The Economic Impact of Coastal Erosion in Louisiana On State, Regional, and National Economies

Prepared for

Department of Natural Resources
State of Louisiana

Prepared by

Dr. James A. Richardson
Alumni Professor of Economics
Louisiana State University

And

Dr. Loren C. Scott, President
Loren C. Scott & Associates, Inc.

April 2004

Table of Contents

Executive Summary		
Chapter 1	**Introduction**	**3**
Chapter 2	**Coastal Louisiana: Economic Description**	**6**
Chapter 3	**Scenarios of Disruptions and Bottlenecks due to Coastal Erosion**	**17**
Chapter 4	**Methodology in Measuring Economic Impact**	**23**
Chapter 5	**Assessment of Economic Impact: Oil and Gas Disruptions**	**33**
Chapter 6	**Assessment of Economic Impact: Navigation and Transportation**	**38**
Chapter 7	**Assessment of Economic Impact: Commercial Fishing**	**43**
Chapter 8	**Assessment of Economic Impact: Recreational Activity**	**49**
Chapter 9	**Aggregation and Summary of Economic Impacts from Various Industries**	**54**
Chapter 10	**Other Costs and Disruptions Associated With Coastal Erosion in Louisiana**	**59**
Appendix A	**Industry Level Impacts: Three Week Oil Disruption**	**63**
Appendix B	**Industry Level Impacts: Five Week Oil Disruption**	**72**
Appendix C	**Industry Level Impacts: Three Week Natural Gas Disruption**	**80**

Appendix D	**Industry Level Impacts: Seven Day Closure of Mississippi River**	**87**
Appendix E	**Industry Level Impacts: Fourteen Day Closure of Mississippi River**	**94**
Appendix F	**Industry Level Impacts: Commercial Fishing Losses in Louisiana**	**101**
Appendix G	**Industry Level Impacts: Loss of Recreational Activities in Louisiana**	**109**

The Economic Impact of Coastal Erosion in Louisiana On State, Regional, and National Economies

EXECUTIVE SUMMARY

I. Introduction

The Department of Natural Resources commissioned Dr. James A. Richardson and Dr. Loren C. Scott to complete a study that identifies and quantifies the economic implications to the rest of the country of disruptions in the Louisiana economy due to coastal erosion in Louisiana. The erosion of the Louisiana coast is a fact. According to **Coast 2050: Towards A Sustainable Coastal Louisiana** the state has lost 40 square miles per year over the last fifty years. It is further anticipated that by 2050, without appropriate response, coastal Louisiana will lose an additional 630,000 acres of coastal marshes, swamps, and islands. This coastal trend indicates loss of land and increased vulnerability to storms and other natural disasters.

II. Direct Impacts on Louisiana Industries

A study by the Waldemar Nelson Company estimated the **direct impacts** of coastal erosion on four distinct areas---oil and natural gas production, transportation and navigation, commercial fishing, and recreational activities (**Economic Impact Assessment Louisiana Coastal Area Comprehensive Coast/wide Ecosystem Restoration Study**). The Nelson Study suggested probable scenarios of what might happen to these dominant coastal industries if coastal erosion is not corrected. These probable scenarios describe the weeks that oil and gas deliveries might be disrupted; the days that navigation along the Mississippi River might be delayed; the reduction in commercial fishing opportunities in Louisiana; and the loss of recreational activities in the state.

III. Estimation of Indirect Economic Impacts through US Economy

The Richardson/Scott study takes the economic impact analysis one step further. When the disruptions identified in the Nelson study occur, **what will be the economic impact on other parts of the country in terms of business activity, household earnings, and job opportunities**? That is, what will be the **multiplier effects** of these disruptions? Using input-output models developed by the US Department of Commerce, Richardson and Scott estimate the loss of jobs, household earnings, and business transactions for the national economy and specific regions of the US economy if disruptions in Louisiana industries occur because of coastal erosion.

Findings by Specific Impact on Industry in Louisiana

The findings of the economic impact on the national economy of the disruption of a specific industry in Louisiana can be summarized as follows:

- The Nelson study identified a scenario where **disruption of oil pipelines** removes 625,000 barrels per day from U.S. oil supplies. In the case of the 3-week disruption consumers would pay $1.74 billion more for oil proudcts, while a 5-week disruption would cost consumers $2.91 billion. Table EX-1 and EX-2 show estimates of the impact of each scenario on the U.S and three different regions of the country:

Table EX-1
The Impact of a Three-Week Louisiana Oil
Disruption on Sales, Earnings and Employment

	Lost Sales (Millions)	Lost Earnings (Millions)	Lost Employment
Continental US	$3,676.1	$1,035.6	32,390
Eastern US	$2,497.7	$702.0	23,344
Western US	$344.5	$99.6	3,026
Louisiana	$68.2	$19.9	831

Table EX-2
The Impact of a Five-Week Louisiana Oil
Disruption on Sales, Earnings and Employment

	Lost Sales (Millions)	Lost Earnings (Millions)	Lost Employment
Continental US	$6,148.0	$1,732.0	54,170
Eastern US	$4,177.2	$1,174.1	39,041
Western US	$576.1	$166.7	5,060
Louisiana	$114.1	$33.2	1,389

- The Nelson study generated a scenario where coastal erosion caused storm damage to **natural gas pipelines**, removing them from service for thee weeks and causing natural gas prices to rise by 11.4%. Table EX-3 reveals the impact of this disruption on the U.S. and 3 other regions of the country.

Table EX-3
The Impact of a Three-Week Louisiana Natural Gas
Disruption on Sales, Earnings and Employment

	Lost Sales (Millions)	Lost Earnings (Millions)	Lost Employment
Continental US	$1,803.1	$455.2	12,897
Eastern US	$1,257.3	$316.4	9,049
Western US	$198.6	$48.4	1,290
Louisiana	$57.4	$12.9	491

- The Nelson group generated three scenarios involving **transportation issues** involved with coastal erosion: (1) a 7-day closure of the lower Mississippi River raising shipping costs by $50 million, (2) a 14-day closure of the lower Mississippi River raising shipping costs by $200 million, and (3) more open water in the Gulf Intracoastal Waterway increasing shipping costs by $8.4 million per year. Tables Ex-4 through Ex-6 indicate our estimates of the impacts of these scenarios on the U.S. Louisiana, and the Louisiana shipping region.

Table EX-4
The Impact of a Seven-Day closure of the Lower
Mississippi on Sales, Earnings and Employment

	Lost Sales (Millions)	Lost Earnings (Millions)	Lost Employment
Continental US	$80.8	$22.2	663
LA Shipping Region	$29.8	$7.8	251
Louisiana	$11.5	$3.1	120

Table EX-5
The Impact of a Fourteen-Day closure of the Lower
Mississippi on Sales, Earnings and Employment

	Lost Sales (Millions)	Lost Earnings (Millions)	Lost Employment
Continental US	$323.3	$88.6	2,653
LA Shipping Region	$119.4	$31.4	1,006
Louisiana	$46.1	$12.4	480

Table EX-6
Annual Impact of Additional Barge Costs
On Sales, Earnings and Employment

	Lost Sales (Millions)	Lost Earnings (Millions)	Lost Employment
Continental US	$13.4	$3.7	110
LA Shipping Region	$5.0	$1.3	42
Louisiana	$3.5	$0.5	20

- The impact on **commercial fishing** is different from the scenarios above in that those involved discrete events, while the impact on commercial fishing is a continuous event due to the gradual loss of coastline. Table Ex-7 shows estimates of the impact on commercial fishing for 2003, the peak loss year of 2026, and the present value over a 94-year period. Impacts are shown for Louisiana and the U.S.

Table EX-7
The Impact of Commercial Fishing Losses
On Sales, Earnings and Employment

	Lost Sales (Millions)	Lost Earnings (Millions)	Lost Employment
2003 only:			
Continental US	$46.2	$11.9	322
Louisiana	$34.3	$8.3	245
2026 only:			
Continental US	$66.0	$16.9	460
Louisiana	$41.6	$11.9	297
Total over all years:			
Present Value			
Continental US	$5,656.3	$1,451.4	NA
Louisiana	$4,192.6	$1,017.9	NA

- Estimates are also provided of the impact on **recreational activities** on the (1) Louisiana economy and the (2) U.S. economy of coastal losses. Table EX-8 shows the impact on the Louisiana economy assuming that 30% of present recreational spending by Louisiana citizens would "leak" to other states, and Table EX-9 shows the impact of recreational losses on the national economy.

Table EX-8
Estimated Annual Impact of Hunting, Fishing and Wildlife Viewing
On Louisiana's Economy Assuming 30% Leakage
(Millions of 2003 Dollars)

	Sales	Earnings	Employment
Saltwater Fishing	$748.6	$246.1	12,842
Migratory Bird Hunting	$99.5	$31.7	1,697
Wildlife Viewing	$109.5	$35.3	1,871
Total	$957.6	$313.1	16,410

Table EX-9
Estimated Annual Impact of Reduced Hunting, Fishing
And Wildlife Viewing On the US Economy
(Millions of 2003 Dollars)

	Sales	Earnings	Employment
Saltwater Fishing	$62.7	$105.0	3,906
Migratory Bird Hunting	$25.2	$7.6	296
Wildlife Viewing	$62.7	$14.7	561
Total	$150.6	$127.3	4,763

In addition to the **aggregate** impacts shown in the tables above for all of the specific industrial disruptions, this study provides estimates of impacts by **various industries** of each scenario. Hence, the impact of a disruption in the delivery of oil for three to five weeks will be specified according to the industries most likely to experience the most loss of economic activity.

Findings of Aggregation of all Industrial Disruptions Occurring Once and Aggregation of all Industrial Disruptions Occurring More Frequently

The estimates shown in Tables EX-1 through EX-9 contain two other significant pieces of information about the effects of coastal erosion.. First, estimates of the economic impacts are generated if all the disruptions occur simultaneously---e.g. oil and gas pipeline disruptions, transportation disruptions, and commercial fishing/recreation losses at the same time. The short-run scenario is illustrated in Table EX-10.

Table Ex-10
Aggregation of Economic Impact on US Economy and
Louisiana Due to Coastal Erosion in Louisiana

	Lost Sales (Millions)	Lost Earnings (Millions)	Lost Employment
Continental US, Short-term	$5,770.2	$1,655.9	51,151
Continental US, Long-term	$8,484.6	$2,418.7	74,921
Louisiana, Short-term	$860.9	$268.7	13,459
Louisiana, Long-term	$941.4	$291.3	14,377

Finally, the next question is what is the present value of these potential disruptions on the US economy if these disruptions occur frequently. Estimates of the present value of the economic losses to the nation were computed if the disruptions occurred every six years, every four years, and then every year through the year 2050. The present value of the economic impact on a national basis for each of these frequencies is illustrated in Table Ex-11.

Table Ex-11
Present Value of Economic Losses Due to
Disruptions in Louisiana Occurring
Frequently Through Year 2050
(Short-term to Long-term Disruptions)

	Lost Sales (Billions)	Lost Earnings (Billions)	Lost Employment
Disruptions Occurring Every Six Years	$26.0 to $38.7	$7.1 to $18.6	Not applicable
Disruptions Occurring Every Four Years	$49.8 to $74.0	$13.5 to $20.4	Not applicable
Disruptions Occurring Every Year	$145.0 to 215.7	$39.5 to $59.3	Not applicable

IV. Interpretation of Results

The estimates derived in the Richardson/Scott Study provide this information for persons evaluating the economic impact of coastal erosion on the Louisiana economy and the national economy. The information from each separate incident provides the spillover effects from that incident occurring in Louisiana to other parts of the nation.

Fox example, a 3 week disruption in oil deliveries will cost the US economy almost 33,000 jobs over an one year time period and household earnings of just over $1 billion. Each possible incident as identified in the Nelson Study is estimated separately in the Richardson/Scott Study. These estimates suggest the economic impacts of the incidents occurring separately and only one time.

Over the next fifty years these incidents may occur simultaneously and much more frequently than only one time. Hence, Richardson/Scott examines the aggregate impact of all of these separate incidents occurring simultaneously. The disruption in oil deliveries, natural gas deliveries, transportation along the Mississippi River, and a loss in fishing and recreations activities occur because of the same natural disaster occurring because of coastal erosion. The US economy would experience a loss of over 51,000 jobs to almost 75,000 jobs depending on if the incidents lasted for a short-term period or a long-term period with the associated loss of earnings of $1.7 to $2.4 billion.

Finally, the incidents could occur more than one time through the year 2050—a year that we selected based on the study **Coast 2050: Towards a Sustainable Louisiana.** The Richardson/Scott study estimated the impact on business activity and household earnings if the incidents were to occur every six years, every four years, and every year. The present value of these losses in household earnings would range from $7 billion to just over $59 billion depending on how long each incident lasted (short v. long term) and the frequency of each incident through 2050.

The Economic Impact of Coastal Erosion in Louisiana
On State, Regional, and National Economies

Chapter 1: Introduction and Purpose

In 1998 the Louisiana Coastal Wetlands Conservation and Restoration Task Force and Wetlands Conservation and Authority published **Coast 2050: Towards A Sustainable Coastal Louisiana**. This study documented the loss of coastal land in Louisiana—namely, as much as 40 square miles per year with a loss of between 25 and 35 square miles per year in the 1990s. It anticipated that by 2050 coastal Louisiana would lose an additional 630,000 acres of coastal marshes, swamps, and islands. The report concluded this systematic collapse threatened the continued productivity of Louisiana's coastal ecosystem, the economic viability of industries in this region, and, the safety of its residents. The overarching purpose of **Coast 2050** was to develop a plan and process to "sustain a coastal ecosystem that supports and protects the environment, economy, and culture of southern Louisiana, and that contributes greatly to the economy and well-being of the nation."

A major concern regarding the loss of coastal Louisiana was the continued economic vitality of the coastal region and the connection of what might happen to major industries in coastal Louisiana to what can be reasonably projected as economic consequences due to the loss of the Louisiana wetlands throughout the rest of the nation. These economic concerns were heightened by the industries that were highlighted in coastal Louisiana: namely, the oil and gas industry, the major ports through which products are transported throughout the United States and through which products from the United States are transported to countries around the globe, the large share of the US fishing industry concentrated in coastal Louisiana, and the recreational attributes of this unique and productive environment.

The Louisiana Department of Natural Resources commissioned Waldemar S. Nelson and Company to provide an economic description of coastal Louisiana; highlight important industries that could have an economic reach well beyond the borders of Louisiana; and, establish possible scenarios of industrial shutdowns if coastal erosion continued and/or if major catastrophic events were to occur. This study, **Economic Impact Assessment Louisiana Coastal Area Comprehensive Coast/wide Ecosystem Restoration Study,** was completed in 2004.

The Louisiana Department of Natural Resources commissioned Dr. James A. Richardson (Alumni Professor Economics at Louisiana State University) and Dr. Loren C. Scott (President, Loren C. Scott and Associates, Inc.) to conduct an economic impact analysis of the possible scenarios of industrial shutdowns as identified by Nelson and Company on the Louisiana economy, regional economies within the United States, and the national economy. This economic impact analysis of the possible scenarios of industrial shutdowns as identified by Nelson and Company is contained within this report.

Purpose and Use of Economic Impact Study

The purpose of the Richardson/Scott study is to demonstrate the economic implications of disruptions in the Louisiana economy due to coastal erosion on the rest of the country. The erosion of the Louisiana coast is a fact. According to **Coast 2050: Towards A Sustainable Coastal Louisiana** the state has lost 40 square miles per year over the last fifty years. It is further anticipated that by 2050, without appropriate response, coastal Louisiana will lose an additional 630,000 acres of coastal marshes, swamps, and islands.

The Nelson Study identifies clearly and vividly the dominant industries in coastal Louisiana. These industries include oil and gas, transportation and navigation, commercial fishing, recreational activities, and other related industries. The Nelson Study specifies the significance of these industries to the Louisiana economy because of their magnitude and scale. This same magnitude and scale also suggests an importance to the national economy. Louisiana's prominence in the oil and gas industry provides support to the national economy. Any reduction in Louisiana's ability to provide oil and gas resources to the rest of the country will affect the national economy. Similarly, any reduction in Louisiana's ability to serve as an intermediary for trade with the rest of the world will affect the national economy. The Nelson Study identifies the significance of the Louisiana industries in a national perspective.

The Nelson Study also suggests probable scenarios of what might happen to these dominant industries if coastal erosion is not corrected. These probable scenarios describe the weeks that oil and gas deliveries might be disrupted; the days that navigation along the Mississippi River might be delayed; the reduction in commercial fishing opportunities in Louisiana; and the loss of recreational activities in the state. These significant disruptions and interruption in business activities in Louisiana become the starting point for economic problems to develop in other parts of the national economy.

The Richardson/Scott Study takes the economic impact analysis one step further. If there is a disruption in oil and gas deliveries from Louisiana or an interruption in the use of the Mississippi River, what will be the economic impact on other parts of the country in terms of business activity, household earnings, and job opportunities? Using the Input-Output Model as developed by the US Department of Commerce, Richardson and Scott estimate the loss of jobs, household earnings, and business transactions for the national economy and specific regions of the US economy if disruptions in Louisiana industries occur because of coastal erosion. For example, if there is a five-week disruption in oil deliveries from Louisiana, what is the impact on jobs throughout the country? The Richardson/Scott Study gives a specific answer to that question.

The Richardson/Scott Study first examines each probable scenario described in the Nelson Study individually. That is, the Richardson/Scott Study examines each disruption as a separate event. Hence, the study estimates the loss of jobs, earnings, and business activity on a national scale if there is a disruption in oil deliveries; if there is a disruption in natural gas deliveries; if there is lack of access to the Mississippi River; if

commercial fishing opportunities are limited; and if recreational activities are truncated. Estimates of loss of jobs, earnings, and business activity due to one of these probable scenarios happening provide insight into the economic impact throughout the national economy due to coastal erosion problems in Louisiana. Louisiana officials can now say that the disruption in oil deliveries along the coast of Louisiana will cause a specific reduction in job opportunities throughout the country as opposed to just saying everyone knows the importance of Louisiana's oil to the rest of the country. This study enhances the specificity of detail that can be used in presentations to other audiences throughout the nation.

The Richardson/Scott Study also takes into account the likelihood that these probable scenarios could happen simultaneously. A disruption in oil deliveries, natural gas deliveries, and access to the Mississippi River could happen all at the same time due to the erosion of the Louisiana coast. The study also takes into account that these probable scenarios could take place more than once during the next fifty years. This analysis becomes important in discussing the request for a certain amount of federal assistance. This analysis does not determine how much it will cost to arrest coastal erosion, but it does provide information about the loss to the rest of the country if nothing is done. The present value of projected economic impacts through the year 2050 suggests what the country will lose in terms of household earnings and business activities due to economic shocks associated with coastal erosion in Louisiana. Doing nothing about coastal erosion may not be a very good idea. There are costs to doing nothing.

Outline of Study

This report contains the following sections: (1) a brief description of the economy of coastal Louisiana, (2) a summary of the possible scenarios of industrial shutdowns as identified by Nelson and Company; (3) a description of the methodology of assessing the economic impact of these industrial shutdowns on the Louisiana economy, regional economies of the United States, and the national economy; (4) an assessment of the economic impact on the state, regional, and national economies of four major industries---oil and gas, navigation and transportation, commercial fishing, and recreation; (5) a summary of the estimated economic impacts associated with all of these industries; and, (6) an analysis of other state, regional, and national costs that may be associated with the continued loss of coastal Louisiana.

The Economic Impact of Coastal Erosion in Louisiana
On State, Regional, and National Economies

Chapter 2: Coastal Louisiana: A Brief Description of the Economy

Coastal Louisiana is made up of 17 parishes: Assumption, Cameron, Iberia, Jefferson, Lafourche, Livingston, Orleans, Plaquemines, St. Bernard, St. Charles, St. James, St. John the Baptist, St. Mary, St. Tammany, Terrebonne, and Vermilion. These parishes are illustrated on Map 1. Nine other parishes are highlighted on Map 1: Acadia, Ascension, Calcasieu, East Baton Rouge, Iberville, Jefferson Davis, Lafayette, St. Martin, and West Baton Rouge. These parishes are just to the north of coastal Louisiana and are intricately related to the oil and gas industry, both upstream and downstream, and the agricultural community. Lafayette is connected to the exploration and development phase of the industry, while Ascension, Calcasieu, East Baton Rouge, Iberville, and West Baton Rouge are connected to the refining industry and the chemical industry. Acadia, Jefferson Davis, and St. Martin parishes have agricultural interests connected to the agricultural interests in the coastal states. All of these parishes are south of, and straddle, Interstate 10. St. Martin Parish is divided by Iberia Parish, but the majority of St. Martin Parish is to the north of Iberia Parish.

The Population & Economy of Coastal Louisiana

The coastal Louisiana economy and the nine adjacent parishes are described in Tables 1 through 3 by population, employment, and employment in specific sectors of the economy. As illustrated in Table 1, the 17 coastal parishes have 43.4 percent of Louisiana's population and 44.4 percent of its employment. The coastal parishes vary from very small parishes in terms of population, such as Cameron Parish with 9,805 residents, to the largest parishes in Louisiana, Orleans Parish with 476,492 residents and Jefferson with 451,459 residents. Employment opportunities also vary from parish to parish within the coastal region with employment in Assumption being only 10.8 percent of its population, while employment in Orleans Parish is 45.1 percent of its population. Obviously, persons living in Assumption Parish work in other parishes, while many people in surrounding parishes work in Orleans Parish.

Map 1. Coastal Parishes and Adjacent Parishes

Coastal Parishes (in green): Assumption, Cameron, Iberia, Jefferson, Lafourche, Livingston, Orleans, Plaquemines, St. Bernard, St. Charles, St. James, St. John the Baptist, St. Mary, St. Tammany, Terrebonne, and Vermilion

Adjacent Parishes (in yellow): Acadia, Ascension, Calcasieu, East Baton Rouge, Iberville, Jefferson Davis, Lafayette, St. Martin, and West Baton Rouge

Red lines are interstate highways in Louisiana

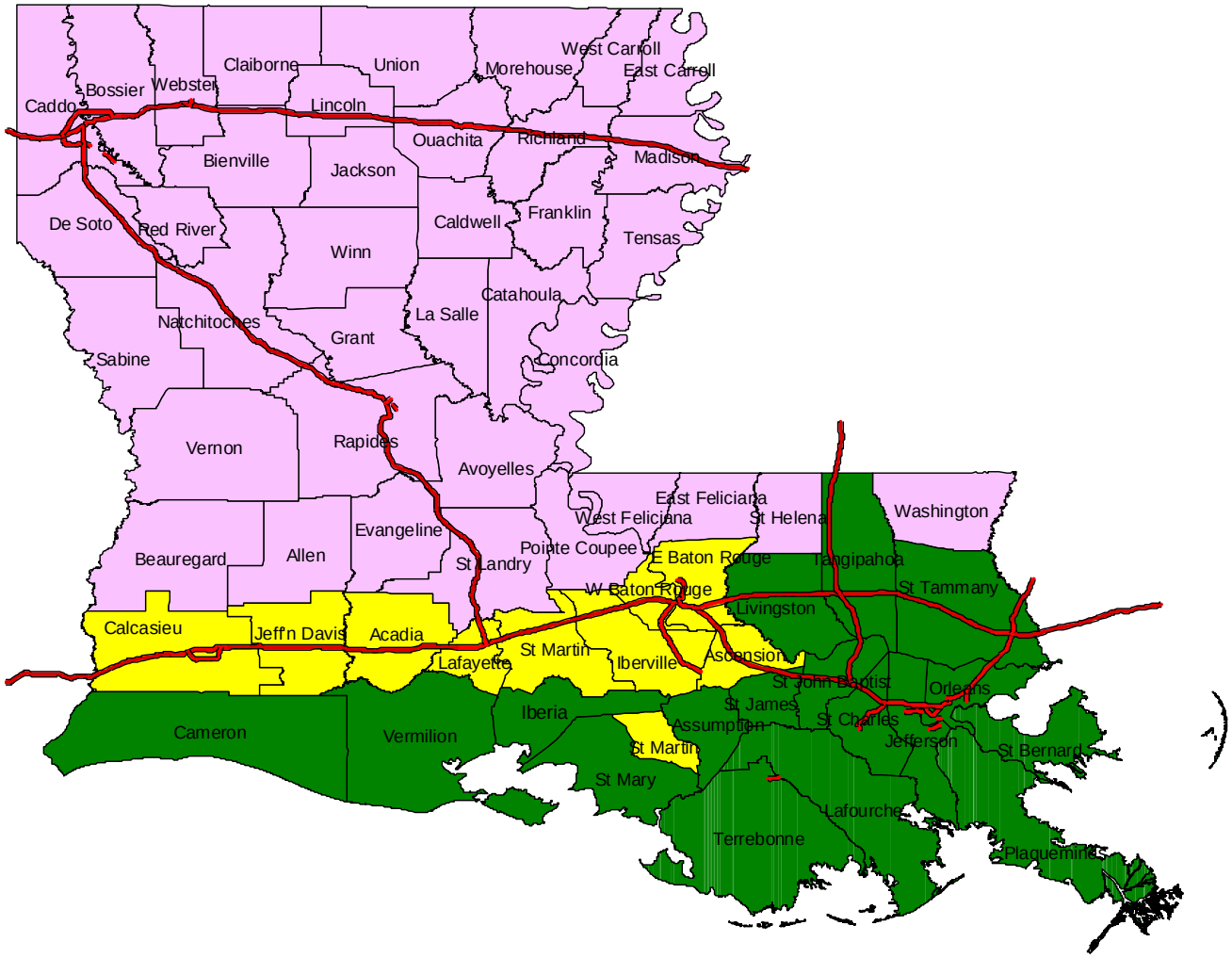

Table 1
Coastal Parishes in Louisiana
Population, Employment, and Employment by Sector

Parish	Population	Employment	Employment by Sector		
			Oil/Gas	Construction	Manufacturing
Assumption	23,257	2,507	187	123	317
Cameron	9,805	2,211	159	310	219
Iberia	73,530	26,689	2,100	1,776	3,619
Jefferson	451,459	212,766	2,010	13,326	16,386
Lafourche	90,273	26,189	933	990	3,084
Livingston	96,257	11,762	85	1,613	1,311
Orleans	476,492	214,914	4,079	6,837	9,371
Plaquemines	27,004	11,368	832	1,626	1,963
St. Bernard	66,486	14,150	105	1,066	1,681
St. Charles	48,548	18,945	129	1,497	5,148
St. James	21,224	5,560	10	141	2,265
St. John the Baptist	43,798	11,336	204	798	2,321
St. Mary	52,833	22,322	1,936	967	4,412
St. Tammany	197,683	52,273	338	3,549	2,434
Tangipahoa	101,930	25,918	60	1,043	2,627
Terrebonne	105,123	40,848	3,901	2,769	3,899
Vermilion	53,661	9,917	861	451	1,020
All Coastal Parishes	1,939,363	709,675	17,929	38,882	62,077
Percent of Louisiana	43.4%	44.4%	38.5%	31.8%	39.0%

Source: County Business Patterns, Louisiana, 2001, and Louisiana Quickfacts, Bureau of Census, 2001 population estimates.

In Table 2 the 17 coastal parishes are combined with the nine adjacent parishes that connect economically to the coastal parishes. These nine parishes connect with (1) the oil and gas activity in coastal Louisiana and offshore Louisiana; (2) the trade that comes through the ports in the coastal parishes; and (3) the agricultural connections that link the coastal parishes to some of the nine adjacent parishes.

Table 2
Coastal Parishes and Nine Adjacent Parishes:
Population, Employment, and Employment by Sector

Parish	Population	Employment	Employment by Sector		
			Oil/Gas	Construction	Manufacturing
Coastal Parishes	1,939,363	709,675	17,929	38,882	62,077
Adjacent Parishes	1,057,632	465,745	9,812	55,351	44,432
Acadia	58,910	12,059	351	1,410	2,239
Ascension	79,896	25,488	92	3,145	5,809
Calcasieu	182,842	69,244	529	4,947	10,205
East Baton Rouge	409,667	221,070	194	35,698	11,444
Iberville	33,261	10,793	83	1,405	3,669
Jefferson Davis	31,275	5,345	129	248	135
Lafayette	190,894	105,419	7,963	6,452	6,624
St. Martin	49,181	7,717	283	632	1,834
West Baton Rouge	21,726	8,610	188	1,414	2,473
Coastal and Adjacent	2,996,995	1,175,420	27,741	94,233	106,509
Percent of State	67.1%	73.5%	59.6%	77.0%	67.0%

Source: same as Table 1.

The 17 coastal parishes and 9 adjacent parishes make up 67.1 percent of the population and 73.5 percent of state employment. These parishes have almost 60 percent of oil and gas employment, 77 percent of construction employment, and 67 percent of all manufacturing employment in the state. The mix of manufacturing employment and transportation employment is illustrated in Table 3.

Table 3
Mix of Employment in Coastal Louisiana and Adjacent Parishes
(Percent of State)

Category	Coastal Parishes	Adjacent Parishes	Coastal and Adjacent
Total Employment	44.4%	29.1%	73.5%
Oil and Gas	38.5%	21.1%	59.6%
Mfg—Food	45.8%	17.3%	63.1%
Mfg—Petroleum	48.1%	44.1%	92.2%
Mfg—Chemical	28.5%	65.5%	94.0%
Mfg—Fabricated Metals	42.9%	26.7%	69.6%
Mfg—Transportation Equipment	74.1%	10.8%	84.9%
Water Transportation	87.3%	12.1%	99.4%

Source: same as Table 1.

The mix of employment within the coastal parishes and the adjacent parishes reveal some tendencies about the nature of this area of Louisiana in terms of economic activities. First and a bit surprising, the oil and gas industry, in terms of employment, has a smaller fraction of people working in this industry than overall employment in this region. "Oil and gas industry" refers to the exploration, development, and production of oil and gas. However, it will be shown that other indicators of oil and gas in this region will support the dominance of this industry within the coastal parishes and within certain adjacent parishes. These indicators will include wells, drilling, and production.

Second, the downstream activities of oil and gas---petroleum refining and chemicals---are dominant in the coastal and adjacent parishes. It is in this region of Louisiana that much of the oil and gas that is produced within the boundaries of Louisiana or in the federal OCS off offshore Louisiana or that is imported from other countries will be processed. Third, the manufacturing of transportation equipment also is very dominant within the coastal and adjacent parishes. Shipbuilding is important to

offshore oil and gas exploration, development, and production. Finally, water transportation is dominant within this region of Louisiana. To this one must add the ports, including the Port of New Orleans, the Port of South Louisiana, the Port of Baton Rouge, the Port of Plaquemines, the Port of Lake Charles, and other ports within this region and the activity that goes through these ports every year.

The employment by parish shows the number of persons employed in the coastal area and the adjacent parishes. The coastal parishes have 44.4 percent of the state's employment, while the adjacent parishes have 29.1 percent of the state's employment. **Together, these 26 parishes have 73.5 percent of the state's employment**. The Louisiana economy is concentrated in the southern region of the state. Specific industries are even more concentrated within the coastal and adjacent parishes, including petroleum refining, the chemical industry, the manufacturing of transportation equipment, and water transportation. The concentration of other industries within this region can be documented by factors other than employment.

Oil and Gas Industry in Coastal Louisiana

The oil and gas industry includes the exploration, development, and production of oil and gas. The oil and gas industry stretches throughout the state. In fact, north Louisiana has over 14,000 producing crude oil wells and over 10,500 producing natural gas wells.[1] South Louisiana and the Louisiana offshore have about 5,000 producing crude oil wells and about 2,300 producing natural gas wells.[2] However, in terms of oil and gas reserves and in terms of oil and gas production, south Louisiana and offshore Louisiana (including the state's three-mile limit and the federal OCS) dominate the state.

Oil and gas reserves and oil and gas production in onshore and offshore Louisiana are illustrated in Table 4. The reserves are clearly concentrated in the federal OCS, an area that requires and receives support from the various businesses and communities in south Louisiana. Over 87 percent of oil reserves are located in the federal OCS and about 67 percent of natural gas reserves are located in the federal OCS. Oil production from the federal OCS accounts for over 85 percent of oil produced in Louisiana including both onshore and offshore. Natural gas production from the federal OCS accounts for 74 percent of natural gas produced in Louisiana including onshore and offshore.

Technology supports the deep water drilling and production. But, deep water drilling and production require assistance from onshore facilities from companies fabricating platforms and other such items to companies providing supplies to the rigs, to hubs gathering the flow of oil and gas from the offshore wells to other companies providing transportation services to the personnel working on the rigs. The oil and natural gas must be transported and processed before it can be used either as an end use by a final consumer or as an intermediate product in the production of some other product such as plastic piping, paint, fabrics, etc.

---

[1] **Louisiana Energy Facts Annual, 2002.** Department of Natural Resources, Technology Assessment Division, December 30, 2002.
[2] Ibid.

Table 4
Oil and Gas Reserves in Louisiana, Onshore and Offshore

Region	Oil Reserves (million barrels)	Natural Gas Reserves (billion cubic feet)
North Louisiana	**87**	**3,881**
South Louisiana	**341**	**5,185**
Offshore Louisiana	**136**	**745**
Federal OCS	**3,877**	**19,721**
Total Reserves	**4,441**	**29,532**
Region	**Oil Production (million barrels)**	**Natural Gas Production (billion cubic feet)**
North Louisiana	**13.1**	**356.7**
South Louisiana	**71.6**	**887.4**
Offshore Louisiana	**11.0**	**136.7**
Federal OCS	**552.0***	**3,960.0***
Total Production	**647.7***	**5,340.8***

Source: Louisiana Energy Facts Annual: 2002, Louisiana Department of Natural Resources, December 30, 2002.
*Estimate since data for federal OCS ended as of June 2002.

Oil production. Louisiana oil and gas production is also significant when put into the national perspective. **Louisiana's crude oil production in 2000 was about 27 percent of total US production with almost 600 million barrels per year**. The oil flowing from the offshore will enter Louisiana at various points along the coast with Port Fourchon in Lafourche Parish being a pivotal station for collecting the oil from the offshore and transmitting it to the various intermediate users in Louisiana and other states.

There are only a few supply bases serving the deepwater oil and gas industry with Port Fourchon being the largest. In addition to the production coming from Louisiana onshore, Louisiana offshore, and federal OCS off the coast of Louisiana, the nation has chosen to place two of its **four Strategic Petroleum Reserve storage facilities** in Louisiana---West Hackberry in Cameron Parish (one of the coastal parishes) and Bayou Choctaw in Iberville Parish (one of the adjacent parishes).

The **Louisiana Offshore Oil Port (LOOP)** is also located about 20 miles off the coast of Louisiana. This port has two immense platforms that serve as the nucleus of the operations through which about 12 percent of the crude oil imported into the United States is transported. The oil flows from LOOP into the pipelines running across Louisiana.

Natural gas production. Louisiana natural gas production in 2000 equaled **27 percent of the natural gas used in the United States**. The overwhelming majority of Louisiana natural gas comes from the federal offshore. At this time natural gas is very different from oil in terms of international trade. Some natural gas is imported from Canada where pipelines can stretch to the United States. Natural gas imports from other countries not connected to the United States by pipelines is more complicated. Liquified natural gas (LNG) is costly to convert from gas to liquid, transport from the country of production to the United States, and then convert from liquid to gas. Special ports are needed to accept the LNG in the United States. Due to economic conditions, environmental concerns, and safety issues, the development of these LNG ports has been slow in the United States. New ports are now planned along the Gulf Coast---at least three in coastal Louisiana---along with an expansion of an existing LNG terminal in Calcasieu Parish, one of the adjacent parishes. One plant in Louisiana has already received the approval of the Federal Regulatory Energy Commission, as well as the expansion of the existing terminal.

Pipelines. Finally, if there is oil and gas development and production, there must be pipelines to carry the oil and gas to shore and on to its final destination. The Louisiana network of pipelines includes the following:[3]

- 25,000 miles of pipe moving natural gas through interstate pipelines
- 7,600 miles of pipe carrying natural gas through intrastate pipelines
- 3,450 miles of pipe carrying crude oil and crude oil products
- thousands of miles of pipe carrying oil and gas from the wellhead to separating facilities.

The assessed value of interstate pipelines in Louisiana is over $600 million, which means the market value is over $2.4 billion. Louisiana's pipeline industry employs almost 5,000 persons with an annual payroll of about $250 million with an average salary of $50,000. The Henry Hub is a prominent site within Louisiana for the natural gas industry since the national price of natural gas is established at this site.

.

Navigation and Transportation: Ports, the Mississippi River and the GIWW

The Louisiana Purchase in 1803 foresaw New Orleans as being the key to the economic development and growth of the mainland of the United States. The Mississippi River has lived up to its potential with ports in Louisiana being instrumental in acting as the intermediaries between foreign countries delivering products to the United States for consumption by US citizens and between the various industries in the United States providing products to foreign countries for consumption by the citizens of these countries.

[3] **Comprehensive Coastwide Ecosystem Restoration Study, Appendix E.**

Ports. Louisiana has five of the top fifteen ports in terms of tonnage—namely, the Port of South Louisiana (#1); the Port of New Orleans (#4); the Port of Baton Rouge (#9); the Port of Plaquemines (#10); and the Port of Lake Charles (#14). **If one considers the area along the Mississippi from Baton Rouge to the mouth of the Mississippi River as one port, it would be the largest port in the world in terms of tonnage moved**.

The GIWW. The ports of South Louisiana handle approximately 14 percent of US crude oil imports and about 57 percent of all grain exports.[4] The **Gulf Intracoastal Waterway** (GIWW) passes through coastal Louisiana on an east to west route. This waterway primarily moves chemicals, petroleum products, and crude oil. It is estimated that in 2000 over 520 million tons of commerce was moved by barge to and from other locations along these waterways with estimated annual savings of $4.7 billion in transportation costs when compared to moving these items by rail or truck.[5]

Commercial Fishing

Commercial fishing in Louisiana is a long-standing enterprise that is important to the persons in south Louisiana as a means of making a living and important to them as part of the culture of the region. Commercial fishing in Louisiana is also meaningful to the rest of the nation since **Louisiana provides over 10 percent of the nation's total revenues from commercial fishing**.[6] In the Gulf of Mexico Louisiana provides about 43 percent of total dockside revenue. **Louisiana is second to Alaska in terms of dockside revenues from commercial fishing**.

Commercial fishing industry. The most important species caught in Louisiana is the shrimp crop that in 2001 was valued at $188 million or 45 percent of the total US total shrimp landings.[7] Louisiana is also a major supplier of menhaden and oysters. In fact, in 2001 oyster production in Louisiana was 37 percent of US oyster production. Other gulf states had 29 percent and the rest of the states had 34 percent. Crab, red fish, and other fish species are also available in Louisiana waters.

The commercial fishing industry is supported by an **infrastructure** including vessels, processing plants, wholesalers, and, of course, employees for all of these activities. In 1999 Louisiana had 122 processing plants for commercial fish with 2,673 employees and 161 wholesalers with 1,189 employees. **In 1997 Louisiana had more fishing vessels, 13,367, than any other state in the nation except Alaska**. As a reference Alabama had only 1,679 fishing vessels; Mississippi had only 1,447 fishing vessels; and, Florida had 9,085 fishing vessels.[8]

---

[4] **Economic Impact Analysis of American Wetlands in Coastal Louisiana,** p. 12.
[5] Ibid.
[6] **Comprehensive Coastwide Ecosystem Restoration Study, Appendix E.**
[7] Ibid.
[8] Ibid.

Fishing and local culture. Commercial fishing is very obvious in the coastal parishes of Louisiana. Towns and villages such as Port La Hache in Plaquemines, Yscloskey in St. Bernard, Golden Meadow in Lafourche, Pointe Au Chene in Terrebone, Delcambre in Vermilion, and other towns and villages in other coastal parishes are easy to identify as fishing communities. Families have worked in the fishing industry for generations. The Louisiana commercial fishing industry connects the persons working to make a living along the coast of Louisiana by fishing to persons enjoying the product of their work effort in the restaurants in New Orleans and other Louisiana cities to restaurants throughout the country. The person involved in commercial fishing appreciates the significance of the commercial fishing industry to Louisiana. The restaurant in Louisiana or in another state appreciates the contribution of Louisiana commercial fishing to the diversity and uniqueness of its menu. However, the financial impact of the Louisiana commercial fishing industry cannot compare to the national economic reach of the oil and gas industry or the national economic consequences of shutting down the ports in south Louisiana for an extended period of time.

Recreational Activity

Louisiana is called the "Sportsman's Paradise." It is a place that serves as a magnet for persons interested in the outdoors, the beauty of the wetlands, the diversity of species, and the cultural uniqueness of Louisiana compared to other recreational venues in the United States. People buy oil and gas produced and processed in Louisiana; people buy goods shipped up the Mississippi River to other states in the Midwest and the East; people buy fish produced and caught in Louisiana waters; but, people also buy the beauty of the state by coming to Louisiana to participate firsthand in the fishing, bird watching, site seeing, and the cultural diversity of south Louisiana.

Saltwater Fishing. In 2002 **almost 650,000 recreational fishermen chose to take a saltwater fishing trip in Louisiana**. Of these 650,000 recreational fishermen almost 100,000 were from out-of-state, while just over 66,000 were from non-coastal parishes in Louisiana. In addition to the fishing, hunting and migratory bird watching are both major sports in Louisiana.[9] With regard to recreational fishing, the Nelson report begins by identifying the total benefits to Louisiana from recreational saltwater fishing. Citing previous studies, their report notes that recreational saltwater fishing generated an estimated $1.2 of revenue for Louisiana businesses in the year 2000.

Migratory Bird Hunting and Wildlife Viewing. The Nelson report also cites previous studies that estimate that hunters of migratory birds spent $90.5 million in 2001 on goods and services in Louisiana and that people engaged in wildlife viewing spent $175.7 million in 2001 in Louisiana for goods and services. Waldemar S. Nelson and Company focused on these outdoor activities because coastal erosion places each of these outdoor activities at risk.

[9] **Economic Impact Analysis of America's Wetlands In Coastal Louisiana,** pages 15-16.

Recreational activities, from saltwater fishing to duck hunting to bird watching, add an economic impetus to the local communities in coastal Louisiana. These activities also create a tourist connection to Louisiana that may encourage the tourists to visit other parts of the state. The economic impact will be especially felt by those persons directly involved in this industry. However, recreational impact, while very important to the people directly involved in the industry, will not reach the national connection that oil and gas will have or that transportation and navigation will have.

Concluding Remarks

Four significant industries in south Louisiana are oil and gas; transportation and navigation along the river and the intracoastal canal; commercial fishing along the Louisiana coast; and, hunting, fishing, and bird watching in coastal Louisiana. Industries in Louisiana are connected to industries in other states. In Louisiana the oil and gas industry obviously affect the economic situation in other states. Similarly, the ability to transport goods along the Mississippi River affects persons in mainland US. The economic connections of the Louisiana oil and gas industry and the Louisiana transportation and navigation industry are significant. The economic connections of the commercial fishing industry and the recreational activities industry are more local, but these activities still affect persons in other states. The first step in understanding the economic reach and significance of each of these industries is to understand the bustle of these industries in Louisiana and then appreciate the connections that these industries and activities have in other states.

The Economic Impact of Coastal Erosion in Louisiana
On State, Regional, and National Economies

Chapter 3: Scenarios of Disruptions and Bottlenecks Due to Coastal Erosion in Louisiana

Louisiana provides oil and gas to the nation. It is the home of major oil and gas fields; its accommodates the exploration, development, and production in waters in the Gulf of Mexico; and, it supports a superport that connects foreign nations with oil supplies to users in the United States. Louisiana supports a port system and a river system that moves commodities up and down the Mississippi River; and, the state also supports an intrastate waterway that moves chemicals and petroleum products from east to west. The country emphasizes trade among the states and trade in the international community. Louisiana accommodates and enhances this trade business. Commercial fishing and recreational activities round out major contributions of Louisiana to the nation.

People in Louisiana and people throughout the country accept these products as a given. Why would the people of Louisiana stop pumping oil into the pipelines and stop shipping it to the Midwest and the east? Why would the people of Louisiana suddenly prevent trade from being fully realized along the Mississippi River? Why would the people of Louisiana suddenly stop fishing for commercial purposes? Why would the people of Louisiana suddenly stop opening up its coastal regions to visitors from other areas of the state and the nation? The answer is that the people of Louisiana would not make such a decision. However, the gradual erosion of Louisiana's coast may force the oil and gas industry to interrupt, postpone, or permanently delay the production and transportation of oil and gas products. Similarly, the gradual erosion of the Louisiana coast may force transportation and navigation industries to shutdown temporarily, at least until the ports and rivers are made operational again. A vanishing coast in Louisiana may affect commercial fishing and recreational activities. The erosion of the coast of Louisiana may lead to disruptions and interruption in service to other parts of Louisiana and to other states in the union.

This erosion of coastal Louisiana becomes the significant event that imposes costs on citizens of the state of Louisiana and citizens of the United States. The nature of this coastal erosion may lead to major events such as the disruption of oil and/or natural gas pipelines that will disrupt the flow of oil and/or natural gas to the rest of the country for a week, two weeks, or some other specified period of time. The oil and gas resources still exist. They are still available for the nation to use. The disruption is one of delay and postponement.

Coastal erosion affects navigation and transportation in a similar way. The ports and the waterways are still present. These facilities just cannot be used for a certain period of time. Goods that typically are transported via these rivers and waterways will

be delayed and postponed from getting to their destination. This will create a cost for the persons depending on these commodities or, more typically, it will cause a price increase for these commodities. This price increase leads to a reduction in household income for persons using these commodities. This reduction in household income reverberates throughout the Louisiana and national economies. The significant event leads to a major disruption in the economic flow, but it does not lead to a permanent change in the economic process. The significant event may lead to a shutdown of the ports in south Louisiana leading to an interruption in the movement of goods to other parts of the nation. The ports are not destroyed; they are just made inaccessible for a week, two weeks, or some other time period.

Commercial fishing is a gradual reduction in productivity. In this situation, commercial fishing will reduce over time by a projected number of acres. Commercial fishing will not go away instantaneously and completely; rather, it will reduce year by year. Recreational activity will be subject to disruptions due to the vanishing wetlands.

The significant event that initiates the economic repercussions through a region, a state, or the nation is obviously extremely important in estimating the economic impact associated with this significant event. If the significant event does not occur, then there is no economic impact. If, however, the significant event does occur, then the economic impact will be fully recognized. The economic impact will be fully recognized every time this significant event occurs. As economists, we cannot project each and every time this significant event will occur. We can estimate the economic impact each and every time it does occur.

The first step in estimating the economic impact of the erosion of the Louisiana coast is to identify **significant economic events** that could occur if the erosion is allowed to proceed. These significant economic events are classified as **scenarios of disruptions, interruptions, and bottlenecks**. These scenarios were identified by each of the four major industries in south Louisiana in **Regional and National Economic Linkages to Coastal Wetlands Loss in Louisiana,** the Waldemar S. Nelson and Company study completed for the Louisiana Department of Natural Resources.

Another way of viewing these events is to classify them as **"what if" scenarios**. The Nelson study suggests certain scenarios if coastal erosion is not contained or corrected. These scenarios include what might happen in the oil and gas industry, the navigation and transportation industry, the commercial fishing industry, and the recreation industry if coastal erosion is not arrested. These "what if" scenarios are important in constructing the estimation and projection of the economic impact throughout the Louisiana economy, the national economy, and certain geographical regions of the United States.

The "what if" scenarios are important from two perspectives: first, they must represent realistic possibilities of what might happen in the short-term and/or long-term to the capacity of the Louisiana industries to carry out their role in the production process; and, second, the suggested scenarios must then be reduced to the type of

information that can be processed in an Input-Output (I/O) Model. The Nelson study established the "what if" scenarios. The authors of this report took the "what if" scenarios and converted them into the appropriate type of information so that they could be processed in an I/O Model.

What If Scenarios: Oil and Gas Industry

The disruptions and interruptions in the delivery of oil and gas obviously create short-term and, possibly, long-term problems for consumers and producers in Louisiana and in other states. The Nelson study determined the following "what if" scenarios for the oil and gas industry:

1. Disruption in the pipeline system removing 625,000 barrels of oil per day from the delivery system in the United States for **three** weeks. The three-week estimate is based on discussions with industry leaders about the time that a major pipeline disruption might last. The Nelson study estimated that such a disruption would raise the price of crude by $9 per barrel and gasoline by 21.6 cents per gallon. These estimated changes in prices and output are based on elasticity models as generated in other research efforts. This would impose a cost of $1.74 billion for the increased cost of gasoline.

2. Disruption in the pipeline system removing 625,000 barrels of oil per day from the delivery system in the United States for **five** weeks. The five-week estimate is based on discussions with industry leaders about the time that a major pipeline disruption might last. The Nelson study estimated that such a disruption would raise the price of crude by $9 per barrel and gasoline by 21.6 cents per gallon. These estimated changes in prices and output are based on elasticity models as generated in other research efforts. This would impose a cost of $2.91 billion for the increased cost of gasoline.

3. Disruption of natural gas pipelines leading to a three week period in which 1.1 billion cubic fee of natural gas could not flow through these pipelines. The three-week estimate is based on discussions with industry leaders about the time that a major natural gas pipeline disruption might last. Nelson estimated this would result in a 11.4 percent increase in the price of natural gas, causing higher costs for the use of natural gas in homes and an increase in the use of natural gas as a feedstock in certain industries such as the manufacturing of fertilizer. Price increases are based on elasticity studies.

These scenarios do not assume that Louisiana oil and gas will disappear from production. Neither is it assumed that a new infrastructure for delivering oil and gas to market would need to be constructed around Louisiana. Rather, it is assumed that these

disruptions will be short-lived; the disruptions may become more frequent as the coastal erosion continues.

"What If" Scenarios: Navigation and Transportation

The disruptions and interruptions in the navigation and transportation along the Mississippi River and the GIWW create short-term and, possibly, long-term problems for consumers and producers in Louisiana and in other states. Nelson determined the following "what if" scenarios for the navigation and transportation industry:

1. Disruption of the lower Mississippi River forces the ports to close for seven days with the result being an estimated $50 million cost due to the delay in getting the merchandise up the river or down the river. The $50 million is the cost of the delay, not the loss of the goods on the ships.

2. Disruption of the lower Mississippi River forces the ports to close for fourteen days with the result being an estimated $200 million cost due to the delay in getting the merchandise up the river or down the river. The $200 million is the cost of the delay, not the loss of the goods on the ships.

3. Coastal erosion forces the Gulf Intrastate Waterway into more open water, thereby increasing the costs of navigation by an estimated $8.4 million per year.

These disruptions suggest the ports and waterways will be shutdown for a relatively brief period of time. The ports and waterways are not permanently damaged---they just cannot be utilized for seven to fourteen days. There is a cost assigned to the delay in delivering the goods on board the ships, but there is no damage to the goods themselves. The inability to get these goods to market will create a price increase for these goods in the short-term. This price increase will cause household income to be reduced.

Coastal erosion effects on the GIWW suggest a more permanent damage to the intrastate coastal canal system. The waterway is being permanently altered in such a way that the cost of moving goods along the waterway will be increased. Continued coastal erosion may increase the annual cost of shipping commodities along the GIWW.

"What If" Scenario: Commercial Fishing

The continued coastal erosion results in a loss of the wetlands, the natural habitat for fish and other specifies of wildlife. This "what if" scenario draws on work by Professor Steven Farber, Professor of Economics at the University of Pittsburgh. Dr. Farber suggests a continuous loss of wetlands per year that implies a permanent loss of commercial fishing on an annual basis.

The "what If" scenario assumes a continuous loss of wetlands of 25,806 acres per year with an associated loss of commercial fishing revenues. This loss is projected through 2083. The commercial fishing is downsized each year until 2083. So each year the commercial fishing loss is increased.

"What If" Scenario": Recreational Activity

Recreational activity includes saltwater fishing, bird watching, hunting, and other related events. The Nelson study estimated the total benefits to Louisiana from recreational saltwater fishing to be $1.2 billion for Louisiana businesses. They also cite previous studies that estimate that hunters of migratory birds spent $90.5 million in 2001 and that people engaged in wildlife viewing spent $175.7 million in 2001.

The Nelson study discusses a catastrophic event which might eliminate all saltwater fishing and hence all revenues from this recreational activity. With regard to recreational fishing, Waldemar S. Nelson and Company's report begins by identifying the total benefits to Louisiana from recreational saltwater fishing. Citing previous studies, their report notes that recreational saltwater fishing generated an estimated $1.2 billion of revenue for Louisiana businesses in the year 2000. Waldemar S. Nelson and Company focus on these outdoor activities because coastal erosion places each of these outdoor activities at risk due to damaging the ecosystem.

The "what If" scenario assumes the total loss of the recreational activities associated with the wetlands. This catastrophic loss of recreational activities in South Louisiana can also be dampened by assuming a smaller loss, such as 10 percent of all saltwater fishing or other recreational activity. In this case the range of the "what If" scenario will vary from no loss of any recreational activity to 100 percent loss of all recreational activities.

The "What If " Scenarios

The "What If" scenarios are only the first step in understanding the economic impact of the erosion of the Louisiana coast. They are obviously the very important first step in the economic impact process. The "What If" scenarios for oil and gas and navigation and transportation create the disruption or postponement in the delivering of goods to the rest of the country that will create pressure on prices of these goods to rise. The "What If" scenarios are visible. They can be documented as they are occurring.

The "What If " scenarios for commercial fishing and recreational activity in coastal Louisiana relate to the gradual reduction in the opportunities of these industries to be viable. The erosion of the coast in Louisiana leaves these industries without the space to operate. In a gradual but persistent manner, the commercial fishing industry and the recreational activities in Louisiana disappear due to the erosion of the coast. These "What If" scenarios are less visible than the disruption in the ability to move oil and gas

through the pipelines or other goods through the ports and waterways, but they are occurring each and every day. This is true unless there is a catastrophic event that would unusually halt any commercial fishing and recreational activity in coastal Louisiana.

The economic impact from these "What If" scenarios is less transparent. These economic repercussions can be described as follows: (1) the increase in prices will result in a real reduction in household income; (2) this reduction in household income will temporarily make consumers around the nation spend less overall; and, (3) this reduction in household income will reverberate throughout the entire economy, from the sector in which the "What If" scenario occurs to the neighborhood retail store. The economic impact on the Louisiana economy and on the national economy will depend on the reduction in household income. The methodology of estimating the economic impact related to these "What If" scenarios is described in the next chapter.

The Economic Impact of Coastal Erosion in Louisiana On State, Regional, and National Economies

Chapter 4: Methodology in Measuring Economic Impact

In chapter 3 we detailed the scenarios, developed under the Nelson study, of the disruptions and bottlenecks that they project to occur under further coastal erosion. These scenarios were developed for four sectors in the coastal region---oil and gas activities, navigation and transportation, commercial fishing, and recreational activities.

The Nelson group was charged with estimating the **direct impacts** of the disruptions and bottlenecks. We are charged in this report to estimate the **multiplier effects** of these disruptions and bottlenecks. The direct impacts are based on the "What If" scenarios associated with the Nelson Study. The subsequent economic impacts or multiplier effects are based on these "What If" scenarios and the methodology described in this chapter.

Measuring the Multiplier Effects

What are these multiplier effects and how are they measured? Consider a counter example of sorts. Instead of something bad---such as a disruption or bottleneck---suppose that something very good happened in the Louisiana economy. Suppose Louisiana persuaded a large automobile manufacturer to locate in the State.

Think of the Louisiana economy as a large economic pond. Into this pond is dropped a rock labeled **"automobile plant**". This rock will make a large splash as it hits the economy. It will be injecting a huge amount of new business sales, household earnings, and jobs into the State's economy. This is what is referred to as the **direct effect** of the new plant on the economy.

However, that rock will also cause ripples in the pond to its outer edges. For example, employees at the plant will spend their paychecks at grocery stores, service stations, department stores, eateries, etc. This will create new income for employees of those establishments, who will then spend their new income at other establishments, etc., etc. Too, the new firm will be purchasing supplies, utilities, materials, etc., from other Louisiana firms which also creates new sales, earnings, and jobs at those establishments, etc., etc. Many different persons and businesses will be affected by the direct impact of the automobile plant locating in Louisiana. These are the so called "**multiplier effects**" of the new auto plant.

For this description of the multiplier effects we used the Louisiana economy as an example. These multiplier effects can be calculated for the Louisiana economy; or, we can be examining another region of the country or the entire US economy. The multiplier

effects can be measured for the US economy, any specific region of the US economy that is relevant to the study, or just for the Louisiana economy.

There is, fortunately, a handy tool for estimating these multiplier effects---an **input-output (I/O) table**. The Bureau of Economic Analysis (BEA) of the US Department of Commerce will construct I/O tables for any geographic region. The BEA is the same agency that generates gross domestic product, unemployment rates, consumer price indices and many other data series for the country. Using an I/O table, we can estimate the economic impact of the auto plant in our example on: (1) **sales** at Louisiana firms; (2) **household earnings** of Louisiana citizens; and (3) **jobs** for Louisianans. These estimates are also distributed across the economy in terms of the various sectors of the economy that will be affected, such as wholesale and retail trade, construction activity, transportation and utilities, business and personal services, financial services, manufacturing activities, and other industrial classifications.

Of course, we described our auto plant scenario as a **counter example** earlier, because what is being dealt with in this report is the equivalent of **removing** a rock from a pond. The multiplier effects are symmetrical. Disruptions and bottlenecks remove money from, rather than inject money into, a region. When monies are removed from a geographic region, the multiplier effect works in reverse. It removes even more sales, earnings, and jobs than suggested simply by looking at the direct effects.

Locating an automobile plant in Louisiana also indicated the region in which we were interested—namely, the state of Louisiana. The disruptions and bottlenecks associated with the erosion of the Louisiana coast will have an impact on commodities that are moved throughout the US economy. These disruptions and bottlenecks will certainly affect the Louisiana economy; however, they will also affect other parts of the US economy since Louisiana provides oil and natural gas to other states and serves as a major intermediary in the transportation of goods to other parts of the United States.

Selecting the Geographic Areas of Multiplier Effects

After reviewing the disruption/bottleneck scenarios that the Nelson group generated in their study, our team examined the impact that each of these scenarios might have on different regions. That examination aided us in selecting the geographic areas for estimating the multiplier effects.

Geographic Areas: Oil & Gas Disruptions

Louisiana has production of oil and gas; it has a superport that acts as a terminal for foreign oil; its has storage facilities for the nation's strategic oil reserves; its has the pipeline structure to support the production of oil and gas and the importation of oil; it has a major LNG terminal and is developing more capacity to import LNG; it has the facilities in south Louisiana to support the oil and gas industry in terms of businesses, launching spots for servicing the deepwater drilling and production activities, and fabrication industries to provide the platforms, jackets, and other facilities needed to

operate in deepwater; and, its has the employees necessary to work in the industry and to service the industry.

Oil and gas are major components of the US economy. Transportation is fueled by fossil fuels regardless if the mode of transportation is cars, trucks, ships, or airplanes. Getting people from home to work and back or getting products from the point of production to the point of consumption requires fossil fuel. The US economy depends on this ease of transportation. In addition, homes are heated by fuel oil and natural gas or by electricity that may be generated by oil and/or natural gas. Factories use oil and natural gas as fuels to assist in the production process or as a feedstock as a major ingredient in another product being manufactured. Louisiana is a pivotal state in providing oil and gas to the nation as a whole. **Any interruption in the ability of Louisiana to provide this oil and gas will be felt throughout the nation because there are not any alternatives for powering transportation, heating homes, fueling factories, and serving as feedstock for the production of other commodities that can be instituted in any reasonable time horizon.** A change in the price of oil and/or natural gas will affect the spending power of citizens and businesses because of its significance in the expenditure patterns of these citizens and businesses.

Table 5 illustrates the pervasive consumption of oil and natural gas throughout the United States by identifying the petroleum expenditures and natural gas expenditures in selected states, namely states with over $4.0 billion of petroleum expenditures and $1.0 billion of natural gas expenditures. There are 31 states that meet these criteria. These 31 states make up 86.4 percent of all petroleum expenditures in the nation and 88.4% of all natural gas expenditures. A disruption in oil deliveries from Louisiana and/or natural gas deliveries from Louisiana will touch states as far away as New York, Illinois, Michigan, and California and as close as Texas, Arkansas, and Mississippi.

Input-output models for the US economy, for regions including these 31 states with 86.4 percent of all petroleum expenditures and 88.4 percent of all natural gas expenditures, and for Louisiana were utilized in this study. The purpose was to ascertain the economic impact on the entire US economy because of the disruption of the oil and gas markets due to the erosion of the Louisiana coast; ascertain the economic impact on the 31 states with high oil and gas expenditures; and ascertain the economic impact on the state of Louisiana, the state in which the disruptions and bottleneck are initiated.

Table 5
Expenditures on Petroleum Products and Natural Gas: Selected States

States Grouped for Economic Impact Analysis Economic Repercussions due to Oil and Gas Complications From the Loss of the Louisiana Coast					
State	Natural Gas Expenditures by state (Millions $)	Percent of Natural Gas Expenditures by State	State	Petroleum Expenditures by state (Millions $)	Percent of Petroleum Expenditures by State
Texas	15,373	13.3%	Texas	45,536	12.6%
California	13,512	11.6%	California	35,101	9.7%
New York	9,695	8.4%	Florida	17,476	4.8%
Illinois	6,682	5.8%	New York	17,030	4.7%
Ohio	5,544	4.8%	Pennsylvania	14,115	3.9%
Louisiana	4,986	4.3%	Ohio	13,359	3.7%
Pennsylvania	4,545	3.9%	Illinois	13,259	3.7%
Michigan	3,975	3.4%	Louisiana	11,753	3.2%
New Jersey	3,565	3.1%	New Jersey	11,403	3.1%
Indiana	3,067	2.6%	Michigan	11,283	3.1%
Massachusetts	2,829	2.4%	North Carolina	9,884	2.7%
Florida	2,803	2.4%	Georgia	9,827	2.7%
Georgia	2,479	2.1%	Virginia	9,041	2.5%
Wisconsin	2,415	2.1%	Indiana	8,426	2.3%
Oklahoma	2,344	2.0%	Washington	7,548	2.1%
Minnesota	1,954	1.7%	Massachusetts	7,439	2.1%
Missouri	1,870	1.6%	Missouri	7,142	2.0%
Virginia	1,867	1.6%	Wisconsin	6,878	1.9%
Maryland	1,731	1.5%	Tennessee	6,858	1.9%
Alabama	1,550	1.3%	Minnesota	6,722	1.9%
North Carolina	1,539	1.3%	Kentucky	6,494	1.8%
Tennessee	1,505	1.3%	Maryland	5,940	1.6%
Washington	1,476	1.3%	Alabama	5,787	1.6%
Colorado	1,458	1.3%	Arizona	5,439	1.5%
Iowa	1,454	1.3%	Colorado	4,820	1.3%
Kansas	1,359	1.2%	South Carolina	4,810	1.3%
Arkansas	1,254	1.1%	Oklahoma	4,788	1.3%
Kentucky	1,220	1.1%	Iowa	4,457	1.2%
Mississippi	1,148	1.0%	Connecticut	4,314	1.2%
Oregon	1,135	1.0%	Oregon	4,129	1.1%
Arizona	1,100	0.9%	Mississippi	4,091	1.1%
Above States less Louisiana		88.4%	Above States less Louisiana		86.4%
Eastern/Midwestern States		73.6%	Eastern/Midwestern States		72.8%
Western States		14.8%	Western States		13.6%
Source: Waldemar Nelson Study					

Geographic Areas: Navigation & Transportation

The number of states affected by navigation along the Mississippi River and the GIWW is listed in Table 6. States bordering on the Mississippi River and rivers that pour into the Mississippi obviously require a well-functioning outlet to the ocean at the mouth of the Mississippi. Tonnage originating in Louisiana and proceeding to states along the Mississippi River range from 9.7 percent of total tonnage originating in Louisiana and going to Illinois to 1.1 percent going to Iowa. Ohio and Pennsylvania, not bordering the Mississippi but having rivers that reach the Mississippi, have 7.6 percent and 3.5 percent respectively of the total tonnage originating in Louisiana and going to the rest of the country. Texas, Florida, Mississippi, and Alabama have almost 20 percent of the tonnage originating in Louisiana and reaching them via the GIWW.

Illinois has 16.8 percent of the tonnage originating within its boundaries with Louisiana as its destination. Kentucky and Missouri have 3.5 percent of the tonnage originating within their boundaries with Louisiana as the destination, and Minnesota and Iowa have 3.0 percent of the tonnage originating within their boundaries with Louisiana as the destination.

No state is self-sufficient in the United States. Every state depends on the transportation of products, either as a means of importing commodities from another state or country to provide the demands of its citizens or as a means of exporting commodities to another state or country thereby providing jobs for its citizens. The ports of south Louisiana are major participants in the movement of goods from other countries throughout the United States and the movements of goods from states in the United States to other countries throughout the world. **Intervening with or disrupting the movement of goods along the Mississippi River and/or along the GIWW will affect other states because there are not reasonable alternatives to move these goods within a reasonable time horizon.** There are transportation and shipping patterns across the states. If a major entry point or exit point in this transportation pattern is closed for a period of time, other economic agents along this transportation trail will be affected. Goods that normally flow to them will be limited. Prices on these goods will rise causing a reduction in the household income of persons living in these regions. This impact will be felt by household and businesses in the United States, in various regions that depend more heavily on goods transported via the Mississippi River and/or the Gulf Intracoastal Waterway, and in Louisiana, the state in which the shutdown in navigation and transportation begins.

Table 6
Tonnage Originating in Louisiana and Tonnage Destined for Louisiana

States Grouped for Economic Impact Analysis Economic Repercussions due to Navigational Complications From the Loss of the Louisiana Coast				
State	**Tonnage Originating in Louisiana (Millions)**	**Percent of Total Tonnage Originating in Louisiana**	**Tonnage with Louisiana as its Destination (Millions)**	**Percent of Total Tonnage with Louisiana as its Destination**
Illinois	**9.7**	**3.8%**	**48.6**	**16.8%**
Texas	**12.4**	**4.8%**	**10.5**	**3.7%**
Kentucky	**7.1**	**2.7%**	**10.1**	**3.5%**
Missouri	**2.9**	**1.1%**	**10.0**	**3.5%**
Minnesota	**2.4**	**0.9%**	**8.7**	**3.0%**
Iowa	**1.1**	**0.4%**	**8.6**	**3.0%**
Florida	**31.4**	**12.1%**	**4.8**	**1.7%**
Tennessee	**7.0**	**2.7%**	**3.7**	**1.3%**
Indiana	**3.8**	**1.5%**	**3.6**	**1.3%**
Mississippi	**4.2**	**1.7%**	**3.5**	**1.2%**
Arkansas	**2.7**	**1.0%**	**2.9**	**1.0%**
Alabama	**3.1**	**1.2%**	**2.2**	**0.8%**
West Virginia	**1.6**	**0.6%**	**2.2**	**0.8%**
Ohio	**7.6**	**2.9%**	**1.6**	**0.4%**
Pennsylvania	**3.5**	**1.3%**	**0.3**	**0.1%**
Total	**100.5**	**38.7%**	**121.3**	**42.1%**
Foreign	**106.6**	**41.2%**	**117.2**	**40.7%**
Selected States As % of US Tonnage	**100.5**	**65.8%**	**121.3**	**71.0%**
Source: Waldemar Nelson Study				

Geographic Areas: Commercial Fishing

Commercial fishing will not have the same immediate impact on the state and national economy as oil and gas and navigation and transportation will have. **However, commercial fishing can and will have a major impact on a community within Louisiana and a major impact on a way of life for families who have fished for generations**. Commercial fishing will also have an impact on the culture of the community.

Also, the loss of commercial fishing is cumulative since the loss of the wetlands will occur over time. The true cost of the loss of commercial fishing due to the loss of Louisiana wetlands is not just the loss of commercial fishing revenues and the spillovers in any year, but the cumulative loss of commercial fishing revenues and spillovers over many years.

The loss of commercial fishing will definitely affect the state of Louisiana. The economic impact of the direct effect of a loss of commercial fishing in Louisiana will be estimated for Louisiana. The economic impact of the direct effect of the loss of commercial fishing in Louisiana due to the erosion of the Louisiana coast will all be estimated for the US economy.

Geographic Areas: Recreation

Tourism is a major industry in Louisiana. Indeed, it is essential to cities such as New Orleans. In New Orleans the magnet is not necessarily fishing, hunting, and bird watching. However, any potential problems for New Orleans due to the erosion of the Louisiana coast will potentially cause problems for the tourist attraction of New Orleans. This would be a major hit on a city that makes tourism a major component of its overall employment structure.

Again, tourism does not have the same economic reach as oil and gas and navigation and transportation. That is, it will not affect many states other than Louisiana except it will possibly cause hotel rates and convention rates to rise in other cities if New Orleans is not available as a possible alternative. However, tourism is vital to the current economic success of New Orleans and of the state of Louisiana. Tourism is also significant to coastal parishes. The significance to the rest of the country is the unique opportunity southern Louisiana offers to curious people from around the country.

The economic impact of the direct effect of a reduction in recreational activity in coastal Louisiana due to the erosion of the coast will be estimated for the state of Louisiana and for the US economy.

Summary of Geographic Areas by Disruption/Bottleneck

Oil and gas and navigation and transportation stand out as major industries in south Louisiana that connect significantly with the rest of the country. The country cannot accomplish in a reasonable amount of time the ability to replace the oil and gas from the federal OCS if it was disrupted. Neither could the country just quickly give up the transportation along the Mississippi River to the Midwest and further east or the GIWW that moves primarily oil and gas products east to west. Interruptions and delays in the delivery of oil and gas from Louisiana to other parts of the nation will create economic hardship on citizens and businesses in other parts of the nation. Similarly, interruptions and delays in the shipment of goods from foreign countries to states in the Midwest and East or in the shipment of goods from states in the Midwest and East to foreign countries will create economic problems to citizens and businesses in these states.

The economic significance of the erosion of the Louisiana coast, if it leads to a major disruption in the delivery of oil and gas or to a major disruption in the delivery of exports and imports via the Mississippi River or the Gulf Intrastate Waterway, becomes larger than just any economic hardship that these disruptions might impose on Louisiana alone. Other states will also sustain an economic hardship due to the erosion of the Louisiana coast and the subsequent disruption of the delivery of oil and gas and/or goods being transported up and down the Mississippi River or across the GIWW.

States to be included in the economic impact analysis for each of the scenarios are listed in Table 7. These states were selected based on oil and gas expenditures, tonnage of goods originating in Louisiana and going to the state and tonnage of goods originating in the state and going to Louisiana, and other factors that were considered significant in the connection of these Louisiana industries to national economic conditions.

Four impact regions are listed for any disruption in the Louisiana **oil and gas industry**. The state of Louisiana and the United States are listed as two of these regions. Two regions of the United States have also been defined as being major users of natural gas and petroleum products.

Table 7
Economic Impact Regions Used in Analysis

Disruption and Interruption in Industrial Activity Due to Coastal Erosion in Louisiana by Specific Industry	States Included in Economic Impact Analysis for Each Major Industry
Oil and Gas Industry (4 impact areas)	Louisiana
	United States
	Alabama, Arkansas, Florida, Georgia, Kansas, Kentucky, Illinois, Indiana, Iowa, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, New Jersey, New York, North Carolina, Ohio, Oklahoma, Pennsylvania, Tennessee, Texas, Virginia, and Wisconsin
	Arizona, California, Colorado, and Oregon
Navigation and Transportation (3 impact areas)	Louisiana
	United States
	Arkansas, Kentucky, Illinois, Indiana, Iowa, Minnesota, Mississippi, Missouri, Ohio, Pennsylvania, Tennessee, and West Virginia
Commercial Fishing (2 impact areas)	Louisiana
	United States
Recreational Activities (2 impact areas)	Louisiana
	United States

Source: authors identified impact regions.

Three impact regions are listed for any disruption in **navigation and transportation** due to coastal erosion in Louisiana. The state of Louisiana and the United States are listed as two of these regions. The other region will be states bordering the Mississippi River, since these states are major beneficiaries of the shipments occurring on a daily basis.

Reductions in **commercial fishing and recreational activity** will be confined primarily to Louisiana so estimates of the impact on the Louisiana economy will be calculated. For informational purposes, estimates of the impact of reduction in commercial fishing and recreational activity in Louisiana on the rest of the country will be calculated.

Geographic Areas: DNR Approval

Before settling on the geographic areas shown in Table 7 a meeting was held with DNR officials and the rationale for selecting these areas was reviewed. Approval was secured from the DNR team to proceed with our analysis using the areas in Table 7.

Continuous Cost v. Catastrophic Event

The scenarios identified in the Nelson study vary considerably. In some cases, the Nelson team identified a **continuous cost** sometimes mounting over time. For example, that study suggests that through turning portions of the Gulf Intracoastal Waterway into open water, coastal erosion can raise the transportation costs of barges by $8.3 million each year.

Other scenarios note the possibility of **catastrophic events** due to coastal erosion such as the closure of the Mississippi River or the inability to transport Louisiana's oil and gas for a defined period of time. The catastrophic events may occur once or multiple times. Likewise, the timing of the event or probability of the event is difficult to predict.

In the case of continuing costs, we present both the one-year cost and the present value of costs over a longer period of years. In the case of catastrophic events, we compute the indirect costs for a single occurrence in current period dollars, and we compute a present value of these costs if the events recur. All costs are computed for the entire US, Louisiana, and for separate regions of the US according to our analysis summarized in Table 7.

The Economic Impact of Coastal Erosion in Louisiana
On State, Regional, and National Economies

Chapter 5: Assessment of Economic Impact: Oil and Gas Disruptions

Louisiana and her coast provided more crude oil for the US than any other state in 2000---over 27 percent of total US production. Louisiana pipelines and pumping stations serve as the key link between that crude oil and an energy-oriented US economy. Coastal erosion makes those pipelines and pumping stations more vulnerable to both weather and accidents. To quantify the impact of this coastal erosion, the Nelson study focused on **scenarios where a hurricane damages these vulnerable assets**. In particular, they analyze the effects of a three- to five-week disruption in Louisiana's crude oil and a three-week disruption in Louisiana natural gas supply. This disruption must be viewed against the backdrop of Louisiana being a major supplier of oil and natural gas to other states in the nation.

Impact of Oil Disruption

Consider first the disruption in crude oil. The scenario consists of a disruption of Louisiana's pipeline system that removes 625,000 barrels per day or 10.68 percent of US production. The Nelson team estimated that this disruption of oil supplies could raise prices by $9 per barrel and 21.6 cents per gallon of gasoline. In the case of a three-week disruption, this translates into a $1.74 billion cost to consumer. For a five-week disruption, consumers would pay $2.91 billion more for gasoline.

While the total impact is large, the indirect impact arises from the small changes in individual consumer's lives and will last longer than the five-week disruption. To pay for higher fuel, consumers must cut back in other areas. Some consumers may adjust weekly expenditures by cutting current expenses, such as canceling a family outing to the movie. For others, the higher gas prices may cause them to rethink the purchase of an appliance or automobile. Due to the impact on savings and employment, a three-week oil disruption will affect the economy for a period longer than three weeks. All calculations suggest the estimated economic impact is spread over a time period of one year.

We consider the impact of the three- and five-week disruptions on four areas: (1) the continental US, (2) grouping of states from the eastern United States and (3) grouping of states from the western United States, and (4) the state of Louisiana. Table 7 contains a list of the 25 states included in the eastern US region and the four states making up the western US region. The eastern US region makes up 72.8 percent of total US petroleum consumption, and the western region consumes 13.6 percent of US petroleum.

Impact of three-week oil disruption. Table 8 lists the estimates of lost sales, earnings, and jobs that would occur with a three-week disruption of Louisiana's oil. The first row shows that the US could expect to lose $3.2 billion of sales, 32,390 jobs, and

$1.0 billion of earnings. The bulk of losses occur in the 25-state eastern US region---over 23,000 lost jobs. The four-state western US region is predicted to lose over 3,000 jobs, while Louisiana employment is predicted to fall by 831 jobs.

Table 8
The Impact of a Three-Week Louisiana Oil
Disruption on Sales, Earnings and Employment

	Lost Sales (Millions)	Lost Earnings (Millions)	Lost Employment
Continental US	$3,676.1	$1,035.6	32,390
Eastern US	$2,497.7	$702.0	23,344
Western US	$344.5	$99.6	3,026
Louisiana	$68.2	$19.9	831

Source: Authors computations using the US Bureau of Economic Analysis RIMS II Input-Output multipliers.

Impact of five-week oil disruption. Table 9 contains the estimated impact of a five-week disruption in Louisiana crude oil. The US job loss rises to 54,170 and again the Eastern US region is the biggest regional loser, dropping 39,041 jobs. Losses in the Western US rise to 5,060, and Louisiana's job decline is estimated at 1,389.

This longer disruption creates proportionately larger sales and earnings losses as well. For the entire US, business sales would decline by over $6.1 billion, and household earnings would fall by over $1.7 billion. A quick review of the last three rows of Table 9 reveal that the sales and earnings losses hit the Eastern US region the hardest, followed by the Western region and Louisiana.

Table 9
The Impact of a Five-Week Louisiana Oil
Disruption on Sales, Earnings and Employment

	Lost Sales (Millions)	Lost Earnings (Millions)	Lost Employment
Continental US	$6,148.0	$1,732.0	54,170
Eastern US	$4,177.2	$1,174.1	39,041
Western US	$576.1	$166.7	5,060
Louisiana	$114.1	$33.2	1,389

Source: Authors computations using the US Bureau of Economic Analysis RIMS II Input-Output multipliers.

Impact of five-week oil disruption on industries. Policy analysts may be interested in which industries would be the most impacted by the five-week oil disruption. Appendix Tables B-1 through B-12 provide the I/O table estimates of these industry impacts for all four regions. The tables show the impacts of the disruption on business sales, household earnings, and jobs within industries across the four regions.

Readers will note a common pattern across the tables. For example, a review of the **sales impact tables**---Tables B-1, B-4, B-7, and B-10---will reveal that in every region the industry hardest hit by the disruption **is** real estate. For example, of the $6,148 million projected sales loss in the US (see the first column of Table 9 above), $800.5 million would be lost in the real estate industry. Health services and retail trade sectors would be the next hardest hit---with over one-half billion in lost sales--- followed by business services, financial institutions, and miscellaneous services. This rank order of industry losses holds across all four sales impact tables in Appendix B.

A similar pattern exists across the **earnings tables**---B-2, B-5, B-8, and B-11. The rank order of the industries does change slightly, however. Of the total of $1.732 million in estimated lost earnings in the US from the five-week disruption (see the second column of Table 9 above), workers in the health services sector take the largest hit---a total decline of $260.2 million---followed by workers in business services (down $211.6 million) and retail trade (a fall of $181.3 million). Again, this rank order of industry losses holds across all four earnings impact tables in Appendix B.

Finally, Tables B-3, B-6, B-9, and B-12 show how the projected 54,170 job losses in the US would be distributed across the various industries in the regions. In all regions, the very labor-intensive retail trade sector would take the biggest hit, losing 8,373 jobs nationally. Health services would drop 6,507 jobs, and approximately 5,500 jobs would disappear in miscellaneous services and business services---two other typically labor-intensive sectors. An estimated 4,853 jobs would be lost in eating and drinking places.

For the reader who is interested in the impact on various industries of a three-week disruption of oil Tables A-1 through A-12 in Appendix A provide those details. It will not take long to figure out that the information in the sales, earnings, and jobs tables in Appendix A follow the same patterns we have described above for the five-week disruption (Appendix B). Since the disruption is for a shorter period, the numbers in Appendix A will be lower than those in Appendix B.

Impact of Natural Gas Disruption

The Nelson study also presented a scenario based on **storm damage to Louisiana's natural gas pipelines**. They conclude that a three-week disruption in Louisiana's natural gas supplies would raise natural gas prices by 11.4 percent.

Table 10 contains 2002 data on natural gas consumption for residential, commercial, industrial and electric power uses. The estimated total cost of the 11.4 percent three-week price increase across these sectors is $739.8 million.

Table 10
Natural Gas Expenditures and Estimated Cost of 11.4% Increase

	Price (Per 1000 cf)	2002 consumption (Billion cf)	Estimated Expenditure (Millions)	Estimated 3-week Expenditure (Millions)	11.4% Increase (Millions)
Residential	$7.85	4,914	$38,574.9	$2,225.5	$253.7
Commercial	$6.56	3,114	$20,427.8	$1,178.5	$134.4
Industrial	$4.01	8,229	$32,998.3	$1,903.7	$217.0
Electric Power	$3.70	5,533	$20,472.1	$1,181.1	$134.6

Source: Energy Information Administration, Annual Energy Review 2002 and author's computations.

Back in Table 5 we detailed natural gas expenditures for the states making up our Eastern and Western US regions. The Eastern region spending accounts for 73.6 percent of the US total compared to 14.8 percent in the Western grouping.

Regional impacts of natural gas disruption. Table 11 contains the estimated impact of the additional expenditures on sales, earnings and employment. The US could expect to lose 12,897 jobs from a three-week natural gas disruption. As in the oil disruption case, the Eastern region would be the hardest hit by the disruption, dropping 9,049 jobs. Job declines in the other two regions would be noticeably smaller, with a fall of 1,290 jobs in the Western region and 491 jobs lost in Louisiana.

Table11
The Impact of a Three-Week Louisiana Natural Gas Disruption on Sales, Earnings and Employment

	Lost Sales (Millions)	Lost Earnings (Millions)	Lost Employment
Continental US	$1,803.1	$455.2	12,897
Eastern US	$1,257.3	$316.4	9,049
Western US	$198.6	$48.4	1,290
Louisiana	$57.4	$12.9	491

Source: Authors computations using the US Bureau of Economic Analysis RIMS II Input Output multipliers.

As seen in column one of this table, business firms would lose an estimated $1.8 billion in sales under the natural gas disruption, and households in the country would find

their earnings falling by nearly one-half billion dollars. The sales and earnings losses across the other regions are proportional to their job losses described above.

Impact of three-week natural gas disruption on industries. Tables C-1 through C-12 in Appendix C indicate how the sales, earnings, and job losses from the natural gas disruption, documented in Table 11, would be distributed across industries in the four regions. The same similar patterns across tables that we discovered in reviewing the oil-disruption-industry-impact tables in Appendix B will be found in these Appendix C tables as well. That is, the top ranked industry in terms of sales losses in the US table (C-1) will be the same top ranked industry in the sales loss tables in the other three regions. The same goes for the earnings and jobs tables.

In all four sales impact tables, the non-durable goods industries suffer the largest sales losses, totaling $410.1 million at the US level (Table C-1). Firms in the service sector would experience the second greatest sales losses at $349.4 million, followed by transportation and utilities (down $286.6 million) and firms in the broadly defined finance/insurance/real estate sector (down $267 million).

When it comes to lost earnings due to the natural gas disruption, workers in the very labor-intensive services (minus $136.4 million) and retail trade (minus $77.2 million) sectors would experience the biggest blows to their pocketbooks. Over $50 million apiece in lost earnings would be felt by workers in the non-durable goods (minus $69 million) and transportation and utilities (down $59 million) industries.

Finally, Tables C-3, C-6, C-9, and C-12 document the job losses across industries for each of the four regions. Job losses in the services sector from the natural gas disruption would total 4,532 at the US level, and the retail trade sector would take a big hit, dropping 3,564 jobs. Just over 1,000 jobs apiece would disappear in non-durable goods, transportation and utilities, and finance/insurance/real estate.

The Economic Impact of Coastal Erosion in Louisiana
On State, Regional, and National Economies

Chapter 6: Assessment of Economic Impact: Navigation and Transportation

The Nelson study focused on two key ways that coastal erosion affects navigation and transportation. First, coastal erosion increases the possibility of a closure of the lower Mississippi due to siltation damage or loss of channel due to a hurricane. Second, erosion is turning a portion of the Gulf Intracoastal Waterway (GIWW) into open water.

Impact of Closure of the Lower Mississippi

The Nelson study analyzed two scenarios for the closure of the lower Mississippi---a **seven-day closure** and a **fourteen-day closure**. They estimate that a **seven-day closure of the lower Mississippi to shipping would cost $50 million, and a fourteen-day closure would result in $200 million in direct losses**. These estimates approximate the cost of not having these products for either 7 days or 14 days. These estimates do not suggest the products will be lost or wasted. The estimates do not assume that the ports will be permanently damaged or that the river will be non-navigable. We computed the indirect cost of both closures for the US, Louisiana, and a group of states that rely heavily on shipping that travels through the channel. This latter group of states is listed back in Table 7.

Table 12 contains the value of lower Mississippi waterway movements. The table includes a group of states that we define as the **Louisiana shipping region (**see also Table 7). We compute lost sales, earnings, and jobs by allocating the direct losses based on the value of shipping. Our calculations also assume 75 percent of the costs are born by consumers, while shippers absorb 25 percent.

Table 12
Waterway Movements with an Origin of Louisiana

Destination	Value (Thousands)	Share
Foreign	$11,736,427	29.4%
LA	$6,564,371	16.4%
FL	$5,758,556	14.4%
LA Shipping Region:		
TX	$2,351,806	5.9%
IL	$2,008,890	5.0%
OH	$1,611,368	4.0%
KY	$1,404,991	3.5%
TN	$1,399,866	3.5%
PA	$716,086	1.8%
AR	$710,588	1.8%
IN	$696,227	1.7%
MO	$499,950	1.3%
MN	$401,347	1.0%
WV	$292,064	0.7%
IA	$160,559	0.4%
Total	$39,914,365	
US Share of Total		70.6%
LA Shipping Region's Share of Total		30.7%
LA Shipping Region's Share of US		43.5%

Source: Table 8-A-3, Waldemar S. Nelson and Company.

Impact of seven-day closure. Table 13 contains the estimated impact of a seven-day closure of the lower Mississippi. One will note that the numbers in this table are a fraction of those back in Tables 8, 9, and 11 that show the impact of the oil and gas disruptions. Still, the impacts of the seven-day closure are non-trivial as the data in Table 13 reveal. Business sales in the US will decline by $80.8 million, and household earnings would fall by $22.2 million. An estimated 663 jobs would disappear in the nation.

For the 12-state region, the drops would be: business sales -$29.8 million; household earnings -$7.8million; and jobs –251. Louisiana's declines would be: business sales -$11.5 million; household earnings -$3.1 million; and jobs –120.

Table 13
The Impact of a Seven-Day closure of the Lower Mississippi on Sales, Earnings and Employment

	Lost Sales (Millions)	Lost Earnings (Millions)	Lost Employment
Continental US	$80.8	$22.2	663
LA Shipping Region	$29.8	$7.8	251
Louisiana	$11.5	$3.1	120

Source: Authors computations using the US Bureau of Economic Analysis RIMS II Input Output multipliers.

Impacts of the seven-day closure **across industries** are documented in Tables D-1 through D-9 in Appendix D. Note in Table D-1 that of the total loss of $80.8 million in business sales in the US the biggest losses would be felt in transportation (minus $13 million). This is not surprising, since this is the sector that contains the barge, shipping, and truck traffic that is most directly involved on the River. According to the data in Table D-1, the real estate sector would suffer sales losses of $8.8 million, followed by firms in business services, where sales are projected to fall by $6.9 million. Over $5 million in sales would be lost by firms in health services, retail trade, and the financial sector.

Table D-2 shows in which industries the greatest household earnings would be lost due to the closure. At the top of the list would be workers in business services, where payrolls would fall by just over $3 million. Nearly $3 million would vanish from payrolls in transportation, followed by a decline of over $2.7 million in health services.

Job losses by industry are itemized in Table D-3. The very labor-intensive retail trade sector would lose 88 jobs, while business services employment would fall by 76 and transportation by 73.

These exact same patterns in sales, household earnings, and job losses for the 12-state region and the State of Louisiana can be found in the remaining six tables in Appendix D. Because the regions get progressively smaller, the impact numbers in these tables are obviously much smaller than for the nation as a whole.

Impacts of fourteen-day closure. Table 14 documents the losses in business sales, household earnings, and jobs in the US due to a fourteen-day closure of the lower Mississippi River. Recall that the Nelson study estimated that though the closure is only twice as long, the direct losses would quadruple (from $50 million to $200 million) if the closure runs an extra week.

Because the direct losses quadruple, basically the numbers in Table 14 follow the same pattern as in Table 13, except the numbers are four times larger. Business sales in the US would decline by $323.3 million, household earnings would fall by $88.6 million, and the nation would lose 2,653 jobs.

Table 14
The Impact of a Fourteen-Day closure of the Lower Mississippi on Sales, Earnings and Employment

	Lost Sales (Millions)	Lost Earnings (Millions)	Lost Employment
Continental US	$323.3	$88.6	2,653
LA Shipping Region	$119.4	$31.4	1,006
Louisiana	$46.1	$12.4	480

Source: Authors computations using the US Bureau of Economic Analysis RIMS II Input Output multipliers.

Impacts of the fourteen-day closure on industries are provided in Appendix E, Tables E-1 through E-9. Again, because the direct losses for the fourteen-day closure are four times that of a seven-day closure, the numbers in tables E-1 through E-9 follow the same patterns as those in D-1 through D-9, except the numbers in Appendix E are four times larger than those in Appendix D.

Impact of More Open Water on the GIWW

The Nelson team also noted that coastal erosion is turning portions of the Gulf Intracoastal Waterway (GIWW) into open water. Open water is more difficult for barges and tugboats to navigate, especially during heavy seas. The Nelson group estimates **this erosion will increase shipping costs by an estimated $8.4 million per year**.

Table 15 contains estimates of the impact of this increase in shipping costs on sales, earnings, and employment for the continental US, Louisiana shipping region, and state of Louisiana.

Table 15
Annual Impact of Additional Barge Costs on Sales, Earnings and Employment

	Lost Sales (Millions)	Lost Earnings (Millions)	Lost Employment
Continental US	$13.4	$3.7	110
LA Shipping Region	$5.0	$1.3	42
Louisiana	$3.5	$0.5	20

Source: Authors computations using the US Bureau of Economic Analysis RIMS II Input Output multipliers.

These impacts are substantially smaller than those expected under the oil and gas disruptions or the potential closure of the lower Mississippi River. Business sales in the US would drop $13.4 million, household earnings would fall by $3.7 million, and 110 jobs would be lost. In the 12-state shipping region business sales would decline by $5 million, while the comparable number for Louisiana business sales would be $3.5 million. Household earnings in the shipping region would drop by $1.3 million and in Louisiana by one half million dollars. Forty-two jobs would be lost in the 12-state shipping region and only 20 jobs would disappear in Louisiana. Because these are all relatively small numbers, we did not calculate losses by industry.

These economic impacts assume no loss of infrastructure and no permanent change in shipping patterns. The costs are simply the delay in receipt of goods. The economic losses associated with the loss of infrastructure, and/or a permanent change in shipping patterns would be more substantial.

The Economic Impact of Coastal Erosion in Louisiana On State, Regional, and National Economies

Chapter 7: Assessment of Economic Impact: Commercial Fishing

The Nelson study's analysis of the impact of coastal erosion on commercial fishing draws heavily on Farber's (1996) *Contemporary Policy Issues* article. Farber's methodology assumes a constant loss in wetlands per year and that the loss is permanent. The Nelson team presented results with several alternative assumptions with regard to the size of loss in wetlands, marginal value of fish lost per acre, and discount rate. In this section, we focus on the baseline Farber model with a 3% discount rate.

The Farber Study

Farber's baseline model assumes a loss of 25,806 acres each year over the 14-year period from 1990 to 2003. Farber estimates the marginal product per acre as $51.52 in 1990, which implies a 1990 loss of $1,329,525 in 1990 dollars. All losses are permanent, so there is also a loss of $1,329,525 for this land in 1991 and in each subsequent year. Using a 3% discount rate, the 25,806 acres first lost in 1990 eventually creates a total loss of $44,317,504 in 1990 dollars or $61,459,807 in 2003 dollars.

In 1991, another 25,806 acres are permanently lost. Farber notes that the marginal product or output per acre will rise as the acreage falls, assuming other factors of production are fixed. His model predicts a marginal product of $51.83 in 1991. In perpetuity, this 1991 figure creates an eventual loss of $60,029,126 in 2003 dollars. Notice that the total loss of wetlands in 1991 is 51,612 acres and the total cost to commercial fishing in that year alone is $3,590,965. In 1992, another 25,806 acres of wetlands permanently disappears, for a total of 77,418 acres of wetlands lost relative to no coastal erosion, and commercial fishing loses an estimated $5,245,263.

Table 16 contains the number of total acres of wetlands lost and the lost revenues to commercial fishing for the 1990-2083 period studied by Farber. The revenue losses rise from $1.8 million in 1990 to $18.2 million in 2003. The revenue loss peaks in 2026 at $26.1 million, as increases in acreage lost is offset by discounting of future dollars. By 2083, over 2.4 million acres of Louisiana wetlands are lost. This loss of 2.4 million acres of wetlands is projected to create a total loss of $2.2 billion (in 2003 dollars) over the entire 94-year period.

Table 16
Loss of Commercial Fishing Revenues by Year

Year	Cumulative Acres Lost	Loss to Commercial Fishing (2003 $)
1990	25,806	$1,843,794
1991	51,612	$3,590,965
1992	77,418	$5,245,263
1993	103,224	$6,810,312
1994	129,030	$8,289,610
1995	154,836	$9,686,538
1996	180,642	$11,004,360
1997	206,448	$12,246,228
1998	232,254	$13,415,186
1999	258,060	$14,514,173
2000	283,866	$15,546,023
2001	309,672	$16,513,476
2002	335,478	$17,419,174
2003	361,284	$18,265,666
2004	387,090	$19,055,413
2005	412,896	$19,790,789
2006	438,702	$20,474,082
2007	464,508	$21,107,501
2008	490,314	$21,693,177
2009	516,120	$22,233,163
2010	541,926	$22,729,440
2011	567,732	$23,183,916
2012	593,538	$23,598,431
2013	619,344	$23,974,760
2014	645,150	$24,314,610
2015	670,956	$24,619,629
2016	696,762	$24,891,402
2017	722,568	$25,131,458
2018	748,374	$25,341,268
2019	774,180	$25,522,249
2020	799,986	$25,675,764
2021	825,792	$25,803,128
2022	851,598	$25,905,604
2023	877,404	$25,984,407
2024	903,210	$26,040,709
2025	929,016	$26,075,634
2026	954,822	$26,090,265
2027	980,628	$26,085,644
2028	1,006,434	$26,062,770
2029	1,032,240	$26,022,606
2030	1,058,046	$25,966,076

Table 16 (continued)
Loss of Commercial Fishing Revenues by Year

Year	Cumulative Acres Lost	Loss to Commercial Fishing (2003 $)
2031	1,083,852	$25,894,069
2032	1,109,658	$25,807,437
2033	1,135,464	$25,707,001
2034	1,161,270	$25,593,546
2035	1,187,076	$25,467,830
2036	1,212,882	$25,330,576
2037	1,238,688	$25,182,480
2038	1,264,494	$25,024,210
2039	1,290,300	$24,856,406
2040	1,316,106	$24,679,681
2041	1,341,912	$24,494,624
2042	1,367,718	$24,301,798
2043	1,393,524	$24,101,743
2044	1,419,330	$23,894,977
2045	1,445,136	$23,681,994
2046	1,470,942	$23,463,269
2047	1,496,748	$23,239,254
2048	1,522,554	$23,010,384
2049	1,548,360	$22,777,073
2050	1,574,166	$22,539,717
2051	1,599,972	$22,298,695
2052	1,625,778	$22,054,369
2053	1,651,584	$21,807,084
2054	1,677,390	$21,557,169
2055	1,703,196	$21,304,939
2056	1,729,002	$21,050,693
2057	1,754,808	$20,794,716
2058	1,780,614	$20,537,280
2059	1,806,420	$20,278,644
2060	1,832,226	$20,019,055
2061	1,858,032	$19,758,746
2062	1,883,838	$19,497,939
2063	1,909,644	$19,236,847
2064	1,935,450	$18,975,670
2065	1,961,256	$18,714,597
2066	1,987,062	$18,453,810
2067	2,012,868	$18,193,478
2068	2,038,674	$17,933,763
2069	2,064,480	$17,674,819
2070	2,090,286	$17,416,788

Table 16 (continued)
Loss of Commercial Fishing Revenue by Year

Year	Cumulative Acres Lost	Loss to Commercial Fishing (2003 $)
2071	2,116,092	$17,159,807
2072	2,141,898	$16,904,004
2073	2,167,704	$16,649,501
2074	2,193,510	$16,396,410
2075	2,219,316	$16,144,838
2076	2,245,122	$15,894,885
2077	2,270,928	$15,646,645
2078	2,296,734	$15,400,205
2079	2,322,540	$15,155,647
2080	2,348,346	$14,913,047
2081	2,374,152	$14,672,476
2082	2,399,958	$14,434,000
2083	2,425,764	$14,197,679

Impact of Commercial Fishing Losses

The losses for commercial fishing also affect other segments of the economy. With lower revenues, commercial fishermen will spend less on everything from equipment to retail products. Table 17 contains the indirect impact of the commercial fishing damages from coastal erosion for 2003, the peak damages year of 2026 and the present value of damages for the 94-year period considered by Farber.

Note that the lost employment is relative to no coastal erosion, so some of the 460 jobs lost in 2026 may be the same positions lost in 2003. Given that employment losses vary by year, no job loss figure is possible for the entire period though lost earnings are computed.

Table 17
The Impact of Commercial Fishing Losses
On Sales, Earnings and Employment

	Lost Sales (Millions)	Lost Earnings (Millions)	Lost Employment
2003 only:			
Continental US	$46.2	$11.9	322
Louisiana	$34.3	$8.3	245
2026 only:			
Continental US	$66.0	$16.9	460
Louisiana	$41.6	$11.9	297
Total over all years:			
Present Value			
Continental US	$5,656.3	$1,451.4	NA
Louisiana	$4,192.6	$1,017.9	NA

Source: Authors computations using the US Bureau of Economic Analysis RIMS II Input Output multipliers.

By 2003, we estimate the total US business sales losses due to the loss of commercial fishing at $46.2 million, and the total loss of household earnings in the US at $11.9 million. Job losses nationwide are estimated to be 322. The losses for the State of Louisiana are correspondingly lower. In either case, the estimated losses are not very large, especially when compared to those for oil or gas disruptions or a closure of the lower Mississippi River.

By the peak loss year of 2026, business sales losses would top at $66 million and household earnings losses would reach a level of $16.9 million. Total jobs lost in commercial fishing and through the multiplier effect would peak at 460. In Louisiana, the job losses would peak at 297.

Finally, data are provided in Table 17 for the present value of business sales and household earnings lost over the entire 94-year period due to harmful effects of coastal erosion on commercial fishing. While these numbers are certainly large, it is important to remember that they are spread across almost a century, and they are still smaller than a one-time, five-week oil disruption (see Table 9).

Impacts on Industries of Commercial Fishing Losses

The impacts of the loss of commercial fishing, due to coastal erosion, on different industries are shown in the tables in Appendix F. Tables F-1 through F-6 provide the industry impacts in the US and Louisiana for the peak loss year of 2026. Tables F-7 through F-10 illustrate the present value sales and household earnings losses by industry over the entire 94-year period of 1990-2083.

It will probably not surprise the reader to discover that in all of these tables the top ranked industry in terms of lost sales, household earnings, and jobs is the forestry/fishing industry---the sector that houses the commercial fishing industry where the direct impacts are initially felt. In the peak loss year of 2026, this sector will lose an estimated $26.1 million in business sales, almost $5.9 million in household earnings, and 138 jobs. In Louisiana, the comparable numbers in that industry are $26.1 million in lost business sales, about $5.6 million in lost household earnings, and 128 jobs. Obviously, very little of the losses in this sector manage to escape beyond the Louisiana border.

One will notice by reviewing the tables in Appendix F that while there are losses incurred in other industries via the multiplier effect, they are all a mere fraction of the hit taken by the fishing sector. For example, note in Table F-1 that while the estimated sales losses in the fishing industry is $26.1 million, the second highest ranked industry losses---transportation---are only $4.1 million.

The Economic Impact of Coastal Erosion in Louisiana
On State, Regional, and National Economies

Chapter 8: Assessment of Economic Impact: Recreational Activity

With regard to recreational fishing, the Nelson study begins by identifying the total benefits to Louisiana from recreational saltwater fishing. Citing previous studies, their report notes that recreational saltwater fishing generated an estimated $1.2 billion of revenue for Louisiana businesses in the year 2000. They also cite previous studies that estimate that hunters of migratory birds spent $90.5 million in 2001 and that people engaged in wildlife viewing spent $175.7 million in 2001. The study notes that coastal erosion places each of these outdoor activities at risk due to damaging the ecosystem.

Direct Spending Estimates in 2003 Dollars

Table 18 contains these spending estimates in 2003 dollars and divides this estimated spending into Louisiana resident and non-resident spending. The table indicates that these activities account for nearly $1.5 billion in resident spending and $75.6 million in spending from those outside the state.

Table 18
Estimated Annual Louisiana Expenditures on
Hunting, Fishing and Wildlife Viewing
(Millions of 2003 Dollars)

	LA Residents	Non-Residents	Total
Saltwater Fishing	$1,240.1	$31.5	$1,271.6
Migratory Bird Hunting	$54.3	$36.2	$90.5
Wildlife Viewing	$167.8	$7.9	$175.7
Total	$1,462.2	$75.6	$1,537.8

Source: Chapter 7, Nelson study

I/O Table Estimates of Total Impact on Louisiana Economy

The nest step is to compute the total annual direct and indirect impact of these sectors on the Louisiana economy. To compute the economic impact, we must quantify the amount of new spending in Louisiana.

For Louisiana, we assume all **non-resident spending** is new. However, further analysis is required for **Louisiana residents**. Most economists agree that much of the Louisiana resident spending would remain in the state even if these activities were less prevalent. Consider a Louisiana resident who finds migratory bird hunting a less

attractive activity when coastal erosion reduces bird populations. What happens to the money that would have been spent hunting? This loss could reduce Louisiana spending if the individual hunts in another state or saves that money. However, many Louisiana residents may choose another activity in Louisiana and keep their spending in the state. Instead of duck hunting, one could choose to hunt quail in Louisiana or may attend another outdoor Louisiana sports event.

It is difficult to estimate the amount of spending that will leave the state if coastal erosion makes these outdoor activities less attractive. Thus, we use sensitivity analysis and report computations for three possibilities---10 percent, 20 percent, or 30 percent of spending leaving the state with the loss of these activities.

Tables 19-21 present the estimated impact of these outdoor activities on the Louisiana economy. From an employment standpoint, **the total impact ranges from 7,095 jobs to 16,410 jobs**. In terms of earnings, the total impact ranges from $134.9 million to $313.1 million.

Table 19
Estimated Annual Impact of Hunting, Fishing and Wildlife Viewing
On Louisiana's Economy Assuming 10% Leakage
(Millions of 2003 Dollars)

	Sales	Earnings	Employment
Saltwater Fishing	$288.7	$94.8	4,955
Migratory Bird Hunting	$78.9	$25.1	1,346
Wildlife Viewing	$46.5	$15.0	794
Total	$414.1	$134.9	7,095

Table 20
Estimated Annual Impact of Hunting, Fishing and Wildlife Viewing
On Louisiana's Economy Assuming 20% Leakage
(Millions of 2003 Dollars)

	Sales	Earnings	Employment
Saltwater Fishing	$518.7	$170.4	8,898
Migratory Bird Hunting	$89.2	$28.4	1,521
Wildlife Viewing	$78.1	$25.2	1,333
Total	$686.0	$224.0	11,752

Table 21
Estimated Annual Impact of Hunting, Fishing and Wildlife Viewing
On Louisiana's Economy Assuming 30% Leakage
(Millions of 2003 Dollars)

	Sales	Earnings	Employment
Saltwater Fishing	$748.6	$246.1	12,842
Migratory Bird Hunting	$99.5	$31.7	1,697
Wildlife Viewing	$109.5	$35.3	1,871
Total	$957.6	$313.1	16,410

The tables also show that the estimated impact of saltwater fishing and wildlife viewing are more sensitive to the assumed leakage to other states (with the associated reductions in Louisiana resident spending) than hunting. This reflects the fact that 40% of hunting revenues come from residents of other states while Louisiana residents make up the bulk of saltwater fishing expenditures. The figures in these tables also provide the upper bound on the impact of lost revenues due to a catastrophic event caused by coastal erosion.

I/O Table Estimates of Total Impact on US Economy

For the US economy, the loss of spending is limited to the amount of saving plus any spending diverted outside the US borders. We assume that 10 percent of all reductions in spending on Louisiana outdoor activities are either saved or diverted outside the US. Equivalently, we assume that 90 cents of every dollar in reduced spending on US activities is diverted to spending elsewhere in the US.

Table 22 supplies the estimated annual impact of reduced recreational sport spending in Louisiana on these key activities on the US economy. These figures again represent the maximum impact of a catastrophic event created by coastal erosion on employment, annual sales and annual earnings.

Table 22
Estimated Annual Impact of Reduced Hunting, Fishing
And Wildlife Viewing On the US Economy
(Millions of 2003 Dollars)

	Sales	Earnings	Employment
Saltwater Fishing	$62.7	$105.0	3,906
Migratory Bird Hunting	$25.2	$7.6	296
Wildlife Viewing	$62.7	$14.7	561
Total	$150.6	$127.3	4,763

Impact on Industries of Loss of Recreational Activity in Louisiana

Impacts of the reduction in recreational activities in Louisiana by industry are documented in Tables G-1 through G-9 in Appendix D. Note in Table G-1 that of the total loss of $518.7 million in business sales in Louisiana due to the loss of recreational saltwater fishing the biggest losses would be felt in retail trade (minus $276.5 million). This is not surprising, since this is the sector that consumers need as they are in the state for their recreational activity. According to the data in Table G-1, the real estate sector would suffer sales losses of $37.7 million, followed by firms in health services, where sales are projected to fall by $21.9 million. Over $10 million in sales would be lost by firms in eating and drinking places, business services, hotel and amusement, electric, gas and sanitary services, banking and brokers, wholesale trade, and transportation.

Table G-2 shows in which industries the greatest household earnings would be lost due to the closure. At the top of the list would be workers in retail trade, where payrolls would fall by just over $100 million. Nearly $11 million would vanish from payrolls in health care services, followed by a decline of $9.5 million in business services.

Job losses by industry are itemized in Table G-3. The very labor-intensive retail trade sector would loss 6,138 jobs, while eating and drinking establishment employment would fall by 551 and business services by 324.

These same industrial classifications in sales, household earnings, and job losses for the State of Louisiana can be found in Tables G-4 to G-6 for losses in Louisiana due to reduction in migratory bird hunting and in Tables G-7 to G-9 for losses in Louisiana due to a reduction in bird viewing.

US losses in business sales, household earnings, and jobs are illustrated in Table G-10 to G-18 for business sales, household earnings, and job losses due to the loss of recreational activity in Louisiana. These losses are classified by the reduction in

saltwater fishing, the reduction in migratory bird hunting, and the reduction in bird viewing. US sales, earnings, and jobs will fall less than Louisiana sales, earnings, and jobs, because it is assumed that many people who had used Louisiana as the point of destination for recreational activity would use another US point of destination, so we would be talking about a transfer of money from point to point and not a loss of spending in total, at least from a national perspective.

The Economic Impact of Coastal Erosion in Louisiana On State, Regional, and National Economies

Chapter 9: Aggregation and Summary of Economic Impacts from Various Industries

To this point we have been focusing on a significant event relating to the erosion of the Louisiana coast affecting a specific industry---such as the oil and gas industry---and how this event would reverberate throughout the Louisiana economy, the national economy, and certain regions within the United States. We have also estimated the economic impact as if each significant event would occur only one time and affect only one industry. These estimates are presented in Chapters 5 through 8. We now need to focus on how the occurrence of a significant event may affect more than one industry at the same time and provide some analysis of estimating the economic impact if this significant event occurred more than once.

Significant Event Affecting More than One Industry

The Louisiana coast is losing acreage on an annual basis. The prediction for the continued loss of these coastal acres is based on the best scientific knowledge currently available. **Coast 2050: Towards A Sustainable Coastal Louisiana** is a very carefully conducted study that projects the loss of another 650,000 acres by 2050 if nothing is done to arrest this loss of coastal acreage. This loss of acres along the Louisiana coast makes the state and its industries vulnerable to a new round of natural events such as flooding, hurricanes, and other such acts of nature. A major event such as a hurricane or high waters or a storm could cause damage in a variety of locations in and around the coast of Louisiana. We cannot pinpoint these locations exactly. However, we can suggest the magnitude of economic damages if all industries are affected by the storm in the short-term and in the long-term. This aggregation of economic impacts will serve as a benchmark, not as a point estimate of economic damages.

The aggregation of economic impacts is presented in Table 23 for the short-term disruption in economic activity and in Table 24 for the long-term disruption in economic activity. This aggregation of economic impacts is presented only for the US economy and for the Louisiana economy since consistent regions were not used for regional analysis in the oil and gas sector and in the navigation and transportation sector. Similarly, in commercial fishing and recreational activity we only used the US economy and the Louisiana economy as the regions to be estimated. The economic impacts illustrated in Tables 23 and 24 represent the economic impact associated with the significant event occurring only once and the estimates are in 2003 dollars.

Table 23
Aggregation of Economic Impact on US Economy and Louisiana Due to Coastal Erosion in Louisiana (Short-Term Impact)*

	Lost Sales (Millions)	Lost Earnings (Millions)	Lost Employment
Continental US	$5,770.2	$1,655.9	51,151
Louisiana	$860.9	$268.7	13,459

*Scenario includes three-week disruption in oil; 3-week disruption in natural gas; a seven-day closure of the ports along the Mississippi; the extra cost of navigation along the GIWW; the gradual reduction in commercial fishing; and, the gradual reduction in recreational activity (20 percent leakage for Louisiana).

The short-term impact in which the oil and gas industry, navigation and transportation industry, the commercial fishing industry, and the recreational activity industry are all affected by the significant event is estimated to lead to a national loss of 51,151 jobs, household earnings of $1.656 billion, and business transactions of $5.8 billion. In Louisiana the short-term impact is estimated to be $890.9 million in loss of business sales; $268.7 million in loss of household earnings; and a loss of 13,459 jobs.

As illustrated in Table 24 the long-term impact in which the oil and gas industry, navigation and transportation industry, the commercial fishing industry, and the recreational activity industry are all affected by the significant event is estimated to lead to a national loss of 74,921 jobs, household earnings of $2.419 billion, and business transactions of $8.5 billion. In Louisiana the long-term impact is estimated to be $941.4 million in business sales losses; a loss of$291.3 million in household earnings; and a loss of 14,377 jobs.

Table 24
Aggregation of Economic Impact on US Economy and Louisiana Due to Coastal Erosion in Louisiana (Long-Term Impact)*

	Lost Sales (Millions)	Lost Earnings (Millions)	Lost Employment
Continental US	$8,484.6	$2,418.7	74,921
Louisiana	$941.4	$291.3	14,377

*Scenario includes five-week disruption in oil; 3-week disruption in natural gas; a fourteen-day closure of the ports along the Mississippi; the extra cost of navigation along the GIWW; the gradual reduction in commercial fishing; and, the gradual reduction in recreational activity (20 percent leakage for Louisiana.

These estimates of economic impacts assume that the significant event occurs only once and that it affects all of the major industries that are projected to be affected adversely by the erosion of the Louisiana coast. These economic estimates range for the nation from the loss of jobs of over 51,000 in the short-term to almost 75,000 jobs in the

long-term; from the loss of household earnings of almost $1.7 billion in the short-term to over $2.4 billion in the long-term; and the loss of business sales of just over $5.8 billion in the short-term to about $8.4 billion in the long-term. Louisiana has a less accentuated range with jobs lost varying from 13,459 to 14,377; household earnings varying from $268.7 million to $291.3 million; and business sales varying from $860.0 million to $941.4 million.

Significant Event Occurring at Various Times

The erosion of the Louisiana coast creates the possibility of natural disasters occurring more frequently. The extreme case of this possibility is the assumption that such a disaster will occur each and every year and that this disaster will affect each and every industry. These estimates for disruptions in the oil and gas delivery system and in navigation and transportation are extrapolated from 2003 through the year 2050 assuming no inflation. The future values are discounted at a rate of 3.0 percent. The present value of the national loss of business sales is $145.0 billion in the short-term and $215.7 billion in the long-term; the present value of the loss of household earnings at the national level ranges from $39.5 billion in short-term to $59.3 billion in the long-term. In Louisiana the present value of the loss of business sales ranges from $3.7 billion in the short-term to $5.8 billion in the long-term; and, the present value of household earnings in Louisiana ranges from $1.0 billion in the short-term to $1.5 billion in the long-term.

In Tables 25 and 26 we present the present value of the loss of business sales and household earnings for significant event occurring each and every year, every fourth year, and every sixth year due to disruptions from oil and gas deliveries and navigation and transportation. Commercial fishing and recreation are excluded since these disruptions are building up over time. These benchmarks provide information about how the US and Louisiana economies are affected by events related to the erosion of the Louisiana coast when these events are frequent.

The present value of the reduction in US business sales will vary from $145 billion if the significant event occurs every year to $26.0 billion if it occurs every sixth year and assuming the event shuts down oil and gas deliveries and navigation and transportation for a short period of time. Household earnings will drop by $39.5 billion to $7.7 billion in the short-run case. In the long run US business sales will decline by $215.7 billion if the significant event occurs every year to $38.7 billion if the disruption occurred every sixth year. Household earnings in the long run will decline by $59.3 billion if the disruption occurs every year to $11.2 billion if it occurred every sixth year.

The Louisiana impact will vary in the short-run from $3.7 billion in business sales if the disruption occurs annually to $0.6 billion if it occurred every sixth year. Household earnings in Louisiana will drop, in present value terms, from $1.0 billion to $0.2 billion for the same frequency of disruptions as above. In the long-term these losses are $5.8 billion if the disruption occurs annually to $1.0 billion if the disruption occurs every sixth year. Household earnings in Louisiana will drop by $1.5 billion to $0.3 billion for the same frequency of disruptions as above.

Table 25
Present Value of Economic Impact on US Economy and Louisiana Economy Due to Coastal Erosion in Louisiana (Short-Term Impact)*

Occurrence of Significant Event	Business Sales (Billions)	Household Earnings (Billions)
Every year		
Continental US	**$145.0**	**$39.5**
Louisiana	**$3.7**	**$1.0**
Every fourth year		
Continental US	**$49.8**	**$13.5**
Louisiana	**$1.3**	**$0.3**
Every sixth year		
Continental US	**$26.0**	**$7.1**
Louisiana	**$0.6**	**$0.2**

*Scenario includes three-week disruption in oil; 3-week disruption in natural gas; a seven-day closure of the ports along the Mississippi; the extra cost of navigation along the GIWW.

Table 26
Present Value of Economic Impact on US Economy and Louisiana Economy Due to Coastal Erosion in Louisiana (Long-Term Impact)*

Occurrence of Significant Event	Business Sales (Billions)	Household Earnings (Billions)
Every year		
Continental US	**$215.7**	**$59.3**
Louisiana	**$5.8**	**$1.5**
Every fourth year		
Continental US	**$74.0**	**$20.4**
Louisiana	**$2.0**	**$0.5**
Every sixth year		
Continental US	**$38.7**	**$10.6**
Louisiana	**$1.0**	**$0.3**

*Scenario includes five-week disruption in oil; 3-week disruption in natural gas; a fourteen-day closure of the ports along the Mississippi; the extra cost of navigation along the GIWW; the gradual reduction in commercial fishing; and, the gradual reduction in recreational activity (20 percent leakage for Louisiana

We cannot project that such a disaster will occur each and every year; nor, can we project that such disasters will occur every fourth or every sixth year. However, as coastal erosion continues, disasters are likely to become more and more frequent. In fact, as projections of such disruptions becoming more and more frequent, then there is another method of assessing the opportunity cost of not arresting the erosion of the Louisiana coast which will be discussed in Chapter 10. However, these estimates of the present value of disruptions on the US and Louisiana economies provide a benchmark for damages that will be absorbed if such a significant event did occur frequently.

The Economic Impact of Coastal Erosion in Louisiana
On State, Regional, and National Economies

Chapter 10: Other Costs and Disruptions Associated With Coastal Erosion in Louisiana

Economic damages can be assessed in a number of ways. One method is, as we did in this report, to assess the economic impact associated with the cessation of an activity for a number of days, weeks, or months. The underlying assumption is that the basic infrastructure is still in place and that the basic activity is still doable within coastal Louisiana. This assumption is typically prudent. The economic damage is the unavailability of the commodities for a certain period of time and the associated economic impact relating to this unavailability of specific products. The logic of this analysis is straightforward.

Economic Damages Related to Disruption in the Market Process

The oil and gas contained in the Gulf of Mexico will not move from its present location. The existing pipelines, processing stations, pumps, and other such facilities are not easy to move. The supporting industries that assist the offshore oil and gas industry are firmly in place in south Louisiana. Hence, one perspective is that the economic damages associated with the erosion of the coast in Louisiana would be the interruption, postponement, or disruption of the movement of this oil and gas from Louisiana to other parts of the country. For a period of time the nation would not be able to avail itself of the oil and gas that typically flows through the Louisiana pipelines. The basic infrastructure, however, remained in tact.

Normal transactions are interrupted by this inability to get the oil and gas to the market. Market reaction will lead to higher prices for the commodities, such as gasoline, associated with oil and gas. The real income of consumers and businesses will fall temporarily. These economic agents will adjust their spending patterns to accommodate the reduction in real income. The reduction in real income leads to the economic ripples affecting other industries.

This same economic process also occurs in the case of navigation and transportation. The ports and waterways are temporarily out of service. The infrastructure is not permanently damaged. Goods simply cannot get to port or out of port. Consumers and businesses are, once again, asked to wait for products that they use.

Normal transactions are interrupted by the inability of the ports and waterways to accommodate the trade that typically moves up and down the river. Market reaction typically results in higher prices for these goods, at least temporarily. Higher prices of these products will cause overall household income to decline. Consumers will react to this reduction in real income by adjusting spending across all economic sectors. The temporary shutdown of the ports and waterways is the significant event that starts the

economic process. This temporary shutdown is converted into a dollar estimate of the cost of waiting for delivery of these goods. The estimate of the cost of waiting for the delivery of goods becomes the reduction in real income that generates the economic ripples throughout the entire economy.

Oil and gas disruptions and navigation and transportation disruptions are similar in terms of coastal erosion leading to a significant event that creates a bottleneck that takes time to overcome—a ruptured pipeline, physical damage at a major hub such as Port Fourchon, a port being besieged by high waters, high winds, or some other force of nature, or the waterways being closed to traffic for a certain period of time. The infrastructure survives; the economic activity is only delayed; the damages are due to the delays, not the ultimate loss of the infrastructure.

A slightly different economic logic was used in the case of commercial fishing and recreational activity. In these cases, the underlying assumption is that the infrastructure that provides a place for commercial fishing or recreational activity is gradually disappearing. It is not assumed that these activities would just suddenly disappear, but they would decline gradually over time.

Commercial fishing is projected to decline systematically over a long period of time due to the continuing erosion of the coast. Commercial fishing will decline and the revenues associated with this industry will decline. This reduction in the commercial fishing business will initiate the economic repercussions within the state that will cause other sectors of the economy to contract.

This same economic reasoning was used in assessing the cost of losing recreational activity in Louisiana and for the loss of a certain amount of recreational spending in Louisiana. It was not assumed that all recreational activity would suddenly cease. It was not assumed that saltwater fishing would be totally eliminated forever or migratory bird hunting or bird viewing. We assumed that a certain amount of recreational activity could be negatively affected by the loss of coastal Louisiana. We assumed that 10 percent, 20 percent, or 30 percent of recreational spending would leave the state because of the erosion of the coast in Louisiana. This loss of recreational activity in Louisiana resulted in less spending in Louisiana—a loss in spending in Louisiana that will create economic ripples throughout the entire economy for the entire year.

The economic focus in the case of oil and gas disruptions, navigation and transportation delays, the gradual loss of commercial fishing operations, and the gradual disappearance of recreational activities is on the loss of real income. This loss of real income initiates an economic process that works its way through the entire economy, affecting the retail clerk to the insurance agent to the construction worker.

The loss of real income and the associated economic ripples are estimated for the state of Louisiana since the coastal erosion is occurring in Louisiana. The Louisiana economy will be expected to incur significant economic damage as basic industries react

negatively to the coastal erosion problem. The economic damages are projected to spread beyond the borders of Louisiana since many of the commodities that will be disrupted are products that are used in many states throughout the country and commodities that cannot be replaced easily and timely. This is why the focus is also on the US economy and specified regions within the nation. These economic damages are itemized in Chapter 5 (oil and gas); Chapter 6 (navigation and transportation); Chapter 7 (commercial fishing); and, Chapter 8 (recreational activity). These economic damages are aggregated over activity and over time in Chapter 9.

This is one method of estimating economic damages associated with the erosion of the coast in Louisiana. Other costs may be associated with not arresting the erosion of the Louisiana coast, namely, the cost of replacing the infrastructure if a series of catastrophic events were to happen on the Louisiana coast. These costs will be in addition to the cost of being deprived of the use of these commodities for a limited amount of time. In fact, if part of the infrastructure has to be replaced, then the limited time dimensions used in the previous analysis may prove to be overly optimistic.

Cost of Replacing the Infrastructure

Louisiana has an infrastructure that accommodates the oil and gas industry and the navigation and transportation industry. The destruction of this infrastructure will not only delay the delivering of the products but it will necessitate the rebuilding of the infrastructure that was destroyed. This infrastructure includes the hubs along the coast of Louisiana that gather and transmit the oil and gas from offshore Louisiana to the rest of the country; the industrial structures on shore that accommodate the offshore oil and gas industry with many of theses enterprises relying on public properties such as roads, waterways, and other such facilities; the ports and public facilities that provide the intermediary between the states shipping products abroad and receiving products from abroad; and, the major metropolitan areas that provide the workforce by which these economic activities are carried out.

A major catastrophic event will delay and disrupt the delivery of products throughout the United States, but it may also necessitate the rebuilding of a major facility or a major metropolitan area. This cost of rebuilding an infrastructure may vary from replacing a pipeline to reconstructing Port Fourchon to rebuilding New Orleans. The costs of replacing the infrastructure will vary considerably depending upon the nature and placing of the catastrophic event.

Economic damages relating to the disruption of the market process as we estimated in Chapters 5 through 9 can be added to the cost of reconstructing the infrastructure in assessing the total damages associated with the erosion of the Louisiana coast. We did not estimate the cost of reconstructing the infrastructure in this report.

Alternative Method of Estimating the Economic Damage Due to the Erosion of the Louisiana Coast

An alternative method of computing the economic damages relating to the erosion of the Louisiana coast is to create alternative ways to bypass the Louisiana coast. The assumption would be that the Louisiana coast is unreliable. Significant events might occur every two or three months. The disruptions become continuous. The focus becomes on how to bypass the Louisiana coast. Can we redirect the oil and gas pipelines through Alabama, Mississippi, and/or Texas? Can we build new hubs that will handle the offshore exploration, development, and production as Louisiana now handles those responsibilities? Can we build a new Superport that would serve as a place for foreign oil to be transported to pipelines in the United States? Can we redirect the flow of foreign trade to other ports in the United States such as Houston, Miami, Mobile, or Los Angeles? Can we invest in the transportation infrastructure—such as roads and rails—to allow such a change in the location of ports to be successful and to be cost effective?

Louisiana now provides very special services to the rest of the nation. But, if Louisiana is unable to provide these services because of the loss of the Louisiana coast, the country will have to find alternative ways of getting these services or do without the products. The cost of creating these alternative methods of providing the delivery of oil and gas to the rest of the nation and the delivery of foreign goods to states and the delivery of goods from states to foreign countries represents the opportunity cost of not arresting the erosion of the coast of Louisiana.

If the erosion of the Louisiana coast becomes a recurring and frequent problem, there will be a challenge to find alternative ways of delivering these products to market

Appendix A

Industry Level Impacts:
Three-Week Oil Disruption

Table A-1
Lost Sales in Continental US Due
To a Three-Week Petroleum Disruption
(2003 Dollars)

Industry	Lost Sales (Millions)
Real Estate	$478.7
Health Services	$334.3
Retail Trade	$300.8
Business Services	$287.8
Financial Institutions & Sec. and Commodity Brokers	$252.6
Miscellaneous Services	$232.6
Wholesale Trade	$182.2
Food and Tobacco Products	$173.1
Transportation	$133.1
Communications	$127.2
Total	**$3,676.1**

Note: This table was constructed using the BEA Input-Output tables, which provide the impact for 38 sectors. The total includes all 38 sectors except those under $125 million.

Table A-2
Lost Earnings in Continental US Due
To a Three-Week Petroleum Disruption
(2003 Dollars)

Industry	Lost Earnings (Millions)
Health Services	$155.6
Business Services	$126.5
Retail Trade	$108.4
Financial Institutions & Sec. and Commodity Brokers	$87.0
Miscellaneous Services	$78.8
Wholesale Trade	$59.3
Transportation	$47.2
Insurance	$40.9
Eating and Drinking Places	$40.7
Hotels, amusement, and recreation	$37.4
Total	**$1,035.6**

Note: This table was constructed using the BEA Input-Output tables, which provide the impact for 38 sectors. The total includes all 38 sectors except those under $35 million.

Table A-3
Lost Employment in Continental US Due
To a Three-Week Petroleum Disruption

Industry	Lost Employment
Retail Trade	5,006
Health Services	3,891
Miscellaneous Services	3,361
Business Services	3,267
Eating and Drinking	2,902
Hotels, amusement, and recreation	1,745
Financial Institutions & Sec. and Commodity Brokers	1,726
Transportation	1,280
Wholesale Trade	1,198
Personal Services	1,025
Total	**32,390**

Note: This table was constructed using the BEA Input-Output tables, which provide the impact for 38 sectors. The total includes all 38 sectors except those under 1,000 employees.

Table A-4
Lost Sales in Eastern US Region Due
To a Three-Week Petroleum Disruption
(2003 Dollars)

Industry	Lost Sales (Millions)
Real Estate	$335.7
Health Services	$238.1
Retail Trade	$209.8
Business Services	$188.9
Financial Institutions & Sec. & Commodity Brokers	$176.6
Miscellaneous Services	$155.3
Wholesale Trade	$125.7
Food and Tobacco Products	$117.0
Transportation	$91.1
Insurance	$87.2
Communications	$87.0
Eating and Drinking Places	$82.2
Chemicals, Petroleum and Coal Products	$80.1
Total	**$2,497.7**

Note: This table was constructed using the BEA Input-Output tables, which provide the impact for 38 sectors. The total includes all 38 sectors except those under $80 million in sales.

Table A-5
Lost Earnings in Eastern US Region
Due to a Three-Week Petroleum Disruption
(2003 Dollars)

Industry	Lost Earnings (Millions)
Health Services	$110.8
Business Services	$83.4
Retail Trade	$75.1
Financial Institutions & Sec. & Commodity Brokers	$59.9
Miscellaneous Services	$53.6
Wholesale Trade	$40.5
Transportation	$32.2
Insurance	$28.8
Eating and Drinking Places	$28.2
Hotels, amusement, and recreation	$20.6
Total	**$702.0**

Note: This table was constructed using the BEA Input-Output tables, which provide the impact for 38 sectors. The total includes all 38 sectors except those under $20 million in earnings.

Table A-6
Lost Employment in Eastern US Region
Due to a Three-Week Petroleum Disruption

Industry	Lost Employment
Retail Trade	3,561
Health Services	2,780
Miscellaneous Services	2,317
Business Services	2,174
Eating and Drinking	2,048
Financial Institutions & Sec. & Commodity Brokers	1,152
Hotels, amusement, and recreation	1,042
Transportation	876
Wholesale Trade	807
Personal Services	742
Total	**23,344**

Note: This table was constructed using the BEA Input-Output tables which provide the impact for 38 sectors. The total includes all 38 sectors except those under $700 employees.

Table A-7
Lost Sales in Western US Region Due
To a Three-Week Petroleum Disruption
(2003 Dollars)

Industry	Lost Sales (Millions)
Real Estate	$53.9
Retail Trade	$35.2
Health Services	$32.7
Business Services	$29.2
Miscellaneous Services	$25.4
Financial Institutions & Sec. and Commodity Brokers	$23.4
Wholesale Trade	$17.9
Communications	$14.0
Eating and Drinking Places	$13.8
Hotels, amusement, and recreation	$11.9
Total	**$344.5**

Note: This table was constructed using the BEA Input-Output tables,which provide the impact for 38 sectors. The total includes all 38 sectors except those under $10 million.

Table A-8
Lost Earnings in Western US Region Due To a Three-Week Petroleum Disruption (2003 Dollars)

Industry	Lost Earnings (Millions)
Health Services	$15.3
Business Services	$12.9
Retail Trade	$12.7
Miscellaneous Services	$8.6
Financial Institutions & Sec. and Commodity Brokers	$8.1
Wholesale Trade	$5.8
Eating and Drinking	$4.8
Hotels, amusement, and recreation	$4.1
Transportation	$3.9
Insurance	$3.8
Total	**$99.6**

Note: This table was constructed using the BEA Input-Output tables, which provide the impact for 38 sectors. The total includes all 38 sectors except those under $3 million.

Table A-9
Lost Employment in Western US Region Due To a Three-Week Petroleum Disruption

Industry	Lost Employment
Retail Trade	506
Miscellaneous Services	353
Health Services	349
Business Services	311
Eating and Drinking Places	306
Hotels, amusement, and recreation	188
Financial Institutions & Sec. and Commodity Brokers	173
Retail Trade	114
Transportation	100
Personal Services	89
Total	**3,026**

Note: This table was constructed using the BEA Input-Output tables, which provide the impact for 38 sectors. The total includes all 38 sectors except those with fewer than 80 lost jobs.

Table A-10
Lost Louisiana Sales Due to a Three-Week Petroleum Disruption
(2003 Dollars)

Industry	Lost Sales (Millions)
Real Estate	$10.8
Health Services	$9.7
Retail Trade	$8.0
Miscellaneous Services	$5.0
Eating and Drinking Places	$3.4
Wholesale Trade	$3.4
Business Services	$3.4
Financial Institutions & Sec. & Commodity Brokers	$3.2
Electric, Gas, and Sanitary	$2.7
Transportation	$2.4
Total	**$68.2**

Note: This table is constructed using the BEA Input-Output tables, which provide the impact for 38 sectors. The total includes all 38 sectors.

Table A-11
Lost Louisiana Earnings Due to a Three-Week Petroleum Disruption
(2003 Dollars)

Industry	Lost Earnings (Millions)
Health Services	$4.8
Retail Trade	$3.0
Miscellaneous Services	$1.9
Business Services	$1.6
Wholesale Trade	$1.1
Eating and Drinking Places	$1.1
Financial Institutions & Sec. & Commodity Brokers	$0.8
Transportation	$0.8
Insurance	$0.7
Hotels, amusement, and recreation	$0.6
Total	**$19.9**

Note: This table was constructed using the BEA Input-Output tables, which provide the impact for 38 sectors. The total includes all 38 sectors except those under $500,000.

Table A-12
Lost Louisiana Employment Due to a Three-Week Petroleum Disruption

Industry	Lost Employment
Retail Trade	179
Health Services	133
Miscellaneous Services	99
Eating and Drinking Places	88
Business Services	49
Hotels, amusement, and recreation	35
Personal Services	32
Wholesale Trade	32
Financial Institutions & Sec. & Commodity Brokers	27
Transportation	25
Total	**831**

Note: This table was constructed using the BEA Input-Output tables, which provide the impact for 38 sectors. The total includes all 38 sectors except those under 25 jobs lost.

Appendix B

Industry Level Impacts:
Five-Week Oil Disruption

Table B-1
Lost Sales in Continental US Attributable
To a Five-Week Petroleum Disruption
(2003 Dollars)

Industry	Lost Sales (Millions)
Real Estate	$800.5
Health Services	$559.0
Retail Trade	$503.1
Business Services	$481.3
Financial Institutions & Sec. and Commodity Brokers	$422.5
Miscellaneous Services	$389.1
Wholesale Trade	$304.7
Food and Tobacco Products	$289.5
Transportation	$222.6
Communications	$212.7
Total	**$6,148.0**

Note: This table was constructed using the BEA Input-Output tables, which provide the impact for 38 sectors. The total includes all 38 sectors except those under $200 million.

Table B-2
Lost Earnings in Continental US Attributable
To a Five-Week Petroleum Disruption
(2003 Dollars)

Industry	Lost Earnings ($ Millions)
Health Services	$260.2
Business Services	$211.6
Retail Trade	$181.3
Financial Institutions & Sec. and Commodity Brokers	$145.5
Miscellaneous Services	$131.8
Wholesale Trade	$99.2
Transportation	$78.9
Insurance	$68.4
Eating and Drinking Places	$68.1
Hotels, amusement, and recreation	$62.6
Total	**$1,732.0**

Note: This table was constructed using the BEA Input-Output tables, which provide the impact for 38 sectors. The total includes all 38 sectors except those under $60 million.

Table B-3
Lost Employment in Continental US Attributable
To a Five-Week Petroleum Disruption

Industry	Lost Employment
Retail Trade	8,373
Health Services	6,507
Miscellaneous Services	5,621
Business Services	5,464
Eating and Drinking Places	4,853
Hotels, amusement, and recreation	2,919
Financial Institutions & Sec. and Commodity Brokers	2,886
Transportation	2,140
Wholesale Trade	2,003
Personal Services	1,713
Total	**54,170**

Note: This table was constructed using the BEA Input-Output tables, which provide the impact for 38 sectors. The total includes all 38 sectors except those with under 1500 jobs lost.

Table B-4
Lost Sales in Eastern US Region Attributable
To a Five-Week Petroleum Disruption
(2003 Dollars)

Industry	Lost Sales (Millions)
Real Estate	$561.4
Health Services	$398.3
Retail Trade	$350.8
Business Services	$315.9
Financial Institutions & Sec. & Commodity Brokers	$295.3
Miscellaneous Services	$259.7
Wholesale Trade	$210.2
Food and Tobacco Products	$195.7
Transportations	$152.3
Insurance	$145.8
Total	**$4,177.2**

Note: This table was constructed using the BEA Input-Output tables, which provide the impact for 38 sectors. The total includes all 38 sectors except those under $140 million.

Table B-5
Lost Earnings in Eastern US Region
Attributable to a Five-Week Petroleum Disruption
(2003 Dollars)

Industry	Lost Earnings (Millions)
Health Services	$185.4
Business Services	$139.4
Retail Trade	$125.6
Financial Institutions & Sec. and Commodity Brokers	$100.2
Misc. Services	$89.6
Wholesale Trade	$67.8
Transportation	$53.8
Insurance	$48.1
Eating and Drinking	$47.2
Hotels, amusement, and recreation	$34.5
Total	**$1,174.1**

Note: This table was constructed using the BEA Input-Output tables, which provide the impact for 38 sectors. The total includes all 38 sectors except those under $30 million.

Table B-6
Lost Employment in Eastern US Region
Attributable to a Five-Week Petroleum Disruption

Industry	Lost Employment
Retail Trade	3,561
Health Services	2,780
Miscellaneous Services	2,317
Business Services	2,174
Eating and Drinking Places	2,048
Financial Institutions & Sec. and Commodity Brokers	1,152
Hotels, amusement, and recreation	1,042
Transportation	876
Wholesale Trade	807
Personal Services	742
Total	**39,041**

Note: This table was constructed using the BEA Input-Output tables, which provide the impact for 38 sectors. The total includes all 38 sectors except those under $5 million.

Table B-7
Lost Sales in Western US Region Attributable
To a Five-Week Petroleum Disruption
(2003 Dollars)

Industry	Lost Sales (Millions)
Real Estate	$90.1
Retail Trade	$58.9
Health Services	$54.7
Business Services	$48.8
Misc. Services	$42.5
Financial Institutions & Sec. and Commodity Brokers	$39.1
Wholesale Trade	$30.0
Communications	$23.4
Eating and Drinking Places	$23.1
Hotels, amusement, and recreation	$19.9
Total	**$576.1**

Note: This table was constructed using the BEA Input-Output tables, which provide the impact for 38 sectors. The total includes all 38 sectors except those under $15 million.

Table B-8
Lost Earnings in Western US Region Attributable
To a Five-Week Petroleum Disruption
(2003 Dollars)

Industry	Lost Earnings (Millions)
Health Services	$25.6
Business Services	$21.6
Retail Trade	$21.2
Miscellaneous Services	$14.4
Financial Institutions & Sec. and Commodity Brokers	$13.6
Wholesale Trade	$9.7
Eating and Drinking Places	$8.0
Hotels, amusement, and recreation	$6.9
Transportation	$6.5
Insurance	$6.3
Total	**$166.7**

Note: This table was constructed using the BEA Input-Output tables, which provide the impact for 38 sectors. The total includes all 38 sectors except those under $5 million.

Table B-9
Lost Employment in Region 3 (Western US) Attributable
To a Five-Week Petroleum Disruption

Industry	Lost Employment
Retail Trade	847
Miscellaneous Services	591
Health Services	584
Business Services	520
Eating and Drinking Places	512
Hotels, amusement, and recreation	314
Financial Institutions & Sec. and Commodity Brokers	289
Wholesale Trade	190
Transportation	168
Personal Services	150
Total	**5,060**

Note: This table was constructed using the BEA Input-Output tables, which provide the impact for 38 sectors. The total includes all 38 sectors except those under 150 lost jobs.

Table B-10
Lost Louisiana Sales Attributable to a Five-Week Petroleum Disruption
(2003 Dollars)

Industry	Lost Sales (Millions)
Real Estate	$18.0
Health Services	$16.3
Retail Trade	$13.4
Miscellaneous Services	$8.4
Eating and Drinking Places	$5.7
Wholesale Trade	$5.6
Business Services	$5.6
Financial Institutions & Sec. & Commodity Brokers	$5.4
Electric, Gas and Sanitary Services	$4.5
Transportation	$3.9
Total	**$114.1**

Note: This table was constructed using the BEA Input-Output tables, which provide the impact for 38 sectors. The total includes all 38 sectors except those under $3 million.

Table B-11
Lost Louisiana Earnings Attributable to a Five-Week Petroleum Disruption
(2003 Dollars)

Industry	Lost Earnings (Millions)
Health Services	$8.0
Retail Trade	$5.0
Miscellaneous Services	$3.1
Business Services	$2.7
Wholesale Trade	$1.9
Eating and Drinking Places	$1.8
Financial Institutions & Sec. & Commodity Brokers	$1.4
Transportation	$1.4
Insurance	$1.1
Hotels, amusement, and recreation	$1.1
Total	**$33.2**

Note: This table was constructed using the BEA Input-Output tables, which provide the impact for 38 sectors. The total includes all 38 sectors except those under $1 million.

Table B-12
Lost Louisiana Employment Attributable to a Five-Week Petroleum Disruption

Industry	Lost Employment
Retail Trade	299
Health Services	222
Miscellaneous Services	165
Eating and Drinking Places	148
Business Services	81
Hotels, amusement, and recreation	59
Personal Services	53
Wholesale Trade	53
Financial Institutions & Sec. & Commodity Brokers	46
Transportation	42
Total	**1,389**

Note: This table was constructed using the BEA Input-Output tables, which provide the impact for 38 sectors. The total includes all 38 sectors except those with under 40 lost jobs.

Appendix C

Industry Level Impacts:
Three Week Disruption in Natural Gas

Table C-1
Lost Sales in Continental US Attributable
To a Three-Week Louisiana Natural Gas Disruption
(2003 Dollars)

Industry	Lost Sales (Millions)
Nondurable Goods	$410.1
Services	$349.4
Transportation & Utilities	$286.6
Finance, Insurance, and Real Estate	$267.0
Retail Trade	$214.2
Durable Goods	$81.2
Wholesale Trade	$70.0
Mining	$63.3
Construction	$39.1
Agriculture	$22.1
Total	**$1,803.1**

Note: This table was constructed using the BEA Aggregate Industry Input-Output tables, which provide the impact for 11 sectors.

Table C-2
Lost Earnings in Continental US Attributable
To a Three-Week Louisiana Natural Gas Disruption
(2003 Dollars)

Industry	Lost Earnings (Millions)
Services	$136.4
Retail Trade	$77.2
Nondurable Goods	$69.0
Transportation & Utilities	$59.0
Finance, Insurance, and Real Estate	$44.3
Wholesale Trade	$22.8
Durable Goods	$18.2
Construction	$11.5
Mining	$10.3
Agriculture	$5.4
Private Households	$1.1
Total	**$455.2**

Note: This table was constructed using the BEA Aggregate Industry Input-Output tables, which provide the impact for 11 sectors.

Table C-3
Lost Employment in Continental US Attributable
To a Three-Week Louisiana Natural Gas Disruption

Industry	Lost Employment
Services	4,532
Retail Trade	3,564
Nondurable Goods	1,100
Transportation & Utilities	1,025
Finance, Insurance, and Real Estate	1,004
Wholesale Trade	460
Durable Goods	379
Construction	318
Agriculture	285
Mining	125
Private Households	104
Total	**12,897**

Note: This table was constructed using the BEA Aggregate Industry Input-Output tables, which provide the impact for 11 sectors.

Table C-4
Lost Sales in Eastern US Region Attributable
To a Three-Week Louisiana Natural Gas Disruption
(2003 Dollars)

Industry	Lost Sales (Millions)
Nondurable Goods	$295.2
Services	$235.5
Transportation & Utilities	$202.2
Finance, Insurance, and Real Estate	$187.5
Retail Trade	$154.6
Durable Goods	$52.9
Wholesale Trade	$49.2
Mining	$40.1
Construction	$26.9
Agriculture	$13.2
Total	**$1,257.3**

Note: This table was constructed using the BEA Aggregate Industry Input-Output tables, which provide the impact for 11 sectors.

Table C-5
Lost Earnings in Eastern US Region Attributable
To a Three-Week Louisiana Natural Gas Disruption
(2003 Dollars)

Industry	Lost Earnings (Millions)
Services	$92.8
Retail Trade	$55.4
Nondurable Goods	$50.0
Transportation & Utilities	$41.5
Finance, Insurance, and Real Estate	$31.0
Wholesale Trade	$15.9
Durable Goods	$11.8
Construction	$7.9
Mining	$6.4
Agriculture	$3.0
Private Households	$0.8
Total	**$316.4**

Note: This table was constructed using the BEA Aggregate Industry Input-Output tables, which provide the impact for 11 sectors.

Table C-6
Lost Employment in Eastern US Region Attributable
To a Three-Week Louisiana Natural Gas Disruption

Industry	Lost Employment
Services	3,139
Retail Trade	2,626
Nondurable Goods	773
Transportation & Utilities	721
Finance, Insurance, and Real Estate	688
Wholesale Trade	316
Durable Goods	251
Construction	222
Agriculture	164
Private Households	75
Mining	74
Total	**9,049**

Note: This table was constructed using the BEA Aggregate Industry Input-Output tables, which provide the impact for 11 sectors.

Table C-7
Lost Sales in Western US Region Attributable
To a Three-Week Louisiana Natural Gas Disruption
(2003 Dollars)

Industry	Lost Sales (Millions)
Nondurable Goods	$44.6
Services	$38.0
Transportation & Utilities	$35.1
Retail Trade	$29.3
Finance, Insurance, and Real Estate	$28.3
Wholesale Trade	$7.4
Mining	$5.4
Construction	$4.6
Durable Goods	$4.6
Agriculture	$1.4
Total	**$198.6**

Note: This table was constructed using the BEA Aggregate Industry Input-Output tables, which provide the impact for 11 sectors.

Table C-8
Lost Earnings in Western US Region Attributable
To a Three-Week Louisiana Natural Gas Disruption
(2003 Dollars)

Industry	Lost Earnings (Millions)
Services	$14.5
Retail Trade	$10.5
Nondurable Goods	$6.5
Transportation & Utilities	$6.4
Finance, Insurance, and Real Estate	$4.4
Wholesale Trade	$2.4
Construction	$1.3
Durable Goods	$1.1
Mining	$0.8
Agriculture	$0.4
Private Households	$0.1
Total	**$48.4**

Note: This table was constructed using the BEA Aggregate Industry Input-Output tables, which provide the impact for 11 sectors.

Table C-9
Lost Employment in Western US Region Attributable
To a Three-Week Louisiana Natural Gas Disruption

Industry	Lost Employment
Services	431
Retail Trade	420
Nondurable Goods	101
Finance, Insurance, and Real Estate	100
Transportation & Utilities	94
Wholesale Trade	47
Construction	32
Durable Goods	22
Agriculture	21
Private Households	12
Mining	9
Total	**1,290**

Note: This table was constructed using the BEA Aggregate Industry Input-Output tables, which provide the impact for 11 sectors.

Table C-10
Lost Sales in Louisiana Attributable
To a Three-Week Louisiana Natural Gas Disruption
(2003 Dollars)

Industry	Lost Sales (Millions)
Nondurable Goods	$13.2
Transportation & Utilities	$11.2
Services	$9.2
Retail Trade	$8.4
Finance, Insurance, and Real Estate	$6.5
Mining	$4.6
Wholesale Trade	$1.8
Construction	$1.4
Durable Goods	$0.8
Agriculture	$0.2
Total	**$57.4**

Note: This table was constructed using the BEA Aggregate Industry Input-Output tables, which provide the impact for 11 sectors.

Table C-11
Lost Earnings in Louisiana Attributable
To a Three-Week Louisiana Natural Gas Disruption
(2003 Dollars)

Industry	Lost Earnings (Millions)
Services	$3.9
Retail Trade	$3.1
Transportation & Utilities	$1.7
Nondurable Goods	$1.5
Finance, Insurance, and Real Estate	$0.7
Wholesale Trade	$0.6
Mining	$0.6
Construction	$0.5
Durable Goods	$0.2
Agriculture	$0.1
Private Households	$0.1
Total	**$12.9**

Note: This table was constructed using the BEA Aggregate Industry Input-Output tables, which provide the impact for 11 sectors.

Table C-12
Lost Employment in Louisiana Attributable
To a Three-Week Louisiana Natural Gas Disruption

Industry	Lost Employment
Retail Trade	187
Services	161
Transportation & Utilities	35
Finance, Insurance, and Real Estate	27
Nondurable Goods	25
Wholesale Trade	17
Construction	16
Mining	8
Private Households	6
Agriculture	4
Durable Goods	4
Total	**491**

Note: This table was constructed using the BEA Aggregate Industry Input-Output tables, which provide the impact for 11 sectors.

Appendix D

Industry Level Impacts:
Seven-Day Closure of the Lower Mississippi

Table D-1
Lost US Sales Attributable to a 7-Day Closure of the Mississippi
(2003 Dollars)

Industry	Lost Sales (Millions)
Transportation	$13.0
Real Estate	$8.8
Business Services	$6.9
Health Services	$5.9
Retail Trade	$5.3
Financial Institutions & Sec.	$5.0
Miscellaneous Services	$4.3
Wholesale Trade	$3.5
Food and Tobacco Products	$3.1
Communications	$2.5
Total	**$80.8**

Note: This table was constructed using the BEA Input-Output tables, which provide the impact for 38 sectors. The total includes all 38 sectors except those under $2.5 million.

Table D-2
Lost US Earnings Attributable to a 7-Day Closure of the Mississippi
(2003 Dollars)

Industry	Lost Earnings
Business Services	$3,002,094
Transportation	$2,997,682
Health Services	$2,726,770
Retail Trade	$1,915,798
Financial Institutions & Sec.	$1,766,664
Miscellaneous Services	$1,428,686
Wholesale Trade	$1,135,713
Insurance	$731,551
Eating and Drinking Places	$723,609
Hotels, amusement, and recreation	$698,018
Communications	$518,880
Total	**$22,151,254**

Note: This table was constructed using the BEA Input-Output tables, which provide the impact for 38 sectors. The total includes all 38 sectors except those under $500k.

Table D-3
Lost US Employment Attributable to a 7-Day Closure of the Mississippi

Industry	Lost Employment
Retail Trade	88
Business Services	76
Transportation	73
Health Services	68
Misc. Services	60
Eating and Drinking Places	52
Financial Institutions & Sec.	36
Hotels, amusement, and recreation	32
Wholesale Trade	23
Total	**663**

Note: This table was constructed using the BEA Input-Output tables, which provide the impact for 38 sectors. The total includes all 38 sectors except those under 20.

Table D-4
Lost Region 1 (Upper Mississippi) Sales Attributable to a 7-Day Closure of the Mississippi
(2003 Dollars)

Industry	Lost Sales
Transportation	$4,887,069
Real Estate	$3,377,393
Health Services	$2,475,578
Retail Trade	$2,263,747
Business Services	$1,942,164
Miscellaneous Services	$1,662,026
Financial Institutions & Sec.	$1,518,503
Wholesale Trade	$1,495,094
Food and Tobacco Products	$1,102,900
Chemicals, Petroleum, and Coal Products	$991,613
Insurance	$934,434
Eating and Drinking Places	$881,860
Communications	$835,042
Total	**$29,844,699**

Note: This table was constructed using the BEA Input-Output tables, which provide the impact for 38 sectors. The total includes all 38 sectors except those under $750k.

Table D-5
Lost Region 1 (Upper Mississippi) Earnings Attributable to a 7-Day Closure of the Mississippi
(2003 Dollars)

Industry	Lost Earnings
Transportation	$1,115,180.41
Health Services	$1,091,771.60
Business Services	$945,946.22
Retail Trade	$760,978.23
Miscellaneous Services	$534,181.39
Financial Institutions & Sec.	$522,285.11
Wholesale Trade	$421,358.60
Eating and Drinking Places	$288,580.75
Insurance	$286,662.00
Total	**$7,843,103**

Note: This table was constructed using the BEA Input-Output tables, which provide the impact for 38 sectors. The total includes all 38 sectors except those under $250k.

Table D-6
Lost Region 1 (upper Mississippi) Employment Attributable to a 7-Day Closure of the Mississippi

Industry	Lost Employment
Retail Trade	37
Transportation	29
Health Services	28
Business Services	25
Miscellaneous Services	24
Eating and Drinking Places	22
Financial Institutions & Sec.	13
Hotels, amusement, and recreation	10
Total	**251**

Note: This table was constructed using the BEA Input-Output tables, which provide the impact for 38 sectors. The total includes all 38 sectors except those under 10.

Table D-7
Lost Louisiana Sales Attributable to a 7-Day Closure of the Mississippi
(2003 Dollars)

Industry	Lost Sales
Transportation	$2,746,505
Real Estate	$1,378,803
Health Services	$1,191,934
Retail Trade	$993,758
Miscellaneous Services	$638,316
Business Services	$595,350
Wholesale Trade	$464,809
Financial Institutions & Sec.	$464,192
Eating and Drinking Places	$427,188
Total	**$11,518,052**

Note: This table was constructed using the BEA Input-Output tables, which provide the impact for 38 sectors. The total includes all 38 sectors except those under $400k.

Table D-8
Lost Louisiana Earnings Attributable to a 7-Day Closure of the Mississippi
(2003 Dollars)

Industry	Lost Earnings
Health Services	$587,744
Transportation	$549,095
Retail Trade	$369,627
Business Services	$277,117
Miscellaneous Services	$235,180
Wholesale Trade	$155,827
Eating and Drinking Places	$133,625
Financial Institutions & Sec.	$126,430
Total	**$3,089,818**

Note: This table was constructed using the BEA Input-Output tables, which provide the impact for 38 sectors. The total includes all 38 sectors except those under $100k.

Table D-9
Lost Louisiana Employment Attributable to a 7-Day Closure of the Mississippi

Industry	Lost Employment
Retail Trade	22
Health Services	16
Transportation	15
Miscellaneous Services	12
Eating and Drinking Places	11
Total	**120**

Note: This table was constructed using the BEA Input-Output tables, which provide the impact for 38 sectors. The total includes all 38 sectors except those under 10.

Appendix E

Industry Level Impacts:
Fourteen- Day Closure of the Lower Mississippi

Table E-1
Lost US Sales Attributable to a 14-Day Closure of the Mississippi
(2003 Dollars)

Industry	Lost Sales (Millions)
Transportation	$52.2
Real Estate	$35.3
Business Services	$27.4
Health Services	$23.4
Retail Trade	$21.3
Financial Institutions & Sec.	$20.1
Miscellaneous Services	$17.1
Wholesale Trade	$13.9
Food and Tobacco Products	$12.3
Communications	$9.9
Chemicals, Petroleum, and Coal Products	$9.3
Insurance	$8.8
Eating and Drinking Places	$8.4
Hotels, amusement, and recreation	$7.9
Electric, Gas, and Sanitary Services	$6.8
Farm Products, Ag., Forestry, and Fishing Services	$5.3
Printing and Publishing	$5.2
Total	**$323.3**

Note: This table was constructed using the BEA Input-Output tables, which provide the impact for 38 sectors. The total includes all 38 sectors except those under $5 million.

Table E-2
Lost US Earnings Attributable to a 14-Day Closure of the Mississippi
(2003 Dollars)

Industry	Lost Earnings (Millions)
Business Services	$12.0
Transportation	$12.0
Health Services	$10.9
Retail Trade	$7.7
Financial Institutions & Sec.	$7.1
Miscellaneous Services	$5.7
Wholesale Trade	$4.5
Insurance	$2.9
Eating and Drinking Places	$2.9
Hotels, amusement, and recreation	$2.8
Communications	$2.1
Total	**$88.6**

Note: This table was constructed using the BEA Input-Output tables, which provide the impact for 38 sectors. The total includes all 38 sectors except those under $2 million.

Table E-3
Lost US Employment Attributable to a 14-Day Closure of the Mississippi

Industry	Lost Employment
Retail Trade	354
Business Services	305
Transportation	293
Health Services	273
Misc. Services	241
Eating and Drinking Places	206
Financial Institutions & Sec.	145
Hotels, amusement, and recreation	127
Wholesale Trade	92
Personal Services	73
Farm Products, Ag., Forestry, and Fishing Services	65
Insurance	63
Real Estate	56
Total	**2,653**

Note: This table was constructed using the BEA Input-Output tables, which provide the impact for 38 sectors. The total includes all 38 sectors except those under $50 million.

Table E-4
Lost Region 1 (upper Mississippi) Sales
Attributable to a 14-Day Closure of the Mississippi
(2003 Dollars)

Industry	Lost Sales ($Millions)
Transportation	$19.5
Real Estate	$13.5
Health Services	$9.9
Retail Trade	$9.1
Business Services	$7.8
Miscellaneous Services	$6.6
Financial Institutions & Sec.	$6.1
Wholesale Trade	$6.0
Food and Tobacco Products	$4.4
Chemicals, Petroleum, and Coal Products	$4.0
Insurance	$3.7
Eating and Drinking Places	$3.5
Communications	$3.3
Electric, Gas, and Sanitary Services	$2.7
Total	**$119.4**

Note: This table was constructed using the BEA Input-Output tables, which provide the impact for 38 sectors. The total includes all 38 sectors except those under $2 million.

Table E-5
Lost Region 1 (upper Mississippi) Earnings
Attributable to a 14-Day Closure of the Mississippi
(2003 Dollars)

Industry	Lost Earnings ($Millions)
Transportation	$4.5
Health Services	$4.4
Business Services	$3.8
Retail Trade	$3.0
Miscellaneous Services	$2.1
Financial Institutions & Sec.	$2.1
Wholesale Trade	$1.7
Eating and Drinking Places	$1.2
Insurance	$1.1
Total	**$31.4**

Note: This table was constructed using the BEA Input-Output tables, which provide the impact for 38 sectors. The total includes all 38 sectors except those under $1 million.

Table E-6
Lost Region 1 (upper Mississippi) Employment
Attributable to a 14-Day Closure of the Mississippi

Industry	Lost Employment
Retail Trade	146
Transportation	116
Health Services	112
Business Services	102
Miscellaneous Services	96
Eating and Drinking Places	87
Financial Institutions & Sec.	53
Hotels, amusement, and recreation	39
Wholesale Trade	34
Personal Services	30
Insurance	26
Total	**1,006**

Note: This table was constructed using the BEA Input-Output tables, which provide the impact for 38 sectors. The total includes all 38 sectors except those under 25.

Table E-7
Lost Louisiana Sales Attributable to a 14-Day Closure of the Mississippi
(2003 Dollars)

Industry	Lost Sales ($Millions)
Transportation	$11.0
Real Estate	$5.5
Health Services	$4.8
Retail Trade	$4.0
Miscellaneous Services	$2.6
Business Services	$2.4
Wholesale Trade	$1.9
Financial Institutions & Sec.	$1.9
Eating and Drinking Places	$1.7
Electric, Gas, and Sanitary Services	$1.4
Chemicals, Petroleum, and Coal Products	$1.1
Food and Tobacco Products	$1.1
Communications	$1.0
Total	**$46.1**

Note: This table was constructed using the BEA Input-Output tables, which provide the impact for 38 sectors. The total includes all 38 sectors except those under $1 million.

.

Table E-8
Lost Louisiana Earnings Attributable to a 14-Day Closure of the Mississippi
(2003 Dollars)

Industry	Lost Earnings
Health Services	$2,350,975
Transportation	$2,196,382
Retail Trade	$1,478,508
Business Services	$1,108,470
Miscellaneous Services	$940,719
Wholesale Trade	$623,309
Eating and Drinking Places	$534,499
Financial Institutions & Sec.	$505,719
Total	**$12,359,272**

Note: This table was constructed using the BEA Input-Output tables, which provide the impact for 38 sectors. The total includes all 38 sectors except those under $500,000.

Table E-9
Lost Louisiana Employment Attributable to a 14-Day Closure of the Mississippi

Industry	Lost Employment
Retail Trade	88
Health Services	65
Transportation	59
Miscellaneous Services	49
Eating and Drinking Places	44
Business Services	34
Hotels, amusement, and recreation	18
Wholesale Trade	17
Financial Institutions & Sec.	17
Personal Services	16
Real Estate	10
Total	**480**

Note: This table was constructed using the BEA Input-Output tables, which provide the impact for 38 sectors. The total includes all 38 sectors except those under 10.

Appendix F

Industry Level Impacts:
Commercial Fishing Losses

Table F-1
Lost US Sales in 2026 Attributable to
Commercial Fishing Losses due to Coastal Erosion
(2003 Dollars)

Industry	Lost Sales (Millions)
Forestry and Fishing Products	$26.1
Transportation	$4.1
Business Services	$3.7
Real Estate	$3.4
Construction	$3.0
Chemicals, Petroleum, and Coal Products	$2.9
Wholesale Trade	$2.7
Financial Institutions & Sec. and Commodity Brokers	$2.1
Retail Trade	$2.1
Health Services	$2.0
Miscellaneous Services	$1.8
Food and Tobacco Products	$1.1
Communications	$1.1
Insurance	$1.0
Total	**$66.0**

Note: This table was constructed using the BEA Input-Output tables, which provide the impact for 38 sectors. The total includes all 38 sectors except those under $5 million.

Table F-2
Lost US Earnings in 2026 Attributable to
Commercial Fishing Losses due to Coastal Erosion
(2003 Dollars)

Industry	Lost Earnings
Forestry and Fishing Products	$5,875,528
Business Services	$1,596,724
Transportation	$1,043,611
Construction	$1,009,693
Health Services	$952,295
Wholesale Trade	$863,588
Retail Trade	$754,009
Financial Institutions & Sec. and Commodity Brokers	$720,091
Miscellaneous Services	$558,332
Chemicals, Petroleum, and Coal Products	$360,046
Insurance	$333,955
Hotels, Amusement, and Recreation	$300,038
Eating and Drinking Places	$281,775
Farm Products, Ag., Forestry, and Fishing Services	$263,512
Total	**$16,943,018**

Note: This table was constructed using the BEA Input-Output tables, which provide the impact for 38 sectors. The total includes all 38 sectors except those under $5 million.

Table F-3
Lost US Employment in 2026 Attributable to
Commercial Fishing Losses due to Coastal Erosion

Industry	Lost Jobs
Forestry and Fishing Products	138
Business Services	44
Retail Trade	35
Construction	26
Transportation	26
Health Services	24
Miscellaneous Services	23
Eating and Drinking Places	20
Wholesale Trade	17
Financial Institutions & Sec. and Commodity Brokers	15
Hotels, Amusement, and Recreation	13
Farm Products, Ag., Forestry, and Fishing Services	13
Total	**460**

Note: This table was constructed using the BEA Input-Output tables, which provide the impact for 38 sectors. The total includes all 38 sectors except those under 10.

Table F-4
Lost Louisiana Sales in 2026 Attributable to
Commercial Fishing Losses due to Coastal Erosion
(2003 Dollars)

Industry	Lost Sales (Millions)
Forestry and Fishing Products	$26.1
Chemicals, Petroleum, and Coal Products	$2.7
Construction	$2.5
Transportation	$2.1
Real Estate	$2.0
Wholesale Trade	$1.7
Health Services	$1.6
Retail Trade	$1.5
Business Services	$1.4
Total	**$41.6**

Note: This table was constructed using the BEA Input-Output tables, which provide the impact for 38 sectors. The total includes all 38 sectors except those under $1 million.

Table F-5
Lost Louisiana Earnings in 2026 Attributable to
Commercial Fishing Losses due to Coastal Erosion
(2003 Dollars)

Industry	Lost Earnings
Forestry and Fishing Products	$5,581,695
Construction	$915,759
Health Services	$790,527
Business Services	$618,333
Wholesale Trade	$584,416
Retail Trade	$560,935
Transportation	$508,755
Miscellaneous Services	$373,087
Chemicals, Petroleum, and Coal Products	$333,952
Financial Institutions & Sec. and Commodity Brokers	$216,547
Eating and Drinking Places	$213,938
Insurance	$172,194
Hotels, Amusement, and Recreation	$148,713
Total	**$11,882,169**

Note: This table was constructed using the BEA Input-Output tables, which provide the impact for 38 sectors. The total includes all 38 sectors except those under $5 million.

Table F-6
Lost Louisiana Employment in 2026 Attributable to Commercial Fishing Losses due to Coastal Erosion

Industry	Lost Jobs
Forestry and Fishing Products	128
Retail Trade	31
Construction	23
Health Services	22
Business Services	21
Miscellaneous Services	19
Eating and Drinking Places	18
Wholesale Trade	15
Transportation	14
Total	**297**

Note: This table was constructed using the BEA Input-Output tables, which provide the impact for 38 sectors. The total includes all 38 sectors except those under 10.

Table F-7
Present Value of Lost Louisiana Sales Attributable to
Commercial Fishing Losses Over 93 Years of Coastal Erosion
(2003 Dollars)

Industry	Lost Sales (Millions)
Forestry and Fishing Products	$2,238.0
Chemicals, Petroleum, and Coal Products	$233.4
Construction	$212.1
Transportation	$180.4
Real Estate	$173.9
Wholesale Trade	$149.5
Health Services	$137.5
Retail Trade	$129.0
Business Services	$116.9
Miscellaneous Services	$89.0
Financial Institutions & Sec. and Commodity Brokers	$70.0
Metal Mining and Non-Metallic Minerals Except Fuels	$61.5
Eating and Drinking Places	$58.3
Total	**$4,192.6**

Note: This table was constructed using the BEA Input-Output tables, which provide the impact for 38 sectors. The total includes all 38 sectors except those under $50 million.

Table F-8
Lost Louisiana Earnings Attributable to
Commercial Fishing Losses Over 93 Years of Coastal Erosion
(2003 Dollars)

Industry	Lost Earnings (Millions)
Forestry and Fishing Products	$478.2
Construction	$78.5
Health Services	$67.7
Business Services	$53.0
Wholesale Trade	$50.1
Retail Trade	$48.1
Transportation	$43.6
Miscellaneous Services	$32.0
Chemicals, Petroleum, and Coal Products	$28.6
Financial Institutions & Sec. and Commodity Brokers	$18.6
Eating and Drinking Places	$18.3
Insurance	$14.8
Hotels, Amusement, and Recreation	$12.7
Total	**$1,017.9**

Note: This table was constructed using the BEA Input-Output tables, which provide the impact for 38 sectors. The total includes all 38 sectors except those under $10 million.

Table F-9
Present Value of Lost US Total Sales Attributable to
Commercial Fishing Losses Over 93 Years of Coastal Erosion
(2003 Dollars)

Industry	Lost Sales (Millions)
Forestry and Fishing Products	$2,238.2
Transportation	$348.9
Business Services	$314.7
Real Estate	$289.0
Construction	$254.8
Chemicals, Petroleum, and Coal Products	$245.6
Wholesale Trade	$227.3
Financial Institutions & Sec. and Commodity Brokers	$180.6
Retail Trade	$179.0
Health Services	$175.2
Miscellaneous Services	$151.8
Total	**$5,656.3**

Note: This table was constructed using the BEA Input-Output tables, which provide the impact for 38 sectors. The total includes all 38 sectors except those under $150 million.

Table F-10
Present Value of Lost US Total Earnings Attributable to Commercial Fishing Losses Over 93 Years of Coastal Erosion
(2003 Dollars)

Industry	Lost Earnings (Millions)
Forestry and Fishing Products	$503.3
Business Services	$136.8
Transportation	$89.4
Construction	$86.5
Health Services	$81.6
Wholesale Trade	$74.0
Retail Trade	$64.6
Financial Institutions & Sec. and Commodity Brokers	$61.7
Miscellaneous Services	$47.8
Chemicals, Petroleum, and Coal Products	$30.8
Total	**1,451.5**

Note: This table was constructed using the BEA Input-Output tables, which provide the impact for 38 sectors. The total includes all 38 sectors except those under $5 million.

Appendix G

Industry Level Impacts:
Losses In Louisiana Recreational Activities

Table G-1
Total Louisiana Sales Attributable to Recreational Saltwater Fishing
(Millions of 2003 Dollars)

Industry	**Sales**
Retail Trade	$276.5
Real Estate	$37.7
Health Services	$21.9
Eating and Drinking Places	$21.4
Business Services	$21.1
Hotels and Amusement	$16.1
Electric, Gas and Sanitary Services	$14.0
Misc Services	$13.8
Banking and Brokers	$12.3
Wholesale Trade	$12.0
Transportation	$10.8
Communications	$9.7
Construction	$7.9
Food and Kindred Products	$7.6
Total	$518.7

Note: This table was constructed using the BEA Input-Output tables, which provide the impact for 38 sectors. The total includes all 38 sectors except those under $7.5 million.

Table G-2
Total Louisiana Earnings attributable to Recreational Saltwater Fishing
(Millions of 2003 Dollars)

Industry	**Earnings**
Retail Trade	$102.8
Health Services	$10.8
Business Services	$9.5
Eating and Drinking Places	$6.7
Hotels and Amusement	$5.8
Misc Services	$4.9
Transportation	$4.1
Wholesale Trade	$4.0
Banking and Brokers	$3.3
Construction	$2.8
Communications	$2.2
Total	$170.4

Note: This table was constructed using the BEA Input-Output tables, which provide the impact for 38 sectors. The total includes all 38 sectors except those under $2 million.

Table G-3
Total Louisiana Employment attributable to Recreational Saltwater Fishing

Industry	Employment
Retail Trade	6,138
Eating and Drinking Places	551
Business Services	324
Hotels and Amusement	310
Health Services	300
Miscellaneous Services	249
Transportation	118
Wholesale Trade	112
Banking and Brokers	107
Real Estate	107
Personal Services	106
Construction	90
Insurance	50
Total	8,898

Note: This table was constructed using the BEA Input-Output tables, which provide the impact for 38 sectors. The total includes all 38 sectors except those under 50.

Table G-4
Total Louisiana Sales attributable to Migratory Bird Hunting
(Millions of 2003 Dollars)

Industry	Sales
Retail Trade	$27.1
Eating and Drinking Places	$13.2
Hotels and Amusement	$12.6
Real Estate	$6.0
Health Services	$3.7
Business Services	$3.6
Electric, Gas and Sanitary Services	$2.5
Wholesale Trade	$2.5
Miscellaneous Services	$2.3
Food and Kindred Products	$2.3
Banking and Brokers	$2.2
Transportation	$2.0
Total	$89.2

Note: This table was constructed using the BEA Input-Output tables, which provide the impact for 38 sectors. The total includes all 38 sectors except those under $2 million.

Table G-5
Total Louisiana Earnings attributable to Migratory Bird Hunting
(Millions of 2003 Dollars)

Industry	**Earnings**
Retail Trade	$10.1
Hotels and Amusement	$4.5
Eating and Drinking Places	$4.1
Health Services	$1.8
Business Services	$1.6
Wholesale Trade	$0.8
Misc Services	$0.8
Transportation	$0.7
Banking and Brokers	$0.6
Construction	$0.5
Total	$28.4

Note: This table was constructed using the BEA Input-Output tables, which provide the impact for 38 sectors. The total includes all 38 sectors except those under .5 million.

Table G-6
Total Louisiana Employment attributable to Migratory Bird Hunting

Industry	**Employment**
Retail Trade	602
Eating and Drinking Places	340
Hotels and Amusement	241
Business Services	57
Health Services	50
Miscellaneous Services	42
Wholesale Trade	23
Total	1,521

Note: This table was constructed using the BEA Input-Output tables, which provide the impact for 38 sectors. The total includes all 38 sectors except those under 20.

Table G-7
Total Louisiana Sales Attributable to Wildlife Viewing
(Millions of 2003 Dollars)

Industry	**Sales**
Retail Trade	$30.9
Eating and Drinking Places	$8.2
Hotels and Amusement	$7.7
Real Estate	$5.4
Health Services	$3.2
Business Services	$3.1
Electric, Gas and Sanitary Services	$2.2
Misc Services	$2.1
Wholesale Trade	$2.0
Banking and Brokers	$1.9
Transportation	$1.7
Food and Kindred Products	$1.7
Total	$78.1

Note: This table was constructed using the BEA Input-Output tables, which provide the impact for 38 sectors. The total includes all 38 sectors except those under $1.5 million.

Table G-8
Total Louisiana Earnings attributable to Wildlife Viewing
(Millions of 2003 Dollars)

Industry	**Earnings**
Retail Trade	$11.5
Hotels and Amusement	$2.7
Eating and Drinking Places	$2.6
Health Services	$1.6
Business Services	$1.4
Misc Services	$0.7
Wholesale Trade	$0.7
Transportation	$0.6
Total	$25.2

Note: This table was constructed using the BEA Input-Output tables, which provide the impact for 38 sectors. The total includes all 38 sectors except those under $0.5 million.

Table G-9
Total Louisiana Employment attributable to Wildlife Viewing

Industry	**Sales**
Retail Trade	686
Eating and Drinking Places	210
Hotels and Amusement	146
Business Services	49
Health Services	44
Miscellaneous Services	37
Total	1,333

Note: This table was constructed using the BEA Input-Output tables, which provide the impact for 38 sectors. The total includes all 38 sectors except those under 30.

Table G-10
Total US Sales attributable to Louisiana Recreational Saltwater Fishing
(Millions of 2003 Dollars)

Industry	**Sales**
Retail Trade	$130.5
Real Estate	$28.8
Business Services	$26.0
Banking and Brokers	$14.0
Health Services	$12.7
Miscellaneous Services	$10.6
Hotels and Amusement	$10.5
Wholesale Trade	$10.1
Eating and Drinking Places	$9.7
Communications	$9.4
Transportation	$9.0
Food and Kindred Products	$8.7
Electric, Gas and Sanitary Services	$6.6
Chemicals	$6.5
Printing and Publishing	$5.9
Insurance	$5.4
Construction	$5.2
Total	$339.2

Note: This table was constructed using the BEA Input-Output tables, which provide the impact for 38 sectors. The total includes all 38 sectors except those under $5 million.

Table G-11
Total US Earnings attributable to Louisiana Recreational Saltwater Fishing
(Millions of 2003 Dollars)

Industry	**Earnings**
Retail Trade	$47.0
Business Services	$11.1
Health Services	$5.9
Banking and Brokers	$4.7
Hotels and Amusement	$3.7
Miscellaneous Services	$3.4
Eating and Drinking Places	$3.3
Wholesale Trade	$3.3
Transportation	$3.3
Communications	$2.0
Printing and Publishing	$1.8
Insurance	$1.8
Construction	$1.7
Real Estate	$1.6
Electric, Gas and Sanitary Services	$1.1
Food and Kindred Products	$1.1
Agricultural	$1.1
Chemicals	$1.0
Total	$105.0

Note: This table was constructed using the BEA Input-Output tables, which provide the impact for 38 sectors. The total includes all 38 sectors except those under $1.0 million.

Table G-12
Total US Employment Attributable to Louisiana Recreational Saltwater Fishing

Industry	Employment
Retail Trade	2,172
Business Services	303
Eating and Drinking Places	237
Hotels and Amusement	151
Health Services	147
Miscellaneous Services	140
Banking and Brokers	95
Transportation	87
Wholesale Trade	66
Real Estate	62
Agricultural	53
Personal Services	52
Total	3,906

Note: This table was constructed using the BEA Input-Output tables, which provide the impact for 38 sectors. The total includes all 38 sectors except those under 50.

Table G-13
Total US Sales attributable to Louisiana Migratory Bird Hunting
(Millions of 2003 Dollars)

Industry	Sales
Retail Trade	$5.5
Hotels and Amusement	$2.7
Eating and Drinking Places	$2.6
Real Estate	$2.0
Business Services	$1.9
Food and Kindred Products	$1.1
Banking and Brokers	$1.1
Health Services	$0.9
Wholesale Trade	$0.8
Miscellaneous Services	$0.8
Total	$25.2

Note: This table was constructed using the BEA Input-Output tables, which provide the impact for 38 sectors. The total includes all 38 sectors except those under $0.8 million.

Table G-14
Total US Earnings attributable to Louisiana Migratory Bird Hunting
(Millions of 2003 Dollars)

Industry	**Earnings**
Retail Trade	$2.0
Hotels and Amusement	$0.9
Eating and Drinking Places	$0.9
Business Services	$0.8
Health Services	$0.4
Banking and Brokers	$0.4
Wholesale Trade	$0.3
Transportation	$0.3
Total	$7.6

Note: This table was constructed using the BEA Input-Output tables, which provide the impact for 38 sectors. The total includes all 38 sectors except those under $.3 million.

Table G-15
Total US Employment attributable to Louisiana Migratory Bird Hunting

Industry	Employment
Retail Trade	91
Eating and Drinking Places	64
Hotels and Amusement	38
Business Services	23
Health Services	11
Miscellaneous Services	10
Total	296

Note: This table was constructed using the BEA Input-Output tables, which provide the impact for 38 sectors. The total includes all 38 sectors except those under 10.

Table G-16
Total US Sales attributable to Louisiana Wildlife Viewing
(Millions of 2003 Dollars)

Industry	Sales
Households	$14.8
Retail Trade	$10.6
Hotels and Amusement	$5.3
Eating and Drinking Places	$5.1
Real Estate	$3.8
Business Services	$3.6
Food and Kindred Products	$2.1
Banking and Brokers	$2.0
Health Services	$1.8
Wholesale Trade	$1.6
Miscellaneous Services	$1.5
Total	$63.7

Note: This table was constructed using the BEA Input-Output tables, which provide the impact for 38 sectors. The total includes all 38 sectors except those under $1.5 million.

Table G-17
Total US Earnings Attributable to Louisiana Wildlife Viewing
(Millions of 2003 Dollars)

Industry	**Earnings**
Retail Trade	$3.8
Hotels and Amusement	$1.8
Eating and Drinking Places	$1.8
Business Services	$1.6
Health Services	$0.8
Banking and Brokers	$0.7
Wholesale Trade	$0.5
Transportation	$0.5
Miscellaneous Services	$0.5
Total	$14.8

Note: This table was constructed using the BEA Input-Output tables, which provide the impact for 38 sectors. The total includes all 38 sectors except those under $0.5 million.

Table G-18
Total US Employment attributable to Louisiana Wildlife Viewing

Industry	**Jobs**
Retail Trade	177
Eating and Drinking Places	125
Hotels and Amusement	74
Business Services	44
Health Services	21
Miscellaneous Services	20
Total	575

Note: This table was constructed using the BEA Input-Output tables, which provide the impact for 38 sectors. The total includes all 38 sectors except those under 20.