

The Confluence

The Journal of Colorado Plateau River Guides

Volume 6, Number 2, Fall 1999



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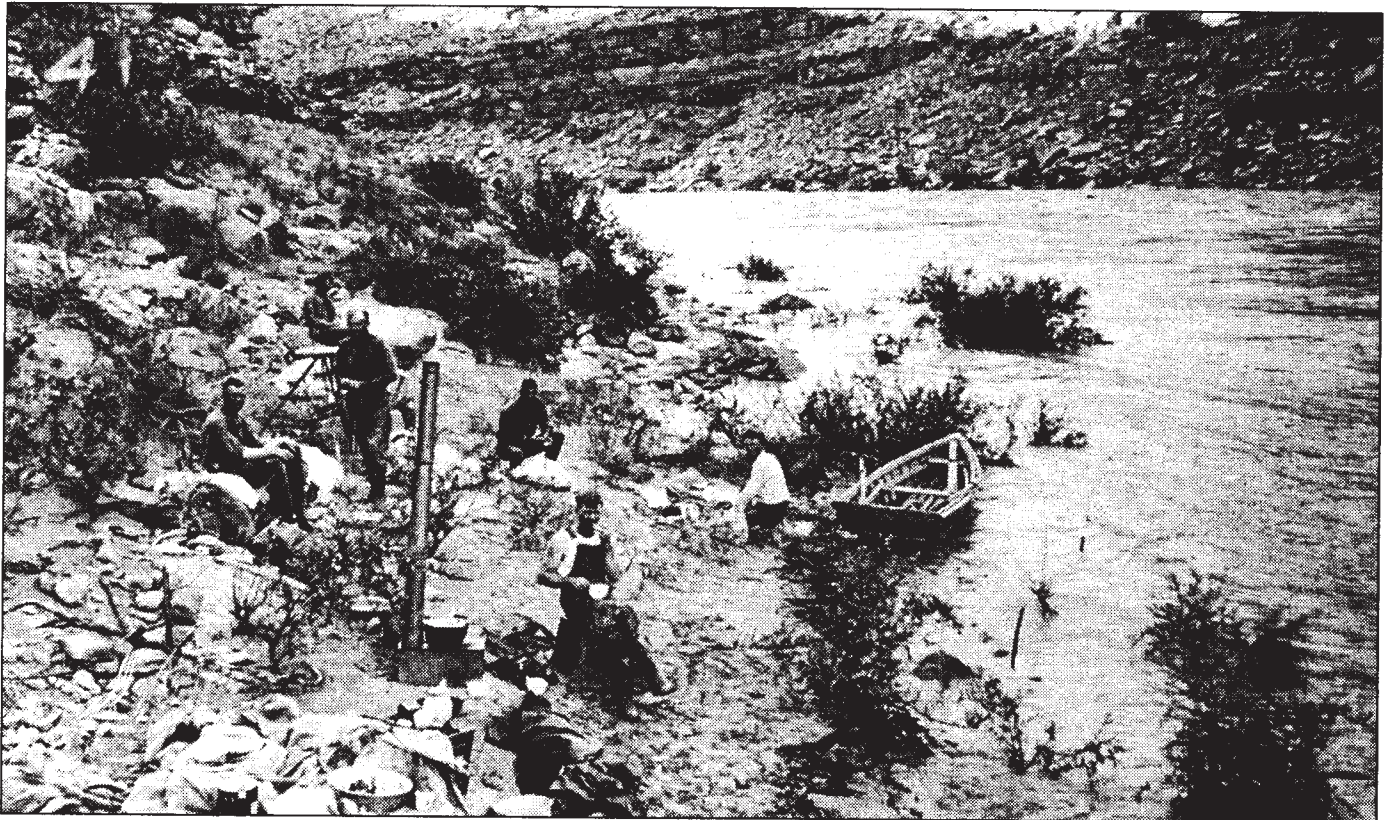
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A camp scene during a summer flood on the USGS San Juan River survey led by Kelly W. Trimble in 1921. The lead boatman, Bert Loper, is sitting next to the camp stove. Photo by Hugh D. Miser. Courtesy of the USGS photo library in Lakewood, Colorado.

The Confluence

...wants to be the quarterly journal of Colorado Plateau River Guides, Inc. (CPRG) CPRG is a member of a 501 (c) (3) non-profit organization called Canyon Country Volunteers. CPRG is dedicated to:

- Protecting the rivers of the Colorado Plateau
- Setting the highest standards for the river profession
- Providing the best possible river experience
- Celebrating the unique spirit of the river community

Guide Membership is open to anyone who works or has worked in the river industry of the Colorado Plateau

General Membership is open to those who love the rivers of the Colorado Plateau

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We need articles, oral histories, poetry, stories, and opinions. This journal is composed using Microsoft Publisher. If you use a word processor, we can translate most programs. Otherwise, please send your text typed. Please include useful photos, charts, diagrams and artwork. There really is no deadline, but the beginning of each quarter works best.

Managing editor: John Weisheit, jweisheit@hotmail.com

Editor of this issue: John Weisheit

Printing: Times-Independent

ISSN # 1078-425X

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SPECIAL THANKS TO:

T-Berry for a Benefactor membership
David Lyle for a Benefactor membership
Gene Stevenson for a Lifetime membership
Rebecca Martin for a Lifetime membership
Gary O'Brien for a Six-year membership
Veronica Egan for a Six-year membership
James Lyle Strong for a Six-year membership
Gary Smith for Six-year membership

RIVER EDUCATION

An outstanding season of river education for guides occurred on the Colorado Plateau like no year before. CPRG members were involved in four river-based seminars and two land-based seminars. **CPRG would like to thank all the cooperating agencies and organizations for their assistance, financial and otherwise:**

Bureau of Land Management, San Juan, Price and Grand Resource areas
Canyonlands Field Institute
Canyonlands Natural History Association
Grand Canyon River Guides
Headwaters Institute
National Park Service, Dinosaur National Monument
National Park Service, Southeast Utah Group
Utah Guides and Outfitters

To all the CPRG members who demonstrated their leadership and commitment to our mission statement: Tom Corcoran, Dave Focardi, Clay Hamilton, Michele Hill, Tamsin McCormick, Dusty Simmons, John Weisheit, Susette Weisheit, and Steve Young.

To all the companies who provided kitchens, food and staff and made the seminars productive: Fat City Smokehouse, OARS, Moki Mac, Tag-A-Long, and Western.

To all the instructors who shared their knowledge and expertise (with our sincerest apologies to those inadvertently omitted): Donald Baars, Gene Stevenson, John Schmidt, Rich Valdez, Rodney Scheetz, William Bussard, Lynn Jackson, Kara Dohrenwend, Damien Fagan, Shawn Duffy, Jake Burnett, Randy Larsen, Diane Allen, Rick Ryan, Skip Edwards, Kent Frost, Brad Dimock, Pamela Hyde, Kevin Pariost, Bill Hedden, Dottie Shinpock, Tamara Naumann, Lee Shropshire, David Whitman, Chad Reid, Barry Davis, Joe Pachak, Nettie Prack, John Balsley, Shanell from CEU, Shana Taner, Steve Platz, Ken Sleight, Eric Brunnemann, Jim Nothnagel, Bob Quist, and George Simmons.

Of Mice and Men

The Hantavirus

By Ken Jenks, P.A.C

What: Sin Nombre Hantavirus was first identified in 1993 in the Four Corners area and has since been blamed for 211 cases of Hantavirus Pulmonary Syndrome (HPS), a very dangerous syndrome with a 40% fatality rate. The time between the day of mouse excreta exposure to the first symptoms is not well defined. Many persons were never able to say when or how they were exposed. One estimate is 4 to 10 days, however, any person who has had a known exposure should remain vigilant for 45 days. The first sign of illness is fever, chills and muscle aches, typically worse in the thighs, back, and shoulders. About half of HPS patients develop headaches, nausea, vomiting, abdominal pain, diarrhea, cough and tiredness. Some develop shortness of breath, dizziness, joint pain, back or chest pain, and sweats. In other words, your typical viral fever symptoms. You can have some reassurance if you have a rash, eye inflammation, sore throat, ankle or facial swelling—none of these symptoms are associated with the disease. The fever lasts 3-5 days, and then all heck breaks loose. HPS develops and the patient deteriorates over 24 hours, most often needing to be placed on a ventilator. When to call for a helicopter is always a difficult decision. It may be almost too late when the patient becomes weak (hypotensive) and the patients lung begin to fill with fluid. At that point, the first aid is transportation and finding the patient the most comfortable breathing position. Profuse bleeding is rare. Other illnesses have similar presentations, particularly heart disease and pneumonias.

How: Mouse excreta that is inhaled, either dry or fresh, is the worst offender. Mouse materials (urine, feces, saliva) can cause disease if rubbed into the eye or any open scratch. There is some possibility that eating or drinking contaminated substances may cause HPS. There is NO evidence of transmission through insects, bites or otherwise, through pets or most other wild animals. In the United States, there has been no documented human to human transmission.

Prevention: Hantavirus is Nature's way of reaffirming what your mother told you: keep a clean camp and don't kill snakes. The Centers for Disease Control (CDC) tells us not to sleep on

garbage piles. Sounds good. They do go on to say that one should at the very least use a ground cover, if not a floored tent and/or a cot 12 inches off the ground.

Do not try to "dry clean", raising dust to be inhaled. If you must enter an enclosed/deserted building, air it out first. Mix 1½ cups of bleach with a gallon of water and hand spray the dust, then use gloves to remove the soggy mess. If you are serious about the risk, or if you are decontaminating a known Hanta virus site, contact the local health department or the CDC for respirator recommendations.

When: Maybe this spring/summer. There is some concern if weather remains moist and warm for a few more months (e.g. April, May, June, 1999) that we may have a bad year for Hantavirus. June/July have been the worst months in the four Corners regions. Cold weather forces mice into domiciles, the disease occurs all year long.

Who: Healthy deer mice (*Peromyscus maniculatus*) are the best known offender, however, in the Four Corners area the brush mouse (*Peromyscus boylii*) and the pinyon mouse (*Peromyscus truei*) have shown up with evidence of Hantavirus. The deer mouse tends to be smaller and sometimes redder than the brush mouse, which is incredibly cute. Both have white bellies and bi-colored tails; the deer mouse has a short haired tail about equal to its body length (total length 4¾ to 7⅜ inches). Brush mice have longer haired tails often longer than their bodies, total length being 7⅛ to 9⅜ inch (like you are going to measure it, right?)

Where: Brush mice like chaparral, deer mice like brushy areas. Particularly *P. maniculatus* will range from the desert to the Arctic tundra, both with a large range.

More Information:

www.uct.ac.za/microbiology/hanta.html

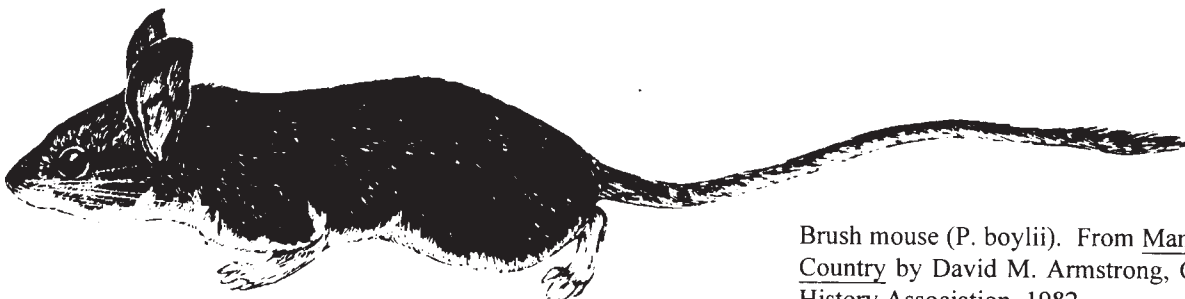
www.cdc.gov/ncidod/diseases/hanta/hps

Pictures of *Peromyscus maniculatus*; gives most of the above information plus laboratory and radiology guides for clinicians.

The Audubon Society Nature Guides: Good pictures and fair description of the ecology of *Peromyscus*.

Arizona Health Department: (602) 230-5890

Colorado Health Department: (303) 692-2700



Brush mouse (*P. boylii*). From Mammals of the Canyon Country by David M. Armstrong, Canyonlands Natural History Association, 1982.

Return Of The Peregrine

Text and photos by Rick Boretti

One of the finest wildlife sights to me, while rowing down Cataract Canyon, will always be that of a peregrine falcon with wings tucked stooping at around 200 mph towards a duck or passerine (song bird) along the river. There are few sites in nature that compare to watching a peregrine pop a meal or chase down prey. It is a sight that is fairly common to observe along the river corridor today, but was almost a sight that we might have never had the privilege of witnessing again.

A Brief History

The peregrine falcon (*Falco peregrinus*) had a population crash first noticed in the 1950s. Organochlorine pesticides with DDT and DDE caused this decline. Chemical sprays create a variety of problems for birds of prey as well as other life. These chemicals move upwards through the food chain, increasing in concentration. The peregrine is at the top of the food chain and suffers from poisons not initially intended for them. Among other problems, the pesticides caused eggshell thinning, causing eggs to break or not to hatch. Also adult birds affected by contaminants were not adequately caring for and even killing their young. The decline was drastic enough by 1970 for the peregrine to be listed as endangered. At this point they were extirpated east of the Mississippi and populations had dropped an estimated 90 percent in the West. Peregrines had declined dramatically in other countries as well. The only other time of peregrine decline that I am aware of was in England in World War II when a bounty was placed on the bird as they were eating carrier pigeons used to carry coded messages in the effort to stop Nazi Germany.

Brief Behavior of the Peregrine

The peregrine falcon has a specialized diet consisting mainly of other birds. Bats will occasionally be taken and insects will be caught by young (An unusual observation was recorded of a fledgling stooping on a deer, however the deer survived this attack.). This specialized diet is a reason for the peregrines decline. Chemicals (DDT, DDE) sprayed on plants are eaten by insects that will carry a higher concentration of the toxins. Insectivorous birds eat the insects making concentration levels even higher. The peregrine feeds on these plant- and insect-eating birds, with their high poisonous contents, receiving dangerous levels of the toxins. Even today, over two decades after being banned in the United States, traces of DDT are found in tissues of many organisms, including humans. Other raptors such as the prairie falcon with a more catholic diet eat birds as well as small mammals and were not receiving as high a dose of the toxins. Birds wintering in countries that still use harmful chemicals and marine pollution remain a problem.

Peregrines nest in the spring. This period is accompanied with fantastic courtship displays. Spectacular flight displays appear early in courtship. The birds can be observed doing incredible dives and loops, figure of eight flights, circles, undulated flights, talon-grappling, and other displays. Cooperative hunting by male and female occurs at this time.

Watching a pair of falcons chasing down swifts is a common sight. Later in the courtship period the male, called a tiercel or tercel (Latin for *une tierce* or $\frac{1}{3}$), which is roughly $\frac{1}{3}$ smaller than the female (female peregrines are on average 15% larger than males and juveniles are slightly larger than adults), starts bringing food to its mate. In air transfers of a kill and ledge displays including head bowing, food exchange and beaking (like kissing) occur. During courtship the adult birds give a different call, a creaking type of call often called chipping or chupping.

During incubation the birds are quieter with the female incubating the majority of the time and the male doing the hunting and some incubating. When the nestlings hatch the male is kept busy bringing kills usually to the female who then feeds the young. Peregrines do not build nests but typically use a ledge on a cliff wall. They use what is called a scrape often just a scratch in any dirt or depression on the ledge. Peregrines prefer sheer, inaccessible cliffs for nesting sites. As these sites become full the birds may choose less desirable cliffs and perhaps even other birds old nests in trees, and other so called unusual spots as they have in the past and in other parts of the world. I have observed a nest (called an eyrie) in Tasmania, that had been carbon dated, which had an extended occupancy back 19,000 years. As the nestlings become more adult sized both adults will often drop off food to them trying to stay away from the talons and beaks of their young. Fledgling time is also an exciting time to observe peregrines. The young fly quite clumsily at first and improve their flying skills daily. Kills are fed by the adults by food drops, aerial transfer (adults being careful not to get talons snagged with the food) and as fledglings age live birds caught by adults can be dropped to the young to try to make their own kill.

Peregrines in this country sometimes tolerate golden eagles near by but will often chase them away from their territory. Golden eagles will prey on the young of the falcons. A study in Arizona found peregrines chasing off bald eagles. The peregrines were observed stooping the bald eagles and bopping the birds in the head. Some bald eagles that were hit were later observed dead of concussion. Great horned owls have also been observed to attack or eat peregrine chicks. Peregrines will also eat young of these species if the opportunity presents itself. I have observed adult golden eagles trying to attack fledgling peregrines. However, I have also observed golden eagles and peregrines nesting very close to each other with apparently little conflict.

Peregrine Nesting Chronology

On average egg laying for peregrines around the canyon country is around mid to late April. Hatching for most peregrines is mid to late May and fledging late June and early July. Most birds will be in these ranges, but there will be the occasional birds that will not be in the average. One example would be if a pair has young that fail early on, they may recycle and fledge birds at a later date.

Peregrine Migration

Research on peregrine migration is still on going at the present time. The peregrine's Latin name means: to wander. Old and new reports of the birds resting on ships on the ocean exist.

Birds that were radioed in Alaska and Glen Canyon migrated to Florida, Mexico, Central and South America. Among some unusual sightings was a peregrine that was banded below Glen Canyon dam that later turned up in Japan, as did a bird that was banded at Padre Island in Texas.

Search and Detection

Falcons, like all raptors, have incredible eyesight. Birds of prey need to pinpoint their prey to ensure capture. Like many animals birds of prey have depressions in the rear of their eyes called fovea, made of densely arranged light sensitive cells. Diurnal raptors have two fovea in each eye. One contains mostly rod cells, providing black and white, light and shade sensitivity, and is used for detection of movement. The other fovea contain mostly cone cells, which provide color vision for fine examination of an object and to break camouflage techniques. Peregrines can sometimes be observed head bobbing when hunting from a perch. When doing this the birds are using the fovea used for detection with their binocular vision. To transfer the detected object from scan to fine the bird may tilt the head, transferring the image to the inner fovea and giving the false impression of listening. Diurnal raptors have about eight times the density of cells in their eyes than we do. They also have a bony ring that can squeeze and elongate the eyeball. This allows them to have telephoto vision. Their eyes are large to provide detailed information. I once heard a comparison that if our eyes were the same proportion to our bodies they would be the size of basketballs.

Locating and Identifying the Peregrine

Falcons are built for speed and aerobic flight. Falcons wings are long, tapered, pointed wings that allow for sustained, fast, flapping flight. The peregrine has a hooked beak with a killing tooth used to crush or break the neck and head of its food. This is different from many raptors that only use their beak to eat and for preening. If you know the falcons, the only bird around here you may mistake a peregrine with is a prairie falcon. Prairie falcons are similar and also nest on the cliffs in Canyonlands. Some differences to look for are as follows: the prairie has a thinner mustache stripe compared to the thick hood of a peregrine. The adult prairie has a lightly spotted belly compared to the heavily barred belly of the adult

peregrine. The prairie also has a dark bar along the underwing. This dark triangle is a distinctive and diagnostic field mark to the prairie falcon. Fledglings of peregrines and prairies are more difficult to tell apart.

Peregrines will often perch near or on top of cliffs. When looking at a cliff there will be streaks of white wash from where the birds perch more often. The streaks of a falcon roost are long and thin lines compared to the thick wash of other raptors. A golden eagle or red tail perch looks more like a bucket of paint thrown at the cliff. A kestrel falcon's wash is not as long as the peregrines or prairie falcons which are similar. By observing different birds and their wash over time you will be able to decipher who is hanging out where. Many times I will hear the peregrines before I see them. The birds have various calls but the distinctive wailing is a good way to find them. The best way to learn this is to watch the birds and learn their calls or listen to bird tapes.

Outlook

Due to the halt of DDT and extensive reintroduction programs, the peregrine falcon has made an amazing comeback. In July 1995 the Fish and Wildlife Service gave notice of intent to delist the peregrines from the endangered list. While the peregrine is still having problems in some parts of the country the bird has recovered remarkably in many areas and on August 26, 1999 Fish and Wildlife Service de-listed the peregrine. This shows that the Endangered Species Act can work and may help save some animals from going extinct. Many animals and plants are still in vital danger and need our protection. Habitat destruction, pollution, pesticides here and in other countries and many other factors still threaten birds such as the northern goshawk and willow flycatcher, to name a few. An alarming decrease of some neotropical birds and species of frogs exists at the present time. Saving birds like the peregrine and other animals probably does more to protect man than a lot of folks realize and is an indication of the health of the environment. These animals show us that, like the canary in the coal mine, we can stop harmful chemicals, pollutants and save habitat, before these things start affecting us, and just as important stop man from destroying the amazing life with which we share the planet.

Photos by Chris Florian



EXPLORING GRAND GULCH

♥ KENT'S KORNER ♥

JANUARY 1-5, 1958

By Susette Weisheit

I first met Kent Frost while preparing for a Guide Interpretive River Trip through Cataract Canyon in 1993. Members of the National Park Service had invited Kent on the trip. Kent and I hit it off immediately, he rode with my husband John and I for most of the trip and I had the opportunity to talk with him about his years of guiding on the Colorado Plateau. I will never forget the scene upon reaching camp that first rainy night. Tents were being erected by all the new guides and seasoned guides alike, as I was throwing my own rain fly over my quickly erected tent, I spotted Kent strolling down the trail. With concern, I approached Kent to inquire if I could help him set up his tent. His expression showed a glint of amusement as he assured me he would find "an little overhang under the cliff for the night." Sure enough the next morning while most of us were getting soaked dismantling our tents, Kent sat visiting with the cooks, dry, happy and sipping his hot beverage. It rained four out of five days and while guides and park personnel struggled to stay dry in all of our high tech fabrics, Kent seemed perfectly happy in his dacron vest and canvas coat topped by a plastic rain poncho.

While on that river trip I realized what a very special life that Kent had created for himself. Kent told us stories of his pen pals; of friend Jim Mike's explanation for Kent's lack of children; of river trips as a guide for Norm Nevills in 1946 and 1947, and the wooden boats they built and used. He told stories of rescuing animals from quicksand; of the tour business he and his wife Fern ran from 1953-77. Stories about the Needles, the Doll House, of naming Beehive Arch, about White Canyon, Katie Lee, Bates Wilson, the BLM, and Utah Parks. He showed us his recycled jacket pockets sewn into his coat to carry matches, cups and papers. He even had some gloves rigged from inside his shirt. He presented me a gift of a water-resistant ditty bag fashioned out of a raincoat arm and some twine. I would find out later that these items were only glimpses into Kent's ingenuity and conservation-minded creations. From that trip onward I've been fascinated by this story telling, canyon man with his soft-spoken good manners and quiet sense of humor. Six years later I find myself attempting to write a book that might bring a sense of this

I once asked Kent why he stamps a heart on to his metal work. He told me "That's so whoever I give it to will know I put all my heart into it."



man's life to others and spread his stories to more people. Thanks to the hard work of Marian Krogmann, Kent's longtime friend, passenger and hiking partner, I now have Kent's personal journals on computer. The following is Kent's journal notes on one trip of hundreds, a hike into Grand Gulch at a time when few bothered to enter the canyon, except when necessary to search for stray cows.

JANUARY 1 – Left Monticello about 9 a.m. in the new rebuilt Green Jeep for Grand Gulch. About 4 miles out there was a transient oil well workman with a jeep pickup that would not run. So I helped him about an hour and pushed the outfit two miles. Then we took out the gas line and melted the ice and he ran O.K.

Drove over to the oil well site five miles off the highway south of the bridges. Turned off toward Grand Gulch about 4 miles before Red House and went down the road almost 7 miles to the head of a canyon and a cowboy camp, possibly named Collins.

Parked the jeep about 3 o'clock and started walking down the side canyon and came into Grand Gulch about one mile down. Then it was dark so kept walking up Grand Gulch until about 9 p.m. and made camp in the bottom of the wash. I set fire to about 50 feet of logs. I chipped up some ice and melted it for water. This was a very bad camp.

JANUARY 2 – I never slept much last night because of the wet ground to sleep on. The logs were still burning good by morning. Started hiking up the canyon before the sun hit the high rims above. About 3 miles up from camp was some perfectly preserved ruins on a big shelf (*Banister Ruins*), but I did not try to climb to them, saw several small ruins.

Stopped about 11 o'clock for lunch and to rest. There was an old large mouth pint bottle sticking out of the sandbank about 2 feet below the surface. Perhaps it was washed in there during the floods in the 1890's. Saw several perfectly preserved dwellings and storage houses. Also saw 3 fortresses with the loopholes looking outward. These fortresses were in caves along with dwellings.

There were several places a person could walk out the East Side by rim rocking around.

It was a warm afternoon and the water was running freely and hard to cross which I had to do often. Because I did not want to get my feet wet, I cut up over the high banks.

Today I got real tired. Found a nice dry cave to sleep in with the water running past about 300 feet away. I made camp just as it was getting dark. It took about 30 minutes to drag in enough wood to keep warm with all night. There was a tall spiral just across from my cave on the West Side.

JANUARY 3 – I did not wake up until it was light and had a very good nights sleep. Just started on up the canyon and saw several ruins and two more fortresses. I named one fortress *Rincon Castle*. There were huge sandbanks about 50 feet high and was confused as to which fork to take but the left one turned out to be correct.

My feet were beginning to hurt from so much walking. Passed another rincon and saw a talus slope that went plumb to the top of the West Side of the canyon. Came by a big overhang with some long poles somebody had used to get into the upper story with. Stopped near here for lunch.

Walked on and on with my left knee and right foot hurting. The sagebrush were getting lots bigger and more snow on the

north slopes. Came by a great rincon and falls. Then started looking for a place to camp. But I was tired and the canyon seemed so bleak and inhospitable at this time. Considered several camping places. Then went into a big overhang with some cliff dwellings. There were lots of box elder wood and the creek about 500 feet away so I made a good camp in this cave.

JANUARY 4 – Got up at the first sign of daylight as I knew by the vegetation that I was close to the head of the deep canyon. The water in my cans froze solid about 15 feet away from my campfire. It was a cold night and I was up several times putting more wood on the fire. Started walking before the sun hit the high rims and was it ever cold facing the cold breeze coming down the canyon. Soon came to a nice arch (the first and only one I saw) and just around from it came to the big overhang full of ruins and a fortress that I had visited several times before. So now I know where I am at, about a mile below Kane Gulch.

I decided to hike out Kane Gulch rather than face the 35 miles back down Grand Gulch to Collins Canyon.

Cached my little shovel that I carried all this way at the spot where the big spruce tree log lays across Kane Gulch. There was lots of ice over the waterfalls. A deer, which I had jumped, tried to go up one of these and lost his footing and slid down a 10-foot ice chute. Then he went out the other side of the wash.

Stopped for lunch at the head of the steep canyon and made lunch of corn meal, raisins, and tea. Got to the highway about noon and waited an hour for an ore truck which carried me to Red Canyon Junction. Then I started walking and hiked almost to the Collins turn off (9 miles) when another ore truck hauled me 3 miles. Then it was getting dark. I took a big drink of water from a small reservoir that the cows used for a watering place. Ate some jerky and walked the remaining 6 miles down to the jeep. Got there about 10 p.m. where I heated up a can of soup and went to bed in my sleeping bag. The end of this trip of tired feet. I went home the next day.

**Excerpt from The San Juan Country by
Dr. Herbert E. Gregory, USGS
Professional Paper 188, 1938.**

An explanation on the formation of rock shelters

Both the flat-roofed and arch-roofed rock shelters of all sizes and shapes are essentially the work of ground water. In regularly stratified rocks water seeping from the contact of porous and impervious beds has developed recesses by undermining the Dakota (?) sandstone, the Bluff sandstone, and in less degree the sandstone beds in the Cedar Mesa sandstone member. In the thick, massive sandstone beds the first stage in the development of cavities is the seepage of water along the surface of some locally impervious lens, with consequent removal of the cement, then the grains from the base of porous, saturated rock. This slight undermining permits grains and thin laminae to fall in response to gravity. As the process continues, shell after shell is detached because the cement has been largely removed by percolating water, reaches the floor as

a disintegrated mass that is borne to the mouth of the cave by intermittent run-off. The back walls of many rock shelters are moist and thinly coated with water-loving plants. Some give rise to springs; others are coated with alkali or salt "bloom"; still others, especially those above the local water table, are dry. No field evidence supports the popular notion that the cavities in the walls of canyons have been produced by sand blasts. On the contrary, little wind enters them. Most of the small ones contain leaves, wings of insects, and dust that even a slight breeze would remove. Birds, bats, and rodents live in them, and during severe windstorms the large ones serve as refuges for beasts and men.

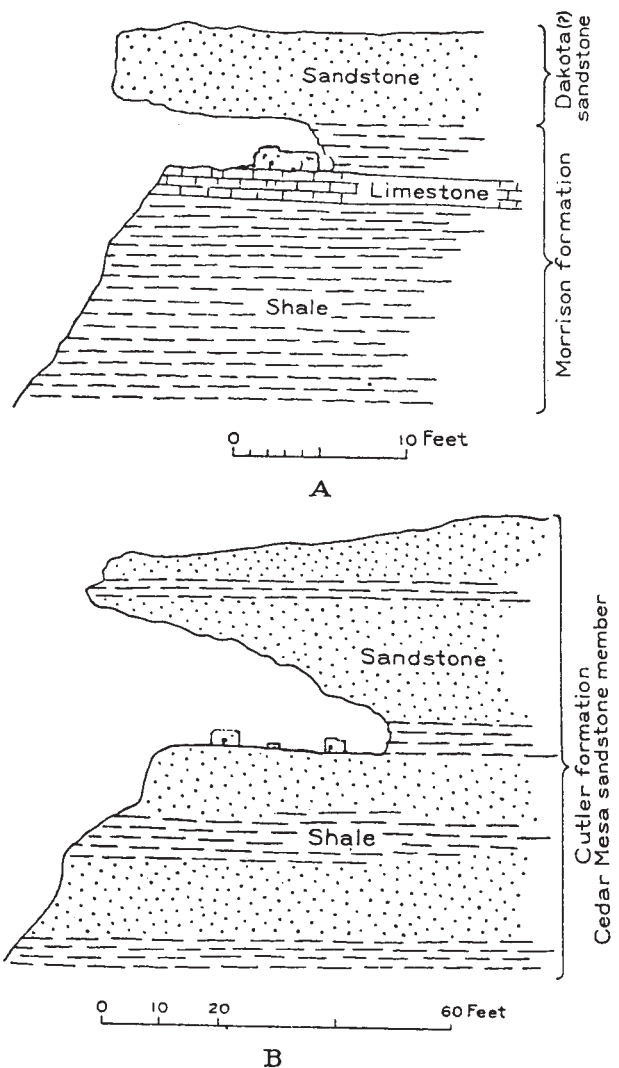


FIGURE 4.—Rock shelters: *A*, At contact of Dakota (?) and Morrison in Cottonwood Canyon; *B*, in thin-bedded Cedar Mesa strata at Cigarette Spring.

Names of Rivers and Their Name Changes

by Jim Strong

QUESTION

I told my passengers, on white water trips through Westwater, Cataract and the Grand Canyon, that during John Wesley Powell's time the Colorado River, from its headwaters in Colorado to the confluence with the Green River, was named The Grand River. From the confluence, all the way to its mouth in the Gulf of California, the river was called the Colorado. At that time I didn't know who changed the names or why they were changed. Historians haven't written much about changing the name of the Grand to the Colorado. My interest was piqued when I tried to find out about the name change of the Colorado and I found almost every history book said the name of the state came from the red Colorado River in Colorado. That seemed reasonable but I had a question. How could the state be named after this river when there was no river in the state named Colorado—when the state was named Colorado in 1876? The trouble was, the mighty river flowing west into Utah, was not named the Grand River until 1921. How did the river's name get changed to the Colorado, 55 years after the state had already been named Colorado? A lot of research, often in areas that seemed not connected with the problem, ultimately provided the needed information.

A BIT OF HISTORY

The Louisiana Purchase of 1803 forced negotiations over a more exact boundary between Spain and the U.S. since, in the 1600s and 1700s, Spain drew no boundaries with New Mexico. In 1819 the Adams-Onís Treaty set the border between Spanish and U.S. territory along the Red River of Texas to the 100th Meridian, north on that line to the Arkansas River, west again to the river's source, north to the 42nd Parallel, and thence to the Pacific Ocean. Immediately you think of the Colorado River. The Louisiana Purchase doubled the size of the U.S. and acquired about half of the present-day state of Colorado. After the war with Mexico (1846–1848) the signing of the treaty of Hidalgo Guadalupe made all of present-day Colorado part of the U.S.

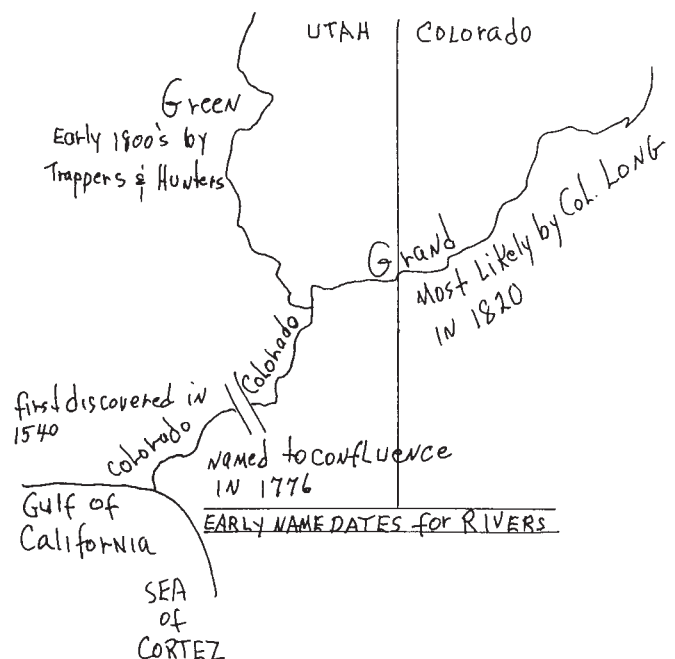
The great expedition of Lewis & Clark (1804–1806) was sent to the northwest to find out about the land that was purchased. Less known is the 1806–1807 expedition of Zebulon Montgomery Pike and 18 men sent out to chart the area of Colorado, the southwest, and to find the source of the Red River. People thought the Red River might begin in Colorado but they knew little, if anything, of the present day Colorado River. The Red River was not the red Colorado River, but it was important for the boundary with Spain. Pike's failure to find the source of the Red River caused a second expedition to be sent out and headed by Major (later

Colonel) Stephen Long in 1819–1821. This expedition was important as, I believe, Colonel Long named the Grand River and discovered the peak that bears his name (even though Col. Long also failed to find the source of the Red River). Captain Randolph Barnes Marcy and his expedition, sent out in 1830–31, did find the source of the Red River. However it was not the red Colorado River.

A LITTLE HISTORY OF RED RIVERS

While there was no red river named the Colorado in the state of Colorado until 1921, there were other Colorado Rivers. One is in southeast Texas (nearly touching the state of Colorado) and forms part of the boundary between Oklahoma and Texas. There is a Red River in Kentucky, in the Dakotas, and there is a Red River in Louisiana which, according to Captain Marcy, was a "real" Red River. You can find it on maps today in Texas and Louisiana where it ends in the Mississippi Delta. He further suggests that Lt. Pike's map basically assigns the headwaters of the Red River to that of the Canadian River. Doctor James, of Long's expedition, wrote that people arriving from Santa Fe gave him information of a road running almost due east to the point on Pike's map where it struck a branch of the Canadian River. He thought the principal source of the Red River was south of this point in the high plains. Capt. Marcy explains that the stream he camped near, on the 31st of August, was the Rio Jaijo of Humboldt and that it has long been mistaken for the source of the Red River of Natchitoches. Marcy writes,

"In a region of red clay and sand, where all the streams become nearly the color of arterial blood, it is not surprising that so accurate a topographer as the Baron Humboldt, having learned that a red river rises forty or fifty miles east of Santa Fe and fans to the east, should conjecture it might be the source of the Red River of



Natchitoches.”

RED RIVER SEARCH

With so many red rivers, who named the red river in Colorado? Marcy wrote that,

“The Mexicans and Indians on the borders of Mexico are in the habit of calling any river, the waters of which have a red appearance, ‘Rio Colorado,’ or Red river, and they have applied the name to the Canadian [river] in common with several others; and as many of the Prairie Indians often visit the Mexicans and some even speak the Spanish language, it is a natural consequence that they should adopt the same nomenclature for rivers, places, etc. Thus if a traveler in New Mexico were to inquire for the head of Red river, he would most undoubtedly be directed to the Canadian, and the same would also be the case in the adjacent Indian Country. These facts will account for the mistake into which Baron Humboldt was led, and it will also account for the error into which Colonel Long and Lieut. Pike have fallen in regard to the sources of the stream which we call Red River.”

RIVER NAMES THAT HAVE LASTED

Each group, Indians, Mexican, Spanish, hunters and trappers, who came across rivers and mountains, would logically give them names. Each Indian tribe, who was in the area first, had their own names for the rivers, mountains, and other special places. However, because they didn’t have a written language and used names that were often hard to pronounce, Indian names were seldom kept; few Indian names have survived for a river or a mountain. The Spanish, Mexicans, U.S. explorers, settlers, miners, et.al., also gave names to rivers, mountains and places. These names have survived and it is by these names that we recognize them today.

INTEREST AROUSED

My interest was piqued about using the name of the Colorado River for the name of the state when the history books I read never mentioned the Grand River or that its name was changed. Strangely they simply said the state of Colorado was named after the Colorado River which flowed through the state. There are two problems with that: First, there was never a river named the Colorado flowing in the area of the state until the Grand River was changed to the Colorado River as recently as 1921. Second, way back in 1861 the land, which became an U.S. Territory and a state in 1876, was named Colorado, 60 years before there was a river by that name in Colorado. If the territory was named Colorado so long ago, how can it be said that the state was named after the river in the state? If the Grand was named by Colonel Long in 1821, it would be 100 years before the name would be changed. I considered that some light should be shed on how the area got its name, if I could find out who proposed the name for the Territory. I found there were several pieces of history I needed to know, in order to understand the whole story of how the name change came about.

DISCOVERY OF GOLD IN CALIFORNIA AND THE PUSH WEST—SKIRTING COLORADO

The discovery of Gold by James Marshall at Sutter's Mill at California in 1848 began a gold miners exodus to the west but did little to bring people to Colorado. Pioneers skirted the Colorado area for two good reasons: First, the formidable Rocky Mountains stood in the way. There were no roads which could be used by wagons over the high mountains, only trails. Second, the explorers Lt. Pike and Colonel Long had described the land east of the mountains as almost a desert wasteland, where there was nothing of value and the area as an ugly place devoid of good land, or anything man could use. These reasons forced the first wagon train, the Bartleson–Bidwell party and those who followed, to head for California by traveling north of present-day Colorado. Other parties heading for Oregon went northwest from Fort Hall over the Oregon Trail. The Donner Party was bound for California and the Mormons headed for a place of sanctuary in Utah. These parties and other pioneer travelers, from 1832 to 1857, traveled north of Colorado through South Pass, the window through the mighty Wind River and Rocky Mountains. [I use the name Colorado, but remember, the area is not yet named Colorado]. Only native Indians, together with hunters and trappers, ventured into the mountains. With 54 peaks over 14,000 feet high, Colorado is the birthplace of many rivers; some flowing east to the Atlantic Ocean and some flowing west to the Pacific Ocean. At first this was not a place sought out by settlers.

A COMPARISON

The settling of Colorado in the early days, in one way, is comparable to the building of the tunnel under the English Channel. Two companies build the tunnel, each starting from a different end, but they are working toward each other and slowly will come together. In the case of Colorado civilization grew toward the continental divide not from the west but from two other directions, the east and the southwest. The discovery of gold would make the push from the east seem like a mad stampede.

DISCOVERY OF GOLD IN COLORADO

Most important for the development of Colorado was the discovery of gold in 1858. Finding gold in Colorado brought the hordes of miners, prospectors, settlers and all others to the area. The glitter of gold kept them from remembering the description of the land by Lt. Pike, Colonel Long, and others, who described it as a wasteland not fit for man. Beyond this “American Desert” stood those mighty mountains where the minerals were to be found. Settling the area required some form of government to be established in order to foster towns and keep them growing. There was no law and order for the mining camps and the Anglo Saxon Americans, who were in the big majority, wanted laws to protect themselves and their holdings—but there was no law. The Colorado Territory would not be established for three more years and some of the land, which now forms part of the state of Colorado before 1861, was to be found in other territories. Boulder was in Nebraska, Denver was in Kansas, Breckenridge in Utah, and Conejos in New Mexico.

ATTEMPTS MADE TO FORM A TERRITORY

Personal responsibility was accepted, at first, for acquiring land and mining claims. Next came claim clubs which took on the responsibility to see that claims were recorded. For this area, without any law, these clubs provided civil law for residents of the South Platte and Arkansas valleys. Ad hoc judicial bodies were a necessity when there was no legally constituted court. Miners had a mind set for the procedures of self-government. When the rush west began, since gold was first discovered in Kansas Territory, Governor Denver of Kansas appointed county officers. He was too late because, before those officials reached Cherry Creek, those who had come earlier had elected Hiram J. Graham as a delegate to Washington and A. J. Smith as their representative to the Kansas Legislature. Mr. Graham, in Washington, did get a bill introduced in Congress to create a Territory where the miners and farmers were, but the measure failed to pass. In the spring of 1859 a new demand went out for an independent government. A caucus of Denverites assembled in a convention at Auraria, April 15, 1859, to consider the future of their community and proposed a constitutional convention for the creation of the "State of Jefferson."

COLORADO ALMOST BECOMES "JEFFERSON TERRITORY"

By summer uncertainties developed and at the meeting in Denver, June 6, the convention decided to adjourn. As time passed, some thought a Territory would be more adaptable to the region than a state and a gathering was held again on September 5 for a decision. The idea was put to a vote by the people and the Jefferson State proposition was defeated. In October they drew up a constitution for Jefferson Territory and ratified it by popular vote. The residents of Pikes Peak territory, however, were offered a choice between a state constitution and a memorial to Congress requesting territorial status. It seems that, before the vote, word got out that if the area became a state, the citizens would have to pay for almost everything, but if it were made a territory, the federal government would pay the costs for running a territorial government. In the vote statehood was rejected partly on the fear of expenses and the resulting taxation it would take to pay those costs. The National Congress, pushed by the Pike's Peakers, enlarged Colorado Territory by stealing from other Territories. They took a sixty mile wide strip from western Kansas. From Utah Territory, home of the Mormons, they took the Colorado Plateau west of the Continental Divide, which contained what is now Dinosaur National Monument and the prehistoric Mesa Verde National Park, the prehistoric cliff dwellings of the ancient Indians. From Nebraska Territory they took the richest part of South Platte Valley and the future Rocky Mountain National Park below Longs Peak. They got all of New Mexico north of Raton Pass, plus the farmlands of San Luis Valley together with those along Huerfano River below the Spanish Peaks.

NAME JEFFERSON TERRITORY DROPPED

When winter weather shut down the mines, promoters resumed their activity by choosing Beverly D. Williams to be their delegate to Congress, as well as a convention to write a

territorial constitution. The voters turned out and registered a 6 to 1 win for the approval of the Territory of Jefferson. R. W. Steele was elected as territorial Governor. On November 7, 1859 the General Assembly of Jefferson Territory met at Denver creating counties, judicial districts, and incorporated Denver City.

COLORADO NEARLY BECOMES "IDAHO"

In December 1860 the people appealed again to Congress for a Territorial Government and a majority vote for the proposition seemed possible. The name Jefferson was dropped because of its unpopular poll tax. Thomas Jefferson was also a slave holding Democrat and most Pike's Peakers resented this, since they were Abraham Lincoln Republicans. Delegates in Washington urged Congress to approve their own version of a territory under several different names, such as: the Ute Indian "Yampa," the Spanish "San Juan," and "Lula" from a miner's sweetheart. However, in 1860, Congress ignored petitions for granting territorial status. So again other politicians took up the fight and statehood advocates convened again. Yet another convention at Central City, in the Territorial area, elected a congress and re-named the area "Idaho Territory." The secession of Texas and the rest of the south in February, 1861, brought about a serious threat of civil war. In addition to the problem of slavery, both for and against, and the location of a transcontinental railroad, the Republicans of the north needed to show peaceful intentions. In the national congress someone proposed the Spanish name "Colorado" for the territory but Senator Gwin of California objected saying,

I have been cheated out of the name. It is the handsomest name that could be given to any Territory or State." (he wanted it reserved for the Arizunia area which would become Arizona Territory.) "I want it reserved for the Territory of Arizona." (See page 5 for the actual debate in Congress.)

"COLORADO" PROPOSED AND USED

The result of slavery and the threat of civil war caused the quick passage of certain acts. The name "Idaho," for the territory, was debated and ultimately withdrawn. Someone proposed the name Colorado, and Congress accepted that name and passed the resolution. However there were some who were not satisfied and wanted to reconsider the vote.

SENATORS BATTLE OVER "RECONSIDERING" THE VOTE

After the bill had passed Senator Douglas, of Illinois, some days later spoke:

I move to take up the motion to reconsider the vote passing the bill to organize the Territory of Colorado. I understand the chairman of the committee wishes to have it disposed of this morning.

The motion was agreed to and the Senate proceeded to consider the motion to reconsider the vote passing the bill (S. 366) to provide for a temporary government in the Territory of Colorado. Senator Wade of Ohio said:

I hope that vote will not be reconsidered. That bill, settling, so far as this body is concerned, a very disputable matter, has already passed, and gone to the House of Representatives; and I hope we shall not have it up again. I believe the bill, as it was passed, is satisfactory to most of the Senators; and I hope, therefore, that it will not be reconsidered. Perhaps we had as well have the test on the reconsideration, as on any other question; and on that motion I ask for the yeas and nays.

Senator Douglas:

I regret that the Senator from Ohio has interposed his objection to reconsideration under the peculiar circumstances. I think it is an act of discourtesy that ought not to be sanctioned in this body. It was well known to the Senate that when this bill was pending last week, I laid upon the table a substitute for the bill, and had it printed, and on that I was entitled to the floor, and I was in the act of offering that substitute when we adjourned one day last week. The other day, when I was called out for a very few minutes, it was taken up and passed, I presume, inadvertently....But I do think that, under the state of facts, it was unusual, and if the attention of the Senate had been called to it, they would not have deprived me of my right under the circumstances.

Senator Green (of Missouri),

I hope there will be no reconsideration. The Senator can record his vote on the motion to reconsider just as well as he could on the direct question upon the amendment. Nobody desired to take any advantage of the Senator; nor do I think that there is any necessity for a reconsideration...I hope the bill will be permitted to stand as the judgment of the Senate and that the people of Pike's Peak, numbering sixty thousand, may have a government and protection according to law."

Mr. Douglas,

I can see now very clearly that the motion to reconsider is not to prevail; (The Senators battled back and forth on the bill which had already been passed. The problems are: territory is taken from New Mexico Territory to add to Colorado; New Mexico is a slave state so what happens to the people displaced to Colorado Territory? Most of those who are to be displaced are Mexicans.)

Senator Douglas further clarifies it by saying,

...who live under different laws and usage's entirely incompatible with the laws that we are in the habit of making for our own people....By the laws of New Mexico that is slave territory. Slavery exists there by law today. This is detaching that portion of slave

territory, a piece of country occupied by men of Mexican birth and habits, entirely identified with New Mexico, and not with the new Territory of Colorado, and attaching it to the new Territory of Colorado....Is the effect of this bill to abolish slavery in part of the territory thus cut off from New Mexico, and to make it free territory?

Some Senators wanted the territory to elect their officials and others thought the President of the U.S. should appoint them. The obvious thing here was, whichever party was in power wanted the President to appoint the officials and the other party wanted the people in the territory to elect them.

SENATE BATTLE—USE OF COLORADO NAME DISCLOSED

The Senators could not seem to stop talking. Mr. Douglas said on page 765 of the Congressional Record, "I have only a few words to reply to the Senator from Missouri." Those few words numbered 603. Mr. Wade said on page 765, "I do not wish to prolong this debate a moment, sir." However it took him 508 words to stop. The Vice President, "The question is, will the Senate reconsider the vote by which this bill was passed?" Upon this question the yeas and nays have been ordered." Mr. Anthony, "Do I understand that the Senator from Illinois desires this to be a test vote and that he waives the question of courtesy?" Mr. Douglas, "I am entirely willing that it shall be a test vote. As it is a compromise, I do not want to disturb it." Mr. Gwyn (California), "I will vote to reconsider, because I have been cheated out of the name. The Territory in which the Colorado river is, through which it runs, I think ought (not) to have the name of Colorado. I think it is the handsomest name that could be given to any Territory or State. I am going to vote to reconsider, in order to strike that name out. That is my objection to the bill. I want to give that name to the Territory of Arizona."

The question being taken by yeas and nays resulted yeas 10, nays 31. The ten who voted to reconsider were: Messrs. Bayard, Crittenden, Douglas, Foot, Gwyn, Kennedy, Latham, Nicholson, Pugh and Wilson.

So the Senate refused to reconsider the vote on the passage of the bill.

COLORADO TERRITORY FINALLY CREATED

Colorado Territory was finally created when, on February 28, 1861 President Buchanan, the 12th President of the U.S. signed the bill into law. The Colorado Territory of 1861 was in the same shape as it is today, a rectangle almost four hundred miles by three hundred miles. The name Colorado was again used for the state when, just 15 years later, the 18th President of the United States, Rutherford B. Hayes, signed the law giving Colorado a place as the 38th state of the United States.

USE OF SPANISH WORD COLORADO

Therefore, back in 1861, the word "Colorado" was first used as it applied to the land of Colorado Territory and the name followed again when the territory became a state. The idea of a name for the Territory after the great river, which

flowed through the area, was misleading since the river was the Grand. The river did flow red in color especially in spring and early summer. Today, above Rifle, it swirls like a huge reddish colored snake and, as it passes Parachute, it often is as red as "arterial blood," to borrow a phrase from Captain Marcy. So we have a problem: back then the land was named Colorado while the river, even though red in color, was named the Grand.

COLORADO – SPANISH & ENGLISH

Those familiar with Spanish understand the name Colorado to be an adjective meaning red and, when written, the noun comes first—Rio Colorado or River Red. English puts the adjective first and is written Colorado River or Red River. With the need for the U.S. to establish its boundaries with Spain, the source of the Red River had been used as a boundary point, and Lt. Pike's expedition had the objective to find the headwaters of that river. He never did find it but ascribed part of the Rio Grande as the headwaters. He went Northwest in a circle but never came within a hundred miles of the Rio Colorado. Colonel Long also did not find the headwaters of the Red River; he knew he was too far west. The 100th meridian, so simply, described the Red River they were looking for in practical terms.

THE GRAND RIVER

John Wesley Powell and the Colorado River are names that are almost inseparable. Often forgotten, however, is the fact that Powell only floated down two of these three great rivers, the Green and the Colorado. His writings name the Grand River but he never floated down it. He and his party started their trip from Green River, Wyoming. The Green River had been named by the hunters and trappers who frequented its drainage from the headwaters at Fremont Peak in the Wind River mountains of Wyoming. He floated down through Wyoming, then into a small portion of Colorado, circled south and came back into Utah. The Green continued on down through Utah and ended where it met the Grand, which flowed 340 miles in Colorado and Utah to meet the Green. From this point on the water of both the Green and the Grand rivers became the Colorado River. It flows down through Cataract Canyon, Glen Canyon, and Grand Canyon all the way to the Gulf of California.

WHO NAMED THE GRAND RIVER?

No one hears the name Grand River anymore; forgotten because its name has been changed. This reddish-colored river, together with its tributaries, was the drainage for the western slopes of the mighty mountains at Colorado. No doubt Colonel Stephen Long first called it the Grand in 1821. I base this on the fact that Colonel Long had the audacity to name the reddish mountain peak, near where the Grand river started, "Long's Peak" after himself. He would see a grand sight when he saw the river, so why not name it—The Grand? Lt. Pike didn't go far enough west and north to see the river, or he might have been inclined to give it a name. I may be a bit harsh with Colonel Long for his "namesake peak" because expedition leaders, sent out to find what we had obtained in the Louisiana Purchase, were notorious for giving names to rivers

and mountains they came across. I studied three of the five expeditions sent out to the Colorado area: Lt. Pike (1806-07), Colonel Stephen Long (1820-21), and Captain Marcy (1830-1831). Each explorer assigned names to undiscovered rivers and mountains, but only Colonel Long named a peak after himself. Lt. Pike came no closer than five miles of the mighty peak named for him by John C. Fremont and the trappers and miners perpetuated the name. Pike never climbed the peak and did not name it after himself.

THESE ARE THEY WHO CHANGED A RIVER'S NAME

The Grand was the name used by Powell and others for the river in Colorado until 1921. I was one year old when the name Grand was changed to the Colorado. To my knowledge there is no one alive now who can tell us first hand how the name change happened. However, there are records and minutes which tell us most of what happened. I studied them to find out why and how the name change happened. What I found confirmed the fact that the name change involved politicians and their political machinations. Politicians involved mainly came from six states, but others too were involved. They include the Governor of Utah, the Senate and House of Representatives of Utah, a U.S. Senator from California, a member of the U.S. House of Representatives from North Dakota, the Colorado State Assembly, Senator Bannister of the Colorado Assembly, U.S. House member from Colorado, Edward F. Taylor, others in the U.S. Senate and House, the 15th President of the United States, James Buchanan, and the 29th President, Warren G. Harding. These people provided events which make a lively melodrama as the whole story unfolds.

POLITICAL ACTIVITY STARTS THE NAME CHANGE

Changing the river's name began with a most unlikely person, Charles R. Maybe, Governor of Utah! During the 14th session of the Utah Legislature, on February 18, 1921, the Utah Senate received a communication from the executive office of Governor Charles R. Maybe in Salt Lake City. Senate Journal (page 453) says, "To The Legislature: Introduction of Bills S. C.M. (Senate Commemorative Memorial) No. 6, by Judiciary Committee, A memorial to the President and Congress of the United States; relating to the change of name of the Grand River to that of Colorado River," was read for the first time and referred to the Committee on Revision and Printing.

Immediately questions come up, since there seemed to be no need or reason to change the name. Why would Governor Maybe want to change the name of the Grand to the Colorado? Was he being coerced or doing it on his own? Did he have pressure from anyone in Colorado for the name change because no river in Colorado was named Colorado? Were there others involved who merely suggested it to him or had something to gain from the change? And why was Utah proposing to change a river's name in Colorado to the Colorado when 90 miles of the Grand were in Utah? Was there pressure from those in Arizona to get rid of the name Grand, so it would not compete with or get mixed up with the "Grand Canyon," thus avoiding the competition from the name "Grand" which now existed in Colorado?

The Senate Journal (page 518) tells the progress of the

name change in the Senate S.J.M. (Senate Judiciary Memorial) No. 6 was read for the second time and, on a motion from Senator Dern, was changed to S.C.M. (Senate Commemorative Memorial) No. 6, which then passed on the following roll call: Ayes, 16; nay, 0; absent, 2. Those voting in the affirmative were: Senators Adams, Bradley, Dern, Fuller, Jenson, Jenkins, Jones, Kinney, Knight, Lamph, Peters, Quinney, Smart, Standish, Tebbs. Absent and not voting: Senators Hayward and Southwick. On Motion of Senator Peters, the rules were suspended, S.C.M. No. 6 was read for the third time and placed on its final passage. Final vote: Ayes, 16; nays, 0; absent, 2. (those voting on the motion by senator were the same and the same two senators were absent) S.C.M. No. 6 was transmitted to the House.

Having been passed by the Senate and sent to the House, the House journal (page 390) records the following (February 25, 1921):

Mr. Speaker, I am instructed to inform Your Honorable Body that the Senate has this day passed S. C.M. No. 6, by the Judiciary Committee, entitled, "A Memorial to the President and Congress of the United States, Relating to the Change of Name of the Grand River to that of Colorado River," and the same is herewith transmitted for your action.

Respectfully,
Q. B. KELLEY
Secretary

The House (House Journal page 652) from REPORT OF STANDING COMMITTEE. March 10, 1921

Mr. Speaker:

Your sifting Committee to which was referred S.D. Nos. 15, 55, 56, 64, 68, 69, 71, 92, 101, 106, 112, 116, 122 S.C.M. Nos. 6 and 7 and S.J.R. No. 3 were rejected and returned to the Senate.

The Senate (Senate Journal page 825) from House of Representatives March 10, 1921

Mr. President:

I am instructed to inform your honorable body that the House has this day Killed Senate Joint Memorial No. 6, by Judiciary Committee, entitled, "A Memorial to the President and Congress of the United States, relating to the change of name of the Grand River to that of Colorado River," by adopting the committee's unfavorable report, and the same is herewith returned.

Respectfully,
C. R. BRADFORD
Chief Clerk

This action by the Utah Legislature is little known or the writers of so many volumes on the rivers would have

mentioned it. In summary the Senate Memorial No. 6 was introduced February 18, 1921, passed the Senate on February 25, 1921, rejected by the House March 10, 1921, and since the Senate took no further action, the matter died in the 14th session of the Utah Legislature. However, the matter of changing the name of the Grand River to the Colorado River was far from over.

FROM THE UTAH LEGISLATURE TO THE COLORADO ASSEMBLY

After the Utah Legislature defeated the memorial to change the name of the Grand River to the Colorado, the Colorado Legislature acted quickly, as did the U.S. Congress. The following is taken from the Colorado General Assembly. The state of Colorado did not keep any minutes (as did Utah) of the actions of their state assembly. They did, however, keep a record of laws passed and the following is from that record (page 161 chapter 111):

COLORADO RIVER (S.B. No. 79 by Senator Bannister) AN ACT CONCERNING THE CHANGE OF THE NAME OF THE GRAND RIVER TO THE COLORADO RIVER

Be it enacted by the General Assembly of the State of Colorado:
Grand River, name changed to Colorado Section 1.
That the name of the Grand River in Colorado is hereby changed to the Colorado River, by which name said River shall hereafter be known, from its source to where it crosses the western boundary of the State of Colorado.

Effect: Section 2.
The change of the name of said River shall in no wise affect the rights of this State, or of any County, Municipality, corporation, association or person; and all laws, records surveys, maps and other public or private documents of every kind and nature in which the said River is mentioned or referred to under or by the name of the Grand River, shall hereafter refer to the same River and with the same purport and effect, under and by the name of the Colorado River.

Approved March 24, 1921

NAME CHANGED ONLY IN COLORADO

In their haste to get the Grand River name changed to the Colorado River, the State Assembly of Colorado only changed the name from the river's source to where it crossed the western boundary of the State of Colorado (the underscore in the bill above is mine). As of March 24, 1921 we now have four rivers: the Colorado, from its source to the western border of the State of Colorado, the Grand from Utah's eastern boarder to its confluence with the Green, the Green from its headwaters to its confluence with the Grand, and the Colorado from the confluence of the Green and Grand to the Gulf of Mexico. I suppose the Colorado Assembly did not want to take it upon themselves to rename a river flowing in Utah, especially after the Utah Legislature had rejected the name change just 14 days before on March 10, 1921. Now the scene

shifts to the Congress of the United States where the final action is played out.

U.S. CONGRESSIONAL ACTION STARTED

In the U.S. House of Representatives Mr. Dennison, of Illinois, took up the measure to change the names because Rep. Taylor of Colorado was ill. The Preamble was three times longer than the simple 2 section bill and was deleted. Mr. Dennison ended by saying:

And inasmuch as the people of Colorado want this name changed, largely for sentimental reasons, and inasmuch as there are no objections, so far as we have been advised, from the people of Utah or from any of the departments of the Federal Government, the committee thought we ought to grant the wishes of the people of Colorado and change the name of the Grand River to the Colorado River.

The one contention came from Mr. Butler of Pennsylvania who said:

Everything the gentleman says is interesting, but I was wondering how we got the jurisdiction. Congress does not name the rivers. It did not name the Mississippi. I shall certainly vote to change the name of the stream as the gentleman recommends, as it is all right; but I was wondering by what right we could do this.

Mr. Dennison replied:

I will state to my friend from Pennsylvania that under the Constitution Congress has complete jurisdiction over this river, because it is an interstate navigable river.

He also followed up with the fact that it was an international stream since it “runs across into the Republic of Mexico.”

LEAGUE OF THE SOUTHWEST – BOULDER DAM – WESTERN STATES

The beginning of allocating Colorado River water between the upper and lower basin states was brought up during the naming of the Colorado River for the Grand River debate. The following is from the Congressional Record of June 1, 1921, page 1996).

Mr. ARENTZ: Has the gentleman ever heard of the League of the Southwest?

MR. DENISON: No.

Mr. ARENTZ: The league of the Southwest, I may say, is an organization of the Western States which has to do with the development of the Colorado River, and while we were on the subject of the Colorado River I thought I might mention this subject. The League of the Southwest contemplates the ultimate construction at Boulder Canyon, on the Colorado River, near Las

Vegas, a 700 foot dam, which would irrigate approximately 3,000,000 acres in Arizona and Nevada, and develop sufficient power to electrify the Santa Fe and Salt Lake routes for several hundred miles, and to make Los Angeles and other points in Southern California, as well as southern Nevada, an industrial center.

Mr. DENNISON: Well, I think there are great possibilities there and I hope that will be done.

COLORADO NAMED FROM THE RIVER

Dennison continued:

Congress has on one other occasion changed by law the name of one of the rivers of this country. Sometime during the fifties, I think it was, the name of a river in the State of Minnesota was by act of Congress changed to the name Minnesota River ... The State of Colorado, one of our greatest and most scenic States, was named by Congress from that great river.

U.S. CONGRESSIONAL ACTION

Upon the efforts of Democrat Congressman Edward F. Taylor, a native of Colorado Springs and a congressman from 1909 to 1941, a bill was introduced into the U.S. Congress which would do what the Utah Legislature had just defeated: change the name of the river in Utah which the Colorado Assembly had not done. Congressman Taylor suggested his state’s tributary be awarded title to the whole river. It was true, he said, that the Green was a far longer tributary (730) miles compared to the Grand’s (340) miles. However, according to him the Grand contributed more water and so deserved to be renamed the Colorado.

SIGNING OF THE BILL

However there apparently was little interest, or reasoning on that account, and certainly no objection in Congress even though the Utah legislature had defeated the bill, because the bill was passed and signed on July 25, 1921 by President Warren G. Harding, 29th president of the United States. He was president for only three years (1921-1923) and signed the bill just over four months from the time the Utah Legislature killed the same proposal. On that date the Colorado river became a fourteen hundred-mile long river beginning in the high mountains of northern Colorado and ending at the Gulf of California in the Sea of Cortez.

REASONING AFTER THE FACTS

The expeditions sent into the Colorado area were looking for the source of the Red River. People knew that river and its blood red color but only Colonel Long went far enough west and north to see another red river—the Rio Colorado. None of these explorers were about to jump into a wooden boat, like Powell, to see where the river went. The Spanish explorers were the first ones to see the Colorado River and gave it that name, they did so because of its color. They didn’t travel to find its source, so the name only went as far as the confluence with the Green and Grand. I get the impression from my

studies that, in those early days, the river would have been the Colorado all the way to its headwaters, but no one knew where the headwaters were.

"BIG RED"

In the spring and early summer during the high run-off above Glen Canyon Dam, today as always, the Colorado river is a red river. It is not something that has to be proved, you can see it for yourself. Before the dam the river runners called the river "Big Red" because of its color. Wild and reddish brown, when combined with the Green, its 100,000, 200,000, or even 300,000 cubic feet per second of water roared through Cataract Canyon, Glen Canyon, Grand Canyon and out into the Gulf of California. It roars through Westwater Canyon, slows, and puts some of its sediment on the beaches all the way to Cataract Canyon where it again springs back to life. After roaring through Cataract Canyon the river flows south, then west, and into the north end of Reservoir Powell at Hite. The river flows swiftly to meet the challenge of the reservoirs vast still water. Suddenly and strangely it appears to be drugged. Unceremoniously the river, without confining walls, loses its power and speed. Its waves flatten and gradually, without a whimper, ceases to move. The vast reservoir wins, swallowing up the river which now becomes a part of its still waters. The colorful sediment carried by the river gradually spreads out and soon begins its slow descent to the bottom of the reservoir. As a roaring whitewater river it dies an ignominious death, a victim of the placid reservoir.

THE BEGINNING AND THE END

Mr. Dennison, of the U.S. Congress suggests the Colorado River was finally given that name in 1776. However the Spanish seafaring men, who first saw the red river and sailed upon it from the Gulf of California, no doubt were the ones who called it the Rio Colorado in 1540. The Colorado was deep enough and wide enough for their ships to sail over 300 miles upstream. No dams stopped their ships only the rocky rapids. Today, however, the river has many dams and the water of the river has been made available for irrigating vast farm areas in the United States. What little flows back into the river is so salty that it cannot be used again. A mighty river once entering the ocean with sufficient water for ships to sail upon has now ceased to flow. Today the mouth of the Rio Colorado is just a large dried up patch of earth which sometimes has a thin line of salty water trying to reach the ocean, but more often simply sinks out of sight.

The river begins as tiny rivulets of pure mountain water, gradually they come together and eventually form the mighty Colorado River. Regardless of its greatness along the way it dies an inconceivable death, a death which it was made to form—an ugly, waterless wasteland.

**"Hurra! Hurra! Hurra! Grand
River came upon us or rather
we came upon that very
suddenly and to me
unexpectedly..."**

*From the diary of George Bradley,
July 16, 1869.*

Book Review

Dancing on the Edge: A Veteran River Guide Shares the Transforming Power of the Grand Canyon by Charly Heavenrich

Dancing on the Edge is a fun read with messages about learning those lessons we keep forgetting. The main story line is one familiar to many Confluence readers—your first Grand Canyon trip. Along with tales of hikes, sights, history and geology the author relates tales of visions with a spiritual guru. "Dancing..." could be described as Rod Nash meets James Redfield. It's a great story about taking a river trip, combined with learning how to remember the lessons life teaches us, and how to recognize when a lesson is being taught. Charly is a good writer with a gentle sense of humor that makes reading this book enjoyable, as well as striking chords of recognition with anyone who has been on a river trip. For thirteen dollars at Back of Beyond, its better than a movie ticket.

The above is a brief review provided by Dave Focardi, a nine year guide at Sheri Griffith Expeditions, who calls Charly a friend.



Oh the river in the canyon is sublime
and the rocky walls speak stories of their time
Way down in Cataract
Strong hearts are not an act
On the river in the canyon oh so fine

Oh the lovers of the river, they are so true & fine
In the canyon on the Colorado line
They ride that foamy crest,
They know they are the best
Oh the Boatmen are the very girlie kind?

And in the night time sky
We watch the moon and sigh
and listen to the river sing her songs
She tells us of her loves and cries to the stars above
for the boatmen who have met her deep desire

I will be coming back
to ride the river down
Back to that rocky river gorge
I'll be listening to the oars,
while the quiet of the canyon fills my mind
And as we drift along
I'll hear that sweet sweet sound
as the deepest distant waters start to roar.....

*by Amy Stinchcomb, a guest on a Sheri Griffith Expeditions
row trip through Cataract at 45,000 cfs this June.*

Lost, Misplaced, or Simply Mistaken?

by Jim Knipmeyer

In his testimony in 1929, during the so-called River Bed Case, Walter E. Mendenhall told of a trip that he and his companions made in March and April of 1908 down the Colorado River from Moab, Utah, into Cataract Canyon. They were prospecting the gravel beds as far as they thought it would be safe to go and then still be able to get back upstream. Mendenhall testified that they "went down to what we called the eleventh rapid."

There, under a big shelving rock below the wash which caused the rapid, they found the remains of a camp, and on the underside of the rock, painted in white, an inscription. Mendenhall recalled that it read: "F. H. Wright passed here in 1878. Lost one boat in this rapid." He also added that afterwards he met this F. H. Wright in Prescott, Arizona, and that, like Mendenhall, he was a miner prospecting down the river.

Also in 1929, author, river runner, and movie-maker Clyde Eddy had a book published entitled Down the World's Most Dangerous River. It tells of his boating expedition down through the canyons of the lower Green and Colorado rivers during the summer of 1927. His party traveled from Greenriver, Utah, to Needles, Arizona, and in Cataract Canyon, somewhere between Miles 210 and 207, he described a similar inscription.

On page 81 Eddy tells how at one place he and guide John Galloway, while working their way back along the rocky shore, discovered what he called "the gruesome record of an otherwise unrecorded disaster that occurred on the river three decades before." Scratched on the surface of a flat rock overlooking the river were the words: "Colorado-Pacific Survey Expedition Wrecked Here July 19, 1897." Below the words were crude drawings of three boats, two of them shown broken in half, pinned against rocks in the river.

There is yet a third inscription found in Cataract Canyon at Mile 204.6, right bank, which is remarkably similar to the previous two above. Incised on the side of a large rock boulder overlooking what is sometimes called Capsize Rapid, is the following: "Col. Grand. Canyon. M. & Impt. Co. July. 22, 1891." To the right of the date is a drawing of a boat with "No. 1" printed on its stern and the word "Wrecked" beneath that. Directly below is a separate inscription reading: "G. M. Wright

Sep. 16. 1892."

The 1891 inscription was carved by members of the Colorado, Grand Canyon, Mining and Improvement Company, under the auspices of Denver capitalist James S. Best. The party was traveling in two boats from Greenriver, Utah, through Cataract, Glen, and Marble canyons to a reported silver mine near Bright Angel Creek in the Grand Canyon. Near the head of Mile Long Rapid they pinned their number one boat to a rock in mid-river and spent the next few days in an unsuccessful attempt to free it.

The above inscription has been noted and photographed many times up until the present. The first two, however, except for their respective mentions in 1929, have NOT been seen since. The similarity of all three inscriptions is undeniable, but is this merely coincidence or something else?

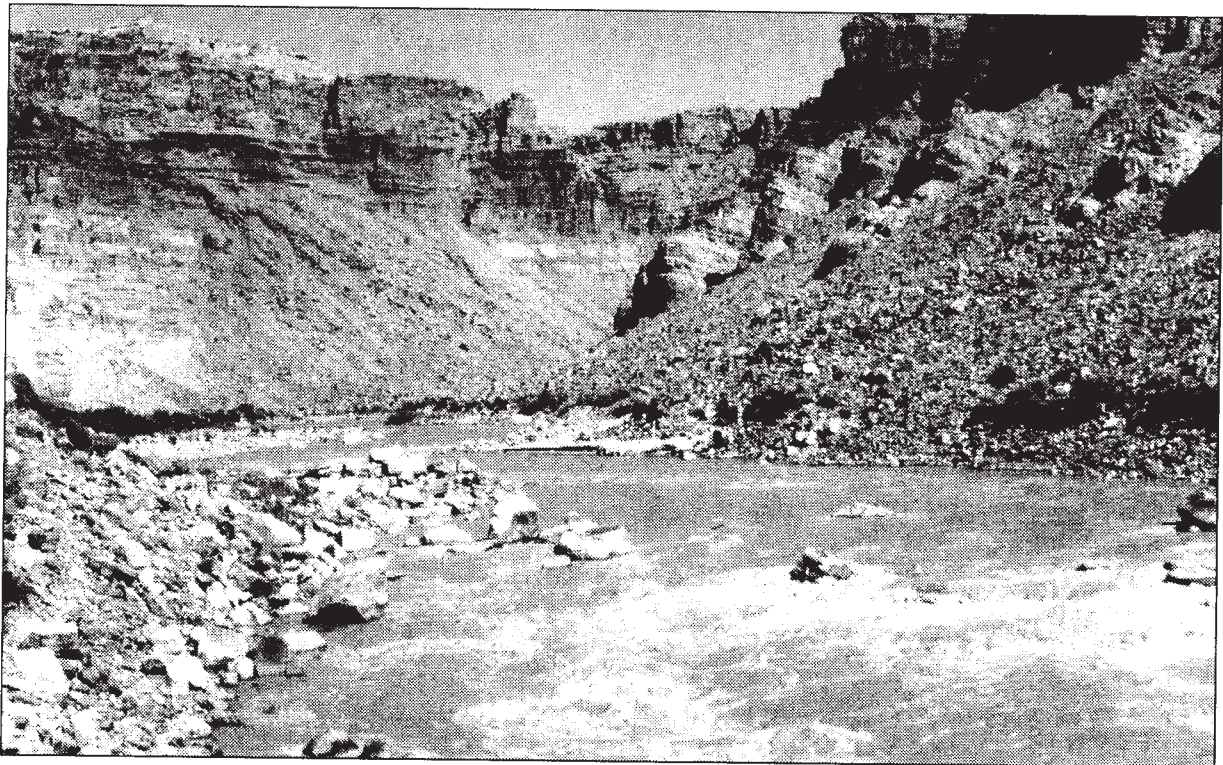
The "eleventh rapid," as reported by Walter E. Mendenhall, would be somewhere about Mile 207, depending on the counting of Cat's rapids during a particular stage of water. None of the rapids in the immediate area are rated as more than a 1 or a 2, and should have presented no obstacle to a boat. Interestingly, in his testimony Mendenhall also stated that after leaving their boats at the eleventh rapid they went afoot on down the river until "about three o'clock," and then returned to their boats. Capsize Rapid and the Best inscription is only a little over two miles downstream. Perhaps they saw the 1891 inscription and, relying on memory twenty-one years later, Mendenhall mistakenly recalled the exact wording and date of the inscription, as well as the nearby reference to a G. M. Wright.

The location of the inscription reported by Clyde Eddy would also put it in the general vicinity of the other two, though he is not very specific in the description in his book. Interestingly, in his daily diary kept on the river trip, Eddy never mentions such an inscription. John Galloway, as far as is known, did not keep an account of this 1927 trip, and Eddy conveniently states in his book, "We decided to say nothing about it to the other members of the party." The expedition camped that night at the head of Mile Long Rapid, near the Best inscription. Eddy could very easily have seen it and upon writing his book, for dramatic purposes or some other reason, changed the wording and location slightly.

So, are these three Cataract Canyon inscriptions in actuality one and the same, or are there two "lost" historic ones? Have these two been "misplaced" and "mistakenly" recorded either unintentionally or intentionally? I believe both of these latter suppositions to be the case; Mendenhall unintentionally and Eddy intentionally.



Rapid at Mile-207, Cataract Canyon. Photo by Jim Knipmeyer.



Head of "Capsize Rapid" (#15) from the Best inscription. Photo by Jim Knipmeyer.

The River Bed Case: The Decree

Transcribed by John Weisheit

The Confluence will continue to publish excerpts from the 1929 testimony of the River Bed Case. A few members have inquired what was the final decree made by Charles Warren, the Special Master of the U.S. Supreme Court which follows:

SUPREME COURT OF THE UNITED STATES.

No. 14 Original—October Term, 1930.

The United States of America, Complainant,

vs.

The State of Utah.

[May 18, 1931]

DECREE

This cause came on to be heard by this Court, upon the exceptions of the parties hereto, to the report of the Special Master.

Now, therefore, for the purpose of carrying into effect the conclusions of the Court, as stated in its opinion, dated April 13, 1931, IT IS ORDERED, ADJUDGED, AND DECREED that:

1. The Bill of Complaint, in so far as it relates to the Green River, is dismissed. The Green River, from a point where the river crosses the township line between townships 23 and 24 South, Range 17 East, Salt Lake Base and Meridian, to the confluence of the Grand (Colorado) River, is now and at all times, on and after January 4, 1896, has been, a navigable river, and the title to the bed thereof vested in the State of Utah upon its admission into the Union on January 4, 1896, except so far as into the Union on January the United States of America may theretofore have made grants thereof. The United States of America is forever enjoined from asserting any estate, right, title, or interest in and to said river bed, or any part thereof, adverse to the State of Utah, or its grantees; and from in any manner disturbing or interfering with the possession use, and enjoyment, thereof by the State of Utah, or its grantees.

2. The Bill of Complaint, in so far as it relates to the Grand (Colorado) River is dismissed. The Grand (Colorado) River, from a point located at the mouth of Castle Creek to the confluence of the Grand (Colorado) River with the Green River, is now and at all times on and after January 4, 1896, has been, a navigable stream, and title to the bed thereof vested in the State of Utah upon its admission into the Union on January 4, 1896, except so far as the United States of America may theretofore have made grants thereof. The United States of America is forever enjoined from asserting any estate right, title, or interest in and to said river bed, or any part thereof, adverse to the State of Utah or its, grantees, and from in any manner disturbing or interfering with the possession, use, and enjoyment thereof by the State of Utah or its grantees.

3. The Bill of Complaint, so far as it relates to the Colorado River, from the confluence of the Green River and the Grand (Colorado) River to Mile 212.15 above Lees Ferry, Arizona, and from Mile 176 above Lees Ferry, Arizona, to the Utah-Arizona Boundary Line is dismissed. Said stretches of said river and each of therein are now and at all times on and after January 4, 1896, have been navigable and title to the beds of said last-mentioned stretches of river and each of them vested in the State of Utah upon its admission into the Union on January 4, 1896, except so far as the United States of America, may theretofore have made grants thereof. The United States of America is forever enjoined from asserting any estate, right, title, or interest in and to said beds of said last-mentioned stretches of river or in or to any portion of said last-mentioned beds, or either of them, adverse to the State of Utah or its grantees, and from in any manner disturbing or interfering with the possession, use, and enjoyment thereof by the State of Utah or its grantees.

4. The Colorado River from Mile 212.15 above Lees Ferry, Arizona, to Mile 176 above Lees Ferry, Arizona, is not a navigable river, and the title to the bed of said last-mentioned stretch of river is vested in the United States of America, except as to lands heretofore granted, and the State of Utah is forever enjoined from asserting any estate, right, title, or interest in and to said bed of said last-mentioned stretch of river or in and to any part of said last-mentioned bed, adverse to the United States of America, or its grantees; and from in any manner disturbing or interfering with the possession, use, awl enjoyment thereof, by the United States of America, or its grantees.

5. The San Juan River, from the Mouth of Chinle Creek to the Confluence of the San Juan and Colorado Rivers, is not a navigable river, and the title to the river bed is vested in the United States of America, except as to lands heretofore granted, and the State of Utah is forever enjoined from asserting any estate, right, title, or interest in and to said river bed, or any part thereof, adverse to the United States of America, or its grantees; and *from in any* manner disturbing or interfering with the possession, use, and enjoyment thereof, by tile United States of America, or its grantees.

6. The United States of America shall in nowise be prevented from taking any such action in relation to said rivers or any of them, as may be necessary to protect and preserve the navigability of any navigable waters of the United States of America.

7. It is further adjudged and decreed by the Court that each party hereto pay its own costs and that each party hereto pay one-half of the expenses incurred by the Special Master, and also one-half of the amount to be fixed by the Court as the compensation of the Special Master.

A True Copy.

Test: [signed Charles E. Cropley]
Clerk, Supreme Court, U.S.

WEEDS

by Kara Dohrenwend

Noxious weeds, also called invasive exotic species, environmental weeds, or non-natives, are rapidly taking over vast areas of public lands. The simplest definition of a weed is "a plant out of place." If you have a garden you are probably familiar with weeds, their impact on the productivity of your garden, and how difficult it can be to get rid of them. Familiar range weeds include Russian thistle, cheat grass, tamarisk, Russian olive, and knapweed. Some of these plants have beautiful flowers and are often sold as landscaping plants.

Noxious weeds are those that are particularly tenacious and do not eventually stabilize within the native plant mosaic. Plants such as these have become so commonplace that many of us cannot recall that these plants haven't always grown here—and we accept them as "belonging". Jerry Asher, a weed specialist for the BLM in Oregon, estimates that every day noxious weeds are spreading over approximately 7 square miles (roughly twice the size of the incorporated parts of the City of Moab) of public lands in the United States; 25,000 square miles in a year!

The ability of noxious weeds to out compete native species is hardly a "natural" occurrence or an example of "nature doing its thing." Most of the noxious weed species have been introduced by people for ornamental plantings, erosion control, food, or by accident. Although it may appear impossible to do anything about weeds, the prospect of simply living with them is not benign. In the desert the side canyons and springs are particularly important areas where it is possible to thwart the progress of these weed species. In riparian areas the most commonly seen weeds are Russian olives and tamarisk. In some places, such as Desolation Canyon, there are so few of these plants that "it would be relatively easy to remove them before they take over larger areas." As Gary Cramer, a former weed control specialist at the University of Arizona, contends about simply living with weeds along streams and rivers: "This is down in the riparian areas—some of the most valuable areas of the southwest. Can we simply accept that the cottonwoods and the willows will be eliminated?"

Over time the cottonwood/willow riparian forest can vanish amongst the olive/tamarisk thickets, although in some places the willows do seem to be making a comeback. Russian olives and tamarisk support approximately one third of the bird species supported by native cottonwood/willow communities. Although some native species eat the olive fruit and may nest in olives or tamarisks, some birds that nest in tamarisk are being found to not reproduce well. For instance, in parts of southern Arizona the endangered southwest willow fly catcher is nesting in tamarisk trees where they have no alternative nesting sites, but researchers are finding their eggs are not hatching. They speculate this may kill the eggs because of the higher ambient temperature during the hot parts of the day in a

tamarisk thicket compared to the slightly cooler temperatures in a willow thicket.

In late February the Utah Weed Control Association held their annual conference in Moab. Weed control supervisors from every county in Utah, National Park Service and Bureau of Land Management representatives, Utah State University students and professors, and a few other non-governmental people attended the conference. Although the majority of the weed control methods discussed involved chemical treatments and biological controls the fact that so many people were talking about ways to address the problem was heartening. A common theme of the discussion was the need for more people to be involved in looking for, mapping, and removing weeds in the wild lands of the Colorado Plateau. With more hands at work more environmentally friendly methods might be able to be used to begin to remove them. In the next few issues of *The Confluence* there will be articles about specific weeds and the native plants they are replacing, and how, as river guides, you might be able to help locate and begin to remove these species before they spread further.

Sources:

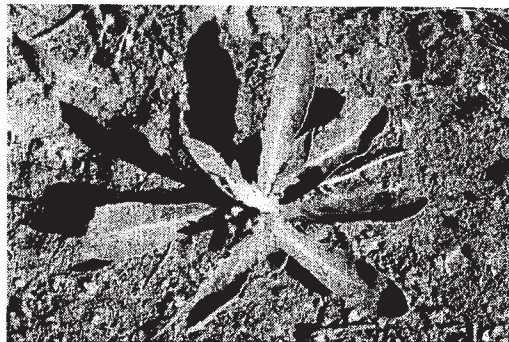
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San Juan and Colorado River Rowboat Expedition

June 10 - 18, 1952

by W. W. Mallory

Special Thanks to William Chenoweth

Foreword

The scientific aspect of this expedition is discussed in a separate report on the subject. This paper is a narrative account of the trip for the benefit of any who find it of interest.

A complete discussion of the San Juan River has been written by Miser in U.S.G.S. Water Supply Paper 538 available in the Geological Library.

A motion picture film documenting the trip is also on file in the library.

To Jack and Frank Frost

Whose experience in planning, organizing and conducting the expedition were evident at all times. Their knowledge of San Juan River navigation and their unconcerned but careful leadership earned them the respect and admiration of the party. The following account records the experiences and reactions of the writer, a first time San Juan tenderfoot, but the reader will realize that the sense of the dramatic emphasized in the text would probably amuse these old hands.

Recognition is also tended to John Duletsky, the other of the three boatmen, all of whose examples were constantly a guide for the "junior boatmen" in the little green boat. The untiring efforts in camp of the rest of the crew completed the success of the expedition.

W. W. Mallory, July 16, 1952

The Diary

Ordinarily the San Juan is a shallow river, but in 1952 the heavy April snows in the Rockies and the unusual warm spell in May nearly doubled its usual quota of June melt water. The Green, the upper Colorado, the Duchesne and the Gunnison Rivers were also in flood. The May melt water crisis in Salt Lake City and vicinity was part of this unusual weather cycle. The San Juan River of June 1952 was therefore a bigger, more powerful San Juan River than anyone on this expedition had run before.

A rowboat expedition down the San Juan and Colorado Rivers from Mexican Hat, southeast Utah, to Lees Ferry, northern Arizona, is conducted yearly by John A. and Frank Frost of Artesia, New Mexico. These men supply the boats, all the equipment and food for a fee. The expedition is open to the general public but is most often patronized by geologists and male vacationers seeking something out of the ordinary.

The interest to Phillips Petroleum Company in the area traversed lies in the Pennsylvanian reefs buried in the Hermosa limestone cliffs, which wall the San Juan River below Mexican Hat. The only possible access for viewing and studying these

reefs is by rowboat. In a day of airplanes and automobiles this is refreshing. Since reefs and associated rocks in the subsurface are significant to petroleum exploration, a better understanding was desired of these reefs, and of the Paradox subsurface basin of which they are a part.

The San Juan River is notorious for its fast current, rapid white water stretches, and imposing canyon walls. The trip is considered a feasible one though not without risks. Other river stretches in the Colorado Plateau region, notably Cataract Canyon and the Grand Canyon of the Colorado, are considered dangerous. The point of origin and destination for this expedition are not chosen at random—they are the only two places where the river is accessible. Once in the river at Mexican Hat you are committed to the entire trip to Lees Ferry. No up-river travel is possible since the speed of the current, its swirling rapids and boulder-strewn bed make motor craft unmanageable and rowing unthinkable. (A shallow-draught equipped with an airplane propeller and engine has been used for up-river navigation on the Colorado from Lees Ferry to Music Temple, but it has not been attempted on the San Juan.)

The group was scheduled to meet at Mexican Hat on June 10. I left Bartlesville Saturday morning, June 7, and flew to Salt Lake City. Sunday morning I picked up a car at the agency garage and drove over the Wasatch Range into the Book Cliff country and southward to Moab and Monticello where I spent the night. En route I looked at exposures of the Paradox member and took pictures. From Monticello to Mexican Hat is only 76 miles where the road is poor to bad, and crosses washes subject to flash flood. Comb Ridge, where the road is steep, should be taken easily. As the flexure marking the eastern edge of the Monument Upwarp, where Pennsylvanian and Permian rocks are exposed, it is of special geologic interest. I allowed all day Monday for this trip. A little south of Monticello the road climbs over the south toe of the Abajo Mountains, before dropping down into the valley of the San Juan. From this point in southern Utah there is a magnificent view across the central part of the Colorado Plateau. You can see 80 miles eastward to the San Juan Mountains of southwest Colorado, 70 miles southeast to Shiprock, New Mexico, 50 miles south to the Carrizo Mountains in northern Arizona, and 80 miles southwest to Navajo Mountain near the lower part of the river trip.

At the top of Comb Ridge I parked the car for a better look at the country and its geology and took some pictures. While I was there a man and his little girl pulled up in a truck with a little ten-foot metal boat in the back. I learned he was Bill Stone from Grand Junction, Colorado, and that he was on his way to Slickhorn Gulch to go fishing. I certainly didn't know it then but a few days later I myself was taking this boat down the river to Lees Ferry. I got to Mexican Hat around 1:00 and hung around the Indian trading post awaiting the rest of the party. The man who ran the post was Jim Hunt. We got to talking about this and that and I watched him trade with the Navajos that came in. Every so often a truckload of uranium ore, mined out of the Shinarump near Oljeto Post, rumbled across the bridge. This bridge is a little wooden suspension job and the ore trucks would make a sag in the bridge as they drove across. We learned at Lees Ferry that a few days after we left one of the trucks cracked the bridge. Another bridge

has been planned and is certainly now needed. During the afternoon I drove to the vantage point for viewing the Goosenecks and took some still pictures and movies. During the afternoon the party drifted in. Everybody was in high spirits so we rapidly became acquainted and had a big time over beer. We slept that night on the rocks next to the river near the boats which were ready for launching next morning.

The crew cooked breakfast at Mrs. Nevills' Mexican Hat Lodge. Frost had arranged previously for some of the cars to be driven to Lees Ferry by a New Mexico scoutmaster and some scouts who would arrive in Mexican Hat during the trip. I arranged with Fred Singleton, who measures the river for the government, to ferry mine. His price was \$25.00, but considering the population of Mexican Hat I was not in a position to quibble. U. S. Highway 89 crosses the Colorado River at Marble Canyon (one filling station and one motel) on the Navajo Bridge, a steel arch over the Marble Canyon, a deep gorge in the Kaibab limestone. A dirt road from Marble Canyon descends to the edge of the river on the Moenkopi outcrop six miles north at the mouth of the Paria River. This spot is Lees Ferry. The cars were to arrive here a day or so before our scheduled landing; they were to be parked and the keys hidden in prearranged spots.

Loading the boats took some time, and they were not launched until about 11:00. The personnel of the party is listed:

John A. Frost ("Jack", guide and organizer of the expedition),
Boatman.

Frank Frost ("Little Jack". "Skipper"), Boatman

John Duletsky (Quiet-water John), Boatman

Phil T., Hayes, Geologist, U.S.G.S., Crew

Paul Meadows, Crew

Bill Chenoweth, Wengerd's field assistant, Crew

Sherman Wengerd, Professor of Geology, University of New
Mexico

St. Clair P. Yates (S. P.) Independent operator.

Charles Waller, Rancher

Bud Eader, Waller's office manager

W. W. Mallory, Regional Exploration Geologist, Phillips
Petroleum Company

Elaine Frost, Jack's daughter

Jimmie Meadows, Paul's wife

Wayne Milheim

The geologists, Wengerd, Hayes, Chenoweth and Mallory were in the lead boat, with Frank Frost, skipper and boatman. At Mexican Hat the river flows in the basal Rico formation at the bottom of the Mexican Hat syncline, a minor feature on the Monument Upwarp. Downstream the rocks rise rapidly approaching the crest of the upwarp so that in Mendenhall Loop and the Goosenecks the river flows in a spectacular canyon of Hermosa limestone containing the reefs. Wengerd's presence was especially welcome since he was able to point out the reefs. Wengerd had made the trip two years before and is the first to have noticed them and written a paper on the subject. He was anxious this time to establish their trend. He was plotting them on the Geological Survey river map as we passed them. After glancing at this map a few times I noticed a curvilinear pattern made by the reefs and called this to his

attention. We were both pleased with Wengerd's success in spotting the reefs and achieving some sort of synthesis. To test our trend theory we predicted at future points in the river where they should appear and enough of them followed our expectations that we became convinced the trend analysis was valid. We landed to study those which were low enough to be accessible. The last reefs visible were on the bend of the river at Honaker Trail where we made our camp for the first night. Here the fishermen caught a string of catfish which we ate for dinner.

June 10 had given us our first taste of boating on the San Juan. A curious aspect is the sizzling noise on the bottom of the boat which is the result of sand and silt striking the bottom as it rolls along in the turbulent current. Riding over three to four foot "sand waves" was a novel experience and showed us that hope of staying dry during the trip was futile. The bailing can was often busy. Sand waves are large, almost stationary waves which occur in rivers carrying a heavy silt load. Pierce (Water Supply Paper 400 pp. 42-43) describes sand waves as follows: "... sand waves are not continuous but follow a rhythmic movement. Their appearance, as seen on the lower San Juan, is as follows: At one moment the stream is running smoothly for a distance of perhaps several hundred yards. Then suddenly a number of waves, usually from six to ten, appear. They reach their full size in a few seconds, flow for perhaps two or three minutes, then suddenly disappear. Often, for perhaps half a minute before disappearing, the crests of the waves go through a combing movement, accompanied by a roaring sound. On first appearance it seems that the wave forms occupy fixed positions, but by watching them closely it is seen that they move slowly upstream. In the narrow parts of the stream the waves may reach nearly the width of the river..."

June 11

At 7:00 next morning, a number of us climbed Honaker trail to The Horn, a prominence about half way up the exposed Hermosa section. We shoved off later, resuming our search for reefs. One questionable exposure was seen near mile 95, but from there on no evidence of reefing in the Hermosa was again apparent. We pulled into Johns Canyon at the foot of its fall of discordance and had lunch and a swim. We spent the afternoon running rapids down to Slickhorn Gulch where we were to camp for the second night. Jack planned to stop and survey Government Rapids, but Frank, the lead boatman, was drawn into them. By passing through we found out they were navigable.

At the point where Slickhorn Gulch joins the San Juan, Don Danvers of San Antonio was drilling a well perched on the side of the canyon. Danvers and Wengerd have been acquainted for some time. Upon learning of our projected expedition, Danvers planned to give us a reception and barbecue dinner. The reception was to be a surprise. A few miles up from Slickhorn Gulch we heard what sounded like dynamite blasts or peals of thunder. These continued at intervals and there was some conjecture as to whether Danvers was dynamiting the cliff to dam the river and make a waterfall for us to run. It turned out they were giant firecrackers. We in the lead boat were unable to make the landing at the upstream side of Slickhorn Gulch,

and in spite of all efforts we were pulled into Slickhorn Rapid. By extreme effort Frank was able to get us into the back eddy below the rapid and beach the boat. He was one spent boatman.

By previous arrangement Mike Keely in Wengerd's field wagon had taken the provisions for that part of the trip below Slickhorn to the well site. It was the task of the entire expedition to carry boxes full of canned goods down the steepest trail I've seen, for loading into the boats. I don't think this procedure will be repeated. After this task, my back started to give me fits and kept it up at intervals the rest of the trip. The work finished, a number of us went swimming *au naturel* in one of the clear pools in Slickhorn Gulch. The camp for the well had been set up on the bench formed at the top of the Rico. It is reached by car by a road branching off from the Goosenecks view road. From the camp another road winds down the face of the canyon wall to the well site about half way down to river level. This road was costly to build and is an experience to ride on. There are two attitudes to take while en route, some like me, preferred to look out the car window and make plans in case of brake failure; others concentrated on conversation, trusting to fate. The state plans to maintain the road even if the well is abandoned. The statement that the canyon is inaccessible between Mexican Hat and Lees Ferry is now not quite true, as a person can climb up from the river to the well site and can be met by pre-arrangement at this point. Gear is transported only by arduous labor, and launching a boat from this point is virtually impossible. Apparently Stone was unaware of this fact as his light boat had slipped off the truck in the attempt and was lying on its side against the canyon wall.

Danvers had flown in with his wife, his Colorado Springs secretary, his cook, her daughter and other help, accompanied by a grocery box full of Texas steaks, beer, whiskey, four pounds of golden guernsey butter and the latest stories. The menu consisted of barbecued steaks, potatoes, hot home-made rolls, iced tea and homemade pie. The party broke up around 11:00 and we picked our way down the trail by flashlight. I laid my bedroll on a sandbar near our boat with Frank Frost and Phil Hayes. The river rose about a foot during the night, floating the boat and causing it to tug, sometimes violently, on the painter. I was uneasy about the boat and couldn't get to sleep. I tried to pull it up on the beach without success. It was

too heavy and the waves too powerful. Sometime during the wee hours I saw Jack Frost checking our boat. He gave me the lugubrious news that John's boat had broken its tether and had floated downstream. Morale in the camp dropped next morning.

June 12

Keely claimed the lost boat would go clear to Lake Mead. Personally I doubted it. John was sent up to Danvers' camp to ask Wengerd if he would take several of the party back to Mexican Hat where they could pick up their cars and go home. John came back, pretty tired from the climb, to tell us that Danvers party had left. Bill Stone, however, was still there with Mike Keely and upon learning of our predicament, he offered us the use of his boat. The substitution of an untried boat about a third the size of the others in a trip of this sort was a matter which needed some thought. However, it was agreed to take Stone up on his offer. The younger men were asked to climb the trail and carry the boat down from the well. After reflecting a moment I decided that 35 years is old and contributed by watching from the river level. To my surprise and admiration they got it down, and without damage to the boat. After Frank's experience the previous day in Slickhorn Rapid the gear in the remaining boat, which landed upstream, was carried on foot to the downstream landing. The boat was then run through the rapid and pulled in at the lower landing. Frank Frost chose to row Bill Stone's little green boat and was joined by Mallory and Hayes. It was considered that the little green boat could take four boxes of groceries and three passengers, but it later became evident that this was too great a load. I eyed the heavy-laden boat and tossed in three kapok life preservers before shoving off.

The little green boat took the lead while the party watched to see how it would handle. After taking the sand waves and general turbulence of the next bend in the river, we decided it would be all right. But within the next three miles we hit a rough stretch (no worse than many, however) and the boat failed to respond adequately. It tossed about and filled two-thirds with water, barely keeping us afloat. After an exchange of glances which said: "Now what do we do?" Hayes had the presence to say, "Let's beach it and bail it". Before setting out again we put on the life jackets and headed for the point about a half-mile downstream where the other two boats had put in, presumably to wait for us. We arrived full of our adventures and noted a smug look on Jack Frost's face. When we finally hit a semicolon, Frost asked us to count the boats. It seems that here, about four miles below Slickhorn, the lost boat had become lodged between two rocks near shore. It was undamaged and ready for the rest of the trip. This was the second fortunate coincidence. (The first was the presence of Stone's boat at Slickhorn). We had about decided that the green boat could not be counted on. The groceries from the little boat were moved into the lost boat, the boatmen took over their respective places as before, and Hayes and Mallory were persuaded to take the little green boat downriver. Neither of us were anxious to do it after our other experiences but neither wanted to admit it. We drew straws to see who would row. From about here to the lunch stop we passed through a long stretch of fast water called



The town of Bluff as it appeared in 1921. Photo by Robert Allen from Water Supply Paper 538 by Hugh Miser. USGS photo.

Express Train Rapid. I was rowing, and a sorry job it was too. We had absorbed a few basic principles of river navigation but had no very specific ideas on the subject and less experience. We agreed that the oarsman was to make all decisions, but that the passenger was to advise, thereby relieving the oarsman of sole responsibility if he accepted the passengers advice. It was a case of the blind leading the blind but there was solace in companionship. Even without its third passenger, and its grocery load, the boat carried only about six to eight inches of freeboard at the stern. Because of its tiny size it inspired no confidence.

As we approached sand waves four to six feet high and spaced closer than the length of the boat, we found, however, that it bounced like a cork over those large waves except when they reached instability and began to break. In this case they were dangerous because the white water rolling back upstream would not support a load and readily filled the boat. We learned later to distinguish the top of a partially submerged rock far downstream with its dangerous water hole from sand waves or a cross channel chop. The first day, however, we were suckers for everything the river had to throw at us. In one instance we had become overconfident about our success of the last three or four minutes. We were overtaking one of the other boats, having picked up a faster current, and made some flip remark about requesting permission to play through. At this instant the cause of the current became evident and the boat dived sickeningly about three feet over a small waterfall into the hole beyond a submerged rock (The expressions on faces were described later as choice). Waves of cold water filled the boat and slapped us around. Our standard bailing equipment was a three gallon water bucket. We needed it. After that we watched for rocks. Another three or four minutes free for bailing again gave us confidence until we discovered we were being sucked into what we later called a cross channel chop. This feature is composed of two intersecting sets of sand waves caused by a narrowing of the channel on both sides. We eyed the small maelstrom of waves coming at us from every direction, roaring like a bull elephant, and cringed. It was too late to do anything. Phil shouted suggestions for action which I ignored feeling full well there was nothing I could do as we zoomed into the vortex of the waves. The boat slid through practically on even keel, waves closing all around us and we came through like a shot without shipping a drop. From then on, cross channel chops were our dish. Apparently the interference pattern along the center line is so spaced that the boat rides neatly on the nodal points. Episode followed episode of this sort through the rough water of Express Train Rapid until we reached the lunch stop pretty exhausted.

Hayes took the oars after lunch. The river was quieter. In Express Train Rapid the river flows in the Rico and Halgaito, a series of redbeds and limes. The current readily cuts into these rocks causing the overlying Cedar Mesa sandstone to break off and fall into the river at a rate faster than the river can carry it away. Below the lunch stop a gentle west dip brings the Cedar Mesa down to river level. The channel here is fast but relatively clean and smooth. About this time my stomach began sending up distress signals but not so strongly that I couldn't enjoy the opportunity to view scenery. About midafternoon Jack signaled a landing at a small side canyon in

the Cedar Mesa. Hayes and Yates took a swim in the clear plunge pool, while Milheim skirted the fall somehow and climbed to the upper level where he reported another plunge pool. During his descent I was certain he was going to slip off the canyon side and drop 40-50 feet.

Toward latter afternoon we approached a point at the end of a straight stretch two and a half miles long (at mile 61) where the river makes a right angle turn. We had been woolgathering and were unprepared for the ensuing commotion. It was too late to row out of the accelerating current toward the undercut bank. The other boats had passed out of sight leaving us with a feeling of being abandoned. With an increasing sense of alarm, we found ourselves being drawn by the current directly into the sidewall of the canyon. We had the feeling of sitting astride a 16-inch shell aimed directly at an RCA Building of Cedar Mesa sandstone, armed only with a pair of flyswatters. At the point where the current impinged on the far wall, a set of sand waves roared with ever increasing volume. Its noise a mile upstream should have warned us. The bow struck the far wall with a blow gentler than we expected and plunged into six foot sand waves that looked like the gaping mouths of whales. We were tossed about at the mercy of the current and acquired a boat full of water before we came out of the turn. I bailed full steam and had the boat in fair shape as we swung into another right angle turn which effectively filled it up again. Two miles down the next straight stretch the other boats had pulled in for the evening camp. We were ready, having had our fill of the green boat and the San Juan River in general. By this time my stomach was tapping out S.O.S.'s; so I hit the sack upon landing and remained until morning. From time to time I wondered "Is this trip necessary?"

June 13

Next morning I felt O.K. but had no intention of tempting fate. Charley Waller and Paul Meadows said they would like to take a crack at the little green boat as we were having so much fun. Hayes and Mallory refrained from demurring. I found a place in Jack Frost's boat with S. P. Yates and Bud Eader. We passed rapidly out of the shallowing canyon where the Cedar Mesa sandstone dips gently west beneath the Organ Rock member of the Cutler. In this area the river flows on the soft redbeds of the Organ Rock and the banks are low, giving us a magnificent view south of the west margin of Monument Valley. Organ Rock was visible about 12 miles southeast. Monitor Butte loomed up ahead capping the Mesozoic sequence. This open area is known as Piute Farms from some abandoned Indian settlements. We expected quiet water but sand waves loomed up here and there. Our boat was well ahead of the others so Jack headed for a whirlpool to allow the others to catch up. While we revolved in slow circles the other boats caught up and passed us. It was curious to note that while we turned smoothly in our eddy, the other boats passed us at arm's length bucking like runaway horses. I was taking movies of their passage. With our increasing rate of revolution it rapidly became more difficult to keep the camera oriented and I nearly developed a case of spiral neck. As the last boat went by us there was no question that we were in a first rate whirlpool. Revolution had nearly become rotation on an axis and was approaching a dizzy pace. While I was unfeelingly

getting pictures, Jack was frantically rowing to get out of this new monster dreamed up by the river. The task was accomplished by applying four hands to the oars and stroking in rhythm.

We stopped at Clay Gulch near mile 50 for a boatmen's rest and took off around a wide bend flanking Monitor Butte. The boat in third position rowed by "Quiet Water" John Duletsky had fallen a mile or so behind. Jack stopped opposite Copper Canyon to let him catch up. "Quiet Water" John had lived up to his name and was aground about a mile and a half upstream on what is probably the biggest sand bar in the river. By peering through the finder of my camera in reverse, which enlarged the view slightly, I could watch the poor guys tugging and pushing the boat for fifteen or twenty minutes. The term sand bar is misleading because the material is more nearly quicksand and generally swallows a man up to his thighs or waist in short order. Pushing a heavy boat in this stuff is work. If it isn't one thing it's another on the San Juan.

At Copper Canyon I investigated the condition of my camera. Earlier in the morning I was taking pictures of sand waves when one broke into my face and splashed over the camera. Shortly thereafter the winding knobs jammed. There seemed nothing left to do but remove the back of the camera and investigate the trouble. I contemplated doing it at night, but from past experience in attempting to repair devices in the dark I decided to sacrifice the pictures already on the role and investigate the trouble. The repair job was simple. The film had become wet and the emulsion had served as an effective glue to the guide flanges inside the camera. I pried the film loose, dried it, cleaned the flanges, replaced the back and it was good as new. I shed a tear over my ten lost pictures and looked ahead to future shots.

The gentle west dip on the west flank of the Monument upwarp changes at the Nokai structure to about 35° east which brings the Cedar Mesa sandstone up to river level at the crest of the structure. We lunched at Nokai Creek, a tributary on the east flank of Nokai. The steep east and gentle west limbs are typical of structures in this region. Nokai and Rapplee anticline, east of Mexican Hat, are the most spectacular. As we passed through the structure we looked for a possible water line, layed by Skelly, for its well a mile and three-quarters north, but saw no sign of one. Passing out of the west flank of Nokai the river banks change locally from canyon to open valley as one passes from hard to soft rocks. It was in this stretch that we hit a series of sand waves which made Jack's mouth drop open. He said they were the biggest he'd ever seen. They were, perhaps, about eight feet from trough to crest.

The old Zahn gold mining camp is in the Organ Rock lowland. Downstream where the Chinle descends toward the river, the Spencer camp, consisting of an old boiler, is visible. Below Spencer camp the Chinle plain narrows quickly into the Wingate, back around a bend. Hayes and Milheim scaled the sides of the canyon and brought back the news that a similar fall in the Navajo discouraged further exploration. We continued around Great Bend, which by airline is only five miles from Colorado River, and camped on a sandbar at mile 30.5. S. P. Yates had lost his hat this morning and had got too much sun. He crawled into the sack for the night.

June 14

Next morning Hayes and Mallory took another crack at the little green boat. We were briefed carefully by Jack Frost who emphasized that the party would land about eight miles below the camp site to survey Piute Rapid and to decide whether it could be run or should be lined. In lining a boat around a rapid the occupants leave the boat and pick their way along the shore easing the boats along the rapid the best way possible. Hayes took the oars in spite of his feeling green around the gills. Our course was smooth for some time. At this passage we were drawn into a swift current, which took us over a rock and threw us broadside into the hole beyond. The situation developed so quickly that it was upon us before we realized it. The boat was rocked sideways so roughly that Hayes lost hold of both oars and was tossed around the boat. The passenger under such circumstances has two free hands with which to hold on to the gunwales, but the oarsman is otherwise occupied. Hayes was unable to control the boat properly because of the load of water shipped. We made shore and bailed her out. Hayes again resumed rowing but had to work so constantly, and with such exertion, that he got pretty tired. His bad stomach wasn't helping him any either. I took over the oars and immediately prepared to run a series of sand waves. These struck so violently that I was thrown to the deck on my back while the oars tossed about. Hayes was drenched from head to foot and grabbed me to keep me from rolling over the side. We knew then why the Frosts used foot-long pins in their oarlocks. In spite of our rough treatment we never lost an oar. We also appreciated why the oars were metal sheathed at the locks. Even hardwood oars, unprotected, would have been worn dangerously thin by friction on a trip like this one. Hayes bailed us out and we landed to survey Piute Rapid near mile 22. There might be trouble here.

Faulting was visible at this point. This canyon wall became complex and we could look into a wide side valley. Presence of the rapid at this point was probably caused directly or indirectly by structure. The open area had attracted early settlers because at the point where we viewed the rapid there were a number of pictographs etched on the rocks--stick figures of people, horses, spirals and a possible conjugal pair. The Frosts outlined a course through the rapid choosing the middle of three rock strewn channels at the start; then, passing to the right of a large rock around the bend, we should have been out of trouble. Back at the boats we were again briefed and a series of signals reviewed. I didn't think the rapid looked too bad but the extensive preparation lent a serious air which could not be whistled away.

The first job was to row cross-channel as fast as possible to reach mid-river before the current could take us down the side channel. Upstream, from the channel we were aiming for, the current braided and intertwined in such complex fashion that keeping the boat on a given heading was a perplexing problem. We were heading first this way and then that, the current growing even louder and faster, and the booming of the rapid increasing with an ominous tone. We made the middle channel although we bashed our stern into the emergent rock which divided it from the left channel. We bounced successfully over two other rocks, struck a number of submerged deeper ones with our oars and swung round and round in giddy fashion

through the fast stretch of white water. At this point the gradient of the river became so obvious to the eye that it looked like a highway with a downhill slope. Controlling a boat is difficult at such speed when obstacles are so numerous. We were approaching the middle of the S-curve and were congratulating ourselves out loud when Hayes noted two large submerged rocks not far ahead. He advised avoiding them and I headed the bow toward left bank. At this point we saw that Jack was also in the left channel, a fact which strengthened our decision to leave our present channel. The other two boats had disappeared around the bend. We made Jack's channel and from then on things began to happen more rapidly than they could be handled. Jack, we later learned, had relaxed for a moment and had unintentionally been drawn into the wrong channel. Ahead of him were two rocks standing out of water a few feet apart. He struck the left one broadside, cracking the boat, but we managed to push off into the torrent between the two. This delay narrowed the gap between us. We were able to get our boat through the narrow passage, but fleeting relief was ahead. The raceway on which we rode was bearing us down upon him at such a rate that only one or two oar strokes could be taken before we would be upon him. While the occupants of Jack's boat tried to free it from the rock, the current which bore down upon them was capsizing his boat and pinning it against the rock. I plowed into them head on, riding up over their boat and effectively sinking it. With quick presence of mind Jack stood on his boat, lifted our bow with a mighty effort, and pushed it into the raceway on left side of the rock. The occupants of his boat had meanwhile climbed up on the rock for safety. The current took us away so fast that Jack was dragged from his perch out into the torrent. He grabbed an oar, then the side of the boat, while I managed to beach it on a gravel bar downstream.

This was quite a situation. Most of us were enjoying it, but Jack was not too happy considering that the personnel and equipment involved were his responsibility. A lunch stop had been planned below the rapid and Hayes went down to find the other boats and bring back a long line, four new oars and the rest of the men to help us out. After pulling in to shore below the rapid, boats 1 and 2 were concerned with our failure to round the bend. They were convinced of some mishap when they saw several cans of coffee floating down the river. With Hayes downstream for help and Jack's passengers stranded in midstream, Jack and I were the only ones free to work on the situation. The castaways were too far from shore to be reached by the line on my boat and had to be content to wait. Jack was anxious to save his boat before the river should dash it apart or take it away downstream. The men on the rock worked the boat loose and the current took it, barely awash, down to where Jack was standing knee-deep in water. Jack caught it while I swam down to help. Between us we beached it on a gravel bar with the aid of a willow sprout about three feet tall. When help arrived we were able to right the boat, bail it out, unload it, beach it, and dry it and its equipment. The inhabitants of the rock were rescued when the boat had been secured. A rope was made fast upstream from the rock and the free end tossed down on a life jacket. One by one the men put on the jacket, tied the rope around their waists and jumped into the river.

We ate lunch down by the two other boats and took a long

and welcome siesta. Hayes, who had been feeling bad all day, slumped on a sand bank. I asked him how he felt, and he said in a dopey voice that all he could see was muddy, swirling water. I knew what he meant because when I closed my eyes all I could see was muddy swirling water. So I kept them open and looked at Baker's Bulletin 865 with Bill Chenoweth and straightened out the Wingate-Kayenta-Navajo section. This of course was just sheer bravado. Yates and Waller were passengers in the overturned boat and all of their gear was soaked. The bedrolls, like everything else, were spread out on snaggy driftwood. Equipment casualties included the loss of Jack's light meter, my geology pick and 5 cans of coffee. Waller's movie camera and films, and Jack's and Yates's still cameras, were in pretty bad shape. Yates had stocked up on cigarettes, and his 20 or so packs lined up on a log to dry, steaming inside their cellophane wrappers, were a sorry sight. Spirits were droopy after this experience but I rather enjoyed it.

The hot wind blowing up the canyon dried out all the gear by late afternoon; so we loaded the boat and ran it down to the lower station. We took a vote whether to camp or keep going. It was about 5:00 and some of us were for camping on the spot. The majority were tired of this location, however, and wanted to go on. We camped about two and a half miles downstream on a nice flat bar at a bend of the river. This was the fifth night or half way, so Waller and I bathed in the river (with soap to make it different), and put on clean khakis. They felt pretty good. Frost's food was excellent and he tossed in some special treats that night. We sat around talking about the wreck.

June 15

Sunday morning we had two bad rapids to take. The majority were in favor of lining them. Mallory and Waller took the little boat to Syncline Rapid. Jack found a little side channel just barely wide enough for the boats and we led them through without incident except hard labor. A gander at Syncline Rapid showed that it would have been foolhardy to run it. Three and a half miles further down was Thirteen-foot Rapid, about a quarter mile long and extending from bank to bank. In order to avoid being swept into the rapid while approaching it the boatmen hugged the left bank and, of necessity, rowed into the whirlpool on the left side. The force of the whirl was so strong that making headway against the current by rowing became impossible. The boats had to be dragged by walking in water, sometimes chest deep, along a weed-grown sandy bank. Jack found a channel and we took one boat down as a test. A rock-and-boulder dam forced us to lift the boats bodily over the dam and down a small rapid into fast water. Once the first boat was through we were assured at least of the possibility of by-passing the rapid although it took most of the entire party to struggle with each boat.

There are structural complications at this rapid also, which locally bring the Chinle down to river level. Below the rapid the channel is in the Wingate and it apparently follows the dip of the formation. The water surface maintained a markedly visible slope, giving the feeling of sliding down a hill, but the channel was fairly clean as in the Cedar Mesa stretch of June 12.

We lunched at a small side canyon at about mile 8 where the boatmen carried the chow up into a cool, green dell

complete with clear pools of flowing water.

After lunch the river continued fast but for the first time began to change in character, decreasing in turbulence as it approached its junction with the Colorado at mile zero. Around 5:00 we merged with the Colorado River, which moved with about the same speed as the San Juan. Though roiling with sediment it was smooth and wide. Passing so momentous a landmark with such ease and quiet seemed strange. For no good reason I rather expected fireworks, brass bands, flashing neon signs. Naturally, my camera was in the other boat at the same time.

It soon became apparent that a different approach to river strategy was necessary here. The Colorado was too broad to allow rapid switching from side to side. What with braiding currents and the speed of the river it would take an oarsman a long time to make the far bank. He would probably strike a cross channel current at the next bend before effecting a landing. It would be necessary from now on to plan each stop ahead so the boatman could be sure to be on the proper side of the river. To miss a stop would be to miss a meal, or even dinner, bed and breakfast.

On the Colorado we found waves of moderate size and moderate back eddies for great exchanged, oversize sand waves, whirlpools, which could not be conquered but rather had to be outwitted. In making the landing at Music Temple, Jack left an outpost far enough upstream to warn those of us in the last two boats of the impending landing. We camped that night at the same spot used by Powell in his survey of 1871. As the boats were unloaded a revolting stench came from one of the pails. The fishermen who had become a well knit group, had been harboring a load of warm, dead worms. Public opinion overwhelmed them and consequently worms, bucket and all were consigned to the river.

At dusk everybody but Bud Eader (who may have been feeling ill) walked back to the canyon wall to look at Music

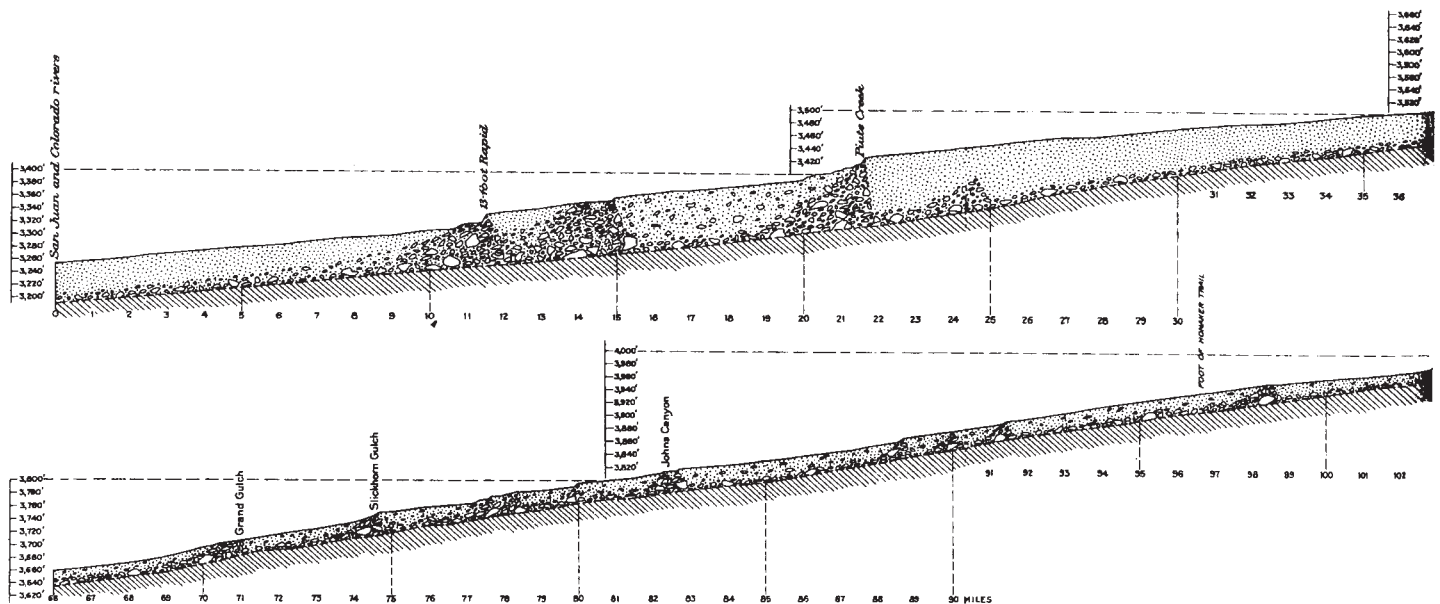
Temple, named by Powell in 1871 on his trip. The place is a theater of Navajo sandstone eroded by the retreat of the fall in the tributary creek. The floor is developed on the Kayenta sandstone and the theater itself is a dome in the Navajo with a thin slit at the top and downstream outlet. Even in daytime the Temple is gloomy. Resonance is remarkable. A stone tossed into the clean pool at the base of the fall sounds strangely loud in the sepulchral silence. We lay around on the sand while Jack tried to start us singing. Everybody was bashful about it and nobody would sing up loud enough to get going. Eventually the embarrassment wore off and we ran through the familiar old numbers. Once we got started we did right well. The resonance of the place made it sound like a tile bath and that always brings out the best in the worst singers. The favorite was "Row, Row Your Boat" which Jimmie Meadows organized to a nice degree, and we sounded pretty good. When we ran out of songs, quiet settled over Music Temple ruffled only by occasional remarks and laughter. Then Johnny Duletsky broke out his harmonica and played several pieces to a hushed and receptive audience. John's rendition was top-notch. The effect in this cathedral of the western wilderness was moving.

Coming back from Music Temple we made a remarkable sight looking back from the head of the line. All that could be seen was a narrow cleft forming a deep canyon with a file of moving lights winding over the rocky trail.

The main camp in Aztec canyon was just off the swollen Colorado under an overhanging Navajo sandstone cliff on the undercut bank of the incised meander. Hayes, Edder and I had ferried our gear across to a wide rock platform on the other side of the creek. Again at bedtime John played his harmonica, very softly. The most comfortable concert I can remember.

Next morning we went back again to look at Powell's name carved in the rock and that of others in his party. We signed a sheet of paper and left it in the tin box which serves as a

U. S. GEOLOGICAL SURVEY



Profile of San Juan River between Colorado River and mouth of Chinle Creek. Shows possible depth to bedrock and character and inferred distribution of the canyon fill under bed of river. From USGS WSP 538 by Hugh Miser, 1924.

register for the occasional visitors to this lonely spot. This box contains a small notebook and several miscellaneous pieces of paper listing the personnel of previous boat parties. Most of these had been brought down the river by Norman Nevills. (See National Geographic Magazine, August 1947, pp. 149-172.) Their accounts of the trip verified our suspicion that at any season it is an experience. John Duletsky added the history of the Frost expedition of June 1952 for posterity.

June 16

This day was heralded as "Dry-Foot Day". From morning till night on the San Juan we had been partially or totally wet. The high spot of each day was the chance to put on dry shoes at supper. To have dry feet all day was downright luxurious.

Phil Hayes and I took the little green boat after a briefing from Jack. We were to take care to stay on the left bank and watch the back eddy at Mystery Canyon. By and large, navigating the Colorado was a matter of drifting with the current although we had to stay alert in order to observe rocks, whirlpools and the activities of the boats ahead. At Mystery Canyon a large whirl rotating counter-clockwise was the first of several we were to encounter in making a landing. On the right bank the river flowed fast and rough; on the left side the eddy was half the river in diameter. Against the left bank it flowed upstream and then turned out toward the center of the river. On its midstream margin it paralleled the main current. After watching the other boats pick their way warily through these currents we found that the trick is to row into the top of the whirl and not be swept into the main current. The critical area is the point where the whirl divides from the main current and begins its turn to reverse flow. At this point it seems a matter of nip and tuck at any given moment just which current one is in. After getting by this point it is relatively easy to follow the whirlpool around its lower perimeter and back up along the left bank up to the mouth of the tiny tributary

canyon.

Mystery Canyon is typical of the many awesome canyons of Glen Canyon. Sheer walls of Navajo sandstone estimated 1000 feet high rise so close together that sometimes there is no room for the outstretched oars of a boat. Furthermore this canyon follows the small meander pattern developed by a meadow stream. Even after you've seen it, you don't believe it. We rowed around a triple S-curve several hundred yards to the upstream end of slack water. At one point a fallen slab made a tunnel so narrow that, as we passed through, the oars were shipped and a man standing in the bow guided the boat through with his hands.

We walked up to the waterfall passing highly weathered ancient steps cut into the rock face leading up to nowhere. The water in the plunge pool was clear and ice cold, but made for swimming.

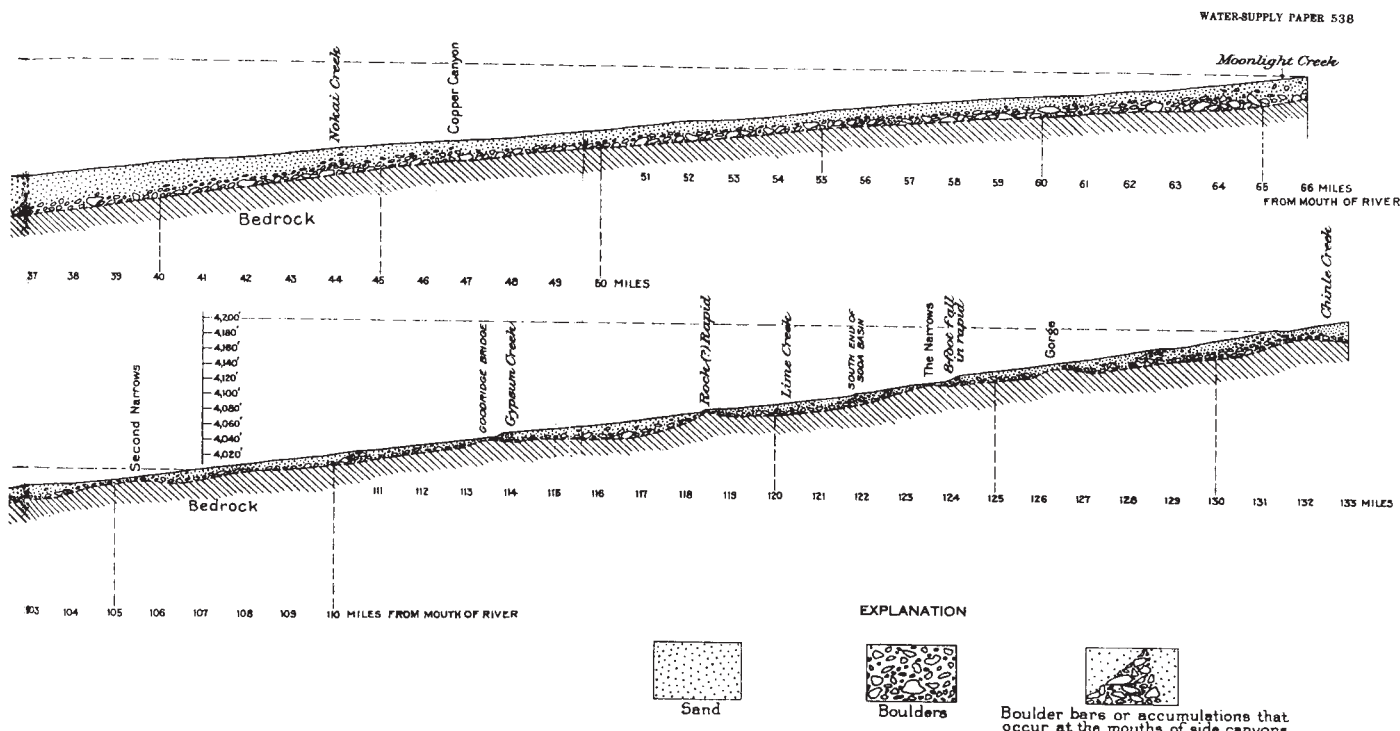
The landing at Aztec or Forbidding Canyon, where we made evening camp, was complicated by a monster whirlpool, perhaps two-thirds of a mile long. It had little subwhirls in it, and navigation was difficult.

June 17

Frost's feature attraction is a day-long hike up Aztec and Bridge Canyon to Rainbow Bridge. I like scenery as well as the next man but six miles up a rocky canyon is a rough haul. The trip was, of course, well worth the effort but by dinner time the majority feeling was to get back on the river and head for Lees Ferry. Aztec Canyon, so named because of the Indian ruins in which we camped, is 70 miles above the destination.

June 18

We shoved off at 8:15 with Lees Ferry in mind. The strenuous episodes of the trip were beginning to tell. The pleasure of drifting with the current was welcome. We were free from the necessity of fencing with whirlpools and free



from the rigors of the San Juan. We watched the Kaiparowits Plateau approach and recede. We saw the Crossing of the Fathers where in 1776 Spanish Padres found a way west. And we counted the miles gliding by. We figured our speed as about eight knots and estimated our arrival at Lees Ferry at around 6:00.

Jack put in for a landing at lunch time, but his crew mutinied. By silent agreement all the other boats continued in midstream. Left far behind, Jack finally shoved off. We rowed around exchanging canned juice, crackers, peanut butter, jam, Spam and cups. I parked in a small convenient eddy under a beetling Navajo precipice to close the gap between Jack's boat and hand them a lunch box. By afternoon the wind became a parching blast. It was blowing upstream, presumably flowing uphill from the Moenkopi plateau onto which Glen Canyon opens at Lees Ferry. I took a dip in the cold river water and was cooled to a teeth-chattering state by the desert wind. Around five o'clock the boats had drifted far apart. Boats 1 and 2 below us were out of sight as also was "Quiet Water" John Duletsky behind us. Bill Chenoweth in boat 2 had the map. It was apparent by the hour that we were approaching the end of Glen Canyon, and we were being careful not to miss the landing. We had been warned of the currents at Lees Ferry and were hugging the right bank, not knowing where the canyon would end. Around a sharp bend the attitude of the Navajo took on a peculiar aspect. The river here flows for a space parallel to the monocline which terminates the plateau into which Glen Canyon is cut. The landing was imminent. Jack appeared suddenly as we round a bend. He signaled a rendezvous near the base of the Navajo and briefed us on landing plans.

By the behavior of the boatmen ahead we could see that the river was especially treacherous on the dipping Triassic. We were frankly nervous at the possibility of being taken by the current in to Marble Canyon from which there is no egress. We thought of comments about Sockdologer Rapid and Lava Falls in Grand Canyon.

Frank's boat took the lead and for some reason headed into mid-channel instead of hugging right bank. Jack hollered at him but to no avail. We in middle position passed the word and pointed right. He appeared to catch on and started rowing toward the bank. He must have realized his predicament at this point because his oars looked like a Mixmaster in high gear. The rest of us picked our way through whirls and shoals and landed within a stone's throw of the cars. The landing spot was at the point where the road from Marble Canyon Lodge leads down to the river, the first road we'd seen since Mexican Hat. This point was just above the rapid leading into Marble Canyon.

The boats were hastily unloaded and lifted into the trailers while the group was still intact. The boatmen were exhausted. Instead of feeling elated at having successfully completed the trip, the group was edgy and strained. After the confusion of mounting the boats, the gang assembled at Marble Canyon Lodge and streaked off to a steak dinner at Cliff Dweller Cafe. The tension of the landing was forgotten over beer and all tongues wagged at once.

The End

Britt Ready and the Vegas Cadillacs

By Earl Perry

"One critically important aspect of our wilderness sojourns is to hold space for the Wild Man," said the men's council wilderness retreat co-facilitator.

"What?" A gray, balding ex-boatman.

"You know. To establish a place of safety so the personal unique Wild Man in each of us can manifest. It's important in male development, and our culture just doesn't do much at all for the Wild Man. It puts us at terrible risk as a society, you know."

"You know, son, I don't reckon I think much a this. I used to work with the Wild Man. Down in Grand Canyon. He was 5'9" tall, and he weighed 200 pounds. He had a merry look, white straw cowboy hat, real nice-looking guy. Except when he got drunk, an' then he looked snake-mean. He could take a 20-horse Merc longshaft in each hand and walk up the beach curling them. Alternately. I saw him do it."

"A what?"

"An outboard motor. We used them on the pontoon rafts we were running down there. Weighs about 125 pounds."

"Well, I didn't mean some *person*. I meant our symbolic, *internal* Wild Man."

"Well, I meant a symbolic, *internal* Wild Man who went *external* pretty goddam often, and his name was Britt Ready. He was in his mid-20s; an older guy. We were about 19. Now the thing about the Wild Man, as I see it, son, you got it reversed. You want to hold a safe space for the Wild Man to manifest, an' I don't. I think you're nuts. You want him to wait his turn until you pass him the Talking Stick. He comes out, he says 'Woof,' he goes back in, curls around 3 times, and goes back to sleep. You want the Wild Man to play nice, and, when I worked with the Wild Man, he sure didn't. Except when he was sober; then he'd give you his last cigarette if you'd run out. But when he was drunk, he was an operations problem and a management problem."

"Well, it seems to me," said the men's council wilderness retreat co-facilitator, "That unless we hold a cultural space for the Wild Man avatar, we shortchange our maleness, we imperil the core of our manhood, and we run the risk of repression. Socially speaking, we need to merge the Wild Man and the Warrior."

"Well, Ol' Britt Ready had done a masterful job of that, and it didn't seem so social to *me*. Take that time he walked up behind this giant cowboy in a bar, probably close to 6'6", and tapped him on the shoulder, and started his punch from right down around his knees. And by the time that guy got his face turned around, Ol' Ready's fist had accelerated right up to speed. Broke his jaw in 5 places. Put him in the hospital for 3 months. No warning, no nothing, just wake up in the hospital with the beginnings of a morphine habit and no solid food for 3 months."

"What it seemed to me, son, the Wild Man and the Warrior were both miscible in whiskey, and you had to hold a safe space for *you* when you worked with them. This business about holding a safe space for the Wild Man, he doesn't like it

safe, and he doesn't confine real well. What I was saying, from an operations perspective, you work with the Wild Man, you have to have immediate access to a heavy-caliber pistol. And from a management perspective, you have to be the only guy he doesn't want to receive death from."

"Oh, I see. You think the Wild Man exemplifies the Death Wish. And of course that's exactly where you're wrong. He's what connects us to the elemental life forces. *Life* forces. Not death. And as for that stuff about guns, the true Warrior has mastered and channeled his violence. He's focussed it and directed it into life-giving, healing directions."

"Son, this is jist crazy. True Warrior, false Warrior; all that matters is whichever Warrior you're facing right here, right now. It's not a society problem, it's a *you* problem, then. You can distribute violence, you can broadcast it, but when you receive it, it's always real personal. I tell you what. Let's just assume that there's such a thing as your basic virtual talking stick. Let's just postulate that, ok?"

"A virtual talking stick? I'm not sure I see the point. I could go get our *real* talking stick, if you want."

"Nope. A virtual talking stick. Got it?"

"Yes."

"No. You don't got it, I got it. The virtual talking stick. I'm talking now. I keep talking until you get the virtual talking stick. Right?"

"Oh, I see."

"Yup. I'm telling a story."

The men's council wilderness retreat co-facilitator settled himself. Lots of men had shared with him. He had been to story-telling conferences. You want audience, he could *do* audience.

"We'd mostly finished a Grand Canyon trip, had a lot of trouble with low water from the head of Hance Rapids to past Crystal, and reached Separation Canyon with an 8-boat trip, and there wasn't enough gas to get across Lake Mead. They gave Britt Ready the gas that could be spared, and of course some whiskey and plenty of money, and sent him off down the lake all night, running an empty. The next day we lashed up the remaining 7 boats, making a barge 63 feet wide and 33 feet long. As the most junior members on the crew, Leachman and I got to run it. All the boatmen fired up their engines and left 'em roaring and headed for the duffel pile and the whiskey."

"Now this was the era when whitewater training was Ted Hatch saying "Soap Creek Rapid's down here a ways. See you in camp." Or Earl Staley: "God dammit, Perry, she'll turn if you turn her." There were two ways to run a largebarge like that one: try to steer with the center motor, or try to steer by varying the speeds of the outer motors. That's what Mark and I did, and in a kind of ponderous way, a stately way, we turned her all right. We steered that largebarge into the Vishnu Schist cliff on the right at full speed. There it stopped, but like a 17-year-old trying to lose his virginity with a willing unready woman, it just kept battering and battering against that cliff. Whole lot of irritated drunk boatmen having to run back, shut down them Mercury outboards. Had to interrupt their drinking for a few minutes, and they weren't happy about it. So the way they fixed the problem and made sure it didn't happen again, they told us, 'God dammit, don't run the goddam boats into the cliffs, for Christ's sake.' Eventually we got that largebarge and

all 90 people going downlake."

"Ready was coming uplake in a hardhull, with a lot of gas and whiskey. When he met us he had been drinking for about 15 hours. By the time we reached Temple Bar, it was dark. None of the experienced hands much wanted to deal with Ready, so they told Leachman and me he was riding with us, and headed toward Vegas at about 95 miles an hour. There in the dark was Leachman's 1956 red Buick Roadmaster convertible. Massive. A little portly. Dignity. But strangely enough, with some of the lines of a crouched mountain lion about the rear fenders. And 4 cruiserline ventiports, which we had to research to learn was the real name a them fake exhaust dumps on the old Buicks. I'll tell you, that car was much loved. It was a *car*. We got Ol' Ready in it. He had one of his bottles. He was still sucking on it; it hadn't quite started sucking on him."

"'Stop. The car,' says Ready."

"Leachman stopped the car. Ready had now been drinking for more than 24 hours. He had American Indian blood, so it was cumulative."

"What?" said the co-facilitator. "What kind of derogatory stereotype is that about Native Americans?"

"Medically true," said the ex-boatman. "Their livers don't metabolize it. True clear down to the 1/16 hybridization level. But anyway, you're forgetting something."

"What?" said the co-facilitator.

"I have the virtual talking stick, and you don't. So anyway, Ready says, 'Gotta call. Call girl. Friend? LaVonetta. Thermop'lis Wyoming. Call.'" He staggers off into a roadside casino, the El Esleasmo."

"Leachman and I considered making the break. We were plenty scared. Terrified. But we were nice boys, raised as the sons of scientists from Los Alamos, and you don't just drive off and *leave* somebody. It would be impolite. After a while Ready comes out and deviates across the parking lot of the El Esleasmo. He's forgotten the girl in Thermopolis Wyoming, and he's hit the jackpot and forgotten that too. He's a shower of silver. Every pocket, every clothes crease, he's raining quarters. He's trying to hit his mouth with the butt end of a cigarette. He clinks as he staggers. We are waiting by the car."

"Ready says, 'Fight. I. Want fight? Me. Fight.' He sways happily and floats some blocky fists around, anticipating. He has just the muscles you'd expect on somebody who picks up his side of an 1100-pound raft with one hand and walks up the beach carrying it like you'd walk away from baggage claim with a suitcase."

"We say, 'Naw. We aren't gonna fight you, Britt.'"

"Please. Fight. I. Please?"

"Nope. We don't wanna fight you, Britt, an' we aren't gonna."

"He considers this for a while. He swings at the right rear window of Leachman's Buick. He runs his fist through that window, to the shoulder. Some quarters splash down. In a moment, some blood splashes down. Pretty soon the arm is pretty well covered with it, from shoulder to hand. Leachman and I look at the arm and at each other."

"But wasn't he hurt?" asked the men's council member. "Didn't you do any first aid? This could have been a very

serious situation.”

“No. And no. And yes. No he wasn’t hurt, not nearly enough, he was just bleeding. Kept it up most of the night too. And no, we knew plenty of first aid, and we didn’t care to use it. That was a real nice car’s window he’d broke. And yes, it was plenty serious, but not because of Ready’s arm. Or at least, not directly.”

“Well, we get on in to Vegas at a nice safe-and-sane 65, which was all Leachman ever drove that car for all the 100,000 miles he put on it. We found the others. Hatch decided he better get us some rooms before we ate.”

“So we drive to the Cacadoro and there we are, out in the parking lot, and there’s Hatch in the lobby, red hair and freckles, serious look and serious voice, he’s the Boss, you understand, trying to get some rooms for his crew.”

“Now Ol’ Ready hated the rich. Purely hated ‘em. Claimed all the Indians like he claimed to be and probably was, based on his liver, they all hated ‘em. So he’s out in the parking lot, under the mercury vapor looking pretty harsh and violet-silver except for his bloody arm, which looked a kind of black-red like Mimbres ware, an’ he’s peeing on Cadillacs. ‘Rich. Fuckin. Fuckin’ rich. Fucks.’ Saved it a bit, like a dog, so’s he could mark as many as possible, but then, he *had* quite a bit to save; he’d been drinking about 26 hours by then. Nothing but Cadillacs would do. Of course, Mercedes and BMWs hadn’t been invented then, so this was reasonable. On his premises, at least. So here’s this clerk looking at Ted Hatch being calm and respectable, and looking out past Hatch’s big sloping shoulder through the glass doors, and here’s this madman that just got out of Hatch’s rig, tilting and slopping around the parking lot, dick in his bloody hand, peeing on Cadillac tires and shaking little freckles of blood off onto their windshields. And quarters, too; they’re still sprinkling down with the piss droplets and bloodspots.”

“No room at the inn,” says the clerk in a strangled voice. So we go on and on, looking for places and trying to get Ready to pee on Cadillacs out of the lightpools, or at least out of the clerks’ vision, while Hatch goes in and does respectable for us.”

“Finally Hatch gets us rooms. Ready’s been drinking about 28 hours now. It’s time for food. Somebody decides on pizza. Massey, who was more of a Wild Man than Ready was, starts to get angry. ‘You know I can’t stand pizza.’ Which was ironic since once he made the river too hot to hold him, a pizza truck was his life. While it lasted. We go anyway. Pizza – it’s a *decision*.”

“Well, we get into the parking lot and Ready is still muttering, ‘Fight. I. Me?’ Everybody says disgustedly, ‘Ready, we ain’t gonna fight you,’ everybody except Massey. His eyes are starting to glitter. But anyway we head for the entrance.”

“Ready totters over behind Hatch. Hatch is a big man, somewhere between 200 and 250 pounds. Ready bearhugs him from behind and lifts him off the ground. Hatch says mildly and precisely, ‘Britt, what do you think you are doing?’”

“It goes slomo. It’s like when a big freight gets under way. Clankings through the couplings, and the slowest, most imperceptible acceleration. Well, that’s Ready, with Hatch

suspended in the air. He starts staggering backward, slowly, pace by pace moving quicker and quicker, starting vertical or tilted a little back, then tilting more and more, faster, until he falls backward in one straight unit like a tree going down, Hatch right on top of him. Near a quarter-ton hits the asphalt, and the cars nearby shake. There’s a noise from the quarters. Hatch gets up and dusts himself off. There’s some blood on his shirt, but not too much. Ready gets up, unhurt but a little unfocused. Whatever he’d been planning to do with Hatch has slipped his mind. Somebody points: ‘Hey. Britt. Over there. A Cadillac.’ Ready arcs off in that direction, scrabbling at his zipper, and we go in to eat, except for Massey, who won’t touch it and is coldly furious; and Staley, who’s looking at a couple of women with improbable hair and trying to borrow a twenty. Leachman and me, we’re willow wands among the oaks.”

“But son, there’s a happy ending. Ol’ Ready left the river, or it left him, but he quit drinking. Become a hairdresser up in Thermopolis and did well for himself. Had a nasty divorce, but he reared some kids, an’ at least one of them and maybe more is a gentleman, which could be not as many of us can say about our kids as would like to. So I’m real glad nobody had to shoot him. Hell, I’m real glad *I* didn’t have to shoot him. We talk every 5 or 10 years. Journey to the East kind of thing, you know?”

“Shooting him would have solved *nothing*,” said the men’s council wilderness retreat co-facilitator angrily, “You didn’t need to shoot him.”

“Son, you go down to the weight room and curl 125 pounds in each hand, alternately, while you’re talking to them gals in spandex, and when you can do that, you come back here and you tell me you don’t need to shoot somebody like that when he’s drunk and he wants to feel face bones splintering under his hand. You do that and I’ll give some thought to listening to you. Hell, if you’re a normal human being, you not only need to shoot them, you need to make sure that first shot tags a nerve plexus.”

“That kind of thinking just perpetuates it,” said the co-facilitator tightly.

“Look, son, that kind of thinking doesn’t perpetuate it, it just *is*. And sometimes it’s up to you to stop it. Sometimes the owner can stop it. Or God does. Anyway, it stopped for Britt. I’m real glad I didn’t shoot Britt, I’m real glad nobody did, but I’m even gladder that he never got a fist on my jaw. The fact is, there’s a Gresham’s Law of Warriors.”

“This is so totally archaic. You know that? *Totally* archaic.”

“Right. Totally. I take it you want the virtual talking stick?”

“Well, yes, I do. I can’t begin to tell you how *wrong* you are about all this.”

“I expect you can’t. But you’re going to try manfully and fail to tell me, aren’t you? About how wrong it is?”

“I have the virtual talking stick now,” said the men’s council wilderness retreat co-facilitator.

“Ho,” said the ex-boatman. “Fair’s fair.”

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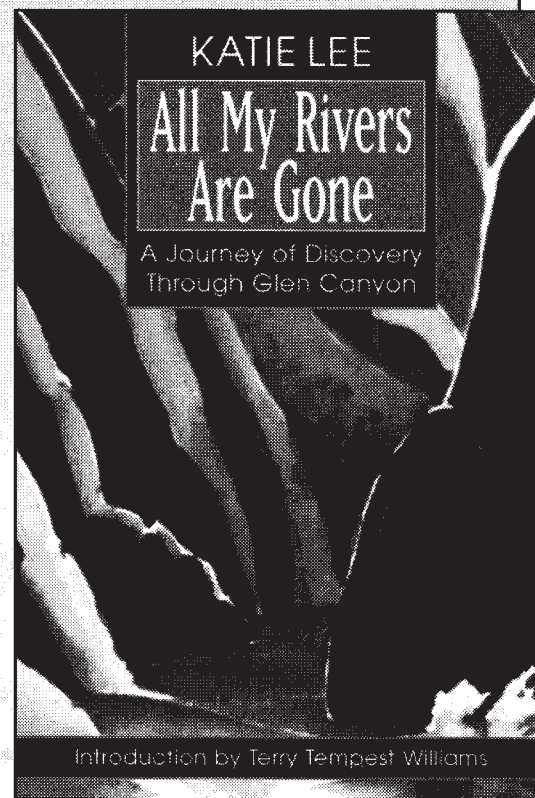
All My Rivers Are Gone

A Journey of Discovery
Through Glen Canyon

KATIE LEE

Introduction by Terry Tempest Williams

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An excerpt by Hugh Miser discussing the phenomenon of sand waves. From USGS Water Supply Paper 538, 1924.

The sand waves take their name from the fact that sand forms a large part of the load of debris transported by the river along its bed at such times. They are produced by a peculiar method by which the debris is transported. This and other methods of transportation are described by [Grove K.] Gilbert in the following concise statements:

Some particles of the bed load slide, many roll, the multitude make short skips or leaps, the process being called saltation. Saltation grades into suspension. ...

When the conditions are such that the bed load is small, the bed is molded into hills, called dunes, which travel downstream. Their mode of advance is like that of eolian dunes, the current eroding their upstream faces and depositing the eroded material on the downstream faces. With any progressive change of conditions tending to increase the load, the dunes eventually disappear and the debris surface becomes smooth. The smooth phase is in turn succeeded by a second rhythmic phase, in which a system of hills travels upstream. These are called antidunes, and their movement is accomplished by erosion on the downstream face and deposition on the upstream face. Both rhythms of debris movement are initiated by rhythms of water movement.

The dune phase is accompanied by comparatively small down-stream-moving waves. The smooth phase has no waves, or only small ones. During this phase, by wading the river, I found the smooth bed to be composed of compact sand. The sand waves appear when the river passes from the smooth to the antidune phase.

R. C. Pierce [WSP 400, 1916], who has studied the sand waves of San Juan River at and near the Goodridge Bridge, describes them as follows:

On the wide, shallow sections of San Juan River sand waves may usually be seen below the riffles at medium stages. In the deeper sections they appear at their best development on rapidly rising stages. In the immediate vicinity of the gaging station, so far as observed, the sand waves appear on rapidly rising stages between gage heights of approximately 4 and 7 feet. With the rise of stage beyond this range the movement is drowned out. Three miles above the gaging station, where the river is wider, sand waves usually may be seen at any stage from about 4 to 10 feet. That section of the river was not visited

at stages higher than 10 feet, and it is not known whether the sand waves continue or are drowned out, as in the vicinity of the station.

The usual length of sand waves, crest to crest, on the deeper sections of the river is 15 to 20 feet, and the height, trough to crest, is about 3 feet. However, waves of a height of at least 6 feet were observed. The sand waves are not continuous, but follow a rhythmic movement. Their appearance, as seen on the lower San Juan, is as follows: At one moment the stream is running smoothly for a distance of perhaps several hundred yards. Then suddenly a number of waves, usually from 6 to 10, appear. They reach their full size in a few seconds, flow for perhaps two or three minutes, then suddenly disappear. Often, for perhaps half a minute before disappearing, the crests of the waves go through a combing movement, accompanied by a roaring sound. On first appearance it seems that the wave forms occupy fixed positions, but by watching them closely it is seen that they move slowly upstream. In the narrow parts of the stream the waves may reach nearly the width of the river, but in the wider parts they occupy smaller proportional widths. Usually they are at right angles to the axis of the stream, but at some places, particularly in the wider parts of the river, they may suddenly assume a diagonal position, moving rather rapidly across the stream in the direction toward which the upstream side of the wave has turned.

In the experiments made by Gilbert at Berkeley he found that the water surface closely paralleled the surface of the antidunes. In natural streams this is not always the case. The writer was informed by Prof. H. E. Gregory, of Yale University, that in swimming down through a short section of the San Juan he found that in going over the crest of the antidunes he could touch bottom with his feet and at the same time keep his head above water, but that in the trough of a wave he had to go down more than arm's length below the surface to touch bottom. From this it would seem that where the antidune movement is well developed and where there is a considerable depth of water the undulations of the sand surface are not closely followed by the water surface, but that the effect is partly smoothed out in being transmitted to the top. It might be proper to infer from this that at high stages the antidune movement may still go on, although no indication of it reaches the surface. This inference must be qualified by the fact that at high stages more of the bed load is picked up and carried in suspension, thus necessitating a lowering of the bed and the movement of new debris.