The Confluence

The Journal of Colorado Plateau River Guides | Number 27, December 2003

Activists from Friends of the Earth, Sierra Club, River Runners for Wilderness, Living Rivers and Colorado Plateau River Guides during the Bureau of Reclamation's centennial celebration in June, 2002.

The Confluence

...wants to be the quarterly journal of Colorado Plateau River Guides. CPRG has a fiscal sponsor, Living Rivers, a 501(c)(3) river advocacy organization that promotes river restoration.

CPRG is dedicated to:

- Protecting and restoring the rivers of the Colorado Plateau
- Setting the highest standards for the river guiding 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 Colorado Plateau

Membership dues
$20 per year
$100 for six years
$295 for life
$495 as a benefactor

General meetings and board meetings will be announced

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We need opinions, articles, poetry, artwork, and photos. Please include graphics with your text submission.

Editor this isue John Weisheit
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Disclaimer: The opinions and statements made within the pages of *The Confluence* are those of the author and do not necessairly represent the position of the guide membership, the board of the Colorado Plateau River Guides, nor our fiscal sponsor. If you have an opposing or supportive viewpoint, please send your comments for publication.

CPRG River Education for 2004: Call CPRG for information and register with your employer.

Cataract Canyon, April 26-29
Westwater Canyon, April 26-27
River Education Seminar, April 23-25
Uinta Basin Training Seminar, May 27

A Special Thanks to 2003 Donors: CPRG would like to give thanks to those who provided generous financial support for our River Education Seminar (RES), which includes the National Park Service, Southeast Utah Group; Utah Guides and Outfitters; Utah State Parks and Recreation; and the Headwaters Institute.

A Special Thanks to 2003 Instructors, Volunteers and Logistical Providers: Rimrock Adventures, Holiday River Expeditions, Sheri Griffith Expeditions, Utah State Parks and Recreation, BLM Price Field Office, BLM Moab Field Office, BLM Grand Junction Office, Canyonlands National Park, US Geological Survey, Jack Schmidt, Roy Webb, Sue Phillips, Steve Young, George Simmons, Ian Torrance, Brad Dimock, Donald Baars, Mike Berry, Sera Janson, Dave Dawson, Steve Anderson, Michael Smith, Herm Hoops, John Weisheit and Annie Payne.

CPRG Web Page: CPRG now has a web page. Very soon our past issues will be archived on the web. Visit our web page at: www.riverguides.org.

IMPORTANT ANNOUNCEMENT! All general memberships to CPRG have been freely extended for one year because no issue of *The Confluence* was produced for 2003. In the past, volunteer members of CPRG have stepped in to help produce *The Confluence*, but these volunteers have since become quite busy with worthwhile endeavors. These volunteers were Michele Hill, Dave Focardi and John Weisheit. CPRG would like to thank Michele, Dave and John for stepping in to fulfill CPRG's journal responsibilities to its members. CPRG urgently needs a volunteer to assemble this journal. Please seriously consider this excellent opportunity to serve the guiding community. Contact information is provided in the column to the left. In the meantime, *The Confluence* will continue forward as best as it can. Thank you for your patience and understanding!

CPRG 2004 General Membership Meeting: please read "The Prez Sezs" in the following column for details.

The Prez Sezs

by Dano Phillips

Happy New Year! I greet you all as the new president of CPRG. I'm excited about this position because I have wanted to be more involved. Involvement is the foundation for our small-but-active organization, and I've decided that this is my "platform". So I invite the 300+ membership to get more involved with article writing, meeting attendance, volunteer time, and all else. We can have a much stronger and more effective voice than we now do.

On a personal note, I was in the Northwest from September 2002 until this past June, studying the process of building wooden boats by traditional methods. It was a fun and interesting course, and out of it I achieved an Associates Degree. We built several boats from the backbone up, and did some repair and restoration. I would like to talk to any and all of you out there who have had experience building boats, for in the near future I want to build myself a dory. And it would be just great to chat about boats in their many forms, with their many challenges.

The board has some new and existing issues to tell you about, and since you haven't heard from us in a while, it is time to get you updated. First of all, **CPRG will be having a general membership meeting during the annual UGO Trade Show, which will happen from the 10th to the 12th of February in Bluff, UT.** We'll have a preliminary get-together on the 10th at 4:30pm, to let everyone know the topics up for discussion, and then a full meeting on the 11th during Red Olerich's talk.

During that meeting, we will be asking the membership to list some priorities they'd like to see CPRG address. If anyone has a pressing issue to discuss, I urge you to attend the meeting. We'll also be attempting to come up with area directors for Green River, Grand Junction, and the Bluff area, and discussing the possibility of a Salt Lake City director.

Another exciting topic is the possibility of a real, weekend-long river festival in 2004. We would try to get all or many of the annual events to happen that weekend in Moab, including demo days to gear reps and the ever popular Boatman's Bash.

The Confluence needs submissions; essays, photos, poetry, stories, and whatever else. One reason why it is overdue is because we lack material. We need more participation to make it a true quarterly.

That goes for all of CPRG, in fact. If you love *The Confluence*, the annual interpretive trips, and the River Education Seminars, please assist me with them. Trip leaders are needed for the existing Westwater (April 26-27) and Cataract (April 26-29) trips, and interpreters for these and the land-based R.E.S. If anyone is interested in a San Juan interp trip, I need help getting that together, too. It's up to all of us to make this stuff happen.

Thanks to everyone who attended and helped with July's Boatman Bash. We collected many new memberships, got several renewals, and the raffle was successful because of the resplendent generosity of businesses. I'd say that we all had a helluva good time! Next year we need to find a place where we won't have to worry about the noise ordinance. Any good ideas? Thanks especially to DJ Bob Fries for keeping us groovin'. And thanks also to Red Bull for supplying us mixers, and to Sally Satterfield who poured. Everyone's help was really appreciated. I thought it was special that Kent Frost hung out for so long, and spoke a little. Thanks are also due to Annie Payne, John Weisheit, Ariana Lowe the organizer, Roy Webb for his Glen Canyon slide show, and Brian "Monkey" Stepek for letting us party at the OARS warehouse.

Hope the holidays were great for all of you. Contact me at <blueinaboat@yahoo.com> or P.O. Box 895; Moab, UT 84532, and we will get things rolling.

CPRG Director Responsibilities

courtesy of Herm Hoops

- Attend CPRG board and member meetings.
- Coordinate or support river education programs.
- Represent CPRG with area river management agencies.
- Keep guides aware of area opportunities, issues and concerns.
- Appraise CPRG of area guide, outfitter, business and agency concerns.
- Keep aware of area river issues and concerns; propose responses to those concerns and secure CPRG approval to take actions.
- Maintain records of the above activities.
- Write articles for *The Confluence.*
- Participate in UGO, America Outdoors and other river-related professional organizational activities.

Who Are Those Guys?

President: Dano Phillips was elected as the new president of CPRG in March of 2003, and assumed the duties in July after returning from school in Washington. He attended the Northwest School of Wooden Boatbuilding in Port Townsend, WA, and came away with an associates degree in Traditional Wooden Boatbuilding after a nine-month course. He hopes to build a dory for himself employing traditional methods, and then avoid rocks with it for years to come. Dano has been guiding in Moab for the past 10 years, and has also guided Dinosaur and in Texas' Big Bend country, where he became a member of the Texas Pack Animal Association the hard way. He's attempting to get his little cow dog as accustomed to the water as he is.

Past President: Annie Tueller-Payne has been guiding rivers for 13 years throughout Colorado, Idaho, Arizona and Utah and she calls Cataract Canyon her "home river". She claims that she will run any type of boat anytime, but she must confess her favorite boat is a motor rig. After serving two terms as the President of CPRG, she is currently serving on the board as the Past President. Annie is committed to the preservation and restoration of the Colo-

rado River. While guiding river trips she not only focuses her efforts toward educating her guests about the flora and fauna of the area, she also try's to show the ramifications of Glen Canyon dam on the river. While not on the river, Annie works on a commercial fishing boat in the Prince William Sound of Alaska. She also works as the administrative coordinator for the Utah Guides and Outfitters. She enjoys sailing, boating and skiing. Annie lives in Salt Lake City, Utah with her husband Tim.

Vice-President: Mark Sundeen is temporarily working in Vermont at the campaign headquarters of presidential candidate Howard Dean. Mark comes from California and is the author of *Car Camping, The Making of Toro: Bullfights, Broken Hearts and One Author's Quest for the Acclaim He Deserves.* He is also the co-founder of a magazine called *Great God Pan*. When he is not writing, Mark pops up on the river scene as an instructor for Colorado Outward Bound School.

Secretary/Treasurer: John Weisheit was conceived on the Colorado River during a drought, which may explain his love for really low water. A former Colorado River weekend warrior from Los Angeles, and later Phoenix, he soon became bored with reservoir-related activities and started running the rivers above Glen Canyon Dam in 1980. Following the advice of professional boaters, usually while scouting major rapids and later flipping his boat back over, he decided to become a commercial river guide. A career in the Grand Canyon did not appeal to John because he considers any trip below Glen Canyon Dam to be a funeral procession, so he moved to Moab in 1987.

A book about Canyonlands, the one he has been talking about for 12 years, will actually debut in April, 2004. Many of us were beginning to wonder if it would ever show up in a bookstore. While doing his 250th trip across the stagnant, stinky, mud-choked and weed-infested Reservoir Foul, he decided to become a full-time river activist. Some people find it very odd that John would willingly take on such abuse to earn even less money. On the other hand, John is wondering why it took so long to make the change. People from other parts of the country took notice of his dedication to river restoration and designated him as the official Colorado Riverkeeper in October of 2002.

Tired of repairs, grease, gasoline, smoke, alienation, noise, and frequent sightings of middle fingers, John decided that having motors in qualifying wilderness areas is really silly. It is also rumored that he periodically wears animal and boat costumes at public meetings and demonstrations to promote the restoration of our river's natural heritage. John says he will sleep when he is dead, or when the river flows freely to the Gulf of California, which ever comes first.

Vernal Director: Herm Hoops is not a man you can overlook easily. With concentrating, deep-set eyes framed by one long eyebrow and a rangy beard, he is a man of intensity. His gaze can be as soft as a warm summer breeze or as steely as cold wire. At age 58 one look will tell you there are still a lot of volts going through those wires.

Herm was born into a world dominated by covalent, non-polar, non-linear bond molecules. His life has been surrounded, and at times obsessed by the influence of water. It has brought him unimaginable joy and indescribable sorrow. The Rivers have been good to him, and he only hopes that he is repaying the favor.

Moab Director: Michael Smith has been a CPRG board member for both Bluff and Moab for the last two years. He is a lifetime member of Grand Canyon River Guides and was one of CPRG's first lifetime members. He has been boating on the rivers of the Colorado Plateau both privately and professionally since 1976. He has earned an Associate Degree in Outdoor Education from Colorado Mountain College and a Bachelors Degree from Prescott College in Outdoor Recreation/Resource Management. Michael is currently the Program Manager for the Sand Flats Recreation Area and is the President and Founder of Plateau Restoration/ Conservation Adventures.

CPRG/UGO Laison: Lars Haarr fills this position that was created by CPRG to ensure communication between CPRG and Utah Guides and Outfitters. Lars was born and raised in northwest Montana. He took his first raft trip on the lower Salmon River when he was six years old, and in subsequent summers a profound love of flowing water developed. At age 20, after a poorly spent year and a half trying to figure out what he wanted to be when he grew up, a position opened up at a raft company in West Glacier, Montana, and the rest is history. He spent two seasons on the middle fork of the Flathead River, then moved to Big Sky, Montana and spent two seasons on the Madison and Gallatin rivers before moving to Moab. He has been a guide for OARS there for the last five years, running the canyons of Cataract, San Juan, Yampa and Lodore.

Comments on the Issue of Motors

by Paul R. "Pops" Smith

I guess my conclusion based on what I have read in *The Confluence* and elsewhere is that the potential position of the CPRG is to advocate for a ban on motor use on our river craft. I also understand there is some dissent to that position within the organization. I should hope so! [See *The Confluence*, Issue 26]

What are the key impacts of a motor on a river craft from my point of view?

It will pollute the water. This is true! The recreational boat and jet ski usage on Lake Powell, however, is equivalent to an Exxon oil spill every two and a half years. Compared to that, the contribution by our few motors is less than a drop in the bucket, by a long shot!

It has the potential to aggravate others and affect the "wilderness experience" if the right is abused. Also true! Thus it is imperative we use proper etiquette when running a motor such as wakeless speed around other craft, minimize noise, etc. Some of the newer motors are very quiet and relatively clean.

A motor provides a way to get to help fast if there is a health or injury problem. Yes it does! Thankfully in my experience, I have not had to rush downriver with any of my customers, but I have provided that service to others who were in a bad fix. In one case I think a life was saved.

A motor provides a way to continue to progress downstream in adverse weather conditions or in low current conditions, thus shortening trips. It also allows us to motor out at the end of trips, as is necessary on Lake Powell and in certain circumstances on Lake Mead. Typical five to six day trips by conventional means can be done in three and in some cases two days with motor power. Perhaps this is merely convenience but I believe it may also be our survival.

Given my druthers, I very much prefer a six or seven day trip down Desolation Canyon or down Cataract from either Mineral Bottom or from Potash. Also my preference is to take 18 or 20 days or even more through the Grand Canyon. Slow and easy with a couple of relaxing layovers is the best way to go by far. Whenever I can, that is what I do on a private basis. After all I am retired, aren't I? I do however bring a motor along and use it in when necessary to overcome some of my "ambulatory" issues due to being older than dirt. My motor allows me to continue to ply these rivers independently as a private boater even though I have physical restrictions that prohibit the more strenuous activity of commercial guiding. When private boating, I do have the option to use or not to use a motor and I exercise it. Realistically, do we as an organization have that option? It depends on how we view and define the statement, whereby we profess to be dedicated toward "Protecting and restoring the rivers of the Colorado Plateau."

One aspect of protection is to try to return to the past. I would love to experience the wild river like Fremont et. al. Will I ever? No way! The damage has been done! Now the effort, rightfully so, must be to undo and repair the damage (Damn Dams!). How do we do that? One way is to make sure the companies that employ us are and remain viable, so they will keep employing us. Elimination of motors where they are currently allowed would be a blow to some of those companies. Through hands on experience I know for a fact, that five, six and seven day Cat's do not sell as well as the shorter motor supported runs of three and sometimes two days. The same goes for shorter rather than longer Desolation Canyon trips. Even one day makes a difference in the salability of a trip. Three day and four day Lodore Canyon trips, presented side by side in the same brochure, always sell out first toward the three-day trip. It is often a scramble to get to financial break-even on the longer trips and often we have to operate at a loss just to preserve credibility. As a guide I try to find out from the customers why these facts are true. Inevitably I get the same feedback. People can get away for a few days, but for most more isn't possible. I would conclude the same goes for the Grand Canyon experience. Have you ever tried to fill a sixteen or eighteen day private trip up to the allowed maximum? Why do you think the usage percentage compared to what is allowed is so low on these private trips? It isn't lack of money nor is it lack of desire. It is lack of time! If the only commercial option in the Grand Canyon was two weeks or more, most of us would be unemployed on the river and working in some damned city to make ends meet! If the only options on the Upper Plateau were five or six days on Deso or Cat, I propose the same would happen. What would CPRG look like then? Would it be around at all? How much influence would it have? Who would be around to fight for the removal of the Damn Dams?

When we suggest as an organization that we are dedicated toward "Providing the best possible river experience" the question that comes to my mind is from whose point of view? To a busload of "seventy-some-things" is a six day trip or even a three day trip down through the Big Drops in August at 105 degrees the best experience, or rather a quick half-day trip in a breezy jet boat? To a really busy executive or broker or politician, is only three days away from the sharks better than five? It damn well was when I was in that realm. To me it sometimes looked like the difference between success and survival in my chosen career.

Getting back to protecting and restoring the river, lets talk about influence for a while. In our free society, how do you influence those that can do something about the things we advocate as an organization? How do we eliminate the evil blockages to our free-running rivers, the really big problem? We must do it by educating the public to what is happening. Droughts are not fun but they are a fact of life. We right now and for the foreseeable future have a great opportunity to maximize the effect of our position related to decommissioning dams by showing the maximum number of participants what we have been talking about since the late fifties when this war began. Rather than sounding like a bunch of tree-hugging "doomsdayers", we can show people the early signs of doomsday at the outlet of the San Juan and the outlet of the Colorado into Lake Powell. There is nothing like giving a "mover and shaker" from the big city a quick but informative look at still reasonably pristine river, within his or her time frame, then

having that person help you drag your boat across a sea of mud where a lake is supposed to be, or wade across a mud flat to get to a place to camp or hike. If you have done your job of pointing out the glory of the river as well as logically and reasonably presenting our position while upstream, then you show them the mess downstream you will have an impact. Let them wade through it, and smell it and see the trash then in your farewell talk, ask them to do something about it. That's how our system works. Only when the power brokers in Washington hear about something from a lot of constituents do they pay any attention. If we eliminate the busy people from the river experience, those who tend to get things done once persuaded; as well as the elderly, who have the time and money to be proactive we should be considered pretty stupid. These are the two most politically active sectors of our public and in my opinion; to hinder their participation destines us to lose the war. Prohibiting motors and lengthening future trips is a step backwards and will guarantee us losing our already precarious position of influence.

How about the politically active aspect? I don't care if you are Democrat or Republican or Independent or Libertarian or whatever; political party isn't an issue. Political activism is! How many of you have written to your Representatives or to your Senators and pitched our position on decommissioning those dams that affect our situation? Have you done it repeatedly and enlisted friends and family and acquaintances to do it too, repeatedly? How many of you have promoted to your employer to allow you to invite one of these power brokers on a trip, and then made the offer? This is another way our system works. Only if they hear from people, or even better if they are offered a freebie and told it'll only take three days, will the message be heard? Remember back in the 60's, when the plan for several dams flooding the Grand Canyon was revived? Regardless of all of the efforts to the contrary by the Sierra Club and other organizations trying to protect the Canyon it looked like a done deal. Only after one of the strongest proponents of more dams, Stewart Udall then Secretary of Interior, took a trip through the Grand Canyon and was influenced by the professionalism and the logic of what he saw and heard did the threat go away again. He went back to Washington and killed all of the then current legislation. That's the way it works folks! We can spend our energy helping these people to become informed, or we can spend it providing ways to prohibit them from finding out what is needed. I propose that motors on our rivers play a part in that. We may stand around and wring our hands and bemoan the state of the Grand Canyon and other sections of rivers we are more familiar with, but it is far better as it is than if it were under several hundred feet of water. Let me assure you, motors on our river craft are the lesser of several evils. To eliminate them would in my view reduce our ability to win the war. Let us put everything into winning that war first, even if the use of these disagreeable motors is one of the weapons in our arsenal. Then after the war is won we can do something about the several lesser evils we have had to maintain to get the job done. Let's not try to eat the whole apple in one bite! We can shoot ourselves in the foot later when we have the luxury, rather than now when the battle is fully engaged.

Once Flaming Gorge Dam and Navajo and Glen Canyon and Hoover are being decommissioned, then I'll toss my little motor on the funeral pyre, wherever you build it, and join all of you in a nice summer float for a month or three throughout the whole deal.

Quite a dream isn't it! Will anybody help me row? For now anyway, that's my story an' ah'm stickin' to it. Don't let the b@$^@rds git ya!

Me and That Lake

by Paul R. "Pops" Smith

I never did see the Canyon called Glen,
T'was there 'fore Lake Powell was made.
There are books and slides of how it was then,
Sheer walls, cool glens, and afternoon shade.

A bold youth was I in a shiny new boat,
Exploring and skiing this great new lake.
And beneath a bright moon I'd stop and float,
All these glories were mine to partake.

I reveled in exotic names and places,
Escalante, San Juan, Music Temple, Slickrock.
Skiing on glass, I put my boat through its paces,
Awed by Mormon guts at "Hole in the Rock".

I first saw the lake very early in the filling,
Cliffs and sheer walls, desert varnish, far and near.
Rainbow Bridge an hour hike for the few willing,
"Fern Grotto" on the way, respite from desert sear.

Next year "Fern Grotto" was engulfed for good,
A quick pause for mourning deemed to be enough.
Way up Rainbow Canyon a Marina now stood,
I shrugged with indifference, "Gee, that's tough."

Then I found the Ancient's Pictograph Cave,
Past Lagorce Arch in the Gulch called Davis.
A friend named Jack did humorously rave,
At the comic message he felt they'd left us.

It seemed to me the site should be sacred,
It's stayed on my mind for many years.
Next time I visited the cave was inundated,
It was wrong and awakened repressed fears.

How come now I can boat up under Rainbow?
I thought they'd promised no water this far back!
Whoa, too much! Who messed up, do you know?
Is my apathy the culprit? Who can I attack?

But back in my reality, premonitions flew away.
Good intentions gone in the pressure cooker race,
Up the corporate ladder, compete to win my way,
Survival is the mode, as I seek my rightful place.

Years later a man returned, perhaps a little wiser,
'Twas full to the brim when I'd left before.
Now the water marks beautiful walls,
A hideous white ring that cuts to my core.

Oil slicks and trash; greasy, muddy beaches,
Sights and sounds and smells to abhor.
Thousands of people, boats up serene reaches,
Magnificence and splendor, gone forevermore.

I'd heard dire predictions, tailings, toxins galore,
Seepage and evaporation a major shortfall.
Endangered fish too few to replenish anymore,
San Juan branch a mud flat from wall to wall.

These, plus everywhere, defiled and stained walls,
And human waste on beaches the lake around,
It became a "no brainer", one of those easy calls,
Drain the lake, do it now, so it'll rebound!

I know it's a "pipe dream", too much money there,
And too few believers to win this "Holy War".
Prophecies are coming true, now I'm aware,
And at Gypsum Canyon the lake's a mud bar.

It took me decades to leave the users,
And join the few vying to see it drained.
If I let it fill with silt, I'll join the abusers.
That's an evil specter! I'm deeply pained!

Last week I ran the river, Mineral Bottom to Hite,
Way below the "Big Drops", mud stuck our boat.
Through Narrow Canyon a very sorrowful sight,
Only a third of the lake left, a skinny slimy moat.

The stained walls are still there, but also I see,
Silt bars, poison ivy, tamarisk and tumbleweeds.
At Mille Crag Bend where Sheep Canyon was,
Is an ugly mud plain as the lake still recedes.

The center buoy there is nearly on the beach,
Both Dark and Rock Canyons are high and dry.
Deep mud along the water, dry sand out of reach,
The sights in this Canyon leave the urge to cry.

We motored till dusk looking for a usable spot,
To no avail till we reached Hite Marina.
But even here bare rock is silted a lot,
Full of trash and other paraphernalia.

I took this all in and it made my heart sore,
I know others down the lake don't ever see this.
But even if, they'd be indifferent, I was before!
Now I'll advocate drainage, I won't be remiss.

A friend named Tim takes the long view,
Natural plugs backed lakes thrice this size.
And nature is relentless, that is nothing new,
All filled and breached, destruction their demise.

Today's tiny blockage will follow the same trend,
True, I won't see it fail while I am still alive.
But if predictions are true, it will see its end,
In just a few generations, as few as five.

No, not in my lifetime, nor that of my boys,
But my hope and prayer will always be.
Our grandchild's grandchild on his grown up toys,
Will float a Glen Canyon once more set free.

The Howland & Wheeler 1894 Inscription(s)

by Jim Knipmeyer

If a boater down the Green River lands at the upstream side of the mouth of Spring Canyon and follows the old uranium road down to the now-fallen log cabin moldering under the canopy of cottonwood trees, he (or she) will pass by a number of large talus boulders. In the vicinity of an old cable and other bits of rusting mining equipment, an interesting inscription can be seen cut into one of the rocks. On the side is "H. HOWLAND 10-94," and "Arthur Wheeler 1894," along with an incised picture-glyph entitled "My Gal and I."

Harry T. Howland was a longtime resident of Green River, Utah, first coming to that community from the mining town of Crested Butte, Colorado, in 1893. It was his stated intention to travel on to Hite, on the Colorado River in Glen Canyon, on a prospecting trip, but evidently changed his mind while in Green River. Instead, Howland and another man, named Spry, took a boat, described as being about 16 or 18 feet long, three and a half feet wide at the bottom and four at the top, and went down the Green River to near The Confluence.

The pair's intent was to both prospect and trap, though the latter turned out to be the most profitable. They reportedly got some fox, bobcat, beaver, and coyotes during the nearly two-month trip. At the conclusion the duo brought their skins back up the river in the boat.

In 1894, Howland made another river trip, this time from Green River all of the way to Moab. His father accompanied him, and once again the voyage was made in one boat, about the same size as the earlier one. The father returned home to Denver from Moab and Harry retraced his "steps" back to Green River, descending the Colorado (in 1894 the Grand) and making his way up the Green. Like the previous year, he again got some furs, shipping them out to market from Green River.

This 1894 trip, however, was not the one on which the Spring Canyon inscription was made. Howland said that the voyage with his father was done in August, while the "10" in the inscription undoubtedly refers to October.

Arthur Wheeler was one of a trio of brothers from the state of New York who, in 1884, had settled on the right bank of the Green River, across from and just south of the mouth of the San Rafael. They installed water wheels for irrigation and planted alfalfa and fruit trees. The three also raised cattle.

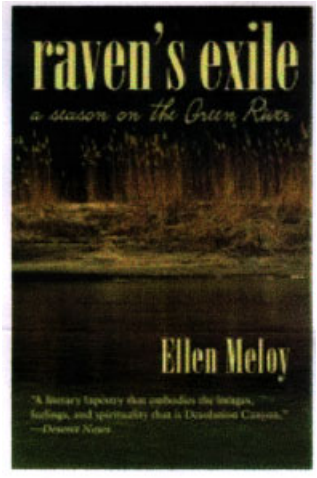
In April of 1892, Wheeler was hired by B.S. Ross of Rawlins, Wyoming, to pilot his steamboat, the *Major Powell* (see the Winter, 1997 issue of *The Confluence*), down the Green River and on to the head of the first cataract on the Colorado. The trip was a success, and Ross eagerly began to promote regularly scheduled steamboat excursions down the river to Spanish Bottom. However, nothing ever came of his promises.

According to Hazel Ekker, of Hanksville, Utah, Wheeler's 1894 inscription near the mouth of Spring

Canyon was made on a trip in company with Harry Howland. The two were said to be close friends, and in later years Harry told Mrs. Ekker that he was with Arthur "when he carved the picture." Since Howland was a married man, while Wheeler was a bachelor, "My Gal and I" probably refers to Arthur. Based on both prior and later trips, the pair was probably trapping for furs during their 1894 voyage.

In the years to come, Howland made many more river trips, mostly on the Green and Grand, but at least once on the Colorado in lower Glen Canyon. Wheeler, on the other hand, left the area in 1898 for the Klondike region of western Canada, where he engaged in the Yukon gold rush. He never returned to Utah.

Looking out from the Hole-in-the-Rock, June 1963.
Photo by Jim Knipmeyer



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The Place No One Knew: Glen Canyon on the Colorado

by Jim Knipmeyer

Soon after the 1963 Sierra Club publication of the above titled book was issued, the name became symbolic of the entire Glen Canyon wilderness-Lake Powell reservoir question. No one knew about the soon-to-be-lost Colorado River paradise to be able to save it from the government dam builders. In the last decade or so, however, there has been somewhat of a backlash against this epitaph. It is now maintained that many people knew about the splendors and beauties of Glen Canyon; just not the high-placed or influential ones.

Be that as it may, in the first few years of the 1960s I myself certainly knew very little about what essayist and novelist Edward Abbey described as "the living heart of the canyonlands." I first saw Glen Canyon in June of 1963. Just earlier that spring the gates of the diversion tunnels around the dam had been closed, but reservoir water already backed a little over eighty miles upstream behind the earthen coffer dam built above the worksite. But it was comparatively shallow, was primarily confined to the narrow "inner" gorge, and did not spread out over the flanking benchlands and up the many tributary canyons as it later would do. So what I got to see was still much more "canyon" rather than "lake."

After crossing the steel-arch bridge just below the still not-quite finished concrete plug of Glen Canyon Dam, my family and I proceeded past the Wahweap area. At that time I did know enough about the history of the region to be aware of the Crossing of the Fathers that lay a few miles to the northeast. We followed a narrow graded and dirt track to the crossing area and what had been, for the past several years, the take-out point for river parties near Kane Creek. The road wound across the sage-covered benchland past the towering pile of Castle Rock and the jutting prow of Romana Mesa, and around the point of Gunsight Butte. Most of the way the inner gorge of Glen Canyon was not visible, but neither was the reservoir water. Only at a place above the Crossing site itself, looking southeast toward the uneven upthrusts of Tse Tonte and Tower Butte, was the spread of the still-infant lake readily apparent.

Our next contact with Glen Canyon was some forty-five miles upstream, but it took a day-and-a-half of driving time to make our way to that point at the Hole-in-the-Rock. Once again, I knew enough about the general history of the region for us to bounce and jolt our way over the newly bladed road to this natural cleft in the rimrock of the canyon. Even to here the reservoir water had crept, but except for its unnatural azure color and the fact that it did partially fill the narrow inner gorge some fifty or so feet above the old river level, an undiscerning eye would have simply identified it as a very blue, very unruffled stream. Green vegetation at the base of the "Hole" bordered the lake water just as it would have the old Colorado, the gash of Cottonwood Creek still wound its way eastward on the opposite bank,

and the flat-sided slabs of Register Rocks rose above what was still dry, almost barren benchland.

But my lack of real, intimate knowledge about Glen Canyon manifested itself at our third and last encounter. After another long and circuitous drive westwards, we came back into the depths of the canyon down the winding course of North Wash. Coming out into the main canyon itself, we drove slowly downstream on a shelf above the right bank of the still flowing, still living Colorado. We soon arrived at the Hite ferry, which would transport our vehicle and us across the river to the continuation of Route 95 on the opposite side. I did not even "know" enough to take a picture of the historic ferry. I did not "know" enough to photograph Hite's old log cabin near the western bank. And I was certainly not aware of the incised "CASS HITE 1883" inscription which we drove right past as we made our way from North Wash down to the ferry crossing.

My ignorance continued on the eastern side as well. As we drove along the west bank up towards the mouth of White Canyon, I was not cognizant of the fact that perched on the rim of the cliffs, not far above our heads, were the hand-laid stone walls of the prehistoric pueblo ruin known as Fort Moqui. Last, but certainly not least in view of my present interest in the old, historic inscriptions of the Colorado Plateau region, I did not "know" that these walls and the surrounding rocks were literally covered with scores of names and dates carved and scratched by early travelers and visitors from as far back as the second Powell river expedition in 1872.

These "historic" remains of Glen Canyon are now gone forever. Even if the Lake Powell reservoir is someday drained, these man-made traces will have been long erased. But the "natural" Glen Canyon can be reclaimed, and Abbey's living heart of the canyonlands can be KNOWN once again!

Green

We are green
big and swirly
and perfectly clear

the dip of our paddles
pushing
the silver river miles along

we are green
and stone
and sky

a dance of Ponderosa Pines
a summer rain
a bubble line

we are smiling
big and perfectly clear
and Salmon River green.

Doug Oblak

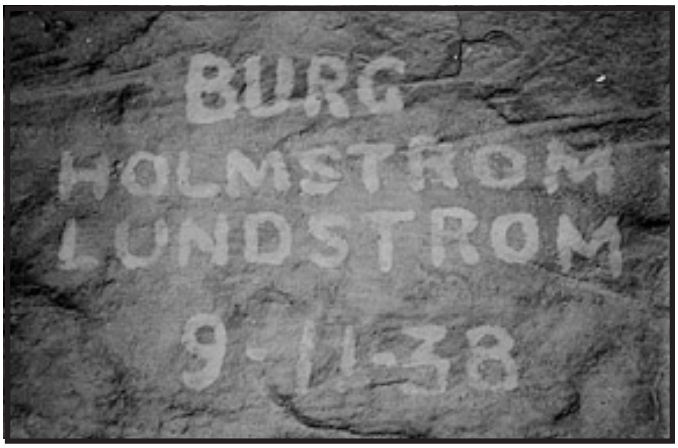
Inscriptions Along The Rivers Of Dinosaur

by Herm Hoops

Those early runners of rivers often left inscriptions to mark their passing or to record significant events on their trip. Their markings are a way for modern river runners to connect with that earlier time, when things on the river were simple and yet still unknown. Rivers flowed as the season dictated, undamned and unharnessed by mankind. The early wavedancers lacked our modern equipment, and without GIS or cell phones took off downstream with their rudimentary maps and supplies.

This is a list of early river runner markings in Dinosaur National Monument, followed by some interesting errata. Many of the inscriptions have significantly deteriorated over the past 30 years, from when I first saw them. You have to imagine your actions multiplied by the hundreds of other folks who have visited these sites. When you visit one of these sites do not touch the inscriptions. Touching inscriptions abrades them and leaves a small oily substance, which is also harmful to them.

The locations are keyed to the Belknap Guide.



Green River: Mile 234, river left

The above inscription is located at river level in a small alcove about 200 yards above Harp Falls, it can be observed from a boat. The inscription was done in yellow paint, which has faded slightly. It is still clearly readable.

Haldane "Buzz" Holmstrom was the first person to run the Green and Colorado rivers solo (1937). In 1938 Amos Burg, an adventurer and National Geographic photographer made a film recreating Holmstrom's solo trip. Buzz ran his homemade boat, the "Julius F." and Burg ran "Charlie" the first inflatable raft to run the canyons. Phil Lundstrom, a friend of Burg's, joined the trip from Green River, Wyoming, to Jensen, Utah.

Green River: Mile 232.3, river left

REYNOLDS HALLACY
1950
A K REYNOLDS
- - - - -
REYNOLDS
G J GREEN

The inscription is located on a rock outcrop just above

the high water line at the upper end of the eddy below Triplet Falls. It was done in white paint, but most of the paint has peeled off.

A.K. Reynolds operated river tours through Dinosaur National Monument in the early 1950's using wooden cataract boats. Dinosaur N.M. has an excellent film of some of these trips.

Green River: Mile 232.3, river left

9 Lee Kay
25 Earl Clyde
38 D.L. Rasmussen
Wes Eddington
39 Roy DeSpain

These men worked for the Utah Department of Fish & Wildlife, and were doing a wildlife survey in 1938. Kay and Clyde had previously run the river with Bus Hatch in 1934. DeSpain joined Hatch on his 1939 trip down the Yampa River and later ran many commercial trips for Hatch. (Note: DeSpain's Rock on the lower left of Moonshine Rapid was named for Roy DeSpain).

Green River: Mile 221.8, river right

D J 1838

The inscription is located on a 20 feet rock wall about 50 yards above the second rapid in Whirlpool Canyon. It is about 4 feet above the high water line and is partially hidden by vegetation. The inscription is chipped lightly into the rock. Glade Ross (Utah river guide license #001 and NPS river ranger) located this inscription in August 1975. Though readable, this inscription has deteriorated over the past 30 years. It is not unlike the deteriorating condition of the Julien inscription at the mouth of Chandler Creek.

Denis Julien trapped and traded in the Midwest from 1805 to 1817. By 1827 he had move to the Taos area and apparently in the 1830's was trapping and exploring along the Green and Colorado River drainage. Julien left seven known inscriptions on or near the river: Whirlpool Canyon, Desolation Canyon, Labyrinth Canyon (two), Cataract Canyon, Arches N.P. and Inscription Rock on the Uintah River, near Vernal, Utah.

Yampa River: Mile 20, river right

Mr. + Mrs. Bus Hatch June 15
Mr. + Mrs. W.N.Eddington 1938
Mr. + Mrs. Roy DeSpain

The inscription is located in Signature Cave about 200 yards across from Harding Hole. The inscription was done in black paint. Part of the Hatch name has been vandalized, but it is readable. There are many other names in the

cave, both historic and modern. In the late 1980's a Sierra Club trip left many inappropriate inscriptions in the cave.

Bus Hatch began his boating career on the Green River in 1931 and continued to expand his river running around the World. Bus' wife's name was Bay. DeSpain and Eddington had previously run the Green River in 1938.

As an aside, the chimney and equipment on the gravel fan below the cave are from Jens Jensen's mining explorations. Jensen made many trips down the Yampa, and may have been the first white person to have descended sections of the Yampa River.

Miscellaneous Inscriptions

Green River: Mile 242.6

A series of white and red survey benchmarks on both sides of the river just above the high water line. They may be from a dam proposed at this site or the Echo Park Dam.

Green River: Mile 232.3, river left

Hung up 4 hrs. at low Tide
May 16 '59
Georgie White + 14 Crew
Ring Done it

This inscription was carved into a driftwood plank that was originally attached to a post. By the mid-1980's it was gone.

Georgie White began her "river running experience" in the Grand Canyon in 1945. On May 16, 1959, one of her 27 feet pontoon rafts became stuck on the rocks at lower Triplet Falls. Ring was one of her boatmen.

Green River: Miile 230.5, river right

John Steward, of Powell's second expedition, recorded in his journal that he, Fredrick Dellenbaugh, and Walter Powell left their names along Rippling Brook (which they called "Leaping Brook") on June 25, 1871. In the mid-1980's I searched the area for several days. This inscription, if it exists has never been located.

Green River: Mile 225, river right

Jack Sumner, of Powell's first expedition recorded in his journal that some of the party carved their names on Echo (Steamboat) Rock opposite their camp at the confluence with the Yampa on June 20, 1869. I have never located this inscription, although there are many petroglyphs along the base of Steamboat Rock.

Green River: Mile 224.4

A two mile walk up Pool Creek ends at the Chew Ranch which is now owned by the National Park Service. On the stone walk leading to the main ranch house notice the diamond shaped stone. The "diamond" is the Chew Family brand, and in a variety of forms is still used by them today.

Green River - mile 222-221

On a bench about 40 feet above river level on the right are survey marks and stakes from the survey of the Moffat Railroad. On the left at about the same level are ladders, cables, painted benchmarks and other debris related to the Echo Park Dam survey.

Unfortunately in 1989 I observed a seasonal river ranger at the Split Mountain boat ramp with much of these historic items. He was "cleaning up the canyon!"

Green River - mile 212.6, river left

"The White Buffalo" a petroglyph-like figure on the wall to the left of a small island. The figure is above a talus slope and partially hidden by vegetation. The figure has characteristics of "cowboy art" although some say that it is Ute.

Green River: Mile 199.5, river left

Note a large talus slope that appears to contact the overhanging cliff just upstream from the boat ramp. There is a 50 feet gap between the talus and the "wall" which is actually a very large alcove or cave. On the boulders facing the cave are several painted inscriptions believed to be from men conducting the Bureau of Reclamation survey for the Split Mountain Dam.

Green River: Mile 199.2, river left

A several hundred yard walk up the bottom of the Split Mountain Escarpment to the second box canyon leads to inscriptions left by Chick and Frank McKnight. Chick and Frank were nephews of Josie Basset Morris whose cabin is at the end of the Cub Creek Road. The McKnight boys left the inscriptions in the late 1950's when they were visiting Josie and their father had let them drive his new (used) Buick. The boys cut across the fields and hiked up the canyon to explore. After leaving the inscriptions they got the car stuck much to the dismay of their father! Frank worked for Hatch River Expeditions for many years.

But an observant naturalist will gaze at the rocks below Triplet Falls across from the inscriptions and imagine a 27 foot pontoon boat high above today's river level. A savvy naturalist will make a connection between the inscriptions, today's lower water levels and the changes we have wrought upon our rivers: involving their customers in a thought provoking activity that highlights what we should do about those changes.

To put these inscriptions into perspective you can read books like *Echo Park* by Jon Cosco; *The Doing of the Thing*, by Welch, Conley and Dimock; *If We Had A Boat* by Webb, and such classics as *The Chew Bunch*.

Coal Creek Dam Site

by Roy Webb

In the Belknap *Desolation River Guide*, on the same page [p. 37] as the photo of the "Thunderous Hole in Coal Creek Rapid" is another one of a man standing in the doorway of an old house, with the caption "Ruin housed Coal Creek damsite workers in 1911." If you look fast, in the tailwaves of Coal Creek—once you're safely past the "Thunderous Hole," of course—you can still see major excavations into the slope on the right side of the river, and the house and associated buildings and corrals are still standing on river left. On the last CPRG interpretative training trip, we stopped and bushwhacked over there to get a look at the excavations, and later camped by the old house across the river. Quite a bit of work went into the keyway, or foundation, of the dam, and the house and corrals have likewise stood the tests of time.

Despite the obvious effort put into the dam site, however, historical sources on the dam are as scarce as shade in Gray Canyon, found mostly in aging newspapers and the voluminous files of the Otis R. Marston collection at the Huntington Library in San Marino, California. It was known as the Buell Dam, after the promoter of the project. Little is known about Buell, not even a first name or an exact date when he started on the project. The most detailed description of the dam comes from the diary of Ed Harmston, a railroad engineer, who surveyed Desolation and Gray canyons by land and boat for the Denver and Rio Grande Railway in September 1913. Harmston's party went by boat from mouth of the Duchesne River to the Seamount Ranch, today known as the Rock Creek Ranch; there they met members of the Buell Dam crew who were surveying the high water line of the proposed dam. From them Harmston learned that the dam "is to be 200 ft high...it is planned to use it for both irrigation and power purposes, the land to be irrigated amounting to 165,000 acres has been segregated under the Carey Act, and lies on both sides of Green River; the estimated cost of the project we are told is $9,000,000. [...] The high water line of this dam will reach within a couple of miles of Seamount's ranch."

Apparently a man named Hyrum Johnson of Provo, Utah, was also involved in the dam in some way. In a 1966 interview between Otis Marston and Bill Seamount, Seamount says that Johnson "had 8 or 10 men drilling 2 or 3

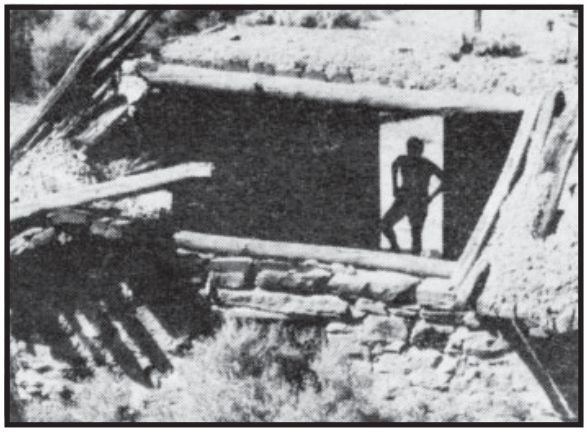


Photo from Belknap's Desolation River Guide

years near Coal Creek for UP&L"; later he wrote to Marston that Johnson was the "foreman." I found a Hyrum E. Johnson in the *Jonas Johnson Family, 1600 - 1970*, who seemed to fit the bill; he studied drafting and construction at Utah State Agricultural College (now Utah State University), and later owned his own contracting firm. But unfortunately his brief biography makes no mention of working on the Buell Dam, and his involvement must for now remain a mystery.

About the only river runners to mention the dam are the Kolb brothers, Ellsworth and Emery, who passed by on their river voyage in 1911. *In Through the Grand Canyon from Wyoming to Mexico*, Ellsworth mentions how they ran into five men in a boat rowing upstream "in a long, still stretch" above Coal Creek rapid [p 104-105]. The men told the Kolbs that they were working on dam a few miles below, and followed them back down river to watch them run Coal Creek Rapid. After their successful run, the brothers tied up at the camp across the river to visit. Most of the dam site workers were gone to Green River, Utah, since it was a Sunday, but there was a small crowd there. In *The Brave Ones*, the edited diaries of Ellsworth and Emery, Emery notes "They kindly invited us to stop for dinner at their head quarters which was a mile or so below. We accepted as usual. The dinner was prepared by Mrs. Steel and the pie not being passed the 2nd time gave no chance to reflect on our manners." [p. 71]

The late 1800s and early 1900s were a time of great boosterism in the West. Anything was possible to "men of energy, enterprise, and capital"; no project was too grandiose, no mine too inaccessible, no river too wild to be tamed. The Buell Dam fits nicely into this pattern. A 1911 article in the *Grand Valley Times* of Moab about the Buell Dam noted that the dam was supposed to irrigate 240,000 acres of land, would cost $10million, and would include "337 miles of canals and provide good agricultural land for from 20 to 50 thousand families." Despite the claims of newspaper editors, however, plans for the Buell Dam ultimately fell through. Ed Harmston noted in 1913 that Buell had been trying for eight years to raise enough money to complete his project, but was unsuccessful. In 1922, when the USGS/UP&L survey went through Desolation and Gray Canyons, engineer Ralf Woolley didn't even note the Buell Dam site. By the 1930s, the damsite and Buell's schemes were abandoned and largely forgotten. In the heady years of the Colorado River Storage Project, after World War II, the Bureau of Reclamation again turned its gaze toward the remote canyons of the Green River, with plans for a series of dams up and down the river. Included in these plans was one to be called the Rattlesnake Dam, near the rapid of the same name in Gray Canyon. Again, however, the site was deemed too remote and the benefits not enough to justify the costs, so the Rattlesnake Dam was likewise cancelled. Today's river runners in Desolation Canyon, whether stopping at Rock Creek, or enjoying the stunning vistas as Desolation Canyon ends, or running the "thunderous hole" in Coal Creek, can be glad that the grand schemes of all the dam promoters came to naught.

Special thanks to Jim Aton for research assistance.

"Set My Spirit Free" A History of SOCOTWA

by Roy Webb

In the past twenty years of researching, writing about, and speaking about river history, I've given many talks to many different groups. Whenever the topic is Glen Canyon, it seems like invariably someone would come up to me afterwards and says, "I went down Glen Canyon with SOCOTWA!" After a while I started getting curious; what was this group with the odd name? I knew about Nevills, and Harry Aleson, and Moki-Mac and the Quist family, all of whom took many people through Glen Canyon over the years before it was flooded by Lake Powell. But SOCOTWA? I ran across their logo, an inverted triangle with a mountain man in the middle, in the Music Temple register books. Obviously SOCOTWA had a lot of impact on Glen Canyon. One of these days, I vowed to myself, I'm going to do some more research and write an article about them.

But it never happened until the 2003 Desolation Canyon CPRG training trip. On that rainy, wonderful trip I was talking around the campfire with Dee Holladay and Annie Payne, president of CPRG; I said something about SOCOTWA and Dee mentioned that in the 1950s, there were only a couple of ways to get down Glen Canyon: either with Moki-Mac or with SOCOTWA. Annie immediately perked up; it turned out that her river mentor, Richard Jones—former owner of World Wide Expeditions—had told her many stories about SOCOTWA trips, and had incorporated many of the traditions and practices of SOCOTWA into his own company. Then and there Annie and I decided to work together on an article for *The Confluence* about SOCOTWA. Once we got back to Salt Lake City, we started setting up interviews with former guides and members of the group, starting with Richard Jones. Richard had started going on SOCOTWA trips when he was only 14 years old, just out of junior high. But at that first interview, also present were Oscar Olson, who had gone on his first trip with the group while he was in the army in 1962, and Dale Labrum, who, as it turned out, was one of the founders of SOCOTWA in the years just after World War II.

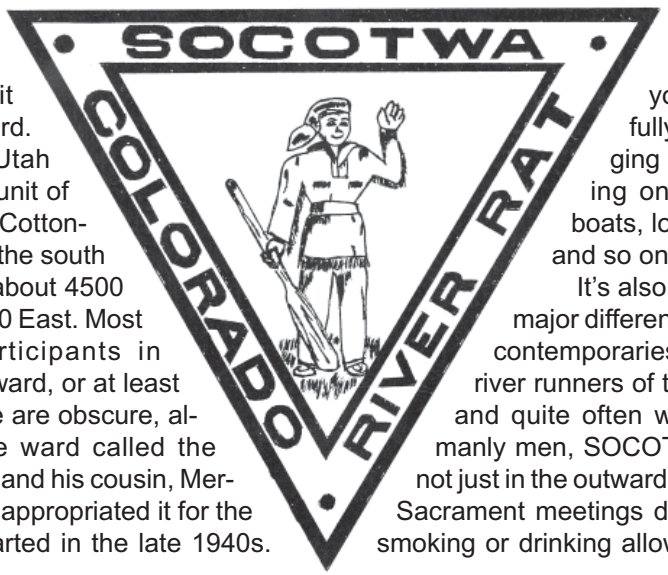
Even though Annie and I did a number of other oral histories with SOCOTWA trip participants, from whom we heard a lot of great stories, that first one with Richard, Oscar, and Dale was the most important. From them we learned a number of startling things: first, that SOCOTWA was still in existence, although it had become, as Oscar put it, a "knife and fork" club, a group that met occasionally for dinner, and to listen to a speaker. Next was the extent of their operation: we were both surprised to hear that in the 1950s, SOCOTWA had over a thousand members, owned as many as 30 surplus inflatable rafts and a couple of busses, and could have half a dozen trips on the water at the same time. Finally, from each of them we received an invaluable gift: Oscar had brought with him a book titled

Socotwa Expeditions: 50 Years, 1948 to 1998. Dale, as mentioned above, was one of the founders of the group, so we got the story of the beginnings and early years right from the proverbial horses mouth. Richard was one of the very few members to have continued his involvement with the river industry, so from him we got a long-term perspective on what impact SOCOTWA had not only on the lives of those who joined, but on the river running world as well.

SOCOTWA started and spent most of its active existence from the end of World War II to the completion of Glen Canyon dam in 1963. This was a time of great change and turmoil in the river running world. There were no rules; if you wanted to run the Grand Canyon, you just showed up at Lees Ferry and talked to the ranger (or more likely, the USGS water gauger), and there you went. If you wanted to float through Dinosaur National Monument on the Green or Yampa, same thing: all you needed was a 10-man raft and a few days off. There were still some of the old timers from the 1940s around, but others were gone: Norm Nevills and Bert Loper had both died in 1949, Buzz Holmstrom in 1946. Other river rats had started their own companies and "gone commercial," like Bus Hatch, Harry Aleson, and Malcom "Moki-Mac" Ellingson. Hatch stayed up on the Green and Yampa, for the most part; Aleson was too crotchety to ever get much of a following; Moki didn't really have his own company, he went along on trips run by Al Quist and his sons Richard, Clair and Bob. In the Colorado drainage, the San Juan was about the only river to have an active river company running regular commercial trips: Mexican Hat Expeditions, formed by former Nevills boatmen Frank Wright and Jim Rigg, had taken over Nevills boats and customers after Norm and Doris' tragic deaths in a plane crash in September 1949. Glen Canyon was especially wide open, given the fact that you didn't really need whitewater skills to get down it safely. Running Glen Canyon was only restricted by the terrible road (or what passed for a road) from Hanksville through North Wash down to Hite. If you could get there without breaking an axle or leaving your oil pan on a ledge, you were home free, no rangers, no rules, no regulations, almost nothing save for scenery, the river, and the night sky until you got to Lees Ferry, some 180 miles downstream.

Into this void stepped SOCOTWA. Okay, I know you're asking, what is with that name? It's actually an acronym of sorts: it stands for South Cottonwood Ward. A ward, as all who've lived in Utah know, is the basic administrative unit of the Mormon church. The South Cottonwood Ward comprised an area of the south Salt Lake valley, in Murray, from about 4500 South to 5600 South and about 900 East. Most of the early leaders and participants in SOCOTWA trips came from that ward, or at least that area. The origins of the name are obscure, although there was a choir in the ward called the SOCOTWA Singers. Dale Labrum and his cousin, Merlin Shaw, liked the sound of it and appropriated it for the outdoor adventure group they started in the late 1940s. Dale and Merlin had grown up together and were always looking for things to do in the great Utah outdoors. After a stint in the Navy during the war, Dale heard about an auction of surplus war materials to be held at the old army air base in Kearns, Utah. He was the highest and only bidder on a brand new surplus 10-man raft at this particular auction, paying $15 for a raft, complete with paddles and other gear, including grooved wooden plugs used for stopping air leaks caused by bullet holes. Dale named the raft "Sweet Lips," to honor his "lost love and misspent youth," called up his cousin Merlin and said, well, I've got a raft, want to give it a try?

After a couple of misadventures, including a trip down the Jordan River in the Salt Lake valley that involved "diversion dams, barbed wire fences, and a multitude of irate farmers,", and an exhausting excursion to Utah Lake that ended up with them slogging through mush ice dragging the boat, they resolved to try other venues for their raft. Their first trip through Glen Canyon was in 1948, although details of that trip are sketchy. Boy Scout groups, which in Utah are all sponsored by the Mormon church, had gone down Glen Canyon with Bert Loper as their guide, and it's likely they heard about how much fun the Scouts had had. But at any rate it was such a success that Dale and Merlin decided to form a non-profit corporation "for the purpose of guiding the youth and providing a meaningful relationship with nature." Interest in the group quickly skyrocketed, inspired by the stories of Glen Canyon that spread through the Mormon grapevine. Within a couple of years their needs had outgrown the original "Sweet Lips," and more rafts and equipment were quickly obtained. By the middle of the 1950s, when plans for the Glen Canyon Dam were made public, SOCOTWA was a going concern, with over 30 rafts and associated equipment, busses and trucks to haul passengers and gear, and half a dozen trips going at the same time. But it's important to point out that SOCOTWA was not a commercial outfitter in the sense we think of today, where guests pay a fee to go on a trip that is catered, and on which all they basically do is get on and off the boats every day. Rather, it was more like a cooperative in which members joined the organization for a nominal yearly fee of $15, and then paid for each trip that they wanted to go on. Once you signed up for a trip, usually about $50 for a week long trip, you were expected to participate fully in the running of the trip, rigging and de-rigging the boats, serving on a kitchen crew, paddling the boats, loading and unloading every day, and so on.



It's also important to point out two other major differences between SOCOTWA and its contemporaries on the river: unlike the other river runners of the day, who were portrayed as, and quite often were, hard-drinking, hard-bitten manly men, SOCOTWA was thoroughly Mormon—not just in the outward trappings of Sunday School and Sacrament meetings during the trip, daily prayers, no smoking or drinking allowed (but plenty of opportunities

for romance, which was winked at by the leaders)—but in the detailed organization, the pioneer spirit, and the shared heritage of ancestors who made a home out of a wilderness. Indeed many of the SOCOTWA leaders were leaders in their local wards; Merlin Shaw was a Bishop, for example, and others held similar positions in the church. Next—and in this they differed not only from other river outfitters but from the standard practices of the Mormon church then and now—women were active participants in all aspects of the trips. Women such as Deween Durrant, Mary Plowgian, and Nancy Anderson served as chefs (who actually managed the kitchen crews instead of doing the actual cooking), as planners, guides, boat captains, and even expedition leaders, as the trip leaders were called. Finally, another Mormon tradition was keeping a journal, and a surprising number of passengers did so, sending copies back to the SOCOTWA offices in Salt Lake City. These ranged from simple type-written accounts a few pages long, to elaborate bound publications with photos, maps, and drawings.

By the middle 1950s, the Glen Canyon trips were down to a routine. The group would meet in Salt Lake City, usually in the vacant lot by Merly Shaw's house in Murray, and then travel in a bus down to an intermediate stop like Green River, Utah, or Arches National Park. There they would be met by a stake bed truck which already had all the boats and river gear. All the personal bags would be loaded into the truck and all the passengers would pile in on top for the bone-jarring, dusty ride down through North Wash to Hite. Once there, the group would be divided into boat crews, which would also be the kitchen crew for one day's duty, the boats were inflated, all gear loaded, and they were off. Each day started at 4 A.M. with Merly Shaw playing a tune on his harmonica, save for Sundays, when they got to sleep in until 5:30. Water fights, a feature of SOCOTWA trips, usually started right away and didn't stop until they were off the river at the end of the trip. Another activity was wallowing in mud bogs; everyone would coat themselves with mud and roll around; some groups would create tableaux of mud-coated figures.

Favorite stops included Bert Loper's cabin at Ticaboo; the petroglyph panel at Smith Fork; SOCOTWA beach at Bullfrog Rapids; Shaw's Spring Canyon, a small side canyon that SOCOTWA claimed to have explored for the first time and where there was a fixed rope for swinging out into the river; and of course Hole-in-the-Rock. Given the Mormon background of virtually all the passengers, the hike up Hole-in-the-Rock was more in the nature of a pilgrimage than just a hike, and even reluctant passengers were inspired by the prospect of a Dairy Queen at the top of the trail. (The mythical Dairy Queen was peripatetic; sometimes it was at Hole-in-the-Rock, sometimes on top of Rainbow Bridge, sometimes up the Escalante a ways; it was a standard trick to play on first-timers). Music Temple was also a favorite, and Sacrament services were often held there, with hymns and people playing instruments, and all would sign the register books found in a can under an overhang. Camps were at places like Lake Canyon, Hole-in-the-Rock, and Forbidding Canyon, where the meals were simple but filling fare such as hamburgers, spaghetti,

SOCOTWA stew, Merly's famous breakfast of bacon, potatoes and eggs mixed together, and so on. Lunches were equally simple, and usually eaten on the boats as they floated along.

The highlight of the trip, though, was the hike to Rainbow Bridge. It was a long slog, 14 miles round-trip, but there were few who didn't go. The camp at the mouth of Forbidding Canyon (sometimes called Aztec Canyon, after the name of the creek that flowed through it) was often crowded, and it was one of the few places where the SOCOTWA trips would run into other parties; government surveyors, private trips, even other outfitters such as Mexican Hat Expeditions or Ken Sleight's Wonderland Expeditions. While the hike was a long one, the goal at the end, and the beautiful slickrock pools along the way made it worthwhile. Once at Rainbow Bridge the more adventurous would use the fixed ropes to climb a buttress on one side of the bridge, from which they could climb down onto the top of the span. Others would look through the registers and sign their names, and lounge in the dammed-up pools at the bottom. Once everyone was back down, it was time for lunch at the Contest Pool. The contest involved running or edging up a steep slickrock slope as far as you could, then make a mark on the wall with a rock. The next contestant would try to reach a little higher or farther. Despite their sore feet and sunburned skin, that night was there was often a grand fiesta, for it was the last night of the trip. Concerts with ukuleles, a violin, and of course Merly's harmonica were held, and one 1958 journal describes a square dance held by firelight.

There are two things that seem to characterize SOCOTWA trips, and that appeared in every journal we read, and in every interview: the emphasis on having fun and romance. Water fights and mud wallowing have already been mentioned; boat crews held competitions and often brought along specially made flags, or color hats for their boat mates. Shaving by the men was frowned on, and while the women would wash their hair, no one was supposed to wash their clothes. Sacre Dulce, an LDS choir group that went on many SOCOTWA trips, was famous for practical jokes. On one trip they somehow smuggled an iced watermelon along, and ate it on the boat in front of the other crews; on another trip, boat leader Glen Fagg secretly brought along ice cream packed in dry ice, with Dairy Queen cups, chocolate topping, and even maraschino cherries. The effect of seeing the Sacre Dulce crews

eating these treats on the boat, while the others washed down smashed peanut butter or Vienna sausage sandwiches with heavily chlorinated water, is easy to imagine. The alleged Dairy Queen at the top of Rainbow Bridge has already been mentioned, and other practical jokes were common in camp. However, it was all done in a spirit of fun. The other aspect of SOCOTWA that seems to crop up in every account is the romance. More than one person we interviewed said that they had met their future spouse on the river, had proposed, or had at least had a brief river romance. Dale Labrum, one of the founders of SOCOTWA and participant on many trips, wrote of meeting his future wife on a trip where everything had gone wrong; flat tires, bugs, wind, poison ivy, a boat flip: "I had already set the wedding date with a bimbo, and she was engaged to a turkey, when we experienced this magical SOCOTWA trip together. Nonetheless, when ... I saw a smile on her blistered lips and she said 'Wasn't that a beautiful moment when we were surrounded by rainbows?' I knew she was the one." They were married three years later and have been married almost fifty years now.

The earliest SOCOTWA trips took out at Lees Ferry, but after construction on Glen Canyon Dam started in 1956, they could only go as far as the landing at Kane Creek, near Crossing of the Fathers. There the boats would be unloaded and washed out; the gear piled up in the back of the old faithful yellow and red stake bed truck, and the weary, sunburned group would climb in on top of it and rattle their way back to civilization, the town of Kanab in the early 1950s and later, the Wahweap Motel. It was time to wash up, comb some of the sand out of their hair, and don their new SOCOTWA t-shirts, given to them at the end of the trip. There the trip began to split up; some left right away, while others would often stop at the site of the Glen Canyon Dam, or visit Bryce Canyon National Park. Once back in Salt Lake City, there was usually a final dinner at someone's house, and their SOCOTWA Glen Canyon trip was over.

Even though Glen Canyon was the main attraction for SOCOTWA, it wasn't the only river trip they offered. Some groups ran the San Juan or the "daily" stretch of the Colorado, from the Dewey Bridge to Moab, Desolation Canyon on the Green, and exploratory trips were done on the Snake River and the Middle Fork of the Salmon in Idaho. The leadership discussed trying Cataract Canyon or the Grand Canyon, but they never ran either of those stretches of river because the former was deemed too dangerous, and the latter too long. One whitewater river they did run on a fairly regular basis, however, was the Green through the Canyon of Lodore in Dinosaur National Monument. Before the Flaming Gorge Dam tamed it, Lodore was a wild stretch of river; spring floods could run as high as 25,000 cfs. At high water it was one continuous rapid, with such famed Class III and IV falls as Disaster Falls, Triplet Falls, and Hell's Half Mile. Even experienced river runners like Bus Hatch and Frank Swain often got themselves into trouble in Lodore. The SOCOTWA crews, made up of equally inexperienced guides and paddlers, often found themselves over their heads. On a high-water 1961 trip, one of the boats wrapped around Winnie's Rock in the first rapid and was lost, despite an all-day effort to free it. Other problems in Dinosaur were caused by weather; in the spring they were often beset by rain and wind. They never carried tents, so they went to bed wet and cold and rose the same way. On the Yampa, the trips were sometimes plagued by mosquitoes. So Dinosaur never held the same attractions that Glen Canyon did for SOCOTWA groups.

In some ways, SOCOTWA was ahead of the curve in river running; they ran more trips and had more boats on the water than any of the early outfitters, and all with volunteer crews. Being ahead of the curve in anything can be risky, and in the wrong situation or setting downright dangerous. It was a function of too many boats on the water with too many inexperienced people-both passengers and staff-and the odds finally caught up with them. SOCOTWA had its share and more of on-river and campsite accidents, and even some tragedies. Of course sunburns, bug bites, cuts and bruises were common and expected, just like they are today; but there were also several cases where horseplay got out of hand, or someone tried to climb a wall that was a little too steep, and bones were broken. SOCOTWA had good first aid, as good as you could get at the time, and many times there were doctors along as passengers. But if you broke an arm or an ankle, or dislocated a shoulder, there were no evacuations. The injured limb was splinted or stabilized, and the other passengers pitched in to help the injured member of the group until they got back to civilization; it was just looked on as part of the risk of going into a wilderness. In the early 1960s, though, SOCOTWA suffered a series of tragedies that staggered the SOCOTWA membership. Even though two of these tragic events didn't even happen on the river, they seemed to spell the end of SOCOTWA's active river program.

The first occurred in May of 1961, on a trip through Split Mountain Canyon on the Green. It was a large group, 55 people, and very high water. At the last small rapid before the Split Mountain boat ramp, where the river pushes up against the cliff on the right, one of the boats got too close and was momentarily pinned by the current. Everyone was thrown clear except for Don Jasperson of Provo and a woman named Peggy Robinson. Ms Robinson was pinned against the wall by the boat, while Jasperson was knocked unconscious when his head hit the cliff and thrown into the bottom of the boat. The next boat behind them was able to free the trapped boat; Ms Robinson floated clear, face down, but was brought around. Mr. Jasperson, however, was dead when they pulled him from the overturned boat. SOCOTWA members had barely had time to digest this awful event when in September of that same year, Walt Scott, a long-time SOCOTWA leader and the person in charge of maintenance of their vehicles, led a large group of Scouts into the Zion Canyon Narrows. On a Sunday, as they were hiking along the bottom of the canyon, a sudden flash flood hit the party and Scott and four of the boy scouts were washed away. Their bodies were all found later, as much as ten miles downriver. The small, close-knit group of SOCOTWA staff was deeply shocked by this sudden loss of someone they all knew so well.

But worse was to come. In June, 1963, a large group of Boy Scouts from the Pleasant View Ward in Utah Valley

were in the back of the SOCOTWA truck on the 50-Mile Mountain road south of Escalante, Utah, on their way to meet a SOCOTWA river trip at the bottom of the Hole-in-the-Rock trail. There they would trade passengers, the river crews hiking out, while the Scouts hiked in to run the last stretch of Glen Canyon. It was one of the most isolated spots in the entire state. As the truck labored up a steep grade out of Carcass Wash, the engine stalled, and as it began to roll backwards the driver could not stop it. The truck rolled off the road and overturned, spilling all passengers and gear and then rolling over some of them. Four adults and eight scouts were killed instantly, while twenty-six more were injured, some critically. Among the dead was Merly Shaw, the most well-loved member of the entire SOCOTWA family. With his loss, and the flooding of Glen Canyon when the gates closed on the dam that same year, the heart went out of the SOCOTWA river program. Even though in later years the group still did occasional river trips, it just wasn't the same. Dale Labrum, one of the founders of the group, shaken by the loss of his friend and cousin, walked away and resigned from the board. One member, John Josephson, took over the river gear and changed the name to Travel Institute, and continued to run some trips through Dinosaur and Desolation Canyon, but SOCOTWA's years on the river were finished.

Even before these terrible occurrences, SOCOTWA had branched out into land trips by bus. Groups went to the Seattle and New York World's Fairs, to the Hill Cumorah Pageant in New York, even to Mexico. These were run the same way as the river trips; they camped out in parks and campgrounds, and brought along their own kitchens and food. Many accounts were written about these trips, but they are outside the scope of *The Confluence*. Suffice to say that they continued into the 1980s and beyond, and as mentioned above, SOCOTWA is still in existence.

Despite these tragedies, many people in Utah and elsewhere have nothing but fond memories of their experiences with SOCOTWA. In the commemorative book SOCOTWA published on its fiftieth anniversary in 1998, members related not tragedy, but how SOCOTWA helped them establish patterns in their lives that they still held to. They remembered the fun times, the camaraderie, the shared joy of the river and the experiences of traveling to far and wild places with a group of friends. Many wrote about the lifelong friends they had made while on a SOCOTWA trips; others remembered the moon over the cliffs in Glen Canyon or the practical jokes by Sacre Dulce. Deween Durrant summed it up for everyone when she wrote:

Very simply, SOCOTWA fulfilled my needs. It provided me with the opportunity to expand my horizons; to experience adventure and daring; to travel to places and see things I never could have afforded. SOCOTWA helped me to establish a circle of friends, a sense of belonging, feelings of acceptance, self confidence, and security. In short, it set my SPIRIT free. [...] What a brilliant landscape of memories these SOCOTWA trips and experiences have provided for us! What a rich heritage of friendships and contacts we've enjoyed from teen age through the "golden" years! What a great legacy of laughter, love, and learning, has lighted our lives!

From the Marriott Library

FILM EVENT

The Special Collections Department of the University of Utah's J. Willard Marriott Library has been collecting historical films that depict Glen Canyon for quite a few years now, and we want to show them off! On Tuesday, April 13, the University will host an all day showing of a number of films from our collections. Both professional and home color movies will be shown that will give you a chance to see what it was like to leave from the Hite Ferry; to float past Tapestry Wall; to sit in Music Temple; and to hike to Rainbow Bridge. An added feature will be films of the canyons of the upper Green that are now flooded by Flaming Gorge Dam. The festival will start at 12:00 PM on Tuesday, April 13, and run until 8:00 PM. The films will be shown in the Marriott Library's Gould Auditorium. For more information, call Roy Webb, Multimedia Archivist, at (801) 585-3073, or email at <roy.webb@library.utah.edu>.

RIVER HISTORY AVAILABLE ONLINE AT MARRIOTT LIBRARY WEBSITE

Ever seen a one of the registers that used to be in Music Temple? How about a page from an original diary kept by pioneer river runner Nathaniel Galloway in 1909? What about photos from Harold Leich's solo run from the source of the Colorado through Westwater in 1933? Or how about photos from Glen Canyon and Flaming Gorge before the dams? You can find all of these and more at the University of Utah's J. Willard Marriott Library website. The URL is http://www.lib.utah.edu/spc/photo. Once there, use the various indexes to look for photos. You can search for photos by using the Alphabetical Index, for instance, or use the Subject Index and look under Rivers and Lakes. You can also use the search engine by putting in a term such as "Glen" or "river". The search engine searches across collections, however, so you might get a picture of the Green in Desolation Canyon and next find one of a dog sled on the Wood River in Idaho. So when you're not able to surf your favorite wave, get on the internet and surf over to some cool historical sources on river running.

Free Replacement if Lost or Stolen

It takes
a certain amount of blue
to be a sky
and a unique collection
of upwardly motivated stars

It takes
an abundance of green
to be a forest
and a little bit of whimsy
to paint enough
wildflowers

It takes
a winter of snow
to be a river
and an order of stones
to punctuate life's
sentimental journeys

It takes
a certain amount of love
woven red with courage
to trust
another human being
with your heart

Doub Oblak

A Colorado River Sediment Inventory

Compiled by John Weisheit

The table below is a compilation of scientific data from reports written by hydrologists. For the US Geological Survey (USGS) Eugene LaRue documented the sediment loads of the Colorado River in early *Water Supply Papers*. A very comprehensive study on sediment in Lake Mead reservoir was conducted by the USGS in 1948-49 and published in 1960 as *Professional Paper #295*. This paper set the standard for the study of sedimentation in large reservoirs that has yet to be repeated. Subsequent studies, but limited in scope, have been accomplished such as the *1986 Lake Powell Survey* by the Bureau of Reclamation, and an excellent report was written by Edmund D. Andrews of the USGS, *Sediment Transport in the Colorado River Basin,* which was published in 1991 by the National Academy of Sciences. Unfortunately, the collection of data for sediment was discontinued by the USGS in 1989.

The chart below is basically accurate in all columns and rows. Two points of climate history must be considered when reviewing this data: 1) sediment loads vary considerably due to changes in climate regimes; 2) since the construction of Hoover Dam, additional reservoirs have been added to the plumbing system, which are collecting sediment independently throughout the entire basin. Incidentally, all river sections between dams have had their sediment loads reduced.

The government scientists who studied the sedimentation of Lake Mead in 1948 were actually alarmed at the rapid accumulation of sediment in that reservoir. To mitigate the problem, and to their chagrin, they recommended the building of upper basin dams. Though this provided more longevity for Lake Mead, it essentially spread the sediment problem to more than one place and effectively increased future mitigation costs substanitally. This demonstrates the mismanagement of water resources in the Colorado River basin, which can be summarized best as stealing the future to gain the present.

What the studies show is that sediment transport in the Colorado River itself has been greatly reduced since 1942 and by as much as 400%. This does not necessarily mean that natural erosion on the Colorado Plateau is at rest. More likely, sediment is being stored in the arroyos of the basin and waiting for threshold events to transport their loads into the Colorado River, and subsequently into mainstream reservoirs such as Mead and Powell.

For example, a flood with a peak discharge of 140,000 cfs roared through San Juan Canyon below Mexican Hat, Utah in October 1911. It is just a matter of time before similar flood events mobilize many decades worth of sediment from arroyos and send huge plugs of sediment into Lake Powell.

A sediment management plan must be conducted in the very near future by the Bureau of Reclamation. This study must not only evaluate the sediment of all the mainstem reservoirs of the Colorado River and its tributaries, but it must also evaluate the storage of sediment in all the ephemeral arroyos, especially where soft Mesozoic rocks dominate the landscape such as the basins of the San Juan and Little Colorado rivers. It must also determine the effects that sediment will have on dam safety, power generation, water storage, recreation, and the management of endangered species.

How Much Sediment Are We Talking About?

According to E. D. Andrews' very reasonable estimate, which was published in 1990, there are 44,400,000 tons of sediment arriving into Lake Powell reservoir on a yearly basis under the current climate regime. A truck pulling a street legal load has a carrying capacity of 22 tons. In one year, it would require 2.018 million truck loads to remove the annual sediment load of Lake Powell. That is 5,529 truck loads per day; 230 loads per hour; 4 loads per minute.

This scenario demonstrates very well the costs and impacts involved in solving the sediment problem of reservoirs. It also destroys the myth that federal dams are cost-effective and that hydropower is a renewable resource.

Author and year	Location	Years of analysis	Total annual average in tons	Total annual average in acre feet
E.C. LaRue 1916	Yuma, AZ	1892-1912 (inclusive)	162,500,000	
E. C. LaRue 1925	Yuma, AZ	1909-1922	196,673,400	
W.O.Smith 1960	Hoover Dam	1935-48	143,000,000	
E. D. Andrews 1990	Grand Canyon @ Bright Angel	1925-1940	195,000,000	
E. D. Andrews 1990	Grand Canyon @ Bright Angel	1941-1957	86,000,000	
E. D. Andrews 1990	Grand Canyon @ Bright Angel	1963-1990	11,000,000	
E. D. Andrews 1990	Lee's Ferry	1941-1957	66,100,000	
BuRec 1962	Glen Canyon Dam	?		85,400
W. Condit; 1978	Glen Canyon Dam	1963-1977		27,000
R. Ferrari 1988	Glen Canyon Dam	1963-1986		36,946
E. D. Andrews 1990	Glen Canyon Dam	1963-1986	44,400,000	

THE SEDIMENT PROBLEM IN RESERVOIRS

by Thomas L. Maddock, Jr
U.S. Bureau of Reclamation

A chapter from: Comprehensive Survey of Sedimentation in Lake Mead, 1948-1949, USGS Professional Paper 295; W. O. Smith, C. P. Vetter, G. B. Cummings, et. al.

The accumulation of sediment in reservoirs has long been recognized as one of the principal problems involved in the Western United States in providing for regulation of rivers by storage. Even the rivers in humid regions carry some sediment, and in several reservoirs in the eastern half of the country the accumulation of sediment is a significant engineering problem. More than 50 years ago F. H. Newell of the Geological Survey, later to become the first Director of the Reclamation Service [now called Bureau of Reclamation] wrote: "Thus, the upper ends of all reservoirs are rapidly filled with silt and it becomes an important question to the projectors of storage works as to how many years will elapse before the value of the reservoir is practically destroyed and whether its use can be restored in part by subsequent removal of some of this material."

To answer part of the question posed by Newell, the Geological Survey undertook, from 1904 to about 1910, what today would be called a miscellaneous sediment sampling program on many streams in the West, particularly those whose load of sediment was obviously great. For a long time records collected during this period formed the basis for estimates of the sediment load of western streams, and such estimates in turn provided the basis for decisions as to the amount of reservoir capacity to allocate to sediment storage and for estimates of the useful life of proposed reservoirs.

The greatest interest centered in the rate of sediment movement in the Rio Grande and Colorado River basins, perhaps the two streams most heavily laden with sediment in the country. Reports by Stabler (1911), Follett (1913), and Fortier and Blaney (1928) are the best known studies of sediment load in these two streams. The early estimates of sediment movement appear to be surprisingly good and reflect the ability and good judgment of those engaged in the early development of the water resources of the West.

In the light of more recent data, the estimates of average sediment load were generally somewhat high, and the predictions of reservoir life thus appear to be conservative. In 1899, the sediment load of the Gila River at San Carlos, Ariz., was estimated to average 8,440 acre-feet per year, but the observed rate of deposition in San Carlos Reservoir on the Gila River in the period 1928-47 was 3,200 acre-feet per year. In 1913, the average annual sediment load of the Rio Grande at Elephant Butte Reservoir, N. Mex., was estimated to be 19,700 acre-feet; the observed rate of accumulation in Elephant Butte Reservoir in 1915-47 was 14,400 acre-feet per year. Prior to the construction of Hoover Dam the sediment load of the Colorado River was estimated to be 137,000 acre-feet per year, but the 1948-49 survey has shown the average annual rate of accumulation to have been about 102,000 acre-feet. In nearly all cases present estimates promise a greater length of life for major western reservoirs than those made prior to 1930.

This encouraging news does not allay the problem of sedimentation in reservoirs, but merely puts off the day of reckoning. Commonly sedimentation is a minor problem during the first years of operation of a reservoir, but as the water-storage facility is used by succeeding generations the problem becomes of progressively greater significance and concern. Sooner or later the water users ask the questions: How long will the reservoir continue to be of use to

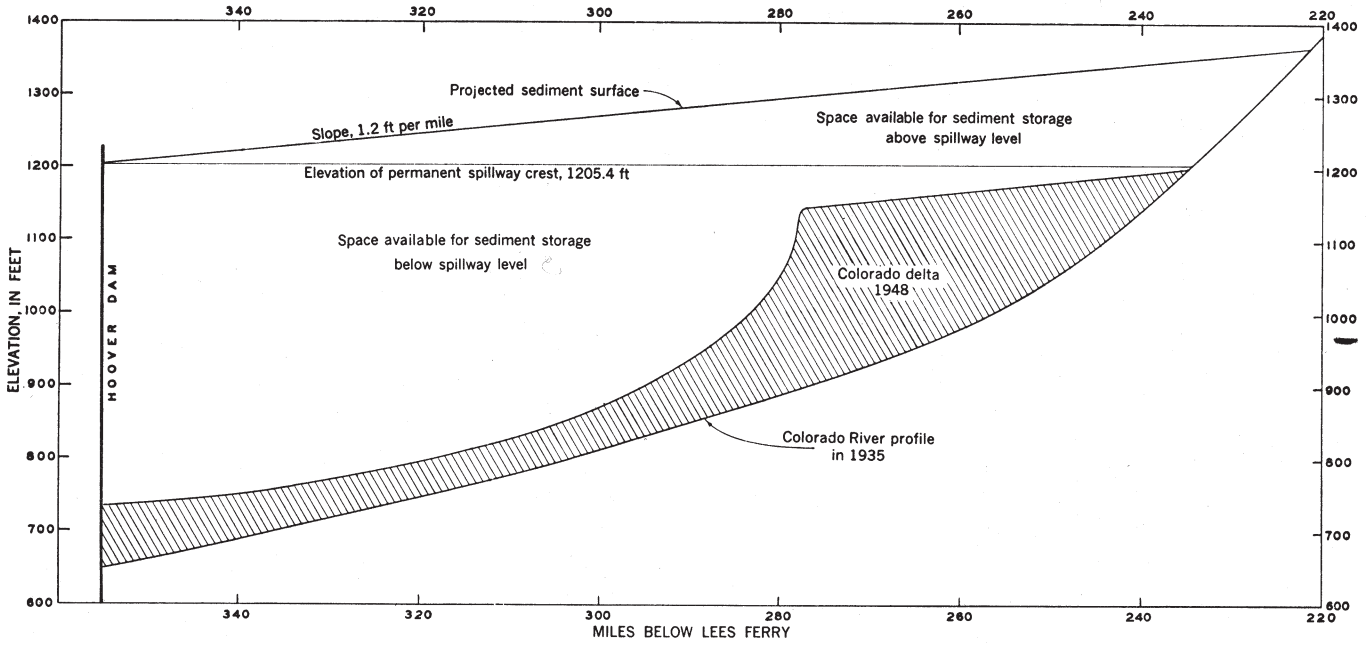


FIGURE 57.—Diagrammatic representation of the surface of the sediment that would be accumulated in Lake Mead when the lake is filled to permanent spillway level.

them; what can be done to increase that economic life; will there be diminution or deterioration of their water supplies (and, if so, when and how much); and what alternatives are available for meeting their continuing requirements?

These questions cannot be answered merely from an analysis of records of the rate of movement of sediment into reservoirs, even if those records were complete and accurate, which they are not. Also, detailed information is essential as to the mechanics of transportation and deposition of sediments in reservoirs, which is obtained by comprehensive surveys such as the one undertaken in Lake Mead during 1948-49. In part, the answers would depend upon an understanding of the dynamics of sedimentation, including erosion and transportation in the tributary watershed, as well as deposition in the reservoir.

It is difficult to predict the useful life of a reservoir even if the rate of sediment movement into the reservoir is known. This difficulty comes about partly because the rate of sediment movement in streams is measured by weight, and the weight of the sediment must be converted into space occupied. The conversion factor as found by reservoir surveys is not constant because the sediment becomes more compact as it dries and as deposits deepen. The space occupied by a given weight of sediment, therefore, will vary with the type of reservoir operation and the age of the reservoir. This is one of the reasons why successive volumetric surveys of a reservoir tend to show decreasing rates of sediment accumulation.

> *"Thus, the upper ends of all reservoirs are rapidly filled with silt and it becomes an important question to the projectors of storage works as to how many years will elapse before the value of the reservoir is practically destroyed and whether its use can be restored in part by subsequent removal of some of this material."*
>
> Frederick Newell, first commissioner of Reclamation.

In the United States there is no experience to guide any estimate of how rapidly a large reservoir will fill to the last stages of its life. It is known that, as the capacity of a reservoir diminishes, more of the sediment load passes through without being deposited. It is known also that, as deposition in a reservoir proceeds, a considerable quantity of sediment is deposited upstream from the flow line of the reservoir. Here again experience is not yet a sufficient guide to a determination of the amount of sediment that will be deposited in such locations. Critical problems can result from upstream deposition, and some have been observed. However, what happens above a reservoir seems to be dependent on many factors, such as reservoir operating levels, the amount of the sediment load, the amount of water carried by the stream, and the potential for vegetal growth.

If the problem of determining the life of a reservoir is not a simple one, the value of preventing sediment accumulation in a reservoir is not easily determined either. The difficulty is complicated by the fact that reservoir storage may have different values from place to place, or from time to time. Streamflow generally must be regulated to be useful, and the degree of regulation desired is a measure of the reservoir storage required. Filling a reservoir with sediment does not destroy the value created by the falling water in power production and may even increase power production by holding a given amount of water at a higher elevation, although if regulatory space is lost the firm power production may be decreased. Loss of reservoir capacity is not of tremendous importance when ample supplies of water are available, nor is it of importance in the dry years when storage space will not be filled. But maintenance of reservoir storage is of tremendous importance in the transition from wet to dry years, and most western irrigation projects now under way contemplate holding over the surplus flows of wet years to make up the expected deficiency in dry years. Thus, irrigated acreage is directly related to reservoir capacity and must be decreased as the reservoir capacity is reduced.

If, then, irrigated acreage is dependent on reservoir capacity, what should be the criteria for project life? This is a question that has never been answered satisfactorily. With few exceptions, large reservoirs so far constructed in the West have economic lives well in excess of 100 years. The economic value of a reservoir during its useful life should be based, not only on the strictly economic benefits that are obtained from its construction as measured by comparison with costs, but on the intangible returns that come from a sustained irrigation economy in an area with little or no other development.

> *"You hear that it is filling with sediment, and it's just not true," he said. "It was built with a 100-year sediment pool, and it isn't collecting as fast as we thought it would."*
>
> John Keys III, current commissioner of Reclamation. See *Deseret News*, June 18, 2002.

The possibility of prolonging the life of a reservoir hinges upon our success in developing economical techniques for either moving some of the sediment out of the reservoir or reducing the rate of sediment contribution to the reservoir. From our present state of knowledge it is apparent that by far the greater part of the incoming sediment load must be trapped in a reservoir in the early stages of its life, and that the movement of sediment out of the reservoir will be uneconomical, because of cost of removal as compared with cost of storage or because of undesirable use of water. Because the early studies made it perfectly clear that the sediment load of streams would eventually reduce or deplete reservoir capacity and render reservoirs of limited or no value, there has been considerable interest in means of evacuating sediment from reservoirs. Many proposals for methods of sediment removal were made, from sluicing to dredging. None of the methods proposed has ever been put to practical use in the West.

Operation of Elephant Butte Reservoir on the Rio Grande, Lake Mead on the Colorado River, and Conchas Reservoir on the South Canadian River brought the phenomenon of density currents to the fore. It was clearly evident that some flows, heavily laden with sediment upon entering a reservoir, plunge beneath the surface water owing to their greater density and travel long distances downlake practically intact. Density currents are responsible for the deposition of sediments of low weight per unit volume that occupy a relatively large amount of space in

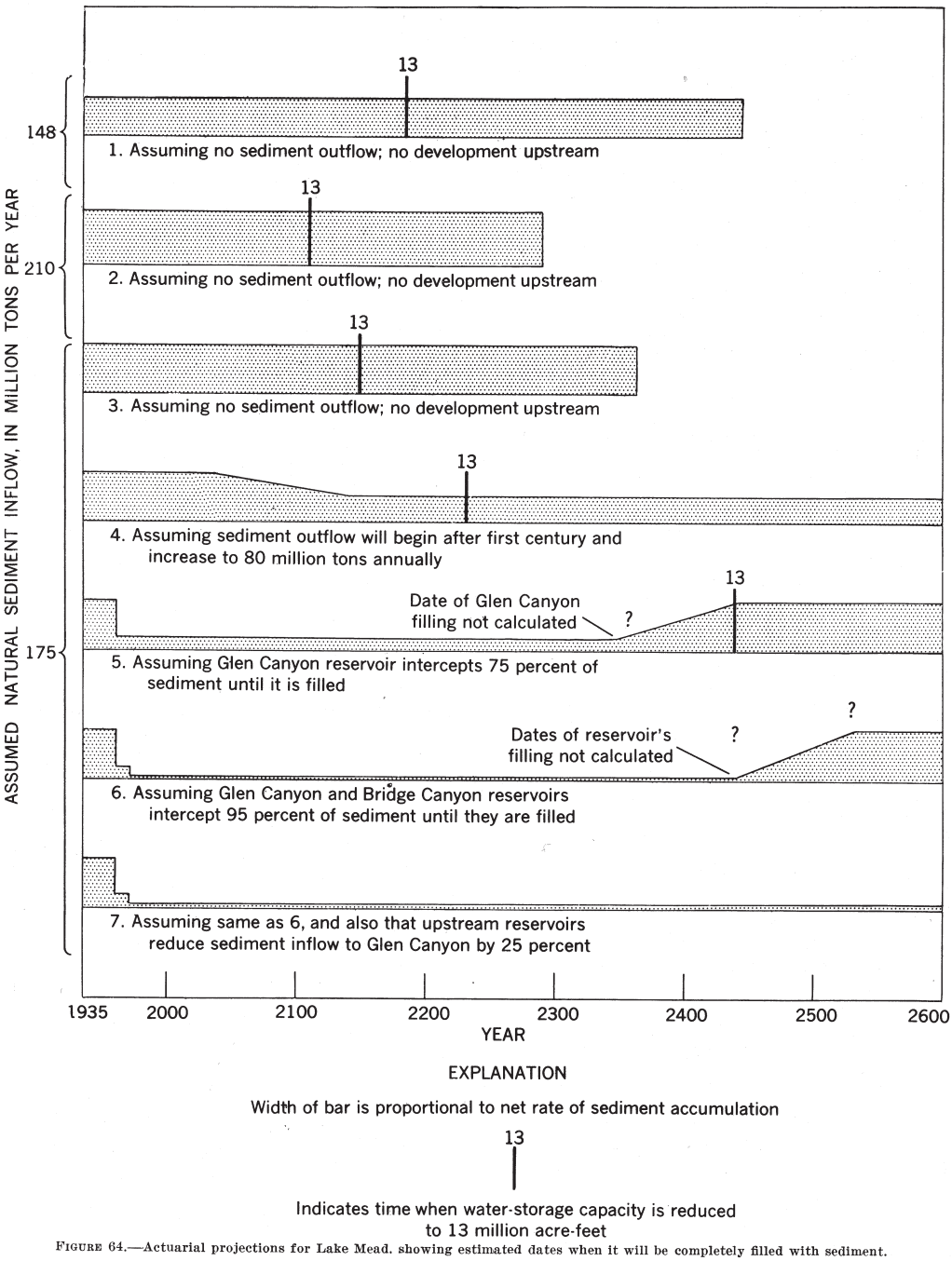


FIGURE 64.—Actuarial projections for Lake Mead, showing estimated dates when it will be completely filled with sediment.

Editor's comment: Survey scientists (circa 1950) determined when Lake Mead becomes half-filled with sediment (13 million acre-feet), it will no longer serve as a beneficial water storage facility. What is important to realize is that a reservoir's life span should not be measured in the terms of complete filling, but in terms of economic efficiency. Today, the public relations office of the Bureau of Reclamation projects the life span of their reservoirs in terms of complete filling, which is an admission of mismanagement and a statement that is unresponsive to science.

the lowest parts of a reservoir, and they have engendered a considerable amount of interest and discussion concerning design of reservoir outlets expressly for evacuation of density currents. The fact that reservoir outlets are not yet so designed is due largely to two factors: (1) The movement of density currents is not yet fully predictable; and (2) the amount of water that must be released from the reservoir for such a purpose must be large. Studies of sediment movement and deposition in Lake Mead will aid in further understanding the density current problem and so help to solve the problem of moving the greatest amount of sediment through the reservoir with the least use of water.

Prolonging reservoir life by reducing sediment inflow is dependent on the potentiality for reducing erosion and sediment movement in streams through watershed control. It is unfortunate that knowledge is so limited regarding the effect of watershed management in terms of reduction of sediment movement in streams. It is known that relatively small areas within western drainage basins contribute disproportionately large quantities of sediment to streams. Within these areas the factors of geology, soils, topography, vegetation, and climate are as critical, from the standpoint of sediment production, as anywhere in the United States. Many of these areas are practically uninhabited and have little present economic value, but they are of considerable local importance; because they are largely within the public domain or Indian reservations, their administration poses many problems for the agency responsible for their use.

It should be stated frankly that not enough is known about the erosion problem to evaluate fully a management program. For example, how well do present rates of sediment movement represent the rates to be expected over a long period of years? Is the long-term rate more or less than the present rate? What stage of gully development provides the greatest amount of sediment load to streams; and in what stage of gully development are we at the present time? To what extent can vegetation be increased in areas of low rainfall; and to what extent will such increases reduce rates of runoff and erosion? These and many other questions cannot be answered at the present time. They will be unanswered for a long time in the future, unless impetus is added to the rate at which investigations are undertaken.

The effect of sediment accumulation in reservoirs upon the quantity and quality of the available water supplies is not apparent at first glance. It should be pointed out that all reservoirs exact a certain water cost for their storage facilities, by reason of evaporation from their water surfaces. As water evaporates, there is some increase in concentration of dissolved solids in the water remaining in the reservoir. In areas where the average evaporation exceeds the average precipitation, therefore, the water in the stream is diminished in quantity and deteriorated in quality by reservoir storage.

> *"Construction of new reservoirs and dams—even if sites were available—does not provide a satisfactory solution to the problem. With the construction of a new, alternate reservoir for storage, the water losses must inevitably increase, because the evaporation from the new water-surf ace area is added to the evapotranspiration from the abandoned, sediment-filled reservoir."*
>
> Thomas L. Maddock, Jr., U.S. Bureau of Reclamation (1949)

Evaporation losses in the West are high, varying from location to location but probably averaging about 50 inches per year. Thus for every acre of exposed water surface in a reservoir, enough water is lost to irrigate as much as two acres of land. The total area of water surface in western reservoirs is measured in thousands of acres, and the magnitude of the price paid for water stored, in terms of water loss, can be readily visualized.

Sediment accumulation in most reservoirs tends to increase the area of exposed water surface per unit of water stored. Thus reservoir sedimentation increases losses from evaporation. But of far greater importance is the fact that most sediment deposits are fertile enough to encourage growth of types of vegetation that consume large amounts of water. It is now considered that the loss of water from reservoir areas having heavy sediment deposits is practically constant from year to year, and that this is due to combined transpiration and evaporation demands and is not dependent upon the area of exposed water surface alone.

Water losses through transpiration can be reduced by providing drainage of the sediment deposits and a channel to carry the streamflow, but these also hasten the movement of sediment into the reservoir area and thus increase the rate of depletion of storage capacity. The whole problem of transpiration and evaporation losses from reservoir areas and from channel deposits upstream from reservoirs is so important that it is the subject of intensive study at the present time. The work now being done toward control of phreatophytic growth in the Southwest shows considerable promise, and water losses from this source may ultimately be shown to be controllable. Increased use of groundwater storage may reduce the amount of surface storage required, thus resulting in a lower loss of water through evaporation. Doubtless it is the fond hope of all water users dependent upon reservoir storage that, as the existing reservoirs become useless by sediment accumulation, new reservoirs can be formed to replace them. It is true that there are numerous damsites and reservoir sites not yet occupied, but their number is diminishing, and some have been rendered unsuitable by reason of development of more favorable sites. A case in point is the Boulder Canyon site, once studied and then passed over in favor of the Black Canyon site for Hoover Dam, and now untenable because it is within the area of sediment accumulation in Lake Mead.

Construction of new reservoirs and dams, even if sites were available, does not provide a satisfactory solution to the problem. With the construction of a new, alternate reservoir for storage, the water losses must inevitably increase, because the evaporation from the new water surface area is added to the evapotranspiration from the abandoned, sediment-filled reservoir.

Future progress will be dependent on further study of the phenomena of reservoir sedimentation. The Lake Mead survey is a survey of but one of the many reservoirs in the West. Other reservoirs have been surveyed and the amount of data available for analysis is growing year by year. Investigations as complete as those at Lake Mead are expensive and can be undertaken only at infrequent intervals, but these serve the special purpose of increasing our understanding of the problems of reservoir storage.

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> *"A 1988 government study found that it would take more than 700 years for sediment to fill the reservoir," said Barry Wirth, a public relations officer for the Bureau of Reclamation. "We know that that reservoir is going to be there for many hundreds of years to come," he said.*
>
> The Associated Press on August 10, 2003

Editor's comment: Mr. Wirth's statement is a complete deception to the American people and assumes that Glen Canyon Dam is a useful facility even after losing its ability to store water and produce power efficiently, and to provide safe flood control and incidental recreation opportunities. After 40 years of operation it has already been demonstrated that sediment has impacted white water recreation and that sediment loads will soon impact dam and power operations as the sediment pool fills, which was estimated to occur in 100 years and confirmed most recently by Commissioner Keys in the Deseret News *on June 18, 2002.*

Persistent Drought In The Colorado River Basin

Compiled by John Weisheit
See Stephen L. Gray, et. al, 2003

Introduction

Scientists have studied tree-ring records that span the last seven centuries for five regions of the United States, including the Colorado River basin. These records have been used to examine both wet and dry cycles of climate that can sometimes last for many decades, or multi-decadal. For example, droughts of 30–70 years persisted from the late 1500s until the mid-1800s in two of the five regions, and wet/dry cycles were synchronous at some sites until the drought of the 1950s. The pattern of severe drought in the late 1500s, followed by unusually wet conditions of the early 1600s, resembled the drought of 1942–1977 and the subsequent wet period from 1978–1998.

The mega-drought of the late 1500s may have resulted from a cooling phase in the tropical Pacific Ocean with a warming phase in the subtropical North Atlantic Ocean, and marked a substantial shift for the climate of the Rocky Mountain region. In 1998, scientists recognized similar sea surface temperatures and forecasted the present drought situation we now find ourselves in, and the present indicators offer little hope for improvement in the next few years. It is unknown if the current drought will become multi-decadal, but such a situation seems likely at some point in time, as do other extremes that include massive flooding, and higher sediment transport regimes.

Tree-Ring Chronologies

The identification of ocean oscillations from past centuries has been accomplished by scientists who have sampled tree-rings from, for example, logs from archeology sites (dwellings), and then comparing them with modern-day precipitation records. By modeling the climate records of the past by this method, there is a high degree of confidence within the science community that significant ocean oscillations in the future can be identified in order for communities to better prepare and manage the impacts of drought and floods.

Scientists have also refined the data for greater accuracy by examining more closely the chronologies from different tree species and geographic areas back to 1400 A.D.such as the central and southern Rocky Mountains. Although these two regions have different precipitation variables, historically they have suffered prolonged catastrophic droughts at similar times, such as the drought of the 1950s.

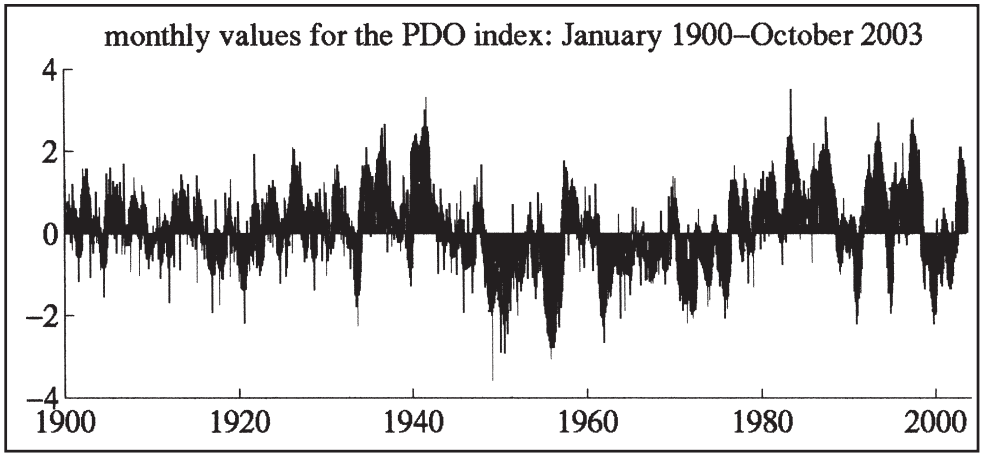
The results of refining the measurements from other tree-ring chronologies and from different regional areas mark both dry and wet periods that alternate for many successive decades, sometimes even four decades and more. However, the frequency and strength of these periods do vary in time spans and among the various regions. In other words, climate cycles do not necessarily impact all regions at the same time. For example, chronologies from Yellowstone and the southwest Rocky Mountains have a strong moisture signal in a band from 30–70 years around 1250–1400 A.D., but these signals are absent from other regions. Additionally, the Bighorn Basin (northern Wyoming) chronology shows significant energy for an even longer wet period that lasted 128 years around 1300–1400 AD.

A significant oscillation was observed during a severe and prolonged drought throughout much of North America from roughly 1575–1595 AD, which was followed by an unusually wet period in the central and southern Rockies from 1600–1625 AD.

Multi-decadal precipitation modes at 30–60 years do not persist after 1650 AD in either Yellowstone or the Colorado Plateau and remains so until the drought of the 1950s. However, the drought of the 1950s, though significant, did not resemble the severity of the drought that occurred in the late 1500s.

Discussion of Sea Surface Temperatures

In the North Pacific, much of the sea surface temperature variance occurs within a time scale of 15–25 years, and is accompanied by the strength and position of the Aleutian Low in winter. These variations have been defined as the North Pacific Oscillation (NPO) when referring to anomalies of the North Pacific, or Pacific Decadal Oscillation (PDO) if they extend into the tropics. The positive, warm phase of the PDO is associated with greater precipitation in all seasons throughout the central and southern Rockies (El Niño or wet). The 1900s were marked by two full +PDO cycles. The warm or positive +PDO regime prevailed from 1925–1946 and from 1977–1998. The cool or negative -PDO (La Niña or dry) regime prevailed



1) PDO means Pacific Decadal Oscillation. Note the dominate negative PDO (dry conditions) from 1942 to 1977 and the dominate positive PDO (wet conditions) from 1978–1997.

2) The alternating varibles as noted from 1900–1941 were decades of increased sediment transport in the Colorado River (see article about sediment inventory in this issue).

from 1890–1924 and 1947–1976.

In 1998, scientists noted the tropical Pacific Ocean was cooling (-PDO).

Warmer sea temperatures in the North Atlantic exhibit a 65–80 year cycle termed the Atlantic Multidecadal Oscillation (+AMO). Warm phases occurred during 1860–1880 and 1930–1960 and cold phases during 1905–1925 and 1970–1990. The AMO shifted to its warm phase around 1995, coincident with the apparent recent shift to the negative, cool phase of the PDO. During the warm phase of the AMO, the central U.S., including the central and southern Rockies, receives less than normal rainfall, particularly in summer.

By 1998 scientists were confident that having a warm North Atlantic and a cool tropical Pacific would spell out a persistent drought for the United States. They were right, for the last five years have substantiated the prediction with water year 2002 being the driest ever in the history of documentation by modern instruments.

This phenomenon is also identified by dry springs (February–April) over most of the western states and were succeeded in the central and southern Rockies by failures in both the early summer (May–June) and late summer (July–August) monsoon moisture that originates in the Gulf of Mexico.

What the scientists envision is a similar pattern of intra-seasonal drought for the mega-drought of the late 1500s, which affected most of North America from northwestern Canada to the Valley of Mexico and the Atlantic Coast. Like the 1950s drought, the mega-drought of the late 1500s was followed by an unusual wet period in the early 1600s, and both events were associated with intense and prolonged La Niña episodes typical of southwestern U.S. and Great Plains droughts. Such continental-scale droughts may be symptomatic of major reorganizations in both Pacific and Atlantic climate.

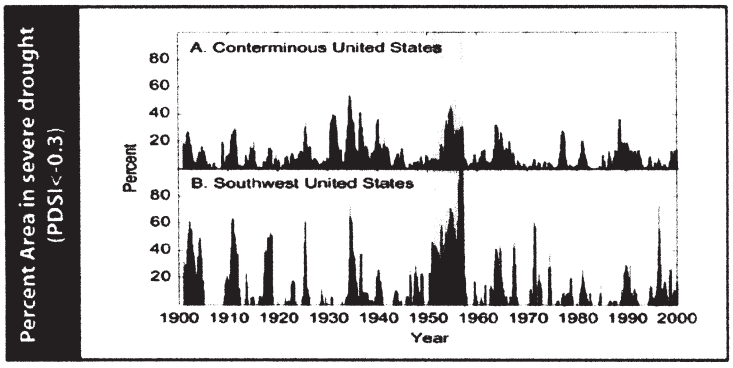
Long-term forecasting remains limited

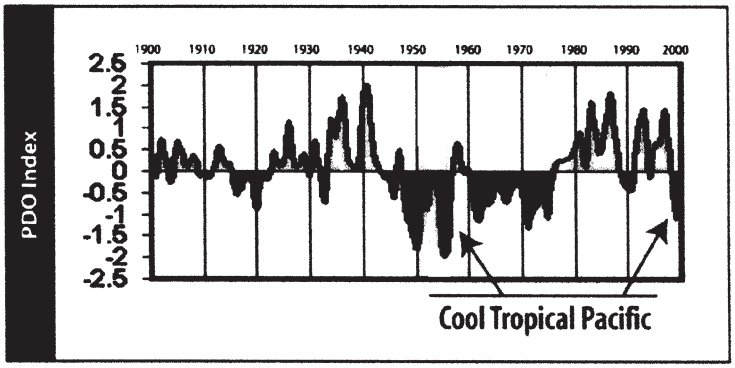
There is considerable discussion about the steady state vs. chaotic behavior of multi-decadal variables in climate, and thus about its predictability. An optimistic view is that knowledge about the present phase of the long-term -PDO or +AMO modes can be used to forecast climate more than a year in advance. Some recent forecasts are already taking into account the possible regime shift in both the Pacific and Atlantic sea surface temperatures during 1995–1998, which could signal prolonged drought in the central and southern Rockies.

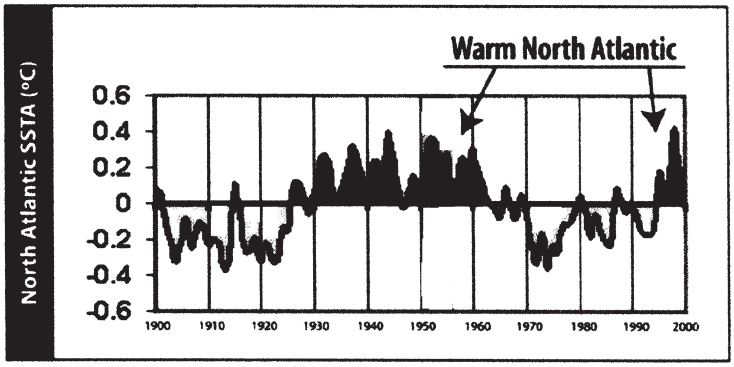
Although there is plenty of multi-decadal persistence in western North America climate, the instabilities argue against extending the forecasting window much beyond 2–3 years. At the very least, however, recent shifts to the cool phase of the -PDO and the warm phase of the +AMO provide little reason for optimism about ongoing drought in the Rockies.

It is probable that multi-decadal variations in North American climate, specifically the occurrence of prolonged, continental-scale drought, involve complex interactions between the Atlantic and Pacific Oceans. Unraveling these relationships will require further development of multi-century, annually-resolved sea surface temperature analyses from the Atlantic and Pacific basins.

Opposing shifts in Tropical Pacific and North Atlantic Ocean temperatures may foretell persistence of disastrous, multiyear droughts across the North American continent.







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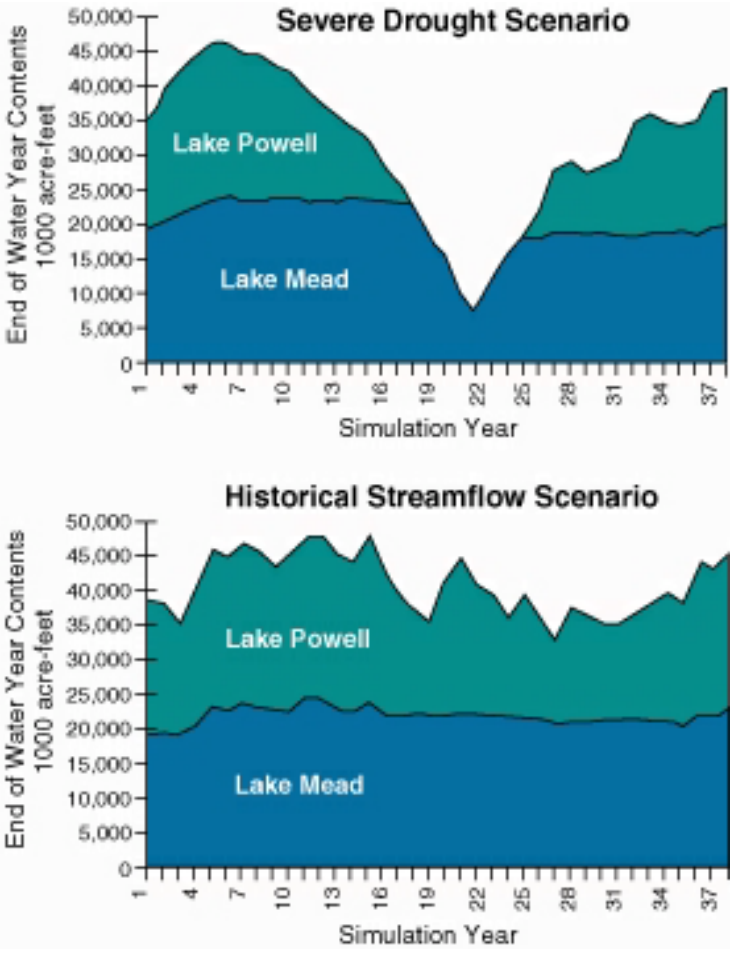
The Future Hydrology of the Colorado River

by John Weisheit

The purpose of this article is to demonstrate that the Colorado River can supply the water required by humans and the enviroment, and is available right now and at little cost. This can be done by reducing consumption through management policies to increase efficiency. Otherwise the eventuality for all residents in these arid lands, as dictated by its present course in history, is to become another failed hydrosociety. If we simply reduced our water consumption to the national average, Lake Powell would not be needed and the ecosystems of the Grand Canyon and the Colorado River delta in Mexico can be restored.

The other alternative is invasive and economically burdensome, which is to finance and construct: 1) massive powerplants to provide energy; 2) large-scale wastewater and desalinization plants; 3) pipelines to deliver water to the users. These alternatives will increase our dependence on finite natural resources, such as petroleum and nuclear fuels. These fuels are very inappropriate considering: 1) our degraded atmosphere; 2) the expense and dangers associated with nuclear technology and waste; 3) our penchant as a country to generate unproductive relationships with other countries to support our rampant consumptive life style.



If the mega-drought of the late 1500s were to repeat itself, Lake Powell reservoir would empty for eight years

Another consideration includes the potential for water to become a commodity controlled by corporations, rather than managed as a public trust.

According to law, the water allocations of the seven states and Mexico is 16.5 million acre-feet. The real-time average supply of the Colorado River is, at best, 14 million acre-feet. The total loss due to evaporation and leakage throughout the whole system is currently 3 million acre-feet, which is nearly the complete allocation for the state of Arizona (2.8 million acre-feet). Any objective financial analyst would be shocked at the poor performance of this business venture. Congress is fully aware of this poor performance because they continue to approve Band-Aid fixes and subsidies every year to maintain it.

When the persistent drought appeared in the middle 1900s, nobody really noticed the shortfall because the supply still exceeded the demand—leaks, evaporation and all. Afterwards, when the metropolitan building booms began, nobody noticed either, because the Colorado River overproduced and filled the reservoirs despite the development. Building so-called metropolitan dreams on luck is called greed, not business.

Things are different now that the swimming pools are dug and the golf courses seeded. The demand has almost peaked and the supply continues to wax and wane at the whim of climate. The drought situation at present is very similar to the 35 years of reduced supply that occurred between 1942 and 1977 when El Niños took a long nap and a negative Pacific Decadal Oscillation locked in for an extended stay (see previous article).

The total storage of the Colorado River system right now is below 50%. It took four years to get there. If the drought persisits for another four more years, the trend will instead become a long reality and will completely drain Lake Powell reservoir. Obviously the drought will break—they always do. But what is the next climate regime going to bring our way? Will extreme flooding occur and bring the associated shuddering at Glen Canyon Dam—as occurred in 1983 when the the spillways choked at only 20% of capacity? Will the four-hundred fold sediment loads of the early 20th century return? The answer to these questions are—yes.

Models have been generated by hydrologists and resource economists with results posted on the web. Visit: <http://geochange.er.usgs.gov/sw/changes/natural/codrought/impacts.shtml>. The model presented at the left is based on 400 years of tree-ring data and simulates a drought of the late 16th century (1570-1598). That severe and sustained drought had a 30 percent reduction in stream flow on average in a 19 year period.

How will a drained reservoir effect river running? Our Colorado River river trips will have to take out at the old ferry roads at Hall's Crossing.

Clay Hills Crossing on the San Juan River will continue to be impacted by sediment. The river incising into the sediment may leave the boat ramp perched above a downcutting river. Channel meandering may place the river on the opposite shore. Trips on the San Juan River may have to locate alternate sites to exit the river as well.

Author	Years of record	Location	Unregulated flow in millions of acre-feet
E.C. LaRue USGS; 1925	1895-1922	Lee's Ferry	16.8
L. B. Leopold USGS; 1959	1896-1956	Lee's Ferry	13.85
Bureau of Reclamation	1906-1983	Lee's Ferry	14.35
D. R. Dawdy 1990		Lee's Ferry	14.0
Tree ring record Meko et. al. 1995 Tarboton 1995	400 years before present	Lee's Ferry	13.5
Bureau of Reclamation	1922-1983	Lee's Ferry	15.0

For the Law of the River to function, Nature must supply 16.5 million acre-feet (unregulated flow) annually at Lee's Ferry. The upper and lower basins each receive 7.5 million acre-feet and Mexico receives 1.5 million acre-feet. As you can see from this chart, statistics very widely according to the data sets used. The fiqure stated by Dawdy, on behalf of the National Academy of Sciences, is probably the best estimate. Regardless, the system is flawed and will fail as demand increases. Presently there is no leadership in government agencies to correct the problem. The environmental issues at risk are decreasing instream flows above Lake Powell reservoir and for the Colorado River delta in Mexico. Litigation will dominate the next decade of Colorado River management due to non-compliance.

Source	Year (s)	Upper Basin depletions in million acre-feet
E. C. LaRue 1925	1985 - 1922	1.80
D. R. Dawdy 1990	1968 - 1974	4.28
Bureau of Reclamation	2000	4.72
Bureau of Reclamation	2010	5.20

This chart explains the consumption of the upper basin above Lee's Ferry, which is allocated 7.5 million acre-feet and includes evaporation and leakage. The lower basin completely consumes their allocation of 7.5 million acre-feet, as does Mexico with their allocation of 1.5 million acre-feet.

Source	Full reservoir calculation	Lake Powell evaporation in acre-feet	Lake Mead evaporation in acre-feet
E.C. LaRue USGS 1925	Evaporation formula	750,000	1,000,000
W.O. Smith et. al. USGS 1960	Water year 1942		1,045,000
US Weather Bureau 1959	Evaporation formula	730,000	
Bureau of Reclamation	Water year 1983	633,000	

This chart explains the evaporation rates for the reservoirs known as Lake Mead and Lake Powell. The combined evaporation of the two reservoirs is equilavent to the complete allocation of Utah (1.7 million acre-feet).

Dam Failure Study
At Glen Canyon Dam

By Stephen E. Latham,
Bureau of Reclamation, July 1998

Note: This document is abridged

Purpose of Study

The purpose of this study is to estimate the magnitude of flooding that would result along the Colorado River from Lake Powell to Hoover Dam due to the failure of Glen Canyon Dam. This study was requested, pursuant to policy, by the Bureau of Reclamation. This information can be used in Reclamation's emergency action plan for Glen Canyon Dam, and as a reference in preparing inundation maps for areas downstream of the dam. It can also be used to help local authorities develop warning and evacuation plans.

Flood Scenarios Evaluated

The following two scenarios were considered to cover the range of events that could cause failure of Glen Canyon dam. Both scenarios represent worst-case scenarios that result in the largest uncontrolled releases of the reservoir. Various assumptions were made to help test the sensitivity of results to these assumptions.

1) Dam failure caused by foundation failure or other defect (Sunny-Day Failure). This scenario includes a 100-year base snowmelt inflow to Lake Powell.

2) Dam failure caused by overtopping brought about by the overtopping failure of Flaming Gorge Dam. This scenario involves an extremely large flood inflow to Lake Powell 580 miles upstream.

For this study, it was assumed that Flaming Gorge Dam would fail during overtopping. Should this overtopping failure occur with the starting reservoir water surface at normal capacity, a combined outflow of 5,320,300 acre-feet would result. With Lake Powell at its normal capacity (elevation 3700 feet), this combined outflow would exceed the available surcharge storage capacity at Glen Canyon by 2,498,560 acre-feet.

The flood forecasting computer program, BOSS DAMBRK (DAMBRK), was used to help prepare this study.

For the Sunny-Day Failure, the initial water surface for the computer model was assumed to be elevation 3711, which is the design maximum water surface at Lake Powell.

For the Overtopping Failure, the initial reservoir water surface for the computer model was assumed to be elevation 3700, or the top of active conservation pool. To determine the duration and magnitude of overtopping potential, a flood inflow hydrograph (due to the Flaming Gorge failure) was first estimated. The Dam Failure Inundation Study for Flaming Gorge Dam of January 1990, was used as a reference to help develop this hydrograph. Since that study ended at Green River, Utah (about 130 miles from the upper reaches of Lake Powell), peak discharges were extrapolated downstream to Lake Powell, and an estimated inflow hydrograph was generated using the Flaming Gorge failure volume (5,320,300 acre-feet). It would take roughly 34 hours for the maximum stage of the flood wave to arrive at the upper reaches of Lake Powell. Routing the estimated flood inflow hydrograph indicated that Glen Canyon Dam would be overtopped for a duration of about 40 hours, with a peak depth of 2.9 feet over the parapet wall. While it is unlikely this overtopping flow would cause the dam to fail, for the purposes of evaluating this scenario, failure was assumed.

Outflow assumptions prior to the Overtopping Failure were as follows. Measures would likely have been taken at Glen Canyon Dam to lower Lake Powell, probably by opening the spillways 2 to 3 hours after notification of the Flaming Gorge Dam failure. Upon arrival of the flood wave at Lake Powell, it was assumed that the spillway gates would be opened uniformly to the normal maximum discharge of 238,000 cfs.

Study Results

Evaluation indicates that the leading edge of the flood wave from Glen Canyon Dam failure would likely reach Diamond Creek (Mile 225) in 10 hours to 12 hours for either failure scenario. This converts to a flood wave travel rate of 20 miles per hour (mph). Arrival of maximum flood stage would occur about 20 hours to 22 hours after dam failure.

The leading, edge of the Overtopping Failure flood wave would likely reach South American Point (Mile 296) in 13 hours to 15 hours after dam failure. This equates to a flood rate in the upper reaches of Lake Mead of 17 mph to I8 mph. Arrival of maximum flood stage would occur about 19 hours to 20 hours after dam failure

The reason for the maximum flood stage times at South American Point being less than at Diamond Creek is likely due to a combination of at least two things: 1) a much shallower channel slope at the upper reaches of Lake Mead, and (2) the fact that the canyon cross section at South American Point is suddenly very narrow and creates a constriction producing some backwater.

The Overtopping Failure of Glen Canyon was routed through Lake Mead and Hoover Dam. The results were practically identical for the water surface elevations assumed for Lake Mead. Assuming Hoover Dam does not fail, overtopping would begin about 23 to 24 hours after the failure of Glen Canyon Dam, continue for about 258 hours (10.75 days), and reach a peak depth of about 68 feet over the parapet wall on the dam crest at hour 74. The depth corresponds to a maximum water surface elevation in Lake Mead of 1304 feet. Maximum discharges would be about 485,600 cfs through the river outlet works, powerplant, and spillways, and 2.02 million cfs over the dam crest. This makes a total discharge immediately downstream from Hoover Dam of over 2.5 million cfs.

Obviously any type of structure less than 400 feet to 500 feet above the Colorado River between Glen Canyon Dam and Lake Mead as shown on USGS topographic maps would be completely inundated and destroyed by the flood from either type of failure. Even Navajo Bridge, which is about 400 feet above the Colorado River, could be damaged or destroyed. Results indicate depths of around 500 feet at this location. Flooding of this altitude here in the

canyon would be very severe and lethal. Anyone still on the river at the time, would have to climb the equivalent of a 40-story building, at a minimum, to have any hope of surviving.

The study indicated that the travel rate for the leading edge of the flood wave was estimated to be 20 mph to 25 mph. Although there have been no dam failures of this magnitude observed, historically, these travel rates may be reasonable for this huge a failure outflow. Some flood wave travel times from other dam failures with similar downstream reaches include:

(1) St. Francis Dam, California, failed on March 12, 1928. Flows traveled 18 mph in the first 1.5 miles downstream from the dam. Peak discharge unknown.

(2) Hell Hole Dam, California, failed on December 23, 1964. Flows traveled 14 mph through the narrow and uninhabited rock canyon 56 miles to Folsom Reservoir. Peak discharge was estimated to be 260,000 cfs. Volume released was 24,800 acre-feet.

(3) Teton Dam, Idaho, failed on June 5, 1976. Flows traveled 19 mph in the narrow canyon for 2.5 miles and averaged 16 mph for the first 8.8 miles downstream from the dam. Peak discharge was estimated to be 2,300,000 cfs. Volume released was 251,700 acre-feet.

(4). Little Deer Creek Dam, Utah, failed on June 16, 1963. Flows traveled 18.9 mph for the first 2.2 miles downstream from the dam, Peak discharge was estimated to be 47,000 cfs. Volume released was 1000 acre-feet.

The study indicated that flood depths in the upper reaches of Lake Mead would progress 507 feet at river mile 238, to 246 feet at river mile 281.5 (approximate end of Pearce Basin).

More populated areas around Lake Mead that would be inundated include marinas, campgrounds, and other concentrations of population and activity. Water depths would be around 94 feet above the July target elevation of 1219.61 feet for Lake Mead.

Glen Canyon Dam Specifications

Structural height of dam: 710 feet
Hydraulic height of dam: 583 feet
Crest length of dam: 1560 feet
Crest elevation of dam: 3715 feet
Top of parapet wall: 3719 feet
Each spillway crest elevation: 3648.0 feet
Elevation top of gates: 3700
Combined spillway capacity at 3711 feet: 276,000 cfs
River outlet works: 15,000 cfs
Powerplant: 28,640 cfs
3711 feet (maximum water surface): 28,230,000 acre-feet
3700 feet (active conservation pool): 26,210,000 acre-feet
3490 feet (top of inactive storage): 5,905,000 acre-feet
(minimum depth for power generation)
3370 feet (top of dead pool) 1,906,000 acre-feet
(level below river outlets)
3132 feet (streambed at dam axis) 0 acre-feet

Table 1

Location (River Miles from Lees Ferry)	Summary of Data Ranges [A]				
	Water surface elev. [B]	Max. depth above water surface [B]	Arrival time of leading edge [C]	Arrival time of peak stage	Maximum discharge
-15.5 Glen Canyon Dam	3700 ft	11.0 - 21.9 ft [D]	0 hr	0 hr	18.0 - 19.2 (million cfs)
0.0 Lees Ferry	3115.5 ft	480 - 520 ft	0.6 - 0.7 hr	5.5 - 6.5 hr	10.0 - 14.7 (million cfs)
4.7 Navajo Bridge	3094.7 ft	470 - 530 ft	0.7 - 0.8 hr	5.6 - 6.7 hr	7.8 - 12.2 (million cfs)
87.0 Phantom Ranch	2428.5 ft	400 - 480 ft	4.0 - 5.5 hr	10 - 14 hr	7.0 - 11.4 (million cfs)
135.3 Granite Narrows	1947.5 ft	440 - 480 ft	6.5 - 8.5 hr	13 - 19 hr	6.9 - 11.2 (million cfs)
178.0 Lava Pinnacle	1680 ft	360 - 430 ft	8.0 - 11.5 hr	15 - 23 hr	6.7 - 11.0 (million cfs)
225.0 Diamond Creek	1327 ft	470 - 540 ft	10.5 - 15.0 hr	18 - 27 hr	6.5 - 10.7 (million cfs)
281.5 [E] End of Pearce Basin	1181 ft [F]	246 ft [G]	14.5 hr	20 hr	8.7 (million cfs)

Footnotes:
[A] Ranges cover extremes for both Sunny-Day Failure and Overtopping Failure plus extremes for Manning's n roughness assumptions.
[B] Water surfaces as shown on USGS 7.5 minute quadrangle maps.
[C] It should be noted that for the Overtopping Failure, major flooding will already be occurring prior to the arrival of the leading edge of the flood wave caused by dam failure.
[D] Depths at this section (the upstream face of the dam) are referenced above Lake Powell normal capacity water surface elevation, 3700 feet.
[E] Values for this location are only for flood from an Overtopping Failure.
[F] "Ballpark" estimate of channel invert for this study (due to accumulated sediments since 1964).
[G] Depth above estimated channel invert.

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Significance of Rock Art In the Southwest

by Stephen Anderson

Native American rock art can be found in many of the canyons of the southwestern states of Utah, Arizona, New Mexico, Colorado and southwest Texas. The oldest sites in the United States are dated back to approximately 4,000 B.P. [before present]. However, ancient people around the world have used rock art as a means of communication for many thousands of years. Although there are similarities across rock art, most is unique in its style and substance. The two primary forms of rock art are petroglyphs and pictographs. Petroglyphs are either scratched or pecked into a rock wall or boulder, while pictographs are painted on using various dyes. For many years now people have attempted to decipher the rock art in an attempt to better understand how the indigenous people of North America lived. Ancient people left little evidence for their purpose of rock art, but speculation and research indicates that there may be historical, functional or religious significance.

The style of petroglyphs and pictographs is dependent upon the techniques and materials used to create them. Petroglyphs, the most common rock art found in the southwest, are found on hundreds of patinated sandstone cliffs and boulders. These figures were created directly onto the rock using a pecking method with a hammer stone. A chisel was also used for more precise and accurate depiction on the rock. Another common method of creating petroglyphs was by incising or scratching designs onto soft sandstone. In some cases, both the pecking method and incision method was utilized. On the other hand, pictographs are usually found on light-colored, protected rock surfaces such as alcoves and rock shelters. These areas are usually moisture-free and lack patinated surfaces. Pictographs were often created using a yucca brush and a mixture of clay-style paints. The most common colors for this style of rock art were white, black, orange and the most widely used color of red. Yellow, pink, green and blue have also been used but are much more rare. The three components of paint are the coloring agent, the pigment, and the binder, usually animal or plant oil, used to adhere the paint to the rock surface. Red is made from hematite or red iron oxide; yellow is created from limonite; orange combines the red and yellow; blue is formed from azurite; and green is formed from malachite. Turquoise-colored paint was also created from ground turquoise rock mixed with clay. Techniques for making both pictographs and petroglyphs were consistent throughout the Southwest and are helpful in the interpretation of the resources available and the cultures that created the rock art. (Schaafsma, 1980: p.25-32)

Some of the earliest rock art in North America was in the form of pictographs. Horseshoe Canyon and Buckhorn Wash in the San Rafael region of southern Utah are two places that display some of these early works. Although it is rare to determine the absolute age of a particular site, various methods have been used to estimate the age and time frame of panels. Procedures used to determine the age of pictographs include 1) optical microscopy, which confirms original paint layers, 2) scanning electron micros-

copy, which conducts a chemical analysis to view the microstructure of the pigment, and 3) x-ray diffraction, which determines the minerals in the white paint (Chaffee et al, 1994). The All-American Man pictograph of Canyonlands National Park in Utah was examined using the aforementioned methods. It was determined from such procedures that this pictograph contained a natural layer of pigment from dehydrated gypsum. In addition, carbon dating was also used to date the age of the blue color containing charcoal found in the All-American Man. From various dating techniques it was estimated that this pictograph figure dated back to around 1260 A.D. ± 46 years (Chaffee et al, 1994). Another procedure commonly used to date pictographs is accelerator mass spectrometry, which uses considerably less paint in the analysis of the rock art. Only a pinhead size amount of paint is needed, which is much less invasive and advantageous to the archeological site (Chaffee et al, 1994).

Although different from pictographs, the relative dating of petroglyphs can also be determined by examining the amount of patination or desert varnish that has reformed over the rock art symbols. The darker the patina, the older the petroglyph. More recent petroglyphs will be lighter in color than the rocks' original patina. Another way to determine age is to look at superimposition of rock art. Often newer petroglyphs are drawn on top of older petroglyphs, with the youngest being the top layer of rock art. Independent of rock art type (i.e. pictograph or petroglyph), substance and style can also used to determine the general age of the panels. Examination of the objects associated in the panels is used to determine the age of the art. For example, the appearance of the bow and arrow replacing the atlatl is a determinant of the era between A.D. 200 and 600. Additionally, depiction of the horse indicates a rock art panel is post-Spanish conquest. (Schaafsma, 1980: p.13-15).

The style of the rock art is suggestive of particular cultures of Native Americans and the time and the geographical location from which they existed. For example, Fremont rock art typically shows figures as broad-shouldered, trapezoidal torsos with horned or intricate headgear and necklaces. This culture thrived in the Southwest from A.D. 500–1300. Another determining factor in dating the All-American Man is that this figure was "horned" and therefore suggestive of the Fremont culture era (Chaffee et al, 1994).

The Histasinom, on the other hand, had many different rock art styles, each indicative of a particular geographical region and chronological era. These representational styles include the San Juan anthropomorphic figures, Chinle, Hidden Valley, Rosa, and Cave Valley to name a few. Many techniques, including scientific analysis as well as geographical location, style and substances are used in determining the relative age of rock art. Determining the age of a particular rock art panel plays an important role in interpreting the meaning or purpose behind the art. For example, panels depicting "rain makers" were perhaps drawn as pleas or prayers during times of drought. Although this is just an example, calculating the date of the panels can provide archeologists with some evidence regarding the culture of the people who left them.

Examination of the rock art panels gives some insight about the cultures and may provide some historical evidence of their existence. It is important to keep in mind that the absolute purpose of rock art is speculative at best. Some anthropologists believe that rock art panels are a form of written language, while others believed they expressed religious beliefs. Still others believe the purpose of rock art was to provide historical or geographical evidence of Native American cultures.

Weaver (1984) suggested that rock art documented important events and marked natural events such as the summer and winter solstice or astronomical events such as the supernova of 1054 A.D. Weaver further suggested that rock art facilitated record keeping and marked clan boundaries as well as popular crossroads. A good example of a crossroads can be found at the Willow Springs site, near Tuba City, AZ, where vertical rows of rock symbols are found representing some twenty-seven clans. It is thought that this site commemorates the Hopi Indians' pilgrimage to the sacred salt deposits near the confluence of the Colorado and Little Colorado rivers. During this pilgrimage, the Hopi passed through Willow Springs and left a mark of their participation in the journey (Weaver, 1984). Documentation of such journeys as well as a strong oral Hopi tradition has enabled scientists to formulate an interpretation of this historical event. In addition to pilgrimages, ancient rock art is thought to represent migration patterns because similarities in clan symbols are found in many locations (Waters 1963: p. 103). As the migration patterns began to end, rock art was thought to document their travels.

Childbirth has also been the subject of many rock art panels. There are several rock art panels that depict either pregnant or birthing mothers of both animals and humans. One notable panel is located in southern Utah at Kane Creek just west of Moab. This panel clearly shows a mother giving birth to an infant thus symbolizing a new beginning. Again, much of the interpretation of rock art is speculative; however, if a historical approach is taken, perhaps some information can be deduced as to the significance of the cultures.

Another interpretation of rock art is that the abstract lines and spiral circles served functional purposes. The spiral circles are often interpreted as representations of objects on a map such as springs or wells (Weaver, 1984). Although there are a few rare instances where the art does depict maps, this is an unsubstantiated interpretation. The same is true for the abstract squiggly lines. Some amateur archeologists have misinterpreted the lines as possible roads or paths that may lead to fertile land, cached food, or trade locations. The truth is that not even scholars are able to interpret these abstract designs (Weaver, 1984).

Cole (1985) describes another functional role of rock art in the San Juan area of southern Utah. Cole examined Basketmaker face pictograph representations in rock art and the association of those with masks found in the area. It appears from some of the San Juan panels that the face pictographs show similar details, such as a loop handle on the top of the head, to the mask artifacts found. The loop was thought to help attach the mask to the face of the individual wearing the mask. Thus, it is possible to gain some insight as to the function of the rock art symbols and what they possibly represent.

Animal or hunting scenes are perhaps the single most depicted form of rock art and suggestive of the types of

animals present during ancient times. Although, we name the rock art based on their descriptors, Weaver (1984) emphasizes that the artist of a particular rock art panel may have intended to depict a mythical clan ancestor and not what appears to us as a bighorn sheep. But, the ancient Native Americans may have used the rock art as a means of recording a large successful hunt or as a means of asking the gods for "hunting magic." Panels all across the Southwest depict various animals such as big horn sheep, deer, antelope, elk, bison, eagles and lizards. By portraying elaborate panels of successful hunts, the panel creator could be insuring future success in real life hunts. Therefore, the natives would have invested a great deal of time in producing panels that showed a multitude of animals (Weaver 1984). Whatever their meaning or purpose, it is apparent that the rock art was important to the Native Americans.


"All American Man"

Who were the creators of these rock art masterpieces? Many archeologists believe that shamans created rock art either exclusively or they supervised highly skilled artists to do their work. Studies have shown that a continuity of rock art style has been established in small sectors (Weaver 1984). This would mean that only qualified people would be allowed to take place in the creation of such panels. Shamans were believed to have an ability to be in contact with supernatural beings through trances and ceremonies. Thus, rock art may be directly associated with ancient rituals, ceremonies and visions. Many of the abstract rock art subjects, or anthropomorphs are disfigured or resemble alien beings and may have been seen in dreams. Anthropomorphs look like human beings but often have many significant amenities such as horned or antennae clad heads, armless or legless trapezoidal shaped torsos and are disproportionate in size. They may represent a ghost or spirit witnessed in a religious ritual or in a vision. In addition to the various anthropomorphs, several zoomorphs are often depicted accompanying the spirits. Zoomorphs are considered to be spirits of animals and share similar characteristics of the anthropomorphs (Hunger 1986). Sego Canyon panel north of Thompson Springs, Utah depicts many spectacular specimens of anthropomorphs. Many scientists interpret prehistoric rock art as a way to appease the supernatural forces in return for prosperity, fertility, health and success in hunting for either an individual or groups. If the shamans were the artists of many of the rock art panels, then it could provide evidence for a direct correlation between rock art and religion.

The correlation between religion and rock art has been well documented and could be the strongest argument in understanding the cultures of the ancient southwestern people. It was suggested by Hunger (1986) that figures engaged in sexual intercourse, such as the one in Wupatki National Monument in Arizona, are performing a religious marriage ceremony between a man and his female partner. In addition to human figures, there are also animals engaged in similar sexual positions. However, Hunger suggests that indeed these may represent animals, but also may be humans participating in religious marriage ceremonies donned with animal masks. Such rock art was also thought to bring about communication with supernatural powers and animal spirits. Also, Katchina religious associations are often depicted in the rock art of the southwest. Katchinas are supernatural anthropomorphic style religious spirits associated with clouds and rain (Schaafsma and Schaafsma 1974). The origin of Katchina representations on the rocks dates to around 1300 A.D. in the Rio Grande valley. Schaafsma and Schaafsma (1974) suggest the Rio Grande style of rock art came directly from the Katchina cult and is found most elaborately in kiva murals. The Katchinas often illustrate the importance of objects such as corn, the earth, the sun, rain and health. Therefore, insight about the Katchina religion leads interpreters of rock art panels to perhaps understand what the artist was drawing on the rock.

Many of the rock art panels and kivas contain elaborately painted Katchina masks and anthropomorphic figures adorned with modern-day sashes and kilts and are suggestive of ceremonial importance within that culture and the clothing worn during these ceremonies. In addition to Katchina figures, other rock art symbols such as horned serpents, birds, badgers, skunks, rabbits and mountain lions can also be found. During this time, important symbols such as rainbows, clouds and the four-pointed star appear. These are symbols that still represent the Katchina religion of the modern puebloans.

Information gained from modern Hopi suggest that these ancient rock art symbols were religiously important and began to show up around the beginning of the Katchina religion. The Katchina religion unequivocally is responsible for the change in rock art iconography of this era. Therefore, rock art found prior to the start of Katchina religion could be representative of an older religion of the cultures. Evidence of this is found in the use of older symbols found in the Katchina panels (Schaafsma and Schaafsma 1974).

Perhaps the most famous depiction in Katchina rock art is the Kokopelli, the humped back, flute-playing Casanova of the Southwest. "Koko" means "Katchina" in the Zuni language and "pelli" refers to "hemisphere" or "hump" in the Hopi language. This particular symbol can be found on numerous panels across the southwestern United States. The legend of Kokopelli is that he traveled from camp to camp during corn-planting time playing his flute and bringing good fortune wherever he went (Alpert 1991). Alpert (1991) believes that the hump on his back was a bag of songs while others believe it was a grain sack and legend has it that when he left a camp the crops would prosper and there would be a stirring in the belly of

the women. It is for this legend that the Kokopelli is known as the fertility god.

Another suggestion with possible implications about disease of that time is that the hump on the back was a significant deformity found during that time. It has been interpreted that the deformity could be as a result of tuberculosis of the spine (Alpert 1991). Since rock art rarely depicts normal figures, it could be that the Kokopelli was an actual individual with a significant spinal curvature. Alpert emphasizes that the Kokopelli rock art figure was not merely decorative but important in ceremony and ritual.

The early inhabitants of the Southwest did not leave behind written accounts or many other clues as to who they were. One way in which to explore their cultures is by taking a closer look at what they did leave behind. Although we cannot interpret the exact meaning of rock art panels, it appears that it was multifaceted and significant in its own way to each culture. Perhaps, the rock art was meant to record historical events or was suggestive of important ceremonies of the clans. Other interpretations of the rock art indicate that there was a religious importance among all forms of rock art. It is possible that based on information surrounding the Katchina religion that this was actually the main purpose of ancient puebloan rock art symbols. However, in the case of the Kokopelli it appears to represent both a religious and historical significance. We may not be able to properly interpret the purpose behind the rock art symbols, but close examination of rock art panels is helpful in determining the eras of the people who left them. Despite our interpretations and understanding, it is apparent that rock art played an integral part in each of the ancient cultures.

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On Any Given Day… Cataract Canyon Flash Flood

by Stephen Anderson

On 2 August 2001, I departed Potash boat ramp on a six-day commercial solo boat Cataract Canyon rafting trip for Tag-A-Long Expeditions.This was to be my twenty-ninth trip down Cataract. My passengers were a jovial French couple, who were on a typical five-week vacation of the western United States.

The trip was going along as normal for the first few days as we silently rowed down the scenic Colorado River taking in the sights and enjoying peace and quiet. This was a rare pleasure especially for me. I had spent the last two seasons running snout rigs through the canyon and had become accustomed to the constant hum of the motor. This indeed was a welcome change.

By early the fourth day we had reached the confluence of the Green and Colorado Rivers, and after a brief stop for lunch we registered for our camps within the walls of Cataract. By 3 p.m. we were at rapid number ten and one of my customers, Yve, was complaining of “feeling ill” and wanted to make camp for the night at a shaded site. I had signed us in at lower Capsize on river left, but because I knew there was only late shade there and Yve was probably suffering from dehydration and fatigue from the heat, I made the decision to stop above Mile Long on river right about a half mile above Range Canyon.

Upon eddying out I walked over the camp area to insure that it was a safe and comfortable spot for the night. We set up the tents and the kitchen along the sandy bank and Yve and his wife took a nap while I prepared dinner. At this point the sky was clear and the weather seemed favorable. By nine o’clock that night, my customers had retired to their tent, and I sat up reading until the sunset and the stars were shining. I remember thinking that since the weather was good I would sleep outside. I put my Paco Pad and sleeping bag in front of a house-size boulder that sat in the middle of our camp, and by 11 p.m. or so, I was sound asleep.

Sometime around midnight I was awakened by an earth shattering crash that I thought was probably thunder. I looked up at the night sky expecting to see rain clouds but saw only stars. I stood up to investigate a possible rock fall, but was instantly swept to my knees by a rush of icy water and debris. Immediately, I was swept thirty or so feet toward the Colorado River. I was fortunate enough to be slammed against a large boulder that had been unearthed by the sudden discharge of water. I was able to climb hands and feet over to safety and to the tent of my customers. My eyes, ears, nose, and mouth were full of sand and I was in a slight state of shock from what had just occurred. It was at this point that I realized that a flash flood was tearing through the camp. The earth-shattering crash that I had heard only seconds before was the raging water and accompanying debris falling a thousand feet or

so over the sandstone cliffs of the canyon's walls.

I remember the mad rush of adrenaline that was surging through my body and the slight sense of panic that was battling inside my mind. I immediately got to my feet and rushed to the tent where my unsuspecting customers were still asleep. The water was still raging throughout the camp and spreading out toward their tent. I shook their tent and was yelling "flash flood, get out of the tent." Startled and still groggy, they didn't seem to realize the events going on only a few feet away. I began to pull their tent to higher ground with them still inside. The water was now pouring into the tent and they began to panic slightly. I helped them out of the tent and moved them to safety.

I went back and pulled their tent out of the eddy of the river, it was then that I looked up and saw that the 17-foot raft that we had traveled so calmly down the river was now drifting downstream. The raft and kitchen were directly downstream of where I was, but the problem was that there was a forty-foot wide flash flood between the boat and me. For a moment I thought about trying to cross the flood and diving in the river to swim after the drifting raft, but then realized that the oars were on shore, my PFD was on the boat, and I was above the rapids of Mile Long. Good sense took over and I chose otherwise.

I went back to comfort and reassure my customers that all would be okay and that they were now safe. The flood was still growing and the icy water now washed most of the camp, including the entire kitchen area, away. I have little recollection of how much time had passed by at this point, it could have been hours, but it seemed like only minutes. After returning to the care of my customers and helping them get resettled for the night, I made several attempts to cross the flood channel and try to salvage any remaining gear. I was continuously swept downstream or flung against exposed rocks. I knew there was nothing that I could do at this point but wait for the steady stream of water to subside. I sat down and took a few minutes to collect my thoughts. I had heard stories of flash floods from my brother Daniel and from other guides, but I didn't expect to experience it myself. I felt helpless with the situation and somehow responsible for the flood.

I made regular trips to check on my customers, who weren't in any hurry to go back to sleep, and tried to make them as comfortable as possible. After a few hours passed, I was able to crawl across the flood channel and search for lost equipment. I walked barefooted down to Range Canyon, but was unable to locate the raft or anything else for that matter. I headed back to where our camp once stood, checked in on my customers and tried to sleep. It was now four in the morning and the flood channel was still roaring through the center of our camp. All of my personal sleeping gear and my Chacos were swept away with the initial blast of water, so I lay down on a flat rock and waited for morning.

I slept like hell for those few hours and woke to what resembled a war zone. The soft sandy beach that we had lounged on only hours ago was now an eight foot deep, forty foot wide muddy ditch. As expected, spirits were down and Yve and his wife were a bit shaken up from the night's experience. I explained to them how our motor support was coming down during the day and that we would have to link up with them. I assessed the camp area and was able to recover a Roll-a-Table and some kitchen equipment from the downstream eddy. I walked the riverbank and found my poco pad and sleeping bag stuck in a strainer that probably came down with the flood the night before. After returning to camp, I conducted an inventory of what was lost. All of the personal items belonging to Yve and his wife, with the exception of what they were wearing to bed, were now gone along with the raft and all of the kitchen gear, as well as my own personal gear. To make matters worse all of the food and water was either washed into the river or was aboard the missing raft. Things only seemed to be getting worse. It was around eight that morning when we decided to just sit down and enjoy the view and the fact that no one was hurt or killed.

Around 11 a.m. the first outside contact arrived as Colorado Outward Bound School was coming down stream with several boats full of students. They pulled in to lend a hand and gave us their last jerry can of fresh water and some food to hold us over until our motor support arrived. I asked them to keep an eye out for our equipment and to tie up the boat if they came across it. By noon, Joe Oneilson from OARS came by with a snout rig and also stopped to make sure that we were all okay. Joe let me use his satellite phone to call Tag-A-Long and the Park Service office to report the flood. Joe offered to motor us out, but I declined, telling him that help was on the way. I also asked him to also keep an eye out for our gear along the way.

The day was getting longer and by four, we were wondering what happened to our motor support boats. It turned out the Tag had three trips that had all linked up and decided to run the canyon together. By five help had arrived. The looks on their faces said it all. Bob Jones motored in and the first question was "is everyone safe". These words were music to my ears. He was more concerned with the safety of the people and didn't mention the thousands of dollars worth of gear that was sacrificed to the river gods. After a short exchange of greetings we loaded up what little we had left and headed downstream. We found the missing raft that COBS had tied up for us at rapid nineteen, but my personal rocket box and a 128 quart cooler was missing, most likely thrown from the unmanned boat as it plunged through the rapids. We rolled the raft and headed out to set up camp below Ten Cent Rapid. I considered myself lucky that we had several snout rigs, piloted by experienced guides coming down with Bob. Everyone banded together to help and comfort my passengers and myself. After the work was done for the night we settled in for a much-needed rest.

The next day we set out for Hite and the trip home. My passengers and I left with Mark Murray and his boatload of people. We arrived at Hite without any problems and the rest of the combined group came in later. I was able to fly back to Moab with my customers and was finally able to relax a little. The reality of the flash flood hadn't

quite settled in yet, but I was relieved to be off the river.

I arrived back at the Tag-A-Long office, unloaded my personal gear, and headed straight for the Moab Brewery to drown my sorrows and make a real effort to forget about this disastrous trip. After a few pitchers of the brewery's finest beer, I retreated to the SPLORE house and hung out with some friends. While I was there Mark Murray called the house to tell me that Joe Oneilson had found my personal rocket box and my passengers' dry bags floating below the Big Drops. I picked up the lost gear and found that despite a few big dents in my rocket box, all of my gear was dry and accounted for. I can't begin to tell you what a relief came over me. Joe also dropped off the dry bags to the Tag-A-Long office and much to the delight of Yve and his wife all of their personal belongings were also dry, including the one hundred and twenty rolls of undeveloped film they had taken over the past month. Fortune was shining on me now.

In the end, the only personal losses were my Chacos and my passengers' sandals. I haven't been back to Cataract since, but I do look forward to returning and making peace with the canyon and the Colorado River once again. Because the weather was clear in my immediate vicinity, it seems likely that the flood came from several miles away, as they often do. I don't feel that I could have done anything to prevent the events of that night, but hindsight is always twenty-twenty in these situations. If I had it all to do again, I would obviously camp in a different spot, but on the other hand, I was dealing with Mother Nature and we all know that She wins every time. This just goes to show that on any given day, things that we take for granted can erupt into disasters right before our eyes.

I would like to thank all of the people who assisted me that day, especially Bob Jones for his understanding and genuine concern for our safety, Cathy Burks, Susette Weisheit, Mark Murray, and Bart Harvey for their help and concern when they picked us up. Most important, I want to thank Joe Oneilson for the use of his satellite phone and for his help in recovering our lost gear and, last but not least, the COBS crew, Greg Bunn, Nicole Parentice, Bret Morton and Matt DiFransesca for the food and their last jerry can of fresh water that they so generously gave to us that morning. I had always believed that there was a strong camaraderie between boatmen. Having all of these people join together and help out in a time of need certainly reaffirmed that belief.

Waterfall at Hite?

by John Weisheit

I attended the 2003 Science Symposium hosted by the Grand Canyon Monitoring and Research Center in Tucson last October. I do not think there is a better educational venue available for a river guide and I highly recommend attending the next program when it becomes available. Outside of travel expenses, the symposium is free to the public. The proceedings from the symposium are now available on the web at <www.gcmrc.gov>.

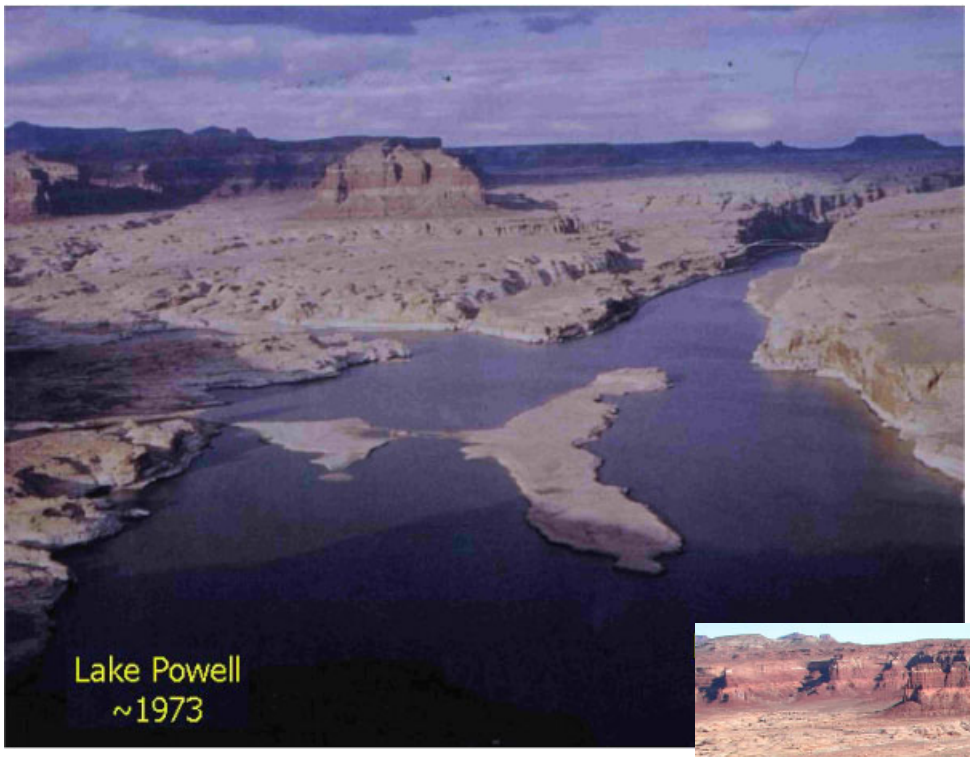
Of particular interest to Cataract Canyon guides was a presentation given by Bill Vernieu, a hydrologist for the USGS in Flagstaff. Bill introduced some compelling evidence that a waterfall could form over a bedrock feature downstream of the Dirty Devil River. Broken surface water is already indicating at the suspected contact point and, should the reservoir continue to drop, the proposed waterfall seems likely to develop. Should this event occur, it is hoped that a river access location can be determined by the National Park Service at Glen Canyon, otherwise access to downstream take-outs may require a portage of gear and equipment.

Bill was able to locate an aerial photograph of the area taken in 1973 during the reservoir's initial filling criteria, and with the reservoir level then nearly equivalent to the present reservoir level, which is basically 100 feet below the full pool elevation of 3700 feet.

Incidentally, a small waterfall has already emerged on the San Juan River. This waterfall is not at the same location as the waterfall that emerged on the San Juan River in 1991 during the drought of 1987–1992 (see the first issue of *The Confluence*, Winter 1993).

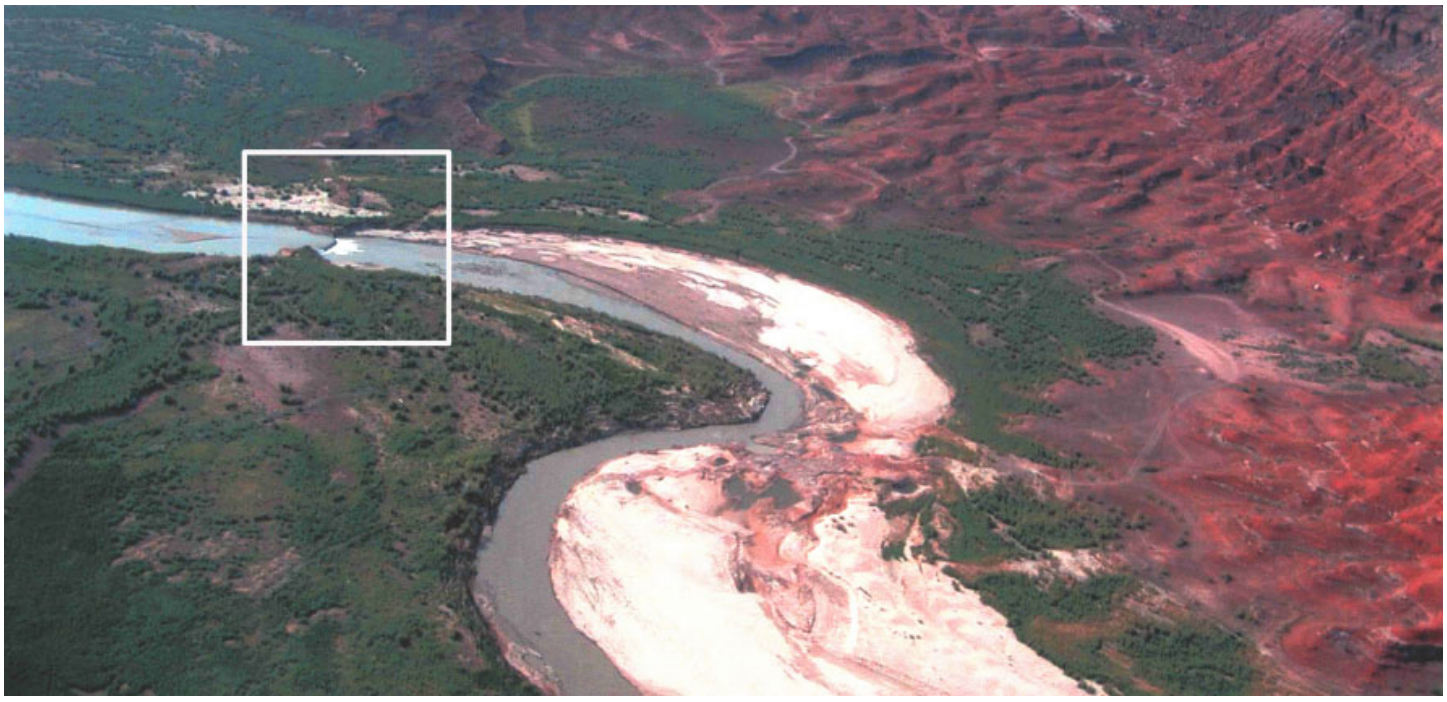
As an informational item, Hite Marina is officially closed and access there is currently impossible. Most river groups traveled over the reservoir to exit at Halls'Crossing or Bullfrog marinas. Others exited the reservoir from the mud flats on the reservoir's west side near Highway 95, which is downstream of the proposed waterfall location.

The bedrock waterfall that emerged below Clay Hills Crossing during the drought of 1987 to 1992, and then subsequently inundated after the huge snowmelt of 1993. Photo courtesy of Gene Stevenson.



Left: Lake Powell just below the mouth of the Dirty Devil River in 1973 during the reservoir's filling criteria, which ended in 1980. This bedrock island is actually a cliff top of Cedar Mesa sandstone. The original Colorado River gorge is on the right, or east side of this photo. Photo courtesy of USGS.

Right: John Dohrenwend, a retired USGS geomorphologist, took the image from 1973 and overlayed it onto a photo he took in 2003. Special thanks to the Moki Mac folks in Salt Lake City for this great idea.



The San Juan River meandering over sediment deposits where downcutting over a bedrock feature has created a new waterfall in 2003. Photo courtesy of USGS.

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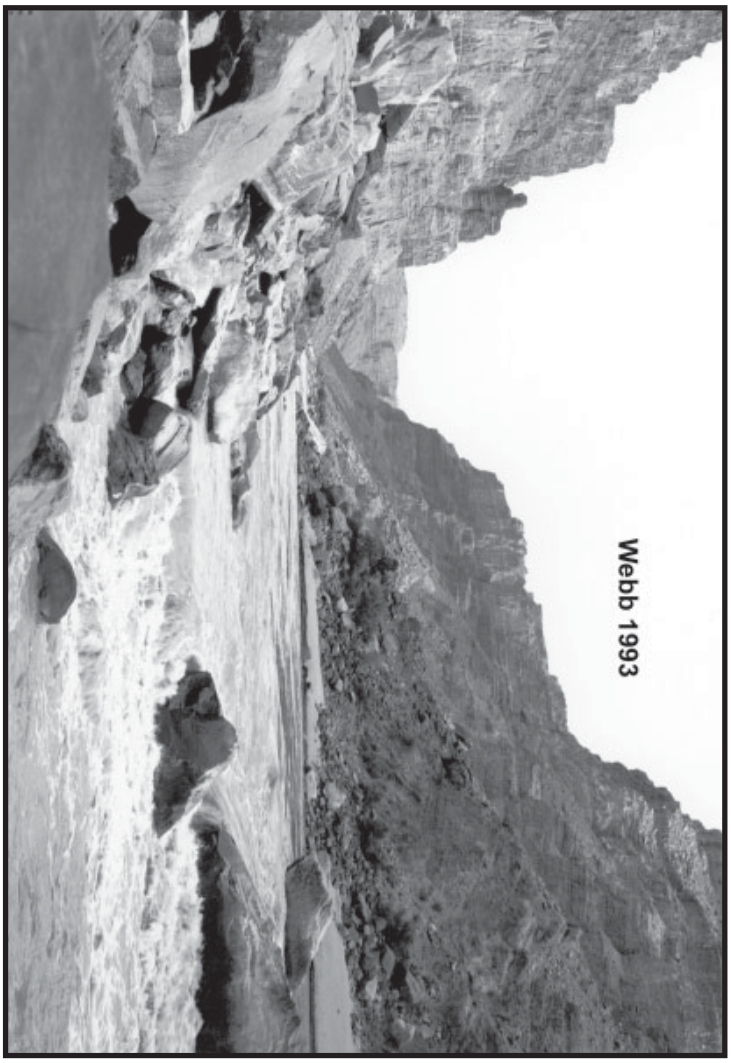

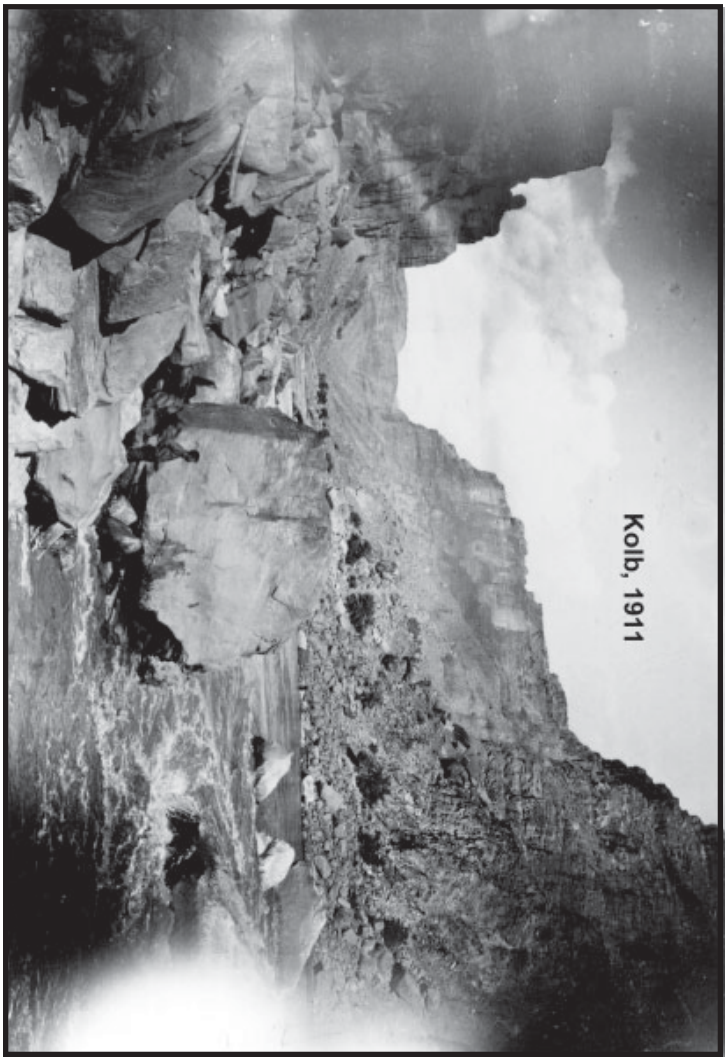

Big Drop Two, river right and looking upstream. Robert Webb's repeat photography of a Kolb Brother's photo from 1911.

In April, 2004 University of Utah Press will release *Cataract Canyon: A Human and Environmental History of the Rivers in Canyonlands* by Robert H. Webb, Jayne Belnap and John Weisheit. This 480 page book will showcase the repeat photography of 80 historic images, and includes the interpretations of this compelling landscape from the perspectives of a geologist, a biologist and a river historian. The cloth bound edition is $60 and the paper bound edition is $26.95. Visit the University of Utah web page at <www.upress.utah.edu> or contact them at 800.773.6672.