Who Destroyed the Marsh?
Oil Field Canals, Coastal Ecology, and the Debate over Louisiana's Shrinking Wetlands

By Tyler Priest and Jason P. Theriot (Houston)

The State of Louisiana possesses the world's seventh largest wetlands and 40 percent of the coastal wetlands of the United States. These wetlands provide vital habitat for abundant wildlife and fisheries, reduce the impact of storm surges on urban dwellings, serve as a filter for the Mississippi River's pollutants that might otherwise contaminate the region's water table, and are home to some of the most culturally diverse communities in the United States. Unfortunately, these wetlands are disappearing rapidly. The U.S. Geological Survey estimates that Louisiana lost approximately 1,900 square miles of coastal land from 1932 to 2000 and could lose another 700 square miles by 2050. By the 1990s, the sinking Louisiana marshes accounted for 80 percent of the nation's ongoing coastal wetland losses.[1]

American wetlands historian Ann Vileisis claims that "wetlands have become the most controversial landscape in America."[2] The preponderant scientific evidence demonstrating their ecological importance combined with widespread alarm at their ongoing destruction has led to efforts at restoration and preservation. But such efforts have been plagued by conflict, discord, and failure. The debate has become intense, because the stakes are so high in preserving this fragile and critical ecosystem. In some ways, the debate mirrors that over climate change and raises some of the same difficult questions: How do we weigh and account for the human and industrial causes of environmental change in comparison to, or apart from, "natural" forces? What are the most feasible and effective means of reducing the human imprint on the physical world and sustaining our environment for the future?

The rapid drowning and disintegration of the Louisiana marsh has sent people scrambling to understand the causes and effects, so that restoration, mitigation, and compensation programs can be developed. There has long been a scientific debate over the causes of this destruction, which in recent years has become increasingly a political debate, with the oil industry – the dominant economic engine in South Louisiana – singled out as a leading culprit. Oil field canals, dredged by the industry to gain access to production sites and to host pipelines that have transported oil and natural gas from coastal Louisiana to the rest of nation, have certainly contributed to wetland loss. Coastal and offshore oil and gas development,

---

1 The coast of Louisiana is divided into two distinct geologic regions: the Deltaic Plain and the Chenier Plain. The Chenier Plain stretches from the Sabine River on the border with Texas eastward to Vermillion Bay. This wetland ridge is made up of mostly ancient shell beaches, old tree lines, and firm marshes. Cameron Parish holds the largest area of marshland in the Pelican state. As seen on a map, the Chenier region is slightly curved and relatively smooth, not frayed, compared to the "Birdfoot" Delta region. Its sediment structure is more stable and therefore suffers less from natural subsidence than its sister region to the east. These unique geological features allow the wetlands of the Chenier Plain to absorb, adapt to, and support man-made activities more naturally than in the Deltaic Plain. See *G.M. Gomez*, A Wetland Biography. Seasons on Louisiana's Chenier Plain, Austin/TX 1998, pp. 15, 54, 182.

2 *A. Vileisis*, Discovering the Unknown Landscape. A History of America's Wetlands, Washington 1997, p. 5.

which dates back to the 1930s, has roughly coincided with the destruction of the wetlands.[3] Each year, more than 25 percent of the petroleum consumed in the United States is transported through the Louisiana wetlands from oil and gas fields in the Gulf of Mexico. Coastal Louisiana is also home to the Strategic Petroleum Reserve and the Louisiana Offshore Oil Port, the nation's premier deepwater port for offloading foreign crude imports. Casting an eye at more than 9,000 miles of oil field canals, nearly 4,000 active platforms servicing 35,000 wells, and 29,000 miles landing across the Louisiana coast, many people have rushed to convict the oil industry as destroyer of the marsh.[4]

Figure 1: Tennessee Gas Oil Field Canal, Cocodrie, Louisiana

This verdict, however, is too simple and misleading. The coastal region along the Northern Gulf of Mexico is a complex ecosystem that has been incorporated in a multi-faceted way into

3 Scientists account for the period of most rapid land loss between 1955 and 1980, the era of intense offshore oil activity.

4 *J. Bourne, Jr.*, Gone with the Water, in: National Geographic 10, 2004, pp. 88-105; *L.L. Carstensen (ed.)*, Drawing Louisiana's New Map. Addressing Land Loss in Coastal Louisiana, Washington 2006, p. 36; *Gomez*, Wetland Biography, p. 55. For background on the history of the offshore oil and gas industry in the Gulf of Mexico, see *T. Priest*, The Offshore Imperative. Shell Oil's Search for Petroleum in Postwar America, College Station/TX 2007; and *T. Priest*, Extraction Not Creation. The History of Offshore Petroleum in the Gulf of Mexico, in: Enterprise & Society 4, 2007, pp. 227-267.

the regional economy. This includes the extensive construction of levees along the Mississippi River to support settlement, in addition to the infrastructure built for oil and gas. Moreover, in recent years, scientists have begun to understand how dynamic changes in the region's geology, hydrology, and geomorphology, independent of human activity, have contributed to wetland's destruction. Humans and their technologies have clearly had a hand in this destruction over time. But there are also environmental forces at work beyond human control, and these must be taken into account in drawing historical conclusions about the relationship between oil and gas development and the disappearance of the marsh.

The Louisiana coastal wetlands are a centuries-old product of a dynamic river and delta system that drains 1,575,000 square miles of North America. The Mississippi River provided the necessary fresh water, sediment, and bed load to coastal marshes, thereby counteracting the naturally occurring subsidence and the encroachment of natural sea level rise. The Mississippi Delta changed its course several times over the last 5,000-7,000 years.[5] As the river migrated from west to east and back again multiple times, it increased wetland sedimentation in the active "lobes" and increased wetland loss in abandoned ones.[6] By the mid-20th century, this dynamic system had been disrupted, and wetlands have since disappeared from South Louisiana at an alarming rate.

Prior to the 1960s, only a few scientists and the small communities living along the coast were aware of the wetland loss. The movement of all kinds of economic activity into the wetlands took place during a time when the idea of environmental protection as we know it did not exist and the concept of the marsh as a valuable resource in itself was not even considered. For much of human history, "cultures worldwide have invested marshes, bogs, and swamps with a rich, dense, and mostly eerie symbolic significance as dark and chaotic places of the earth."[7] The words "marsh" and "mire" have a long lineage in the English language as referents to negatively perceived types of wet areas that harbored disease.

Since the earliest French settlements in New Orleans, people have continuously sought to control the direction and frequent floodwaters of the Mississippi River.[8] In the mid-19th Century, the federal government transferred federally held wetlands to Louisiana and other flood-prone states, so they could sell the land and generate funds for drainage and levee building. Swamps and wetlands, it was hoped, would be turned into farmland, bringing lightness and order out of darkness and chaos.

By the late 1870s, containing and controlling the Mississippi River, let alone draining the swamps along its banks, seemed futile. But in the wake of the deadly 1927 flood, the U.S. Army Corps of Engineers set about constructing a major flood control system to circumvent any future potentially disastrous floods.[9] By the 1930s, the engineers had built almost a

5 *J.W. Day, Jr. et al.*, Pattern and Process of Land Loss in the Mississippi Delta. A Spatial and Temporal Analysis of Wetland Habitat Change, in: Estuaries 4, 2000, p. 426; *R.E. Turner/D.R. Cahoon*, Causes of Wetland Loss in the Coastal Central Gulf of Mexico, Vol. I: Executive Summary, New Orleans 1987, p. 2.

6 *Day et al.*, Pattern and Process, p. 426.

7 *L. Buell*, Wetlands Aesthetics, in: Environmental History 4, 2005, pp. 670-671.

8 See *C.E. Colten (ed.)*, Transforming New Orleans and its Environs, Pittsburgh 2000.

9 See *J. Barry*, Rising Tide. The Great Mississippi Flood of 1927 and How It Changed America, New York 1997.

thousand miles of levees along the Mississippi.[10] Because of these man-made structures, particularly the Old River Control Structure, which diverts a portion of the Mississippi's waters into the Atchafalaya River, and the dam-building on all the Mississippi's main tributaries, the annual flow of sediment down the Mississippi River into the delta region by the 1960s had been reduced by 60 percent.[11] Seventy-five years of redirecting the Mississippi's natural flow has "largely halted the delta building process" along the coast.[12]

The first studies on the Louisiana wetlands began in the 1930s and early 1940s and focused on mapping and identifying vegetation types and wildlife habitats. Early scholars reported on Louisiana's shrinking wetlands and understood the main factors that contributed to marsh deterioration: subsidence, erosion, and sea-level rise. Some of these factors were natural, subtle, geologic processes; others were man-induced, such as sediment starvation due to controlling the natural flow and sediment load of the Mississippi River. But not until the 1970s, when ecologists began to substitute "wetlands" for the pejorative terms "swamp" and "marsh," did they begin to measure the rate and extent of wetlands loss in South Louisiana. Research by Sherwood M. "Woody" Gagliano and J. L. van Beek reported land loss rates of about 16.5 square miles/year over a 30-year period, which sparked a new wave of scientific inquiry into explaining Louisiana's ever-changing coastal landscape.[13]

Initially, scientists believed that reduced sedimentation was responsible for the disappearing wetlands. New studies published in the 1980s aimed to quantify the rate of wetland loss and identify its causes. The methods used typically involved analyzing aerial imagery, data summaries of maps, and field investigations. This new scholarship began to show that man-made structures, mainly navigation, access, and oil and gas pipeline canals, had a major influence on altering wetland hydrology. The accepted interpretation noted two types of impacts from canals: direct and indirect impacts. The direct impacts of these canals accounted for the actual conversion of marshland to open water. The indirect impacts were the "secondary or subsequent changes resulting from, for example, reductions in sediment supply or from dredging, from subsurface fluid withdrawal, or from hydrologic alterations."[14] Beginning in the 1980s, researchers noted that these canals increased in size over time, some by more than 30 percent, depending on their location.[15]

---

10 *U.S. Department of the Interior (ed.)*, The Impact of Federal Programs on Wetlands, Vol. II, Washington 1994, p. 145.

11 *Turner/Cahoon*, Causes of Wetland Loss, p. 28. For a history of the Old River Control Structure, see *M. Reuss*, Designing the Bayous. The Control of Water in the Atchafalaya Basin, 1800-1995, College Station/TX 2004, pp. 207-247.

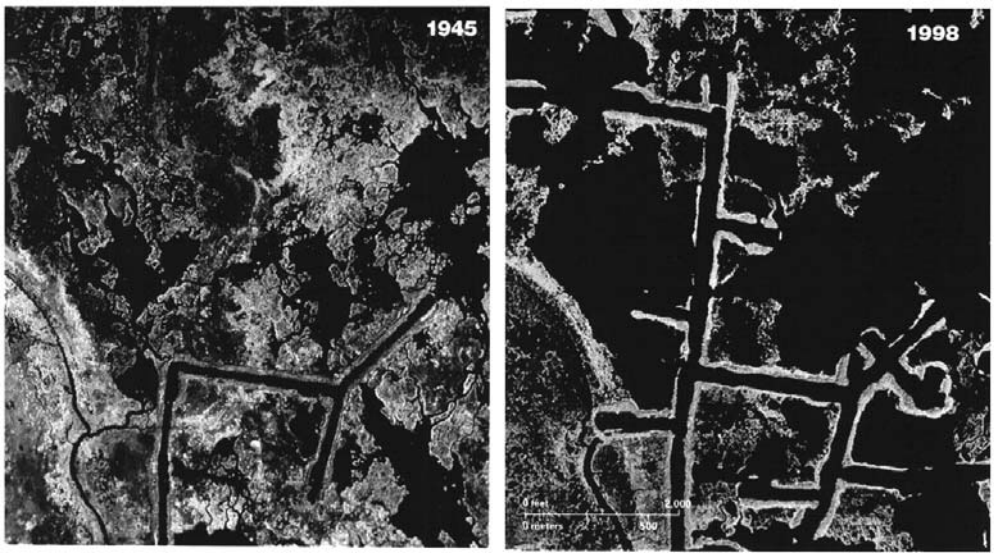
12 *U.S. Department of the Interior*, Impact of Federal Programs, p. 145.

13 *H.J. Walker et al.*, Wetland Loss in Louisiana, in: Geografiska Annaler, Series A, Physical Geography 1, 1987, p. 189; *Battelle Columbus Laboratories (ed.)*, Environmental Aspects of Gas Pipeline Operations in the Louisiana Coastal Marshes: Report to Offshore Pipeline Commission, Columbus 1972, p. 3.3.

14 *R.E. Turner*, Wetland Loss in the Northern Gulf of Mexico: Multiple Working Hypotheses, in: Estuaries 1, 1997, p. 1.

15 A 1989 study funded by the Minerals Management Service (MMS) identified 41 pipeline canals in the Mississippi Deltaic Plain region and reported that erosion rates varied between 12 meters (approximately 40 feet) per year to 17 meters (approximately 55 feet) per year. See *K.M. Wicker et al.*, Pipelines, Navigation Canals, and Facilities in Sensitive Coastal Habitats: Coastal Gulf of Mexico, Volume I: Technical Narrative, New Orleans 1989, pp. 333-339.

Figure 2: Aerial footage showing the indirect impact (ponding) of oil field canals over time



A close examination of the "Muskrat Line," a 355-mile large diameter natural gas transmission line built by Tennessee Gas in the 1950s, and one of the largest pipelines ever constructed through the Louisiana wetlands, illustrates the ways in which technology not only facilitated the transportation of petroleum through the nearly impassable marshes and swamps but also how it reshaped the coastal environment. Much of the pipeline was laid by dredging a 40 foot by 8 foot "flotation canal" through the marsh, which allowed for the continuous movement of pipe-laying barges and equipment. Engineers installed hundreds of concrete bulkheads and earthworks along the pipeline canal in order to keep out boat traffic and to protect the marsh from salt water intrusion. Over time, however, this pipeline canal and its many tributaries have increased in width, by as much as 150 feet in some areas, while ponding behind the spoil banks and saltwater intrusion through the outdated and weakened bulkheads have eroded the surrounding marsh.[16]

In 1983, researchers from Louisiana State University compared coastal maps from 1955 and 1978 to assess wetland loss in South Louisiana and noted that scientists were "only beginning to appreciate" how canals influenced local ecology. The scholars, Gene Turner, William W. Scaife, and Robert Costanza, were some of the first to suggest that indirect impacts, such as salt water intrusion and soil erosion, may extend decades beyond the construction of the oil field canals themselves. In addition to quantifying the vast network of pipeline canals, the scientists also analyzed the accompanying spoil banks that were created during the dredging of the various canals. These spoil banks, particularly those built parallel to the coastline, created conditions for extensive ponding and flooding that over time drowned sections of the

16 Co-author *J.P. Theriot* is currently working on a Ph.D. dissertation about the history of oil field canals entitled, Tennessee Gas' Muskrat Line: Building America's Energy Corridor through Coastal Louisiana's Wetlands.

wetlands through altered hydrology. The scientists concluded by calling for proper mitigation techniques in future canal projects, such as restricting or rejecting dredging permits, constructing weirs to limit salt water intrusion, and backfilling the canals.[17]

In the late 1980s, several major studies were published by scientists at LSU, the Louisiana Universities Marine Consortium, U.S. Fish and Wildlife Service, and the U.S. Minerals Management Service documenting the subtle, indirect effects over time caused by the dredging of canals for navigation as well as oil and gas pipelines.[18] These studies helped clinch federal support of Louisiana's restoration efforts for which the state's U.S. senators had been lobbying for years. In 1990, Congress enacted the Coastal Wetlands Planning, Protection, and Restoration Act (CWPPRA) – or the "Breaux Act" after Louisiana Senator John Breaux – a joint-venture partnership between the state of Louisiana and the federal government to fund, build, and manage long-term restoration projects in coastal Louisiana. The Act appropriated $50 million annually for the federal government's 75 percent share of the costs involved. Several major restoration projects, more than half a billion dollars worth, were completed or started in the 1990s, including the Caernarvon Freshwater Diversion, the Davis Pond Freshwater Diversion, the Bonnet Carre Freshwater Diversion, and dozens of smaller projects, such as creating crevasse splays and terraces to build marsh and impoundments to protect marsh.[19]

By the late 1990s, as the problem continued to worsen, and as CWPPRA projects seemed to have visible but negligible effects (the "proverbial finger in the dike"), some scientists and observers began to turn up the heat. In 1997, Gene Turner published a controversial article in the journal *Estuaries*. In his essay "Wetland Loss in the Northern Gulf of Mexico: Multiple Working Hypotheses," Turner argued that wetland loss resulted not from sediment starvation and subsidence, not from controlling the Mississippi River, but from extensive coastal zone canal construction, mostly by the oil and gas industry.[20] Subsequently, in the early 2000s, Robert A. Morton and others argued that oil and natural gas extraction was reactivating subsurface faults near the reservoirs causing an increase in subsidence. Morton analyzed what he called "hotspots" in Terrebonne Parish and determined that a correlation existed between subsurface fluid withdrawal and wetland loss. He concluded that the increasing amount of subsidence in these "hotspots" was directly attributed to the increase of oil and gas extraction in the same area during the same period, the 1960s and 1970s.[21]

---

17 *W.W. Scaife/R.E. Turner/R. Costanza*, Coastal Louisiana Recent Land Loss and Canal Impacts, in: Environmental Management 5, 1983, pp. 433-442.

18 *Turner/Cahoon*, Causes of Wetland Loss, Vol. I; *W.H. Conner/J.W. Day, Jr. (eds.)*, The Ecology of Barataria Basin, Louisiana: An Estuarine Profile. Washington 1987; *Wicker et al.*, Pipelines; *D.F. Boesch/N.N. Rabalais (eds.)*, Long-Term Environmental Effects of Offshore Oil and Gas Development, London 1987.

19 *Louisiana Coastal Wetlands Conservation and Restoration Task Force and the Wetlands Conservation and Restoration Authority (ed.)*, Coast 2050. Toward a Sustainable Coastal Louisiana, Baton Rouge/LA 1998.

20 *Turner*, Wetland Loss, pp. 1-13.

21 *R.A. Morton/G. Tiling/N.F. Ferina*, Primary Causes of Wetland Loss at Madison Bay, Terrebonne Parish, Louisiana, St. Petersburg/FL 2002; *R.A. Morton/N.A. Buster/M.D. Krohn*, Subsurface Controls on Historical Subsidence Rates and Associated Wetland Loss in Southcentral Louisiana, in: Transactions Gulf Coast Association of Geological Societies, Vol. 52, pbl. unknown n.d., pp. 767-778.

These studies, especially Turner's, set off a firestorm of controversy. In a letter to the *New Orleans Times-Picayune*, the president of the Louisiana Land & Exploration (LLE) company called Turner a "two-dimensional thinker," contrasting him with "three- and four-dimensional scientists" who "say these canals are responsible for about 10 percent of the problem."[22] Other wetlands scientists objected to Turner's methodology and simple thesis, arguing that complex geologic processes in the delta region could not be overlooked. Subsidence and sea level rise were essential components to this environmental phenomenon, along with habitat type and condition and sediment availability in a specific region. Therefore, they argued, restoration efforts must "emphasize riverine inputs of freshwater and sediments."[23]

Despite the challenges to Turner's thesis, his view that oil companies were the ones responsible for destroying the wetlands became common currency. Landowners, private and public, filed lawsuits against oil companies for property damage, claiming that lease agreements obliged leaseholders to restore the marsh to its original state. Citing a lessee's obligation to act as a "reasonably prudent operator" under Article 122 of the Louisiana Mineral Code, plaintiffs alleged that oil and pipeline companies had an obligation to restore dredged marshland to its "original" state. In 2005, a Louisiana Supreme Court decision denied these claims. In a case brought by the Terrebonne Parish School Board, a landholder, versus Castex Energy, Inc. and other pipeline company defendants, the Court found that although it "was not unaware of the plight of Louisiana's coastal wetlands […] imposing an implied duty to restore the surface that was clearly beyond the contemplation of the parties at the time they contracted is not a legally supportable resolution to an undoubtedly difficult problem confronting our state."[24]

As litigation wound through the courts, a political effort was organized to fund Louisiana coastal restoration, based on, among other factors, the underlying assumption that oil field canals were responsible for a percentage of the land loss. In 1997, the Coalition to Restore Coastal Louisiana combined all the local, state, and federal restoration programs into one management plan – Coast 2050, which attempted to look at the problem from an integrated regional perspective, as opposed to local, pork-barrel type projects like those funded under CWPPRA. Louisiana's Washington political delegation hoped the federal government, which has issued most of the oil and gas leases in the Gulf of Mexico, would pick up the estimated $14 billion tab for Coast 2050. Louisiana Senator Mary Landrieu made it her mission to obtain a share of federal royalties collected from federal offshore leases to pay for it. In August 2002, coastal restoration advocates launched "America's Wetland," a massive public education initiative to spread awareness across the nation and around the world about Louisiana's shrinking wetlands. Shell Oil, one of the largest operators in the Gulf of Mexico, was the major sponsor of the $10 million campaign.[25] In 2006, after the destruction wrought by Hurricanes Katrina and Rita in South Louisiana, some federal royalty revenues were pledged to the state, but the amount is far too small to fund Coast 2050 according to restoration advocates.

---

22 Quoted in *B. Streever*, Saving Louisiana? The Battle for Coastal Wetlands, Jackson/MS 2001, p. 21.

23 *Day et al.*, Pattern and Process, pp. 425-438.

24 Terrebonne Parish School Board Versus Castex Energy, Inc., Samson Hydrocarbons Company, Bois D'Arc Corporation, Fina Oil and Chemical Company, Samson Resources Company, No. 04-C-0968, Supreme Court of Louisiana, January 19, 2005, Decided.

25 See *Streever*, Saving Louisiana; *Borne*, Gone With the Water.

Meanwhile, scientific opinion has been moving against Turner's thesis. In 2004, LSU geologist Roy Dokka published a pathbreaking study, sanctioned by the National Oceanic and Atmospheric Administration (NOAA) and using G.P.S. technology. The study showed that for the past several decades, surveyors, floodplain managers, and levee engineers have systematically overstated elevations in coastal Louisiana. They had calculated heights using "benchmarks" which were supposedly stable, but which, as the report noted, were themselves subsiding. The big, underlying cause of wetlands destruction was regional subsidence resulting from multiple, interacting regional and local processes. Oil and gas extraction and associated canals no doubt speed the process of marsh drowning, but according to Dokka, they are neither the root cause (sediment and water load induced flexure of the lithosphere) nor the proximate cause (river leveeing, which prevents sediment deposition and accretion). In Dokka's view, the entire region, not just the wetlands, is subsiding, due to "unrelenting natural processes." According to research biologist Bill Streever: "In coastal Louisiana, where almost nothing about marsh restoration is clear, one fact stands out: elevation matters." Dokka and a growing number of others believe that merely fixing the wetlands will not save the coast, and this alone cannot provide adequate protection against storm surge. Says Dokka: "Higher and still higher ocean levees will unfortunately be needed for protection of human population if society insists on living in this dangerous environment." In Dokka's study, the environment of South Louisiana is a creation of the interaction between a complex geological, hydrological, and biological system and a complex regional economy, dominated by oil and gas extraction, but not necessarily determined by it.

Dokka's theory not only challenges the conventional wisdom about wetlands loss in South Louisiana, but it challenges some of the certainties we have about the relationship between humans and nature. Despite the alarming rate of wetlands destruction, until recently it was an article of faith, backed by controversial scientific theories, that not only had humans damaged the wetlands, but that humans had the ability to restore them. Clearly, the Louisiana ecosystem has been re-plumbed and its "natural" hydrology and geomorphology reshaped. But in recent years, and particularly since the storms of 2005, the emphasis has shifted from "restoration" and discrete scientific studies focused on the mechanisms of wetland destruction to more coordinated action by scientists, policymakers, and businesses to find ways to slow the process of destruction and protect the people, infrastructure, and economy.

A few oil companies are participating in this coordination, namely Shell Oil, the company that has dominated offshore oil development in the Gulf of Mexico since the 1950s. Some people dismiss the participation of Shell and other firms involved with coastal restoration as a publicity stunt intended to deflect criticism of the industry as a destroyer of the wetlands. Environmental advocates have openly criticized Shell for sponsoring "America's Wetland." They argue that the central mission of the non-profit initiative and Shell Oil has been to pass the liability and price tag for destroying the marsh onto the federal government and U.S. taxpayers. The critics point to the fact that "America's Wetland" has not explicitly acknowledged the thousands of miles of oil field canals that have attributed to wetland loss over the decades.[26] On the other hand, people working in, or close to, the oil industry grumble that

26 http://houston.bizjournals.com/houston/stories/2003/07/14/story7.html, **01.12.2008**; http://truevoiceofthewetlands.org/shelloil.html, **01.12.2008**.

Shell's association with Coast 2050 is, in effect, tacit acknowledgment that pipeline canals are leading culprits in the destruction of the wetlands. In their view, Shell's management has conceded too much in the service of "political correctness" and has uncritically accepted the "junk science" produced by Eugene Turner and others.[27]

The oil industry's long dominance in Louisiana business, its deep entwinement in state politics, and the notorious corruption at all political levels in the state automatically raises suspicions about oil company involvement in public initiatives such as Coast 2050.[28] But there is ample reason to believe that oil operators have as much to protect along the coast as residents and therefore have a sincere interest in addressing the problem. Wetlands form a barrier between the open Gulf and oil fields and pipelines built inland; an estimated 3,000 wells and production facilities and thousands of miles of oil and natural gas pipelines and access canals are currently protected by marshes and barrier islands. In a 2004 congressional testimony, Ed Landgraf, environmental coordinator for Shell Pipeline Company, stated that coastal erosion is a "national problem with serious national implications […] National energy security can be maintained only if Louisiana's coast is restored and preserved."[29]

The massive hurricanes that ripped apart the Louisiana Gulf coast in 2005 and 2008 spotlighted the vulnerability of the nation's petroleum infrastructure, most of which is located in southern Louisiana, prompting some in the industry to recognize that the long-term cost of inaction far outweighs the costs of wetland restoration. Within 50 years, an estimated 155 miles of what are now protected navigation waterways will be exposed to open water, leading to billions of dollars of losses in shipping and increased requirements for shoreline protection and dredging, not to mention repairing and relaying exposed pipelines. It is estimated that three miles of wetlands can absorb one foot of storm surge, and the loss of a one-mile strip of wetlands can increase average annual property damage by about $200,000 per acre of wetland lost. Furthermore, as the marsh sinks, insurance rates rise.[30]

In his book *Nature's Economy*, American environmental historian Donald Worster once spoke of the shifting dialectical tension in American history between the "Arcadian" impulse to discover and preserve nature's intrinsic value and the "Imperialist" impulse to dominate and extract value from nature.[31] The Arcadian impulse operates from the assumption that nature has its own order, its own pattern, and its own economy which humans are bound to adapt to and respect. The Imperialist ethos, by contrast, sees nature as having no economy, no concern for cost or efficiency, and thus it must be managed in the interest of "civilization." Efforts in the 1990s to "restore" the wetlands in South Louisiana may seem Arcadian in spirit, but they can also be interpreted as an Imperialist impulse to preserve habitation in an

27 Kathy Haggar, Riparian Inc., Baton Rouge/LA, email communication to author, April 21, 2008. Riparian does "commercial physical research" for the oil industry.

28 For more on the history of oil, politics, and corruption in Louisiana, see *G. Jeansonne*, Leander Perez. Boss of the Delta, Baton Rouge/LA 1977; *B.M. Banta*, The Regulation and Conservation of Petroleum Resources in Louisiana, 1901-1940, PhD dissertation, Baton Rouge/LA 1981; *W.M. Dodd*, Peapatch Politics. The Earl Long Era in Louisiana Politics, Baton Rouge/LA 1991; and *W. Parent*, Inside the Carnival: Unmasking Louisiana Politics, Baton Rouge/LA 2004.

29 http://www.louisianaspeaks.org/static.html, **01.12.2008**.

30 *Streever*, Saving Louisiana?, p. 104.

31 *D. Worster*, Nature's Economy. A History of Ecological Ideas, Cambridge 1977.

increasingly uninhabitable environment and to sustain methods of extraction that may no longer be sustainable.

In the last decade, there has been a perceptible shift to a more genuinely Arcadian perspective regarding the environmental transformation of South Louisiana. Communities, government officials, and businesses in the region are aware of their role as historical actors in this transformation, but they increasingly recognize that they do not have control over it. The best they can do is to try to accommodate the changing environment. The imperative of "restoring the wetlands" has been replaced by the objective of "protecting the coast." The Cajun people who populate much of South Louisiana derive their name from the French Acadians (exiled from Nova Scotia in 1755), and for generations they have adapted to "nature's economy" in their region. But the ongoing transformation of their natural surroundings may be the biggest adaptive challenge they have ever faced.

The destruction of the Louisiana wetlands has generated human, economic, and cultural loss. We must think about it in those terms, not as a preventable environmental tragedy for which blame can be readily assigned. German environmental historian Joachim Radkau cautions against environmental history as "the inexorable decline of nature as it is increasingly subjugated by humanity," or as "the history of a fall from grace and its unending consequences." According to Radkau, "Environmental protection today means providing for the future – but the future is uncertain, and therein lies the dilemma. A striving for sustainability that postulates the unending continuation of one's own world as one imagines it, and pursues that goal with rigid monomania, suffers from a dangerous delusion. […] In reality, even today, the history of the environment is not completely congruent with a history of environmental policy, that is, with a history deliberately and consciously created by humanity. Instead, at its core it remains a history of the unplanned and unexpected, of the always unstable symbiosis between humans and nature. […] For while it may have a certain logic to believe in the 'End of History' from an economic point of view – from an ecological perspective, such an end is nowhere in sight."[32] Although it may be uncharitable to label efforts to protect the Louisiana coast delusional, Radkau's observations make us think about the meaning of wetland loss in South Louisiana. This region is a hallmark example of the "always unstable symbiosis between humans and nature" and a place where the disappearance of the wetlands may be a minor episode in a larger historical drama. Nevertheless, the land loss in coastal Louisiana constitutes arguably one of the greatest environmental tragedies of modern time.

The on-going political and academic debates about the causes of wetland loss and the direction of restoration efforts have overshadowed the public projects that have begun the actual rebuilding of the coast. According to a 2007 annual review published by the Louisiana Department of Natural Resources, 711 restoration projects have been authorized since 1989 and more than 600 have been constructed. The types of projects range from freshwater diversions to open water land terraces that trap and build up sediments.[33] Although these projects represent only a tiny gain in the overall battle against coastal erosion, the coordinated efforts and funding by state and federal agencies have shown some sign of progress. Most

32 *J. Radkau*, Nature and Power. A Global History of the Environment, Cambridge 2008, pp. 302-303 [originally: *ibid.*, Natur und Macht. Eine Weltgeschichte der Umwelt, München 2000, p. 339-340].

33 *D.C. Lindquist/S.R. Martin*, Coastal Restoration Annual Project Reviews: December 2007, Baton Rouge/LA 2007, p. 123.

people involved in the discussion believe that the small scale restoration projects can at best "hold the line" in the near-term, particularly as the Gulf hurricanes increase in size, while larger and more expensive projects, such as reintroducing Mississippi River sediment into the dying marsh and bayous using massive pipelines, might actually make a real difference in the long-term. The political, environmental, and financial issues involved in such projects, however, pose enormous challenges to the lawmakers and discouraged stakeholders of coastal Louisiana who continue to watch in disbelief as the wetlands and all that they support – energy infrastructure, coastal communities, and wildlife habitat – slowly erode toward the sea with each passing tide.