Wetland Loss and Restoration in Louisiana: Policy Implications

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Abstract:

Environmental protection is essential in order to preserve our world. Environmental protection that is specifically important to coastal regions are wetlands. There has been general controversy over what regions should be protected due to the lack of a single definition for what a wetland is. However, there is no disagreement that wetlands do provide very valuable infrastructures for ecosystems and protection from winds and waves. Throughout the scope of history, wetlands have been recklessly destroyed in order for human expansion throughout the land. Examples of this destruction are visible in places such as New Orleans, where a vast majority of the city once laid on wetlands. In recent years, the value of wetlands has been realized by many. Government groups and NGO's have been working to preserve and protect wetland regions. This study examines the history of wetland use and management, with a focus on Louisiana. It concludes that while some improvements in wetland management have been made in recent years, more effort is needed to protect and restore these critical ecosystems.

Introduction

In August 2005, Hurricane Katrina, a category 4 hurricane, plowed into Southern Louisiana. The effects of Katrina were felt throughout the state and the country. Approximately 1.2 million people from Louisiana to Alabama were under evacuation order due to the storm. 1,577 people died within Louisiana alone, and over 6,000 people were missing (Johnson 2005). Hurricane Katrina was responsible for the destruction of many homes along the Gulf Coast. It has been reported that 275,000 homes were lost as a result of the hurricane (HurricaneKatrinaRelief.com) (Weather.com). The monetary damaged caused by Hurricane Katrina was also astronomical totaling $81 billion (Weather.com). Also, approximately 80% of New Orleans was flooded (Fritz 2007). New Orleans lively demeanor changed instantly to one of depression.



The 9th Ward of New Orleans
Source: Know Your Rights

Many errors occurred during Hurricane Katrina. The evacuation plans did not go as well as planned. Also, the levees broke in many places, allowing water to rush into the city.

Many different factors were blamed for the mass devastation within Louisiana and elsewhere. One of these factors was the loss of natural buffers. These buffers, also known as wetlands, have had a long history throughout the colonization of America. This paper will address what wetlands consist of, history of wetlands, and ways to protect these valuable ecosystems.

Chapter 1
1.1 Wetlands: Definition and Characteristics

Wetlands cover approximately 6 million square kilometers of the Earth, roughly ten times the size of France (Keddy 2000). Mitsch and Gosselink state that any definition of a wetland to some extent is arbitrary. "As a result, there is no single, universal recognized definition of what a wetland is. This lack has caused confusion and inventorying of wetland systems" (Keddy 2000). Due to the lack of one common definition for wetlands, a working definition will be presented.

The coastal region of many countries have been protected by wetlands for hundreds of years but population growth, increased desire for coastal development, industries such as agriculture and shipping, and many other influences are damaging the system (Nicholls 1999; Nicholls 2004; Coleman et al 2008). Wetlands need to be protected from major disturbances since these changes can alter the way a wetland works, disrupting the habitat and ultimately leading to the destruction of the wetland and an increase in flooding.

William J. Mitsch and James G. Gosselink describe wetlands as ""the kidneys of the landscape" because they function as the downstream receivers of water and waste from both natural and human sources. They stabilize water supplies, thus ameliorating both floods and drought. They have been found to clean polluted waters, protect shorelines, and recharge groundwater aquifers" (*Wetlands* 2007). Mitsch and Gosselink's description is a small summary of all of the things wetlands can do for the environment and the people surrounding them. The world's wetlands contain some of the most productive and sensitive ecosystems found on Earth (Coleman et al 2008).

Wetlands are noticeably different from other areas that are always dry or always wet. The resident plant and animal communities can tolerate saturation or inundation for long periods of time. Wetlands can also usually withstand desiccation on the surface (Lewis 2001). The United States Fish and Wildlife Service described wetlands as often having several attributes that help identify them. The first of these attributes is a predominance of plants specifically adapted to life in saturated soils, called hydrophytes. The US Army Corps of Engineers also believes that the prevalence of hydrolytic vegetation, meaning vegetation that is adapted to the wet conditions, is needed for wetlands (Mitsch 2007). The second is a predominance of soils showing evidence of development under saturated conditions, called hydric soils. The third attribute is that the substrate is not a true soil, either being sand or gravel, saturated with water each year (Lewis 2001).

The Committee of Characterization of Wetlands also stated that wetlands are an ecosystem that requires a constant or recurrent, shallow inundation or saturation at or near the surface of the substrate, also wetlands have hydric and hydrophytic vegetation (Keddy 2000). The National Research Council Committee's reference definition also specifies that wetlands are ecosystems which require in all cases recurrent and sustained saturation with water at or near the surface and that saturation must be sufficient to sustain distinctive physical, chemical, and biotic characteristics (Lewis 2001).

Wetlands also stabilize water supplies, thus ameliorating both floods and droughts. Wetlands are sometimes called the "ecological supermarkets" because of the food chain and rich biodiversity and nature conservation that they support (Mitsch 2007; Nicholls 2004). Flooded wetlands provide a refuge for animals from predators and

security from the physical and biological threats of channels (See figure 1.1) (Mitsch 1994). “When you lose wetlands…you lose their natural services including storage capacity during floods, and when you lose coastal wetlands, you lose wave and storm protections” states Sandra Postel, the director of the Global Water Policy Project. Postel also stated that Hurricane Katrina was an example of what happens when the natural infrastructure is disturbed (Tibbetts 2006).

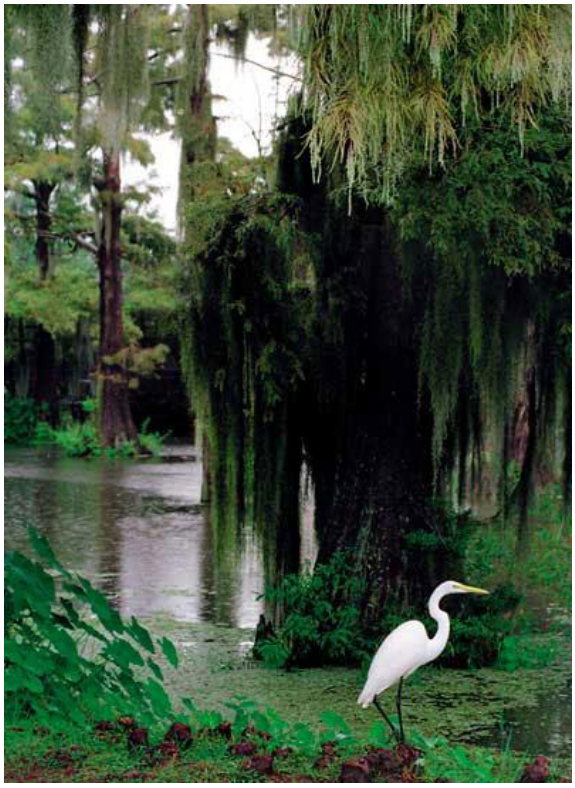


Figure 1.1:
Wetlands provide a vital ecosystem for animals and plant species.

Source: US Fish and Wildlife Service

1.2- Scope of Wetland Loss

In a report entitled “Rivers for life: managing water for people and nature” Postel and Richter state that “the US has lost nearly 117 million acres of wetlands since the 1800s” (Postel and Richter as cited in La Point, 2007). This number is more than half of the 220 million acres that were present during European settlements (Portney 1992). This

loss of wetlands presents a major problem for inhabitants in the coastal regions, as their protection from storm surges can be cut dramatically.

Globally, there were at least 300,000 km2 of coastal wetlands of international importance in 1990. As of 1997, there was a large coverage of major wetlands and abundant wetlands (see figure 1.2).Valuable coastal wetlands are subject to elimination because their ability to migrate inland is limited by human infrastructure and/or the rapid rate of change (Nicholls et al 1999). It is estimated that a 1-m rise in sea level could threaten up to half of the world's coastal wetlands which are labeled as internationally important (>168,000km2). Wetland areas are already under stress and are declining rapidly. Approximately 1% of the global coastal wetland stock was being lost each year in the late 20th century (Hoozemans et al 1993 as cited in Nicholls 2004).

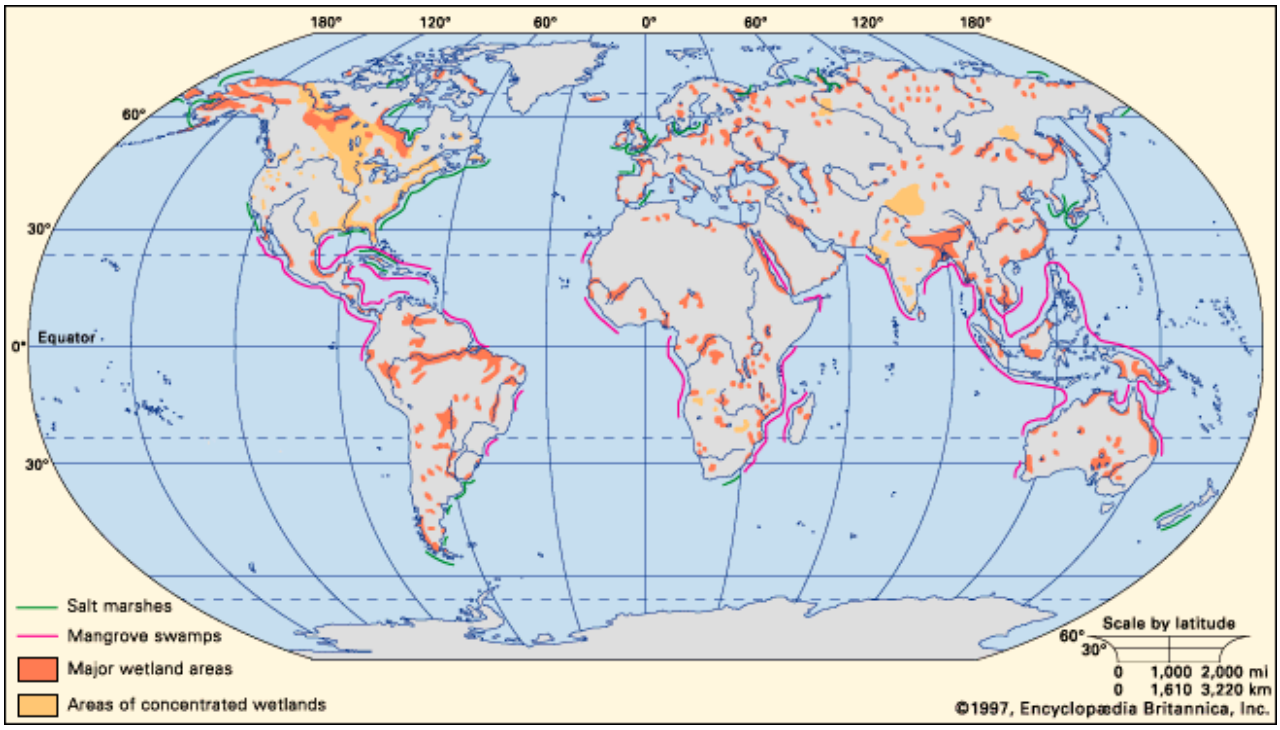


Figure 1.2
Demonstrates the major wetland area and the area's with abundant wetland coverage as of 1997.

Source: Encyclopedia Britannica

In the mid 1980's, scientists estimated that 53 percent of wetlands in the United States had been lost to either agriculture or development. Also, as recently as 1990, an average of 800 acres, or 600 football fields, of wetlands were lost on an average day (Vileisis 1997).

Other values of wetlands were not realized until the 1970's. These values include flood control, coastal protection, and water quality enhancement. Unfortunately, it has taken major disasters such as the 2004 Indian Ocean tsunami and the 2005 Hurricane Katrina disaster in New Orleans to cause societies to focus on the potential lives and property that could be saved if wetland buffer systems were provided at land-water margins (Mitsch, W. Gosselink, J. 2007).

The U.S Army Corps of Engineers has exercised authority over America's navigable waterways since approximately 1899. The Corps has been involved in literally thousands of public works projects during this time. Many of the projects have affected wetland areas, as the Corps often is responsible for issuing permits for dredging or filling any water sources in the US (Portney 1992).

Storm surges often occur from storms such as hurricanes. Positive storm surges that last for several days can raise the water level producing significant differences between the observed level and the astronomical tide. If the storm surges take place during the highest astronomical tide, the effects can be more severe. Effects would also be more serious if the storm surge height and duration increase as a result of climate change. The abnormal sea-level elevation near the coastline can cause the highest waves generated to reach the upper beach, causing more damage (Fiore et al. 2009). The number

of people flooded by storm surge in a typical year will be more than five times higher due to sea-level rise by the 2080s (Nicholls et al. 1999).

"By the 2080s, sea-level rise could cause the loss of up to 22% of the world's coastal wetlands. When combined with other losses due to direct human action, up to 70% of the world's coastal wetlands could be lost by the 2080s" (Nicholls et al 1999). This number is cause for concern for many coastal regions. As wetlands are reduced, storm surge impact will increase. Also, the Intergovernmental Panel on Climate Change determined that global-mean sea level rise will increase through the 21st century and beyond due to greenhouse gas induced changes on climate (Church et al 2001) and that this change could have important impacts on coastal populations and ecosystems (Mclean at al 2001) including changes to flooding by storm surges, which is a human system impact, and a loss of coastal wetlands which is an ecosystem impact (Nicholls 2004).

1.3: Louisiana in Focus

Approximately one half of the area of Louisiana is classified as wetland soil and as of 1994, 25 percent of the state was considered wetlands. Due to canalization and land subsidence, wetland loss is in excess of 250 km2 per year (Mitsch 1994).

Coastal geologist, Gregory W. Stone, stated that if the current trend of wetland loss and barrier island erosion continues, it will worsen the effect of future hurricane surges in south Louisiana. Stone also states "wetlands and barrier islands are the first line of defense. That means areas such as New Orleans would become more vulnerable to inundation" (Tibbetts 2006).

Paul Keddy discusses the wetlands in the New Orleans region. He states that the socio-economic well-being of southern coastal states is tied to the ecological health of

their wetlands, and thus, there is considerable interest in conserving and maintaining such areas. Even with this interest and concern, coastal wetland loss in Louisiana averaged 34.9 mi2/ year from 1978 through 1990 (Keddy, P. et al. 2007).

The coastal zone of Louisiana contains almost 40 percent of the lower 48 states' coastal wetlands and Louisiana's wetland is the earth's seventh largest delta (Finkl and Khalil 2005; Hajjali, I et al). A majority of these are depicted on figure 1.3. This area also includes the Atchafalaya River Basin, a large area of bottomland forest. The Atchafalaya River is the largest distributor of the Mississippi River, and historically has flooded regularly, allowing the development of large cypress-tupelo forests, which need heavy saturation (Figure 1.4). The Atchafalaya is actively building a delta in Atchafalaya Bay, and its fresh waters are distributed across the coastal zone by the Gulf Intracoastal Waterway and natural bayous. Wetlands more distant from the mouth of the Atchafalaya are degrading more rapidly.

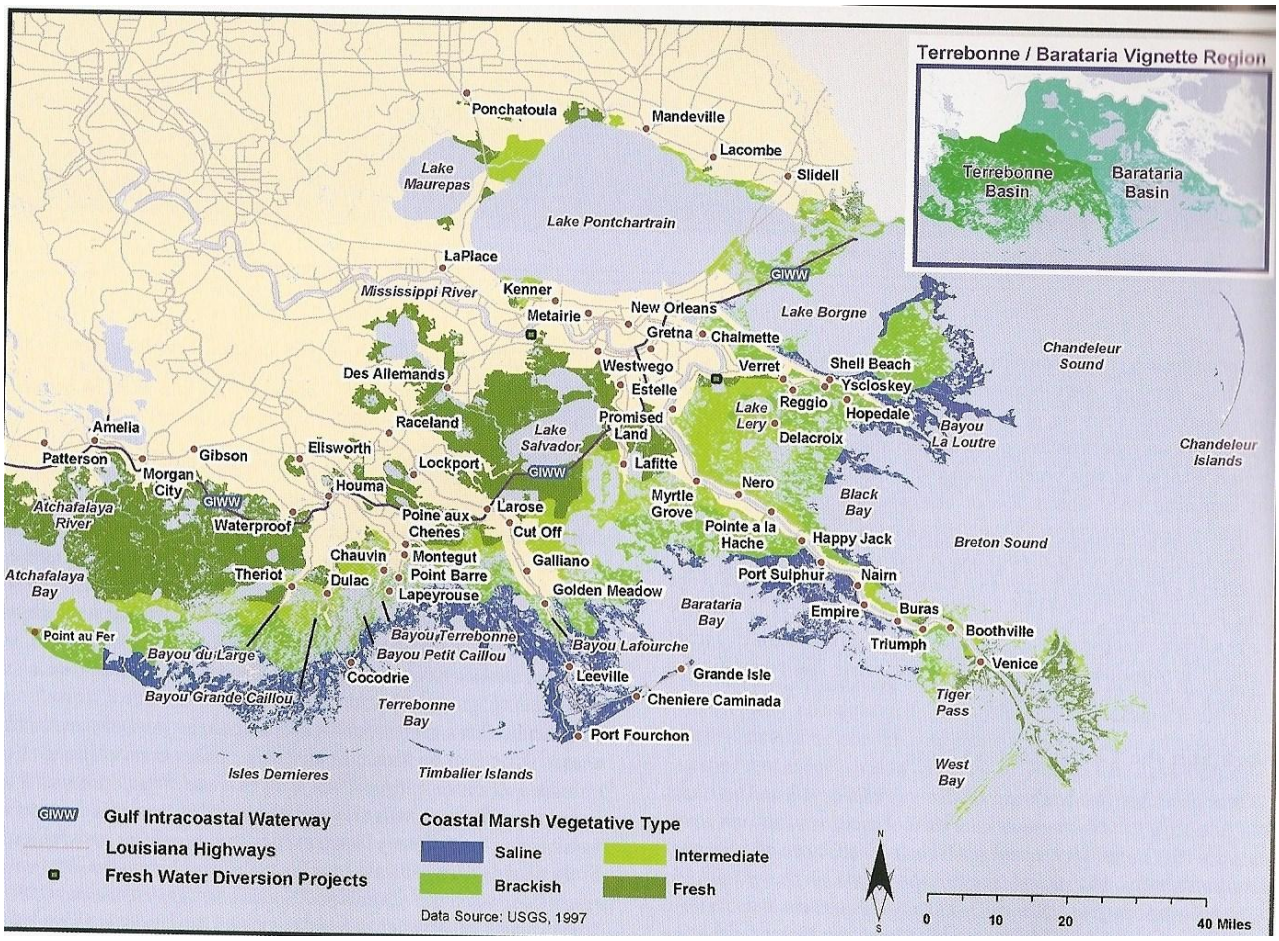


Figure 1.3: Four types of marshes are illustrated throughout the Eastern Louisiana region

Source: Finkl, Khalil, and Gramling, R. 2005



Figure 1.4:
Large cypress-tupelo forests form part of a wetland in Atchafalaya River Basin. The region is heavily saturated.

Source: United States Geological Survey

Louisiana's Gulf shoreline is rapidly eroding. Over the last century the rate of erosion has progressively increased, threatening the health of the coastal Louisiana region. Also the average rate of long-term shoreline change (greater than 100 years) is -19.9 feet/year, while the average short-term rate of shoreline change, less than 30 years, is -30.9 feet/year (Penland, S, Connor, P. Jr., et al). This amount of loss can be detrimental for the region. Since the 1930's, approximately 2800km2 of wetlands have been converted to open water in the Louisiana region (Coleman et al 2008). Louisiana has also lost half of its native forested bottomlands (Vileisis 1997).

Wetlands have many important benefits for the world, however throughout time wetlands have been degraded for many reasons. Chapter 2 will discuss the historical views of wetlands.

CHAPER 2
Wetlands Throughout History

2.1 Wetland History of the U.S. Prior to 1900

Many cultural attitudes have shaped our perception and understanding of wetlands. This perception has also lead to how we have mistreated and underestimated the value of wetlands.

Throughout time, many cultures have been able to coexist with wetlands and have economically benefited from the regions. Such cultures include the Marsh Arabs of southern Iraq and the Cajuns of Louisiana (see figure 2.1). The Russians, Finns, Irish, and other cultures have been using peat from the wetlands for centuries as a source of energy production (Mitsch, Gosslink 2007). Cajun traditions or everyday "folk life" practices have been defined in the expansive prairies, bayous, backwater swamp, and coastal wetlands of south Louisiana (Comeaux 1983; Rees 2008).



Figure 2.1:
A Cajun lumberjack camp in the Atchafalaya Swamp of coastal Louisiana. Their society and culture flourished within the bayou wetlands.

Source: Mitsch and Gosselink 2007

Colonists in America generally considered wetlands as ugly, repulsive, and a nuisance. They did produce goods such as fish, fur, fowl, and fiber, but they also impeded transportation. Early Americans had trouble traveling by wagons in these regions. Historical geographer Hugh Price stated "Natives were able to paddle small canoes along narrow channels through reeds and rushes, or leap fleet-footed from tussock to tussock.

White travelers and their horses had to wallow in mud and water" (Prince 1997 as cited within Spray,S. McGlothlin, K. 2004). Native Americans were also able to flee into the swamps, withholding from battle. A Boston preacher by the name of Increase Mather stated that Native Americans had a great advantage in the wetlands because they were "so light on foot that they [could] run away…through inaccessible Boggs…and thickets" (Vileisi 1997).

Wetlands also were seen as impossible to cultivate, unless used for rice growing. The majority of Euro-American people farmed for a living. However, few of them practiced farming methods suitable to wetlands. Thus, the farmers saw wetlands as little more than useless wastelands. Once drained, however, many of the wetlands yielded rich soil capable of sustaining high yields of crops (Lewis 2001; Spray, S. McGlothlin, K. 2004).

Prior to Colonial times, natives used the wetlands as a source of food and a source of defense from attacks or reprisals during the period of European conquest and settlement. Native settlements tended to move seasonally or at intervals of several years, however the new comers to North America had permanent towns. The flooding in low-lying river bottomland was much more of a hazard for the permanent towns (Spray,S. McGlothlin, K. 2004).

Along urban shorelines, as the population grew, wetlands blocked the approach of shipping and were also useless for construction. They were viewed by many early Americans as a dangerous place with bugs and reptiles, and also places for diseases, such as malaria, to grow. It was believed that malaria was caused by miasma which is a gaseous substance supposedly emitted from stagnant waters and decaying vegetation.

Many people believed that the wetlands allowed the emissions of the malaria causing gas. The obvious course of action for many was to turn wetlands into solid ground by making channels through inland swamps to carry the excess water into local streams and rivers. This idea was doubly attractive because it minimized the area for disease spread and made more land useful for farming or construction (Spray,S. McGlothlin, K. 2004).

In 1728, Colonel William Byrd II was quoted as describing a wetland area as "[a] horrible desert, the foul damps ascend without ceasing, corrupt the air and render it unfit for respiration…" (Mitsch, Gosselink 2007).

In the 1700's farmers realized their profits could be larger by growing crops instead of salt hay, which grew well in wetland regions. Farmers in the Northeast US decided that it was hard to individually drain the wetlands, so they formed meadow companies to drain them collectively. In 1788, the New Jersey legislature enacted its statewide drainage law which allowed groups of landowners to elect officers to manage and oversee drainage projects. These types of laws became very common (Vileisis 1997).

2.2 Wetland History of the U.S after 1900

Prior to 1986, a federal tax allowed farmers to deduct the costs of filling or draining wetlands. In 1986, the reduction was removed in the 1986 tax Reform Act. Also, before 1985, federal agencies would provide flood and crop insurance to farmers who engaged in wetland draining and filling in (Portney 1992).

In many northern plains states, farmers have converted over 60 percent of prairie pothole wetlands, which are regarded as the most productive breeding grounds for ducks and geese worldwide, into farmlands. Other states, such as Iowa, had been covered in vast marshes, however now approximately 89 percent of them have been drained for

cultivation. California's San Francisco Bay estuary, the Central valley, along with the rest of the state has lost 91 percent of their wetlands (Vileisis 1997). The total amount of artificially drained agricultural land as of 1980 totaled 107,483,000 acres (see figure 2.1)

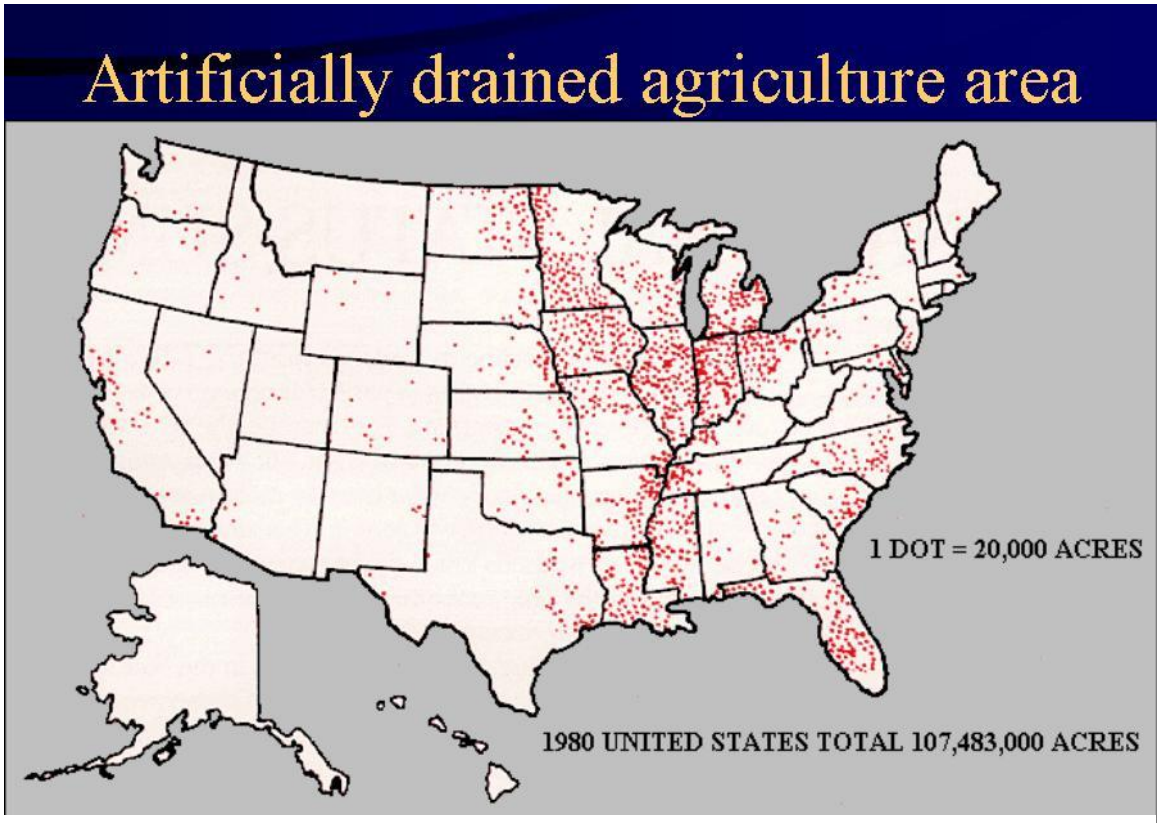


Figure 2.1
Artificially drained Agriculture Area- 1980

Source: US Forest Service

Many major cities and airports are located where wetlands were once located. Such locations include the Louis Armstrong New Orleans International Airport (Mitch, Gosslink 2007).

2.2: Wetland History in New Orleans

New Orleans was founded in 1718 by French settlers. They founded New Orleans on a natural ridge of high land on a bend of the Mississippi River. Lake Pontchartain was to the north and coastal wetlands were to the east, west, and south (see figure 2.2).

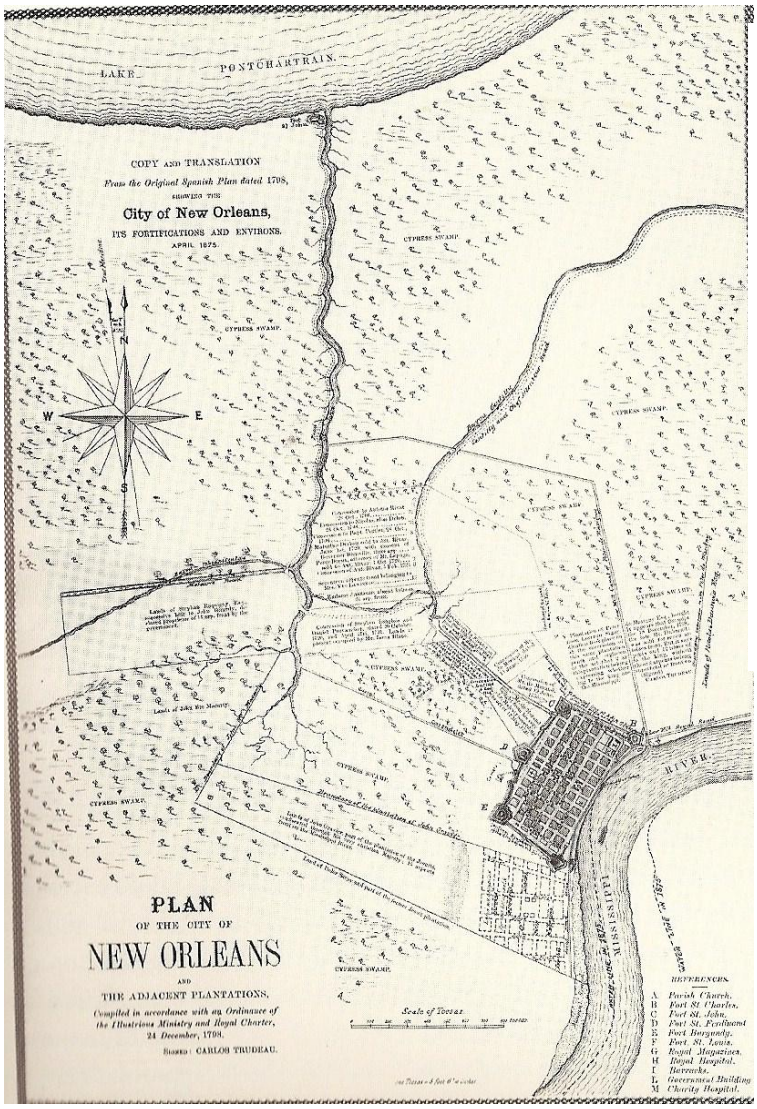


Figure 2.2:
A 1798 plan of New Orleans shows the original section of the city, located next to the Mississippi River and the vastness of wetlands that surrounded the area.

Source: Hallowell

The proximity to the water sources made flooding a problem in New Orleans. By 1812, the settlers of New Orleans had built levees along the east and west banks. Over the next two centuries, New Orleans, along with many other cities, drained the surrounding wetlands to prevent exposure to disease and encourage development. When the Yellow

fever struck New Orleans between 1817 and 1905, 40,000 residents died. After the fever occurred, the city eliminated many swamps (Tibbetts 2006). Figure 2.3 demonstrates land-use change in the Lower Mississippi River Basin landscape, including Louisiana for the period from 1600-1992.

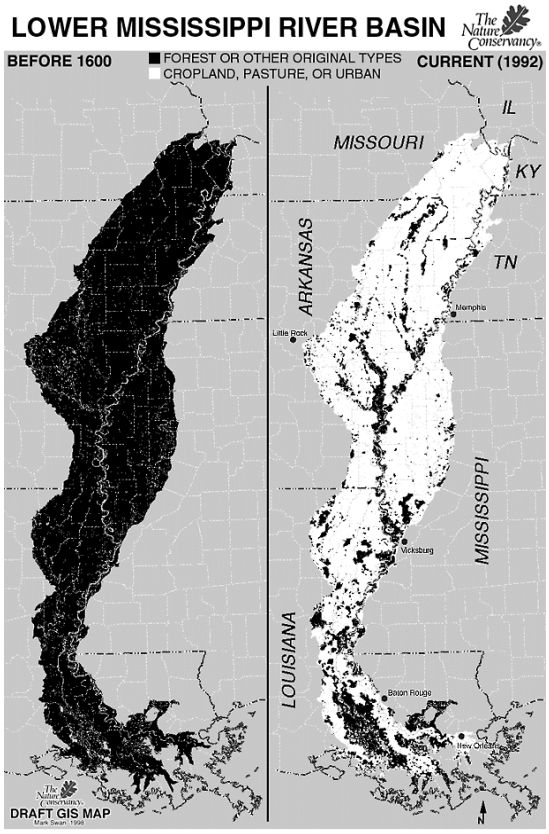


Figure 2.3:
Change in land use from before 1600 to 1992.

Source: Mitsch and Gosselink 2007

The low lying lands of New Orleans were originally only inches above sea level in the 18th century. Cohen explains that "when you drain these areas, you suck the water out of the peaty soils, which begins to compress, or subside" which then leads to the ground level dropping. Due to this compression, New Orleans continually built higher and stronger levee systems to contain river flooding (Tibbetts 2006). Currently, a majority of New Orleans is 7 to 10 feet below sea level and could be described as a bowl (Beckham 2005). Figure 2.4 is a topographic view of New Orleans. As the shade of color turns from green to red, the elevation drops. The cross section view demonstrates the

overall bowl shape of the city. It also demonstrates the higher elevation of the French Quarter, where New Orleans was originally established and the expansion into the lower regions.

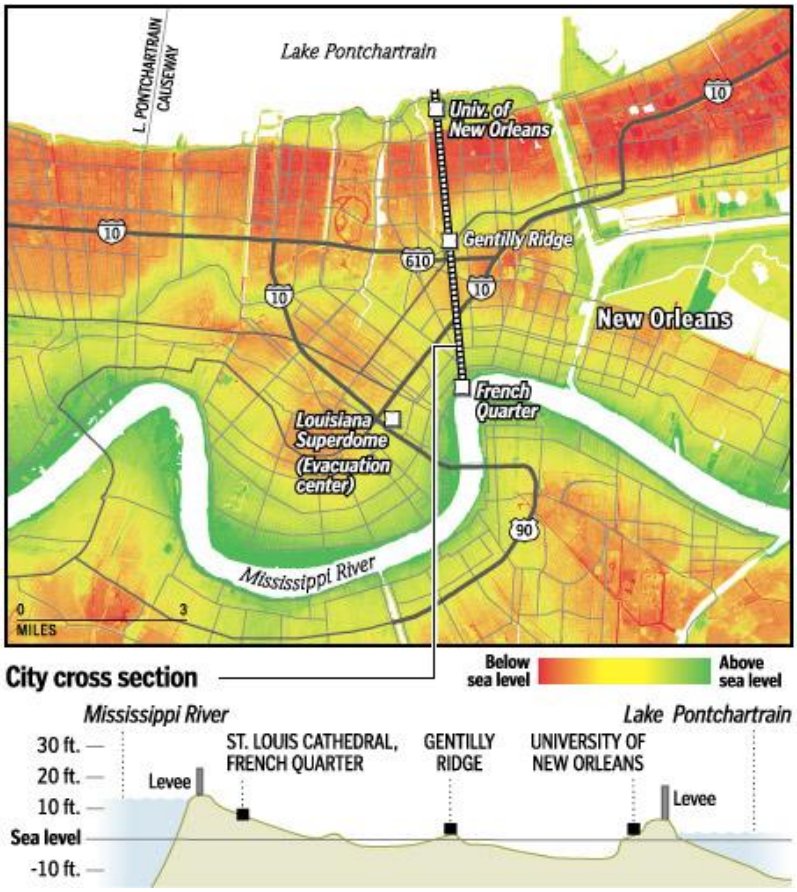


Figure 2.4: Topographic and cross sectional map of New Orleans show the proximity to sea level

Source: The Washington Post

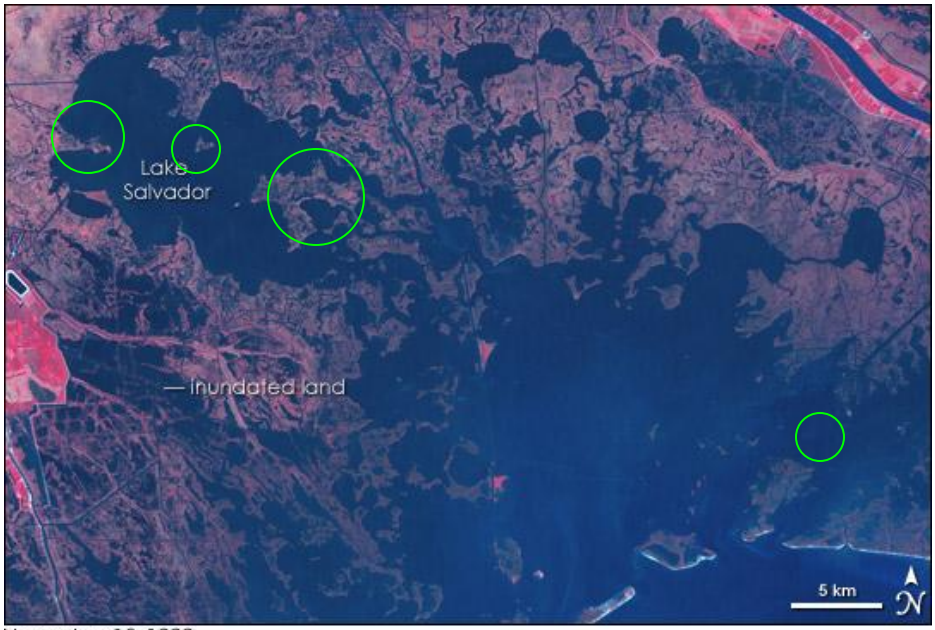
Also, the south Louisiana coastal wetlands, which have helped buffer the city from giant storms in the past, have been disappearing at an astonishing pace. An average of 34 sq miles of southern Louisiana land, most of which is marsh, has been disappearing each year for the past five decades, totaling 1,700 square miles, according to the U.S. Geological Survey (USGS). This number is equivalent to approximately a football field sized parcel of land disappearing every hour (Beckham 2005). During the past 50 years, as much as 80 percent of the American overall coastal wetland loss has occurred in

Louisiana. Between 1932 and 2000, Louisiana lost 1,900 square miles of land to the Gulf of Mexico (Tibbetts 2006). Figure 2.5 and 2.6 demonstrates the wetland loss.



Figure 2.5
Wetland loss in Louisiana

Source: Habeas Index



November 18, 1999



April 9, 1976

Figure 2.6:
Two aerial views of the wetland area in Louisiana. One from November 1999 and the other from April 1976- a 23 year period. The pink area represents wetlands. The 1976 photo has a more dense population of wetlands than the 1999 photo. Also, the photo from 1999 has four major noticeable differences from the 1976 photo including a loss of an island.

Source: Earth Observatory- NASA

It is predicted that by 2050, if nothing is done to stop the process of wetland loss, Louisiana could lose another 700 sq miles and also one-third of the 1930's coastal state will have disappeared. This reduction will continue to make the New Orleans region susceptible to future storms. Craig E. Cohen, a geographer at Louisiana State University,

states that “New Orleans can’t be restored unless we also address coastal and wetland restoration too” (Tibbetts 2006).

Currently, southern Louisiana is one of the most intensively engineered places in the U.S. Navigation corridors move large quantities of water through 2,000 miles of earthen, rock, and concrete levees. The levees were able to end the spring floods along the lower Mississippi, which is good for the local population but bad for the environment as the reduced flooding eliminated wetlands, floodplains, and barrier islands (Tibbetts 2006).

During the 1960s through 1980s, oil and gas companies dredged canals for exploration purposes. There are currently 10 large navigation canals and over 9,000 miles of pipelines in coastal Louisiana that serve approximately 50,000 oil and gas production facilities. These canals, which are good for industrial use, have also created new open water areas which drown wetlands and allow saltwater intrusion into freshwater ecosystems (Tibbetts 2006). Figure 2.1 demonstrates the increase of pipe lines and decrease of wetland coverage.

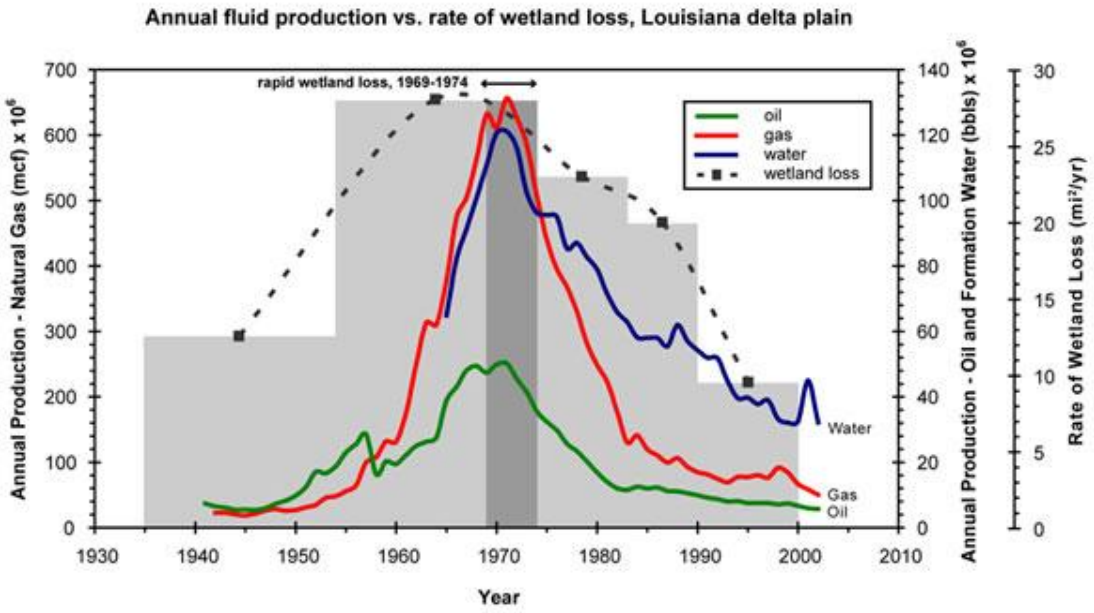


Figure 2.1 Fluid production vs wetland loss

Source: USGS

Further loss of land could endanger oil and gas facilities, the port complex, and the valuable fishing industry. The southern Louisiana wetlands are also an important nursery area for commercial fish including shrimp, blue crabs, oysters, redfish, and menhaden. Gregory Stone, a coastal geologist at Louisiana State University states that land loss is "not a local problem—it's a national problem" (Tibbetts 2006).

Historian Ari Kelman states New Orleanians manipulated nature in numerous ways to make a more secure settlement on the bank of the Mississippi River (Colten 2002). Baldwin Wood designed the first pumps and drainage canals for New Orleans in the 1910's. This allowed New Orleans to grow onto former wetland regions. These pumps, however, are not capable to pump large amounts of water out (Beckham 2005). Walter Maestri, the former Director of Emergency Management in Jefferson Parish, Louisiana, states that the natural high ground that New Orleans formed on is now the French Quarter. He also discusses how the wetlands were formed. He states that the flooding of the Mississippi allowed silt to be moved to the delta, allowing the creation

and revitalization of wetlands. These wetlands protected New Orleans. When levees were made, they kept the river from flooding. The wetlands were no longer being replenished and were becoming more vulnerable to salt water, which kills native species (Beckham 2005).

In 1927, the Army Corps took over the levee projects in New Orleans. They used two types of levees to protect the city, earthen levees (see figure 2.2) and concrete and steel levees (see figure 2.3). These levees were to hold back the sea and were supposed to be able to survive a category 3 hurricane.



Figure 2.2:
An example of an earthen levee in New Orleans by Lake Pontchartrain. The levee is made out of thick clay and will be seeded with grass in order to help prevent erosion of the wall by water that might overtop the levee in the case of a major storm surge (Terdiman).



Figure 2.3:
An example of a concrete and steel levee in progress (NOLA.com)

After Hurricane Katrina struck New Orleans, the Army Corps of Engineers planned on repairing levees to category 3 hurricane standards. They could not upgrade them to higher standards due to a lack of additional funding (Beckham 2005).

Given the usefulness and historical perception on wetlands and their loss, it is now apparent that wetlands must be preserved. Chapter 3 discusses the policies and programs that are being implemented to preserve and protect the wetlands.

Chapter 3- Wetland Policy and Programs

3.1 Wetland Policy

Many groups throughout the United States are pushing for wetland preservation and re-creation through reductions in navigation routes to overall reduction of harmful practices.

William Mitsch and James Gosselink state that the management of wetlands usually means setting several objectives based on the priorities of the wetland manager, current environmental regulation, and the wishes of any stakeholder involved (Mitsch, Gosselink 2007). Several goals of wetland management applicable today include:

- Maintaining water quality
- Reducing erosion
- Protecting from floods and storm damage
- Providing a natural system to process airborne pollutants
- Providing a buffer between urban residential and industrial segments to ameliorate climate and physical impact such as noise
- Maintaining a gene pool of marsh plants and provide examples of complete natural communities
- Providing aesthetic and psychological support for human beings
- Producing wildlife
- Controlling insect populations
- Providing habitats for fish spawning and other food organisms
- Producing food, fiber, timber, and other goods
- Expediting scientific inquiry (Mitsch, Gosselink 2007).

Mary A. Hague writes that “during the past 25 years, wetlands regulatory policy has frequently been described as murky, muddy, and swampy—even as a quagmire.” The act of making environmental policy can be a very frustrating and a long-term process because it concerns peoples health, property, sensibilities, and future. It also requires a thoughtful analysis of complex and unclear information. The majority of environmental policies are based on the concept that any natural resources should be protected as public goods for the society. There is an intense disagreement over whether or not wetlands protection is considered a public good (Spray, S, McGlothlin, K 2004).

3.2 The Army Corps of Engineers

The US Army Corps of Engineers was originally meant to prevent obstructions to navigation, although an early 20th century law gave the Corps regulatory authority over the dumping of trash and sewage. The passage of the Clean Water Act in 1972 greatly broadened this role by giving the Corps authority over dredging and filling in the "waters of the United States," including many wetlands. A major aspect of the Corps program is determining which areas qualify for protection as wetlands. In reaching these decisions, the Corps uses its 1987 Wetland Delineation Manual. This works well for the Corps, but other groups disagree with some of the Corps decisions. In making decisions on whether to grant, deny or set conditions on permits, District commanders are required to consider all of the factors in the public interest, including economic development and environmental protection (US Army Corps).

In 2000 the Corps published new versions of nationwide permits in the Federal Register which modified certain nationwide permit conditions. In 2001, the U.S. Supreme Court, in a 5-4 decision in the case Solid Waste Agency of Northern Cook County v. U.S.

Army Corps of Engineers, limited the scope of the Corps Section 404 authority applied to "isolated wetlands". It is estimated that this legal decision left 30 to 60% of the nation's wetlands susceptible to development. This is detrimental for wetlands since as much acreage of the wetlands as possible should be protected from development. Also in 2001, the National Academy of Sciences released a report on Wetland Mitigation which claims that lost wetlands (ones being delineated) are not being replaced functionally by mitigation wetlands (EPA).

3.3 The Environmental Protection Agency

The Environmental Protection Agency (EPA) has several approaches to dealing with wetlands. Section 404 of the Clean Water Act established a program to regulate the discharge of dredged or fill material into water, including wetlands. Activities in waters of the United States regulated under this program include fill for development, water resource projects, infrastructure development, and mining projects. A permit is generally not needed for discharge material associated with normal farming, ranching, and forestry activities, such as plowing, cultivating, minor drainage, and harvesting for the production of food, fiber, and forest products or upland soil and water conservation practices.

In March 2008, the EPA and the U.S. Army Corps of Engineers issued revised regulations governing compensatory mitigation for authorized impacts to wetlands, streams, and other waters of the U.S. under Section 404 of the Clean Water Act. These regulations are designed to improve the effectiveness of compensatory mitigation to replace lost aquatic resource functions and area, expand public participation in compensatory mitigation decision making, and increase the efficiency and predictability of the mitigation project review process. Compensatory mitigation is often required to replace the loss of wetland functions in the watershed. These projects have several forms.

The recipient of a permit may agree to offset wetland drainage through a wetland restoration project where wetlands previously altered or degraded by humans are restored. The second form is wetland construction, where a wetland is created where none previously existed with the goal of pollution removal and wastewater runoff mitigation. The third are wetland preservation projects which required the recipient to protect a fully functioning wetland from future threats. The last form is wetland enhancement, where one or more wetland functions are enhanced in an existing wetland area (Spray 2004).

The EPA also has the Water Quality Standards Regulation which requires states to adopt criteria sufficient enough to protect uses. These criteria may include general statements and specific numerical values which could include, for example, concentrations of contaminants and water quality characteristics (EPA).

In addition, the EPA and the government created a State/Tribal/Local Wetlands Grant Program to aid with finances. These funds go towards enhancing existing programs or to develop new programs (EPA).

The Louisiana Coastal Wetlands Program was established as a federal task force to develop a comprehensive approach for restoring and preventing further loss of coastal Louisiana wetlands. Of the coastal wetland restoration projects that can be completed within a 5 year period, the priority of the projects must be assigned by the task force. Also, a long term wetland restoration plan must be developed by the program. This task force is comprised of the Secretary of the Army, who is the Chair, the Administrator of the EPA, the Governor of Louisiana, and the Secretaries of the Interior, Agriculture, and Commerce (USFWS).

The coastal wetlands list developed by the Task Force is required to be updated every year by the task force members and conveyed to Congress annually by the Corps of Engineers. The Fish and Wildlife Service, along with EPA and the Corps, are required to report to Congress at specific intervals regarding the status and effectiveness of the plan. Parallel authority is granted to the Corps of Engineers, EPA, and the Fish and Wildlife Service to work with Louisiana to develop, review, approve and evaluate the State's Coastal Wetlands Conservation Plan. This plan is to achieve a goal of "no net loss of wetlands" in coastal Louisiana through a combination of regulatory and non-regulatory measures (USFWS).

Federal aid in the Sport Fish Restoration Act authorizes the Secretary of the Interior to distribute 18 percent of each annual appropriation made in accordance with that Act for the Coastal Wetlands Planning, Protection, and Restoration Act authorizes funds for this purpose through fiscal year 2009 (USFWS).The funds are authorized for distribution to three sources, 70 percent to develop and implement Louisiana restoration and conservation plans; 15 percent for the National Coastal Wetlands Conservation Grant program, including $2.5 million for Texas wetlands assessment; and 15 percent to conduct activities authorized by the North American Wetlands Conservation Act (USFWS).

In March 2010, the Obama Administration released a “Roadmap for Restoring Ecosystem Resiliency and Sustainability in the Louisiana and Mississippi Coasts” that emphasizes the protection and restoration of coastal ecosystems as a key element to the long-term safety and viability of the region. The released Roadmap outlines Federal actions over the next eighteen months to address policy, process, and legal red tape to

coastal restoration in the region. A joint statement from the Coalition to Restore Coastal Louisiana, Environmental Defense Fund, Gulf Restoration Network, Lake Pontchartrain Basin Foundation, National Audubon Society and National Wildlife Federation states that "the working group's proposals will put this program into gear with strong new leadership, better science and improved coordination among federal and state partners to restore the Mississippi River Delta, as well as to create safe and resilient communities". Earlier in 2010 President Obama requested more than $40 million in his budget for multiple agencies to restore wetlands in Louisiana. This work plan is to ensure that this funding and all future funding is utilized as effectively and efficiently as possible (Whitehouse.gov).

3.4 Non-Governmental Organizations

The Gulf Restoration Network (GRN) "works to protect wetlands from reckless development, destructive logging practices, and harmful U.S. Army Corps of Engineers projects and policies." Recently the GRN project supported an effort against the construction of an industrial park that would destroy 57 acres of wetlands along the Mississippi River Gulf Outlet (Gulf Restoration Network). According to Matt Rota of the Gulf Restoration Network, "the City of New Orleans has postponed their decision until the developer provides them with more information. They are supposed to provide that information by April 13th, and New Orleans will make a decision regarding their coastal use permit by April 20th " (Rota 3/18/2010).

Another group, entitled "MRGO Must go" deals with Mississippi River Gulf Outlet. The MRGO site claims "The Army Corps of Engineers constructed the MRGO in the 1960s as a shortcut for navigation between New Orleans and the Gulf of Mexico. Its

full name is the Mississippi River Gulf Outlet, but most locals call it “Mister Go”. The MRGO resulted in severely damaged wetlands (tens of thousands of acres) that once protected communities in New Orleans and St. Bernard Parish from storms” (MRGOmustgo.org). The group states that the Mississippi River Gulf Outlet must go because it allowed an increase to Hurricane Katrina's destructive power by destroying the natural storm buffer of wetlands. The construction, use, and maintenance of the outlet caused the loss of 27,600 acres of wetlands and converted an additional 38,000 acres to higher salinity habitats. MRGO runs to the east of New Orleans (figure 3.3). MRGO is a 70-mile deep-draft man made channel. It consists of 40 miles dredged through marshland in St. Bernard parish and was originally 750 feet wide. MRGO has eroded to 2000 feet in many places and is considered a funneling effect for storm surge (Fitzpatrick 2007).



Figure 3.3: An aerial view of MRGO

Source: St. Bernard residents talk about "Hurricane Highway" Dier, C

Due to the destructive nature of MRGO, Congress has directed the Corps to develop a comprehensive closure plan for the outlet that includes the restoration of wetlands. A restoration plan was called for by May 2008. However, the Corps has not yet complied and estimates a May 2010 date for the restoration draft plan (MRGOmustgo.org).

The Environmental Defense Fund (EDF) is also working towards fixing the Louisiana issue. The EDF has teamed up with local organizations as well as national groups to restore coastal Louisiana. Things they are currently working on include the MRGO project, restoring the 30,000 acre Central Wetlands Unit which is located immediately next to the Lower Ninth Ward of New Orleans, and building land in the deteriorated Barataria Basin through large scale river diversions and other sediment conveyance methods (EFD.org).

The Lake Pontchartrain Basin Foundation supports the Louisiana Coastal Lines of Defense which include:

- Barrier island restoration- similar to wetland restoration, slows down wind and waves
- Land Building Diversion- sub-delta land building process
- Ridge Restoration- similar to wetland restoration, slows down wind and waves
- Reef Restoration- similar to wetland restoration, slows down wind and waves
- Re-Route Navigation- changing navigation channels
- Major Evacuation Routes- To aid in evacuation of the are
- Elevated Housing- Raising the houses up to avoid flooding
- Levees- Man made barriers against waves

- Salinity Control- control amount of salt water invading fresh water habitats

Figure 3.4 demonstrates locations for each of the defenses.

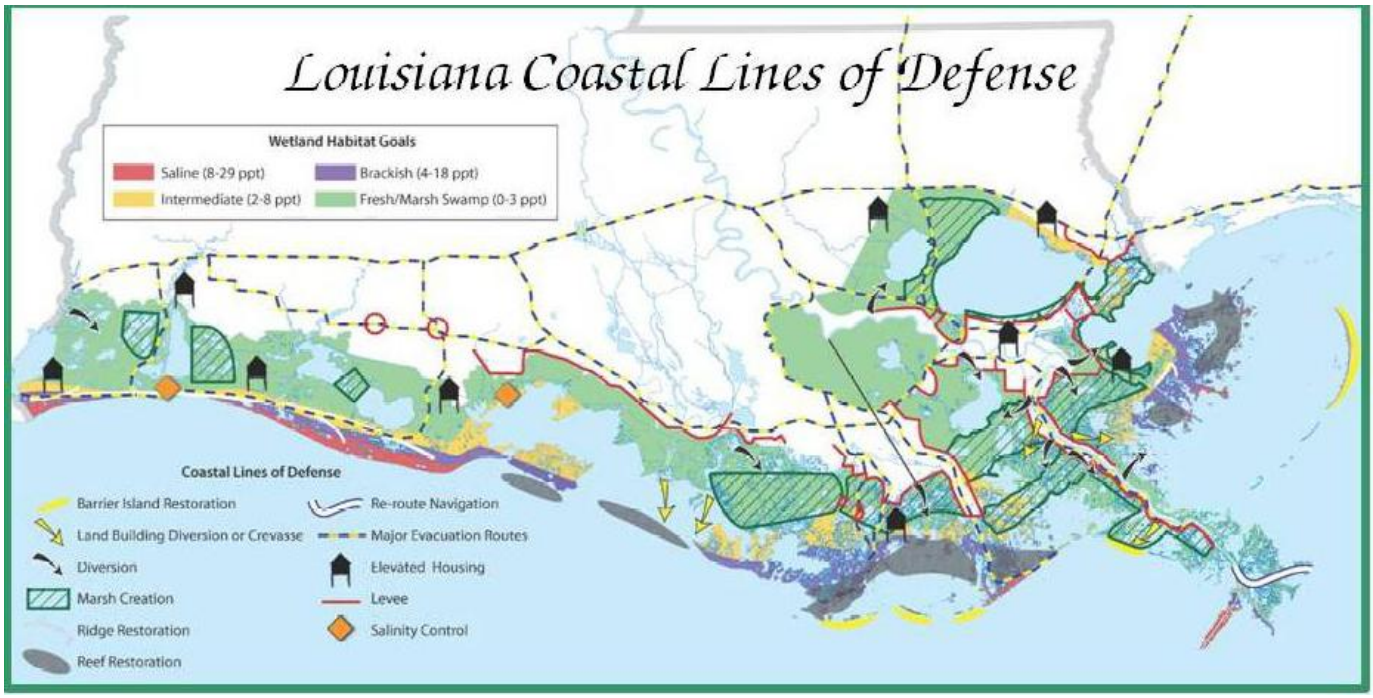


Figure 3.4
Louisiana Coastal Lines of Defense

Source: Comprehensive Recommendations Supporting the Use of the Multiple Lines of Defense Strategy to Sustain Coastal Louisiana 2008 Report

Chapter 4- Recommendations

Many activities have taken place over the course of American history that have had an irreversible effect on the habitats of the nation. Vast amounts of wetlands and marshes throughout the country have been drained or otherwise destroyed in order for population to grow and thrive agriculturally. Many species of birds and other animals have become endangered through their habitat being destroyed. Now, cities are at risk of destruction due to the careless desire for expansion and economic growth.

4.1 Policies, Funding, and Laws

Any successful project must be supported by policies, laws, and adequate funding. In order for any improvements to be made, the government must allocate more funds to coastal restoration and levee projects. In 2010, President Obama requested more than $40 million in his budget for multiple agencies to restore wetlands in Louisiana, but more still needs to be allocated (Whitehouse.gov). In addition, the decisions of wetland management and levee management should be shared between the Environmental Protection Agency and the Army Corps of Engineers, being that they each have their own specialties. The Corps should reduce the number of wetland degradation permits allowed each year to reduce the overall loss of wetlands. In 2008, there were approximately 138 nation wide permits, many of which affected wetland regions (Coperland, C 2008).

4.2 Engineering

Several engineering options have been proposed for New Orleans and Louisiana. One radical idea is to invert the New Orleans “bowl” by filling the ground in to bring the city above sea level (Beckham 2005). This is unfeasible for a few reasons. First, the majority of infrastructure of the city would have to be demolished for this increase in

ground level to occur. Also, the people of New Orleans would have to leave for a period of time, leaving their livelihoods and their homes behind. This wouldn't occur. The cost of such a project would also be astronomical.

Another idea is to allow parts of the river to run freely (Beckham 2005). This would allow new tributaries to be created and could rebuild wetlands. Much of the engineering of this region does not allow the rivers any freedom. Before the levees were built, the Mississippi was able to move tons of silt to the coastal region each year. This allowed wetlands to be created and recharged. The feasibility of this idea would be difficult since the levees are protecting the cities. If a section of the river was able to flow freely, however, there would be a beneficial increase in coastal wetland coverage.

The MRGO Must Go project has also been presented. The creation of Mississippi River Gulf Outlet destroyed a plethora of wetlands and allowed saline water to penetrate fresh water regions, killing the freshwater ecosystems. The MRGO Must Go project is an important project for the restoration and re-creation of damaged or destroyed wetlands and also an important project for protecting the New Orleans region. This project should be prioritized. Effects of this outlet have been too disastrous for it to remain.

Wetland creation, protection and re-creation should be a priority for coastal regions that are as vulnerable as Louisiana. Nature has demonstrated what can occur without the natural protection of wetlands.

In addition to wetlands, the levee system has been very important for the region throughout time. The current levees are able to withstand a category 3 hurricane according to the Corps of Engineers. These levees need to be upgraded to withstand the highest hurricanes as it is partially their job to protect thousands of people's lives.

Without sufficient levee systems, the city of New Orleans can and will suffer substantial flooding.

4.3 Education and Public Relations

The city of New Orleans has been partially destroyed due to flooding several times, with each reoccurring time becoming worse than the previous. In 2000, New Orleans was home to approximately 484,674 people. As of July 1, 2008, the population of New Orleans was 311,853 (U.S. Census Bureau). As noted, New Orleans is located in-between two large water bodies and the majority of land coverage is below sea level. In order to protect this large population, changes must be enacted.

There have been controversial discussions about abandoning New Orleans. However, it is unfeasible to ask the residents of New Orleans to relocate due to the dangerous nature of the land. The atmosphere of New Orleans could not be relocated to another location as it is a city of tradition and culture. The people would be unwilling to leave, as seen by the number of residents who stayed, on their own will, during the Hurricane Katrina disaster.

Residents of coastal regions should have more education about their whereabouts. This should include any information regarding elevated housing for flood protection and financial assistance for the project. Also, a reliable evacuation route should be provided to every citizen in case of an emergency.

The population of the city can not be removed, but with the right combination of policies, engineering, and education the infrastructure and the residents can be protected. Also the valuable ecosystems of wetlands can be preserved and expanded for migratory

routes, fresh water fish, and many other creatures that reside in these incredibly important regions.



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