



DROWNED RIVER

THE DEATH & REBIRTH OF GLEN CANYON ON THE COLORADO

MARK KLETT — REBECCA SOLNIT — BYRON WOLFE

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RADIUS BOOKS

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INTRODUCTION

David Brower, the Sierra Club's first executive director and the man who invented my job, was a master of the dramatic declaration, and his 1966 foreword to Eliot Porter's *The Place That No One Knew: Glen Canyon on the Colorado* got right to the point: "Glen Canyon died in 1963 and I was partly responsible for its death. So were you." That he and the board of the Sierra Club had chosen not to contest the damming of Glen Canyon was, in his mind, his greatest failure. By all accounts, though, it also transformed him. Brower went on to forge a template for modern activism that still defines much of the work of the Sierra Club to this day.

David Brower had many years to regret the loss of Glen Canyon. He died in 2000—soon after "climate change" entered the national lexicon and shortly before the Sierra Club's volunteer leadership resolved to focus on addressing it. Would he have savored the irony that climate pollution from fossil fuels is hastening the demise of Lake Powell? Perhaps, but such a harsh remedy surely is not one he would have chosen.

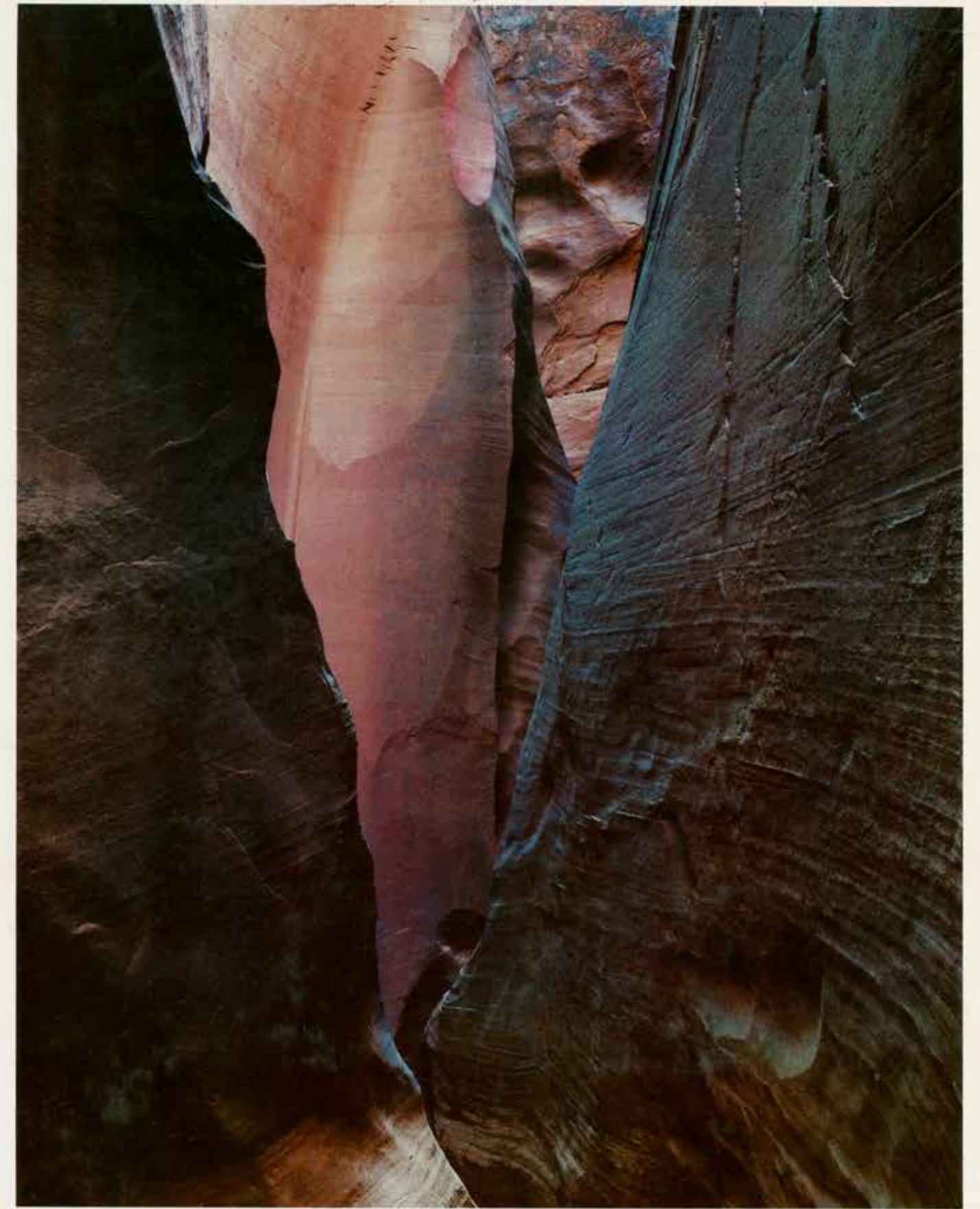
Brower certainly knew that someday Glen Canyon would return to its natural state no matter what we humans chose to do. Dams are constructed with equal measures of hubris and cement. A million years from now, the earth may scarcely register our vandalism. But that's small solace for those living through this particular millisecond of our planet's history.

What made the loss of Glen Canyon so stinging for Brower was that it was a careless and self-inflicted injury—for him personally but also for the public whose apathy and ignorance he believed made them complicit. On a far greater scale, you could say the same about the disruption of our climate we see today—if we allow it to continue unchecked.

In the spirit of the David Brower who vowed never again to surrender without a fight, I believe we'll succeed in stopping runaway climate change before it's too late. We will because we must. Every day, I meet and work alongside people whose passion and commitment renew that faith for me. And one day I hope to make a dramatic declaration of my own: "The reckless destruction of our climate has been stopped and I was partly responsible. So were you."

— MICHAEL BRUNE
Executive Director, Sierra Club

The Place No One Knew, Glen Canyon on the Colorado by Eliot Porter (shown right and on the following 18 pages) was published by the Sierra Club in 1963, and marked the confluence of photography and environmental activism in response to the building of the Glen Canyon dam. Porter's book became an elegy for a natural wonder lost in the name of growth and development.



THE PLACE NO ONE KNEW
Glen Canyon on the Colorado
by ELIOT PORTER

Publisher's Note: *Glen Canyon* is lithographed in four colors on one-sided Kromekote and lacquered to achieve maximum brilliance and fidelity in the color reproductions, themselves made directly from 4 x 5 and 2¼ x 2¼ transparencies. The text is on the uncalendered side for easier reading. The pages had to be collated singly and side-sewn; this assures a firm anchorage, among other advantages, but prevents the book's lying quite flat—especially the left-hand pages. The color, however, is the main thing to display.

It was of transcending importance to have a top-quality printer who would hue to Mr. Porter's interpretation. Barnes Press, Inc., New York City, met the platemaking and printing challenge just as the firm had done for Eliot Porter's earlier book, "*In Wilderness . . .*" The book is set in Centaur and Arrighi by Mackenzie & Harris, Inc., San Francisco. It is bound in Columbia Mills' Sampson linen by Sendor Bindery, New York City. The design is by David Brower.

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FOREWORD

Glen Canyon died in 1963 and I was partly responsible for its needless death. So were you. Neither you nor I, nor anyone else, knew it well enough to insist that at all costs it should endure. When we began to find out it was too late. On January 21, 1963, the last day on which the execution of one of the planet's greatest scenic antiquities could yet have been stayed, the man who theoretically had the power to save this place did not find a way to pick up a telephone and give the necessary order. I was within a few feet of his desk in Washington that day and witnessed how the forces long at work finally had their way. So a steel gate dropped, choking off the flow in the canyon's carotid artery, and from that moment the canyon's life force ebbed quickly. A huge reservoir, absolutely not needed in this century, almost certainly not needed in the next, and conceivably never to be needed at all, began to fill. At this writing the rising waters are destined to blot out everything of beauty which this book records.

It is Eliot Porter's gift to be able to reveal this beauty as no other photographer has done. Color is indeed his music, as all will believe who in due course follow him and have any wish to listen to light. I was fortunate enough to do this myself on three trips to Glen Canyon. I learned that you can no more impose preconceptions of color on this place than you can impose patterns of Alpine structure on Colorado River canyon forms. The inner world of the side canyons, walled in shadows, will never know the sun but may catch reflected hues from a high opposite wall. The thin crescent of blue is the inner world's only fragment of sky, and any shiny place in the depths will mirror but distort it. The reflected light cannot be conventional when the incident light is not, but thinking can almost make it so. The camera, however, must come closer to the truth, especially when it is in the hands of a colorist. Eliot Porter's name will be inseparable from the spirit of Glen Canyon, just as John Wesley Powell's is from the discovery of the canyon, because of what his perceptive camera has recorded there.

The best of the canyon is going or gone. Some second-best beauty remains along the Colorado of course, but much of its meaning vanished when Glen Canyon died. The rest will go the way Glen Canyon did unless enough people begin to feel uneasy about the current interpretation of what progress consists of—unless they are willing to ask if progress has really served good purpose if it wipes out so many of the things that make life worthwhile.

Evolution demonstrates the value of learning from mistakes; so perhaps we can evolve a subservient technology—one that follows man instead of leading him. The closing of Glen Canyon dam in our time was a major mistake to learn from, and our purpose here is to help the world remember these things lost.

There could be long and acrimonious debate over the accusation of mistake. Good men, who have plans for the Colorado River whereby "a natural menace becomes a natural resource," would argue tirelessly that the Colorado must be controlled, that its energy should be tapped and sold to finance agricultural development in the arid west. But our point here is that for all their good intentions these men had too insular a notion of what man's relation to his environ-

ment should be, and it is tragic that their insularity was heeded. The natural Colorado—what is left of it—is a miracle, not a menace. The menace is more likely the notion that growth and progress are the same, and that the gross national product is the measure of the good life.

It is a well-documented fact that the Colorado River is being overdeveloped. A bookkeeping transaction could have served the ostensible purpose of Glen Canyon dam, which without that transaction emerges as a costly device to make sure water will flow downhill. What water this reservoir holds back for credit above the arbitrary division point of Lee's Ferry could be credited in Lake Mead much more economically and far less wastefully. The dam irrigates nothing. Instead, it evaporates an enormous quantity of water that could otherwise have irrigated land or supplied cities in an arid region that is short of water. To the extent reservoir storage adds to the already high mineral content of the water, the water's quality is diminished for all downstream use, including Mexico's. The transcendent purpose of the dam is to produce hydroelectric power, and the revenues incident thereto, which could finance irrigation of new and costly agriculture—as if there were no way to finance development of a region other than to sacrifice irretrievably its most important scenic assets—assets equaled nowhere else on earth.

Hoover, Parker, and Davis dams already exist and control the river adequately; they could probably continue to do so until Lake Mead is silted in completely, perhaps two hundred years from now. The Colorado-Big Thompson diversion project and developments like it which are already under way or planned will exploit the Colorado's waters upstream, where nearly half the flow has been allocated. Glen Canyon dam is a monument to man's lack of flexibility—to his having concluded that the only way to finance Reclamation is to sell the hydroelectric power produced by falling water of the streams he proposes to irrigate with. Revenue by other routes, including that from other sources of power which are already or will soon be less expensive to develop, was not politically attainable at the moment. This public failure—the inability to finance reasonable development of the West by means that financed it elsewhere—has cost all men, for all time, the miracle of an unspoiled Glen Canyon.

Other miracles will vanish by the same route unless we can learn from this mistake. The plans are well under way to eradicate the finest of those miracles left on the Colorado, as well as on other major rivers. A similar mistake was made early in the century at Hetch Hetchy in the Sierra Nevada, where a second Yosemite, now much needed for its natural beauty, was flooded to provide power for San Francisco. Alternative sources of water and power that could have saved Hetch Hetchy are still unused. Out of that mistake grew the National Park Act of 1916. If the destruction of Glen Canyon leads indirectly to a diminishing of such forces of rapacity or can somehow correct the belief that man's only road to salvation is a paved one, then there will be some amelioration.

The alternatives that could have saved Glen Canyon are still unused. Fossil fuels, for one. The states of the Upper Basin of the Colorado contain a major part of the earth's coal reserves. The development of these resources is in the doldrums—and they are a much longer-lived source of energy than the short-lived reservoirs planned for the silty Colorado. Atomic and solar sources of energy will beyond doubt, generations before Lake Mead is silted in, make the destruction of Glen Canyon appear to have been the most naive of choices in the search for electricity. Nothing our technology will have taught us, in this century or any other, will be able to put Glen Canyon back together again.

The Place No One Knew has a moral—which is why the Sierra Club publishes it—and the moral is simple: Progress need not deny to the people their inalienable right to be informed and to choose. In Glen Canyon the people never knew what the choices were. Next time, in other stretches of the Colorado, on other rivers that are still free, and wherever there is wildness that

can be part of our civilization instead of victim to it, the people need to know before a bureau's elite decide to wipe out what no men can replace. The Sierra Club has no better purpose than to try to let people know in time. In Glen Canyon we failed. There could hardly be a costlier peacetime mistake. With support from people who care, we hope in the years to come to help deter similar ravages of blind progress.

ACKNOWLEDGMENTS

On behalf of the Sierra Club—its members, its publications committee, and its directors—I should like first of all to acknowledge our gratitude to Eliot Porter for finding us, first with the series of photographs and selections from Thoreau which led to "*In Wildness . . .*" and for his subsequently sending selections from his Glen Canyon Series, 1961 and 1962, which made clear immediately that *The Place No One Knew* must come into being.

Of hardly less importance is our debt to the people who said what they did so well that it was inevitable that their words should find a way to the text pages facing Eliot Porter's photographs. We recognize that there would have been a pleasant and useful homogeneity had we relied upon one person alone to tell the Glen Canyon story. But when Wallace Stegner (who could have told the story) reviewed the photomanuscript in its strange mixture of wonderful dye-transfer prints and chaotic cut-and-paste text spread around our headquarters, he said that the book is right the way it is: one person's words would have been a voice in the wilderness; we have a chorus instead—many voices, not to be dismissed, for the wilderness. We are grateful for all these voices.

Given one hundred fifty dye-transfer prints of Glen Canyon, we found that the book could evolve swiftly, once we had survived the trauma of eliminating half the prints. The beauty of each photograph is self-sufficient. The beauty is augmented in much of the text, but in parts the textual concepts are not always pleasant; photographs less excellent than Porter's might not have borne the burden the text places upon them. Porter's not only hold up, we feel, but reinforce as well. Their very sculpture adds extra emphasis where none was supplied. What has happened to the sculpture since he photographed it adds poignancy, and it is the presumption of this that imposes continuity on what might sometimes appear to be a tangled skein.

Thanks to the perusing of some sixty books, most of it done by Russell Butcher, we were as hard-pressed in leaving out excerpts of text as we were with casting aside photographs. There is still a very beautiful book in what we are not publishing! Our greatest difficulty was in finding enough about the place—and this difficulty led to our choice of title.

It is one thing to know that you have a book, and another to know how to finance its publication when you are a nonprofit organization and the work to be done exceeds the funds available to do it. We asked several of the people who have been especially interested in Sierra Club books for help, suggesting that the help might be of various kinds—an outright gift which could continue to revolve in the club's publishing program, spreading the conservation story; an interest-free loan contingent upon sales; or an advance order for a quantity of books. We are grateful to the following, who generously responded in one of these ways:

Mrs. Therese P. Atwater, Lavina Betty Bierer, Professor and Mrs. Harold C. Bradley, William C. Bradley, Mr. and Mrs. Wesley Bunnelle, B. C. Cochrane, Norman L. Cram, Randal Dickey, Jr., Dyson Duncan, Walter Meayers Edwards, Charles Eggert, James Harvey Fahs, Fred D.

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Still earlier generosity permitted the club to establish the revolving publication fund itself, without which this book—and earlier books—would not have been possible; we are therefore recurrently grateful to the Belvedere Scientific Fund, the McGraw Foundation, the late Inez Mexia, the late Marion Randall Parsons, and to Walter A. Starr—all principal sources of the publications fund.

The most reassuring part of the whole effort to publish the book was the wealth of material we found about the wilderness idea—the *national park* idea, if we go back to the concept that underlay the first great parks and that has been a unique American contribution toward harmony between man and the natural world. We hope that the testimony of the text, combined with Eliot Porter's keen powers of observation, will serve lasting purpose by in some way stepping up the pace with which mankind preserves what is left of the world's irreplaceables.

DAVID BROWER

Berkeley, California
March 13, 1963

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SEVENTY-TWO PLATES

Perhaps this planet does somewhere else contain a thing like the Colorado River—but that is no matter; we at any rate in our continent possess one of nature's very vastest works. After the River and its tributaries have done with all sight of the upper world, have left behind the bordering plains and streamed through the various gashes which their floods have sliced in the mountains that once stopped their way, then the culminating wonder begins. The River has been flowing through the loneliest part which remains to us of that large space once denominated "The Great American Desert" by the vague maps in our old geographies. — OWEN WISTER

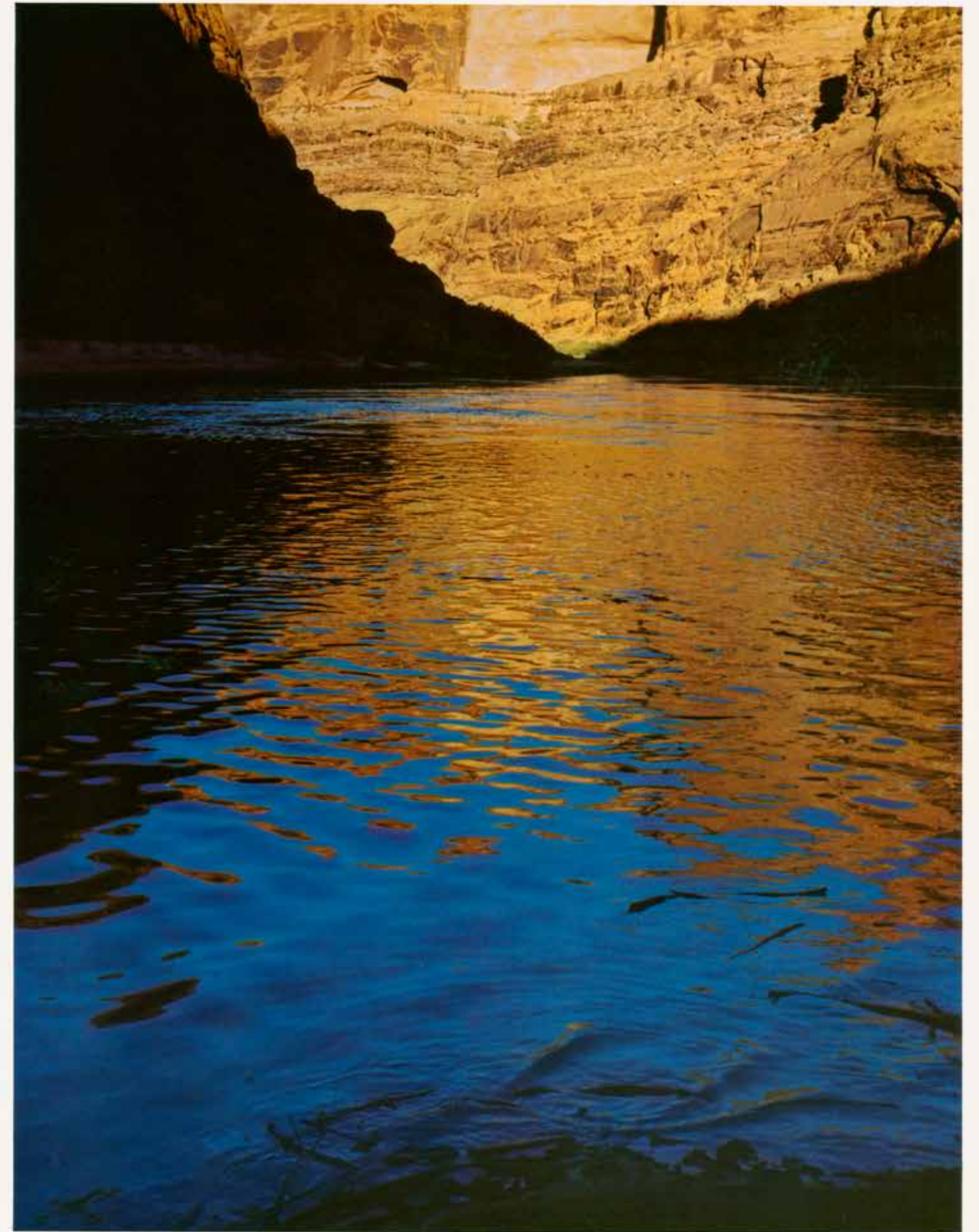


Here the earth has had a slow, regular pulse. It rose and fell for millions of years under Carboniferous, Permian, Triassic oceans, under Cretaceous seas, under the fresh-water lakes of the Eocene, before it was heaved up and exposed to rain and frost and running water and the sandblast winds. Mountains were carved out of its great tables and domes, river systems cut into it and formed canyons, elevations were weathered and carried away. What had accumulated pebble by pebble and grain by grain, cemented with lime and silica, folding into itself the shells of sea life, scales of fishes, the compacted houses of corals, began to disintegrate again. Vast cyclic changes have left only traces. Though the geological record in the Plateau Province is probably as clear as it is anywhere on earth, the boundary between ignorance and knowledge, between speculation and certainty, is often no more than a line of ancient fracture almost obliterated, or an enigmatic unconformity between two layers of rock, or a slight but significant change from salt water to brackish water fossils. — WALLACE STEGNER



Now the whole enormous drainage basin of the river was floating them, melted snow from the high Wind River peaks, and from the Wasatch, and from the Uintas with their hundred cold streams, Black's Fork, Henry's Fork, Ham's Fork, Kingfisher Creek, Brush Creek, the Uinta; the western slopes of the Colorado Rockies whose creeks poured into the Yampa and the White; the waters all the way from Grand Lake under the shadow of Long's Peak, and the tributary springs and creeks and runoff gulches that fed the Grand all the way to modern Grand Junction and Moab; and finally the San Juan, muddy from recent rains, its headwaters tangled with those of the Rio Grande in the Five Rivers country of southwest Colorado, its gathering waters coming down from the San Juan Mountains through New Mexico and what would sometime be Arizona and across the southeastern corner of Utah through the country of the Navajo. It was a big river by now, a tremendous surge . . .

WALLACE STEGNER [*about the Powell party, 1869*]



“...The waters from the bare rocks back of the canyon, gathering rapidly into a small channel, have eroded a deep side canyon, through which they run, until they fall into the farther end of this chamber. The rock at the ceiling is hard, the rock below, very soft and friable; and having cut through the upper harder portion down into the lower and softer, the stream has washed out these friable sandstones; and thus the chamber has been excavated. ...



Some night lie at the mouth of a rock-carved amphitheater two or three times the size of anything you've ever been in. Look up the two-thousand-foot wall to the billion stars and listen to the murmuring of the river still carving deeper the slot of canyon you're in. Think of nothing but what you see and feel and hear and smell.

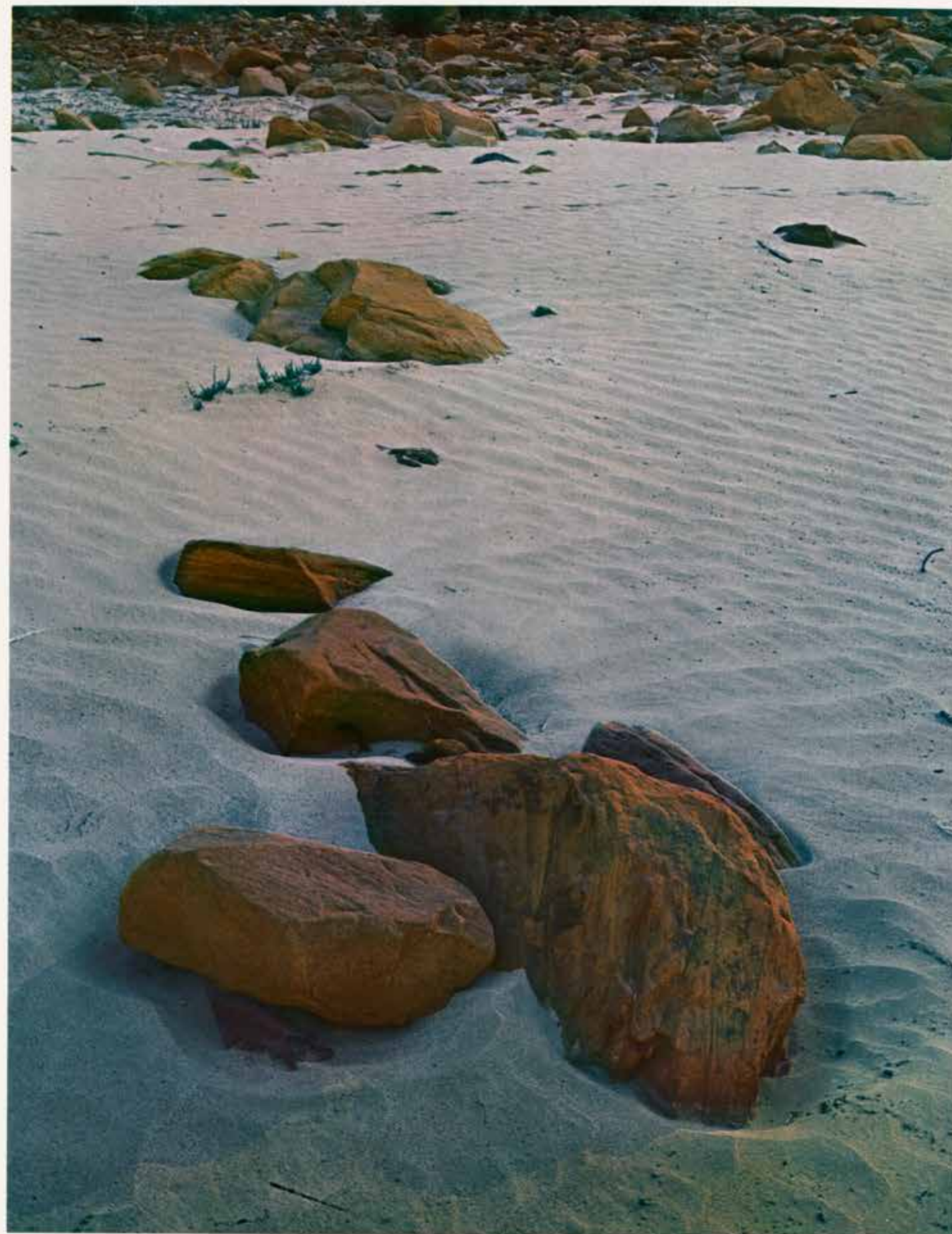
What a campsite we had picked! . . . Beyond us, the river made a lazy curve to the left and there the canyon wall rose straight up a thousand feet. For a mile and a half this cliff followed the river before the wall fell back again. The face of the cliff was stained with long, black streamers from the water which cascaded over the rim in wet weather. It was an imposing sight, a gigantic backdrop—a motionless hanging tapestry . . .

— CHARLES EGGERT



*Whether you will or not
You are a King, Tristram, for you are one
Of the time-sifted few that leave the world,
When they are gone, not the same place it was.
Mark what you leave.*

— EDWIN ARLINGTON ROBINSON



DROWNED RIVER

Text by Rebecca Solnit — Photographs by Mark Klett & Byron Wolfe

Over and over again we returned to the big reservoir behind Glen Canyon Dam on the Arizona-Utah border,

to try to understand what this place has been and will be, to try to come to terms with what it means to float on still water

hundreds of feet above where a river once flowed, to watch the place's fate become clear over the years we explored the unstable

relationship between sky, land, and water. This place with two conflicting names—Glen Canyon for what it had been and will be,

Lake Powell for what it has been for half a century—was a good place to think about the madness of the past and the terror of

the future, amid the epiphanies of beautiful light and majestic space and the contradictions of the present.





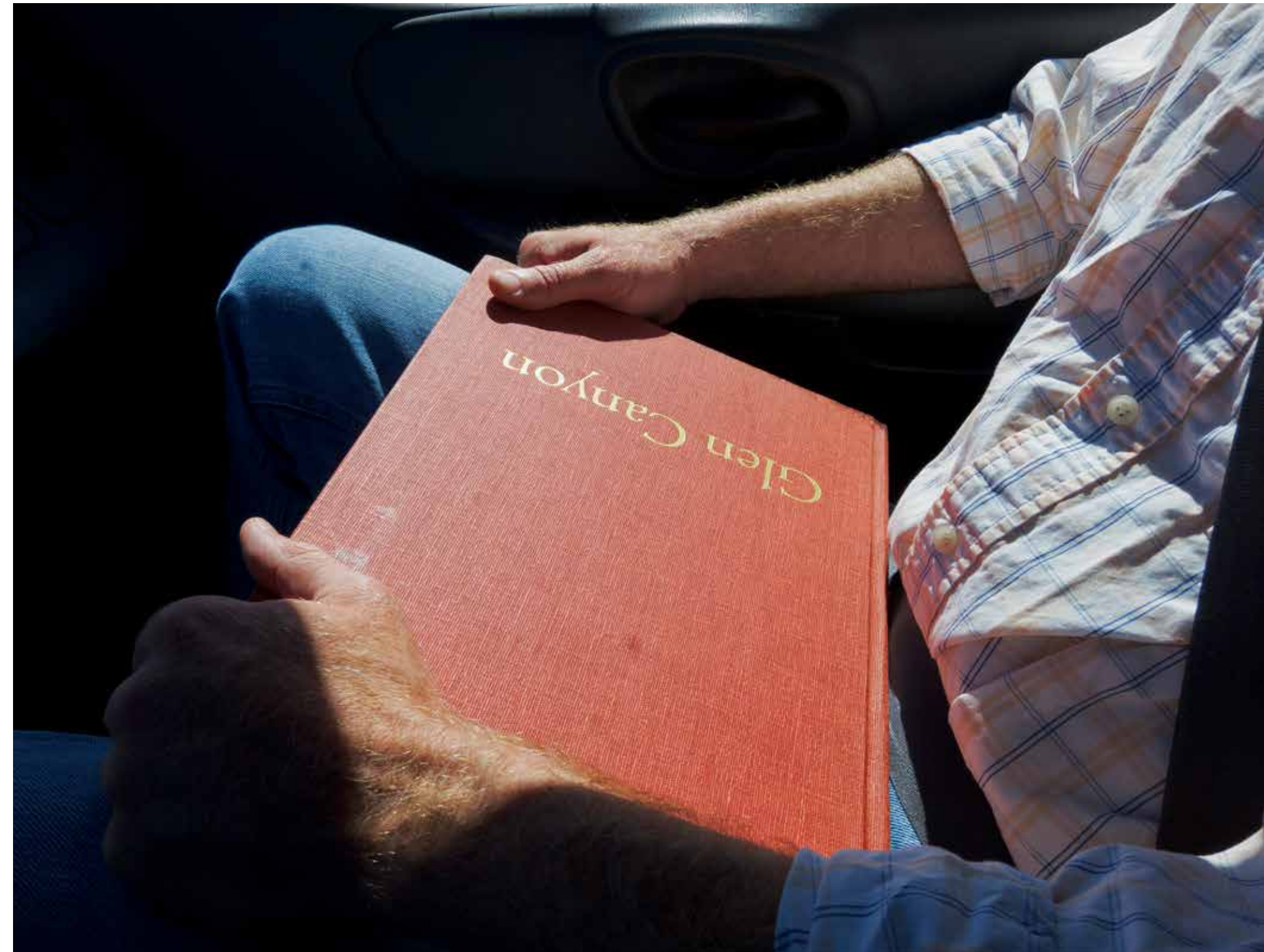


We came to know the flat blue water the hard sunlight bounced off, the green water in shallower places, the water that turned red with the dust storms washed down from the sandstone landscape, the roiling waters of Dirty Devil River pushing a wall of debris downstream after a deluge, the clear little streams and waterfalls in the side canyons whose lively movement died in the placid lake. In our second year we discovered the river reemerging from the lake, like a serpent writhing through quicksand, and by our third, the impact of climate change had become more dramatic worldwide, as had the grim scientific prognosis of what the future held. What had seemed an uncertain fate for the reservoir at the outset seemed settled by the time we wound down our work five years after we started—settled in a way that had once seemed outrageous and unlikely.

Things change. Our present is a future no one anticipated.

One summer day on our first year at Lake Powell, we went looking for Dungeon Canyon in the powerboat with shoddy steering that had come with the cheap houseboat we'd rented. Dungeon Canyon had been one of the sites Eliot Porter had photographed half a century before, and our expedition began as a quixotic quest for his sites, which we knew were mostly underwater. Porter had, at the behest of the Sierra Club, documented Glen Canyon as the dam was rising at its far end. Its fate seemed sealed, its intricate landscapes due to be lost for what was often described as forever. His book of color photographs published by the club was an obituary and a protest, designed to make people know and care about what was vanishing underwater.

The Wilderness Act would be passed in 1964 and the case for defending remote places that most of us would never see was being framed. For defending them in their pristine condition, but one of the arguments for Lake Powell was that it turned a remote canyon accessible by foot or raft or rowboat into an easily accessible recreation site for houseboats, motorboats, and day-trippers in cars. They came by the millions during the reservoir's heyday, and many of them loved the place wholeheartedly. Others had loved the canyon that disappeared and prayed to see it again. Some loved both, and the Utah writer Terry Tempest Williams recounts a childhood going to the site every summer with her family, seeing as the water rose behind the dam a new place each year with new coastlines and new underwater hazards. By the teens of the twenty-first century, the water levels had dropped and the crowds had declined. (Visitation dropped by a third in a single year, from 2,495,093 visitors in 2015 to 1,608,437 visitors in 2016, and continued to drop in 2017.)









We went up Dungeon Canyon in the rented powerboat, using a fisherman's sonar depth finder to take dozens of readings that Byron would stitch into a picture of an underwater landscape. The results of our transect across the drowned canyon were akin to the sonograms expectant parents get of their in-utero child, though this place is not waiting to be born. It is, perhaps, waiting to be reborn or to emerge from one kind of death to face others. That summer day at Dungeon was cloudless and would have been scorching if not for the hot wind. The water beneath us had been part of a warm red river, but as it deepened and slowed, the sediment settled, the color of the water shifted to blues and greens, and the water cooled. In the cooler water, native fish suffered and non-native fish flourished.

The scenery around us was wonderful and, if you remembered that about four-fifths of it was underwater, terrible, like seeing a giantess sentenced to stand immersed up to her neck for decades. The depth finder my companions deployed was a way to chart the underwater topography of the world lost below the flat blue water lapping against the red sandstone walls of Glen Canyon. We were floating nearly two hundred feet above the floor, across the broad upper end of the canyon that would've looked, in cross section, like a funnel but from the surface just looked like an inlet or bay.

We were trying to see beneath the surface of the present to find the past. Somewhere below us, beyond us, was an intricate stone passage, across whose sandy floor fifty years before, Eliot Porter had walked up the narrow bottom of Dungeon Canyon to make color pictures of the dry world about to drown. His images of Dungeon Canyon's depths show a narrow sculptural space of twisting red-brown stone walls and light filtering down to make one wall glow carnelian. Now that's buried treasure you can only see in photographs. After the reservoir recedes, years or decades of rain and running water will wash it clean of half a century of silt, sunlight will filter through the twists, and someone will walk up that labyrinth again.

Porter's book was a few kinds of landmark of its own: a large, lush photographic book made by an early master of color photography, a project born out of the idea that beauty might have political clout, and a testament to and protest of a place's disappearance. Porter's work also, more than any other photographer's, laid down the frameworks for what would come to be known as nature photography, as distinct from landscape photography: a genre more concerned with natural phenomena, often seen in close-up, and less with the space of landscape. In his Glen Canyon book, Porter often did not show the sky even in broader views ("don't show the sky unless the sky has something to say," he said elsewhere).

We did find some of his sites, some partially immersed, some beyond the reach of the waters or reappeared as waters sank, but his book was only a starting point, a benchmark for us. His work defined a moment and its worldview rapidly shrinking in the distance. "The true content of a photograph is invisible," John Berger wrote in 1968, "for it derives from a play, not with form, but with time."







The place Porter explored was remote and accessible largely by slow travel—by foot or by raft or small craft capable of dealing with a sometimes shallow, sometimes rough river—not the place you could tote a houseboat across. It was hard to get to and demanding to explore. The place we were in as we floated a couple of hundred feet above where he had walked and photographed was easy, and travel on its surface was fast. It is too simple to argue that it lacked depth, but the depth was below us, under opaque water, rather than above us in clear air and canyon walls.

One afternoon, we pitched our aluminum and plastic gasoline-driven houseboat at the mouth of submerged Dungeon Canyon, on the barren shores where invasive tamarisk trees were killed every time the water rose and tiny clams were killed every time the water fell. From there, we walked onward to the silted-up head of the canyon no longer scoured out by water. Beyond that was another water-carved basin full of hundreds of tumbleweeds. Evidently wind had blown them into this crevice in the ground, over and over.

The invasive plants were beautiful in and of themselves, spheres in various shades of brown from gold to gray, abundant and ethereal. They were also signs of the disturbance of the place. How do you respond to visual beauty when it's also ecological trouble, to water where it shouldn't be, to invasive species, to a world turned upside down and a river that drowned? That's part of what the world we've made demands of us, a capacity to deal with complexity, to not turn away from beauty and not forget it's not always synonymous with good or healthy or viable in the long term.

A world that is made out of more questions than answers, a world of uncertainties and instabilities. A world where ugly processes can create the appearance of beauty, maybe that demands the scrutiny and knowledge that uncovers other kinds of beauty, in the integrity of processes, in the commitment to the fragile and attention to the subtle, in hope for the future, in the merits of a decision.









There was delight to be had in the way we traveled, as well as awareness it was part of the damming, the flooding, the denaturing of the place. And clearly the jet boaters and water-skiers were having an exciting time going at speeds the open water and powerful gas-gulping engines made possible. One hot midsummer day we took the powerboat out and passed through labyrinths of overhanging walls, down long shady passages, past niches where water reflected upward on canyon walls, a traverse of green water that was always the same and orangey sandstone that never was as it rose, dipped, tilted out, leaned in. Another time we took the powerboat up a channel so narrow that when we reached the place where the water ran out, we could touch canyon walls on either side.

But in many other places in the lower lake the water was near the top of the canyon walls, so we were in open vistas rather than the remnant intimacy of canyons. I wrote in my notebook, "The eyebrow arches over and over again. The openings of the desert: the ways narrow canyon walls create mouth-and-eye-shaped windows of sky, these eyebrow porches everywhere, the sense of facial features." We found one of the eyebrow porches Porter had photographed, no longer far above the water but just above it, staring above its own reflection. And gradually we stopped looking for him; gradually we moved past using him as a baseline or anchor for our expeditions to understand this place. But we never stopped being appreciative of his work as a starting point and a reminder of what had been here.

On a map, Glen Canyon before its submersion looks like a centipede: a long central canyon bending and twisting with a host of little canyons like legs on either side. Some were dry, many had seasonal or year-round streams or small rivers flowing through them. Those side canyons were sometimes hundreds of feet high and many miles long. Some, like Dungeon Canyon, were so narrow you could touch both walls with your outstretched hands. Some had year-round running water in them or potholes explorers had to swim across; sometimes in the cool shade of side-canyon ledges and crevices, ferns and other moisture-loving plants made hanging gardens. Even the names of these drowned places are beautiful: Forbidding Canyon, Face Canyon, Dove Canyon, Red Canyon, Twilight Canyon, Balanced Rock Canyon, Ribbon Canyon. Dungeon Canyon is still there, partly underwater, likely partially buried in the silt that running water carries and still water allows to settle. No one has walked up it for more than half a century.



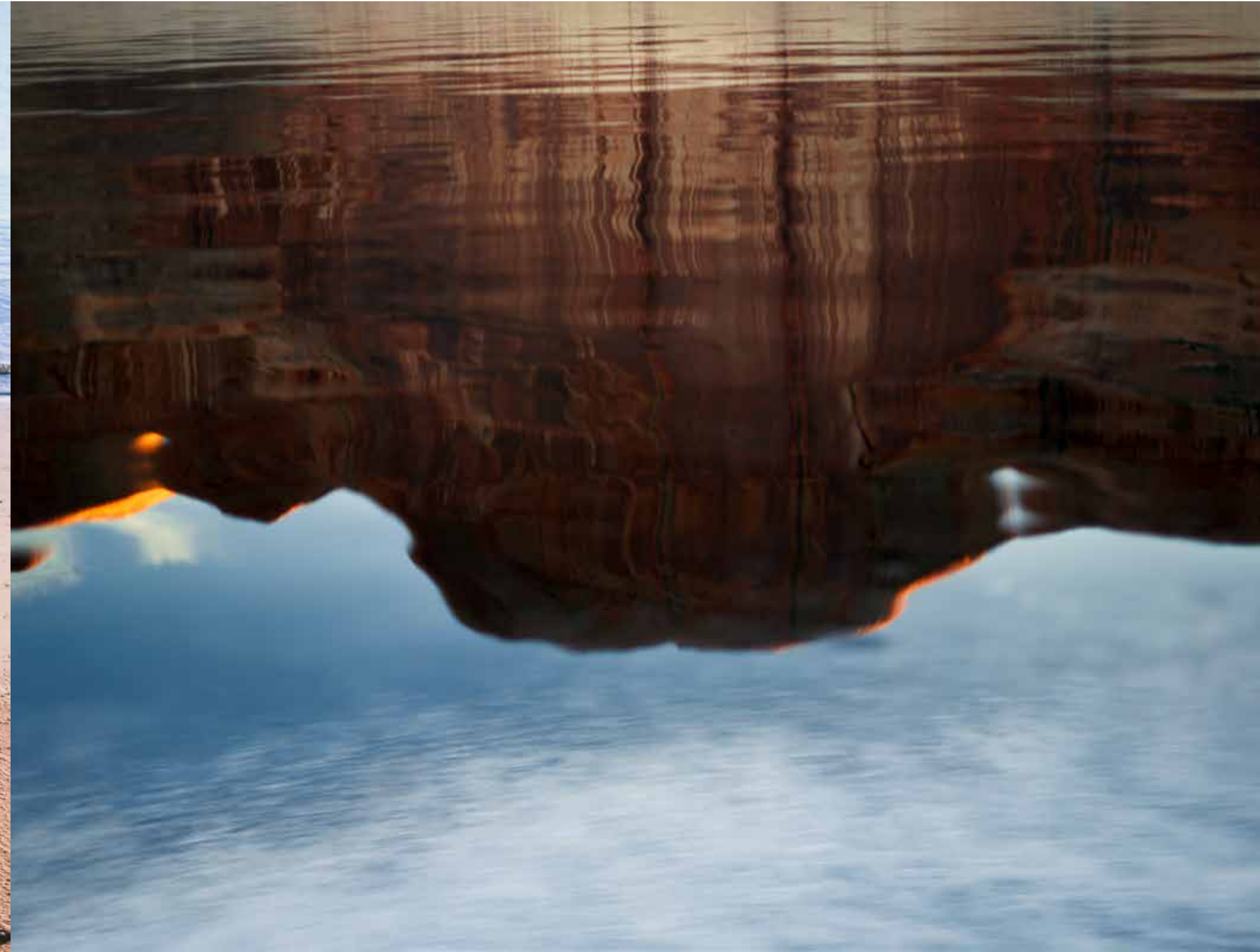




Even a river can drown. In 1963 the Sierra Club pronounced Glen Canyon—the name for the two-hundred-mile-long main canyon with several dozen intricate, narrow side canyons—dead. The organization's mournful leaders expected it to stay dead and drowned under the reservoir called Lake Powell for the foreseeable future. But the future we foresee is often not the one we get, and the reservoir is shriveling, thanks to more water consumption and less water supply than anyone anticipated. Beneath its waters lie narrow canyons, spires, crests, labyrinths of sandstone, Anasazi ruins, petroglyphs, and burial sites, an intricate complexity hidden by flat blue and green water, depth lost in surface. The uninvited guest, the unanticipated disaster, is climate change, reducing rainfall and snowmelt and increasing heat, drought, and evaporation in the Southwest, with dire results for the land and its flora and fauna, as well as the human residents and agriculture of the region.

Glen Canyon Dam is a monument to overconfidence seven hundred ten feet high, an engineering marvel and an ecological mistake whose future grows more uncertain as the symptoms of its failure increase. The American West is full of these follies—decommissioned nuclear power plants surrounded by the spent radioactive waste that will remain dangerous for 100,000 years, the bomb-torn and toxins-strewn land of military testing and training sites; the radioactive waste around Los Alamos National Laboratory in New Mexico and the troubled nuclear waste dump further south near Carlsbad, New Mexico; the Nevada Test Site itself, about ninety miles due north of the other huge reservoir on the Colorado River, Lake Mead. That latter body of water has dropped so dramatically that Las Vegas built a new intake pipe for its drinking water and is fighting a long war against rural Nevada to siphon off water to keep the fountains and golf courses going. You can regard Las Vegas and Phoenix, two sprawling cities that exploded in size in recent decades, as monuments to overconfidence in a future of stable temperatures and inexhaustible fossil fuel for the cars and water for the homes and lawns. Like so much else in the American West, they were bets that the future would look like the present of 1950 to 2000. Building a dam stills running water; the builders often imagine that they can also still the flow of time.





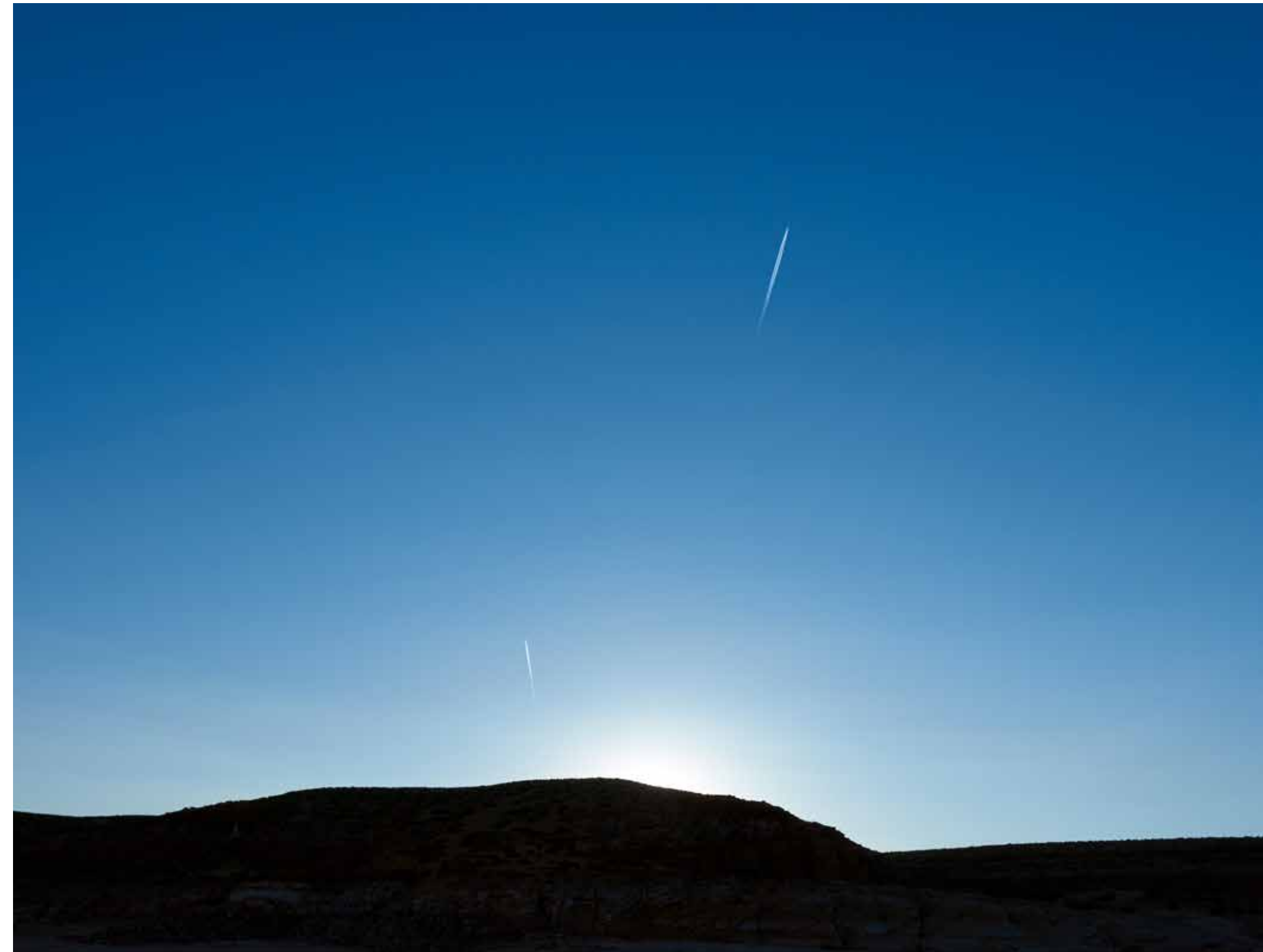




Some regard the enormous projects of this era as a continuation of the Second World War or as war by other means. That war was fought with new chemicals, like DDT, with new weapons including the nuclear bombs developed in Los Alamos, New Mexico, and dropped on Hiroshima and Nagasaki in 1945, new airplanes (and the crop dusters of the postwar era brought the techniques of aerial bombardment to food), new industrial plants. The war had taken the United States out of the Great Depression in part by creating massive industrial projects, dams to generate electricity for, among other things, refining uranium for bombs, airplane and weapons factories, shipyards, mining operations, airfields, and chemical plants. Endless development kept the new economy going.

In the West, that meant industrialization, executed in a way that resembled a war against nature, an attempt to conquer heat, dryness, remoteness, the variability of rainfall and waterflow from year to year, to triumph over the way water limits growth. That war didn't really begin with the Second World War. It was what pioneers and settlers waged as they attempted to make the arid West agrarian, domesticated, a place that behaved like Eastern and European landscapes, as they misunderstood its scant, unreliable rainfall, its frail soils, its scale, and its ecosystems. Lack of water was the limiting factor in much growth, control of water central to the conquest of the West.

Which is an irony built into this place's name: John Wesley Powell was a geologist and expedition leader, later head of the U.S. Geological Survey who warned that the aridity of the West limited growth here, a position that made him unpopular with boosters and developers. He had led the expedition to explore, map, and study the Colorado River Basin, floating down the Green River and the Colorado River in 1869. That is to say, the reservoir is named after the man who doubted the wisdom of large-scale development and confidence about water in the West. He was overruled, reviled, and then his name became an adornment for the epitome of what he opposed.







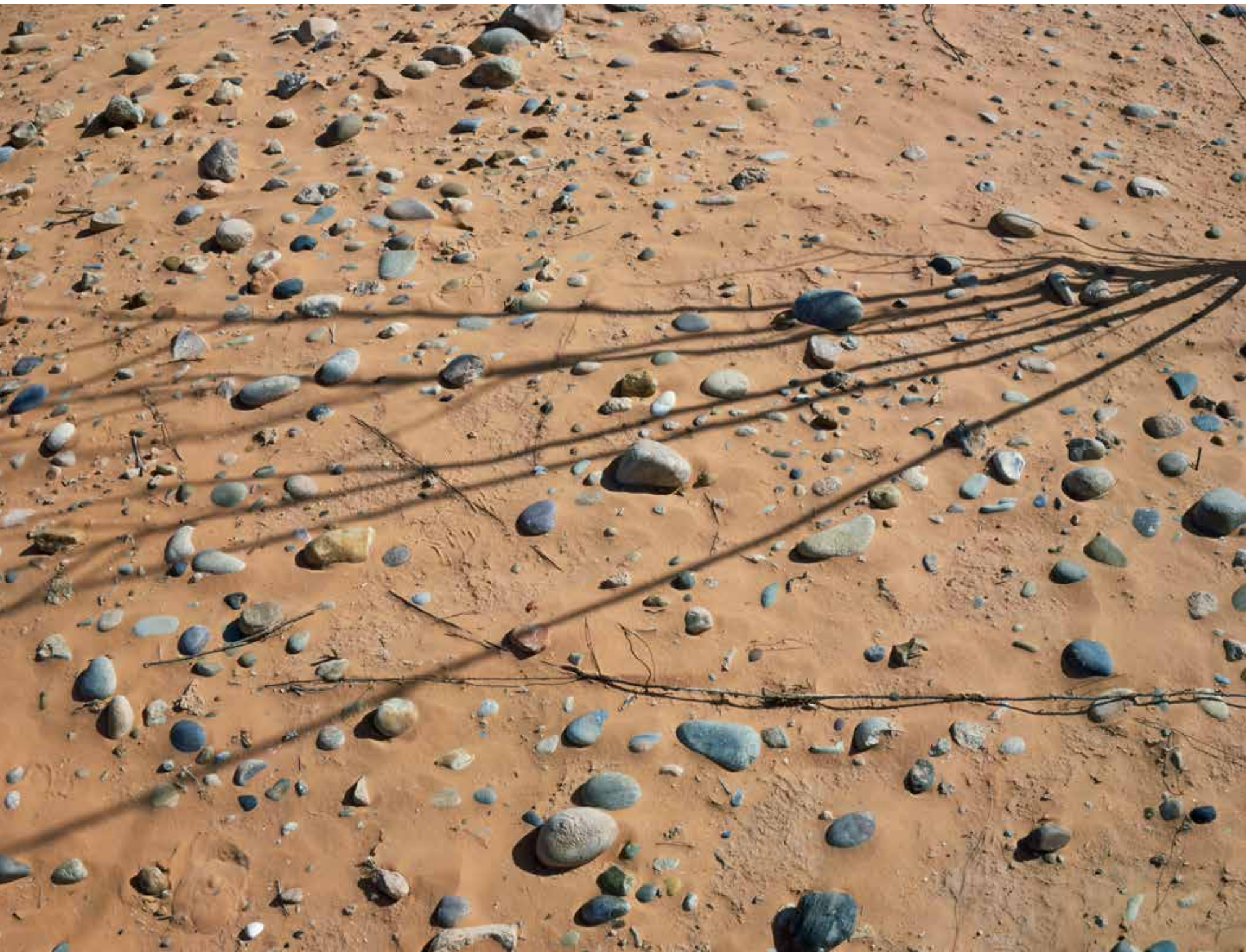
As the environmental writer William deBuys put it, “Thanks to reservoirs large and small, scores of dams including colossi like Hoover and Glen Canyon, more than 1,000 miles of aqueducts and countless pumps, siphons, tunnels and diversions, the West had been thoroughly re-rivered and re-engineered. It had acquired the plumbing system of a giant water-delivery machine. . . . Today the Colorado River, the most fully harnessed of the West’s great waterways, provides water to about 40 million people and irrigates nearly 5.5 million acres of farmland.” Along the way, so many parties sip and gulp from the Colorado that little water reaches Mexico.

The postwar era’s hubris led to confidence that nature could be tamed and the past thrown out like trash, that human beings could reinvent everything from food and agriculture and energy to the landscapes of cities and towns and the workings of rivers, that we could trust ourselves to make decisions that would impact life on earth for tens or hundreds of thousands of years, that what could be achieved in the present would be stable and enduring, that the world’s resources were inexhaustible and the world big enough to absorb our damage and our garbage. It was a vision of a future in which an entirely new order could be imposed on the natural world, a vision based on a collective self-confidence that is staggering.

No one yet realized that our technologies were simultaneously unleashing chaos, though in 1953, as the congressional debate on building dams in the West was intensifying, a little-known young scientist named Charles David Keeling began measuring atmospheric carbon. In 1956, he joined the Scripps Institution of Oceanography, where he remained active until his death in 2005. The year he began, Congress authorized the Colorado River Storage Act, which licensed the building of Glen Canyon Dam. In 1958, atop the Mauna Loa volcano in Hawaii, Keeling established a permanent monitoring station that is now maintained by the Scripps Institute of Oceanography and his son Ralph. The measurements confirmed that atmospheric carbon levels were steadily rising. Scientists had theorized this might be happening; Keeling proved that it was. The resultant curve of increasing carbon dioxide is known as the Keeling Curve. (Later it was dubbed the Hockey Stick, as an exponential rise in atmospheric carbon dioxide after millennia of comparative stability made the lines on the graphs resemble the sporting equipment.)









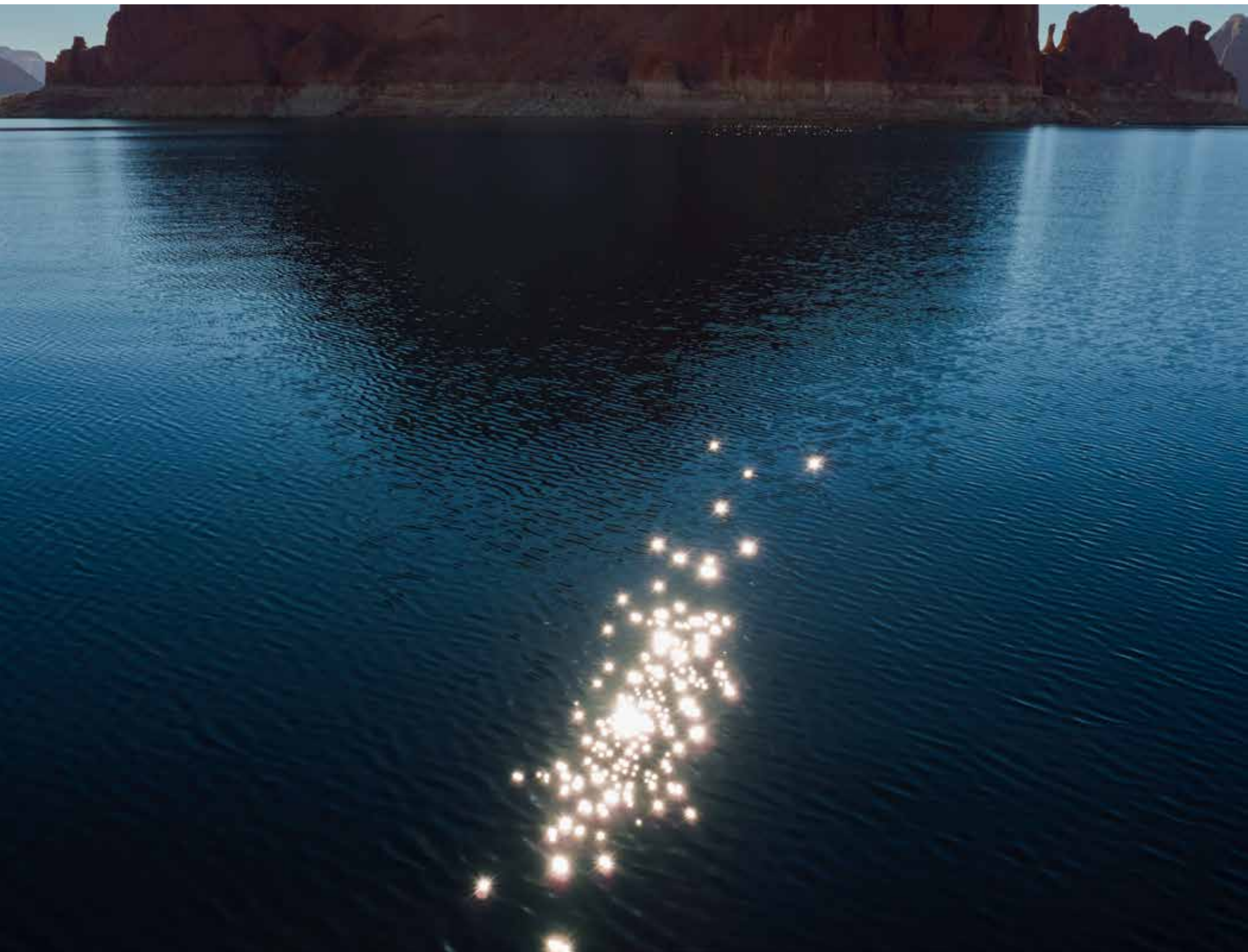
The impact of this rising carbon was dubbed “global warming,” and it was finally discussed in Congress and the media in the late 1980s. Many thought this was a slow-moving problem we could respond to slowly, but climate change has accelerated in the past several years. We now know that the consequences aren’t just steady warming, but disruptions that produce cold, heat, drought, flood, and every kind of instability, and consequences from forest fires to crop failure to melting permafrost and glaciers. Many now call it climate chaos. It rips apart the delicate patterns of the natural world: the temperatures and timing that regulate oceans; fish, bird, and butterfly migration; wildflower blooming; hibernation; and snowpack and spring melt. It’s what we’ve been making, together, since the Industrial Revolution gave us the means and the motives to burn ever-greater quantities of fossil fuel and otherwise disrupt the composition of the very atmosphere. Into the first several years of the millennium, it was imagined as a problem for the future. That future arrived hard and fast, harder and faster than almost anyone imagined. We’re in it; it’s the present.

In the late 1950s, when Keeling was just a young scientist gathering data, no one imagined that the world might be so destabilized. It was a world without environmentalists or an environmental perspective. It had, instead, conservationists, though the battle over damming the West would be one source of the emergence of environmental thinking and the modern environmental movement. Most conservationists of the 1950s were anxious to make it clear they had no desire to question or stop what was universally regarded as progress.

In the Southwest, progress meant development of the upper half of the Colorado River. "All conservationists are undoubtedly in sympathy with further development of the upper Colorado River," said former National Parks director Horace Albright dutifully, defensively in a letter entered into the Congressional Record on July 14, 1955. There's a long backstory to how that moment came about. A short version might start with the 1922 agreement between all seven of the states on the Colorado River System about how to divide up the water. The Law of the River, as it became known, was written when the population of most of the states was diminutive. California already dwarfed the other states in economic and political power, agricultural development and residents (though its 3.5 million people were less than a tenth of its current population).









The 1922 agreement divided the seven states into the upper- and lower-basin areas and allocated the same amount of water—7.5 million acre-feet per year—to each. (An acre-foot is the amount of water it takes to cover an acre one foot deep: 43,560 cubic feet or 325,851 gallons.) In the postwar era, the sparsely inhabited upper-basin states—New Mexico, Colorado, Wyoming, and Utah—turned to the question of how to hang onto their share of water while meeting their obligation to deliver the lower basin's share. The Department of the Interior's Bureau of Reclamation proposed to do this with a series of dams, including two in Dinosaur National Monument on the Colorado-Utah border.

The Colorado River Storage Project had many goals with these dams. One was to irrigate farmland in the upper basin, much of it in places less than ideal for agriculture. Another was to bank water, so that the upper basin wouldn't suffer in dry years when the lower basin took its hefty share. A third was to generate electricity to sell to pay for the project whose form changed over years of intense conflict, but whose price tag hovered around a billion dollars. By 1951, the Sierra Club was making plans to challenge building dams in Dinosaur, so named because an extraordinary trove of dinosaur fossils was found there where the Yampa and the Green rivers come together in a dramatic geological landscape. Sierra Club board minutes for May of that year note, "The campaign of conservationists opposing the construction of dams in Dinosaur National Monument has caused the Bureau of Reclamation to plan for a serious battle in Congress." Part of that battle was about whether Dinosaur was a beautiful place we should cherish or a bleak backwater no one would miss. David Brower, a board member until 1952, and then until 1969 the Sierra Club's first executive director, went to see the place for himself and found it worthy of defending.

To say *Sierra Club* in 2017 may summon up images of a powerful environmental organization with nationwide reach and hundreds of thousands of members. That's not what it was when the battle over Dinosaur began. Founded in San Francisco in 1892 by John Muir and a group of urban professionals, it had about 9000 members in the mid-1950s. It was a California-based, Sierra-Nevada-focused hiking and mountaineering club with a modest conservation and education mission. Like other mountaineering groups—the Adirondack Club, the Wasatch Mountain Club—it was genuinely a club whose members shared class and cultural values as well as a passion for hiking, camping, and mountaineering. Its members made many first ascents and laid down climbing routes in the Sierra Nevada and other parts of the West.

The campaign on behalf of Dinosaur expanded the club's reach beyond the Sierra Nevada, in its sense of mission and impact, and in its techniques, including publishing photography books as lobbying and educational tools. When on behalf of the club, Brower went to Congress in 1954, he mounted three arguments against the dams then under consideration. The first was technical, about the relative amount of evaporation that would be lost from different configurations of dams and reservoirs. The second was that Dinosaur was part of the national park system, that nothing should violate national parks and monuments, and that this beautiful place was not disposable, nor would it be improved by a dam that would flood its canyons and submerge its geology. The third was that the United States did not need the hydropower when coal, oil, and nuclear were abundantly available energy solutions that were cheaper than building dams.

Nine years later, Brower still believed in the unholy trinity of coal, oil, and atomic power. He wrote in his introduction to Porter's book of Glen Canyon photographs, "The alternatives that could have saved Glen Canyon are still unused. Fossil fuels, for one. The states of the Upper Basin of the Colorado contain a major part of the earth's coal reserves . . . and they are a much longer-lived source of energy than the short-lived reservoirs planned for the silty Colorado."









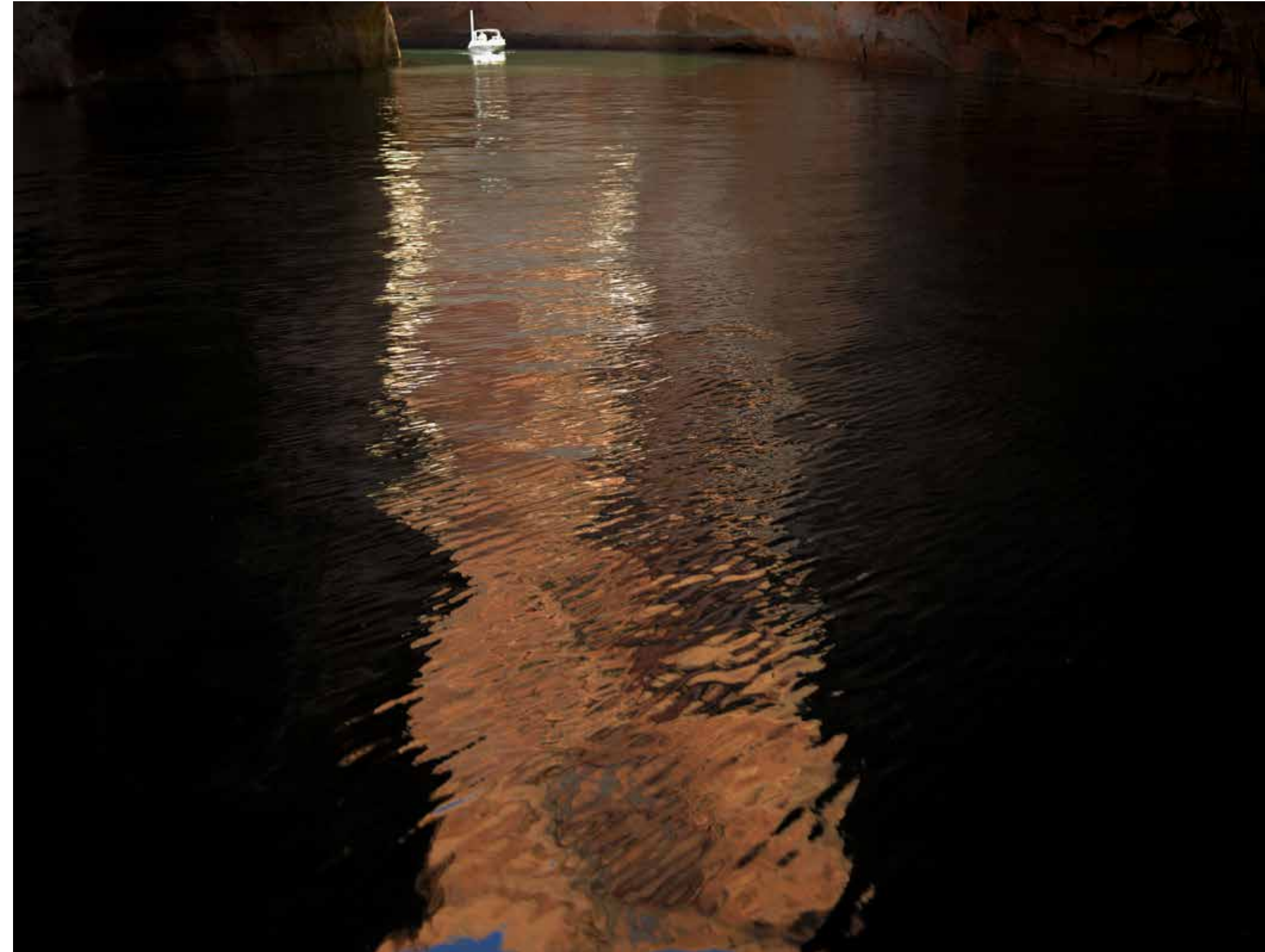
The current club is doing its best to shut down the fossil fuel industry. One of its defining accomplishments is its Beyond Coal campaign that has, in collaboration with other groups, retired 50 percent of dirty power plants in the United States and has plans to retire hundreds of others. Campaigns against oil and gas and for newly efficient, economically viable forms of clean energy are booming. And every climate activist recognizes that we need to leave fossil fuel behind, because its cumulative damage is colossal beyond almost any other kind of human-driven destruction, from the sky to the sea, from the Arctic to the tropics—and the desert Southwest.

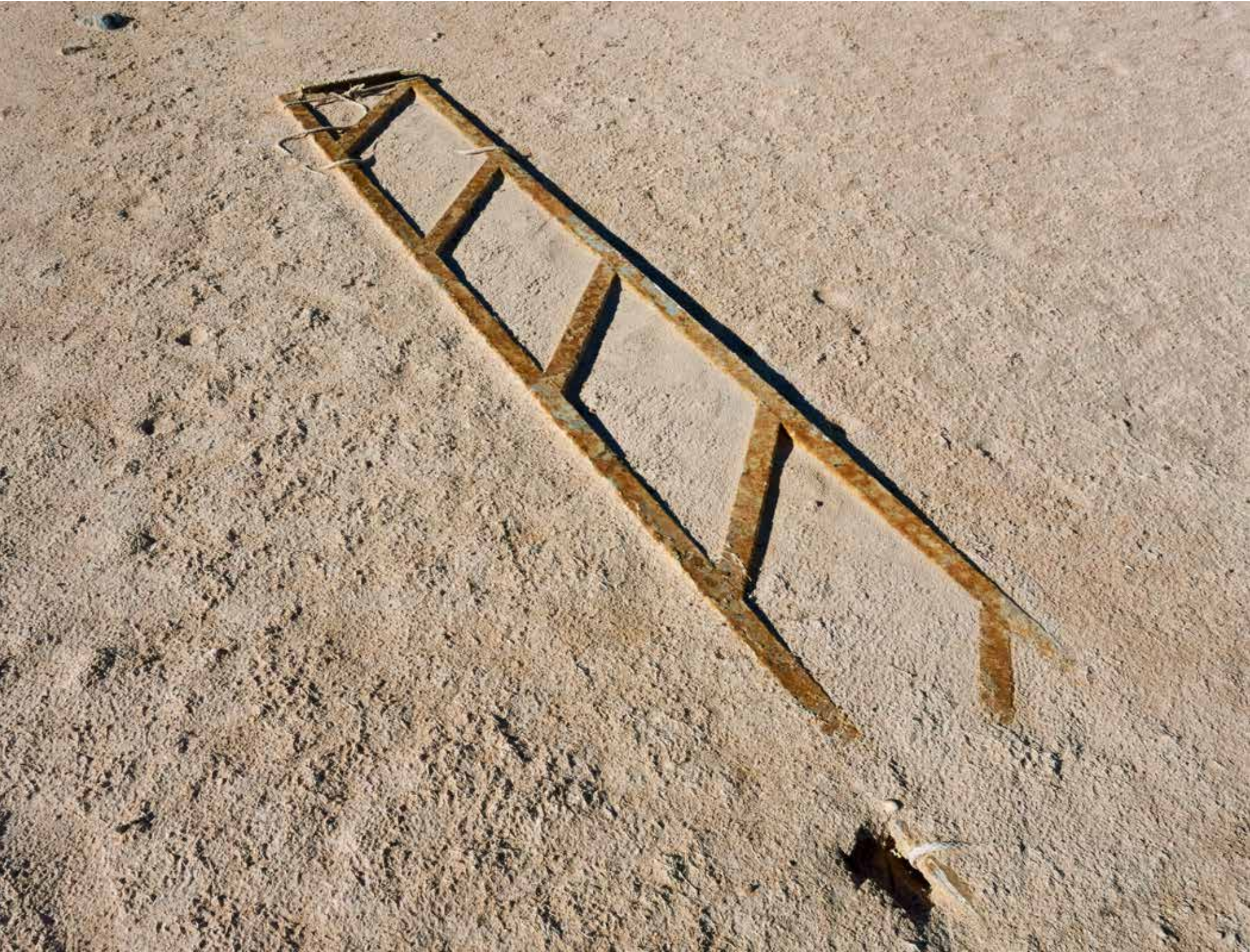
No one knew that in 1955. Fifties conservationists were arguing against hydropower and for fossil fuel and maybe nuclear. The point is not to scorn them for what they didn't know and we do, but to see how utterly foreign the world of the mid-1950s was, how their vision of what is prudent and safe in the present and for the future is not ours. Mark likes to say that change is the measure of time; this enormous shift marks how long ago and far away the conservationists who thought like that were, and how much has happened in the interim.

Many of the conservationists were arguing for a dam in Glen Canyon as a trade-off, believing that if there was going to be a dam, then that little-known, unprotected, remote place was one they were willing to sacrifice. They were feeling their way through new territory that required them not only to learn about dams and water and the landscapes of the Southwest, but about themselves, who they were and what they stood for and who they dared stand against. Then members of the Sierra Club leadership went to Glen Canyon and learned how magnificent the place was and regretted their decision. It was too late, though they fought for the place until the end.

On October 15, 1956, President Eisenhower pushed a telegraph key that sent the signal that detonated the first round of dynamite. Construction of Glen Canyon Dam began with this warlike gesture by the former supreme commander of the allied forces in Europe. A temporary dam was built upstream of the dam site, and two 3000-foot-long diversion tunnels were blasted into the canyon walls to send the river through while the dam was built. Archaeologists scrambled to document thousands of sites of burials, homes, petroglyphs, and more: the place had an ancient history. In March of 1963, water began backing up behind the new dam, drowning many of the archaeological sites, but the scale of the reservoir was so vast that it did not fill up for seventeen years, until 1980. Full, its surface elevation was 3700 feet, more than 500 feet above the riverbed at the damsite.

It will never be full again.

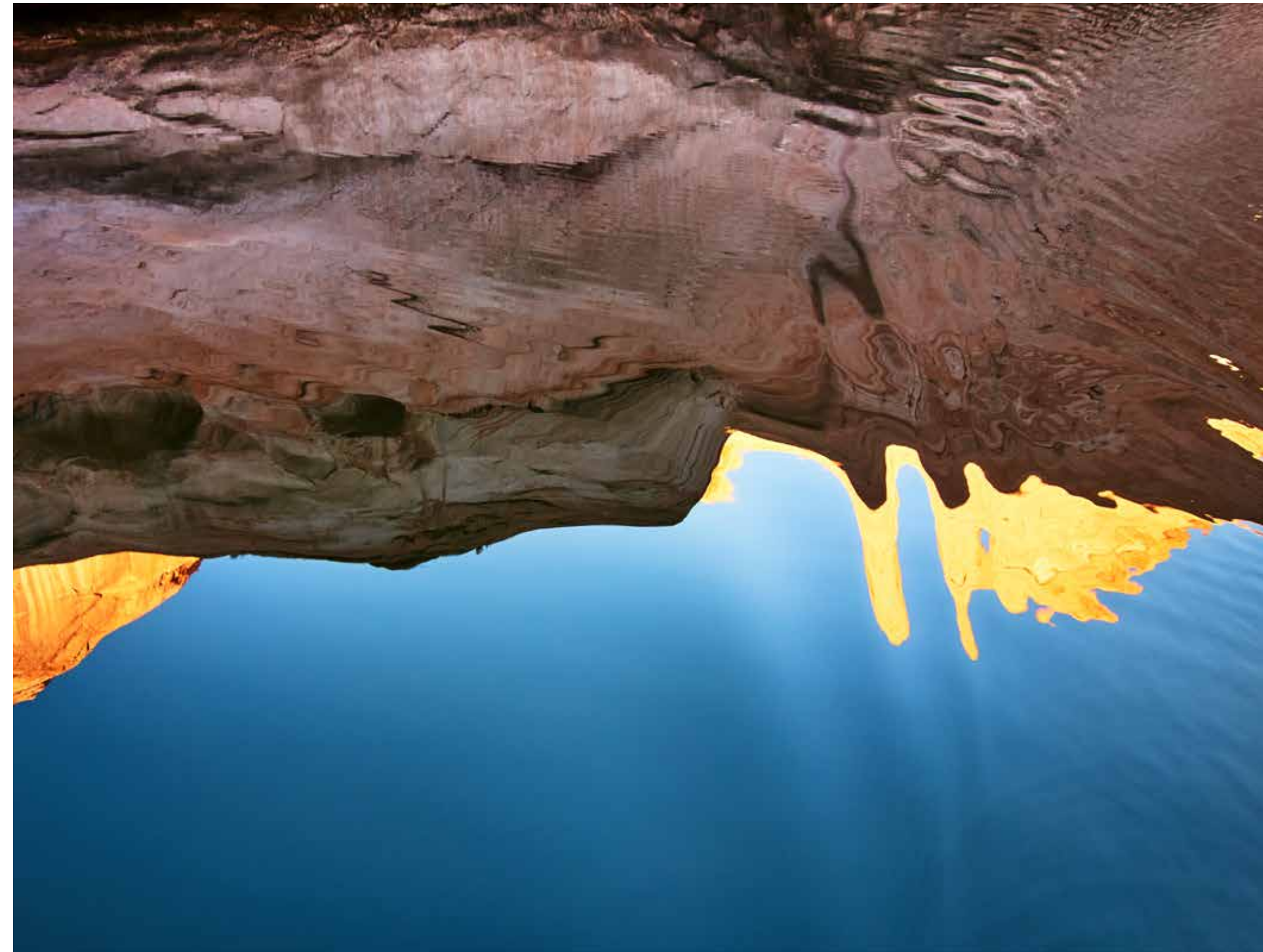




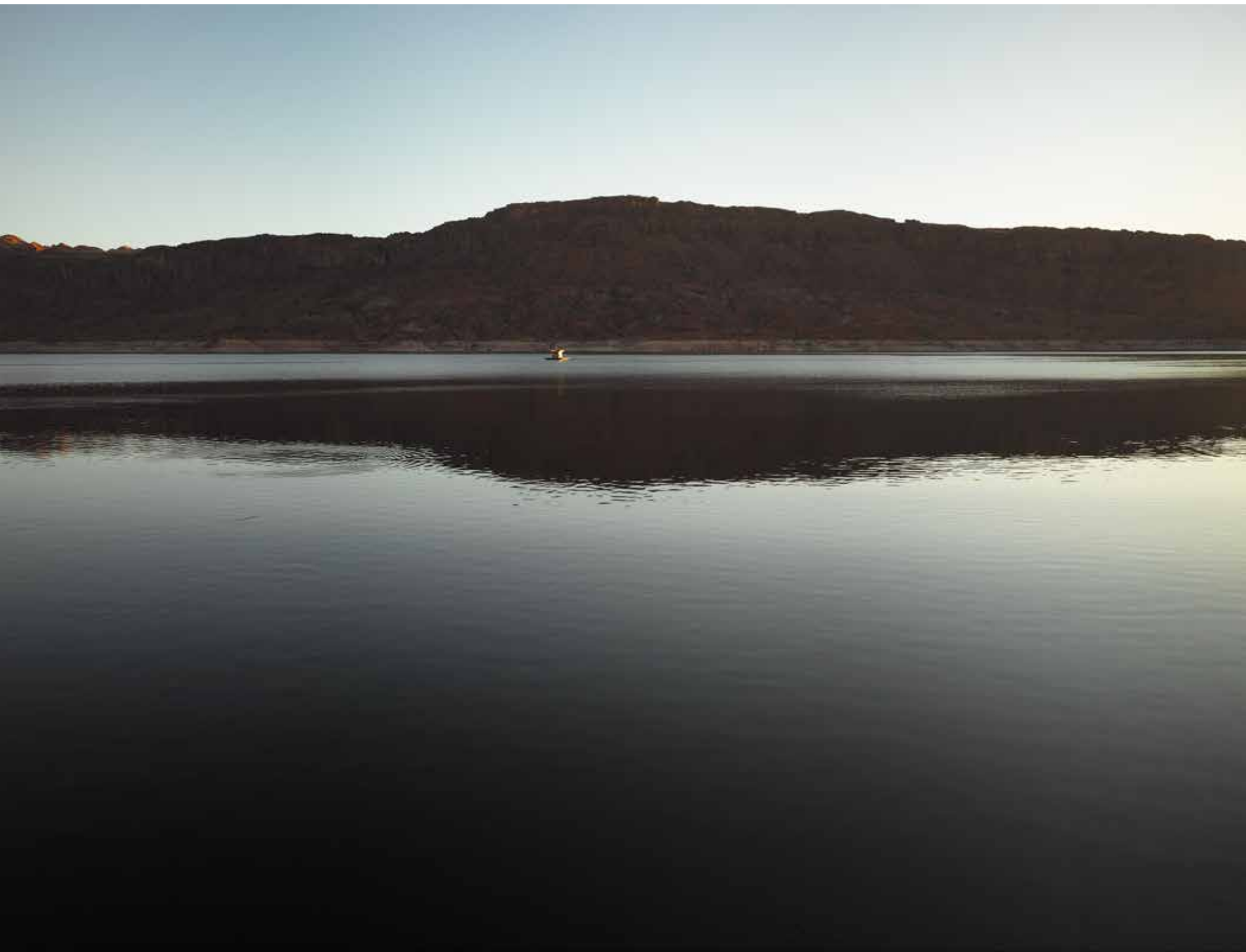


The first two summers we explored Lake Powell, we rented a houseboat towing a powerboat, bemused and a little appalled by the ease of propelling an awkward mobile home on pontoons across a vast body of water that shouldn't be there. But it got us to the beauty that still rims the lake. The sandstone formations that rose above water level were stunning, majestic. One sublime afternoon we took the powerboat out and went for hours among the mazelike channels that had once been side canyons, sometimes taking the boat under overhanging cliffs, along canyon walls with overhanging arches, into shadow and out into the sun again. Long streaks of color on high rock faces reached the water and must have extended much farther. We took the boat up a channel so narrow we stopped where the water ran out and we could touch canyon walls with our hands on either side. We camped for two days in a shadowy cul-de-sac atop water so deep it was terrifying. We swam across the unseeable depths anyway, in the cool, still water that had once been warm, moving river. It was an enchanted place in both senses—sublimely beautiful and under a spell that made it something other than itself.

In some places sunlight reflected off ripples of water to cast reflections on the overhanging walls, like pulsing nets of light; in others the blue water reflected the orange rock so that the ripples were an impressionist's weave of contrasting color. The seam between deep blue water and dry red sandstone is confusing, as though one of the elements had been photoshopped. High above the current waterline, lines of clamshells trace where it once was. Litter and lost belongings lay along the shoreline, and sometimes the stagnant shallow water was disgusting, stinking with dead fish, surface gunk, and clouds of flies. Sometimes the place is ugly, often beautiful, and sometimes that beauty seems almost more troubling, because it seems to reconcile you to something that you may regard as wrong.







Dammed, the place became a popular recreation area, visited by millions annually, full of bulky houseboats, sleek powerboats cutting across the water, here where even pleasure had been industrialized. Downstream in the Grand Canyon, people mostly travel by raft and camp, but the flooding of Glen Canyon has made it an easy place. Or did: the surrounding area is full of houseboats up on blocks as attendance drops at the shrinking reservoir.

The Sierra Club published Eliot Porter's last-minute documentation of the region before it went underwater as *The Place No One Knew: Glen Canyon on the Colorado* (though a small but devoted regional population explored and adored the place before the dam and didn't take well to the title). Mark dubbed Lake Powell "the place everyone knew" for its vacationland heyday, and we wondered who will visit when the place has changed again. The infrastructure for mass tourism can be strange. One day we boated past the Forgotten Canyon Floating Restroom, a sort of raft-borne Porta-Potty on our way to the Anasazi ruins nearby, secure above the reservoir. The stone buildings tucked into a fold of the cliffs had stood for centuries, still solid; the Porta-Potty rocked back and forth on the wake of the boats like a buoy. It was a good thing, keeping human waste out of the land and water, but it was also an amusing landmark.

In the big picture, things were often disturbed and disturbing. On the small scale, they were sometimes what they had always been. We wandered on foot across great domes of solid stone, up canyons that had remained above water level or reemerged, into the dryness that spreads in all directions beyond Powell and the delicate tributaries that feed the Colorado. Small streams poured down slot canyons and made clear pools. Desert plants cast precise shadows on the red sand that also bore the trails of birds and of lizards, whose tails draw neat lines between their footprints, subtle and tiny, like evanescent hieroglyphs. Our footprints joined and sometimes obliterated theirs.

Over and over we found lithic shards—stone chips from indigenous toolmakers long ago—on the shore, pinks, reds, oranges, greens, as though the artisans who'd sat in these places had chosen their materials for beauty as well as for utility. Inland from a muddy place at the high end of the reservoir, Mark found a gorgeous potsherd bigger than his palm, textured on one side, painted in black and white on the other. We saw the sun going down turn the dull red rocks vivid orange, saw stars come out by the tens of thousands on moonless nights far from any artificial light. We also saw water-skiers, houseboats, powerboats racing and roaring across the water, floating latrines, debris, and the marinas where you could buy diesel fuel and Popsicles. Then we went upriver, or uplake, or upreservoir, or whatever you call it when you go to the upper end of what used to be a stretch of river before the water stopped flowing and started piling up.









1955 is a foreign country some remember but none will ever visit again. Its certainties have been shattered, and its assumptions revised beyond recognition. The Sierra Club itself was transformed by its win over Dinosaur and its loss at Glen Canyon into a tougher, more far-reaching organization with a much higher profile. Over the ensuing years, debates over nuclear power and pesticides stretched its sense of self and mission. The old idea that you could just put a border around a beautiful place and consider it saved was fading.

In the late 1950s, the alarming news about radioactive fallout across the United States from the frequent aboveground nuclear tests at the Nevada Test Site was one reminder of systemic connection; pesticides were another. Rachel Carson's 1962 book, *Silent Spring*, made it clear that our modern poisons spread beyond the places to which they were applied and ended up in us as well as in wilderness. What you did here mattered there. When you switch from thinking about protecting particular places to address the interconnectedness of all things you turn from a conservationist into an environmentalist. The critique of these things led both to a distrust of authority, including the authority of governments and corporations behind these phenomena. What gets called "the sixties" was partly a revolt against this confidence in authority, technology, and control of nature.

I was along on all but one of the photographic expeditions with Mark and Byron, and I made my own forays into the archives of Bancroft Library, where the Sierra Club's records are housed, and to my public library to read the Congressional Record for the years of debate over the fate of Lake Powell. I sat for hours in front of the shelves of volumes, in an aisle through which no one else passed, opening huge red volumes full of many columns of tiny print, entering into a past when the House and the Senate were debating the dam. Nuclear power and weapons, communism and anti-communism, and other issues were also being debated, and the debates were stately, occasionally rancorous but generally gentlemanly—I do not recall reading a woman speak, either as an elected official or an expert testifying. In their ponderous, ritualized deliberations, over the course of many years, the fate of the river was decided.

“We sometimes note derision in the voices of those who make attempts to demonstrate through inference and implication that the spokesmen for the lay conservationists represent a misty-eyed sect of idealists who spurn reality in their battle to obstruct the progress of normal development and use of our country's resources,” said George Miller of California to the House of Representatives on July 23, 1954. But, he assured his listeners, “They support a conservation program that affirms the necessity for assuring fullest development of water and land resources in a manner which takes cognizance not only of the multiple-purpose needs of the present but also of the long-term needs of the future.” They were not, in other words, radical. But they would be.

Many of the old-timers on the Sierra Club board believed that you had to be reasonable and moderate and civil and willing to compromise and find common ground. They were conservationists. A newer generation was willing to fight harder and oppose and demand more. The Sierra Club continued to grow in membership, in clout, and in definition of its mission. In the 1960s, it fought dams that would have backed up their waters into the Grand Canyon. They opposed siting a nuclear power plant at Bodega Bay on the California coast, a ski resort, roads in the wilderness, logging redwoods. Its members fought each other and their executive director about what their mission was. Other environmental organizations arose, sometimes more radical, often with more specific foci: whales, rainforests, air pollution, eventually environmental justice and climate. The news on how everything is connected to everything else got more complicated, as air and water pollution became bad enough, by the 1960s, that the Environmental Protection Agency was established in 1970, the Clean Water Act in 1972, and the Endangered Species Act in 1973.

By 1977, Exxon's own scientists had privately established that its main product, petroleum, would heat up the earth in ways that could prove catastrophic. That year, James F. Black, a scientific advisor in the products research division of Exxon Research & Engineering, said, "There is general scientific agreement that the most likely manner in which mankind is influencing the global climate is through carbon dioxide release from the burning of fossil fuels," said. *Inside Climate News* reported in 2015, "He warned Exxon scientists and managers that independent researchers estimated a doubling of the carbon dioxide (CO₂) concentration in the atmosphere would increase average global temperatures by 2 to 3 degrees Celsius (4 to 5 degrees Fahrenheit), and as much as 10 degrees Celsius (18 degrees Fahrenheit) at the poles. Rainfall might get heavier in some regions, and other places might turn to desert." The stunning data pitted what was good for the earth and all living things against what was good for the oil industry. The major fossil fuel companies chose the latter. Later, when politicians began to consider climate change legislation, Exxon and other big fossil fuel corporations launched campaigns of denial, disinformation, and sabotage.







In 1973, Jim Harrison published a novel whose central trio wanted to blow up a dam on the Grand Canyon (that was, thanks in large part to the Sierra Club, never built). In 1975, Edward Abbey published a similar novel, *The Monkey Wrench Gang*, whose quartet set out to blow up Glen Canyon Dam. In the years after the dam was completed, as the waters were rising, people seemed to imagine that only violent opposition or wholesale destruction would take out the dam. Abbey's book inspired a small cadre of environmentalists to found Earth First!, a radical group committed to direct-action tactics, including blockades and occasional sabotage of equipment. In 1981, Earth First! activists unfurled a gigantic banner painted to look like a crack down the face of the dam, symbolically breaking it, imaginatively opening a future without it. The bearded Edward Abbey inveighed like a cranky prophet from the bed of a pickup truck nearby, to a small crowd, against the dam and all it represented. They imagined that the dam would have to be destroyed in violence (which would, of course, have scoured the Grand Canyon with a wall of water that would itself have been an ecological disaster). They loved the canyon and the Colorado passionately, but they did not see how the river would reassert itself.

It's often assumed that you get to know a place by being in it, but understanding any place means understanding the politics and larger forces that shape it, and often understanding those things means looking elsewhere, where the decisions are made, where the history is remembered, where the future is being planned, or ignored.

Climate change means that Lake Powell's fate is inseparable from that of the global climate. The 15 million acre-feet of water the river was supposed to annually supply for human use was an unrealistic overallocation even before climate change spelled out a hotter, dryer future for the Southwest. Lake Powell is failing, and its failure means that Glen Canyon is reappearing. Most reports on the failure of Lake Powell describe the bathtub ring. As water levels have dropped, the lower lake's stone walls emerged whitewashed by mineral deposits. The highest water recorded at Powell was around 3700 feet above sea level. In the past five years, levels have been 75 to 100 feet lower than that. As a result there is, famously, a chalky ring the height of a several-story building along hundreds of miles of shoreline. The ring is evidence of change at the lower end of what used to be a body of water about 186 miles long. It's now about 153 miles long.

But the most remarkable consequences are at the other end of the dying reservoir. The upper thirty miles of what was once a recreational reservoir is now a river again, struggling, through stacks and cliffs and beds of silt, to be reborn. That transition zone is a muddy, treacherous, muddled place few inspect. At that northeastern end, there's a place that all the maps show as Hite Marina, though the road signs have been altered to just read Hite, the name it had before the reservoir. Even the maps inside the little store attached to the gas station there show a body of water that no longer exists, while the government signage in the parking lot across the road proclaims "Lake Powell—Pure Now and Forever," a defiant cry against the fate visible below. Past the parking lot's little information kiosk, the paved boat ramp goes for hundreds of yards, and beyond it is a dirt path where people had continued launching boats as the water levels sank. The dirt path continues into tall weeds. Far into the weeds water runs sluggishly, not enough to launch a motorboat in. Around it is the soft, treacherous silt.









When I first visited what had once been lake and was now a chimera of still water starting to move again, I walked along one long stretch of riverside silt, following the footsteps of great blue herons, and Mark and Byron stayed behind, watching to see if the stuff would hold me. The mush I walked on will wash away, and the water will carve its way through the stacks of the stuff that filtered down from the lake's muddy waters to establish a stable bed again. The Colorado is a silty river, and one of the arguments against dams on it is that the reservoirs behind them will silt up relatively rapidly. On the other hand, one of the contemporary arguments for Glen Canyon Dam is that it's extending the life expectancy of Lake Mead by holding back much of the silt upstream.

One of the arguments against it is evaporation.

It may not sound like an exciting subject, but put it this way: imagine a huge lake that disappears, to be replaced by another lake that disappears, year after year. At full pool, about 860,000 acre-feet of water evaporates annually out of Lake Powell. More water seeps into the sandstone of Glen Canyon: just by putting the river water in a leaky lake under a broiling desert sun wastes about a million acre-feet a year. Hetch Hetchy Reservoir in the high Sierra holds about 360,000 acre-feet of water when it's full, and I've hiked all day from the dam and gotten nowhere near the far end of that body of water. It's huge. At Lake Powell, an amount of water more than twice the size of Hetch Hetchy vanishes into thin air annually. It's like throwing a lake into the sky every year, fifty lakes over the past half century. Lake Mead loses a similar amount to the sky, so the two reservoirs together lose about ten percent of the flow of the Colorado River through evaporation and seepage.





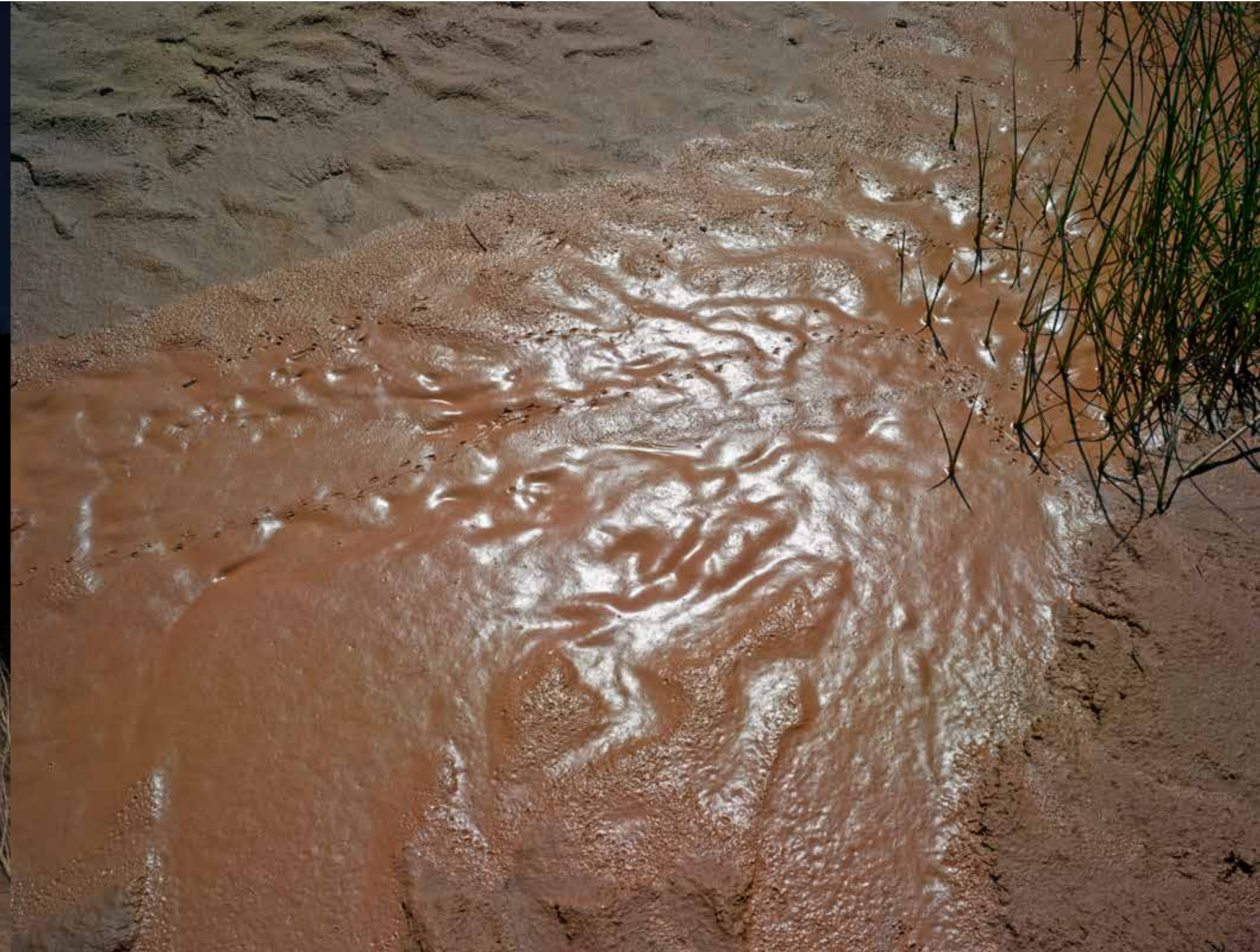


They were built to bank surplus water in wet years to use in dry years, but there is no surplus and there have been too many dry years. Until this decade, the Bureau of Reclamation that built the dams avoided mentioning climate change. But at the end of 2012, they admitted that the system was failing and climate change was a major reason why. Their publication *Colorado River Basin Water Supply and Demand Study* declares: "the median of the mean natural flow at Lees Ferry over the next 50 years is projected to decrease by approximately nine percent, along with a projected increase in both drought frequency and duration.... Droughts lasting 5 or more years are projected to occur 50 percent of the time over the next 50 years. Projected changes in climate and hydrologic processes include continued warming across the Basin, a trend towards drying... increased evapotranspiration, and decreased snowpack as a higher percentage of precipitation falls as rain, rather than snow and warmer temperatures, causes earlier melt."

In other words, what we used to call drought may be the new normal, and there is not nearly enough water to meet the demands we have put on the Colorado system. Turning it into a plumbing system solves nothing if there's no water to be piped and shipped and stored and poured out for industry, agriculture, and residents of the Southwest. And every year of this decade, the data on how much and how fast the climate is changing has been adjusted upward, and the consequences grow more dire. The 2012 Bureau of Reclamation report is a radical departure from earlier estimates, but a conservative estimate of what we're actually facing. As of late summer 2016, Powell was 56 percent full and Lake Mead was about 38 percent full. Together they held less than half the water they were intended to. Scientists and environmental journalists have speculated for years on whether or when they would reach dead pool—the point at which the water level is below the dam gates, electrical power is no longer being generated, and the river no longer flows.

Dead pool is catastrophic failure.





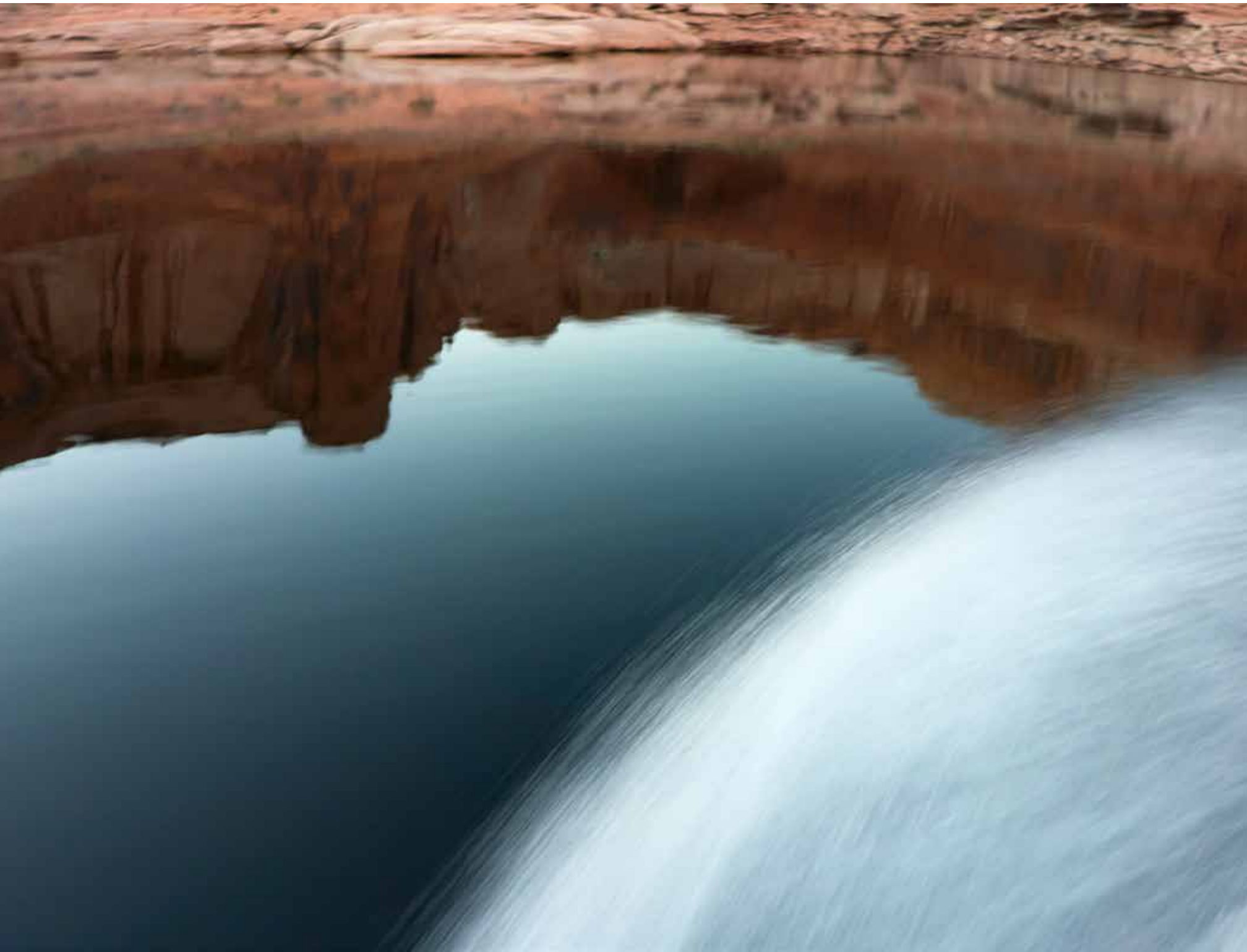


One solution is to abandon Lake Powell. More than twenty years ago, Utah native Richard Ingebretsen founded the Glen Canyon Institute. It's dedicated to bringing back to life and light the place the waters had buried. When the institute was founded, its mission was regarded as radical, unrealistic, and unreasonable, not far removed from the fantasies of blowing up the dam. Now the idea the institute promulgated has reached, to use a watery metaphor, the mainstream, gathering adherents as it comes to seem like the only sensible solution. (A lot of important ideas and framework have that kind of evolutionary history, trickles become streams or torrents washing into and transforming sometimes, the very bed in which the mainstream flows.) Abandoning Lake Powell doesn't mean taking down the dam, an impossibly expensive proposition that would then leave huge mountains of silt to pour downstream, clogging the Grand Canyon. Many years ago, when Ingebretsen visited Floyd Dominy, the cocky commissioner who headed the Bureau of Reclamation when the dam was built, the latter sketched out how easy it would be to restore Glen Canyon. You couldn't dig all the concrete out of the diversion tunnels that were dug and then plugged when the dam was built, Dominy said. To Ingebretsen's amazement, since you wouldn't expect the man who built and defended the dam to tell you how to (literally) undermine it, Dominy told him, "All you would have to do is drill new bypass tunnels."

That may need to happen soon to save Lake Mead, since there is not enough water for both reservoirs, and since consolidating water in one would reduce evaporation. Doing so means doing many other things. One is recognizing that the water was overallocated even before climate change changed everything; we are going to have to use less water in the Southwest. About 80 percent of that water goes to agriculture. That could mean cutting back on some of the extravagantly inappropriate crops, the lettuce in the blistering Imperial Valley, the cotton in Arizona, the water-intensive alfalfa everywhere grown for cows here and for shipping across the Pacific, a practice sometimes described as exporting scarce water by other means. It means giving up the electricity generated by the turbines in Glen Canyon Dam. It means recognizing that the politicians and engineers who planned Glen Canyon Dam failed to imagine a future that looked like this.

For the Colorado River, victory and defeat are hard to tell apart, and they may be the wrong terms for the end of an era and the arrival of another.









In 2012, Mark and Byron and I went to some low cliffs on the other side of the river from Hite, near where the Dirty Devil River pours its water into the Colorado. Sometimes another car or truck pulled in off the road, but mostly we had the place to ourselves. The era when this part of Glen Canyon was part of an attractive destination called Lake Powell was over. It was also less accessible than it had been before—you couldn't walk on that soft silt or boat down that shallow channel.

The stone was a duller yellowy color than the red sandstone downstream, but beautiful for its whorling complex of bulbs and domes and potholes, a Constantinople of forms inhabited only by lizards, flies, and a few birds. Great rafts and piles of iron-gray driftwood marked where the shoreline had once been, and old campfire rings sat not far above them. The usual lines of stranded clamshells marked that the water had once lapped at the upper end of the cliffs. Dozens of feet below spread a shallow meander of what was no longer a lake but not yet quite a river, struggling through stuff that looked like pancake batter. There were high walls of silt on the far side of the water, stacks of the choking stuff that once would have been dispersed by powerful currents.

We came back two years later, in 2014, and what had been raw silt was covered in green plants, and a shallow river channel had begun to form. The water had gathered its strength and begun to carve out a route for itself. The tributaries and the Colorado River will continue wearing away stone as they have for eons to form the canyonlands, storms will pass over, sun will scorch, life and death will pursue each other through the light and shadows, the days and nights, but the place will never be what it was in 1955, nor will any other part of the earth. It is all changed.

In May of 2016 we came back again to what had become a familiar landscape. Understanding this place took time, time for our own understanding to deepen, for the impact of climate to clarify, for us to travel from the still-populated bustle of the lower reservoir to the spaces upstream where, as Mark noted, it felt as though “the party is over.” He found exactly the vantage points he’d used in earlier years and pulled up his pictures from 2012 and 2014. With the prints in hand, we could see that the river had carved its channel deeper, the plants were lusher on the banks of silt, and the natural processes were, if not restoring the river that was, creating the river that will be. Nature bats last was a favorite motto of the radical environmentalists of the 1980s, but what the word *nature* means now that human beings have altered the climate itself is hard to say.





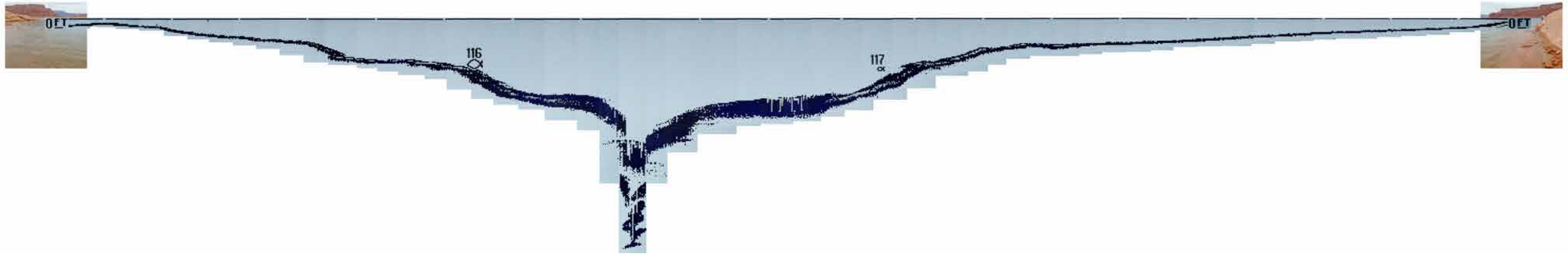
Receding Dead Pool and signs of a future river, Lake Powell in 2012 (left) and 2014 (right)



What's not hard to say is that Lake Powell is dying and from its corpse the Colorado River is emerging.



Lake Powell in Glen Canyon showing the historic course of the Colorado River and the reservoir at full height, with insets showing the receding water and the reemergence of the river and tributary streams.



"Fishfinder" sonar map of Dungeon Canyon, showing where Eliot Porter stood to make his cover photograph, now below the waterline, 2011



Two journeys into the Hidden Passage, 2011

ABOVE: Photographs from a boat floating the lake waters in Hidden Passage, almost 50 years after Porter's hike

BELOW: Eleven photographs of Hidden Passage by Eliot Porter c. 1962



Changing shades of silt concentrations while riding a motor boat down a side canyon of Lake Powell, 2011



Drowned River: The Colorado River and Glen Canyon beneath Lake Powell, 2011.
Inset: Timothy O'Sullivan, *Cañon of the Colorado River near Mouth of San Juan River, Arizona, 1873*

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Selected pages from *The Place No One Knew, Glen Canyon on the Colorado* by Eliot Porter (Sierra Club Books, 1963), reproduced with permission from the Sierra Club.

COVER: Detail of *Still Water in Side Canyon, Lake Powell*, 2012

FRONT END-PAPERS: Map used as the end-papers in *The Place No One Knew, Glen Canyon on the Colorado* by Eliot Porter (Sierra Club Books, 1963).

BACK END-PAPERS: Map annotated by Mark Klett and Byron Wolfe, marked with the locations of Eliot Porter's photographs and used for fieldwork in 2011.