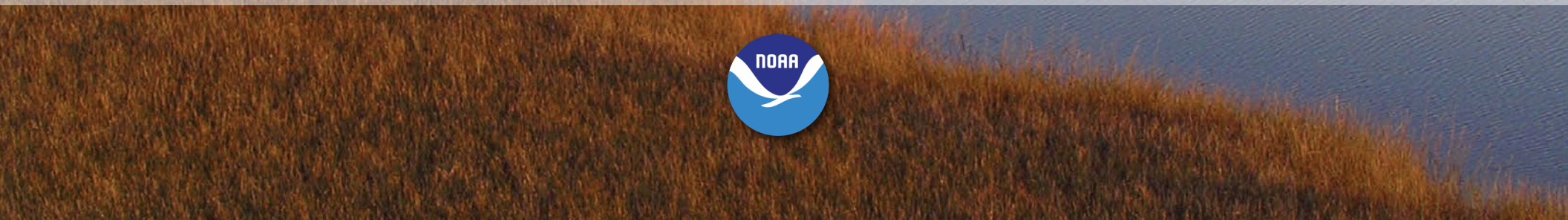
NOAA'S STATE OF THE COAST

The GULF OF MEXICO at a GLANCE:

A Second Glance

Explore Coastal Communities, Economy, and Ecosystems



NOAA's State of the Coast Web site, and associated products like this *Gulf of Mexico at Glance: A Second Glance* report, exist to help citizens gain a deeper appreciation of the connections among healthy coastal ecosystems, a robust U.S. economy, a safe population, and a sustainable quality of life for coastal residents ... and the consequent need to better understand, manage, and protect our Nation's coastal resources.

Visit: http://stateofthecoast.noaa.gov

This document is a publication of the National Oceanic and Atmospheric Administration (NOAA), produced by the National Ocean Service (NOS) Special Projects Division.

To further explore socioeconomic attributes presented in this report, or to download the relevant coastal socioeconomic data sets, please visit NOAA's Spatial Trends in Coastal Socioeconomics, or STICS, Web site at: http://stics.noaa.gov.

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Cover Photo
Looking south on Bayou Heron, Grand Bay National Estuarine Research Reserve in Jackson County, MS. Credit: Gretchen L. Grammer

Inside Cover Photo
Black Skimmers on the coast of Ship Island. Credit: Barbara Ambrose, National Coastal Data Development Center, NOAA

Back Cover Photo
Galveston Bay, TX. Credit: Texas Parks and Wildlife Department

Dear Readers,

The Gulf of Mexico region provides the Nation with valuable energy resources, abundant seafood, extraordinary beaches and leisure activities, and a rich cultural heritage. At the same time, the Gulf of Mexico has endured incredible natural and man-made catastrophes in the last decade, including the most costly natural disaster in U.S. history – Hurricane Katrina in 2005 – and the largest accidental marine oil spill in U.S. history – Deepwater Horizon MC252 in 2010. All the while, coastal and ocean managers in the region continue to address complex ecosystem health and water quality and quantity challenges.

Since 2004, the Gulf of Mexico Alliance has worked to increase regional collaboration at state, local, and federal levels, with the goal of improving the ecological and economic health of the Gulf region. NOAA continues as a proud partner in this collaborative approach where shared scientific strengths are matched with shared management strengths.

One objective of the Gulf of Mexico Alliance is to build public awareness about the connections between healthy coastal ecosystems, a robust economy, a safe population, and a sustainable quality of life for coastal residents. To this end, the *Gulf of Mexico at a Glance: A Second Glance* provides highlights of what we know about the Gulf region's coastal communities, coastal economy, and coastal ecosystems, and how climate change might impact the Gulf coast. While this report presents only a small selection of regional attributes within these themes, we hope to inspire others to increase our collective understanding about these connections.

Sincerely,

David Kennedy
Assistant Administrator for Ocean Services and Coastal Zone Management
National Ocean Service
NOAA

Buck Sutter
Deputy Regional Administrator
Southeast Regional Office
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The GULF OF MEXICO at a GLANCE: *A Second Glance*

June 2011

Reprinted February 2012

This document is a product of the NOAA State of the Coast Report Series (http://stateofthecoast.noaa.gov), and a publication of the National Oceanic and Atmospheric Administration, Department of Commerce, developed in partnership with the U.S. Environmental Protection Agency Gulf of Mexico Program and U.S. Census Bureau, in support of the Gulf of Mexico Alliance.

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The **Gulf of Mexico Alliance** is a partnership among the states of Alabama, Florida, Louisiana, Mississippi, and Texas, with the goal of significantly increasing regional collaboration to enhance the environmental and economic health of the Gulf of Mexico region. By working together on priority regional issues, the five Gulf states are committed to realizing the benefits of shared management successes and coordinated environmental monitoring and ultimately striving towards a common regional vision and strategy for enhancing the Gulf of Mexico region.

The Gulf of Mexico Alliance actively works to collaborate with the six Mexican Gulf states and is engaged in a number of ongoing activities in Mexico. Both parties acknowledge that the environmental and economic health of the Gulf of Mexico is contingent upon responsible management by both the United States and Mexico

GULF OF MEXICO ALLIANCE

http://gulfofmexicoalliance.org/

Introduction

The Gulf of Mexico waters touch the shores of the United States, Mexico, and Cuba. The Gulf of Mexico has an area of approximately 580,000 square miles, contains an approximate 584,000 cubic miles of water, and has an average depth of 5,299 feet (Nipper et al., 2008). The U.S. portion of the Gulf of Mexico region extends from the Florida Keys westward to the southern tip of Texas, following the coastline of five states. The combined coastline of these states, Alabama, Florida, Louisiana, Mississippi, and Texas totals over 47,000 miles.[1]

Ship Island, Gulf Islands National Seashore. MS. Credit: Barbara Ambrose, National Coastal Data Development Center, NOAA

The well-being of the Gulf of Mexico region depends on a suite of benefits that flow from healthy coasts: food, clean water, jobs, recreation, and protection from hurricanes. But the ability of the Gulf coast to deliver these benefits is being eroded by the extensive environmental alterations we have made to the region's coastal ecosystems. In some cases, these benefits are being further eroded by changes in climate. Whatever the cause, these changes threaten to compromise the health and economic well-being of our coastal communities and the benefits that the Gulf region brings to the Nation.

A charter boat and a line of shrimp boats docked at a working waterfront in Bayou La Batre, AL. Credit: Melissa Schneider

As a product of the NOAA State of the Coast Report Series, *The Gulf of Mexico at a Glance: A Second Glance* provides highlights of what we know about the Gulf region's coastal communities, coastal economy, and coastal ecosystems, and how climate change might impact the Gulf coast (Figure 1). This report is an update to the original *Gulf of Mexico at a Glance*, published in June 2008 and includes an expanded suite of regional attributes. Information in this report is organized by the following interconnected themes: Communities, Economy, and Ecosystems.

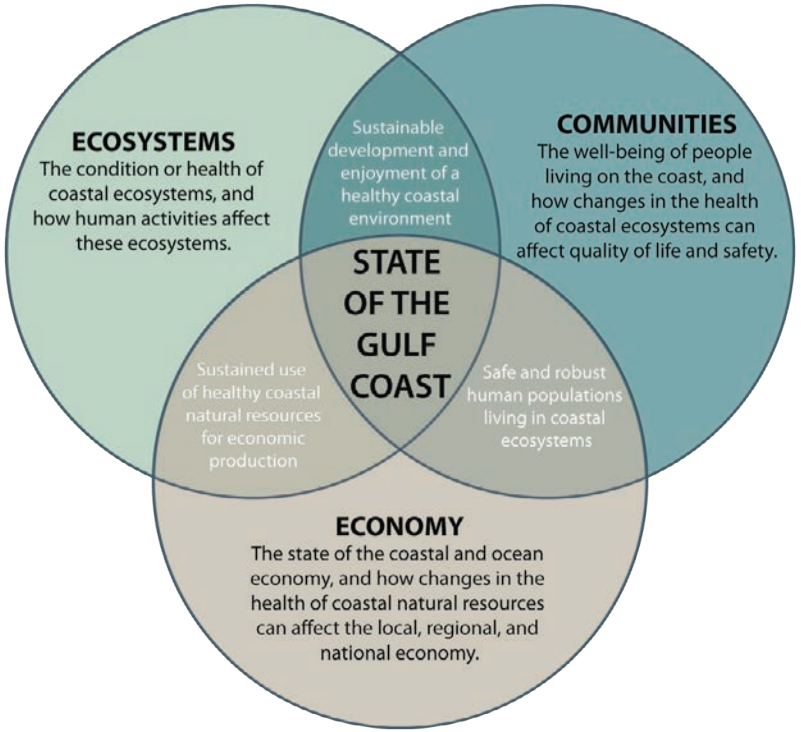


Figure 1: The three major report themes and the significance of their connections.

Data and Geography in this Report

The statistics, charts, and maps presented in this report provide a snapshot of the most current, readily available data at the time of publication. All data sources are cited in references available at the end of the report. Data were acquired directly from several data originators and any subsequent manipulations were thoroughly verified. Representations of the coastal economy and coastal employment in this report are not necessarily ocean or coastal dependent, but rather economic production that occurs in coastal areas. Demographic projections presented in this report were derived from data generated by Woods and Poole Economics, Inc. The projections are intended to highlight where regional change might occur, and are not intended to be interpreted as actual future conditions.

The "Gulf Coast Region," referenced throughout this report as a regional, aggregated geographic reporting unit, is a suite of 141 NOAA Coastal Watershed Counties chosen by NOAA to represent a relevant geographic area for describing community, economic, and ecosystem attributes of the Gulf of Mexico region (Figure 2). In total, this area contains almost 117,000 square miles of land area. For maps and details about the Gulf Coast Region, and for further information on how NOAA Coastal Watershed Counties are determined, see Appendices A and B.

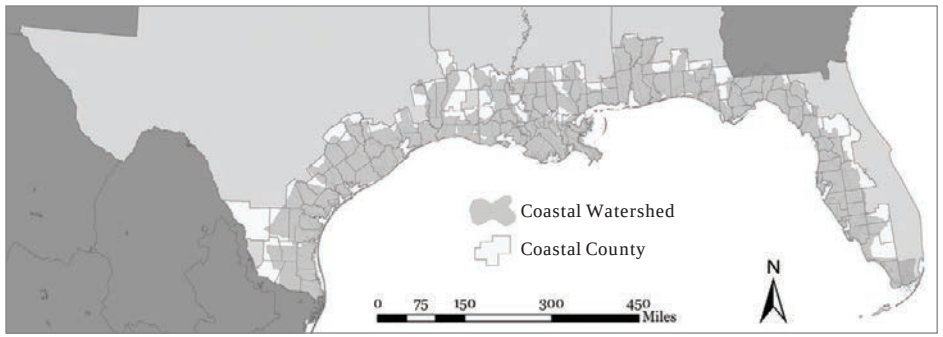


Figure 2: Coastal watersheds and corresponding coastal counties that make up the Gulf Coast Region (see Appendices A and B for further information).

Deepwater Horizon MC252 Oil Spill and this Report

Credit: NOAA, 2010

The April 20, 2010 explosion on the Deepwater Horizon MC252 drilling platform killed eleven people. The subsequent oil spill resulted in almost 4.9 million barrels of oil released into the Gulf (NOAA, 2010a). During the height of the spill, federal fishery closed areas totaled as much as 88,522 square miles (NMFS, 2010c) and NOAA Natural Resource Damage Assessment teams documented the presence of oil on more than 950 miles of shoreline (NOAA, 2010d). As of early November 2010, response teams had documented 2,263 visibly oiled dead birds; 2,079 visibly oiled live birds; 18 visibly oiled dead sea turtles; and 456 visibly oiled live sea turtles (NOAA, 2010c). Additionally, as of August 6, 2010, approximately 1.84 million gallons of total dispersant had been applied—1.07 million on the surface and 771,000 sub-sea (Deepwater Horizon Incident Joint Information Center, 2010).

This report presents information about a wide range of topics and most of the data available for those topics predates the Deepwater Horizon MC252 oil spill. Where possible and relevant, information is presented about how different aspects of the oil spill may be connected to various topics in the report. However, this report does not reflect or attempt to characterize effects of the oil spill.

For further information regarding the oil spill, visit: http://www.noaa.gov/deepwaterhorizon/

COMMUNITIES

There exists a tremendous variety of communities in the Gulf Coast Region, with many different assemblages of people, cultures, occupations, and living and settlement patterns. Vibrant communities provide a sense of togetherness, interdependent working relationships, and social cooperation and association.

In this section, some of the more prominent factors that shape and influence the nature, health, and vitality of Gulf coastal communities are examined and discussed.

Population in the Gulf Coast Region

Examine the characteristics of this fundamental component of communities, including population density and historic and expected future population change.

Characteristics of the Population

Learn about the Gulf Coast Region's unique population, including age distribution, race, education, and household income.

Population in the Special Flood Hazard Area

Explore the population residing in the Gulf coast Special Flood Hazard Area and those subpopulations considered to be at elevated risk to coastal hazards.

Housing and Development

Discover housing and development characteristics including building permits, housing density, and housing unit change.

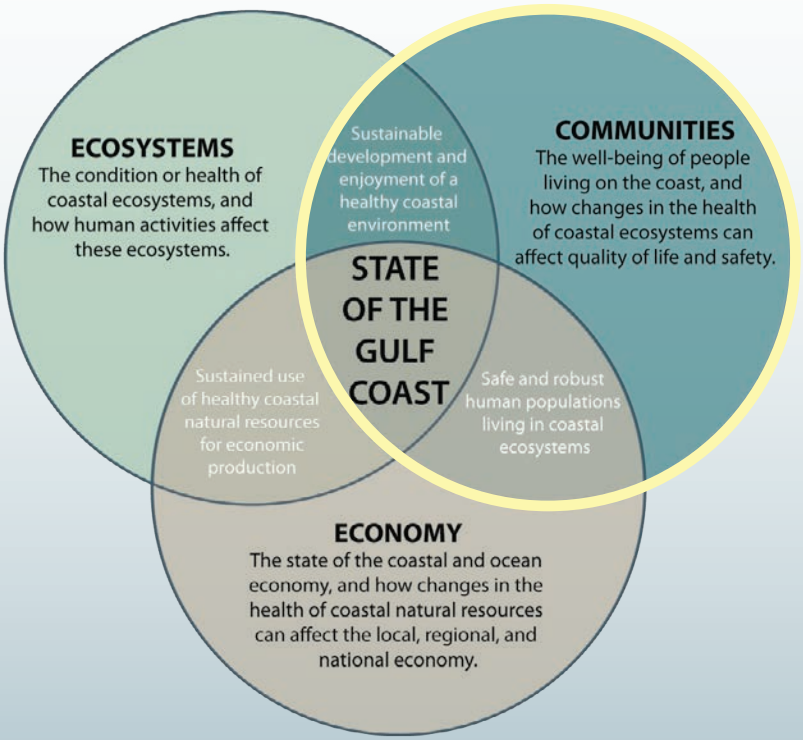
Water Use

Examine sources and consumption patterns of this critical resource.

Santa Rosa Sound, FL. Credit: Kim Penn, NOAA

While the spirit of neighborliness was important on the frontier because neighbors were so few, it is even more important now because our neighbors are so many.

~Lady Bird Johnson



The three major report themes and the significance of their connections.

Population in the Gulf Coast Region

Approximately 37 percent of the Gulf states' population lives in the Gulf Coast Region (25 percent of the land area). Such a concentration of people places pressures on sensitive coastal ecosystems. As the region's coastal population continues to grow, it is imperative to understand, manage, and protect the bounty and beauty that have drawn so many to the coasts.

Orange Beach, AL. Credit: Melissa Schneider

Population in the Gulf Coast Region has increased by 109% since 1970, compared to a 52% increase in total U.S. population.

2010 Population

United States *(excluding Territories)*	**308,745,538**
Gulf States	**56,227,276**
Gulf Coast Region	**20,999,881**

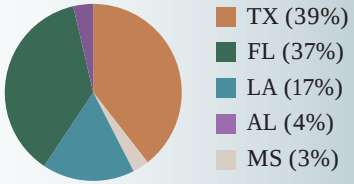


Figure 3: Population distribution among states in the Gulf Coast Region. Total Gulf Coast Region population compared to U.S. and Gulf state totals.

Source: U.S. Census Bureau, 2011a

Population Change from 1970 to 2020

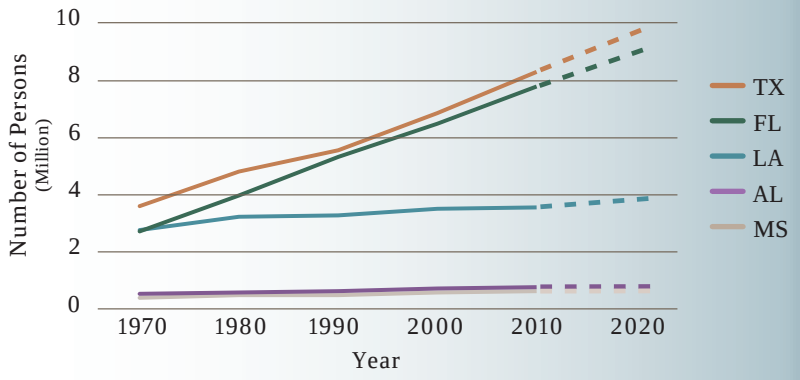


Figure 4: Population change from 1970 to 2020 of the Gulf Coast Region.

Source: U.S. Census Bureau, 2011a; Woods and Poole Economics, Inc., 2010

Population Density

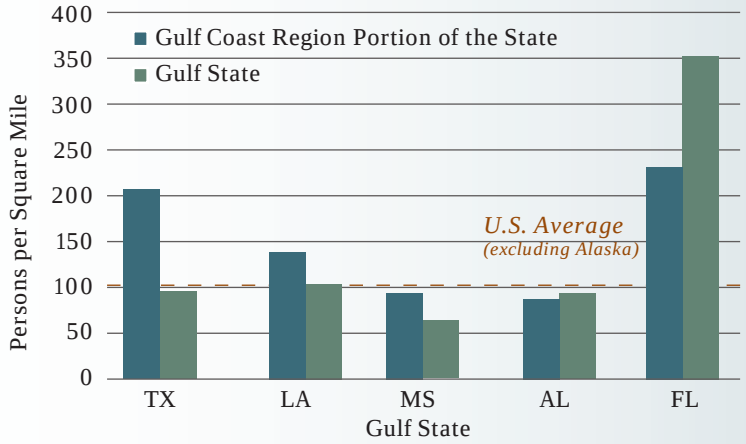


Figure 5: Population density of the Gulf Coast Region and Gulf states in 2010.

Source: U.S. Census Bureau, 2011a

Leading Counties in Population Density in the Gulf Coast Region

(Persons Per Square Mile)

Pinellas, FL	**3,348**
Harris, TX	**2,402**
Orleans, LA	**2,029**
Jefferson, LA	**1,463**
Hillsborough, FL	**1,205**

10,958,081

Increase in population in the Gulf Coast Region since 1970. This is roughly equivalent to adding a population the size of Los Angeles County, CA, to the Region.

15%

Expected increase of population in the Gulf Coast Region by 2020. The U.S. total population is expected to increase by 11% in the same time period.

184

Population density of the Gulf Coast Region. The U.S. population density is 104 persons per square mile (excluding Alaska and U.S. Territories).

Source: U.S. Census Bureau, 2011a; Woods and Poole Economics, Inc., 2010

Projected Percent Population Change from 2010 to 2020

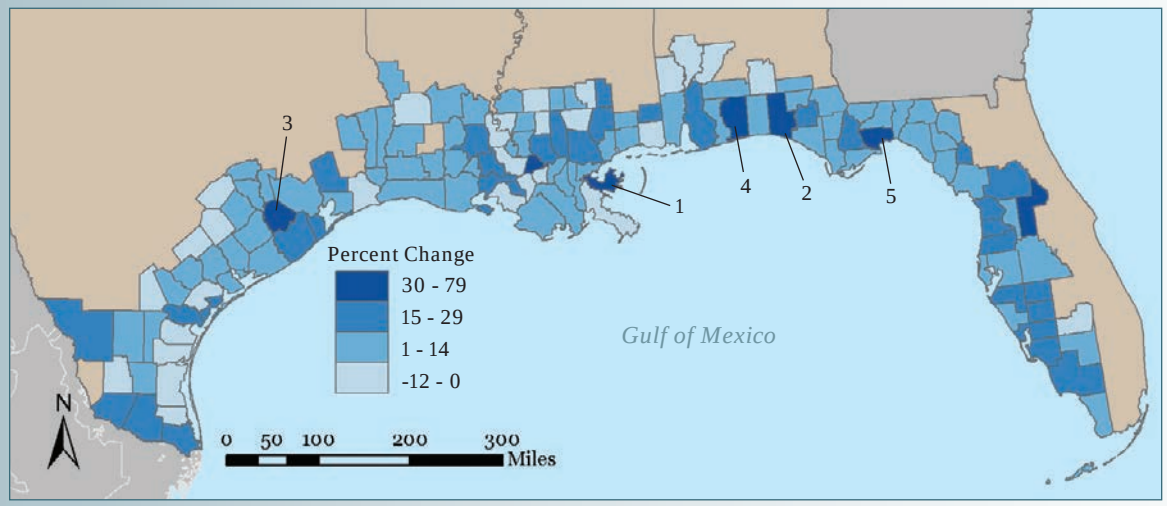


Figure 6: Projected percent population change from 2010 to 2020 in the Gulf Coast Region.
Source: U.S. Census Bureau, 2011a; Woods and Poole Economics, Inc., 2010

Leading Counties in Projected Percent Population Change from 2010 to 2020

1. St. Bernard Parish, LA*	**79%**
2. Walton, FL	**44%**
3. Fort Bend, TX	**43%**
4. Santa Rosa, FL	**41%**
5. Wakulla, FL	**38%**

*Between 2000 and 2010, St. Bernard Parish lost almost half of its population. By the year 2020, it is anticipated that the population will return to approximate year 2000 numbers.

Source: U.S. Census Bureau, 2011a; Woods and Poole Economics, Inc., 2010

Presidential Disaster Declarations from 2004 to 2010

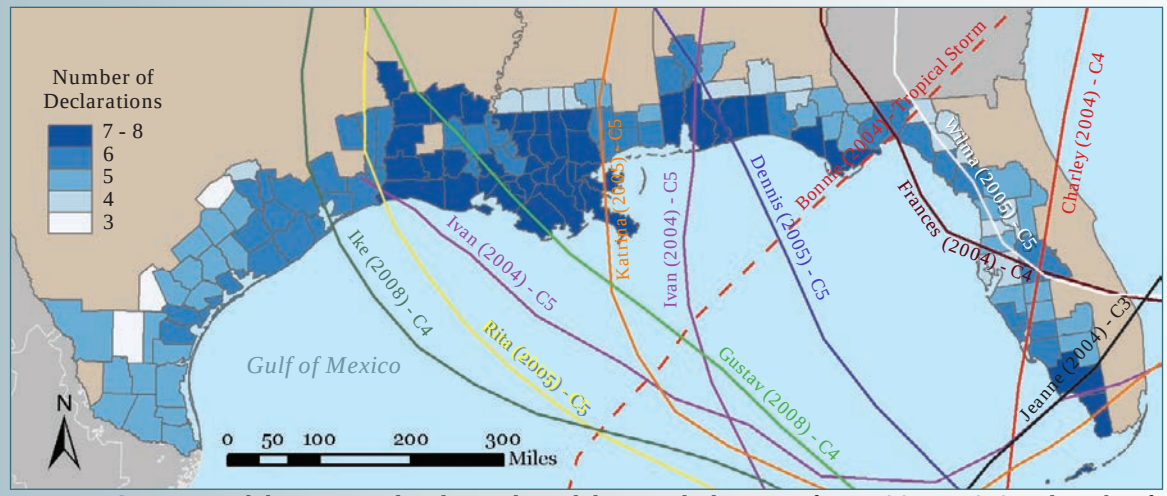


Figure 7: Counties with hurricane related presidential disaster declarations from 2004 to 2010 and tracks of the costliest hurricanes within the same time period. Hurricane Ivan made landfall twice and Tropical Storm Bonnie struck 22 hours before Hurricane Charley, resulting in combined disaster declarations.
Source: Federal Emergency Management Agency, 2011a; NOAA Coastal Services Center, 2010

Ten Costliest Hurricanes from 2004 to 2010

Katrina (2005)	**$134 billion**
Ike (2008)	**$27 billion**
Wilma (2005)	**$17 billion**
Rita (2005)	**$17 billion**
Charley (2004)	**$17 billion**
Ivan (2004)	**$15 billion**
Frances (2004)	**$10 billion**
Jeanne (2004)	**$8 billion**
Gustav (2008)	**$5 billion**
Dennis (2005)	**$2 billion**

Note: Events prior to 2007 are normalized to 2007 dollars.
Source: National Climate Data Center, NOAA, 2011

Characteristics of the Population

The Gulf Coast Region is known for its unique coastal population, one that exemplifies diversity and a strong cultural heritage. The people that reside in this region help shape a thriving economy as well as the environment to which their quality of life is closely tied.

Pensacola Beach, FL. Credit: Kim Penn, NOAA

Seventeen percent of the population in the Gulf Coast Region lives below the poverty level (compared to 13% nationally).

Age and Sex

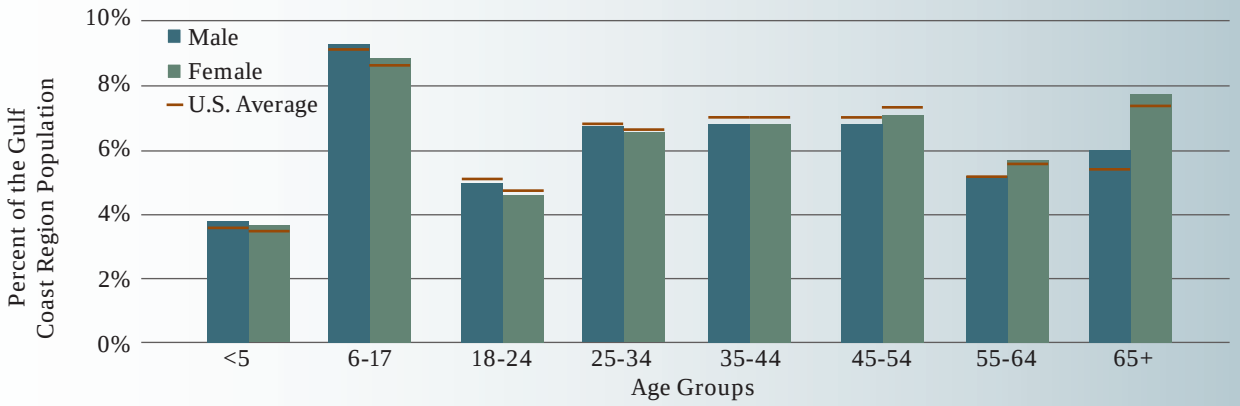


Figure 8: Population by age group and sex as a percent of the total population in the Gulf Coast Region, based on data collected from 2005 to 2009. See stics.noaa.gov for margin of error calculations.

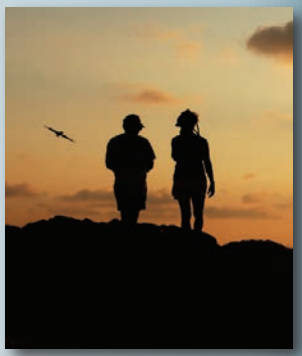
Source: U.S. Census Bureau, American Community Survey, 2010b

Race

	Gulf Coast Region	Gulf States	United States
White (including Hispanic)	73%	72%	74%
Black or African American (including Hispanic)	17%	17%	12%
American Indian and Alaska Native	<1%	<1%	1%
Asian	3%	3%	4%
Native Hawaiian and Pacific Islander	<1%	<1%	<1%
Some other race	6%	6%	6%
Two or more races	2%	2%	2%

Table 1: Major race categories of the population in the Gulf Coast Region, based on data collected from 2005 to 2009. See stics.noaa.gov for margin of error calculations.

Source: U.S. Census Bureau, American Community Survey, 2010b



Packery Channel, TX. Credit: Texas Parks and Wildlife Department

15%

Percent of the population in the Gulf Coast Region that hold a bachelor's degree (compared to 17% in the total U.S.).

68%

Percent of the foreign born population in the Gulf Coast Region that is from Latin America.

$41,203

Annual median household income in the Gulf Coast Region (when averaged across counties). This is $2,259 less than the national average.

14%

Percent of the population in the Gulf Coast Region that is of retirement age (65 and over) (compared to 13% in the total U.S.).

Source: U.S. Census Bureau, American Community Survey, 2010b

Education

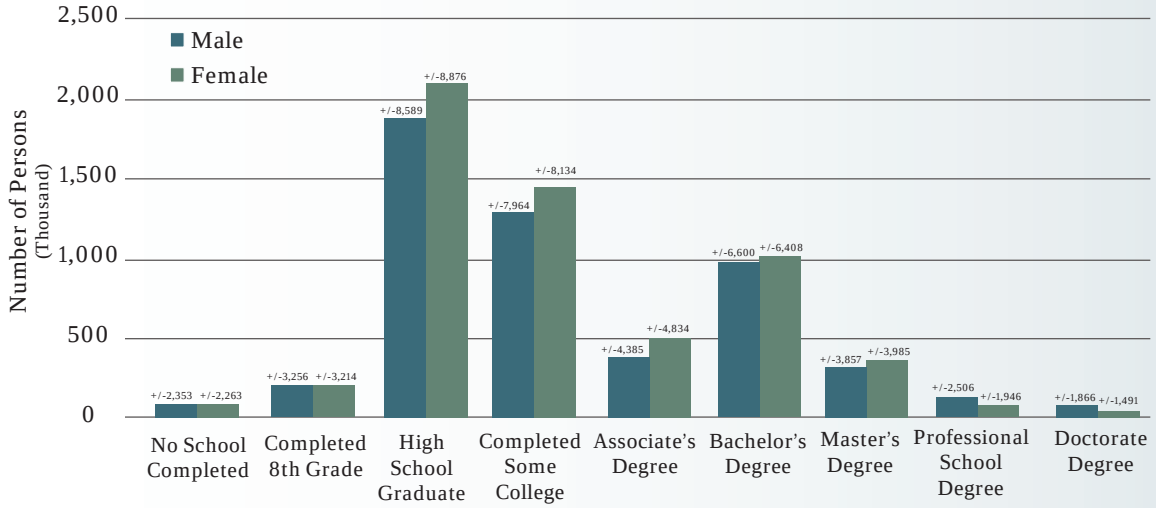


Figure 9: Educational attainment of the population twenty-five years and older in the Gulf Coast Region, based on data collected from 2005 to 2009. Numbers above the bars represent margin of error.

Source: U.S. Census Bureau, American Community Survey, 2010b

	Gulf Coast Region	Gulf States	United States
No School Completed	1%	1%	1%
Completed 8th Grade	3%	3%	3%
High School Graduate	30%	29%	29%
Completed Some College	21%	21%	20%
Associate's Degree	7%	7%	7%
Bachelor's Degree	15%	16%	17%
Master's Degree	5%	6%	7%
Professional Degree	2%	2%	2%
Doctorate Degree	1%	1%	1%

Table 2: Educational attainment of the population twenty-five years and older in the Gulf Coast Region compared to Gulf states and the U.S., based on data collected from 2005 to 2009. See stics.noaa.gov for margin of error calculations.

Source: U.S. Census Bureau, American Community Survey, 2010b

Household Income

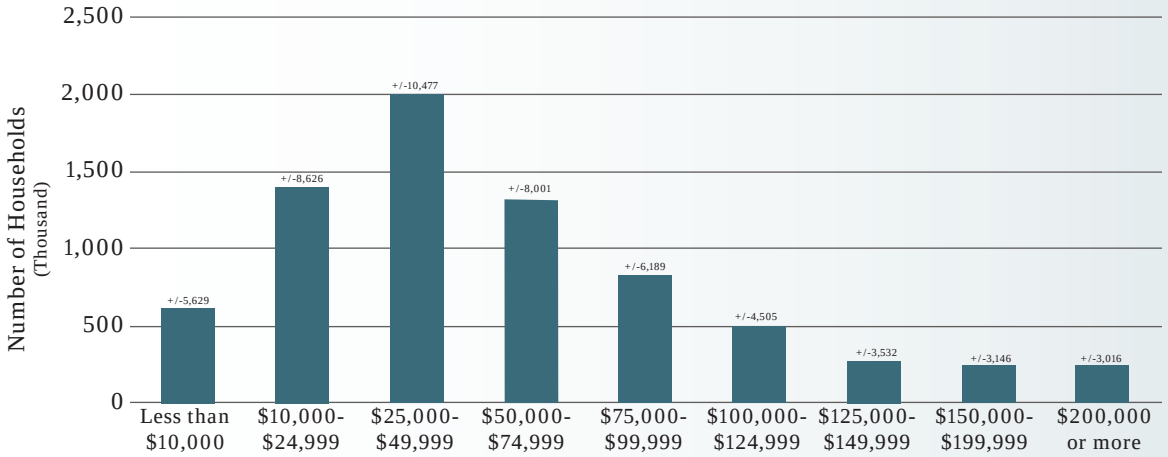


Figure 10: Household income in the Gulf Coast Region, based on data collected from 2005 to 2009. Numbers above the bars represent margin of error.

Source: U.S. Census Bureau, American Community Survey, 2010b

	Gulf Coast Region	Gulf States	United States
Population Above the Poverty Level	83%	84%	87%
Population Below the Poverty Level	17%	16%	13%

Table 3: Percent of population above and below the poverty level in the Gulf Coast Region compared to Gulf states and the U.S., based on data collected from 2005 to 2009. See stics.noaa.gov for margin of error calculations.

Source: U.S. Census Bureau, American Community Survey, 2010b

COMMUNITIES: Population in the Special Flood Hazard Area

The Gulf Coast contains low lying areas that are prone to flooding. Assessing the growing population within these areas provides us a better understanding of who is at risk to coastal inundation from storm surge and long-term sea level rise.

Dauphin Island, AL. Credit: Adrien Lamarre

Fourteen percent of the population within the Gulf coast Special Flood Hazard Area is living below the poverty level.

Land Area in the Gulf Coast Special Flood Hazard Area

The Special Flood Hazard Area (SFHA) is the area where the National Flood Insurance Program's (NFIP) floodplain management regulations must be enforced and where the mandatory purchase of flood insurance applies. Information related to the Gulf coast SFHA is reported for counties containing Federal Emergency Management Agency V-Zones (see Appendix C).

	Gulf Coast Special Flood Hazard Area as a Percent of Area within Gulf Counties Containing FEMA V-Zones
Texas	31%
Louisiana	84%
Mississippi	35%
Alabama	23%
Florida	37%

Table 4: Land area of the Gulf coast Special Flood Hazard Area by state, in relation to counties that contain FEMA V-Zones.

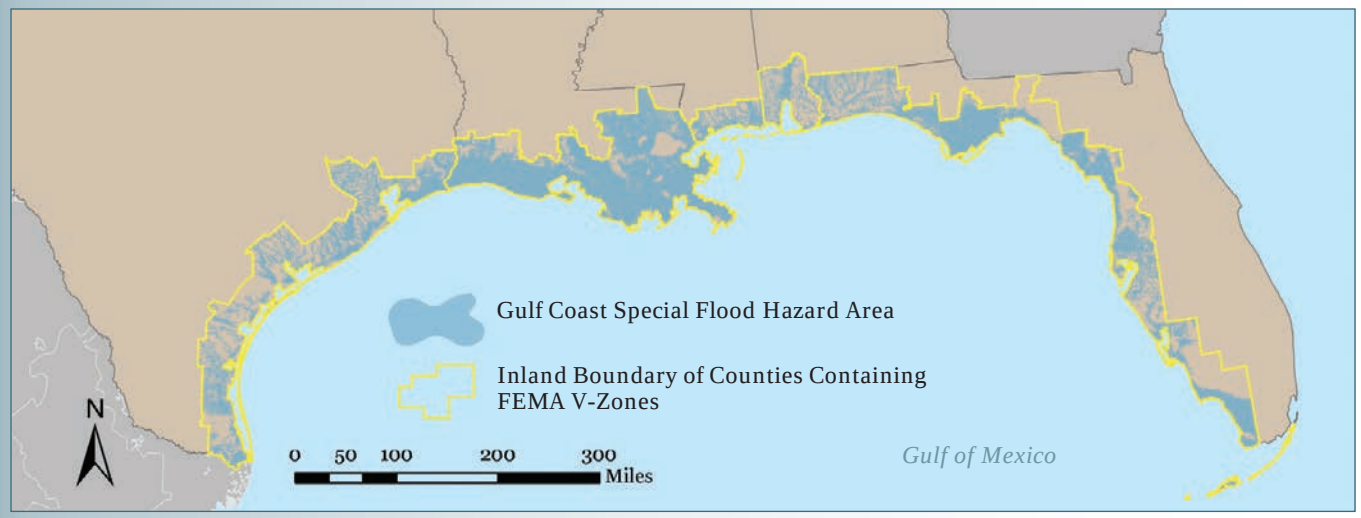


Figure 11: The Gulf coast Special Flood Hazard Area and the inland boundary of counties containing FEMA V-Zones (see Appendix C).

47%

Percent land area of counties containing FEMA V-Zones that is within the Gulf coast Special Flood Hazard Area.

28%

Percent of the population of counties containing FEMA V-Zones that is within the Gulf coast Special Flood Hazard Area.

Source: U.S. Census Bureau, American Community Survey, 2010b

Did You Know?

You can further explore demographic attributes of the population in the Nation's coastal Special Flood Hazard Areas. Visit:

NOAA's Spatial Trends in Coastal Socioeconomics, or STICS, Web site: **stics.noaa.gov**

Coastal County Snapshots: **www.csc.noaa.gov/snapshots/**

Estimated Total Population

	Population in the Gulf Coast Special Flood Hazard Area	Gulf Coast Special Flood Hazard Area Population as Percent of Population in Gulf Counties Containing FEMA V-Zones
Texas	1,072,642	18%
Louisiana	1,290,051	49%
Mississippi	129,265	37%
Alabama	83,881	15%
Florida	1,645,514	29%

Table 5: Estimated population within the Gulf coast Special Flood Hazard Area by state compared to population in counties containing FEMA V-Zones, based on data collected from 2005 to 2009. See stics.noaa.gov for margin of error calculations.

Source: U.S. Census Bureau, American Community Survey, 2010b

Estimated Subpopulations Considered at Elevated Risk

	Population 65 Years and Over	Population 5 Years and Younger	Population Below Poverty Level
Texas	10%	9%	17%
Louisiana	11%	7%	16%
Mississippi	13%	7%	14%
Alabama	15%	6%	16%
Florida	23%	5%	10%

Table 6: Estimated subpopulations considered to be at elevated risk to flooding within the Gulf coast Special Flood Hazard Area, based on data collected from 2005 to 2009. See stics.noaa.gov for margin of error calculations.

Source: U.S. Census Bureau, American Community Survey, 2010b

Did You Know?

The ability of wetlands to store floodwaters reduces the risk of costly property damage and loss of life in flood prone areas. Just one acre of wetland can store **1.5** million gallons of floodwater. The presence of wetlands in only **15%** of a watershed can reduce flooding by as much as **6%**.

Source: USDA, 2007

Case Study: Possible Sea Level Rise Impacts to Transportation Infrastructure

Along the Gulf coast, between Houston, TX, and Mobile, AL, an estimated 2,400 miles of major roadway and 246 miles of freight rail lines are at risk of permanent flooding within 50 to 100 years if relative sea level rises four feet. The Gulf coast is particularly at risk to service disruptions due to the interdependent nature of a transportation network that relies on minor roads and other low-lying infrastructure.

The Gulf coast is home to six of the ten largest commercial ports (by tons of traffic) in the country. The region also hosts a significant portion of the U.S. oil and gas industry, with its offshore drilling platforms, refineries, and pipelines. Roughly two-thirds of all U.S. oil imports pass through the Gulf. Sea level rise could potentially affect commercial transportation activity valued in the hundreds of billions of dollars annually through inundation of area roads, railroads, airports, seaports, and pipelines (U.S. Global Change Research Program, 2009).

Figure 12: The Gulf coast area roads at risk from four feet of long-term relative sea level rise. *Source: U.S. Global Change Research Program, 2009*

Housing and Development

Residential development accommodates new residents that are drawn to the Gulf coast. Well-planned development can enhance communities and preserve open space, farmland, and environmental areas that are critical to a healthy coastal region.

Gulfport, MS. Credit: George Armstrong

Sixteen percent of the Nation's building permits were issued in the Gulf Coast Region from 2006-2010.
(single family units only)

Building Permits Issued for Construction

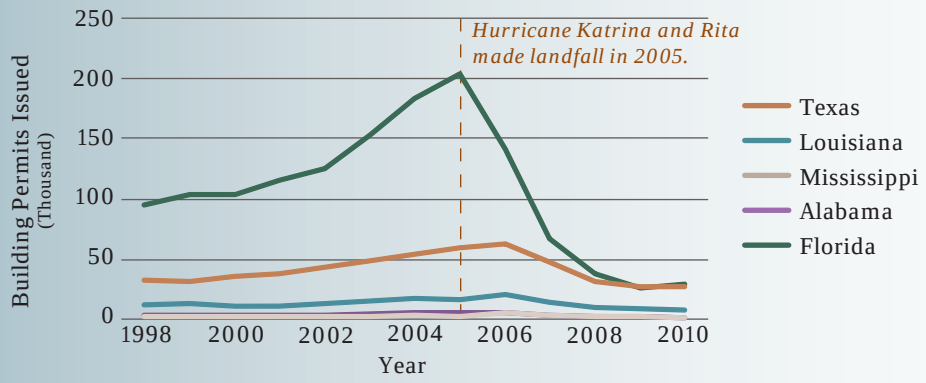


Figure 13: Number of building permits issued for single family homes in the Gulf Coast Region from 1998 to 2010.
Source: U.S. Census Bureau, 2010b

Construction of homes in Jefferson Parish, LA. Credit: Louisiana Recovery Authority

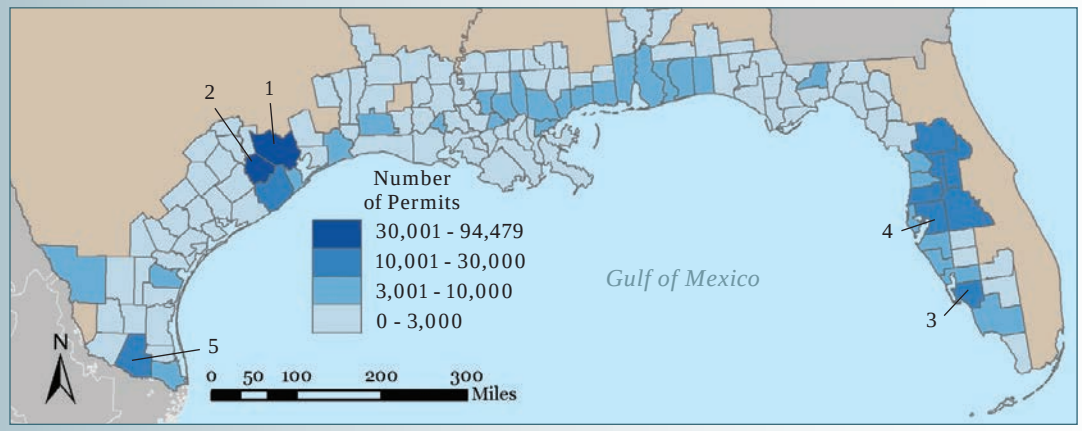


Figure 14: Number of building permits issued for single family homes in the Gulf Coast Region from 2006 to 2010.
Source: U.S. Census Bureau, 2010b

Leading Counties in Building Permits Issued for Single Family Homes from 2006 to 2010

1. Harris, TX
2. Fort Bend, TX
3. Lee, FL
4. Hillsborough, FL
5. Hidalgo, TX

20%
Percent increase in the number of housing units in the Gulf Coast Region from 2000 to 2010. The number of housing units in the U.S. increased by 14% in the same time frame.

6%
Percent of homes that are seasonal in the Gulf Coast Region (based on data from 2005 to 2009).

1,938,343
Approximate number of building permits issued from 2006 to 2010 in the Gulf Coast Region.

94,479
Harris County, Texas, led the Nation in the number of building permits issued for single family homes from 2006 to 2010.

Source: U.S. Census Bureau, 2010a, 2011a, 2011b

Seasonal Homes

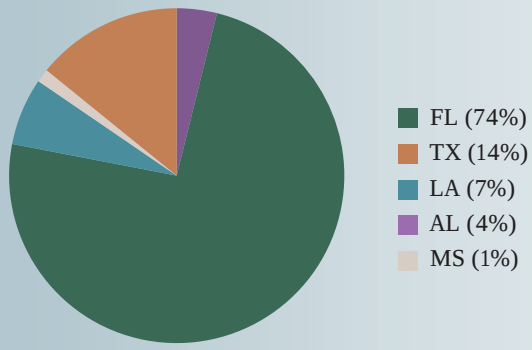


Figure 15: Distribution of the over 500,000 seasonal homes in the Gulf Coast Region, based on data collected from 2005 to 2009.

Source: U.S. Census Bureau, American Community Survey, 2010b

Leading Counties in Seasonal Housing	Number of Seasonal Homes	Percent of County Housing Unit Total
Lee, FL	58,730	17%
Collier, FL	53,458	28%
Pinellas, FL	48,329	10%
Sarasota, FL	32,940	15%
Polk, FL	25,124	9%

Table 7: Leading Gulf Coast Region counties in the number of seasonal homes, based on data collected from 2005 to 2009.

Source: U.S. Census Bureau, American Community Survey, 2010b

Housing Unit^2 Change

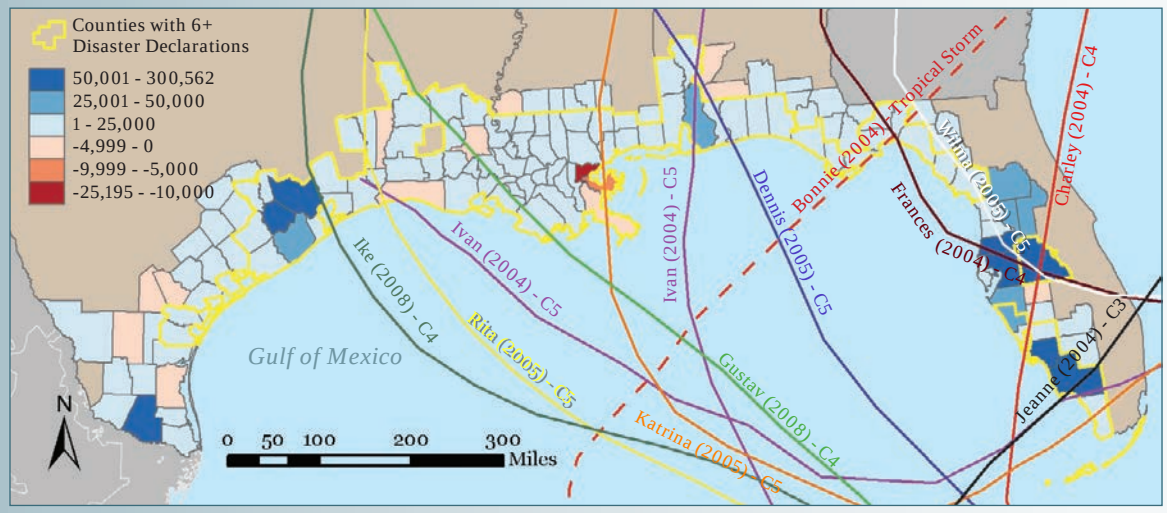


Figure 16: Housing unit change in the Gulf Coast Region from 2004 to 2010 and tracks of the costliest hurricanes within the same time period. Hurricane Ivan made landfall twice and Tropical Storm Bonnie struck 22 hours before Hurricane Charley resulting in combined disaster declarations.

Source: U.S. Census Bureau, 2010a, 2011a; FEMA, 2010; NOAA CSC, 2010

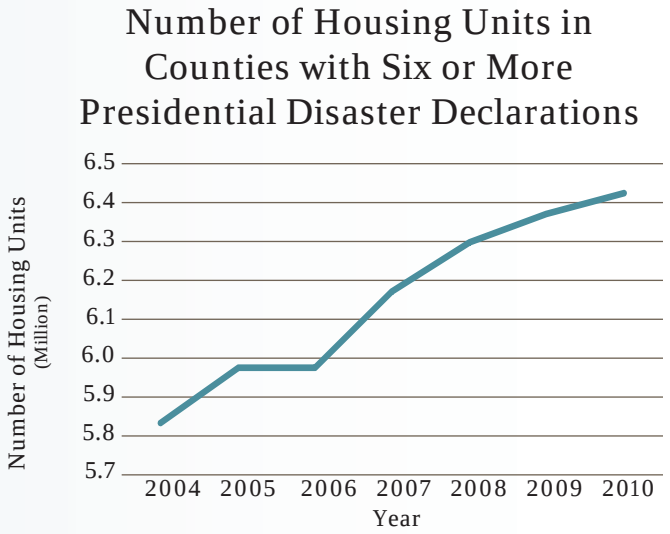
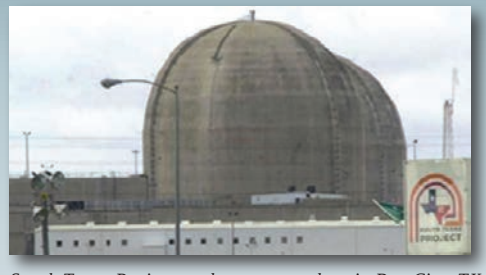


Figure 17: Number of housing units in counties with six or more presidential disaster declarations from 2004 to 2010.

Source: U.S. Census Bureau, 2010a

Water Use

Gulf Coast Region communities, farms, and industries share the need for freshwater with rivers and estuaries, where freshwater is necessary to sustain ecologically and economically important fish species and habitats. As the coastal population and the subsequent demand for clean freshwater increases, so does the risk of limited freshwater.



South Texas Project nuclear power plant in Bay City, TX, is cooled by a 7,000 acre reservoir. Credit: U.S. Nuclear Regulatory Commission

Per capita water use in the Gulf Coast Region averages 147 gal/person/day compared to 172 used nationally.

Water Sources and Uses

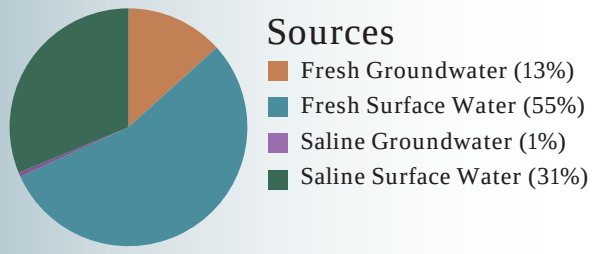


Figure 18a: Water sources in the Gulf Coast Region in 2005.

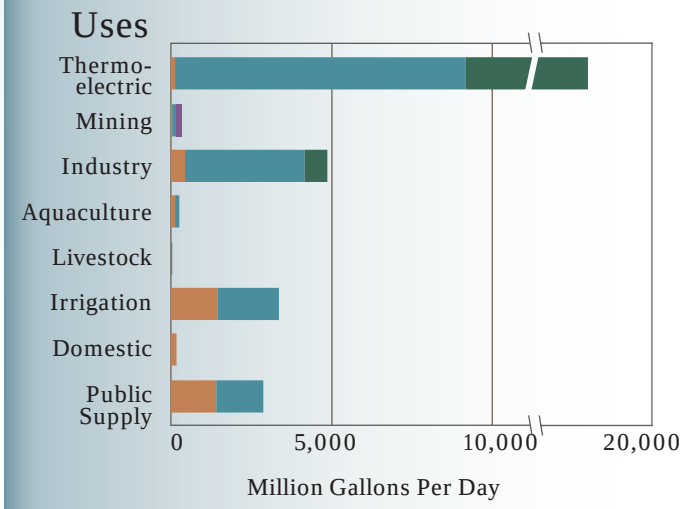
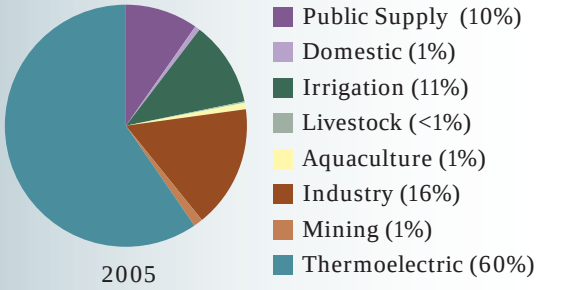


Figure 18b: Water uses in the Gulf Coast Region in 2005.

Source: U.S. Geological Survey, 2009

Water Use Over Time



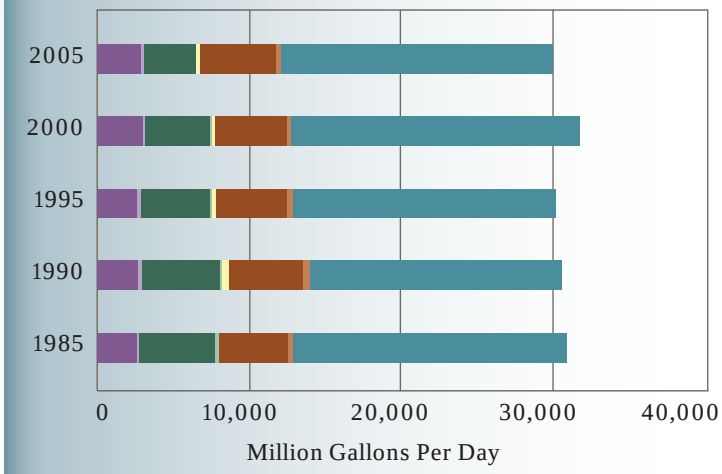


Figure 19: The Gulf Coast Region's water use from 1985 to 2005.

Source: U.S. Geological Survey, 2009

68%
Percent of the total water used in the Gulf Coast Region that is freshwater (compared to 85% for the total U.S.)

80%
Percent of the total freshwater used in the Gulf Coast Region that is from surface waters (compared to 82% for all U.S. coastal watershed counties combined and 77% for the total U.S.)

91%
Percent of all saline water used in the Gulf Coast Region that is for thermoelectric purposes. The remaining 7% and 2% are used for industry and mining, respectively.

Source: U.S. Geological Survey, 2009

ECONOMY

The Gross Domestic Product (GDP) of the five states of the Gulf Coast Region was almost 2.4 trillion dollars in 2009, representing 17% of the Nation's GDP (Bureau of Economic Analysis, 2011). The Gulf Coast Region's economy is highly intertwined with its natural resource base, including oil and gas deposits, commercial and recreational fisheries, and waterways for ports and waterborne commerce.

In this section, coastal and ocean-related revenue sectors of the Gulf coast economy are explored.

Coastal Economy
Explore key components of the Gulf Coast Region's economy, including employment, and wages.

Federally-Insured Assets
Examine basic statistics about the National Flood Insurance Program in the Gulf Coast Region.

Oil and Gas Production
Discover facts about oil and gas production in the Gulf region and the infrastructure required to support production and distribution.

Waterborne Commerce
Learn about this critical component of the Gulf economy through data on major ports and the distribution of commodities shipped through these ports.

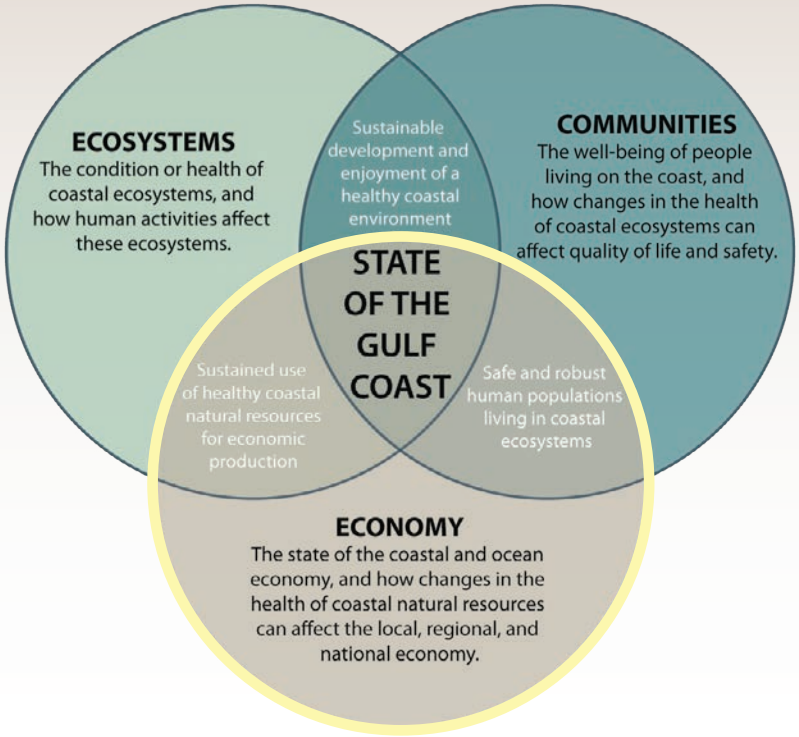
Commercial Fishing
Explore the weight and value of commercial fisheries landings by port, and state, and the top species landed.

Marine Recreational Fishing
Discover the importance of marine recreational fishing through data on fishing trips by state and top species caught by pounds.

Shrimp boat in the Gulf of Mexico off the coast of Biloxi, MS. Credit: Barbara Ambrose, National Coastal Data Development Center, NOAA

The Gulf of Mexico region is a vital economic engine for the Nation, supplying trillions of dollars annually to the U.S. economy and providing jobs for millions of people.

-Governors Action Plan II, 2009



The three major report themes and the significance of their connections.

Coastal Economy

The Gulf of Mexico region is a vital economic engine for the Nation, supplying trillions of dollars annually to the U.S. economy and providing jobs for millions of people. The Gulf supports major marine industries such as commercial seafood, oil and gas production, and shipping. The Gulf of Mexico is also home to white sand beaches, excellent seafood restaurants, and warm weather, creating recreation opportunities and a thriving tourism industry.

Unloading shrimp in Cameron, LA.
Credit: Beth Bourgeois, NOAA

The U.S. Gulf states, if considered an individual country, would rank 7th in global Gross Domestic Product.

Jobs and Wages by Major Economic Sector

Industry	Employment	Average Annual Wage
Construction	628,518	$37,545
Education & Health Services	1,608,147	$31,095
Financial Activities	460,964	$38,065
Information	133,613	$35,078
Leisure & Hospitality	871,703	$14,109
Manufacturing	639,661	$45,471
Natural Resources & Mining	232,614	$43,447
Other Services	237,236	$24,353
Professional & Business Services	1,061,878	$37,393
Public Administration	398,210	$37,959
Trade, Transportation & Utilities	1,733,893	$31,551

Table 8: Total number of jobs and total wages for major industry sectors in the Gulf Coast Region in 2008.
Source: Bureau of Labor Statistics, 2010

Average Annual Wages by State

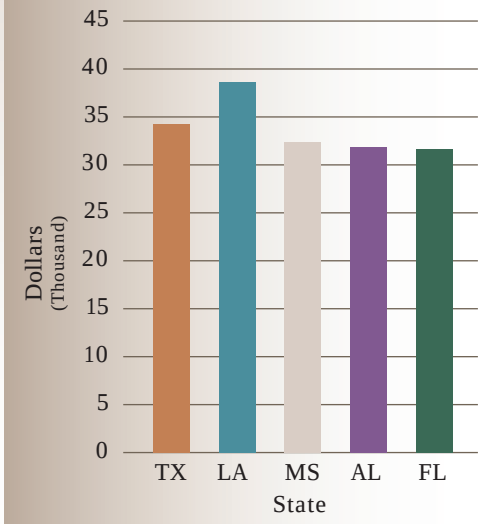


Figure 20: Average annual wages by state in the Gulf Coast Region in 2008.
Source: Bureau of Labor Statistics, 2010

8.3 million
Total number of jobs in the Gulf Coast Region.

$35,393
Average annual wage in the Gulf Coast Region in 2008.

$359 billion
Wages paid out to employees working at establishments in the Gulf Coast Region.

8%
Percent of jobs in the Gulf Coast Region that are in the tourism and recreation industry.[3]

Source: Bureau of Economic Analysis, 2011; Bureau of Labor Statistics, 2010; Colgan, 2004

Total Employment by County

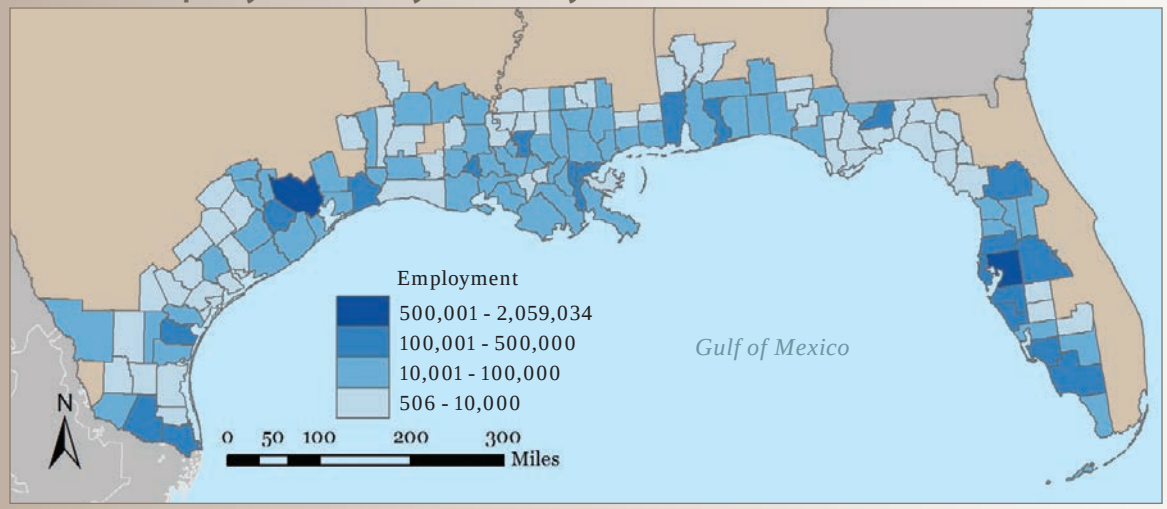


Figure 21: Total employment by county in the Gulf Coast Region in 2008.

Source: Bureau of Labor Statistics, 2010

Construction after Hurricanes Katrina and Rita in south Louisiana. Credit: Louisiana Recovery Authority

Employment by State

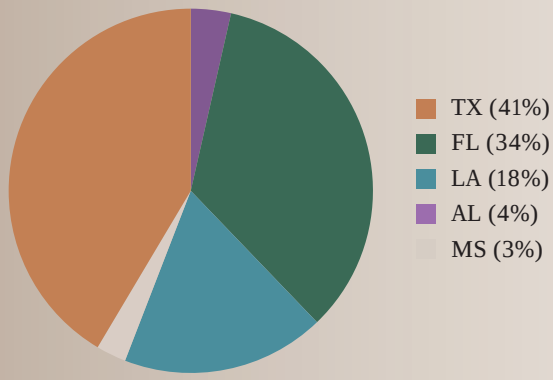


Figure 22: Distribution of the over 8.3 million jobs in the Gulf Coast Region by state in 2008.

Source: Bureau of Labor Statistics, 2010

Port of Corpus Christi, TX. Credit: Port of Corpus Christi Authority

Commercial fishermen unloading red snappers from the Destin docks, FL. Credit: June Weeks, NOAA/NMFS - Panama City Laboratory

Tourism and Recreation[3] Employment

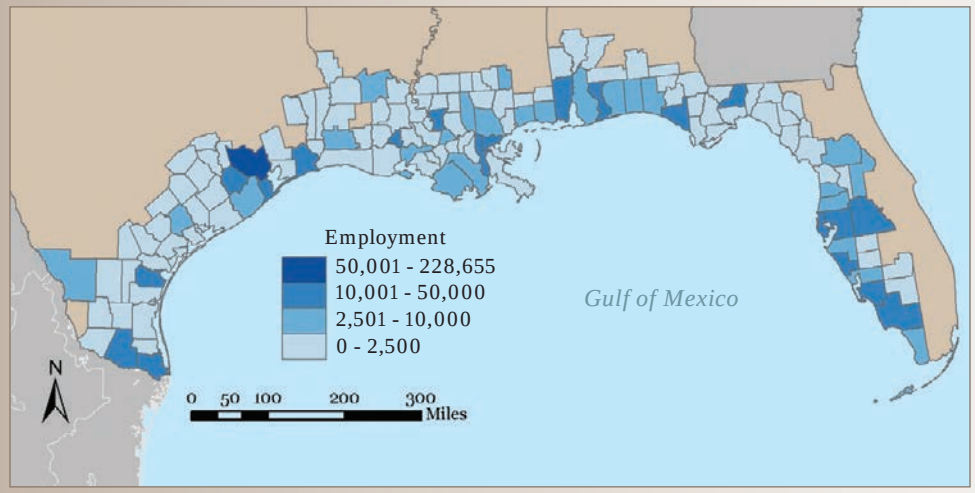


Figure 23: Tourism and recreation employment in the Gulf Coast Region in 2009.
Source: Bureau of Labor Statistics, 2010; Colgan, 2004

Industry	Employment	Total Wages *(Million)*
Eating and Drinking Establishments	565,638	$8,477
Hotels and Lodging	60,566	$1,435
Amusement and Recreation Services	10,258	$191
Boat Dealers	3,784	$138
Zoos and Aquaria	3,514	$117
Marinas	2,306	$70
Scenic Water Tours	1,136	$27
Recreational Vehicle Parks/Campsites	1,019	$20
Sporting Goods	347	$13

Table 9: Tourism and recreation jobs and total wages in the Gulf Coast Region in 2009.
Source: Bureau of Labor Statistics, 2010; Colgan, 2004

Total Income from Farm-Related Sources

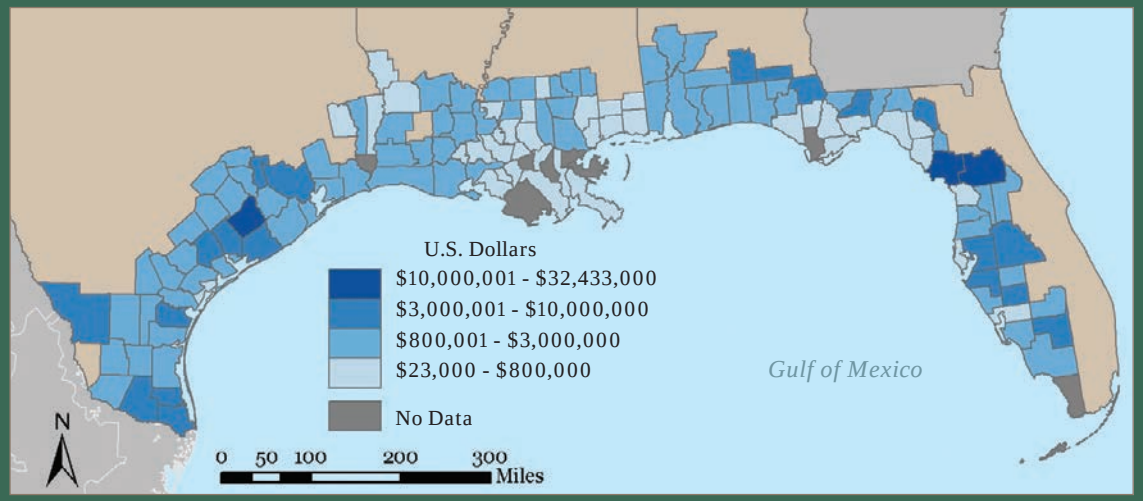


Figure 24: Total income from farm-related sources, gross before taxes and expenses in 2007.
Source: U.S. Department of Agriculture, 2009

Gulf Coast Region Facts

1. Total number of farms: 108,779
2. Total land area of farm properties: 48,641 square miles, or 40% of the total Gulf Coast Region
3. Market value of agricultural products sold: $8,617,228,000
4. Total income from farm-related sources, gross before taxes and expenses: $295,363,000

Federally-Insured Assets

Connections to a Changing Climate

The second largest fiscal liability of the U.S. Government, behind Social Security, is the National Flood Insurance Program (Beatley, et al. 2002). Insured assets in flood prone areas along the Gulf coast represent almost half of the U.S. total.

Galveston, TX. Credit: USGS

Taxpayers are responsible for $204 billion of insured assets in the Gulf coast Special Flood Hazard Area (compared to $521 billion in total U.S. assets insured).

Federally-Insured Assets in Gulf Coast Special Flood Hazard Area

	Gulf Coast Special Flood Hazard Area	Percent of U.S. Total
Number of Policies	990,496	41%
Total Premium	$756,113,124	42%
Total Coverage	$203,912,369,300	39%
Total Claim Payouts *(1978-2010)*	$19,802,037,380	84%

Table 10: Characteristics of federally-insured assets as a percent of U.S. totals in the Gulf coast Special Flood Hazard Area within counties containing FEMA V-Zones in 2010 (see Appendix C).

Source: Federal Emergency Management Agency, 2011b

Insurance Coverage

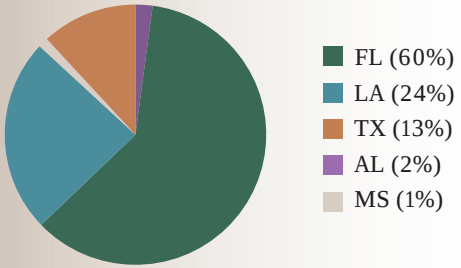


Figure 25: Total coverage by the National Flood Insurance Program in the Gulf coast Special Flood Hazard Area in 2010.

Source: Federal Emergency Management Agency, 2011b

Claim Payouts

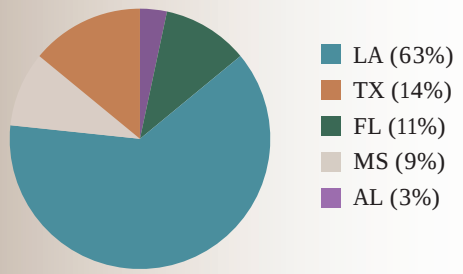


Figure 26: Total claims paid by the National Flood Insurance Program in the Gulf coast Special Flood Hazard Area from 1978 to 2010.

Source: Federal Emergency Management Agency, 2011b

1

Florida Gulf coast's rank among all U.S. states for total insurance coverage (more than double the coverage of any other state in the U.S.).

1

Louisiana's rank among all U.S. states for total claim payouts from the National Flood Insurance Program (more than four times that of any other state).

$20 billion

Total claims paid out by the National Flood Insurance Program within the Gulf coast Special Flood Hazard Area from 1978 to 2010.

$97,000

Average payout per claim by FEMA after Hurricane Katrina (largest average payout for a flood event since 1978).

Source: Federal Emergency Management Agency, 2011b, 2011c

Oil and Gas Production

The Gulf of Mexico region's oil and gas industry is one of the most developed in the world, supplying the region with jobs and the Nation with a valuable energy source.

Offshore aquaculture cage near an oil rig in the Gulf of Mexico. Credit: Tim Reid

The Gulf Region's Contribution to U.S. Energy Production

Crude Oil Production

54% of U.S. total based on a three year average from 2008 to 2010.

Natural Gas Production

52% of U.S. total based on a three year average from 2007 to 2009.

Crude Oil Refinery Capacity

47% of U.S. total based on a three year average from 2008 to 2010.

Figure 27: Energy production and refining capacity of the Gulf of Mexico region as percentages of the total U.S. share. The crude oil and natural gas percentages represent the aggregation of federal and state offshore production in the Gulf of Mexico and the entire states of Florida, Alabama, Mississippi, Louisiana, and Texas. Crude oil refining capacity represents the entire states of Florida, Alabama, Mississippi, Louisiana, and Texas. Data is not readily available below the state level.

Source: U.S. Energy Information Administration, 2011a, 2010a, 2011b

The Gulf Region's Energy Production and Hurricanes

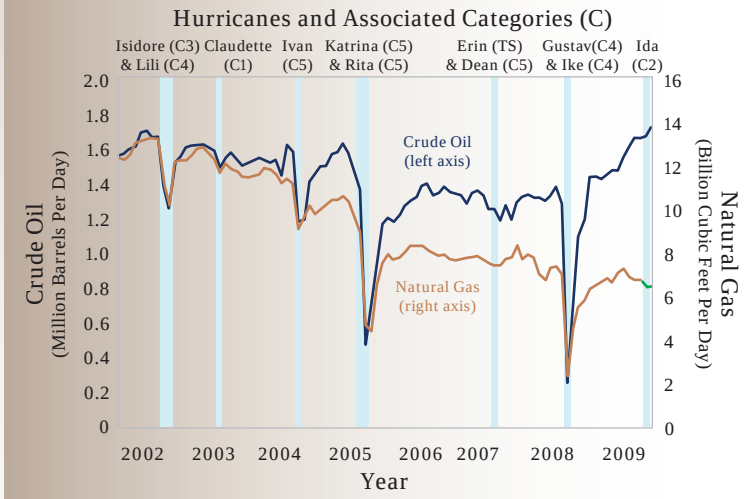


Figure 28: Crude oil and natural gas production in federal offshore Gulf of Mexcio in relation to hurricanes, 2002 to 2009.
Source: U.S. Energy Information Administration, 2010b

Offshore oil production is susceptible to extreme weather events. Hurricane Ivan in 2004 destroyed **seven** platforms in the Gulf of Mexico, significantly damaged **24** platforms, and damaged **102** pipelines. Hurricanes Katrina and Rita in 2005 destroyed more than **100** platforms and damaged **558** pipelines.

Source: U.S. Global Change Research Program, 2009

If placed end to end, the oil and gas pipelines in the Gulf of Mexico could wrap around the Earth's equator.

Source: BOEMRE, 2011

50%
Percent of leased acreage for oil and gas production in the U.S. Gulf of Mexico that is located in deep water (> 1,000 feet).

Source: Minerals Management Service, 2003

3,701
Approximate number of U.S. based Gulf of Mexico active oil and gas platforms.

Source: BOEMRE, 2011

120,676
Reported number of petroleum-related workers employed in the Gulf Coast Region in 2009.

Source: Bureau of Labor Statistics, 2010

$15.6 billion
Total wages earned by those working in the oil and gas industry in the Gulf Coast Region in 2009.

Source: Bureau of Labor Statistics, 2010

Status and Location of Oil and Gas Pipelines in the Gulf of Mexico

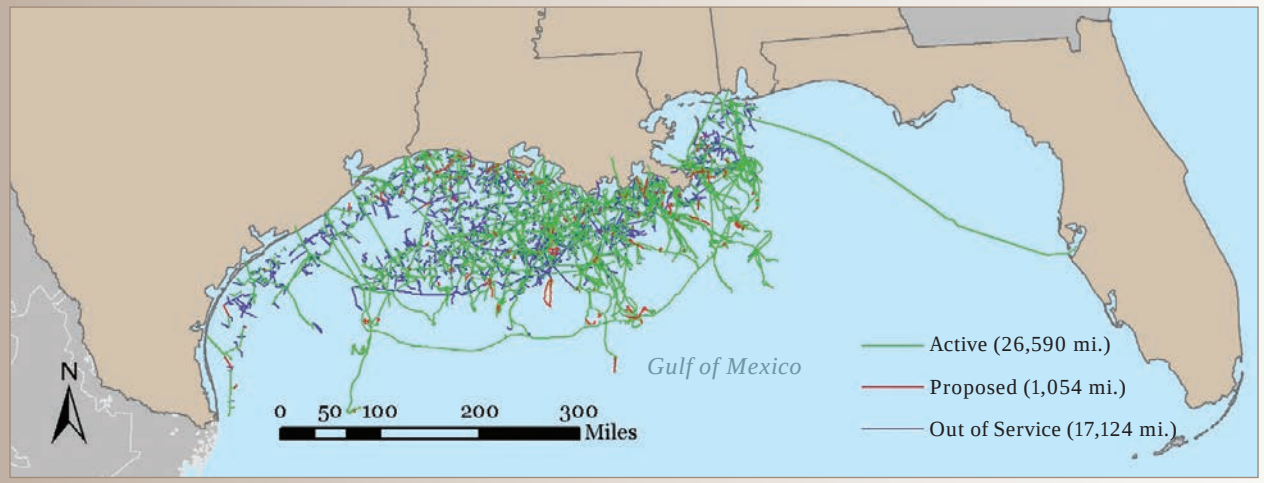


Figure 29: Oil and gas pipelines in the U.S. portion of the Gulf of Mexico in 2010.
Source: BOEMRE, 2011

Port Fourchon, LA, services approximately ninety percent of all deepwater rigs and platforms in the Gulf of Mexico and is host for the Louisiana Offshore Oil Port (LOOP) Credit: Greater Lafourche Port Commission

Location of Active Oil and Gas Platforms in the Gulf of Mexico

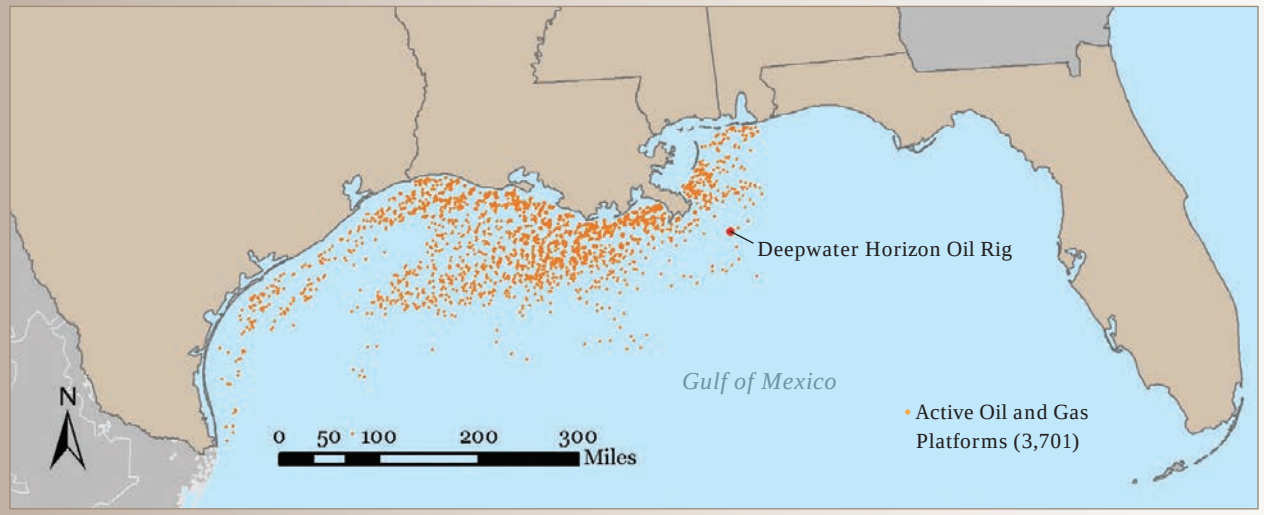


Figure 30: Active oil and gas platforms in the U.S. portion of the Gulf of Mexico in 2010.
Source: BOEMRE, 2011

The Louisiana Offshore Oil Port (LOOP) is the only offshore deepwater port in the U.S. LOOP is connected to over 50 percent of the U.S. refinery capacity and has offloaded over 7 billion barrels of foreign crude oil since its installation (http://loopllc.com). Credit: Bob Webster

Waterborne Commerce

The U.S. economy relies heavily on the ports in the Gulf of Mexico region for the import and export of both foreign and domestic goods. The Gulf of Mexico region supports many ports that lead the Nation in total commerce.

Port of Corpus Christi, TX. Credit: Port of Corpus Christi Authority

The Gulf Coast Region contained thirteen of the Nation's 20 leading ports for tonnage in 2009.

Source: U.S. Army Corps of Engineers, 2010a

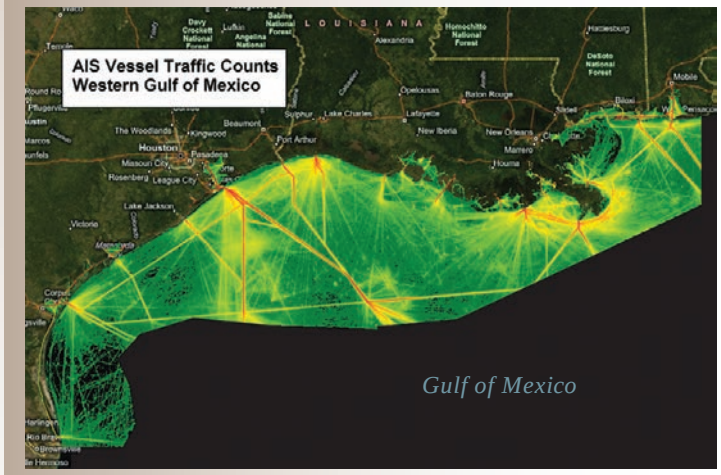
Leading Ports in Tonnage in 2009

U.S. Rank	Port	Short Tons *(Millions)*
1	South Louisiana, LA	213
2	Houston, TX	211
5	Corpus Christi, TX	68
6	New Orleans, LA	68
7	Beaumont, TX	68
10	Texas City, TX	53
11	Lake Charles, LA	52
12	Mobile, AL	52
13	Baton Rouge, LA	52
14	Plaquemines, LA	51
16	Pascagoula, MS	37
17	Tampa, FL	35
19	Port Arthur, TX	34
27	Freeport, TX	27
47	Galveston, TX	10

Table 11: In 2009, 15 of top 50 U.S. ports, by tonnage, were located in the Gulf Coast Region. Ports are listed individually and do not include port complexes. For the geographic description of each port, visit: http://www.ndc.iwr.usace.army.mil/wcsc/webpub09/Part2_Ports_tonsbycommCY2009.htm.

Source: U.S. Army Corps of Engineers, 2010a

Vessel Transits



Vessel Transits from July, 2009 - July, 2010

Low	Medium	High
(0 - 10 unique vessels)	*(1,180 - 2,070 unique vessels)*	*(17,880 - 38,240 unique vessels)*

Figure 31: Volume of unique vessels reported per day by the Automatic Information System (AIS) in the Western Gulf of Mexico.

Source: Ward and Gallagher, 2011

1 and 2

Respective state rankings of Louisiana and Texas in U.S. waterborne traffic in 2009.

Source: U.S. Army Corps of Engineers, 2010b

50%

Percent of all U.S. international trade tonnage passing through Gulf coast ports in 2009.

Source: U.S. Army Corps of Engineers, 2010a

54

Number of miles the port of South Louisiana stretches along the Mississippi River. The port has been ranked first in the U.S. for total tonnage for more than a dozen years and is the largest tonnage port in the Western Hemisphere.

Source: U.S. Army Corps of Engineers, 2010b

49

Million cubic yards of material dredged by the U.S. Army Corps of Engineers from 30,000 square miles of south central and coastal Louisiana in 2009.

Source: U.S. Army Corps of Engineers, 2010b

Did You Know?

The Gulf Intracoastal Waterway extends **1,109** miles, greater than the distance from Washington, DC, to Miami, FL. The waterway is a dredged canal spanning from Florida to Texas, linking commerce along all five U.S. Gulf of Mexico states.

Source: USACE, 2010b

The Location of the Gulf Coast Region's Principal Ports and Shipping Routes

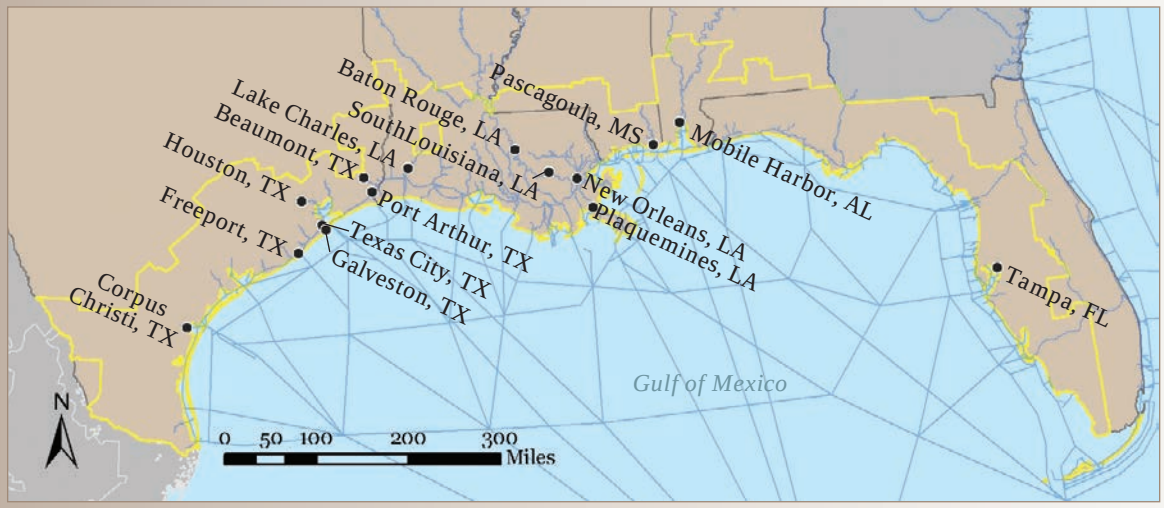


Figure 32. Location of the top 15 Gulf ports by tonnage, and principal shipping routes (blue lines) in 2009.
Source: U.S. Army Corps of Engineers, 2010a

A ship arriving into the Port of Tampa, Florida's largest port. Credit: Mike Henderson, NOAA

Primary Commodities of the Leading Gulf Ports

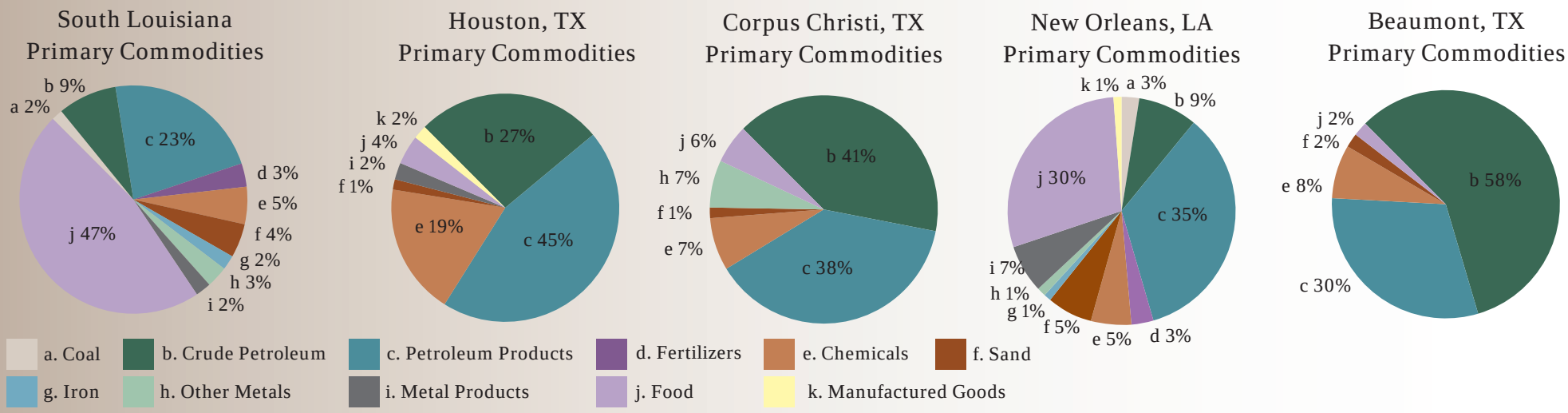


Figure 33. Primary commodity charts of the leading five Gulf ports in total tonnage in 2009.
Source: U.S. Army Corps of Engineers Navigation Data Center, 2010

Commercial Fishing

Commercial fishing, which has long supported the livelihood of many regional residents and provided the Nation with abundant seafood, is dependent on a healthy Gulf of Mexico ecosystem. This multi-billion dollar industry has traditionally included fin fish, shrimp, oysters, and crab.

Pass Christian Harbor shrimp boats. Credit: Barbara Ambrose, NOAA National Coastal Data Development Center.

Most Productive Ports by Value

U.S. Rank	Port	Dollars *(Million)*
6	Empire-Venice, LA	68
11	Brownsville-Port Isabel, TX	47
12	Dulac-Chauvin, LA	45
15	Intracoastal City, LA	37
16	Galveston, TX	36
18	Key West, FL	35
19	Bayou La Batre, AL	35
20	Port Arthur, TX	35
29	Palacios, TX	28
30	Lafitte-Barataria, LA	27

Table 12: Average annual value of commercial landings from 2007 to 2009 in the Gulf Coast Region's most productive commercial fishing ports.
Source: National Marine Fisheries Service, 2010d

Most Productive Ports by Poundage

U.S. Rank	Port	Pounds *(Million)*
3	Empire-Venice, LA	363
5	Intracoastal City, LA	266
6	Pascagoula-Moss Point, MS	208
7	Cameron, LA	187
26	Dulac-Chauvin, LA	34
30	Brownsville-Port Isabel, TX	24
31	Lafitte-Barataria, LA	23
33	Bayou La Batre, AL	21
36	Golden Meadow-Leeville, LA	19
38	Galveston, TX	18

Table 13: Average annual pounds of commercial landings from 2007 to 2009 in the Gulf Coast Region's most productive commercial fishing ports.
Source: National Marine Fisheries Service, 2010d

In 2009, three of the top six commercial fishing ports in the U.S. by pounds landed were in the Gulf Coast Region.
Source: National Marine Fisheries Service, 2010d

78%
Percent of total U.S. shrimp landings that were from the Gulf of Mexico region from 2007 to 2009, a three-year average of 221 million pounds.
Source: National Marine Fisheries Service, 2010a

62%
Percent of total U.S. oyster landings that were from the Gulf of Mexico region from 2007 to 2009, a three-year average of 22 million pounds.
Source: National Marine Fisheries Service, 2010a

16%
Percent of total U.S. commercial fishery landings that were from the Gulf of Mexico region between 2007 and 2009 (Alaska accounts for 55% of all landings).
Source: National Marine Fisheries Service, 2010a

1.4 billion
Average number of pounds of commercial landings per year in the Gulf of Mexico region from 2007 to 2009, yielding a value of $660 million.
Source: National Marine Fisheries Service, 2010a

Commercial Fishing Landings

Landings by Poundage

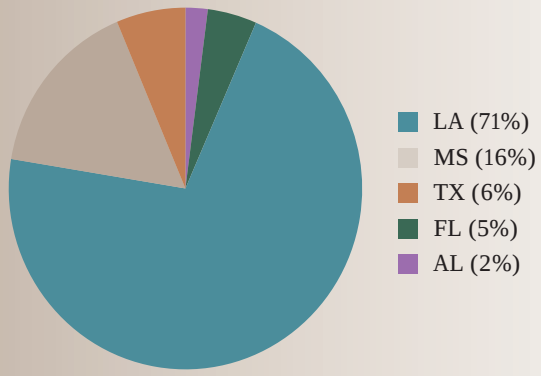


Figure 34: Distribution of the 1.4 billion pounds of commercial fishing landings by state. An average annual number from 2007 to 2009.

Source: National Marine Fisheries Service, 2010a

Landings by Value

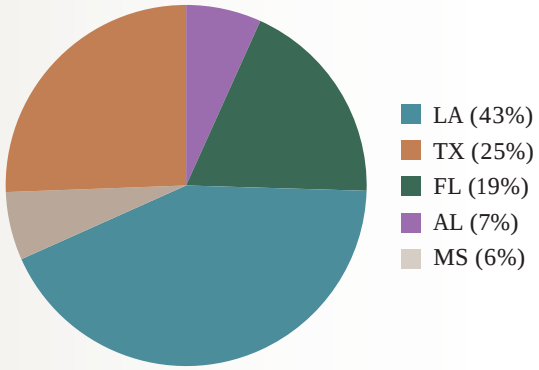


Figure 35: Distribution of the $660 million of commercial fishing value by state. An average annual value from 2007 to 2009.

Source: National Marine Fisheries Service, 2010a

Top Commercial Species

Species Landings by Poundage

Rank	Species	Pounds *(Million)*
1	Menhaden	978
2	Brown Shrimp	106
3	White Shrimp	104
4	Blue Crab	55
5	Eastern Oyster	22

Table 14: The top five species landings by poundage in the Gulf of Mexico, a three-year average from 2007 to 2009.

Source: National Marine Fisheries Service, 2010a

Species Landings by Value

Rank	Species	Dollars *(Million)*
1	White Shrimp	176
2	Brown Shrimp	152
3	Eastern Oyster	67
4	Menhaden	62
5	Blue Crab	43

Table 15: The top five species landings by value in the Gulf of Mexico, a three-year average from 2007 to 2009.

Source: National Marine Fisheries Service, 2010a

Fishing Closures and the Deepwater Horizon MC252 Oil Spill

Oil has the potential to impact fish directly through uptake by gills, ingestion of oil or oiled prey, effects on eggs and larval survival, or changes in the ecosystem that support the fish.

The Deepwater Horizon MC252 oil spill forced the temporary closure of up to 88,522 square miles or 36 percent of federal Gulf waters, and more in state waters, to fishing. In 2010, the majority of state and federal waters had been reopened based on joint efforts of NOAA, the EPA, the Food and Drug Administration and the states in developing a reopening protocol that includes sensory and chemical testing of seafood for components of the oil (Mabus, 2010). As of April 2011, all federal waters of the Gulf once closed to fishing due to the spill are now open (NOAA, 2011).

Figure 36: Geoplatform.gov provided current information on fisheries closures in the Gulf of Mexico that were a direct result of the Deepwater Horizon MC252 oil spill.

Marine Recreational Fishing

From fly fishing in shallow-water flats for red drum to fishing artificial reefs for grouper, the Gulf of Mexico offers a variety of diverse habitats and species for those seeking a recreational fishing adventure. Both residents and tourists alike are drawn to the Gulf for extraordinary fishing opportunities.

A recreational fisherman in Nueces County, TX.
Credit: Texas Parks and Wildlife Department

The Gulf of Mexico accounted for over 44% of all U.S. marine recreational fishing catch in 2009.

Recreational Fishing Trips

Recreation fishing trip along the Florida Gulf coast.
Credit: Russell Dunn

Fishing Trips by State

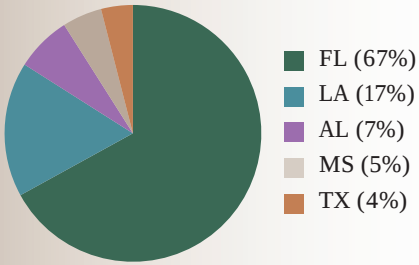


Figure 37: Distribution of the 23 million Gulf of Mexico marine recreational fishing trips by state in 2009.
Note: Marine recreational fishing in Texas is monitored by the Texas Parks and Wildlife Department and has not been surveyed by the National Marine Fisheries Service's survey program since 1985.
Source: National Marine Fisheries Service, 2010c

Recreational Fishing Species

Father and son catch a red drum along the Florida Gulf coast.
Credit: Russell Dunn

Top Six Species Caught in 2009

Rank	Species	Pounds *(Million)*
1	Spotted seatrout	14.5
2	Red drum	11.9
3	Sheepshead	4.4
4	Red snapper	3.6
5	King mackerel	3.3
6	Black drum	2.9

Table 16: Top six marine recreational fishing species in the Gulf of Mexico by pounds harvested (harvest numbers do not include Texas).
Source: National Marine Fisheries Service, 2010c

31%
Percent of total U.S. marine recreational fishing trips taken in the Gulf of Mexico in 2009.

23 million
Number of marine recreational fishing trips taken in the Gulf of Mexico during 2009.

2.8 million
Number of Gulf Coast Region residents who took part in marine recreational fishing in 2009.

47%
Percent of fish that were released out of a total catch of 173 million fish in the Gulf of Mexico during 2009 (harvest value does not include Texas).

Source: National Marine Fisheries Service, 2010c

ECOSYSTEMS

The Gulf of Mexico region boasts a wide range of ecosystems with unique features and habitats, and Gulf waters are home to a rich diversity of species. Its coastal areas contain half of the coastal wetlands in the United States, and are home to vital natural resources, including nesting waterfowl, colonial waterbird rookeries, sea turtles, and fisheries. National, local, and state protected areas have been established to conserve many of these unique places. However, these ecosystems have been both under pressure by human uses and stressed by natural processes over time.

In this section, explore unique habitats in the Gulf of Mexico region and the threats facing those habitats.

Unique Habitats
Explore the Gulf coast's many different natural habitats.

Wetlands
Discover the current extent of wetlands in the Gulf of Mexico coastal watershed area and how wetland coverage has changed over time.

Protected Areas
Learn about both land based and marine protected areas and collective protection level and conservation focus.

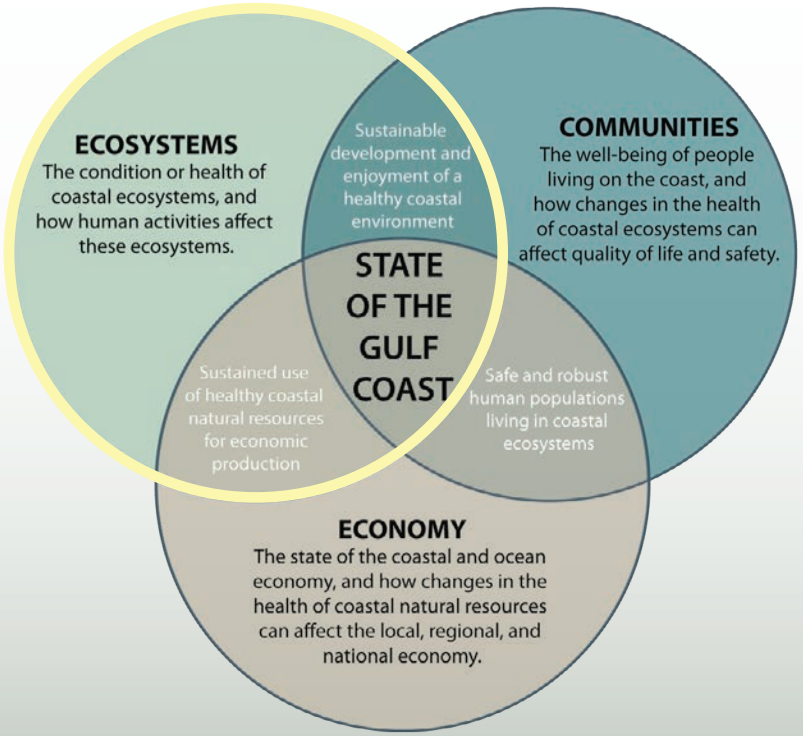
Species Diversity
Investigate the rich diversity of species associated with marine aquatic environments by types of organisms and by species richness at varying depths in the Gulf of Mexico.

Nonindigenous Aquatic Species
Explore nonindigenous plants and animals in the Gulf Coast Region and some of their impacts on ecosystems and economies.

Coastal Vulnerability
Gain an appreciation for the vulnerability of coastal areas to sea level rise, and current rates of change in local sea level.

Nutrient Pollution and Hypoxia
Gain insight about hypoxic "Dead Zones" and other problems associated with nutrient pollution.

Chemical Contaminants
Explore chemical contamination in natural environments through a look at contaminants in oysters, as well as EPA's National Priority List of Superfund sites.



The three major report themes and the significance of their connections.

Unique Habitats

The Gulf of Mexico is home to diverse habitats, some unique to the Nation and the world. These habitats provide a rich mosaic of features that support not only the large marine ecosystem but its sensitive and commercially important species.

Red mangroves found in Florida. Credit: U.S. Geological Survey

Habitats of Particular Concern

Habitat Areas of Particular Concern (HAPC) represent only a subset of particularly important areas along the Gulf coast that are recognized by conservation entities. They are designated to focus conservation priorities on specific areas that play a particularly important role in the life cycles of federally managed fish species. HAPC are designated within areas identified as Essential Fish Habitat[4] and are based on one or more of the following considerations:

- the importance of the ecological function provided by the habitat;
- the extent to which the habitat is sensitive to human-induced environmental degradation;
- whether and to what extent development activities are or will be stressing the habitat; and,
- the rarity of the habitat type (Dale and Santos, 2006).

A giant anemone (Condylactis gigantea) at the Flower Garden Banks National Marine Sanctuary. Credit: NOAA

Turtle Grass in the Florida Keys National Marine Sanctuary. Credit: Paige Gill

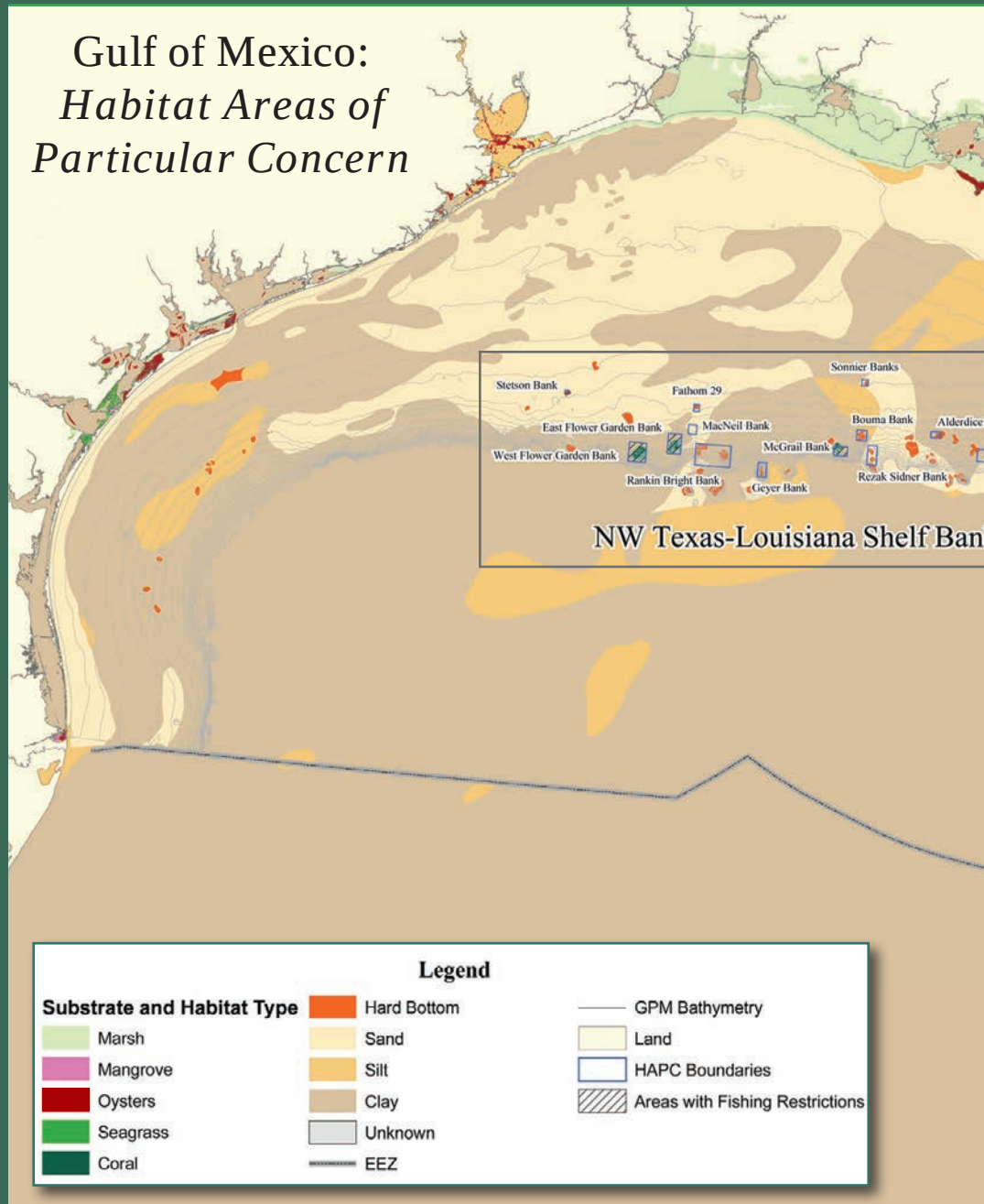
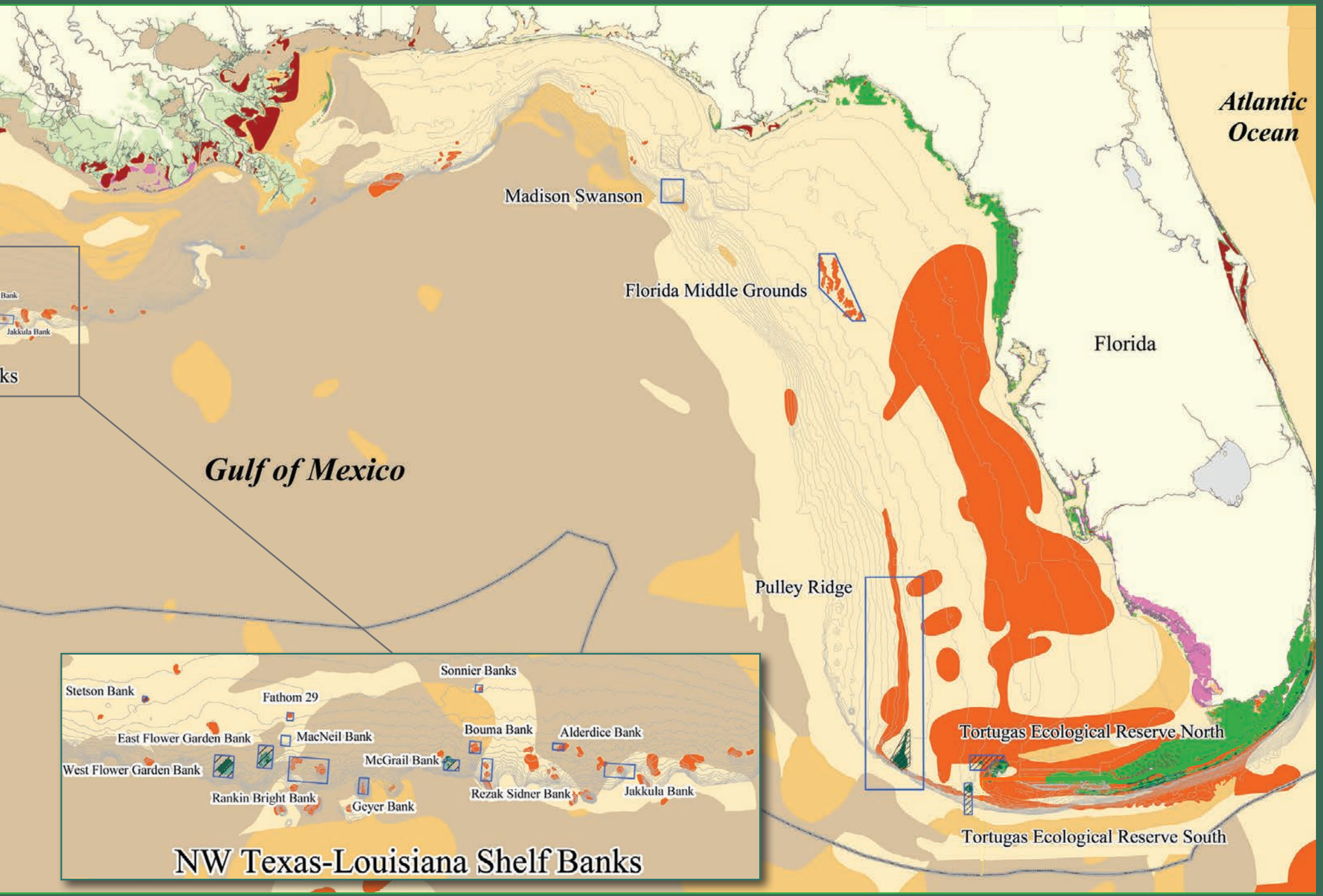


Figure 38: Habitat Areas of Particular Concern in the Gulf of Mexico in 2006.
Source: Dale and Santos, 2006


Atlantic Ocean
Madison Swanson
Florida Middle Grounds
Florida
Gulf of Mexico
Pulley Ridge
Tortugas Ecological Reserve North
Tortugas Ecological Reserve South
Jakkula Bank
ks
Sonnier Banks
Stetson Bank
Fathom 29
East Flower Garden Bank
MacNeil Bank
Bouma Bank
Alderdice Bank
West Flower Garden Bank
McGrail Bank
Rankin Bright Bank
Geyer Bank
Rezak Sidner Bank
Jakkula Bank
NW Texas-Louisiana Shelf Banks

Wetlands

Wetlands are among the Gulf region's most ecologically and economically important habitats, and provide a host of benefits for fish, wildlife, and coastal communities. Wetlands are valuable because they help remove pollutants from the water, recharge water supplies, provide flood and storm surge protection, prevent soil erosion, and provide valuable fish and wildlife habitat. In addition, wetlands provide people with an abundance of aesthetic qualities and recreational opportunities, and also serve as exceptional sites for scientific research and public education.

Whooping Cranes. Credit: Texas Parks and Wildlife Department

Wetland Change

Land Cover Types that Wetlands have been Lost To or Gained From, 1996 to 2006

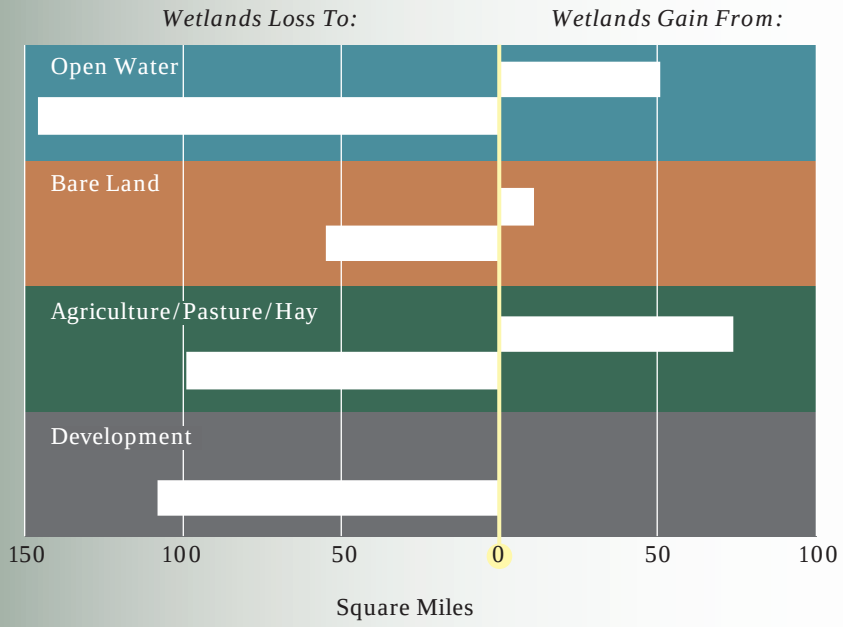


Figure 39: Changes in wetlands land coverage in the Gulf of Mexico coastal watershed area from 1996 to 2006. See Appendix B for the extent of the coastal watershed area.

Source: NOAA Coastal Services Center, 2006

Wetlands on St. Vincent Island, FL were restored by removing water flow blockages by many miles of roads. Credit: NOAA

272 square miles of wetlands were converted to open water, bare land, agriculture, and developed area between 1996 and 2006 in the Gulf of Mexico coastal watershed area (See Appendix B for the extent of the coastal watershed area).

Thirty-one percent of the Gulf of Mexico coastal watershed area is comprised of wetlands, a total of 28,372 square miles.

Source: NOAA Coastal Services Center, 2006

108

Square miles of wetlands lost to development between 1996 and 2006 in the Gulf coastal watershed area.

Source: NOAA Coastal Services Center, 2006

$474 million

Value of annual commercial shellfish harvest in the Gulf of Mexico's coastal wetlands in 2009. This is approximately 355 million pounds of shellfish.

Source: National Marine Fisheries Service, 2010a

198

Amount of marsh (in square miles) that was transformed into open water in coastal Louisiana as a result of Hurricanes Rita and Katrina.

Source: Barras et al., 2008

1/3

The amount of Louisiana's coastal wetlands that will be lost by the year 2050 at current rates of loss.

Source: America's Energy Coast, 2009

Gross Loss and Gain in Saltwater and Freshwater Wetlands, 1996 to 2006

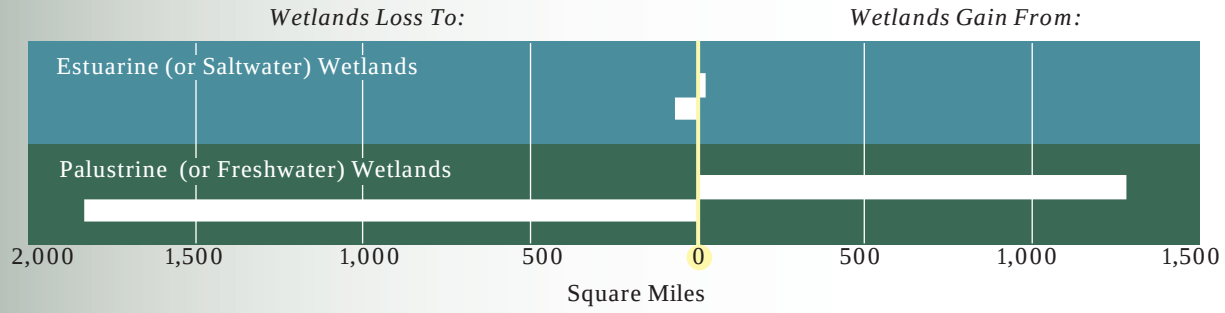


Figure 40: Changes in saltwater and freshwater wetlands in the Gulf of Mexico coastal watershed area from 1996 to 2006.
Source: NOAA Coastal Services Center, 20o6

Gross Loss and Gain in Wetlands by Vegetation Type, 1996 to 2006

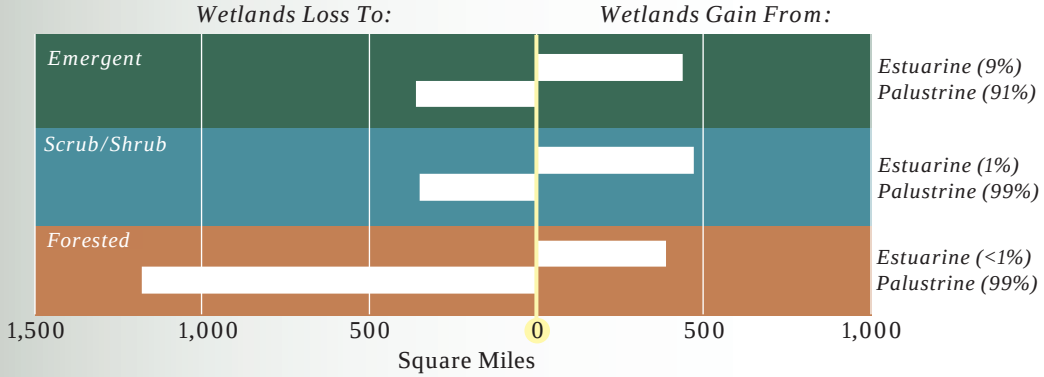


Figure 41: Changes in different types of wetland vegetation in the Gulf of Mexico coastal watershed area from 1996 to 2006. The percentages to the right of the chart represent the estuarine and palustrine make-up of each wetland category.
Source: NOAA Coastal Services Center, 20o6

An example of emergent wetlands in Grand Bay National Estuarine Research Reserve, MS. Credit: P. R. Hoar, NOAA/NESDIS/NCDDC

An example of scrub/shrub wetlands in Grand Bay National Estuarine Research Reserve, MS. Credit: P. R. Hoar, NOAA/NESDIS/NCDDC

An example of forested wetlands in Grand Bay National Estuarine Research Reserve, MS. Credit: P. R. Hoar, NOAA/NESDIS/NCDDC

Wetlands and the Oil Spill

The effect of the Deepwater Horizon MC252 oil spill on coastal wetlands will be determined by how much oil reaches these habitats, and how long it stays there.

Ninety-seven percent (by weight) of the commercial fish and shellfish landings from the Gulf of Mexico are species that depend on estuaries and their wetlands at some point in their life cycle.

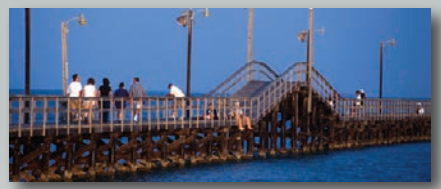
Oil resting on vegetated coastal shorelines could cause the vegetation to become stressed and die, increasing the vulnerability of marsh soils to accelerated erosion from waves and storms.

Overall, the presence of discharged oil in the environment may cause decreased habitat use in the area, altered migration patterns, altered food availability, and disrupted life cycles.

Typical oiling in wetland areas on May 21, 2010, near the mouth of South Pass, LA. The oil forms a 'bathtub ring' marking the high tide line from a previous week's storm tide. Credit: NOAA

Protected Areas

Protected areas in the Gulf Coast Region and Gulf of Mexico waters vary widely in purpose, legal authorities, managing agencies and levels of protection provided. They are meant to provide greater protection for natural or cultural resources within a specific geographic area.



Goose Island State Park, TX. Credit: Chase Fountain

70% of all marine protected areas are state managed, whereas 92% of the total area protected is federally managed.

Source: National Marine Protected Areas Center, 2008

Protected Areas in the Gulf Coast Region and Marine Waters of the Gulf of Mexico

Land Based Protected Areas

Federal, state, local and private forests, parks, preserves, wildlife refuges and other similar areas.

Marine Protected Areas

Uniform and Zoned Multiple Use - Fishing and other extractive uses are allowed with restrictions. These tend to be very large fishery management areas where the focus is on sustainable production of commercial fish stocks.

Zoned With No Take Areas - Fishing and other extractive uses are allowed with variable levels of restrictions. Contains at least one management zone within the protected area where extractive uses are prohibited.

No-Take - The extraction or destruction of natural or cultural resources is prohibited in the entire protected area.

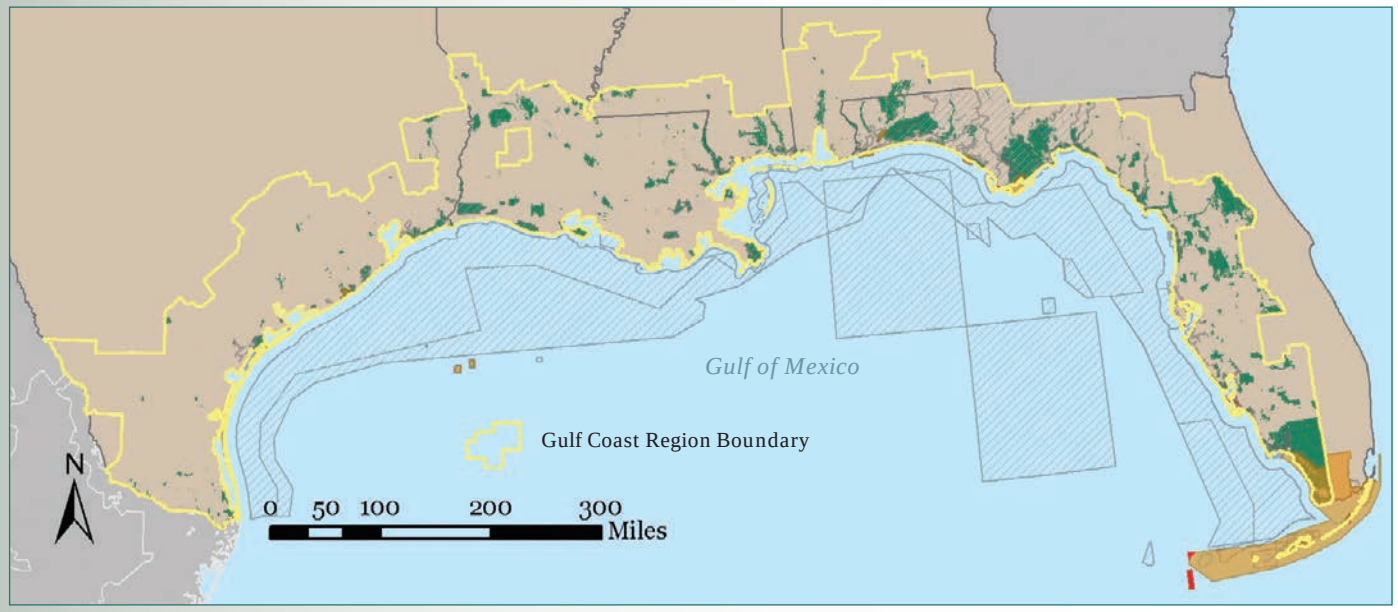


Figure 42: Location of land based and marine protected areas and their use categories.
Source: National Marine Protected Areas Center, 2008; USGS National Gap Analysis Program, 2010

99%

Percent of spatial area in marine protected areas where fishing and other extractive uses are allowed.

Source: National Marine Protected Areas Center, 2008

67%

Percent of land based protected area that is managed for multiple use (including extractive uses) of natural resources.

Source: USGS National Gap Analysis Program, 2010

Flower Garden Banks National Marine Sanctuary. Credit: G.P. Schmahl, NOAA

Everglades National Park. Credit: National Park Service

Land Based Protected Areas

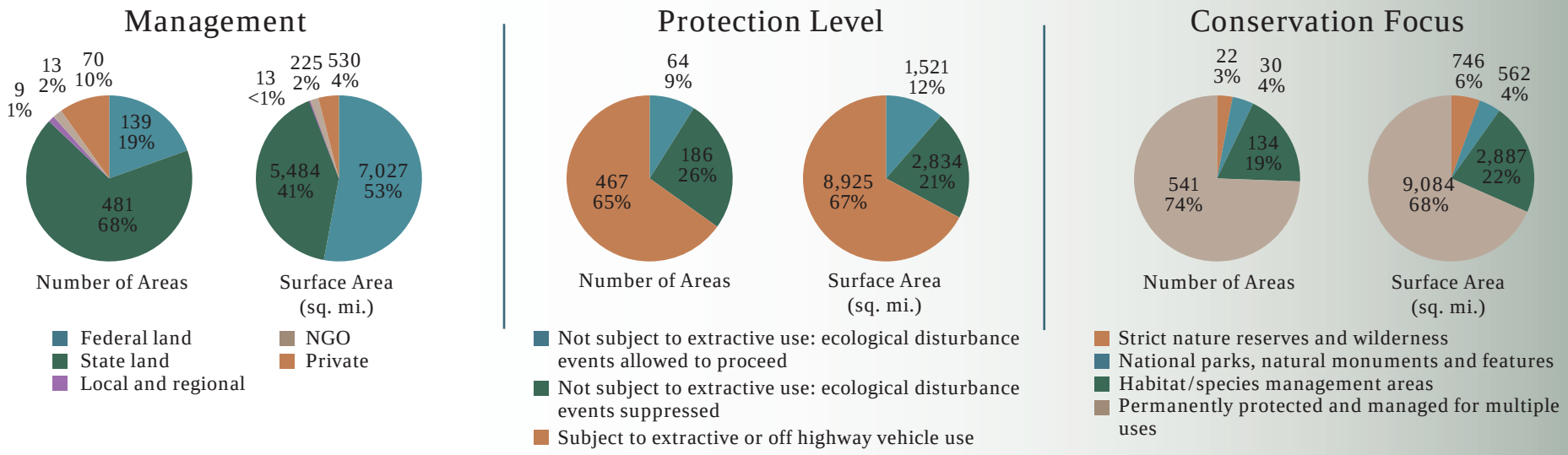


Figure 43: Management, protection level, and conservation focus of land based protected areas in the Gulf Coast Region.
Source: USGS National Gap Analysis Program, 2010

Marine Protected Areas

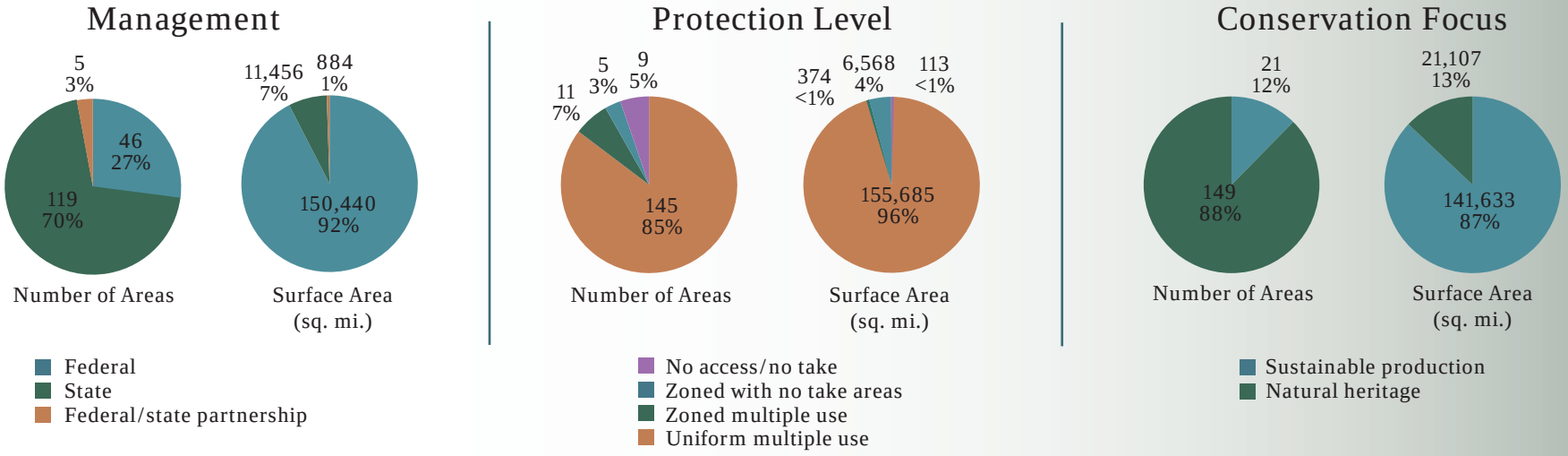


Figure 44: Management, protection level, and conservation focus of marine protected areas in the Gulf of Mexico.
Source: National Marine Protected Areas Center, 2008

Species Diversity

Marine biodiversity helps the Gulf of Mexico's ability to produce seafood, resist diseases, filter pollutants, and rebound from stresses such as overfishing and man-made and natural disasters. From the smallest microbe to the largest mammal, each species plays an important role in how the Gulf of Mexico functions.

Baby loggerhead sea turtles on Santa Rosa Island, FL. Credit: Airman Anthony Jennings, U.S. Air Force

Over 15,000 species are found in Gulf of Mexico waters.

64%

Percent of fishes in the Western Central Atlantic Ocean that occur in the Gulf of Mexico.

38%

Percent of marine mollusks in the Western Central Atlantic Ocean that occur in the Gulf of Mexico.

Source: Felder and Camp, eds., 2009

Known Species Richness at Varying Depths within the Gulf of Mexico

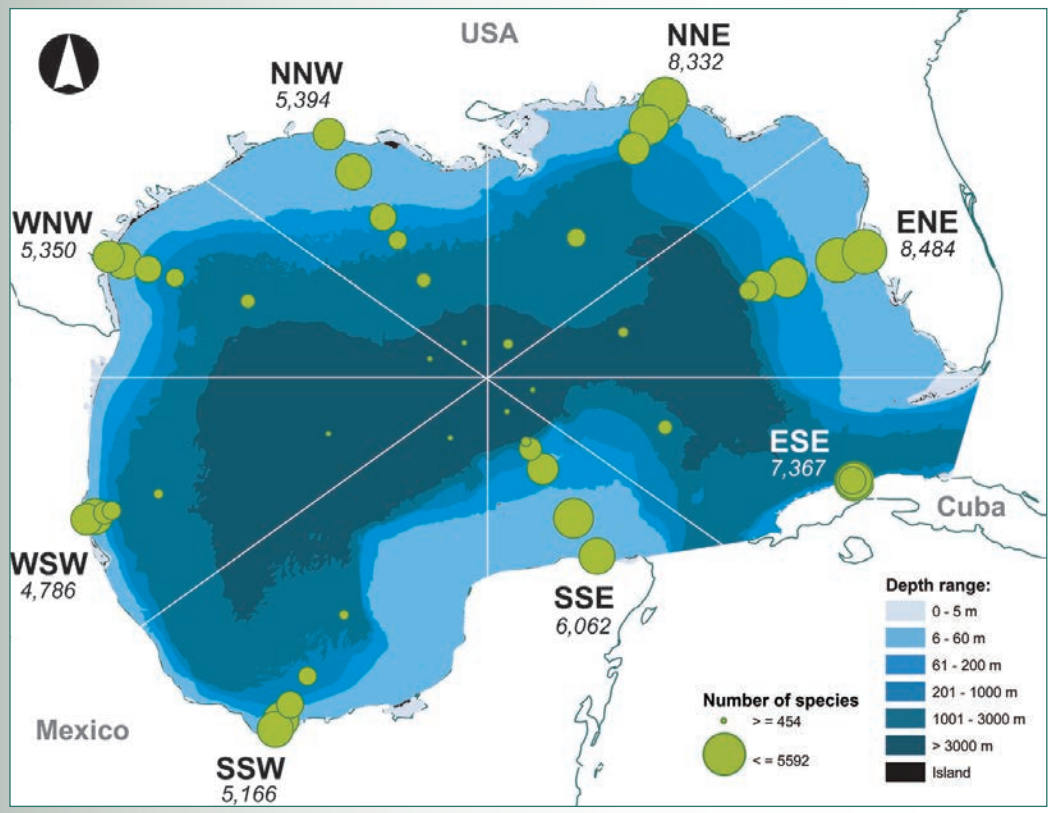


Figure 45: Total number of plant and animal species reported for each region. Sizes of circles are proportional to species numbers within each depth range of the Gulf of Mexico.

Source: Brenner and Moretzsohn, Harte Research Institute for Gulf of Mexico Studies, 2010.

The west coast of Florida and the Florida panhandle areas are relatively rich in species diversity in the Gulf of Mexico. As the water depth increases, the number of species decreases, indicating the importance of coastal areas to species richness.

Adult Nassau grouper. Credit: C. Dahlgren

A red night shrimp (Cinetorhynehus manningi) perched on the reef. Credit: NOAA

This hermit crab (Paguristes hernancortezi) was found scuttling across the sea floor in deeper areas of Flower Garden Banks National Marine Sanctuary. Credit: NOAA

Diversity of Species in Gulf of Mexico Waters

Species Associated with Marine and Aquatic Environments

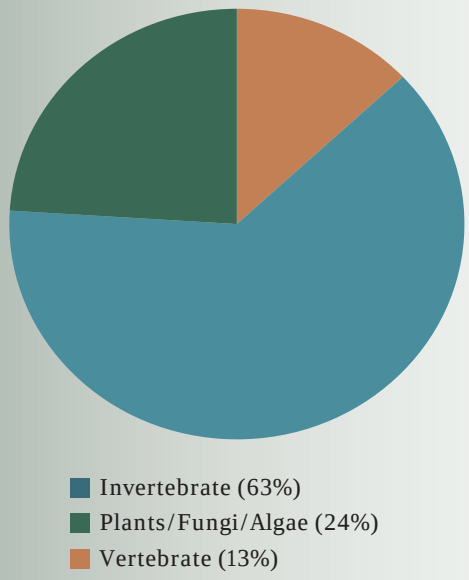


Figure 46: Gulf of Mexico species (of the more than 15,000 species) associated with marine and aquatic environments.

Source: Felder and Camp, eds., 2009

The present inventory of 15,419 species covers roughly 80% to 85% of all known (or described) organisms in the entire Gulf Region.[5]

Source: Felder and Camp, eds., 2009

Selected Species Associated with Marine and Aquatic Environments

Types of Species	Species Count
Crabs and shrimp	2,638
Clams, snails, and octopi	2,455
Boney fish	1,413
Corals, anemones, and jellyfish	792
Red, green, and brown seaweeds	673
Sea stars and urchins	522
Birds	395
Sponges	339
Sharks, skates, and rays	123
Whales and dolphins	28
Sea turtles	5
Snakes	2
Crocodiles	1
Manatees	1

Table 17: Select Gulf of Mexico species (of the more than 15,000 species) associated with marine and aquatic environments.

Source: Felder and Camp, eds., 2009

An oil spill in 1990 (the Mega Borg spill) off Galveston, TX, showed that bottlenose dolphins do not know how to avoid extensive oil-covered areas, and were seen resurfacing in fresh areas of the spill.

Source: Smultea and Wursig, 1995

Brown pelicans fly over Plover Island, near the mouth of the Mississippi River, joined by laughing gulls. Credit: Doug Spinks, USACE New Orleans

Dense swarm of jellyfish in the Gulf of Mexico. Credit: Monty Graham, Dauphin Island Sea Lab

Bottlenose dolphin in the Gulf of Mexico. Credit: NOAA

Nonindigenous Aquatic Species

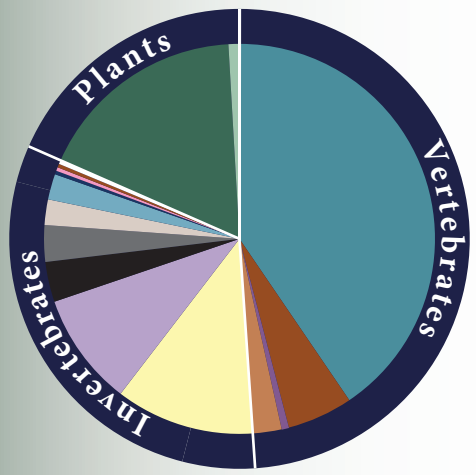
Most nonindigenous aquatic organisms are transported into aquatic ecosystems beyond their historic or native range as a result of human activities. They have the ability to adversely impact local economies, fisheries, sensitive coastal ecosystems, and human health, and are second only to habitat destruction as the greatest cause of biodiversity loss. The cost to manage this problem in the U.S. is estimated at $137 billion annually (Pimentel et. al. 2000).

Zebra Mussel. Credit: National Park Service

Over 331 nonindigenous aquatic species have been found in the Gulf Coast Region.[6]

Source: U.S. Geological Survey, 2010; Froese and Pauly, 2010; Steves et al., 2003; NEMESIS, 2011

Species Introduced



Plants
- Plants (18%)
- Algae (1%)

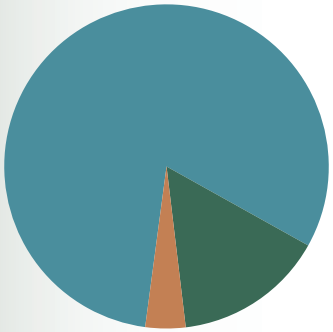
Vertebrates
- Fishes (40%)
- Reptiles (5%)
- Amphibians (2%)
- Mammals (1%)

Invertebrates
- Crustaceans (11%)
- Mollusks (9%)
- Arthropods (3%)
- Cnidarians (3%)
- Annelids (2%)
- Tunicates (2%)
- Echinoderms (<1%)
- Bryozoans (<1%)
- Platyhelminthes (<1%)
- Protozoans (<1%)

Figure 47: Proportions of nonindigenous aquatic species that have been introduced into the Gulf Coast Region and Gulf of Mexico.

Source: U.S. Geological Survey, 2010; Froese and Pauly, 2010; Steves et al., 2003; NEMESIS, 2011

Marine and Freshwater Introductions



- Freshwater (70%)
- Marine (27%)
- Freshwater/Marine (Anadromous) (3%)

Figure 48: Proportion of over 331 species introduced to either freshwater or marine areas, including those species that did not become established. Estuarine species are included as marine.

Source: U.S. Geological Survey, 2010; Froese and Pauly, 2010; Steves et al., 2003; NEMESIS, 2011

What are the major ecological impacts of nonindigenous species?

1. Decline of native species due to alteration of food webs and habitat, competition for food and space, and predation.
2. Changes in ecosystem structure and function, such as nutrient availability and water movement.
3. The introduction of virulent plant and animal diseases and parasites.

Source: U.S. Environmental Protection Agency, 2000

$14.5 million
Approximate amount Florida spends to control hydrilla, a submersed plant with rapid growth rates.

Source: U.S. Environmental Protection Agency, 2000; Pimentel, et. al, 2005

$10 million
Estimated annual recreational losses in just two Florida lakes due to infestation of hydrilla.

Source: U.S. Environmental Protection Agency, 2000; Pimentel, et. al, 2005

59%
Percent of counties in the Gulf Coast Region where nutria have been sighted.

Source: U.S. Geological Survey, 2010

$1 billion
Estimated U.S. damage and control costs per year from zebra and quagga mussels.

Source: Pimentel, et. al, 2005; U.S. Geological Survey, 2010.

Some Nonindigenous Species in the Gulf Coast Region

Credit: Alabama Department of Conservation and Natural Resources

Nutria, *Myocastor coypus*
Large semi-aquatic rodents indigenous to South America.

Means of Introduction: Imported to Louisiana for fur farming.
Status: Feral populations reported in 83 counties in the Gulf Coast Region.
Impact: Over-grazing and destruction of wetland habitats, burrowing into flood protection levee.

Source: U.S. Geological Survey, 2010

Credit: Alabama Department of Conservation and Natural Resources

Water-Hyacinth, *Eichhornia crassipes (Mart.) Solms*
Floating perennial plants native to Brazil.

Means of Introduction: Sold as an ornamental plant for fish ponds.
Status: Reported in 68 counties in the Gulf Coast Region.
Impact: Grows at explosive rates – leading to clogged waterways, altered water temperature and chemistry, and the exclusion of native plants and wildlife.

Source: U.S. Geological Survey, 2010

Credit: © John M. Randall, The Nature Conservancy

Alligatorweed, *Alternanthera philoxeroides*
Floating perennial plants native to South America.

Means of Introduction: Ballast water exchange (most likely).
Status: Reported in 65 counties in the Gulf Coast Region.
Impact: Forms dense mats that crowd out native species and impedes recreational activities such as boating, swimming, and fishing.

Source: U.S. Geological Survey, 2010; U.S. Department of Agriculture, 2010

Credit: Noel M. Burkhead

Asian Clam, *Corbicula fluminea*
Small freshwater clams native to southern and eastern Asia and Africa.

Means of Introduction: Source of first introduction unknown, although believed to be introduced as a food item by Chinese immigrants.
Status: Reported in 59 counties in the Gulf Coast Region.
Impact: Large numbers, either dead or alive, clog water intake pipes, costing about $1 billion annually for removal.

Source: U.S. Geological Survey, 2010

Lionfish in the Gulf of Mexico

Indo-Pacific Lionfish (*Pterois volitans/miles*) have become widely established in the Southeast U.S. and Caribbean in less than a decade. These fish pose a significant threat to the Gulf of Mexico as they are capable of permanently impacting native reef fish communities. Lionfish are known to eat native fish and crustaceans in large quantities, and once established, lionfish are very difficult to control.

Lionfish have now been sighted in multiple locations in the Gulf of Mexico. Figure 49 shows the northward movement of lionfish into this region. It is anticipated that this species will continue their expansion and spread throughout the entire Gulf of Mexico (Schofield, 2010).

Figure 49. Map showing time lines indicating when lionfish were first sighted in the region. The star represents an anomalous lionfish sighting from 2006 (Schofield, 2010)

Coastal Vulnerability

It is certain that Gulf coastal communities will continue to experience significant, destructive coastal storms, as well as long-term sea level rise. By becoming more "resilient," communities can increase their ability to "bounce back" after hurricanes and flooding. More resilient communities, with the ability to quickly recover both economically and socially, will be critical to the region's long-term viability and success.

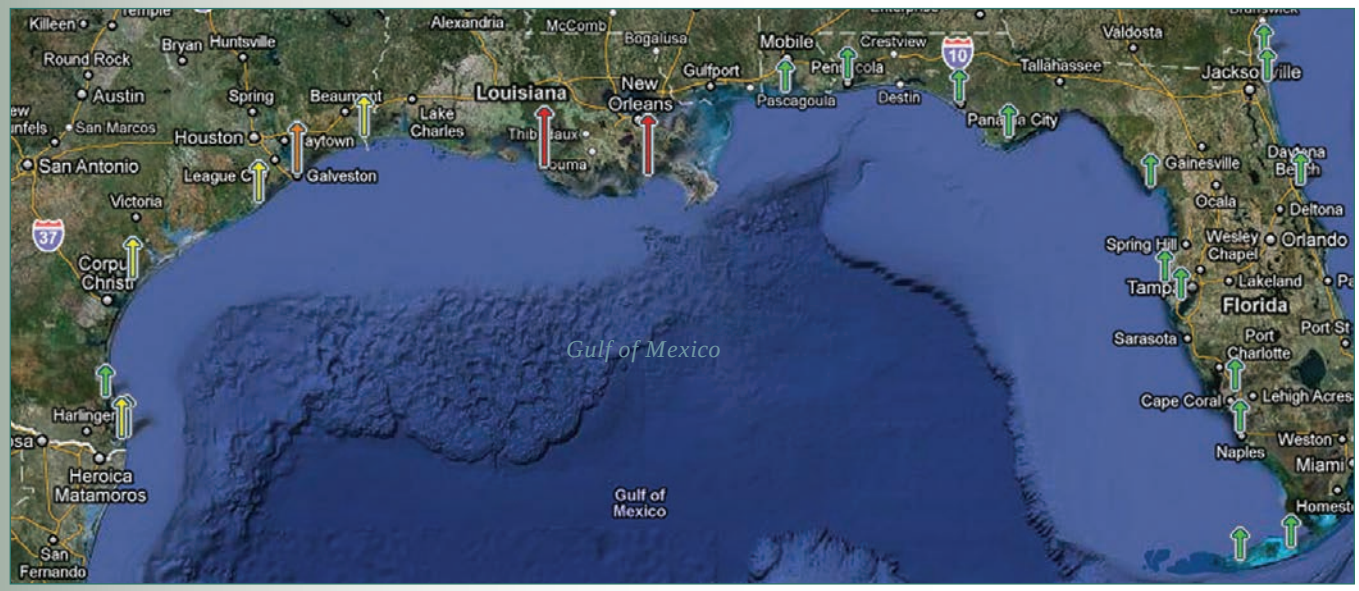
Flooding in New Orleans after Hurricane Katrina. Credit: NOAA

Fifty-nine percent of the U.S. Gulf of Mexico shoreline is considered very vulnerable to sea level rise.

Source: Thieler and Hammer-Klose, 2006

Sea level Rise along the Gulf Coast

Global sea level rise is currently estimated as 1.7-1.8 mm/year. Local sea level change, which is of more direct concern to coastal communities, is a combination of the global rise in sea level and local changes in land elevation. While some areas of the country (for example, areas of Alaska) are actually experiencing a lowering of local sea level due to the land rising faster than the sea level is rising, the Gulf Coast is experiencing land subsidence at varying rates and thus local sea level rise.



Sea level Trends
mm/yr (feet/century)

0 to 3 (0 to 1) 3 to 6 (1 to 2) 6 to 9 (2 to 3) 9 to 12 (3 to 4)

Figure 50: Local sea level trends along the U.S. Gulf coast.
Source: NOAA, 2010e.

3.03

100-year projected local sea level rise (in feet) at Grand Isle, LA, one of the highest projected in the U.S.

Source: NOAA Tides & Currents, 2010

100%

Percent of Texas, Louisiana, and Mississippi coasts that are at high or very high risk to sea level rise.

Source: Thieler and Hammer-Klose, 2006

St. Charles, LA tide gauge, one component of the St. Charles Parish Water Level Monitoring System. This system will provide critical information to save lives, protect property, and restore the environment in this community. Credit: NOAA

How Sea Level Trends are Determined

Changes in Mean Sea level (MSL), either a sea level rise or sea level fall, have been computed at 128 long-term water level stations around the country using a minimum span of 30 years of observations at each location. These measurements have been averaged by month to remove the effect of high frequency phenomena, such as waves and tides, to compute an accurate local sea level trend. For more information, visit: *http://tidesandcurrents.noaa.gov*

Source: NOAA, 2010e.

What is Considered When Determining Coastal Vulnerability Index Ratings?

Shoreline Erosion Rate

Geomorphology
(erodibility of shoreline)

Historic Sea Level Rise Rate

Regional Coastal Slope
(steepness or flatness)

Tide Range

Wave Height

Source: Thieler and Hammer-Klose, 2006

Coastal Vulnerability Index

Awareness of the relative vulnerability (physical change) of coastal areas to sea level rise will help communities consider the longer-term costs of protecting or relocating themselves. The preliminary assessment presented here, conducted by the U.S. Geological Survey, describes how vulnerable the Gulf of Mexico region might be to long-term sea level rise.

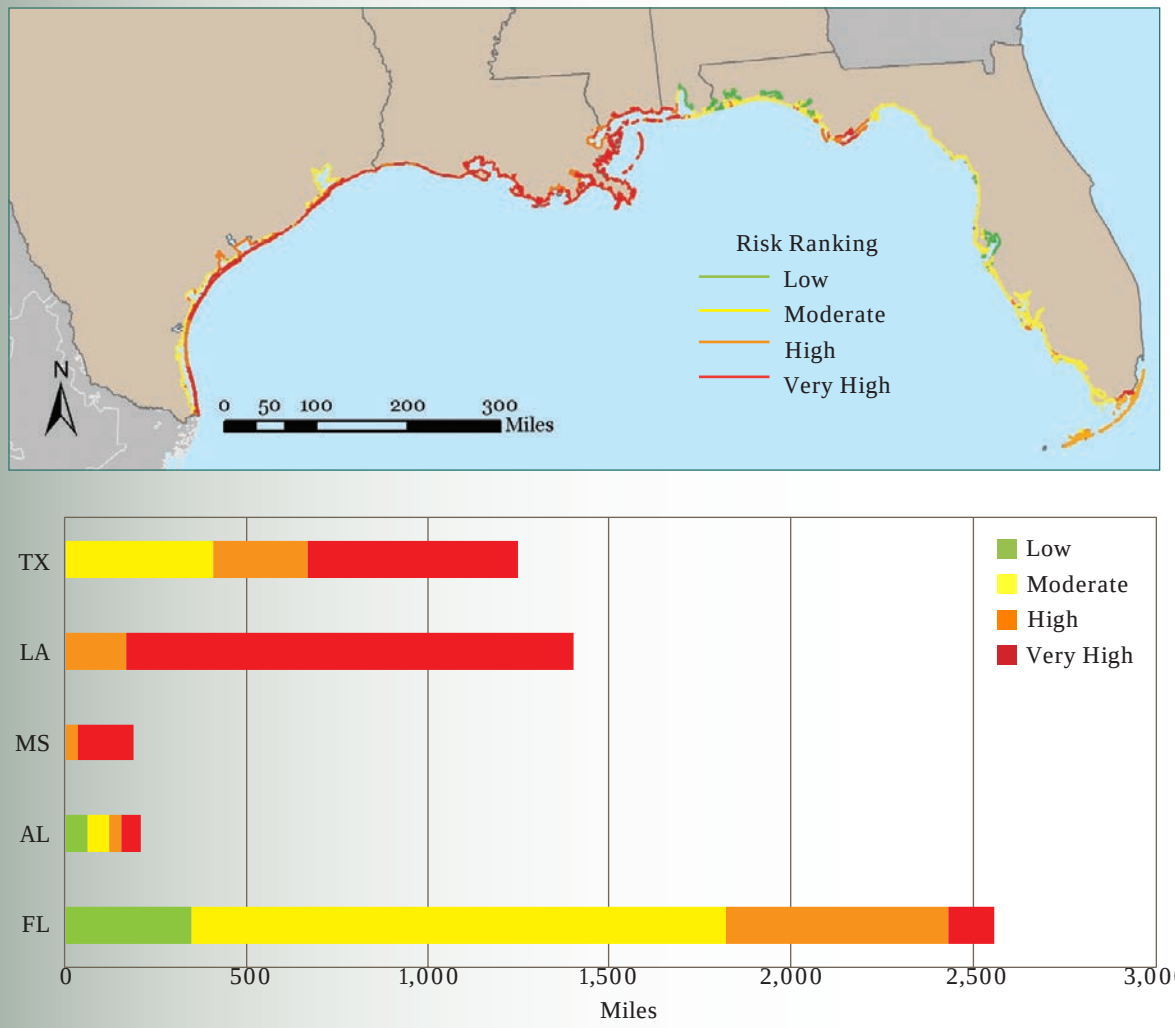


Figure 51: Coastal vulnerability index rating for the U.S. Gulf of Mexico coastline.

Source: Thieler and Hammer-Klose, 2006

The Gulf of Mexico "Dead Zone"

Hypoxia refers to lower levels of oxygen in the water column. Levels can be so low that fish and shellfish might not have enough oxygen to survive. Hypoxia can occur naturally, however, it often indicates a human-caused oversupply of nutrients, specifically nitrogen and phosphorus, from urban, agricultural, and other sources. This oversupply of nutrients in the water can cause intensive unnatural growth, or blooms, of algae. When these blooms of algae die, they sink to the bottom and decompose, a process which consumes oxygen.

Facts

1. The Mississippi River begins in northern Minnesota, and flows 2,350 miles to the Gulf of Mexico, capturing runoff from 41% of the continental United States.

2. Since the 1970s, scientists have documented a large area of hypoxia off the coast of Louisiana and Texas called the "Dead Zone." It occurs in the middle of a nationally important commercial and recreational fishing area, forms every year starting in late spring, and reaches its greatest extent by midsummer.

3. Since systematic measurement began in 1985, the hypoxic "Dead Zone" has averaged about 5,000 square miles, roughly the size of the state of Connecticut.

4. In 2010, the size of the "Dead Zone" was one of the largest on record at 7,722 square miles (its largest known size of 8,494 square miles occurred in 2002).

Figure 52: The Mississippi River watershed and general location of the hypoxic "Dead Zone" in the Gulf of Mexico.

Source: EPA, Mississippi River Gulf of Mexico Watershed Nutrient Task Force, 2011

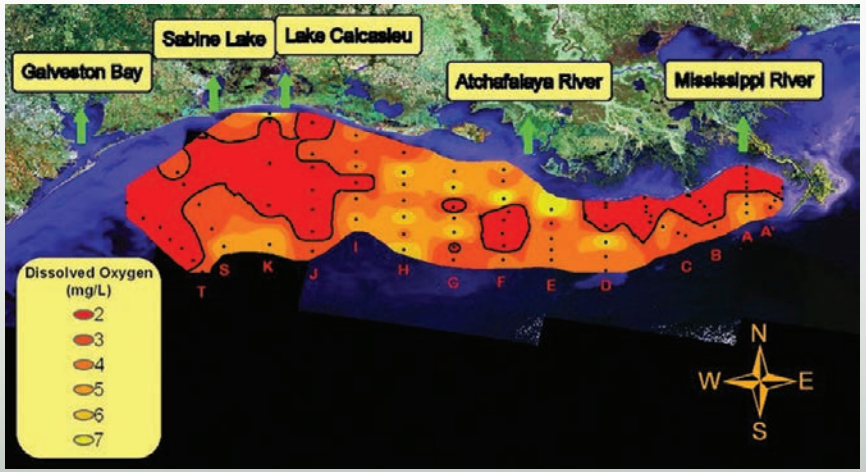


Figure 53: Dissolved oxygen concentration in bottom-water across the Louisiana-Texas shelf from July 25 to 31, 2010. The black line outlines values less than 2 mg/L, or hypoxia.

Source: Louisiana Universities Marine Consortium; Funded by NOAA, Center for Sponsored Coastal Ocean Research, 2010

Nutrient Pollution in Gulf Estuaries

The "Dead Zone" is not the only area in the Gulf region to have problems with nutrient pollution, and hypoxia is just one of many problems that can result from nutrient pollution. Other manifestations include increasing occurrence and severity of harmful algal blooms, loss of desirable sea grass beds, and longer term loss in ecological ability to support high abundance of desirable fish species.

Facts

1. There are 37 major estuarine systems in the Gulf region and many of these diverse and productive water bodies are susceptible to the negative effects of nutrient pollution.

2. Sixteen of these estuaries (43%) have experienced at least moderate problems with nutrient pollution. The problem could actually be worse since there were insufficient data to make a determination of nutrient pollution impact for 11 Gulf estuaries.

3. Hypoxia is now known to occur in at least 105 distinct locations within these estuaries (some estuaries experience it in more than one location) (Committee on Environment and Natural Resources, 2010).

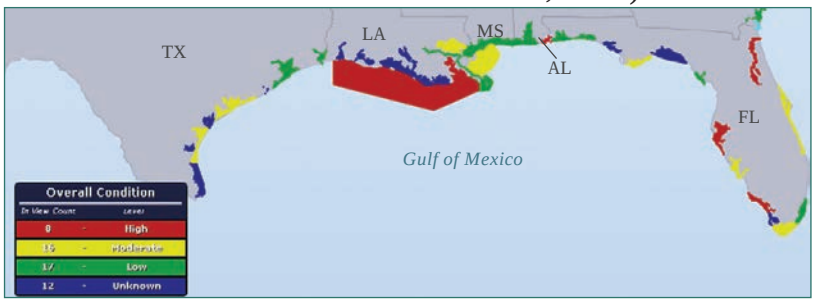


Figure 54: The varying colors represent the expression of nutrient pollution indicators in the major Gulf estuaries as of 2004. For information on this index, visit: http://stateofthecoast.noaa.gov/hypoxia/welcome.html
Source: Bricker et al., 2007

Harmful Algal Blooms

Harmful Algal Blooms (HABs) occur when a few algae species undergo rapid population growth and cause negative impacts to human health, coastal economies, and coastal ecosystems. Algal blooms of *Karenia brevis*, commonly referred to as red tide, are currently most problematic in Florida and Texas, but HABs can occur in the coastal waters of any of the Gulf states.

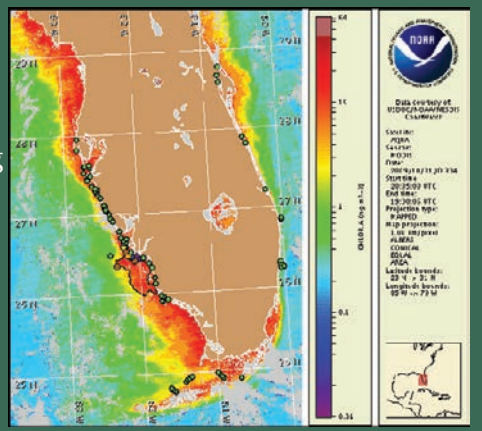
Facts

1. HABs in the Gulf region have caused acute human illness from ingestion of contaminated shellfish, massive fish kills, sea bird mortality, and deaths of marine mammals such as manatees and bottlenose dolphins.

2. HABs can cause major economic damage. It has been estimated that such costs are up to $19 to $32 million per year in Florida (NOAA, 2010b).

3. In Texas, just one event in 2000 cost the oyster industry $10 million in lost revenue due to closure from harvest to protect public health (NOAA, 2010b).

NOAA's Harmful Algal Bloom Operational Forecast System (HAB-OFS) provides alerts to coastal managers about developing blooms and changes in the location and extent of existing blooms. Managers can use this system to design more precise and selective shellfish harvesting closures, thereby minimizing economic impacts on local communities while protecting human health. *For information visit: http://tidesandcurrents.noaa.gov/hab/*



Chemical Contaminants

Chemical contaminants of natural environments are explored through an examination of data on contaminants in oysters and mussels as well as a look at the Environmental Protection Agency's National Priority List of Superfund clean-up sites.

Lavaca bay, TX. Credit: NOAA

Hazardous Waste Sites

Superfund is the name given to the environmental program established to address abandoned hazardous waste sites. It is also the name of the fund established by the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) of 1980 (as amended). It allows the EPA to clean up such sites and to compel responsible parties to perform clean-ups or reimburse the government for EPA-led clean-ups.

Superfund sites, which are recorded on the EPA's National Priority List, are divided into three categories:

Proposed sites: Undergo a determination if they qualify for Final Listing

Final Listing sites: Undergo active clean-up and remediation.

Deleted sites: Have been cleaned up and remediated and no longer pose a threat to human health or the environment.

Number of Superfund Sites in the Gulf Coast Region

	Total		Final Listing		Deleted		Proposed	
State	State-Wide	Coastal Counties	State-Wide	Coastal Counties	State-Wide	Coastal Counties	State-Wide	Coastal Counties
Texas	61	32	49	26	10	5	2	1
Louisiana	23	19	8	5	12	12	3	2
Mississippi	11	4	4	2	3	1	4	1
Alabama	16	8	13	7	1	0	2	1
Florida	78	36	54	24	23	11	1	1
Gulf Coast	**189**	**99**	**128**	**64**	**49**	**29**	**12**	**6**
National	1,703		1,290		347		66	

Table 18: EPA Superfund sites in the Gulf Coast Region and Gulf states compared to the number of sites nationwide.
Source: EPA, 2011a

Fourteen percent of all Superfund sites nationwide that have been cleaned up or remediated are located in the Gulf Coast Region.

Source: EPA, 2011a

100%

Percent of Louisiana's cleaned up or remediated Superfund sites that are located in Louisiana's coastal region.

Source: EPA, 2011a

Seventy acres of salt marsh were created as a result of the Lavaca Bay Superfund site remediation. As part of the Aransas National Wildlife Refuge, this new marsh adds to the foraging area of endangered whooping cranes. Credit: NOAA

Oyster reef in the Gulf of Mexico. Oysters can act as indicators of pollution in the surrounding area. Credit: NOAA

Case Study: Chemical Contamination in Oysters

At the Lavaca Bay Superfund site (a Final Listing site), on Point Comfort, Texas, 64 square miles of the estuary were contaminated by chronic mercury releases from processes at Alcoa's Lavaca Bay facility. High levels of mercury released from the facility contaminated sediments, oysters, and several species of fish and crabs. Eventually, the Texas Department of Health closed a portion of the bay to fishing in 1988.

Oysters and Mussels as Indicators of Pollution

Since bivalves (oysters and mussels) filter their food from the water and can store contaminants in their tissues, they are good indicators of contaminants in the water. Two NOAA Mussel Watch sites are located adjacent to the Lavaca Bay Superfund site (Figure 55). Oysters tested at one of these sites, Dredge Island, have shown high levels of mercury, exceeding FDA limits for consumption over a several year period (Figure 56).

Management Success

A cooperative, integrated approach is used to address both the clean-up of contaminated areas and to plan the on-the-ground restoration needed to resolve natural resource damages liability. As a result, at the Lavaca Bay Superfund site, over eleven acres of oyster reef and seventy acres of salt marsh have been built, over 700 acres of coastal prairie habitat is recovering from overuse by cattle and is being permanently preserved, and three lighted fishing piers and boat ramps are now in place to restore the fishing opportunities the public had lost. Clean-up measures should eventually result in the Texas Department of Health removing the fish closure order.

Source: EPA, 2011b; NOAA's Mussel Watch Program, 2010.

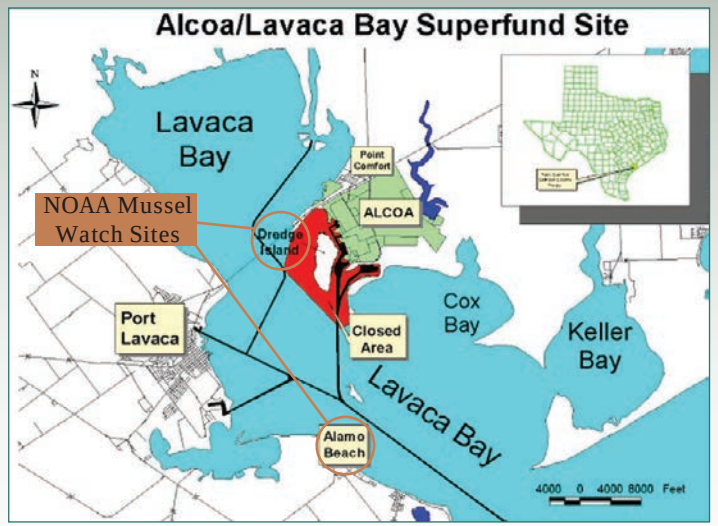


Figure 55: Location of the Lavaca Bay Superfund site and nearby NOAA Mussel Watch sites.
Source: EPA, 2011; NOAA's Mussel Watch Program, 2010

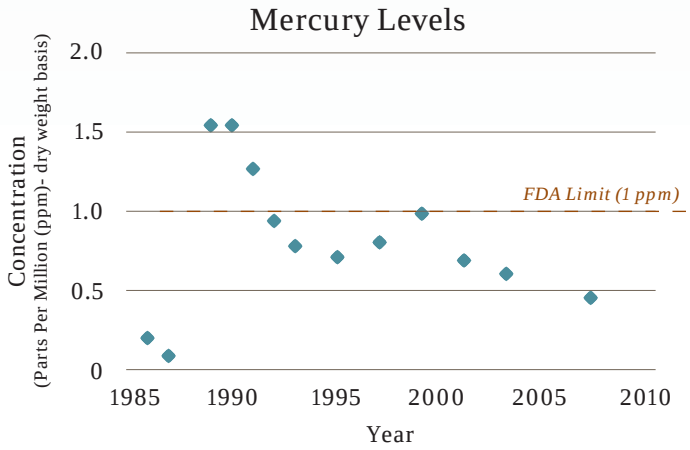


Figure 56: Mercury levels found in oysters at Dredge Island near the Lavaca Bay Superfund site.
Source: NOAA's Mussel Watch Program, 2010

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End Notes

[1] - The Gulf of Mexico shoreline length presented in the Introduction, 47,000 miles, was developed using the mean high water line digitized from NOAA's nautical charts at 1:80,000 scale, also referred to as NOAA's medium resolution shoreline. To view this or other recognized shorelines, visit http://shoreline.noaa.gov/. Note, there are many documented shoreline length calculations, and figures can vary greatly depending on the level of cartographic generalization. For example, *The Coastline of the United States* (US Department of Commerce publication NOAA/PA 71046 1975) states that the shoreline of the U.S. portion of the Gulf of Mexico is 17,141 miles. The shoreline length measured for that report was measured in 1939-1940 by hand tracing charts, and measurements stopped where tidal waters narrowed to a width of 100 feet. As a result, the shoreline from *The Coastline of the United States* is much more generalized, not including all inland bays, wetlands, and barrier islands included in the medium resolution shoreline measurement.

[2] - A housing unit is a house, an apartment, a mobile home, a group of rooms, or a single room that is occupied (or if vacant, is intended for occupancy) as separate living quarters. Separate living quarters are those in which the occupants live and eat separately from any other persons in the building and which have direct access from the outside of the building or through a common hall.

[3] - The Tourism and Recreation data is a grouping of specific sectors in the North American Industry Classification System's Leisure and Hospitality supersecter that are descriptive of the ocean (Colgan, 2004). NAICS is the standard used by Federal statistical agencies in classifying business establishments for the purpose of collecting, analyzing, and publishing statistical data related to the U.S. business economy.

[4] - The Essential Fish Habitat (EFH) provisions of the Magnuson-Stevens Fishery Conservation and Management Act require NOAA's National Marine Fisheries Service (NMFS) and the regional Fishery Management Councils to describe and identify an EFH in the respective Fishery Management Plan (FMP) for each managed fish species.

[5] - The present inventory of about 15,419 species is distributed over 40 phyla. This present inventory covers roughly 80% to 85% of the known (described) Gulf eukaryotic taxa.

[6] - The nonindigenous aquatic species numbers found in this report were compiled from four sources and do not include pathogens. As a result, numbers may be an underestimation of actual nonindigenous aquatic species found in the Gulf of Mexico waters and the Gulf Coast Region.

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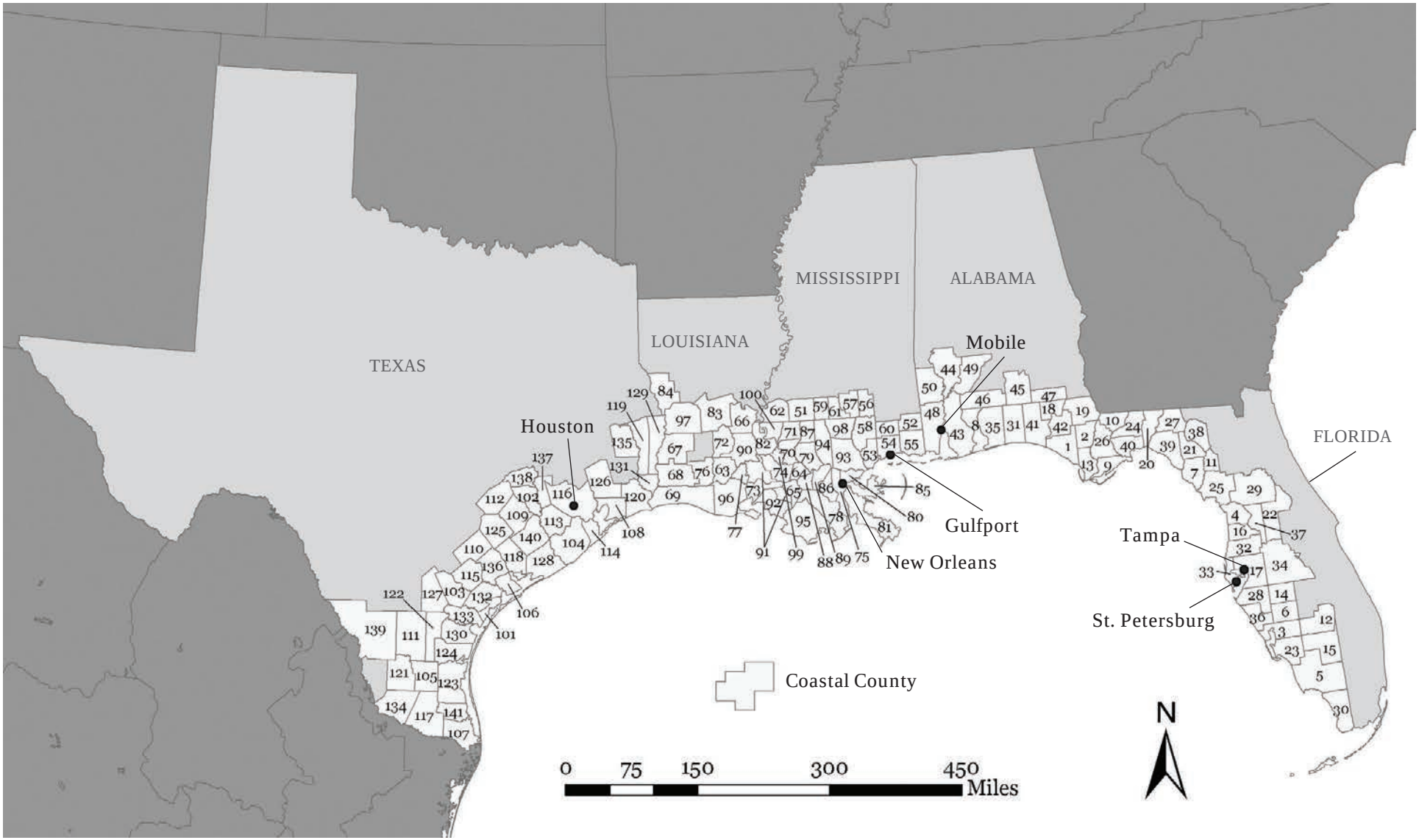
Coastal Watershed Counties that Comprise the Gulf Coast Region



Florida

1 Bay
2 Calhoun
3 Charlotte
4 Citrus
5 Collier
6 DeSoto
7 Dixie
8 Escambia
9 Franklin
10 Gadsden
11 Gilchrist
12 Glades
13 Gulf
14 Hardee
15 Hendry
16 Hernando
17 Hillsborough
18 Holmes
19 Jackson
20 Jefferson
21 Lafayette
22 Lake
23 Lee
24 Leon
25 Levy
26 Liberty
27 Madison
28 Manatee
29 Marion
30 Monroe
31 Okaloosa
32 Pasco
33 Pinellas
34 Polk
35 Santa Rosa
36 Sarasota
37 Sumter
38 Suwannee
39 Taylor
40 Wakulla
41 Walton
42 Washington

Alabama

43 Baldwin
44 Clarke
45 Covington
46 Escambia
47 Geneva
48 Mobile
49 Monroe
50 Washington

Mississippi

51 Amite
52 George
53 Hancock
54 Harrison
55 Jackson
56 Lamar
57 Marion
58 Pearl River
59 Pike
60 Stone
61 Walthall
62 Wilkinson

Louisiana

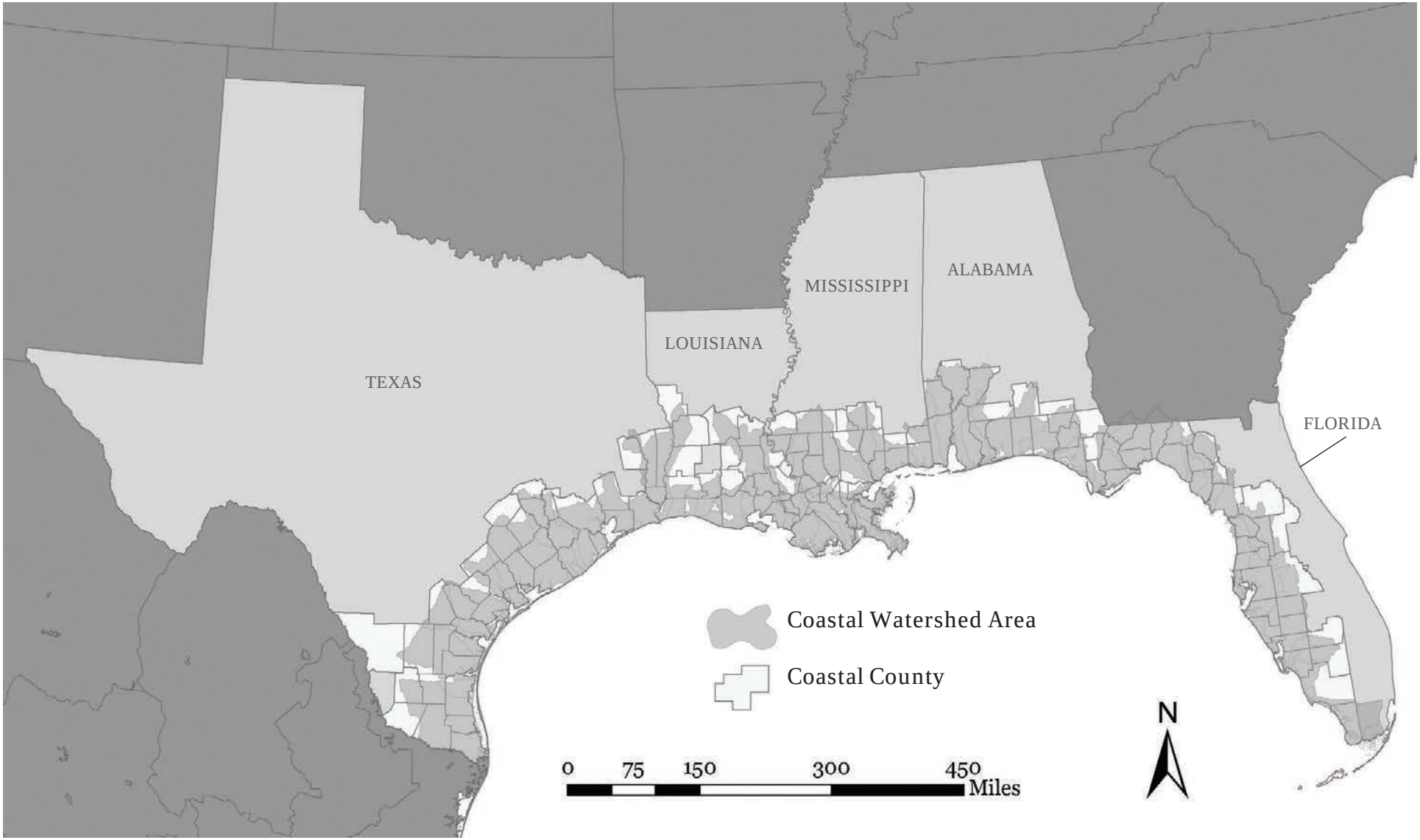
63 Acadia
64 Ascension
65 Assumption
66 Avoyelles
67 Beauregard
68 Calcasieu
69 Cameron
70 East Baton Rouge
71 East Feliciana
72 Evangeline
73 Iberia
74 Iberville
75 Jefferson
76 Jefferson Davis
77 Lafayette
78 Lafourche
79 Livingston
80 Orleans
81 Plaquemines
82 Point Coupee
83 Rapides
84 Sabine
85 St. Bernard
86 St. Charles
87 St. Helena
88 St. James
89 St. John the Baptist
90 St. Landry
91 St. Martin
92 St. Mary
93 St. Tammany
94 Tangipahoa
95 Terrebonne
96 Vermilion
97 Vernon
98 Washington
99 West Baton Rouge
100 West Feliciana

Texas

101 Aransas
102 Austin
103 Bee
104 Brazoria
105 Brooks
106 Calhoun
107 Cameron
108 Chambers
109 Colorado
110 DeWitt
111 Duval
112 Fayette
113 Fort Bend
114 Galveston
115 Goliad
116 Harris
117 Hidalgo
118 Jackson
119 Jasper
120 Jefferson
121 Jim Hogg
122 Jim Wells
123 Kenedy
124 Kleberg
125 Lavaca
126 Liberty
127 Live Oak
128 Matagorda
129 Newton
130 Nueces
131 Orange
132 Refugio
133 San Patricio
134 Starr
135 Tyler
136 Victoria
137 Waller
138 Washington
139 Webb
140 Wharton
141 Wilacy

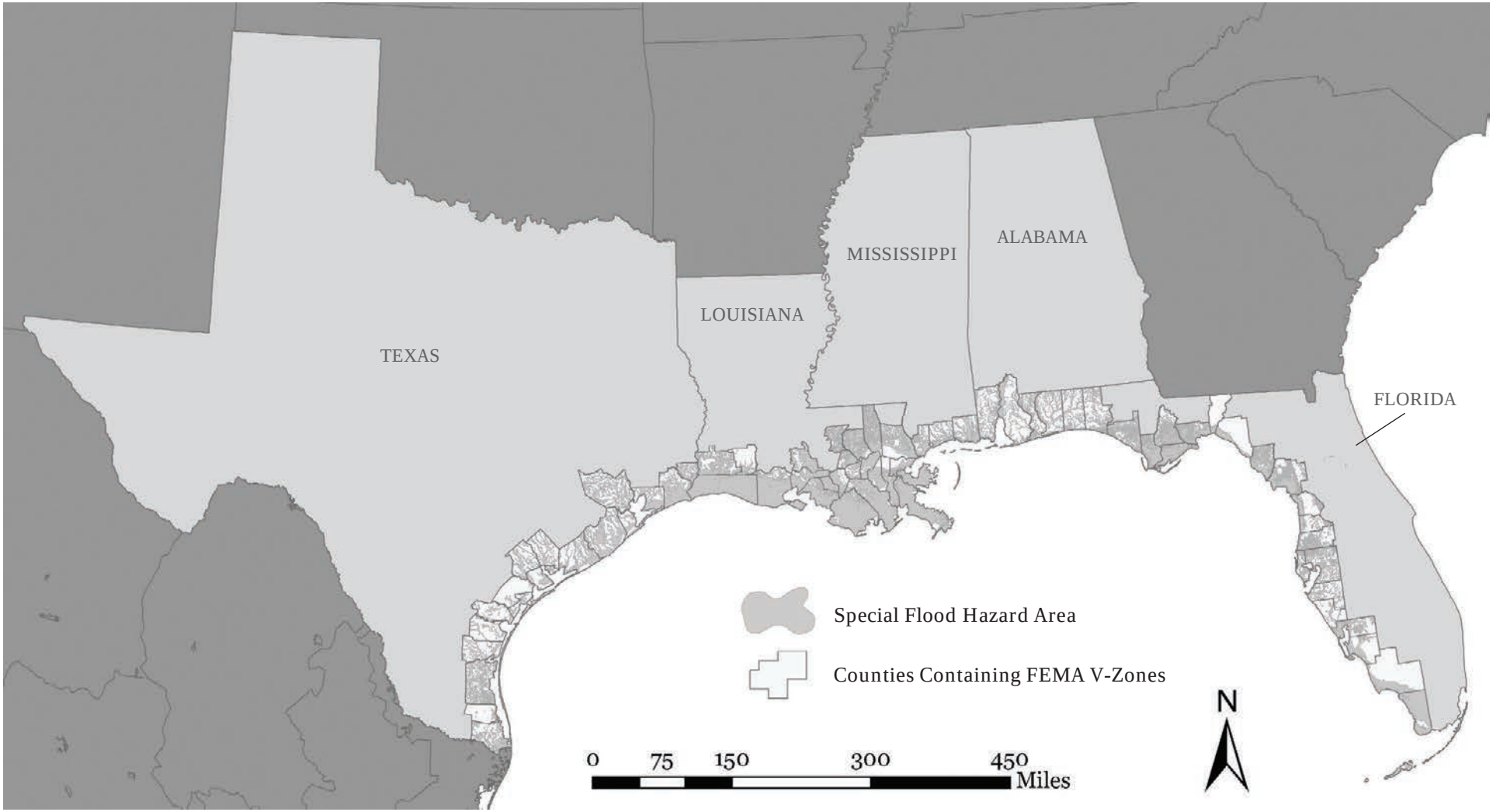
How Coastal Watershed Counties are Determined

The Gulf of Mexico coastal watershed counties were chosen to represent what is referred to in this report as the "Gulf Coast Region." To be included as a "coastal watershed county" one of the following criteria must be met: (1) at a minimum, 15% of the county's total land area is located within a coastal watershed or (2) a portion of or an entire county accounts for at least 15% of a U.S. Geological Survey coastal cataloging unit. The Gulf Coast Region contains a total of 141 coastal counties across the five U.S. Gulf States. For more detailed information visit: http://stics.noaa.gov/coast_defined.html.



Gulf Coast Special Flood Hazard Area

The Federal Emergency Management Agency's (FEMA) Special Flood Hazard Area (SFHA) is the area where the National Flood Insurance Program's floodplain management regulations must be enforced and the area where the mandatory purchase of flood insurance applies. The SFHA includes Zones A, AO, AH, A1-30, AE, A99, AR, AR/A1-30, AR/AE, AR/AO, AR/AH, AR/A, VO, V1-30, VE, and V. For the purposes of this document, the data related to the SFHA are reported for counties that have a coastline bordering the Gulf of Mexico or contain velocity zones (V-Zones) or coastal high hazard areas. V-Zones are areas where wave heights more than 3 feet and/or high velocity water can cause structural damage in a 100-year flood, a flood with a 1-percent chance of occurring or being exceeded in a given year. In this report, this suite of Gulf counties are referred to as "**counties containing FEMA V-Zones**."



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