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LINES

On the high plains of western Kansas, there is no clear line between water and second chances. Although I didn't know it at the time, I was in search of both when I turned my Prius off a two-lane highway and onto the washboard gravel that led back to the farm.

After fifteen years, the land matched my memories of it. I recalled precisely the vault of space, the circled sky the most dominant feature and the sun a physical weight. Grids of stubble that rotate every half-mile, from corn to wheat to sorghum to corn. Each field a parable about boys who become men by learning to plow every inch, by knowing what not to know, by never leaving or by never coming back.

The road dead-ends at the breaks of the now dry Cimarron River, where the tablelands fall abruptly to a ribbon of short-grass nestled in a river bend with sage sand hills rising to the south. Here stands the Little Rock House. Named after century-old concrete walls and corrals, it was once my great-grandfather's cattle camp. It is where I spent most of my adolescent summers and it is where my father has returned to live out his years amid broken flints and buried bison bones.

He answered the metal door in his preferred retirement getup, a SpongeBob bathrobe and a silverbelly Stetson. At that moment, I realized the only thing I could say for certain was that he was born to this gusty land. Before, he liked to keep his

distance. By then, he had little choice. And sometimes distance is as close to caring for each other as a father and a son can get.

I stayed one night. Like always, I slept in the fixed-up barn, not the house. When the irrigation motor woke me up, I knew I'd been gone too long. The unmuffled Case engine sits a mile-and-a-cornfield from the Little Rock House. The big motor pumps 1,400 gallons of crystalline groundwater per minute nearly every day from early spring to late fall straight into the desiccating wind. Its steady drone was the backdrop to my childhood summers on the farm, as ordinary as the heat and flies and storms. But that first night back, its ceaseless rhythm was distracting.

Because it draws from the water sands under the former riverbed, this motor was one of the few wells in this corner of the Plains still pumping at full capacity. After eight decades of intensive irrigation, other wells in the county had dwindled. Many had gone dry. In 2014, the well at the Little Rock House hit bottom. My father redrilled and luckily hit water farther down. Since then he'd grown increasingly alarmed about the dropping water table. He asked around. Neighbors confirmed his suspicions. During my visit, my father told me about a nearly incredible scale of aquifer decline.

His stories lingered after I left. Over the following weeks, I checked out my father's claims. The situation was worse than he suspected. I learned that southwest Kansas is a front line of the global water crisis.¹ The planet's supply of freshwater is unable to meet the demands that intensive agriculture places on it. It is predicted to only get worse. Pollution and population growth combine to make access to safe water an urgent concern for people across the world.

Groundwater, in particular, is under threat.² Worldwide, billions rely on it as their primary source of water. More than half



FIGURE 1

of the water used in agriculture is mined from underground. As industrial extraction grows and the planet warms, these strains on groundwater increase, especially in those dry regions that are becoming hotter and drier. At the same time, groundwater supplies are poorly monitored and managed. Oversight is often nonexistent. Far more groundwater is pumped than can be naturally replenished.

The result is that most of the major aquifers in the world's arid or semiarid zones are rapidly declining. Groundwater extraction is draining aquifers across the globe, including those under the North China Plain, the Arabian peninsula, northern India, central Australia, California, parts of Chile, and many others.³ Most of this groundwater eventually makes its way to the sea. So much groundwater is pumped to the surface and drained into the oceans that it is now a major contributor to sea level rise, roughly on par with melting glaciers.⁴ Aquifers around

the world are vanishing. Their disappearance often goes unnoticed or unmourned. Many will never return.

The Ogallala formation is part of the High Plains aquifer system underlying much of the Great Plains, including southwest Kansas. Nearly all of its waters are taken for irrigated agriculture.⁵ They are pulled from deep layers of sand or gravel. Owing to this depth, such confined groundwater recharges very slowly or not at all.⁶ In most areas of southwest Kansas, this means groundwater is basically a nonrenewable resource. Depletion can permanently alter this kind of aquifer. Once the water is extracted, the spaces between the aquifer sands can collapse.⁷ Once the spaces collapse, such sands cannot refill entirely in the future.

Groundwater monitoring began near the Little Rock House in 1958. Since that time, test wells show the water table has dropped more than two hundred feet.⁸ Hydrologists estimate that three-fourths of the groundwater in that area is already gone. That is, the Ogallala aquifer has some of the highest rates of groundwater loss in the world.⁹ The portions of the aquifer beneath southwest Kansas have some of the highest rates of loss in the Ogallala region. And groundwater losses near the Little Rock House are among the highest in southwest Kansas. All this meant that, by 2016, the place that nurtured five generations of my family was an epicenter of global aquifer depletion.

The paradox is that the loss of southwest Kansas groundwater is coupled with extreme dependence on it. There, aquifer water is the foundation of society. Pumping groundwater has made this semiarid region into one of the world's most productive agricultural zones. The profits of agribusiness depend on subterranean flows. But so do property values, school budgets, job opportunities, and family ties. As experts debate the imminent end of the area's aquifer, state laws allow farmers to con-

tinue mining the groundwater that remains. Further depletion is guaranteed.

If groundwater loss is assured, what it means remains an open question. Partisan divides shape how depletion is understood. The loss of groundwater cuts in opposite political directions at once. Some progressives seize decline as proof of rural voters' ruinous shortsightedness. Conservatives invoke it as a rallying cry to protect a threatened farming way of life and to protest regulation. For many Plains residents, groundwater loss is just another pragmatic obstacle that requires grit and hard work to overcome. Regardless of political position, all agree that aquifer loss is a threat to ideal homelands. We do not agree on who can feel at home on the Plains or in the name of what.

The depletion of the High Plains aquifer is a defining drama of our times. Within it, planetary crises of ecologies, democracy, and interpretation are condensed. It demands a response. One return visit with my father made that clear. But I did not know where to begin. Like my father, I was soon struggling to understand the fact that groundwater was running out on the Plains. What else, I wondered, may be running out with it? What would it mean if I could share the concerns of my father and other Plains residents about the declining aquifer? Had we already lost our last best chance at finding common ground? Or was this it?

* * *

On the surface, there appears to be little room for common ground. My great-grandfather RW helped to start deep well irrigation in southwest Kansas in the 1940s. Like others, he imagined it would save the region from Dust Bowl droughts and charter the prosperity to come. For two generations, it more or less worked.

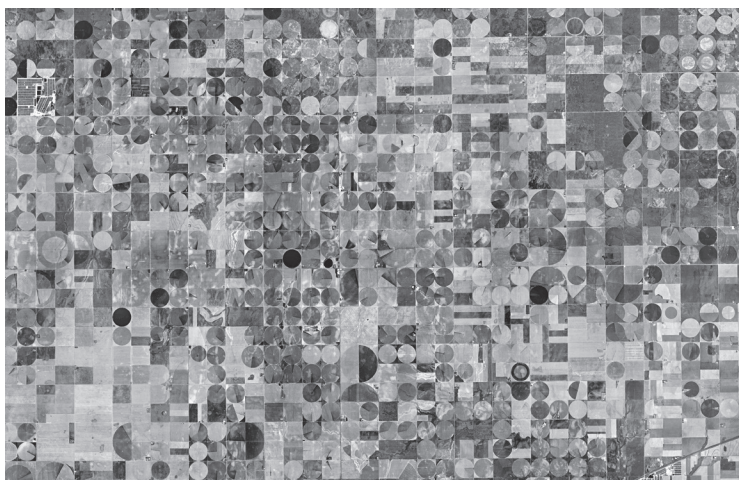


FIGURE 2

Around eleven thousand irrigation wells have transformed this corner of the former Great American Desert into the so-called breadbasket of the world.¹⁰ Agriculture in southwest Kansas generates several billion dollars of revenue each year. Nearly all of the shortgrass has been plowed into fields. Industrial agribusiness has remade this space in its own image.

Grain fields, dairies, hog barns, and feedlots blanket the vast landscape. Grain elevators loom for miles. Dirt is plowed up to front doors. Commodity prices are incanted on the radio. Spray planes pass in formation. Machines never stop. Sprinklers flash all night. Furrows stretch to the horizon. Roads are ruler straight. Mechanical grids and circles dominate the space. When seen from above, the space resembles a pointillist rendition of a bygone land. The drive for order and mastery is etched into every circle and line.

The lines contain their own mythology. Agribusiness myths reduce depletion to economic common sense, as simple as the

bottom line. Whether pro- or anti-depletion, abashed or defiant, people often talk about aquifer loss in terms of markets, profit, and arithmetic. The trick is that such logics do not explain depletion but justify and perpetuate it.¹¹ At the same time, they also deny the realities, contingencies, and capacities of actual people on the Plains. They reduce us all to stereotypes, make eradication seem inevitable, and let everyone off the hook.

The depths, however, may tell a different story. If the surface appears foreclosed by the lines of agribusiness, the subterranean is not. Despite early reports of an “ocean of water” buried under the shortgrass, the High Plains aquifer is not an underground river or lake.¹² It is the remnant of great inland seas, buried millions of years ago by movements of water and wind.¹³ Now it is a mass of water-saturated sediments ranging from beach-fine sand to gravels as big as a thumb. These sediments are honeycombed in countless pockets and chambers and bands.¹⁴

Some of the water-bearing layers are thick and connected and consistent. A well driller’s dream. Others are a nightmare. They are thin and broken and fickle. The strata can be laced with clays or stoppered by shales or stretch uninterrupted for miles or stacked all at once. Some of the aquifer’s layers breach in sand stream beds. Some are sealed deep and cold. In certain places the layers mingle and communicate. In others, the quiet waters are absent altogether.

The aquifer is patchy and uneven. It is not a single thing. It is a set of age-old relations between blockage and flow and pore. Most of its underground structures are unmapped. They are poorly understood by farmers, scientists, and policy makers alike. That means the ancient waters move in ways that can seem mysterious to all involved. This patchiness was once the domain of the Water Witch.¹⁵ These practitioners of sympathetic

magic traveled the Plains locating hidden groundwater with forked wands of peach or willow wood. Water witchery drew power from the mystery of the depths.

Depletion only intensifies this mystery. So do many attempts to dispel it. They say the bottom of the aquifer is more uneven than the top. Some wells respond to other wells miles away. Others are not affected by those nearby. One farmer runs out while his neighbor pumps for years. The relationship between surface and depth varies wildly from place to place, despite no visible differences in the land.

* * *

The depths are personal as well as geologic. Aquifer waters are suffused with sediments of another kind. Traces of destructive processes linger beneath the Plains. Like groundwater, these subterranean layers accrete over generations and imperceptibly bind people's lives to these lands.¹⁶ Depletion brings them to the surface. When I returned to the farm in 2016, I did not realize how far I had drifted away from home, or what it would take to find my way back.

I left the Plains in my twenties. Dreams of wider horizons led me to anthropology, then to New York and South America. I spent 52 months in the Gran Chaco of Paraguay, studying how the destruction of a forest wilderness altered the lives of a recently contacted Indigenous group. During my travels, I learned many lessons and found other families. But I got in too deep and caused damage, too. Looking back, I suppose I was already primed to participate in the violent disintegration of a lifeworld. Something of the destruction I witnessed got on me. I could never quite shake it off.

Anthropologists have developed polite ways to gloss over the insights of return. We talk about reverse culture shock, proclaim ourselves twice born, or repeat T. S. Elliot's adage that the end of our exploring will be to arrive where we started and know the place for the first time. For me, it was not so nice. Call it shame, witchcraft, PTSD, my toe on the trigger—it doesn't matter. I came back out of synch. The overwhelming feeling was something like homelessness.

Shortly afterwards, I returned to the Little Rock House only to perceive traces of the same disintegration everywhere I looked. The Plains appeared to be a mirror image of the tropics. Kansas and Paraguay shared a set of visual and moral cues. The same agribusiness logics were evident in each. It was no coincidence.¹⁷ Some of those deforesting the Gran Chaco were the same people driving groundwater depletion in western Kansas. A group of farmers traveled between the Kansas Plains and the Chaco. Bibles, tractors, seeds, cattle genetics, and market trends went with them. Newly cleared fields in Paraguay, I wrote earlier, looked like pieces of Kansas laid somewhere they didn't belong.¹⁸

Aquifer loss made this kinship more than a footnote.¹⁹ While my critiques of those responsible for deforestation were unsparing, accounting for aquifer depletion cut closer to the bone. It meant confronting my family's complicity in those very same patterns of destruction. It meant trying to own up to what I was responsible for, too.

In 2016, complicity was on my mind. I was teaching anthropology in Oklahoma, where I had a front-row seat for the social upheavals of that year. Some nights, earthquakes caused by fracking shook the ground. Sometimes on my way to class, I stepped over leaflets from White supremacist hate groups.

Popular elegies were no answer at all. Environmental crisis and the hard-right turn in the United States added a sense of urgency to my growing question. How could we take responsibility for the future we are making?²⁰ It felt like time to do so was running out.

By then, running out had become an intimate habit of my own. I was in my late thirties, a string of broken relationships behind and an uncertain career ahead. I tried to put down roots and build lasting ties and write a world where I belonged. My attempts failed. Usually it was my fault.

Somewhere along the way, it grew easier for me to cut ties than to repair them. Not long after my return from Paraguay, I broke with my father over an incident that cut me deeply but seemed so minor to him that I'm not sure he noticed. Years passed. I did not know if I was still capable of reconciling with him or with the place my life began. I did not know if I could hold myself to account, either. Searching for the home I'd lost seemed like the only way to find out. I needed to try before it was too late.

These currents eventually came together in aquifer waters and the depletion of them. At the beginning of my search for water, I didn't have ways to truly understand how people come to live with imminent eradication. I was missing the vocabulary to talk about what it means and how it feels when something crucial is running out. I soon learned that depletion is a personal and emotional language, saturated with familiar words.²¹ Those words tell stories that remain unfinished. And those stories may lead to other ends. A few of those stories are mine. Like aquifer waters, they seep through layers impossible to chart from surface appearances alone.

* * *

Groundwater Management District Southwest, or Southwest GMD, is spread over the twelve counties of southwest Kansas. It covers around 8,400 square miles of land and 4,400 farms, including the Little Rock House.²² This area accounts for around a third of the state's agricultural economy and nearly half of the state's groundwater use.²³ If there is an institutional center to aquifer depletion, Southwest GMD is it.

Kansas established five GMDs in the mid 1970s, in response to local concerns about the dropping water table.²⁴ The original purpose of the GMDs was to conserve groundwater, stabilize agriculture, and allow western Kansas water users to determine their own future destiny.²⁵ The state ceded much, but not all, aquifer governance to the GMDs.

Today, the GMD boards have extensive authority. They can sell water rights, monitor use, permit or restrict pumping, and grant waivers to exceed legal allotments.²⁶ According to Southwest GMD's rules, membership is restricted to those who own forty acres of land or water rights to one acre-foot, equivalent to around 325,000 gallons. Only members can vote on its policies. Because my father owns land, he is a voting member and officials may have felt obliged to meet with him.

It seemed like the logical place to start asking questions about decline. When I started learning more about groundwater depletion in 2016, I did not intend to write about my family or the Plains waters. I told my father I was just curious and wanted to learn more.

At the time, I took it for granted that I was on my own. I thought I no longer required anything from my father. I would have said that the disappointments of my childhood were in the past, that I had no expectations left at all. I thought I could make the right choices about what was entrusted to me or suffer

the consequences. Like the cowboys of the paperback westerns I read as a child, I thought that I did not need help.

My father tried anyway. He offered to call and make an appointment with someone at the GMD. When I asked him if he wanted to come along, I presumed he would say no. He chose to join. I don't think either of us knew then how far the partnership would eventually go. Only now do I realize his presence was the reason most people agreed to talk to me at all.

We made the hour-long drive from the farm. Over the radio came predictions of a drought for southwest Kansas. We listened quietly until it was over.

Are you ready for this? I asked.

Sure, he said.

You probably know this already. I just want to hear his point of view.

Alright. I got some questions too.

Let me handle it.

We'll see what happens.

My father didn't ask me what I was really after or what I hoped to find. At the time, I could not have given an honest answer. To say I was interested in groundwater or family history was to not say anything. To say I was making a journey to rediscover my home seemed sappy and abstract, even though in some ways it was true. How could I have articulated that I wished to come closer to the mystery of the aquifer in search of some unknown kinship that might be running out with it?

The headquarters of Southwest GMD were in an unmarked brick building off a residential street in a town fifty miles north of the Little Rock House. An official who I'll call John greeted us warmly at the door and ushered us into a boardroom with a shiny table. He agreed to let me record our conversation. Large portraits of the fifteen sitting board members lined the

walls. Based on the pictures, they were all ruddy White men like us.

Are these all irrigation farmers? my father asked as we sat down.

Most of them, said John. He wore loafers instead of boots and wool instead of denim. He used statutory metaphors more assuredly than farm ones.

You know, it's sort of a third barn door being open kind of thing, he said. It all depends on how you define conserve.

Let me ask you about that, my father said. I just bought a piece of land without water rights. The guy who sold it to me said the state owns the water and it's going to reach a point where they won't let people irrigate anymore because the water is running out. Is that true?

Well, John said, it's true that the resource has been dedicated by the state legislature to the people, so the people of the state can use the resource subject to a process of application and the putting of water to use for the public interest. So how do we define public interest? It is commerce.

John then walked us through the basics of aquifer policy. I was surprised to learn that most seemed to encourage water use. Before 2004, he told us, Southwest GMD's standard for permitting new wells was based on how much of the aquifer would be lost over a twenty-five-year period.²⁷ If a well was predicted to deplete 40 percent or less of the groundwater, then it was allowed.

The standard coincided with a state use-it-or-lose-it policy. Until 2012, farmers were required to use their full allotments of groundwater, or two acre-feet of water per acre per year—roughly 651,000 gallons per acre.²⁸ A farmer who did not use this amount risked losing water rights for the future. At the same time, the state kept granting more farmers the right to pump water. The

area of Southwest GMD was closed to further allotments only in 2015, the year before our meeting.

The result was what John called an over-appropriated aquifer. The term was unfamiliar to me. Later I looked it up. It means that farmers are permitted to pump more than the amount of groundwater that remains. Depletion is authorized by law.

Staggering amounts of water are involved. In Southwest GMD alone, farmers are permitted to pump 3.6 million acre-feet of aquifer water per year.²⁹ By way of comparison, the city of New York consumed less than one-third of this amount for domestic and industrial use in 2018.

This water is taken from an aquifer with negligible rates of recharge. Aquifers are replenished by water moving down through a porous surface or across the saturated layers by lateral flows. Across southwest Kansas, these movements are irregular. Only a few shallow areas of the region's aquifer system recharge quickly. Most refill very slowly. Some zones contain fossil waters that never replenish at all. Aquifer recharge rates near the Little Rock House range from 0.1 to 1.0 inches per year.³⁰

That day, we learned farmers in Southwest GMD do not extract all of the groundwater they are permitted to pump by law. Some claim conservation is the cause. But John said the real reason is that the water no longer exists. There is a name for the gap between the actual amount of groundwater and what is legally authorized to be extracted. They call it paper water.

Let me ask you about that, my father said. I'm down by the river, totally encircled by irrigation motors. All of my neighbors double-crop. The water wells never stop pumping all year long. I can't see how that is not overusing their water rights and taking mine. I don't have any way of checking.

We could investigate that, John said. They're not supposed to overpump. But as long as they follow the rules, he said, they



FIGURE 3

have the liberty to implement their strategy to use the water that is allotted to them.

John talked fast and kept going. He told us aquifer decline was necessary for economic growth and he equated the economy with society in general. Because a sustainable level of groundwater use would mean no economic growth, he said, Southwest GMD did not aim to achieve zero loss. Instead, the institution sought what John called a situation of controlled decline.

I was confused. Did that mean the GMD had already conceded the loss of the aquifer or did they have an alternative in mind? John said that an eighteen-billion-dollar aqueduct and water conservation areas, or WCAs, were the best solutions to the problem. These WCAs are effectively gentlemen's agreements between two or more landowners to voluntarily limit their joint water use. Enrollments were very low, although the

WCAs entitle farmers to have greater flexibility in how they use their allotted water.

We have to be careful, John continued, that people don't use the tools of conservation as a way to pump out the water that remains. We need to identify criteria. That's why we're in the process of updating our management process document. Everything is driven by this program management document, he said.

The more I heard, the less I understood. Something did not seem to add up but I was not sure what. On the one hand, it was clear that groundwater management was taken seriously. A large number of experts were actively addressing aquifer loss. On the other, the regional management of the problem did not seem to match its scale. My time in South America had made me suspicious of official numbers and narratives. I felt old habits rising to the surface. It was the kind of mystery guaranteed to catch an anthropologist's attention.

I glanced over at my father's clenched jaw and wondered what he thought. After an hour we were both ready to go. John walked us to the door.

Let me ask you, my father said. What do you see for the future?

John paused. He said he was puzzled by how many people who no longer have any water under their land still don't want to sell their water rights to the government for the common good. For a lot of folks, he said with a chuckle, it seems like giving up known rights to an unknown future is like giving up grandpa.

* * *

Before I started searching for the aquifer, I thought I'd already left my grandparents and the farm far behind. But I learned that destructive inheritances are not so easy to shed.

Groundwater runs through my family lines like blood. My great-grandfather RW was among the second wave of settlers invading ancestral Kiowa, Cheyenne, Plains Apache, and Comanche lands in western Kansas, after genocidal campaigns pushed these Native peoples south to the ever-shrinking confines of Indian Territory. RW followed his own grandfather's travels from central Kansas to the Wichita Mountains and then back. In the 1920s, water drew RW to a sod hut on the flat uplands near the Cimarron breaks, where he dedicated himself to breaking out the windswept range still dotted with skeletons overlooked by bone pickers.

There are many stories about RW. None are about stewardship. Most suggest that he was singularly focused on agribusiness. Someone told me that RW thought he could violate the laws of nature and make money doing it. There is one faded photograph of him holding me when I was a toddler. But I never really knew him. All I could say when I started trying to understand depletion was that he was personally responsible for breaking out thirty-eight square miles of shortgrass, that by mid-life he was the largest landowner in Grant County, and that when he died his eldest son had to sell the farm to a multinational pork corporation to pay his debts. I also knew that RW was one of the first to tap the aquifers below the Cimarron River, where the Little Rock House lies.

There is no denying it. The river is gone and my great-grandfather's wells caused it. Like many desert rivers, the Cimarron was a groundwater stream. Its waters were aquifer waters. The riverbed is a crack in the aquifer's earthen cover. Where the water table was higher than the stream bed, the river and its springs flowed. Otherwise, the waters did not.³¹

For early travelers through the immense grasslands, the only comparable space was the sea. The ground is so level and vast

that there is an unbroken view to the horizon dozens of miles away. Traveling over the uniform landscape can give the impression that one has not moved at all, so that the past begins to blur into the present. “That tract may truly be styled the grand prairie ocean,” wrote the merchant Josiah Gregg in his 1831 diary entry near the Little Rock House.³² On the oceanic Plains, waters were mapped like islands. Few of these waters were as precious as the Lower Springs of the Cimarron.

The Springs lay two miles east of the Little Rock House. They were the only permanent source of water in a fifty-mile radius of shortgrass prairie. For millennia, they had been cherished by all those who lived and traveled in the area. Stone spearpoints and butchering sites show that Native peoples inhabited the region for more than ten thousand years. *Cibolero* bison hunters from the New Mexican settlements also frequented the place. In the nineteenth century, the Springs became a noted landmark for those traversing the Santa Fe Trail that led from Missouri to the Rio Grande Valley. Travelers sank a wooden wagon box into the earth and renamed it Wagonbed Springs.

It was a favored spot. “With its delightful green grass glades and flowing torrent,” wrote Gregg, “it had all the aspect of an Elysian vale.” “We rejoiced,” he noted, “at having again made a port.”³³ In this place, the Cimarron was said to be a clear stream that flowed year-round through tallgrass meadows and a small green valley. Early visitors agreed that it appeared like “an oasis in the desert.”³⁴

A nineteenth-century government surveyor described this place as “a series of water holes connected by a narrow channel of pure sparkling water,” which he could easily step across.³⁵ The water trickled into green pools lined with rushes. Bison, elk, antelope, wolves, and bears once drank from the waters. Each year migratory water birds filled the valley. In the pools



FIGURE 4

lived otters and beaver and quicksilver fish found nowhere else. The first settlers recalled waters so rich that “the cowboys would tie their ropes on two ends of a seine and take up enough fish at one haul to feed everyone around.”³⁶

The Cimarron was notorious for its quicksand and floods.³⁷ Its fragility must have been less obvious. Records show that plowing of the uplands along the river began in the 1880s but grew exponentially between 1903 and 1914. Eroded topsoil soon choked the Cimarron’s flow. In 1914, a massive flood filled the riverbed and valley with silt. Some parts of the river’s channel expanded from thirty to eight hundred feet wide overnight.³⁸ Other floods followed in the 1940s. The clear ribbon turned into a damp muddy sheet.

RW stayed through the Dust Bowl and acquired as much land around the Cimarron as he could. This included the Little Rock House. It was built in 1906 out of crude concrete made

with river rocks, a line camp for one of the early ranches. Deeds show the land was sold a dozen times by settlers and speculators before 1945, when RW bought it cheap from the Federal Land Bank. Shortly after, he began irrigating along the Cimarron breaks.

One decade of deep-well pumping was enough to drop the water table some 30 feet below the surface. The state started tracking groundwater levels near the Little Rock House in 1958. By 1976, the Kansas Geological Survey reported that the water table in this spot had dropped by 134 feet.³⁹ It was the highest measured decline in western Kansas and among the highest in the country.

Irrigation motors meant the end of living water in the river and springs. As the aquifer waters sank, the channels turned to sand. The pools dried up. So did the region's smaller creeks and streams and playa lakes. With them went all the life the desert waters had nourished. The river stopped flowing in the 1950s. The Cimarron vanished around the time my father was born, and so did Wagonbed Springs.⁴⁰

The name of the river still lingers alongside those of other dry watercourses. Cimarron is an archaic Spanish word that refers to a fugitive or something gone feral. It hints at forgotten stories of flight, defiance, and refuge. The river's former path through western Kansas is bordered by sage sand hills that defy the plow. On satellite maps, the sandy bed is a twisting thread from New Mexico's grasslands that disrupts the linear grids and crop circles. Today it contains the last corridors of unplowed shortgrass in the county. The river valley is home to remnant bands of mule deer and prairie dogs and eagles and coyotes.

They say RW was fond of hunting coyotes along the drained riverbed. He would shoot them on sight and poison them and drown them and run them with relays of greyhounds until

they died. Those who knew him remember the time he wrecked a brand-new Lincoln car chasing a coyote across the river breaks at night. I picture his fuzzy figure in the bucking car and wonder whether my great-grandfather ever imagined that he would alter the flows and rhythms of this land or that doing so would be the legacy left his descendants. I wonder if he felt any kind of loss as the river dried up and the furrows lengthened. I doubt it.

* * *

If RW offers one kind of settler inheritance, Lila Fern—his daughter and my grandmother—may offer another. She was raised in a clapboard shack on what they called the Old Neese Place, amid prayers and dust storms. Her high-school graduation picture shows a lovely black-haired young woman with an easy smile. By all accounts, Fern was as strong willed as her father. They clashed frequently. She left home and was married in Guymon, Oklahoma, the day she turned eighteen. Her husband Roy came back broken from the war. Against her wishes they returned to the Little Rock House.

Fern spent the rest of her life stuck in a small prairie world under the thumbs of less-talented men. In her mid-thirties, she was afflicted by what they called nervous breakdowns. Afterwards, she grew obsessed with traces of the past. She spent the rest of her life trying to reassemble them.

When I was a child, she walked through pastures to show me Wagonbed Springs and the ruts of the Santa Fe Trail and the grass circles she called tipi rings. I remember her talking about the kind of man she hoped I'd become but I don't remember what she said. She died when I was almost twelve and I have forgotten her last words to me.

She spoke about the Springs so often that they assumed a mythic quality in my mind, although I retain no details of what she must have told me. Fern knew a great deal about the area. She led the county historical society. She founded the town's museum, organized reenactments of historical events and compiled records of all kinds. For several months in 1972, she hosted an AM radio program that shared episodes of local history. But most of her efforts focused on memorializing the original location of the Springs. Perhaps that is why my memory of her is fused with her pursuit of the vanished Springs and why my search for water so quickly blurs into a search for kinship and home.

In middle age, Fern began assembling files of notes for books she never wrote. She dreamed about escape routes and she sought solace in writing a different world. When I stayed at her house I often fell asleep to the smell of her midnight cigarettes and the clatter of her typewriter but I never read anything she typed. It was somehow fitting that most of her files ended up back at the Little Rock House, packed in three battered tin cabinets in the barn.

There I found them in the spring of 2017, almost three decades after her death. The yellowed folders were chewed by mice and sutured with cobwebs. I leafed through them slowly. There were dozens of files labeled in her slanting script with themes like "Crops" and "Churches" and "Indian Stories." Each folder was stuffed with newspaper clippings and correspondence and carbonic transcripts.

In the middle of the second bin lay her thickest folder. "Irrigation" was written on the label. I stopped. Then I eased it from the cabinet and held it in my hands. Time seemed compressed into the fragile tissues and loops of faded ink, hopes and disappointments cycling together like seasons. It felt like some kind of sign.

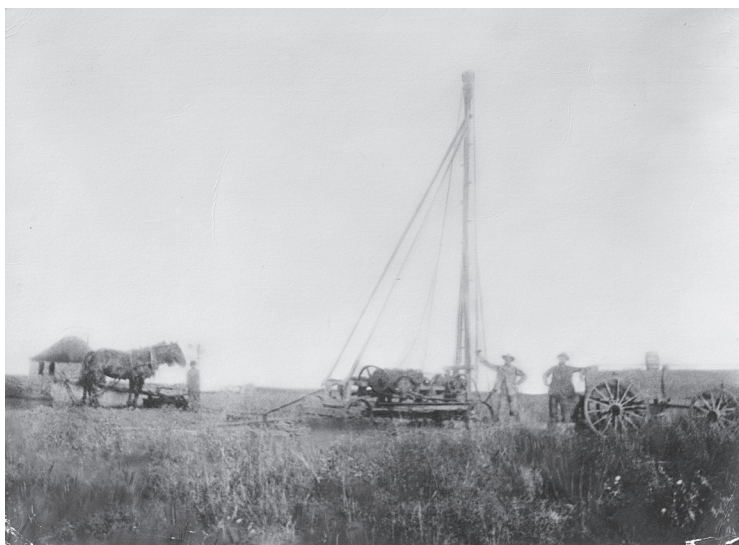


FIGURE 5

I opened the manila paper to discover a mass of details about pumps and flows and acres, as well as transcribed interviews Fern had done with farmers. On the first page were notes she had typed to herself. “Let’s have a little discipline, doll . . . all this stuff in your files and in your head is good for absolutely nothing if you don’t get it down in black and white on paper for posterity. . . . You know all this stuff about irrigation: Write it down!”

Fern collected far more than she ever wrote. Her archive traced one genealogy of groundwater. It included the local origin story. According to this story, the area’s aquifer was discovered in 1893 when a well driller from Lancashire, England, named William Humphreys struck 240 feet of sheet water while he was drilling a water well for the Johnson townsite, using horses and a wooden drilling tower. Humphreys set off a furor when he declared that he had found a massive subterranean

river, with “enough water to float the largest ocean vessel,” buried under the nearby Plains.⁴¹

Others tried to pump this mysterious sheet water to the surface.⁴² Fern’s files showed that area newspapers tracked early drilling experiments like melodramas.⁴³ Editors detailed how a farmer’s choice of bore width, motor power, and pipe casing was rewarded or punished by amount of flow. The principal characters in these moral plays were all men like Charles Rea, H. H. Brown, Buell Scott, R. R. Wilson, and Earl Brookover. The role of women in farming was hardly mentioned in public.⁴⁴ Fern noted the first successful well in Grant County was drilled in 1938 on Otto Fischer’s place, the same German settler who poured the concrete for the Little Rock House thirty years earlier. The discovery of a huge natural gas field in the area boosted irrigation in the early 1940s. By 1966, Fern wrote that flood irrigation from the aquifer watered nearly half of the county’s land.

When I found her files, I did not yet know that Fern’s notes contained few of her own reflections about the groundwater declines that occurred through her lifetime. Those she did give were cryptic: “watertable drop—increased cost of natural gas—question: 39 ft per year, average?” I can only guess how she may have imagined the spread of irrigation and its effects. I cannot say if she ever reflected on the ways the dropping water table mirrored her own personal struggles. But she was undoubtedly aware that her father’s irrigation had caused Wagonbed Springs to go dry. I began to wonder what those lost waters meant to her and why she held so tightly to their memory.

The turnoff to Wagonbed Springs lies two miles down a dirt road. It is easy to miss the dusty sign, which points down a double-track road into a pasture. On a blanched summer day in 2017, I unhooked the wire gate and bounced across the cattle



FIGURE 6

guard. I followed the bumpy path for a half mile, past the ruins of an old dugout and stick corral and dead walnut trees to a small clearing of buffalo grass and bitter gourds. A red pipe fence enclosed a square of imported tallgrass. Just beyond it was a circle of irrigated wheat. As I wandered through the enclosure, I could hear the motors on the breeze.

There was nothing about the place to suggest its past. The site looked like any other spot of pasture, except for a handful of plaques and monuments scattered seemingly at random. The words on them were faded by the sun. I supposed one of these markers had been placed by Fern but I didn't know which. A replica wagon box, bent and half full of faucet water, was set into the ground in the middle of the enclosure. Just beyond the pipe fence stood a pink granite marker. It was the same size and style as a tombstone on a grave. The stone angled toward a sheet-metal silhouette of a buffalo bull, set on the bank of the former river. Something about the likeness was off. But dozens of bullet holes pierced the rusted flanks and head.

Brown sand hills framed the strange figure, with the empty riverbed just beyond. There was no stream, no waterhole, no springs, no rushes, no meadow, no fish, no birds, no visitors. A line of dead cottonwoods tracked the dry channel. They had perished when the water table dropped below the reach of their roots. The massive trunks were peeled and bleached a pale gray. Broken branches reached for the sun. They lay like the bones of some extinct creature that once filled this space and enlivened the yellow grass and whose absence was to blame for the austere flatness of the scene.

* * *

Bones tell secrets and I only know a few. Once a librarian gave me a horse. Mrs. Smith worked in the town's elementary school library for a long time. So long that she had blended into the murmuring voices of children and the smells of cafeteria sweet rolls.

I started school there as a fourth grader, after my father sent us away to the Plains for the second time. My sister and I moved with our mother into a prefab home that faced into the north winds. Mom worked long hours to make ends meet. I spent a lot of time in the tiny school library, with its secondhand books and shrunken tables.

They said the only friend a cowboy needed was his horse. When I finished all the horse books Mrs. Smith had on hand, I read them again. Fern must have heard me talking about it. She started to write me cowboy stories and she found people who had horses I could ride. She never told me that she had set it up or whether she paid them. She just took me to some barn or pen where somebody was waiting and they pretended like I would be doing them a favor to work their horse. I never wanted to

leave the animals no matter their disposition. Even their sweat smelled good to me.

A year later, my father came back. He had lost my sister's dog but had found a girlfriend with a southern drawl. He moved the woman into the middle of a town where everybody knew everybody's business and got her pregnant and my mother filed the papers. One night around that time Mrs. Smith's husband called the house and asked if he could give me a horse. Now it occurs to me that my grandmother must have arranged it. But I cannot say for sure.

The horse was named Stone. He was flea-bitten gray and grotesquely swaybacked and his brown eyes glowed and when Mr. Smith backed him out of a rusted trailer in the old feedlot where my dad was staying I thought he filled the space like lightning. Just before leaving, Mr. Smith hesitated. He stopped his two-tone Ford and got out and walked over to where the horse and I were staring at each other. The big man bent over and looked at me under his John Deere cap. I could smell his aftershave on the wind.

He said there was one condition for the gift and it was that I do my best to treat the old horse right and that I bury him when he died. The horse had done good for him. He wanted to do good by the horse. I nodded my oversized cowboy hat. I said I promised and took his liver-spotted hand and shook it. He started to say something else but he didn't and that was the last time I saw him.

My father soon moved from the old feedlot to the Little Rock House. My sister and I moved with our mother to a meat-packing town fifty miles south, where the profits of industrial agriculture were built from the labor of Hispanic, Black, and resettled refugee workers. We came back to spend our adolescent summers on the farm. Things happened. Some were ugly.

There are many stories that I could tell about the care of my mother and my sister. Out of respect for their privacy, I'll just say that getting through those tough times sealed the pact between us forever.

During those years, my father worked the night shift at the gas plant. Often our new stepmother wouldn't let us stay in the house with her daughter and the baby. We slept in a camper and found company elsewhere. My sister wasn't too interested in horses but Stone carried me far away.

I rode him aimlessly: up the riverbed, around the Big Circle, down the dirt roads. Eventually the horse wouldn't let anyone else ride him but he did what I asked without saddle or bridle and he grazed quietly while I napped on his bare back, cowboy hat covering my face. I try to recall what I dreamed during those horseback naps but I cannot. Stone outlived Fern by a decade, far longer than anyone expected.

I was in college when the horse died. No one told me. When I heard six months later, I made the long drive to the farm to bury the bones. They said he was in the south pasture but I didn't find the skeleton after two hours of walking and when I turned back to the house I knew it had gone wrong. My father's story started to slip so I dropped it. Later, a laughing stepmother said they'd dragged the body to the road with a chain but pieces kept falling off and the rendering man had to be convinced to take what was left.

* * *

A man I'll call Robert now lives in my great-grandfather's home north of the Little Rock House and farms part of his former land. In many ways, he is a typical irrigation farmer. Our ties are

both tenuous and deep. When Robert was a child, RW took him to church and helped teach him to farm.

In the late 1990s, my grandmother's brother Gene sold the farm to a corporate hog concern to pay off family debts. The corporation then resold much of the land under the condition that the buyers would waive environmental rules and permit industrial hog barns. It was the beginning of the pig barns in that region. My father eventually bought back the Little Rock House and two quarter sections. Robert stayed to work some of RW's former fields for a few of the new owners.

These fields included the cornfield across from the Little Rock House. As large as four normal fields, it is called the Big Circle. RW installed a half-mile center pivot irrigation system there in the 1960s.⁴⁵ The sprinkler was a Valley Model 1060, renowned for its so-called water drive. The innovative machine did not require a motor or electricity to move around its center pivot. Instead, the sprinkler was propelled solely by the force of groundwater channeled through an intricate mechanism of hydraulic pistons, gears, and rods. According to family lore, this was the longest pivot system in the world at the time.

My father often saw Robert's pickup coming and going from the Big Circle to check the sprinkler water. He wanted to help me learn more about depletion. So he called Robert out of the blue and asked him to stop by the next time he was down that way to talk about irrigation.

The following week, Robert accepted the invitation. It was the first time he had visited the house in twenty years. He sat on the edge of the couch, his leg bouncing in work pants.

I haven't seen you in years, he said to me. Since that time you broke the augur off that grain cart. Gene was so mad he turned blue. I don't even remember when that was.

It was around 1995. I was fifteen years old. My great-uncle hired me to drive a tractor and grain cart for summertime wheat harvest. At the time it just seemed like a job. Looking back, I suppose he was giving me the chance to share this family labor before the farm was sold. I took a tractor driving class but had no idea what I was doing. The first day I scissored the grain cart into a pole and sheared off the bolts that held the auger arm in place. We lost half an evening of cutting time while Robert welded it and I just watched.

Now I can relate better, Robert continued, cause I watch my kids do stupid stuff all the time.

My father told him that I was working on a book about the dropping water table and that I wanted to ask him some questions. His leg bounced faster. He said he didn't have much to say beyond what everybody already knew.

But he did have a story. Like all farmers, Robert knew the water was running out. He'd watched the water table near his house drop several feet a year. In some places he could only keep irrigating by six-packing, or combining several low-output wells into a single pivot system. Sometimes he wasn't sure what to believe. Robert said he had to grow crops to survive and that crops don't grow without irrigation. Like many other farmers and bankers in southwest Kansas, he defined profitable crops as corn. Wheat and milo just aren't worth enough, he said. And if they start charging for water or if corn prices fall even further, I won't be able to keep going.

To keep going is a cardinal virtue, moral and economic at once. It implies endurance, strength, and grit. And it justifies doing whatever it takes. Faced with rising debts and dwindling water, many farmers turned to double-cropping. It usually goes like this. Every fall around October, a farmer harvests yellow corn. After harvest, fertilizer and pesticides are sprayed

(continued...)

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