Final Technical Report

Preliminary Assessment of the Impacts of Hurricane Katrina on Gulf of Mexico Coastal Fishing Communities

Submitted to:

U.S. Department of Commerce
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Southeast Regional Office (SERO)
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St. Petersburg, FL 33701

Submitted by:

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March 2007

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PRELIMINARY ASSESSMENT OF THE IMPACTS OF HURRICANE KATRINA ON GULF OF MEXICO COASTAL FISHING COMMUNITIES

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NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL MARINE FISHERIES SERVICE
SOUTHEAST REGIONAL OFFICE
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CONTRACT # WC133F-06-CN-0003

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Dear Drs. Ingles, Travis, and Abbott-Jamieson:

In accordance with the terms of our contract with the NOAA's National Marine Fisheries Service (NMFS), we are submitting the enclosed Final Technical Report entitled PRELIMINARY ASSESSMENT OF THE IMPACTS OF HURRICANE KATRINA ON GULF OF MEXICO COASTAL FISHING COMMUNITIES in compliance with the terms of Contract WC133F-06-CN-0003 awarded October 13, 2005

We wish to again acknowledge, and express our appreciation for, the on-the-scene field involvement of NMFS staff, the close guidance and oversight offered at all stages of the process, and for the highly detailed and valuable critical comment offered on previous iterations of this study report. It is our hope that this report will serve as the foundation for monitoring of what are certain to be ongoing social and economic impacts of Hurricane Katrina.

We look forward to working with you again on future projects.

Sincerely,

John S. Petterson, Ph.D.
Principal Investigator

ACKNOWLEDGMENTS

The research on which this report is founded began within the first week following landfall of Hurricane Katrina and continued until early July 2006. This early phase of work proved vital to the ultimate detail and utility of the preliminary impact assessment and to the quality of the overall report - and credit must go to NOAA's National Marine Fisheries Service (NMFS) senior staff for the accelerated decision-making, contract scoping, and award that made early field work possible.

We wish to thank Patrick Moore, and his University of West Florida public history graduate students, for helping to assemble and field the research efforts carried out in coastal Alabama and Mississippi during the initial weeks following landfall. Special thanks are also owed to the IAI field team that arrived in Houston during the evacuation and were able to document the sequence and consequences of the "resettlement" process through to the last evacuee – and then into ten-month field research program. The team of Terra Tolley, Tibora Girczyc-Blum, Katherine Rodela, Laura Stanley, James Philipp, Jennifer Smith, Edward Glazier, and Pamela Godde was responsible for collecting, organizing, and preparing the research results. Their commitment to the research and their perseverance under extremely difficult field conditions is acknowledged and much appreciated. Laura and Pam are due special thanks for final integration of the results.

Susan Abbott-Jamieson, Senior Social Scientist, NMFS Office of Science and Technology, Headquarters, and Palma Ingles, Social Scientist, NMFS Southeast Regional Office, both deserve special credit for enduring the harsh conditions and inevitable difficulties of fieldwork in remote locations. Their observations and field notes derived from work in some of the hardest hit areas proved to be of great utility in developing our analysis. We also wish to thank NMFS Southeast Fisheries Science Center for allowing Bichnga Boulet to work directly with the field team as both a research assistant and Vietnamese translator. Her dedication to the task at hand and her familiarity with the communities were invaluable in our efforts to collect detailed information about the effects of the hurricane on persons of Vietnamese ancestry in all three affected states.

Most importantly, the members of the research team wish to acknowledge the unflinching and generous participation of over 2,000 field informants, businessmen, fishermen, residents and municipal, parish, county, state, and federal government officials, including over 600 formal interviews. Under the most difficult of conditions, informants eagerly gave of their time, energy, and thought in the hope of improving the quality and utility of the study results.

Finally, we wish to extend our appreciation and special thanks to contract monitors Susan Abbott-Jamieson, Rita Curtis, Palma Ingles, and Michael Travis who were so dedicated in providing their expertise and attention to detail over the course of this intensive effort.

John S. Petterson, Ph.D.
Principal Investigator
March 2007

Executive Summary

This report documents the impacts of Hurricane Katrina on 38 fishing-involved communities in affected areas of Alabama, Mississippi, and Louisiana. It was prepared for the Southeast Regional Office of NOAA Fisheries as an extension of the agency's fishing community profiling program.[1] The work was undertaken by Impact Assessment, Inc. (IAI), a research firm specializing in maritime social science along the coastal zone of the U.S. IAI researchers were deployed to investigate the effects of the hurricane soon after Katrina made landfall, and continued to document and monitor conditions during the autumn and winter months of 2005, and during the spring and early summer months of 2006. This report describes the nature and findings of the research through July 2006, with clear acknowledgement that the effects of the storm continue to unfold as fishery participants throughout the region adapt to radically altered conditions in a perennially challenging industry.

Background. The landfall of Hurricane Katrina in August of 2005 resulted in one of the worst natural disasters in the history of the United States. The physical effects of the storm were disastrous throughout much of coastal Louisiana, Mississippi, and Alabama and, in fact, life continues in a state of disruption throughout the region nearly a year later. Moreover, the event exacerbated various social problems and economic trends that were notable prior to August 2005. In the case of marine fisheries, the storm accelerated a regional trend of significant decline in participation and production that had begun in 2001. For large vessel operators especially, this was a period of significant challenges. Surging imports of shrimp had led to diminishing market prices for domestic products and fuel costs had increased dramatically over previous years. Moreover, coastal development and gentrification were in some cases already reducing the availability of waterfront property for use by the industry. Thus, when the winds and storm surge from Hurricane Katrina ruined much of the commercial fishing fleet and infrastructure in the region, many participants were already on the brink of departure from the industry.

While we in no way intend to trivialize the destruction and loss incurred by Hurricane Rita (September 24, 2005), our emphasis in this report is on the effects of Katrina (August 29, 2005), the first of the two devastating storms to hit the region within a period of three weeks. Therefore, while Rita served to magnify and aggravate impacts in an already compromised region, most of the consequences we will be addressing here resulted from Katrina in the states of Louisiana, Mississippi, and Alabama. The following section summarizes the key impacts of this storm on the commercial and recreational fisheries in each state.

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[1] NOAA Fisheries community research is an ongoing project being conducted around the nation in order to identify fishing communities per the stipulations in the Magnuson-Stevens Fishery Conservation and Management Act and National Standard 8.

LOUISIANA

Synopsis of Key Impacts on Louisiana State Fisheries

- Thousands of commercial vessels lost and damaged throughout coastal Louisiana;
- Commercial landing revenues in 2005 (Sept-Dec) declined 32 percent from the same period in 2004;
- Losses to Louisiana's seafood industry are estimated at $1.3 billion (annual total retail value);
- ~ 40,000 recreational vessels throughout the state were lost;
- Loss of revenue to the recreational fishing industry in the study parishes is estimated at $145 million;
- Estimated losses to the charter boat industry include $13 million in lost trips and $8 million for lost and damaged charter vessels;
- Damages to the farmed alligator industry are estimated at $4 million;
- Lack of ice, diminished processing and cold-storage capacity, infrastructure damage, debris in the water, fuel costs, and scarcity of marine supplies and services have severely constrained recovery efforts;
- Accelerated labor shortages have also significantly constrained production capacity: processors in the affected parishes have lost between 35 and 40 percent of their labor force.

MISSISSIPPI

Synopsis of Key Impacts on Mississippi State Fisheries

- All seafood dealerships along the Mississippi Gulf Coast were seriously damaged or destroyed, including six of Biloxi's largest seafood processing plants;
- Damages to seafood processing plants and seafood dealers are estimated at $101 million;
- 90 percent of primary oyster reefs were destroyed;
- Seafood processors and retailers rely on out-of-state product;
- Commercial landings revenues in 2005 (Sept.- Dec.) represent a 79 percent decline in revenue from the same period in 2004;
- Hurricane-related impacts to Mississippi's marine fisheries are estimated at nearly $484 million;
- Damages to the resident commercial fishing fleet are estimated at $35 million. One hundred percent of these economic losses occurred in Hancock, Harrison, and Jackson Counties;
- Within the study counties of Hancock, Harrison, and Jackson alone, 87 percent of commercial vessels were damaged.
- Estimated economic impacts to the recreational fleet amounted to $160 million;
- 74 charter boats were damaged/destroyed; damages/losses amount to $2 million;
- Charter vessel operators lost nearly 5,000 trips in 2005 valued at $7.5 million;
- So far, aid from FEMA and the SBA for charter boat operators has not materialized;
- The majority of Mississippi Gulf Coast marinas, harbors, roads, and bridges were seriously damaged or destroyed; the remaining infrastructure is insufficient to support tourism. Accommodations are particularly scarce;
- Fuel, ice, and other marine-based supplies are in short supply;
- Significant labor shortages slow recovery efforts; dependency upon immigrant labor sharply increases.

ALABAMA

Synopsis of Key Impacts on Alabama State Fisheries

- Many commercial fishing vessels were beached, damaged, or destroyed; Katrina destroyed 60 percent of the commercial shrimp boats in Bayou La Batre;
- Commercial landings revenues in 2005 (Sept.- Dec.) represent a 20 percent decline in revenue from the same period in 2004;
- While only 20 percent of state oyster beds were damaged, the oyster fishery continues to depend on harvests from oyster beds in neighboring waters, particularly Mobile Bay and the Mississippi Sound;
- The few operational industrial processors are understaffed and cannot handle the high volumes of product coming to them from all over the Gulf Coast;
- Based on loss of product and revenue, estimated losses for seafood processing facilities in Mobile and Bon Secour total $23 million;
- Hurricane Katrina damaged/destroyed 24 charter boats in Alabama. Total damages/losses amount to $436 thousand;
- Although Alabama's charter fleet remained mostly intact, nearly 84 percent of charter boat operators received trip cancellations in the months following the storm; these vessel operators lost over 5 thousand trips valued at $5.3 million;
- Total projected losses to 133 Alabama Charter Boats = $20 million;
- Fuel costs and historically low shrimp prices have been the key factors in keeping Bayou La Batre's remaining commercial vessel fleet moored through at least May 2006;
- Escalating labor shortages contribute to poor post-Katrina production rates.

Challenges to Recovery for the Commercial and Recreational Fishing Industries in Hurricane Katrina Impacted Gulf Coast States.

In the context of historical trends within the Gulf States' commercial and recreational fishing industry, Hurricane Katrina accelerated but did not introduce the current challenges to recovery. Rather, this devastating storm brought into sharp relief the struggles commercial shrimpers are having, such as rising costs and shrinking revenues, labor shortages, and loss of marine-based infrastructure and services due to coastal development and erosion. The future of the industry depends on how these economic and social concerns are addressed. While the nuances of these problems are particular to each Gulf state, the accelerated trends noted in this section are overarching and largely shared by commercial fishery participants across the Gulf.

- ***Declining Shrimp Prices*** – Despite an abundance of shrimp in the post-Katrina waters, prohibitively low shrimp prices, combined with increasing overhead costs, are discouraging some shrimpers from participating in the industry.
- ***Escalating Fuel Costs*** – Rising fuel prices, in concert with declining shrimp prices, make breaking-even exceedingly difficult. In recent years, operating costs are commonly said to surpass revenues.
- ***Coastal Erosion –*** Accelerated loss of coastal marshland and damage to wetlands has disrupted shellfish grounds and nursery grounds for juvenile finfish; intensified land conservation efforts may also disrupt long-standing fishing practices.
- ***Coastal Gentrification –*** Coastal development is proceeding at an unprecedented pace as developers replace destroyed public fishing marinas, harbors, and other vital fishing infrastructure and services with high rise condominiums and private marinas. Lack of infrastructure and affordable housing is pushing many fishery participants further inland and/or out of the industry altogether.
- ***Accelerated Shift from Commercial to Recreational Fishing Activities -*** Recreational fishing has become increasingly significant in economic terms throughout much of the Gulf of Mexico; the hurricanes have magnified and accelerated this shift from reliance on commercial fishing activities to recreational, leisure, and tourism-related activities and services.
- ***Labor Shortages -*** With many residents displaced, preoccupied with individual recovery concerns, or taking temporary, but lucrative, jobs in construction, unemployment levels have increased in all three Katrina-ravaged states—despite the high number of employers looking to hire. Seafood processors, fishing crews, restaurants, and retailers are particularly understaffed.
- ***Rising Insurance costs -*** Rising insurance costs over the last several years have disproportionately increased commercial fishery participants' operational costs. Balanced against rising fuel prices and diminishing returns, insurance is increasingly viewed as an unaffordable luxury; the commercial fishing industry in Louisiana, Mississippi, and Alabama is presently underinsured.
- ***Overcapitalization –*** Overcapitalization has largely driven the commercial fishing industry in the Gulf Coast states for the last 50 years and contributed to its decline. Many fishermen who took advantage of attractive loan packages in the 1990s now find themselves strapped as they struggle to make both boat and home payments in the uncertain and financially challenging post-Katrina environment.
- ***Inadequate Financial Assistance –*** Fishery participants need government aid programs to help them recover from Katrina's destructive forces. Such aid has not sufficiently materialized. Although funds have been allocated to aid in the recovery of oyster and shrimp grounds, the extent of aid to be expended on reconstruction of marine infrastructure and direct assistance to fishery participants remains unclear.
- ***Flagging morale -*** The lengthy and uncertain recovery process is exacting an emotional and psychological toll on many fishery participants.

Hurricane Katrina has exacerbated preexisting disincentives for participating in the commercial fishing industry in the Gulf of Mexico. Some participants have already left the industry as a result of the storms and are unlikely to return, and some fishing-oriented villages are struggling to rebuild but are not guaranteed to recover. The likely manner and extent of future participation in the commercial fishing industry is uncertain.

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A. Hurricane Katrina: Gulf States Fisheries Impact Report

I. INTRODUCTION

The following pages document the impacts of Hurricane Katrina on 38 fishing-involved communities in affected areas of Alabama, Mississippi, and Louisiana. The report was prepared for the Southeast Regional Office of NOAA Fisheries as an extension of the agency's fishing community profiling program.[1] The work was undertaken by Impact Assessment, Inc. (IAI), a research firm specializing in maritime social science along the coastal zone of the U.S. IAI researchers were deployed to investigate the effects of the hurricane soon after Katrina made landfall, and continued to document and monitor conditions during the autumn and winter months of 2005, and during the spring and early summer months of 2006. This report describes the nature and findings of the research through July 2006, with clear acknowledgement that the effects of the storm continue to unfold as fishery participants throughout the region adapt to radically altered conditions in a perennially challenging industry.

Background. The landfall of Hurricane Katrina in August of 2005 resulted in one of the worst natural disasters in the history of the United States. The physical effects of the storm were disastrous throughout much of coastal Louisiana, Mississippi, and Alabama, and in fact life continues in a state of disruption throughout the region nearly a year later. Moreover, the event exacerbated various social problems and economic trends that were notable prior to August 2005. In the case of marine fisheries, the storm accelerated a regional trend of significant decline in participation and production that had begun in 2001. For large vessel operators especially, this was a period of significant challenges. Surging imports of shrimp had led to diminishing market prices for domestic products; fuel costs had increased dramatically over previous years; and shrimp were not superabundant - especially between 2001 and 2002. Moreover, coastal development and gentrification were in some cases already reducing the availability of waterfront property for use by the industry. Thus, when the winds and storm surge from Hurricane Katrina ruined much of the commercial fishing fleet and infrastructure in the region, thereby opening the coast to further development, many participants were already on the brink of departure from the industry.

Understanding of this context is critical to a valid assessment of Katrina's effects. The following pages describe that context, with special focus on the status of commercial fisheries in coastal Louisiana, Mississippi, and Alabama prior to and following landfall. Based on that description and on a wide range of pertinent data, we also provide a preliminary assessment of the effects of the storm on these once highly productive forms of enterprise and activity. Given the massive extent and broad geographic scope of Katrina's effects, descriptive emphasis is necessarily applied to those parishes and counties in which commercial fisheries were most clearly and severely affected. Pre-existing conditions and the affects of the storm on the region's charter and recreational fisheries are also documented.

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[1] NOAA Fisheries community research has been and is being conducted around the nation in order to identify fishing communities per stipulations in the Magnuson-Stevens Fishery Conservation and Management Act and National Standard 8.

Additionally, while we in no way intend to trivialize the destruction and loss incurred by Rita (September 24, 2005), our emphasis in this report is on the effects of Katrina (August 29, 2005), the first of the two devastating storms to hit the region within a period of three weeks. Therefore, while Rita served to magnify and aggravate impacts in an already compromised region, in particular the western parts of Louisiana (primarily Calcasieu, Cameron, and Vermilion Parishes) and the northeastern part of Texas, most of the consequences we will be addressing here resulted from Katrina. Hence, in an attempt to minimize confusion, we refer to only Hurricane Katrina when describing and discussing the impacts of the storm on the Gulf Coast fishing communities in the states of Louisiana, Mississippi, and Alabama.

We begin by describing the methodological approach used to conduct the research across the affected region. This approach included a range of primary and secondary source methods appropriate to the topical issues and field situations at hand. Next, we discuss regional geophysical attributes and economic trends that are most clearly relevant to description and assessment of the fishing industries in the current context. This is followed by an overview description of the pre-Katrina status of the fishing industries in each of the three affected states. This is then followed by descriptive analysis of the preliminary effects of the storm on the region's fishery participants and infrastructure and services and on the economic and social configuration of the fisheries in general. The report concludes with a discussion of the many challenges confronting commercial and recreational fishing industries in the region as the participants seek to recover from a storm that was unprecedented in geographic scope and combined effects of wind and storm surge.

II. RESEARCH METHODS

Goal and Objectives. The research described in this report was conducted to assist NOAA Fisheries in its efforts to assess the social and economic impacts of Hurricane Katrina as these relate to the conduct of marine fisheries in the affected region. A series of interrelated objectives were developed to meet this overarching goal. These involved: (1) initial characterization of the effects of the storm on fishing-related businesses and infrastructure in communities directly affected by the storm, (2) highly-focused and in-depth examination of the immediate and short-term social and economic impacts of the event, and (3) documentation of the major financial, material, technical, and logistical impediments to recovery, and analysis of the prospects for recovery.

Study Communities. IAI focused its efforts in 38 study communities in 10 parishes or counties across the affected region. The research team examined 26 communities in Louisiana, nine in Mississippi, and three in Alabama (see Table 1).

Table 1. Study Communities in Coastal Louisiana, Mississippi, and Alabama

State	County/Parish	Study Communities
Alabama	Mobile	Mobile, Bayou La Batre
Alabama	Baldwin	Bon Secour
Mississippi	Jackson	Moss Point, Pascagoula
Mississippi	Harrison	Biloxi, Gulfport, D'Iberville, Long Beach, Pass Christian
Mississippi	Hancock	Bay St. Louis, Waveland
Louisiana	St. Bernard	Chalmette, Delacroix, Hopedale, Yscloskey
Louisiana	Plaquemines	Boothville, Buras, Empire, Point a la Hache, Port Sulphur, Venice
Louisiana	Jefferson	Barataria, Grand Isle, Gretna, Lafitte, Westwego
Louisiana	Lafourche	Cut-Off, Galliano, Golden Meadow, Larose, Leeville, Port Fourchon
Louisiana	Terrebonne	Chauvin, Cocodrie, Dulac, Houma, Theriot

Selection criteria for the study communities included the following: (a) historic and ongoing community involvement in marine fisheries, (b) proximity to the storm surge and associated damage propagated by Katrina[2], (c) physical accessibility and/or the availability of key informants, and (d) the health and safety of our research team. Selection of the study communities was also informed by an earlier research program conducted for NOAA Fisheries by IAI. The research was designed to identify communities that are differently involved in fishing-related industries across the region. That effort resulted in a four-volume, 2,000 page report describing social, economic, and demographic attributes of 335 towns and cities across the Gulf of Mexico in the states of Texas, Louisiana, Mississippi, Alabama, and Florida (Impact Assessment, Inc. 2005a, 2005b, and 2005c). For this present study, the issues of physical access, the availability of key informants, and health and safety were particularly limiting in some cases and resulted in the exclusion of a few potential study communities. For example, New Orleans was excluded because the magnitude of devastation in this city rendered fieldwork both dangerous and impractical. Additionally, our selection criteria eliminated New Orleans as a potential study community because it is only a "tangentially-involved" fishing community; that is it is a

> place in which fishing clearly plays an ancillary role to other forms of economic and social activity. While there may be small sub-groups of residents who are active in fishing and related industry, the scope of those activities are minor relative to the local social and economic mainstream. The activities of residents of sub-communities in the greater New Orleans area, such as Bucktown, Lake Catherine, South End, Little Woods,

[2] "Damaged" areas are those identified by FEMA and the Dartmouth Flood Observatory as flooded or with storm damage ranging from moderate to catastrophic.

> and Venetian Isles, are highly focused on fishing, but that enterprise is insignificant in scale when weighed against the overall economy and social activities of New Orleans in total (IAI 2005: 609).

Of the 335 towns and cities described in the 2005 research effort, 150 were located in the three states most directly impacted by Hurricane Katrina: Louisiana, Mississippi, and Alabama. Given practical constraints to completing the current project in both a timely fashion and within financial bounds, we focused on coastal communities located in parishes and counties where marine-related activities and/or infrastructure experienced serious disruption (limiting our universe of potential study communities to 94) *and* had received a designation as a primarily- or secondarily-involved fishing community in 2005[3] (further streamlining our universe of potential study communities to 58). Then, relying on breaking news reports and on-the-ground discussions, we eliminated the following cases: 10 communities because their fishing-related industries reportedly were not significantly disrupted by Hurricane Katrina, 6 damaged communities because of difficulties physically accessing the location and/or a lack of access to key informants, 3 because they could be considered as part of a larger metro region or in tandem with a neighboring damaged community, and 1 because of limited time and fiscal resources. Additionally, based on our discussions with key informants and our on-the-ground analysis, we decided to add four "tangentially-involved" communities because of (1) the significant role they played in supporting the marine-related economies of neighboring communities, and (2) the significant disruption to the fishing-related industries they support as a result of Hurricane Katrina. In the final analysis, we selected 19 primarily-involved fishing communities, 14 secondarily-involved fishing communities, and 5 tangentially-involved fishing communities (see Appendix A).

Per contract requirements, field staff conducted in-depth ethnographic research in a sufficient number and type of communities as needed to ensure full representation of the variable effects of the storm. Field staff was ultimately situated in satellite offices in safe and strategic locations from which they were able to conduct ongoing research forays into adjacent towns, cities, and rural areas. These "home base" communities were Bayou La Batre in Alabama, Biloxi and Pass Christian in Mississippi, and Venice and Grand Isle in Louisiana.

Data Collection Rationale and Approach. The project methodology was configured based on NOAA Fisheries' need for assessment of changes in the conduct of marine fisheries subsequent to the landfall of Hurricane Katrina. Given the aforementioned trend of ongoing challenges and decline in participation and production in many of the area's commercial fisheries, this required some mechanism for discerning hurricane effects from pre-existing conditions in fishing, offloading, processing, distribution, and wholesale and retail sales of

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[3] As defined during the IAI research effort (2005), "primarily-involved" fishing communities are cities/towns where there remains an observable collective focus on fishing and its associated industries, even though the economies and primary foci of social interaction in such places may be mixed to greater and lesser degrees. In "secondarily-involved" communities the significance of commercial fishing and associated industry is important, but, demonstrably, secondary to other economic emphases. Included in this type are places in which sub-groups of residents are very active in fishing and related industry, but hidden in economic scale and focus of collective social interaction by those activities of the surrounding population that are not related to fishing (609: 2005).

seafood. We therefore set out to collect valid information about the conduct of marine fisheries both prior to and following the storm. This would enable a natural experimental pre-test post-test analysis, with the storm as the (unfortunate) agent of change. The challenges inherent in this classic impact assessment design should be noted at the outset in conjunction with our methodological solutions.

First, although it has long been known that a storm of the magnitude of Katrina could ultimately affect the region, its eventual timing, movement, and full scope of effects were quite obviously unknowable. Thus, information most useful for comprehensive social and economic assessment was not immediately available for all affected communities of interest. This basic problem was overcome within the practical limitations of available time and resources through retrospective collection of pertinent primary source data, and through compilation and use of existing data such as those previously collected by IAI in the communities and those maintained by local, county/parish, state, and federal agencies across the region. Forethought, ongoing interaction with SERO staff (the NMFS Southeast Regional Office), and persistence in what were often highly challenging field settings ultimately enabled collection and compilation of necessary and sufficient data for describing and assessing the effects of the hurricane.

Second, as noted above, marine fisheries and communities in the storm-affected region had already undergone or were undergoing (often rapid) change by the time Katrina made landfall. It was therefore necessary that close attention be paid to collection of data that would enable analysis of pertinent pre-existing trends in the fisheries and communities, even those involving change into the summer months of 2005. This also was accomplished through retrospective collection of data, with especial attention to identification and compilation of data indicative of the changes occurring in the years and months prior to the hurricane, and data descriptive of the larger social and economic context of those changes.

Third, the hurricane led to a range of effects which varied by community per pre-existing conditions and relative proximity to wind and storm surge. The problem of sub-regional availability was addressed by working in communities that would enable analysts to infer the nature of changes prior to and following the hurricane across the larger region of interest.

Finally, it was clear from the start that the extensive damage and number of displaced residents in the study communities presented unique challenges to fieldwork and data collection. This challenge was addressed through the flexibility and persistence of the field team. That team often found themselves working with people whose homes were damaged or demolished, whose jobs had been deferred or lost, and whose lives had been fundamentally disrupted. Data collection procedures were thus necessarily adaptive, and researchers quickly became adept and flexible in very challenging circumstances. As such, we were able to consistently acquire the data needed for effective analysis of the effects of the hurricane vis-à-vis other, ongoing sources of change in the region.

Field Teams. Field research for the Hurricane Katrina Impact Study began in the days immediately following Katrina's landfall on August 23, 2005, in Houston and along Gulf of Mexico between Louisiana and Alabama. Following NOAA project authorization, the IAI Principal Investigator engaged the assistance of the University of West Florida Public History

Graduate Program under the direction of Dr. Patrick K. Moore. This decision was based on recently completed collaborative projects undertaken under the direction of IAI for both the Minerals Management Service (MMS) and the National Oceanic and Atmospheric Administration (NOAA). These graduate students were recruited on the basis of their specialized local knowledge, and their expertise and training in oral history, community history assessment, and field experience.

Field assignments were based upon the experience and training status of each candidate, their desire (and willingness) to participate in a complex and potentially dangerous environment, and their abilities to adapt to changing research protocols and conditions. Project development and training initially occurred in late August, 2005 in Pensacola, Florida under the direction of John Petterson, Patrick Moore, Ed Glazier, Pamela Godde, and Laura Stanley of the IAI professional team. Training and project development included establishing research protocols for data acquisition and transmission; developing methods for locating and identifying pertinent subjects, often displaced by the storm and without access to electronic communications; establishing access procedures with local, state, and federal law enforcement and agencies to enter restricted roads, coastal areas, and facilities; and addressing issues associated with ethical concerns, confidentiality, and crisis-management techniques. Arriving in the field, often the first "official" contact with anybody outside the immediate community, field workers found themselves not only collecting data, but providing basic information on conditions and support services for individuals isolated without power, water, gasoline, or operational communications resources. Because of these circumstances, team meetings were often held several times a week, sometimes multiple times a day, to disseminate information on changing conditions and to redirect and refocus the research protocols in response to the evolving information associated with the afflicted disaster areas (see Appendix B).

Following intensive fieldwork, compilation, review, and analysis of incoming data led to development of a preliminary impact report in January 2006. The draft report served as a basis for configuring the next phase of fieldwork, and for further refinement of the research protocols. A special-communities field visit was arranged for the purposes of conducting interviews with Vietnamese-speaking shrimp harvesters in Bayou La Batre, Alabama, Biloxi, Mississippi, and in St. Bernard and Plaquemines Parishes in Louisiana. This was made possible through the efforts of a NOAA Fisheries staff member who introduced IAI to a language translator with extensive knowledge of the fleets of interest. A range of additional interviews and ethnographic exercises were also conducted at this time. Similar work was conducted throughout the successive stages of fieldwork in the region.

Primary Source Data Collection and Sampling Methods. Much of the primary source data were obtained through formal and informal interview methods, and through observation while in the study communities. This primary source data was critical in establishing the pre-Katrina presence and post-Katrina operational capacity of marine-related infrastructure and services within the study communities, as well as the ways in which fishery participants adapted to the significant disruption to their industry activities. During initial field site visits, study teams engaged willing participants in informal, open-ended interviews. A snowball or network sampling technique was subsequently used to identify respondents knowledgeable of factors and issues pertinent for purposes of description and assessment. Once rapport was developed with

key informants, additional interviews were arranged and conducted at their convenience. Research participants included persons in the harvesting, processing, and distribution sectors of the region's commercial fisheries, persons involved in the recreational fishing industry, government officials, and local residents not directly involved in the fishing industry. Over 615 interviews were conducted in the affected regions, including 150 interviews with captains and crew in the harvesting sector (see Appendix C).

Secondary Source Data Collection and Analysis. As part of our survey of hurricane related damages, we constructed a database that would allow comparison of the status of marine-related infrastructure and services in each study community prior to and following the hurricane. So as to create the most complete and accurate database possible, we relied on four cross-validating methods of data collection: (1) interviews with knowledgeable residents, (2) public and private information sources such as phone directories, waterfront planning documents, and information from chambers of commerce, (3) previous research conducted by IAI, and (4) field observation and attendance at local meetings and other relevant venues where recovery and related issues were discussed.

Our work with government agencies also yielded valuable archival data. Representatives in federal agencies such as the Federal Emergency Management Agency (FEMA) and the U.S. Coast Guard (USCG), and in state agencies such as the Mississippi Department of Marine Resources (MDMR) and Louisiana Department of Wildlife and Fisheries (LDWF), provided critically important secondary source data regarding, for example, trends in the number of licensed vessels, the location and number of post-hurricane salvaged vessels, and processor contact information. Additional secondary data were compiled from official documentation of federal hearings, various published reports, historical documents, and recent newspaper articles. Finally, we gathered extensive data from the U.S. Census Bureau and from a private data source regarding fishing-related businesses in the area.

Confidentiality. Efforts to protect the anonymity of respondents and the confidentiality of the information they so graciously provided were enacted throughout the course of the project. Certain interviews are paraphrased in this report, but names are not provided and such information is presented only where respondents signed consent forms authorizing IAI to judiciously and confidentially include their responses.

Time Frame. The fieldwork conducted for this research occurred in four stages over the course of the nine months following landfall of the hurricane. These were: September to December 2005, January through February 2006, March 2006, and April through May 2006. A series of follow-up interviews were conducted by telephone during June 2006 (see Table 2 below).

Table 2: Time Frame for Conducting Field Work

Stage	Nature of work	Location of Teams
Fall 2005	Document primary impacts of storm and potential secondary impacts; storm responses and reasons; locate re-distribution patterns within the support sector of industry and consequent shifts in social and economic networks.	Three teams located in each of the three Gulf states. Site visits to all study communities. Observation focused in Bayou La Batre, Biloxi, and Grand Isle.
Winter 2005-2006	Document primary and secondary impacts of storm; study of inter- and intra-governmental relations and issues concerning post-disaster recovery; interview Vietnamese-speaking communities in three states; interview English-speaking informants with attention to economic, social, and political impacts and concomitant coping strategies.	Visits to all study communities with concentrated focus in Bayou La Batre and Biloxi, and Plaquemines and St. Bernard Parishes in Louisiana.
Early Spring 2006	Document secondary and tertiary impacts of storm; monitor impacts.	Visits to all study communities; Extended stays in Bayou La Batre, Biloxi, and Plaquemines Parish
Mid-Late Spring to May 2006	Monitor changes associated with start of shrimp season; conduct ongoing monitoring across region.	Visits to all study communities with the exception of Grand Isle, and those in Terrebonne Parish where contact was made by phone.

Challenges in the Field. As might be expected given the nature and extent of damage resulting from the hurricane, field staff encountered numerous challenges during the various stages of data collection. These included the basic difficulty of navigating between communities using road maps that had been rendered obsolete by the hurricane and along roads and bridges that were blocked by debris or destroyed by the forces of water and wind. Staff also encountered communication problems resulting from power outages and downed phone lines, and continually dealt with the challenge of maintaining contact with informants who had no working telephone, computer, or physical address.

Establishing and maintaining contact with displaced fishery participants was particularly challenging. Many fishery participants had lost both homes and vessels and thus were preoccupied with recovery. This involved boat salvage and repair efforts, filing of insurance claims, contacting various government agencies for loans, temporary assistance, and emergency disaster funds, and so on. As fishermen began returning to their homes and harbors, and cell towers and power lines were slowly re-established, contacting them became less problematic. Some prospective informants remained too preoccupied with recovery to engage in this research, and others were reluctant to provide certain kinds of information. For example, some oil and gas industry representatives were reluctant to provide information about the effects of the hurricane on offshore facilities, and despite assurances of confidentiality and adherence to the rule of three,

and some persons in the fishing industry were reluctant to release information about production, employment, and market conditions. This was in fact not atypical of other research conducted in the region. Some non-response is anticipated in all social research, and despite the added exigencies of hurricane response, we generally encountered broad understanding and acceptance of our efforts in the field.

Of interest from a linguistic perspective, there were notable differences in use of fishing industry terminology across the study areas. For example, residents in one community termed facilities that offload and pack seafood from vessels as "sheds," while others referred to these as "off-loaders". Terms for ice facilities, shrimp peelers, and various other infrastructure and processes also varied. While such differences in terminology may seem unimportant to outside observers, certain terms often connote specific meaning for industry insiders. This required that field staff remain attentive to variation in usage within and between sectors, communities, and sub-regions, and collaborate on meaning during the analytical phase of the research. However, to improve inter-interviewer communication and data collection, IAI also attempted to standardize terminology use among field staff, wherever possible (see Appendix D).

Finally, the highly seasonal nature of the industry affected our ability to capture an absolutely accurate accounting of some marine-based services. For example, in some cases our enumeration work may have missed boats that were at sea during the field visits, resulting in lower counts than might otherwise be typical. Similarly, the number of vessels included in post-Katrina counts may reflect the fact that some captains left or arrived in anticipation of the storm, resulting in higher or lower counts that might otherwise be normal, as the case may be. Problems associated with enumeration of vessels and fishery participants may be solved over time through effective monitoring and understanding of long-term trends in the fisheries and communities of interest. We have made solid inroads in this regard.

III. INDUSTRY TRENDS PRECEDING HURRICANE KATRINA

The commercial and recreational fisheries of Louisiana, Mississippi, and Alabama constitute important components of each state's economy. Revenue is generated both directly and indirectly through a variety of fisheries and sectors. Table 3 below is provided as one indication of the importance of marine fisheries in the region. It depicts total revenue generated through commercial landings for each of the Gulf States in 2004.

Table 3. Gulf of Mexico Commercial Fishing Revenue: 2004

Species	Revenue by State or Region in Dollars				
	Alabama	Louisiana	Mississippi	Florida Gulf	Texas
Oyster	2,120,392	34,893,978	6,073,242	2,883,422	14,954,140
Shrimp	29,196,628	139,176,331	26,524,987	34,032,690	137,673,711
Finfish	5,718,251	100,995,026	11,192,325	110,934,000	13,580,377
Total	37,035,271	275,065,335	43,790,554	147,850,112	166,208,228
<Total: 669,949,500>					

Source: NMFS 2005a.

Harvest, processing, and distribution of seafood are critically important to communities affected by Hurricane Katrina, and seafood products produced in the region are important to the nation as a whole. For instance, in 2004, Louisiana led the nation in production of blue crab with 26 percent of all landings, the Gulf region led in production of oysters with 65 percent of all landings, and the Gulf region led in domestic shrimp production with 83 percent of all landings, with most landings occurring in Louisiana (NMFS 2005c: xii-xiii).

In recent years, however, several economic, socio-demographic, and geophysical factors have threatened these important fisheries. These include: (1) the continuing downward spiral of market values, especially for domestically-landed shrimp, (2) escalating fuel and other operational costs, and (3) changing conditions and opportunities resulting from coastal development and shoreline erosion in the region. While these factors and trends predate the 2005 hurricane season, Hurricane Katrina clearly accelerated problematic change in the region, and furthered the challenges faced by participants in the region's commercial fishing industry.

The Shrimp Market. The price of domestically-caught seafood, most notably shrimp, has plummeted in recent years (Maitzels 1992; Marks 2005; Robbins 2003). Decline in value has accelerated since 2001, with prices falling markedly lower than at any point since 1950. The situation undoubtedly relates to trends in global commodity transactions, and the effects of farm-raised shrimp imports entering U.S. markets at the beginning of the 21st century. Indicative of the dramatic downward trend, Marks (2005) describes the trajectory of shrimp prices in the Gulf of Mexico between 1980 and 2003:

> In 1980, average nominal Gulf of Mexico shrimp prices were $1.63 per pound, and $1.43 in 2003; however, factoring in CPI adjustments (1982-84=100), the price of shrimp was $1.98 in 1980 but only $0.78 in 2003, constituting a 60 percent decline. Shrimpers were in effect working for less than half the money they were almost a quarter century earlier. The average price of Gulf of Mexico shrimp in 2003 was (in CPI adjusted terms) $0.78, while in 1950, the earliest year for which NMFS maintains public records, it was $0.91, a decline of 14 percent. The average CPI adjusted shrimp price in 2003 was $0.58, and in 1950 it was $0.87, a decline of 33 percent.

While some slight improvement in the situation occurred between 2003 and 2005, this appears largely countered by concurrent increases in fuels costs, as depicted in Figure 1 below.

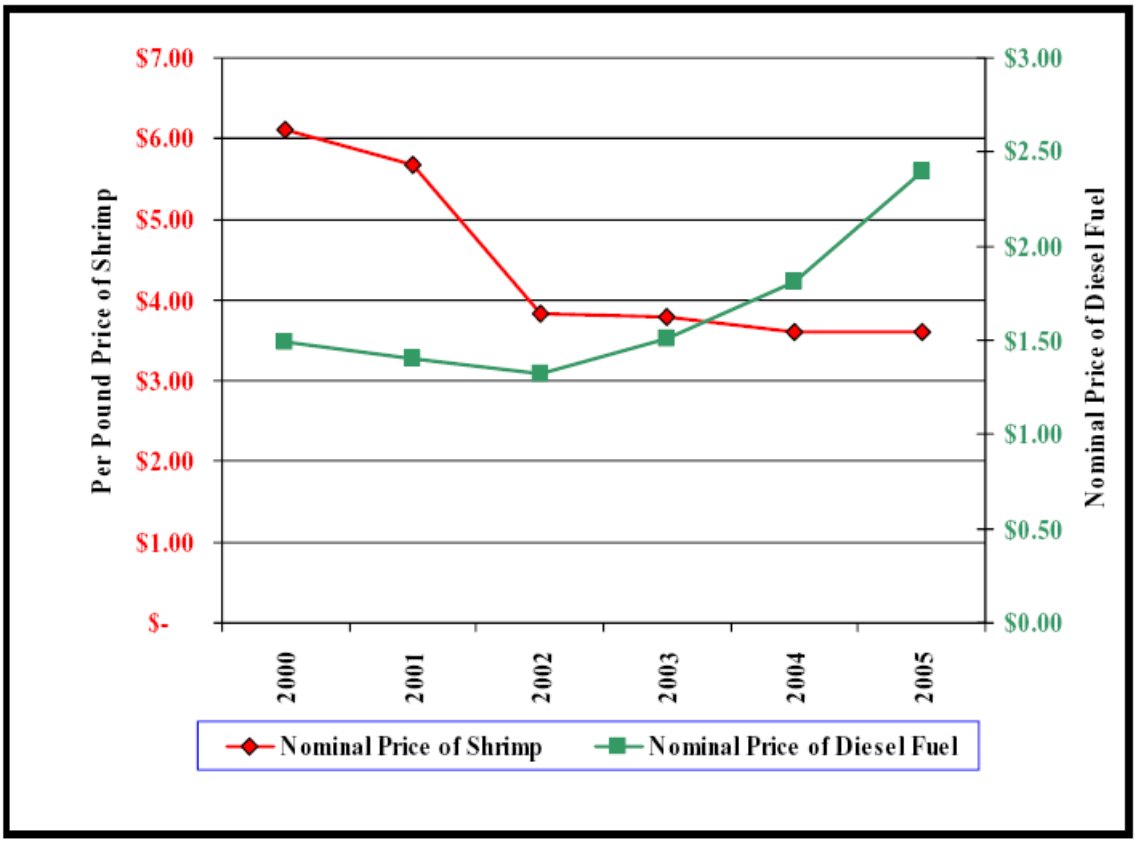


Figure 1. Trends in Average Price of U.S. Diesel Fuel vs. Nominal Price Nominal Price (dollars per pound, Penaeid species only, headless, July) for the Northern Gulf (Alabama, Louisiana, & Mississippi).
Source: U.S. Department of Energy 2005; NMFS 2005d.

Travis and Griffin (2004) report that economic conditions deteriorated dramatically for the entire Gulf shrimp fleet toward the end of 2001, and that the situation related to the combined effects of the faltering macroeconomic context post-9/11, increasing fuel prices, problems with abundance of shrimp, and surging shrimp imports which depressed domestic prices by as much as 28 percent. Haby et al. (2003) assert that the primary factor affecting the trawl fleet was flooding of the domestic market with large farm-raised shrimp, enabled by favorable tariff and exchange rate conditions. The domestic share of the shrimp supply had decreased from around 45 percent in 1980 to around 15 percent in 2001. Imports have truly surged in recent years, with a 17.5 percent increase reported for 2003. As noted in Table 4 below, many countries are now providing shrimp to domestic markets.

Table 4. Shrimp Imports, by Major Countries of Origin, 2003 and 2004

Country	2003 Volume (thousand pounds)	2004 Volume (thousand pounds)	Percent of Total Imports in 2004
Thailand	293,697	291,318	25
China	178,597	145,451	13
Indonesia	47,758	103,541	9
India	100,241	90,397	8
Vietnam	126,496	81,788	7
Ecuador	75,020	82,692	7
Mexico	56,204	63,909	6
Total (all countries)	1,112,207	1,141,138	100

Source: NMFS 2005c

Considered in terms of tonnage, shrimp imported to the United States increased steadily and dramatically between 1995 and 2004 (see Figure 2 below).

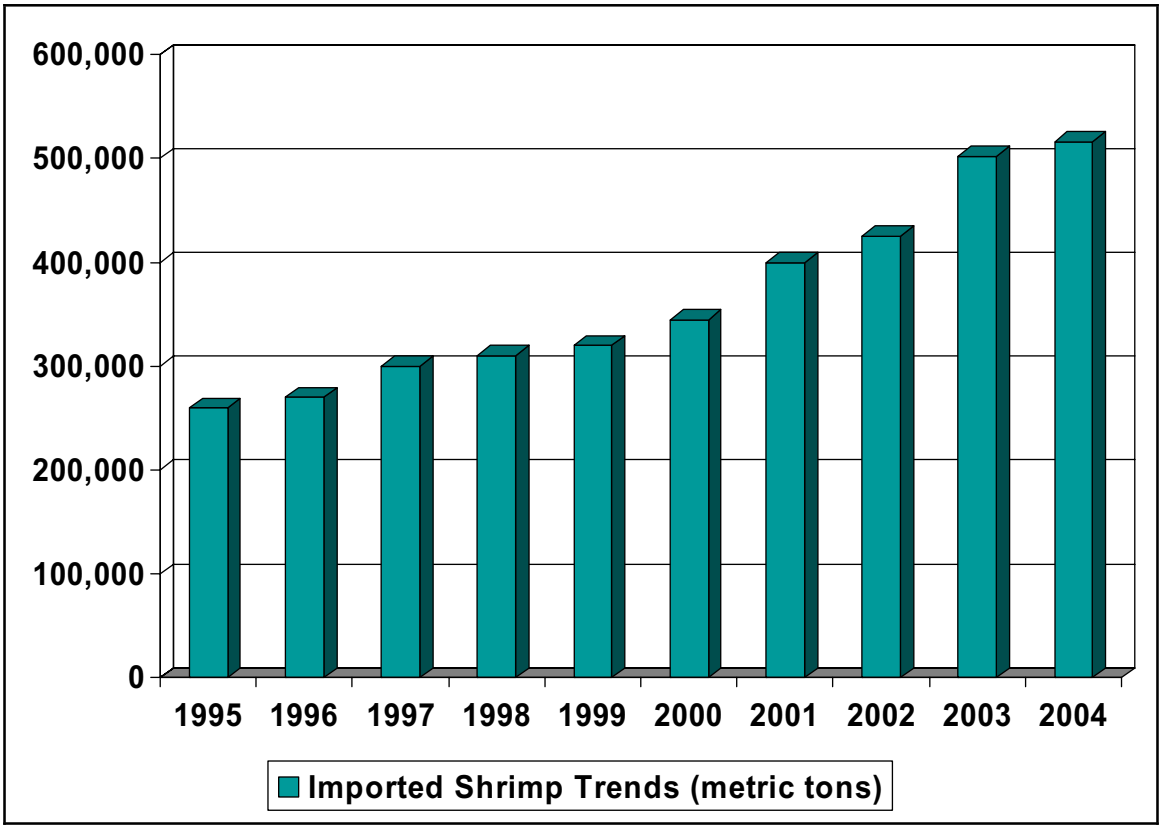


Figure 2: Shrimp Import Trends in the United States: 1995-2004.
Source: NMFS 2005d.

As foreign-caught shrimp sales continued to rise, increasing by 50 percent from 345,000 tons to 517,000 between 2000 and 2004, the total value of that shrimp actually declined by $100 million dollars, from $3.8 billion to $3.7 billion. As Marks points out, the per pound price of imported shrimp declined by 35 percent from $5.50 to $3.57 over this same period (2005).

Fuel Costs. The price of diesel fuel has increased over the last several decades as the commodity has shifted from a petroleum by-product to an important consumer good. Unlike the agriculture industry, which was able to diversify its energy inputs, the fishing industry continues to rely upon diesel fuel and therefore its remaining participants have had to adapt to associated increases in cost.

While the price of gasoline increased steadily during the latter half of the 20th century, diesel fuel prices accelerated rapidly between 1950 and 1970, and steadily between 1970 and 2005. According to long-term fishery participants working in the study region, the price of diesel fuel increased significantly in the Gulf of Mexico during the period 1955 to 1975, with prices rising from 3 cents to 53 cents per gallon over the period. According to the U.S. Department of Energy (USDOE 2005), the nationwide average price for marine diesel fuel increased by 34 percent between 1995 and 2000, from $1.11 to $1.49 per gallon. Following a brief drop in average prices in 2002 (to $1.32 a gallon), prices rebounded to $1.81 per gallon by 2004.

Coastal Development. The conversion of coastal space for development of homes, condominiums, and large casinos has increasingly displaced low-income fishery participants and waterfront fishing businesses. Diminished space at the waterfront is an important issue for commercial fishing interests across the region. Given that extensive coastal areas are used by the oil and natural gas industry in Louisiana, availability of high ground for fishing-related infrastructure and services is further limited in that state. The situation has led to escalation of the value of developable coastal properties across the region. In many cases, buyers build expensive homes, driving tax rates and the value of adjacent lands even higher. In Louisiana, this has historically occurred in the outlying New Orleans area as wealthy urbanites sought second homes along the coast. The trend is now occurring elsewhere, however, and currently there are four primary regions in Southeast Louisiana where coastal gentrification is taking place: South Plaquemines Parish (Venice); South Lafourche Parish (Port Fourchon); South Jefferson Parish (Grand Isle); and South Terrebonne Parish (Cocodrie).

Gentrification has also been occurring in Alabama's coastal Baldwin County. Condominium developments have been steadily increasing since 1995, primarily in the southeastern coastal communities of Orange Beach, Gulf Shores, and Bon Secour. Historically, this region has hosted a large charter fishing fleet. Charter guides initially benefited from the influx of new residents and second homeowners settling along the coast, but are ultimately being priced out of the area as developers purchase existing marinas and dock space and replace them with luxury housing.

Coastal Erosion. While coastal erosion has been occurring in each of the Gulf Coast states discussed in this report, it is a particularly pressing concern in Louisiana where the rate of erosion is unprecedented. Louisiana has lost approximately 19,000 square miles of coastal terrain since the 1930s. Coastal erosion in Louisiana accounts for the loss of 25 to 40 square

miles of land each year, and 80 percent of total coastal wetland erosion in the United States (Louisiana Coast 1993). Many argue that rapid erosion and associated saltwater intrusion is stressing various fisheries in the region.

Stakeholders articulate concerns with varying degrees of justification about many aspects of life along the Louisiana coast: commercial fishing and harvesting of furbearers and alligators; ecotourism and recreational hunting and fishing; endangered species; water quality; navigation corridors and port facilities; flooding and hurricane storm surges; and traditional ties to land and sea. According to Louisiana Vision 20/20 (2003), the total public use value of coastal lands and activities is estimated to exceed $37 billion by 2050.

Erosion has also been altering the Mississippi coastline. Even before Katrina, Hurricanes Camille (1969) and George (1998) accelerated the retreat of lands along the Mississippi shoreline (Meyer-Arendt 1991; Schmid 1999; Schmid and Yassin 1999).

IV. DEMOGRAPHIC OVERVIEW

The nature and extent of demographic changes following the 2005 hurricane season are still being assessed by agencies throughout the region. Storm-related out-migration was dramatic in several parishes and counties, and in the case of St. Bernard Parish in Louisiana, it was extreme. In other less severely impacted counties, such as Mobile and Baldwin Counties in Alabama, demographic change was not as remarkable and not clearly attributable to the effects of the hurricanes.

The U.S. Census Bureau released its "Special Population Estimates for Impacted Counties in the Gulf Coast Area" on January 1, 2006. While we rely, for the most part, on the accuracy of these Census estimates for the purpose of the present demographic impact overview, there are a number of important caveats to their use. First, and most importantly, the Census estimates could not assess the "nature" of residency reported. That is, while tens of thousands of individuals evacuated the Gulf Coast before and following the hurricane, tens of thousands more have subsequently been drawn into the area in search of the now plentiful employment and business opportunities associated with reconstruction and relief efforts. Many of the new "inhabitants" of New Orleans, and coastal Mississippi, for example, are temporary residents seeking employment, and a great many are of foreign nationality. We need to keep these two countervailing effects clearly in mind, particularly as impacts are monitored over time.

For purposes of clarity (and consistency) this overview reports on the basis of parishes or counties. In effect, each of the different parishes experienced the hurricane as a consequence of its geophysical setting (e.g., coastal, interior, insular, peninsular, riverside, or lakeside) in relation to the hurricane forces (e.g., overtopping or undermining of river, lake, or tidal levee protections; coastal, insular, or peninsular inundations; wind and rain; tornadoes) affecting that particular geography. This is of particular importance from the perspective of understanding the reports and data that have been collected and reported since the hurricane. For example, Orleans Parish (sometimes misidentified as "New Orleans Parish"), is geographically constrained, very

heavily populated, and contains the areas hardest hit by the post-hurricane flooding. In comparison, St. Bernard Parish, which extends from the urban outskirts of the City of New Orleans to well out into the Gulf, received a direct and massive blow from storm surge, a 10-20 foot overflow in some areas, and residual flooding in the wake of Katrina. Plaquemines Parish extends from the outskirts of New Orleans out along the Mississippi River to its terminus in the Gulf. The entire parish suffered a complete overflow of between 10 and 20 feet, destroying virtually every home, building, port and docking facility. Lafourche and Terrebonne Parishes experienced the direct storm surge impacts, flooding, and associated property, livestock, and infrastructure destruction over a broad, but relatively sparsely populated, area.

The third, and perhaps most important variable, concerns the social and economic characteristics of the affected areas. Simply stated, the social and economic baseline conditions of affected coastal areas were not equal. These social, economic, and demographic differences were well reflected in previous censuses, in community descriptions compiled just prior to the hurricane (IAI 2005a; IAI 2005b; IAI 2005c), and in many published reports. From the perspective of understanding the distribution and relative severity of the resulting human consequences of Hurricane Katrina, we must first identify the specific nature of the impacting agent (e.g., tornado, wind, storm surge, flooding), the precise geographic location of those effects, and, finally, the specific social vulnerabilities at that location.

While this report is not intended to quantify, or analyze in depth, the social vulnerabilities from which the human impacts of Hurricane Katrina arose, the following preliminary discussion and demographic analyses are needed in order to understand the general characteristics of Hurricane Katrina's impacts and their distribution.

General Characteristics. First, the physical consequences of Hurricane Katrina fell primarily on the Louisiana parishes of St. Bernard, Jefferson, Plaquemines, Lafourche, Terrebonne, St. Tammany, and Orleans (the latter two of which do not contain primarily- or secondarily-involved fishing communities and therefore are not a focus of this analysis). In Mississippi, the counties of Hancock, Harrison, and Jackson bore the brunt of the hurricane storm surge, flooding, and wind damage. Virtually all of the damage sustained from storm surge in Alabama centered on Mobile and Baldwin Counties.

Louisiana Synopsis. As reported in the U.S. Special Census, Orleans Parish lost an estimated 278,833 residents as a consequence of Hurricane Katrina, from 437,186 residents in June of 2005 to 158,353 residents in January 2006, a loss of nearly 64 percent. The loss of 278,833 residents represents a crushing impact on the City of New Orleans, the core community of Orleans Parish. In terms of relative severity, however, it was St. Bernard Parish that experienced the greatest relative demographic impact of the hurricane, losing nearly 95 percent of its population, or a total of 61,215 residents out of a total population of 64,576. Plaquemines Parish is reported to have lost 29 percent of its total permanent population, from 28,282 in July, 2005 to 20,164 in January 2006 (our field experience, including several visits since January, however, lead us to question this particular enumeration). Jefferson Parish experienced an 8 percent loss in population, from 448,578 to 411,305 residents in January 2006 – representing an absolute population loss of 37,273. Terrebonne Parish's population increased by 1 percent (Table 5).

Table 5. Resident Populations in Study Parishes, Pre- and Post-Katrina: Louisiana

Parish	Time 1 2004	Time 2 July 2005	Time 3 Dec. 2005	% Change between Time 2 and Time 3
Jefferson	448,843	448,578	411,305	(8.3%)
Lafourche	90,319	90,543	91,153	0.6%
Plaquemines	28,258	28,282	20,164	(28.7%)
St. Bernard	64,848	64,576	3,361	(94.8%)
Terrebonne	105,041	106,078	107,291	1.1%

Source: U.S. Census Bureau 2006.

Mississippi Synopsis: A similar pattern of population changes occurs in Mississippi. The three principally impacted Mississippi counties are Hancock, Harrison, and Jackson. Hurricane Katrina, when it first struck the Gulf Coast mainland, struck with full fury in Hancock County. Over the period July 2005-January 2006, Hancock County lost 24 percent of its population – from 46,240 to 35,129 (a loss of 11,111 residents). Harrison County, however, lost 30,713 residents, a far larger number than Hancock County, but representing only 16 percent of its total population (declining from 186,530 to 155,817 during the 6-month period). Jackson County lost 7,938 residents, or about 6 percent of its population, from 134,249 in 2005 to 126,311 over the same period of time (Table 6).

Table 6. Resident Populations in Study Counties, Pre- and Post-Katrina: Mississippi

County	Time 1 2004	Time 2 July 2005	Time 3 Dec. 2005	% Change between Time 2 and Time 3
Hancock	45,428	46,240	35,129	(24.0%)
Harrison	185,178	186,530	155,817	(16.4%)
Jackson	133,020	134,249	126,311	(5.9%)

Source: U.S. Census Bureau 2006.

Alabama Synopsis: While Mobile County was among the largest affected regions in Alabama, its principal population centers were mostly protected from storm surge (because of direction) and flooding (because of intervening habitat). Out of a total population estimated at 393,585 in July 2005, an estimated 391,251 were present in January 2006 representing a total loss of 2,334 (a combination of both out-migration plus in-migration minus estimated mortality). Despite direct flooding in Bayou La Batre, Bayou Coden, and the western halves of Dauphin Island and Gulf Shores, the coastal counties of Alabama did not register significant loss. Certainly, the homes that were occupied in Bayou La Batre prior to the hurricane do not appear to be registered in this census. A number of variables would have an affect, including land allocation within the county. Because most houses could not have been fully reconstructed nor reoccupied by January 2006, it is our belief that the rudimentary counts may not have captured

occupation, employment, and resulting immigration. Perhaps a similar explanation could hold for the areas of Dauphin Island and Gulf Shores where the highly seasonal population was already at minimum levels when the hurricane struck, and for the most part, have yet to return to pre-hurricane season densities (Table 7).

Table 7. Resident Populations in Study Counties, Pre- and Post-Katrina: Alabama

County	Time 1 2004	Time 2 July 2005	Time 3 Dec. 2005	% Change between Time 2 and Time 3
Baldwin	154,456	160,354	160,573	0.1%
Mobile	392,265	393,585	391,251	(0.6%)

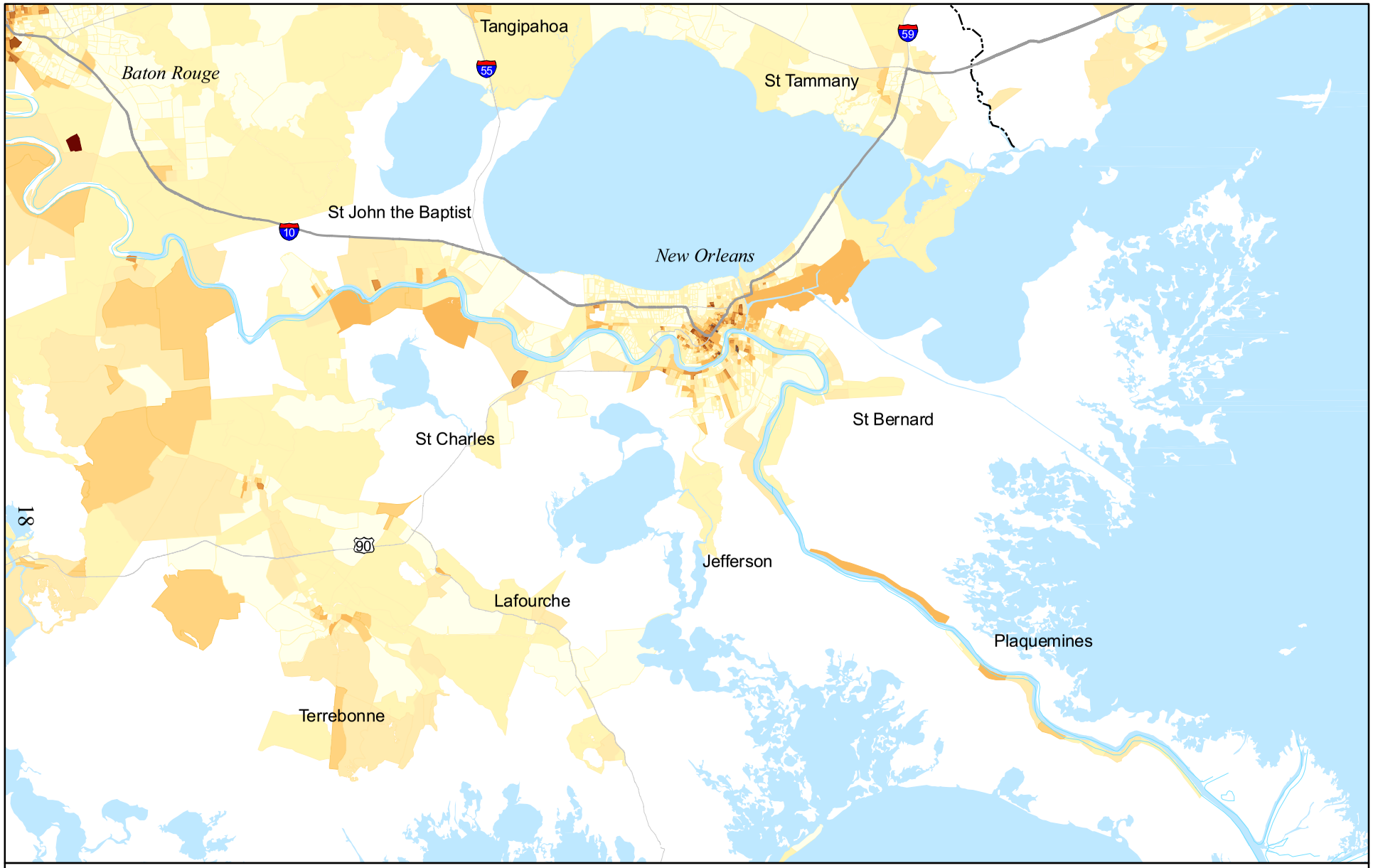
Source: U.S. Census Bureau 2006.

Preliminary Assessment of Vulnerability. The full demographic impacts of these distributions, however, are not reflected in these summary numbers. This is because those that suffered the greatest human losses, in terms of severity of the consequences, were disproportionately distributed among the poor, the undereducated, the unemployed, the underemployed, and minorities (Logan 2006). The issue of greatest importance in this demographic overview analysis is the issue of *relative vulnerability*. We do not pursue analysis of the cause of the distributional skew of the social and economic impacts from Hurricane Katrina.

With these understandings in mind, we provide geographic information system (GIS) analyses and depictions for the coastal areas of the three affected states of the distribution of affected populations by relative indicators of poverty, ethnicity, and by home ownership status. In terms of this demographic overview, we concentrated here only on the coastal communities directly affected by the storm surge. This analysis thus provides a "baseline" portrait of the impact of Hurricanes Katrina on population shifts and changing characteristics in the Gulf Region in the immediate months following the storms.

It is important to note, however, that the U.S. Census Special Assessment, as well as the following GIS analysis, is founded on U.S. Census 2000 databases, and therefore neither offers a comparison of 2005 data with 2006 data. This is not an unimportant issue, since over a five-year period the populations of all of these areas have increased considerably. The point here is that the following comparisons systematically understate the numerical significance of the differences between pre- and post-Katrina demography Hurricane Katrina.

Louisiana. Figure 3 represents the distribution of population in Southeast Louisiana by density and by poverty levels prior to Hurricane Katrina.



Pecent in Poverty

0 - 10	50 - 60
10 - 20	60 - 70
20 - 30	70 - 80
30 - 40	80 - 90
40 - 50	90 - 100

Percent in Poverty by Census 2000 Block Group for Areas in Louisiana Affected by Hurricane Katrina

Very low density block groups not mapped.

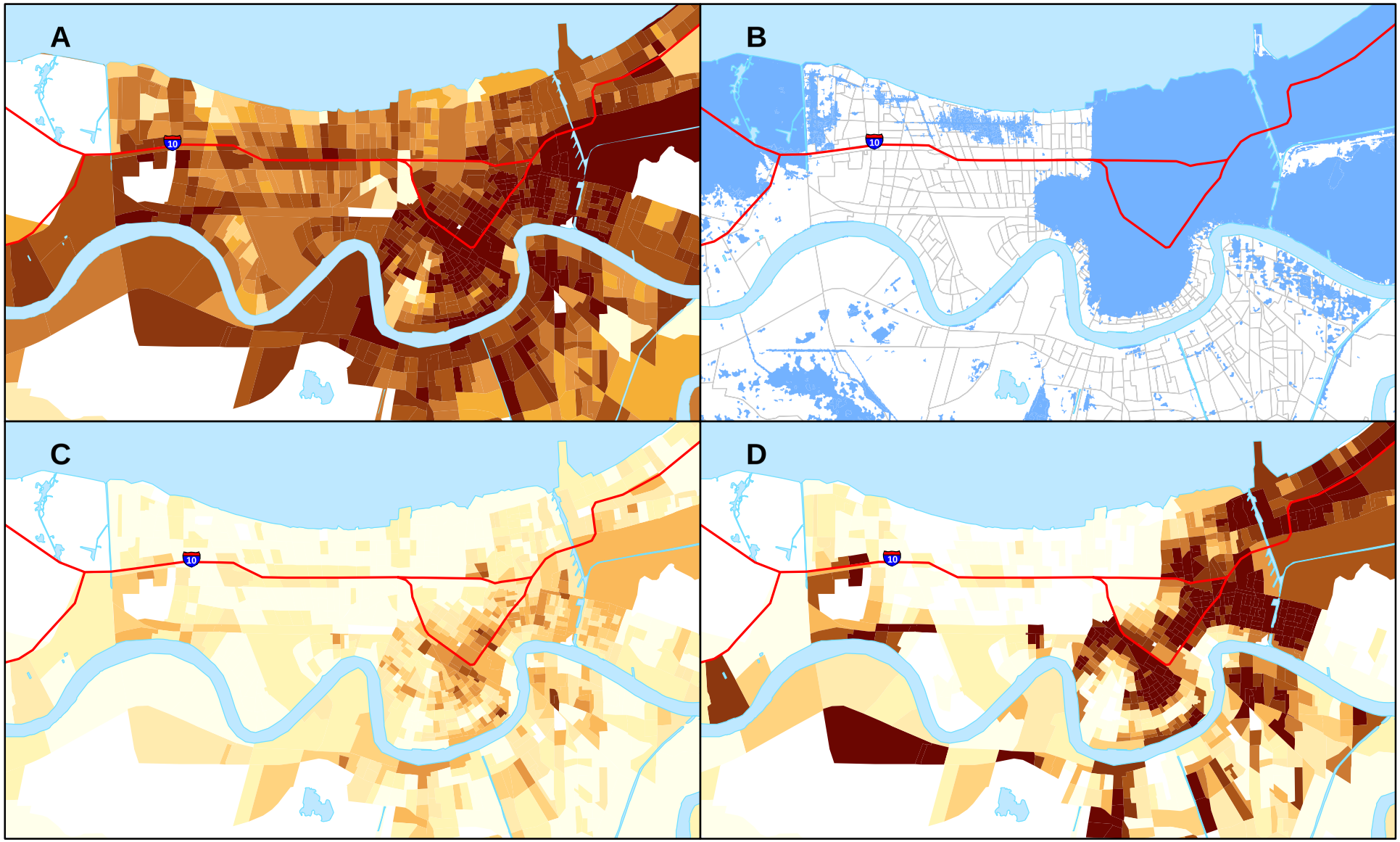
Note: This graphic has a resolution of 300 dpi, allowing the viewer to zoom in .

Miles

0 5 10 20 30 40

In the New Orleans metropolitan area, hurricane-induced loss produced a population that is more white, affluent, and transitory than the pre-hurricane population. These changes resulted from the disproportionate out-migration and slower return of lower-income and black residents from the entire metropolitan area after the storms.

The following figures focus in on several demographic characteristics of New Orleans' residents prior to the storm. Figure 4 maps year 2000 median household income, poverty levels and ethnicity, while Figure 5 depicts homeownership characteristics in that year.



A **Median Household Income**

Thousands of dollars per year

100 - 201	50 - 60
90 - 100	40 - 50
80 - 90	30 - 40
70 - 80	20 - 30
60 - 70	0 - 20

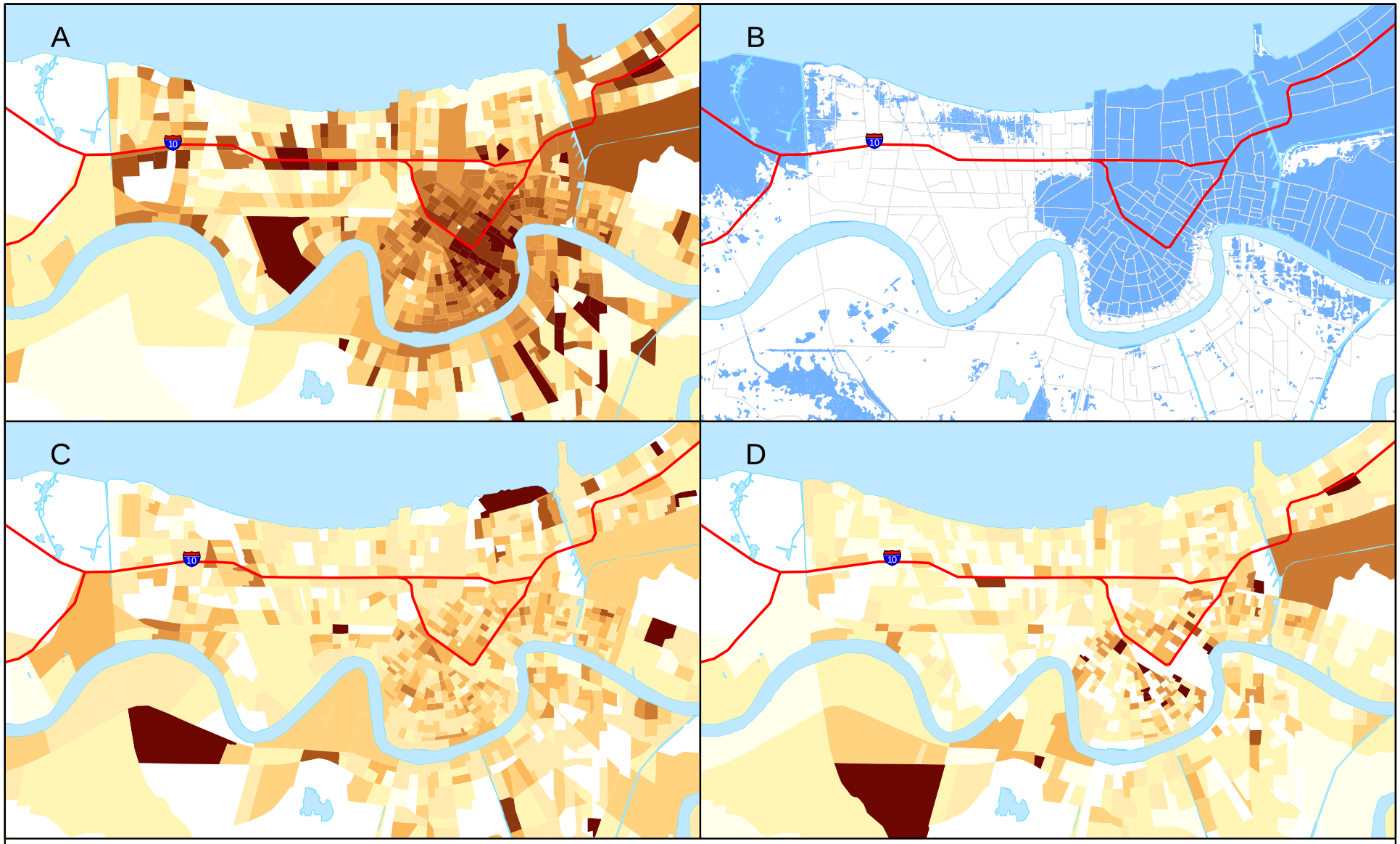
B **Post Hurricane Katrina Inundation and Blockgroups**

New Orleans
Census 2000 Blockgroups

0 2 4 6 8 10
Miles

C **Percent below the Poverty Level**
D **Percent African American**

> 0 - 10	50 - 60
10 - 20	60 - 70
20 - 30	70 - 80
30 - 40	80 - 90
40 - 50	90 - 100



A Percent Renters

> 0 - 10	50 - 60
10 - 20	60 - 70
20 - 30	70 - 80
30 - 40	80 - 90
40 - 50	90 - 100

B Post Hurricane Katrina Inundation and Tracts

New Orleans
Census 2000 Blockgroups

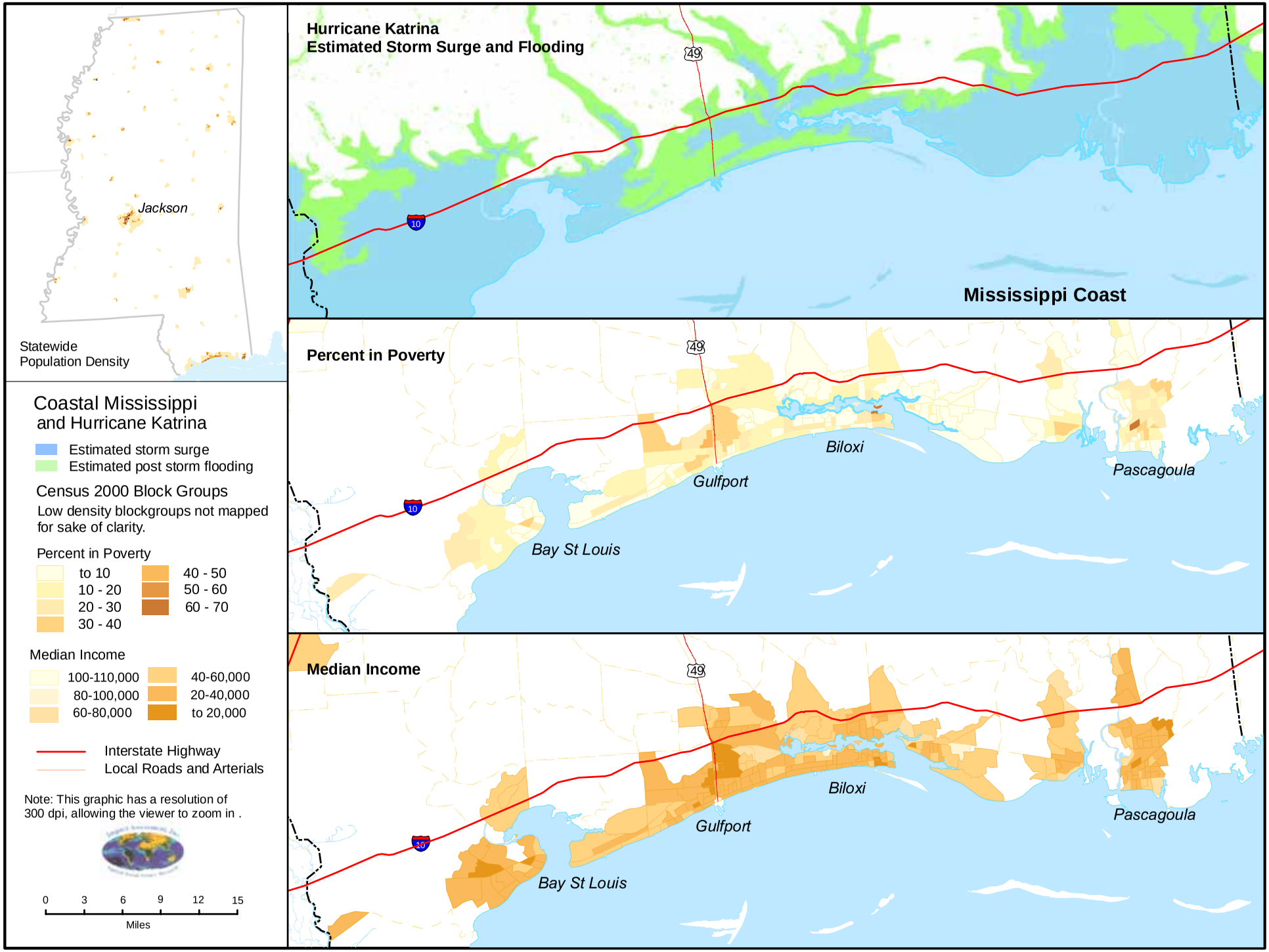
0 2 4 6 8 10
Miles

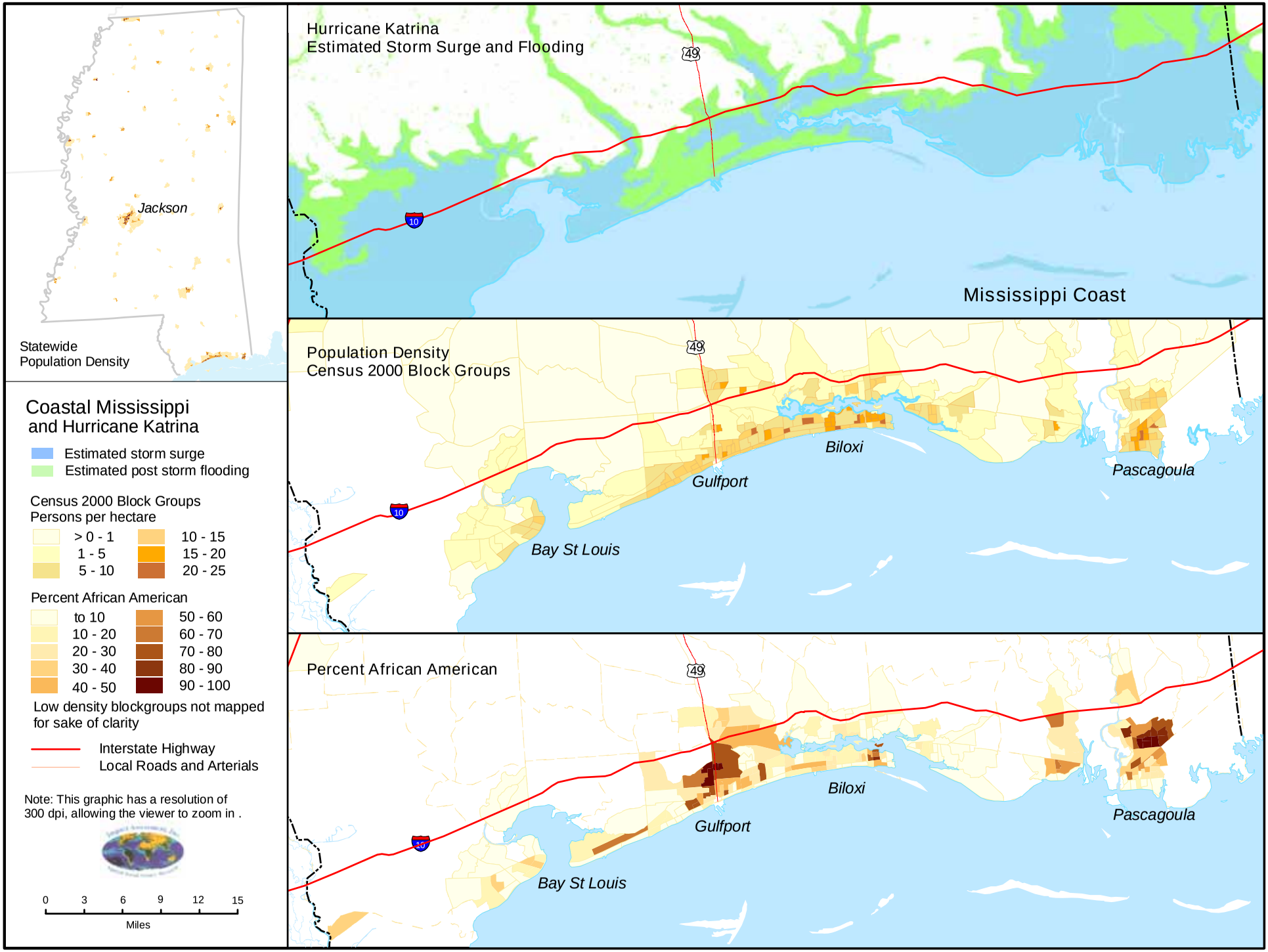
C Renters: Housing Costs exceeding 40% of gross income

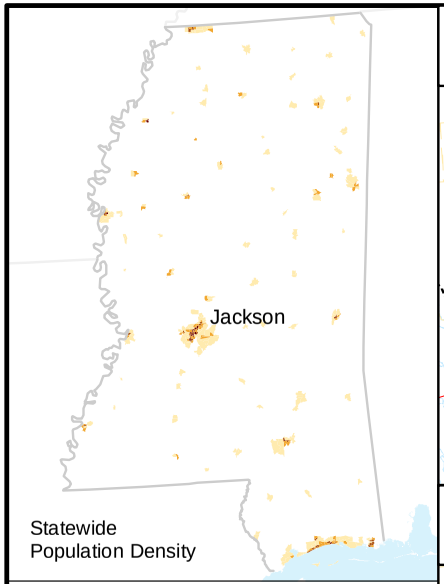
D Mortgage Holders: Housing Costs exceeding 40% of gross income

Note that Fannie Mae regards 28% of gross income as the limit of permissible mortgage burden.

Mississippi. In contrast, counties along the Mississippi coast lost a sizeable share of their white residents and homeowners after the hurricane, while other Gulf Coast metro areas, especially those that gained residents, experienced relatively minor overall shifting in their demographic profiles. Figure 6a maps poverty levels and median household income of coastal Mississippi residents prior to the storm, as well as estimated storm surge and flooding. Figure 6b shows population density and the percent of African American residents in the inundation areas of coastal Mississippi by Census 2000 block groups. Figure 7 details by block group the percent of renters and mortgage holders whose housing costs exceeded 40 percent of their gross income in 2000 in Hurricane Katrina affected areas of coastal Mississippi.


Jackson
Statewide
Population Density
Coastal Mississippi
and Hurricane Katrina
Estimated storm surge
Estimated post storm flooding
Census 2000 Block Groups
Low density blockgroups not mapped
for sake of clarity.
Percent in Poverty
to 10
10 - 20
20 - 30
30 - 40
40 - 50
50 - 60
60 - 70
Median Income
100-110,000
80-100,000
60-80,000
40-60,000
20-40,000
to 20,000
Interstate Highway
Local Roads and Arterials
Note: This graphic has a resolution of
300 dpi, allowing the viewer to zoom in .
0 3 6 9 12 15
Miles
Hurricane Katrina
Estimated Storm Surge and Flooding
49
10
Mississippi Coast
Percent in Poverty
Biloxi
Gulfport
Pascagoula
Bay St Louis
Median Income


Jackson
Statewide
Population Density
Coastal Mississippi
and Hurricane Katrina
Estimated storm surge
Estimated post storm flooding
Census 2000 Block Groups
Persons per hectare
> 0 - 1
1 - 5
5 - 10
10 - 15
15 - 20
20 - 25
Percent African American
to 10
10 - 20
20 - 30
30 - 40
40 - 50
50 - 60
60 - 70
70 - 80
80 - 90
90 - 100
Low density blockgroups not mapped
for sake of clarity
Interstate Highway
Local Roads and Arterials
Note: This graphic has a resolution of
300 dpi, allowing the viewer to zoom in .
0 3 6 9 12 15
Miles
Hurricane Katrina
Estimated Storm Surge and Flooding
49
10
Mississippi Coast
Population Density
Census 2000 Block Groups
Biloxi
Gulfport
Pascagoula
Bay St Louis
Percent African American



Coastal Mississippi and Hurricane Katrina

Census 2000 Block Groups

Low density blockgroups not mapped for sake of clarity

Percent Categories

to 10	50 - 60
10 - 20	60 - 70
20 - 30	70 - 80
30 - 40	80 - 90
40 - 50	90 - 100

Interstate Highway

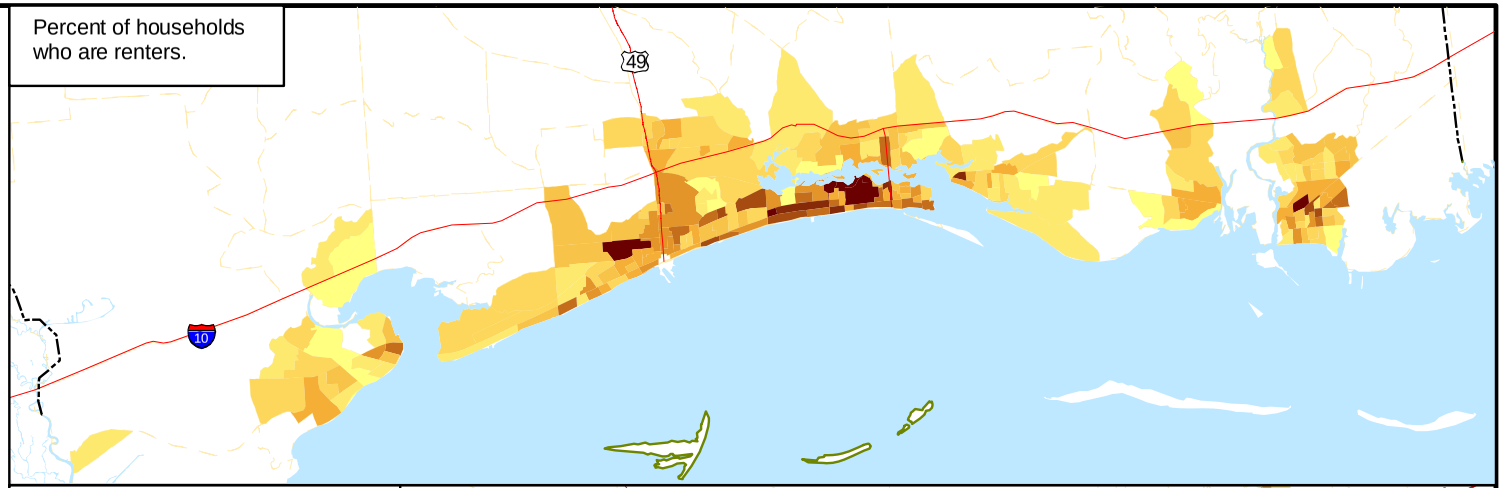
Local Roads and Arterials

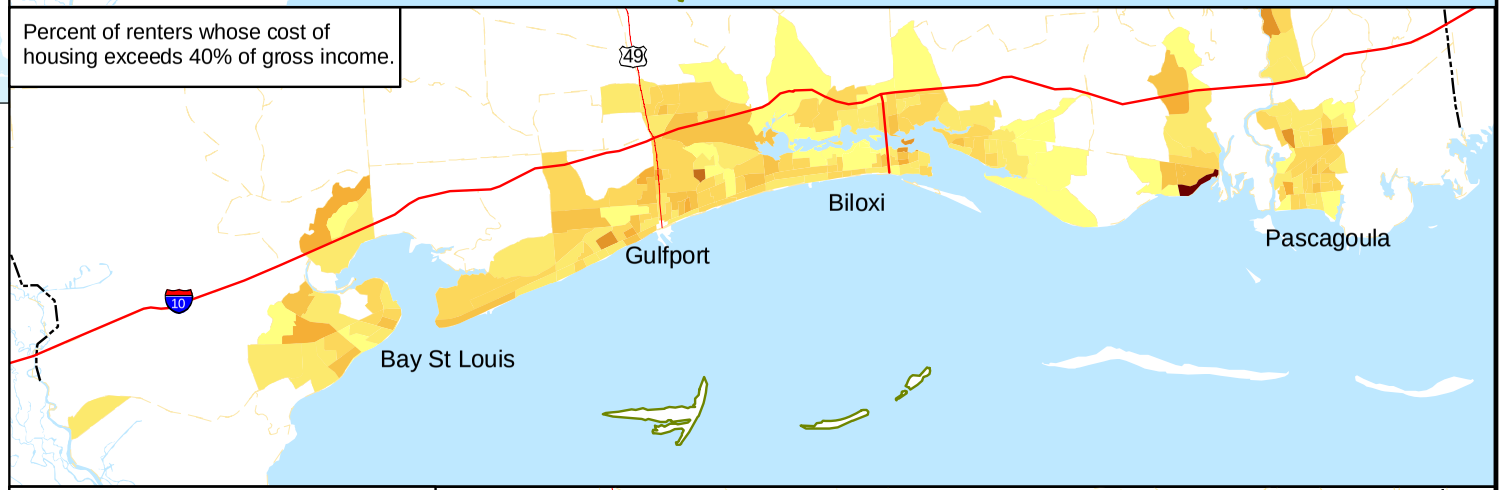
Note that Fannie Mae regards 28% of gross income as the limit of permissible mortgage burden.

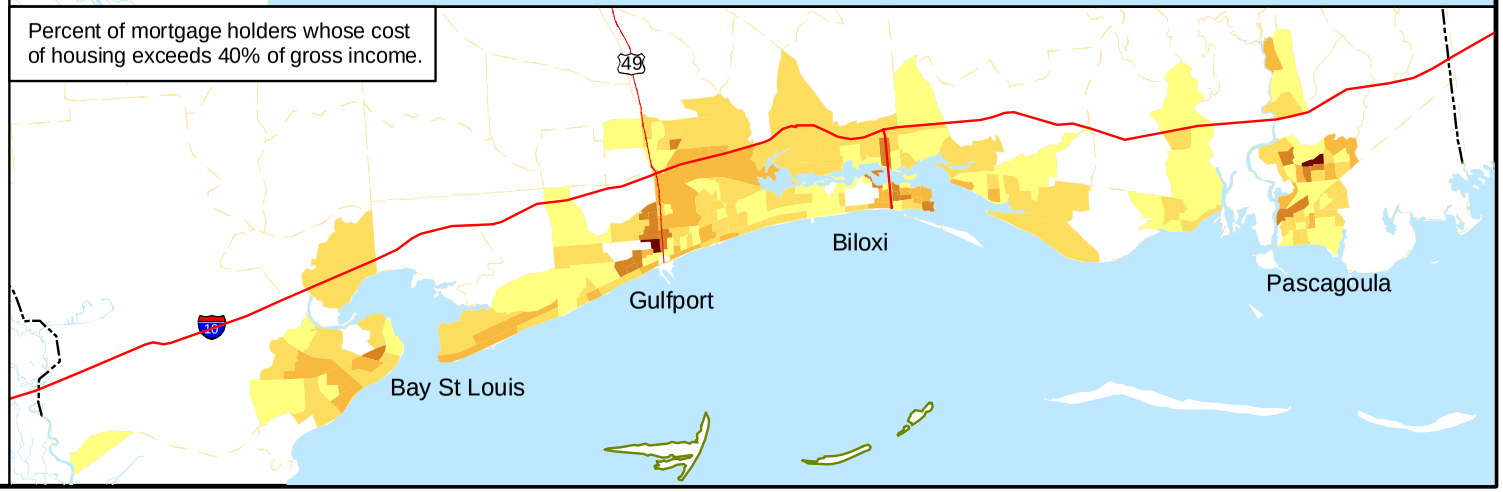
Note: This graphic has a resolution of 300 dpi, allowing the viewer to zoom in .

0 3 6 9 12 15

Miles







Alabama. Finally, in coastal Alabama, demographic change was not as remarkable as in the two other affected Gulf States and not clearly attributable to the effects of the hurricanes. The following figures depict several demographic characteristics of coastal Alabama residents prior to the storm. Figure 8 maps population density and the percentage of residents over the age of 65 in the year 2000, while Figure 9 indicates poverty levels, median household income, and the percentage of African-American residents prior to Hurricane Katrina. Both images also provide estimates of storm surge and post-storm flooding. Figure 10 details by block group the percent of renters and mortgage holders whose housing costs exceeded 40 percent of their gross income in 2000 in Hurricane Katrina affected areas of coastal Alabama.

Low density block groups not mapped.

Estimated Storm Surge

Estimated Post Storm Flooding

Population Density
Persons per hectare

1 - 5
5 - 10
10 - 20
20 - 30
30 - 40
40 - 50

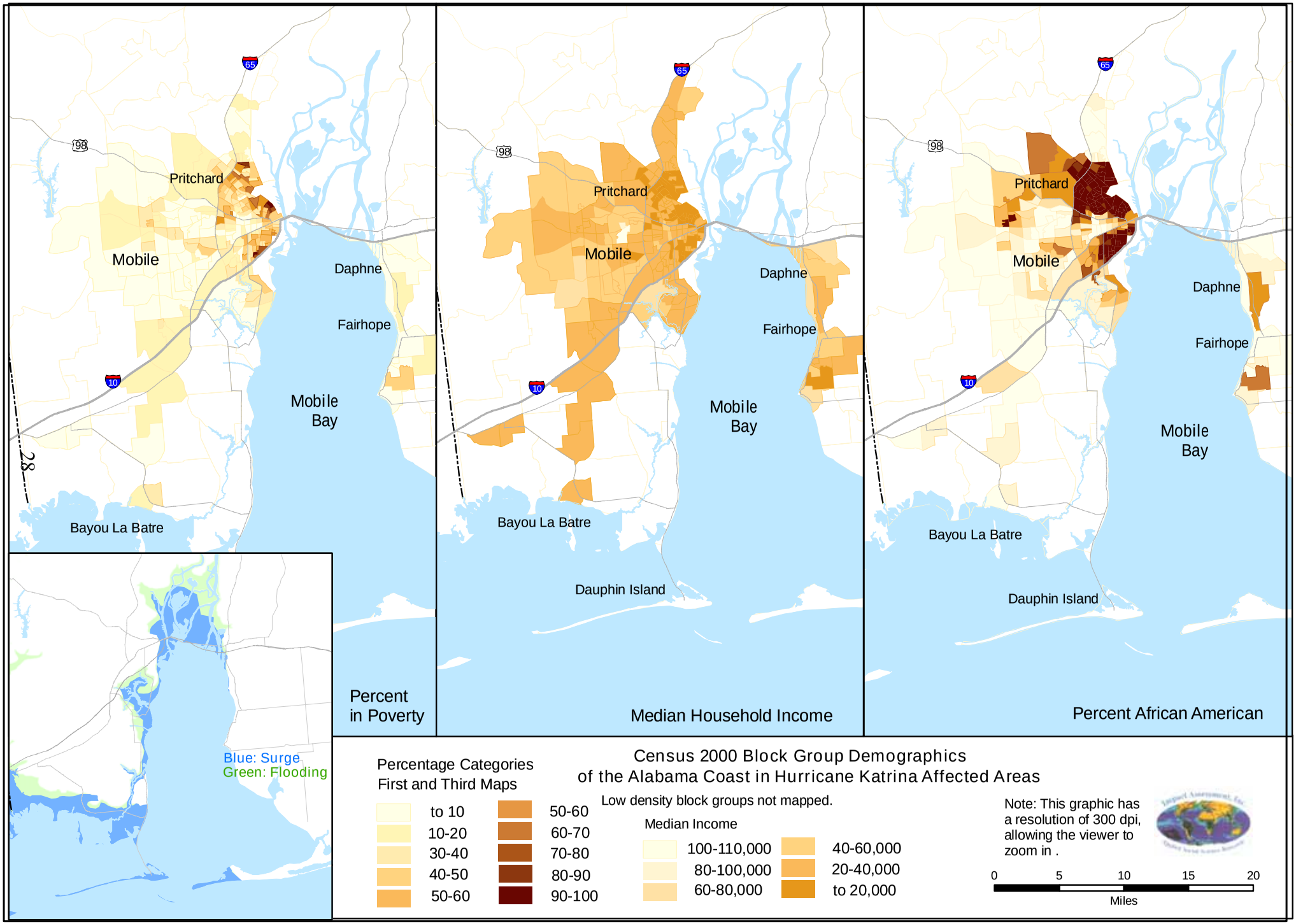
Census 2000 Block Group Demographics
of the Alabama Coast in Hurricane Katrina Affected Areas

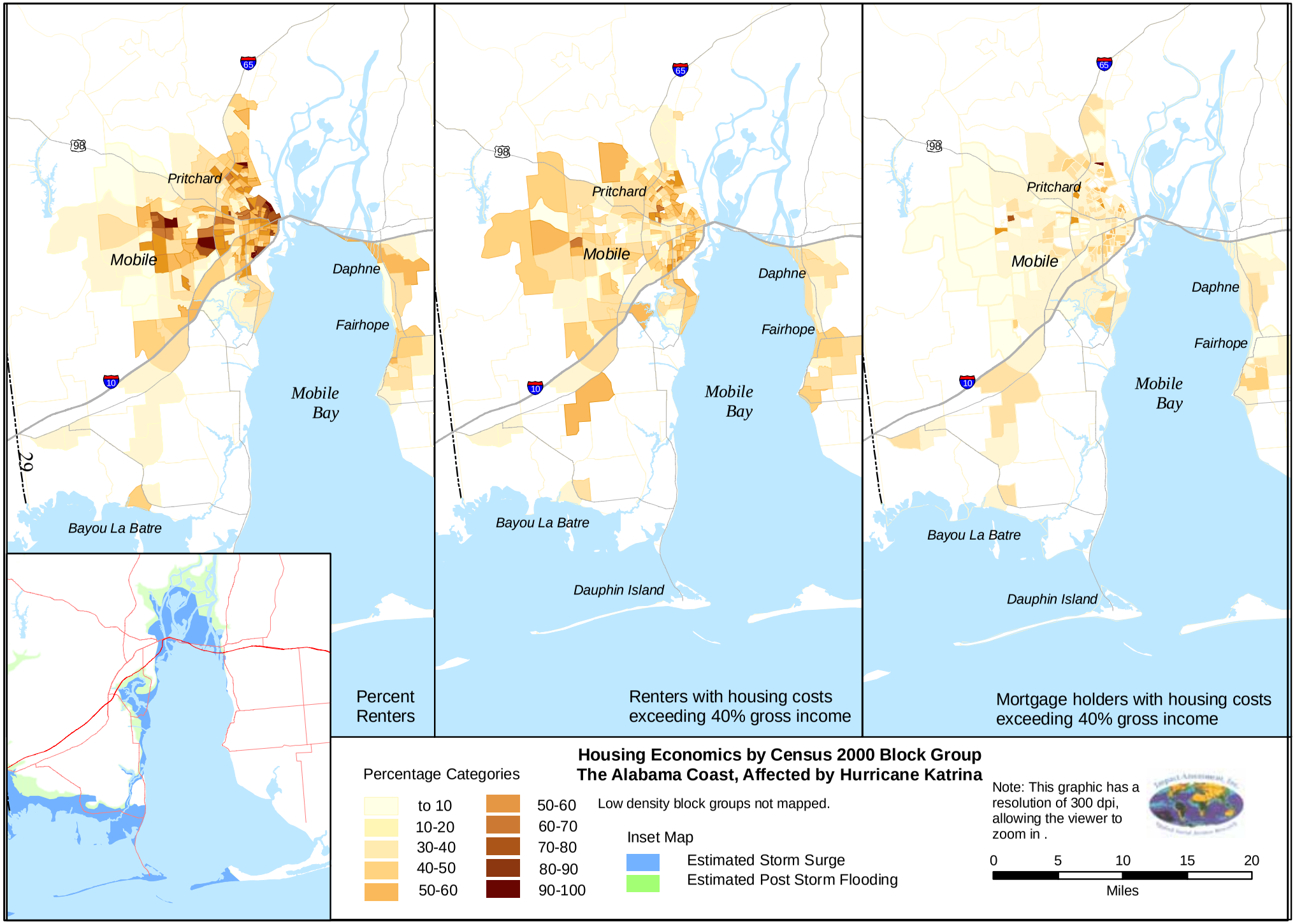
Percent Over Age 64

to 10
10-20
30-40
40-50
50-60

Note: This graphic has a resolution of 300 dpi, allowing the viewer to zoom in .

0 5 10 15 20
Miles


Pritchard
Mobile
Daphne
Fairhope
Mobile Bay
Bayou La Batre
Dauphin Island
Percent in Poverty
Median Household Income
Percent African American
Blue: Surge
Green: Flooding
Percentage Categories First and Third Maps
to 10
10-20
30-40
40-50
50-60
50-60
60-70
70-80
80-90
90-100
Census 2000 Block Group Demographics of the Alabama Coast in Hurricane Katrina Affected Areas
Low density block groups not mapped.
Median Income
100-110,000
80-100,000
60-80,000
40-60,000
20-40,000
to 20,000
Note: This graphic has a resolution of 300 dpi, allowing the viewer to zoom in .
0
5
10
15
20
Miles


Pritchard
Mobile
Daphne
Fairhope
Mobile Bay
Bayou La Batre
Dauphin Island
29
Percent Renters
Renters with housing costs exceeding 40% gross income
Mortgage holders with housing costs exceeding 40% gross income
Housing Economics by Census 2000 Block Group
The Alabama Coast, Affected by Hurricane Katrina
Percentage Categories
to 10
10-20
30-40
40-50
50-60
50-60
60-70
70-80
80-90
90-100
Low density block groups not mapped.
Inset Map
Estimated Storm Surge
Estimated Post Storm Flooding
Note: This graphic has a resolution of 300 dpi, allowing the viewer to zoom in .
0
5
10
15
20
Miles

B. Pre-Hurricane Katrina: An Overview of the Commercial and Recreational Fishing Industries in Louisiana.

Hurricane Katrina Affected Areas
of Southeast Louisiana

Note: This graphic has a resolution of
300 dpi, allowing the viewer to zoom in .

Miles

0 5 10 20 30 40

N

I. PRIMARY FISHING INDUSTRIES IN LOUISIANA

Louisiana's commercial and recreational fishing industries constitute key components of the national fisheries economy. In 2003, fishing, hunting, and boating had a total state economic impact of $7.1 billion and provided 77,690 jobs (Reeves 2005). Of these industries, commercial fishing had the greatest economic impact, injecting a total of $2.6 billion into the state's economy and accounting for some 30,000 jobs (Louisiana Sea Grant 2005a). In this same year, the recreational angling business generated $895 million in retail sales and employed 17,000 persons (Louisiana Sea Grant 2005a; Reeves 2005). The charter boat industry in Louisiana is also economically important. In 2003, saltwater fishery participants spent a total of $28 million on charter fishing trips (Louisiana Sea Grant 2005a).

Shrimp, oyster, crab, menhaden, and finfish are the primary marine fisheries in Louisiana. Farmed and wild crawfish, catfish, and alligator are also economically significant. The revenue generated by the oyster (Eastern) and shrimp (brown and white) fisheries is the highest among all the Gulf Coast states in which oysters and shrimp are commercially harvested. Between 2000 and 2004, inclusive, commercial landings in Louisiana had an average ex-vessel value of $329 million (Table 8).

Table 8. Commercial Landings in Louisiana (all species combined), Thousands of Pounds (live weights), and Thousands of Current Dollars: 2000-2004

Year	Pounds	Value
2000	1,359,156	$420,975
2001	1,195,622	$347,247
2002	1,305,922	$306,726
2003	1,189,992	$294,352
2004	1,096,582	$275,065
<5 Year Average>	<1,229,455>	<$328,873>

Source: NMFS SEFSC Accumulated Landings Database;
2005 data is preliminary.

Commercial Landings in Louisiana between 1995 and 2004. Between 1995 and 2004, Louisiana's fisheries (all species combined) produced 13 percent of the nation's seafood harvest, on average (Table 9). In 2004, commercial fisheries in Louisiana produced nearly 1.1 billion pounds of fish (all species combined), with a value of $275 million (NMFS 2005a).

Table 9. Pounds and Value of all Commercial Landings in the United States and Louisiana: 1995-2004

Year	Pounds (all species), U.S.	Value (in billions), U.S.	Pounds (all species), Louisiana	Value (in millions), Louisiana	% of Total U.S. lbs. from LA	% of Total U.S. Value from LA
1995	9,912,807,044	$3,826,360,342	1,128,577,118	$315,833,002	11.4%	8.2%
1996	9,643,821,438	$3,564,587,048	1,136,721,165	$270,800,782	11.8%	7.6%
1997	9,951,898,930	$3,592,218,307	1,425,886,505	$317,152,354	14.3%	8.8%
1998	9,332,712,602	$3,221,433,652	1,131,977,817	$311,855,620	12.1%	9.7%
1999	9,409,192,065	$3,575,730,880	1,524,728,384	$336,963,461	16.2%	9.4%
2000	9,142,633,213	$3,674,425,002	1,359,156,036	$420,974,997	14.9%	11.4%
2001	9,511,750,925	$3,243,655,393	1,195,622,124	$347,246,659	12.6%	10.7%
2002	9,428,867,963	$3,191,297,481	1,305,921,816	$306,726,051	13.8%	9.6%
2003	9,515,048,681	$3,371,930,855	1,189,991,546	$294,352,001	12.5%	8.7%
2004	10,084,780,228	$3,816,500,440	1,096,581,770	$275,065,335	11.8%	7.2%
<10 Year Averages>	<9,593,228,233>	<$3,508,517,784>	<1,249,516,428>	<$319,697,026>	<13.1%>	<9.1%>

Source: NMFS 2005a.

Top Seafood-producing Ports. Plaquemines, Vermilion, Cameron, Jefferson, Terrebonne, and Lafourche have long been the leading seafood-producing parishes in Louisiana. Together, these ports account for roughly 83 percent of all seafood produced in the state each year. The top producing ports in Louisiana for shrimp are: Venice-Empire, Dulac-Chauvin, Grand Isle, Lafitte, Cameron, Delacroix, Delcambre, Intracoastal City, and Morgan City-Berwick. The ports at Venice-Empire and Cameron are also top in oyster production.

Tables 10 and 11 below rank the top-producing ports in Louisiana in terms of landings and value. Each also identifies the ranking of each port in relation to the top performing ports in the United States (please note that the terms "value" and "revenue" are used interchangeably throughout this report when referencing dollar amounts).

Historically, Empire-Venice has been a particularly productive port, ranking third in the nation in terms of pounds landed in 2004, and sixth in terms of value.

Table 10. Total Commercial Fishery Landings at Select Louisiana Ports and Ranking* by U.S. Dollars: 2004

Port	Parish	U.S. Rank by Value	Value in Millions	Pounds in Millions
Empire-Venice	Plaquemines	6th	$60.2	379.0
Dulac-Chauvin	Terrebonne	11th	$42.8	40.4
Golden Meadow-Leeville	Lafourche	18th	$31.6	26.1
Cameron	Cameron	24th	$27.6	243.1
Delcambre	Iberia	36th	$20.7	14.5
Intracoastal City	Vermilion	39th	$20.3	301.8
Delacroix-Yscloskey	St. Bernard	50th	$14.4	12.0
Grand Isle	Jefferson	51st	$14.2	12.5
Lafitte-Barataria	Jefferson	59th	$10.9	8.8
Morgan City-Berwick	St. Mary	75th	$ 6.6	17.8

* There are 97 ranked ports in the United States.
Source: NMFS 2005b.

Table 11. Total Commercial Fishery Landings at Select Louisiana Ports and Ranking* by Pounds: 2004

Port	Parish	U.S. Rank by Pounds	Pounds in Millions	Value in Millions
Empire-Venice	Plaquemines	3rd	379.0	$60.2
Intracoastal City	Vermilion	5th	301.8	$20.3
Cameron	Cameron	6th	243.1	$27.6
Dulac-Chauvin	Terrebonne	23rd	40.4	$42.8
Golden Meadow-Leeville	Lafourche	35th	26.1	$31.6
Morgan City-Berwick	St. Mary	44th	17.8	$ 6.6
Delcambre	Iberia	50th	14.5	$20.7
Grand Isle	Jefferson	53rd	12.5	$14.2
Delacroix-Yscloskey	St. Bernard	56th	12.0	$14.4
Lafitte-Barataria	Jefferson	62nd	8.8	$10.9

* There are 97 ranked ports in the United States.
Source: NMFS 2005b.

II. PRIMARY FISHERIES AND PRODUCTION LEVELS IN COASTAL LOUISIANA: 1995 TO 2004

Shrimp Production. The commercial shrimping industry in Louisiana has historically led the Gulf and the nation in shrimp landings (Figure 12).

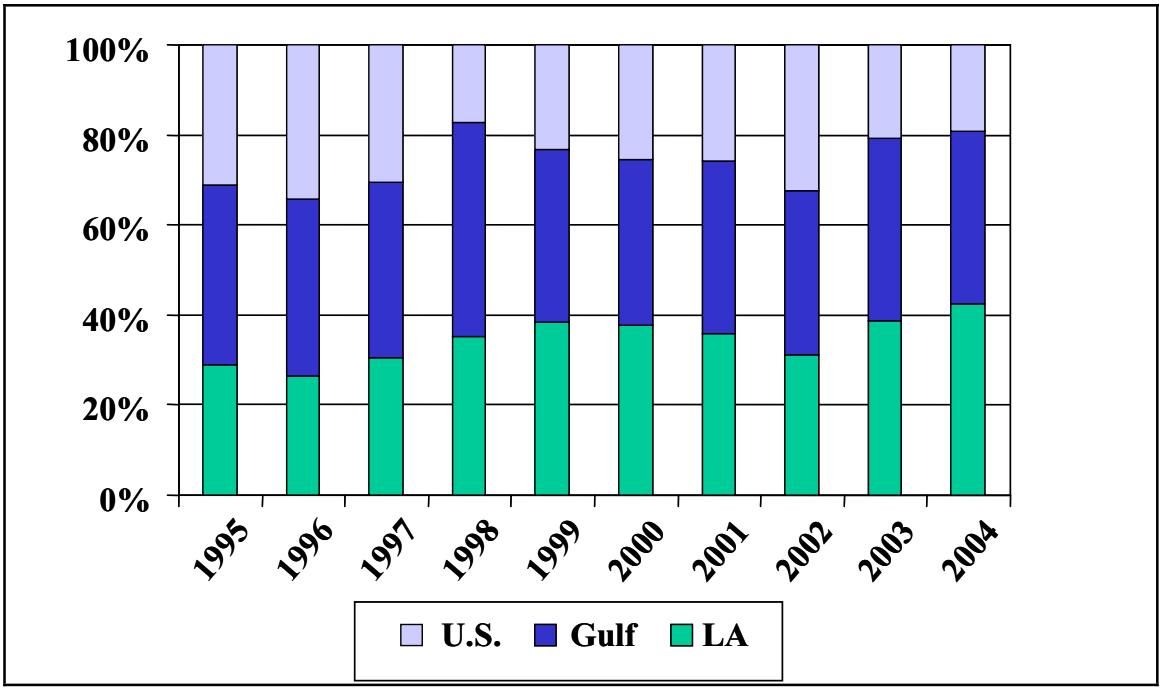


Figure 12: Shrimp Landings by Pounds and Region: 1995-2004.
Source: NMFS 2005a.

Over the past decade (1995-2004), shrimp landings in Louisiana have averaged 46 percent of all shrimp landings in the Gulf of Mexico. These landings had an average ex-vessel value of $163 million (heads-on) (see Table 12).

In 2004, the most recent year for which national data are currently available, a total of 317 million pounds of shrimp worth $446 million dollars were landed in the U.S. In this same year, 134 million pounds or 42 percent of these U.S. shrimp were landed in Louisiana, with a value of $139 million (heads-on) (NMFS 2005a). Of the five Gulf Coast states, Louisiana ranks first in terms of shrimp production (NMFS 2005a).

Table 12. Pounds and Value of Louisiana Shrimp* Harvest: 1995-2004

Year	Pounds	Value	Percent of Gulf Harvest/Pounds	Percent of Gulf Harvest/Value
1995	98,367,687	$167,140,630	41.9	35.5
1996	90,608,480	$128,030,131	40.2	30.6
1997	93,234,396	$149,894,267	43.8	32.8
1998	111,995,607	$159,176,385	42.4	32.8
1999	121,003,740	$171,481,148	50.0	35.8
2000	145,384,688	$253,032,194	50.4	38.6
2001	124,812,770	$187,968,710	48.5	37.8
2002	107,794,921	$141,213,327	46.1	36.6
2003	125,730,160	$135,152,868	49.0	37.0
2004	134,290,113	$139,157,862	52.2	37.9
<10 Year Average>	<115,325,155>	<$163,226,599>	<46.4>	<35.5>

*Brown, White, and Other.
Source: NMFS 2005a.

As assessed for recent years, Louisiana's shrimp fishery peaked in 2000, with 145 million pounds of shrimp valued at $253 million dollars (Figure 13). However, ex-vessel prices paid for Gulf of Mexico shrimp have been in a state of decline, with average per pound prices falling from $2.26 to $1.64 between 1997 and 2002. As a result, gross revenue declined significantly from $654 million to $381 million in this region during the period (NMFS 2004). This decline relates in part to ongoing increases in seafood imports, especially shrimp, and concomitant effects on local, regional, and national seafood market conditions.

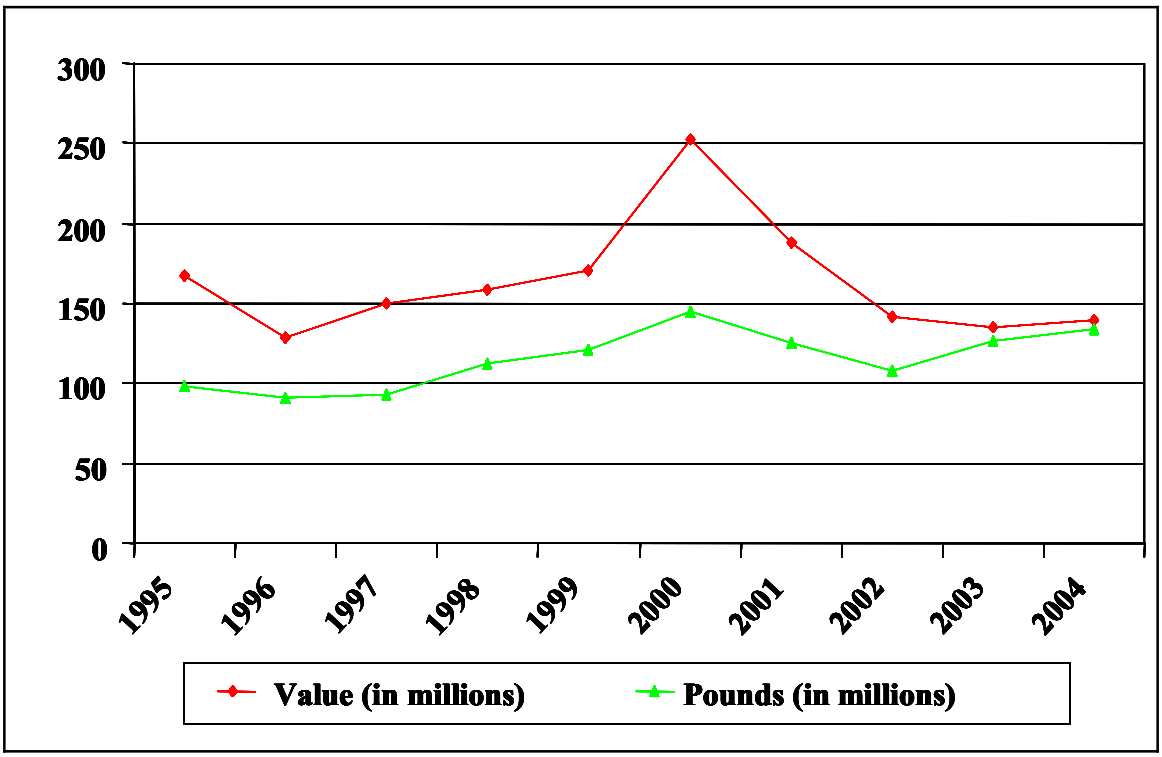


Figure 13: Louisiana's Shrimp Harvest in Pounds and Value: 1995-2004.
Source: NMFS 2005a.

Oyster Production. Oyster production contributes significantly to Louisiana's fisheries economy. According to the Louisiana Department of Wildlife and Fisheries (LDWF), the Louisiana industry is the largest in the nation. The majority of Louisiana-harvested oysters are processed out of state or sent directly to restaurants. Over the past decade (1995-2004), oyster beds in Louisiana have produced an average of 57 percent of all the oysters harvested in the Gulf of Mexico. The average annual value of this ten-year harvest was $30 million dollars (Table 13).

Table 13. Oyster Landings for Louisiana by Pounds and Value: 1995-2004

Year	Pounds	Value	Percent of Gulf Harvest/Pounds	Percent of Gulf Harvest/Value
1995	13,800,076	$25,837,277	62.8	65.9
1996	12,934,925	$26,675,678	58.0	59.5
1997	13,221,705	$29,770,615	58.6	62.0
1998	12,856,173	$30,994,392	65.9	69.4
1999	12,128,187	$25,776,785	53.8	55.8
2000	12,702,767	$27,497,878	49.3	51.8
2001	15,132,631	$31,853,824	59.1	60.9
2002	13,961,579	$30,318,456	57.9	59.7
2003	13,606,883	$33,368,831	50.3	54.1
2004	13,902,704	$34,893,978	55.5	57.3
<10 Year Average>	<13,424,763>	<$29,698,771>	<57.1>	<59.6>

Source: NMFS 2005a.

Louisiana ranks first both in the Gulf and in the nation in terms of oyster production (NMFS 2005a). In 2004, a total of 27 million pounds of oysters valued at $72 million dollars were landed in the U.S; 93 percent of these oysters came from the Gulf of Mexico, of which over half came from Louisiana grounds (see Figure 14). Between 2002 and 2004, 62 percent of Louisiana's oyster harvest came from private leases (270,677 acres); and 38 percent from public grounds (33,852 acres). The three-year value of these leases totaled $206,811,000 (private grounds = $128,233,428; public grounds = $78,577,572) (LDWF 2005).

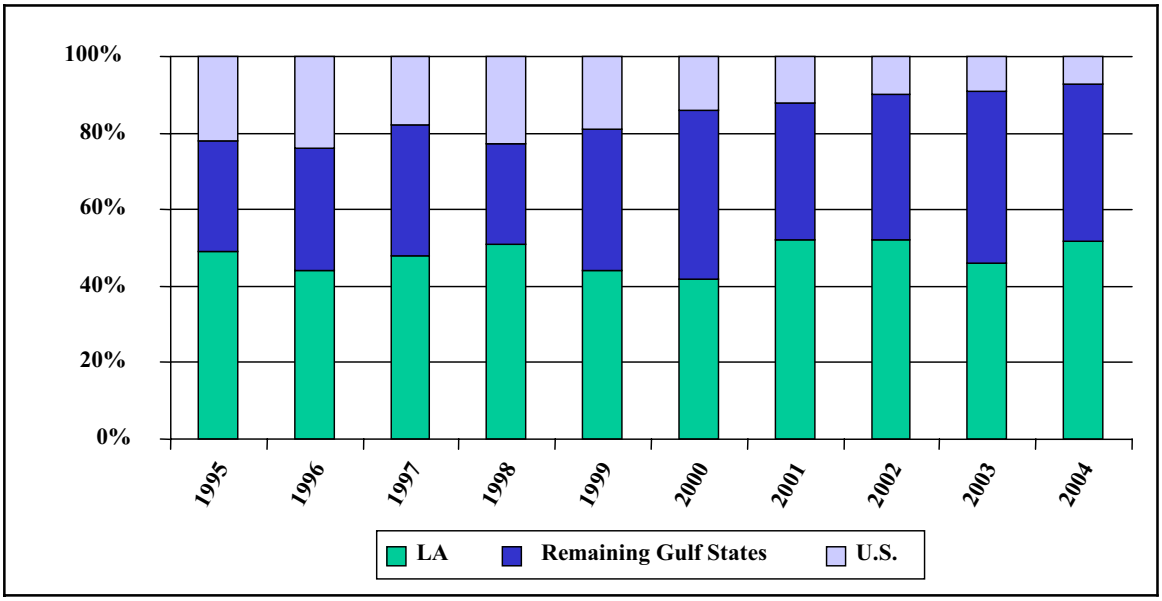


Figure 14: Oyster Landings by Region: 1995-2004.
Source: NMFS 2005a.

With regard to concentration of effort in oyster harvest and leased oyster acres, Plaquemines Parish is ranked first, with 3,502 commercial permits and 40,600 acres. Terrebonne is second in terms of permits and leased acres, with 92,023 acres and 2,238 permits. St. Bernard, Jefferson, and Lafourche rank third, fourth, and fifth, respectively (LDWF 2005).

Unlike participants in the Louisiana-based shrimp industry, who often report struggling with regulations (e.g., open seasons, species, and by-catch) and increasing competition from foreign markets, Louisiana oyster harvesters have experienced relatively profitable and stable conditions. Ex-vessel landings have remained fairly constant while product value has increased (Figure 15).

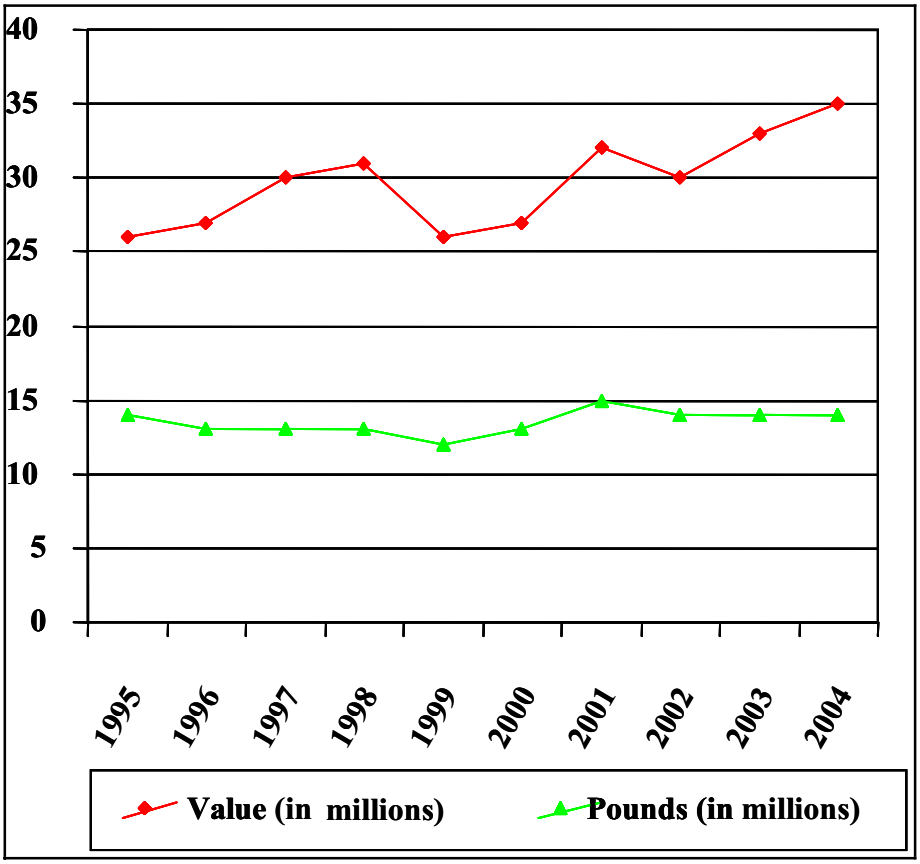


Figure 15: Louisiana's Oyster Harvest in Pounds and Value: 1995-2004.
Source: NMFS 2005a.

Aquaculture. Louisiana is also home to highly diversified aquaculture industries, and these lead the nation in crawfish, oyster, and alligator sales. Tilapia, redfish, ornamental fish, fish bait, minnows, and soft-shell crabs are also farmed extensively. Buffalo fish and gar are important freshwater fisheries, some component of which is farmed. The Louisiana State University Agricultural Center (LSUAC) reported that the total value of all aquaculture production in the State of Louisiana equaled $212 million in 2004. This total includes farm value plus value-added through processing and marketing (LSUAC 2004a).

Acreage for farm-raised crawfish in Louisiana fluctuates from season to season, as do harvest and value (see Figure 16). For example, in 2002, the state had a reported 1,135 farmed and 1,068 wild crawfish producers, with over 106,650 acres of state land concentrated in Lafourche and Terrebonne parishes devoted to production. In that year, nearly 74.5 million pounds of crawfish were farmed, with a gross farm value of over $56.5 million. By 2004, there were 1,226 farmed and 1,481 wild crawfish producers, harvesting 78 million pounds of crawfish on 118,250 acres of state land. However, despite an increase in the number of landings, gross farm value dropped to $46.5 million (LSUAC 2005a). In recent years, diminished production in the crawfish processing sector is indicative of fewer channels for marketing small and medium crawfish, amidst higher industry demand for large crawfish (LSUAC 2004a).

Fluctuations in acreage and production of farmed crawfish are partially attributable to the success or depression of the previous season's rice crops. In years when returns are poor, many rice farmers will use their land for crawfish farming.

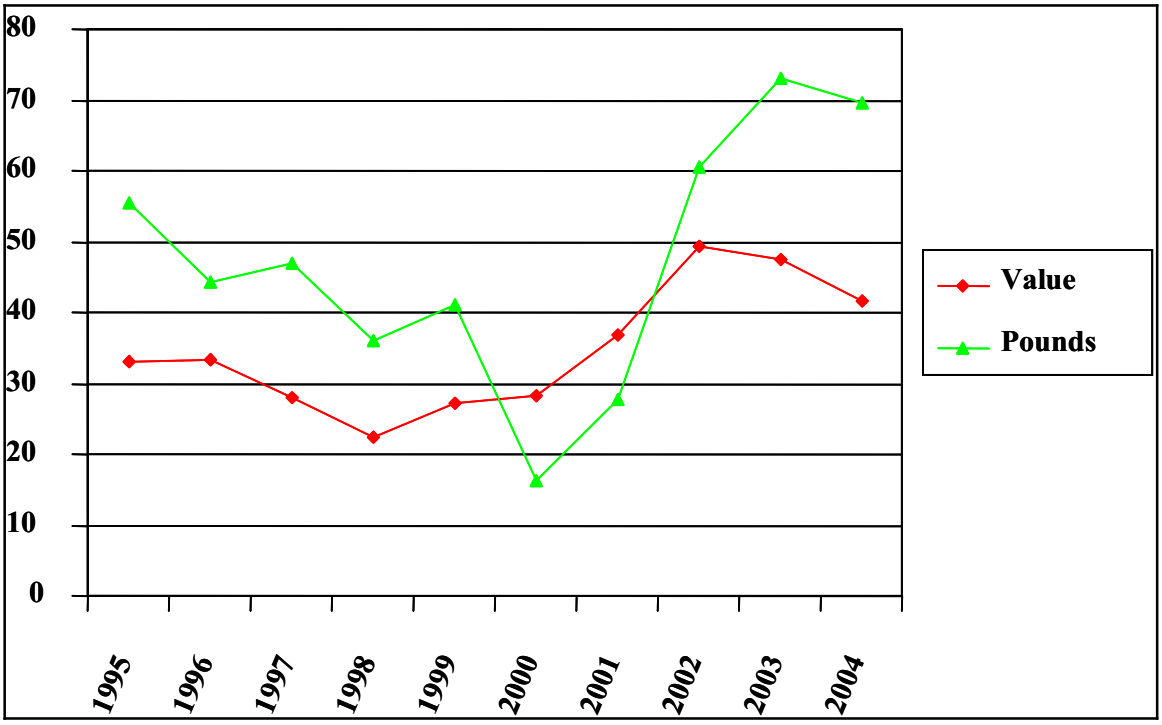


Figure 16: Pounds and Value (in millions) of Louisiana Crawfish (farmed only): 1995-2004. Source: LSUAC 2005a.

The top five crawfish producing parishes in the state are: St. Martin, Acadia, Jefferson Davis, Vermilion, and St. Landry. Together, these five parishes produced 67 percent of all farmed crawfish in Louisiana in 2004 (LSUAC 2005a). Table 14 below lists the five study parishes and identifies the extent of their involvement in crawfish aquaculture.

Table 14. Estimated Louisiana Crawfish Aquaculture Production by Selected Study Parishes: 2004

Parish	State Ranking by Acres (of 10)	State Ranking by Production (of 10)	Crawfish Producers	Crawfish Acres	Crawfish Pounds	Crawfish Value
Jefferson	0	0	0	0	0	$0
Lafourche	8	7	57	6,393	4,539,030	$2,723,418
Plaquemines	0	0	0	0	0	$0
St. Bernard	0	0	0	0	0	$0
Terrebonne	0	0	14	528	369,600	$221,760
5 Parish Total	n/a	n/a	71	6,921	4,908,630	$2,945,178
Percent of State Total	n/a	n/a	6	6	7	7
State Totals	n/a	n/a	1,226	118,250	69,546,680	$41,728,008

n/a = not applicable.
Source: LSUAC 2005a.

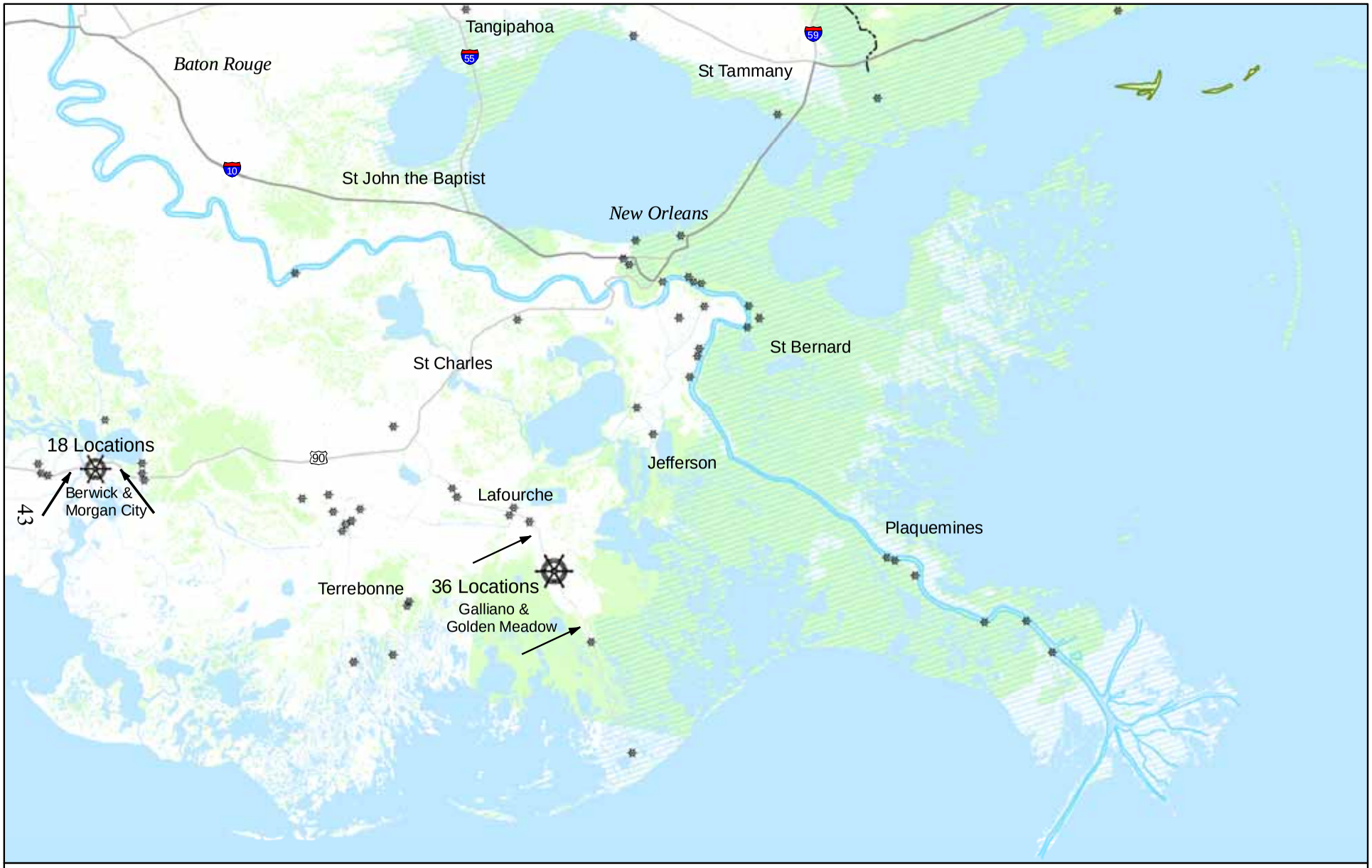
Louisiana is fourth in the nation in terms of channel catfish production. In 2004, 53 producers farmed 31.5 million pounds of catfish on 7,525 acres of land, with a gross farm value of $21.4 million (LSUAC 2004a). Value and production of this product varies cyclically and seasonally. Recently, value has decreased due to high volume of imported catfish filets and prolific catfish production in neighboring Mississippi, Alabama, and Arkansas. The continued viability of this industry reportedly depends on programs for channeling capital into new acreage (currently diminishing), and providing financial assistance to new farmers wishing to purchase or lease existing ponds as established catfish farmers retire (LSUAC 2004a). Catfish production in Louisiana is most extensive in East Carroll, Franklin, Madison, Morehouse, Richland, Tensas, and Washington Parishes, all of which are located in the northeast corner of the state. Residents in the five parishes examined in this report are minimally involved in catfish production.

The value of farmed alligator continues to rise. Farmed alligator had a gross farm value of $14.2 million in 2002; in 2004, gross farm value was $18.4 million (LSUAC 2004a). Vermilion Parish is the top producer of farmed alligator in the state, followed by Terrebonne and Lafourche Parishes. In 2004, 298,981 feet of alligator with a gross farm value of $5,082,991 were produced in Vermilion Parish. In that year, Terrebonne produced 199,981 feet of farmed alligator with a gross farm value of $3,386,273; Lafourche produced 169,696 feet with a gross farm value of $2,884,846 (LSUAC 2004c).

III. RECREATIONAL AND COMMERCIAL FISHING INDUSTRIES AND PARTICIPANTS IN LOUISIANA

Recreational and Charter Fisheries. Louisiana ranks in the top ten states in terms of the number of registered recreational vessels. In 2004, there were 324,900 registered recreational boats in Louisiana (LDWF 2005). Annual revenues from recreational angling and charter boat fishing in Louisiana are substantial. In 2003, recreational fishing in Louisiana generated a total of $895 million in retail sales, with a total state combined economic effect of $1.6 billion dollars (includes multiplier effect). In that year, recreational fishing and associated marine services supported 17,000 jobs, and paid out $395 million dollars in salaries and wages. Further, recreational fishing generated some $120 million in sales and motor fuel, state, and federal income tax revenues (American Sportfishing Association 2004).

According to the Gulf States Marine Fisheries Commission (GSMFC 2005), there were an estimated 532 charter vessels operating in Louisiana in 2004. In that year, 1.1 million anglers took a total of 4.8 million recreational fishing trips in Louisiana (NMFS 2005c). Figure 17 provides GIS analysis of the charter and support facilities located in Southeast Louisiana prior to Hurricane Katrina.



Charter or Support Facility

Large symbol for clusters too close to map

Estimated Storm Surge

Estimated Post Storm Flooding

Charter and Support Facilities of the Southeast Louisiana Coast and Hurricane Katrina Affected Areas

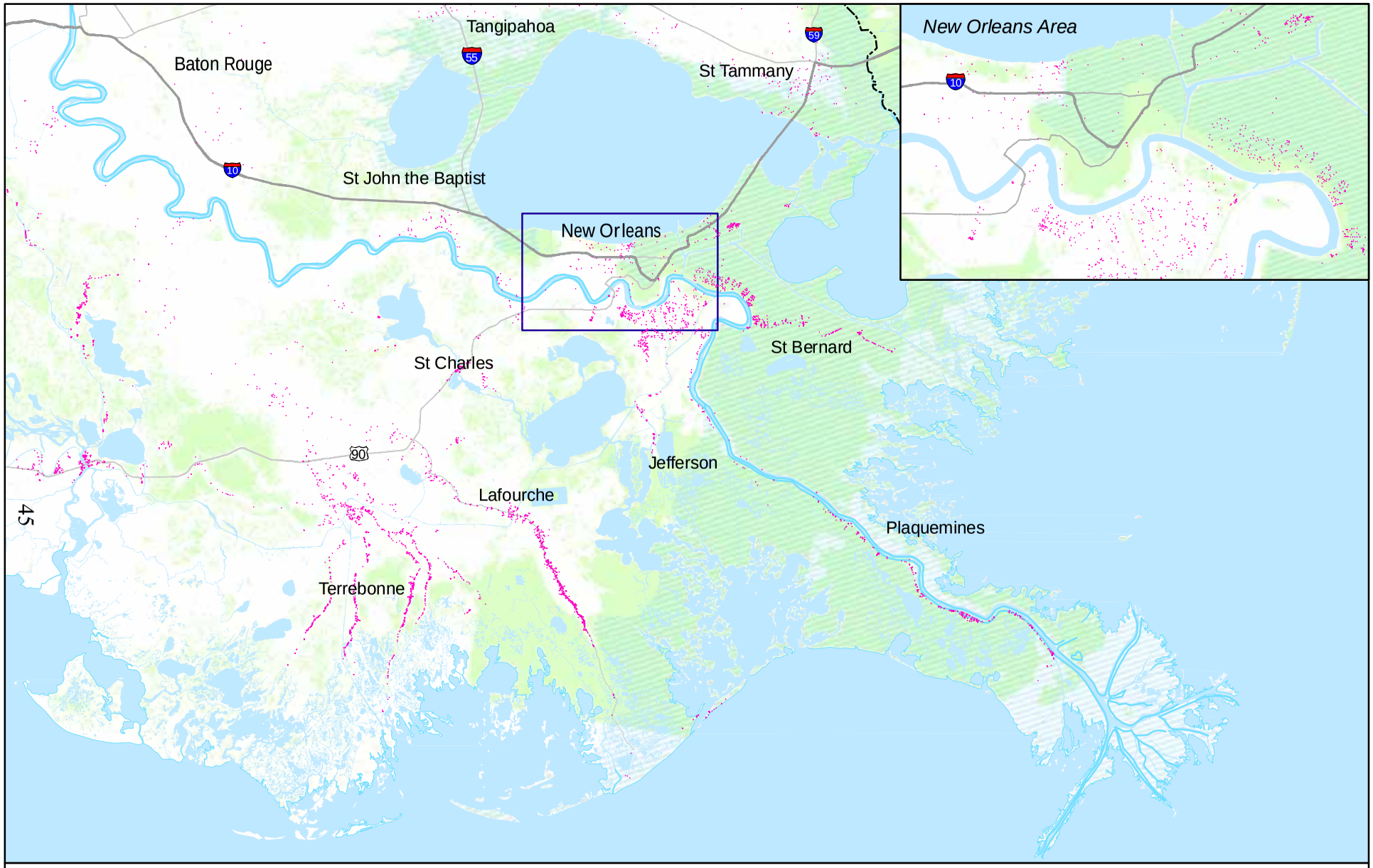
Note: This graphic has a resolution of 300 dpi, allowing the viewer to zoom in .

Miles

0 5 10 20 30 40

Commercial Fishery Participants. According to the U.S. Census Bureau (2004), approximately 17,000 or 0.09 percent of the employed civilian population in Louisiana identified farming, fishing, and forestry occupations as their primary source of income. This figure is largely unchanged from the Census 2000 report (0.08 percent). However, empirical research suggests that the actual number of commercial fishery participants in Louisiana may be higher than recorded according to Census criteria. Many commercial fishermen work on a part-time basis, supplementing their incomes with second or even third jobs, and, therefore, do not claim fishing as their primary occupation.

Preliminary data released in 2004 by NMFS (Southeast Region) indicate a total of 8,433 commercial fishery participants in the State of Louisiana (1,033 federal permits and 7,400 state licenses). Of the federal permits, 757 were for shrimp (NMFS SEFSC 2004). In that same year, the LDWF reports a total of 7,679 resident shrimpers (commercial and recreational combined) in the State of Louisiana. In 2005, the number of state licensed shrimpers (combined) dropped to 6,694 (LDWF 2006a). Figure 18 provides GIS analysis of the commercial fishing permit holders located in coastal Southeast Louisiana and areas affected by Hurricane Katrina.



Commercial Fishing Permit Holder

Estimated Storm Surge

Estimated Post Storm Flooding

Commercial Fishing Permit Holders
of the Southeast Louisiana Coast
and Hurricane Katrina Affected Areas

Note: This graphic has a resolution of 300 dpi,
allowing the viewer to zoom in .

Miles

0 5 10 20 30 40

Terrebonne, Jefferson, Lafourche, Plaquemines, and St. Bernard Parishes have the highest number of resident shrimp license holders in the state; some 66 percent of all state shrimpers reside in these parishes (LDWF 2006a). In all, there were 4,935 state-licensed vessels and 4,767 state-licensed commercial fishermen (all species combined) with addresses in these parishes when Hurricane Katrina made landfall (Table 15) (LDWF 2006a).

Table 15. Commercial Shrimp Licenses in Louisiana by Parish (Top 12): 2005

Parish	Rank by Number of Licenses	Number of Licenses 2005	Percent of Statewide Total	Change in # between 1989 and 2005	% Change between 1989 and 2005
Terrebonne	1	1,234	18.4	(1,428)	-53.6%
Jefferson	2	1,120	16.7	(1,836)	-62.1%
Lafourche	3	901	13.5	(1,078)	-54.5%
Plaquemines	4	732	10.9	(279)	-27.6%
St. Bernard	5	437	6.5	(698)	-61.5%
St. Mary	6	239	3.6	(476)	-66.6%
St. Tammany	7	235	3.5	(394)	-62.6%
Orleans	8	217	3.2	(535)	-71.1%
Vermilion	9	210	3.1	(393)	-65.2%
Iberia	10	189	2.8	(370)	-66.2%
St. Charles	11	165	2.5	(224)	-57.6%
Cameron	12	133	2.0	(202)	-60.3%
Remaining 46 Parishes Combined	--	882	13.3	(913)	-49.1%
Statewide (58 Parish) Total	--	6,694	100.0	(8,826)	-53.5%

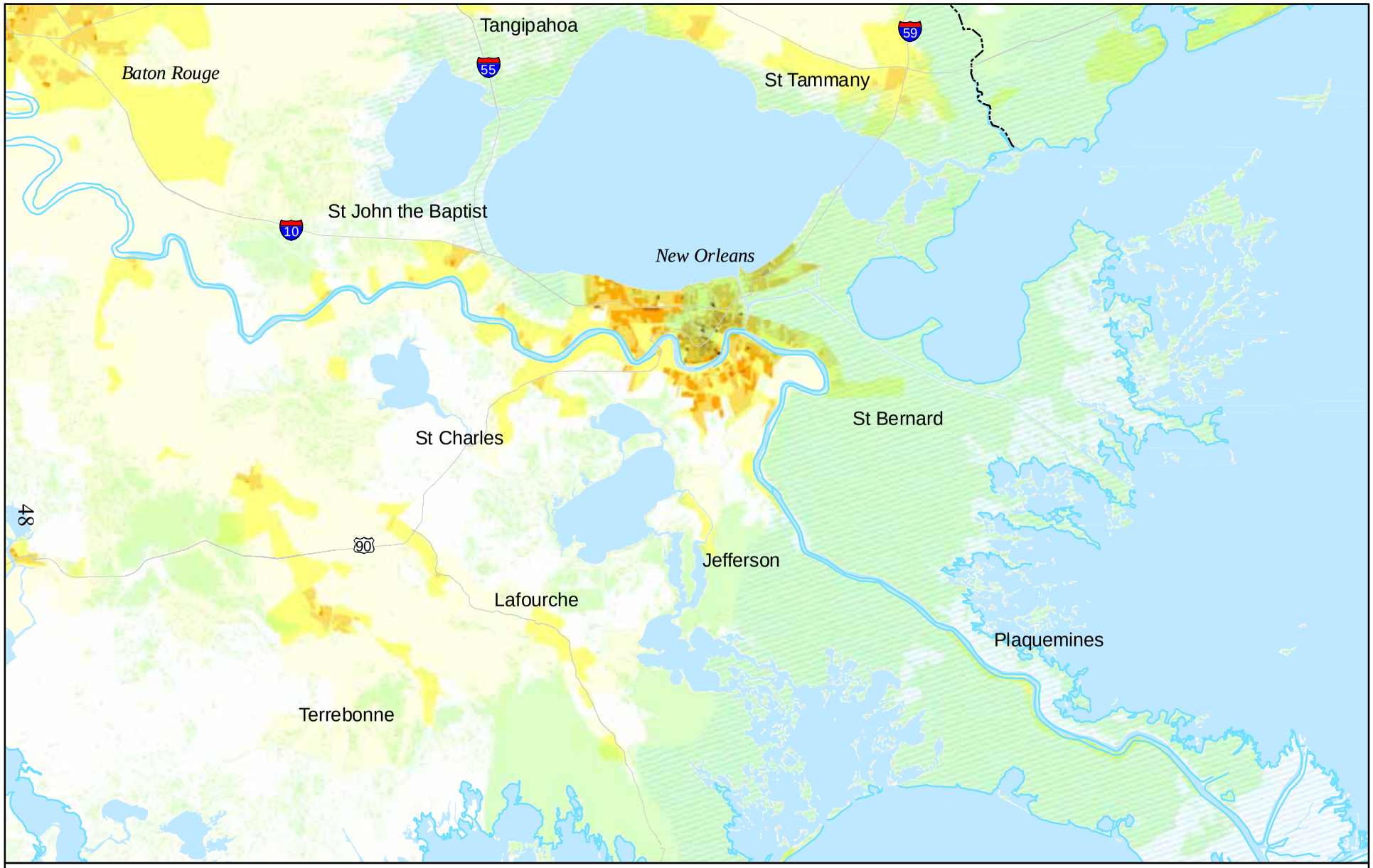
Source: LDWF 2006a.

C. Hurricane Katrina: Louisiana State Fisheries Impact

I. GEOGRAPHY OF STORM SURGE AND WINDS ASSOCIATED WITH HURRICANE KATRINA

Hurricane Katrina, one of the most destructive storms in our nation's history, made landfall along the Central Gulf Coast on August 29, 2005. With rain bands up to 300 miles long, an eye 32 miles wide (ten is typical for a storm of this magnitude), and winds extending roughly 105 miles from its center many Gulf Coast communities experienced extensive damage. In Louisiana, the eye passed near Buras and Empire with Category 4 winds. As the pin-wheeling storm crossed the Breton and Chandeleur Sounds to the east, it decimated thousands of acres of oyster reefs and wetlands.

Figure 19 depicts, at the level of block groups, the pre-Katrina distribution of the year 2000 population in Southeast Louisiana in relation to the storm surge, inundation, or flooding associated with Hurricane Katrina.



Persons per Hectare

- 0.1 - 1
- 1 - 10
- 10 - 25
- 25 - 50
- 50 - 75
- 50 - 100
- 100 - 200
- Estimated Storm Surge
- Estimated Post Storm Flooding

Population Density by Census 2000 Blockgroup of the Southeast Louisiana Coast and Hurricane Katrina Affected Areas

Note: This graphic has a resolution of 300 dpi, allowing the viewer to zoom in .

Miles

0 5 10 20 30 40

Residents of communities in St. Bernard and Plaquemines Parishes experienced severe wind and storm surge damage. Officials estimate that the storm surge in Pointe a la Hache was over 14 feet. Many areas in southeast Louisiana were completely submerged (Figure 20).

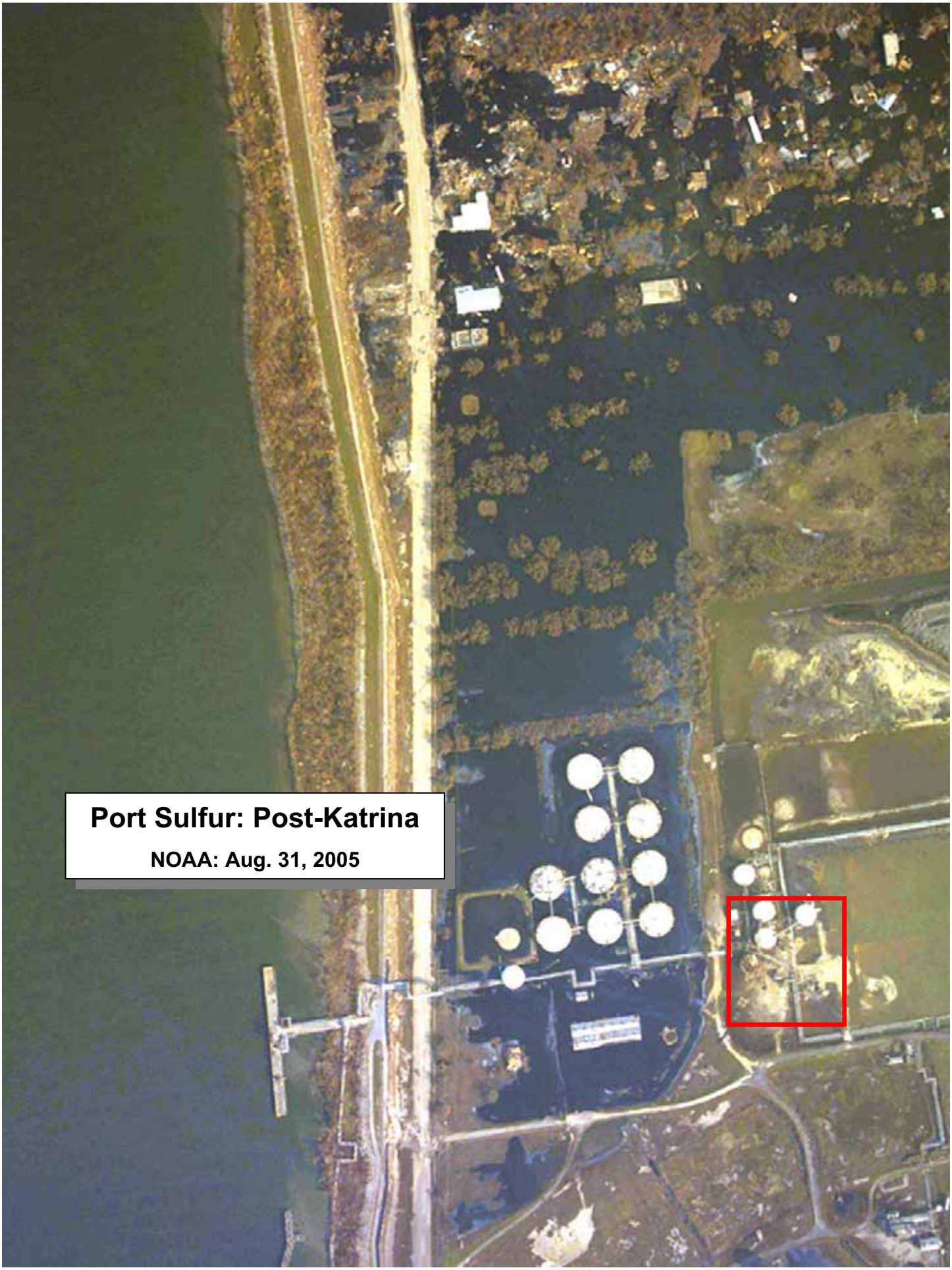
Figure 20: Venice, Louisiana.
Source: IAI Staff, September 2005.

Grand Isle, located due west of Venice in Jefferson Parish, also was hard-hit, receiving 12 feet of storm surge from Barataria Bay to the north, rather than from the ocean to the south. This surge, created by the southwest quadrant of Hurricane Katrina pushing water across the shallow bay, literally swept away numerous homes in this area. Long-time residents reported that, to their knowledge, this was the first time flooding occurred from the bay side. Hurricane Rita, which occurred on September 24, 2005, caused even more extensive damage to areas previously affected by Katrina. This second powerful storm further complicated already challenging recovery efforts (Figure 21).

Figure 21: Lafitte (Jefferson Parish) in the Wake of Wind Damage from Hurricane Katrina and Surge Damage by Hurricane Rita.
Source: IAI Staff, September 2005.

Louisiana has only experienced one storm with stronger sustained winds than Hurricane Katrina in recent history—Hurricane Camille (August 1969). This hurricane made landfall in Mississippi as a Category 5 storm and caused considerable damage to both Mississippi and Louisiana. Hurricane Betsy (1965) is another key point of reference for long-term Gulf Coast residents. With gusts up to 160 mph, this hurricane made landfall in southeast Louisiana, destroying almost every building in Grand Isle.

Figures 22 through 27 provide an aerial survey of some of the infrastructure damage that resulted from Hurricane Katrina.


Port Sulfur: Post-Katrina
NOAA: Aug. 31, 2005

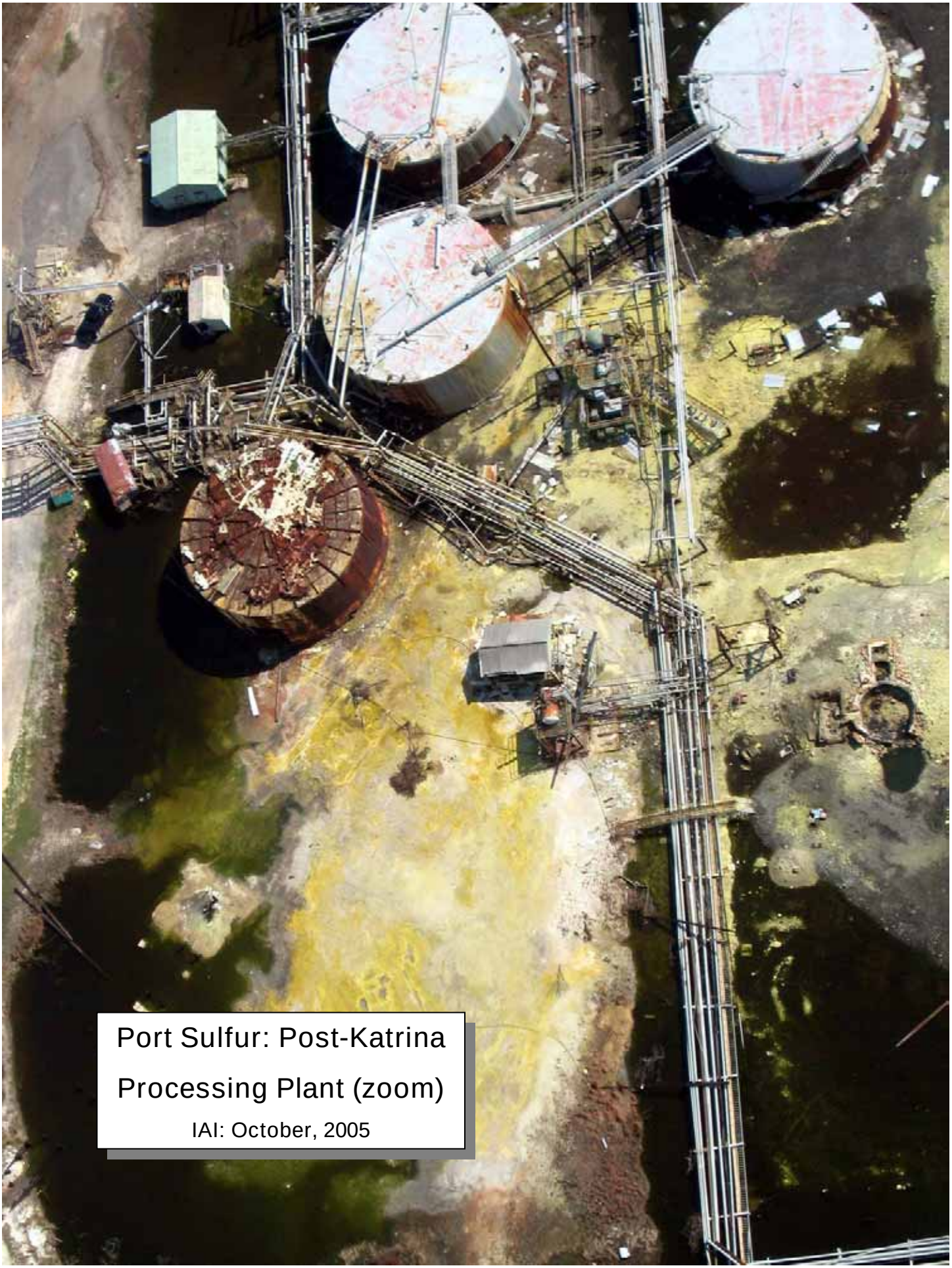
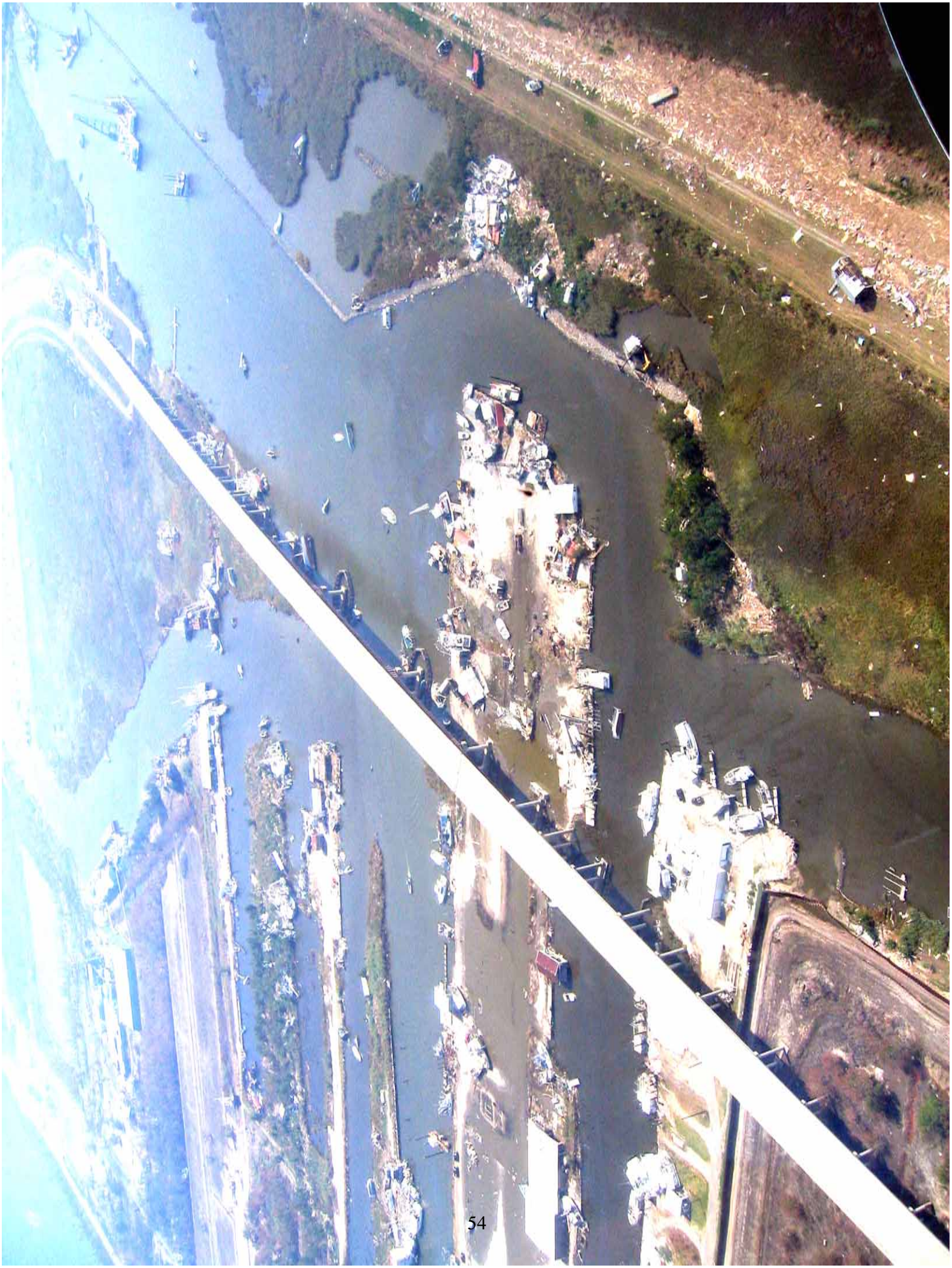
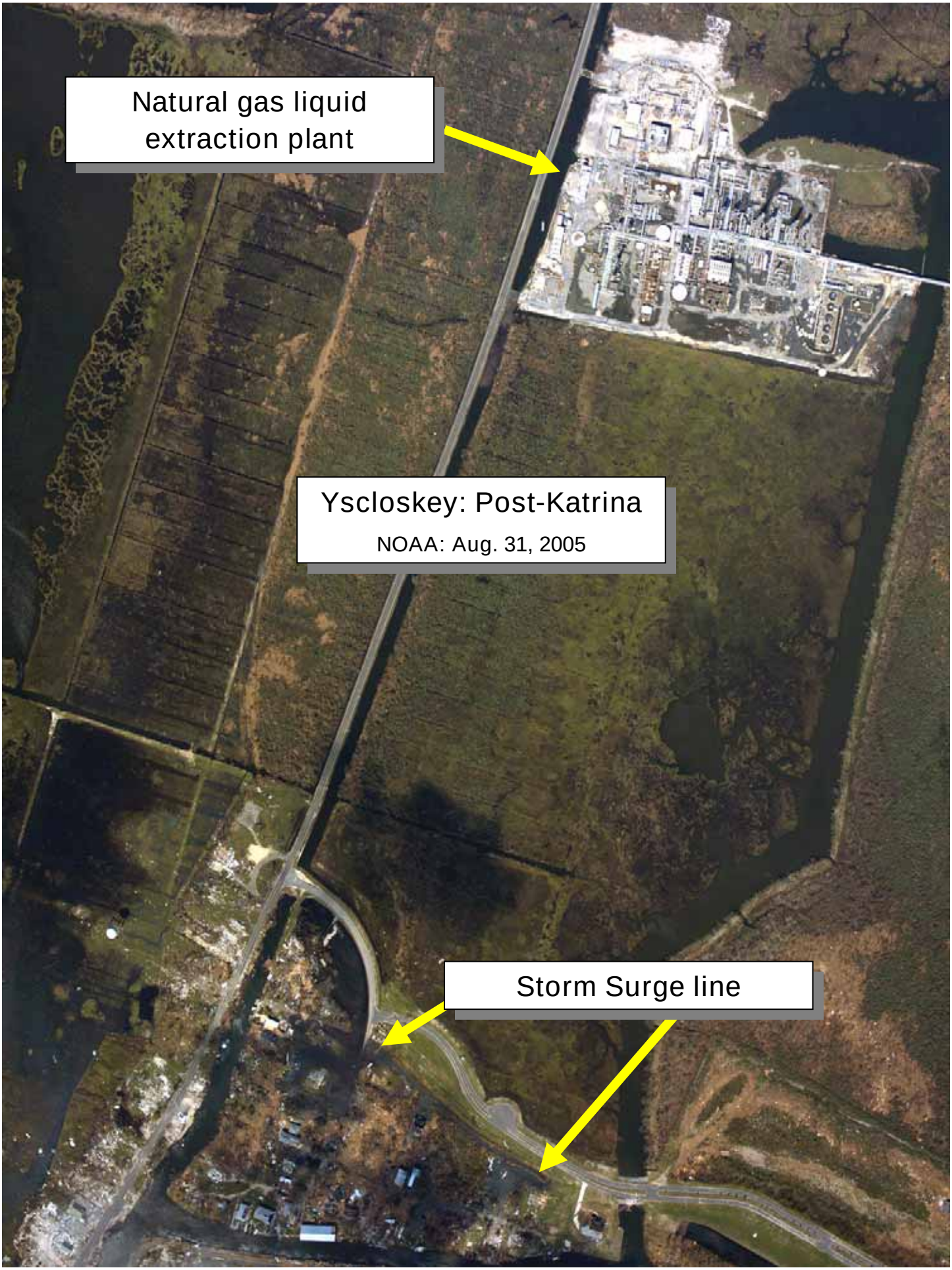

Port Sulfur: Post-Katrina
Processing Plant (zoom)
IAI: October, 2005

Figure 17
Port of Venice
IAI Overflight
October 2005




Natural gas liquid extraction plant
Yscloskey: Post-Katrina
NOAA: Aug. 31, 2005
Storm Surge line

Jean Lafitte: Post-Katrina
NOAA: Aug. 31, 2005

Preparing for the Storm. In the two days preceding Hurricane Katrina (August 27-28, 2005), fishermen in Louisiana generally adopted one of two plans for minimizing damage to their boats. They either tightly moored their boats at their home docks, or they moved their vessels up into the bayous and lock systems. Most generally, Plaquemines Parish fishermen and St. Bernard Parish fishermen remained moored at their home ports. Many, in fact, had already off-loaded at facilities further west (Grand Isle and Dulac) in anticipation of the storm and had returned home in order to secure belongings. While most of the boats moored in the bayous in the aftermath of Katrina were from Grand Isle, Bayou Lafourche, and Dulac/Cocodrie, many also came from St. Bernard and Plaquemines Parishes. Others unable to move in time moored at the public docks in Port Fourchon and off-loading areas in Port Fourchon and Leeville. Many from south Terrebonne Parish relocated their boats to Houma for safekeeping.

One's decision to steam inland prior to a storm or remain in one's home port can be complicated by many indeterminate factors. Moving up to the Lafitte/Barataria area potentially means that, following a storm, one's vessel could be trapped inside by fallen bridges, excess debris in the water, or newly-created sand bars. Should a fisherman be caught inshore after a storm, he risks losing productive work days. Significantly, many fishermen believe good fishing follows stormy weather.

Interviews with fishermen throughout southeast Louisiana reveal four primary reasons for returning to one's home port: (1) limited experience with hurricanes *of this magnitude*; (2) sufficient experience with hurricanes in general to know that they often randomly alter course; (3) in the case of Venice/Empire fishermen, lack of an established tradition of moving up-bayou prior to major hurricanes; and (4) anticipation of large catches in the days following the storms (the "jack-pot"). All individuals interviewed explained that, although they were aware of the storm's magnitude, they did not anticipate the damage it would incur. As the mean age of fishermen presently fishing Louisiana waters is about 45 years, most are too young to remember much about the hugely destructive Hurricanes Betsy (1965) and Camille (1969). Furthermore, the majority of fishery participants of Vietnamese ancestry who settled along the Gulf Coast in the late 1970s had never experienced a hurricane of this magnitude.

On the other hand, Cajun fishermen *have* grown up listening to stories about Hurricane Betsy and Camille. These "danger narratives" may contribute to the boat relocation along the inland waterway system, particularly Bayou Lafourche, in Lafourche Parish. This water body is protected by the northern lock located south of Larose and the southern lock located just north of Leeville. This lock system provides protection against storms; even during Hurricane Katrina, it proved ample protection. More than half of the southeast Cajun fleet moored inside this lock system and sustained comparatively minimal impacts to their vessels. The remaining boats relocated to the Barataria/Lafitte area, which provided substantial protection for the moored vessels from Katrina's winds (Figure 28).

Figure 28: Golden Meadow Shrimper who had Moored his Vessel in Bayou Lafourche prior to Katrina Resuming Work Immediately after the Storm.
Source: IAI Staff, September 2005.

II. EFFECTS OF HURRICANE KATRINA ON LOUISIANA'S MARINE-BASED INFRASTRUCTURE

The wind and water damage caused by Hurricane Katrina initially led to closure of the state's commercial fishing industry. Infrastructure associated with commercial and recreational fishing, maritime transportation, and the petrochemical industry was particularly hard-hit. All along this coastal region of Louisiana, marinas, icehouses, boat launches, docks, piers, seafood restaurants, vessels, bait and tackle shops, and processors were either destroyed or rendered inoperable.

Commercial and recreational fishery participants in the hardest hit areas of St. Bernard and Plaquemines Parishes have endured extremely difficult challenges as they struggle to recover. In Plaquemines Parish, for example, nearly 100 percent of its marine-based infrastructure was destroyed. In Venice, alone, nearly 1,000 fishing vessels and a majority of homes were obliterated. Much of this parish still lacked electricity, water, phone service, supply centers, and medical services as of mid-June, 2006. This absence of infrastructure prevents displaced residents from returning; many continue to reside with friends and relatives outside of the area in neighboring Belle Chasse, Gretna, Westwego, or Harvey.

The absence of services has also hindered the recovery of Plaquemines' seafood industry. Most critical has been the lack of ice. Since Katrina, most offloading facilities have had to truck their

ice in from great distances and rely on makeshift strategies to resume even limited operations. A main power line installed in April 2006 needed for supplying power to the offloading facilities located in the southernmost area of Plaquemines had yet to be hooked up as of May 2006, as the demand for electricians in the area exceeds their availability to provide service.

The recovery of the Plaquemines commercial fishing industry also remains constrained by a lack of federal assistance for upgrading its levee system, without which puts the region at high risk for serious wind and water damage from future and inevitable storms. While the Bush administration has approved more than $3.5 billion for repairing New Orleans' levee system, it is reluctant to provide the additional estimated $1.6 billion to $2.9 billion the Army Corps of Engineers says is needed to protect the residents of Plaquemines (Alpert and Powell 2006). Officials argue that the combination of damaged levees and loss of barrier islands and wetlands from Katrina have left Plaquemines Parish–and nearly 15,000 residents–especially vulnerable to flooding from storms that are Category 3 or higher. While only 2 percent of the region's local population resides in Plaquemines, it is a major hub for the seafood, charter, and oil industries. Thus, the degree to which these industries can recover strongly hinges upon the commitment the current administration will make to fund its recovery (Alpert and Powell 2006). Additionally, without adequate flood protection, residents may not be able to get flood insurance, and without flood insurance they may not rebuild.

The infrastructure in St. Bernard Parish was also awaiting repair as of June 2006. Although electricity was partially restored in the inland communities of Delacroix and Hopedale between March and May 2006, many bayou-side communities were still relying on generators for power, and some offloading facilities still lacked water service. As of May 2006, only two of six off-loaders in St. Bernard Parish had resumed operations, and one of these off-loaders was relying on a generator to make ends meet for the 2006 shrimp season:

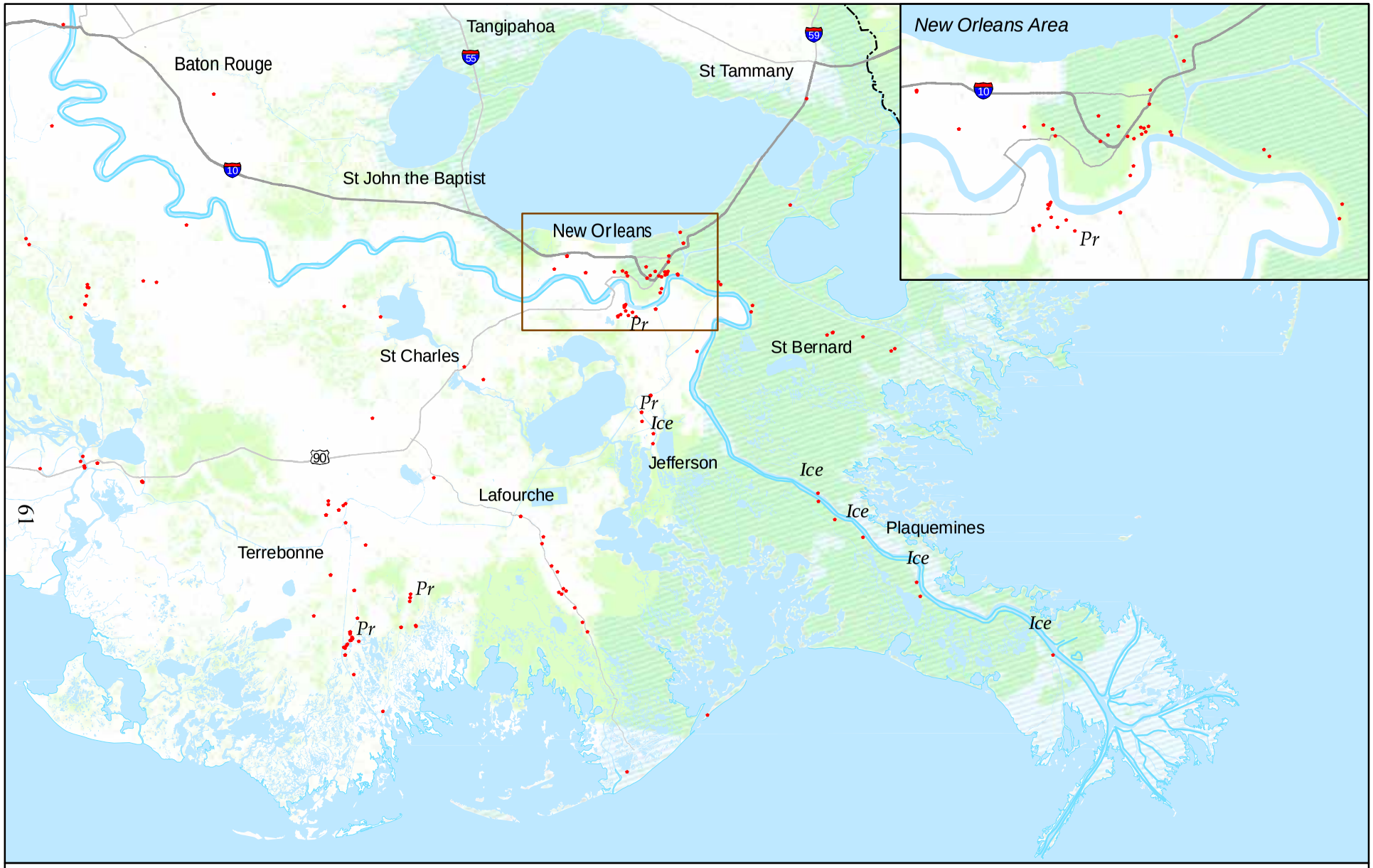
> My ice machine could be ready if we had power. Yesterday, we unloaded 6,000 pounds [of shrimp], getting mostly 80-100 count, from 30 to 40 people in the last three days. Ice costs $15 a block at Amigo Ice. My freezers would be okay if we had power; we need to repair the walk-in coolers (Personal Communication, IAI, St. Bernard Parish, May 14, 2006).

State officials in the most severely damaged coastal parishes all made the same claims: infrastructure damage, debris in the water, fuel costs, lack of marine supplies and services, and labor shortages continue to hamper recovery efforts. The diminished processing and cold-storage capacity along the coast has further impeded industry recovery (CNREP 2005).

Diesel fuel, however, has gradually become more available in Venice where all supply centers were destroyed. Since May 2006, shrimpers have been able to purchase some diesel from Stone Fuel located at the Coast Guard Station (Personal Communication, IAI, LDWF, May 03, 2006).

Seafood Processors. The report *Fisheries of the United States 2004* identified a total of 90 seafood processors (14 shrimp) located throughout the State of Louisiana employing 2,273 workers in 2003 (NMFS 2005c). These processors ranged from comparatively large corporate operations, such as the Bumble Bee Cannery in St. Bernard Parish, to small backyard enterprises.

Fisheries of the United States 2004 also identified 114 wholesale seafood plants employing 732 workers in 2003 (NMFS 2005c). Figure 29 depicts the seafood processors located along the southeast coast of Louisiana prior to Hurricane Katrina.



Seafood Processor
Pr Peelers
Ice Ice Provider

Estimated Storm Surge
Estimated Post Storm Flooding

Seafood Processors
of the Southeast Louisiana Coast
and Hurricane Katrina Affected Areas

Note: This graphic has a resolution of 300 dpi, allowing the viewer to zoom in .

Miles
0 5 10 20 30 40

Bumble Bee Cannery in Violet (St. Bernard Parish) and Piazza Seafoods in New Orleans (Orleans Parish), the two largest seafood processors in coastal Louisiana, were left inoperable by Hurricane Katrina. Owners of Bumble Bee—the last processor in the country to can domestically-caught shrimp landed in U.S. waters— has permanently closed due to the costs associated with rebuilding. A long-time employee explained that the facility had been experiencing challenges prior to the hurricane, and that Katrina may simply have sounded the death knell (Foster 2005) (Figure 30).

Figure 30: Severely Damaged Seafood Processing Equipment in Jefferson Parish. Source: IAI Staff, October 2005.

Although the total damage to this industry is still under assessment, the number of processors that existed in coastal Louisiana prior to the storms provides a baseline for assessing this impact. Thirty-one of Louisiana's 64 parishes are federally recognized as affected by Hurricanes Katrina and Rita. Eighty-three percent of Louisiana's seafood processing establishments and all eight of its seafood canning factories were located in a hurricane-affected parish (Harrison and Sambidi 2005).

Accelerated labor shortages in the seafood industry correlate with facility damage. The combined effect of demand and supply pressures on the local labor market is notable. On average, processors in the affected parishes have lost between 35 and 40 percent of their labor force to the aftermath of Katrina (Table 16). To compensate for this loss, many employers have increased their reliance on immigrant labor (IAI, Field Observations, October 2005-May 2006). While an increased reliance on immigrant labor is an industry trend that predates Katrina, it is one that has become even more prevalent as operators struggle to reduce expenses in light of the

cumulative effects of the storm. Indeed, many functioning processors continue to work at reduced capacity due to labor shortages.

Table 16. Labor Losses among Large-Scale Processing Plants in Affected Louisiana Parishes

Number of Processors	Parish	Employees as of 8/28/05	Employees after 8/29/05	Operational Status as of Nov. 2005	Operational Status as of May 2006
8	Terrebonne	385	167	Operating	Operating
2	Jefferson	170	108	Operating	Operating
3	Lafourche, Orleans, St. Bernard	250	35	2 inoperable, 1 operating	2 operating, 1 out of business

Source: IAI, Field Observations, 2005 & 2006.

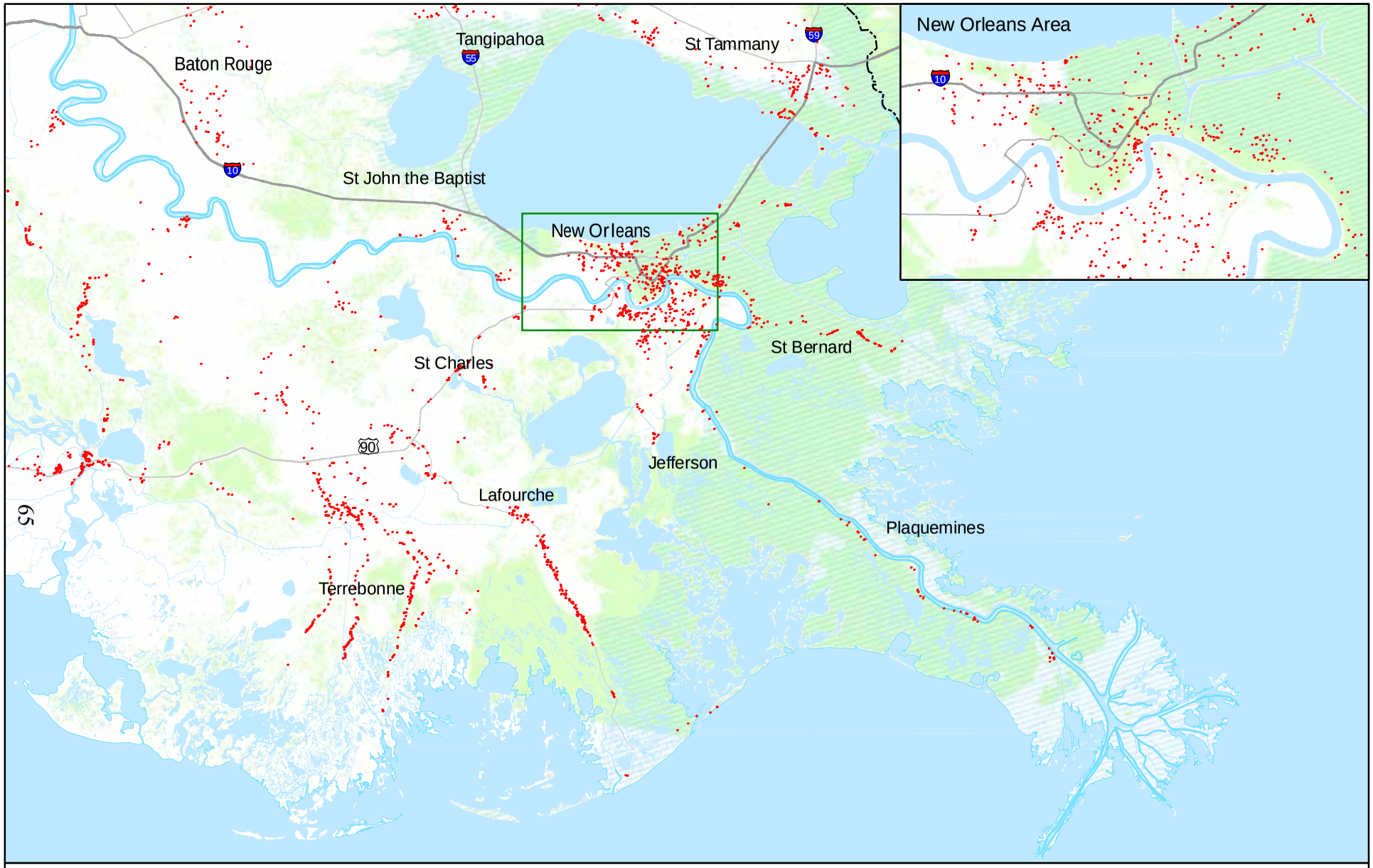
Jefferson Parish experienced a 56 percent labor loss in its seafood retail sector and a 33 percent decline in its processing, offloading, and wholesale sectors between 2004 and 2006 (Table 17). Two Jefferson Parish communities –Lafitte and Gretna– experienced a 50 percent labor decline in their processing and offloading sectors between 2004 and 2006: Lafitte lost 72 employees; Gretna lost 20 (IAI, Field Observations, May 2006). Employment in Lafourche and Terrebonne Parishes also declined in these sectors, although their losses were primarily in processing, offloading, and wholesale rather than in retail. Some of these labor losses are due to Katrina, while others are related to general downward trends in the industry.

Table 17. Employment Loss by Parish in Select Seafood Processing and Offloading Facilities*: April 2004 and April 2006

Community	# of Facilities	# of 2004 Employees	# of 2006 Employees	% Change, 2004 to 2006
Jefferson Parish				
Barataria, Grand Isle, Lafitte, Gretna, Westwego	12	360	157	-56%
Lafourche Parish				
Cut Off, Leeville, Galliano, Golden Meadow, Port Fourchon	9	98	66	-33%
Terrebonne Parish				
Chauvin, Cocodrie, Dulac, Theriot	19	604	372	-38%

* Includes processors, off-loaders, and wholesalers.
Source: IAI, Field Observations, 2006.

Seafood Dealers. Figure 31 maps the location of seafood retailers and wholesalers in southeast Louisiana prior to Hurricane Katrina.



Seafood Dealer

Estimated Storm Surge

Estimated Post Storm Flooding

Seafood Retailers and Wholesalers
of the Southeast Louisiana Coast
and Hurricane Katrina Affected Areas

Note: This graphic has a resolution of 300 dpi,
allowing the viewer to zoom in .

Miles

0 5 10 20 30 40

About 33 percent of the state's wholesale and retail seafood dealers were located in parishes where the hurricane made landfall (Table 18) (Alford 2005a; LDWF 2005). These parishes include the study communities located within Jefferson, lower Lafourche (includes all communities south of Cut Off), Plaquemines, and St. Bernard.

Table 18. Licensed Wholesale/Retail Seafood Dealers by Parish: 2004

Parish	Wholesale/Retail Seafood Dealers
Jefferson	143
Lower Lafourche	36
Plaquemines	58
St. Bernard	51
Orleans	69
St Tammany	69
Total	426
Percent of State	32.5%

Source: LDWF September 7, 2005.

Employment at seafood retail facilities has also fallen in the wake of Katrina, although its incipient decline predates this storm (Table 19).

Table 19. Employment Loss by Parish in Select Seafood Retail Facilities: April 2004 and April 2006

Community	# of Facilities	# of 2004 Employees	# of 2006 Employees	% Change, 2004 to 2006
Jefferson Parish				
Barataria, Grand Isle, Lafitte, Gretna, Westwego	28	134	90	-33%
Lafourche Parish				
Cut Off, Leeville, Galliano, Golden Meadow, Port Fourchon	10	58	52	-10%
Terrebonne Parish				
Chauvin, Cocodrie, Dulac, Theriot	3	13	13	0%

Source: IAI, Field Observations, 2006.

Off-loading facilities associated with wholesale seafood distributors and processors constitute a large portion of Louisiana's seafood industry infrastructure. At least 50 such facilities served participants in each of the five study parishes of St. Bernard, Plaquemines, Jefferson, Lafourche,

and Terrebonne. The majority of these facilities catered to the shrimp industry. Most offloading facilities in Louisiana also produce their own ice for their commercial fleet and packing (Figure 32).

Figure 32: Damage to Fisheries Infrastructure in Southwest Louisiana (X=Off-loading Sheds; I= Ice Plants; O = Processors). (All Infrastructure East of Dotted Line was Significantly Disrupted.)

Source: Base map courtesy of Louisiana Map Online; Facility detail courtesy of IAI staff 2005.

Katrina destroyed or incapacitated the majority of ice-plants in Plaquemines, St. Bernard, and Jefferson Parishes. In this study, an "ice-plant" refers to those facilities that produce and sell ice to fishermen. An off-loading facility may also produce its own ice, but it is usually for in-house use only. Prior to Katrina, there were eight ice-plants in Plaquemines Parish: seven small facilities in Venice/Boothville and Buras/Empire, producing approximately 30 tons of ice per facility per day, and one larger facility in Port Sulphur. In St. Bernard Parish, there was only one plant in Yscloskey that produced substantial amounts of ice. Jefferson Parish had five ice plants: two in Lafitte and three in Grand Isle. Together, these five plants produced nearly 300 tons of ice per day, pre-Katrina. Finally, there was one ice plant in Lafourche Parish in Leeville. In all, there were 15 major facilities selling ice to fishermen in these four coastal parishes.

Unfortunately, the storm initially put 12 of these 15 ice plants out of commission, thereby incapacitating the commercial and recreational fishing industries in the region. As small- and medium-sized boats with little on-vessel cold storage capacity comprise the majority of the Louisiana fleet, ice plants and storage sheds are critical to the industry's success (Table 20).

Table 20. Pre- and Post-Katrina Status of Select Industry Infrastructure in Southeast Louisiana: 2005

Parish(es)	Number of Processing Plants	Number of Ice Plants	Number of Off-loading Sheds	% of Open Facilities (combined), Dec. 1, 2005	% of Closed Facilities (combined), Dec. 1, 2005
Terrebonne	8	0	5	100	0
Jefferson, Lafourche, Plaquemines, St. Bernard	4	15	40	46	54 (10 ice plants, 21 off-loading sheds, 1 processing plant)
Total	12	15	45	55	45

Source: IAI, Field Observations, 2005.

Although 8 of these 15 ice plants had fully resumed operations by May 2006, they were unable to meet the demand for ice which escalated precipitously following the start of the 2006 shrimp season (Table 21). As of mid-June 2006, the limited supply of ice continues to curtail the fishing efforts of commercial shrimpers who are trying to earn a living (IAI, Field Observations, 2006).

Since the storm, much local effort has gone into addressing the storm-related destruction of ice-making and ice storage capacity. On August 23, 2006, Shell Oil donated $500,000 to the Louisiana Wildlife and Fisheries Foundation assist with the recovery effort. These monies will be used to cover the costs of purchase, delivery and installation of three industrial ice machines. Because Chalmette is the regional ice hub of southeast Louisiana, the two of the new machines, capable of producing 20 tons of ice per day, will be located in Chalmette, St. Bernard Parish; the third will be located in Cameron, Cameron Parish (Ewell 2006).

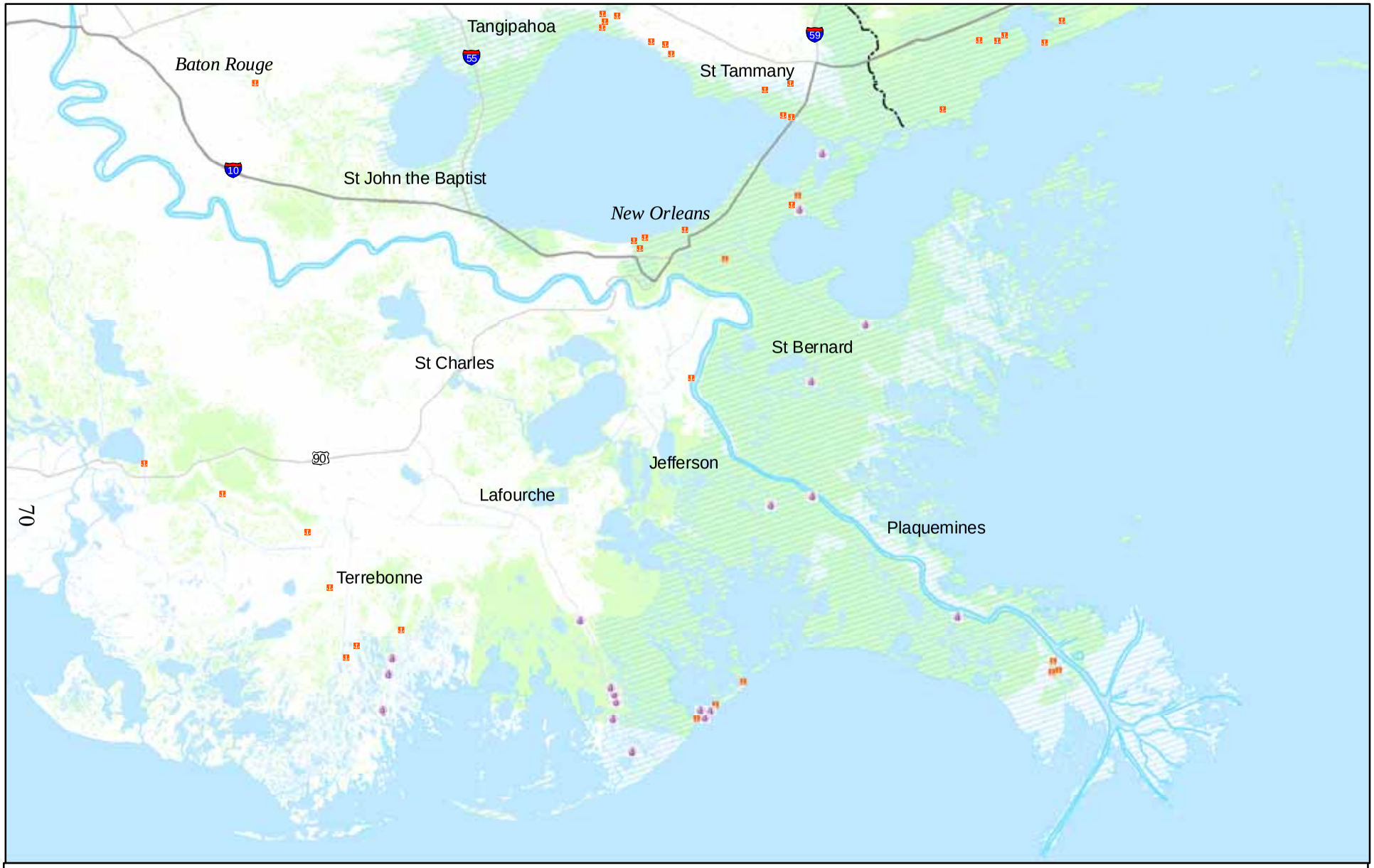
Table 21. Hurricane Effects on Ice Plant Production of Select Facilities in Louisiana: May 2006

Parish(es)	Number of Facilities	Pre-Storm Production Tons/Day	Post Storm Production Tons/Day	Operational Status, May 2006
Jefferson	6	~330	~465	6 operating
St. Bernard, Lafourche, Plaquemines	5	~320	~60	3 operating, 2 out of business

Source: IAI Field Observations, 2005 & 2006.

Two of the facilities in Jefferson Parish invested in new, larger ice production machines after Katrina destroyed their old equipment, thereby increasing their post-storm ice production capacity. As Jefferson Parish is the last place to stop for ice before heading out to sea, those two facilities serve as a strategically important offloading and supply hub for ice-dependent vessels that would otherwise have to travel to Barataria Bay to meet their service needs (IAI, Field Observations, 2006).

Marinas. Hurricane Katrina also caused major structural damage to many of the marinas in southeast Louisiana. There are approximately 80 recreational marinas in coastal Louisiana, 22 of which are located in the five study parishes. While there are some large, well-appointed marinas that can accommodate 100-plus vessels, most are small "mom and pop" operations with limited slips (>50) and amenities. The latter are common in rural areas of the study parishes (Louisiana Sea Grant 2006a). Figure 33 depicts the location of the marinas along the southeast coast of Louisiana prior to Hurricane Katrina.



Marina

Small Marina

Small Marinas are those with 50 or fewer slips.
This distinction can only be made for Louisiana.

Estimated Storm Surge

Estimated Post Storm Flooding

Marinas of the Southeast Louisiana Coast and Hurricane Katrina Affected Areas

Note: This graphic has a resolution of 300 dpi, allowing the viewer to zoom in .

Miles

0 5 10 20 30 40

As of May 2006, 80 recreational marinas in coastal Louisiana are fully operational; 27 are partially operational, and 46 remain closed. Of the 21 marinas located in the study parishes, the majority (81%) have reopened for business, if only partially. Within these study parishes, three marinas in St. Bernard Parish (Yscloskey, St. Bernard) and one in Plaquemines Parish (Empire) remain closed, while one in Lafourche Parish (Galliano), one in Jefferson Parish (Grand Isle), and one in St. Bernard (Hopedale) are partially operational (Figure 34) (Table 22) (Louisiana Sea Grant 2006a).

Figure 34: Marina in Lafourche Parish.
Source: IAI Staff, October 2005.

Table 22. Operational Status of Louisiana's Recreational and Commercial Marinas in the Five Study Parishes: May 2006

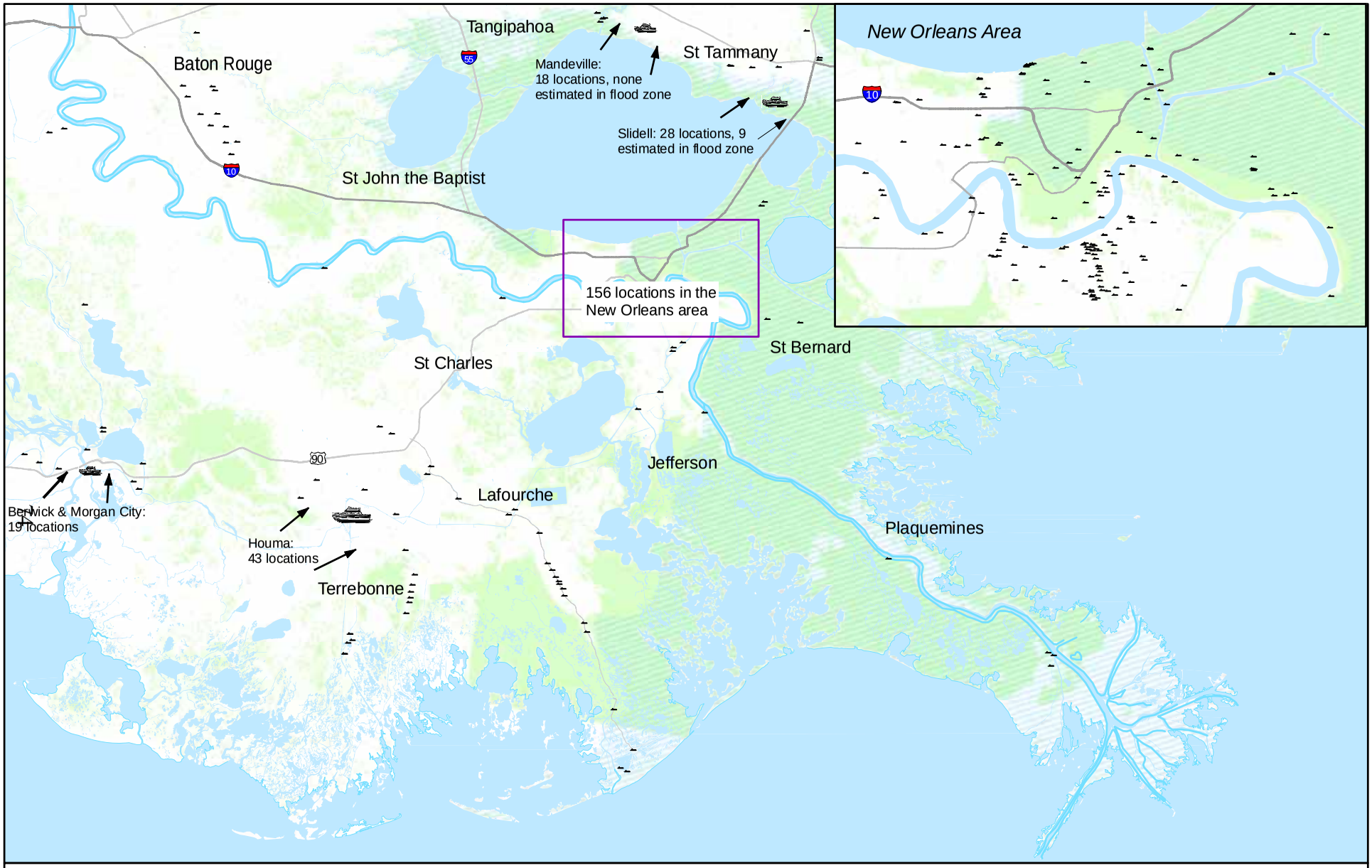
Marina	Parish	Community	Status
Bridge Side Marina & Cabins	Jefferson	Grand Isle	Open
Gulf Stream Marina	Jefferson	Grand Isle	Partially operational
Sand Dollar, Inc., Motel & Marina	Jefferson	Grand Isle	Open
Cochiara Marina	Jefferson	Lafitte	Open
Lafitte C-Way Marina	Jefferson	Lafitte	Open
Belle Pass Marina	Lafourche	Golden Meadow	Open
Bobby Lynn's Marina	Lafourche	Golden Meadow	Open
Kajun Sportsman	Lafourche	Golden Meadow	Open
Griffin's Marina & Ice	Lafourche	Galliano	Partially operational
Irvin P. Melancon Rec. Boat Launch	Lafourche	Galliano	Open
Cypress Cove Marina	Plaquemines	Venice	Open
Delta Marina	Plaquemines	Empire	Closed; clean up in progress
Riverside Marina & Guide Service	Plaquemines	Buras	Open
Gulf Outlet Marina	St. Bernard	Chalmette	Closed
Pip's Place Marina	St. Bernard	St. Bernard	Closed
Blackie Campo's Marina	St. Bernard	Yscloskey	Closed
Breton Sound Marina	St. Bernard	Hopedale	Partially operational
Boudreaux's Four Point Marina	Terrebonne	Dulac	Open
CoCo Marina	Terrebonne	Chauvin	Open
Pointe-Aux-Chien Marina	Terrebonne	Montegut	Open
T-Irv's Marina	Terrebonne	Dulac	Open

Source: Louisiana Sea Grant 2006a.

The Breton Sound Marina in St. Bernard Parish was able to resume partial operations in June 2006 by securing ice from Houma and dead bait from the north shore. Their utilities have been restored and they plan to rebuild. At that same time, nearby Joe's Landing marina in Lafitte experienced a surge in business as it absorbed customers who previously frequented other now-closed marinas. Blackie Campo's Marina in Yscloskey, however, may not reopen (Figure 35). In business for nearly a century, this marina lost its hoist to the storm and cannot afford to spend the $500,000 to replace it and still break even. The owners of Blackie's are considering reopening on a much smaller scale, offering only bait and fuel in the future (Associated Press 2006a).

Figure 35. Blackie Campo's Marina, Yscloskey, October 2005.
Source: Photo courtesy of Chuck Rogers, New Orleans resident (http://www.macchuck.com/index.html).

Figure 36 below details the location of the boat builders and related maintenance and repair facilities along the southeast coast of Louisiana. Only one remained out of business as a result of Hurricane Katrina as of June 2006.



Boat Builders & Brokers,
Maintenance and Repair

Large symbol for clusters too close to map

Estimated Storm Surge

Estimated Post Storm Flooding

Boat Builders, Brokers and Maintenance of the Southeast Louisiana Coast and Hurricane Katrina Affected Areas

Note: This graphic has a resolution of 300 dpi, allowing the viewer to zoom in .

Miles

0 5 10 20 30 40

Tables 23 through 46 below provide the number and status of marine-related infrastructure and services in Louisiana both before and after Hurricane Katrina, through May 2006. It must be stressed, however, that total damages to Louisiana's commercial and recreational fisheries are still being assessed. Additionally, currently available damage and/or loss estimates sometimes vary or even conflict between reporting agencies due to differences in data collection and assessment methods, and the units of analysis included or excluded for measurement. Further, the profound and widespread nature of the damage means that many factors confound the provision of a definitive loss assessment. Some of these confounding factors or limitations include: the difficulty in contacting displaced fishery participants to assess their damages, the need to rely on historical data to make projections about long-term economic losses, and the uncertain nature of the reconstruction process. The following sections provide and discuss both actual and projected damages and losses to various components of Louisiana's commercial and recreational fisheries as a result of Hurricane Katrina, but do not attempt a total or final quantification.

Infrastructure Tables 23 through 46 for Louisiana Study Communities in Five Parishes: Jefferson, Lafourche, Plaquemines, St. Bernard, and Terrebonne

Note: Selection of infrastructure/service/vessel items in each table varies by community and is based on the presence of the infrastructure/service item in each community at the time of original pre-Katrina data collection.

Also, extreme caution must be taken in the use of visual observation for obtaining vessel counts because of the many reasons vessels might or might not be present at the time of observation. Therefore, both increases and decreases in the number of vessels observed at any particular dock in the months following Hurricane Katrina may correlate with events and circumstances unrelated to the effects of the storm.

JEFFERSON PARISH

Table 23. Presence of Select Fishing Infrastructure, Services, and Boats in Barataria, Louisiana, Pre- and Post-Hurricane Katrina: 2004, 2005, 2006

Infrastructure or Service	Oct. 2004	Oct. 2005	March 2006	May 2006	Comments
Commercial docking facilities	2	1	1	1	1 rebuilding
Offloading facility	1	0	0	1	--
NMFS or state fisheries office (port agent, etc.)	1	1	1	1	--
Public boat ramp	1	1	1	1	--
Recreational docks & marinas	1	1	1	1	--
Bait & tackle/fishing supplies	1	1	1	1	--
Recreational fishing tournaments	1	1	0	0	--
Charter/party boats	~25	~20	n/a	~20	--
Commercial fishing boats	~100	~60	n/a	~40	--

n/a = not available.
Source: IAI, Field Observations, 2005 and 2006.

Table 24. Presence of Select Fishing Infrastructure, Services, and Boats in Grand Isle, Louisiana, Pre- and Post-Hurricane Katrina: 2004, 2005, 2006

Infrastructure or Service	Oct. 2004	Oct. 2005	March 2006	May 2006	Comments
Commercial docking facilities	1	0	1	1	--
Fish processors, Wholesale fish house	2	2	2	2	Blanchard & Estay
Ice houses	2	0	1	1	One is operating; one is rebuilding
Fishing pier	1	0	0	0	--
Hotels/Inns (dockside)	5	0	2	2	--
Offloading facilities	2	2	2	2	--
Public boat ramps	2	1	2	2	--
Recreational docks/marinas	6	0	1	1	--
Bait & tackle/fishing supplies	2	1	2	2	--
Recreational fishing tournaments	Several	0	0	0	Per annum
Seafood restaurants	7	0	0	0	--
Seafood retail markets	2	0	0	0	--
Trucking operations	2	0	2	2	--
Charter/party boats	~25	0	n/a	~9	--
Commercial fishing boats	~240	~10	n/a	~50	--

n/a = not available.
Source: IAI, Field Observations, 2005 and 2006.

Table 25. Presence of Select Fishing Infrastructure, Services, and Boats in Gretna, Louisiana, Pre- and Post- Hurricane Katrina: 2004, 2005, 2006

Infrastructure or Service	Oct. 2004	Oct. 2005	March 2006	May 2006	Comments
Air fill stations (diving)	1	0	0	0	--
Boat yards/boat builders	1	0	1	1	--
Hotels/Inns (dockside)	6*	3	6	6	*All non-dockside
Bait & tackle/fishing supplies	1	1	1	1	--
Seafood restaurants	8	6	8	8	--
Seafood retail markets	9	4	5	5	--
Charter/party boats	~20	~15	n/a	~15	--
Commercial fishing boats	~16	~15	n/a	~15	--

n/a = not available.
Source: IAI, Field Observations, 2005 and 2006.

Table 26. Presence of Select Fishing Infrastructure, Services, and Boats in Lafitte, Louisiana, Pre- and Post- Hurricane Katrina: 2004, 2005, 2006

Infrastructure or Service	Oct. 2004	Oct. 2005	March 2006	May 2006	Comments
Air fill stations (diving)	1	0	0	0	--
Boat yards/boat builders	2	2	2	2	--
Commercial docking facilities	6	5	5	5	1 rebuilding
Fish processors, Wholesale fish house	2	1	2	2	--
Ice houses	1	1	1	1	--
Fishing piers	2	0	2	2	--
Marine railways/haul-out facilities	1	0	1	1	--
Offloading facilities	6	5	5	5	--
Net makers	3	0	1	1	--
Public boat ramps	10	5	8	8	--
Recreational docks/marinas	2	1	2	2	--
Bait & tackle/fishing supplies	2	1	2	2	--
Recreational fishing tournaments	1	0	1	1	Per annum
Seafood restaurants	5	1	5	5	--
Seafood retail markets	1	1	1	1	--
Trucking operations	1	1	1	1	--
Site-seeing/pleasure tours	2	0	2	2	--
Charter/party boats	~25	~25	n/a	~25	--
Commercial fishing boats	~800	~200	n/a	~60	--

n/a = not available.
Source: IAI, Field Observations, 2005 and 2006.

Table 27. Presence of Select Fishing Infrastructure, Services, and Boats in Westwego, Louisiana, Pre- and Post-Hurricane Katrina: 2004, 2005, 2006

Infrastructure or Service	Oct. 2004	Oct. 2005	March 2006	May 2006	Comments
Air fill stations (diving)	1	1	1	1	--
Boat yards/boat builders	1	1	1	1	--
Commercial docking facilities	1	1	1	1	--
Fishing gear, electronics, welding, other repair	2	2	2	2	--
Fish processors, Wholesale fish house	2	1	2	2	--
Net makers	2	2	2	2	--
Public boat ramps	1	1	1	1	--
Recreational docks & marinas	1	1	1	1	--
Bait & tackle/fishing supplies	3	3	3	3	--
Recreational fishing tournaments	1	1	1	1	Per annum
Seafood restaurants	7	7	7	7	--
Seafood retail markets	17	17	17	17	--
Trucking operations	1	1	1	1	--
Site-seeing/pleasure tours	2	0	2	2	--
Charter/party boats	~30	0	n/a	~10	--
Commercial fishing boats	~135	~80	n/a	~80	--

n/a = not available.
Source: IAI, Field Observations, 2005 and 2006.

LAFOURCHE PARISH

Table 28. Presence of Select Fishing Infrastructure, Services, and Boats in Cut Off, Louisiana, Pre- and Post- Hurricane Katrina: 2004, 2005, 2006

Infrastructure or Service	Oct. 2004	Oct. 2005	March 2006	May 2006	Comments
Commercial docking facilities	Several	Several	Several	Several	Vessels dock along bayou
Net makers	1	1	1	1	--
Public boat ramps	1	1	1	1	--
Seafood restaurants	4	4	4	4	--
Seafood retail markets	5	3	3	3	--
Trucking operations	1	1	1	1	--
Charter/party boats	Few	Few	n/a	Few	--
Commercial fishing boats	~30	~150	n/a	~70	--

n/a = not available.
Source: IAI, Field Observations, 2005 and 2006.

Table 29. Presence of Select Fishing Infrastructure, Services, and Boats in Galliano, Louisiana, Pre- and Post- Hurricane Katrina: 2004, 2005, 2006

Infrastructure or Service	Oct. 2004	Oct. 2005	March 2006	May 2006	Comments
Air fill stations (diving)	1	1	1	1	--
Boat yards/boat builders	1	1	1	1	--
Commercial docking facilities	Many	Many	Many	Many	Vessels dock all along the bayou
Fishing gear, electronics, welding, other repair	5	5	5	5	--
Fishing associations (recreational/commercial)	3	3	3	3	--
Fish processors, Wholesale fish house	1	0	1	1	--
Ice houses	1	1	1	1	--
NMFS or state fisheries office (port agent, etc.)	1	1	1	1	--
Public boat ramps	1	1	1	1	--
Recreational docks/marinas	1	0	0	0	--
Recreational fishing tournaments	3	0	3	3	Per annum
Seafood restaurants	6	0	6	6	--
Seafood retail markets	1	1	1	1	--
Trucking operations	1	1	1	1	--
Charter/party boats	Few	Few	n/a	Few	--
Commercial fishing boats	~100	~100	n/a	~50	--

n/a = not available.
Source: IAI, Field Observations, 2005 and 2006.

Table 30. Presence of Select Fishing Infrastructure, Services, and Boats in Golden Meadow, Louisiana, Pre- and Post-Hurricane Katrina: 2004, 2005, 2006

Infrastructure or Service	Oct. 2004	Oct. 2005	March 2006	May 2006	Comments
Boat yards/boat builders	6	5	6	6	--
Commercial docking facilities	3	3	3	3	Most vessels dock in nearby Leeville, and along the bayou.
Fishing gear, electronics, welding, other repair	3	3	3	3	--
Fishing associations	1	1	1	1	--
Fish processors, Wholesale fish house	1	1	0	0	Oyster
Fishing pier	3	0	3	3	--
Hotels/Inns (dockside)	3	3	3	3	--
Marine railways/haul-out facilities	3	3	3	3	--
Offloading facilities	3	1	2	2	--
Net makers	1	1	1	1	--
NMFS or state fisheries office (port agent, etc.)	1	1	1	1	--
Public boat ramps	2	2	2	2	--
Bait & tackle/fishing supplies	3	3	3	3	--
Recreational fishing tournaments	3-4	1	3-4	3-4	Per annum
Seafood restaurants	3	2	3	3	--
Seafood retail markets	6	0	5	5	--
Trucking operations	2	2	2	2	--
Site-seeing/pleasure tours	2	0	2	2	--
Charter/party boats	~15	~15	n/a	~15	--
Commercial fishing boats	~390	~200	n/a	~100	--

n/a = not available.
Source: IAI, Field Observations, 2005 and 2006.

Table 31. Presence of Fishing Infrastructure, Services, and Boats in Larose, Louisiana Pre-and Post-Hurricane Katrina: 2004, 2005, 2006

Infrastructure or Service	Oct. 2004	Oct. 2005	March 2006	May 2006	Comments
Fish processors, Wholesale fish house	3	3	3	3	--
Public boat ramps	2	2	2	2	--
Recreational docks/marinas	1	1	1	1	--
Bait & tackle/fishing supplies	2	2	2	2	--
Seafood restaurants	3	3	3	3	--
Seafood retail markets	1	1	1	1	--
Trucking operations	3	3	3	3	--
Charter/party boats	~35	~70	n/a	~35	--
Commercial fishing boats	~70	~90	n/a	~70	--

n/a = not available.
Source: IAI, Field Observations, 2005 and 2006.

Table 32. Presence of Select Fishing Infrastructure, Services, and Boats in Leeville, Louisiana, Pre- and Post-Hurricane Katrina: 2004, 2005, 2006

Infrastructure or Service	Oct. 2004	Oct. 2005	March 2006	May 2006	Comments
Commercial docking facilities	6	5	5	5	--
Fish processors/peelers	1	1	1	1	--
Hotels/Inns/Cabins (dockside)	2	1	1	1	--
Marine railways/haul-out facilities	7	7	7	7	--
Offloading facilities	6	5	5	5	--
NMFS or state fisheries office (port agent, etc.)	1	1	1	1	--
Public boat ramps	3	3	3	3	--
Recreational docks/marinas	2	1	1	1	--
Bait & tackle/fishing supplies	1	1	1	1	--
Seafood restaurants	1	0	1	1	--
Trucking operations	4	4	4	4	--
Charter/party boats	n/a	0	n/a	0	--
Commercial fishing boats	~150	~60	n/a	~120	--

n/a = Not available.
Source: IAI, Field Observations, 2005 and 2006.

Table 33. Presence of Select Fishing Infrastructure, Services, and Boats in Port Fourchon, Louisiana, Pre- and Post-Hurricane Katrina: 2004, 2005, 2006

Infrastructure or Service	Oct. 2004	Oct. 2005	March 2006	May 2006	Comments
Boat yards/boat builders	1	1	1	1	1 (Bollinger)
Commercial docking facilities	2	2	2	2	--
Fishing gear, electronics, welding, other repair	2	2	2	2	--
Fisheries research laboratories	1	1	1	1	LUMCON*
Hotels/Inns/Cabins (dockside)	1	0	1	1	--
Offloading facilities	1	1	1	1	Semi-operational
NMFS or state fisheries office (port agent, etc.)	1	1	1	1	--
Public boat ramps	4	2	2	2	--
Recreational docks/marinas	2	0	2	2	--
Bait & tackle/fishing supplies	2	1	2	2	--
Recreational fishing tournaments	1	0	1	1	Per annum
Seafood restaurants	2	0	2	2	--
Seafood retail markets	1	0	1	1	--
Trucking operations	1	1	1	1	--
Charter/party boats	~4	0	n/a	~4	--
Commercial fishing boats	~40	0	n/a	~40	--

* Louisiana Universities Marine Consortium
n/a = not available.
Source: IAI, Field Observations, 2005 and 2006.

PLAQUEMINES PARISH

Table 34. Presence of Select Fishing Infrastructure, Services, and Boats in Buras-Empire, Louisiana, Pre- and Post-Hurricane Katrina: 2004, 2005, 2006

Infrastructure or Service	Oct. 2004	Oct. 2005	March 2006	May 2006	Comments
Boat yards/boat builders	1	1*	1*	1*	*Now a staging area for salvaged boats
Commercial docking facilities	5	0	3	3	Semi-operational
Marine supply	2	0	0	0	--
Fish processors, Wholesale fish house	2	0	0	0	--
Ice houses	6	0	0	0	--
Offloading facilities	7	0	1	1	--
Net makers	4	0	0	0	--
Public boat ramps	1	0	0	0	--
Recreational docks/marinas	1	0	1	1	--
Bait & tackle/fishing supplies	2	0	0	0	--
Recreational fishing tournaments	6	0	0	0	Per annum
Seafood restaurants	8	0	1	1	Semi-operational
Seafood retail markets	2	0	0	0	--
Seafood transport	1	0	0	0	--
Site-seeing/pleasure tours	12	0	0	0	--
Charter/party boats	12	0	0	0	--
Commercial fishing vessels	450	0	n/a	44	--

n/a = not available
Source: IAI, Field Observations, 2005 and 2006.

Table 35. Presence of Select Fishing Infrastructure, Services, and Boats in Pointe a la Hache, Louisiana, Pre- and Post-Hurricane Katrina: 2004, 2005, 2006

Infrastructure or Service	Oct. 2004	Oct. 2005	March 2006	May 2006	Comments
Commercial docking facilities	1	0	0	0	--
Fisheries research laboratories	1	0	0	0	--
Offloading facilities	1	0	0	0	--
Public boat ramps	1	0	0	0	--
Recreational docks/marinas	1	0	0	0	--
Bait & tackle/fishing supplies	1	0	0	0	--
Seafood restaurants	1	0	0	0	--
Seafood retail markets	1	0	0	0	--
Site-seeing/pleasure tours	2	0	0	0	--
Charter/party boats	30	0	0	0	--
Commercial fishing boats	80	0	30	30	--

Source: IAI, Field Observations, 2005 and 2006.

Table 36. Presence of Select Fishing Infrastructure, Services, and Boats in Port Sulphur, Louisiana, Pre- and Post-Hurricane Katrina: 2004, 2005, 2006

Infrastructure or Service	Oct. 2004	Oct. 2005	March 2006	May 2006	Comments
Commercial docking facilities	1	0	1	1	Semi-operational
Fishing gear, electronics, welding, other repair	1	0	0	0	--
Fishing associations	3	3	3	3	--
Fish processors, Wholesale fish house	4	0	2	2	--
Ice houses	1	0	0	0	--
Offloading facilities	1	0	1	1	--
Public boat ramps	3	0	0	0	Private land; paid access
Recreational docks/marinas	3	0	0	0	--
Bait & tackle/fishing supplies	1	0	0	0	--
Seafood restaurants	3	0	0	0	--
Seafood retail markets	4	0	1	1	--
Trucking operations	1	0	0	0	--
Site-seeing/pleasure tours	2	0	0	0	--
Charter/party boats	~10	0	n/a	n/a	--
Commercial fishing boats	~260	0	n/a	~50	--

n/a = not available.
Source: IAI, Field Observations, 2005 and 2006.

Table 37. Presence of Select Fishing Infrastructure, Services, and Boats in Venice-Boothville, Louisiana, Pre- and Post-Hurricane Katrina: 2004, 2005, 2006

Infrastructure or Service	Oct. 2004	Oct. 2005	March 2006	May 2006	Comments
Boat yards/boat builders	2	0	2	2	--
Commercial docking facilities	5	0	2	2	--
Fishing gear, electronics, welding, other repair	1	0	0	0	--
Fish processors, Wholesale fish house	6	0	3	3	--
Ice houses	4	0	1	1	Semi-operational
Hotels/Inns (dockside)	1	0	0	0	--
Offloading facilities	4	0	3	3	--
Net makers	2	0	0	0	--
Public boat ramps	7	0	0	0	--
Recreational docks/marinas	2	0	1	1	--
Bait & tackle/fishing supplies	2	0	0	0	--
Recreational fishing tournaments	Several *	0	0	1	*Per annum
Seafood restaurants	1	0	0	0	--
Seafood retail markets	1	0	0	0	--
Charter/party boats	~100	0	n/a	~20	--
Commercial fishing boats	~600	0	n/a	~120	--

n/a = Not available.
Source: IAI, Field Observations, 2005 and 2006.

ST. BERNARD PARISH

Table 38. Presence of Select Fishing Infrastructure, Services, and Boats in Chalmette, Louisiana, Pre- and Post-Hurricane Katrina: 2004, 2005, 2006

Infrastructure or Service	Oct. 2004	Oct. 2005	March 2006	May 2006	Comments
Boat yards/boat builders	2	1*	1	1	*Inoperable
Commercial docking facilities	3	0	1	1	--
Fishing associations	Several	Several	Several	Several	--
Fishing Gear, electronics, welding, other repair	1	0	0	0	--
Fish processors, Wholesale fish house	3	0	1	1	--
Ice houses	1	0	1	1	--
Hotels/Inns (dockside)	1	0	0	0	--
Marine railways/haul-out facilities	1	0	1	1	--
Offloading facilities	3	0	0	0	--
Net makers	2	0	0	0	--
Public boat ramps	2	0	0	0	--
Recreational docks & marinas	2	0	0	0	--
Bait & tackle/fishing supplies	5	0	0	0	--
Recreational fishing tournaments	4+	0	0	0	Per annum
Seafood restaurants	3	0	0	0	--
Seafood retail markets	7	0	0	0	--
Trucking operations	4	0	0	0	--
Charter/party boats	~10	0	n/a	n/a	--
Commercial fishing boats	~130	0	n/a	n/a	--

n/a = not available.
Source: IAI, Field Observations, 2005 and 2006.

Table 39. Presence of Select Fishing Infrastructure, Services, and Boats in Delacroix, Louisiana, Pre- and Post-Hurricane Katrina: 2004, 2005, 2006

Infrastructure or Service	Oct. 2004	Oct. 2005	March 2006	May 2006	Comments
Commercial docking facilities	4	0	0	0	--
Offloading facilities	4	0	2*	2*	*No electricity
Public boat ramps	2	0	0	0	--
Recreational docks/marinas	2	0	0	0	--
Recreational fishing tournaments	2	0	0	0	Per annum
Charter/party boats	n/a	0	n/a	0	--
Commercial fishing boats	n/a	0	n/a	~30	--

n/a = not available.
Source: IAI, Field Observations, 2005 and 2006.

Table 40. Presence of Select Fishing Infrastructure, Services, and Boats in Yscloskey, Louisiana, Pre- and Post-Hurricane Katrina: 2004, 2005, 2006

Infrastructure or Service	Oct. 2004	Oct. 2005	March 2006	May 2006	Comments
Commercial docking facilities	5	0	2	2	--
Fishing gear, electronics, welding, other repair	1	0	0	0	--
Fish processors, Wholesale fish house	5*	0	0	2	*Small shrimp off-loaders who also wholesale
Ice houses	1	0	0	0	--
Offloading facilities	6	0	2	2	--
Public boat ramps	2	0	0	0	--
Recreational docks/marinas	1	0	0	0	--
Seafood restaurants	1	0	0	0	--
Seafood retail markets	1	0	0	0	--
Charter/party boats	n/a	0	n/a	0	--
Commercial fishing boats	n/a	0	n/a	~15	Crab boats

n/a = not available.
Source: IAI, Field Observations, 2005 and 2006.

Table 41. Presence of Select Fishing Infrastructure, Services, and Boats in Hopedale, Louisiana, Pre- and Post-Hurricane Katrina: 2004, 2005, 2006

Infrastructure or Service	Oct. 2004	Oct. 2005	March 2006	May 2006	Comments
Commercial docking facilities	3	0	0	0	--
Fishing gear, electronics, welding, other repair	2	0	0	0	--
Fishing associations	1	1	1	1	--
Ice houses	1	0	0	0	--
Hotels/Inns (dockside)	1	0	0	0	R.V. Park
Offloading facilities	7	0	4	4	Oysters, working off slabs; no electricity
Public boat ramps	3	0	1	1	--
Recreational docks/marinas	3	0	1	1	1 rebuilding
Bait & tackle/fishing supplies	3	0	1	1	--
Recreational fishing tournaments	1	0	0	0	--
Charter/party boats	5	0	0	0	--
Commercial boats	~30	0	~15	~15	--

Source: IAI, Field Observations, 2005 and 2006.

TERREBONNE PARISH

Table 42. Presence of Select Fishing Infrastructure, Services, and Boats in Chauvin, Louisiana, Pre- and Post-Hurricane Katrina: 2004, 2005, 2006

Infrastructure or Service	Oct. 2004	Oct. 2005	March 2006	May 2006	Comments
Boat yards/boat builders	1	1	1	1	--
Commercial docking facilities	5	5	5	5	--
Fishing gear, electronics, welding, other repair	1	1	1	1	--
Fishing associations (recreational/commercial)	1	1	1	1	--
Fish processors, Wholesale fish house	6	2	5	5	--
Fisheries research laboratories	1	1	1	1	LUMCON*
Hotels/Inns (dockside)	2	2	2	2	--
Offloading facilities	10	10	10	10	--
Net makers	1	1	1	1	--
Public boat ramps	2	2	2	2	--
Recreational docks/marinas	3	1	1	1	--
Bait & tackle/fishing supplies	3	1	2	2	--
Recreational fishing tournaments	2	0	0	0	Per annum
Seafood restaurants	3	0	2	2	--
Seafood retail markets	2	0	1	1	--
Trucking operations	5	5	5	5	With docks
Charter/party boats	~15	~15	n/a	~15	--
Commercial fishing boats	100+	100+	n/a	100+	--

* Louisiana Universities Marine Consortium
n/a = not available.
Source: IAI, Field Observations, 2005 and 2006.

Table 43. Presence of Select Fishing Infrastructure, Services, and Boats in Cocodrie, Louisiana, Pre- and Post-Hurricane Katrina: 2004, 2005, 2006

Infrastructure or Service	Oct. 2004	Oct. 2005	March 2006	May 2006	Comments
Commercial docking facilities	3	2	3	3	--
Fishing gear, electronics, welding, other repair	1	0	1	1	--
Fisheries research laboratories	1	1	1	1	LUMCON*
Ice houses	1	0	1	1	--
Hotels/Inns (dockside)	3	1	3	3	--
Offloading facilities	2	1	2	2	--
Recreational docks/marinas	2	1	2	2	--
Bait & tackle/fishing supplies	2	1	2	2	--
Recreational fishing tournament	Several	0	0	0	Per annum
Seafood restaurants	3	0	3	3	--
Charter/party boats	Few	Few	Few	Few	--
Commercial fishing boats	Few	Few	Few	Few	--

* Louisiana Universities Marine Consortium
Source: IAI, Field Observations, 2005 and 2006.

Table 44. Presence of Select Fishing Infrastructure, Services, and Boats in Dulac, Louisiana, Pre- and Post-Hurricane Katrina: 2004, 2005, 2006

Infrastructure or Service	Oct. 2004	Oct. 2005	March 2006	May 2006	Comments
Boat yards/boat builders	3	3	3	3	--
Commercial docking facilities	9	7	8	8	Off-loaders
Fishing gear, electronics, welding, & other repair	2	2	2	2	--
Fishing associations	1	1	1	1	--
Fish processors, Wholesale fish house	5	5	5	5	--
Ice houses	4	4	3	3	--
Marine railways/haul-out facilities	2	2	2	2	--
Offloading facilities	9	7	8	8	--
Public boat ramps	3	2	3	3	--
Recreational docks/marinas	2	1	2	2	--
Bait & tackle/fishing supplies	2	1	1	1	--
Recreational fishing tournaments	Several	0	0	0	Per annum
Seafood restaurants	2	2	2	2	--
Seafood retail markets	1	1	1	1	--
Trucking operations	6	4	5	5	--
Charter/party boats	~15	~15	n/a	~15	--
Commercial fishing boats	~100	~100	n/a	~100	--

n/a = not available.
Source: IAI, Field Observations, 2005 and 2006.

Table 45. Presence of Fishing Infrastructure, Services, and Boats in Houma, Louisiana Pre- and Post-Hurricane Katrina: 2004, 2005, 2006

Infrastructure or Service	Oct. 2004	Oct. 2005	March 2006	May 2006	Comments
Air fill stations (diving)	2	1	2	2	--
Boat yards/boat builders	Several	Several	Several	Several	1 large; all oil support
Commercial docking facilities	1	1	1	1	--
Fishing gear, electronics, welding, other repair	5	5	5	5	--
Fishing associations	1	1	1	1	--
Fish processors, Wholesale fish house	6	6	6	6	--
Fisheries research laboratories	1	1	1	1	LUMCON*
Marine railways/haul-out facilities	Several	Several	Several	Several	6 motor freight carriers
Offloading facilities	1	0	1	1	--
NMFS or state fisheries office (port agent, etc.)	1	1	1	1	LDWF
Public boat ramps	2	2	2	2	--
Recreational docks/marinas	2	2	2	2	--
Bait & tackle/fishing supplies	4	4	4	4	--
Recreational fishing tournaments	18-24	0	0	0	Per annum
Seafood restaurants	30	30	30	30	--
Seafood retail markets	20	15	20	20	--
Trucking operations	Several	Several	Several	Several	--
Site-seeing/pleasure tours	5	4	5	5	--
Charter/party boats	45	10	~12	~12	--
Commercial fishing boats	~250	~50	~50	~50	--

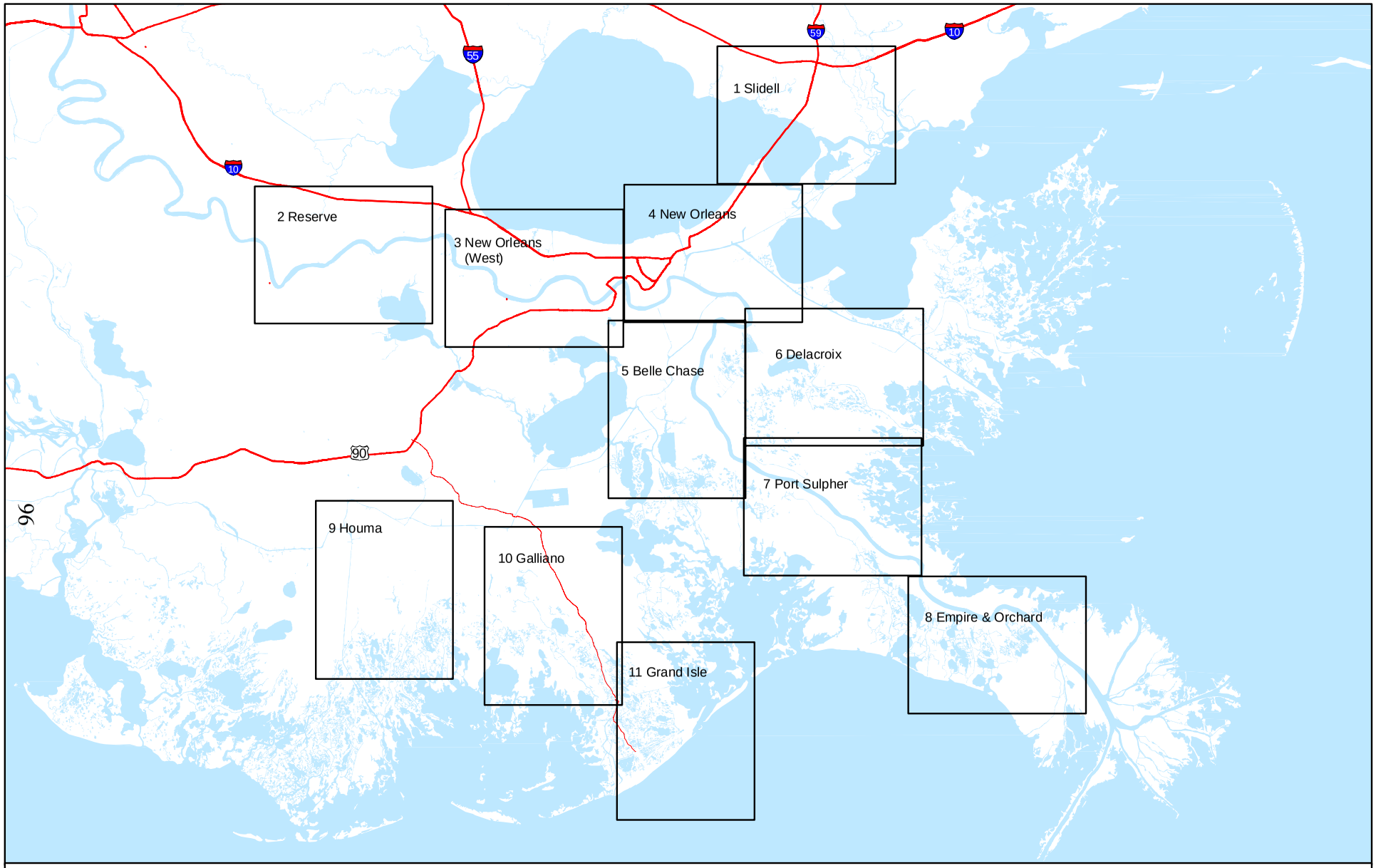
*Louisiana Universities Marine Consortium
Source: IAI, Field Observations, 2005 and 2006.

Table 46. Presence of Select Fishing Infrastructure, Services, and Boats in Theriot, LA Pre- and Post-Hurricane Katrina: 2004, 2005, 2006

Infrastructure or Service	Oct. 2004	Oct. 2005	March 2006	May 2006	Comments
Air fill stations (diving)	1	1	1	1	--
Boat yards/boat builders	1	1	1	1	--
Commercial docking facilities	4	4	4	4	--
Fishing gear, electronics, welding, other repair	3	3	3	3	--
Fishing associations (recreational/commercial)	Several	Several	Several	Several	--
Fish processors, Wholesale fish house	4	4	4	4	--
Ice houses	3	3	3	3	--
Hotels/Inns (dockside)	50	0	50	50	Private camp units
Marine railways/haul-out facilities	1	1	1	1	--
Offloading facilities	4	4	4	4	--
Net makers	2	0	2	2	--
NMFS or state fisheries office (port agent, etc.)	1	1	1	1	--
Recreational docks/marinas	2	2	2	2	--
Bait & tackle/fishing supplies	3	1	3	3	--
Recreational fishing tournaments	1	0	1	1	1 per month in summer
Sea Grant Extension office	1	1	1	1	--
Seafood restaurants	2	1	2	2	--
Seafood retail markets	1	1	1	1	--
Trucking operations	3	3	3	3	--
Charter/party boats	~5	~5	n/a	~5	--
Commercial fishing boats	~30	~30	n/a	~30	--

n/a = not available.
Source: IAI, Field Observations, 2005 and 2006.

Vessel Damage. As most official counts only include lost or destroyed boats, the total number of commercial fishing vessels damaged by Hurricanes Katrina and Rita is still not definitive. Yet, it is safe to say that thousands of commercial and recreational fishery participants and their vessels have been significantly and detrimentally affected. The following figures (37-48) show the observed pattern of vessel sinking and stranding following the storm.



Source: NOAA, 2006 (courtesy, Doug Helton)

Index Map
Wrecked and Sunken Vessels in Louisiana
from Post Hurricane Katrina Surveys

N

Miles

0 5 10 20 30 40

Note: These graphic are high resolution (300 dpi) and intended for zoom in .

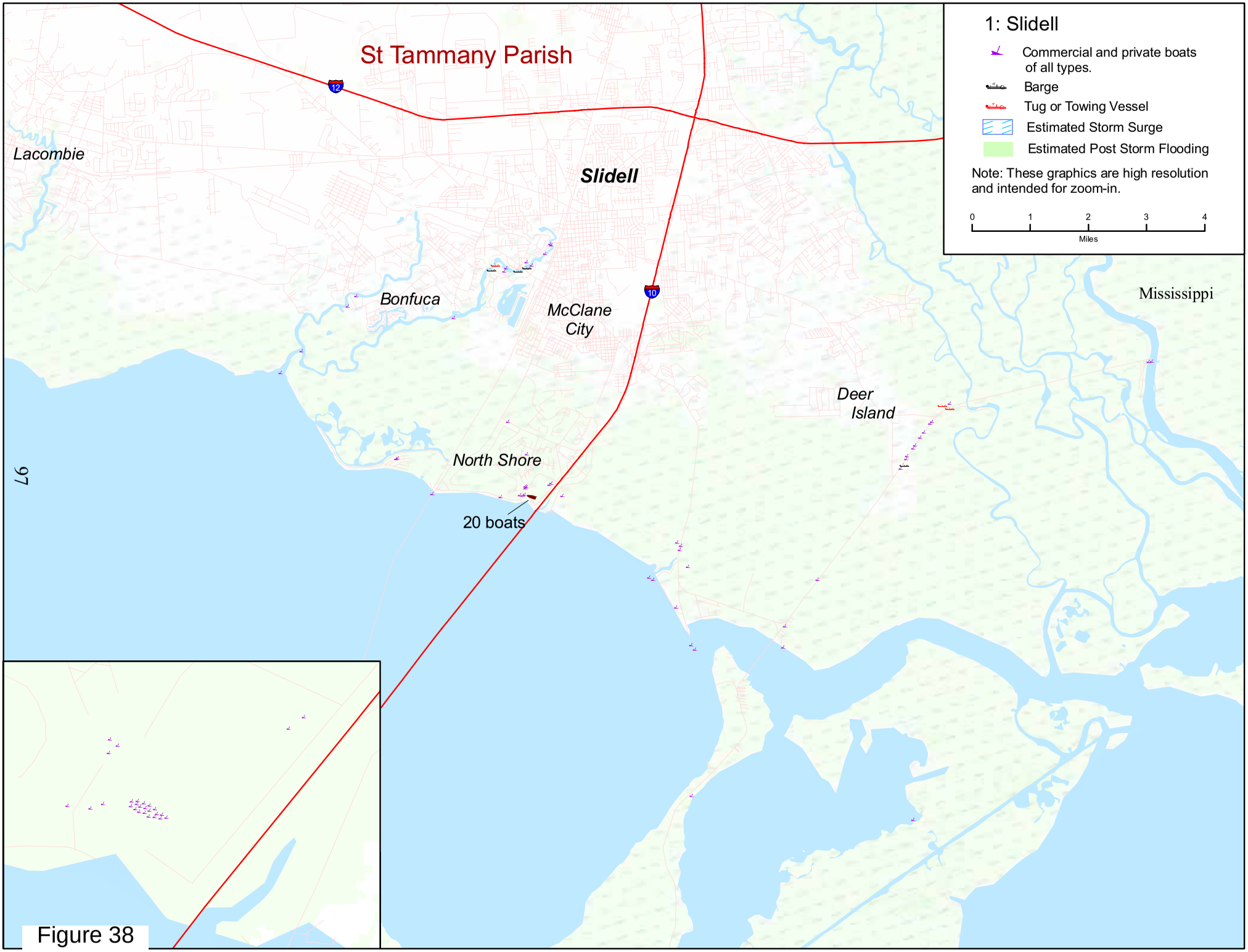

1: Slidell
Commercial and private boats of all types.
Barge
Tug or Towing Vessel
Estimated Storm Surge
Estimated Post Storm Flooding
Note: These graphics are high resolution and intended for zoom-in.
0
1
2
3
4
Miles
St Tammany Parish
12
Lacombie
Slidell
10
Bonfuca
McClane City
Mississippi
Deer Island
North Shore
97
20 boats

Figure 38

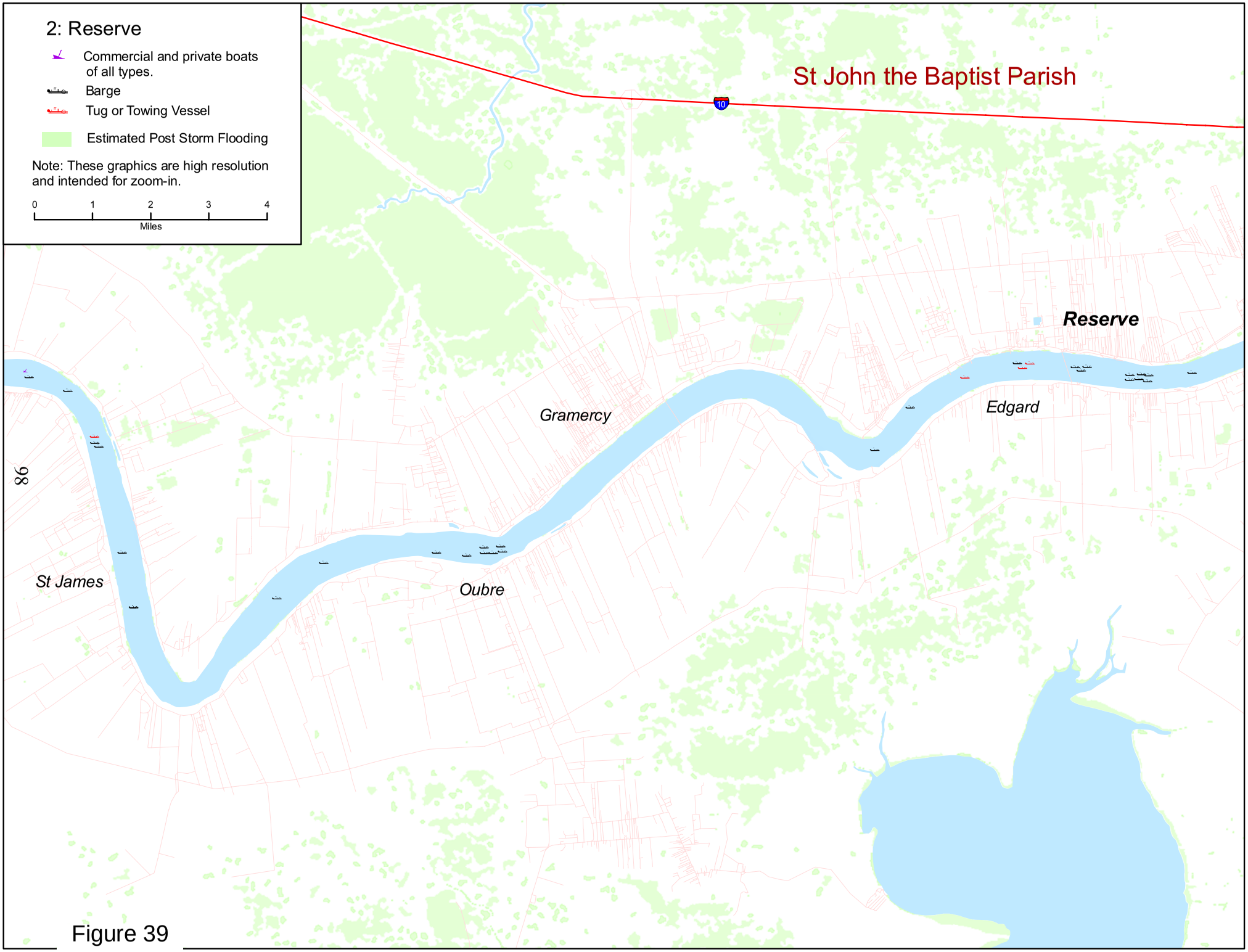

2: Reserve
Commercial and private boats of all types.
Barge
Tug or Towing Vessel
Estimated Post Storm Flooding
Note: These graphics are high resolution and intended for zoom-in.
0
1
2
3
4
Miles
St John the Baptist Parish
10
Reserve
Edgard
Gramercy
St James
Oubre

Figure 39

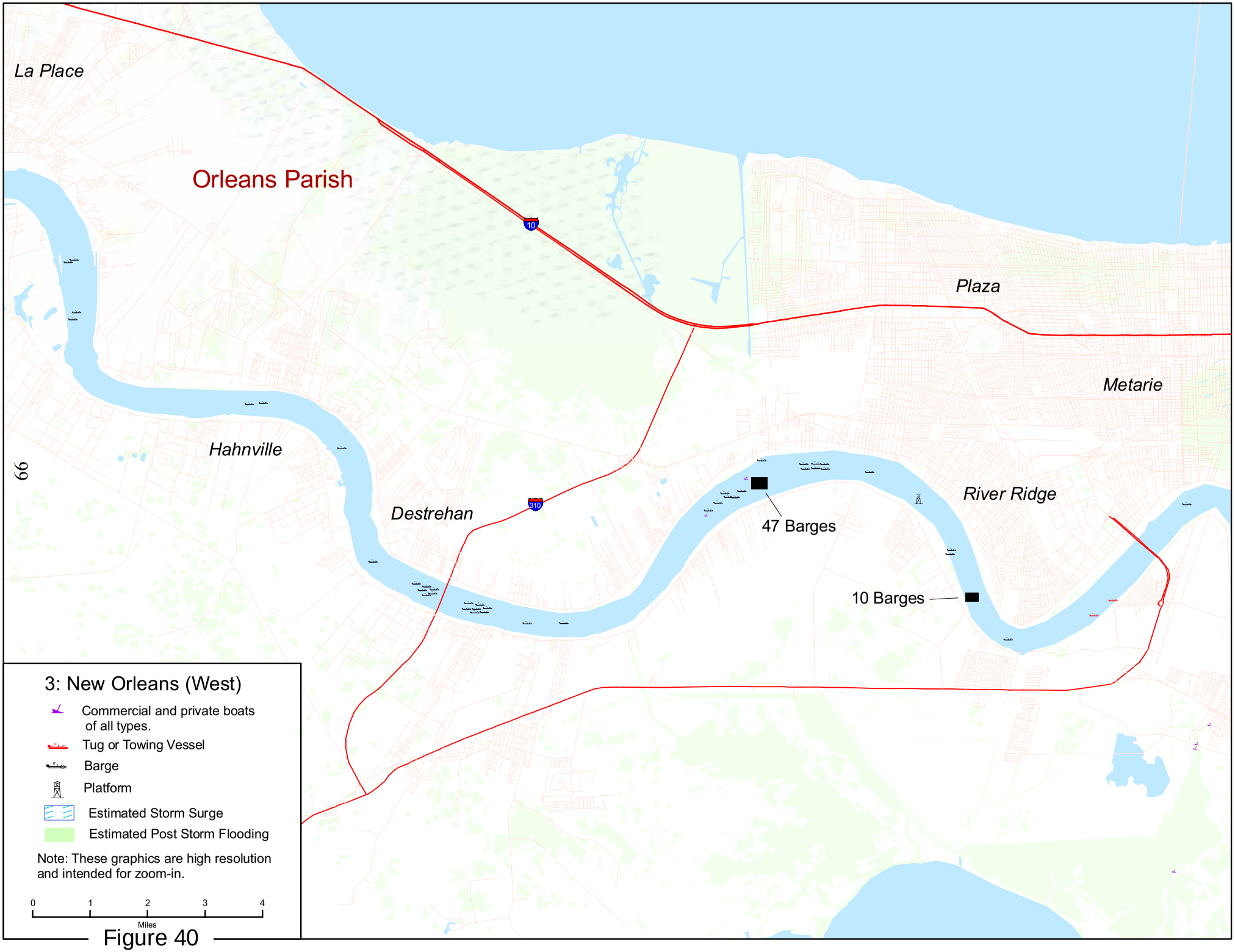

La Place
Orleans Parish
10
Plaza
Metarie
Hahnville
Destrehan
310
47 Barges
River Ridge
10 Barges
3: New Orleans (West)
Commercial and private boats of all types.
Tug or Towing Vessel
Barge
Platform
Estimated Storm Surge
Estimated Post Storm Flooding
Note: These graphics are high resolution and intended for zoom-in.
0
1
2
3
4
Miles

Figure 40

4: New Orleans
Commercial and private boats of all types.
Barge
Tug or Towing Vessel
Platform
Jack-up Rig
Estimated Storm Surge
Estimated Post Storm Flooding
0
1
2
3
4
Miles
Note: These graphics are high resolution and intended for zoom-in.
Orleans Parish
East Gentilly
New Orleans
Arabi
McDonoghville
40 Barges
20 Barges
2 Tugs
35 Boats
10
610
100

Figure 41

Belle Chasse
Estelle
Plaquemines Parish
Jean Lafitte
Alliance
5: Belle Chase
Commercial and private boats of all types.
Barge
Tug or Towing Vessel
Estimated Storm Surge
Estimated Post Storm Flooding
Note: These graphics are high resolution and intended for zoom-in.
0
1
2
3
4
Miles

Figure 42

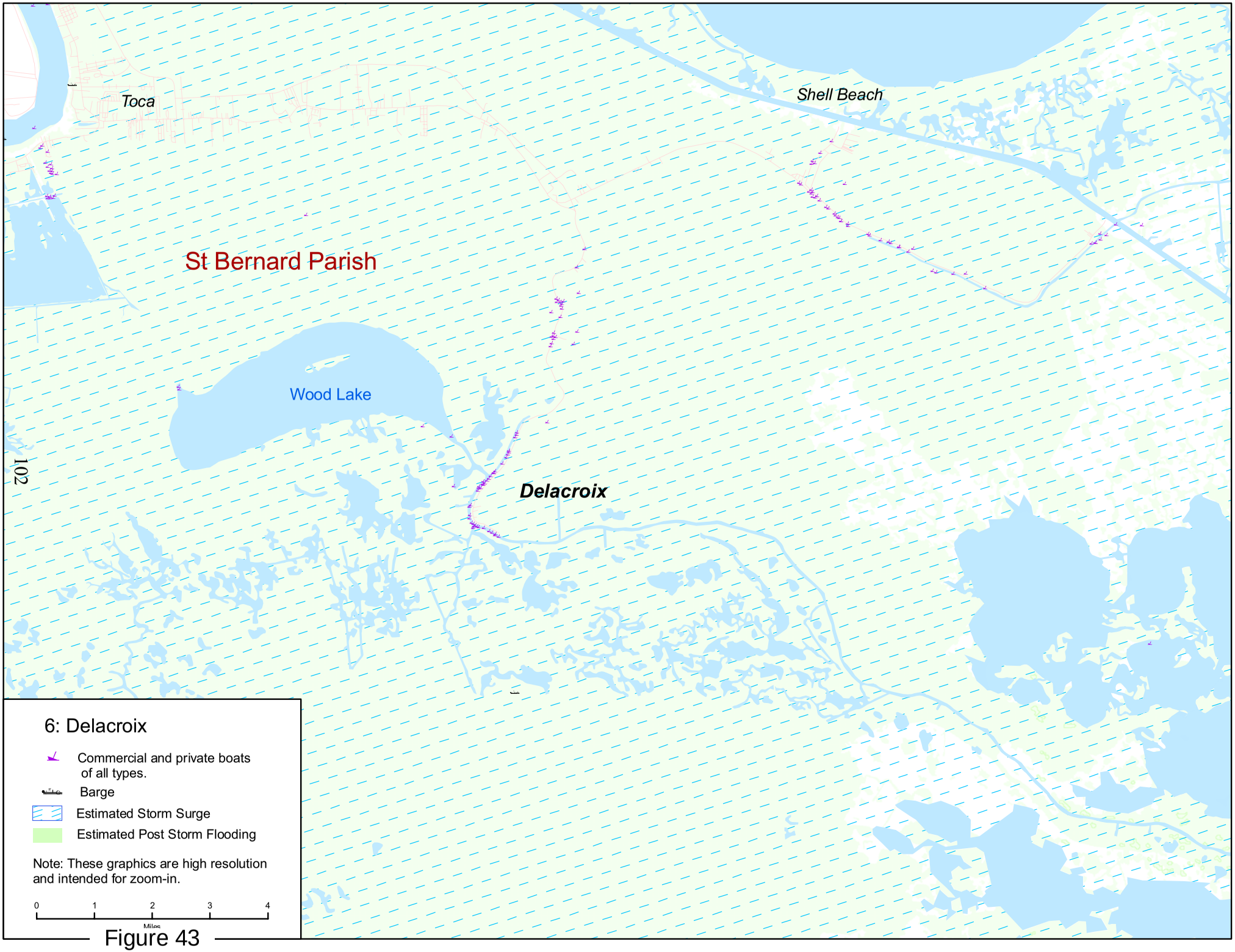

Toca
Shell Beach
St Bernard Parish
Wood Lake
Delacroix
6: Delacroix
Commercial and private boats of all types.
Barge
Estimated Storm Surge
Estimated Post Storm Flooding
Note: These graphics are high resolution and intended for zoom-in.
0
1
2
3
4
Miles

Figure 43

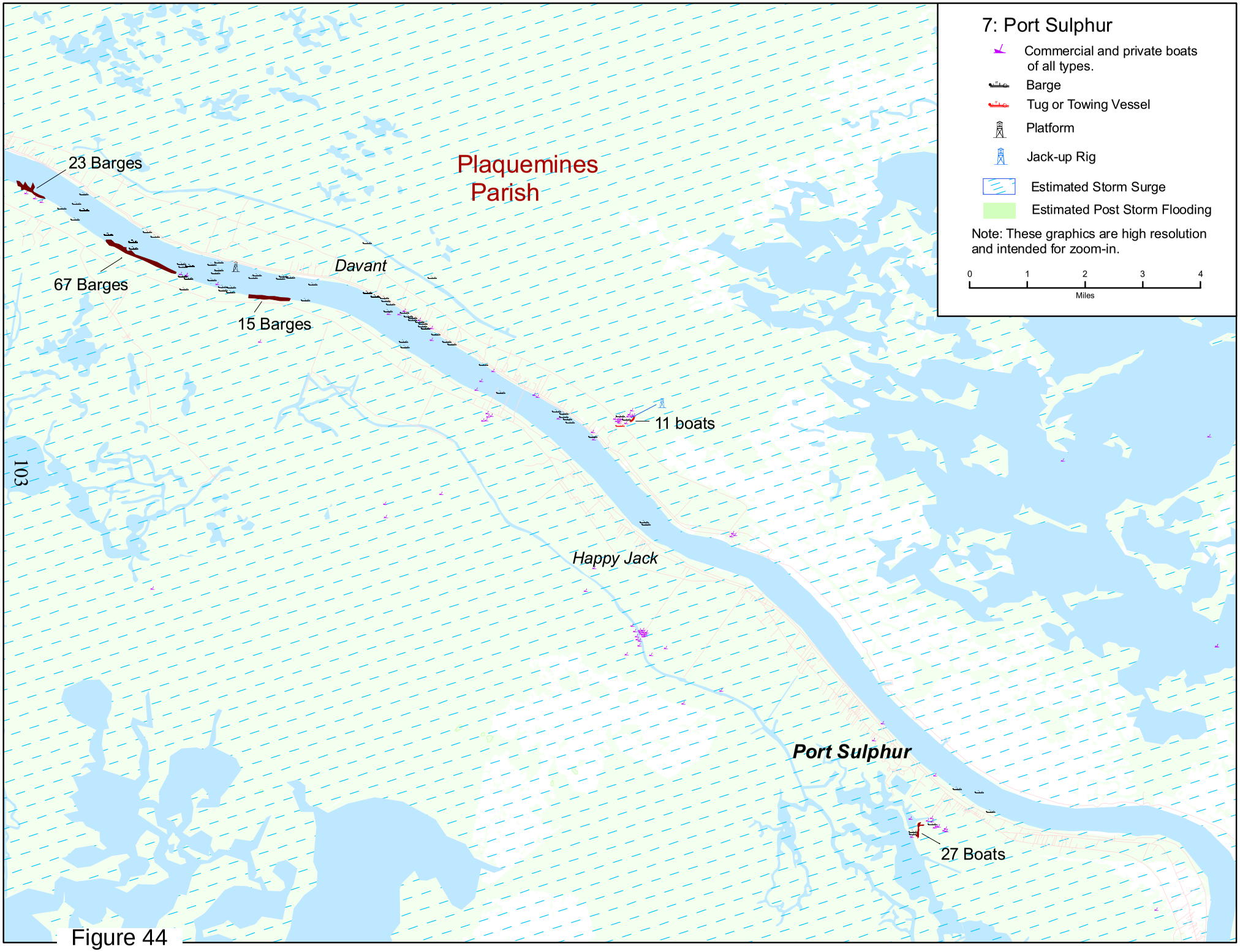

7: Port Sulphur
Commercial and private boats of all types.
Barge
Tug or Towing Vessel
Platform
Jack-up Rig
Estimated Storm Surge
Estimated Post Storm Flooding
Note: These graphics are high resolution and intended for zoom-in.
0
1
2
3
4
Miles
Plaquemines Parish
23 Barges
67 Barges
15 Barges
Davant
11 boats
Happy Jack
Port Sulphur
27 Boats

Figure 44

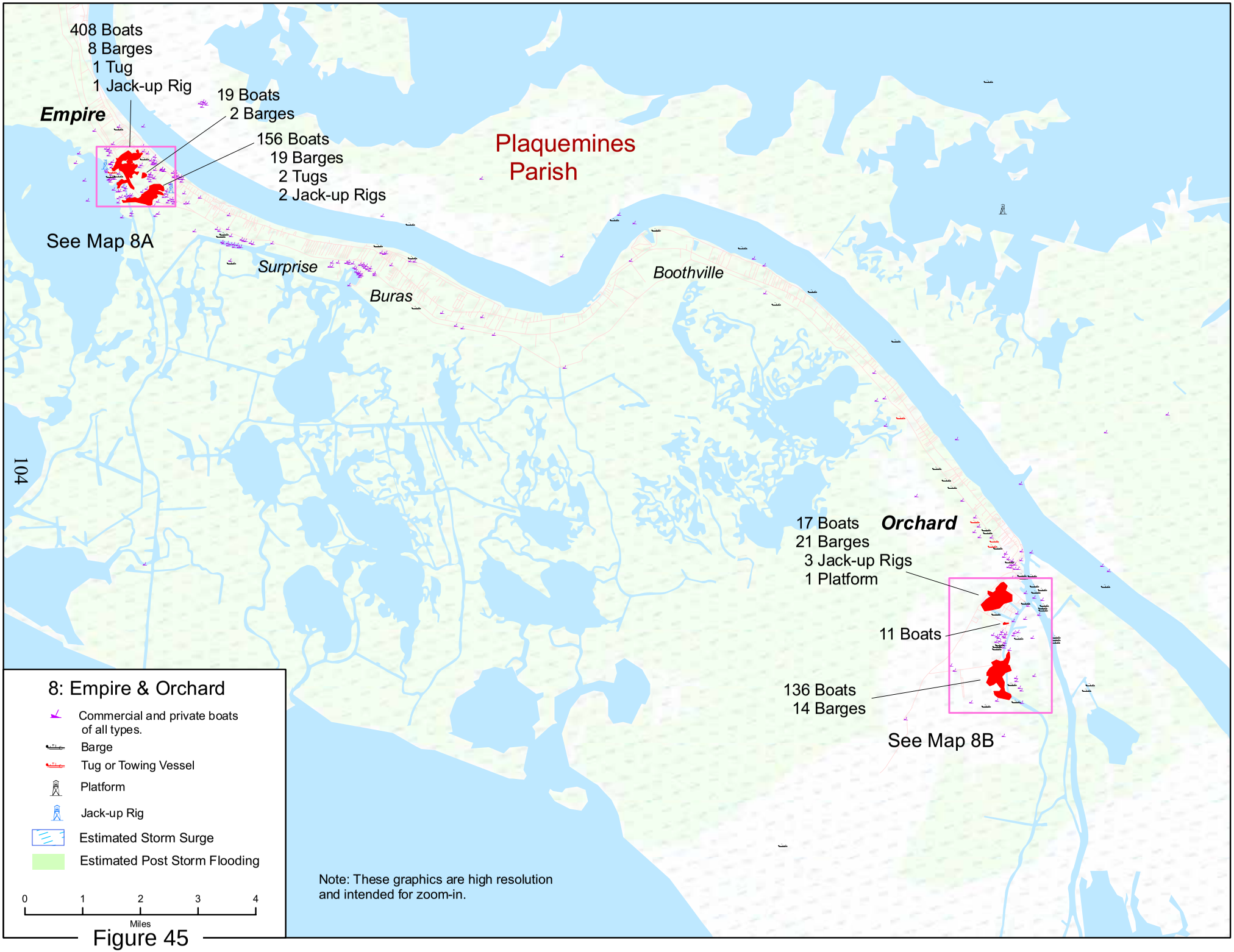

408 Boats
8 Barges
1 Tug
1 Jack-up Rig
Empire
19 Boats
2 Barges
156 Boats
19 Barges
2 Tugs
2 Jack-up Rigs
Plaquemines Parish
See Map 8A
Surprise
Buras
Boothville
17 Boats
21 Barges
3 Jack-up Rigs
1 Platform
Orchard
11 Boats
136 Boats
14 Barges
See Map 8B
8: Empire & Orchard
Commercial and private boats of all types.
Barge
Tug or Towing Vessel
Platform
Jack-up Rig
Estimated Storm Surge
Estimated Post Storm Flooding
0
1
2
3
4
Miles
Note: These graphics are high resolution and intended for zoom-in.

Figure 45

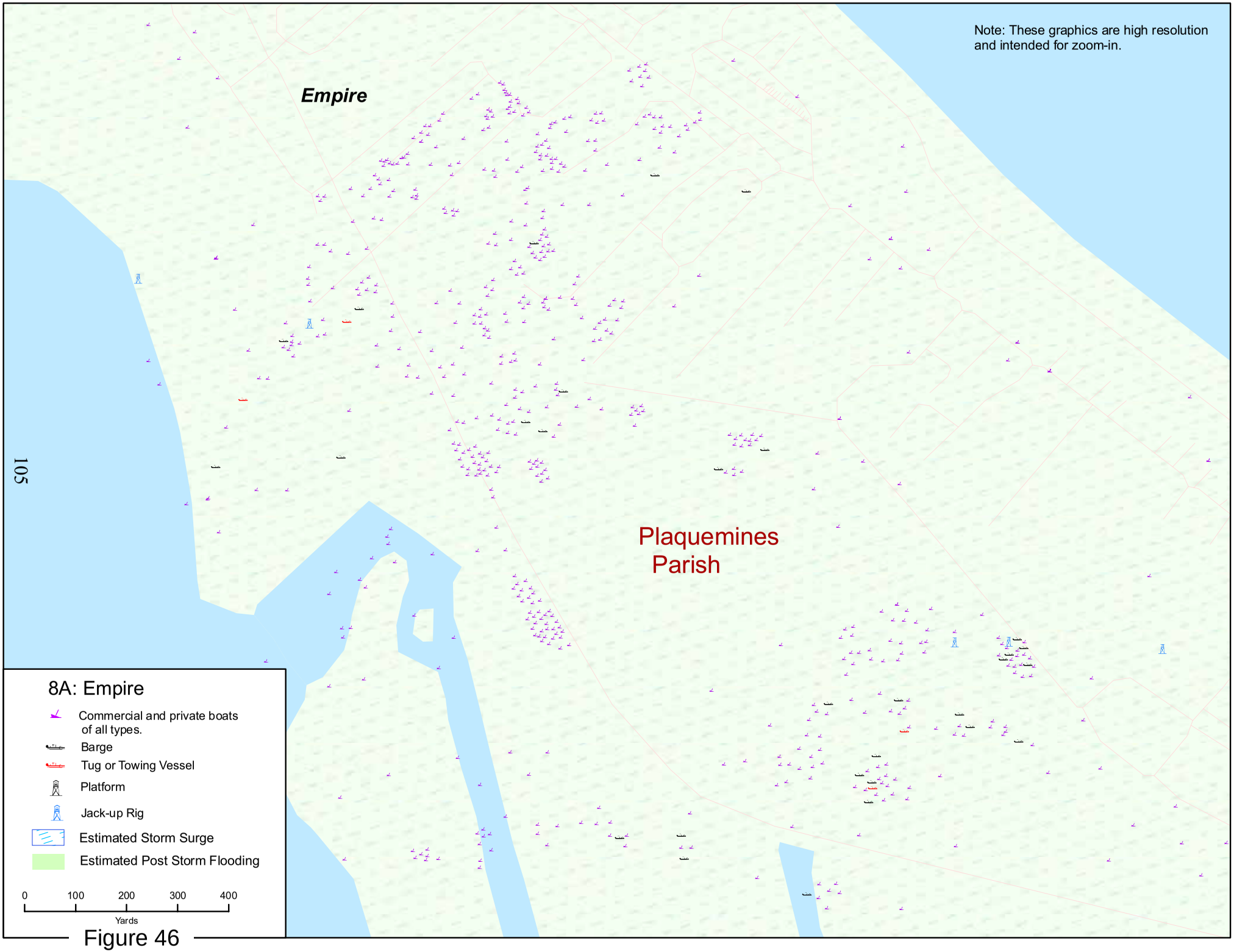

Note: These graphics are high resolution and intended for zoom-in.
Empire
Plaquemines Parish
8A: Empire
Commercial and private boats of all types.
Barge
Tug or Towing Vessel
Platform
Jack-up Rig
Estimated Storm Surge
Estimated Post Storm Flooding
0
100
200
300
400
Yards

Figure 46

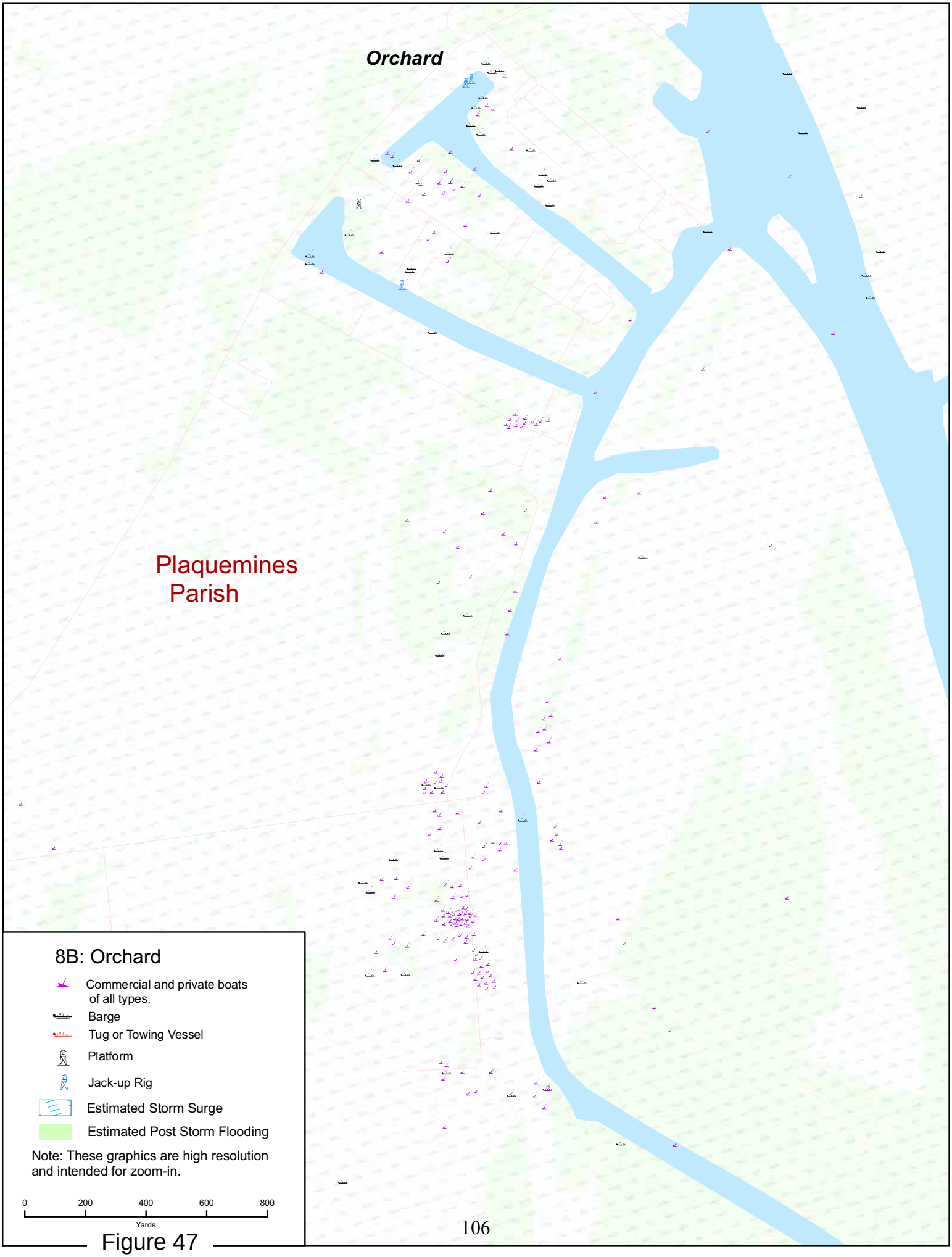

Orchard
Plaquemines Parish
8B: Orchard
Commercial and private boats of all types.
Barge
Tug or Towing Vessel
Platform
Jack-up Rig
Estimated Storm Surge
Estimated Post Storm Flooding
Note: These graphics are high resolution and intended for zoom-in.
0
200
400
600
800
Yards

Figure 47

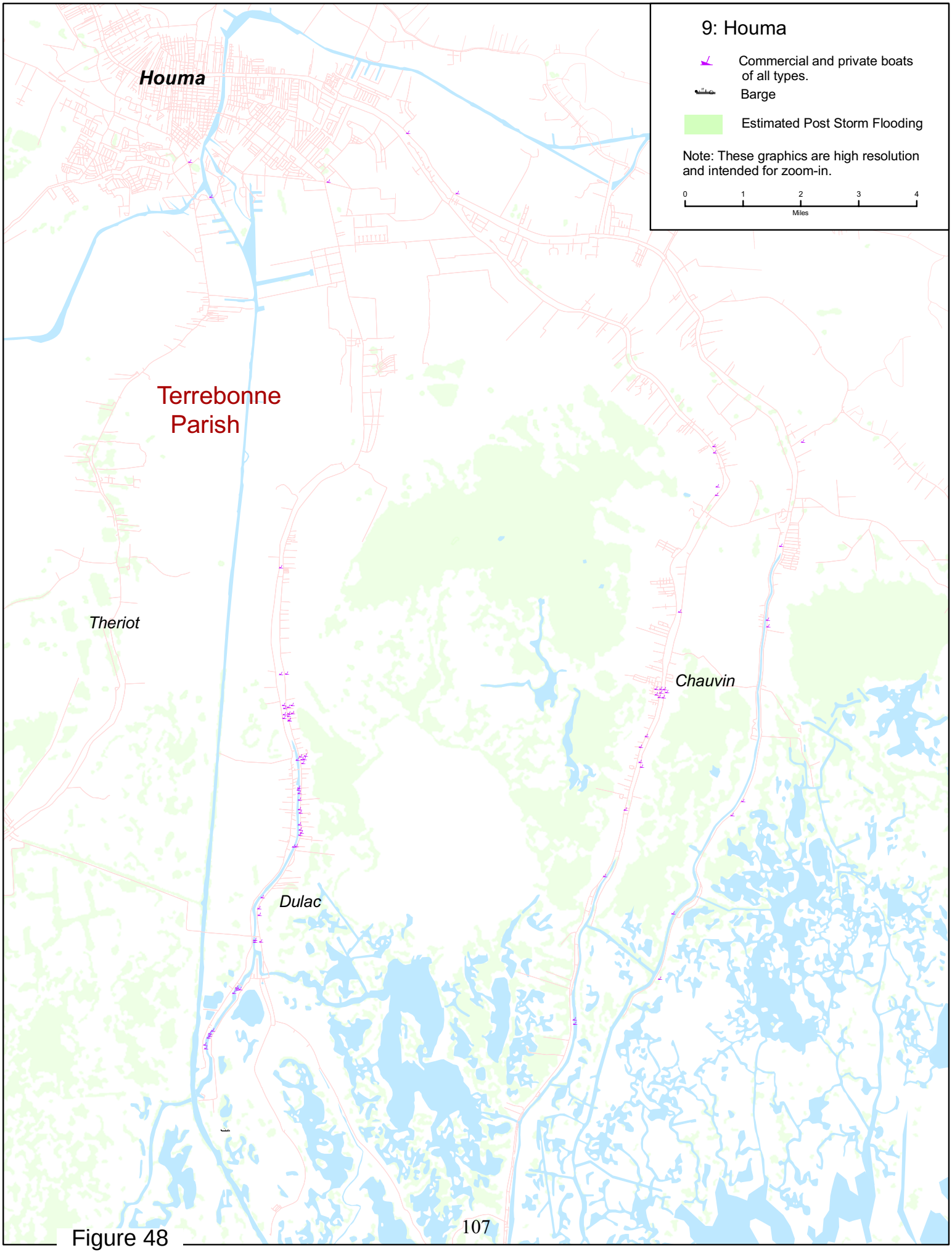

9: Houma
Commercial and private boats of all types.
Barge
Estimated Post Storm Flooding
Note: These graphics are high resolution and intended for zoom-in.
0
1
2
3
4
Miles
Houma
Terrebonne Parish
Theriot
Chauvin
Dulac

Figure 48

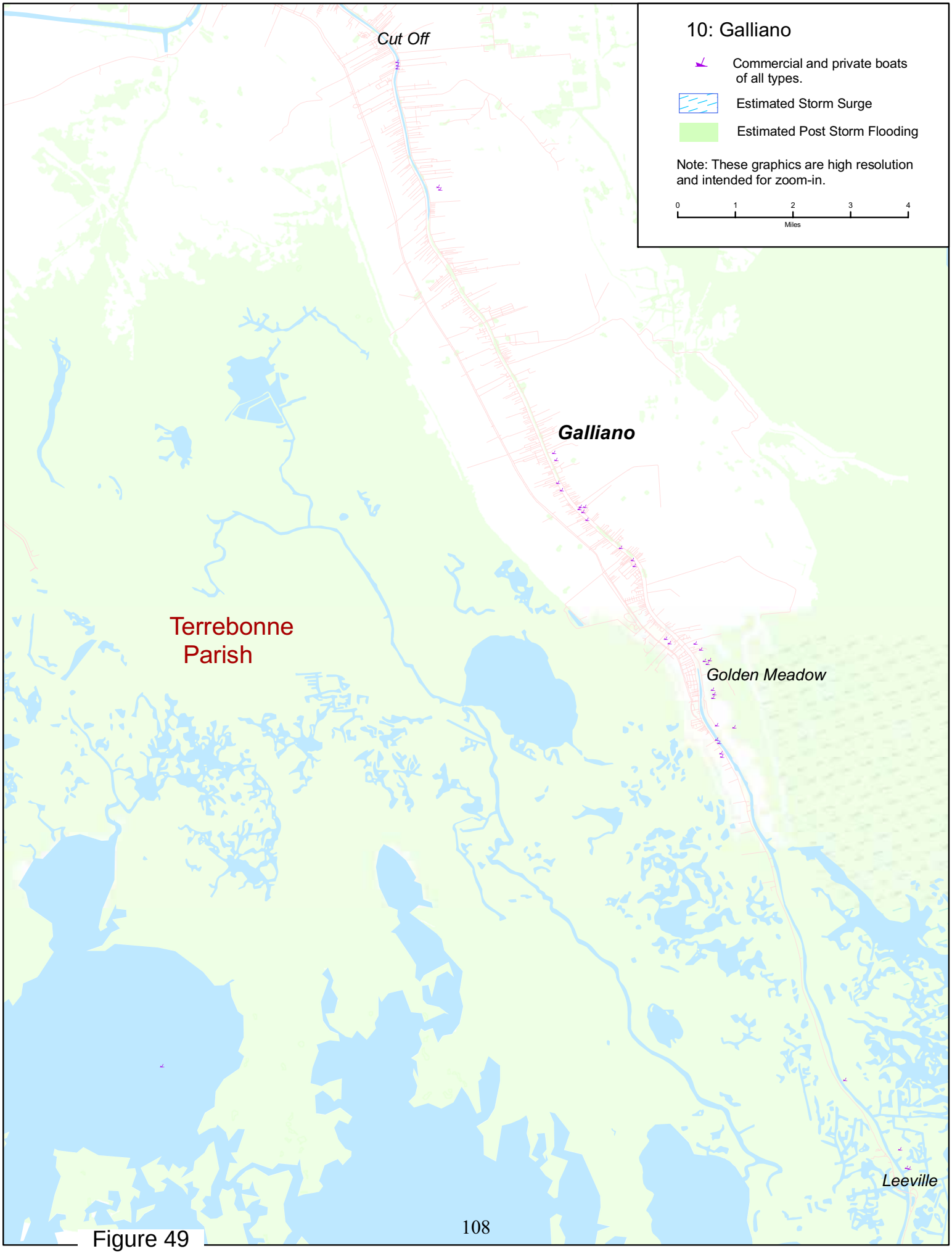

10: Galliano
Commercial and private boats of all types.
Estimated Storm Surge
Estimated Post Storm Flooding
Note: These graphics are high resolution and intended for zoom-in.
0
1
2
3
4
Miles
Cut Off
Galliano
Terrebonne Parish
Golden Meadow
Leeville

Figure 49

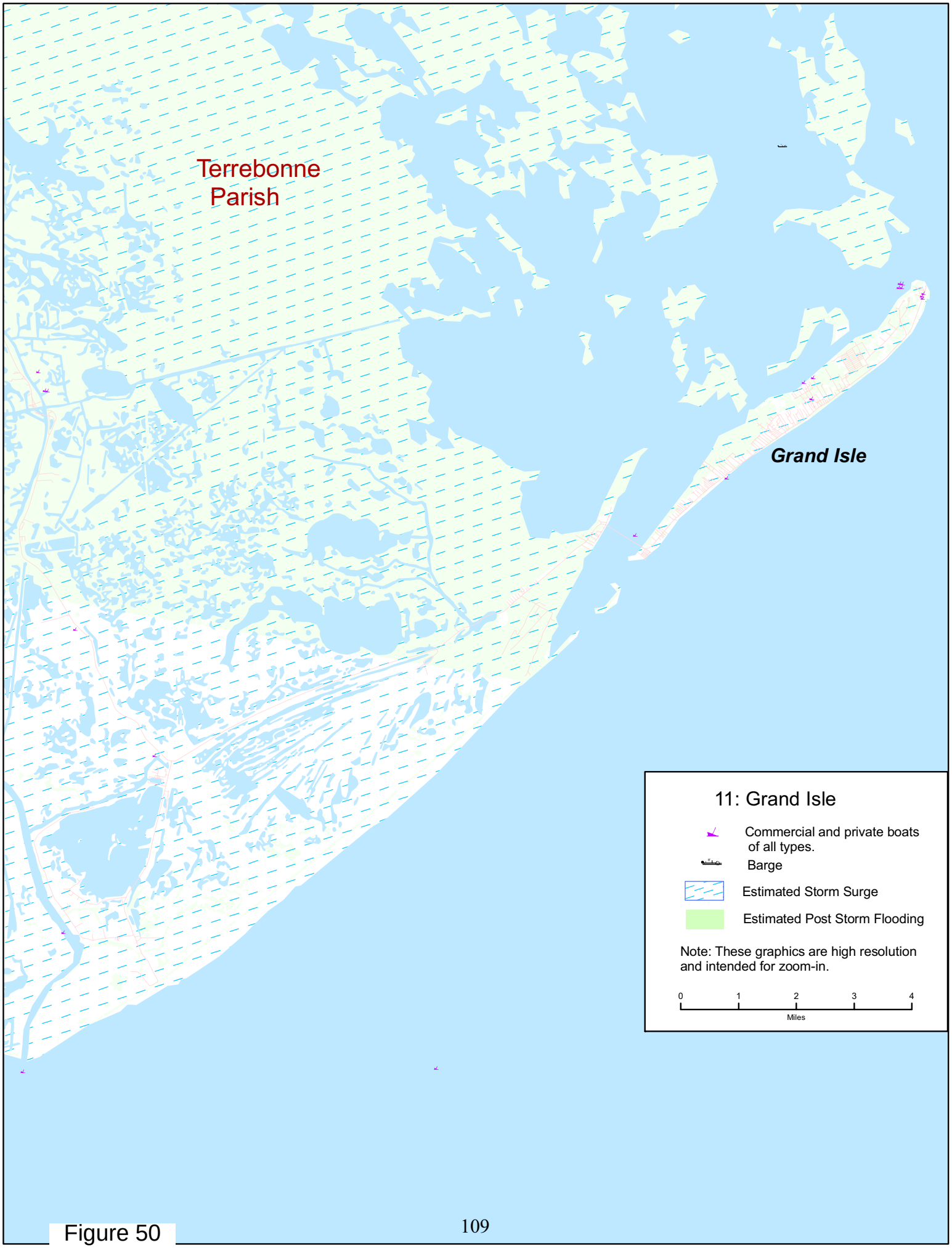

Terrebonne
Parish
Grand Isle
11: Grand Isle
Commercial and private boats of all types.
Barge
Estimated Storm Surge
Estimated Post Storm Flooding
Note: These graphics are high resolution and intended for zoom-in.
0
1
2
3
4
Miles

Figure 50

As indicated by the observed pattern of damage, vessels moored in St. Bernard and Plaquemines Parishes were more impacted by Hurricane Katrina than were those moored in parishes to the west of the passage of the storm's center. At the end of October, 2005, U.S. Coast Guard Wreck and Salvage Group representatives estimated that about 200 commercial boats from Empire and another 100 from Venice, both in Plaquemines Parish, were in need of salvage. In this same month, officials estimated that between 200 and 300 commercial vessels needed to be removed from the water in St. Bernard Parish, and that another couple of hundred required salvaging in the Grand Isle area in Lafourche Parish, and in the Slidell and Mandeville areas north and east of New Orleans. Figure 49 depicts the storm-related damage to a fisherman's vessel in Venice, Louisiana.

Figure 49: Venice Fisherman Showing a Photo of Damage to Local Venice Vessels. Source: IAI Staff, September 2005.

LDWF officials estimate that an additional 35,000 recreational fishing vessels throughout Louisiana were lost or destroyed by the hurricanes, with some 3,000 in lower Plaquemines Parish alone (Brown 2005; Canulette 2006). This estimate does not include boats that sustained significant damage but were not total losses (Canulette 2006). However, the Coast Guard's job description does not include the removal of land-locked or wrecked recreational boats, nor does the agency have sufficient funding to do so. Likely this task will fall to private salvage companies or to whatever arrangements boat owners can make on their own.

In Venice, salvaged commercial boats are being relocated to a parish-owned boat repair yard; but, once repaired there is no way to return the boat to the water. The boatyard lost its launching equipment to the storm, and replacements are both expensive and difficult to come by; used "Travelifts" from recent years sell for around $100,000, and there are few local dealers who sell

such large machinery. In mid-March 2006, however, the residents of Plaquemines Parish received a 60-ton Marine Travelift, used to move fishing boats in and out of the water as a gift from the city of Valdez in Alaska. The following agencies coordinated the relocation effort: the Louisiana, Washington, and Alaska Sea Grant programs, FEMA, LDWF, the Pacific Coast Congress of Harbormasters, the Louisiana Seafood Promotion and Marketing Board, and the Valdez Port Authority. The Alaska Fishing Industry Relief Mission contributed funding toward the lift's transportation (Louisiana Sea Grant 2006b)

In some cases, vessel salvage complications have impeded the recovery efforts of other fishery participants in excess of the vessel owner. For example, as shown below in Figure 50, grounded vessels block the staging area of an offloading dock. This otherwise operable facility could have resumed operations as early as October 2005 if the boat salvage issue had been resolved. As of May 2006, however, this vessel remained in need of salvage (Personal Communication, IAI, May 2006).

Figure 50. Offloading Dock in St. Bernard Parish with Grounded Vessels Blocking Operations.
Source: IAI Staff, November 2005.

Under the terms of the Stafford Disaster Relief and Emergency Assistance Act (1974, amended 1988), FEMA has charged the U.S. Coast Guard (USCG) and the Army Corps of Engineers (ACE) with spearheading the vessel removal project. Working under an $85 million contract, the USCG has brought in salvage firms with five heavy-lift, barge-based cranes to lead the commercial vessel cleanup (Brown 2005). To qualify for salvage assistance from the USCG or ACE, commercial and recreational vessels must be impeding either a commercial waterway or levy, or pose an immediate hazard to human life or public health or safety. Vessels that do not

meet these criteria must make other arrangements for salvage. In December 2005, vessels that met the federal salvage guidelines were assigned a case number, which was then spray painted on the side of the boat. Roughly 788 vessels in Plaquemines and 118 in St. Bernard Parishes received case numbers. However, receiving a USCG case number turned out to be no guarantee of receiving salvage services, as some disappointed fishermen discovered. Rather, a case number indicated only that one's vessel has been assessed by the USCG and, funds providing, *may be* eligible for salvage (Farrell and Gaude 2006). As of January 3, 2006 the Coast Guard had identified 2,266 commercial vessels in Louisiana in need of salvage, of which 725 had already been salvaged by the USCG or the owners themselves (Farrell and Gaude 2006).

The number of bureaucratic agencies and jurisdictions involved in the salvage efforts has also complicated the recovery process. For the most part, the USCG spearheaded the salvage of boats that are blocking navigable commercial waterways from September 2005 through June 2006. In July, the Louisiana Department of Environmental Quality (LDEQ) assumed the lead position in the recovery effort (LSU AgCenter, Personal Communication, July 19, 2006). The removal of vessels obstructing roads and highways, however, falls to the Department of Transportation (DOT) *unless* they are leaking fuel or pose environmental hazards. In the latter case, DOT needs to follow EPA guidelines and/or coordinate efforts with the USCG. Once salvaged, boats are relocated to a staging area for further inspection, processing, and/or owner notification. Departmental guidelines, which can vary widely between agencies, dictate the specific protocols for these salvage operations and generate copious paperwork, including required forms and documents. For fishery participants lacking English or literacy skills, such paperwork is daunting.

Many boats in both Plaquemines and St. Bernard Parishes were still awaiting salvage as of May 2006. In St. Bernard, the USCG cannot find enough state-owned staging areas to which to relocate these damaged vessels. Negotiations with private entities for rental space were underway but progressing slowly (Personal Communication, IAI, May 2006).

By contrast, boats moored to the west of Plaquemines Parish sustained less extensive damage. Based on queries with 50 full-time fishermen in Lafourche, Jefferson, and Terrebonne Parishes, it was determined that about two dozen vessels were damaged, and that a total of $250,000 in damages was experienced across the group. Only 24 vessels in these areas received USCG case numbers, while the majority of the fishermen suffered "minor" or "no damage." Only one reported a loss in income ($500 per day) due to time off for repairs.

One ramification of all this vessel damage and loss is the temporary or perhaps permanent egress of fishermen from the industry. One indication of this trend is the change in the number of licensed resident commercial fishing vessels between 2004 and 2006. Table 47 below illustrates the changes in vessel licenses between March 2004 and March 2006 for the communities under consideration in this report. In terms of percentages, St. Bernard Parish has experienced the greatest decline in licensed resident commercial fishing vessels. During that period licensed vessels in St. Bernard Parish declined by 44 percent or 29 boats. However, in terms of sheer volume, Plaquemines Parish experienced a much greater loss, losing 273 or 38 percent of its licensed vessels (Table 48).

Table 47. State Licensed Resident Commercial Fishing Vessels by Town and Parish of Study Communities, Pre- and Post-Katrina, as of March 1: 2004, 2005, and 2006

Community	2004 Licenses as of March 1	2005 Licenses as of March 1	2006 Licenses as of March 1	2004-2005 Average	2006 # Change from 2004-05 Average	2006 % Change from 2004-05 Average
Jefferson Parish						
Barataria	96	113	110	105	5	4.8%
Lafitte	141	152	148	147	1	1.0%
Grand Isle	56	61	41	59	(18)	-30.5%
Gretna	53	54	46	54	(8)	-14.8%
Westwego	49	51	53	50	3	6.0%
Parish Total	395	431	398	413	(15)	-4.1%
Lafourche Parish*						
Cut Off	191	172	179	182	(3)	-1.6%
Galliano	97	94	92	96	(4)	-4.1%
Gold. Meadow	109	99	109	102	7	6.8%
Larose	33	29	30	31	(1)	-3.2%
Parish Total	430	394	410	412	(2)	-0.5%
Plaquemines Parish						
Boothville	85	81	47	83	(36)	-43.4%
Buras	276	267	160	272	(112)	-41.1%
Empire	152	163	128	158	(30)	-19.0%
Pt. a la Hache	16	17	3	17	(14)	-82.3%
Port Sulphur	91	91	48	91	(43)	-47.2%
Venice	93	90	54	92	(38)	-41.3%
Parish Total	713	709	440	711	(271)	-38.4%
St. Bernard Parish*						
Chalmette	67	63	36	65	(29)	-55.3%
Hopedale	1	1	1	1	0	0.0%
Parish Total	68	64	37	66	(29)	-43.9%
Terrebonne Parish						
Chauvin	226	216	235	221	14	6.3%
Cocodrie	1	1	1	1	1	0.0%
Dulac	73	67	83	70	13	18.5%
Houma	255	264	269	260	9	3.4%
Theriot	101	107	110	104	4	3.8%
Parish Total	656	655	698	656	42	6.4%

*Commercial license data for Leeville and Port Lafourche in Lafourche Parish, and Yscloskey and Delacroix in St. Bernard Parish are not available at this time.
Source: LDWF, Personal Communication, May 2006.

Table 48. State Licensed Resident Commercial Fishing Vessels by Parish-wide Total, Pre- and Post-Katrina, as of March 1: 2004, 2005, and 2006

Parish	2004 Licenses as of March 1	2005 Licenses as of March 1	2006 Licenses as of March 1	2004-2005 Average	2006 # Change from 2004-05 Average	2006 % Change from 2004-05 Average
Jefferson	395	431	398	413	(15)	-4.1%
Lafourche*	430	394	410	412	(2)	-0.5%
Plaquemines	713	709	440	711	(271)	-38.4%
St. Bernard*	68	64	37	66	(29)	-43.9%
Terrebonne	656	655	698	656	42	6.4%
Total	2,262	2,253	1,983	2,258	(275)	-12.2%

*Commercial license data for Leeville and Port Lafourche in Lafourche Parish, and Yscloskey and Delacroix in St. Bernard Parish are not available at this time.
Source: LDWF, Personal Communication, 2006.

III. ESTIMATED ECONOMIC EFFECTS OF HURRICANE KATRINA ON LOUISIANA'S FISHERIES AND RELATED INDUSTRIES

Commercial Landings. As indicated in Figure 51 below, seafood landings in Southeast Louisiana shifted to the west in the months following the storm. Fishery participants who harvested out of Barataria Bay and Breton Sound before Katrina were traveling to Lafitte in north Jefferson Parish and to Leeville in Lafourche Parish, or to Cocodrie or Dulac in Terrebonne Parish in order to off-load their products. Two off-loading sheds in Hopedale (St. Bernard Parish) and two in Venice (Plaquemines Parish) resumed operations in early December 2005. However, as these sheds were only operating at about 30 percent of their former capacity, overall landings' values in St. Bernard and Plaquemines Parishes both declined to nearly zero following the hurricane, while they increased in the adjacent parishes.

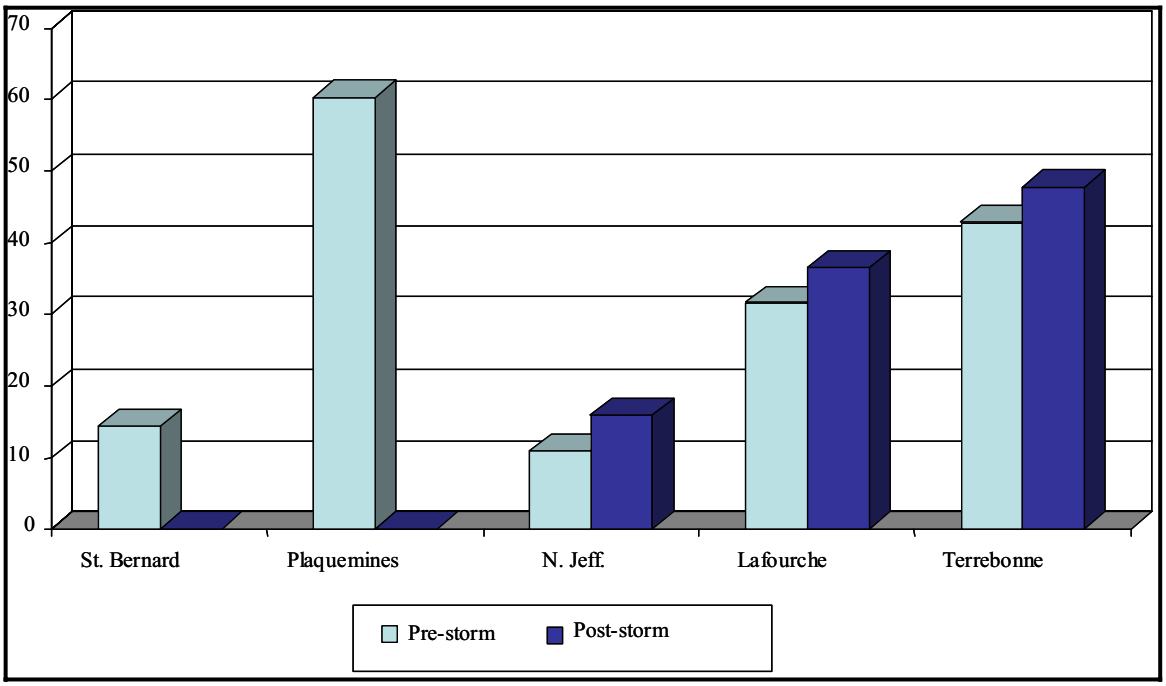


Figure 51: Pre- and Post-Storm Landings' Values (in millions of dollars).
Source: IAI, Field Observations, 2005.

Louisiana Department of Wildlife and Fisheries (LDWF) representatives offered a preliminary assessment of damages to Louisiana's fisheries in the first week following Hurricane Katrina. First, Table 49 provides the five-year average value of dockside landings of commercial shrimp, crabs, and finfish for the six month interval (Sept. 1-Feb 28) and entire year (Sept. 1-Aug. 31) total. The figures are averages for the period 2000 to 2004 for the most severely impacted parishes of Jefferson, Lower Lafourche, Orleans, Plaquemines, St. Bernard, and St. Tammany.

Table 49. Pre-Katrina Value of Dockside Landings, Five-year Average: 2000-2004

Fishery	6 Month Interval	12 Month
Crab	$5,092,813	$12,297,617
Freshwater Fish	$54,652	$189,019
Menhaden	$3,806,250	$14,050,883
Saltwater Fish	$5,319,153	$11,836,588
Shrimp	$29,554,270	$81,054,864
Total	$43,827,138	$119,428,971

Source: LDWF September 7, 2005.

Table 50 below depicts projected losses for the study parishes based on the ex-vessel value of lost sales resulting from experienced and projected disruption of fishing activities. Direct losses to the resource base were not considered in the projections. The figures derive from LDWF trip ticket landings and value data averaged over the period 2000 to 2004 (LDWF 2005).

Table 50. Projected Fisheries Losses for Heavily Impacted Parishes: Jefferson, Lower Lafourche, Orleans, Plaquemines, St. Bernard, and St. Tammany

Fishery	Losses at 6-Month Interval (Sept. 1, 2005-March 1,2006)	Losses at One Year (Sept. 1, 2005-Aug. 31, 2006)
Crab	$33,866,078	$81,776,427
Freshwater Fish	$363,424	$1,256,934
Menhaden	$25,310,719	$93,435,257
Saltwater Fish	$35,371,188	$78,710,687
Shrimp	$196,529,345	$538,996,879
Total	$291,440,753	$791,176,185

Source: LDWF September 7, 2005.

With regard to changes in fishing effort, an analysis of trip ticket data undertaken by the LDWF reveals that the average number of trips taken during September 2004 was 31,393, with 4,891 boats leaving port. By contrast, only 5,656 trips were taken in September 2005, with just 1,092 vessels leaving port (IAI, Personal Communication, October 30, 2005).

In mid-September 2005, Louisiana officials estimated ex-vessel losses at $81 million for shrimp, $44 million for oysters, $12 million for crab, and $11 million for saltwater fish over the next 12 months. These figures represent loss of product only, and exclude losses associated with damaged boats, gear, processing plants, and other marine-related infrastructure (Alford 2005a).

By October 15, LDWF representatives indicated that the damage was worse than previously estimated, and that 80 percent of the projected seafood harvest for the year following the hurricanes would be lost. Estimated losses were revised to $1.3 billion. This figure is based on year 2003 total commercial and recreational retail sales of $2.85 billion, and derives from "historical data using previous losses sustained after hurricanes averaged over the past five years," and aerial and on-the-ground assessments (Advocate 2005).

The Center for Natural Resource Economics and Policy (CNREP) in late November assessed ex-vessel revenue losses as even higher than previously estimated by the LDWF. The CNREP assessment increased the LDWF's projected one-year economic losses for the commercial shrimp fishery to $90.4 million and $18.7 million for the crab fishery, but reassessed the projected one-year loss to the oyster fishery downward to $27.5 million from $44 million (2005). The reduced loss estimate for the oyster fishery likely follows from the much earlier than anticipated reopening of state oyster beds in mid-October after repeated chemical and microbiological tests by the Louisiana Department of Health and Hospitals declared them safe for consumption.

More recently, preliminary data from the National Marine Fisheries Service (NMFS) on commercial landings in Louisiana (all species combined) indicate that, in the last 4 months of 2005, landings revenue received was just over $69.5 million dollars. This figure represents a 32 percent decline in revenue from the same period in 2004, and a 36 percent decline from the five

year average for the same period (see Table 51) (NMFS SEFSC Accumulated Landings Database; 2005 data is preliminary).

Table 51. Louisiana Post-Katrina Value of Dockside Landings: 2000-2005

Fishery	Year	September-October	November-December	4-Month Interval
Shrimp	2000-2004 Average	$40,956,405	$23,073,927	$64,030,333
	2004	$36,534,732	$25,117,676	$61,652,408
	2005	$23,702,857	$26,960,090	$50,662,947
Percentage Change in Shrimp Landings Revenue				
	5-Year Avg. to 2005	-42%	17%	-21%
	2004 to 2005	-35%	7%	-18%
Oyster	2000-2004 Average	$5,743,466	$4,638,972	$10,382,438
	2004	$6,044,654	$5,881,901	$11,926,555
	2005	$1,878,528	$3,014,519	$4,893,047
Percentage Change in Oyster Landings Revenue				
	5-Year Avg. to 2005	-67%	-35%	-53%
	2004 to 2005	-69%	-49%	-59%
All Other	2000-2004 Average	$22,963,110	$10,504,629	$33,467,739
	2004	$18,058,522	$9,954,720	$28,013,242
	2005	$6,156,848	$7,817,397	$13,974,245
Percentage Change in All Other Species Landings Revenue				
	5-Year Avg. to 2005	-73%	-26%	-58%
	2004 to 2005	-66%	-21%	-50%
Total	2000-2004 Average	$69,662,110	$38,217,528	$107,879,638
	2004	$60,638,522	$40,954,297	$101,592,819
	2005	$31,738,848	$37,792,006	$69,530,854
Percentage Change in All Species Landings Revenue				
	5-Year Avg. to 2005	-54%	-1%	-36%
	2004 to 2005	-48%	-8%	-32%

Source: NMFS SEFSC Accumulated Landings Database; 2005 data is preliminary.

The significant distributional impacts that occurred are discussed next.

Shrimp. Commercial shrimp operators working from or delivering to Louisiana (and Alabama and Mississippi) ports accounted for nearly half of all shrimp production in the nation. Unfortunately, winds or storm surge associated with Hurricane Katrina destroyed or severely damaged many processing facilities, ice plants, off-loading and storage facilities, and seafood transport vehicles and routes throughout Louisiana (and Alabama and Mississippi) during the end of the peak harvesting season for shrimp, which generally runs from about May to October.

Moreover, numerous shrimp trawlers remained incapacitated, beached or trapped by debris blocking shipping channels (Buck 2005), as of June 2006 (IAI, Field Observations, June 2006).

As pointed out earlier, the Empire-Venice region is one of the top shrimp and oyster producing areas in Louisiana and the Gulf of Mexico as a whole. It is also a leading U.S. port in terms of overall seafood landings and ex-vessel value. The Empire-Venice region was also among the hardest hit regions in both the state and the Gulf (Figure 52). In October 2005, local officials estimated that approximately two-thirds of Empire's fishing fleet was out of commission due to damage or total loss (Wulfhorst 2005). Others described the Plaquemines Parish area fleet as decimated, with only 10 percent of vessels and infrastructure still functional. The economic impact of this damage is significant - landings at this port were valued at $60.2 million in 2004 (NMFS 2005b).

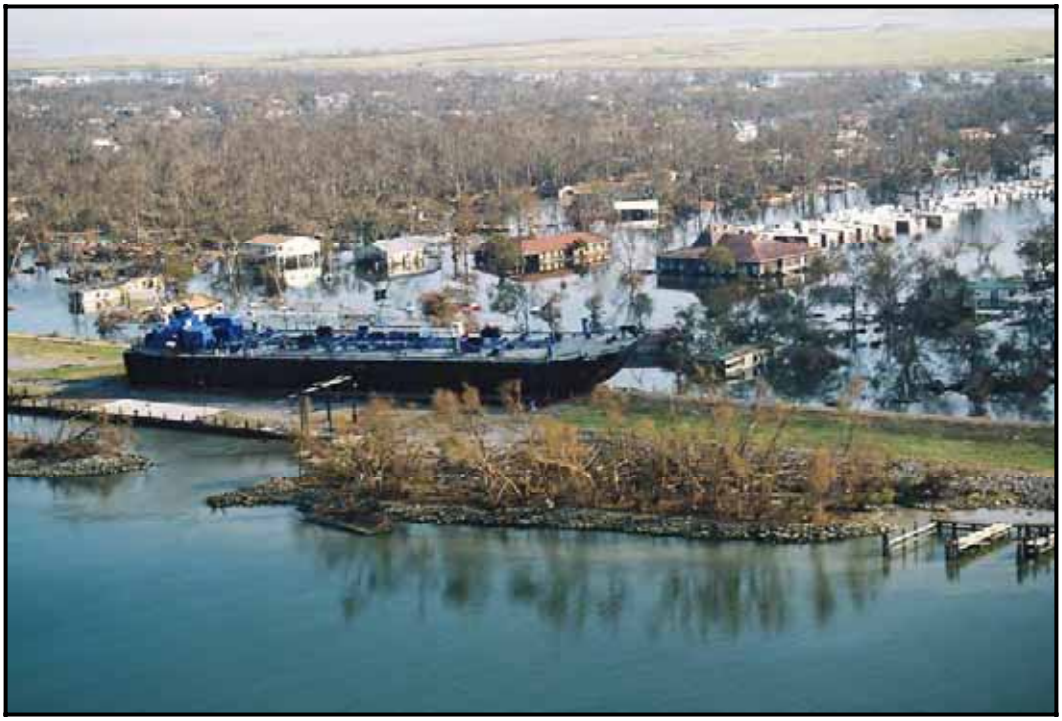


Figure 52: Venice in September 2005.
Source: Photo courtesy of Alidore Leon Marmade, resident of Lafitte, LA.

2006 Shrimp Season. After hearing public comment from members of the Louisiana fishing industry in April 2006, the Louisiana Wildlife and Fisheries, Marine Fisheries Division subsequently declared a state of emergency in accordance with the emergency provisions of R.S. 49:953(B) and R.S. 49:967 of the Administrative Procedure Act. This Act allows the Wildlife and Fisheries Commission to use emergency procedures to set shrimp seasons.

The 2006 Louisiana Spring shrimp season opened in Shrimp Management Zone 2 on May 4. Zone 2 includes state waters from the eastern shore of South Pass of the Mississippi River to the western shore of Vermilion Bay and Southwest Pass at Marsh Island. This Zone remained

open through June 13. The Shrimp Management Zone 1, which includes state waters from the Mississippi/Louisiana state line to the eastern shore of South Pass of the Mississippi River, opened on May 15. Zone 3, which includes state waters from the western shore of Vermilion Bay and Southwest Pass at Marsh Island to the Louisiana/Texas line, opened on May 22 (Figure 53) (LDWF 2006).

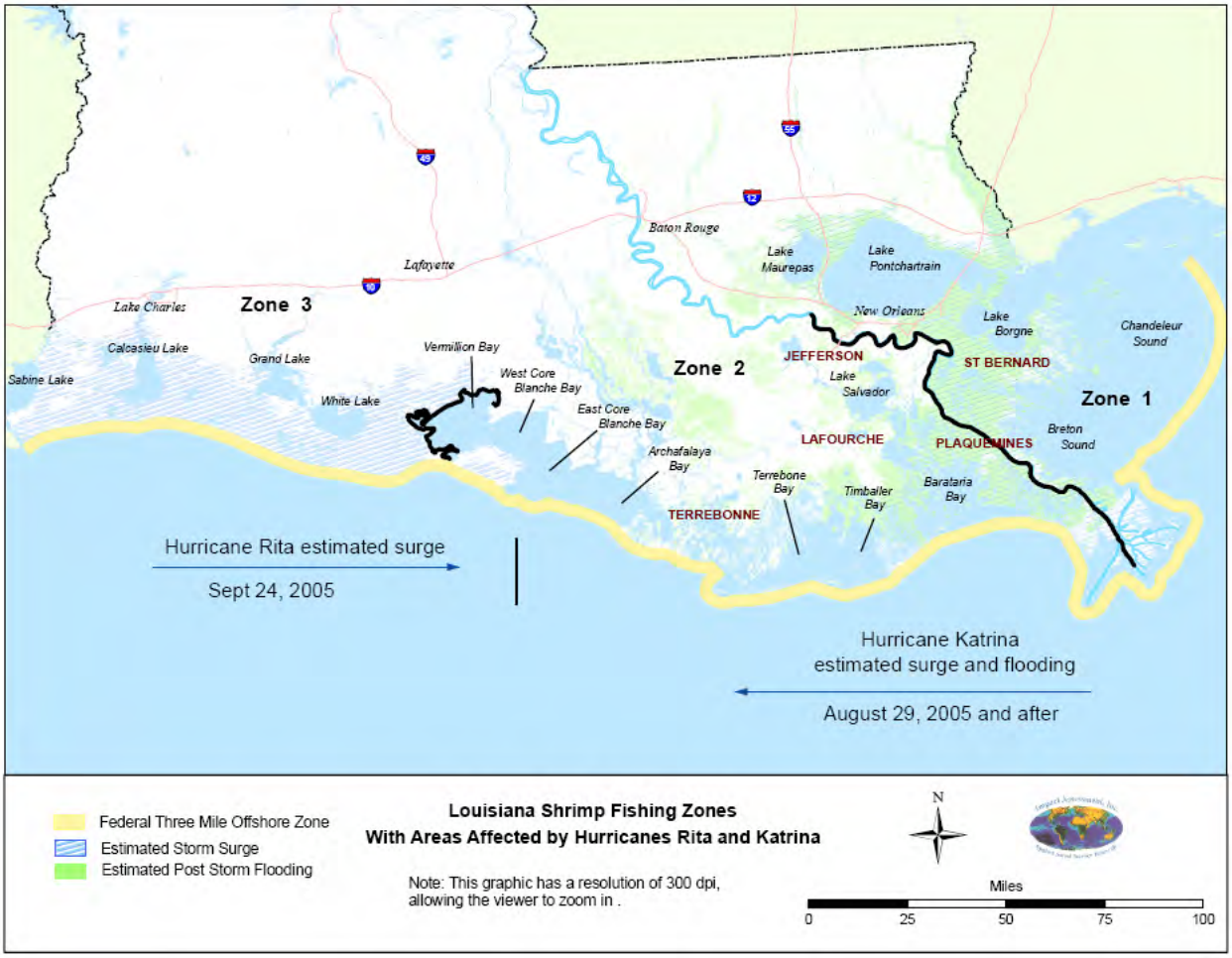


Figure 53. Louisiana Shrimp Management Zones, 1, 2, and 3; and Study Parishes in each Zone. Source: IAI 2006.

Since the start of this season, shrimpers trawling in Vermilion Bay in the Terrebonne Basin have been reporting high-volume catches of large, white shrimp. However, in nearby Barataria Basin, shrimpers report that the shrimp are unusually small (McKnight 2006). Such fluctuations are considered normal.

The 2006 commercial shrimping fleet is substantially diminished from that of the 2005 fleet. According to an off-loader in Venice, "there used to be between 450 and 500 boats in the water between Venice and Buras (Plaquemines Parish, Zone 1), with about 150 to 200 boats docked in the Venice Marina at the start of shrimp season". In 2006, however, there were between 20 and 30 boats. Another off-loader offered that his operation typically bought product from about 200 boats last year, but was now buying from about 30. Many more boats were observed in Lafitte (Jefferson Parish, Zone 2), where roughly 200 boats were working the area. Jefferson Parish is one of the few areas in southeast Louisiana where fishery participants were able to directly offload and purchase ice and some supplies during this 2006 season (IAI, Field Observations, May 2006).

High fuel costs and the difficulty of obtaining marine-related supplies contributed to a poor turnout of shrimping vessels this season. In part, the observed fleet was also smaller at the start of the 2006 shrimp season because many more shrimpers than usual reportedly were coordinating their trips with the new moon phase, when larger tidal ranges "stir up" the shrimp and make them easier to catch. Although many shrimpers often coordinated their trips with the moon phases in the past, more were reportedly doing so because of higher fuel costs and the need for greater catch certainty (McKnight 2006).

However, the reduced number of vessels shrimping in Gulf waters was, in some ways, a silver lining for those who were still capable of fishing. For instance, the storm surges from Hurricanes Katrina and Rita reportedly resulted in higher volumes of shrimp per unit effort in specific areas. Additionally, some captains and crew were operating in certain fisheries with less competition from their affected counterparts, and/or in closer proximity to viable infrastructure.

At the same time, the resulting abundance further depressed product price. Consequently, many shrimpers were finding it difficult to keep up with their bills. One second-generation shrimper recalled that in 1999, one pound of headless shrimp sold for $7.20 per pound; in 2006, the same quantity, regardless of size, was fetching $3.90 per pound. One processor explained that the declining prices that they were paying for shrimp was linked to a lack of operational capital, which was forcing processors to get the shrimp to market faster and at lower prices (Newsom 2006).

The demand for ice sharply increased following the start of Louisiana's shrimping season in May. Additionally, increased competition for scarce resources, in this case ice, created user conflicts. For example, only two facilities in Jefferson Parish, both of which are located in Grand Isle, would sell ice to anybody– as opposed to a select clientele, such as the shrimpers with whom they had existing business arrangements. Consequently, "outsiders," who then had to travel to other locales for ice, were at a competitive disadvantage as they lost fuel and catch-time in their search for ice. Many vessels traveled to Bayou La Batre or Bon Secour in Alabama, for example, to secure the ice they needed to shrimp in Louisiana waters.

Offloading facilities in Lafitte and Venice, Louisiana were also relying in part on Bayou La Batre or Bon Secour in Alabama for ice. In reciprocal fashion, processors in Bayou La Batre were relying on the fresh shrimp they could buy from off-loaders in northeast Louisiana. An off-loader describes her frustration with that situation:

> We have offloaded 50-60 boats since the opening [of shrimp season], producing 200 blocks of ice a day, unloading 30,000 pounds of shrimp a day, and we have a major problem with lack of labor. We need more people to offload, and we don't have enough ice to sell to other fishermen than those that we offload, and usually not even enough for them. I send fishermen to my aunt (a major Venice-based off-loader) for ice. We are sending fishermen all over the Gulf for ice the same way we send shrimp all over the Gulf (Personal Communication, IAI, Jefferson Parish, May 15, 2006).

Another off-loader from Jefferson Parish explains how this critical ice shortage affected his business:

> We are getting ice from Dulac (Terrebonne Parish). We buy ice for $8.50 a block, but have to pay an extra $500 per truck, plus fuel, and time for driver, so it costs about $15.00 per block, and we have to give it to many of the fishermen for free just to get them on the water (Personal Communication, IAI, Jefferson Parish, May 15, 2006).

The few operational processors in-state quickly became glutted with product within the first two weeks of the new season. Therefore, off-loading facilities in Louisiana also had to sell their shrimp to other processors in other Gulf Coast states (IAI, Field Observations, May 2006).

This glut of product, however, did not assure huge revenues for the processors. Persistent labor shortages mean less operational capacity: "The fishermen want to go out and offload but the processor doesn't have enough staff to run 24 hours; they can only run 12," notes a Lafitte fisherman (Personal Communication, IAI, Lafitte, May 15, 2006). Additionally, a lack of cold storage facilities and the difficulty of obtaining ice meant that processors could not purchase any more shrimp than they could immediately store on premises.

At the same time, however, some other processors claimed that they could not buy enough product to sustain operations because fewer fishery participants were working the waters in the 2006 season. One off-loader in Venice explained that, with fewer vessels working, he only offloaded ten small boats and five larger vessels in the first two weeks of the 2006 shrimp season; 60 to 100 boats would be typical at this same time, pre-Katrina. Other processors complained that the low market price for domestic shrimp made it difficult to turn a profit and further depressed ex-vessel prices. For example, one large processor in Lafitte was paying off-loaders in Venice $1.20 to $1.34 for 16-20 count (heads-on) – the price was $3.25 in 2000– and a little over $0.50 for 80-100 count in May 2006. These prices left little room for either the shrimper or the off-loader to profit. Many fishery participants blame the flood of farmed and foreign shrimp on the market for such low prices and assert that marketing efforts to promote consumption of wild-caught domestic shrimp need to be greatly stepped-up.

As a result of the low market price, many shrimpers cut out the "middle man" wherever possible and sold their wares directly to the consumer. A key official with LDWF confirmed this trend, noting that, post-Katrina, more shrimpers were purchasing the $20 retail license permitting them to bypass the docks and sell shrimp directly to the public, where they could command a higher price (McKnight 2006).

Understandably, frustration levels with consistently poor market conditions, exacerbated by Katrina, are on the rise. Many shrimpers describe themselves as "fed up" – an affective state was materially evidenced in the numerous shrimp boats that were for sale (Figure 54). In May 2006, 33 percent or 19 of the 57 shrimp boats observed along Highway LA 1 between Leeville and Galliano were for sale, as were 35 percent or 7 of the 20 boats observed between Galliano and Cut Off (IAI, Field Observations, May 2006).

Figure 54. Boat for Sale: Cut Off.
Source: IAI Staff, May 2006.

Oysters. On August 30, 2005, Louisiana officials mandated emergency closure of essentially all of its oyster beds. Harvest Areas 2-4, 8-13 and 24-28, and the West Cove Conditional Management Areas and Lower Calcasieu Conditional Management Area remained closed through most of October.

The lack of available product was immediately felt by area restaurant operators. Given high local demand for shellfish, many restaurant owners and buyers were forced to purchase oysters and other shellfish from non-local dealers since local beds were closed (Hackenburg 2005). In

the months following Katrina, some restaurateurs experienced low sales because of public fears of oyster contamination following the hurricanes and associated oil spills. A restaurant owner from Lafourche Parish described this challenging situation: "Not only are we unable to open because of no labor, lack of tourism, and loss, but where are we getting the oysters from? Prices have gone up, I can't afford to buy them, and people don't want to eat them" (Personal Communication, IAI, Lafourche, October 03, 2005).

According to the Louisiana Oyster Task Force, a 100 to 110 pound sack of oysters at the dock cost about $20 before the hurricanes, but climbed to between $26 and $30 after the storms (Solet 2005). Interviews with oystermen in Terrebonne Parish put the price of shucked oysters in mid-November, 2005 at $7.50-$8.00 a pound; the same oysters were fetching $4.70 per pound during the 2005 summer months.

Following extensive testing for bacterial and chemical contamination, the Louisiana Department of Health and Hospitals (DHH) reopened *private* oyster grounds east of the Mississippi River. These included Harvest Areas 14 through 23, opened on October 22, 2005 and 1 and 5 through 7, opened on October 24, 2005. These areas are located in St. Bernard, Plaquemines, (west) Lafourche, and Terrebonne Parishes. Shellfish Harvest Area 2, located in St. Bernard Parish, was reopened for harvesting on November 5, 2005. This was one of the most heavily damaged oyster grounds. Private farms west of Bayou Lafourche in Lafourche Parish, and all beds in Terrebonne Parish were also open for harvest on this date. Only one *public* oyster bed in the State of Louisiana –Sister Lake in south Terrebonne Parish – was allowed to reopen at this time (LDWF 2005).

Louisiana is one of the nation's leading oyster producers. Early predictions held that as much as two-thirds of the state's beds were detrimentally affected by the season's hurricanes and that damaged beds could take up to two years to return to life, as oysters die or diminish significantly when their beds are upturned by storm surge or silted over by storm-driven mud and sand (Louisiana Sea Grant 2005a; Wulfhorst 2005). Meanwhile, the Louisiana Oyster Task Force, together with the Louisiana Department of Wildlife and Fisheries, estimated oyster mortality would reach 99 percent in Jefferson, Lower Lafourche, Orleans, Plaquemines, St. Bernard, and St. Tammany Parishes. Direct losses of available oyster resources in these areas are projected to exceed $205 million. The cost of recovery for Louisiana's public oyster grounds will likely exceed $120 million dollars, with $26 million going toward reef rehabilitation and transplantation. Restoration of private leases is estimated at $60 million (Louisiana Sea Grant 2005b).

Dire projections notwithstanding, interviews with oyster harvesters in Terrebonne Parish in December 2005 revealed that participants battled through caked mud and debris to reach the beds. Some report having managed successful harvests in certain areas.

Table 52 depicts the pre-Katrina annual dockside value of oysters, based on a five-year average (2000-2004) over 6-month (Sept. 1-Feb 28), 12-month (Sept. 1-Aug. 31), and 24-month periods in what would become the most severely impacted parishes (Jefferson, Lafourche, Orleans, Plaquemines, St. Bernard, and St. Tammany). The 24-month period is included since oysters

take a minimum of two years to mature from larvae to market size. Table 53 illustrates the estimated losses to this fishery based on recent trends in retail value.

Table 52. Pre-Katrina Annual Dockside Value of Oysters for Severely Impacted Parishes

Fishery	6 Month Interval	12 Months	24 Months
Oyster	$11,354,791	$22,288,536	$44,577,072

Source: LDWF 2005.

Table 53. Estimated Oyster Industry Total Losses for Severely Impacted Parishes, Retail

Fishery	6 Month Interval	12 Months	24 Months
Oyster	$75,506,843	$148,213,824	$296,427,648

Source: LDWF 2005.

Fishery participants in this industry remain hopeful about its recovery. According to one local oysterman, "funding from Hurricane Ivan was going to be used to rehabilitate reefs; now it is going to be used to rehabilitate fishermen and oyster beds" (Personal Communication, IAI, Delacroix, May 4, 2006).

Aquaculture. The farmed alligator industry is the component of Louisiana's aquaculture industry that will likely be most affected by Hurricane Katrina. Much of industry takes place in parishes damaged by Katrina: Plaquemines, St. Bernard, Orleans and St. Tammany Parishes. Damage to the farmed alligator industry from Hurricane Katrina is preliminarily estimated at $3,797,091 (LSUAC 2005b). This assessment is based on 2004 farm-gate values (the alligator's retail value after all selling costs have been estimated and deducted from the market price) and the Louisiana State University Agricultural Center's assessment of potential revenue losses. Not included in this estimate is infrastructure damage ($7 million) and the as of yet unknown implications of saltwater intrusion on alligator egg production in the coastal marshes (LSUAC 2005b). Importantly, these eggs are the source of all hatchlings used in the farmed alligator industry (Personal Communication, LSUAC, June 13, 2006). According to officials at LDWF,

> Hurricane Katrina may impact wild nest production and future egg collections in Plaquemines, St. Bernard, Orleans and St. Tammany Parishes. In these parishes an estimated 3,700 nests are produced on privately owned wetlands while an estimated 750 nests are produced on public lands. While all permitted 2005 egg collection activities were completed prior to the impact of Hurricane Katrina, it is anticipated that the 2006 nest production and subsequent egg collections will be impacted. The marshes in Plaquemines and St. Bernard Parishes in the area of the Caernarvon Freshwater Diversion were damaged by storm surge and saltwater intrusion. Initial aerial observations indicated significant physical marsh damage to large areas of vegetated wetlands. This area has been particularly productive in recent years and nest production

may be impacted significantly in selected areas in 2006 and in future years (Elsey et al., 2006).

Recreational and Charter Fishing Industries. The charter boat industry in Louisiana was heavily impacted by Katrina. In 2004, there were 515 charter and guide vessels registered in Louisiana. Sixty-three percent of these vessels were registered in the six parishes most severely impacted by Hurricane Katrina (Table 54). According to LSU Agricultural Center economists, this industry will lose $27 million in revenue in 2006 as a result of the storms (CNREP 2005).

Table 54. Licensed Charter Vessels by Parish: 2004

Parish	Charter Vessels
Jefferson	79
Lower Lafourche	30
Plaquemines	157
St. Bernard	43
St Tammany	13
Orleans	3
Total	325
Percent of State	63.1%

Source: LDWF September 7, 2005.

Alternatively, LDWF provides an estimate of loss based only on revenue associated with fishing-related retail sales. The retail value of losses listed below do not include direct losses to the resource base, only losses to the industry in terms of lost sales related to fishing activity (Table 55). "These calculations were based on the numbers of recreational license holders in that area as a fraction of the statewide license base, and with retail estimates based on a study by Southwick and Associates estimating 2003 values for recreational fishing in Louisiana" (LDWF 2005: 4).

Table 55. Recreational Fishing Licenses in 2004 and Estimated Loss of Revenue to the Recreational Fishing Industry in the Six Parishes Most Impacted by Hurricane Katrina

Parish	Recreational Fishing Licenses	Estimated Loss of Revenue to the Retail Industry
St. Bernard	15,921	$19,910,788
Jefferson	65,836	$85,058,147
Plaquemines	20,373	$19,495,632
Lafourche	16,220	$20,238,825
St. Tammany	33,374	$42,273,996
Orleans	9,252	$12,640,357
Total	160,976	$199,517,744

Source: LDWF September 7, 2005.

One charter boat operator in Jefferson Parish had 17 boats ranging from 24-38 feet and employed several captains prior to Katrina. Despite steaming his fleet to Houma for safe-keeping in preparation for the storm, he still lost many boats, and each lost vessel cost him roughly $200,000. This operator provides insight into the importance of recreational fishing infrastructure and the effects of its loss:

> All captains and their private businesses are out of work. There are no motels in area. The chartering market is devastated. We have lost bait; lost freezers…we have to buy from Alabama and Florida. We lost 2,500 pounds of recreational fish bait, and we've been out of business since August 29th. The chartering community usually goes strong until October 31st (Personal Communication, IAI, Jefferson Parish, November 17, 2005).

One of the biggest challenges facing the charter fishing industry is the lack of infrastructure. Motels for housing clientele are severely damaged; bait has been extremely difficult to locate; and without New Orleans as a functioning tourist destination, fishing-related tourism in the general region is down significantly. A 30-year veteran of the St. Bernard Parish charter fishing industry stated, "I don't have any customers now because there aren't any hotels, or restaurants to house [customers]". A displaced charter fisherman, from Venice, tried to relocate to Lafitte, but explained, "all the marinas were ruined in Venice and now there is too much competition in Lafitte; I'm out of business" (Personal Communication, IAI, Lafitte, October 25, 2005). A local charter boat guide from Plaquemines Parish estimated that 250 guide boat operators in southeast Louisiana were out of work as of November 2005 (Robertson 2005).

Fishing guides working out of mid-coastal Terrebonne and Lafourche Parishes to the west of Plaquemines were faring somewhat better. One charter boat guide in Houma asserted that fishing guides and marinas in these parishes have been absorbing the bulk of the recreational fishing business in Louisiana, given the infrastructure and habitat damage sustained across the rest of the coast (Robertson 2005).

Fortunately, the charter industry in Louisiana is seasonal in nature. Most charter fishermen interviewed for this study prepare in the winter months for potential business in the spring, which typically includes fishing tournaments and rodeos. However, some charter operations continue working in winter, despite often adverse weather conditions. For such guides, the winter of 2005 was uncertain; one charter captain stated:

> I don't know how I am going to make it through [this] winter. [My fleet] used to take as many as 100 clients out a day. Our main source of business is people from New Orleans, Baton Rouge and Texas. We used to have 38-40 employees, now [we have] just two (Personal Communication, IAI, October 25, 2005).

The total economic losses to this industry are still being determined. To better assess damages and costs, the National Association of Charter Boat Operators (NACO) has conducted an economic loss survey among its industry members across the Gulf region. NACO has asked charter boat captains to estimate income lost due to lost charters and damage to their boats from Hurricanes Katrina and Rita. In Louisiana, NACO conducted surveys with 398 of the state's 470

identified licensed charter boat vessels. Of those sampled, 315 are guide boats, 75 are six passenger charter boats and 8 are multi-passenger charter boats. One hundred thirty-seven operate in federal waters, 226 operate in state waters, (Louisiana state waters extend 3 miles offshore) and 328 operate in inshore waters. Hurricanes Katrina and Rita (but primarily Katrina) damaged 81 of these charter boats and totaled 83. Of these lost and damaged vessels, losses/damages amounted to $7,851,310; insured losses totaled 47 percent. According to NACO, these vessel operators lost 19,459 trips valued at nearly $13 million (Walker et al. 2006). Nevertheless, charter boat operators in Louisiana remain optimistic about their future participation in this industry. Some 360 or 90 percent of the 398 guide boat owners who responded to this survey expect to continue in business; the remainder does not plan to continue in business, are not sure if they will continue, or did not respond to this question (Walker et al. 2006).

Table 56 shows the overall projected economic loss to the State of Louisiana from the losses incurred by her charter boat fleet (Walker et al. 2006: 108). NACO included in this analysis lost trips immediately following the storms, physical loss to vessels, one lodge and some tackle losses, support personnel lost trip gross income and the projected gross lost income to owners only that was reported for the year following the storms (Walker et al. 2006: 108).

Table 56. Total Projected Losses to 398 Louisiana Charter Boats from Hurricanes Katrina and Rita*

Lost Trips (up to submittal of survey)	$12,729,400
Physical Damage	$7,851,310
Physical loss to lodge and tackle	$1,033,100
Support Personnel Loss	$1,914,388
Annual Income Loss for 1 year (after survey was submitted)	$28,233,550
Total	$51,761,748

*Data only available for both storms combined.
Source: Walker et al. (2006).

IV. RESPONSE AND ADAPTATION TO HURRICANE KATRINA

Fishermen responded to post-Katrina conditions based on the resources that remained available to them, their particular fishery adaptation, and the nature of physical impacts to their specific location or fishery. The principal adaptation strategies employed fall into five (5) broad categories: (1) cooperation with others in the fishing industry; (2) reliance on make-shift strategies that involved local community members rather than remote government support; (3) local government assistance; (4) concentration of fishing effort in viable off-loading areas; and (5) reliance on the region's oil and gas industry for alternative forms of employment.

1. Cooperation with others in the fishing industry. Although Katrina damaged much of the marine-related infrastructure and initially put many fishing operations out of commission, some commercial fishing participants and enterprises were able to resume activities to varying extents by December 2005 by pooling resources and drawing on firmly established social networks. For example, in the aftermath of the storm, there was extensive collaborative effort between fishery participants and shrimp/fish shed owners. In the case of Griffin's seafood, for example, 20 fishermen who traditionally sell to the shed joined forces with another 20 fishermen from other destroyed sheds in the Venice/Buras area and rebuilt Griffin's facility in Leeville. With lumber brought in from Florida and equipment brought down from storage in the north, the business was rebuilt and able to resume operations within weeks of the storm.

Another example of inter-occupational cooperation involved the efforts of a Grand Isle shed owner who brought in a truck to off-load any catches being made during the first three weeks following Katrina. This proprietor was motivated not only by his business interests, but also by his sense of loyalty to his fishermen, who had large catches but no off-loading facility. This effort, in fact, stimulated the re-establishment of Venice Seafood Exchange. The shed owner detailed his surprise the first time he made the pick-up when, upon having to write a single pay check for the full load, the fishermen decided among themselves how the check would be divided. This reportedly was the first time anyone had ever witnessed this level of cooperation.

Some off-loading facility operators extended use of their facilities to other operators who lost their own. For example, Blanchard's shed in Grand Isle moved operations to Leeville, sharing a facility with Griffin's. This cooperative endeavor permitted the Grand Isle operator to maintain a large portion of his fleet while his facility and ice plant are being rebuilt.

Shed and ice-plant owners have also relied on loans from family, personal savings, or inter-industry loans to remain operational. One marine operator explained that "the insurance company never showed up, so I spent $54,000 out of own pocket to repair the dock" (Personal Communication, IAI, Jefferson Parish, November 11, 2005). Examples of inter-industry loans include loans made by shed operators to fishermen for fuel and ice, and loans by processing plants to shed owners for general machinery repairs. Regarding the former, the extreme rise in fuel costs made it impossible for many fishery participants, now financially challenged by the cost of repairs, to re-enter the fishery in question. In some cases, shed operators helped fishery participants finance their fuel costs by offering long-term (e.g., two year) loans. In doing so, shed operators and area processors helped to maintain a steady supply of fish. Interviews with

area fishery participants reveal that financial assistance is commonplace among suppliers and consumers, and off-loaders and processors with well-established relationships.

2. Reliance on make-shift strategies. Many fishery participants have had to rely on their own ingenuity to remain viable participants in the region's fisheries. One important adaptation in the post-Katrina environment includes using small generators to make ice. For example, the Venice Seafood Exchange (VSE) in Plaquemines Parish was the only off-loading shed in this area able to resume operations within the one month of Katrina. However, substantial damage to electrical equipment forced VSE personnel to rely on generators for electricity and ice trucked in from Lafitte Frozen Foods, some 53 miles away. This "jerry-rigged" operation, in fact, typified local reliance on trucks during the post-storm period (Figure 55).

Figure 55: Seafood Transport Vehicle, a Vital Service following the Hurricanes.
Source: IAI Staff, October 2005.

Additionally, given obstacles to selling through normal channels, many commercial fishery participants have been selling seafood directly from the back of vehicles. In many instances, chain stores have opened up parking lots to allow fishermen to sell their goods directly to the public.

3. Local government assistance. Subsequent to the retreat of storm waters from the low-lying areas, many fishery participants and their families have been hoping for federal and state assistance. However, the extent of support in Louisiana is said to have remained comparably less than that in adjacent affected states. For instance, FEMA's assurance that trailers would be provided for homeless fishing families reportedly has been slow to manifest relative to other, less dramatically affected areas. Moreover, many Southeast Louisiana residents report feeling

overlooked, in part as a result of media attention paid to New Orleans. The situation has led to increasing interaction between fishery participants and local leadership, with the objective of securing timely external assistance of *some* sort. The mayors of Jefferson Parish and the presidents of St. Bernard, Plaquemines, Jefferson, Lafourche, and Terrebonne, have subsequently become highly engaged with local efforts to rebuild local fishery infrastructure and capacity.

4. Concentration of fishing effort in viable offloading areas. The Louisiana shrimp industry may be seen as a network of relatedness between fishermen, offloading docks, ice plants, and processing/peeling plants. The interdependence of various industry operators is clear. For example, only one off-loading facility in the Venice/Boothville area had resumed operations, albeit in limited capacity, one month after Katrina. By early November, a second offloading facility in this area and two in the devastated St. Bernard Parish region had been re-established. In order to compensate for the relative paucity of off-loading facilities in this area of formerly highly active wholesale seafood distribution, other facilities in alternative locations accepted much higher volumes of product than usual. While buyers welcomed the extra product, many operations were already operating at maximum capacity as they struggled to meet the demands of a now highly concentrated business.

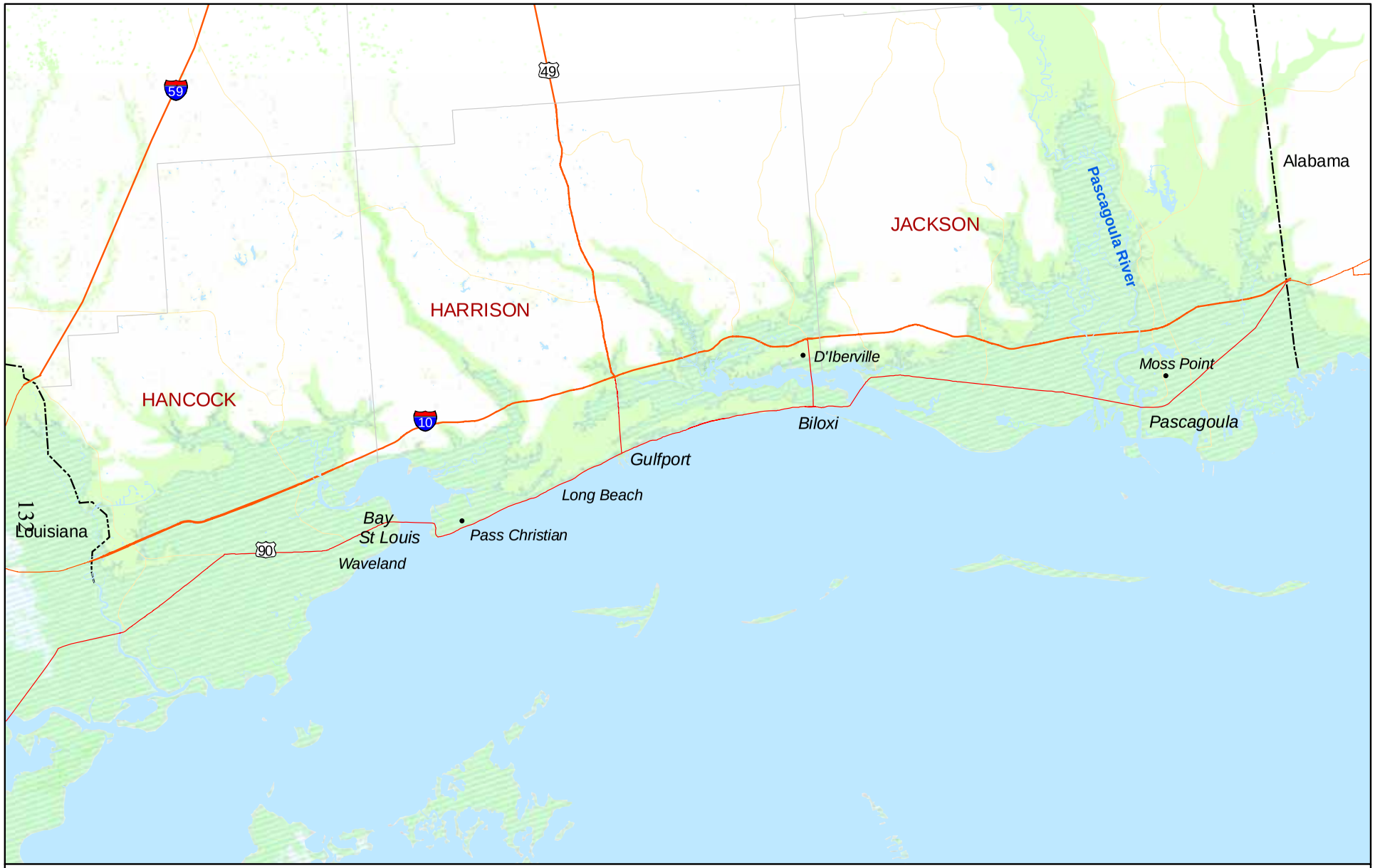
5. Reliance on oil industry for alternative employment. The fishing and oil and gas industries have long had a symbiotic relationship in Louisiana. Throughout the mid- to late-1980s, the coastal seafood industry in Louisiana expanded, while the offshore oil and gas production industry underwent a period of decline. Subsequent to this downturn, many unemployed oil workers turned to commercial fishing for employment, as many already owned boats and fishing gear. Oilfield workers typically worked seven days on and seven days off, or a similar configuration, and commercially fished during their off days. According to one fishery participant, "fishing was a safety net for getting laid-off and vice versa". Following a lay-off, it was relatively easy to convert their vessels and experience into full-time fishing operations. One fisherman from Lafourche Parish noted that the oil industry is often regarded as a safety net for many fishery participants:

> Everyone wants to work on the oil boats, 'cause they are actually making money that way. If I did it again, I would work for oil companies and become a millionaire. Many of my buddies are in oil now. It used to be they worked for Exxon in the off-season of fishing. Now it is all oil. Can't compete with the foreign import of shrimp. Gotta try domestic oil now (Personal Communication, Cut Off, October 25, 2005).

Many Cajuns who inhabit southern Jefferson, Lafourche, and Terrebonne Parishes may occupy both fields of work, with one brother working as a fisherman and another as an oil worker, or with each working at least part time in the both industries. More recently, however, the balance is shifting toward work in the oil and gas industry, as related by a Cajun fisherman in Grand Isle:

> [The] fishing industry used to have a platform, now that is gone. A lot of them are taking their rigs and going into oil. In other places, fishermen have gotten federal money for doing clean up. In St. Bernard and Plaquemines Parish money will be available for oystermen to do clean up. Here, we just rely on the oil business (Personal Communication, Grand Isle, October 25, 2005).

D. Pre-Hurricane Katrina: An Overview of the Commercial and Recreational Fishing Industries in Mississippi



Hurricane Katrina Affected Areas of the Mississippi Coast

Note: This graphic has a resolution of 300 dpi, allowing the viewer to zoom in .

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I. PRIMARY FISHING INDUSTRIES IN MISSISSIPPI

There are three major seafood ports in coastal Mississippi: Biloxi, Pascagoula/Moss Point, and Gulfport. Shrimp, oysters, crabs, and finfish constitute the state's primary commercial fisheries in which producers and processors participate. Landings coming through these ports averaged about 203 million pounds per year between 1994 and 2004. The annual value of these fisheries is approximately $44 million. When including the multiplier effect, the total economic impact of the industry on the state exceeds $450 million annually (NMFS 2005a; Mississippi State University Sea Grant, No date). Shrimp production generates the highest annual revenue, bringing in $27 million in 2004 (NMFS, SEFSC 2005). The oyster fishery brought in $6 million dollars in 2004. In this same year, the crab fishery contributed $3 million dollars, while the menhaden and edible finfish market accounted for the remainder of the revenue (NMFS SEFSC 2005; Mississippi State University Sea Grant, No date). Between 2000 and 2004, inclusive, commercial landings in Mississippi had an average ex-vessel value of $49 million (Table 57).

Table 57. Commercial Landings in Mississippi (all species combined), Thousands of Pounds (live weights), and Thousands of Current Dollars: 2000-2004

Year	Pounds	Value
2000	217,744	$58,715
2001	213,889	$50,561
2002	217,968	$47,565
2003	213,469	$46,149
2004	183,762	$43,791
<5 Year Average>	<209,366>	<$49,356>

Source: NMFS SEFSC Accumulated Landings Database; 2005 data is preliminary.

While Mississippi is not the most abundant Gulf Coast state seafood producer, the total direct, indirect, and induced economic value of this industry to the state is considerable (see Table 58 below). In 2003, the production sector of the Mississippi commercial seafood industry–which includes harvesting and processing–employed 6,230 persons and had a statewide economic impact of $403 million dollars. The distribution sector, which includes wholesaling, restaurant, and retailing, employed 10,588 persons and accounted for $497 million in earnings. Together, these sub-sectors awarded $279 million in labor compensation and paid $42 million in state taxes. The restaurant and processing sub-sectors are particularly active, supporting a total of 74 percent of all jobs in this industry (Posadas 2005a).

Table 58. Economic Impact of Mississippi Commercial Seafood Industry by Sector: 2003

Sector	Output		Employment		Labor Income		State Taxes	
	$M	Percent	Jobs	Percent	$M	Percent	$M	Percent
Harvesting	66.8	7%	2,472	15%	39.7	14%	2.2	5%
Processing	336.5	37%	3,758	22%	75.2	27%	7.8	19%
Wholesaling	55.8	6%	436	3%	14.6	5%	4.2	10%
Restaurant	384.4	43%	8,791	52%	122.8	44%	21.1	50%
Retailing	57.2	6%	1,361	8%	26.8	10%	6.7	16%
Total	900.8	100%	16,818	100%	279.3	100%	42.2	100%
Production Sector	403.4	45%	6,230	37%	115.0	41%	10.1	24%
Distribution Sector	497.4	55%	10,588	63%	164.3	59%	32.1	76%

Source: Posadas 2005a.

According to Posadas (2006a), the combined plant-gate value of Mississippi's seafood processing plants in 2003 totaled nearly $338 million dollars (Table 59). In that year, 69 processing plants employed almost 2,600 workers (Posadas 2006a).

Table 59. Plant-gate Values* and Number of Workers Employed in Mississippi Seafood Processing Plants: 2003

Category	Plant-gate Values	Number of Workers
Shrimp	$73,402,922	503
Oysters	$9,181,372	288
Crabs	$838,128	78
Foodfish	$84,432,502	1,082
Total	$337,863,746	2,582

*Plant-gate value = retail value after all selling costs have been estimated and deducted from the market price.
Source: Posadas 2006a.

Commercial Landings in Mississippi between 1995 and 2004. Between 1995 and 2004, Mississippi's fisheries (all species combined) produced on average 2 percent of the nation's seafood harvest. In 2004, Mississippi's commercial fisheries produced 184 million pounds of fish (all species combined), with a value of $44 million (NMFS 2005a). Of the five Gulf Coast states, Mississippi ranked fourth in terms of annual seafood production revenue in 2004. Total seafood landings coming through Mississippi state ports has been decreasing since 2000 (Table 60).

Table 60. Pounds and Value of all Commercial Landings in the United States and Mississippi: 1995-2004

Year	Pounds (all species), U.S.	Value (in billions), U.S.	Pounds (all species), Mississippi	Value (in millions), Mississippi	% of Total U.S. Lbs. from MS	% of Total U.S. Value from MS
1995	9,912,807,044	$3,826,360,342	144,897,569	$41,704,923	1.5%	1.1%
1996	9,643,821,438	$3,564,587,048	162,362,302	$35,022,604	1.7%	1.0%
1997	9,951,898,930	$3,592,218,307	180,395,328	$47,645,089	1.8%	1.3%
1998	9,332,712,602	$3,221,433,652	210,690,418	$48,320,740	2.3%	1.5%
1999	9,409,192,065	$3,575,730,880	267,561,885	$48,529,722	2.8%	1.3%
2000	9,142,633,213	$3,674,425,002	217,743,660	$58,714,947	2.4%	1.6%
2001	9,511,750,925	$3,243,655,393	213,888,537	$50,560,590	2.2%	1.5%
2002	9,428,867,963	$3,191,297,481	217,967,609	$47,565,219	2.3%	1.5%
2003	9,515,048,681	$3,371,930,855	213,468,811	$46,148,637	2.2%	1.4%
2004	9,664,977,837	$3,714,515,156	183,761,862	$43,790,554	1.9%	1.2%
<10 Year Averages>	<9,593,229,233>	<$3,508,517,784>	<201,273,798>	<$46,800,302>	<2.1%>	<1.3%>

Source: NMFS 2005a.

Top Seafood-Producing Ports in Mississippi. Jackson and Harrison are the leading seafood producing counties in the State of Mississippi. Pascagoula-Moss Point (Jackson) and Gulfport-Biloxi (Harrison) are the top producing state ports (NMFS 2005b). Tables 61 and 62 below rank the top-producing ports in Mississippi in terms of landings and value. Each also identifies the ranking of each port in relation to the top performing ports in the United States.

Historically, Pascagoula-Moss Point has been a particularly productive port, ranking eighth of 97 ports in the nation in terms of pounds landed in 2004, and 57th in terms of value (NMFS 2005b).

Table 61. Total Commercial Fishery Landings at Select Mississippi Ports and Ranking* by U.S. Dollars: 2004

Port	County	U.S. Rank by Value	Value in Millions	Pounds in Millions
Gulfport-Biloxi	Harrison	26th	$26.2	16.3
Pascagoula-Moss Point	Jackson	57th	$11.9	162.8

* There are 97 ranked ports in the United States.
Source: NMFS 2005b.

Table 62. Total Commercial Fishery Landings at Select Mississippi Ports and Ranking* by Pounds: 2004

Port	County	Rank of Port in U.S.* by Pounds	Pounds in Millions	Value in Millions
Pascagoula-Moss Point	Jackson	8th	162.8	$11.9
Gulfport-Biloxi	Harrison	46th	16.3	$26.2

* There are 97 ranked ports in the United States.
Source: NMFS 2005b.

II. PRIMARY FISHERIES AND PRODUCTION LEVELS IN COASTAL MISSISSIPPI: 1995 TO 2004

Shrimp Production. The commercial shrimp fishery is a vital contributor to Mississippi's seafood industry. Brown, white, and pink shrimp are the most widely harvested, with brown shrimp constituting 85 percent of the annual harvest (MDMR, No date). Annual commercial landings for the State of Mississippi average about 17 million pounds (NMFS 2005a).

Over the past decade (1995-2004), shrimp landings in Mississippi have averaged 6 percent of all shrimp harvested in the Gulf of Mexico. These landings had an average ex-vessel value of $29 million dollars (heads-on) (Table 63) (NMFS 2005a).

Table 63. Pounds and Value of Mississippi Shrimp Harvest*: 1995-2004

Year	Pounds	Value	Percent of Gulf Harvest/Pounds	Percent of Gulf Harvest/Value
1995	15,409,938	$29,018,763	6.6%	6.2%
1996	10,384,211	$20,485,757	4.6%	4.9%
1997	12,339,047	$30,251,332	5.8%	6.6%
1998	16,082,976	$32,853,742	6.1%	6.7%
1999	14,461,139	$29,354,111	5.9%	6.1%
2000	14,793,949	$38,257,585	5.1%	5.8%
2001	15,915,059	$31,541,871	6.2%	6.3%
2002	16,821,526	$29,910,101	7.2%	7.7%
2003	17,560,228	$25,619,197	6.8%	7.0%
2004	18,195,623	$26,524,987	7.1%	7.2%
<Average>	<15,196,370>	<$29,381,745>	<6.1%>	<6.4%>

*Brown, White, and Other.
Source: NMFS 2005a.

In 2004, the most recent year for which national data was available when writing this report, 18 million pounds or 7 percent of all U.S. shrimp landings (317 million pounds) were landed in Mississippi, with a value of $26 million (heads-on) (NMFS 2005a). Of the five Gulf Coast states, Mississippi ranks fifth in terms of shrimp production (Figure 57) (NMFS 2005a).

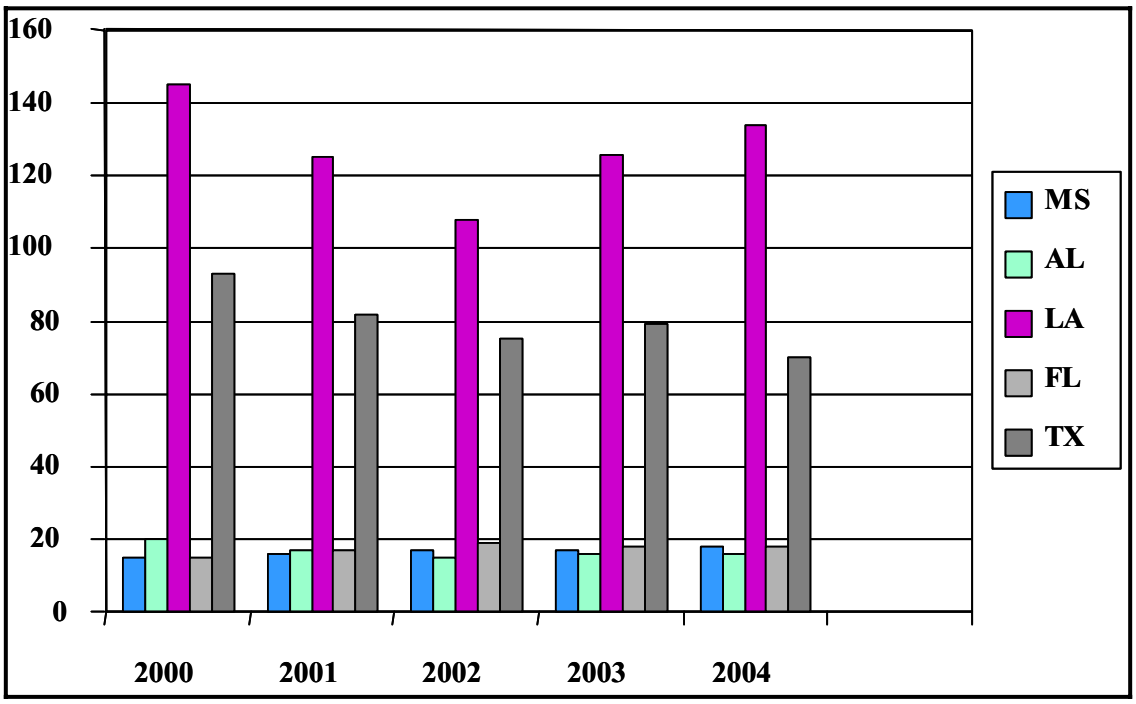


Figure 57. Shrimp Landings in the Gulf Coast States (in millions): 2000-2004.
Source: NMFS 2005a.

While the contribution of Mississippi's shrimp fishery to the Gulf Coast harvest has remained more or less constant between 1995 and 2004, the value of this harvest has been steadily decreasing relative to pounds landed. As assessed for recent years, Mississippi's shrimp fishery peaked in 2000, with 15 million pounds of shrimp valued at $38 million dollars. In 2001, however, 16 million pounds of landings fetched only $32 million dollars. In 2002, 17 million pounds of shrimp had an ex-vessel value of $30 million, and by 2004, the dockside value of 18 million pounds of shrimp dropped to $27 million (Figure 58) (NMFS 2005a). The increase of imported shrimp into the U.S. market has contributed to falling dockside values since 2000.

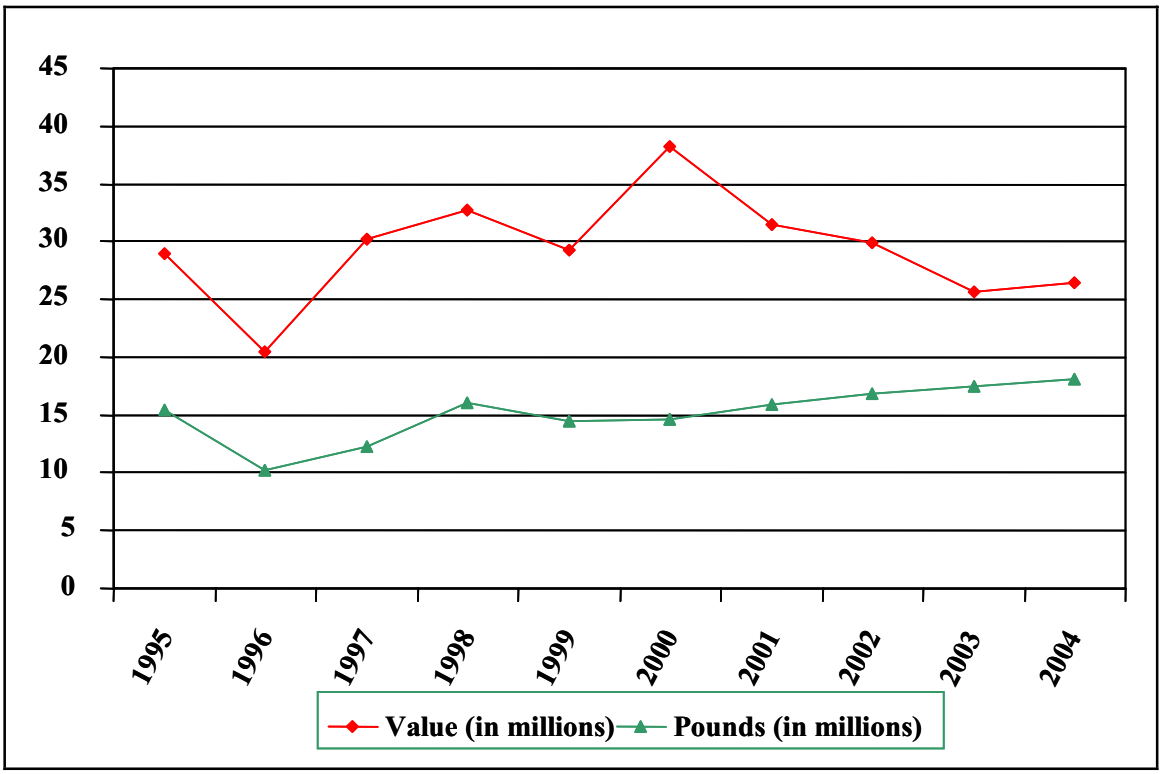


Figure 58. Mississippi's Shrimp Harvest in Pounds and Value: 1995-2004.
Source: NMFS 2005a.

The production and distribution sectors of the shrimping industry are economically compelling (see Table 64). In 2003, the production sector of the Mississippi commercial shrimp industry–which includes harvesting and processing–employed 2,102 persons and had a statewide economic impact of $129 million dollars. The distribution sector—which includes wholesaling, restaurant, and retailing—employed 7,337 persons and accounted for $344 million in earnings. Together, these sub-sectors awarded $150 million in wages and paid $25 million in state taxes. The restaurant and harvesting sub-sectors are particularly active, supporting a total of 79 percent of all jobs in this industry (Posadas 2005b).

Table 64. Economic Impact of Mississippi Commercial Shrimp Industry by Sector: 2003

Sector	Output		Employment		Labor Income		State Taxes	
	Value*	Percent	Jobs	Percent	Value*	Percent	Value*	Percent
Harvesting	34.8	7%	1,285	14%	20.7	14%	1.1	5%
Processing	94.2	20%	817	9%	16.3	11%	1.7	7%
Wholesaling	37.9	8%	297	3%	9.9	7%	2.9	12%
Restaurant	268.6	57%	6,143	65%	85.8	57%	14.8	59%
Retailing	37.7	8%	897	10%	17.6	12%	4.4	18%
Total	473.1	100%	9,439	100%	150.4	100%	25.0	100%
Production Sector	129.0	27%	2,102	22%	37.0	25%	2.9	11%
Distribution Sector	344.2	73%	7,337	78%	113.4	75%	22.1	89%

* Value in millions of dollars.
Source: Posadas 2005b.

Oyster Production. Oysters are an economically and culturally important state fishery. Biloxi was once heralded as the "oyster capital of the world". While this is no longer the case, oyster production in Biloxi remains energetic. According to Mississippi State University Sea Grant (MSUSG), the direct, indirect, and induced value of the state's oyster production component was approximately $22 million in 2003, with a value-added direct annual impact of $6 million because the majority of the harvest is consumed within the state (MSUSG, No date; Posadas 2005c). The distribution sector was valued at $78 million in 2003 (Posadas 2005c).

Mississippi's commercial oyster industry includes harvesting, processing, and distribution components. Annual oyster harvests can fluctuate widely from year to year primarily because of variations in the natural environment. Due to variability in production levels, the number of state-issued oyster licenses sold each year can range from 200 to 700 in any given year (MSUSG, No date). Over the past decade, oyster beds in Mississippi have produced an average of 10 percent of all the oysters harvested in the Gulf of Mexico. The average annual value of this ten-year harvest was $4 million dollars (Table 65).

Table 65. Oyster Landings for Mississippi by Pounds and Value: 1995-2004

Year	Pounds	Value	Percent of Gulf Harvest/Pounds	Percent of Gulf Harvest/Value
1995	1,327,100	$1,658,189	6.0%	4.2%
1996	1,623,778	$2,498,025	7.3%	5.6%
1997	2,093,148	$2,671,554	9.3%	5.6%
1998	1,344,688	$2,188,072	6.9%	4.9%
1999	1,407,809	$2,205,895	6.2%	4.8%
2000	3,548,240	$6,113,303	13.8%	11.5%
2001	2,653,270	$4,195,464	10.3%	8.0%
2002	2,737,839	$4,455,647	11.3%	8.8%
2003	4,042,136	$7,227,588	14.9%	11.7%
2004	3,029,391	$6,073,242	12.1%	10.0%
<10 Year Average>	<2,380,740>	<$3,928,698>	<9.8%>	<7.5%>

Source: NMFS 2005a.

As assessed for recent years, Mississippi oyster production peaked in 2003 with 4 million pounds of oysters, valued at $7 million. The dockside value of oysters cultivated in Mississippi state waters (as well as other Gulf of Mexico states), can vary when consumer groups concerned with the health risks of eating raw oysters increase their activities, or when harvest areas are closed due to increased levels of pollution associated with coastal development (MSUSG, No date). However, the ratio of oyster landings to value has remained mostly constant over the last decade (Figure 59).

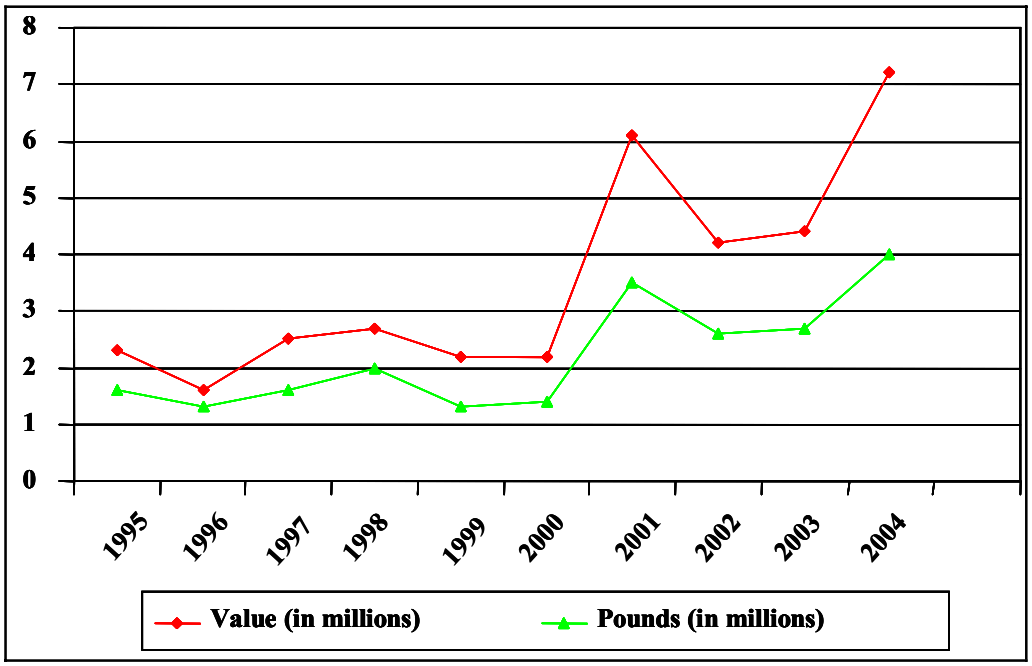


Figure 59. Mississippi's Oyster Landings in Pounds and Value: 1995-2004.
Source: NMFS 2005a.

More oysters are processed in Mississippi than produced. Approximately 80 percent of oysters processed in Mississippi are harvested in other Gulf Coast states (MSUSG, No date). In 2003, the total plant-gate value of oyster products handled by ten oyster processing plants in coastal Mississippi equaled $22 million (Posadas 2005c). The oyster distribution sector, which includes wholesaling, retailing, and restaurant establishments, produced $78 million in economic output in 2003, and paid $5 million in indirect business taxes (Table 66) (Posadas 2005c). This sector also supported 1,658 jobs, paying $26 million in compensation. While economically profitable, this industry's dependence on oysters from other states limits expansion—especially in the wake of Hurricane Katrina.

Table 66. Economic Impact of Mississippi Commercial Oyster Industry by Sector: 2003

Sector	Output		Employment		Labor Income		State Taxes	
	$M	Percent	Jobs	Percent	$M	Percent	$M	Percent
Harvesting	10.4	10%	387	18%	6.2	18%	0.3	6%
Processing	11.8	12%	102	5%	2.0	6%	0.2	4%
Wholesaling	8.7	9%	68	3%	2.3	7%	0.7	12%
Restaurant	60.2	60%	1,377	64%	19.2	57%	3.3	59%
Retailing	8.9	9%	213	10%	4.1	12%	1.0	19%
Total	100.1	100%	2,147	100%	34.0	100%	5.6	100%
Production Sector	22.2	22%	489	23%	8.2	24%	0.7	10%
Distribution Sector	77.9	78%	1,658	77%	25.7	76%	4.9	90%

Source: Posadas 2005c.

Aquaculture. Mississippi, Alabama, Arkansas, and Louisiana are the nation's top four performing states in terms of farmed catfish production. Of these four southern states, Mississippi ranked first in small, medium, and large food-sized catfish production, raising 162 million pounds in 2005. In comparison, Arkansas, which ranked second for catfish production, produced 52 million pounds of farmed catfish, all sizes, in this same year (USDA 2005). Figure 60 maps the location of fish hatcheries and fish farms in Mississippi.

Mississippi produces 75 percent of all domestically farmed catfish in the nation. In 2005, there were 95,100 acres of water surface used for farming catfish (foodsize, fingerlings, and broodfish combined). Five thousand pounds per acre per year is the usual production, but some farmers harvest in excess of 7,000 pounds per acre. The farm production value of catfish in Mississippi is estimated at $224 million per year (Mississippi Department of Agriculture and Commerce, No date).

Catfish production in Mississippi is most extensive in the counties of Sunflower (24,500 acres), Humphreys (21,300 acres), Leflore (16,400 acres), Washington (6,800 acres), and Noxubee (6,300 acres) (Mississippi Department of Agriculture and Commerce, No date). These counties are located in the northwestern part of the state. Due to their inland location, the farmed catfish industry in these counties was not disrupted by Hurricane Katrina.

Fish Hatchery

Aquaculture

Estimated Storm Surge

Estimated Post Storm Flooding

Fish Hatcheries and Aquaculture of the Mississippi Coast

in Hurricane Katrina Affected Areas

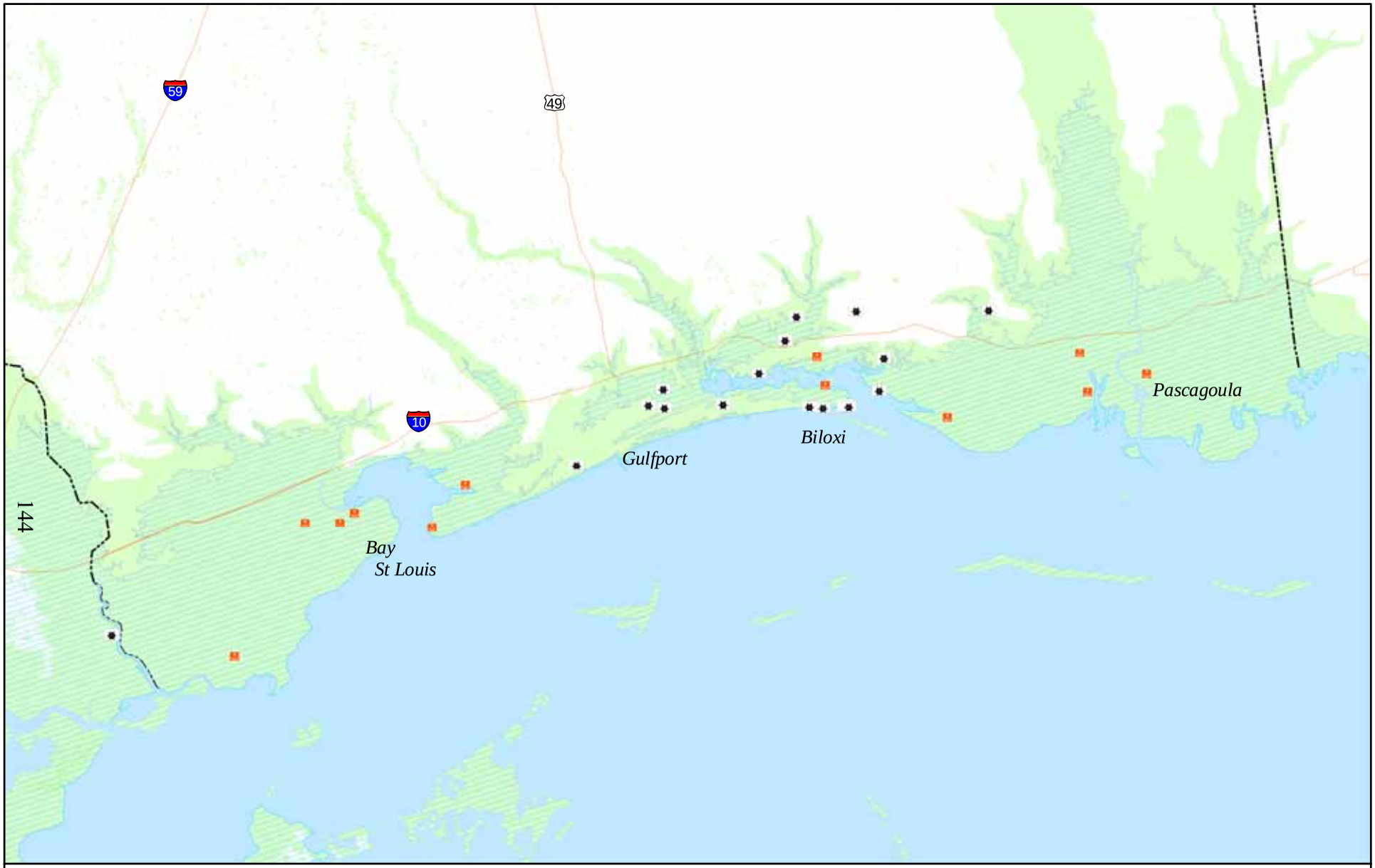
Note: This graphic has a resolution of 300 dpi, allowing the viewer to zoom in .

Miles

0 5 10 15 20

III. RECREATIONAL AND COMMERCIAL FISHING INDUSTRIES AND PARTICIPANTS IN MISSISSIPPI

Recreational and Charter Fisheries. Recreational fishing and charter boating are major contributors to the state's tourism-based economy. Approximately one-quarter of recreational fishing in Mississippi occurs in coastal waters (NMFS 2005c). According to the Mississippi State University, Sea Grant Program, commercial sports fishing has a statewide economic impact of $35.9 million (MSUSG, No date). The revenues generated by recreational and charter fishing activities in Mississippi increase each year. In 2001, approximately 600,000 recreational anglers (75% resident, 25% non-resident) spent approximately $211 million dollars on trip-related expenses (U.S. Fish & Wildlife Service 2002). In 2003, recreational fishing in Mississippi generated a total of $219 million in retail sales for a total state combined economic effect of $423 million dollars (includes multiplier effect). In that year, recreational fishing and associated marine services supported nearly 4,600 jobs, and paid out $100 million dollars in wages. Further, recreational fishing generated some $31 million in sales and motor fuel, state, and federal income tax revenues (American Sportfishing Association 2004). Figure 61 provides the pre-Katrina location of marinas and charter services along the Mississippi coast.



Marinas

Charter Companies

Estimated Storm Surge

Estimated Post Storm Flooding

Marinas and Charter Services of the Mississippi Coast
in Hurricane Katrina Affected Areas

Note: This graphic has a resolution of 300 dpi,
allowing the viewer to zoom in .

Miles

0 5 10 15 20

The approximately 18 saltwater fishing tournaments held each year throughout coastal Mississippi attract both resident and out-of-state anglers (MDMR, No date). According to NMFS (2005c) some 400,000 licensed recreational fishery participants (315,610 residents; 63,650 non-residents) took 1.1 million trips and caught 2.7 million pounds of fish in Mississippi in 2004. Of these recreational outings, 12,300 were charter boat trips. Bass, crappie, and blue gill were the most popular recreational catches.

Long a popular local and tourist destination, Biloxi has been the main hub for charter boat fishing in Mississippi. Historically, the majority of visitors have come from the Midwest and Southeastern states. Increasingly, however, charter boat guides are using the Internet to advertise their services and are drawing clients nationwide. In 2005, there were 100 members registered with the Mississippi Charter Boat Captains Association. In Biloxi, there were 75 fully licensed charter boat operators, with the majority holding a federal reef fish permit.

In the Biloxi fleet, there are three main types of charter vessels, "Six Packs," "T-Boats," and "Chandeleur Boats." "Six Packs" are licensed "OPUV" (Operation Passenger Uninspected Vessels) charters that carry up to six passengers. Six Packs comprise the majority of the Biloxi charter fleet. "T-Boats" are multi-passenger vessels; some of the larger models carrying between 20 and 40 passengers. There are approximately six T-Boat captains in the Biloxi fleet who make a living solely running charter trips. "Chandeleur Boats" are unique to the Mississippi charter industry. Chandeleur Boats are so called because they charter three to four day trips to the Chandeleur Islands off the coast of Louisiana; passengers sleep aboard the "Mothership." The "Mothership," which is generally more than 50 feet in length, carries several smaller skiffs from which clients can fish. There were 14 Chandeleur boats in the pre-Katrina Biloxi fleet (IAI, Field Observations, Biloxi, October 2005).

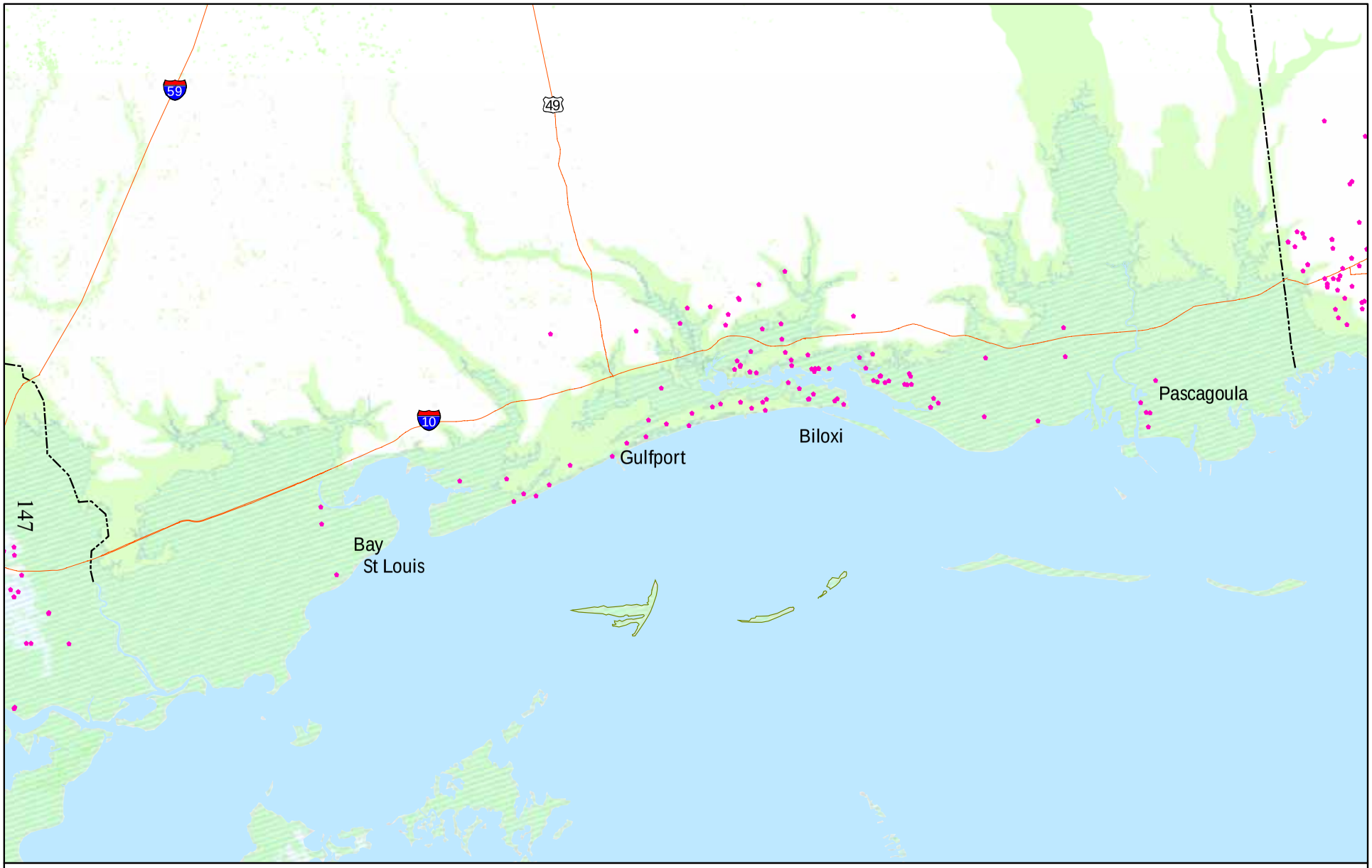
The majority of charter fishing in Biloxi takes place in three areas: the Back Bay (freshwater); inside the islands (state waters); and offshore (federal waters). There are four "charter boat" seasons: spring (April-May), summer (June-August); fall (September-October); and winter (November-March). In the spring, recreational fishermen typically fish for cobia ("lemon-fish") inside state waters, and small sharks, bonnethead, bull sharks, and Atlantic angel sharks outside of state waters. During the summer season, charter fishing participants target red fish ("red drum") inshore, and tarpon, jack crevalle, and shark offshore. In the fall, king mackerel and red snapper are the main targets. Winter fishing is weather-dependent, with white and speckled trout, ground mullet, red fish, and mackerel as the primary catches.

Clearly, recreational and sport fishing are economically important to the state economy. MSUSG further anticipates that this industry will grow 18.5 percent in Mississippi by the year 2025. In support of this industry's growth, the federal government has in the past apportioned nearly $2 million dollars per year to Mississippi's state recreational fishery. These funds have been used to improve and maintain access to fishing-related infrastructure such as fishing piers and boat ramps (MSUSG, No date).

Commercial Fishery Participants. According to the U.S. Census Bureau (2004), approximately 15,495 or 1.3 percent of the employed civilian population in Mississippi identified farming, fishing, and forestry occupations as their primary source of income. In 2000, 14,462 or

1.2 percent of the employed civilian population in this state claimed farming, fishing, and forestry occupations as their primary source of income (U.S. Census Bureau 2000; U.S. Census Bureau 2004).

Preliminary data from NMFS (2005e) indicates that there were 351 federally-permitted and 750 state-permitted fishing vessels (all species) in Mississippi in 2004. In 2004, the state issued a total of 688 commercial shrimping licenses: 512 resident and 176 non-resident. These vessels averaged 46.7 feet in length and were licensed to harvest an average of 1.8 species. Figure 62 details the location of commercial fishing permit holders along the Mississippi coast prior to Hurricane Katrina.



Commercial Fishing Permit Holders

Estimated Storm Surge

Estimated Post Storm Flooding

Commercial Fishing Permit Holders of the Mississippi Coast in Hurricane Katrina Affected Areas

Note: This graphic has a resolution of 300 dpi, allowing the viewer to zoom in .

Miles

0 5 10 15 20

In 2005, there were 662 licensed commercial shrimping vessels in the Mississippi fishing fleet in (Table 67). Nearly 45 percent of these vessels were licensed to Harrison County residents. Almost 30 percent of this fleet was licensed to Jackson County residents, and 18 percent to Hancock County residents (Posadas 2006b).

Table 67. Licensed Resident Mississippi Commercial Shrimping Units: 2005

County	<30 Feet	30-45 Feet	>45 Feet	Total	Percent
Hancock	50	49	23	122	18.4%
Harrison	47	80	168	295	44.6%
Jackson	47	72	76	195	29.5%
Others	35	10	5	50	7.6%
Total	179	211	272	662	100.0%

Source: Posadas 2006b.

The licensed resident commercial fleet in Mississippi in 2005 numbered 1,030 (Table 68). Nearly 94 percent of all commercially licensed vessels in 2005 were located in the coastal counties of Hancock, Harrison, and Jackson, with 40 percent licensed to residents of Harrison County, alone (Posadas 2006b). Nearly two-thirds (64%) of all licensed vessels were engaged in shrimping, with 93 percent located in Hancock (18%), Harrison (45%), and Jackson (30%) Counties (Posadas 2006b).

Table 68. Licensed Resident Mississippi Commercial Fishing Units, Net of Multiple Licenses: 2005

County	Number	Percent	Average # of Licenses per Vessel	Average Length of Vessel (ft.)
Hancock	220	21.4%	1.7	39.3
Harrison	418	40.6%	1.8	53.4
Jackson	326	31.7%	2.0	39.0
Others	66	6.4%	1.2	19.5
Total	1,030	100.0%	1.8	46.7

Source: Posadas 2006b.

Prior to Katrina, a commercial shrimping fleet of approximately 180 fishing vessels (70-95 feet) served the Biloxi processing and marketing sector. The Biloxi shrimp fleet delivered to three primary buyers: P & M Seafood (with about 60 vessels), Golden Gulf Coast (with approximately 80 vessels), and R.A. Lesso (with some 30 vessels) (IAI, Field Observations, October-November 2005).

Ninety-five percent of commercial shrimpers in Biloxi are Vietnamese (IAI, Field Observations, Biloxi, October 2005). Most came to Mississippi as refugees from the Vietnam War and settled in Point Cadet in East Biloxi. Approximately 80 percent of Biloxi's Vietnamese population worked in the fishing industry; the remaining 20 percent worked in the casinos that surround Point Cadet and on offshore oil rigs (IAI, Field Observations, Biloxi, October 2005; Worden 2005).

The Pass Christian or "western" Mississippi fishery consists primarily of oysters– there is only one large shrimp processor in this region. Pass Christian's on-shore processing sector consists mainly of brokers who buy oysters and shrimp from the harvesters. These brokers also ice and transport the seafood to nearby processing plants, mainly in Biloxi. A comparatively modest number of large fishing vessels (50) serve the Pass Christian area. Most of Pass Christian's fishermen are oyster harvesters who rely heavily on additional income earned from shrimping or other second jobs (IAI, Field Observations, October-November 2005).

There are typically fewer commercial oyster harvesters than shrimpers. Variance in the number of commercial oyster fishery participants in any given year is typical for the industry. Between 1992 and 2002, the number of oyster harvesters ranged from 250 to 500, with an average of 350 participants. In 2002, there were some 350 commercial oyster men and women in Mississippi. The change in numbers of oyster participants is largely due to wide variations in production levels. Figure 63 also reveals an increase in dredge use by fishermen as a preferred method of harvesting.

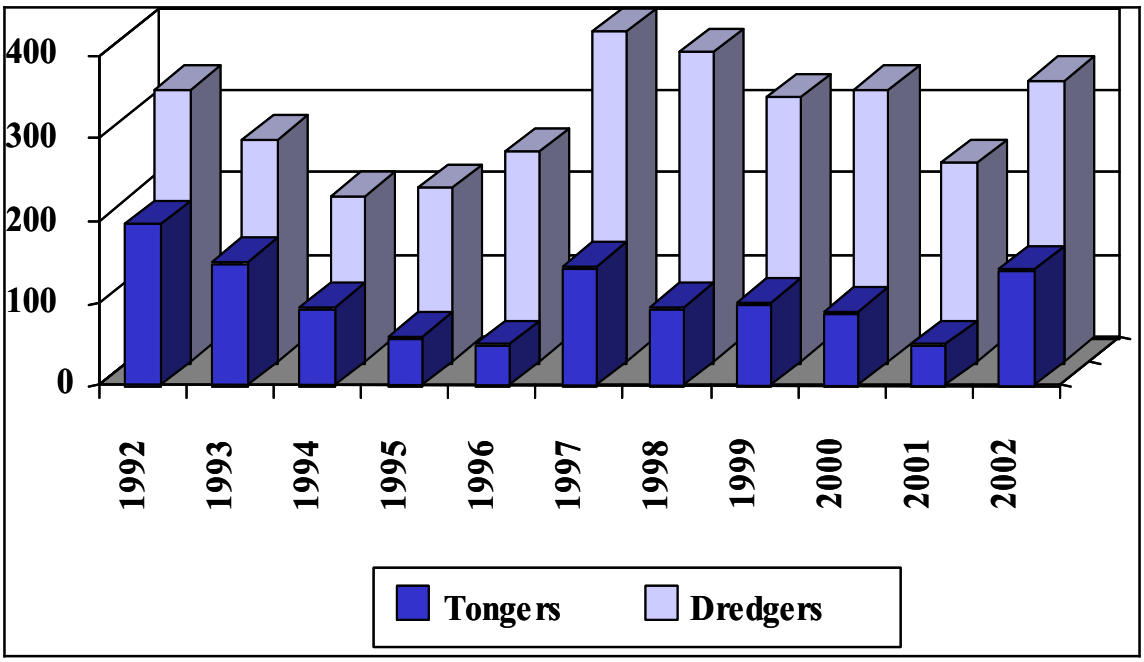
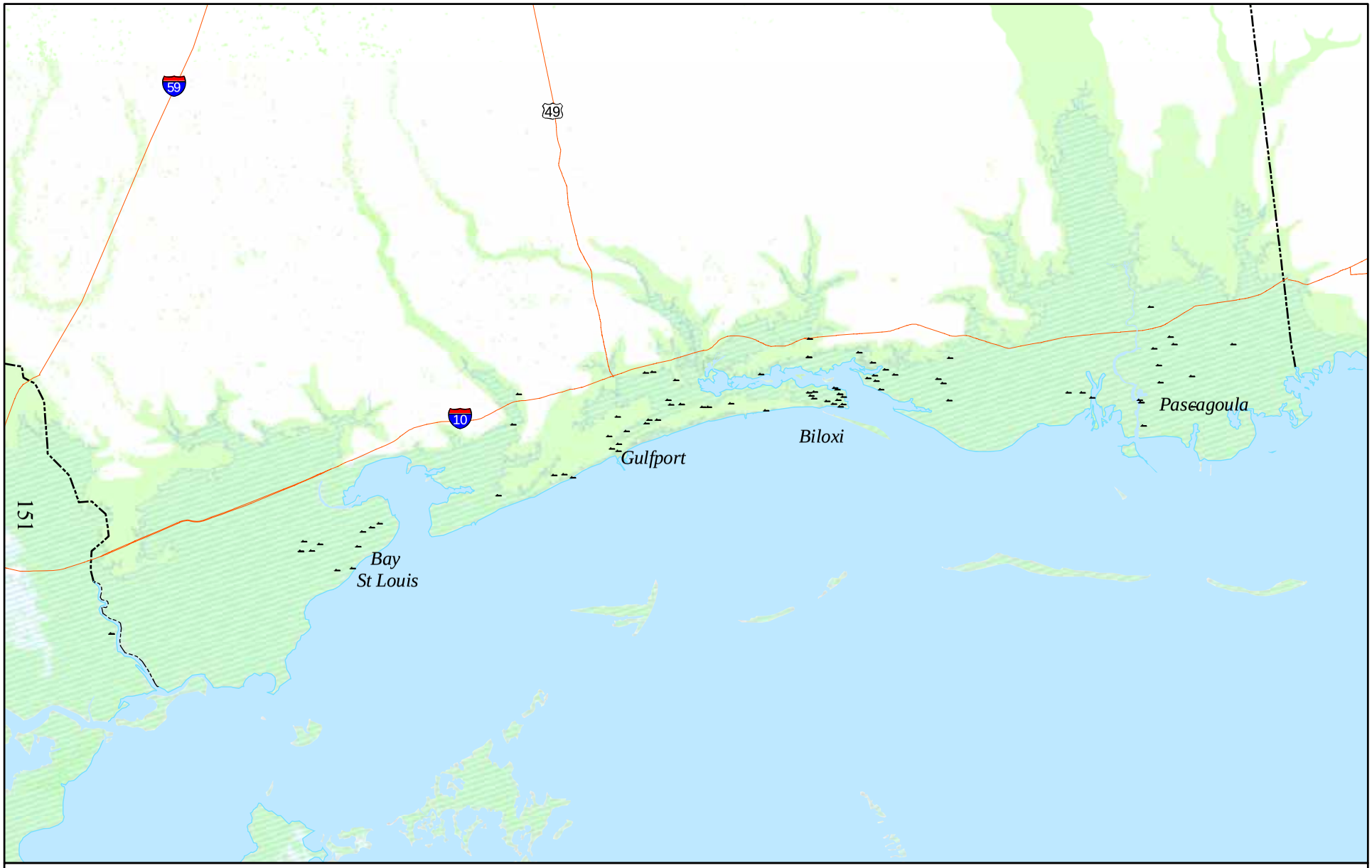


Figure 63. Number of Commercial Oyster Fishery Participants, Mississippi: 1992-2002. Source: Posadas 2005c.

Additional Infrastructure. Figure 64 identifies the pre-Katrina location of boat builders and related facilities in coastal Mississippi.



Boat Builders & Brokers, Maintenance and Repair

Estimated Storm Surge

Estimated Post Storm Flooding

Boat Builders & Brokers of the Mississippi Coast in Hurricane Katrina Affected Areas

Note: This graphic has a resolution of 300 dpi, allowing the viewer to zoom in .

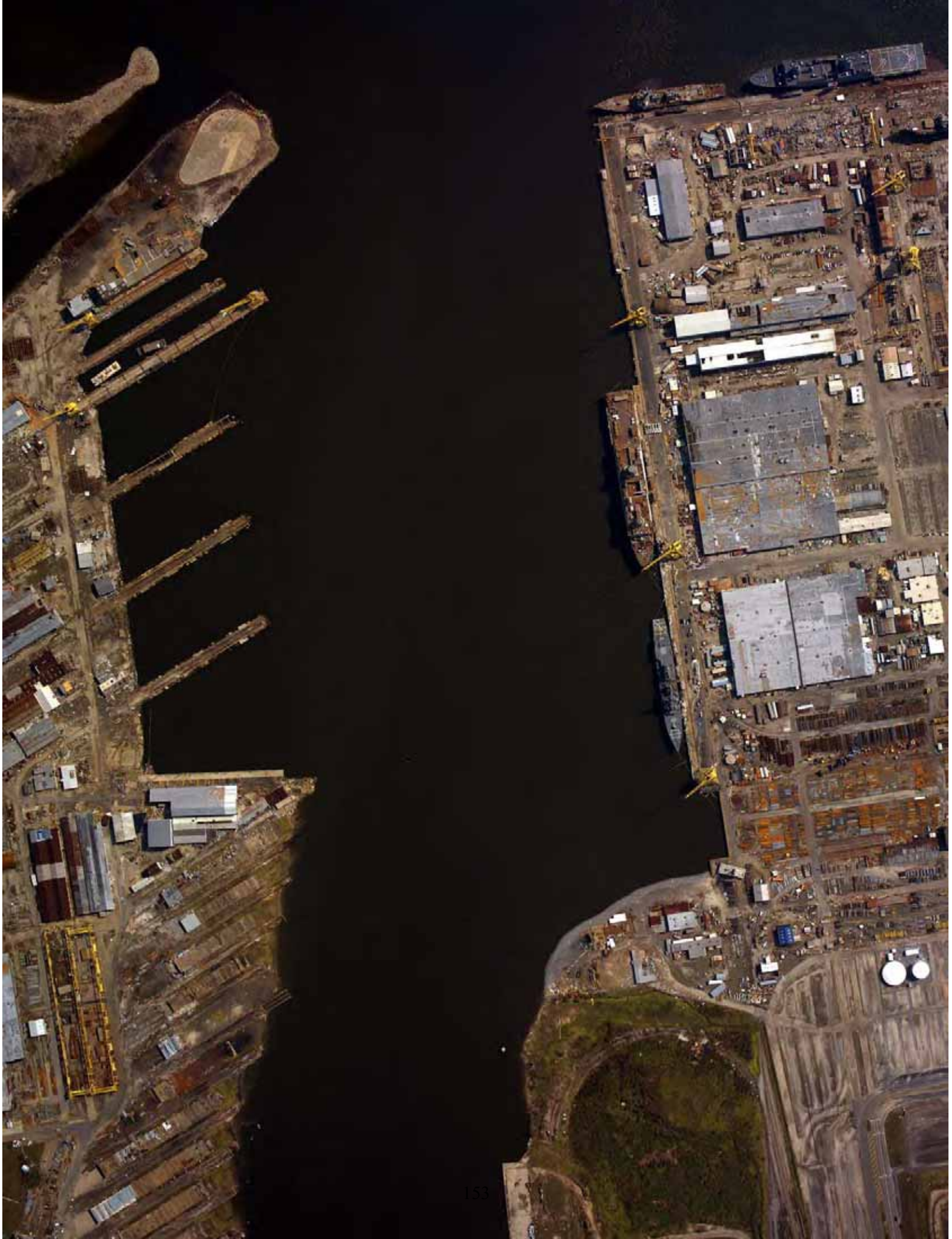
Miles

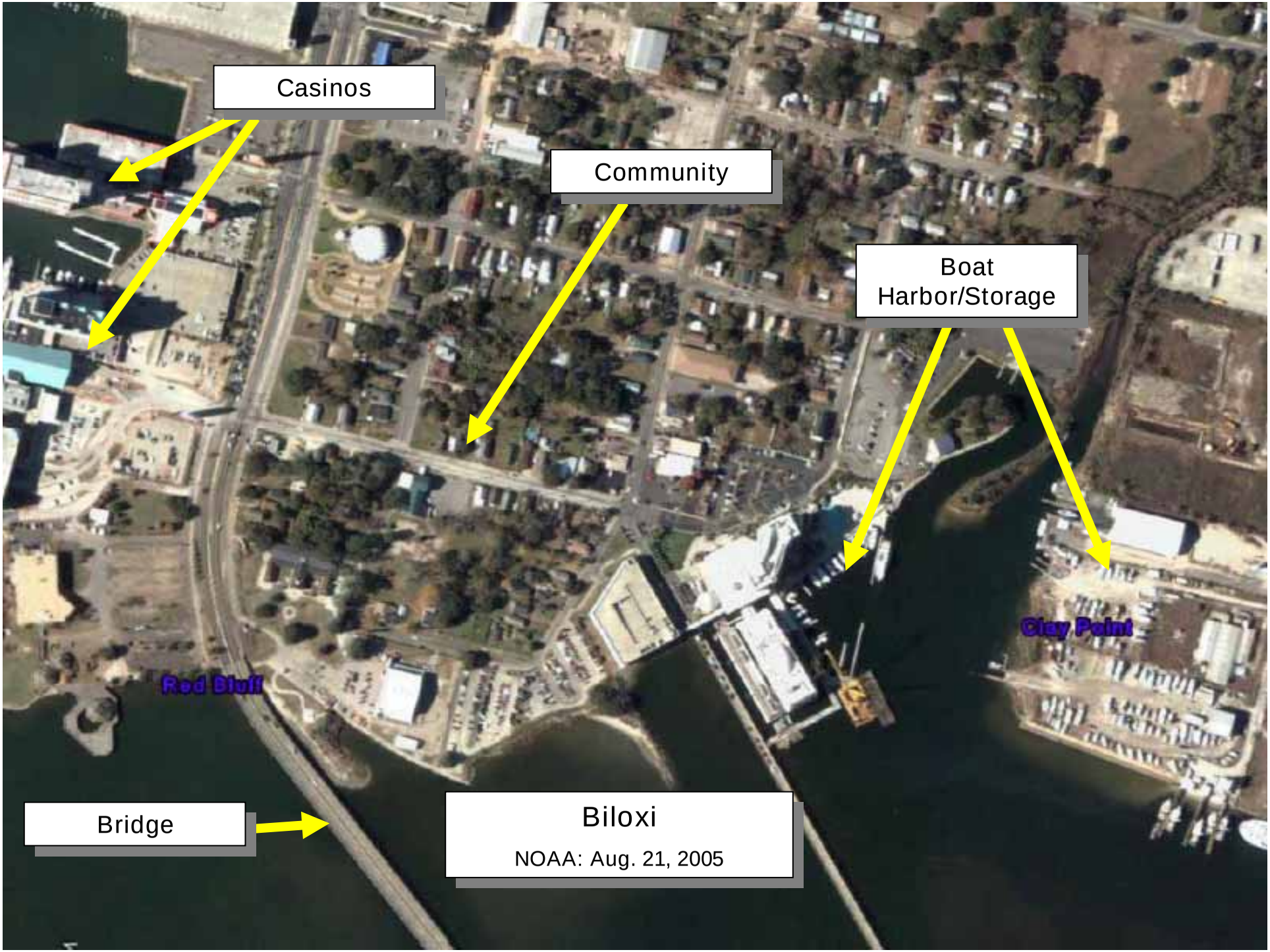
0 5 10 15 20

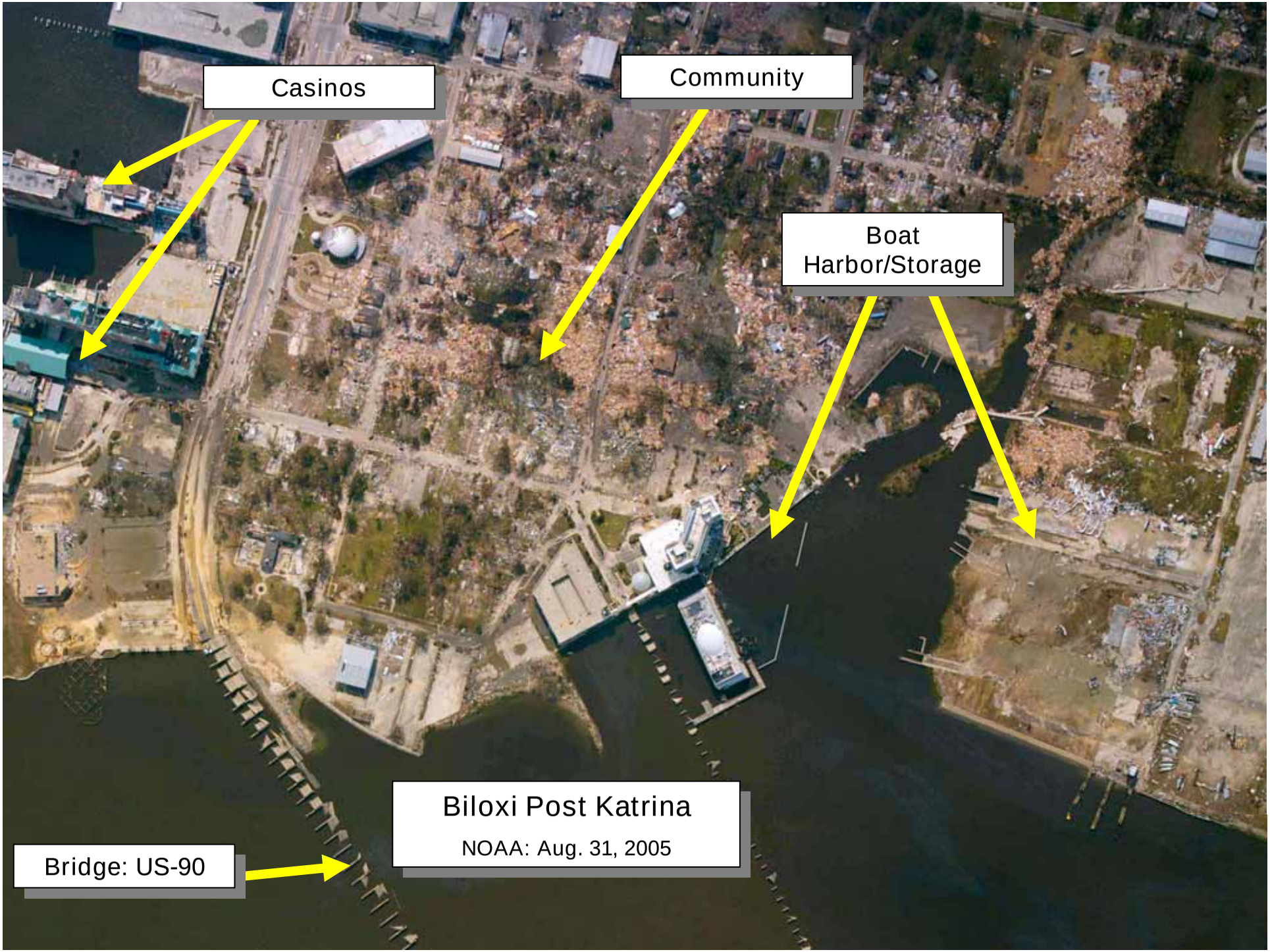
E. Hurricane Katrina: Mississippi State Fisheries Impact

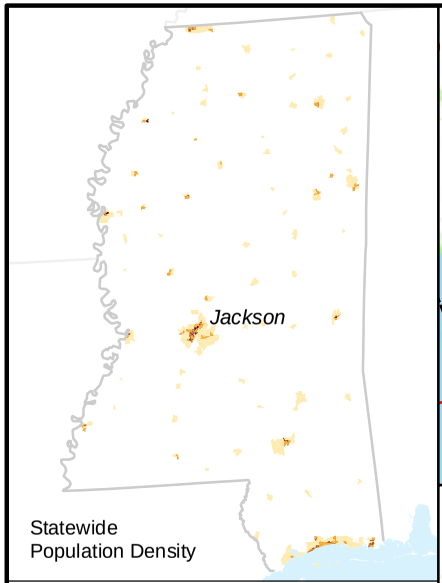
I. GEOGRAPHY OF STORM SURGE AND WINDS ASSOCIATED WITH HURRICANE KATRINA

Hurricane Katrina caused severe flooding and wind damage throughout much of coastal Mississippi. In Hancock and Harrison Counties, storm surge damage extended from north of the bayous to Interstate Highway 10. The storm surge rose to 28 feet in Hancock County, 26 feet at the Biloxi River at Wotham, and 16 feet in Pascagoula. Flooding in the eastern part of Pass Christian exceeded 20 feet above ground level. According to the National Weather Service Forecast Office, "Severe damage was seen near and up to 76 miles east of the center of Katrina" (2005). The following figures (65 through 67) provide aerial representations of some of the Katrina affected areas in coastal Mississippi. Figure 68 provides an indication of pre-Katrina population density and the percent of African-American residents living in coastal Mississippi in 2000. It also depicts estimated Katrina-related storm surge and flooding in these areas.




Casinos
Community
Boat
Harbor/Storage
Red Bluff
Clay Point
Bridge
Biloxi
NOAA: Aug. 21, 2005


Casinos
Community
Boat
Harbor/Storage
Biloxi Post Katrina
NOAA: Aug. 31, 2005
Bridge: US-90



Coastal Mississippi and Hurricane Katrina

Estimated Storm Surge and Flooding

Transportation Infrastructure

Population Density

- Interstate Highway
- Local Roads and Arterials
- Railroad Line

- Estimated storm surge
- Estimated post storm flooding

Census 2000 Block Groups

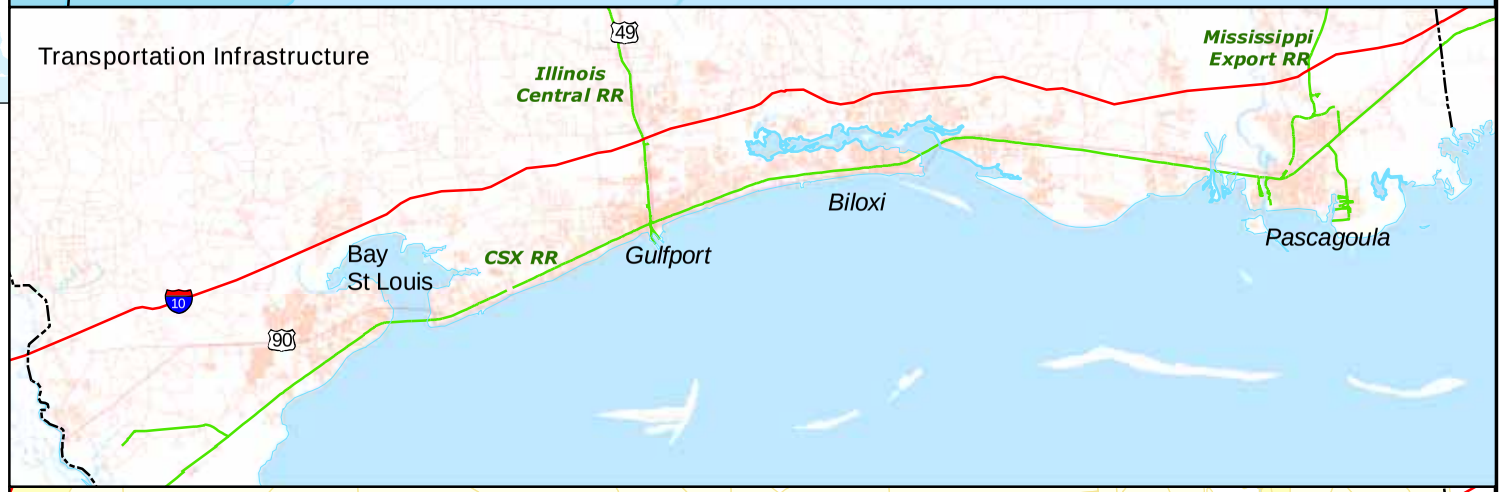
Persons per hectare

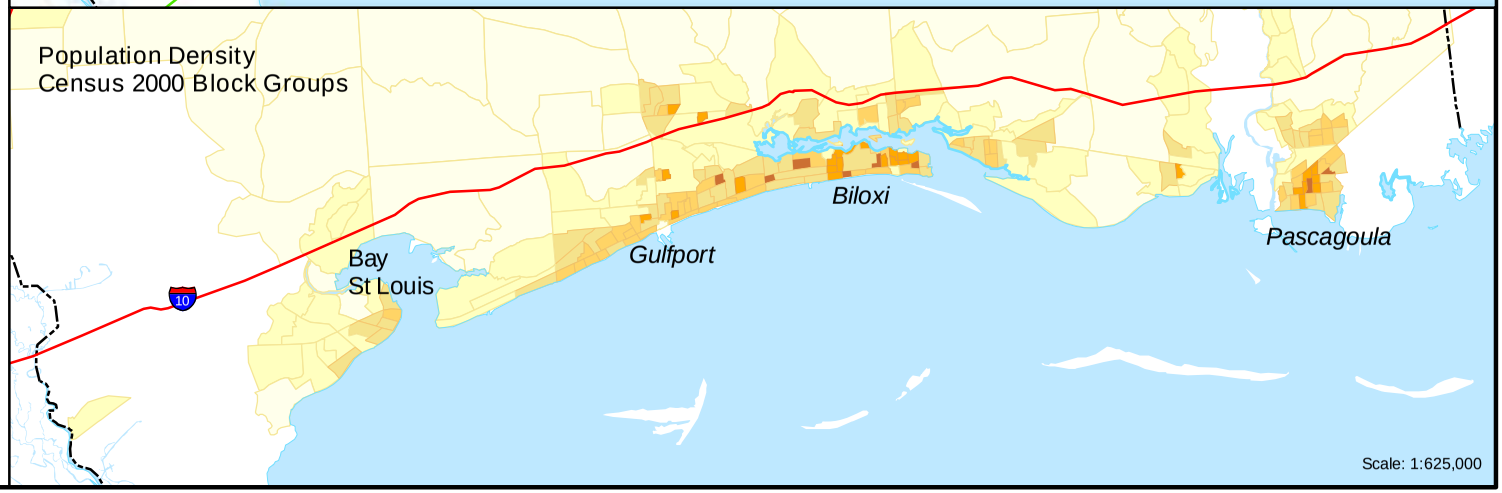
> 0 - 1	10 - 15
1 - 5	15 - 20
5 - 10	20 - 25

Note: This graphic has a resolution of 300 dpi, allowing the viewer to zoom in .

0 3 6 9 12 15

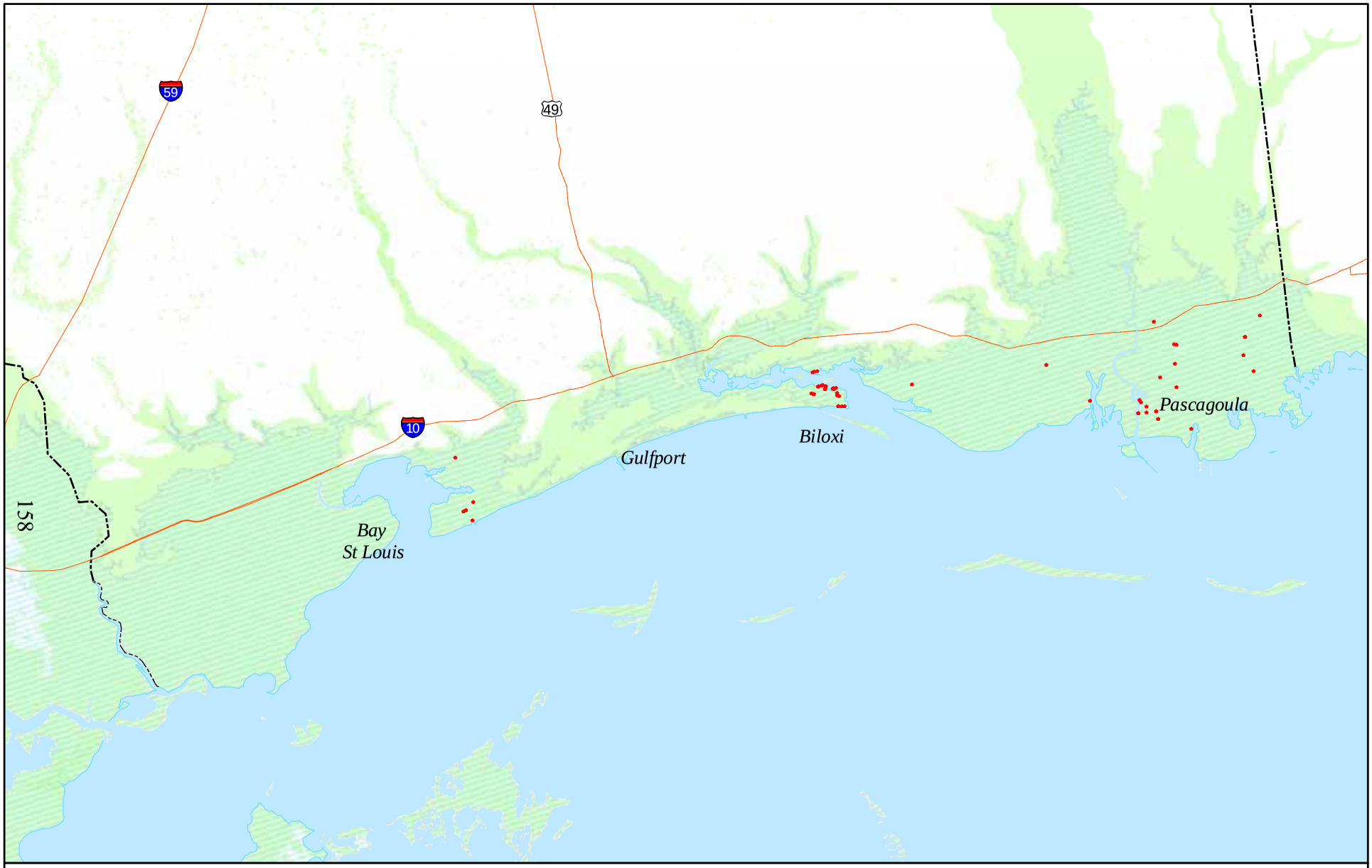
Miles





II. EFFECTS OF HURRICANE KATRINA ON MISSISSIPPI'S MARINE-BASED INFRASTRUCTURE

The marine-related infrastructure in the coastal counties of Harrison, Hancock, and Jackson supports various marine-based industries, ranging from harvesting and production to processing. The seafood processing and distribution sectors are particularly active in this state (Figure 69).



Seafood Processors of the Mississippi Coast in Hurricane Katrina Affected Areas

Seafood Processor

Estimated Storm Surge

Estimated Post Storm Flooding

Note: This graphic has a resolution of 300 dpi, allowing the viewer to zoom in .

Miles

0 5 10 15 20

Seafood Processing. Harrison County is the center of Mississippi's seafood processing industry. The bulk of shrimp processing occurs in Biloxi (east Mississippi), while Pass Christian (west Mississippi) specializes in oyster production. The Biloxi industry is by far the largest of the two market systems. Much of the shrimp processed in Biloxi is imported from Louisiana, Texas, Thailand, and India (NMFS and Mississippi Department of Seafood Resources 2005).

There were 69 licensed seafood processing establishments in Mississippi in 2005, pre-Katrina (Table 69). The majority of the processing plants (57 or 83%) were located in the 3 coastal counties, with 34 facilities in Harrison County, 14 facilities in Jackson County, and 9 in Hancock County (Posadas 2006a).

Table 69. Number of Pre-Katrina Seafood Processing Plants, Mississippi: 2005

County	Licensed Seafood Processing Plants	
	Number	Percent
Hancock	9	13.0%
Harrison	34	49.3%
Jackson	14	20.3%
Others	12	17.3%
Total	69	100.0%

Source: Posadas 2006a.

Within Harrison County, the majority of seafood processing facilities were located in Biloxi (Posadas 2006a). Prior to Katrina, there were 18 seafood processors, 15 of which processed only shrimp, in Biloxi (IAI, Field Observations, October 2005; Posadas, No date; Posadas 2006a). Seven of these plants employed up to 40 full-time employees and 100 seasonal employees (IAI, Field Observations, October 2005). The remaining plants were smaller, family-run businesses with five to eight employees.

The seven large processing facilities freeze, package, and distribute the majority of shrimp landed each year by the "eastern Mississippi fleet" (IAI, Field Observations, October-November 2005). Approximately 75 percent (n=390) of the total on-shore processing sector labor force (N=505) worked for one of these seven major processors (IAI, Field Observations, October-November 2005). Distributors, who typically purchase product at the dock and deliver it to the principal processors, employed another 15 percent of the industry workers. "Brokers," who purchase product at the docks and deliver or "truck" it to any number of distant U.S. markets, comprised the remaining 10 percent of on-shore processing employment. Although a few of the processors and dealers in Biloxi are almost entirely dependent on domestic shrimp, most rely on a "mixed" market, importing 50 to 90 percent of their product (IAI, Field Observations, October-November 2005).

Six of Biloxi's largest seafood processing plants were destroyed (Newsom 2006). Table 70 provides the operational status of the major seafood processors in Biloxi as of May 2006.

Table 70. Status of Major Biloxi Processors: May 2006

Processors	Location	Status	Comments
R.A. Fayard Seafood	Biloxi	Closed	Sold site to Boomtown Casinos. Currently operating in Harvey, LA. Rebuilding new facility in Biloxi.
J & W Seafood	Biloxi	Closed	--
C.F. Gollot Brothers	Biloxi	Closed	Currently operating out of Harvey, LA.
Global Seafood Technologies	Biloxi	Closed	Trying to relocate
R.A. Lesso	Biloxi	Open	Sells ice to others.
Gulf Pride	Biloxi	Open	Shared its facility with 2 other processors between Sept. 2005 and May 2006
Suarez/M & M	Biloxi	Open	Moving into former "Ole Biloxi" site. Adding 2 new peelers.
Golden Gulf	Biloxi	Open	Shared its facility with 2 other processors between Sept. 2005 and May 2006
Weem's Brothers	Biloxi	Closed	--
Shemper Seafood	Biloxi	Closed	--
Biloxi Freezing & Processing, Inc.	Biloxi	Closed	--

Source: IAI, Field Observations, May 2006.

In May 2006, the four operating plants were processing about 200,000 pounds of shrimp from non-Mississippi waters everyday– about half of what they did before Katrina (Keller 2006b).

In Pass Christian (Hancock County), the principal oyster processor sustained severe damage, but was able to resume limited operations by the end of October 2005. Prior to Katrina, most of the oysters processed in Pass Christian came from Mississippi oyster reefs, supplemented by oysters from Western Louisiana and Texas. In the months following the storm, however, all of their supply came from the Houma area of Louisiana and Texas (IAI, Field Observations, October-December 2005).

Estimates of recovery time for each facility vary from a few months, for those with relatively minor damage, to more than one year. Facility owners base their recovery time estimates on the provision that required materials, supplies, equipment, and employees will be available–and affordable. These estimates also assume that the processors will be able to purchase seafood as fishing is resumed. However, a failure in any one of these essential fishery components or recovery efforts could disrupt all recovery. For instance, the hint of contaminated product, a regulatory constraint on fishing, continually escalating fuel prices, debris-related closures, falling prices for product, or any number of other disruptions could significantly delay recovery. For the oyster industry, the destruction of the primary oyster reefs, both off the immediate coast of Mississippi and off the coast of Louisiana (the principal source of U.S. oysters), will almost certainly create a two-year hiatus in the delivery of Gulf oysters to market.

Two of the now-closed processors in Biloxi–Weems and Del Seaway– were in the process of selling their businesses when Katrina made landfall; Katrina merely closed the deal. Gollott's Seafood in D'Iberville is one of the Coast's oldest seafood processing plants. This is the first season since Hurricane Camille in 1969 that they have not been open. Gollott's, which is planning to build a new processing plant 30-feet above sea level, had hoped to be open by the start of shrimp season, but construction delays pushed their grand reopening off until at least July 2006[4] (WLOX 2006).

By January 2006, there were four operational seafood processing plants in coastal Mississippi: two in Biloxi, one in Pascagoula, and one in Pass Christian. Only one facility, however, was able to find affordable and reliable labor; three of the four remain understaffed relative to their pre-Katrina employment levels. That processing plant has been dependent upon immigrant laborers who are participants in the H2B Visa program since Katrina, but is still understaffed. Typically, H2B Visa employees return to their country of origin during the usually slow winter months, but with few operational processors on the coast this winter, work was still plentiful and many H2B Visa employees took advantage of this unusually plentiful labor opportunity. According to an executive of this processing plant, "Without [H2B Visa employees), we would be greatly hurt" (Personal Communication, IAI, Mississippi, January 11, 2006).

Processors describe their industry as "in turmoil and looking for answers"; inflated property values means less affordable real estate available for processors along the Mississippi Coast (IAI, Field Observations, October 2006). In response to this problem, the Harrison County Development Commission (HCDC) is pursuing the establishment of an industrial park dedicated to seafood production. Since current regulations do not require processing plants to be on the waterfront, seafood could be trucked in. However, the project is still in its early stages and developers must address the lack of pier space, and secure funding (Newsom 2006). Meetings on the seafood industrial park first occurred during January 2006 (Kessie 2006). On June 7, 2006, the HCDC received $180,000 from the U.S. Economic Development Administration to conduct an engineering site survey to find the best location within the county for the park. An HCDC commissioner indicates that land north of Interstate 10 is a likely location. Once built, this park will be open to any Gulf Coast processing company (Keller 2006a).

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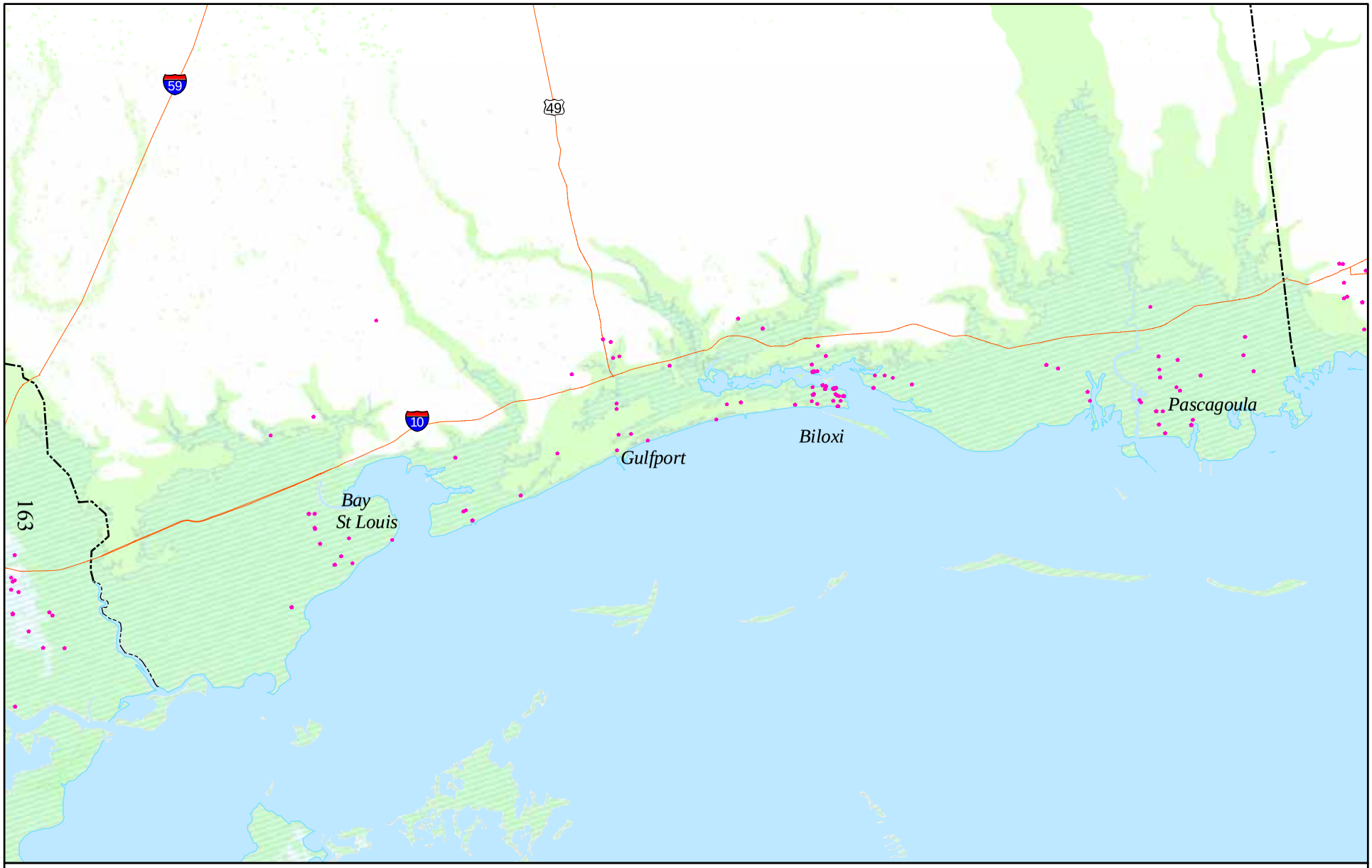
[4] Gollot's was still closed and unable to process orders as of January 2007.

Seafood Dealers. There were 141 licensed seafood dealers (commercial and retail, combined) in Mississippi in 2005 prior to Katrina's arrival (Figure 70) (Posadas 2006a).



Seafood Dealer

Estimated Storm Surge

Estimated Post Storm Flooding

Seafood Retailers and Wholesalers of the Mississippi Coast in Hurricane Katrina Affected Areas

Note: This graphic has a resolution of 300 dpi, allowing the viewer to zoom in .

Miles

0 5 10 15 20

More than half (79 or 56%) of these dealers were located in the three coastal counties of Hancock (19 dealers), Harrison (39 dealers), and Jackson (21 dealers) (Table 71) (Posadas 2006a).

Table 71. Number of Pre-Katrina Licensed Seafood Dealers, Mississippi: 2005

County	Licensed Seafood Dealers	
	Number	Percent
Hancock	19	13.5%
Harrison	39	27.7%
Jackson	21	14.9%
Others	62	44.0%
Total	141	100.0%

Source: Posadas 2006a.

Hurricane Katrina seriously damaged or destroyed all of the seafood dealerships along the Mississippi Gulf Coast. In Pass Christian, Katrina destroyed the facilities of all eleven major seafood brokers and dealers located at the harbor, including Jerry Forte Seafood, Kimball's Seafood, and Pass Purchasing Seafood Company. In Biloxi, nine wholesale seafood dealerships were severely damaged. Six of these wholesale dealers were unable to resume operations until March 2006 (IAI, Field Observations, May 2006).

Shrimp. Commercial shrimpers in Mississippi are struggling to survive and rebuild in the wake of the storms, and it remains to be seen how many will remain in the industry. One 65-year old shrimper describes the post-Katrina industry;

> The future of Biloxi seafood looks bleak. The shrimp looks good, but there is no ice, fuel docks, original slips (to dock boats) are busted up and we have tons of debris. I am not going to make it out this year because I have to repair my boat now that I have made my home livable. There is nothing consistent but problems down here (Personal Communication, IAI, Biloxi, May 5, 2006).

In the first few months after Katrina, few shrimpers resumed operations because essential marine-related infrastructure and services, such as ice and fuel, were non-existent. Additionally, many fishermen were focused on repairing homes as well as boats and resettling their families and could not make fishing their first priority. In early November, for example, only six shrimpers (four in Biloxi; two in Pascagoula) were shrimping consistently. These few shrimpers were using fuel they had purchased prior to the storm or were traveling to Alabama to buy it. These shrimpers were also traveling inland for ice and trucking it back to Biloxi – all time and expense consuming activities. With only a few processors and dealers operating, however, there were few commercial buyers; a condition which served to further discourage erstwhile shrimpers who might otherwise consider fishing. Instead, most working shrimpers sold white shrimp off their boats directly to consumers at a rate of $3 to $4 dollars per pound for smaller sizes and $4

to $6 for the larger variety. They explained that "cutting out the middleman" was the only way to cover the high costs of operations and make a profit.

The month of May marked the opening of the 2006 shrimp season in Louisiana. In the first half of this month, approximately 35-40 vessels from Biloxi (about 15 percent of the pre-Katrina fleet) and ten vessels from Pass Christian left port to join other shrimpers in Louisiana. Of these vessels, approximately 33 were large freezer vessels and 17 were smaller trawlers. The majority of the large freezer vessels (30) were Vietnamese-owned boats from the Back Bay. These large vessels represent approximately 75 percent of the total *operational* freezer boat fleet in Biloxi; the remaining vessels are either in need of repair or the owners could not afford the overhead required for a shrimping trip to Louisiana.

Many of the smaller vessels returned within 48 hours of their trip, explaining that the scarcity of ice, the high cost of fuel, the number of shrimpers competing in state waters, and the poor catches did not justify staying out longer. There are at least two reasons why these comparatively small boats with lower operational costs have more difficulty competing for shrimp in the post-Katrina environment than do the freezer vessels. First, unlike the freezer boats which have their own freezer compartment aboard for ice (hence the name, "freezer vessel"), the smaller boats hold only a limited amount of ice. Once melted, it must be replenished to protect freshly-caught shrimp against spoilage. However, there were only two places in south Louisiana in May 2006 that were selling ice to anyone ("outsiders"), as opposed to a select ("insider") clientele. The difficulty in obtaining fuel was discouraging to outsider shrimpers. Second, small boats also have small fuel tanks, and motoring between Mississippi and Louisiana burns a great deal of fuel. In comparison, large vessels can hold up to several weeks of fuel and typically do not have to worry about refueling while in the waters on a single trip. Thus, despite having higher overhead costs, larger freezer vessels have a competitive advantage over smaller boats that cannot afford to stay in the waters long enough to catch enough shrimp to profit–or reliably purchase fuel.

At the start of the shrimp season in August 2005, the Mississippi Department of Marine Resources (MDMR) conducted an aerial survey. They observed a total of 603 shrimp boats, representing an increase from 2004 when the MDMR tallied 538 shrimp boats. The majority of these boats congregated in the Petit Bois, Cat, and Horn islands areas (Gulf Coast Fisherman 2005).

At the start of the shrimp season in Mississippi on June 7, 2006, however, the MDMR observed only 306 shrimp boats in their aerial survey of the waters. This represents a 50 percent decrease from 2005. The majority of these boats were congregated in the Petit Bois and Horn islands areas, where waters were still a landmine of debris (WLOX 2006).

As of May 31, 2006, MDMR had issued 215 commercial shrimping licenses. Last year at that same time, MDMR had issued 588 commercial shrimping licenses. This change represents a 63 percent decline (Keller 2006b).

Oysters. Pass Christian's oyster reefs were among the largest on the Mississippi Gulf Coast (Coast Chamber 2003). Prior to this storm, some $15 million in oysters and $5 million in

shrimp came through the Pass Christian Marina each year (Leslie 2005). Following the storm, the Mississippi Gulf Coast oyster fleet was completely shut down, with 50 percent of vessels in Pass Christian destroyed. According to the Mississippi Department of Marine Resources (MDMR), Hurricane Katrina damaged and disrupted approximately 90 percent of these oyster beds. Although there are active beds, oysters are not expected to mature for two years. At this point, the future of the commercial fishing industry in this Gulf Coast area is unknown.

Although state oyster beds were initially closed to fishing because of pollution and debris concerns immediately following the storm, biologists quickly concluded that water pollution was not a public health concern and soon reopened state waters. However, debris in the water continued to be a major concern as of May 2006 – especially to shrimpers working inshore.

Debris removal efforts have been inconsistent. Along the eastern shoreline of Pascagoula, for example, initial efforts by the Coast Guard in the days following Katrina to clean local waterways were abruptly halted by inter-agency bureaucracy and have yet to resume as of May 2006. In the interim, individual boat building companies began doing much of the debris removal (Personal Communication, IAI, Processor, Pascagoula, May 2006). In Biloxi, the Army Corps of Engineers cleared the Back Bay's major channels in the weeks after the storm, but very little clean-up has taken place in the Front Bay. The tremendous amount of debris still left in the water concerns small craft fishermen who do not want to damage their boats or gear. A 60-year old shrimper moored at the Small Craft Harbor describes the local clean-up efforts:

> We have been waiting for the city, or DMR to come clean up the water, but we know that's not going to happen, so we will be pulling debris with our first shrimp trawls. The lucky will come home with nets. We will be doing the clean up ourselves. It's a gamble (Personal Communication, IAI, Biloxi, May 2006).

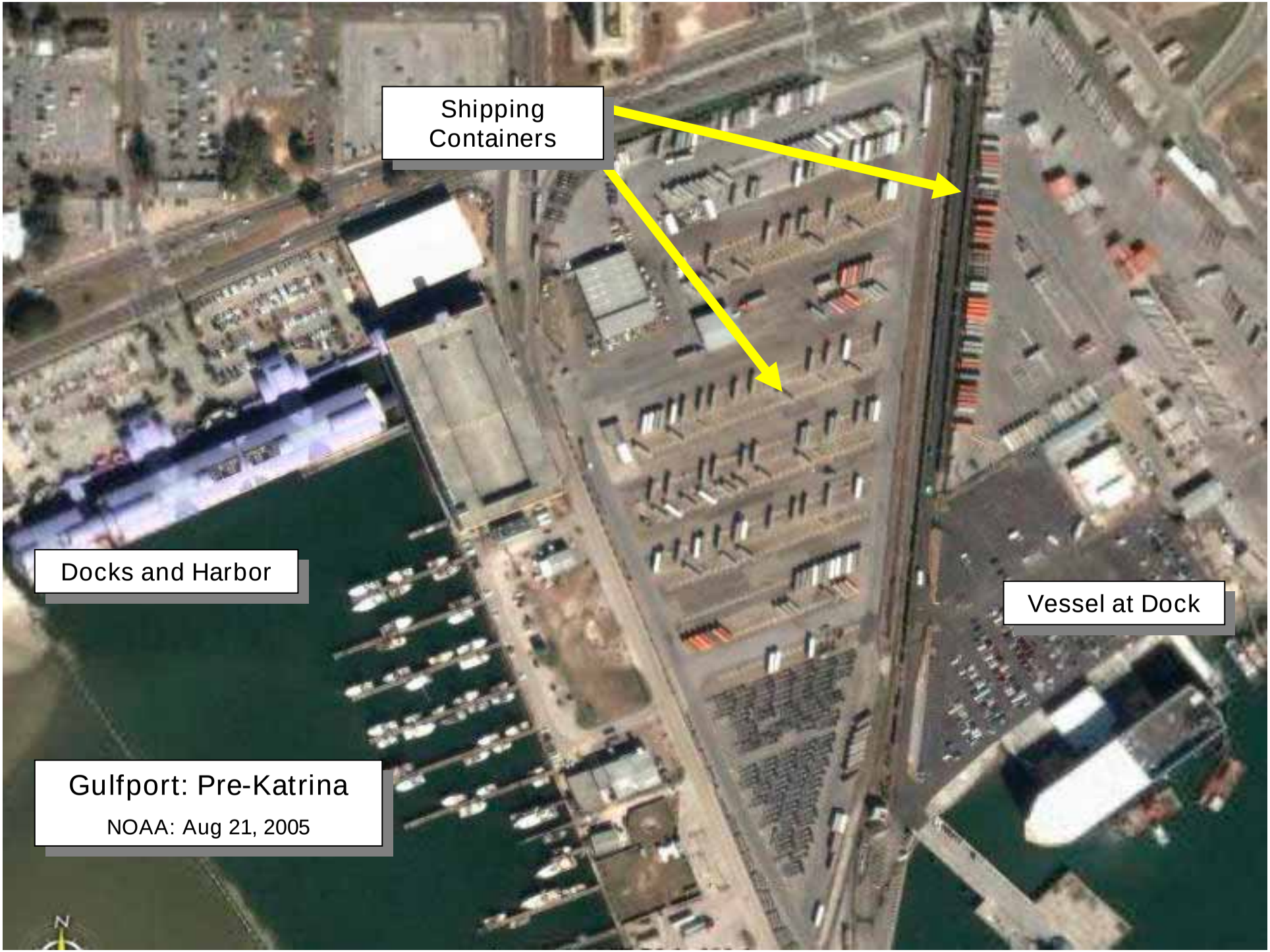
Marinas. Several marinas in Biloxi were also damaged by Katrina. Both the Small Craft Harbor in Biloxi's Front Bay and the Biloxi Back Bay commercial marina lost about half of their slips (Figure 71). The Point Cadet recreational harbor lost 22 of its 299 slips. By May 2006, however, the Small Craft Harbor, which docked up to 50 boats before the storm, was under repair and docking up to 37 boats (Figure 72). Also by May, 50 of Back Bay's 70 slips were available for use, and the Point Cadet marina was semi-operational and docking 175 boats (Figure 73), but lacking power and supplies. Fuel, bait, ice, and tackle were only minimally available. Fifty of the boats docking here are charter boats. These charters offer construction workers an opportunity to engage in recreational fishing as a break from their work. The Point Cadet Marina intends to build at least 20 more slips to house the bigger 40-to-60 foot boats, as demand for such slips is growing (Jones 2006).

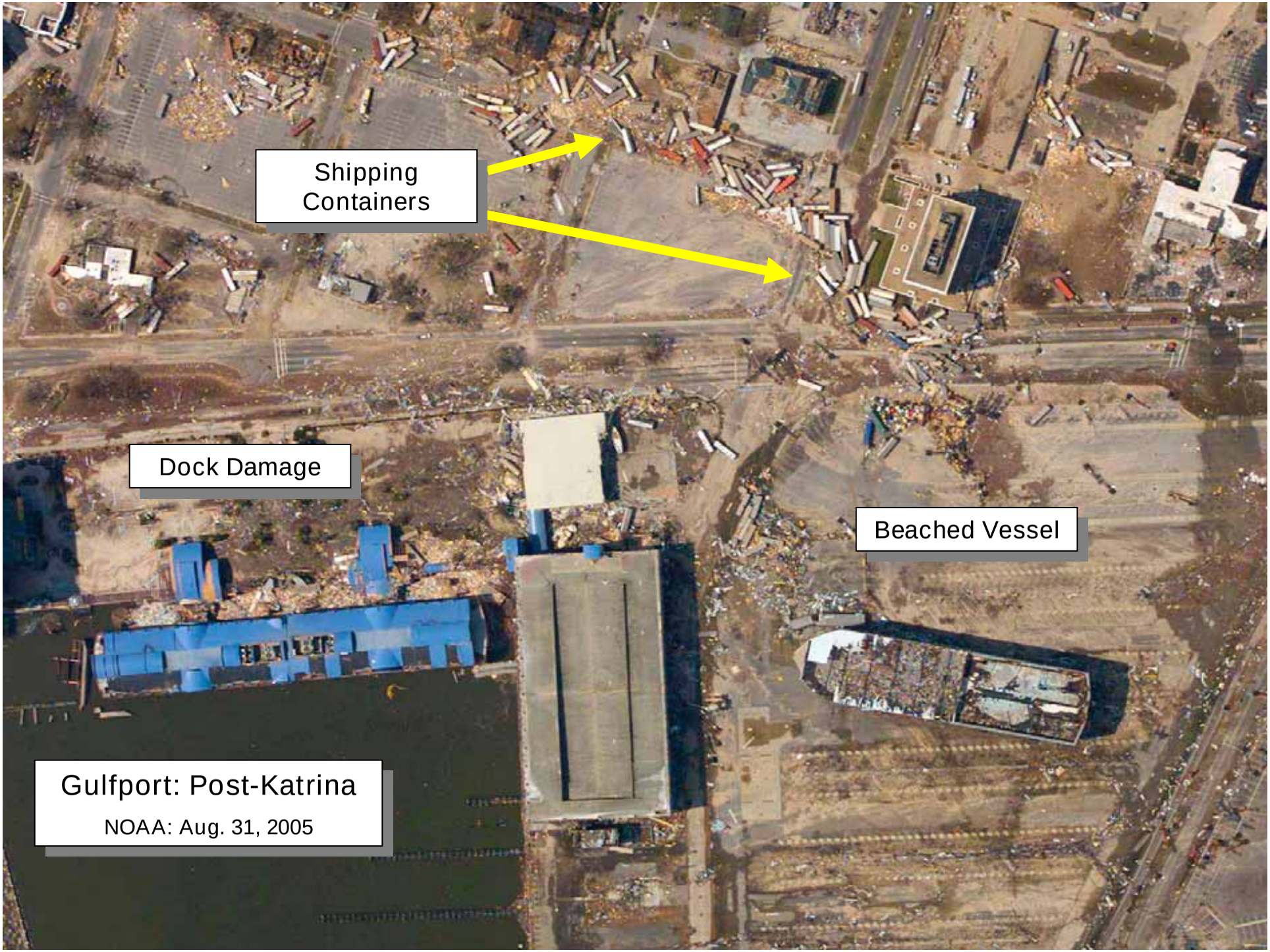
Figure 71. Small Craft Harbor, Front Bay, Biloxi, MS: November 2005.
Source: IAI Staff, November 2005.

Figure 72. Small Craft Harbor, Front Bay, Biloxi: May 2006.
Source: IAI Staff, May 2006.

Figure 73. Recreational Harbor, Point Cadet.
Source: IAI Staff, May 2006.

The Gulfport Harbor sustained much greater damage; it was virtually destroyed with most of its buildings literally blown or swept away (Figures 74 and 75). The harbor was home to a number of boat sales and repair yards including Kremer Marine, Ability Marine, and Competition Marine, and to dock constructors Coastal Marine Construction (Martin 2005).


Shipping Containers
Docks and Harbor
Vessel at Dock
Gulfport: Pre-Katrina
NOAA: Aug 21, 2005
N


Shipping Containers
Dock Damage
Beached Vessel
Gulfport: Post-Katrina
NOAA: Aug. 31, 2005

Charter Boats. Biloxi's charter industry faces huge obstacles in the wake of Hurricane Katrina because of the significant damage to the marine-related infrastructure. The majority of the marinas on the Mississippi Gulf Coast were either seriously damaged or destroyed; the remaining few are only semi-operational and lack fuel docks and electricity. Major harbors, roads, and bridges were destroyed; and the remaining infrastructure is insufficient to support tourism. Accommodations are particularly scarce. Rooms at the three operating casino hotels are full, and most of the smaller motels along Highway 90 were destroyed; motels on I-10 and I-49 are fully occupied by construction and recovery personnel. Tourists who otherwise might have booked a three-day trip are now driving in from other locations for day trips. Effectively, all charter operations in Biloxi were shutdown through the end of November 2005.

The President of the Mississippi Charter Boat Association estimates that 50 percent of the charter fleet in Mississippi, Alabama, and Louisiana, combined was damaged, with ten percent damaged in Mississippi alone. Formerly, 150 charter boats operated out of the Biloxi area. As of June 2006, there were a few charters operating in Biloxi from the Point Cadet Harbor, the one fully operational public marina in Biloxi. Additionally, there was only one commercial fuel facility open at that time. The lack of accommodations and restaurants are deterring tourists from booking charter trips. Most of the current clientele are construction and recovery personnel who are working in the area (IAI, Field Observation, June 2006).

Additional Infrastructure Damage. Biloxi's harbor infrastructure was significantly impacted by Hurricane Katrina's powerful storm surge. All seven public piers in Biloxi received some sort of damage, including the four piers which provided anglers with immediate access to the Sound. All three of Biloxi's marine haul-out facilities and ice plants were destroyed (IAI, Field Observations 2005; Newsom 2006). By mid-November 2005, three of Biloxi's four commercial docks were operating at only 60 percent, with the fourth operating at 80 percent (Table 72).

Table 72. Presence of Fishing Infrastructure, Services, and Boats in Biloxi, Mississippi, Pre- and Post-Hurricane Katrina: 2004, 2005, 2006

Infrastructure or Service	Oct. 2004	Oct. 2005	March 2006	May 2006	Comments
Boat yards/boat builders	3	0	1	1	--
Commercial docking facilities	4	1	1	1	--
Recreational docks/marinas	6	1	1	1	Point Cadet is open
Fishing Gear, electronics, welding, and other repair	4	0	4	4	--
Fishing associations (recreational/commercial)	1	1	1	1	--
Fish processors	18	2*	2*	4	*Two facilities open with three processors operating at each.
Major offloading facilities	5	1	1	1	--
Fisheries research laboratories	1	1	1	1	--
Fishing monuments	1*	0	0	0	*The "Golden Fisherman" was destroyed
Fishing pier	7	2	2	3	Public piers.
Marine railways/haul out facilities	3	0	1	1	--
Maritime museums	1	0	0	0	--
Net makers	2	0	1	1	--
NMFS or state fisheries office (port agent, etc.)	2	1	2	2	--
Public boat ramps	7	2	6	6	--
Recreational docks/marinas	5	1	1	1	--
Bait & tackle/fishing supplies	7	0	0	0	--
Recreational fishing Tournaments	9	0	3	3	--
Seafood retail markets	3	1	3	3	--
Seafood wholesale dealers	9	2	6	6	--
Trucking operations	1	1	1	1	--
Charter/party boats	65	20	30	30	--
Commercial boats	180	300	20	20	--

Source: IAI, Field Operations, 2005 & 2006.

Much of Biloxi's marine-related infrastructure and services had yet to be restored as of May 2006 (IAI, Field Observations, May-June 2006). Difficulty in finding construction crews was delaying much of the restoration work, as the majority of construction workers were engaged rebuilding businesses and homes (Jones 2006).

Marine-related infrastructure and services in Pass Christian also had not returned to their pre-Katrina capacities. As of May 2006, all six fishing piers and fishing supplies stores remained closed; only two of the public boat ramps were operable. Additionally, just one of five wholesale seafood dealers had resumed business. About half of the commercial fishing vessels licensed to Pass Christian residents still needed salvage and/or repair (Table 73).

Table 73. Presence of Fishing Infrastructure, Services, and Boats in Pass Christian, Mississippi, Pre- and Post-Hurricane Katrina: 2004, 2005, 2006

Infrastructure or Service	Oct. 2004	Oct. 2005	March 2006	May 2006	Comments
Docking facilities (commercial)	1	1	1	1	--
Fishing gear, electronics, welding, and other repair	5	0	0	0	--
Fish processors	1	1	1	1	--
Fishing pier	6	0	0	0	--
NMFS or state fisheries office (port agent, etc.)	1	1	1	1	--
Public boat ramps	4	2	2	2	--
Bait & tackle/fishing supplies	3	0	0	0	--
Sea Grant Extension office	1	1	1	1	--
Seafood retail markets	6	0	0	0	--
Seafood wholesale dealers	5	0	1	1	--
Charter/party boats	1	1	0	0	--
Commercial boats	55	30	25	25	Moored at the marina

Source: IAI, Field Observations 2005 & 2006.

Tables 74 through 80 provide data on the marine-related infrastructure and services in the other study communities surveyed for this study. Counts for these communities were conducted in October 2004, October 2005, and June 2006.

Harrison County

Table 74. Presence of Fishing Infrastructure, Services, and Boats in D'Iberville, Mississippi, Pre- and Post-Hurricane Katrina: 2004, 2005, 2006

Infrastructure or Service	Oct. 2004	Oct. 2005	June 2006
Docking facilities (commercial)	4	0	1
Major processors	2	0	1
Other processors	3	0	1
NMFS or state fisheries office (port agent, etc.)	1	1	1
Seafood wholesale dealers	5	0	2
Charter/party boats	n/a	n/a	n/a
Commercial boats	~50	0	n/a

n/a = not available.
Source: IAI, Field Observations 2005 & 2006.

Table 75. Presence of Fishing Infrastructure, Services, and Boats in Gulfport, Mississippi, Pre- and Post-Hurricane Katrina: 2004, 2005, 2006

Infrastructure or Service	Oct. 2004	Oct. 2005	June 2006
Boat yards/boat builders	1	0	1
Recreational docking facilities	1	0	1
Fishing gear, electronics, welding, and other repair	2	0	0
Hotels/Inns (dockside/ocean front)	20	0	5
Public Boat Ramps	1	0	1
Bait & Tackle/fishing supplies	2	0	0
Seafood restaurants	10	3	10
Seafood retail markets	4	0	0
Charter/party boats	n/a	0	0
Commercial boats	n/a	0	0

n/a = not available.
Source: IAI, Field Observations 2005 & 2006.

Table 76. Presence of Fishing Infrastructure, Services, and Boats in Long Beach, Mississippi Pre-and Post-Hurricane Katrina: 2004, 2005, 2006

Infrastructure or Service	Oct. 2004	Oct. 2005	June 2006	Comments
Commercial docking facilities	1	0	0	--
Seafood processors	1	0	0	--
Hotels/Inns (dockside)	2	0	0	--
Offloading facilities	1	0	0	--
Public boat ramps	2	0	2	--
Recreational docks/marinas	1	0	0	The city plans to rebuild.
Bait & tackle/fishing supplies	2	0	0	Waiting for the harbor to be rebuilt before reopening.
Seafood restaurants	9	n/a	3	At least four have moved inland.
Seafood retail markets	4	0	1	--
Trucking operations	1	0	0	--
Charter/party boats	4	0	4	--
Commercial fishing boats	n/a	0	0	--

n/a = not available.
Source: IAI, Field Observations 2005 & 2006.

Jackson County

Table 77. Presence of Fishing Infrastructure, Services, and Boats in Moss Point, Mississippi, Pre- and Post-Hurricane Katrina: 2004, 2005, 2006

Infrastructure or Service	Oct. 2004	Oct. 2005	June 2006	Comments
Boat yard/boat builder	4	n/a	2	--
Commercial docking facilities	1	0	1	--
Seafood processors	1	0	1	Oyster and crab
Fishing piers	2	0	2	--
Offloading facilities	1	0	1	--
Public boat ramps	5	0	2	--
Recreational docks/marinas	5	0	3	One is rebuilding.
Bait & tackle/fishing supplies	1	0	1	--
Seafood restaurants	4	0	4	--
Seafood retail markets	4	0	1	3 permanently closed.
Charter/party boats	n/a	n/a	n/a	--
Commercial fishing boats	n/a	n/a	n/a	--

n/a = not available.
Source: IAI, Field Observations 2005 & 2006.

Table 78. Presence of Fishing Infrastructure, Services, and Boats in Pascagoula, Mississippi, Pre- and Post-Hurricane Katrina: 2004, 2005 & 2006

Infrastructure or Service	Oct. 2004	Oct. 2005	June 2006	Comment
Boat yards/boat builders	3	3	3	--
Docking facilities (commercial)	4	1	1	--
Fishing gear, electronics, welding, and other repair	2	1	2	--
Seafood processors	1	1	1	Semi-operational
NMFS or state fisheries office	1	1	1	--
Bait & tackle/fishing supplies	2	1	2	--
Sea Grant Extension office	1	1	1	--
Seafood retail markets	5	1	3	--
Seafood wholesale dealers	5	2	2	--
Charter/party boats	n/a	n/a	n/a	--
Commercial fishing boats	n/a	n/a	n/a	--

n/a = not available.
Source: IAI, Field Observations 2005 & 2006.

Hancock County

Table 79. Presence of Fishing Infrastructure, Services, and Boats in Bay St. Louis, Mississippi, Pre- and Post-Hurricane Katrina: 2004, 2005, 2006

Infrastructure or Service	Oct. 2004	Oct. 2005	June 2006	Comments
Commercial docking facilities	1	0	0	--
Major processors	1	0	0	Carmel Seafood
Hotels/Inns (dockside)	2	0	0	Bay Marina lost lodge in storm; docks & RV park open
Offloading facilities	1	0	0	--
Public boat ramps	1	0	1	--
Recreational docks/marinas	5	0	3	--
Bait & tackle/fishing supplies	3	0	0	--
Seafood restaurants	7	0	1	--
Seafood retail markets	5	0	1	--
Trucking operations	1	0	0	--
Charter/party boats	n/a	0	2	--
Commercial boats	n/a	0	5	Oyster beds closed

n/a = not available.
Source: IAI, Field Observations 2005 & 2006.

Table 80. Presence of Fishing Infrastructure, Services, and Boats in Waveland, Mississippi Pre- and Post-Hurricane Katrina: 2004, 2005, 2006

Infrastructure or Service	Oct. 2004	Oct. 2005	June 2006	Comments
Seafood restaurants	9	0	0	--
Seafood retail markets	4	0	0	--
Charter/party boats	n/a	0	0	--
Commercial boats	n/a	0	0	--

n/a = not available.
Source: IAI, Field Observations 2005 & 2006.

Coastal Mississippi was still experiencing shortages of marine-based supplies and products as of May 2006. Many vessels in Pass Christian, for example, were relying on fuel trucks from Louisiana, while vessels in Biloxi were steaming to Alabama for fuel (Figure 76). A few of the smaller vessels in Biloxi were able to purchase fuel locally from a small fuel owner "by

appointment only," while others – ostensibly on the outside of this political and social network– had to go to Alabama. Ice was also difficult to come by at that time. However, because relatively few shrimpers went out during the 2006 shrimp season, those who needed ice were able to obtain it either from a processor in Biloxi or one in Pascagoula. Finally, Mississippi seafood processors and retailers continued to rely on out-of-state product. In Pass Christian, processors were buying their oysters from Hopedale, Louisiana, while shrimp retailers in Biloxi were primarily getting their product from Bayou La Batre, Alabama.

Figure 76. Fuel-truck from Louisiana Fueling Boats in Pass Christian, Mississippi. Source: IAI Staff, 2006.

Special Population Effects. The commercial fishing fleet in Mississippi is multi-cultural, consisting predominantly of first generation American men and women who self-identify as "Vietnamese" or "Croatian". Other participants include Americans whose families have participated in fishing in the region for generations. Ethnic cleavages are evident in the individual fisheries.

Before Katrina, there were nearly 2,000 Vietnamese-Americans living in Biloxi, accounting for 35 percent of Mississippi's entire Vietnamese population. The majority lived in the Point Cadet area. Most of the Vietnamese immigrants who lived in Biloxi, as well as the rest of the Gulf Coast, arrived as refugees between 1970 and 1980, some of them as "boat people". Almost all were Southern Vietnamese fleeing the Communist takeover. Many of these refugees were also fishermen in their native land, who continued to earn their living with fishing in the U.S. Like other Asian-American groups, the Gulf Coast Vietnamese fishing population has achieved a

"functional level" of adaptation, assimilating where needed and utilizing skills from their homeland.

In recent years, as much as 80 percent of Vietnamese-Americans living in Biloxi worked in the fishing industry– the remainder worked in retail, on offshore oil rigs, and the casinos that surround Point Cadet. While Cajun and Croatian immigrants once dominated Biloxi's seafood industry, Vietnamese comprised 95 percent of shrimpers along the Mississippi coast (Figure 77). In many cases, fathers and sons shrimped, while mothers and daughters worked in the processing plants or on the docks alongside their husbands (IAI, Field Observations, October-December 2005).

Figure 77. Vietnamese Shrimpers on Boat in Biloxi, MS.
Source: IAI Staff, January 2006.

Hurricane Katrina almost entirely destroyed the marine-based infrastructure and dwellings in the Point Cadet area (Figure 78). Having lost both homes and boats, much of the Vietnamese-American community was displaced.

Figure 78. Howard Avenue (three blocks from Point Cadet), Biloxi, MS.
Source: IAI Staff, October 2005.

When it became clear that Katrina would likely make landfall as a Category 4 hurricane, many of the Point Cadet women and children fled to the homes of out-of-state family and friends or rode out the storm at one of the local churches or Buddhist temples. These facilities also served as a central meeting place for community members after the storm, providing a place for community connection, and a headquarters for coordinating action and relief efforts. Many of the men stayed behind on their boats hoping to protect their investments. In later interviews with IAI field workers, several shrimpers explained this potentially self-destructive decision by saying: "That's all we've got is these boats. One of these big boats, they cost $700,000. Even if it sank, we'd still owe the payment; these boats are everything to us" (Personal Communication, IAI, Point Cadet, September 2005).

The storm destroyed about one-third of the Point Cadet shrimp fleet – one-third of the larger vessels had already been repossessed by the SBA the previous year– and about one-third remained operable. Some of the intact fleet went out at least a few times to shrimp in the first few months after the storm, but with the low price of shrimp, high price of fuel, and no local places to offload, many opted not to fish.

Several factors complicate both the short- and long-term recovery efforts of this community. Language, literacy, and cultural competency issues are the greatest barriers Vietnamese-Americans face when trying to access FEMA or other forms of federal assistance. FEMA forms are currently only available in English, and there have been few or no translators and interpreters at FEMA and Red Cross registration centers (Tang 2005). Many first generation Vietnamese also do not realize they may be eligible for loans and grants from the government to help them rebuild boats and homes, or lack experience seeking federal aid and completing standardized

forms. Additionally, the Vietnamese tend to rely on extended kin and informal community networks for financial assistance rather than on other formal distributional networks. These factors combine to produce an ethnic enclave that is not plugged into mainstream sources of aid, and cannot access resources outside of their neighborhood.

Housing is now a particular challenge for those who want to return. About two-thirds of this Vietnamese community were living in motels, with relatives in nearby states, or went back to Vietnam in January. Many of the remaining one-third –mostly men–were living out of cars or in tents pitched on their property. Most said they wanted to return to Point Cadet, but did not have a place to live during the rebuilding process; most also lack insurance. Some who owned lots are funding their rebuilding efforts with cash.

As coastal development makes affordable housing increasingly difficult to find, the Point Cadet fishing families will need governmental intervention if they are to remain in this area. Increasing property values and waterfront development mean force many of these shrimpers to find other places to dock and sell their catches (Schwartz 2006). Biloxi officials do describe themselves as "working" to protect the interests of shrimpers who fear displacement (Wilemon 2006). Mayor Holloway acknowledges that, "If they don't have a place to dock, they're not going to come back. I don't want that to happen. The Vietnamese community is an important part of Biloxi" (Wilemon 2006). Nonetheless, there are trade-offs between the shrimping industry and waterfront development that Biloxi faces. Recovery options include constraining waterfront development, accepting an accelerated decline of their shrimping industry, or relocating the industry's infrastructure elsewhere.

Because the Vietnamese came to this country as a result of war, they feel things can always be worse. Immigrant narratives largely told and retold within the family unit and to close friends, now take the form of, "We came here with nothing, and we can start with nothing once more". Although many of the fishermen have lost homes, boats, and deck hands, faith in rebuilding is strong. "We can survive anything," Vietnamese fishermen often say.

Individual recovery efforts, however, can only be as successful as their civic leaders' commitment to, and investment in, rebuilding essential marine-based infrastructure and services, including, but not limited to, access to loading, unloading, ice and fuel, and repair facilities. These fishermen need safe access to state and federal fishing waters without undue risk and the uncertainties associated with the debris brought by the hurricanes.

III. ESTIMATED ECONOMIC EFFECTS OF HURRICANE KATRINA ON MISSISSIPPI'S FISHERIES AND RELATED INDUSTRIES

Estimates of the economic effects of Hurricane Katrina on Mississippi's commercial and recreational fishing industries vary, sometimes widely, depending on the units of analysis included in a particular estimate. For example, in his presentation before the House Subcommittee on Fisheries and Oceans on December 15, 2005, Corky Perret, Vice-Chairman of Gulf of Mexico Fishery Management Council, estimated hurricane-related impacts to

Mississippi's marine fisheries at nearly $484 million (Table 81) (Gulf of Mexico Fishery Management Council 2005).

Table 81. State Estimates of Hurricane Related Impacts to Mississippi Marine Fisheries as of November 3, 2005

Marine-related Commodity or Infrastructure	Estimated Loss
Dockside Revenue Loss	$31 million
Loss of Economic Output associated with Dockside Revenue Loss	$98 million
Pier Replacement	$9 million
Menhaden Fishery Net Replacement	$700 thousand
Economic Output Associated with Marine Recreational Expenditures	$293 million
Seafood Dealer and Processor Facilities Losses	$43 million
Seafood Product Losses	$9 million
Total	$484 million

Source: Gulf of Mexico Fishery Management Council 2005.

Alternatively, the Gulf Coast Research Laboratory (GCRL) estimates the economic losses to Mississippi commercial and recreational fishing industries at around $170 to $200 million. However, this estimate does not include infrastructure damages to marinas, piers, ice houses, wharves, boat ramps, and related marine-based businesses. The GCRL based their preliminary estimates on interviews with roughly 25 percent of commercial fishery participants who work out of the Mississippi Sound. These fishermen additionally estimate damage to the fleet alone at $50 million. Interviews with 30 percent of the processors and dealers estimate losses to their segment of the industry at $120 million (Surratt 2005).

More recently, preliminary data from the National Marine Fisheries Service (NMFS) on commercial landings (all species combined) in Mississippi indicate that, in the last four months of 2005, landings revenue received for all species combined was just over $4.5 million dollars. This figure represents a 79 percent decline in revenue from the same period in 2004, and a 78 percent decline from the five-year average for the same period (see Table 82) (NMFS SEFSC Accumulated Landings Database; 2005 data is preliminary).

Table 82. Mississippi Post-Katrina Value of Dockside Landings: 2000-2005

Fishery	Year	September-October	November-December	4-Month Interval
Shrimp	2000-2004 Average	$6,108,982	$4,335,555	$10,444,537
	2004	$5,461,637	$5,081,666	$10,543,303
	2005	$429,653	$2,185,196	$2,614,849
Percentage Change in Shrimp Landings Revenue				
	5-Year Avg. to 2005	-93%	-50%	-75%
	2004 to 2005	-92%	-57%	-75%
Oyster	2000-2004 Average	$1,738,236	$5,613,049	$7,351,285
	2004	$2,298,655	$6,073,242	$8,371,897
	2005	$0,000	$1,447,132	$1,447,132
Percentage Change in Oyster Landings Revenue				
	5-Year Avg. to 2005	-100%	-74%	-80%
	2004 to 2005	-100%	-76%	-83%
All Other	2000-2004 Average	$3,091,480	$296,513	$3,387,994
	2004	$2,247,949	$239,544	$2,487,493
	2005	$413,877	$86,867	$500,744
Percentage Change in All Other Species Landings Revenue				
	5-Year Avg. to 2005	-87%	-71%	-85%
	2004 to 2005	-82%	-64%	-80%
Total	2000-2004 Average	$10,938,698	$10,245,117	$21,183,815
	2004	$10,008,241	$11,394,452	$21,402,693
	2005	$843,530	$3,719,195	$4,562,725
Percentage Change in All Species Landings Revenue				
	5-Year Avg. to 2005	-92%	-64%	-78%
	2004 to 2005	-92%	-67%	-79%

Source: NMFS SEFSC Accumulated Landings Database; 2005 data is preliminary.

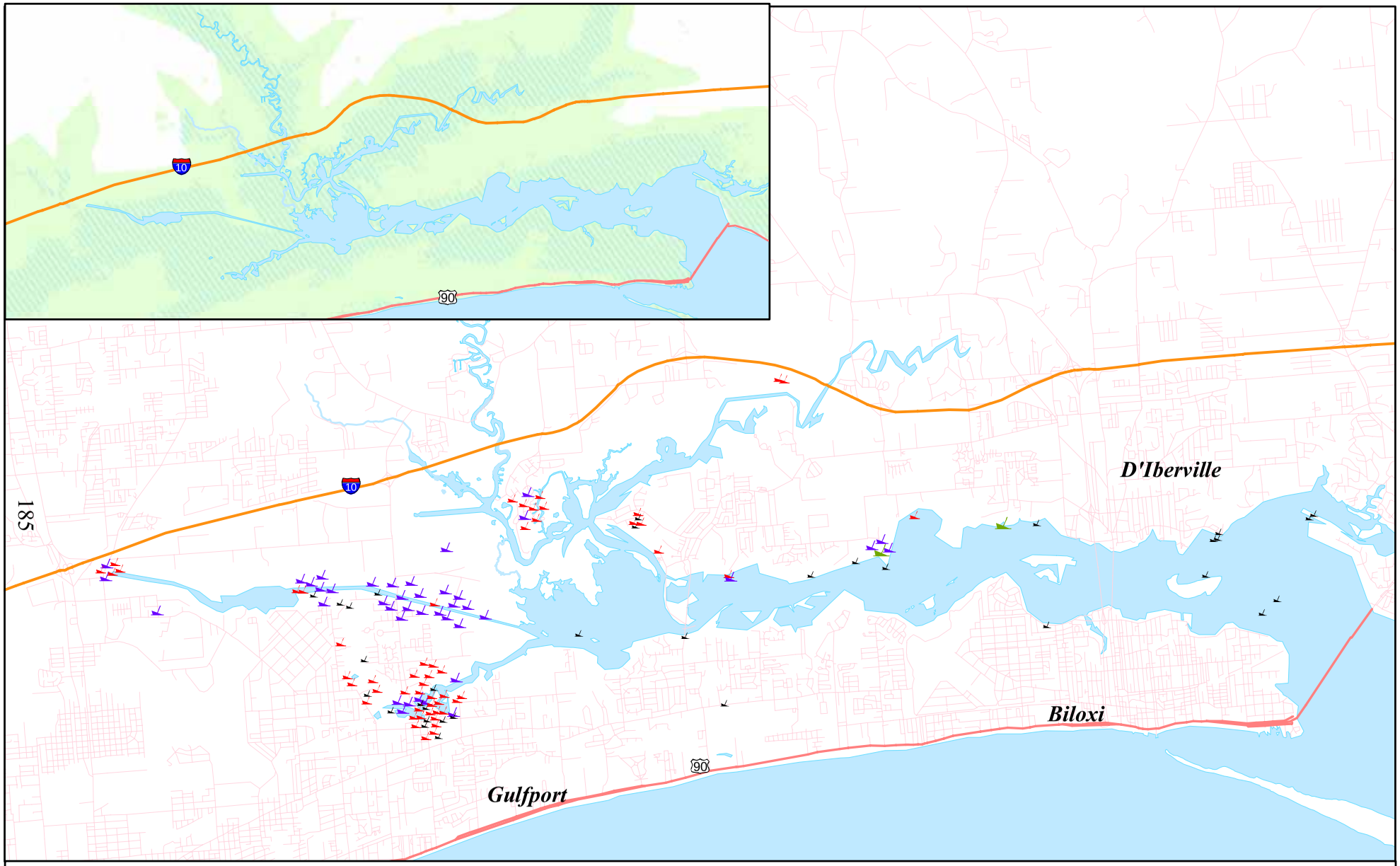
Seafood Processing and Seafood Dealers. There were 69 seafood processing plants and 79 wholesale seafood operations in Mississippi employing roughly 2,600 people prior to Katrina in 2005 (Posadas 2005). Processing plants and seafood dealers in Harrison County reported the most damage from Hurricane Katrina, with damage at $45.6 million for processing plants and $20.3 million for seafood dealers. Hancock County reported the second highest amount of damage, with $15.4 million for processing plants and $8.5 million for seafood dealers (Table 83). Buildings and equipment accounted for 72 percent of all incurred damage (Posadas 2006a).

Table 83. Estimated Total Damage to the Mississippi Seafood Processing Plants and Seafood Dealers

County	Seafood Processing Plants			Seafood Dealers		
	# of Plants	Average	Total $	# of Dealers	Average	Total $
Hancock	9	1,706,167	15,355,500	19	446,680	8,486,920
Harrison	34	1,340,058	45,561,962	39	264,935	10,332,481
Jackson	14	610,222	8,543,111	21	101,361	2,128,586
Others	12	22,400	201,600	72	36,835	1,263,602
Total	69	1,127,937	77,827,681	141	151,157	21,313,205
Total Projected Damage for the Above Sectors					**$101,259,884**	

Source: Posadas 2006a.

Commercial Vessel Damage. Estimates of damage and loss to Mississippi's commercial fleet of approximately 1,100 vessels range from 40 percent by the Mississippi Department of Marine Resources (Keesie 2006) to 87 percent by the Mississippi State University-Coastal Research and Extension Center (Posadas 2006b). The majority of this fleet was located in the three study counties: Harrison, Hancock, and Jackson (Figures 79 and 80).



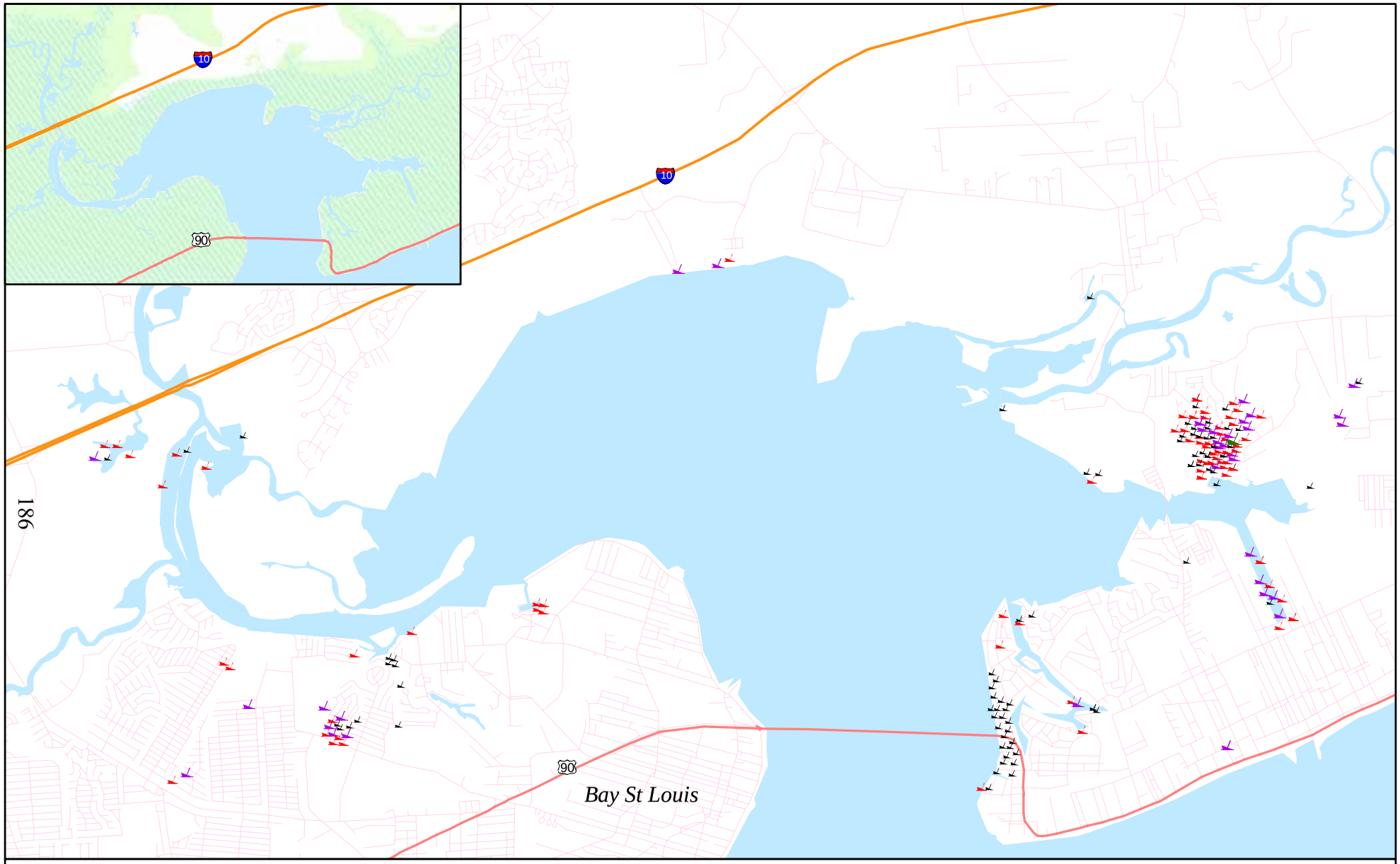
> 100 foot Vessel
> 50 - 100 foot Vessel
> 30 - 50 foot Vessel
< 30 foot or unknown Vessel

Biloxi Bay, Mississippi
Ocean Going Vessels Sunk or Swept Inland
by the Hurricane Katrina Storm Surge

Note: This graphic has a resolution of 300 dpi, allowing the viewer to zoom in .

Estimated Storm Surge
Estimated Post Storm Flooding

0 1 2 3 4
Miles



186

> 100 foot Vessel
> 50 - 100 foot Vessel
> 30 - 50 foot Vessel
< 30 foot or unknown Vessel

Bay St Louis, Mississippi
Ocean Going Vessels Sunk or Swept Inland
by the Hurricane Katrina Storm Surge

Note: This graphic has a resolution of 300 dpi, allowing the viewer to zoom in .

Estimated Storm Surge
Estimated Post Storm Flooding

0 1 2 3
Miles

According to Posadas (2006), 89 percent of the 376 commercially registered vessels in Harrison County were damaged, as were 88 percent of its 278 commercially registered shrimping vessels. In Hancock County, 89 percent of its 220 commercially registered vessels were damaged. In Jackson County, 82 percent of the 326 licensed commercial fishing units suffered damages (Figure 81). Of the 40 boats that were moored in the Pass Christian marina when Katrina made landfall, only two survived intact; the rest are in pieces (Leslie 2005).

Figure 81. Industrial Canal, Gulfport, Mississippi.
Source: IAI Staff, November 2005.

In February 2006, Posadas estimated the damage to the resident Mississippi commercial fishing fleet at $35.3 million (Table 85). One hundred percent of these economic losses occurred in Hancock, Harrison, and Jackson Counties. Harrison County reported most of the damage, with losses amounting to $18.6 million. The damage to fishing units in Hancock County reached $5.6 million. Total damage in Jackson County approached $6.4 million. Damage to boats, fishing gear, and other accessories accounts for 97 percent of all reported losses (Posadas 2006b).

Table 84. Estimated Total Damage to Resident Licensed Mississippi Commercial Fishing Vessels from Hurricane Katrina

County	# of Vessels	% of Vessels Damaged	Average Damage	Total Damage
Hancock	220	89%	$25,523	$ 5,615,106
Harrison	418	88%	$44,557	$18,624,956
Jackson	326	82%	$19,627	$ 6,398,340
Others	66	0%	$ 0	$ 0
Total	1,030	87%	$34,268	$35,296,545

Source: Posadas 2006b.

Net damage to fishing vessels located in Harrison County equaled $17.5 million. Hancock County reported net damage amounting to $5.6 million. Net damage in Jackson County was $6.2 million (Table 85). As of February 2006, insurance payments had covered only about 5 percent of the total damage (net damage = $33.6 million). The vast majority of vessel owners did not have insurance or did not expect to receive any insurance payments to cover damage (Posadas 2006b).

Table 85. Estimated Net Damage to Resident Licensed Mississippi Commercial Fishing Vessels from Hurricane Katrina

County	Number of Vessels	Average Damage	Total Damage
Hancock	220	$25,457	$ 5,600,439
Harrison	418	$41,786	$17,466,352
Jackson	326	$19,127	$ 6,235,340
Others	66	$ 0	$ 0
Total	1,030	$32,619	$33,597,148

Source: Posadas 2006b.

Recreational Vessel Damage. Recreational vessels in several coastal Mississippi counties also incurred significant damage as a result of Hurricane Katrina. Pre-Katrina, there were 57,189 recreational vessels in Hancock, Harrison, and Jackson Counties. Estimated impacts to the recreational fleet amounted to $160 million. This estimate includes $56 million for the vessels themselves, $25 million for the engines, $39 million for boat storage, and other trip-related losses (Jones 2006).

Both commercial and recreational fishery participants are facing significant challenges as they attempt to repair their boats. Lacking insurance, many must pay steep prices for repair if they are unable to do it themselves. Others are selling their boats and leaving the industry (Figure 82). The nearest operational boatyards are in Mobile, Alabama (about 55 miles) or Pensacola, Florida (100 miles); damaged boats must be towed. Many vessels damaged by the storm are still in need of salvage and/or repair.

Figure 82. Shrimp Boat for Sale in Biloxi.
Source: IAI Staff, May 2006.

Charter Boats. While the total economic losses to this industry are still being determined, NACO's economic loss survey conducted in late 2005 provides some preliminary damage assessments for the Mississippi fleet. In Mississippi, NACO conducted surveys with 98 of the state's 120 identified licensed charter boat vessels. Of those sampled, 11 are guide boats, 55 are "six-pack" charter boats, 15 are multi-passenger charter boats, 3 are head boats (tour vessels), and 14 are Chandeleur Boats. Sixty-three of these vessels operate in federal waters, 87 operate in state waters (up to 3 miles offshore), and 47 operate in inshore waters

Hurricane Katrina damaged 64 and totaled 10 charter boats in Mississippi. Of those lost and damaged vessels, damages/losses amounted to $2,015,450; insured losses totaled 32 percent. According to NACO, these vessel operators lost 4,978 trips valued at $7.5 million (Walker et al. 2006). Nevertheless, charter boat operators in Mississippi remain optimistic about their future participation in this industry. Approximately 91 operators or 92 percent anticipate remaining in business; the remainder does not plan to continue in business, are not sure if they will continue, or did not respond to this question (Walker et al. 2006).

Table 86 shows the overall projected economic loss to the State of Mississippi from the losses incurred by her charter boat fleet (Walker et al. 2006: 138). NACO included in this analysis lost trips immediately following the storms, physical loss to vessels, support personnel lost trip gross income and the projected gross lost income that was reported for the year following the storms to owners only (Walker et al. 2006: 138).

Table 86. Total Projected Losses to 98 Mississippi Charter Boats from Hurricanes Katrina and Rita*

Lost Trips (up to submittal of survey)	$7,516,816
Physical Damage	$2,015,450
Support Personnel Loss	$857,300
Annual Income Loss for 1 year (after survey was submitted)	$8,356,500
Total	$18,746,066

* Data available only for both storms combined.
Source: Walker et al. (2006).

Despite the stated optimism of charter boat operators regarding the post-Katrina future of this industry the charter boat industry has been challenged by a number of obstacles over the last decade, which has arguably limited its expansion. These obstacles include: increasing numbers of regulations, rising competition, laws prohibiting private artificial reef development, the red snapper moratorium, rapidly rising fuel prices, the aftermath of recent hurricanes, and decreasing levels of tourism. During interviews, many guides described the Mississippi charter industry as "in decline" even before Hurricane Katrina. They explain that, to make ends meet, they have been cutting corners by shutting down operations during the winter, catching their own bait, limiting their charters to inshore fishing, or supplementing their income with marsh tours in the winter. Some of these guides are advocates of private reef development to increase fish population and decrease competition (IAI, Field Observations, Biloxi, October 2005).

Mississippi's coastal communities will likely need financial assistance to restore the infrastructure so crucial to the survival of its tourism industry. The recovery process for this industry has been slow-going and problematic. Aid from FEMA and the SBA has not been forthcoming so far for charter boat operators. As most for-hire guides have small businesses that operate on marginal profits, they cannot survive a four to six month wait for assistance. Complicating the prospects for recovery, many of the charter boats are under-insured due to the prohibitive cost of marine hull insurance (Mannina 2005).

To help charter boat operators regain an economic foothold, Mannina suggests that NMFS be "flexible in fishery permits and renewals and should waive renewal fees for the next three years" (Mannina 2005). Mannina further advocates that,

> NMFS develop a vessel and permit buyout plan with provisions for retraining participating fishermen so that those unable to return to their profession can find new forms of employment. Congress' disaster response should be coupled with a voluntary buyout program to address the overcapitalization issues plaguing commercial and recreational fisheries such as the red snapper industry (Mannina 2005).

Without such assistance, Mannina concludes, fishing communities and the charter boat industry in coastal Mississippi are in danger of losing the economic benefits associated with tourism.

Casino Industry Effects. Pre-Katrina, there were 21 land-based and nine waterfront state casinos in Mississippi. In 2004, Mississippi state casinos earned $2.7 billion in casino revenues, placing it third behind Nevada and New Jersey ($10.3 billion and $4.8 billion, respectively). This figure does not include the state income taxes paid by the 17,000 people employed by the gaming industry, the sales taxes paid by the casinos, the property taxes they pay, and indirect economic benefits. Biloxi has the third-largest gaming industry and is one of the top ten tourist destinations in the nation (Coast Chamber 2003).

The tourism and gaming industries on the Mississippi Gulf Coast were particularly hard hit by Hurricane Katrina, wiping out 70 percent of the state's tax base (CBS News 2005). All 13 hotel-casinos in this region were destroyed; including seven in Biloxi (Associated Press 2005a). Pre-Katrina, casino revenues in Biloxi earned $611 million for the state, $185 million for the city, and $73 million for city and county schools (Associated Press 2006b). The executive director of the Mississippi Gaming Commission claims that the state loses about $500,000 in revenue every day that the Biloxi-area casinos are closed, not counting the revenue attached to the hotels and restaurants serving the casinos (Abraham 2005).

Nevertheless, Biloxi's books remain in the black. The city had the foresight or good fortune to take out a $10 million dollar business interruption policy in June 2005, paying only $93,000 in premiums when Hurricane Katrina struck. These funds will help to offset losses of casino revenue (Wilemon 2006).

While Mayor Ray Nagin's plans to revive New Orleans' destroyed economy with casinos were met with strong opposition, Biloxi Mayor A.J. Holloway has been successful in rallying city officials, residents, and developers around a plan to turn Biloxi into "another Las Vegas." Indeed, Holloway asserts that "legalized gaming is going to be what saves us" (Rivlin 2005). To facilitate this plan, Governor Haley Barbour signed legislation allowing casinos to build up to 800 feet inland. Civic leaders anticipate that the new land-based casinos will provide an economic boon for the region, bringing in much-needed jobs and tax revenues (Associated Press 2005a).

All nine casinos in Biloxi said they intend to rebuild, and most are planning bigger, more elaborate establishments. Harrah's Entertainment, the largest gaming company in the world, intends to invest upward of $1 billion dollars in two new land-based casino-hotels – an investment that rivals the scale of Las Vegas casino-resort projects (Wilemon 2006). At least a dozen developers have expressed interest in building casinos in Biloxi since the storms. A Mississippi Gaming Commission executive predicts that Biloxi will have three or four more new gaming halls by 2007 (Rivlin 2005). For example, the Isle of Capri Casinos has proposed a new 2,500-room hotel casino on the north side of U.S. 90 in Point Cadet. This new resort would be three times larger than its current casino. However, this city-owned land is believed to be the most valuable in Biloxi, and the city will likely entertain other offers. Indeed, it has already rejected two offers to lease the land to Ameristar and Landry's Restaurant earlier this year. City officials indicate that the winning proposal will have to agree to help cover the expense of relocating the Seafood Industry Museum, which is located on city land in Point Cadet, and create twice the number of gaming positions of a pre-Katrina casino (Wilemon 2005b).

Gaming officials conservatively project that by 2008 Mississippi's coastal casinos will generate $2 billion in profits and contribute over $240 million in taxes per year to the state and county (Rivlin 2005). Indeed, they have already made rapid progress in this direction. In mid-December, three of Biloxi's hurricane damaged casinos– the Imperial Palace, the Palace Casino, and the Isle of Capri–reopened to large and eager crowds (Wilemon 2005a).

However, Katrina also has accelerated Biloxi's transformation into a regional gambling center. And, while gaming has increased local employment opportunities at restaurants, hotels, and entertainment venues associated with the casino-resorts, the growth of dockside gaming has had severe consequences for the commercial seafood industry. In his study of the effects of dockside gaming on the Mississippi fishing industry, Posadas (1993) located a number of key negative effects, including: the closure of fishery support services; the concomitant decline in the volume and value of Mississippi's commercial landings; a reduction of the size of the commercial fishing fleet and the number of commercial fishing licenses issued; considerable decline in seafood processing capacity and employment due to a decrease in values of fishery products and lesser value added; a decline in the average volume and nominal values of fishery products processed by each plant; a downward adjustment in the region's economy in terms of output, jobs and income related to commercial fishing; and decline in income and employment in the seafood processing sector in coastal Mississippi. Indeed, the construction of water-front casinos already has displaced three offloading docks since the early 1990s, either putting them out of business or pushing offloading efforts to the Back Bay area. The inability of the fishing industry to compete with rising rent and/or property taxes in an area slated for development of the recreational sector ultimately means an end to the physical presence of commercial fisheries on the central Mississippi waterfront. It also means a beginning to the end of Biloxi's cultural and historical relationship with shrimping.

Additionally, the growth of the casino-resort industry puts increasing pressure upon older, non-casino hotels. While the revenue generated by expanding casino-resorts will lead Biloxi's recovery efforts, they will also confront "mom and pop" non-casino beach front hotels with serious competition. According to the Hotel, Motel and Lodging Association, 51 of the non-casino beach front hotels in Gulfport and Biloxi are either destroyed or too damaged to reopen, while eight are operating at diminished capacity. In Biloxi, non-beach front hotel rooms are down to 388 from 3,252, post-Katrina. In Gulfport, the post-Katrina drop is from 2,468 to 1,099. According to one long time hotel operator, many area hotels were built after Hurricane Camille in 1969 on elevations considered sufficient by those who had not experienced this storm. Compliance with new post-Katrina regulations that require hotels to be elevated at least 28-feet above sea level will cost hundreds of thousands of dollars, thus effectively pricing many small hotel owners out of the market. Smaller property owners also are receiving offers from corporations and condominium developers to buy their land, and at least nine were considering these buyout offers (Thomas 2006).

IV. RESPONSE AND ADAPTATION TO HURRICANE KATRINA

Following the storms, fishery participant responses to post-Katrina conditions depended upon the resources that remained available to them, their particular fishery niche, and the nature of physical impacts to their specific location or fishery. Their principal coping strategies fall into four broad categories: (1) concentration of efforts in viable processing areas; (2) reliance on make-shift strategies and traditional techniques; (3) reliance on community support; and (4) utilization of federal, state, and local government assistance.

1. Cooperation with others in the fishing industry. As of January 2006, about 8 percent of the Mississippi fleet had resumed harvesting operations. Unlike eastern Louisiana, which has concentrated its efforts on re-establishing offloading facilities in strategic places to keep the shrimp industry operating, Mississippi has been slow to regroup. With only two operational processing plants (Golden Gulf in Biloxi and Pascagoula Ice and Freezer), offloading efforts redistributed primarily to Bayou La Batre, Alabama to the east, and Venice, Grand Isle, Lafitte, Dulac, and Chauvin in Louisiana to the west. These two processors shared their facilities with several other processors whose facilities were out of commission until May 2006 when they were able to return to their plants. Through these cooperative efforts, seafood processors were able to elevate production levels in the wake of Katrina.

2. Reliance on make-shift strategies. Hurricane Katrina effectively put all seafood retailers in Biloxi out of business. Many fishery participants have had to rely on their own ingenuity to remain viable participants in the region's fisheries. These make-shift techniques include: (1) selling directly from vessels, vehicles, or from home; (2) offloading at public docks using personal ice chests and wheel-barrows; and (3) exchanging mechanical and construction services for boat repair.

The first retailers to resume operations did not reopen until the end of December 2005. Given the obstacles to selling through normal channels, many small scale commercial fishery participants have been selling seafood directly from their homes (Figure 83 below).

Figure 83. Sign Advertising Shrimper's Wares in Front of House.
Source: IAI Staff, January 2006.

Many grocers were also allowing fishermen to sell their fish "straight off the boat" to hungry customers in the parking lots of their markets. This informal buyer-seller relationship served all members of the community: fishery participants had a much-needed venue to sell their wares, consumers had access to a culturally and nutritionally important local product, and grocers, some of whose stores lacked electricity or were partially boarded up, were able to attract a much-needed clientele to their stores with the fishermen in the parking lot (Figure 84).

Figure 84. Shrimp Sales in Parking Lot, Biloxi.
Source: IAI Staff, October 2005.

Another make-shift adaptation included the barter of services for boat repair in the absence of cash. The cost of hiring skilled labor is exorbitantly high, and a luxury many financially strapped fishery participants were not able to immediately afford. Thus, bartering skills for equipment has become an important means of rebuilding boats and, in the process of doing so, has fostered a renewed sense of community. For example, a welder will fix his co-fisherman's mast in exchange for fiberglass repair, while a fisherman that is a particularly skilled electrician might exchange his talents for hull repair. Welders and electricians needed to repair GPS equipment were in particular demand. Such acts of trade exchange have been witnessed all along the damaged Mississippi coastline.

3. *Reliance on community support.* The creation of an informal financial institution built with communal funds for lending money to close friends and family, particularly in times of crisis, is a common practice among Vietnamese-American shrimping community members in coastal Mississippi. In this practice, everyone from the group puts a set amount of money into "the bucket" (an actual bucket) each month. The bucket acts as a savings account without the advantage of interest. The group records how much each individual pays in. When a loan is needed, members can request to borrow money from the fund, at a set interest rate. Should two people need to borrow funds at the same time, the loan goes to the person who bids a higher interest. Typically, however, these community-determined interest rates are much lower than those offered through formal lending institutions.

Community funds offer something mainstream financing institutions cannot: relatively restriction-free and rapidly processed loans. This source of immediate financial support has

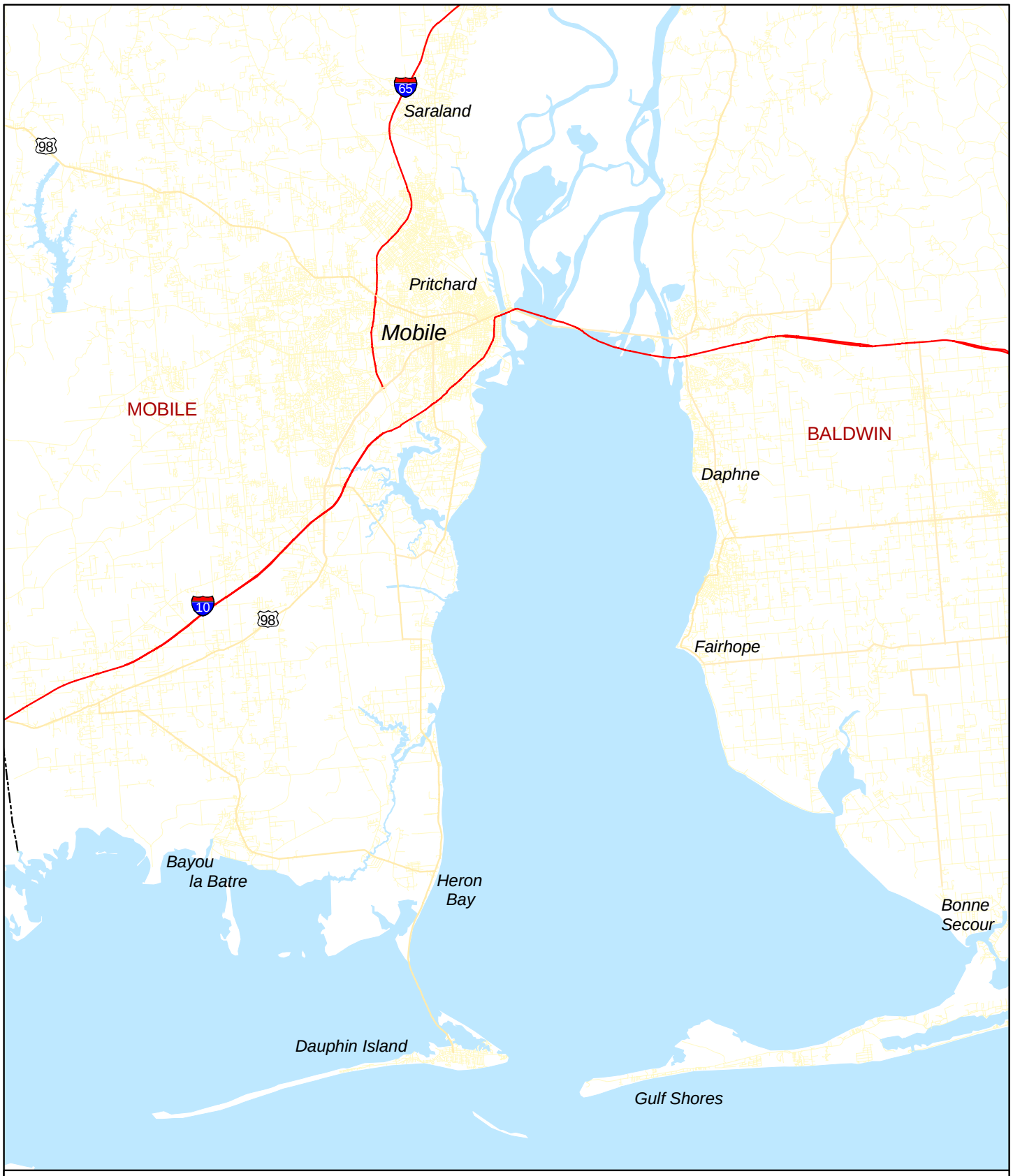
become critically important to Vietnamese shrimpers in the post-Katrina environment. Some fishermen interviewed explained that they sought loans from the community fund instead of pursuing insurance claims or SBA loans, since these two financial pathways are slow to process claims, if they are processed at all. Thus, reliance on one's community rather than on more distant, private or government source of aid not only expedited the recovery process, but provided a source of psychological sustenance. However, with so many demands upon this funding system, the "bucket" is now empty, and borrowers will need to look outside of their immediate network to fund longer term recovery needs and those unmet by insurance.

4. Local government assistance. Since the retreat of storm waters from the low-lying areas of the State, many fishery participants have accessed financial aid, housing, and employment assistance offered through the federal, state, and local governments. However, ease of access to such assistance programs varies by ethnic group. While FEMA has served as a significant resource for all in this region, both Caucasian and Vietnamese fishery participants have experienced difficulty navigating FEMA's bureaucratic waters.

For example, although FEMA was notoriously slow in securing and setting up trailers for the displaced, once positioned, FEMA trailers provided much needed shelter for persons in otherwise dire situations. Trailers allowed displaced fishing families to move off their boats and begin to repair damages. Approximately 105,000 displaced Mississippians had been placed in 38,000 FEMA trailers along the Mississippi Gulf Coast as of May 2006 (FEMA 2006).

Federal and State government-funded jobs also have provided many unemployed fishery participants with alternative, temporary work opportunities. Construction jobs have been particularly profitable. Fishermen and women are often by necessity "Jacks and Jills of all-trades" and many therefore can perform construction, welding, machine, and electrical work. Such skills proved valuable in this time of limited fishing activities. The MDMR also provided a boost to the local fishing economy by providing unemployed oystermen with temporary research positions. These research positions involved the mapping of the state's oyster reefs using GPS transects to assess the sediment quality on the floor of the Mississippi Sound. Vessel captains reportedly received a stipend of $600 per day for their efforts.

F. Pre-Hurricane Katrina: An Overview of the Commercial and Recreational Fishing Industries in Alabama.



N

Hurricane Katrina Affected Areas of the Alabama Coast

Note: This graphic has a resolution of 300 dpi, allowing the viewer to zoom in .

Miles

0 3 6 9 12 15

I. PRIMARY FISHING INDUSTRIES IN ALABAMA

In the State of Alabama, the majority of commercial fishing and seafood processing industry activity takes place in the highly productive ports of Bon Secour and Bayou La Batre. These ports annually contribute roughly 93 percent of the state's commercially produced seafood. There are four primary commercial fisheries in Alabama in which producers and processors participate: shrimp, oysters, finfish and crabs. Between 2000 and 2004, inclusive, commercial landings in Alabama had an average ex-vessel value of $44 million (Table 87).

Table 87. Commercial Landings in Alabama (all species combined), Thousands of Pounds (live weights), and Thousands of Current Dollars: 2000-2004

Year	Pounds	Value
2000	30,530	$64,075
2001	25,858	$44,941
2002	23,658	$35,925
2003	25,535	$36,844
2004	26,559	$37,035
<5 Year Average>	<26,428>	<$43,764>

Source: NMFS SEFSC Accumulated Landings Database; 2005 data is preliminary.

Commercial Landings in Alabama between 1995 and 2004. Between 1995 and 2004, Alabama's fisheries (all species combined) produced 0.3 percent of the nation's seafood landings (Table 88). In 2004, commercial fisheries in Alabama produced about 27 million pounds of fish, with a value of $37 million dollars (NMFS 2005a). Of the five Gulf Coast states, Alabama's seafood production industry ranked last in terms of total annual revenue generated in 2004.

Table 88. Pounds and Value of all Commercial Landings in the United States and Alabama: 1995-2004

Year	Pounds (all species), U.S.	Value (in billions), U.S.	Pounds (all species), Alabama)	Value (in millions), Alabama	% of total U.S. lbs. from AL	% of total U.S. Value from AL
1995	9,912,807,044	$3,826,360,342	28,740,210	$49,874,071	0.3%	1.3%
1996	9,643,821,438	$3,564,587,048	26,578,650	$38,341,730	0.3%	1.1%
1997	9,951,898,930	$3,592,218,307	24,952,436	$43,264,471	0.3%	1.2%
1998	9,332,712,602	$3,221,433,652	30,098,924	$47,013,377	0.3%	1.5%
1999	9,409,192,065	$3,575,730,880	27,438,244	$50,488,086	0.3%	1.4%
2000	9,142,633,213	$3,674,425,002	30,530,385	$64,075,386	0.3%	1.7%
2001	9,511,750,925	$3,243,655,393	25,858,342	$44,941,006	0.3%	1.4%
2002	9,428,867,963	$3,191,297,481	23,658,021	$35,925,479	0.2%	1.1%
2003	9,515,048,681	$3,371,930,855	25,534,971	$36,843,888	0.3%	1.1%
2004	9,664,977,837	$3,714,515,156	26,558,704	$37,035,271	0.3%	1.0%
<10 Year Averages>	<9,551,532,004>	<$3,498,259,060>	<26,553,044>	<$44,503,997>	<0.3%>	<1.3%>

Source: NMFS 2005a.

Top Seafood-Producing Ports in Alabama. Tables 89 and 90 depict the value and pounds of dockside landings for Bayou La Batre and Bon-Secour in 2004. They also identify the ranking of each port in relation to the top performing ports in the United States. Historically, Bayou La Batre has been a particularly productive port, ranking 40th out of 97 ports in the nation in terms of pounds landed and 23rd in terms of revenue in 2004.

Table 89. Total Commercial Fishery Landings at Select Alabama Ports and Ranking by U.S. Dollars: 2004

Port	County	U.S. Rank by Value	Value in Millions	Pounds in Millions
Bayou La Batre	Mobile	23rd	$28.4	19.1
Bon Secour-Gulf Shores	Baldwin	72th	$7.0	6.0

Source: NMFS 2005b.

Table 90. Total Commercial Fishery Landings at Select Alabama Ports and Ranking by Pounds: 2004

Port	County	U.S. Rank by Pounds	Pounds in Millions	Value in Millions
Bayou La Batre	Mobile	40th	19.1	$28.4
Bon Secour-Gulf Shores	Baldwin	77th	6.0	$7.0

Source: NMFS 2005b.

II. PRIMARY FISHERIES AND PRODUCTION LEVELS IN COASTAL ALABAMA: 1995 TO 2004

Shrimp Production. Alabama produces an average of 7 percent of all shrimp harvested from the Gulf. Figure 86 compares the percentage of the pounds of shrimp landed in Alabama to the percentage of shrimp landed in the four remaining Gulf States, and to the United States as a whole, between 1995 and 2004, inclusive. Of the five Gulf Coast states, Alabama ranks fourth in terms of the annual revenue its commercial shrimping industry generates.

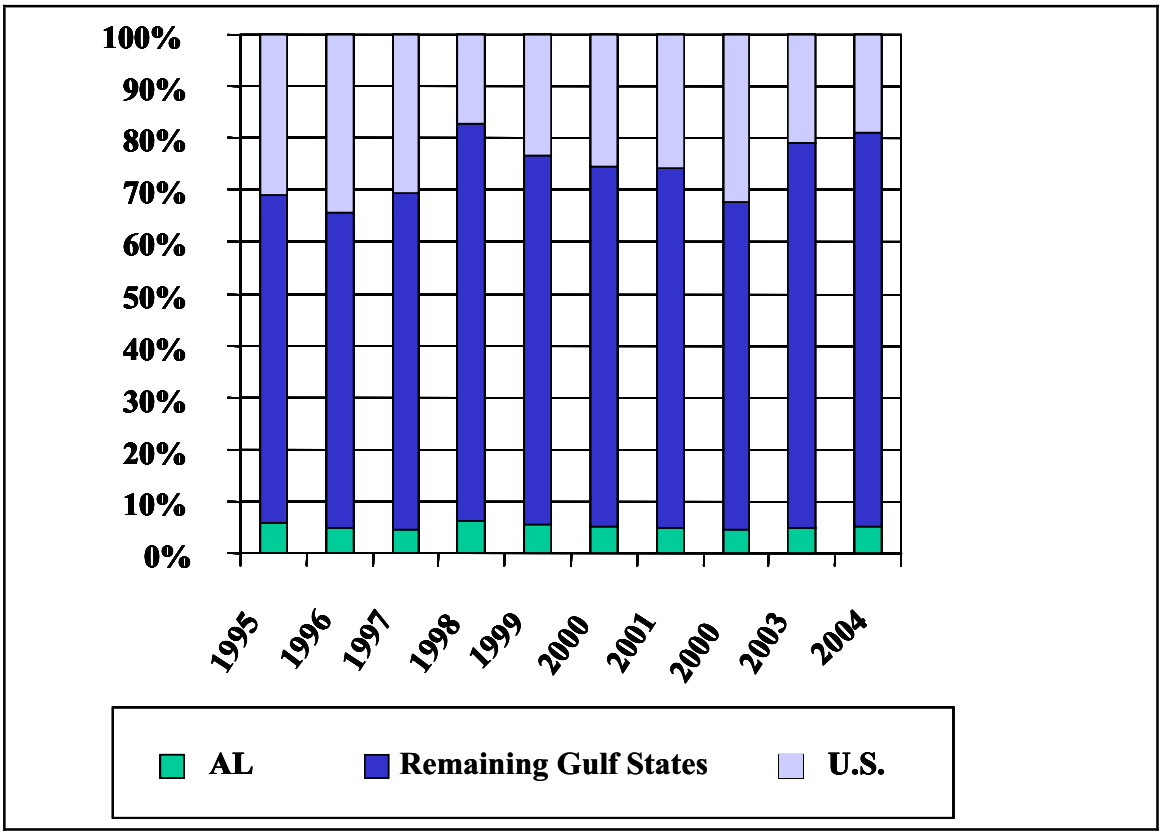


Figure 86. Percentage of Total Pounds of Shrimp Landed Annually in Alabama, the Four Remaining Gulf States and the United States: 1995-2004.
Source: NMFS 2005a.

Over the past decade (1995-2004), shrimp landings in Alabama have had an average ex-vessel value of $39 million dollars (Table 91). In 2004, the most recent year for which national data are currently available, a total of 317 million pounds of shrimp worth $446 million dollars (heads-on) were landed in the U.S. In this same year, 16 million pounds or 5 percent of this U.S. shrimp was landed in Alabama state waters, with a value of $29 million (NMFS 2005a).

Table 91. Pounds and Value of Alabama Shrimp* Harvest: 1995-2004

Year	Pounds	Value	Percent of Gulf Harvest/Pounds	Percent of Gulf Harvest/Value
1995	20,466,758	$45,088,938	8.7%	9.6%
1996	16,556,103	$32,984,225	7.3%	7.9%
1997	13,551,650	$37,229,793	6.4%	8.1%
1998	20,094,344	$42,276,989	7.6%	8.7%
1999	17,721,221	$44,668,558	7.3%	9.3%
2000	20,103,457	$56,661,066	7.0%	8.6%
2001	16,565,677	$38,592,085	6.4%	7.8%
2002	14,857,115	$29,602,637	6.3%	7.7%
2003	15,769,627	$30,284,382	6.1%	8.3%
2004	16,064,334	$29,196,628	6.2%	7.9%
<Average>	<17,175,028>	<$38,658,530	<6.9>	<8.4>

*Brown, White, and Other.
Source: NMFS 2005a.

As assessed for recent years, Alabama's shrimp fishery peaked in 2000, with 20 million pounds of shrimp valued at nearly $57 million dollars. However, ex-vessel prices paid for Gulf of Mexico shrimp have been in a state of decline, dropping precipitously in 2001 and 2002. This decline relates in part to ongoing increases in imported shrimp and concomitant effects on local, regional, and national seafood market conditions (Figure 87).

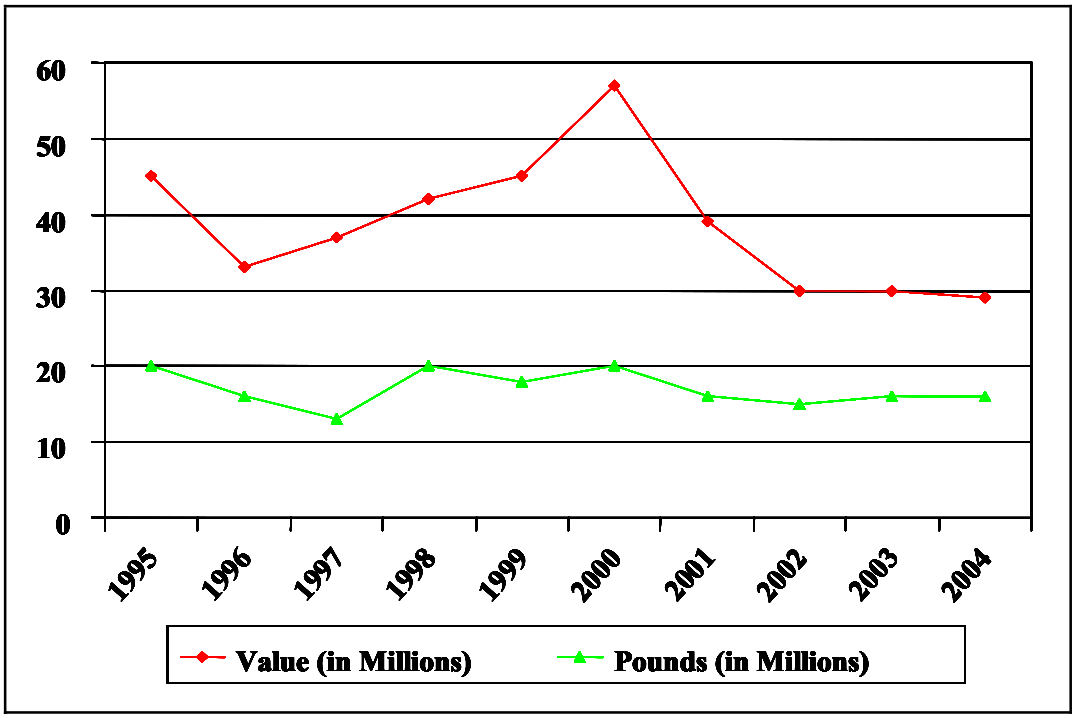


Figure 87. Alabama's Shrimp Harvest in Pounds and Value: 1995-2004.
Source: NMFS 2005a.

Oyster Production. Relative to other states that commercially harvest oysters, Alabama's oyster fishery is rather small. In recent decades, Alabama has produced only about 1 percent of the nation's oyster supply. Still, the Eastern Oyster is an economically important fishery in Alabama. Over the past decade, oyster beds in Alabama have produced nearly 3 percent of all oysters harvested in the Gulf of Mexico. These oysters had an average value of nearly $1.4 million dollars (Table 92).

Table 92. Oyster Landings for Alabama by Pounds and Value: 1995-2004

Year	Pounds	Value	Percent of Gulf Harvest/Pounds	Percent of Gulf Harvest/Value
1995	709,992	$1,117,548	3.2%	2.8%
1996	620,910	$1,193,043	2.8%	2.6%
1997	695,320	$1,397,908	3.1%	2.9%
1998	340,186	$783,499	1.7%	1.7%
1999	363,863	$888,785	1.6%	1.9%
2000	791,908	$1,755,475	3.1%	3.3%
2001	574,902	$1,235,314	2.2%	2.4%
2002	759,194	$1,602,331	3.1%	3.1%
2003	815,530	$1,622,785	3.0%	2.6%
2004	908,181	$2,120,392	3.6%	3.5%
Average	<657,999>	<$1,371,708>	<2.7%>	<2.7%>

Source: NMFS 2005a.

In 2004, the most recent year for which national oyster data was available when writing this report, Alabama produced nearly 4 percent of the nation's 27 million pounds of oysters. This increase in production is related to the near collapse of oyster populations and harvests in Chesapeake Bay in 2003 and 2004 (Raines 2004). Nevertheless, despite this spike in production, Alabama ranks last in Gulf Coast oyster production; Louisiana ranks first (NMFS 2005a). Figure 88 compares the percentage of the pounds of oysters landed in Alabama to the percentage of oysters landed in the four remaining Gulf States, and to the United States as a whole between 1995 and 2004, inclusive.

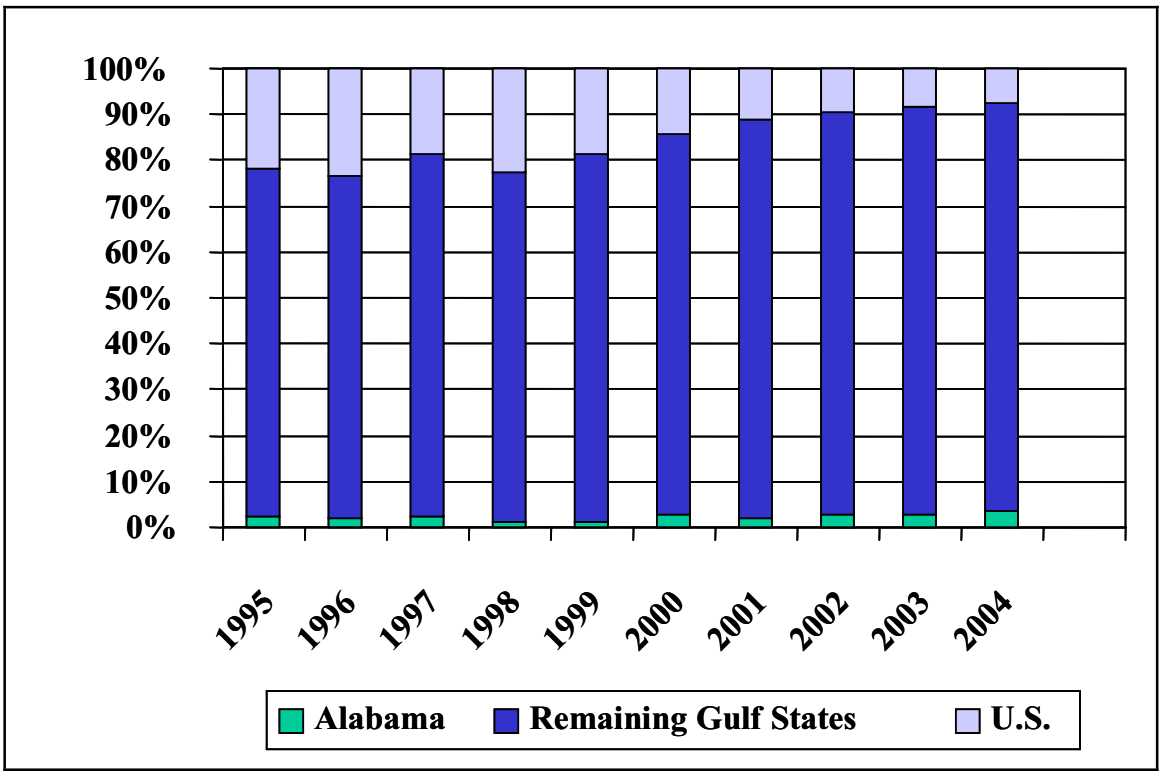


Figure 88. Percentage of Total Pounds of Oysters Landed Annually in Alabama, and the Four Remaining Gulf States and the United States: 1995-2004.
Source: NMFS 2005a.

The dockside value of Alabama's oysters has remained fairly constant in relation to pounds harvested between 1995 and 2004. However, the product value of this fishery sharply increased in 2004 (Figure 89).

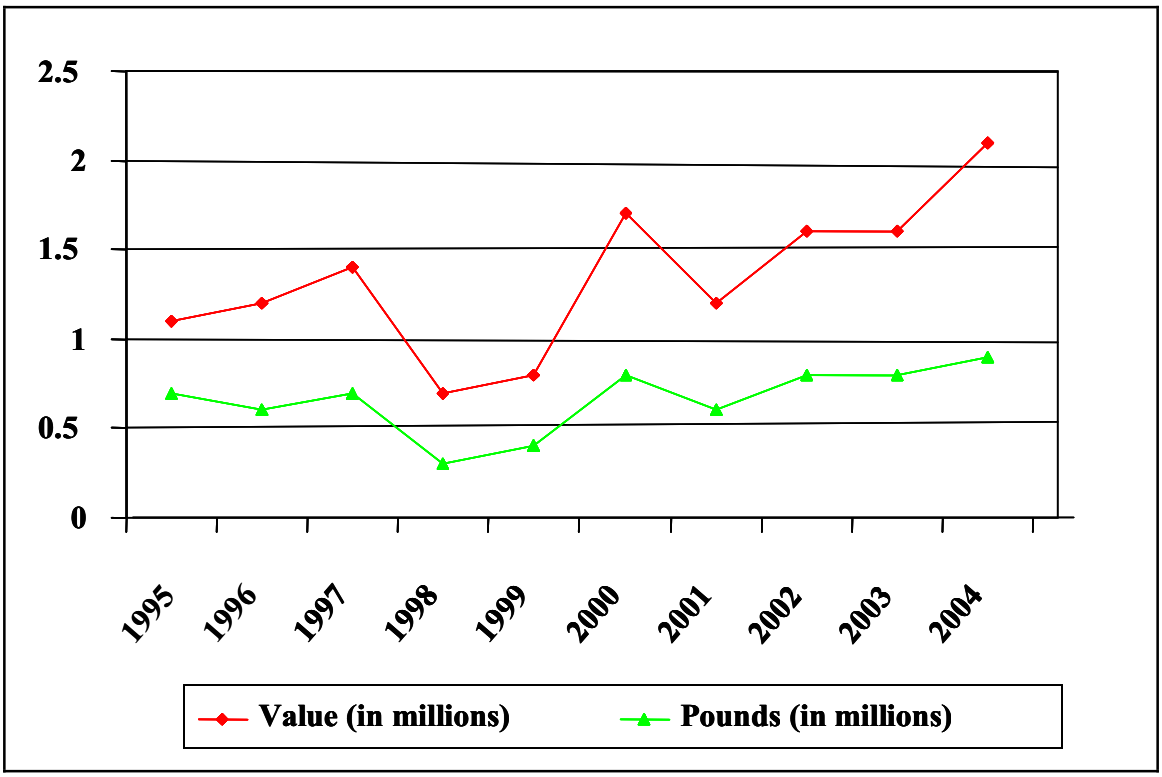


Figure 89. Alabama's Oyster Harvest in Pounds and Value: 1995-2004.
Source: NMFS 2005a.

Aquaculture. Aquaculture in Alabama had an overall state economic impact of $275 million dollars in 2004 (ACES 2005). Catfish is the primary fishery. In that year, more than 145 million pounds of catfish were produced. According to the Alabama Cooperative Extension System (ACES), there were over 26,000 water acres of fish farms in Alabama in 2004. In that year, some 300 producers –200 of which are considered "large scale"– provided more than 3,000 jobs in production and processing. Alabama is second only to Mississippi in U.S. catfish production.

While all counties in Alabama engage in some form of commercial aquaculture, producing upward of 25 aquatic species, residents in Mobile and Baldwin Counties are only minimally dependent on catfish farming (ACES 2005). Catfish production in Alabama is most extensive in Hale, Dallas, Perry, Montgomery, and Wilcox Counties, all of which are located along the Alabama River Basin (Clean Water Partnership 2004).

III. RECREATIONAL AND COMMERCIAL FISHING INDUSTRIES AND PARTICIPANTS IN ALABAMA

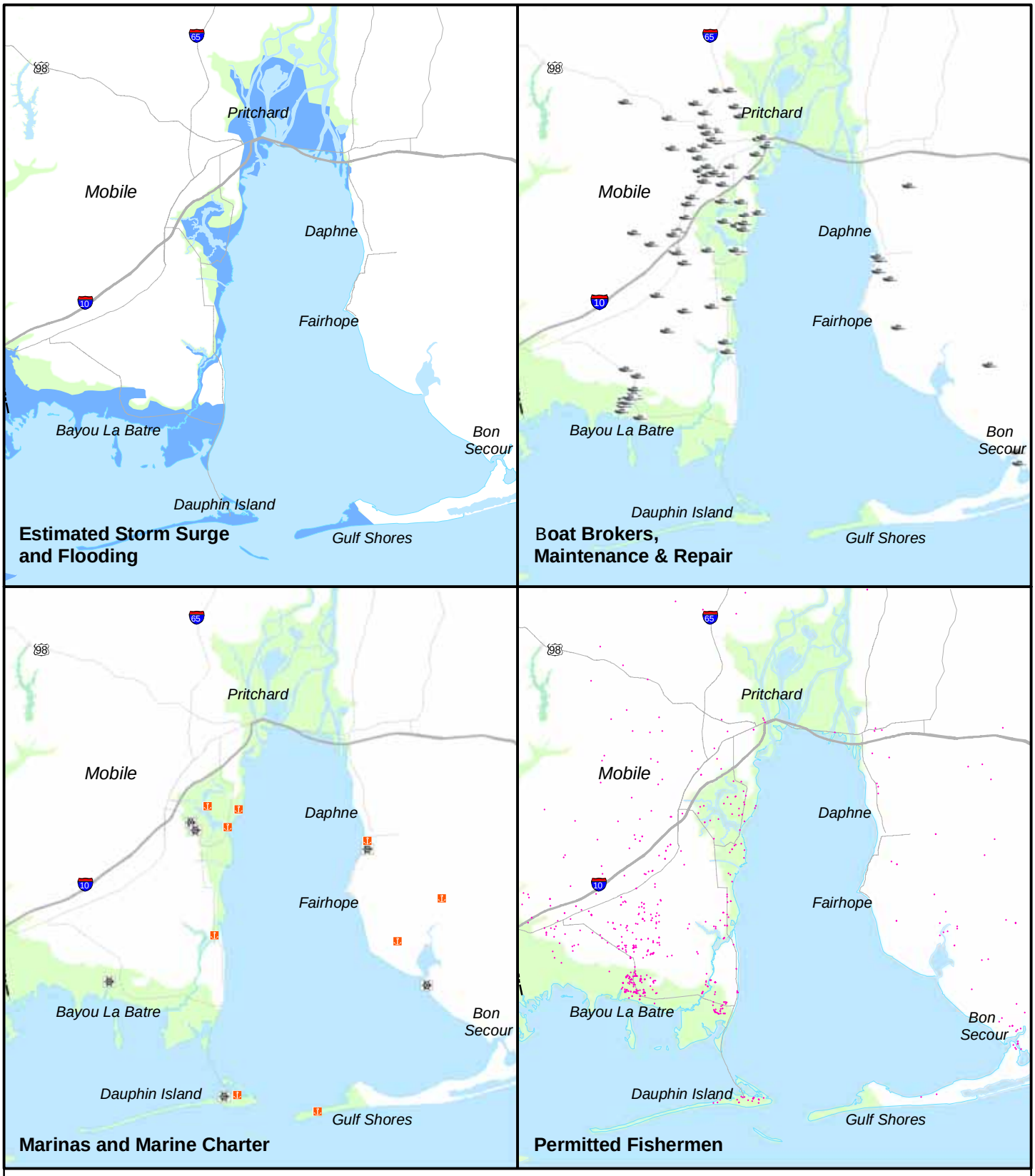
Recreational and Charter Fisheries. Recreational angling and charter boat fishing generate millions of dollars in sales and revenue in Alabama each year. In 2003, fishing trips had a total combined economic effect of $1.6 billion dollars (multiplier effect included), with $831 million in retail sales. In that year, recreational and charter fishing supported nearly 19,000 jobs, paying out $399 million in wages. Further, recreational fishing generated approximately $99.5 million in sales and motor fuel, state, and federal income tax revenues (American Sportfishing Association 2004).

According to NMFS (2004), 191 registered for-hire vessels took residents and visitors on a total of 72,000 charter trips in Alabama waters in 2004. In that year, 806,000 recreational anglers took 2.1 million outings and landed 8.9 million pounds of fish (Steinbeck et al. 2004).

Commercial Fishery Participants. According to the U.S. Census Bureau (2004), approximately 9,500 or 0.04 percent of the employed civilian population in Alabama identified farming, fishing, and forestry occupations as their primary sources of income. This figure reflects a 50 percent decrease from the Census 2000 report when 0.08 percent of the labor force worked in this sector.

Preliminary data released in 2004 by NMFS (Southeast Region), documents a total of 1,732 commercial fishing vessels in the State of Alabama (432 federally- and 1,300 state-permitted). Of the federally issued permits, 196 were for shrimping (NMFS SEFSC 2004).

Figure 90 provides GIS analysis detailing location of the fishermen and related marine-based facilities along the southwest coast of Alabama.



Boat Sales and Maintenance

Marinas

Charter Companies

Permitted Commerical Fishermen

Estimated Storm Surge

Estimated Post Storm Flooding

Fishermen and Fishing Facilities Commercial and Recreational of the Southwest Alabama Coast

Note: This graphic has a resolution of 300 dpi, allowing the viewer to zoom in .

0 6 12 18 24

Miles

G. Hurricane Katrina: Alabama State Fisheries Impact Report

I. GEOGRAPHY OF STORM SURGE AND WINDS ASSOCIATED WITH HURRICANE KATRINA

Alabama's coastline is low-lying and prone to damage from storm surge during major hurricanes. Bayou La Batre sits at 7-feet above sea level, and Gulf Shores at 9-feet above sea level. The Mobile State Docks reported storm surge of 11.5 feet of water in Mobile, the highest in this zone, and surge as much as 12-13 feet high in Bayou La Batre. However, locals in Bayou La Batre also pointed out high-water marks in excess of 20 feet (Figures 91 and 92).

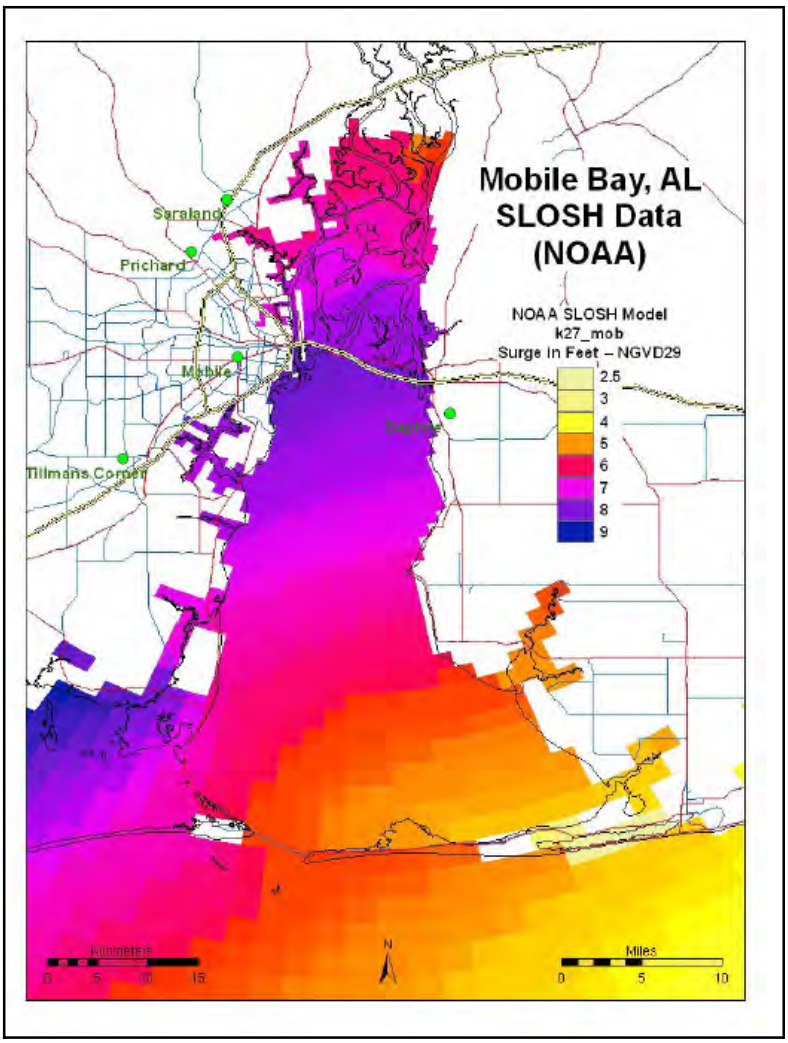
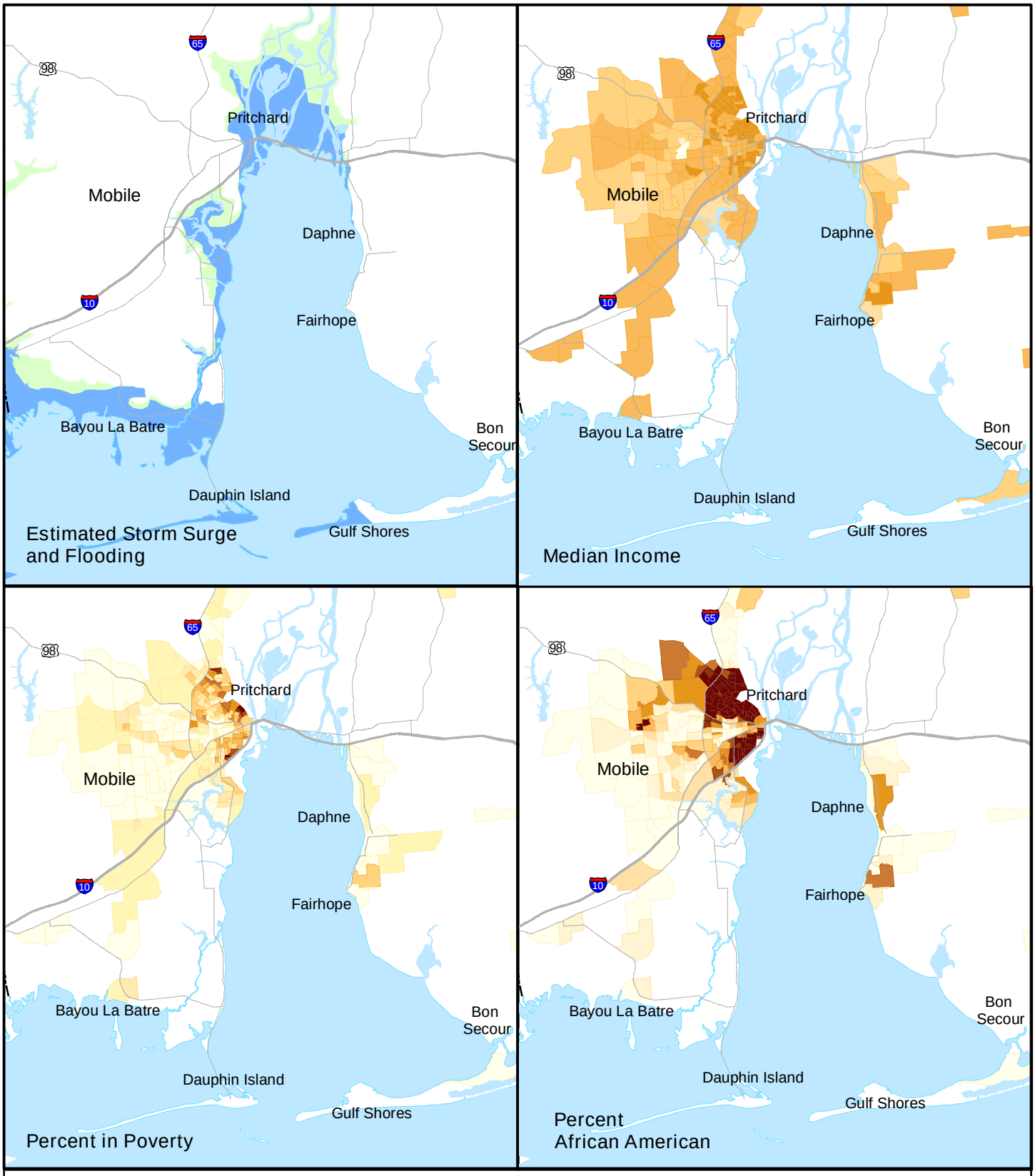


Figure 91. NOAA Slosh Model; Hurricane Katrina, Mobile Bay.
Source: NOAA 2005.



Median Income

- 100-110,000
- 80-100,000
- 60-80,000
- 40-60,000
- 20-40,000
- to 20,000

Percent Breaks for lower maps

- to 10%
- 20%
- 30%
- 40%
- 50%
- 60%
- 70%
- 80%
- 90%
- 100%

Estimated Storm Surge

Estimated Post Storm Flooding

Coastal Southwest Alabama Demographics By Census 2000 Block Group

Low density block groups not mapped for sake of clarity.

Note: This graphic has a resolution of 300 dpi, allowing the viewer to zoom in .

0 6 12 18 24

Miles

Hurricanes Ivan in 2004 and Katrina in 2005 are the largest storms to have hit the Alabama coastline in recent history. Despite the damage Ivan inflicted, many locals believe that Katrina's wrath was the more devastating (Figures 93 through 98). As one Bayou La Batre fisherman stated, "Ivan was a drop in the bucket compared to Katrina; it was nothing but a wind swell" (Personal Communication, IAI, Bayou La Batre, December 20, 2005). According to Medlin et al. (2005):

> Many homes were completely engulfed by Katrina's surge in Bayou La Batre. The surge in Mobile Bay led to inundation of downtown Mobile causing the imposition of a dusk-to-dawn curfew. The Mobile State Docks' surge value of 11.45 feet was extremely close to being the highest value ever recorded (which was 11.6 feet on July 5, 1916).

Figure 93. Coden (near Bayou La Batre) and Entrance to Bayou Coden, Post-storm Surge (aerial)

Figure 94. Bayou la Batre, Entrance to the Bayou.
Source: NOAA, September 2005.

Figure 95. Bayou La Batre, Dockside, During Storm Surge.
Source: Courtesy of Local Bayou La Batre Resident, September 2005.

Figure 96. Bayou La Batre, Dockside, Post-storm Surge.
Source: Courtesy of Local Bayou La Batre Resident, September 2005.

Figure 97. Bayou La Batre, Landside, During Storm Surge.
Source: Courtesy of Local Bayou La Batre Resident, September 2005.

Figure 98. Bayou La Batre, Landside, Post-storm Surge.
Source: Courtesy of Local Bayou La Batre Resident, September 2005.

Preparing for the Storm. Traditionally, commercial fishery participants in Alabama have tied-up their vessels in local ports or moved them further inland via Mobile Bay for protection from a hurricane. Prior to Hurricane Katrina's landfall, however, the majority of commercial and charter fishermen left their vessels in Bayou La Batre believing they were out of the storm's projected trajectory. Most fishermen did not anticipate the level of storm surge that would strike their coastline and so elected to stay in their home ports. Some felt that moving to Mobile Bay would simply be responding to a "cry wolf" scenario. Consequently, many boats, particularly those not strongly secured, were beached, damaged, or destroyed (Figure 99).

Figure 99: Grounded Shrimping Vessel: Bayou La Batre, Post-Katrina.
Source: IAI Staff, September 2005.

Although coastal Alabama has not suffered the direct brunt of major hurricanes in the past, Bayou La Batre has experienced repeated storm surge and repeated flooding. In response, several fishing families have recently moved northward. One area net shop owner summarizes local responses to hurricanes as, "Run from Dennis, run from Ivan, run from Katrina. People sold out because they're tired of storms" (Personal Communication, IAI, Bayou La Batre, October 07, 2005). These relocations have caused the local demographics to shift. Previously populated by multi-generational Caucasians, this coastal area is primarily inhabited by first or second-generational Vietnamese fishermen. Those who could afford to move inland or up the coast have already done so.

II. EFFECTS OF HURRICANE KATRINA ON ALABAMA'S MARINE-BASED INFRASTRUCTURE

Alabama's seafood industry is centered in Bayou La Batre. Landings in this port generated a combined annual economic effect of $350 million prior to Katrina. Until this storm, Bayou La Batre was the nation's number one processor of oysters and crabmeat and a leader in shrimp production. The shipbuilding industry is also very active in this area, generating $100 million in revenue per year.

In 2004, Bayou La Batre fishery participants caught 19 million pounds of fish with a market value of $28 million dollars (Table 93). In that same year, it ranked 17th of all commercial ports in the nation in terms of dollars (NMFS 2004).

Table 93. Total Commercial Fishery Landings at an Individual U. S. Port: Bayou La Batre, Alabama, 2000-2004

Year	Pounds in Millions	Value in Millions
2000	23.0	$48.9
2001	18.0	$38.9
2002	17.1	$27.4
2003	18.5	$30.8
2004	19.1	$28.4

Source: NMFS 2005b.

According to a local official, nearly 80 percent of the Bayou La Batre labor force worked in some aspect of the commercial seafood industry prior to Katrina in occupations such as seafood processing, net making and boat building (Kim et al., 2005). Another local official estimates that 75 percent of shrimpers lost their primary source of income in the months following Katrina due to the significant amount of structural damage to local harbors and vessels (Personal Communication, IAI, Bayou La Batre, December 20, 2005).

Alabama's second major commercial seaport is located in Bon Secour. Bon Secour is a small, close-knit fishing community where the fishing industry employs a large number of residents. Its seafood facilities include two central shrimp and seafood processing facilities and three wholesale businesses; five in total. Family businesses and long-standing community relationships characterize the town's fishing industry (IAI, Field Observations, October 2005).

In 2004, Bon Secour fishery participants caught 6 million pounds of fish with a market value of $7 million dollars (Table 94). In that year, Bon Secour ranked 67th of all commercial ports in the nation in terms of revenue (NMFS 2004).

Table 94. Total Commercial Fishery Landings at an Individual U. S. Port: Bon Secour-Gulf Shores, Alabama, 2000-2004

Year	Pounds in Millions	Value in Millions
2000	5.5	$12.5
2001	6.0	$8.9
2002	3.8	$7.0
2003	4.1	$7.9
2004	6.0	$7.0

Source: NMFS 2005b.

Seafood Processing. Seafood processing historically has been the state's most economically important industry component. The NMFS report *Fisheries of the United States, 2004* identified 69 seafood processing plants in Alabama, employing 1,222 persons, and 26 wholesale establishments, employing 427 persons in 2003 (NMFS 2005c). Of these, 13 (large facilities) or 19 percent were located in the Alabama study communities: one in Mobile and five in Bon Secour (Baldwin County), and seven in Bayou La Batre (Mobile County). Only two of the processors in Bayou La Batre are industrial seafood processing plants. Bayou La Batre is the central commercial fishing harbor for Alabama and largest oyster and crabmeat processor in the nation. Figure 100 shows the pre-Katrina location of seafood processors and dealers, and fish hatcheries along the southwest coast of Alabama.

Seafood Processor
Seafood Seller
Hatchery

Estimated Storm Surge
Estimated Post Storm Flooding

Seafood Processing & Sales and Fish Hatcheries of the Southwest Alabama Coast

Note: This graphic has a resolution of 300 dpi, allowing the viewer to zoom in .

0 6 12 18 24
Miles

The two largest seafood processing plants in Bayou La Batre were initially put out of commission by the storm, but reopened for business mid-October. Both processors, however, were overwhelmed by the high volume of vessels coming to them from all over the northern Gulf Coast trying to unload their product. Complicating matters, storage for the excess shrimp was non-existent. One processor contends that the lack of cold storage has been one of the most important and overlooked issues facing the industry. The primary seafood storage facility in Mobile is operational, but has been at its full capacity of 12 million pounds since even before Katrina hit; the second largest storage facility in Mobile filled up its 1.3 million-pound freezer in mid-November (Personal Communication, IAI, December 1, 2005). Industry participants describe the region as "log-jammed;" every operational cold storage shed is full. Processors explain that they have only been able to buy about half of the catch vessels are trying to offload (Henderson 2005b). These conditions continued to characterize the industry in this region as of May 2006.

Labor shortages have also contributed to poor post-Katrina production rates. Although labor shortages within the industry predate Katrina, they have escalated in its wake. Processors identify this as one of the leading factors contributing to underproduction in their plants. Figure 101 below highlights the post-Katrina labor loss within four of the smaller seafood processing facilities.

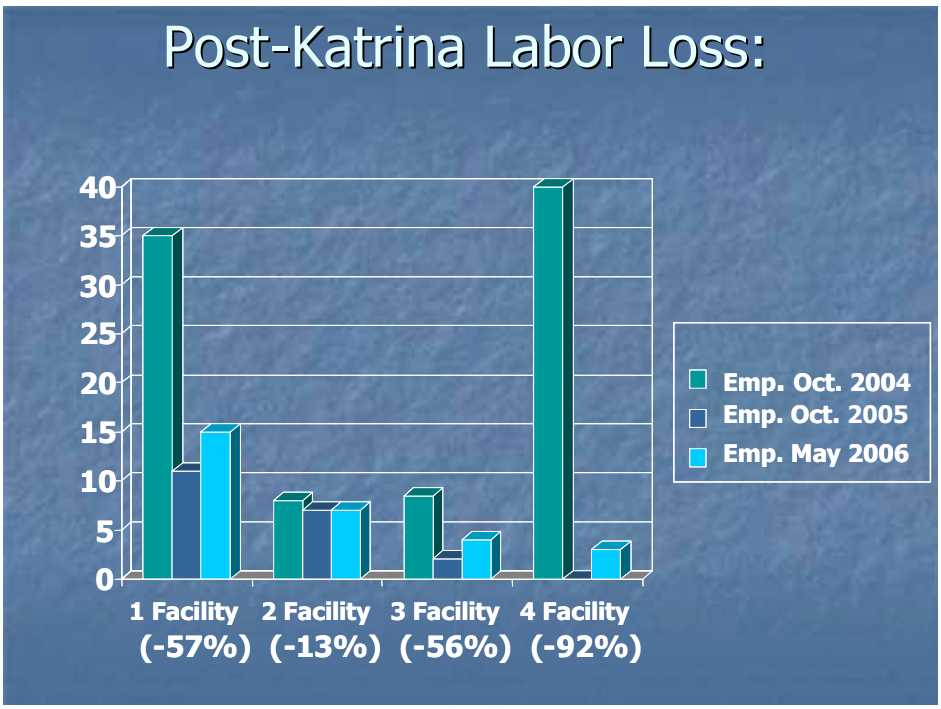


Figure 101. Employment Figures at Four Small Seafood Processing Facilities in Bayou La Batre at Three Points in Time.
Source: IAI, Field Observations, 2005 & 2006.

Shrimp. There were few shrimpers out in the waters in the first few months after the storm; those with intact trawlers, however, were catching tremendous amounts of shrimp. One commercial shrimper explained that, comparatively, at the same time last year there were more than one dozen trawlers out shrimping. In December 2005 there were only three. With less competition, these shrimpers were catching upwards of 3,000 pounds a day, whereas they were only catching 1,000 pounds per day last year at this time (Figures 102 and 103).

Figure 102. A Shrimp Vessel under Repair in Bayou La Batre.
Source: IAI Staff, May 2006.

Figure 103. Fisherman Offloading Post-storm Harvest in Bayou La Batre. Source: IAI Staff, 2005.

These shrimpers, however, are not getting rich; one local shrimper describes shrimp sales as "terrible, now" (Personal Communication, IAI, Bayou La Batre, December 19, 2005). Post-Katrina shrimp sales have been down because, as mentioned previously, the few operational industrial processors are understaffed and cannot handle high volumes of product.

Fuel costs are also keeping shrimpers out of the waters in all affected Gulf Coast states. However, commercial shrimpers in Alabama reportedly received funds from the Saudi Arabian Oil Company to help them with this struggle. These benefactors donated the equivalent of 600,000 gallons of diesel valued at approximately $1.2 million; it is also roughly equivalent to the amount of diesel used by state shrimp trawlers in an average month.

Administered through the Organized Seafood Association of Alabama and/or the Southern Shrimp Alliance beginning in early February 2006, these funds were distributed to shrimpers as fuel vouchers (Associated Press 2005b). These vouchers made it possible for one offloading facility to send ten small boats from Bayou La Batre (ranging in size from 40-60 feet) to Louisiana in May at the start of shrimp season. Another offloading facility owner used the vouchers to send 27 of his freezer vessels to Louisiana. However, most large freezer vessel owners elected not to shrimp until June, believing that they would be assured of high quality, large shrimp at that time. Larger shrimp means more profit – or at least more money with which to cover the cost of their operations. In May, the size of the catch was typically 31-35 per pound, which had an ex-vessel, heads-on, price of $1.15. One informant reports, "Fishermen aren't

enthused to go out at all; but, we need to keep working" (Personal Communication, IAI, Bayou La Batre, May 18, 2006).

While the commercial fishing industry in coastal Alabama appears to be on the road to recovery, rising overhead costs and fuel prices threaten to undermine its overall and long-term stability. Although the price of fuel began dropping in November after spiking in September, fuel costs, in combination with historically low shrimp prices, have kept Bayou La Batre's large vessel fleet moored through at least May 2006. In May, commercial diesel fuel sold for approximately $2.32 a gallon. Consequently, only the few shrimpers who could afford the upfront fuel costs for the longer trips into Louisiana state waters participated in this state's spring shrimp season.

Oysters. In contrast, the collapse of the oyster fisheries in Louisiana and Mississippi has resulted in an economic boon for Alabama harvesters. Although Alabama's oyster beds are still recovering from Hurricane Ivan (2004), that wiped out 80 percent of its harvest, these beds came through Hurricane Katrina with relatively little damage. Biologists estimate that perhaps only 20 percent of state oyster beds were damaged, with an 80 percent survival rate in the Cedar Point reefs surrounding the Dauphin Island Bridge (Raines 2005).

Alabama's state leases reopened on September 22 after biologists completed testing the state's reefs for pathogens and pollutants. When demand for oysters approached their seasonal holiday peak, prices for Alabama's oysters tripled over what they were at this same time in 2004. In July of 2004, Alabama's oysters sold for about $10 per sack of 200. After Katrina, in September 2005, they sold for almost $30 per sack (Raines 2005). In June 2006, oystermen were selling their product in-shell to processors for roughly $3.50 per pound; processors were selling their shucked product to retail seafood dealers for $9.99 per pound (Personal Communication, IAI, Bayou La Batre, June 27, 2006).

Local fishery participants described post-Katrina oyster production in Bayou La Batre as strong, despite the fact that many processing and unloading docks were destroyed (Figure 104). A major oyster processor in coastal Alabama, who buys in the shell and then sells to a wholesaler on the East Coast, states that he was buying 122 bushels of oysters a day in December 2005, an uncommon situation: "Before Katrina, Alabama oysters made up 10 percent of what I processed; now it makes 90 percent. Presently, we dredge around Portersville on public reefs, but before the storm we worked only in private leased beds" (Personal Communication, IAI, Alabama, December 20, 2005).

Figure 104. Oyster Shell Mounds Lining Bayou La Batre Harbor.
Source: IAI Staff, October 2005.

In some cases, harvest rates were uninterrupted or improved because state officials began allowing commercial harvesters to use mechanical dredgers in state waters as of October 3, 2005. Nevertheless, only a small percentage of the approximately 600 oystermen in the region could afford the $2,000 it costs to rig up a mechanical dredging operation (Personal Communication, IAI, Bayou La Batre, December 20, 2005). To make ends meet, many Alabama oystermen engaged in public reef restoration and bottom cultivation. NOAA and FEMA funded these exploratory research projects to ascertain the whereabouts and assess the health of remaining state oyster beds and help unemployed fishery participants earn a living. Overall, oystermen and women in this area remain optimistic about the future of this fishery:

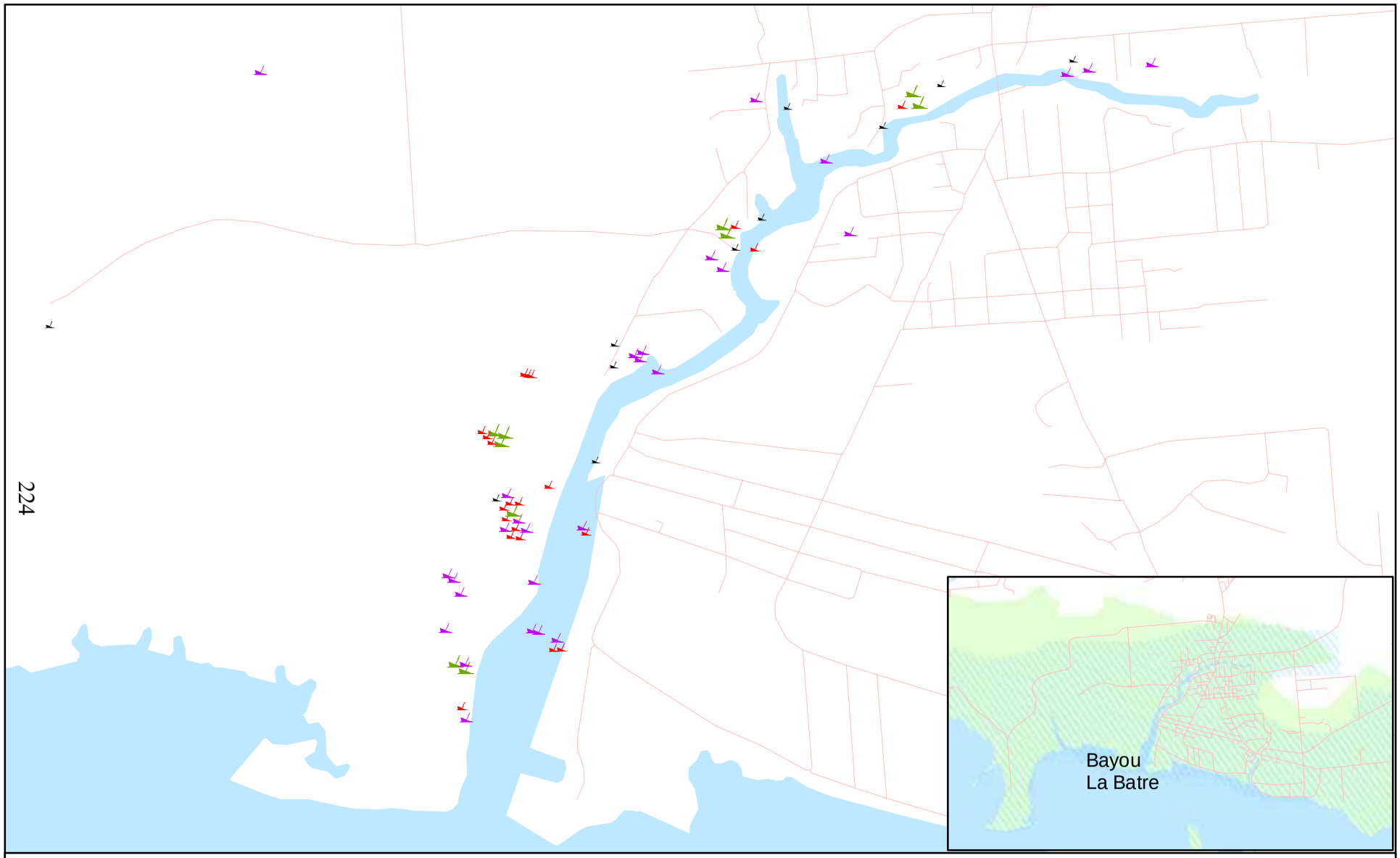
> There is a predicted elevated tropical activity in the next few years. We are trying to plant areas that are protected, especially in Herring Bay and Porterville, places that have natural barriers. They historically survive erosion. Put shells in the right place and it should be okay (Personal Communication, IAI, Bayou La Batre, December 20, 2005).

In the meantime, the oyster fishery continues to depend on harvests from oyster beds in state and neighboring waters, particularly Mobile Bay and the Mississippi Sound. While catch rates increased in the months after Katrina, production rates declined, primarily because of persistent labor shortages. One oyster processor explains that production rates in 2006 trail about 25 percent behind pre-storm efforts. To compensate for this shortage, he has suspended his oyster shucking and shrimp packaging services. Instead, he offers only icing and oyster packing and

shipping, all of which are less labor intensive activities. Still, his adaptations speak to the resiliency of the commercial fishing participants in this community; despite challenges, nearly 70 percent of Bayou La Batre's "mom-and pop" oyster processing operations have resumed post-Katrina operations to some degree as of May 2006 (Personal Communication, IAI, Oyster Processor, Bayou La Batre, May 2006).

However, it must be noted that many small-scale processors, including oyster shuckers and crab pickers, suffered serious economic setbacks as a result of the storm. In 2004, there were approximately 50 small-scale oyster, shrimp, and crab processing plants in Bayou La Batre. After the storms, only half of these remained operational. In part, the current demise of these smaller operations is a consequence of "shallow roots," whereas the major processing plants in Bayou La Batre are all family-owned, operated, and transferred across generations. These characteristics translated into a more immediate social and economic advantage after the storm than was available to many of the smaller, less established businesses.

Commercial Vessels. City officials initially estimated that Katrina destroyed 60 percent of the commercial shrimp boats in Bayou La Batre (Pemberton 2005). According to the U.S. Coast Guard's (USCG) Gulf Strike team, between 72 and 80 commercial fishing vessels in Bayou La Batre were damaged, beached, or submerged by the storm (Figure 105). The USCG first removed ten of these vessels from the waters because of fuel leaks (Mitchell 2005b). Understandably, local fishermen are concerned about the short and long term effects of such contaminants on their catch.



> 100 foot Vessel
> 50 - 100 foot Vessel
> 30 - 50 foot Vessel
< 30 foot or unknown Vessel

Bayou La Batre, Alabama

Ocean Going Vessels Sunk or Swept Inland by the Hurricane Katrina Storm Surge

Note: This graphic has a resolution of 300 dpi, allowing the viewer to zoom in .

Estimated Storm Surge
Estimated Post Storm Flooding

0 0.25 0.5 0.75 1
Miles

Charter Boat Effects. Charter boat operators also incurred sizeable losses as a result of Hurricane Katrina. Nearly 84 percent received trip cancellations in the weeks and months following the storm (Chang et al. 2006). As in other storms, however, many owners/operators of for-hire vessels in Alabama heeded the broadcast weather warnings and took extra precaution to dock and secure their vessels. Through interviews, Chang et al. discovered that most of the charter fleet remained intact (2006: 26). However, several marinas throughout Baldwin County experienced minor damage which required temporary closure, thus underscoring a primary concern of many for-hire operators in Alabama: diminishing dock space. Following Hurricane Ivan in September 2004, many dock/marina owners sold their property to condominium developers. Hurricane Katrina may accelerate this trend of limiting public access as marina owners weigh the costs and benefits of continuing their businesses (Chang et al. 2006).

Other Infrastructure Damage. Table 95 provides a snapshot of Bayou La Batre's marine-related infrastructure and services both pre-Katrina and at several points in time after the storm. The most recent update for this community was conducted in May 2006 (IAI, Field Observations, 2005 & 2006).

Only one processor in Bayou La Batre –one of the largest–had not reopened as of May 2006. This processor, which employed some 110 workers, reportedly was "on its way out anyway," due to increasing competition (Personal Communication with Processor, IAI, Bayou La Batre, October 2005).

However, two-thirds of the commercial docking facilities damaged by the storm in Bayou La Batre had not resumed operations as of May 2006. In part, recovery for this infrastructure is stymied by a lack of funding coupled with the reported tripling of construction prices in the area.

Table 95. Presence of Fishing Infrastructure, Services and Boats in Bayou La Batre, Alabama, Pre- and Post-Hurricane Katrina: 2004, 2005, 2006

Infrastructure or Service	Oct. 2004	Oct. 2005	March 2006	May 2006	Comments
Commercial docking facilities	12	4	4	4	Includes State and Private Docks
Fishing associations	4	4	4	4	--
Major processors (shrimp)	7	2	6	6	--
Other seafood processors (oyster and crab)	50	25	30	30	Operating at 50% due to lack of product and/or employees
Hotels/Inns (dockside)	1	1	1	1	--
Marine railways/haul out facilities	3	3	3	3	--
Offloading facilities	15	1	12	12	--
Net makers	3	1	3	3	--
Public boat ramps	3	3	3	3	--
Bait & tackle/fishing supplies	1	0	1	1	--
Recreational fishing tournaments	2	0	0	2*	*Planned for summer
Seafood restaurants	1	1	1	1	--
Seafood retail markets	5	1	5	5	--
Trucking operations	4	4	4	4	--
Charter/party boats	n/a	n/a	n/a	n/a	--
Commercial fishing boats	~250	~100	~200	n/a	--

n/a = Not available.
Source: IAI, Field Operations, 2005 & 2006.

In Bon Secour, recovery for the commercial processing industry and some fishery participants in coastal Alabama is well underway. The vast majority of marine-related facilities sustained only slight damage from an eight to ten foot storm surge during Hurricane Katrina. Therefore, most were able to resume operations within weeks of the storm. Only one recreational marina and the town's solitary seafood restaurant remained closed longer; the latter primarily because of the difficulty its owner had in finding a reliable supply of fresh seafood.

Table 96 provides infrastructure and service data for Bon Secour, pre- and post-Katrina. Table 97 provides infrastructure and service data for Mobile. For this city, counts were taken in October 2004 and 2005, and in June 2006.

Table 96. Presence of Fishing Infrastructure, Services, and Boats in Bon Secour, Alabama, Pre- and Post-Hurricane Katrina: 2004, 2005, 2006

Infrastructure or Service	Oct. 2004	Oct. 2005	March 2006	May 2006	Comments
Commercial docking facilities	4	4	4	4	--
Fishing gear, electronics, welding, other repair	2	0	2	2	--
Fish processors	2	2	2	2	--
Marine railways/haul out facilities	1	1	1	1	--
Offloading facilities	4	4*	4*	4*	*Not operating at full capacity
Net makers	2	2	2	2	--
Recreational docks/marinas	1	0	0	0	--
Bait & tackle/fishing supplies	1	1	1	1	--
Seafood restaurants	1	0	1	1	--
Seafood retail markets	3	3	3	3	--
Trucking operations	4	4	4	4	--
Site-seeing/pleasure tours	2	0	2	2	--
Charter/party boats	n/a	n/a	n/a	n/a	--
Commercial fishing boats	n/a	n/a	n/a	n/a	--

n/a = not available.
Source: IAI, Field Operations, 2005 & 2006.

Table 97. Presence of Fishing Infrastructure, Services, and Boats in Mobile, Alabama, Pre- and Post-Hurricane Katrina: 2004, 2005, 2006

Infrastructure or Service	Oct. 2004	Oct. 2005	June 2006	Comments
Boat yards/boat builders	2	2	2	--
Recreational docking facilities	5	5	5	--
Fishing gear, electronics, welding, & other repair	16	16	16	--
Fish processors	1	1	1	--
NMFS or state fisheries office (port agent, etc.)	1	1	1	--
Public boat ramps	1	1	1	--
Bait & tackle/fishing supplies	4	4	4	--
Seafood retail markets	20	12	19	--
Seafood wholesale dealers	3	3	3	--
Charter/party boats	10+	n/a	n/a	--
Commercial boats	n/a	n/a	n/a	--

n/a= not available.
Source: IAI, Field Operations, 2005 & 2006.

III. ESTIMATED ECONOMIC EFFECTS OF HURRICANE KATRINA ON ALABAMA FISHERIES AND RELATED INDUSTRIES

According to the Organized Seafood Association of Alabama (OSAA), the 13 seafood processing facilities in Mobile and Bon Secour had combined annual sales of $123 million in 2004. Thus, based on loss of product and revenue, total estimated losses are $22.9 million (income loss = $8.8 million; inventory loss = 2.8 million; repair cost = $7.8 million; employee's lost salary = $3.5 million) (OSAA 2005).

The Bayou La Batre production center estimates its total industry losses at $7.2 million (loss of production = $4.1 thousand; deductible and uninsured losses = $1.5 million; loss of crew shares = $1.6 million). Together, these facilities represent 85 percent of Alabama's producing facilities and vessels (OSAA 2005).

Alternatively, Table 98 below enumerates Chang et al's. (2006) estimated direct and indirect losses to the Alabama seafood industry. For several reasons, these authors offer a significantly higher estimate of industry losses than do others. First, Chang et al.'s analysis focuses more broadly on "losses" rather than "costs". Conventionally, "costs" is a subset of losses that are reimbursed by insurance companies and governments (Chang et al. 2006: 6). Second, there are two areas where Chang et al. may have biased samples. Chang et al. derive their estimates from data collected in the most damaged regions of Alabama—Baldwin and Mobile Counties. Their respondents may not be representative of the state's total affected population. Additionally, the

data were collected by the Alabama Marine Resources Division using telephone interviews and questionnaires completed by commercial and recreational fishermen, charter boat operators, and seafood processors. Yet, both the decision to reply and the capacity to respond introduce an element of self-selection into the sample collection. Thus, these respondents may not have been typical of the total population. Chang et al. derived their loss estimates from averages obtained from this sample and then multiplied their results by the total number of potential fishery participants in each sector in the area. For example, the loss estimates derived for the 210 shrimp fishermen in Baldwin and Mobile Counties were extrapolated from the responses of the 52 shrimp fishermen who participated in this research. An average was obtained from the 52 responses and then multiplied by 210. Third, the figures provided by Chang et al. exclude the multiplier effect from their analysis. These researchers contend that, because Bayou La Batre is a small town of 2,313, any multiplier effect is likely to be negligible (2006: iii).

Table 98. Total Losses from Katrina to the Alabama Seafood Industry: September 2005-December 2005

Loss Items	Sub-category
Net value of damages on boats & facilities:	
Dealers & Processors	$19,742,000
Shrimp fishermen	$ 7,890,000
Other fishermen	$ 5,613,000
Charter boats	$ 4,097,000
Subtotal	*$37,342,000*
Less Insurance Coverage	<$12,732,000>
Subtotal	**$24,610,000**
Vessel removal:	$3,840,000
Lost inventories:	
Dealers & Processors	$ 3,409,000
Shrimp fishermen	$ 9,838,000
Other fishermen	$ 3,968,000
Charter boats	$ 3,304,000
Subtotal	**$20,519,000**
Wages & invoices unpaid:	
Dealers & Processors	$3,934,000
Shrimp fishermen	$ 399,000
Other fishermen	$ 819,000
Charter boats	$ 695,000
Subtotal	**$5,847,000**
Lost revenues & future lost sales:	
Dealers & Processors	$29,393,000
Fishermen	$18,885,000
Charter boat operators	$ 9,156,000
Subtotal	**$57,434,000**
Total Actual Losses	**$112,250,000**

Source: Chang et al. 2006.

Seafood processing plant loss estimates are based on the assumption of 100 percent loss of revenues, inventories, and wages in September 2005, 75 percent loss in October 2005, 50 percent loss in November 2005, and 25 percent loss in December and 2006 (Chang et al. 2006: 16). Economic losses to fishermen are based on the same assumptions. Chang et al. caution, however, that the availability of assistance will have a direct impact on the loss estimate. If the speed of assistance is delayed, the loss estimate is likely to be higher due primarily to the continued increase of lost sales resulting in the loss of some dealers and/or processors (2006: iii).

More recently, preliminary data from the National Marine Fisheries Service (NMFS) on commercial landings in Alabama indicate that, in the last four months of 2005, landings revenue received (all species combined) was just over $16 million dollars. This figure represents a 20 percent decline in revenue from the same period in 2004, and an 8 percent decline from the five year average for the same period. An increased demand for and price surge of Alabama oysters following the closure of state oyster beds in Mississippi and Louisiana after Hurricane Katrina likely accounts for this slight increase in overall *value* despite the decrease in overall dockside *landings*. However, it is also worth noting that the figure for total landings (all species combined) in Alabama in 2005 (22 million lbs.) was still below that for 2004 (27 million lbs.), despite the fact that many fishermen from Louisiana and Mississippi had offloaded their catch in Alabama during the months following the hurricane (Table 99).

Table 99. Alabama Post-Katrina Value of Dockside Landings: 2000-2005

Fishery	Year	September-October	November-December	4-Month Interval
Shrimp	2000-2004 Average	$7,681,433	$5,203,468	$12,884,901
	2004	$7,360,418	$4,011,898	$11,372,316
	2005	$4,946,175	$8,426,867	$13,373,042
Percentage Change in Shrimp Landings Revenue				
	5-Year Avg. to 2005	-36%	62%	4%
	2004 to 2005	-33%	110%	18%
Oyster	2000-2004 Average	$297,796	$283,338	$581,135
	2004	$378,417	$196,561	$574,978
	2005	$266,850	$926,853	$1,193,703
Percentage Change in Oyster Landings Revenue				
	5-Year Avg. to 2005	-10%	227%	105%
	2004 to 2005	-29%	372%	108%
All Other	2000-2004 Average	$803,523	$857,307	$1,660,829
	2004	$731,299	$891,813	$1,623,112
	2005	$872,709	$853,369	$1,726,078
Percentage Change in All Other Species Landings Revenue				
	5-Year Avg. to 2005	9%	0%	4%
	2004 to 2005	19%	-4%	6%
Total	2000-2004 Average	$8,782,752	$6,344,113	$15,126,865
	2004	$8,470,134	$5,100,272	$13,570,406
	2005	$6,085,734	$10,207,089	$16,292,823
Percentage Change in All Species Landings Revenue				
	5-Year Avg. to 2005	-31%	61%	8%
	2004 to 2005	-28%	100%	20%

Source: NMFS SEFSC Accumulated Landings Database; 2005 data is preliminary.

The significant distributional impacts which occurred are discussed next.

Charter Boat Industry. In late 2005, the National Association of Charter Operators (NACO) conducted a survey among Gulf Coast charter boat operators to determine the extent of economic losses as a result of Hurricanes Katrina and Rita. In Alabama, NACO conducted surveys with 133 of the state's 180 identified licensed charter boat vessels. Of those sampled, 46 are guide boats, 53 are "six-pack" charter boats, 29 are multi-passenger charter boats, and 5 are head boats. Ninety-two operators reported fishing in federal waters, 79 in State waters, (up to three miles offshore) and 54 in inshore waters.

Hurricane Katrina damaged 22 and completely destroyed two charter boats in Alabama. Of these lost and damaged vessels, total damages/losses amounted to $436,390; insured losses totaled 64 percent. According to NACO, these vessel operators lost 5,253 trips valued at $5.3 million (Walker et al. 2006). Nevertheless, charter boat operators in Alabama remain optimistic about their future participation in this industry. Some 120 operators or 90 percent anticipate remaining in business; the remainder does not plan to continue in business, are not sure if they will continue, or did not respond to this question (Walker et al. 2006).

Table 100 shows the overall projected economic loss to the State of Alabama from the losses incurred by its charter boat fleet (Walker et al. 2006: 138). NACO included in this analysis lost trips immediately following the storms, physical loss to vessels, support personnel lost trip gross income and the projected gross lost income that was reported for the year following the storms to owners only (Walker et al. 2006: 138).

Table 100. Total Projected Losses to 133 Alabama Charter Boats from Hurricanes Katrina and Rita*

Lost Trips (up to submittal of survey)	$ 5,321,600
Physical Damage	$436,390
Support Personnel Loss	$1,165,225
Annual Income Loss for 1 year (after survey was submitted)	$12,976,998
Total	$19,900,213

* Data only available for both storms combined.
Source: Walker et al. (2006).

IV. RESPONSE AND ADAPTATION TO HURRICANE KATRINA

In several respects, Hurricane Ivan left the State of Alabama better prepared to handle Katrina's post-storm impacts. First, the state was able to quickly establish relief, clean-up, and rebuilding contracts. For example, debris removal contracts were more easily secured in Alabama than in other areas because of pre-established relations with local primary contractors responsible for cleaning up after Ivan. The Alabama Department of Conservation and Natural Resources (ADCNR), which had previously secured emergency funding from FEMA, was thus able to begin clean-up efforts immediately following the storm (Figure 106). Most beneficially, these contracts provided unemployed fishermen with an opportunity for immediate short-term employment removing debris.

Figure 106. Bayou La Batre, Post-Katrina Clean-up Efforts.
Source: IAI Staff, September 2005.

In several other respects, however, Hurricane Ivan undercut individual and local abilities to respond to Katrina's aftermath. Many state and county funding sources used to finance rebuilding efforts were depleted after Ivan. And, many fishery participants had already taken loans to repair vessels and homes damaged by Ivan and exhausted their personal savings. A key informant summarizes the situation:

> Problem here is there is no cash flow. Normally in fishing communities everybody helps everybody, but since Ivan, everyone has spent savings and used up loans. Everything is now cash basis. No reserves for banks, no finances (Personal Communication, IAI, Bayou La Batre, May 07, 2006).

Fishery participants in Baldwin and Mobile Counties have been drawing upon a variety of coping strategies to address the impacts of Hurricane Katrina, exacerbated by a post-Ivan backdrop. These strategies include: (1) using small fishing vessels to meet government funded clean-up efforts; (2) minimizing harvest efforts where revenue potential is diminished; (3) concentrating purchase efforts outside the state; (4) increasing reliance on government aid programs; and (5) increasing reliance on community support.

1. Use of small fishing vessels to meet government-funded clean-up efforts. The Army Corp of Engineers (undertaking critical navigation channel dredging of Dauphin Island Bay, Mobile Harbor, and various waterways), the Environmental Protection Agency, and FEMA were

working together to fund and operationalize various clean-up efforts along coastal Alabama. More than 2.8 million cubic yards out of an estimated 3.2 million cubic yards of storm-related debris have been collected statewide (FEMA 2005). Debris removal efforts have focused on Mobile and Baldwin Counties, particularly in the Bayou La Batre and Dauphin Island areas. An ADCNR official estimates that expenditures for the marine debris removal project will approach $20 million.

FEMA funds released to Alabama state officials in late September were used to hire four contractors– three out of Mobile and one from North Carolina–for overseeing debris removal. These four contractors subcontracted with about 200 local vessels to do the work. Small vessels, like shrimp boats that require less fuel, were ideal candidates for the job. One local contractor subcontracted with about 70 boats (36 of which were shrimp boats), employing some 108 shrimp fishermen (deckhands and captains) over the clean-up period. Two charter boats were hired to monitor the efforts. Pay ranged from $90 to $200 for an acre of clean-up area.

Although this contract was cancelled one month later in late October, the work provided many small-vessel fishermen with a much-needed opportunity to earn income far in excess of what they would have earned shrimping. High fuel prices following the storms–which spiked to nearly $3.00 a gallon– made breaking even a difficult task. Thus, fishery participants with small operations (and small vessels) who were willing and able to participate in government-funded clean-up programs were better positioned to withstand industry disruptions in the aftermath of Katrina.

2. ***Minimizing harvesting efforts where the potential for revenue is diminished.*** Fishermen, particularly those with large, freezer vessels, curtailed offshore outings as another way to adapt to the post-Katrina climate of high fuel prices and low revenues. Offshore trips noticeably dropped during September, when diesel fuel prices exceeded the "break-even point". On average, before the price of fuel increased in post-Katrina era, a single trip might consume between $22,000 and $30,000 in fuel, roughly half of total revenue. After Katrina, fuel costs for an average single trip approached $45,000. Moreover, the majority of fishery participants interviewed for this research emphasized that the price of diesel must drop to less than $1.00 per gallon, if the domestic shrimp industry is to robustly recover; diesel fuel must sell for less than $2.00 per gallon if a commercial shrimper is just to survive.

3. Concentration of purchasing efforts outside the state. High fuel prices and closed fishing grounds put most large vessel operators out of commission in the months following the storm. At the same time, smaller vessel operators discovered that working for contractors funded by FEMA in the water-based debris removal effort was more profitable than fishing. The net effect of these occupational shifts was a lack of product for local seafood wholesalers and retailers.

One way that seafood retailers have been able to adapt to this lack is by purchasing product from outside the area. One mullet and flounder retailer in Bayou La Batre now buys fish from Houston instead of local venues; "can't get no fish" is the local lament (Table 101).

Table 101. Purchasing Changes of Mobile Seafood Dealers, Post-Katrina

Community	Product	Pre-Katrina Purchasing Sources	Post-Katrina Purchasing Sources
Bayou La Batre	Mullet, flounder	Bayou La Batre	Houston
Bayou La Batre	Flounder, shrimp	Bayou La Batre and local fisheries	Bayou La Batre and local fisheries
Bayou La Batre	Shrimp, mullet, trout	Bayou La Batre	East coast
Bayou La Batre	Shrimp, crab, trout, flounder, mullet	Bayou La Batre	East coast

Source: IAI, Field Observations, December, 2005.

At the same time, operational seafood processors and dealers in Mobile and Bon Secour have been profiting as they absorb product previously processed and sold out of Bayou La Batre and Biloxi, Mississippi. Indeed, the complaint in these areas is the opposite of that issued in Bayou La Batre: "too *much* fish". In these cities, processors have been having a difficult time simply keeping up with the increase in demand. Many dealers in Mobile additionally report that demand for seafood increased as evacuees from other parts of the Gulf swelled the local population. As the Alabama shrimp season had not yet opened as of May 2006, all local processors were relying on out-of-state shrimp.

Nine months after Hurricane Katrina, Mobile and Baldwin County seafood processors, ice suppliers, and fuel dispensers continued to experience increased demand for its marine-related services and supplies. In particular, the opening of the Louisiana shrimp season in Shrimp Management Zone 2 on May 4 accelerated precipitously such demands, as marine-based supplies and services remained hard to come by in southeast Louisiana (Figure 107). Indeed, trucks from as far away as Texas were trucking in shrimp to Bayou La Batre for processing and trucking out fuel and ice. One fuel merchant reported that roughly 40 percent to 50 percent of his customers were coming from Louisiana, 25 percent from Mississippi, and the rest from Texas and Alabama (Personal Communication, IAI, Bayou La Batre, May 11, 2006). Ice sales were also skyrocketing. One ice house in Bayou La Batre received an order from commercial fishery participants in Louisiana for 16 pallets of ice on the first day of the shrimp season. On that day, this icehouse sold roughly 57,000 pounds of ice to two storage sheds in Louisiana. In May 2006, this icehouse was producing approximately 80 bars of ice per hour, the equivalent of 170-200 blocks of ice per day (Personal Communication, IAI, Bayou La Batre, May 11, 2006).

Figure 107. Re-fueled and Re-iced Vessel Leaving Bayou La Batre and to Louisiana Waters for the Opening of Shrimp Season.
Source: IAI Staff, May 2006.

Unlike other parts of the Gulf Coast (e.g., southeast Louisiana) that suffered severe shortages of marine-based fuel supplies in the wake of Katrina, coastal Alabama had access to fuel supplies within a month of the storm. Significantly, this access facilitated the relatively rapid recovery of Bayou La Batre's and Bon Secour's commercial fishing industries.

4. Reliance on government aid programs. As discussed above, fishery participants need government aid programs to help them recover from Katrina's destructive forces. Government funded debris removal contracts in Alabama provided for some a quick and ready source of income. The FEMA trailer and Red Cross meal programs in this state have also relieved some of the financial strain for affected persons.

Alabama's seafood retailers also require some federal assistance for recovery. Recently, a special "post-Katrina" federal provision was instituted permitting needy individuals to purchase hot meals with food stamps. Mobile seafood dealers report a significant increase in the number of customers presently using food stamps to buy hot meals. This revision in federal legislation has helped to stimulate the local seafood retail economy.

5. ***Reliance on community support.*** Community cohesion characterizes many fishing communities in Alabama; a quality that becomes readily apparent during times of trouble. For example, in addition to supplying hot meals for displaced individuals on a regular basis, many faith-based agencies in Bayou La Batre also cooperatively provided special Thanksgiving dinners for community members (Findley 2005).

H. Overview of the Impacts of Hurricane Katrina on the Fishing Industries in the States of Louisiana, Mississippi, and Alabama

From the Mississippi Sound through the Louisiana Delta, Hurricane Katrina decimated commercial and recreational fishery infrastructure. Not only was commerce affected, thousands of fishery participants were displaced. Losses to man-made, marine-based infrastructure are estimated at $330 million throughout the Gulf. Incomplete commercial fishing trips added another estimated $490 million in lost dockside commercial revenues (NMFS 2005). While damage was widespread along the Gulf Coast, the fishing industries in Southeast Louisiana, coastal Mississippi and Alabama experienced the greatest amount of storm-related damage.

Hurricane Katrina also disrupted the charter-boat industry in this region—destroying nearly half of the Gulf Coast fleet. An estimated 50 percent of the charter fleet in Mississippi, Alabama, and Louisiana, combined was damaged. Gulf-wide losses of recreational fishing trips resulted in $990 million in foregone economic activity, which includes lost revenues from restaurants, lodging, marinas, and general tourism (NMFS 2005). One of the biggest challenges facing the charter-fishing industry is the lack of support infrastructure. Motels for housing clientele are severely damaged; bait has been extremely difficult to locate; and without New Orleans as a functioning tourist destination, fishing-related tourism in the general region is down significantly.

Gulf Coast ports were also directly affected. Port infrastructure in Gulfport (Harrison County, MS), and Plaquemines (Plaquemines Parish, LA) all sustained massive damage, whereas the ports at Port Fourchon (Lafourche Parish, LA), St. Bernard (St. Bernard Parish, LA), Mobile (Mobile County, AL), and Pascagoula (Jackson County, MS) sustained significant, although less severe, damage. These impacts have contributed to the shifting concentration of commercial shipping and fishing support activities and infrastructure to the west (to central Louisiana), east (to Alabama and Florida) and, to a lesser extent, north of New Orleans to Baton Rouge. The following sections provide a brief state by state overview of some of the key impacts sustained by the commercial and recreational fishing industries as a result of Hurricane Katrina.

LOUISIANA

Synopsis of Key Impacts on Louisiana State Fisheries

- Thousands of commercial vessels lost and damaged throughout coastal Louisiana;
- Commercial landing revenues in 2005 (Sept-Dec) declined 32 percent from the same period in 2004;
- Losses to Louisiana's seafood industry are estimated at $1.3 billion (annual total retail value);
- ~ 40,000 recreational vessels throughout the state were lost;
- Loss of revenue to the recreational fishing industry in the study parishes is estimated at $145 million;
- Estimated losses to the charter boat industry include $13 million in lost trips and $8 million for lost and damaged charter vessels;
- Damages to the farmed alligator industry are estimated at $4 million;
- Lack of ice, diminished processing and cold-storage capacity, infrastructure damage, debris in the water, fuel costs, and scarcity of marine supplies and services have severely constrained recovery efforts;
- Accelerated labor shortages have also significantly constrained production capacity: processors in the affected parishes have lost between 35 and 40 percent of their labor force.

Hurricane Katrina significantly disrupted fishing communities along Louisiana's southeastern coast. Table 102 below provides a before and after snapshot of the marine-related infrastructure and services in the five study parishes, and their operational status as of May 2006. The state's shrimp and oyster fisheries were particularly hard hit. Marinas, icehouses, boat launches, docks, piers, seafood restaurants, vessels, bait and tackle shops, and processors were largely destroyed in these areas—crippling local commercial and recreational fishing industries. Few commercial fishery participants in the area had anything left with which to fish. Although the shrimp fishery is thriving in the post-Katrina environment (in terms of volume), fishery participants with both intact vessels and the ability to reach the fishing grounds had no reliable means for distributing or marketing the product. At the same time, as much as two-thirds of the state's oyster beds were detrimentally affected by the season's hurricanes; damaged beds could take up to two years to return to life, as oysters die or diminish significantly when beds are upturned by storm surge or silted over by storm-driven mud and sand (Louisiana Sea Grant College Program [LSGCP] 2005; Wulfhorst 2005). Seafood landings have necessarily shifted west to Texas and east to Mississippi and Alabama. State officials estimate Katrina-related losses to Louisiana's seafood industry at about 40 percent of the industry's annual total retail value or $1.3 billion (Wulfhorst 2005).

Table 102. Louisiana: Combined Presence and Operational Status of Select Fishing Infrastructure, Services, and Boats in Jefferson, Lafourche, Plaquemines, St. Bernard, and Terrebonne Parishes, Pre- and Post-Hurricane Katrina: 2004 and 2006

Infrastructure or Service	Oct. 2004	May 2006	% Operable
Air fill stations (diving)	7	5	71
Boat yards/boat builders	22	20	91
Commercial docking facilities	74	52	70
Fishing gear, and repair materials	30	24	80
Fish processors, Wholesale fish house	52	39	75
Ice houses	25	12	48
Fishing pier	7	5	71
Offloading facility	72	49	68
Marine railways/haul-out facilities	15	15	100
Hotels/Inns (dockside and/or catering to recreational fishermen)	75	68	91
Net makers	16	6	38
Public boat ramp	55	31	56
Recreational docks & marinas	42	21	50
Bait & tackle/fishing supplies	43	28	65
Recreational fishing tournaments	58	11	19
Seafood restaurants	123	96	78
Seafood retail markets	71	42	59
Charter/party boats	~406	~207	~50
Commercial fishing boats	~4,661	~1,234	~26

Source: IAI, Field Observations 2005 & 2006.

Lack of ice, diminished processing and cold-storage capacity, infrastructure damage, debris in the water, fuel costs, and scarcity of marine supplies and services severely constrained recovery efforts. As of May 2006, approximately 63 percent of the marine-related infrastructure and services in the five study parishes had resumed operations or were considered operational. The figures listed above, however, obscure the *extent* to which these facilities have been able to resume operations consonant with their pre-Katrina production capacities. For example, while 75 percent of the seafood processors reported being operational, the vast majority of them were operating at severely reduced levels due to significant labor shortages. Labor shortages have also undercut the operational capacities of seafood restaurants and retail markets. In addition, seafood restaurants and retail markets were often unable to meet the public's ongoing demand for seafood in the months following Katrina because of the disrupted seafood supply. Many of the ice houses that had resumed operations also were functioning below their pre-Katrina capacities and, in some cases, were still relying on generators for electricity. Fifty percent of recreational docks and marina, and 70 percent of commercial docks had reopened by May 2006, but with significantly less dockage space and amenities.

Recovery of the commercial and recreational fishing industries in Plaquemines Parish, where nearly 100 percent of the marine-related infrastructure (and much of the housing) was destroyed, remains particularly uncertain. There, recovery is undermined by a lack of federal assistance needed to upgrade its levee system. However, the Army Corps of Engineers is not likely to advocate spending between $1.6 billion and $2.9 billion to build miles of higher levees in south Plaquemines where some 4,000 people live. Plaquemines Parish residents who stay will have to raise their homes 14 feet to be eligible for federal flood insurance. And, although the offshore oil and gas production, commercial seafood and sport fishing tourism industries historically have been very active–and economically important– in this coastal parish, without sufficient protective barriers there is less incentive to invest in infrastructure.

MISSISSIPPI

Synopsis of Key Impacts on Mississippi State Fisheries

- All seafood dealerships along the Mississippi Gulf Coast were seriously damaged or destroyed, including six of Biloxi's largest seafood processing plants;
- Damages to seafood processing plants and seafood dealers are estimated at $101 million;
- 90 percent of primary oyster reefs were destroyed;
- Seafood processors and retailers rely on out-of-state product;
- Commercial landings revenues in 2005 (Sept.- Dec.) represent a 79 percent decline in revenue from the same period in 2004;
- Hurricane-related impacts to Mississippi's marine fisheries are estimated at nearly $484 million;
- Damages to the resident commercial fishing fleet are estimated at $35 million. One hundred percent of these economic losses occurred in Hancock, Harrison, and Jackson Counties;
- Across the state, estimates of damage and loss to Mississippi's total commercial fleet of approximately 1,100 vessels range from 40 percent to 87 percent;
- Within the study counties of Hancock, Harrison, and Jackson alone, 87 percent of commercial vessels were damaged. Loss estimates for damages to the boats in these three counties approach $160 million;
- 74 charter boats were damaged/destroyed; damages/losses amount to $2 million;
- Charter vessel operators lost nearly 5,000 trips in 2005 valued at $7.5 million;
- So far, aid from FEMA and the SBA for charter boat operators has not been available;
- The majority of Mississippi Gulf Coast marinas, harbors, roads, and bridges were seriously damaged or destroyed; the remaining infrastructure is insufficient to support tourism. Accommodations are particularly scarce;
- Fuel, ice, and other marine-based supplies are in short supply;
- Significant labor shortages slow recovery efforts; dependency upon immigrant labor sharply increases.

Hurricane Katrina seriously damaged fisheries in Biloxi, Gulfport, and Pascagoula, rendering 70 percent of the state's commercial fleet and most of its seafood dealers and major seafood processing plants inoperable (Mississippi State University, Sea Grant Program 2005). First year losses to Mississippi's commercial and recreational fishing industries are estimated at $170 to $200 million. This estimate does not include an additional $10 million dollars needed to repair damaged marinas, piers, ice houses, wharves, boat ramps, and related marine-based businesses. Estimates of recovery time for each facility vary from a few months, for those with relatively minor damage, to more than one year. Facility owners base their recovery estimates on the assumption that required materials, supplies, equipment, and employees will be available–and affordable. These estimates also assume that the processors will be able to purchase seafood as fishing is resumed. Table 103 below provides a before and after snapshot of the marine-related infrastructure and services in the three study counties, and their operational status as of May 2006.

Table 103. Mississippi: Combined Presence and Operational Status of Select Fishing Infrastructure, Services, and Boats in Hancock, Harrison, and Jackson Counties, Pre- and Post-Hurricane Katrina: 2004 and 2006

Infrastructure or Service	Oct. 2004	May 2006	% Operable
Boat yards/boat builders	11	7	64
Commercial docking facilities	16	5	31
Fishing gear, electronics, welding, other repair	13	6	46
Fish processors, Wholesale fish house	43	14	33
Fishing pier	15	5	33
Offloading facility	8	2	25
Marine railways/haul-out facilities	3	1	33
Hotels/Inns (dockside or catering to recreational fishermen)	24	5	21
Net makers	2	1	50
Public boat ramp	20	14	70
Recreational docks & marinas	17	8	47
Bait & tackle/fishing supplies	20	3	15
Recreational fishing tournaments	9	3	33
Seafood restaurants	39	18	46
Seafood retail markets	35	9	26
Charter/party boats	~74	~34	~46
Commercial fishing boats	~235	~45	~19

Source: IAI, Field Observations 2005 & 2006.

Even more so than in Louisiana, recovery efforts along the Mississippi Gulf Coast are constrained by lack of ice, increased fuel costs, diminished offloading, processing and cold-storage capacity, infrastructure damage, and scarcity of marine supplies and services. As of May 2006, only about 38 percent of the marine-related infrastructure and services in Hancock,

Harrison, and Jackson Counties had resumed operations to varying extents. Nonetheless, operational offloading facilities, seafood processors, and commercial docking facilities are still in short supply. Most open businesses have been operating at maximum capacity; although acute labor shortages prevent most from attaining pre-Katrina production levels. In some communities the shortages are transformational. Notably, in Biloxi, seafood processors will likely be forced to move inland by developers, and, the lack of infrastructure and affordable housing almost ensures that commercial fishing participants—once the corner stone of the Point Cadet area—will not be coming back.

ALABAMA

Synopsis of Key Impacts on Alabama State Fisheries

- Many commercial fishing vessels were beached, damaged, or destroyed; Katrina destroyed 60 percent of the commercial shrimp boats in Bayou La Batre;
- Commercial landings revenues in 2005 (Sept.- Dec.) represent a 20 percent decline in revenue from the same period in 2004;
- While only 20 percent of state oyster beds were damaged, the oyster fishery continues to depend on harvests from oyster beds in neighboring waters, particularly Mobile Bay and the Mississippi Sound;
- The few operational industrial processors are understaffed and cannot handle the high volumes of product coming to them from all over the Gulf Coast;
- Based on loss of product and revenue, estimated losses for seafood processing facilities in Mobile and Bon Secour total $23 million;
- Hurricane Katrina damaged/destroyed 24 charter boats in Alabama. Total damages/losses amount to $436 thousand;
- Although Alabama's charter fleet remained mostly intact, nearly 84 percent of charter boat operators received trip cancellations in the months following the storm; these vessel operators lost over 5 thousand trips valued at $5.3 million;
- Total projected losses to 133 Alabama Charter Boats = $20 million;
- Fuel costs and historically low shrimp prices have been the key factors in keeping Bayou La Batre's remaining commercial vessel fleet moored through at least May 2006;
- Escalating labor shortages contribute to poor post-Katrina production rates.

Because Louisiana and Mississippi bore the brunt of Hurricane Katrina, Alabama's Gulf Coast marine-based infrastructure sustained relatively less damage than did the infrastructure in either Louisiana or Mississippi (Table 104). Nevertheless, many seafood processors, retailers, and vessels in coastal Alabama sustained serious damages and losses. For example, Katrina destroyed 60 percent of the commercial shrimp fleet in Bayou La Batre, one of Alabama's top producing ports. As a result, approximately 75 percent of shrimpers lost their primary source of income in the months following the storm. However, some sectors benefited from diminished competition. Hence, the collapse of the oyster fisheries in Louisiana and Mississippi resulted in an economic boon for Alabama harvesters, with prices for Alabama's oysters tripling after Katrina from what they were in 2004 at this time (Raines 2005).

Table 104. Alabama: Combined Presence and Operational Status of Select Fishing Infrastructure, Services, and Boats in Baldwin and Mobile Counties, Pre- and Post-Hurricane Katrina: 2004 and 2006

Infrastructure or Service	Oct. 2004	May 2006	% Operable
Boat yards/boat builders	2	2	100
Commercial docking facilities	16	8	50
Fishing gear, electronics, welding, other repair	18	18	100
Fish processors, Wholesale fish house	63	42	67
Offloading facility	19	16	84
Marine railways/haul-out facilities	4	4	100
Hotels/Inns (dockside or catering to recreational fishermen)	1	1	100
Net makers	5	5	100
Public boat ramp	4	4	100
Recreational docks & marinas	6	5	83
Bait & tackle/fishing supplies	2	2	100
Recreational fishing tournaments	2	2	100
Seafood restaurants	2	2	100
Seafood retail markets	28	27	96
Charter/party boats	~180	~158	~88
Commercial fishing boats	n/a	n/a	n/a

n/a = not available
Source: IAI, Field Observations 2005 & 2006.

Because of their exposed location, Alabama's docks and marinas, seafood processors and boats took the hardest hit from Katrina. As of May 2006, only 50 percent of commercial docking facilities and 67 percent of seafood/fish processors had resumed operations. In part, recovery for this infrastructure is stymied by a lack of funding coupled with the reported tripling of construction prices in the area. Overall, however, coastal Alabama is well on the road to recovery. Unlike other parts of the Gulf Coast (e.g., southeast Louisiana) that suffered severe shortages of marine-based fuel supplies in the wake of Katrina, coastal Alabama had access to fuel supplies within a month of the storm. Significantly, this access allowed the relatively rapid recovery of Bayou La Batre's and Bon Secour's commercial fishing industries. As of May 2006, approximately 91 percent of the overall marine-related infrastructure and services in Baldwin and Mobile Counties had resumed operations.

I. Interim Conclusions

In the context of historical trends within the Gulf states' commercial and recreational fishing industry, Hurricane Katrina accelerated but did not introduce recent challenges. Rather, this devastating storm brought into sharp relief the struggles commercial shrimpers are having, for example, with rising costs and shrinking revenues, labor shortages, and loss of marine-based infrastructure and services due to coastal development and erosion. The future of the industry depends on how these economic and social concerns play out. While the nuances of these problems are particular to each Gulf state, the accelerated trends discussed in this section are overarching and largely shared by commercial fishery participants across the Gulf.

Declining Shrimp Prices. Arguably, the greatest threat in recent years to commercial fishery participants has been the widening margin between rising costs and decreasing revenues. While numerous factors affect both costs and revenues, escalating fuel costs and declining ex-vessel prices of shrimp are two of this decade's most critical determinants.

Already in decline in recent years, shrimp prices continue to fall in the aftermath of Katrina, and in some areas, are prohibitively low. According to a dealer in southeast Louisiana, the price for shrimp is essentially set by a large processing facility, at $1.50 per pound (Personal Communication, IAI, Lafourche Parish, November 7, 2005). One processing plant owner, who has worked in the industry for at least four decades, describes the last few years as "the worst" he has seen:

> Four years ago, it was all domestic shrimp from independent shrimp vessel owners…This year would have been a better year, until hurricanes came. So many plants have been demolished due to storms. We couldn't fish…What's happened to us is we lost our market share, more and more imports throughout the last 30 years. We saw domestic [shrimp] go from 60 percent of the market in the late 60s and 70s. In 1980 it was 50/50 [domestic to foreign shrimp], then the Chinese got online and flooded the market. The number of processors and vessels are diminishing. If prices of shrimp crept back up you would see it grow again. It's been a painful downsizing the last 10-12 years. Worst years I can remember…2002, 2003, 2004. From late 2001 to 2004, it's been devastating years. Never thought I would see such bad fishing years in all my life…Time to leave the shrimping business, after all those generations. What has happened to the plant is typical of the industry (Personal Communication, IAI, Lafourche Parish, November 7, 2005).

In Biloxi, fishery participants also point out that prices for shrimp no longer vary much according to size. Despite less supply and constant demand, brokers were paying $1.40 for 21/25 *and* 26/35 count head on shrimp– and only five cents more than 41/50 count head on shrimp– in January 2006. Many fishermen expressed dismay and frustration, not only with the low price, but also with the lack of broker discernment regarding product quality or size (Personal Communication, IAI, Biloxi, January 10, 2006).

Fuel Costs. Interviews with fishermen along the Gulf Coast confirm their concern with escalating fuel costs, especially in concert with declining shrimp prices in the post-Katrina environment when the price of marine diesel fuel rose to $3.00 per gallon (USDOE 2005). This increase further crippled many fishing operations in the Gulf. We illustrate the scope of effect for individual operators with the following hypothetical example. Although capacities vary extensively, the fuel tank of a distant water trawl vessel (~80 feet in length) often holds in the range of 20,000 gallons of fuel. Fueling such a vessel in 2000 would have cost in the range of $13,000, but given price increases, it would have cost nearly $24,000 to fill such a tank in 2005 even prior to Katrina. Given the lack of available fuel and loss of fuel docks following the hurricane, filling this hypothetical tank would cost about $75,000 in the months immediately following Katrina. Prices have resolved somewhat, though one fisherman in Biloxi laments that he paid 80 cents per gallon for diesel in 1999 and $2.40 in January of 2006 (Newsom 2006). By June 2006, diesel fuel was selling for between $2.50 and $2.75 per gallon in the study region. One Pass Christian fisherman comparatively noted that diesel fuel cost less than $1.00 per gallon in 2000, while one pound of in-season medium shrimp (heads-on) sold for about $4.00; in 2005, however, diesel fuel sold for about $3.00 a gallon, while the same medium-sized shrimp fetched about $1.50 per pound.

In recent years, fixed trip costs are commonly said to exceed revenues. According to one long-term shrimper, if fuel costs exceed much more than one-third of total expenses, net income is small and the enterprise precarious. Figure 108 below illustrates this scenario. The records show that, between January and August 2005, one vessel grossed a total of $146,934, but netted only $5,756. Fuel costs accounted for roughly 36 percent of total expenses, with 24 percent of the gross going toward crew share. The remaining 20 percent covered insurance and supply costs. When fuel costs increase, as they did in the months following Katrina, returns are further diminished (IAI, Field Observations, January 2006).

"Vessel X"
Profit and Loss
January through August 2005

	Jan-Aug 05	% of Income
Ordinary Income Expense		
Income		
SALES	146,934.32	100.00%
Total Income	146,934.32	100.00%
Expense		
Accounting Fees	775.00	0.5%
Automobile Expense	1,174.87	0.8%
Bank Service Charges	1,194.96	0.8%
Contributions	221.00	0.2%
Crew Share	35,139.33	23.9%
Dues and Subscriptions	34.00	0.0%
FUEL, OIL	52,164,70	35.5%
Groceries	5,424.18	3.7%
Insurance	14,212.24	9.7%
Interest Expense	514.64	0.4%
Licenses and Permits	1,485.00	1.0%
Miscellaneous	1,100.00	0.7%
Net Expense	6,097.51	4.1%
Repairs		
Equipment Repairs	421.05	0.3%
Repairs – Other	5,054.15	3.4%
Total Repairs	5,475.20	3.7%
Supplies	13,520.14	9.2%
Telephone	751.75	0.5%
Travel and Entertainment		
Travel/mileage expense	268.73	0.2%
Travel and Ent. – Other	1,625.19	1.1%
Total Travel and Ent.	1,893.92	1.3%
Total Expense	141,178.44	96.1%
Net Ordinary Income	5,755.88	3.9%
Net Income	**5,755.88**	**3.9%**

Figure 108. Profit and Loss Margins for "Vessel X," a Commercial Shrimping Vessel in Bayou La Batre.
Source: IAI, Field Interview, January 2006.

In addition to fuel, however, fishermen have to figure in other production costs such as labor, crew share, repairs, supplies, and groceries. And, as they did before Katrina, fishermen continue to weigh the costs of production against potential revenue. One shrimper further explains this struggle, "With the current price of fuel, you can't make it. You got to catch two pounds of shrimp to pay for one gallon of fuel every time you go out" (Personal Communication, IAI, Galliano, October 22, 2005). Another shrimper expresses how such rising overhead costs accumulate and contribute to a growing and shared sense of uncertainty about continued participation in this industry:

> There ain't no future in the shrimp industry. Price of shrimp has gone down and with the overhead prices, we can't even dip our nets. Prices of everything has gone up, from webbing prices to fuel. We're hanging on, but we have to skimp on everything. We can't even make all the same (i.e., "normal") repairs. I don't know if we're going to recover (Personal Communication, IAI, Bayou La Batre, May 2006).

The soaring cost of fuel has even affected local net-menders who dip nets in a petroleum-based substance (Figure 109). Consequently, the increase in fuel prices is financially squeezing small net-shop owners as well.

Figure 109. Nets in Need of a Dip: Bayou La Batre.
Source: IAI Staff, October 2005.

Coastal Erosion. Landsat images from September and October reveal that Hurricane Katrina converted approximately 39 square miles of marshland around the upper and central portions of Breton Sound into open water. This area, located southeast of New Orleans adjacent to St. Bernard and Plaquemines Parishes, had already lost 21 square miles or 16 percent of its land area between 1956 and 2004, with an additional 47 square miles of marsh lost during that period throughout the Ponchartrain, Pearl River, Barataria, and Terrebonne Basins. Storm surge from Katrina also submerged 14 square miles of marshlands along the Mississippi Delta. Scientists expect that much of this loss will be permanent (U.S. Geological Survey 2005). This accelerated loss of marshlands means loss of protection from future flood and storm events, and significant changes in ecosystems and habitats associated with shrimp, oysters, crabs, and other commercially valuable species.

The lower Pearl River Basin in Mississippi lost six square miles of wetlands following Katrina (Brown 2005). Coastal erosion has direct consequences for fishing interests in Mississippi in that damage to coastal wetlands disrupts shellfish grounds and nursery grounds for juvenile finfish. Indirect consequences include intensified conservation efforts, which may ultimately disrupt or displace long-standing fishing practices and their practitioners.

(Click link for map of Upper Breton Sound Potential Land Loss after Hurricane Katrina at: http://www.nwrc.usgs.gov/hurricane/breton_poststkatrina_letter.pdf.)

Gentrification. Coastal gentrification has accelerated in all three storm-affected states. Typically, increased recreational fishing and boating activities and infrastructure accompany gentrification. While this can provide new opportunities for displaced commercial fishermen, such opportunities are not infinite. Grand Isle has long been a getaway for residents and tourists alike, with guides and charter operators increasingly catering to this clientele. Charter operations in Venice and Cocodrie have maintained a largely corporate clientele. With charter operations in both Venice and Cocodrie severely damaged by Katrina, many charter boat captains and guides are relocating to Grand Isle, at least temporarily. The ultimate effects of the storm on the trend toward gentrification and changes in the distribution of recreational fishing activities along the Louisiana coast remain uncertain at this point in time.

Coastal Mississippi is experiencing an unprecedented growth as developers replace public fishing marinas and harbors with high rise condominiums and private marinas. Harrison County and Hancock County are two of the fastest growing counties in the nation, and the coastal portion of Biloxi is the site of an unprecedented, city-supported, post-Katrina land boom. According to a high-ranking governmental official, coastal land sold for $1.5 million an acre just prior to August 2005. The value of this same property reportedly has now risen to between $2 million to $5 million per acre. Moreover, prior to the landfall of Katrina, condominium developers had proposed building some 3,000 units in the Biloxi area. Toward the end of 2005, the proposed total number of units had risen to 9,587. Developers and architects explain that the information provided in the detailed Biloxi Land Development Ordinance makes it particularly easy to follow the necessary steps for gaining official approval for their projects (Newsom 2005).

To accommodate this pro-development climate, representatives of the City of Biloxi are considering a proposal to allow an increase in housing density from 30 units per acre to 40 units per acre for development projects located on more than ten acres of land. The proposal would also allow an increase in the density of waterfront units from the existing allowance of 30 units per acre to 110 units per acre (Newsom 2005). At this point, however, demand is speculative and opponents argue that overpriced units could flood the market and potentially stall the hurricane recovery process. Nevertheless, the arrival of speculators has led to questions about the future of what remains of the bungalow-style homes and neighborhoods that comprise one of the region's oldest waterfront communities. Developers have not proposed affordable housing arrangements in areas ruined by the hurricane. Escalating land values, proposed requirements for building at higher elevations, and property ownership issues present obstacles to the creation of low-income or affordable housing (Wilemon 2006). Many former residents with limited resources may not be able to reestablish themselves in the area.

Long-term employment opportunities in the fishing industry also appear to be waning. It is difficult to parse hurricane effects and ongoing trends in this regard, but it is clear that the hurricane is part of the problem. For instance, insurance companies reportedly are not fully remunerating hurricane damages, and seafood processors in Biloxi's Back Bay and Point Cadet are adapting in part by rapidly selling their piers and waterfront properties to developers. But again, the trend was pre-existing and the hurricane is best seen as an accelerating factor in that it has been a disincentive for already struggling processors and a source of opportunity for capital-laden developers. A city official in Biloxi explains the situation from his perspective:

> They [the processors] are getting offers for $2 million an acre, and it is tough to turn the casinos down with that kind of offer. Casinos have gotten so big the last few years. It started with three river boats, went to barges…. Everything has changed. Prices are terribly higher, for property tax and such. It is almost unaffordable for the normal person to survive now. Property taxes have definitely gone up with casinos. We get $20 million in gaming revenue annually, and then sales tax and property tax (Personal Communication, IAI, Biloxi, December 2005).

Many fishery participants in this area believe that Biloxi and Gulfport will become popular areas for people who wish to purchase second homes. The push for new development is particularly strong in areas that have been cleared of old structures by Katrina, such as East Biloxi. According to one Biloxi official, approximately 5,000 people in the city lost their homes, and some 75 percent of homeowners in East Biloxi were displaced. Given that so many fishermen formerly resided in East Biloxi, and given changing values of land and property in the area, the future of this community and its commercial fisheries remain highly uncertain.

The future may be brighter for participants in the region's charter fishing industry, though many operations were detrimentally affected by the storms of 2005. The roughly 100 licensed charter boats in Mississippi reported an estimated $2.1 million in storm damages. Similarly, commercial live bait dealers suffered $3.8 million in estimated damages (Mississippi State University Sea Grant, No date).

The 2005 hurricane season accelerated gentrification in coastal Alabama as well. Land speculators are rapidly buying damaged and destroyed waterfront properties there, with plans to replace public marinas and docking areas with high rise and luxury condominiums. This is occurring in Bayou La Batre and Coden in Mobile County, and in Orange Beach, Gulf Shores, and Bon Secour in Baldwin County.

Ongoing investment and development along the coast of Bayou La Batre have accelerated in the wake of Katrina. For example, one development group is in the process of purchasing (or optioning) bayou and coastal property for future residential development. This property includes city-owned coastal land that had served as commercial docks prior to destruction by Katrina. The group plans to build 6,000 waterfront condominiums with the stated intention of "diversifying" the community. Some commercial fishery participants report dismay at the plans. As stated by one informant:

> Land used to be [for] city docks, unloading shrimp and other seafood. That's all over now. There isn't a future for shrimp. These people can't operate. Most shrimp boats have [already] been seized (Personal Communication, IAI, February 2006).

Should the sale go through, the development will undoubtedly further marginalize the commercial fishing industry in the region (see Figure 110). The net effect will be what Siegel refers to as a "clean slate" in post-Katrina Bayou La Batre:

> Communities can be re-organized, not just rebuilt. But officials will be tempted to exclude the poorest "least productive" segments . . . making the area appear cleaner, providing safer environs for tourists, and reducing continuing demand for social services. This could mean gentrification on a scale unimagined elsewhere (Siegel 2005: 3).

Figure 110. Bayou La Batre Site Plan.
Source: City of Bayou La Batre.

Labor Shortages. Even before the storms, seafood processors were having difficulty securing affordable, reliable labor. Now, with many residents displaced, preoccupied with individual recovery concerns, or taking temporary, but lucrative, jobs in construction, unemployment levels have increased in all three Katrina-ravaged states—despite the high number of employers looking to hire. For example, in the first month following Katrina, unemployment rates in Jackson, Harrison and Hancock Counties in Mississippi ranged from 23 to 24.2 percent. By November 2005, unemployment rates for these three counties had fallen somewhat to 20.6 percent in Hancock County, 20.2 percent in Harrison County and 14.1 in Jackson County (Goodman and Joyner 2006). Still, however, employers complain that they are unable to find the help they need.

In addition to housing shortages and the high number of residents that remain displaced, some employers blame the thinning labor pool on extended state unemployment disaster-relief benefits (which averaged about $210 per week). For Katrina victims, these benefits expired on June 3, 2006; how this will change the prevailing labor conditions remains to be seen. In the meantime, all Gulf Coast fishermen interviewed voiced a concern about the difficulty of finding enough people to crew their boat. In January 2006, fishery participants with operational vessels made due with a crew of two or three instead of the usual four. In many cases, family members or inexperienced workers are filling in for experienced labor. Such improvisation is now typical along much of the Katrina-damaged Gulf Coast (IAI, Field Observations, October-December 2005).

Competition for affordable labor between employment sectors also makes finding workers difficult in the post-Katrina environment. For example, the gaming industry can afford to pay higher wages and overtime to meet its demand for employees. According to one informant, an individual can find work in any one of Biloxi's or Gulfport's casinos for $10.00 an hour, and is guaranteed ten hours of work a day, plus overtime; labor conditions that the processors cannot match.

Other industry participants blame the shrinking workforce on federally-funded debris clean-up contracts. Offering better pay than most processing plant positions, these temporary clean-up positions have lured many laborers away from their regular jobs in both marine-based and non marine-based enterprises. Consequently, many short-staffed processors have been operating at less than full capacity. One processor remarks: "I used to employ 35 people personally; now I only have 11. I have Mexican H2B workers, but they all left for debris clean up and refused to come back after all the money I spent getting them here" (Personal Communication, IAI, Bayou La Batre, March 08, 2006).

In addition to contributing to a labor shortage, government-funded debris removal contacts mean that there is less product on the market for processing. One seafood processor pointedly identifies FEMA as more of a hindrance than a help to the fishing industry – "First we had Katrina, then we had FEMA" (Personal Communication, IAI, Bayou La Batre, October 7, 2005). Consequently, seafood processors—particularly those in coastal Alabama— must buy product from the East Coast and Texas, further undermining the recovery of the local fishing economy.

Until the labor pool increases, many employers are offsetting their labor shortages where possible with H2B Visa laborers. By importing workers, some processors have been able to hire enough affordable labor to keep pace with the significant increase in product. Most, however, remain understaffed; hiring processes have been hampered by the gross lack of affordable or available housing.

Historically, working as a laborer in an off-loading shed, a processing plant, or on a shrimp boat provided more than just income; it was a way to maintain connections to a heritage or family tradition. While members of many fishing families desire to remain in this industry, others are realizing that they can no longer afford to do so. Fewer young adults are choosing this line of work, viewing the industry as much work for little reward. Consequently, finding workers to occupy primarily minimum or low-wage positions –essential to maintaining low operation costs –is increasingly difficult. Processors and off-loaders are thus relying more upon their own extended families and immigrant labor for critically important but "low status" labor.

Insurance. Rising insurance costs over the last several years have also burdened commercial fishery participants, disproportionately increasing their operational costs. Balanced against rising fuel prices and diminishing returns, shrimpers increasingly view insurance as a luxury they cannot afford. As a result, the commercial fishing industry in Louisiana, Mississippi, and Alabama is presently underinsured. Based on findings from fieldwork conducted by IAI in these states between September and November 2005, less than 40 percent of research participants carried some form of insurance for their fishing operation. Although the majority of

off-loading facility operators and processors were insured, coverage reportedly is substantially less now than in times past.

According to fishermen in the Biloxi area, insurance costs range from $20,000 to $30,000 a year, depending on the type of vessel. However, while it may prove cost effective to insure newer and factory constructed steel-hulled boats, a shrimper from Pass Christian insists that it is not cost effective to insure older, large wood-hulled shrimping vessels. For example, his 1976 vessel has a value of approximately $30,000, an amount roughly equal to its annual insurance costs. Thus, if his vessel is destroyed, he could not afford to purchase a new boat. Another shrimper, whose vessel sustained $40,000 in wind damage from Katrina, cannot afford the $10,000 deductible on his $500,000 policy.

Additionally, in the post-Katrina environment, many fishery participants are discovering that *having* insurance is no assurance of *receiving* recovery benefits. While financial institutions mandate insurance coverage on a financed vessel, some insurance companies have not been forthcoming with due compensation. Interviews with fishery participants all along the Gulf Coast reveal that few insurance companies responded to claims and those that did often rejected them. In many instances, insurance companies rejected the claims if vessels damaged by Katrina's winds were further damaged by Rita's waters. Despite the fact that wind caused the flooding, insurance companies have refused to pay if the owner did not also carry flood insurance. Such poor service delivery serves as a disincentive for future insurance investment. Some individuals have begun to take matters into their own hands, applying make-shift solutions to move their operations forward (IAI, Field Observations, October-December 2005).

Additionally serving as a disincentive to buying insurance are instances in which commercial fishery participants are, in effect, penalized for having it. In Louisiana, for example, FEMA contracted with the U.S. Coast Guard Wreck and Salvage Group for the removal of commercial vessels from navigable waters. Once salvaged, insured boat owners are expected to reimburse the agency about—and sometimes in excess of— $50,000 for this service. Once the fees are deducted from the fishermen's policies, many are left with insufficient insurance monies to cover essential repairs. In contrast, uninsured vessel owners are not charged for salvage services underwritten by FEMA (Brown 2005).

Overcapitalization. Declining profits are making it increasingly difficult for fishery participants to meet their financial responsibilities. Even before Katrina cut a devastating path across the Gulf coastline, many fishery participants were struggling to make ends meet. Some of the financing issues they currently confront are linked to larger trends in the American economy and, more specifically, to the history of U.S. loan programs. Fishermen who took advantage of creative financing packages offered, for example, through the Small Business Administration (SBA) and Caterpillar, Inc. in the late 1980s and early 1990s were able to secure relatively large (80-feet or more) freezer vessels. However, many also found themselves quickly strapped by the 15-year pay-back terms that required hefty monthly payments, often in addition to a home mortgage.

In the aftermath of Katrina, fishermen are increasingly concerned with their ability to pay both insurance and monthly bank notes on their vessels and homes. This concern is not unfounded:

thousands of vessels were put out of commission by Hurricane Katrina leaving many shrimpers unable to earn a living. Many shrimpers now face the unfortunate position of investing whatever savings they have into boat repairs or making loan payments on a seriously damaged vessel. Consequently, bank repossession rates of commercial vessels in the wake of Katrina have escalated. In Bayou La Batre, for example, one major lender recently repossessed 25 vessels and tied-up another 67 boats. These boats had an average purchase price of about $800,000 (Figure 111) (Personal Communication, IAI, Bayou La Batre, October 07, 2005). In Biloxi, over 25 percent of the roughly 48 boats previously moored at the public docks were recently repossessed. Worried that his vessel may suffer the same fate, a fisherman confides, "I can't lose the boat, or I will lose everything" (Personal Communication, IAI, Biloxi, January10, 2006).

In the first few months following the storms, a relative handful of shrimpers with operational vessels went out hoping to catch enough shrimp to make their monthly loan payments. However, these fishermen also ran the risk of *losing* money every time they went out to fish. For example, one Biloxi vessel captain recently had revenues of only $30,000 while gas, loan payment, insurance, city dock fees, groceries and crew expenses came to $60,000. These returns discourage hard-working fishermen who must make up losses on future trips. Further, these shrimpers report contending with rising gear and equipment costs:

> Materials have gone up; oil goes up everyday since 2002. Webbing and nets only changed in the last couple of years because oil went up. Gorilla nets [large trolling nets used in the offshore oil industry] cost four to five thousand dollars. Basic shrimping nets cost $18,000 now. They were $300 less last year. Nobody's trawling, because you can't afford shrimp and ice (Personal Communication, IAI, Galliano, October 22, 2005).

Overcapitalization has contributed to poor credit histories. As a result, many fishermen have had difficulty obtaining SBA loans to repair damaged boats or purchase new ones. Local shrimpers interviewed for this research claim that it is almost impossible for a fishery-related business to receive a loan; "We have received zero assistance. There were a few hundred SBA loan applications, and only three were accepted" (Personal Communication, IAI, Bayou La Batre, March 08, 2006). However, even if SBA loans were forthcoming, these short-term funds are not sufficient to help fishermen who require long-term assistance to purchase new or repair damaged gear, restore living quarters and vessels, and return to fishing (Wadlow 2006).

Figure 111. "CAT Fleet": Repossessed Caterpillar-financed Fishing Vessels: Bayou La Batre, Alabama.
Source: IAI Staff, October 2005.

Overcapitalization has largely driven the commercial fishing industry in the Gulf Coast states for the last fifty years and contributed to its decline. Federal assistance programs, combined with technological advances in navigational and refrigeration systems have encouraged the continued growth of this industry. Between 1966 and 1987, the U.S. commercial fleet expanded from roughly 12,000 to 23,000 vessels. Now, with ever-increasing competition for resources and declining revenues, the problems associated with overcapitalization are becoming visibly manifest (Buck 1995). Hurricane Katrina may prove a breaking point for many fishery participants already suffering the consequences of the declining fish market and financial environment.

Financial Assistance. Financial aid to help restore Gulf Coast fisheries and assist struggling commercial fishery participants has not been forthcoming. As of May 2006, the "failure of the fishery" in the Gulf of Mexico issued on September 9, 2005 by Secretary of Commerce Carlos Gutierrez has resulted in virtually no aid for Gulf Coast fishery participants. A $1.1 billion dollar Gulf Coast fisheries relief package proposed by Senator Shelby, R-Tuscaloosa earlier in 2006 was rejected by the House. Predictably, commercial fishery participants' optimism about their recovery prospects remain dampened and some fishermen are

losing hope that they will be able to remain in this industry. A key executive of a prominent commercial fishing association describes the problem:

> There's no playbook…nobody in government knows exactly what [a failure of the fishery] means. [Agencies] haven't done anything. The way things are set up, they don't have the ability to do anything… federal fishery laws talk about providing disaster relief, but they don't say what it is, and there's no money there for it (Wadlow 2006).

Informal interviews conducted in May by IAI captured the frustration of many informants at the government's seeming lack of interest in helping them rebuild. In Pascagoula, for example, a 4th generation seafood dealer describes his community's frustration with the lack of government assistance, "The government hasn't given us anything. If we are going to survive we are going to do it by ourselves" (Personal Communication, IAI, Pascagoula, May 11, 2006). A 65-year old shrimper echoed the sentiment:

> In '69 [after Camille] there were wood boats. People helped each other rebuild. Now people can't make their bank notes or help each other weld a 100 ft steel hull… You either have to accept loss or deny it, and then move on. Now, everything is red tape. We can't get loans, the water and the boats are regulated… We can't get the momentum we need to go back out [shrimping] because we have no normalcy. Our emotions are running high. Like WWII, this is going to affect us for a long time (Personal Communication, IAI, Biloxi, January 17, 2006).

In mid-June 2006, Congress authorized $120 million in funding for oyster and shrimp bed restoration along the Gulf Coast. Louisiana will receive $50 million, Mississippi is earmarked to receive $35 million, Alabama will get $28 million; Florida and Texas will receive $4 million and $3 million respectively. The remaining funds will be used for debris surveys, research, and unspecified aid for the fishermen. Much of the distribution will be handled by the Gulf States Marine Fisheries Commission, headquartered in Ocean Springs, Mississippi. The Commission and the National Marine Fisheries Service will also receive funds for cooperative research. The Commission will get $7 million for cooperative research, while NMFS will receive $1 million for the same purpose (Reilly 2006).

Morale. The lengthy and uncertain recovery process is exacting an emotional and psychological toll on many fishery participants. IAI field researchers increasingly described their interviewees as seemingly depressed, distracted, and sometimes surly. Poor attendance at this year's Blessing of the Fleet held on May 6 in Bayou La Batre is but one indication of waning morale and increasing uncertainty. Only 25 vessels participated in the 2006 boat parade and ritual blessing; some 50 vessels participated in 2005 (Figure 112). Many fishery participants simply could not afford to take their boats out. One shrimper explains, "We don't even have enough money to rebuild our homes. We are unemployed and stir crazy" (Personal Communication, IAI, Bayou La Batre, May 8, 2006).

Figure 112. A Blessed Boat, Bayou La Batre.
Source: IAI Staff, May 2006.

Adding to the already mounting concerns about the future, shrimpers in this area apprehensively note the unseasonably warm May waters. Local fishermen correlate rising temperatures with an early and intense hurricane season. The possibility of another storm equal to or worse than Katrina is causing some to reconsider their commitment to remaining in this profession.

In conclusion, Hurricane Katrina has exacerbated preexisting disincentives for participating in the commercial fishing industry in the Gulf of Mexico. While major fisheries in the Gulf region may eventually attain some measure of former status, this will require a long period of adaptation that may not bode well for vulnerable fishery participants and certain fishing-involved communities in the particularly hard-hit areas. Indeed, some participants have already left the industry as a result of the storms and are unlikely to return, and some fishing-oriented villages are struggling to rebuild but will not easily recover. Given that we may be entering a period of heightened climatic challenges (Patz et al. 2005), and given the deleterious consequences of the hurricane season of 2005 amidst pre-existing trends of decline, the future health of commercial fisheries in the region appears uncertain.

Indicative of major changes and pressures in the commercial fishing industry throughout the Gulf of Mexico, the number of commercial fishermen active in Louisiana, Mississippi, and Alabama has diminished by nearly 50 percent over the last 15 years. In Mississippi, one informant-processor has watched his competitors dwindle from 50 to 25 operations since 1990. Most participants in the harvest sector who have left the industry in recent years report having been forced from their businesses by challenging market conditions, diminishing availability of processors, and lack of affordable labor. Moreover, the value of the waterfront and coastal lands has accelerated, effectively reducing the availability of vital infrastructure and services, and limiting access to the fishing grounds. Again, all of these problems were exacerbated by the highly destructive tropical weather systems of 2005.

Recreational fishing has become increasingly significant in economic terms throughout much of the Gulf of Mexico, and the hurricanes have magnified and accelerated the shift, already underway, from reliance on commercial fishing activities to recreational, leisure, and tourism-related activities and services. The commercial fishing industry has increasingly been nudged aside. Given that so many pressures now affect participants in the commercial fishing industry, and that current trends tend to favor recreational fishing interests, issues associated with the value and use of coastal lands and waterfront properties clearly will remain a source of continuing tension between the fleets. Coexistence of casinos, condominiums, commercial fishing operations, and recreational fishing fleets will be challenging at best, and return to the days of the commercial fishing waterfront is highly unlikely throughout the region.

The likely manner and extent of future participation in the commercial fishing industry is uncertain. Fewer young people are entering commercial fisheries and associated industries. Virtually all shrimp trawl operators interviewed in the Biloxi and Moss Point areas stated that they would prefer that their children enter professions other than fishing. Many second-generation Vietnamese-Americans are pursuing higher education and have already chosen different occupational paths than their parents who have been so avidly involved in commercial fishing. The trend of decline notwithstanding, many long-time commercial fishery participants are reluctant to leave the only life they have ever known. One processor, whose family has been in the industry for more than 60 years, offered the following assertion:

> My granddaddy opened this place in the 1920s, my father ran it, my brother and I ran it, and now my nephews are going to buy us out. We may have to change, but we will survive. The seafood industry is like a family. It's a way of life. As a way of life, it can't easily be abandoned.

For many individual fishermen, Hurricanes Katrina and Rita were likely pivotal sources of additional pressure in an ongoing struggle against the effects of market challenges, increasing overhead costs, tightening regulations, and competition for space and access at the waterfront. By way of contrast, many well-established seafood processing and distribution firms will likely remain in the hands of families that have been able to retain the social and economic capital to survive such pressures and destructive natural events such as Katrina and Rita.

Given low operational costs and flexibility in operations, small vessel fishery participants may prove relatively resilient in adapting to storms and the range of ongoing pressures affecting

commercial fishing operations throughout the Gulf of Mexico. Moreover, while we can anticipate that many businesses in the distribution sector will continue to focus on the purchase and sale of imported and farm-raised products, this could change in the event that consumers express demand for and willingness to value domestically landed wild seafood.

Short and long-term recovery of the commercial fishing industries in the Gulf of Mexico is related to a range of uncertain factors. Federal assistance to fishing-oriented communities is one such uncertainty. At the time of this writing, none of the nearly $100 billion approved for storm relief has been directly expended on assisting recovery of the region's fishing industries (Brown 2006). Although funds have been allocated to aid in the recovery of oyster and shrimp grounds, the extent of aid to be expended on reconstruction of marine infrastructure and direct assistance to fishery participants remains unclear (Taylor 2006).

Indeed, the future as a whole remains uncertain for fishery participants throughout the Gulf of Mexico. Future natural events and social and economic processes and consequences are difficult to predict. But it is our hope that this document will contribute to a reduction in uncertainty about the effects of the destructive hurricane season of 2005 and the cogent challenges that have confronted and continue to challenge fishery participants across the region. Ideally, the report and associated data will also be used as a platform for monitoring and documenting further change and adaptive response as we approach the first anniversary of one of the worst natural disasters in the nation's history and, ominously, the peak months of a new hurricane season.

J. APPENDIX A: Universe of 58 Potential Study Communities

State	County or Parish	Potential Study Communities	Level of Involvement with Fishing Industries	Selected as Study Community	Rationale
AL	Mobile	Mobile	Secondarily	Yes	Sustained serious damage/important as a processing hub
		Bayou La Batre	Primarily	Yes	Fishing-related industries significantly disrupted
		Coden	Primarily	No	Considered in tandem with the greater Bayou La Batre area
		Dauphin Island	Primarily	No	Physical access problems
		Grand Bay	Primarily	No	Considered in tandem with Bayou La Batre where Grand Bay vessels moor
		Irvington	Primarily	No	Fishing-related industries ***not*** significantly disrupted
		Theodore	Secondarily	No	Part of the Mobile Metro area
AL	Baldwin	Bon Secour	Primarily	Yes	Fishing-related industries significantly disrupted
		Daphne	Secondarily	No	Fishing-related industries ***not*** significantly disrupted
		Fairhope	Secondarily	No	Fishing-related industries ***not*** significantly disrupted/part of the Mobile Metro area
		Foley	Secondarily	No	Fishing-related industries ***not*** significantly disrupted
		Gulf Shores	Primarily	No	Fishing-related industries ***not*** significantly disrupted
		Orange Beach	Primarily	No	Fishing-related industries ***not*** significantly disrupted
MS	Jackson	Moss Point	Secondarily	Yes	Fishing-related industries significantly disrupted
		Pascagoula	Primarily	Yes	Fishing-related industries significantly disrupted
		Gautier	Secondarily	No	Physical access problems/ Difficulty finding key informants
		Ocean Springs	Primarily	No	Physical access problems/ Difficulty finding key informants
MS	Harrison	Biloxi	Primarily	Yes	Fishing-related industries significantly disrupted
		D'Iberville	Tangentially	Yes	Part of the disrupted Gulfport/Biloxi metro area
		Gulfport	Primarily	Yes	Fishing-related industries significantly disrupted
		Long Beach	Secondarily	Yes	Part of the disrupted Gulfport/Biloxi metro area

Appendix A (cont.)

MS	Hancock	Bay St. Louis	Primarily	Yes	Fishing-related industries significantly disrupted
		Waveland	Tangentially	Yes	Fishing-related industries significantly disrupted
		Lakeshore	Primarily	No	Difficulty finding key informants
		Pass Christian	Primarily	Yes	Fishing-related industries significantly disrupted
LA	St. Bernard	Chalmette	Secondarily	Yes	Fishing-related industries significantly disrupted
		Delacroix	Primarily	Yes	Fishing-related industries significantly disrupted
		Hopedale	--	Yes	While not a designated "fishing-involved" community, nearby Yscloskey offloads much of its catch in Hopedale and moors its commercial fleet there.
		Yscloskey	Primarily	Yes	Fishing-related industries significantly disrupted
		Violet	Secondarily	No	Difficulty finding key informants
		St. Bernard	Primarily	No	Difficulty finding key informants
LA	Plaquemines	Boothville	Secondarily	Yes	Fishing-related industries significantly disrupted
		Buras	Secondarily	Yes	Fishing-related industries significantly disrupted
		Empire	Primarily	Yes	Fishing-related industries significantly disrupted
		Pointe a la Hache	Tangentially	Yes	Fishing-related industries significantly disrupted
		Port Sulphur	Secondarily	Yes	Fishing-related industries significantly disrupted
		Venice	Primarily	Yes	Fishing-related industries significantly disrupted
LA	Jefferson	Barataria	Secondarily	Yes	Fishing-related industries significantly disrupted
		Grand Isle	Secondarily	Yes	Fishing-related industries significantly disrupted
		Gretna	Secondarily	Yes	Fishing-related industries significantly disrupted
		Lafitte	Primarily	Yes	Fishing-related industries significantly disrupted
		Marrero	Secondarily	No	Fishing-related industries ***not*** significantly disrupted
		Metairie	Secondarily	No	Fishing-related industries ***not*** significantly disrupted
		Westwego	Secondarily	Yes	Fishing-related industries ***potentially*** disrupted

Appendix A (cont.)

LA	Lafourche	Cut-Off	Primarily	Yes	Fishing-related industries significantly disrupted
		Galliano	Primarily	Yes	Fishing-related industries significantly disrupted
		Golden Meadow	Primarily	Yes	Fishing-related industries significantly disrupted
		Larose	Secondarily	Yes	Fishing-related industries significantly disrupted
		Leeville	Primarily	Yes	Fishing-related industries significantly disrupted
		Lockport	Secondarily	No	Fishing-related industries ***not*** significantly disrupted
		Port Fourchon	Tangentially	Yes	Fishing-related industries significantly disrupted
LA	Terrebonne	Bourg	Secondarily	No	Fishing-related industries ***not*** significantly disrupted
		Chauvin	Primarily	Yes	Fishing-related industries significantly disrupted
		Cocodrie	Secondarily	Yes	Fishing-related industries significantly disrupted
		Dulac	Primarily	Yes	Fishing-related industries significantly disrupted
		Houma	Primarily	Yes	Fishing-related industries significantly disrupted
		Montegut	Primarily	No	Limited time/fiscal resources
		Theriot	Secondarily	Yes	Fishing-related industries significantly disrupted

K. APPENDIX B: Field Protocols

(1) Protocol for Data Collection: Fishing-related Infrastructure

Code: _____ Date: _____
Name: _____ Contact Info.: _____
Community: _____ Job Title: _____
Name of Dock/Harbor/Location: _____

1. How long have you been in this job? How many people worked and currently work with you (e.g., dock/port workers)?

2. How much do you produce annually?

3. Can you describe the infrastructure of the port/harbor?

4. How was the industry doing before Katrina?

5. What are your immediate industry-related challenges to recovery?

6. What is your estimate of damage? Approximate costs to replace or repair damaged facilities, equipment, and/or infrastructure?

7. What do you think is the likelihood of reconstruction? Any expected timeline?

8. Are there plans for collaboration with any agencies or companies?

9. Other Contacts/Phone Numbers

I give IAI permission to record and use this information in their study on the human social and economic impacts of Hurricane Katrina and its aftermath. I understand my name will not be used in any portion of their report and that complete confidentiality of this information will be maintained in its storage and use otherwise.

_____ _____

Signature Date

(2) Protocol for Data Collection: Fishing-related Facilities

Code: _____ Date: _____
Name: _____ Contact Info.: _____
Community: _____ Job Title: _____
Name of Business/Work Location: _____

1. What are the principal activities of your job? How many people were employed with you?

2. What were the pre-Katrina assets of the company? Previous value? Estimated costs of damage?
   -Land:
   -Buildings:
   -Vessels:
   -Processors/Machinery:

3. Did you have adequate insurance coverage on business? Is it sufficient to rebuild?

4. Why did you initially choose to locate your business here? Which of those factors still apply?

5. Do you plan on rebuilding? If so, in the same community? If not, then where?

6. Do you plan on rebuilding your home? If so, in the same community? If not, where will you move?

7. What are the most important factors to you in deciding to rebuild? Timeframe for rebuilding?

8. Are you expecting supplementary coverage from other sources to rebuild your home, your vessel, or to buy a new vessel?

9. Before Katirna, to whom did you sell (e.g., local dealer, fixed based operator, retail/wholesale market, etc.)? Have you had contact with your buyers recently? If so, do you know of their plans? Contact Information?

10. Are you in contact with other fishermen from your community? Do you know of their plans? Contact information?

I give IAI permission to record and use this information in their study on the human social and economic impacts of Hurricane Katrina and its aftermath. I understand my name will not be used in any portion of their report and that complete confidentiality of this information will be maintained in its storage and use otherwise.

_____ _____

Signature Date

(3) Protocol for Data Collection: County/Parish, and Municipal Officials

Code: _____ Date: _____
Name: _____ Contact Info.: _____
Community: _____ Job Title: _____
Name of Office/Branch/Agency: _____

1. How long have you been in this job? What are the principal responsibilities of this position? How many people work in your office/agency?

2. What is the average annual budget for your office? Revenues and expenditures? Copies of past year's revenues and expenditures? Who has this information?

3. Has your office done any sort of preliminary damage assessment of this community?
Estimates on percentages of damaged and/or destroyed:
-Homes? -Businesses? -Schools? -Hospitals?

4. Do you have a sense of the status of the following services:
-Roads? -Power/electricity? -Water systems? -Sewage? -Communication services?

5. What is the likelihood of reconstruction? Has your office discussed reconstruction plans?

6. Is there any expected timeline for reconstruction projects? Does the community/municipal government have an estimate of planned expenditures for the next 6 months? The next year? Copies of this information?

7. Has your office spoken with any other agencies or groups about rebuilding plans? Does the community/county/parish anticipate receiving external sources of funding to support reconstruction projects?

8. Do you have a sense of how many people are currently here in the community? What communication does the city/county/parish have with its citizens?

9. Contacts/Phone Numbers

I give IAI permission to record and use this information in their study on the human social and economic impacts of Hurricane Katrina and its aftermath. I understand my name will not be used in any portion of their report and that complete confidentiality of this information will be maintained in its storage and use otherwise.

_____ _____

Signature Date

(4) Protocol for Data Collection: General Employers

Code: _____ Date: _____
Name: _____ Contact Info.: _____
Community: _____ Job Title: _____
Name and address of Business: _____

1. How long have you been in this job? What are the principal responsibilities of this position?

2. Is the business currently operating? If so, at what approximate capacity?

3. How was the company affected by the hurricane?
   - What were your principal assets (buildings, cars, etc.) before Katrina? Approximate value?
   - Degree of damage? Approximate costs for repair?
   - Do you have sufficient insurance to cover those costs?

4. How many people were employed by the company before the hurricane? How many people, if any, are currently employed with the company?

5. What is the likelihood of rebuilding/re-opening the business in this community? If not, where?

6. What are the incentives to rebuilding? Disincentives?

7. When do you expect to begin reconstruction? Anticipated timeline?

8. What is the status of similar businesses in the area? Who is your counterpart at those companies? Contacts/Phone Numbers?

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_____ _____
Signature Date

(5) Protocol for Data Collection: Hotel/Casino

Code: _____ Date: _____
Name: _____ Contact Info.: _____
Community: _____ Job Title: _____
Name of Business: _____

1. How long have you been in this job?
   -How many people were employed in the business before Katrina?

2. Capacity/volume of customers
   - Number of hotel rooms?
   - Average occupancy before the hurricane?
   - Size and description of (Casino) facility?
   - Average volume of customers?

3. Estimate of the damages to the facility? Approximate costs? Is the business sufficiently insured to cover those costs?

4. What is the likelihood of rebuilding the hotel/casino? In this community? If not, where?

5. What are the incentives to rebuilding? Disincentives?

6. Any expected timeline for reconstruction?

7. What is the status of other hotels/casinos in the area? Who is your counterpart at the other hotels/casinos? Contacts/Phone Numbers?

I give IAI permission to record and use this information in their study on the human social and economic impacts of Hurricane Katrina and its aftermath. I understand my name will not be used in any portion of their report and that complete confidentiality of this information will be maintained in its storage and use otherwise.

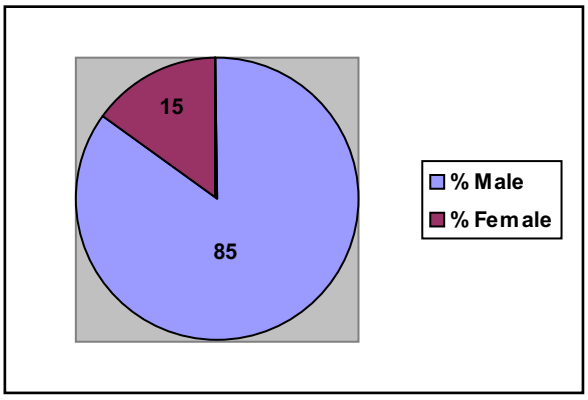
_____ _____
Signature Date

L. APPENDIX C:

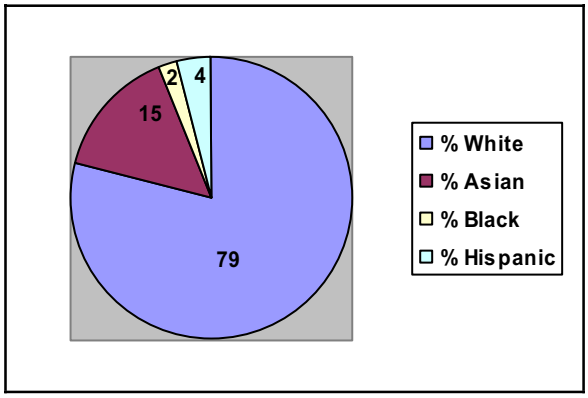
Key Informant Demographics by State and Study Community

Interviews by State and Study Community

Total Interviews with Key Informants: Louisiana, Mississippi, Alabama						
Profession	**Male/Female**	**Caucasian**	**Asian**	**Black**	**Hispanic**	**Total**
Seafood Retailers	109/44	140	5	5	3	153
Seafood Processors	137/25	138	19	0	5	162
Fishermen	236/17	165	66	9	13	253
Port Harbor Officers	7/1	8	0	0	0	8
Federal, State, and City Government Officials/Employees	17/6	21	2	0	0	23
Other	16/1	15	1	0	1	17
Total	**522/94**	**487**	**93**	**14**	**22**	**616**



Percent of Total Interviews by Sex.



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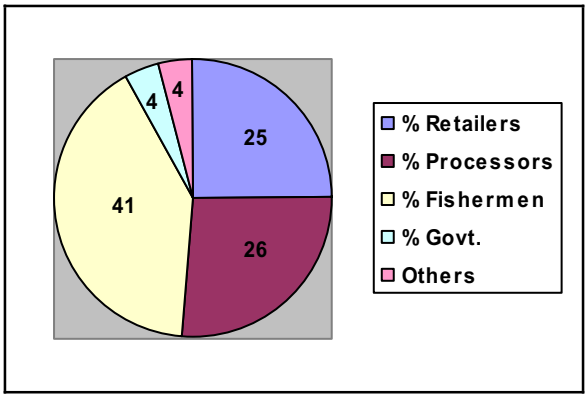
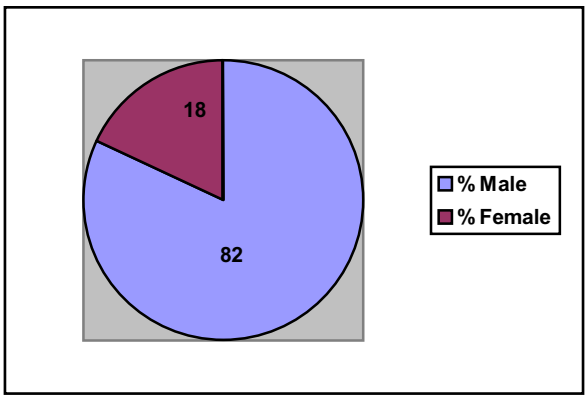


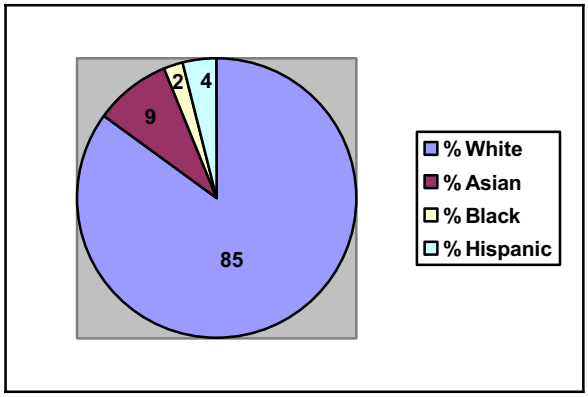
Percent of Total Interviews by Profession.

Interviews by State: Louisiana

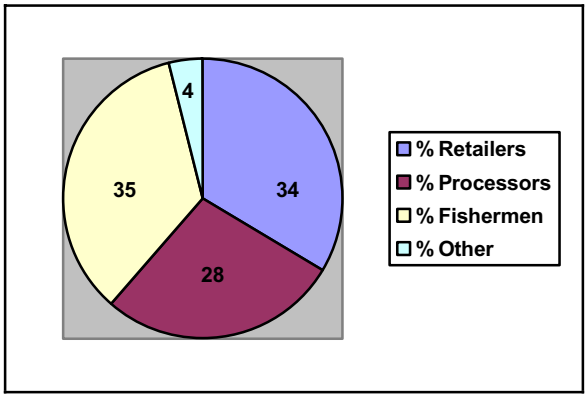
State of Louisiana						
Profession	**Male/Female**	**Caucasian**	**Asian**	**Black**	**Hispanic**	**Total**
Seafood Retailers	64/36	94	1	4	1	100
Seafood Processors	71/11	66	14	0	2	82
Fishermen	99/5	81	12	3	8	104
Port Harbor Officers	2/0	2	0	0	0	2
Federal Government Officials/Employees	2/0	1	1	0	0	2
City Government Officials/Employees	2/0	2	0	0	0	2
Marina Owners	4/0	4	0	0	0	4
Other	1/0	1	0	0	0	1
Total	**245/52**	**251**	**28**	**7**	**11**	**297**



Percent of Interviews in Louisiana by Sex.



Percent of Interviews in Louisiana by Ethnicity.



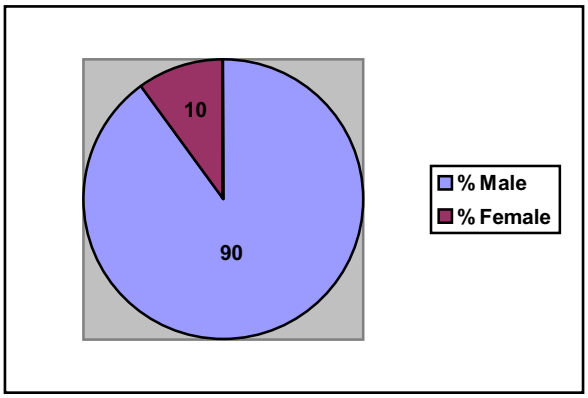
Percent of Interviews in Louisiana by Profession.

Interviews by Study Community: Louisiana

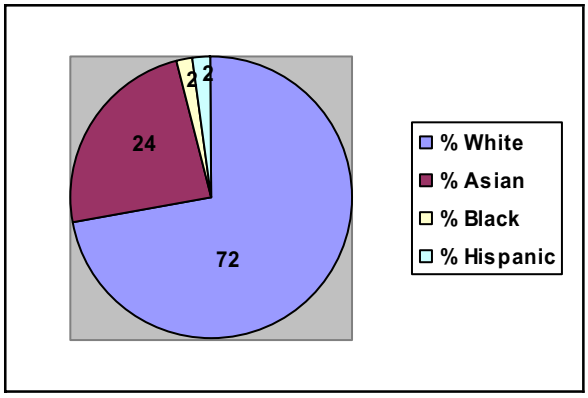
State of Louisiana: Study Communities								
Community	**Seafood Retailers**	**Seafood Processors**	**Fishermen**	**Port Harbor Officers**	**Federal, State, or City Government Officials/Employees**	**Marina Owners**	**Other**	**Total**
Barataria	--	1	3	--	--	1	--	5
Boothville	2	--	--	--	--	--	--	2
Buras	--	3	2	--	2	--	--	7
Chalmette	2	5	--	1	--	--	--	8
Chauvin	4	4	2	--	--	--	--	10
Cocodrie	1	4	3	--	--	--	--	8
Cut Off	2	--	13	--	--	--	--	15
Delacroix	5	3	4	--	--	--	--	12
Dulac	2	9	5	--	--	--	--	16
Empire	--	5	10	1	--	--	--	16
Galliano	3	--	4	--	--	--	--	7
Grand Isle	6	3	5	--	1	2	1	18
Gretna	9	--	--	--	--	--	--	9
Golden Meadow	14	2	8	--	--	--	--	24
Hopedale	--	5	4	--	--	--	--	9
Houma	15	3	--	--	--	--	--	18
Lafitte	2	10	18	--	--	--	--	30
Larose	2	3	--	--	--	--	--	5
Leeville	4	3	--	--	--	--	--	7
Pointe a la Hache	--	1	2	--	--	--	--	3
Port Fourchon	1	1	4	--	--	1	--	7
Port Sulphur	3	4	--	--	--	--	--	7
Theriot	3	4	7	--	--	--	--	14
Venice	1	5	--	--	--	--	--	6
Westwego	19	1	--	--	1	--	--	21
Yscloskey	--	3	10	--	--	--	--	13
Total	**100**	**82**	**104**	**2**	**4**	**4**	**1**	**297**

Interviews by State: Mississippi

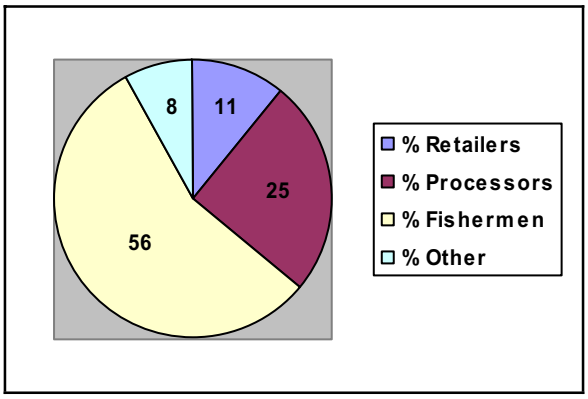
State of Mississippi						
Profession	**Male/Female**	**Caucasian**	**Asian**	**Black**	**Hispanic**	**Total**
Seafood Retailers	17/2	16	3	0	0	19
Seafood Processors	38/4	37	2	0	3	42
Fishermen	87/7	56	35	3	0	94
Port Harbor Officers	4/1	5	0	0	0	5
Federal Government Officials/Employees	0/1	1	0	0	0	1
State Government Officials/Employees	3/0	3	0	0	0	3
City Government Officials/Employees	1/0	1	0	0	0	1
Marina Owners	1/0	1	0	0	0	1
Other	3/0	2	1	0	0	3
Total	**154/15**	**122**	**41**	**3**	**3**	**169**



Percent of Interviews in Mississippi by Sex.



Percent of Interviews in Mississippi by Ethnicity.



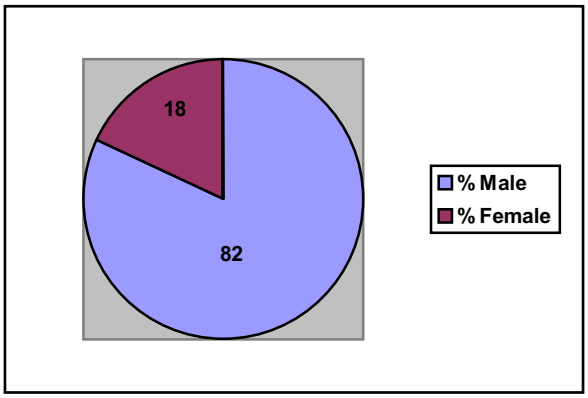
Percent of Interviews in Mississippi by Profession.

Interviews by Study Community: Mississippi

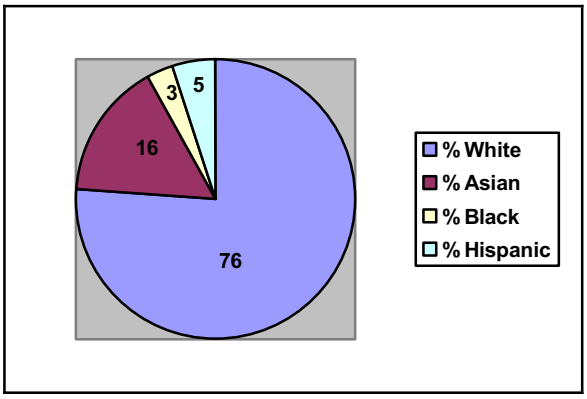
State of Mississippi: Study Communities								
Community	**Seafood Retailers**	**Seafood Processors**	**Fishermen**	**Port Harbor Officers**	**Federal, State, or City Government Officials/Employees**	**Marina Owners**	**Other**	**Total**
Bay St. Louis/Waveland	1	--	2	--	--	1	--	4
Biloxi	8	20	61	3	5	--	2	99
D'Iberville	--	5	--	--	--	--	--	5
Gulfport	2	--	7	--	--	--	--	9
Long Beach	--	1	3	1	--	--	--	5
Moss Point	--	1	--	--	--	--	--	1
Ocean Springs	--	1	--	--	--	--	--	1
Pascagoula	2	8	9	1	--	--	--	20
Pass Christian	6	6	12	--	--	--	1	25
Total	**19**	**42**	**94**	**5**	**5**	**1**	**3**	**169**

Interviews by State: Alabama

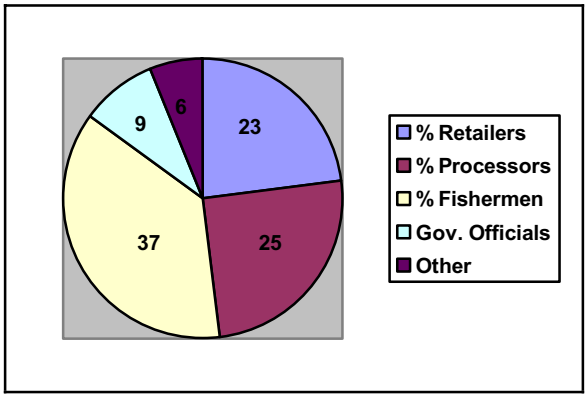
State of Alabama						
Profession	**Male/Female**	**Caucasian**	**Asian**	**Black**	**Hispanic**	**Total**
Seafood Retailers	28/6	30	1	1	2	34
Seafood Processors	28/10	35	3	0	0	38
Fishermen	50/5	28	19	3	5	55
Port Harbor Officers	1/0	1	0	0	0	1
Federal Government Officials/Employees	1/0	1	0	0	0	1
City Government Officials/Employees	8/5	12	1	0	0	13
Net Mender	2/0	1	0	0	1	2
Other	5/1	6	0	0	0	6
Total	**123/27**	**114**	**24**	**4**	**8**	**150**



Percent of Interviews in Alabama by Sex.



Percent of Interviews in Alabama by Ethnicity.



Percent of Interviews in Alabama by Profession.

Interviews by Study Community: Alabama

State of Alabama: Study Communities								
Community	**Seafood Retailers**	**Seafood Processors**	**Fishermen**	**Port Harbor Officers**	**Federal, State, or City Government Officials/Employees**	**Net Menders**	**Other**	**Total**
Bayou La Batre	33	33	50	1	14	2	6	139
Bon Secour	1	5	5	--	--	--	--	11
Total	**34**	**38**	**55**	**1**	**14**	**2**	**6**	**150**

M. APPENDIX D: Glossary of Terms

Boatyard/Boat builder – a facility that builds boats, including oil support vessels, freight vessels, and commercial and recreational boats.

Dock/Marina – a public or private (e.g., casino) facility used to moor a fleet of commercial or recreational vessels. A dock or marina may or may not have other facilities, such as a supply shop or loading ramp.

Facility – a physical building that serves as a site for offloading, processing, or selling seafood product. A facility is distinguished from a business, as one or more businesses may operate in the same facility.

Ice House/Plant – a facility that produces ice for purposes of sale. An ice house may be also be an offloading or processing facility or a facility that produces ice in excess of its operational needs and sells it, often along with other products (i.e., fuel or bait). Normally, an ice house that is also an offloading facility produces in excess of 30 tons of ice daily.

Offloader – a facility that offloads seafood product from fishing vessels and that ices, packs, and/or transports whole, or de-headed, seafood product.

Operational – capable of operation, but not necessarily in operation; having the necessary infrastructure (e.g., electricity and machinery) to be in operation, but lacking the external, support infrastructure or conditions sufficient to facilitate operations.

Processing Plant – a facility that transforms raw seafood into salable product ready for distribution through the processes of peeling or drying (shrimp), shucking, steaming, and/or canning (oysters), or picking (crab). A facility that *only* de-heads and packs shrimp is not considered a processing plant in this study, nor is a retail facility that prepares seafood for sale to the public.

Retailer – a dealer or vendor of seafood product who purchases from wholesalers and sells in small quantities to the general public.

Wholesaler – a dealer or vendor of seafood product who purchases from fishermen, offloader, or from other wholesalers (e.g., processing plant) and sells in large quantities to retailers. A fisherman is not considered a wholesaler in this study.

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