the cobs from sites south of Flagstaff show this treatment, but most of the cobs I have seen from sites in Glen Canyon, the Arizona Strip, and Yampa Canyon had the grains removed, while still moist, by scraping or cutting. When dry and fully mature grains are removed from an ear, the entire grain breaks readily at the base and does not leave a fragment of the base with some of the starchy content still attached to the spikelet. Harvesting and preparing unripe corn may reflect a nomadic habit with a need to dry the corn at the time the fields were visited; it may indicate that rains needed for planting came so late that the kinds of corn used could not mature, or it may simply show a preference for this kind of food.

About a dozen kernels from NA6456 were from the Pima-Papago race of corn and may have been light rust-red. Because most of them were slightly burned, and heating, as well as aging, causes color

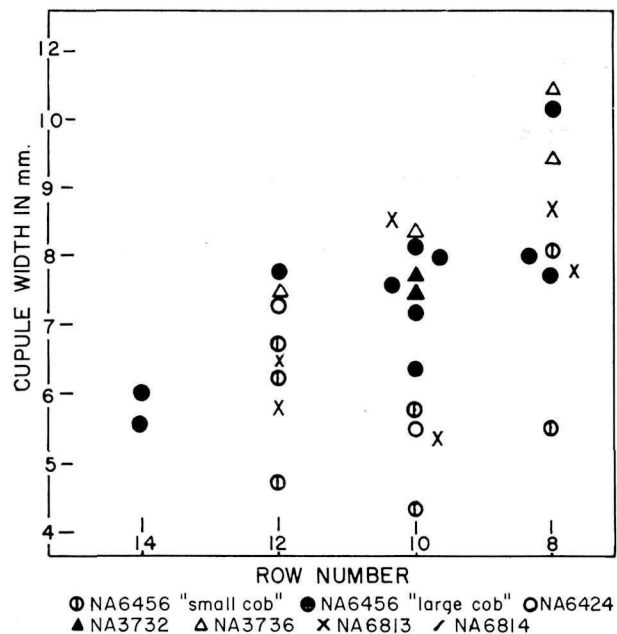


Fig. 1. Cupule width and row numbers of corn from various southwestern sites.

changes so that a kernel that once was white or yellow may turn out to be as reddish-brown as one that originally was that color.

The charred kernels of recent Navajo corn from NA6426 were very uniform, small, and from an ear that had 12 to 14 rows of grains. These grains probably came from the blue flour corn which many Navajos grow, and which is grown in practically all of the Pueblos, including Zuni and the Hopi villages, and in most of the very old Spanish villages of the upper Rio Grande.

Every cob except two in a collection of 19 cobs from a Navajo sheep camp in Binne Etteni Canyon, a tributary of Navajo Canyon was strongly purple. All the cobs, cupules, and shanks were large, and the glumes firm. All except the white cobs must have come from one of the blue-purple varieties commonly grown in the Rio Grande Pueblos and not so common among the Hopi. Among the Hopi the cobs of almost any variety are smaller and have smaller cupules and shanks than cobs of a similar variety grown in Pueblos farther to the east. A comparison of Navajo corn with that of the Rio Grande Pueblo, Zuni, and the Hopi villages indicates that Navajo corn is largely derived from the eastern Pueblos. Studies on recent collections made in the Southwest and on an extensive series of corn ears collected 30 to 50 years ago and now at the Missouri Botanical Garden are being supplemented with information derived from archaeological material of Navajo origin.

#### LIST OF WILD PLANTS

*Pinus edulis*, pinon  
*Juniperus osteosperma*, juniper, cedar  
*Ephedra torreyana*, Mormon tea  
*Distichlis stricta*, salt grass  
*Oryzopsis hymenoides*, Indian rice grass  
*Phragmites communis*, reed grass, giant reed  
*Allium* sp., wild onion

*Calochortus nuttallii* (?), sego lily, mariposa lily  
*Yucca baccata*, large-leaved yucca  
*Yucca angustissima*, narrow-leaved yucca, soapweed  
*Populus fremontii*, cottonwood  
*Alnus oblongifolia* (?), alder  
*Quercus* sp., oak  
*Celtis reticulata*, hackberry  
*Atriplex canescens*, saltbrush  
*Astragalus* sp., locoweed, astragalus  
*Cercis canadensis*, redbud  
*Rhus trilobata*, skunk bush  
*Echinocereus* sp., cactus  
*Opuntia* sp., cactus  
*Datura meteloides*, jimson weed  
*Xanthium saccharatum*, cocklebur

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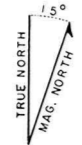
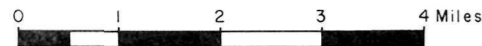
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# LOWER GLEN CANYON OF THE COLORADO RIVER, UTAH and ARIZONA

BASE MAP OF THE MUSEUM OF NORTHERN ARIZONA  
ARCHAEOLOGICAL SURVEY AND EXCAVATIONS, 1952-58

- △ SITES EXCAVATED OR TESTED, 1958 (hollow symbol)
  - ▲ ANASAZI SITES
  - NAVAJO-PAIUTE SITES
  - ◆ LITHIC WORKSHOP SITES
  - PETROGLYPH SITES
  - ⋈ PECKED STEPS AND STOCK TRAILS
- MAJOR HIGHLANDS OVER 4,400 FEET ABOVE SEA LEVEL
- 3732 SITE SURVEY NUMBER



Compiled From United States Geological Survey Topographic Quadrangle Maps, 1952-4

