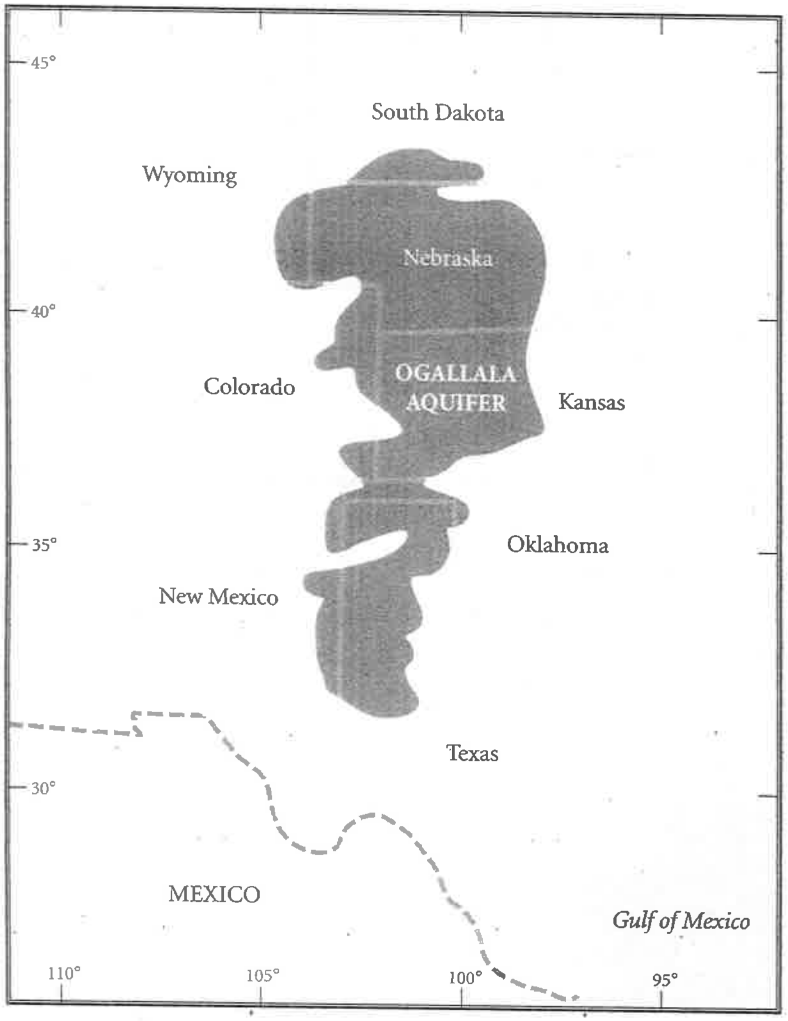

OGALLALA BLUE

WATER AND LIFE ON THE HIGH PLAINS

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THE PHANTOM RESERVOIR

ONE DOES NOT GENERALLY lose an Army Corps of Engineers' dam, so it is notably odd when you can't find one. I had left the tidy little city of Guymon, Oklahoma, early on a cool spring Sunday, headed east toward a large, blue, reservoir-shaped blob athwart the Beaver River that the people at Rand McNally had labeled Optima Lake. The sun struggled through a high, thin layer of haze; the flat green surface of the Oklahoma Panhandle glittered with myriad tiny rainbows, one in each droplet of water shed by the dozens of slowly moving center-pivot sprinklers. Somewhere along US 412 I should have found signs directing me to the dam. Where were they?

Acting on a hunch, I turned north onto a paved side road marked by a small hand-lettered sign that offered "camping." Two miles up the road I came to a much larger sign, a curvilinear shape of decrepit, brown-painted wood mounted on a weed-covered base made from cemented chunks of sandstone: standard-issue Corps of Engineers recreation area construction, but badly gone to seed. The sign had originally said WELCOME TO OPTIMA DAM. Those words had been covered by a big blue placard with white lettering, which read:

Attention Visitors

This park is closed, although access will remain open. No services are provided. Please do not litter. To report area abuse call 405–766–2701.

It was another three quarters of a mile down a branch road to a deserted parking lot at the edge of a bluff overlooking the confluence of the Beaver River and Coldwater Creek. Grasses and yuccas grew up through checkerboard cracks in the asphalt. An imposing restroom facility was locked and deteriorating into shabby irrelevance. A faded sign attached to the remnants of a cyclone fence warned anglers that any bass caught were to be returned to the lake immediately. There was no lake. The dam's immense earthen pile, 3 miles long and 120 feet high, loomed to the east, its square concrete intake structure towering forlornly beside it. Two little riverlets trickled in and pooled in a depression in the valley floor. The pond they made there failed to reach even to the base of the dam.

Ever since its completion in 1978 at a cost of forty-six million dollars, Optima Dam has looked exactly like this: a huge pile of expensive dirt in front of a puddle of water. The intake structure has so far taken in nothing but air; the carefully wrought upstream slope of the dam, made to withstand the pressure of several cubic miles of lake water, has withstood nothing damper or more stressful than raindrops. Designers of dams specify three reservoir depths, called *maximum*, *minimum*, and *conservation pools*. The last-named is the shallowest level the reservoir is expected to drop to in the driest years. In the twenty-five years since its completion, Optima Lake has never even approached the conservation-pool level.

Where is the water that should be filling the phantom reservoir

behind Optima Dam? Where is the water that should be running down Running Water Draw in Texas, or springing forth from Wagon Bed Spring in Kansas, or welling from the earth at Cheyenne Wells, Colorado? What is wringing the dry center of North America even drier?

Look in your cupboard. Look in your refrigerator. Look in your closet. The water is there—pulled from beneath the plains and shipped to a shopping center near you, as food, as drink, and as clothing.

Water is life. It is our primary support system, the chief component of our tissues, and the only substance that all living things must have or die. There are bacteria that can live without oxygen; there are cave creatures and deep-sea dwellers that can live without sunlight. Nothing can live without water. Water grows our food, floats our boats, flushes our waste, builds our bodies, and pumps through us—thinly disguised as blood—at roughly one heartbeat per second. Civilizations rise and fall on it. The great dams of the United States are the hallmark of our culture as much as the flood irrigation systems of Egypt, the levees of China, the aqueducts of the Roman Empire, and the canals of Mesopotamia were hallmarks of theirs.

Those who live in humid lands can afford to take water for granted. Arid-land dwellers know better. Where little rain falls, each drop is a benediction. A glass of water is a miracle; a crop is an engineering feat. Rainwater must be captured, tamed, transported, hoarded for an unrainy day. Without irrigation, an arid-land farm cannot exist.

The High Plains region of North America is officially classed as semiarid, not arid, but the distinction does not matter much. Little rain falls on the wide earth of this immense, dun-colored expanse once roamed by the buffalo peoples, the Cheyenne and the Pawnee and the Oglala and the Comanche. The Rockies wring moisture from the western sky; winds blowing north from the Gulf of Mexico swing to the right, dropping their wet gifts well to the east of the hundredth meridian. Thunderstorms and tornados wreak brief havoc, and the southward swing of the jet stream in winter brings cold storms down from Canada, but for most of the year, over most of the plains, the sky is Ogallala blue.

The explorers and surveyors who followed Coronado into this land called it the Great American Desert. They thought it worthless for farming; today, it is one of the prime agricultural areas of the world. The magic that has made this possible is another Ogallala blue—a wide, dark blue that hides beneath the soil. Groundwater is the glass slipper that has transformed this Cinderella landscape into a princess. Under the sand hills, under the shortgrass prairie, under the rich harvest of corn and wheat and cotton, lurks an ocean: the Ogallala Aquifer. It sprawls from central Texas to southern South Dakota and from eastern Colorado almost into Iowa, and there is enough water in it to fill Lake Erie. Nine times.

It is hard to overestimate the impact that this bounty of buried water has had on American life. If you snack on popcorn or peanuts, you are probably eating Ogallala water; if you dress in cotton clothing, you are probably wearing it. The Ogallala grows wheat and milo, sunflowers and sorghum. It grows alfalfa for cattle, and it grows the cattle as well. It provides drinking water for large parts of eight states. The fourteen million acres of crops spread across its flat surface account for at least one-fifth of the total annual U.S. agricultural harvest. Five *trillion* gallons of water are drawn from the Ogallala annually—about 30 percent of all groundwater used for irrigation in the United States. If the aquifer went dry, more than $20 billion worth of food and fiber would disappear immediately from the world's markets.

Or perhaps we should say *when* the aquifer goes dry. That is not hypothetical doomspeak; it is happening. Not overnight, not next week, but steadily, stealthily, and for the most part irreversibly. The bulk of the water here is what geologists call fossil water—dampness from a distant era, preserved in earth and stone like the bones of dinosaurs. Most of it arrived during the aquifer's formation; much of the rest trickled in as groundwater flow while the aquifer was still connected to its sources in the snow-covered Rocky Mountains. Now that connection has been severed—save in one small place—and except for the inconsequential rains, inflow has ceased. Water is being pulled out much faster than it is being put back in. Since widespread irrigation began in the 1950s, the Ogallala has sustained a net loss of as much as 120 trillion gallons—11 percent of its original volume. One entire Lake Erie, plus a little. Gone. Most of it gone with full knowledge that it was going. Groundwater overdraft is not an accident here; it is a way of life. But because it means that the water will someday disappear, it is also a way of death.

It would be easy to twist that last sentence into a demand for an immediate end to all Ogallala-sourced irrigation. It would also be wrong. There are a number of very good reasons to continue to pump water out of the Ogallala Aquifer, even though we know it cannot be replaced on anything less than a geologic time scale. The best of these reasons was famously articulated a quarter of a century ago by Steve Reynolds, then New Mexico's state engineer, in an interview with *National Geographic* writer Thomas Y. Canby. "There's nothing intrinsically evil about mining groundwater, as long as everyone understands just what he's doing," Reynolds pointed out. "The alternative is to leave it underground and simply enjoy knowing that it's there."

Groundwater is a mineral, and like most minerals it has practical value. Mining it is a means to realizing that value. We can use mined water to feed ourselves, and clothe ourselves, and keep a substantial portion of the American economy humming—one might say, floating—nicely along. We would be improvident not to do this. But do note the state engineer's caveat: *as long as everyone understands just what he's doing*. Pumping the Ogallala dry will have consequences. It is necessary to understand these consequences, to mitigate them where mitigation is possible, and to figure out how we are going to live with them where it is not. If we can neither mitigate the consequences nor adapt to them, we had better know it now, while it is still possible to turn off the pumps in a controlled manner and keep a little water in the aquifer to temper the problems we will leave our children to deal with as we move on to whatever must inevitably come afterward.

Some of the consequences of groundwater mining are environmental: springs dry up, rivers diminish, the numbers and varieties of plants and animals are reduced. Some are economic: increased pumping costs as wells deepen, increased food costs and decreased land values as crops shrink. And some are human. The human costs may include bankruptcies, foreclosures, and forced migrations. They may include failed businesses and abandoned towns. They are not likely to include thirst—municipal water systems will be among the last users of Ogallala water—but they may well include starvation.

This last will probably happen to people in other countries, not to us. The United States is a wealthy nation, and we can afford to import food as needed. This should not deaden us to the fact that it will be real human lives that are lost. Nor should it blind us to our own peril, should this come to pass. We will be taking bread out of the mouths of other peoples' children. Wars have been fought over much, much less.

Thus the management of water on the High Plains looms as one of the most important American challenges of the twenty-first century. We must find answers to a number of vexing questions. Some are questions of allocation: Once the water is pumped, who receives it? In this, farmers compete with each other, municipalities, industries, recreational users, and wild creatures. Others are questions of quality: Will the water remain safe to drink, to give to livestock, to use on crops? There are debates over the wisdom of water-saving technologies that often lead, paradoxically, to more water use rather than less, and over who should pay for the technologies we choose to employ. Profiteering has become an issue, particularly in Texas, where antiquated water laws allow well owners to suck water from beneath their neighbors' land and sell it to the highest bidder. And the problems posed by interbasin water transport loom larger and larger, as Ogallala users attempt to find replacements for the water they have lost, and as residents of even drier regions attempt to take the remaining water in this underground ocean away.

ALL OF THESE ISSUES can seem grimly unreal as you drive across the green, well-irrigated, apparently endless spaces of the High Plains. You come nose to nose with them at Optima Dam. The phantom reservoir behind it is not the result of poor design, or poor data gathering, or poor construction: The absence of water is directly attributable to groundwater decline. Baseflow—the flow of a river in dry weather—depends on springs, and springs depend on the presence of groundwater. Optima Dam was clearly designed for a baseflow level that is no longer present. Ron Bell, the chief of the Water Management Section for the Corps' Tulsa District, confirmed my suspicions in correspondence a few months after I had visited the place. Here is what Bell had to say:

> The lack of inflow into Optima Lake since its construction is probably due to a combination of factors. The amount and intensity of rainfall events may have declined. Also, farming practices may have had an impact on runoff. I am, however, of the opinion that a decrease in the upper level water table (which may or may not have been affected by the decline in the Ogallala) has probably had the greatest impact.
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> During the period of record that the dam and lake were being designed, the baseflow at the dam site was usually greater than 20 cubic feet per second (cfs). Rainfall events would then add substantially to the flow in the river. The baseflow since completion of the dam has been zero most of the time. Now when rainfall

does occur, the river channel is bone-dry and most of the runoff is lost to infiltration.

During the period from 1940 to 1966, the average annual flow volume at the dam site was greater than 40,000 acre-feet per year. The average annual flow volume from 1977 to 1993 was only 4,400 acre-feet per year. The flow volume from 1984 to 1993 was only 2,200 acre-feet per year.

It is apparent that something has changed the baseflow and runoff characteristics of the Beaver River.

Note that Bell pointedly refrained from speculating that the drop in the water table that killed Optima Lake was caused by pumping from the Ogallala Aquifer. But in this part of Oklahoma, there is no other reasonable cause.

IF YOU ARE A LOVER of big skies and bigger horizons, travel on the High Plains in summer is about as good as life can get. Clean, black-topped highways thread among green fields; blackbirds declaim from cattails in roadside ditches; hawks preen and glare on fence posts. In the early morning, with the air-conditioning off and the car windows open, you can smell sprinklers and hear meadowlarks; in the late afternoon, thunderheads loom in the long light like galleons. Small, shaded towns appear at discrete intervals, each with its trim frame homes and sandstone business blocks and the dappled green restfulness of parks where teenagers flirt around community swimming pools and small boys on bicycles eat ice cream beneath giant cottonwoods. It is a perfect Norman Rockwell vision, but it is built on a lie. These fields, these towns, this American-dream lifestyle all depend on the assumption that the water will be available forever. It will not be and it cannot be. Ogallala water is the keystone of an economic and social structure that is poised, as a geologist in Kansas once remarked to me, to "go down like Rome" as soon as the water is gone. We cannot

save this lifestyle—not in this form. All we can do is plan for its failure. And we had better be doing exactly that.

What will our water-guzzling culture look like when the water is gone? Can we replace it? Will we find a way to do without? Must we choose between bread and beef, between industry and agriculture, between having enough to eat and enough to drink? If you never miss the water 'til the well runs dry, and there is no future for the well, what is the future of those who depend on the water?