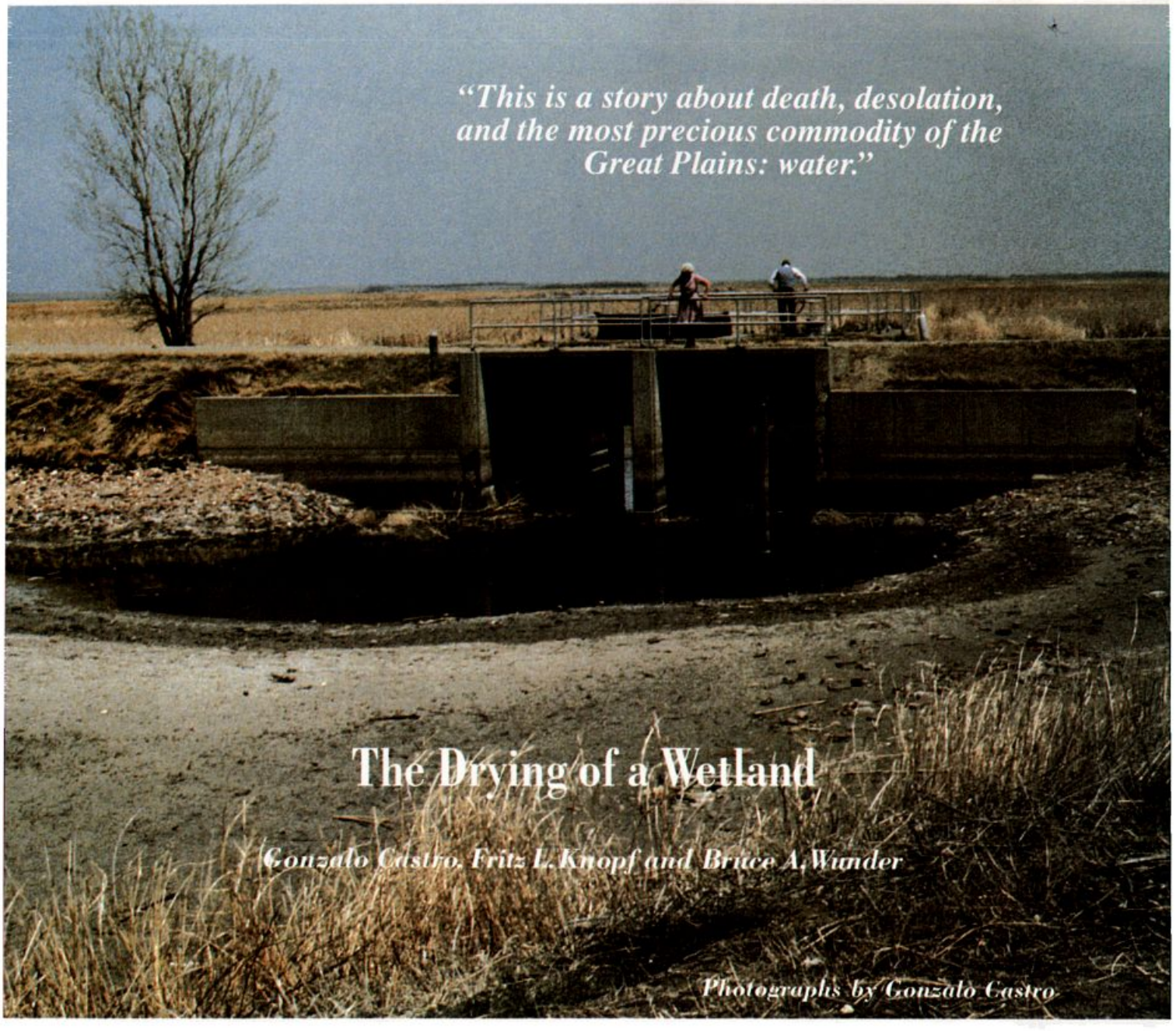

The Drying of a Wetland

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Photographs by Gonzalo Castro

The inlet canal, which brings water to Cheyenne Bottoms from the Arkansas River, was completely dry in 1989.

UNDER NORMAL CIRCUMSTANCES, walking through the cattails along the shore during this April afternoon would have brought us the sight of a flushing Virginia Rail, the sudden spectacle of a landing flock of white pelicans, or the unjustified rush of adrenaline that results from a quick glance at a harmless Diamondback Water Snake fleeing away. Instead, the heavy odor of death hung in the air as brown and dusty cattails stood sentinel over piles of drying fish and the empty carapaces of Painted Turtles.

Cheyenne Bottoms, in central Kansas, has been well-known among hunters, fisherman and bird watchers for many decades as the home of millions of ducks, shorebirds, herons and all the frogs, turtles, snakes, and other creatures that are associated with such a marsh. In the spring of 1989, however, this great wetland dried up completely. This is a story about death, desolation, and the most precious commodity of the Great Plains: water. More than anything it is a reflection of our society's antiquated economics, based on the 19th century assumption that natural resources are limitless.

Cheyenne Bottoms is a 41,000-acre natural basin that has existed as a wetland for 100,000 years. Located in Barton County, in the heart of Kansas, it has been protected since 1957, when the State of Kansas concluded long negotiations for its protection in recognition of its great importance as a resting area for waterfowl. Today it is a wildlife management area.

Besides its importance for waterfowl, it is also a critical stopover area

Piles of turtle carapaces, primarily of Painted Turtles, were seen everywhere.

for shorebirds during migration. Estimates by the Manomet Bird Observatory in Massachusetts suggest that up to 50 percent of all shorebirds that migrate through the interior of the United States use Cheyenne Bottoms during the spring and fall migrations. Thirty-nine species of shorebirds have been recorded there, including Old-World vagrants such as the Ruff and Curlew Sandpiper. Red Knots, Ruddy Turnstones and Dunlins, primarily coastal species, are also observed every year, as well as the endangered Piping Plover. Other endangered species that regularly use Cheyenne Bottoms are the Whooping Crane and the Least Tern.

Many shorebirds are long-distance migrants, breeding every year in the Arctic and traveling to Latin America for the North American winter. The migratory trip itself is usually made in a few long non-stop flights, each of which can last as long as 60 hours and transport birds for up to 2,500 miles in a truly remarkable display of endurance. By comparison, imagine a world-class marathon runner running for two hours to cover 25 miles.

Since flying is metabolically one of the most expensive methods of locomotion, large amounts of fuel must be stored to accomplish these migratory flights. The fuel is fat, which has great caloric content. Birds can store in their bodies an amount of fat equal to their own weight, doubling their weight before a flight in just a few weeks. This rapid weight gain can only be achieved in areas that offer plentiful food, such as Cheyenne Bottoms. We visited Cheyenne Bottoms to document the arrival and departure schedules for several species of shorebirds, as well as the dynamics of fat deposition during the brief stopover period.

We arrived during early April and immediately contacted Karl Grover, the enthusiastic manager of the Bottoms. "You chose the worst year for your research," he said, "because if it doesn't rain soon the place is going to dry up." He then proceeded to explain the design of the Bottoms. There are five large pools, each of which covers roughly 3,000 acres. There is a central pool (Pool 1) that stores the water needed to maintain water levels in the surrounding four pools. As we drove around, we discovered that all but Pool 1 were dry. The water left in Pool 1 covered about two-thirds of its area, and was five inches at its deepest part. In normal years, Grover told us, Pool 1 can hold five feet of water, and the other pools are completely covered with birds.

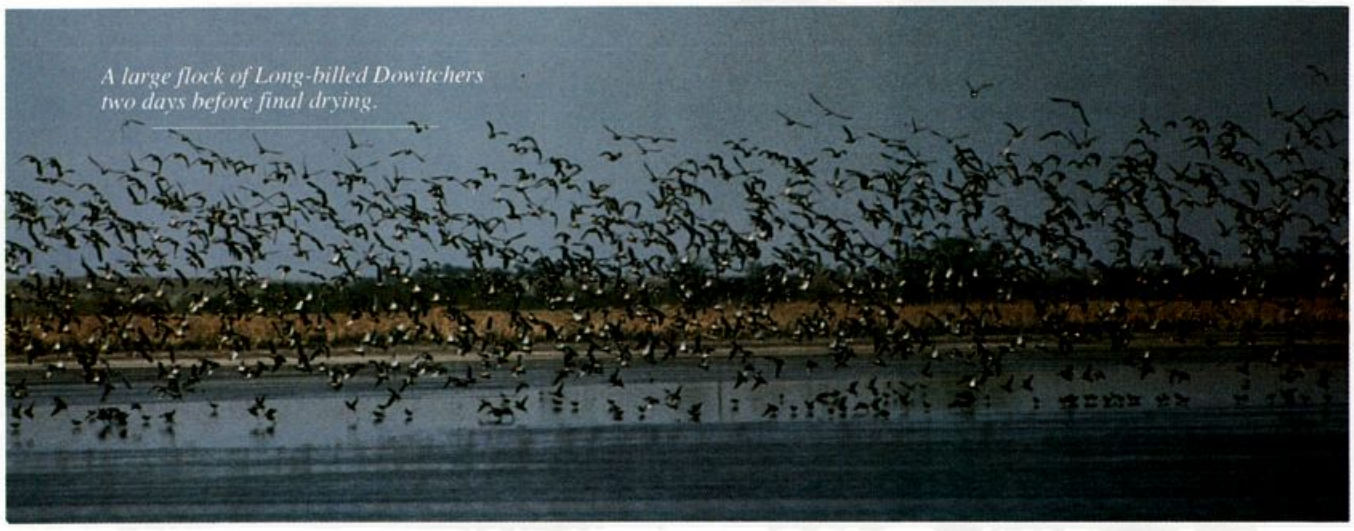
The position of the birds in the little water left on Pool 1 was fairly typical of that in a healthy wetland. At the center, the deepest part, was a flock of

A female Wilson's Phalarope in breeding plumage.

500 American White Pelicans. Other species arranged themselves in concentric circles around the pelicans, depending on their preferred water depth. A few American Coots, Marbled Godwits, and American Avocets composed the inner circle of the bullseye. About 300 Greater and Lesser yellowlegs followed, with a few early Wilson's Phalaropes. Immediately outside them, 4,000 Long-billed Dowitchers formed a broad dark band. Finally, right at the shore, about 12,000 Baird's Sandpipers completed the scene.

Since it was necessary to estimate and identify the birds accurately, we walked into the pool for a better look. Then is when we realized that things were far from normal. Thousands of dead, foul-smelling carp lay on the shore, apparently washed up recently. By carefully censusing shore transects around Pool 1, we estimated the total number of dead fish at close to 40,000. Obviously, five inches of water is not deep enough for a 20-inch Common Carp.

The White-faced Ibis is becoming more numerous at Cheyenne Bottoms.



A large flock of Long-billed Dowitchers two days before final drying.

The channels that surround Pool 1 also had some water left in them, and most of the ducks were feeding there. Green-winged Teals, Mallards, Northern Shovelers, and Northern Pintails were the most numerous, although the total number of ducks was only about 1,000. The dry pools, on the other hand, offered perfect habitat for pheasants. Pheasants were so abundant that we had to drive very carefully around these empty pools. These flashy exotics crossed the road constantly, just like their close relatives, domestic chickens.

At least 40,000 large fish died, primarily Common Carp.

The pelicans left Cheyenne Bottoms the next afternoon, and never returned. All the fish were decaying rapidly, and there was no reason for them to stay. During the next weeks we observed a progressive drying of the channels around Pool 1, so the next to leave were the ducks.

After two weeks the five inches of water in Pool 1 had become two inches, covering only one-third of the pool. This created an extensive mudflat, ideal for shorebirds. By this time, more shorebirds had shown up, and there were about 15,000 dowitchers, 12,000 Baird's Sandpipers, and 15,000 Semipalmated Sandpipers. Also present, although in smaller numbers, were Least Sandpipers, Pectoral Sandpipers, Black-Bellied Plovers, Snowy Plovers, Piping Plovers, both yellowlegs, Wilson's Phalaropes, Hudsonian and Marbled godwits, Willets, two Dunlins and one Sanderling. We also saw White-tailed and Mule deer, Eastern Cottontails, Raccoons, Striped Skunks, and Muskrats.

Besides the shorebirds, spectacularly large flocks of Yellowheaded Blackbirds were starting to form. These flocks were joined by Red-winged Blackbirds, Brown-headed Cowbirds, and Brewer's Blackbirds. Wayne Hoffman, an ornithologist who studied the Bottoms two years ago, recalls that some of these flocks in the past have contained as many as 12 million birds

Yellow-headed Blackbird are abundant visitors to Cheyenne Bottoms.

Apart from the census, we spent most of the time colorbanding birds, following the convention of the Pan American Shorebirds Program, which allows the identification of the banding location of any shorebird in the Western Hemisphere. All shorebirds banded at Cheyenne Bottoms carry a "green flag," which means they were banded in the United States. They also carry an orange band on the left leg, for the specific location (Cheyenne Bottoms) With this simple system, we learned that a Semipalmated Sandpiper carrying a yellow flag had been banded in Peru, and that a Baird's Sandpiper with a red flag had been banded in Chile This South American connection had already been established from recoveries in northern South America of shorebirds banded at the Bottoms by Ed Martinez. Martinez, an entomologist with the State Agricultural Department, is a shorebird enthusiast who has been banding here for the last 30 years His work has provided important information about shorebird use of the Bottoms.

The red-flagged Baird's Sandpiper was brought to our attention by Doug Helmers, a graduate student at the University of Missouri who was conducting research at the Bottoms. His aim is to identify the food base that makes this place so good for shorebirds, as well as other aspects of their ecology He explained that shorebird migration

here coincides with the emergence of the larvae of chironomid flies, which are extremely abundant. His research will provide information on how to maximize the yield of chironomids in order to assure a constant food supply for migrating shorebirds.

"What is going to happen if it doesn't rain?", we asked Helmers. Since we had not received any rain during these two weeks, we were starting to worry. "Do you think that this place will dry up completely?"

"I don't know what will happen with the birds," he said. "All I know is that it is not going to rain anytime soon. We are in the middle of a drought," he added in a pessimistic tone.

The next few days demonstrated that he was disturbingly right. Although we had three days in a row with 80 percent chances of severe rain in the forecast, it did not rain at all. And Pool 1 was drying up rapidly.

The banding activities also gave us the opportunity to learn how much fat the birds were putting on. Before their release, all banded birds were placed through a device that accurately measures their body fat. This state-of-the-art method, based on electrical conductivity, is harmless and circumvents the old-fashioned procedure that requires the sacrifice of sample birds for analysis. Our initial data painted a dismal picture: birds were not fattening quickly enough. It was obvious that a major disturbance in their migration was taking place.

Pool 1 dried up completely on April 28. The shorebirds, which by then numbered about 50,000, waited until the last second to vacate the Bottoms. The fat in their bodies at this time provided only enough fuel to fly between 250 to 800 miles, less than 50 percent of the 1,500 to 2,200 miles that separate the Bottoms from their breeding grounds in the Canadian Arctic.

The fate of the 50,000 birds that left the Bottoms is unknown. Even if they were lucky enough to find an alternative area a few hundred miles farther north, it is unlikely that they were able to put on fat quickly enough to complete their migration on schedule. We immediately checked Quivira National Wildlife Refuge, about 40 miles south of Cheyenne Bottoms, which seemed our best bet as an alternative area, but without success.

Even more dubious was the fate of the 100,000 White-rumped Sandpipers and Stilt Sandpipers that were expected to stop during the month of May. These birds might die without food.

"Our initial data painted a dismal picture: birds were not fattening quickly enough. It was obvious that a disturbance in their migration was taking place."

The month of May offered a lamentable spectacle to the dozens of disappointed bird watchers, many of whom had driven great distances, in hopes of seeing the marvelous phenomenon of migration at its best. Instead, skinny deer wandered near the roads, and dead raccoons, snakes, and skunks were everywhere. The other birds that normally breed here had also left, with the exception of a few blackbirds. The catastrophe, the breakdown of the migratory stopover, was now a reality.

American Avocets were unable to breed in Cheyenne Bottoms in 1989.

Why did Cheyenne Bottoms dry up, and could the calamity have been avoided? A little bit of history will serve to clarify the point. At 26 inches, the annual rainfall is about one-half of the evaporation rate of 59 inches. But since Cheyenne Bottoms is located in a natural depression, runoff from the surrounding areas has been sufficient to maintain a healthy water level. It is safe to assume, however, that during periods of severe drought large portions of the Bottoms have dried up. Until this century, such droughts did not mean a calamity for the birds because there were many other wetlands in the surrounding areas. Today, these have been drained for agriculture purposes. Since 1955, 40 percent of the wetlands in Kansas have been lost to agriculture. Rivers that now flow very modestly because of excess consumptions of water upstream probably brought more water from the Rockies, giving birds alternative habitats.

The people who designed the Cheyenne Bottoms Wildlife Management Area were aware of the natural water regime, and built a canal in the late 1950s to divert water from the Arkansas River during very dry years. In this way, the water from the Arkansas served to keep the Bottoms

alive during several drought periods in the last three decades.

In the 1960s a new form of agriculture started to change the region. Deep-well irrigation, using the central-pivot system, made its debut. The underground water that is used comes from the Ogallala aquifer, which lies underneath this part of the high plains. This form of irrigation has depleted the aquifer, and the result is that many rivers that depend heavily upon the aquifer for their water are now dry in many places. Such a river is the Arkansas. The flow of the Arkansas at the diversion point has been diminishing steadily, and this has meant less and less water for the Bottoms. Coupled with the 1988-1989 drought, the deadly combination was no rain at Cheyenne Bottoms and no water in the Arkansas. The outcome was inevitable.

The long-term solution for Cheyenne Bottoms will be tied to a change in agricultural practices. The natural recharge rate of the Ogallala aquifer is on the order of less than one inch per year, but in some areas water is extracted at a rate of up to six feet per year. Chris Madson wrote a few years ago that permits for well irrigation were granted on the assumption that a 40-percent depletion of the aquifer within the next 25 years was acceptable. Why farmers should be allowed to deplete a source of water that does not belong to them is unclear, although Paul Ehrlich, the renowned ecologist from Stanford University, has one answer. He points out that our world is run by politicians, who govern following rules from the social sciences. There rules are based on an economic theory that has two basic assumptions: that natural resources are inexhaustible and that an acceptable substitute can always be found for any resource. The corollary is that unlimited economic growth is possible. But ecologists are aware that infinite growth is abnormal in the natural world, and that all processes in nature finally stop growing and reach the so-called "carrying capacity." Water from the Ogallala should be extracted at a rate equal to the natural rate of recharge.

In the eyes of economists, the depletion of the Ogallala is acceptable, since it yields the maximum rate of economic return. They are assuming that there are an infinite number of aquifers, which we know is not true. But only when politicians realize the tremendous discrepancy between these two opposing views will there be a small chance for our planet to be managed more intelligently. And perhaps the Ogallala aquifer will be allowed to recharge. Although this would be the solution for the Cheyenne Bottoms, such a change will not happen soon.

The long-term solution for Cheyenne Bottoms will be tied to a change in agricultural practices.

Meanwhile, there is a positive side to all of this. Subsidies for grain farmers that rely heavily on center-pivot irrigation may end within the next few years. This could mean a healthy shift to more traditional forms of agriculture based on natural precipitation, perhaps stopping further depletion of the aquifer. At the same time, Cheyenne Bottoms has gained tremendous recognition in the last few years. It is now considered a wetland of international importance within the Ramsar Conservation and a hemispheric site of the Western Hemisphere Shorebird Reserve Network. This international recognition will play a strong role in its conservation.

The people and organizations of Kansas are also committed to work for the future of Cheyenne Bottoms. State agencies such as Wildlife and Parks are increasing their efforts to help the Bottoms, and have committed 1.6 million dollars to explore and implement alternative forms of management, including the search for new sources of water. W. Al Wentz, Assistant Secretary of the Kansas Department of Wildlife and Parks, mentions that these 1.6 million dollars can only be the down payment for a possible 15-million-dollar project. And the Kansas congressional delegation is working to match state funding with federal dollars. Since Cheyenne Bottoms owns senior water rights to 50,000 acre-feet of water from the Arkansas River, the state has initiated steps to have the water delivered even if that means a battle with junior rights holders. Finally, private organizations such as The National Audubon Society, Ducks Unlimited, and The Nature Conservancy are also involved in helping Cheyenne Bottoms.

However, action beyond these efforts is required if we truly want to make Cheyenne Bottoms thrive again. The greenhouse effect predicts even less rain on the plains in the future. Ultimately, new attitudes towards the environment, including measures to counter the greenhouse effect, and a complete halt to groundwater irrigation are mandatory if Cheyenne Bottoms is to be enjoyed by future generations. Until then, let's just hope it rains...a lot!

Postscript. June and July of 1989 turned out to be exceptionally wet months and indeed, it rained a lot Significant amounts of runoff were diverted to the Bottoms. By mid-July, Pool 1 had two feet of water, enough, one hopes, to provide sufficient water and resources for the fall migration ■

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