

“The Cat Became the Companion of the Crawfish’: Struggling to Drain New Orleans’ Wetlands”

Ari Kelman

In the mid 1890s, as its competitors like Atlanta and Memphis scrambled to prove themselves part of a “New South”—a region of purported racial harmony, far removed from the ugly matter of secession, and, above all, devoted to business—New Orleans was stuck in the mud. In the wake of the Civil War, the Crescent City had tried and failed to reinvent itself, to recapture lost antebellum glory at the center of the Lower Mississippi Valley’s commercial bustle. New Orleanians had lured railroads to town by granting vast swaths of land to private corporations. They had built huge commodities’ exchanges to house the valley’s produce. They had even hosted a world’s fair to showcase their city’s rebirth. The results—the railroads had brought as much conflict as commerce; the exchanges had been unable to revive the economy by themselves; and as for the fair, too few people had come, saddling the city with debt and leaving a sour taste in the mouths of its citizens. So with the turn of the century looming, something drastic had to be done, and reformers, who called themselves “Progressives,” believed they grasped the problem. The solution, they suggested, lay in the mud itself. New Orleans’ wetlands had to go, to be replaced by solid terrain amenable to development, ready for the imprint of progress.¹

The urban wetlands, these reformers insisted, were a major handicap, embarrassing to the city for a host of reasons. They served as fertile breeding grounds for the rodents, mosquitoes, and giant roaches (known locally as “Palmetto bugs,” a deceptively benign name for these winged behemoths) that flew and scurried throughout New Orleans, annoying its citizens and undermining efforts to depict the city as a clean and modern metropolis. Local sanitarians also believed the wetlands had fostered epidemics that had laid New Orleans low from its founding, accounting for

Ari Kelman is Assistant Professor in the Department of History at the University of Denver in Colorado. *Historical Geography* Volume 32(2004): 157-80. ©2004 Geoscience Publications.

its sickly reputation and robbing it of tens of thousands of citizens. Most of all, though, Progressives mourned that the swamps confined New Orleans to a narrow track of relatively dry terrain shadowing the Mississippi River. Until the wetlands could be reclaimed, therefore, these reformers insisted, New Orleans could not grow. And growth was one of the main-springs of activity in the New South. New Orleans, in other words, was being strangled by its swampy surroundings. A solution had to be found, or the city could not survive.²

The effort to drain New Orleans' wetlands provides a window into a field of inquiry that has captivated urbanists in recent years—the study of the “production of space.” This body of literature owes much to geographers who often have drawn on the trailblazing work of Michel Foucault and Henri Lefebvre, especially Edward Soja, who began arguing for a “reassertion of space in critical social theory” more than fifteen years ago. Scholars who have heeded Soja's call, including Gray Brechin, Mike Davis, and Don Mitchell, have convincingly demonstrated that urban spaces are products of power dynamics and negotiation. Surely it is coincidental but nonetheless telling that each of these authors has focused on California, where contests over the urban landscape apparently have been particularly bitter, providing an ideal laboratory to test theories about the ways in which city spaces are produced over time.³

Still, these works typically have lacked a crucial environmental voice, as urban spaces have been seen only as products of discourse, as representations or abstractions. In such cases, the *material* dimension of space has been missing, in other words. This work also has usually focused only on the “social production of urban space,” overlooking the power of the non-human world in shaping city landscapes. Nature, in short, has been static or passive; it has been acted upon rather than acting in city life. As I have suggested elsewhere, this misconception may emerge from the long-standing myth that cities are solely human artifacts, inhospitable to nature. Numerous scholars, of course, including William Cronon, have debunked this view. Even in Cronon's work, however, the question of exactly how, or even if, nature is woven into the city fabric goes unasked and unanswered. In *Nature's Metropolis*, for instance, readers, after learning how corporate capital industrialized time, deforested Chicago's surroundings, and commodified agricultural produce that once linked city consumers with rural producers, might wonder whether what Cronon, drawing on Marx and Hegel, calls “first nature” matters anymore. The following article, in contrast, can be read with Matthew Gandy's and Adan Rome's recent work, suggesting that the non-human world does matter, that geographers and environmental historians can provide a corrective for past oversights if they incorporate material nature into future studies of the production of urban spaces.⁴

In no way should this indicate that the reclamation of New Orleans' wetlands and the resulting production of space was not a social process.

Indeed, the effort to drain the city's swamps was marked by an intersection of several late- nineteenth and early twentieth-century social trends—spreading urban-reform impulses, as Progressives attempted to improve New Orleans' national standing; transformations in the fields of public health and engineering, as these reformers drew on emerging ideas about the genesis and spread of disease and a growing faith in the efficacy of technology to control nature; and shifting gender relations, as some women in New Orleans attempted to redefine their roles in society by entering the public or political sphere. But this is only part of the story. The environment—ideas about nature and the physical power of the non-human world—also played a role. Reclaiming New Orleans' wetlands was part of a broader project sweeping the nation at the time, as people attempted to impose order on their surroundings, urban and otherwise. At the same time, a series of disasters, labeled “natural” in New Orleans, provided much of the motivation to drain the city's swamps. In sum, it is futile to draw a line between the social and natural production of urban space; *all* of the factors listed above fostered a cultural climate in which New Orleanians believed it was both possible and necessary to transform local wetlands into dry land.⁵

The repercussions of these reclamation projects are also interesting, although, for urban geographers and environmental historians at least, somewhat predictable. The struggle to drain the city transformed New Orleanians' perceptions of their surroundings as surely as the wetlands themselves disappeared. Living in an era of steel rails, huge river improvement projects, and ascendant science, the city's residents grew certain that their environment could be tamed. Such confidence made sense, because in these years public health professionals and engineers, working with New Orleans' commercial community, won what appeared to be stunning victories in their battles with the city's dynamic site. The costs of those victories would not come due until years later. By altering New Orleans' wetlands ecology, sanitary reformers visited two cruel ironies on the city—the challenge of keeping an expanding (growth made possible by reclamation) metropolis dry only became more difficult with the construction of each new neighborhood or paved road; and the swamps themselves, viewed at the time as wasteland, or worse, had helped protect the city from catastrophic flooding. Before New Orleanians would have to grapple with those issues, though, they first had to drain their city's wetlands.

A City Confined

Identifying the swamps as a pothole on New Orleans' road to economic recovery was relatively easy; doing something about this perceived problem was more complicated. This was so because the city's topography is unique, a product of “dynamic sedimentation.” Over millennia, when the Mississippi River flooded annually, it carried massive quantities of

solid material suspended in its waters—thus the nickname “Big Muddy.” When the river left its channel, its current dissipated suddenly, diminishing the stream’s ability to carry sediment. The Mississippi thus deposited most of this material closest to its banks during floods, leaving the surrounding land sloping gently down, away from the stream, like a long, muddy ramp. In 1718, on this relatively dry soil—some of the only terrain rising above sea level in the area—colonists began building the original city of New Orleans, what we now know as the French Quarter. The most obvious result of their choice for a town site still staggers the imaginations of visitors to the area—the Mississippi looms high above New Orleans during its flood stages, contained only by artificial levees that usually keep the city dry except during the worst river floods (Figure 1).⁶

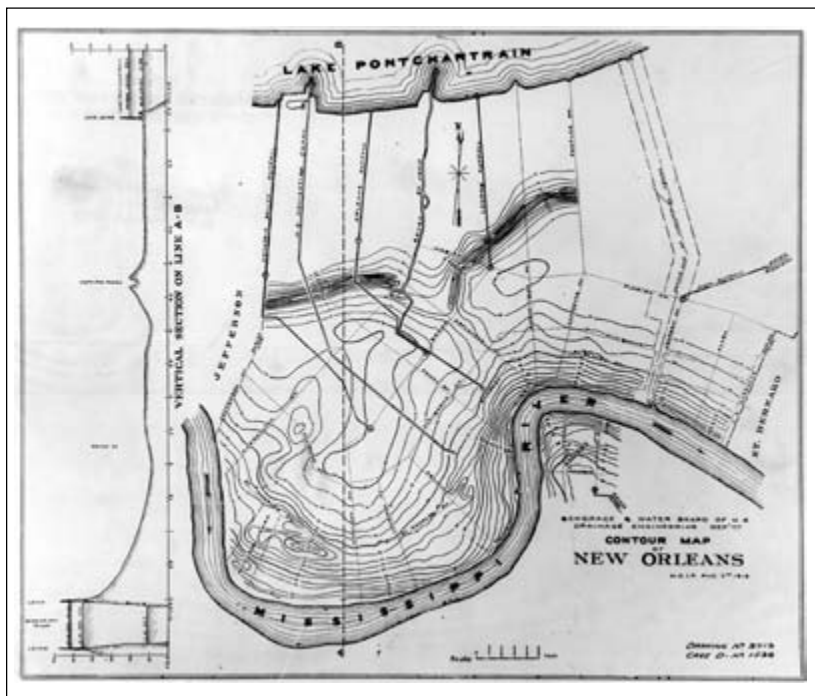


Figure 1. This contour map (1919) demonstrates that terrain in New Orleans becomes recessed as one travels away from the engineered levees flanking the Mississippi River and Lake Pontchartrain. Courtesy of the Special Collections Division, Tulane University.

Another consequence of New Orleans’ unusual locale was that the city was surrounded by either open water or the not-quite land of the swamps. In the mid 1890s, a pedestrian standing with her back to the river on the Mississippi’s east bank in New Orleans would have looked upon the town below her. Walking away from the stream and into the city she would slowly have descended the natural levee’s slope, losing approximately fifteen feet of elevation over roughly a mile and a quarter. She then

would have stood on ground below sea level, next to Claiborne Avenue, a major through street running parallel to the river along its crescent-shaped meander. Any further hiking would have traversed a cypress wetland—known locally as the “backswamp.” The tough going would have extended over relatively flat terrain for nearly five more miles, until finally the exertion would have ended with an ascent up another engineered levee, this one forming the shore of Lake Pontchartrain, at New Orleans’ rear. Like the river’s, Lake Pontchartrain’s waters are elevated above the city, held in check by the high ground of the lake levee. In short, New Orleans resembles a bowl floating in a massive cauldron; only a rim of raised edges keeps water from flowing into a sunken center (Figure 2).⁷



Figure 2. This bird's-eye view (1885), with the Mississippi River in the foreground and Lake Pontchartrain at the rear, shows how water-bound New Orleans is. Courtesy of the Historic New Orleans Collection.

Despite this precarious position, the lake and river rarely overflowed into New Orleans, though floods of another origin often crippled the city. From its earliest days, New Orleanians augmented the surrounding natural levees, generally keeping the river and lake out. The artificial levees, though, had unintended consequences. They were the highest ground in the city, and thus the only local land with effective drainage. Unlike most urban areas, where rain typically flows down slope out of town, in New Orleans runoff travels off the levees *away* from the river and lake, and *toward* the recessed terrain between the two. A guide published in 1885 explained: “the streets of the city are several feet below the level of the [Mississippi], and the stranger is at once struck by the novel sight of the surface water running from the river.” This oddity coupled with a high

water table, made flooding a constant threat during storms that buffeted the region. Once rain fell, it had nowhere to go. An observer explained that “into the New Orleans area, then, all the water in the world could flow, but not one gallon could flow out naturally. Nor could it sink into the ground and so lose itself.” So although the bowl’s high walls generally proved tall enough to keep surrounding water from flowing in, if a storm laddled out a hearty portion of rain, the city filled to the brim (Figure 3).⁸



Figure 3. This wood engraving (1871) depicts Canal Street, one of New Orleans’ main commercial arteries, during the 1871 flood, which was caused by a crevasse at Bonnet Carré, the site of a flood-control spillway today. Courtesy of the Historic New Orleans Collection.

By the 1890s, the quest to drain the city had been going on for 100 years—a centerpiece in New Orleanians’ efforts to impose order on their surroundings and to make clear the distinction between the urban and the natural. As early as the Spanish colonial period, engineers constructed a canal to augment drainage, but the ditch choked with weeds and filth, overcome by vegetation and effluent generated by a growing city. Then, in 1835, New Orleans chartered a drainage company, prompting cheers from a journalist who hoped the city would no longer have to “be amphibious.” Before such a dream could be realized, however, the Panic of 1837 arrived, leaving New Orleans cash-strapped, soggy, and frustrated by connections between the economy and sanitary reform. For fifteen years after that, drainage efforts bogged down, until a yellow fever epidemic in 1853 nearly decimated the city, again spurring interest in the problem.⁹

In an era in which miasmatic theory—the popular belief that foul smells, often spawned by swamps or decaying organic material, caused disease—prompted New Orleanians to fear the “deadly contents” of the local wetlands, drainage became a renewed municipal priority. Already facing stiff competition for control of the region’s commerce, New Orleanians worried that their city would suffer in comparison to rela-

tively healthy trade centers, such as St. Louis. Then, after yellow fever killed nearly 10,000 people during the summer of 1853, observers vilified New Orleans as a "wet graveyard" and a "vast necropolis." In response, in the years leading to the Civil War, engineers implemented plans to use huge, wooden paddle wheels, driven by Corliss steam engines, to propel the contents of New Orleans' drainage canals into Lake Pontchartrain. One municipal official predicted that "when the drainage of our swamps shall be perfected, our city will rank among the healthiest in the world," and "a large amount of property, at present valueless, will amount to millions." Unfortunately for boosters, the paddle wheels, along with almost everything else in the city, ground to a halt during the war.¹⁰

At the end of the war, New Orleanians began trying to revive their city from what they hoped would be a short period of economic sluggishness. At the time, they were confident that environmental hurdles, such as the drainage problem, were all that stood between the city and a return to its exalted antebellum economic status. Thomas Hardee, for instance, a local engineer, suggested that "the future of New Orleans, as a great and populous city, depends more upon the successful solution of this drainage problem than almost any other question connected with her welfare." Believing Hardee was right, but constrained by tight finances, New Orleanians turned to the private sector to solve their drainage woes. Even capitalism's invisible hand, though, failed to reclaim the swamps. So in 1880 the city council sent a commission upriver to study Memphis' vaunted drainage system, which had been designed by a leading sanitarian, George Waring. After Waring's works proved impractical in Louisiana's bayou country, New Orleans had no choice but to continue using its antiquated drainage apparatus, still composed of steam-powered water wheels, ill equipped to maintain a steady flow in the city's drainage canals.¹¹

Then the problem became intolerable. In the mid 1880s, as New Orleanians tried to cast their city as a leader in the New South and a candidate to serve again as the market for the country's mid section, bad drainage continually undercut their efforts. In 1884, renowned local author George Washington Cable surveyed the moist municipal landscape, acknowledging that during rainstorms "large portions of the city are inundated; miles of streets become canals." Cable complained that "all manner of loose stuff floats in the streets; the house cat sits on the gate-post; huge rats come swimming, in mute and loathsome despair, from that house to this one ... even snakes seek the same asylum." Later in the decade, Charles Dudley Warner arrived in New Orleans to write a travel piece for *Harpers* magazine. Warner was stunned by what he found. He wrote of "open gutters green with slime ... little canals in which the cat became the companion of the crawfish, and the vegetable in decay sought in vain a current to oblivion." The water wheels, even when working at maximum capacity, could only remove just over one-tenth of an inch of rain per hour, a drop in the bucket compared to the output of Gulf of

Mexico storms, which sometimes dumped more than ten times that amount on New Orleans.¹²

With famed writers mocking it, New Orleans became a laughing-stock in an era noted for sanitary reform and successful efforts to domesticate previously wild landscapes. Citizens committees, drawing on a heady combination of Progressive optimism and New South boosterism, responded to the taunts by pressuring officials to improve “the almost impassable condition of some of our streets, the deplorable condition of the others, and the dangerous lack of a proper system of drainage.” Using a vocabulary of expertise becoming common in the period, concerned members of the so-called Citizens Drainage and Paving Association called for a “scientific system of drainage as will keep our gutters from becoming stagnant pools in dry weather, our streets from becoming canals in rainy weather.” Other editorialists focused on the public health revolution taking place nationwide, warning that New Orleans’ high death rate—more than 28 per 1,000, as opposed to other large U.S. cities, whose death rates hovered near 18 per 1,000—was “traceable directly to bad drainage.” Bowing to this pressure, the city council passed an ordinance in February 1893 calling for a detailed and “scientific” study of the drainage problem to be conducted by the New Orleans Drainage Advisory Board. Soon after the council’s decision, a series of so-called “natural” catastrophes and social contests elevated this burgeoning reform impulse to new heights.¹³

“Natural” Disasters, Gender Dynamics, and Urban Reform

It began with a flash of lightning across the southern sky and a tremendous clap of thunder. Then, as rain continued to pour down throughout the day on August 13, 1894, it became clear that the squall was different from most other storms in New Orleans. For almost ten hours a heavy shower fell, remarkable not only for its duration, but also for the vast area it covered and the way it seemed to hover just over the city. At the storm’s peak, it pelted the whole of New Orleans with more than three inches of rain falling in an hour. By late evening, when the downpour finally abated, the city felt cooler than it had in some time, but the refreshing air carried a price—much of New Orleans stood under water so deep that it threatened house pets and small children, and the city, once again, had to confront the lingering dynamism of its non-human environs.¹⁴

More than 140 million cubic feet of water fell in New Orleans on August 13—in excess of one billion gallons of rain. Those biblical figures were nearly three times greater than the volume of other storms that had drenched the city in 1894. Heavy rain in July and early August had raised the local water table, rendering already poor drainage nearly nonexistent. As a result, on August 13, New Orleans looked like “Venice,” with “high skirts at a premium.” One observer reported “high tides in the streets,” and said that “regattas could have been rowed on Canal Street.” Camp

Street, another of the city's main commercial thoroughfares, had been "transformed into a veritable river," and few people had the courage to "brave the powerful current." In the days following the storm, a local engineer summed up the obvious, ruefully acknowledging that the "drainage of the city of New Orleans is extraordinarily defective and thoroughly inefficient."¹⁵

Consequently, though it caused great destruction in the city, the storm of August 13 came at a fortuitous time for self-described Progressives working in New Orleans. Flooding following the rain prompted many residents to demand better drainage. In response, a coalition of planners, engineers, commercial elites, and opportunistic politicians—an alliance common to Progressive reform efforts—capitalized on the outcry for civic improvement. Sanitarians, already at work on the Drainage Advisory Board, redoubled their efforts after the storm. These reformers promised to engage in urban wetlands reclamation on an unprecedented scale, and the drainage works they designed fit their grand vision. Their system ultimately would eliminate many of the swamps in and around the city, lower the local water table, drain already developed sections of town, and in the process reshape people's interactions with their surroundings.

Six months after the storm of August 13, the Drainage Advisory Board presented its long-awaited report. The committee's makeup and findings both typified the Progressive enterprise. Its members were urban professionals, drawn from New Orleans' commercial, engineering, and scientific communities. Benjamin Harrod, its chair, had spanned two vastly different eras in his lifetime—the first, antebellum and pre-industrial, the second, a postbellum, New South age of technological advance and quick change. Born in New Orleans in 1837, Harrod attended Harvard, where he became somewhat infamous as a champion of slavery. After serving the South in the Civil War, he won fame in Louisiana as an architect and engineer before heading the Drainage Advisory Board. The committee members had similar backgrounds—business leaders, engineers, and public health practitioners. In short, they were successful professionals who revered expertise. Perhaps most important, they believed New Orleans' history of inconclusive skirmishes with its environment could end in victory for the city.¹⁶

Across nearly 100 pages of text, maps, and diagrams, the report of 1895 revealed the Drainage Board's conviction that New Orleans *could* expand off the high ground near the river and remain dry, even during the heaviest storms. The task, the Board admitted, was complicated. Adequate drainage in New Orleans required two things—first, it required "the removal of the rain water falling upon the inhabited and built-up part of the city," and second, it required "the removal of ground water which at present saturates the soil, causing unsanitary conditions, besides preventing the usefulness of the territory, for one or another purposes as may be required in a large city." The problem was exacerbated by New Orleans'

topography and the question of where water would go once it was removed from the city. Still, the Board's members were certain of success. Due to their training and the empirical foundation of their report, which explained that "the principal reason why so many projects for the solution of the drainage problem have been proposed, and again abandoned, is the fact that insufficient information was at hand," the Board insisted that in a dawning Progressive age, New Orleans could grow. Armed with reams of statistics, the Board suggested a complex program to wring out the city, promising that its plan would keep New Orleans dry and healthy into the future.¹⁷

The key tool in the battle to reclaim the wetlands would be an expertly crafted, scientifically founded, publicly funded system built on ideas the city's drainage engineers had suggested for more than a century. The Board called for improving existing street gutters and constructing new ones. The gutters would flow into bigger branch drains. The branch drains would lead into still larger main drains. The main drains would travel into a network of huge canals, some as much as forty feet across. The canals, in turn, would lead to a single central outflow channel and would be gravity-fed; thus the city's natural slope away from the high ground on the river's or lake's levees would provide the impetus for the drainage inside them. The central channel then would be sited on the lowest point of elevation in the city to take advantage of the slope leading into it. Pumping stations located strategically along its length would maintain a powerful current for the drainage within, until a final set of powerful pumps would raise the contents over the levees and into a bayou that ultimately drained into a nearby bay (Figure 4).¹⁸

In a sense, the Drainage Board recommended that New Orleans create an artificial river system in the city—tiny streams (the gutters) leading to small tributaries (the branch drains) linking with bigger tributaries (the main drains) eventually coupling with still greater tributaries (the branch canals) of a trunk stream (the main channel) finally flowing into a major body of water (one of the lakes surrounding the city). The key difference, of course, lay in the New Orleans' topography. While river systems follow the natural slope of the earth's surface, the Drainage Commission's works would not have that luxury. The pumps would have to overcome the shortcomings of the city's environs; in short, in some ways technology would have to both mimic nature and control nature.

Once completed, the drainage system would be huge, composed of more than 100 miles of canals. The main channel alone would be seven miles long, seventy feet wide, and more than fifteen feet deep on average. At least five sets of multiple pumps would maintain the flow along its length, and four other sets of multiple pumps would be in use elsewhere in the system. The plan's embrace would be massive as well. New Orleans' drainage system at the time included approximately 13,000 acres, leaving vast sections of the developed districts of the city "wholly undrained and



Figure 4. This map of proposed drainage and sewerage improvements (1903) depicts an early iteration of the system that would ultimately drain the wetlands in New Orleans. Courtesy of the Special Collections Division, Tulane University.

other portions, of considerable area ... partially drained.” The plan of 1895, in contrast, would drain an area nearly twice that size. The Board members were gazing into the future, a time when they predicted that New Orleans would be larger, denser, and better paved. Consequently, they promised that their plan accounted for the city’s “improvements and extensions of the next 50 years.” Indeed, better drainage, they suggested, would spur expansion, vaulting New Orleans into the future by improving municipal health and cleanliness.¹⁹

In its reliance on data, expertise, and its faith in a huge, integrated system, the Drainage Board marked itself as Progressive. So, too, did its members’ views of what they called “nature.” Board members acknowledged the power of the “natural” world by predicating their findings on the supposition that New Orleans’ future hinged on matters of topography, geology, and climate. They also were certain that “nature” could be studied, quantified, and ultimately controlled by experts. Finally, the Board believed that any decision to shape the city’s environs carried consequences and responsibilities, and in that understanding, its members also sub-

scribed to an emerging worldview, becoming common among some turn-of-the-century reformers. Still, though Board members understood the non-human world's power, they were not preservationists, interested in protecting nature for its own sake. Instead, the Board saw "nature" as a resource to be nurtured and improved, with an eye toward future exploitation.²⁰

For example, regarding the final outlet for the city's drainage, the Board attempted to protect property rights rather than nature. Most previous drainage plans had projected Lake Pontchartrain as the best end-point for the city's runoff. The lake was close by and vast, and its levee was surmountable compared to the Mississippi River's levee. In an era when natural resources had seemed endless, water pollution had barely merited a second thought. In 1895, however, the Board hoped to leave Lake Pontchartrain pure by delivering drainage to more distant Lake Borgne. Their decision was not shaped by science so much as commerce. Lake Pontchartrain's banks housed "numerous pleasure resorts," and foul water might limit future investment. Lake Borgne's shore, in contrast, was "mostly uninhabited and" therefore "a slight pollution of the water has no disadvantages." What the Board left unstated was that Lake Pontchartrain was shaping up as a playground for elites, while Lake Borgne was the realm of backcountry, hardscrabble trappers, and fisherfolk.²¹

As a result, the Board argued that the "flow should not be delivered where even slight pollution would be undesirable" if such filth might be "detrimental to the value of adjoining lands." Instead they suggested that "drainage should, if possible, be discharged at points where no considerable development is expected." Protecting Lake Pontchartrain, therefore, merited building elaborate mechanisms into the nascent drainage system. The Board, for example, knew the city's "daily flow"—the small quantity of runoff during dry periods—contained the greatest quantity of pollutants, the most "foul drainage of the city." Its report suggested, therefore, shunting that runoff to Lake Borgne, despite the high cost of building a lengthy system of works to reach that location. By contrast, runoff from heavy storms, which flushed out pollutants lingering in the city's streets, could be dumped into Lake Pontchartrain. That water was "less than objectionable in quality." Thus, Lake Borgne could be sacrificed to technology, commerce, and the New South, while Lake Pontchartrain would remain relatively pristine, conserved by reformers concerned with its future and the relatively affluent people already frolicking on its shores.²²

In 1896, shortly after the report's publication, the Louisiana Legislature passed Act 114, clarifying how the drainage system would be paid for and administered. The so-called Drainage Commission of New Orleans would oversee the system and float bond offerings to cover construction costs. Act 114 also stated that the Drainage Commission would be composed of nine members, including city government officials and prominent members of New Orleans' commercial community. The organization would receive state funding but would govern itself. It was charged

with carrying out the Board's plan, letting out contracts "to the lowest responsible bidder," and operating the drainage system. Beyond that, the state gave the Commission great latitude.²³

By October 1896, the Drainage Commission had formed, but numerous hurdles stood in its path, including waning enthusiasm among New Orleanians for a project that would likely cost the city untold millions of dollars. As a result, it took another disaster, again called "natural" in New Orleans, and the impact of shifting gender dynamics in the city, to ensure that the Commission could accomplish its goals. The disaster arrived in the form of another yellow fever epidemic during the summer of 1897. Although the outbreak was relatively minor, the scourge caused unprecedented panic, perhaps because the city had been spared any serious bouts with the virus since the plague of 1878. Ultimately, fewer than 300 people died from yellow fever in 1897, but the epidemic led New Orleanians to demand widespread sanitary reforms, though many members of the city's medical community had abandoned miasmatic theory in favor of an understanding that germs caused illness. Regardless, another epidemic the next summer cemented public opinion, and the city government made sanitary measures a municipal priority, yielding a remarkable series of social and environmental transformations.²⁴

In 1899, the Progressive Citizens League held sway with key members of the city council, and Mayor Walter Flower counted himself among the nation's growing ranks of reform politicians. When councilman Abraham Brittin called on the city to secure control of its water and sewerage system, and then administer them with the planned drainage works, the idea received support from his Progressive colleagues. Such a step, though, required funding, and for that Brittin's allies turned to the city's voters. The reformers argued that New Orleanians should choose municipal control of sanitary services, in which case a tax would have to be enacted. The sanitarians believed that the city's "experiences of the past two summers" with yellow fever had convinced most citizens of the need for reform. So Brittin, Flower, and their cohort called for a special election, leaving the Drainage Commission's fate up in the air, with voters weighing the merits of sanitary reform and choosing whether to pay the costs of cleaning up the city.²⁵

Unwilling to assume that the political culture of Progressivism had swept through the city's electorate, proponents of Brittin's plan formed organizations like the Sewerage and Drainage League and the Citizens Drainage and Paving Association. With the help of these organizations, on April 18, 1899, triumphant reformers presented the city council with a petition signed by more than a third of the property owners in New Orleans, demanding public ownership of municipal sanitary services. Less than a week later, the council passed an ordinance calling a special election to determine if voters would favor a two-mill annual levy to underwrite the acquisition of the city's water works, the construction of a sew-

erage system, and the completion of the drainage plan. Mayor Flower then announced that the election would take place on June 6, 1899.²⁶

With just six weeks until the vote, sanitarians turned to previously disfranchised citizens for help—women. From the campaign's start, women had done research and secured signatures during the petition drive. Then, reform-minded members of the city government chose to allow property-holding women, who almost certainly would embrace sanitary measures, to vote in the upcoming election. Oddly, these activities, even voting, were so couched in Victorian notions of femininity—after all, women were only engaging in a kind of “municipal housekeeping”—that they could be accepted by men eager to uphold traditional gender roles in the city. Indeed, years later, one observer cast female reformers as nurturing homemakers, looking back on women voting as a logical extension of their role in the domestic sphere. “I have always contended that municipal government, akin in so many ways to good housekeeping, affords an admirable field for the exercise of feminine administrative talents,” he wrote. And the day after the election, perhaps guarding her sisters' new political prerogatives, a female voter reassured the city's patriarchs that “women will never hang around polls. Voting was an innovation in their lives yesterday, but the regular work of the day in housekeeping, etc. went on just as though such a momentous affair as casting her first vote was not the question of the hour.” Another woman promised a reporter that “as soon as the result of the election is known the Women's League will disband, for our work will be over.”²⁷

From the first, however, there were subversive undercurrents to these forays into the public sphere. One female organizer explained of activities that many onlookers dismissed as gossip sessions: “Our parlor meetings, social gatherings and so on...have succeeded in educating women.” In short, the petition drive had offered an opportunity to politicize women involved in the campaign. Of even greater significance, though, on election day few women went to the polls; members of the Drainage League, having foreseen their sisters' reluctance in the weeks prior, had secured proxies from eligible female voters in favor of the measure. Impressed, a journalist observed that women “did as much work as all the men in this city put together.” One of the state's leading suffragists, Caroline Merrick, went so far as to gloat about what she saw as a watershed event in the city's history. Responding with a smile that turned into a chuckle when asked how it felt to cast her ballot, she said: “Why it seemed just the most natural thing in the world.” Merrick also proudly noted that suffragists from around the country and the world had telegraphed their support and hinted that the special election would soon be remembered as an important step on the road to women voting nationwide.²⁸

Reclaiming the Swamps

With the help of women casting ballots and a cultural climate shaped by events like the storm and flood of 1894 and the yellow fever epidemic of 1897, the sanitary reform measures won by a landslide—6,272 for and 394 against. Two weeks later, the city council created the so-called Sewerage and Water Board of New Orleans. And with the two-mill annual levy guaranteeing a steady flow of cash, the Board began creating landscapes of progress throughout the city at the turn of the century. Then, as time passed, the drainage system reshaped New Orleans, leaving its signature in webs of canals crisscrossing the city, and its footprint in dry districts that had recently been damp.²⁹

By 1908, the drainage works consisted of more than forty miles of canals and seven pumping stations. The stations could be found at the corners of busy intersections, serving as beacons of human ingenuity, their mass and sturdy construction designed to narrate the story of technology's triumph over once-intractable environs. At the time, the Board bragged especially about its power system, which included electric generators delivering more than 3,000 volts of current to the pumps. Even George Washington Cable marveled that "the curtains of swamp forest are totally gone. Their sites are drained dry and covered with miles of gardened homes." The author begrudgingly admired the fruits of reclamation—where there had been a morass stood evidence that New Orleans had joined the New South. That was just the beginning.³⁰

With each passing year the city advanced and the backswamp retreated. By 1914, more than 2.5 million gallons of water could be pumped out of New Orleans daily, and the Sewerage and Water Board reported that "practically the whole of the 25,000 acres of the City is now available for development." Steady growth in assessed taxable property told part of the story of the drainage system's impact—in 1890 the tax rolls had included just \$132 million worth of property; by 1914 that number had climbed to \$250 million. At the same time, sanitary reformers credited better drainage with making the city healthier. New Orleans' death rate, which had exceeded 27 per 1,000 at the turn of the century, dropped under 20 per 1,000 by 1914. For some boosters, nothing better evoked the changing landscape than a feature that was increasingly included in some new buildings in the city—below-ground cellars, "hitherto unknown in the architectural scheme of New Orleans and never dreamed of in the wildest imaginings of her citizens."³¹

Over time, New Orleans became an oft-cited example of the power of Progressive reform to reshape the environment, as visitors and local politicians hailed changes wrought in the city's fabric. One correspondent exclaimed that "nowhere else in America has any generation been privileged to witness a transformation so complete and extraordinary ... It is a transformation from medieval conditions to the standards of the twenti-

eth century.” Martin Behrman, New Orleans’ self-styled Progressive mayor, also invoked the drainage system as evidence that the postbellum crisis was long gone. “Land before worthless, became at once available for agriculture and city development; mosquitoes were perceptibly on the decrease; gutters were no longer stagnant, and the death rate dropped as if by magic,” he crowed. Applying principles that Behrman insisted were hallmarks of Progressivism had apparently freed New Orleans from limits that climate, geology, and topography had recently imposed on the city’s spatial and economic expansion. If there were still problems in New Orleans—and indeed there were, as the economy never fully regained its antebellum vitality—Behrman and other reformers could ignore such issues in favor of triumphal rhetoric about the civilizing influence of growth.³²

Lingering economic woes, however, were not the only problem; the drainage system had environmental costs as well—some of them immediately evident, others hidden for years. From the start, dissenters had carped that outflow would pollute nearby lakes, and these warnings soon proved prescient. As early as 1901, news of fish kills in Lake Pontchartrain began filtering to the Board, whose spokesman at the time, Charles Loque, dismissed the issue. Loque promised that “whatever deleterious matter that may be contained in the water when it leaves the drainage machines disappears before it reaches the lake, and there the water is perfectly pure.” When pressed, he asked: “Supposing for one instant that the drainage into Lake Pontchartrain would pollute its waters, what effect could this have on the health or comfort of the residents of this city? Lake Pontchartrain water is not potable—it is brackish and cannot be used for drinking or cooking.” By 1910, though, pollution could not be shrugged off. Many New Orleanians were using the canals as dumpsites and some businesses poured toxins into their drainage, prompting complaints of sickening “odors.” But the dumping continued, an example of a growing problem facing the Drainage Board in an expanding urban area.³³

Bitter class conflicts, and, as other scholars have suggested, deeply held racial antagonisms also plagued the Board, as the city’s spatial politics repeatedly turned divisive over issues of adequate drainage. From the planning stage of the system, the question of which districts of New Orleans would receive service troubled drainage engineers. By 1902, members of the Drainage Board acknowledged that the patience of many New Orleanians had waned. Board members especially complained of pressure from real estate speculators who hoped to see wetlands drained to improve returns on their investments. Also in that year, residents of one of the city’s lower-income areas fumed that the Board had neglected them while servicing the neighborhoods of the wealthy. In time, the Board deflected claims of preferential treatment based on race and class, admitting only that residents of the least-developed portions of the city endured worse drainage, while New Orleanians living in more populous areas enjoyed drier land.³⁴

In other instances, the Drainage Board suffered because of its success. One truism of drainage engineering is that the more paved land, the more runoff, and therefore the more complicated the problem. As wetlands shrank and the city grew, developers paved vast tracts of new terrain. At the same time, New Orleans' population grew steadily—from under 300,000 in 1900 to almost 400,000 by 1920, creating an insatiable demand for housing and still more expansion. By 1910, the Drainage Board realized its system was outmoded, and it overhauled the plan of 1895. Yet not even better machinery—including huge, new pumps designed by A. Baldwin Wood—could keep pace with the city, which, by 1915, boasted more than 500 miles of new, paved roads. Overwhelmed by growth, Board members moaned about a “great scattering of the population.” The Board, in sum, hesitated before some of the first pitfalls of suburbanization, the antecedents of urban sprawl that its reclamation efforts had in part fostered.³⁵

At the same time, New Orleans' environs sometimes overwhelmed the drainage system. The weather, for instance, overwhelmed the pumps with periodic deluges, such as the downpours of March 14, 1903 and March 4, 1904. New Orleans' flora also wreaked havoc. Water hyacinths, growing at a scary pace, clogged drainage canals, sometimes leading to flash floods. Finally, the city's geology proved difficult to overcome. As New Orleans expanded onto previously swampy terrain, and improved drainage lowered the water table, catastrophic soil subsidence arrived in tandem with new neighborhoods. When developers built structures atop spongy, drained land, some buildings sank more than two feet in a year. Sewers, gas lines, and water mains sometimes cracked as reclaimed ground subsided, and occasionally natural gas explosions consumed portions of homes or commercial buildings. To wary New Orleanians trying to impose order on their dynamic, urban environment, it seemed that nature sometimes intruded on processes that were supposed to be predictable and under human control.³⁶

None of these problems, though, caused the city to slow its advance or many New Orleanians to question the drainage system's overall impact. At the time, the wetlands remained the enemy of growth and the production of dry space seemed a worthy goal for city officials. New Orleans was cleaner, dryer, and healthier—at least as measured by statistics such as death rates—than ever before. As a result, politicians like Mayor Behrman could gloat that “no project ever brought to a successful issue in the history of New Orleans had so deep and wide an influence for good in all directions as that which ensued from this achievement.” The drainage system had achieved all of the goals that its designers had originally set forth—the local wetlands had retreated, the water table had plummeted, and New Orleans had expanded off its narrow perch near the river. The city had grown so quickly, in fact, that it could realistically claim a place in the New South as a Progressive metropolis committed to controlling its dynamic environment in service of commerce. It would be years before

additional ecological problems inherent in draining wetlands would become evident, and even then, few New Orleanians would question the gospel of growth on which the drainage system, and indeed the city, rested.³⁷

Conclusion

In the twentieth century, with New Orleans extending from the Mississippi River to the shores of Lake Pontchartrain, and local wetlands receding into the realm of dim memory, it was possible to forget the impact that the non-human world had once had on the production of space in the city. New Orleans, so recently down on its luck, had become one of the world's most ingeniously engineered metropolises—where the Mississippi ran behind artificial levees, its waters high above the rooflines of grand, antebellum mansions; where public health officials bested the nation's last yellow fever epidemic; and where the dreaded swamps had been replaced by new development, testifying to the impact of Progressive reform. So pervasive was the sense of expertise's triumph over the vagaries of climate, topography, and geology that one tourist gasped: "every problem of Nature is bound to yield to the ingenuity of man ... man and the hour must eventually meet—and in the meeting Nature must succumb." But in New Orleans, as elsewhere in the nation, nature had not given way to artifice, despite appearances and claims to the contrary. The non-human world still played an important, albeit often hidden, role in producing spaces in the city. At the same time, the technologies at work in New Orleans could sometimes exacerbate the very problems they were designed to solve (Figure 5).³⁸

On April 15, 1927—Good Friday—as New Orleans' Catholic community participated in the Stations of the Cross, a steady rain made the holy day seem more somber even than usual. Still, though much of the Lower Mississippi Valley was under water, overwhelmed by one of the nation's worst floods ever, most New Orleanians remained confident that the artificial levee would protect them from the rampaging river. They were right; the embankment would hold in New Orleans. Yet the city would still flood, because the previous night, a stray bolt of lightning had struck the power station that provided current for New Orleans' renowned drainage system. Without power, the pumps keeping the city dry spun to a halt; and without the pumps, New Orleans slowly began filling with water. Throughout Good Friday, workers struggled to repair the damaged power station as rain fell. By evening, boats navigated the main thoroughfares of the city's commercial district. All told, more than fourteen inches of rain fell in New Orleans on April 15—more rain in a *day* than the city usually received in its wettest *month*.³⁹

The impact of the Good Friday storm and the 1927 flood was immediate in New Orleans and was far reaching. The city government and commercial community together pushed successfully for sweeping reforms



Figure 5. This aerial view (ca. 1940s) demonstrates how the drained city has expanded off of the Mississippi River's natural levee and now stretches across terrain that used to be known as the "backswamp," all the way to the shores of Lake Pontchartrain. Courtesy of the Special Collections Division, Tulane University.

in the nation's flood-control policies. But not even the Good Friday storm caused New Orleanians to reexamine the potential hazards inherent in the city's drainage system or the decision to have reclaimed the local wetlands. Indeed, even as congressional inquiries into the 1927 flood drew on a brewing ecological revolution, discovering that wetlands acted as reservoirs for floodwaters, guarding against catastrophic inundations, Louisiana lobbyists fought to remove sections from new flood-control legislation that would have restored swampland in the Bayou State. And engineers in New Orleans insisted that the Good Friday storm had been a freak event, a "natural disaster" that could not have been avoided. With a crisis at hand, as historian Theodore Steinberg has noted, use of the words "natural disaster" absolved experts and elites in New Orleans from culpability in the destructive flood.⁴⁰

New Orleanians ultimately reacted to the Good Friday storm not by restoring wetlands in the city, as some experts suggested at the time, but by improving the river and lake levees as well as the drainage system, all of which spurred further urban expansion. This response reflected an age-old perception that nature and cities are antithetical and that wetlands

necessarily threaten urban development. Consequently, New Orleans' once massive and thriving swamps, which today could aid the city in its ongoing battles with flooding, are virtually extinct. Except for high water that sometimes lingers after especially heavy rains, it is possible to forget that much of the city lies below sea level on terrain that was recently part of a huge network of wetlands. As geographer Craig Colten has noted, it is only because of another cultural shift, in which tourists and locals have recently begun to associate swamps with the now-venerated natural world, that New Orleanians have started to consider a place for wetlands in the city. Still, today one must either drive miles out of town to see the swamps or go to a wetlands exhibit at the city zoo. There the wetlands apparently have been denatured, and they are displayed along with other exotic species. The drainage system, though, is functioning better than ever; it is considered a cultural landmark and a key to the city's future.⁴¹

Although the broad contours of this case—the dangers of attempting to control nature—are familiar to geographers and environmental historians, the particulars remain instructive, because this story is about the production of urban space. This case, then, suggests an opportunity for such scholars to engage an emerging literature in urban studies, incorporating nature as an analytical category in studies often devoid of such direction. The effort to drain New Orleans' swamps was shaped by social contests, to be sure. Wetlands reclamation was dragged through the muck of urban politics and culture. But the non-human world played a critical role in this drama as well. Disasters that were dubbed as natural, and the city's topography, climate, and geology, all shaped the discourse surrounding reclamation in New Orleans and constrained the process of producing new spaces in the city. Attempting to find or define the boundary where social forces yielded to the non-human world—or vice versa—would be as futile and counterproductive as trying to uphold the dated and discredited nature/culture dichotomy.

Acknowledgements

The author wishes to thank Craig Colten, Ingrid Tague, and two anonymous readers—all of whom provided valuable suggestions that considerably improved this article.

Notes

1. Edward L. Ayers, *The Promise of the New South: Life After Reconstruction* (Oxford: Oxford University Press, 1992): 3-33; Ari Kelman, *A River and Its City: The Nature of Landscape in New Orleans* (Berkeley: University of California Press, 2003): 119-56; C. Vann Woodward, *Origins of the New South, 1877-1913* (Baton Rouge: Louisiana State University Press, 1951): 107-41.
2. Jo Ann Carrigan, *The Saffron Scourge: A History of Yellow Fever in Louisiana, 1796-1905* (Lafayette, LA: The Center for Louisiana Studies, 1994): 38-116; John Duffy, *Sword of Pestilence: The New Orleans Yellow Fever Epidemic of 1853* (Baton Rouge: Louisiana State University Press, 1966): 73.

3. Quote one from Henri Lefebvre, *The Production of Space*, trans. Donald Nicholson-Smith (Oxford: Basil Blackwell, 1998): 68-168. Quote two from Edward Soja, *Postmodern Geographies: The Reassertion of Space in Critical Social Theory* (London: Verso, 1989). Also see Gray Brechin, *Imperial San Francisco: Urban Power, Earthly Ruin* (Berkeley: University of California Press, 1999): xxi-xxvi; Mike Davis, *City of Quartz: Excavating the Future in Los Angeles* (New York: Vintage Books, 1992): 3-14, 101-49, 223-63; Mona Domosh, "Controlling Urban Form: The Development of Boston's Back Bay," *Journal of Historical Geography* 18 (1992): 288-306; Michel Foucault, "Questions on Geography," in Colin Gordon, ed., *Power Knowledge: Selected Interviews and Other Writings, 1972-1977* (New York: Pantheon, 1980): 63-77; Mark Gottdiener, Claudia C. Collins, and David R. Dickens, *Las Vegas: The Social Production of an All-American City* (Oxford: Blackwell Publishers, Inc., 1999): 1-9; Dolores Hayden, "Urban Landscape History: The Sense of Place and the Politics of Space," in Paul Groth and Todd W. Bresi, eds., *Understanding Ordinary Landscapes* (New Haven: Yale University Press, 1997): 113-4; Don Mitchell, "The End of Public Space? People's Park, Definitions of the Public, and Democracy," *Annals of the Association of American Geographers* 85 (1995): 15; Michael Sorkin, ed., *Variations on a Theme Park: Scenes from the New American City and the End of Public Space* (New York: Hill and Wang, 1992): xi-xiii; Sharon Zukin, *Landscapes of Power: From Detroit to Disney World* (Berkeley: University of California Press, 1991): 11-4.
4. Quote one from Mark Gottdiener, *The Social Production of Urban Space* (Austin: University of Texas Press, 1994). Quote two from William Cronon, *Nature's Metropolis: Chicago and the Great West* (New York: W.W. Norton & Co., 1991): xix. Also see Mike Davis, *Ecology of Fear: Los Angeles and the Imagination of Disaster* (New York: Metropolitan Books, 1998): 5-55, 95-147, 197-271; Matthew Gandy, *Concrete and Clay: Reworking Nature in New York City* (Cambridge, MA: MIT Press, 2002): 1-75, 187-234; Blake Gumprecht, *The Los Angeles River: Its Life, Death, and Possible Rebirth* (Baltimore: Johns Hopkins University Press, 2001): ix-xii, 1-7; Kelman, *A River and Its City*, 10; Adam Rome, *The Bulldozer in the Countryside: Suburban Sprawl and the Rise of American Environmentalism* (Cambridge: Cambridge University Press, 2001): 1-13, 87-118, 153-88.
5. M. Christine Boyer, *Dreaming the Rational City: The Myth of American City Planning* (Cambridge, MA: MIT Press, 1983): 6; John D. Fairfield, *The Mysteries of the Great City: The Politics of Urban Design, 1877-1937* (Columbus: Ohio State University Press, 1993): 2-7; Mary P. Ryan, *Civic Wars: Democracy and Public Life in the American City During the Nineteenth Century* (Berkeley: University of California Press, 1997): 7-18; David Schuyler, *The New Urban Landscape: The Redefinition of City Form in Nineteenth-Century America* (Baltimore: Johns Hopkins University Press, 1986): 186-96; Ann Vileisis, *Discovering the Unknown Landscape: A History of America's Wetlands* (Washington, D.C.: Island Press, 1997): 111-41.
6. Charles R. Kolb and Jack R. Van Lopik, "Depositional Environments of the Mississippi River Deltaic Plain," in Martha Lou Shirley, ed., *Deltas in their Geologic Framework* (Houston: Houston Geologic Society, 1969): 17; Roger T. Saucier, *Geomorphology and Quaternary Geologic History of the Lower Mississippi Valley* (Vicksburg, MS: U.S. Army Corps of Engineers Waterways Experiment Station, 1994): 136-41; J.O. Snowden, J.R.J. Studlick, and W.C. Ward, *Geology of Greater New Orleans* (New Orleans: The New Orleans Geological Society, 1980): 1-22.
7. Thomas Ewing Dabney, *The Indestructible City* (New Orleans: New Orleans Association of Commerce, 1928): 3, 4; "Map of New Orleans, Showing Drainage System as Completed to Date," in *Twenty-Eighth Semi-Annual Report of the Sewerage and Water Board of New Orleans* (New Orleans: American Ptg. Co., 1913); *Report on the Drainage of the City of New Orleans, by the Advisory Board, Appointed by Ordinance No. 8327, Adopted by the City Council, November 24, 1893* (New Orleans: T. Fitzwilliam & Co., 1895): 15, 17, 34.
8. Quote one from James S. Zacharie, *The New Orleans Guide and Exposition Hand Book* (New Orleans: New Orleans News Co., 1885): 44. Quote two from Dabney, *The Indestructible City*, 7. Also see George C. Earl, *Sewerage, Water and Drainage System of New Orleans* (New Orleans: Sewerage and Water Board of New Orleans, 1904): 1; Marcel Giraud, *A History of French Louisiana V* (Baton Rouge: Louisiana State University Press, 1987): 206; Kelman, *A River and Its City*, 157-96.
9. Quote from *New Orleans Bee*, 16 June 1835: 2. Also see Duffy, *Sword of Pestilence*, 11-23.
10. Quote one from *New Orleans Daily Picayune*, 14 September 1853: 2. Quote two from B. Dowler, "On the Necropolis of New Orleans," *New Orleans Medical and Surgical Journal* 7 (November 1850): 277. Quote three from "Yellow Fever in New Orleans," *De Bow's Review of the Southern and Western States*, 16 (May, 1854): 464. Quote four from *Report on the Drainage of the City of New Orleans*, 47. Also see Act 165 in *Acts of the State Legislature for 1858* (n.p.:

- n.p., n.d.); Act 179 in *Acts of the State Legislature for 1859* (n.p.: n.p., n.d.); Act 57 in *Acts of the State Legislature for 1861* (n.p.: n.p., n.d.); Major P.G.T. Beauregard, *Report on Proposed System of Drainage for First Drainage District, New Orleans* (New Orleans: Bulletin Book and Job Office, 1859): 3-7; *Charter of the New Orleans Drainage Company* (New Orleans: Brusle & Lesseps, 1839): 1; Duffy, *Sword of Pestilence*, 11-23; John Smith Kendall, *History of New Orleans II* (Chicago: Lewis Publishing Company, 1922): 565-7.
11. Quote from Thomas S. Hardee, "The Topography and Drainage of New Orleans," *The Sanitarian* 3 (October 1875): 302. Also see Act 30 in *Acts of the State Legislature for 1871* (np.: n.p., n.d.); Act 16 in *Acts of the State Legislature for 1876* (np.: n.p., n.d.); City Ordinance No. 1148, N.S. (np.: n.p., n.d.); City Ordinance No. 3448 (np.: n.p., n.d.); City Ordinance No. 3539 (np.: n.p., n.d.); Martin Melosi, *The Sanitary City: Urban Infrastructure in America from Colonial Times to the Present* (Baltimore: Johns Hopkins University Press, 2000): 155-7; *New Orleans Daily Picayune*, 8 and 14 April 1881: 1 and 2, respectively; *New Orleans Times Democrat*, 18 July 1880: 2; *Report of the Committee on Sewerage and Drainage to the City Council* (New Orleans: Madden & Otis, 1880): 11; *Report on the Drainage of the City of New Orleans*, 48-50.
 12. Quote one and two from George Washington Cable, *The Creoles of Louisiana* (New York: Charles Scribner's Sons, 1884): 271. Quote three from Charles Dudley Warner, "New Orleans," *Harpers New Monthly Magazine* 24 (January 1887): 186. Also see *Report on the Drainage of the City of New Orleans*, 51.
 13. Quote one from *Address from the Executive Committee of the Citizens Drainage and Paving Ass'n to the People of New Orleans* (New Orleans: A.W. Hyatt, 1889): 1. Quote two from *New Orleans Times-Democrat*, 13 September 1891: 4. Also see City Ordinance No. 7170, C.S. (n.p.: n.p., n.d.); City Ordinance No. 7350, C.S. (n.p.: n.p., n.d.); City Ordinance No. 8327, C.S. (n.p.: n.p., n.d.); Melosi, *The Sanitary City*, 103-304; Official Minutes, November 21, 1893, City Council, New Orleans, in Louisiana Division, New Orleans Public Library; *Report on the Drainage of the City of New Orleans*, 4; C.H. Tebault, M.D., "The Drainage System Peculiar to New Orleans," *Gaillard's Medical Journal* 49 (October 1889): 326-32.
 14. *New Orleans Daily Picayune*, 14 and 15 August 1894: 3 and 3, respectively; *New Orleans Times-Democrat*, 15 August 1894: 2.
 15. All quotes from *New Orleans Daily Picayune*, 14 and 15 August 1894: 3 and 3, respectively; Also see *Report on the Drainage of the City of New Orleans*, 71-2.
 16. *National Register Evaluation of New Orleans Drainage System, Orleans Parish, Louisiana* (draft report), prepared for the U.S. Army Corps of Engineers, New Orleans District (May 1996): 111-6; *Report on the Drainage of the City of New Orleans*, 3-7; John Buenker, John Burnham, and Robert Crunden, *Progressivism* (Rochester, VT: Schenkman Book, 1977): 3-29, 71-103; Daniel Rodgers, "In Search of Progressivism," *Reviews in American History* 10 (December 1982): 113-32.
 17. Quotes one and two from *Report on the Drainage of the City of New Orleans*, 15 and 22 respectively.
 18. *Report on the Drainage of the City of New Orleans*, 23-38.
 19. Quotes one and two from *Report on the Drainage of the City of New Orleans*, 52 and 26, respectively. See also *Report on the Drainage of the City of New Orleans*, 22-56.
 20. *Report on the Drainage of the City of New Orleans*, 47-50.
 21. Quotes one and two from *Report on the Drainage of the City of New Orleans*, 24 and 25, respectively.
 22. Quotes one, two, and three from *Report on the Drainage of the City of New Orleans*, 16, 23, and 49, respectively. Also see Samuel P. Hays, *Conservation and the Gospel of Efficiency* (Cambridge, MA: Harvard University Press, 1959): 2-4.
 23. Act 114, approved July 9, 1896, in *Acts Passed by the General Assembly of the State of Louisiana at the Regular Session, Begun and Held in the City of Baton Rouge on the Eleventh Day of May, 1896* (Baton Rouge: *The Advocate*, 1896): 162-5.
 24. Carrigan, *The Saffron Scourge*, 141; *Sixth Semi-Annual Report of the Sewerage and Water Board of New Orleans* (New Orleans: L. Graham Co., 1903): 28; *Eighteenth Semi-Annual Report of the Sewerage and Water Board of New Orleans* (New Orleans: n.p., 1908): 66; *Twentieth Semi-Annual Report of the Sewerage and Water Board of New Orleans* (New Orleans: L. Graham Co., 1909): 108, 109.
 25. Quote from *New Orleans Times Democrat*, 18 November 1898: 3. See also Kendall, *History of New Orleans II*, 523-37.
 26. *By-Laws, Sewerage and Water Board of New Orleans, LA. / Act No. 6 Extra Session 1899, Amended by Acts Nos. 85 and 111, Session 1902, and Act No. 69, Session 1904, and as Interpreted by the*

- Supreme Court of Louisiana, Saunders vs. Kohnke, January 19, 1903 (109 La. 838) / Record of Levy of Special Tax of Two Mills and Organization of Sewerage and Water Board and Subsequent Acts (New Orleans: Dameron-Pierson Co., 1904): 14; City Ordinance No. 15,214 C.S. (n.p.: n.p., n.d.).*
27. Quote one from Frank Putnam, "New Orleans in Transition," *New England Magazine* 36 (April 1907): 234. Quotes two and three from *New Orleans Daily Picayune*, 7 June 1899: 1 and 1, respectively. Also see Melosi, *The Sanitary City*, 184-5.
 28. All quotes from *New Orleans Daily Picayune*, 7 June 1899: 1.
 29. Act No. 111 in *Acts Passed by the General Assembly of the State of Louisiana at the Regular Session Begun and Held in the City of Baton Rouge on the Twelfth Day of May, 1902 (Baton Rouge: The Advocate, 1902): 170-81; By-Laws, Sewerage and Water Board of New Orleans...and Subsequent Acts, 14-5.*
 30. Quote from Cable, "New Orleans Revisited," 560. Also see *Sixth Semi-Annual Report of the Sewerage and Water Board of New Orleans*, 30-33; *Seventh Semi-Annual Report of the Sewerage and Water Board of the City of New Orleans* (New Orleans, The L. Graham Co., 1903): 19; *Eighth Semi-Annual Report of the Sewerage and Water Board of the City of New Orleans* (New Orleans, The L. Graham Co., 1903): 31; *Eighteenth Semi-Annual Report of the Sewerage and Water Board of New Orleans*, 61.
 31. Quote one from *Thirty-Second Annual Report of the Sewerage and Water Board of the City of New Orleans* (New Orleans: American Ptg., 1915): 65. Quote two from Martin Behrman, *New Orleans: A History of Three Great Public Utilities. A Paper Read by Martin Behrman, Mayor of New Orleans, Before a Convention of League of American Municipalities, Milwaukee, Wisconsin. September, 29, 1914* (New Orleans: Brando Print, 1914): 5. See also Behrman, *A History of Three Great Public Utilities*, 3, 12; *Thirty-Second Annual Report of the Sewerage and Water Board of the City of New Orleans*, 41.
 32. Quote one from Putnam, "New Orleans in Transition," 229. Quote two from Behrman, *A History of Three Great Public Utilities*, 5.
 33. Quotes from Charles Loque, "Draining the City," (1901), in Drainage Folder, Brochure File, Louisiana Collection, Howard-Tilton Memorial Library, Tulane University: 3 and 5, respectively. Also see *Twenty-Fourth Semi-Annual Report of the Sewerage and Water Board of the City of New Orleans* (New Orleans: Steeg Printing, 1909): 22, 37.
 34. Craig E. Colten, "Basin Street Blues: Drainage and Environmental Equity in New Orleans, 1890-1930," *Journal of Historical Geography* 28 (2002): 237-57; *Eighth Semi-Annual Report of the Sewerage and Water Board of the City of New Orleans*, 6; *Fourteenth Semi-Annual Report of the Sewerage and Water Board of the City of New Orleans* (New Orleans: Searcy and Pfaff, 1906): 12; *Sixteenth Semi-Annual Report of the Sewerage and Water Board of the City of New Orleans* (New Orleans: Searcy and Pfaff, 1907): 33; *Eighteenth Semi-Annual Report of the Sewerage and Water Board of the City of New Orleans*, 15; *Report of the Board of Inquiry on the Conduct and Character of the Drainage Works, New Orleans, LA* (New Orleans: C.W. Corson, 1902): 172.
 35. Quote from *Thirty-Second Semi-Annual Report of the Sewerage and Water Board of the City of New Orleans*, 65. Also see Kendall, *History of New Orleans II*, 552; *Twenty-Second Semi-Annual Report of the Sewerage and Water Board of the City of New Orleans* (New Orleans: Romanski Press, 1909): 23.
 36. *Tenth Semi-Annual Report of the Sewerage and Water Board of the City of New Orleans* (New Orleans: Searcy and Pfaff, 1905): 9, 13, 61; Snowden, Studlick, and Ward, *Geology of Greater New Orleans*, 14-16.
 37. Behrman, *A History of Three Great Public Utilities*, 5.
 38. Quote from Garnault Agassiz, "The Untold Treasures of Louisiana," *National Magazine* (February 1912), in "Description 1912-1913," Vertical Files, Louisiana Collection, Special Collections, Howard-Tilton Memorial Library, Tulane University: 71.
 39. *Hearings Before the Committee on Flood Control, House of Representatives, 70th Congress, First Session on the Control of the Destructive Flood Waters of the United States, November 7, 1927 to November 22, 1927, Part 1* (Washington, D.C.: Government Printing Office, 1927): 255; *New York Daily Mirror*, 27 April 1927, in Box 1, Mississippi River Flood Papers, Record Group 44, Louisiana State Museum, Historical Center Library: 1.
 40. John Barry, *Rising Tide: The Great Mississippi Flood of 1927 and How It Changed America* (New York: Simon and Schuster, 1996): 189-206, 222-81, 339-406; *Christian Science Monitor*, 4 May 1927: 2; Donald W. Davis, "Historical Perspectives on Crevasses, Levees, and the Mississippi River," in Craig E. Colten, ed., *Transforming New Orleans and Its Environs: Centuries of Change* (Pittsburgh: University of Pittsburgh Press, 2000): 84-106; Arthur D. Frank, *The De-*

- velopment of the Federal Program of Flood Control on the Mississippi River (New York: Columbia University Press, 1930): 205-47; Gay M. Gomez, "Perspective, Power, and Priorities: New Orleans and the Mississippi River Flood of 1927," in Colten, ed., *Transforming New Orleans and Its Environs*, 109-20; *Hearings Before the Committee on Flood Control, House of Representatives, 70th Congress, First Session on the Control of Destructive Flood Waters of the United States, November 28, 1927 to December 19, 1927*, Part 3 (Washington, D.C.: Government Printing Office, 1928): 1772; *Hearings Before the Committee on Flood Control, House of Representatives, 70th Congress, First Session on the Control of Destructive Flood Waters of the United States, January 18, 1928 to January 26, 1928*, Part 5 (Washington: Government Printing Office, 1928): 3129, 3467-74; *New Orleans Item*, 1 May 1927: 1; George S. Pabis, "Subduing Nature Through Engineering: Caleb G. Forshey and the Levees-only Policy, 1851-1881," in Colten, ed., *Transforming New Orleans and Its Environs*, 64-83; Theodore Steinberg, *Acts of God: The Unnatural History of Natural Disaster in America* (Oxford: Oxford University Press, 2000): xx.
41. Craig E. Colten, "Reintroducing Nature to the City: Wetlands in New Orleans," *Environmental History* 7 (April 2002): 226-46; J.P. Kemper, *A.B.C. of the Flood Problem* (New Orleans: National Flood Prevention and River Regulation Commission, 1927): 1; Kemper, "The Mississippi River Flood Problem," *New Orleans Life* (August 1927), in J.P. Kemper Papers, Record Group 52, Louisiana State Museum Historical Center Library: 16; *New Orleans Times Picayune*, 20 May 1927: 1.