Where the River Ran Backwards: Modernity, Myth, and the Making of Chicago

Introduction

“Bubbly Creek,” wrote Upton Sinclair in *The Jungle*, “was an open sewer of festering filth, where the grease and chemicals of the stockyards formed a scum that burst in great blisters... the place seemed hardly human.”

Perched on the edge of Lake Michigan, early Chicago was a city built on water—and poisoned by it. Open sewers fed its river, waste seeped into its wells, and disease claimed thousands. In response, Chicago turned to engineers, not doctors, producing some of the boldest public works in American history: elevated streets, offshore cribs, and ultimately, a river made to flow in reverse.

But these transformations weren’t driven by science alone. They were fueled by fear, political spectacle, and civic performance. This is the story of how Chicago reversed not only its river, but its identity—crafting modernity out of crisis, and exporting the cost downstream.

Historical Context

From its very conception, Chicago was plagued with waterborne pathogens. With no centralized water infrastructure, residents relied on wells or barrels of water drawn from Lake Michigan. “Sewage treatment” consisted of privies, outhouses, or cesspits: little more than glorified holes percolating into the very groundwater supplying their wells. It’s no surprise that typhoid, dysentery, and cholera were looming threats with every sip of water. Particularly egregious was the meatpacking industry, where butchers discarded blood, entrails, and all manner of waste directly into the river.

As the city grew, so did their sanitary problems. Before 1880, over half of the city’s deaths came from children under five. An outbreak of Cholera in the summer of 1849 killed nearly 700 people, representing around 3% of the city, or one in every 36. Just five years later, another outbreak killed 1,424 people. It seemed that only those rich enough to purchase bottled water or hire servants to boil water were reliably safe from disease.

At the time, the prevailing explanation for disease was still of “miasma” or bad odors. People had noticed that there was some correlation between filth and disease, but they mistakenly focused on improving smells instead of the water supply. For example, after the 1854 outbreak, all male Chicago residents aged 21 to 60 were forced to clean up the city for three days. Additionally,

there simply wasn't sufficient political capital to spend significant tax money investing heavily in public infrastructure. Instead the public was happy to purchase quick fixes such as "anti cholera syrups".

Chicago's early public health institutions were fragile, easily dismantled once a crisis passed. The city created its first Board of Health in 1837 – managing quarantine, death certificates, and checking incoming vessels – in response to cholera, but public support quickly evaporated as outbreaks waned. By the mid-1850s, the board had become a political afterthought, and in 1857, amid the Great Panic, it was disbanded entirely, its responsibilities absorbed into the police department. It would take another wave of death in the 1860s for the board to be resurrected.

After the 1854 outbreak however, something shifted. The public menace of disease was too much to ignore. The focus was now placed on solving the city's water and sewage problems. Politicians quickly formed the Board of Sewerage Commissioners and hired Ellis S. Chesbrough, a self-taught engineer renowned for his Boston aqueduct—to lead an unprecedented transformation of the city.

Two Critical Innovations

Chesbrough was a man who dared to dream. After studying London's failures and successes with handling the "Great Stink", he came back to Chicago to build the nation's first comprehensive, unified, city-wide sewer system. Massive gravity-based pipes were constructed above ground – then buried by dirt, elevating the street level of the city. Buildings had to literally be lifted 12 feet by synchronized workers turning jackscrews in a period known as the "Raising of Chicago". The scale of the project was unprecedented. It marked a turning point in the city's relationship with its own infrastructure – an acknowledgment, at last, that protecting the water supply was not optional, but essential. The Raising of Chicago wasn't just a feat of engineering; it was the physical embodiment of a city beginning to confront the consequences of its rapid, messy growth and the decades of disease it had endured.

The sewers fixed one problem, but the crux of the issue was still omnipresent: the sewers drain into Lake Michigan, the same place that feeds Chicago's waters. Thus came the second of his visionary projects, a water intake crib two miles out from shore. Requiring constant labor 24 hours a day, 6 days a week, the project was heralded as the 8th wonder of the world upon its creation.

The concept of a crib drawing water away from the shore of Lake Michigan wasn't new. In fact, the Chicago Hydraulic company was granted a 70 year charter to supply water to the city using similar systems in 1836 – before Chicago was even formally a city. They painstakingly struggled to raise funds until 1840, where they spent $24,000 ($882,000 in 2025) building a pumping station that drew in 25 barrels of water per minute 150 feet from shore. Eventually, this system was overwhelmed by the growing population, prompting the city to hire William J. McAlpine to build a new pumping station and crib 600 feet out from shore. Construction started in 1851 and ended in 1854, ironically coinciding with one of the greatest Cholera epidemics the city had

seen. While not explicitly a “reaction” to the 1854 epidemic, nor did engineers understand the germ theory of disease, the completion of the project that year gave it powerful symbolic importance as a civic response to urban disease. Affectionately called “Sally” by the engineers, the station was upgraded incrementally and given more uptime to adapt to the ever increasing demand for water.

But increasing water flow couldn’t solve the city’s deeper problem: a growing population meant growing waste. An already thriving slaughterhouse industry exploded in 1861 when the Union demanded beef and pork to feed its growing army. This meatpacking powerhouse culminated in the opening of the Union Stock Yards in 1865: processing millions of animals per year and dumping all their entrails, manure, and chemical waste into the “bubbling creek” – aptly named for its steaming methane bubbles and described by Sinclar in all its putrid, gore-slicked horror.

Chesborough’s two mile crib bought the city time. It would take an incredible amount of growth for the city’s waste to extend that far, that is barely a decade or two until the water supply was threatened again. The Great Chicago Fire exposed the need for a more robust, decentralized water distribution system, spurring on future projects. But while Chicago’s water problems were solved for now, the shadow of Cholera and Typhoid loomed over every drink of water.
But while Chesbrough’s innovations bought Chicago time, they couldn’t overcome the foundational forces working against the city—forces built into the land itself.

Geography

Chicago sits atop a subtle yet vitally important geographical feature: the subcontinental divide. This barely perceptible ridge, just west of the city, separates two of North America’s great watersheds. Rainfall to the west flows into the Des Plaines and eventually the Mississippi River; water to the east drains into the Chicago River and out to Lake Michigan. This natural boundary, though almost invisible, would shape the city’s fate in profound ways.

In 1848, construction of the Illinois–Michigan Canal carved a low-elevation channel across this divide, creating a continuous waterway from New York to New Orleans. Just 60 feet wide and six feet deep, the canal sparked a commercial boom. Chicago, now a key link in a national trade network, quickly became the railroad and shipping hub of America. The canal brought in capital, labor, and industry; between 1840 and 1860, the city’s population exploded from just 4,000 to over 100,000.

But the same canal that made Chicago rich also made it vulnerable. Because it provided a direct, low-lying path between watersheds, heavy rains often reversed the natural flow—sending dirty water from the Des Plaines into the Chicago River, and from there, into Lake Michigan. During floods, the city’s waste was effectively funneled back into its drinking supply.

It took two major events to galvanize political will. The first came on August 3, 1885, when unprecedented rainfall overwhelmed the sewers. Waste backed up through city drains, and a visible wave of sewage drifted ominously toward the offshore cribs. The wind shifted just in time,

pushing the filth away, but the near-miss exposed a terrifying weakness. All it would take was one unlucky storm, and thousands could die.

The second event followed soon after: a deadly typhoid epidemic that struck just as Chicago prepared to host the 1893 Columbian Exposition. With the world's attention turning toward the city, its water problems were no longer just a local embarrassment—they were a global concern.

World Fair

America wanted to mark the 400th anniversary of Columbus's historic voyage with a world fair: the so called "Columbian Exposition". An unprecedented bidding war between multiple cities ensued. New York was backed by unimaginably wealthy tycoons – Cornelius Vanderbilt, J.P. Morgan and others were willing to provide $15 million in private funds ($530 million today) – but Chicago successfully marketed itself as the modern, democratic, rising city of the future. After garnering comparable financial might through its railroad and meatpacking industries and running a nationwide lobbying campaign, a narrow vote in Congress granted Chicago the prize of hosting the world fair.

This success reflected a plethora of changes throughout the nation, and was powerfully symbolic to the city. It was a city built and run by blue collar workers, a win by the Midwest against the East Coast elite. As the Chicago Tribute put it, "We have shown the country that we can do something else besides pack pork." The city had been devastated by fire only two decades before, but they had rebounded stronger than ever; their symbolic victory over New York proclaiming a shift in American power westward. However, the story of so called modernity meant its public health image was more critical than ever.

Typhoid cases had naturally spiked after the mass destruction from the fire, but despite a dip due to the new infrastructure, cases had crept up again scarily fast. Two scientists, William T. Sedgwick, Professor of Biology at our very own MIT, and his student, Allen Hazen, a chemist on the State Board of Health in Lawrence, Massachusetts, recognized this grim reality and published a scathing critique of the state of typhoid in the city. Examining official reports from the Chicago Department of Health, Chicago's typhoid related deaths had doubled just the year before in 1891, killing ~2000 people. Foreign newspapers were shocked by the prevalence of known unsafe procedures, such as the nigh universal practice of chilling water using contaminated ice from the river. Even the fanciest hotels would ruin their purified, imported water with river ice.

Chicago's Commissioner of Health during this time was Dr. John D. Ware, appointed in 1891 by incoming mayor Hempstead Washburne. This appointment, reflective of the deeply entrenched machine politics of the era, had him under the political influence of Washburne, who in turn was heavily controlled by the city council. Ware's paradoxically nonchalant response in comparison to the immediate, urgent action by Chicago is proof of this. He claimed that Chicago was "the healthiest city of its size in the world" in spite of his department's own records reflecting the nearly 2000 deaths. He even attacked the report by Sedgwick and Hazen, claiming physicians

had been overreporting and misattributing deaths to typhoid, while European physicians were biased and “unfriendly to Chicago for various reasons”. Yet the damage was done. Europeans were worried about bringing back a plague they’d just begun to eradicate.

Ware was much more wary of the disease than these politically motivated words would make him seem. It was clear to everybody that there was something that needed to be done. In a speech leading up to the fair, an outwardly confident Mayor confided his concerns to the city council, lamenting that they must keep the city healthy so that “when the world comes here it will not enter upon a charnel-house”. A four mile crib was opened in December 1892 – drawing water from even further out from shore. A truly ambitious project, the brainchild of Ellis Chesbrough but never implemented in his tenure, also finally got the green light. They were going to reverse the Chicago river, funneling waste into the Mississippi away from their water supply of Lake Michigan. Construction of this canal began in 1892, but could not be completed in time. Any further remedies would lie elsewhere.

Preparations for the World Fair involved building a “second city” to the south of Chicago. Led by a superstar team of architects and engineers, Daniel Burnham, Frederick Law Olmsted (responsible for Central Park), John Wellborn Root, and Charles Atwood, these men aimed to design a neoclassical dreamscape—orderly, gleaming, and serene. A counterpoint to the chaos just north of it. Where the city of Chicago was sick, sprawling, and chaotic, the Fair’s White City offered a sanitized mirage—planned from scratch, governed by engineers, and immune to filth. It was a controlled performance of the modern city Chicago wanted to be.

W.S. MacHarg, the Chief Engineer of Water, Supply, Sewage and Fire Protection, had the gift of designing the city from scratch, rather than having to do patchwork fixes in response to a rapidly growing city. He estimated that there would be up to 700,000 people at the exposition’s peak, and needed to build a robust system that could accommodate that. Additional care was also taken to keep the shore as pristine as possible; in addition to the obvious health concerns of polluting their water intake, visitors would hardly appreciate the stench or raw sewage along the soon to be built scenic lagoons and waterfront promenade.

Supplying water for the fair itself was as complicated logistically as it was politically. Years of (deserved) terrible publicity forced Chicago’s hand in having the Waukesha Hygeia company, well known for its reputation as safe, potable bottled water within the city, supply water to the exposition. Due to increased concerns about the use of lake ice to cool drinks, the Waukesha Hygeia company used a newfangled invention – the Linde ice machines – to cool their water instead. However, not everybody could afford to buy water, and Chicago needed to prove to the world that their drinking water was safe after years of bold claims. MacHarg constructed 100 stations fed from the their water intake at Hyde Park, the same system that had sustained the 30,000 workers during the construction process. To improve confidence in the water, he used Pasteur Chamberland Filters, a well known company famous for their prevalence in homes and hotels. However, these stations spread disease until MacHarg rebuilt the massive boiler and condenser systems which sterilized all water before distribution. Furthermore, in a clever act of

social engineering, MacHarg proactively prevented any other water sources not under his control by banning exhibitions from supplying their own water.

A lack of pre-existing sewers meant MacHarg could create a system that better represented the modern knowledge of disease and water works. Surface water and roof water could be redirected back into the lake, but they were kept strictly separate from the treatment of sewage. 6 million gallons of waste were collected using the newly invented Shone-Hydropneumatic system, treated through a flocculation process used in Germany, and burned into an ash that could be reused for construction.

The so called “White City” was a miracle of urban engineering. Utilizing modern inventions and cutting edge technical knowledge, these designers showed the world and proved to Chicago what a city could and should be. Their water infrastructure was a demonstration of world class technologies and likewise produced world class results: in 1893, the mortality rate of Chicago was the lowest of any large city in the world except Berlin.

Modern waterworks engineering was not just silently sustaining the millions of visitors; in many ways it was at the very forefront of the world fair. Some of the greatest scientific minds of the day discussed Chicago’s water situation at the World’s Public Health Congress. Visitors loved to tour the new sanitary innovations, and the ongoing construction attempting to reverse the Chicago river was a popular tourist attraction. Ultimately, it would be this river reversal that made the biggest mark on history – defining the future of Chicago and cementing its identity for the next century.

Reversing the River

Vague concepts of “reversing” the Chicago river can trace back to the IM canal. In order to ensure water levels for the transportation of boats through the canal, a set of pumps at Bridgeport drew in water from Lake Michigan and pumped it westward, temporarily reversing the flow while active. Observant scientists noticed that this also flushed waste *away* from Lake Michigan, hinting at a more permanent solution than building cribs farther and farther out from shore. In fact, Sedgwick and Hazen’s original report recommended that the Bridgeport pumps be upgraded as soon as possible. Ellis Chesbrough himself had considered widening and deepening the IM canal as early as 1858, but he recognized that the financial scale and timeline was an impossibility for post Civil War Chicago.

However, with mounting political pressure and newfound economic muscle as the World Fair approached, Chicago set out to finally tackle this ambitious idea. They decided to dig a new canal – the Chicago Ship and Sanitary Canal – connecting the Chicago river to the Des plains, through the subcontinental divide. An earthworks project of this magnitude was unprecedented: 28 miles long, 22 feet deep, and 202 feet wide. This was larger than the Erie or Suez canal, required moving roughly 40 million tons of dirt, equivalent to around 13 times the Great Pyramid.

Construction was an ongoing process of adaptation and invention as technologies developed in response to the problems that emerged. Initial efforts were mostly manual, picks, shovels, and wheel barrows powered by human muscle, although assisted with dynamite for removing rock. Later on, steam shovels and steam powered drills greatly sped up the excavation. The vast majority of dirty, dangerous labor was carried out by immigrant labor. Although drawn by the promise of a new life, immigrants slaved away for 10-12 hour workdays, soaked through in water and mud, paid a measly 15 cents an hour, and living in squalid, ghetto-like encampments. Often it was black immigrants from the South who were stuck with the worst, least desirable roles. Disease was rampant, and dissent simmered until the summer of 1893, when 2000 workers went on strike. The Illinois national guard was called, five men were killed, but ultimately the strike was unsuccessful. Certain workers were blacklisted or replaced, and the tragedy is mostly forgotten beneath the glory of completing the canal. Everything learned from this project formed the Chicago School of Earth Moving, the definitive leader in earthworks engineering and eventually responsible for many of the techniques used in the Panama Canal.

Even before the canal opened, fear flared downstream. St. Louis—terrified that Chicago's sewage would pollute its water supply—sued the Sanitary District in 1899. Facing a potential injunction, the trustees of the District snuck out on the morning of January 2, 1900. In a pre-dawn ceremony, they broke through the final dam of frozen dirt before a court could stop them.

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Eight years and $33 million later—over $1.2 billion in today's dollars—Chicago had achieved the unthinkable: it turned a river around. The once-murky, sewage-choked water began to run clear. The *Chicago Record-Herald* marveled at "water that was actually blue in color and had blocks of ice of a transparent green hue floating in it… causing people who crossed bridges over the Chicago River… to stop and stare in amazement." It was declared the eighth wonder of the world. For a moment, it seemed Chicago had saved itself.

But nature does not yield without consequences. The 1899 lawsuit was just the first ripple in a coming wave of political, legal, and ecological fallout.

Aftermath

Missouri struck first. The Supreme Court heard St Louis's case in 1906, and a massive scientific study ensued. Thousands of water samples were taken up and down the Mississippi river, and both sides tried interpreting the data to their favor. Eventually, the Supreme Court ruled in Chicago's favor, explaining that St. Louis could not definitively trace the river's waste to Chicago rather than the other cities upstream of it, nor could it prove that the river had gotten significantly more polluted due to Chicago's influence. In 1929, Wisconsin sued Illinois, alleging that the diversion of water way from Lake Michigan was affecting water levels. Illinois was ordered in this case to regulate the flow to a daily quota of 2.1 billion gallons per day.

These lawsuits were just one front in a broader cultural war. The reversal of the river became a flashpoint for Midwestern resentment. Chicago's baseball team was mockingly nicknamed the "Microbes"—a name that nearly stuck before they rebranded as the White Sox. Political cartoons showed fishermen pulling up grotesque, hybrid creatures labeled *Chicagoius typhoidus.* A popular joke flipped the narrative: "We sent St. Louis our waste, and an entrepreneurial resident bottled it up and sold it back to us—that's where Budweiser comes from."

This image is in the public domain.

Ultimately, there were consequences to playing God. Despite favorable Supreme Court rulings, the Mississippi River suffered. Eutrophication spread, aquatic life died off, and the canal became an open pathway for invasive species like Asian carp—now a constant threat to the Great Lakes' billion-dollar fishing industry. Chicago had bought itself a new future: one of growth, industry, and modernity. But it did so by burdening downstream ecosystems, destabilizing natural boundaries, and exporting the very consequences it had tried to escape.

A Mythical Epidemic

While researching this paper, I kept stumbling across reports of a deadly cholera epidemic in 1885—one said to have killed 90,000 people, or nearly 12% of Chicago's population. The story appears in textbooks, engineering manuals, even popular histories. A 1964 newspaper commemorating the 75th anniversary of the Sanitary District solemnly recalled "that day in August 1885, when nature pulled the stopper and the rains came… [and] Chicago was to find itself drinking raw sewage and death along with its breakfast coffee." Authors like Erik Larson (*The Devil in the White City*) and Steven Johnson (*The Ghost Map*) echoed the tale, and the *Chicago Tribune* repeated it as recently as 2004.

And yet, it never happened.

There is no mention of such a catastrophe in mortality records from 1885—no newspaper headlines, no mass burials, no documented panic. A death toll of that magnitude would have shaken the nation. The earliest known reference comes not from the 19th century, but from 1941, when Thomas D. Garry, Superintendent of Sanitation, casually referenced a "fearful typhoid epidemic" from that year. From there, the story snowballed—picked up in reports, repurposed in speeches, and ultimately deployed as political capital.

Why? One clue lies in the real events of that summer: torrential flooding that nearly swept sewage into the city's water intake cribs. It was a narrow escape—one that made Chicagoans acutely aware of their vulnerability. In hindsight, that near-miss became a useful fiction. None of the city's water infrastructure projects were cheap, and each required convincing voters that the threat was real, urgent, and deadly. The myth of 1885 helped justify the canal. It reemerged to support the Deep Tunnel. It became part of Chicago's political repertoire—a story of disease and salvation, told just often enough to feel like truth.

"There was no epidemic in 1885," writes Libby Hill, author of *The Chicago River: A Natural and Unnatural History.* "There was fear. And that fear was very useful to the people who needed to build a canal."

Conclusion

Chicago did more than reverse a river—it reversed its narrative. In the span of a few decades, it transformed from a city drowning in its own filth to one that projected modernity, control, and progress. But beneath the engineering marvels and gleaming fairgrounds was a deeper story: one of crisis-driven innovation, political spectacle, and carefully curated fear. Each new project—from cribs to canals—was both a solution and a performance. And in the decades that followed, even the memory of disaster was reshaped to justify the city's ambition. The mythical epidemic of 1885 may not have killed 90,000 people, but its legacy helped build one of the most audacious public works projects in American history. Chicago's water story reminds us that cities are shaped not just by what they build, but by how they choose to remember—and retell—why they built it.

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