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Clear as Mud: The Struggle Over Louisiana’s Disappearing Wetlands

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Clear as Mud: The Struggle Over Louisiana's Disappearing Wetlands

A dissertation submitted in partial satisfaction of the requirements
for the degree Doctor of Philosophy

in

Communication

by

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The Dissertation of Edward G. Randolph, III is approved, and it is acceptable in quality and form for publication on microfilm and electronically:

Chair

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DEDICATION

To my wife, Jessica, who is my steady hand; and my late father, Ned, whose kindness and principle of fairness I forever try to emulate.

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ABSTRACT OF THE DISSERTATION

Clear as Mud: The Struggle Over Louisiana's Disappearing Wetlands

by

Edward G. Randolph, III

Doctor of Philosophy in Communication

University of California San Diego, 2019

Professor Patrick Anderson, Chair

The dissertation is about power and the landscape that power produces. It explicates a paradox of modernity, which is this: how one of the most vulnerable places to sea-level rise organizes its economy and culture around extractive thinking and the production of fossil fuels. To do that, it tracks how power produces its own conditions of possibility through crises and responses to such crises that guarantee future action. The

dissertation likewise interrogates structures of discourse, science, and common sense. It analyzes and problematizes the state of Louisiana's historic responses to various environmental crises of flooding, storms, and, starting in the late 20th century, its disappearing coastal wetlands. It frames the state's efforts to restore its coast as part of a complex but ongoing continuum that began three centuries ago with the 1718 colonial settlement of New Orleans and recently made visible by Hurricane Katrina. I argue that the state's political economy organizes itself as the solution to the environmental crisis of its own making. The dissertation relies on mixed methods of archival research, interviews and discourse analysis from a variety of texts, policy position papers, historic newspaper articles, scientific studies, and transcripts of public meetings and court cases. It gestures to traditional and emerging critical fields in the Humanities and Social Sciences such as political geography and political ecology, cultural studies, environmental humanities, science studies, and cultural history. The dissertation is conceptionally grounded and organized around a material component of Mississippi Delta Mud. Through mud, it explicates a cultural and environmental history of New Orleans and Lower Mississippi River Delta region. This is a story of both the natural environment and the social conditions and histories entangled within it. Far from being a passive object that has meandered through the backdrop of national identity and struggle, the Mississippi River and its mud functions as agents in the production of difference – racial and ethnic, colonizer and colonized. This dissertation attends to stories as they have been told and uses these moments to provoke a discussion of the way in which natural history becomes a venue for violence.

Introduction: A turn to Mud

This is a dissertation about water and land in a place called New Orleans. It is a study about a place and how it came to be itself. It is likewise a genealogy of power and the landscape that power produced. It explicates a paradox of modernity, which is this: how one of the most vulnerable places to sea-level rise has organized its culture and economy around extractive thinking and the production of fossil fuels. To do that, I track how power produces its own conditions of possibility through crises and responses to such crises that guarantee future crises. This dissertation will read at times like a narrative. It will likewise interrogate structures of discourse, science, and common sense. What I ask of the reader is to bear with the narrator and allow the story to unfold in a way that illuminates the complex and ever-changing object of inquiry at the center of my research — the Mississippi River and its delta. Because this is a dissertation about material culture, it is conceptionally grounded and organized around a material component: Mississippi Delta Mud. The material of mud is my framework for understanding this place and its past. While mud is intended to ground this study, the work also critiques relations of social power. Through mud, it explicates a cultural history of New Orleans as well as an environmental history of the Lower Mississippi River Delta region and its role in 19th century America. Through mud, it tells a story about the people who have ruled and been under rule. This is a story of both the natural environment and the social conditions and histories entangled within it. Far from being a passive object that has meandered through the backdrop of national identity and struggle, the Mississippi River and its mud functions as an agent in the production of difference – racial and ethnic, colonizer and colonized. This dissertation attends to stories as they have been told and uses these moments to provoke a discussion of the way in which natural history becomes a venue for violence. After the following narrative, I will lay out the methodology and chapters of the dissertation.

Since I will also cover much of the social and environmental history of New Orleans, I propose to should begin with the elephant in the room. Few contemporary narratives of New Orleans escape the thematic vortex of Katrina; so it is with this account. By the time that Category-3 hurricane churned into New Orleans, the swamps and marshes that buffered the city from major storms off the Gulf of Mexico were long denuded and the concrete seawalls on the city's edge proved feckless. The storm easily penetrated the weakened system, pushing water up dredged canals into an urban bowl that had for all intents and purposes constituted a 300-year project of a *modern imaginary* known as New Orleans. The long arc of survival for this city in a swamp has required an ongoing regime of cultural, political and economic practices to stabilize the Mississippi River, drain swamplands and build a fortification of levees in response to one crisis after another. In fact, such crises and the responses to them organized much of the city's political economy and culture. Yet, within the perennial threat of water, there has existed a less-examined change agent: the ontology of mud. To understand New Orleans and the future of this place, which stands as a harbinger to the effects of a warming planet, we must understand it in its unique ecological context, history, and politics.

Many thinkers and spiritualists, philosophers and scientists have noted the peculiar commonality among rivers. Paraphrasing a quote attributed to Heraclitus, no one ever steps in the same river twice, for it is not the same river, and they are not the same person. A river is always in motion. As a result, a river is not even a thing, but instead a procession of action and activity: a site where things happen. It is a locus of force and a canvas of imagination. In this spirit, I have chosen to imagine a journey down the Mississippi River through the perspective of its most basic assemblage – the mud that constitutes it.

Imagine a collection of fragments: granite dust, animal waste, decomposed bone, flakes from an ancient pot shard collected into a fist-sized lump that slides down into a rain puddle. Let us give this lump a name: “mud.” Imagine the mud stuck to the leg of a bear that has wandered through. Dried now, but with its structure intact, mud’s interloper finds her way to a river in search of food. Now freed and reanimated by water, our mud begins to move –now pushed, now pulled – into an alluvial flow of a stream that empties as it travels through and around a cluster of stones and trees into a tributary or brook whose immediate aim is to join with other sediments and flows. By now, our lump of mud has grown in size, collecting unto itself a series of other cast-offs: the remains of rotted leaves, larvae and feces. Let us remember that the lump is alive, home now to a gathering of microbial agents whose work to digest its component parts continues with its interaction with hydrogen, carbon and oxygen. This living lump now finds itself in a tidal pool: lurching, joining and separating into a viscous torrent of carbon-based fragments of leaves, limbs, bone, food, waste, fur, pesticide, garbage, oil, effluent – a changing manifest that gathers through many layered registers of geography and history. Microbial matter, human waste, preservatives in processed foods, plastics, coal ash, concrete morsels and clay, nails, a broken roof shingle, plastic tarp, a chunk of Styrofoam and industrial lubricants intermix with what we have dreamed as the natural world. They are suspended in animation together in confluent currents pitting and prying against stratified forces within the water column that swirl and eddy against themselves – but always in the inevitable urge towards the sea – eventually through the forceful momentum of movement itself that began when a tectonic collision buckled the continent at its center and lifted up the Appalachian Mountains two million years ago. Into the resulting crease, a great basin of tributaries flowed taking the continental face with it.[1] Epochs of glacial movement and withdrawal followed by regular seasonal snow melts have ever since poured an entanglement of waters and sediments into this cleft from as far as the Rockies to the west and Alleghenies to the east. In these upper portions of the Mississippi River's tributary basin, the current moves swiftly through old glacial groves towards and into the crevasse of the Mississippi River watershed. In the less rocky lower valley, the Mississippi broadened and slowed because it was unconstrained by hard ridges. Through this flat delta the river meandered "like a pianist playing with one hand – frequently and radically changing course."[2] Like those cultural iconoclasts who created the rhythmic register of the Delta, the river's promiscuity overflowed constraining boundaries of the day – scouring and consuming its banks in unexpected shifts that moved territory and state borders overnight. The mud in the river directed the stream where to go – surging over to the left or right, slowing to a ridge of its own making – from which to push off into new directions. As it meandered, it dropped sediment that added to the resistance of the land by adding to the land itself. Within its "concatenation of currents,"[3] the river traveled at different velocities at different depths, causing the water to fold over onto itself, creating a unique hydraulic phenomenon unlike any other waterway in the world. "Not only is it acted upon; it acts. It generates its own internal forces through its size, its sediment load, its depth, variations in its bottom, its ability to cave in the riverbank and slide sideways for miles, and even tidal influences, which affect it as far north as Baton Rouge."[4]

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[1] Christopher Morris, *The Big Muddy: An Environmental History of the Mississippi and Its Peoples from Hernando de Soto to Hurricane Katrina* (New York: Oxford University Press, 2012).
[2] John McPhee, "Atchafalaya," *New Yorker*, February 23, 1987, https://www.newyorker.com/magazine/1987/02/23/atchafalaya.
[3] John M. Barry, *Rising Tide: The Great Mississippi Flood of 1927 and How It Changed America* (New York: Simon & Schuster, 1997), 38.
[4] Barry, *Rising Tide*, 38.

The last 450 miles of the river's flow lies below sea level, which means that river bottom currents have no reason to flow at all. "But the water above it does. This creates a tumbling effect as water spills over itself, like an enormous ever-breaking internal wave."[5] It could attack a riverbank like a buzz saw until it forced passage, resulting in a torrent that would become a cascade. "The banks dissolve like sugar, and the next day steamboats can cross where the day before were fields and maybe houses."[6] In the fall and spring, in particular, the water could rise with "terrifying rapidity and overflow its banks in certain reaches till it is sixty miles wide."[7] The Mississippi was the only river in the world with "mud lumps" or volcano-like geysers of gasses and liquid mud. They ranged in height from three to ten feet that could spontaneously lift a passing ship.[8] The turbid rush of mud and silt built and washed away subsurface sandbars and protruding islands in a manner so fickle that 19th century riverboat pilots were required to memorize every changing inch, curve and depth with each new trip. A pilot's memory was updated with new reports from other pilots to be learned by heart, described by Twain, "as if one were dropped at random on the longest street in New York in the middle of an "inky black night" and must describe every lamppost and doorway."[9] By the return journey, the map had changed.

Before the arrival of Europeans and their levees, the Mighty Mississippi is said to have resembled an inland lake – a "shallow and wide glade of free-flowing tributaries from the western and eastern corners of the northern continent" – that seasonally flooded for miles and nourished an expansive milieu of hardwoods: oak, ash, elm, willow, cottonwood, tupelo, cypress and sweet gum, habitats of fish, shellfish, reptiles, amphibians, panthers, wolves raccoons, otters,

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[5] Barry, *Rising Tide*, 38.
[6] Louis How, *James B. Eads* (Cambridge, MA: Riverside Press, 1900; Project Gutenberg, 2008), http://www.gutenberg.org/ebooks/26052.
[7] How, *James B. Eads*, 7.
[8] Barry, *Rising Tide*, 38.
[9] Mark Twain, *Life on the Mississippi* (Toronto: Musson, 1883; Project Gutenberg, 2006, last updated 2018), chap. 13, https://www.gutenberg.org/files/245/245-h/245-h.htm.

muskrats, opossums and great flocks of birds.[10] It drained into a delta that stretched south from the town of Cairo, Tennessee to beyond the Pleistocene ridge at what is now Baton Rouge. The land south of Baton Rouge consists of what's called alluvial delta. It began forming over 8,000 years ago as the great sediment flow from melting glacial ice pushed south past the Pleistocene shelf and out onto a muddy shelf of its own making, unevenly dropping and pushing mud, clay, sand and silt into the body of water named by Spanish explorers as *Seno Mexicano*. When the conquistador, Hernando de Soto, reached the eastern Mississippi shores in the spring of 1541, in what is today northern Mississippi and Tennessee, his expedition's quest for gold and subjugation was slowed only by the river's intransigent muddy edges. The expedition of more than 600 soldiers, retainers, captives and war dogs trudged through waist-deep fecund marsh.[11] They were beset by a problem of mud and marsh that both impeded their progress yet provided ample supplies of fish and nourishment for the marooned encampments. They waded through water, and when the river receded that summer and fall, they marched through mud. The next spring, the river returned, muddying the valley again. For De Soto's men, the "pathless forests" were sometimes too muddy and inundated even for horseback.[12]

But there was food: fish so plentiful they were killed with clubs. And there were people that the conquistadors exploited, killed and made alliances with during their unrequited search. Just after reaching the eastern shores of the Mississippi, the expedition was met by the Aquixo ruler of a populous community from the western shore, who presented De Soto with three boatloads of fish.[13] The native Americans claimed that Aquixo's province and nearby Quizquiz

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[10] Morris, *Big Muddy*, 10.
[11] John R. Swanton, "Hernando de Soto's Route through Arkansas," *American Antiquity* 18, no. 2 (October 1952): 156, https://doi.org/10.2307/276540; Jeannie M. Whayne et al., "Spanish and French Explorations in the Mississippi Valley," in *Arkansas: A Narrative History*, 39–52 (Fayetteville: University of Arkansas Press, 2013).
[12] Morris, *Big Muddy*, 12.
[13] Morris, *Big Muddy*.

was subject to an even more powerful leader, named Pacaha, who lived further north. Five weeks later, the Spanish expedition successfully crossed the river on four large rafts constructed from tree logs near present day Memphis. "They entered the province of Casqui after two days of very difficult travel through swampy lands."[14] En route to the settlement, Casqui's leader several times sent him "a present of skins, shawls and fish." Catfish alone weighed up to 100 pounds. There were Buffalo Fish, Paddle fish, Large-Mouth Bass, Bluegill Sunfish, and Freshwater Drum "the size of hogs." [15]

Our basic knowledge of the expedition comes from narratives of the Spaniards and later archaeological and environmental studies that attempt to clarify interactions and the subsequent devastation of the indigenous chiefdoms that largely disappeared. Some of the chiefdoms are thought to have reorganized into more fragmented groups shortly thereafter.[16] Records of their warring exploits aside, the Europeans also introduced continental diseases such as influenza, whooping cough, measles and smallpox that many scholars believe contributed to the wide-scale collapse of indigenous Mississippian culture. Finally, recent research on trees has uncovered evidence of a drought at the time, as well as a possible "little ice age" of colder than average temperatures, so that by the time the English established Charleston in 1670 and the French began their exploration of the Lower Mississippi Valley in 1673, the complex societies that de Soto had encountered had vanished.[17]

That the Spanish and French chroniclers used entirely different names to identify the indigenous Americans they encountered over the 150-year interval adds to the mystery of the

[14] Whayne, "Spanish and French Explorations," 34.
[15] Morris, *Big Muddy*, 10–14.
[16] Kathleen DuVal, *The Native Ground: Indians and Colonists in the Heart of the Continent* (Philadelphia: University of Pennsylvania Press, 2006).
[17] David H. Dye, "Death March of Hernando de Soto," *Archaeology* 42, no. 3 (May/June 1989): 26–29, 31.

expedition. The river itself, particularly in the lower delta, was also in dynamic action creating new land and shifting directions altogether so much so that René Robert Cavelier, Sieur de la Salle, who "claimed" the river in 1682 for France when he sailed out of Lake Pontchartrain, failed to locate the mouth of the river four years later.[18] He was following the cartographic writings of the de Soto expedition, which may have actually descended down the present day Atchafalaya River, not the Mississippi. La Salle was subsequently murdered in a mutiny after landing 500 miles off course near present day Galveston, Texas. Whether the mouth of the Mississippi shifted or was mis-documented, a change in appearance 150 years later is plausible given that the river and mud were in constant flux forging new meander paths to the sea.

Digs funded by the Works Progress Administration in the 1930s have identified sophisticated indigenous settlements, earthworks, and pottery pieces along the Mississippi River's former meander routes.[19] Indigenous societies date to 4,000 BCE. Artifacts discovered in shell middens in the Pontchartrain basin outside of New Orleans and 5,500-year-old earthen mounds from the "Poverty Point" World Heritage site in northeast Louisiana have helped western researchers infer that the location of the earliest settlements along the Mississippi River are some of the oldest in North America. Described by Western anthropologists as "Middle Archaic hunter-foragers," the people of Poverty Point near present day Monroe, Louisiana spent 500 years constructing a concentric circle of six mounds surrounding a 37-acre plaza. The largest mound is longer than 1,300 yards. Nearby midden mounds are filled with bones of fish from the river, three species of gar, three species of sucker, five species of catfish and various bass, drum and crappie, as well as remains of deer, opossum, moles, voles, various mice and rats, pocket

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[18] John W. Day Jr. et al., eds., *Perspectives on the Restoration of the Mississippi Delta: The Once and Future Delta* (Dordrecht: Springer, 2014).
[19] Edwin Austin Lyon, *A New Deal for Southeastern Archeology* (Tuscaloosa: University of Alabama Press, 1996); Morris, *Big Muddy*.

gophers, gray squirrels and fox squirrels, cottontail and swamp rabbits, beaver, raccoon, muskrats, otters, turtles of all kinds, snakes, alligators, frogs, toads, geese, ducks, turkeys, grouse and eighteen different species of river mussel. The Lower Mississippi Valley is one of few places in the world where agriculture developed independent of outside influence. “Wild Gourds were used as containers and food by indigenous North Americans as early as eight thousand years ago.”[20] As late as 5,000 years ago, domesticated seeds of acorn squash and bottle gourd were used. Indigenous people who lived 4,800 years ago at Duck River in Tennessee raised sunflowers.[21] Subsequent settler-colonialist writings documented the mysterious mounds along the Mississippi River that many posited as burial sites, effigies, staging points or navigational sites for orientation when the river was in high seasonal flood stages.

The Lower Mississippi Delta on which modern-day metropolitan New Orleans resides consists of alluvial swamp forests and wetlands created over various meandering episodes in the Holocene Epoch, which began 11,650 years ago. As the Mississippi’s mud flow reached further and further south of Baton Rouge, it built what are called delta “path lobes” that extended the riverine delta into the sea. The longer the ridge held the channel, the further out the path lobe extended, until the river jumped and its “avulsion” began forming a new path lobe, all but abandoning its former channel. Current barrier islands that protect contemporary coastal communities from storm surge are remnants of former path lobes.[22] Geologists identify six major episodes of land construction, resulting in six distinct delta complexes that comprise sixteen separate delta lobes. “Before recent artificial levee construction, channel avulsions created a new

[20] Morris, *Big Muddy*; Paul Schneider, *Old Man River: The Mississippi River in North American History* (New York: Picador, 2014), 55.
[21] Schneider, *Old Man River*.
[22] John W. Day Jr. et al., eds., *Perspectives on the Restoration of the Mississippi Delta: The Once and Future Delta* (Dordrecht: Springer, 2014).

course for the Mississippi river every one-to-two thousand years." Each time this happened a new delta complex began and the former delta slowly deteriorated.[23] Old path lobes often become distributary bayous which, without the Mississippi's fresh water flow, ultimately recede and subside under the counter force of tidal surges and salt water inundation. The bayou communities of south Louisiana that spread like fingers through the marsh into the sea were established generations ago in 18th, 19th, and 20th century immigration waves along these former path lobes. Their main thoroughfares are the bayous themselves, which lie nearly even with the height of adjacent banks. Historic civic buildings and houses face each other from opposite banks across the water. Today, they are encircled by levees that lie a few leagues back on either side. These levees have become naturalized ramparts against encroaching water from subsiding delta marshes. The current Plaquemines-Modern complex that reaches down to the Mississippi River's mouth extends in three narrow channels that conjures the image of a bird's claw and inspires the name, Bird's Foot Delta. This complex is today maintained by a vast infrastructure of dams, spillways, jetties and levees to deter the river from making its once in a millennial jump – this time to the east into the Atchafalaya River. That jump, which researchers say has been overdue for a century, would turn its current path along Baton Rouge and New Orleans into a small distributary bayou. The levee system that keeps the river in its current course has also prevented the Delta's building block of mud from meandering and replenishing its adjacent marshes and delta around southeast Louisiana.

[23] Day et al., *Perspectives on the Restoration,* 30. Of the 16 separate lobes, 14 are included in the Teche-St. Bernard-Lafourche Delta complexes that are now the site of Bayou Lafourche which are in their "destructive phase"; the remaining two include the present Bird's Foot Delta, which is an extension of the earlier formed initial lobe of the Plaquemines-Modern complex.) Each delta complex is genetically related to a major Mississippi River course. Individual delta lobes within each complex are the result of the successive distributary networks of a major river course. A river shift from one major course to another caused the temporary cessation of development in one delta complex and new progression in another.

A century ago, the Lower Mississippi River carried 400 million metric tons of sediment to the lowlands and Gulf Coast every year – enough to cover the entire state of Louisiana in almost an inch of mud.[24] Army Corps of Engineers historian Todd Shallat describes the Mississippi as a mud-scape in motion "curling and coiling like a snake in a sandbox" bleeding soil from 31 states and weighing down on "butter-soft low-lands."[25] The amount of mud carried in the Mississippi has historically ebbed and flowed by the runoff that drains from the continental basin's rivers and streams.[26] Today, an estimated 600,000 cubic feet of water and sediment flows down the Mississippi every second -- equal to the 53 million residents in ten states along the river's watershed from Minnesota to Louisiana flushing their toilets twice a minute every day.[27] In the mid-19th century, the Mississippi was called "the great sewer" by Mark Twain's mentor, Captain Marryat. "This mud, solidified, would make a mass a mile square and 241 feet high."[28] And during the steamboat age, its mud flow carried sunken paddle boats and drowning passengers in a tide of accidents resulting from boiler explosions and hulls ripped open by underwater tree "snags."[29] Some of the greatest maritime tragedies occurred on the Mississippi River. Steamboats were lost every week to the violent turbidity of the river. They descended into the dark brown current carrying valuable machinery and cargo — all but buried by the mud of the river in deep moving quicksand. Insurance companies were willing to give salvage wreckers sometimes as much as a half of the rescued cargoes; and there was a law by which a vessel or freight that had been wrecked for five years belonged to whomever could get it

[24] Schneider, *Old Man River*.
[25] Todd Shallat, "Holding Louisiana," *Technology and Culture* 47, no. 1 (January 2006): 102, https://doi.org/10.1353/tech.2006.0097
[26] The river's largest sediment flow probably came at the end of the 19th century as forest lands in the Midwest were cleared for agriculture.
[27] Morris, *Big Muddy*, 2.
[28] Twain, *Life on the Mississippi*, chap. 1.
[29] Christine A. Klein and Sandra B. Zellmer, *Mississippi River Tragedies: A Century of Unnatural Disaster* (New York: New York University Press, 2016).

up.[30] One of the most successful subsequent salvage companies was started by James Eads, who would become a larger-than-life figure in the modern river's legacy. In the late 19th-century rush to tame the unruly Mississippi, Eads was among the first souls to walk the riverbed. After spending several years as a clerk among St. Louis river pilots where Mark Twain probably passed through as an apprenticing pilot, Eads in 1842 at the age of twenty-two formed a partnership with a boat builder to begin salvaging the underwater graveyard. He and his team would descend into the violent darkness that seemingly had no bottom with diving bells made from wooden barrels and connected by oxygen tubes connected to a floating wrecker. Eads (who will make later appearances in this story) describes wading a through a "snowstorm" of sand and finding little purchase for his feet as he pushed against the constant force that few attempted or understood.[31]

Somewhere within this chaos, I imagine our clump of mud or one of billions like it whirring by the diving bell, breaking apart on a submerged tree trunk and pushing down onto the ripped hull of a paddle boat snagged on its invisible spear. On this gathering bed of quicksand, Eads would search into the depths with little certainty of what he would find.[32] "Eads and his partners worked up and down the river for hundreds of miles."[33] He walked the bed of that huge river four hours a day, every day. He would later write:

> "The sand was drifting like a dense snowstorm at the bottom … At 65 feet below the surface I found the bed of the river, for at least three feet in depth, a moving mass and so unstable that, in endeavoring to find a footing on it beneath my bell, my feet penetrated through it until I could feel (it). Although standing erect, the sand rushing past my hands, driven by a current apparently as rapid as that on the surface. I could discover the sand in motion at least two feet below the surface and moving with a velocity diminishing in proportion to its depth.[34]

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[30] How, *James B. Eads*.
[31] Barry, *Rising Tide,* 26.
[32] How, *James B. Eads*, 6.
[33] How, *James B. Eads*, 6.
[34] Barry, *Rising Tide,* 26.

With this pragmatic knowledge, he would make a lasting impact on the river — designing and erecting the first bridge to cross it in 1874 at St. Louis, which allowed railroad passage to supplant river boats. He eventually designed jetties to open the South Pass of the Bird's Foot Delta into the Gulf of Mexico with lumber piles lined with willow trees coated with a limestone-based concrete. The jetties compressed the water into a spigot and cleared the pass of its "mud lumps" and sand bars. The spigot scoured a deep enough draft for ocean going vessels to access the river year-round.[35]

The legacy of men like Eads would forever alter the process of delta formation in Louisiana. To improve navigation and decrease the threat of floods and falling riverbanks, boulder-inducing rapids were removed in the upper river and a fortification of levees rose alongside the lower portion. Meander paths were shortened with canal cuts to increase water velocity and reduce the distance between points. No longer could the alluvial material spread far and wide across the deltaic plain. Of course, these actors did not anticipate the unintended consequences of liberating the river from its constituent sediment and mud, which had little value at the time. Such sediment was listed in old boring logs as "swamp muck." It teamed with life and smelled of rotten eggs.

Where once the continental matter poured from the dynamically moving river into the adjacent marshes of south Louisiana, this offloading sediment was now sealed off by levees to protect property from floods and to "reclaim" adjacent swampland for agricultural farmland. With every flood that overflowed into the governed landscape, residents petitioned their local, state and national governments for higher and stronger levees. The efforts led to a national

[35] Barry, *Rising Tide*. The jetty system remains although the main passage of the Mississippi has been moved to the Southwest Pass.

project to control all of the nation's waterways, starting in the early decades of the 19th century, which pushed levee coverage up and down the nation's rivers. The Mississippi's sediment flow was permanently sealed off its adjacent marshes with a massive levee program following the great floods of 1927.[36] Within the following decades, what had been one of the most productive wetlands in the world was effectively drained.[37]

Today, the river's sediment and water stay in the channel, except for prescribed spillways maintained by the Army Corps of Engineers to regulate water flow during floods. As the largest system in North America, the Mississippi watershed is perhaps the most studied and controlled in the world. "It is not a matter of a few dams here and there. There are 40 dams on the upper Mississippi itself above St Louis. There 15 dams on the Mississippi above Yankton, South Dakota and 21 dams on the Ohio. It's when you start look at the tributaries to the tributaries, however, that the real picture begins to come into focus."[38] There are more than 500 dams on the various forks of the Platte River. In the state of Kansas there are 6,087 dams on tributaries to the Mississippi River., while the Missouri has another 5,099 and Oklahoma has 4,758. In Iowa, there are 3,340. Montana has 2,917. In the 11 states that lie entirely within the Mississippi River watershed there are more than 30,000 dams. The total number of dams that alter the Mississippi River Watershed exceed 50,000.[39]

Within this now entrapped water column resides an archive of the nation's detritus and living material. Along with those mountainous minerals and continental dust that find their way south, there are also remnants of industrial manufacturing, agriculture and municipal effluent,

[36] Ned Randolph, "River Activism, 'Levees-Only' and the Great Mississippi Flood of 1927," *Media and Communication* 6, no. 1 (February 2018): 43–51.
[37] Morris, *Big Muddy*.
[38] Schneider, *Old Man River*, 329.
[39] Schneider, *Old Man River*, 329.

along with nitrogen and synthetic chemicals from fertilizer, herbicides and pesticides. Runoff from paved surfaces carries with it all sorts of debris from various confluent tributaries to mix a dystopian stew.[40] Returning to our mud lump, we find that our matter has been toxic for miles, and its toxicity has grown in complexity. Appalachia footprints mingle with Illinois corn husks and swiftly bounce against man-made jetties and concrete "rip rap" blocking old bayou distributaries. Some of our congregant inventory is forced to the bottom of the riverbed where it scours against other sediment to keep the river swiftly moving — and through shortcuts made by the Corps of Engineers. Our inventory joins with other fragments and castoffs: gravel, sand, plastics and petrochemicals. Some of our lumpy ooze will veer off just north of Baton Rouge through the Old River Control gates down the deeper Atchafalaya River into which the Army Corps of Engineers funnels a changing ratio of Mississippi volume in a formula to maintain the integrity of the Mississippi River channel.

Old River Control lies in an old Oxbow meander path of the Mississippi River that nearly touches the Red River. Prior to the 15th Century, the Red River and the Mississippi River flowed parallel to each other to the Gulf of Mexico. Just as Europeans were arriving in Louisiana, the Mississippi created a natural oxbow that briefly intersected into the Red River. This created a confluence with the Red River that turned the Upper Red into a tributary to the Mississippi and Lower portion of the Red into the Atchafalaya Distributary. The Atchafalaya/Red complex was also congested by a 20- to 30-mile long raft of logs, referred to as the Great Red River Raft. "The raft was so compact that El Camino Real, the Spanish trail coming in from Texas, crossed the

[40] The river is found to contain endrin, nitrogen, phosphorous, nitrate nitrite benzene, carbon tetrachloride, hexachlorobenzene, poly-chlorinated byphenos, styrene, arsenic, cadmium, lead, zinc, copper, mercury and uranium. Morris, *Big Muddy*, 6.

Atchafalaya near its head, and cattle being driven toward the Mississippi walked across the logs."[41]

During the Riverboat period of the early 19th century, vessels took as long as 20 hours to travel the oxbow, called Turnbull's Bend, to advance one mile as the crow flies. In 1831, a riverboat captain named Henry Shreve proposed to address the problem by first excavating a mile-long canal from the Mississippi to the Upper Red River complex across a narrow tuft that shaved off 19-miles from the oxbow route. Since the Atchafalaya system was deeper (and closer to the sea), the Mississippi River would periodically flood over during high water through Shreve's cut into the Atchafalaya Distributary. Meanwhile Shreve's 'snag boats' began clearing the great log raft to open up Red/Atchafalaya complex to trade. "Snag boats worked on it, and an attempt was made to clear it with fire. The flood of 1863 apparently broke it open, and at once the Atchafalaya began to widen and deepen, increasing its draw on the Mississippi."[42] The opening allowed riverboats to reach into the Red River Valley as far as Texas. But it created an unintended consequence that the Army Corps of Engineers continues to wrestle with to this day – and will do so by all accounts in perpetuity. By 1900, river gauges indicated that 10 percent of the Mississippi River was flowing into the Atchafalaya. With each flood, the gap widened. By 1930, 20 percent of the Mississippi flowed through the crevasse, and by 1950, 30 percent flowed. At the time, the Corps estimated that by 1970 the entire Mississippi would be irreversibly captured by the Atchafalaya Distributary, which would turn New Orleans and Baton Rouge into bayou cities. Such a dramatic shift in course could potentially spoil the drinking water for 1.5 million people who rely on the Mississippi River Delta. Meanwhile, a corridor of petrochemical plants had grown up between Baton Rouge and New Orleans.

[41] McPhee, "Atchafalaya."
[42] McPhee, "Atchafalaya."

> As a result of settlement patterns, this reach of the Mississippi had long been known as "the German coast," and now, with B. F. Goodrich, E. I. du Pont, Union Carbide, Reynolds Metals, Shell, Mobil, Texaco, Exxon, Monsanto, Uniroyal, Georgia-Pacific, Hydrocarbon Industries, Vulcan Materials, Nalco Chemical, Freeport Chemical, Dow Chemical, Allied Chemical, Stauffer Chemical, Hooker Chemicals, Rubicon Chemicals, American Petrofina—with an infrastructural concentration equaled in few other places—it was often called "the American Ruhr."[43]

Today, the corridor is euphemistically known as "cancer alley" due to the highest carcinogenic rates in the United States. The industries were there because of the river's deep draft access and fresh water. Without the volume of the Mississippi, they wouldn't have enough fresh water for their processes. "They would not and could not, linger beside a tidal creek. For nature to take its course was simply unthinkable."[44]

So, Congress authorized the Old River Control structure, which opened in 1963. It was folded into the ongoing "Mississippi River and Tributaries" project – known as Project Flood — that was authorized after the Great Flood of 1927. Project Flood is the largest flood control project in the world. Intended to provide flood protection for the 36,000 square-mile lower Mississippi valley that includes 1.5 million homes, 33,000 farms and four million people, its interventions include meander cutoffs, levees, jetties and diversion spillways. The main stem levee system is 2,203 miles long, including 1,607 miles of levees along the Mississippi River itself and 596 miles of levees along the south banks of the Arkansas and Red rivers and in the Atchafalaya Basin.[45]

Here we say goodbye to some of our mud as it forks to the west through the sluice gates and canal of Old River Control into the Atchafalaya river and swamp, which is the largest

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[43] McPhee, "Atchafalaya."
[44] McPhee, "Atchafalaya."
[45] US Army Corps of Engineers, New Orleans District, "Old River Control," accessed June 14, 2019, https://www.mvn.usace.army.mil/Missions/Recreation/Old-River-Control/.

wetland swamp in the United States. The rest of our mud and matter will continue down the Mississippi's main stem past Baton Rouge as it enters Cancer Alley, the 85-mile-long cluster of plants in what are known as the River Parishes: St. James, St. John the Baptist and St. Charles parishes. This corridor continues to open its banks to newer and more sophisticated plants that produce materials and lubricants used in cars and products impervious to biodegradation. Their production is also imminently harmful to their human neighbors, the most affected of which are disproportionately African American and poor. A 2006 geographic information system (GIS) mapping study revealed that the polluting industries in St. James Parish are located in areas with the highest percentages of African Americans, the lowest average household income and the most residents without a high-school diploma. Meanwhile, the residents employed by those industries tend to live the furthest away, are wealthier, better educated and less likely to be African American.[46]

In neighboring St. John the Baptist Parish, a recent U.S. Environmental Protection Agency (EPA) assessment found areas on the poorer east side of the Mississippi River to be more than twice at risk for certain cancers as their neighbors on the west side, where there are fewer petrochemical facilities. Three years ago, the EPA declared that St. John had the highest cancer risk in the nation from airborne pollutants because of the "likely carcinogen" chloroprene manufactured along the Mississippi River. Just downstream in adjacent St. Charles Parish scientists say residents in one census tract face the highest risk in the country of developing

[46] Abigail D. Blodgett, "An Analysis of Pollution and Community Advocacy in 'Cancer Alley': Setting an Example for the Environmental Justice Movement in St James Parish, Louisiana," *Local Environment: The International Journal of Justice and Sustainability* 11, no. 6 (2006): 647–661, https://doi.org/10.1080/13549830600853700.

lymphoid or breast cancers.[47] More such plants are on the way – subsidized by hundreds of millions of dollars in Louisiana industrial tax exemptions.

Now supercharged with unspeakable carcinogenic toxicity, our lump passes out of Cancer Alley and continues on its way to New Orleans, passing the company town of Norco, home of a number of diesel, gasoline and petrochemical facilities that routinely face leaks, occasional shutdowns, regulatory fines and life-ending explosions. There, it also passes the Bonnet Carré Spillway constructed between 1929-31 about 25 miles upriver from New Orleans as the last line of defense for New Orleans. The spillway was excavated on the site of four antebellum sugar plantations, where generations of enslaved Africans and African Americans toiled amid torturous sexual, physical and spiritual assault. There were two cemeteries behind the plantations for the slaves and their descendants that were still being used just prior to the spillway's excavation. The Army Corps of Engineers was charged with moving the graves. But they are unaccounted for. The four plantations, Delhommer, Roseland, Myrtleland, and Hermitage, became the townships of Montz and Sellers. The town of Sellers (named after the town's pastor) was renamed "Norco" in 1934 after the arrival of the Northern Oil Refinery Company.48

This spillway site today is under the full command of the Army Corps of Engineers, which opens it when the Mississippi exceeds the designated 17-foot flood stage there. The spillway consists of 350 bays along a mile-long trellis. They must be opened individually by hardhat crews using cranes that remove giant cypress pins. The open bays allow river water to

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[47] Steve Hardy, Della Hasselle, and Nick Reimann, "New Cancer-Causing Danger in Baton Rouge-New Orleans Corridor, EPA Report Says," *The Advocate*, September 29, 2018, https://www.theadvocate.com/baton_rouge/news/article_7da74512-c376-11e8-a2f0-bfcdeb36764f.html.

[48] Robin McDowell, "Sacred Ground: Unearthing Buried History at the Bonnet Carré Spillway," in "A People's History of the Bonnet Carré Spillway," special issue, *Antigravity Magazine* 17.5, no. 178 (May 2019), http://antigravitymagazine.com/feature/sacred-ground-unearthing-buried-history-at-the-bonnet-carre-spillway/.

flood into the marshy plains between the river and the brackish tidal waters of Lake Pontchartrain. In 90 years, the Bonnet Carré Spillway has been opened 13 times. But its frequency of use has dramatically increased in recent years. In 2019, the river broke the record set in 1927 for the most continuous days at flood stage. For seven months, the river towered over the urbanized areas behind the levees. As Hurricane Barry approached Louisiana in July 2019, the Parish of Plaquemines on the downriver side of New Orleans was ordered to evacuate because of fears that the wind would push the bloated river over the levees. At the same time, owners of the Mosaic fertilizer plant upriver at St. James Parish were warning that a 200-foot-high pile of toxic material called "phosphgypsum" and nearly 1 billion gallons of acidic process water that was laden with iron, cadmium, chromium, lead, radium-226, and uranium could be released. Its containment walls were shifting. The plant's emergency contingency plan for the toxic material, should the wall collapse, was to pour it into the Mississippi River – about six miles upriver from intake pipes that supply treated drinking water to nearly 1 million residents living in and around the New Orleans area.[49]

The metropolitan area's western edge is demarcated by a regional levee ring which was rebuilt by the Army Corps of Engineers after Katrina. The metro region's first municipal town inside the levee ring is the city of Kenner, where our lump may at times bob to the water's surface above suburban rooftops. Because the area protected by levees is often below sea-level, flood waters are removed manually. Giant pumping stations remove every inch of rainfall that descends over this urban tropic – once called Île d'Orléans because of its unwalkable marshy surroundings. While most of Kenner was built on drained, marshland in the 20th century that

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[49] David J. Mitchell, "St. James Parish Council Narrowly Approves Land Use Needed for Controversial Bayou Bridge Pipeline," *Advocate* (Baton Rouge, LA), August 23, 2017, https://www.theadvocate.com/baton_rouge/news/article_75ce88a4-885e-11e7-b190-2b6288b27150.html.

transformed back swamps into a suburban grid, its historic "Rivertown" settlement – like all of the older communities here – follows the snaking embankment of the river, which offers the highest alluvial ridge at sea level. The mud flow passes Kenner into the unincorporated urban area of Metairie and then onto the city of New Orleans. There, our toxic lump will whip around one last major meander and turn due north at the French Quarter – site of the original 1718 settlement. New Orleans was chosen for settlement by the French because it was accessible not only by the great river but also a short portage used by the Bayogoula and Acolapissas, Biloxi and Houma to a bayou that connected to Lake Pontchartrain and the Gulf.[50]

According to the Paper Monument Project sponsored by the Midlo Center for New Orleans Studies, when Frenchmen and Africans arrived in this bend of the Mississippi that would eventually be re-named New Orleans, they encountered a place that had been home to Native Americans for hundreds, if not thousands, of years. Archeology and historical accounts just prior to colonization point to settlements in the present day French Quarter near Conti and Chartres streets, upriver at what is now the Lower Garden District near Orange and Constance Streets, and at the mouth of Bayou Saint John that connects Lake Pontchartrain to the original river portage. "Although we are not certain what they called this place, Tchoupitoulas Street shares an origin with the 'village of the Chapitoulas', or 'river people' in Choctaw, as recorded in 1718. The Chapitoulas were one of the small groups that moved up and down the river according to trade routes and seasonal hunting in the 1600's and early 1700's."[51] In the garden behind St. Louis Cathedral at Jackson Square, archaeologists discovered the oldest known building from the colonial period – a palmetto thatch hut built in the indigenous style, suggesting that Native

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[50] Elizabeth Kolbert, "The Control of Nature: Louisiana's Disappearing Coast," *New Yorker*, April 1, 2019; published online March 25, 2019, https://www.newyorker.com/magazine/2019/04/01/louisianas-disappearing-coast.
[51] Daniela Marx and Shannon Lee Dawdy, "La Village des Chapitoulas," Paper Monuments Project #014, *New Orleans Historical*, accessed April 24, 2019, https://neworleanshistorical.org/items/show/1404.

American know-how and labor helped build the city. “Hand-built pottery, smoking pipes, trade beads, and stone hide scrapers are found in underground layers scattered throughout modern-day New Orleans.”[52] After colonial settlement, the site behind St. Louis Cathedral was used by Native American traders to exchange their goods on market days. Native American hunters, fisherman, and herbalists supplied the French Market well into the 1800s. Some communities of Choctaw, Chitimacha, and Houma maintained their independence outside the city while others blended into the urban population, contributing one of the many lineages that makes up Creole culture. This cultural adaptation likely contributed to the unique New Orleans tradition of the Mardi Gras Indians, which performatively honor the memory of the city’s earliest inhabitants every year with hand-sewn and intricately beaded outfits representing different “tribes” of neighborhoods of New Orleans – known by the Choctaw as Bulbancha. It translates to, “the place of many languages” or “place of many tongues.”[53] The filé powder used in Creole Gumbo was introduced by the Choctaw who processed it from wild sassafras.[54] Excavations after Katrina by the Federal Emergency Management Administration (FEMA) discovered pottery pieces, bones and clay pieces of pipe dating to the late Marksville Period from 300-400 AD at what is believed to be a midden mound at the mouth of Bayou St. John (then called Choupique) that was used as a foundation for the French Fort St. Jean.[55]

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[52] Marx and Dawdy, “La Village des Chapitoulas.”
[53] Laine Kaplan-Levenson, “New Orleans: 300 // Bulchancha: 3000,” *TriPod: New Orleans at 300* (New Orleans Public Radio program), December 20, 2018, https://www.wwno.org/post/new-orleans-300-bulbancha-3000; Bulbancha Is Still A Place, “Resources,” accessed October 29, 2019, http://bulbanchaisstillaplace.org/resources/.
[54] Cynthia LeJeune Nobles, “Gumbo,” in *New Orleans Cuisine: Fourteen Signature Dishes and Their Histories*, ed. Susan Tucker and Frederick S. Starr, 98–115 (Jackson: University Press of Mississippi, 2009).
[55] Bruce Eggler, “FEMA Archeologists Find American Indian Pottery, Other Items by Bayou St. John,” *Times-Picayune*, February 21, 2013, https://www.nola.com/news/politics/article_538a51a4-04ed-5ffb-a02d-c526e698ff39.html.

As the stream of the river and mud flows past the French Quarter and makes its final twist at the Ninth Ward,[56] our lump will now veer off south east through various shimmies and twists down to the river's mouth – a series of narrow passes that extend outward like the claw of a bird's foot. Along this last stretch below New Orleans in Plaquemines Parish, some of our material will collect together in sandbars at inside curves of the river, where it is dredged by "hoppers" employed by the Army Corps of Engineers to maintain a Congressionally-mandated 45 feet shipping depth up to Baton Rouge. Some of the dredged sand slurry will be sucked through large pipes and directed into scattered clumps of vegetation that have been converting to open water to try to reclaim Louisiana's disappearing barrier islands and marshes.[57] But the vast majority of it will continue in a flurry storm along the narrowing confines of levees and jetties of the aptly named Bird's Foot Delta.

From high in the sky, our lump's coherence appears as an uninterrupted brown wispy tendril wafting into the green and cobalt waters of the Gulf of Mexico. But on the surface of the river's discharge, we discover an aquatic dead zone of algae stretching for hundreds of square miles. Our procession of nutrient-rich bundles of phosphorous and nitrogen is digested by blooms of algae that quickly die and decompose in a bacterial metabolism that consumes all the surface oxygen in the water. A resulting hypoxic zone suffocates fish and shrimp and kills off stationary species like oysters. It worsens in the summer months as the warmer river water glides over the colder and denser saltwater below it. This stratification of waters also prevents the seawater from mixing with the comparatively more oxygen-rich surface water. Less oxygenated

[56] The Upper and Lower Nine were cleaved by the Industrial Canal, which opened in 1923 to link the Mississippi River and Lake Pontchartrain to compete against the Houston Ship Channel dug in 1914.
[57] In 2009, the state approved a $27 million project to restore 471 acres at Bayou Dupont, which also required newly constructed dikes and new plantings of native inter-tidal marsh grass. Costing $3.7 million per acre. Louisiana Coastal Wetlands Conservation and Restoration Task Force, "Mississippi River Sediment Delivery System - Bayou Dupont (BA-39)," rev. April 2016, accessed June 15, 2019, https://lacoast.gov/reports/gpfs/BA-39.pdf.

water is trapped at lower depths and the surface hypoxia closes off the surface. The zone grows every year as both a harbinger of human-activated climate change and an effect which is simultaneously part of the natural fluxes of this area. According to scientific measurements, this hypoxic zone equals the size of Vermont.[58] Currently there are multi-billion-dollar plans to divert some of this toxic sediment into the adjacent disappearing marshes, which we will return to at the end of the introduction. But for now, let us try to frame exactly what this entire journey and changing landscape implies for this land and its diverse generations of inhabitants. Let us return to the legacy of modern imaginaries that took hold of this landscape.

A Modern Project

Chandra Murkerji describes Modernity as a culture of survival and reinvention that has altered the relationship between people and the environment using dreams of possibility and material means to address the experience of dislocation and discontent. It is fueled by dreams of utopia that fail to account for the underside dystopic effects it creates. Modernity is built upon the ashes of its own creation.[59] Powered by fossil fuels that radically alter their environment as they burn, modernity destroys as it offers hopes for progress, dialectically generative from its own destruction. It produces the conditions of its own possibilities through its many agents, from individuals who seek to make their own marks on history as they respond to an inherited set of geographic, economic and cultural conditions to the infrastructures themselves that hide and

[58] Mississippi River/Gulf of Mexico Hypoxia Task Force, “Hypoxia 101,” United States Environmental Protection Agency, accessed April 6, 2017, https://www.epa.gov/ms-htf/hypoxia-101; Donald A. Goolsby, “Mississippi Basin Nitrogen Flux Believed to Cause Gulf Hypoxia,” *Eos: Transactions, American Geophysical Union* 81, no. 29 (July 18, 2000): 321, 326–327; Nancy N. Rabalais et al., “Characterization of Hypoxia: Topic I Report for the Integrated Assessment on Hypoxia in the Gulf of Mexico,” NOAA Coastal Ocean Program Decision Analysis Series 15 (NOAA/National Centers for Coastal Ocean Science, Silver Spring, MD, 2000), http://oceanservice.noaa.gov/products/hypox_t1final.pdf.

[59] Chandra Mukerji, *Modernity Reimagined: An Analytic Guide* (New York: Routledge, 2017).

concretize relations of power. Modernity contains the seeds of its own continual destruction and reinvention.[60]

Modern thinking approached the wilderness, in the words of Thomas Hughes, as a second Eden, ready to be manifested through man's unique aspiration and inspiration.[61] Modernity is an anthropogenic project that directs all available resources for its own future possibility. It is part of a long legacy of what I call *Extractive Thinking*, which I will develop in the coming chapters, that continues to constrain future possibilities. Louisiana's political economy throughout the last three centuries has been predominated by extractive thinking. The project to build a civilization on an alluvial delta, which required constant redoubling of intervention, has been fueled by extractive thinking. Earlier, I called New Orleans a product of the modern imaginary. This is because New Orleans was made possible through a philosophy of taming a wild landscape through rational governance. It was made possible by separating water from land. This project to build a modern city in a delta required erasing the ubiquitous mud that created it.

New Orleans perseveres through a slate of actions that reproduce conditions of their necessity. It arises from the ashes of its own making, in the words of Mukerji. Specifically, New Orleans is maintained by a slate of interventions that are supported by and allow for the continued existence of a particular kind of political economy. This political economy attempts to reconcile what I identify as an irresolvable tension between *survival* and *annihilation*. The history of New Orleans has taken place along a spectrum of external threats in the form of massive storms, levee breaks and even pestilence and disease. For all of its existence, New Orleans has lived in a state of hyper vigilance of its surroundings: the Mississippi River on its

[60] Mukerji, *Modernity Reimagined*.
[61] Thomas P. Hughes, *Human-Built World: How to Think about Technology and Culture* (Chicago: University of Chicago Press, 2005).

front side and the swamps to its rear. The river was historically framed as the city's greatest threat, if not also its reason for existence. The outpost of Nouvelle Orleans provided the French crown with access to the Gulf of Mexico in order to stake a claim deep into the interior of a contested continent. The French soon learned that living in the delta wetlands required constant repair. These early settler-colonists endured seasonal floods, scourges, intense weather events, diseases and an overall hostile terrain for permanent settlement.[62] In what contemporary geographers have framed as either New Orleans' "inevitable"[63] founding or "Bienville's Dilemma,"[64] the colonists were plagued by the very mud and water upon which New Orleans' strategic value depended. The first levee around New Orleans was ordered by Gov. Bienville in 1719, the year after the city was founded. Well prior to Louisiana and New Orleans' annexation by the United States, the French engineer Vitrac de La Tour had understood that the new settlement was prone to periodic flooding and he opposed locating the city at its present site. Bienville, however, overruled La Tour's objection, and the engineer had to design a 5,400-foot-long and 18-foot-wide earthen embankment along the Mississippi, completed in 1727, to protect the city from seasonal floods. The levee stood three feet high, 18 feet wide and 5,400 feet long, and doubled as a roadway. Three years later, New Orleans was flattened by a hurricane. Between 1559 and 2008, an estimated 177 hurricanes have struck southern Louisiana.[65] The city spread across unstable deltaic plain of marshlands and peat.[66] While the accounts overtly document the story in terms of a struggle against water, the story of mud haunts these histories as well.

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[62] Morris, *Big Muddy*.
[63] Peirce F. Lewis, *New Orleans: The Making of an Urban Landscape* (Charlottesville: University of Virginia Press, 2002).
[64] Richard Campanella, *Bienville's Dilemma: A Historical Geography of New Orleans* (Lafayette: Center for Louisiana Studies, University of Louisiana at Lafayette, 2008).
[65] J. D. Rogers, "Development of the New Orleans Flood Protection System prior to Hurricane Katrina," *Journal of Geotechnical and Geoenvironmental Engineering* 134, no. 5 (May 2008): 602.
[66] For a fuller discussion of the alluvial landscape of New Orleans, see Lewis, *New Orleans*.

Letters to the crown document a dirty struggle. While the river seemed to beckon settlement, the mud foiled it. Mud stymied efforts to govern a rational landscape and harvest the bounty that the river promised. Muddy streets. Muddy clothes. Surrounding swamps blamed for “miasmic” diseases. New Orleans was infamously muddy, which motivated massive drainage programs to develop land more suitable for Cypress Tupelo than concert halls. To the early colonialists, deltaic mud was a nuisance for the type of European knowledge they brought with them. Persistently muddy roads and dank puddles exasperated ordinary folks and building experts alike, among them Benjamin Latrobe, the first formally trained American architect and designer of the U.S. Capitol. "Mud, mud, mud," Latrobe sighed in 1819. "This is a floating city, floating below the surface of the water on a bed of mud.”[67] Western anthropogenic practices treated mud as anathema to human habitation. It was a nuisance to be removed from the river channel, stacked along the banks in levees to prevent flooding, and drained from behind the levees for plantation and urban development. Mud was the unwelcome interloper in efforts to stabilize the land from the river. While the river made the city famous, the mud gave New Orleans its sense of fecundity. Backwater swamps behind the French Quarter attracted illicit gatherings of Indians and African slaves where a sensual entanglement of blood and marginalized histories are said to have created America’s original art form of Jazz.

Instead of incorporating the river’s seasonal flooding into building designs and learning to live in its muddy system, administrators of New Orleans worked to keep the water and mud at bay. New Orleans was a delta city that operated under the logic of a dry city. As a modern imaginary, it relied on intensive drainage, levees and labor, pumps and money to erase mud

[67] Richard Campanella, “A Look Back at New Orleans’ 300-Year-Long Drainage Drama,” *Times-Picayune*, August 22, 2018, https://www.nola.com/expo/life-and-culture/erry-2018/08/790f1ed00f4886/a-year-after-the-aug-5-flood-a.html.

altogether. This battle of erasure historically sustained the geographical, administrative, social, and economic structures of the city. Even today, water is collected by huge pipes that are buried beneath uneven pavement and flushed out through pumping stations arranged geometrically across the landscape. It has to be pushed up and over the city's concrete flood walls into the surrounding marsh and brackish lakes. It rains down. It swells up through the ground. It gathers in mists. It pools. It rots wood and molds sheet rock. It hangs in the air like hot breath. In the summer, afternoon showers are met with frigid, air-conditioned lobbies to fight advancing mildew. Yet even as battle lines were drawn, the full erasure of mud never happened. It reappears through the etchings of cracked sidewalks and sunken medians (called neutral grounds); as sinkholes and potholes; in tourist blogs of festival goers regaling or lamenting their muddy slog to their destinations. When a giant sinkhole opened on Canal Street in 2016 – the city's tourist thoroughfare that would take six months to repair – a group of residents staged a "Sinkhole de Mayo" costume party.[68]

Away from the city, the ecology of mud was disrupted through capital extraction. Valuable cypress hardwoods were harvested. Muskrat, panther and bear were hunted to extinction or near extinction, leaving the denuded landscape to be preyed upon by the invasive South American nutria rat that was introduced by the state wildlife officials in the 1930s to replace declining muskrat hides. After oil was discovered in 1901, this degraded landscape was cut by canals for oil and gas finds and further exposed to oil spills. The swamps and marshes of southern Louisiana were already on life support, then further laid bare to incoming saltwater from inlet bays that killed the root systems of the remaining vegetation and estuarine hatcheries.

[68] Melinda Daffin, "Sinkhole de Mayo Party on Canal St.: When Life Hands You Sinkholes, Make Margaritas," *Times-Picayune*, May 3, 2016, https://www.nola.com/entertainment_life/festivals/article_f3c467e8-5127-5ef9-ba38-3c71277fed9f.html.

The latest scourge is the Asian scale bug that is laying waste to Rousseau cane in the marsh that is the last vestige holding this beleaguered system together.

Ecologists in Louisiana identify six major categories of habitat: bottomland hardwood forest, swamp forest, fresh marsh, intermediate marsh, brackish marsh, saline wetlands.[69] In Wetland areas, the vegetation can be divided approximately into two types, marsh and swamp. "In many cases the distinction is arbitrary as many areas represent transitions between the two." Several ecological factors acting in combination can create marsh. Further north, fluctuating water levels seem to be the single major cause of marsh formation, with high water periods killing colonizing woody plants, and intervening low water periods allowing regeneration of non woody herbaceous species. In contrast, southern marshes have more complex and diverse origins.[70]

Cypress swamps and marshes register the transition from freshwater habitats in the upper delta plain, to brackish and saline habitats in the lower delta plain.[71] Areas that are less inundated become forested. Closer to the sea, much of the marsh is un-walkable "flottant."[72] In essence, the taxonomy of southern Louisiana is a classification of mud, which is somewhere between land and water – a liminal state that even today resists stable classification. It performs a particularly unruly ontology in different contexts. "Biologists and ecologists have found that wetlands are

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[69] P. A. Keddy et al., "The Wetlands of Lakes Pontchartrain and Maurepas: Past, Present and Future," *Environmental Reviews* 15 (December 2007): 54, https://doi.org/10.1139/a06-008.

[70] Keddy, "Wetlands of Lakes Pontchartrain," 3. They fall into one of five categories, areas with "hydrophytes" and hydric soils known as marshes, swamps and bogs, areas that are flats with drastic fluctuation in water level, wave action, turbidity or high concentration of salts, impounded areas where hydrophytes have established by hydric soils have not developed, areas without soil but hydrophytes such as seaweed covered rocky shores, and wetlands without soil and without hydropytes such as rocky shores without vegetation. Areas that have been drained are not considered wetlands.

[71] Day et al., *Perspectives on the Restoration,* 3.

[72] Coastal surfaces in south east Louisiana "build down" as new vegetation springs up each year at a near-constant elevation. When vegetation cannot keep pace with this natural subsidence, it begins to submerge. Grasses die, and the area transitions to lakes linked by inter-tidal channels.

difficult to define – they have identified thirteen types in all, and their boundaries are hard to define. They may be permanently inundated, seasonally inundated, intermittently inundated, or seasonally waterlogged."[73] They may be part of larger aquatic systems as with coastal estuaries or they may be independent systems. The US Department of Interior Fish and Wildlife Service calls wetlands lands where water saturation is the dominant factor determining the nature of soil development and the types of plant and animal communities living there. "The single feature that most wetlands share is soil or substrate that is at least periodically saturated with or covered by water."[74] In other words, wetlands are classified not only by what they *are* but what they *do* – which opens interesting questions of ontology that this project will explore, thinking alongside literatures in STS Scientist Studies and feminist writings. How we think about mud and water has a lot to do with how they are framed and by whom they are used.

The Problem of Mud

The Mississippi River is a marker of national and regional identity. Throughout the nation's history, the Mississippi River and its tributaries were described as a national artery. When we talk about a "river" we automatically create boundaries of river and land. This ontological construction is part of its discursive formation of modernity. When the boundary breaks, and the river spills into other geographical social and political areas, it is corralled back and stabilized through interventions. Levees are raised higher and the river's confines are narrowed. Intensified efforts to discipline the river in the late 19th and 20th centuries would

[73] Morris, *Big Muddy*.

[74] Lewis M. Cowardin et al., "Classification of Wetlands and Deepwater Habitats of the United States," FWS/OBS-79/31 (Washington, DC: U.S. Department of the Interior, Fish and Wildlife Service, December 1979; repr., 1992), 3, https://www.fws.gov/wetlands/Documents/Classification-of-Wetlands-and-Deepwater-Habitats-of-the-United-States.pdf.

ironically contribute to a large extent to the current problem of mud in the form of delta erosion – which further reduces the security of those who support and depend on intervention. As engineers leveed, narrowed and shortened the river, they turned it into a more efficient waterway, a self-scouring engine, which can then become a cataclysmic force when the levees fail. Intervention in the Mississippi River has not only led to the largest "natural" disasters in American history – recounted in American literature, oral histories, news reports, geological surveys, spirituals, blues recordings, ballads, journals, jail logs, plays, and civil rights complaints – but this legacy has also disrupted the ecological processes of the Louisiana Delta that had taken place over several millennia.

By the 1930s, researchers understood that the Mississippi's River's historic, geomorphic meandering had built the delta beneath New Orleans. As the decades into the 20th century progressed, they began to suspect that the Herculean effort by the Army Corps of Engineers to levee the River following the great deluge of 1927 – to protect communities from flooding, improve navigation and reclaim swamp "bottomlands" – was choking off the Louisiana marshlands from their progenitor. As sediment of mud, silt and farmland runoff is jettisoned into the Gulf of Mexico, the adjacent marshes were left vulnerable to other man-induced stressors, particularly intensive oil and gas drilling that has left behind thousands of miles of canals and pipelines, canal dredging and invasive species. The cumulative effect had been obvious to locals for years. The wetlands and barrier islands were converting to open water. No one seemed to quantify this historic dynamism until the 1970s. A paper published in 1975 by an LSU geomorphologist, Sherwood Gagliano, relied on aerial photographic data that provided a much larger picture of erosion. Despite a landmark 1981 paper by Gagliano that linked coastal erosion to river control, the US Army Corps of Engineers in 1994 was still officially doubting the link of wetland erosion to river controls and instead attributed it in a conference paper to natural seismic movement from submarine salt domes, geologic faults and oil and gas canal spoil banks. The Corps of Engineers simply refused to consider their own work on the river as a cause of coastal erosion. And the powerful energy lobby refused to accept their own role in the region's subsidence. As various actors in the political economy pointed fingers at the other's culpability, the swamps and wetlands that buffered the city from storms and sustained a rich ecology of seafood, flora and migratory flyways maintained their dramatic retreat.

Rates of localized subsidence and erosion fluctuate based on activity, but the US Geological Survey estimates that the state loses 45 square miles of coastline a year – the equivalent of a football field every 90 minutes – faster than anywhere in North America. "Coastal Louisiana experience some of the highest subsidence rates worldwide, making the Mississippi River delta one of the first areas to experience the effects of global seal level rise.[75] Sea level rise will exponentially accelerate this retreat,[76] leaving New Orleans increasingly vulnerable, while also drowning the working-class hamlets, state-recognized indigenous communities and fishing villages that help comprise South Louisiana's unique Creole and Cajun culture. By the time Katrina (and Rita) struck the state in 2005, the state had lost 1.2 million acres of wetlands in 75 years.

As before, the struggle is justified by the bounty offered by its location for its strategic importance as a deep water port, its bountiful seafood harvest, and more recently, its industrial assets that include that corridor of petrochemical plants between New Orleans and Baton Rouge and an oil and gas infrastructure that accounts for 25 percent of the nation's energy supply and

[75] Day et al., *Perspectives on the Restoration* John, 31
[76] Brady R. Couvillion et al., "Land Area Change in Coastal Louisiana (1932 to 2016)," pamphlet to accompany Scientific Investigations Map 3381, U.S. Geological Survey, 2017, https://doi.org/10.3133/sim3381.

90 percent of its offshore supply. Its alluvial sediment, once "reclaimed" from the marsh through levees and canals, provides millions of acres of agricultural farmland. And Louisiana's remaining delta estuary is home to 25 percent of the nation's seafood catch.[77] City and state officials would like you to remember all of these assets, which they continually use to rationalize the state's strategic importance in order to justify the vast federal resources required to maintain the current channel of the Mississippi River from Baton Rouge to New Orleans. Shallat puts this dilemma quite vividly:

> Therein lies the tragedy of safety innovations that promote unsafe construction. Katrina underlined what we already know. We know that the levees prevent the river from replenishing the Delta landscape. We are aware that our activities in the saltwater marshes further their destruction as natural defenses against storms. We understand that the cost of maintaining deep-water shipping channels in the Gulf can be much greater than any savings gained from faster shipping. We know that a moving shoreline is not much of a problem until we try to stop it, that concrete solutions to coastal erosion can steepen a beach from defecting its sand supply. But we also realize, or we should, that there is no turning back from all that we've made of the marsh without risking economic disaster. Technology is seldom an unmixed blessing. Certainly, it is not in Louisiana, where the levees that shield New Orleans also intensify the process that are consigning it to the Gulf.[78]

This project sets out to examine how the landscape and the technical interventions to manage the forces of nature also (re)generate a particular kind of governance that continues to reproduce the conditions for its necessity through interventions into the surrounding environment. Currently, the conditions for its necessity take the form of a 50-year, $50 billion Comprehensive Master Plan for a Sustainable Coast that deploys capital projects for restoration that have "territorialized" the state[79] as the arbiter of life on the Lower Mississippi River and

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[77] Coastal Protection and Restoration Authority of Louisiana, "Louisiana's Comprehensive Master Plan for a Sustainable Coast: 2017" (Baton Rouge, LA: OTS-State Printing, 2017), https://coastal.la.gov/our-plan/2017-coastal-master-plan/.
[78] Shallat, "Holding Louisiana," 107.
[79] Chandra Mukerji, *Impossible Engineering: Technology and Territoriality on the Canal du Midi* (Princeton, NJ: Princeton University Press, 2015).

Coastal Louisiana. That includes a rebuilt $14.5 billion levee hurricane protection ring around the metropolitan New Orleans area, and the U.S. Army Corps of Engineers' ongoing program to dredge the river bottom to keep shipping lanes open. These efforts to secure the people, economy and culture paradoxically increase the existential threats against them due to the dialectical destruction of the land itself. By erasing and refashioning the mud for their own discrete purposes to build levees or dredge the river and canals, the administrators of New Orleans and south Louisiana only inch closer to the imminent demise of their project.

Always pushing against the modern project of New Orleans and Louisiana is the *problem of mud*. While the river is memorialized in the national and New Orleans imaginary, mud fails to mark any identity. It is viscerally known and discarded. It is classified as clay, muck, coarse sediment, peat. It seems to hide within the discourse of the river, as an underside to a binary or disruptive agent. This is not only a story about the Mississippi River as we popularly conceive it. That story is famously retold with each new edition of Mark Twain's canon or any travel article to New Orleans; or even through the scratchy recordings of Jellyroll Morton and Bessie Smith and lamentations in Paul Robeson's Old Man River about the unrequited nature of it all.

A particular kind of water story prevails through the reports of sedimentologists and geologists that present papers and write textbooks on delta systems; and state restoration boosters who fetishize the river and erect a multi-million dollar "water campus" to revitalize a downtrodden downtown area of Baton Rouge. While this story will certainly visit these hegemonic sites of enactment, this story is also about what is not discussed when talking about the Mississippi: the vast sediments, clays and muds that are carried through the continental body, escaping through various entrapments designed to keep the water flowing for shipping, and eventually making their way down to the sea. This is a story of delta mud and the politics of that mud. While the story of South Louisiana and New Orleans is the result of a bias of privileging water over mud this project also explores what can happen when we start at the unit of mud – when we destabilize and disorient the landscape as it is normatively conceived in order to bring forth questions that are not being asked in the deluge of water.

Methodology

This dissertation gestures to many conversations in traditional and emerging fields of critical studies in the Humanities and Social Sciences. It raises questions of political geography and political ecology, cultural studies, environmental humanities, science studies and cultural history. In researching this project, I have relied on a wide variety of genres from literature, history, policy position papers, historic newspapers, scientific studies and event transcripts of public meetings and court cases. I have called upon the scholarly research by geographers and sedimentologists; boring samples and LIDAR reports; discourses by state restoration authorities who talk of repairing mother nature; the coastal fisherman watching the tides; and plaintiffs resisting the state's complicity to turn their communities into oil and gas sacrifice zones.

I consider previous research to include the cultural promiscuity of New Orleans: its particular rendition of blues and jazz whose trajectory followed the Mississippi River to St. Louis and Chicago, and its stubborn resistance to modernize or embrace an American ethos. I consider the physical models of the Mississippi Delta as research that is legible to cultural studies scholars and geologists alike. The canonical literature of Mark Twain has opened not only historical documentation of the river by a fledgling river boat pilot but also erected a mythical canvas through which the Mississippi will always be viewed. Likewise, we can read the mud as a dynamic but disruptive archive to this history. In what ways does the presence of mud begin to disorient the demarcation of water and land? It performs not an erasure but an embodiment of the past. It exhales the breath of decay and unstable earth made visible by a sinking landscape: New Orleans fire hydrants that poke and lean ever higher through the receding ground; cracked home foundations that smile crookedly in the streets; leaning telephone poles; and bulging asphalt. Mud collects in the sunken corners of sidewalks that buckle over the undulating tree roots, and it gathers in the ramps of curb cuts and lines storm drains.

How can we benefit from a reconsideration of mud as a primary building block, rather than an afterthought? The story of mud is as much the story of the people of this delta. The forensic anthropologist tracks the mud-stains on the bones of skeletons as a clock for the time of death in south Louisiana with its dark "gumbo" clay that processes a body through the animals that begin to inhabit them. When archaeologists opened a dig on the site of a former French Quarter church that was destroyed in a 1722 hurricane, they used the alkalinity in the mud to date coins. A dig at St. Antoine's Garden not only reveals a mixture of two major types of soils — "Commerce" mud, which is commonly found near natural levees on the Mississippi's alluvial plain and "Sharkey series" mud found in lower "back swamp" areas – but also 221 ceramic vessels associated with food preparation. The ceramics and other "clean" domestic trash were probably gathered up and used to add traction to the frequently muddy streets, given the fact that no natural gravel occurs south of Lake Pontchartrain.[80]

All of this has enabled me to think about river and its mud and the construction of this place within a geopolitical and cultural landscape. I am attempting to show the structures of both knowledge, feeling and experience that were not only shaped by but also produced the landscape

[80] Larry J. Trahan, "Soil Survey of Orleans Parish, Louisiana," United States Department of Agriculture, Soil Conservation Service, O - 251-877 : QL 3 (Washington, DC: Government Printing Office, 1989), 49, https://www.nrcs.usda.gov/Internet/FSE_MANUSCRIPTS/louisiana/LA071/0/orleans.pdf.

in question. I am attempting to place this delta and its mud back in its rightful place in history. It has been the mud that sustained the people of New Orleans and lower Mississippi Delta, despite their historic aversion to it. “Mud is, or was, the essential building block of the Mississippi Valley. Mud was the substance that held together all the pieces and components – animal, vegetable, human of the floodplains’ wetland ecology. “[81] It is the mud that is today desperately needed but is growing in ever short supply. There is simply not enough mud to replenish the subsiding boundary of Louisiana over which the City of New Orleans and coastal communities are mapped. The answer, we are told, lies in the sediment in the Mississippi River, whose impact and efficacy are passionately debated by fishermen, shippers, oystermen, scientists and community leaders. These fights, I argue, play out over the same trajectory of extractive thinking that has led to the current crisis. As interests compete over a shrinking footprint, newly erected levees rise alongside gaping “borrow” pits that fill with water and threaten the people they portend to protect. Mud is pulled from the floor of the river mechanically by dredgers and hoppers in order to allow shipping interests to prosper. It is pumped into the marsh. It is used to bolster barrier islands. It is trapped in spillway gates. It is sometimes produced by one interest and given to another. It builds estuaries by holding vegetation together. It is used in oil and gas drilling to cool the drill bits and stabilize bore holes. It produces value for contractors that are studying it, capturing it, and moving it. It is rendered, studied and represented in scientific reports, software modeling and maps. In some cases, it is produced through sewerage and municipal effluence. “People have sought to change certain aspects of it while struggling mightily to keep others unchanged. They have tinkered with it piecemeal, as if it were not a whole system, but a series of discrete parts loosely connected and patched together.[82] And this

[81] Morris, *Big Muddy*.
[82] Morris, *Big Muddy*, 6.

ad-hoc system may rationalize profitable practices for some – but proves demonstrably inept at maintaining a system." This, I hope, will show that there is no tabula rasa from which to start, but that instead we are building upon an anthropogenic legacy with all of its problematic entanglements and possibilities. Writing from ethnographic interviews, archival documents and observations from field sites and workshops, I analyze how the river's delta and its mud is discursively constructed and produced. If centuries of discursive practices are embedded into the vast artillery of dams, levees, jetties and spillways that produced a deep and swiftly moving Mississippi River, how might we frame mud as an alternative modality of inquiry? What would it mean to reread the history of New Orleans and the Mississippi River through the optics of mud? What kinds of naturalized discourses could a genealogy of mud dislodge? With this project, I gesture towards a set of questions. I examine the rationales, ideologies and culture located upon this spectrum of tension. I examine how ongoing interventions bolster the status quo in the name of security – both material and economic – prompting additional measures of security. One of the things we will be considering is how the logic of extraction that led to this moment became naturalized in economic, political, and scientific thought over the last three centuries. It is through this naturalization process where both extraction and restoration have become so entangled that they are part of the same conundrum.

Conventionally, this dissertation relies on traditions of political economy and tracks the way in which economic conditions and naturalism become entangled through state ideology and material culture. I look to scholarship from cultural studies particularly when it comes to the construction of race, discourses of common sense, and power. Discourse Analysis aids in close readings of documents that provide founding principles of state action. I look to the work of STS scholars, particularly Bruno Latour's Actor Network Theory and Donna Haraway's unique ability to deconstruct and demystify the material world that elides relations of power. This is a dissertation that could only be possible through the transdisciplinary training and critical valence provided by the Department of Communication at the University of California San Diego. I am likewise influenced by scholars from my own department, drawing on themes of imaginative geography developed by Gary Fields, who explicates the ways that state hegemony is mapped onto landscapes and how this power transforms territorial spaces. This happens through the interplay between a landscape's material morphology and the human systems of political economy and culture. "Landscapes," Fields argues, "emerge from the way the land surface anchors human populations and the systems of cultivation, the patterns of economy and culture, and the architectural forms sustaining human presence."[83] And yet, landscapes not only reflect society but become sources and sites of projection and imagination. Thus, landscapes are both material and representational. They are imagined and projected through tools of statecraft, discursive practices, sites of production and construction of difference. I likewise look to Chandra Mukerji's vast project of cultural materialism that illuminates the myriad ways that the built environment disciplines and interpellates cultural subjects. Val Hartouni's explication of the politicization of bodies and how the "unthinkable" becomes narrativized is invaluable to this study. It calls attention to ways in which the Mississippi is narrativized through cultural discourses that create an entirely new object of inquiry quite apart from and exceeding its material reality. Likewise, Patrick Anderson's work to probe and interrogate the interdependence of subjects and objects in fields of discourse has been helpful for me in understanding how we come to know something co-produces the relationship between the thing known and the knowing knower. Kelly Gates' scholarship on police surveillance and the tacit cultural work of post-

[83] Gary Fields, *Enclosure: Palestinian Landscapes in a Historical Mirror* (Oakland: University of California Press, 2017), 7.

editing pixilated videos uncovers the how normative thought patterns influence the ways that visual evidence is encoded, archived, and decoded. Angela Booker was generous with her time and intellect when I was first conceptualizing my topic and needed a sounding board, and Octavio Aburto's use of beautiful photography in his ecological studies illustrates the importance of public scholarship in what are normally conceived as technical questions models how science and society can work together for a common good.

As a graduate student of University of California San Diego's Communication Department, I am deeply influenced by the work of critical social theorists and issues of social justice. I look to the landscape, the built environment and the river itself as the canvas from which social relations are understood. In addition to the many historians and scholars of the Mississippi River, the U.S. Army Corps of Engineers, and Louisiana and American culture, I am likewise deeply indebted to the theorists who help me make sense of the empirical and deconstruct the iconic Mississippi River through the implications of power: Michel Foucault, Karl Marx, Donna Haraway, Wendy Brown, James Scott, Stuart Hall, Steven Jackson, Edward Said, Friedrich Nietzsche, among others. Pierre Bourdieu, Karen Barad, Antonio Gramsci, and David Harvey haunt these pages. My project applies contributions and theoretical concerns of these authors to the land itself. It investigates how power shapes the land and those who move through it.

As I undertook and continued to wrestle with this complex project, I was left wondering what effect an apparent and visual disruption of the natural order in terms of controlling the Mississippi River had on those in the path of potential destruction, who depend on the state to hold the river in its course. How did living in the specter of disaster – both economic and existential – affect their worldview on the arbitrariness of nature? At the other pole, lay the extreme pragmatic if not cynical account of a petroleum-dependent economy that appears to any outsider to be destroying the very land on which its participants lived. How was it possible that the biggest critics of environmental regulation during the British Petroleum oil spill were those people in the very path of the spilling crude? From these two poles, I began to search for a common link. On the one hand there was a population dependent on the state's tenuous hold of the status quo. And on the other hand, a polis whose very way of life was organized around degrading their surroundings. Were they connected? If so, how? They seemed to be brought together by an extractive mindset from living in the shadow of environmental manipulation that in some way demystified and commodified the landscape. It produced a crude and pragmatic calculation and a kind of fatalism; an environmental fatalism. It seemed related and tied together, but what was the connecting braid? What I came to suspect is that the long history of intervention in the river had been so "naturalized" that the possibility of the river to resume its prehistoric behavior of meandering to forge new paths came to be seen as unnatural. Witness that the United States Senator from Louisiana, J. Bennett Johnson, called it "unthinkable."[84] In this perverse perspective – something completely paradoxical in fact – the artificial became natural and the natural, unthinkable.

This dissertation is a beginning effort to map a vocabulary for this logic and its place, as part of a global ecology but specific to its own eccentric and complex locality; where climate change is read not generically but as one of a many places of climate changes, each unique to its own history, trajectory and meaning. This is the domain of this dissertation – the archive of the mud itself.

[84] *Old River Control Structure, Louisiana: Hearing before a Subcommittee of the Committee on Appropriations: Special Hearing: Corps of Engineers—Civil Nondepartmental Witnesses*, 96th Congress, 2nd Session (December 22, 1980) (statement of J. Bennett Johnston, United States Senator of Louisiana).

Dissertation organization

In Chapter 1, I begin this genealogy of Lower Mississippi mud in order to disrupt the current episteme of extraction that continues to rationalize the political economy of coastal Louisiana. The narrative is drawn from various popular and technical accounts that document attitudes of fear and aversion towards undeveloped swampland that surrounded New Orleans. The location of the French colony at a bend in the Mississippi River and bayou portage to Lake Pontchartrain provided the French with a strategic outpost but it was accompanied by the perennial threat of the river and the ubiquitous mud. Muddy soil foiled construction and led to chronic drainage problems and standing water. The site was routinely overrun by river floods and storms off the Gulf of Mexico. Cultural engagement with mud was expressed through aversion, filth and fear. New Orleans administrators viewed undeveloped swampland as not only disease ridden and worthless, but as a refuge for runaway slaves and a general lawless chaos to be governed. Programs to erase the swamps and everything associated with them were rationalized by technical discourses of urbanization in the coinciding scientific turn of the 19th century and the Sanitary Movement’s focus on enclosure, circulation and morality. It was also visited by bouts of Yellow Fever, Bubonic Plaque and Malaria. Such disease outbreaks were blamed on the swampy conditions and poor hygiene. Public health campaigns and racialized ideology helped drive urban development and “Swamp buster” land reclamation drainage programs. This also caused the land to sink, increasing its vulnerability to floods, which required additional protective levees and seawalls around the city.

Chapter 2, examines the problem of mud through 19th century river politics. It investigates media coverage of 19th and early 20th century river activism and its effect on federal policy to control the Mississippi River. River conventions starting in the mid-century were called through newspaper announcements by local business and civic groups to lobby Congress for projects to improve navigation and reduce flooding along the Mississippi River. These conventions highlight the ways in which the Mississippi River was discursively produced as a canvas against which regional and national politics played out. This chapter also unpacks the entanglement of politics with river science that helped shape federal policy for nearly a century and led to the Army Corps of Engineers' disastrous "levees-only" policy that joined disparate navigation and flood control interests. Levees-only is largely blamed for the Great Flood of 1927, called the largest peacetime disaster in American history. River activists organized annual conventions, and later, professional lobbies organized media campaigns up and down the Mississippi River to sway public opinion and pressure Congress to fund flood control and river navigation projects. Annual river conventions drew thousands of delegates such as plantation owners, shippers, bankers, chambers of commerce, governors, congressmen, mayors and cabinet members with interests on the Mississippi River. Public pressure on Congress successfully captured millions of federal dollars to protect property, drain swamps for development, subsidize local levee districts and influence river policy.

Chapter 3, provides a genealogy of 20th century scientific research about Louisiana wetlands that eventually framed the Mississippi River as the progenitor of the Louisiana delta. The chapter identifies the point at which the loss of wetlands was first documented and later recognized by the state and federal governments. Here, mud becomes a problem not in its unmanaged ubiquity but in its scarcity. I trace early grassroots campaigns to call attention to wetland loss as well as oil industry efforts to fight scientific and community consensus about causes of coastal erosion. The chapter timeline culminates with the 1998 passage of the state's first comprehensive wetland restoration strategy, called Coast 2050, which focused on diverting the Mississippi back into the marshes and backfilling the byzantine oil and gas canals. But the failure to secure federal funding for the plan led to a public partnership between environmentalists and the oil industry that reframed coastal erosion as a threat to the nation's energy infrastructure in order to secure federal support. This ultimately laundered big oil's culpability in wetland loss and removed from discussions moves to reverse damages from canals, pipelines, and subsidence related to rapid hydrocarbon withdrawal.

Chapter 4, charts the "Katrina Effect" that followed hurricanes Katrina and Rita, which destroyed nearly 220 square miles of wetlands and eventually resulted in the $50 billion Master Plan for a Sustainable Coast. Following Katrina and Rita the oil lobby joined by the Louisiana delegation successfully argued to lift a 25-year-old drilling moratorium in the Gulf of Mexico and boost the state share of royalties on wells in federal waters in the name of hurricane relief. The royalties were then dedicated to fund coastal restoration projects enumerated under the Master Plan. The logic of the Master Plan folded wetland restoration into an acute flood prevention strategy for south Louisiana and New Orleans. I analyze and historicize the euphemism of the "working coast" that reconciles Louisiana's paradoxical ontology of survival and annihilation by rationalizing many of the destructive industry practices that cause erosion. This chapter theorizes how the Master Plan produces its own conditions of possibility through its reliance on oil royalties and promises of economic development. I argue that the Master Plan addresses the problem of mud by rationalizing itself not only as an instrument for saving coastal industries but also as a site of investment for the economic and public survival of the state.

My conclusion circles back to ask the most fundamental question of the project: what is a river? It examines the political stakes of competing ontologies of the river as a marsh builder, continental sewer pipe and commercial highway. It examines a material site through which the state produces its authority to intervene in the river. And it discusses a way forward that disrupts the extractive discourse that pervades the political economy of Louisiana by looking to alternative modes of being and living that provide an alternative imaginary that can rise up from the ontological death of modernity in the delta.

Chapter 1: Muddy Foil

Introduction

This chapter begins a genealogy of Lower Mississippi Delta Mud in order to disrupt the current episteme of extraction that continues to rationalize interventions to restore coastal Louisiana. A genealogy of mud can help us reread the history of this place, whose natural resources have been colonized for a particular kind of anthropogenic utility based on rationalized land use of control, enclosure and utility. This chapter tracks newspaper articles, technical reports and other accounts that document attitudes of fear and aversion towards undeveloped swampland that surrounded New Orleans. By examining how delta mud was discursively constructed, we can track attitudes about mud through imperial and colonial discourses that persist today. This may allow us to disentangle some of the associations at work that naturalize and hide semiotic values tied to mud and the disappearing Lower Mississippi Delta. If, as I argue, mud is a critical mediator of scientific and political discourses in present efforts to restore coastal Louisiana, let us closely examine what we're really indexing when we talk about mud.

Centuries of extractive thinking are embedded into the vast artillery of dams, levees and spillways that have produced a deep, swiftly moving Mississippi River that has been sealed off its adjacent marshes. Proposals to capture and redirect sediment from the now polluted and channelized river elicits passionate debates among fishermen, shippers, oystermen, scientists and community leaders over the efficacy of desired results versus impact to their livelihoods. These fights, I argue, track the same trajectory of extractive thinking that caused Katrina and rationalized the infrastructure that produced the Mississippi River and New Orleans. This chapter charts an unbroken connection between these technical, extractive solutions and the historically racialized project of eradicating swamps, wetlands, and mud. While the Mississippi River enjoys a rich lexicon of cultural signification its mud indexes a very different legacy. The muddy swamps and wetlands surrounding New Orleans were considered a site of miasmic disease, lawlessness and a hindrance to moral conduct. In this article, I follow Foucault's methodology that calls for "an insurrection of subjugated knowledges"[85] that has buried mud as an agent of history. Mud was a disqualified site of miscegenation; a protean material always in the act of becoming; not quite water, not quite land; and anathema to the modern project of enclosure.

We locate discourses of mud and wetlands that indexed loathing and dread that likewise reflected attitudes towards non-white, not fully human individuals who filled such spaces. I also gesture to Foucault's supposition of bourgeois power and its preoccupation with instruments over ideology. He reminds us to analyze power through the techniques and tactics of domination.[86] I apply these methodological concerns to techniques and tactics of domination on the landscape itself that reifies racial formations. For example, the forces that hold the river in place are bound up in a particular legacy of plantation capitalism, which drove levee demand and swamp reclamation programs that were forced upon black bodies for the benefit of a white landowners. The plantation economy that levees enabled generated further demand for enslaved and racialized labor. Within New Orleans itself, techniques to drain marshy lands around the city were rationalized through technical and moral discourses of the scientific turn of the 19th century and rise of the Sanitary Movement. The city's vast drainage infrastructure allowed for the separation of white from non-white populations based on elevation topography. It also made the

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[85] Michel Foucault, "Two Lectures," in *Power/Knowledge: Selected Interviews and Other Writings, 1972–1977*, ed. Colin Gordon, 78–108 (Brighton, UK: Harvester Press, 1980), 81.
[86] Foucault, "Two Lectures," 81.

city vulnerable to the very conditions it was meant to counter and required an ongoing regime of repair. These practices led to the near erasure of the protective marshlands and swamps that were once so ubiquitous. While planners eventually articulated the importance of muddy wetlands as strategic buffers for what they called “critical infrastructures,”[87] they did so through an extractive lens. Mud functions as an agent of the state to protect its extractive economy. Wetlands are called strategic buffers against storms for thousands of miles of oil and gas pipelines (that destroy wetlands) and important estuaries for seafood industries. This logic position wetlands as something to be controlled and expatriated through rationalized economic metrics that fail to account for the value of such ecologies to the myriad of non-human actors that comprise the Lower Mississippi River Delta.

Ile d’Orleans

Because of its mushy topsoil and stagnant rain pools, New Orleans was called by the French “le flottant” or floating land, “La prairie tremblant” or the shaking prairie; and “wet grave” by the English.[88] The area that constitutes New Orleans is a “Paludal” environment which is “half-land and half water” that is characterized by organic to highly organic sediments deposited in swamps and marshes. There are two principal types of swamps in the New Orleans area, inland swamps and mangrove swamps. Inland swamps typically occupy poorly drained areas enclosed by higher ground. Mangrove swamps are found along the barrier of the

[87] Ned Randolph, “License to Extract: How Louisiana’s Master Plan for a Sustainable Coast Is Sinking It," *Lateral: Journal of the Cultural Studies Association* 7, no. 2 (Fall 2018), https://doi.org/10.25158/L7.2.8
[88] Mel Leavitt, *A Short History of New Orleans* (San Francisco: Lexikos, 1982), 136, https://archive.org/details/shorthistoryofne00leav.

Mississippi Delta, often rooting themselves on submerged natural levees, and reaching of 20 to 25 feet in some places.[89]

Early settlement patters snaked along the embankments of the river, while areas in the soggy "back of town" were sparsely populated.[90] From its very beginnings, the city's mud shocked arriving travelers, which were described as unanimous in their condemnation of the unpaved streets, which, though well laid out, were little more than muddy canals. [91] City streets were 37 feet wide and lined with ditches to carry off seepage from the river levee. Open, crisscrossed ditches, when flooded, functioned on the "curious" phenomenon of draining water and refuse of the city away from the river towards the lower-lying "back-a-town" cypress swamps. These back swamps were described as a muddy "gruel" of water and organic matter. "Slop and garbage thrown in the gutters" created a stench that could only be expelled by flushing rains. "The blocks after a hard rain were completely surrounded by water, and as a consequence, came to be called islets." Drainage could only help alleviate flooding in the highest areas which were along the river and canals. A Captain Hamilton wrote in 1833 that after a rain, the center of the street was at least a foot thick in mud. "The only sewers were open drains clogged with garbage, refuse and human waste, euphemistically termed night oils. Many Orleanians grew up learning to swim in the city's gutters."[92]

In correspondences during the early settlement period, the local Bishop de Luxembourg's requests for supplies to the New Orleans Mission illuminated the muddy reality of making a go

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[89] Independent Levee Investigation Team, "Geology of the New Orleans Region," chap. 3 in "Investigation of the Performance of the New Orleans Flood Protection Systems in Hurricane Katrina on August 29, 2005" (National Science Foundation; CITRIS at the University of California at Berkeley, July 31, 2006), http://projects.ce.berkeley.edu/neworleans/report/CH_3.pdf.
[90] Craig E. Colten, "Basin Street Blues: Drainage and Environmental Equity in New Orleans, 1890–1930," *Journal of Historical Geography* 28, no. 2 (April 2002): 237–57, https://doi.org/10.1006/jhge.2001.0400
[91] Federal Writers' Project, *New Orleans City Guide*, written and compiled by the Federal Writers' Project of the Works Progress Administration for the City of New Orleans (Boston: Houghton Mifflin, 1938), 12.
[92] Leavitt, *Short History*, 85.

in the delta. He describes the inadequate supplies to the friars and "a diet of a little boar, a half-pound of bread and a quarter liter of wine" after supplying for mass. "The fatigue we endure running night and day to visit the sick and carry the sacraments to them, generally in mud knee deep, does not accord with such scanty nourishment."[93]

Early houses were set on pillars with ground floor cellars. Sidewalks were elevated and wooden. Called banquettes, they were often uneven and beset by detours around standing water. "Walking was an adventure. On more than one occasion high-born ladies went to balls with their skirts lifted high and their party shoes and stockings in their hands."[94] Alexis de Tocqueville noted the ubiquity of mud: "Fine houses, huts; streets muddy and unpaved."[95] The New Orleans City Guide produced through the Works Progress Administration in the 1930s stated that, it was a wonder New Orleans existed at all with the "soggy nature of the subsoil, the low elevation of the city, climatic conditions favorable to malignant diseases, and danger of Mississippi River flood waters."[96] The city's unkempt conditions were attributed to everything from open sewers to the "privileged indolence" of European creoles.[97] The City Guide opening pages cite a cautionary 19th century minstrel.

> HAVE you ever been in New Orleans? If not, you'd better go. It's a nation of a queer place; day and night a show! Frenchmen, Spaniards, West Indians, Creoles, Mustees, Yankees, Kentuckians, Tennesseans, lawyers and trustees, Negroes in purple and fine linen, and slaves in rags and chains. Ships, arks, steamboats, robbers, pirates, alligators, Assassins, gamblers, drunkards, and cotton speculators; Sailors, soldiers, pretty girls, and ugly fortune-tellers; Pimps, imps, shrimps, and all sorts of dirty fellows; A progeny of all colors an infernal motley crew; Yellow fever in February muddy streets all the year; Many things to hope for, and a devilish sight to fear![98]

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93 Shannon L. Dawdy et al., "Archaeological Investigations at St. Anthony's Garden (16OR443), New Orleans, Louisiana: Volume II: 2009 Fieldwork Results, Faunal Report, Artifact Analyses and Final Site Interpretations" (University of Chicago Department of Anthropology, March 2014), 7.
94 Federal Writers' Project, *New Orleans City Guide*, 12.
95 George Wilson Pierson, *Tocqueville in America* (Baltimore: Johns Hopkins University Press, 1959), 622.
96 Pierson, *Tocqueville*, 156.
97 Pierson, *Tocqueville*, 156.
98 Federal Writers' Project, *New Orleans City Guide*, 9.

These words, attributed to a Colonel Creecy in the 1830s, reflected a prevailing trope of the city as not only a place of filth but also disrepute. New Orleans was considered a risky locale of unsavory characters and pestilence – a reputation that may have served a certain imaginary of adventure, but also stymied outside investment and commerce. Cleaning up the sources of disrepute and disease became a preoccupation among city authorities. To them, the problem originated from the land itself. Urban improvement focused on conquering the swamps through drainage, circulation, and enclosure.

New Orleans administrators viewed undeveloped swampland as not only disease ridden and worthless, but as a refuge for runaway slaves and lawlessness. Aversion to mud ranged from health concerns to a general sense of chaos to be organized, which has a long history in western sensibility that predates the founding of New Orleans. Muddy wetlands with their stench, heat, and lack of solidity challenged the very foundation of Western Enlightenment and earlier logics of pre-Christian Hellenic society, according to Rodney Giblet.[99] As far back as the 5th century BCE, we find recorded abjection to mud that disparages terrains that are uncultivated, difficult to pass, full of malaria and death, and a certain ambiguous in-betweeness.[100] Hippocratic writings associated unhealthy waters as still and bilious. “Turbid stagnant water in marshes and swamps are hot, thick and evil-smelling in summer because of their stagnation and failure to flow.”[101] Pliny the Elder in the first century condemned stagnant, sluggish waters that he contrasts with beneficial running water cleansed by the “agitation” of the current. “Wholesome waters should also be without taste or smell.”[102] Wetlands in their oozy, liminal materiality challenged

[99] Rodney James Giblett, *Postmodern Wetlands: Culture, History, Ecology* (Edinburgh, UK: Edinburgh University Press, 1997).
[100] Giblett, *Postmodern Wetlands*, 104–105.
[101] Giblett, *Postmodern Wetlands*, 109.
[102] Giblett, *Postmodern Wetlands*, 109.

rationalized configurations of the world because they were neither land nor water. Such mud represented a conflagration against categories, a material in process of becoming the other. Such a protean threat, which was thought to house sickness and the monstrous, was later mapped onto discourses that reflected the slippery abyss of the human unconscious – a trope that emerged during the 1850s, that likewise spawned phantasmal threats of malarial disease and a return to the barbarian. Such representations found analogues in Freud's formulation of the Id as something that needs to be drained and excised from its seething excitation.[103]

In the colonial imagination, mud was often gendered as the feminized body or racialized in the dark jungles of Africa. In E.M. Forester's African Queen, the swamps are described as a dreary, marshy amphibious country, "half black mud and half water," neither solid nor liquid, not light nor dark. They were smelly and disease ridden. "Undoubtedly the worse feature of the swamp was the awful smell of rotting vegetation that hung about it, which was at times positively overpowering, and the malarious exhalations that accompanied it, which we were of course blighted to breath."[104] According to Giblett, the slimy composition of the swamp is what makes it such an abject object of horror that won't "sit still as some sort of fixed and static mediator."[105] It lurks in the "murky" edges between water and land.[106] Writing about a genealogy of the European imaginary of the swamp, anthropologist Stuart McLean argues that swamps are zones of mixture or transition where land and water, solidity and liquidity transform and intermingle. Yet the pairing of adjective and noun of "wetlands" conveys too an unmistakable partiality for terra firma and a desire to reduce liquidity and wetness to predicates

[103] David C. Miller, *Dark Eden: The Swamp in Nineteenth-Century American Culture* (Cambridge: Cambridge University Press, 2010), 48.
[104] Giblett, *Postmodern Wetlands*, 109.
[105] Giblett, *Postmodern Wetlands*, 41.
[106] Ari Kelman, "Boundary Issues: Clarifying New Orleans's Murky Edges," *Journal of American History* 94, no. 3 (December 2007): 695–703.

of the solid substance of dry land. “What the term wetlands simultaneously references and seeks to contain is precisely the volatility of substance that characterizes such land–water admixtures, their existence betwixt and between clearly differentiated states of matter.”[107] It is at this conjuncture where Utopian imaginaries battled folklore using the tools of technology and science.

With a deference to dry land, wetlands were thought suited for the monstrous, home to Western literature’s famous ogres. Grendel, along with his mother, lived in a perilous marsh where the mountain stream goes underneath the mists of the cliff. A wanderer of the marsh, Grendel was guardian to Moors and alien spirits. In Paradise Lost, Milton’s Satan is a swamp serpent and marsh monster. The swamp, like Satan, trespasses on every domain. In Dante’s fifth circle of hell, the ‘sullen souls’ are stuck in the slime’[108] It is into the primeval darkness of the swamps that Marlow must venture to rescue the dissembling Col. Kurtz. He describes his journey inland where “the savagery, the utter savagery,” had closed around him.[109] One is never alone in the swamps, where the foreboding of otherness watches from the impenetrable thicket. Swamps and wetlands buzz with non-human life.

The dark expanse of the unknown – and its in betweenness – generated threats of fantasy through stories of swamp creatures in the form of werewolves and other monsters with humanoid qualities. Louisiana’s Honey Island Swamp Monster as well as the Loup Garou werewolf, supposedly inherited from France, found their way into local folklore and popular music. The

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[107] Stuart McLean, “BLACK GOO: Forceful Encounters with Matter in Europe’s Muddy Margins,” *Cultural Anthropology* 26, no. 4 (November 2011): 589–619, https://doi.org/10.1111/j.1548-1360.2011.01113.x
[108] Giblett, *Postmodern Wetlands*, 119.
[109] Giblett, *Postmodern Wetlands*, 97.

"rugarou," a variation of the Cajun French version, were known among Louisiana tribes as skin walking shape shifting half-humans that haunted Louisiana swamps.[110]

Nevertheless, the unmanaged realm of nature had its advocates. Henry David Thoreau said that a howling wilderness does not howl. It is the imagination of the traveler that does the howling.[111] One wonders if the swamps – in their wild and chaotic attributes – also mapped onto Thoreau's own politics of disobedience and anarchic tendencies.[112]

Threatening Presence

Conquest of wetlands by drainage was consequently framed in terms of imperial conquest and security. Benito Mussolini who drained the "never-ending fen' of the malarial marshes, later bragged that his two main achievements were that had made the trains run on time and draining the Pontine Marshes.[113] Drainage likewise rendered land useful to industrial modernity – making land profitable for commodification through mono-cultivation and exchange value. John Locke argued that uncultivated lands should be available for seizure, which was used by American colonists to dispossess native Americans from their ancestral lands throughout the 17th to 19th centuries.[114] Historian Thomas Hughes argues that the U.S. experiment by the mid-18th century relied on the exported ethos and technology of the British Industrial Revolution that was driven by canals, steam, iron and coal to make up for what the fledgling republic lacked in labor to tame its vast wilderness. "Some have argued that the book of Genesis still persuades many, convincing

[110] Brad Steiger, *The Werewolf Book: The Encyclopedia of Shape-Shifting Beings* (Canton, MI: Visible Ink Press, 2012).
[111] Giblett, *Postmodern Wetlands*, 229.
[112] David C. Miller, *Dark Eden*, 186.
[113] Giblett, *Postmodern Wetlands*, 115.
[114] Gary Fields, "'This Is *Our* Land': Collective Violence, Property Law, and Imagining the Geography of Palestine," *Journal of Cultural Geography* 29, no. 3 (October 2012): 267–91, https://doi.org/10.1080/08873631.2012.726430.

Americans that God has given them domination over nature, empowering Americans to lay waste to nature to transform resources into consumer goods."[115] Indeed, we see such justification in the words of Pres. Trump channeling 19th century discourse of "Manifest Destiny" while speaking at a 2018 Naval Academy commencement ,that "our ancestors tamed a continent" and "we are not going to apologize for America."[116]

Historically, wetlands were also easy to defend and beneficial to localized resistance that used the shadowy thicket to stage ambushes. Revolutionary guerrillas in the American Revolution were called Swamp Foxes. The muddy swamps of the Chalmette battlefield aided Andrew Jackson's forces against the British landing in the 1815 Battle of New Orleans. We see correspondence of frustration in weeding out of the Seminole warriors by the Americans during the two Seminole Wars in the Florida Everglades, as well as the American capitulation in the Mekong Delta in the Vietnam War. In the Seminole Wars, the Florida swamps were described as taking the sunshine from a man's life. "Cypress knees, mangrove roots, and saw grass tortured the foot soldier. Too much water, and the lack of water, made his life a torment. There was marching in water from ankle to armpit deep, hour after hours, with no chance to dry off, not even light.[117] In Vietnam the French deployed drainage canals as a colonial technology for subduing an indigenous population and environment.

William Styron's fictional confessions of Nat Turner mused about the stronghold of the swamps he called "forbidding as well as the dawn of creation, it was still profusely supplied with game and fish and springs of sweet water – all in all hospitable enough a place for a group of

[115] Hughes, *Human-Built World*, 43.
[116] Jason Le Miere, "Donald Trump Says 'Our Ancestors Tamed a Continent' and 'We Are Not Going to Apologize for America,'" *Newsweek*, May 25, 2018, https://www.newsweek.com/donald-trump-tame-continent-america-945121.
[117] Giblett, *Postmodern Wetlands*, 217.

adventurous, hardy runaways to live there indefinitely, walled up in its green luxuriant fastness beyond the pursuit of white men."[118] Harriet Beecher Stowe writes about a runaway slave, Dred, who takes refuge in the Great Dismal Swamp, which like Dred, becomes a symbol for the dark recesses of the mind.[119] She describes the Great Dismal Swamp's "goblin growth … all sorts of vegetable monsters stretch their weird, fantastic forms along its shadows…it is a mysterious and dread condition of existence."[120] Recent scholarship by archaeologists have unearthed evidence that runaway slaves persevered for generations in the Great Dismal Swamp evading capture by slave owners and allying with Native Americans, themselves fleeing the colonial frontier and forced resettlement from at least 1680 to the Civil War nearly two centuries later.[121]

In fact, it is throughout the lower swamps of the Mississippi Delta that the Choctaw, Houma and Chitimacha and other first peoples took refuge to resist their forced relocation in the 19th century. "The American swamp has served three different military and political functions over the course of its recent history: firstly, as the first refuge of runaway slaves seeking freedom; secondly as the last resort and base for the white revolutionary struggling to overthrow imperial government; and thirdly, as the last refuge of indigenous people trying to hold onto their freedom and lands."[122] Maroon territory stretched up and down the Mississippi River -- from St. John the Baptist and St. Charles parishes immediately upriver from New Orleans to downriver from the English Turn through Lake Borgne – where the swamps were nearly impenetrable – and down to Lake Barataria.

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118 Giblett, *Postmodern Wetlands*, 217.
119 Giblett, *Postmodern Wetlands*, 211.
120 Giblett, *Postmodern Wetlands*, 214.
121 Richard Grant, "Deep in the Swamps, Archaeologists Are Finding How Fugitive Slaves Kept Their Freedom," *Smithsonian Magazine*, September 2016, https://www.smithsonianmag.com/history/deep-swamps-archaeologists-fugitive-slaves-kept-freedom-180960122/.
122 Giblett, *Postmodern Wetlands*, 214; Herbert Aptheker, "Maroons Within the Present Limits of the United States," *Journal of Negro History* 24, no. 2 (April 1939): 167–184, https://doi.org/10.2307/2714447.

Spanish authorities of the late 17th century were deeply impressed and quite frightened by the military strength of the maroon settlements. The so-called San Malo Maroons who lived in the swamps surrounding New Orleans established permanent settlements in Chef Menteur and in Gaillardeland, a settlement in St. Bernard Parish downriver from New Orleans. Largely self-sufficient, they cut and delivered cypress logs to mill owners for cash. They fished and hunted. They grew beans, corn and herbs that were sold in street markets in New Orleans. They were armed with muskets whose shot and powder were purchased in New Orleans. And there was some apparent collaboration among maroons and enslaved people on plantations, including some marriages. In 1784, following a series of uprisings by enslaved people against their masters, paid spies led a series of costly expeditions to root them out. San Malo and many of his fellow maroons were captured and hung in front of St. Louis Cathedral, while women and children were brutally flogged. [123]

Settlements were often near loved ones in proximal, but autonomous spaces in the woods, swamps and marshes. Often, they were behind the Plantation 'Big House' cabins and fields, where undeveloped land provided game, firewood, and timber. To planters and overseers, these marginal lands were untamed, out of control, savage, dark, and mysterious, just like the "negroes and other slaves," whom the preamble of the 1712 South Carolina slave code described as having "barbarous, wild, savage natures."[124] Their mere existence represented a direct challenge by authorities to impose a hard line of separation between their sphere of control and wilderness, where Maroons were able to inhabit. "The maroons inhabited the fluid landscape of the borderlands that shifted with the tides and was remodeled by the floods and the droughts, and the

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[123] Pippin Frisbie-Calder and Gwendolyn Midlo Hall, "San Malo Maroons," Paper Monuments Project #010, New Orleans Historical, accessed June 16, 2019, https://neworleanshistorical.org/items/show/1403.
[124] Sylviane A. Diouf, *Slavery's Exiles: The Story of the American Maroons* (New York: New York University Press, 2014), 7.

clearing and drying of lands for cultivation."[125] Maroon settlements were depicted in New Orleans newspapers as sources of danger and ambush against whites.[126] Newspapers documented periodic efforts by New Orleans authorities to suppress maroon activity. In July 1837, the New Orleans Picayune reported that "a band of runaway Negroes in the Cypress Swamp" near New Orleans "had been committing depredations." The next year, in July, a newspaper reported the killing of an outlaw slave leader, Squire, near New Orleans, who was blamed on the deaths of several white men. According to the report, Squire's career had lasted for three years. A guard of soldiers was sent to the swamp for his body, which was exhibited for several days in the public square of the city.[127] In October 1841, the New Orleans Bee reported that "runaway Negroes" had made frequent attacks on white men in Terrebonne Parish. In November 1846, about a dozen armed slaveholders surprised "a considerable gang of runaway Negroes " in rural St. Landry Parish, Louisiana. The maroons refused to surrender and fled. Two Negroes, a man and a woman, were killed, and two Negro women were "badly wounded." The others escaped.[128] What is known about maroon communities is to be gleaned from court minutes, letters, parish and plantation records, jail notices and runaway slave advertisements. Despite the specter of danger against whites, or the more violent Maroon uprisings of Jamaica which were cited as a cautionary tale, the hypothetical power and influence of Maroon communities were grossly exaggerated. They were leveraged by authorities in order to tame what was otherwise wild.

Miasmic Threats

[125] Diouf, *Slavery's Exiles*, 8.
[126] Aptheker, *Maroons*, 179.
[127] Aptheker, *Maroons*, 180.
[128] Aptheker, *Maroons*, 181.

In addition to the protean threats of ungoverned non-white bodies, discourses around swamp conquering were also rationalized by the mid-19th century's rise of the Sanitary movement, which postulated that good drainage promoted upstanding morals. The Sanitary Movement rationalized the improvement of public health through the management of space and principles of economic circulation.[129] Scholars point to the movement's emergence with Chadwick's Report on the Sanitary Condition of the Labouring Population of Great Britain in 1842. The industries of medicine and agriculture stood the most to gain from the Sanitary Movement as fallow and otherwise unregulated lands came under enclosure and surveillance of the state. Chadwick blamed Typhus on the miasma rising from unenclosed fens or marshes.[130] Chadwick was a former literary assistant to Jeremy Bentham, who is known as the progenitor of the panopticon that so affected Michele Foucault. Bentham was an overall advocate of the upright morals of spatial circulation and discipline. In the 19th century, Foucault argues, the state began regulating the well-being of its citizens through statistical demographics and the management of space. This "conduct of conduct" is the foundation for modern government. "A good street is one in which there is, of course, a circulation of what are called miasmas, and so diseases, and the street will have to be managed… " [131] This space or milieu was a tableau of uncertainty and possibility. "The milieu needs to be managed because overcrowding or congestion leads to poor circulation which leads to increased miasmas and disease."[132]

New Orleans stood at the nexus of this problematic relationship in the 18th and 19th centuries. "New Orleans needed to domesticate its landscapes to secure the border between itself

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[129] Edwin Chadwick, *Report on the Sanitary Condition of the Labouring Population of Great Britain* [...], (London: Printed by W. Clowes and Sons for Her Majesty's Stationery Office, 1843).
[130] Chadwick, *Sanitary Condition*.
[131] Michel Foucault, *Security, Territory, Population: Lectures at the Collège de France, 1977–78*, ed. Michel Senellart, trans. Graham Burchell (Basingstoke, UK: Palgrave Macmillan, 2007), 19.
[132] Foucault, *Security, Territory, Population*, 21.

and its surroundings."[133] Throughout most of the 19th century, drainage projects were ad-hoc and privately funded. They largely benefited disconnected and affluent areas of town. The city's average rainfall of 60 inches a year ended up turning these private canals into "beds of garbage and excrement, fit only to generate fever and breed mosquitoes," according to an 1880 Louisiana Board of Health report.[134] Fires were particularly dangerous due to the inability of fire protection teams to navigate effectively through the mud. Victims of fire include the original church sited at the St. Louis Cathedral and most of the early French colonial structures of the French Quarter. An ordinance was passed in 1788 forbidding the buildings financed by the King's loan to be constructed with cypress wood.[135] As the city grew, the complexity of levee and drainage designs increased. Levees spread up and down the river and its connecting bayous. Eventually, authorities eyed the back-of-town swamps. They called for a functional drainage system to enable more people to live in "reclaimed" areas once uninhabitable, but consequently more exposed to infrastructural disruptions during major storms and floods.

Prior to 1835, the city had invested nearly $5 million in streets, drains and elevated banquettes. But gutters and canals clogged with subsurface seepage from backyard privies and mud, which made cleaning and clearing them a never-ending task.[136] In 1835, the city awarded the New Orleans Drainage Company a 20-year charter to drain the cypress swamps between the riverbank and Lake Pontchartrain. Between 1833 and 1878, more than 35 miles of drainage canals were dug across the natural levee back-slope and through the lower lying swamps.[137] By

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[133] Kelman, "Boundary Issues," 699.
[134] Colten, "Basin Street Blues."
[135] Richard Campanella, "Disaster and Response in an Experiment Called New Orleans, 1700s–2000s," in *Oxford Research Encyclopedia of Natural Hazard Science* (Oxford University Press, March 2016), https://dx.doi.org/10.1093/acrefore/9780199389407.013.1
[136] F. R. Southmayd, *Report of the Howard Association of New Orleans, of Receipts, Expenditures, and Their Work in the Epidemic of 1878, with Names of Contributors, etc.* (New Orleans, LA: A.W. Hyatt, 1878), https://collections.nlm.nih.gov/catalog/nlm:nlmuid-9711174-bk.
[137] Campanella, "New Orleans' 300-Year-Long."

1890, New Orleans had only one and a half miles of paved roadway inside its city limits, although there were 200 miles of streetcar tracks with 26 different lines.[138]

Calls for drainage were laced with public health imperatives, particularly concerns with regular summer bouts of Yellow Fever, among other scourges. Perennial outbreaks of disease in the 18th and 19th centuries plagued New Orleans at a level that was said to be twice that of other large urban areas.[139] Diseases were thought to be endemic to the surrounding swamps of New Orleans. “Miasmas” were considered vaporous swamp fumes that were assumed to be indigenous to place rather than spread by organism. Such fumes were attributed to having both gas and liquid – air plus water. Wetlands were believed to be laden with infectious air that emanated from decaying matter.[140]

Methods of protections included shooting cannons to dispel vaporous air. Officials also speculated that contagion spread from the cemeteries. The City Council carried on a prolonged controversy with the wardens of the Cathedral to move St. Louis Cemetery to some other location.[141] Cholera, malaria and dengue claimed the lives of thousands, but Yellow Fever took the most. Over 100,000 Louisianans, including nearly 40,000 New Orleanians died from Yellow Fever between 1796 and 1905. The worst outbreaks occurred during the late 1840s to late 1850s when at least 22,500 residents perished. The so-called “Yellow Jack” seemed to be a chronic, albeit cyclical, part of life in the city. It tended to arrive in the summer and fall and dissipate as the months cooled. It was a visible and horrible disease. In mild cases, infected persons would feel muscular pain, probably vomit for several days and swing from intense chills to intense

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[138] Leavitt, *Short History*, 127.
[139] Leavitt, *Short History*, 97.
[140] David C. Miller, *Dark Eden*.
[141] J. H. Bauer, “Yellow Fever,” *Public Health Reports (1896–1970)* 55, no. 9 (March 1, 1940): 362–371, https://doi.org/ 10.2307/4583195.

fevers. In severe cases, the skin would turn yellow as the disease incapacitated the liver, kidneys and heart. The infected victims would then vomit digested blood that had turned black. New Orleans experienced 12 Yellow Fever epidemics in 35 years.[142] "As late as 1887, with rival cities, such as Memphis, Tennessee, embracing sanitary reform, Charles Dudley Warner visited New Orleans on assignment for Harper's. He was stunned by "gutters green with slime . . . canals in which the cat became the companion of the crawfish, and the vegetable in decay sought in vain a current to oblivion."[143] Perennial outbreaks threatened not only residents but also financial development and investment in a port city that counted on regular visits of people and shipments of goods. Foreign businesses often shunned New Orleans as too great a health risk for commercial investment.

The dreaded "late-summer plague" forced public quarantines of riverboats. Costs of disrupted trade were continually weighed against the social cost of outbreaks. Some outbreaks were exacerbated by the suppression of public information. There are numerous cases of Yellow Fever epidemics that for weeks went unreported by newspapers and authorities concerned about hurting business at the docks. This led to more deaths of workers, visitors and city residents.[144] Those with resources fled north across Lake Pontchartrain to the piney woods of what is now Mandeville or east to the Mississippi Gulf Coast. As a result, poor whites and African Americans bore the brunt of the scourges. As is true today, the poor of New Orleans suffered more than the rich because of inequitable residential geographies, where the poorer sections of town lie in the lower topographies and lack resources to evacuate.[145]

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[142] Joseph Roach, *Cities of the Dead: Circum-Atlantic Performance* (New York: Columbia University Press, 1996).
[143] Kelman, "Boundary Issues," 699.
[144] Kelman, "Boundary Issues," 699; Barry, *Rising Tide*.
[145] Richard Campanella, "Above-Sea-Level New Orleans: The Residential Capacity of Orleans Parish's Higher Ground," ed. Douglas J. Meffert (Center for Bioenvironmental Research, April 2007), http://richcampanella.com/assets/pdf/study_Campanella%20analysis%20on%20Above-Sea-Level%20New%20Orleans.pdf.

The longest and most fatal U.S. Yellow Fever outbreak started in New Orleans with the arrival of an infected sailor in May 1878. Some historians have speculated that it arrived from Havana. It continued to take victims through June and July and travel from city to city along the disease vector of the Mississippi River. New Orleans lost 4,600 lives. Memphis lost 5,000, which was 20 percent of its 40,000 residents. By December, Yellow Fever had struck parts of Mississippi, Louisiana, Tennessee, Kentucky, Georgia, Ohio and Missouri. After traveling from New York City to New Orleans in September 1878, one dry goods merchant expressed astonishment at the extensive reach of the fever: "[T]he country between Louisville, Kentucky and New Orleans is one entire scene of desolation and woe."[146] Amid the terror, residents of Jackson, Tenn., placed armed guards on incoming roads to turn away anyone attempting to enter. Towns in Texas refused trains, mail and people from New Orleans for fear that they would be infected. "Shot-gun quarantines," the editor of the Memphis Appeal reported later, "were by this time (the 26th of August) established at nearly all points" in the Mississippi Valley. The Washington Post noted "a first-class panic in... small towns and villages" surrounding New Orleans.[147]

Seeking to quell public hysteria, a consortium of New Orleans physicians in 1878 issued a public treatise that stated that Yellow Fever was a specific disease “that had once been exotic but was now domesticated or endemic.” Since quarantine had never prevented the occurrence of either isolated cases or epidemics, the physicians protested against it. They blamed Yellow Fever on the city’s sanitary condition. But they could not explain why the pestilence prevailed only in

[146] Federal Writers’ Project, *New Orleans City Guide*, 14.
[147] Edward J. Blum, “The Crucible of Disease: Trauma, Memory, and National Reconciliation during the Yellow Fever Epidemic of 1878,” *Journal of Southern History* 69, no. 4 (November 2003): 799, https://doi.org/10.2307/30040097.

the summer.[148] They issued calls for urban improvement and a comprehensive program of sanitary reform in keeping with late 19th century discourses of the reform movement. They called for paving and cleaning of city streets together with efficient disposal of garbage in the Mississippi River. And they called for a safe and adequate municipal water supply.[149] "As absolutely necessary" preventive measures, the New Orleans Medical and Surgical Association recommended proper drainage of the city, including an underground sewer system and abolition of the backyard "privy" or outhouse. The physicians' report calculated that residents deposited over two million pounds of human 'excreta' into the soil annually, which was "the most difficult problem connected with the sanitation of New Orleans." New Orleans had 44,000 privies. Of these, inspectors declared that over half were "foul" or "defective." These devices introduced sewage into an already saturated ground.[150] The physicians outlined a comprehensive program of sanitary reform.

Ironically, it was an aversion to mud that may have aided the spread of Yellow Fever in New Orleans. To avoid drinking muddy river water, residents relied on backyard cisterns, which were breeding grounds for the chief disease vector, the Aedes Aegypti mosquito (which also carries Zika Virus). The mosquito breeds almost exclusively in and around houses – in containers such as drinking cisterns, tanks, buckets, roof gutters and bottles filled with rainwater. It also breeds in flower vases and icebox drainage pans. While the Pasteur Institute had by 1880 exonerated vaporous swamp fumes that stem from the Italian word, mal'aria or bad air.[151] In the case of Yellow Fever, a causal viral organism was suspected, but not actually isolated until 1928.

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148 John H. Ellis, *Yellow Fever and Public Health in the New South* (Lexington: University Press of Kentucky, 1992), 84, http://www.jstor.org/stable/j.ctt130hnmm.
149 Ellis, *Yellow Fever*, 84.
150 Colten, "Basin Street Blues," 30.
151 Bauer, "Yellow Fever"; Sheldon Watts, "Yellow Fever, Malaria and Development: Atlantic Africa and the New World, 1647 to 1928," in *Epidemics and History: Disease, Power and Imperialism*, 213–268 (New Haven, CT: Yale University Press, 1997), 216, http://www.jstor.org/stable/j.ctt1nq8qw.11

"It has practically never been found breeding in swamps, rivers, lakes, or other places where malaria mosquitoes usually breed.[152]

After half a century of marginally successful privately financed public works projects, the city embarked on a major improvement program in the 1890s to relieve the soil of its "soggy conditions."[153] The Drainage Commission of New Orleans was formed in 1896 and developed a $27 million drainage plan. "By 1905, workers completed 40 miles of open and underground canals, hundreds of miles of drains and pipes, and six pumps draining 22,000 acres at 5,000 cubic feet per second. The work was not yet half done, but the effects were already apparent." Muddy street began to dry. Swamp water disappeared. Soils were able to be paved. California-style bungalows started appearing on streets designed for automobiles in areas that were previously marsh.[154] Even the sharp-tongued New Orleans-born author, George Washington Cable, marveled: "The curtains of swamp forest are totally gone. Their sites are drained dry and covered with miles of gardened homes."[155]

Racial alignment

But not everyone of course was served equally. While the Drainage Commission had undertaken an ambitious Progressive Era citywide drainage program of pumping stations and canals, the coinciding Jim Crow policies challenged principles of social equity by prohibiting the movement of African Americans and denying services to non-white neighborhoods. Before 1900, the city's black population typically occupied the swampy portions "back-of-town" towards Lake Pontchartrain. The new sewerage system approved by voters would use "the

[152] Bauer, "Yellow Fever," 366.
[153] Colten, "Basin Street Blues," 243.
[154] Campanella, "A Look Back."
[155] Kelman, "Boundary Issues."

diluting power of the Mississippi River" and replace old drainage canals by pumps that force effluent through closed pipes up the natural levee and into the river at a discharge point below the city.[156] Gaps in the system became apparent in the 1920s. City ordinances and later deed restrictions legally obstructed desegregation. Vast tracts of lakefront property drained after 1920 became entirely new subdivisions, and ordinances and racially restrictive deeds effectively closed them to African Americans. A 1923 assessment of the sewerage system revealed a major neighborhood without a sewer main. It was a low-lying, largely African American industrial district. But according to Colten, by 1930, engineering concerns seemed to overcome prevalent racism of the day and the sewerage system reached previously unserved areas, allowing black residents to move into previously uninhabited portions of the city. But it also meant that even when black New Orleanians received drainage and sewerage services in the 1930s, they were limited to the lowest sections of the city.

The inventor largely credited with "conquering the swamp" was Albert Baldwin Wood, a local resident who designed the Wood Screw Pump, which was shaped like a corkscrew and could pull 10 million cubic feet of water out of the "soup bowl" of New Orleans. Wood's system drained the "floating land" of its excess subsurface moisture. The famous Baldwin Screw-pump patented in 1912 – still being used by the city when Katrina struck in 2005 – moved water through the drainage canals and up out of the city. The pump is credited with expanding New Orleans' urban footprint to its existing scope. More pumps, canals and levees were built. By 2005, there were 22 drainage-pumping stations in New Orleans with the pumping capacity to empty a ten-square-mile lake, 13.5 feet deep, every 24 hours.[157] These same canals would later provide Katrina's floodwaters access to the heart of the city.

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[156] Colten, "Basin Street Blues."
[157] Davis, "Historical Perspectives," 89.

Draining the old swamps triggered an early 20th century real estate boom that witnessed a 700 percent increase in the City's urban acreage and an 80 percent increase in assessed valuations during the same period.[158] Most of these lowland lots were not developed until after World War I. More land was reclaimed from the south shore of Lake Pontchartrain in 1928–1931, and the remaining balance of the lowlands of the city was built out between 1946 and 1975, following the World War II.[159] "Beautiful neighborhoods like Lakeview and Gentilly came to life. Later, eastern New Orleans, Metairie and Kenner, the urbanized West Bank and St. Bernard Parish would all replicate the basic concept of the 1895 New Orleans plan. However, in later reclaimed areas, pumps would be placed at the perimeter, and not the interior, of the basin being drained."[160] This would become a critical outer layer of protection during Katrina for suburban areas adjacent to the city of New Orleans.

A Century of Land Reclamation

Meanwhile, the disappearance of the Cypress swamps behind the city through drainage and land reclamation led to root die offs and ground subsidence.[161] Geologist Sherwood Gagliano wrote in the 1970s that the reclamation projects throughout Louisiana peaked between 1915-1920 and were largely focused on agricultural reclamation. The act of draining and developing swamplands seemed to pick up again in the 1960s with new urban and industrial developments. In fits and starts, the practice of draining uninhabited swamplands for

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[158] J. D. Rogers, "Development of the New Orleans Flood Protection System prior to Hurricane Katrina," *Journal of Geotechnical and Geoenvironmental Engineering* 134, no. 5 (May 2008): 602.
[159] Rogers, "Development," 602.
[160] Campanella, "A Look Back."
[161] Sherwood M. Gagliano, "Canals, Dredging, and Land Reclamation in the Louisiana Coastal Zone," Hydrologic and Geologic Studies of Coastal Louisiana, Report 14 (Baton Rouge: Louisiana State University Center for Wetland Resources, October 1973), https://www.govinfo.gov/content/pkg/CZIC-gc57-2-l667-no-14/html/CZIC-gc57-2-l667-no-14.htm.

neighborhood development continued through the late 1980s and expanded not only the city footprint of the New Orleans but opened new areas for development in neighboring parishes for white suburbanites.[162] Some geographers and social historians have pointed to this period of development as a response to Brown v. Board of Education that desegregated public schools. While Brown was decided in 1954, the Orleans Parish School Board held out another eight years before it allowed African Americans to attend schools with white students, ushering an intensive period of white flight by families afraid of miscegenation.

New Orleans had developed into low-lying areas because of drainage technology and white flight continued turning vast areas of the city into poor ghettos with ridges of old wealth along the historically settled areas. This, in effect, left the city with a growing concentration of poorer African Americans.[163] As the city footprint expanded into the edges of Lake Pontchartrain to the north and into the wetlands of New Orleans East, developers used suction dredges to build leveed canals, allowing them to pull up and fill in local sands and clay material from below the water bottom. The dredged materials piped in slurry form over varying distances and discharged at the point of levee construction. But these last developed neighborhoods in the city became more difficult to maintain. While natural levee ridges are easily protected from both river floods and storm-induced tides, the protection of drained flood basins by dikes or artificial levees is more complicated. The level of river floods may stand as much as 20 feet above the drained flood basin surfaces, and storm-generated tides may be even higher. Hurricanes Betsy (1965) and Camille (1969), both of which inundated large areas of the drained flood basin of New Orleans, provided ample proof of the undesirable nature of reclaimed marsh and swamp land for urban development. Yet develop they did. “Modern drainage thus enabled the crescent-shaped city of

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[162] Rogers, “Development.”
[163] Lewis, *New Orleans*.

the 1800s to expand into the spread-eagle-shaped metropolis it is today."[164] But it came at a cost. The drainage system was so successful in removing water from the soil that it opened air cavities where organic matter decomposes, shrinks and creates more cavities. Fine sediment particles collect and consolidate. "Half of greater New Orleans would subside below the level of the sea, into a series of bowls -- even as they were paved, further reducing the soil's absorption capacity and increasing runoff. Each paved bowl required that the pumps do more and more lifting of more and more water."[165] Meanwhile, more than 120 miles of subterranean canals under-laced the city. Pumps located in the interior of the city required that the lifting of water be done early in the outfall path to the lake, which raised water levels in the outfall canals above the surrounding (and subsiding) neighborhoods rather than at the end of the canal just before being pumped into the lake. "All that stood between high water and low neighborhoods were thin floodwalls."[166] Pumps originally located behind populated areas were now surrounded by these areas. "Unbeknownst to new residents, their exposure to hazard grew with every centimeter that neighborhoods sank, as did their dependence on pumps and barriers to prevent rainwater or seawater from pouring in."[167] A now fateful decision reached in 1895 to expel runoff into Lake Borgne rather than Lake Pontchartrain, changed the positioning of the pumps. Had they turned to Lake Pontchartrain the pumps likely would have been positioned along the lakeshore heads of the outfall canals – instead of the interior of the city – which would have added protection against incoming storms. "The pump themselves would have acted as gates, and the canals would have been below grade, dug deep enough to let gravity draw the runoff toward the

[164] Campanella, "A Look Back."
[165] Campanella, "A Look Back."
[166] Campanella, "A Look Back."
[167] Campanella, "Disaster and Response," 21.

pumps." In other words, Katrina's damage throughout the interior of the city of New Orleans may have been avoided.[168]

Meanwhile the built environment of canals, levees and seawalls created the fiction of a dry city though it had sunk by three meters in some areas. Ships floating on the Mississippi River pass by like a parade of carnival floats elevated above the rooftops. This would force a greater reliance levees and flood walls, which perpetuated a devastating cycle of ground water removal, flooding and vulnerability. Taken with the long-term problem of coastal erosion of South Louisiana, the surrounding saltwater of the Gulf of Mexico creeps ever closer to a dense urban population that is living below sea level.[169] This uninterrupted positive feedback loop is the result of modern, extractive thinking that must somehow be interrupted. I again leave it to Shallat to eloquently sum up the dilemma of living in the delta:

> Construction interferes with the land-building process: levees contain the silt needed to replenish the lowlands, dredging loosens the land by killing freshwater plants, floodgates and reservoirs further aggravate marsh subsidence. To abandon these kinds of projects is to court economic disaster; to build as before is to invite a worse catastrophe. "It's ironic," writes Robert Brown of New Orleans a corps publicist. "The system which brings prosperity and security to humans is literally costing them the earth beneath their feet." [170]

This paradox, I argue throughout this dissertation, stems from a philosophy of *extractive thinking* that traces its origins to Modernity itself.

Sustainable Development Discourse

[168] Campanella, "A Look Back."
[169] During a heavy rainstorm last fall, the city's streets filled in areas that are above sea level. In the subsequent investigation, it was discovered that several of the water pumps had malfunctioned likely from the stress caused by congestion of debris. The CEO of the sewerage and water board resigned. When forensic teams went through the system, they pulled out 40 tons of Mardi Gras Beads.
[170] Shallat, "Holding Louisiana," 103.

Local observations towards the last quarter of the 20th century began to note the disappearance of fields and marshes on the other side of the levees and along the Louisiana coast. Around the same time, new schools of thought emerged that began to change the national political landscape around natural resources. In 1962, Rachel Carson's *Silent Spring* was published, pointing to the damage inflicted by pesticides on bird and aquatic species in California's Central Valley. And then, after being polluted for decades by industrial waste, an oil slick on the Cuyahoga River at Cleveland caught fire in June 1969. The public spectacle is often cited as the catalyst for the creation of the Environmental Protection Agency in 1970, which began reformulating what had otherwise been thought of as untamed wilderness. 'Environmentalism' coincided with legislative developments that included the federal Clean Water Act, first passed in 1960 and amended (generally in a more stringent direction) five times over the next twenty years; the Endangered Species Act of 1966 (updated in 1969 and again in 1973); the National Environmental Policy Act of 1969; and the National Wild and Scenic Rivers Act of 1968, which barred or severely restricted new project development on listed rivers throughout the country. At the same time, an important judicial development was the granting of legal "standing rights" to environmental groups, allowing them to bring suit before courts and administrative agencies on the grounds of the public interest.[171] The Santa Barbara oil spill in 1969 and Earth Day in 1970, cemented what became the modern environmental movement.

In 1971, Congress passed the Environmental Protection Act, which required the Army Corps of Engineers to assess environmental damage of proposed projects. The following year, Ralph Nader published his book, *Water Wasteland,* about the destruction of the Chesapeake Bay habitat, and Congress subsequently rewrote the Water Pollution Control Act. It is hard to refute a

[171] Steven J. Jackson, "Building the Virtual River: Numbers, Models, and the Politics of Water in California" (PhD diss., University of California San Diego, 2005), 131, ProQuest (AAT 3212684).

turning point in the 1970s towards a new environmental ethic.[172] This new age of environmental sensitivity would also affect Louisiana. In 1971, the state legislature established the Louisiana Advisory Commission on Coastal and Marine Resources, which provided a foundation for the establishment of Louisiana's Coastal Zone Management (CZM) Program in 1978. By the end of the decade, the state of Louisiana officially recognized that its wetlands were eroding.

A new rhetoric transformed swamps and marshes, which for almost three centuries were generally repelled by the urban inhabitants in New Orleans, into something that environmentalists and biologists called "wetlands." Lynn A. Greenwalt, Director of Fish and Wildlife Service, issued a comprehensive report in 1977 on the classification of wetlands, officially acknowledging that wetlands and deep-water habitats are essential breeding, rearing and feeding ground for many species of fish and wildlife. This report expanded an initial inventory conducted by the USFWS in 1954 – which at the time was to assess "valuable waterfowl habitat." That report described 20 wetland types. Greenwalt's report was more comprehensive and has been called "one of the most common and most influential documents used in the continuous battle to preserve a valuable but rapidly diminishing National Resource."[173] The Fish and Wildlife Service adopted the new wetland classification system – while acknowledging there is no single, ecologically sound definition for wetlands, "primarily because of the diversity of wetlands and because the demarcation between dry and wet environments lies along a continuum." As an object of discourse, wetlands connoted scarcity and utility – just as it draws upon problematic extractive discourses about the non-human world. Under the header, "Wetlands and Deepwater Habitats," the report reads, "Marshes, swamps, and

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[172] James T. B. Tripp and Michael Herz, "Wetland Preservation and Restoration: Changing Federal Priorities," *Virginia Journal of Natural Resources Law* 7, no. 2 (Spring 1988): 221.
[173] Greenwalt, foreword to Cowardin et al., "Classification of Wetlands," iii.

bogs have been well-known terms for centuries, but only relatively recently have attempts been made to group these landscape units under the single term "wetlands." This general term has grown out of a need to understand and describe the characteristics and values of all types of land, and to wisely and effectively manage wetland ecosystems."[174]

In his foreword, Greenwalt pointed to other uses of wetlands that he said, "perform important flood protection and pollution control functions. Increasing National and international recognition of these values has intensified the need for reliable information on the status and extent of wetland resources."[175] As such, it appears that wetlands emerged through a government inventory motivated through perceived scarcity and anthropogenic value.

Wetlands also became commodified as eco-services for recreational and taxable hunting and fishing that brought tourists and vacationers into forested areas. Arguably along this fracture, Louisiana's swamps and marshlands finally emerged as something other than "wasteland" and therefore worth protecting. But this occurred by virtue of a value system that prized their utility in providing a protective buffering for oil and gas infrastructure from storms and for commercial services like tourism, fish hatcheries, and waterfowl flyways rather than an ethical stewardship.

This discursive regime conjures both the mud and wetlands' role in a complex ecosystem of nonhuman actors, as well as their vulnerability that should be protected for capital extraction. It emerged around the same time as discourses on sustainable development, which governs the field under which wetlands are viewed today. Political ecologist Arturo Escobar tracks sustainable development discourse to a 1987 report of the World Commission on Environment and Development convened by the United Nations under the leadership of Norway's former prime minister, Gro Harlem Bruntland. The impetus was fostered by Club of Rome reports of the

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[174] Cowardin et al., "Classification of Wetlands," 3.
[175] Cowardin et al., "Classification of Wetlands," iii.

1970s, which provided a distinctive vision of the world as a global system where all parts are interrelated, thus demanding management of planetary proportions. The Club of Rome reports argued that nature can be managed scientifically – much like the scientific management of labor – and thus reframed nature as commodity. Escobar argues that this reframing is an attempt by sustainable development discourse to reconcile two old enemies – economic growth and the preservation of the environment – without any significant adjustments in the market system. “This reconciliation is the result of complex discursive operations of capital, representations of nature, management and science. In the sustainable development discourse nature is reinvented as environment so that capital, not nature and culture, may be sustained.”[176] As wetlands entered the nomenclature, its discursive function and situatedness among industrial and commercial threats also accompanied it.

Conclusion

Wetlands exist discursively with an entire apparatus of value and scarcity that are inimically threatening these same wetlands. What were referred to as swamps in the 19th century – with their noxious fumes and miasmas – were replaced by capitalist, neoliberal systems of valuation, which focuses on the amount of money the wetland commodity could generate in terms of eco-tourist dollars, valuable estuaries for seafood and fish hatcheries, protection of infrastructural pipelines from storms, and habitat for water fowl migratory flyways that are important to hunters. In Louisiana the perceived value of coastal wetlands is tied to its value to industry along the coast.[177] Today, this discursive stamp runs throughout the 11-year-old

[176] Arturo Escobar, “Construction Nature: Elements for a Post-Structuralist Political Ecology,” *Futures* 28, no. 4 (May 1996): 328, https://doi.org/10.1016/0016-3287(96)00011-0.
[177] This is slightly different than in other areas like the Florida Everglades, where arguably the wetlands’ value became linked to the need for municipal drinking water for the sizable population of South Florida.

Louisiana Master Plan for a Sustainable Coast as authors point specifically to the financial importance of wetlands to the area's economy in order to justify investments to protect them:

> "Experts have tried various ways to put a value on the coast's abundance, more in the spirit of highlighting the incredible gifts of our landscape than out of certainty that these gifts can be perfectly captured in numbers. One of the ways researchers assign value to natural systems is by considering what are known as ecosystem services, meaning the benefits that the environment provides to people. In Louisiana, these benefits range from oyster and shrimp fisheries, to flood reduction, to nature-based tourism."[178]

And according to the master plan, these benefits have a dollar value.

This reconciliation between nature and capital allows the state to move forward with mitigation plans that place eco-services within the same capital calculus of valuation as all other surplus value commodities. Of course, those that are most lucrative – such as oil and gas infrastructure – stand at the front of the line for coastal restoration protection. The 300-year effort to separate water from land tends to map onto a project of modernity to not only finish God's second Eden by making "fallow land" productive but to separate humans from nature. Today, contemporary schools of environmental science recognize the efficacy of sustainable practice in one form or another in order to sustain human communities and/or capitalist systems operating under scarce resources. But we might also ask what politics are foregrounded by positioning marsh and mud as commodities and protectors of cities and infrastructure. How does this arrangement naturalize the infrastructures and cities – and perhaps modernity itself – and frame marshlands and mud as almost a fungible utility. Their associated value lies in how they are used and manipulated, which continues to place them within a rationalized value system. An alternative is nearly impossible to imagine if we continue to use the same canvas from which

[178] Coastal Protection and Restoration Authority, "Master Plan 2017," ES-10.

these questions themselves are drawn. To conjure New Orleans or Louisiana is in fact to reflect and reproduce a discourse of a land that is predicated on extraction.

Chapter 1, in part, has been submitted for publication of the material as it may appear in the journal, *Communication and Critical/Cultural Studies*. Randolph, Ned. The dissertation author was the primary investigator and author of this paper.

Chapter 2: The Villainous River

Introduction

For much of American history, engagement with the Mississippi River was often mediated by its instability. Writers and legislators of the 19th century commonly described it as villainous. A "crevasse" through a side embankment turned vast acres and miles of dry land into torrents of muck. It likewise inspired a sense of awe for its vast reach and power. It seemed untamable and impervious to dredging because of its ever-changing bottom depths, moving sandbars, meander paths, and seasonal floods. Its currents travel at different velocities at different depths, which causes the water to fold over onto itself, creating a unique hydraulic phenomenon unlike any other waterway in the world.[179] The river divided the continent in two – a cleave that wasn't bridged until 1874 at St. Louis. Its sediment would ceaselessly eat away at its yellow banks, washing off in the bends and leaving deposits that formed greater and greater curves, "so that often the distance between two points is very much less by land than by water. Sometimes there are only a few yards across the neck of a peninsula, around which the channel distance is many miles; and on one side the level of the river is several feet higher than on the other."[180] Gradually, the current would force a passage through the neck, opening in a loud cascading roar. Its ceaseless force would constantly wash away and build hidden bars on the river bottom and islands above its surface. In the fall and spring, it would flood over its banks, creating an inland lake dozens of miles wide. By the time a flood subsided, the river may have chosen a new channel.[181] Mark Twain described the river as a particularly unruly object in his

[179] Barry, *Rising Tide*.
[180] How, *James B. Eads*, 1.
[181] How, *James B. Eads*.

memoir, *Life on the Mississippi*. The river's most famous traveler cut his teeth as a steamboat pilot in the heyday of riverboat culture and frontier adventure. Twain reflects on the constant state of vigilance of an apprentice pilot plying the river before the age of dams and jetties. He describes the river of his youth: "whose alluvial banks cave and change constantly, whose snags are always hunting up new quarters, whose sandbars are never at rest, whose channels are forever dodging and shirking, and whose obstructions must be confronted in all nights and all weathers without the aid of a single light-house or a single buoy; for there is neither light nor buoy to be found anywhere in all this three or four thousand miles of villainous river."[182]

Twain described the river's "pollution" of mud spilling into the clear blue Gulf waters as a "river of desolation," whose energies had been overcome by the "wonderful power of steam."[183] Twain did not purely think of the Mississippi River as a waterway, possibly because he had witnessed its primordial condition and the eroding banks that were carried off in the form of mud. Farmhouses and structures could be lost overnight. As a pilot, Twain was always searching for new clues in a changing landscape and hungrily gathering new intelligence on the river from other pilots

Yet the power of the river and the awe it created also invited the hubris of oversized egos and the application of grand engineering methods and technologies. The 19th century saw an almost religious belief in science that would reveal the laws of the river's mechanics and put it to work for men. This essentially meant ridding the river of its murky boundaries of mud so that water would be its main currency. By the time Twain had penned *Huckleberry Finn*, the river had indeed been indelibly altered. Its banks had been leveed and fortified. It had become relatively quiet, and to some extent docile, under a regime of techno-scientific discipline. To

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[182] Twain, *Life on the Mississippi*, chap. 10.
[183] Twain, *Life on the Mississippi*, chap. 3.

maintain the Mississippi in such a state required the continual application of organized oversight and intervention by the U.S. Army Corps of Engineers, the Mississippi River Commission, local "levee boards" and a number of river conventions that organized lobbying petitions to the federal government.

A contemporary of Twain's who was also concerned about the Mississippi was Captain James Eads, a self-educated man mentioned in the introduction. In addition to designing and completing the first Mississippi River Bridge at St. Louis, Eads also implemented the first jetty that opened the mouth of the Mississippi. About the same time as Twain published *Life on the Mississippi*, Eads filed a report on the river to Congress in 1878, describing the river as a force that is both immense, yet tamable.

> Every atom that moves onward in the river … is controlled by laws as fixed and certain as those which direct the majestic march of the heavenly spheres. Every phenomenon and eccentricity of the river, its scouring and depositing action, its caving banks, the formation of the bars at its mouth, the effect of waves and tides of the sea upon its currents and deposits, are controlled by laws as immutable as the Creator, and the engineer needs only to be assured that he does not ignore the existence of any of these laws, to feel positively certain of the result he aims at.[184]

Like Twain, Eads learned his trade from river pilots among whom he worked as a clerk. "(A)s time went on, he came to realize that although the Mississippi seems so capricious in its terrible games that one would think them the result of chance."[185] But to Eads and some of his contemporaries, this invited the ultimate challenge.

This chapter explores how the Mississippi River functioned discursively through various sites of production: the halls of government, newspapers, popular conventions, and various technical reports through which its various constituents grappled not only with attempting to control the river but live securely near its banks. The river's fickle behavior affected each

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[184] McPhee, "Atchafalaya."
[185] How, *James B. Eads*, 7.

constituency differently based on both its physical properties as well as the political economy of localities that it bordered. Preferred interventions to manage the river were contested by sectional, political and economic interests and couched in discourses of sovereignty, nation building, protection and even religion. Each of these interests had a major influence on river science and policy in the 19th and 20th centuries.

Discursive Production

River activism via river conventions constituted an early form of political lobbying in the 19th and early 20th centuries. These public gatherings of self-appointed public representatives helped shaped federal responsibility over U.S. waterways. Through written “memorials” sent to Congress and published in newspapers to drum up public pressure, these early lobbyists appealed to the origin myth of the nation itself and its manifest destiny. Some appeals focused on the economic benefits to the nation that river commerce produced. In many ways the management of the Mississippi River provided a common site to organize Americans of different geographic areas and political stripes around a modern notion of controlling American waters and ridding its constituents of its unruly mud. For example, a problem that Mississippi River flooding posed for southern interests also created opportunities for western states to exercise their growing political might by leveraging Congressional votes in exchange for interventions along the Sacramento River Valley. This alliance provided a bulwark against the Northeast’s political might and created informal routes for the federal government to pay for flood control even though it was outside of its official responsibility. The modern emergence of newspapers and steam transportation were critical in creating and sustaining the alliances.

Newspapers organized what Benedict Anderson called “imagined communities” by creating the “ceremony” of common readership. Each reader knows that “the ceremony he performs is being replicated simultaneously by thousands (or millions) of others of whose existence he is confident, yet of whose identity he has not the slightest notion.”[186] River conventions organized around event-driven news gained popularity by engaging a reading public. Convention delegates staged their events for news coverage, which often focused on the size and atmosphere of crowds in attendance. Delegates explicitly performed emissary-like roles on behalf of a presupposed public at home. They promoted conventions through newspaper announcements and generated news reports from the convention floor. Memorials of resolutions that emerged at a convention’s conclusion were printed in newspapers and sent to Congress. They often invoked the iconic imagery of the Mississippi River, such as the “Father of Waters”, “the Nation’s Canal”, and “A Ribbon of Commerce and Empire.” Such 19th-century gatherings functioned as the archetypal public sphere that Jürgen Habermas[187] idealized – one that mediated between society and the state to air public opinion through a salon of private citizens. This type of informed public opinion emerges “when a reasoning public is presupposed.” It is an opinion directed at power. It can happen formally through voting or informally through a kind of demonstration. Explicating Habermas, Nancy Fraser[188] identifies this public as one of “discursive relations” and a theater for debating and deliberating rather than for buying and selling. These self-appointed members must represent their interests as being aligned with that of a presumed public by using newspapers as their instrument.

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[186] Benedict Anderson, *Imagined Communities: Reflections on the Origin and Spread of Nationalism* (London: Verso, 1983), 35.
[187] Jürgen Habermas, “The Public Sphere: An Encyclopedia Article (1964),” trans. Frank Lennox and Sara Lennox, *New German Critique*, no. 3 (Autumn 1974): 50.
[188] Nancy Fraser, “Rethinking the Public Sphere: A Contribution to the Critique of Actually Existing Democracy,” *Social Text*, no. 25/26 (1990): 56–80.

Convention delegates performed before multiple audiences: those in attendance, as well as an audience mediated through newspapers, which included the congressional representatives they hoped to impress. The audience of delegates – which Michael Warner[189] calls a public witnessing itself in visible space with a "sense of totality bounded by the event or shared physical space" – was a critical ingredient of staging news events about the river. This latter public "comes into being only in relation to texts and their circulation."[190] It is through this mediated public that discourses circulated about the river. Imagining this reading public was a critical function of not only the delegate performances but also of congressional representatives who received reports about the conventions. These articles produced an image of the Mississippi River that exceeded even its vast material body through discourses that positioned the river as an organizing force of a political economy of culture and trade as it flowed through a divided nation, connecting free and slave states. The river was not only an object of intervention, but a political canvas over a diverse and contentious nation.

Gibbons, Federal Jurisdiction and Political Organizing

Congress's official oversight of the Mississippi River followed the 1824 U.S. Supreme Court decision, *Gibbons v. Ogden*, which upheld that the "Commerce Clause" of the U.S. Constitution gave the federal government the power to regulate river navigation.[191] The Gibbons case, which was regularly cited as constitutional justification for federal intervention into the economy, allowed Congress to direct the Army Corps of Engineers to make navigational improvements to river channels. The General Survey Act, passed in 1826, appropriated $40,000

[189] Michael Warner, "Publics and Counterpublics," *Public Culture* 14, no. 1 (Winter 2002): 49–90.
[190] Warner, Publics and Counterpublics," 50.
[191] Gibbons v. Ogden, 22 U.S. 1 (1824).

for two pier projects and $75,000 for experiments on sandbars on the Ohio River and for de-snagging on the lower Mississippi River by the Army Corps of Engineers. It was the first Rivers and Harbors legislation to improve navigation.[192] And it elevated the use of the survey, which was the engineer's chief method of knowledge production and rationalization of the landscape. Army surveyors were deeply involved in the conquest of the American continent, from stabilizing its wild rivers and cutting canals to opening the west to railroads, often displacing the continent's native inhabitants in the process. Surveys became beachheads for modern conquest. In *Seeing Like a State*, James Scott notes how surveys operate as tools of empire that separate the rational social actors from those who are incapable of participating in the survey language. Survey reports and resulting maps are techniques of statecraft that are both representations and material actors of discourse production. Citizens must adhere to the grammar of the survey and standardized measurements for legal standing. "The categories used by state agents aren't merely means to make their environment legible; they are the authoritative tune to which most of the population must dance."[193] Representations become reified through administrative practices. They produce records of ownership, categories of race and ethnicity, arrest records, political boundaries and economic plans. Modern statecraft is largely a product of internal colonization on behalf of the state itself.[194]

The semiotics of the Mississippi River as the Nation's River was entangled within practices of surveying its adjacent lands. Taming the river elevated the modern project of empire-making on the American continent. River engineers trafficked in the same project of

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[192] George S. Pabis, "Delaying the Deluge: The Engineering Debate over Flood Control on the Lower Mississippi River, 1846–1861," *Journal of Southern History* 64, no. 3 (August 1998): 421–454.
[193] James C. Scott, *Seeing Like a State: How Certain Schemes to Improve the Human Condition Have Failed* (New Haven, CT: Yale University Press, 1998), 83.
[194] Scott, *Seeing Like a State*, 83.

empire – and created the demand for slave labor throughout the southern river basin as adjacent swamplands were drained and cleared for plantation agriculture. As the river was being surveyed and rationalized, so too was the political economy of slavery and global capitalism. And as we explored in Chapter 1, public hygiene campaigns also rationalized and dictated drainage and reclamation programs of swamplands along the Mississippi River, which fed into the political economy of slavery.[195]

In the first comprehensive survey of the Ohio and Mississippi rivers in 1822, published in the Bernard and Totten Report, Army Corps engineers confirmed travelers' tales that the Ohio was only three feet deep and was crossed by 21 sandbars that "render it impassable by steamboats six months in a year." They also confirmed reports that the lower Mississippi held thousands of submerged trees or "snags" that were fatally hazardous to riverboats, while the river itself, because of its alluvial nature, constantly tried to change course.[196] Meanwhile, at the mouth of the Mississippi enormous sandbars often blocked access to the Gulf of Mexico. "Sometimes 50 ships waited there for the sandbars to dissipate enough to allow passage into or out of the river; the largest ships sometimes waited as long as three months."[197] There was still no consensus on how best to control floods and improve navigation. Engineers recommended that the government devise new ways to clear the rivers which included removing submerged trees, implementing dams to narrow the river, removing sandbars and building levees to hasten navigation and prevent flooding. For decades after the War of 1812, Congress dedicated the

[195] Colten, "Basin Street Blues."
[196] Isaac Lippincott, "A History of River Improvement," *Journal of Political Economy* 22, no. 7 (July 1914): 636.
[197] Barry, *Rising Tide*, 34.

Army to exploring the West, waging wars of attrition against indigenous peoples and surveying and building public works.[198]

Emblems of forced relocation dot the Louisiana landscape as well. At the end of an old Indian trail, called Chef Menteur, which is known today for its underbelly of sex trade and depressed property values, sits Fort Pike. The fort's main use was supporting the internal colonialization of Indian territory. It functioned as a federal detention center to incarcerate Creeks and Seminoles in the mid-19th century during the Indian Relocation Act that forcibly removed native peoples from their homelands east of the Mississippi River. The fort was the third of 42 eventual federal forts constructed after the War of 1812 and physically guards the Rigolets, a pass from the Gulf of Mexico into Lake Pontchartrain, that leads to the back of New Orleans via Bayou St. John. It lies an hour outside of New Orleans, beyond partially occupied strip malls and apartment buildings, faded brick slab subdivisions, and bait and tackle shops. Its main entrance is today protected by a moat of algae-laden water crossed by a low foot bridge. One of its corners is stabilized by steel beams to keep the edge from splitting off into the water as evidenced by a cracked fault. The outer walls of the fort that gaze out into the open water are losing bricks where the lower levels [NR1]are exposed to saltwater. The interior of the fort houses a sizable courtyard now overgrown with weeds, standing water and mosquitos. Originally home to sea-facing cannons that never fired in combat the structure was abandoned in 1890 and now stands empty and unarmed as a state historic site. The fort, which is protected on the auspices of the State Park system, has been closed to visitors since 2015. Since Hurricane Katrina, which damaged the structure, public access to the site has been intermittent due to subsequent storms. Today, the visitor center and bathrooms are fenced off. The only analogy I

[198] Karen M. O'Neill, *Rivers by Design: State Power and the Origins of U.S. Flood Control* (Durham, NC: Duke University Press, 2006), 21.

can think of is that this place is really on the edge of a place that itself is disappearing. It, along with vulnerable hamlets like Irish Bayou, Lake St. Catherine, the Rigolets, and Venetian Isles communities, lies outside of the vaunted hurricane protection system and in a kind of no man's land. It is also one of the main reasons this area was colonized. The Rigolets pass provided a short cut to a portage and trading post on the Mississippi River that we know as the French Quarter. The location was shared with the French Canadian, Bienville, by a local indigenous tribe, whose descendants may have later found themselves in this very jail. (The fort's contoured interior ring is checkered with doorways that create individual cells that look out onto the water through window portals with metal bars.) By 1824, Army outposts were established throughout the West, the Army being the government's only body of skilled builders.

Lobbying for Flood Control

While federal authority over navigation was codified in the 1824 Gibbons Decision, flood control was relegated to local landowners and districts, a fact that generally led to uneven construction standards. A weak levee upriver might collapse and spread misery to all. Major storms also brought fears that saboteurs would intentionally sever a levee across the river to release water pressure on their own levee defenses. This particularly impacted slave states in the lower delta that were encouraging cotton and sugar plantations through programs to drain and "reclaim" former swamplands. Without official federal oversight on flood control, any significant levee aid required political pressure on congressional representatives. A number of destructive floods between the years 1828 and 1849 in the lower portion of the Mississippi River stoked early political stirrings for federal river and levee improvements. Advocates argued through the press that only a central government could provide enough resources for complex surveys and levee projects that individual states could not muster. Local resources were further hampered by the Panic of 1837, which coincided with multiple presidential vetoes of River and Harbor bills, as well as the Mexican War, the Seminole uprising in Florida and the advent of the railroads. “Hardly a day passed that did not see the assembling of a mass meeting at some point in the quest to urge on their representatives and prepare memorials. The improvement of the Western waters, the building of hospitals and armories, the construction of levees and military roads, all these the general government was called upon to do by a people whom the panic of 1837 had left entirely without resources of their own.”[199] Even Southern states-righters, who otherwise fought expansion of federal power, acknowledged that only federal engineers had the expertise and resources necessary to survey the Mississippi River.

In the 1830s and 1840s, American settlers began clearing the rich alluvial lands in Arkansas and Mississippi in earnest. Already by the mid-1830s, the reliance upon riparian landowners to provide levees for community needs had proved insufficient in the State of Mississippi, for example, and flood-control projects were placed under public officials in each county. Known as the Board of Police, the county officials largely determined levee lines and were responsible for securing the cooperation of the landowners in levee construction and cost sharing. If flooding threatened, levee inspectors could order planters to send out their slaves for levee work. Construction standards varied widely, and funding was always a problem.[200] As the inadequacy of local governance became evident, state and federal governments began to assume more responsibility for the region’s evolving water management. Political pressure mounted from the south as flooding threatened newly claimed agricultural lands and growing townships.

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[199] Robert Spencer Cotterill, “Improvement of Transportation in the Mississippi Valley 1845–1850” (PhD diss., University of Wisconsin–Madison, 1919), 18.
[200] Mikko Saikku, “Taming the Rivers,” in *Thomas Pynchon and the Dark Passages of History*, 138–164 (Athens: University of Georgia Press, 2012), http://www.jstor.org/stable/j.ctt46n4v9

In 1835, southern politician Henry Clay campaigned in the U.S. Congress for a survey to consider leveeing of public lands on the west bank of the Mississippi. Congress objected to such an expenditure of federal funds. In the 1840s, advocates of river aid who were frustrated with small appropriations for the Mississippi Valley began to organize lectures, meetings and conventions to attract attention to their cause. From the 1840s to the 1910s, landowners, levee district managers, politicians, shippers and businessmen from the Middle West and South attended river improvement conventions in port cities connected to the Ohio-Mississippi River system, including Memphis, Dubuque, St. Louis, Vicksburg, New Orleans and Chicago. Nearly any convention could attract local congressional representatives. Many attracted governors and senators from the region.

An 1844 flood broke the levee at Bonnet Carré, 30 miles upriver from New Orleans, and sent the river into Lake Pontchartrain for six months, disrupting traffic. By early 1845, calls for a Southern and Western Convention came from many sources. The "river problem" provided commercial organizations and local governments in the Middle West and the South a common interest in warding off challenges from emergent railroads and the Erie Canal, both of which were publicly subsidized and capturing trade. The Port of New York, prior to the Erie Canal's completion, counted $33 million in imports and $31 million in exports. By 1845, exports grew to $45 million, and to $75 million two years later. The increasing rivalry of the Great Lakes turned into a contest between North and South, both of which were attempting to secure an economic and political allegiance with the West.[201]

[201] Cotterill, "Improvement of Transportation." Baltimore merchants and city officials raised public and private funds and got the Army Corps of Engineers to survey a route for the country's first passenger railway in 1831, the Baltimore and Ohio Railroad. When it became evident that towns and ports might wither if bypassed by a rail line, states and local governments mounted efforts to raise money for new rail lines. In Chicago, eleven major railroad lines to eastern ports were built with the aid of federal government surveys, private consulting by army engineers, federal tariff relief on iron imports, and federal and state land grants. The rail lines also gave Chicago an advantage over St. Louis and New Orleans in the bid to build the first midwestern rail connection to the Pacific coast

During the sittings of the United States Court in Springfield, Missouri, meetings were held nightly to discuss the interests of the West (which is today's Midwest.) Resolutions were finally adopted for holding a convention at Memphis on July 4th. A letter published by "Old Planter" specified a number of interests which were favored by western and southern constituents concerned with the increasing rivalry of the Great Lakes. The resulting Mississippi River Improvement Convention in Memphis opened July 4, 1845. It marked the first-ever multi-state convention for river work. J.C. Calhoun, a Southern Democrat, was elected chairman. He called the Mississippi the "great inland sea of the country" that the government was obligated to protect and improve just as it did the Atlantic Seaboard. The memorial sent to Congress and published in newspapers called for the improvement of the Ohio and Mississippi Rivers and their tributaries, the deepening of the mouth of the Mississippi and the connection of the river and the Great Lakes by ship canal. "Similar resolutions were adopted at other conventions, except that assemblies north of St. Louis were often called more specifically to (remove) rapids of the Mississippi."[202]

Mr. Calhoun's Report, published in The *Richmond Times,* professed that the river was "the common highway" among states and should be regulated by the Commerce Clause.[203] A similar report ran in *The Mississippian* that the "conclusion is irresistible that its commerce comes as fully within the power to regulate commerce as that of the coast itself."[204] But Calhoun's preference for boosting Southern infrastructure alienated many legislators from the North and Middle West, who felt that the Upper Mississippi interests were neglected.[205] This

[202] Lippincott, "History of River Improvement," 644–645.
[203] J. C. Calhoun, "Mr. Calhoun's Report," *Richmond Times*, June 26, 1846.
[204] J. C. Calhoun, "Mr. Calhoun Made the Following Report: To Accompany Bill S. No. 216," *Mississippian*, August 5, 1846, 2.
[205] Mentor L. Williams, "The Chicago River and Harbor Convention, 1847," *Mississippi Valley Historical Review* 35, no. 4 (March 1949): 607–626.

came to a head in August 1846, when President James Polk vetoed the Rivers and Harbors Bill, condemning the ‘‘disreputable scramble’’ for aid.[206]

After the veto, William Hall, a “disaffected” Democrat and member of the Lake Steamboat Association, reached out to his contacts in Chicago, Detroit, Cleveland, Buffalo, Syracuse, Rochester, Utica, Albany, Hartford, New Haven, Springfield, Boston and Providence[207]. They hastily gathered at the Rathburn Hotel in New York to plan a second convention.[208] Organizers held pre-convention press briefings in several cities. They placed news stories featuring the coming convention and printed the lists of delegates. Whig papers such as Horace Greeley’s *New York Herald* claimed the convention was non-partisan. The *American Whig Review* stated that the convention was “so thoroughly Whiggish in its aims, although studiously and designedly divested of any mere party organization.”[209] In regular dispatches, Greeley argued the convention would permanently guarantee the welfare of the North and West.[210] The convention was preceded by a grand procession “staged with floats, bands, military units, and the inevitable gorgeously caparisoned volunteer fire companies.”[211] The *American Whig Review* swooned: “nothing could be better arranged, or better adapted to the ends in view, than the preparations and accommodation for the Convention, both while assembled as a body, and when scattered amongst the various public and private houses in the town.”[212] The paper praised the decisive unanimity of the convention “that not a case occurred, during the whole deliberations, where a sort to division by states was necessary – all questions having been carried

[206] O’Neill, *Rivers by Design*, 46.
[207] Williams, “Chicago River.”
[208] “The Chicago Convention,” *The American Review: A Whig Journal of Politics, Literature, Art and Science* 6, no. 2 (August 1847): 111–122, https://babel.hathitrust.org/cgi/pt?id=mdp.39015004886829&view=1up&seq=129.
[209] “The Chicago Convention,” 112.
[210] Lippincott, “History of River Improvement.”
[211] Williams, “Chicago River,” 608–614.
[212] “Chicago Convention,” 111.

by acclamation that amounted almost to absolute unanimity."[213] In the convention's memorial to Congress, delegates repeatedly cited the Commerce Clause and its interpretation by multiple administrations from Jefferson to Polk to argue for river improvements.[214]

Swampland Acts

An 1849 flood deluged New Orleans when it broke through the levee at Pierre Sauvée's plantation 17 miles upriver. Within three days the water reached the French Quarter. Nervous uptown residents considered severing the levee at the New Basin Canal behind the French Quarter, inviting a threat of armed response by downtown residents. Three weeks later, the upper New Basin Canal collapsed, which deluged 220 mid-city blocks and forced the evacuation of 12,000 residents.[215] After the 1849 flood, Congress acceded to pressure from Southern constituents to pass the Swampland or "Swamp-buster" Acts, which provided a mechanism for levee construction through land reclamation.

All told, millions of acres of federal riverine bottom lands and swamps on the Mississippi were turned over to states, which sold them to pay for levee building and flood control. As states from other parts of the country demanded similar grants, Congress extended the program in 1850 to California, Florida, Oregon, and eleven states in the Ohio – Mississippi Valley. Barry argues that Eastern politicians agreed to pass the swampland grants to keep the South from forging a political alliance with the West.[216] By 1909, nearly 82 million acres had passed into private hands through the swampland program, some for as little as ten cents to $1.25 per acre.[217] The

[213] "Chicago Convention," 112–113.
[214] *Semi-Weekly Union*, "The Chicago Convention," July 16, 1847, 1.
[215] Rogers, "Development," 604.
[216] Barry, *Rising Tide*.
[217] J. O. Wright, *Swamp and Overflowed Lands in the United States: Ownership and Reclamation*, U.S. Department of Agriculture, Office of Experiment Stations, Circular 76 (Washington, DC: Government Printing Office, 1907), https://doi.org/10.5962/bhl.title.87650; O'Neill, *Rivers by Design*, 49.

swampland program also boosted the flood control cause by sponsoring Army Corps of Engineers surveys, which consistently recommended that the federal government build protective levee projects.[218] The program led to the formation of state levee districts which directed construction work and provided flood control advocates with a political base for lobbying efforts.[219] "Congress ceded millions of acres of federally owned swamps and overflowed lands to the states."[220] But the program was beset by lawsuits. Complaints about corrupt state-level deals and about land speculation provoked repeated government investigations.[221] Nonetheless, swampland grants financed levee lines and drained swamps in California, Arkansas, Louisiana and Mississippi and were responsible for accelerating growth of large-scale agriculture and forestry. These in turn established a well-funded and motivated lobby for flood control assistance. Swampland Acts also involved Army Corps engineers in assessing the viability of grant lands, and they trained capitalist land holders to organize politically. "The creation of levee districts was, therefore, an important step for an agency that had devoted itself solely to navigation improvement work."[222] The acts allowed the federal government to encourage flood control outside of its official purview.

Before 1860, less than 100,000 acres of farmland were serviced by drainage districts and municipal drainage projects. In the next 40 years, the amount of acreage served by districts grew exponentially. In the last decade of the 19th century, more than 6 million acres of U.S. farmland

[218] Barry, *Rising Tide*, 34.
[219] O'Neill, *Rivers by Design*, 40.
[220] Barry, *Rising Tide*, 34.
[221] In 1915, a Commissioner of the General Land Office that administered the program concluded that recipient states had failed to promote drainage of most of their swamplands. He judged the program to be the greatest failure of the federal government's land grant programs. Land claimed as swamp included parcels in the Ozark mountains. Plots of other supposed swamps were adjacent to lands that had been claimed under the desert land grant program. According to public land historian Paul Gates, the primary problem was the vagueness of the acts themselves. In particular, the swampland acts failed to require states to actually drain land or build levees in order to gain title.
[222] O'Neill, *Rivers by Design*, 51.

were served by drainage projects. After the Civil War, many states of the Lower Mississippi Valley responded to floods by entrusting the rebuilding of the levee system to levee districts who had the power to sell bonds based on the future value of the previously overflowed land. Drainage district laws varied from state to state. They generally required petition by owners of the land to be drained. Once approached, a district could assess taxes in proportion to the landowners' estimated future benefits which was determined by a board of reviews.[223]

Civil War Disruptions

As cultivable land increased, the issue of labor and visibility of slavery grew with it, eventually shattering national political parties into sectional interests. Plantation slavery had thrived in the 1830s because northeastern banking and shipping firms benefited from selling southern produce, but by the 1860s, abolitionist sentiment was growing. Democrats had split into northern and southern organizations. Regions competed for new settlement and private investment. Newspaper editors in Mississippi, for instance, recruited planters from southern states bordering the Mason–Dixon line, where abolitionists were more vocal.[224] Regional conflicts over land and infrastructure development added to tensions leading to the Civil War. Congressional debates in the 1850s concerned the admission of slave and non-slave states to the Union. Planters debated whether the far western territories would be climatically suitable for slaves. Most southern politicians at that time favored or tolerated central government river improvement projects if they did not benefit the north. [225]

[223] The first president of the Mississippi Board of Levee Commissioners, James Lusk Alcorn, was the highest paid state official with an annual salary of $6,000. He was a Coahoma County planter and state legislator who later became the governor of Mississippi and a U.S. Senator. Saikku, "Taming the Rivers."

[224] Robert W. Harrison, *Levee Districts and Levee Building in Mississippi: A Study of State and Local Efforts to Control Mississippi River Floods* (Stoneville, MS: Delta Council, 1951), https://catalog.hathitrust.org/Record/001514795.

[225] Harrison, *Levee Districts*.

A settlement boom in the Delta was comparable to a gold rush. The growing availability of cheap farmland attracted thousands of white slave owners from the Atlantic seaboard to make their fortune. Slaves were transported in forced migration over land and sea from the older slave states to the newer cotton states. By 1850, a quarter of New Orleans' population had come from the North.[226] An article reprinted in the New Orleans-based *De Bow's Commercial Review* in 1858 touted the strength of local levees to protect newly reclaimed delta farmland. "We can levee successfully!…We have but one outlet, the Yazoo Pass, and the levee there, the heaviest and highest in the world, has stood the flood. It stood because it was properly and securely built."[227] The population in Mississippi and Alabama doubled between 1840 and 1860 from 179,074 whites and 195,211 slaves in 1840 to 354,000 whites and 436,631 slaves in 1860. Cotton production more than doubled in half of that period, from 194 million pounds in 1849 to 535.1 million pounds in 1859.[228]

While the Northern Democrats approved platforms for presidential elections from 1840 to 1852 asserting that the federal government had no constitutional power to finance and build a general system of internal improvements, Southern congressional Democrats thinking of their local constituencies favored modest interventions. Northerners no longer accepted the idea that development aid to the South was of general public benefit, in effect questioning how the South related to the nation.[229] The presidential election of the Democratic southerner, Franklin Pierce (1853–57), provided a new opportunity for southern interests, and the great question of a Pacific

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[226] Eugene R. Dattel, "Cotton in a Global Economy: Mississippi (1800–1860)," *Mississippi History Now: An Online Publication of the Mississippi Historical Society* (October 2006), http://mshistorynow.mdah.state.ms.us/articles/161/cotton-in-a-global-economy-mississippi-1800-1860.
[227] Harrison, *Levee Districts*, 13.
[228] Dattel, "Cotton."
[229] Dattel, "Cotton."

railroad, which had excited popular enthusiasm. Secretary of War Jefferson Davis was charged with undertaking surveys of possible routes.[230]

Davis, a Mississippi planter and former U.S. senator, who later became the president of the Confederacy, was keenly interested in pushing a route through the south. “Not only would the South benefit economically, but there would arise a golden opportunity to forge political ties between the South and the West.”[231] Davis appointed Andrew Atkinson Humphreys, who later became chief of the Army Corps of Engineers, to direct the Pacific Railroad Surveys (1853-1857). His team included “an unprecedented assemblage of more than 100 soldiers, scientists, and technicians marshaled for the single purpose of identifying the most practical and economical route for the nation's first transcontinental railroad.” His 13-volume final report on the various expeditions was considered a virtual encyclopedia of the western experience.[232]

Meanwhile, northern legislators were penning new bills concerning tariffs, taxes, banking, subsidies and land grants to boost the Far West as an agricultural region in competition with the South and to increase links between the Northeast and the Far West. Southern politicians saw that the impending Republican control of the federal government could permanently subordinate the cotton South and doom southern leaders’ hopes of establishing a direct cotton trade between New Orleans and England. Congress began passing many of these improvement bills even as southern states seceded. The Far West, rather than the South, had

[230] Henry H. Humphreys, *Andrew Atkinson Humphreys: A Biography* (Philadelphia: John C. Winston, 1924), https://catalog.hathitrust.org/Record/000602014.

[231] David M. Jordan,*“Happiness Is Not My Companion”: The Life of General G. K. Warren* (Bloomington: Indiana University Press, 2001), 14.

[232] After the war, Humphreys became the father and vigorous defender of the Corps’ disastrous levees-only policy, which incidentally aligned him to southern flood-control interests.

become the key to the continued economic growth of the Northeast.[233] Then on Feb. 8, 1861, the Confederate States of America was formed.

Post-War Unification

The Civil War deserves its own project focus, which is outside the scope of this effort. But let me just say that years of warfare diverted federal resources away from river navigational and flood control projects. The Union Army also used the river as a weapon against plantation landowners in the Lower Alluvial Delta, a tactic that left levees up and down the river in tatters. Once the war ended, calls for river improvements resumed. They focused on repairing the war-torn infrastructure and, ostensibly, the national psyche. The Mississippi River became the great unifier. During the 1867 St. Louis River Improvement Convention, the chairman, Gen. William Vandever of Iowa, noted the sacrifices of “immense treasures of blood and money” and said the Mississippi had the power to unite “heart and hand now in burying the animosities of the past” by improving common prosperity.[234] A *New York Times* article described an 1869 river convention in New Orleans in which the Chamber of Commerce convention hall was decorated with such motto's as: “The South extends to the Northwest a cordial welcome”; “The West and the South join hands”; “The river to the sea and the sea to the river.”[235] From 1866 to 1882, Congress passed a Rivers and Harbors bill each year, an occurrence that pleased local merchants, many of whom turned to river shipping to avoid the cost of railroad monopoly rates. A *New York*

[233] US Army Corps of Engineers, Headquarters, “Andrew Atkinson Humphreys (1810–1883),” accessed June 16, 2019, https://www.usace.army.mil/About/History/Army-Engineers-in-the-Civil-War/Engineer-Biographies/Andrew-Humphreys/.
[234] Union Merchants’ Exchange of St. Louis, *Proceedings of the River Improvement Convention, Feb. 12 & 13, 1867* (St. Louis, MO: George Knapp, 1867), https://quod.lib.umich.edu/cgi/t/text/text-idx?c=moa;idno=AEC2760.
[235] *New York Times*, “The New-Orleans Convention: Opening of the Louisiana Commercial Convention—Significant Mottoes in the Hall of Assembly—Preliminary Business,” May 24, 1869, 1.

Times reporter in 1878 wrote from a convention in New Orleans that, “Railroads might come and go but this Mississippi River would flow on to the end of the time.”[236]

Conventions called in St. Louis, Chicago and Quincy, Illinois issued extensive arguments about freight cost savings from river shipments and the potential of new inland markets. They argued that domestic commerce was far more important to the U.S. economy than international commerce and, therefore, deserved the same congressional support as lighthouses and harbor construction. At an 1877 convention in St. Paul, one of the speakers argued that it took less time to sail across the Atlantic from Europe than to traverse 800 miles from St. Paul to St. Louis because of rocks and low water. The memorial to Congress stated, “No valid objection to improvement of our seaports, but the rivers of the Mississippi Valley are entitled to equal commercial facilities.”[237] In the Lower Mississippi Valley, Southern activists argued that the difficulties of maintaining levees and shipping channels on the river had to be solved in tandem because they were caused by the same thing: a river that carried large volumes of silt and rapidly shifted its banks.[238] Flood disruptions also easily crossed state borders and disruption of production was a disruption of the political economy of the nation.

Arkansas argued that the lack of levees left the National Road from Memphis to Little Rock frequently under water and impassable. The road, which was designed for military purposes, was planned in 1828 with an appropriation of $2,500. It had never been finished. One completed segment next to Memphis was impassable by 1845. The Arkansas Legislature was

[236] *New York Times*, “Jefferson Davis Talks: Urging the Needs of the Mississippi,” December 6, 1878, 1.
[237] Sylvester Waterhouse, “A Memorial to Congress to Secure an Adequate Appropriation for a Prompt and Thorough Improvement of the Mississippi River, with an Appendix,” resolution adopted by the River Improvement Convention, St. Paul, MN, October 11 and 12, 1877 (St. Louis, MO: John J. Daly, 1877).
[238] O’Neill, *Rivers by Design*.

asking for $100,000 to finish the work.[239] However, this request was heavily contested by other sectional areas of the country vying for their share of a limited federal purse.

Southern interests argued then (as they do now) that they carried the burden of the nation's floodwaters. States along the lower portion of the river were unable to maintain bridges and levees used by trains for interstate commerce. It was, therefore, clearly a duty of the central government to facilitate commerce.[240] Rationalities surrounding river intervention ranged from their economic merits to the importance of uniting sectional interests of the South and West with commercial interests in the East. Some southern members of Congress parroted the sentiments expressed in activist petitions, arguing river improvement would better unite North and South by reconstructing the damaged South after the Civil War. By the 1880s, when the federal government's reconstruction of the South had ended, Rivers and Harbors bills for navigation work had become a congressional mainstay, and the Army Corps of Engineers had begun to build flood control levees on the lower Mississippi River. The river program would become the Army's largest civilian project.[241]

The Stirrings of Public Relations

Appeals for intervention were explicitly aimed to apply pressure through the press. An 1877 call by businessmen from 18 states to convene a Mississippi River Improvement Convention in St. Paul specifically focused on public relations: "to organize the public sentiment of the Mississippi Valley in support of a systematic pressure upon Congress to recognize the importance of navigation from St. Paul to St. Louis, which was impassible during low water

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[239] Cotterill, "Improvement of Transportation."
[240] Union Merchants' Exchange of St. Louis, *Proceedings*.
[241] Later, railroad interests would join with other river lobbyists to unleash the purse strings of the Progressive era federal government.

stages."[242] The *St. Louis Globe- Democrat* published a call by the St. Louis Chamber of Commerce for a convention of "representative men of the Mississippi Valley, including editors of newspapers, to meet in that city, Oct. 11, for the consideration of the river improvement question."[243] Separately, the *Daily Arkansas Gazette* out of Little Rock reprinted a column from the *Memphis Appeal* entitled, "Facts and Figures are an Unanswerable Argument in Favor of the Improvement of the Mississippi."[244] The column was written by Rep. Casey Young, a Democrat from Tennessee, to the president of the Memphis Chamber of Commerce requesting an appointment of delegates to the St. Paul convention.

At the 1881 Mississippi River Improvement Convention meeting in St. Louis, the president of the Merchants Exchange called for the general desire "communicated through the press, emanating from various commercial bodies recognizing the importance of united and intelligent action on a subject of the most vital importance."[245] News stories of the day may have elevated self-appointed insiders as representatives of "the public," but printed accounts also reflected the complexity of satisfying the different needs of states affected by the river. "If all the members of the eighteen great states directly interested in this grand work would pull together, they could pass a bill that would provide for the immediate commencement of the work on the Mississippi on a scale commensurate with the importance of the undertaking."[246]

The undertaking was vast indeed and was rationalized through not only commercial appeals, but also through appeals to the cultural importance of the river as an object of

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[242] Waterhouse, "Memorial to Congress."
[243] *St. Louis Globe-Democrat*, "Reporting a Call by the St. Louis Chamber of Commerce," September 22, 1877.
[244] Casey Young, "The Great River: Facts and Figures That Are an Unanswerable Argument in Favor of the Improvement of the Mississippi," *Daily Arkansas Gazette*, October 7, 1877.
[245] Mississippi River Improvement Convention, "Official Report of the Proceedings of the Mississippi River Improvement Convention Held in Saint Louis, Missouri, on October 26th, 27th and 28th, 1881" (St. Louis: Great Western Printing, 1881), 5, https://catalog.hathitrust.org/Record/002005708.
[246] *St. Louis Globe-Democrat*, "Washington Letter," January 23, 1881.

unification. The *New York Times* gave a hero's welcome to Jefferson Davis, the defeated president of the Confederacy, who walked into the 1878 river convention hall to a standing ovation in New Orleans. In his speech, he claimed solidarity with not only the state of Mississippi but "every state bordering upon that great river."[247] *The Washington Post* reported from a river convention in 1884 where the Mississippi was called the "Father of Waters" by the convention secretary G.L. Wright, was quoted as saying: "In no manner had the provident care of the creator for the ideal Republic been so manifested as in the location of the Mississippi River. The great empire in the West now demanded the full improvements of that great river so that it would not only float the commerce of the country but would remain a bond of good will and fellowship between the sections."[248] Clearly, cultural appeals were common currency in tying the river to federal oversight.

Activists adopted a new repertoire of political action by creating permanent membership organizations to arrange conventions and undertake year-round mailings, organizing and lobbying. As they took hold in the latter half of the 19th century, conventions became important stops by politicians, from mayors to governors to presidents. These groups mobilized a coalition of Progressive Movement organizations and other groups, cultivated public sentiment and lobbied government officials.[249] Organizational work, personal politicking by activist leaders and actions by sympathetic legislators eventually won official flood control aid for the Mississippi and Sacramento rivers in 1917.[250]

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[247] *New York Times*, "Jefferson Davis Talks."
[248] *Washington Post*, "Our Greatest River: A Convention of Five Hundred Delegates Seeking Its Improvement," February 6, 1884, 4.
[249] Pres. Teddy Roosevelt personally spoke at the Memphis Deep Waterways Convention in 1907.
[250] Conventions were held at: Cincinnati in 1842 and 1889; Memphis in 1845, 1846 1887 and 1907; Chicago in 1847, 1896 and 1927; Burlington, Iowa in 1851; Dubuque Iowa in 1864, 1866 and 1867; Keokuk, Iowa in 1867; St Louis in 1867, 1872, 1873, 1881 and 1927; Prairie du Chien in 1868; Louisville in 1869, New Orleans in 1869, 1874, 1875, 1876, 1878, 1885, and 1903, ; Vicksburg in 1875 and 1895; St. Paul in 1875, 1877 and 1885; Quincy, Ill. in 1879 and 1887; Rock Island, Ill. In 1881 and 1888; Davenport, Iowa in 1881 and 1884; Washington D.C. in

Politics and River Science

One question that continues to vex historians is to what extent these activists influenced burgeoning river science and the Army Corps of Engineers' policy. Army Corps historian Todd Shallat has likened the Corps' operating logic to his observations of Max Weber, who marveled at a bureaucracy's ability to affect policy through its vast power of implementation, often using covert powers. The Corps, according to Shallat, attempted to garner jurisdiction over projects through self-promotion and by cultivating local support from regional directors. They also assisted corporations and promoted their own facility for production.[251] Often the rationale for river intervention was based on the path dependency of protecting a previous intervention. A circular logic emerged early that continues to govern the Corps modus operandi to this day. If a waterway was navigable it was important and worth defending. And once fortified and stabilized, it was worth protecting, if not improving in order to facilitate better defenses. Once a river had been dredged or "de-snagged" the Corps of Engineers would continue to maintain the waterway regardless of its cost or relevance, Shallat says. Byzantine Congressional appropriation bills – that contained everything from a pier in St. Louis to resources to clear the Delaware River breakwater – turned waterway spending into a jigsaw puzzle of agreements. [252]

Arguably, the inability to separate the "value" of wetlands from its functional utility in support of the economy – which we explore throughout this study – is part of an extended lineage of U.S. pragmatism that began with the 1775 appointment of the First Chief of Engineers

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1881 and 1884; Tuscaloosa, Al. In 1885; Peoria, Ill. In 1887; Augusta, Ga. 1888; Baton Rouge, La. In the 1890s and Natchez, Miss. In the 1890s.

[251] Todd Shallat, "Building Waterways, 1802–1861: Science and the United States Army in Early Public Works," *Technology and Culture* 31, no. 1 (January 1990): 18–50.

[252] Shallat, "Building Waterways," 151.

by the Continental Congress to support the Continental Army. Col. Richard Gridley of Massachusetts was Washington's first engineer.[253] The lineage of the U.S. Army Corps of Engineers exemplified the two main progenitors of American philosophy – science and government – whose original technocrats are found in the Army Corps of Engineers itself, an organization that has been called a "nation-builder."[254] Officially created as a war academy and fort- building agency in 1802, the Corps embodied the discourse of the early American period that success of the Union was tied to the development of the vast continent through the control and management of its rivers and harbors. The oft-heard phrase of the period was that developing and improving land was to "complete what god had started" – the same philosophy espoused by the English philosopher John Locke. It is hard to overstate the importance of the Corps to river interventions, levees and navigation improvements. Of importance to river development was the argument of Federalist party leaders that vigorous, central-state programs of internal improvements linking the sections would create common interests across the sections. Jefferson opposed a military elite, but he revived the Army Corps of Engineers and signed bills to have the Army build piers, harbors, and lighthouses for civil purposes.[255]

The early Americans understood the strategic importance of water communication which married the nation's commercial aspirations to its security and defenses. "Surveying and science converged in a literature on the strategic importance of water communication," writes Shallat. "Army maps and reports became aids to commerce that marked the defensible limits of territorial expansion."[256] In Shallat's analysis, the Army's philosophy of science was an "organizational

[253] US Army Corps of Engineers, New England District, "About: History," accessed November 2, 2019, https://www.nae.usace.army.mil/About/History/.
[254] Shallat, "Building Waterways."
[255] O'Neill, *Rivers by Design*.
[256] Shallat, "Building Waterways," 4.

philosophy" of order and classification. River construction was reduced to a regimen of standardized steps. But as their study moved from planning into the field, the Corps became a champion for large "scientific" projects – which were political by nature – such as canals, dams, lighthouses levees and ports. Often the costs of large projects were only partly divulged to Congress in order to begin a project that would clearly require subsequent authorizations to complete. And lobbying the Corps for projects was a national past-time by elected officials from every corner of the country. Louisiana was front and center for flood protection requests. Such spending requests were made through a decentralized system of local, regional and state level harbor boards, levee commissions and other public constituencies.

In the mid-19th century, there was no pure public policy and no clear understanding of the river and its mechanisms, despite myriad surveys and efforts to improve the river for navigation and stabilize it in some way against floods.[257] Until 1837, there were no American books with sections on dams and jetties. Craftsmanship was more ancient than the sciences — and relied on apprenticeship and builder-to-builder contact.

> River engineers faced an array of questions such as: Why do alluvial rivers like the Mississippi weave back and forth like drunks in an alley; do meanders result from terrain characteristics or from alluvial processes; how does the sediment or bed-load material moving along a stream bed affect sediment deposition; do bed-load particles leap along the bottom like ballet dancers across a stage; do they slide along in a layer like maple syrup across a stack of pancakes or roll along like bowling balls? (Eventual answer: all of them, depending on various factors.) Science desired answers; politics demanded them.[258]

In the last two and a half centuries, river engineers have applied mathematical rationalization to structural design, allowing each unique design to respond to the particular

[257] Martin Reuss, "The Army Corps of Engineers and Flood-Control Politics on the Lower Mississippi," *Louisiana History: The Journal of the Louisiana Historical Association* 23, no. 2 (Spring 1982): 131–148.
[258] Martin Reuss, "The Art of Scientific Precision: River Research in the United States Army Corps of Engineers to 1945," *Technology and Culture* 40, no. 2 (April 1999): 297, https://doi.org/10.1353/tech.1999.0104

combination of variables affecting flow in a given stretch of river over time. Three decades into the twentieth century, engineers still knew far more about the structures they placed in streams than about the streams themselves.[259] Variables such as sediment load, morphology, discharge and even location can change. And even more variables are perpetually coming together to affect river flow such as velocity, channel width, channel depth, gradient and bed "roughness" (the resistance of a bed to flow). “The challenge is somewhat analogous to designing suits for a customer who is both demanding in his needs and discontented with his shape, constantly indulging in fad diets and binge eating.”[260] Experts must come to a consensus on how to design a dam, revetment or levee for a constantly changing profile. “The answer is to design within a range of anticipated parameters. Still, neither the tailor nor the river engineer will sanguinely predict success.” In river engineering, humility is a necessity.[261]

A river's discharge can vary widely for many reasons, not the least of which is human activity upstream, which can modify the floodplain. River engineers came to recognize that idealized fluid mechanic theories that were French in origin and based on Newtonian physics could not fully account for the many forces that influence river dynamics. Army engineers as a result relied on empirical adaptation and “inductive reasoning,” says Reuss. “When planning a project, they would ascertain the river's shape and geometry, the velocity and volume of water passing a particular point, regional geology, and the quantity and concentration of sediment.”[262]

According to technology historian Edward Layton, the Communities of Science and Technology in 19th-Century America went through a scientific revolution from a “craft affair” that was similar to that of the Middle Ages, where oral traditions passed from master to

[259] Shallat, “Building Waterways.”
[260] Reuss, “Art of Scientific Precision,” 293.
[261] Reuss, “Art of Scientific Precision,” 293.
[262] Reuss, “Art of Scientific Precision,” 293.

apprentice. The new technologist was apprenticed through a college education, a professional organization and technical literature that was modeled after those of science. By the end of the 19th century, technological problems could be treated as scientific ones, and traditional methods and empiricism could be supplemented by tools borrowed from science. Changes were taking place throughout the physical sciences, from the engineering branches to chemistry, biology and geology. "The result might be termed 'the scientific revolution in technology.'"[263] American civilian engineers, like their military counterparts in the Army, borrowed from Europe, but few shared the West Point fascination with European theory. Even the most famous 'hydraulicians' stopped short of grand abstractions. While civilian researchers borrowed chiefly from the methods of science, officers moved quickly beyond scientific methods to universal theorems and global solutions to waterway problems.[264]

There was much disagreement among the experts in the field, a situation that allowed various constituencies to advocate for particular solutions that served their local interests. While flood control was the main preoccupation among southern states, there were many outside engineers, a few Corps engineers, and even some down-stream residents who were beginning to advocate for various combinations of outlets and spillways. This was also a view that was supported as early as the 1840s by the Louisiana State Engineer Paul Octave Hebert. Outlets would constantly drain water from the main channel, and spillways would divert water only during heavy floods. Many engineers favored a controlled outlet at Bonnet Carré upriver from New Orleans that had been the site of the 1844 levee break into Lake Pontchartrain.[265] On

[263] Edwin Layton, "Mirror-Twins: The Communities of Science and Technology in 19th-Century America," *Technology and Culture* 12, no. 4 (October 1971): 562–580.
[264] Reuss, "Art of Scientific Precision," 295.
[265] Martin Reuss, "Andrew A. Humphreys and the Development of Hydraulic Engineering: Politics and Technology in the Army Corps of Engineers, 1850–1950," *Technology and Culture* 26, no. 1 (January 1985): 1–33, https://www.jstor.org/stable/3104527.

September 30, 1850, Congress authorized a complete survey of the lower valley from Cairo, Illinois to the Gulf. “The aim was to discover the laws governing the Mississippi River and determine how to tame it.”[266] Secretary of War Charles Magill Conrad authorized the Mississippi Delta Survey, calling upon military engineers to conduct a study whose primary purpose was to discover a means to prevent flooding. Civilian Charles Ellet applied to lead the Delta Survey. Ellet had been educated in France, where he attended the Ecole des Ponts et Chaussees, one of the best engineering schools in the world. In his travels through Europe, he examined suspension bridges, reservoirs and canals. These structures influenced his later engineering design – particularly the operation of weirs utilized for the Canal du Midi, which connected the Atlantic to the Mediterranean through Languedoc.[267]

The year before his Mississippi Report, Ellet had published an essay in which he described his method for allowing year-round navigation of the river: the use of reservoir basins along tributaries of the Ohio, which he said could store vast quantities of water during flood season that could spill back into the river during low water stages. Ellet proposed that the federal government subsidize his reservoir plan. A bill supporting his proposal passed the Senate with the support of Southerners Henry Clay and Jefferson Davis. But the House of Representatives defeated the measure.[268] When Ellet applied to lead the Delta Study, Conrad wanted him to work alongside the Army engineers and Andrew Humphreys. Ellet refused.

After pressure from some Congressmen, and after conferring with Pres. Millard Fillmore, Conrad divided the $50,000 appropriation between the Army and U.S. Civilian Corps, each of which would issue competing surveys. One was awarded to Humphreys of the U.S.

[266] Barry, *Rising Tide*, 35.
[267] Pabis, “Delaying the Deluge,” 430.
[268] Pabis, “Delaying the Deluge,” 431.

Topographical Corps, and the other was led by Ellet, who issued his report within a year.[269] It was 150 pages and outlined four reasons why floods on the Mississippi were growing: the expansion of cultivation of farmland, which meant that forests and swamps no longer absorbed flood waters and runoff; the extension of the levee system; the creation of cutoffs; and the lateral elongation of the river into the Gulf of Mexico. His prescription required three approaches: stronger levees; improved natural and artificial outlets; and a system of high dams and floodwater reservoirs to release excess water during low water season. His work was more a theoretical exposition rather than a survey.[270]

The other report by the Corps' Humphreys, which would take 11 years, had a lasting impact on national river management policy. Humphreys suffered multiple health problems during the survey work but finished his *Report upon the Physics and Hydraulics of the Mississippi River* just months before the Civil War. Humphreys concluded that building continuous levee lines would "concentrate" the flow of the river.[271] Assisted by Lt. Henry L. Abbot, a fellow West Point alumnus, Humphreys' survey teams painstakingly obtained data on riverine channel cross-sections and topographical and geological formations. They took measurements from the confluence of the Mississippi and Ohio rivers to the mouth of the Mississippi at the Gulf of Mexico. They studied the tributaries of the Lower Mississippi. They applied insights from geology and European hydraulics to challenge the conventional wisdom about alluvial deposits. The result, declared the *American Journal of Science*, was "one of the most profoundly scientific publications ever published by the U.S. government."[272] The report rejected reservoirs and cutoffs to bypass bends in the river. Their final analysis recommended

[269] Reuss, "Andrew A. Humphreys."
[270] Reuss, "Andrew A. Humphreys."
[271] Pabis, "Delaying the Deluge."
[272] Shallat, "Building Waterways," 41.

maintaining all water flow within the main channel by closing the remaining natural outlets that drained water away into adjacent swamps. And it proposed stronger levees. As a rebuke to Ellet and the Civilian Corps, Humphreys boasted that his report had revealed new laws "that were before unknown; new formula have been prepared, possessing far greater precision than the old; and improved methods of gauging streams have been devised." This endorsement of a "single-channel theory" tied flood control interests to navigation interests, which was politically attractive.[273]

But the survey assumed the riverbed consisted of hard blue clay, based on discoveries of clay deposits at the head of Bayou Plaquemine, in Bayou Lafourche and on the prairies in between. Blue clay was found in an artesian well in New Orleans and in the Yazoo Swamps in Mississippi. "Although not one of these facts may be considered itself conclusive, it must be allowed that together they afford good grounds for doubting the recent alluvial character of the bed of the Mississippi, even as far down as the head of passes," Humphreys concluded.[274] He argued that since the bed of the Mississippi River was made of clay, it could not be sufficiently "scoured" through flow restriction.[275] Humphreys resisted the idea of a proposed outlet at Bonnet Carré above New Orleans because of the cost of construction and the fact that he believed sediment carried by the river would lodge itself in Lake Pontchartrain and impede all navigation eventually and possibly alter the main channel of the river.

While levees were built back from the river's natural banks, sometimes more than a mile back, the river had to overflow its banks before the levees would begin to confine it. Any force generated by this confinement was dissipated over an area far greater than the river's natural

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[273] Pabis, "Delaying the Deluge," 439
[274] Pabis, "Delaying the Deluge," 440.
[275] Reuss, "Andrew A. Humphreys," 26.

channel. Also, a levees-only configuration confined the river only during floods. Thus, levees could increase current velocity for only a few weeks each year.[276] Yet the Corps of Engineers accepted these conclusions for decades. Though it was challenged by other civil engineers and powerful individuals, it provided political cover for southern flood control interests.

Through the delta survey, military engineers became an integral part of the national conversation. The delta survey also allowed engineers to apply new hydraulic theories to other western rivers. With its completion, the Army topographical engineers, which merged with the Army Corps of Engineers in 1863, proved it was the one institution capable of gathering and analyzing data that was necessary to plan large-scale flood control programs along America's waterways. Although the Humphreys-Abbot "universal formula" proved flawed, their report received the respect of engineers around the world. "No one could fault the authors' ambition, intelligence, and diligence. In this, Humphreys and Abbot clearly surpassed their fellow army engineers." They are probably the only American army engineers mentioned in monographs on the evolution of hydraulic engineering.[277]

Humphreys went on to serve as a Union officer during the Civil War. He was commended multiple times for his service in battle, where his stubborn tenacity earned the moniker, "the Fighting Fool of Gettysburg," for resisting a Confederate attack. He also became the chief of staff of the Army of the Potomac under Major General George G. Meade and in November 1864, he took command of the celebrated II Corps, earning more accolades and contributed to Robert E. Lee's final surrender at Appomattox Courthouse. At war's end, Charles Dana, Assistant Secretary of War, called Humphreys "the great soldier of the Army of the

[276] Reuss, "Andrew A. Humphreys," 26.
[277] Reuss, "Andrew A. Humphreys," 3.

Potomac."[278] Ellet, meanwhile, served as a Confederate colonel during the Civil War and was mortally wounded at the Battle of Memphis.

Humphreys and Eads

Humphreys was promoted to Brigadier General. Sixteen months after the Civil War ended, General Ulysses S. Grant appointed him to lead the Army Corps of Engineers. Now ascendant, Humphreys met a new archrival, Capt. James Eads, who owned a successful salvage company that pulled boats from the floor of the Mississippi. As we saw in the introduction, Eads had personally experienced the alluvial floor of the river. He did not believe that the riverbed was made of blue clay. He believed that a jetty system to constrain the width of the river would increase the velocity enough to scour the bed and lower the level of the river even during low stages. He also advocated for cutoffs to shorten the river's path to the Gulf and hasten the water flow.[279] Eads argued that a jetty system could also deepen the troubled mouth of the Mississippi River, which experienced shallow mud lumps and sand bars that regularly blocked shipping lanes. He made a formal proposal to open the mouth in 1874. By then, as Chief of the Army Corps of Engineers, Humphreys was developing plans for a shipping canal that would by-pass the mouth for a proposed cost of $7.4 million. Humphreys vociferously fought, undermined and attempted to sabotage Eads' proposal, leading Eads to put up his own money to win the project.

Humphreys had argued that any jetties to increase the power of currents would be offset by tides from the Gulf. "The House rejected jetties and passed the canal bill. The Senate refused to consider a canal. The two houses finally compromised by creating a new board of

[278] Reuss, "Andrew A. Humphreys," 14.
[279] Barry, *Rising Tide*.

engineers."[280] Staffed with three Army engineers, three civilians and one member from the Coast Guard, the board voted 6-1 to allow Eads to put up $10 million of his own money to try to achieve and maintain a depth of 28 feet. Grant signed the legislation for the jetty project over the objection of Humphreys. On June 9, 1875, a steamer left from New Orleans tugging a pile driver and three flatboats of housing materials. They arrived in a cloud of biting mosquitoes at the Mississippi River's South Pass, one of three openings at the mouth, where a torrent of brown water boiled into the green expanse of the Gulf of Mexico. The new jetty system, Eads promised, would carve a channel using the river's own sediment to hydraulically accomplish what earlier months of attempted dredging had failed to do. At the height of the project, 850 workers drove several thousand lumber piles deep into muddy banks of the pass. In less than three months, the piles "extended in a lonely curve of wood two and one-third miles into the Gulf."[281] The piles were lined with thin flexible willow tree trunks coated with limestone-based concrete from the U.S. interior that acted as fascine mattresses. All of the raw materials, the lumber, the willow trees and sandstone had been collected upriver and shipped to the project site. Within a year, the partially completed lining had already begun compressing the current and deepening the channel of the pass.[282]

Within three years, Eads had completed his untested jetty system at the South Pass, blowing away the impermanent sandbars and accomplishing what mere levees could not. By squeezing the water, the river was able to scour its own channel. Eads proposed building modified jetties all along the lower river, making cutoffs, and temporarily confining the river with levees to help concentrate the flow and deepen the channel. In the 1870s, both Eads and

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[280] Barry, *Rising Tide*, 75.
[281] Barry, *Rising Tide*, 82.
[282] Barry, *Rising Tide*.

Humphreys sought to force their views on others at the cost of scientific debate. Both castigated engineers who advocated for a more diversified approach to flood control and neither tolerated dissent. The engineering debate turned into a battle of egos and power.

As Eads' jetties began to take effect, an 1874 flood upriver from New Orleans exploited a weakened levee system and deluged swaths of land as wide as 50 miles in some places. As many as 24 school districts south of New Orleans were closed, according to the Houma Courier,[283] a situation that forced the federal government to redirect attention to flood problems of the delta. Congress turned to Humphreys' loyalists. An appointed commission was headed by Gen. G. K. Warren, who had served under Humphreys. Henry Abbot, who co-authored the Humphreys report, sat on the commission board.[284] The Warren Commission conducted no fieldwork and looked only at Humphreys' report. It subsequently endorsed a "levees-only" policy and blamed uncoordinated levee building by local levee districts for producing a defective system. It proposed creating regional districts with federal aid to build a system of levees, which Humphreys and Abbot had recommended in 1861. Not surprisingly, Eads attacked the Warren Commission plan.[285] The feud matched a self-made engineer with only a few years of formal education against the chief of engineers, a West Point graduate who had co-authored a book on hydraulic engineering that had been honored around the world.[286] On the basis of the Warren Commission's report, Representative Randall L. Gibson of Louisiana in 1875 created a House

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[283] Bill Elzey, "Mississippi Overflow Caused Misery and Destruction in 1874," *Houma Today*, January 20, 2015, https://www.houmatoday.com/opinion/20150119/mississippi-overflow-caused-misery-and-destruction-in-1874.
[284] Reuss, "Andrew A. Humphreys."
[285] Reuss, "Andrew A. Humphreys."
[286] In 1857, he was elected member of the American Philosophical Society, was an honorary member of the Imperial Geological Institute of Vienna and a fellow of the American Academy of Arts and Sciences.

Committee on Mississippi River Levees, which "became a battering ram for flood control interests for 35 years."[287]

Bureaucratic Class

Pabis argues that the surveys and intervention on the rivers moved Congress toward national planning and bonded engineers to the state. "(Engineers) saw themselves as an emerging professional class whose technical expertise would command respect."[288] The Corps had become powerful because it utilized statistics and packaged information to shape government, while Congress issued shifting mandates and ambiguous legal directives. The Corps' powers of implementation extended federalism, but they also stirred a critique that dogs its large-scale public projects and management to this day. The rise of scientific professionalism was a gradual process. Statistical reporting, cost-benefit analysis, specialized field offices, and standardized forms and regulations were sold as the solution to partisan gridlock. The professional state was a response to the chaos that had stalled public works. But of course, the Corps was not immune to chaos. "The Corps, say its defenders, suffers for sins of Congress, but engineers invite the abuse by overselling their science and lavishing public money on four-color books and pamphlets that downplay the long resistance to federal projects."[289] There was seldom a time in American history, not even wartime, when the Corps worked in a vacuum without facing stiff opposition from river organizations and bureaucracy.[290]

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[287] US Army Corps of Engineers, Mississippi Valley Division. "Mississippi River Commission (MRC): History." Accessed November 2, 2019. https://www.mvd.usace.army.mil/About/Mississippi-River-Commission-MRC/History/.
[288] Pabis, "Delaying the Deluge," 424.
[289] Todd Shallat, *Structures in the Stream: Water, Science, and the Rise of the U.S. Army Corps of Engineers* (Austin: University of Texas Press, 1994), 206.
[290] Shallat, *Structures in the Stream*.

In the wake of the success of Eads' jetties, which were completed in 1879 (and still remain today), his supporters proposed a bill to create a commission of civilian and military engineers independent of the Corps of Engineers, with Eads presumably as chair. Legislators in favor of such a commission saw it as an opportunity for decreasing their own reliance on the Corps' advice. The Mississippi River Commission (MRC) would be a seven-member body consisting of four civilian engineers and three representatives from the Army Corps of Engineers appointed by the president. The MRC would oversee future internal improvement projects on the Mississippi River and advise the Army Corps of Engineers. Humphreys opposed the bill since he felt the Corps was entirely capable of managing the Mississippi, and he retired shortly after its formation.

Although Eads became a commission member, northern critics saw some of President Hayes' early appointments to the commission as evidence that Hayes intended it to promote levees for flood control.[291] Debates again focused on the constitutionality of aid that might benefit private landowners rather than navigation. Representative William A. J. Sparks from Illinois argued that adjacent alluvial lands were the property of private citizens and within the sole control and under the jurisdiction of the states.[292] While the 1824 Gibbons decision seemed to limit Congress to improving navigation channels, a delicate compromise was struck between the North and South after the Civil War that informally broadened federal powers to aid economic development in the 1880s. Congress had written appropriations bills from 1881 to 1890 allowing levee building for the ostensible purpose of improving the navigation channel.

After floods in 1881 and 1882, leaders of levee districts in Arkansas, Louisiana and Mississippi, including planter W. A. Percy, attended commission meetings to plead for aid. The

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[291] O'Neill, *Rivers by Design*.
[292] O'Neill, *Rivers by Design*.

commission members provided some aid to repair crevasses in the locally built levees. With limited funds arriving from Congress, however, the commission gradually adopted a policy that discontinued the scientific study of outlets and other options rejected in the Humphreys and Abbot survey. Eads quit the commission in 1883. Despite the commission's caution, members of river committees in Congress informally directed the Army Corps of Engineers to assist levee districts in building levees and enclosing large crevasses during floods. According to critics, members of Congress understood in practice that navigation bills for the Mississippi River delivered some funds for levee work that benefited private landowners. Landowners along the Mississippi River also found advantage in avoiding political scrutiny by requesting small projects directly from the Mississippi River Commission rather than from Congress. This indirect approach to policymaking therefore reinforced the localism of the Corps' river management work. While the commission was originally created to counter the dependence on the Army Corps of Engineers, it adapted the 1861 recommendations by Humphreys and Abbot and by the 1920s had come to favor a levees-only policy. But there was plenty of disagreement even within the MRC. Comstock, the president of the MRC, told a Senate Committee on Commerce in 1890 that to relieve pressure during floods, water must be allowed to escape from the Mississippi down the Atchafalaya River and into the Gulf of Mexico.

Throughout this time, private engineers attacked the Corps' competence. However, many were at least as concerned about their exclusion from public works projects. Criticism against the Corps appeared in Lippincott's Magazine, The Engineering and Mining Journal (1885 and 1892), Engineering News and American Contract Journal (1886), Forum (1887) and Engineering Magazine (1892). [293] A civil engineers' convention in Cleveland in 1885 urged Congress to

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[293] Lippincott, "History of River Improvement."

establish a “Civil Bureau of Public Works” to develop a “comprehensive system of public works.” The following year, 21 civil engineering society clubs formed a "Council of Engineering Societies on National Works" with the object of promoting “an improved system of public works.”[294]

Still, many officers continued to hold the Humphrey report in high esteem and defended the one conclusion that continued to enjoy widespread, if not unanimous, support: levees only controlled floods on the Mississippi.[295] “Humphreys came to identify attacks on the report as attacks on the Corps itself. Conservative by nature, possessing an ego largely untouched by failure, and convinced of the soundness of his position, Humphreys became increasingly frustrated and defensive in the changing political and engineering concepts.”[296] The more he was attacked, the less willing he seemed to modify his position. Tragic for the Corps, it was this inflexibility that became his main legacy, rather than the scientific dedication to truth that had characterized his work on the Mississippi. “An examination of his career and its effect on the Army Corps of Engineers shows how a bureaucracy can be crippling when it elevates theory to dogma and forgets that scientific reason is by definition, innovative and subject to improvement.”[297] There is no evidence that Humphreys planned a report with such obvious political appeal. “Quite the contrary, he insisted on a rigorous unbiased approach to the work. However, when he finally did arrive at the levees-only policy, he firmly put his reputation behind it and defended it before critics within and outside of Congress.”[298] Although Eads had argued in the mid–nineteenth century that cutoffs forcing the meandering river into a straighter channel

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[294] Reuss, “Andrew A. Humphreys,” 24.
[295] Reuss, “Andrew A. Humphreys,” 24. In 1912, a Mississippi River Commission report officially admitted that its primary objective in building levees was to protect land from overflow. *Congressional Record* 48, pt. 12 (1912).
[296] Pabis, “Delaying the Deluge,” 453.
[297] Reuss, “Andrew A. Humphreys,” 11.
[298] Reuss, “Andrew A. Humphreys,” 33.

would improve flood control, the view attracted few advocates. A committee of the American Society of Civil Engineers approved of levees-only for the flat, alluvial portions of the lower Mississippi River, but the report failed to mollify civilian critics of the Mississippi River Commission.

Levees-Only

By the 1880s, Army engineers were building flood control levees all along the Lower Mississippi River. As the levee lines became more complete, downstream residents continued to suffer. The "levees-only" approach was causing the river to carry a greater volume of water, and it was raising the riverbed, thus forcing engineers to construct taller levees. A break in the larger, modern levees wreaked tremendous devastation. Yet other proposals to manage river flooding, such as opening spillway outlets into bayous, required the government to appropriate private lands, a prospect which was met with resistance. "Levees-only" represented a political compromise, supported by enough engineers and scientists, along with Delta landowners to become accepted policy.

By the turn of the century, Southern and Western activists seeking federal flood control aid for the Mississippi and Sacramento rivers were working alongside activists seeking federal flood control aid for all navigable rivers. They broadened their public appeals and traded votes in Congress, which often passed veto-proof legislation with something for each region, giving birth to the phrase "pork-barrel."[299] In this sense, activists began to professionalize. In the 1880s, the Reform Movement began emphasizing rational informed citizenry and professionalism. Reformists favored pamphlets over parades and urged voters to make a rational choice among

[299] O'Neill, *Rivers by Design*.

candidates and policies over emotional allegiance.[300] Newspapers began to open bureaus in the nation's capital at the same time as lobbyists and press agents proliferated. "One journalism critic noted that by 1920 there were nearly a thousand 'bureaus of propaganda' in Washington, D.C."[301]

New lobby groups used the rhetoric of efficiency and progress favored by the Progressive Movement. In 1890, the first permanent river lobby was formed by planters and levee district boards from Louisiana and Mississippi. It was called the Inter-state Mississippi River Improvement and Levee Association. Like the Corps of Engineers, the association opposed outlets and promoted levees. They established a bureau of correspondence in Washington, D.C., sent speakers to other river organizations and circulated thousands of documents. The group's strategy was to arm delegations with "facts and figures to demonstrate the right of the people of the Mississippi Valley" and to create "continual agitation" to strengthen public sentiment in favor of larger appropriations by the central government.[302]A column by the group's president, Mississippi planter Charles Scott, addressed to "America's Businessmen," touted millions of acres of potential farm land that awaited cultivation in the Delta: "The total value of the staple crops raised on these lands heretofore brought under the plow, will approximate seventy-five millions of dollars per annum!! What a wonderful empire of richness lies here yet undeveloped."

The association published columns in the southern *Manufacturers Record* by Louisiana Supreme Court Judge N. C. Blanchard who rationalized constitutional authority for congressional intervention, as well as articles by a former Mississippi Attorney General, State

[300] Michael Schudson, "The Varieties of Civic Experience," *Citizenship Studies* 10, no. 5 (November 2006): 591–606, https://doi.org/10.1080/13621020600955033.
[301] Michael Schudson, "Where News Came From: The History of Journalism," *The Sociology of News* (New York: W. W. Norton, 2003), 83.
[302] Frank H. Thompkins, *Riparian Lands of the Mississippi River: Past–Present–Prospective* (Chicago: A. L. Swift, 1901), 4, https://archive.org/details/riparianlandsmi00tompgoog/.

Senator T. C. Catchings, and Corps of Engineers officers James A. Quinn, Smith S. Leach, and T. G. Dabney among others.[303] In 1901, a separate group of New Orleans shippers and bankers formed the National Rivers and Harbors Congress in protest of the filibuster of a Rivers and Harbors bill. Adopting the slogan, "a policy, not a project," they were the first group to consult directly with congressional committees. They held each annual meeting in Washington, D. C., where they relocated their headquarters in 1911. This second group lobbied initially for flood control on the Lower Mississippi River but eventually promoted nationwide flood control. Sen. Joseph E. Ransdell of Louisiana chaired its executive committee and traveled with other legislators in 1906 to meet with waterway associations around the country. They attracted members from shipping companies, regional trade and river organizations, chambers of commerce, farming organizations and levee districts from other river valleys. Their 1906 convention drew 189 commercial associations and 14 governors. The 1908 convention drew 287 mayors.[304]

Ransdell, on his way to view the Panama Canal with a contingent of Congressmen, was quoted in the *New York Tribune* as saying the country is waking up to the importance of a settled water policy: "We believe that the people of the country are coming to feel that, in view of the terrible congestion of traffic on the railways, the demonstrated cheapness of transportation by water…and efficiency of water competition (to be) the best regulator of railway rates."[305] In their 1911 convention in New Orleans, Ransdell said they had increased $20 million in expenditures

[303] Thompkins, *Riparian Lands*.
[304] O'Neill, *Rivers by Design*.
[305] *New York Tribune*, "Better Waterways: Congressman Ransdell Says They Will Regulate Railway Evils," March 7, 1907, 14.

to $30 million in the six years since the group was formed, and turned semi-annual bills into annual appropriations.[306]

By 1917, Ransdell and the National Rivers and Harbors Congress came under intense criticism for their lobbying methods. A *New York Tribune* article cites multiple examples of targeted campaigns by the NRHC against critics. Sen. Jones from Washington State accused the group of trying to "enlist the newspapers of Washington State to make a campaign against him." Sen. Kenyon of Iowa said that one of his Davenport constituents had received a letter from Sen. Ransdell regarding Mr. Kenyon's opposition to a bill. In response Sen. Ransdell said he had merely advised the Davenport correspondent to "to do all that he could with his friends to support the bill."[307]

Multipurpose Approach

Despite the Corps' resistance, many engineers began to advocate various combinations of outlets and spillways at the turn of the century to address flooding. Capt. John Millis of the Fourth Mississippi River Commission District recommended construction of two artificial outlets in the levees to disperse floodwaters.[308] At a 1911 National Rivers and Harbors Convention, the Corps' Chief Engineer W. H. Bixby said individual Corps engineers recognized the need *for multipurpose developments*, including power, irrigation, drainage, and bank and levee protection. The New York Board of Trade and Transportation in 1913 published a report from its members supporting multipurpose development. The president of the Mississippi River Commission,

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[306] *New York Times*, "Seek Aid for Waterways: National Rivers and Harbors Congress Meets Dec. 6, 7, and 8," November 30, 1911, 12.
[307] *New York Tribune*, "Senators Assail Rivers Congress for Lobbying: National Body Accused of Fighting Congressman Who Opposes It," July 26, 1917, 4.
[308] Reuss, "Andrew A. Humphreys," 27.

Army engineer C. M. Townsend, went on record supporting multipurpose development. The National Drainage Congress created in Chicago in 1911 called for the conservation of water and land and tied drainage improvements to public health. Some convention speakers argued that the General Welfare Clause of the Constitution justified drainage in part because of the connection of malaria to swamps.[309] Yet the Corps argued that such projects could harm navigation.

Meanwhile, a devastating flood in 1912 broke water level records at 17 of the 18 river gauges south of Cairo, Illinois, even though its volume was far less than the volume of the 1882 flood. This indicated that the riverbed of the levee-constrained river was rising. That same year, a convention of planters and levee district officials in Memphis formed the Tri-State Levee Association (later renamed the Mississippi River Levee Association), which used the devastation of the 1912 flood to argue for stronger levees. The group included business owners, lawyers and planters from Chicago to New Orleans. They lobbied for aid to the Lower Mississippi River and eventually allied with the National Rivers and Harbors Congress to support flood control aid for the Mississippi and Sacramento rivers. The group's secretary-manager, John A. Fox, wrote letters, pamphlets, and several books, and he organized a speaker's bureau. A book printed by the group, *A National Duty*, highlighted endorsements by the Democratic, Republican and Progressive parties. It featured a prominent article by the Mississippi River Commission, entitled "The Bed of the River is Not Rising"[310] and included sympathetic photos of flood victims, tenants and black farm laborers stranded in the 1912 deluge.

The public relations campaign that coincided with the 1912 flood and another devastating flood the following year garnered enough public sentiment to sway all three major political

[309] O'Neill, *Rivers by Design*.
[310] John A. Fox, *A National Duty: Mississippi River Flood Problem: How the Floods Can Be Prevented*, prepared and presented by the Mississippi River Levee Association (Washington, DC: J. W. Bryan Press, 1915), https://archive.org/details/cu31924022876233.

parties to incorporate planks in their platforms "recognizing the national character" of the disasters and committing their candidates "to the speedy solution of the problem." The presidential nominees all subscribed to declarations.[311] President Taft declared that the 1912 flood demonstrated that flooding on the Lower Mississippi River was a national problem. His 1912 Reform Party platform stated that the federal government should assume a ‘‘fair portion’’ of the burden in building levees, which also included opening Western and Southern waterways to federal protection.[312] An expanded federal presence was endorsed by the Louisiana Bankers Association, the National Drainage Congress, the New Orleans Progressive Union and the National Flood Prevention and River Regulation Conference in New Orleans, as well as newspapers across the country.[313] A renewed alliance was forged between the West and South.

After years of organizational work, personal politicking by activists and actions by sympathetic legislators, flood control supporters eventually won official aid for the Mississippi and Sacramento rivers with the 1917 Ransdell- Humphreys Flood Control Act.[314] It directed the Corps of Engineers to provide levee aid for the two rivers and authorize federal payment of up to two-thirds of the cost of levee construction. Local interests remained responsible for acquiring the rights-of-way and some maintenance costs. Yet, in the spring of 1922, the lower Mississippi River flooded again. The river was so high that its tributary waters flooded six Yazoo–Mississippi Delta counties. Some critics blamed the flood on the closure of the Cypress Creek Gap by the Corps of Engineers the year before. The only remaining outlet on the Mississippi was at Old River, where Captain Henry Shreve made his 1831 cut to the Red River. The cut would

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[311] "Floods and Levees of the Mississippi River: Supplemental Report," H.R. Rep. No. 63-300, pt. 2 (1914), https://louisianadigitallibrary.org/islandora/object/lsu-govdocs-p16313coll35%3A167
[312] O'Neill, *Rivers by Design*, 118.
[313] *Congressional Record* 48, pt. 12 (1912).
[314] Matthew T. Pearcy, "A History of the Ransdell–Humphreys Flood Control Act of 1917," *Louisiana History: The Journal of the Louisiana Historical Association* 41, no. 2 (Spring 2000): 113–159.

later threaten to open a permanent course for the Mississippi down the Atchafalaya River away from New Orleans and require an ongoing regime of intervention through Old River Control.

Conclusion

During the winter and spring months of 1927, the Mississippi River surpassed record flood stages. Prolonged rainfall in the headwaters swelled its tributaries and increased the already elevated water levels in the Lower Mississippi. In April 1927, waters began to rise precipitously, approaching 60 feet above mean sea-level. Federal levees along the Lower Mississippi began to breach. By May, floods had devastated 32 towns and cities and pushed the Ohio tributary backwards.[315] On May 24, the river broke through Old River and sent 30-foot waters down the Atchafalaya. The breach panicked New Orleans authorities, who convinced the Corps of Engineers and Mississippi River Commission to dynamite the levee south of the city. They used 39 tons of dynamite – starting in a noontime spectacle of press, VIPs and newsreels – to sacrifice the small rural farmers and fur trappers downstream for the good of the city. The first explosion opened a ditch 10 feet deep and six feet wide. Two more explosions followed to little avail. Workers used pitches and shovels. Divers set depth charges beneath the surface. Finally, the disappointed crowds went away. It would take another 10 days of dynamiting to do the job. When it was over, 250,000 cubic feet per second, or 20 percent of the river's volume, poured through a hole 3,213 feet wide into St. Bernard Parish and Plaquemines Parish on its southeastern border. According to author John Barry, 526 claimants filed suits against the city of New Orleans. Total claims reached $35 million. The city settled $3.9 million but then deducted $1 million for feeding and housing the claimants while they were homeless. Of the settlement,

[315] Saikku, "Taming the Rivers."

half went to the Acme Fur Company for losses of the muskrat habitat caused by the flooding. Not a single trapper received any compensation. Another $600,000 went to Louisiana Southern Railroad. The remaining $800,000 was divided among 2,809 claimants who averaged $284 for losing their homes and livelihoods. An additional 1,024 claimants received nothing, despite commitments by New Orleans boosters that all victims would be compensated.[316]

The claimants' attorney Leander Perez, who was a political boss of Plaquemines Parish, quoted Louisiana Oramel Simpson's statement: "The people in the affected area will be removed to safety and properly cared for. No lives will be sacrificed. The damage to property resulting from this act will be paid for." Some have argued that city leaders were motivated to show investors the extent they would go to protect capital investments at the port, which was essential to the city's economy. In truth, the river had crested north of Baton Rouge the month before the dynamiting. All spring, local newspapers had played down the panic. Yet business was drying up.[317]

Referred to as the greatest peacetime disaster in U.S. history by Secretary of Commerce Herbert Hoover, the 1927 floods caused staggering economic losses and human suffering. Over 16 million acres in seven states were inundated and property loss estimates varied from $236 to $363 million. Nearly 700 people are known to have died. Another 637,000 were left homeless. The American Red Cross, responsible for most of the relief work, provided food and shelter for more than 300,000 people in refugee camps. As emblemized by Charlie Patton's famous delta blues song, "High Water Everywhere," black refugees were particularly harmed. Imprisoned in refugee camps, they were coerced to perform manual labor and prevented from fleeing the Delta

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[316] Barry, *Rising Tide*, 358.
[317] Barry, *Rising Tide*.

because planters were afraid of losing their workforce.[318] In the aftermath of the devastation, Congress ordered the Army Corps of Engineers to examine the flood problem in a national context. As a result, Corps Chief Lt. General Edgar Jadwin proposed a nearly $300 million program of multi- purpose development for the Mississippi and its tributaries, named Project Flood.[319]

It would be inaccurate to attribute the failed "levees-only" policy to any one group, agency or even government. It was a manifestation of political agendas that evolved over a century. Public discourse in the press and convention memorials to Congress justified federal intervention in the Mississippi River and managed to hijack or at least influence the policy findings of the emergent professional class. It was as much ideology as political pragmatism that led to river policy. Interventions into the Mississippi River embedded the federal state into the river that flowed through a diverse and contested nation. To respond to the Mississippi River in those early American decades was to respond to changing physical and political variables. Moving through states and jurisdictions, the river forged alliances with divergent and convergent interests that swirled together for a common application or outcome, much like a whirlpool or eddy that kicks out and then re-emerges in the main current. The Mississippi River helped suture the public body consciousness by giving conventions and newspapers a common frame of focus. It functioned discursively as an object of unification, and materially as a potentially catastrophic force. The politics of river improvement and the growing influence of the conventions and press were entangled components of emerging forms of democracy that saw a public growing in power and advocating for a larger role of its national government. In 1928, Congress Approved the Mississippi River and Tributaries Project that enlisted billions of dollars after infrastructure over

[318] Saikku, "Taming the Rivers."
[319] Reuss, "Army Corps of Engineers."

the next half century to build spillways, seal off the remaining Louisiana marshes from its progenitor and construct Old River Control at the confluence of the Mississippi, Red and Atchafalaya Rivers about 30 minutes north of Baton Rouge. Since the 1930s, Louisiana has lost 2,000 square miles of wetlands. Today it is not only a loss of silt and sediment that Louisiana must contend with but also the politics that produced the Father of Waters that flows through it.

Chapter 2, in full, contains material as it appears in *Media and Communication*, Vol 7, No. 1, 2018. Randolph, Ned. Cognito Press. The dissertation author was the primary investigator and author of this paper.

Chapter 3: The Birth of River Science

Introduction

To understand what Foucault called a discursive episteme, he suggested we create "a history of the present" by genealogical method. Lisa Bloom's work, *Gender on Ice*, illustrates how gender constructions and visions of empire shaped and motivated North Pole expeditions. She suggests that prevailing narratives that become discourses and the truth of things are heavily dependent upon the institutional formations behind knowledge production and circulation. How we come to understand the relationship between the Mississippi River and Louisiana wetlands is heavily dependent upon the institutional formation that produced both cultural and scientific knowledge about the river and Louisiana coast. That we value the utility of the coast for its extracted resources is part of this discursive regime. But how did this regime come to be? What were the political forces that contested and shaped our understanding? What were the economic structures surrounding the objects of knowledge? What shaped the science – or the scientific questions – that produced authoritative knowledge about them? The prior chapter looked at how science and policy on the Mississippi River arose through 19th century river conventions that lobbied for flood control and river management as a rationale for nation-building. These contested interests that played out on convention floors, in newspaper articles, and in contracts awarded to investigative teams contributed to the levees-only policy and consequent floods of 1927. The response to the catastrophic floods was a Congressionally-approved intensive infrastructural program that removed the river's mud from public view and attempted to control the height and behavior of the Mississippi River right up until present day.

This chapter examines knowledges that came of age after the great floods of 1927 with the emergent understanding of river physiology and its role in producing the delta's coastal wetlands. I begin with early studies out of Louisiana State University that were in turn supported by national oil interests and the U.S. Army Corps of Engineers – two participants with often opposing interests. The LSU research programs were indebted – if not directly subsidized – by the petroleum industry, the petroleum-friendly Louisiana Geologic Survey, New Deal funding and the Army Corps of Engineers who needed institutional research assistance for their ongoing project of managing the Mississippi River through mechanical engineering principles.

As I hint here and thoroughly show in subsequent sections, the legacy of petro-dollars in Louisiana has fundamentally shaped how the state articulates its strategy for wetland restoration and how Louisiana residents accept the existence of oil and gas as an economic benefactor and part of the natural order of things. The second part of this chapter lays out the political entanglements that shaped wetland science as residents and coastal advocates began witnessing with alarm the disappearance of the surrounding wetlands and set about trying to halt the loss. They produced working documents with calls for action. They also attempted to identify the myriad causes of wetland degradation, which continues to be a controversial endeavor. Intense scientific and political disagreements over the causes of wetland subsidence and erosion played out through various strategic plans and efforts to address the many stressors destroying the ecology of the area. I highlight the role of grassroots stakeholder coalitions in bringing attention to the plight of land loss, culminating in America's WETLAND Foundation led by Shell Oil Co. and the Environmental Defense Fund that represented a "middle way" strategy to move forward with coastal restoration efforts. America's WETLAND launched a national campaign to call attention to the erosion of Louisiana's "working wetlands" in order to leverage federal dollars for coastal restoration efforts without accounting for the petroleum industry's culpability. America's WETLAND effectively removed from restoration discussions the role and effects of energy exploration in the coastal zone.

Early Study of Landforms: Berkeley on the Bayou

This chapter opens in the early days of the LSU Geology Department, which was officially formed in 1922 by Henry V. Howe, who arrived from Stanford University a year after Louisiana's first oil gusher in Jennings.[320] Dr. Howe came with a mandate from Louisiana Governor John M. Parker to build a department "to train Louisiana boys for the oil industry."[321] He was charged with rebuilding a minor department that had collapsed four years prior "leaving only scattered heaps of rocks, minerals and fossils." Known for his enthusiasm for the subject matter, Howe attracted a number of students and began to lay a new foundation for a department that would be intimately tied to the state's petroleum industry.[322] Soon after joining, Howe persuaded the administration to hire his colleague, Richard Russell, who received his PhD from the University of California Berkeley, to help develop the field of physical geography at LSU. In September 1928, Russell arrived in Baton Rouge, where he and Howe together built a major program of geology and geography, establishing the Louisiana Department of Conservation, which combined geomorphological, archaeological and botanical reports in a single bulletin. The bulletins provided a publication venue for many of the early studies of the Mississippi River Delta. Much of their research on Louisiana landforms was tied to contracts by the petroleum

[320] Geology was formally established at LSU during the period from 1892-1898 and designated the Department of Geology, Mineralogy and Botany. By 1922, the Department had been renamed the Department of Geology.
[321] Louisiana State University, "A Brief History of LSU Geology and Geophysics," accessed June 14, 2019, https://www.lsu.edu/science/geology/about_lsu_geology/program_history/index.php.
[322] Louisiana State University, "A Brief History."

industry to appraise property values and land titles.[323] He soon made two additional hires: B.C. Craft to train students in petroleum engineering and Fred Kniffen, who brought from UC Berkeley a strong background in cultural geography, anthropology, and geomorphology. "From this strong academic nucleus, the departments of geology, geography-anthropology, and petroleum engineering were combined in 1931 to form the School of Geology, with H.V. Howe as its director."[324] Kniffen bridged anthropology and human geography, which allowed him to work with Russell to create a methodology that considered the habitation patterns of indigenous Native Americans in response to changing geological conditions in the riverscape itself. They were able to date geographic formations in river patterns by indigenous artifacts they uncovered. This example of interdisciplinary knowledge was also supported by the availability of new topographic quadrangle maps and aerial photographs. Russell's physical approach and Kniffen's archaeological analysis provided a natural fit.[325] One trip involved a visit to Larto Lake in Central Louisiana which resulted in the theory that the lake had once been a former channel of the Mississippi River miles from its present location.[326] Kniffen focused on midden sites and earthen mounds. He found multiple sites with collections of pottery: Natchez, Tunica, Caddo, Bayou Cutler, Coles Creek, Deasonville and Marksville. This chronologically confirmed Russell's interpretation of the physiographic history of the area. In a 1939 paper "Quaternary history of LA," they concluded that Bayou Teche, where no Native American habitation artifacts were found, was the oldest Mississippi River course.[327]

[323] Charles A. Anderson, *Richard Joel Russell 1895–1971: A Biographical Memoir* (Washington, DC: National Academy of Sciences, 1975), http://www.nasonline.org/publications/biographical-memoirs/memoir-pdfs/russell-richard-j.pdf.
[324] Louisiana State University, "A Brief History."
[325] Charles A. Anderson, *Richard Joel Russell*, 251.
[326] Charles A. Anderson, *Richard Joel Russell*, 376
[327] Lyon, *New Deal*, 82.

Russell and Kniffen began scouring Louisiana's muddy swamps and coastal estuaries for indigenous artifacts in order to establish river meander dates. Russell's analysis was based on physical features, while Kniffen used cultural features such as pottery designs and mound and village sites. Russell accompanied Kniffen on four trips to the delta. "In all, Kniffen visited 44 sites that included earthen mounds, shell mounds, shell middens and natural beach deposits containing pottery. He sketched mounds, bore sites and collected artifacts from the surface of sites."[328] Russell used Kniffen's site survey and prehistoric chronology to date the sub deltas of the Mississippi River. He was able to demonstrate that a sub delta identified by LSU archaeologist James Ford was older than the current St. Bernard sub delta. Ford, who was a student of Kniffen, started the archeology program at LSU in 1937. After receiving a BA from LSU in 1936, he remained a research archaeologist for LSU until 1946. While working on his graduate degree at the University of Michigan, Ford organized a Works Progress Administration (WPA) program for Louisiana, which was approved in September 1938. He helped establish excavation sites throughout Louisiana,[329] establishing an outline of the ceramic chronology of the Lower Mississippi Valley and forming the basis for the description of the Tchefuncte culture and the late prehistoric Plaquemine Culture site in West Baton Rouge Parish where geomorphology helped date archaeological ruins. WPA digs also oversaw the excavation of Bayougoula in Iberville parish, which identified the villages of Bayougoula, Mugulasha, Acolapissa and other tribes of the late 17th century period of historic contact.[330]Ford developed a

[328] Lyon, *New Deal*, 81.
[329] Lyon, *New Deal*, 81.
[330] The start of World War II was the beginning of the end of WPA archeology as government funds were steered towards the war effort.

cultural sequence for the Lower Mississippi Valley resulting in the cultural sequence: Tchefuncte – Marksville – Troyville – Coles Creek – Plaquemine – Natchez/Caddoan.[331]

Ford's work demonstrated to Russell that three of the Native American cultures in the lower delta were relatively recent. He matched this evidence with shallow, marine shells close to the surface at New Orleans and the sequence of channel positions – to theorize that the deltas themselves were fairly young. His research on the geology of Plaquemines and St. Bernard parishes also helped verify the historic meandering pattern of the river that created the Louisiana Delta. His study seems to presciently contextualize the future damage caused by the vast infrastructural intervention to control the river. In his classic 1936 paper, "The Physiography of the Lower Mississippi River," he pointed out that in addition to the active delta, a sequence of abandoned deltas were in varying stages of decay in coastal Louisiana. In other words, the delta was dynamic and in various stages of formation and erosion. It appeared that deltas were either in the process of growth because of the active sedimentation of river silt or decline because of a changed meander channel that was no longer active and subject to natural subsidence and the stress of coastal erosion. The work was one of several contributions on delta studies published by the Louisiana Department of Conservation. Russell's discussion in the 1936 publication also introduced for the first time the concept that the weight of the sedimentary deposits of successive deltas caused local down-warping of the earth's crust, thus developing a "geosyncline."[332] The delta was naturally sinking under its own weight.

Petroleum-fueled research

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[331] Mark A. Rees, ed., *Archaeology of Louisiana* (Baton Rouge: Louisiana State University Press, 2011).
[332] Charles A. Anderson, *Richard Joel Russell*, 376.

By the time of Kniffen and Russell's collaboration, oil had also been discovered in Louisiana. The state of Louisiana issued the first coastal zone oil lease in 1921, and land development companies began acquiring huge tracts of swampland. Timber and fur companies were incentivized to hold onto land and lease it for exploration. In fact, the oil boom promised that even land too wet for agriculture or timber had potential value for what lay below its surface in mineral rights. During the 1930s, as swamp and marshlands suddenly became valuable, legal issues of ownership arose. The state had title to navigable waterways as of the date of its admittance to the Union in 1812, and many titles hinged on the boundaries of water bodies at that time. New appraisals of property values were required. Russell's fieldwork in alluvial morphology attracted interest in soliciting his skills as an expert witness in the various land-title lawsuits. Russell's extracurricular role as an expert witness on landforms sometimes earned him more money in fees than his university salary. He and Howe presented evidence that won Louisiana title to extensive water bodies in southwestern Louisiana. From this activity, came the addition of the term "Chenier," meaning ridge of sand, to the terminology of geomorphology" on Cameron and Vermilion parishes in 1935.[333]

In addition to Howe's academic responsibilities, from 1934 to 1940, he served as the Director of Research for the Louisiana Geological Survey, which was supported by the petroleum industry. This active geological survey brought oil money into the department that supported more faculty and graduate students. Oil money subsidized field work and made possible the geological mapping of the state's parishes. And it established the Bulletin publications of the State Survey. Howe personally authored or coauthored the first eight parish Bulletins. The papers emphasized the importance of the thick, elongate, sedimentary sequence

[333] Charles A. Anderson, *Richard Joel Russell,* 377.

paralleling the coast –which is the main source of Louisiana's petroleum. Howe also developed concepts of salt dome growth and recognized the significance of subsidence under deltaic loading, Pleistocene terrace formation and the Quaternary deltaic history of coastal Louisiana.[334]

The petroleum lobby wanted to expand the geologic survey under LSU's management with proposed legislation to triple their fees with each drilling permit, however Howe and Russell resisted expansion pressures. They cited difficulty in training personnel to interpret geologic evidence in the densely vegetated and muddy coast.[335] "In order to establish precise locations for necessary boring and land surveyors, they had to cut trails through the swamps or walk miles on unstable floating marsh. In some cases, botanists, chemists and other specialists were included in the field parties." The bulletin, "Louisiana Stream Patterns," published in 1939 in the Louisiana Geological Survey, was the product of one of these expeditions.[336]

In 1937, Russell was given the first Wallace A. Atwood Award by the Association of American Geographers. His groundbreaking report established Russell as one of the leading geomorphologists in America.[337] The physiography of the delta is characterized by dominant natural levees that form the high land; the gentle slopes of these natural levees lead away from the river to marshes, swamps and open waters. Upstream, the floodplains have tributaries; downstream, the deltas have distributaries and abandoned channels that have been down-tilted in the direction of the "distal" parts of old deltas. "Meanders are present only on the floodplains where the channels encounter material deposited during the same cycle of alluviation and where

[334] Louisiana State University, "A Brief History."
[335] Charles A. Anderson, *Richard Joel Russell*, 378–379.
[336] Charles A. Anderson, *Richard Joel Russell*, 377.
[337] Charles A. Anderson, *Richard Joel Russell*, 376.

the banks are lined by natural levees. He emphasized that the bottoms of large lakes are uniformly hard sand whereas those of small lakes are silty or oozy."[338]

Russell was also a member of the Committee on Geophysics and Geography for the Department of Defense. He served as adviser to the Office of Naval Research. During World War II, German U-boats prowled the Gulf waters to disrupt Allied shipping lanes from the Mississippi River. After the war in 1949, Russell was urged by Army and Navy officers to help improve the "trafficability" of vessels throughout the coastal complex. This offer came as he was named Dean of the Graduate School at LSU. With the assistance of James P. Morgan, they presented a proposal to the Geography Branch of the Office of Naval Research to study the ability of large vessels to navigate through the shallow, muddy Louisiana coastal marshes. This study led to the establishment in 1954 of the Coastal Studies Institute with Russell as director.[339] Today, there are ten major navigational canals connecting the Gulf of Mexico to inland Louisiana ports. Studies in more recent decades indicate that the presence of these canals allows saltwater to intrude into the fresh marshes, especially during storm surges. Dredging of straight canals through channels that previously meandered also accelerates the speed of storm surge and tidal action, causing destruction of the healthy wetlands. Additionally, canals with high "spoil" banks disrupts wetland sheeting and hydrology of wetlands, which results in deterioration of marshes and ultimately loss of land to open water.[340]

Fisk's Arrival

[338] Charles A. Anderson, *Richard Joel Russell*, 377.
[339] Charles A. Anderson, *Richard Joel Russell*, 381.
[340] Denise J. Reed and Lee Wilson, "Coast 2050: A New Approach to Restoration of Louisiana Coastal Wetlands," *Physical Geography* 25, no. 1 (2004): 17, https://doi.org/10.2747/0272-3646.25.1.4

In addition to the Louisiana Geologic Survey, the Army Corps of Engineers was interested in commandeering research labor from the LSU department. They were seeking a better understanding of the physics and morphology of the Mississippi River and its former meander paths. The Army Corps of Engineers in 1941 hired Harold Fisk, who arrived at LSU in 1935.[341] with expertise in volcanic rocks in the Columbia River region. Fisk began making important discoveries in central Louisiana and formulated an explanation of Quaternary deposits that received widespread acceptance. Building on this work, Fisk at the behest of the Corps of Engineers undertook a comprehensive geological study of the entire alluvial valley of the lower Mississippi. Nothing of such magnitude had previously been attempted.

Starting around the 1930s, the Corps recognized the intertwined relationship of geology with most engineering problems. They relied on localized geological studies for insight on potential construction sites and materials. The Fisk study, completed in 1944, included a summary of the valley's characteristics, chronology and historical evolution. It also included characteristics of the alluvial plain and discussion of the river and its activities. The investigation provided a glimpse into not only the major factors that led to the establishment of the river's modern course, but what may shape the river's future behavior. Fisk's team used detailed topographic maps, aerial photography and historical accounts of the river valley – which included narratives from Spanish explorers of the 16th century – to help identify abandoned courses of the Mississippi River and its tributaries. They also incorporated data from 16,000 soil borings.[342]

[341] Kent Mathewson and Vincent J. Shoemaker, "Louisiana State University Geography at Seventy-Five: 'Berkeley on the Bayou' and Beyond," in *The Role of the South in the Making of American Geography: Centennial of the AAG, 2004*, eds. James O. Wheeler and Stanley D. Brunn, 245–267 (Columbia, MD: Bellwether, 2004).
[342] Harold N. Fisk, "Geological Investigation of the Alluvial Valley of the Lower Mississippi River," conducted for the Mississippi River Commission, U.S. Army Corps of Engineers, Vicksburg, Mississippi, December 1, 1944, https://ngmdb.usgs.gov/Prodesc/proddesc_70640.htm.

The report's results would drive Mississippi River engineering for decades. The Fisk study had a profound impact on the geological understanding of the Mississippi River valley and greatly influenced future strategies to control it. Along with the report were several volumes of multi-colored, detailed topographical and geological maps that set a new standard for geological illustrations. These maps trace significant river course changes over the last 2,000 years. For instance, the river has taken at least three different routes through Louisiana to the Gulf of Mexico; its present course through New Orleans dates only to around 650 years ago, although more recent studies suggest its present course may be as young as 350 years.[343] During his service to the Army Corps of Engineers, Fisk was apparently shocked at the militant culture of the corps, which operated under strict, standard procedures that were unlike his experience at LSU. "For example, whenever they began a new construction project, such as a levee setback, they made borings at very regular intervals without considering the surface geology of the area."[344] Fisk, who was not known for his diplomacy, immediately advocated changes in the manner in which proposed borings were located. "Thus, early in the game there was obvious resentment and foot-dragging, especially at the middle working levels in the (Mississippi River Commission) MRC. Fisk reasoned that there was only one way to win the non-believers over on his side: show them what we could do." His team early on established definite relationships between types of sediments (gravel, sand, silt and clay) and the common, different depositional environments of the floodplain such as natural levees, low flood basins, abandoned channels, and point bars – all of this was later recognized as a major break-through in classic sedimentology. As Fisk busily mapped abandoned river courses and stages of the current meander belt, the Army

[343] Rufus J. LeBlanc Sr., "Harold Norman Fisk as a Consultant to the Mississippi River Commission, 1948–1964—an Eye-Witness Account," *Engineering Geology* 45, nos. 1–4 (December 1996): 22; Day et al., *Perspectives on the Restoration*.
[344] LeBlanc, "Harold Norman Fisk," 22.

Corps of Engineers began studying laboratory alluvial river models.[345] Models were constructed in 1942 and experiments were aimed at trying to establish some basic principles of meandering and changes brought about by stabilization of caving banks.[346]

Fisk and his associates revised the original sequence proposed by Russell. They worked out some of the details of the development of the deltaic plain (Fisk, 1944, 1952). Later work by Morgan, Van Lopik and Nichols (1953), Mclntire (1954), Van Lopik (1955), Kolb and Van Lopik (1958), further revised this sequence.[347] Later studies have followed that direction with particular attention on the cyclic nature of delta growth. Fisk resigned from LSU in 1948 to become Chief of the Geologic Research Section of the Humble Oil and Refining Company in Houston and stayed on as a consultant to the Army Corps of Engineers. He died in 1964. [348]

New Understanding of Coastal Processes

Between the 1940s and the 1980s, a range of new research on the river revealed the river's mechanism of delta construction and ultimately the impacts that both the Army Corps of Engineers' ever-growing system of levees to hold the river in a single channel and the growing labyrinth of oil and gas canals were having on the lower delta marsh. Prior to the 1980s, it was universally thought that the coastal marshlands were in symbiotic balance. But geologists began to gather and examine historic aerial photographs and other evidence that revealed a very different story. Coastal erosion in Louisiana was accelerating.

[345] LeBlanc, "Harold Norman Fisk."
[346] LeBlanc, "Harold Norman Fisk."
[347] James M. Coleman and Sherwood M. Gagliano, "Sedimentary Structures: Mississippi River Deltaic Plain," in *Primary Sedimentary Structures and Their Hydrodynamic Interpretation*, papers presented as part of a symposium of the Society of Economic Paleontologists and Mineralogists, Toronto, May 18, 1964, 133–148 (special publication of the SEPM Society for Sedimentary Geology, 1965), https://doi:10.2110/pec.65.08.0133
[348] Michael C. Robinson, "Harold N. Fisk: A Luminescent Man," *Engineering Geology* 45, nos. 1–4 (December 1996): 37–44, https://doi.org/10.1016/S0013-7952(96)00005-1.

In 1964, Louisiana geologist Sherwood Gagliano began a series of studies that further altered the trajectory of popular thought about dynamic formation and erosion of river deltas, as well as about the ecologic devastation caused by disrupting the Mississippi's natural sedimentation cycle. His 1964 paper, "Cyclic Sedimentation in the Mississippi River Delta" looked at the natural effects of river deltas when rivers changed course and began building new deltas. The abandoned delta was essentially "starved" of nourishment and began a coastal retreat that led to its eventual inundation by sea water. Gagliano examined sub-deltas or crevasses around southeast Louisiana that were no longer main channels of the Mississippi River. His work was joined by a raft of studies by natural scientists that coincided with the emergence of the environmental movement in the late 1960s. Evidence mounted that correlated land loss to both the management of the Mississippi River and the promiscuous oil and gas exploration and drilling. As mentioned in chapter 1, in 1971, the Louisiana Legislature established the Louisiana Advisory Commission on Coastal and Marine Resources. The same year, a pair of studies was released by R.H. Chabreck that quantified land disappearance in the coastal zone at a rate of 16.5 miles a year. Called "Ponds and lakes of the Louisiana Coastal Marshes and their value to fish and wildlife," the study relied on a helicopter survey of marsh vegetation and soils. Chabreck sampled quarter-mile intervals over a study area of more than 12,000 miles, followed by a second survey of 20,488 miles. These studies were compiled in the survey, "Hydrological and Geologic Studies of Coastal Louisiana," where he began pushing for a more coordinated state-led response to coastal land loss. Mapping studies by coastal scientists continued through the 1970s that showed that coastal loss was not gradual but actually accelerating. Land loss had nearly doubled by the end of the decade. Evidence pointed overwhelmingly to man-made factors, and a coastal restoration movement began to take hold. Starting in 1973, Gagliano also began advocating for controlled diversions along the Mississippi River and the need for deploying the river's sediment load to replenish the marshlands through a dynamic management plan.[349] But dedicated funding for restoration projects and supporting applied research would not become a reality until 1981 when the Louisiana Legislature created a one-time fund of $35 million. The move coincided with a groundbreaking study in 1981 in which Gagliano quantified the loss of coastal wetlands directly tied to the management and leveeing of the Mississippi River. Using comparisons of black and white aerial photographs and color infrared imagery taken at five periods from 1890-1978, he contextualized the rate of land loss and habitat change within the Mississippi Deltaic Plain, arguing that 7,000 years of land production by the river had been reversed starting in the late 19th century and accelerated in the 20th century. Such land loss rates progressed from 6.7 square miles a year in 1937 to a projected 29.4 square miles a year in 1980. The greatest loss occurred in the wetlands and barrier islands. Natural-levee ridges were also disappearing at a very high rate.

> The apparent causes of the high rates of land loss include the harnessing of the Mississippi River by levees and control structures which reduce tendencies toward natural diversion and funnel valuable sediments to deep, offshore waters. Additional factors include canal dredging and accelerated subsidence related to mineral extraction, both of which are often associated with saltwater intrusion. The net effect is a rapidly accelerating man-induced transgression of a major coastal system."[350]

Essentially, practices to control the river, which were thought to be either benign or beneficial for two centuries, suddenly became tied to an alarming rate of coastal erosion.

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[349] Sherwood M. Gagliano, Phillip Light, and Ronald E. Becker, "Controlled Diversions in the Mississippi Delta System: An Approach to Environmental Management," Hydrologic and Geologic Studies of Coastal Louisiana, Report 8 (Baton Rouge: Louisiana State University Center for Wetland Resources Coastal Resources Unit, 1973).
[350] Sherwood M. Gagliano, Klaus J. Meyer-Arendt, and Karen M. Wicker, "Land Loss in Mississippi River Deltaic Plain," *AAPG Bulletin* 65, no. 9 (September 1981): 1684.

Levees

Around 1970, Gagliano began another series of landmark observations that measured the impact of levees on protected land. He found, alarmingly, that levees were contributing to subsidence as well. He identified three separate processes: 1) By cutting off the natural flow of water, levees were essentially starving the root systems of the land inside the protection rings. 2) The existence of the levees themselves was causing the land to sink, since they resided on mud — consisting of organic peats and soft clays, silts and sediments – that were too soft to bear the weight of the levees. 3) Plus, the organic peat on developed land inside the levees shrank as the water was drained and pumped outside of the levee system. "Furthermore, when dried, they shrink appreciably with a volume reduction of as much as 50 percent or more in the peats." The clays fared a little better with a maximum reduction of 10 to 15 percent if dried completely. But when exposed to oxidizing conditions, through diking and draining, they further sink.[351]

Drained back-swamp areas – like many of the post war development in New Orleans and adjacent suburbs discussed in Chapter 1 – were simply poor landforms to build on. They could sink by several feet. Other practices such as using fires for clearing stumps or accidental fires could smolder in the peat for months and cause further subsidence. "The net effect is that the surface of the newly reclaimed land may be lowered five feet or more below sea level within a decade after drainage. If the drained area has ponds and small lakes, the effects may be even more drastic. The higher the compaction and settlement rate, the greater is the cost of drainage, flood control, and foundation engineering."[352] A more coordinated state-led response to coastal land loss began to emerge in the 1970s as more and more reports (Hydrologic and Geologic

[351] Gagliano, "Canals, Dredging," 28.
[352] Gagliano, "Canals, Dredging," 30.

Studies of Coastal Louisiana) documented coastal land loss and pointed to some of its causes. Following the Louisiana Advisory Commission on Coastal and Marine Resources in 1971, the Louisiana Coastal Zone Management (CZM) Program was created in 1978 pursuant to the Federal Coastal Zone Management Act of 1972.

Oil and Gas

In the late 1970s, U.S. Fish and Wildlife Service and the U.S. Bureau of Land Management contracted with Gagliano and his firm, Coastal Environments Inc. (CEI), to produce a series of habitat maps for use in planning for Outer Continental Shelf oil and gas development and predicting potential impact of future expansion on fisheries. It resulted in the "Mississippi Delta Plain Region Habitat Mapping Study" in 1980, under the direction of Karen Wicker, also of CEI. Wicker developed a methodology for establishing hydrological units and analyzing habitat maps to determine change. Her team modeled their methodology after a similar study by Gagliano and Johannes Van Beek's first mapping study in 1970 for the Atchafalaya Basin. Wicker's study used more data imagery from aerial photos taken in 1978. She overlaid new photographic data with previous maps to produce a serious of new maps over the entire Louisiana coast, which consists of two plains: the Mississippi River Delta Plain between the Bird's Foot South of New Orleans to Vermillion Bay in Iberia Parish, and the adjacent Chenier Plain in southwest Louisiana. The Wicker habitat maps produced dramatic results: 465,000 acres of marsh had been lost in the Mississippi River Delta between 1955-1978, with an average loss of 32.3 square miles per year (20,600 acres). But the Chenier plan in southwest Louisiana was sinking faster. The total loss came to 25,000 acres or 39 square miles a year, twice the rate identified by coastal scientists ten years before.[353]

As the methodologies for studying land loss improved, some scientists using aerial photographs started recognizing another correlation to the land loss phenomenon: the state's web-like labyrinth of canals – thousands of miles of them. By comparing aerial maps, researchers began plotting in the 1970s the conversion of wetlands to open water as a result of canal construction. In 1983, another study, using Wicker's 1980 mapping study and earlier data, suggested that canals were causing local submersion of wetlands. The density of navigation and oil pipeline canals in a given geographical area was directly proportional to high rates of land loss, especially in younger, abandoned deltas, such as Terrebonne and Plaquemines parishes. The question became whether canals contributed to land loss not only directly, but indirectly. The later implication would become a major point of contention and controversy that mired restoration science in a political quagmire for decades in Louisiana. One issue was how to measure direct or indirect causes of land loss caused by canals. In basic terms, land loss meant converting wetlands to open water. The next issue concerned the myriad ways in which canals could be potentially harmful to marshes, which bled into questions of horticulture, hydraulics and invasive species. Canals opened saltwater channels into fresh and brackish marshes. This had to have some effect on plant and marine ecology. Canals also entrapped water behind unnatural ridges caused by dredged "spoil ridges" stacked along the edges of canals during the excavation process. And then, what of the oil pipelines themselves whose subterranean leaks and ruptures caused unknown havoc on the regional ecology? Still, an even thornier question related

[353] Karen M. Wicker et al., "Mississippi Deltaic Plain Region Ecological Characterization: A Habitat Mapping Study: A User's Guide to the Habitat Maps," FWS/OBS-79/07 (United States Fish and Wildlife Service, Office of Biological Services, May 1980), https://catalog.hathitrust.org/Record/007402320.

to the fact that this growing web of canals – which today amounts to more than 14,000 miles – resides on private property whose landowners were often absentee owners who received oil and gas royalties. They may have a vested interest in resisting any sorts of claims of culpability in coastal erosion by oil and gas interests. An estimated 80 percent of Louisiana's coastal lands are privately-owned.[354]

Canals

Louisiana's canal network can be divided into five types: drainage, trapping, logging, petroleum and transportation. All of these provided access to the resources in the marsh-swamp complex. Historic maps indicate marsh and swamp drainage ditches were excavated as early as 1720. Such watercourses helped drain agricultural land and extract cypress timber. The earliest available maps indicate drainage channels were the first artificial waterways used in resource exploitation. They were built by the French for land drainage but also served as drainage and access channels. Coastal dwellers cut small, narrow marsh passageways called "pirogue trails" or traînasse trapping ditches for quick access to their traps and an easy way to move furs and other supplies. Trappers had complete freedom to dig as many canals as needed to work their land efficiently. Hence, the most intensive trapping networks prior to the 20th century developed in muskrat and nutria feeding areas. By 1915, as muskrat fur became fashionable, pelts increased in value and trappers extended their hunting ditches into muskrat habitat. Trapping canals connected fields to camps, where the animals were skinned and dried. During this early period, a

[354] Jim Wilkins et al., "Preliminary Options for Establishing Recreational Servitudes for Aquatic Access over Private Water Bottoms," submitted by the Louisiana Sea Grant College Program in response to House Resolution 178 of the Louisiana Legislature (Louisiana Sea Grant, March 1, 2018), http://www.laseagrant.org/wp-content/uploads/LSG-Coastal-Access-Report.pdf.

good trapper could catch up to 200 muskrat a day.[355] In good trapping years, demand for fur was so high that many land owners and fur buyers hired men to work all year cutting traînasses. A string of men working a section of ditch cost about $10 to $15 dollars per mile. The channels were small, but effective in the trapper's efforts to catch muskrat, mink, otter, raccoon and nutria (which were introduced into the United States from Argentina in 1937 and are now an invasive species).

Mudboats were utilized to excavate ditches west of Vermilion Bay but were not employed east of the Bay. There, men used shovels, rakes and sweepers until Wash Rodrigue at Larose, around 1933, invented the "ditch digger." In the Deltaic Plain, this new tool effectively cut trails in the floating vegetation and high organic soils.[356] A floating vessel 20-feet-long and five and a half feet wide, it is powered by an inboard engine. It houses two bow-mounted 36-inch rotating cutting blades designed like an airplane propeller capable of excavating a six-foot-wide, six-inch-deep channel. The propeller cuts the vegetation and at the same time pulls the boat through the marsh. As long as the machine operates in at least five inches of water, it can cut traînasse.

Canal Excavation by Industry: Sugar, Timber and Oil

In order to remove cypress from the swamp, the lumber industry built navigable connecting canals through which "pull-boats" dragged large stands of timber that left still visible scars. The sugar and timber industries collectively decimated the Louisiana cypress swamps as land reclamation projects using levee and drainage programs coincided with the rise in the mid-

[355] Donald Wayne Davis, "Louisiana Canals and Their Influence on Wetland Development" (PhD diss., Louisiana State University and Agricultural & Mechanical College, 1973), https://biotech.law.lsu.edu/blog/Don-Davis-Dissertation-on-South-Louisiana-Canals.pdf.
[356] Davis, "Louisiana Canals."

19th century of major sugar plantations. Wetland Reclamation Techniques were based on a system of levees, internal drains and pumping plants. Once the area to be reclaimed was defined, a large "dredge-boat canal" at least 25-feet-wide and five-feet-deep was constructed around the project's perimeter. In building these canals, the dredged spoil was used as a protective levee with a height of five to six feet and a top width up to 12 feet. When the boundary canals and levees were completed, the internal drainage network was constructed.[357]

The sugar industry and its subsequent demand for wood-powered steam in the mid-19th century further decimated the state's Old Growth Timberlands. The introduction of the railroads also provided direct access to logging – while disrupting the ecology of the marsh through levee spoil banks that impounded water. As the cypress were depleted, the practice ended, leaving only the canals as evidence of this economic activity. However, the collapse of the cypress industry coincided with discoveries of petroleum and natural gas along the coast. After 1930, oil companies began to use canals in their work, thereby changing the transportation patterns along the coast. These patterns were further altered with the completion of the Gulf Intracoastal Waterway, which, along with the Mississippi, has become the dominant water route in the state.

According to Oliver Houck,[358] it was the Seneca Nation along the Mississippi River who showed Hernando De Soto the viscous springs they used to gum cracks in their boats and for "medicinal properties." Oil bubbled up from seeps in the Gulf of Mexico and salt domes in the ground. "If you were traveling in Louisiana, they would appear before you as a guiding light.

[357] Davis, "Louisiana Canals."

[358] Footnote: Houck was recently awarded the American Bar Association's 2019 Lifetime Achievement in Environmental, Energy and Resources Law and Policy.

They looked like balls of fire drifting up from the ground. They bounced off fence posts, sometimes lingering to play with the airy arms of Spanish moss hanging in the trees."[359] They left "wisps of methane in the air, exploding, usually in tiny pockets, once big enough to set an entire island on fire for several months." Oil was sold by enterprising Americans as a tonic. It was used to lubricate wagon wheels. Europeans used oil for streetlights and the manufacture of kerosene. Salt domes were early signals for oil. The stratified sediment layers and faults contained vast pools of petroleum. "In the late 1890s, Capt. Anthony Lucas came to Avery Island to manage the salt works there and discovered that along with the salt came pockets of black goo: petroleum."[360] "Five Island" salt domes – Jefferson Island, Avery Island, Weeks Island, Cote Blanche Island, and Belle Isle – lie in a straight line near the gulf between Chenier Plain and the Mississippi Deltaic plain. Some salt domes are as high as 100 feet above sea level. They served as landmarks for early explorers. Lucas and a wildcatter named W. Scott Heywood struck a lode near Beaumont, Texas, whose oil gusher shot 185 feet in the air and raged for seven days, sending oil men on a frenzied hunt for salt domes in Louisiana. Louisiana's first gusher spouted in September of 1901 outside of Jennings, La. about 45 miles from Lake Charles. That initial find produced 80,000 barrels a day, and later resulted in a labyrinth of pipes and refineries up and down what is now Interstate 10 in southwest Louisiana.[361]

Pipelines were constructed to get the crude to rail and barges along the Mermantau River. The oil was stored in earthen pits. Other discoveries followed in northern Louisiana – in Caddo Lake in 1906 and Monroe in 1912. And by the 1920s came the first lease sales by the

[359] Oliver A. Houck, "The Reckoning: Oil and Gas Development in the Louisiana Coastal Zone," *Tulane Environmental Law Journal* 28, no. 2 (Summer 2015): 186.
[360] Jason P. Theriot, *American Energy, Imperiled Coast: Oil and Gas Development in Louisiana's Wetlands* (Baton Rouge: Louisiana State University Press, 2014), 17.
[361] Theriot, *American Energy*, 17.

state of Louisiana along the southern coastal parishes. Newer technology increased finds, including deep-seated domes that lay thousands of feet below the surface, which required opening the remote marshes to equipment. Initially, oil companies built board roads to reach remote locations through the floating marsh. Texaco built a series of plank roads across the *floatant* to develop its Paradise Salt Dome Field, 25 miles west of New Orleans. Muskrats constantly ate away at the vegetation, and the plank roads could not withstand the heavy loads from trucks and equipment, forcing the roadbed to break through the marsh crust and plunge into the water.[362]

Shell's Gibson field, 15 miles west of Houma and into the swamp, required 40 men who labored for two months in stagnant muddy water to build a board road of half a million board feet of lumber and one thousand pilings. The board road production was likely supplied by local mills and a vanishing stock of Old Growth Timber. As the supply of board roads diminished, their effective reach was also limited. Board roads could not reach into the interior of the swamps, so the oil companies looked to other methods such as cutting through the marsh and hauling supplies by tugboat. Tugboats hauled barges of oil from one bayou to the next through dredged canals. Eventually, pipelines connected offshore discoveries to onshore processing and transportation facilities. The pervasive use of Rodrigue's ditch digger allowed oil companies to cut trails in floating vegetation and high organic soils. In the 1930s, oil companies were using both navigational canals and dredging canals in their work – which was aided by the completion of the Gulf Intracoastal Waterway.[363]

Floating drill barges began appearing in early 1930s. Texaco's Giliasso (1933) was a submersible drilling barge. These "floating derrick" drill barges became the industry standard for

[362] Theriot, *American Energy*, 17–20.
[363] Theriot, *American Energy*, 22.

the area. They were towed by tugboat and made ready for operation within 24 hours if a wide access canal was dredged. The first drill barge's well at the Lake Pelto salt dome in Terrebonne Parish reduced operating time by 20 percent. The land was leased by Louisiana Land & Exploration Co., one of the largest wetlands holding firms in the region, a firm that originally trafficked in Muskrat furs.

> "Once the barge rig arrived on the scene, the industry began an unprecedented construction of canals through the wetlands to facilitate marsh drilling, transportation, and production operations. Canals had been built in the region before, but nothing on the scale of the oil industry's rapid expansion into the coastal wetlands. Using barge-mounted draglines to dig access canals on the flanks of salt domes was easier than laying board roads. There were no regulations to control the number or size of canals."[364]

By the early 1950s, the industry had excavated 100 miles of canals, which had been approved by the landowners and permitted by the state mineral board. At Bayou St. Denis Field, 15 miles west of the Mississippi River near the town of Lafitte, they realized that barging through existing canals was cheaper than hauling supplies by truck. In some cases, dredging was favored over available roads. In the 1930s, it cost 15 cents per cubic yard to dig a canal and $3-$5 per foot for large channels.[365]

A dredge machine operated by J Ray McDermott using a ten cubic yard bucket crane, could clear 20,000 cubic yards of marsh in a day. The State Mineral Board required no disposal of dredged material except in cases where the canal crossed navigable streams. So, the material

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[364] Theriot, *American Energy*, 23.

[365] Theriot, *American Energy*, 23. In their exploration programs, canals were constructed to simplify the problems of drilling, maintenance and logistics. These channels have become an integral part of the landscape and, due to the constant addition of well sites, the system continues to grow. This canal network — partly by design — has become the principal transportation system, in every regard, in the state's oil-rich marsh and swamp. Louisiana's coastal area is crisscrossed, ringed, cut and otherwise dominated by a massive grid of man-made canals. Interest, time, technology and population characteristics have changed, but canals endure, many for over 150 years. Their influence continues to have a decisive and cumulative impact on the wetlands environment.

was usually stacked along the side of the canal, creating spoil ridges.[366] These resulting "spoil" ridges also known as "spoil banks," according to findings by Eugene Turner, William W. Scaife, and Robert Costanza, blocked natural drainage and the flow of water and sediment deposition across the marsh. By altering natural hydrologic processes, the canals and spoil banks created conditions for excessive "ponding" that drowned marsh areas adjacent to the canals. Turner's 1979 article, "Land Loss in Coastal Louisiana," made the first inquiries into the relationship between canal spoil ridges and ponding effects. They argued water ponding was transforming marshes adjacent to canals into open water. Land loss, the study found, was directly proportional to canal density in certain areas. "Canals also allowed salt water from the Gulf tides to seep into the coastal interior, well beyond the protective natural barriers, killing cypress swamps and freshwater marsh vegetation and increasing subsidence in these areas."[367] Gagliano wrote as far back in 1973 that canals threatened to "seriously upset natural circulation patterns and water chemistry." Canal excavation had made "the petroleum industry the greatest wetland canal builder," he said. He cited the continual addition of new channels without any effort to refill the old ones. "When a canal is cut, it often becomes a permanent feature." Single canals became webs of canals that coalesce into small lakes and bays.[368]

Empirical Observations

In practice, habitat loss associated with industry canal and pipeline dredging was a well-known occurrence for much of the 20th century. As early as 1913, Tulane-educated

[366] Two basic types of equipment were used: steam bucket dredges and draglines. Using a bucket dredge, large channels were excavated. Draglines dug smaller channels that often connected to the main canal. Both tools left a distinct "continuous embankment of spoil on one or both sides of the excavation." Gagliano, "Canals, Dredging," 4.
[367] Theriot, *American Energy*, 148.
[368] Gagliano, "Canals, Dredging," 1.

conservationist Percy Viosca, who was head of the Louisiana Department of Conservation (later renamed the Louisiana Department of Wildlife and Fisheries) began sounding the alarm through two separate administrations of state government. By 1925, Viosca was proselytizing about disappearing wetlands and salt-water intrusions from navigation and drainage canals and other measures. “Man-made modifications in Louisiana wetlands, which are changing the conditions of existence from its very foundations, are the result of flood protection, deforestation, deepening channels[,] and the cutting of navigation and drainage canals,” he argued. [369]

The oil and gas canals that were dredged for laying pipelines or for granting access to well sites were disrupting various habitats. An agency biologist reported in 1940 that, “Through the digging of canals[,] good muskrat country can be readily and quickly ruined.”[370] It wasn’t just muskrats being affected. Oyster beds were also being fouled, which was a larger problem because oysters represented a growing industry. The state began leasing oyster seed grounds along the coast in the first decade of the 20th century, and by 1960, it had leased over 70,000 acres. The number climbed to 400,000 acres by the end of the 20th century. Gulf oysters accounted for two-thirds of the nation’s domestic oyster supply.[371] At a 1953 conference on oil and gas impacts, James McConnell, the DWF's oyster and water bottoms chief, provided empirical observations about the disruptions caused by spoil ridges. When the ridges are placed along the sides of canals, he noted that current flows are lessened if not stopped entirely, which changes the ecology of a given area. While he appreciated the value of the oil industry to the state, he continued, everyone should “recognize that there are other very old industries here ... that are now being seriously affected by these mineral operations.”[372]

[369] Houck, “Reckoning,” 5.
[370] Houck, “Reckoning,” 8.
[371] Houck, “Reckoning,” 8.
[372] Houck, “Reckoning,” 8.

Meanwhile, scientists in and out of academia were also documenting the phenomenon. A 1956-57 biennial report by the Louisiana Wildlife and Fisheries Commission noted “drastic increases in salinity” and “rapid deterioration” of the marshes around Barataria Bay Waterway. In a 1959 report on drilling in the Rockefeller Wildlife Refuge and Game Preserve, an area supposedly demonstrating the compatibility of oil and wildlife for many years, a Department of Wildlife and Fishery (DWF) researcher noted that the more than 20 miles of access canals there, within a few years, had enlarged by 20 percent. In the early 1960s, a report out of Texas concluded that canal dredging could also be a reason for increased salinity in the Louisiana marshes. Dr. Van Lopik of LSU echoed the findings of DWF scientists that “many oil company canals, with their flanking spoil banks, cross the marsh giving rise to changes of drainage[,] and hence, vegetation. Thus, relatively minor modifications in marshland drainage may create many unforeseen problems.” By 1971, St. Amant of the DWF was even more emphatic, pronouncing that the canal effects for the most part were “irreversible and permanent” and represented a “true ecological upheaval.” By 1973, even the Army Corps of Engineers recognized that “onshore pipeline construction may cause irretrievable marshland loss.”[373]

More detailed studies identifying the mechanics and extent of the damage soon followed. In 1983, a single article cited the work of more than 20 professionals in the field, each investigating one aspect of canal damage or another. “These reports were published and available to all. No one could fairly claim surprise by their findings, then or now.”[374] Turner’s team called for limits on dredging permits by the state and the Corps of Engineers, as well as new construction techniques and requirements for backfilling new and existing canals. “It wasn't arm waving. You had data all across the coast,” said Turner. “We had maps of change. We had maps

[373] Houck, “Reckoning,” 8.
[374] Houck, “Reckoning,” 9.

of little ponds, big ponds, straight lines. Finally, people were looking at this as a whole system. So it fit. It was a whole coastal view. There were differences in there, but, my God, every place on the coast was losing land."[375]

Prior to Turner's work, canal spoil ridges or banks were seen as beneficial for hunting and fishing. Hunters would burn the grass on one end of the muddy strip and shoot the animals retreating towards them. Some landowners would build and lease camps on spoil banks. In 1971, a group applying for a six mile pipeline through the marsh in southern Louisiana at Pecan Island was approved by the interstate regulatory Federal Power Commission, who found that whatever disruption caused by the canals would be more than offset by improved deer habitat and access to trapping grounds provided by the spoil banks.[376] Some landowners believed that the spoil banks would protect them from hurricanes. "In the background, there was always the possibility that oil companies would want to re-access the wells for more production."[377]

Turner and Donald Cahoon conducted another major study in 1987 entitled, "Causes of Wetland Loss in the Coastal Central Gulf of Mexico" which became a definitive scholarly work on the science of oil field canals and wetland impacts. The two-year study made the first serious attempt to quantify the land loss indirectly attributable to pipeline construction in the wetlands. The study found that oil pipelines, accounted for approximately four to five percent of the total land loss from 1955-1978. The team also analyzed the few backfilled canals in the region and determined that backfilling reduced direct impacts of the canals by as much as a third.[378] But indirect effects were harder to quantify. A "waterlogging" effect in an adjacent marsh occurs when water is unable to naturally drain back toward the Gulf and the saltwater begins to change

[375] Theriot, *American Energy*, 149.
[376] Theriot, *American Energy*, 96.
[377] Houck, "Reckoning," 9.
[378] Theriot, *American Energy*, 151.

the chemical and biological conditions of that marsh soil. Over a short time, the marsh vegetation will deteriorate and soils oxidize, leading to another cause of land loss – subsidence. Over time, the internal ponds will enlarge. Pipelines that ran into the marsh from Outer Continental Shelf drilling, they estimated, was responsible for 8-17 percent of land loss.

"There are quite a few thousand abandoned canals. If they were officially abandoned, (the state) could have them backfilled, but they didn't do it. There are a lot more that are practically abandoned but not legally abandoned."[379] Meanwhile, landowners, many of whom are absentee landowners don't want intrusion on their property of any kind, he said. Once, Jack Caldwell of the Department of Natural Resources proposed that the state use a small dredge to fill in some canals, but he could never fund it. "They couldn't get through the threshold that if you say you're going to do it, it means someone will be blamed. You have to come up with cause and effect which means blame, but that means nothing gets done"[380] An industry field study supported the Turner analysis. From 1979 to 1980, the Louisiana Offshore Oil Port excavated a five-mile pipeline canal, which was then backfilled. Field studies done in 1985, a relatively short time later, showed a third of the spoil areas to be between 23 percent to 75 percent covered with renewed marsh. Although the backfill had not yet fully restored original conditions, the corrective resulted in shallow water areas with higher habitat value for fish and wildlife compared to unfilled canals.[381]

The presumption that federally permitted pipelines in Louisiana caused significant land loss led the U.S. Minerals Management Service (MMS)[382] to initiate coastal impact studies of its own. MMS published Pipeline Impacts on Wetlands: Final Environmental Assessment. The

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[379] Eugene Turner, in conversation with the author, 2017.
[380] Eugene Turner, in conversation with the author, 2017.
[381] Houck, *American Energy*, 20.
[382] The federal agency established in 1982 to manage the development of the petroleum resources in the deep waters.

authors of the report found that during the period of 1951- 1982, the government approved 72,870 miles of pipeline rights-of-ways on the Outer Continental Shelf in the Gulf of Mexico. Approximately 130 of these pipelines made landfall on the Louisiana coast. The report looked at five pipelines built between 1978 and 1984 and determined that pipelines and canals did have major impacts on marsh vegetation. Fast forward to 2009, the same agency renamed as the U.S. Bureau of Ocean Energy Management (BOEM) said that construction of Outer Continental Shelf-related pipelines can cause intense habitat changes and conversion to open water locally. It found that the practice of direct dredging opened areas to saltwater intrusion and that spoil banks altered flooding patterns. But impacts associated with specific pipeline canals varied. Some pipelines contributed to habitat loss and others didn't, depending on the quality of mitigation applied and the kind of habitat that is crossed. "Our analysis also suggest that the cumulative effect of hundreds of pipelines contributes to regional trends in land loss."[383] In 2010, a backfilling test on old oil and gas access canals in the Jean Lafitte National Park's Barataria Unit compared success rates in two sections, one restored simply by pushing in the spoil banks, and the other by adding soil from other sources to hasten the process. Both demonstrated progress. Somewhat unexpectedly, the test area where the spoil banks were simply pushed in recovered at the same recovery rate as the section with the soil enhancement.

[383] James B. Johnston, Donald R. Cahoon, and Megan K. La Peyre, technical summary for "Outer Continental Shelf (OCS)-Related Pipelines and Navigation Canals in the Western and Central Gulf of Mexico: Relative Impacts on Wetland Habitats and Effectiveness of Mitigation" (OCS Study MMS 2009-048), access no. 14961 (US Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA, September 2009), 3, https://www.boem.gov/ESPIS/4/4875.pdf.

Low Tech

Turner also argued that backfilling old canals costs a fraction of other proposals. Several times, he said, the EPA argued for pilot projects to backfill canals. His study with Dr Sikora in 1985 looked at all known examples of backfilling from 1979 to 1984 and concluded that, where properly done, the technique restored natural hydrology and began the process of in-fill of the open canals. In 1987, Neill and Turner did a follow-up study of some 30 sites, confirming further progress. In 1994 and 2004, the 10-and 20-year marks, more follow-up studies showed more progress still. In 2005, an analysis by Turner's graduate student, Joel Baustian, showed wetland recovery in 65 percent of the spoil areas and 25 percent of the formerly open canals.[384]

The DNR's Coastal Management Division made one attempt to implement backfilling. Prompted by the Sikora and Turner study in 1985, program administrator Joel Lindsey forwarded it up the chain to the DNR Secretary with a memorandum summarizing its conclusions: "even partial backfilling" of a canal was beneficial, creating a shallow lake occupied by marsh-typical organisms and reducing "water logging" in the adjacent wetlands, which allowed "marsh plant re-vegetation to occur."[385] The field work was characterized as "done in a professional manner," "outstanding," and "excellent." Criticisms received on the report were minor and would be addressed in the final version. Continental Land and Fur, a major royalty owner, opposed, as did the state DWF, which concluded that "several recommendations stated in the report cannot be justified" and requested that "the report not be published in a final form until our concerns are addressed."[386]

[384] Joseph. J. Baustian and R. Eugene Turner, "Restoration Success of Backfilling Canals in Coastal Louisiana Marshes," *Restoration Ecology* 14, no. 4 (December 2006): 636–644.
[385] Houck, "Reckoning," 21.
[386] Houck, "Reckoning," 21.

Meanwhile, industry contested the applicability of a Louisiana law that mandated restoration of wetlands to their pre-existing condition, called section 705. Backfilling, the industry argued, was only required “upon cessation of use for navigation purposes.” A company might at some time want to go back and work over a rig or a drill in a different direction. And secondly, the canals in the meantime were “navigated” regularly by Louisiana fishermen. The arguments stymied backfilling within the DNR's Coastal Management Division. Then DNR announced a “temporary moratorium” on the requirement, which had rarely been implemented.[387] The Turner and Sikora study was sent for review to LSU's Center for Wetlands Resources, which found it to be inconclusive. The moratorium was never lifted. Nor are there any projects or studies in the state’s current Master Plan for Coastal Restoration to test backfilling.

Today, the 30 projects surveyed by Turner and his colleagues over the past four decades represent the sum total of all backfilling done in the Louisiana coastal zone. That’s fewer than 10 restored miles of more than 14,000 miles of canals from the Texas border to Mississippi. Following up in 2014, a master’s in environmental management project by a Duke University student examined backfilling potential coast-wide and its projected costs. It found over 100,000 acres damaged by canal banks, of which nearly half had the necessary features for success. “Based on the highest cost per acre estimate available,” this acreage could be successfully backfilled for $8.7 million. By comparison, the state's 2017 iteration of the Master Plan outlined a suite of techniques (none of them backfilling) to restore an area slightly less than 20,000 acres, at an estimated $3 billion. Which is almost four times the cost per acre. Nearly four times the

[387] Houck, “Reckoning,” 22.

cost per acre, for techniques less proven than simply pushing in the spoil banks and letting nature do the rest.[388]

In Turner's view, backfilling canals with material from existing spoil banks would restore some of the natural hydrological function at a low cost-benefit ratio similar to other individual projects such as sediment trapping (terracing), shoreline protection (rocks) and mimicking natural "breaks," man-made crevasse plays or openings in the levee. In a letter to the editor in the Times-Picayune in 1997, the President of Louisiana, Land and Exploration Company called Turner a "two-dimensional thinker," noting that canals account for only 10 percent of erosion.[389] Other scientists objected to Turner's methodology, arguing that complex geological processes in the delta could not be overlooked. Subsidence and sea level rise were essential components, along with habitat type, soil condition and sediment availability. Sediment diversions from the river as outlined in the Master Plan was the best hope for the coast going forward, they argued.[390]

Subsidence

While canals cause erosion through saltwater intrusion and water "ponding," there is another correlation between deep well extraction and the disappearance of the coast. In the early 2000s, scientists began studying the impacts of drilling and extraction on natural subsurface faults. Decades of fluid withdrawal from oil and gas reservoirs, some believed, had increased

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[388] R. Eugene Turner and Giovanna McClenachan, "Reversing Wetland Death from 35,000 Cuts: Opportunities to Restore Louisiana's Dredged Canals," *PLoS ONE* 13, no. 12 (December 2018): e0207717, https://doi.org/10.1371/journal.pone.0207717
[389] Theriot, *American Energy*, 174.
[390] John W. Day Jr. et al., "Patterns and Processes of Wetland Loss in Coastal Louisiana Are Complex: A Reply to Turner 2001. Estimating the Indirect Effects of Hydrologic Change on Wetland Loss: If the Earth Is Curved, Then How Would We Know It?" *Estuaries* 24, no. 4 (August 2001): 647, https://doi.org/10.2307/1353265.

subsidence rates, particularly in localized areas. Robert Morton, a geologist with the United States Geological Survey (USGS) who specialized in subsidence, analyzed what he called "hotspots" in Terrebonne Parish. He argued that a correlation existed between petroleum removal below ground and wetland loss in the marshy areas. According to Morton, an increasing amount of subsidence in these hotspots was directly attributable to the increase of oil and gas extraction during the same period.

Morton had worked as a petroleum geologist for a major oil company, with field assignments both offshore and in Lafourche Parish, where his later studies would center. He had witnessed subsidence firsthand, noting at times the pipe casing collapsed, and he did not expect his findings for the USGS to be dramatic or controversial. He and two colleagues reported hydrocarbon production and resulting pressure losses in several large South Louisiana fields, each pumping out as much as 920 billion cubic feet of gas, 55 million barrels of oil, and 87 million barrels of brines and related waters, which were very big numbers. Production showed large spikes, peaking in the 1970s, while pressure in the reservoirs fell, ultimately to near-zero, which is when the surface began to sink. The highest subsidence rates closely tracked the maximum rates of fluid extraction. The report concluded that, "The primary factor causing accelerated interior wetland loss in south central Louisiana between the 1950s and 1970s was accelerated subsidence and probably fault reactivation induced by rapid, large volume production of hydrocarbons (primarily gas) and formation water."[391]

During the subsequent periods of production, which has lasted some 60 to 75 years, individual fields have produced on the order of hundreds of billions to trillions of cubic feet of

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[391] Robert A. Morton, Noreen A. Buster, and Dennis M. Krohn, "Subsurface Controls on Historical Subsidence Rates and Associated Wetland Loss in Southcentral Louisiana," *Transactions: Gulf Coast Association of Geological Societies* 52 (2002): 767.

natural gas, tens of millions of barrels of oil, and tens of millions of barrels of associated formation water with the produced water substantially exceeding the volume of produced oil. They concluded with an observation seemingly directed to Louisiana itself, that “despite numerous field studies around the world since the 1920s and acknowledgment by the petroleum industry that hydrocarbon production can induce subsidence,” the presence of this same phenomenon in the Mississippi Delta region "has been largely ignored.”[392] One early allusion to the problem in Louisiana dates back to an Army Corps of Engineers environmental impact statement on crude oil and natural gas production in 1973, noting that “rapid dynamic local subsidence has been noted in some neighboring areas to the west,” the cause of which “appears to have been withdrawal of gas, oil, water, salt, or sulfur from substrata.” Nonetheless, it concluded, “Local subsidence has never been extensive enough in Louisiana to be considered significant concerning water changes in the total ecosystem.”[393]

Hydrocarbon extraction has been associated with significant subsidence elsewhere. A well-known example is in the Los Angeles area where two production fields were linked to substantial drops in the land above. Long Beach was once known as the “Sinking City” where 3.7 billion barrels were extracted from the Wilmington Oil Field, which created a 20-square mile “subsidence bowl” of up to 29 feet deep around the Port of Long Beach and the coastal strand of the City of Long Beach. In the 1950's, water injection was shown to re-pressure the oil formations, stop the underground compaction as well as surface subsidence, and increase oil recovery – which ultimately led to the California Subsidence Act in 1958.[394] Subsidence

[392] Robert A. Morton and Julie C. Bernier, “Recent Subsidence-Rate Reductions in the Mississippi Delta and Their Geological Implications,” *Journal of Coastal Research* 26, no. 3 (May 2010): 559, https://doi.org/10.2112/jcoastres-d-09-00014r1.1
[393] Houck, “Reckoning,” 9.
[394] City of Long Beach, “Subsidence,” accessed September 27, 2018, http://www.longbeach.gov/lbgo/about-us/oil/subsidence.

episodes occurred in Venezuela's famed Lake Maracaibo and sites in Russia, Indonesia, Malaysia, and the Norwegian North Sea, “causing concern for platform safety.” Experiences in the Netherlands have led to regulations requiring oil companies there to routinely monitor and report rates of subsidence relating to extraction, as they go forward.[395]

Morton also correlated land loss in Louisiana to deep well withdrawal, which he theorized may trigger fault activity among the two fault lines that crisscross the lower portion of the state. That research is controversial and largely discredited under the argument that oil and gas wells at 17,000 feet below the surface are much deeper than the analogous sites he considered in Galveston and California. Opposing researchers argue that most of the subsidence in Louisiana is closer to the surface and likely has more to do with organic compaction, and ponding from water entrapped behind canal spoil banks, rather than depressurized wells or drilling-caused fault activity. Yet few follow-up studies have been pursued. Perhaps no one wants to be attacked by a hostile energy lobby. “He spent his career looking for the smoking gun and never found it,” according to Denise Reed, the former chief scientist at the Water Institute of the Gulf. Other geologists say there’s not enough data.

Today's petroleum lies in layers of sand pressed under layers of mud and caps of salt. The sand grains themselves are irregular, packed together like jacks in a box and buffered by the petroleum and brines. Pumping out these fluids reduces the total mass below ground. It also reduces the pressure of the formation that kept the roof up. And it removes the buffer fluids that keeps the sand grains apart, which now jam more tightly together. The result is that the strata above begins to sink. It may also depressurize formations along fault lines, triggering shifts. The shallower the wells, “the more localized and dramatic these effects.” The impacts of deeper wells

[395] Houck, “Reckoning,” 9.

are less pronounced, but their impacts may actually extend widely.[396] "In brief, we were data short and interested-in-getting-it short." A sweep of related literature published ten years later stated that "in the absence of more direct studies," the impacts of subsurface oil and gas extraction "may never be proven."[397] The evidence, it concluded, while suggestive, "remains circumstantial."[398] In 2009, Denise Reed acknowledged Morton's work on subsidence and down-faulting but added the studies were in their infancy. "In some areas fault movements associated with these withdrawals appear to have resulted in a tripling of subsidence rates." Indeed, in some "hot spot" areas of land loss, marsh sediments can be found more than a meter below their natural elevation, suggesting rapid subsidence at rates much higher than the few mm/year associated with the compaction of deltaic sediments.[399]

In 2011, Dr. Alex Kolker of the Louisiana Universities Marine Consortium (LUMCON) presented a new method for calculating subsidence rates and found that these rates do indeed fluctuate in relation to fluid withdrawal. Onshore oil production in the state was 114 million barrels in 1945, soared to 437 million barrels in 1968 and then declined to 55.5 million in 2005 -- which, in sum, tracked onshore subsidence rates directly. "Taken together," the study concluded, "these findings point to a tight coupling between fluid withdrawal, subsidence rates, and wetland loss." Extraction was by no means the sole cause, but it increasingly seemed to be a significant one. In 2014, the most recent piece fell into place with investigations by Dr. Chandong Chang and associates from Stanford University, who discovered that subsidence continued after production had ended. Fluids were apparently leaking back into production cavities from

396 Houck, "Reckoning," 10.
397 Houck, "Reckoning," 10.
398 Houck, "Reckoning," 10.
399 Brendan Yuill, Dawn Lavoie, and Denise J. Reed, "Understanding Subsidence Processes in Coastal Louisiana," *Journal of Coastal Research*, no. 54 (2009): 30, https://www.jcronline.org/doi/full/10.2112/SI54-012.1

adjoining areas. The first blitz of withdrawal lowered surfaces by up to 3.5 inches, followed by another potential 3.5 inches in succeeding years.[400]

As of 2015, approximately 100 trillion cubic feet of natural gas and 12 billion barrels of oil have been extracted from the Louisiana coastal zone. The brines and produced waters that came up with them at least equal the figure for oil. “That removing this colossal volume of material will impact the surface above is supported by the best evidence available from home and abroad, throw in a pinch of common sense.”[401] Morton had to rely on analogic studies in Coastal Texas and other coastal locations because of a lack of available data in Louisiana. “Morton was one of the few in the wilderness asking such questions. Making the science nearly impossible to advance provides cover for industry defenders and skeptics who claim that there is not enough data yet to support the claims.” Pointing to a 50-year-old mandate in California that oil and gas companies re-inject wells to re-pressurize them, “in every other state, that is common practice,” says Houck.[402]

Brady Couvillion, whose work with high definition land and GIS measurements are regularly cited as the authoritative measurement of land loss (which currently checks in at a football field of marsh loss every 90 minutes) said by phone one day that a subsidence study like Morton’s is hard to design and replicate. As for now, Couvillion says, Morten’s correlation does not mean causation.[403] As recent as April of 2019, a petro-geologist with the Louisiana Geologic Survey and president of the New Orleans Geological Society penned an opinion-editorial lambasting a recent decision by the City of New Orleans to join in a lawsuit by an assortment of southeast Louisiana parishes against six oil and gas companies for the loss of the city’s buffering

[400] Houck, “Reckoning,” 11.
[401] Houck, “Reckoning,” 11.
[402] Oliver Houck, in conversation with the author, 2017.
[403] Brady Couvillion, in conversation with the author, 2017.

wetlands. The geologist-cum lobbyist argued that the suit has no merit and takes a punitive approach to an industry that has helpfully shared 3-d seismic data with universities, whose early research has found "many if not most" of wetland loss are directly associated with geological faults.

> The first published study to use industry seismic data came from a cooperative research project between Tulane and the University of Texas at Austin. This study used a 500-square mile, 3D survey in Plaquemines Parish to map 28 geological faults. The study found that most of these faults extended to the surface, and several of them "correspond to abrupt shifts from emergent wetlands to fully submerged areas of open water.[404]

In other words, he said, movement on the faults is causing the wetlands to submerge, not the promiscuous practices by the oil and gas industry itself.

Two schools of Thought and Grass Roots Movement

As the decade of the 1980s wound down, a consensus began to emerge, particularly among coastal experts, that the environmental cost of building the energy corridor had been substantially greater than previously estimated. But there also emerged a disagreement over the main culprits of land loss. While some researchers focused on the actions by the Army Corps of Engineers to manage the Mississippi River, others pointed to the oil and gas industry: its byzantine canals throughout the marsh complex and impacts of hydrocarbon withdraw. Yet it seems just as plausible that they all worked in tandem to create these adverse effects.

The academic community held its first major wetland conference in 1981 to identify the cause of loss and set an agenda to study problems and recommend options. The Coastal Erosion and Wetland Modification in Louisiana Conference confirmed that human activity had

[404] Chris McLindon, "Oil and Gas Geologist: Suing Energy Industry Won't Help Preserve New Orleans," *Advocate* (Baton Rouge, LA), April 16, 2019, https://www.theadvocate.com/baton_rouge/opinion/article_75060ee0-6059-11e9-9e4f-33d83a94e673.html.

“disturbed natural processes” which had for thousands of years maintained an ecological balance between accretion and subsidence.[405] Any acceptance of findings that oil and gas exploration was tied to erosion was actively resisted by the energy lobby and state lawmakers. This despite the fact that much of the research on navigation and pipeline canals used the same principles of natural hydrology as the levee’s theory – which asserted that (like canal ridges) levees disrupt the sheeting flow of sediment deposition. That same year, the state Legislature held a special session and passed Act 41, which formed the first Coastal Environmental Protection Trust Fund with $35 million to fight erosion. It funded research and developed a set of pilot restoration projects to demonstrate the effectiveness of various restoration techniques. The state used the trust fund to provide cost-shares for the Army Corps of Engineers-sponsored freshwater diversion projects. Gagliano worked with state legislatures natural resource committee to develop the first restoration project list, and in the early 1980s, the legislature called for the creation of a coastal master plan. It charged the newly established Coastal Protection Section of the petroleum-friendly Louisiana Geological Survey to develop a 10-year plan and oversee restoration activities. But the project was fraught with mismanagement and a lack of oversight. By 1987, only a portion of the $35 million trust fund had been spent, with most of it going to independent studies. No master plan materialized.

Throughout the 1980s, maps produced by the US Geologic Survey and the US Army Corps of Engineers convinced the public of the need for restoration. Of critical importance during this period was the incorporation in 1988 of a non-profit group, the Coalition to Restore Coastal Louisiana (CRCL), and its publication, “Coastal Louisiana: Here Today and Gone

[405] Theriot, *American Energy*, 133.

Tomorrow?"[406] This groundswell of attention also spurred the Army Corps of Engineers into action. The Corps issued a 1990 report on land loss in the Mississippi Delta Plain using a meta-analysis of independent studies, starting with Gagliano's 1970 study, as well as the Wicker Study and a study by Meyer-Arendt which involved a comparison of various US Geological Survey topographical maps from 1890 to 1967 and aerial photography from 1955-56 and 1978. The Corps of Engineers took pains to demarcate the difference between land and water in what is essentially a sea of mud. They classified as water any area of water having no permanent vegetation visible at the surface. "Permanent vegetation, for purposes of this investigation, is that which is attached to the substrate, not floating vegetation such as hydrilla and hyacinths."[407] The Corps study considered "land loss" to be any land area visible in photography from the 1930's but interpreted as water on later photographic coverages. This included loss from man-made causes as well as loss due to natural processes. Land was simply defined as everything on the photography not classified as water.[408]

The Corps downplayed the net effect of the 300-year legacy of river management on wetland erosion. Instead, the study claimed that most of the man-made loss was the result of dredging activity by oil and gas extraction. "Drill rig location canals and waterways designed to aid navigation account for most of the man-made land loss in the Mississippi River Deltaic

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[406] Coalition to Restore Coastal Louisiana, "Coastal Louisiana, Here Today and Gone Tomorrow? A Citizens' Program for Saving the Mississippi River Delta Region to Protect Its Heritage, Economy and Environment: Draft for Public Review," April 1987, https://www.govinfo.gov/app/details/CZIC-qh541-5-c65-c63-1987.

[407] Louis D. Britsch and E. Burton Kemp III, "Land Loss Rates: Mississippi River Deltaic Plain," Technical Report GL-90-2, US Army Engineer District, New Orleans, Louisiana, April 1990, 9, https://apps.dtic.mil/dtic/tr/fulltext/u2/a220403.pdf.

[408] They summarized that for the 1930 to 1967 period Gagliano, Meyer-Arendt, and Wicker determined a land loss rate of 15.8 square miles per year. Whereas they found during the same period a loss rate of 12.89 square miles per year for the 1930's to 1956-58 period. For the 1955-56 to 1978 period, Gagliano, Meyer-Arendt, and Wicker calculated a loss rate of 28.1 square miles per year. The corps found roughly the same result.

plain."[409] The claim undercut the Corps' credibility by downplaying the effects of their own activity and its contribution to coastal erosion.

The Birth of a Grassroots Response

As residents of southeast Louisiana witnessed the alarming disappearance of their surrounding landscape, where many of them fished and all of them lived, a small but growing group of wetland advocates and conservationists in the 1980s began promoting awareness of the coastal crisis. But like the researchers themselves, they were fragmented and divided on many of the key issues. The great oil bust of 1980 left the south Louisiana extractive economy decimated. In May 1982, newly-elected governor Dave Treen introduced the controversial "Coastal Wetlands Environmental Levee" to tax transportation of oil and gas production that moved through pipelines across state wetlands. Supporters cited the recent scientific evidence by Turner and his colleagues on the harm of canals and argued that the tax would provide reasonable compensation for the environmental cost of building pipelines. But Treen, who was the first Republican governor since Reconstruction, became a cautionary tale for environmental advocates. He targeted the industry rather than the federal government. According to Houck, Louisiana's energy lobby saw to it that he would be a one-term governor. In mass mailings, CEOs urged shareholders, employees, vendors and landowners receiving oil and gas royalties to inform elected officials about potential economic impacts of the bill on the state's leading industry. The mailer said it threatened increases in energy prices, loss of oil field jobs, loss of state revenue and reduced incentives for exploration. After all, for more than 30 years, the state

[409] Britsch and Kemp, "Land Loss Rates," 9.

had promoted activities and permitted them. Treen's bill failed. He lost his subsequent re-election.[410]

Meanwhile, land loss continued at an alarming pace. In the mid-1980s, a new citizen-directed initiative began to coalesce in the southern parish of Terrebonne, where the wetlands account for 70 percent of the parish's land mass. Its disappearance began to alarm the Catholic Church, which grew concerned about the impact of land loss on its parishioners, particularly the fishermen. In the early 1980s, parish leaders launched an educational campaign with brochures, billboards and classes to inform citizens. After Hurricane Juan ripped through the parish in 1985, community leaders saw firsthand how the loss of storm-buffering barrier islands and marshes led to increased storm surges and flooding onshore. Moreover, the introduction of marsh management projects on private property using weirs to regulate water flow, which was a restoration effort supported by the state, led to closures of fishing grounds. The impact of environmental and economic decline created a community crisis that led to the formation of the Louisiana Coastal Wetlands Interfaith Stewardship Initiative.

Jim Tripp, the general council of the Environmental Defense Fund (EDF),with considerable experience litigating damages caused by navigation canals, teamed up with Oliver Houck, who was a member of the National Wildlife Federation, as well as the southern Louisiana arch-diocese and a number of coastal scientists and researchers who had been studying the area for decades, to write a citizen plan for restoration.[411] They called themselves the Coalition to Restore Coastal Louisiana (CRCL), which for the first time brought many of the groups and opposing viewpoints under a unified agenda. The CRCL was the precursor to today's coastal planning advocates. The Coalition's capstone report finalized in 1989, entitled, "Here

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[410] Houck, "Reckoning," 26.
[411] Houck, "Reckoning," 255.

today Gone Tomorrow" (mentioned earlier), which recommended 19 action steps for reversing coastal erosion. They included building fresh water diversions from the Mississippi River, bringing regulatory pressure to backfill petroleum canals, establishing a pipeline user fee, establishing a restoration management office in state government and phasing out new canal construction in the marshes.[412] The plan was endorsed by a diverse group, including the Catholic Social Services, League of Women Voters, Natural Resources Defense Council, a number of local chambers of commerce, National Wildlife Federation, the Louisiana Interchurch Conference, Orleans Audubon Society, Greater New Orleans Tourist and Convention Commission, and Houma Nation.[413]

In the report, the authors asserted that 40 percent of the nation's wetlands were under threat and were receiving little national support. "We need to think more boldly, agree more collectively and act more swiftly if we hope to retain more than a few museums of marsh along the Gulf of Mexico." A letter from Bishop Boudreaux to the Houma-Thibodaux Diocese stated, "We are morally obligated, as stewards of God's gifts, to protect and restore our coastal wetlands."[414] However, the report coincided with another downturn in the oil and gas industry that had drastically cut state revenues and left the oil industry in disarray and Louisiana's oil-driven economy in shambles. The coalition's goals seemed overly ambitious. Yet many of its recommendations are now familiar correctives in the current Master Plan for Coastal Restoration: using sediment and freshwater from the Mississippi River to slow land loss, pumping dredged materials from the river channel into coastal marshes and stabilizing barrier islands through vegetation, natural processes and beach nourishment. Other recommendations

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412 Theriot, *American Energy*; Houck, "Reckoning"; Coalition to Restore Coastal Louisiana, "Coastal Louisiana, Here Today."
413 Coalition to Restore Coastal Louisiana, "Coastal Louisiana, Here Today," 1.
414 Theriot, *American Energy*, 144.

never made it into implementation once the oil industry became an active partner in selling coastal restoration, such as the "development of alternative means of access to oil and gas sites within the coastal zone" and "marsh restoration by means of plugging and backfilling strategic canals and water management" including a prioritized schedule for backfilling abandoned or little used canals.[415] The citizens report concluded in its assessment that oil and gas production and construction of navigation and access canals were major causes of subsidence. "While any single oil and gas canal…may have only a minor effect, the cumulative impact of these canals on the coastal zone is devastating."[416]

At the time, new GIS imagery data was providing convincing evidence connecting Louisiana wetland losses to a labyrinth of access and pipeline canals. Studies by the Corps, Mineral Management Service, and the EPA all confirmed significant industry impacts. Even the Wall Street Journal published a series of articles on Louisiana and the oil and gas industry, the third of which was captioned, "Oil's Legacy: Louisiana Marshlands, Laced with Oil Canals, Are Rapidly Vanishing."[417]

Opposition from Oil and Gas

The Coalition's recommendations struck a nerve with the oil and gas interests. Instead of accepting these findings, the oil and gas lobby fought the citizen coastal plan. "As they had done since the beginning of the crisis, oil and gas companies and their political supporters joined big

[415] Coalition to Restore Coastal Louisiana, "Coastal Louisiana, Here Today," 17–18.
[416] Houck, "Reckoning," 26; Coalition to Restore Coastal Louisiana, "Coastal Louisiana, Here Today," 16.
[417] Houck, "Reckoning," 26.

landowners in resisting efforts to impose regulatory oversight."[418] They challenged the science, even arguing that some oil and gas impacts were exaggerated, temporary or even beneficial.[419]

The Louisiana Land & Exploration Company and the Continental Land & Fur Company, two of the largest coastal landowners, had a vested financial interest in maintaining and even expanding oil and gas development activities on their properties. Nationally, oil and gas corporations were challenging new federal wetland protections across the board. In 1989, sensing new federal regulations in the wings, oil giants Exxon, Shell, Conoco, Texaco, BP America, and Arco Alaska teamed up with mining and real estate companies to form a lobby ironically called the National Wetlands Coalition, which successfully lobbied two Louisiana congressmen, Jimmy Hayes and Billy Tauzin, to introduce the "Comprehensive Wetlands Conservation and Management Act of 1995," which removed the EPA entirely from wetland protection.[420] The Louisiana-based energy lobbying firm, Mid-Continent, funded a report from three LSU geologists who minimized impacts of canals, claiming they caused less than 10 percent of erosion, and did not account for any off-site impacts. Continental Land and Fur Company, with its large lease holdings in fast-disappearing Terrebonne Parish, where its muskrat pelts had long been depleted, warned that more environmental regulation would send the oil and gas sector off to "look for new places to explore."[421] Louisiana Land & Exploration Company, the largest independent oil producer in America, went one step further. As a rebuke to the citizen plan, "Here Today and Gone Tomorrow," it launched a public relations campaign featuring a film, "Countdown on the Coast," which roundly blamed the Army Corps of Engineers' Mississippi

[418] Theriot, *American Energy*, 144.
[419] Houck, "Reckoning," 12.
[420] Houck, "Reckoning," 26.
[421] Houck, "Reckoning," 27.

River levees for coastal erosion. Several experts were interviewed. No mention was made of the pipelines and canals.

However, the Coalition To Restore Coastal Louisiana managed to effect a series of state and federal laws that would eventually result in the passage by Louisiana voters of Act 6 by the Louisiana Legislature in 1989, which created the Wetlands Conservation and Restoration Authority. This body consists of agency heads from various state agencies with interests in the coast and was charged with overseeing the annual Coastal Wetlands Conservation and Restoration Plan, and the State Wetlands Trust Fund.[422] Under Act 6**,** the first annual coastal plan was completed in 1990.

In 1989, Louisiana received federal recognition of its coastal wetland crisis when Congress authorized the Barataria-Terrebonne National Estuary Program (BTNEP) "for the purpose of protecting and restoring the 4. 2 million acres of wetlands in the Barataria-Terrebonne estuary, one of the most ecologically productive and fastest disappearing landmasses on earth."[423] The BTNEP Management Conference established a framework for stake-holder engagement, project design and priority-setting. The local oyster fishermen, shrimpers, scientists, educators, citizens, environmental groups, and oil and gas interests that had a stake in the Barataria-Terrebonne region worked together to come up with a plan. Over the course of three years, these stakeholders produced 51 separate action steps that, taken as a whole and completed over time, could restore this local ecosystem to sustainable levels. According to Kerry St. Pe, the

[422] R. H. Caffey and M. Schexnayder, "Coastal Louisiana and South Florida: A Comparative Wetland Inventory," NSGL Document # LSU-G-03-021, National Sea Grant Library, 2003, https://eos.ucs.uri.edu/seagrant_Linked_Documents/lsu/lsug03021.pdf.
[423] Theriot, *American Energy*, 162.

director of BTNEP and a stanch coastal advocate, “We defined what restoration meant to the people of the Barataria-Terrebonne region.”[424]

The BTNEP initiative provided momentum for the 1990 Coastal Wetland Planning, Preservation, and Restoration Act (CWPPRA), which is colloquially known as the Breaux Act after its sponsor, then U.S. Sen John Breaux, D-La.. The act authorized $40 million a year for restoration projects and planning and called for the development of a comprehensive plan within three years. The resulting Louisiana Coastal Wetlands Restoration Plan, completed in 1993, called for a basin-by-basin planning approach within the nine different hydraulic basins across the coastal area. The authors stated that coastal Louisiana had lost over 900,000 acres since the 1930s, and as late as the 1970s, the loss rate totaled 25,600 acres per year. They attributed 30 percent of the land losses to natural causes and 70 percent to man-made activities such as oil and gas extraction – saying that these activities may have triggered fault movements – as well as river levees, canals, and spoil banks and invasive species such as nutria rats – all of which change the hydrology of the marsh.[425] While the funds were relatively modest, the Breaux Act at least codified that the state’s wetlands were disappearing, and it was largely industry’s fault. It also is credited with establishing a multi-agency task force to begin restoration actions, which would continue to be the model going forward.

Each basin had its own unique features, hydrologic regimes and environmental problems. Moreover, each basin had different kinds of resources, users and experts who were most knowledgeable about that particular area. Basin teams outlined the parameters for the restoration

[424] Theriot, *American Energy*, 162–163.
[425] Louisiana Coastal Wetlands Conservation and Restoration Task Force, “Louisiana Coastal Wetlands Restoration Plan: Main Report and Environmental Impact Statement,” November 1993, https://la-dwh.com/wp-content/uploads/2018/02/8.2.4.6.1.3.1_LCWCRTF.1993_LaCoastal_Wetlands_RestorationPlan_Main_ReportEIS.pdf.

plan. They nominated projects that were selected by a taskforce. CWPPRA also provided a monitoring program for the first 20 years of the life of each project. The initiative resulted in two, large-scale freshwater reintroductions, Caernarvon and Davis Pond. The act, which was originally funded from small engine fuel taxes from the Highway Trust Fund, averaged $40 million a year, according to the CPWRA website. Its funding has been reauthorized four separate times. But the modest funding was having little impact on Louisiana's coast. In 1995, 80 percent of voters in coastal parishes considered coastal wetlands a valuable natural resource and supported state-funded restoration. New evidence suggested that CWPPRA would prevent less than 20 percent of land loss by 2050 and the state should expect to lose more than 600,000 acres of wetlands in 50 years.[426]

Third Channel Conveyance

In 1991, a more radical idea was officially floated by Gagliano and his associate, Johannes van Beek, to produce a new river channel that could replenish the marsh. Called the Third Delta Conveyance Channel, it would divert 200,000 cubic feet per second of river water through a break in the river levee just downstream of Donaldsonville between Baton Rouge and New Orleans. Thirty miles downriver from there, around Lake Boeuf, the channel would split in two with the water continuing down man-made channels on either side of Bayou Lafourche. One channel would empty into the Barataria Estuary, the other into the Terrebonne Estuary. Its projected cost was $2 billion. Their study was released in a 1994 report for the governor's coastal-erosion committee.

[426] CWPPRA, "What is CWPPRA?," accessed June 14, 2019, https://lacoast.gov/new/Default.aspx.

Meanwhile there was still disagreement as to whether wetland deterioration was due primarily to natural or human causes, which human activities were most harmful, and which measures of repair were most effective, for instance, barrier island restoration versus water-level control in tidal wetlands. And finally, could anything really be done to reverse wetland destruction? What would be needed, the governor's panel concluded, was not only a government-legislative response but also advocacy groups for wetland protection and restoration and a financial commitment on a massive scale. Those conclusions would prove to be politically charged and fraught with potential conflicts of interests. In 1996, Governor Mike Foster announced his commitment to add state general funds to the coastal restoration trust fund to match all available federal funds. While the CWPPRA was intended to provide a comprehensive approach to restoration and the prevention of further loss of coastal wetlands, it lacked region-wide strategies for better integration and for technical and policy review.[427] In the late 1990s, Chip Groat, who ran the Center for Coastal Energy, and Environmental Resources at LSU, which was friendly with the petroleum industry, urged more big-picture solutions. The projects under the CWPPRA had had visible but negligible effect. They represented a proverbial finger in the dike, when what Louisiana needed was a comprehensive plan. But CWPPRA projects succeeded in "preserving, creating or restoring 75,000 acres by end of decade."[428] The state cost share with Water Resources Development Act to build two diversions at Caernarvon and Davis Pond at $100 million each had shown some effectiveness. And smaller restoration techniques – such as vegetative plantings in barrier island restorations – had established a new model for restoration ecology.[429]

[427] Reed and Wilson, "Coast 2050."
[428] Reed and Wilson, "Coast 2050," 12.
[429] Theriot, *American Energy*.

Mark Davis, who was the Director of the Coalition to Restore Coastal Louisiana, wrote to Sen. John Breaux of Louisiana in 1997 that the CWPPRA lacked a clear vision of what kind of restored coastline it would produce and lacked a clear strategy for getting there. The State Department of Natural Resources and the Corps of Engineers disagreed on which agency would have control over contracts and project designs for the CWPPRA. Other issues included property rights disputes, inter-agency squabbling and permit and construction delays. Meanwhile the oystermen filed a precedent-setting lawsuit against the State of Louisiana over economic damages created by the Caernarvon freshwater diversion project because of a desalinization effect on their seeding grounds. This foregrounded political dissension in the Master Planning diversion projects a decade later (See Chapter 4).

An outside panel led by Donald Boesch from the University of Maryland found that the CWPPRA did not have enough broad-based support. They published a report titled *Scientific Assessment of Coastal Wetland Loss, Restoration and Management in Louisiana* that argued for balancing private land rights with greater public interests.[430] And in 1999, a study of the barrier island restoration was projecting land loss into the future even with all of the proposed Breaux Act projects being implemented. In response, the CWPPRA Task Force of federal agencies and the State of Louisiana, that was created by the CPWRA, sponsored an 18-month effort by academia, private industry and local, state and federal agencies to develop a strategic plan to save the Louisiana coast, which culminated in *Coast2050* in 1998.

Coast 2050

[430] Donald Boesch et al., "Scientific Assessment of Coastal Wetland Loss, Restoration and Management in Louisiana," special issue, *Journal of Coastal Research*, no. 20 (1994): i–v, 1–103.

The *Coast2050* plan outlined an eco-system view of restoration and environmental management for what would be needed to maintain “essential ecological processes” over the next 50 years. Rather than a project-specific approach, it considered what the system needed to be sustainable. It recognized Gagliano’s “environmental blueprint” for the coast, which called for a defensive and offensive approach, suggesting some areas were not restorable. *Coast2050* laid out the consensus of geological research that most of the land in coastal Louisiana was built by deltas of the Mississippi River or by Mississippi River sediments entering the coastal mud stream. Barrier islands and sandy shorelines developed as waves and coastal currents eroded and reworked sediments, to build beaches and barrier islands. Maintaining the landscape required these and other processes. Soil-building processes would be vital to maintaining the system. *Coast2050* was also the first coastal restoration plan to anticipate the role of sea-level rise on the coastal delta. Natural processes of sediment compaction and gradual sea-level rise, it argued, submerge marsh plants and swamp forests, unless the soil can build up to compensate and maintain a high enough elevation for plants and trees to survive.[431]

The plan also leveled direct aim not only at river levees, but also at canals that provided water access to drilling sites and their associated spoil banks.

> “Navigation channels and canals dredged for oil and gas extraction have dramatically altered the hydrology of the coastal area. North-south channels and canals brought saltwater into fresh marshes where the salinity and sulfides killed the vegetation. Saltwater intrusion, caused by channel deepening, endangers the potable water supply of much of the coastal region. Canals also increased tidal processes that impacted the marsh by increasing erosion. East- west canals impeded sheet flow, ponded water on the marsh, and led to stress and eventual loss. Jetties at the mouth of the Mississippi River directed sediment into deep waters of the gulf.”[432]

[431] Reed and Wilson, “Coast 2050,” 5.
[432] Louisiana Coastal Wetlands Conservation and Restoration Task Force and the Wetlands Conservation and Restoration Authority, “Coast 2050: Toward a Sustainable Coastal Louisiana, An Executive Summary” (Baton Rouge: Louisiana Department of Natural Resources, 1998), 40, https://biotech.law.lsu.edu/la/coast/2050/2050execsumm.pdf.

The plan specifically called for cutting gaps into spoil banks to release entrapped water, and it included Gagliano's Third Delta Conveyance Channel from Donaldsonville to Barataria to create a third delta. All 20 parishes in the coastal region adopted resolutions supporting the plan. The report priced what it considered to be a sufficient restoration program to be a 10-fold increase in the funding provided by the Breaux Act. *Coast2050* outlined 77 restoration strategies needed to protect 449,250 acres of coastal wetlands. Additionally, it established that the natural geomorphic and ecological processes that had created the coast were impaired and that reestablishment of these processes was essential. *Coast2050* contained two important differences from previous coastal planning efforts in Louisiana. It focused on meeting strategic goals rather than listing projects, and it took a regional view of what interventions were needed.

The Coalition to Restore Coastal Louisiana was meanwhile lobbying for federal support to help pay for the plan's estimated $14 billion price tag. The organization created a national network called Restore America's Estuaries to advocate for national wetlands recognition with a goal of restoring one million acres of estuarine habitat, half of which would be in Louisiana. And they explicitly urged the passage of *Coast2050.* The Coalition in 2000 published companion report, entitled "No Time to Lose" that framed the loss of Louisiana's wetlands as an economic loss to the nation.

CARA: Conservation and Reinvestment Act

Once adopted by the Louisiana Legislature, *Coast2050* required a massive infusion of funding. The Louisiana Congressional delegation was tasked with finding matching funds to help pay the $14 billion, 50-year price tag. The state pinned its efforts to a long-standing grievance with the federal government on offshore royalty collections. Louisiana lawmakers for years had argued that they were shouldering most of the burden of infrastructure without fair compensation. The state has also had a long-standing objection to the boundary line that the federal government has recognized since the 1930s.[433] Louisiana claims that its boundary line began at its barrier islands, but the court has disagreed. “The Case established the boundaries of Texas and Florida at three marine leagues (10.3 geographical miles) off of their respective coastlines, while limiting the boundaries of Louisiana, Mississippi, and Alabama to only three geographical miles.”[434] The court refused to draw the state’s 1812 boundary starting at the barrier islands, essentially ignoring the state’s unique geography. Through the 1970s and 1980s, the state lost a string of cases.

Louisiana Department of Natural Resources Sec. Jack Caldwell convinced U.S. Sen. Mary Landrieu, La-D, who was friendly with the energy industry, to go after federal royalty collections. Landrieu introduced the Conservation and Reinvestment Act (CARA) of 1999. She argued that Louisiana supported 90 percent of offshore development in the Gulf for more than 50 years and benefited from decades of economic activity, but had “not received appropriate

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[433] Patrick B. Sanders, “Blanco v. Burton: Louisiana’s Struggle for Cooperative Federalism in Offshore Energy Development,” *Louisiana Law Review* 69, no. 1 (Fall 2008): 255–279, http://digitalcommons.law.lsu.edu/lalrev/vol69/iss1/11. Until 1937, the Dept. of Interior deferred mineral lease activity to states, which it recognized as owners of submerged lands. But Roosevelt’s Interior Sec. Harold Ickes announced that the federal government — not the states — would grant oil leases offshore. Eight years later, the Truman Administration said that the U.S. federal jurisdiction extended over the “the natural resources of the subsoil and seabed of the continental shelf beneath the high seas.” Sanders, “Blanco v. Burton,” 259. The proclamation essentially limited states’ mineral jurisdiction to its boundary line. Louisiana claimed its boundary along what’s called the “Equal Footing Clause” contained in the resolution admitting Louisiana into the Union in 1812. The Supreme Court rejected the claim and awarded title to the submerged lands to the federal government. Louisiana, the court said, had no title to the submerged lands beyond the low water mark in the Gulf of Mexico or where the sea met the inland waters.” Sanders, “Blanco v. Burton,” 261. However, Louisiana continued to issue leases based on the Coast Guard Line, which included the barrier islands, its marshlands and other submerged lands. Under Pres. Dwight Eisenhower’s administration, Congress passed the Submerged Land Act that allowed the Gulf states to assert a claim to submerged land within three marine leagues (10.3 miles) of their coastlines. In 1956, during an offshore oil boom, both Louisiana and the federal government attempted to lease tracts in the same area, located between three miles and three marine leagues from the shore. The court established a new test to claim the three marine league boundary: the state boundaries had to have been defined as exceeding three miles from their coastline on the day the state was admitted to the Union and Congress had to approve it. Sanders, “Blanco v. Burton.”

[434] Sanders, “Blanco v. Burton,” 263.

compensation for the use of its land and the environmental impacts of this production."[435] Since more than 80 percent of oil and gas activity in the Gulf of Mexico had taken place for decades beyond Louisiana's three-mile territorial waters, the state received a fraction of the compensation as it did on onshore wells. While the state received a 50/50 royalty share on oil and gas extraction within its legal boundary, it received a tiny portion of royalties between three and six miles offshore and virtually nothing beyond the 6-mile range. State officials long argued for more offshore royalties since it hosted virtually all of the infrastructure to bring it onshore – for which it paid a huge environmental price.[436]

"These areas and their fragile environments in Louisiana were sacrificed long ago for the benefit of industry investment and development," Landrieu said. "I intend to ensure that these areas will be ignored no longer."[437] The act would have boosted Louisiana's annual share of offshore revenues to about $200 million for 15 years. Louisiana's Secretary of Natural Resources Jack Caldwell cited the Houma Navigation Channel as an example of a federal waterway built mainly to service the Outer Continental Shelf that caused erosion of several square miles of land in south Terrebonne Parish over three decades. "In addition, the Louisiana coast is crisscrossed by 14,000 miles of pipelines," he said.[438] In the past, Louisiana's energy lobby had steadfastly denied the long-term impacts from dredging and drilling.[439] But CARA did not increase royalties paid by the industry. It instead asked for a larger share of existing collections. With CARA, Louisiana was not claiming new boundary recognition but rather compensation for local costs of providing a national good.

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[435] Theriot, *American Energy*, 187.
[436] Sanders, "Blanco v. Burton"; Theriot, *American Energy*, 187.
[437] Theriot, *American Energy*, 187.
[438] Theriot, *American Energy*, 188.
[439] Theriot, *American Energy*, 189.

Congressional support for the bill, however, began to wane in early 2000. Anti-drilling proponents such as Vice President Al Gore believed that revenue sharing might stimulate additional offshore drilling. In a scathing letter, Robert Szabo, a Louisiana lobbyist, wrote to the U.S. Senate committee on Natural Resources: “Let me state clearly that the foundation for this bill has been, from the very beginning, Louisiana's need to restore our coast due to its unique value both to the nation and our state.” He further declared that energy production from the OCS had generated "substantial costs that are not being paid by the Federal government. These costs “are in the form of environmental damages and infrastructure costs that are either not being addressed or are being funded by the State of Louisiana and our parish governments.”[440]

In the spring of 2000, Congress took up the legislation along with an environmental bill for Florida’s Everglades: the Comprehensive Everglades Restoration Plan (CERP), which was a 20-year, $7.8 billion federal request.[441] Landrieu’s amendment failed and with it a federal partnership. But Florida’s bill passed. A pair of Louisiana coastal planners attributed Florida’s success to a “linchpin issue” that bound disparate groups behind a common message and shared commitment.[442] Florida’s linchpin issue rested on the municipal water supply for south Florida’s 20 million people. Louisiana’s linchpin issue was different. “While the loss of so much physical habitat would be dire, environmental concerns alone are not sufficient to warrant the billions needed for comprehensive restoration,” the planners said.[443] So how to convince Congress that Louisiana’s coast – similar to Florida’s coast in terms of size, rate of disappearance and ecological inventory – was important?

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[440] Theriot, *American Energy*, 189.
[441] Caffey and Schexnayder, “Coastal Louisiana.”
[442] Caffey and Schexnayder, “Coastal Louisiana,” 5.
[443] Caffey and Schexnayder, “Coastal Louisiana,” 5.

Between the 1780s and 1980s, Florida and Louisiana each lost about 46 percent of their wetland acreage or 9.3 and 7.4 million acres, respectively.[444] The authors lauded Florida's success in assembling the necessary stakeholders to publicize its erosion problem to win federal money. They questioned how Louisiana could create an identity for itself commensurate with the Everglades. Louisiana's wetlands, they said, lacked an identity. Florida's success was traced to its social infrastructure, political will and history of activism that began back in the 1920s. In 1994, the state had established the Governor's Commission for Sustainable South Florida, a panel of prominent industry and environmental leaders that built the political infrastructure for Everglades restoration.[445] Two years later, Congress passed the 1996 Water Resources Development Act (WRDA), which authorized the Army Corps of Engineers and the State of Florida to re-evaluate a mid-century Corps project to provide water and flood control for cities and farms in south and central Florida. This re-evaluation led to development of the Comprehensive Everglades Restoration Program under the subsequent water resources act in 2000. Its primary goal was to return the hydrology of the Everglades into a more "natural" pattern. The $7.8 billion authorized under the plan was added to $3.2 billion already dedicated to Everglades restoration efforts since 1983. The new CERP contained more than 60 project features and was projected to create 217,000 acres of new reservoirs and wetlands.[446]

When Everglades environmental activism was starting up, Louisiana was opening its wetlands to oil and gas development. "In 1923, seismic exploration technology was introduced to the region, and a decade later the LCZ (Louisiana Coastal Zone) was bustling with exploration

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[444] Often wetland "loss" was intentional. So-called "swamp buster" programs launched in the 19th century were actively supported by Louisiana and Florida among other states as a mechanism to transform wetlands into cultivatable land.
[445] Caffey and Schexnayder, "Coastal Louisiana."
[446] Caffey and Schexnayder, "Coastal Louisiana."

and production."[447] After the Great Mississippi Flood of 1927, Congress directed the Corps of Engineers to construct a fortified and fully contiguous levee system along the lower Mississippi River, which effectively cut off all sediment distribution from Louisiana's marshes. "Coastal Louisiana would be severely altered by the 1960s. The confined river no longer deposited alluvial sediments and nutrients on adjacent marshes, and the coast was dissected by thousands of miles of oil and gas navigation canals." The severity of this crisis was formally documented in 1970 in a series of reports out of Louisiana State University, entitled "Hydrologic and Geologic Studies of Coastal Louisiana," which began a long debate and ultimately laid the foundation for restoration planning at the feet of the Mississippi River – and not with the oil and gas industry (which I cover in Chapter 4). "Louisiana's appeal for restoration funding will be predicated on a host of concerns, but the linchpin issues are likely to be fisheries and petroleum infrastructure." While half of the Everglades are in a national park, most of the Louisiana wetlands support commercial enterprises. The relevant question would be whether Louisiana could convince the nation that a "working coast" was worth saving.[448]

James Trip of the Environmental Defense Fund, who had helped form the Coalition to Restore Coastal Louisiana (CRCL) in the 1980s that ultimately led to *Coast2050*, suggested coastal advocates approach his old friend and prep-school classmate, the New Orleans banker King Milling, who had deep roots in Louisiana landownership and oil and gas interests.[449] Milling was the president of Whitney Bank. Tripp and Mark Davis, the new head of (CRCL) with a background in real estate development, appealed to Milling on his own terms: Whitney

[447] Caffey and Schexnayder, "Coastal Louisiana," 4.
[448] Caffey and Schexnayder, "Coastal Louisiana," 4.
[449] Houck, "Reckoning," 27.

Bank's "collateral" of oil and gas infrastructure was disappearing into the sea.[450] Milling soon became the public face for the coalition and Louisiana coastal restoration writ-large. "He spoke well, looked the part, and was patently sincere. He saw no conflict between saving his coast and protecting his industry. They were one and the same thing."[451]

In 2001, Republican Gov. Mike Foster formed the "Committee on the Future of Coastal Louisiana," which in February 2002 submitted its report: "Saving Coastal Louisiana: A National Treasure, Recommendations for Implementing an Expanded Coastal Restoration Program." Milling chaired the new Governor's Advisory Commission on Coastal Protection, Restoration and Conservation. Also in 2001, Governor Foster, organized a major coastal summit in Baton Rouge, La. At it, Milling said the cost of coastal erosion should be told in dollars, commercial impact and cultural values. "Oil and gas platforms and facilities, including pipelines … will have to be either rebuilt or totally replaced." On Aug. 27, 2002, Governor Foster announced a campaign to increase national awareness of the state's dramatic coastal land loss: America's WETLAND: Campaign to Save Coastal Louisiana. It was funded by a $3 million donation from Shell Corp. "Although the entire nation depends on Louisiana's coastal wetlands for its energy production, seafood harvest, leading port system and wildlife habitat, very few people know they even exist," said Foster.[452] Milling became the spokesman for America's WETLAND Foundation. "He stated his conviction early and often: coastal stakeholders needed to form a new band of brothers and fight towards a common objective: securing federal (public) funding to restore the zone."[453] What followed was a massive, industry-led public relations campaign.

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[450] Milling's uncle had also formed Louisiana Land & Exploration, an enormous oil producer and once one of the largest private landowners in South Louisiana, until it sold to an out of state company. Another client was Continental Land and Fur Company, whose original interests in muskrat pelts had long ago been replaced by its land's mineral rights. Houck, "Reckoning."
[451] Houck, "Reckoning," 27.
[452] Theriot, *American Energy*, 192.
[453] Houck, "Reckoning," 28.

America's WETLAND partnered with Marmillion & Company, a national strategic communications firm led by a Louisiana native. A media buy was committed by TIME for KIDS, a division of TIME Magazine, to "develop educational and youth-focused materials." An education video premiered at the 2002 Southern Governor's Association Conference in New Orleans stressing the importance of "America's Wetland" to the nation's energy and economic security.[454] Two days after the governor's presentation, Tripp's Environmental Defense Fund praised the America's WETLAND campaign as an important step toward "informing Americans about the value of vast but threatened coastal wetlands created by the Mississippi River." The focus of the new effort to restore the coast would focus squarely on river sediment and the past practices of the U.S. Army Corps of Engineers to levee the river, and not on curtailing commercial activity in the marsh itself. "Instead of being dumped off the continental shelf, river sediment should be diverted and used to rebuild wetlands," Tripp said in EDF's release. "We support the Governor's efforts to raise awareness about the plight of the wetlands and the federal funding needed to develop and implement a comprehensive, science-based restoration plan."[455] Tripp and EDF recruited the National Wildlife Federation and National Audubon Society into the campaign.[456]

Much like its 19th century special interest predecessors, America's WETLAND sponsored international wetland science summits, organized congressional briefings and recruited corporate sponsors. A successful campaign, they said, "will require that Louisianans speak with a unified voice and exhibit a strong commitment to paying the state's share of

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[454] America's Wetland Foundation, press releases archives, accessed September 27, 2018, https://www.americaswetland.com/category/press-releases/.
[455] America's Wetland Foundation, press releases archives, accessed September 27, 2018, https://www.americaswetland.com/category/press-releases/.
[456] Houck, "Reckoning."

restoration costs."[457] At an early commission meeting in 2003, EDF's Tripp announced that "the environmental community and the energy industry must be partners as one part of creating the political will" for coastal restoration. The President of Shell Chemical echoed, "We must realize that we have been part of the problem and that we can be part of the solution." Essentially, oil and gas would fund the America's WETLAND Foundation campaign[458] The WETLAND group focused their energies through a campaign entitled "America's Energy Coast" that issued a publication called "A Region at Risk" on the nation's vulnerable energy infrastructure. The main highway to reach Port Fourchon – a major hub at the edge of the Louisiana Coast that services offshore energy platforms – was vulnerable to environmental threats. "If broken by storms, floods or further erosion, it can disrupt the flow of goods and services that are the key to fueling America." Sen. Mary Landrieu of Louisiana said: "When we lose resources so vital to our national security, it's as if we're under attack. We should respond accordingly. We would not allow a foreign power to threaten our land without a fight. Therefore, we should not allow a less obvious, but equally threatening power to take our land away."[459] Members of America's WETLAND and the Governor's Advisory Commission regularly met with officials from the Army Corps of Engineers to develop a "Louisiana Coastal Area (LCA) Ecosystem Restoration Plan" which revived many projects in the Coast 2050 report such as large-scale river diversions and shoreline stabilization. In 2004, following a five-year, $20 million study funded by the Corps

[457] America's Wetland Foundation, press releases archives, accessed September 27, 2018, https://www.americaswetland.com/category/press-releases/.
[458] Houck, "Reckoning"; America's Wetland Foundation's major donor list identifies Shell as its "World Sponsor. Sustainability Sponsors include Chevron, ConocoPhillips, and ExxonMobil. America's Wetland Foundation sponsored an ad in the journal article, saying that a successful campaign - Caffey and Schexnayder, "Coastal Louisiana."
[459] America's Wetland Foundation, press releases archives, accessed September 27, 2018, https://www.americaswetland.com/category/press-releases/.

of Engineers and Louisiana, the Corps released its LCA report and environmental assessment of the comprehensive coast-wide plan.

The campaign was intended to appear as a "grass roots" movement that would convince Congress to increase the share of federal royalties from offshore wells for Louisiana. But perhaps even more important, the campaign also aimed to expand the Outer Continental Shelf exploration to capture more dollars for Louisiana to pay for coastal restoration. That would require lifting a 25-year moratorium on drilling that covered 90 percent of the Outer Continental Shelf (OCS). As late as April 2005, Mary Landrieu was publicly vowing to expand drilling and get a better royalty deal with the federal government. At the time, current law generally gave producing states 27 percent of revenues from production three to six miles offshore that had to be shared equally with all states hosting pipelines, while revenues from drilling farther out where the bulk of production takes place went entirely to the federal Treasury. "The talking points for Louisiana politicians and coastal advocates had clearly shifted from solely protecting environmental resources to preserving the coast for America's energy and economic needs."[460] As gas prices started to rise in 2005, Landrieu tried again to revive CARA. But her effort stalled again after the Bush Administration balked at giving up federal royalties and environmentalists along with Florida officials opposed opening the OCS. Then later that summer in 2005 something else happened: Hurricane Katrina made landfall.

[460] Theriot, *American Energy*, 195.

Chapter 4: The Working Coast

"This money will help us restore our beautiful coast so that we can continue to provide oil, natural gas and seafood to the rest of the nation." - Sen. John Kennedy, R-La [461]

This chapter explores the sociological and technical impact of Hurricane Katrina and the subsequent $50 billion, 50-year *Master Plan for a Sustainable Coast* that was passed by the Louisiana Legislature in the storm's wake. The Master Plan is often characterized as saving Louisiana's *Working Coast* of disappearing marshlands that are home to several major industry sectors, along with migratory flyways, seafood estuaries and two million people. As a concept, the Working Coast attempts to signify the importance of Louisiana's coastal zone to the nation's economy in order to justify expensive restoration plans. By complicating the euphemism and the extractive logic it signifies, this chapter demonstrates that the state's current restoration strategy to slow the disappearance of its coastline in fact rationalizes the very practices sinking it. As touched on in the introduction, the ontology of Louisiana resides in a state of contradiction. Many of the people most at risk of environmental annihilation from coastal erosion depend on the industries responsible for it; just as state coffers depend on them for revenue streams. State administrators reconcile this paradox through an ongoing state of repair, which is encapsulated in a simple but effective euphemism.

The Working Coast rationalizes industrial and commercial practices that harm the fragile ecology of the area – a phenomenon akin to what the political ecologist Erik Swyngedouw calls

[461] Bryn Stole, "Louisiana Gets $82 Million for Coastal Restoration from Gulf of Mexico Offshore Oil Revenue-Sharing Deal," *Advocate* (Baton Rouge, LA), April 26, 2018, https://www.theadvocate.com/baton_rouge/news/politics/article_776dbaa2-4976-11e8-9aec-9f5b2e230e21.html.

the metabolism of an environment to extract surplus value from it.[462] The Lower Mississippi River Delta is eroding into the Gulf of Mexico and forcing the relocation of coastal communities, as well as threatening the geography of New Orleans. From an urban ecological perspective, this dialectic metabolism that has transformed the coast into capitalist production has consumed the very milieu onto which this production has taken place. In section 1, I trace the discursive appearance of the Working Coast that emerged just before Hurricane Katrina and subsequently became the organizing rationale for the state's Master Plan for coastal restoration after Katrina to re-energize moribund efforts to enroll federal support. In section 2, I show how the state's Master Plan creates the conditions for its own possibility as an "extraction machine" through multiple rationalities. They include: 1) a dedicated funding source by oil and gas royalties collected on new offshore leases; 2) dredging projects along the Mississippi River and navigation channels within coastal wetlands that primarily benefit commercial shipping; and 3) through the promise of economic development dollars in the form of restoration-related jobs for struggling communities and a "water knowledge sector" that can be exported with global sea-level rise (incidentally caused by fossil fuel development that the Master Plan supports). As a concept, the Working Coast reifies the state's fragile marshlands through metrics that can only be realized through continued extraction, which limits the types of interventions coastal planners consider.

Section 1

The French-speaking Native American tribe, Biloxi-Chitimacha-Choctaw, about 50 miles southeast of New Orleans made international news in 2016 when it was named the recipient of a $48 million U.S. Housing and Urban Development grant to abandon Isle de Jean Charles. A

[462] Erik Swyngedouw, Maria Kaïka, and Esteban Castro, "Urban Water: A Political-Ecology Perspective," in "Water Management in Urban Areas," special issue, *Built Environment* 28, no. 2 (2002): 124–137.

disappearing isthmus that the tribe has lived on for 170 years, has in the last half century, withered from 22,000 acres to just over 300 acres. The remaining strip is surrounded by a small tidal ring levee and patches of grass converting to open water. The village is reachable by the two-lane Island Road from the Pointe aux Chenes village at the end of an obscure bayou by the same name. The access road is often submerged during storms and high tides. Isle de Jean Charles is "teetering at land's edge" like many Native American communities in Louisiana historically pushed by European settlers into the swamps and wetlands of the southern coast.[463] In 1998, Jean Charles was removed from a revised design of the highly anticipated "Morganza-to-the-Gulf" regional levee system that is now being built.[464] An Army Corps of Engineers cost benefit analysis determined it was too expensive to extend the new levee to the isthmus. The 70 remaining tribal members instead won a relocation grant, funded in Congress's Superstorm Sandy appropriations package, earning the moniker as the first U.S. climate refugees.[465] There is little doubt that sea-level rise will engulf the last stitch of Isle de Jean Charles, but its current fate as well as the loss of over 2,000 square miles of Louisiana marshland since 1930 are not caused by climate change, but instead its predecessor: the production of Louisiana's *Working Coast*. In short, the state's economic practices are sinking it.

Coastal Louisiana has long been valued for the resources plumbed from it. Such an otherwise inhospitable location for New Orleans (see Chapters 1-3), may not have been chosen and defended for three centuries were it not for its bounty of natural resources and proximity to the Gulf of Mexico. As I mentioned, this tension between economic survival and environmental

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[463] Mike Tidwell, *Bayou Farewell: The Rich Life and Tragic Death of Louisiana's Cajun Coast* (New York: Vintage, 2003), 137.

[464] US Army Corps of Engineers, New Orleans District. "Summary of the Morganza to the Gulf of Mexico, Louisiana: Final Post Authorization Change Report." May 2013. 4. Accessed Nov. 4, 2019. https://www.mvn.usace.army.mil/Portals/56/docs/PD/Projects/MTG/-M2GPACReportMay2013.pdf.

[465] Coral Davenport and Campbell Robertson, "Resettling the First American 'Climate Refugees,'" *New York Times*, May 2, 2016, https://www.nytimes.com/2016/05/03/us/resettling-the-first-american-climate-refugees.html.

annihilation is reconciled through an ongoing state of repair that currently takes the moniker of the Working Coast. This gives state restoration officials a palatable shorthand for discussing interventions in the coast and the geography's uneasy relationship with the industries that contribute to its dissolution. While this paradoxical euphemism has gone by other names such as "America's Wetland" or "America's Energy Coast" that were coined through public information campaigns by stakeholder coalitions starting in 1980s (see Chapter 2), the current handle is reified in the state's $50 billion, 50-year *Comprehensive Master Plan for a Sustainable Coast.* It is repeated by politicians and now appears in countless articles and newspaper editorials.

Much like the Army Corps of Engineers "Levee's-Only" policy (discussed in Chapter 2) provided a middle-way that attempted to satisfy competing interests, the Working Coast functions as both a political and technical strategy. The Louisiana government, which presumably needs to deploy every scientific and social tool at its disposal to mitigate the upheaval of environmental and human geography, has organized its restoration strategy primarily around a plan to deploy sediment diversions from the Mississippi River. This strategy has the backing of a coalition of high-profile environmentalists and industrial interests. Still only partially funded, the 11-year-old Master Plan frames the state's coastal wetlands as a national asset whose wetland estuaries and infrastructure supports 90 percent of the oil and gas from the Outer Continental Shelf, over 25 percent of the nation's seafood catch, 20 percent of the nation's waterborne shipping (by weight) through its five major ports and millions of migratory birds.[466] The Master Plan was first passed by the Louisiana Legislature in late 2006, just over a year after hurricanes Katrina and Rita devastated 217 square miles of marshlands. Catalyzed by what I call the *Katrina Effect* that led to the bureaucratic reorganization of coastal governance, the Master

[466] Coastal Protection and Restoration Authority, "Master Plan 2017."

Plan folds Louisiana's 80-year problem of coastal disappearance into an emergent strategy of hurricane protection, catalyzed by Katrina and Rita.

The restoration strategy includes a multi-pronged approach: pumping dredged mud and sediment into marshes and onto barrier islands off the coast; securing shorelines with shoal barriers; heightening seawalls and ring levees around populated areas; and raising homes. But its most ambitious proposal applies diversion spillways along the Mississippi River to "pulse" sediment back into the adjacent marshes. The first two of ten such projects had been approved by Louisiana's Coastal Protection and Restoration Authority (CPRA) by the time of this writing for an estimated $2 billion.[467] The diversions would provide a dedicated source of mud to the delta by its original progenitor, which is captured in discourses by state supported-scientists, coastal planners and some environmentalists of returning the Mighty Mississippi to its "natural" role of land building.[468] Authors of the Master Plan say they are using "the best available science and engineering to prioritize and sequence projects for implementation."[469] But in adjudicating decisions about where and how to divvy up a limited supply of sediment, money and other resources to protect populated areas and what authors call "critical infrastructures," the Master Plan is also deeply political. Supporters frame it as the protector of Louisiana's Working Coast as well as an instrument for economic diversification for struggling coastal communities. These "political rationalities"[470] appeal to a broad cross section of stakeholders, who may otherwise be in opposition. The plan also traffics in what I call *Extractive Thinking*. It establishes a future for

[467] Coastal Protection and Restoration Authority, "Master Plan 2017."
[468] David Festa, "In a Race Against Time, Officials Collaborate to Speed up Coastal Restoration. Here's How," *Growing Returns* (blog), Environmental Defense Fund, April 23, 2018, http://blogs.edf.org/growingreturns/2018/04/19/officials-collaborate-to-speed-up-coastal-restoration.
[469] Coastal Protection and Restoration Authority of Louisiana, "Louisiana's Comprehensive Master Plan for a Sustainable Coast: 2007," Baton Rouge, LA, 2007, executive summary, https://coastal.la.gov/resources/library/reports/.
[470] Wendy Brown, *Undoing the Demos: Neoliberalism's Stealth Revolution* (New York: Zone Books, 2017), 115–118.

the state's people and economy through the conditions created by the practices it supports. This chapter explicates some of the ways that the state's power structure rationalizes fossil fuel production and other extractive practices for its restoration agenda, which has implications for the physical safety of two million coastal residents. The Working Coast speaks to the historically extractive nature of Louisiana's industries and their deleterious effects on the environment through a neoliberal valuation of the landscape that has co-opted imagined futures of Louisiana's wetlands. It justifies certain intervention efforts under the rationality of economic sustainability. Much like we explored in Chapter 1, nature here has been commodified in order for its preservation to be justified.

Katrina Effect

The 2005 storm's legacy on Louisiana governance today simply cannot be minimized. The winds and tidal surges of Hurricane Katrina and fellow Category-3 hurricane, Rita, which struck the western side of the state three weeks later, not only deluged the City of New Orleans but uprooted more than 217 square miles of coastal wetlands in its track. Industrial ports and processing facilities were drowned. Major pipelines were severed. Damages from the hurricanes burnished the state's argument that its infrastructure was both important to the national energy and shipping sectors and it was vulnerable. The storms disrupted 95 percent of the offshore oil and gas production. Natural gas production throughout coastal Louisiana dropped by 50 percent and remained disrupted for months. Plants were damaged. Pipeline deliveries of gasoline, diesel and jet fuel to East Coast buyers were suspended. Pres. George W. Bush ordered the withdraw of emergency oil supplies from the Strategic Petroleum Reserve within salt dome caverns along the

Louisiana and Texas coasts. Floodwaters swamped the low-lying highway to Port Fourchon, whose once green adjacent wetlands "resembled a vast open bay."[471]

Storm recovery efforts would require a reorganization of water and flood management and a plan to restore the beleaguered marshes. State and city leaders pitched their recovery by framing the region as a national asset with strategic importance. They leveraged Louisiana's five deep water ports. They leveraged the state's seafood estuaries. And they leveraged a massive oil and gas pipeline infrastructure. By disrupting the Louisiana coast, the storm had disrupted the economy, causing fuel price spikes and shipping delays of grain and other goods to world markets.

The cause to rebuild New Orleans and the coast after the storms re-energized the stalled campaign to save *America's Wetland*.[472] "This extreme rate of loss threatens a range of key national assets and locally important communities," Louisiana Gov. Kathleen Blanco wrote after Katrina. "Pipelines, navigation channels, and fisheries as well as centuries-old human settlements and priceless ecosystems are all at risk."[473] State officials argued that "a sustainable landscape" was a prerequisite for both storm protection and "ecological restoration." They argued that hurricane protection must rely on "multiple lines of defense."[474] The pitch worked. The federal government not only approved the $14.5 billion levee wall around Greater New Orleans, which contains the largest pumping stations in the world, but it accepted the argument that the restoration of the state's coastal marshlands is an essential buffer for storm protection.[475]

[471] Theriot, *American Energy*, 197
[472] Louisiana Recovery Authority, "Progress Report," December 2007, letter from the Governor, http://lra.louisiana.gov/assets/docs/searchable/Quarterly%20Reports/December2007QtReport.pdf; Louisiana is the largest producer of shrimp, oyster and blue crab in the nation, which provides shipping and processing jobs for 30,000 Americans (LDNR 2006)
[473] Coastal Protection and Restoration Authority, "Master Plan 2007."
[474] Coastal Protection and Restoration Authority, "Master Plan 2007."
[475] The state must pay $100 million a year for 30 years starting in late 2019 as a local share of the remaining $1.5 billion of the systems construction costs, which will raise the state's overall share to $3 billion

Hurricanes Katrina and Rita were not only meteorological events of falling barometric pressure and increased moisture, but they were also sociological events whose effects not only reorganized governance in south Louisiana but also lifted a 25-year moratorium on new oil drilling in the Outer Continental Shelf. The storms catalyzed an alignment of rationalities among multiple regimes. The oil lobby that had been pushing to lift a drilling moratorium in the Gulf of Mexico found common cause with the Louisiana Congressional delegation seeking a higher percentage of royalties on wells in federal waters. These two interest groups came together under the auspices of hurricane relief and a narrative of energy independence. The year 2005 was also a period of rising fuel prices and a quagmire in Iraq. The storms raised the profile and political potency of these pre-existing agendas.

The Katrina Effect problematizes what sounds like a straight-forward question: what is a hurricane? Author Naomi Klein in her book *Shock Doctrine* describes moves to implement long-held and often controversial agendas as post-shock opportunism that allows for "orchestrated raids on the public sphere in the wake of catastrophic events, combined with the treatment of disasters as exciting market opportunities."[476] Efforts to support Louisiana's Working Coast after Katrina became a discursive vehicle to help rebuild New Orleans and Louisiana by lifting the Outer Continental Shelf (OCS) drilling moratorium. In the resulting debris and chaos of the storms, state officials found their long sought federal partnership. In the following months, a multi-prong political offensive was launched in the name of national energy security. The Louisiana Delegation in Congress renewed efforts to increase the state's share of oil royalties

[476] Naomi Klein, *The Shock Doctrine: The Rise of Disaster Capitalism* (New York: Picador, 2008), 4; Cedric Johnson, ed., *The Neoliberal Deluge: Hurricane Katrina, Late Capitalism, and the Remaking of New Orleans* (Minneapolis: University of Minnesota Press, 2011).

collected on deep shore oil and gas drilling with support from Republicans who had long advocated for more drilling in the Gulf and Alaskan National Wildlife and Refuge (ANWR).

A week after Katrina made landfall on Sept. 5, 2005, the Republican chairman of the Senate Energy and Natural Resources Committee, Pete Domenici, R-N.M., said he would seek legislation authorizing oil and gas development on portions of the Outer Continental Shelf then closed to such activity. "I'm going to go after OCS," Domenici told reporters following a hearing on gasoline.[477] A week later on Sept. 12, the American Gas Association (AGA) petitioned Congress to open the eastern portion of Gulf of Mexico to development through Lease 181. In addition, the energy lobby called for lifting the drilling ban in federal-controlled Atlantic and Pacific coastal waters. The petitioners argued that the ban was implemented years ago under an energy scenario entirely different from the one facing them today. A move to drill in the Arctic Natural Wildlife Refuge (ANWR) was pushed into a version of a federal budget bill that was being debated. The efforts were accused by environmentalists of opportunistically taking advantage of the energy production crisis caused by Hurricane Katrina.[478] At the same time, Louisiana's two senators David Vitter, R-La, and Mary Landrieu, D-La., proposed, as part a larger hurricane relief package that was backed by Louisiana's state lawmakers, to give Gulf states a 50-percent share of the billions of dollars the federal government receives annually in royalty and leasing payments from energy companies drilling in federal waters – and to open new areas using the same revenue formula. The money would go toward coastal restoration and flood control. The *Associated Press* noted that "Hurricane Katrina has reopened a national debate on energy policy, generating new congressional support for more stringent automobile fuel

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[477] *Inside Energy Extra*, "Domenici Plans New Drive on OCS," September 6, 2005, 1, Nexis Uni.
[478] Olivia Amaewhule, "Hurricane Katrina Renews Push for Drilling in Restricted Offshore Areas," *IHS Global Insight*, September 12, 2005, Nexis Uni.

economy requirements and a fresh push by the oil industry for drilling in areas now off-limits.[479] Forbes added, "Katrina wasn't all bad for the cause of oil and gas production. For political reasons, it may end up making Alaska and the Outer Continental Shelf more accessible."[480] On Dec. 19, 2005, Alaska's Ted Stevens tied efforts to expand OCS drilling to opening ANWR.[481] A lobbyist with the Sierra Club noted two months later that the threat to open the ANWR and OCS was "greater than ever" this year."[482]

In Sept. 28, 2006, twelve months after Katrina, Landrieu formerly introduced a bill to boost Louisiana's royalty share for expanded OCS drilling, which was taken up by the House of Representatives. By December 2006, with the winds of Katrina at her back, Landrieu's efforts paid off. Congress passed a co-sponsored bill by Landrieu and Pete Domeninci, R-NM, called the Gulf of Mexico Security Act (GOMESA) that increased Louisiana's share of federal royalties and opened 8.3 acres to new oil and gas exploration in the Gulf of Mexico. Congress overrode a presidential veto by George W. Bush to do it. And Louisiana's long-sought increased revenue-sharing agreement on federal oil royalties was realized.

The move would formerly enshrine deep water drilling as the funding mechanism for Louisiana's coastal restoration efforts.[483] The federal government agreed to share 37.5 percent of royalties collected on wells in the OCS with the Gulf states, with Louisiana receiving the lion's

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[479] H. Josef. Hebert, "Katrina Spurs New Debate on Energy, Fuel Economy, Offshore Drilling," *Associated Press*, September 12, 2005.
[480] Christopher Helman, "Open the Spigots," *Forbes*, October 3, 2005, https://www.forbes.com/free_forbes/2005/1003/049.html.
[481] Gerard Shields, "Bill Ties La. Aid, ANWR Drilling: Relief Plan Added to Defense Budget," *Advocate* (Baton Rouge, LA), December 19, 2005.
[482] Justin Blum, "Offshore Drilling Backers Smell Victory," *Washington Post*, February 21, 2006, final edition, ProQuest.
[483] Louisiana Recovery Authority, "Progress Report," letter from the Governor.

share.[484] Meanwhile, the Louisiana legislature had been working in concert on the state level to create a legal mechanism to tie any future OCS revenue streams to coastal protection. In the Fall of 2005, the legislature in an extraordinary session passed a proposed constitutional amendment, called Act 69, to dedicate OCS royalties to the coastal protection fund, which was ratified by Louisiana voters in November 2006. When Congress passed the GOMESA revenue act in December 2006, Louisiana voters had already approved the constitutional amendment to dedicate the money to a coastal trust fund. Today GOMESA is the only major recurring revenue stream funding the state's Master Plan.

Social Reform

The *Katrina Effect* was also at work on New Orleans and Louisiana social policy. It unleashed a series of reforms addressing "pre-existing social problems"[485] that had little to do with hurricane protection. It helps illustrate how the levers of power can hide behind environmental destruction. Power, after all, is maintained by logics that seem commonsensical and rarely questioned. "Call it the silver lining," wrote the Aspen Institute's Walter Isaacson, who was appointed by Governor Blanco to help lead state recovery efforts. "Hurricane Katrina washed away what was one of the nation's worst school systems and opened the path for energetic reformers who want to make New Orleans a laboratory of new ideas for urban schools."[486] An assortment of think-tanks joined reformers and newspaper editorial boards around the country to frame the catastrophe as an exciting opportunity. Republican State Judge

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[484] The passage of GOMESA created a model for the Trump Administration to incentivize congressional support for drilling in states protected by drilling moratoriums off the shore of Virginia, North Carolina, South Carolina, and Alaska.
[485] Coastal Protection and Restoration Authority, "Master Plan 2007."
[486] Walter Isaacson, "The Greatest Education Lab: How Katrina Opened the Way for an Influx of School Reformers," *Time*, September 6, 2007, http://content.time.com/time/subscriber/article/0,33009,1659767,00.html.

Joe Cannizaro called Katrina a “clean sheet” to create a “smaller safer city.” Baton Rouge-area Republican Congressman Richard Baker noted in a speech to lobbyists, “We finally cleaned up public housing in New Orleans. We couldn’t do it, but God did.”[487] New Orleans public schools were taken over by a state educational recovery board in Baton Rouge and transformed into a charter system. And all nine of the infamous public housing projects were torn down. The city began redeveloping mixed-income housing on the same footprint, offering housing vouchers to 19,000 of its poorest households, whose reimbursement rates have remained stagnant as rents have increased by six to eight percent per year. According to the New Orleans Redevelopment Authority, the majority of New Orleans renters spend more than 50 percent of their income on housing – nearly three out of every five renters – which far exceeds the national average. Four out of five low-income, “cost-burdened renters” in New Orleans are African American households.[488]

If anything, Hurricane Katrina provided a visual narrative of historic geographic and racial inequality in New Orleans, which continues to persist today. An examination of flood maps show that Katrina rendered the heaviest damage to lower-lying African American neighborhoods.[489] Of course, it wasn’t God that flooded them but the legacy of racial economic and geographic inequality through drainage politics and historic segregation (covered in chapter 1). The Crescent City, so named for the wide crescent-like bend in the Mississippi River, had been transformed into a fortified bowl surrounded by water. Its edges were ringed by levees. Internal ridges that were built by old river meander paths prior to the levees, like Esplanade and

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[487] Klein, *Shock Doctrine*, 4.
[488] Alan Mallach, “Where Will People Live? New Orleans’ Growing Rental Housing Challenge,” prepared for the New Orleans Redevelopment Authority (Washington, DC: Center for Community Progress, June 2016), https://www.communityprogress.net/filebin/NORA-Rental-Housing-Report-final_6_20_16.pdf.
[489] Richard Campanella, *Delta Urbanism: New Orleans* (Chicago: Planners Press of the American Planners Association, 2010).

Metairie ridges, that sat a bit higher near sea level, were home to affluent neighborhoods. The city's working-class neighborhoods, the majority of them African American, sat in the lowest area of elevation that flood in heavy rain – in essence at the bottom of the bowl.[490]

By the end of the morning of August 28, there were 50 separate breaches to the regional levee system. The worst hit neighborhoods lay in New Orleans East, flooded through a controversial shipping canal built by the U.S. Army Corps of Engineers in the 1950s. Known colloquially as MR-GO, the 76-mile Mississippi River Gulf Outlet cleaved through wetlands to allow smaller vessels avoid the yawning turns of the Mississippi. But MR-GO required regular dredging and was long criticized by environmentalists for the aggressive erosion it caused. Katrina floodwaters surged through MR-GO through the back door of New Orleans[491] and T-boned into the Industrial Canal at the Lower Ninth Ward levee, a working class African American neighborhood, where the income averaged $16,000 a year. "It would be the Lower Ninth Ward – a mixed-race community before school desegregation, but 98 percent black at the time of Katrina – that stood as a synecdoche for anyone debating the rebuilding question" after the storm.[492]

In the fall of 2005, Louisiana Gov. Kathleen Blanco created the bi-partisan, Louisiana Recovery Authority to direct post-storm recovery efforts, which more than doubled congressional appropriations for Louisiana to $28 billion.[493] Gov. Blanco and Louisiana

[490] Campanella, *Delta Urbanism*; Lewis, *New Orleans*.
[491] William R. Freudenburg et al., "Disproportionality and Disaster: Hurricane Katrina and the Mississippi River-Gulf Outlet," *Social Science Quarterly* 90, no. 3 (September 2009): 497–515.
[492] Gary Rivlin, "Why New Orleans's Black Residents Are Still Under Water after Katrina," *New York Times Magazine*, August 23, 2015, https://www.nytimes.com/2015/08/23/magazine/why-new-orleans-black-residents-are-still-under-water-after-katrina.html.
[493] Louisiana Recovery Authority, "Progress Report." The LRA attributed its lobbying efforts to: two additional block grants in June 2006 and November 2007 totaling $7.2 billion; appropriations of $7.1 billion for levee repairs and a commitment from the Bush Administration to fund another $7.6 billion to complete the $14.5- billion levee system around metropolitan New Orleans; and helping pass the 2007 Water Resources Development Act, overriding a Pres. Bush veto, that authorized nearly $7 billion for hurricane protection projects in Louisiana with $2 billion in

Recovery Authority (LRA) representatives traveled numerous times to Capitol Hill to argue for recovery funds and generate sympathetic news coverage. The Washington Post said in an editorial, “Louisiana is the nation’s energy hub, ranking first in crude oil production and second in natural gas production. The Port of New Orleans is a major import-export route, with global merchandise exports totaling $23.5 billion in 2006. The state shouldn’t have to keep begging Washington to help it rise from the most damaging natural disaster in U.S. history.”[494]

Storm recovery led to a complete reorganization of local, state, and federal responses to water management. Louisiana’s byzantine levee board system was consolidated into regional districts appointed by the governor with a percentage of members required to have expertise in flood protection.[495] And in November 2005, the state legislature passed Act 8, which established the Coastal Protection and Restoration Authority (CPRA) to oversee hurricane protection and ecosystem restoration under the single mission of sustaining the land and economy of Louisiana. Act 8 stated that the loss of the state's coastal wetlands threatened its “natural, cultural, and economic resources.”[496] The law articulated the economic benefits of coastal wetlands that “support recreational and commercial interests.”[497] In addition, Act 8 pointed to coastal wetlands “as the first line of defense for coastal communities, including New Orleans, in the face of hurricanes and tropical storm surges.” The act advocates for protection of oil and gas pipelines, “through which much of our nation's energy supply flows” and gestures to the diverse coastal

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funding for the state’s coastal restoration strategy of Coast2050 discussed in the previous chapter, which eventually became the Master Plan.

[494] Louisiana Recovery Authority, “Progress Report,” 4.

[495] Southeast Louisiana Flood Protection Authority–East (Flood Protection Authority) (website), accessed February 10, 2018, http://ww.slfpae.com.

[496] Act 8, Senate Bill No. 71 (duplicate of House Bill No. 141), First Extraordinary Session of the Louisiana Legislature (2005), 21, http://www.columbia.edu/itc/journalism/cases/katrina/State%20of%20Louisiana/Louisiana%20State%20Legislature/LA%20Senate/SB71%20Coastal%20Protection.pdf.

[497] Act 8, Senate Bill No. 71, First Extraordinary Session of the Louisiana Legislature (2005).

cultures, "that have called the wetlands home for many generations." The CPRA was given oversight of all coastal activities, which had previously run through various departments and agencies. The CPRA director would have a cabinet position in the governor's office.

Act 8 established the CPRA as a critical player in securing federal funds in housing, environmental support, transportation and marine and flood protection.[498] The CPRA was to implement a new "multiple lines of defense" strategy to prioritize restoration methods and projects that likewise provided flood protection. "Coastal restoration is targeted where it can provide flood protection benefit."[499] It operationalized wetland restoration to benefit certain prioritized goals. The CPRA was then tasked to produce a comprehensive master plan, which would be updated every five years. The next Spring in April 2007, a newly minted Master Plan was sent to the legislature. It was described as a working document with an "adaptive management framework." In her introductory letter, Governor Blanco explicitly tied the often-paradoxical effort of providing flood protection with restoring wetland ecology as a response to Hurricanes Katrina and Rita. "The death and devastation caused by hurricanes Rita and Katrina has strengthened our resolve to establish a lasting legacy of coastal protection and restoration for south Louisiana. The passage of this Master Plan is the first step in making that legacy a reality for our coastal communities today."[500]

The plan established five mission priorities. At the top was maintaining Louisiana's Working Coast. "Louisiana's working coast, America's Wetland, supports vital ecosystems,

[498] Coastal Protection and Restoration Authority, "Master Plan 2007."
[499] John A. Lopez, "The Multiple Lines of Defense Strategy to Sustain Coastal Louisiana," in "Geologic and Environmental Dynamics of the Pontchartrain Basin," special issue, *Journal of Coastal Research*, no. 54 (Fall 2009): 187, http://www.jstor.org/stable/25737479.
[500] Coastal Protection and Restoration Authority, "Master Plan 2007," Governor's Letter.

national energy security, a unique culture, and thousands of jobs. However, the region is changing before our eyes, threatening benefits we have relied upon for decades." [501]

Master Plan and the Working Coast

The 2007 Master Plan increased the total bill from $14 billion estimated by *Coast2050* in 1998 (covered in Chapter 3) to $50 billion. The plan rehashed many of the arguments that state officials had been making about the value of shipping lanes, fisheries, energy infrastructure and the seafood industry. It listed the "host of benefits" of Louisiana's coastal landscape, including protection from incoming storms by cypress swamps, barrier islands and healthy marshes by "slowing down and reducing incoming surges of water." And it laid out the national pipeline assets at risk by coastal erosion and storm surge – as well as Henry Hub, which is the pricing point for natural gas throughout North America – and Port Fourchon, which supplies hundreds of offshore drilling rigs in the Gulf. It squarely quantified the assets of the wetlands in economic terms.[502] It also plugged the coast's ecological 'services' such as the North American flyway over south Louisiana, which is home to more than five million migratory waterfowl that winter in Louisiana marshes, and 17 endangered or threatened species, including the Bald Eagle, Gulf Sturgeon, Louisiana Black Bear and a number of sea turtles. All of this provides recreational opportunities and jobs associated with birding hunting, fishing and eco-tourism.[503] These lines emphasize the anthropogenic utility of protecting human settlement and economic resources.

[501] Coastal Protection and Restoration Authority, "Master Plan 2007," 30.
[502] Direct land loss in Louisiana threatens $3.4 billion in assets, $7.4 billion in economic activity, and up to 12,200 jobs. A storm striking the New Orleans area in a future with increased land loss could result in a $133 billion increase in storm damages in spite of the new $14.5 billion levee ring. Economic disruptions from this storm event could affect 26,000 establishments, 320,000 employees and $50 billion in output above the impacts of a similar event occurring on today's coast (CPRA). Coastal Protection and Restoration Authority, "Master Plan 2007," 28.
[503] Coastal Protection and Restoration Authority, "Master Plan 2007," 29.

The plan also articulates the incumbent contradiction of living on the spectrum of survival and annihilation. “This function, combined with man-made levees and other flood control measures, have allowed Louisiana’s working coast to thrive in a flood-prone area. Whether or not these citizens are able to maintain their connection to the region depends on how quickly the state can find ways to rebuild wetlands and provide adequate storm protection.”[504] Therein lies the ongoing dilemma. The practices of building man-made levees “and other flood control measures” have allowed for a Working Coast. And this Working Coast is part and parcel not only of the resources that are extracted from it, but also the measures that are taken to protect it and generate it.[505]

Through Act 8 and now the Master Plan, coastal planning officials have justified saving coastal Louisiana by maintaining its industrial and economic activity that give it value[506]around two rationales: first by positioning the Louisiana coast as a national asset that supports national industries; and second by raw return on direct investment in the form of economic development. The CPRA argues the Master Plan will create jobs and economic spin-off effects, “to foster our state’s employment capacity and contribute to the growth of Louisiana’s future economy.” [507] These two rationales bring the wide tableau of various interests and rationalities under a single strategy.

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[504] Coastal Protection and Restoration Authority, “Master Plan 2007,” 27.

[505] Touting itself as the steward for the important Mississippi River dates back to the 19th century as an argument for federal support for navigation and flood control.

[506] A 2015 study conducted by LSU and the Rand Corps estimated that at least $100 billion of energy and petroleum infrastructure is at risk by a receding coastline over the next 25 years including annual sales of $2.4 billion to $3.1 billion and associated payroll between $400 and $575 million; and between $5.8 billion and $7.4 billion in annual “output” at risk. Similarly, they estimated that increased storm damage could have a total impact on the nation of between $8.7 billion and $51.5 billion, and increased disruption to economic activity leading to $5 billion to $51 billion in total lost output, including indirect and induced effects.

[507] Coastal Protection and Restoration Authority of Louisiana, “Louisiana’s Comprehensive Master Plan for a Sustainable Coast: 2012,” Baton Rouge, LA, 2012, 121, https://coastal.la.gov/our-plan/2012-coastal-masterplan/.

Five years after Katrina, despite assurances by the GOMESA supporters about better, safer drilling technology.[508] BP's Deep Horizon oil well exploded, killing 11 workers and causing the world's largest oil spill over 87 days. An estimated 500,000 cubic meters of crude oil gushed into the Gulf of Mexico.[509] A legal settlement against BP and its partners provided Louisiana and local coastal parishes with $6.5 billion over 15 years. The money, which is dubbed the Resources and Ecosystems Sustainability, Tourist Opportunities, and Revived Economies of the Gulf Coast States Act or RESTORE, includes multiple civil, criminal and punitive judgments. It is dedicated by the Natural Resource Damage Act to coastal restoration projects. The state was awarded another $2.2 billion in civil and criminal penalties,[510] which Mark Davis, the director of Tulane's Institute on Water Resources Law and Policy, called analogous to "paying for a gym membership by winning pie-eating contests."[511]

By 2017, coastal plan authors had also updated a much more pessimistic estimation of sea-level rise, which had flipped the 2012 Plan's worst-case scenario into the 2017's Plan's best-case scenario. Geological surveys suggest that the rate of sea-level rise is twice that estimated in the 2012 Master Plan update and may overtake the ability of the planned diversions to rebuild

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[508] Louisiana coastal planners and economic officials point out that the state has better permitting regulations for oil exploration, and companies have less intrusive technology such as directional drilling. Besides, the big oil patch today resides well offshore from the coastal marshes. Most of the inland coastal oil drilling has passed peak production, even though the canals remain open, and the wells uncapped. Yet there is a new kind of energy patch in the western corner of the state. A boom in liquified natural gas (LNG) is happening throughout the Louisiana coastal areas. In the southwestern Chenier plain, which is also threatened from eroding pipeline and navigation canals, more than $90 billion of LNG projects and pipelines are in various stages of construction or planning.

[509] Coastal Protection and Restoration Authority of Louisiana, "Deep Horizon Oil Spill Restoration: RESTORE Act," accessed October 31, 2019. http://coastal.la.gov/deepwater-horizon-oil-spill-content/oil-spill-overview/restore-act/; Coastal Protection and Restoration Authority of Louisiana, "Multiyear Implementation and Expenditure Plan." Baton Rouge, LA, 2015, http://coastal.la.gov/wp-content/uploads/2015/05/Draft-RESTORE-Act-Multiyear-Implmentation-and-Expenditure-Plan.pdf.

[510] Coastal Protection and Restoration Authority, "Deep Horizon Oil Spill."

[511] The National Fish and Wildlife Foundation (NFWF) is in charge of funding projects using the criminal penalties. Kevin Sack and John Schwartz, "Left to Louisiana's Tides A Village Fights for its Life," *New York Times*, February 24, 2018, https://www.nytimes.com/interactive/2018/02/24/us/jean-lafitte-floodwaters.html.

land.[512] State officials conceded that the subsidence of the coast could no longer be arrested but merely slowed. Policy makers also began discussing “non-structural” efforts for communities such as buyouts for relocation. Traveling around the coastal communities, CPRA representatives also began working with stakeholder groups to discuss several controversial ideas to encourage relocation. They include: prohibiting any residential construction outside of planned levees and flood walls in areas that could experience extreme flooding; creating a buyout program for high-risk areas; phasing out the homestead exemption for property taxes in high-risk areas; requiring new commercial developments to have bonding for demolition costs at the end of their useful life or long-term vacancy; and requiring certain communities to participate in a program that lowers flood insurance rates for using flood-resistant construction. In response to the proposals, the president of Plaquemines Parish downriver from New Orleans, Amos Cormier, called it effectively condemning homes. “It’s patently clear to anyone who lives here that all of these proposals are against the residents’ interests. Just put yourself in that position. It’s the same as your home being condemned.”[513]

Conditions of Possibility.

On the front wall of the large CPRA-funded river model housed at the Water Campus near downtown Baton Rouge is a quote attributed to Albert Einstein: “We cannot solve our problems with the same thinking we used when we created them.” But instead of moving away from *Extractive Thinking*, the Master Plan allows for the continued historic practices that led to

[512] Footnote: A recent study showed an increase of 2 degrees Celsius would rise the water surrounding the city levees by 14.5 inches by 2040 and 6.5 feet by 2100. Jevrejeva, Svetlana, Jackson, Luke, Riccardo E., Riva M, and others. “Coastal sea level rise with warming above 2 °C.” Proceedings of the National Academy of Sciences Nov 2016, 201605312; DOI: 10.1073/pnas.1605312113.

[513] Della Haselle, “Voluntary Relocation, Construction Limits among the Options to Deal with Rising Water along Louisiana Coast,” *The Lens*, February 15, 2018, https://thelensnola.org/2018/02/15/voluntary-relocation-construction-limits-among-the-options-to-deal-with-rising-water-along-louisiana-coast/.

the conditions it was created under and which guarantee its future necessity. The plan to sustain Louisiana's Working Coast is inextricably tied to its extractive industries through the plan's funding mechanisms, to political rationalities that organize its logic, and to the political ecologies that render the region more vulnerable.

As I mentioned earlier, its largest source of recurring revenue comes from royalty collections on oil and gas platforms in federal waters. The Gulf of Mexico Energy Security Act passed by Congress in the wake of Katrina provides up to $170 million annually.[514] The 2006 state constitutional amendment dedicated GOMESA revenues to Louisiana's Coastal Protection and Restoration Trust Fund for the sole purposes of "integrated coastal protection." That definition was so expansive that it also included improvement of infrastructure directly impacted by coastal wetland loss such as pipelines and elevating Highway 1 – the oil highway to Port Fourchon – which was regularly deluged by high tides. The elevated super highway project to ensure that oil and gas activity will avoid disruption by rising seas was surprisingly supported by the Environmental Defense Fund.[515] But as mentioned in Chapter 3, the EDF was an original partner in joining with the oil industry to promote America's WETLAND.

While tying oil royalties to mitigate damage caused to the coast on its surface may seem appropriate. The inverse of that logic is also true: it turns the restoration authority into advocates for an industry that has shredded the state's wetlands and increased the danger of sea-level rise. For example, in October 2017, coastal officials announced that restoration projects would have to be scaled back due to falling global petroleum prices that reduced the state's royalty check

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[514] Bureau of Ocean Energy Management, "Gulf of Mexico Energy Security Act (GOMESA)," accessed July 27, 2018, https://www.boem.gov/Oil-and-Gas-Energy-Program/Energy-Economics/Revenue-Sharing/Index.aspx.
[515] Coastal Protection and Restoration Authority, 2017; Environmental Defense Fund, "Groups Pleased as Key Sediment Diversions Advance, Coastal Restoration Funds Protected: CPRA Board Moves Forward on Two Diversion Projects, Proposes Using GOMESA Funds for Highway Elevation" (press release), October 25, 2015, https://www.edf.org/media/groups-pleased-key-sediment-diversions-advance-coastal-restoration-funds-protected.

from the federal government. In response, the governor's coastal adviser, Chip Kline (now head of the CPRA), said there was reason to be hopeful because Trump's Department of Interior Secretary, Ryan Zinke, was about to announce the largest offshore oil and gas lease sale in history: 77 million acres in the Gulf of Mexico. He said, "Zinke was here in Louisiana a couple of weeks ago, and he promised to help us move some of our much-needed coastal projects forward. He gets it."[516] More drilling will place more pressure on pipeline routes through the marsh and add carbon dioxide to the atmosphere.

The Master Plan creates the conditions for its own possibility through dialectical effects upon the local ecology. It funds ring levees that protect coastal communities from flooding in the short-term, but whose presence disrupts the hydrological "sheeting" of sedimentation that maintains healthy estuaries. Levees not only entrap water after storms, but they encourage development in flood plains. Communities surrounded by levees are dependent on electric drainage pumps to remove floodwaters. Ultimately this cycle of water removal causes land within levee systems to sink. In Coastal Louisiana, communities protected by levees have dipped as much as 10 feet below sea level, which then leaves them more vulnerable and imminently harmed by catastrophic flooding.[517] Ecologically speaking, the vulnerability of these social geographies is reinforced by their protection, which requires subsequent intervention.

Technically, the master plan's multiple lines of defense strategy represents a contradiction of approaches. Roughly half of the resources in the plan is earmarked for coastal erosion and half is intended for flood control and river dredging. And sometimes the projects to dredge the river for navigation – which exacerbates coastal erosion by disrupting the natural

[516] Coastal Protection and Restoration Authority of Louisiana, "Clarity on GOMESA Funding and FY19 Annual Plan Presented at CPRA Board Meeting," December 13, 2017, http://coastal.la.gov/wp-content/uploads/2017/12/2017.12.13-GOMESA.pdf.
[517] Gagliano, "Canals, Dredging."

sedimentation hydrology of the river system – are rationalized by using the mud for wetland restoration. These are contradictory moves that undermine each other – but they are directed towards a common goal of supporting the Working Coast of Louisiana.

Supporters of the plan also tout its ancillary economic benefits in the form of a "water jobs cluster" that can be exported to other areas afflicted by sea-level rise and environmental decline. The plan becomes its own asset. "The unprecedented investment in coastal restoration and risk reduction in the last 10 years has put Louisiana at the forefront of using science and innovation to plan a sustainable future for our coastal communities and our valuable ecosystem."[518] The plan has become the organizing site for researchers and practitioners, scientists and design engineers, agencies and academics, focused on moving projects "from concept to construction." The authors frame this as "a significant workforce opportunity in coastal Louisiana with employment in the water management sector projected to increase 23 percent over the next 10 years."[519]

The 2017 Master Plan cites various studies that promote positive returns on workforce investment into a water management cluster, including a 2011 Louisiana Workforce Commission report on coastal restoration spending in Louisiana that found that coastal restoration expenditures in 2010 directly created 4,880 jobs and indirectly created 4,020 jobs. Future spending estimates reported a range of total employment impact from 5,510 to 10,320 jobs annually. Total economic output of employment including wages and "value added," ranged from $700 million to $1.3 billion. "There are two main job sectors in Louisiana that will see an increase in available job opportunities in the near-future: water management and energy." Within the New Orleans region an estimated 24,000 "job opportunities" will be created in these two job

[518] Coastal Protection and Restoration Authority of Louisiana, "Master Plan 2017," E5-11.
[519] Coastal Protection and Restoration Authority of Louisiana, "Master Plan 2017," E5-11.

sectors by 2025, including 13,632 in water management over the next ten years ranging from civil engineers and operations managers to analysts and construction laborers. “The 2015 Coastal Index published by the Data Center noted that within the New Orleans region, more than 9,500 water management jobs were gained from 2010 to 2014.” A $25 billion investment will create 57,697 jobs over ten years and 77,453 over 50 years.[520]

Windfalls of federal and state money are also changing the institutional landscape. Tulane University in New Orleans recently opened a “water campus,” called the Center of Academic Excellence for Research and Partnerships, to capture CPRA grant funding and foster collaboration among coastal researchers.[521] The new campus is partnering with the entrepreneurial community that sprouted up post-Katrina such as the technology business incubator, Propeller, which sponsors award contests and business challenges for “water entrepreneurs.”[522] The State of Louisiana in January 2018 opened a water campus in Baton Rouge to house the CPRA and its research arm, the Water Institute of the Gulf, which issues CFPs and carries out its own environmental studies for CPRA projects. The sleek 35-acre Water Campus includes other tenants carrying out CPRA designs, such as the LSU Center for River Studies which operates a 90-foot by 130-foot Mississippi River Model, the largest “movable bed” model in the world, to run sediment delivery experiments. The Water Campus held a public grand opening with the media, touting that its presence will bolster a blighted area adjacent to downtown Baton Rouge and help elevate the city’s business climate.[523] The campus

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[520] Coastal Protection and Restoration Authority of Louisiana, “Master Plan 2017,” 157.
[521] Tulane University, “River and Coastal Center,” accessed July 26, 2018, http://www2.tulane.edu/projects/rccenter.cfm.
[522] Propeller (website), accessed July 26, 2018, http://gopropeller.org. ORA Estuaries a startup founded by a pair of LSU engineering students, received some startup money for winning Propeller’s “Big Idea” competition in 2015 and the “New Orleans Water Challenge” in 2014 for their OysterBreak system, which is a rock-like modular platform for colonizing oyster larvae and growing oyster reefs. The company’s mission is to “empower coastal communities to rebuild the historic oyster reefs which provided storm resiliency, food security and economic opportunity.”
[523] The Water Campus (website), accessed July 26, 2018, http://www.thewatercampus.org/.

is promoted through glossy brochures touting shared workspaces overlooking the Mississippi River. Louisiana economic development officials tout the positive impacts that the BP legal settlement money following the Deep Horizon blowout will have on state contracts and workforce investment. “We foresee Louisiana as not only addressing its own water management issues but also developing scientific, engineering and construction expertise in the field that can be exported worldwide,” said Steve Grissom, the secretary of the Department of Economic Development. He also touted the “crossover” skills from shipbuilding, maritime and other oil-and-gas-related jobs. “So the slowdown in the oil patch adds to the potential labor pool.”[524] On Feb. 21, 2018, the CPRA announced its first six winners of the local parish matching program under the RESTORE Act, which will set aside $100 million in local project funding over 15 years. A spokesman from an industry advocacy group, “Restore or Retreat,” said a water management sector could help diversify the local economy from its reliance on the oil and gas industry, while aiding the fight against coastal erosion. “It's been a nice silver lining to this problem that we're facing now is that this could be workforce development, it could be diversity, and it could be an economic driver for our area."[525]

According to scholar Wendy Brown, Political Rationality brings together disparate interests under a governing form of reason, which once it takes hold, promotes the interests of that logic. “Political rationality is not an instrument of governmental practice, but rather the condition of possibility and legitimacy of its instruments, the field of normative reason from which governing is forged.” The Master Plan has become the normative form of reason for the

[524] Jerry Martin, “Contracting for Louisiana Coastal Restoration,” *1012 Industry Report*, September 22, 2015, https://www.1012industryreport.com/environmental/contracting-louisiana-coastal-restoration/.
[525] Jordan Legendre, “Coastal Plan Could Help Diversify Economy,” *Houma Today*, February 3, 2017, https://www.houmatoday.com/news/20170202/coastal-plan-could-help-diversify-economy.

benefits and opportunities it provides.[526] It helps explain how seemingly incompatible schemes – and players such as the Environmental Defense Fund and Shell Oil Co. – can join forces and serve to provide legitimacy to its logic.[527] For example, the Master Plan also enjoys the support of the powerful shipping lobby because it discursively and materially maintains the "Mighty Mississippi River" as a principle engine of commerce.[528] It rationalizes dredging the Mississippi River channel in order to pump "mud slurry" into endangered marshes.

Urgency

The Master Plan has laid out an argument for the urgency of its implementation. A study released by the state's quasi research arm, The Water Institute of the Gulf, for which the state CPRA is the main client, released a report in December 2016 that urged rapid implementation of the Master Plan to avoid cost inflation. The report said that delays in creating wetlands and ridges in open water with sediment dredged from elsewhere could balloon costs by 200 to 600 percent. Cost increases would be the result of additional erosion, increased construction costs and inflation during the delays. While dredging projects make up about $18 billion of the $25 billion in the 2012 version of the state's master plan, delays could add $5 billion or more to the total. The study, which found that cost per acre more than doubles in 20 years, was funded by several industry stakeholders, including the Coast Builders Coalition, which includes more than 20 businesses with present or hoped-for roles in coastal restoration, including dredging, engineering and project design; and the Restore the Mississippi River Delta Coalition, which includes the Environmental Defense Fund, National Audubon Society, National Wildlife

[526] Brown, *Undoing the Demos*, 116.
[527] Brown, *Undoing the Demos*.
[528] Big River Coalition (website), accessed September 27, 2018, http://www.bigrivercoalition.org.

Federation, Coalition to Restore Coastal Louisiana and the Lake Pontchartrain Basin Foundation, which has been assisting state officials in restoration planning. Both coalitions said they were concerned that delays in building coastal projects would reduce the amount of money available for actual construction.[529]

While Louisiana has identified roughly $10.7 billion to pay for Master Plan projects, the money is expected to be parsed out slowly to the state over 15 years. "If you build these projects now, you don't have to fill them to the same depth as you would if you waited 20 or 30 years," said Steve Cochran, director of the Delta coalition. "You're able to build above the water level now, and you also get the additional protection from the new wetlands during that period of time. That means you're keeping our heads above water for a longer period of time."[530] The industry-backed study also accounted for the cost of borrowing money to speed project implementation, such as selling bonds and the amount of interest that might accrue if money that's available now is not used because of delays in construction. The report concluded that interest earned on money not spent also would be dwarfed by increased construction costs. The report reviewed its assumptions at seven 2,000-acre locations with similar baseline conditions, applying five scenarios of subsidence and sea level rise. "Louisiana must seek ways to build on the significant work CPRA has already executed to date by accelerating the funding of restoration projects," said Coast Builders Coalition President Scott Kirkpatrick. "With over $10 billion committed to the Louisiana coast over the next 20 years, we must find ways to advance this funding, thereby allowing us to reduce project costs and realize marsh restoration benefits sooner."[531] In addition

[529] Water Institute of the Gulf. “"Future Costs of Restoration Projects in Coastal Louisiana: Summary Findings." Fall 2006. Accessed Nov. 4, 2019. http://www.mississippiriverdelta.org/files/2016/12/FutureCostof-RestorationAnalysisFall2016.pdf?_ga=2.249982278.1762513596.1572902244-384675608.1572275525.
[530] Coastal Protection and Restoration Authority board meeting observed by author, Aug. 20, 2018.
[531] Coastal Protection and Restoration Authority board meeting observed by author, Aug. 20, 2018.

to bond financing, the state is considering letting private wetlands restoration contractors build some of the projects, which could be paid by selling pollution credits to other businesses –who need to mitigate environmental damage for construction in wetlands areas.

A separate report issued by the independent Tulane Law School Water Policy Institute warned about the "chilling" effect of the rising cost of disaster insurance in coastal communities that will dampen their ability to recover from storm damages. Rising flood and crop insurance rates may "presage the physical impacts of climate change and could destroy communities just as surely as rising seas and land loss," the authors say. "The decisions on whether to offer insurance and for how much exist outside the civic discourse and often wholly outside Louisiana. If the Federal Government moves to reduce taxpayer burden and reduce its liability exposure, it will require an increase in premiums, a reduction in subsidies, and likely a shift towards private flood insurance. In order to survive, the state and its local governments will have to work with insurers and the federal government to stave off the "cascading impacts" of rising insurance costs that threatens long-term community viability.[532]

In this way, the Master Plan promotes that which justifies its necessity. It is the embodiment of the ongoing state of repair for Louisiana, which attempts to reconcile the irresolvable tension between survival and annihilation. By shoring up its value as both the economic driver and environmental savior, the Master Plan becomes the way forward for the political economy as well as the cultural imaginary of Louisiana that began as far back as the settlement of New Orleans and the various interventions into the unruly landscape that organized society around addressing – if not creating – the ongoing plight of living in an alluvial delta.

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[532] Tulane Institute on Water Resources Law and Policy, "Coastal Land Loss in Louisiana Has Far Reaching Impacts Beyond Those on the Physical Landscape: The Viability of Insuring Coastal Communities Will Presage Physical Land Loss, and Could Gut Communities Just as Surely as Floods and Hurricanes" (news release), February 27, 2018, https://www.tulanewater.org/insurability-of-coastal-communities.

One could think of the Master Plan as kind of a demonstration document: the wetlands as a laboratory to test speculative ideas; and the rise of a water cluster sector as an industry that could be exported to other communities in an age of global warming and rising sea levels, which are expected to hit New Orleans particularly hard. State officials admit the publicly funded interventions will not restore the entire "boot" of Louisiana or many of the vulnerable communities along the coast. Therefore, one might wonder what is it sustaining? Through a kind of governmentality, it appears that it is sustaining the industrial activity and assets that make the coast a viable site of investment for continued intervention. It is sustaining a rationale for intervention.

The governing logic of the Master Plan and the "Working Coast" reproduces the ongoing dialectic of depending on a diminishing landscape for one's livelihood, which further diminishes the landscape. If the wetland estuaries continue to transform into open water, the state's robust seafood industry will collapse. One could argue that oil and gas development and other heavy industry are actively transforming a landscape into one that can only support those industries. As an instrument of restoration, the Master Plan should be thought of as an *extraction machine*. It fails to call for reduction in oil and gas production that has left more 14,000 miles of canals open to salt water intrusion and "ponding" effects that have been associated with a third of all wetland losses.[533] It contains no projects to backfill oil and gas canals, which have been identified as a "low tech" solution[534] embraced by previous restoration plans. Leaving canals untouched satisfies oil interests as well as the faction of a few but powerful private landowners whose

[533] R. Eugene Turner, "Discussion of: Olea, R.A. and Coleman, J.L., Jr., 2014 [...]," *Journal of Coastal Research* 30, no. 6 (November 2014): 1330–1334, https://www.jcronline.org/doi/pdf/10.2112/JCOASTRES-D-14-00076.1; Shea Penland et al., cartographers, *Process Classification of Coastal Land Loss Between 1932 and 1990 in the Mississippi River Delta Plain, Southeastern Louisiana*, Louisiana Marine Coastal Geology Program, 43 × 33 in., USGS Open-file Report 00-418, US Geological Survey, 2001, http://pubs.usgs.gov/of/2000/of00-418/ofr00-418.pdf.
[534] Jeremy B. Jackson and Steve Chapple, *Breakpoint: Reckoning with America's Environmental Crises* (New Haven, CT: Yale University Press, 2018).

access canals and wells either produce steady royalty checks or may again in the future with newer drilling technology or increased market prices.[535]

An estimated 80 percent of coastal land in Louisiana is privately held, most of it by a handful of large landowners residing outside of Louisiana. Conoco, for example, owns 700,000 acres.[536] Randy Moertle, who represents a consortium of six south Louisiana landowners that collectively own 185,000 acres and sits on several stakeholder coalition boards, including America's Wetland and Ducks Unlimited, said that backfilling canals is extremely unpopular among landowners. Moertle's consortium typically lease their mineral rights to oil and gas companies and use their surface rights for alligator hatchlings, ranch land pasturing, duck hunting, fishing, and other revenue producing outdoors activities. What irks them, according to Moertle, is when a scientist will propose a marsh restoration project on their property without collaborating with the landowner. "They might say let's put a marsh here, but that's on top of my alligator hatchlings. That's not going to happen." For all intents and purposes, without the landowner's consent, any effort to backfill canals would require imminent domain and a legal "taking" by the state and end up in court litigation, which will take time and resources away from the unfolding catastrophe of coastal erosion. (Yet oil companies do it all the time.)[537] Backfilling is also unpopular with fisherman, said Jim Tripp with the Environmental Defense Fund, who characterized backfilling canals as "buying Peter to pay Paul" because the sediment would have to come from somewhere. The lack of sediment is an ongoing constraint cited by coastal planners. Even river sediment – if directed into the marsh – contains about half the volume it once did because of urban hard scape development throughout the Mississippi River Basin.

[535] Houck, "Reckoning."
[536] Mark Davis, in conversation with the author, September 24, 2018.
[537] Randy Moertle, telephone interview by the author, August 31, 2018.

Backfilling canals is too individualized to be considered as part of the large scale system wide approach the Master Plan takes, according to Denise Reed, one of the plan authors.[538] Creating a backfill program would require a large mobilization effort to directly siphon mud and small amounts of material to different places, she said. Meanwhile, one of the early coastal restoration advocates, Mark Davis, says that the longer backfilling is neglected, the less sediment is available for it. When the state was first considering backfilling in the 1980s, the "spoil bank" ridges of mud cuttings along the side of canals could have been pushed back into the water channel and prevented subsequent saltwater intrusion while providing platforms for vegetative growth. Those solutions were actively fought by the oil and gas lobby, and many were screened out of the 2012 Master Plan update. Today many of the banks themselves have compacted into the eroding conditions they helped cause through hydrological disruption.[539] Their neglect has been productive for the political interests that have long resisted them.

As an extraction machine, the Master Plan also fails to build upon findings by US Geological Surveys on subsidence "hot spots" in the marsh. These spots correlate to periods of rapid removal of crude oil that may have been caused by either depressurized well cavities beneath the surface or from deep well brine that may have triggered subterranean fault activity.[540] There is no public discussion by coastal planners to re-pressurize old wells with fluid to halt subsidence as is required in California and other places.[541] Instead the Master Plan

[538] Denise Reed, telephone interview by the author, Sept. 20, 2018.
[539] Denise Reed, telephone interview by the author, Sept. 20, 2018.
[540] Reed and Wilson, "Coast 2050"; Robert A. Morton, Julie C. Bernier, and John A. Barras, "Evidence of Regional Subsidence and Associated Interior Wetland Loss Induced by Hydrocarbon Production, Gulf Coast Region, USA," *Environmental Geology* 50, no. 2 (May 2006): 261–274, https://doi.org/10.1007/s00254-006-0207-3; Coastal Protection and Restoration Authority of Louisiana, "Louisiana's Comprehensive Master Plan for a Sustainable Coast: 2012: Appendix A1: Projects Screened Out of Consideration in the 2012 Coastal Master Plan," Baton Rouge, LA, https://coastal.la.gov/our-plan/2012-coastal-masterplan/cmp-appendices/.
[541] Long Beach was once known as the "Sinking City" where 3.7 billion barrels were extracted from the Wilmington Oil Field that created a 20-square mile "subsidence bowl" of up to 29 feet deep around the Port of Long Beach and the coastal strand of the City of Long Beach. In the 1950's, water injection was shown to re-pressure the oil

focuses on implementing system wide projects like diversions – which has been met with resistance by many coastal communities whose residents rely on the brackish estuaries for seafood harvesting, oyster farming and fishing.

Technical Disagreements

Opponents to diversions argue that they are unpredictable, slow and expensive. Two pilot diversion projects created in the 1990s by the Coastal Wetlands Conservation Grant Program or "Breaux Act" have produced mixed results.[542] Public forums held by the CPRA in coastal communities are often punctuated with heated discussions and acrimony, resulting in what Craig Colten calls a "democratic deficit."[543] Social scientists generally have argued that the social effects of the Master Plan and diversions need to be considered with the same priority as the technical efficacy of land restoration. The very population that depend on this environmental setting for their traditional livelihoods will be the most immediately impacted and often feel they are not able to participate in the planning as they would like. Good science is essential, but because environmental management is fundamentally a human activity, effective predictions of human impacts demand, at the very least, paying equal attention to the social, political, cultural, and economic systems in which environmental management takes place.[544]

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formations, stop the underground compaction as well as surface subsidence, and increase oil recovery — which ultimately led to the California Subsidence Act in 1958. City of Long Beach, "Subsidence."

[542] R. Eugene Turner, "Doubt and the Values of an Ignorance-Based World View for Restoration: Coastal Louisiana Wetlands," *Estuaries and Coasts* 32, no. 6 (November 2009): 1054–1068, https://doi.org/10.1007/s12237-009-9214-4; R. Eugene Turner, "The Mineral Sediment Loading of the Modern Mississippi River Delta: What Is the Restoration Baseline?," *Journal of Coastal Conservation* 21, no. 6 (December 2017): 867–872, https://doi.org/10.1007/s11852-017-0547-z.

[543] Craig E. Colten and Scott A. Hemmerling, "Social Impact Assessment Methodology for Diversions and other Louisiana Coastal Master Plan Restoration and Protection Projects," produced for and funded by the Coastal Protection and Restoration Authority of Louisiana (The Water Institute of the Gulf, February 2014), 61–66, https://thewaterinstitute.org/assets/docs/reports/4_22_2014_Social-Impact-Assessment-Methodology-for-Diversions-and-other-Louisiana-Coastal-Master-Plan-Projects.pdf.

[544] Colten and Hemmerling, "Social Impact Assessment Methodology."

The state's powerful oyster lobby is also against the diversions, which they fear will "over-fresh" their leases. In 1994, the state's 1,500 oyster leases won a class action lawsuit in federal court over damages from the Caernarvon freshwater diversion. They wanted 100 years of revenue from the leases and were initially awarded a $1 billion jury settlement. However, on appeal the Louisiana supreme court reversed the decision and held the state harmless finding that the state was not liable for damages to oyster leases because of a "hold harmless" clause within the contract.[545] The presiding judge in the case reduced their harm to 3 years of revenue with a fair relocation fee. However, the Caernarvon diversion led to the state's oyster lease moratorium in 2002. By then, more than 400,000 acres of state-owned water bottoms had been leased for oyster production, which raised more than $1.2 million in annual revenues. In 2016, legislation passed that established a framework to lift the moratorium.[546]

State officials are sensitive to the various positions and pots of funding sources related to projects, particularly the proposed sediment diversions. In a 2018 guest newspaper column, CPRA Director John Bradberry took pains to specify that the two sediment diversion projects that are advancing through federal permitting, the Mid-Barataria and Mid-Breton sediment diversions, are being funded by "money available from the criminal settlement of the 2010 Deepwater Horizon oil spill – not your tax dollars."[547] A fishing boat captain, George Ricks, who represents one such group, Save Our Coast, questions why the state is embarking on unproven

[545] Avenal v. State, 03-C-3521 (La. 10/19/04), 886 So. 2d 1085, http://www.lasc.org/opinions/2004/03c3521.opn.pdf
[546] Sara Sneath, "Louisiana Hopes New Oyster Leases Will Ease Pain of Coastal Restoration Efforts," *Times-Picayune*, June 19, 2018, https://www.nola.com/environment/2018/06/louisiana_searches_for_ways_to.html.
[547] Johnny Bradberry, "Coastal Protection Guest Column: Louisiana Land Loss a Crisis; Here's What We're Doing About It," *Advocate* (Baton Rouge, LA), April 3, 2018, https://www.theadvocate.com/baton_rouge/opinion/article_7179c8c2-3691-11e8-a12a-63644815819e.html.
Pres. Obama appointed Ray Mabus, the former governor of Mississippi and U.S. Sec. Of the Navy, who led a gulf coast ecosystem restoration task force that recommended that Congress dedicate a significant portion of any civil penalties paid by the responsible spill parties under the Clean Water Act (CWA) to the larger restoration efforts in the Gulf. With the potential CWA fines running between $5 billion and $20 billion.

projects that cost billions of dollars when they could more quickly pump dredged slurry into marshes which will have an immediate effect versus waiting years for the marsh to recover, if at all. “We need land now,” says Ricks, who runs charters out of St. Bernard Parish downriver of New Orleans. “The only way we can do that is by dredging.” Meeting one afternoon at a family-owned diner in St. Bernard Parish, the fishing captain said it’s obvious to him why the state favors big diversion projects over small targeted efforts. “Look at all the money behind this,” he said. Hairless on top with an outdoorsman’s tan and a black mustache, Ricks repeats a familiar argument of many others dependent on the seafood industry. But he is more concerned about salt-water catches being replaced by bass and other freshwater fish. “What makes Louisiana so unique,” he said, “is the saltwater fish in the marshes.”[548] Ecologists argue that the estuaries and marshes are becoming saltier precisely because of the erosion of the estuaries. The observation of Bottle Nose Dolphin a stone’s throw from at the Pointe-Aux-Chenes Marina at the water’s edge in Terrebonne Parish would have been quite a spectacle a generation ago. Today they are common. Yet Ricks feels that the displacement effects of the old pilot diversion at Caernarvon Freshwater Project, which operates at 8,000 cubic feet per second (cfs), will be dwarfed by the much larger sediment diversions the state is planning.

Others are concerned about pollutants from the Mississippi River. While there is evidence supporting the efficacy of marshes to filter municipal effluence, for instance,[549] it is not at all clear if Louisiana’s degraded marshes can filter what’s flowing down the Mississippi River. Currently, farm pesticide and nutrient runoff at the river’s mouth generates a hypoxia “dead

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[548] George Ricks, in conversation with the author, 2016.
[549] Rachael G. Hunter et al., “Using Natural Wetlands for Municipal Effluent Assimilation: A Half-Century of Experience for the Mississippi River Delta and Surrounding Environs,” in *Multifunctional Wetlands: Pollution Abatement and Other Ecological Services from Natural and Constructed Wetlands*, eds. Nidhi Nagabhatla and Christopher D. Metcalfe, 15–81 (Cham, Switzerland: Springer, 2018).

zone" of algae whose plume rivals the size of Vermont and consumes enough oxygen to suffocate marine life.[550] The openings of the Bonnet Carré Spillway this year to relieve flood levels from the Mississippi River into Lake Pontchartrain and the Gulf of Mexico were expected to exacerbate what was expected to be one of the largest if not the single largest hypoxia dead zone in the Gulf of Mexico this past summer. In a recent example of resistance, the local government of Plaquemines Parish tried to withhold permission for the state to take soil samples for its $1.4 billion diversion structure that could send as much as 75,000 cubic feet per second of sediment-laden freshwater from the Mississippi into brackish Barataria Bay. To which, the state threatened to withhold other restoration projects until the local government complies with its requests.[551]

Beyond that, some communities in the path of diversions will be forced to move because of increased water levels.[552] Located 25 south of New Orleans, the town of Jean Lafitte discovered in the 2012 version of the Master Plan that it would was not on the list to be included in the new "Morganza-to-the-Gulf" levee system. It was also in the path of the proposed $1.4 billion Mid-Barataria Diversion. The town's leadership set out to increase the community's strategic value by securing so much public infrastructure that it would become too valuable to abandon. The town's longtime mayor Tim Kerner has successfully secured a suite of state projects, including a 1,300-seat auditorium, a library, a wetlands museum, a civic center and a baseball park. "Jean Lafitte did not have a stop light, but it had a senior center, a medical clinic, an art gallery, a boxing club, a nature trail and a visitor center where animatronic puppets acted

[550] Mississippi River/Gulf of Mexico Hypoxia Task Force, "Hypoxia 101"; Goolsby, "Mississippi Basin Nitrogen Flux"; and Rabalais et al., "Characterization of Hypoxia."
[551] Faimon A. Roberts III, "Deadline in Plaquemines Parish-State Standoff Passes without Action," *Advocate* (Baton Rouge, LA), June 29, 2018, https://www.theadvocate.com/new_orleans/news/environment/article_2cd394de-7be5-11e8-88f5-73f3952a60be.html.
[552] Craig E. Colten, "The Place for Humans in Louisiana Coastal Restoration," *Labor e Engenho* 9, no. 4 (December 2015): 6–18.

out the story of its privateer namesake." It mattered less how much the facilities had been used but that they existed. "Do we lose that investment, or do we protect it? I hope people will see that, hey, not only are we fighting hard to exist, but, you know, maybe this place is worth saving."[553] Based on that argument, the town was able to convince state planners to establish limited levee protection in the 2017 Plan update. On my drive through Lafitte in June, I witnessed an uncanny site of dozens and dozens of brick slab houses hoisted atop 20-foot pilings.

Lafitte may have simply taken a page from New Orleans. Rather than retreating after Katrina, New Orleans city leaders doubled down. The city's airport authority just opened a new $1.3 billion airport.[554] The state delegation has been deploying the same argument for the value of the coast ever since it failed to win the passage of the afore mentioned Conservation and Reinvestment Act (CARA). The state's way forward is through ambition for a future, and they believe the Working Coast gives them an effective strategy.

Meanwhile, there exists a contingent of researchers who argue that building sediment diversions without addressing the thousands of miles of oil and gas pipeline canals throughout the coast may actually increase subsidence.[555] Some ecologists and other marine researchers also criticize the diversions as being the wrong tool for marsh restoration. The ecologist Eugene Turner argues that the thick gnarly cord grass is needed to keep the dirt together. It's not just mud, but organic plant matter that is needed to create marsh that is sturdier than the marsh created by the Caernarvon pilot diversion site. That marsh is "floating mat," says Turner. It was pushed up like an according during Hurricane Katrina because it's infused with water loaded with nitrates and other fertilizers that are harmful to marshlands when overloaded. "Flooding

[553] Sack and Schwartz, "Left to Louisiana's Tides."
[554] However, the opening which was envisioned to coincide with New Orleans' 300-year anniversary in 2018 has been beset by delays and is now pushed back to late fall of 2019.
[555] Jackson and Chapple, *Breakpoint*.

them with Mississippi Water is the worst thing you can do. The state built a geology model when this is living organic marsh, a biological system."[556] The rebuilt marsh by Caernarvon has shallow roots. All you have to do is reach down and grab a tuft. "They come out in your hand," observed Ricks.[557] His concerns echo the results of a 2011 paper, "Freshwater River Diversions for Marsh Restoration in Louisiana" that analyzed satellite images of the areas of three freshwater diversions and found that, through 2009, marsh area had not grown significantly at the diversion sites and that the diversion regions suffered more damage during Hurricane Katrina than other areas, apparently due to freshwater plants being more fragile than brackish-water plants.[558] The authors concluded that the scientific basis for river diversions needs to be more convincing before embarking on a strategy that may result in marshes less able to survive hurricanes.

It leaves one speculating that research questions outside of acceptable political parameters supporting the Working Coast have been effectively sidelined. As an individual case, Louisiana reflects the larger social and environmental impact of 21st century energy policy. It has fostered a plan that deploys science for coastal restoration efforts that ends up rationalizing the state's petro-economy. The commonsense that it relies on participates in an already existing global logic reproduced through international oil and gas production networks where oil companies either extract without hindrance[559] or buy what Toby Miller describes as "social licenses to operate." By purchasing other goodwill offsets, oil companies produce a[560]

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[556] Jackson and Chapple, *Breakpoint*, 59.
[557] George Ricks, in conversation with the author, 2016.
[558] Michael S. Kearney, J. C. Alexis Riter, and R. Eugene Turner, "Freshwater River Diversions for Marsh Restoration in Louisiana: Twenty-Six Years of Changing Vegetative Cover and Marsh Area," *Geophysical Research Letters* 38, no. 16 (August 2011): L16405, https://doi.org/10.1029/2011GL047847.
[559] Julie Koppel Maldonado, "A Multiple Knowledge Approach for Adaptation to Environmental Change: Lessons Learned from Coastal Louisiana's Tribal Communities," *Journal of Political Ecology* 21, no. 1 (2014): 61–82, https://doi.org/10.2458/v21i1.21125
[560] Toby Miller, *Greenwashing Culture* (London: Routledge, 2018), 74.

"Greenwashing Effect," which is particularly insidious in Louisiana, which is both one of the nation's largest producers of fossil fuels and singularly vulnerable to sea-level rise. Louisiana's coast constitutes 40 percent of the U.S. coastal marshes and 80 percent of its losses.[561] Greenwashing allows corporations to act as good stewards even though their primary concern is extracting profit for shareholders at minimal costs. In Greenwashing campaigns, corporations routinely describe themselves as citizens, while principally pursuing economic interests, argues Miller. "Their restless quest for profit unfettered by regulation is twinned with a desire for moral legitimacy and free advertising, based on 'doing right' in a very public way, while growing rich in a very private one."[562]

I recently attended a meeting of America's WETLAND coalition comprised of high-profile environmentalists, landowners and restoration planners, at Nicholls State University 50 miles southeast of New Orleans at the steps of Terrebonne Parish's receding coast. The meeting was sponsored by the international mining and petroleum company, BHP (formerly BHP Billiton). A spokeswoman for the Australian-based multi-national said they intended to operate in the Gulf of Mexico for decades to come. "Part of who we are is sustainability and partnering. We want to make sure that we are part of a stewardship to leave things in a better position than when we arrived."[563] BHP in February 2017 invested $2.2 billion into the new "Thunder Horse" water injection platform owned by BP, which marked BP's first project in the Gulf of Mexico

561 S. Jeffress Williams, "Louisiana Coastal Wetlands: A Resource at Risk," US Geological Survey Fact Sheet, accessed September 28, 2018, https://pubs.usgs.gov/fs/la-wetlands/.
562 Toby Miller, *Greenwashing Culture*, 79.
563 Rachel Archer, public comments at the Communities Adaptation Leadership Forum, Nicholls State University, Thibodaux, LA, August 29, 2018, observed by the author. BHP is also on record for paying a $25 million fine issued by the U.S. Securities and Exchange Commission in 2015 related to its "hospitality program" at the 2008 Summer Olympics in Beijing that provided 176 government and state-owned-enterprise officials an all-expenses paid package to attend the Games. While BHP claimed to have compliance processes in place to avoid conflicts of interest, the SEC found the company violated the Foreign Corrupt Practices Act by inviting officials from at least four countries where BHP had interests in influencing the officials' decisions.

since its 2010 Deepwater Horizon oil disaster, which is still the world's worst environmental disasters on record.[564] At the WETLAND meeting, Rachel Archer, who is BHP's general manager for Gulf of Mexico operations, stressed their commitment to social responsibility. "We need to be able to demonstrate we are responsible, good stewards."[565] She pointed to the company's international presence as a point of its stewardship. "We are global mining, and petroleum – beneficiaries of these resources all over world. That comes with a social responsibility." BHP is currently in the midst of settling a $51 billion compensation claim for the massive mining dam collapse in 2015 – called the worst environmental disaster in Brazil's history – that killed 19 people, destroyed three towns and contaminated 280 miles of river with iron waste.[566] In June, the company issued a report that five of its mining dams in Brazil and Australia "are at extreme risk of collapse," which would cause damage and loss of life. [567]BHP was also fined $25 million by the U.S. Securities and Exchange Commission in 2015 related to its "hospitality program" at the 2008 Summer Olympics in Beijing that provided 176 government and state-owned-enterprise officials an all-expenses paid package to attend the Games. The SEC found the company violated the Foreign Corrupt Practices Act by inviting officials from at least four countries where BHP had interests in influencing the officials' decisions

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[564] Jillian Ambrose, "BHP Billiton Backs BP's Return to Gulf of Mexico with £1.75bn Investment," *Telegraph*, February 9, 2017, https://www.telegraph.co.uk/business/2017/02/09/bhp-billiton-backs-bps-return-gulf-mexico-175bn-investment/.

[565] Rachel Archer, public comments at the Communities Adaptation Leadership Forum, Nicholls State University, Thibodaux, LA, August 29, 2018, observed by the author; Audine Bartlett, "Foreign Bribery Update: A Harsh Lesson for a Global Miner," *Resources Newsletter*, June 2015 (Carter Newell Lawyers, Brisbane, Australia), https://www.carternewell.com/icms_docs/218542_Foreign_bribery_update_A_harsh_lesson_for_a_global_miner.pdf.

[566] Jon Yeomans and Donna Bowater, "One Year On, Brazil Battles to Rebuild after the Samarco Mining Disaster," *Telegraph*, October 15, 2016, https://www.telegraph.co.uk/business/2016/10/15/one-year-on-brazil-battles-to-rebuild-after-the-samarco-mining-d/.

[567] Sandra Laville, "BHP Reveals Five Mine Dams at 'Extreme' Risk of Causing Damage and Loss of Life," *Guardian*, June 7, 2019, https://www.theguardian.com/business/2019/jun/07/bhp-reveals-five-mining-dams-at-extreme-risk-of-causing-damage-and-loss-of-life.

It is challenging to be a good local steward when the profit centers and headquarters of companies are thousands of miles away, says Mark Davis, which adds to the conundrum in Louisiana which is full of “middle managers.”[568] Under the current legal architecture, oil producing landowners are simply incentivized to turn areas into what Julie Maldonado calls “Sacrifice Zones.” In sacrifice zones, human lives are valued less than the natural resources extracted from a place.[569] Such extraction activity generates shareholder profits and state tax revenues. Rapid resource extraction that denudes the surrounding area makes those within the sacrifice zone increasingly vulnerable and marginalized, causing further economic or physical displacement. Maldonado points to the displacement of Isle de Jean Charles as a result of social and economic inequality – resulting from a lineage of decisions and values that privileged corporate interests and distant shareholders over local users who depend upon local resources.

In Sacrifice Zones, the levers of power are hidden by what appear to be natural disasters such as hurricanes or ecological disasters such as oil spills. The social impacts of these disasters are worsened because of poor regulatory oversight, improper compensation to victims, and cultural disregard to certain communities that already live on the margins. Examples abound in Louisiana of environmental injustice to poor communities without political, legal or educational capital to fight harmful projects that further marginalize them. Consider the plight of poor residents in western St. James Parish, set between Baton Rouge and New Orleans, on an 85-mile stretch of Mississippi River that hosts a cluster of petrochemical plants known not so affectionately as “cancer alley.” The St. James Parish Council split 5-4 in August 2017 to allow the state permitted Bayou Bridge Pipeline project by Energy Transfers Partners, owners of the Dakota Keystone pipeline, to acquire land needed to reach its destination in the petrochemical

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[568] Mark Davis, in conversation with the author, September 24, 2018.
[569] Maldonado, “Multiple Knowledge Approach.”

cluster on the west side of the river. The $670 million project would funnel 480,000 gallons of crude oil daily to East St. James Parish, cutting 62 miles across south Louisiana through the sensitive Atchafalaya Basin wetlands. It is opposed by a small collection of landowners resisting rights of way for the project as well as the nonprofits Atchafalaya Basinkeeper and the Louisiana Crawfish Producers Association-West who say the dredging and ditches for the pipeline are ruining the landscape and destroying their livelihood.[570] Bayou Bridge will soon be joined in St. James Parish by a proposed $9.4 billion ethylene oxide plant by Formosa Petrochemical Corp., which received $207 million in tax break subsidies from the state that perennially ranks at the bottom in environmental and public health on every major index.[571]

In order to understand environmental degradation and displacement as what Maldonado calls "tacit persecution," we must understand how such conditions are created. A genealogy of extraction and political ecology of Louisiana helps us de-naturalize bad air and weather. The social and environmental exploitation by the oil and gas industry has roots in earlier landscape exploitation. According to Diane Austin, the sugar and timber industries, along with the water development projects created to protect them, set the stage and established the actors for oil and gas. Land wrestled from the swamps through levee and drainage programs coincided with the cultivation in the mid-19th century of sugar plantations. Sugar producers imported large numbers of African slaves, which created a rural population outside New Orleans that outnumbered white residents by three to one. Incited by competition from Cuban and West Indies sugar producers, Louisiana planters intensified cultivation and increase economies of scale through land

[570] Mitchell, "St. James Parish Council."
[571] Nationally, Louisiana ranks 4th in all cancer rates, 5th in heart disease, 1st in kidney disease and 1st in septicemia, 2nd in percentage of births to unwed mothers, 1st in cesarean deliveries, 2nd in preterm birth, and 2nd in low birthrate. National Center for Health Statistics, "Stats of the State of Louisiana," Centers for Disease Control and Prevention. accessed September 27, 2018, https://www.cdc.gov/nchs/pressroom/states/louisiana/louisiana.htm.

consolidation and new equipment technology such as steam and rail transportation.[572] New Orleans merchants purchased sugar that was cultivated by slave labor. Sugar was carried by steamboat, powered by wood. “From 1850 to 1860, planters seized rich levee crests, drained swamps, constructed canals, dredged rivers, and acquired their neighbors’ properties.”[573] The average size of farms in neighboring St. Mary Parish for example nearly doubled from 230 acres in 1850 to 413 acres by 1860. By that time, Louisiana planters were producing one-fourth of the world's sugar and were among the south's wealthiest slaveholders.[574] Throughout the early 1900s, lumber companies established camps and communities to house workers, mostly blacks and Cajuns, who received low wages or “scrip” payments for long hours and dangerous work. Workers frequently remained indebted to the company store. Their employers occupied key positions in local banks, city and state government, and ship channel companies. Because most of the logging occurred on private land, there was little opportunity for public dissent. Those working in the forests were widely dispersed,[575] and timber companies moved quickly, clearing one stand to the next. This “pulse” of logging between 1876 and 1956 all but eradicated the cypress forests in Louisiana.[576] By the early 1930s, just one percent of the cypress forests remained, and the industry was almost completely gone.[577] After the state of Louisiana issued the first coastal zone oil lease in 1921, Land development companies began acquiring huge tracts of

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[572] Diane E. Austin, “Coastal Exploitation, Land Loss, and Hurricanes: A Recipe for Disaster,” *American Anthropologist* 108, no. 4 (December 2006): 671–91, http://www.jstor.org/stable/4496511.
[573] Diane E. Austin, “History of the Offshore Oil and Gas Industry in Southern Louisiana: Volume III: Morgan City’s History in the Era of Oil and Gas—Perspectives of Those Who Were There,” OCS Study MMS 2008-044 (US Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA, 2008), 5, https://www.boem.gov/ESPIS/4/4532.pdf.
[574] Austin, “History,” 5.
[575] Austin, “Coastal Exploitation,” 676.
[576] Keddy et al., “Wetlands of Lakes Pontchartrain.”
[577] Keddy et al., “Wetlands of Lakes Pontchartrain.”

swampland, which also prompted timber and fur companies to hold onto land and lease it for exploration.

Over at Isle de Jean Charles, mentioned at the beginning of this chapter, tribal members were up against the power of private developers and oil companies backed by the state that forced the residents to sign leases for mineral rights they could not read or understand as most of them did not speak English. Other tribal members who failed to pay property taxes forfeited their mineral rights to the state which then sold them to oil corporations.[578] Without land rights in a sacrifice zone, the tribe could not initiate reclamation projects to buffer their immediate property since reclamation projects must be initiated by the landowner and approved by the state.[579] The intense production of the surrounding fields from hydrocarbon withdrawal and dredged canals led to extreme subsidence and erosion.[580] In 1955, the Isle de Jean Charles comprised of more than 22,0000 acres, which had been enough land for the community members to farm, trap, and shelter from storms off the Gulf of Mexico. Today, the remaining 320 acres are surrounded by a watery landscape dotted with refinery tanks, flaring gas lines and pipeline signs warning against anchoring. The Corps of Engineers determined it was cheaper to move the people rather than extend the levee. However, to add insult to injury the state-recognized tribe has not received federal recognition as of this writing, which has held up funding for the $48 million resettlement grant. Through an arrangement with the state, Louisiana has taken over the grant for land acquisition but is now opening the parcels to non-tribal members.[581]

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[578] Maldonado, "Multiple Knowledge Approach."
[579] Mark Davis, in conversation with the author, September 24, 2018.
[580] Isle De Jean Charles, Louisiana, "The Island," accessed September 27, 2018, http://www.isledejeancharles.com/.
[581] Sara Sneath, "Louisiana Tribes Say Federal Recognition Will Help to Face Threat of Climate Change," *Times-Picayune*, July 26, 2018, https://www.nola.com/expo/news/erry-2018/07/449c2f22d39490/louisiana-tribes-say-federal-r.html; Jesse, Nathan, comments during presentation at the Social Studies of Science 2019 Annual Meeting in New Orleans.

Visiting the sinking island in the fall of 2016, I witnessed yet another uncanny site of a landscape sliding beneath the water's surface. This frontier of land loss – which is also a site where sea-level rise is conflating onto an existing problem – is 2 ½ hours south of New Orleans. The route winnows from a four-lane highway to a two-lane bayou road that eventually leads to a single paved road surrounded on all sides by open water. There, I witnessed the quiet erasure of a nearly abandoned hamlet of stilt-raised homes and fishing camps bearing witness to the rising tides of man's hubris. It was late afternoon when I reached the isthmus and a school bus was making its way back out. A storm was approaching from the south and few people were about. A lawn mower mechanic tinkered around engines beneath his raised home. I passed a silent figure on a porch and an angler troubling his tackle and supplies at his boat which sat on a trailer by the bait shop boat launch. More houses than not were empty. As I proceeded to the dead end of the road, I was met with standing water creeping up beneath the car parks of two elevated homes at the end. The sheet of water rippled from storm gusts approaching. The water's crooked line across the road marked the beginning of the sea. I reversed a stone's throw back into the bleached oyster shelled parking lot of the bait shop. The same boat and trailer stood alone. I parked in front of the bait shop and went upstairs to the porch. I sat on a swing and looked around the swales of water and patches of green behind the narrow strip of camps. The storm had turned the sky milky white. Wind was kicking up. I walked downstairs to the landing and looked out over empty slips. The wooden fishing piers lay inches beneath the surface of the water. It was quiet. I was reminded of Mike Tidwell's descriptions from his book, Bayou Farewell, where he documented the town of Leeville and other Louisiana fishing communities slipping into the sea. He writes:

> "We all pile into the crab boat and Tim tells his son to head down the bayou. A few hundred feet away, just before Route 1 crossed Bayou Lafource atop the

> rusting Leeville Bridge, Tim points toward a water stretch of marsh grass oddly littered with bricks and concrete."
> "It's a cemetery," he says.
> "There, shockingly, along the grassy bayou bank, I can now make out a dozen or so old tombs, all in different stages of submersion, tumbling brick by brick into the bayou water."[582]

Conclusion

It seems clear that in Louisiana, environmental sustainability signifies sustaining an extractive business environment at the expense of other ecologies of social and environmental health. Discourses of sustainability flow throughout the state's Master Plan and discussions of the "Working Coast."[583] Active measures to intervene and reverse coastal erosion are undertaken in order to continue extraction. So ultimately, the cycle continues. It's part of an ongoing continuum of Louisiana's political economy of extracting and exhausting its natural resources – from old growth timber and muskrat fur to fisheries and oil and gas. Extracting resources from the land is part of the state's identity, which provides the cultural cover of continued extraction if only to justify the ongoing governmentality of mitigation. Through an effective Greenwashing campaign, the industrial polluters and oil companies that have operated for years in the Louisiana wetlands and Gulf of Mexico joined forces with environmentalists in the early 2000s to successfully underwrite a national campaign that framed the oil industry not as the cause of land loss but one of its victims. We can locate the deployment of the "Working Coast" precisely to this campaign, which was developed after efforts failed in 2000 to win federal support for the state's first comprehensive restoration plan, called *Coast 2050*. This

[582] Tidwell, *Bayou Farewell*.
[583] The disconnect is not lost on the fishermen who live downstream of New Orleans "Why are we the ones that got to adapt?!" One of them yelled at a heated town hall that was organized this spring by the CPRA and La. Seagrant to discuss ways to adapt to the changes that diversions will be bringing to the marshes. Observed by author, Feb. 13, 2019.

argument for national relevancy of the coast's industries ties the preservation of the coast to the very practices causing coastal erosion. It cements the uneasy mixture of oil and water that is part of the ontological dilemma of Louisiana that I explore in the introduction.

As groundbreaking as *Coast2050* was in terms of its strategic and regional approach, coastal planners were unable to attract a federal partner without a financial calculus that dollars invested in coastal restoration would be justified through financial return. They had to quantify the value of the wetlands through its industrial productivity, which continues to limit imagined futures for the land. Today as part of any restoration argument, coastal advocates and industrial interests highlight the industrial productivity of the coast in order to justify financial returns on investment. This neoliberal rationale ties the preservation of the coast to the very practices causing its destruction. An emerging moniker of the "Working Coast" as the state's linchpin issue provided talking points for saving the coast while eliding the problematic strategy of protecting an industry from the destruction it causes and tacitly shifting the financial burden of restoration onto the federal government and U.S. taxpayers. While the plan traffics in discourses of "resilience" on behalf of some communities, it brackets off expectations of sacrifices by capital interests. Without curtailing drilling, the state leveraged the devastation wrought by Katrina and Rita to successfully renegotiate the state/federal royalty share through GOMESA, something they had failed to accomplish in 2000. They were able to build upon a legacy of extractive thinking by using Katrina and coastal erosion as a vehicle to intensify oil and gas drilling – which would presumably fund a master plan to mitigate damages from oil and gas drilling. This required some admission to the industry's historic destruction in the state's wetlands, which they could ostensibly mitigate through further energy production. They aimed their ire instead at the Army Corps of Engineers' leveeing of the Mississippi River, which is only one of several causes to coastal erosion and subsidence. As a result, they produced a plan that I argue rationalizes further activity and reproduces a need for itself and future mitigation measures. In this way, the plan reproduces the conditions for its own possibility. It bolsters a political economic regime that reproduces itself through further interventions in the landscape. All of this begs a fundamental question of whether Louisiana can be separated from the economic rationalities that set the crisis in motion and justify an unending continuum of intervention. Simply, can Louisiana and New Orleans exist without a Working Coast that appears to be both sinking it and rationalizing a plan to maintain it? Can we envision the existence of New Orleans or Louisiana without its accompanying sign of extraction – that includes not only deep draft shipping along the Mississippi River and a robust oil and gas and petrochemical industry, but also measures to mitigate its damage funded by the extraction itself? Or is Louisiana simply fated to become the Nation's *Disaster Laboratory*: either a cautionary tale or model of resiliency for other governments facing the cross hairs of the approaching onslaught caused by global climate change.

Chapter 4, in full, contains material as it appears in *Lateral: A Journal of the Cultural Studies Association*, Vol 7, No. 1, 2018. Randolph, Ned. The dissertation author was the primary investigator and author of this paper.

Conclusion: What is a River?

"…he was not alarmed. He paddled on, upstream without knowing it, unaware that all the water which for forty hours now had been pouring through the levee break to the north was somewhere ahead of him, on its way back to the river." – from William Faulkner's *The Old Man*.

At the river's edge of the Lower Ninth Ward, one of the most devastated neighborhoods during Katrina, three fishermen sat in folding chairs on a recent July afternoon amongst the large rip-rap boulders on the river side of the levee. Benches dotted the walking path atop the levee, each one marked by an overflowing garbage can. One of the fishermen fussed with a line hung up on a rock. Summer's dull humidity was occasionally interrupted by a tease of turbid air over the brown water. Red ant bites from the unkempt grass along the levee needled my ankle. I slapped at a horsefly on my neck. This location – affectionately known by locals as the "World's End" – felt like the backstage of an elaborate, technical performance.

Downriver, a string of tankers muscling against the current lined up like jetliners arrayed for landing at Lindberg Field. The low buzz of industry never leaves the surface of the waterscape in this section of river. The skyline of downtown New Orleans to my right was tanned in a khaki reflection off the brown sea. I marked points of the city skyline – the Twin Span Bridges, the Belle Chasse Navy Tower, the Central Business District – all mixed out of order by the unseen turns in the river. Miraculously, a school of three ducks floated by on an independent current as if on an arctic ice flow. On the opposite bank, I could see a pair of tugboats and a line of wharfs and docks with rusted warehouses. There is little of what is perceived as the natural world in this watery industrial corridor – even as the men next to me cast their lines in the water. Their buckets were empty, but they'd only recently arrived. "Y'all leave any fish in the lake for us?" a voice called on approach. Three newcomers staked a place just inside the turn where the levee forks into the Industrial Canal path that cleaves Ninth Ward into the Upper and Lower Nine. A pair of tugboats with barges waited in the canal for the St. Claude Avenue drawbridge to rise.

Every couple of minutes, the horn of a barge or tanker bellowed out a "Mark Twain" to communicate its position. Currents in the middle of the river channel crested like class-2 whitecaps. A small transport boat, *Miss Emerson*, awaited an approaching tanker sliding around Algiers Point downstream. This particular turn, described as "driving a truck down a road of ice," is one of the most treacherous points on the river. Pilots describe two simultaneous forces: the current pushes down the stern of the boat while the eddy pushes up the bow.[584] And this year was one of the most treacherous. In mid-June, a barge hit the shore in Algiers knocking over a utility pole and causing an outage for 5,000 people.[585] As *Miss Emersion's* charge began swinging around, its bow began pointing towards the west bank at Algiers and its stern towards the east bank at the French Quarter. As it whipped around in slow motion, *Miss Emerson* pulled up beside it, where two men climbed out of the smaller vessel onto the ladder on the belly of the tanker. They were there to navigate the remaining 106 treacherous river miles to Pilot Town where river meets the sea. Local river pilots belong to the Crescent River Port Pilots Association. For many of the most experienced pilots, this year was their most difficult with the river in flood stage for a record seven months.[586] *Miss Emerson* seemed to physically nudge the tanker into its turn, before backing off to receive a tanker and pilot coming upstream. Meanwhile, the 19th century Creole Queen pushed by a stern paddle wheel, made its sliding turn behind the tanker

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[584] Paul Murphy, "Maneuvers on the Mississippi River Difficult as Waters Rise," *WWL-TV*, March 7, 2018, https://www.wwltv.com/article/news/local/maneuvers-on-the-mississippi-river-difficult-as-waters-rise/289-526764668.
[585] Henry Grabar, "Hell Is High Water: When Will the Mississippi River Come for New Orleans?," *Slate*, June 18, 2019, https://slate.com/business/2019/06/new-orleans-mississippi-river-high-water-climate-change.html.
[586] Grabar, "Hell is High Water."

without assistance as it took its usual round of tourists to the Chalmette Battlefield downriver to replay the Battle of New Orleans against the British. Limbs and debris surfed along the currents at different velocities. The high surface of the river rose behind the weedy forests sprouting up from the batture inside the levees. By July, the immediate threat of overtopping had passed, but the river level towered over the Ninth Ward rooftops on the other side of the earthen embankment. Such a specter, it seemed, was normalized. The fishermen, all African American, cast their lines of shrimp and cut bait into the brown water as if it was the most normal thing to do; as if the catch was safe to eat, which they said they would. I walked down the levee through the tall grass to my car and slowly drove upriver towards the French Quarter. There, tourists plied t-shirt shops with Styrofoam cups of daiquiris and over wrought straw hats oblivious to the cat and mouse game of mammoth steel and hydrologics taking place just out of view on the river. A city more Caribbean than American, New Orleans is described in a passage by the Louisiana mystery writer James Lee Burke as a city where "the air smells of the river, dead beetles in a storm sewer, the wine and beer cups in the gutters, damp soil and night-blooming flowers and lichen on stone."[587] But even that doesn't fully capture it.

A Braided Logic through Tangled Ontologies

Some of the big questions my research has been circling is how one of the most vulnerable places to sea level rise can likewise be a vociferous champion of fossil fuels. This requires unpacking how Louisiana's political economy was organized around its landscape, and how technical and scientific discourses are deployed on behalf of the regime. The state focuses its restoration tool mainly on controlling and redirecting Mississippi River sediment into the

[587] James Lee Burke, *The New Iberia Blues: A Dave Robicheaux Novel* (London: Orion Books, 2019), 2.

marshlands and not on efforts to mitigate damage caused by oil and gas activity. Coastal planners characterize their work as returning the river to its "natural" role of land building, which allows Louisiana to supply the nation with its energy and shipping needs. This regime marshals the tools of science to support a logic that has naturalized industry in need of protection against a deteriorating and changing environment that the same industry is culpable in degrading. By tying oil and gas royalties to restoration efforts, the state turns its authority not towards curtailing greenhouse gas emissions but on boosting them.

Coastal protection and restoration are presented as technical issues, but this study raises many questions about the ways in which technical discourses and tools of statecraft hide sociological issues such as inequality, marginalization, and power. As Science Studies scholars demonstrate, science itself is a human enterprise that consists of small discrete translations and inductive imagination. Ethnographies of scientific practice trace the way in which objects are translated and maintained through various inscriptions from the field to the lab and onto the lab report – which in the words of Bruno Latour "pack the world into words."[588] Such ethnographies demonstrate how different ontologies are brought into being by showing that "reality does not precede the mundane practices in which we interact with it, but is rather shaped in these very practices."[589] Latour's 1999 ethnographic account of the way soil scientists conscript or stabilize a phenomena called "soil" explores the way that "soils" are produced through a complex set of cultural practices engaged in by real people, rather than simply being a bundle of natural determinations waiting for the expert's successful unveiling. How does a botanist, a pedologist and a war reporter look at a path in the Columbian forest? What do they jot in their notebook?

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[588] Bruno Latour, *Pandora's Hope: Essays on the Reality of Science Studies* (Cambridge, MA: Harvard University Press, 1999), 24.

[589] Kristina Marie Lyons, "Soil Science, Development, and the 'Elusive Nature' of Colombia's Amazonian Plains," *Journal of Latin American and Caribbean Anthropology* 19, no. 2 (July 2014): 214.

What are the tools of their discipline? How is this path constructed through their discipline, disseminated along the networks of their discipline, and taken up by fellow practitioners? The contours of its questions and claims are shaped by concerns of attention, sources of funding, disciplinary standards, etc. The elevated status of scientific discourse often precludes participation by participants from other disciplines or participants not formally educated but apprenticed in local expertise. Certainly, there is room for questions that ask in whose service and at what cost, does Louisiana "provide the nation's energy needs" as is often stated by the Coastal Protection and Restoration Authority (CPRA). "Energy" itself should be de-constructed. We might discover we are talking less about a unit of heat called "energy" and more about private property interests, relations of production and contracts, fossil fuel impacts, risk tolerance, public health needs and sacrifice zones. "For it is really against the effects of the power of a discourse that is considered to be scientific that genealogy must wage its struggle," says Foucault.[590] Truth claims after all, do not exist on their own in the abstract ether. They are supported and reinforced by the discourse and its apparatuses. They require practices and allies. They require systems of writing and reinforcing machines that pull together and hold a claim as a fact. Facts travel "with an apparatus that can care for and feed the fact," says Haraway. Speaking at a symposium on the Plantionocene, Haraway attributed truth claims to a certain semiotic strength that is also "profoundly material." Truth claims, she said, do not exist in the sky. "They are rooted in practices in material semiotic engagements."[591] A computer chip for example, is useless on its own without its relational system of machines. Likewise, truth claims take on conjunctures within complex practices, she says.[592] Part of the valence of technical discourses is

[590] Foucault, "Two Lectures," 84.
[591] Gregg Mitman, "Reflections on the Plantationocene: A Conversation with Donna Haraway and Anna Tsing," *Edge Effects*, June 18, 2019, https://edgeeffects.net/haraway-tsing-plantationocene.
[592] Mitman, "Reflections on the Plantationocene."

that they presume a naturalized realism and perhaps benevolence, even among its scientific practitioners, who don't acknowledge or perhaps realize the tacit social political trade-offs of quotidian decision-making. They may not identify the power flowing unseen behind actions and decisions taken as common sense. Such power is likewise upheld by the production of state authority through a wide pantheon of tools, which I will discuss next.

Producing State Authority

To master a force as complex and unyielding as the Mississippi River, the state must not only marshal a proverbial army of resources but must also demonstrate that it can do so. Its authority here is not just presumed but performed. At its disposal lies tradition, resources, technical discourses and discursive sites of production. One of these discursive sites resides within the burgeoning Water Campus near downtown Baton Rouge. Next door to the CPRA headquarters sits the Center for River Studies, which is home to the newly-constructed 10,000 square foot Mississippi River model. The model is described on the center's website as a "collaborative partnership between CPRA and LSU" that provides "an unprecedented effort to showcase Louisiana's w*orking delta*, Louisiana's coastal program, and research dedicated to coastal restoration and river management." The model is an updated version of an earlier prototype that was housed at LSU. The upgrade represents an increase in investment not only in testing the efficacy of planned sediment diversions but in promoting them to the public.

The river center opens to a large, 10,000 square foot, exhibition space of interactive tools, maps and other physical displays. It is advertised as a community space. It situates the visitor within the restoration narrative, which according to the website, "offers several distinct themes with illustrations and interactive features to help visualize and communicate the importance of the Mississippi River Delta, the ongoing coastal land-loss crisis, and CPRA's comprehensive Coastal Master Plan restoration and risk reduction program."[593] The lobby includes a 2-story satellite map of all restoration projects and several other visual displays as well as exhibits that naturalize various industrial and commercial practices that comprise what the state calls its "Working Coast." The CPRA outreach team hosts public tours for schools, business groups and government officials. From the lobby exhibit area, the visitor proceeds upstairs to the center's main gem: the Lower Mississippi River Physical Model. The model represents 14,000 acres of southeast Louisiana, beginning just upriver from Baton Rouge down through the mouth of the River. It is designed to give researchers a better understanding of how sediment diversions will affect the river and marshlands. It follows a long tradition of not only studying 3-dimensional analogues but performing it for others. "In this regard, physical models could be witnessed in commonly understandable and visually compelling ways."[594] Models function as a way to demonstrate authority – a function perfected by the Army Corps of Engineers. The implementation of physical models provided the Corps with not only authority over its subject matter but among peers. "Under the right conditions, worlds could be folded into models, and models could in turn be unfolded into worlds. Significantly limited in experimental forms of access to waterscapes in the wild, engineers could deal comfortably, even authoritatively, with its potentially endless proliferations in the lab. For the first time, engineers became bigger than their rivers. In this reversal lay new possibilities of knowledge and control."[595]

The model in this way is pedagogical. Above the LSU model, a second story viewing balcony wraps around the cavernous room. In the middle of the ceiling, 20 high-resolution

[593] Louisiana State University, "LSU Center for River Studies," accessed October 31, 2019, https://lsu.edu/river.
[594] Jackson, "Building the Virtual River."
[595] Jackson, "Building the Virtual River," 173.

projectors – like those in NBA arenas – are mounted for presentations. They can animate the model's white plaster surface in high resolution green marshes, urban areas and anything visibly imaginable. Visitors are typically greeted with an opening presentation of a short film touting the work by the CPRA and efforts by Louisiana researchers to optimize river diversions. The CPRA promotes the model as a not only a tool for research but as an asset to "develop coastal knowledge that can be exported to other coastal communities around the world."[596] But when the projectors are off, the model's hard surface and curves conjure not an alluvial flow of mud and water, but something more predetermined.

On my recent visit there, an LSU research team directed by principle investigator, Clinton Wilson, was simulating hydrographic "runs" to mimic sediment distribution over the last 50-years. The experiment was commissioned by the CPRA to measure how sediment patterns will change when researchers open two sediment diversions on the model to mimic the sediment diversions currently under construction. Small clear tubes separately pulsed water and a dark granular compound into the channel to begin their journey down the model river. The rate of water was calibrated so that one hour equated to one year. A computer adjusted the flow every few seconds to mimic historic climate conditions of the past five decades. Polymer grains purchased in Germany used to mimic sand were held in a mixer pot and conveyed through a separate tube. As they bounced along the channel floor, they collected in small "sand" dunes that rolled and gathered alongside various meander turns. Over time, dark clusters of sediment appeared to slowly escape the claw-like extensions of the river's mouth – appropriately named the Bird's Foot Delta.

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[596] Louisiana State University, "Center for River Studies."

Skeptical

When they were first introduced in the 1930s by the Army Corps of Engineers, researchers were skeptical about the accuracy of 3-dimensional analogue models. The relative shallowness of rivers compared to their geographic coverage required adjusting for significant scale distortion. Otherwise, physical models would be too large for the laboratory. A laboratory model at scale would likewise require depths in hundredths of inches, which would make measuring friction and viscosity exceedingly difficult. The solution was to introduce a concept of spatial distortion which many feared would bias the results in other ways. "No less exemplary was the distinctive and quite literal problem of granularity that confronted model applications around crucial questions of sediment scour and transport."[597]

But that spatial distortion raised other questions of whether a system compressed in time and space could replicate real conditions. Or would the analogue simply miss significant data? "As two centuries of scientific hydraulics research and a much longer history of pragmatic engagement with water management had revealed, the dynamic properties of water did not proceed from small to large in a smooth and unbroken continuum…" Water instead functioned within poorly understood thresholds such as "the moment at which forming waves might break, and the force under which bed-load (e.g. boulders) might begin to shift."[598]

Modelers used sewn patches of wire screen to represent vegetation and various substances to represent sediment. While issues of finding good sediment analogues are rarely noted in published literature – particularly for suspended silt and mud – they occupied plenty of concern among researchers. They trade tips and recipes for the construction of synthetic

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[597] Jackson, "Building the Virtual River," 176.
[598] Jackson, "Building the Virtual River," 176.

substitutes, ranging from coal dust to ground walnut shells. Even in the state of the art LSU model, researchers cannot study the behavior of silt and clay because they are too fine at the scale of the model, according to Wilson.[599] In the actual river, such material circulates at all levels of the water column. Whereas, sand rolls along the bottom and forms sandbars throughout the river. This syncs with the CPRA's stated goal of capturing and diverting sand into the marshes. Many sedimentologists consider sand capture as the most promising way to build land. Yet, excluding the efficacy of silt and sand in diversions is a wasted opportunity, according to a recent study by Tulane researchers. There exists a bias towards sand because researchers have for years been analyzing the growth of the Wax Lake Delta at the mouth of the Atchafalaya Basin, which is the only point of river-related land building taking place in Louisiana. Wax Lake is built almost exclusively from sand. This focus on sand is essentially a red herring, the Tulane researchers argue. The muds, clays and sediments in the water column are much more effective at building the kind of delta and supporting the vegetation that is consistent with the current marshes of Southeast Louisiana. The Wax Lake Delta, by contrast, fails to capture 70 percent of the sediment flowing into it.[600] It's not a very efficient delta. Nonetheless, the model is only capable of demonstrating the behavior of sand. Likewise, it also seems to treat the river as less of an alluvial product of its own making, but as a contained channel that carries sediment.

Outside the Baton Rouge center, one can see the Mississippi's brown rush of water and mud just over the levee. It is both an alluvial mudscape and a navigational corridor. Researchers have found that the river channel requires a certain amount of water and baseline sediment to maintain its banks and channel either by the direct reinforcement of its ridges in certain places by

[599] Dr. Clinton Wilson, in conversation with the author, April 2, 2019.

[600] Jaap H. Nienhuis, Torbjörn E. Törnqvist, and Christopher R. Esposito, "Crevasse Splays Versus Avulsions: A Recipe for Land Building with Levee Breaches," *Geophysical Research Letters* 45, no. 9 (May 2018): 4058–4067, https://doi.org/10.1029/2018GL077933.

the Corps of Engineers or by its own accretion of sediment on the floors and edges of its channel. The river is its own container. There is no a-priori river out there in the wild. It has no hard bed beneath.[601] But on the surface of the miniaturized model, the river channel is grouted into plaster. Rolling sandbars may not make it down to the Bird's Foot Delta, but its claw-like passes will remain there in the model. In other words, what cannot be studied is whether diverting sediment upstream will undo the integrity of the Delta and its nearby communities, as some researchers warn. Without the mud maintaining the riverbed and edges – can the existing Bird's Foot Delta withstand the tidal effects of the Gulf of Mexico? Or, do the fishing and river piloting communities that live beyond the highway's reach need to start packing for an unannounced exodus? Can the model traffic in questions it wasn't designed to ask? Are limitations a product of design shortcomings or planning priorities; and can these be separated, or do they begin to rationalize each other?

As Stephen Jackson explains, despite their impression of comprehensiveness, physical analogue models are at best geared to understanding "very particular sorts of questions with little capacity or inclination to entertain others. Under such circumstances, analytic intent – and the corresponding possibilities of knowledge – was built in a very physical way, into the structure of the models themselves."[602] Also left out is the impact of pollutants on the marshes. Will that piece of mud that we met in the introduction benevolently glob onto a piece of marsh grass that comprises the living ecology? Or will it carry so much nitrogen, phosphorous and other nutrient compounds as to overwhelm the system through "eutrophication" where algae blooms consume

[601] Mead A. Allison et al., "A Water and Sediment Budget for the Lower Mississippi–Atchafalaya River in Flood Years 2008–2010: Implications for Sediment Discharge to the Oceans and Coastal Restoration in Louisiana," *Journal of Hydrology* 432–433 (April 2012): 84–97, https://doi.org/10.1016/j.jhydrol.2012.02.020; Turner, "Mineral Sediment Loading."
[602] Jackson, "Building the Virtual River," 179.

the oxygen and transforms the estuary into a dead zone as currently happens at the river’s mouth?

According to Martin Reuss, a historian of the Army Corps of Engineers, models were at best imperfect with their sewn patches of wire screen to represent vegetation and various substances to represent sediment. They are more comparable to topographical maps that approximate the earth’s surface. Their limitations are both spatial and temporal. “For the prototype itself constantly changes, especially if the river is geologically young and subject to alluvial processes.” At best they offer a fuzzy snapshot, requiring significant interpretation.[603] No universal theory or differential equation sufficiently explains the world of turbulent motion to everyone’s satisfaction, which is why river hydraulics and mechanics remains an art form. “Hans Albert Einstein is reported to have said that his more famous father, Albert, was interested in river mechanics but after careful consideration opted for the simpler aspects of physics.”[604] Instead, the Army Corps of Engineers after a half century of predicting through physical models, obtained a respect for the mysteries of nature and the need to improvise in the field. “Reflecting on his experiences on the Mississippi River in the 1970s, one engineer general proclaimed, "You can’t sit down with a bunch of mathematics and formulas and predict in advance how a hydraulic structure is going to act and how water will act in different conditions of flow.”[605] The only thing to do, he advised, was to gather the best data possible over the years and base the design on it. "You make corrections, thereafter, from experience. It is very similar to the practice of medicine.”[606]

[603] Reuss, “Art of Scientific Precision,” 318.
[604] Reuss, “Art of Scientific Precision,” 316.
[605] Reuss, “Art of Scientific Precision,” 322.
[606] Reuss, “Art of Scientific Precision,” 322.

Meanwhile, as climate change annihilates historic trends with more severe events, the river is subject to increasingly changing conditions. Dr. Wilson believes that the past 50 years of moisture is no longer indicative of future conditions. Instead, he says three cycles of the most recent 15-year segments of sediment flow is more realistic because conditions have changed so rapidly. For example, the Bonnet Carré spillway that connects to Lake Pontchartrain and is New Orleans' last line of flood defense has been opened twice this year for the first time in its 90-year history. Record floods throughout the Mississippi River Basin created the longest period of flood stage in Baton Rouge and New Orleans, surpassing records set by the Great Deluge of 1927.

The Bonnet Carré is a nearly 6-mile long trellis set across the site of an old levee break. Its spillway bridge consists of 350 separate bays, each of which contain 20 man-sized cedar planks that literally hold back the Mississippi's vast weight and force. All of the water and snow from 41 percent of the continental United States drains into the Mississippi River Basin and finds its way there. The spillway has only been opened 13 times since 1931. But its rate of use has quadrupled in the last decade. Since 2008, it's been opened four times, or about every 2.5 years.[607] This is because the river is carrying more water and sediment, or to put another way more moisture is entering the watershed.[608] The extended openings this last year devastated

[607] US Army Corps of Engineers, New Orleans District, "Bonnet Carre' Spillway Overview: Spillway Operation Information," accessed June 13, 2019, https://www.mvn.usace.army.mil/Missions/Mississippi-River-Flood-Control/Bonnet-Carre-Spillway-Overview/Spillway-Operation-Information/.

[608] Researchers are now warning about accumulated sediment within the lower portion of the Mississippi south of the control structure. The sediment is restricting the amount of water the Lower Mississippi stem is capable of carrying, which puts more pressure on Old River Control and increases the threat of the river jumping. The Mississippi's alluvial floor is shaped by sediment and loose moving sands and soils. The new research suggests that sediment is accumulating between the flood gate structure and the 300 mile-course to New Orleans. While the floodgate system regulates the flow of water, it does little to address sediment moving downstream in the Mississippi and where this sediment accumulates when the river's flow naturally slows. The result is a 200 percent increase in sandbars. At least 36 million metric tons of coarse sand has been added to the river and narrowed the river channel by half a mile. American Geophysical Union, "Research from the AGU Fall Meeting: Accumulating Sediment in Mississippi River Threatens Course Change, Water Supply," AGU Release No. 17-93, American Geophysical Union, December 12, 2017, https://news.agu.org/press-release/agu-fall-meeting-accumulating-sediment-in-mississippi-river-threatens-course-change-water-supply/.

seafood and brackish marine life throughout Lake Pontchartrain and the Mississippi area beaches. The Institute for Marine Mammal Studies in Gulfport, Miss., which is about 60 miles east of New Orleans, reported 25 dead Ripley sea turtles and 93 dead dolphins washed ashore in the first six months of the year – a huge uptick from an average of 32 strandings.[609] Louisiana officials, meanwhile, acknowledged that opening the spillway hurt oysters and slow the growth of shrimp, but they argued that larger, more mobile animals can simply swim away. However, bottle-nose dolphin that live off the Mississippi coast stick to their home territory even when faced with destruction. When salinity drops, it affects the animals at a cellular level. Skin cells can't regulate the amount of fluid inside them. They balloon up and deteriorate, allowing bacteria and fungi in, where they can cause infections and lesions as evidenced last year off the Gulf coast of Florida where many dolphins died during a red tide outbreak.[610]

Fallen salinity and increased algae levels indeed led to wholesale complete mortality rates of oysters and hatchery nurseries. Shrimp, Crab and commercial seafood catches also plummeted, prompting Louisiana Gov. John Bel Edwards to request a federal fisheries disaster declaration from the U.S. Department of Commerce[611] and the closure of swimming areas throughout the lakeshore. “What we’re seeing is a preview of what’s going to happen,” George Ricks, the commercial charter boat captain and opponent of diversions, told the CPRA board in June. He noted that the rate of the spillway runoff (at 148,000 cubic feet per second) matched the

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[609] Lindsay Knowles, “Four More Dead Dolphins Wash Ashore between Long Beach and Ocean Springs,” *Fox 8 Live*, May 28, 2019, http://www.fox8live.com/2019/05/28/three-more-dead-dolphins-wash-ashore-between-long-beach-ocean-springs/; and Institute for Marine Mammal Studies, “About Stranded Marine Mammals,” accessed June 13, 2019, https://imms.org/about-stranded-marine-mammals.

[610] Steve Hardy and Faimon Roberts, “Did Opening the Bonnet Carré Kill Dolphins, Turtles in Gulf? Mississippi, Louisiana Officials Disagree,” *Advocate* (Baton Rouge, LA), April 23, 2019, https://www.theadvocate.com/baton_rouge/news/environment/article_3ca62d56-6611-11e9-80df-eb098a8b021b.html.

[611] Louisiana Office of the Governor, “Gov. Edwards Requests Federal Disaster Declaration for Flooded Fisheries” (news release), June 17, 2019, http://gov.louisiana.gov/index.cfm/newsroom/detail/1995.

combined rate of the two sediment diversions the state is building downriver from New Orleans at a combined cost of $2 billion. "Is this what we want to do?" he asked.[612] One begins to worry that the CPRA and state of Louisiana are repeating their own version of the ill-fated "levees-only" policy that was born of a compromise to reconcile competing interests.

The Bonnet Carré allows the river to continue being itself – the commercial corridor that carries barges and tankers past huge smoke-topped refineries. But this role of a commercial highway rests in uneasy tension with the river's role as a marsh builder. Nearly 300 years of deforestation, channelization, levees and spillways have reduced the sediment load and efficacy of the river to produce marsh in the way that it created south Louisiana. In the most basic terms, can seemingly opposed ontological enactments of the Mississippi River – as a commercial highway, continental sewer pipe and a land building mudscape – co-exist? And if so, what are the terms of their co-existence?

Each ontological enactment of the Mississippi River requires an intensive amount of maintenance that sometimes conflicts with the other, and sometimes rationalizes it. But they do not function in harmony. They must be reconciled in some fashion, which has preoccupied this study. Often this reconciliation involves obfuscating the entire question. I invite the reader to the newly encased headquarters of the CPRA next to the River Center. Earlier this year, I found myself in the lobby waiting to meet with a CPRA outreach coordinator when I noticed a vertical banner of an image of the Lower Mississippi Delta next to the receptionist desk. It appeared at first glance to be a satellite image. Thick green marshes at the Barataria and Breton basins sprawled along either side of the Mississippi River channel, where the first sediment diversions are planned. Further down the river channel at its terminus, stood a robust, marshy footprint

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[612] Coastal Protection and Restoration Authority of Louisiana monthly board meeting, observed by the author, Houma, LA, June 17, 2019.

surrounding the claw-like spread of the Bird's Foot Delta. It was a comforting image. But unlike those I had seen on an actual satellite photograph, I realized this image was a mock-up that illustrated an imaginary of the delta under the state's interventions. It was a public relations pitch and not realistic because of the conflicting ontologies of the river at work. There is not enough sediment to divert to replenish the marshes upstream while also maintaining the Bird's Foot Delta. In order to direct enough sediment upstream to replenish those marshes, the Bird's Foot Delta would likely be sacrificed to the pounding tidal sea.[613] Nowhere is this sacrifice stated explicitly in the Master Plan. But it is generally acknowledged by sedimentologists. The banner, much like the messaging in the Master Plan document, is a hopeful imaginary. Working against it are intensive interventions along the river of dams and jetties that enact the ontology of the Mississippi River as a navigable waterway. When I shared the picture with Dr. Turner, he replied that it wasn't realistic even if the state executed all they hoped to do in the Master Plan. The reclaimed land areas at the diversion sites were larger in the picture than what the Master Plan itself projects, he said.[614]

God Trick

Next door at the LSU river model, the Bonne Carré is quite small and barely noticeable in the white plaster. It is marked by a pair of acoustic sensors. There are 18 total acoustic sensors that match the Army Corps of Engineers river gauges on the Lower Mississippi River. To walk one of these river models is to occupy the imagined omniscience of what Donna Haraway called the "God Trick"[615] which is the impossible prerogative of the human logic of extraction and

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[613] Turner, "Mineral Sediment Loading."
[614] R. Eugene Turner, "Re: Your Thoughts?," email message to author, March 14, 2019.
[615] Donna Haraway, "Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspective," *Feminist Studies* 14, no. 3 (Autumn 1988): 575–99, https://doi.org/10.2307/3178066.

containment. Efforts to control, predict and optimize the forces of the Mississippi River are just the latest attempts in a long legacy of interventions that have sustained an incredible infrastructure of governance and a diversion of attention from an unfolding ecological catastrophe. Any project to model the entire behavior of the river – a massively complex hydrological and ecological system – is an impossible performance. What these models give us is a record of human attempts to make the Mississippi something it can never be: an unruly child who need only be disciplined into a docile body. This is because the river itself refuses to be what either the Louisiana CPRA wants it to be – an efficient builder of marshland – or what the U.S. Army Corps of Engineers wants it to be – an efficient commercial corridor. These two diametrically opposed ontologies of the river are played out not only by two competing agencies but by the behavior of the river itself.

Louisiana did not invent the method of modeling authority, but rather inherited a well-worn method from the Army Corps of Engineers, which perfected what Reuss calls the “Art of Scientific Precision.”[616] The most audacious of these Corps projects was the construction of a 200-acre Mississippi Basin model outside of Jackson, Mississippi that was commissioned in World War II. To minimize distortion, the Corps attempted to simulate the hydrologic behavior of the entire river basin – 15,000 miles of rivers whose winding miniaturized streams run a total of total eight miles throughout the abandoned site. The model was the largest of its kind and took 23 years to build. Begun in 1943, the Army Corps was short on manpower – so it conscripted German prisoners of war captured from Field Marshal Rommel’s “Afrika Korps.” At its peak, there were 1,797, German prisoners sculpting, clearing and excavating. They lived in an army-built internment camp adjacent to the model site that included a 151-bed hospital. The prisoners

[616] Reuss, “Art of Scientific Precision.”

worked on it for three years until they were transferred in 1946. By then, they had completed a drainage ditch around the upper limits of the model and installed most of the storm-sewer system underlying the site. Essentially a giant relief map of the nation's drainage system, the site required a maximum difference in elevation of 50 feet. It was chosen for its gently rolling terrain with "as close a resemblance to the natural features of the Mississippi Basin as could be found anywhere near the WES" (Waterways Experiment Station).[617] Grading required a topography of ridges and valleys as well. A majority of the excavation was performed with wheelbarrow and shovel in which "a general slowdown was noticed, and a real indifference developed toward the work." The prisoners were used not only as common laborers, but also as surveyors, draftsmen, 'computers,' engineering aides, inspectors, mechanics, cooks, and clerks.[618]

The model wasn't completed until 1966. However, individual sections were used as early as 1943. Not long ago, I found myself wandering through brambly woods with a volunteer group clearing away brush and pine needles. Walking the model, I lost my companion in the woods as I followed the upper reaches of the tributaries from the Alleghanies to the East. We met up by yelling out to each other through the brush and hidden openings. Together, we traced the western tributaries back to Minnesota and into Canada. Flattened, smooth concrete gave way to carved hills. Rapids were simulated by raised pegs of concrete. The flattened deltaic portion downriver was littered with metal screen mesh that calibrated some sort of alluvial resistance. Corps documents describe folded screen wire cut to the scale of trees placed on the model to match aerial photographs of trees.

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[617] J. E. Foster, "History and Description of the Mississippi Basin Model," Mississippi Basin Model Report I-6, U.S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, August 1971, 11, https://apps.dtic.mil/dtic/tr/fulltext/u2/a107494.pdf.
[618] Foster, "History and Description," 11.

Streams and floodplains molded in concrete were fed by a towering diesel-powered water tank. Viewing stands were erected for prominent elected officials ostensibly in charge of the Corps of Engineers budget. All scheduled tests were completed in 1971. A comprehensive testing program began in 1959-69. Tests to aid in development of computer programs were performed from 1969-71. Reams of large printer paper are still stacked inside one of the abandoned, graffiti-tagged office buildings. The relief model reproduces the engineer drainage base of the Mississippi and its tributaries to a horizontal scale of 1:20000 and vertical scale of 1:100. Streams and floodplains molded in concrete were fed by a towering water tank that was operated by a pair of diesel engines that remain encrusted and rusty. Viewing stands were erected for prominent elected officials ostensibly in charge of the Corps of Engineers budget. It was located near a rail spur and high voltage transmission line that crosses the property.

It is ironic that the Army Corps was dragged kicking and screaming into the physical model business. It had spent a decade resisting demands for such methods. But in 1929, it dropped its earlier opposition to open its Waterways Experiment Station, which soon became the largest and most influential experimental hydraulics facility in the country. “Driven in part by calls for analysis to support a raft of New Deal construction and improvement projects, by the mid-1930s more than 200 engineers, tradespersons and laborers were employed at the station, performing a wide variety of model studies on various sections of the Mississippi and its tributaries.”[619] Reflecting its mandate, most of the models focused on flood control. Tests also related to patterns of sediment behavior and associated phenomena such as erosion, shoaling and meandering. The largest model at Waterways Experiment Station, completed in 1935, represented a stretch of the Mississippi more than 600 miles long, covered a length of more than

[619] Jackson, “Building the Virtual River,” 165.

1000 feet, and required a staff of 42 to operate. The now derelict, much larger basin model outside of Jackson helped with flood prediction on the Missouri River during the April 1952 flood. “Missouri River Division personnel said the model was one of the vital factors in the success of the flood fight that prevented flood damages of an estimated $65,000,000 and possibly loss of lives.”[620]

The Corps envisioned the basin model to orchestrate a basin-wide system of 200 existing and proposed reservoirs. Such a model would have a great potential value for demonstrating flood control measures to government officials and laymen as well as to engineers. The model, according to the Corps, focused on “demonstrating to levee board members and other interested persons the effectiveness of flood control structures constructed or proposed by the U.S. Engineers.” Demonstration was often the point of Corps projects. Had the model been manually operated, it would have required a staff of 600, requiring too much training and money to maintain. The leadership set out to make it automatic through electronic instrumentation. About 125 instrument manufacturers were consulted. By the end of the fourth year, the team was able to write and bid out their specifications. “The operation of all instruments is governed from the control houses. In preparation for a test, the timer, the calendar, the program rolls in the inflow programmers, and the recorder charts on the stage recorders are set for the month, day, and hour of starting time; then by means of a single switch all instruments in the control house and on the model are started simultaneously.”[621]

There were six control houses on the model: three on the Mississippi River: at St. Louis, Mo., Helena, Ark., and Baton Rouge, La.; one on the Missouri River at Kansas City, Mo.; one on the Arkansas River at Fort Smith, Ark. and one on the Ohio River at Cincinnati. A two-way

[620] Foster, “History and Description,” 2.
[621] Foster, “History and Description,” 18–21.

public address system was installed at the control house for communication between operators in the control houses and those on the model. This exploration of mid-century automation is itself worthy of its own article but imagine the technical orchestration and apparent authority that just operating such a multi-headed hydra projected – despite its efficacy of prediction. Imagine the Godlike feeling of coordinating a system of 200 reservoirs that comprise half of the United States. Imagine the political potency of putting policy makers and budget legislators in that proverbial catbird seat. Whoever managed to build and operate such a modern Prometheus certainly commanded authority.

In 1971 it was used for the last time. During its latter years, the corps opened it to visitors. One has the feeling from the Corps report that the sites of the model took on their own geographic status."These facilities include a visitor assembly building near Cairo, Ill., a 40-ft observation tower nearby, an operation observation room near Memphis, Tenn., and elevated platforms, walks, and sidewalks at selected locations on the model."[622]The visitor assembly building contained restrooms and a lectern area with various maps, pictures, and other visual aids for visitors. An observation room was located in one of the control houses behind a glass partition where visitors could observe the "model instruments in operation" and walk the elevated platforms, walkways and sidewalks for close up looks at levees, highways, floodways and other flood control works. In 1990, the Corps of Engineers donated the model to the city of Jackson, but it was too expensive to maintain as a tourist site. Over time, it was forgotten and lost to the overgrowth. Today, the giant relief model is surrounded and hidden by woods.

A new generation of model authority is underway at the LSU Center for River Studies in Baton Rouge – not for its sprawling instrumentation but its precise digital augmentation. Only

[622] Foster, "History and Description," 29.

four people were on hand to run the model during my visit: a principle investigator, a pair of graduate students, and an undergraduate. Fewer are probably needed. It's very quiet. Much like the Corps' use of models, the LSU River Center is open to schools, business groups and government officials. On a recent day, a civic leadership group was viewing a presentation by a Chamber of Commerce official touting the "business-friendly" climate of Louisiana's capital region. He noted the Mississippi River corridor, its petrochemical plants and the five major ports. The program, I was told, was part of the group's Economic Day. They were visiting the River Center to learn about the burgeoning water economy that these state officials tout as an ancillary benefit of restoration-related investments and the Master Plan. The visitors walked through the doors to the viewing balcony over the river model for a presentation by an outreach coordinator. Below, the white slate had been running for about 45 equivalent years. We could see the veiny tendrils flowing through the channel and cloud-like plumes flowing out of the passes of the claw-like birds' foot delta.

As the outreach coordinator took the microphone, the room and river model darkened. The colorful projections took charge and narrated a history of coastal erosion in Louisiana, which was squarely directed at the Army Corps of Engineers flood-control levees. Nowhere in the 10-minute video did we learn about the impact of oil pipeline canals, rapid fluid extraction of oil wells, ecological damage caused by oil spills or the increasing role of invasive species such as Nutria, which were incidentally introduced into the marsh by state wildlife agents in the 1930s.[623] These elisions have become common in my research. Anything that bucks the narrative of the state's *Working Coast* is effectively silenced. After this blinkered history, the presentation

[623] Guerry O. Holm Jr., Elaine Evers, and Charles E. Sasser, "Nutria in Louisiana: A Current and Historical Perspective," prepared for the Lake Pontchartrain Basin Foundation, John Lopez. Louisiana State University School of the Coast and Environment, Department of Oceanography and Coastal Science, September 22, 2011, https://saveourlake.org/wp-content/uploads/PDF-Documents/our-coast/LPBF-LSU-Nutria-FINAL-11-22-11.pdf.

highlighted the state's proposed restoration projects, river diversions and the wonders of the Center for River Studies in solving Louisiana's erosion crisis. Even one skeptic who earlier asked about the disruptions the diversions would have on fisheries seemed placated. Generally, after attending one of these presentations, there's a feeling of inevitability and scale that seems to overwhelm concerns by various constituencies. We learn to put aside our local interests for the future of the state. We become interpellated into the state's history as it becomes our history. We have it seems, been to the mountain top and learned to trust the authority behind process, which privileges economic continuity over coastal restoration. And that has always been the model's most important function.

Questions Raised

So what does all this mean for readers outside of Louisiana? How can Louisiana's very specific case of environmental degradation and proposed interventions be useful to others trying to understand how destructive practices that sabotage ecological health continue? For one thing, I believe even the most insidious arrangement of practices can be naturalized to appear as inevitable. We have seen that vividly in this case how crisis, money and power can align seemingly incompatible interests with one another through various political rationalities. This hegemony is maintained through various techniques of statecraft, discursive appeals and even technical discourses of positivist science and its models. I would like to introduce two lines of theoretical inquiry that can help us unpack this spatial expression of hegemony. By doing so, we can then take the case study of Louisiana and explicate hegemonic enactments of landscapes happening elsewhere in the service of powerful interests. We must examine not only the imagined geography by the state and logics of extraction of this place but the tools of interpellation that reinforce them.

Gary Fields argues by way of Foucault that power is a spatial phenomenon that is applied onto a landscape by virtue of an imagined geography supported by hegemonic forces. These forces generate a territoriality by which landscape is a socially-constructed outcome of human imagination and activity. Ideas, he says, act as change agents.[624] "Just as books communicate through words, landscapes communicate through the contours of land. While there is not always a directly perceivable route from the material landscape to human life processes in a place, the land surface is nevertheless a starting point for reading land as a document that reflects meanings about the society and human activity anchored to it."[625] And this anchoring of activity often follows a long trajectory, which despite a change of onsite appearance and/or practices, is governed by a persistent, naturalized logic. For example, petrochemical plants that stand on the site of former plantations on river road operate through the same, inherited logic. Both depend on river access. Both are governed by a logic of alienation of labor, ecology, and extraction. "The plantation was precisely the conjuncture between ecological simplifications, the discipline of plants in particular, and the discipline of humans to work on those," says Anna Tsing. "That legacy… is so naturalized that many people believe that that is the meaning of the term agriculture; we forget that there are other ways to farm."[626] To love and care for a place is "radically incompatible" with the plantation, says Donna Haraway who argues that we are still living in the "plantatiocene" in which production requires a radical simplification and substitution of local, indigenous ecologies, crops, microbes and even people for imported crops,

[624] Fields, *Enclosure*, 7.
[625] Fields, *Enclosure*, 7.
[626] Mitman, "Reflections on the Plantationocene."

microbes and people – whose simplified labor can now be replaced with machines. And this colonized landscape becomes naturalized through mythologies, statecraft, the built environment and other discursive practices. We can track power here in how a landscape is imagined – particularly when it alienates a sense of care from its extractive production.

The state of Louisiana through its CPRA describes the “natural” history of the Lower Mississippi River Delta as it existed in the late 17th and early 18th centuries. This is the baseline by which its coastal restoration efforts aspire towards. This starting point is not entirely arbitrary. It provides the best face for the Mississippi River as a land builder while not sacrificing its efficacy as a national highway. It supports this imaginary geography through several pedagogical sites — from the Master Plan document to websites, presentations, press releases, editorials and even the river model itself at the Center for River Studies. However, the CPRA does not have a monopoly over imagining the geography of Louisiana. Claims of imagined geography are narrativized by competing regimes of actors: the fisherman, the independent scientist, the coastal planner, the oil man, the politician, the indigenous tribesman, or the environmental NGO specialist.[627] The imaginative power articulated through each narrative is dependent upon other factors as well – their tools, their claims to legitimacy, how they use the space – as well as how this use impacts or is impacted by the many non-human actors (or actants as Latour calls them)[628] that comprise the system such as: microbes, moss grass, rusting pipelines, property law, invasive species, etc. The efficacy of competing claims may also depend on their adaptability to the political rationalities of hegemonic regimes or other lesser competing regimes. A claim’s durability may depend on its malleability with other regimes.

[627] Commercial Fishermen and Oystermen are quite content to maintain the ecological regime as it currently exists with some modifications to ridges around tidal lakes to prevent further erosion. But they have fewer tools at their disposal to assert hegemony over this imagined landscape.
[628] Latour, *Pandora’s Hope*.

No ontological claim on the river can outcompete the power of the Corps of Engineers mandated by Congress in a twisted turn of 19th century logic and enduring precedent to maintain the river as the economic corridor of the nation. This enactment of the river requires constant dredging, which is undertaken with militaristic determination by the Corps at two main sites: the upstream "crossings" where the river meanders above Old River Control and often builds sandy shoals along the inside meanders and down at the Southwest Pass – which keeps the officially designated mouth of the river open to water borne freight. The Army Corps dredgers work 24 hours a day, seven days a week to maintain the channel by dredging the riverbed and using some of the cuttings to reinforce the channel ridges. They do the repair work to keep the river's ontology from slipping back into land building. The corps is charged with maintaining the "economic security of the nation," Corps official Mark Wingate told board members of the CPRA.[629]

Wingate characterized the Mississippi River as a national highway and compared shoaling via sand building up sandbars in the channel, to a traffic accident. "We're the firetrucks and ambulances clearing the river to keep it open."[630] When the river shoals, the goal is to move the material out as quickly as possible. The corps employs two cutter dredges to take the material and build up the banks. It uses hopper dredges to suck it up and either release it into the middle of the water column or take it slightly upriver to the head of passes, dump it and then "get back to the fight." The corps wages a never-ending war against mother nature, against the river's countervailing ontology. If the channel is not dredged, the banks will close. Dredging "keeps the navigation channel in-tact. If we don't, we'll lose the banks, and we'll lose Southwest Pass." The

[629] Mark Wingate, "Mississippi River Deepening Update," address presented at the Coastal Protection and Restoration Agency Board Meeting, observed by the author, February 20, 2019, Pavilion of the Two Sisters, New Orleans, LA.
[630] Wingate, "Mississippi River Deepening Update."

Corps likewise must fight each year for Congressional Appropriations –which amount to half of the $300 million they are authorized to spend on this effort. If the mouth of Southwest Pass were clogged, the river would no longer support commercial shipping because the river as we know it would spew off to a new avulsion to begin a new delta lobe. The Bird's Foot Delta and the upstream trunk of the Mississippi River exists because of the intensive ontological repair work to keep the river from flooding its banks and setting entirely new courses.

If we acknowledge that landscapes can be materialized through hegemonic actors and their technologies of statecraft, how can we also account for the material affordances of the landscape itself? I'm thinking in this regard of the river's agency in resisting control, or the unintended consequences of nitrous algae blooms at the river's mouth because of upriver pesticides? For Chandra Mukerji the built environment constructs a pedagogical arena through which subjects are interpellated into behaviors. Mukerji argues that material spaces do not just instantiate or constrain relations of power but can help shape the worlds of imagination that animate politics.[631] This figured world is a contested field through which different groups vie for authority. Players struggle to dominate them, using materials and artifacts to further their agendas. "But figured worlds also depend on and produce (even in contested moments) shared forms of imagination."[632] Material environments are not only imagined and discussed but they are experienced. In this way, places are pedagogical. New meanings are taken from them even as social reproduction and material repetition attempts to stabilize them. This allows for a multiplicity of enactments. "Combining figured world theory with Ortner's "serious games" and Haraway's 'politics by other means,' we end up with a model of material politics that can

[631] Chandra Mukerji, "Space and Political Pedagogy at the Gardens of Versailles," *Public Culture* 24, no. 3 (September 2012): 509–34, https://doi.org/10.1215/08992363-1630663.
[632] Mukerji, "Space and Political Pedagogy," 513.

explain how places serve as pedagogical tools of political change that can teach identities and political logics through material activity."[633]

For Mukerji, one's own consciousness is shaped by both the material environment and the social environment, so spaces and places can be powerful tools for shifting figured worlds. "People learn from spaces by inhabiting them, playing the games they facilitate, and learning their material affordances and aesthetic properties by experience."[634] Mukerji's iconic example is the use of Versailles by the French court in teaching the nobility the vision of Roman succession. In Figured Worlds, certain hegemonic interests construct material environments such as gardens or galleries to indoctrinate subjects into a figured world that participants may also project themselves into. Mukerji also deploys a concept of territoriality but in a slightly different way than Fields. Her use of territoriality describes how the built environment allows the state to modify behavior from a distance through a kind of soft or indirect power.

Experiencing the landscape as a commercial fishermen or oyster farmer over decades or generations of activity, financial investment and risk and social community constitutes a figured world. This figured world would likely run counter to an arbitrary period of history state planners are ascribing to naturalize the landscape into an certain imaginary that no one living has experienced. The pedagogical interpellation happening at specific discursive sites runs headlong into the experienced figured world of someone who lives and makes their livelihood through the dynamic landscape. Landscapes often become naturalized as they typically operate on longer temporal scales than people, companies or sometimes even governments. A landscape typically expresses the materialized values of a culture in space and over time. Its constituents are

[633] Mukerji, "Space and Political Pedagogy," 513.
[634] Mukerji, "Space and Political Pedagogy," 513.

inheritors of decades and centuries of practices, and in the case of the people of the Mississippi River, centuries of interventions.

But the timescale of change is compressed in coastal Louisiana. There are competing regimes that exist in overlapping tableaus of inherited conditions. Groups have organized themselves in time and space through what Joshua Lewis calls "ecological regimes" of behavior.[635] They organize around different time scales of a dynamically changing landscape. There is no single way to inhabit coastal Louisiana. Nor is there a single way to preserve its current assemblage. It has no stasis. Its pace and trajectory of change are contingent on a number of feedback loops from a combination of practices. Change has been activated through interventions to build flood protection levees, remove rapids, build dams and dig canals. Some regimes have benefited from these actions and others have suffered the ecological repercussions of those actions. One regime's claim to how the landscape should be preserved or altered is often informed by a timeline – whether by the "deep time"[636] enacted by the state or their own experience. So what does this mean for Louisiana?

Positivism and Power

As I mentioned, I have discovered a predictable pattern of elisions when it comes to historicizing coastal erosion by state planners, particularly regarding oil and gas operations. I wonder if indeed funding sources themselves have contoured research outcomes. Or perhaps the technical tools themselves are not equipped to traffic in questions they cannot answer. To some extent, as I've explored, the coastal planner must filter future imaginaries of what is possible

[635] Joshua A. Lewis and Henrik Ernstson, "Contesting the Coast: Ecosystems as Infrastructure in the Mississippi River Delta," *Progress in Planning* 129 (April 2019): 1–30, https://doi.org/10.1016/j.progress.2017.10.003
[636] Lewis and Ernstson, "Contesting the Coast," 21.

through the policy constraints of supporting a Working Coast of shipping, seafood and oil extraction. But the planner is also limited by the resolution of the planning tool, which for instance cannot differentiate between organic or inorganic sediment. So, not surprisingly, the CPRA does not differentiate between organic and inorganic material flows that may be diverted by the Mississippi River. They do not have a modeling system that can pixelate at the organic/inorganic level of detail. The limitation is technical. But the elision becomes rationalized and perhaps under-prioritized. Or perhaps, they just don't think it's important. It becomes a question not of science then but of rationality.

Science is not a capital "S." It consists of many disciplines that may take up the same object of inquiry and create opposing realist productions depending on how the material is cut, studied, carried, historicized, valued, sold or otherwise combined. There is no one way to produce a world even among scientists – not to mention the many other disciplines making worlds. The same mud teaming with bacteria, nitrates, phosphorous and atoms can be many different things depending on what is emphasized and indexed. The same light can produce different colors by refraction. The same discursive definition can change over time. There are many different disciplines, practices and tools through which we put the world into words.[637] When state coastal planners describe the land building properties of the river – they begin profiling a flow of sand, silt and mud. Each material grain is implicated for its size, behavior, and ability to form land. These analyses are drawn from spreadsheets, analysis, and coring samples from analogue sites. They do not formally engage in the whys or sociology of action and impact. They may debate the variables included or excluded in their model analysis. The geologist measuring weight and mass of sediment, is criticized by the ecologist studying the effect of

[637] Latour, *Pandora's Hope*.

nitrates and phosphorous on existing vegetation. The ecologist may prioritize the vegetation as an essential ingredient to build land because it holds sediments together. If pollutants kill the vegetation, the sediment will be lifeless. Indeed, a thing is not just a thing – but something that exists in many ways in the world. But such concerns do not weigh as heavily on a sedimentoloigsts measuring the efficacy of particle capture.

Conflicting Claims: Having Your Coast and Eating it Too

So how to account for these interwoven, sometimes contradictory imagined geographies of competing regimes? The state is essentially attempting to traffic in dual imaginative geographies of the Mississippi River as both a navigable waterway and land builder. They legitimize their vision by recalling the deep historical time that narrativizes the river's original role as the progenitor of the Louisiana delta. This narrative is taken up through public relations campaigns, not just by the CPRA but also by other actors such as environmentalists and oil interests who point to the river's role in land building without accounting for the vast infrastructure of oil and gas and shipbuilding that the Working Coast comprises.

One of the more egregious examples of the conflict between the Working Coast and its future existence lies in a pair of proposals to build oil and liquefied natural gas terminals on the Lower Mississippi River at the Port of Plaquemines south of New Orleans. The port is located in a parish that consists of a narrow, 90-mile long peninsula that stretches out from the southeastern portion of Louisiana as the Mississippi River spills into the Gulf of Mexico. The parish has lost 248 square miles of land between 1956 to 2006 and is projected to be the second highest site of land loss in the state by 2050.[638] The Port sits on a sliver of leveed land between the river and

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[638] Nandini Seth, "Coastal Land Loss and Collaborative Resource Governance: The Case of Plaquemines Parish, Louisiana" (master's thesis, University of New Orleans, 2014), https://scholarworks.uno.edu/td/1955/.

disappearing marshes opening to sea water. There are plans to build multi-billion-dollar terminals on opposite sides of the river – on these leveed slithers of land. One would export crude oil by ship and the other liquified natural gas. Both would be supplied through pipeline infrastructure. They would be connected by three newly dredged pipelines in the marsh that hook into the massive pipeline network existing through Louisiana. They will be connected over the levee to terminal docks built through public private partnerships between the Port of Plaquemines and private energy companies. One of the projects is a proposal by Tallgrass Plaquemines LLC for a $2.5 billion project to store and export crude oil. Its proposed location is adjacent to the $1.4 billion, mid-Barateria Diversion Project. According to a subcontractor on the project that used the CPRA's modeling, the oil terminal would block sediment flow of the diversion and reduce the efficacy of marsh restoration by 17 percent.[639] The project is being financed by $650 million in 30-year revenue bonds that the parish government would underwrite. Drexel Hamilton, a Philadelphia investment firm, will repay to the parish the principle and interest payments of the bonds through the operations of the facility. However, one problem with these two projects is that they may be standing in open water in 30 years. "They should have designed these as offshore platforms," said Scott Eustis, Community Science Director with the Gulf Restoration Network.[640] If Drexel Hamilton defaults on the agreement because the oil market collapses or coastal erosion undermines the site, then Plaquemines Parish taxpayers will likely be left holding the debt. The terminal is being designed in anticipation of the Mississippi River being dredged to allow ships with drafts of 50 feet to dock, which is five feet deeper than the current channel. The CPRA determined in late April that the project is "not inconsistent"

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[639] Mark Schleifstein, "Proposed Oil Export Terminal May Conflict with Mid-Barataria Sediment Diversion," *Times-Picayune*, September 6, 2018, https://www.nola.com/expo/news/erry-2018/09/ee9b94614c5492/proposed-oil-export-terminal-m.html.

[640] Scott Eustice, in conversation with the author, December 20, 2018.

with the coastal Master Plan – a consistency determination required by law to protect restoration and hurricane protection projects.[641] The determination allows the project to take another step forward. But its presence not only may interfere with diversions but any leak from the 20-billion-gallon storage tanks and pipelines could affect the adjacent wetlands that the state's diversions are trying to rebuild.

Just downriver, a separate $9.8 billion proposal to build a 630-acre liquefied natural gas terminal, proposed by Venture Global, will disrupt more than 800 acres of wetlands during construction of the facility and another 6,000 acres from additional pipelines. When complete, the terminal would be able to ship up to 20 million tons per year of super-cooled liquid natural gas to buyers overseas. To offset the impacts of pipeline dredging and marsh disruption, the company would buy credits towards an established wetland mitigation banking site, as if the dissolution of one dynamic ecology can simply be replicated elsewhere.[642] This only seems plausible if you are thinking about wetlands as infrastructural buffers – and not as complex ecological systems. The projects are in the permitting stages and amount to billions of dollars of capital investment each, to further monetize the natural resources extracted from the Louisiana wetlands. This extractive commodity would then be shipped on deep draft tankers out of the deepened 50-foot Mississippi River channel to the rest of the world, which would then burn them and generate global-warming causing fossil fuels that will contribute to rising sea levels - to which Louisiana is the single most vulnerable state in the country. In addition, the proximity of these energy terminals will disrupt current and planned state diversion projects that are being undertaken at huge public expense. On July 10, as Hurricane Barry approached Louisiana and

[641] Schleifstein, "Proposed Oil Export Terminal."
[642] Kristin Mosbrucker, "Residents Concerned about Pipeline for New LNG Export Facility, but Others See Economic Driver," *Advocate* (Baton Rouge, LA), September 23, 2019, https://www.theadvocate.com/baton_rouge/news/environment/article_a309e57a-d654-11e9-bfaf-77e734ff81aa.html.

Plaquemines Parish, the parish president, Kirk Lepine, issued a mandatory evacuation of the entire east bank and parts of the west bank of the bloated Mississippi River because of fears that the river could overtop the levee at multiple points.[643] The order was lifted three days later as Barry's potential destruction was not realized, but it underscores the vulnerability of such infrastructure along an increasingly exposed stretch of land.

Prior to Barry, at a CPRA board meeting in February, the commissioner of the state's Department of Transportation and Development, Tommy Clark, began touting the terminal projects at Plaquemines despite their apparent inconsistency with the state's diversion proposals. His report was received without comment by the board. Clark touted the proposed crude oil terminal project but failed to mention that it would directly interfere with one of the proposed billion-dollar diversion projects. He also touted the proposed Liquid Natural Gas project that would be supplied by a 750-mile highly pressured gas pipeline from Oklahoma through Louisiana's deteriorating marshes, by calling it "a prize to the maritime industry and LNG."[644]

Clark also touted the Port of Plaquemines' ongoing expansion plan – which if coordinated with the Ports of New Orleans and Baton Rouge – could together comprise the second largest containerized cargo port complex in the world. But that would be contingent on the Corps of Engineers dredging the Mississippi River five feet deeper – to 50 feet which would allow Louisiana to receive the larger Panamax vessels coming through the expanded Panama Canal. "The battleground for cargo is the Midwest," Clark said. "Cargo containerization is the number one disruptive force. The second is the Panama Canal, which is the aperture for the

[643] Faimon A. Roberts III, "Mandatory Evacuation in Plaquemines: Order to Leave East Bank, Parts of West Bank Goes into Effect Thursday," *Times-Picayune*, July 10, 2019, https://www.nola.com/news/weather/article_eb02773e-a350-11e9-96b1-fbd563cfc0b0.html.
[644] Mark Wingate, "Mississippi River Deepening Update," address presented at the Coastal Protection and Restoration Agency Board Meeting, observed by the author, February 20, 2019, Pavilion of the Two Sisters, New Orleans, LA.

Mississippi River." In other words, the 2016 expansion of the Panama Canal to accommodate larger vessels had set a new standard opening access to larger ships in the Mississippi River. This would require deeper dredging from the river's mouth at Southwest Pass, passed New Orleans to Baton Rouge. Larger ships are moving through the Panama Canal, which opens opportunities to capture larger cargo ship traffic from Plaquemines to Baton Rouge, he said.

In 2016, Panamanian officials opened a larger lock that allows wider, heavier ships to cut across the Americas. The new Third Lock increases the 39.5-feet deep "draft" for container ships to a 50-foot draft. In August 2108, the Corps of Engineers agreed to deepen the Mississippi River channel by five feet to fifty feet in order to serve the larger ships calling on the newly expanded Panama Canal. The move was celebrated by shipping interests such as the Big River Coalition, whose membership includes an assortment of port operators, petrochemical refineries, and shipping companies that advocate using dredged material for marsh restoration.[645] The deeper lock set off a proverbial arms race among U.S. port cities to boost their port infrastructure to capture deeper cargo ships that had previously sailed around the tip of South America and avoided the Gulf of Mexico and Caribbean.

The Louisiana Port Association hired an LSU economist to write a report that claims industries that depend on shipping are responsible for one in five Louisiana jobs.[646] As southern port facilities expanded to receive bigger ships, Louisiana officials clamored for the Corps of Engineers to deepen the Mississippi River to keep its ports competitive. Although the federal Water Resources Reform and Development Act of 2014 authorized the Army Corps of Engineers to deepen the Mississippi channel from 45 feet to 50 feet, the initiative requires a 50/50 federal-

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[645] Mark Schleifstein, "Dredging Mississippi River to 50 Feet Clears Corps Approval Hurdle," *Times-Picayune*, August 20, 2018, https://www.nola.com/environment/2018/08/dredging_mississippi_river_to.html.
[646] Schleifstein, "Dredging Mississippi River."

state match. Louisiana Republican Congressman Garret Graves, the former CPRA executive director and now a member of the House Transportation and Infrastructure Committee, floated an idea that the channel deepening project could qualify as a coastal restoration project, allowing BP or GOMESA restoration money to cover Louisiana's local match with the Corps.[647]

The state through its multiple agencies and departments traffics in what on its surface is a unified message of the importance of its coast to industrial and economic productivity. But I argue that this unified message – which itself supports an untenable system – also traffics in contradictory ontologies for the river. During public comments, a Sierra Club representative was the sole critic of Clark's presentation, which she called the state's attempt to "have its coast and eat it too." What this demonstrates is a conflict of ontologies that supports an unsustainable regime. Louisiana attempts to reconcile this tension through its continuum of repair that currently goes by the name, the Working Coast. It is a reconciliation that continues to bridge what appears to be an unresolvable tension between survival and annihilation that is baked into the ontology of the state of Louisiana. The tension is both the crisis and solution of power. It is caused by past actions and current arrangements, and it continues to invite future crisis. The state, perhaps even unconsciously, is in the business of upholding this tension which sustains its rationale for intervention. These tension points are where power resides. It results from conflicting claims on its landscape, its economy and its imaginary future. It also offers us a rubric for tracking power.

In this regard, I propose to look to the point of what appears to be an irreconcilable solution and ask who is it serving and what past solutions and future trajectories of interventions does it invite? And that I believe will begin to bring the contours of power into relief. When we

[647] David Jacobs, "Making Mississippi River Deeper Remains Unknown—and Unfunded—Variable in Local Impact from Panama Canal Expansion," *Greater Baton Rouge Business Report*, June 8, 2016, https://www.businessreport.com/business/making-mississippi-river-deeper-remains-unknown-unfunded-variable-local-impact-panama-canal-expansion.

open the Black Box of what is otherwise seen as natural, we can track the power that makes it so. I offer a more dire example shared by Anthropologist Kristina Lyons, who worked with Amazonian farmers threatened by war and working land written off as fallow by the Columbian Government. She wondered how such communities could sustain themselves and thrive in the midst of the threat of annihilation. And she found something surprising. The communities were not participating in the "high-modernist extractive policy of narco-eradication" which was replaced by mining extraction. Instead she found a "tenacious vitality of life" in the midst of war."[648] These communities had carved out a transformative space within the dense entanglements of decomposing leaves and rootlets, insects, small animals and birds cloaked by selva canopy – "it was bundles of life pulsating away…" Modes of eating, seeing, cultivating, and decomposing allowed this various ecologies to produce. "What I learned was that rather than on productivity—one of the central elements of modern capitalist growth—the regenerative potential of these ecologies relies on organic decay, impermanence, decomposition, and even a robust fragility that complicates modernist bifurcations of living and dying."[649] There is some value to that life in Louisiana. The presumption that oil is the lifeblood of the economy belies generations of communities who have carved out their own covenant with the land.

When I as a researcher think of the local and global disconnect between fossil fuel exportation and local sea-level rise, the words of one particular emergency manager from Lafourche Parish haunt me: "if we don't have an economy, then what is there to protect?"[650] Indeed, how can Louisianans and the rest of us survive without annihilating ourselves? At some

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[648] Kristina Marie Lyons, "Decomposition as Life Politics: Soils, Selva, and Small Farmers under the Gun of the U.S.–Colombian War on Drugs," *Cultural Anthropology* 31, no. 1 (February 2016): 59, https://doi.org/10.14506/ca31.1.04
[649] Lyons, "Decomposition as Life Politics," 59.
[650] Wendell Curole, in conversation with the author, 2016.

point the continuum of tension begins to complete the circle so that they are one in the same practice. Can there be survival without annihilation? If there is no path through this paradoxical ontology of survival and annihilation that can only be reconciled through extraction, then perhaps we must settle for death itself – the death of this modernist quandary. How then can we and others find life through such ontological deaths? While we are on this trajectory of failure, perhaps we may find hope in it. I don't mean profiting through disaster capitalism and Louisiana's Master Plan, but something else.

We must locate an alternative modality through death; something processional. A modern question – one born from extractive thinking – focuses on solving the Louisiana conundrum and "fixing" its crisis. But a modern answer simply reproduces the same conditions. A modern answer continues to commodify the coast for extraction – as has been done since the arrival of settler colonialists – as is done in other developing national sites to the detriment of marginalized and indigenous peoples who have been violently dispossessed of their homes. This extractive logic has led to a federalized response to controlling the river and "protecting" New Orleans. It led to a new $14 billion levee wall around New Orleans, which is already starting to subside,[651] and a partially funded $50 billion Master Plan. It has tied Louisiana's future interventions to the extractive processes that led us to this moment. Because the state's logic ties the understanding of wetlands to an anthropogenic valuation that serves a variety of functions with humans at the center. But instead we might trace the contours of that logic and how that logic has brought mud itself into being. We do this in order to understand the logics at work in its destruction and its supposed restoration. We might think about how the naming and handling of

[651] US Army Corps of Engineers, "Notice of Intent to Prepare a Draft Environmental Impact Statement for the Lake Pontchartrain and Vicinity General Re-evaluation Report, Louisiana," *Federal Register* 84, no. 63 (April 2, 2019): 12598–12599, https://www.govinfo.gov/content/pkg/FR-2019-04-02/pdf/2019-06354.pdf.

mud is reflective of these logics and reproduces these logics. Because of course we are made and make the environment we co-produce. To alter our common future may require us to unmake our current selves.

Just as imaginaries of a place are how we see something that is not yet there we can acknowledge different imaginaries of coastal Louisiana. "Farms are never only farms when they are also always regional watersheds, foothills, forests, biological corridors, and floodplains."[652] What is needed is a completely new methodology that re-frames what we think we know about the world, acknowledging that how we come to know something co-produces the relationship between the thing known and the knower. It enacts an ontology of an object as part of its past, past, and future trajectory. By problematizing what is otherwise taken as a given, we can begin to interrogate how knowledge production about the environment – for example scientific research or environmental journalism – constructs a particular environment for human centered extraction. So, how deeply must we go to interrogate this relationship and rethink how the environment can be experienced and represented? How can we interrogate what we mean by the "environment" and how changing our rhetorical frame on the environment has affected our engagement with what we consider the non-human world? In short, what is needed is a visible light on the script and practices through which we too have been cast.

I offer a surprising case of hope in New Orleans itself. New Orleans resembles what James Scott calls a "thick city." Its archeology of practices are often hidden, but influence contemporary life. Some cities hide those influences better than others. In New Orleans, they are visible. If we think of cities as a palimpsest of dreams and detritus, as Michael Sheringham suggests, we may gesture towards a place of possibility – which itself is a product of

[652] Lyons, "Decomposition as Life Politics," 73.

decomposition and archival traces. Cities are “multi-decked” upon streets and monuments and history. They are imbued with memories of the past. [653] New Orleans has been described as a simulacrum of itself, apparently frozen in time for the throngs of tourists looking for traces of its brothelized past in the gutted historic facades of French Quarter voodoo and daiquiri shops. But its aura emanates from a multi-layered archive that complicates the racial binary of America. It was a place of slavery, free people of color, black creole slave owners, indigenous tribes, European settlers and sensibility, and American capitalism. It was also a site of disease, exoticism, and deception. And it is stalled in a century of economic malaise. The genealogies of New Orleans are traced around the footprints of its centuries of wayfarers. They are etched and written in the mud itself, cast into the architectural cornices and performed on public streets. They travel. They intermingle in art, music, and material culture. New Orleans is a city whose culture comes from the street up, where according to famed trumpeter, Wynton Marsalis, “elegance met an indefinable wildness.”[654] A romantic depiction here, notwithstanding the problematic of appropriation and commodification, any description of New Orleans seems to slip along an palette of percussive rhythm, color, and sound. There is a wild and elegant substance that resides within the mud that constitutes the city – an improvised timelessness deposited by the meandering Mississippi itself. Its history remains on the surface to intermingle with the living. It offers an opening to rethink archeology. Its mud processes history, performing not an erasure but an embodiment of the past. It becomes the refuse and bodies that are buried within it. New Orleans is beautiful and powerful in its decay. It demonstrates that there is life in futility, decay, and death. In a place of contradictions, of fragility of landscape, and resilience of spirit. It

[653] Michael Sheringham, “Archiving,” in *Restless Cities*, eds. Matthew Beaumont and Gregory Dart, 1–18 (New York: Verso, 2010).
[654] Wynton Marsalis, “Saving America’s Soul Kitchen,” *Time*, September 12, 2005, https://wyntonmarsalis.org/news/entry/wyntons-article-on-time-magazine-today.

"exists under constant reminders of its contingent mortality. Not only is it sinking, but the muddy depths into which it sinks are becoming increasingly toxic."[655] Within this improbable fragile place, there is something to document because it refuses the inevitable. I'm thinking of the second line parades that perform this celebratory affirmation of life after funerals and cultural ruptures. Joel Dinnerstein describes walking with the Prince of Wales Social Aid and Pleasure Club. They were leaving a small stucco Baptist Church, called the Spring Hill Missionary. Led by a marching band, the second line of walkers shift and stride with the changing rhythmic percussion as the energy and tempo shifts within the human geography of present and past.

> "After only two blocks, we slow the parade roll to honor the dead. The band downshifts into a dirge in front of the late Jimmy Parker's house on Annunciation and the Walers fall into a halting step with a syncopated slip: we strut in two lines with a slight diagonal step, shaping the air into chords of an ancient worship. Maybe we pick up his spirit. Maybe he's satisfied we are all still dancing for him. Once past Jimmy's house, the Tuba, and snare drum pick up the groove, and down the block we pick up the Queen and her court.[656]

They joyously dance in the face of death, and likely because of death. Decomposition enables life. This is a place of the Jazz Funeral and the Second line. In the face of repression for people of color in the Jim Crow South, it responded with "social aid and pleasure clubs" – holding not only social aid, but more importantly, pleasure. This spirit is both memorialized in records and ritual, but it is always being reinterpreted. In the face of interminable odds, it perseveres through a kind of baseline that it loves to play for itself. It is a human ecology whose refusal requires and responds to its own improbability. A place of distinct and old neighborhoods, whose wards are mapped onto a byzantine coalition of political families. Their political coalitions are based on their neighborhoods, known by their acronyms: BOLD (in

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[655] Rebecca Solnit and Rebecca Snedeker, *Unfathomable City: A New Orleans Atlas* (Berkeley: University of California Press, 2013), 83.
[656] Solnit and Snedeker, *Unfathomable City*, 110.

Central City), LIFE (in Mid City), COUP (in the Seventh Ward), and LAVA (in Lakeview); as well as the Mardi Gras Indian Tribes, and even the music itself. Its neighborhoods are mapped by their musical proclivities, whose province is as unique as the iconography and stitching of each a Mardi Gras Indian tribe. Meters' bassist George Porter, Jr., known as one of the progenitors of the 19670s funk sound, explains to an interviewer the musical geography of the city, and his place in it.

> In the studio, you know (Alan) Toussaint, he lays out a guideline about where we want to be. So Toussaint would say, "We want to be in the Sixth Ward." Or, "We going to the Ninth Ward." Because if you went to different wards, you'd hear different styles of Music….because you know, the Lower Ninth Ward was gospel. The Upper Ninth Ward was blues. The Seventh, the Sixth, was predominantly brass bands. The Fifth … that was the police! Then, there was the Third Ward, where I grew up; that was the R&B guys, Earl King, Snooks (Eaglin) – that areas was turning out those R&B musicians. And then there was Nevilleville. That was the Thirteenth... and then there was everything in between. The Irish Channel – they had brass bands over there, with all the Irish and Italian guys. People like Louis Prima – and, you know, his band was typically of what the Italian community, musically, was bringing to the table. It was jazz – but it was like…fun jazz. At that time, when for the black jazz guys, you know, it was serious – those (Italian) guys, they encouraged feedback from the audience at all that.[657]

Perhaps there is something to be learned from this refusal to bow down and to cultivate care for one another and one's place here. Perhaps there is something to be learned from hearing the joyous noise and then becoming it, in spite of yourself. New Orleans is always telling stories about itself – a practice that may have indeed saved it after Katrina and helped organize a national conversation around rebuilding in order to save its unique culture – a practice that might behoove all of us to start replicating. There is possibility in decay. It is the birth of the imaginative soul, which may end up saving us.

[657] Solnit and Snedeker, *Unfathomable City*, 119.

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