Hidden Passage

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Cover: White Canyon, where Bears Ears meets Glen Canyon. Photo by Ray Bloxham/SUWA.

Editor's Introduction

by Wade Graham

As this issue was going to press, the news of Katie Lee's passing, at her home in Jerome, Arizona at the age of 98, rippled out through the river community and far beyond. To most of us, Katie needs no introduction. She was among the first, most eloquent, most tireless, most inspiring, and without rival the fiercest, defender of Glen Canyon ever since she witnessed its attempted murder by the US Bureau of Reclamation (which she unforgettably named, in her songs and stories, the Wreck-the-nation Bureau). She defined the wild recesses of the Glen not just as an incomparable river wilderness that we must fight to reclaim and restore, but as something far more important because it was magical, moving, alive, capable of reaching us in spiritual and other ways. Glen brought forth a deeper humanity in those who were open to experiencing it. She talked of the canyons in the most lyrical and vivid voice. Of the torture of watching the reservoir first fill with fetid "spinach water," she wrote: "Some of the first to go under were in the Wild Secret Heart of the Glen—Dungeon, Grotto, Dangling Rope, Balanced Rocks, Little Arch, Cathedral, Driftwood, Mystery, Music Temple and Hidden Passage—those fluid, heart-stopping, erotic sinuosities; the sequestered gracilities (anything but a slot)—the Eros-Apollo, phallic protrusions, and all those lounging beds of tits and bums."

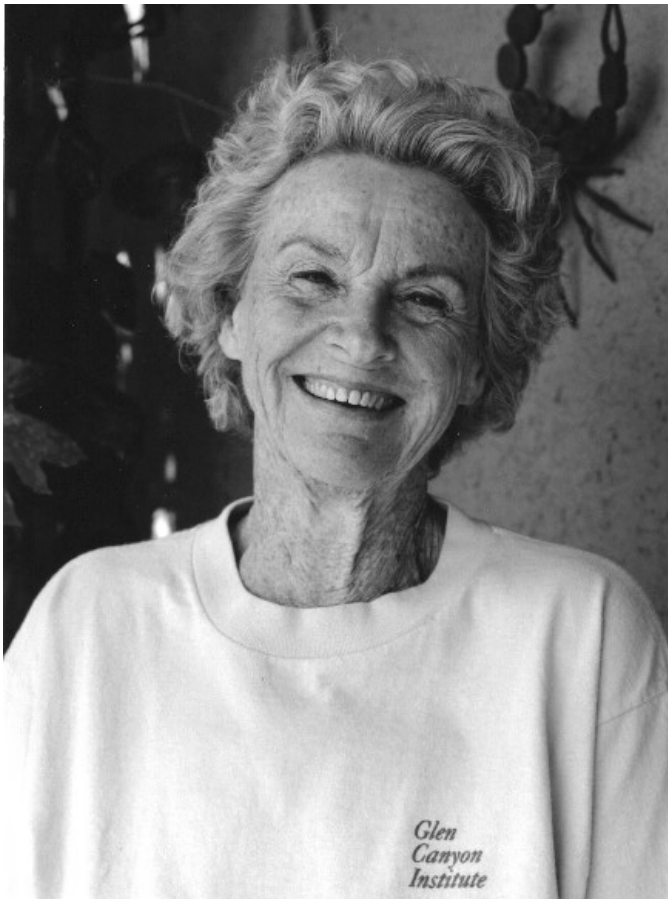
In her twinkling, brilliant way, she understood that our relationship with the natural world is personal, and flows both ways. She wrote: "Often someone will ask how I got to the river. I usually smile because they never ask the important question: How did the river get to me?"

Katie was the muse, and sometimes scourge, of this organization, Glen Canyon Institute, always leading from the front, never standing for equivocation or half-measures. Anyone who heard her talk or sing was invariably brought to tears—and to righteous indignation at what our society has allowed to happen to its natural patrimony in the name of material progress. She wrote: "Witnessing the asphyxiation of Glen Canyon—slowly, inch by inch—acted like a brand on my soul, burning in my anger, my contempt for those who killed it. Anger—an emotion as powerful as love—can be used as a stimulant, exciting and creative, a force. I would wear my anger like a crown!" And she did, the irascible and irreverent River Queen, until the last. We mourn her passing and revel in her life.

Back in the canyons, there is change. In spite of last year's relatively wet winter, reservoir storage on the Colorado continues its downward trend, and flushing of sediment and reviving of native ecosystems continues apace. A recent study anticipates that Lake Powell could reach minimum power pool in six years—leaving a surface area less than one-third as large as at full pool, shrunken down to the narrow confines of the river channels themselves, in the process uncovering many thousands of acres of land. How to manage this dramatic drawdown and return of inundated landscapes is a critical question. In keeping with GCI's mission of supporting science, we are helping to initiate a study of sediment flushing and the potential for restoration in the Glen's side canyons by Utah State University, and will participate in a biological survey led by Brigham Young University, next spring. And GCI's Fill Mead First proposal continues to shape the conversation about how best to manage our dwindling water resources on the Colorado River. Good data is required, and in acknowledgment that its numbers are scant and out of date, the Bureau of Reclamation is moving to more accurately measure evaporation rates at Lake Powell—an important step forward on the road to a free-flowing river in Glen and Grand Canyons.

Farewell Katie Lee, Glen Canyon's Original Champion

by Eric Balken



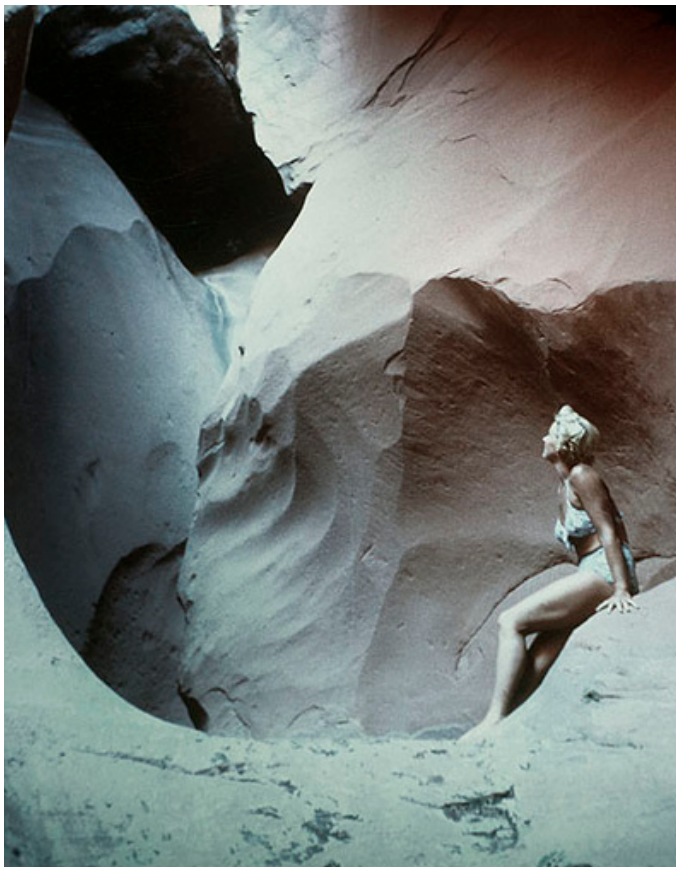
On November 1st, 2017, Glen Canyon Institute and the river community lost a friend, muse, and river-running icon, the legendary Katie Lee. Katie passed away in her sleep just a few weeks after celebrating her 98th birthday at her home in Jerome, Arizona. Katie was an integral part of the movement to restore Glen Canyon, becoming an outspoken opponent of the dam, and later helping with the formation of GCI in 1996.

In the 1950's, Katie was pursuing a career as a singer and actress in Hollywood when she was invited on a Grand Canyon trip with friend and river guide Tad Nichols. She immediately fell in love with the Colorado River, beginning a lifelong obsession with the Grand Canyon and Glen Canyon. She was one of the first women to work for river guide companies, and made it a personal mission to explore as many of the side canyons and grottoes in Glen as she could.

Katie found deep emotional connection and artistic inspiration in Glen Canyon, making sixteen trips down the river. She would write songs, stories, and poetry, taking pictures and video—famously wandering throughout the canyons in the most humanly natural way, bare naked. Glen Canyon became a part of who she was, describing it as heaven on earth. A place by which no one could help but be inspired if they made the journey.

In 1956, when it was announced that a dam would be constructed in Glen Canyon, Katie's passion for the river turned into a fiery opposition against it and the Bureau of Reclamation who would build it. She became one of the most outspoken opponents of the dam, writing songs and books that would epitomize the fight against Glen Canyon Dam's ecological destruction. After Glen Canyon was flooded, her works became the underpinnings of the Glen Canyon restoration movement. It became her life's work to fight for a free-flowing river in Glen Canyon. She was a driving force that galvanized Glen Canyon as a nationally recognized issue among an emerging national environmental movement.

When GCI's president and founder Rich Ingebretsen set out to organize a non-profit with a mission to restore the river in the 1990's, he knew he had to call Katie Lee. Ingebretsen recalls, "When we started to organize, I wanted to get everyone that had ever floated Glen Canyon to come to our first meeting. Katie was vital to GCI's formation, bringing with her a huge following of the most vocal and passionate restoration advocates."



In a visceral and fervent way, Katie captured the emotional loss of Glen Canyon like no other artist or author could. She shared this experience with a broad audience in her books *Glen Canyon Betrayed* and *All My Rivers Are Gone*, as well as her unforgettable folk music albums *Glen Canyon River Journeys* and *Colorado River Songs*. These works of art would become centerpieces in the collective memory of Glen Canyon before it was dammed.

While her body began to age in her later years, Katie's intellect and passion never faded. She became a nationally-recognized icon of environmentalism, inspiring thousands of young people across the country to be loud, speak their minds, and fight for flowing rivers and wild places. She was prominently featured in the award-winning 2014 film *DamNation*, once again winning the hearts of audiences with her unforgiving love for Glen Canyon.

GCI hosted a number of events with Katie over the years, usually culminating with audiences succumbing to tears. Katie would swear, crack jokes, and spontaneously break into song, provoking emotions for the river many didn't know they had. This was her magic: she was so transformed by her connection to Glen Canyon, and was able to convey that connection to everyone else through her words and music. No one else could capture the emotional and spiritual significance of the Glen like she did.

In her later years, Katie stayed in close touch with GCI, regularly checking in to see what we were up to and always sending eager young activists our way. On phone calls, she would regularly joke about the fact that she was still alive and kicking, "I'm still here, damn it!"

Photo by Michael Brown.

We hosted our last event with Katie in the fall of 2016, premiering the documentary *Kick Ass Katie Lee* by George and Beth Gage. After the film, there was a Q&A session with Katie fielding questions over the phone. Despite an imperfect form of communication, she brought the audience to tears with her passion, authenticity, and sheer love for the canyons. In classic form, Katie ensured there wasn't a dry eye in the house.

In one of our last conversations with Katie, we left her with a promise. That we would never stop fighting for the river and for Glen Canyon. Katie's passion now lives in all of us, and it is our job to keep fighting. We'll keep her in our hearts and minds anytime we float down a river, wander through a slot canyon, or bury our toes in the desert sand. Cheers to you Katie!

Phtoto by Michael Brown.

I've Been Singing Since Katie Lee Passed

by Barbara Brower

Barbara Brower, Katie Lee, and Terry Tempest Williams at a GCI event in 2010. Photo by Michael Brown.

I've been singing since learning Katie Lee died: "Schizophrenic Moon"; "Shrinker Man, Shrinker Man"; "The Will to Fail"; "Gunslinger"; "Properly Loved" . . . Anyone who knows Katie as the Voice of Glen Canyon will be mystified, maybe offended, but it was through these satirical, slightly twisted, wonderfully musical and witty songs on vinyl—*Songs of Couch and Consultation*, released in 1957—that my family first met Katie Lee. I learned my psychiatric vocabulary from her songs decades before I learned that we shared the magical, tragic, life-changing experience of Glen Canyon before the dam.

That record was often background music for the cocktail gatherings of my parents and their conservation-minded friends. I don't doubt that one conversation then, in the middle 1950s, was how to stop the dam proposed for Dinosaur National Monument. Would the world be different if Katie herself had been there, imbibing (as she surely would have done) and joining the conversation? She would have told about the wonders of Glen Canyon, and once she started to speak, no one—certainly not my dad—could have failed to recognize that this Colorado canyon also needed to be saved. There would have been no Dinosaur-for-Glen trade-off in the congressional hearings where the Sierra Club sacrificed a place no one knew for a desert version of Hetch Hetchy. Dad would have found another way, he said, had he only known what Katie could have told him.

I wonder if that notion ever came up, in the many occasions my parents got together with Katie Lee, once they'd actually met and discovered they had Glen Canyon in common. We talked about it, Katie and I, on the one memorable occasion we shared a stage at a Glen Canyon Institute function, with another of my earth-activist heroines, Terry Tempest Williams. Growing up, I was the only daughter in a heavily male household, surrounded by passionate, powerful, dedicated, environmental warriors—all men. Then to spend an evening with those two—whew!

Well, maybe they can talk about it now. The only afterlife I can imagine for my dad and Katie is an earth-bound one, where the Colorado runs muddy to the Gulf, and my dad can film light on water while Katie explores the erotic sinuousities of Glen's side canyons.

New Study Expands FMF Conversation

—EB

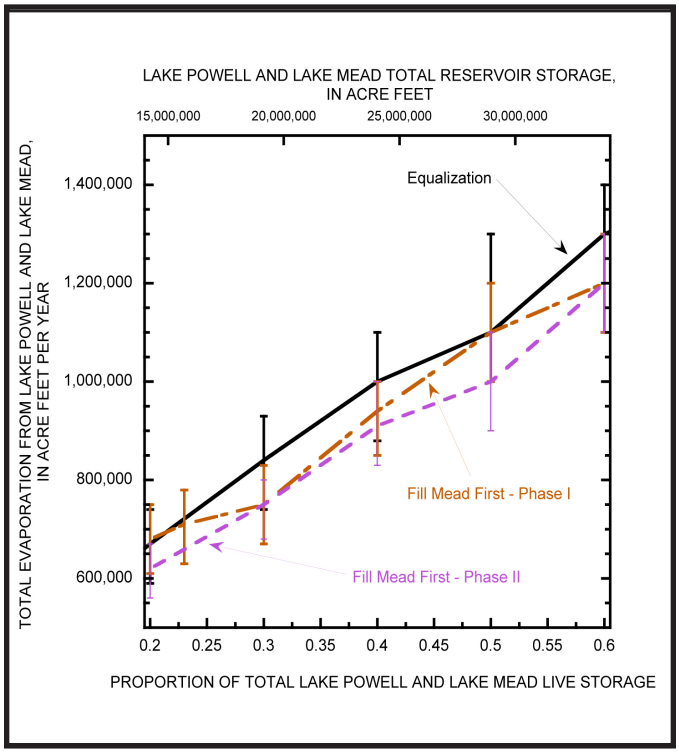
Last November, a technical assessment of Glen Canyon Institute's Fill Mead First (FMF) proposal was released from Utah State University's Center for Colorado River Studies. After a widely-read editorial in *The New York Times* created national buzz around the proposal, USU Watershed Sciences Professor Jack Schmidt was moved to conduct a technical analysis to begin fleshing out the logistics of actually draining Lake Powell. Many water managers and Lake Powell supporters were quick to cite this paper as evidence that Fill Mead First has no benefit. The truth is, it makes an even stronger case for studying it.

The USU white paper was the first of its kind to model different ways to drain Lake Powell—projecting reservoir elevations, surface areas, possible flow regimes, investigating potential water savings, drawbacks, and areas requiring new measurement tools. Schmidt has presented the findings to the Glen Canyon Adaptive Management Working Group, the Upper Colorado River Commission, and other agency and stakeholder groups.

The study, which was not published in a peer-reviewed journal, projects that future ground seepage at Lake Powell may be less than previous studies have shown, but shows that Lake Mead's evaporation may actually be lower as well. In addition, it demonstrates that filling Mead first would reduce total surface area between the two reservoirs, potentially increasing system efficiency. The conclusion of the paper asserts FMF would likely save water for the system and deserves a full-fledged analysis from the federal government.

After the release of Dr. Schmidt's assessment, some within the water management community quickly claimed the study proved FMF is based on bad science and should be disregarded. Even the conservation group American Rivers released an opinion editorial advocating refilling Lake Powell, saying the paper proves FMF shouldn't be studied for another 20 years. The reality is Dr. Schmidt's analysis stresses the importance of seriously considering the proposal, building on scientific work that's been done, and filling the gaps of knowledge about these reservoirs—of which there are many.

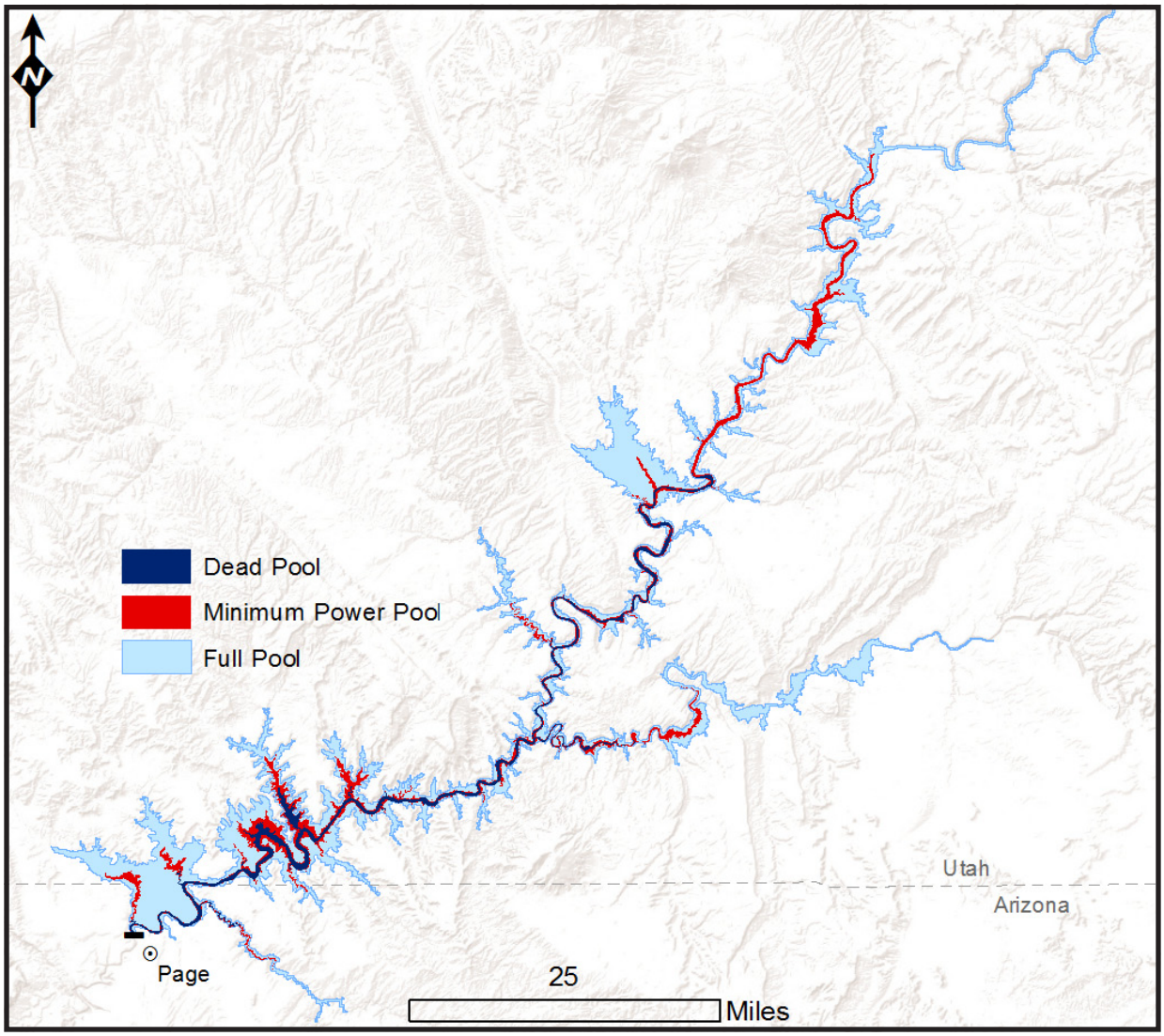
A 2013 study by Dr. Tom Myers, commissioned by GCI and published in the *Journal of the American Water Resources Association*, used Bureau of Reclamation data to show Lake Powell has lost significant amounts of water into its porous walls since it began filling. Myers projected Powell would keep seeping into the future, lessening as the reservoir drops, but sparking the conversation of whether it's a good place to store water at all. Schmidt's research predicts future losses would be less than those projected by Myers, but stresses that available data is insufficient to know for sure. There is disagreement between the two scientists, but both agree the data is sparse and needs to be further studied.



Graph showing total annual evaporation as a function of total storage of water in Lake Powell and Lake Mead. Graph by Jack Schmidt/USU.

While water managers were glad to point out the potential shortfalls of FMF, they overlooked the conclusion of the analysis: Fill Mead First needs to be studied in a serious way. For those who wish to see Lake Powell exist forever, it's difficult to admit that filling Lake Mead could save water and continue the restoration of America's greatest lost treasure, Glen Canyon. The canyon is already beginning to come back, its tributary rivers now flowing miles beyond where stagnant backwaters used to be, and its 125 side canyons being flushed of sediment, allowing native flora and fauna to return. Its resurrection is something that cannot be ignored, especially when climate scientists predict the reservoirs won't fill again.

Draining Lake Powell would probably never happen in a Colorado River system with full reservoirs, because despite the dam's ecological drawbacks, it would still serve the purpose of storing water. But a system of full storage is a thing of the past. Despite the reprieve of this year's heavy snowfall, storage between Powell and Mead has been steadily declining for over 15 years, and is currently below 50% capacity. New data published in the journal *Water Resources Research* suggests climate change has already been reducing the Colorado's flows for years, a trend that is likely to grow stronger over the next century.



Map showing estimated surface area of Lake Powell at full operating pool, minimum power pool, and dead pool. Because of Glen Canyon's "martini glass" profile, reductions in elevation have a magnified effect on surface area. Map by Jack Schmidt/USU.

Reservoir Elevation (ft. above sea level)	Reservoir Surface Area (acres)
Dead Pool - 3,370'	20,303
Minimum Power Pool - 3,490'	49,330
Full Pool - 3,700'	160,784

Additionally, a risk study from the Colorado River District is now underway, with preliminary findings showing Lake Powell could fall below power pool (elevation 3,490') in as few as six years. That is without considering the impact of climate change. In a statement made to the district's governing board, study lead Eric Kuhn stated, "I haven't shown the climate change hydrology because it just scares everybody."

It's clear the hydrology of the Colorado River Basin is rapidly changing. The historical assumptions behind maintaining two massive reservoirs are flawed. As the basin states continue weighing their options to adapt to the new normal of reduced flows, every alternative should be explored. It is encouraging that, as a result of GCI and USU's studies, the Bureau of Reclamation is now pursuing new data gathering on Powell's evaporation. Studying the potential savings and technical hurdles of management regimes for Lakes Powell and Mead shouldn't be a novelty project. These alternatives should be investigated to the fullest extent now so water managers have every tool available when the time comes, which may be sooner than we all think.

Bears Ears: Our Endangered National Monument

by Michael Kellett

Lockhart Basin, Bears Ears. Photo by Ray Bloxham/SUWA.

People across Utah and America celebrated when, on December 28, 2016, President Obama designated Bears Ears National Monument. The monument encompasses 1.35 million acres of spectacular public lands north and east of Glen Canyon National Recreation Area (NRA). This is one of the most remarkable ecological, geological, archaeological, and cultural landscapes in America.

Bears Ears National Monument is especially important to those who care about the health of the Colorado River ecosystem. It contains much of the Glen Canyon watershed, so the air and water quality, wildlife habitats, scenery, and wilderness of these lands are critical to the integrity of Glen Canyon itself. The Bears Ears monument is essential to keeping these values intact.

Most of the lands of Bears Ears monument are administered by the federal Bureau of Land Management and U.S. Forest Service. The region is predominantly wild and roadless. However, under standard "multiple-use" management, these agencies could potentially open the area to expanded mining, oil and gas drilling, transmission corridors, and off-road motor vehicle use. The new monument adds an additional layer of protection against these harmful activities.

Bears Ears was designated under the Antiquities Act, signed by President Theodore Roosevelt in 1906, which gives presidents the authority to proclaim federal lands as national monuments. Many presidents have used this law to protect millions of acres of public lands, including such natural wonders as Grand Canyon and Zion, and such cultural icons as Mesa Verde and Chaco Culture. Past presidents have, on occasion, moderately reduced the size of a monument, but none has tried to abolish one. In recent years, however, conservative politicians have increasingly complained that Democratic presidents have used the Antiquities Act excessively, especially to designate vast monuments such as Bears Ears.

The designation of Bears Ears National Monument came only after many decades of work by visionary conservationists and Native American Tribes. In the 1930s, the area was within a proposal for a 4.5-million-acre Escalante National Monument. In the 21st century, some of these lands have been proposed as an expansion of Canyonlands National Park, as a part of a Greater Canyonlands National Monument, and as a Cedar Mesa national monument or conservation area. All of these proposals were thwarted by the opposition of entrenched resource development and anti-public land interests.

In 2013, Congressman Rob Bishop of Utah, the chair of the House Natural Resources Committee, announced his Public Lands Initiative (PLI). The PLI was supposed to bring diverse "stakeholders" together in a "grand bargain" that would determine the future of the public lands of the region. Several years of meetings were held with county commissioners, fossil fuel and mining industries, ranchers, tribes, and conservation groups. However, the final proposal released in 2016 would have opened the vast majority of the region to resource extraction, industrial exploitation, off-road motorized recreation, and other destructive uses.

Not surprisingly, this plan was almost universally rejected by protection advocates. The deal was also opposed by anti-environmental interests, which could not accept even the small, scattered, and poorly protected "conservation" areas in the PLI. A bill to authorize the PLI was introduced in Congress in 2016, but it did not pass and has not yet been reintroduced in the current Congress.

The advocates of Bears Ears National Monument took a different approach than past protection efforts. This proposal was developed by the Bears Ears InterTribal Coalition, which includes representatives of the Hopi Nation, Navajo Nation,

Ute Mountain Ute Tribe, Ute Indian Tribe of the Uintah Ouray and Zuni Tribe, in collaboration with conservationists, businesses, and other constituencies. It envisioned management of the area as a cooperative effort between the federal land agencies and the tribes, which would strengthen protection for the area while honoring and providing for Native American traditions.

The Bears Ears proposal immediately met strong opposition from the same interests that obstructed past protection efforts. This time, however, advocates did an excellent job of generating broad public awareness and support across Utah and the country. This convinced President Obama to designate the Bears Ears monument, despite the aggressive opposition.

Even this victory did not come without major compromise. Several contentious areas in the original 1.9-million-acre monument proposal were deleted by President Obama to try to appease monument opponents. This includes areas that were left unprotected in Bishop's PLI plan, such as the Abajo Mountains, Allen Canyon, Black Mesa, Wingate Mesa, Nokai Dome, and the Deneros Uranium Mine—which is poised to expand its toxic footprint tenfold.

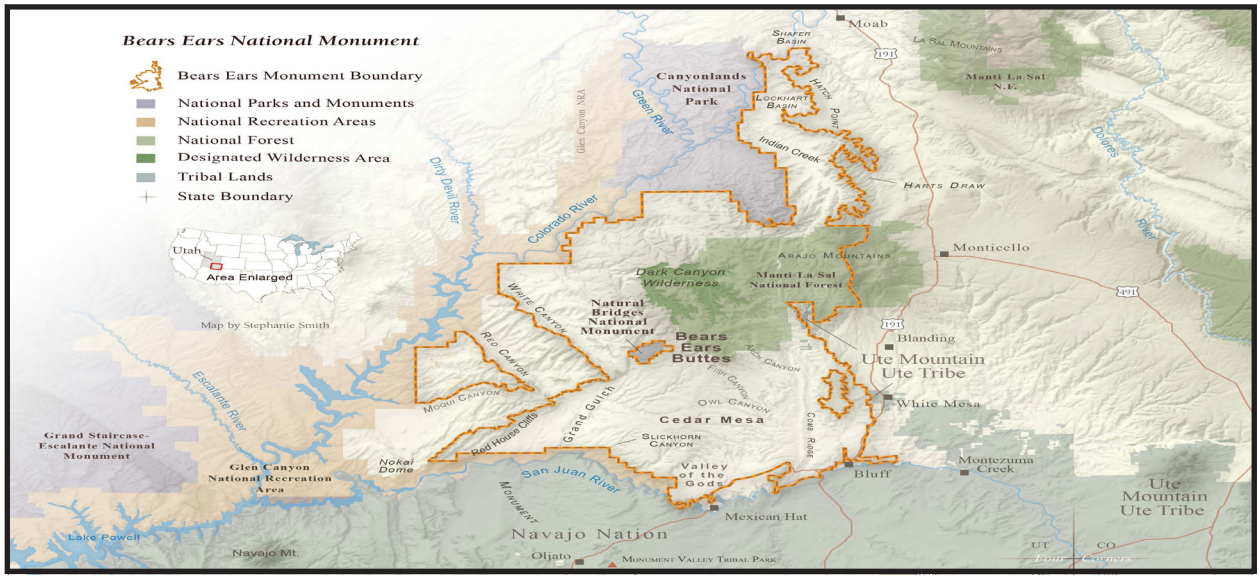
Worse, recent events have left the future of Bears Ears National Monument uncertain. Since the day it was proclaimed by President Obama, Utah federal, state, and local politicians have aggressively attacked the monument. In April 2017, President Trump ordered Interior Secretary Ryan Zinke to begin a review of more than two-dozen national monument designations dating back to 1996. The review's 60-day comment period generated almost 3 million comments from the public. A review by nonprofit organizations of these comments indicated that the overwhelming majority of them—including 88 percent of Utah residents—were supportive of maintaining current national monument boundaries.

On August 24, Secretary Zinke submitted his monument report to President Trump—although not to the public. However, according to a leaked copy of the report and other inside sources, Zinke ignored the clearly expressed wishes of the public. Instead, he recommended drastically reducing the size of Bears Ears National Monument, as well as reducing Utah's Grand Staircase-Escalante National Monument (which is also adjacent to Glen Canyon NRA) and recommended shrinking or weakening protection for a number of other monuments.

The specifics of Zinke's recommendations are still secret. Utah's congressional delegation, the governor, and conservative legislators and local politicians have been pushing Trump to eliminate or shrink Bears Ears from the moment he won the presidency. In May, Senator Orrin Hatch said Native Americans had been "manipulated" into their support for Bears Ears' current size. The State of Utah urged Zinke to slash the size of Bears Ears to one-tenth its current 1.35 million acres, cutting the southeastern Utah monument down to a tiny 120,000 acres surrounding Mule and Arch canyons west of Blanding. According to news reports, Zinke recommended reducing to 160,000 acres.

Leaders of the Bears Ears Inter-Tribal Coalition, the business community, and conservation organizations have vigorously opposed any reduction or weakening of protection for Bears Ears National Monument. Many legal experts assert that the president does not have the power to reduce the size of or abolish a national monument. A number of organizations have pledged to challenge Zinke's recommendations in court, if they lead to harmful changes in any of the monuments. It is possible that the final decision on this issue will be made by the U.S. Supreme Court.

As of this writing, Secretary Zinke's national monument recommendations have still not been released and President Trump has taken no official action to change current monuments. Glen Canyon Institute will continue monitoring the situation and is prepared to support citizen efforts to fight back against any attempt by the Trump Administration to shrink or weaken protection for Bears Ears or Grand Staircase-Escalante National Monuments. We will keep our members informed of any new developments on this issue.



Map of Bears Ears National Monument by Stephanie Smith/Grand Canyon Trust.

Glen Canyon's Restoring Side Canyons: Time for Scientific Study

—EB

Hiker walks well below the high water mark in West Canyon, 2014. Photo by NIck Woolley.

As climate change and ever-rising demand have perpetuated a water shortage on the Colorado River over the past 17 years, the levels of the nation's two largest reservoirs, Lake Powell and Lake Mead, have reached record lows. Powell, the second largest reservoir in the nation, has hovered around half full for most of the last decade. Once considered the biological heart of the Colorado River, much of Glen Canyon's riverine and side canyon ecosystems were submerged when Lake Powell filled up between 1963-1980. But were those ecosystems permanently destroyed?

The Heart of the Plateau is Emerging

Since the reservoir began receding in 2000, the side canyons, washes, streams, creeks, alcoves, and grottoes that epitomized Glen Canyon have begun to emerge from the grave. Between the tributary rivers, including the Colorado, San Juan, Escalante, and Dirty Devil, approximately 100 miles of river channels have started flowing again. Hundreds of acres of new land are now exposed. In many areas, especially side canyons, sediment is being flushed away, allowing flora and fauna to once again inhabit the unique sandstone landscape.

While there has been extensive photographic documentation of these emerging landscapes by interested citizens and groups like Glen Canyon Institute and Glen Canyon Rising, a legitimate scientific assessment of ecological recovery and sediment movement has not been conducted. The Bureau of Reclamation monitors sediment movement from the Glen's tributary rivers, but not in the multitude of side canyons that encompass the vast region. The Utah Division of Wildlife Resources monitors fish in the reservoir and inflowing rivers, the National Park Service conducts biological monitoring above Lake Powell's high water mark (3,700 feet above sea level), but there has been little research done on ecosystems in any of Glen Canyon's hundreds of side canyons that were once under water.

An Unprecedented Case of Ecological Succession

Glen Canyon is at the heart of the Colorado Plateau's immense ecosystem, connecting Canyonlands and Grand Canyon National Parks, two of the most iconic national parks in the world. At the time of Glen Canyon Dam's construction in the early 1960s, few could have predicted the reservoir would ever dip to the levels we've seen in recent decades. As such, these newly emerged landscapes are managed as though they are still under Lake Powell's high water mark.

In the early years of the Colorado River shortage, many in the water management community wrote off Powell's low levels as a fluke event that would fade as wetter conditions returned to the basin. But after nearly two decades of shortage, low flows

and low levels at Powell and Mead are considered the new normal. A growing body of climate change data is making it clear that the Colorado River Basin is getting hotter, experiencing lower runoffs, and is likely to get worse over time. These data have many implications, one of which is that much of Glen's newly emerged landscape is probably here to stay.

Currently Glen Canyon National Recreation Area (GCNRA) does not have an ecosystem management plan for these reemerged areas. There is a significant need to understand how these canyons are recovering, and to measure various aspects of these unique ecosystems, such as:

- Reestablishment of native plant communities
- Reestablishment of native wildlife communities
- Presence of non-native/invasive plants or wildlife
- Remaining impacts of reservoir sediment deposition and reservoir inundation
- Amount of sediment accumulated in Glen's side canyons
- Potential for large-scale sediment flushing and ecological recovery of the greater Glen Canyon area

New Research Efforts: Sediment and Biology

Since its inception, GCI's mission has been to facilitate science that addresses Glen Canyon's restoration. Investigating the recovery of Glen Canyon's emerging landscape is the next step in this process. These canyons were once forgotten, and now that climate change and water shortage have brought much of them back into the light, it's time to assess what their recovery looks like from a scientific standpoint. The scientific community and the public deserve to know how sediment is moving out of newly emerged areas, and what type of ecological resurgence is taking place in the canyons.

To that end, Glen Canyon Institute is excited to announce we will be partnering in two new research efforts: a multi-year sediment mobilization study led by researchers from Utah State University, and a Glen Canyon Bio Blitz with Brigham Young University.

Davis Gulch. Phtoto by James Kay.

Davis Gulch. Phtoto by James Kay.

Sediment in Glen Canyon

The Utah State study concerning fine sediment redistribution in Lake Powell is being conducted by USU's Center for Colorado River Studies. This multi-year effort is led by Dr. Jack Schmidt, and much of the work will be conducted by Maddie Friend, a graduate student pursuing her MS degree in the Department of Watershed Sciences. This project seeks to document the magnitude of fine sediment accumulation during reservoir high stands and fine sediment evacuation during reservoir low stands. The project is focused on the moderate and small size tributaries to Glen Canyon that include all of the famous side and slot canyons of the region. The project, jointly funded by GCI and other supporters, seeks to quantify the magnitude of natural restoration resulting from "flushing" of fine sediment in side canyons caused by flash floods and other stream flows. The project seeks to document the likelihood of large-scale rejuvenation of Glen Canyon's side canyons in the event of future low reservoir levels. Findings of this project will offer new insights about the true possibilities for Glen Canyon's future restoration.

Glen Canyon Bio Blitz

The Glen Canyon Bio Blitz will be co-sponsored with biologists from BYU, and will likely take place near the Escalante drainage of Glen Canyon in May of 2018. This will be an amazing opportunity for GCI members, students, and the public to take part in an effort to identify as many species of plants, animals, algae, microbes, fungi, and other organisms as possible in this section of Glen Canyon. This will be a fun and educational event, and a rare opportunity to get out in the field with GCI board and staff to study Glen Canyon's restoration firsthand. The bio blitz will be the first step in developing a larger research undertaking on Glen Canyon's ecological recovery.

Water Year 2017 in the Colorado River Basin: A Year of Variability

by Dave Wegner

At 12:01 am on October 1, 2017, Water Year 2018 officially began. It marks the end of the 2017 Colorado River watershed water year which can best be labeled as "interesting". After a much heralded and anticipated yet weak-producing El Nino over the winter of 2015/16, concerns were raised that the 2016/17 winter would not be a water producer. While the 2015-16 event possessed many of the defining features of a large El Nino event—warmer water temperatures in the eastern equatorial Pacific Ocean and increasing equatorial wind—yet snows of consequence did not materialize, largely due to the variability in the upper atmosphere that pushed the storms into the Pacific Northwest.

So expectations for the winter of 2016/17 were subdued. Initial winter season water supply forecasts indicated near or above average conditions throughout much of the watershed. In late January and February a series of "atmospheric rivers " began to hit California and trickle over into the Great Basin. By the end of the winter, 49 atmospheric rivers had hit California, resulting in record breaking snowpack in the Sierra Mountains. Some of that moisture made it over the Sierras and across the Great Basin to the Rockies.

The 2016/2017 winter in the Colorado River Basin was active, resulting in a series of winter storms that brought considerable snow to the mainstem Green River Basin and the tributaries. The same trend, though to a lesser extent existed in the Colorado western slope streams, resulting in above average inflows to all the major Upper Colorado River reservoirs except Navajo Reservoir on the San Juan River. To illustrate the dynamic nature of the snowpack and its impact on the available water in the Upper Colorado River Basin look at the table below.

As Water Year 2017 ended on September 30, the unregulated inflow to Lake Powell was 11.90 million acre feet (maf) which equates to a runoff of 111% of average. Over the entire water year the release at Glen Canyon Dam from Lake Powell was 9.0 maf. The end-of-water-year stand of the reservoir was 14.66 maf, 60% capacity, at 3,628.31 feet in elevation (72 below full pool of 3,700 ft elevation).

The runoff of 2017 was above normal throughout the Upper Colorado River watershed. As of October 8, 2017 the 28 primary reservoirs above Lake Powell were collectively at approximately 84% of full pool capacity. Does this mean the drought is over? It's not likely.

A River System of Variability

The Colorado River system is one of variability. Even before the water nobility of the seven basin states and the Bureau of Reclamation went on their dam building splurge, the river basin experienced significant extreme events, both high and low. So variability is to be expected. The question is, what will the future bring and how will the dams and reservoirs play into meeting the regions water needs? A few factoids:

- The 1922 Compact was negotiated and agreed to during a period of above average water years.
- The period of dam building and initial filling largely occurred during a period of above average water years.
- During the period 2000 - 2017, the unregulated inflow to Lake Powell (which is a good proxy for runoff in the Colorado River Basin), has been above average in only 4 of the past 18 years.
- Bureau of Reclamation data shows the period of 2000 to 2017 to be the lowest 18 year period of water inflow to Lake Powell since the closure of Glen Canyon Dam in 1963.
- A majority of climate scientists from multiple agencies and academia predict that the drying of the Southwest will continue with only periodic and unpredictable high snowpack years.
- The Bureau of Reclamation acknowledges that a structural deficit of 1.2 maf exists for releases to the Lower Colorado River basin from Hoover Dam.

2017 Forecast	January 1	April 1	June 1
Fontanelle Reservoir, Green River	128% of average	232% of average	232% of average
Flaming Gorge Reservoir, Green River	126%	281%	222%
Blue Mesa Reservoir, Gunnison, River	85%	138%	124%
McPhee Reservoir, Dolores River	84%	142%	110%
Navajo Reservoir, San Juan River	79%	103%	97%
Lake Powell, Colorado River	91%	130%	116%

Drought Contingency Plans in Both Basins

As long-term drought conditions are likely to impact water deliveries to both the Upper and Lower Colorado River Basin states, both basins are working to develop Drought Contingency Plans to delay the day when shortage conditions exist on the river system. In order to avoid a shortage call on the Colorado River system and the resulting control of lower Colorado River water by the Federal Government and the inevitable litigation, turning the courts into potential determiners of who gets water, the seven Colorado River Basin states are willing to assess the potential for voluntary actions.

The Lower Colorado River Basin states of California, Arizona and Nevada are assessing voluntary water conservation measures that would allow for more water to be stored in Lake Mead in order to keep the elevation of the reservoir above the end of calendar year elevation of 1,075 feet where automatic shortage conditions would occur. Examples of potential actions include:

- Voluntary crop fallowing
- System conservation
- Storing a portion of Mexico's water in Lake Mead (also dependent on Minute 323 implementation)
- Water efficiency measures
- Environmental water management

In the Upper Colorado River Basin the goal is to reduce risk for the watershed while also protecting the individual states' ability to fully develop their Upper Colorado River Compact (1948) allocations. While the Colorado River Compact allocated 7.5 maf in develoable water from the river, the basin states have concluded that a safe yield with a tolerable risk of shortage is approximately 6 maf annually.

Unlike the Lower Colorado River Basin, which has the buffer of both Lake Mead and Lake Powell above their diversion points, the Upper Colorado River Basin is dependent upon storing water in the much smaller reservoirs above Lake Powell, resulting in considerably more risk and limited hydrologic capacity to buffer drought if they get an incorrect runoff forecast. Unlike the Lower Basin states, if the Upper Basin states make a water management decision that is incorrect, a large buffer reservoir does not exist upstream to provide relief.

The Water Path Forward

The drought of the early 2000s changed the dynamic of how the basin states look at Colorado River management. When the 2007 shortage guidelines were agreed to, they set specific thresholds for action based on elevations of Lake Mead and the operations of Glen Canyon Dam. Today, even with average runoff conditions in the watershed, a structural deficit of water exists in the basin. Concurrent with reductions in runoff volumes watershed-wide, increased demand has come from Indian water settlements, population growth, and the legal need to satisfy the United States treaty commitments with the Republic of Mexico.

Since the late 1960s the complexity and risk of getting water right on the Colorado River has increased. The negotiation of a voluntary drought contingency plan in the Lower Colorado River Basin now has to include the relationship of Colorado River water with the Bay-Delta and California WaterFIX program, Salton Sea restoration, and providing flows to Mexico. Arizona's and Nevada's activities for the surface water flows require a coordinated effort in management of both surface and groundwater reserves.

The Upper Colorado River Basin states have needs that include additional funding for conservation programs, better runoff forecasting tools, system reoperations, increased water efficiency, demand management policy, scalable water banks, and better coordination with the Indian tribes. At the base of both programs is the continuing commitment to protect and manage the environmental resources of the basin.

From September 27 to 29, representatives of the basin convened in Santa Fe, NM to discuss the future of the Colorado River system. It was clear from those discussions that an updated "Culture of the River" needs to be established in order to help develop and guide future water management of the river system. Many in attendance agreed that the historical approach utilizing monolithic and linear thinking no longer can provide the flexibility that water management in the basin demands. The tribes control approximately 20% of the water of the Colorado River so it is clear that they have to be active partners in whatever approach is agreed upon.

What is required, especially in light of the increasing risk that climate change poses to the annual hydrology, is a paradigm shift in how we collectively coordinate water planning in the Colorado River Basin. While the 2016/2017 runoff gave some breathing room and buffer in the watershed, it is not a time to forget about the planning for the future of a new normal in the Colorado River basin. Variable and extreme weather events are significant drivers in water management of the river system. As citizens of the West we are responsible for being involved and working for solutions in the Colorado River system.

Down the River with GCI

by Jack Stauss

The meandering San Juan River. Photo by Jack Stauss.

In early August, members of GCI's staff and board joined 14 of our supporters, Guides from Holiday River Expeditions, and Environmental Policy expert Dan McCool to float the San Juan River from Mexican Hat to Clay Hills, into a newly-flowing section of river that was once drowned under Lake Powell reservoir. As we pulled life vests over our shoulders and greeted one another on the banks of the put-in, we knew we were in for a great adventure.

The lower section of the San Juan offers an amazing lesson in geology, history, and biology. From my repose in the back of our rubber raft, I watched this show in the limestone canyon walls we floated past. The layering of geology told a story of time: tectonics, volcanism, erosion, and sedimentation. Every half an hour or so someone would yell from another boat, "hawk!" or "goat!" and we'd all rearrange our position to observe the natural inhabitants of the place.

Being able to unplug from my usual busy life was a blessing. We had no phones, no screens, just the water, the desert, and the company of our companions. I contemplated the ancient and indigenous people that had lived along the river corridor. I thought of the first pioneers that came here, looking for riches. I thought of the reeds and willows that we had been camping among. Mostly I wondered at the walls, those vast and mighty towers of stone that told stories of old oceans and ancient creatures.

Throughout the trip our head guide Jess knew exactly when and where to stop for hikes into the surrounding red rocks. We explored old hovels that had been used for mining a hundred years ago. Their crumbling walls made it hard to imagine working the land to make a living. One evening Jess regaled us with the history of the ancient people who inhabited the Colorado Plateau and we were able to gain a better understanding of those who first called this place home.

On an especially scenic hike up Slickhorn Gulch, we were able to saunter from the river into a ravine full of waterfall terraces and slick polished limestone eroding away a hallway of geologic beauty. We lay beneath a slab of rock riddled with ancient sea creatures. Further along the trail we walked up to pools high above the river, fresh clear water flowing from the creeks above. The crystal water fed resilient green ferns and mosses growing right out of the canyon wall. I stood under a small waterfall for a long time, letting it wash away the sandstone silt that had layered my skin for days.

Each night we gathered for educational talks led by Dr. McCool and GCI, as well as lively discussion and story sharing from the whole group. McCool guided us through the nuances of Colorado River history and policy, exploring the complexities of all the stakeholders who have an interest in the river we were exploring. The group members learned from the evening talks and, over dinner, incorporated their own expertise into the dialogue.

As the last 18 miles of our float meandered towards Glen Canyon through river that had once been drowned and now come back to life, the group couldn't help but be inspired by the resilience of nature and its ability to rebound. Many of us were surprised to learn the reservoir backed up all the way to Slickhorn Gulch—the river showed very little sign of ever being submerged by the reservoir. Our group was made up of diverse backgrounds and political beliefs, but we all found common ground in our love for the river and the desire to see its full return. From the stories of people's life work and passions, I found optimism in the otherwise complicated issues of conservation and the river.

As the evening crept to dark the wine bags were forgotten and one by one, we all silently padded our way across the desert beaches back to our little tents. Each night I let the sound of the river guide me into sleep.

The group enjoys the view from atop the Honaker Trail. Photo by Jack Stauss.

The group utilizes a variety of watercraft to enjoy days on the river. Photo by Jack Stauss.

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"What enthralls me about Mother Earth is her disrespect for what humans consider their greatest achievements: skyscrapers, bridges, dams, etc. With a small adjustment of her girdle, they all came tumbling down, and sometimes she just wrings out her laundry." "

—Katie Lee

Arch Canyon, Bears Ears National Monument. Photo by Ray Bloxham/SUWA.