Today’s hike takes us eighteen miles downstream. Luckily it’s not too hot, and we knock off the miles despite a few grumblings here and there. A few miles below Happy Canyon, the Dirty Devil opens to wide sloping benches covered with tamarisk and rabbitbrush. The river alternates between sheer cliffs and low rounded hills covered in cheatgrass. We leave the abundant flowers and thick soil crust behind as we pass into another grazing allotment, the first since before Robbers Roost.

Two fighter jets roar through the canyon filling the sky. I look up. This has happened often enough that I’m no longer scared shitless. I know it’s a couple of flyboys on a quick joyride detouring off radar. I glance up, shake my head and dismiss the intrusion. Yes, there’s another world out there, an insane world, racing by at eight hundred miles per hour. But I feel less and less a part of it. It’s become an abstraction. This river, these rocks, these brethren frolicking in the water, the trees, swallows and ravens, this is The World. How quickly we adapt to the old ways. Yet in three days we’ll be driving to Salt Lake City.

The next morning I draw a long line in the damp sand to represent the Colorado River. I add a few more lines to indicate the Colorado’s tributaries, the San Juan, the Little Colorado, the Escalante, the Dirty Devil, and the Green (which isn’t really a tributary since it has more water than the Colorado). Earlier, I collected all the students’ water bottles and grouped them along the line in the sand. When the thirsty students have gathered, I let them choose a state within the Colorado’s watershed to represent: Wyoming, Colorado, New Mexico, Utah, Arizona, Nevada, and California.
“We’ll add Mexico since it also has a claim on the water. The year is 1922 and the other states are worried about California’s rapid growth. Remember the Doctrine of Prior Appropriation?” I ask.

Blank looks. “Uh, no.”

“Remember during the Homestead Act when you guys all got parcels,” prompts Metta.

“Oh yeah, first come, first serve,” says Bobofet.

“That’s such a playground mentality,” says Sage.

“California is using the water from the river, and thereby establishing water rights. The other states are worried that there won’t be any water left by the time they need it. We have to figure out how to divide the river’s water between these eight political entities. After prolonged debate, we decide to split the Colorado River between upper and lower basin states, Arizona, Nevada, and California form the lower basin, and the others are in the upper basin.”

“What about Mexico?” asks Yucca, standing at the river’s terminus.

“We’re not worried about you right now.”

“Yeah, nobody cares about Mexico,” he says sulkily.

“So, each basin gets 7.5 million acre-feet. The lower basin gets an additional million as a signing bonus to placate California and Arizona.”

“What’s a million acre-feet?” asks Patience.

“An acre-foot is a measurement of water—the amount of water it takes to cover one acre of land one foot deep. Can anybody see any problems with this approach to split the basin?”

“Yeah, it doesn’t really solve anything,” says Mud.

“Yep, Arizona refuses to sign the compact and ends up in an eleven-year court battle with California. Finally in 1952 the Supreme Court decides that California gets 4.4 million acre-feet, Arizona gets 2.8 million, and Nevada gets 300,000.” I hand Sage five empty water bottles, Patience three bottles, and Huckleberry one. “Each liter represents one million acre-feet,” I add.

“How come Nevada gets screwed?” demands Huckleberry.

“The allocation is based upon an amount of irrigable land. Political power also plays a factor. It takes until 1948 for the upper basin states to work out their own allocation. They come up with percentages that, using 7.5 million acre-feet, translate to the Colorado receiving 3.9 million. Metta gets four water bottles. Utah gets one and seven-tenths, and two water bottles go to Seeker. Wyoming and Bobofet get one. New Mexico and Mud end up with 800,000 acre-feet. So now each state has its water allocation?”

“What about Mexico?” insists Yucca.

“Oh right. In 1944 Mexico received 1.5 million acre-feet as result of a treaty. So you get two bottles. Our total allocation is 16.4 million acre-feet. I have here the Colorado River.” I hold up our two water jugs. “In order of
priority, Mexico is guaranteed 1.5 million.” I fill Yucca’s water bottles. “The next in line are the Indian tribes which have senior water rights. Only the tribes along the lower Colorado have established their claims so far, and they get 900,000 acre-feet.” I fill my water bottle nearly full. “Now the lower basin is guaranteed 7.5 million by the Colorado River Compact, and 1990 was the first year that the lower basin used it all. So California gets 4.4 million.” I fill Sage’s bottles. “But they are actually using 5.2 million so we’ll fill them all full. Then Arizona and Nevada. Counting the tribes, Mexico, and California’s excess, we’re at 10.7 million. Now we’ll fill Colorado’s since they’re growing fast and using lots of water.” I pour the remaining water into Metta’s bottles.

“Oops all out. What happened?”

“The river’s over allocated?” suggests Mud.

“Yep, although we’ve allocated 17.3 million acre-feet, the river’s natural flow from 1906 to 1994 averaged only 15.1 million. And that has varied from 4.4 million to 22 million. During the drought from 1954 to 1963, the Colorado averaged only 11.8 million acre-feet. And of course there’s evaporation from reservoirs, leakage through the sandstone, and tamarisk transpiration, all of which account for another 2.2 million acre-feet.”

“Does that mean the river gets dried up?” asks Seaweed.

I nod. “Some years no water from the Colorado reaches the Gulf of Mexico.”

“That’s nuts,” says Seeker.
“Dude, can I like, get some water?” Bobofet holds his water bottle out to Sage.

“So what about us?” asks Mud, representing New Mexico.

“Well, so far the upper basin states aren’t using all their allotment, and California has promised to scale back. On the other hand, several Indian tribes including the Navajo haven’t asserted their water rights yet. So how do we solve this problem?”

“Use less water,” suggests Huckleberry.

“Well, that would be the obvious solution, but what else?”

“Renegotiate the compact,” demands Mud.

“Yeah, they are just now beginning to do that. But if you wanted to make sure everyone got their water, especially in a dry year, what would you do?”

“Build dams!” exclaims Bobofet.

“Exactly. One of the catalysts for the compact was the federal government’s plan to build a giant dam near Las Vegas. When it was built in the thirties, it was the largest man-made structure on earth. Boulder Dam, later renamed Hoover dam, created Lake Mead and allowed the lower basin states to store their water and generate massive amounts of electricity for southern California,” I say, placing a rock in the sand across the lower Colorado.

“This marked the beginning of the great dam building era. The Bureau of Reclamation built dams all along the Colorado and Green Rivers, turning the Colorado River into a giant plumbing system.”

Beginning at the Mexican border, I stick rocks in the sand at Imperial, Lake Havasu, Lake Mohave, in Arizona. At Navajo Reservoir on the San Juan River. At Glen Canyon on the Colorado. At Flaming Gorge and Fountenelle on the Green, and Curecanti on the Gunnison. The Colorado River Basin hosts twenty-nine dams, storing 72 million acre-feet, six times the river’s annual flow. Several more proposed dams were never built, including Junction Dam at the confluence of the Colorado and the Green. This would have backed water 109 miles up the Green and 93 miles up the Colorado, flooding Canyonlands National Park and Moab.

Authorized by Congress in 1956, the Colorado River Storage Project (CRSP) used river basin accounting to justify building large cash register dams to generate hydro power to pay for various irrigation projects. CRSP authorized some of the most destructive dams in the country, Flaming Gorge, Curecanti, Navajo, and Glen Canyon, the lynchpin in the system. However, a smaller dam at the confluence of the Green and Yampa in Dinosaur National Monument captured all the attention when CRSP moved through Congress. David Brower and the Sierra Club successfully led a nationwide fight to save Dinosaur National Monument from flooding.
The environmental groups felt they scored a major victory when Congress agreed to drop Dinosaur from the CRSP. But once David Brower visited Glen Canyon and saw what would be lost, he continued to lobby Stewart Udall, Secretary of the Interior, to stop the project.

Stewart Udall, however, was from Arizona. The Glen Canyon Dam would be built just a few miles upstream from Lee’s Ferry, the demarcation between the upper and lower basins. A giant reservoir at Glen Canyon would insure that the lower basin would always get their allotted water even in times of drought. The dam would also generate cheap electricity for the growing Southwest.

Visiting Glen Canyon after construction on the dam had already begun, Udall became enamored with the canyon country and pushed for a series of parks along the Colorado, perhaps to mollify his conscience for vigorously supporting Glen Canyon Dam. He proposed enlarging Rainbow Bridge National Monument to 274,000 acres, lobbied for protection of the Escalante country, and helped create Canyonlands National Park in 1964. Udall sought what he viewed as a balance between power generation, recreation, and wilderness. Yet in 1963 Udall announced the proposal to build two dams in the Grand Canyon. Conservation groups again led by David Brower and the Sierra Club beat back the proposals to build dams at either end of the Grand Canyon. Congress approved a $1.3 billion Colorado River Basin project, which prohibited future construction of dams between Glen Canyon and Hoover dams and instead sanctioned the construction of a coal-fired power plant at Page, Arizona. The Navajo power plant uses coal strip-mined from the Navajo reservation and, as the country’s single largest source of particulate pollution, is responsible for the haze that visitors to the Grand Canyon now experience.

Years later Udall told me that approving Glen Canyon Dam was the biggest mistake he had ever made. Even Barry Goldwater, upon retirement, stated that if he could have changed one vote in his entire Senate career, it would have been the one approving Glen Canyon Dam.

The numbers behind Glen Canyon Dam are as staggering as the edifice itself. It stands 710 feet high and contains 10 million tons of concrete, enough to build a highway across the U.S. At 186 miles long, Lake Powell is the world’s longest reservoir; it boasts 2,000 miles of shoreline and contains 33 million acre-feet of water, twice the annual flow of the entire Colorado.

In the spring of 1963, construction was completed on the dam, and the reservoir began to fill, a process that would take seventeen more years. By 1966 Glen Canyon Dam was generating one million, three hundred thousand kilowatts, enough to supply a city of one million.
While the dam was being constructed, teams of archaeologists scoured the canyons cataloging rock art and Anasazi ruins, desperately trying to salvage all the artifacts before they were inundated. The teams recorded more than two thousand archeological sites, including multi-story dwellings, kivas, and villages. Undoubtedly, the hurried survey bypassed hundreds more. Some of the sites were unique, such as a masonry dam, stone-lined ditches, and agricultural terraces, rare evidence of Anasazi irrigation.

The free-flowing Colorado had also created a particular set of conditions to which dozens of species had evolved suburb adaptations. The dam changed that, flooding out the heart of the river system and isolating aquatic populations up and downstream. Eight fish species were pushed to the brink of extinction.

Not just archeological sites and valuable habitat were lost, but something even more precious. As one of the last to float through Glen Canyon, even as the concrete was being poured, Ed Abbey stated, “The canyonlands did have a heart, a living heart, and that heart was Glen Canyon and the wild Colorado.” Of the one hundred and forty-nine miles that were once Glen Canyon Wallace Stegner wrote, “As beautiful as any of the canyons, it is almost absolutely serene, an interlude for a pastoral flute. . . . Its walls are the monolithic Navajo sandstone, sometimes smooth and vertical, rounding off to domes at the rims, sometimes undercut by great arched caves, sometimes fantastically eroded by slit side canyons, alcoves, grottoes green with redbud and maidenhair and with springs of sweet water.”

Buried forever beneath the mud are places like Cathedral in the Desert and Music Temple, named by John Wesley Powell because, “When ‘Old Shady’ sings us a song at night we are pleased to find that this hollow in the rock is filled with sweet sounds. It was doubtless made for an academy of music by its storm-born architects so we name it Music Temple.” Powell and his men were so taken with Music Temple that they stayed an extra day, despite their low rations.

On his first voyage down the Colorado, Powell wrote, “On the walls, and back many miles into the country, [a] number of monument-shaped buttes are observed. So we have a curious ensemble of wonderful features—carved walls, royal arches, glens, alcove gulches, mounds and monuments. From which of these features shall we select a name? We decide to call it Glen Canyon.”

Bestowing the Major’s name upon the reservoir may be the ultimate insult to a man who spent the last thirty years of his life fighting against the megalomaniacal attempt to turn the arid West into a hydraulic empire that consolidates power into the hands of a few wealthy industrialists.
From the Mormons, Powell saw how cooperative irrigation could be used more efficiently than competition based on prior appropriation, which he felt would turn agriculture into a monopoly dominated by a few wealthy capitalists. Powell realized that not only was irrigation essential for settlement in the arid West, but that it was beyond the individual’s capabilities. This left three possibilities: private capital, which would monopolize and control the water; government control and distribution; or community cooperation. He advocated the third option in bills to Congress that would provide for the establishment of irrigation districts capable of self-government and communal water rights.

Powell advised against the prevailing land settlement patterns of arbitrary and indiscriminate homesteading. Instead he suggested that the land should be classified as to what purpose it best serves and that settlement be dictated by the nature of the terrain. Instead of a rectangular grid of forty acre parcels, “Powell proposed surveys based on the topography, letting farms be as irregular as they had to be to give everyone a water frontage and a patch of irrigable soil,” wrote Wallace Stegner. Powell believed the West should be settled along watersheds controlled by cooperative communities.

All this appeared in Powell’s Report on the Lands of the Arid Region of the United States. Released in 1878, the report boldly indicated that most of the West was in fact arid, and thus largely uninhabitable. Perhaps only twenty percent could support irrigated agriculture. This was not what western politicians and economic boosters wanted to hear.

Stegner summarized Powell’s report, “Embodied in the scant two hundred pages of his manuscript—actually in the first two chapters of it—was a complete revolution in the system of land survey, land policy, land tenure, and farming methods in the West, and a denial of almost every cherished fantasy and myth associated with the Westward migration and the American dream of the Garden of the World. Powell was not only challenging political forces who used popular myths for a screen, he was challenging the myths themselves, and they were as rooted as the beliefs of religion.”

In 1889 Powell persuaded the Interior Department to close all lands west of the hundredth meridian to settlement until he completed his study of the potentially irrigable lands. This infuriated western politicians, who wanted development to proceed as rapidly as possible. Congress overturned the withdrawal the following year. In 1893 at a meeting of irrigation boosters, Powell warned, “There is not water enough in all the arid region to irrigate the lands which the Government has already disposed of.” Despite the heckling, he continued, “You are piling up a heritage of conflict and litigation over water rights for there is not sufficient water to supply the land.”
They ignored him and persuaded Congress to create the Bureau of Reclamation.

Originally conceived to help farmers develop irrigation, the Bureau, as it became known, developed a personality and life of its own and quickly became the nation’s premier dam building entity. Smaller irrigation projects were subsumed for the glory of large hydro facilities.

A natural outlet for boosterism, the Bureau also dabbled in image making. Bureau officials thought calling it a lake rather than Powell Reservoir would sound more attractive to tourists they hoped would flock to the area. And flock they did. When Glen Canyon Dam was authorized in 1956, the U.S. Geological Survey listed the region as the most isolated in the contiguous U.S., containing the fewest people, roads, and towns. Now Lake Powell receives more than 3.5 million visitors every year.

In addition to flooding an entire canyon system, placing a dam just above the Grand Canyon has created a host of environmental effects downstream. Glen Canyon Dam functions as a giant silt trap. The world’s siltiest river, seventeen times siltier than the Big Muddy, the Colorado contains eleven tons of silt for every acre-foot of water. The Colorado and San Juan rivers contribute 66 million tons of silt annually to Lake Powell, burying Stanton’s dredge beneath hundreds of feet of sediment. Bureau engineers estimate Lake Powell will completely fill with silt in seven hundred years and Glen Canyon Dam will become a monumental waterfall. Other estimates place the reservoir’s life span at as little as a hundred and fifty years. Furthermore, the sediment contains naturally occurring heavy metals that build up, move through the water table, and bioaccumulate in fish and birds. Because of these toxins, the EPA recommends limiting consumption of fish taken from Lake Powell.

More immediate, however, is the loss of that silt downstream. Drawn from the depths of the reservoir, the river emerges from the dam cold and clear, perfect for exotic trout, but deadly for native fish adapted to warm, muddy water.

The dam allows the Colorado River to be turned on and off like a spigot to meet peak power demands, wreaking havoc downstream where river levels fluctuate as much as thirteen feet. Prior to Glen Canyon Dam, the river ran warm and muddy with huge seasonal fluctuations. Once the floodgates closed, the seasonal fluctuations were replaced with daily fluctuations in response to the electrical demands of the Southwest. When the air conditioners in L.A. and Phoenix come on, the river level skyrocketed and then nearly dries up at night when the demand for electricity drops. The Grand Canyon’s riparian area supports more than five thousand species, nearly all of which are stressed by the wildly fluctuating water levels. The daily fluctuations also destroy
precious beaches and sandbars. After much negotiation and pressure from the multi-million dollar rafting industry, in 1993 the Bureau began moderating the water level and leaving more water in the river continuously.

Then in the spring of 1996, a remarkable event took place: an artificially created flood. Recognizing that the river was more than just a plumbing system to delivery water and electricity, the Department of Interior agreed to open up the floodgates, bypass the generators, and create a flood through the Grand Canyon to mimic the normal spring runoff. This week-long flood sacrificed millions of dollars in lost electrical generation to restore beaches and habitat, such as backwaters and lagoons crucial for imperiled species. However, the much-heralded flood turned out to be a temporary Band-Aid, as more than eighty percent of the new beaches collapsed back into the river within the year.

Nevertheless, the Bureau's hold on the river had begun to crack. In October the floodgates of public consciousness were thrown wide open when the newly formed Glen Canyon Institute began serious talks with Bureau engineers and officials about decommissioning the dam. After a three-decade hiatus, David Brower was now on the board of directors of the Sierra Club, and soon the Sierra Club voted to endorse the proposal to drain Lake Powell. Representative James Hansen of Utah held congressional hearings to put an end to this crackpot idea. Instead, the hearings attracted public attention and support for the proposal. Dan Beard, former chief of the Bureau, even praised the notion of draining Lake Powell.

Dave Wegner, architect of the artificial flood and a twenty-two-year veteran of the Bureau, now works for the Glen Canyon Institute, conducting a Citizens Environmental Assessment to study the environmental costs of Glen Canyon Dam and restoration options. “If you want to restore the Grand Canyon ecosystem, removing the dam is the only long term solution,” stated Wegner.

While physical removal of the dam is daunting, decommissioning would allow the river to bypass the dam, resulting in nearly half a million acre-feet flowing to the Gulf of California and restoring Colorado River Delta, as well as Glen Canyon. The river would also gain the nearly one million acre-feet lost to evaporation and leakage from Lake Powell every year. Delivered to California, that lost water is worth nearly a billion dollars.

The legions of motorboats that dump the equivalent of an Exxon Valdez oil spill into Lake Powell every four years would be gone, but there would still be an enormous mess to clean up. One can only imagine how many beer cans, lawn chairs, and car batteries lie at the bottom of Lake Powell. And the accumulated silt. Would it take centuries or just a few good floods to scour the canyon of monumental hubris?
Nature, however, may not wait for us to complete all the studies, build the popular support and political will to drain Lake Powell. In June of 1983, high runoff, not predicted in the computer models, caught the Bureau off guard. To keep the water from cresting over the dam and wiping out the power plant below, Bureau officials opened up the spillway tunnels that run through the canyon walls around the dam. Although the spillway tunnels were designed to handle 138,000 cubic feet per second, they began to degrade at 10,000 cubic feet per second. The water came crashing through the tunnels ripping out the concrete lining and disgorging huge pieces of concrete and rebar. Bureau employees managed to close the spillways before the river eroded into the sandstone and undermined the dam’s foundation. For seven weeks Bureau officials sweated as the lake level kept increasing. Floaters in the Grand Canyon were even evacuated by helicopter. The reservoir finally peaked just seven feet below the crest of the dam.

Is a river a living being, a dynamic system? Or simply the water’s response to gravity? Regardless, the river is, and our response to it says something about ourselves. Perhaps this is the best reason for restoring Glen Canyon. What does it say about us as a people, if we are able to admit to making a colossal mistake and then use our ingenuity and creativity to restore the river? However, a shift in consciousness, may still be a long ways off. Congress recently appropriated funding for the Animas-La Plata Project or A-LP. A-LP would consist of damming the Animas River, a free flowing tributary of the San Juan, and pumping the water five hundred feet up a ridge to another reservoir. From there the water would be pumped another five hundred feet over Red Mesa to irrigate alfalfa and grain crops. The last of the dinosaur dams, A-LP was first authorized in 1968 and has limped along ever since despite a $710 million price tag and the impact upon two endangered fish.

For the past six weeks we’ve followed this river from its origins to its fate. From desiccated badlands to cottonwood Eden, from spectacular slots to grandiose vistas. We’ve held our noses at the rotting cow carcasses and rolled joyously in its silky mud. Its waters quench our thirst, cook our food, loosen our boots. At what point did revulsion become love? The river flowed patiently while we changed. It remained constant, ever changing, while we moved toward consistency.

Ten years is an absurdly short time to try and know anything. Especially something as complex as a river. I thought I knew where the channel was, but it always changed. I thought I could predict quicksand and found myself mired. I thought I could read the river and found I was illiterate.
Sometimes when I sit and listen patiently without asking questions, seeking no answers, I can almost discern fragments of the language of rivers. A language older than humanity, a language that the heron wades into, a language spoken by water and rock. A language spoken so slowly that a human lifetime measures one sentence.