LOUISIANA COAST WETLANDS LOSSES

Are federal Outer Continental Shelf activities responsible?

July 10, 2000

prepared for

American Land Rights Association
30218 NE 82nd Avenue
PO Box 400
Battle Ground WA 98604

by

Ray Kreig, P.E., P.G.
RA Kreig & Associates
201 Barrow Street #1
Anchorage Alaska 99501-2429
(907) 276-2025 fax (907) 258-9614
ray@kreig.com

Lee Ann Gerhart, CPA
3818 Clay Products Road
Anchorage Alaska 99517
(907) 243-8951
lag@gci.net

R.A. KREIG & ASSOCIATES
201 BARROW STREET #1 • ANCHORAGE, ALASKA 99501-2429
(907) 276-2025
FAX (907) 258-9614
E-MAIL: ray@kreig.com

ENGINEERS
GEOLOGISTS
LAND CONSULTANTS

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Financial Analysis by Lee Ann Gerhart, CPA (Texas)

EXECUTIVE SUMMARY

1) Is Louisiana really losing 25 to 35 square miles a year of wetlands?
ANSWER: Yes, this is a widely accepted estimate (Kreig).

2) Are the dramatic wetlands losses and coastal erosion in Louisiana caused primarily by OCS activities?
ANSWER: No. OCS activities have always been and remain a minor source of wetlands losses compared to the major causes of leveeing the rivers, subsidence and sediment starvation. OCS-caused direct wetlands losses in the Louisiana coastal plain are likely to comprise only 10 to 15 percent of all wetlands losses to date (Kreig).

3) To what extent does the $285 million in Title I funds to be paid to Louisiana each year under CARA ($4.3 billion projected over the 15 year life of CARA) relate to wetlands losses suffered by Louisiana from OCS oil and gas activities?
ANSWER: The OCS's remaining potential obligation of the cost to restore the wetlands after taking into account past and future 8(g) revenue payments to the state is none to, at most, $16 million per year. $285 million a year would then be overpaying for such damage by a factor of 18 times or more (Gerhart).

4) Confirm the claims made that Louisiana has received no share of the OCS activities that take place off their shores and that they have received no compensation for the damages that have occurred because of these activities.
ANSWER: These claims are false. In addition to enjoying an annual $3 billion positive impact on the economy from offshore oil and gas operations in the Gulf of Mexico, Louisiana has directly received $900 million in OCS 8(g) revenues since 1986, $15 million in 1999 (Gerhart).

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by Ray Kreig, P.E., P.G.
R.A. Kreig & Associates
Anchorage, Alaska

with Financial Analysis by Lee Ann Gerhart, CPA (Texas)

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BACKGROUND

CARA, the Conservation and Reinvestment Act (HR701/S25) has been proposed to redirect a substantial portion of federal Outer Continental Shelf (OCS) revenues to a number of revenue sharing, environmental, land acquisition, and public works projects. About $3 billion a year now deposited to the treasury would be diverted for 15 years.

CARA Title I provides that one $billion/year (about one-third) of the CARA funds are to be spent on coast-related “impact” projects with no requirement for state matching. CARA defines “coast” to include states with frontage on the Great Lakes.

Under the House version of CARA, HR701, Louisiana is the designated recipient of, by far, the largest portion of the Title I funds, $285 million a year ($4.3 billion for the 15 year term of CARA). The next largest amount goes to Texas, $132 million annually.

Part of the debate which has unfolded about CARA has left a widespread impression that oil and gas production activities — especially the federal OCS activities that are the source of the CARA funds — are responsible for extensive coastal area damage that will be remediated by CARA. In particular, the large amount of Title I funds for Louisiana are justified by the claim that these OCS activities have caused the dramatic coastal erosion and wetlands losses that have taken place in the Louisiana coastal plain.

This report considers this issue and others concerning the proposed use of Title I funds in Louisiana.

SCOPE

The American Land Rights Association asked for assistance in addressing several questions:

1) Is Louisiana really losing 25 to 35 square miles a year of wetlands?

2) Are the dramatic wetlands losses and coastal erosion in Louisiana caused primarily by OCS activities?

3) To what extent does the $285 million received by Louisiana each year under CARA ($4.3 billion projected over the 15 year life of CARA) relate to wetlands losses suffered by Louisiana from OCS oil and gas activities?

4) Confirm the claims made that Louisiana has received no share of the OCS activities that take place off their shores and that they have received no compensation for the damages that have occurred because of these activities.

In addition we were asked to comment on statements made in various press releases, news accounts, Congressional debates etc. (included in Appendix B).

PERSONNEL

RAY KREIG

Mr. Kreig is a professional civil engineer and geologist specializing in terrain analysis. He is president of R.A. Kreig & Associates and has 30 years experience in project management, geotechnical investigation, natural resource evaluation and land consulting. Since establishing his own consulting firm in 1975, he has completed numerous studies for industry and government in Alaska and Russia. Mr. Kreig is especially experienced in feasibility studies for pipelines and has had a major role in geotechnical and routing studies of virtually all the large pipelines in Northwestern North America.

He estimated Alaska statewide wetland areas lost to development 1867-1989. Airphotos and satellite imagery were interpreted to produce figures that have been subsequently used in public policy discussions regarding wetlands regulation and development in Alaska. He estimated wetland acreages preserved inside National Parks, Wildlife Refuges and Forests in Alaska. He testified on *Permafrost in Alaska as it Relates to the Wetlands Issue* before the White House Domestic Policy Council, Interagency Task Force on Wetlands (September 7, 1990).

B.S., Civ. Eng., Cornell Univ., 1968. M.S., Civ. Eng., Cornell Univ., 1970. Professional Engineer - Alaska #3713E (Civil). Professional Geologist - Alaska #AA 104.

LEE ANN GERHART

Lee Ann Gerhart is a CPA, certified in the State of Texas. She began her career as an auditor of gas royalty payments made to the State of Texas, followed by 10 years with Exxon where she led audits of pipeline companies, onshore and offshore exploration and production facilities, and gas processing plants. Her work has taken her through Louisiana bayous and offshore platforms, inspecting gas plates, observing meter calibrations, and following the flow of oil and gas through the lines and facilities including the Blue Water Gas Plant. After an assignment as lead auditor of ARCO's Prudhoe Bay operations, Ms. Gerhart moved to Alaska as a business analyst for pipeline operations for Alyeska Pipeline and served one year on the Prudhoe Bay Management Team as an Operations Analyst for BP. Ms. Gerhart has owned her own business since 1995, providing analytical business services to a variety of industries.

DISCLOSURES

Kreig and Gerhart are contributing their expertise for this analysis to assist decision makers and encourage an informed public debate on the Conservation and Reinvestment Act. Both have previously submitted Congressional hearing testimony on CARA. Neither they nor R.A. Kreig & Associates will be compensated for this report.

THIS REPORT

Ray Kreig will address engineering and scientific questions in this main report. He is a registered professional engineer (Civil) and registered professional geologist, both in Alaska. Financial aspects will be addressed by Lee Ann Gerhart, CPA (Texas) in Appendix A.

This effort consisted of a literature review which included an extensive internet search before the analysis was undertaken and professional opinions formulated. No field work was conducted as part of this study.

In addition to this main report by Ray Kreig there are three appendices:

Appendix A - Economic Analysis by Lee Ann Gerhart, CPA - Addresses questions 3 and 4 above as well as other economic matters.

Appendix B - Statements from the CARA Political Debate - Includes statements and clippings provided for comment by the American Land Rights Association.

Appendix C - Additional Authoritative Summaries of the Louisiana Wetlands Loss Problem, Causes and Solutions. *The purpose of this appendix is to collect discussion of the causes of Louisiana wetlands loss from the major policy documents of state and federal government in one*

place. This will enable users of our study to read the entire sections in these sources and judge for themselves the importance placed by these regulatory and policy making agencies on wetlands damage from OCS activities as opposed to other causes.

- LACoast - Louisiana Coastal Restoration Web Site www.lacoast.gov This site is funded by Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA) [Breaux Act] and is maintained by the USGS National Wetlands Research Center. Louisiana Coastal Wetlands Conservation and Restoration Task Force [Governor of Louisiana, Administrator of EPA, Secretary of the Interior, Secretary of Agriculture, Secretary of Commerce, Secretary of the Army]. Publishers of WaterMarks quarterly.

- THE 1997 EVALUATION REPORT TO THE U.S. CONGRESS ON THE EFFECTIVENESS OF LOUISIANA COASTAL WETLAND RESTORATION PROJECTS Submitted by the Louisiana Coastal Wetlands Conservation and Restoration Task Force, which consists of the Secretary of the Army, Administrator of the Environmental Protection Agency, Governor of Louisiana, Secretary of the Interior, Secretary of Agriculture and Secretary of Commerce. In accordance with THE COASTAL WETLANDS PLANNING, PROTECTION AND RESTORATION ACT PUBLIC LAW 101-646, TITLE III OR "BREAUX ACT"

- COASTAL LOUISIANA - THE UNIFIED VISION (June 1996) State report on saving Louisiana's coast. Prepared by the Governor's Office of Coastal Activities and the Louisiana Department of Natural Resources.

- RESTORATION PLAN [no given date, printed from website on 7/9/00] The mandated comprehensive wetlands restoration plan for coastal Louisiana required by Section 303(b) of the CWPPRA.

ENVIRONMENTAL SETTING OF THE LOUISIANA GULF COAST

The entire Louisiana coast is marshy and low-lying. Geologically, it consists of an eastern delta system and associated barrier islands built by the Mississippi River through numerous ancient deltas (Figure 1). To the west, a geologically distinct Chenier Plain, which is named for the linear, oak-dominated ridges that parallel this part of the coast ("chenier" is the French word for oak). This Chenier Plain was accreted from Mississippi borne sediments transported west by Gulf currents and deposited along the coast (After Gosselink et al., 1998).

There is widespread scientific agreement that Louisiana is undergoing a rapid loss of land and wetland area to the sea.

TABLE 1. LOUISIANA COASTAL LAND AND WETLAND LOSS RATES

ANNUAL LOSS RATE (SQUARE MILES/YEAR)	PERIOD	SOURCE
14	1930-1958	Gosselink, James G., et al., 1998
44	1955-1978	Gosselink, James G., et al., 1998
25-35	1978-1990	Dunbar et al. 1992; Barras et al., 1994

The prevailing view of scientific investigators and governments (federal and state) is that the primary reason causing the land losses is the reduction in sediment deposition from natural flooding of the coastal wetlands caused by construction of the flood control levees along the Mississippi and other major rivers after 1850 and especially after the great flood of 1927. Typical of the findings of researchers is this description:

> A combination of natural processes modified by humans is responsible for the present high rates of wetland degradation and loss along the Louisiana coast. The sea level relative to the land surface (relative sea level) is rising because the rates of coastal land lowering are very high. Large winter storms and hurricanes resculpt the coastline and rapidly change habitats. As the relative sea level rises, wetlands sink beneath the intertidal zone, and barrier island systems move shoreward and become thinner. Some barrier islands have submerged entirely in the last 50 years, and more are on the verge of total submergence.
>
> Human influences have helped tip the balance of growth and shrinking of coastal delta ecosystems. In particular, the levees and associated navigational works of the Mississippi River prevent the overflow of fresh water and sediments into the adjacent marshes during spring floods. These structures extend to the river's mouth, where fresh water and heavy, delta-building sediments enter deep water on the edge of the Gulf of Mexico Continental Shelf. The levees have eliminated almost all inflow to the marsh system from the Mississippi River, except in the Atchafalaya basin and at the very mouth of the river at the Balize delta. When levees were built to control

> flooding and aid navigation, no one anticipated their contribution to wetland loss. Canals built for oil and gas exploration, pipelines, well maintenance, and transportation have also contributed to wetland loss. Artificial canals and their associated spoil deposits are directly responsible for at least 10% to 30% of the loss, and an additional but unknown percentage of loss may be attributed to their indirect effects. (Gosselink, James G., et al., 1998)

This loss of sediment to the deep Gulf of Mexico starves the coastal wetlands and is dramatically shown in Figure 2.

Another major factor is that south Louisiana is naturally sinking due to compaction of the thick unconsolidated delta deposits (Figure 3). Sediment deposition normally counteracted the effects of this natural settlement before construction of the river levee systems.

A third factor is that sediment transported in the Mississippi and other major rivers has declined (Figure 4) and is no longer available to maintain the wetlands and counteract the natural subsidence. The decline has occurred due to upstream soil conservation practices and construction of upstream dams which trap sediment. In the west, the Toledo Bend Reservoir was constructed in 1964 only 80 miles from the coast on the Sabine River which marks the border between Texas and Louisiana.

> Barataria-Terrebonne National Estuary Program Office
> http://www.btnep.org/pages/sediment1.html
>
> **Less Deposits Available to the Natural System**
> Louisiana marshes need a source of sediment to survive. Historically, the Mississippi River provided the sediment. Now, however, levees confine the sediment to the river thus bypassing the marshes, ultimately depositing it on the continental shelf in the Gulf. Our coastal marshes constantly undergo a natural process called "subsidence" which results in the land slowly sinking. In the past, the rate of sediment building equaled or surpassed the rate of sinking and the level of the marsh remained above the level of the sea.
>
> Today, the river carries up to 80 percent less sediment than it did a century ago. Dams, reduction in land clearing and tilling, and implementation of conservation measures that reduce erosion upriver are the major causes of the reduction. Thus, even if all of the levees along the Mississippi River were removed today, the marshes would still receive significantly less sediment than they did in the 1800s.
>
> Still, some sediment does move into coastal marshes during hurricanes and winter cold fronts when winds stir mud on the bottom of shallow bays. The volume of this sediment, however, is usually inadequate to counter the effects of subsidence. The existence of levees, canal banks, roadbeds, railroad embankments and changes upriver all contribute to the problem of inadequate sediment distribution in our coastal marshes.

THE MAJOR CAUSE OF LOUISIANA COAST WETLANDS LOSSES IS MISSISSIPPI RIVER FLOOD CONTROL LEVEE CONSTRUCTION AND DELTA SUBSIDENCE

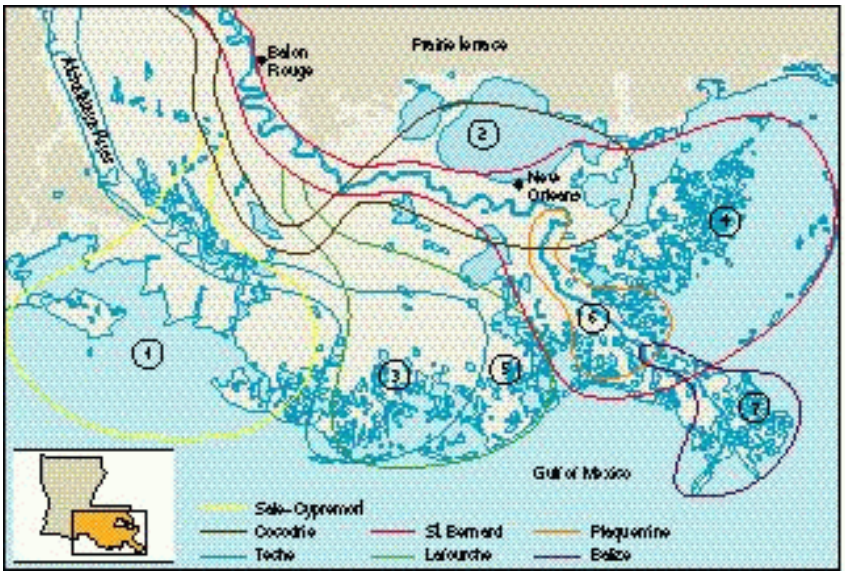

Fig. 1. Lobes of ancient Mississippi River deltas, numbered in chronological order of formation (modified from Kolb and Van Lopik 1958). Light shading shows extent of current coastal marsh and bottomland forest. Levees now constrain river and prevent natural sediment replenishment needed to maintain marshes and counteract natural subsidence.

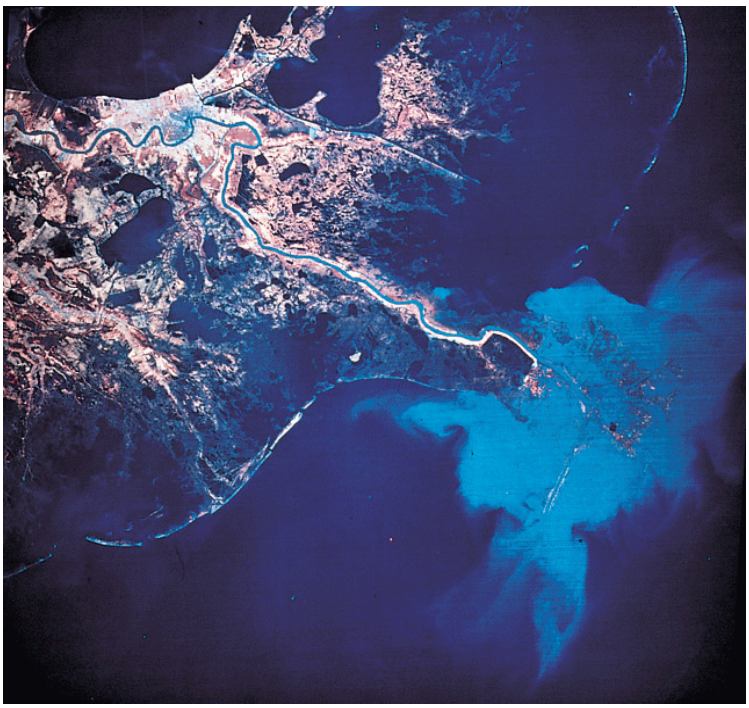

Fig. 2. NASA Satellite image of the Mississippi River delta below New Orleans and Lake Pontchartrain (upper left) showing sediment discharge (light area, lower right) direct to Gulf of Mexico (Gosselink, James G., et al., 1998). Prior to flood control levee construction along the river, much of this sediment was distributed over the whole region in natural flooding. These deposits maintained the marshes which are now sinking and disappearing – in large part – from sediment starvation caused by the levees.

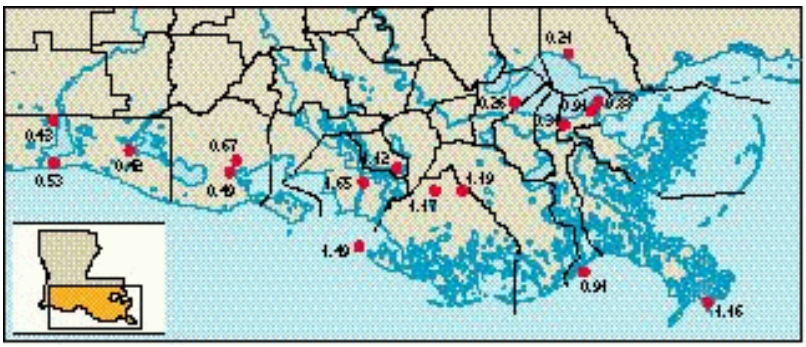

Fig. 3. Coastal Louisiana subsidence rates, centimeters per year (modified from Ramsey and Penland 1989; Penland and Ramsey 1990).

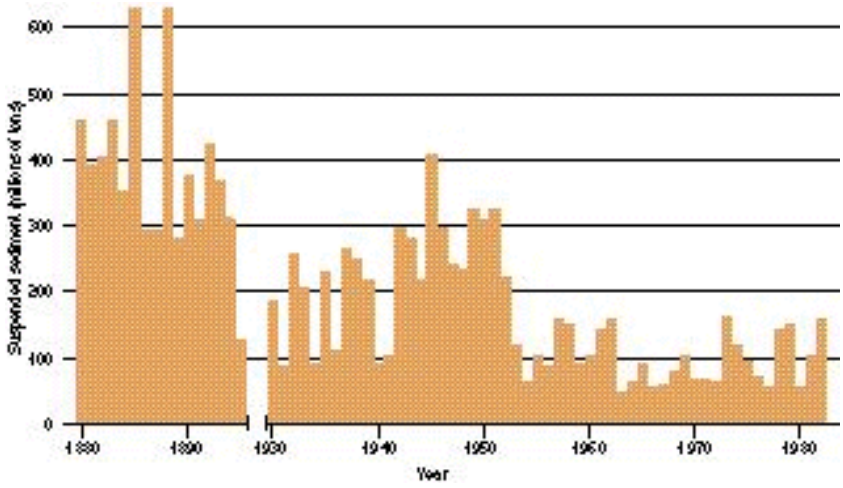

Fig. 4. Historical record of the suspended sediment load of the Mississippi River at New Orleans (Kesel 1987). Historical period = before 1900, pre-dam period = 1930**n**1952, and post-dam period = 1963**n**1982.

With this background it is instructive to look at the current loss rates basin by basin (Figure 5).

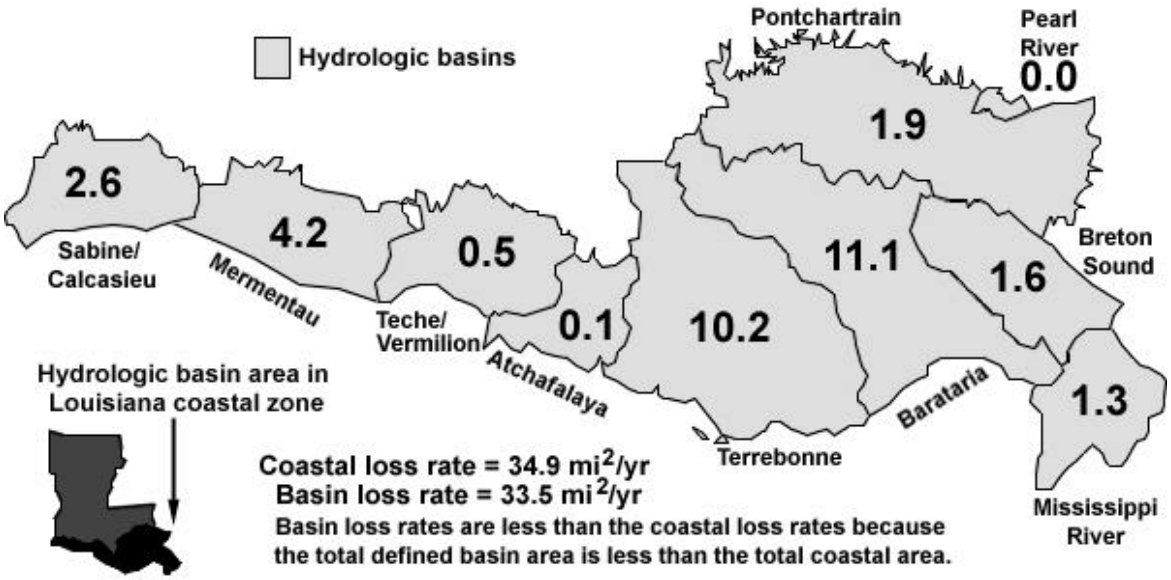

Fig. 5. Land loss rates for 1978-90 by hydrologic basin. Land loss is net conversion of land to water and does not reflect conversion of lands to agriculture, urbanization or other development (from Barras et al., 1994).

Note that the highest loss rates are in Terrebonne and Barataria basins which are largely leveed off from the Mississippi River flood sediment source.

> "Land loss rates within coastal Louisiana, although decreasing, remain high at 34.9 mi2/yr for the 1978-90 time period. The Deltaic Plain accounts for 80.7% of total coastwide land loss, while the Chenier Plain accounts for the remaining 19.3% land loss for this time period. Loss rates are almost a magnitude higher within the

Terrebonne and Barataria Basins than within all of the remaining basins and account for 61% of coastwide land loss between 1978 and 1990. Much of the large areas of land loss occurring within the Chenier Plain appears to be related to impounded areas and therefore may be an artifact of managed water levels." (Barras et al., 1994)

The Federal-State, Louisiana Coastal Wetlands Conservation and Restoration Task Force publishes the quarterly WaterMarks. Its Winter 2000 special issue describes the differences between the basins:

"A major accomplishment of the Breaux Act restoration planning process was delineating the unique landscape features and key processes affecting wetlands in each of Louisiana's nine hydrologic basins. The various causes of wetland loss, and the specific solutions for offsetting those losses, vary from basin to basin. Some specific problems and how they are being addressed through Breaux Act projects follow.

- "The basins with active deltas, like the Mississippi and Atchafalaya rivers, have been affected by maintenance of large navigation channels through the deltas. Restoration efforts focus on improved management of sediment carried by those rivers, to facilitate accretion of new deltaic marsh. Small-scale sediment diversions (artificial crevasses) created in the Mississippi Delta provide clear evidence that large-scale delta-management projects could be successful as well.

- "The Pontchartrain, Breton Sound, Barataria, and Terrebonne basins are inactive delta regions where the Mississippi River once provided abundant sediment. (The highest marsh loss rates in the state are in the Barataria and Terrebonne basins.) Causes of coastal wetland loss in all of these regions include subsidence, sea-level rise, erosion, excessive ponding, and saltwater intrusion due to canals and channels. Projects in these basins reintroduce river water, sediments, and nutrients by a variety of means, such as siphons and freshwater and sediment diversions; use dredged material to restore wetlands and barrier islands; reduce erosion by wetland plantings; and restore natural hydrology to reduce excessive ponding in marshes and swamps and prevent salt water from moving into previously fresh areas.

- "In the Chenier Plain of southwestern Louisiana - the Teche/Vermilion, Mermentau, and Calcasieu/Sabine basins - the greatest threats to wetlands are shoreline erosion, saltwater intrusion, and excessive ponding. The loss of the shoreline causes breakup of interior wetlands by allowing salt water to penetrate further into fresh marsh areas. Once plants die, fragile organic marsh soils can be easily eroded. Stabilization projects such as marsh plantings and breakwaters protect banks from further erosion, and water control structures moderate salinities and water levels. Dredged material helps replenish what has been lost by creating new marsh."

MORE ON THE MAIN PROBLEM: MISSISSIPPI RIVER LEVEE CONSTRUCTION
From WaterMarks (Fall 1995)

Coastal Wetlands Dictionary - Understanding Sediment, Accretion and Subsidence
CWPPRA [Breaux Act] technicians, planners and engineers use a specialized vocabulary when discussing the restoration and protection of coastal wetlands. Three of the most commonly used terms are sediment, accretion and subsidence.

Sediment
Sediment is the primary ingredient used in building wetlands, whether naturally or artificially. Composed mostly of inorganic particles, such as sand, silt or clay, sediment is transported by a moving water source like a river or bayou. Sometimes these particles are also referred to as "suspended sediment" because they are trapped in fast-flowing water. As the water's speed decreases, the sediment settles to the bottom and accretes, or builds up. As sediment continues to accumulate, new land is formed.

Accretion
Accretion, also called sediment accretion, is the basic process in wetland formation. Under natural conditions, a river seasonally overflows its banks, carrying sediment-rich water into outlying areas. When the water later recedes, sediment is left behind on riverbanks and mudflats. As this process is repeated over time, the remaining sediments build the soil base for wetlands (see illustration below).

Modern levee systems, however, prevent this natural process, denying sediment to existing wetlands and making the creation of new wetlands impossible.

Subsidence
Subsidence is the process by which land surface becomes lower over time. As sediments compact, the level of the land will sink. This is a natural process, normally offset by accretion. However, if the rate of subsidence exceeds the rate of accretion - in other words, if the land sinks faster than it is built up - the affected land is said to suffer a sediment deficit. Eventually, land with a sediment deficit is flooded by rising sea water.

Because modern levee systems limit the rate of accretion, subsidence is occurring at an abnormal rate throughout much of coastal Louisiana.

Old Man River's Not What He Used to be — from WaterMarks (Fall 1995)
The Mississippi River is resolutely single**n**minded - its only goal is to reach its destination by the shortest possible route.

Geologists tell us that in pursuit of that goal, the Mississippi carved five distinct channels through Louisiana over the last 7,000 years. Draining nearly 40 percent of the continental United States, the Mississippi picked up huge quantities of sediment

in its journey south. As the river slowed in its final approach to the sea, this sediment, mostly clay and organic matter, settled to the river's bed, creating deltas and wetlands.

But if the Mississippi is single**n**minded, it is also fickle. About every thousand years, it changed course, depriving existing wetlands of life**n**giving fresh water and sediment and bestowing them on another portion of the coast. This cycle of creation, abandonment and deterioration produced seven distinct deltoid lobes in Louisiana and added millions of acres to its boundaries. In fact, when the rich and varied resources of the region began attracting European settlers in the early 18th century, Louisiana had more than 4 million acres of coastal wetlands.

However, the unpredictable nature of the river made life hazardous for these early settlers. The spring floods that washed through the wetlands also filled fields and homes, forcing the construction of crude levees. As the population grew, so did the flood control system, navigational dredging and industrial expansion. By the 1940s the combination of these forces had confined the Mississippi to its current channel. The river had been domesticated, but at a price. Hundreds of thousands of acres of wetlands once fed by annual floods were cut off from nutrients and fresh water critical to their survival. They began to die and disappear, while the rich cargo of sediment was carried out into the deep waters of the Gulf.

This loss is unprecedented in the 7,000-year history of the Mississippi. Mankind's attempt at control has produced a radical shift that, if continued, will not only have changed the character of a river but will also alter the face of a continent.

LAND AND WETLANDS LOSSES – CONFUSION AS TO CAUSE

As previously stated, the media debate and legislative record surrounding the CARA deliberative process has left a widespread impression that oil and gas production activities — especially the federal OCS activities that are the source of the CARA funds — are responsible for the extensive coastal area damage that CARA is intended to restore. More specifically, it is asserted or inferred that the coastal erosion and wetlands losses in Louisiana have been caused by OCS oil and gas production and exploration activities.

A typical example is this statement from Senator Mary Landrieu (D-La):
CARA Background http://www.senate.gov/~landrieu/issues/cara.html

> Since the federal government began collecting revenues from Outer Continental Shelf oil and gas drilling in the mid-1950s, it has taken in more than $120 billion. However, coastal states are platforms for this vital industry, but have received only a minute portion of those revenues – in some cases less than 1 percent.

> **In the meantime, no one can argue that offshore drilling, while vastly important to this nation, is hard on our environment. In the past 10 years, 3,500 square miles of Louisiana coastline have been lost. Every 10 minutes we lose another 25 acres. At least some of this loss can be attributed to federal Outer Continental Shelf oil and gas development.**

Here, Senator Landrieu has Louisiana disappearing ten times too fast. It should be 250 to 350, not 3,500 square miles per ten years lost and then only one acre every 25 minutes, not 25 acres every 10 minutes.

Landrieu uses an old associative technique that leaves the majority of her readers with the impression that OCS development is responsible for the (incorrect) mega-catastrophic wetlands losses she is publicizing.

In the first sentence she talks about offshore drilling. Then in the next, massive losses of land. And finally, "At least some of this loss can be attributed to OCS." No specific cause and effect is ever stated. As we will discuss later, in reality, OCS development might be responsible for 10 to 15% of a much lower rate of wetland loss. And that means something else is responsible for 85 to 90% of the problem.

A more accurate statement would replace "offshore oil drilling" with "Mississippi River flood control levees" in the first sentence of the highlighted paragraph.

Appendix B has numerous similar items from the CARA political debate.

Review of the scientific and engineering literature and the public education and policy statements produced by the State of Louisiana for its citizens, Federal agencies and Joint State - Federal organizations leaves an entirely different impression from that gained from the Landrieu statement above. They all identify as THE prime cause: Mississippi River flood control levee construction. Secondary causes are subsidence and falling sediment loads in rivers. Then canal and pipeline construction leading to salt water invasion and killing of marsh vegetation are factors. These are frequently (but not always) oil and gas related. Many are general transportation and shipping channels (Intracoastal Waterway). Those that are oil and gas related were mostly constructed to serve on-shore wells and facilities, or those facilities in state waters. Only a relatively small portion of the canals and pipelines serve OCS activities.

Except for the CARA-related debate and media coverage, I found it was uncommon for the science and government policy community to emphasize or even identify oil and gas activity as the predominant factor or cause for overall Louisiana wetlands losses. I was unable to find ANY example of a scientific or government policy report that identified OCS activities as the major factor in overall Louisiana wetlands losses. On the other hand, there is no question that oil and gas activities can be a major factor at a particular local site.

Typical of the scientific or government policy reports of the causes of the losses is Figure 6 from the WaterMarks quarterly newsletter.

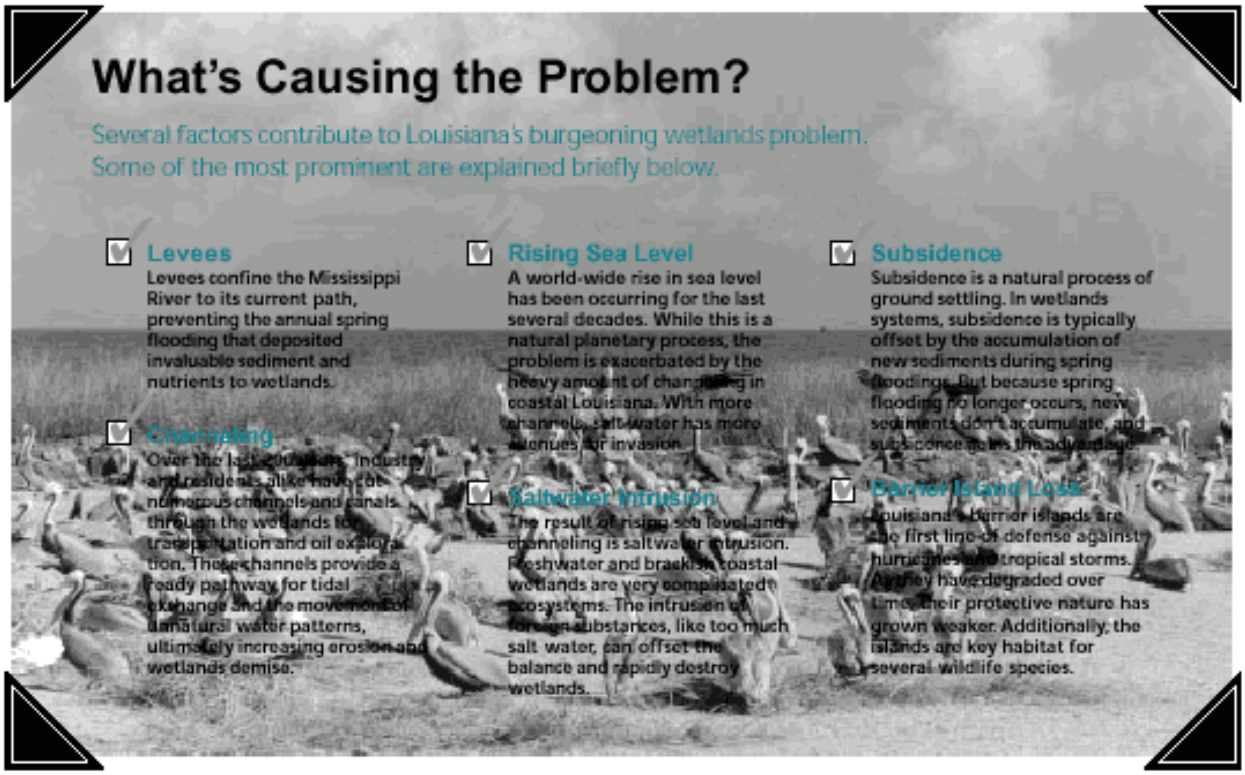

Figure 6. What's causing the wetlands loss problem? The six prominent factors listed: Levees; Rising Sea Level; Subsidence: Channeling; Saltwater Intrusion; Barrier Island Loss. Only the last three could even partly be caused by OCS Oil and Gas activities (From Summer 1999 WaterMarks). Levees confining the Mississippi River are listed first.

I reviewed all five years of issues of WaterMarks. Only one article highlighted oil and gas activities as the primary damaging factor in wetlands losses. It is important to note that the author could be considered to have presented this for the political arena. He was testifying before Congress advocating an increase in federal funds for wetlands restoration rather than preparing an educational, policy or scientific report. Most of what Louisiana DNR Secretary Caldwell is describing here originated with on-shore oil and gas development on private and state lands, not federal OCS lands.

Summer 1999 WaterMarks — Excerpt from the testimony of Jack Caldwell, Secretary of the Louisiana Department of Natural Resources, before the U.S. Senate Energy and Natural Resources Committee on January 27, 1999. The committee was considering federal legislation to increase Louisiana's share of oil and gas royalties for financing wetlands restoration:

The Oil and Gas Industry — Impacts Come Full Circle

"The United States depends on the oil and gas shipped through and produced in Louisiana's coastal zone. Wetlands and barrier islands protect the billions of dollars worth of infrastructure that supports the industry from wave and storm damage and is an integral part of the nation's energy system. The industrial uses associated with offshore exploration and production, pipelines, and canal developments have directly and indirectly contributed to marsh destruction, putting the industry itself at risk.

"Navigation channels and canals dredged for oil and gas extraction have dramatically altered the hydrology of the coastal area. North-south channels and canals have brought salt water into fresh marshes, killing vegetation and habitat. East-west canals have impeded sheetflow, ponding the water on the marsh and leading to stress and eventual loss. Canals have also increased tidal processes that impact the marsh by increasing erosion. Channel deepening has caused saltwater intrusion, endangering the potable water supply of much of the coastal region.

"As of 1997, there were more than 20,000 miles of pipelines in federal offshore lands and thousands more inland. They all make landfall on Louisiana's barrier islands and wetland shorelines. The barriers are the first line of defense against combined wind and water forces of a hurricane, and they serve as anchor points for pipelines originating offshore. These islands protect the wetland habitants from an offshore oil spill and are critical in protecting the state's wetland-oriented oil and gas facilities and thousands of jobs directly and indirectly tied to the industry.

"If the barrier islands erode entirely, as expected in the next 50 years, platforms, pipelines and wells will be damaged in increasing numbers. More than 58 percent of the region's wells are located in coastal parishes. Most of them are more than 50 years old and were not designed to withstand the conditions of open water they could face in the next 50 years. More than 30,000 wells are at risk within the 20-parish coastal area. Wells that were on land only a few years ago are now surrounded by water, a situation hazardous to boat traffic and an environmental liability to habitat and fisheries.

"Workers, equipment, supplies and transportation facilities that accompany the rapid growth of the offshore oil and gas industry depend on land-based facilities. Roads, housing, water, acreage for new business locations and expansions of existing businesses, waste disposal facilities and other infrastructure facilities will be needed in localized areas along the Louisiana coast. Existing land-based infrastructure is already heavily overburdened and needs expansion and improvement, requiring extensive financial infusions from state and local governments. For example, Louisiana's only highway leading to Port Fourchon is on the verge of crumbling under the strain of the thousands of trucks that travel on it each week. It will cost about $266 million to make the highway safe and fully useable. LOOP also depends on onshore infrastructure protected by wetlands. Without this protection, America will lose an essential trade and navigation center that would affect commerce throughout the world."

Excerpts from other WaterMarks articles mentioning the oil and gas activities on the Louisiana coastal wetlands:

WaterMarks (Fall 1998)
The Oil and Gas Industry At Work: Reducing Impact on Wetlands
Barge-mounted oil derricks — a common sight in Louisiana's wetlands — contribute to the more than $3 billion in federal petroleum taxes collected from the Gulf region annually.

According to John Johnston, Deputy Director of the Louisiana Geological Survey (LGS), preliminary findings by LGS indicate that the size of canals and drilling sites has decreased roughly 30 percent since the 1980s. **When asked about the oil industry's impact on coastal wetlands, Johnston said, "Don't believe the hype. They aren't all bad."**
....

A Checkered Past
Historically, the oil and gas industry hasn't had a reputation for being environmentally friendly. When companies first started drilling in Louisiana during the 1930s, few understood the marsh's high sensitivity to human interference. Consequently, wetlands were freely dredged, drilled and channeled. Dredging for channels was the industry's primary destructive force in the wetlands, allowing salt water into fresh and brackish marshes, drastically changing their salinity levels. The earth dredged from canals was often heaped along the sides in spoil banks, preventing the natural flow of water from distributing nutrients and sediments. The result was the destruction of perhaps hundreds of thousands of acres of natural vegetation in coastal Louisiana.

Innovations Lead to Less Damage
Dredging still remains a destructive practice in the industry, but designs are in place for vehicles that can operate in minimum water depths. For example, shallow-draft barges have been developed that can operate in less than four feet of water while the typical barge needs eight. Additionally, new aluminum marsh buggies, nearly half the weight of their steel predecessors, can skim the surface of wetlands, bending grasses without destroying them during seismic surveys. While these vehicles represent encouraging trends for the future, they have not as yet changed the standard industry practice of dredging canals to 8-foot depths.
...
Regulatory Influence
Unquestionably, the efforts of governmental agencies have also had a major influence on the industry's exploration efforts...Roger Swindler, a civil engineer for the regulatory branch of the Corps of Engineers, sums up the government's role, stating "With the help of regulatory agencies, the industry's impacts on Louisiana wetlands have definitely gone down."

> An examination of the number of permits authorized for the oil and gas industry by the Coastal Management Division of the Louisiana DNR supports Swindler's assessment. The number of these permits has plummeted since 1982 when approximately 1,450 acres of wetlands were disturbed by about 300 projects. By 1992, only 72 projects were given permits for a total of 72 acres. That's a 95 percent decrease in acres disturbed since 1982. Although the number of new projects increased substantially in 1995 and 1996, they fell again in 1997, and the number of acres disturbed by permitted projects remains approximately 65 percent below the 1982 figures.

Additional authoritative summaries of the Louisiana wetlands loss problem, causes, and solution are included in Appendix C.

ESTIMATE OF IMPACTS ON LOUISIANA WETLANDS LOSSES FROM OCS ACTIVITIES

The key study is that performed for the Minerals Management Service for the period 1955/56 to 1978 by Louisiana State University (Baumann and Turner, 1990). It found that OCS activities were responsible for only 4 to 4.7 percent of direct wetlands losses in the Louisiana coastal plain for that period (Table 2).

> ABSTRACT The direct impacts of outer continental shelf (OCS) development on recent wetland loss in the northern Gulf of Mexico were quantified using aerial imagery, field surveys and literature review. The total direct impacts accounted for an estimated 25.6 percent of total net wetland loss within the Louisiana portion of the study area from 1955/56 to 1978. Of the total direct impacts of 73,905 ha, OCS-related activities accounted for 11,589 to 13,631 ha of the wetland loss during the same time interval. Although this is a substantial areal loss, it represents only 4.0 to 4.7% of the total Louisiana wetland loss from 1955/56 to 1978, and 15.7 to 18.4% of direct impacts.

TABLE 2 - OCS ACTIVITY IMPACTS ON LOUISIANA COASTAL ZONE WETLANDS 1955/56 TO 1978

Prepared by RA Kreig & Associates from Table 2. Baumann, R.H. and Eugene Turner. "Direct Impacts of Outer Continental Shelf Activities on Wetlands Loss in the Central Gulf of Mexico." Environ. Geol. Water Sci., Vol. 15, No. 3, 1990, pp. 189-198.

Area (ha) by habitat type in Louisiana's coastal zone and the change in areal extent at each habitat type from 1955/56 to 1978 (derived from Wicker 1980, 1981).

Habitat description	Area (ha) 1955/56	Area (ha) 1978	Change, 1955/56-1978	OCS+ non-OCS wetlands losses (ha)	OCS+ non-OCS Direct Impacts (ha)	Direct Impacts supporting facilities used by OCS (ha)	**MINIMUM Direct Impacts Allocated OCS only (ha)**	**MAXIMUM Direct Impacts Allocated OCS only (ha)**
Agriculture	139,823	123,017	-16,806		-16,806			
Beaches and dunes	4,758	3,081	-1,677					
Bottom land hardwood forest	37,502	29,003	-8,499	-8,499				
Brackish marsh		a 557,153	557,153 a	557,153				
Canal	18,483	36,593	18,110		18,110	12,150	**7,407**	**8,712**
Cypress tupelo swamp	172,243	145,120	-27,123	-27,123				
Fresh aquatic bed	533	8,096	7,563					
Fresh marsh	543,654	270,773	-272,881	-272,881				
Fresh open water	66,766	40,356	-26,410					
Fresh shrub/scrub	6,348	13,945	7,597					
Mangrove	63	2,955	2,892	2,892				
Mudflat	6,008	8,066	2,058					
Nearshore gulf	76,505	74,721	-1,784					
River, stream, bayou	34,528	35,782	1,254					
Estuarine aquatic bed	4	10,626	10,622					
Estuarine open water	1,797,600	2,011,917	214,317					
Salt marsh	721,350 a	181,394 a	-539,956 a	-539,956				
Spoil	15,588	43,833	28,245		28,245	6,860	**4,182**	**4,919**
Upland forest	42,171	43,605	1,434					
Urban/industrial	44,475	88,831	44,356		44,356			
	3,728,402	3,728,867	465	(288,414)	73,905	19,010	**11,589**	**13,631**
As a % of all wetlands losses in the LA coastal zone:				**100.0%**	**25.6%**	**6.6%**	**4.0%**	**4.7%**
As a % of only the direct wetlands losses in the LA coastal zone:					100.0%	25.7%	15.7%	18.4%

Marsh	1,265,004	1,009,320	-255,684	-255,684
Swamp	209,808	177,078	-32,730	-32,730
Forest/upland	48,519	57,550	9,031	
Aquatic grass bed/mudflat	6,545	26,788	20,243	
Canal and spoil	34,071	80,426	46,355	
Open water	1,975,399	2,162,776	187,377	
Urban/agriculture	184,298	211,848	27,550	
Beaches and dunes	4,758	3,081	-1,677	
	3,728,402	3,728,867	465	(288,414)

a = Brackish marsh was not delineated as a separate category on the 1955 habitat maps but as "non-fresh marsh."

> Direct impacts from OCS pipelines averaged 2.49 ha/km, lower than published guidelines, and totaled 12,012 ha. Lowest impacts are for backfilled pipelines in the Chenier Plain of western Louisiana and for small young pipelines built in clustered rights-of-way. Widening of OCS pipeline canals does not appear to be an important factor for total net wetland loss in the coastal zone because few pipelines are open to navigation and, for the examples found, the impact width was not significantly different than for open pipelines closed to navigation. Navigation channels account for a minimum of 16,902 ha of habitat change. Direct impacts per unit length of navigation channel average 20 times greater than pipelines.

I could not find that the 4 to 4.7 percent estimate of OCS direct impact as of 1978 has been revised to a later date. The factors in such a revision would take into account the additional OCS facility construction since 1978.

Direct impacts include the canals, spoil banks, and pads themselves; indirect impacts are the secondary effects like saltwater intrusion, drainage and sediment interdictions that can eventually result in additional losses. Indirect losses are difficult to attribute to one source because in reality they are usually the result of multiple causative factors.

Tremendous growth in OCS activity occurred during between 1960 and 1972. Fortunately they were covered in the interval studied by Baumann and Turner. OCS production since then has leveled off (but some new facilities have nevertheless been constructed).

Most canals were dredged from the 1950s to the 1970s. The current regulatory climate, along with improved exploration technologies, minimizes similar impacts today. However, this damage to the coastal ecosystem continues to make local areas less able to combat subsidence and more susceptible to saltwater intrusion (www.lacost.gov).

In my opinion, doubling or tripling the 1978 Baumann and Turner findings for OCS direct wetland impacts should conservatively bracket today's direct impacts from OCS activities on Louisiana wetlands. That would indicate that current OCS activity losses are likely to lie in the 10 to 15 percent range.

CONCLUSIONS

1) Is Louisiana really losing 25 to 35 square miles a year of wetlands?
ANSWER: Yes, this is a widely accepted estimate.

2) Are the dramatic wetlands losses and coastal erosion in Louisiana caused primarily by OCS activities?
ANSWER: No. OCS activities have always been and remain a minor source of wetlands losses compared to the major causes of leveeing the rivers, subsidence and sediment starvation. OCS-caused direct and indirect wetlands losses in the Louisiana coastal plain are likely to comprise only 10 to 15 percent of all wetlands losses to date.

3) To what extent does the $285 million in Title I funds to be paid to Louisiana each year under CARA ($4.3 billion projected over the 15 year life of CARA) relate to the wetlands losses suffered by Louisiana from OCS oil and gas activities?

ANSWER: See Gerhart Report - Appendix A.

4) Confirm the claims made that Louisiana has received no share of the OCS activities that take place off their shores and that they have received no compensation for the damages that have occurred because of these activities.

ANSWER: See Gerhart Report - Appendix A.

See Appendix B - STATEMENTS FROM THE CARA POLITICAL DEBATE for comments on statements made in various press releases, news accounts, Congressional debates etc.

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