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REPORT

Beyond Dead Pool

A trip down the Colorado

A hideous accounting trick is destroying America's rivers

Lake Powell is the American Pompei, preserved under oozing tonnages of mud

CASH-REGISTER DAMS PROP UP A FORSAKEN NINETEENTH-CENTURY FANTASY

The horror of carp slowly cooking alive

By WADE GRAHAM

When we got to the North Wash boat ramp, we pulled up, four of us in a truck towing an inflatable rib boat on a trailer, but there was no ramp. Instead, we were confronted by a steep dirt bank, almost a cliff, crumbling into the fast current ten feet below. It was May, 2005, and the water of Lake Powell, the second-largest reservoir in the United States, was at its lowest level since May, 1969. We'd come to put a boat on the water in order to find out what we didn't know, and what no one seemed to know: What was happening now that the Colorado River, after being smothered for 42 years, had begun pushing back?

This ramp of sorts is not where North Wash empties into the Colorado River — that is a mile and a half downstream — but is nevertheless called the North Wash boat ramp. I mention this because it is a pattern in this story, that things are officially called one thing in spite of in reality being quite another.

Five hours from Salt Lake City and about 40 miles from the nearest town, Hanksville, in southeastern Utah, the North Wash boat ramp is smack in the middle of one of the most remote, forbidding, and roadless parts of the Lower 48. For millennia, this has been one of the few places to cross the Colorado, which is fenced in for most of its length by impenetrable canyons with sheer rock walls hundreds, if not thousands, of feet high. The first place people tried to ford the river, by swimming horses or hoping for a raft, was upstream at Moab, roughly 60 miles as the crow flies. Downstream, the next chance was at Lee's Ferry, just over the Arizona state line, at the head of the beyond-impenetrable, 200-mile long Grand Canyon.

Few living Americans remember how final a barrier the Colorado River once was, its bottomless chasms cutting off one half of the Southwest — already vast, inaccessible, and virtually unpeopled — from the other. Historians wonder if the exploring Spanish, who rode their horses up to the edge of the mile-deep Grand Canyon, in 1540, simply turned away in disbelief that God would have created such a thing. In the late 19th century, a small settlement of shacks, fruit trees, and gardens irrigated from the river popped up on the opposite bank from the ramp; the town was named Hite, after Cass Hite, a prospector famed for his lethal skill with a revolver. Until 1946, the one-tenth of Utah beginning on the far bank was unreachable by car.

In that year, a car ferry, no more than a Huck Finn-style raft pulled along an overhead cable by a salvaged Dodge truck motor, was installed by Art Chaffin, whose nearby cattle ranch in Hite was then and probably remains the most isolated in the US, being 120 miles from the nearest railroad. Known as the Hite ferry, it established the first road link between Blanding, the biggest town in San Juan County, Utah, with 3,375 current inhabitants, and Hanksville, population 171, which is in Wayne County, which has a total countywide population of 2,486. For two decades after that, even with the ferry, little changed.

Then, this place was remade — it's more accurate to say it was invaded and altered beyond recognition — by something that seemed like nature but was in fact its opposite. A lake appeared here — emerged out of nowhere in geologic time, and outside of all geologic sense. The brown, muddy, wild and free Colorado River was gradually pushed back and erased by a kind of water so different that it constitutes another, incom-

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REPORT

A CATTLEMAN'S FEAST

Bitcoiners weep bitter tears while learning lessons about scarcity, market forces, and the power of adaptive multi-paddock grazing

TEXAS SLIM VS. THE BIG FOUR

Johnny Ochoa works with gravity to break down an entire cow using only a knife and a small hatchet. Spoiler: It's delicious.

By CHANDLER FRITZ



Arriving in Nashville to cover July's 2024 Bitcoin Conference — a celebration of digital currency — my first order of business was to check in at the Music City Center to fetch my press pass. A press pass, like money, used to be a tangible commodity. One could fidget with them on a lanyard or tuck them neatly into the ribbon of a fedora. It said: I am a man of the press, which, like this pass, is made of paper. At the Bitcoin conference, the press pass is a digitally linked bracelet that you receive by scanning a QR code sent to your email. Incredibly, I somehow missed a link in this chain when applying, and the support staff are now staring at me blankly as I attempt to retrieve my pass the old-fashioned way: by stating my name.

"We do not have that identity," reports a blond man with an efficient buzz cut.

"The identity is not in our

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JEREMIAD

BLAME THE BUTCHER

The syringes and the diabetes testing strips are just two sides of the same bad penny.

WE ARE NOT THE GIANTS WE WERE MEANT TO BE

What have they ever got done?

By CYRUS CORON

Poverty, like butchery, is the commodification of the parts to the desecration of the whole. America is a people in squalor, trafficked by godless, market-based renderings. Our bodies are monetized, while our souls are demonetized. It's unholy, the grifts we bear. From birth house to death house, we are hustled for parts. Our parts.

South Phoenix is 50 percent Latino, 25 percent black, 25 percent white, and 100 percent piss-poor. Myself, I'm three quarters bastard, one quarter Irish. We're always working, so we're always in the Poor House. When my girl Cricket and I moved here in 2009, peak Great Recession, we came for proximity to the cancer-discharging fuel terminals and concrete plants where the trucking jobs are always available. We were both hazmat tanker truckers at the time. I still am. I drive a bomb that has yet to go off.

The air here is acrid from auto parts recyclers, plating factories, forever-smoldering industrial composting lots, and invasive stinknet. Dawn breaks languid and heady with fumes. Most kids are pudgy and grounded by asthma. The adults are overweight and diabetic. Used needles are left in the streets and alfalfa fields, as track scars from fentanyl and insulin share the same revolving-door lineage — addiction, pollution, sorry nutrition, economic destitution, and corporate collusion all being afflictions of the poor.

There is no kleptobrat inheritance here. Families gather at stoplights on weekends, collecting donations to cover funeral expenses for a dead little girl or leukemia treatments for a dying old man. Sidewalk signs festoon the streets, pedaling "CASH FOR DIABETIC STRIPS," and "WE BUY MOBILE HOMES — CA$H." Ads for the end-times. If you've never seen a chain of Rent-A-Tire shops, we got 'em. When there's nothing left, they pick the fuckin' bones.

What we consume determines whether we thrive or falter. Fast food is whole food here. We all eat from the same nutritionally toxic dollar menu. It's our only option. Don't tell me we're fat by choice! How else can you inhale your five-bite dinner while ridesharing between zombie-shift gigs? Where else can you feed and poison your whole family for a buck apiece?! It's a cardiac-ending sweetheart of a deal.

There's no retirement here. We stop working when our bodies stop working. Till then, we don't stop. Grandparents, grandkids, and cousins alike hustle 'round the clock in the bowels of churn 'n burn Amazon fulfillment centers, maniacally picking and packing Same-Day Deliveries, while chewing down Dollar General Tylenol to stifle the algorithmic pain. Grit, like poverty, is a family affair.

We're poorly paid because we're poorly educated, they say. Our schoolhouses, like the hand-to-mouth neighborhoods we reside in, are strategically defunded, guaranteeing that our wages remain the lowest in the land. This

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REPORT

THE GREATEST SHOW ON EARTH

A Trump rally in Montana brings out the walking wounded and the Second Coming of William Jennings Bryan

THE LEAN, MEAN CHICAGO MACHINE WANTS TO OWN THE INSIDE OF YOUR SKULL

An obsession with politics is a form of mental colonization by people who truly aren't your friends; it's un-American, and uncool.

By DAVID SAMUELS

You can smell what's coming. It isn't good, what they're cooking up. It's been almost a decade now, so we already know the drill: Keep quiet, do what you're told, don't think wrong thoughts, and make yourself as small as possible, in the hopes of maybe becoming invisible. This is plainly no recipe for free people to live by, but it's what seems to be on the menu, today, tomorrow, three months from now, until everywhere in the country feels like the inside of a prison cell in some Latin American country. Dank, damp and dark.

At any rate, that's the view from beneath the floppy fishing hat that I bought at the outfitting store in Livingston, before I drove out here to Bozeman. Go read Milan Kundera and Czesaw Miosz, the literary giants from the days of Soviet domination of the Eastern Bloc, and tell me that at least half of it doesn't seem familiar.

America was never this way before. Politics was more a form of entertainment than an obsession, but now it's all these people think about day and night, obsessing about their fantasy of total control in which they use their giant whispering machine with its bells and whistles and psy-ops to regulate the doses of fear and anxiety that are fed through the tubes they installed in our brains — a non-stop barrage of propaganda poison, whose objects and storylines change daily, and very often contradict each other week to week. The message being that it's better to trust in the Party. No shop class dropout I knew growing up would ever stand for this. And yet, here we are.

Where does the force of their obsession come from? Out here on the plains, where the towns have saloons rather than churches at their centers, which is a thing I love about visiting Montana — that and the sheer numbers of dinosaurs who walked here, leaving behind their bones, which are so gigantic that it almost makes sense to imagine that evolution is a fake — the answer seems simple: They are afraid of what happens when 350 million free atoms interact with each other in unpredictable ways in a continent-sized space — a scary, vertiginous thought. Someone needs to lock that down, before all hell breaks loose, before some maniac or wacko starts a global pandemic or brings down the Twin Towers. First George W. Bush, then the Obama Party — the goal they share in common being to turn America into one big jail. Freedom is the enemy. Meaning us. That's where the prison-feeling comes from.

Better to use my time up here in Montana to clear my head and do some fishing. Be careful, though. Because if you're not careful, they'll write you a $100 ticket for the wrong kind of fishhook. Meanwhile, the zombies are smoking fentanyl in broad daylight in front of city hall without anyone so much as asking them politely to move on. Sometimes they die right there on the sidewalk, gasping and twitching like in a scene from a horror movie.

Freedom is good. Americans from all walks of life and all parts of the political spectrum agreed on that. It was why our ancestors came here. From the gas stations to the airfields and rock concert arenas to the Western ranges, freedom was the rubric under which people naturally aspired to live their lives without thinking too deeply about it. Freedom, baby. Dig it. Hippies were free. Cowboys were free. Greasers were free. Walt Whitman wrote and thought freely. Descendants of slaves with wild Afros played free jazz. Rock and roll music became the sound of freedom across the generations, from Bill Haley's "Rock Around the Clock" to Woodstock. Astronauts floated freely in space, proving that mankind was still bigger than the machines. Even when American lives fell short of ideal, there was always a taste or memory of freedom in there somewhere.

The shitheads who are afraid of freedom don't give a crap about any of that. Freedom complicates the clean functioning of their algorithms. Their dream is to turn the living, breathing, yearning thing that was America into a two-dimensional video game like Pong! In the dark of their Steve Jobs-curated stainless-steel offices and bedrooms, they fantasize about a digital reward-and-punishment machine that they can control from their keyboards inbetween workouts while drinking bottled water brimming with unhealthy plastic particles that are messing with their testes — which makes sense, reproduction being our only real promise of freedom from death. They're playing a different game, though. They want to build a world that is void of transcendence, in which the spark of divinity inside every human being is no more inherently significant than a pixel. To achieve that dream, they need to occupy the inside of your skull, in order to manipulate us all into whatever forms they find most pleasing, while importing millions of migrants who will work for $15 an hour — all of which more or less describes the system that the oligarchs and the party bosses installed in New York and Chicago back in the 1880s. Only now, it's gone national. The point of the new system is the same now as it was back then: The Robber Barons keep their wealth, while the Party maintains control.

Who will ultimately win the coming showdown between the oligarchs and the Party to have final say over the machine is a question for another day. Or maybe it will be settled in the coming election, with Elon Musk and his posse of red-pilled Founders standing by the side of Donald Trump, the Demon Emperor who would gladly trample our beloved democracy, if only such a thing existed. That's because, in the space of a decade or so, the Democrats have transformed themselves from the Party of FDR and the middle class to the Party of Bill Gates, George Soros, Warren Buffet and J.P. Morgan, along with their various retainers and foot-soldiers and NGOs. There is nothing surprising about any of this. Just ask J.P. Morgan himself, who oversaw the transformation of the Party of Lincoln into the party of the Robber Barons.

How's that for a history lesson, eh? America is reliving the Gilded Age, with all of its nauseating excess and pinched-nose Victorian mores, glimmering

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DISPATCH

WISCONSIN SUPPER CLUBS

Childhood memories may be haunted but the relish tray abides

PICKLED MUSHROOMS AND ASPARAGUS DON'T MIX WELL WITH ALCOHOL; NEITHER DOES ICE CREAM

The first rule of Supper Club is that they don't take reservations; the last rule is that no one eats alone

By MEAGHAN GARVEY

It's been said that Wisconsin has more ghosts per square mile than any state in America, a claim I can't substantiate but buy nevertheless. It seems like every town has its own ghost story: haunted hotels, haunted theaters, haunted steakhouses and saloons. Some have seen the apparition of a Christmas-tree delivery ship that sank into Lake Michigan off the shore near Manitowoc in November of 1912, or heard the disembodied sounds of the Kickapoo Polka Band, whose eerie music floats through the Vernon County woods. Others have seen the ghosts of gangsters who laid low in the Northwoods at spots like Manitowish Waters' Little Bohemia Lodge, where to this day you can enjoy fried lake perch, potatoes, coleslaw, and rye bread in a place whose windows still have bullet holes from the FBI's botched 1934 raid on the Dillinger Gang.

This was more or less what brought me heading north on Highway 51 towards the vast woods and glacial lakes of the Chequamegon-Nicolet National Forest — not gangster lore or stray ghosts, but Friday fish fry, my favorite Wisconsin tradition. The European Catholic immigrants who settled the state in the late 1800s abstain from meat on Fridays; luckily, lake fish like bluegill, perch, walleye were plentiful and cheap. During the Prohibition years, law-abiding local taverns stayed afloat by selling fish plates at weekly Friday socials, and by the '60s, when the Catholic church relaxed their dietary rules, the Friday fish fry had become embedded in Wisconsin life. You could find one at just about any neighborhood bar or restaurant, but for the true experience, you went to the supper club.

Those who claim that the Midwest is absent of style have clearly never dined at a Wisconsin supper club, whose dark wood-paneled walls are hung with taxidermy and prize fish, cozily aglow with lighting on the spectrum between "yuletide" and "brothel." At least that's the Northwoods hunting lodge ideal; other supper clubs are modest, with church-basement ceiling tiles and vinyl tablecloths, done up in the dusty kitsch of grandma's living room. A few supper clubs exist in cities like Madison or Milwaukee, but they're hardly the real deal. You'll find those on the side of two-lane highways, overlooking lakes or encircled by tall pines. They're family-owned and -operated and often keep odd hours — closed for lunch and on most weekdays but never Friday or Saturday night.

I pride myself on social graces, having mostly overcome the painful shyness of my youth to become the kind of woman who waltzes into strange bars and leaves with strange new friends. But in the taverns of Wisconsin, it's as if they see right through me — some yuppie city slicker dressed self-seriously in black, batting fake eyelashes, scribbling in... is that a *notebook*? It's a tough blow to the ego to be so thoroughly

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JEREMIAD

"I see great things in baseball. It is our game — the American game."
— Walt Whitman

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Beyond Dead Pool

From PAGE 1

patible element — the still, flat, blue-green, clear waters of a gigantic reservoir, creeping upstream from its origin at the alien, gray concrete wall of Glen Canyon Dam, 153 miles downstream.

The gates of Glen Canyon Dam closed in 1963. When the flatwater from the Dam arrived at North Wash in 1964, the Hite ferry was removed, and a highway bridge was built a mile upstream at Narrow Canyon. (Narrow Canyon was actually one of three bridges that were required to make the crossing onward to Blanding: a second to cross the Dirty Devil River that empties into the Colorado a half-mile upstream of Hite, and a third to cross White Canyon, five miles south.) A concrete boat ramp was built on the other side of Narrow Canyon to launch lake craft: speedboats, pontoon boats with shade canopies, and houseboats — two-story fiberglass boxes like house trailers mounted on aluminum floats, complete with kitchens (not galleys), bedrooms (not berths), bathrooms (not heads), and waterslides for the kids — vessels that could never have navigated the wild Colorado.

On June 20, 1980, an evanescent wonder named Lake Powell, not a lake but a reservoir, was full for the first time. It had taken 17 years, substantially more than government experts had predicted, owing to the loss of massive amounts of water into the cracked and porous layers of sandstone out of which Glen Canyon is carved. At Full Pool (engineer-speak for maximum reservoir elevation), Lake Powell backed up 186 miles from Glen Canyon Dam. Traced along the fractal geometry of the Colorado and its two big tributaries, the San Juan and the Escalante, and a combined total of more than 90 side canyons, its shoreline was 1,960 miles long — longer than the West Coast of the United States from Canada to Mexico. After Lake Mead, the reservoir backed up by Hoover Dam outside of Las Vegas, it was the second-largest reservoir in the United States, covering 161,390 acres and storing more than 25 million acre-feet of water.

On that June day in 1980, anyone standing on the shoreline near Hite would have seen a picture of contented American fun, Cold War-style: people fishing, waterskiing, riding jet skis (the first commercial model, the Kawasaki JS400, had gone on sale in 1972), and relaxing on houseboats in the Utah sun. The clear blue lake in the red rock desert was the "Jewel of the Colorado," according to the Bureau of Reclamation, the federal agency that built Glen Canyon Dam.

In 1980, Ronald Reagan, a swaggering, wisecracking embodiment of US Cold War truculence in the face of its ungodly, communist enemies, was elected president. Like Reagan's presidency, reaching Full Pool at Lake Powell amounted to the delayed fulfillment of promises made to Americans, or at least some Americans, in the 1950s: the successful culmination of the Cold War through indomitable will and technological prowess, projected into American living rooms by cathode-ray tubes. Full Pool was a battle won in the nation's other endless war, the war against wasteful, irrational nature, which would be transformed by man's rational technology from natural menace to natural resource.

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I'd come to the North Wash ramp with Chris Peterson, the executive director of Glen Canyon Institute (GCI), an organization founded in 1996 by Dr. Richard Ingebretsen, a Salt Lake City physician, to advocate for the draining of Lake Powell and the restoration of Glen Canyon. I'd served on its board since 1999, out of love for the river and canyons and outrage at the way the US and state governments, captured by rapacious economic interests, had systematically sacrificed our shared natural inheritance. GCI was a tiny, shoestring operation, with only two paid staff members — Chris and an assistant — but was effective at least at generating conversation about the need for restoration, including front-page coverage in national media outlets.

GCI also managed to stir things up in the opposite camp. In October, 1997, Utah Representative Jim Hansen held hostile hearings in Congress on the issue of draining Lake Powell, which brought GCI national publicity and instant credibility in the larger environmentalist community. In 2005, the Utah congressional delegation even introduced a legislative rider to the Department of Interior's latest appropriations bill to prohibit the agency from using government funds to "study or implement any plan to drain Lake Powell." Utah Senator Orrin Hatch denounced the effort as "looney."

On the afternoon of May 13, 2005, in North Wash, we were off the known conceptual map, quite literally. Full Pool had been achieved only twice — in 1980, and on July 14, 1983. It would never be seen again. After six years of a punishing drought that had begun in 1999, Lake Powell was just 33 percent full, 145 feet below its Full Pool elevation of 3,700 feet. At Hite, the blue "Jewel of the Colorado" was gone. In its place was a deceptively narrow, muddy river eating into the slope that had been the old boat ramp.

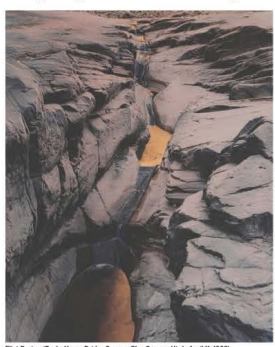
The Colorado has the second largest natural sediment load of any large river on the continent, moving an estimated 54-60 million metric tons per year into Lake Powell. When it hits the reservoir and slows, the sediment load drops out. This phenomenon, called aggradation, had completely transformed the upper reaches of the reservoir, covering the original river bottom with deep deposits of sand and silt 100 feet thick in some places. Across the channel, sediment banks on the river's edge, some that looked to be nearly 100 feet high, collapsed into the water with a loud slap every few minutes, sending up clouds of rock flour. The Colorado was running at 31,000 cubic feet per second (cfs) that day — still more than the average flow of the Hudson, the Sacramento, or the Tombigbee. Beyond the line of fast current, a sea of drying mud covered in thickets of invasive tamarisk stretched the quarter-mile across from North Wash to the Hite marina, which lay abandoned, its long concrete ramp high and dry, the red-and-white marker buoys toppled onto dusty, cracked ground.

Chris, myself, and two friends — Agustin, an artist; and Jeff, a musician — had set out from Salt Lake City in Chris's truck, towing a borrowed motor rig — a 17-foot rigid inflatable with a 40-horsepower outboard mounted to the tail plate. We had intended to put in at Bullfrog Marina, another 30 miles down the reservoir, and motor up, but the chance to actually float a free-flowing Colorado River where Lake Powell had once been was too exciting, so we decided to put in at the historic North Wash instead. We slid the boat off of the trailer and down the gravel bank. We handed down our gear, put on life jackets, clambered in, and pushed off.

The current, running four to five knots, bit the boat and pulled it downstream under a blue sky and a warm wind from the west. The boat bucked through sprightly class-two wave trains as the river bounced from bank to bank, then settled down and ran smoothly but surprisingly fast. Red walls streamed past on river right, then North Pond, a small trapped lake between North Wash and the Colorado, appeared, and as quickly disappeared behind. The Colorado was alive again. It was exhilarating. High-fives were shared all around.

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The Colorado was the last, wildest, big river in the continental United States to feel "the reins of man's control." It wasn't by any stretch the biggest — it's not even in the top 25 US rivers by volume of flow. But in the Southwest, it is *the* river. It is long: reaching 1,444 miles from the high northern Rockies in Wyoming to the Gulf of California in Mexico. And significant: collecting runoff from 108,000 square miles — one-twelfth of the land area of the continental US — draining parts of seven US states and passing through two Mexican ones before meeting the sea. It is among the most volatile rivers in the world, called "erratic," "stochastic," and even "psychotic." Often it is no more than a warm trickle — in the fall and winter of low water years a person can walk across it in parts of its lower reaches. But in spring, the Rocky Mountain snowpacks melt, accelerated by rains, sending torrents of runoff into innumerable mountain streams, which gather in smaller rivers, which in turn join the Green River flowing from Wyoming into Utah and the Colorado River flowing from the state of Colorado's western slope. Combined, these are joined by the San Juan flowing from the mountains of southwestern Colorado, before plunging on to Mexico, and, finally, the sea.



Eliot Porter, 'Pools, Upper Bridge Canyon, Glen Canyon, Utah, April 11, 1962'

(C) 1995 AMON CARTER MUSEUM OF AMERICAN ART

For its size, no river on earth has more capacity for work. Its gradient is steep: 11,000 feet in its journey from the peaks of the Wind River Range to the Gulf. And it is prone to floods, big ones and occasionally huge ones, big enough to float a battleship down the Grand Canyon. Much of its watershed is arid and sparsely vegetated, allowing the river, when it is energetic, to pick up earth — silt, sand, and rock — in prodigious quantities. The Spanish named it Rio Colorado, red river, for a reason. Where it crosses the border into Mexico, it used to carry an average of 160 million tons of sediment a year. That grinding powder scoured out the mile-deep Grand Canyon, not to mention Meander, Cataract, Glen, Bridge, Marble, and Black canyons — just to name the largest on the mainstem of the river. Over 13 million years, the river gouged more than a quadrillion tons of earth from the Colorado Plateau and deposited it all in the lowlands of southeastern California and Mexico, forming a deep delta covering two million acres, more than 3,000 square miles of rich earth for farming.

An "erratic" river is of little use for would-be developers, though. Turning the Colorado to profitable use would require "ironing out" its highs and lows through irrigation and hydropower, capturing its floods and storing them to be meted out during dry years. Privately funded efforts to profitably divert the river ended in spectacular failure, as the wild waters repeatedly tore through physical barriers meant to constrain them. For three years it poured into a vast desert sink near the Mexican border, creating the Salton Sea, a mistake that remains the largest lake in California. Big government, with its organizational capacity and its treasury, would perforce have to be harnessed.

The practical problem of taming the river was solved with the building of Hoover Dam: the nation's most important symbolic achievement during the Great Depression, an incredible feat of engineering and logistics. No dam remotely as big had ever been attempted, much less on a river as ornery as the Colorado. From beginning to end, the massive structure was completed in three years, including two straight years of pouring concrete, 220 cubic yards an hour, 24 hours a day, until the dam topped out at 726 feet, capable of storing 32 million acre-feet of water. When it was dedicated on March 23, 1935, the country's pride soared. Marc Reisner, author of *Cadillac Desert*, the definitive history of water in the American West, wrote: "One could say that the age of great expectations was inaugurated at Hoover Dam — a fifty-year flowering of hopes when all things appeared possible." Hoover Dam's water and hydropower built up Los Angeles into the largest megacity on the West Coast, an industrial powerhouse that shifted the balance of America's economic and demographic weight sharply westward. Its electricity won World War II, welding the aircraft frames that turned the tides of war in both Europe and the Pacific.

In the case of Hoover Dam, too, the dream of "reclamation," or the greening of the deserts through irrigation, at least made potential sense: The irrigable lands lying below Lake Mead in southeastern California and around Yuma, Arizona, could be watered by gravity, providing a frost-free climate and long growing season capable of growing citrus, dates, grapes, and other high-value crops that grow nowhere else in the United States. Hoover Dam irrigated more than a million acres, though not without a hefty subsidy from hydropower revenue. After Hoover, it was harder to justify Colorado River dams, though: The basin above Lake Mead is arid and mostly rocky, sits at ever-higher elevations with short growing seasons and snow. It had few population centers to sell its produce to. Its most successful crop, alfalfa, barely covered the costs of growing it even where the water was free. Already, by midcentury, it was clear that federal irrigation was a farce: acreage limitations that were intended to restrict subsidized water to small farms were flagrantly flouted, leading to concentrations of landowning that can only be described as oligarchic; repayment obligations, already no-interest and stretched over 40 years, were routinely ignored; and true project costs were obscured by writing off fictional benefits to flood control and recreation.

But politics, not economics or hydrology, rules the rivers. The first scientist to systematically survey the resources of the watershed, Major John Wesley Powell, who mounted two US government expeditions by boat down the Colorado so arduous as to be fairly called suicidal, warned in his official 1878 *Report on the Lands of the Arid Region of the United States* that there existed only enough water in the arid West to irrigate 3 percent of the arable land in the region. No one wanted to hear about intrinsic, immoveable natural limits, though. Powell was silenced.

When the time came to divide up the Colorado River among the seven states with claims to it — California, Nevada, and Arizona in the Lower Basin; Utah, New Mexico, Colorado, and Wyoming in the Upper Basin — entitlement, not caution, was the top priority. In 1922, in a fancy vacation lodge in Santa Fe, New Mexico, representatives of the basin states and the federal government had agreed to split the river's flow between two, arbitrarily defined basins, signing a document called the Colorado River Compact, which was ratified by Congress. Thereafter, economic rationality — rationality of any kind — went out the window, and building projects to reclaim the water became the only imperative. Thus, the Bureau of Reclamation was going to build enough dams to allow the Upper Basin states to use half of the flow of the river, come hell or high water.

The agency first set its eyes on two sites in the northeast corner of Utah, at Echo Park, on the Green River within Dinosaur National Monument. But these dams energized a rising national conservation movement, which mobilized to block them. Critically, the Sierra Club, led by its bold, young president David Brower, published a book, *This Is Dinosaur*, to rally public opinion against the desecration of a national treasure. When the Echo Park plan was dropped in 1954, the Bureau moved on to Glen Canyon. Nevermind that, for all the hoopla and confident propaganda, it was not the damsite the Bureau wanted: The Navajo sandstone is weak and porous, and the site is not only inconveniently isolated but sits in the bottom corner of the Upper Basin, so that no water impounded there could be used in the Upper Basin. It would only serve as a symbolic double to Lake Mead — which would have served equally well to store the water — being a defiant demonstration of ownership.

The 17 years Lake Powell had taken to fill were an interregnum between two incommensurate realities in the Colorado River Basin. In 1963, only California was using its full entitlement. The other six states had not yet begun to win their own, federally funded projects to divert the river. But over the years, more and more projects had come into operation: Lake Powell and Lake Mead, once full, were dropping. The assumption in the Compact of an annual average flow of 16.5 million acre-feet was based on a mere 30 years of streamflow records, measured from the late 1890s. Yet it turned out that the early 20th century was one of the wettest periods in the last 800 years, a fact theorized by government hydrologists who were predictably silenced or ignored. Long-term average flow really had been somewhere between 13 and 14.5 million acre-feet. In drought years, which were growing more frequent, the flow was about 11 million acre-feet.

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Authorized by Congress in April, 1956, work on Glen Canyon Dam began five months later, on October 15, when President Dwight D. Eisenhower pushed a button in the Oval Office sending a telegraph signal to the dam construction site to trigger the first dynamite blast. At the peak of construction, 2,500 workers labored to reshape the canyon, replacing sandstone with steel-reinforced concrete, with the goal of replacing the brown water with blue. In a promotional film made by Bureau and titled "Operation Glen Canyon," men are shown driving heavy machines in constant motion, blasting, breaking, crunching, hauling, forming, and pouring. Speed was all-too clearly of the essence, as if damming the Colorado River were an existential race against the communists. Like the concurrent space race between the US and the USSR, it made manifest man's dominance over nature — the apotheosis of the world's new technological religion, which was common to both competing empires.

On February 29, just 22 months after the award of the prime construction contract — for $108 million, the largest in Bureau of Reclamation history — the diversion tunnels were complete, and the river was shunted into them by bulldozers pushing boulders into the current. In the brand-new town built to house the effort, Page, Arizona, people went bowling and to the supermarket, and drove station wagons on empty suburban streets. Women — of course there were women, wearing A-line dresses and pleated poodle skirts — minded the home front. A "traditionally" garbed Navajo band played jaunty 19th-century marches, written for reviewing Prussian troops, providing an absurd soundtrack to the theft of their land and water.

After six years of work and three million barrels of concrete poured, the dam topped out at 710 feet — 583 feet above the river level, sitting on another 127 feet of concrete below the river, anchored into the excavated bedrock, where the structure's base reaches 300 feet thick. Ten million tons of concrete and 28,900,000 pounds of reinforcing steel were used, making it the world's fourth largest concrete structure at the time. Glen Canyon Dam was a modern pyramid erected to honor modern American gods: efficient, rational control by Man of wasteful, wild Nature; and to bring order, abundance, and civilization to the remaining waste spaces of the continent.

Watching and rewatching the promo movie while writing this piece, I was fascinated by what, according to the Bureau of Reclamation, was Glen Canyon Dam's ultimate purpose. The film continues, with a shot of a gate closing on one of the dam's two diversion tunnels, on March 13, 1963, and the narrator solemnly pronounces: "No longer would this be a river. Soon the trapped water rose against the dam. At this moment Lake Powell was born."

The apparent impetus for its erection and the death of the living river wasn't simply "total possession" of nature, the achievement of America's manifest destiny, nor Cold War geopolitical necessity. Instead, it was happiness. Swelling, cheerful music plays. A speedboat is shown zooming down the lake between sheer sandstone walls: "Above the dam, the Colorado River was turned back. The brown sediment that clogged the river was gone, leaving a sapphire lake of matchless beauty." Two water skiers are pulled behind another speedboat. More scenes of contented recreation. Lake Powell is, "A boating avenue, a place to catch big bass, a place to relax." The lake's creation is, finally, "An important and noble venture for all Americans."

It wasn't for all Americans, though. Lake Powell wasn't made for the Indian tribes who had been left out of the negotiations that divided up the water of the Colorado River among "stakeholders." Nor was it made for the millions of farmers and electricity customers in the East, Midwest, and South not offered the benefit of federally subsidized water and power. Nor for people without access to speedboats and water skis. Full Pool at Lake Powell was success defined a certain way, by certain people, for a certain segment of Americans — but paid for by all of them.

For all the Cold War technocratic efficiency, Lake Powell was really an expression of the 19th-century United States' obsession with land — with the notion, in practice largely a fantasy, of providing every (white) man with a farm large enough to support a family: what the 18th-century Founders had called a "competence" — not only the basis of subsistence but of manly independence, therefore the measure of whether or not a man should be allowed to vote in the new republic. The Homestead Act of 1862 and its successors had been the 19th century's most impactful expression of this project. The Reclamation Act of 1902, conceived in the 19th century but only made law in the third year of the 20th, was its extension, proposing that, since essentially all naturally farmable lands in the country had already been taken, dams on rivers would allow irrigation farming on the apparently infinite arid lands of the West. Dams would be the new railroads: built by the federal government, paid for by the US taxpayer, benefitting mostly private interests, yet magically fulfilling the promises of America's Manifest Destiny. "Reclamation" — the odd verb its promoters chose for their dream — had more than a whiff of Biblical redemption to it, with Man (more specifically the Bureau of Reclamation) playing the role of a beneficent God.

A traditional 19th-century Mormon hymn expressed this vision clearly:

Oh faith rewarded! Now no idle dream,
The long-sought Canaan before him lies;
He floods the desert with the mountain stream,
And lo! It leaps transformed to paradise.

Yet not an acre in the states of the Upper Basin of the Colorado River for which Glen Canyon Dam was built would be irrigated with the water held behind it. No new farms would be created, and no new families settled on the land — unless we count those happy suburbanites in the tract homes with their green lawns on the curving streets of Page. The Jewel of the Colorado was a chimera, a persistence of an old but still-seductive myth, like the spirit of a dead person hanging around the living world, continuing to trouble its inhabitants long after it should have gone to rest.

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As we floated triumphantly downstream, savoring the visceral pull of a newly free Colorado River, Agustin became solemn and said: "Guys, I think I hear a waterfall." A small wave ahead kicked up flecks of spray in the sun. As we moved closer, we gradually realized that whatever was making the sound was huge, and not in sight. We decided to paddle to the bank on river left and scout it.

We reached the bank and hauled the boat up. The bank joined an enormous sediment bar, its ridge taller than us, spanning the river. A huge amount of mud and sand had been dropped here, forced from the river's maw by the slack water of the reservoir as it rose, then pushed up into a berm by the river as the reservoir receded. We walked along it towards the sound: to the west, on river right. The sound grew louder and louder, becoming deafening as we rounded a knob on the bar and saw a monster: a brown, boiling, roaring rapid, with two huge holes and a 100-yard wave train. The river, pooled up behind the bar, compressed and swelled upward into a kind of dome, then turned toward the cut, uncompressing and speeding up, hurling itself into the gap — the entire 31,000 cfs flowing through a single cut maybe 50 feet wide. After the first descending tongue the water reared up into a huge hydraulic wave, then plunged down again only to rise in another, and another. The wave train continued straight into an enormous, flat sheet of water, like an ocean, that struggled to absorb and contain it. It was the reservoir, 10 or 15 feet lower than the river, stretching away downstream.

This was a surprise. We had not rigged for whitewater — our gear was loose in the boat — and had only paddles, no oars. Nevertheless, we thought we could run it by keeping close to the right bank with the motor, skirting the frightening holes, and slipping into the eddy beyond. No problem. But when Chris fired up the motor, he couldn't keep it running. It seemed like something in the fuel line. Rather than risk hitting the huge hole, Chris decided to hike back to the truck and drive to the nearest store, in Ticaboo, to buy a fresh filter.

Agustin, Jeff, and I elected to stay behind and survey the area. Stretching two miles back upstream, from the bar all the way to where we launched near Hite, was a landscape of mud flats being reclaimed by tamarisk and tumbleweeds,

"The scientists say
It will all wash away
But we don't believe any more"
— Chris Hillman / Gram Parsons, "Sin City"

POLITICS, NOT ECONOMICS OR HYDROLOGY, RULES THE RIVERS.

separated from the downcutting river channel by 20-foot high mudbanks and sand dunes. Within a half mile of the bar, the earth mixed with water in a phantasmagoria of forms that belonged to neither element. Behind the dunes were a series of stranded lakes, one a quarter-mile long, others much smaller. In all of them were carp — thick, two-foot long invasive fish that thrive in Lake Powell, that had swum up to the head of the reservoir to spawn and been trapped by the falling lake level. Hundreds of them milled in the shallow ponds, half-in, half-out, cooking in the sun, apparently dying, frequently gasping for air. Coyote tracks were everywhere, but the carp were well guarded by zones of quicksand, painted in hideous, beckoning colors, that partially surrounded the lakes, and threatened to suck us down. Elsewhere, there were smooth fields of silt, some patches wet, some drying and cracking and curling into chips. Crevices up to three feet deep ran across the landscape, many filled with running water, caught after percolating up out of the ground, in which carp struggled, swimming towards their promised land.

One rill led to the base of a cliff, on top of which some ravens were perched, working to kick off chunks of rock to fall onto the carp below. One rock hit its target, and the birds descended and began to tear it apart. The ground seemed to be in motion, and it was. It sloughed and leaned, slumped and bended, seemingly trying to reach the lower reservoir level. Chains of mud pots bubbled up, burping and sloshing audibly like the ones in Yellowstone, but here they spurted methane gas, from decomposing vegetation buried below, mixed with cold, oily mud. The whole of it was headed to sea, delayed by Lake Powell, just as this bar had delayed us.

The Bureau had two big problems in the Upper Basin. The first was how to justify building more irrigation projects — projects that couldn't pay for them-

selves, even under the Bureau's loose interpretation of reclamation law. It hit on a brilliant solution, really just a version of an age-old sleight-of-hand accounting trick called "river basin accounting." It would pool the revenues from an entire watershed's worth of projects — which is to say, spread the losses from irrigation projects over a basin. This magic card makes a bad hand a winning one.

The ace pulled from their sleeve was the "cash register dam" — a dam designed in truth only to generate hydropower. As Marc Reisner wrote: "It was as if a conglomerate purchased a dozen money-losing subsidiaries while operating a highly profitable silver mine — a case of horribly bad management, which, nonetheless, still leaves the company barely in the black." Glen Canyon was such a dam, the first among many, the revenue from which was used to build more dams — the Bureau was "literally forced to build dams," in Reisner's words, as part of a pyramid scheme, which in turn proved to be "a blanket death sentence for the free-flowing rivers in 16 states." In the Upper Basin alone, the rivers dammed, at least once, by the malign magic of river basin accounting, include the Gunnison, Green, Dolores, San Juan, Uncompahgre, Fryingpan, Price, Strawberry, Taylor, Los Pinos, Williams Fork, Muddy, Blacks Fork, Smiths Fork, Morida, Animas, La Plata, and White.

All told, dams have the theoretical capacity to impound five times the annual flow of the watershed. But paper isn't reality, and pouring concrete does not make it rain or snow. In fact, reservoirs lose more water, through seepage into the ground and evaporation — the engineered basin now loses at least one-tenth of the river flow to the sky every year.

The second problem the Bureau faced was the corollary of its successful solution to the first: By developing the Upper Basin, too much water would be depleted for it to continue to meet its delivery obligation to the Lower Basin, violating the Compact and creating an interstate crisis. The Bureau saw not a terrible, inexcusable failure to do its mandated job but a business opportunity: It would have to build still more projects, bigger and costlier than anything ever attempted in the world. It calculated that by 2030, the Colorado Basin would need 5.62 million acre-feet of water to make up for the shortfall — more than the entire Upper Basin has ever used. Where to get it? Through "augmentation" — a good, obscuring Latin word, for theft in this case, of water from other rivers in other basins.

The Bureau first set its sights on the still-free big North Coast rivers of far-northwestern California, the Klamath and the Eel, which it would dam, then pump uphill and through major mountain ranges to slake Southern California's thirst and allow its Colorado entitlement to flow to others. Additionally, it would dam the Pend Oreille in Washington state near the Canadian border, tunnel it under mountains, and pump it through desert aqueducts, 1,020 miles to California. Less publicly, it also looked at how to tap and divert the Columbia, and even the Missouri.

To pay for such Soviet-style wonders, the Bureau planned to build two, thousand-foot high cash register dams at either end of the Grand Canyon — a plan which it tried to sell to the public by saying that boaters on the resulting reservoirs would have a better view of the canyon. The dams very nearly became reality. But, after another campaign by Brower and the Sierra Club — in which he took out a full-page ad in *The New York Times*, asking, sarcastically, "Should we dam the Sistine Chapel so that visitors can get closer to the ceiling?" — the Senate voted against the proposal, by one vote.

During the Cold War, we must remember, Americans — some at least — believed in and pursued technological solutions to largely imaginary problems, solutions that can only be seen in hindsight as pathological. Project Plowshare, the use of "peaceful nuclear explosions" to do engineering work, was part of the vision outlined by President Eisenhower in his famous "Atoms for Peace" speech in December of 1953. The reference is of course to Isaiah 2:4, in which swords are to be beaten into plowshares — in this case the swords would be hydrogen bombs employed to blast harbors out of the Alaskan coastline, canals across Nicaragua and the Negev Desert (in response to the Suez Canal crisis), or to cut through mountains for aqueducts. Apparently reasonable government engineers detailed how to use nukes to reroute the Yukon River from Canada to Los Angeles. Until its end in 1977, the US conducted 27 tests as part of Plowshare; one, a 104-kiloton detonation at Yucca Flat, Nevada, moved 12 million tons of earth and sent a radioactive dust plume 12,000 feet into the air.

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Chris returned the next day with a new fuel filter — a miraculous piece of cargo from the other world — but the motor still wouldn't idle. The trip was turning into less of a lark. There was no way to paddle the boat back upstream — we would need a motor for that. The only way to get it out was downriver, to the reservoir, where we might see another boat. There was no cellphone coverage, but at Ticaboo Chris had phoned his brother, Brad, in Salt Lake. Brad agreed to come up from Bullfrog on a pontoon boat and bring us another motor. On the second day at the camp, Jeff said he was feeling sick; Agustin had work commitments. The two of them decided to hike out the next morning and hitchhike to Salt Lake. We wished them luck, and watched them walk north through the mudflats.

The emergency spillways at Glen Canyon Dam are not conventional, over-the-top spillways, as described by the US Army Corps of Engineers' technical reference manual: "Spillways typically represent structures at the top of the dam that allow water to go over the dam top in an uncontrolled manner." Instead, they are tunnels, drilled into the canyon walls upstream of the dam, one on each side. The dam's engineers bored two steep tunnels, 46 feet in diameter and descending at 55 degrees towards the river level on the downstream side. In order to save money and time, they aligned these new tunnels to intersect with the original, horizontal diversion tunnels used during dam construction, which measure 41 feet in diameter. At each intersection, the two tunnels form an "elbow" — a condition that creates a risk of cavitation at the bend. Cavitation can occur when vapor bubbles or voids form in high-velocity streams of liquid, especially as they flow over uneven surfaces such as those that occur at the juncture between new and old tunnels; when these voids collapse, they create shock waves that can cause significant damage.

The Bureau knew the theoretical risks of cavitation — engineers had seen the damage from spill events at Hoover Dam in 1941 and Yellowtail Dam in 1967, both with similar tunnel designs. Nevertheless, they maintained that the practical danger at Glen Canyon was negligible. The Bureau assured skeptics: "A well-managed reservoir should almost never spill, and then only for very short periods, after which the cavitation could be repaired."

The winter of 1983 was an El Niño year, probably the biggest of the 20th century, producing a huge Rocky Mountain snowpack. As early as January, forecasters began to warn of a big and early snowmelt: 10 percent higher than normal, raised to 14 percent higher than normal in April, and 20 percent higher in May. Regardless, the Bureau kept water storage in Powell high, to maximize water for users downstream and for hydropower revenue. The reservoir was kept 90 percent full in January, and up to 96 percent in May.

Was it Russian roulette? Overconfidence? Or a predictable collision of priorities, since the dam was, by its authorizing legislation, expected to achieve contrary goals at the same time — storage, hydropower, and flood control chief among them? As the lake level began rising, fast and faster — up to a foot a day at the end of May — operators pushed the maximum releases through the powerhouse; but eight generators running at full-tilt were not enough. They opened the left spillway tunnel, up to a flow volume of 20,000 cubic feet per second — just 10 percent of the combined spillways' designed capacity of 208,000 cfs.

On June 6, engineers heard loud sounds from the tunnel, and saw car-sized chunks of concrete being spat out of the tunnel mouth into the river below — clearly cavitation exploding the tunnel walls. The right spillway was then opened, but at a lower volume, for fear that water would eat back into the concrete plugs in the diversion tunnels behind the elbows. If that happened, the reservoir would begin draining uncontrollably, and total destruction downstream would ensue, all the way to Hoover Dam and possibly beyond. The water kept rising. Operators were forced to open the right tunnel above 20,000 cfs. The doomsday scenario began to become conceivable: that cavitation would completely blast out the tunnel and spread horizontally toward the foundation of the dam, potentially undermining it. In one of the more desperate solutions imaginable, the engineers of the mighty United States Bureau of Reclamation went to the nearest lumber yard and bought every four by eight foot sheet of plywood they could find, then fixed them to welded steel frames on top of the spillway gates to try to keep the reservoir from spilling uncontrolled into the tunnels.

The reservoir elevation reached 3708.4 feet, 6.6 feet below the top of the dam in mid-July, then stopped rising, and slowly inched downward. The engineers exhaled. Inspection of the dried tunnels revealed a 32-foot-deep, 40-foot-wide, 180-foot-long crater at the elbow of the left tunnel. Plugging the gouge, which had to be completed before the next season, took more than 3,000 cubic yards of concrete.

What lessons were learned? Understanding that the Colorado River remains wild, and will always be wild, despite any number of dams the Bureau of Reclamation may attempt to tame it with, is probably not one of them. That the Bureau is a "captured agency," which in effect serves the economic interests — big irrigation districts, urban water agencies, and power customers — that profit from its taxpayer-subsidized projects, is an established fact among students of American public policy. Thus, it can be expected to prioritize those interests over the public interest, which is not served by having catastrophic dam failures.

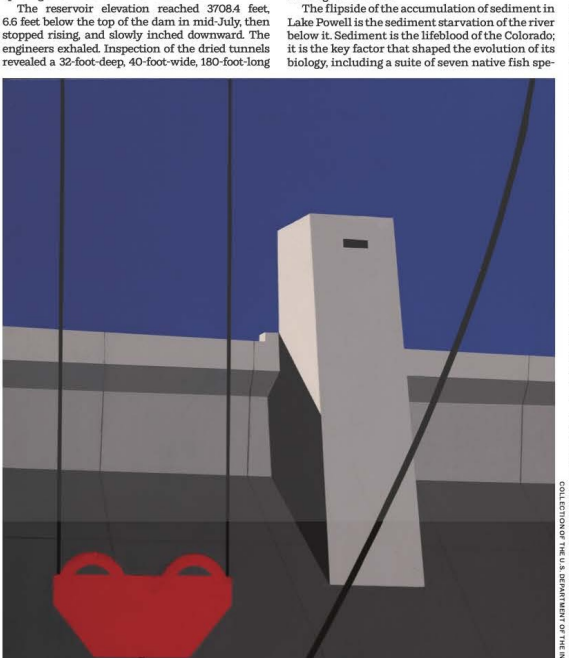
When Lake Powell began to recede after a period of relative stasis culminating in its (last) high stand of 3,695 feet above sea level, in 1997-98, visitors to Glen Canyon were witnesses to an extraordinary demonstration of nature's ability to heal itself. Rains, especially summer flash flooding, quickly began scouring out sediment deposits and pushing them downstream. In side canyons, a single flash flood could blow a portion of a canyon clean of mud, down to bedrock. Observant photographers made repeat trips to spectacular parts of the Glen, including the Escalante River arm, with its twisting redrock slot canyons and soaring arches, documenting the changes. In weeks, and months, seeds took hold and sprouted; sapling cottonwoods, Goodding's willows, and coyote willows rose up amidst meadows of grasses and wildflowers; ferns waved again in newly dripping grottoes. Animals came too: beavers, otters that had been extirpated early in the 20th century and later reintroduced, deer, coyotes, bobcats, mountain lions, and bighorn sheep. Trash too, surfaced — relics and testaments of the go-go years: sunglasses, beer cans (some still unopened), lawn chairs, boat batteries, fishing poles, you name it.

But the reservoir level fluctuated. After 2005's low tide of 3,555 feet, the water rose 55 feet in 2006, only to drop again for several years. In 2009, the reservoir reached a low that was still 55 feet above 2005's, and then a high 30 feet above that. For those who had seen their recovery, it was heartbreaking to see the restored canyons go back under, swamped and drowned by bad water: not Jewel-of-the-Colorado blue when it crept back up, but greasy, gray, full of trash and debris, and coated with suspect bubbles and petroleum slicks. With the flatwater always comes the muck, dropping out of the current, piling up, reburying what had been exposed by the streams and rivers.

Geologists call the sediment deposited in Glen Canyon the Dominy Formation, named after Floyd Dominy, the irascible commissioner of the Bureau of Reclamation who presided over the building of Glen Canyon Dam. The Dominy is one of the first ever man-made geological strata, evidence of the disturbances of the Anthropocene. In Glen Canyon, it is everywhere, giving scientists a clear record of geological processes at a timescale — annually, weekly, even daily — that is visible almost nowhere else. For researchers trained to catalog change over millions of years, it has been a once-in-a-million-lifetimes kind of opportunity.

More importantly from a practical perspective, scientists (including specialists in the delightfully named field of fluvial hydrogeomorphology) have documented how the sediment deltas, laid down where the reservoir confronts the main rivers, migrate as lake levels fall and rise. Satellite imagery has shown that the delta of the San Juan River, closer to the dam (two-thirds of the way from the top of the reservoir to the dam), has moved by an average of over 120 feet per day over the last 22 years, pushing a huge plug of sediment dozens of miles downstream into areas once under deep water. The face of the delta can move as much as 6-12 miles a year, up- or downstream. One sequence of such imagery, between March and June of 2017, showed the delta had moved by nearly 12 miles after the spring runoff brought up reservoir levels. Movements of this size and speed show the capacity of the sediment to quickly refashion the shape of the reservoir, impacting operations in potentially grave ways. The San Juan, one of the siltiest rivers in the Southwest, is already close to spilling across the channel of the Colorado where they meet, and could conceivably block it, creating a lake that would prevent water from reaching the dam. What we had fetched up on in 2005 was part of this complex dynamic, geology moving in real time.

The flipside of the accumulation of sediment in Lake Powell is the sediment starvation of the river below it. Sediment is the lifeblood of the Colorado; it is the key factor that shaped the evolution of its biology, including a suite of seven native fish species that live nowhere else. And since Glen Canyon Dam closed its gates in 1963, all of the river's sediment above it has been trapped in Lake Powell.



Allan D'Arcangelo, 'Untitled (Dam),' 1973

COLLECTION OF THE U.S. DEPARTMENT OF THE INTERIOR, BUREAU OF RECLAMATION

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Chris and I began packing the boat as best we could to run the rapid, or, hopefully, to bypass it. We grabbed ropes and hauled it upstream along the bank, stumbling and falling in the quicksand-like shallows. We needed as much distance from the bar as possible in order to paddle to the far side before the boat would be pulled into the chute. When we thought we had gone far enough, we pushed off and paddled hard. But we had underestimated the current, as the river was a smooth sheet of brown glass with little texture to indicate speed. The boat was enormously heavy, and we made pathetic progress with our little paddles. We wouldn't make our line. The river gripped the vee hull of the RIB and pulled it straight at the swollen tongue that aimed into the first hole. All we could do was to straighten the boat out so that it would hit bow-first.

The noise of the rapid soon became deafening. We screamed at one another, but I don't remember what either of us was saying. The bow rode up the tongue and the stern dug down. Over the top, the bow dropped and pointed down into the hole, as dark and deep a river hole as I had ever seen, comparable to the infamous Big Drops upriver in Cataract Canyon, holes big and hungry enough to flip any boat. I grabbed the seat and held on. The bow dove down into the bubbling water, then tipped up as the hull climbed the wall of the rearing wave. It never stopped tipping upward. I watched the bow clear the top of the brown wave, saw sky behind it, before shadow enveloped us as it tipped backward past vertical, blocking the sunlight. Pushed by the counterweight of the heavy motor hanging from the stern, then grabbed by the water and thrust down and forward, the bow rotated backwards and the boat flipped fully, crashing down on top of us.

Water exploded everywhere. Chris and I were submerged, as the boat bottomed out in the second hole, then jacked up its wave, then pushed down again. This rinse cycle repeated, many times. Gear crashed into me as it was washed away. A rope wrapped around my leg, tightened and tugged, before miraculously slipping free.

Gradually, the water settled. I swam out from under the boat and climbed onto the inverted vee bottom. Our gear floated all around. In a minute, Chris paddled over, having swum to catch his river kayak, which had floated clear of our yard sale. Floating into the reservoir on a slowing but still strong current, we surveyed the damage and retrieved our stuff from the flotsam. Below the rapid, a field of debris had collected: dead trees and bushes festooned with trash and gear. We came upon a blue plastic canoe, overturned and tangled in a bush. In it was a man's wallet with a driver's license still inside. We took both, using the canoe and the kayak to slowly nudge the overturned boat, still being pulled by the current, towards the bank.

A mile or so downstream from the rapid, we managed to catch the boat on a steeply banked rocky slope. We pulled it up and as far as we could, but were unable to turn it over. Now shivering, I dove under the hull and untied our strapped gear bags, pulling out our sodden sleeping bags and camp kit. Night was falling, but the slope was too steep to sleep on. So we paddled our plastic lifeboats across the reservoir to the other side, where we made a fire and tried without much success to dry the bags.

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Clearly, it is time to rethink how we manage the Colorado River. We are going to have to learn to live with less water. And Glen Canyon Dam itself must be physically modified to deal with this new reality.

The sequel to the near-disaster of 1983 came in March, 2023, when the reservoir level dropped to 3,520 feet, — 36 feet lower than in 2005, and within 30 feet of the "minimum power pool" of 3,490 feet — the minimum water level required for power generation. 3,490 is 20 feet above the actual intakes for the generators, called penstocks, but the dam's eight turbines must be shut down there due to the risk (again) of cavitation — in this case, air that would be pulled down the 20-foot water column, like the whirlpool that appears when air is suddenly sucked down a sink or toilet, and down to the generators, forming explosive bubbles and blasting the blades apart. In the face of this very real threat, there has lately been much hand wringing about the loss of electricity generation that would ensue if the water level reached 3,490 feet. But the worry is something of a red herring: The dam provides electricity amounting to less than half a percent of that traveling through the Western power grid. One study calculated that replacing its power, with renewables, would cost residential customers a mere $0.08 more per month, while commercial customers would pay $0.59 more per month.

What is far more consequential lies below. If the penstocks are closed, the only remaining way to pass water through the reservoir is through the "river outlet works": two intakes in the face of the dam leading to four, 96-*inch* diameter pipes with a combined maximum discharge capacity of 15,000 cubic feet per second. Such a flow is far too small to comply with the Compact. Nor, in simple terms, can this meager flow rate deliver water to the 40 million people downstream who rely at least to some extent on the Colorado River. Impeded flow from Lake Powell would be a disaster of unprecedented magnitude, affecting some of the largest economies in the world — those of Southern California, Las Vegas, and Arizona. To make matters worse, the Bureau has admitted that using the river outlet works for more than a short interval raises operational and safety concerns, as they weren't designed for continuous operation. Indeed, the ROWs were used in April of 2023 and cavitation occurred.

Below the river outlet works lies the point of Dead Pool. The ROWs sit at 3,370 feet above sea level. No other intakes nor spillways exist below them in the dam. At Dead Pool, what would be left of Lake Powell would be "run of river" — effectively the Colorado River simply flowing through the dam, the inflow to the reservoir equal to its outflow below it. Yet there is 240 feet more dam before the bottom of the lake, at the old river level. If Dead Pool was reached, this not-insignificant impoundment would hold something like 1.7 million acre-feet of water, which would be trapped with no way out, a stagnant pond heating up in the sun, fostering algal blooms, and becoming anoxic and deadly to most organisms. It would also rise and fall violently, as much as 100 feet in a single season, in response to river inflows, because of the martini-glass shape of Lake Powell's vertical cross-section. Climate modeling indicates that the Dead Pool scenario will become more and more likely in coming years. It is not a reality anyone would like to see.

The design decisions made at Glen Canyon were arguably a gross miscalculation of risk — with the example of Hoover Dam standing in sharp contrast. It is too reductive to say that Hoover was a "good" dam and Glen Canyon a "bad" one. But their differences are suggestive. One can read a theory of American history in them and see our different zeitgeists uncannily and consequentially embodied in the design of dams. In 1983, the Bureau kept too much water behind Glen Canyon Dam, even in the face of dire warnings of coming runoff. Since, the Bureau has let too much water out, satisfying users' demands while ignoring the basic math that there isn't enough water in the system to release it at such a scale. In June of 2022, the Bureau announced that the seven Colorado River Basin states had just 60 days to devise a plan to cut 2-4 million additional acre-feet of water use per year from the system. The states missed the deadline, by nearly a year, and then proposed only to conserve 1 million acre-feet per year, and only as long as the federal taxpayer replaced the foregone water with money — about $1.2 billion, they calculated. The alternative to this shakedown being Dead Pool.

It is inescapable now that Glen Canyon Dam must be modified to allow sediment to be carried through or around it, replenishing and rebalancing the Grand Canyon's ecosystem. As it would happen, Floyd Dominy, the dam's builder, left a plan for how to do exactly that. In 1997, GCI's founder, Richard Ingebretsen, visited Floyd at his horse farm in the Virginia mountains. The two had become friends when GCI asked Dominy to come to Salt Lake City in 1995 to debate David Brower at the University of Utah. In retirement, the former commissioner was raising horses and building small, hobby dams on his property — several dozen, Ingebretsen remembered: "He is a beaver, to be sure."

When the topic of decommissioning Glen Canyon Dam came up, Dominy "offered something startling," Ingebretsen recalled: "Brower has proposed to drill out the original bypass tunnels to drain the reservoir. Well, you can't do that. It is 300 feet of reinforced concrete." Dominy went on: "There is a better way. All you have to do is drill new bypass tunnels around the old ones in the sandstone, then you can put waterproof valves at the bottom of the lake. They can be raised and lowered as you need, to let water out." Ingebretsen recounted the moment: "With that he pulled over a cocktail napkin and drew a sketch of Glen Canyon Dam, the old bypass tunnels, the lake, the river, and the new tunnels with the waterproof valves that will be used to drain the reservoir. His hands worked busily as he explained what he was sketching." Finally, he looked up at Ingebretsen and said: "This has never been done before, but I have been thinking about it, and it will work."

He signed and dated the napkin, which is still in Ingebretsen's possession. What it prescribes in order to keep the patient — the Colorado River, now on life support — alive, is open heart surgery, a full bypass, just like the ones that Cold War survivors get by the dozens every day in hospitals in Phoenix. A blueprint for a brave new future in the American Southwest.