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Iowa's Waters: A Mirror of the Land

I. THE IOWA FLOODS OF 2008

In June 2008, floods of historic proportions raged across the Iowa landscape. For weeks, rivers rose to leave their banks, in many eastern Iowa locations spreading farther and deeper than at any time in recorded history. Hardest hit were towns along the Cedar and Iowa Rivers. In Cedar Rapids, floodwaters rose to a stage of 31.12 feet, 11 feet above the previous historic high and 19 feet above the flood stage of 12 feet, and flows crested at 140,000 cubic feet per second (cfs). Discharges of the next largest floods here (in 1961 and 1993) had been about half that size; the average Cedar River flow in Cedar Rapids is a mere 3,807 cfs. More than nine square miles of downtown business and residential buildings, or 1,300 city blocks, went underwater; 25,000 people were evacuated in Linn County alone. Twenty miles to the south, Iowa City felt the largest floods since the construction of the Coralville Dam several miles upstream on the Iowa River. At the University of Iowa, nestled along the Iowa River in downtown Iowa City, twenty-two major buildings—including the entire School of Music and most of the Art and Art History complex—took on water. University flood damages were estimated at \$232 million. For the state as a whole, losses of physical property (including crop losses) were estimated at \$3.5 billion. FEMA declared eighty-five of Iowa's ninety-nine counties federal disaster areas.

Even before the floodwaters peaked, Iowans began asking why. Why now, why here? Cloaked in that question were feelings of anger as well as self-recrimination: What did we do to deserve this? But also, what have we done to cause this? Some clung to the fact that Iowa has always flooded, long before the state's transformation to one of the world's most intensively managed agricultural landscapes. Others stated that a flood was inevitable given the year's weather conditions—rivers running high with snowmelt from the unusually cold, wet, long winter; the cool wet spring preventing planting of crops that would have helped to dry soaked soils; and the intense May and June rainstorms that fell on a saturated land-

scape, swelling the rivers until the water raced out over city parks and fields, into homes and farmsteads.

Given the weather, perhaps flooding *was* inevitable. But many continue to search for deeper explanations and messages. Why were the floods monstrously large? What about the cities that now dot our floodplains and shed rainfall directly into rivers—did they magnify flood levels? And what about climate change? Are we, while using fossil fuels to transport our families to work and school, bringing weather disasters upon ourselves? It is true that the International Panel on Climate Change predicts a rising frequency of high-intensity weather events in the Midwest. Were these floods an expression of such?

And what about the basis of Iowa's economy and culture: the farmscapes that cover about eighty-eight percent of the state? These farms are firmly rooted in Iowa's "black gold," the deep, prairie-bred soils that are among the richest in the world. But the prairies that built the soils also used to blanket them year-round with dense, deep-rooted plants that turned the earth into a gigantic sponge. Prairie landscapes soaked up and held immense quantities of precipitation, releasing it slowly and reluctantly (rather than shedding runoff rapidly into flooding rivers). Could this altered landscape, which we have reshaped to drain land as rapidly as possible, be a source of floods and their destructive powers?

The flatlands of north-central and northwest Iowa, once a vast sea of flowers, grasses, and ponds that bred millions of waterfowl, now stretch to the horizon with corn, soybeans, and little else. Iowa State University Professor Michael Burkart, who has studied the flow of water through Iowa's lands, has tallied the changes that have occurred in the Raccoon River watershed, which bisects this part of Iowa: stream discharge (flow) is now 2.5 times as great as it was eighty years ago (in 1927), a rise that is at least partially explained by the parallel growth in row-crop coverage. (Row crops, which cover and protect the land perhaps a third of the year, neither catch, hold, nor transpire as much water as perennial vegetation does, nor do they store as much water in organic-rich soils.) In addition, much of today's farmland was created by drying over 700,000 acres of prairie wetlands in the Raccoon River watershed, through the construction of artificial drainage systems (networks of underground field tiles, surface drains, and ditches).

Over thirty percent of the watershed's stream channels are modern constructs, which along with straightened, deepened natural stream channels have accelerated the flow of water from the land and increased flood discharge. The Raccoon is a source of Des Moines's water, and has contributed to the flooding of that city.

Iowa's land transformation and other human factors may not have caused the enormous 2008 floods, but is it possible that our intensively farmed landscape swelled their size? Although Mother Nature does in the end prevail, at times dumping amazing quantities of water on our lands, we humans are also good at shooting ourselves in the feet. We have abused as well as used the very lands that feed and house us. Without better care, they are likely to continue to seek retribution.

Knowing this, growing numbers of Iowans have been working to redress the land's wounds—to recloak our landscape in perennial vegetation that will once again hold both soil and water firmly in place. These are Iowa's restorationists: landowners, volunteers, and trained scientists who are steadily, quietly working to replant prairies and other perennial vegetation and to improve the health of our woodlands. Their passion and determination come from their love of the land and its inhabitants, and from the larger knowledge that they are restoring the land's ecological function—returning the prairie state to its original integrity and sustainability as a gift for those to come.

One of Iowa's largest restoration efforts is the Whiterock Conservancy, a large tract on the Middle Raccoon River near Coon Rapids. In an amazing way, this one stretch of land reflects the evolution of agricultural tendencies and values, from the settler's compulsion to transform nature into something "of worth and use," to the farmer's desire to manipulate the land for maximum production, to today's growing sense that we have lost too much in the process. Perhaps it is now time to return to deeper, more ancient roots: the roots of the native communities that once supported life and spirit here in Iowa, America's heartland. The following essay tells the story of Whiterock's people, land, and hopes for what is still to come.

II. WHITEROCK

The Middle Raccoon River originates in Carroll County in west-central Iowa. Its waters pass through Coon Rapids, flowing to the southeast until they eventually feed into the Des Moines River, which continues a southeasterly course. As these rivers cross through the croplands and villages of Iowa, they gather a distinctive blend of soils, agricultural chemicals, city wastes, and anything else small enough to be washed into the swelling flow. All are carried into the Mississippi River at Keokuk, in Iowa's southeastern corner. In this way, the character and quality of Iowa's water becomes an encyclopedia of its tributaries' surrounding lands.

I am walking through a ridgetop meadow near the Middle Raccoon River, whose grassy banks meander through the valley below me. Between me and the river, ball-shaped savanna oaks dot the steep hillside. Just below me a hillside seep wets a rocky outcrop, which glistens in the sunlight. If I impose a sizeable dose of imagination, I can see myself in an Iowa of two hundred years ago, with tallgrass prairie flowing for miles unending over eighty percent of my home state, and bands of forest and savanna running along floodplains and rugged streamside slopes and sometimes onto uplands. Then, as now, the flow and quality of water throughout Iowa was determined by what happened on the land.

This blufftop has until recently been owned by the Garsts, one of the area's founding and most influential families. Although many Garst agricultural operations are now owned by other firms, the family presence remains. Approach Coon Rapids from the east on Highway 141 and you'll see placards announcing Garst Farm Resorts. Drive to the nearby village and a large sign states, "Garst Welcomes You to Coon Rapids." Turn right into the town's business district and the trend continues. Garst Chemical and Fertilizer. Garst Seed Company. Garst Trucks—Turn Here.

Since the first Garsts settled in Iowa in the mid-1800s, the family's activities have paralleled those of 200,000-plus farm families who entered the Iowa wilderness and carved it into home and field. But whatever people did elsewhere, the Garsts did in a big way. In the process, they helped shape agricultural practices across the Midwest and around the world, feeding millions even as they left their mark on the planet's land and thus on its rivers. In an amazing way, the

activities of the Garst family trace the development of agriculture in Iowa and now point us toward a healthier environmental future.

The first Coon Rapids Garst, Edward, arrived in 1869. He drove a wagon here from Boone, forty-five miles to the northeast, loaded with the remnants of his father's failed store: dry goods, groceries, pots and pans, work clothes, hardware, drugs. With these sundries, Edward set up his own dry goods outlet. He and his brother Warren, who later joined him, exhibited a business acumen that through the years came to characterize the growing Garst empire. The Garst Store quickly became one of the town's major business enterprises.

Toiling behind the counter of their store, the Garst brothers did not themselves carve farms into the surrounding prairie wilderness. However, they did supply the growing number of settlers who plowed the tallgrass prairie and were starting to redefine water's flow through the landscape. Cultural expectations and human need dictated that virtually all of Iowa's moist, rich prairie soils would be drained and cropped. As an 1841 Iowa guidebook stated, "However our prairies may have added to the beauty of the landscape, they are impediments to the settlements of a country" (Newhall 17).

Before the prairie was broken and for thousands of years prior, water and the tallgrass soil formed an inseparable unit. The vast North American prairies acted like expansive sponges that rolled uphill and down toward the horizon. Valley bottoms were oozing swales with water hidden just below the soil's surface, filtering slowly downhill, feeding moisture-loving grasses that reached higher than a horse's head. Occasionally the valley water surfaced as ponds, creeks, or rivers. On hillsides, seeps and springs were commonplace, a product of the groundwater leaking to the soil's surface. Fully a quarter of the land surface in Iowa—the geographic heart of the tallgrass prairie—was water-saturated.

While still intact, the massive meshwork of dense prairie roots provided the matrix for filtering and storing a large volume of water and releasing it slowly and constantly. Thus surfacing waters ran crystal clear, and erosion was nearly nonexistent. But settlers near Coon Rapids, like settlers across Iowa, severed this positive union between water and land and began to relegate each to a new function. Once the plow bared the soil surface and cut the prairie roots, the prairie-bred soils lost much of their ability to capture, hold, and

filter water. Efforts to dry and crop the land were magnified a few years later when farmers started digging drainage channels, creating mud-lined ditches where water surfaced and flowed away. Rivers and creeks were straightened. Ponds and backwaters were drained. Soon underground drainage tiles were collecting and feeding water into the proliferating meshwork of creeks and ditches. The goal, later urged forward by the federal government's incentive programs, was to speed the flow of water to the sea. These efforts were especially meaningful just north and east of Coon Rapids, where the prairie pothole region—one of Iowa's wettest landscapes—bred waterfowl by the millions.

The new rapid flows over and through the land behaved very differently from the earlier slow-moving, ground-based seepages, both in what they carried and in how they acted. As if water was loath to release its soil-based harbor, the rapid surface flows picked up and carried soil particles downslope. Valleys received thick sediment deposits. Streams became muddy silt-laden gushes. The prairie's "black gold" ironically became the region's major water pollutant. Soon, sewage and livestock manure were added to the mix. Water's energized surges carved erosion channels on hillsides and cut deep gullies into once-U-shaped valley bottoms. There, the previous slow-moving, constant oozes were transformed into flashy streams that filled rapidly after a rainfall, then dried to a trickle. Upland seeps and springs dried up as the water table dropped. Floods became larger and more severe. Thus, the seemingly innocuous acts of plowing and draining the prairie initiated the severe erosion, sedimentation, water pollution, more intense flooding, and other water-related environmental problems we confront today.

While working as Coon Rapids store owners, Edward and Warren Garst also acquired and bartered land and in the process became owners of considerable tracts. Thus in 1930 when Edward's son Roswell decided to become a farmer, Edward had a piece of land to offer him: a 200-acre farm just south of town. Here Roswell exercised the entrepreneurial skills he had inherited from his father, combining them with a love for experimentation and innovation applied to all aspects of farming. The results were nothing less than spectacular.

Roswell had grown up while farms were still being powered by horses and farmers picked corn by hand, saving the best ears as seed

for the following year. But by 1930, tractors were proving themselves to be more efficient than horses. The development of ever-more-sophisticated farm implements was eliminating hand labor. And, for Roswell, hybrid seed corn had become a reality.

Roswell knew Henry A. Wallace, an Iowan of importance who shared Roswell's love of agricultural innovation and who, in the 1930s, became President Roosevelt's Secretary of Agriculture. Wallace had for years been experimenting with hybrid corn, which was produced by carefully cross-breeding selected corn strains, and which consistently increased productivity. Roswell tested some of Wallace's newly-developed hybrid seed corn. His pleasure with the results led him to grow hybrid seed and promote its use by regional farmers, demonstrating in the process his ability to educate others on the benefits of mechanization and modernization. Within several years, thanks to Roswell's salesmanship, hybrid corn was becoming the norm, its rising yields coupling with greater disease resistance, increased vigor, more efficient use of applied fertilizer, and greater uniformity, all of which helped make large-scale mechanization possible.

Hybrid corn, tractors, and increasingly sophisticated farm implements were elements of the ongoing technological revolution that had characterized agriculture since Iowa's first settlers had crossed the Mississippi River. These elements had many positive results: they steadily increased farm productivity, efficiency, and per-acre yield while decreasing the amount of back-breaking labor and time required to produce each unit of food. However, they also pushed farmers away from self-sufficiency into high-input systems based on imported oil and large cash outlays for equipment, seed, energy, and chemical products.

These many changes were soon amplified by another innovation championed by Roswell: the substitution of commercial fertilizer for manure. Always one to experiment, he had applied chemical fertilizers during the 1930s and found that they magnified hybrid corn's yields. After World War II, the factories that had been built to supply nitrogen for munitions shifted to producing large quantities of inexpensive nitrogen-based fertilizers. Roswell shifted his salesmanship and educational focus to advancing commercial inorganic fertilizer. Soon, applying nitrogen-based fertilizer to row crops was as routine as manure applications had been in previous decades.

About this time, the first synthetic insecticides and herbicides were also being integrated into farming operations. They were rapidly adopted as miraculous compounds that eliminated insect and weed pests with ease.

All these new chemicals permitted the disarticulation of the traditional farming systems that had governed Iowa's agriculture for the previous century. Prior to the mid-1900s, farms utilized crop rotations to protect and maintain soil fertility and to retard the spread of weeds, insects, and diseases. Crop rotations alternated growth of corn, small grains, and hay on croplands, and held additional land in pasture. Much of each farm's crop was fed directly to cattle, hogs, and work horses, whose manure then became cropland fertilizer. The self-maintaining small, diversified farms were far more environmentally sustainable than today's industrial-scale operations. Intermingled small fields, mixed croplands, and pastures also afforded habitat for native animals and plants.

The introduction of tractors and synthetic chemicals set the stage for the abandonment of traditional diversified farming operations and crop rotations. Livestock were no longer necessary to produce manure; commercial fertilizers did the job. Hay and oats were decreasingly needed for feeding the diminishing numbers of horses. And insect pests and weeds could be handled with chemical pesticides. The door was opened for simplified farming systems dominating a greatly simplified landscape. Lands that had once been equally divided between row crops and small grains, hay, and other sod-forming cover crops shifted nearly completely to expansive, row crop monocultures. Increased row crop coverage went mostly to soybeans, the production of which soared after World War II.

Roswell Garst passionately advanced all of these trends. Throughout the mid-1900s, he actively campaigned against crop rotations and the use of legumes to renew soils. He was a strong advocate of simplifying farming and mechanizing production. He promoted continuous cropping of two crops, corn and beans, maximizing their yields through heavy applications of fertilizers, herbicides, and insecticides. He boasted that with proper fertilizer application, he could produce full yields even where topsoil had been removed. He fertilized his pastureland as heavily as his row crops, seeing nitrogen fertilizer as one of the greatest developments in modern agriculture. He firmly believed in maximizing the food

production and profitability of each acre of land. His yields and techniques set a standard not only within Iowa but also internationally: Roswell promoted his theories worldwide and hosted Soviet Premier Nikita Khrushchev at his family farm in 1959.

Meanwhile, the increase in corn and bean row crops, with their typically high soil erosion rates and heavy chemical dependence, started taking a toll on the land's and water's integrity. The push toward one or two uniform commodities meant that more chemicals were applied, more heavily, on more land. Now water washed away not only soil particles and organic pollutants, but also synthetic pollutants—the fertilizers and pesticides sprayed on fields, along with their breakdown products. In addition, wildlife habitat was lost as mechanization was intensified, fencerows were eliminated, row crop monocultures became ever more expansive, and farming practices became more specialized and simplified.

These changes intensified the water pollution problems initiated by the plowing of the prairie. Modern farming practices have also magnified the loss of “free ecosystem services”—basic amenities once inherent in the Midwestern landscape, such as flood control, water purification, safeguarding of topsoil, and decomposition of wastes. These types of ecological services are essential to the preservation of life and basic to our economy: worldwide ecosystem services of all types are valued at \$38 trillion annually. Their loss comprises a major environmental impasse in Iowa. But our state's environmental problems no longer end at our borders. Floodwaters and chemicals from Iowa's farmland wash into the Mississippi River and from here into the Gulf of Mexico. There, the nitrogen intended to stimulate growth of corn and soybeans instead stimulates explosions of algae that, when they die, claim the Gulf's oxygen and kill fish and shellfish, periodically creating a “Dead Zone” of expanding intensity a thousand miles from Iowa.

Roswell Garst's granddaughter Liz lives in a sprawling, hundred-year-old farmhouse on the bank of the Middle Raccoon River, about five miles downstream from Coon Rapids. I join her here late one fall afternoon. We sit on the wraparound porch in the deepening shade, and she tells me about her father, Steve, Roswell's son. About the time that he started farming in the mid-1900s, Roswell developed ideas about using the cobs, leaves, and stalks of corn as

feed for breeder cows. Father and son proved that the feeding plan was profitable. They started to implement it by expanding the size of their cattle herd and their pasture holdings. Steve, who had a passion for owning land, selected hilly tracts bordering the Middle Raccoon south of town. That land, unsuited for cropland because of its steep slopes and high erosion potential, was less expensive than the rich, level cropland farther north. Thus, Steve could buy more land, eventually amassing thousands of acres grazed by thousands of cattle.

In addition to running cattle, Steve managed the Garst Company, an agricultural chemical and fertilizer business. He used large quantities of these products himself. Ridgetops above the Middle Raccoon were sprayed with herbicides and planted to brome, which was heavily fertilized to produce the best pasture. But Steve also loved nature; he was an avid hunter and fisherman. With time, he came to see that continued efforts to drain wetlands were harming the ducks he loved to hunt. His local observations reflected what was happening across the Midwestern Corn Belt: water pollution along with the elimination of about nine-tenths of Iowa's wetlands had caused a crash in waterfowl populations. Other native species were also being lost. For example, Iowa's river mussels dropped from fifty-five species in the 1800s to half that number by 1985; from that year until 1998, the number of stream sites boasting live mussels declined by forty-four percent.

But for Steve, the loss of waterfowl alone was a sufficient inducement for changing course. In his later years, he became an ardent advocate of wetlands. Instead of installing drainage tiles, he began to break them and allow wetlands to refill. He also built ponds, dozens of ponds, and stocked them with fish. He fenced cattle out of these ponds to reduce erosion along their banks. Exhibiting his largesse, he invited others to fish his ponds and hunt his hillsides. The public benefited, but so did the water: his efforts helped reduce the gushing floodwaters and flow of sediment and pollutants into the Middle Raccoon.

Steve's growing conservation interests led him toward additional innovations. While his beliefs in corn-based high-input agriculture continued, he became one of the first in the region to reduce soil erosion by building terraces in his croplands, to install grassed waterways, and to practice no-till farming. He encouraged his fertil-

izer customers to do the same. He also slowly but steadily stopped plowing his hilly lands and converted them to pasture. And he sought ways to share the natural world with others, becoming a strong advocate for rural trail systems and an active member of his local county conservation board in Carroll.

Steve's efforts were a model for the times, but they were not unique. By the 1980s, farmers across the state were adopting no-till farming, installing grassed waterways, and building terraces. Federal programs such as the Conservation Reserve Program started to promote long-term perennial vegetation on the steepest agricultural land. Collectively these practices drew precipitation into the soil, slowing the rate of water's flow and encouraging its release into waterways at a more measured pace. In this way, conservation practices started to reunite water and land in a positive way, healing the landscape wounds of the previous century.

Today we must ask whether such piecemeal efforts to reform agriculture are sufficient. Market forces and federal farm subsidies initiated in the 1930s continue to push the large-scale production of corn and soybeans. These two row crops in the early twenty-first century covered two-thirds of Iowa, a fraction sure to rise even higher as corn-based biofuels pull marginal set-aside lands back into production. Already in 2005, 1.7 billion pounds of nitrogen were applied to cornfields in Iowa alone. That year, nearly 36 million pounds of herbicide and 700,000 pounds of insecticide were applied to Iowa's corn and soybeans. Iowa's agricultural applications, some of the highest in the nation, resulted in a bewildering array of chemicals washing into streams and groundwater. And in the 1990s, manure spills from a growing number of large confined animal feeding operations (CAFOs) began to threaten stream inhabitants. For all these reasons, Iowa's soil erosion and water pollution levels remain high despite conservation efforts to reduce per-acre contributions.

These problems pale in comparison with the larger trends now shaping Midwestern agriculture. Certain commodities are increasingly being farmed under contract to multi-national agribusiness corporations whose profit-driven management decisions are dictated from afar. Ever-more-powerful technologies continue to intensify the use of our agricultural landscape, which some ecologists now consider an "ecological sacrifice zone," exhibiting signs of ecological

collapse. Such are the costs of valuing efficiency, productivity, and short-term profit over long-term environmental sustainability.

These concerns seem distant as I sit on Liz Garst's porch. I watch the Middle Raccoon flow by, just downslope. Like all Iowa rivers, it is carved deep into its floodplain, a sign of heavy runoff and massive erosion. But unlike most Iowa streams, the water runs clear over its rocky and sandy bottom, at least in times of low rainfall. Nearby a prairie planting rustles in the wind. Both upstream and down, as far as I can see, perennial vegetation clothes the floodplain, guarding the soil underneath as well as the stream's clarity and flow.

Liz and her family want to keep it that way. When her father died in 2000, she, her mother Mary, and her four sisters came to a decision: their legacy, the land that Steve had purchased along the Middle Raccoon River, would be preserved as a single unbroken unit. Its size and beauty would be maintained. Choosing a means of accomplishing this was not so straightforward. Their goals for the land were not those of a typical park or land preserve. Because of their agricultural interests, the family wanted to create a site where the working landscape could blend with native plant communities and healthy soils and hydrology, each element nurturing the others in a sustainable manner. They also wanted to dedicate 5,400 acres—over eight square miles of land—to reuniting people with nature and with agriculture. And they wanted to find a way to bolster the long-term economic sustainability of nearby Coon Rapids.

Their solution was establishing the Whiterock Conservancy, a private non-profit land trust aimed at fulfilling all these goals. The family turned the first lands over to the Conservancy in 2004, with donations to continue for the following ten to fifteen years. Once completed, Whiterock Conservancy will constitute one of the largest land contributions ever to be made in Iowa. How it will meet its goals is still being determined, but this much is known: the land will be managed in a way that will promote the reunification of land and water along approximately eight meandering miles of the Middle Raccoon River.

As Liz describes her family's plans to me, I wonder how she got to this point. I ask her: How did your generation reverse the paradigm of intensifying farmland use for maximum profit? Was it the weekly Sunday picnics in the woods that your father insisted upon? Or the hunting trips that you'd taken with him since you were young? Was

it the way he took you wading in creeks and taught you to catch fish with your hands?

Maybe all of these, she says, and maybe none. Then she denies that she is following anything other than the usual Garst economic paradigm, but giving it a different twist. Conservancy land will continue to pay for itself with its earnings, she insists, just like lands across the state must do. Iowa's fertile fields will remain predominantly private for the indefinite future. Liz explains that we need new approaches to land management that will fill the needs of farmers and recreational land owners while allowing them to remain good land stewards. She believes that developing and demonstrating such approaches will become one of Whiterock's primary purposes.

I listen to Liz talking about productivity, but when I look at the nearby river, I see a different story. I know what Liz has already done to purify the Middle Raccoon's flow: the floodplain prairie plantings she has made, the hundreds of acres she has entered in the federal Wetlands Reserve Program. The forest burns she has conducted along the river's banks since the mid-1990s, attempting to stimulate woodland understory that will decrease erosion. Her careful management of cattle on the land. Her self-education in water quality assessment techniques.

And she has told me of her plans for future years: Constructing trails that do not erode. Interseeding native species into grasslands to increase their diversity. Determining how to simultaneously maximize the health of both native plant communities and the cattle that graze them. Certainly these are changes of a totally different character from those her family has introduced in past decades.

Then Liz points out that we are always learning, that change is always occurring. "My father appreciated nature," she says. "He saved habitat for his ducks. We're just taking his interests one step further. We understand the value of biodiversity. We want to get research programs going to demonstrate working landscapes that are both profitable and sustainable." And again I look downstream, seeing the glistening white rocks of the bluffs above the river, imagining the laughs of children yet unborn exploring these hillsides, wondering how much I dare to hope for the future. Is it possible that corridors of native lands could once again line Iowa's rivers? That water again could be coaxed into and through our soils before exiting the state? If so, could flood flows decrease here and all the

way down the Mississippi River to the Gulf of Mexico? And could we dare hope that the Gulf's expanding Dead Zone will start to shrink? I know that if this is to happen, the restraining and cleansing of the waters will need to begin in dozens of rivers like the Middle Raccoon that flows below me.

The dusk thickens and a chill sets in. Liz and I go inside. The river can no longer be seen. Only our dreams remain visible.

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Information Sources

Statistics in "The Iowa Floods of 2008" are taken from a forthcoming book on the science of these floods, edited by C.F. Mutel, to be published in 2009 by The University of Iowa Press, and from Bradley and Mutel (2009).

Information in "Whiterock" was based in part on interviews with Liz, Mary, and Rachel Garst; many thanks to these women for sharing their time and information about their family and its history. Information on the Garst enterprises was also provided by Tolif Hunt (Executive Director of the Whiterock Conservancy) and by Drache (1976) and Lee (1984). Statistics on mussels, wetlands, the economic value of ecological services, and agricultural chemical use are from Mutel (2008), which also discusses many of the broader ecological, historical, and restoration themes outlined in this essay.