UNDER A WHITE SKY

THE NATURE OF THE FUTURE

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PULITZER PRIZE-WINNING AUTHOR OF *THE SIXTH EXTINCTION*

WITH A NEW AFTERWORD BY THE AUTHOR

"Beautifully and insistently, Kolbert shows us that it is time to think radically about the ways we manage the environment." —Helen Macdonald, *The New York Times Book Review*

2022 Crown Trade Paperback Edition

Published in the United States by Crown, an imprint of Random House, a division of Penguin Random House LLC, New York.

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Originally published in hardcover in the United States by Crown, an imprint of Random House, a division of Penguin Random House LLC, New York, in 2021.

Portions of this work originally appeared in *The New Yorker*.

Library of Congress Cataloging-in-Publication Data

Names: Kolbert, Elizabeth, author.
Title: Under a white sky / Elizabeth Kolbert.
Description: First edition. | New York: Crown, [2021] | Includes bibliographical references and index.
Identifiers: LCCN 2020047398 (print) | LCCN 2020047399 (ebook) | ISBN 9780593136287 | ISBN 9780593238776 | ISBN 9780593136294 (ebook)
Subjects: LCSH: Nature—Effect of human beings on. | Human ecology. | Environmental protection. | Ecological engineering. | Sustainability.
Classification: LCC GF75 .K65 2021 (print) | LCC GF75 (ebook) | DDC 304.2/8—dc23
LC record available at lccn.loc.gov/2020047398
LC ebook record available at lccn.loc.gov/2020047399

Printed in the United States of America on acid-free paper

crownpublishing.com

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Book design by Simon M. Sullivan

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DOWN THE RIVER

other canal, known as the Cal-Sag. At the meeting of the waters, there's a V-shaped park, featuring picturesque waterfalls. Like just about everything else on our route, the waterfalls are manufactured.

If Chicago is the City of the Big Shoulders, the Sanitary and Ship Canal might be thought of as its Oversized Sphincter. Before it was dug, all of the city's waste—the human excrement, the cow manure, the sheep dung, the rotting viscera from the stockyards—ran into the Chicago River, which, in some spots, was so thick with filth it was said a chicken could walk from one bank to the other without getting her feet wet. From the river, the muck flowed into Lake Michigan. The lake was—and remains—the city's sole source of drinking water. Typhoid and cholera outbreaks were routine.

The canal, which was planned in the closing years of the nineteenth century and opened at the start of the twentieth, flipped the river on its head. It compelled the Chicago to change its direction, so that instead of draining into Lake Michigan, the city's ordure would flow away from it, into the Des Plaines River, and from there into the Illinois, the Mississippi, and, ultimately, the Gulf of Mexico. WATER IN CHICAGO RIVER NOW RESEMBLES LIQUID, ran the headline in *The New York Times*.

The reversal of the Chicago was the biggest public-works project of its time, a textbook example of what used to be called, without irony, the control of nature. Excavating the canal took seven years and entailed the invention of a whole new suite of technologies—the Mason & Hoover Conveyor, the Heidenreich Incline—which, together, became known as the Chicago School of Earth Moving. In total, forty-three million cubic yards of rock and soil were gouged out, enough, one admiring commentator calculated, to build an island more than fifty feet high and a mile square. The river made the city, and the city remade the river.

But reversing the Chicago didn't just flush waste toward St. Louis. It also upended the hydrology of roughly two-thirds of the United States. This had ecological consequences, which had financial consequences, which, in turn, forced a whole new round of interventions on the backward-flowing river. It is toward these that *City Living* is cruising. We're approaching cautiously, though maybe not cautiously enough, because at one point *City Living* almost gets squished between two double-wide barges. The deckhands yell down instructions that are initially incomprehensible, then become unprintable.

About thirty miles up the down river—or is it down the up river?—we draw near our goal. The first sign that we're getting close is a sign. It's the size of a billboard and the color of a plastic lemon. WARNING, it says. NO SWIMMING, DIVING, FISHING, OR MOORING. Almost immediately there's another sign, in white: SUPERVISE ALL PASSENGERS, CHILDREN, AND PETS. Several hundred yards farther along, a third sign appears, maraschino red. DANGER, it states. ENTERING ELECTRIC FISH BARRIERS. HIGH RISK OF ELECTRIC SHOCK.

Everyone pulls out a cell phone or a camera. We photograph the water, the warning signs, and each other. There's joking on board that one of us should dive into the river electric, or at least stick a hand in to see what happens. Six great blue herons, hoping for an easy dinner, have gathered, wing to wing, on the bank, like students waiting on line in a cafeteria. We photograph them, too.

That man should have dominion "over all the earth, and over every creeping thing that creepeth upon the earth," is a prophecy that has hardened into fact. Choose just about any metric you want and it tells the same story. People have, by now, di-

rectly transformed more than half the ice-free land on earth—some twenty-seven million square miles—and indirectly half of what remains. We have dammed or diverted most of the world's major rivers. Our fertilizer plants and legume crops fix more nitrogen than all terrestrial ecosystems combined, and our planes, cars, and power stations emit about a hundred times more carbon dioxide than volcanoes do. We now routinely cause earthquakes. (A particularly damaging human-induced quake that shook Pawnee, Oklahoma, on the morning of September 3, 2016, was felt all the way in Des Moines.) In terms of sheer biomass, the numbers are stark-staring: today people outweigh wild mammals by a ratio of more than eight to one. Add in the weight of our domesticated animals—mostly cows and pigs—and that ratio climbs to twenty-two to one. "In fact," as a recent paper in the *Proceedings of the National Academy of Sciences* observed, "humans and livestock outweigh all vertebrates combined, with the exception of fish." We have become the major driver of extinction and also, probably, of speciation. So pervasive is man's impact, it is said that we live in a new geological epoch—the Anthropocene. In the age of man, there is nowhere to go, and this includes the deepest trenches of the oceans and the middle of the Antarctic ice sheet, that does not already bear our Friday-like footprints.

An obvious lesson to draw from this turn of events is: be careful what you wish for. Atmospheric warming, ocean warming, ocean acidification, sea-level rise, deglaciation, desertification, eutrophication—these are just some of the by-products of our species's success. Such is the pace of what is blandly labeled "global change" that there are only a handful of comparable examples in earth's history, the most recent being the asteroid impact that ended the reign of the dinosaurs, sixty-six million years ago. Humans are producing no-analog climates, no-analog eco-

systems, a whole no-analog future. At this point it might be prudent to scale back our commitments and reduce our impacts. But there are so many of us—as of this writing nearly eight billion—and we are stepped in so far, return seems impracticable.

And so we face a no-analog predicament. If there is to be an answer to the problem of control, it's going to be more control. Only now what's got to be managed is not a nature that exists—or is imagined to exist—apart from the human. Instead, the new effort begins with a planet remade and spirals back on itself—not so much the control of nature as the *control of* the control of nature. First you reverse a river. Then you electrify it.

The United States Army Corps of Engineers has its Chicago District headquarters in a Classical Revival building on LaSalle Street. A plaque outside the building explains that it was the site of the General Time Convention of 1883, held to sync the country's clocks. The process involved pruning dozens of regional time zones down to four, which, in many towns, resulted in what's become known as the "day with two noons."

Since its founding, under President Thomas Jefferson, the Corps has been dedicated to out-scaled interventions. Among the many world-altering undertakings it's had a shovel in are: the Panama Canal, the St. Lawrence Seaway, the Bonneville Dam, and the Manhattan Project. (To build the atomic bomb, the Corps created a new division; it called this the Manhattan District to disguise the project's true purpose.) It is a sign of the times that the Corps finds itself increasingly involved in backward-looping, second-order efforts, like managing the electric barriers on the Sanitary and Ship Canal.

One morning not long after my boat trip with the Friends, I visited the Corps' Chicago office to talk with the engineer in

charge of the barriers, Chuck Shea. The first thing I noticed on arriving was a pair of giant Asian carp, mounted on rocks, next to the reception desk. Like all Asian carp, they had eyes near the bottom of their heads, so it looked as if they'd been mounted upside down. In a curious commingling of fake fauna, the plastic fish were surrounded by little plastic butterflies.

"I never would have pictured when I was studying engineering years ago that I would spend so much time thinking about a fish," Shea told me. "But, actually, it's pretty good for party conversation." Shea is a slight man with graying hair, wire-rimmed glasses, and the diffidence that comes from dealing with problems words can't solve. I asked him how the barriers worked, and he stuck out his hand, as if to shake mine.

"We pulse electricity into the waterway," he explained. "And basically you just have to transmit enough electricity to the water to ensure that you're getting an electrical field throughout the area.

"The electric-field strength is increasing as you move from upstream to downstream or vice versa, so if my hand were a fish, its nose is here," he continued, indicating the tip of his middle finger, "and its tail is here." He pointed to the base of his palm, then set the outstretched hand wiggling.

"What happens is, the fish is swimming in, and its nose is experiencing one electrical voltage, and its tail is experiencing another. That's what makes the current actually flow through the body. It's the current flowing through a fish that will shock them or electrocute them. So a big fish has a big voltage difference from its nose to its tail. A smaller fish doesn't have that much distance for the voltage to cover, so the shock is smaller."

He sat back and dropped his hand into his lap. "The good news is that Asian carp are very big fish. They're public enemy number one." A person, I noted, is pretty big, too. "All people

zapping it with ozone, using power-plant effluent to heat the water, and installing giant filters. It even looked into loading the canal with nitrogen to create the sort of anoxic environment typically associated with raw sewage. (This last option was rejected in part owing to its cost—an estimated $250,000 a day.) Electrification won out because it was cheap and seemed the most humane option. Any fish approaching the barrier would, it was hoped, be repelled before it was actually killed.

The first electric barrier went live on April 9, 2002. The species it was originally supposed to repel was a frog-faced interloper called the round goby. The round goby is a native of the Caspian Sea and an aggressive consumer of other fishes' eggs. It had established itself in Lake Michigan, and the fear was it would use the Sanitary and Ship Canal to swim out of the lake and into the Des Plaines River. From there, it could swim into the Illinois River and on to the Mississippi. But, as Shea put it to me, "Before the project could be activated, the round goby was already on the other side." It became a case of electrifying the canal after the fish had bolted.

Meanwhile, other invaders—Asian carp—were moving in the opposite direction, up the Mississippi, toward Chicago. If the carp got through the canal, they would, it was feared, wreak havoc in Lake Michigan, before moving on to wreak more havoc in Lakes Superior, Huron, Erie, and Ontario. One Michigan politician warned the fish could "ruin our way of life."

"Asian carp are a very good invasive species," Shea told me. Then he corrected himself: "Well, not 'good'—they're good at being invasive. They're adaptable and they're able to thrive in a lot of different environments. And that's what makes them so difficult to deal with."

The Corps later installed two additional barriers on the canal, which significantly upped the voltage, and, at the time of my

visit, it was replacing the original barrier with a more powerful version. It was also planning to take the fight to a whole new level, by installing a barrier that featured loud noise and bubbles. The cost of the bubble barrier was first estimated at $275 million, then later rose to $775 million.

"People joke about it being a disco barrier," Shea said. It was a line, it occurred to me, he might well have used at a party.

Though people often talk about Asian carp as if it were a single species, the term is a catchall for four fish. All four are native to China, where they're referred to collectively as 四大家鱼, a phrase that translates into English roughly as the "four famous domestic fishes." The Chinese raise the famous four together in ponds and have been doing so since the thirteenth century. The practice has been called "the first documented example of integrated polyculture in human history."

Each of the famous four has its own special talent, and when they join forces, they are, like the Fantastic Four, pretty much unstoppable. Grass carp (*Ctenopharyngodon idella*) eat aquatic plants. Silver carp (*Hypophthalmichthys molitrix*) and bighead carp (*Hypophthalmichthys nobilis*) are filter feeders; the two fish suck water in through their mouths and then rake out the plankton using comb-like structures in their gills. Black carp (*Mylopharyngodon piceus*) eat mollusks, like snails. Throw farm clippings into a pond and the grass carp will eat them. Their waste will promote algae growth. The algae will then feed silver carp and also tiny aquatic animals, like water fleas, the preferred diet of bighead carp. This system has allowed the Chinese to harvest immense quantities of carp—almost fifty billion pounds in 2015 alone.

In the sort of irony the Anthropocene teems with, the number

of free-swimming carp in China has crashed even as pond-raised populations have soared. Thanks to projects like the Three Gorges Dam, on the Yangtze, river fish are having trouble spawning. The carp are thus at once instruments of human control and victims of it.

The four famous fish ended up in the Mississippi, at least in part, owing to *Silent Spring*—another Anthropocene irony. In the book, whose working title was *The Control of Nature*, Rachel Carson denounced the very idea.

"The 'control of nature' is a phrase conceived in arrogance, born of the Neanderthal age of biology and philosophy, when it was supposed that nature exists for the convenience of man," she wrote. Herbicides and pesticides represented the very worst kind of "cave man" thinking—a club "hurled against the fabric of life."

The indiscriminate application of chemicals was, Carson warned, harming people, killing birds, and turning the country's waterways into "rivers of death." Instead of promoting pesticides and herbicides, government agencies ought to be eliminating them; "a truly extraordinary variety of alternatives" were available. An alternative Carson particularly recommended was setting one biological agent against another. For instance, a parasite could be imported to feed on an unwanted insect.

"In that book the problem—the villain—was the broad, almost unrestricted use of chemicals, particularly the chlorinated hydrocarbons, like DDT," Andrew Mitchell, a biologist at an aquaculture research center in Arkansas who's studied the history of Asian carp in America, told me. "So that's the context of all this: How are we going to get rid of this heavy chemical usage and still have some sort of control? And that probably has as much to do with the importation of carp as anything. These fish were biological controls."

One year after *Silent Spring*'s publication, in 1963, the U.S. Fish and Wildlife Service brought the first documented shipment of Asian carp to America. The idea was to use the carp, much as Carson had recommended, to keep aquatic weeds in check. (Weeds like Eurasian watermilfoil—another introduced species—can clog lakes and ponds so thoroughly that boats or even swimmers can't get through.) The fish were baby grass carp—"fingerlings"—and they were raised at the agency's Fish Farming Experimental Station in Stuttgart, Arkansas. Three years later, biologists at the station succeeded in getting one of the carp—now grown—to spawn. Thousands more fingerlings resulted. Pretty much immediately, some escaped. Baby carp made their way into the White River, a tributary of the Mississippi.

Later, in the 1970s, the Arkansas Game and Fish Commission found a use for silver and bighead carp. The Clean Water Act had just been passed, and local governments were under pressure to comply with the new standards. But a lot of communities couldn't afford to upgrade their sewage-treatment plants. The Game and Fish Commission thought that stocking carp in treatment ponds might help. The carp would reduce the nutrient load in the ponds by consuming the algae that thrived on the excess nitrogen. For one study, silver carp were placed in treatment lagoons in Benton, a suburb of Little Rock. The fish did indeed reduce the nutrient load before they, too, escaped. No one is quite sure how, because no one was watching.

"At the time, everybody was looking for a way to clean up the environment," Mike Freeze, a biologist who worked with carp at the Arkansas Game and Fish Commission, told me. "Rachel Carson had written *Silent Spring*, and everybody was concerned about all the chemicals in the water. They weren't nearly as concerned about non-native species, which is unfortunate."

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The fish—mostly silver carp—lay in a bloody heap. There were scores of them, and they'd been tossed alive into the boat. I'd been watching them pile up for hours, and while the ones at the bottom were, I figured, by now dead, those on top continued to gasp and thrash. I thought I could detect an accusatory glint in their low-set eyes, but I had no idea if they could even see me or whether this was just projection.

It was a sultry summer morning a few weeks after my trip on *City Living*. The gasping carp, a trio of biologists employed by the state of Illinois, several fishermen, and I were all bobbing on a lake in the town of Morris, about sixty miles southwest of Chicago. The lake had no name, having started off as a gravel pit. To get access to it, I'd had to sign a release form from the company that owned it, stating that, among other things, I was not carrying any firearms and would not smoke or use "flame-producing devices." The form showed the outline of the pit-turned-lake, which looked like a child's drawing of a tyrannosaurus. Where the tyrannosaurus's navel would be, if tyrannosauruses had had navels, was a channel linking the lake to the Illinois River. This arrangement accounted for the carp. Carp need moving water to reproduce—either that or injections of hormones—but once they're done spawning, they like to retreat to slack water to feed.

Morris might be thought of as the Gettysburg in the war against Asian carp. South of the town, the carp are legion; north of it they are rare (though how rare is a matter of debate). A great deal of time, money, and fish flesh are devoted to trying to keep things this way. The process is known as "barrier defense," and it's supposed to prevent large carp from reaching the electric barriers. If electrocution were a fail-safe deterrent, then barrier defense wouldn't be necessary, but no one I spoke to, and this

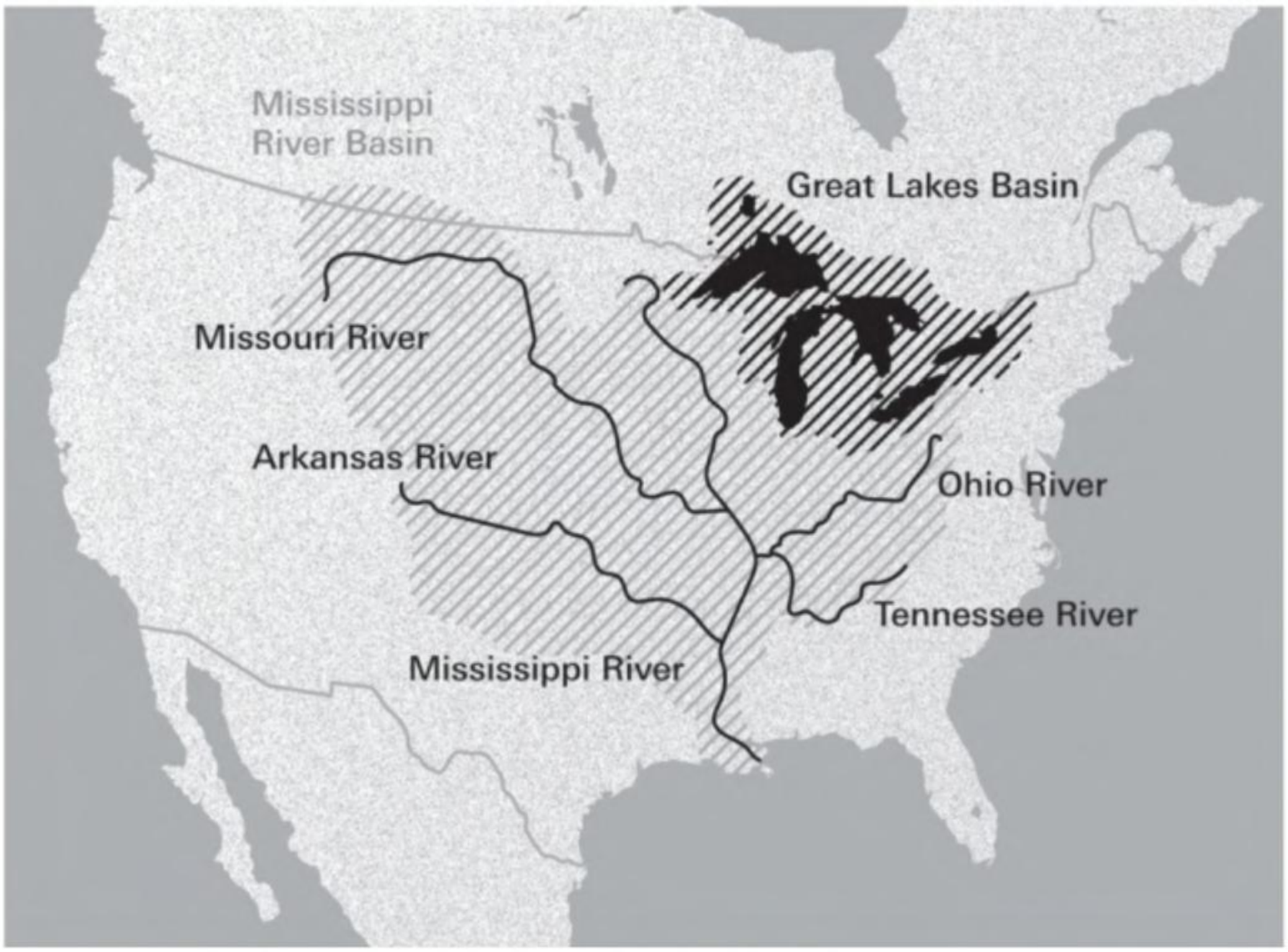
boats on trailers and, with the carp still in them, drove into town. The fish, now inert and glassy-eyed, were dumped into a waiting semi-trailer.

This round of barrier defense continued for another three days. The final tally was six thousand four hundred and four silver carp and five hundred and forty-seven bighead. Collectively, the fish weighed more than fifty thousand pounds. They were shipped west in the semi, to be ground into fertilizer.

The Mississippi River's drainage basin is the third largest in the world, exceeded in area only by the Amazon's and the Congo's. It stretches over more than 1.2 million square miles and encompasses thirty-one states and slices of two Canadian provinces. The basin is shaped a bit like a funnel, with its spout sticking into the Gulf of Mexico.

The Great Lakes' drainage basin is also vast. It extends over three hundred thousand square miles and contains eighty percent of North America's fresh surface water supply. This system, which has the shape of an overfed seahorse, drains east into the Atlantic, by way of the St. Lawrence River.

The two great basins abut each other, but they are—or were—distinct aquatic worlds. There was no way for a fish (or a mollusk or a crustacean) to climb out of one drainage system and into the other. When Chicago solved its sewage problem by digging the Sanitary and Ship Canal, a portal opened up, and the two aquatic realms were connected. For most of the twentieth century, this wasn't much of an issue; the canal, loaded with Chicago's waste, was too toxic to serve as a viable route. With the passage of the Clean Water Act and the work of groups like the Friends of the Chicago River, conditions improved, and creatures like the round goby began to slip through.



The Chicago River's reversal connected two great drainage basins.

In December 2009, the Corps shut down one of the electrical barriers on the canal to perform routine maintenance. The nearest Asian carp was believed to be fifteen miles downstream. Still, as a precaution, the Illinois Department of Natural Resources dosed the water with two thousand gallons of poison. The result was fifty-four thousand pounds of dead fish. In the mix, one Asian carp—a twenty-two-inch-long bighead—was discovered. Doubtless many fish had sunk to the bottom before they could be netted. Were there more Asian carp among them?

The reaction from neighboring states was fierce. Fifty members of Congress signed a letter to the Corps, expressing their dismay. "There may be no greater threat to the ecosystem of the Great Lakes than the introduction of the Asian carp," the letter said. Michigan filed a lawsuit, demanding that the link between

the drainage systems be broken. The Corps studied the options and then, in 2014, released a two-hundred-thirty-two-page report.

According to the Corps' assessment, reimposing "hydrologic separation" would, indeed, be the most effective way to keep carp out of the Great Lakes. It would also, in the Corps' estimate, take twenty-five years—three times as long as the original digging of the canal had—and cost up to $18 billion.

Many experts I spoke to said the billions would be money well spent. They pointed out that each of the two drainage basins has its own roster of invasives, some, like the carp, brought over intentionally, but most introduced accidentally, in ballast water. On the Mississippi side, these include: Nile tilapia, Peruvian watergrass, and convict cichlid from Central America. On the Great Lakes side are: sea lamprey, threespine stickleback, fourspine stickleback, spiny waterflea, fishhook waterflea, New Zealand mud snail, European valve snail, European ear snail, greater European pea clam, humpbacked pea clam, Henslow pea clam, red swamp crayfish, and bloody red shrimp. The surest way to control the invaders would be to plug the canal.

But no one who spoke up for "hydrologic separation" said they thought it would ever happen. To re-replumb Chicago would mean rerouting the city's boat traffic, redesigning its flood controls, and revamping its sewage-treatment system. There were too many constituencies with a vested interest in the way things were. "Politically, it just would never move," the leader of one group that had pushed for separation but had eventually given up on the idea told me. It was a lot easier to imagine changing the river once again—with electricity and bubbles and noise and anything else anyone could dream up—than changing the lives of the people around it.

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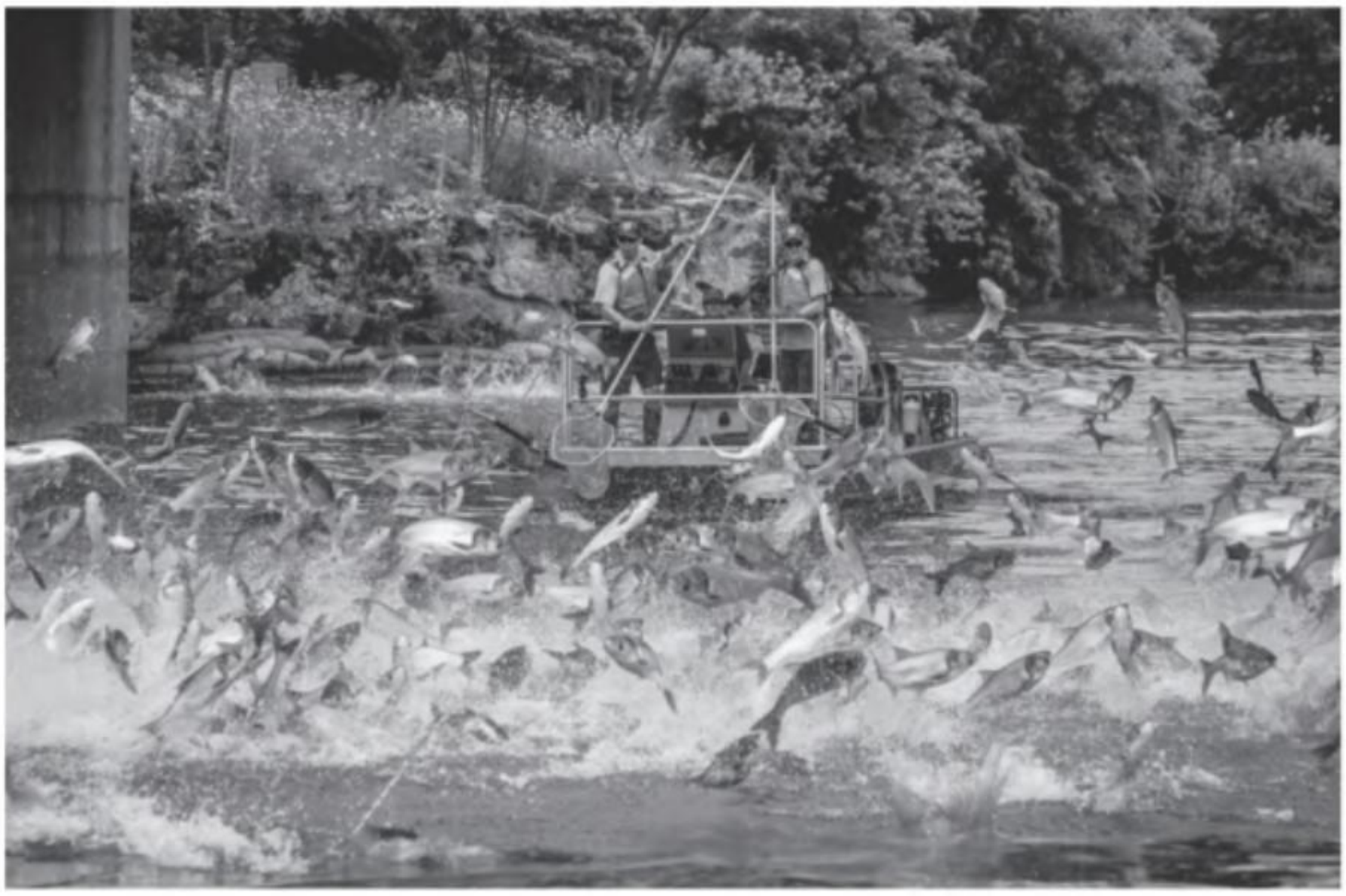
The first time I got hit by a carp was near the town of Ottawa, Illinois. It felt like someone had slammed me in the shin with a Wiffle-ball bat.

What people really notice about Asian carp—what literally leaps out at them—is that silver carp jump. One noise that sends them jumping is the thrum of an outboard motor, so waterskiing in carp-infested areas of the Midwest has become its own version of an extreme sport. The sight of silver carp arcing through the air is at once beautiful—like attending a piscine ballet—and terrifying—like facing incoming fire. One of the fishermen I met in Ottawa told me he'd been knocked unconscious by an encounter with a flying carp. A second said he'd long ago lost track of his carp-related injuries, because "you pretty much get hit every day." A woman I read about was knocked off her Jet Ski by a carp and survived only because a passing boater noticed her life jacket bobbing in the water. Countless videos of carp acrobatics



Silver carp, when startled, fling themselves out of the water.

are available on YouTube, with titles like "Asian Carpocalypse" and "The Attack of the Jumping Asian Carp." The town of Bath, Illinois, which sits on a particularly carp-rich stretch of river, has tried to cash in on the mayhem by holding an annual "redneck fishing tournament," which participants are encouraged to attend in costume. "Protective gear is highly recommended!" the tournament's website advises.

The day I got hit, I was out on the Illinois River with another group of contract fishermen doing "barrier defense." Also on the trip were several other tagalongs, including a professor named Patrick Mills. Mills teaches at Joliet Junior College, which is just a few miles from the spot where the Corps is hoping to erect its "disco" noise-and-water-jet barrier. "Joliet is kind of the tip of the spear," he told me. He was wearing a Joliet Junior College baseball cap with a GoPro camera clipped to the bill.

Mills was one of several people I met in Illinois who, for reasons that were not always entirely clear to me, had decided to throw themselves into the fight against Asian carp. A chemist by training, he'd developed a special kind of flavored bait that was supposed to attract carp to the nets. With the help of a local confectioner, he'd produced a truckload of prototypes. These were the size and shape of bricks and made mostly of melted sugar. "It's a bit MacGyvered," Mills acknowledged.

The flavor being tested on this day was garlic. I sampled one of the baits, and it tasted, not unpleasantly, like a garlicky Jolly Rancher. Mills informed me that the following week would be devoted to anise. "Anise is a very good river flavor," he said.

Mills's work had attracted the interest of the U.S. Geological Survey, and a research biologist had come up from Columbia, Missouri—a six-hour drive—to see how the trials were going. The candymaker who'd helped make the baits had come, too, and so had his wife. The Illinois River at this point, about eighty

careful about saying, 'Oh, this pristine system,' because it's not really natural anymore." Irons himself grew up in Ohio, fishing on Lake Erie. In recent years, Lake Erie has been subject to algae blooms that turn huge expanses of the water a nauseous green. Were Asian carp to make their way into Lake Michigan and from there into the other lakes, the blooms, biologists fear, would provide them with an all-you-can-eat buffet. The gorging carp might help cut down on the algae, but, in the process, they'd displace sport fish like walleye and perch.

"Lake Erie, that's where we'd most likely see the greatest impact," Irons said.

As we talked, a large man was cutting up a large silver carp in the center of the tent. A group had gathered around to watch.

"You see, I angle my knife," the man, Clint Carter, explained to the assembled spectators. He had skinned the fish and was now cutting long strips of flesh from its flanks.

"You can take these and grind them and make your fish patties and fish burgers," Carter told the group. "You can't tell the difference between that and a salmon burger."

Of course, in Asia, people have been happily eating Asian carp for centuries. This is the whole reason for raising the "four famous domestic fishes" and, indirectly at least, the reason they came to the attention of American biologists back in the 1960s. A few years ago, when a group of U.S. scientists visited Shanghai to learn more about the fish, the *China Daily* ran an article headlined ASIAN CARP: AMERICANS' POISON, CHINESE PEOPLE'S DELICACY.

"Chinese people have eaten the tasty fish, which are a rich source of nutrition, since ancient times," the paper noted. Accompanying the article were photos of several savory-looking dishes, including milky carp soup and stewed carp with chili

sauce. "Serving a carp whole is a symbol of prosperity in Chinese culture," the paper said. "At a banquet it is customary to serve the whole fish last."

China is an obvious market for America's Asian carp. The problem, Irons explained to me, is that the fish would have to be frozen for export, and the Chinese prefer to buy their fish fresh. Americans, for their part, are put off by the fishes' boniness. Bighead and silver carp have two rows of what are known as intramuscular bones; these are shaped like the letter Y and make it all but impossible to produce a bone-free fillet.

"People hear Asian carp—'carp' is a four-letter word—and they're like 'ewww,'" Irons said. But then, when they try it, they change their tune. One year, Irons recalled, the Illinois DNR served carp-based corn dogs at the state fair: "Everybody loved them."

Carter, who owns a fish market in Springfield, is, like Irons, a carp-eating evangelist. He told me that one of his friends had his nose broken by a jumping carp and, as a result, had to have eye surgery.

"We need to control them," he said. "If you can catch millions and tens of millions of pounds of them, it's going to help, and the only way to do that is to create a demand for them." He took the strips he'd cut, rolled them in breadcrumbs, and deep-fried them. It was a warm late-summer day, and by this point he was sweating profusely. When the strips were done, he offered them around as samples, to general approval.

"Tastes like chicken," I heard one boy say.

Sometime around noon, a man in a white chef's jacket showed up at the tent. Everyone referred to him as Chef Philippe, though his full name is Philippe Parola. Parola, originally from Paris, now lives in Baton Rouge, and he'd made the trip to

northern Illinois—twelve hours by car, though Parola said he'd done it in ten—to promote his own idea of a killer dish.

Parola was smoking a fat cigar. He handed around more swag—T-shirts that showed a carp smoking a fat cigar and eyeing a frying pan with alarm. SAVE OUR RIVERS, the shirts read on the back. He'd also brought along a large box. On one side of the box was printed THE ASIAN CARP SOLUTION and, under that, CAN'T BEAT 'EM, EAT 'EM! Inside were fish cakes that resembled giant meatballs.

"With a little spinach bed, a little cream sauce, this can be an appetizer," Parola said in a thick French accent, as he passed around a plate of the cakes. "You put two of these with fries, with cocktail sauce, that can be served at a football stadium. You can put them on a tray for a wedding reception. So the diversity of the product is unbelievable."

Parola told me he'd devoted nearly a decade of his life to devising his cakes. Much of that time he'd spent banging his head against the Y-bone problem. He'd tried specialized enzymes and high-tech deboning machines imported from Iceland; the only result was Asian carp mush. "Every time I was trying to cook something with it, it was turning gray, and it tasted like pastrami," he recalled. Finally, he concluded that the fish would have to be deboned by hand, but, since labor costs in the United States were prohibitively high, he would need to outsource.

The cakes he'd brought to CarpFest had been made from fish caught in Louisiana. These had been frozen and shipped to Ho Chi Minh City. There, Parola related, the carp had been thawed, processed, vacuum-packed, refrozen, and put on another container ship, bound for New Orleans. In a concession to Americans' anti-carp prejudice, he'd rechristened the fish "silverfin," a term he'd had trademarked.

It was hard to know how many miles Parola's "silverfin" had

traveled in their journey from fingerlings to finger food, but I figured it had to be at least twenty thousand. And that wasn't counting the trip their ancestors had made to get to the United States in the first place. Did this really represent "the Asian Carp Solution"? I had my doubts. Still, when the cakes came my way, I took two of them. They were, indeed, quite tasty.

2

New Orleans Lakefront Airport sits on a tongue of fill that sticks out into Lake Pontchartrain. Its terminal is a splendid Art Deco affair that at the time of its construction, in 1934, was considered state of the art. Today, the terminal is rented out for weddings and the tarmac used for small planes, which is how I came to be there, a few months after CarpFest, riding shotgun in a four-seat Piper Warrior.

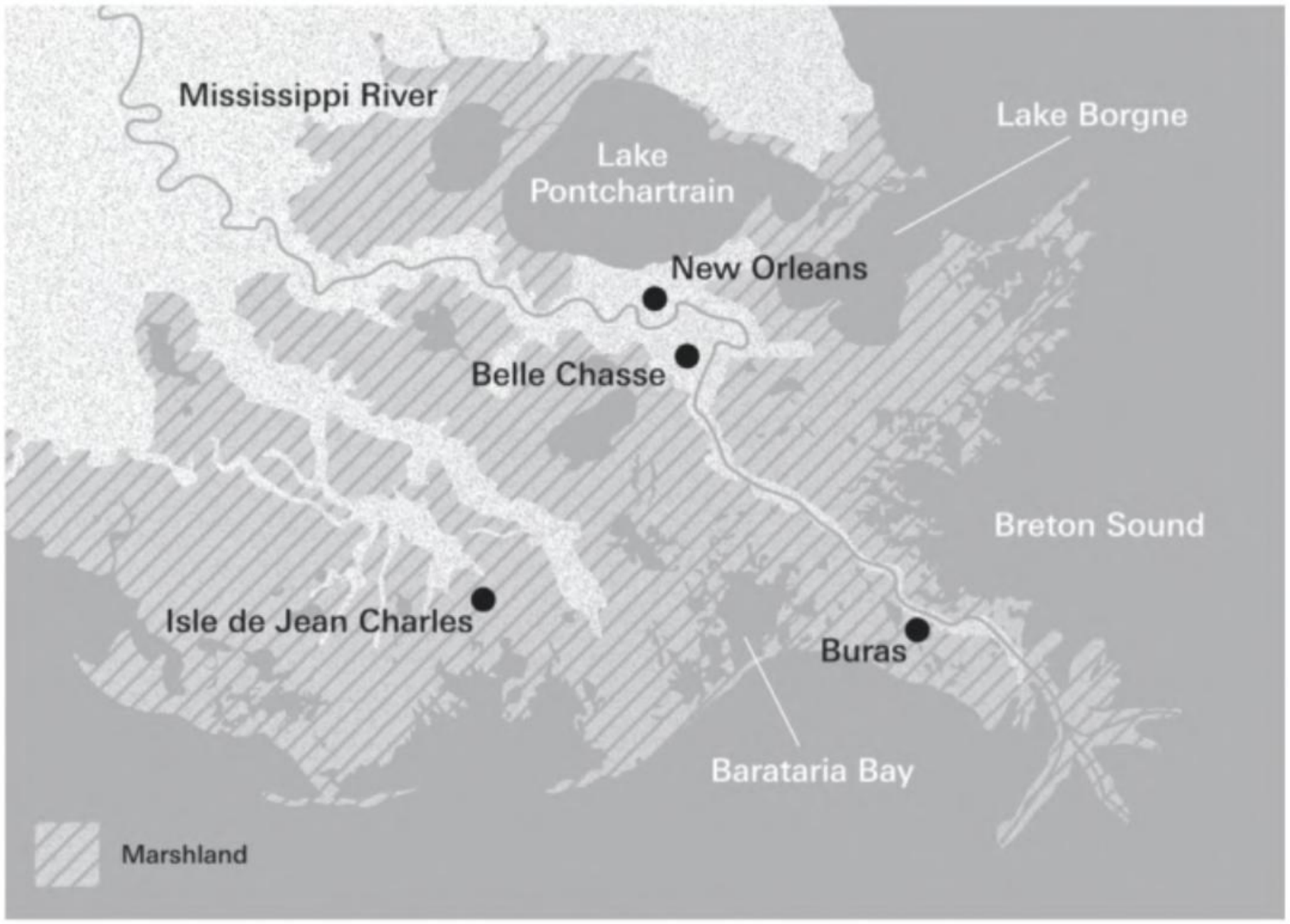
The Piper's owner and pilot was a semi-retired lawyer who liked having an excuse to fly. Often, he told me, he volunteered his services to transport rescue animals between shelters. Dogs, he indicated, without quite saying so, were his favorite passengers.

The Piper took off to the north, over the lake, before looping

stored in vaults. Keep digging and eventually you'll hit sand and clay. Dig on and you will reach more sand and more clay, and this process will repeat for hundreds—in some places thousands—of feet. Except for those that have been imported to shore up the levees and reinforce the roads, there are no rocks in southern Louisiana.

The layers of sand and clay are, in a manner of speaking, imported, too. A version of the Mississippi has been flowing for millions of years, and all the while it has carried on its broad back vast loads of sediment—at the time of the Louisiana Purchase some four hundred million tons' worth annually. "I do not know much about gods; but I think that the river is a strong brown god," T. S. Eliot wrote. Whenever the river overtopped its banks—something it used to do virtually every spring—it cast its sediment across the plain. Season after season, layer after layer, clay and sand and silt built up. In this way, the "strong brown god" assembled the Louisiana coast out of bits and pieces of Illinois and Iowa and Minnesota and Missouri and Arkansas and Kentucky.

Because the Mississippi is always dropping sediment, it's always on the move. As the sediment builds up, it impedes the flow, and so the river goes in search of faster routes to the sea. Its most dramatic leaps are called "avulsions." Over the last seven thousand years, the river has avulsed six times, and each time it has set about laying down a new bulge of land. Lafourche Parish is what's left of the lobe laid down during the reign of Charlemagne. Western Terrebonne Parish is the remains of a delta lobe built during the time of the Phoenicians. The city of New Orleans sits on a lobe—the St. Bernard—created around the time of the Pyramids. Many still-more-ancient lobes are now submerged. The Mississippi fan, an enormous cone of sediment



Much of southern Louisiana is no longer dry land.

deposited during the ice ages, now lies under the Gulf; it's larger than the entire state of Louisiana and in some places ten thousand feet thick.

Plaquemines Parish was constructed in this same way. Geologically, it's the baby of the family. It started to form around fifteen hundred years ago, following the river's last great leap. Since it's the youngest lobe, you might think it would be the most long-lasting, but the opposite is true. The delta's soft, Jell-O-like soils tend to dewater and compact over time. The newest layers, which are wetter, lose bulk most rapidly, so as soon as a lobe ceases to grow, it starts to sink. In southern Louisiana, to borrow from Bob Dylan, any place that is "not busy being born is busy dying."

Such a mutable landscape is a tough one to settle. Neverthe-

less, Native Americans were living in the delta even as it was being created. Their strategy for dealing with the river's vagaries, as far as archaeologists have been able to determine, was one of accommodation. When the Mississippi flooded, they sought higher ground. When it shifted quarters, they did, too.

The French, on arriving at the delta, consulted with the tribes living there. In the winter of 1700, they erected a wooden fort on what's now the east bank of Plaquemines. Pierre Le Moyne d'Iberville, the fort's commander, had been assured by a Bayogoula guide that the site was a dry one. Whether this represented a purposeful misstatement or just a misunderstanding—"dry" in southern Louisiana being a relative term—the place soon flooded out. A priest who visited the following winter found soldiers wading "mid-leg deep" to get to their cabins. In 1707, the fort was abandoned. "I do not see how settlers can be placed on this river," Iberville's brother, Jean-Baptiste Le Moyne de Bienville, wrote to the authorities in Paris, explaining the retreat.

Bienville went on to found New Orleans in 1718, in spite of his cold, wet feet. The new city was called, in honor of its watery surroundings, L'Isle de la Nouvelle Orléans. Not surprisingly, the French chose to build where the land was highest. Counterintuitively, this was right up against the Mississippi, on ridges built by the river itself. During floods, sand and other heavy particles tend to settle out of the water first, creating what are known as natural levees. (*Levée* in French simply means "raised.")

One year after its founding, L'Isle de la Nouvelle Orléans suffered its first inundation. "The site is drowned under half a foot of water," Bienville wrote. The settlement would remain submerged for six months. Rather than retreat again, the French dug in. They raised artificial levees atop the natural ones and started cutting drainage channels through the muck. Most of this backbreaking labor was performed by African slaves. By the