



United States Department of the Interior

GEOLOGICAL SURVEY



RESEARCH PROJECT OFFICE
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MEMORANDUM

DATE: December 25, 1994

TO: Dave Wegner, Bureau of Reclamation, Flagstaff, Arizona

FROM: Robert H. Webb

SUBJECT: Report of Scientific Findings from the Old Timer's Trip

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SUMMARY OF FINDINGS FROM THE OLD TIMERS TRIP

- Few debris flows were noted between 1938 and 1963; debris flows appear to have increased in frequency coincident with closure of Glen Canyon Dam.
- Certain rapids — such as Bedrock — are now more severe than in the pre-dam era whereas others are unchanged. We now have more accurate information on changes in rapids.
- Erosion of camping beaches used by pre-dam river runners is severe and particularly affects now-popular sites along the river.
- Riparian vegetation has changed along the river; tamarisk is now much denser and cottonwoods and tree-form willows are fewer than in the pre-dam era.
- Pestilent insects were common along the pre-dam river, including biting flies and red ants.
- Fires had a significant impact on the amount of driftwood along the river corridor.
- Catfish were the most common fish caught in the pre-dam river, although rainbow trout were also caught. Few of the Old Timers saw native fish.
- Beavers were common in the pre-dam river; otters were observed as late as 1962.
- Ducks and other waterbirds were commonly observed along the river before Glen Canyon Dam. Some species, such as Great Blue Heron and bats, may have decreased.
- The low temperature of the water is considered one of the largest changes in the river since completion of Glen Canyon Dam.

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TRIP DESCRIPTION

The Old Timer's Trip, from September 8 to 20, 1994, was a great success in terms of Grand Canyon history and memorabilia. Of equal importance were the scientific knowledge gained about environmental change in Grand Canyon. This knowledge came in the form of direct observations from the trip participants, journals written on historic river trips and loaned to us for examination and interpretation, and old photographs we were given to analyze and replicate. In this Memorandum, I will briefly summarize the results from the trip. I will also include some of the results from examination of journals and new photographs gained from the trip participants and others who chose not to go on the river.

THE OLD TIMERS

The Old Timers that we took down the river in September 1994 included John Cross Sr., John Cross Jr., Lois Jotter Cutter, Kent Frost, Les Jones, Martin Litton, Garth Marston, Shirley Marston, Tad Nichols, Sandy Nevills Reiff, Woody Reiff, Gene Shoemaker, Joan Nevills Stavelly, and Bob Rigg. In addition, we had five guides with long experiences in Grand Canyon: Brian Dierker, Kenton Grua, Lew Steiger, Aleister Bleifuss, and Brad Dimmock. All of these individuals were interviewed for their knowledge of changes in Grand Canyon. Additional information was obtained from the diaries of Norman D. Nevills, which were previously unavailable, and P.T. Reilly. Bill Beer was interviewed before the trip; he graciously loaned us a video and still photographs which were matched as part of the trip. The following biographies will establish the experiences of these individuals in Grand Canyon. Those individuals listed with a * participated in the river trip.

BILL BEER - Has the distinction of being the first and only group, with John Daggett, to have swum through Grand Canyon. He also lectured extensively in the late 1950s and early 1960s and ran several river trips with Dock Marston. His book is an excellent account of his swimming adventures; he also loaned copies of his movie and photographs for this project.

***JOHN CROSS Sr.** - Founder of Cross Expeditions; organized early Explorer Scout trips through Glen Canyon with Bert Loper; also ran the Colorado commercially in the early years after closure of Glen Canyon Dam. He had extensive experience with the pre-dam Glen Canyon and knew many of the first river runners. First Grand Canyon trip was in 1969.

***JOHN CROSS Jr.** - Commercial boatman between 1961 and 1968 in Grand Canyon; first person to run the newly enlarged Crystal Rapid formed by a debris flow in December 1966. His first river trip was 1961. John Jr. has a remarkable memory of very subtle changes in the Colorado River.

***LOIS JOTTER CUTTER** - Botanist; one of the first two women to run the Colorado River through Grand Canyon. Lois accompanied Dr. Elzada Clover during the 1938 Norman Nevills trip. She published botanical papers with Dr. Clover on Grand Canyon flora, enjoyed a long career as a botanist and professor, and had not been on the river in 56 years. One of the first 100 river runners in Grand Canyon.

ROBERT C. EULER - Formerly, head archeologist at Grand Canyon National Park, Bob Euler is an authority on the pre-historic cultures and archeological resources of the southwestern U.S. He has published extensively on the archeology of Grand Canyon, and he has worked extensively to document the cultures of present-day native peoples such as the Havasupai. He has loaned us notes and photographs, which we have used in our project.

*KENT FROST - Kent ran Grand Canyon as a boatman with Norman Nevills in 1947; he had earlier run the Green, Snake and Salmon Rivers with Nevills. Kent is also the author of *My Canyonlands*, which was based on his many years exploring the Canyonlands region of southern Utah; his mainstay advocacy helped lead to the formation of Canyonlands National Park. One of the first 100 river runners in Grand Canyon. His most recent trip was 1981.

BARRY GOLDWATER - A former Senator from Arizona, Barry ran Grand Canyon on a Norm Nevills trip in 1940 and again in 1965. Known for his photographs as well as his politics, Barry contributed duplicate negatives of his Grand Canyon photos to this project. Also, his diary is one of the best ever written about running Grand Canyon. One of the first 100 river runners in Grand Canyon.

DON AND MARY HARRIS - Don is considered to be one of the most skilled pre-dam era boatman; he ran his first Grand Canyon trip in 1939 with Bert Loper. Don and Bert were the last two people to run Lava Falls Rapid (July 1939) before it changed radically in September 1939; recent geologic studies of Prospect Canyon and Lava Falls Rapid have benefitted greatly from film shot during their trip. One of the first 100 river runners in Grand Canyon. Mary Harris made her first of 20 Grand Canyon trips in 1965; her recent death underscores the need to talk with veteran river runners.

*LES JONES - An avid canoeist, Les first ran the Colorado River through Grand Canyon in 1953. He created and published the first river guide, a scroll map, of the Colorado River and made solo runs in 1953-54 and 53 on Cataract Canyon. He also made solo runs through the middle fork of the Salmon River, and from the Gates of Lodore to Split Mountain Canyon in 1957; in 1963 following closure of Glen Canyon Dam, Les ran through Grand Canyon at a record low discharge (about 1,000 second feet) in a custom-built 19 foot-wide Aluminum kayak. The only crew to previously run the river at such a low discharge was the 1935 Hatch expedition. One of the first 200 river runners in Grand Canyon, his most recent trip was 1963.

*MARTIN LITTON - Accomplished river runner and photographer; Litton founded Grand Canyon Dories. A prominent member of the Sierra Club, Litton led the fight to stop the Bridge and Marble Canyon dams from being built. He first ran the river with P.T. Reilly in 1955; was part of the Flush on Down trip in 1963; and took many key photographs of the river just after closure of Glen Canyon Dam. He still runs the river on a regular basis and is the oldest person to have rowed Grand Canyon.

*GARTH AND SHIRLEY MARSTON - Garth is the son of Otis "Dock" Marston who is acclaimed as the premier Colorado River historian. Garth first ran the Colorado through Grand Canyon in 1942 at age 16 with his father; he later ran a trip with his mother Margaret in 1947 [the first mother and son combo to do a Grand Canyon trip together] and he recently made his 50th

anniversary trip with family members. One of the first 100 river runners in Grand Canyon. Shirley's first river trip was on the Green River through Lodore Canyon in 1947.

*TAD NICHOLS - An excellent and accomplished professional photographer, Tad first ran the Colorado in 1952 with Frank Wright and the Rigg brothers. He also photographed Glen Canyon extensively before closure of Glen Canyon Dam; we are indebted to him and others for capturing the magic of that place that no one knew. In recent years Tad has mesmerized the professional river-guiding community at training seminars with his many fine photographs of Glen Canyon; among his many diverse projects, he was also the photographer who provided the unique film footage of a canyon flash-flood for the Disney Productions *Living Desert*. One of the first 200 river runners of Grand Canyon. His most recent trip was 1968.

P.T. REILLY - Pat Reilly first ran the Colorado River in 1949 as a boatman on Norm Nevills last trip. He subsequently ran his own trips through the 1950s, culminating in a 1964 river trip that was the basis for the Sierra Club book *Time and River Flowing*. An avid photographer, Reilly took the most photographs of the pre-dam Colorado River; luckily for us, his photographs are meticulously cataloged and stored. He is the first person to track down an old photograph of Grand Canyon and match it, which we then matched for our interpretations. He also wrote extensive trip logs, which are extremely useful for interpreting change in Grand Canyon. One of the first 100 river runners in Grand Canyon.

*SANDRA NEVILLS REIFF - Sandy is the youngest daughter of Norman and Doris Nevills; she made her first trip on the Colorado in Doris' womb. Sandy has a great love for the Canyon and enjoys running rivers whenever she gets the chance with her family. She has photographic albums and movies compiled by her parents of river trips between 1938 and 1949. Her first Grand Canyon trip was 1959; her most recent was in 1971-72.

*WOODY REIFF - Sandy's husband Woody ran trips through Glen Canyon in the 1940s and 50s; while working for the Bureau of Reclamation in 1941, Woody drove a boat up-lake to give Norm Nevills and his commercial passengers a tow-out. Woody also did a couple of trips through Grand Canyon in the 1970s with Canyoners. Following completion of Glen Canyon Dam, Woody managed the Rainbow Bridge Marina from 1964 to 1968; the National Park Service hired him in 1968 to act as ranger at Lees Ferry.

*BOB RIGG - Bob made his first trip in Grand Canyon in 1950 along with brother Jim. In 1951, the brothers set the oar-powered speed record for a run through Grand Canyon from Lees Ferry to Separation Rapid in 38 hours during 1951. During his 1950 trip, Bob found Ed Hudson's powerboat the *Esmerelda II*, which he repaired and drove out of the Canyon. Bob, Jim, and Frank Wright formed Mexican Hat Expeditions and ran the Nevills Expeditions boats after Norm's death in 1949. In addition, Bob grew up with Sandy and Joan Nevills. Bob was also involved in running cabin cruisers through Grand Canyon. Bob made numerous movies and took many photographs of Grand Canyon. One of the first 200 river runners in Grand Canyon. His most recent trip was 1965.

BOB SHARP - An internationally renowned geomorphologist, Bob Sharp first ran the Colorado River in 1937 as part of the Carnegie Institution - California Institute of Technology trip. Of

the pre-dam river runners still with us, he therefore has the distinction of having made the earliest run of the Canyon. Sharp loaned us his 1937 photographs and negatives for this project; these recently were donated to NAU. One of the first 100 river runners in Grand Canyon.

*GENE SHOEMAKER - Internationally recognized geologist, comet-hunter and long-time Colorado River enthusiast, Gene co-author of *In the Footsteps of John Wesley Powell* with photographer Hal Stephens. These two, along with others, matched numerous photographs taken by Jack Hillers during the second Powell expedition a century later. Now retired from the Geological Survey, Gene is a member of the National Academy of Sciences. We now match the Stephens - Shoemaker photographs in addition to the original Hillers views.

*JOAN NEVILLS STAVELY - The eldest daughter of Norman and Doris Nevills, Joan first ran the Colorado in 1949 as a child. She later carried on the tradition of Nevills Expeditions along with her former husband Gaylord Stavely at Canyoners [a direct descendent of Nevills' original company]. Joan was the first paid director of the John Wesley Powell Museum in Page, Arizona; she is presently Executive Director of the Page Chamber of Commerce and is a presidential appointee of the Advisory Council to the Arizona Strip Commission. She is executor of the Nevills' estate and its holdings of photographs and diaries, which were loaned for use on this project.

OUR APPROACH TO THE INTERVIEWS

We basically just listened and did not intentionally prompt the Old Timers. We wanted to hear what they had to say and purposefully let many sites pass without discussing some obvious changes that have occurred within the history of the Glen Canyon Environmental Studies Program. We devised some simple tests; for example, I asked whether Bedrock and Dubendorff Rapids had changed, knowing full well that Bedrock had and Dubendorff had not. By listening to the answers, I established the credibility of the Old Timers as very high in remembering specific and detailed information about changes in Grand Canyon.

We also asked for letters specifically addressing the five most important changes the Old Timers have seen in the Canyon. Although some did that, most chose to expound on the things they had seen. I have attempted to collate those answers into the results presented below.

SPECIFIC OBSERVATIONS OR CHANGES NOTED BY THE OLD TIMERS

RIPARIAN VEGETATION

Almost everyone we talked to mentioned the huge change in riparian vegetation along the Colorado River. The change was considered both good and bad: good for shade, bad for the environmental aesthetics. The Old Timers recognized tamarisk as the major contributor to the increase in riparian vegetation. A good example is Lees Ferry. Lois Jotter Cutter spent considerable time there in 1938 amid extensive media coverage. She remembered some willows where the boats landed, but not the extensive stands of tamarisk that currently are present.

Early river runners commonly observed large cottonwood trees, but few tamarisk. Shade was eagerly sought but rarely found under trees during the Nevills' expeditions. However, several large trees were noted prominently in diaries. Huge cottonwood trees were reported at President Harding in 1938. Barry Goldwater notes a large cottonwood tree was present at mile 220 in 1938. Norm Nevills notes a large willow across from Pumpkin Spring was being gnawed by beavers in 1948.

Tamarisk was rare enough that its presence was noted. For example, Reilly notes tamarisk at Bridge Canyon, at Spring Canyon, at Beamer's Cabin. Nevills observed invasion of tamarisk at the mouth of Spring Canyon between 1942 and 1947; he like the shade they provided. Shade was sought under tamarisk trees at Kanab Creek in 1947 and Whitmore Wash in 1948. He also observed the deltaic deposits at the head of Lake Mead were covered with tamarisk. The willows and tamarisk at Spring Canyon were damaged by a flash flood in 1955; Reilly notes that Martin Litton set some of the new drift on fire. Bermuda grass was observed by Reilly at Tapeats Creek and "several other places in the Canyon" in 1956.

Lois Jotter Cutter confirmed the photographic evidence that no marshes were present along the river that were not fed by perennial sidestreams or springs. The known marshes -- the warm springs below Lava Falls, Three Springs Canyon -- were observed and collections were made by Clover and Jotter. Lois noted the current large amount of *Equisetum* in specific areas as not resembling anything she saw in 1938. Reilly observed that the marsh in the mouth of Three Springs Canyon had a patch of cane 100-feet across; it also contained willows, tamarisk, and cattails. Rigg and Nichols stopped at Cardenas Creek before Glen Canyon Dam and agreed that the area now supporting a marsh was sand and rocks. Reilly noted the presence of willows at the site but did not specifically mention tamarisk, which he did note at other sites.

DESERT VEGETATION

The only specific comments concerning desert vegetation came from Lois Jotter Cutter. She specifically noted that the desert vegetation appeared greener now than in 1938. We attribute the difference to the large increase in brittlebush along the river determined from replication of the Stanton photographs. She affirmed that Elzada and her were extremely efficient in collecting plants and would have listed now-common species such as *Gutierrezia sarothrae* and *Tamarisk chinensis* if they had been present at one of their sampling locations. This allows us to interpret the plant lists published by Clover and Jotter (1944) more broadly in terms of potential invasions or increases. I took her to the site where the type specimen of *Opuntia basilaris* var. *longiaureolata* was collected in 1938. We could find nothing that matched the original plant, which has not been recollected. I concluded the variety was nothing more than yet another *Opuntia* hybrid, albeit a different-looking one.

FISH

Many river runners note the presence of fishermen hiking into the river corridor, particularly in the first 32 miles. Nevills observed a fishing boat pulled up on the bank at mile 187 in 1947. Many trips had fishermen along, which led to many observations about fish in the river. John Cross Sr. talked with Bert Loper about fishing in Glen Canyon in the 1940s.

Apparently, dynamiting earlier in the century yielded Colorado River squawfish, whereas later dynamiting yielded only catfish. Norm Nevills found a cache of dynamite at the mouth of Parashant Wash in 1942 that he thought was used for fishing. Bob Rigg and Tad Nichols remembered dynamite being used to fish for catfish at Whitmore in the 1950s.

Few of the currently listed endangered fish of Grand Canyon were noted by river runners. In 1940, Goldwater mentions catching "salmon" (Colorado River squawfish) in the mouth of Shinumo Creek in addition to catfish. Nevills observed 4 in. suckers and 2 in. minnows in Shinumo Creek 2.5 miles upstream from the Colorado River.

Catfish were extremely common and are mentioned in every fishing reference (1938-1962) except most years at Tapeats Creek. Nevills observed catfish jumping in the mouth of Havasu Creek in 1942. Goldwater observed catfish in Tapeats Creek and speculated they spawned in the side canyons. In 1955, Reilly observed 3 in. fish he thought were catfish in Nankoweap Creek. Carp were commonly observed in Shinumo Creek near the waterfall and large specimens were caught in the river.

Rainbow trout were commonly caught in Tapeats Creek. Garth Marston felt they increased in size about 1 in. per year in the 1940s. Reilly notes trout were caught and left by a river party at mile 38.5-L in 1959; these could have only come from the main river. On two consecutive days in 1962, Reilly observed trout in Lava Canyon; trout were never planted in Lava Canyon. Reilly also observed bluegill and crappie in the backwaters of Separation Canyon in 1955 and rainbow trout at Spencer Canyon in 1962. John Cross Sr. remembers catching blue gill in tributaries of Glen Canyon in the 1950s.

Most tributaries had water backed up into their mouths during high water. Reilly, who took many high-water trips, notes water backed up into House Rock Canyon, South Canyon, Nankoweap, the Little Colorado River, Shinumo Creek, Kanab Creek, and Havasu Creek. "Fish" occasionally were observed in these pools. In the dry years of the 1950s, Reilly noted the width and depth of perennial streams. He noted that Nankoweap dried up 1/2 mile above the river, stranding fish in the channel upstream. He noted that the flow in Nankoweap Creek decreased between 1949 and 1955, or the early period of drought on the Colorado Plateau.

After closure of Glen Canyon Dam, Sandy Nevills Reiff notes that extreme fluctuations of dam releases caused an abundance of dead fish floating in the river.

BEAVERS AND OTTERS

Sightings of river otters were rare in the Colorado River. William Edwards observed two river otters at Turquoise Rapid on February 14, 1890. He expressed surprise and noted he had never seen them before. Reilly notes an otter at mile 19-L in 1959.

Beavers were commonly observed in the pre-dam river. However, their presence typically resulted in a note in P.T. Reilly's diary, so sightings could be cataloged. Even more notes were made on beaver effects on riparian vegetation.

INSECTS

Various types of insects were bothersome to pre-dam river runners. Stanton first mentions problems with bugs at Hance Rapid in 1890; he described "flies, millers, and moths flying about." Goldwater noted his body was covered with welts from nocturnal bug bites at the end of his 1940 trip. Nevills and Goldwater mention "deer flies" at mile 68 that were so bad that they kept the river party up all night in 1940. Reilly discusses "many large black flies" that pestered their trip at mile 80 in 1964; he wrote about the "hum of everpresent flies" in 1956. In some years (1942), Nevills complained vehemently about "flies" at Diamond Creek; in others (1947), he observed no flies. Nevills blamed the prevalence of livestock for their abundance. Red ants were particularly bothersome all throughout the river corridor; both Nevills and P.T. Reilly complained about them in 1942 and 1957. In particular, Nevills complained that "Bugs and red ants are a nuisance" at Spring Canyon. Reilly notes aphids on plants at Hermit Rapid in 1958.

The frequency of complaints about noxious bugs increases in diaries of trips taken after low-water runoff in the Colorado River with some notable exceptions (red ants). This could explain why some pre-dam river runners (e.g., Nichols) does not remember pestilent insects, whereas others (e.g., Reilly) complained vehemently about them.

BIRDS AND BATS

Ducks were commonly observed on early river trips. Even as early as 1890, William Edwards noted the presence of "lots of ducks" downstream from Lava Falls Rapid. Goldwater may have summed up the frequency of observance: "Ducks and geese are constantly rising from the water ahead of us." Species mentioned by name include Red-breasted Mergansers, Mallards, and Blue-Wing Teal. Snowy egrets commonly were seen near or with the ducks. Great Blue Heron were commonly seen, particularly in western Grand Canyon. The Old Timers with us on the 1994 trip found nothing unusual in the current waterfowl population along the river, with the exception of Great Blue Herons, which they felt had decreased.

Hummingbirds also occasionally were observed, sometimes flying about the drifting boats. Reilly specifically mentions seeing a Ruby-Throated Hummingbird at mile 155.8 and a Black-Chinned Hummingbird between Hermit and Boucher in 1956. Bats were commonly observed, particularly in the early morning hours. Nevills noted many bats at the mouth of Havasu Creek; Reilly notes bats at Spring Canyon. Fresh bat guano was seen by early visitors to Christmas Tree Cave. The Old Timers specifically noted a decrease in bats. They also noted a large increase in swallows in the Furnace Flats area. The change was attributed to an increase in insects using tamarisk.

Eagles, most likely Golden Eagles, were sighted occasionally by P.T. Reilly. On the Old Timers Trip, several participants noted the peregrine falcons and mentioned that as something they had not seen before along the river corridor. We saw several turkeys on the 1994 trip; most Old Timers registered surprise at this event. John Cross Jr., however, noted the presence of turkeys at the mouth of Boucher Creek in the early 1960s.

LARGE MAMMALS

Bighorn sheep may have increased along the river corridor since the first river runners. Beginning with the Stanton expedition, most river trips have observed few large mammals along the river corridor. William Edwards noted tracks of bighorn sheep and coyotes at Bright Angel Creek in 1890; he observed a herd of 15 bighorn sheep at Whitmore Wash. The most common sightings were between Elves and mile 126 and in the vicinity of Havasu Creek. The 1938 Nevills expedition saw a bighorn on the left side above Diamond Creek. In 1942, the Nevills party saw 7 bighorn sheep on the right side at National Canyon and 3 adults and 2 juveniles at Whitmore Wash. In 1958, Reilly observed bighorn sheep tracks in Stone Creek. He also saw 10 bighorn sheep at mile 96 in 1962.

Now, bighorn sightings are very common. Joan Nevills Stavely notes that she never saw bighorn sheep so far up canyon (near Navajo Bridge). No historic river trips ever saw bighorn sheep in that reach. Moreover, several people indicated they saw more bighorn sheep on the Old Timer's Trip than on any other. I personally felt we saw very few.

Burro sightings became more common through the 1940s and 1950s. The sightings appear to follow the generally known distribution of the animals. In 1938, Clover and Jotter observed burros on both sides of the river at Diamond Creek. Reilly observed burros at the mouth of Hermit Creek in 1962. A domestic sheep was observed at Spring Canyon in 1942; the Stone Expedition killed domestic sheep near Salt Water Wash in 1909. The most apparent populations of burros along the river were downstream of Whitmore Wash.

Deer sign was observed, particularly from about mile 35 to Phantom Ranch. Jotter and Clover saw a deer at the mouth of Kwagunt Creek in 1938. Nevills saw a large buck at mile 71-L in 1947. Reilly saw tracks of a large buck at Buck Farm Wash, tracks at Kwagunt, and a doe at Tanner. Dock Marston saw many deer in Lava Canyon in 1948. Several Old Timers mentioned seeing deer swimming in front of the boats in the 1950s; John Cross Jr. noted he observed deer swimming 6 times on his trips.

Mountain lions were observed on a Nevills trip in 1947 (mile 215) and a Reilly trip in 1956 (mile 177). P.T. Reilly commonly mentions sightings of bobcats or bobcat tracks in his notes. He observed bobcats at mile 200; bobcat tracks were observed at Unkar Creek, Lava Canyon, Nankoweap Creek, Kwagunt Creek, Stone Creek, Fern Glen, Whitmore Wash, and Gneiss Canyon. Kent Frost had a special memory of seeing a bobcat in the vicinity of Three Springs Canyon. Ringtail cats were also seen during pre-dam river trips, but no river party appears to have had problems with nightly food theft. Several Old Timers mentioned they were not a problem.

DRIFTWOOD FIRES

Considerable driftwood was burned before closure of Glen Canyon Dam. These fires probably caused a considerable reduction in the amount of dead biomass below the old high-water zone. This "decomposition" of driftwood, which is known to have accumulated over a thousand years, represents a huge acceleration in the release of nutrients into the atmosphere and in the sands adjacent to the river. I was astounded at the magnitude and number of fires set along the river

corridor by pre-dam river runners. The attached list was compiled from the Nevills and Reilly diaries and details the locations of fires and their approximate sizes. The effects of fires could be seen for years, depending on how high they were above the river and its flow. For example, the effects of the 1940 fire at the mouth of Saddle Canyon were still prominent in 1942.

The reduction apparently was severe. Bob Rigg remembers seeing huge piles of driftwood on every debris bar below Lava Falls Rapid. Now, there is little driftwood on the same debris bars. Many Old Timers indicate the decrease in driftwood is one of the major changes in the river corridor.

The number of pre-dam fires may have been largely responsible for the current state of depleted firewood in the canyon during winter trips. As early as 1967, John Cross Jr. noted the abundance of new driftwood during the 1966 floods, adding that "firewood would not be a problem" during the 1967 river season. Sandy Nevills Reiff thought there was more driftwood now than when she last was on the river in 1972. She also felt the ban on summer wood fires has had a major effect on increasing the amount of driftwood along the river.

DEBRIS FLOWS AND FLOODS

After showing them recent debris-flow deposits, we consistently asked the Old Timers if they had seen any fresh-looking deposits along the river during their experience. Bob Rigg remembered when the debris fan of Boucher Creek was radically altered in 1951 or 1952. Les Jones remembered the debris fan of Prospect Canyon paved with fine gravel in 1963. P.T. Reilly observed the effects of the debris flow of 1955 in Prospect Canyon. He also observed that the 1956 high water had sliced into the newly deposited debris fan, leaving a 15-foot high bank. Reilly also observed the removal of the Quigley grave at President Harding Rapid by a debris flow between 1964 and 1982.

Martin Litton and John Cross Jr. both commented on the extensive channel and rapid changes associated with the 1966 flood in Bright Angel Creek. We already knew that changes in the debris fan under the Silver Bridge were among the most extensive of the last century in Grand Canyon, but Litton and Cross reinforced that there was probably a debris flow early in the flood, followed by higher flood waters bearing less sediment.

Some Old Timers did not remember debris flows specifically, but they recognized changes in a place they had previously visited. Kent Frost knew that the mouth of South Canyon had changed radically; the date of the debris flow causing the change is still unknown. Everyone seemed to agree that the current number of changed rapids and debris fans is unusual in their experience.

The Old Timers have contributed greatly to our knowledge of debris-flow frequency with their photographs. For example, Tad Nichols' consistently took photographs of Badger Rapid from the left rim. His photographs meticulously document changes in the sand bars and tamarisk, but also provided the background for assessing the frequency of the 1994 debris flow. After the trip, Nichols showed us photographs of Tanner Rapid that we could use to document the 1993 debris flow there. We have used many of P.T. Reilly's photographs to document debris-flow frequency in Grand Canyon, particularly at Lava Falls Rapid.

Reilly meticulously noted the signs of recent flooding in tributary canyons. Most of what he observed can be attributed to streamflow and (or) hyperconcentrated flows, not debris flows. He observed new mud and silt in the mouth of Shinumo Creek in 1949. In 1954-1955, a flood removed large redbuds from the mouth of an unnamed canyon at mile 38.7-R, and a "heavy flood" down Red Canyon cut a channel 5-feet deep and 40-feet wide. Also in 1955, a flood cut a large swath through the sand at Spring Canyon. A flood in Deer Creek in 1956 filled in the pool and changed the mouth considerably, and a Diamond Creek flood changed the channel there considerably. Reilly was particularly impressed with the effects of flooding in 1962; a new deposit formed beneath the waterfall at Deer Creek and the mouth of Tapeats Creek changed considerably.

The Old Timers recognized the large change at the mouth of Tapeats Creek, where many of them had spent considerable time. They also noted a large change in the amount of sand present (see below), which in part was related to channel change at the mouth. The flood -- in 1961 -- may have had a debris-flow component to it; the rapid was filled in on the top righthand side.

CHANGES TO RAPIDS

The Old Timers recognized some very obvious and subtle changes in rapids. The change in Crystal Rapid, which many of the Old Timers had not seen before, is the most dramatic of any noted, although Bob Rigg was also impressed with the changes in Lava Falls. However, several boatmen recognized changes in Bedrock Rapid while agreeing that Dubendorff Rapid is unchanged.

John Cross Jr. had a wealth of information on recent (1960s-1970s) changes in rapids. He gave us his notes of the first run after the December 1966 storm. Change in House Rock Rapid, which was attributed to that event, actually occurred later but before 1971. Crystal Rapid was the most obvious change, but Lava Falls Rapid also changed on the left side due to many large boulders being deposited in a former "sneak" run.

Although the Old Timers could not agree on when changes occurred in House Rock Rapid, the body of observations is suggestive that more than one event contributed. Martin Litton insists the change occurred in 1966, but John Cross Jr. did not observe changes there in March 1967. Brian Dierker claims the large event occurred sometime prior to 1969, when he started, but subsequent events constricted the river further. Bob Rigg noted changes between 1959 and 1965, but noted the constriction was much worse now. Taken together, the observations of the Old Timers indicate a typical pattern of increased frequency of debris flows in one tributary for a short period of time, with little change before or after. This is exactly the same course of events in Prospect Canyon, which contributed four debris flows and several other floods to alter Lava Falls Rapid between 1939 and 1966.

Brad Dimmock provided photographs and observations about the 1984 debris flow in Monument Creek. His trip photographed an enormous wave that formed briefly just after the event. After successfully running (and photographing) the wave, Dimmock never saw it or anything like it again. Dimmock also noted changes on the left side of Soap Creek Rapid (1979-1982) and

reworking of House Rock Rapid in 1983. He and other guides had many observations and dates for changes in rapids.

One of the most insightful observations came from the logs of P.T. Reilly. He noted the changes caused by the 1955 debris flow at Lava Falls Rapid and saw fewer holes in the whitewater. He claimed that the spaces behind the large boulders had been filled in with smaller ones, smoothing out the rapid. The reworked material filled in much of the area downstream to the Warm Springs, making the walk (and lining operation) easier.

CHANGES TO SAND BARS

Most of the Old Timers lamented the current status of sand bars in Grand Canyon. They commonly pointed to a sand bar and noted how small it was. Surprisingly, those comments decreased downstream of Havasu Creek, which may be significant or may reflect a continuation of sand bar erosion already mentioned.

Bill Beer and P.T. Reilly lamented the loss of camping beaches. In 1984, Reilly noted erosion of sand bars he used to camp on at Tuckup Canyon, National Canyon, and Fern Glen. Beer, in particular, remembers the sound of sand bars calving off into the river as he swam by. Rigg noted several bars he had camped on were either reduced or eliminated. Nichols, in particular, noted reductions in sand bars at the mouth of the Little Colorado River, Elves Chasm, and Deer Creek Falls. John Cross Jr. pointed out a large reduction in the sand bar at the mouth of Stone Creek as an example of extreme erosion.

P.T. Reilly observed the relation between sand bar erosion, tributary flows, and pre-dam river flows. He observed bank caving during a 3-4 foot rise in the river in 1956. At Tapeats Creek, Reilly noted that the river was eroding the sand bar below the rapid in 1962 as they watched. He observed large channels cut through sand bars during storms in 1953. These incidents were mentioned primarily because Reilly considered sand bar erosion a hazard to sleeping boatmen.

John Cross Jr., who ran the river frequently in the years after closure of Glen Canyon Dam, believed that wind erosion and human impacts were the dominant reasons for sand bar erosion, not large clearwater releases such as the 1965 flood. He used the separation bar at Soap Creek Rapid as an example. Bob Rigg noted that the sand-bar erosion downstream from Nankoweap was probably the greatest of any place in Grand Canyon. What formerly was a sand-lined channel is now a reach lined with gravel bars.

CHANGES TO NAVIGATION OF THE RIVER

The Old Timers were impressed with several channel changes in the Colorado River. In particular, three debris-bar controlled rapids attracted attention. The Rock Garden at Crystal is related to the changes caused by the 1966 debris flow. Rigg and Nichols felt the bars at the mouth of the Little Colorado and Vasey's Paradise are significantly bigger. Pre-dam river runners, particularly P.T. Reilly, ran left of the island at the mouth of the Little Colorado River; such a run today would be difficult, even at high stage in the Colorado River. Although they saw these bars at river flows that would have inundated much of their area, there are

subtle implications to their observations. The 1973 flood in the Little Colorado River changed the bar at the mouth significantly; Gene Shoemaker asked us to match his 1968 photograph to verify this. The debris flow out of South Canyon could have added significantly to the material in the debris bar adjacent to Vasey's Paradise. This relation between debris bars and the parent debris fan represents another documented case of the relation between debris flows and the geomorphology of the Colorado River.

MISCELLANEOUS

The aesthetics of river trips were a common theme among the Old Timers. Some, particularly the Nevills' sisters, commented on how clean the canyon now is. Their most recent canyon experiences were just before the current policy of cleaning up trash and hauling human waste from campsites. Others noted the oppressive noise of aircraft overflights compared to the rare airplane in the pre-dam era. Several Old Timers missed the effects of a silt-laden river on the quality of the river trip; they missed the sound of sand scraping on the sides and bottoms of boats. Joan Nevills Stavely also noted the high degree of cooperation among guides now, instead of the competitive atmosphere that prevailed on her last trip.

Reilly noted the occurrence of rockfalls. He particularly mentions a 1,500 pound boulder falling at Diamond Creek in 1949. On one of his last river trips in 1982, Reilly noted the unusually large number of rockfalls that had occurred since his previous trip in 1964. Bob Rigg also mentioned lack of rockfalls when he ran the river.

Rigg and Joan Nevills Stavely noted the air quality as a major concern. Rigg stated that the sky was much hazier now than when he ran the river and that it significantly degraded the experience. He also lamented the loss of the Bass cableway, which is especially interesting since most current river runners would just as soon cut down the USGS cableways.

RESEARCH TRIP AND RECEPTION SPONSORS

Science, History and Trip Logistics: Bureau of Reclamation, Glen Canyon Environmental Studies Program; U.S. Geological Survey; Northern Arizona University, Cline Library, Special Collections & Archives Department; Southwestern Foundation for Education and Historical Preservation; University of Utah Special Collections.

Pre-Trip Reception: Northern Arizona University, Cline Library, Special Collections & Archives Department; The Grand Canyon Trust; Arizona Raft Adventures; Red Lake Books; Grand Canyon River Guides Association.

Pre-Trip Lecture, Cline Library Auditorium, Northern Arizona University: Robert H. Webb, U.S. Geological Survey.

LIST OF KNOWN DRIFTWOOD FIRES, 1938-1964

This list was compiled from the diaries of Norm Nevills, Barry Goldwater, and P.T. Reilly. It does not include fires set by the Georgie White parties, Mexican Hat Expeditions, or other river runners.

<u>Date</u>	<u>Diarist</u>	<u>Location</u>	<u>Size</u>
7/11/38	NEVILLS	Tanner	Large
8/5/40	NEVILLS	Boulder Narrows	Large
8/7/40	NEVILLS	Vasey's Paradise	Small
8/8/40	NEVILLS	Saddle Canyon	Large
8/8-20/40	NEVILLS	All rapid scouts	Small
8/20/40	NEVILLS	*Diamond Creek	Large
7/17/41	NEVILLS	Nankoweap	Large
7/18/41	NEVILLS	Nankoweap	Large
7/16/42	NEVILLS	Vasey's Paradise	Unknown
7/17/42	NEVILLS	Nankoweap	Large
7/19/42	NEVILLS	Tanner	Unknown
7/27/42	NEVILLS	Fern Glen	Large
7/12/47	NEVILLS	Navajo Bridge	Unknown
7/15/47	NEVILLS	Nankoweap	Unknown
7/17/47	NEVILLS	Palisades Creek	Brush fire
7/17/47	NEVILLS	Lava Canyon	Small
7/17/47	NEVILLS	Tanner	Large
7/18/47	NEVILLS	Unkar	Large
7/14/48	NEVILLS	mile 40	Unknown
7/14/48	NEVILLS	Buck Farm Canyon	Unknown
7/15/48	NEVILLS	Nankoweap	Unknown
7/16/48	NEVILLS	Tanner	Large
7/23/48	NEVILLS	Mile 118-R	Unknown
7/14/49	REILLY	President Harding Rapid	Large
7/15/49	REILLY	Nankoweap	Unknown
7/16/49	REILLY	Nankoweap	Unknown
7/2/55	REILLY	Fern Glen	Unknown
7/4/55	REILLY	Spring Canyon	Large
7/5/55	REILLY	Spring Canyon	Large
6/19/56	REILLY	24 1/2-Mile Rapid	Unknown
6/20/56	REILLY	President Harding Rapid	Unknown
6/30/56	REILLY	Fern Glen	Large

* Cabins at the mouth of Diamond Creek.

Table 2. List of the photographic views of the Colorado River made by the Old Timers or relatives of the Old Timers that were replicated in this study

[Photographs were obtained from various sources. Photographer, is the last name of the photographer of the original view (if known). New, indicates a new camera station was established by personnel of the U.S. Geological Survey to monitor some aspect of the river corridor. Number, refers to the large number on album prints that were assigned by the original photographer or photographic archive. Date of original, was obtained from either captions in a photographic album, diaries of river trips, or written accounts. Date of repeat, is exactly known. When more than one replicate was made, the first three columns and the last column appear blank in the lines referring to the replicate(s). Stake number, is a number assigned for permanent storage of replicate negatives in the repeat photography collection at the Desert Laboratory, University of Arizona, Tucson. Letters following a number indicate a swing of two or more views; not all swings were assigned stake numbers with letters, however. River mile, was estimated to the nearest tenth of a mile using the 1990 revision of a popular river guide (Stevens, 1990). Side, direction, (R), and (L), refers to the side of the channel when facing downstream of the camera station and the relative direction of the view. (US), upstream; (DS), downstream; (AC), across the Colorado River, (UC), up a side canyon; (DC), down a side canyon. Location, is the name of a geographical feature at or near the camera station. Wherever possible, names were obtained from 7.5-minute quadrangle maps, but some names are generally recognized and used in a popular river guide (Stevens, 1990). Subject(s), designated by footnotes, refer to the type of information that was interpreted from the view. (---), view contained little of interest in terms of geomorphology or biotic habitat; (n.d.), no data; (n.a.), not applicable; (n.m.), photograph was analyzed, but not matched; (?), the exact date of the photograph is uncertain]

Appendix 6. List of the photographic views made by other photographers of the Colorado River corridor in Glen, Marble and Grand Canyons which were replicated in this study-Continued.

Photographer	Number	Date of original	Date of repeat	Stake number	River mile	Side, direction	Location	Subject(s)
Clover	2:13:02	1938	2/22/1993	2727	8.0	L, AC	Badger Rapid	(5,14,15,17)
Heald	3:06:12	1941	2/21/1993	2726	8.0	L, US	Badger Rapid	(14,15,17)
Wilson	4:06:12	7/15/1942	2/21/1993	2725	8.0	L, US	Badger Rapid	(14,15,17)
Belknap	n.d.	7/11/1952	4/21/1991	2016	8.0	L, AC	Badger Rapid	(5,14,15,17)
			10/04/1991	2016	8.0	L, AC	Badger Rapid	
Belknap	n.d.	7/12/1952	4/21/1991	2017	8.0	L, DS	Badger Rapid	(5,14,15,17)
			10/04/1991	2017	8.0	L, DS	Badger Rapid	
Belknap	n.d.	7/12/1952	10/04/1991	2048	8.0	L, DS	Badger Rapid	(5,17)
NPS	2333	9/21/1952	10/04/1991	2059	8.0	L, DS	Badger Rapid	(5,14,15,17)
Marston	559	9/13/1955	10/04/1991	2012	8.0	R, US	Badger Rapid	(5,14,15,17)
Nichols	n.d.	1956	4/21/1991	2060	8.0	L, DS	Badger Rapid	(5,14,15,17)
Rowlands	n.d.	6/19/1956	10/04/1991	2062	8.0	L, AC	Badger Rapid	(5,14,15,17)
Atherton	103	5/31/1956	10/04/1991	2064	8.0	L, AC	Badger Rapid	(5,14,15,17)
Marston	598	8/28/1959	10/06/1991	2352	8.0	L, AC	Badger Rapid	(5,14,15,17)
Marston	8.28.12	9/13/1959	8/03/1991	1787	8.0	L, AC	Badger Rapid	(5,14,15,17)
Marston	599.8.11	9/26/1959	8/03/1991	1788	8.0	L, DS	Badger Rapid	(5,14,15,17)
Marston	566.8.7	6/19/1959	4/21/1991	2013	8.0	L, AC	Badger Rapid	(5,14,15,17)
Marston	8.28.22	8/28/1959	4/21/1991	2014	8.0	L, DS	Badger Rapid	(5,14,15,17)
Marston	586.8.8	6/02/1959	10/04/1991	2015	8.0	L, DS	Badger Rapid	(5,14,15,17)
Reilly	56-02	6/24/1962	10/04/1991	2063	8.0	L, AC	Badger Rapid	(5,14,15,17)
Reilly	L66-15	6/17/1963	10/04/1991	2061a	8.0	L, DS	Badger Rapid	(5,14,15,17)
Reilly	L78-01	6/17/1963	10/04/1991	2061b	8.0	L, AC	Badger Rapid	(5,14,15,17)
Nichols	n.d.	8/?/1964	9/5/1994	2862	8.0	L, DS	Badger Rapid	(5,6,14,15,17)
Davis	423A	1967	12/31/1991	2070	8.0	R, US	Badger Rapid	(5,14)
Nichols	n.d.	10/?/1968	9/5/1994	2862	8.0	L, DS	Badger Rapid	(5,6,14,15,17)
Marston	477.8.1	7/12/1947	8/03/1991	2019	8.1	L, US	Badger Rapid	(5,17)
Wilson	4:09:11	7/15/1942	2/22/1993	2589	11.3	R, US	Soap Creek Rapid	(14,15)
Heald	3:02:09	7/15/1941	2/22/1993	2588	11.3	R, US	Soap Creek Rapid	(5,14,15)
Marston	12.4	6/09/1958	2/22/1993	2572	12.1	L, US	Salt Water Wash	(5,7,14,15)

Appendix 6. List of the photographic views made by other photographers of the Colorado River corridor in Glen, Marble and Grand Canyons which were replicated in this study-Continued

Photographer	Number	Date of original	Date of repeat	Stake number	River mile	Side, direction	Location	Subject(s)
Marston	12.5	6/09/1958	2/22/1993	2590	12.1	L, DS	Salt Water Wash	(5,7,15,17)
Sharp	n.d.	10/?/1937	8/03/1991	2020	20.6	R, AC	North Canyon Rapid	(2,13,14)
Goldwater	CR 36	8/07/1940	2/23/1993	2730	31.6	R, UC	South Canyon	(5,15)
Nichols	n.d.	7/?/1951	9/10/1994	2926	32.8	L, US	Redwall Cavern	(2,13,17)
Nichols	n.d.	7/?/1951	9/10/1994	2863	32.8	L, US	Redwall Cavern	(2,13,17)
Nichols	n.d.	7/?/1951	9/10/1994	2927	32.8	L, DS	Redwall Cavern	(2,13,17)
Reilly	L04-12	7/15/1949	8/04/1991	2022	52.2	R, DS	Nankoweap Creek	(15,17)
Reilly	L14-01	6/23/1955	8/04/1991	2021	52.3	R, DS	Nankoweap Creek	(15,17)
Richardson	n.d.	7/08/1978	2/05/1991	1740	52.3	R, DS	Nankoweap Creek	(15,17)
Nichols	n.d.	1957	9/11/1994	2928	59.7	L, DS	60-Mile Rapid	(5,14,15,17)
Nichols	n.d.	1957	9/11/1994	2929	59.7	L, AC	60-Mile Rapid	(5,14,15,17)
Sharp	n.d.	10/?/1937	1/05/1992	2078	59.9	R, US	Obscure location	(5,15,17)
Blaisdell	4278	7/13/1963	9/02/1973	729	61.3	L, US	Cape Solitude	(4,5,15,17)
Blaisdell	4288	7/13/1963	5/24/1992	729	61.3	L, US	Cape Solitude	(4,5,15,17)
Blaisdell	4283	7/13/1963	9/02/1973	730	61.3	L, US	Cape Solitude	(5,15,17)
Blaisdell	4283	7/13/1963	5/24/1992	730	61.3	L, US	Cape Solitude	(5,15,17)
Sharp	n.d.	10/?/1937	8/06/1991	2024	62.8	L, US	Cape Solitude	(5,15,17)
Wilson	4:07:11	7/19/1942	2/25/1993	2734	65.5	L, AC	Blw Crash Canyon	(5,17)
Reilly	L44-26	6/25/1959	8/06/1991	2026	65.5	R, DS	Lava Canyon Rapid	(14,17)
Heald	3:06:09	7/19/1941	2/25/1993	2733	65.6	L, US	Lava Canyon Rapid	(5,15,17)
Beer	n.d.	4/?/1995	9/12/1994	1094	67.0	R, AC	Comanche Creek	(15,17)
Blaisdell	4250	6/19/1963	3/21/1974	1094	87.4	R, DS	Bright Angel Creek	(5,14,15,17)
Blaisdell	4250	6/19/1963	10/23/1983	1094	87.4	R, DS	Bright Angel Creek	(5,14,15,17)
Leding	2245	6/28/1952	3/21/1974	1094	87.4	R, DS	Bright Angel Creek	(5,14,15)
Leding	2349	10/?/52	6/19/1963	716	87.4	L, AC	Bright Angel Creek	(5,14,15)
Leding	2349	10/?/52	8/23/1972	716	87.4	L, AC	Bright Angel Creek	(5,14,15)
Leding	2349	10/?/52	10/12/1982	716	87.4	L, AC	Bright Angel Creek	(5,14,15)

Appendix 6. List of the photographic views made by other photographers of the Colorado River corridor in Glen, Marble and Grand Canyons which were replicated in this study-Continued

Photo-grapher	Number	Date of original	Date of repeat	Stake number	River mile	Side, direction	Location	Subject(s)
			10/12/1983	716	87.4	L, AC	Bright Angel Creek	(5,14,15)
			8/19/1984	716	87.4	L, AC	Bright Angel Creek	(5,14,15)
			3/03/1994	716	87.4	L, AC	Bright Angel Creek	(5,14,15)
Nevills	589	7/22/1938	2/27/1993	2592	87.9	R, DS	Phantom Ranch	(5,15,17)
Wilson	4:13:16	7/23/1942	2/27/1993	3002	90.3	R, AC	Horn Creek Rapid	(4,14,17)
Heald	3:02:19	7/23/1941	2/27/1993	3001	90.3	R, AC	Horn Creek Rapid	(5,14,17)
Reilly	R02-03	7/19/1950	2/01/1992	2538	93.5	L, AC	Monument Creek	(5,15)
Burg	n.d.	10/26/1938	8/10/1991	2346	93.5	L, US	Monument Creek	(5,14,15,17)
Butchart	1227	8/29/1962	2/27/1993	2646	93.6	L, DS	Granite Rapid	(5,14,17)
Butchart	1226	8/29/1962	2/27/1993	2647	93.6	L, US	Granite Rapid	(5,14,17)
Clover	2:14:07	7/23/1938	2/27/1993	2735	93.6	L, AC	Granite Rapid	(5,14,17)
Clover	2:14:08	7/23/1938	2/27/1993	2648	95.0	L, AC	Hermit Rapid	(5,14)
Euler	n.d.	1967	3/06/1994	2813a	98.3	R, AC	Crystal Rapid	(1,3,7)
Reilly	L38-23	5/21/1958	8/10/1991	2347	98.3	R, UC	Crystal Creek	(7,15)
Butchart	2366	5/31/1966	2/01/1990	1466	98.3	R, DC	Crystal Creek	(5,7,14,15)
Butchart	2367	5/31/1966	4/03/1986	1268	98.3	R, DC	Crystal Creek	(5,7,14,15)
Reilly	L69-37	5/07/1964	2/19/1992	2088	104.6	L, UC	Ruby Canyon	(7,15,17)
Reilly	L70-00	5/07/1964	2/19/1992	2607	106.0	L, AC	Serpentine Rapid	(5,14)
Euler	AZ B:15:00.28	4/30/1975	3/07/1994	2904	107.7	L, US	Bass Rapid	(1,7,15)
Marston	576 108.11	6/15/1957	3/08/1994	2767	107.8	R, AC	Hotauta Canyon	(7)
Marston	576 108.6	6/15/1957	3/07/1994	2766	108.0	R, US	US of Bass Camp	(7,14)
Marston	576 108.11	6/15/1957	3/07/1994	2761	108.3	R, AC	Bass Camp	(1,7,14)
Euler	AZ B:15:1.25	7/?/1978	3/07/1994	2763	108.3	R, AC	Bass Camp	(1,7)
Euler	AZ B:15:1.34	9/?/1987	3/07/1994	2764	108.3	R, DS	Bass Camp	(1,7)
Balsam	AZ B:15:1.42	10/22/1988	3/07/1994	2762	108.3	R, AC	Bass Camp	(1,7)
Euler	AZ B:15:1.1	6/?/1962	3/08/1994	2768a	108.4	R, US	Bass Camp	(1,7,15,17)
Euler	AZ B:15:1.16	7/14/1978	3/08/1994	2768b	108.4	R, US	Bass Camp	(1,7,15,17)
Wilson	4:14:19	7/24/1942	3/01/1993	3003	112.2	L, DS	Waltenberg Rapid	(5,14)
Burg	n.d.	10/28/1938	3/01/1993	3004	112.3	L, US	Waltenberg Rapid	(5,14)

Appendix 6. List of the photographic views made by other photographers of the Colorado River corridor in Glen, Marble and Grand Canyons which were replicated in this study-Continued.

Photo-grapher	Number	Date of original	Date of repeat	Stake number	River mile	Side, direction	Location	Subject(s)
Clover	2:14:03	7/24/1938	3/02/1993	3005	130.5	R, US	Bedrock Rapid	(7)
Reilly	L57-14	7/05/1962	8/13/1991	2035	131.9	R, UC	Stone Creek	(13,15,17)
Reilly	L16-05	6/28/1955	8/13/1991	2036	131.9	R, UC	Stone Creek	(15,17)
Goldwater	CR 150	8/15/1940	3/04/1993	2738	133.8	R, US	Tapeats Creek	(5,17)
Sharp	n.d.	11/?/1937	2/25/1992	2701	134.8	R, DS	Granite Narrows	(5,15,17)
Sharp	n.d.	11/?/1937	8/13/1991	2037	136.1	L, AC	Deer Creek Falls	(5,17)
Wilson	4:06:01	7/26/1942	3/04/1993	3006	136.3	R, UC	Deer Creek Falls	(5,17)
Wilson	4:08:21	7/26/1942	3/04/1993	2595	143.5	R, DS	Kanab Creek	(5,14)
Reilly	L70-24	5/10/1964	8/14/1991	2038	143.6	R, DC	Kanab Creek	(15)
Reilly	R42-7	7/06/1953	8/14/1991	2040	143.6	R, DC	Kanab Creek	(15)
Reilly	L70-19	5/10/1964	8/15/1991	2042	143.6	R, DC	Kanab Creek	(5,15,17)
Reilly	L70-17	5/10/1964	8/15/1991	2042b	143.6	R, DS	Kanab Creek	(5,15,17)
Sharp	n.d.	11/?/1937	2/01/1992	2611	148.0	R, US	Matkatamba Creek	(2,13,14,17)
Marston	v. 80,166	7/25/1947	3/11/1994	2831	156.9	L, US	Havasu Creek	(7,14,17)
Reilly	R01-7	7/24/1950	3/05/1993	2656	166.3	L, DS	National Canyon	(5,17)
Nichols	1	7/?/1957	9/17/1994	2931	171.4	L, DS	Mohawk Canyon	(5,15,17)
Belknap	n.d.	8/?/1963	6/10/1979	968	178.0	R, AC	Vulcan's Anvil	(5,17)
Scoyen	6616		1929	967	179.3	R, DS	Lava Falls Rapid	(5,15,17)
Fraser	307 GDCN		7/?/1930	967	179.3	R, DS	Lava Falls Rapid	(5,17)
	179.1							
Eden	2085		9/?/1951	967	179.3	R, DS	Lava Falls Rapid	
Reilly	L19-33		3/25/1956	967	179.3	R, DS	Lava Falls Rapid	
Reilly	G-164		4/16/1956	967	179.3	R, DS	Lava Falls Rapid	
Dodge	8346		8/21/1959	967	179.3	R, DS	Lava Falls Rapid	
Eden	2068		10/?/1951	966				
Eden	2089		10/?/1951	966				
Dodge	8340		8/?/1959	966				
Turner	966		6/10/1979	966				
Sharp	n.d.	11/16/1937	8/16/1991	1795	179.3	L, US	Prospect Canyon	(7)

Appendix 6. List of the photographic views made by other photographers of the Colorado River corridor in Glen, Marble and Grand Canyons which were replicated in this study-Continued

Photo-grapher	Number	Date of original	Date of repeat	Stake number	River mile	Side, direction	Location	Subject(s)
Sharp	n.d.	11/16/1937	8/16/1991	2045	179.3	L, AC	Lava Falls Rapid	(5,6,14)
Clover	3412:14:14	7/29/1938	3/14/1994	2838	179.3	L, US	Lava Falls Rapid	(7,14)
Goldwater	CR 24	8/17/1940	3/08/1993	2657	179.3	L, AC	Lava Falls Rapid	(5,6,14)
Goldwater	CR 57	8/17/1940	3/08/1993	2742	179.3	L, DS	Lava Falls Rapid	(5,6,14)
Goldwater	CR 34	8/17/1940	3/10/1993	2659	179.3	L, UC	Lava Falls Rapid	(5)
Heald	3:6:6	7/27/1941	7/26/1942	2741	179.4	L, DS	Lava Falls Rapid	(5,6,14)
			3/08/1993	2741	179.4	L, AC	Lava Falls Rapid	
Wilson	4:08:11	7/26/1942	3/10/1993	2660a	179.4	L, AC	Lava Falls Rapid	(5,6,14)
Wilson	4:06:08	7/26/1942	3/10/1993	2660b	179.4	L, AC	Lava Falls Rapid	(5,6,14)
Wilson	4:12:5	7/26/1942	3/13/1994	2834	179.3	L, AC	Lava Falls Rapid	(5,14)
Riffey	477 GDCN	7/27/1947	2/20/1991	1769	179.3	L, AC	Lava Falls Rapid	(5,6,14)
	179.444							
Marston	477 GDCN	7/27/1947	2/20/1991	1770	179.3	L, AC	Lava Falls Rapid	(5,6,14)
	179.2							
Marston	477 GDCN	7/27/1947	2/20/1991	1768	179.3	L, AC	Lava Falls Rapid	(5,6,14)
Nevills	5:12:01	7/27/1947	3/10/1993	2661	179.3	L, AC	Lava Falls Rapid	(5,6,14)
Anspach	497 GDCN	7/27/1949	2/20/1991	2004	179.3	L, AC	Lava Falls Rapid	(5,6,14)
	179.8							
Reilly	L6-35	7/27/1949	8/16/1991	2043	179.3	L, DS	Lava Falls Rapid	(5,6,14)
Belknap	48826	6/19/1950	3/13/1994	2772	179.3	L, DS	Lava Falls Rapid	(5,6,7,14,15)
Belknap	48841	6/19/1950	3/10/1993	803	179.3	R, AC	Lava Falls Rapid	(5,6,14)
			9/26/1976	803	179.3	R, AC	Lava Falls Rapid	
			3/25/1974	803	179.3	R, AC	Lava Falls Rapid	
			10/31/1983	803	179.3	R, AC	Lava Falls Rapid	
			8/24/1963	803	179.3	R, AC	Lava Falls Rapid	
Reilly	R01-11	7/25/1950	8/16/1991	2046	179.3	L, US	Lava Falls Rapid	(5,6,14)
Nichols	n.d.	1952	9/18/1994	2935	179.3	L, DS	Lava Falls Rapid	(5,6,14)
Nichols	n.d.	1953	9/18/1994	2933	179.3	L, UC	Lava Falls Rapid	(7)
Beer	n.d.	4/?/1955	9/18/1994	2934	179.3	L, US	Lava Falls Rapid	(5,6,14)

Appendix 6. List of the photographic views made by other photographers of the Colorado River corridor in Glen, Marble and Grand Canyons which were replicated in this study-Continued.

Photo-grapher	Number	Date of original	Date of repeat	Stake number	River mile	Side, direction	Location	Subject(s)
Nichols	n.d.	7/13/1957	9/18/1994	2932	179.3	L, DS	Lava Falls Rapid	(5,6,14)
Beckwith	II-17	7/13/1957	2/20/1991	1586	179.3	L, DS	Lava Falls Rapid	(5,6,14)
Stavely	n.d.	7/20/1958	2/20/1991	2002	179.3	L, DS	Lava Falls Rapid	(5,6,14)
Marston	606 GDCN 179.2,19	6/23/1960	2/20/1991	1585	179.3	L, DS	Lava Falls Rapid	(5,6,14)
Marston	48832	6/23/1960	2/20/1991	1587b	179.3	L, DS	Lava Falls Rapid	(5,6,14)
Marston	606 GDCN	6/23/1960	2/20/1991	1588	179.3	L, DS	Lava Falls Rapid	(5,6,14)
Marston	179.18,10 606 GCN 179.2,14	6/23/1960	2/20/1991	1587a	179.3	L, DS	Lava Falls Rapid	(5,6,14)
Reilly	L58-3	7/10/1962	2/20/1991	2003	179.3	L, AC	Lava Falls Rapid	(5,6,14)
Reilly	L58-4	7/10/1962	3/13/1994	2834	179.3	L, DS	Lava Falls Rapid	(5,6,14)
Belknap	48858	8/24/1963	3/09/1993	2746	179.4	R, AC	Lava Falls Rapid	(5,6,14)
Belknap	48865	8/24/1963	3/09/1993	2746	179.4	R, AC	Lava Falls Rapid	(5,6,14)
Reilly	R40-8		6/01/1958	969	179.3	R, DS	Lava Falls Rapid	(5,6,14)
Belknap	48824		8/24/1963	969	179.3	R, DS	Lava Falls Rapid	(5,6,14)
			6/10/1979	969	179.3	R, DS	Lava Falls Rapid	(5,6,14)
Reilly	L24-7		4/16/1956	969	179.3	R, DS	Lava Falls Rapid	(5,6,14)
Leding	236		10/22/1952	969	179.3	R, DS	Lava Falls Rapid	(5,6,14)
Reilly	G875		4/16/1956	969	179.3	R, DS	Lava Falls Rapid	(5,6,14)
Eden	2082		10/?/1951	969	179.3	R, DS	Lava Falls Rapid	(5,6,14)
Hamilton	8353		10/?/1955	969	179.3	R, DS	Lava Falls Rapid	(5,6,14)
Reilly	L40-10		6/01/1958	969	179.3	R, DS	Lava Falls Rapid	(5,6,14)
Leding	2359		10/22/1952	969	179.3	R, DS	Lava Falls Rapid	(5,6,14)
Hamilton	46 3 5605		10/?/1955	969	179.3	R, DS	Lava Falls Rapid	(5,6,14)
Wieland	24		5/?/1963	969	179.3	R, DS	Lava Falls Rapid	(5,6,14)
Marston	563 GDCN- 179.8		3/25/1956	969	179.3	R, DS	Lava Falls Rapid	(5,6,14)
n.d.	63-9-25	9/25/1963	2/21/1991	1589	179.3	R, DS	Lava Falls Rapid	(5,6,14)

Appendix 6. List of the photographic views made by other photographers of the Colorado River corridor in Grand Canyon which were replicated in this study-Continued

Photo-grapher	Number	Date of original	Date of repeat	Stake number	River mile	Side, direction	Location	Subject(s)
n.d.	GDCN 179-25		3/09/1993	1589	179.3	R, DS	Lava Falls Rapid	(5,6,14)
	63-9-25	9/25/1963	3/10/1993	2005	179.4	R, US	Lava Falls Rapid	
	GDCN 179-28							
Reilly	L70-32	5/12/1964	8/16/1991	2044	179.3	L, AC	Lava Falls Rapid	(5,6,14)
Visbak	16	2/21/1965	2/20/1991	1592	179.3	R, DS	Lava Falls Rapid	(5,6,14)
			3/12/1994	1592	179.3	R, DS	Lava Falls Rapid	
Visbak	24	2/21/1965	3/09/1993	3050	179.4	R, US	Lava Falls Rapid	(5,6,14)
Harris	2	5/21/1965	3/10/1993	3010	179.3	L, DS	Lava Falls Rapid	(5,6,14)
Harris	3	5/21/1965	3/13/1994	2836	179.3	L, AC	Lava Falls Rapid	(5,14,15)
Harris	896	4/30/1967	3/08/1993	2739	179.3	L, AC	Lava Falls Rapid	(5,6,14)
Harris	4	7/?/1969	3/08/1993	2740b	179.3	L, AC	Lava Falls Rapid	(14)
Harris	1	7/?/1969	3/08/1993	2740a	179.3	L, AC	Lava Falls Rapid	(14)
Belknap	48866	8/25/1963	9/26/1976	803	179.3	R, AC	Lava Falls Rapid	(5,6,14)
			10/31/1983	803	179.3	R, AC	Lava Falls Rapid	(5,6,14)
Turner	967	7/01/1930	9/01/1951	967	179.3	R, DS	Lava Falls Rapid	(5,6,14)
			10/22/1952	967	179.3	R, DS	Lava Falls Rapid	
			3/25/1956	967	179.3	R, DS	Lava Falls Rapid	
			4/16/1956	967	179.3	R, DS	Lava Falls Rapid	
			8/21/1959	967	179.3	R, DS	Lava Falls Rapid	
Hertzog	6525NA		5/19/1965	967	179.3	R, DS	Lava Falls Rapid	(5,6,14)
			6/10/1979	967	179.3	R, DS	Lava Falls Rapid	
			8/18/1992	967	179.3	R, DS	Lava Falls Rapid	
Sharp	n.d.	11/?/1937	3/12/1993	2747	205.5	L, US	205-Mile Canyon	(5,14,15)
Wilson	4:07:06	7/28/1942	3/13/1993	2748a	209.0	L, AC	Granite Park	(2,13,14)
Wilson	4:15:22	7/28/1942	3/13/1993	2748b	209.0	L, US	Granite Park	(14,17)

Appendix 6. List of the photographic views made by other photographers of the Colorado River corridor in Grand Canyon which were replicated in this study-Continued

Photo-grapher	Number	Date of original	Date of repeat	Stake number	River mile	Side, direction	Location	Subject(s)
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1 Archaeology, the view contained an archaeological site.

2 Boats, one or more boats appear in the view.

3 Cryptobiotic soils, the view contains a significant amount of cryptobiotic soils.

4 Debris bar, a debris bar in the Colorado River appears in the view.

5 Debris fan, a debris fan appears in the view, but not all views with debris fans are listed.

6 Debris flow, a debris flow has occurred during the last century in the view.

7 Desert, the view contained desert vegetation.

8 Driftwood, the view contains driftwood at or near the highest flood stage of the Colorado River during the last century.

9 Eolian sand, the view contains eolian sand.

10 Grazing, desert vegetation in the view was grazed by domestic livestock (at or upstream of Lees Ferry), heavily grazed by deer, or heavily grazed by burros.

11 New desert, the view contains significant amounts of desert vegetation that has invaded the new high-water zone.

12 Old high-water line, the view contained vegetation of the old high-water zone, but not all views could be interpreted for change.

13 People, member(s) of various river parties appear in the view.

14 Rapid, the view contains a rapid.

15 Riparian, the view contained riparian vegetation that could be interpreted for change.

16 Rockfall, a rockfall has occurred in the view during the last century.

17 Sand bars, the view contains sand bars.

18 Lake, matched views show Lake Mead.

Wonderland Expeditions

KEN SLEIGHT, GUIDE
3862 South 825 West
Bountiful, Utah 84010

March 23, 1967

John Cross, Jr.
945 So. 800 E.
Orem, Utah

Dear John,

Thank you for the information pertaining to the Grand situation. A number had inquired further as to the conditions and so your letter and reports was most timely.

I am in the process of making up a list of Professional guides and outfitters who are doing business. Would you prepare a resume of your operations in 100 words, so that I may include your Guide Service in the preparation of such a listing?

You should include name of operation, type of operation, address, area of operations, etc.

Would you do this as soon as possible so that I can begin sending this information out.

Sincerely,



Ken Sleight

WESTERN RIVER GUIDES ASSOCIATION, Inc.
Ken Sleight, President
3862 So. 825 West
Bountiful, Utah

February 24, 1967

Dear Member:

This letter is sent to you at this time because of its immediate importance. I just received a letter from Frank Betts of the Grand Canyon National Park in which he sends along information pertaining to Crystal Creek and rapids. He writes:

"We have a little information to pass on to the river runners, particularly those running the Grand this year. Just recently we learned that since the December floods on the North Rim the character of the river at Crystal Creek has changed tremendously. I have not seen this myself, but the U.S. Geological Survey was in doing some research in the canyon and they say these rapids have changed so much the topographical maps will need to be revised. I talked to the helicopter pilot who flew these people into the canyon and he says Crystal rapids is now the most vicious he has seen. He has flown the river many times over the past two years and knows a good rapid when he sees one. There is a possibility we may get down there next week. If so, we will get some pictures to pass on to your organization."

Frank also sends the following thank you message to the Association and pledges the cooperation of the Park Service.

"You have a fine organization which we would like to assist in any way possible to promote the continuance of safe and enjoyable boating. I think Bates Wilson, as NPS Utah Coordinator, has already expressed his thanks in behalf of the National Park Service for allowing us to attend your meeting. Jack Currey did a fine job as your predecessor in conducting the meeting and making us feel at home."

Sincerely,



Ken Sleight

WESTERN RIVER GUIDES ASSOCIATION
Ken Sleight, Pres.
3862 South 825 West
Bountiful, Utah 84010

March 23, 1967

Dear Member,

This letter is a follow-up of our recent announcement as to conditions in the Grand Canyon. John L. Cross, Jr. sends us a more detailed report of the conditions after his first run of the canyon this year. Following are excerpts from his report:

Kwagunt Creek

"The Rapid was not changed noticeably."

Bright Angel Creek

"A lot of damage to the trail, mule area at Phantom, and public campground is evident. The public shower and toilets were washed out. The rapid has become slightly more difficult. But still it is not much.

Crystal Creek

"Here the country really changed. A huge delta of boulders has dammed the river forcing the river over to the south wall. The main current flows against the cliff. In this channel is a number of tremendous holes. The difficulty of the rapid comes when the current splits into a "Y". At the junction of the "Y" is a large pile of boulders. "

"A boat will have a wild ride down the left, and would need a lot of power to break out of current and get around the right side. It is my opinion that a boat trying the latter would probably hit the boulders at the center of the "Y" because of momentum built up in the extremely fast current. A "Sneak" Row Job down the right would be extremely difficult if not impossible to accomplish because of the shallows and number of rocks."

"I ran the left side down the cliff with two pontoons tied side by side because of the big cargo that I had. We had a wild ride - about like the right side of Lava Falls. Made it O.K. A single boat might have trouble in the holes. At 12 to 14,000 I would rate this rapid close to 10. It looks like it will be much worse at lower water.

Lava Falls (Volcan Rapid)

"Prospect Canyon flooded a good deal dumping a great number of huge boulders into the left side of Lava. A left hand sneak used to be difficult, but now you really have to thread the needle. But there still is a channel. The right side seems to be its same wild self."

Other comments:

"The floods have put a lot of wood on the beaches all the way to Diamond Creek. No wood problem this year."

"As of March 18, Diamond Creek road was open."

.....

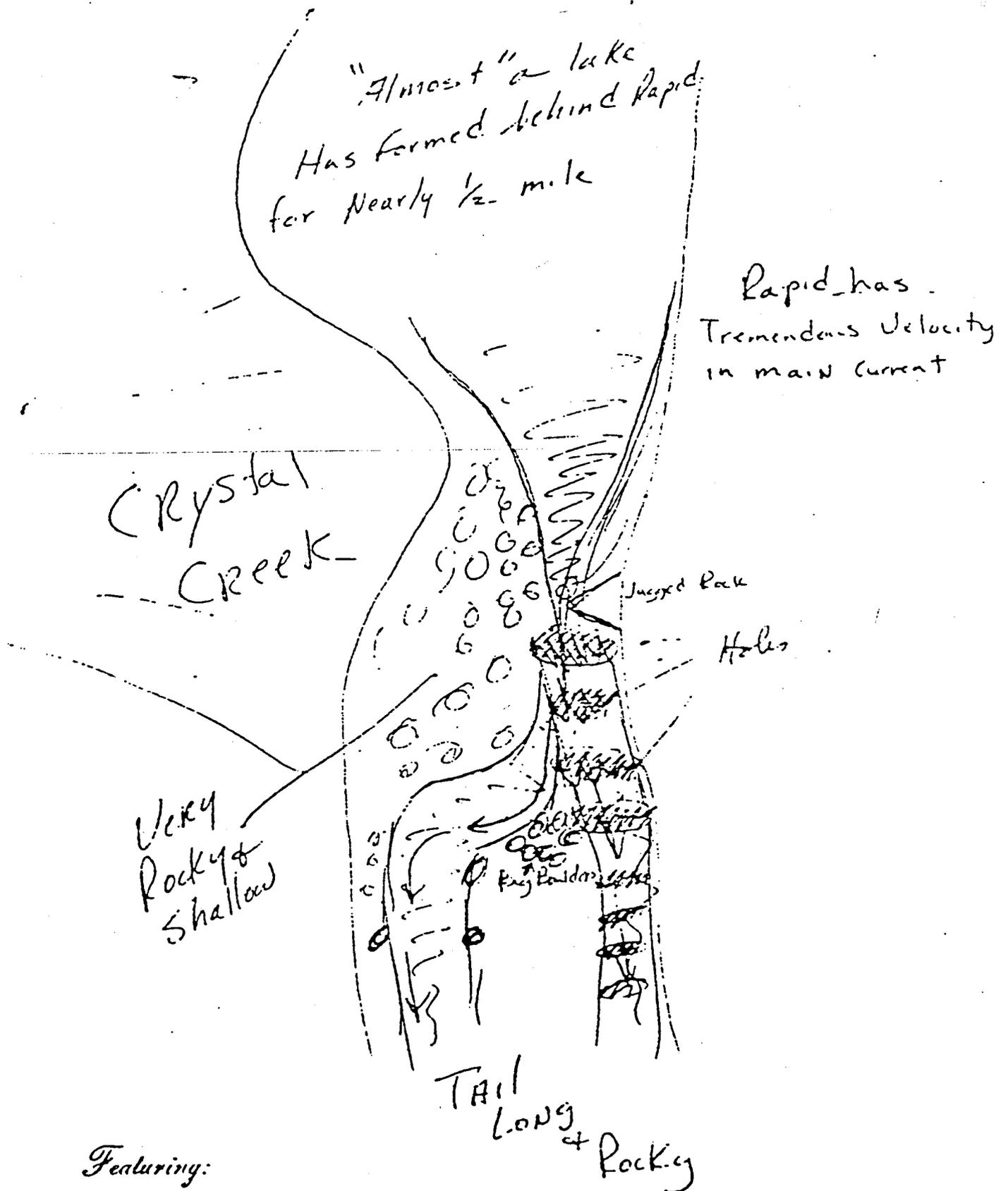
John also writes that he has left two ten-mans, food and gear on the river from "just above Lava to about Mile 203". These boats are being used by geologists for the next two months. If any find these boats unattended, it does not mean that they have been abandoned.

I am sure that the above report will prove valuable to those running the Grand this year. Our thanks to John.

Sincerely,

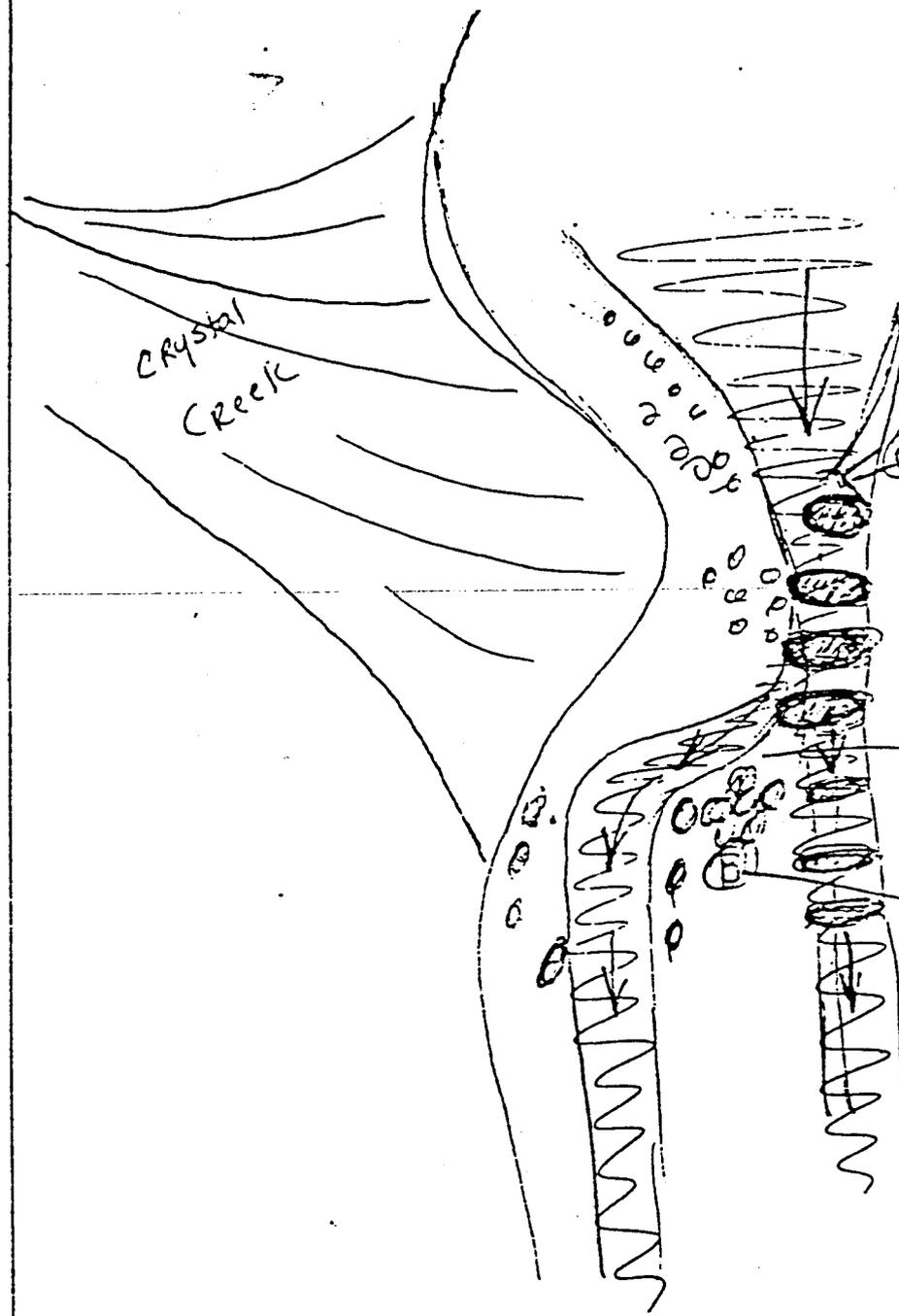
Ken Sleight

Cross Tours & Exploration Inc.



River Expeditions -- Scenic Tours -- Study Tours -- Treks -- Explorations -- Hunting -- Fishing

Cross Tours & Exploration Inc.



Most of the Current has been pushed over to the South wall where it flows next to the wall and a number of huge holes have been formed. Upon reaching point A the current splits and runs direct at 90° to the Right of River then swings downstream to run down the Right Side of the main current to a turn to Right to follow ^{Right} ~~some~~ channel would be ideal but shallowness of upper Right side and velocity of main current would put a great right boulder a large number of boulders in the center (point B) unless one had enough power to back water ^{main current} The Right Side is very shallow and full of boulders which should make a low job very difficult if not impossible. especially in low water. Another alternative would be to barely miss huge Rock (Point C) and ride out big holes down left wall.

Any way you look at it Crystal has become one of the worst rapids in the Canyon. At 12-14,000 fps I would rate Crystal ~~comparatively~~ at ~~7-10~~ ^{probably a 10} It looks like it might be worse in lower water

Featuring:

River Expeditions -- Scenic Tours -- Study Tours -- Treks -- Explorations -- Hunting -- Fishing

RIVER TRIP SCHEDULE - 1967

MONTH & INCLUSIVE DATES OF TRIP	OPERATOR	NUMBER OF PEOPLE
March 4 - May 5 (geo. expedition)	Cross Tours	14
March 18 - 26	American River Touring Assoc.	19
March 19 - 24	Western River Expeditions	69
March 20 - 31	Georgie White	55
April 7 - 16	Hatch River Expeditions	21
April 10 - 21	Western River Expeditions	14
April 14 - 23	Grand Canyon Expeditions	8
April 20 - 27	Hatch River Expeditions	48
April 24 - May 3	Cross Tours	19
April 24 - May 3	Harris-Brennan Expeditions	17
April 24 - May 5	Georgie White	30
		<u>66</u>
April 26 - May 5	Hatch River Expeditions	15
April 28 - May 5	Hatch River Expeditions	27
May 6 - 16	Cross Tours	6
May 8 - 19	Western River Expeditions	5
May 10 - 19	Hatch River Expeditions	19
May 12 - 21	Grand Canyon Expeditions	13
May 15 - 26	Georgie White	27
May 16 - 30	Evans (Private Party)	7
May 22 - June 2	Western River Expeditions	14
May 22 - 31	Sanderson Brothers	17
		<u>31</u>
May 26 - June 6	Hatch River Expeditions	32
May 28 - June 1	Cross Tours	34
May 29 - June 7	Hatch River Expeditions	35
May 30 - June 10	Drury (Private Party)	18

3/15/94 below Spring Canyon
Lower flow w/ fluvial
basalt cobbles/boulders
cobbles and
surface.

Many clasts of muscovite are wetland
to thin disks. The % of muscovite
measured (2%) may be low if a
cross section were available. Larger
more numerous clasts are present in
the side of the deposit above the
fluvial sand/silt/cobble unit.
Only exposure of the petrocalic horizon
indicates stage III - IV? thin and
directly overlying the fluvial ash unit.

Should dig a soil pit and describe the
soil here

9/9/94 Old-Timer's Trip

We rambled 9/8 after considerable
chaps at Lees Ferry. The bus did not
arrive until about 1:00 PM. We were
joined at the Ferry by Harvey Bitterback
and Don & Mary Harris. I talked quite
a bit to Don & Mary -- it's too bad
they could not go down with us. Mary
had 20 Grand Canyon trips between 1965
& the late 1970s. Harvey had many
interesting stories about his exploits
along the river. He only had two
river trips in boats, but floated
a lot of the river on an air
mattress. He ran Sockdolager &
Grapvine Rapids on his air mattress.

We set up the well-known photopoint
of Don Harris and Lois Jetter Carter in
the Astor boat at Lees Ferry.
We seemed to get about a dozen
people photographing that scene. It
looked great.

9/9/94 Old Tim's Trip

We began the trip with a science crew of Larry Stevens, Bill Webb, Jack Schmidt, & Ted Melis. We have historian Ray Webb, Richard Quantzoli, & members of the oral history group from the Grand Canyon Professional River Guides. We already have some returns on the trip in terms of science gain.

Badger had a debris flow & layer flood on August 17, 1994. The flow partially constricted Badger Rapid & changed the pattern of flow. The rapid now has a second drop about $\frac{1}{3}$ of the way from the top with some larger waves.

We had a great new photograph of this site, but Tad Nichols contributed two more photographs taken from the rim that help with sand bar volume estimates. We know from the photographs evidence that the August 17 event was the largest in the last

9/9/94 Old Tim's Trip

century. Tad's photos, plus those of the Nevill's daughters, helped with making this observation more definite.

Obviously, most of the participants were very interested in the new bridge being built. We saw 7 bighorn sheep just downstream from the bridge.

Bob Rigg will be a key resource on this trip. He had something like 20 trips on the river before closure of Glen Canyon Dam. His last trip was in 1965, so he experienced the river just after the dam closed. He brought a box of video & told me that he had numerous slides of the river taken by passengers in the 1950s. He is very willing to loan these to us.

Lois Toth Butler is very sharp & is a wonderful resource to have on the trip. Larry Stevens is already arriving

9/9/79 Old Tim's trip
having her co-author a paper on broad
Congo grasses. She brought several
old photographs - including the one
that shows tamarisk at Badon
Rapids in 1938 -- and brought the
original copies of her notes, which
are nitrate-based. She seems to
remember quite well -- she does not
recall extensive tamarisk at Lees
Ferry. She does recall seeing willows
at the place where the expedition
pulled in. She was surprised to
see the amount of riparian vegetation
in the reach downstream of the bridge.
She recalled the water was much higher
in 1938, & wondered whether the rocks on
river right were covered or not (they
weren't).

John Corso Jr. told me a story about
an accident in 1978 or 1979. It
was Richard Quantavoli's first trip.
Verify the details with Richard. The
water was not that different than
this evening. His motor mechanism

9/9/84 Old Tim's trip
had not put all the screws in the
lower unit of the motor. The motor
fell out of gear & he lost power on
a downstream ferry to the left.
He ended up stuck on a distinctive
notched piece of Coconino Sandstone.
This rock is now on the edge of the
river at 8,000 cfs. The boat was
very stuck. Mike Denoyer was in
the trip; he got a boat up to within
30-50 feet of the stuck boat. The
passengers jumped into the water & were
picked up by the lower boat. The
stuck boat remained in the water
overnight. The next morning, the water
dropped enough to walk out & push
the boat off (they unloaded some of
the weight from the rear before they
pushed it off).

9/9/94 Old Times Trip

Spent the morning with Martin Litten.

One of the issues discussed was the change in Horse Rock Rapid. Martin claims it changed in December 1966. However, he had no specific notes or other evidence.

John Cross Jr. did not notice a change in March 1967. He was the first through the cove after the 1966 storm. He did notice that the sand bar had been washed away -- Cross used to camp at lower Horse Rock until 1965. John Jr. first thought the change in 1965 was caused by tributary flow, but later he stated the erosion was by the 1965 release from the dam.

Bob Rigs noted that Horse Rock Rapid became more difficult between 1959 & 1965. However, he was surprised at how difficult it is now.

Brian Dickson ran the river beginning in 1969. He believes that 1-2 floods in the 1970s (early) changed (constricted) the rapid significantly. The rockfall occurred in the 1970s.

9/9/94 Old Times Trip

John Cross Jr. also noted a major change in the "early to mid-1970s". He was away from the river & returned. He was worried specifically about the change in Horse Rock.

Larry Stevens noted the small rockfall on the upstream side of the pile on the beach occurred in 1976. The larger pile -- which was deposited after 1923, predates his experience. Cross Jr. also remembers the pile, which places its occurrence before 1963.

Brad Dimmock began river running in 1971. He felt the only change in the rapid was in 1983 -- the boulders were rearranged on the underwriter part of the debris fan.

Gene Shoemaker believes Horse Rock looked similar in 1968. He went through at a similar water level. Everybody acknowledges in sand level has declined.

9/9/44 Old Times Trip

Redneck Rapid formed from a rockfall in Supai Group in 1975. Pete Resnick was nicknamed Redneck, & he felt the rapid should be named for him because he was the first to run it.

House Rock is pretty controversial in terms of how many events & when they occurred. No doubt it was a large debris flow and a major change. The question is: how many events & what the dates are.

Bob Rigg told me Boulder Rapid changed between 1951 & 1952. He may have photos. He said it was very obvious. He also noted that "Hermit Rapid kept changing."

Martin Litten went down the Tomowasep Trail in 1950 & 1951. He carried a 4x5 & took photographs of Lava Falls. He said they were beautiful. We need copies of these.

9/9/94 Old Times Trip

George Wendt was camped below Warm Springs Rapid at the time of the 1966 debris flow. Clear evidence of temporary backwater above the rapid.

Lee Jones 1953 - ^{Yampa, Wapiti & Salt-Mtn.} first trip. Designed his own aluminum kayak - 17' & 14'

Cataract -- August 1953 -- in a canoe solo. Did it in a day & a half.

Thanks giving of 1953, went through Marble Canyon. April 1954, went through from Bright Angel to end. Smoo Allen.

Bus Hatch. Ron Smith & Larry Allen wanted to go through, ran down to Bright Angel, hauled a kayak out on his head 1963 -- flow cut to 1,000 cfs.

Oct. 1963

Gene Shoemaker is interested in the breakout floods from the lava dams in western Grand Canyon. Wants to do Al & Be dating of quartz crystals.

9/9/94 Old Timer's Trip

viewed movies by Bob Rigg on at least in his possession. Footage was

partly transferred to videotape. We

saw footage of Whay Law Falls in

1949 -- may have been 25,000 ft³/s.

Saw Doc Martin & Chris Craft run the

Badger Rapid in 1951. Some additional

1947 footage of Badger. Mostly shows

the river right bank & the top

right riparian zone.

9/10/94 Old Timer's Trip

Foster may have helped clamp the
question of change at House Rock Rapid,
He observed a small flow that extended
the debris fan in 1971-72. He noted
the major change occurred before his first
trip in 1969.

Kent Frost noticed major change in the
mouth & delta at South Canyon.

9/10/94 Old Timer's Trip

Ted Nichols said the pull in at Vasey's

used to be much easier. Bob Rigg

said the island did not used to be

there (it was 1923 USGS photographed

from the island).

Bob Rigg said that the President Harkin

said there has been several eroded. He

said the eddy used to be a major

reporting for driftwood.

We watched 6 photographs today. Four

photos were in Redwall Cavern, one

at mile 37.0, & 1 at Bert's Canyon.

Major sand loss US of mile 41, but

aggradation at Redwall Cavern & at

mile 37.0.

Ted Nichols said the craft used by

Shoemaker & Stephens was 211-22 ft.

All rowing boats (1968). 1969, he

went with Don Harris & Jack Brennan.

Jack died 10 years ago. Heart attack.

9/10/54 Old Timer's Trip.
Large sand bar in front of Vasey's
They used to stop there, camped there
occasionally. Hiked up to the Stanton's
cave for protection from rain. River
used to flow further from Vasey's at
lower velocity. May 26, 1952, Bob Riggs
remembers water pushing from Vasey's.
Riggs saw it at higher water, island
was probably under water.
Contract boats would be 18 days,
power boats would be 7-10 days.
1953 & 1954, 1955 did two trips back
to back.

Les Jones remembered the depletion in
the 1963 at Lava Falls Rapid.

Bob Riggs indicated they scouted few
of the rapids except Lava Falls.
They portaged lava mostly because
that's the way things were done.

Les Jones liked Powell river running
to motor boats.

9/10/44

Bob Riggs, Jack Riggs, & Jim Riggs
all ran power boats in one trip.
Jack ran Mexican Hat Lodge for many years.
Woman in Ted Nichols photos of Redwall
Caveau was Naomi.

Alister said that Buck Farm flooded
& deposited new material recently (1980s?)

Frank Wright's photos were given to
the University of Utah. Frank said the
1957 trip did him in. Said it was horrible.

Bill Davis ran a rubber raft down in 51-53.
Capsized in 75-mile Rapid.

Trudy McMurrin @ University of Nevada
Press, all acquisitions.

Bob Riggs said he saw deer swimming in
front of boats in Marble Cyn, 1950s.

9/11/94 Old Timmer's Trip
we met on a GCE trip;
Dr. George Butler

U.S.D.A. Cotton Research Lab
4135 E Broadway
Phoenix AZ 85282 85040

1530 E. Broadway
Tempe AZ 85282

1953 Entomologist - collected insects
Deported in Park Service at South Rim
worked on some crows as check house

Joan Newell Stavel

Mary Beckwith may be still alive & living
in Attadene, California

Fred Eisman (Maggie)
12530 E. Mountain View Rd
Scottsdale, AZ 85382

She hadn't heard about Joyce Visbeck

9/11/94 Old Timmer's Trip
Fred. named the 1969 trip -- started
for Mexican West Expedition in 1965.
Maggie was a transcendental photographer &
always went on the trips.

Stan Jones -- Page, Arizona,
(602)-645-2836 has a great photograph
downstream from Nankawage granaries in
the 1970s.

9/12/94 Old Timmer's Trip

Kent Frost went down first in 1947 &
again in 1953. He has taken four trips
through Cataract, one through Hell's Camp,
and several through the upper green.
He appears to be really sharp & vividly
remembers certain sites along the river.
1939 was a dry summer, San Juan was
dry at mouth.

John Curo Sr. sons Jerry
Tim, Jack, John Jr.
all ran boats for Curo. They have
extensive files on all of their trips

John Curo Jr. -- knows where to get a video
of jet boat upstream of Cataract in 1960s.

9/12/99

Old-Timer's Trip

John Cross Sr. -- remembers more water on the right side. More water on left. Water appears to be further left. Between 1963-1973 era. May be because the water is lower now. Ran it several times between 35,000 & 50,000 cfs. Talk to John Cross Jr.

Brian says it hasn't changed significantly since 1969.

Les Jane

Looks like the same rapid on the right. He remembers it mostly from low-water runs. Says it had a line of large rocks at its head.

9/12/99

Old-Timer's Trip

Stable
 Miller # 885 (1872)
 Little Colorado River mouth, an island near its head. Also Stephens # 885 (1969)

Time 11:50 MST 11:51 MST 11:53 MST

Film Triox 120 do do

no number do do

exp: 1/125 sec 1/125 sec 1/125 sec

f: 1/11 1/16.5 1/8 +f

film size 1A do do

camera: Speed Graphic

lens: 65 mm Schneider

2.5muth N 201K

tilt up 1035'

height 1.40 m above sand

marker rebar in front of 1.5 m

Gocemina ss. 6/14

height above rebar 1.37 m

9/12/94 Old-Timer's Trip
mouth of the Little Colorado

Bob Rigg -- all the terraces upstream of the point are new. Little bit of sand, big rocks, but no trees. They would have lived in the left rocks. Doesn't recall the island being there (it was). Kent Frost first remembers the island in 1983. Bob Rigg remembers the left channel -- the tool the boats down that channel. Rigg thinks the island wasn't so large. He thinks there might have been a debris flow from the Little Colorado River. He doesn't recall the island being such a big presence at the confluence. Tad Nichols didn't recognize the place when he moved up. Kent Frost remembers 1983, seeing the island & not recognizing the place. Bob Rigg remembers rowing the cataraft boats 1/2 mile or so up the LCR. It was high water & LCR backed up, so that could explain much of the difference.

9/12/94 Old-Timer's Trip
Kwaqunt -- looked easier to Bob Rigg

60-mile Rapid -- used to have the passengers ~~run~~ the rapid. Had a big eddy with lots of driftwood & a big sand bar. More rocks exposed in the eddy now -- most of the sand has been lost.

John Cross Jr. March 1967, no obvious sign of change in Lava Canyon Rapid. He was hauling supplies in for the Hamblin/Rigg geologic studies. Hauled in a number of supplies including 10-man boats, 4 motors. Lava Canyon Rapid had not changed.

Heard some flooding had happened, new rocks on the right. Jimmy Hall (late 1960s) experienced a flood flood in Lava Canyon but it may not have been significant. Used to camp down on the reattachment bar. Used to be 4-5 decent camps. They changed their schedule so they didn't use Patinades any more.

9/12/94 Old Times Trip

John Cox Jr. was on Dolan - Howard trip as a representative of the river running community. NPS ran the trip. Kim Krumbo was on the trip and was on the NPS staff.

Boulder island at Lake Espejo was covered with more sand in "early years" (early 1960s)

Western River Guides - divided up canyon, log-frogged down & cleaned up the canyon. 8 outfits cleaned up charcoal, fire pits, garbage. Guides were leading the effort, not following the NPS.

Remnant toilets put in at Nankeweg ^{been} & Tucker. River runners filled them with cans. Warren Jensen was river ranger.

John Cox Sr. went back to Washington to testify concerning trash & human waste removal in the canyon. He said everyone was concerned about it, but that many people were pointing their fingers at the commercial outfitters. 8 companies banded together to clean up the canyon at their expense.

9/12/94 Old Times Trip

John Cox Jr. noted no particular difference in Unkar Rapid, although he did state that he did not remember the debris that has accumulated in the mouth. That debris appears recent, could be fluvial from Unkar Creek.

No one mentioned changes in Nevills Rapid which is good because there have been only insignificant changes there.

Lois noted to her surprise the canyon appeared greener than it did in 1938. She said she could see the desert plants on an trip & they weren't as obvious as in 1938. Note: 1938 was a wet summer, particularly in June. Her observation was not necessarily the result of the civil foremen. Also, the winter was relatively wet. Lois also discussed some of her feeling about the 1938 trip, her relation with Elsie Olson, & her relation with Norm Nevills.

9/13/94 Old Tim's Trip

Walked with Lois Cutter up Monument Creek to look at possible Opuntia basilaris longicaudata specimens; do not have elongated areoles but do have elongated pods.

Everyone (Bob Rigg, Jean Devils Stavel, and Lois Jotta Cutter) are commenting on the increase in Swallows, particularly at Tanner & below Hance Rapids. Lois wonders if it has to do with the increase in insect life associated with riparian vegetation.

Garth Matton especially noted the increase in riparian vegetation at Neill's Rapid

Bob is unsure whether Boulder happened between 1950 & 1951 or 1951 and 1952. He felt the aggradation was 3-4 feet. Frank Wright was amazed - "he was really awed by the change". He saw drift & the mud was still soft. Frank Wright kept diaries of his trips. They did not walk their canyon. Boulder was never a bad rapid but they knew but had changed. It moved over to the wall more.

9/13/94 Old-Tim's Trip

Kent Frost remembers little from his 1947 Leo Toms' rapids. The rapid being about the same length & the same severity.

John Cross Jr.: water had backed up so that you could see a high-water mark all the way from the tailwaters to Crystal. Saw leaves stripped off of riparian vegetation in reach above Crystal. ~~Flooded~~ Rapid was still running in March 1967, he thinks the rapid was mostly restored by March 1967. Never was a big rapid, hasn't changed in his experience.

John Cross Sr. First trip was in 1969.

Tad Nichols. Lower half trip in 1952. Menton thinks that it may have gotten more intense with time. He has no specific memory of when the change. Sand bar at the upper pool has eroded tremendously. Pre-1966, Crystal was like this rapid.

9/13/94 Old-Timer's Trip
Boucher washed back out quickly after
the Crystal Creek debris fan was reworked
in the winter of 1966-67

Guth Marston - easy rapid, could
give you trouble but rarely did.
Ceaseped it to Unken
1942, 1946, 1947, in early 1950s was in
his cribboard phase, Twin 30's
1959, 1950, 1953-4?

Martin Utten says that the change in
Horse Rock was the biggest change
in Grand Canyon (beside Crystal)

Bob Rigg doesn't recall any major debris
flows that changed a rapid (beside
Boucher).

Boucher: Rigg thinks between 1950-51

Kent Frost - saw a bobcat in the
Canyon above Diamond Creek (1953).
(Someone had asked him about that)

9/14/94 Old-Timer's Trip
Kent Frost hiked from Hack's Canyon through
wire down to mouth of Kanab Creek &
up to Thunder River. He had a memory
of a ledge at the mouth of Kanab.
He said a feature article was published
in Arizona Highway in 1964 about the
trip. A Marvin Goldman of Bluff
took the photographs. He is dead but
his wife is still alive.

Both John Cox Jr & Martin Utten commented
on the change in the debris fan of
Bright Angel Creek by the debris flow/
flood of 1966. (It is one of the
most impressive erosional events on a
debris fan this century.)

Had a great talk and hike with Lois Cutler
up Monument Creek. She stated emphatically
that if Gutierrez were present in 1938,
it would have been noted or collected.
She felt certain looking at its current
debris that they would have noted its
presence.

9/14/74 Old-Timer's Trip

was also looked at the cactus at the north of Granite Rapid. The Opuntia boissainii var longiaureolata was not obviously present. Lois suggested looking for the specimen number. She stated they were looking for different species & may have collected an unusual individual from the site. She had trouble recognizing the specimens of the place & thought that Elizabeth Clark may have done the collecting. She emphatically noted the absence of trees along the large rapids. She said they sat under the sun or under rocks when boats were being lined.

Kent Frost -- got a phone call from Joe Desjays, Jr. a few weeks ago. Ann Desjays were travelling around recently, spent some time in Mont. at the Park Deal Ranch. They invited Kent down for dinner. Joe Desjays Jr, swam Dubendorf before in lifejackets. He dived from cliffs at Tapeats Creek. They still live near St. Louis. Donk Martin would egg the Tin on to do crazy things.

9/14/74 Old-Timer's Trip.

Sandy Nevill Peiff: the canyon is much cleaner now than when she saw it in 1971-72. First trip was in 1959. She is surprised at the cooperation among the river companies -- they used to be highly competitive. She likes the level of current cooperation. She went with Canyoners -- in 1959 she went with Mexican Hat Expeditions (Gaylord Sturdy). Canyon had some fire pits, broken branches on trees (careless use of the canyon). 1971-72, most of the beaches had smell from human waste. Toilet paper, cat hair everywhere. She noticed the large amount of driftwood on this trip, compared with little driftwood in 1971-72. She thinks the ban on summer fires has had a major effect. She is seeing much fewer great blue herons now than in 1971-72. Would see 2-3 ducks before, but no large flocks of ducks. She doesn't remember seeing porcupine quills; she saw one at Nevill & a pair in Marble Canyon.

9/14/94 Old Timer's Trip

1959 (1971-72): She had a very negative reaction to (1) boatmen attitude, (2) motor sounds in 1971-72. She remembers seeing a green rattle snake -- she thought that was very unusual. Between 1971-72 & now, she doesn't remember seeing cattails. Doesn't remember seeing cottonwood trees as far upstream as they are now. At Nankawep, they camped in middle camp (now sand that now).

9/15/94 Old-Timer's Trip

Tad Nichols & Bob Pigg noted large clays in sand bars at Elvas channel. There used to be an extremely large sand bar at the mouth of Elvas. Bob also noted debris flow had recently occurred.

No one mentioned anything about waterbury or the Jewels.

Glen Woodrige on the Rogue River in Oregon developed the jacks for motor rigs to pull the motor & avoid rocks.

9/15/94 Old-Timer's Trip

Crystal: We had a long discussion of clays in Crystal. Bob Pigg, Lois Joth, & Leo Jones all noted no severe difficulties in the rapid before 1966. John Cross Jr. has a remarkably complete memory of before & after conditions in Crystal. He gave me a rather complete set of notes. Martin Litten told a set of stories about clays in the holes that others disputed later. Brad Dimmock & Brian Dieker both had stories of specific runs through Crystal at high water. Kesten Green talked about pre-1983 clays in the rapid.

Tad Nichols walked on the debris fan in 1967 & reported seeing mud coating on everything. He also saw the abraded logs from rolling in the debris flow. He took many pictures. Pete Kresan used some in lectures in Astoria to George John Cross Jr. & Sr.:

Bob Loper would throw dynamite in at Red Canyon, Cross Hite would net the fish below. But said there weren't any small squawfish. They got cutfish & squawfish.

Herrington at Red Canyon

9/15/94

Old - Timer's Trip

Body was buried below Foster Rapid at mile 123 on left side. Up in terrace with a lot of sand. (Both Rigs)

→ Look up exact river mile ← ^{before} BWI

John Cross Sr. Bent Loper → 18 years in Glen Canyon. He would dynamite in pools in the Colorado. Case title would be below at Tickenbaro if he would not the dead fish. Only spoke of Colorado River Salmon (Squawfish + other minnows). Never mentioned getting catfish. (Can't get a firm date on this). Were catching catfish in

The mid-1950s. Lumped squawfish & humpback chub together under Colorado Salmon. 1947 - March 25 - April 6, would catch catfish. Was with Bent Loper & Loper would tell the scout kids where to fish. Mud catfish & channel catfish were both present. In fresh water streams used to catch blue gills (Lake Canyon), Arctostichus. Minnows were brought in by Ben scouts. They fished with them.

9/15/94 Old - Timer's Trip

Bob Rigs told me that there used to be substantial sand on the left bank above Fossil Canyon. Lot of sand up to the catclaw line. (Has pictures of it). Catclaw trees were just above the sand.

Bob Rigs: Zackoff was buried on left bank in sand under the catclaw line. The picked up the body, it had been in the river for 46 days. They notified the Park, but no one knows whether the body was removed or not.

John Cross Sr.: Glen Canyon Bend

Used to be quite a few Canadian geese that migrated through in the Spring.

Bob Rigs: Don't remember seeing cottonwood trees anywhere in the canyon except below Lava Falls. Lost the steering in a power boat above here. Changed from pipe arrangement to pulley arrangement in steering. Had to handle the cables on the steering in Bedrock Rapid. Cut it really close to the Bedrock. Don't call

9/15/94 Old-Time's Trip

Bedrock was generally an easy run (Cataract & power boats). Never walked passengers around Bedrock (Bot Rj)

Harder run now. #11

Leo Tins: Bedrock at 9,000 today. Has pictures of Bedrock. Showed me a map of Hated River Expedition run. The gorge goes closer to the Bedrock now. (1953). Big chags

Factor doesn't remember any past chags in Bedrock (1965-present) except in 1985.

Factor: Crystal Rapid. First chags occurred during either the LER flood or the dam release in ~~APR~~ 1973. The chags was in the second hole; the boulder rolled downstream, forming the hole.

9/15/94 Old-Time's Trip

Factor: doesn't remember any other time that Bedrock Rapid was as scoured as now. Accidents occurred here, but rapid was wider. They didn't scout.

Had a great deal of respect for P.T. Reilly - it affected his judgment on living versus running. Told a story about 1965 @ Carr Falls -- he thinks

he was there in June or July on "good" water. His son & Françoise Leggett ran their boats through. John Blaustein is alive & living in Berkeley, California. In general, rapids have increased in severity.

Walked up on the high angle chute on lower left of Oubendorf. Very interesting; we need to work here. We have two debris-floes levees. A catchaw tree has been hammered; a dead broken branch is lying on the levee. Great potential for doing the deposit. Saw wood in drift pile. Colorado R. is high on the chute. Should survey it in. Great survey present at the bottom of the debris fan.

9/15/94 Old-Timer's Trip

John Cross Sr. (and Tad Nichols):

No flies, no mosquitoes, no gnats in Grand Canyon.

Bob Pigg: No change in Oubanderuff Rapid

Les Jones: No change in Dubendorff Rapid
Boy when he saw it. At low water, he could not separate Dubendorff from Tapeats Rapid.

John Cross Jr. No change in Dubendorff Rapid
used to be a hummingbird beach at the bottom of Tapeats Rapid. Thought either the 1965 flood or the heavy wind took the beach out.

Martin Litten: No change in Dubendorff.
Water level makes big difference in the rapid.

Geeth Marston: Riparian vegetation is not
noticeable at mouth of Tapeats Creek.
Trout in Tapeats Creek: 6-7 in in 1942,
in 1947, 15-11", 1948, 11-12"
About an inch a year.

9/15/94

Old-Timer's Trip

John, Jr. -- pretty massive beach at
Stone Creek -- much smaller beach now.

Martin Litten: Creek used to divide
at creek emptied near the cliff.
Cottonwood trees & willow trees in
the mouth Deep harbor. Cottonwood gave shade.
Flooded about 1975 or so (Factor)

most of the rocks in the mouth have
changed? Picture in Martin's old brochure
Current sand bar wasn't here
Used to be large beach -- sand bars
prevented boats from using it -- too
many rocks exposed. New sand in 1983.
Bob Pigg camped with game boats & catamarans
below rapid. Bob thinks there are more
rocks in the mouth. Used grasshopper
to catch trout.

Kent Frost -- Docks Marston caught fish
in Tapeats Creek.

1984 flash flood nearly flipped Ann Cross's
boat pushed in the mouth of Deer Creek

Snow alluvium higher; just above 128-mile
Rapid.

9/16/94 Old-Timer's Trip

Went first, the mouth of Kananak Creek changed between 1963 & 1983. The number cottonwood trees in the mouth & lots of sand bars that are now gone.

Talked some this morning with Tom Nevill Stovely. She is nothing the haze in the air things the canyon. She follows it closely because it was likely to Page Cemetery Station, New, LA is considered the source of the pollution. It is noticeable.

A dozen egrets between granaries below Rancho (actually bottom of Dris Rapid) and bottom of Fishtail.

9/17/94

Old-Timer's Trip

Brad Dimmock -- on a day trip in July 1984. Roved down to run Granite. Could see the new aggraded debris fan. Walked out onto calf-deep running reef ooze. Scouted the rapid; it was significantly different than before or after. One huge wave dam at the bottom ~~against~~ left-center wave. Could not avoid it to the right.

Had to run the wave in the center, Mike Davis was trip leader, he ran it first. Next trip the rapid had reverted to previous self as far as that big wave was concerned. A Western group camped below on the left but did not report (notice) any changes to Brad.

Soap Creek changed -- rockfill on upper left filled in a gorge on far left. About 1980 (1971-82), that run was clogged up. House Rock changed significantly in 1983. No change between 1971 & 1983. 2.4-mile was insignificant rapid with a rock on left side of the tailwades. Brad noticed that the tailwades of Lone Eden Rapid were drained out by 2.4-mile in 1989.

9/17/99 Old-Timer's Trip
25-mile was filled in by the 1989 debris
flow. Brad indicated that the left run
became much easier. Redneck (Peter Resnick)
formed after a rockfall in 1975. MNA
he put a motorway in that for 10 hrs.
1976 (1976). Upper Basalt Rapid, August
1983. Obliterated the Ute Car. New
rapid at the mouth of Basalt Creek.
High water there still are good waves
i. Basalt Rapid. Dates on Basalt Creek
are either 1983 or 1984. King's fur
Tatहतो drum to Willie Taylor's flaked
in one event. Sockdologe Rapid changed in
1983. Right hole used to be the biggest
with a large lateral wave. Left one
became much larger. Right wave became
insignificant after 1983. Think the 96k
moved a few rocks. Horn Creek, bottom
hole became a lot less traumatic.
Can probably run it if you miss the
right - to - left now. New take hole is
a big breaking wave; it used to be a
wall of foam. In 1981-82, baggage
boat got caught on that rock above Pipe
Creek. Remembers running that wall of
foam at Horn Creek.

9/17/94 Old-Timer's Trip.
Hermit -- 4th wave had a tricky lateral
that flipped down before 1983. Ken
says it is still there, Brad says it
isn't. Crystal -- he never recall
the lower hole. The old hole was there,
he put a motorway in that hole in 1971.
It nearly flipped. Ran into Rock Garden.
Did not change until 1983. Rocks
part of the island moved downstream.
Drop & violence moved to the entry.
To his knowledge, Wulstebay did not
change. Elves changed in 1985. He had
the Yorkshire School Society Trip.
Was at Haversham Creek, noted smell
of dirty water. Heard Elves had
flushed. Several changes in the
streambed, some waterfalls changed
shape, one went underground.
Forster, no change. Fossil had new rocks,
Bedrock & Specter changed in sand
event. 128-mile Rapid was downed
out after 1989 storm. Eddie above
& below are not as difficult to get
through now.

7/17/94 Old-Time's Trip

Winter of 1980-81, rockfall above Anvil at lower. Heard about it in April 1981.

Dierker -- a rockfall occurred at the

Warm Springs, 1988 -- unsure of the year.

Filled in ~~the~~ one of the ponds.

Subtle change in lower falls in 1983.

Chase -- meteor rock became more prominent

in the top of the V Water. Slot became

a little more hazardous after that time.

Bubble line changed a lot in 1983.

Nearly flipped a boat (motor off) in

Griens Canyon Rapid in the 1970s.

Diamond Creek Rapid got clogged up in

1984. More rocks up on the left tip

a more dam near the truck on the

right. Really sloppier now.

Cully below the Anvil, 1976 debris flow

in night gully. 1985, small flood

20' wide, 6' deep gash, Firepan creek

shell, lawn chain, punch bucket at

Fat City. Yale Charter. Kasten hiked to

rim for liquor, did the double flip in

Crystal.

9/17/94 Old-Time's Trip

Lower Falls:

It walked around with Kate & Kelly.

They had done dolomitic limestone pitting on

the high surface, old surface C, Surface

f, & another intermediate-aged surface.

Their technique appears to be well thought

out & defensible. I really like what they

are doing scientifically. We walked at

the high surface & there are no apparent

differences in age across it. That is

nearly unbelievable.

Bob Pyss noticed the big chert in lower

Falls. He stated the chert here was

larger than the chert at Crystal Rapid.

He also stated that the "rocks in the

center" had shifted position; i.e., the

ledge hole is different than what he

remembered. What a memory this

guy has!

9/18/94 Old-Timer's Trip
Lava Falls

last here in 1965. Remembers boulders that they hauled back over the rocks on left-side change. Ran it once in 1951. Comment "It's not Lava Falls". Ledge hole was not there. He does not recognize the rapid. "An incredible change in this rapid."

Joan Newell: Big triangular rock at the top used for lining is now gone.

Les Jones: In 1963, paved like a sidewalk on the left side. Rapid was pushed over to the right

John Cross Jr.: Started at the end of the line of debris flow. In 1966, noted a gully had been cut through the mouth. Rocks had been pushed out into the left side. Flat rock was a marker for the left sneak run of Habel Expedition. Not sure if it was December 1966.

Left side change. Saw rock that Joan indicated was missing.

Joan Newell: left side is more shobal.

9/18/94 Old-Timer's Trip

Martha Litten: "I guess I'm numb when I get there"

Lois: Lined boat down the left side

Martin: P.T. Ralls was through lava only twice, once in a day & once in a night.

Geoff Marston:

Brad Dimock: Meteor rock has rolled in

Foster: Bubble lines have changed

Bob Biggs + Tad Nickals

Dropped dynamite into the big eddy at Whitmore. They only got cat fish. 1952

+ 1953-54. Tad fished with a hook baited

with cheese. Never caught anything but

cat fish. Never caught trout in the river

Never caught Squalid fish or chub.

All the islands in the western canyon had large driftwood piles.

9/19/94

Old-Timer's Trip

Spent about an hour talking with Gertl Munster about the canyon. Gertl does not seem to have much to say about environmentally change in Grand Canyon. However, getting some historical information from him is very profitable. He stated that the rift between Dock Munster & Norm Nevils did not spring from a specific incident or fight. As Gertl put it, "we asked ourselves what Norm brought to the trip". The answer apparently was not much. Also, Munster wanted to experiment with other types of craft, especially motor boats.

People have mentioned several times the lack of bats along the river corridor. Also, the burros were missed. Most had a similar reaction: Sorry they are gone because they had personality, but glad they are gone because they were overgrazing the vegetation.

Bob Pig, all the islands and bars downstream from Lower Falls had large

9/19/94

Old-Timer's Trip

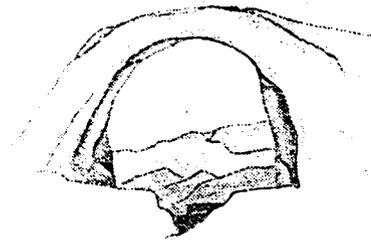
piles of driftwood on them. It was similar in Glen Canyon.

No one has mentioned beavers recently, whether they have eroded or aggraded.

We have continued to see willows. We saw more bighorn sheep just upstream from Parashant Canyon. Kent Frost thinks he saw a bobcat near Three-Springs Canyon in the 1950s.

I saw several more places where we could work on Lower Dam outburst floods. Mile 202, right, appears to have flood deposits on top of the lava flows.

Sandra Neville Reiff, B.A., CADAC
Certified Addictions Counselor • Psychotherapist



November 17, 1994

Robert H. Webb, Ph.D.
U.S.G.S.
1675 Anklem Rd.
Tucson, AZ 85745

Dear Bob:

I have had time to sort through the myriad impressions of our canyon trip and the changes in the river since my first upper half trip in 1959 and our last two trips in 1971 and 1972.

In 1959, we ran the upper half in a Cataract boat. The river still had its lovely red color, driftwood was plentiful, and blue herons were abundant. The beaches had more sand, pebble and rock barriers were not as prominent nor as far out in the river. Clearly the beaches are not being replenished and the loss of upstream deposits of silt has substantially changed them. The vegetation has been altered because of the lack of upstream flooding. Beaches were not as overgrown and it appears new guys are moving in—reeds, pampas-type grasses and moss along the main river corridor were unknown.

Bert Loper's boat was intact. The skeleton as Vasey's Paradise was also intact except for the skull. I don't remember poison ivy being identified there although we could have overlooked it.

The Nankoweap graneries were not stabilized, and serious looting was evident. The Redwall Cavern beach was more extensive and less sharply inclined as I remember it.

The Little Colorado was in flood, a lovely red, viscous in texture and still the home for a diminishing number of easily irritated rattlers. I remember seeing, at some point, a vividly-colored small rattler which some of the crew were teasing with a stick, tormenting it but not killing it. A subtle but major difference from 1959 to today is attitude, people today are less ready to kill, loot, remove, start rock slides, and posture as conquerors, whether that change is through heightened consciousness or controls, I don't know.

Colorado river traffic was nonexistent, we were blessedly alone. The debris from the UAL/TWA crash was very visible high on the slopes. Gossip in low, shocked tones

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revolved around the supposed looters who had hiked to the site and sifted through the debris looking for valuables.

Fred and Maggie Eiseman were on our trip and had "discovered" the Hopi salt mines the previous year. They hiked down the L.C.R. Until then, no Anglos had identified the mines and few, if any, Anglos had ever hiked down the L.C.R. to the Sipapu and then to the Colorado. The Eisemans did not reveal the exact location of the mine in deference to the Hopis.

We also explored what I believe to be the McCormick mine. It was thrilling as the timbers shifted and creaked and small amounts of debris sifted down from, I suppose, the vibrations of our feet or voices. It had an exquisitely beautiful blend of salt and blue copper crustations on the walls.

The wildness of that trip was accentuated by a huge sandstorm, subsequent cloud bursts which caused substantial flash flooding and the numbers of winged critters. Blue Heron were very plentiful and bats put on a dive bombing exhibition each evening at twilight. Their sonar voices were companionable and clear. I, however, don't remember any Snowy Egrets in 1959 or the early 1970's.

The river was wild—her voice was rich with the silt and shifting of rocks during flood. the absence of other people, the almost complete inaccessibility into the inner gorge except on major trails, the absolute lack of air traffic added to the genuine wilderness. It was an unexpected event if a jet flew overhead, usually at 30,000+ feet. I reflected on this sadly on the Old Timer's trip when the air corridor traffic was absolutely overwhelming and invasive.

In 1971 and 1972, Woody and I ran both sections of the Canyon. Our kids and Navajo foster daughter also went. We believe our five-year-old son was a record breaker, being the youngest to complete a trip by boat. We also know of no Navajo traveling through the Canyon by boat until later.

Years 1971 and 1972 were transition years when Canyoneers shifted from rowing cataract boats to 33-foot jrigs. Several clear impressions linger, our boatmen and crew were not old timers and had little interest in the uniqueness of the Canyon. Time did not permit exploration of most treasured spots. That may have been a consequence of dying motors, breaking frames and terrible drops and rises in water levels! Dying or dead fish were sometimes seen due to the huge fluctuations in water discharge. Canyoneers ran 7-day trips so the contrast between the early trips and 1971-72 was radical—the condition of the Canyon was appalling, human debris was all over. Individual "cat holes," toilet paper and tampons littered each site. At Travertine, the smell of feces and urine was especially noxious. As the

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result of the 1971 trip, Woody presented a plan to the Park Service for a waste hauling service. The idea of hauling everything out was in its infancy although some companies (including Canyoners) were beginning to experiment with systems of removal. Others simply gave lip service to the idea.

Some trees were being stripped of branches for firewood and fire pits were dirty and obvious at previously pristine sites. Partially because of my shock and repulsion at the condition of the Canyon, we pursued other rivers through the years. Certainly the long-term wait for permits also was a major contributor. So it was with some inward bracing that I approached the Old Timers trip.

Some of the changes I witnessed this year were green algae at water line, beach erosion, the greater impact from side canyon floodings, and the cold, cold water. These are clearly the result of the upstream dam. Other changes are due to the heavy river travel. I felt ambivalent about the large numbers of people on the river. On the one hand, the more who experience the Canyon, the safer it is. On the other hand, it clearly is no longer a "wilderness" experience. The corridors where air traffic is channeled was reminiscent of L.A. freeways and amazing in terms of volume and invasiveness.

In 1959, there was rare air traffic (traffic would have been an event!). On the early 70's trips and on subsequent inner gorge hikes, helicopters were extremely irritating. This time the outstanding characteristic was in extremely heavy volume. I am deeply grateful below the rim flights are no longer permitted.

Some critters which were much less numerous were bats and Blue Heron as I've previously noted. Bats were uncountable and as much a part of our Canyon experience as sand storms or gully washers. The mountain sheep seem to be further up river now. I don't remember ringtail cats previously although we may have just missed them. The crows are clearly acclimatized to people and are much bolder. I didn't hear the lonely Canyon wren nor do I recollect Ocotillo being so far up river but that may be inaccurate.

The changes in rapids from side stream debris flow not being flushed through from upstream is amazing. Crystal and Lava were mind-boggling. (I do understand the changes in Crystal were due to the 1983 flood.) Havasu being scoured seemed to be a natural change and less disturbing.

Of most importance to me was how profoundly all of our lives have been affected by our deep and sustaining love of this Canyon. This love has led us to value and seek out other wild spots. The magnitude of these feelings has led us to be sensitive to and to seek

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preservation of other secluded, secret places where magic still reigns. The fear of the Canyon being lost or irreparably damaged has urged us all to become gate keepers.

Kent Frost - Canyonlands - Martin Litton's struggle in the Canyon out of his awareness what had been lost in the Glen Canyon/Flaming gorge trade - Ken Sleight - leading the fight to protect Rainbow Bridge from further encroachment. Woody Reiff actively advocating all trash being carried through the Canyons — Each person has in some way become more environmentally aware and active. In a recent letter, Fred Eiseman passionately spoke of his work in Bali — the need to preserve. In the final analysis that may be why wilderness is absolutely essential to our survival. Each old timer throughout their lives and in their own way was somehow made larger by their Canyon experiences and has struggled to save our birthright, our "world right." It was truly an honor to be among those accomplished people and to know we all share abiding love and respect for natural wonders.

As a southwesterner growing up with "Bureau of Wreck" animosity I felt reasons to be cautiously optimistic. The responsiveness of persons at the local and regional level is encouraging. I still fear career bureaucrats who have never listened to the stillness of nightfall, the lilt of the Canyon wren, and who have never accepted the challenge of the outdoors. Their lack of expertise and experience doesn't allow them to see the fundamental necessity in preserving wilderness. Each of us has seen and experienced their ignorance and arrogance at making irrevocable decisions which destroy that which cannot be replaced. Indiscriminate "progress projects" will always be a part of the American way, but I feel a very real change in the bureaucracy at a grassroots level. And for that I am hopeful.

Personally, my trip through the Canyon has led me to reevaluate my own commitment to environmental causes. I believe I need to do more than be a dues-paying member to environmental groups. My sporadic letter writing will now be more committed and more consistent. The changes I witnessed, both positive and negative, were all about human impact on the wilderness. I want the Canyon here for my children's children and their children.

Thank you, Bob. for making this special time and place available and for honoring our personal history in relationship to the Grand Canyon. And a special thanks for the superb crew and staff (scientists, river guide, etc.) which you put together.

Sincerely,



Sandra Nevills Reiff

Roy Webb
University of Utah
Salt Lake City, Utah

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FYI

Dear Roy,

I have been able to locate a picture, albeit not too good, of the "Rigg Brothers" in the Grand Canyon. Actually, we have a third brother, Jack, who also made a few trips on the San Juan and Colorado. He made two trips through the Grand Canyon, one with the first power boat run in 1952, and then again in 1957 or 1958 when we ran three (3) Chris Craft power boats through the Canyon. I believe that is the only time that three brothers have ever made a trip - as boatmen - together - on a Grand Canyon trip or "expedition."

I have enclosed copies of some correspondence which reflects some on the speed run of 1951. Also, I have a copy of our list of supplies and emergency provisions. Jim called and told me what to pick up on the way from Grand Junction to Lee's Ferry, and you will note the list is very short!

The Nevills family was not unknown to our family. Norm and his family were "friends" of our parents. They came to our home in 1940 or 1941 and showed films of his trips through the Grand Canyon. I believe they may have even stayed at our home. Dad was a physician (EENT), and took care of the Nevills family from time to time. Then, after the war, Jim pursued a flying career and got to know Norm quite well. I believe Norm learned to fly in Grand Junction from Eddie Drapela, who ran the air service. Jim eventually bought out Drapela, and Norm continued to have his airplane serviced at "Rigg Aviation" in Grand Junction.

Norm asked Jim to be a boatman for him in 1949, and that is how Jim got into the river running business. He had been involved with Nevills in aviation, charter, and logistics, so they had some common ground. They really were the best of friends.

As for the Rigg Brother escapades, they were perhaps not legion, but they were certainly exciting. We (Mexican Hat Expeditions) retrieved the Esmarelda in 1950, being the only group to end up with more boats at the end of the trip than at the start! Jim and I eventually took over the power boats and Frank took over the cataract boats.

Let's see, for the record, in 1950 we ran four San Juan trips, the Grand Canyon, and a late season Glen Canyon with a group of movie starlets for the "River Goddess" movie. For the human interest point, one of the young starlets, Irish McCalla, later became a real star of TV (Sheena) and movies, and she was the number one pin-up in the world for two years. I understand she is also a very accomplished artist.

Our speed run was awesome in retrospect. We departed from Lee's Ferry a little after 7:00 AM in the morning and ran without stopping to mile 107 1/2 the first night. We ran every rapid "wide open" non-stop. The second day, we did stop at Lava Falls, looked it over very briefly, ran the first tongue on the left, and headed on down the river. We passed Diamond Creek a little after 8:00 PM in the evening. Actually, it was getting pretty dusky, and by the time we were in the rapids between Diamond and the headwaters of Lake Mead it was just plain dark! It really became a situation of "rowing away" from the noise of the rapids and the rocks, because we really could not see much at all! We passed what we felt was Separation Rapid sometime after 9:00 PM, the second evening out. Finally, we stopped for the night around the bat cave, and the next morning we drifted (there was good current) and rowed on into Pierce's Ferry. We ran from Lee's Ferry to Separation in about 38 or so hours.

Jim wrote a very detailed (for us) account of the trip and sent it to Dock Marston. I believe it may still be in his records, but who knows where. Obviously, it was high water, which certainly helped. Of course, we were "veteran" river runners... Jim had made two (2) trips down the Canyon, and I had made one (1) trip. Neither of us had seen the river at that stage. As you might expect, it was absolutely exhilarating and great fun.

As for records, we probably had (have) a few. Only boatmen to run all the rapids in both cataract boats and power boats. Incidentally, we did the same thing in Cataract Canyon in August of 1952 with our wives. We ran from the confluence in one day, stopped only 3 or 4 times, and had a great time! That was the easiest way to take the boats to Hite for a Glen Canyon trip! But, back to the Grand Canyon. Records? Guess we'll have to let the books and stats speak for them. Brothers and the speed run? Yes, probably OK for cataract boats. Jim was 24 years old when he ran with Nevills, and 25 in 1950. I was 19 years old in 1950, and I made five (5) trips before I was 21. I never did see the Grand Canyon from the North or South Rim until about 1952, although we had flown it several times, right up the bottom of the Canyon. It sorta gives you a different perspective when you fly it. And, watch out for the cables at the Redwall dam site! We spread the ashes from Norm and Doris from Mexican Hat down the Grand Canyon (via Beech Bonanza). Jim flew part of the time, and I flew part of the time. He took over when we completed the run, and I mean to tell you, we were right on the deck up through the Granite Gorge. We nearly took a run a flying under the bridge at Bright Angel, but chickened out at the last minute because of the concern that wires and cables might be hanging down... and there were indeed wires and cables hanging down from the bridge! Oh me but it was an exciting time in our lives.

For the record, I actually ran the cataract boat through Lava Falls. The rationale for this was that Jim had run the Esmarelda through Lava Falls the previous year. Jim wanted me to have the "record" of also having run Lava Falls, and believe me, I had no

desire one way or the other. He was really a great "big" brother to his "little" brother, having taught me all about everything in life you ever needed to know! He taught me the important things in life like flying (1948), river running, work, school, and girls and all that other important stuff!

Incidentally, I had helped drive a vehicle for Nevills (and Jim) when they ran the Green River in 1949. Also, I was at Marble Canyon when they took off in 1949, and I flew Nevills airplane back to Grand Junction for some maintenance. It was a really great PA-12, with a two-speed propeller which was state of the art for "bush" or short field high performance flying. I met them in Boulder City in 1949, and attended the very sentimental dinner when the "River Rat" song was sung by Mrs. Anspach (Bud and Troe). (I am not certain how she spelled her name.)

Well, you wanted a 200 word section of something about the "Brothers Rigg," and I gave you lots of nostalgia. We did have a great time. I loved the cataract boats. Even Dock said that we were the best boatmen on the Colorado River at the time. We ran them all, and we litterally never dinged a boat, never upset, and never had any serious problems. It was all fun and good times, very "clean" in every respect. We loved the Grand Canyon! Yes, there was a recent war, and another started when we were on the Glen Canyon part of a San Juan trip. I got a note (via air drop) from Uncle Sam when we were taking the River Goddess's down through Glen Canyon.

THE GRAND CANYON

1994

OBSERVATIONS AND RUMINATIONS OF A RIVER RAT

The summer of 1994 afforded a unique group of Colorado River "old-timers" and former river rats an opportunity to re-visit the Grand Canyon and the mighty Colorado River. I am especially indebted to Bob Webb, the USGS, GCES, NPS, George Wendt, OARS, Brad Dimock and all the boatmen, those responsible for the logistics, boats, food, arrangements, and all the "river rats" whose past and present contributions made this trip possible. Perhaps most of all, I am indebted to Tad Nichols, who persisted and insisted on my presence on the trip. To all of you, I say "Thank you for a most wonderful time!"

I wish to address the issue of "change" in the Grand Canyon. What is significant? Why? What looms in the future? Is there a concern or possibility of catastrophic changes in the Colorado River and the Grand Canyon? What can we do to assure the continued beauty of one of the truly great creations of the world? Could we not each be more proactive in preservation and restoration? If not, why not? Or, are we too late? Perhaps most importantly, is there someone out there who listens and cares, or will listen and act? The Grand Canyon needs help!

Bob Webb asked each river expedition participant to note the major changes we individually noted in the Grand Canyon and the Colorado River. This is an awesome challenge! Change is frequently so subtle and inconspicuous that it may be difficult to really say that something has changed; much less estimate the true magnitude of an isolated small event. We may not know or realize just what that seemingly insignificant "change" might be, or represent, or result in over long periods of time.

With that mandate, and fading memories of one of the great wonders of the world, I will offer you some of the nostalgic ruminations and observations of Bob Rigg, unquestionably unembellished, obviously unedited, and in part unsolicited.

I would appreciate hearing from others, their views, opinions, and clarifications of any potential "misinformation" which I may inadvertently or purposely place in writing.

Again, thanks to all of you made this trip possible. It was a dream come true. You are the greatest people ever, and I do hope that we can again "meet together by the river" to break bread, sip a little Colorado River water, and reminisce of times and friends and "river family" long since gone but not forgotten.

MAJOR CHANGES IN THE GRAND CANYON OF THE COLORADO

1. The SILT and DRIFTWOOD content of the Colorado River.
2. The TEMPERATURE of the water of the Colorado River.
3. The HAZE in the air.
4. The SANDBARS, their size and number along the river.
5. The VEGETATION along the river corridor.
6. The CONTROLLED RIVER FLOW without a seasonal peak runoff.

1. SILT AND DRIFTWOOD:

The "screw worms" are no longer active on the bottom of our boats as we traverse through the Grand Canyon! The sand and driftwood content of the river is "nil" compared to the pre-dam era. This is a major issue, and has resulted in a major depletion of good clean sand bars, once beautiful beaches, the sand and driftwood habitat for wildlife, and the cleansing abrasive effect of the sand in the water. The rocks along the river have become overgrown with moss and vegetation. Footing is much more delicate, almost to the point of being treacherous along some of the rocky shoreline areas. Driftwood is virtually nonexistent!

2. TEMPERATURE OF THE WATER:

The temperature of the Colorado River water in the Grand Canyon is 25 degrees colder than in the pre-dam era. This single issue may represent the most significant change in the Colorado River. No one has addressed the environmental impact the temperature change may have made on the ecology of the river and Grand Canyon flora and fauna. From the river running standpoint, it is no longer possible to comfortably swim and "cool off" in the Colorado River. We need to ask questions as to what major ecological change, for good or for bad, this "cooling" of the river has had on the river vegetation, fish species, migration, and even the people running the river. Certainly, hypothermia is a very real possibility and much more likely to occur with the colder water temperature. Please be aware that the water temperature of the pre-dam era ranged from the mid 70's to the 80's during the summer. Yes, it was much colder in the winter, but normal seasonal fluctuations may have served a very valuable environmental need for river and canyon flora and fauna.

3. HAZE:

There is a major change in the air quality in the Grand Canyon. This is the direct result of regional industrialization of the desert and the resulting adverse impact on the environment.

I have flown in the Grand Canyon and Glen Canyon (or Lake Powell) area since 1948, and what was formerly an absolutely clean air environment has become very polluted with haze. The entire desert area has been negatively impacted. The coal plant near Page is probably the most serious offender. However, local pollution from Las Vegas and as far away as the west coast is now noted when flying in the area. This must be addressed. It literally impacts the entire Colorado River basin area from Arizona to Colorado. I realize there are changes being implemented to clean the emissions from the Page coal plant, but it may be too little too late. Sulfur is environmentally toxic!

4. SANDBARS: Obviously, without silt and sand in the river, sandbars may enjoy only a temporary existence in the Grand Canyon. Many sandbars have become rocky beaches. It is true that sandbars changed from year to year, depending on the runoff flows and seasonal changes in the river, but there were always sandbars, and always sandbars of significant size, frequently extending high up along the river banks. Significant residual high water sand bars were always present, witness the high water driftwood and sandbar levels, including one below Forster Rapid where we buried a hiker who drowned at Bright Angel trying to cool off by swimming across the river. I was unable to exactly identify the eddy location, as there was significant erosion of the high water sand bars along that stretch of the river. Sandbar depletion is an ongoing progressively evolving process which, without silt in the river, will ultimately result in further significant loss, stabilizing at some minimal level. It is my understanding that with the large "pulse" planned for next year, the sand in the bottom of the river will be recirculated and redeposited as sandbars. At least theoretically that is what the powers that be are planning and anticipating. While I am not always skeptical, I personally believe that the only way to rebuild sandbars is to slurry silt from the San Juan and/or the Hite area to below the dam. That is not a major obstacle from the engineering standpoint. However, from the political arena, the Grand Canyon loses, i.e., it will never happen.

5. VEGETATION:

Major change is evident, both in comparing pictures and simply by observation. The Tamarisk has really made itself known over the past 50 years. In the 1950's, it was a real problem on the upper stretches of Lake Mead, where the sandbars were thickly covered with impenetrable stands of Tamarisk. There were some areas of Tamarisk in the Grand Canyon, mostly along the lower Canyon beaches, but nothing like now exists. I believe I have films showing Tamarisk along the shore near Soap Creek. Also, it was present in Glen Canyon, where it made a name for itself there as a not too desirable inhabitant of the river sandbars. Other forms of vegetation are rapidly encroaching upon the areas along the river where formerly much of the vegetation was cleared out annually with the spring flooding and seasonal high water.

I consider the intense growth of vegetation to be potentially a major concern. Will it wash out with large river flows? Will it add to the debris flow in the river? What about the potential for large trees to grow along the river, and will that present a hazard of any kind? Are not many of the plants foreign to the delicate eco-system, and what will be their place in the land and water sovereignty fight? There is precious little room for encroachment by the foreign opportunistic plants which devour large amounts of water and nutrients from the desert soil.

6. CONTROLLED RIVER FLOW:

This is the single most negative impact on the entire eco-system of the Grand Canyon. It affects all of the other "changes" in the Canyon except for the air pollution. Salinization of the lower Colorado River Basin, development of aquifers below the Glen Canyon dam (which were not present in the pre-dam era), lack of seasonal run-offs to reconstitute sand bars and cleanse side stream debris flows, vegetation encroachment along the river, and multiple other environmental and ecological factors are negatively impacted by the lack of the seasonal fluctuations in river flow. Not every year produced huge run-offs. On the contrary, flows varied from year to year, and there are still periods of drouth and surplus runoff. The Colorado River has been negatively impacted in its ability to naturally cleanse the area along the course of the river. Tributaries continue to bring debris into the river bed, but there is no "normal" high water to dissipate the rocks and debris from the side streams. The island at the Little Colorado River was formerly very small to virtually non-existent in the pre-dam era. That island may be the largest debris flow in the river! It is certainly higher and larger than ever before. More importantly, innumerable changes in the rapids, dams, pools, and rocks, now unaffected by previous seasonal river flows, are readily apparent. Some changes are insignificant, while others are quite remarkable. Not all of these changes in the river can be restored to their former state by a single "pulse" of high water flow. Things never will be the same, and it is not expected that they could be or would be. Regardless, there are the obvious "changes" in the river and the rapids, but those changes are not necessarily the most critical and important alterations in the Grand Canyon. Simply put, they are the most obvious.

The Grand Canyon is dynamic, always changing, always challenging!

OTHER OBSERVATIONS

PROFOUND
&
NOT SO PROFOUND
&
IN NO PARTICULAR ORDER

Access at Lee's Ferry: Unbelievably easy! Please think of we wayward souls fording Paria during flood stage, drowning out the engines, pushing through sand, the heat, rocks, muddy roads, etc. But, it was fun!

Wildlife: All along the river! Wildlife! The waterfowl, deer, sheep, and all other species of wildlife! Why, they are almost like pets! Likely just waiting for someone to take their pictures. They were there before, but certainly not in such large numbers.

Water and Bathrooms: At Lee's Ferry? What a change!

Navajo Bridge(s): And now there are almost two (2) bridges to fly under, and that is the normal air traffic procedure. Also easier to drop things on the boats below!

Sandbars: 'Nuff said!

Tamarisk: Too much!

Badger Rapid: No sandbar, still changing, and will continue to change.

Soap Creek: Easier at this stage. Can be a really big ride!

Pools and Sharp Drops: Yep! Many! And there will be more.

House Rock Rapid: More significant! Not much in the 1950's.

North Canyon: Also worse.

Hansbrough-Richards Rapid: New name.

Rocks: Caution! Low water exposure!

25 Mile: "Exciting" Always fun!

Vasey's Paradise: Always a paradise and fresh water! Much more water coming out than during a former "usual" summer. No sand.

Redwall Cavern: Well, no sand, and the sand that is there just seems "dirty" when compared to the gigantic clean sand-filled cavern of the past. More progress, no doubt.

Loper's Boat: Long since gone, like some mighty good boatmen.

President Harding: The eddy used to catch everything! And there was a nice sandbar, good camping, etc. However, it lost its luster with the graves. The boy scout was lost on a trip from Hite through Glen Canyon. They were on rubber rafts. The poor little boy was not feeling well as they started out the morning he drowned. Just after they left camp, he fell off the raft. The guide tried to rescue him, was able to locate him in the water, but with panic and fighting, the guide was unable to save him. We just happened to come by about an hour after the incident. It was really a pitifully sad situation. Then, when we were on the Grand Canyon later in the summer, we came by President Harding Rapid about 5 days after his body had been buried by, I believe, Doc Marston's group.

Rock Fall: Never heard one in the Grand Canyon until 1994.

Nankoweap: Just where was that elusive Catclaw tree that we camped near? That was the only shade in the area! Right along the creek? Some changes! Nice gravel bars? Yes, they were previously sandy! (the beaches) You might wish to compare the view downstream from the granaries. What are now gravel bars as far as the eye can see were once sandbars! Quite a nice trail up the slope to the granaries. We burned a huge driftwood pile at Nankoweap on just about every trip. It really was awesome, with a red glow and reflection off the canyon walls lighting up the whole area. Buggy mentions this in his dairy of 1953. Actually, we almost burned Buggy (George Butler, Entomologist).

Kwagunt Rapid: Similar!

Mile 60 Rapid: We always let the passengers run this rapid! Tad Nichols ran the "Norm" on one trip. (that was my boat) There was a good eddy, nice sand bar, and, as you may have noted, sand all along the shore from above the rapid.

Little Colorado River: We have taken boats, even the Chris Craft Powerboats, up into the beautiful turquoise water. Again, the large island was frequently covered, and we ran down the left side of the river. That is the big debris flow change!

Salt Mine: Off limits. Doc Marston seemed to like the mine. He always spent time there.

Unkar Rapid: Only time I ever even touched a rock was in Unkar. Tad Nichols was riding "Fisheye" on the deck of the "Norm" when I went just a bit left of the route and briefly hit a rock in the bottom of a hole. My goodness, Tad did the most beautiful flip over the end of the boat! Or was it a hand-stand? Anyway, he came up from the river looking like a drowned rat. What fun!

Nevills Rapid: We called it "75 mile Rapid" before the name change. It always had good big waves! We had a fellow and his 12 year old daughter in a 12 foot rubber raft tag along on one trip. They flipped in the rapid. We picked them up, and they were none the worse for the experience. What was their name? Really nice family on a shoe-string trip. Fished every night for supper! We did help them along, all the way through the Canyon. He had been on the San Juan and/or the Glen a year or two earlier, and sorta tagged along with us at that time. They were very modest, humble, good folks.

Hance Rapid: We ran it at times, and lined it at times. Of course, with the Chris Crafts, it was no problem. Now, everyone runs everything! No line, no more, never! Barry Goldwater would have liked that! Oh yes, on the 1965 Stavely trip with Barry and his family, the helicopters brought steak and refreshments, plus helped in the historical "lining via helicopter" episode at Hance. Isn't that one for the books!

Sockdolager Rapid: I hope you all have great reverence for this one! If you are going to upset a boat, do it in a big rapid! No, I don't recall what, if any, the changes were in Sockdolager, as I was under the boat breathing from the air pocket and drinking some water to replenish my depleted fluid balance! I recall being told by Kenton to drink more water! And I did! Anyway, I do recall a hole, and I also remember that you never want to go sideways into a hole, or even just a little skewed off one way or another. And you never want a wave to break at the wrong moment, as it might just result is a swimming party. I do recall thinking that I needed to do something, go one way or the other, stern or bow, right or left, or something! Ah me, there goes my unblemished record. It was bad enough to throw Tad off the boat in Unkar way back when! And that was nothing! Oh well, I really do like good tasty "upside down" cake for supper! And that was really the highlight of all the meals and desserts! So, to the very renowned "Sockdolager" I pay my undying respects! I can't wait to meet you again! Yes, "There are them that have and them that will!" Thanks, Brad, for your help!

Grapevine: Nice ride! Yes, I rode, not rowed!

Phantom Ranch/Bright Angel: Don't forget the source of the name and why! No sandbars! Yes, there is a history of "debris flows" coming out of Bright Angel Creek. It sure messed up a nice swimming pool at Phantom Ranch. Water? Telephones? Bathrooms? Well, there are some changes, thanks to the US Government and their gifts and benevolence for Fred Harvey, et al.

Horn Creek: Always a good place for pictures!

Hermit Rapid: "Waves 30 feet high with spray twice that high!" Dellenbaugh must have been right! This is always a good one, just up and up and down and down! Really one of the best rides in years gone by. Huge waves. Sometimes we cheated, sometimes we just had an absolutely great, wild, fun, ride!

Boucher Rapid: Yes, there was a debris flow of some significance in either 1951 or 1952. I recall that we stopped to look at it, and I am not sure that we had done so the year before. Anyway, we hiked over boulders and debris that were not previously there, decided there was no problem, and ran the rapid. I am sure there was a small impact on the rapid, but not a "bad" change.

Crystal Rapid: I do not recall anything of significance from the 1950's, except we just ran wide open the "gem" rapids. They were always just unbelievably exciting! So you have a "new" rapid? Let me assure you that there will be many "new" rapids in the Grand Canyon over the years to come! Some may be "born" this year, some perhaps not for generations to come! But, I assure you that they will come, they will change, and at some remote time in the future, there will be "unrunable" rapids.

Mile 107 1/2: This is where the Rigg Brothers stopped on the first night of their "epic" speed run through the Grand Canyon! I looked and looked for the small sandbar on the right side along the granite cliff. No beach! Oh well! Anyway, nostalgia and fun good memories! Let's see, peanut butter sandwiches for lunch on the boat. The same, or perhaps a can of roast beef for supper. It was a tad bit cool that evening! Yes, we were veteran river runners. Jim had been through the Canyon twice, and I had been through once! Unbelievable! Yes, that was our first stop!

Bass Cable Crossing: Talk about destroying the historical things of the past! That old cable and the wooden conveyance for transporting people, donkeys, gear, etc., has been mutilated by progress and the helicopter "cable cutter." Not good!

Walthenberg (or Waltenberg) Rapid: We always liked it.

Rancid Tuna Rapid? Must be a name from a "modernist" or "The Woman of the River" as it was not there before! A "Dock-ism?"

Elves Chasm: Much the same, and some change along the shoreline. There was a register there, and it did have the names of the great river runners of the past. It should be in a museum. NOW! It does not belong in some box in someone's attic. Oh well!

Forster Rapid: It was in this area that the "Esmarelda" was found by our party in 1950. I thought it was above Forster, but I will have to check it out. Anyway, in here someplace was where we re-floated the Esmarelda. Not much wrong. Just a blown head gasket between two of the cylinders. Repaired that night. Jim ran the boat on out of the Canyon.

When we arrived on Lake Mead, we pulled the cataract boats to Pierce's Ferry, and then went on across Lake Mead with our passengers. Quite the event! But, that is another story, so check with me sometime and we'll see if we can bring up some of the history. I do have pictures of it, and the pulling of the boat to the river over logs, much like the ancients of old moving rocks for their pyramids. Well, not quite, but you get the idea.

Fossil Rapid: Someplace along the left bank between Forster and Fossil Rapids, closer to Forster, at ultra-high sand and water level is where a Mr. Zachow was buried. I mentioned his demise elsewhere in this write-up. He was from Cleveland, Ohio. I had some correspondence with his sister, who wanted to know some of the details of the drowning and where he was buried. We were on a Powerboat trip, and when we stopped at Phantom Ranch they informed us of the accident. As noted, he had hiked down from, I believe, the South Rim. It was hot. Two of the hikers decided to swim across the river to cool off. One either turned back, or else he made it safely all the way across. I believe he turned back shortly after starting the swim. Mr. Zachow continued, and was within just a few agonizing feet of the shore when he became unable to go further, or had a cramp, or whatever. Anyway, we were told by the people at Phantom Ranch to look for his body as we went on down the river. His body was floating in the river. We realized there was something decomposing about a mile before we located the body! Jim arrived first at the eddy on the left (just a short ways below Forster) and hooked a line onto his body. We placed him in a ground cloth, carried his body up the shoreline as high as possible to where there was still some sand, and placed him in a grave. High water should not have disturbed the grave, as it was well above the usual 100,000 foot levels experienced at that time. I will look for his full name and the old address, if I still have it, and likely I do, someplace!

Bedrock Rapid: Not much water! And, more debris flow. Might be a good idea to look again at that left side! You might be running the left with a little more flow from the creek. This is always an interesting rapid. Things happen here that never happen anyplace else or for any reason! Like loosing the steering on the Powerboat! Why, of all places? Oh well, it ended fine, no problem, just hang on to the cables, pull, retract the throttle, turn, throttle, on and on, and miss the rock by at least a few inches. This one may get worse. Need some dynamite?

Deubendorff Rapid: Rocks! Always!

Tapeats Creek: Lots of change at the flow into the Colorado! In the past, the creek water temperature seemed very cold. Now, with the river water so cold, the creek seemed warm! Strange! This is still an awesome place. Heavily trampled by feet, now, but still nice.

Deer Creek Falls: There was an old miner's shovel way up the creek, and we left it there. I am sure that it found its way into someone's garage, and likely trash. Too bad! I like this canyon just about as much as any of them. Nice canyon. We did pull the Powerboats over towards the waterfall once at high water, but, rocks! Nice place in a nuclear war.

Doris Rapid: Good name!

Kanab Creek: The water was never as good in the lower Canyon. Too much livestock and too many wild burros.

Matkatamiba Rapid: Another good name. I always liked the sound of this one.

Upset Rapid: Good for cheating!

Havasu Creek: Still a beautiful place. Yes, we did take cataract and powerboats up into the creek. The large boulders are the same in spite of big floods. I have pictures of the same boulders showing me jumping off of them into the big pool. Lots of limestone deposits that make for big skin abrasions. Jim and I hiked up the canyon a time or two, and if ever there was a "Garden of Eden" on this earth, it was mighty close to Havasu. Just so beautiful! It was difficult to stop at some water levels, and it seems to me that we camped both on sand and the hot rocks along the shoreline on the left. Pretty hot camp on the rocks. No sand today.

Lava Falls: Another "unbelievable" change! Better look at the old pictures of the alluvial fan vs the current alluvium. That is one huge change. Better yet, look at the old pictures of us lining the cataract boats, or the powerboats running Lava Falls, and you will get an idea of the magnitude of the debris, or the alluvium, that has been deposited since the 1950's. I won't say the course of the river has changed, but the large rocks are covered with the smaller debris, and those huge rocks over which we pushed and struggled to portage and line the cataract boats are not readily visualized! Most of the present river runners have not seen Lava Falls at 80,000 to over 100,000 second feet. As you are aware, it has a huge tongue with a one gigantic hole on the right, and just immense waves. It has changed! On the speed run, we did stop and look at Lava. We ran the first tongue from the left, zip, zip, practically no water in the boat, and we were through it without any difficulty whatsoever. Yes, my eternal respect for Lava Falls. You might check the river water levels above and below during both high and low water, and see if there is any significant variation in the drop. For some reason, it looked sharper and higher in high water. Also, of interest, this is where I first met Martin Litton in 1952. He hiked down, filmed us lining at Lava Falls, and rode on down to Whitmore. Georgie White was on her first trip, and she and Elgin had tagged along a bit.

Jim had given her all the information he could on running the rapids. Anyway, we all helped line their rubber raft through Lava Falls at the same time we lined the cataract boats. No one seems to know that Jim, more than anyone else, helped Georgie to get started on the river. It all began in 1950, when Jim and I took the movie group down Glen Canyon. Georgie and the movie starlets were the stars in the "River Goddess" movie. But, that is another story! Check with me on that one! Kinda fun! Hmmm! Irish McCalla lives in Prescott. You might check out the story with the real "River Goddess!"

Whitmore Rapid: Always smelled like livestock along here. We used to see a few burros here. Of course, the water was not too palatable. Oh yes, this is where Pat Bundy and others visited from time to time. He was a good swimmer! He once asked if we wanted any fresh fish for supper. With an affirmative answer, he went off for a few minutes, came back with some dynamite, lit the fuse, promptly threw it out in the big eddy (still there), "kah-whoomp" and fish began floating to the surface of the river. He jumped in, swam around like a bird dog, and retrieved some 15 or 20 catfish. As I recall, he did it a couple of times. On another trip he asked if anyone wanted cold fresh water. With another "yes" from the group, he promptly ran off up the hill, disappeared for a few minutes, and came back with ice cold water! I have no idea where he found it, or if it was a spring or an ice block he packed in from the rim, but it happened. Jim always said that there was a cold spring known only to Bundy. Well, we'll keep looking! I doubt that he had access to ice blocks, or ice at all, so I tend to go along with the cold spring theory.

Mile 205 Rapid: Hot days and warm water! Oh yes, that was then! Sorry about that!

Mile 217 Rapid: I recall that this one stopped the Esmarelda on its upstream run of 1949. Jim thought about running up in 1950, as the water flow was much different (lower) when we came off the river. He could have done it, and likely gone on to Lava Falls. He was in the eddy as we ran the cataract boats, and except for his concern that it might blow out the gasket patch between the cylinders on the engine, he would have. We talked about it, and we all agreed that he could have made the run up the rapid. Such is life!

Diamond Creek: Well, we had our "River Rat" initiation here. Lots of fun! No cars, no people, just a hot beach! And, as I recall, we did not camp here too often, either. If you want change, look at the colonization at Diamond Creek. That would have made the pioneers envious. I am awaiting with great anticipation the time when the motel and hotel complexes will be built for the enjoyment of all! Maybe that should be a "zoo." It is already somewhat like one!

Well, you do need a place to take the boats out, load up, and head back to reality. It is still nice at Diamond Creek. Jim and I passed by here on the second day of our speed run at about 8:00 pm or a little later. It was getting dark, and it was darker than we wanted to admit, but we just kept on going. The run on down the Canyon and the lake was like you rowed away from the noise and the sounds of the waves. We had no moon, so it was really pretty dark. We thought we knew when we passed by Separation Rapid, but we were not sure. We drifted on to about the Bat Cave area, where we finally found a place we could get up the bank and through the Tamarisk to camp.

We drifted on to Pierce's Ferry the next morning, where we met Bill Belknap, and a plane from Rigg Aviation was waiting for us. We flew back to Lee's Ferry, where Frank Wright was waiting. You might have heard that he was a little upset, and I guess he was.

Miscellaneous: Not to repeat, but, there are aquifers present below Glen Canyon which were not present in the pre-dam era. Other seeps and water flow seem to be more significant, especially on the north side of the Canyon. Yes, multiple debris flows have occurred. The rapids seemed a little tough with the low water. More rocks, sharper drops, pools, debris flow, all contribute to change in the Grand Canyon. We need to ask what all this means!

It would be inconceivably ignorant to not believe that there will be ongoing major debris flows in the Grand Canyon. There will be major changes. Dams will result from the debris flows. At some time in the future, there will be even more calm lakes with steep rocky falls and rapids. It is very likely that unrunable rapids and dams will eventually obstruct the Colorado River to the extent that the commercial river expeditions, as now operating, will be unable to run some rapids.

I see no way in which the Grand Canyon and the Colorado River can be expected to not have potentially serious major changes in the Canyon and river environment. Dams, debris, rapids, lakes, rock falls, the ecology, all is changing and will continue to change. There will be major impacts on the flow of the water.

I do not see a "mini-pulse" of water, such as is proposed to be released from Glen Canyon Dam next spring, as anything other than a feeble effort to appease the concerns of bureaucrats, politicians, and the many environmental groups who are all vying for control and power in and over the Colorado River, its development, and its resources. The river running community may lose in this one.

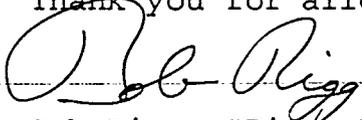
Believe it or not, there have been significant major changes in the few brief years since the 1950's. No one can predict what changes lie ahead.

The only constant in the whole scenario is change.

The Colorado River needs to do what it was placed there to do. Everything needs a good "flush" from time to time. The Grand Canyon is no exception.

I am grateful for the opportunity to have been on the river again. I do hope there will be unification, both in thought and action, of all the parties involved with the management and future of the Grand Canyon of the Colorado. The Colorado River and the Grand Canyon are not only among the great wonders of the world, but they are also among our greatest national assets and most valuable natural resources.

Thank you for allowing me to be a part of the "legends" group.

A handwritten signature in cursive script that reads "Bob Rigg". The signature is written in black ink and is positioned above a horizontal line.

Bob Rigg, "River Rat"



U.S. Department
of Transportation
Federal Aviation
Administration

Alaskan Region

222 W. 7th Avenue #14
Anchorage, Alaska
99513-7587

Glen Canyon Environmental Studies
Dave Wegner, Program Manager
P.O. Box 222459
Flagstaff, AZ 86002-2459

Dear Mr. Wegner:

I wish to personally thank you for the opportunity to participate in the recent Grand Canyon Colorado River expedition. There are more changes in the Grand Canyon and the Colorado River than one can imagine!

As for the trip, it was very productive. I am positive that the information shared by the "old-timers" will be very beneficial to the ongoing environmental studies. Regrettably, very few people really know what the changes are, and what very significant impact the Glen Canyon dam has had on the Grand Canyon. Perhaps even more regrettable is the fact that these studies were not done before the dam was built. I can assure you that there would have been a much different outcome, with the very real possibility that the Glen Canyon dam may not have been built.

My only regret is that the multitudes who now enjoy Lake Powell and the Grand Canyon did not have the opportunity to experience Glen Canyon and the Grand Canyon in their primeval state. Had they seen the Glen and the Grand Canyon then, there may have been a different damsite.

Again, my heartfelt thanks for the opportunity to participate in the USGS/GCES Colorado River trip. It was absolutely a most worthwhile endeavor. I am most appreciative of having been invited to be a participant. I do look forward to future meetings and discussions on the multitudinous issues involving the Glen Canyon dam, Lake Powell, the Colorado River, and the Grand Canyon.

Sincerely,

Robert W. Rigg

Robert H Webb
US Geological Survey.

October 25, 1994.
Old timers legends 1947-195.

Dear Robert.

I am pleased to be a part of the
Glen Canyon Environmental Studys and here
some comments I wish to present and hope
they will help in your studys of Grand Canyon.

Tamarask are difficult to control with
human resources, so nature is efficient
with periods of time using high water flooding
over beaches where seedings are starting to grow.

Flooding with silt laden water is needed
to control vegetation and transfer sand
back onto beaches in Grand Canyon,
So large releases of clear water from
Glen Canyon Dam should help some sand
onto beaches and may help control tamarask.
Refer to 1983 release flooding.

It is easy to remember when the natural
Colorado River with its balancing power
had control to regulate high and low
water lines with lots of clear sand bars
and rapids did not change often.

Hypothermia is a serious problem now
with the cold water, also the flora and fauna
have to adjust to the new environment.

I believe the NPS. is doing a great job
in regulating the flood of human users in
Grand Canyon with seldom a trace of

garbage lying around and no obvious human waste or odor was observed by me.

The present numbers of travelers through Grand Canyon seem to be compatible with the canyon environment.

In sections of lower Grand Canyon I noticed traces of wild burrow trails along hillsides and I believe the Park Service were wise in removing the destructive beasts.

on 1947 and 1953 trips we seen very few bighorn sheep, however this trip I seen approx. 30.

at special locations we stopped to compare photographs and note many environmental changes.

Especially where Kanab Canyon enters there is gravel bars extending out into the river which has covered a sandstone shelf we walked around on to continue up along side the river to Deer Creek on my hike down Kanab Creek with Nell + Rosalie Goldman April of 1962. That ledge must be under several feet of gravel.

as an old timer I felt it a privilege to be on this important trip and share my thoughts in front of video and cameras, also many talk sessions including Vasey Paradise, Redwall Cavern, Bedrock Rapid, Little Colo. River, Crystal Rapid and Lava Falls.

Camp at mile 220 being extra special as we shared the beautiful full moon, Camp fire and Companionship, with Environmental Chemists, Scientists, Photographers, Doctor Walt, Professional Crew who were kind and helpful to all furnishing good food and equipment by Park Co.

I enjoyed the wonderful experience of renewing old friendships and meeting Lois Jotter Cutter one of the first 2 women going through Grand Canyon with Nevills Expedition 1938.

Now Robert if I can help in any way just let me know.

Sincerely Kent Frost

Diane Grua
734 E. David Dr.
Flagstaff AZ 86001

October 6, 1994

Robert H. Webb
USGS Research Project Office
Desert Laboratory
1675 Anklam Rd.
Tucson, AZ 85745

Dear Bob:

You asked what changes in the Grand Canyon have struck me the most. Please bear in mind that I wouldn't win any prizes for observation, nor do I have an extensive number of trips under my lifejacket. Nonetheless, for the record (and not necessarily how I view them in order of importance):

1. The decrease in the size of beaches, as well as the increase in amount of vegetation present upon them. In addition to seeing this while matching photos, I have also observed it in processing the Georgie Clark collection at work, as many of her camps were at enormous, long, flat beaches (at least in 1958).

2. The presence of large amounts of tamarisk, camel thorn, russian thistle and other exotics. While I suppose that wholesale elimination is not practical, some sort of control seems necessary.

3. The decline in the native fish populations. A trout just can't replace a humpback chub.

4. The substantial changes to Lava Falls. I realize that most of these changes were due to debris flows which have nothing to do with the dam. Nonetheless, I am intrigued by the notion that main channel floods might have washed out the results of major debris flows, and that without these floods, the river could be rendered unnavigable.

5. The loss of an unbridled, muddy river, which is of course tied in to the changes I've listed above. But I often wonder how commercial river running would differ if the dam had never been built. Would more people be going down? Fewer? Flows of 2,000 or 120,000 cfs would certainly weed out a few folks.

Let me know if you need any additional comments. I'll keep thinking, especially as I process photo collections and correspond with the old timers.

Best--


Diane Grua

Kenton Grua
734 E. David Dr.
Flagstaff AZ 86001

25 October 1994

Robert H. Webb
US Geological Survey
Research Project Office, Desert Laboratory
1675 Anklam Road
Tucson AZ 85745

Dear Bob,

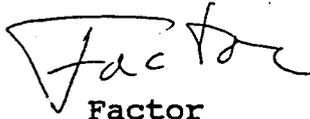
Well here it is, the Factor's list of the changes that have occurred in Grand Canyon that can be blamed on the Glen Canyon Dam. All of which were confirmed and elaborated upon during our recent trip with a few of the few people that actually saw the place before the dam.

- [1] First would have to be the lack of and greatly reduced size of the available camping beaches. That was the most striking change noticed by all of the Legends. At almost every camp I've witnessed significant loss of beach area during the past twenty six years that I've been working in the canyon.
- [2] Second, the extent to which the riparian vegetation has moved down to the new high water mark of 20,000 cfs. This could be construed as a benefit since it has probably created a more favorable habitat for many bird and small mammal populations. To some extent, the vegetation also helps to contain the sand on the beaches. The negative aspect is that many usable campsites were also completely overgrown before the camping pressure grew to its current proportions. The most positive solution to mitigate the problem would be to identify potential campsites in reaches where more camps are needed and remove enough vegetation to make usable campsites. Post-dam vegetation removal by flooding was shown in 1983 to be only temporarily and marginally effective and the havoc wrought by a clearwater flood of such magnitude leaves one to believe that such floods are best avoided if possible.
- [3] Obnoxious exotic plant species colonizing the new post-dam riparian zone have become a serious problem and seem to be getting worse each year. The worst of these species is not Tamarisk. Camelthorn and russian thistle are probably the top contenders for this award. The fire hazard posed by cheat grass puts it pretty high on the list, too. It is a species that thrives throughout the canyon and would be very difficult to control. Once again probably selective mechanical control would be the most effective means of dealing with the problem.

- [4] The post-dam river has become more difficult to navigate and could suddenly be made unrunable due to debris flows from side canyon tributaries. I've witnessed changes in Badger Rapid, Soap Creek Rapid, Houserock Rapid, 17.5 (Redneck Rapid), 24 Mile Rapid, 25 Mile Rapid, 26.9 Mile (MNA Rapid), 62.5 Mile (above Crash Canyon), 63.4 Mile (above the Hopi Salt Mine), Lava Canyon Rapid, Comanche Creek, Tanner Rapid, Basalt Rapid, 70.9 Mile (across from Cardenas), Granite Rapid, Crystal Rapid, Elves Chasm, Forester Rapid, 124 Mile, Fossil Rapid, 127 Mile Rapid, 127.7 Mile, 128 Mile Rapid, Specter Rapid, Bedrock Rapid, Havasu Rapid, 157.7 (First Chance), 160.9 Mile, Lava Falls Rapid, 209 Mile Rapid and Gneiss Canyon Rapid. Pre-dam high flows of greater than 100,000 cfs were what it took to remove debris and maintain a clear channel. The post-dam solution would be a clear water high flow with all of it's inherent negative side effects or possibly some kind of mechanical intervention.
- [5] The river water is clear and cold. This makes it difficult for native fish species, adapted to wide fluctuations in water temperature and sediment concentration to survive and reproduce. The clear cold water is also more conducive to predatory introduced species which put even more pressure on declining native species. The only viable solution to this problem is to get rid of all the dams.

Well there you have it. Sorry it took me so long to crank it out. Boy that was a great trip wasn't it. Looking forward to the next one.

GUANO!


Factor

Bill Beer
PO Box 7595
St. Thomas, USVI 00801
Fax: (809) 775-6374

Oct. 23, 1994

Robert H. Webb
United States Geological Service
1675 Anklam Rd.
Tucson, AZ 85745

Bob,

Thanks for your last letter—dated January 1, 1904, strangely. Computer error? Appreciated your kind comments on our film. Looks pretty amateurish to me these days.

The family and I had a lovely trip, virtually without incident. Dad did wrench his perennial slipped disk early on and was physically somewhat incapacitated, but seemed to enjoy it all. I must say those Snouts certainly make the toughest rapids into trivial experiences. Was sorry I had to miss your trip, sounded like it was fun if perhaps a bit wet they tell me. Ah, perhaps next time.

Since my return I've been swamped with work of various kinds and am just now coming up for air. Eventually I shall likely see to it that the slides and movie are placed with NAU, but at the moment the correspondence, etc. are too much.

John Daggett returned from California the other day and I talked with him about the boxes. In an event all too typical of John's life, they were seized by the DEA in a raid on his house in Ft. Lauderdale (occupied by tenants as he was living here in St. Thomas). John had all his income tax records in them (obviously a secure container, Grand Canyon proven). The DEA search squad threw the boxes, spilling contents, out on the front lawn and hauled the tenants away to jail for growing a potted marijuana plant. When the papers started blowing around the neighborhood, neighbors picked up papers and boxes and consigned them to the nearest dumpster. Exit boxes. But the real de/ouement came a few years later when John was audited by the IRS. He gleefully pointed out to IRS that a sister agency had illegally destroyed his records. Exit audit!

So there remains but one of the original four. It is safely tucked in my storeroom, sans documents. I would find it amusing and delightful should it wind up on display in company with a collection of Grand Canyon boats as the only non-boat and the cheapest way to make a Canyon traverse. John, of course, agrees; and sadly regrets the story of *his* boxes cannot somehow be told. So if Stavely or another should like to exhibit the remaining one, I would enjoy donating it.

Very truly,



Bill Beer

October 7, 1994

David Wegner, Program Manager
P.O. Box 22459
Flagstaff, AZ 86002-2459

Dear Mr. Wegner:

It was suggested that we pass on to you any observations that we had during the "Legends" trip.

1. In the macrocosm, things don't change very much. In the microcosm, they don't either - unless one watches carefully through a well placed camera lens.

2. Tamarisk is a real pain.

- it creates mud - slippery, gooey mud,
- it changes the visual environmental impact in: River left at Nankoweap. In '47 or '48 there was a barren sandy beach with a few rocks (I know, I camped there during a wind/rain storm).

So Tamarisk ruins the waterfront and probably drinks more than its share.

3. Someone does nice work in inspiring guides and passengers alike to treat the landscape gently. New places of activities are being developed (hiking, waterfall sliding and scientific study). I've taken 3 trips in the past 8 years and have only seen a couple of pieces of trash (except at Soap).

4. The whole area at Veasey seems to be getting bigger.

5. Given an either/or choice, I'd take a quiet boat. Motors have merit so it seems to me that joint use is the proper goal.

6. What a great place to teach geology.

7. The river water is a lot colder. I think that it's cooler by the river banks, too.

Yours sincerely,



Garth Marston

GM/ram

\\office\misc\wegner

Bob
For your information, Thank you again
JGC

3225 Forsyth Drive
Greensboro, N.C. 27407
October 5, 1994

Dave Wegner
Glen Canyon Environmental Studies
PO Box 22459
Flagstaff, AZ 86002-2459

Dear Dave Wegner:

My heartfelt thanks to the Glen Canyon Environmental Studies for funding the recent Grand Canyon trip with Bob Webb. Not only was the trip a truly wonderful experience, with all the remembered beauty and excitement, but also one I had never expected to repeat.

Bob has asked that the participants summarize the differences which we observed in the Canyon:

First, there is certainly more vegetation along the shores in terms of tamarisks and grasses. I believe even the talus seemed to support more vegetation, as viewed from a distance.

Second, I do not remember marshy areas in the inner gorge, and was amazed at two big flocks of swallows near Tanner Creek Rapids, apparently feeding on big hatches of insects. I remember the area on the right bank as very stony, with some sand, but little vegetation, but apparently now it supports the development of insects in numbers. Certainly we saw many peregrine falcons this time, although it is possible that we were concentrating on the difficulties of travel in 1938.

Third, we saw mountain sheep near the confluence of the Green and the Grand Rivers, but I do not recall seeing any in the inner gorge of the Colorado, as we did this time. I was also surprised at seeing wild turkeys.

Fourth, the tamarisk was not apparent at Lee's Ferry in 1938, and has now completely replaced the scrubby willows.

Fifth, Vasey's Paradise, where Elzada and I collected extensively in 1938, seemed much the same, although I remember more poison ivy, and less watercress. There was also space below the vegetation, in which I sat to put up plants in the press, and I do not believe that I sat in water to do this. This time there was no dry area between the vegetation and the river's edge. I believe that I gave Bob a picture of me, taken by Lorin Bell, as I sorted plants, and perhaps Bob can match rocks.

Sixth, (and very expected) the greatest difference was in the amount of flow. I know that as we began the 1938 trip that the water level was high, possibly up to 70,000 cfs as we were told. However, Bob tells me that the flow was much less three weeks later as we reached the Grand Canyon. Even so, I still say "much more water then."

I do regret the fallibility of ancient memories, and the fact that I was not much help to Larry and Bob on species. Elzada, experienced as she was in southwestern vegetation, would truly have been a wonderful help, and would have loved it, too.

The greatest difference between the two trips in the Canyon is that of purpose. Certainly Elzie and I originally envisioned the trip as a botanical collecting trip in which we would be in control. We never thought of it as a commercial trip, but rather a cooperative venture. However, the difficulties of navigating the river, and the necessity of compromise, made it impossible to stop at some spots, limited the time spent in collecting, and subverted our original plans. This time, the supporting pontoon boats, able to hold position in the river, made a tremendous difference in navigation, as well as providing more security, and much more space to carry supplies and collections. The accumulated knowledge of years of experience also made a tremendous difference. Even more important, the scientific aims were preeminent ~~eminent~~, even over the videos and photography, other than the matching of earlier pictures. In 1938, we spent a lot of time and energy simply in getting down the river, and certainly that became most important.

The other old timers on the trip were great companions, and I especially appreciated the help and friendship of "the Nevills girls". All of the personnel, (scientists and guides) were uniformly helpful, efficient, effective, and delightful. The effort required to get the cataract boat into a river-worthy state was greatly appreciated. I also enjoyed the two dories that were provided.

As to my recommendations as to future management, the idea of allowing an increased flow on a one-time yearly basis, has great appeal. Perhaps this flooding would alter the composition of the banks enough to slow the expansion of the tamarisk populations, without adversely affecting the animal populations.

I am sorry that you were unable to join us on a wonderful trip, and hope that you will find the information obtained to be useful. Certainly I was impressed with the information to be obtained from Bob's picture match-ups.

Sincerely,

A handwritten signature in cursive script that reads "Lois Jotter Cutter". The signature is written in dark ink and is positioned above the printed name.

Lois Jotter Cutter

P.O. Box 233
Page, Arizona 86001

October 11, 1994

Robert H. Webb
USGS, Research Project Office, Desert Laboratory
1675 Anklam Road
Tucson, Arizona 85745

Dear Bob:

The "Legends" trip was one of the best I have ever made on any river. The fact we all knew what to expect, all had shared or similar memories, were self reliant and into the Canyon made it super special. Thank you for your part in helping to provide this experience!

You asked for five changes/similarities etc. we noticed:

1. Visual knowledge that regardless of Glen Canyon Dam or approximately 30,000 people per year through the Canyon, the sandbars, like those in the Mississippi, continue to change through a grander plan than ours! With thanks to Paria and Little Colorado sand is picked up and re-distributed, although not at the pace it was before the above two impacts.
2. I was surprised by ^{less} the tamarisks/salt cedars than I anticipated. Thinking back a few years when we "hit" a beach for camp and had to move on because of a 4-6" proliferation of them. I was surprised to see cottonwoods up high in Canyon - floored at the number of beavertail cactus, relieved at the recovery of Granite Park area from the "rocky mountain canary".
3. Thrilled with the changes in Badger (Note: talked to a friend whose house sits on the edge of Badger and it was in raging flood mode as was Jackass - Rick Smith 355-2225) Creek, Sock a bit more choppy, Horn Creek with its two horns now and the right hand run; seeing the "near dam" at Bedrock, especially for the big rigs; Crystal is not the same rapid, merely a rapid at the same site. This was the biggest and most impressive single change in rapids as far as I was concerned. The BIG hole created in 1966 at the head of the rapid has moved downstream - may it continue its travels - Would like to see this one at say 20,000 - have the feeling it may be an 11 or 12 again! The changes in Lava were somewhat expected - can't help but think how easy it would be to line boats in these days as opposed to the past -Hauling equipment around is now near to impossible - the canyon's conglomerate has moved out, cutting access to the river and the greenery would take a machete where it

just took determination before.

4. The apparent increase in the variety of wildlife. I do not remember ever seeing desert bighorn on the Upper Half before. The swallows and globe swifts - telling me there are more bugs. There ARE more red ants than I remember - also deer flies. There were flies at Fern Glen before the restrictions on dish washing practices and dumping of dirty water. Loved seeing the number of peregrines and even the broken necked egret.
5. The sociological changes in the Canyon. It would appear there is a greater familiarity and partnership with the Canyon eg. people hiking in and out at will on routes considered as Escape Routes only. The running of all rapids without regard to a "flip" or passenger weight etc (knowledge the snout rigs would act as pickup boats). Some of the mystique - the titillating fear, the feeling of adventure is gone. Wonder if familiarity breeds contempt in this scenario?
6. The tremendous changes in equipment, both in type/style and amount! I am still nursing a sore shoulder from carrying too much personal equipment - before I would have had a bed roll and a SMALL duffel bag - no availability of a tent or cot (tent was nice), would have carried my own "tp" in the earliest days; used a flushing porta potti in the 70s, but now have a tent, a measuring cup monitoring dehydration as well as keeping the Canyon clean and urinating in the river. Kitchen equipment - cooking over campfires to large gas grills - menus reflecting better methods of cooling and packing. Motors are much quieter and less exhaust fumes/smoke.

Enough of the rambling: The Canyon continues to change eg. the rock fall at 44.5, recent floods from the North Rim, quiet in the Canyon - was most impressed with the lack of noise - only two places the tour planes were noticeable - Little Colorado area and Crystal. - Evolution of the people/Grand Canyon experience.

I believe the studies being done will provide valuable base information for the future - I DO NOT believe we should hang our hat on them to make a determination cast in concrete for the future of the Grand Canyon, but continue to watch, educate and enjoy God's wonder.

Sincerely,

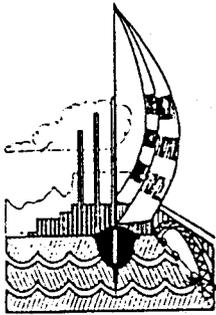

Jean Nevills Staveley

P.S. enclosure - Dave Wegner's letter
Log notes to follow

Page-Lake Powell Chamber of Commerce

VISITOR & CONVENTION BUREAU

P.O. Box 727, Page, Arizona 86040 --- Telephone: (602) 645-2741



PAGE-LAKE POWELL
CHAMBER OF COMMERCE

Page, Arizona

September 26, 1994

Dave Wegner, Program Manager
Bureau of Reclamation
Glen Canyon Environmental Studies Office
Post Office Box 22459
Flagstaff, Arizona 86002-2459

Dear Mr. Wegner:

The concept of putting together a group of people representing over fifty years of Grand Canyon river history in order to gain not just visual and memory, but access to their original photos was a great one. We understand it was with your work behind the scenes the trip was not called off at the last moment.

The changes both in the canyon, rapids, sandbars, animal life, the expanded use of the river corridor with people hiking in and out using what were only considered "escape routes", the varied types of equipment, people from all strata; not just the "elite of the late 30s - early 40s are significant.

Rapids: Badger Creek (changed in less than a month before we embarked) - Bedrock with the challenging encroachment of the gravel bar. Crystal with the BIG HOLE gone or at least moved down river - the multitudinous debris flows from the North Rim mainly new, surprise at seeing a lone cottonwood up mid river where there hadn't been. The changes in Lava - the left hand side where Daddy lined the boats would be a breeze with some of the huge boulders gone. In general the tamerisks have not taken over as badly as I had feared - the beaches were not eroded as badly as I had been led to believe - the Canyon is cleaner than I EVER remember and in general, I feel the stewardship of the professional operators and others are maintaining the grandest of Grand Canyon.

Sincerely,

Joan Nevills Staveley
Executive Director

PAGE LAKE POWELL CHAMBER OF COMMERCE

cc: Bob Webb

PAGE — LAKE POWELL — A PLACE FOR ALL SEASONS



U.S. Department
of Transportation
Federal Aviation
Administration

Alaskan Region

222 W. 7th Avenue #14
Anchorage, Alaska
99513-7587

Robert H. Webb
US Geological Survey, Research
Project Office, Desert Laboratory
1675 Anklam Road
Tucson, AZ 85745

Dear Bob,

First of all, I wish to thank you all for inviting me to participate in the USGS/GCES Colorado River expedition of 1994. It was a truly spectacular trip, with lots of nostalgia, change, excitement, and as always, good people.

I have tried to put together some thoughts on the trip. Oh yes, I did write a note to Dave Wegner. I would like to have met him on the trip. Perhaps next time!

As for the return back home, I did have a mini-violent experience in Grand Junction when I returned the cataract boat to Jack Treece. He was just a little bit livid with rage. Actually, almost uncontrollable rage! You see, for some reason, we had painted "Mexican Hat Expeditions" on the side of his boat (which I would do again), and we also changed the baby blue (Jacuzzi) color of the cockpit to cataract boat green, and that was not particularly to his liking! I can only tell you that we were very close to a brawl before he settled down, and then it was all silence as we unloaded the boat. Man alive, was he ever mad! I could not talk to him or tell him about the trip or anything about the whole purpose of the expedition! It really was a violent encounter! Oh well, such is life.

Back to the summary! There are so many things that could be said, and so much that has changed. It was almost overwhelming! I guess what I really need to do is make a few more trips to help me sort out thoughts and changes! Well, maybe someday!

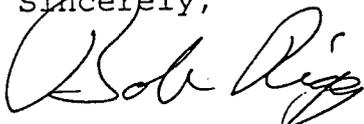
Regardless, it was great! The people were really great! And there is one last thing that we did not do that must be done, and that is an initiation of you into the "Royal Order of River Rats of the Colorado River!" That is an absolute MUST! I don't know how we can get you into the "Driftwood Burner's Association" (DWB's) as there is not too much driftwood. But, there is enough

when no one is looking. Rules? I personally don't recall any rules about anything. Let's just have a good time!

Above all, it was a wonderful trip. It really opened my eyes to the changes in the Colorado River and the Grand Canyon. Again, I do thank you for your kindness and help. I would certainly like to share and receive information, pictures, reports, findings, etc., which come forth from your studies.

Bob, I do wish you the very best in your research projects and studies on the Glen Canyon and Grand Canyon "Colorado River" country.

Sincerely,



Robert W. Rigg

Dear Bob -

I still have NOT gone through my notes & diary - (collogs?) - But - the items I did write about on this letter are from my "other" notes - en route & immediately post-trip.

Pics? - some good - some interesting things!
also - copy of a letter to Roy Webb 2-3 years ago.

So - perhaps this review will add more controversy to the whole scenario -

I may send a copy to Tad - and ? Bud - or others - but have not done so, yet.

Again - Many thanks -

P.S. Any Civil Service Jobs around? (Ariz?)
Kindest Regards -
Bob



CLINE LIBRARY

October 4, 1994

Robert H. Webb
USGS, Research
Project Office, Desert Laboratory
1675 Anklam Road
Tucson, AZ 85745

Dear Bob:

What three environmental changes caught my attention?

- *Bedrock--the rock itself--looked smaller.
- *A new kind of insect was present that liked to bite a select group.
- *The beach at 209 appeared a little more worn.

Seriously, while I personally may not be a tremendous help in terms of environmental change, I do want to take the opportunity to describe the kinds of comments that were repeated in interviews and conversations.

*The beaches are smaller. Most folks attribute this to a lack of seasonal flows with silty water (sediment).

*The spread of tamarisks is tremendous, again related to reduced, clear flows.

*The debris flows are accreting material (lack of high, powerful flows).

*For some, the beaches are cleaner today than in the 1960's and 1970's.

*Kent talked about fishing for trout in, I believe, Tapeats Creek.

*Bob Rigg spoke of fishing in Kanab Creek (not trout).

I expected that the Legends expedition members would be articulate, interested observers. However, their level of recall and ability to supply such precise details surprised me, both from a scientific and historical standpoint. I agree that John Cross, Jr. is something of a "missing link" regarding the river in the mid-1960's.

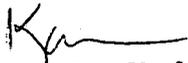
Bob, I am truly amazed at the numbers of photos, films, and logs that the participants have created . . . and this is just the tip

of the iceberg? I hope that the "historical" record that you unearthed in association with this trip will provide the foundation for some good science for years to come. I appreciate your willingness to allow the Cline Library to follow in your wake and solicit those record-keepers you have contacted, such as Bob Sharp. You are absolutely correct that you have made these people aware of the importance of their material and the need to preserve it.

As for the interviews, they were for the most part quite moving--goosebumps, hair standing on the back of the neck sort of stuff. Lew did an excellent job of placing each participant's experience in a greater context. Lois's interview alone was worth the expense of the camera, and we can add to that Tad, Les, Martin, Bob, Sandy & Joan, Garth etc. The transcripts will hopefully contain information of use to you. For me the trip exemplified my favorite Arthur Schlesinger Jr. quote about history, "history is for society, what memory is for human beings."

Finally, this letter is also intended as an official thank you for your role in making the 1994 Legends trip happen. It was unforgettable.

Cordially,



Karen J. Underhill
Head, Special Collections and Archives



Notes from a Dark Room

October 4, 1994

Bob Webb
U.S. Geological Survey
1675 West Anklam Rd., Bldg 803
Tucson, AZ 85745

Dear Bob,

We want to thank you for the opportunity to be a part of the "Legends" trip in September. Our role was to take photographs of the event, and document the research conducted at various sites in Grand Canyon. We shot 37 rolls of slide film, 3 rolls of color film, 7 rolls of B&W film, 19 sheets of 4x5 color film and 20 sheets of 4x5 B&W film. We have lots of wonderful images, which will all become part of NAU's Cline Library Special Collections archives.

You are welcome to come by our photo lab to take a look at these images, as we still have them here while we consider how to make them available to the participants of the trip. We are open from Monday through Friday from 10:30 to 5:30, or call us to make arrangements if these hours are not convenient for you.

Thank you again for making this trip possible, and allowing us to be part of it.

Sincerely,

Kathy Lampros

Richard Jackson

Kathy Lampros
Richard Jackson

October 25 1994.

Dear Friends,

Read on as I tell you about my most exciting trip this year and possibly of a lifetime, being invited as a guest of the National Park Service on Glen Canyon Environmental Studies through the Grand Canyon, September 8-20, 1994.

There were 15 of us "old timers". Lois Jotter, first woman on the 1938 Nevill's Expedition where her and Elzada Clover made history being the first women going through the canyon, Kent Frost and Garth Marston on 1947 Nevills Expedition, also Kent Frost on the 1953 Mexican Hat Expedition, Bob Rigg Mexican Hat Expedition in 1954, Less Jones first canoe going through, John Cross Jr. first to run Crystal Rapids after the flood of 1966, (made it a most dangerous rapid), Martin Litton started business of running Dories, Tad Nichols photographer, John Cross Sr., and Joan and Sandra Nevills. Also going along were six scientists who have been studying Grand Canyon since Glen Canyon Dam, 1963. Also 3 historians, 2 medical doctors, 3 special guests, 4 camera and video people, 9 guides and crew furnished by Oars Dories Company of Flagstaff, Arizona.

The main purpose of the trip was to collect information from "old timers" through audio video sessions and conversations. The scientists had lots of matching photos taken at different periods of time showing changes in the river channels. The sand bars have mostly disappeared. Rapids have changed by more debris coming in from side canyons and not being flushed away by the annual high waters which used to come. Also willows, tamarask and other vegetation is creeping down toward the lower water level and covering more shore line.

Well, we started out at Lee's Ferry, Arizona riding 2 large rafts 15X37 feet powered with a 30 HP engine. Martin Litton had his Dorey Sequia with 4 passengers. Kenton Grua, Dorey Grand Canyon and 4 passengers and Bob Rigg rowing the Mexican Hat Expedition. It was a cataract boat (Nevills design) with 2 passengers, which was the most popular boat of the trip as everybody wanted to row or ride in it, including the guides of other river party's we met along the river.

Being on a river trip again was exciting for me. Looking up 400 feet above as we passed beneath Marble Canyon Bridge along highway 89. Also the half span of a new bridge attached to the south wall as workmen were busy putting the pieces together. Then we drifted on down leaving the industrial civilization behind us.

We passed 8 deseret bighorn sheep grazing at the river's edge, then made an early camp below Badger Creek Rapid. Everyone became busy getting used to this new way of life, with new friendships being created and renewing bonds with old friends.

As we continued on down the walls are getting higher above us on the first half of the 225 mile journey through. We stopped several hours at Redwall Cavern, a huge cave with a sandy floor as the river used to flow into it in high water. The crew moved the cataract boat up on shore to match previous photos and take new pictures. Also the audio video crew were busy interviewing the "old timers".

As we set up camp (miles 44 1/2) just at dark, approximately

September 8-20, 1994
USGS/GCES Trip Participants

OLD TIMERS

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Les & Kathryn Jones
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Summary of Notes Recorded by Ted Melis during: "Legends"
River Trip, Sept. 8th-to 20th, 1994

[Bracketed text indicates my impressions and/or interpretations of the specific accounts given by trip participants.]

***INDICATES GENERAL IMPRESSIONS AND/OR CONCLUSIONS ABOUT SPECIFIC RIVER REACHES BASED UPON CONVERSATIONS.

9-8-94:

Joan Nevills-Staveley: Told me that desert bighorn sheep had been recently re-introduced to the river corridor in the vicinity of Cathedral Wash (upper Marble Canyon) about 10 years ago. She was a member of the commission that got permission to conduct the re-introduction.

[We actually saw 3 sheep in the vicinity of 6-Mile Wash during the first day of the trip.]

Brad Dimock: Claims that Badger Rapid "sounds different" as a result of the August 17th, 1994 debris flow that came in from Jackass Canyon.

[I interviewed a Western boatman on August 30th who told me that it rained quite hard for about 3 hours on the afternoon of the 17th; later in the early evening he saw the river come up about one-to two feet and turn orange. Most of the south-side tributaries look like they ran pretty good. Jackass Canyon appears to have had the largest flood, which initially had a small debris flow. The flood in upper Marble Canyon reportedly (Mark Law, NPS) occurred sometime between 5:00 and 8:00 PM on the 17th.]

Kenton Grua: Said that in his opinion, Badger Rapid had changed quite dramatically as a result of the August 17th debris flow and flood in Jackass Canyon. Kenton was at Bedrock Rapid when the river rose very quickly at around 11:00 AM on the 18th; he also said that the sediment concentration in the river later increased substantially by about 12:30 or 1:00 PM on the 18th. His estimation of the river flow at bedrock was about 25,000 cfs. He said that when he got down to Stone Creek, the camp there was nearly all under water. In Kenton's estimation, the rapid now has larger holes in it toward the bottom of the rapid which have more punch to them.

[Substantial amounts of fine organic debris (mostly woody twigs) was deposited on the separation bar downstream of Jackass Canyon as a result of the flood there. Bob Webb and I estimate that this is the first major flood and certainly the first debris flow to come out of this tributary in about 50 to 100 years. Most of the original debris-flow fan deposit was completely reworked by a later-stage streamflow flood of greater magnitude. 6-Mile and Cathedral Washes appeared to have had substantial floods also.]

9-9-94:

Bob Rigg: Recounts stories of commonly seeing "sand waves" on the pre-dam Colorado River upstream of Lake Mead. According to Bob, sand waves were most commonly seen in Glen Canyon

during his trips in the late 40s to late 50s, but were also seen in the western Grand Canyon during high flows. He said that sand waves were even occasionally seen in Marble Canyon that were often 3-5 ft high; the highest would hide a Cataract boat in its trough and sometimes these hydraulic features would actually flip boats. The unpredictable nature of sand waves presented a navigation hazard, but one that was, for the most part, a fun annoyance.

[This would confirm our present belief that the channel bed of the Colorado River was mantled by a relatively thick layer of transient sand in the pre-dam era. I have never before heard eyewitness accounts of sand waves on the Colorado River in Grand Canyon, with the exception of Robert Stanton's written journal account made in spring 1890. This information may be of interest to the sediment-modeling group of the USGS in Boulder and Denver.]

Rigg also recounted the former existence of very large separation and reattachment-type sand bars located downstream of both Jackass and Badger Canyons throughout the 1950s. According to him, the existing separation bars located there were several feet higher than they are now.

[Eyewitness accounts by others have now confirmed the timing of erosion of these sand bars with the period following closure of Glen Canyon Dam. We need to ask Bob Rigg for photodocumentation of these sand bars and sand waves if he has any.]

John Cross Jr.: Recalled the large size the separation bar located downstream from the mouth of Soap Creek on river right. John said that almost all the rocks exposed along the shoreline today were under sand in the early to late 60s. He expressed his belief that the erosion of this and other sand bars in Marble Canyon was gradual during his years on the river (early 60s to mid 70s). He also indicated that he believed that much of the erosion was probably caused by ablation (wind) and/or human impact from campers as the river was being used by more people after closure of the dam. John stated that most of the sand bars that he saw on our trip through upper Marble Canyon (river miles 0-42) looked like they had eroded by 3-4 ft.

[John's account of erosion of sand bars located in upper Marble Canyon is rather different than what I had imagined had probably occurred there after closure of the dam. I had formerly thought that erosion occurred initially in a rather catastrophic manner during the first clearwater releases from Glen Canyon Dam in May of 1965 (58,000 cfs). See video tape interview on tape #1. John's account would suggest that the large clearwater releases were not as catastrophic as I originally thought, and that wind erosion may have been the biggest part of the story until the 96,000 cfs release of 1983.]

Kent Frost: Recounted that Dock Marston had caught trout in Tapeats Creek during his July 1947 river trip. Kent didn't recall seeing sand waves in Grand Canyon in 1947, but said that they were common in Glen Canyon during his earlier trips beginning in 1939.

[We know that the trout Marston caught were introduced by the National Park Service.]

Lois Jotter-Cutter: Stated that she remembered less vegetation density on the Badger Canyon debris fan in 1938 than she saw in 1994.

[Lois definitely remembered that there were Tamarisk trees along the right shore upstream of Badger Canyon in 1938, but said that they were less dense. This makes sense because the trees would have had more difficulty getting established because of frequent floods prior to regulation.]

*****] HEARD NO ACCOUNTS OF MAJOR CHANGES IN SAND BARS OR RAPIDS BETWEEN 1938 AND 1975 FOR RIVER MILES 0 TO 16.**

Martin Litton: Tells us of a major change to the river at the confluence of House Rock (Ryder) Canyon. He claims that in 1966 a large debris flow formed the present debris fan located there now and caused the rapid to worsen considerably. This had the effect of constricting the river channel and making the large hydraulics on the left side of the river more severe and difficult to avoid.

[Bob Webb and I are having a difficult time corroborating this with photographs because we don't have good coverage of this site. Since this change is not reported by Cooley and others in their USGS report, we assume that this debris flow did not occur in December of 1966]

Bob Rigg: Definitely feels that the rapid is bigger than it used to be the last time he saw it in July 1965. He does not remember the debris fan being there at all. He claims that he used to row his boat right through the area of the river channel where the debris fan is now, and that it was easy to avoid the large hole that was there on the left side of the river at lower discharge levels. At high water, the rapid is apparently a complete washout according to his account. /

[I was afraid that Bob's impression of the river might be skewed by the fact that he ran it at high water discharge so often. Actually, we need to see what the discharge was in July of 1965 when he ran the river last.]

Les Jones: Senses that a change has occurred in the vicinity of House Rock Rapid, but does not remember the location well enough to say for sure what the debris fan looked like in 1963 when he saw it last at 1,000 cfs.

[My impression is that if House Rock had looked like it did now in 1963, that Les would have taken more notice of it than he did; especially since he was making a guide of the river. He remembered that there was a large hole on river-left, but could not distinctly remember the debris fan being there. At 1,000 cfs the present debris fan would have stuck-out like a sore thumb. I get the distinct feeling from the responses of Rigg, Litton, and Jones that something has probably changed here and that Litton is on track with his debris flow story, although I suspect his memory of the date. Cooley may have missed this change if it had been caused by the December 1966 storm if he had floated through the Marble Canyon at a discharge of greater than 40,000 cfs. At high

discharge House Rock Rapid and the debris fan are a complete washout and would probably be easy to miss.]

***I DID NOT HEAR ANY REFERENCE TO SAND BAR EROSION BETWEEN RIVER MILES 12 AND 20 FROM THOSE WHO RAN BETWEEN 1938 AND 1965. HOWEVER, EARLY MODERN-DAY RIVER RUNNERS, SUCH AS LARRY STEVENS, KENTON GRUA, BRAD DIMOCK AND JOHN CROSS JR. DISTINCTLY REMEMBERED THE LARGE SEPARATION BAR AT HOUSE ROCK CANYON. THESE PEOPLE ALSO RECALLED THE EROSION OF SAND BARS IN UPPER MARBLE CANYON FOLLOWING CLOSURE OF GLEN CANYON DAM.

John Cross Jr.: Noticed the change to 24-Mile Rapid that occurred on August 1, 1989. He also recalled that he often used to camp on a large sand bar located on the upstream side of the 24-1/2-Mile debris fan with commercial parties.

[The location of this former camp shown to me by Cross consists mostly of an armored debris fan today. It would never be used as a commercial camp now. This was an interesting and somewhat surprising piece of news to me. I had formerly thought that owing to the large debris fans between river miles 20 and 30, and the fact that some large sand bars remain there, that erosion had not been severe in that reach. This account demonstrates that erosion occurred in upper Marble Canyon even on high-profile debris fans. This should be kept in mind during future clearwater spike flows.]

Bob Rigg: Remembered the separation bar located downstream of South Canyon as being larger with less dense vegetation growing on it.

Martin Litton: Set the record straight, by saying that the USGS folks from the 1923 trip had mistakenly reversed the labeling of "Royal Arches" and "Triple Alcoves."

9-10-94:

Tad Nichols: Matched two of his own photographs taken in 1951 at Redwall Cavern.

[The photos showed a slight reduction in sand at this unique location, but nothing that I would say was equivalent to the erosion seen in other parts of upper Marble Canyon. The unique geomorphic control of this spot makes it difficult to erode sand out of there.]

Lois Jotter-Cutter: Recounted that she was unhappy with all of the publicity that they received about their 1938 collecting trip. She said that she and Dr. Clover felt that it was not a commercial trip in the modern sense of the term, but that it was merely another collecting trip for them. She and Elzada felt that Norman Nevills was trying to use the trip for self-promotion at their expense. She also stated that owing to the small size of the crew, she and Dr. Clover were required to stick to the itinerary set by Nevills and were unable to set their own collecting schedule.

[See videotape footage of interview conducted on boat by Ted Melis.]

***RAINED FOR ABOUT 45 MINUTES DURING LUNCH, LARGE ROCKFALL OCCURRED ON RIVER-RIGHT AT RIVER MILE 44 ACROSS FROM EMINENCE CAMP AT 7:15 PM.

Bob Rigg: Recollected that the river-left eddy at President Harding Rapid contained much more sand during his earlier trips through the Canyon. He said that the eddy was basically filled with sand throughout the 1950s and early 60s.

[Again, this observation demonstrates that the lower reaches of Marble Canyon have experienced erosion even where large debris fans and strong geomorphic control exists. We know that deposition occurred in the reach between river miles 42 and 56 between the years 1983 and 1985. However, according to Rigg's account there was much more sand in the eddies.]

9-11-94:

Garth Marston: Visited Willie Taylor's grave site and recounted tale of Willie's death. According to Garth, Taylor was loner who smoked and drank heavily. He apparently died of heart failure after a short struggle while on the river; there was no chance to get him out of the Canyon before he died. The party decided that since Willie had no family and loved th Canyon so, that they would bury him there in Marble Canyon. While walking back to the boat, Garth remembered that the reattachment bar located on the upstream side of the debris fan located at river mile 44.6-L was lower and broader in 1956.

[See videotape footage of Garth's story. The change in the morphology of the sand bar in question is probably related to the reworking and re-deposition of sand during the high water years of the early-to mid 80s.]

John Cross Jr.: Remembered the Saddle Canyon camps in the 60s much as they appear today. He said they mostly used the upper camp, but that they also used the large reattachment bar too.

[See if we can get photo documentation of this site from Les Jones and Bob Rigg.]

***TRANSITION FROM UPPER TO LOWER MARBLE CANYON AT RIVER MILE 42. I HEAR ACCOUNTS OF EROSION OF ALL SAND BARS, BUT IT IS LESS SEVERE FROM RIVER MILE 42 TO ABOUT 52. WE SPOT 3 WILD TURKEYS ON RIVER-RIGHT AT ABOUT RIVER MILE 46.5.

John Cross Jr.: Never remembers seeing any turkeys on the river during the early 60s to mid 70s. This is confirmed by Les Jones. Also, neither of them ever remember seeing cattails growing along the shoreline during their early trips.

[This would be understandable, as both turkeys and cattails are probably only able to thrive in the new riparian habitat of the regulated river.]

Lois Jotter-Cutter: Remarks that she doesn't remember seeing as much horsetail growing along the river in 1938. However, Lois has documented that she collected 2 species of cattail during the 1938 trip.

[My guess is that reduced flooding has allowed many of the riparian species to flourish.]

NANKOWEAP STOP:

[We hiked to the granaries at Nankoweap to talk about sand bar erosion in lower Marble Canyon.]

Bob Rigg: Bob was very adamant about his memories of really classic sand beaches that existed mid-way through Nankoweap Rapid on the Nankoweap debris fan, and downstream as far as one could see from the granaries on what are now cobble bars. He said that from river level in a boat you couldn't see down the river because of the huge sand bars that protruded out into the river channel. He also claimed that the cobble and gravel bars located on the downstream side of the Nankoweap delta were all mantled with sand. Every gravel bar seen today from the granaries downstream was formerly covered by sand bars. Rigg stated that at the time of his early trips they always camped and parked the boats near the mouth of Nankoweap Creek and tied their boats to an old Acacia tree growing near the river's edge. Bob also recalled that the old high water zone vegetation looked very similar today to that of 1950 to 1965 along the shorelines downstream of Nankoweap.

[Bob said that he cannot get over the amount of sand loss that has occurred downstream from river mile 52. He said that he will try to find his photographs of the downstream view from the granaries for further proof of the environmental changes that have occurred there. Bob was on the river immediately following the first high-magnitude clearwater releases from Glen Canyon Dam in May 1965. His 1965 photographs would be great to study in order to determine if these initial clearwater releases caused much erosion]

Les Jones: Corroborated the story that Bob Rigg recounted of conditions of sand bars in the Nankoweap reach prior to 1963.

[I have heard these types of stories about the huge sand bars that formerly existed downstream from Nankoweap before, but only second hand. These firsthand accounts convinced me that in the presence of fine sediment transport in the river, sand will tend to deposit in lower Marble Canyon (river miles 42 to 61) more readily than in other reaches of upper Marble Canyon (river miles 12 to 20 and 30 to 42). I think that wind transport must play a big part in the erosion of sand bars in all parts of Marble Canyon (and Grand Canyon in general), but the upper reaches of Marble Canyon tend to erode more because they are also subject to more severe erosion from clearwater river releases.]

Kent Frost: Recounted an early trip on the Colorado River in 1939 one evening after dinner.

He and a cousin made their way from Hite Crossing to Lee's Ferry in a homemade boat that a rancher (Bud Vinegar) had made for them in payment for one week of work on his ranch. Kent remembered killing a beaver in Glen Canyon and using it for fishing bait (after the two found it too horrible to eat). The two lived mainly off of catfish which they caught daily. He also recalled that it was so dry that summer that they found the San Juan River dry at the confluence; it was the only time he had ever seen or heard of that happening before or since. Kent had run through the San Juan and Glen Canyon the year before so he recognized the San Juan confluence when they came to it from upstream.

9-12-94:

John Cross Jr.: Recalled having seen wild turkeys at the mouth of Boucher Canyon in early 1960s. Also, he remembered seeing sheep around there quite regularly in 1964. He also recalled seeing deer swimming across the river six times in the 60s. John also said that it was common to start seeing burros as far upstream as Conquistador Isle; they would really increase below Whitmore Wash.

Brad Dimock: Recalled that there were 2 or 3 albino sheep living in the reach upstream of Tapeats in the 1980s.

~~Les Jones and Bob Rigg: Maintain that in the 1950s there was only sand and rocks where the Cardenas Creek marsh is located today.~~

[This again confirms what Bob Webb and I had seen in the Robert Stanton photos. It also supports the idea that marsh habitat was probably rare in the pre-dam era along the Colorado River. This is logical because the annual floods would have made it difficult to impossible for marsh species to exist at their present elevations. If they established at higher elevations, then they would find it hard to survive without a continuous supply of water, such as a spring.]

9-13-94: [PHANTOM RANCH INTERCHANGE DAY]

[As we scout and run Hance Rapid this morning, I hear no accounts of changes in this rapid by any of the trip's members; same goes for Sockdolager, Grapevine and the rest of the inner gorge rapids. We camp at Crystal Creek, where many varied accounts of how that rapid has changed are given (see videotape footage).]

STOPPED TO CONDUCT INTERVIEWS AT BOUCHER CREEK:

Martin Litton: Said that he remembered that Boucher Rapid was formerly more of a severe rapid in the early days, but not to any great degree. He said that he did not remember a debris flow occurring at Boucher Creek. Martin maintains that the single biggest change to a rapid other than Crystal Rapid was caused by the debris flow at House Rock in the mid-60s.

Les Jones: Does not distinctly remember anything unusual about changes at Boucher Rapid.

[This would be logical because Les ran his first trip through Grand Canyon in 1953 and Bob Rigg says that the debris flow there occurred in the winter of 50-51. Hence, Les would never have detected a change there related to the debris flow.]

Bob Rigg: Restates his account of stopping at Boucher Creek in 1951 and looking over the new debris fan deposited there with Frank Wright. He said that he noted the muddy texture of the deposit and stated that there were many new large boulders on the debris fan. However, he does not say that the rapid was changed to any notable extent.

INTERVIEWS FROM THE SCOUT POINT ABOVE CRYSTAL RAPIDS:

John Cross Jr.: Tells of first seeing and running the newly enlarged Crystal Rapid in March of 1966. He said that he could see the high water marks below Boucher Creek and on downstream that indicated how high the river had backed up immediately after the Crystal Creek flow occurred. He and Bob Rigg both said that the river between Boucher and Crystal had formerly consisted of fast current prior to the 66' debris flow, but was really ponded now forming a lake. John said that he could hear the rapid's roar from a long way upstream and knew that a large flood had occurred there based on accounts from a helicopter pilot that had flown in to see if the rapid was still runnable. The pilot had said that he did not think that the rapid could be run; John felt otherwise and became the first person to run the new rapid that day in March. (see videotape of John's account)

[Several other accounts of Crystal Rapid evolution and behavior can be found on videotape segments recorded by Lew Stieger, Brian Diercker, and Ted Melis]

9-14-94:

[I heard no accounts of major changes in rapids between Crystal and Hakatai Creeks. Also, I heard of no major changes in the "Jewels" or in any rapids down to our camp at river mile 121.]

Tad Nichols: Told of the major changes that he noticed during his afternoon stop at Elves Chasm. He said that they used to camp there on a large sandbar and would spend time swimming in the pools there during his trips in the 1950s. He said that the mouth of Elves looked really different in 1994, and that he would let us look at his photographs of the popular stop in the 1950s. Tad was quite dismayed by the extent of change that had occurred at Elves Chasm over the last 43 years. He said that the place used to be really lovely.

[We knew that the mouth of Elves Chasm had been altered significantly by a debris flow in 1987. Also, it was apparent that the canyon's pools had been partially fill-in by debris during the flood.]

9-15-94:

[I asked Tad about the large separation bar located at river mile 122 that has been intensively studied by researchers recently. He said that he could not

distinctly remember the site. Perhaps others had memories of the site, but I did not ride with them on this day.]

[I stopped with Tad Nichols to match photographs taken by Bill Beer on river right in the vicinity of river mile 127 that showed changes to the river's channel caused by the debris flow of 1989. I explained to Tad how debris flows could erode and/or bury beaches through time. River mile 127 is the location of a new rapid that was formed in 1989.]

STOPPED TO CONDUCT INTERVIEWS AT BEDROCK RAPIDS:

Bob Rigg: Said that he had never seen Bedrock Rapid so constricted on the right side as it is now. Bob also said that at higher water in the 1950s that it was quite easy to avoid the left side of the bedrock exposure.

Kenton Grua: Recounted a story that occurred recently about a dory being stuck on the rocks just downstream and to the right of the bedrock for several hours. Finally, the rising stage in the river dislodged the boat and it was retrieved and repaired. He stated that the rapid has been significantly worsened by the 1989 debris flow.

Les Jones: Stated that he couldn't remember the rapid being as tight as it is now at anytime during his earlier trips; not even during his low-discharge run in 1963. Les observed that nearly all of the force of the current is now being driven to the left side of the bedrock by the debris fan constriction. He now thinks that Bedrock Rapid is now the most dangerous rapid on the river at present releases.

John Cross Jr.: Said that when he ran commercially it was always pretty easy to get a motorboat through Bedrock Rapid, but that occasionally someone would get hung-up there or get washed into the left channel. He said that it happened to Georgie Clark at least once, and that it took some time for her to wash through there.

[I asked several of the modern guides how Georgie got her big triple rig through there in the years after the 1989 debris flow? They responded that they weren't quite sure, but that she managed somehow; probably by bouncing off the bedrock and out to the right they guessed; kind of like a billiard ball we imagined. I know that she ran her triple rig through there at about 6,000 cfs at least once during the summer of 1990. Unfortunately, I couldn't catch-up with her in time to see how she did it that morning. All of the experienced river runners on the trip believe that another debris flow from Bedrock Canyon could seriously inhibit navigation of the Colorado River. After lunch we ran Dubie; no accounts of any big changes there.]

John Cross Jr.: Told me that the sand bars at both Stone and Galloway Canyons were formerly larger than they are today. He also said that he remembered a flood out of Galloway Canyon, but could not remember exactly what year it occurred.

STOPPED TO CONDUCT INTERVIEWS AT TAPEATS CREEK:

Bob Rigg: Remembered that the mouth of the tributary was different in the 1950s. He said that the creek channel flowed into the river against the upstream side of the canyon wall there at the confluence where most people park their boats today. He also said that there was formerly somewhat of a harbor where you could park your boat; it was located about where the mouth of the creek is today.

Tad Nichols: Also corroborated what Rigg said about the condition of the Tapeats Creek confluence in the 1950s.

[We camped just downstream from Poncho's Kitchen (the Football Beach). See videotape for interesting historical accounts from Roy Webb, John Cross Jr. and Kent Frost after dinner.]

9-16-94:

[I spent the morning traveling down to Havasu Creek with Kenton and Diane Grua, and Bob Webb. Therefore, I did not have a chance to interview anyone about changes in the reach I call the Muav Gorge. I did get the impression from talking to trip members that they never tried to camp much in the Muav Gorge because their schedules usually took them from Tapeats Creek to National Canyon or Havasu Creek where they often camped back then.]

STOPPED TO CONDUCT INTERVIEWS AT HAVASU CREEK:

[We matched photographs taken by Ben Wittick (1885) and E.C. LaRue (1923). The LaRue shot showed that the large boulders located just upstream of the confluence were basically unaffected by the large floods of 1990 to 1993, as they are in the same positions that they were in 1923. These large boulders were obviously deposited in the creek channel by debris flow(s).

The Wittick match showed a dramatic change in the desert vegetation growing on the river-right hillslope downstream of the mouth of the confluence. The hillslope vegetation appears to be more dense today. At least 4 species were recorded in the 1994 view that were not growing in the scene in 1885; including Ocotillo, Prickly-Pear, Agave, and Ferocactus. Wittick's view doesn't really show anything of note in terms of changes at the mouth of the creek since the river in the 1885 view was about 20-30 feet higher than today.]

Bob Rigg: Remembers that there were many more trees and pools in the lower reach of Havasu Creek the last time that he was here in 1965. Bob says that he has good photos that show the place back in the 1950s and 60s that he will try to find for me. He also says that he remembers the large boulders shown in the LaRue photograph, and that he and his brother Jim used to spend hours jumping off of it.

John Cross Jr.: Remembers Havasu Creek as paradise in the 1960s and 70s, with very lush vegetation. He remembers only small floods that caused little or no damage to the pools and

trees. He says that these smaller floods occasionally filled-up the lower pools with fine gravel that would later be swept out by other small floods. He also remembers the harbor at the mouth of the creek being much deeper when he would pull-in.

[No one remembers the mouth of Havasu Creek ever being as filled-in with coarse gravel and cobbles as it is now. It is pretty clear that the recent floods in Havasu Creek far exceeded any that occurred in the 1950s to late 1980s based on the accounts of pre-dam river runners, and modern guides. This information has also been recently corroborated by George Billingsley's written field notes.]

Lois Jotter-Cutter: Said that she remembered Havasu Creek as looking much "whiter" when she visited here in 1938. She also said that she might have some photographs of the canyon, and that she would look for them for us.

[Lois might have seen Havasu Creek in a more scoured condition following the 1935 flood described by Minnie Marshall of Supai, AZ. There may have been more new Travertine following the flood at that time as a result, than there is now.]

Martin Litton: Said that he first hiked-down into Havasu-Creek in 1946, and that he may have some photos taken during that early hike. He said th place really looks different.

Les Jones: Also said that he has photographs of Havasu Creek in the 1950s and early 1960s. Les says that he never saw any evidence of floods as destructive as that of 1990.

Joan Nevills-Staveley: Did not want to visit Havasu Creek because she said she wanted to remember it as it was before, and didn't want to see it since the floods.

Kenton Grua: Said that he had never seen any floods as large as the September 1990 flood since he started on the river in 1969.

Tim Whitney: Concurred with Kenton's conclusion that he had really only seen small flash-floods in the 70s and 80s.

Lois Jotter-Cutter: Remarked later at camp that she remembered that the vegetation was denser along the hillslopes above the river in 1938.

[Lois said this by chance during a conversation with Shirley Marston in my presence before Bob or I had told her of our conclusions drawn from the Wittick photograph matched that day. She might have felt that way because she was down the river with Clover earlier in the growing season (early July) before the monsoon had really started; that might explain some of her impression. However, I think that the Wittick photograph and the many others we have matched would confirm that the desert and riparian vegetation have both increased in density over the last 50 to 100 years along the river corridor. No mention by anyone of major changes to rapids between Kanab Creek and National

Canyon.]

Les Jones: While camped at National Canyon, Les remarked that the sand bars didn't look too bad down this way (specifically referring to our camp at the lower beach at National Canyon).

[Les' impression may be, in part, the result of deposition of sand during the January 1993 flood on the river caused by flooding on the Little Colorado River. This flood restored much of the previously eroded camp area at National Canyon in my estimation (mostly eroded by tributary flooding over the previous 25 years). Alternatively, I am hearing less about how badly eroded the sand bars are in the western canyon as we proceed downstream. Perhaps they (pre-dammers) are just not seeing erosion as dramatically as they were in upper Marble Canyon. This would support the conclusions that Bob Webb and I have made about sand-bar erosion and restoration downstream of the dam, and the cumulative input of sand that occurs in a downstream direction with tributary input (particularly downstream of the Little Colorado River).]

9-17-94:

[I traveled down to Lava Falls with Bob Webb, Brad Dimock, and Brian Diercker to meet Kate Thompson, Kelly Burke and Jack Schmidt in order to conduct fieldwork there with them. Lava Falls is a major study site which Bob Webb and I are planning to publish a monograph on in 1995.]

Brad Dimock: Stated to Bob Webb that he believed that the 1980s debris flows in the vicinity of Unkar Creek occurred in the summer of 1983 instead of 1984, as we have reported. Brad also mentioned that the prominent rockfall seen just upstream from Vulcan's Anvil occurred in the winter of 1980-81.

[Larry Stevens had previously also stated this. We should revise our report to reflect this new information. Gary Bolton and Dennis Silva had told me that these debris flows had occurred in 1984. I must try to confirm this.]

9-18-94:

STOPPED TO CONDUCT INTERVIEWS AT LAVA FALLS:

[I was busy matching videos, and photos by myself, and working with Kate and Kelly during the day and a-half that we were at Lava Falls. Therefore, I did not spend time interviewing folks about their memories of changes at Lava Falls. Bob Webb spent most of the morning on the 18th asking them about this location. (see Bob's notes for information on accounts of Lava Falls during the period 1938 to the present based on personal interviews.)]

***MATCH OF 1939 GIBSON FILM TAKEN OF DON HARRIS AND BERT LOPER IN JULY 1939 SHOWS THAT THE LENGTH OF LAVA FALLS RAPID HAS INCREASED DRAMATICALLY; MAINLY AS A RESULT OF THE SEPTEMBER 1939 DEBRIS FLOW.

***A MATCH OF A BILL BEER PHOTO TAKEN IN APRIL 1955 SHOWS THAT NEARLY ALL OF THE BOULDERS SEEN ON THE LEFT SIDE OF THE RAPID REMAINED THERE DURING THE HIGH PRE-DAM FLOW OF 1957 AND THE POST-DAM HIGH FLOW OF 1983.

9-19-94:

***GENERALLY FEW REMARKS OF SAND BAR EROSION MADE TO ME BETWEEN RIVER MILES 180 AND 220 DURING THIS DAY. NO MAJOR CHANGES TO RAPIDS NOTED BY TRIP MEMBERS WITH EXCEPTION OF 209-MILE RAPID WHICH WAS PREVIOUSLY KNOWN ANYWAY.

9-20-94:

TAKE-OUT DAY:

[I matched two photographs with Kenton Grua and Diane Grua on the way down to Diamond Creek. Cogswell (1909) photograph showed debris fans at river mile 222.5; match showed little change in river channel, fans etc. Wittick photo (1883) ~~taken from river-left shore at about river mile 225, showed increased sand in channel-margin bar on river-left.]~~



Copy

September 28, 1994

Dave Wegner, Program Manager
Bureau of Reclamation
Glen Canyon Environmental Studies Office
P.O. Box 22459
Flagstaff, Arizona 86002-2459

Dear Mr. Wegner:

I am writing in regard to the recent GCES-sponsored Grand Canyon river trip, called the "Legends" trip, which took place from Sept. 8-20, 1994. I participated in that trip as one of the historians. First let me thank you for allowing me the opportunity for such an experience. On a personal level it was truly the chance of a lifetime. I have studied and read about many of the people who were also on the trip--the "legends"--for many years, and had met most of them, but I had never had the opportunity to go down a river with them and talk to them at length about their experiences and places in Grand Canyon history and river running history in general. I obtained a great deal of new and very useful information about these topics, and in addition many memories which I will always cherish.

I know from talking to Dr. Robert Webb of the U.S. Geological Survey, who was the trip leader, that it was very successful from his point of view. The information he was able to gather from trip participants, both "legends" and the not-so-legendary, I am sure will be of great use to him in his continuing studies of debris flows, beach erosion, and other geomorphological changes in the Grand Canyon. He expressed to all of us, and to me individually, how pleased he was with the results of the trip.

On the historical level, let me say first that this trip was a history-making event in itself. Never before had that many people with that much experience been brought together in the Canyon for such a length of time, and the results were outstanding. Speaking as a professional historian and archivist, it is very seldom that we get the opportunity to interview so many people in such depth and in such a setting. Even had Dr. Webb learned nothing new about his particular topic, from my point of view I would have judged the trip a complete success, and well worth the effort of obtaining the permit and putting the trip together. As it was, then, it was a winning situation for everyone.

(continued)

University Libraries
Marriott Library
Salt Lake City, Utah 84112
(801) 581-8558

Dave Wegner
September 28, 1994
page 2

In summary, let me again express my thanks for including me among the members of the trip. The amount of information obtained, the contacts made for future such studies, and the relationships with those who truly made history in the Grand Canyon made this one of the most worthwhile river trips I have ever been on. I think it was a very worthwhile expenditure of GCES funds, and I applaud both you and Dr. Webb for making it possible.

Roy Webb, Audio-Visual Curator
Special Collections, Marriott Library
University of Utah
Salt Lake City, Utah 84112

cc: Dr. Robert Webb, USGS
Karen Underhill, Northern Arizona University

RW:kh

July 1933

Les Jones Event Dates

A time
Frame

July 1933 508 head of horses were trail herded by my father and four riders from the Canadian border to Billings, Montana. I was one of the riders from the Missouri river to Billings.

In October 1952 my father, Reynold Jones, Dave Jones, my brother and I ran the Missouri River from Fort Benton, near Great Falls, to Fort Peck Reservoir in four days in two canoes. Thousands of geese and ducks.

May 1953 Yampa, Whirlpool and Split Mountain Canyons with Bus and Don Hatch and Dave Horsley in ten man and pontoon rafts with oars. The Sierra Club was the client publicising resistance to building a dam in the canyon below the Yampa.

August 1953 Moab to Hite 114 miles in 37 hours solo rowing a decked and compartmented canoe, looking over the shoulder.

Thanksgiving day and the day following soloed with the same boat in the same manner the Grand Canyon from Lee's Ferry to Bright Angel running all with no problem. Stored my boat on a shed roof at Bright Angel to run out in the spring as I had no more vacation until then.

April 1954. I patch squirrel holes in the deck of the canoe and continue from Bright Angel to Bedrock Rapid. There I rendezvous with Bus and Ted Hatch with their pontoon load of people and their ten man, to see them clear Bedrock OK. Shallow water helps pin the pontoon underwater on the nose of Bedrock Island. I get the rope and as everyone pulls the bottom splits, Smuss jumps ten feet down and on through the hole to the bottom. Coming up surprised, Smuss rows to camp. Bus and Ted in the ten man are retrieving floating gear. Movie gear and Scotch are gone. I lead rescue, gear retrieval and patching of the pontoon. In return Bus photographs my run of the big hole in Deubendorf Rapid, and going over the left falls in Lava Falls. The patched pontoon runs fine. Bedrock water force tore a 25 foot hole in it.

July 1954, solo Lodore, Whirlpool and Split Mountain Canyons to Highway 40 in 8 hours.

September 1954, my brother, Dave, and I run whirlpool and Split Mountain Canyons.

April 1955, I take Federal Heights scouts, Salt Lake City, through Glen Canyon, seeing scenic stops in two days.

June 1955, I go with Charlie Eggerts Expedition beginning in Green River, Wyoming to run the Green and Colorado. Buss and Don Hatch get called from the expedition to run the Gilgat River in Pakistan for Lowell Thomas.

1964 to 1968 I and Kathryn design and build our present home near Midway, Utah in the commanding presence of Mount Timpanogas in the mighty Wasatch mountain range.

1970-1974 I make first runs of 4 miles on the Uintah River and 4 miles on the Uinta's Yellowstone River, 3 miles on the Whiterocks River, 1.5 miles on Rock Creek, 2 miles above Moon Lake and four miles below Moon Lake on Lake Creek.

July 29, 1971, I first ran the main Blacks fork from the first bridge to Meek's Cabin Dam. In 1973 Klaus Axman and I ran on to the Bigelow Diversion below the dam.

June 1972 I got Cal Giddings, Jay Dewell and another friend to run the Bear River from Stillwater Campgrounds twelve miles to the Chalk Creek Bridge on the Bear- a first run. I hate to admit that I tried out a slow, yellow plastic "Rubber Ducky"; it was work.

May 1973 I tow my new aluminum 23"x13' kayak over the snow to run the Bear River Hayden Fork tributary from Sulfur Camp Grounds to the confluence with the main Bear. Great winter scenery. A first run. Then I ran a great whitewater stretch above of 2 miles to Sulfur Camp Ground, a first run with ice in the water. If any experience was my finest that was it in boating and wilderness. The last five miles of the river are continuous stony whitewater. » June-July 1973. "American Rivers" is organized in Denver. I proposed the "American Rivers" in its name. Conservation Council is dropped.

» June 1973 In high water I first run the last 4 miles of the East Fork of the Bear River and the upper two miles of the Stillwater Fork of the Bear.

June 1973 I first run the last two miles of the West Fork of the Black River and 4 miles of the East Fork to it's confluence. Later Kathryn and I first run the 7 mile lower Park of the West Fork.

July 29, 1973, Cal Giddings and I first run the West Fork of the Blacks Fork from the Upper Swiss Park to the Lower Park - 4 miles of great whitewater. Les soloed the same 4 miles in flood water in June 6, 1974.

September 25, 1973, Cal Giddings, son Steve and I first run the Falls River 30 miles beginning at the border of Yellowstone Park. Then we run the Teton River from five miles above the North Fork to the site of the failed Teton Dam, a first run on the 26th. Cal ran through the dam site later.

May 25, 1974, I first run the 2 miles of Henry's Fork of the Green River above the roads's end. June runs were in my new 23"x13' aluminum kayak, weighing 35 pounds.

May 1974 I first run the Provo River from Rolling Thunder Canyon to Soapstone Bridge, and later on to Pine Valley Camp Ground. June 9, 1974 Cal Giddings, a friend and I run Pine

Rivers to do yeoman service to the public benefit. Work to be done increases. Time to get to work helping to see that we have a future on this planet Earth.

G H O S T R I V E R

Where a wild River in majesty winds, through a Canyon Grand
will flow unnumbered raindrops from these clouds.

With a deep - chilling wind from the far Northland
driven snows will cover these Mountains in shrouds.

A Cloud Canyon bends where the Thundercliffs stand
and with foaming, grey billows all earth enshrouds.

The River of wrath, that thundering stream,
whose billows will roar and break o'er the beam,
will crash in my path and boom through the boulders,
re-echoing from heights of the Canyon's grand shoulders.

With it's chilling challenge in the cold, grey sky,
flows the wild river to the sea from the sky.

From the mountain divide 'neath the heavens so wide,
flows the wild river I will ride;
the river of life all men must ride.

With a lonely sigh of the Creator on high
flows the Ghost River In the sky.....

© November 1953, Thanksgiving Day minus one, Leslie A Jones, Wilderness Songs
Prelude to running the Grand Canyon on the waters of recent storms....

This second day of May I have received a request from the U. S. Geological Survey to run the Grand Canyon with them in September to help define the impact of usage. I would rather remember the Grand as it was before heavy use and before Russian Tamarisk invaded it. But that is selfish. Kathryn and I will go, and do our share of the work.

MARTIN LITTON
180 BEAR GULCH DRIVE
PORTOLA VALLEY, CALIFORNIA 94028
415-851-2616



Robert H. Webb
Research Project Office
Desert Laboratory, USGS
1675 Ankiam Road
Tucson, Arizona 85745

Dear Bob:

Thank you for inviting me and Esther on the special Grand Canyon trip. It will be wonderful to see so many old friends and contemporaries again--something I'm sure I would never have had the opportunity to do but for your inspired idea.

I will have memorabilia, including videotapes taken from old (but good) films, and even one of Les Jones's original scroll maps of the Canyon. Did I tell you I have a good part of Dellenbaugh's log--I mean the real thing written in pencil, not a copy, sent to me by Art Chaffin. Now if I can only remember where I put it....

Although I am somewhat ancient at 77½, I still row through the Canyon--setting a new world's record for age each time, they tell me--averaging about two times per year. Last time was April-May this year, for an Audubon TV documentary. So you can understand why just sitting on a baloney boat would be hard for me. I can have a boat ready at LF a couple of days before the party arrives and still get to Flagstaff for the party.

Also, the dory can happily accommodate any members of the group (up to four or five) who might want to ride from time to time. I have a current Grand Canyon National Park boatman's license, etc. And I need all the exercise I can get.

Esther is with the local school district (to keep us in beans) and won't be able to go in September. I told you about Tom Knudson, who I think would be a great asset. Enclosed is a reprint of a series of his which won him one of his two (to date) Pulitzer prizes. He is also a good oarsman, and I can't think of anyone better to log and report the expedition.

Are you planning to get Don Briggs to bring his miles of historical videotape conversions?

I might have a little pull with the Park Service (I'm pretty close to Stan Albright and Ken Miller) if needed.

Call on me if there's any way I can assist.

Sincerely,

Martin Litton



United States Department of the Interior

GEOLOGICAL SURVEY



MEMORANDUM

TO: David L. Wegner
FROM: Ted Melis *T.M.*
CC: Marzolf, Schmidt, Stevens, Webb
DATE: September 22, 1994
RE: Summary of "Legends" Grand Canyon Research Trip

As you know, Bob Webb, Jack Schmidt, Larry Stevens and I recently concluded a research trip that included several pre-dam era river runners. Some of our guests, such as Lois Jotter-Cutter, had traversed the Colorado River as early as 1938. The goals of the trip were: to collect historical accounts of pre-dam environmental conditions along the river corridor (ie. conditions of rapids, sand bars, riparian vegetation, and abundance/type of wildlife); to confirm and/or refute conclusions that we and other researchers have made recently about historic patterns and types of environmental changes that have occurred downstream of Glen Canyon Dam (changes in navigability and availability of camps); and to record oral histories of early river-runners experiences on the river; comparing their impressions today with those from earlier trips.

I speak only for myself here, I am sure that others may have different impressions of the trip's scientific value depending on their specific research interests and levels of interaction with trip guests. In short, I considered the trip a great success and thought that it was very informative scientifically. Early river runners' memories of the environment were remarkable in some instances. As often occurs with elderly folks, they tended to remember things in the far past as well or better than in the near past. Conversations between trip members about previous trips together tended to trigger memories and accounts that may have even surprised them (I know some of them certainly surprised us). Based on the recollections of trip participants, Bob and I have added new information to our study of historical debris flows in the Canyon. I cannot speak for Jack or Larry, but I got the impression that they also found their interactions with trip guests very enlightening. In addition, I feel that we researchers gained detailed insights from this trip about the pre-dam river that simply would not have been available otherwise.

A brief summary of my impressions from the trip:

SAND BARS: Most participants expressed dismay at the degree of sand bar erosion that they witnessed from Lee's Ferry down to about river mile 115. Beyond this point I personally heard fewer accounts of how much larger sand bars had once been between there and Diamond Creek. Perhaps this was the result of having been on the water for several days and having the initial shock of environmental change diminish, but I tend to doubt this. Trip members Bob Rigg and Les Jones gave detailed descriptions of how large sand bars had formerly filled the river channel

at times throughout certain reaches of Marble Canyon (specifically downstream from Nankoweap Canyon). Eddies which today contain abundant sand in Marble Canyon (river miles 42 to 56) apparently contained much more sand between about 1940 and 1965. The severe degree of sand bar erosion throughout most of Marble Canyon described by trip members corroborates recent conclusions based on matched photographs made since 1872. I believe that the areas of Marble Canyon where erosion has been less severe are most likely to experience beach building during future "spike flows." These sites are characterized by strong geomorphic controls which favor deposition of fine sediment and have been recently mapped by Jack Schmidt.

I recorded far fewer accounts of severe beach erosion in western Grand Canyon during the latter half of the trip. This appears to corroborate the conclusions we have made from photographs matched between river mile 115 and 225. During our trip several of Tad Nichols' photographs taken between 1951 and 1957 were matched as we traversed Marble Canyon. Each of Tad's matches showed severe beach erosion except for one taken at Redwall Cavern. Geomorphic control for deposition of sand at this unique site appears to be quite strong, and we can probably expect sand deposition to occur there during spike flows as well.

In contrast, a Ben Wittick photograph (1883) matched near Diamond Creek showed increased amounts of sand in both channel margin and reattachment-type bars. Increased density of riparian vegetation along the shore may explain this to some extent. This result also follows the pattern that Bob and I have followed in historical matched photos of the western Grand Canyon.

DEBRIS FANS AND RAPIDS: Based on the debris-flow research that Bob and I have conducted in Grand Canyon over the past several years, we conclude that at least 90-to 100 such floods have occurred in Grand Canyon since 1890. However, we knew of only 20-to 30 that had occurred there since about 1939 (from historical accounts and aerial photos). As a result we had tentatively concluded that debris flows may have clustered in space and time throughout the Canyon during the last century. Since more than two-thirds of the known debris flows over that time must have occurred between 1890 and 1940, we hypothesized that early river runners probably wouldn't have many memories of debris flow activity between 1938 and 1965. In fact, trip participants recounted only two major changes to rapids caused by debris flows between 1938 and 1965: House Rock Rapids' increased severity (Martin Litton, Les Jones and Bob Rigg remembered that it occurred sometime from about 1966 to 1973), and dramatic changes at Lava Falls Rapid (verified by P.T. Reilly, Bob Rigg and others).

Bob Rigg and Frank Wright (not on the trip) stopped at the mouth of Boucher Creek to look at some fresh-looking boulders and mud in 1951. Bob Rigg distinctly remembered this large debris flow in Boucher Creek and was sure that it must have occurred sometime during the winter of 1950-51. We had determined that a major debris flow had occurred there sometime between 1935 and 1965, but did not know exactly when. Although this flood changed the debris fan radically, it apparently had little effect on Boucher Rapid. Rigg also mentioned that river parties often lined boats through Hermit Rapid and that the rapid was changing frequently in the early 50s. We suspect that the debris flow at Boucher Creek drowned-out the tail waves at Hermit Rapid by constricting the river and raising the stage/discharge relations upstream toward Hermit Creek.

We went into the trip knowing that Lava Falls Rapid has been changed several times by debris flows since 1939. This fact was confirmed by many members of our party. A photograph provided by Bill Beer showing the mouth of Prospect Canyon in 1955 pictured a sizable debris fan on the left side of Lava Falls Rapid (the result of a 1954 debris flow). Jack Schmidt and I matched this photo on the trip and found that while the majority of the 54' fan was reworked after 1955 (probably by the 1957 high water on the river), all of the large boulders in the rapid seen in the view remain there. This indicates that new boulders transported to the rapid by Prospect Canyon debris flow of 1939 resisted transport by unregulated river flows in excess of 120,000 cfs and regulated releases of 96,000 cfs. This information has bearing on future management of the river, because other large debris-flow deposits will eventually occur throughout the Canyon. Results of the Beer match and others photographic evidence suggests that future changes to rapids caused by deposition of boulders may be permanent under regulated conditions. All river party members agreed that the potential for future debris flows from Prospect Canyon is great.

We stopped at Bedrock Canyon to discuss the effects of the 1989 debris flow there on Bedrock Rapid. Nobody on the trip could ever remember it being so tightly constricted in the pre-dam era; even at 1,000 cfs. Les Jones now feels that Bedrock Rapid is the single most dangerous rapid on the river because of the 1989 debris flow. Les is revising his river guide to reflect the rapids' increased hazard. He and others on the trip felt that another moderate to large debris-flow from Bedrock Canyon could drastically affect the navigability of the river.

VEGETATION ALONG THE RIVER CORRIDOR: Information on the invasion of exotic species of riparian vegetation over the past century is not new. However, several trip members, including Lois Jotter-Cutter recalled memories of the desert vegetation on hillslopes above the riparian zone as being much denser today than in the past. Remarkably, these comments were made on the same day that Bob Webb, Diane Grua and I matched a Ben Wittick photograph (1885) taken about 200 ft above the river near the mouth of Havasu Creek. This photograph showed drastic changes in the density and variety of species of desert plants growing on hillslopes along the river. New species now in the scene which were not present in 1885 include Ocotillo, Ferocactus, Prickly-Pear, and Agave.

We were astonished by remarks made later that evening at camp by Lois about how much greener the hillslopes looked than they did in 1938. The trend of increased frost-intolerant plants has been showing up throughout the Canyon during our match-photography studies (a database derived from over 1,000 photos matched so far). Bob and I believe that the reduced frequency of killing frosts since sometime in the early part of the 20th century explains the upstream migration of these species. One hypothesis for this trend is that frequent killer frosts occurred with the passage of more frequent, intense winter storms during the late 19th and early 20th centuries. More frequent winter frontal storms could also account for a higher frequency of debris flows 50 to 100 years ago as suggested by the Stanton rephotography results.

HAVASU CREEK:

We asked many trip participants about the condition of riparian habitat and channel conditions along lower Havasu Creek during the late 40s to early 70s. All agreed that the tributary had never experienced a destructive flood as large as the one that occurred in September 1990.

Trip members reported large trees growing in the canyon as early as 1950. Growing evidence is leading me to believe that the lush riparian habitat that existed in lower Havasu Canyon up to 1990 resulted from an exceptional period of quiescence relative to large floods there. This appears to correlate with the period of reduced debris-flow magnitude during that time. While it is not certain, recent frequency and magnitude of large floods in Havasu Creek, in combination with an upward trend in intense precipitation since 1960, suggests that this tributary may be entering a new erosional cycle.

WILDLIFE: As expected, I heard no accounts of eagles being sighted in the canyon in the pre-dam era. Most trip participants told accounts of catching catfish in the pre-dam river. I heard of no accounts of Humpback Chub or other native species being caught on river trips. Trout were caught in Tapeats Creek (they were introduced in the early part of this century). I did hear accounts of beaver being sighted on early trips, especially in Glen Canyon. I heard few accounts of waterfowl being sighted, but this may reflect the fact that most trip members ran their early trips in spring and summer months.

Desert bighorn sheep were seen frequently on our 1994 trip between river miles 115 and 205, as is common on most modern river trips. Early sightings of sheep by trip members on river trips in the 1940s to 70s would seem to suggest that these herbivores are doing well and that populations have remained fairly stable. We did see some of the introduced sheep in upper Marble Canyon near Cathedral Wash; my notes indicate that our guests couldn't remember seeing sheep that far upstream on their earlier trips.

Wild Turkeys were seen on early trips, but only very rarely in the pre-dam era. Today it is becoming more common to see these birds, especially in Marble Canyon. The one sighting reported by a trip member in the pre-dam era occurred at Boucher Canyon. It was my impression that birds are generally more abundant in Grand Canyon today owing to the increased riparian habitat.

After leaving the trip at South Canyon, Larry Stevens had asked us to inquire about the degree to which tributary mouths were inundated by pre-dam river floods. I asked several guests about this. Most responded that it depended on where you were on the river; each tributary/river confluence being unique. However, they stated that the perennial streams such as the Little Colorado River, Havasu, Tapeats, and Kanab Creeks would form rather large clearwater ponds or backwaters. Apparently the sediment-laden river water would not readily mix with the clear tributary discharge until it was relatively far out in the river channel. This information may be important relative to the role of pre-dam river floods and reproduction of native fish species. Another surprise along this topic: Bob Rigg, Tad Nichols, Gene Shoemaker, and Les Jones were amazed by the degree to which the confluence of the Little Colorado River had changed since their trips in the 1950s and 60s. We had not anticipated major changes there, but will try to document the timing of these changes during future studies.

SUMMARY:

I have only included a few of the observations and preliminary conclusions that were made during the course of this research trip. Returning from this unique research experience, I am only now beginning to realize how fortunate we researchers are to have these river elders around to put-up with all of our prying questions and strange idiosyncrasies. In general, these

folks (some call them "old-timers," although I am not sure I would) were extremely cooperative and very appreciative for having one more opportunity to experience the Colorado River. Everyone of them bid us "young-timers" farewell with the hope that we would do whatever we could to preserve the river's resources, and with the promise of their continued help should we ask for it. Seeing their reverence for the place we have gotten to know so well renewed my dedication and devotion to preserving those portions of the Colorado River which still exist downstream of the big dams. Seeing their perseverance both on the river and in their lives gave me hope for the future.

Soon after putting-in, I realized that this trip wasn't just a single research event in space and time, but the beginning of a new collaborative era. The generation that preceded modern river running made numerous observations, sketches, photographs etc. These folks want to be involved in the research process and have a lot to contribute. While on the trip I proposed that we organize an informal researchers workshop to be held for one or two days at the 1995 spring guide's training seminar. Many of the guests on our recent trip referred to others whom we hadn't heard of; other folks that had potentially-valuable information to share with researchers on many topics.

I am presently pursuing this idea with Bob Webb, Jack Schmidt, Larry Stevens, Kenton and Diane Grua, and the GCRG board members. I hope that you will continue to support our efforts to extract as much information about the resources and condition of the pre-dam river as possible. I know that I speak for everyone on the trip when I say thanks for believing in this research trip enough to see it through when others may not have seen the value of this unique investigative approach.

9202 W.Raintree Drive
Sun City, AZ. 85351
May 4, 1994

Robert H. Webb
U.S.Geological Survey
1675 Anklam Road
Tucson, AZ. 85745

Dear Bob,

Your interesting envelope was received on the last day of April and I had to stop what I was doing and read it. The reason is simple - it is difficult to resist Canyon matters. Your professional paper 1492 is noteworthy and I thank you for the copy.

I am not playing hard to get, rather I am stating that I have so much work ahead of me that I am sure I will not be through by the date of your trip. I will be 83 in June and admittedly do not work as fast as I did a few years ago. You may or may not know this, but my major interest is completing my Lee's Ferry book.

For your information, if I haven't told you previously, I wrote the book in two volumes, nearly a thousand pages. It seems that editors like to tell authors to give the complete story. When the author does, the editor adds "unless it become too long." Of course my Lee's Ferry was too long and the U of U Press wanted it shortened to one volume. I had decided how I would accomplish this when a lousy doctor in Sun City over-medicated me for high blood pressure and sent me to the hospital. Naturally all work ceased. I wrote very little until I felt better and the MS gathered dust. Meanwhile, mail continued to come in and things piled up. My desk resembles Fibber McGee's closet. Now I am back, trying to clear it and return to my main work. However, it's not easy. I can handle the partial day things, but a 12-day river trip plus travel time both ways is more than I can stand until the aforementioned book is back to the publisher.

You have some good people selected to accompany you and I hope you know something about them. For instance, Frank Wright is in his mid-90s and deaf as a post. Otherwise he is A-1. Tad Nichols takes fine movies, in fact has an eye for a good shot, but that is about as far as he goes. Don Harris is very knowledgeable and has all kinds of experience. As far as I know, Lois Jotter made that one trip with Nevills in 1938, and to the best of my knowledge never made another trip. She is no spring chicken and I would think that outside of botany, she is relatively green on canyon matters. Of course her expertise in botany could be very worthwhile. Bob Rigg was a fine boatman when we were on the river together. I took Martin Litton and his wife Esther on their first trip thru G.C, in 1955, and he has gone on from there. Martin is good.

Without taking time to remember too much, I know that tamarisk has proliferated upstream since the 1940s. My last stop at Mile 25.3 in

1984 (?) showed a heavy tamarisk growth. In the 1940s there were none.

Sandbar erosion has been extremely heavy throughout the canyon. Lack of annual renewal is stripping the sandbars.

Before you get too far along, you should take a look at my color. In my river days I really concentrated on color. The B/W was just incidental. Everything I have in B/W I also have in color, plus much more.

On p.80 of the Workshop paper, I note the authors state the freeze in January 1925 was "less notable." I have photos showing the entire river frozen and Mrs. J.E. Klohr and her children walking on the ice in mid-river.

I hope you are able to see why I can't devote a couple of weeks to your project. I would if I could.

Best regards,



P.T. Reilly



United States Department of the Interior

GEOLOGICAL SURVEY



**RESEARCH PROJECT OFFICE
DESERT LABORATORY - USGS
1675 Anklam Road
Tucson, AZ 85745**

December 27, 1994

Dave Wegner
Glen Canyon Environmental Studies
U.S. Bureau of Reclamation
P.O. Box 22459
Flagstaff, AZ 86002-2459

Dear Dave,

Enclosed is a memo that serves as the ~~draft final report on~~ the Old Timers Trip. This memo will serve as my final report to the National Park Service. Also enclosed are photocopies of all notes and letters taken on the trip that I have received. More may come, but they are not yet available.

Lew Steiger and Ted Melis are in the process of copying the 60+ hours of videotape that was shot on the trip. Copies of the video will go to Northern Arizona University and the National Park Service. At this time, I have no plans for sending a copy to your office, largely because Richard Quartaroli has such close contacts with NAU Special Collections. If you want me to provide a copy of the raw footage, please let me know.

As per our phone conversation, I intend to get feedback on this draft report and write an article for the Boatman's Quarterly Review. I hope to co-author such a report (or write several reports) with Ted Melis, Larry Stevens, and Jack Schmidt. Drafts of this report(s) will be submitted for review through your office. Thanks again for your support of this work, Dave. I think it will continue to yield important information relevant to management of Grand Canyon.

Yours truly,

Robert H. Webb

ENCL: Draft report for Old Timers Trip

GLEN CANYON ENVIRONMENTAL
STUDIES OFFICE

RECEIVED
FLAGSTAFF, AZ

