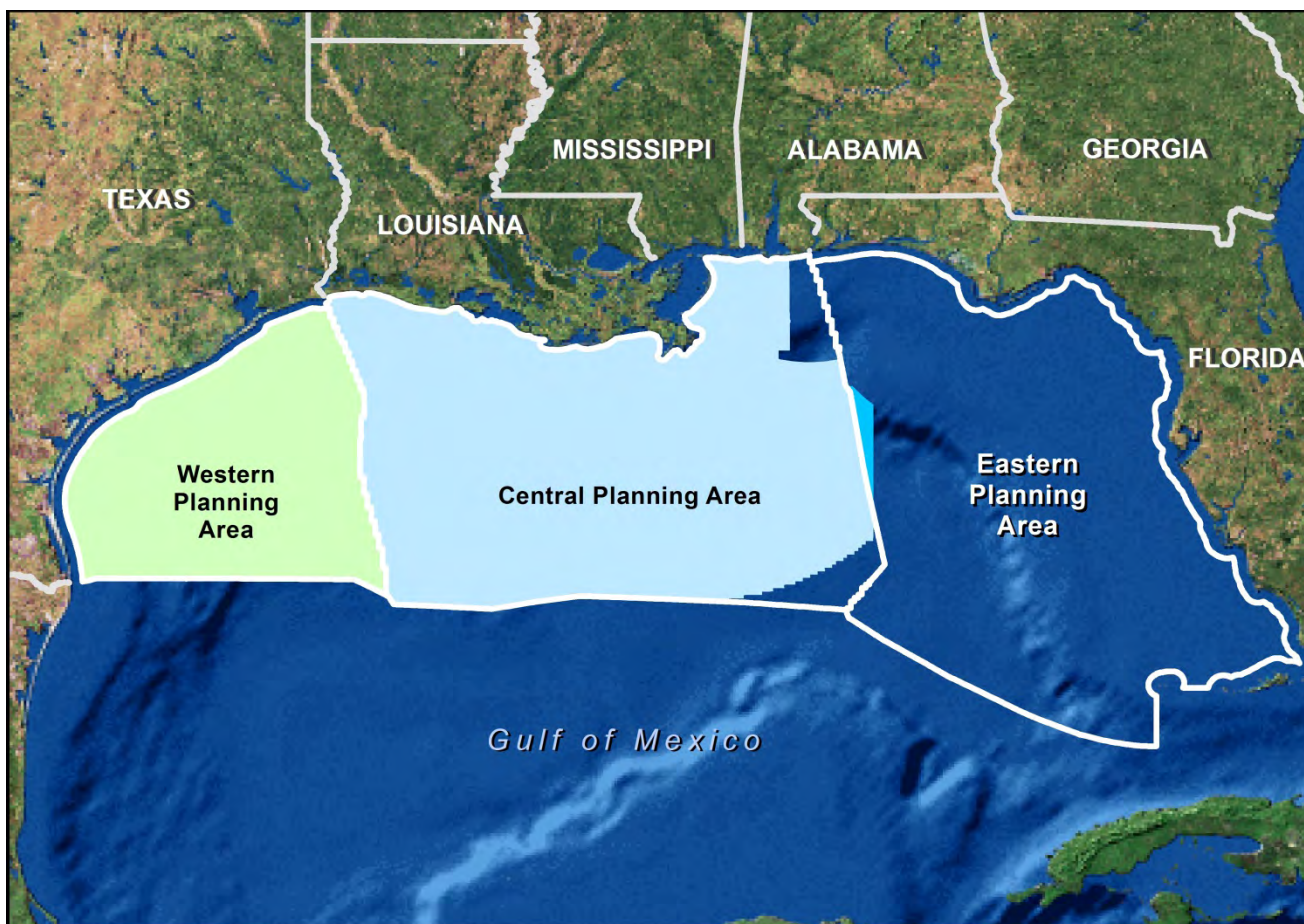


Gulf of Mexico OCS Oil and Gas Lease Sales: 2017-2022

Gulf of Mexico Lease Sales 249, 250, 251, 252, 253,
254, 256, 257, 259, and 261

Draft Environmental Impact Statement

Volume II: Chapters 5-8, Appendices, and Keyword Index



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Bureau of Ocean Energy Management
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CHAPTER 5
CONSULTATION AND COORDINATION

- What's in This Chapter**
- BOEM coordinated the prelease process with key agencies and organizations.
 - The prelease and NEPA process has included the following to date: publication of the Notice of Intent to Prepare an EIS (NOI); the Call for Information (Call); and the Area Identification (Area ID) memorandum.
 - BOEM conducted internal and public scoping to determine the content of this Multisale EIS.
 - Ten comments were received during the scoping process.
 - One comment was received in response to its Call.
 - The USEPA (Regions 4 and 6) is a cooperating agency on this Multisale EIS.
 - BOEM is undertaking consultation and other activities to comply with the following laws, including but not limited to, the following: the development of consistency determinations under the Coastal Zone Management Act (CZMA); consultation under the Endangered Species Act (ESA) for potential impacts to listed species or designated critical habitat; completion of an Essential Fish Habitat assessment pursuant to the Magnuson-Stevens Fishery Conservation and Management Act; and a request for comments and consultation with federally recognized Tribes pursuant to the National Historic Preservation Act and Executive Order 13175.

5 CONSULTATION AND COORDINATION

5.1 DEVELOPMENT OF THE PROPOSED ACTIONS

This Multisale EIS addresses 10 proposed regionwide Federal OCS oil and gas lease sales, as tentatively scheduled in the Proposed Program. BOEM conducted early coordination with appropriate Federal and State agencies and other concerned parties to discuss and coordinate the prelease process for the proposed GOM lease sales and this Multisale EIS. Key agencies and organizations included the FWS, NOAA, NOAA’s National Marine Fisheries Service, National Park Service, U.S. Coast Guard, U.S. Department of Defense, USEPA, State governors’ offices, federally recognized Indian Tribes, industry, and nongovernmental organizations. The timeline for coordination with these agencies and concerned parties throughout the development of this Multisale EIS is illustrated in **Figure 5-1**.

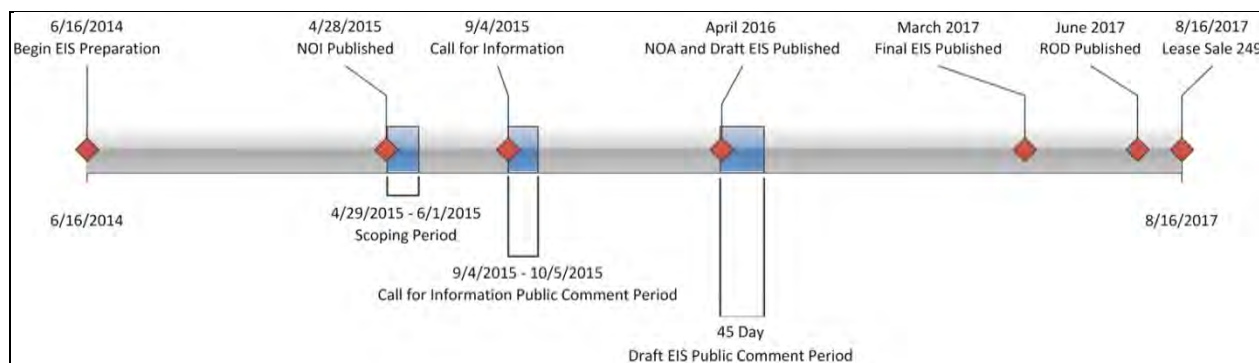


Figure 5-1. Timeline for the Development of This Multisale EIS.

5.2 NOTICE OF INTENT TO PREPARE AN EIS AND CALL FOR INFORMATION

On April 29, 2015, the Notice of Intent to Prepare an EIS (NOI) for the proposed regionwide lease sales was published in the *Federal Register* (2015c). Additional public notices, including individual consultation invitations to federally recognized Indian Tribes, were distributed via the U.S. Postal Service, local newspapers, and the Internet. A 30-day comment period was provided; it closed on June 1, 2015. Federal, State, and local governments, federally recognized Indian Tribes, nongovernmental organizations, other interested parties, and the public at large were invited to send written comments on the scope of the Multisale EIS to the Gulf of Mexico OCS Region. BOEM received 10 comment letters in response to the NOI. These comments are summarized below in **Chapter 5.4.1**.

Pursuant to the Outer Continental Shelf Lands Act of 1953, as amended (OCSLA), BOEM published a Call for Information (Call) to request and gather information to determine the Area Identification (Area ID) for each proposed lease sale. The Call was published in the *Federal Register* (2015d) on September 4, 2015. The Call invited potential bidders to nominate areas of interest within the program area(s) included in the 2017-2022 Draft Proposed Program. The Call was also an opportunity for the public to provide information on environmental, socioeconomic, and other considerations relevant to determining the Area ID.

The comment period for the Call closed on October 5, 2015. BOEM received one comment letter in response to the Call from the Louisiana Department of Natural Resources. This comment is summarized below in **Chapter 5.4.2**.

5.3 AREA ID MEMORANDUM

Using information provided in response to the Call and from scoping comments, BOEM then developed an Area ID recommendation memorandum. The Area ID is an administrative prelease step that describes the geographical area for environmental analysis and consideration for leasing. All of this information is being used to develop the proposed action and a reasonable range of alternatives for this Multisale EIS.

On November 20, 2015, the Area ID decision was made. One Area ID was prepared for all proposed lease sales. The Area ID memo recommended keeping the entire regionwide area of the GOM included in the Draft Proposed Program for consideration in this Multisale EIS. The area identified for lease includes all of the unleased blocks in the GOM not subject to Congressional moratorium pursuant to the Gulf of Mexico Energy Security Act of 2006.

5.4 DEVELOPMENT OF THE DRAFT MULTISALE EIS

Scoping for the Draft Multisale EIS was conducted in accordance with CEQ regulations for implementing NEPA. Internal scoping provides BOEM an opportunity to update the BOEM Gulf of Mexico OCS Region's environmental and socioeconomic information base. The internal scoping process for the Draft Multisale EIS yielded the following:

- effort to make the document more reader-friendly by reducing the amount of text, optimizing the layout, and increasing the use of graphics;
- a workshop was held for all subject-matter experts to reevaluate their resources and conclusions from prior lease sale EISs;
- several resources have been reorganized or renamed to increase document readability and reduce redundancies:
 - Coastal Habitats (Estuarine Systems [Wetlands and Seagrasses/Submerged Vegetation] and Coastal Barrier Beaches and Associated Dunes);
 - Deepwater Benthic Communities (Chemosynthetic Communities and Deepwater Coral Communities);
 - Nonchemosynthetic Communities has been renamed to Deepwater Coral Communities;
 - *Sargassum* Communities was renamed *Sargassum* and Associated Communities;
 - Live Bottom Habitats (Topographic Features and Pinnacles and Low-Relief Features);
 - Invertebrate Resources were added to the resource description for Fishes (i.e., Fishes and Invertebrate Resources);
 - Coastal and Marine Birds was renamed to Birds;
 - Protected Species (Marine Mammals, Sea Turtles, Beach Mice, Protected Birds, and Protected Corals);
 - Commercial Fisheries will be re-focused on industry trends as the biological aspects are being addressed in the Fishes and Invertebrate Resources chapter; and
 - Social Factors (Demographics and Environmental Justice);
- after careful consideration, the diamondback terrapin was eliminated from further analysis as a species of special concern as they are neither listed as endangered nor threatened by the FWS nor are they likely to be impacted by a proposed action. Any potential impacts to diamondback terrapins would likely be as a result of their habitat location and, therefore, they are generally considered as part of the wetlands community. BOEM reserves the right to add them at a future date as designations and overall environmental indicators may change following consultations with, and concerns of, the FWS; but at present, their inclusion is not warranted since the potential for impacts are speculative at best; and

- several white papers, which are incorporated by reference, were created and publicly released to reduce the amount of technical information contained in an EIS, such as the catastrophic spill event analysis, the description of essential fish habitats, and the OCS regulatory framework.

Public scoping provides those with an interest in the OCS Program an opportunity to provide comments on the proposed actions. Public scoping meetings were held in Texas, Louisiana, Mississippi, Alabama, and Florida on the following dates and at the times and locations indicated below:

Tuesday, April 12, 2015
 1:00 p.m. CDT
 Bureau of Ocean Energy Management
 Gulf of Mexico OCS Region
 1201 Elmwood Park Boulevard
 New Orleans, Louisiana 70123
 2 registered attendees
 0 speakers
 0 verbal comments received
 0 written comments received

Thursday, April 14, 2015
 1:00 p.m. CDT
 Hilton Garden Inn Houston/Bush
 Intercontinental Airport
 15400 John F. Kennedy Boulevard
 Houston, Texas 77032
 1 registered attendee
 0 speakers
 0 verbal comments received
 0 written comments received

Tuesday May 19, 2015
 6:00 p.m. CDT
 Hilton Garden Inn Panama City
 1101 US Highway 231
 Panama City, Florida 32405
 2 registered attendees
 0 speakers
 0 verbal comments received
 0 written comments received

Wednesday May 20, 2015
 3:00 p.m. CDT
 Hilton Garden Inn Mobile West
 828 West I-65 Service Road South
 Mobile, Alabama 36609
 1 registered attendee
 0 speakers
 0 verbal comments received
 0 written comments received

Thursday May 21, 2015
 3:00 p.m. CDT
 Courtyard by Marriott
 Gulfport Beachfront MS Hotel
 1600 East Beach Boulevard
 Gulfport, Mississippi 39501
 1 registered attendee
 0 speakers
 0 verbal comments received
 0 written comments received

5.4.1 Summary of Scoping Comments

In addition to accepting oral and written comments at each public meeting, BOEM accepted written comments by mail, email, and through the regulations.gov web portal (<http://www.regulations.gov>). BOEM received a total of 10 comments: 5 were mailed formal letters; 3 were emails; and 2 were received through the regulations.gov web portal. Comments came from

Federal and State agencies, interest groups, industry, and the general public on the scope of the this Multisale EIS, significant issues that should be addressed, alternatives that should be considered, and mitigating measures. Each comment was read and categorized according to its source and the nature of the information included. All scoping comments received that were relevant for a lease sale NEPA document were considered in the preparation of the Draft Multisale EIS. The scope and content of this Multisale EIS was formulated to ensure that the relevant issues and concerns expressed by stakeholders during the scoping process were fully addressed. Summaries of comments received follow.

United States Environmental Protection Agency, Regions 4 and 6 (letter dated September 8, 2015)

- The USEPA formally requested Cooperating Agency status for this Multisale EIS. As a cooperating agency, the USEPA will
 - provide expertise on NEPA compliance and other applicable subject matters;
 - provide timely technical reviews and comments on preliminary documents, reports, analyses, and sections of the Draft and Final Multisale EISs;
 - participate in meetings as resources allow;
 - provide available information during preparation of the Draft and Final Multisale EISs in areas in which the USEPA has expertise; and
 - review and comment on the Draft and Final Multisale EISs pursuant to USEPA regulatory responsibilities under Section 309 of the Clean Air Act.

Louisiana Department of Natural Resources, Office of Coastal Management (letter dated May 22, 2015)

- The Louisiana Office of Coastal Management requests that BOEM revisit the predictions of social and environmental effects on coastal resources made for earlier lease sales and compare them to existing environmental conditions.
- The State of Louisiana expressed that indirect and cumulative impacts to Louisiana's coastal resources are not adequately addressed in previous EISs.
- The State of Louisiana is also concerned that Louisiana's coastal wetlands are disproportionately bearing the impacts from OCS oil- and gas-related activities and requests compensatory mitigation.
- Louisiana supports the expansion of exploration and development of Gulf of Mexico energy resources.

Louisiana Department of Culture, Recreation, and Tourism; State Historic Preservation Office (letter dated May 12, 2015)

- The Louisiana State Historic Preservation Office determined that the proposed actions will have no adverse effect on historic properties.

Florida Department of State, Division of Historical Resources (letter dated April 15, 2015 and email dated May 12, 2015)

- The State of Florida determined that BOEM's proposed 2017-2022 GOM lease sales will have no effect on historic properties but requested to be notified if any cultural resources are identified (April 15, 2015).
- Florida clarified that they are primarily interested in resources that are identified off Florida that cannot be avoided (May 12, 2015).

Alabama Historical Commission (letter dated April 30, 2015)

- The State of Alabama agreed that the proposed phased approach to meeting Section 106 requirements is reasonable and appropriate for the proposed actions.

Conoco Philips (email dated April 28, 2015)

- Conoco Philips recommends that this Multisale EIS address the effects of the GOM lease sales using alternatives that are formulated to mitigate known risks or adverse impacts.
- BOEM must try to reach an appropriate balance of all oil and gas exploration and production, environmental protection, and potential impacts to coastal zone factors when implementing the Five-Year Program.
- BOEM should apply its best available scientific analysis to operating scenarios that accurately reflects actual OCS oil- and gas-related activities that occur on a day-to-day basis.
- Conoco Philips opposes the use of mitigations based on the use of dated technologies for new studies or the reapplication of findings from previous studies that used out-of-date technology, as well as the use of studies outside normal parameters of oil and gas development.

The American Petroleum Institute (email dated May 29, 2015)

- The American Petroleum Institute recommends that the Multisale EIS be designed specifically with the idea that it will be used as a reference for future NEPA analysis.

- BOEM should consider the extensive safety improvements implemented by industry and new requirements imposed on offshore operations since the *Deepwater Horizon* explosion, oil spill, and response, particularly the formation of many well containment companies and their ability to assist in any potential future incidents.

Save the Manatee Club (regulations.gov submission dated May 29, 2015)

- The Save the Manatee Club requests NEPA analysis of the EPA in a separate process.
- The Multisale EIS analysis should assess the impacts from all aspects of offshore oil and gas development and the cultural value of resources, and it should differentiate the risks of deepwater drilling from those of less technologically difficult operations.
- BOEM should analyze an alternative that includes a buffer around the portions of the EPA that are under Congressional Moratorium.

Center for Biological Diversity (regulations.gov submission dated May 29, 2015)

- The Center for Biological Diversity asked BOEM to delay leasing until after the effects of the *Deepwater Horizon* explosion, oil spill, and response are known and the ecosystem has recovered.
- The Multisale EIS should consider the direct, indirect, and cumulative impacts of oil spills, including catastrophic spills, and consider the science that has been released since the *Deepwater Horizon* explosion, oil spill, and response.
- BOEM must also analyze the direct, indirect, and cumulative effects of oil and gas activities, particularly air, water, noise, and light pollution, and increased vessel traffic in relation to sensitive biological resources.
- The Center for Biological Diversity requested that BOEM consider the impacts of offshore fracking and a reasonable range of alternatives.

Jean Public (email dated April 29, 2015)

- Jean Public opposes the proposed actions due to the lack of safety changes since the *Deepwater Horizon* explosion, oil spill, and response.

5.4.2 Summary of Comments Received in Response to the Call for Information

In response to the Call, BOEM received one letter from the Louisiana Department of Natural Resources.

Louisiana Department of Natural Resources, Office of Coastal Management (letter dated September 29, 2015)

- The Louisiana Office of Coastal Management requests that BOEM consider secondary and cumulative impacts of OCS lease sales on coastal environments.
- BOEM should identify, quantify, and mitigate (e.g., compensatory mitigation) secondary and cumulative harm that occurs to Louisiana's coastal wetlands.
- BOEM should implement plans for validating predictions of social and environmental effects on coastal resources.
- Offshore exploration and development of hydrocarbon resources has been and continues to be of significant value to Louisiana and coastal communities.

5.4.3 Additional Public Input Opportunities

Although scoping is a formal, defined process initiated by the publication of the NOI and Call with an identified closing date, public input and other coordination meetings continue to proceed throughout this NEPA process. Public input and coordination opportunities were also available during BOEM's requests for information, comments, input, and review of its other NEPA documents, including the following:

- Request for Information on the *2017-2022 Outer Continental Shelf Oil and Gas Leasing: Draft Proposed Program*;
- Notice of Availability for the *2017-2022 Outer Continental Shelf Oil and Gas Leasing: Draft Proposed Program*; and
- Scoping for the 2017-2022 Five-Year Program EIS.

Comments from these additional public input opportunities are incorporated, where relevant, in the Multisale EIS through the tiering process. One comment from the NPS was identified by BOEM's 2017-2022 Programmatic EIS project team as more relevant to a regional NEPA review. Therefore, it was considered during the preparation of this Multisale EIS. The NPS comment requested an exclusion zone south and within 15 mi (24 km) of the Mississippi portion of the Gulf Islands National Seashore.

5.4.4 Cooperating Agencies

According to Part 516 of the DOI Departmental Manual, BOEM must invite eligible government entities to participate as cooperating agencies when developing an EIS in accordance with the requirements of NEPA and CEQ regulations. BOEM must also consider any requests by eligible government entities to participate as a cooperating agency with respect to a particular EIS, and must either accept or deny such requests.

The NOI, which was published on April 29, 2015, included an invitation to other Federal agencies and State, Tribal, and local governments to consider becoming cooperating agencies in the preparation of this Multisale EIS. In a letter dated September 8, 2015, USEPA Regions 4 and 6 requested cooperating agency status for the Multisale EIS. On December 16, 2015, a Memorandum of Agreement between BOEM and USEPA Regions 4 and 6 was initiated, which defines the roles and responsibilities for each agency (**Appendix C**).

5.5 DISTRIBUTION OF THE DRAFT MULTISALE EIS FOR REVIEW AND COMMENT

BOEM will send copies of the Draft Multisale EIS to the government, public, and private agencies and groups listed below. Local libraries along the Gulf Coast will be provided copies of this document; a list of these libraries is available on BOEM’s website at <http://www.boem.gov/nepaprocess/>.

Federal Agencies

Congress

- Congressional Budget Office
- House Resources Subcommittee on Energy and Mineral Resources
- Senate Committee on Energy and Natural Resources

Department of Commerce

- National Oceanic and Atmospheric Administration
- National Marine Fisheries Service

Department of Defense

- Department of the Air Force
- Department of the Army
- Corps of Engineers
- Department of the Navy
- Naval Mine and Anti-Submarine Warfare Command

Department of Energy

- Strategic Petroleum Reserve PMD

Department of Homeland Security

- U.S. Coast Guard

Department of State

- Bureau of Oceans and International Environmental and Scientific Affairs

Department of the Interior

- Bureau of Ocean Energy Management
- Bureau of Safety and Environmental Enforcement
- Fish and Wildlife Service
- Geological Survey
- National Park Service
- Office of Environmental Policy and Compliance
- Office of the Solicitor

Department of Transportation

- Pipeline and Hazardous Materials Safety Administration
- Office of Pipeline Safety

Environmental Protection Agency

- Region 4
- Region 6

Marine Mammal Commission

State and Local Agencies

Alabama

- Governor’s Office
- Alabama Highway Department
- Alabama Historical Commission and State Historic Preservation Officer
- Alabama Public Library Service
- Alabama Public Service Commission
- City of Mobile
- City of Montgomery
- Department of Conservation and Natural Resources
- Department of Environmental Management
- Geological Survey of Alabama
- South Alabama Regional Planning Commission
- State Legislature Natural Resources Committee
- Town of Dauphin Island

Florida

- Governor’s Office
- Bay County
- Citrus County
- City of Destin
- City of Fort Walton Beach

City of Gulf Breeze	Lafourche Parish Coastal Zone Management
City of Panama City	Lafourche Parish Water District #1
City of Pensacola	Louisiana Geological Survey
Department of Agriculture and Consumer Services	South Lafourche Levee District
Department of Environmental Protection	St. Bernard Planning Commission
Department of State Archives, History and Records Management	State House of Representatives, Natural Resources Committee
Escambia County	State Legislature, Natural Resources Committee
Florida Emergency Response Commission	State of Louisiana Library
Florida Fish and Wildlife Conservation Commission	Terrebonne Parish
Franklin County	
Gulf County	Mississippi
Hernando County	Governor's Office
Hillsborough City-County Planning Commission	City of Bay St. Louis
Lee County	City of Gulfport
Monroe County	City of Pascagoula
North Central Florida Regional Planning Council	Department of Archives and History
Okaloosa County	Department of Environmental Quality
Pasco County	Department of Marine Resources
Santa Rosa County	Department of Wildlife, Fisheries, and Parks
Sarasota County	Jackson-George Regional Library System
Southwest Florida Regional Planning Council	Mississippi Development Authority
State Legislature Agriculture and Natural Resources Committee	State Legislature Oil, Gas, and Other Minerals Committee
Tampa Bay Regional Planning Council	
Walton County	Texas
West Florida Regional Planning Council	Governor's Office
Withlacoochee Regional Planning Council	Aransas Pass Public Library
	Attorney General of Texas
Louisiana	Chambers County Library System
Governor's Office	City of Lake Jackson
Calcasieu Parish	General Land Office
Cameron Parish	Southeast Texas Regional Planning Commission
City of Grand Isle	State Legislature Natural Resources Committee
City of Lake Charles	State Senate Natural Resources Committee
City of Morgan City	Texas Historical Commission
City of New Orleans	Texas Legislation Council
Department of Culture, Recreation, and Tourism	Texas Parks and Wildlife Department
Department of Economic Development	Texas Sea Grant
Department of Environmental Quality	Texas State Library and Archives
Department of Natural Resources	Texas Water Development Board
Department of Transportation and Development	
Department of Wildlife and Fisheries	<i>Federally Recognized Indian Tribes</i>
Houma-Terrebonne Chamber of Commerce	Alabama-Coushatta Tribe of Texas
Jefferson Parish Director	Caddo Nation of Oklahoma
Jefferson Parish President	Chitimacha Tribe of Louisiana
	Choctaw Nation of Oklahoma

Coushatta Tribe of Louisiana
 Jena Band of Choctaw Indians
 Miccosukee Tribe of Indians of Florida
 Mississippi Band of Choctaw Indians
 Poarch Band of Creek Indians
 Seminole Tribe of Florida
 Seminole Nation of Oklahoma
 Tunica-Biloxi Indian Tribe of Louisiana

Larose Intercoastal Lands, Inc.
 Linder Oil Company
 Louisiana Oil and Gas Association
 Magnum Steel Services Corp.
 Marine Safety Office
 Mid Continent Oil and Gas Association
 Nature's Way Marine, LLC
 Newfield Exploration Company
 Offshore Process Services, Inc.
 Oil and Gas Property Management, Inc.
 Phoenix International Holdings, Inc.
 Project Consulting Services
 R.B. Falcon Drilling
 Raintree Resources, Inc.
 Science Applications International Corporation
 Seneca Resources Corporation
 SEOT, Inc.
 Shell Exploration & Production Company
 Shell Offshore, Inc.
 Stone Energy Corporation
 Strategic Management Services-USA
 T. Baker Smith, Inc.
 Texas Geophysical Company, Inc.
 The SJI, LLC
The Times-Picayune
The Washington Post
 URS Corporation
 W & T Offshore, Inc.
 Waring & Associates
 WEAR-TV

Industry

Adams and Reese, LLP
 Alabama Petroleum Council
 American Petroleum Institute
 Applied Technology Research Corporation
 Area Energy LLC
 Associated Gas Distributors of Florida
 Baker Atlas
 Baker Energy
 Bepco, Inc.
 C.H. Fenstermaker & Associates, Inc.
 Century Exploration N.O., Inc.
 Chet Morrison Contractors
 Chevron U.S.A. Inc.
 C-K Associates, LLC
 Coastal Conservation Association
 Coastal Environments, Inc.
 Columbia Gulf Transmission
 Continental Shelf Associates, Inc.
 De Leon & Associates
 Ecological Associates, Inc.
 Ecology and Environment
 Ecosystem Management, Inc.
 Energy Partners, Ltd.
 EOG Resources, Inc.
 Exxon Mobil Production Company
 Florida Natural Gas Association
 Florida Petroleum Council
 Florida Power and Light
 Florida Propane Gas Association
 Freeport-McMoRan, Inc.
 General Insulation, Inc.
 Global Industries, Ltd.
 Gulf of Mexico Newsletter
 Halliburton Corporation
 Han & Associates, Inc.
 Horizon Marine, Inc.
 Industrial Vehicles International, Inc.
 J. Connor Consultants
 John Chance Land Surveys, Inc.
 L&M Botruc Rental, Inc.
 Lampl Herbert Consultants

Special Interest Groups

1000 Friends of Florida
 Alabama Oil & Gas Board
 Alabama Nature Conservancy
 Alabama Wildlife Federation
 American Cetacean Society
 Apalachee Regional Planning Council
 Apalachicola Riverkeeper
 Audubon Louisiana Nature Center
 Audubon of Florida
 Barataria-Terrebonne National Estuary Program
 Bay County Chamber of Commerce
 Bay Defense Alliance
 Capital Region Planning Commission
 Center for Marine Conservation
 Citizens Association of Bonita Beach
 Clean Gulf Associates
 Coalition to Restore Coastal Louisiana

Coastal Conservation Association
 Concerned Shrimpers of America
 Conservancy of Southwest Florida
 Earthjustice
 Florida Chamber of Commerce
 Florida Natural Area Inventory
 Florida Wildlife Federation
 Gulf and South Atlantic Fisheries
 Foundation, Inc.
 Gulf Coast Environmental Defense
 Gulf Coast Fisherman's Coalition
 Gulf Restoration Network
 Houma-Terrebonne Chamber of Commerce
 LA 1 Coalition, Inc.
 League of Women Voters of the Pensacola
 Bay Area
 Louisiana Wildlife Federation
 Manasota-88
 Marine Mammal Commission
 Mobile Bay National Estuary Program
 Natural Resources Defense Council
 Nature Conservancy
 Offshore Operators Committee
 Organized Fishermen of Florida
 Panama City Beach Convention and Visitors
 Bureau
 Pensacola Archaeological Society
 Perdido Key Association
 Perdido Key Chamber of Commerce
 Perdido Watershed Alliance
 Restore or Retreat
 Roffers Ocean Fishing Forecast Service
 Save the Manatee Club
 Sierra Club
 South Central Industrial Association
 Surfrider Foundation
 The Nature Conservancy
 The Ocean Conservancy

Ports/Docks

Alabama

Alabama State Port Authority
 Port of Mobile

Florida

Manatee County Port Authority
 Panama City Port Authority
 Port of Pensacola
 Port St. Joe Port Authority
 Tampa Port Authority

Louisiana

Abbeville Harbor and Terminal District
 Grand Isle Port Commission
 Greater Baton Rouge Port Commission
 Greater Lafourche Port Commission
 Lake Charles Harbor and Terminal District
 Plaquemines Port, Harbor and Terminal
 District
 Port of Baton Rouge
 Port of Iberia District
 Port of New Orleans
 Twin Parish Port Commission
 St. Bernard Port, Harbor and Terminal
 District
 West Cameron Port Commission

Mississippi

Mississippi State Port Authority

Texas

Brownsville Navigation District—Port of
 Brownsville
 Port Freeport
 Port Mansfield/Willacy County Navigation
 District
 Port of Beaumont
 Port of Corpus Christi Authority
 Port of Galveston
 Port of Houston Authority
 Port of Isabel—San Benito Navigation
 District
 Port of Port Arthur Navigation District

Educational Institutions/Research Laboratories

Abilene Christian University
 Dauphin Island Sea Laboratory
 Florida A&M University
 Florida Institute of Oceanography
 Florida Institute of Technology
 Florida Sea Grant College
 Florida State University
 Foley Elementary School
 Gulf Coast Research Laboratory
 Gulf Coast State College
 Harbor Branch Oceanography
 Louisiana Sea Grant College Program
 Louisiana State University
 Louisiana Tech University
 Louisiana Universities Marine Consortium
 Loyola University
 McNeese State University

Mississippi State University	University of Mississippi
Mississippi-Alabama Sea Grant Consortium	University of New Orleans
Mote Marine Laboratory	University of South Alabama
Nicholls State University	University of South Florida
Pensacola Junior College	University of Southern Mississippi
Tulane University	University of Texas at Arlington
	University of Texas at Austin
University of Alabama	University of Texas Law School
University of Florida	University of Texas Libraries
University of Louisiana at Lafayette	University of West Florida
University of Miami	

5.6 COASTAL ZONE MANAGEMENT ACT

The Federal agency performs a consistency review pursuant to the Coastal Zone Management Act (CZMA), and CDs are prepared for each coastal State with a federally approved Coastal Management Plan prior to each of the proposed lease sales. To prepare the CDs, BOEM reviews each State's approved Coastal Management Plan and analyzes the potential impacts as outlined in this Multisale EIS, new information, and applicable studies as they pertain to the enforceable policies of each Coastal Management Program (CMP). The CZMA requires that Federal actions that are reasonably likely to affect any land or water use or natural resource of the coastal zone be "consistent to the maximum extent practicable" with relevant enforceable policies of the State's federally approved coastal management program (15 CFR part 930 subpart C).

Based on these and other analyses, BOEM's Gulf of Mexico OCS Region's Regional Director makes an assessment of consistency, which is then sent to the States of Texas, Louisiana, Mississippi, Alabama, and Florida for proposed regionwide lease sales; to Texas and Louisiana for proposed WPA lease sales; or Louisiana, Mississippi, Alabama, and Florida for proposed CPA and/or EPA lease sales. If the State concurs, BOEM can proceed with the proposed lease sale. A State's concurrence may be presumed when a State does not provide a response within the 60-day review period. A State may request an extension of time to review the CD within the 60-day period, which the Federal agency shall approve for an extension of 15 days or less. If a State objects, it must do the following under the CZMA:

- (1) indicate how BOEM's prelease proposal is inconsistent with the State's federally approved CMP and suggest alternative measures to bring BOEM's proposal into consistency with the State's CMP; or
- (2) describe the need for additional information that would allow a determination of consistency. In the event of an objection, the Federal and State agencies should use the remaining portion of the 90-day review period to attempt to resolve their differences (15 CFR § 930.43(b)).

At the end of the 90-day review period, the Federal agency shall not proceed with the activity over a State agency's objection unless the Federal agency concludes that, under the "consistent to the maximum extent practicable" standard described in 15 CFR § 930.32, consistency with the

enforceable policies of the CMP is prohibited by existing law applicable to the Federal agency and the Federal agency has clearly described, in writing, to the CZMA State agency the legal impediments to full consistency; or, the Federal agency has concluded that its proposed action is fully consistent with the enforceable policies of the CMP, though the State agency objects. Unlike the consistency process for specific OCS plans and permits, there is no procedure for administrative appeal to the Secretary of Commerce for a Federal CD for prelease activities. In the event that there is a serious disagreement between BOEM and a State, either agency may request mediation. Mediation is voluntary, and the Secretary of Commerce would serve as the mediator. Whether there is mediation or not, the final CD is made by DOI, and it is the final administrative action for the prelease consistency process. Each Gulf State's CMP is described in **Appendix G**.

5.7 ENDANGERED SPECIES ACT

The Endangered Species Act of 1973 (16 U.S.C. §§ 1531 *et seq.*) establishes a national policy designed to protect and conserve threatened and endangered species and the ecosystems upon which they depend. BOEM and BSEE are currently in consultation with NMFS and FWS regarding the OCS oil and gas program in the Gulf of Mexico. BOEM is acting as the lead agency in the ongoing consultation, with BSEE's assistance and involvement. The programmatic consultation, which was reinitiated in 2010, was expanded in scope after the reinitiation of consultation by BOEM following the *Deepwater Horizon* explosion and oil spill, and it will include both existing and future OCS oil and gas leases in the Gulf of Mexico over a 10-year period. This consultation also considers any changes in baseline environmental conditions following the *Deepwater Horizon* explosion, oil spill, and response. The programmatic consultation will also include postlease activities associated with OCS oil- and gas-related activities in the Gulf of Mexico, including G&G and decommissioning activities. While the programmatic Biological Opinion is in development, BOEM and NMFS have agreed to interim consultations on postlease approvals.

With consultation ongoing, BOEM and BSEE will continue to comply with all reasonable and prudent measures and the terms and conditions under the existing consultations, along with implementing the current BOEM- and BSEE-required mitigation, monitoring, and reporting requirements. Based on the most recent and best available information at the time, BOEM and BSEE will also continue to closely evaluate and assess risks to listed species and designated critical habitat in upcoming environmental compliance documentation under NEPA and other statutes.

5.8 MAGNUSON-STEVENSON FISHERY CONSERVATION AND MANAGEMENT ACT

Pursuant to Section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act, Federal agencies are required to consult with the NMFS on any action that may result in adverse effects to EFH. The NMFS published the final rule implementing the EFH provisions of the Magnuson-Stevens Fisheries Conservation and Management Act (50 CFR part 600) on January 17, 2002. Certain OCS oil- and gas-related activities authorized by BOEM may result in adverse effects to EFH and therefore require EFH consultation.

BOEM prepared an EFH Assessment that describes the OCS proposed activities, analyzes the effects of the proposed activities on EFH, and identifies proposed mitigating measures (USDOJ, BOEM, 2016d). The programmatic EFH consultation covers proposed lease sales analyzed in this Multisale EIS and related activities (i.e., decommissioning and geological and geophysical). The EFH Assessment and the formalized conservation recommendations put forth by the NMFS and accepted by BOEM complete the EFH consultation. While the necessary components of the EFH consultation are complete (as per BOEM's June 8, 2012, response letter to the NMFS), there is ongoing coordination among NMFS, BOEM, and BSEE. This coordination includes annual reports from BOEM to the NMFS, meetings with regional staff, and discussions of mitigation and relevant topics. All agencies will continue to communicate for the duration of the EFH consultation (2017-2022).

5.9 NATIONAL HISTORIC PRESERVATION ACT

In accordance with the National Historic Preservation Act (54 U.S.C. §§ 300101 *et seq.*), Federal agencies are required to consider the effect of their undertakings on historic properties. The implementing regulations for Section 106 of the National Historical Preservation Act, issued by the Advisory Council on Historic Preservation (36 CFR part 800), specify the required review process. Because of the extensive geographic area analyzed in this Multisale EIS and because there will be no adverse effects to historic properties as a result of the proposed actions, BOEM will complete its Section 106 review process once BOEM has performed the necessary site-specific analysis of postlease permitted or approved activities. Additional consultations with the Advisory Council on Historic Places, State Historic Preservation Offices, federally recognized Indian Tribes, and other consulting parties may take place at that time, if appropriate. Refer to **Chapter 4.13** for more information on this review process.

As an early planning effort, BOEM initiated a request for comment on the NOI for the Multisale EIS via a formal letter to each of the affected Gulf Coast States on April 3, 2015. A 30-day comment period was provided. The State Historic Preservation Officers for Alabama, Florida, and Louisiana responded via formal letters, all concurring that no historic properties will be affected. The Florida State Historic Preservation Officer further requested to be notified and given the opportunity to comment should any cultural resources be identified off the Florida coast. No additional responses were received.

BOEM also solicited Tribal comment on the *2017-2022 Outer Continental Shelf Oil and Gas Leasing: Draft Proposed Program* via a formal letter on March 4, 2015. That letter was addressed to each of the Gulf Coast State-affiliated federally recognized Indian Tribes, including the Alabama-Coushatta Tribe of Texas, Caddo Nation of Oklahoma, Chitimacha Tribe of Louisiana, Choctaw Nation of Oklahoma, Coushatta Tribe of Louisiana, Jena Band of Choctaw Indians, Miccosukee Tribe of Indians of Florida, Mississippi Band of Choctaw Indians, Poarch Band of Creek Indians, Seminole Tribe of Florida, Seminole Nation of Oklahoma, and Tunica-Biloxi Indian Tribe of Louisiana. No comments or requests to consult have yet been received; however, BOEM continues

to invite Tribal consultation on all of its activities and will be responsive to any Tribal concerns that may arise.

Historic Preservation Fund

In 1977 the Historic Preservation Fund (54 U.S.C. §§ 303101-303103) was established to assist State and Tribal Historic Preservation Officers in their efforts to protect and preserve historic properties as set forth in the requirements of the National Historic Preservation Act. The Historic Preservation Fund is authorized at \$150 million per year and is fully funded from OCS oil and gas revenues payable to the United States under Section 9 of the OCSLA (43 U.S.C. § 1338). However, these funds are available for expenditure only when appropriated by Congress, which has never fully appropriated the available funds. Since inception, approximately \$3.3 billion of the Historic Preservation Fund remains unappropriated (National Conference of State Historic Preservation Officers, 2015).

The Historic Preservation Funds' monies may be used directly by State Historic Preservation Officers/Tribal Historic Preservation Officers or passed on as subgrants and contracts to public and private agencies, nonprofit organizations, educational institutions, and individuals. Eligible preservation projects include historic properties' survey and inventory, National Register of Historic Places' nominations, preservation education, architectural planning, historic structure reports, community preservation planning, and brick and mortar repairs to buildings (USDOJ, NPS, 2014). These historic preservation programs can further catalyze community and neighborhood revitalization, job creation, and economic development, primarily through heritage tourism and the rehabilitation of historic properties through the Historic Tax Credit, which is administered by State Historic Preservation Officers. Since the Historic Preservation Fund was implemented in 1977, the Historic Tax Credit program nationwide has rehabilitated nearly 39,000 buildings, created 2.4 million jobs, created 140,000 low- and moderate-income housing units, and leveraged \$109 billion in non-Federal investment (National Conference of State Historic Preservation Officers, 2014; USDOJ, NPS, 2014). In FY 2015, Congress allocated a total of \$56.41 million from the Historic Preservation Fund, of which \$46.925 million was awarded to State Historic Preservation Officers and \$8.985 million was awarded to Tribal Historical Preservation Officers. An additional \$500,000 was awarded for projects that will increase diversity in the National Register of Historic Places and the National Historic Landmarks Programs (National Conference of State Historic Preservation Officers, 2015).

5.10 GOVERNMENT-TO-GOVERNMENT

In accordance with Executive Order 13175, "Consultation and Coordination with Indian Tribal Governments," Federal agencies are required to establish regular and meaningful consultation and collaboration with Tribal officials in the development of Federal policies that have Tribal implications to strengthen the United States' government-to-government relationships with Indian Tribes, and to reduce the imposition of unfunded mandates upon Indian Tribes. On March 4, 2015, BOEM sent a formal letter to federally recognized Indian Tribes notifying them of the development of the *2017-2022 Outer Continental Shelf Oil and Gas Leasing Draft Proposed Program* and the Gulf of Mexico

Geological and Geophysical Activities Programmatic EIS. That letter was addressed to each of the Gulf Coast State-affiliated Indian Tribes, including the Alabama-Coushatta Tribe of Texas, Caddo Nation of Oklahoma, Chitimacha Tribe of Louisiana, Choctaw Nation of Oklahoma, Coushatta Tribe of Louisiana, Jena Band of Choctaw Indians, Miccosukee Tribe of Indians of Florida, Mississippi Band of Choctaw Indians, Poarch Band of Creek Indians, Seminole Tribe of Florida, Seminole Nation of Oklahoma, and Tunica-Biloxi Indian Tribe of Louisiana. The letter was intended to be the first step of a long-term and broad consultation effort between BOEM and the Gulf-area Tribes, inclusive of all BOEM activities that may occur under the Draft Proposed Program, as well as ongoing activities. As of this writing, no formal responses have been received in response to the March 4, 2015, letter; however, informal discussions with designated Tribal representatives are ongoing to determine if any of the individual Tribes desire continued consultations on these issues.

The Poarch Band of Creek Indians has indicated that they do not have any specific concerns with BOEM's activities on the OCS, but they would like to continue to receive notifications on BOEM's activities (McCullers, official communication, 2015). Additionally, the Jena Band of Choctaw has indicated a general concern over adverse effects to documented or undocumented prehistoric and historic sites in the CPA and requests to be notified should such effects occur, as well as to continue being notified on BOEM's activities (Shively, official communication, 2015a and 2015b).

BOEM has also analyzed environmental justice issues for minority and low-income populations, which is broadly applicable to federally recognized Indian Tribes. Further information on that analysis can be found in **Chapter 4.14.3.3**.

CHAPTER 6
REFERENCES CITED

6 REFERENCES CITED

- Adams, J.A. 1960. A contribution to the biology and postlarval development of the *Sargassum* fish, *Histrio histrio* (Linnaeus), with a discussion of the *Sargassum* complex. *Bulletin of Marine Sciences of the Gulf and Caribbean* 10:55-82.
- Adcroft, A., R. Hallberg, J.P. Dunne, B.L. Samuels, J.A. Galt, C.H. Barker, and D. Payton. 2010. Simulations of underwater plumes of dissolved oil in the Gulf of Mexico. *Geophysical Research Letters* 37, L18605. doi:10.1029/2010GL044689.
- Addis, D.T., W.F. Patterson III, M.A. Dance, and G.W. Ingram Jr. 2013. Implications of reef fish movement from unreported artificial reef sites in the northern Gulf of Mexico. *Fisheries Research* 147:349-358.
- Agardy, M.T. 1990. Preliminary assessment of the impacts of Hurricane Hugo on sea turtle populations of the eastern Caribbean. In: Richardson, T.H., J.I. Richardson, and M. Donnelly, comps. *Proceedings of the 10th Annual Workshop on Sea Turtle Biology and Conservation*, February 20-24, Hilton Island, SC. NOAA Technical Memorandum NMFS-SEFSC-278.
- Aguilar-Perera, A. and A. Tuz-Sulub. 2010. Non-native, invasive red lionfish (*Pterois volitans* [Linnaeus 1758]: Scorpaenidae), is the first recorded in the southern Gulf of Mexico, off the Northern Yucatan Peninsula, Mexico. *Aquatic Invasions*, Volume 5, Supplement 1:S9-S12.
- Air Force Air Armament Center. 2002. Eglin Gulf test and training range, final programmatic environmental assessment. RCS 97-048. Prepared by Science Applications International Corporation and submitted to Air Force Air Armament Center. Air Force Air Armament Center, Range Environmental Planning Office. Eglin Air Force Base, FL. 277 pp.
- Ajemian, M., J. Wetz, B. Shipley-Lozano, J.D. Shively, and G. Stunz. 2015. An analysis of artificial reef community structure along the northwestern Gulf of Mexico shelf: Potential impacts of "Rigs-to-Reefs" programs. *PLOS ONE* 10(5):e0126354. doi:10.1371/journal.pone.0126354.
- Al-Dahash, L.M. and H.M. Mahmoud. 2013. Harboring oil degrading bacteria: A potential mechanism of adaptation and survival in corals inhabiting oil-contaminated reefs. *Marine Pollution Bulletin* 72:364-374.
- Alexander, S.K. and J.W. Webb. 1987. Relationship of *Spartina alterniflora* growth to sediment oil content following an oil spill. In: *Proceedings, 1987 Oil Spill Conference*. April 6-9, 1988. Baltimore, MD. Washington, DC: American Petroleum Institute. Pp. 445-450.
- Ali, S., D. Norman, D. Wagner, J Ayoub, J Desroches, H. Morales, P. Price, D. Shepherd, E. Toffanin, J. Troncoso, and S. White. 2002. Combined stimulation and sand control. *Oilfield Review* 14(2):30-47. Summer 2002. Internet website: http://www.slb.com/~media/Files/resources/oilfield_review/ors02/sum02/p30_47.pdf. Accessed February 19, 2016.
- Allen, A. 2010. Observations & lessons learned: Offshore operations, *Deepwater Horizon* oil spill. Spiltec. 9 slides. Internet website: <http://www.bsee.gov/BSEE-Newsroom/Publications->

- [Library/Drilling-Forums---Aug-2010/Anchorage,-Alaska--August-26,-2010/Panel_II_Presentation_3_anchorage/](#). Posted Summer 2010. Accessed December 23, 2010.
- Almeda, A., S. Baca, C. Hyatt, and E.J. Buskey. 2014. Ingestion and sublethal effects of physically and chemically dispersed crude oil on marine planktonic copepods. *Ecotoxicology* 23:988-1003.
- Alves-Stanley, C.D., G.A.J. Worthy, and R.K. Bomde. 2010. Feeding preferences of West Indian manatees in Florida, Belize, and Puerto Rico as indicated by stable isotope analysis. *Marine Ecology Progress Series* 402:255-267.
- American Petroleum Institute (API). 2011. High production volume (HPV) chemical challenge program: Crude oil category assessment document. API Petroleum HPV Testing Group, January 14, 2011. 108 pp.
- American Petroleum Institute (API). 2015. Offshore sand control and well stimulation technology. Briefing paper. Washington, DC: American Petroleum Institute. 2 pp. Internet website: <http://www.energynation.org/wp-content/uploads/2015/03/Offshore-Sand-Control-Well-Stimulation-Technology.pdf>.
- Anchor Environmental CA, L.P. 2003. Literature review of effects of resuspended sediments due to dredging operations. Prepared for the Los Angeles Contaminated Sediments Task Force, Los Angeles, CA. 140 pp.
- Anderson, C.M. and R.P. LaBelle. 1990. Estimated occurrence rates for analysis of accidental oil spills on the U.S. outer continental shelf. *Oil & Chemical Pollution* 6:21-35.
- Anderson, C.M. and R.P. LaBelle. 1994. Comparative occurrence rates for offshore oil spills. *Spill Science & Technology Bulletin* 1(2):131-141.
- Anderson, C.M. and R.P. LaBelle. 2000. Update of comparative occurrence rates for offshore oil spills. *Spill Science & Technology Bulletin* 6(5/6):302-321.
- Anderson, C., M. Mayes, and R. Labelle. 2012. Update of occurrence rates for offshore oil spills. U.S. Dept. of the Interior, Bureau of Ocean Energy Management and Bureau of Safety and Environmental Enforcement, Herndon, VA. OCS Report BOEM 2012-069 or BSEE 2012-069. 87 pp.
- Andrew, R.K., B.M. Howe, and J.A. Mercer. 2002. Ocean ambient sound: Comparing the 1960s with the 1990s for a receiver off the California coast. *Acoustics Research Letters Online*, February 2002. Pp. 65-70.
- Antweiler, R.C., D.A. Goolsby, and H.E. Taylor. 1995. Nutrients in the Mississippi River. U.S. Dept. of the Interior, Geological Survey, Reston, VA. USGS Circular 1133.
- Aratame, N. and J. Singelmann. 2002. Effect of the oil and gas industry on commuting and migration patterns in Louisiana: 1960-1990. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 2002-072. 43 pp.

- Argonne National Laboratory, J.A. Veil, T.A. Kimmeol, and A.C. Rechner, 2005. Characteristics of produced water discharged to the Gulf of Mexico hypoxic zone. Prepared for the U.S. Dept. of Energy, National Energy Technology Laboratory. 69 pp.
- Aridjis, H. 1990. Mexico proclaims total ban on harvest of turtles and eggs. *Marine Turtle Newsletter* 50:1.
- Atauz, A.D., W. Bryant, T. Jones, and B. Phaneuf. 2006. Mica shipwreck project: Deepwater archaeological investigation of a 19th century shipwreck in the Gulf of Mexico. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 2006-072. 116 pp.
- Atkins, M., S. Mirza, J. Skinner, A. Mathew, and T. Edward. 2006. Pipeline damage assessment from Hurricane Ivan in the Gulf of Mexico. U.S. Dept. of the Interior, Minerals Management Service, Herndon, VA. TA&R 553.
- Atkins, M., T. Edward, D. Johnson, and M. Dance. 2007. Pipeline damage assessment from Hurricanes Katrina and Rita in the Gulf of Mexico. U.S. Dept. of the Interior, Minerals Management Service, Herndon, VA. TA&R 581.
- Atlas, R.M. and T.C. Hazen. 2011. Oil bioremediation: A tale of the two worst spills in U.S. history. *Environmental Science and Technology* 45:6709-6715.
- Auburn University. Samuel Ginn College of Engineering. 2012. Research brief-II: Impact of Hurricane Isaac on mobilizing Deepwater Horizon oil spill residues along Alabama's coastline – a physicochemical characterization study. September 20, 2012. 11 pp. Internet website: http://www.eng.auburn.edu/files/acad_depts/civil/oil-research-hurricane-isaac.pdf. Accessed March 26, 2015.
- Austin, D., A. Gardner, R. Higgins, J. Schrag-James, S. Sparks, and L. Stauber. 2002. Social and economic impacts of outer continental shelf activities on individuals and families. Volume II: Case studies of Morgan City and New Iberia, Louisiana. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 2002-023. 197 pp.
- Austin, D., T. McGuire, and D. Woodson. 2014a. Gulf coast communities and the fabrication and shipbuilding industry: a comparative community study. Volume 3: Technical papers. U.S. Dept. of the Interior, Bureau of Ocean Energy Management, Gulf of Mexico OCS Region, New Orleans, LA. OCS BOEM 2014-611. 241 pp.
- Austin, D., B. Marks, K. McClain, T. McGuire, B. McMahan, V. Phaneuf, P. Prakash, B. Rogers, C. Ware, and J. Whalen. 2014b. Offshore oil and *Deepwater Horizon*: Social effects on Gulf Coast communities. Volume I: Methodology, timeline, context, and communities. U.S. Dept. of the Interior, Bureau of Ocean Energy Management, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study BOEM 2014-617.
- Austin, D., S. Dosemagen, B. Marks, T. McGuire, P. Prakash, and B. Rogers. 2014c. Offshore oil and *Deepwater Horizon*: Social effects on Gulf Coast communities. Volume 2: Key economic

- sectors, NGOs, and ethnic groups. U.S. Dept. of the Interior, Bureau of Ocean Energy Management, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study BOEM 2014-618.
- Baca, B.J., T.E. Lankford, and E.R. Gundlach. 1987. Recovery of Brittany coastal marshes in the eight years following the *Amoco Cadiz* incident. In: Proceedings of the 1987 International Oil Spill Conference. Washington, DC: American Petroleum Institute. Pp. 459-464.
- Baguley, J.G., P.A. Montagna, C. Cooksey, J.L. Hyland, H.W. Bang, C. Morrison, A. Kamikawa, P. Bennetts, G. Saiyo, E. Parsons, M. Herdener, and M. Ricci. 2015. Community response of deep-sea soft-sediment metazoan meiofauna to the *Deepwater Horizon* blowout and oil spill. *Marine Ecology Progress Series* 528:127-140.
- Bahreini, R., A.M. Middlebrook, C.A. Brock, J.A. de Gouw, S.A. McKeen, L.R. Williams, K.E. Daumit, A.T. Lambe, P. Massoli, M.R. Canagaratna, R. Ahmadov, A.J. Carrasquillo, E.S. Cross, B.Ervens, J.S. Holloway, J.F. Hunter, T.B. Onasch, I.B. Pollack, J.M. Roberts, T.B. Ryerson, C. Warneke, P. Davidovits, D.R. Worsnop, and J.H. Kroll. 2012. Mass spectral analysis of organic aerosol formed downwind of the *Deepwater Horizon* oil spill: Field studies and laboratory confirmations. *Environmental Science & Technology* 46:8025-8034. doi:10.1021/es301691k.
- Bailey H. and P. Thompson. 2010. Effect of oceanographic features on fine-scale foraging movements of bottlenose dolphins. *Marine Ecology Progress Series* 418:223-233.
- Baker, J.M., M.L. Guzman, P.D. Bartlett, D.I. Little, and C.M. Wilson. 1993. Long-term fate and effects of untreated thick oil deposits on salt marshes. In: Proceedings of the 1993 International Oil Spill Conference. Washington, DC: American Petroleum Institute. Pp. 395-399.
- Baker, K., D. Epperson, G. Gitschlag, H. Goldstein, J. Lewandowski, K. Skrupky, B. Smith, and T. Turk. 2013. National standards for a protected species observer and data management program: A model using geological and geophysical surveys. U.S. Dept. of Commerce, NOAA Technical Memorandum NMFS-OPR-49. 73 pp.
- Bakhtyar, S. and M.M. Gagnon. 2012. Improvements to the environmental performance of synthetic-based drilling muds. In: Anastas, P.T., R. Boethling, and A. Voutchkova, eds. *Handbook of green chemistry: Green processes*. Volume 9: Designing safer chemicals. Weinheim, Germany: Wiley-VCH Verlag & Co. Pp. 309-328.
- Balazs, G.H. 1983. Recovery records of adult green turtles observed or originally tagged at French Frigate Shoals, northwestern Hawaiian Islands. NOAA Technical Memorandum NMFS-SWFC-36.
- Balazs, G.H. 1985. Impact of ocean debris on marine turtles: Entanglement and ingestion. In: Shomura, R.S. and H.O. Yoshida, eds. *Proceedings of the Workshop on the Fate and Impact of Marine Debris*, 26-29 November 1984, Honolulu, HI. NOAA Technical Memorandum NMFS-NOAA-TM-NMFS-SWFC-54. Pp. 387-429.
- Barbier, C.J. and S. Shushan. 2015. In the United States District Court for the Eastern District of Louisiana; In re: Oil spill by the oil rig "Deepwater Horizon" in the Gulf of Mexico, on April 20,

- 2010, this document applies to: No. 10-2771, In re: The Complaint and Petition of Triton Asset Leasing GmbH, et al. and No. 10-4536, United States of America v. BP Exploration & Production, Inc., et al. MDL 2179, Section J, Judge Barbier, Mag. Judge Shushan. Case 2:10-md-02179-CJB-SS; Document 14021; filed January 15, 2015. 44 pp.
- Barras, J.A. 2006. Land area change in coastal Louisiana after the 2005 hurricanes: A series of three maps. U.S. Dept. of the Interior, Geological Survey. Open-File Report 2006-1274. Internet website: <http://pubs.usgs.gov/of/2006/1274/>. Posted October 6, 2006.
- Barras, J.A. 2007a. Land area changes in coastal Louisiana after Hurricanes Katrina and Rita (Chapter 5). In: Farris, G.S., G.J. Smith, M.P. Crane, C.R. Demas, L.L. Robbins, and D.L. Lavoie, eds. Science and the storms: The USGS response to the hurricanes of 2005. U.S. Dept. of the Interior, Geological Survey. Geological Survey Circular 1306. Pp. 97-112. Internet website: http://pubs.usgs.gov/circ/1306/pdf/c1306_ch5_b.pdf.
- Barras, J.A., S. Beville, D. Britsch, S. Hartley, S. Hawes, J. Johnston, P. Kemp, Q. Kinler, A. Martucci, J. Porthouse, D. Reed, K. Roy, S. Sapkota, and J. Suhayda. 2003. Historical and projected coastal Louisiana land changes: 1978-2050. U.S. Dept. of the Interior, Geological Survey. Open-File Report 03-334.
- Barros, N.B. and D.K. Odell. 1990. Ingestion of plastic debris by stranded marine mammals from Florida. In: Shomura, R.S. and M.L. Godfrey, eds. Proceedings of the Second International Conference on Marine Debris, 2-7 April 1989, Honolulu, HI. U.S. Dept. of Commerce, NOAA Technical Memorandum NOAA-TM-NMFS-SWFSC-154. 746 pp.
- Batubara, D.S., D.D. Adrian, M.S. Miles, and R.F. Malone. 2014. A laboratory mesocosm as a tool to study PAH degradation in a coastal marsh wetland. In: Proceedings, International Oil Spill Conference, May 5-8, 2014, Savannah, GA. Washington, DC: American Petroleum Institute. Pp. 400-407.
- Baumann, R.H. and R.E. Turner. 1990. Direct impacts of outer continental shelf activities on wetland loss in the central Gulf of Mexico. *Environmental Geology and Water Sciences* 15(3):189-198.
- Baumgartner, M.F. 1995. The distribution of select species of cetaceans in the northern Gulf of Mexico in relation to observed environmental variables. M.S. thesis, University of Southern Mississippi.
- Bea, R.G., N.W. Lai, A.W. Niedoroda, and G.H. Moore. 1983. Gulf of Mexico shallow-water wave heights and forces. In: Proceedings, Offshore Technical Conference, Houston, TX, May 1983. OTC 4586. Pp. 49-62.
- Bearden, D.M. 2007. U.S. disposal of chemical weapons in the ocean: Background and issues for Congress; updated January 3, 2007. Congressional Research Service Report for Congress. Order Code RL33432. 22 pp. Internet website: <https://www.fas.org/sqp/crs/natsec/RL33432.pdf>.

- Beaubouef, B. 2015. Lower oil prices begin to take toll on Gulf drilling. Offshore Magazine 75(6). Internet website: <http://www.offshore-mag.com/articles/print/volume-75/issue-6/gulf-of-mexico/lower-oil-prices-begin-to-take-toll-on-gulf-drilling.html>. Accessed August 31, 2015.
- Behrens, E.W. 1988. Geology of a continental slope oil seep, northern Gulf of Mexico. American Association of Petroleum Geologists Bulletin 72(2):105-114.
- Bell, I. and D.A. Pike. 2012. Somatic growth rates of hawksbill turtles *Eretmochelys imbricata* in a northern Great Barrier Reef foraging area. Marine Ecology Progress Series 446. Pp. 275-283.
- Benfield, M.C. and T.J. Minello. 1996. Relative effects of turbidity and light intensity on reactive distance and feeding of an estuarine fish. Environmental Biology of Fishes 46:211-216.
- Bergmann, M., L. Gutow, and M. Klages. 2015. Marine anthropogenic litter. Springer Open Access. University of Gothenburg. doi:10.1007/978-3-319-16510-3.
- Berman, A.E. 2005. The debate over subsidence in coastal Louisiana and Texas. Houston Geological Society. Internet website: <http://www.hgs.org/node/4080>. Posted November 24, 2005. Accessed March 13, 2016.
- Bernhardt, S., S. Brody, H. Grover, C. Spence, Z. Tang, and B. Whitaker. 2006. Identifying potential conflict associated with oil and gas exploration in Texas state coastal waters: A multi-criteria spatial analysis. Environmental Management 38:597-617.
- Berns, D.M. 2003. Physiological responses of *Thalassia testudinum* and *Ruppia maritima* to experimental salinity levels. M.Sc. Thesis, University of South Florida, St. Petersburg, FL. 71 pp.
- Berryhill, H.L., J. R. Suter, and N.S. Hardin. 1987. Late Quaternary facies and structure, northern Gulf of Mexico: Interpretations from seismic data. American Association of Petroleum Geologists. 289 pp.
- Best, P.B., P.A.S. Canham, and N. Macleod. 1984. Patterns of reproduction in sperm whales, *Physeter macrocephalus*. Report International Whaling Commission (Special Issue 8):51-79.
- Betz, C. 2010. Official communication. Email regarding data from the National Survey on Recreation and the Environment. September 24, 2010.
- Bierman, V.J., S.C. Hinz, D. Justic, D. Scavia, J.A. Veil, K. Satterlee, M.E. Parker, and S. Wilson. 2008. Predicted impacts from offshore produced water discharges on hypoxia in the Gulf of Mexico. Society of Petroleum Engineers. SPE Projects, Facilities & Construction (No. 106814, June 2008).
- Billings, R. and D. Wilson. 2004. Data quality control and emissions inventories of OCS oil and gas production activities in the Breton area of the Gulf of Mexico: Final report. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 2004-071.

- Bindoff, N.L., J. Willebrand, V. Artale, A. Cazenave, J. Gregory, S. Gulev, K. Hanawa, C. Le Quéré, S. Levitus, Y. Nojiri, C.K. Shum, L.D. Talley, and A. Unnikrishnan. 2007. Observations; oceanic climate change and sea level. In: Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Avery, M. Tignor and H.L. Miller, eds. *Climate change 2007: The physical science basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate*. Cambridge, United Kingdom and New York, NY: Cambridge University Press.
- Birkett, S.H. and D.J. Rapport. 1999. A stress-response assessment of the northwestern Gulf of Mexico ecosystem. In: Kumpf, H., K. Steidinger, and K. Sherman, eds. *The Gulf of Mexico large marine ecosystem: Assessment, sustainability, and management*. Malden, MA: Blackwell Science, Inc. Pp. 438-458.
- Bittner, J.E. 1996. Cultural resources and the *Exxon-Valdez* oil spill: An overview. In: *Proceedings of the Exxon-Valdez Oil Spill Symposium*. American Fisheries Society Symposium 18:814-818.
- Bjorndal, K.A. 1997. Foraging ecology and nutrition of sea turtles. In: Lutz, P.L. and J.A. Musick, eds. *The biology of sea turtles*. Pp. 199-231.
- Bjorndal, K.A., A.B. Bolten, and C.J. Lagueux. 1994. Ingestion of marine debris by juvenile sea turtles in coastal Florida habitats. *Marine Pollution Bulletin* 28(3):154-158.
- Bjorndal, K.A., B.A. Schroeder, A.M. Foley, B.E. Witherington, M. Bresette, D. Clark, R.M. Herren, M.D. Arendt, J.R. Schmid, A.B. Meylan, P.A. Meylan, J.A. Provancha, K.M. Hart, M.M. Lamont, R.R. Carthy, and A.B. Bolten. 2013. Temporal, spatial, and body size effects on growth rates of loggerhead sea turtles (*Caretta caretta*) in the northwest Atlantic. *Marine Biology*. 13 pp. doi:10.1007/s00227-013-2264-y.
- Blake, N.J. and D.L. Johnson. 1976. Oxygen production-consumption of the pelagic *Sargassum* community in a flow-through system with arsenic additions. *Deep Sea Research and Oceanographic Abstracts* 23(8):773-778. doi:10.1016/S0011-7471(76)80020-4.
- Blum, M.D. and H.H. Roberts. 2009. Drowning of the Mississippi Delta due to insufficient sediment supply and global sea-level rise. *Nature Geoscience* 2:488-491.
- Boehm, P.D. and D.L. Fiest. 1982. Subsurface distributions of petroleum from an offshore well blowout. The *Ixtoc 1* blowout, Bay of Campeche. *Environmental Science & Technology* 16(2):67-74.
- Boehm, P., D. Turton, A. Raval, D. Caudle, D. French, N. Rabalais, R. Spies, and J. Johnson. 2001. Deepwater program: Literature review, environmental risks of chemical products used in Gulf of Mexico deepwater oil and gas operations. Volume I: Technical report. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 2001-011. 326 pp.

- Boesch, D.F., M.N. Josselyn, A.J. Mehta, J.T. Morris, W.K. Nuttle, C.A. Simestad, and D.J.P. Swift. 1994. Scientific assessment of coastal wetland loss, restoration and management in Louisiana. *Journal of Coastal Research*, Special Issue No. 20.
- Bologna, P.A.X. and K.L. Heck, Jr. 1999. Macrofaunal associations with seagrass epiphytes: Relative importance of trophic and structural characteristics. *Journal of Experimental Marine Biology and Ecology* 242(1):21-39.
- Borkhataria, R.R., P.C. Frederick, R. Hylton, A.L. Bryan, Jr., and J.A. Rodgers, Jr. 2008. A preliminary model of wood stork population dynamics in the southeastern United States. *Waterbirds* 31(Special Publication 1):S42-S49.
- Borrell, A. 1993. PCB and DDTs in blubber of cetaceans from the northeastern North Atlantic. *Marine Pollution Bulletin* 26:146-151.
- Bortone, S.A., P.A. Hastings, and S.B. Collard. 1977. The pelagic *Sargassum* ichthyofauna of the eastern Gulf of Mexico. *Northeast Gulf Science* 1:60-67.
- Bossart, G.D. 2006. Marine mammals as sentinel species for oceans and human health. *Oceanography* 19(2):134-137.
- Boulon, R., Jr. 1989. Virgin Islands turtle tag recoveries outside the U.S. Virgin Islands. In: Eckert, S.A., K.L. Eckert, and T.H. Richardson, comps. *Proceedings of the 9th Annual Workshop on Sea Turtle Conservation and Biology*. NOAA Technical Memorandum NMFS/SEFC-232. Pp. 207-209.
- Boulon, R., Jr. 1994. Growth rates of wild juvenile hawksbill turtles, *Eretmochelys imbricata*, in St. Thomas, U.S. Virgin Islands. *Copeia* 1994(3):811-814.
- Boulon, R., Jr. 2000. Trends in sea turtle strandings, US Virgin Islands: 1982 to 1997. U.S. Dept. of Commerce. NOAA Technical Memorandum NMFS-SEFSC 436. Pp. 261-263.
- Boulton, R.L., J.L. Lockwood, and M.J. Davis. 2009. Recovering small Cape Sable seaside sparrow (*Ammodramus maritimus mirabilis*) subpopulations: Breeding and dispersal of sparrows in the eastern Everglades 2008. A report to the U.S. Dept. of the Interior, Fish and Wildlife Service, South Florida Ecological Service Office, Vero Beach, FL, and the U.S. Dept. of the Interior, National Park Service, Everglades National Park, Homestead, FL.
- Bounds, J.K. 2012. Drilling by the numbers, again: The economic impact of gas exploration offshore of Mississippi. Published January 23, 2012, and updated February 13, 2012. 18 pp. Internet website: <http://www.healthygulf.org/sites/default/files/DrillbyNos.pdf>. Accessed September 10, 2015.
- Bowen, W.W. 1968. Variation and evolution of Gulf coast populations of beach mice, *Peromyscus polionotus*. *Bulletin of the Florida State Museum, Biological Sciences* 12(1):1-91.
- Bowers, Q.D. 2008. *The treasure ship S.S. New York: Her story, 1837-1846*. New York, NY: Stacks. 94 pp.

- Bozlaker A., J.M. Prospero, M.P. Frazer, and S. Chellam. 2013. Quantifying the contribution of long-range Saharan dust transport on particulate matter concentrations in Houston, Texas, using detailed elemental analysis. *Environmental Science & Technology* 47:10179-10187.
- Brady, S. and J. Boreman. 1994. Sea turtle distributions and documented fishery threats off the northeastern United States coast. In: *Proceedings, 13th Annual Symposium on Sea Turtle Biology and Conservation*, February 23-27, Jekyll Island, GA. NOAA Technical Memorandum NMFS-SEFSC-341. Pp. 31-34.
- Bresette, M., J. Gorham, and B. Peery. 1998. Site fidelity and size frequencies of juvenile green turtles (*Chelonia mydas*) utilizing near shore reefs in St. Lucie County, Florida. *Marine Turtle Newsletter* 82(5).
- Brewton, R.A., R. Fulford, and R.J. Griffitt. 2013. Gene expression and growth as indicators of effects of the BP Deepwater Horizon oil spill on spotted seatrout (*Cynoscion nebulosus*). *Journal of Toxicology and Environmental Health, Part A*, 76:1198-1209.
- Bright, T.J. and R. Rezak. 1978. Northwestern Gulf of Mexico topographic features study: Final report. U.S. Dept. of the Interior, Bureau of Land Management, New Orleans OCS Office, New Orleans, LA. Contract No. AA.550-CTZ-15. Publication No. 1978-4. 692 pp. Internet website: <http://www.data.boem.gov/PI/PDFImages/ESPIS/3/4069.pdf>.
- Bright, T.J., R. Rezak, A.H. Bouma, W.R. Bryant, and W.E. Pequegnat. 1976. A biological and geological reconnaissance of selected topographical features on the Texas continental shelf. Final report to the U.S. Dept. of the Interior, Bureau of Land Management, New Orleans OCS Office, New Orleans, LA. Contract No. 08550-CT5-4. Publication No. 1976-2. 381 pp. Internet website: <http://www.data.boem.gov/PI/PDFImages/ESPIS/4/4106.pdf>.
- British Petroleum. 2015. BP Exploration and Production, Inc., Development and Operations Coordination Document Plan S-7706 (public information copy). 58 pp.
- Britsch, L.D. and J.B. Dunbar. 1993. Land loss rates: Louisiana coastal plain. *Journal of Coastal Research* 9(2):324-338.
- Brock, C.A., R. Bahreini, A.M. Middlebrook, J.A. de Gouw, S.A. McKeen, L.R. Williams, K.E. Daumit, A.T. Lambe, P. Massoli, M.R. Canagaratna, R. Ahmadov, A.J. Carrasquillo, E.S. Cross, B. Ervens, J.S. Holloway, J.F. Hunter, T.B. Onasch, I.B. Pollack, J.M. Roberts, T.B. Ryerson, C. Warneke, P. Davidovits, D.R. Worsnop, and J.H. Kroll. 2012. Mass spectral analysis of organic aerosol formed downwind of the *Deepwater Horizon* oil spill: Field studies and laboratory confirmations. *Environmental Science & Technology* 46:8025-8034. doi:10.1021/es301691k.
- Brooks, J.M., ed. 1991. Mississippi-Alabama continental shelf ecosystem study: Data summary and synthesis. Volume I: Executive summary and Volume II: Technical summary. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 91-0062 and 91-0063. 43 and 368 pp., respectively.

- Brooks, J.M. and R.M. Darnell. 1991. Executive summary. In: Brooks, J.M. and C.P. Giammona, eds. Mississippi-Alabama continental shelf ecosystem study: Data summary and synthesis. Volume I: Executive summary. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS-91-0062. 43 pp.
- Brooks W.B. and T. Dean. 2008. Measuring the biological status of the U.S. breeding population of wood storks. *Waterbirds* 31(Special Publication):50-59.
- Brown, S., C. Hickey, B. Harrington, and R. Gill, eds. 2001. The U.S. shorebird conservation plan. 2nd edition. , Manomet, MA: Manomet Center for Conservation Sciences. 64 pp. Internet website: <http://www.shorebirdplan.org/wp-content/uploads/2013/01/USShorebirdPlan2Ed.pdf>. Accessed March 14, 2016.
- Brown-Peterson, N.J., M. Krasnec, R. Takeshita, C.N. Ryan, K.J. Griffitt, C. Lay, G.D. Mayer, K.M. Bayha, W.E. Hawkins, I. Lipton, J. Morris, and R.J. Griffitt. 2015. A multiple endpoint analysis of the effects of chronic exposure to sediment contaminated with *Deepwater Horizon* oil on juvenile Southern flounder and their associated microbiomes. *Aquatic Toxicology* 165:197-209.
- Bruseth, J.E. and T.S. Turner. 2005. From a watery grave: the discovery and excavation of La Salle's shipwreck *La Belle*. Texas Historical Commission, Austin, TX.
- Bryan, A.L., Jr., W.B. Brooks, J.D. Taylor, D.M. Richardson, C.W. Jeske and I.L. Brisbin, Jr. 2008. Satellite tracking large-scale movements of wood storks captured in the Gulf Coast region. *Waterbirds* 31(Special Publication 1): 35-41.
- Bugoni, L., L. Krause, and M.V. Petry. 2001. Marine debris and human impacts on sea turtles in southern Brazil. *Marine Pollution Bulletin* 42(12):1330-1334.
- Burks, C.M., W.B. Driggers, and K.D. Mullin. 2006. Abundance and distribution of whale sharks (*Rhincodon typus*) in the northern Gulf of Mexico. *Fisheries Bulletin* 104:579-584.
- Burns, K.A. and J.M. Teal. 1973. Hydrocarbons in the pelagic *Sargassum* community. *Deep Sea Research and Oceanographic Abstracts* 20(2):207-211. doi:10.1016/0011-7471(73)90051-X.
- Burns, K.A., S.D. Garrity, and S.C. Levings. 1993. How many years until mangrove ecosystems recover from catastrophic oil spills? *Marine Pollution Bulletin* 26(5):239-248.
- Caetano, M., M.J. Madureira, and C. Vale. 2003. Metal remobilization during resuspension of anoxic contaminated sediment: Short-term laboratory study. *Water, Air, and Soil Pollution* 143:23-40.
- Caillouet, Jr., C.W., D.J. Shaver, W.G. Teas, J.M. Nance, D.B. Revera, and A.C. Cannon. 1996. Relationship between sea turtle stranding rates and shrimp fishing intensity in the northwestern Gulf of Mexico: 1986-1989 versus 1990-1993. *Fishery Bulletin* 94:237-249.
- Cairns, S.D. 1982. Stony corals (Cnidaria: Hydrozoa, Scleractinia) of Carrie Bow Cay, Belize. *Smithsonian Contributions to the Marine Sciences* 12: 272-302.

- Cairns, S.D. 2007. Deep-water corals: An overview with special reference to diversity and distribution of deep-water scleractinian corals. *Bulletin of Marine Science* 81: 311-322.
- Caldwell, J. 2001. Acoustic activities of the seismic industry. In: McKay, M, J. Nides, W. Lang, and D. Vigil, eds. *Gulf of Mexico Marine Protected Species Workshop*, June 1999. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 2001-039. Pp. 55-68.
- Caldwell, D.K. and M.C. Caldwell. 1989. Pygmy sperm whale *Kogia breviceps* (de Blainville, 1838): Dwarf sperm whale *Kogia simus* (Owen, 1866). In: Ridgway, S.H. and R. Harrison, eds. *Handbook of marine mammals*. Vol. 4: River dolphins and the larger toothed whales. London, UK: Academic Press. Pp. 235-260.
- Camacho, M., L.D. Boada, J. Oros, P. Calabuig, M. Zumbado, and O. Luzardo. 2012. Comparative study of polycyclic aromatic hydrocarbons (PAHs) in plasma of Eastern Atlantic juvenile and adult nesting loggerhead sea turtles (*Caretta caretta*). *Marine Pollution Bulletin* 64:1974-1980.
- Camacho, M., O.P. Luzardo, L.D. Boada, L.F. Fopez-Juardo, M. Medina, M. Zumbado, and J. Oros. 2013. Potential adverse health effects of persistent organic pollutants on sea turtles: Evidences from a cross-sectional study on Cape Verde loggerhead sea turtles. *Science of the Total Environment*, Volumes 458-460:283-289.
- Camacho, M., L.D. Boada, J. Oros, P. Lopez, M. Zumbado, M. Almeida-Gonzalez, and O.P. Luzardo. 2014. Monitoring organic and inorganic pollutants in juvenile live sea turtles: Results from a study of *Chelonia mydas* and *Eretmochelys imbricata* in Cape Verde. *Science of the Total Environment* 481:303-310.
- Cameron, B., Jr. and T. Matthews. 2016. OCS regulatory framework for the Gulf of Mexico region. U.S. Dept. of the Interior, Bureau of Ocean Energy Management, Gulf of Mexico OCS Region, New Orleans, LA. OCS Report BOEM 2016-014. 24 pp.
- Campbell, T., L. Benedict, and C.W. Finkl. 2005. Regional strategies for coastal restoration along Louisiana barrier islands. *Journal of Coastal Research*, Special Issue 44. Pp. 245-267.
- Candler, J.E. and R.J. Primeaux. 2003. Field measurements of barite discharges in the Gulf of Mexico. Society of Petroleum Engineers, Inc. SPE 80568.
- Carls, M.G., G.D. Marty, T.R. Meyers, R.E. Thomas, and S.D. Rice. 1998. Expression of viral hemorrhagic septicemia virus in prespawning Pacific herring (*Clupea pallasii*) exposed to weathered crude oil. *Canadian Journal of Fisheries and Aquatic Sciences* 55(10):2300-2309.
- Carlson, P.R., Jr. and K. Madley. 2007. Statewide summary for Florida. In: Handley, D.A., D. Altzman, and R. DeMay, eds. *Seagrass status and trends in the northern Gulf of Mexico: 1940-2002*. U.S. Dept. of the Interior, Geological Survey, Scientific Investigations Report 2006-5287 and U.S. Environmental Protection Agency, 855-R-04-003. Pp. 99-114. Internet website: <http://pubs.usgs.gov/sir/2006/5287/pdf/StatewideSummaryforFlorida.pdf>.

- Carney, R. 1993. Presentation at the Thirteenth Gulf of Mexico Information Transfer Meeting, December 4-6, 1993. Sponsored by the U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA.
- Carney, R.S. 1997. Workshop on environmental issues surrounding deepwater oil and gas development: Final report. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 98-0022. 148 pp.
- Carney, R.S. 1999. Status of environmental and physical oceanography information on the continental slope in the Gulf of Mexico—results of a workshop. In: McKay, M. and J. Nides, eds. Proceedings: Seventeenth Annual Gulf of Mexico Information Transfer Meeting, December 1997. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 99-0042. 419 pp.
- Carpenter, E.J. and J.L. Cox. 1974. Production of pelagic *Sargassum* and a blue-green epiphyte in the western Sargasso Sea. *Limnology and Oceanography* 19(3):429-436.
- Carr, A.F., Jr. 1980. Some problems of sea turtle ecology. *American Zoologist* 20:489-498.
- Carr, A. 1987a. New perspectives on the pelagic stages of sea turtle development. *Conservation Biology* 1:103-121.
- Carr, A. 1987b. Impact of non-degradable marine debris on the ecology and survival outlook of sea turtles. *Marine Pollution Bulletin* 18:352-356.
- Carr, M.H. and M.A. Hixon. 1997. Artificial reefs: The importance of comparisons with natural reefs. *Fisheries* 22(4):28-3.
- Carr, A. and A.B. Meylan. 1980. Evidence of passive migration of green turtle hatchlings in *Sargassum*. *American Society of Ichthyologists and Herpetologists* 2:366-368.
- Carr, R.S., D.C. Chapman, B.J. Presley, J.M. Biedenbach, L. Robertson, P. Boothe, R. Kilada, T. Wade, and P. Montagna. 1996. Sediment porewater toxicity assessment studies in the vicinity of offshore oil and gas production platforms in the Gulf of Mexico. *Canadian Journal of Fisheries and Aquatic Science* 53:2618-2682.
- Castellanos, D.L. and L.P. Rozas. 2001. Nekton use of submerged aquatic vegetation, marsh, and shallow unvegetated bottom in the Atchafalaya River Delta, a Louisiana tidal freshwater ecosystem. *Estuaries* 24(2):184-197.
- Castro, G. 2015. Official communication. Email regarding Port Dolphin project information request.
- Chan, E.H. and H.C. Liew. 1988. A review of the effects of oil-based activities and oil pollution on sea turtles. In: Sasekumar, A., R. D'Cruz, and S.L.H. Lim, eds. Thirty years of marine science research and development. Proceedings of the 11th Annual Seminar of the Malaysian Society of Marine Science, 26 March 1988, Kuala Lumpur, Malaysia. Pp. 159-168.

- Chapman, P.M., E.A. Power, R.N. Dexter, and H.B. Andersen. 1991. Evaluation of effects associated with and oil platform, using the sediment quality triad. *Environmental Toxicology and Chemistry* 10:407-424.
- Cheniere Energy. 2015. Corpus Christi liquefaction project. Internet website: <http://www.cheniere.com/terminals/corpus-christi-project/>. Accessed September 14, 2015.
- Chesney, E.J., D.M. Baltz, and R.G. Thomas. 2000. Louisiana estuarine and coastal fisheries and habitats: Perspectives from a fish's eye view. *Ecological Applications* 10(2):350-366.
- Chevron. 2015. Chevron Pascagoula refinery – a success story. Internet website: <http://pascagoula.chevron.com/home/abouttherefinery.aspx>. Accessed September 25, 2015.
- Chin, C.S. and J. Church. 2010. Field report: Fort Livingston, Grand Terre Island (September 9-10, 2010). National Center for Preservation Technology and Training, Natchitoches, LA. Internet website: <http://www.ncptt.nps.gov/2011/field-report-fort-livingston-grand-terre-island/>. Accessed March 18, 2011.
- Cho, H.J. and C.A. May. 2008. Short-term spatial variations in the beds of *Ruppia maritima* (*Ruppiales*) and *Halodule wrightii* (*Cymodoceaceae*) at Grand Bay National Estuarine Research Reserve, Mississippi, USA. *Journal of the Mississippi Academy of Sciences* 53(2-3):133-145.
- Church, R.A. and D.J. Warren. 2008. Viosca Knoll wreck: Discovery and investigation of an early nineteenth-century sailing ship in 2,000 feet of water. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 2008-018. 41 pp.
- Church, J.A. and N.J. White. 2011. Sea-level rise from the late 19th to the early 21st century. *Surveys in Geophysics* 32:4-5:585-602.
- Church, R., D. Warren, R. Cullimore, L. Johnston, W. Schroeder, W. Patterson, T. Shirley, M. Kilgour, N. Morris, and J. Moore. 2007. Archaeological and biological analysis of World War II shipwrecks in the Gulf of Mexico: Artificial reef effect in deep water. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 2007-015. 387 pp.
- Clark, C.E. and J.A. Veil. 2009. Produced water volumes and management practices in the United States. U.S. Dept. of Energy, Office of Fossil Energy, National Energy Technology Laboratory. ANL/EVS/R-09/1. 64 pp. Internet website: <http://www.ipd.anl.gov/anlpubs/2009/07/64622.pdf>.
- Clarke M.R. 1962. Significance of cephalopod beaks. *Nature* 193:560-561.
- Clarke, M.R. 1976. Observation on sperm whale diving. *Journal of the Marine Biological Association of the United Kingdom* 56:809-810.
- Clarke, M.R. 1979. The head of the sperm whale. *Scientific American* 240(1):106-117.

- Clausen, C.J. and J.B. Arnold III. 1975. Magnetic delineation of individual shipwreck sites; a new control technique. *Bulletin of the Texas Archaeological Society* 46:69-86.
- Clean Gulf Associates. 2015. Equipment. Internet website: <http://www.cleangulfassoc.com/equipment>. Accessed June 11, 2015.
- Coastal Environments, Inc. (CEI). 1977. Cultural resources evaluation of the northern Gulf of Mexico continental shelf. Prepared for the U.S. Dept. of the Interior, National Park Service, Office of Archaeology and Historic Preservation, Interagency Archaeological Services, Baton Rouge, LA. 4 vols.
- Coastal Environments, Inc. (CEI). 1982. Sedimentary studies of prehistoric archaeological sites. Prepared for the U.S. Dept. of the Interior, National Park Service, Division of State Plans and Grants, Baton Rouge, LA.
- Coastal Environments, Inc. (CEI). 1986. Prehistoric site evaluation on the northern Gulf of Mexico outer continental shelf: Ground truth testing of the predictive model. Prepared for the U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA.
- Coastal Response Research Center. 2007. Submerged oil—state of the practice and research needs. Prepared by the Coastal Response Research Center, Durham, NH. 29 pp. + app.
- Colborn, T., F.S. vom Saal, and A.M. Soto. 1993. Developmental effects of endocrine-disrupting chemicals in wildlife and humans. *Environmental Health Perspectives* 101:378-384.
- Cole, D.N. 2012. Wilderness visitor experiences: Progress in research and management; 2011 April 4-7; Missoula, MT. Proceedings RMRS-P-66. Fort Collins, CO. U.S. Dept. of Agriculture, Forest Service, Rocky Mountain Research Station. 219 pp.
- Collard, S.B. and A. Lugo-Fernández. 1999. Coastal upwelling and mass mortalities of fishes and invertebrates in the northeastern Gulf of Mexico during spring and summer 1998. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 99-0049. 20 pp.
- Collard, S.B. and L.H. Ogren. 1990. Dispersal scenarios for pelagic post-hatchling sea turtles. *Bulletin of Marine Science* 47(1):464-491.
- CommonHealth ACTION. 2015. Mississippi Gulf Coast community portrait final report. National Cancer Health Disparities Geographic Intervention Project. Internet website: http://c-change.together.org/Websites/cchange/images/Disparities/GIP/MS_Gulf_Coast_Community_Portrait.pdf. Accessed September 9, 2015.
- Conant, T.A., P.H. Dutton, T. Eguchi, S.P. Epperly, C.C. Fahy, M.H. Godfrey, S.L. MacPherson, E.E. Possardt, B.A. Schroeder, J.A. Seminoff, M.L. Snover, C.M. Upite, and B.E. Witherington. 2009. Loggerhead sea turtle (*Caretta caretta*) 2009 status review under the U.S. Endangered Species Act. Report of the Loggerhead Biological Review Team to the U.S. Dept. of Commerce, National Marine Fisheries Service, August 2009. 222 pp.

- Congdon, J.D. 1989. Proximate and evolutionary constraints on energy relations of reptiles. *Physiological Zoology* 62:356-373.
- Continental Shelf Associates, Inc. (CSA). 1992. Preliminary report of potential effects of oil spilled from Texaco's proposed pipeline from Platform A in Garden Banks Block 189 to the subsea tie-in with High Island Pipeline System's (HIPS) existing pipeline in High Island Area Block A-377 (modified route). Prepared for Texaco Pipeline, Inc., Jupiter, FL.
- Continental Shelf Associates, Inc. (CSA). 2002. Deepwater program: Bluewater fishing and OCS activity, interactions between the fishing and petroleum industries in deep waters of the Gulf of Mexico. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 2002-078. 193 pp. + apps.
- Continental Shelf Associates, Inc. (CSA). 2004a. Gulf of Mexico comprehensive synthetic based muds monitoring program: Final report. Volume II: Technical. 224 pp. Internet website: <http://www.data.boem.gov/PI/PDFImages/ESPIS/2/3051.pdf>.
- Continental Shelf Associates, Inc. (CSA). 2004b. Geological and geophysical exploration for mineral resources on the Gulf of Mexico outer continental shelf: Final programmatic environmental assessment. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS EA/EIS MMS 2004-054. 466 pp.
- Continental Shelf Associates, Inc. (CSA). 2006. Effects of oil and gas exploration and development at selected continental slope sites in the Gulf of Mexico. Volume II: Technical report. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 2006-045. 636 pp.
- Continental Shelf Associates, Inc. (CSA) and LGL Ecological research Associates, Inc. 2014. Gulf of Mexico cooling water intake structure entrainment monitoring study: Final report. Prepared for the Offshore Operators Committee participants of the industry-wide cooling water intake structure entrainment monitoring study in fulfillment of the requirements for entrainment monitoring under USEPA Region 6 NPDES permit GMG290000.
- Continental Shelf Associates, Inc. (CSA) and Texas A&M University, Geochemical and Environmental Research Group (GERG). 2001. Mississippi/Alabama pinnacle trend ecosystem monitoring: Final synthesis report. U.S. Dept. of the Interior, Geological Survey, Biological Resources Division, USGS/BRD/CR-2001-0007 and Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 2001-080. 415 pp. + apps.
- Cook, C.B. and A.H. Knap. 1983. Effects of crude oil and chemical dispersant on photosynthesis in the brain coral *Diploria strigosa*. *Marine Biology* 78:21-27.
- Cordes, E.E., M.P. McGinley, E.L. Podowski, E.L. Becker, S. Lessard Pilon, S.T. Viada, and C.R. Fisher. 2008. Coral communities of the deep Gulf of Mexico. *Deep Sea Research Part I: Oceanographic Research Papers* 55(6):777-787. doi:10.1016/j.dsr.2008.03.005.

- Coston-Clements, L. and D.E. Hoss. 1983. Synopsis of data on the impact of habitat alteration on sea turtles around the southeastern United States. U.S. Dept. of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Fisheries Center, Beaufort Laboratory, Beaufort, NC.
- Coston-Clements, L., L.R. Settle, D.E. Hoss, and F.A. Cross. 1991. Utilization of the *Sargassum* habitat by marine invertebrates and vertebrates, a review. U.S. Dept. of the Interior, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, Southeast Fisheries Science Center, Beaufort Laboratory, Beaufort, NC. 32 pp.
- Cottingham, D. 1988. Persistent marine debris: Challenge and response; the federal perspective. Alaska Sea Grant College Program. 41 pp.
- Coulter, M.C., J.A. Rodgers, J.C. Ogden, and F.C. Depkin. 1999. Wood stork (*Mycteria americana*). The birds of North America online (A. Poole, ed.). Ithaca: Cornell Lab of Ornithology, retrieved from the Birds of North America Online. Internet website: <http://bna.birds.cornell.edu/bna/species/409>. doi:10.2173/bna.409.
- Council on Environmental Quality (CEQ). 1981. Memorandum for general counsels, NEPA liaisons and participants in scoping. April 30, 1981. 16 pp. Internet website: <https://ceq.doe.gov/nepa/regs/scope/scoping.htm>. Accessed October 7, 2015.
- Council of Environmental Quality (CEQ). 2010. Report regarding the Minerals Management Service's National Environmental Policy Act policies, practices, and procedures as they relate to outer continental shelf oil and gas exploration and development, August 16, 2010. 41 pp. Internet website: <http://www.whitehouse.gov/sites/default/files/microsites/ceq/20100816-ceq-mms-ocs-nepa.pdf>.
- Couvillion, B.R., J.A. Barras, G.D. Steyer, W. Sleavin, M. Fischer, H. Beck, N. Trahan, B. Griffin, and D. Heckman. 2011. Land area change in coastal Louisiana from 1932 to 2010: U.S. Geological Survey Scientific Investigations Map 3164, scale 1:265,000. 12 pp.
- Couvillion, B.R., G.D. Steyer, H. Wang, H.J. Beck, and J.M. Rybczyk. 2013. Forecasting the effects of coastal protection and restoration projects on wetland morphology in coastal Louisiana under multiple environmental uncertainty scenarios. In: Peyronnin, N. and D. Reed, eds. Louisiana's 2012 coastal master plan technical analysis. Journal of Coastal Research, Special Issue 67. Pp. 29-50. ISSN 0749-0208.
- Cox, S.A., E.H. Smith, and J.W. Tunnell, Jr. 1997. Macronektonic and macrobenthic community dynamics in a coastal saltmarsh: Phase I. Texas A&M University-Corpus Christi, Center for Coastal Studies. Technical Report No. TAMU-CC-9701-CCS. Corpus Christi, TX. 81 pp.
- Cox, J., C. Coomes, S. DiMarco, K. Donohue, G.Z. Forristall, P. Hamilton, R.R. Leben, and D.R. Watts. 2010. Study of deepwater currents in the eastern Gulf of Mexico. U.S. Dept. of the Interior, Bureau of Ocean Energy Management, Regulation and Enforcement, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study BOEMRE 2010-041. 473 pp.

- Cranford, T.W. 1992. Directional asymmetry in the odontocete forehead. *American Zoological* 32(5):104.
- Cranswick, D. 2001. Brief overview of Gulf of Mexico OCS oil and gas pipelines: Installation, potential impacts, and mitigation measures. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Report MMS 2001-067. 19 pp.
- Crececius, E., J. Trefry, J. McKinley, B. Lasorsa, and R. Trocine. 2007. Study of barite solubility and the release of trace components to the marine environment. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 2007-061. 176 pp.
- Creef, E. 2011. Official communication. Email updates on dredged material placement and volume. U.S. Dept. of the Army, Corps of Engineers, Operations Division, New Orleans District, New Orleans, LA.
- Crouse, D.T. 1982. Incidental capture of sea turtles by U.S. commercial fisheries. Unpublished report to the Center for Environmental Education, Washington, DC.
- Crowder, L.B., S.R. Hopkins-Murphy, and J.A. Royle. 1995. Effects of turtle excluder devices (TEDs) on loggerhead sea turtle strandings with implications for conservation. *Copeia* 1995(4):773-779.
- Cullinane-Thomas, C., C. Huber, and L. Koontz. 2015. 2014 National Park visitor spending effects: Economic contributions to local communities, states, and the nation. Natural Resource Report NPS/NRSS/EQD/NRR-2015/947. U.S. Dept. of the Interior, National Park Service, Fort Collins, CO.
- Cummings, W.C. 1985. Bryde's whale—*Balaenoptera edeni*. In: Ridgway, S.H. and R. Harrison, eds. Handbook of marine mammals. Volume 3: The sirenians and baleen whales. London, UK: Academic Press. Pp. 137-154.
- Cummins, R., Jr., J.B. Rivers, and P.J. Struhsaker. 1962. Exploratory fishing off the coast of North Carolina, September 1959 - July 1960. *Commercial Fish Review* 24(1):1-9.
- Curry, B.E. and J. Smith. 1997. Phylogeographic structure of the bottlenose dolphin (*Tursiops truncatus*): Stock identification and implications for management. In: Dizon, D.E., S.J. Chivers, and W.F. Perrin, eds. Molecular genetics of marine mammals. Society for Marine Mammalogy, Special Publication 3. Pp. 227-247.
- Dahl, T.E. 2005. Florida's wetlands: An update on status and trends 1985 to 1996. U.S. Dept. of the Interior, Fish and Wildlife Service, Washington, DC. 80 pp.
- Dahl, T.E. 2006. Status and trends of wetlands in the conterminous United States 1998 to 2004. U.S. Dept. of the Interior, Fish and Wildlife Service, Washington, DC. 112 pp. Internet website: <http://library.fws.gov/Pubs9/wetlands98-04.pdf>.
- Dahl, T.E. 2011. Status and trends of wetlands in the conterminous United States 2004 to 2009. U.S. Dept. of the Interior, Fish and Wildlife Service, Washington, DC. 107 pp. Internet website:

<http://www.fws.gov/wetlands/Documents/Status-and-Trends-of-Wetlands-in-the-Conterminous-United-States-2004-to-2009.pdf>.

- Dahl, K.A. and W.F. Patterson III. 2014. Habitat-specific density and diet of rapidly expanding invasive red Lionfish, *Pterois volitans*, populations in the northern Gulf of Mexico. PLOS ONE 9(8):1-13.
- Dahl, T.E. and S.M. Stedman. 2013. Status and trends of wetlands in the coastal watersheds of the conterminous United States 2004 to 2009. U.S. Dept. of the Interior, Fish and Wildlife Service and U.S. Dept. of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service. 46 pp.
- Dahlheim, M.E. and J.E. Heyning. 1999. Killer whale *Orcinus orca* (Linnaeus, 1758). In: Ridgway, S.H. and R. Harrison, eds. Handbook of marine mammals. Volume 6: Second book of dolphins. San Diego, CA: Academic Press. Pp. 281-322.
- Dalton, M.S. and S.A. Jones, comps. 2010. Southeast regional assessment project for the National Climate Change and Wildlife Center, U.S. Geological Survey. U.S. Dept. of the Interior, Geological Survey. Open-File Report 2010-1213. 38 pp. Internet website: <http://pubs.usgs.gov/of/2010/1213/>. Accessed September 14, 2015.
- Dance, M.A., W.F. Patterson, and D.T. Addis. 2011. Fish community and trophic structure at artificial reef sites in the northeastern Gulf of Mexico. Bulletin of Marine Science 87(3):301-324.
- Davenport, J., J. Wrench, J. McEnvoy, and V. Camacho-Ibar. 1990. Metal and PCB concentrations in the "Harlech" leatherback. Marine Turtle Newsletter 48:1-6.
- Davis, G.E. 1982. A century of natural change in coral distribution at the Dry Tortugas: A comparison of reef maps from 1881 and 1976. Bulletin of Marine Science 32(2): 608-623.
- Davis, C. 2014. Mississippi offshore drilling plan rejected as inadequate. Internet website: <http://www.naturalgasintel.com/articles/98782-mississippi-offshore-drilling-plan-rejected-as-inadequate>. Accessed June 30, 2014.
- Davis, R.W. and G.S. Fargion, eds. 1996. Distribution and abundance of cetaceans in the north-central western Gulf of Mexico: Final report. Volume II: Technical report. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 96-0027. 355 pp.
- Davis, R.W., G.S. Fargion, N. May, T.D. Leming, M. Baumgartner, W.E. Evans, L.J. Hansen, and K. Mullin. 1998. Physical habitat of cetaceans along the continental slope in the north-central and western Gulf of Mexico. Marine Mammal Science 14(3):490-507.
- Davis, R.W., W.E. Evans, and B. Würsig, eds. 2000. Cetaceans, sea turtles and seabirds in the northern Gulf of Mexico: Distribution, abundance and habitat associations. Volume II: Technical report. U.S. Dept. of the Interior, Geological Survey, Biological Resources Division, USGS/BRD/CR-1999-0006 and U.S. Dept. of the Interior, Minerals Management Service, Gulf of

- Mexico OCS Region, New Orleans, LA. OCS Study MMS 2000-002. 346 pp. Internet website: www.data.boem.gov/PI/PDFImages/ESPIS/3/3153.pdf. Accessed July 31, 2015.
- Davis, R.W., J.G. Ortega-Ortiz, C.A. Ribie, W.E. Evans, D.C. Biggs, P.H. Ressler, R.B. Cady, R.L. Leben, K.D. Mullin, and B. Würsig. 2002. Cetacean habitat in the northern Gulf of Mexico. *Deep Sea Research: Oceanographic Research Papers* 49:121-142. doi:10.1016/S0967-0637(01)00035-8.
- de Robertis, A., C.H. Ryer, A. Veloza, and R.D. Brodeur. 2003. Differential effects of turbidity on prey consumption of piscivorous and planktivorous fish. *Canadian Journal of Fisheries and Aquatic Sciences* 60:1517-1526.
- de Soto, N.A., N. Delorme, J. Atkins, S. Howard, J. Williams, and M. Johnson. 2013. Anthropogenic noise causes body malformations and delays development in marine larvae. *Scientific Reports* 3(2831):1-5.
- DeepFlex. 2014. DeepFlex new facility. Internet website: <http://www.deepflex.com/news/82-deepflex-new-facility>. Accessed September 24, 2015.
- Dehart, J. 2013. Northwest Florida's ports see a bright future on the world stage. *850 Business Magazine*. December-January 2013. Internet website: <http://www.850businessmagazine.com/December-January-2013/Northwest-Floridas-Ports-See-a-Bright-Future-on-the-World-Stage/>. Accessed September 24, 2015.
- DeLaune, R.D. and A.L. Wright. 2011. Projected impact of *Deepwater Horizon* oil spill on U.S. Gulf Coast wetlands. *Soil Science Society of America Journal* 75(5):1602-1612.
- DeLaune, R.D., W.H. Patrick, and R.J. Buresh. 1979. Effect of crude oil on a Louisiana *Spartina alterniflora* salt marsh. *Environmental Pollution* 20:21-31.
- DeLeo, D.M. D.V. Ruiz-Ramos, I.B. Baums, and E.E. Cordes. 2015. Response of deep-water corals to oil and chemical dispersant exposure. *Deep Sea Research Part II: Topical Studies in Oceanography*. doi:10.1016/j.dsr2.2015.02.028.
- Delphin LNG. 2015. Project overview. Internet website: <http://www.delfinlng.com/phoenix.zhtml?c=253829&p=irol-project>. Accessed September 14, 2015.
- Dennis, G.D. and T.J. Bright. 1988. Reef fish assemblages on hard banks in the northwestern Gulf of Mexico. *Bulletin of Marine Science* 43:280-307.
- Dewald, J.R. and D.A. Pike. 2013. Geographical variation in hurricane impacts among sea turtle populations. *Journal of Biogeography* 2013:1-10.
- Diercks, A-R., R.C. Highsmith, V.L. Asper, D.J. Joung, Z. Zhou, L. Guo, A.M. Shiller, S.B. Joye, A.P. Teske, N. Guinasso, T.L. Wade, and S.E. Lohrenz. 2010. Characterization of subsurface polycyclic aromatic hydrocarbons at the *Deepwater Horizon* site. *Geophysical Research Letters*, Volume 37, L20602. doi:10.1029/2010GL045046.

- Dillehay, T.D. 1989. Monte Verde: A late Pleistocene settlement in Chile. Washington, DC: Smithsonian Institution Press.
- Dinsdale, E.A. and V.J. Harriott. 2004. Assessing anchor damage on coral reefs: A case study in selection of environmental indicators. *Environmental Management* 33(1):126-139.
- Dismukes, D.E. 2010. Fact book: Offshore oil and gas industry support sectors. U.S. Dept. of the Interior, Bureau of Ocean Energy, Management, Regulation and Enforcement, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study BOEMRE 2010-042.
- Dismukes, D.E. 2011. OCS-related infrastructure fact book. Volume I: Post-hurricane impact assessment. U.S. Dept. of the Interior, Bureau of Ocean Energy, Management, Regulation and Enforcement, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study BOEMRE 2011-043.
- Dismukes, D. 2011a. Official communication. Email regarding scenario projections. Associate Director, Louisiana State University, Center for Energy Studies, Baton Rouge, LA. June 29, 2011.
- Dismukes, D. 2011b. Official communication. Email regarding tanker port areas scenario. Associate Director, Louisiana State University, Center for Energy Studies, Baton Rouge, LA. August 25, 2011.
- Dismukes, D. 2015. Official communication. Email regarding scenario projections. Director, Louisiana State University, Center for Energy Studies, Baton Rouge, LA. August 20, 2015.
- Dismukes, D.E., M. Barnett, D. Vitrano, and K. Strellec. 2007. Gulf of Mexico OCS oil and gas scenario examination: Onshore waste disposal. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Report MMS 2007-051. 5 pp.
- Ditton, R.B., H.R. Osburn, T.L. Baker, and C.E. Thailing. 2002. Demographics, attitudes, and reef management preferences of sport divers in offshore Texas waters. *ICES Journal of Marine Science*, 59:S186-S191.
- Dodd Jr, C.K. 1988. Synopsis of the biological data on the loggerhead sea turtle *Caretta caretta* (Linnaeus 1758). FWS-88(14). Florida Cooperative Fish and Wildlife Research Unit, Gainesville, FL.
- Dodge, R.E., S.C. Wyers, A.H. Knap, H.R. Frith, T.D. Sleeter, and S.R. Smith. 1984. The effects of oil and oil dispersants on hermatypic coral skeletal growth (extension rate). *Coral Reefs* 3:191-198.
- Doherty, P. and T. Fowler. 1994. An empirical test of recruitment limitation in a coral reef fish. *Science* 263:935-939.
- Dokka, R. 2006. Modern-day tectonic subsidence in coastal Louisiana. *Geology* 34(4):281-284.
- Dokken, Q., R. Lehman, J. Prouty, C. Adams, and C. Beaver. 1993. A preliminary survey of Sebree Bank (Gulf of Mexico, Port Mansfield, TX), August 23-27, 1993. Texas A&M University, Center

- for Coastal Studies, Corpus Christi, TX. Center for Coastal Studies Technical Report No. TAMU-CC-9305-CCS. 13 pp.
- Donato, K.M. 2004. Labor migration and the deepwater oil industry. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 2004-057. 123 pp.
- Doney, S.C., V.J. Fabry, R.A. Feely, and J.A. Kleypas. 2009. Ocean acidification: The other CO₂ problem. *Annual Review of Marine Science* 1:169-192.
- Donohue, K., P. Hamilton, R. Leben, R.Watts, and E. Waddell. 2008. Survey of deepwater currents in the northwestern Gulf of Mexico. Volume II: Technical report. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 2008-031. 375 pp.
- Dooley, J.K. 1972. Fishes associated with the pelagic *Sargassum* complex, with a discussion of the *Sargassum* community. *Contributions in Marine Science* 16:1-32.
- Dorn, P.B., D.C.L Wong, J. Ye, and V.A. Martin. 2011. Chemical properties affecting the environmental performance of synthetic based drilling fluids for the Gulf of Mexico. Society of Petroleum Engineers, Inc. SPE 142008.
- Doughty, C.L., A.M. Quattrini, and E.E. Cordes. 2014. Insights into the population dynamics of the deep-sea coral genus *Paramuricea* in the Gulf of Mexico. *Deep Sea Research Part II: Topical Studies in Oceanography* 99:71-82. doi:10.1016/j.dsr2.2013.05.023
- Dow Piniak, W.E., S.A. Eckert, C.A. Harms, and E.M. Stringer. 2012. Underwater hearing sensitivity of the leatherback sea turtle (*Dermochelys coriacea*): Assessing the potential effect of anthropogenic noise. U.S. Dept. of the Interior, Bureau of Ocean Energy Management, Herndon, VA. OCS Study BOEM 2012-01156. 35 pp.
- Duarte, C.M., J.J. Middelburg, and N. Caraco. 2005. Major role of marine vegetation on the oceanic carbon cycle. *Biogeosciences* 2:1-8.
- Dunnet, G.M., D.J. Crisp, G. Conan, and W.R.P. Bourne. 1982. Oil pollution and seabird populations [and discussion]. *Philosophical Transactions of the Royal Society of London B: Biological Sciences* 297(1087):413-427.
- Dunton, K.H., S.V. Shonberg, S. Herzka, P.A. Montagna, and S.A. Holt. 1998. Characterization of anthropogenic and natural disturbance on vegetated and nonvegetated bay bottom habitats in the Corpus Christi Bay National Estuarine Program Study Area. Volume II: Assessment of scarring in seagrass beds. CCBNEP-25B. 23 pp.
- Duronslet, M.J., C.W. Caillouet, S. Manzella, K.W. Indelicato, C.T. Fontaine, D.B. Revera, T. Williams, and D. Boss. 1986. The effects of an underwater explosion on the sea turtles *Lepidochelys kempi* and *Caretta caretta* with observations of effects on other marine organisms (trip report). U.S. Dept. of Commerce, National Marine Fisheries Service, Southeast Fisheries Center, Galveston, TX.

- Eastern Research Group, Inc. 2011. Analysis of the oil services contract industry in the Gulf of Mexico region. U.S. Dept. of the Interior, Bureau of Ocean Energy Management, Regulation and Enforcement, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study BOEMRE 2011-001. 216 pp.
- Eastern Research Group, Inc. 2014a. Measuring county-level tourism and recreation in the Gulf of Mexico region: Data, methods, and estimates. U.S. Dept. of the Interior, Bureau of Ocean Energy Management, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study BOEM 2014-660. 59 pp.
- Eastern Research Group, Inc. 2014b. Assessing the impacts of the *Deepwater Horizon* oil spill on tourism in the Gulf of Mexico region. U.S. Dept. of the Interior, Bureau of Ocean Energy Management, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study BOEM 2014-661. 188 pp.
- Eckert, S.A., K.L. Eckert, P. Ponganis, and G.L. Kooyman. 1989. Diving and foraging behavior of leatherback sea turtles (*Dermochelys coriacea*). *Canadian Journal of Zoology* 67:2834-2840. doi:10.1139/z89-399.
- Edney, J. 2006. Impacts of recreational scuba diving on shipwrecks in Australia and the Pacific: A review. *Micronesian Journal of the Humanities and Social Sciences* 5(1/2):201-233.
- Ehrhart, L.M. 1978. Choctawhatchee beach mouse. In: Layne, J.N., ed. *Rare and endangered biota of Florida. Volume I: Mammals.* Gainesville, FL: University Presses of Florida. Pp. 18-19.
- Ehrhart, L.M. 1989. Status report of the loggerhead turtle. In: Ogren, L., F. Berry, K. Bjorndal, H. Kumpf, R. Mast, G. Medina, H. Reichart, and R. Witham, eds. *Proceedings of the Second Western Atlantic Turtle Symposium.* NOAA Technical Memorandum NMFS-SEFC-226. Pp. 122-139.
- Ehrhart, L.M. and B.E. Witherington. 1992. Green turtle *Chelonia mydas* (Linnaeus). In: Moler, P.E., ed. *Rare and endangered biota of Florida. Volume 3.* University Press of Florida. Pp. 90-94.
- Ehrhart, L.M., D.A. Bagley, and W.E. Redfoot. 2003. Loggerhead turtles in the Atlantic Ocean: Geographic distribution, abundance, and population status. In: Bolten, A.B. and B.E. Witherington, ed. *Loggerhead sea turtles.* Washington, DC: Smithsonian Books. Pp. 157-174.
- Elango V, M. Urbano, K.R. Lemelle, and J.H. Pardue. 2014. Biodegradation of MC252 oil in oil: Sand aggregates in a coastal headland beach environment. *Frontiers in Microbiology* 5:161. doi:10.3389/fmicb.2014.00161.
- Elder, B.D. and M.P. Nott. 2008. Changing landscapes, changing demography: An individual-based model for the endangered Cape Sable seaside sparrow (*Ammodramus maritimus mirabilis*). *Journal of Applied Ecology* 45:258-268.

- Elgershuizen, J.H.B.W. and H.A.M. De Kruijf. 1976. Toxicity of crude oils and a dispersant to the stony coral *Madracis mirabilis*. *Marine Pollution Bulletin* 7(2):22-25.
- Elsner, J.B., T.H. Jagger, M. Dickinson, and D. Rowe. 2008. Improving multiseason forecasts of North Atlantic hurricane activity. *American Meteorological Society* 21:1210-1219. doi:10.1175/2007JCLI1731.1. Internet website: <http://myweb.fsu.edu/jelsner/PDF/Research/ElsnerJaggerDickinsonRowe2008.pdf>.
- Emery, W.J., K. Cherkauer, B. Shannon, and R.W. Reynolds. 1997. Hull-mounted sea surface temperatures from ships of opportunity. American Meteorological Society, Boston, MA. *Journal of Atmospheric and Oceanic Technology* 14:1237-1251.
- EnergO Engineering. 2010. Assessment of damage and failure mechanisms for offshore structures and pipelines in Hurricanes Gustav and Ike. U.S. Dept. of the Interior, Minerals Management Service, Herndon, VA. TA&R 642.
- Engås, A., S. Løkkeborg, E. Ona, and A.V. Soldal. 1996. Effects of seismic shooting on local abundance and catch rates of cod (*Gadus morhua*) and haddock (*Melanogrammus aeglefinus*). *Canadian Journal of Fisheries and Aquatic Science* 53:2238-2249.
- Engelhaupt, D., A.R. Hoelzel, C. Nicholson, A. Frantzis, S. Mesnick, S. Gero, H. Whitehead, L. Rendell, P. Miller, R. De Stefanis, A. Cañadas, S. Airoldi, and A.A. Mignucci-Giannoni. 2009. Female philopatry in coastal basins and male dispersion across the North Atlantic in a highly mobile marine species, the sperm whale (*Physeter microcephalus*). *Molecular Ecology* 18:4193-4205.
- Engler, R.E. 2012. The complex interaction between marine debris and toxic chemicals in the ocean. *Environmental Science and Technology* 46:12302-12315.
- Environment Canada. 2013. Oil properties database. Environmental Technology Centre. Internet website: <http://www.etc-cte.ec.gc.ca/databases/OilProperties/Default.aspx>. Accessed April 24, 2013.
- Epperly, S.P. and W.G. Teas. 2002. Turtle excluder devices--Are the escape openings large enough? *Fishery Bulletin* 100(3):466-474.
- Epperly, S.P., J. Braun, and A. Veishlow. 1995. Sea turtles in North Carolina waters. *Conservation Biology* 9(2):384-394. doi:10.1046/j.1523-1739.1995.9020384.x.
- Epperly, S.P., J. Braun, A.J. Chester, F.A. Cross, J.V. Merriner, P.A. Tester, and J.H. Churchill. 1996. Beach strandings as an indicator of at-sea mortality of sea turtles. *Bulletin of Marine Science* 59(2):289-297.
- Epperly, S., L. Avens, L. Garrison, T. Henwood, W. Hoggard, J. Mitchell, J. Nance, J. Poffenberger, C. Sasso, E. Scott-Denton, and C. Yeung. 2002. Analysis of sea turtle bycatch in the commercial shrimp fisheries of southeast U.S. waters and the Gulf of Mexico. U.S. Dept. of Commerce, NOAA Technical Memorandum NMFS-SEFSC-490. 88 pp.

- Epperly, S.P., J. Braun-McNeill, and P.M. Richards. 2007. Trends in catch rates of sea turtles in North Carolina, USA. *Endangered Species Research* 3(3):283-293.
- Ertfemeijer, P.L.A. and R.R.R. Lewis III. 2006. Environmental impacts of dredging on seagrass: A review. *Marine Pollution Bulletin* 52:1553-1572.
- Ernst, C.H., R.W. Barbour, and J.E. Lovich. 1994. *Turtles of the United States and Canada*. Washington, DC: Smithsonian Institution Press. 578 pp.
- Etkin, D.S. 2009. Analysis of U.S. oil spillage. American Petroleum Institute, Regulatory and Scientific Affairs Department. API Publication 356. 86 pp.
- Etnoyer, P.J. and J. Warrenchuk. 2007. A catshark nursery in a deep gorgonian field in the Mississippi Canyon, Gulf of Mexico. *Bulletin of Marine Science* 81(3):553-559.
- European Research Office of the U.S. Army. 2008. Current and historical sediment loads in the lower Mississippi River. University of Nottingham, School of Geography. Contract No. 1106-EN-01.
- Evans, D. 2006. Satellite tracking of leatherbacks reveals unexpected foraging ground. *Sea Turtle Conservancy Newsletter "Velador"* Issue 4, 2 pp. Internet website: <http://www.conserveturtles.org/velador.php?page=velart66>.
- Evans, P. and A. Bjørge. 2013. Impacts of climate change on marine mammals. *MCCIP Science Review* 2013:134-148.
- Evans, P.G.H., G.J. Pierce, and S. Panigada. 2010. Climate change and marine mammals. *Journal of the Marine Biological Association of the UK* 90:1483-1488.
- Fahrig, L. 1997. Relative effects of habitat loss and fragmentation on population extinction. *The Journal of Wildlife Management* 61(3):603-610.
- Fahrig, L. 1998. When does fragmentation of breeding habitat affect population survival? *Ecological Modelling* 105(2):273-292.
- Fahrig, L. 2001. How much habitat is enough? *Biological Conservation* 100(1):65-74.
- Fair, P.A., J. Adams, G. Mitchum, T.C. Hulsey, J.S. Refi, M. Houde, D. Muir, E. Wirth, D. Wetzel, E. Zolman, W. McFee, and G.D. Bossart. 2010. Contaminant blubber burdens in Atlantic bottlenose dolphins (*Tursiops truncatus*) from two southeastern US estuarine areas: Concentrations and patterns of PCBs, pesticides, PBDEs, PFCs, and PAHs. *Science of the Total Environment* 408:1577-1597.
- Falcy, M.R. 2011. Individual and population-level responses of the Alabama beach mouse (*Peromyscus polionotus ammobates*) to environmental variation in space and time. Iowa State University. Graduate Theses and Dissertations. Paper 12192.
- Fangman, M.S. and K.A. Rittmaster. 1994. Effects of human beach usage on the temporal distribution of loggerhead nesting activities. In: *Proceedings, 13th Annual Symposium on Sea*

- Turtle Biology and Conservation, 23-27 February, Jekyll Island, GA. NOAA Technical Memorandum NMFS-SEFSC-341.
- Fannin, M. and D. Varnado. 2015. Memorandum titled, Overview of Bureau of Ocean Energy Management (BOEM) economic impact area procedures. Delivered as part of Cooperative Agreement #M12AC00021 with Louisiana State University.
- Fanning, K., K.L. Carder, and P.R. Betzer. 1982. Sediment resuspension by coastal waters: A potential mechanism for nutrient re-cycling on the ocean's margins. *Deep Sea Research Part A: Oceanographic Research Papers* 29(8):953-965. doi:10.1016/0198-0149(82)90020-6.
- Farrell, P. and K. Nelson. 2013. Trophic level transfer of microplastic: *Mytilus edulis* (L.) to *Carcinus maenas* (L.). *Environmental Pollution* 177:1-3.
- Federal Register*. 1967. Office of the Secretary, Native fish and wildlife: Endangered species. Final rule. March 11, 1967. 32 FR 4001, pp. 4001.
- Federal Register*. 1970a. Conservation of endangered species and other fish or wildlife: List of endangered foreign fish or wildlife. Final rule. July 30, 1970. 35 FR 18319, pp. 18319-18322.
- Federal Register*. 1970b. Conservation of endangered species and other fish or wildlife: List of endangered foreign fish and wildlife. Listing of Kemp's ridley (Atlantic ridley), leatherback and hawksbill sea turtles as "endangered." Final rule. December 2, 1970. 35 FR 18319. Pp. 18319-18322.
- Federal Register*. 1973a. Secondary National Ambient Air Quality Standards for sulfur dioxide. Final rule. September 14, 1973. 38 FR 25678.
- Federal Register*. 1973b. Conservation of endangered species and other fish or wildlife: Amendments to lists of endangered fish and wildlife. Final rule. June 4, 1973. 38 FR 106, p. 14678.
- Federal Register*. 1975. Mississippi sandhill crane: Determination of critical habitat. Proposed rule. 40 FR 40521-40522. September 3, 1975.
- Federal Register*. 1977a. Endangered and threatened wildlife and plants: Determination of critical habitat for Mississippi sandhill crane. Final rule. August 8, 1977. 42 FR 152, pp. 39985-39988.
- Federal Register*. 1977b. Endangered and threatened wildlife and plants: Determination of critical habitat for six endangered species. Final rule. August 11, 1977. 42 FR 155, pp. 40685-40690.
- Federal Register*. 1978a. Listing and protecting loggerhead sea turtles as "threatened species" and population of green and olive ridley sea turtles as threatened species or "endangered species." Final rule. July 28, 1978. 43 FR 146, pp. 32800-32811.
- Federal Register*. 1978b. Determination of critical habitat for whooping crane. Final rule. May 15, 1978. 40 FR 94, pp. 20938-20942.
- Federal Register*. 1980. Ocean discharge criteria source. October 3, 1980. 45 FR 194, p. 65942.

- Federal Register*. 1984. Endangered and threatened wildlife and plants: U.S. breeding population of the wood stork determined to be endangered. Final rule. 49 FR 40, pp. 7332-7335. February 28, 1984.
- Federal Register*. 1985. Endangered and threatened wildlife and plants; determination of endangered and threatened status for the piping plover. Final rule. December 11, 1985. 50 FR 238, pp. 50726-50734.
- Federal Register*. 1987. Endangered and threatened wildlife and plants; determination of endangered and threatened status for two populations of the roseate tern. Final rule. November 2, 1987. 52 FR 211, pp. 42064-42068.
- Federal Register*. 1993. Oil and gas extraction point source category; offshore subcategory effluent limitations guidelines and new source performance standards. Final rule. March 4, 1993. 58 FR 41, pp. 12454-12512.
- Federal Register*. 1996. National Ambient Air Quality Standards for nitrogen dioxide. Final decision. October 8, 1996. 61 FR 196, pp. 52852-52856.
- Federal Register*. 1997. Hydrogen sulfide requirements for operations in the outer continental shelf. Final rule. January 27, 1997. 62 FR 17, pp. 3793-3800.
- Federal Register*. 1998. Endangered and threatened wildlife and plants; determination of endangered status for the St. Andrew beach mouse. Final rule. December 18, 1998. 63 FR 243, pp. 70053-70062.
- Federal Register*. 2006a. National Pollutant Discharge Elimination System; establishing requirements for cooling water intake structures at Phase III facilities. Final rule. June 16, 2006. 71 FR 116, pp. 35006-35046.
- Federal Register*. 2006b. National Ambient Air Quality Standards for particulate matter. Final rule. October 17, 2006. 71 FR 200, pp. 61144-61233.
- Federal Register*. 2006b. Endangered and threatened wildlife and plants; designation of critical habitat for the Perdido Key beach mouse, Choctawhatchee beach mouse, and St. Andrew beach mouse. Final rule. October 12, 2006. 71 FR 197, pp. 60238-60370.
- Federal Register*. 2006c. Endangered and threatened species: Final listing determinations for elkhorn and staghorn corals. Final rule. November 26, 2008. 71 FR 26852, pp. 26852-26861.
- Federal Register*. 2007. Endangered and threatened wildlife and plants; critical habitat revised designation for the Cape Sable Seaside Sparrow. Final rule. November 6, 2007. 72 FR 214, pp. 62736-62766.
- Federal Register*. 2008a. Record of decision for the final programmatic environmental impact statement for alternative energy development and production and alternate use of facilities on the outer continental shelf. January 10, 2008. 73 FR 7, pp. 1894-1895.

- Federal Register*. 2008b. National Ambient Air Quality Standards for lead. Final rule. November 12, 2008. 73 FR 219, pp. 66964-67062.
- Federal Register*. 2008c. National Ambient Air Quality Standards for ozone. Final rule. March 27, 2008. 73 FR 60, pp. 16436-16514.
- Federal Register*. 2008d. Endangered and threatened species; critical habitat for threatened elkhorn and staghorn corals. Final rule. November 26, 2008. 73 FR 72210, pp. 72210-72240.
- Federal Register*. 2009. Renewable energy and alternate uses of existing facilities on the outer continental shelf. Final rule. April 29, 2009. 74 FR 81, pp. 19638-19871.
- Federal Register*. 2010a. Primary National Ambient Air Quality Standards for nitrogen dioxide. Final rule. February 9, 2010. 75 FR 26, pp. 6474-6537.
- Federal Register*. 2010b. Primary National Ambient Air Quality Standard for sulfur dioxide. Final rule. June 22, 2010. 75 FR 119, pp. 35520-35603.
- Federal Register*. 2011a. Review of National Ambient Air Quality Standards for carbon monoxide. Final rule. August 31, 2011. 76 FR 169, pp. 54294-54343.
- Federal Register*. 2011b. Endangered and threatened species; determination of nine distinct population segments of loggerhead sea turtles as endangered or threatened. Final rule. September 22, 2011. 76 FR 58867, pp. 58867-58952.
- Federal Register*. 2011c. Endangered and threatened wildlife and plants; establishment of a nonessential experimental population of endangered whooping cranes in southwestern Louisiana. Final rule. February 3, 2011. 76 FR 23, pp. 6066-6084.
- Federal Register*. 2012. Standards for living organisms in ship's ballast water discharged in U.S. waters. March 23, 2012. 77 FR 57, pp. 17254-17320.
- Federal Register*. 2013. National Ambient Air Quality Standards for particulate matter. Final rule. January 15, 2013. 78 FR 10, pp. 3086-3287.
- Federal Register*. 2014a. Endangered and threatened species; critical habitat for the northwest Atlantic Ocean loggerhead sea turtle distinct population segment (DPS) and determination regarding critical habitat for the North Pacific Ocean loggerhead DPS. Final rule (50 CFR 226). July 10, 2014. 79 FR 132, pp. 39855-39912.
- Federal Register*. 2014b. Endangered and threatened wildlife and plants; final listing determinations on proposal to list 66 reef-building coral species and to reclassify elkhorn and staghorn corals. Final rule. October 10, 2014. 79 FR 53851, pp. 53851-54123.
- Federal Register*. 2014c. Endangered and threatened wildlife and plants; designation of critical habitat for the northwest Atlantic Ocean distinct population segment of the loggerhead sea turtle. Final rule. July 10, 2014. 79 FR 39855, pp. 39755-39854.

- Federal Register*. 2014d. Endangered and threatened wildlife and plants; threatened species status for the rufa red knot (*Calidris canutus Rufa*). Final rule. December 11, 2014. 79 FR 238, pp. 73706-73748.
- Federal Register*. 2014e. Endangered and threatened wildlife and plants; reclassification of the U.S. breeding population of the wood stork from endangered to threatened. Final rule. June 30, 2014. 79 FR 125, pp. 37078-37103.
- Federal Register*. 2015a. Outer continental shelf, region-wide Gulf of Mexico oil and gas lease sales for years 2017-2022. Call for information and nominations. September 4, 2015. 80 FR 172, pp. 53565-53567.
- Federal Register*. 2015b. National oil and hazardous substances pollution contingency plan. Proposed rule. January 22, 2015. 80 FR 14, pp. 3380-3446.
- Federal Register*. 2015c. Deepwater port license application: Delfin LNG, LLC, Delfin LNG deepwater port. Notice of application. July 16, 2015. 80 FR 136, pp. 42162-42165.
- Federal Register*, 2015d. RESTORE Act spill impact component allocation. September 29, 2015. 80 FR 188, pp. 58417-58421.
- Federal Register*. 2015e. Gulf of Mexico Fishery Management Council; public notice. Notice of a public meeting. May 8, 2015. 80 FR 89, p. 26546.
- Federal Register*. 2015f. Endangered and threatened wildlife; 90-day finding on a petition to list the Gulf of Mexico Bryde's whale as threatened or endangered under the Endangered Species Act. Proposed rule. April 6, 2015. 80 FR 18343, pp. 18343-18346.
- Federal Register*. 2015g. Endangered and threatened species; identification and proposed listing of eleven distinct population segments of green sea turtles (*Chelonia mydas*) as endangered or threatened and revision of current listings. Proposed rule. March 23, 2015. 80 FR 15271, pp. 15271-15337.
- Federal Register*. 2015h. Outer continental Shelf (OCS), Gulf of Mexico (GOM), oil and gas lease sales for 2017-2022. Notice of intent to prepare an environmental impact statement and notice of public scoping meetings. April 29, 2015. 80 FR 82, pp. 23818-23820.
- Federal Register*. 2016a. Fisheries of the Caribbean, Gulf, and South Atlantic; aquaculture. Final rule. January 13, 2016. 81 FR 8, pp. 1762-1800.
- Federal Register*. 2016b. Endangered and threatened wildlife and plants; 12-month finding on a petition to downlist the West Indian Manatee, and proposed rule to reclassify the West Indian Manatee as threatened. Proposed rule. January 8, 2016. 81 FR 5, pp. 999-1026.
- Felder, D.L. and D.K. Camp. 2009. Gulf of Mexico origin, waters and biota. Volume 1: Biodiversity. College Station, TX: Texas A&M University Press.

- Felder, D.L., D.K. Camp, and J.W. Tunnell Jr. 2009. An introduction to Gulf of Mexico biodiversity assessment. In: Felder, D.L. and D.K. Camp, eds. Gulf of Mexico origin, waters, and biota. Volume 1: Biodiversity. College Station, TX: Texas A&M University Press.
- Felder, D.L., B.P. Thoma, W.E. Schmidt, T. Sauvage, S. Self-Krayesky, A. Chistoserdov, H.D. Bracken-Grissom, and S. Fredericq. 2014. Seaweeds and decapod crustaceans on Gulf deep banks after the Macondo oil spill. *BioScience* 64:808-819.
- Fertl, D., A.J. Shiro, G.T. Regan, C.A. Beck, N. Adimey, L. Price-May, A. Amos, G.A.J. Worthy, and R. Crossland. 2005. Manatee occurrence in the northern Gulf of Mexico, west of Florida. *Gulf and Caribbean Research* 17:69-94.
- Fikes, R. 2013. Artificial reefs in the Gulf of Mexico: A review of Gulf state programs and key considerations. National Wildlife Federation staff report.
- Fingas, M. 1995. Oil spills and their cleanup. *Chemistry and Industry* 24:1005-1008.
- Fingas, M. 2013. The basics of oil spill cleanup, 3rd edition. Boca Raton, FL: CRC Press. 286 pp.
- Finkbeiner, E.M., B.P. Wallace, J.E. Moore, R.L. Lewison, L.B. Crowder, and A.J. Read. 2011. Cumulative estimates of sea turtle bycatch and mortality in USA fisheries between 1990 and 2007. *Biological Conservation* 144: 2719-2727.
- Fischel, M., W. Grip, and I.A. Mendelssohn. 1989. Study to determine the recovery of a Louisiana marsh from an oil spill. In: Proceedings, 1989 Oil Spill Conference, February 13-16, 1989, San Antonio, TX. Washington, DC: American Petroleum Institute. Pp. 383-387.
- Fisher, C.R. 1995. Characterization of habitats and determination of growth rate and approximate ages of the chemosynthetic symbiont-containing fauna. In: MacDonald, I.R., W.W. Schroeder, and J.M. Brooks, eds. 1995. Chemosynthetic ecosystems study: Final report. Volume 2: Technical report. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 95-0022. Pp. 5.1-5.47.
- Fisher, M. 2015. Official communication. Email regarding recreational fishing data from the Texas Parks and Wildlife Department. March 31, 2015.
- Fisher, C.R., I. Urcuyo, M.A. Simpkins, and E. Nix. 1997. Life in the slow lane: Growth and longevity of cold-seep vestimentiferans. *Marine Ecology* 18:83-94.
- Fisher, C.R., H. Roberts, E. Cordes, and B. Bernard. 2007. Cold seeps and associated communities of the Gulf of Mexico. *Oceanography* 20(4):6879.
- Fisher, C.R., A.W.J. Demopoulos, E.E. Cordes, I.B. Baums, H.K. White, and J.R. Bourque. 2014a. Coral communities as indicators of ecosystem-level impacts of the *Deepwater Horizon* spill. *BioScience* 64(9):796-807.
- Fisher, C.R., P-Y Hsing, C.L. Kaiser, D.R. Yoerger, H.H. Roberts, W.W. Shedd, E.E. Cordes, T.M. Shank, S.P. Berlet, M.G. Saunders, E.A. Larcom, and J.M. Brooks. 2014b. Footprint of

- Deepwater Horizon* blowout impact to deep-water coral communities. Proceedings of the National Academy of Science. doi:10.1073/pnas.1403492111.
- Fodrie, F.J. and K.L. Heck Jr. 2011. Response of coastal fishes to the Gulf of Mexico oil disaster. PLOS ONE 6(7):e21609.
- Fodrie, F.J., K.W. Able, F. Galvez, K.L. Heck, O.P. Jensen, P.C. López-Duarte, C.W. Martin, R.E. Turner, and A. Whitehead. 2014. Integrating organismal and population responses of estuarine fishes in Macondo spill research. BioScience 64(9):778-788.
- Foley, A.M., B.A. Schroeder, R. Hardy, S.L. MacPherson, M. Nicholas, and M.S. Coyne. 2013. Postnesting migratory behavior of loggerhead sea turtles *Caretta caretta* from three Florida rookeries. Endanger Species Research 21:129-142.
- Foley, A.M., B.A. Schroeder, R. Hardy, S.L. MacPherson, and M. Nicholas. 2014. Long-term behavior at foraging sites of adult female loggerhead sea turtles (*Caretta caretta*) from three Florida rookeries. Marine Biology 161(6):1251-1262. doi:10.1007/s00227-014-2415-9.
- Ford, B., A. Borgens, W. Bryant, D. Marshall, P. Hitchcock, C. Arias, and D. Hamilton. 2008. Archaeological excavation of the Mardi Gras shipwreck (16GM01), Gulf of Mexico continental slope. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Report MMS 2008-037. 313 pp.
- Forrest, J., E.E. Marcucci, and P. Scott. 2007. Geothermal gradients and subsurface temperatures in the northern Gulf of Mexico. Search and Discovery Article #30048. Internet website: <http://www.searchanddiscovery.com/documents/2007/07013forrest/images/forrest.pdf>.
- Francaviglia, R.V. 1998. From sail to steam. Austin, TX: University of Texas Press. 324 pp.
- Frankovich, T.A., D. Morris, and J.W. Fourqurean. 2011. Benthic macrophyte distribution and abundance in estuarine mangrove lakes and estuaries: Relationships to environmental variables. Estuaries and Coasts 34(1):20-31.
- Fraser, S.B. and G.R. Sedberry. 2008. Reef morphology and invertebrate distribution at continental shelf edge reefs in the South Atlantic Bight. Southeastern Naturalist 7:191- 206.
- Frazer, N.B., J.W. Gibbons, and J.L. Greene. 1989. Life tables of a slider turtle population. In: Gibbons, J.W., ed. Life history and ecology of the slider turtle. Washington, DC: Smithsonian Institution Press.
- Frazer, T.K., S.K. Notestein, C.A. Jacoby, C.J. Littles, S.R. Keller, and R.A. Swift. 2006. Effects of storm-induced salinity changes on submersed aquatic vegetation in Kings Bay, Florida. Estuaries and Coasts 29(6A):943-953.
- Frazier, D.E. 1967. Recent deltaic deposits of the Mississippi River: Their development and chronology. In: Sandridge, J.R., ed. Transactions Gulf Coast Association of Geological Societies 27:287-315. Internet website: <http://search.datapages.com/data/gcags/data/017/017001/pdfs/0287.pdf>.

- Frazier, J.G. 1980. Marine turtles and problems in coastal management. In: Edge, B.C., ed. Coastal Zone '80: Proceedings of the Second Symposium on Coastal and Ocean Management. Volume 3. New York, NY: American Society of Civil Engineers. Pp. 2395-2411.
- Frazier, J., T. Linton, and R. Webster. 2015. Advanced prediction of the Intra-Americas *Sargassum* season through analysis of the *Sargassum* Loop System using remote sensing technology. American Shore and Beach. Internet website: <http://seas-forecast.com/Pages/stories%20article/Papers/JeffFrazierthesisformattedforpublishingNEW.pdf>.
- Fredericq, S., N. Arakaki, O. Camacho, D. Gabriel, D. Kravesky, S. Self-Kravesky, G. Rees, J. Richards, T. Sauvage, D. Venera-Ponton, and W.E. Schmidt. 2014. A dynamic approach to the study of Rhodoliths: A case study for the northwestern Gulf of Mexico. *Cryptogamie* 35:77-98.
- Freese, L., P.J. Auster, J. Heifetz, and B.L. Wing. 1999. Effects of trawling on seafloor habitat and associated invertebrate taxa in the Gulf of Alaska. *Marine Ecology Progress Series* 182:119-126.
- Freiwald, A., J.H. Fosså, A. Grehan, T. Koslow, and J.M. Roberts. 2004. Coldwater coral reefs. UNEPWCMC, Cambridge, UK.
- French-McCay, D.P. 2004. Oil spill impact modeling: Development and validation. *Environmental Toxicology and Chemistry* 23(10):2441-2456.
- Fritts, T.H. and M.A. McGehee. 1982. Effects of petroleum on the development and survival of marine turtle embryos. Prepared for the U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. Contract No. 14-16-0009-80-946.
- Fry, B. and L.C. Anderson. 2014. Minimal incorporation of *Deepwater Horizon* oil by estuarine filter feeders. *Marine Pollution Bulletin* 80:282-287.
- FSG Social Impact Consultants. 2011. Gulf Coast regional overview. February 2011. Internet website: <http://greatertexasfoundation.org/wp-content/uploads/2011/03/Gulf-Coast-Full-Research-Loop-FINAL.pdf>. Accessed September 9, 2015.
- Fucik, K.W., T.J. Bright, and K.S. Goodman. 1984. Measurements of damage, recovery, and rehabilitation of coral reefs exposed to oil. In: Cairns, J. and A.L. Buikema, Jr., eds. Restoration of habitats impacted by oil spills. Boston, MA: Butterworth Publishers.
- Fucik, K.W., K.A. Carr, and B.J. Balcom. 1995. Toxicity of oil and dispersed oil to the eggs and larvae of seven marine fish and invertebrates from the Gulf of Mexico. In: Lane, P., ed. The use of chemicals in oil spill response. ASTM 1252. American Society for Testing and Materials, Philadelphia, PA. 343 pp.
- Gagliano, S.M. 1999. Faulting, subsidence and land loss in coastal Louisiana. In: Louisiana Coastal Wetlands Conservation and Restoration Task Force and Wetlands Conservation and Restoration Authority, Coast 2050: Toward a Sustainable Coastal Louisiana, Appendix B— Technical methods. Louisiana Dept. of Natural Resources, Baton Rouge, LA.

- Gagliano, S.M. 2005a. Effects of earthquakes, fault movements, and subsidence on the south Louisiana landscape. Reprinted from *The Louisiana Civil Engineer*, Journal of the Louisiana Section of The American Society of Civil Engineers, Baton Rouge, LA. February 2005, 13(2):5-7 and 19-22. Internet website: <http://www.coastalenv.com/EffectofEarthquakeFaultMovementsandSubsidence.pdf>.
- Gagliano, S.M. 2005b. Effects of natural fault movement on land submergence in coastal Louisiana. In: *Proceedings, 14th Biennial Coastal Zone Conference*, New Orleans, LA, July 17-21, 2005. 5 pp.
- Gales, R.S. 1982. Effects of noise of offshore oil and gas operations on marine mammals—an introductory assessment. U.S. Dept. of the Navy, Navy Oceans Systems Center, San Diego, CA. Technical Report 844.
- Galloway, B.J. and M.C. Kennicutt II. 1988. Chapter 2. The characterization of benthic habitats of the northern Gulf of Mexico. In: Galloway, B.J., ed. *Northern Gulf of Mexico continental slope study, final report: Year 4. Volume II: Synthesis report*. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 88-0053. Pp. 2-1 to 2-45.
- Galloway, B.J., L.R. Martin, and R.L. Howard, eds. 1988. *Northern Gulf of Mexico continental slope study, annual report: Year 3. Volume II: Technical narrative*. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 87-0060. 586 pp.
- Galloway, B., S. Szedlmayer, and W. Gazey. 2009. A life history review for red snapper in the Gulf of Mexico with an evaluation of the importance of offshore petroleum platforms and other artificial reefs. *Reviews in Fisheries Science* 17(1):48-67.
- Gannier, A. and G. Marty. 2015. Sperm whales ability to avoid approaching vessels is affected by the sound reception in stratified waters. *Marine Pollution Bulletin* 95:283-288.
- Garber, S.D. 1985. The integration of ecological factors affecting marine turtle nesting beach management. In: *Proceedings of the Ninth Annual Conference of the Coastal Society*, October 14-17, 1984. Atlantic City, NJ: The Coastal Society.
- Garcia-Parraga D, J.L. Crespo-Picazo, Y. Bernaldo de Quiros, V. Cervera, L. Marti-Bonmati, J. Diaz-Delgado, M. Arbelo, M.J. Moore, P.D. Jepson, and A. Fernandez. 2014. Decompression sickness ('the bends') in sea turtles. *Diseases of Aquatic Organisms* 111:191-205. doi:10.3354/dao02790.
- Gardner, J.V., P. Dartnell, and K.J. Sulak. 2002. Multibeam mapping of the pinnacles region, Gulf of Mexico. U.S. Dept. of the Interior, Geological Survey. USGS Open File Report OF02-006. Internet website: <http://geopubs.wr.usgs.gov/open-file/of02-006/>.
- Gannier, A. and G. Marty. 2015. Sperm whales ability to avoid approaching vessels is affected by the sound reception in stratified waters. *Marine Pollution Bulletin* 95:283-288.

- Garrison, E.G., C.P. Giammona, F.J. Kelly, A.R. Tripp, and G.A. Wolf. 1989. Historic shipwrecks and magnetic anomalies of the northern Gulf of Mexico: Reevaluation of archaeological resource management. Volume II: Technical narrative. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 89-0024. 241 pp.
- Garrison, L.P., L. Stokes, and C. Fairfield. 2009. Estimated bycatch of marine mammals and turtles in the U.S. Atlantic pelagic longline fleet during 2008. NOAA Technical Memorandum NMFS-SEFSC-591. 63 pp.
- Gaston, K.J., T.W. Davies, J. Bennie, and J. Hopkins. 2012. Reducing the ecological consequences of night-time light pollution: Options and developments. *Journal of Applied Ecology* 49:1256-1266. doi:10.1111/j.1365-2664.2012.02212.x.
- Gearhart II, R., D. Jones, A. Borgens, S. Laurence, T. DeMunda, and J. Shipp. 2011. Impacts of recent hurricane activity in historic shipwrecks in the Gulf of Mexico outer continental shelf. U.S. Dept. of the Interior, Bureau of Ocean Energy Management, Regulation and Enforcement, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study BOEMRE 2011-003.
- Gentner Consulting Group. 2010. Economic impacts of recreational fishing closures resulting from the Deepwater Horizon oil spill: Preliminary estimates.
- Gentner, B. and S. Steinback. 2008. The economic contribution of marine angler expenditures in the United States, 2006. NOAA Technical Memorandum NMFS-F/SPO-94.
- Geological Survey of Alabama. 1998. Governor's report: Options for development of potential natural gas reserves from central Gulf of Mexico, Mobile Area Blocks 826 and 829.
- Geraci, J.R. 1990. Physiologic and toxic effects on cetaceans. In: Geraci, J.R. and D.J. St. Aubin, eds. *Sea mammals and oil: Confronting the risks*. San Diego, CA: Academic Press. Pp. 167-197.
- Geraci, J.R. and D.J. St. Aubin. 1980. Offshore petroleum resource development and marine mammals: A review and research recommendations. *Marine Fisheries Review* 42:1-12.
- Geraci, J.R. and D.J. St. Aubin. 1982. Study of the effects of oil on cetaceans. Final report prepared for the U.S. Dept. of the Interior, Bureau of Land Management, New York OCS Office. 274 pp.
- Geraci J.R. and D.J. St. Aubin. 1983. Effects of outer continental shelf oil and gas development on marine mammals and reptiles. Wildlife Section Dept. of Pathology, Ontario Veterinary College Draft Technical Report. 57 pp.
- Geraci, J.R. and D.J. St. Aubin. 1985. Expanded studies of the effects of oil on cetaceans, part I. Final report prepared for the U.S. Dept. of the Interior, Minerals Management Service, Washington, DC.
- Geraci, J.R. and D.J. St. Aubin, eds. 1990. *Sea mammals and oil: Confronting the risks*. San Diego, CA: Academic Press, Inc. 282 pp.

- Geraci, J.R., D.J. St. Aubin, and R.J. Reisman. 1983. Bottlenose dolphins, *Tursiops truncatus*, can detect oil. *Canadian Journal of Fisheries and Aquatic Science* 40(9):1,515-1,522.
- Gero, S., J. Gordon, C. Carlson, P. Evans, and H. Whitehead. 2007. Population estimate and inter-island movement of sperm whales, *Physeter macrocephalus*, in the eastern Caribbean Sea. *Journal of Cetacean Research and Management* 9(2):143-150.
- Gerstein, E.R., L. Gerstein, S.E. Forsythe, and J.E. Blue. 1999. The underwater audiogram of the West Indian manatee (*Trichechus manatus*). *Journal of the Acoustical Society of America* 105:3,575-3,583.
- Getter, C.D., G. Cintron, B. Kicks, R.R. Lewis III, and E.D. Seneca. 1984. The recovery and restoration of salt marshes and mangroves following an oil spill. In: Cairn, J., Jr. and A.L. Buikema, Jr., eds. *Restoration of habitats impacted by oil spills*. Boston, MA: Butterworth Publishers, Ann Arbor Science Book. Pp. 65-104.
- Gilmore, M.D. and B.R. Hall. 1976. Life history, growth habits, and constructional roles of *Acropora cervicornis* in the patch reef environment. *Journal of Sediment Petrology* 46:519-522.
- Gitschlag, G.R. and B.A. Herczeg. 1994. Sea turtle observations at explosive removals of energy structures. *Marine Fisheries Review* 56(2):1-8.
- Gitschlag, G., M. Schirripa, and J. Powers. 2001. Estimation of fisheries impacts due to underwater explosives used to sever and salvage oil and gas platforms in the U.S. Gulf of Mexico. Prepared under Interagency Agreement Number 17912 between the U.S. Dept. of the Interior, Minerals Management Service and the U.S. Dept. of Commerce, National Marine Fisheries Service.
- Gittings, S.R., G.S. Boland, K.J.P. Deslarzes, D.K. Hagman, and B.S. Holland. 1992a. Long-term monitoring at the East and West Flower Garden Banks. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 92-0006. 206 pp.
- Gittings, S.R., T.J. Bright, W.W. Schroeder, W.W. Sager, J.S. Laswell, and R. Rezak. 1992b. Invertebrate assemblages and ecological controls on topographic features in the northeast Gulf of Mexico. *Bulletin of Marine Science* 50(3):435-455.
- Gochfeld, M., J. Burger, and I.C. Nisbet. 1998. Roseate tern (*Sterna dougallii*). In: Poole, A., ed. *The birds of North America online*. Number 370. Cornell Lab of Ornithology, Ithaca, NY. doi:10.2173/bna.370. Internet website: <http://bna.birds.cornell.edu/bna/species/370>. Accessed April 23, 2012.
- Goldberg, W.M. 1973. The ecology of the coral-octocoral communities off the southeast Florida coast: geomorphology, species composition, and zonation. *Bulletin of Marine Science* 23(3):465-488.
- Good, B., J. Buchtel, D. Meffert, J. Radford, K. Rhinehart, and R. Wilson. 1995. Louisiana's major coastal navigation channels. Louisiana Dept. of Natural Resources, Baton Rouge, LA. 35 pp. Internet website: http://www.ocpr.louisiana.gov/crm/D%20R%20S%20Reports/General/La.%20Navigation%20Channels/Channels_1.pdf.

- Goodbody-Gringley, G., R.M. Woollacott, and G. Giribet. 2012. Population structure and connectivity in the Atlantic scleractinian coral *Montastraea cavernosa* (Linnaeus, 1767). *Marine Ecology* 33:32-48.
- Goodbody-Gringley G, D.L. Wetzel, D. Gillon, E. Pulster, A. Miller, and K.B. Ritchie. 2013. Toxicity of *Deepwater Horizon* source oil and the chemical dispersant, CorexitH 9500, to coral larvae. *PLOS ONE* 8(1):e45574. doi:10.1371/journal.pone.0045574.
- Goodyear, A.C. 2005. Evidence for pre-Clovis sites in the eastern United States. In: Bonnicksen, R., B.T. Lepper, D. Stanford, and M.R. Waters, eds. *Paleoamerican origins: Beyond Clovis*. College Station, TX: Center for the Study of the First Americans, distributed by Texas A&M University Press. Pp. 103-112.
- Goold, J.C. and S.E. Jones. 1995. Time and frequency domain characteristics of sperm whale clicks. *Journal of the Acoustical Society of America* 98:1279-1291.
- Gordon, J. and A. Moscrop. 1996. Underwater noise pollution and its significance for whales and dolphins. In: Simmonds, M.P. and J.D. Hutchinson, eds. *The conversation of whales and dolphins*. New York, NY: John Wiley and Sons. Pp. 281-319.
- Gore, R.H. 1992. *The Gulf of Mexico*. Sarasota, FL: Pineapple Press.
- Gore, J. and T. Schaeffer. 1993. Santa Rosa beach mouse survey final performance report. 21 pp.
- Gosselink, J.G., C.L. Cordes, and J.W. Parsons. 1979. An ecological characterization study of the Chenier Plain coastal ecosystem of Louisiana and Texas. 3 vols. U.S. Dept. of the Interior, Fish and Wildlife Service. FWS/OBS-78/9 through 78/11.
- Govoni, J.J., M.A. West, L.R. Settle, R.T. Lynch, and M.D. Greene. 2008. Effects of underwater explosions on larval fish: implications for a coastal engineering project. *Journal of Coastal Research* 24(2B):228-233.
- Gower, J. and S. King. 2008. Satellite images show the movement of floating *Sargassum* in the Gulf of Mexico and Atlantic Ocean. *Nature Proceedings*, hdl:10101/npre.2008.1894.1.
- Gower, J.F.R. and S.A. King. 2011. Distribution of floating *Sargassum* in the Gulf of Mexico and the Atlantic Ocean mapped using MERIS. *International Journal of Remote Sensing*, 32(7):1917-1929
- Gower, J., C. Hu, G. Borstad, and S. King. 2006. Ocean color satellites show extensive lines of floating *Sargassum* in the Gulf of Mexico. *IEEE Transactions on Geoscience and Remote Sensing* 44(12):3619-3625.
- Gower, J.E. Young, and S. King. 2013. Satellite images suggest a new *Sargassum* source region in 2011. *Remote Sensing Letters* 4:764-773.
- Gramentz, D. 1988. Involvement of loggerhead turtle with the plastic, metal, and hydrocarbon pollution in the central Mediterranean. *Marine Pollution Bulletin* 19:11-13.

- Gramling, R. 1984. Housing in the coastal zone parishes. In: Gramling, R.B. and S. Brabant, eds. The role of outer continental shelf oil and gas activities in the growth and modification of Louisiana's coastal zone. U.S. Dept. of Commerce, National Oceanic and Atmospheric Administration; Louisiana Dept. of Natural Resources, Lafayette, LA. Interagency Agreement NA-83-AA-D-CZ025; 21920-84-02. Pp. 127-134.
- Gratto-Trevor, C., D. Amirault-Langlais, D. Catlin, F. Cuthbert, J. Fraser, S. Maddock, E. Roche, and F. Shaffer. 2012. Connectivity in piping plovers: Do breeding populations have distinct winter distributions? *The Journal of Wildlife Management* 76:348-355. doi:10.1002/jwmg.261.
- Gray, J. 2002. Biomagnification in marine systems: The perspective of an ecologist. *Marine Pollution Bulletin* 45:46-52.
- Gray, S.M., L.J. Chapman, and N.E. Mandrak. 2012. Turbidity reduces hatching success in threatened spotted gar (*Lepisosteus oculatus*). *Environmental Biology of Fishes* 75(4):1-6.
- Greater New Orleans, Inc. 2011. A study of the economic impact of the Deepwater Horizon oil spill. 144 pp.
- Green S.J., J.L. Akins, A. Maljković, and I.M. Côté. 2012. Invasive lionfish drive Atlantic coral reef fish declines. *PLOS ONE* 7:e32596. doi:10.1371/journal.pone.0032596.
- Greene, C.M., K. Blackhart, J. Nohner, A. Candelmo, and D.M. Nelson. 2014. A national assessment of stressors to estuarine fish habitats in the contiguous USA. *Estuaries and Coasts* 38(3):782-799.
- Groom, M.J. and M.A. Pascual. 1998. The analysis of population persistence: An outlook on the practice of viability analysis. In: Fiedler, P.L. and P.M. Kareiva, eds. *Conservation biology*. 2nd edition. New York, NY: Chapman and Hall. Pp. 4-27.
- Gulf Coast Ecosystem Restoration Council. 2013. Final initial comprehensive plan – restoring the Gulf Coast's ecosystem and economy. Gulf Coast Ecosystem Restoration Council. 32 pp.
- Gulf Coast Ecosystem Restoration Council. 2014. FY 2014 annual report to Congress. Gulf Coast Ecosystem Restoration Council. 20 pp.
- Gulf Coast Ecosystem Restoration Council. 2015. Resources and ecosystems sustainability, tourist opportunities and revived economies of the Gulf Coast States Act (RESTORE Act) draft initial funded priorities list. Internet website: https://restorethegulf.gov/sites/default/files/Draft_Initial_FPL_0.pdf#overlay-context=our-work/draft-initial-funded-priorities-list-draft-fpl. Accessed November 10, 2011.
- Gulf of Mexico Fishery Management Council. 1998. Generic amendment for addressing essential fish habitat requirements. Gulf of Mexico Fishery Management Council, Tampa, FL. NOAA Award No. NA87FC0003. 244 pp.
- Gulf of Mexico Fishery Management Council. 2005. Generic amendment number 3 for addressing essential fish habitat requirements, habitat areas of particular concern, and adverse effects of fishing in the following fishery management plans of the Gulf of Mexico: Shrimp fishery of the

- Gulf of Mexico, United States waters red drum fishery of the Gulf of Mexico, reef fish fishery of the Gulf of Mexico coastal migratory pelagic resources (mackerels) in the Gulf of Mexico and South Atlantic, stone crab fishery of the Gulf of Mexico, spiny lobster in the Gulf of Mexico and South Atlantic, coral and coral reefs of the Gulf of Mexico. Gulf of Mexico Fishery Management Council, Tampa, FL. 106 pp.
- Gulf of Mexico Fishery Management Council. 2010. Final report Gulf of Mexico Fishery Management Council 5-year review of the final generic amendment number 3 addressing essential fish habitat requirements, habitat areas of particular concern, and adverse effects of fishing in the fishery management plans of the Gulf of Mexico. Gulf of Mexico Fishery Management Council, Tampa, FL. Pp. 105.
- Gulf of Mexico Fishery Management Council. 2013. Final summary report: Workshop on Interrelationships between Coral Reefs and Fisheries. Gulf of Mexico Fishery Management Council, Tampa, FL. 56 pp. Internet website: <http://gulfcouncil.org/docs/Coral%20Workshop%20Final%20Summary%20Report%2009-26-13.pdf>.
- Gulf of Mexico Fishery Management Council. 2015. Gulf of Mexico Fishery Management Council. Internet website: <http://www.gulfcouncil.org/>. Accessed June 30, 2015.
- Guo, W.J., Y. Hao, L. Zhang, T. Xu, X. Ren, F. Cao, and S. Wang. 2014. Development and application of an oil spill model with wave-current interactions in coastal areas. *Marine Pollution Bulletin* 84:213-224.
- Guzmán, H.M. and I. Holst. 1993. Effects of chronic oil-sediment pollution on the reproduction of the Caribbean reef coral *Siderastrea siderea*. *Marine Pollution Bulletin* 26:276-282.
- Haag, W.G. 1992. The Monte Sano site. In: Jeter, M.D., ed. Southeastern Archaeological Conference: Abstracts of the Forty-ninth Annual Meeting, Arkansas' Excelsior Hotel, October 21-24, 1992. Little Rock, AR. 18 pp.
- Haig, S.M., C.L. Ferland, F.J. Cuthbert, J. Dingleline, J.P. Goossen, A. Hecht, and N. McPhillips. 2005. A complete species and evidence for regional declines in piping plovers. *Journal of Wildlife Management* 69:160-173.
- Hale, L.F., S.J.B. Gulak, and J.K. Carlson. 2009. Characterization of the shark bottom longline fishery, 2008. U.S. Dept. of Commerce, National Marine Fisheries Service, Southeast Fisheries Science Center, Panama City, FL. NOAA Technical Memorandum NMFS-SEFC-586.
- Hall, R.J., A.A. Belisle, and L. Sileo. 1983. Residues of petroleum hydrocarbons in tissues of sea turtles exposed to the *Ixtoc I* oil spill. *Journal of Wildlife Diseases* 19(2):106-109.
- Hamilton, P. and A. Lugo-Fernandez. 2001. Observations of high speed deep currents in the northern Gulf of Mexico. *Geophysical Research Letters* 28:2767-2870.
- Hamilton, P., J.J. Singer, E. Waddell, and K. Donuhue. 2003. Deepwater observations in the northern Gulf of Mexico from in-situ current meters and PIES: Final report. Volume II:

- Technical report. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 2003-049. 95 pp.
- Handley, D.A., D. Altsman, and R. DeMay, eds. 2007. Seagrass status and trends in the northern Gulf of Mexico: 1940-2002. U.S. Dept. of the Interior, Geological Survey Scientific Investigations Report 2006-5287 and U.S. Environmental Protection Agency 855-R-04-003. Internet website: <http://pubs.usgs.gov/sir/2006/5287/>.
- Haney, J.C. 1986. Seabird patchiness in tropical oceanic waters: The influence of *Sargassum* "reefs." *Auk* 103:141-151.
- Haney, J.L., Y. Wei, T. Myers, and S. Douglas. 2008 (unpublished). An assessment of onshore air quality impacts for the eastern Gulf Coast (Louisiana to Florida) using the 2005 Gulfwide emissions inventory. Prepared for the U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA.
- Haney, J.C., H.J. Geiger, and J.W. Short. 2014a. Bird mortality from the *Deepwater Horizon* oil spill. I. Exposure probability in the offshore Gulf of Mexico. *Marine Ecology Progress Series* 513:225-237.
- Haney, J.C., H.J. Geiger, and J.W. Short. 2014b. Bird mortality from the *Deepwater Horizon* oil spill. II. Carcass sampling and exposure probability in the coastal Gulf of Mexico. *Marine Ecology Progress Series* 513:239-252.
- Hansen, D.J. 1985. Potential effects of oil spills and other chemical pollutants on marine mammals occurring in Alaskan waters. U.S. Dept. of the Interior, Minerals Management Service, Alaska OCS Region, Anchorage, AK. OCS Study MMS 85-0031. 21 pp.
- Hansen, L.J., ed. 1992. Report on investigation of 1990 Gulf of Mexico bottlenose dolphin strandings. U.S. Dept. of Commerce, National Marine Fisheries Service, Southeast Fisheries Center, Miami, FL. Report MIA-92-93-21. 219 pp.
- Hart, A.D., K.D. Spring, J.M. Brooks, B.J. Presley, and B.A. Vittor. 1989. Fate and effects of drilling fluid and cutting discharges in shallow, nearshore waters. Washington, DC: American Petroleum Institute.
- Hart, K.M., D.G. Zawada, I. Fujisaki, and B.H. Lidz. 2010. Inter-nesting habitat-use patterns of loggerhead sea turtles: Enhancing satellite tracking with benthic mapping. *Aquatic Biology* 11(1):77-90.
- Hart, K.M., M.M. Lamont, I. Fujisaki, A.D. Tucker, and R.R. Carthy. 2012. Common coastal foraging areas for loggerheads in the Gulf of Mexico: Opportunities for marine conservation. *Biological Conservation* 145(1):185-194.
- Hart, K.M., M.M. Lamont, A.R. Sartain, I. Fujisaki, and B.S. Stephens. 2013a. Movements and habitat-use of loggerhead sea turtles in the northern Gulf of Mexico during the reproductive period. *PLOS ONE* 8(7):e66921. doi:10.1371/journal.pone.0066921.

- Hartman, D.D. 1979. Ecology and behavior of the manatee (*Trichechus manatus*) in Florida. American Society of Mammalogists Special Publication No. 5.
- Harvey, J.T. and M.E. Dahlheim. 1994. Cetaceans in oil. In: Loughlin, T.R., ed. Marine mammals and the *Exxon Valdez*. San Diego, CA: Academic Press. Pp. 257-264.
- Hausfather, Z. 2013. IPCC's new estimates for increased sea-level rise. Internet website: <http://www.yaleclimateconnections.org/2013/10/ipccs-new-estimates-for-increased-sea-level-rise/>. Posted October 23, 2013. Accessed July 2, 2014.
- Hawkins, A.D., A.E. Pembroke, and A.N. Popper. 2014. Information gaps in understanding the effects of noise on fishes and invertebrates. *Reviews in Fish Biology and Fisheries* 25(1):39-64.
- Hayes, M.O., D.D. Domeracki, C.D. Getter, T.W. Kana, and G.I. Scott. 1980. Sensitivity of coastal environments to spilled oil, south Texas coast. Research Planning Institute, Inc. Report No. RPI/R/80/4/11-12. U.S. Dept. of Commerce, National Oceanic and Atmospheric Administration, Office of Marine Pollution Assessment, Columbia, SC. 89 pp.
- Hayworth, J.S., T.P. Clement, and J.F. Valentine. 2011. *Deepwater Horizon* oil spill impacts on Alabama beaches. *Hydrology and Earth System Sciences* 15(12):3639.
- Heck, K.L., G. Hays, and R.J. Orth. 2003. Critical evaluation of the nursery role hypothesis for seagrass meadows. *Marine Ecology Progress Series* 253:123-136.
- Heck, K.L., Jr., J.F. Valentine, J.R. Pennock, G. Chaplin, and P.M. Spitzer. 2006. Effects of nutrient enrichment and grazing on shoalgrass *Halodule wrightii* and its epiphytes: Results of a field experiment. *Marine Ecology Progress Series* 326:145-156. Internet website: <http://www.int-res.com/articles/meps2006/326/m326p145.pdf>.
- Helicopter Safety Advisory Conference, 2010. Offshore (VFR) operating altitudes for helicopters. Internet website: http://www.hsac.org/portals/45/rp/rp93_1new.pdf. Accessed November 6, 2015.
- Helicopter Safety Advisory Conference. 2015. 2014 Helicopter Safety Advisory Conference (HSAC) Gulf of Mexico offshore helicopter operations and safety review. Internet website: http://hsac.org/portals/45/HSAC_2014_Report.pdf. Updated April 19, 2015. Accessed September 10, 2015.
- Helix Well Containment Group. 2015. Our response system and capabilities. Internet website: <http://www.hwccg.org/responsesystem/>. Accessed June 11, 2015.
- Hemmerling, S.A. and C.E. Colten. 2003. Environmental justice considerations in Lafourche Parish, Louisiana. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 2003-038. 354 pp.
- Henkel, J.R., B.J. Sigel, and C.M. Taylor. 2014. Oiling rates and condition indices of shorebirds on the northern Gulf of Mexico following the *Deepwater Horizon* oil spill. *Journal of Field Ornithology* 85:408-420.

- Hennige, S.J., L.C. Wicks, N.A. Kamenos, G. Perna, H.S. Findlay, and J.M. Roberts. 2015. Hidden impacts of ocean acidification to live and dead coral framework. Proceedings of the Royal Society of London B 282:20150990.
- Henriksen, J., M. Warwick, R. Munger, and S. Kay. 2015. Engineering analysis of turtle exclusion device. Proceedings of Western Dredging Association and Texas A&M University Center for Dredging Studies. Dredging Summit and Expo 2015, Houston, TX, USA, June 22-25, 2015.
- Herbst, L.H. 1994. Fibropapillomatosis in marine turtles. Annual Review of Fish Diseases 4:389-425.
- Herbst, L. 2014. Effective well control-prevention and response. U.S. Dept. of the Interior, Bureau of Safety and Environmental Enforcement, Gulf of Mexico OCS Region, New Orleans, LA. 25 slides.
- Hernandez, F.J., Jr., R.F. Shaw, J.C. Cope, J.G. Ditty, M.C. Benfield, and T. Farooqi. 2001. Across-shelf larval, postlarval, and juvenile fish communities collected at offshore oil and gas platforms and a coastal rock jetty west of the Mississippi River Delta. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 2001-077. 144 pp.
- Hersh, S.L. and D.A. Duffield. 1990. Distinction between northwest Atlantic offshore and coastal bottlenose dolphins based on hemoglobin profile and morphometry. In: Leatherwood, S. and R.R. Reeves, eds. The bottlenose dolphin. San Diego, CA: Academic Press. Pp. 129-139.
- Heyning, J.E. 1989. Cuvier's beaked whale—*Ziphius cavirostris* (G. Cuvier, 1823). In: Ridgway, S.H. and R. Harrison, eds. Handbook of marine mammals. Volume 4: River dolphins and the larger toothed whales. London, UK: Academic Press. Pp. 289-308.
- Hickerson, E.L., G.P. Schmahl, M. Robbart, B. Precht, and C. Caldw. 2008. The state of coral reef ecosystems of the Flower Garden Banks, Stetson Bank, and other banks in the northwestern Gulf of Mexico. In: Waddell, J.E. and A.M. Clarke, eds. State of coral reef ecosystems of the United States and Pacific freely associated states: 2008. NOAA Technical Memorandum NOS-NCCOS 73 Pp. 189-218.
- Hiett, R.L. and J.W. Milon. 2002. Economic impact of recreational fishing and diving associated with offshore oil and gas structures in the Gulf of Mexico: Final report. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 2002-010. 98 pp.
- Hildebrand, J.A. 2009. Anthropogenic and natural sources of ambient noise in the ocean. Marine Ecology Progress Series 395:5-20. Internet website: <http://www.int-res.com/articles/theme/m395p005.pdf>.
- Hillestad, H.O., J.I. Richardson, C. McVea, Jr., and J.M. Watson, Jr. 1982. Worldwide incidental capture of sea turtles. In: Bjorndal, K.A., ed. Biology and conservation of sea turtles. Washington, DC: Smithsonian Institution Press. Pp. 489-495.

- Hine, A.C., R.B. Halley, S.D. Locker, B.D. Jarrett, W.C. Jaap, D.J. Mallinson, K.T. Ciembronowicz, N.B. Ogden, B.T. Donahue, and D.F. Naar. 2008. Coral reefs, present and past, on the West Florida shelf and platform margin. In: Riegl, B.M. and R.E. Dodge, eds. *Coral reefs of the USA*. Dordrecht: Springer. Pp. 127-173.
- Hoff, R.Z. and G. Shigenaka. 2003. Response consideration for sea turtles. In: Shigenaka, G., ed. *Oil and sea turtles: Biology, planning, and response*. U.S. Dept. of Commerce, National Oceanic and Atmospheric Administration, Office of Response and Restoration. P. 49.
- Hoffman, G.E., J.P. Barry, P.J. Edmunds, R.D. Gates, D.A. Hutchins, T. Klinger, and M.A. Sewell. 2010. The effect of ocean acidification on calcifying organisms in marine ecosystems: An organism-to-ecosystem perspective. *Annual Review of Ecology, Evolution, and Systematics* 41:127-47. doi:10.1146/annurev.ecolsys.110308.120227.
- Holeywell, R. 2014. Fuelfix: Time may be coming for subsea well replacements. Internet website: <http://fuelfix.com/blog/2014/05/08/time-may-be-coming-for-subsea-well-replacements/>. Accessed October 6, 2015.
- Hönisch, B., N.G. Hemming, D. Archer, M. Siddall, and J.F. McManus. 2009. Atmospheric carbon dioxide concentration across the mid-Pleistocene transition. *Science* 324(5934):1551-1554. Internet website: http://128.135.10.93/~archer/reprints/honisch.2009.mid_pleist_co2.pdf.
- Horel, A., B. Mortazavi, and P.A. Sobczyk. 2012. Seasonal monitoring of hydrocarbon degraders in Alabama marine ecosystems following the *Deepwater Horizon* oil spill. *Water, Air, & Soil Pollution* 223(6):3145-3154. doi:10.1007/s11270-012-1097-5.
- Houde, M., R.S. Wells, P.A. Fair, G.D. Bossart, A.A. Hohn, T.K. Rowles, J.C. Sweetney, K.R. Solomon, and D.C.G. Muir. 2005. Polyfluoroalkyl compounds in free-ranging bottlenose dolphins (*Tursiops truncatus*) from the Gulf of Mexico and the Atlantic Ocean. *Environmental Science & Technology* 39:6591-6598.
- Hourigan, T.F. 2014. A strategic approach to address fisheries impacts on deep-sea coral ecosystems. In: Bortone, S.A., ed. *Interrelationships between corals and fisheries*. Boca Raton, FL: CRC Press. 321 pp.
- Houser, C., P. Wemette, E. Rentschlar, H. Jones, B. Hammond, and S. Trimble. 2015. Post-storm beach and dune recovery: Implications for barrier island resilience. *Geomorphology* 234(April 1, 2015):54-63.
- Howard, R.K. and F.T. Short. 1986. Seagrass growth and survivorship under the influence of epiphyte grazers. *Aquatic Botany* 24(3):287-302.
- Hsing, P.-Y., B. Fu, E.A. Larcom, S.P. Berlet, T.M. Shank, A.G. Govindarajan, A.J. Lukasiewicz, P.M. Dixon, and C.R. Fisher. 2013. Evidence of lasting impact of the Deepwater Horizon oil spill on a deep Gulf of Mexico coral community. *Elementa: Science of the Anthropocene* 1:000012. 15 pp.
- Hsu, S.A. and B.W. Blanchard. 2005. Visibility and atmospheric dispersion capability over the northern Gulf of Mexico: Estimations and observations of boundary layer parameters: Final

- report. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 2005-008. 184 pp.
- Hudson, J.H. and D.M. Robbin. 1980. Effects of drilling mud on the growth rate of reef-building coral, *Montastraea annularis*. The R&D Program for OCS Oil and Gas Operations. U.S. Dept. of the Interior, Geological Survey, Fisher Island Station, Miami Beach, FL.
- Hudson, J.H., E.A. Shinn, and D.M. Robbin. 1982. Effects of offshore oil drilling on Philippine reef corals. *Bulletin of Marine Science* 32(4):890-908.
- Huffard, C.L., S. Thun, A.D. Sherman, K. Sealy, and K.L. Smith, Jr. 2014. Pelagic *Sargassum* community change over a 40-year period: temporal and spatial variability. *Marine Biology* 161:2735-2751.
- Humphrey, S.R. and D.B. Barbour. 1981. Status and habitat of three subspecies of *Peromyscus polionotus* in Florida. *J. Mammal.* 62(4):840-844.
- Hunter, W. C., W. Golder, S. Melvin, and J. Wheeler. 2006. Southeast United States regional waterbird conservation plan. U.S. Department of the Interior, Fish and Wildlife Service, Division of Migratory Bird Management, Atlanta, GA, USA. 134 pp. Internet website: <http://www.pwrc.usgs.gov/nacwcp/pdfs/regional/seusplanfinal906.pdf>. Accessed January 20, 2011.
- Huntington, H.P. and S.E. Moore. 2008. Arctic marine mammals and climate change. *Ecological Applications* 18(2)(supplement):S1-174.
- Hurka, M. 1971. Factors influencing the gas composition in the vesicles of *Sargassum*. *Marine Biology* 11:82-89.
- Hutchinson, J. and M. Simmonds. 1991. A review of the effects of pollution on marine turtles. Greenpeace International. 27 pp.
- IMPLAN Group, LLC. 2015. 2013 county dataset.
- Incardona, J.P., L.D. Gardner, T.L. Linbo, T.L. Brown, A.J. Esbaugh, E.M. Mager, J.D. Stieglitz, B.L. French, J.S. Labenia, C.A. Laetz, M. Tagal, C.A. Sloan, A. Elizur, D.D. Bennetti, M. Grosell, B.A. Block, and N.L. Scholz. 2014. *Deepwater Horizon* crude oil impacts the developing hearts of large predatory pelagic fish. *Proceedings of the National Academy of Sciences* 111(15):E1510-E1518.
- Industrial Economics. 2012. Forecasting environmental and social externalities associated with OCS oil and gas development: The Revised Offshore Environmental Cost Model (OECM).
- Industrial Economics, Incorporated, Applied Science Associates, Inc., Northern Economics, and N.Z. Muller. 2015. Forecasting environmental and social externalities associated with OCS oil and gas development: The revised offshore environmental cost model (OECM). U.S. Dept. of the Interior, Bureau of Ocean Energy Management. OCS Study BOEM 2012-025. 292 pp.

- Ingalls Shipbuilding. 2015. Ingalls shipbuilding facilities. Internet website: <http://ingalls.huntingtoningalls.com/about/facilities>. Accessed September 25, 2015.
- Inoue, M., S.E. Welsh, L.J. Rouse, Jr., and E. Weeks. 2008. Deepwater currents in the eastern Gulf of Mexico: Observations at 25.5°N and 87°W. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 2008-001. 95 pp.
- Intergovernmental Panel on Climate Change (IPCC). 2012. Managing the risks of extreme events and disasters to advance climate change adaptation. A special report of Working Groups I and II of the Intergovernmental Panel on Climate Change. Cambridge, UK, and New York, NY: Cambridge University Press. 582 pp. Internet website: http://www.ipcc.ch/pdf/assessment-report/ar4/wg1/ar4_wg1_full_report.pdf.
- Intergovernmental Panel on Climate Change (IPCC). 2014. Climate change 2014 synthesis report summary for policymakers. Internet website: http://www.ipcc.ch/pdf/assessment-report/ar5/syr/AR5_SYR_FINAL_SPM.pdf.
- Intergovernmental Panel on Climate Change (IPCC). 2016. Fifth assessment report (AR5). Internet website: <http://www.ipcc.ch/>. Accessed March 8, 2016.
- International Association of Oil and Gas Producers. 2003. Environmental aspects of the use and disposal of non aqueous drilling fluids associated with offshore oil and gas operations. Report No. 342. 105 pp. Internet website: <http://www.ogp.org.uk/pubs/342.pdf>.
- International Tanker Owners Pollution Federation Limited (ITOPF). 2002. Fate of marine oil spills. Technical Information Paper. London, UK. 8 pp. Internet website: <http://www.itopf.com/assets/documents/tip2.pdf>. Accessed December 2, 2010.
- International Tanker Owners Pollution Federation Limited (ITOPF). 2010. Containment and recovery. Internet website: <http://www.itopf.com/spill-response/clean-up-and-response/containment-and-recovery/>. Accessed December 23, 2010.
- International Whaling Commission. 1997. Report of the IWC workshop on climate change and cetaceans. Report of the International Whaling Commission 47:293-313.
- International Whaling Commission. 2009. Report of the IWC workshop on cetaceans and climate change. Report of the International Whaling Commission 61(4):1-31.
- Irion, J.B. and R.J. Anuskiewicz. 1999. MMS seafloor monitoring project: First annual technical report, 1997 field season. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico Region, New Orleans, LA. OCS Report MMS 99-0014. 63 pp.
- Irion, J.B. and D.A. Ball. 2001. The *New York* and the *Josephine*: Two steamships of the Charles Morgan Line. International Journal of Nautical Archaeology 30(1):48-56.
- Irvine, G. 2000. Persistence of spilled oil on shores and its effects on biota. In: Seas at the millennium: An environmental evaluation. Volume III: Global issues and processes. Elsevier Science Ltd.

- Jaap, W.C. 1984. The ecology of south Florida coral reefs: A community profile. U.S. Dept. of the Interior, Fish and Wildlife Service. FWS/OBS-82/08.
- Jaap, W.C. 2015. Stony coral (Milleporidae and Scleractinia) communities in the eastern Gulf of Mexico: A synopsis with insights from the Hourglass collections. *Bulletin of Marine Science* 91(2):207-253. Internet website: <http://dx.doi.org/10.5343/bms.2014.1049>.
- Jackson, L.E., J.C. Kurtz, and W.S. Fisher. 2000. Evaluation guidelines for ecological indicators. U.S. Environmental Protection Agency, Research Triangle Park, NC. EPA/620/R-99/005. Internet website: http://www.epa.gov/emap/html/pubs/docs/resdocs/ecol_ind.pdf.
- Jacobson, E.R. 1990. An update on green turtle fibropapilloma. *Marine Turtle Newsletter* 49:7-8.
- Jacobson, E.R., S.B. Simpson, Jr., and J.P. Sundberg. 1991. Fibropapillomas in green turtles. In: Balazs, G.H. and S.G. Pooley, eds. *Research plan for marine turtle fibropapilloma*. NOAA Technical Memorandum NMFS-SWFSC-156. Pp. 99-100.
- Jacobsen J.K., L. Massey L., and F. Gulland. 2010. Fatal ingestion of floating net debris by two sperm whales (*Physeter macrocephalus*). *Marine Pollution Bulletin* 60(5):765-767.
- Jaquet, N. 2006. A simple photogrammetric technique to measure sperm whales at sea. *Marine Mammal Science* 22(4):862-879.
- Jasny, M. 1999. *Sounding the depths: Supertankers, sonar and the rise of undersea noise*. Natural Resources Defense Council. 75 pp.
- Jefferson, T.A. and A.J. Schiro. 1997. Distributions of cetaceans in the offshore Gulf of Mexico. *Mammal Review* 27(1):27-50.
- Jefferson, T.A., S. Leatherwood, L.K.M. Shoda, and R.L. Pitman. 1992. *Marine mammals of the Gulf of Mexico: A field guide for aerial and shipboard observers*. Texas A&M University Printing Center, College Station, TX. 92 pp.
- Jefferson, T.A., S. Leatherwood, and M.A. Webber. 1993. *FAO species identification guide, marine mammals of the world*. Food and Agriculture Organization of the United Nations, Rome, Italy. 320 pp.
- Jefferson, T.A., M.A. Webber, and R.L. Pitman. 2008. *Marine mammals of the world: A comprehensive guide to their identification*. Amsterdam Elsevier. Pp. 112-115.
- Jenkins, C. 2011. *Dominant bottom types and habitats in the Gulf of Mexico Data Atlas*. Stennis Space Center, MS: National Coastal Data Development Center. Internet website: <http://gulfatlas.noaa.gov/>. Accessed July 29, 2015.
- Jervis, R. 2015. *Plunging oil prices, Gulf on brink of boom*. USA Today. Internet website: <http://www.usatoday.com/story/money/markets/2015/01/06/deep-water-oil-production-gulf/20752155/>. Accessed August 20, 2015.
- Ji, J. 2015. Official communication. Email from with OSRA results for 2017-2022 Multisale in the Gulf of Mexico. November 20, 2015.

- Jochens, A.E., L.C. Bender, S.F. Di Marco, J.W. Morse, M.C. Kennicutt II, M.K. Howard, and W.D. Nowlin, Jr. 2005. Understanding the processes that maintain the oxygen levels in the deep Gulf of Mexico. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 2005-032. 129 pp.
- Jochens, A., D. Biggs, K. Benoit-Bird, D. Engelhaupt, J. Gordon, C. Hu, N. Jaquet, M. Johnson, R. Leben, B. Mate, P. Miller, J. Ortega-Ortiz, A. Thode, P. Tyack, and B. Würsig. 2008. Sperm whale seismic study in the Gulf of Mexico: Synthesis report. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 2008-006. 341 pp.
- Johansen, O., H. Rye, and C. Cooper. 2001. DeepSpill JIP—field study of simulated oil and gas blowouts in deep water. In: Proceedings from the Fifth International Marine Environment Modeling Seminar, October 9-11, 2001, New Orleans, LA. 377 pp.
- Johnson, S. and M. Ziccardi. 2006. Marine mammal oil spill response guidelines. U.S. Dept. of Commerce, National Marine Fisheries Service Guidance Document.
- Johnson, S.A., K.A. Bjorndal, and A.B. Bolten. 1996. Effects of organized turtle watches on loggerhead (*Caretta caretta*) nesting behavior and hatchling production in Florida. Conservation Biology 10(2):570-577.
- Johnston, P.A., R.L. Stringer, and D. Santillo. 1996. Cetaceans and environmental pollution: The global concern. In: Simmonds, M.P. and J.D. Hutchinson, eds. The conservation of whales and dolphins. Chichester, England: John Wiley & Sons. Pp. 219-261.
- Johnston, J.B., D.R. Cahoon, and M.K. La Peyre. 2009. Outer continental shelf (OCS)-related pipelines and navigation canals in the Western and Central Gulf of Mexico: Relative impacts on wetland habitats and effectiveness of mitigation. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 2009-048. 200 pp.
- Johnston, M.A., M.F. Nuttall, R.J. Eckert, J.A. Embesi, N.C. Slowey, E.L. Hickerson, and G.P. Schmahl. 2013. Long-term monitoring at the East and West Flower Garden Banks National Marine Sanctuary, 2009-2010. Volume 1: Technical report. U.S. Dept. of Interior, Bureau of Ocean Energy Management, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study BOEM 2013-214. 219 pp.
- Johnston, M.A., M.F. Nuttall, R.J. Eckert, J.A. Embesi, N.C. Slowey, E.L. Hickerson, and G.P. Schmahl. 2015. Long-term monitoring at East and West Flower Garden Banks National Marine Sanctuary, 2011-2012. Volume 1: Technical Report. U.S. Dept. of Interior, Bureau of Ocean Energy Management, Gulf of Mexico OCS Region, New Orleans, Louisiana. OCS Study BOEM 2015-027. 194 pp.
- Joint Analysis Group. 2010. Review of R/V *Brooks McCall* data to examine subsurface oil. Internet website: http://www.noaa.gov/scienceemissions/PDFs/JAG_Report_1_BrooksMcCall_Final_June20.pdf. Accessed October 14, 2010.

- Jönsson, M., L. Ranåker, P.A. Nilsson, and C. Brönmark. 2013. Foraging efficiency and prey selectivity in a visual predator: Differential effects of turbid and humic water. *Canadian Journal of Fisheries and Aquatic Sciences* 70(12):1685-1690.
- Jordan, S.J., T. O'Higgins, and J.A. Dittmar. 2012. Ecosystem services of coastal habitats and fisheries: multiscale ecological and economic models in support of ecosystem-based management. *Marine and Coastal Fisheries: Dynamics, Management, and Ecosystem Science* 4:573-586.
- Judy, C.R., S.A. Graham, Q. Lin, A. Hou, and I.A. Mendelssohn. 2014. Impacts of Macondo oil from *Deepwater Horizon* spill on the growth response of the common reed *Phragmites australis*: A mesocosm study. *Marine Pollution Bulletin* 79(1):69-76.
- Kaiser, M.J. 2010. An integrated systems framework for service vessel forecasting in the Gulf of Mexico. *Energy* 35: 2777-2795.
- Kaiser, M.J. 2015a. Hurricane clean-up activity in the Gulf of Mexico, 2004-2013. *Marine Policy* 51:512-526.
- Kaiser, M.J. 2015b. Offshore service vessel activity forecast and regulatory modeling in the U.S. Gulf of Mexico, 2012-2017. *Marine Policy* 57:132-146.
- Kaiser, M.J., B. Snyder, and A.G. Pulsipher. 2013. Offshore drilling industry and rig construction market in the Gulf of Mexico. U.S. Dept. of the Interior, Bureau of Ocean Energy Management, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study BOEM 2013-0112. 375 pp.
- Kaplan, M.F., A. Laughland, and J. Mott. 2011. OCS-related infrastructure fact book. Volume 2: Communities in the Gulf of Mexico. U.S. Dept. of the Interior, Bureau of Ocean Energy Management, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study BOEM 2011-044. 163 pp.
- Karl, T.R., J.M. Melillo, and T.C. Peterson, eds. 2009. Global climate change impacts in the United States. New York, NY: Cambridge University Press. 180 pp. Internet website: <http://downloads.globalchange.gov/usimpacts/pdfs/climate-impacts-report.pdf>.
- Karnauskas, M., M.J. Schirripa, J.K. Craig, G.S. Cook, C.R. Kelble, J.J. Agar, B.A. Black, D.B. Enfield, D. Lindo-Atichati, B.A. Muhling, K.M. Purcell, P.M. Richards, and C. Wang. 2015. Evidence of climate-driven ecosystem reorganization in the Gulf of Mexico. *Climate Change Biology* 21:2554-2568. Internet website: <http://dx.doi.org/10.1111/gcb.12894>.
- Kaschner, K., D.P. Tittensor, J. Ready, T. Gerrodette, and B. Worm. 2011. Current and future patterns of global marine mammal biodiversity. *PLOS ONE* 6(5):e19653. doi:10.1371/journal.pone.0019653.
- Keenan, S.F., M.C. Benfield, and J. K. Blackburn. 2007. Importance of the artificial light field around offshore petroleum platforms for the associated fish community. *Marine Ecology Progress Series* 311:219-231.

- Keevin, T.M. and G.L. Hempen. 1997. The environmental effects of underwater explosions with methods to mitigate impacts. U.S. Dept. of the Army, Corps of Engineers, St Louis District, St. Louis, MO. 99 pp.
- Keller, J.M., G.H. Balazs, F. Nilsen, M. Rice, T.M. Work, and B.A. Jensen. 2014. Investigating the potential role of persistent organic pollutants in Hawaiian green sea turtle fibropapillomatosis. *Environmental Science & Technology* 48 (14):7807-7816. doi:10.1021/es5014054.
- Kemball-Cook S., A. Bar-Ilan, J. Grant, L. Parker, J. Jung, W. Santamaria, J. Mathews, and G. Yarwood. 2010. Ozone impacts of natural gas development in the Haynesville shale. *Environmental Science and Technology* 44(24):9357-9363.
- Kemp, W.M. 1989. Estuarine seagrasses. In: Day, J.W., Jr., C.A.S. Hall, W.M. Kemp, and A. Yanez-Arancibia, eds. *Estuarine ecology*. New York, NY: John Wiley & Sons. 558 pp.
- Kendall, J.J. and G. Rainey. 1991. Produced waters: Findings of recent studies in the coastal waters of Louisiana; session introduction. In: Geo-Marine, Inc., comp. *Proceedings: Eleventh Annual Gulf of Mexico Information Transfer Meeting, November 1990*. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 91-0040. 524 pp.
- Kennicutt II, M.C., ed. 1995. Gulf of Mexico offshore operations monitoring experiment, Phase I: Sublethal responses to contaminant exposure: Final report. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 95-0045. 709 pp.
- Kennicutt II, M.C., P.N. Boothe, T.L. Wade, S.T. Sweet, R. Rezak, F.J. Kelly, J.M. Brooks, B.J. Presley, and D.A. Wiesenburg. 1996. Geochemical patterns in sediments near offshore production platforms. *Canadian Journal of Fisheries and Aquatic Science* 53:2554-2566.
- Kenworthy, W.J. and M.S. Fonseca. 1996. Light requirements of seagrasses *Halodule wrightii* and *Syringodium filiforme* derived from the relationship between diffuse light attenuation and maximum depth distribution. *Estuaries* 19(3):740-750.
- Ketten, D.R. 1998. Marine mammal auditory systems: A summary of audiometric and anatomical data and its implications for underwater acoustic impacts. NOAA Technical Memorandum NOAA-TM-NMFS-SWFSC-256.
- Kingston, P.F., I.M.T. Dixon, S. Hamilton, and D.C. Moore. 1995. The impact of the *Braer* oil spill on the macrobenthic infauna of the sediments off the Shetland Isles. *Marine Pollution Bulletin* 189:159-170.
- Kinlan B.P., M. Poti, P. Etnoyer, L. Siceloff, C. Jenkins, D. Dorfman, and C. Caldow. 2013. Digital data: Predictive models of deep-sea coral habitat suitability in the Western U.S. Gulf of Mexico. Downloadable digital data package. U.S. Dept. of Commerce, National Oceanic and Atmospheric Administration, National Ocean Service, National Centers for Coastal Ocean Science, Center for Coastal Monitoring and Assessment, Biogeography Branch. Released

- August 2013. Internet website: <http://coastalscience.noaa.gov/projects/detail?key=35>. Accessed April 16, 2015.
- Kirkham, I.R. and I.C.T. Nettleship. 1987. Status of the roseate tern in Canada. *Journal of Field Ornithology* 58:505-515.
- Knap, A.H., T.D. Sleeter, R.E. Dodge, S.C. Wyers, H.R. Frith, and S.R. Smith. 1983. The effects of oil spills and dispersant use on corals: A review and multidisciplinary approach. *Oil and Petrochemical Pollution* 1(3):157-169. doi:10.1016/S0143-7127(83)90134-5.
- Knap, A.H., S.C. Wyers, R.E. Dodge, T.D. Sleeter, H.R. Frith, S.R. Smith, and C.B. Cook. 1985. The effects of chemically and physically dispersed oil on the brain coral *Diploria strigosa* (Dana)—a summary review. In: *Proceedings, 1985 Oil Spill Conference, February 25-28, 1985, Los Angeles, CA*. Washington, DC: American Petroleum Institute. Pp. 547-551.
- Ko, J-Y. and J.W. Day. 2004a. Wetlands: Impacts of energy development in the Mississippi Delta. *Encyclopedia of Energy* 6:397-408.
- Ko, J-Y. and J.W. Day. 2004b. A review of ecological impacts of oil and gas development on coastal ecosystems in the Mississippi delta. *Ocean and Coastal Management* 47(11-12):597-623.
- Kokaly, R.F., D. Heckman, J. Holloway, S. Piazza, B. Couvillion, G.D. Steyer, C. Mills, and T.M. Hoefen. 2011. Shoreline surveys of oil impacted marsh in southern Louisiana, July to August 2010. U.S. Dept. of the Interior, Geological Survey. Open-File Report 2011-1022. 124 pp.
- Kostka, J.E., O. Prakash, W.A. Overholt, S.J. Green, G. Freyer, A. Canon, J. Delgardio, N. Norton, T.C. Hazen, and M. Huettel. 2011. Hydrocarbon-degrading bacteria and the bacterial community response in Gulf of Mexico beach sands impacted by the Deepwater Horizon oil spill. *Applied and Environmental Microbiology* 77(22):7962-7974.
- Kovacs, K.M. and C. Lydersen. 2008. Climate change impacts on seals and whales in the North Atlantic Arctic and adjacent shelf seas. *Science Progress* 92:117-150.
- Krapu, G.L., J.L. Eldridge, C.L. Gratto-Trevor, and D.A. Buhl. 2006. Fat dynamics of Arctic-nesting sandpipers during spring in mid-continental North America. *Auk* 123:323-334.
- Krasnec, M.O., J.M. Morris, and C. Lay. 2015. An evaluation of the toxicity of deep sea sediment collected after the *Deepwater Horizon* oil spill on the amphipod *Leptocheirus plumulosus*. (TOX_TR.25). Boulder, CO. DWH Toxicity NRDA Technical Working Group Report.
- Krivor, M.C., J. de Bry, N.J. Linville, and D.J. Wells. 2011. Archival investigations for potential Colonial-era shipwrecks in ultra-deepwater in the Gulf of Mexico. U.S. Dept. of the Interior, Bureau of Ocean Energy Management, Regulation and Enforcement, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study BOEMRE 2011-004. 158 pp.

- Kroeker, K.J., R.L. Kordas, R. Crim, I.E. Hendriks, L. Ramajo, G.S. Singh, G.S. Duarte, and J.P. Gattuso. 2013. Impacts of ocean acidification on marine organisms: Quantifying sensitivities and interaction with warming. *Global Change Biology* 19:1884-1896.
- Kucklick, J., L. Schwacke, R. Wells, A. Hohn, A. Guichard, J. Yordy, L. Hansen, E. Zolman, R. Wilson, J. Litz, D. Nowacek, T. Rowles, R. Pugh, B. Balmer, C. Sinclair, and P. Rosel. 2011. Bottlenose dolphins as indicators of persistent organic pollutants in the western North Atlantic Ocean and northern Gulf of Mexico. *Environmental Science & Technology* 45(10):4270-4277.
- Kushlan, J.A. and P.C. Frohring. 1986. The history of the southern Florida wood stork population. *Wilson Bulletin* 98:368-386.
- Kushmaro, A., G. Henning, D.K. Hofmann, and Y. Benayahu. 1997. Metamorphosis of *Heteroxenia fuscescens* Plaunlae (Cnidaria: Octocorallia) is inhibited by crude oil: A novel short-term toxicity bioassay. *Marine Environmental Research* 43(4):295-302.
- Kvenvolden, K.A. and C.K. Cooper. 2003. Natural seepage of crude oil into the marine environment. *Geo-Marine Letters* (2003) 23:140-146.
- LaCoast.gov. 2011. Atchafalaya Basin: Summary of basin plan. Internet website: http://lacoast.gov/new/About/Basin_data/at/Default.aspx. Accessed January 28, 2011.
- LaCoast.gov. 2015. CWPPRA projects. Internet website: <http://www.lacoast.gov/projects/list.asp>. Accessed March 24, 2015.
- LaDeau, S.L., A.M. Kilpatrick, and P.P. Marra. 2007. West Nile virus emergence and large-scale declines of North American bird populations. *Nature* 447(7145):710-713.
- Ladich, F. 2013. Effects of noise on sound detection and acoustic communication in fishes. In: Brumm, H., ed. *Animal communication and noise*. Berlin Heidelberg: Springer-Verlag. Pp. 65-90.
- Laffoley, D., H.S. Roe, M.V. Angel, J. Ardron, N.R. Bates, I.L. Boyd, S. Brooke, K.N. Buck, C.A. Carlson, B. Causey, M.H. Conte, S. Christiansen, J. Cleary, J. Donnelly, S.A. Earle, R. Edwards, K.M. Gjerde, S.J. Giovannoni, S. Gulick, M. Gollock, J. Hallett, P. Halpin, R. Hanel, A. Hemphill, R.J. Johnson, A.H. Knap, M.W. Lomas, S.A. McKenna, M.J. Miller, P. Miller, F.W. Ming, R. Moffitt, N.B. Nelson, L. Parson, A.J. Peters, J. Pitt, P. Rouja, J. Roberts, J. Roberts, D.A. Seigel, A.N. Siuda, D.K. Steinberg, A. Stevenson, V.R. Sumaila, W. Swartz, S. Thorrold, T.M. Trott, and V. Vats. 2011. The protection and management of the Sargasso Sea: The golden floating rainforest of the Atlantic Ocean. Summary Science and Supporting Evidence Case. Sargasso Sea Alliance. 44 pp.
- Laidre, K.L., I. Stirling, L. Lowry, Ø. Wiig, M.P. Heide-Jørgensen, and S.H. Ferguson. 2008. Quantifying the sensitivity of arctic marine mammals to climate-induced habitat change. In: Huntington, H.P. and S.E. Moore, eds. *Arctic marine mammals and climate change*. Ecological Applications 18(2)Supplement, 2008:S97-S125.
- Laist, D.W. 1997. Impacts of marine debris: Entanglement of marine life in marine debris including a comprehensive list of species with entanglement and ingestion records. In: Coe, J.M.,

- D.B. Rogers, eds. Marine debris: Sources, impacts, and solutions. New York, NY: Springer-Verlag. Pp. 99-139.
- Laist, D.W., A.R. Knowlton, J.G. Mead, A.S. Collet, and M. Podesta. 2001. Collisions between ships and whales. *Marine Mammal Science* 17:35-75.
- Lambersten, R.H., J.P. Sundberg, and C.D. Buergelt. 1987. Genital papillomatosis in sperm whale bulls. *Journal of Wildlife Disease* 23(3):361-367.
- Lamont, M.M., R.R. Carthy, and I. Fujisaki. 2012. Declining reproductive parameters highlight conservation needs of loggerhead turtles (*Caretta caretta*) in the northern Gulf of Mexico. *Chelonian Conservation and Biology* 11(2):190-196. doi:<http://dx.doi.org/10.2744/CCB-1006.1>.
- Lamont, M.M., N. Putman, I. Fujisaki, and K. Hart. 2015. Spatial requirements of different life-stages of the loggerhead turtle (*Caretta caretta*) from a distinct population segment in the northern Gulf of Mexico. *Herpetological Conservation and Biology* 10(1):26-43.
- Lange, R. 1985. A 100-ton experimental oil spill at Halten Bank, off Norway. In: Proceedings, 1985 Oil Spill Conference, February 25-28, 1985, Los Angeles, CA. Washington, DC: American Petroleum Institute.
- Langtimm, C.A., M.D. Krohn, J.P. Reid, B.M. Stith, and C.A. Beck. 2006. Possible effects of the 2004 and 2005 hurricanes on manatee survival rates and movement. *Estuaries Coasts* 29:1026-1032.
- Lapointe, B.E. 1986. Phosphorus-limited photosynthesis and growth of *Sargassum natans* and *Sargassum fluitans* (Phaeophyceae) in the western North Atlantic. *Deep Sea Research Part A: Oceanographic Research Papers* 33(3):391-399. doi:10.1016/0198-0149(86)90099-3.
- Larino, J. 2015. Baker Hughes closes Houma plant, lays off 60 workers amid oil slump. TimesPicayune-NOLA.com, February 6, 2015. Internet website: http://www.nola.com/business/index.ssf/2015/02/baker_hughes_closes_houma_plan.html. Accessed September 7, 2015.
- Lavender, A.L., S.M. Bartol, and I.K. Bartol. 2014. Ontogenetic investigation of underwater hearing capabilities in loggerhead sea turtles (*Caretta caretta*) using a dual testing approach. *The Journal of Experimental Biology* 217:2580-2589. doi:10.1242/jeb.096651.
- Le Henáff, M., V.H. Kourafalou, C.B. Paris, J. Helgers, Z.M. Aman, P.J. Hogan, and A. Srinivasan. 2012. Surface evolution of the *Deepwater Horizon* oil spill patch: Combined effects of circulation and wind-induced drift. *Environmental Science & Technology* 46:7267-7273.
- Learmonth, J.A., C.D. Macleod, M.B. Santos, G.J. Pierce, H.Q.P. Crick, and R.A. Robinson. 2006. Potential effects of climate change on marine mammals. *Oceanography and Marine Biology* 44:431-464.
- Leary, T.R. 1957. A schooling of leatherback turtles, *Dermochelys coriacea coriacea*, on the Texas coast. *Copeia* 1957:232.

- Leatherwood, S. and R.R. Reeves. 1983. The Sierra Club handbook of whales and dolphins. San Francisco, CA: Sierra Club Books. 302 pp.
- Leblanc, D.J. 1985. Environmental and construction techniques involved with the installation of a gas pipeline across Timbalier Island, Louisiana. In: Proceedings, Sixth Annual Gulf of Mexico Information Transfer Meeting, October 22-24, 1985. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 86-0073. Pp. 203-205.
- Lee, D.S. and M.L. Moser. 1998. Importance des Sargasses pelagiques pour la recherche alimentaire des oiseaux marins. *El Ptitre* 11(3):111-112.
- Leis, J.L. 1991. The pelagic stage of reef fishes: The larval biology of coral reef fishes. In: Sale, P.F., ed. The ecology of fishes on coral reefs. New York, NY: Academic Press. Pp. 183-230.
- Lenhardt, M.L. 1994. Seismic and very low frequency induced behaviors in captive loggerhead marine turtles (*Caretta caretta*). In: Bjorndal, K.A., A.B. Bolten, D.A. Johnson, and P.J. Eliazar, comps. Fourteenth annual symposium on sea turtle biology and conservation. NOAA Technical Memorandum NMFS-SEFSC351. Pp. 238-241.
- Lenhardt, M.L., S. Bellmund, R.A. Byles, S.W. Harkins, and J.A. Musick. 1983. Marine turtle reception of bone conducted sound. *Journal of Auditory Research* 23:119-125.
- Lessard, R.R. and G. Demarco. 2000. The significance of oil spill dispersants. *Spill Science & Technology Bulletin* 6:59-68.
- Levin, P.S. and G.W. Stuntz. 2005. Habitat triage for exploited fishes: Can we identify essential "Essential Fish Habitat?" *Estuarine, Coastal and Shelf Science* 64:70-78.
- Lewis, A. and D. Aurand. 1997. Putting dispersants to work: Overcoming obstacles. 1997 International Oil Spill Conference. API 4652A. Technical Report IOSC-004.
- Lewis, J.B. 1971. Effect of crude oil and an oil-spill dispersant on reef corals. *Marine Pollution Bulletin* 2:59-62.
- Lewison, R.L., S.A. Freeman, and L.B. Crowder. 2004. Quantifying the effects of fisheries on threatened species: The impact of pelagic longlines on loggerhead and leatherback sea turtles. *Ecology letters*, 7(3), 221-231.
- Lewison R, B. Wallace, J. Alfaro-Shigueto, J.C. Mangel, S.M. Maxwell, and E.L. Hazen. 2013. Fisheries bycatch of marine turtles: Lessons learned from decades of research and conservation. In: Wyneken, J., K.J. Lohmann, and J.A. Musick. The biology of sea turtles. Volume III. Pp. 329-351.
- Lewison, R.L., L.B. Crowder, B.P. Wallace, J.E. Moore, T. Cox, R. Zydalis, S. McDonald, A. DiMatteo, D.C. Dunn, C.Y. Kot, R. Bjorkland, S. Kelez, C. Soykan, K.R. Stewart, M. Sims, A. Boustany, A.J. Read, P. Halpin, and W.J. Nichols. 2014. Global patterns of marine mammal,

- seabird, and sea turtle bycatch reveal taxa-specific and cumulative megafauna hotspots. *Proceedings of the National Academy of Sciences*. 6 pp.
- LGL Ecological Research Associates, Inc. 2009. Gulf of Mexico cooling water intake structure: Source water biological baseline characterization study. Prepared for the Offshore Operators Committee, Environmental Sciences Subcommittee.
- Lin, Q. and I.A. Mendelssohn. 1996. A comparative investigation of the effects of south Louisiana crude on the vegetation of fresh, brackish and salt marshes. *Marine Pollution Bulletin* 32:202-209.
- Lindo-Atichati, D., F. Bringas, G. Goni, B. Muhling, F.E. Muller-Karger, and S. Habtes. 2012. Varying mesoscale structures influence larval fish distribution in the northern Gulf of Mexico. *Marine Ecology Progress Series* 463:245-257.
- Lissner, A.L., G.L. Taghon, D.R. Diener, S.C. Schroeter, and J.D. Dixon. 1991. Recolonization of deep-water hard-substrate communities: Potential impacts from oil and gas development. *Ecological Applications* 1: 258-267.
- Littler, D.S. and M.M. Littler. 2000. Caribbean reef plants; an identification guide to the reef plants of the Caribbean, Bahamas, Florida and Gulf of Mexico. OffShore Graphics Inc., Florida. Pp. 280-290.
- Liu, Z., J. Liu, W.S. Gardner, G.C. Shank, E.O. Nathaniel. 2014. The impact of *Deepwater Horizon* oil spill on petroleum hydrocarbons in surface waters of the northern Gulf of Mexico. *Deep Sea Research Part II: Topical Studies in Oceanography*. doi:10.1016/j.dsr2.2014.01.013.
- Løkkeborg, S., E. Ona, A. Vold, and A. Salthaug. 2012. Sounds from seismic air guns: gear-and species specific effects on catch rates and fish distribution. *Canadian Journal of Fisheries and Aquatic Sciences* 69:1,278-1,291.
- Long, B.F. and J.H. Vandermuelen. 1983. Geomorphological impact of cleanup of an oiled salt marsh (Ile Grande, France). In: *Proceedings, 1983 Oil Spill Conference, February 28-March 3, 1983, San Antonio, TX*. Washington, DC: American Petroleum Institute. Pp. 501-505.
- Longcore, T. and C. Rich. 2004. Ecological light pollution. *Frontiers in Ecology and the Environment* 2:191-198.
- LOOP LLC. 2015. The LOOP story. Internet website: <https://www.loopllc.com/About-Loop/Story.aspx>. Accessed September 14, 2015.
- Loren C. Scott & Associates. 2008. The economic impacts of Port Fourchon on the national and Houma MSA economies. 31 pp. Internet website: http://www.portfourchon.com/site100-01/1001757/docs/port_fourchon_economic_impact_study.pdf.
- Loss, S.R., T. Will, and P.P. Marra. 2013. The impact of free-ranging domestic cats on wildlife of the United States. *Nature Communications*. 7 pp.

- Loss, S.R., T. Will, and P.P. Marra. 2014a. Estimation of bird-vehicle collision mortality on U.S. roads. *Journal of Wildlife Management* 78:763-771.
- Loss, S.R., T. Will, S.S. Loss, and P.P. Marra. 2014b. Bird-building collisions in the United States: Estimates of annual mortality and species vulnerability. *Condor* 116:8-23.
- Louisiana Coastal Wetlands Conservation and Restoration Task Force. 2006. The 2006 evaluation report to the U.S. Congress on the effectiveness of Coastal Wetlands Planning, Protection and Restoration Act projects. Submitted by the Chairman of the Louisiana Coastal Wetlands Conservation and Restoration Task Force, U.S. Dept. of the Army, Corps of Engineers, New Orleans District, New Orleans, LA. 73 pp.
- Louisiana Offshore Oil Port. 2015. The LOOP story. Internet website: <https://www.loopllc.com/About-Loop/Story.aspx>. Accessed July 1, 2015.
- Louisiana Universities Marine Consortium (LUMCON). 2014. Press release: Louisiana Universities Marine Consortium, August 4, 2014. 7 pp. Internet website: http://www.gulfhypoxia.net/research/shelfwide%20cruises/2014/hypoxia_press_release_2014.pdf. Accessed April 1, 2015.
- Louisiana Universities Marine Consortium (LUMCON). 2015. 2015 forecast: Summer hypoxic zone size, northern Gulf of Mexico. 13 pp. Internet website: http://www.gulfhypoxia.net/Research/Shelfwide%20Cruises/2015/2015_hypoxia_forecast.pdf. Accessed August 5, 2015.
- Lowe, M.R. and M.S. Peterson. 2014. Effects of coastal urbanization on salt-marsh faunal assemblages in the northern Gulf of Mexico. *Marine and Coastal Fisheries* 6(1):89-107.
- Lowe, M. and S. Stokes. 2013. Wildlife tourism and the Gulf Coast economy. 57 pp.
- Lubchenco, J.L., M. McNutt, B. Lehr, M. Sogge, M. Miller, S. Hammond, and W. Conner. 2010. BP *Deepwater Horizon* oil budget: What happened to the oil? Internet website: http://www.noaa.gov/stories2010/PDFs/OilBudget_description_%2083final.pdf. Accessed September 8, 2010.
- Lubowski, R.N., M. Vesterby, S. Bucholtz, A. Baez, and M. Roberts. 2006. Major uses of land in the United States, 2002. U.S. Dept. of Agriculture, Economic Research Service. Economic Information Bulletin No. (EIB-14). 54 pp. Internet website: <http://www.ers.usda.gov/publications/eib-economic-information-bulletin/eib14.aspx>. Accessed September 6, 2015.
- Ludwick, J.C. and W.R. Walton. 1957. Shelf-edge, calcareous prominences in the northeastern Gulf of Mexico. *Bulletin of the American Association of Petroleum Geologists* 41(9):2054-2101.
- Lugo-Fernández, A, K.J.P. Deslarzes, J.M. Price, G.S. Boland, and M.V. Morin. 2001. Inferring probable dispersal of Flower Garden Banks coral larvae (Gulf of Mexico) using observed and simulated drifter trajectories. *Continental Shelf Research* 21:47-67.
- Lugo-Fernandez, A., D.A. Ball, M. Gravois, C. Horrell, and J.B. Irión. 2007. Analysis of the Gulf of Mexico's Veracruz-Havana route of La Flota de la Nueva España. *Journal of Maritime Archaeology* 2(1):24-47.

- Lukens, R.R. and C. Selberg. 2004. Guidelines for marine artificial reel materials. Joint Publication of the Gulf and Atlantic States Marine Fisheries Commissions. No. 121
- Lukina, L., S. Matisheva, and V. Shapunov. 1996. Ecological monitoring of the captivity sites as a means of studying the influence of contaminated environment on cetaceans. In: Öztürk, B., ed. Proceedings, First International Symposium on the Marine Mammals of the Black Sea, 27-30 June 1994, Istanbul, Turkey. Pp. 52-54.
- Lunden, J.J., S.E. Georgian, and E.E. Cordes. 2013. Aragonite saturation states at cold-water coral reefs structured by *Lophelia pertusa* in the northern Gulf of Mexico. *Limnology and Oceanography* 58:354-362.
- Lunden, J.J., C.G. McNicholl, C.R. Sears, C.L. Morrison, and E.E. Cordes. 2014. Acute survivorship of the deep sea coral *Lophelia pertusa* from the Gulf of Mexico under acidification, warming, and deoxygenation. *Frontiers in Marine Science* 1.
- Lunt, J. and D.L. Smee. 2014. Turbidity influences trophic interactions in estuaries. *Limnology and Oceanography* 59(6):2002-2012.
- Lutcavage, M.E., P.L. Lutz, G.D. Bossart, and D.M. Hudson. 1995. Physiologic and clinicopathologic effects of crude oil on loggerhead sea turtles. *Archives of Environmental Contamination and Toxicology* 28:417-422.
- Lutcavage, M.E., P. Plotkin, B. Witherington, and P.L. Lutz. 1997. Human impacts on sea turtle survival. *The Biology of Sea Turtles* 1:387-409.
- Luthi, D., M. Le Floch, B. Bereiter, T. Blunier, J.-M. Barnola, U. Siegenthaler, D. Raynaud, J. Jouzel, H. Fischer, K. Kawamura, and T.F. Stocker. 2008. High-resolution carbon dioxide concentration record 650,000-800,000 years before present. *Nature* 453:379-381.
- Lutz, P.L. 1990. Studies on the ingestion of plastic and latex by sea turtles. In: Shomura, R.S. and M.L. Godfrey, eds. Proceedings, Workshop on the Fate and Impact of Marine Debris, November 26-29, 1984, Honolulu, HI. NOAA Technical Memorandum NOAA-TM-NMFS-SWFC-154. Pp. 719-735.
- Lutz, P.L. and M. Lutcavage. 1989. The effects of petroleum on sea turtles: Applicability to Kemp's ridley. In: Caillouet, C.W., Jr. and A.M. Landry, Jr., eds. Proceedings of the First International Symposium on Kemp's Ridley Sea Turtle Biology, Conservation and Management. Texas A&M University Sea Grant College Program, Galveston, TX. TAMU-SG-89-105. Pp. 52-54.
- Lyn, H., A. Coleman, M. Broadway, J. Klaus, S. Finerty, D. Shannon, and M. Solangi. 2012. Displacement and site fidelity of rehabilitated immature Kemp's ridley sea turtles (*Lepidochelys kempii*). *Marine Turtle Newsletter* 135:10-13.
- Lytle, J.S. 1975. Fate and effects of crude oil on an estuarine pond. In: Proceedings, Conference on Prevention and Control of Oil Pollution, San Francisco, CA. Pp. 595-600.
- MacDonald, I.R., ed. 1992. Chemosynthetic ecosystems study literature review and data synthesis, northern Gulf of Mexico: Volumes I-III. U.S. Dept. of the Interior, Minerals Management Service,

- Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 92-0033, 92-0034, and 92-0035. 25, 218, and 263 pp., respectively.
- MacDonald, I.R., ed. 1998. Stability and change in Gulf of Mexico chemosynthetic communities: Interim report. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 98-0034. 114 pp.
- MacDonald, I.R., N.L. Guinasso, Jr., J.F. Reilly, J.M. Brooks, W.R. Callender, and S.G. Gabrielle. 1990. Gulf of Mexico hydrocarbon seep communities. VI: Patterns in community structure and habitat. *Geo-Marine Letters* 10:244-252.
- MacDonald, I.R., N.L. Guinasso Jr., S.G. Ackleson, J.F. Amos, R. Duckworth, R. Sassen, and J.M. Brooks. 1993. Natural oil slicks in the Gulf of Mexico visible from space. *Journal of Geophysical Research* 98(C9):16,351-16,364.
- MacDonald, I.R., N.L. Guinasso, R. Sassen, J.M. Brooks, S. Lee, and K.T. Scott. 1994. Gas hydrates that breach the sea-floor and intersect with the water column on the continental slope of the Gulf of Mexico. *Geology* 22:699-702.
- MacDonald, I.R., W.W. Schroeder, and J.M. Brooks, eds. 1995. Chemosynthetic ecosystems study: Final report. Volume 2: Technical report. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 95-0022. 319 pp.
- MacLeod, C.D. 2009. Global climate change, range changes and potential implications for the conservation of marine cetaceans, a review and synthesis. *Endangered Species Research* 7:125-136.
- Mager, E.M., A.J. Esbaugh, J.D. Stieglitz, R. Hoenig, C. Bodinier, J.P. Incardona, N.L. Scholz, D.D. Bennetti, and M. Grosell. 2014. Acute embryonic or juvenile exposure to *Deepwater Horizon* crude oil impairs the swimming performance of mahi-mahi (*Coryphaena hippurus*). *Environmental Science & Technology* 48(12):7053-7061.
- Magnuson, J.J., K.A. Bjorndal, W.D. DuPaul, G.L. Graham, D.W. Owens, C.H. Peterson, P.C.H. Pritchard, J.I. Richardson, G.E. Saul, and C.W. West. 1990. Decline of the sea turtles: Causes and prevention. National Research Council, National Academy of Sciences Press, Washington DC, 190 pp.
- Maiaro, J.L. 2007. Disturbance effects on nekton communities of seagrasses and bare substrates in Biloxi Marsh, Louisiana. Master's thesis, Louisiana State University, Baton Rouge, LA. 78 pp. Internet website: http://etd.lsu.edu/docs/available/etd-07032007-101237/unrestricted/Maiaro_thesis.pdf.
- Mallman, E.P. and M.D. Zoback. 2007. Subsidence in the Louisiana coastal zone due to hydrocarbon production. In: Proceedings, 9th International Coastal Symposium. *Journal of Coastal Research*, Special Issue 50:443-449. Gold Coast, Australia. Internet website: [http://www.cerf-jcr.org/images/stories/Subsidence%20in%20the%20Louisiana%20coastal%20zone%](http://www.cerf-jcr.org/images/stories/Subsidence%20in%20the%20Louisiana%20coastal%20zone%20)

[20due%20to%20hydrocarbon%20production.%20E.%20P.%20Mallman%20and%20M.%20D.%20Zoback.%20Pg%20443-448.pdf](#).

- Manzella, S., J. Williams, B. Schroeder, and W. Teas. 2001. Juvenile head-started Kemp's ridleys found in floating grass mats. *Marine Turtle Newsletter* 52:5-6.
- Marcano, L.A. and J.J. Alio-M. 2000. Incidental capture of sea turtles by the industrial shrimping fleet off northwestern Venezuela. U.S. Dept. of Commerce. NOAA Technical Memorandum NMFS-SEFSC-436-107.
- Marine Spill Response Corporation. 2015a. Marine Spill Response Corporation's containment systems overview. Internet website: <http://www.marinewellcontainment.com/containment-system/>. Accessed June 11, 2015.
- Marine Spill Response Corporation. 2015b. Marine Spill Response Corporation major equipment list. Internet website: https://www-msrc-org-documents.s3.amazonaws.com/major-equipment-list/MSRC_Major_Equipment_List.pdf?download=1425092063. Accessed June 11, 2015.
- Marinevesseltraffic.com. 2015. Vessel traffic maps. Internet website: <http://www.marinevesseltraffic.com/2013/06/gulf-of-mexico-marine-traffic.html>. Accessed October 9, 2015.
- Marquenie, J., M. Donners, H. Poot, W. Steckel, and B. de Wit. 2013. Bird-friendly light sources: Adapting the spectral composition of artificial lighting. *Industry Applications Magazine*, IEEE, 19(2):56-62.
- Marsh, H. 1989. Mass stranding of dugongs by a tropical cyclone in northern Australia. *Marine Mammal Science* 5:78-84.
- Marsh, B. 2016. Official communication. Email granting permission to use photographs of the Mississippi barrier islands in the U.S. Dept. of the Interior, Bureau of Ocean Energy Management's NEPA documents. February 1, 2016.
- Marszalek, D.S. 1981. Impact of dredging on a subtropical reef community, southeast Florida, USA. In: *Proceedings of the Fourth International Coral Reef Symposium*. Volume 1. May 18-22, 1981. Manila, Philippines.
- Martínez, M.L., R.A. Feagin, K.M. Yeager, J. Day, R. Costanza, J.A. Harris, R.J. Hobbs, J. López-Portillo, I.J. Walker, E. Higgs, P. Moreno-Casasola, J. Sheinbaum, and A. Yáñez-Arancibia. 2012. Artificial modifications of the coast in response to the *Deepwater Horizon* oil spill: Quick solutions or long-term liabilities? *Frontiers in Ecology and the Environment* 10(1)February 2012:44-49.
- Matkin, C.O., G.M. Ellis, M.E. Dahlheim, and J. Zeh. 1994. Status of killer whales in Prince William Sound, 1985-1992. In: Loughlin, T.R., ed. *Marine mammals and the Exxon Valdez*. San Diego, CA: Academic Press. Pp. 141-162.

- Matkin, C.O., E.L. Saulitis, G.M. Ellis, P. Olesiuk, and S.D. Rice. 2008. Ongoing population-level impacts on killer whales *Orcinus orca* following the "Exxon Valdez" oil spill in Prince William Sound, Alaska. *Marine Ecology Progress Series* 356:269-281.
- Mays, J.L. and D.J. Shaver. 1998. Nesting trends of sea turtles in national seashores along Atlantic and Gulf coast waters of the United States. 61 pp.
- Maze-Foley, K. and K.D. Mullin. 2006. Cetaceans of the oceanic northern Gulf of Mexico: Distributions, group sizes and interspecific associations. *J. Cetacean Res. Manage.* 8(2):203-213.
- McAuliffe, C.D., A.E. Smalley, R.D. Groover, W.M. Welsh, W.S. Pickle, and G.E. Jones. 1975. Chevron Main Pass Block 41 oil spill: Chemical and biological investigation. In: *Proceedings, 1975 Conference on Prevention and Control of Oil Pollution, March 25-27, 1975, San Francisco, CA.* Washington, DC: American Petroleum Institute.
- McAuliffe, C.D., B.L. Steelman, W.L. Leek, D.E. Fitzgerald, J.P. Ray, and C.D. Baker. 1981a. The 1979 southern California dispersant treated research oil spills. In: *Proceedings, 1981 Oil Spill Conference, March 2-5, 1981, Atlanta, GA.* Washington DC: American Petroleum Institute. Pp. 269-282.
- McAuliffe, C.D., G.P. Canevari, T.D. Searl, J.C. Johnson, and S.H. Greene. 1981b. The dispersion and weathering of chemically treated crude oils on the sea surface. In: *Petroleum and the Marine Environment. Proceedings of Petromar '80.* London, UK: Graham and Trotman Ltd.
- McBride, R.A., S. Penland, M.W. Hiland, S.J. Williams, K.A. Westphal, B.J. Jaffe, and A.H. Sallenger. 1992. Analysis of barrier shoreline change in Louisiana from 1853 to 1989. In: Williams, S.J., S. Penland, and A.H. Sallenger, eds. *Atlas of shoreline changes in Louisiana from 1853 to 1989.* U.S. Dept. of the Interior, Geological Survey. Miscellaneous Investigation Series I-2150-A. Pp. 36-47.
- McCauley, R.D., J. Fewtrell, A.J. Duncan, C. Jenner, M.N. Jenner, J.D. Penrose, R.I.T. Prince, A. Adhita, J. Murdoch, and K. McCabe. 2000. Marine seismic surveys: Analysis and propagation of air-gun signals; and effects of air-gun exposure on humpback whales, sea turtles, fishes and squid. A report prepared for the Australian Production Exploration Association. Project CMST 163, Report R99-15. 198 pp.
- McClellan, C.M. and A.J. Read. 2007. Complexity and variation in loggerhead sea turtle life history. *Biological Letters* 3:592-594.
- McClenachan, G., R.E. Turner, and A.W. Tweel. 2013. Effects of oil on the rate and trajectory of Louisiana marsh shoreline erosion. *Environmental Research Letters* 8 (2013) 044030. 8 pp. doi:10.1088/1748-9326/8/4/044030.
- McDaniel, C.N. and D.N. Borton. 2002. Increased human energy use causes biological diversity loss and undermines prospects for sustainability. *Bioscience* 52:929-936.

- McDonald, D., P. Dutton, D. Mayer and K. Merkel. 1994. Review of the green turtles of South San Diego Bay in relation to the operations of the SDG&E South Bay Power Plant. Document 94-045-01. Prepared for San Diego Gas & Electric Co., San Diego, CA. C941210311.
- McEachran, J.D. 2009. Fishes (Vertebrata: Pisces) of the Gulf of Mexico. In: Felder, D.L. and D.K. Camp, eds. Gulf of Mexico origin, waters, and biota. 1, Biodiversity. College Station, TX: Texas A&M University Press.
- McEachran, J.D. and J.D. Fechhelm. 1998. Fishes of the Gulf of Mexico: Volume 1. Austin, TX: University of Texas Press. 1,112 pp.
- McGrail, D. 1982. Water and sediment dynamics at the Flower Garden Banks. In: Norman, R., ed. Environmental studies at the Flower Gardens and selected banks: Northwestern Gulf of Mexico, 1979-1981. Executive summary. Technical Report No. 82-8-T. Pp. 27-29.
- McKenna, M.F., D. Ross, S.M. Wiggins, and J.A. Hildebrand. 2012. Underwater radiated noise from modern commercial ships. *Journal of the Acoustical Society of America* 131(1):92-103.
- McNutt, M., R. Camilli, G. Guthrie, P. Hsieh, V. Labson, B. Lehr, D. Maclay, A. Ratzel, and M. Sogge. 2011. Assessment of flow rate estimates for the *Deepwater Horizon*/Macondo Well Oil Spill. Flow Rate Technical Group report to the National Incident Command, Interagency Solutions Group, March 10, 2011.
- Mead, J.G. 1989. Beaked whales of the genus—*Mesoplodon*. In: Ridgway, S.H. and R. Harrison, eds. Handbook of marine mammals. Volume 4: River dolphins and the larger toothed whales. London, England: Academic Press. Pp. 349-430.
- Mead, J.G. 2002. Beaked whales, overview. In: Perrin, W.F., B. Wursig, and G.M. Thewissen, eds. Encyclopedia of Marine Mammals. San Diego, CA: Academic Press. Pp. 81-84.
- Mead, J.G. and C.W. Potter. 1990. Natural history of bottlenose dolphins along the central Atlantic coast of the United States. In: Leatherwood, S. and R.R. Reeves, eds. The bottlenose dolphin. San Diego, CA: Academic Press. Pp. 165-195.
- Meckel, T.A., U.S. ten Brink, and S.J. Williams. 2006. Current subsidence rates due to compaction of Holocene sediments in southern Louisiana. *Geophysical Research Letters* Volume 33, L11403. 5 pp. doi:10.1029/2006GL026300. Internet website: http://woodshole.er.usgs.gov/staffpages/utenbrink/my%20publications/Meckel_GRL.pdf.
- Melton, H.R., J.P. Smith, H.L. Mairs, R.F. Bernier, E. Garland, A Glickman, F.V. Jones, J.P. Ray, D. Thomas, and J.A. Campbell. 2004. Environmental aspects of the use and disposal of non aqueous drilling fluids associated with offshore oil and gas operations. Society of Petroleum Engineers, Inc. SPA 86696.
- Meltzer, D.J., D.K. Grayson, G. Ardila, A.W. Barker, D.F. Dincauze, C.V. Hanes, F. Mina, L. Nunez, and D.J. Stanford. 1997. On the Pleistocene antiquity of Monte Verde, Chile. *American Antiquity* 62(4):659-663.

- Mendelssohn, I.A. and K.L. McKee. 1987. Chapter 8: Experimental field and greenhouse verification of the influence of saltwater intrusion and submergence on marsh deterioration—Mechanisms of action. In: Turner, R.E. and D.R. Cahoon, eds. Causes of wetland loss in the coastal central Gulf of Mexico. Volume II: Technical narrative. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 87-0120. Pp.145-180.
- Mendelssohn, I.A., M.W. Hester, and J.M. Hill. 1993. Effects of oil spills on coastal wetlands and their recovery. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 93-0045. 46 pp.
- Meylan, A.B. 1988. Spongivory in hawksbill turtles: A diet of glass. *Science* 239:393-395.
- Meylan, A.B. 1999. International movements of immature and adult hawksbill turtles (*Eretmochelys imbricata*) in the Caribbean region. *Chelonian Conservation and Biology* 3(2):189-194.
- Michel J., E.H. Owens, S. Zengel, A. Graham, Z. Nixon, T. Allard, W. Holton, P.D. Reimer, A. Lamarche, M. White, N. Rutherford, C. Childs, G. Mauser, G. Challenger, and E. Taylor. 2013a. Extent and degree of shoreline oiling: *Deepwater Horizon* oil spill, Gulf of Mexico, USA. *PLOS ONE* 8(6):e65087.
- Michel, J., A.C. Bejarano, C.H. Peterson, and C. Voss. 2013b. Review of biological and biophysical impacts from dredging and handling of offshore sand. U.S. Dept. of the Interior, Bureau of Ocean Energy Management, Herndon, VA. OCS Study BOEM 2013-0119. 258 pp.
- Middlebrook, A.M., D.M. Murphy, R. Ahmadov, E.L. Atlas, R. Bahreini, D.R. Blake, J. Brioud, J.A. de Gouw, F.C. Fehsenfeld, G.J. Frost, J.S. Holloway, D.A. Lack, J.M. Langridge, R.A. Lueb, S.A. McKeen, J.F. Meagher, S. Meinardi, J.A. Neuman, J.B. Nowak, D.D. Parrish, J. Peischl, A.E. Perring, I.B. Pollack, J.M. Roberts, T.B. Ryerson, J.P. Schwarz, J.R. Spackman, C. Warneke, and A.R. Ravishankara. 2012. Air quality implications of the *Deepwater Horizon* oil spill. *Proceedings of the National Academy of Sciences of the United States of America*. 109(50):20280-20285. doi:10.1073/pnas.1110052108.
- Mignucci-Giannoni A.A, G.M. Toyos-González, J. Pérez-Padilla, M.A. Rodríguez-López, and J. Overing. 1999. Mass stranding of pygmy killer whales (*Feresa attenuata*) in the British Virgin Islands. *Journal of Marine Biology Association of the United Kingdom* 79:383-384.
- Millemann, D.R., R.J. Portier, G. Olson, C.S. Bentivegna, and K.R. Cooper. 2015. Particulate accumulations in the vital organs of wild *Brevoortia patronus* from the northern Gulf of Mexico after the *Deepwater Horizon* oil spill. *Ecotoxicology*: 1-17.
- Miller, J.E., S.W. Baker, and D.L. Echols. 1995. Marine debris point source investigation 1994-1995, Padre Island National Seashore. U.S. Dept. of the Interior, National Park Service, Corpus Christi, TX. 40 pp.
- Miller, S.L., M. Chiappone, L.M. Rutten, and D.W. Swanson. 2008. Population status of *Acropora* corals in the Florida Keys. *Proceedings of the 11th International Coral Reef Symposium*. Pp. 775-779.

- Miller, L.J., A.D. Mackey, T. Hoffland, M. Solangi, and S.A. Kuczaj, II. 2010. Potential effects of a major hurricane on Atlantic bottlenose dolphin (*Tursiops truncatus*) reproduction in the Mississippi Sound. *Marine Mammal Science* 26:707-715.
- Mills, P. 2006. Barium minerals. In: Kogel, J.E., N.C. Trivedi, J.M Barker, and S.T. Krukowski, eds. *Industrial minerals and rocks*. 7th ed. Littleton, CO: Society for Mining, Metallurgy, and Exploration, Inc. Pp. 219-226.
- Milton, S.L., S. Leone-Kabler, A.A. Schulman, and P.L. Lutz. 1994. Effects of Hurricane Andrew on the sea turtle nesting beaches of South Florida. *Bulletin of Marine Science* 54:974-981.
- Minello, T.J., R.J. Zimmerman, and E.X. Martinez. 1987. Fish predation on juvenile brown shrimp, *Penaeus aztecus* Ives: effects of turbidity and substratum on predation rates. *Fishery Bulletin* 85(1):59-70.
- Mississippi Development Authority. 2011. Press release: Mississippi Development Authority publishes draft rules and regulations for offshore seismic surveying, mineral leasing. Internet website: <http://www.mississippi.org/press-room/mda-publishes-draft-rules-and-regulations-for-offshore-seismic-surveying-mineral-leasing.html>. Posted December 19, 2011. Accessed March 6, 2012.
- Mississippi Energy Future. 2012. Facts about offshore oil and natural gas exploration and production in Mississippi. Internet website: <http://www.msenergyfuture.com/facts.php>. Accessed March 6, 2012.
- Mitchell, R., I.R. MacDonald, and K.A. Kvenvolden. 1999. Estimation of total hydrocarbon seepage into the Gulf of Mexico based on satellite remote sensing images. *Transactions, American Geophysical Union* 80(49), Ocean Sciences Meeting OS242.
- Mitsch, W.J. and J. Gosselink. 2000. *Wetlands*. New York, NY: John Wiley & Sons, Inc. 600 pp.
- Miyazaki, N. and W.F. Perrin. 1994. Rough-toothed dolphin—*Steno bredanensis* (Lesson, 1828). In: Ridgway, S.H. and R. Harrison, eds. *Handbook of marine mammals*. Volume 5: First book of dolphins. San Diego, CA: Academic Press. Pp. 1-21.
- Moein, S., M. Lenhardt, D. Barnard, J. Keinath, and J. Musick. 1993. Marine turtle auditory behavior. *Journal of the Acoustical Society of America* 93(4, Pt 2):2,378.
- Montagna, P.A. and D.E. Harper, Jr. 1996. Benthic infaunal long-term response to offshore production platforms in the Gulf of Mexico. *Canadian Journal of Fisheries and Aquatic Science* 53:2567-2588.
- Montagna, P.A., J.G. Baguley, C. Cooksey, I. Hartwell, L. Hyde, J.L. Hyland, R.D. Kalke, L.M. Kracker, M. Reuscher, and A.C.E. Rhodes. 2013. Deep-sea benthic footprint of the *Deepwater Horizon* blowout. *PLOS ONE* 8(8):e70540. doi:10.1371/journal.pone.0070540.
- Moody, R.M., J. Cebrian, and K.L. Heck Jr. 2013. Interannual recruitment dynamics for resident and transient marsh species: Evidence for a lack of impact by the Macondo oil spill. *PLOS ONE* 8:e58376.

- Mooney, T.A., R. Hanlon, P.T. Madsen, J. Christensen-Dalsgaard, D.R. Ketten, and P.E. Nachtigall. 2012. Potential for sound sensitivity in cephalopods. In: Popper, A.N. and A. Hawkins, eds. The effects of noise on aquatic life. New York, NY: Springer. Pp. 125-128.
- Morreale, S.L. and E.A. Standora. 1995. Cumulative evidence of southward migration of juvenile sea turtles from temperate northeastern waters. NOAA Technical Memorandum NMFS-SEFSC-36. U.S. Dept. of Commerce, National Marine Fisheries Service, Miami, FL.
- Moridis, G.J., T.S. Collett, R. Boswell, M. Kurihara, M.T. Reagan, C. Koh, and E.D. Sloan. 2008. Toward production from gas hydrates: Current status, assessment of resources, and simulation-based evaluation of technology and potential. Society of Petroleum Engineers. Unconventional Reservoirs Conference, Keystone, CO, February 10-12, 2008. 43 pp. Internet website: http://www.netl.doe.gov/technologies/oil-gas/publications/Hydrates/reports/G308_SPE114163_Feb08.pdf.
- Morris Jr, J.A. and J.L. Akins. 2009. Feeding ecology of invasive lionfish (*Pterois volitans*) in the Bahamian archipelago. Environmental Biology of Fishes 86(3):389-398.
- Mortimer, J.A. and M. Donnelly. 2008. Hawksbill turtle (*Eretmochelys imbricata*) in IUCN 2012 red list status of threatened species. Version 2012.2. Internet website: http://jr.iucnredlist.org/documents/attach/Reptiles/8005_Eretmochelys_imbricata.pdf.
- Morton, R.A. 1982. Effects of coastal structures on shoreline stabilization and land loss—the Texas experience. In: Boesch, D.F., ed. Proceedings of the Conference on coastal erosion and wetland modification in Louisiana: Causes, consequences, and options. Washington, DC: U.S. Dept. of the Interior, Fish and Wildlife Service, Biological Services Program. FWS/OBS-82/59.
- Morton, R.A. 2003. An overview of coastal land loss: With emphasis on the southeastern United States. U.S. Dept. of the Interior, Geological Survey. Open-File Report 03-337. Internet website: <http://pubs.usgs.gov/of/2003/of03-337/intro.html>. Accessed May 11, 2010.
- Morton, R.A. 2008. Historical changes in the Mississippi-Alabama barrier-island chain and the roles of extreme storms, sea level, and human activities. Journal of Coastal Research 24(6):1587-1600. West Palm Beach (Florida), ISSN 0749-0208.
- Morton, R.A., N. Buster, and M. Krohn. 2002. Subsurface controls on historical subsidence rates and associated wetland loss in south-central Louisiana. Transactions Gulf Coast Association of Geological Societies 52:767-778.
- Morton, R.A., T.L. Miller, and L.J. Moore. 2004a. National assessment of shoreline change: Part 1: Historical shoreline changes and associated coastal land loss along the U.S. Gulf of Mexico. U.S. Dept. of the Interior, Geological Survey. Open-File Report 2004-1043. 45 pp.
- Morton, R.A., J.C. Bernier, J.A. Barras, and N.F. Ferina. 2005. Rapid subsidence and historical wetland loss in the Mississippi Delta plain: Likely causes and future implications. U.S. Dept. of the Interior, Geological Survey. Open-File Report 2005-1216. 116 pp. Internet website: <http://pubs.usgs.gov/of/2005/1216/ofr-2005-1216.pdf>.

- Moser, M.L. and D.S. Lee. 2012. Foraging over *Sargassum* by western North Atlantic seabirds. *Wilson Journal of Ornithology* 124:66-72.
- Mosier, A. 1998. The impact of coastal armoring structures on sea turtle nesting behavior at three beaches on the east coast of Florida.
- Moulton, D.W., T.E. Dahl, and D.M. Dall. 1997. Texas coastal wetlands. Status and trends mid 1955 to early 1990's. U.S. Dept. of the Interior, Fish and Wildlife Service, Southwest Region.
- Moyers, J.E. 1996. Food habits of Gulf Coast subspecies of beach mice (*Peromyscus polionotus* spp.). M.S. Thesis, Auburn University, AL. 84 pp.
- Mrosovsky, N., C. Lavin, and M.H. Godfrey. 1995. Thermal effects of condominiums on a turtle beach in Florida. *Biological Conservation* 74:151-156.
- Mrosovsky, N., G.D. Ryan, and M.C. James. 2009. Leatherback turtles: The menace of plastic. *Marine Pollution Bulletin* 58(2):287-289.
- Mueller, M.S., J. Froeschke, D. Naar. 2014. Progressing from data to information: Incorporating GIS into coral and fisheries management. In: Bortone, S.A., ed. *Interrelationships between corals and fisheries*. CRC Press. 321 pp.
- Mulabagal, V., F. Yin, G.F. John, J.S. Hayworth, and T.P. Clement. 2013. Chemical fingerprinting of petroleum biomarkers in *Deepwater Horizon* oil spill samples collected from Alabama shoreline. *Marine Pollution Bulletin* 70:147-154.
- Muller-Karger, F.E., F. Vukovich, R. Leben, B. Nababan, C. Hu, and D. Myhre. 2001. Surface circulation and the transport of the Loop Current into the northeastern Gulf of Mexico: Final report. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 2001-102. 39 pp.
- Mullin, K.D. and G.L. Fulling. 2004. Abundance of cetaceans in the oceanic northern Gulf of Mexico, 1996-2001. *Marine Mammal Science* 20:787-807.
- Mullin, K.D. and W. Hoggard. 2000. Visual surveys of cetaceans and sea turtles from aircraft and ships: Chapter 4. In: Davis, R.W., W.E. Evans, and B. Würsig, eds. *Cetaceans, sea turtles and birds in the northern Gulf of Mexico: Distribution, abundance and habitat associations*. Volume II: Technical report. U.S. Dept. of the Interior, Geologic Survey, Biological Resources Division, USGS/BRD/CR-1999-005 and U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 2000-003. 364 pp.
- Mullin, K., W. Hoggard, C. Roden, R. Lohofener, C. Rogers, and B. Taggart. 1991. Cetaceans on the upper continental slope in the north-central Gulf of Mexico. U.S. Dept. of the Interior, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 91-0027. 108 pp.
- Mullin, K.D., W. Hoggard, C.L. Roden, R.R. Lohofener, C.M. Rogers, and B. Taggart. 1994a. Cetaceans on the upper continental slope in the north-central Gulf of Mexico. *U.S. Fishery Bulletin* 92:773-786.

- Mullin, K.D., L.V. Higgins, T.A. Jefferson, and L.J. Hansen. 1994b. Sightings of the Clymene dolphin (*Stenella clymene*) in the Gulf of Mexico. *Marine Mammal Science* 10:464-470.
- Mullins, J., H. Whitehead, and L.S. Weilgart. 1988. Behavior and vocalizations of two single sperm whales, *Physeter macrocephalus*, off Nova Scotia. *Canadian Journal of Fisheries and Aquatic Sciences* 45:1736-1743.
- Murawski, S.A., W.T. Hogarth, E.B. Peebles, and L. Barbeiri. 2014. Prevalence of external skin lesions and polycyclic aromatic hydrocarbon concentrations in Gulf of Mexico fishes, post-*Deepwater Horizon*. *Transactions of the American Fisheries Society* 143(4):1084-1097.
- Murphy, T.M. and S.R. Hopkins. 1984. Aerial and ground surveys of marine turtle nesting beaches in the southeast region, United States. Final report to the U.S. Dept. of Commerce, National Marine Fisheries Service, Southeast Fisheries Science Center. NMFS Contract No. NA83-GA-C-00021. 73 pp.
- Murray, S.P. 1997. An observational study of the Mississippi-Atchafalaya coastal plume: Final report. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 98-0040. 513 pp.
- Musick, J.A. and C.J. Limpus. 1997. Habitat utilization and migration in juvenile sea turtles. *The Biology of Sea Turtles* 1:137-163.
- Nalco. 2010. Oil dispersant expert testimony. Internet website: <http://www.nalco.com/news-and-events/4259.htm>. Accessed December 27, 2010.
- Nash, H.L., S.J. Furiness, and J.W. Tunnell, Jr. 2013. What is known about species richness and distribution on the outer-shelf South Texas banks? *Gulf and Caribbean Research* 25:9-18.
- Nassauer, J.I. and M.K. Benner. 1984. Visual preferences for a coastal landscape including oil and gas development. *Journal of Environmental Management* 18:323-338.
- National Academy of Sciences. 1975. Assessing potential ocean pollutants, a report of the study panel on assessing potential ocean pollutants to the Ocean Affairs Board, Commission on Natural Resources, National Research Council. 438 pp.
- National Association of Corrosion Engineers (NACE). 2003. Standard material requirements—methods for sulfide stress cracking and stress corrosion cracking resistance in sour oilfield environments. National Association of Corrosion Engineers. ANSI/NACE MR1075-2003. 44 pp.
- National Center for Disease Preparedness. 2013. Impact on children and families of the *Deepwater Horizon* oil spill: Preliminary findings of the coastal population impact study. Earth Institute, Columbia University. Internet website: http://ncdptraining.cumc.columbia.edu/~columbia/files/GCPI_Community_Brochure_FINAL.pdf. Accessed September 9, 2015.
- National Center for Disease Preparedness. 2014. The Gulf Coast population impact project. Shoreline: Youth helping youth recover from disaster. Earth Institute, Columbia University. Internet website: <http://ncdptraining.cumc.columbia.edu/~columbia/files/gulf-coast-brochure.pdf>. Accessed September 9, 2015.

- National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling. 2011. Deep water: The Gulf oil disaster and the future of offshore drilling. Report to the President (January 2011). Internet website: <http://tinyurl.com/p8d7c8b>. Accessed August 5, 2015.
- National Conference of State Historic Preservation Officers. 2014. Testimony before the U.S. House of Representatives Committee on Appropriations, Subcommittee on Interior, Environment and Related Agencies. April 3, 2014. Internet website: <http://docs.house.gov/meetings/AP/AP06/20140410/101761/HHRG-113-AP06-Wstate-HughesE-20140410.pdf>.
- National Conference of State Historic Preservation Officers. 2015. Historic Preservation Fund. Internet website: <http://www.ncshpo.org/historicpreservationfund.shtml>. Accessed July 20, 2015.
- National Education Association. 2015. Rankings & estimates: Rankings of the States 2014 and estimates of school statistics 2015. NEA Research, March 2015. Internet website: http://www.nea.org/assets/docs/NEA_Rankings_And_Estimates-2015-03-11a.pdf. Accessed September 9, 2015.
- National Fish and Wildlife Foundation. 2015a. Gulf Environmental Benefit Fund funding priorities. Internet website: <http://www.nfwf.org/gulf/Pages/fundingpriorities.aspx>. Accessed March 11, 2015.
- National Fish and Wildlife Foundation. 2015b. Gulf Environmental Benefit Fund. Internet website: <http://www.nfwf.org/gulf/Pages/home.aspx>. Accessed March 11, 2015.
- National Institute of Environmental Health Science. 2014. GuLF STUDY gears up for second round of health exams. News release. April 11, 2014. Internet website: <http://www.niehs.nih.gov/news/newsroom/releases/2014/april11/index.cfm>. Accessed September 13, 2015.
- National Offshore Safety Advisory Commission (NOSAC). 1999. Deepwater facilities in the Gulf of Mexico: Final report. NOSAC Subcommittee on Collision Avoidance, New Orleans, LA.
- National Research Council (NRC). 1983. Drilling discharges in the marine environment. Panel on assessment of fates and effects of drilling fluids and cuttings in the marine environment. Marine Board, Commission on Engineering and Technical Systems, National Research Council. Washington, DC: National Academy Press. Pp. 18-21.
- National Research Council (NRC). 1990. Decline of the sea turtles: Causes and prevention. Committee on Sea Turtle Conservation. Washington, DC: National Academy Press. 280 pp.
- National Research Council (NRC). 1996. An assessment of techniques for removing offshore structures. Washington, DC: National Academy Press. 86 pp.
- National Research Council (NRC). 2003. Oil in the sea III: Inputs, fates, and effects (Committee on Oil in the Sea: J.N. Coleman, J. Baker, C. Cooper, M. Fingas, G. Hunt, K. Kvenvolden, J. McDowell, J. Michel, K. Michel, J. Phinney, N. Rabalais, L. Roesner, and R.B. Spies). Washington, DC: The National Academies Press. 265 pp.

- National Research Council (NRC). 2005. Oil spill dispersants: Efficacy and effects. Committee on understanding oil spill dispersants: Efficacy and Effects, Ocean Studies Board, Division on Earth and Life Studies, National Research Council, National Academy Press, Washington, DC. 400 pp.
- National Research Council (NRC). 2010a. Advancing the science of climate change. America's climate choices: Panel on advancing the science of climate change. Washington, DC: The National Academies Press. 528 pp.
- National Research Council (NRC). 2010b. Assessment of sea turtle status and trends—integrating demography and abundance. Washington, DC: National Academies Press. 175 pp.
- National Research Council (NRC). 2014. Evaluating the effectiveness of fish stock rebuilding plans in the United States. National Research Council, Ocean Studies Board. Washington, DC: National Academies Press. Pp. 1-143.
- National Response Corporation. 2015. National Response Corporation's major equipment list. Internet website: <http://nrcc.com/pdf/Website.pdf>. Accessed June 11, 2015.
- National Wetlands Inventory Group. 1985. Status and trends of wetlands and deepwater habitats in the conterminous United States, 1950's to 1970's. Transactions of the North American Wildlife and Natural Resources Conference 50:440-448.
- NaturalGas.org. 2010. Offshore drilling. Internet website: http://www.naturalgas.org/naturalgas/extraction_offshore.asp. Accessed December 21, 2010.
- Navigant Consulting, Inc. 2013. Offshore wind market and economic analysis: Annual market assessment. Internet website: http://www1.eere.energy.gov/wind/pdfs/offshore_wind_market_and_economic_analysis.pdf. Accessed May 14, 2014.
- Neal Adams Firefighters Inc. 1991. Joint industry program for floating vessel blowout control. Prepared for the U.S. Dept. of the Interior, Minerals Management Service. TA&R Project 150. 476 pp.
- Neff, J.M. 1987. Biological effects of drilling fluids, drill cuttings and produced waters. In: Boesch, D.F. and N.N. Rabalais, eds. Long-term environmental effects of offshore oil and gas development. London, UK: Elsevier Applied Science. Pp. 469-538.
- Neff, J.M. 1990. Composition and fate of petroleum and spill-treating agents in the marine environment. In: Geraci, J.R. and D.J. St. Aubin, eds. Sea mammals and oil: Confronting the risks. San Diego, CA: Academic Press, Inc. Pp. 1-33.
- Neff, J.M. 2002. Fates and effects of mercury from oil and gas exploration and production operations in the marine environment. Prepared under contract for the American Petroleum Institute, Washington, DC.
- Neff, J.M. 2005. Composition, environmental fates, and biological effects of water based drilling muds and cuttings discharged to the marine environment: A synthesis and annotated bibliography. Prepared for the Petroleum Environmental Research Forum and American

- Petroleum Institute. Duxbury, MA: Battelle. 83 pp. Internet website: <http://www.perf.org/pdf/APIPERFreport.pdf>.
- Neff, J.M. and T.C. Sauer, Jr. 1991. Review: Findings of the American Petroleum Institute study on produced waters. In: Geo-Marine, Inc. Proceedings: Eleventh Annual Gulf of Mexico Information Transfer Meeting. November, 1990. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 91-0040. 524 pp.
- Neff, J.M., T.C. Sauer, and N. Maciolek. 1989. Fate and effects of produced water discharges in nearshore marine waters. Prepared for the American Petroleum Institute, Washington, DC.
- Neff, J.M., S. McKelvie, and R.C. Ayers, Jr. 2000. Environmental impacts of synthetic based drilling fluids. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 2000-064. 118 pp.
- Negri, A.P. and A.J. Heyward. 2000. Inhibition of fertilization and larval metamorphosis of the coral *Acropora millepora* (Ehrenberg, 1834) by Petroleum Products. Marine Pollution Bulletin 41:420-427.
- Nelson, H.F. and E.E. Bray. 1970. Stratigraphy and history of the Holocene sediments in the Sabine-High Island Area, Gulf of Mexico. In: Morgam, J.P., ed. Deltaic sedimentation; modern and ancient. Special Publication No. 15. Tulsa, OK: SEPM.
- Nero, R.W., M. Cook, A.T. Coleman, M. Solangi, and R. Hardy. 2013. Using an ocean model to predict likely drift tracks of sea turtle carcasses in the north central Gulf of Mexico. Endangered Species Research 21:191-203.
- Nicholls, J.L. and G.A. Baldassarre. 1990. Winter distribution of piping plovers along the Atlantic and Gulf Coasts of the United States. Wilson Bulletin 102:400-412.
- Niederoda, A., S. Davis, M. Bowen, E. Nestler, J. Rowe, R. Balouskus, M. Schroeder, B. Gallaway, and R. Fechhelm. 2014. A method for the evaluation of the relative environmental sensitivity and marine productivity of the Outer Continental Shelf. Prepared by URS Group, Inc., Normandeau Associates, Inc., RPS ASA, and LGL Ecological Research Associates, Inc. for the U.S. Department of the Interior, Bureau of Ocean Energy Management. Herndon, VA. OCS Study BOEM 2014-616. 80 pp. + apps.
- Nola.com. 2014. Judge blocks Mississippi offshore drilling rules. Internet website: http://www.nola.com/environment/index.ssf/2014/06/judge_blocks_mississippi_offsh.html.
- Normandeau Associates, Inc. 2012. Effects of noise on fish, fisheries, and invertebrates in the U.S. Atlantic and Arctic from energy industry sound-generating activities. A literature synthesis for the U.S. Dept. of the Interior, Bureau of Ocean Energy Management. Contract No. M11PC00031. 135 pp.
- Norris, D.R. 2005. Carry-over effects and habitat quality in migratory populations. Oikos 109:178-186.

- Norris, K.S. and G.W. Harvey. 1972. A theory for the function of the spermaceti organ of the sperm whale (*Physeter catodon* L.). In: Galler, S.R., K. Schmidt-Koenig, G.J. Jacobs, and R.E. Belleville, eds. Animal orientation and navigation. National Aeronautics and Space Administration, Washington, DC. Pp. 397-417.
- Norris K.S. and B. Mohl. 1983. Can odontocetes debilitate prey with sound? *American Naturalist* 122(1):85-104.
- North American Water Fowl Management Plan. 2004. North American Waterfowl Management Plan 2004 implementation framework: Strengthening the biological foundation. Environment Canada, U.S. Fish and Wildlife Service, Secretaria de Medio Ambiente y Recursos Naturales.
- Nott, M.P., O.L. Bass, Jr., D.M. Fleming, S.E. Killeffer, N. Fraley, L. Manne, J.L. Curnutt, J.M. Brooks, R. Powell, and S.L. Pimm. 1998. Water levels, rapid vegetational changes, and the endangered Cape Sable seaside sparrow. *Animal Conservation* 1:23-32.
- Nowacek, S.M. and R.S. Wells. 2001. Short-term effects of boat traffic on bottlenose dolphins, *Tursiops truncatus*, in Sarasota Bay, Florida. *Marine Mammal Science* 17:673-688.
- Nowacek, D.P., L.H. Thorne, D.W. Johnston, and P.L. Tyack. 2007. Responses of cetaceans to anthropogenic noise. *Mammal Review* 37(2):81-115.
- Nowlin, W.D., Jr. 1972. Winter circulation patterns and property distributions. In: Capurro, L.R.A. and J.L. Reid, eds. Contributions on the physical oceanography of the Gulf of Mexico. Texas A&M University Oceanographic Studies, Volume 2. Houston, TX: Gulf Publishing Co. Pp. 3-51.
- Nyman, J.A., D.M. Baltz, M.D. Kaller, P.L. Leberg, C.P. Richards, R.P. Romaine, and T.M. Soniat. 2013. Likely changes in habitat quality for fish and wildlife in coastal Louisiana during the next fifty years. In: Peyronnin, N. and D. Reed, eds. Louisiana's 2012 Coastal Master Plan Technical Analysis. *Journal of Coastal Research Special Issue* 67:60-74.
- O'Hara, J. 1980. Thermal influences on the swimming speed of loggerhead turtle hatchlings. *Copeia* 1980:773-780.
- O'Hara, J. and J.R. Wilcox. 1990. Avoidance responses of loggerhead turtles, *Caretta caretta*, to low frequency sound. *Copeia* (1990)2:564-567.
- O'Keefe, D.J. and G.A. Young. 1984. Handbook on the environmental effects of underwater explosives. U.S. Dept. of the Navy, Naval Surface Warfare Center, Dahlgren, VA, and Silver Spring, MD. NSWC TR 83-240.
- O'Shea, T., J. Moore, and H. Kochman. 1984. Contaminant concentrations in manatees in Florida. *The Journal of Wildlife Management* 48:741-748.
- O'Shea, T.J., B.B. Ackerman, and H.F. Percival, eds. 1995. Population biology of the Florida manatee. National Biological Service, Information and Technology Report 1.
- Ocean Conservancy. 2007. National Marine Debris Monitoring Program. Submitted to the U.S. Environmental Protection Agency: Grant No. 83053401-02. 74 pp.

- Ocean Conservancy. 2014. Turning the tide on trash: 2014 report. Internet website: <http://www.oceanconservancy.org/our-work/marine-debris/icc-data-2014.pdf>.
- Odell, C. 2015. Construction expected to be down in 2015 and 2016. *Offshore Magazine* 75(7). Internet website: <http://www.offshore-mag.com/articles/print/volume-75/issue-7/rig-report/new-rig-orders-slow-almost-to-a-halt.html>. Accessed August 31, 2015.
- Odell, D.K. and C. MacMurray. 1986. Behavioral response to oil. In: Vargo, S., P.L. Lutz, D.K. Odell, T. van Vleet, and G. Bossart, eds. Study of the effects of oil on marine turtles: Final report. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 86-0070.
- Offshore Inland. 2014. OIMO expands operations at the Port of Pensacola. *Offshore Inland Marine Oilfield*. July 23, 2014. Internet website: <http://offshoreinland.com/oimo-expands-operations-port-pensacola/>. Accessed September 24, 2015.
- Ogden, J.C., D.A. McCrimmon, Jr., G.T. Bancroft, and B.W. Patty. 1987. Breeding populations of the wood stork in the southern United States. *Condor* 89:752-759.
- Ogren, L.H. 1989. Distribution of juvenile and subadult Kemp's ridley turtles: Preliminary results from the 1984-1987 surveys. In: Proceedings from the 1st Symposium on Kemp's Ridley Sea Turtle Biology, Conservation, and Management. Sea Grant College Program, Galveston, TX. Volume 116.
- Onuf, C.P. 1996. Biomass patterns in seagrass meadows of the Laguna Madre, Texas. *Bulletin of Marine Science* 58(2):404-420.
- Operational Science Advisory Team (OSAT). 2010. Summary report for sub-sea and sub-surface oil and dispersant detection: Sampling and monitoring. Unified Area Command, New Orleans, LA. Internet website: http://www.restorethegulf.gov/sites/default/files/documents/pdf/OSAT_Report_FINAL_17DEC.pdf. Released December 17, 2010. Accessed March 14, 2011.
- Operational Science Advisory Team (OSAT-2). 2011. Summary report for fate and effects of remnant oil in the beach environment. Operational Science Team (OSAT-2), Gulf Coast Incident Management Team. Prepared for Lincoln H. Stroh, CAPT, U.S. Coast Guard, Federal On-Scene Coordinator, Deepwater Horizon MC 252. 35 pp. Internet website: http://www.dep.state.fl.us/deepwaterhorizon/files2/osat_2_report_10feb.pdf.
- Orth, R.J., T.J.B. Carruthers, W.C. Dennison, C.M. Duarte, J.W. Fourqurean, K.L. Heck, Jr., A.R. Hughes, G.A. Kendrick, W.J. Kenworthy, S. Olyarnik, F.T. Short, M. Waycott, and S.L. Williams. 2006. A global crisis for seagrass ecosystems. *BioScience* 56(12):987-996.
- Otvos, E.G. 1979. Barrier island evolution and history of migration: North central Gulf Coast. In: Leatherman, S., ed. Barrier islands from the Gulf of St. Lawrence to the Gulf of Mexico. New York, NY: Academic Press. Pp. 219-319.
- Overton, E.B., C.J. Byrne, J.A. McFall, S.R. Antoine, and J.L. Laseter. 1983. Results from the chemical analyses of oily residue samples from stranded juvenile sea turtles collected from

- Padre and Mustang Islands, Texas. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA.
- Owens, E.H., E. Taylor, A. Graham, and R.W. Castle. 2011. Sand beach treatment studies and field trials conducted during the *Deepwater Horizon*-Macondo response operation. In: Proceedings, 2011 International Oil Spill Conference, May 23-26, 2011, Portland, OR. 9 pp.
- Oynes, C. 2006. Deepwater expansion continues in the Gulf of Mexico. *Pipeline & Gas Journal* 231(6):58.
- Papastavrou, Y., S.C. Smith, and H. Whitehead. 1989. Diving behavior of the sperm whale, *Physeter macrocephalus*, off the Galapagos Islands. *Canadian Journal of Zoology* 7:839-846.
- Parker, R.O., Jr., D.R. Colby, and T.P. Willis. 1983. Estimated amount of reef habitat on a portion of the U.S. South Atlantic and Gulf of Mexico continental shelf. *Bulletin of Marine Science* 33:935-940.
- Parr, A.E. 1939. Quantitative observations on pelagic Sargassum vegetation of the western North Atlantic. *Bulletin of the Bingham Oceanographic Collection* 6:1-94.
- Parsons, J.J. 1972. The hawksbill turtle and the tortoise shell trade. In: *Études de géographie tropicale offertes a Pierre Gourou*. Paris, France: Mouton. Pp. 45-60.
- Parsons, G. and A. Kang. 2007. Valuing beach closures on the Padre Island National Seashore. University of Delaware, Graduate College of Marine Studies. U.S. Dept. of Commerce, NOAA Grant No. NA04NOS4190063. Project No. 06-090. 31 pp.
- Passow, U., K. Ziervogel, V. Asper, and A. Diercks. 2012. Marine snow formation in the aftermath of the *Deepwater Horizon* oil spill in the Gulf of Mexico. *Environmental Research Letters* 7. doi:10.1088/1748-9326/7/3/035301.
- Patrick, S.R., D.R. Patrick, and S.W. Fardo. 1993. Energy conservation guidebook. Lilburn, GA: The Fairmont Press, Inc. 471 pp. Internet website: http://books.google.com/books?id=f45IIzt4DCIC&pg=PA143&lpg=PA143&dq=ship,+%22discharge+water+temperature%22&source=bl&ots=CEHy0wpaMz&sig=BZam0pB-2mDwo4vO5zGM9jBsQWY&hl=en&ei=nMEpTYnqJsSBI_Af_-7joAQ&sa=X&oi=book_result&ct=result&resnum=5&ved=0CC0Q6AEwBA#v=onepage&q&f=false. Accessed January 10, 2011.
- Pattengill, C.V. 1998. The structure and persistence of reef fish assemblages of the Flower Garden Banks National Marine Sanctuary. Ph.D. Thesis, Texas A&M University, College Station, TX.
- PCCI Marine and Environmental Engineering. 1999. Oil spill containment, remote sensing and tracking for deepwater blowouts: Status of existing and emerging technologies. Report prepared for the U.S. Dept. of the Interior, Minerals Management Service. TA&R Project 311. 66 pp. + apps.
- Pearson, C.E., D.B. Kelley, R.A. Weinstein, and S.W. Gagliano. 1986. Archaeological investigations on the outer continental shelf: A study within the Sabine River valley, offshore

- Louisiana and Texas. U.S. Dept. of the Interior, Minerals Management Service, Reston, VA. OCS Study MMS 86-0119. 314 pp.
- Pearson, C.E., S.R. James, Jr., M.C. Krivor, S.D. El Darragi, and L. Cunningham. 2003. Refining and revising the Gulf of Mexico outer continental shelf region high-probability model for historic shipwrecks: Final report. Volumes I-III. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 2003-060, 2003-061, and 2003-062. 13, 338, and 138 pp., respectively.
- Peele, R.H., J.I. Snead, and W. Feng. 2002. Outer continental shelf pipelines crossing the Louisiana coastal zone: A geographic information system approach. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans LA. OCS Study MMS 2002-038. 24 pp.
- Pennycuik, C.J. and P.F. Battley. 2003. Burning the engine: A time-marching computation of fat and protein consumption in a 5420-km non-stop flight by great knots, *Calidris tenuirostris*. *Oikos* 1032:323-332.
- Pensacola News Journal. 2014. Hayward announces 200 new jobs at Port of Pensacola. July 10, 2014. Internet website: <http://www.pnj.com/story/money/business/2014/07/10/mayor-announces-new-jobs-port/12472063/>. Accessed September 24, 2015.
- Pequegnat, W.E. 1983. The ecological communities of the continental slope and adjacent regimes of the northern Gulf of Mexico. Prepared by TerEco Corp. for the U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. 398 pp.
- Perrin, W.F. and J.W. Gilpatrick, Jr. 1994. Spinner dolphin—*Stenella longirostris* (Gray, 1828). In: Ridgway, S.H. and R. Harrison, eds. Handbook of marine mammals. Volume 5: First book of dolphins. London, UK: Academic Press. Pp. 99-128.
- Perrin, W.F. and A.A. Hohn. 1994. Pantropical spotted dolphin—*Stenella attenuata*. In: Ridgway, S.H. and R. Harrison, eds. Handbook of marine mammals. Volume 5: The first book of dolphins. London, UK: Academic Press. Pp. 71-98.
- Perrin, W.F. and J.G. Mead. 1994. Clymene dolphin *Stenella clymene* (Gray, 1846). In: Ridgway, S.H. and R. Harrison, eds. Handbook of marine mammals. Volume 5: The first book of dolphins. London, UK: Academic Press. Pp. 161-171.
- Perrin, W.F., D.K. Caldwell, and M.C. Caldwell. 1994a. Atlantic spotted dolphin *Stenella frontalis* (G. Cuvier, 1829). In: Ridgway, S.H. and R. Harrison, eds. Handbook of marine mammals. Volume 5: The first book of dolphins. London, UK: Academic Press. Pp. 173-190.
- Perrin, W.F., S. Leatherwood, and A. Collet. 1994b. Fraser's dolphin—*Lagenodelphis hosei* (Fraser, 1956). In: Ridgway, S.H. and R. Harrison, eds. Handbook of marine mammals. Volume 5: The first book of dolphins. London, UK: Academic Press. Pp. 225-240.

- Perrin, W.F., C.E. Wilson, and F.I. Archer II. 1994c. Striped dolphin—*Stenella coeruleoalba* (Meyen, 1833). In: Ridgway, S.H. and R. Harrison, eds. Handbook of marine mammals. Volume 5: The first book of dolphins. London, UK: Academic Press. Pp. 129-159.
- Perry, S.L., D.P. DeMaster, and G.K. Silber. 1999. The great whales: History and status of six species listed as endangered under the U.S. Endangered Species Act of 1973. Marine Fisheries Review 61(1).
- Peterson, M.S. and M.R. Lowe. 2009. Implications of cumulative impacts to estuarine and marine habitat quality for fish and invertebrate resources. Reviews in Fisheries Science 17(4):505-523.
- Petkova, E.P., K.L. Ebi, D. Culp, and I. Redlener. 2015. Climate change and health on the U.S. Gulf Coast: Public health adaptation is needed to address future risks. International Journal of Environmental Research and Public Health 12:9342-9356. doi:10.3390/ijerph120809342. August 2015. Internet website: <http://academiccommons.columbia.edu/catalog/ac:187854>. Accessed September 9, 2015.
- Petterson, J.S., E. Glazier, L.D. Stanley, C. Mencken, K. Eschbach, P. Moore and P. Goode. 2008. Benefits and burdens of OCS activities on states, labor market areas, coastal counties, and selected communities. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 2008-052. 470 pp.
- Pezeshki, S.R., M.W. Hester, Q. Lin, and J.A. Nyman. 2000. The effects of oil spill and cleanup on dominant U.S. Gulf Coast marsh macrophytes: A review. Environmental Pollution 108:129-139.
- Plotkin, P. and A.F. Amos. 1988. Entanglement in and ingestion of marine debris by sea turtles stranded along the South Texas coast. In: Proceedings, 8th Annual Workshop on Sea Turtle Conservation and Biology. NOAA Technical Memorandum NMFS-SEFSC-214.
- Pollak, J. 2013. Extremes on the Mississippi River. Internet website: <http://cuahsihis.blogspot.com/2013/01/extremes-on-mississippi-river.html>. Accessed March 25, 2015.
- Pollock, C.G., T.J. Code, I.F. Lundgren, M. Alter, A. Andres, P. Steinburg, and Z. Hillis-Starr. 2015. Buck Island sea turtles research program data summary. Technical report for the U.S. Dept. of Interior, National Park Service, Buck Island Reef National Monument. 13 pp.
- Popper, A.N., R.R. Fay, C. Platt, and O. Sand. 2003. Sound detection mechanisms and capabilities of teleost fishes. In: P. and N.J. Marshall, eds. Sensory processing in aquatic environments. New York, NY: Springer-Verlag. Pp. 3-38.
- Popper, A.N. and M.C. Hastings. 2009. Effects of anthropogenic sources of sound on fishes. Journal of Fish Biology 75:455-498.
- Popper, A.N., M.E. Smith, P.A. Cott, B.W. Hanna, A.O. MacGillivray, M.E. Austin, and D.A. Mann. 2005. Effects of exposure to seismic airgun use on hearing of three fish species. Journal of the Acoustical Society of America 117(6):3958-3971.

- Popper, A.N., A.D. Hawkins, R.R. Fay, D.A. Mann, S. Bartol, T.J. Carlson, S. Coombs, W.T. Ellison, R. Gentry, M.B. Halvorsen, S. Lokkeborg, P. Rogers, B.L. Southall, D.G. Zeddies, and W.N. Tavolga. 2014. ASA S3/SC1. 4 TR-2014 sound exposure guidelines for fishes and sea turtles. A technical report prepared by ANSI-Accredited Standards Committee S3/SC1 and Registered with ANSI. New York, NY: Springer. 78 pp.
- Port of Gulfport. 2016. Port of Gulfport carriers and tenants. Internet website: <http://shipmspa.com/carriers-customers/tenants/#sthash.5i5b1HH7.dpbs>. Accessed February 19, 2016.
- Port of Pascagoula. 2015. Port facts and stats. Internet website: <http://www.portofpascagoula.com/port-facts.html>. Accessed September 25, 2015.
- Portnoy, J.W. 1978. Colonial waterbird population status and management on the north Gulf of Mexico coast. Proceedings of the Conference of the Colonial Waterbird Group 1:38-43.
- Portnoy, J.W. 1981. Breeding abundance of colonial waterbirds on the Louisiana-Mississippi-Alabama coast. American Birds 35:868-872.
- Powell, E.N. 1995. Evidence for temporal change at seeps. In: MacDonald, I.R., W.W. Schroeder, and J.M. Brooks, eds. Chemosynthetic ecosystems study: Final report. Volume 2: Technical report. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 95-0022. Pp. 8.1-8.65.
- Powers, S.P., F.J. Hernandez, R.H. Condon, J.M. Drymon, and C.M. Free. 2013. Novel pathways for injury from offshore oil spills: Direct, sublethal and indirect effects of the *Deepwater Horizon* oil spill on pelagic *Sargassum* communities. PLOS ONE (9):e74802. doi:10.1371/journal.pone.0074802.
- Price, J.M., W.R. Johnson, Z.-G. Ji, C.F. Marshall, and G.B. Rainey. 2001. Sensitivity testing for improved efficiency of a statistical oil spill risk analysis model. In: Proceedings, Fifth International Marine Environment Modeling Seminar, October 9-11, 2001, New Orleans, LA. Pp. 533-550.
- Priest, T. and J. Lajaunie. 2014. Gulf Coast communities and the fabrication and shipbuilding industry: a comparative community study, Volume 1: Historical overview and statistical model. U.S. Dept. of the Interior, Bureau of Ocean Energy Management, Gulf of Mexico OCS Region, New Orleans, LA. OCS BOEM 2014-609. 185 pp.
- Pritchard, P.C.H. 1997. Evolution, phylogeny, and current status. In: Lutz, P.L. and J.A. Musivk, eds. The biology of sea turtles. Boca Raton, FL: CRC Press. Pp. 1-28.
- Prouty, N.G., C.R. Fisher, A.W.J. Demopoulos, and E.R.M. Druffel. 2014. Growth rates and ages of deep-sea corals impacted by the *Deepwater Horizon* oil spill. Deep Sea Research Part II: Topical Studies in Oceanography. doi:10.1016/j.dsr2.2014.10.021.
- Pulsipher, A.G., O.O. Iledare, D.V. Mesyanzhinov, A. Dupont, and Q.L. Zhu. 2001. Forecasting the number of offshore platforms on the Gulf of Mexico OCS to the year 2023. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 2001-013. 52 pp.

- Purser, J. and A.N. Radford. 2011. Acoustic noise induces attention shifts and reduces foraging performance in three-spined sticklebacks (*Gasterosteus aculeatus*). PLOS ONE 6:2.
- Pusceddu, A., S. Bianchelli, J. Martin, P. Puig, A. Palanques, P. Masque, and R. Danovaro. 2014. Chronic and intensive bottom trawling impairs deep-sea biodiversity and ecosystem functioning. Proceedings of the National Academy of Sciences 111:24.
- Putman, N.F. and K.L. Mansfield. 2015. Direct evidence of swimming demonstrates active dispersal in the sea turtle “lost years.” Current Biology 25:1221-1227.
- Putman, N.F., K.L. Mansfield, R. He, D.J. Shaver, and P. Verley. 2013. Predicting the distribution of oceanic-stage Kemp’s ridley sea turtles. Biological Letters 9:20130345. Internet website: <http://dx.doi.org/10.1098/rsbl.2013.0345>.
- Quattrini, A.M., S.E. Georgian, L. Byrnes, A. Stevens, R. Falco, and E.E. Cordes. 2013. Niche divergence by deep-sea octocorals in the genus *Callogorgia* across the continental slope of the Gulf of Mexico. Molecular Ecology 22(15):4123-4140. doi:10.1111/mec.12370.
- Quest Offshore Resources, Inc. 2011. United States Gulf of Mexico oil and natural gas industry economic impact analysis: The economic impacts of GOM oil and natural gas development on the U.S. economy. Prepared for the American Petroleum Institute and National Ocean Industries Association.
- Rabalais, N.N. 2005. Relative contribution of produced water discharge in the development of hypoxia. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 2005-044. 37 pp. Internet website: <http://www.data.boem.gov/PI/PDFImages/ESPIS/2/2964.pdf>.
- Rabalais, N.N. and R.E Turner. 2001. Coastal hypoxia: Consequences for living resources and ecosystems, coastal and estuarine studies, Volume 58. American Geophysical Union. 464 pp. New York, NY: John Wiley & Sons. ISBN:978-0-87590-272-2.
- Radford, C.A., J.A. Stanley, C.T. Tindle, J.C. Montgomery, and A.G. Jeffs. 2010. Localized coastal habitats have distinct underwater sound signatures. Marine Ecological Press Series 401:21-29.
- Radford, A.N., E. Kerridge, and S.D. Simpson. 2014. Acoustic communication in a noisy world: Can fish compete with anthropogenic noise? Behavioral Ecology 00(00):1-9. doi:10.1093/beheco/aru029.
- Railroad Commission of Texas. 2009. Self-evaluation report. Submitted to the Sunset Commission, September 2009. 215 pp. Internet website: <http://www.rrc.state.tx.us/about/divisions/RRCSelfEvaluationReport2009.pdf>.
- Railroad Commission of Texas. 2015. Offshore production. Internet website: <http://www.rrc.state.tx.us/oil-gas/research-and-statistics/production-data/offshore-production/>. Updated June 21, 2015.

- Ramírez, E., G. Marín, J. Mpodozis, & J.C. Letelier. 2014. Extracellular recordings reveal absence of magneto sensitive units in the avian optic tectum. *Journal of Comparative Physiology A*, 200(12):983-996.
- Raymond, W.W., M.A. Albins, and T.J. Pusack. 2014. Competitive interactions for shelter between invasive Pacific red lionfish and native Nassau grouper. *Environmental Biology of Fishes* 98(1):57-65.
- Reef Relief. 2015. A brief history of oil and gas off Florida. Internet website: <http://reefrelief.org/wp-content/uploads/History-of-Oil-and-Gas-in-Florida3.doc>. Accessed September 2015.
- Rees, M.A. 2010. Paleoindian and early archaic. In: Reese, M.A., ed. *Archaeology of Louisiana*. Baton Rouge, LA: Louisiana State University Press. Pp. 34-62.
- Reeves, R.R. and H. Whitehead. 1997. Status of the sperm whale, *Physeter macrocephalus*, in Canada. *Canadian-Field Naturalist* 111(2):293-307.
- Reible, D. 2010. After the oil is no longer leaking. The University of Texas, Austin. *Environmental Science & Technology* 44(15):5685-5686.
- Reimer, A.A. 1975. Effects of crude oil on corals. *Marine Pollution Bulletin* 6:39-43.
- Renaud, M.L. 1995. Movements and submergence patterns of Kemp's ridley turtles (*Lepidochelys kempii*). *Journal of Herpetology* 29:370-374.
- Renaud, M.L. and J.A. Williams. 2005. Kemp's ridley sea turtle movements and migrations. *Chelonian Conservation and Biology* 4:808-816.
- RestoreTheGulf.gov. 2010. Shoreline treatment recommendation report. 27 pp. Internet website: http://www.restorethegulf.gov/sites/default/files/imported_pdfs/external/content/document/2931/737627/1/9JUN%20LAJF01-008-003-STR%20for%20Jeff%20Par-Grand%20Isle%20Beach.pdf. Posted June 10, 2010.
- RestoreTheGulf.gov. 2015. Gulf Coast Ecosystem Restoration Council: About the Council fact sheet. Internet website: http://restorethegulf.gov/sites/default/files/About%20the%20Council%20Fact%20Sheet%20Oct%202014_1.pdf. Accessed March 11, 2015.
- Rezak, R. and T.J. Bright. 1979. Northwestern Gulf of Mexico topographic features study. Executive summary of the final report. U.S. Dept. of the Interior, Bureau of Land Management, New Orleans OCS Office, New Orleans, LA. Study No. 1979-14.
- Rezak, R. and T.J. Bright. 1981a. Northern Gulf of Mexico topographic features study: Final report to the U.S. Dept. of the Interior, Bureau of Land Management, Contract No. AA551-CT8-35. 5 vols.
- Rezak, R. and T.J. Bright. 1981b. A biological and reconnaissance of selected topographical features on the Texas continental shelf: A final report. U.S. Dept. of the Interior, Bureau of Land Management, Contract No. 08550-CT5-4. 381 pp.

- Rezak, R., T.J. Bright, and D.W. McGrail. 1983. Reefs and banks of the northwestern Gulf of Mexico: Their geological, biological, and physical dynamics. Final Technical Report No. 83-1-T.
- Rezak, R., T.J. Bright, and D.W. McGrail. 1985. Reefs and banks of the northwestern Gulf of Mexico: Their geological, biological, and physical dynamics. New York, NY: Wiley and Sons. 259 pp.
- Rezak, R., S.R. Gittings, and T.J. Bright. 1990. Biotic assemblages and ecological controls on reefs and banks of the northwest Gulf of Mexico. *American Zoologist* 30:23-35.
- Rice, D.W. 1989. Sperm whale—*Physeter macrocephalus* Linnaeus, 1758. In: Ridgway, S.H. and R. Harrison. Handbook of marine mammals. Volume 4: River dolphins and the larger toothed whales. London, England: Academic Press. Pp. 177-234.
- Richardson, W.J. and B. Würsig. 1997. Influences of man-made noise and other human actions on cetacean behaviour. *Marine and Freshwater Behaviour and Physiology* 29:183-209.
- Richardson, W.J., C.R. Greene, C.I. Mame, and D.H. Thomson. 1995. Marine mammals and noise. San Diego, CA: Academic Press Inc.
- Richardson, G.E., L.D. Nixon, C.M. Bohannon, E.G. Kazanis, T.M. Montgomery, and M.P. Gravois. 2008. Deepwater Gulf of Mexico 2008: America's offshore energy future. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Report MMS 2008-013. 102 pp. Internet website: <http://www.bsee.gov/Exploration-and-Production/Development-and-Production/Gulf/2008-013-pdf/>.
- Richmond, E.A. 1962. The fauna and flora of Horn Island, Mississippi. *Gulf Research Reports* 1(2):59-106.
- Ridgway, S.H., E.G. Wever, J.G. McCormick, J. Palin, and J.H. Anderson. 1969. Hearing in the giant sea turtle *Chelonia mydas*. In: Proceedings of the National Academy of Sciences 64:884-890.
- Roberts, D. and A.H. Nguyen. 2006. Degradation of synthetic-based drilling mud base fluids by Gulf of Mexico sediments: Final report. U.S. Dept. of the Interior, Minerals Management Service. Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 2006-028. 122 pp.
- Roberts, H.H. and T.W. Neurauter. 1990. Direct observations of a large active mud vent on the Louisiana continental slope. *Association of Petroleum Geologists Bulletin* 74:1508.
- Roberts, H.H., P. Aharon, R. Carney, J. Larkin, and R. Sassen. 1990. Sea floor responses to hydrocarbon seeps, Louisiana continental slope. *Geo-Marine Letter* 10(4):232-243.
- Roche, E.A., J.B. Cohen, D.H. Catlin, D.L. Amirault-Langlais, F.J. Cuthbert, C.L. Gratto-Trevor, J. Felio, and J.D. Fraser. 2010. Range-wide piping plover survival: Correlated patterns and temporal declines. *Journal of Wildlife Management* 74:1784-1791.

- Rodgers J.A., Jr., S.T. Schwiker, G.A. Griffin, W.B. Brooks, D. Bear-Hull, P.M. Elliott, K.J. Ebersol, and J. Morris. 2008. Productivity of wood storks (*Mycteria americana*) in north and central Florida. *Waterbirds* 31(Special Publication):25-34.
- Rogers, C.S. 1990. Responses of coral reefs and reef organisms to sedimentation. *Marine Ecology Progress Series* 62:185-202.
- Rogers, C.S. and V.H. Garrison. 2001. Ten years after the crime: Lasting effects of damage from a cruise ship anchor on a coral reef in St. John, U.S. Virgin Islands. *Bulletin of Marine Science* 69(2):793-803.
- Rooker, J.R., S.A. Holt, M.A. Soto, and G.J. Holt. 1998. Postsettlement patterns of habitat use by Sciaenid fishes in subtropical seagrass meadows. *Estuaries* 21(2):318-327.
- Rooker, J., L. Kitchens, M. Dance, R. Wells, B. Falterman and M. Cornic. 2013. Spatial, temporal, and habitat-related variation in abundance of pelagic fishes in the Gulf of Mexico: potential implications of the *Deepwater Horizon* oil spill. *PLOS ONE* 8(10):e76080.
- Rosel, P.E. and H. Watts. 2008. Hurricane impacts on bottlenose dolphins in the northern Gulf of Mexico. *Gulf of Mexico Science* 1:88-94.
- Rosel, P. and L. Wilcox. 2014. Genetic evidence reveals a unique lineage of Bryde's whales in the northern Gulf of Mexico. *Endangered Species Research* 25:19-34.
- Ross, J.P. 1979. Historical decline of loggerhead, ridley, and leatherback sea turtles. In: Bjorndal, K.A., ed. *Biology and conservation of sea turtles*. Washington, DC: Smithsonian Institution Press. Pp. 189-195.
- Ross, G.J.B. and S. Leatherwood. 1994. Pygmy killer whale—*Feresa attenuata* (Gray, 1874). In: Ridgway, S.H. and R. Harrison, eds. *Handbook of marine mammals. Volume 5: The first book of dolphins*. London, UK: Academic Press. Pp. 387-404.
- Ross, B.J. and P. Hallock. 2014. Chemical toxicity on coral reefs: Bioassay protocols utilizing benthic foraminifers. *Journal of Experimental Marine Biology and Ecology* 457:226-235.
- Rowe, G.T. and M.C. Kennicutt II, eds. 2009. Northern Gulf of Mexico continental slope habitats and benthic ecology study: Final report. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 2009-039. 456 pp.
- Rowe, G. and D.W. Menzel. 1971. Quantitative benthic samples from the deep Gulf of Mexico with some comments on the measurements of deep-sea biomass. *Bulletin of Marine Science* 21(2):556-566.
- Rozas, L.P. and W.E. Odum. 1988. Occupation of submerged aquatic vegetation by fishes: Testing the roles of food and refuge. *Oecologia* 77:101-106.
- Russell, R.W. 1999. Comparative demography and life-history tactics of seabirds: Implications for conservation and marine monitoring. *American Fisheries Society Symposium* 23:51-76.

- Russell, R.W. 2005. Interactions between migrating birds and offshore oil and gas platforms in the northern Gulf of Mexico: Final report. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 2005-009. 327 pp.
- Russo, M. 1992. Variations in late archaic subsistence and settlement patterning in peninsular Florida. In: Jeter, M., ed. Southeastern Archaeological Conference: Abstracts of the forty-ninth annual meeting, Little Rock, AR.
- Ruzicka, R.R., M.A. Colella, J.W. Porter, J.M. Morrison, J.A. Kidney, V. Brinkuis, K.S. Lunz, K.A. Macaulay, L.A. Bartlett, M.K. Meyers, and J. Colee. 2013. Temporal changes in benthic assemblages on Florida Keys reefs 11 years after the 1997/1998 El Niño. *Marine Ecology Progress Series* 489:125-141.
- Rybitski, M.J., R.C. Hale, and J.A. Musick. 1995. Distribution of organochlorine pollutants in Atlantic sea turtles. *Copeia* 1995:379-390.
- Ryerson, T.B., R. Camilli, J.D. Kessler, E.B. Kujawinski, C.M. Reddy, D.L. Valentine, E. Atlas, D.R. Blake, J. de Gouw, S. Meinardi, D.D. Parrish, J. Peischl, J.S. Seewald, and C. Warneke. 2011. Chemical data quantify *Deepwater Horizon* hydrocarbon flow rate and environmental distribution. *Proceedings of the National Academy of Sciences*. doi/10.1072/pnas.1110564109.
- S.L. Ross Environmental Research Ltd. 2000. Technology assessment of the use of dispersants on spills from drilling and production facilities in the Gulf of Mexico outer continental shelf. Prepared for the U.S. Dept. of the Interior, Minerals Management Service, Engineering and Research Branch, Herndon, VA. 19 pp. Internet website: <http://www.boemre.gov/tarprojects/349/349AB.pdf>.
- Sadiq, M. and J.C. McCain. 1993. *The Gulf War aftermath: An environmental tragedy*. Dordrecht, The Netherlands: Kluwer Academic Publishers.
- Sager, W. 1997. Geophysical detection and characterization of seep community sites. In: MacDonald, I.R., ed. 1998. *Stability and change in Gulf of Mexico chemosynthetic communities: Interim report*. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 98-0034. Pp. 49-60.
- Sager, W.W., W.W. Schroeder, J.S. Laswell, K.S. Davis, R. Rezak, and S.R. Gittings. 1992. Mississippi-Alabama outer continental shelf topographic features formed during the late Pleistocene-Holocene transgression. *Geo-Marine Letters* 12:41-48.
- Sammarco, P.W. 2014. New invasive marine species colonizing energy platforms in the northern Gulf of Mexico: Verification and examination of spread. U.S. Dept. of the Interior, Bureau of Ocean Energy Management, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study BOEM 2015-005. 72 pp.
- Sammarco, P.W., A.D. Atchinson, G.S. Boland, J. Sinclair, A. Lirette. 2012. Geographic expansion of hermatypic and ahermatypic corals in the Gulf of Mexico, and implications for dispersal and recruitment. *Journal of Experimental Marine Biology & Ecology*. 436-437:36-49.

- Sammarco, P.W., S.R. Kolian, R.A. Warby, J.L. Bouldin, W.A. Subra, and S.A. Porter. 2013. Distribution and concentrations of petroleum hydrocarbons associated with the BP/Deepwater Horizon oil spill, Gulf of Mexico. *Marine Pollution Bulletin* 73(1):129-143.
- Samson, J.E., T.A. Mooney, S.W. Gussekloo, and R.T. Hanlon. 2014. Graded behavioral responses and habituation to sound in the common cuttlefish *Sepia officinalis*. *The Journal of Experimental Biology* 217(24):4347-4355.
- Sanchez, M. and R. Tibbles. 2007. Frac packing: Fracturing for sand control. *Middle East and Asia Reservoir Review* 8:36-49. Internet website: http://www.slb.com/~media/Files/resources/mearr/num8/37_49.pdf. Accessed June 17, 2015.
- Sanders, R. 2015. Official communication. U.S. Dept. of the Interior mail; draft summary of water quality inspection function and attachment BSEE water quality program. February 6, 2015.
- Santos, R.G., R. Andrades, M.A. Boldrini, and A.S. Martins. 2015. Debris ingestion by juvenile marine turtles: An underestimated problem. *Marine Pollution Bulletin* 93:37-43.
- Sargent, F.J., T.J. Leary, D.W. Crewz, and C.R. Kruer. 1995. Scarring of Florida's seagrasses: Assessment and management options. FRMI TR-1, Florida Marine Research Institute, St. Petersburg, FL. 37 pp. + app.
- Sassen, R. 1998. Origins of hydrocarbons and community stability. In: MacDonald, I.R., ed. *Stability and change in Gulf of Mexico chemosynthetic communities: Interim report*. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 98-00034. Pp. 71-76.
- Saunders, J.W., R.D. Mandel, C.G. Sampson, C.M. Allen, E.T. Allen, D.A. Bush, J.K. Feathers, K.J. Gremillion, C.T. Hallmark, H.E. Jackson, J.K. Johnson, R. Jones, R.T. Saucier, G.L. Stringer, and M.F. Vidrine. 2005. Watson Brake, a middle archaic mound complex in northeast Louisiana. *American Antiquity* 70(4):631-668.
- Schiff, K., D. Diehl, and A. Valkirs. 2004. Copper emissions from antifouling paint on recreational vessels. *Marine Pollution Bulletin* 48:371-377.
- Schmid, J.R. and W.N. Witzell. 1997. Age and growth of wild Kemp's ridley turtles (*Lepidochelys kempii*): Cumulative results of tagging studies in Florida. *Chelonian Conservation and Biology* 2(4):532-537.
- Schroeder, W.W. 2000. Shelf hard bottom habitats. In: Schroeder, W.W. and C.F. Wood, eds. *Physical/Biological Oceanographic Integration Workshop for DeSoto Canyon and Adjacent Shelf, October 19-21, 1999*. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 2000-074. Pp. 67-71.
- Schroeder, D.M. and M.S. Love. 2004. Ecological and political issues surrounding decommissioning of offshore oil facilities in the southern California Bight. *Ocean and Coastal Management* 47:21-48.

- Schroeder, W.W., A.W. Shultz, and J.J. Dindo. 1988. Inner-shelf hardbottom areas, northeastern Gulf of Mexico. *Transactions of the Gulf Coast Association of Geological Societies* 38:535-541.
- Schroeder, W.W., M.R. Dardeau, J.J. Dindo, P. Fleisher, K.L. Heck Jr., and A.W. Shultz. 1989. Geophysical and biological aspects of hardbottom environments on the MAFLA shelf, northern Gulf of Mexico. *Proceedings Oceans '88 Conference*. Pp. 17-21.
- Schuler, M. 2014. Harvey Gulf breaks ground on nation's first LNG bunkering facility. Internet website: <http://gcaptain.com/harvey-gulf-breaks-ground-on-nations-first-lng-bunkering-facility/>. Posted February 14, 2014. Accessed September 25, 2015.
- Schultz, J.P. 1975. Sea turtles nesting in Surinam. *Nederlandsche Commissie voor Internationale Natuurbescherming. Mededelingen No. 23*. 143 pp.
- Schumacher, H. and H. Zibrowius. 1985. What is hermatypic? A redefinition of ecological groups in corals and other organisms. *Coral Reefs* 4:1-9.
- Schuyler, Q., B.D. Hardesty, C. Wilcox, and K. Townsend. 2012. To eat or not to eat? Debris selectivity by marine turtles. *PLOS ONE* 7(7):e40884. doi:10.1371/journal.pone.0040884.
- Schuyler, Q., B.D. Hardesty, C. Wilcox, and K. Townsend. 2014. Global analysis of anthropogenic debris ingestion by sea turtles. *Conservation Biology* 28(1):129-139.
- Schwacke, L.H., C.R. Smith, F.I. Townsend, R.S. Wells, L.B. Hart, B.C. Balmer, T.K. Collier, S. De Guise, M.M. Fry, L.J. Guillette, Jr., S.V. Lamb, S.M. Lane, W.E. McFee, N.J. Place, M.C. Tumlin, G.M. Ylitalo, E.S. Zolman, and T.K. Rowles. 2013. Health of common bottlenose dolphins (*Tursiops truncatus*) in Barataria Bay, Louisiana, following the *Deepwater Horizon* oil spill. *Environmental Science & Technology* 2014, 48(1):93-103. doi:10.1021/es403610f.
- Schwartz, F.J. 1988. Aggregations of young hatchling loggerhead sea turtles in the *Sargassum* off North Carolina. *Marine Turtle Newsletter* 42:9-10.
- Scott, L.C. 2014. The energy sector: Still a giant economic engine for the Louisiana economy - - An update. Loren C. Scott and Associates, Inc. for Mid-Continent Oil and Gas Association. 51 pp.
- Scott-Denton, E., P. Cryer, J. Gocke, M. Harrelson, D. Kinsella, J. Pulver, R. Smith, and J.A. Williams. 2011. Descriptions of the U.S. Gulf of Mexico bottom longline and vertical line fisheries based on observer data. *Marine Fisheries Review*. 26 pp.
- Scyphers, S.B., T.C. Gouhier, J.H. Grabowski, M.W. Beck, J. Mareska, and S.P. Powers. 2015. Natural shorelines promote the stability of fish communities in an urbanized coastal system. *PLOS ONE* 10(6):e0118580.
- Sebastian, S. 2011. Fuelfix: Feds say aging equipment sparked platform fire. Internet website: <http://fuelfix.com/blog/2011/05/26/feds-say-aging-equipment-sparked-platform-fire-2/>. Accessed October 6, 2015.

- Secor, D.H., J.R. Rooker, B.I. Gahagan, M.R. Siskey, and R.W. Wingate. 2015. Depressed resilience of bluefin tuna in the western Atlantic and age truncation. *Conservation Biology* 29(2):400-408.
- Secretariat of Environment & Natural Resources, National Commission of Natural Protected Areas, Federal Attorney of Environmental Protection (PROFEPA) Mexico and U.S. Department of Commerce National Oceanic and Atmospheric Administration, and U.S. Department of the Interior Fish and Wildlife Service. 2011. Bi-National recovery plan for the Kemp's ridley sea turtle (*Lepidochelys kempii*). Second revision. 177 pp.
- Setälä, O., V. Fleming-Lehtinen, and M. Lehtiniemi. 2014. Ingestion and transfer of microplastics in the planktonic food web. *Environmental Pollution* 185:77-83.
- Shaffer, G.P., J.W. Day, S. Mack, G.P. Kemp, I. van Heerden, M.A. Poirrier, K.A. Westphal, D. FitzGerald, A. Milanés, C.A. Morris, R. Bea, and P.S. Penland. 2009. The MRGO navigation project: A massive human-induced environmental, economic, and storm disaster. *Journal of Coastal Research* 54:206-224.
- Share the Beach. 2015. Alabama sea turtle nesting statistics. Internet website: <http://www.alabamaseaturtles.com/nesting-season-statistics>. Accessed March 8, 2016.
- Sharp, J.M. and D.W. Hill. 1995. Land subsidence along the northeastern Texas Gulf Coast: Effects of deep hydrocarbon production. *Environmental Geology* 25(3):181-191. Internet website: <http://www.springerlink.com/content/t5072854ukl2r262/>.
- Shaver, D.J. 1991. Feeding ecology of wild and head-started Kemp's ridley sea turtles in south Texas waters. *Journal of Herpetology* 25(3):327-334.
- Shaver, D.J., K.M. Hart, I. Fujisaki, C. Rubio, A.R. Sartain, J. Pena, P.M. Burchfield, D.G. Gamez, and J. Ortiz. 2013. Foraging area fidelity for Kemp's ridleys in the Gulf of Mexico. *Ecology and Evolution* 3(7):2002-2012. doi:10.1002/ece3.594.
- Shaw, R.F., D.C. Lindquist, M.C. Benfield, T. Farooqi, and J.T. Plunket. 2002. Offshore petroleum platforms: Functional significance for larval fish across longitudinal and latitudinal gradients. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 2002-077. 107 pp.
- Sheavly, S.B. 2007. National marine debris monitoring program: Final program report, data analysis and summary. Prepared for the U.S. Environmental Protection Agency by Ocean Conservancy. Grant No. X83053401-02. 76 pp.
- Sheavly, S.B. and K. Register. 2007. Marine debris & plastics: Environmental concerns, sources, impacts and solutions. *Journal of Polymers and the Environment* 15:301-305.
- Shedd, W. 2015. Official communication. Email regarding studies of the seafloor in the vicinity of the *Deepwater Horizon* explosion, oil spill, and response. April 13, 2015. U.S. Dept. of the Interior, Bureau of Ocean Energy Management, Gulf of Mexico OCS Region, New Orleans, LA.

- Shigenaka, G., S. Milton, P. Lutz, R. Hoff, R. Yender, and A. Mearns. 2010. Oil and sea turtles: Biology, planning and response. U.S. Dept. of Commerce, National Oceanic and Atmospheric Administration, National Oceanic and Atmospheric Administration, Office of Restoration and Response. 116 pp.
- Shinn, E.A., J.H. Hudson, D.M. Robbin, and C.K. Lee. 1980. Drilling mud plumes from offshore drilling operations: Implications for coral survival. In: Geyer, R.A., ed. Marine environmental pollution. Elsevier Oceanography Series 27A. Amsterdam, The Netherlands: Elsevier Scientific Publishing Company. Pp. 471-495.
- Shipp, R. 1999. Status of exploited fish species in the Gulf of Mexico. In: Kumpf, H., K. Steidinger, and K. Sherman, eds. The Gulf of Mexico large marine ecosystem: Assessment, sustainability, and management. Malden, MA: Blackwell Science, Inc.
- Shipp, R. and S. Bortone. 2009. A perspective of the importance of artificial habitat on the management of red snapper in the Gulf of Mexico. *Reviews in Fisheries Science* 17(1):41-47.
- Shipp, R.L. and T.L. Hopkins. 1978. Physical and biological observations of the northern rim of the DeSoto Canyon made from a research submersible. *Northeast Gulf Science* 2(2):113-121.
- Shoop, C.R. and R.D. Kenney. 1992. Seasonal distributions and abundances of loggerhead and leatherback sea turtles in waters of the northeastern United States. *Herpetological Monographs* 6:43-67. Internet website: <http://www.jstor.org/stable/1466961>.
- Short, F.T., R.G. Coles, and C. Pergent-Martini. 2001. Global seagrass distribution. In: Short, F.T. and R.G. Coles, eds. 2001. Global seagrass research methods. Amsterdam, The Netherlands: Elsevier Science B.V. Pp. 5-6, 20.
- Silva, M., P.J. Etnoyer, and I.R. MacDonald. 2015. Coral injuries observed at mesophotic reefs after the *Deepwater Horizon* oil discharge. *Deep Sea Research II: Topical Studies in Oceanography*. TBD-Accepted Manuscript. doi:10.1016/j.dsr2.2015.05.013.
- Simmonds, M. and S. Isaac. 2007. The impacts of climate change on marine mammals, early signs of significant problems. *Oryx* 41:1-8.
- Simmons, C., A.B. Collins, and R. Ruzicka. 2014. Distribution and diversity of coral habitat, fishes, and associated fisheries in U.S. waters of the Gulf of Mexico. In: Bortone, S.A., ed. Interrelationships between corals and fisheries. CRC Press, Taylor & Francis Group. 321 pp.
- Skagen, S.K. 2006. Migration stopovers and the conservation of Arctic-breeding Calidridine sandpipers. *Auk* 123:313-322.
- Slabbekoorn, H., N. Bouton, I. van Opzeeland, A. Coers, C. ten Cate, and A.N. Popper. 2010. A noisy spring: The impact of globally rising underwater sound levels on fish. *Trends in Ecology & Evolution* 25:419-427.
- Slay, C.K. and J.I. Richardson. 1988. King's Bay, Georgia: Dredging and turtles. In: Schroeder, B.A., comp. Proceedings of the Eighth Annual Conference on Sea Turtle Biology and Conservation. NOAA Technical Memorandum NMFS-SEFC-214. Pp. 109-111.

- Smith, M.F., ed. 1984. Ecological characterization atlas of coastal Alabama: Map narrative. U.S. Dept. of the Interior, Fish and Wildlife Service, FWS/OBS-82/46 and U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 84-0052. 189 pp.
- Smith, P. 2015. Official communication. Pipeline information. U.S. Dept. of Interior, Bureau of Safety and Environmental Enforcement, Gulf of Mexico OCS Region, New Orleans, LA. June 2015.
- Smith, G.M. and C.W. Coates. 1938. Fibro-epithelial growths of the skin in large marine turtles, *Chelonia mydas* (Linnaeus). *Zoologica* 24:93-98.
- Smith, R.A., J.R. Slack, T. Wyant, and K.J. Lanfear. 1982. The oil spill risk analysis model of the U.S. Geological Survey. U.S. Dept. of the Interior, Geological Survey. Professional Paper 1227.
- Smith, C., B. Hurley, C. Toms, A. Mackey, M. Solangi, and S. Kuczaj II. 2013. Hurricane impacts on the foraging patterns of bottlenose dolphins *Tursiops truncatus* in Mississippi Sound. *Marine Ecology Progress Series* 487:231-244.
- Smultea, M. and B. Würsig. 1991. Bottlenose dolphin reactions to the *Mega Borg* oil spill, summer 1990. Ninth Biennial Conference on the Biology of Marine Mammals, Chicago, IL.
- Smultea, M.A. and B. Würsig. 1995. Behavioral reactions of bottlenose dolphins to the *Mega Borg* oil spill, Gulf of Mexico 1990. *Aquatic Mammals* 21:171-181.
- Snyder D.B. 2000. Chapter 10: Fishes and fisheries. In: Continental Shelf Associates, Inc. Deepwater Gulf of Mexico environmental and socioeconomic data search and literature synthesis. Volume I: Narrative report. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 2000-049. Pp. 255-283.
- Snyder, S.M., E.L. Pulster, D.L. Wetzel, and S.A. Murawski. 2015. PAH exposure in Gulf of Mexico demersal fishes, post-*Deepwater Horizon*. *Environmental Science & Technology*.
- Southall, B.L., A.E. Bowles, W.T. Ellison, J.J. Finneran, R.L. Gentry, C.R. Greene, Jr., D. Kastak, D.R. Ketten, J.H. Miller, P.E. Nachtigall, W.J. Richardson, J.A. Thomas, and P. Tyack. 2007. Marine mammal noise exposure criteria: Initial scientific recommendations. *Aquatic Mammals* 33:411-521.
- Spalding, E.A. and M.W. Hester. 2007. Effects of hydrology and salinity on oligohaline plant species productivity: Implications of relative sea-level rise. *Estuaries and Coasts* 30(2):214-225.
- Sparks, T.D., J.C. Norris, R. Benson, and W.E. Evans. 1996. Distributions of sperm whales in the northwestern Gulf of Mexico as determined from an acoustic survey. In: Proceedings of the 11th Biennial Conference on the Biology of Marine Mammals, 14-18 December 1995, Orlando, FL. P. 108.
- St. Aubin, D.J. and V. Lounsbury. 1990. Chapter 11. Oil effects on manatees: Evaluating the risks. In: Geraci, J.R. and D.J. St. Aubin, eds. *Sea mammals and oil: Confronting the risks*. San Diego, CA: Academic Press, Inc. Pp. 241-251.

- Stanley, D.R. and C.A. Wilson. 1997. Seasonal and spatial variation in the abundance and size distribution of fishes associated with a petroleum platform in the northern Gulf of Mexico. *Canadian Journal of Fisheries and Aquatic Sciences* 54(5):1166-1176.
- Stanley, D.R. and C.A. Wilson. 2000. Seasonal and spatial variation in the biomass and size frequency distribution of fish associated with oil and gas platforms in the northern Gulf of Mexico. U.S. Dept. of the Interior, Minerals Mgmt. Service, Gulf of Mexico OCS Region, New Orleans, LA OCS Study MMS 2000-005. 252 pp.
- State of Alabama. Oil and Gas Board. 2015. Petroleum exploration and development offshore Alabama. Geological Survey of Alabama, State Oil and Gas Board. Internet website: <http://www.gsa.state.al.us/ogb/ogal.html>. Accessed April 3, 2015.
- State of Alabama. Geological Survey of Alabama. 1998. Governor's report: Options for development of potential natural gas reserves from central Gulf of Mexico, Mobile Area Blocks 826 and 829.
- State of Florida. Dept. of Environmental Protection. 2011. Letter dated May 5, 2011, requesting change in Region IV dispersant preapproval zones for the State of Florida. Internet website: [http://www.nrt.org/production/NRT/RRTHome.nsf/Resources/DUP/\\$file/Florida_Environmental_Protection.pdf](http://www.nrt.org/production/NRT/RRTHome.nsf/Resources/DUP/$file/Florida_Environmental_Protection.pdf).
- State of Florida. Dept. of Natural Resources. 1991. Part I, 1988 and 1989 Florida petroleum production and exploration. Information Circular 107. Prepared by Jacqueline M. Lloyd, P.G. #74. Printed for Florida Geological Survey. Internet website: <http://ufdcweb1.uflib.ufl.edu/UF00001168/00001/3x>.
- State of Florida. Fish and Wildlife Conservation Commission. 2015a. Manatee synoptic surveys. Internet website: http://myfwc.com/research/manatee/research/populationmonitoring/synoptic_surveys/. Accessed December 2, 2015.
- State of Florida. Fish and Wildlife Conservation Commission. 2015b. 2013 preliminary red tide manatee mortalities. Marine Mammal Pathobiology Laboratory. Internet website: <http://myfwc.com/media/2477220/2013PreliminaryRedTide.pdf>. Last updated March 17, 2015. Accessed August 14, 2015.
- State of Florida. Fish and Wildlife Conservation Commission. 2015c. Manatee mortality statistics. Florida Fish and Wildlife Conservation Commission, Fish and Wildlife Research Institute. Internet website: <http://myfwc.com/research/manatee/rescue-mortality-response/mortality-statistics/>. Accessed August 13, 2015.
- State of Florida. Fish and Wildlife Conservation Commission. 2016a. Fish and Wildlife Research Institute sea turtle nesting. Internet website: <http://myfwc.com/research/wildlife/sea-turtles/nesting>. Accessed March 8, 2016.
- State of Florida. Fish and Wildlife Conservation Commission. 2016b. FLSTSSN archived sea turtle stranding data. Internet website: <http://myfwc.com/research/wildlife/sea-turtles/mortality/archived-stranding-data/>. Accessed March 3, 2016.

- State of Louisiana. Coastal Protection and Restoration Authority. 2007. Integrated ecosystem restoration and hurricane protection: Louisiana's comprehensive master plan for a sustainable coast. State of Louisiana, Coastal Protection and Restoration Authority, Baton Rouge, LA.
- State of Louisiana. Coastal Protection and Restoration Authority. 2012. Louisiana's 2012 coastal master plan. May 23, 2012. 190 pp.
- State of Louisiana. Coastal Protection and Restoration Authority. 2014. CWPPRA's role key as restoration gains speed. Water Marks, December 2014, No. 50.
- State of Louisiana. Coastal Protection and Restoration Authority. 2015. FY2015 annual plan. Internet website: <http://coastal.la.gov/a-common-vision/annualplan/>. Accessed March 24, 2015.
- State of Louisiana. Dept. of Natural Resources. 1998. Coast 2050: Toward a sustainable coastal Louisiana. Report of the Louisiana Coastal Wetlands Conservation and Restoration Task Force and the Wetlands Conservation and Restoration Authority. Baton Rouge, LA. 173 pp. Internet website: <http://www.coast2050.gov/products/docs/orig/2050report.pdf>.
- State of Louisiana. Dept. of Natural Resources. 2009. Louisiana is proud to be a hub of industry. 6 pp. Internet website: http://dnr.louisiana.gov/assets/docs/hub-of-business_brochure.pdf. Accessed September 14, 2015.
- State of Louisiana. Dept. of Natural Resources. 2015a. Louisiana state crude oil production. Internet website: <http://assets.dnr.la.gov/TAD/OGTABLES/Table01.htm>. Last updated October 27, 2015. Accessed November 9, 2015.
- State of Louisiana. Dept. of Natural Resources. 2015b. Louisiana state natural gas production wet after lease separation. Internet website: <http://assets.dnr.la.gov/TAD/OGTABLES/table09.htm>. Last updated October 27, 2015. Accessed November 9, 2015.
- State of Louisiana. Dept. of Natural Resources. 2015c. Leasing manual how to acquire a mineral lease on state and state agency lands and water bottoms in the State of Louisiana. State Mineral Board, Office of Mineral Resources. Internet website: <http://dnr.louisiana.gov/index.cfm?md=pagebuilder&tmp=home&pid=178>.
- State of Louisiana. Dept. of Wildlife and Fisheries. 1987. Louisiana artificial reef plan. Louisiana Dept. of Wildlife and Fisheries. Technical Bulletin No. 41.
- State of Mississippi. Dept. of Marine Resources. 1999. Mississippi's coastal wetlands. Coastal Reserves Program. 19 pp.
- State of Texas. Commission on Environmental Quality. 2014a. Revisions to the State of Texas air quality implementation plan concerning regional haze: Five-year regional haze project report. Project No. 2013-013-SIP-NR. 99 pp. Internet website: http://www.tceq.texas.gov/assets/public/implementation/air/sip/haze/13012SIP_ado.pdf. Accessed May 15, 2014.

- State of Texas. Dept. of State Health Services. 2015. Harmful algal blooms – Seafood and aquatic life. Internet website: <http://www.dshs.state.tx.us/seafood/harmful-algal-blooms.aspx>. Accessed September 28, 2015.
- State of Texas. General Land Office. 2015. Coastal erosion. Internet website: <http://www.glo.texas.gov/what-we-do/caring-for-the-coast/coastal-erosion/>. Accessed June 3, 2015.
- State of Texas. Parks and Wildlife Dept. 1990. Texas artificial reef fishery management plan. Fishery Management Plan Series Number 3.
- Stavros, H., R. Bonde, and P. Fair. 2008. Concentrations of trace elements in blood and skin of Florida manatees (*Trichechus manatus latirostris*). Marine Pollution Bulletin 56:1221-1225.
- Stedman, S. and T.E. Dahl. 2008. Status and trends of wetlands in the coastal watersheds of the eastern United States 1998-2004. U.S. Dept. of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service and U.S. Dept. of the Interior, Fish and Wildlife Service, Washington, DC. 36 pp.
- Steinmetz, J.H. 2010. Examining mid-Atlantic Ocean shipwrecks and commercial fish trawling & dredging. Master's Thesis, East Carolina University.
- Stephens, B.P. 2009. Basement controls on subsurface geologic patterns and coastal geomorphology across the northern Gulf of Mexico: Implications for subsidence studies and coastal restoration. Transactions Gulf Coast Association of Geological Societies 59:729-751. Internet website: <http://www.searchanddiscovery.net/abstracts/html/2009/gcags/abstracts/stephens.htm>.
- Stephens, B.P. 2010. Basement controls on subsurface geologic patterns and coastal geomorphology across the northern Gulf of Mexico: Implications for subsidence studies and coastal restoration. Adapted from the presentation given to New Orleans Geological Society, July 14, 2010.
- Steyn, P. 2010. *Exxon Valdez* oil spill. Internet website: <http://www.answers.com/topic/exxon-valdez-oil-spill>. Accessed November 23, 2010.
- Stickney, K. 2015. Schlumberger announces layoffs to 11,000 employees. The Advertiser. April 16, 2015. Internet website: <http://www.theadvertiser.com/story/money/business/2015/04/16/schlumberger-announces-layoffs/25918819/>. Accessed September 7, 2015.
- Stoner, A.W. 1983. Pelagic *Sargassum*: Evidence for a major decrease in biomass. Deep Sea Research Part A: Oceanographic Research Papers 30(4):469-474. doi:10.1016/0198-0149(83)90079-1.
- Strauss, G. 2015. Baker Hughes to lay off 7,000 as oil patch layoffs mount. USA Today. January 20, 2015. Internet website: <http://www.usatoday.com/story/money/2015/01/20/baker-hughes-latest-hit-by-oil-slump-to-lay-off-7000/22042433/>. Accessed September 7, 2015.

- Stright, M.J., E.M. Lear, and J.F. Bennett. 1999. Spatial data analysis of artifacts redeposited by coastal erosion: A case study of McFaddin Beach, Texas. U.S. Dept. of the Interior, Minerals Management Service, Herndon, VA. OCS Study MMS 99-0068. 2 vols.
- Stucker, J.H. and F.J. Cuthbert. 2006. Distribution of nonbreeding Great Lakes piping plovers along Atlantic and Gulf coastlines: 10 years of band resightings. Report to the U.S. Dept. of the Interior, Fish and Wildlife Service, East Lansing, MI and Panama City, FL Field Offices. 20 pp.
- Stucker, J.H., F.J. Cuthbert, B. Winn, B.L. Noel, S.B. Maddock, P.R. Leary, J. Cordes, and L.C. Wemmer. 2010. Distribution of non-breeding Great Lakes piping plovers (*Charadrius melodus*) along Atlantic and Gulf of Mexico coastlines: Ten years of band sightings. *Waterbirds* 33:22-32.
- Sturges, W., E. Chassignet, and T. Ezer. 2004. Strong mid-depth currents and a deep cyclonic gyre in the Gulf of Mexico: Final report. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS-2004-040. 89 pp.
- Stutzenbaker, C.D. and M.W. Weller. 1989. The Texas coast. In: Smith, L.M., R.L. Pederson, and R.K. Kaminski, eds. Habitat management for migrating and wintering waterfowl in North America. Lubbock, TX: Texas Technical University Press. Pp. 385-405.
- Substance Abuse and Mental Health Services Administration and Centers for Disease Control and Prevention (SAMSA and CDCP). 2013. Behavioral health in the Gulf Coast region following the *Deepwater Horizon* oil spill. HHS Publication No. (SMA) 13-4737, Rockville, MD; Atlanta, GA. Internet website: <http://www.samhsa.gov/data/sites/default/files/NSDUH-GSPS-GulfCoast-Apps-2012/NSDUH-GSPS-GulfCoast-2012.pdf>. Accessed September 13, 2015.
- Switzer, T.S., D.M. Tremain, S.F. Keenan, C.J. Stafford, S.L. Parks and R.H. McMichael, Jr. 2015. Temporal and spatial dynamics of the lionfish invasion in the eastern Gulf of Mexico: Perspectives from a broadscale trawl survey. *Marine and Coastal Fisheries: Dynamics, Management, and Ecosystem Science* 7:10-17. doi:10.1080/19425120.2014.987888.
- Systems Applications International, Sonoma Technology, Inc., Earth Tech, Alpine Geophysics, and A.T. Kearney. 1995. Gulf of Mexico air quality study: Final report. 3 vols. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 95-0038, 95-0039, and 95-0040. 650 pp., 214 pp., and 190 pp., respectively.
- Szedlmayer, S.T. and J.D. Lee. 2004. Diet shifts of red snapper, *Lutjanus campechanus*, with changes in habitat and fish size. *Fisheries Bulletin* 102:366-375.
- Tabb, D. and A. Jones. 1962. Effect of Hurricane Donna on the aquatic fauna of north Florida Bay. *Transactions of the American Fisheries Society* 91:375-378.
- Tacha, T.C., S.A. Nesbitt, and P.A. Vohs. 1992. Sandhill crane (*Grus canadensis*). In: Poole, A., ed. *The birds of North America online*, Number 31. Cornell Lab of Ornithology, Ithaca, NY. doi:10.2173/bna.31. Internet website: <http://bna.birds.cornell.edu/bna/species/031>. Accessed April 23, 2012.

- Tarpley, R.J. and S. Marwitz. 1993. Plastic debris ingestion by cetaceans along the Texas coast: Two case reports. *Aquatic Mammals* 19(2):93-98.
- Teal, J.M. and R.W. Howarth. 1984. Oil spill studies: A review of ecological effects. *Environmental Management* 8:27-44.
- Teal, J.M., J.W. Farrington, K.A. Burns, J.J. Stegeman, B.W. Tripp, B. Woodin, and C. Phinney. 1992. The West Falmouth oil spill after 20 years: Fate of fuel oil compounds and effects on animals. *Marine Pollution Bulletin* 24(12):607-614.
- Teas, W.G. and A. Martinez. 1992. Annual report of the sea turtle stranding and salvage network Atlantic and Gulf Coasts of the United States, January-December 1989.
- Thatcher, C.A., S.B. Hartley, and S.A. Wilson. 2011. Bank erosion of navigation canals in the western and central Gulf of Mexico. U.S. Dept. of the Interior, Geological Survey, National Wetlands Resource Center, Open-File Report 2010-1017 and U.S. Dept. of the Interior, Bureau of Ocean Energy Management, Regulation and Enforcement, Gulf of Mexico OCS Region, New Orleans, LA, OCS Study BOEMRE 2010-039. 32 pp. + 2 apps. Internet website: <http://pubs.usgs.gov/of/2010/1017/pdf/OF10-1017.pdf>.
- Thatcher, C., J.C. Brock, and E.A. Pendleton. 2013. Economic vulnerability to sea-level rise along the northern U.S. Gulf Coast. *Journal of Coastal Research* 63(1):234-243.
- The Encyclopedia of Earth. 2008. Gulf of Mexico large marine ecosystem. Internet website: http://www.eoearth.org/article/Gulf_of_Mexico_large_marine_ecosystem?topic=49522. Updated December 28, 2010. Accessed January 11, 2011.
- The Greater Lafourche Port Commission. 2015. Port facts. Internet website: <http://www.portfourchon.com/explore.cfm/aboutus/portfacts/>. Accessed July 1, 2015.
- The Louis Berger Group, Inc. 2004. OCS-related infrastructure in the Gulf of Mexico fact book. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 2004-027. 234 pp.
- The White House. 2012. Executive Order—Gulf Coast Ecosystem Restoration. The White House, Office of Press Secretary, Washington DC. Internet website: <http://www.whitehouse.gov/the-press-office/2012/09/10/executive-order-gulf-coast-ecosystem-restoration>. Posted September 10, 2012. Accessed July 29, 2013.
- Thompson, M.J., W.W. Schroeder, and N.W. Phillips. 1999. Ecology of live bottom habitats of the northeastern Gulf of Mexico: A community profile. U.S. Dept. of the Interior, Geological Survey, Biological Resources Division, USGS/BRD/CR-1999-0001 and U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 99-0004. x + 74 pp.
- Thresher, R.E., J.M. Guinotte, R.J. Matear, and A.J. Hobday. 2015. Options for managing impacts of climate change on a deep-sea community. *Nature Climate Change* 5(7):635-639. July 2015.

- Tiner, R.W. 1984. Wetlands of the United States: Current status and recent trends. U.S. Dept. of the Interior, Fish and Wildlife Service, Newton Corner, MA. vii + 59 pp.
- Tkalich, P. and E.S. Chan. 2002. Vertical mixing of oil droplets by breaking waves. *Marine Pollution Bulletin* 44:1219-1229.
- Tolstoy, M., J. Diebold, L. Doermann, S. Nooner, and S.C. Webb. 2009. Broadband calibration of the R/V *Marcus G. Langseth* four-string seismic sources. *Geochemistry, Geophysics, Geosystems* 10, Q08011. doi:10.1029/2009GC002451.
- Torres, R., M. Chiappone, F. Geraldese, Y. Rodriguez, and M. Vega. 2001. Sedimentation as an important environmental influence on Dominican Republic reefs. *Bulletin of Marine Science* 69(2):805-818.
- Townsend, C.H. 1935. The distribution of certain whales as shown by logbook records of American whale ships. *Zoologica* 19:1-50.
- Trefry, J.H. 1981. A review of existing knowledge on trace metals in the Gulf of Mexico. In: *Proceedings of a symposium on environmental research needs in the Gulf of Mexico (GOMEX). Volume II-B.* U.S. Dept. of Commerce, National Oceanic and Atmospheric Administration, Environmental Research Laboratory. Pp. 225-259.
- Trefry, J.H., K.L. Naito, R.P. Trocine, and S. Metz. 1995. Distribution and bioaccumulation of heavy metals from produced water discharges to the Gulf of Mexico. *Water Science and Technology* 32(2):31-36.
- Trefry, J.H., R. Trocine, M. McElvaine, R. Rember, and L. Hawkins. 2007. Total mercury and methylmercury in sediments near offshore drilling sites in the Gulf of Mexico. *Environmental Geology* 53:375-385.
- Tucker, A.D., B.D. MacDonald, and J.A. Seminoff. 2014. Foraging site fidelity and stable isotope values of loggerhead turtles tracked in the Gulf of Mexico and northwest Caribbean. *Marine Ecology Progress Series* 502:267-279.
- Tuler, S., T. Weber, R. Lord, and K. Dow. 2010. A case study into the human dimensions of the DM-932 oil spill in New Orleans. Greenfield, MA: Social and Environmental Research Institute. 32 pp.
- Turner, R.E. and D.R. Cahoon. 1987. Causes of wetland loss in the coastal Central Gulf of Mexico. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 87-0119, 87-0120, and 87-0121. 32, 400, and 122 pp., respectively.
- Turner, R.E., J.M. Lee, and C. Neill. 1994. Backfilling canals to restore wetlands: Empirical results in coastal Louisiana. *Wetlands Ecology and Management* 3(1):63-78.
- Turner, R.E., N.N. Rabalais, E.M. Swenson, M. Kasprzak, and T. Romaine. 2005. Summer hypoxia in the Northern Gulf of Mexico and its prediction from 1978 to 1995. *Marine Environmental Research* 59:65-77.

- Turner, R.E., N.N. Rabalais, and D. Justić. 2012. Predicting summer hypoxia in the northern Gulf of Mexico: Redux. *Marine Pollution Bulletin* 64(2):319-324. Internet website: <http://www.sciencedirect.com/science/article/pii/S0025326X1100600X>.
- Turner-Tomaszewicz, C. and J. Seminoff. 2012. Turning off the heat: Impacts of power plant decommissioning on green turtle research in San Diego Bay. *Coastal Management* 40:73-87. doi:10.1080/08920753.2012.640267.
- Turtle Expert Working Group. 1998. An assessment of the Kemp's ridley (*Lepidochelys kempii*) and loggerhead (*Caretta caretta*) sea turtle populations in the western North Atlantic. NOAA Technical Memo NMFS-SEFSC-409. 96 pp.
- Tuttle, J.R. and A.J. Combe III. 1981. Flow regime and sediment load affected by alterations of the Mississippi River. In: Cross, R.D. and Williams, D.L., eds. *Proceedings, National Symposium: Freshwater Inflow Estuaries*. U.S. Dept. of the Interior, Fish and Wildlife Service, Office of Biological Services. FWS/OBS-81/104. Pp. 334-348.
- Twachtman, Snyder, & Byrd, Inc. and Louisiana State University, Center for Energy Studies. 2004. Operational and socioeconomic impact of nonexplosive removal of offshore structures. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 2004-074. 59 pp.
- Tyack, P.L. 2008. Implications for marine mammals of large-scale changes in the marine acoustic environment. *Journal of Mammalogy* 89(3):549-558.
- Tynan, C. and D. DeMaster. 1997. Observations and predictions of arctic climatic change, potential effects on marine mammals. *Arctic* 50:308-322.
- Underwood, A.J. and P.G. Fairweather. 1989. Supply side ecology and benthic marine assemblages. *Trends in Ecology & Evolution* 4(1):16-20.
- United Nations Environmental Programme. 2005. Marine litter: An analytical overview.
- U.S. Congress. Office of Technology Assessment. 1990. Coping with an oiled sea: an analysis of oil spill response technologies, OTA-BP-O-63, Washington, DC: U.S. Government Printing Office. 70 pp. Internet website: <http://www.fas.org/ota/reports/9011.pdf>. Accessed December 27, 2010.
- U.S. Dept. of Agriculture. Economic Research Service. 2008. County typology codes. Internet website: <http://www.ers.usda.gov/data-products/county-typology-codes.aspx>. Accessed June 16, 2015.
- U.S. Dept. of Agriculture. Natural Resource Conservation Service. 2015. Nutrient management. Internet website: <http://www.nrcs.usda.gov/wps/portal/nrcs/detailfull/national/technical/ecoscience/mnm/?cid=stelprdb1044741>. Accessed April 2, 2015.
- U.S. Dept. of Commerce. Census Bureau. 2010a. Coastline population trends in the United States: 1960-2008, population estimates and projections. May 2010. Internet website: <https://www.census.gov/prod/2010pubs/p25-1139.pdf>. Accessed September 8, 2015.

- U.S. Dept. of Commerce. Census Bureau. 2010b. Census Bureau report documents rapid expansion of Gulf Coast population in recent decades. U.S. Census Bureau Newsroom Archive. May 26, 2010. Internet website: <http://www.census.gov/newsroom/releases/archives/population/cb10-76.html>. Accessed September 8, 2015.
- U.S. Dept. of Commerce. Census Bureau. 2013a. S1701 poverty status in the past 12 months. 2009-2013 American community survey 5-year estimates. American fact finder. Internet website: <http://factfinder.census.gov/faces/nav/jsf/pages/index.xhtml>. Accessed August 17, 2015.
- U.S. Dept. of Commerce. Census Bureau. 2013b. About poverty: 2013 highlights. Internet website: <https://www.census.gov/hhes/www/poverty/about/overview/index.html><http://factfinder.census.gov/faces/nav/jsf/pages/index.xhtml>. Accessed September 9, 2015.
- U.S. Dept. of Commerce. Census Bureau. 2013c. B02001: Race – universe: Total population. 2009-2013 community survey 5-year estimates. American fact finder. Internet website: <http://factfinder.census.gov/faces/nav/jsf/pages/index.xhtml>. Accessed August 18, 2015.
- U.S. Dept. of Commerce. Census Bureau. 2014. PEPANNRES: Annual estimates of the resident population: April 1, 2010 to July 1, 2014. American fact finder. Internet website: <http://factfinder.census.gov/faces/nav/jsf/pages/index.xhtml>. Accessed August 17, 2015.
- U.S. Dept. of Commerce. Census Bureau. 2015. Facts for feature: Hurricane Katrina 10th anniversary: Aug. 29, 2015. Release number: CP15-FF.16. July 2015. Internet website: <http://census.gov/newsroom/facts-for-features/2015/cb15-ff16.html>. Accessed September 9, 2015.
- U.S. Dept. of Commerce. Economics & Statistics Administration. 2015. Census bureau data shows Gulf Coast's recovery from Hurricane Katrina. August 25, 2015. Internet website: <http://www.esa.doc.gov/under-secretary-blog/us-census-bureau-data-shows-gulf-coasts-recovery-hurricane-katrina>. Accessed September 9, 2015.
- U.S. Dept. of Commerce. National Aeronautics and Space Administration. 2003. SeaWiFS Project—detailed description. Internet website: http://oceancolor.gsfc.nasa.gov/SeaWiFS/BACKGROUND/SEAWIFS_970_BROCHURE.html. Updated July 30, 2003. Accessed January 11, 2011.
- U.S. Dept. of Commerce. National Marine Fisheries Service. 2001. Stock assessments of loggerhead and leatherback sea turtles and an assessment of the impact of the pelagic longline fishery on the loggerhead and leatherback sea turtles of the western north Atlantic. NOAA Technical Memorandum NMFS-SEFSC-455.
- U.S. Dept. of Commerce. National Marine Fisheries Service. 2007a. Endangered Species Act Section 7 consultation on the effects of the five-year outer continental shelf oil and gas leasing program (2007-2012) in the Central and Western Planning Areas of the Gulf of Mexico. Biological Opinion. June 29, 2007. F/SER/2006/02611. 127 pp.

- U.S. Dept. of Commerce. National Marine Fisheries Service. 2007b. Report to Congress on the impact of Hurricanes Katrina, Rita, and Wilma on commercial and recreational fishery habitat of Alabama, Florida, Louisiana, Mississippi, and Texas. July 2007. 191 pp. + apps. Internet website: http://www.nmfs.noaa.gov/msa2007/docs/HurricaneImpactsHabitat_080707_1200.pdf. Accessed December 30, 2010.
- U.S. Dept. of Commerce. National Marine Fisheries Service. 2009. Fishery management plan for regulating offshore marine aquaculture in the Gulf of Mexico—final programmatic environmental impact statement. 569 pp.
- U.S. Dept. of Commerce. National Marine Fisheries Service. 2010a. Marine fisheries habitat assessment improvement plan. NOAA Technical Memorandum NMFS-F/SPO-108.
- U.S. Dept. of Commerce. National Marine Fisheries Service. 2010b. Final recovery plan for the sperm whale (*Physeter macrocephalus*). U.S. Dept. of Commerce, National Marine Fisheries Service, Silver Spring, MD. 165 pp. Internet website: http://www.nmfs.noaa.gov/pr/pdfs/recovery/final_sperm_whale_recovery_plan_21dec.pdf.
- U.S. Dept. of Commerce. National Marine Fisheries Service. 2013. Biological report on the designation of marine critical habitat for the loggerhead sea turtle, *Caretta caretta*. 166 pp. Internet website: http://www.nmfs.noaa.gov/pr/pdfs/criticalhabitat/loggerhead_criticalhabitat_biological.pdf.
- U.S. Dept. of Commerce. National Marine Fisheries Service. 2014a. Fisheries economics of the United States 2012; Gulf of Mexico. Internet website: http://www.st.nmfs.noaa.gov/Assets/economics/documents/feus/2012/FEUS2012_GulfofMexico.pdf. 23 pp.
- U.S. Dept. of Commerce. National Marine Fisheries Service. 2014b. Recreational fisheries statistics. Internet website: <http://www.st.nmfs.noaa.gov/st1/recreational/queries/index.html>. Accessed June 25-26, 2014.
- U.S. Dept. of Commerce. National Marine Fisheries Service. 2015a. Status of stocks 2014: Annual report to Congress on the status of U.S. fisheries. Internet website: http://www.nmfs.noaa.gov/sfa/fisheries_eco/status_of_fisheries/archive/2014/2014_status_of_stocks_final_web.pdf.
- U.S. Dept. of Commerce. National Marine Fisheries Service. 2015b. Marine mammal stock assessment reports (SARS) by species/stock. Internet website: <http://www.nmfs.noaa.gov/pr/sars/species.htm>. Accessed December 2, 2015.
- U.S. Dept. of Commerce. National Marine Fisheries Service. 2015c. Sperm whale (*Physeter microcephalus*) 5-year review: Summary and evaluation. Internet website: http://www.fisheries.noaa.gov/pr/species/Status%20Reviews/sperm_whale_5-year_review_final_june_2015.pdf.
- U.S. Dept. of Commerce. National Marine Fisheries Service. 2015d. Morbillivirus infection in dolphins, porpoises, and whales. Internet website: http://www.nmfs.noaa.gov/pr/health/mmume/midatlantic2013/morbillivirus_cetaceans.pdf. Accessed August 13, 2015.

- U.S. Dept. of Commerce. National Marine Fisheries Service. 2015e. Marine mammal unusual mortality events. Internet website: <http://www.nmfs.noaa.gov/pr/health/mmume/>. Accessed June 8, 2015.
- U.S. Dept. of Commerce. National Marine Fisheries Service. 2015f. Cetacean unusual mortality event in northern Gulf of Mexico (2010-present). Internet website: http://www.nmfs.noaa.gov/pr/health/mmume/cetacean_gulfofmexico.htm. Accessed August 13, 2015.
- U.S. Dept. of Commerce. National Marine Fisheries Service. 2015g. Sea turtle strandings in the Gulf of Mexico. Internet website: <http://www.nmfs.noaa.gov/pr/species/turtles/gulfofmexico.htm>. Accessed September 14, 2015.
- U.S. Dept. of Commerce. National Marine Fisheries Service. 2015h. Impacts of oil on marine mammals and sea turtles. 2 pp.
- U.S. Dept. of Commerce. National Marine Fisheries Service. 2015i. Draft recovery plan for elkhorn (*Acropora palmata*) and staghorn (*A. cervicornis*) corals. Prepared by the Acropora Recovery Team for the National Marine Fisheries Service, Silver Spring, MD. 167 pp.
- U.S. Dept. of Commerce. National Marine Fisheries Service. 2015j. Commercial fishery landings by port ranked by dollar value. Internet website: <http://www.st.nmfs.noaa.gov/commercial-fisheries/commercial-landings/other-specialized-programs/total-commercial-fishery-landings-at-major-u-s-ports-summarized-by-year-and-ranked-by-dollar-value/index>. Accessed June 30, 2015.
- U.S. Dept. of Commerce. National Marine Fisheries Service. 2015k. Fisheries of the United States: 2013. 144 pp.
- U.S. Dept. of Commerce. National Marine Fisheries Service. 2015l. Federal waters off Texas closed to shrimping on May 15, 2015. Southeast Fishery Bulletin FB15-034, May 6, 2015. 1 p.
- U.S. Dept. of Commerce. National Marine Fisheries Service. 2015m. NOAA Fisheries announces commercial and recreational quota increases for red snapper and the recreational seasons in the Gulf of Mexico. Southeast Fishery Bulletin FB15-032, April 30, 2015. 1 p.
- U.S. Dept. of Commerce. National Marine Fisheries Service and U.S. Dept. of the Interior, Fish and Wildlife Service. 1991. Recovery plan for U.S. population of Atlantic green turtle. U.S. Dept. of Commerce, National Marine Fisheries Service, Washington, DC. 52 pp.
- U.S. Dept. of Commerce. National Marine Fisheries Service and U.S. Dept. of Interior, Fish and Wildlife Service. 2007a. Kemp's Ridley sea turtle (*Lepidochelys kempii*) 5-year review: Summary and evaluation. Internet website: http://www.nmfs.noaa.gov/pr/pdfs/species/kempstridley_5yearreview.pdf. August 2007. 50 pp.
- U.S. Dept. of Commerce. National Marine Fisheries Service and U.S. Dept. of Interior, Fish and Wildlife Service. 2007b. Loggerhead sea turtle (*Caretta caretta*) 5-year review: Summary and

- evaluation. Internet website: http://www.nmfs.noaa.gov/pr/pdfs/species/loggerhead_5year_review.pdf. August 2007. 67 pp.
- U.S. Dept. of Commerce. National Marine Fisheries Service and U.S. Dept. of Interior, Fish and Wildlife Service. 2007c. Green sea turtle (*Chelonia mydas*) 5-year review: Summary and evaluation. Internet website: http://www.nmfs.noaa.gov/pr/pdfs/species/greenturtle_5year_review.pdf. August 2007. 105 pp.
- U.S. Dept. of Commerce. National Marine Fisheries Service and U.S. Dept. of Interior, Fish and Wildlife Service. 2013a. Leatherback sea turtle (*Dermochelys coriacea*) 5-year review: Summary and evaluation. Internet website: http://www.nmfs.noaa.gov/pr/listing/5yearreview_leatherbackturtle.pdf. November 2013. 93 pp.
- U.S. Dept. of Commerce. National Marine Fisheries Service and U.S. Dept. of Interior, Fish and Wildlife Service. 2013b. Hawksbill sea turtle (*Eretmochelys imbricata*) 5-year review: Summary and evaluation. Internet website: http://www.nmfs.noaa.gov/pr/pdfs/species/hawksbillseaturtle_2013_5yearreview.pdf. June 2013. 92 pp.
- U.S. Dept. of Commerce. National Marine Fisheries Service and U.S. Dept. of Interior, Fish and Wildlife Service. 2015. Kemp's Ridley sea turtle (*Lepidochelys kempii*) 5-year review: Summary and evaluation. Internet website: http://www.nmfs.noaa.gov/pr/listing/final_july_2015_kemp_s_5_year_review.pdf. July 2015. 63 pp.
- U.S. Dept. of Commerce. National Oceanic and Atmospheric Administration. 1988. Interagency task force on persistent marine debris. U.S. Dept. of Commerce, National Marine Fisheries Service, Office of the Chief Scientist, Ecology and Conservation.
- U.S. Dept. of Commerce. National Oceanic and Atmospheric Administration. 2005. NOAA attributes recent increase in hurricane activity to naturally occurring multi-decadal climate variability. NOAA Magazine. November 29, 2005. Internet website: <http://www.magazine.noaa.gov/stories/mag184.htm>.
- U.S. Dept. of Commerce. National Oceanic and Atmospheric Administration. 2007. National artificial reef plan (as amended): Guidelines for siting, construction, development, and assessment of artificial reefs.
- U.S. Dept. of Commerce. National Oceanic and Atmospheric Administration. 2008a. The Gulf of Mexico at a glance. U.S. Dept. of Commerce, National Oceanic and Atmospheric Administration, National Ocean Service, Washington, DC. 34 pp. Internet website: http://gulfofmexicoalliance.org/pdfs/gulf_glance_1008.pdf. Accessed July 31, 2015.
- U.S. Dept. of Commerce. National Oceanic and Atmospheric Administration. 2008b. Interagency report on marine debris sources, impacts, strategies, and recommendations. Interagency Marine Debris Coordinating Committee, Silver Spring, MD. 62 pp.
- U.S. Dept. of Commerce. National Oceanic and Atmospheric Administration. 2010a. Tarballs. U.S. Dept. of Commerce, National Oceanic and Atmospheric Administration, National Ocean Service,

- Office of Response and Restoration. Internet website: http://www.noaa.gov/deepwaterhorizon/publications_factsheets/documents/2055_understanding_tar_balls_070810.pdf.
- U.S. Dept. of Commerce. National Oceanic and Atmospheric Administration. 2010b. Characteristic coastal habitats: Choosing spill response alternatives. Internet website: http://response.restoration.noaa.gov/sites/default/files/Characteristic_Coastal_Habitats.pdf.
- U.S. Dept. of Commerce. National Oceanic and Atmospheric Administration. 2010c. Flower Gardens National Marine Sanctuary species list. Internet website: http://flowergarden.noaa.gov/document_library/aboutdocs/fgbnmscoralcapspecies.pdf. Accessed September 16, 2010.
- U.S. Dept. of Commerce. National Oceanic and Atmospheric Administration. 2010d. 2010 dead zone – one of the largest ever. Internet website: <http://www.gulfhypoxia.net/research/Shelfwide%20Cruises/2010/PressRelease2010.pdf>.
- U.S. Dept. of Commerce. National Oceanic and Atmospheric Administration. 2011. The Gulf of Mexico at a glance: A second glance. Washington, DC: U.S. Dept. of Commerce. Internet website: <http://stateofthecoast.noaa.gov/features/gulf-of-mexico-at-a-glance-2.pdf>. Accessed September 9, 2015.
- U.S. Dept. of Commerce. National Oceanic and Atmospheric Administration. 2013a. Shoreline assessment manual, 4th edition. U.S. Dept. of Commerce, National Oceanic and Atmospheric Administration, Office of Response and Restoration, Energy Response Division, Seattle, WA. 73 pp + apps. Internet website: <http://response.restoration.noaa.gov/oil-and-chemical-spills/oil-spills>.
- U.S. Dept. of Commerce. National Oceanic and Atmospheric Administration. 2013b. Risk assessment for potentially polluting wrecks in U.S. waters. U.S. Dept. of Commerce, National Oceanic and Atmospheric Administration, Office of National Marine Sanctuaries, Office of Response and Restoration. 195 pp. Internet website: http://sanctuaries.noaa.gov/protect/ppw/pdfs/2013_potentiallypollutingwrecks.pdf.
- U.S. Dept. of Commerce. National Oceanic and Atmospheric Administration. 2013c. Draft damage assessment and restoration plan/environmental assessment for the tank barge DBL 152 oil spill. 77 pp. Internet website: http://www.darrp.noaa.gov/southeast/dbl152/pdf/2404%20DBL_152_DRAFT_DARP_EA%203_18_13%20%28final%29.pdf.
- U.S. Dept. of Commerce. National Oceanic and Atmospheric Administration. 2014. Deep sea coral research and technology program: 2014 Report to Congress. 54 pp. Internet website: http://www.habitat.noaa.gov/pdf/FINAL_DSCRtC_4_17_2014_Interactive.pdf.
- U.S. Dept. of Commerce. National Oceanic and Atmospheric Administration. 2015a. NOAA chart 411. Internet website: <http://www.charts.noaa.gov/OnLineViewer/411.shtml>. Accessed June 15, 2015.
- U.S. Dept. of Commerce. National Oceanic and Atmospheric Administration. 2015b. Stellwagen Bank National Marine Sanctuary – ocean and dredged material disposal. Internet website: <http://stellwagen.noaa.gov/about/sitereport/dredge.html>. Accessed April 13, 2015.

- U.S. Dept. of Commerce. National Oceanic and Atmospheric Administration. 2015c. Phase III of early restoration. Internet website: <http://www.gulfspillrestoration.noaa.gov/restoration/early-restoration/phase-iii/>. Accessed September 14, 2015.
- U.S. Dept. of Commerce. National Oceanic and Atmospheric Administration. 2015d. U.S. linear relative mean sea level (MSL) trends and 95% confidence intervals (CI) in mm/year and in ft/century. Internet website: <http://tidesandcurrents.noaa.gov/sltrends/mslUSTrendsTable.htm>. Accessed April 17, 2015.
- U.S. Dept. of Commerce. National Oceanic and Atmospheric Administration. 2015e. *Deepwater Horizon* NRDA trustees commend Gulf Task Force efforts. Internet website: <http://www.gulfspillrestoration.noaa.gov/2011/10/deepwater-horizon-nrda-trustees-commend-gulf-task-force-efforts/>. Accessed March 12, 2015.
- U.S. Dept. of Commerce. National Oceanic and Atmospheric Administration. 2015f. Trustees: Working cooperatively. Internet website: <http://www.gulfspillrestoration.noaa.gov/about-us/co-trustees/>. Accessed March 12, 2015.
- U.S. Dept. of Commerce. National Oceanic and Atmospheric Administration. 2015g. Phase III of early restoration. Internet website: <http://www.gulfspillrestoration.noaa.gov/restoration/early-restoration/phase-iii/>. Accessed March 12, 2015.
- U.S. Dept. of Commerce. National Oceanic and Atmospheric Administration. 2015h. 2015 Gulf of Mexico dead zone “above average.” Internet website: <http://www.noaanews.noaa.gov/stories2015/080415-gulf-of-mexico-dead-zone-above-average.html>. Accessed August 4, 2015.
- U.S. Dept. of Commerce. National Oceanic and Atmospheric Administration. 2015i. National database for deep-sea corals and sponges. Internet website: <https://deepseacoraldata.noaa.gov/>. Accessed August 19, 2015.
- U.S. Dept. of Commerce. National Oceanic and Atmospheric Administration. 2015j. National centers for environmental information coastal ecosystem maps – Gulf of Mexico. Internet website: <http://service.ncddc.noaa.gov/website/CHP>. Accessed March 25, 2015.
- U.S. Dept. of Commerce. National Oceanic and Atmospheric Administration. 2015k. NOAA’s oil spill response: Effects of oil on marine mammals and sea turtles. May 12, 2010. Internet website: http://www.noaa.gov/factsheets/new%20version/marinemammals_seaturtles.pdf.
- U.S. Dept. of Commerce. National Oceanic and Atmospheric Administration. 2015l. Marine protected areas center: MPA mapping products. Internet website: <http://www.marineprotectedareascenter.noaa.gov/dataanalysis/maps/>. Accessed July 22, 2015.
- U.S. Dept. of Commerce. National Oceanic and Atmospheric Administration. 2015m. Environmental response management application (ERMA). Internet website: <http://gomex.erma.noaa.gov>.
- U.S. Dept. of Commerce. National Oceanic and Atmospheric Administration. 2016a. National Hurricane Center. Hurricane landfalls in the northern Gulf of Mexico from 1995 through 2015.

- Internet website: <http://www.ncdc.noaa.gov/oa/climate/severeweather/hurricanes.html>. Accessed March 4, 2016.
- U.S. Dept. of Commerce. National Oceanic and Atmospheric Administration. 2016b. NOAA habitat conservation; highlights; two new projects proposed to restore the Gulf. Internet website: <http://www.habitat.noaa.gov/highlights/newprojectstorestorethegulf.html>. Accessed March 8, 2016.
- U.S. Dept. of Commerce. National Oceanic and Atmospheric Administration. 2016c. Gulf spill restoration; early restoration projects atlas. Internet website: <http://www.gulfspillrestoration.noaa.gov/restoration/early-restoration/early-restoration-projects-atlas/>. Accessed March 8, 2016.
- U.S. Dept. of Commerce. National Oceanic and Atmospheric Administration. 2016d. *Deepwater Horizon* Natural Resource Damage Assessment Trustees. *Deepwater Horizon* oil spill: Final programmatic damage assessment and restoration plan and final programmatic environmental impact statement. 495 pp. Internet website: <http://www.gulfspillrestoration.noaa.gov/restoration-planning/gulf-plan/>.
- U.S. Dept. of Energy. 2011. A national offshore wind strategy: Creating an offshore wind energy industry in the United States. Internet website: http://energy.gov/sites/prod/files/2013/12/f5/national_offshore_wind_strategy.pdf. Accessed May 14, 2014.
- U.S. Dept. of Energy. Energy Information Administration. 2007. Regional underground natural gas storage, close of 2007. Internet website: ftp://ftp.eia.doe.gov/pub/oil_gas/natural_gas/analysis_publications/ngpipeline/undrgrnd_storage.html. Accessed July 1, 2015.
- U.S. Dept. of Energy. Energy Information Administration. 2011. Natural gas processing plants in the United States: 2010 update regional analysis. U.S. Dept. of Energy, Energy Information Administration, Office of Oil and Gas, Washington DC. Internet website: http://www.eia.gov/pub/oil_gas/natural_gas/feature_articles/2010/ngpps2009/gom.cfm. Accessed July 1, 2015.
- U.S. Dept. of Energy. Energy Information Administration. 2012. Potential of gas hydrates is great, but practical development is far off. Internet website: <http://www.eia.gov/todayinenergy/detail.cfm?id=8690>. Accessed April 2015.
- U.S. Dept. of Energy. Energy Information Administration. 2014a. Sales of fossil fuels produced from Federal and Indian lands, FY 2003 through FY 2013. Internet website: <http://www.eia.gov/analysis/requests/federallands/pdf/eia-federallandsales.pdf>. Accessed April 17, 2015.
- U.S. Dept. of Energy. Energy Information Administration. 2014b. Texas state energy profile. Internet website: <http://www.eia.gov/state/print.cfm?sid=TX>. Updated March 27, 2014.
- U.S. Dept. of Energy. Energy Information Administration. 2015a. Short-term energy outlook; U.S. petroleum and other liquids; March 10, 2015. Internet website: http://www.eia.gov/forecasts/steo/report/us_oil.cfm. Accessed April 1, 2015.

- U.S. Dept. of Energy. Energy Information Administration. 2015b. Total natural gas production, consumption, and imports in reference case, 1990-2040 (trillion cubic feet). Internet website: http://www.eia.gov/forecasts/aeo/excel/figmt42_data.xls. Accessed April 1, 2015.
- U.S. Dept. of Energy. Energy Information Administration. 2015c. Table 3. Capacity of operable petroleum refineries by state as of January 1, 2015. Internet website: <http://www.eia.gov/petroleum/refinerycapacity/table3.pdf>. Accessed August 20, 2015.
- U.S. Dept. of Energy. Energy Information Administration. 2015d. Frequently asked questions. When was the last refinery built in the United States? Internet website: <http://www.eia.gov/tools/faqs/faq.cfm?id=29&t=6>. Accessed August 20, 2015.
- U.S. Dept. of Energy. Energy Information Administration. 2015e. Mississippi state energy profile. Internet website: <http://www.eia.gov/state/print.cfm?sid=MS>. Updated April 16, 2015.
- U.S. Dept. of Energy. Energy Information Administration. 2015f. Gulf of Mexico factsheet. Internet website: http://www.eia.gov/special/gulf_of_mexico/. Accessed July 22, 2015.
- U.S. Dept. of Energy. Energy Information Administration. 2015g. Henry Hub natural gas spot price. Internet website: <http://www.eia.gov/dnav/ng/hist/rngwhhdM.htm>. Accessed August 18, 2015.
- U.S. Dept. of Energy. Energy Information Administration. 2015i. Annual energy outlook 2015.
- US Dept. of Energy. Energy Information Administration. 2016a. Short-term energy outlook – February 2016: Data tables. Internet website: <http://www.eia.gov/forecasts/steo/>. Accessed February 18, 2016.
- US Dept. of Energy. Energy Information Administration. 2016b. Oil production in federal Gulf of Mexico projected to reach record high in 2017. Today in Energy: February 18, 2016. Internet website: <http://www.eia.gov/todayinenergy/detail.cfm?id=25012>. Accessed February 18, 2016.
- U.S. Dept. of Energy. Federal Energy Regulatory Commission. 2015a. North American LNG import/export terminals approved. September 15, 2015. Internet website: <https://www.ferc.gov/industries/gas/indus-act/lng/lng-approved.pdf>. Accessed September 25, 2015.
- U.S. Dept. of Energy. Federal Energy Regulatory Commission. 2015b. LNG. Internet website: <http://www.ferc.gov/industries/gas/indus-act/lng.asp>. Accessed September 14, 2015.
- U.S. Dept. of Energy. Office of Energy Efficiency and Renewable Energy. 2015. Offshore wind advanced technology demonstration projects. Internet website: <http://energy.gov/eere/wind/offshore-wind-advanced-technology-demonstration-projects>. Accessed September 14, 2015.
- U.S. Dept. of Homeland Security. Coast Guard. 2008. Aids to navigation on artificial islands and fixed structures. Title 33, Part 67.
- U.S. Dept. of Homeland Security. Coast Guard. 2012. Polluting incidents in and around U.S. waters. A spill/release compendium: 1969-2011. U.S. Dept. of Homeland Security, Coast Guard, Office of Investigations & Compliance Analysis (CG-INV), Washington, DC.

- U.S. Dept. of Homeland Security. Coast Guard. 2015a. Marine casualty and pollution data for researchers. Internet website: <https://homeport.uscg.mil/mycg/portal/ep/programView.do?channelId=-18374&programId=91343&programPage=%2Fep%2Fprogram%2Feditorial.jsp&pageTypeId=1348>. Accessed September 28, 2015.
- U.S. Dept. of Homeland Security. Coast Guard. 2015b. Tar balls in the coastal environment. Internet website: [http://www.nrt.org/production/NRT/RRTHome.nsf/resources/RRTIV-Pamphlets/\\$File/23_RRT4_Tar_Ball_Pamphlet.pdf](http://www.nrt.org/production/NRT/RRTHome.nsf/resources/RRTIV-Pamphlets/$File/23_RRT4_Tar_Ball_Pamphlet.pdf). Accessed August 20, 2015.
- U.S. Dept. of Homeland Security, Coast Guard and U.S. Dept. of Transportation, Maritime Administration (MARAD). 2003. Final environmental impact statement for the Port Pelican LLC Deepwater Port License Application. Commandant, U.S. Dept. of Homeland Security, Coast Guard, Washington, DC.
- U.S. Dept. of Labor. Occupational Safety and Health Administration. 2010. OSHA statement on 2-butoxyethanol & worker exposure. July 9, 2010. Internet website: <https://www.osha.gov/oilspills/oilspill-statement.html>. Accessed March 14, 2012.
- U.S. Dept. of the Army. Corps of Engineers. 1992. Planning assistance to states program, Section 22 report, inlets along the Texas Gulf Coast. Galveston District, Southwestern Division, August 1992. 56 pp. Internet website: http://cirp.usace.army.mil/pubs/archive/Inlets_Alone_TX_Gulf_Coast.pdf.
- U.S. Dept. of the Army. Corps of Engineers. 2004. Louisiana coastal area (LCA), Louisiana: Ecosystem restoration study. Volume I: LCA Study—main report and Volume II: Programmatic environmental impact statement. U.S. Dept. of the Army, Corps of Engineers, New Orleans District, New Orleans, LA. 506 and 918 pp., respectively. Internet website: <http://www.lca.gov/Library/ProductList.aspx?Prodtype=0&folder=1118>. Accessed March 18, 2011.
- U.S. Dept. of the Army. Corps of Engineers. 2008. Maintenance dredging and disposal of dredged materials Mississippi and Louisiana portions of the Gulf Intracoastal Waterway federally authorized navigation project: Draft environmental assessment, January 2008. Mobile District Office, Mobile, AL. 232 pp. Internet website: [http://www.sam.usace.army.mil/pd/EAs/GIWW_DRAFTEAforPUBLIC\(2\)jj.pdf](http://www.sam.usace.army.mil/pd/EAs/GIWW_DRAFTEAforPUBLIC(2)jj.pdf).
- U.S. Dept. of the Army. Corps of Engineers. 2009a. Louisiana coastal protection and restoration (LACPR): Final technical report. Programmatic cumulative effects analysis appendix. U.S. Dept. of the Army, Corps of Engineers, New Orleans District, Mississippi Valley Division. 49 pp. with annexes. Internet website: <http://www.hsdl.org/?view&did=9380>.
- U.S. Dept. of the Army. Corps of Engineers. 2009b. Louisiana coastal protection and restoration (LACPR): Final technical report. U.S. Dept. of the Army, Corps of Engineers, New Orleans District, Mississippi Valley Division. 265 pp. with attachments. Internet website: <http://www.mvd.usace.army.mil/lcast/pdfs/06jun/LaCPR.pdf>.

- U.S. Dept. of the Army. Corps of Engineers. 2013. Beneficial use of dredged material. Internet website: <http://www.mvn.usace.army.mil/About/Offices/Operations/BeneficialUseofDredgedMaterial.aspx>. Accessed December 12, 2013.
- U.S. Dept. of the Army. Corps of Engineers. 2015a. Ocean disposal database: Dredging operations technical support. Internet website: <http://el.erdc.usace.army.mil/odd/DisposalSearch.cfm>. Accessed August 26, 2015.
- U.S. Dept. of the Army. Corps of Engineers. 2015b. The Mississippi drainage basin. Internet website: <http://www.mvn.usace.army.mil/Missions/MississippiRiverFloodControl/MississippiRiverTributaries/MississippiDrainageBasin.aspx>. Accessed February 19, 2015, and March 19, 2015.
- U.S. Dept. of the Army. Corps of Engineers. 2015c. Waterborne commerce statistics center: Principal ports of the United States. Internet website: <http://www.iwr.usace.army.mil/About/TechnicalCenters/WCSCWaterborneCommerceStatisticsCenter.aspx>.
- U.S. Dept. of the Interior. 2010. Increased safety measures for energy development on the outer continental shelf, May 27, 2010. U.S. Dept. of the Interior, Washington, DC. 44 pp.
- U.S. Dept. of the Interior. 2015a. Record of Decision for the *Deepwater Horizon* oil spill: Final Programmatic and Phase III Early Restoration Plan and Early Restoration Programmatic Environmental Impact Statement (Phase III ERP/PEIS). 273 pp. Internet website: http://www.doi.gov/deepwaterhorizon/upload/Final-Phase-III-ERP-PEIS-Record-of-Decision_FINAL.PDF
- U.S. Dept. of the Interior. 2015b. Economic report for FY 2014, June 23, 2015. U.S. Dept. of the Interior, Washington DC. 57 pp.
- U.S. Dept. of the Interior. Bureau of Ocean Energy Management. 2012a. Proposed final outer continental shelf oil & gas leasing program: 2012-2017. U.S. Dept. of the Interior, Bureau of Ocean Energy Management, Herndon, VA. 223 pp.
- U.S. Dept. of the Interior. Bureau of Ocean Energy Management. 2012b. Gulf of Mexico OCS oil and gas lease sales: 2012-2017; Western Planning Area Lease Sales 229, 233, 238, 246, and 248; Central Planning Area Lease Sales 227, 231, 235, 241, and 247—final environmental impact statement. 3 vols. U.S. Dept. of the Interior, Bureau of Ocean Energy Management, Gulf of Mexico OCS Region, New Orleans, LA. OCS EIS/EA BOEM 2012-019.
- U.S. Dept. of the Interior. Bureau of Ocean Energy Management. 2013a. Report to Congress: The comprehensive inventory of U.S. Outer Continental Shelf oil and natural gas resources: 2013 update. Internet website: <http://www.boem.gov/Final-Comprehensive-Inventory-Report-Delivered-to-Congress/>. Accessed November 9, 2015.
- U.S. Dept. of the Interior. Bureau of Ocean Energy Management. 2013b. Fourth biennial report to Congress: Estimates of natural gas and oil reserves, reserves growth, and undiscovered resources in federal and state waters off the coasts of Texas, Louisiana, Mississippi, and Alabama.

- U.S. Dept. of the Interior. Bureau of Ocean Energy Management. 2014a. Atlantic OCS proposed geological and geophysical activities; Mid-Atlantic and South-Atlantic planning areas; Final programmatic environmental impact statement. 3 vols. U.S. Dept. of the Interior, Bureau of Ocean Energy Management, Gulf of Mexico OCS Region, New Orleans, LA. OCS EIS/EA BOEM 2014-001. Internet website: <http://www.boem.gov/Atlantic-G-G-PEIS/>.
- U.S. Dept. of the Interior. Bureau of Ocean Energy Management. 2014b. Exploration and development plans online query. Internet website: http://www.data.boem.gov/homepg/data_center/plans/plans/master.asp. Accessed December 8, 2014.
- U.S. Dept. of the Interior. Bureau of Ocean Energy Management. 2015a. Draft proposed outer continental shelf oil & gas leasing program: 2017-2022. U.S. Dept. of the Interior, Bureau of Ocean Energy Management, Herndon, VA. 299 pp.
- U.S. Dept. of the Interior. Bureau of Ocean Energy Management. 2015b. BOEM Environmental Studies Program: Ongoing studies; Air quality modeling in the Gulf of Mexico Region (GM-14-01). Internet website: <http://www.boem.gov/GM-14-01/>. Accessed September 23, 2015.
- U.S. Dept. of the Interior. Bureau of Ocean Energy Management. 2015c. Seismic water bottom anomalies map gallery. Internet website: <http://www.boem.gov/Seismic-Water-Bottom-Anomalies-Map-Gallery/>.
- U.S. Dept. of the Interior. Bureau of Ocean Energy Management. 2015d. Royalty relief information. Internet website: <http://www.boem.gov/Royalty-Relief-Information/>. Accessed October 5, 2015.
- U.S. Dept. of the Interior. Bureau of Ocean Energy Management. 2015e. Fair market value. Internet website: <http://www.boem.gov/Oil-and-Gas-Energy-Program/Energy-Economics/Fair-Market-Value/econFMV.aspx>. Accessed September 14, 2015.
- U.S. Dept. of the Interior. Bureau of Ocean Energy Management. 2016a. 2017-2022 outer continental shelf oil & gas leasing: Proposed program. U.S. Dept. of the Interior, Bureau of Ocean Energy Management, Herndon, VA. 279 pp.
- U.S. Dept. of the Interior. Bureau of Ocean Energy Management. 2016b. Outer Continental Shelf oil and gas leasing program: 2017-2022—draft environmental impact statement. U.S. Dept. of the Interior, Bureau of Ocean Energy Management, Herndon, VA. OCS EIS/EA BOEM 2016-001.
- U.S. Dept. of the Interior. Bureau of Ocean Energy Management. 2016c. Catastrophic spill event analysis: High-volume, extended-duration oil spill resulting from loss of well control on the Gulf of Mexico outer continental shelf. U.S. Dept. of the Interior, Bureau of Ocean Energy Management, New Orleans, LA. OCS Report BOEM 2016-017. x + 320 pp.
- U.S. Dept. of the Interior. Bureau of Ocean Energy Management. 2016d. Essential fish habitat assessment for the Gulf of Mexico. U.S. Dept. of the Interior, Bureau of Ocean Energy Management, New Orleans, LA. OCS Report BOEM 2016-016. iv + 52 pp.

- U.S. Dept. of the Interior. Bureau of Safety and Environmental Enforcement. 2011. Pollution prevention, last update – 2011. Internet website: http://www.bsee.gov/uploadedFiles/BSEE/Enforcement/Inspection_Programs/GLE.pdf.
- U.S. Dept. of the Interior. Bureau of Safety and Environmental Enforcement. 2015a. Incidents of noncompliance. Internet website: <http://www.bsee.gov/Inspection-and-Enforcement/Enforcement-Programs/Incidents-of-Non-Compliance/>. Accessed September 10, 2015.
- U.S. Dept. of the Interior. Bureau of Safety and Environmental Enforcement. 2015b. Loss of well control—statistics and summaries. Internet website: <http://www.bsee.gov/Inspection-and-Enforcement/Accidents-and-Incidents/Loss-of-Well-Control/>. Accessed September 10, 2015.
- U.S. Dept. of the Interior. Bureau of Safety and Environmental Enforcement. 2015c. Collisions – statistics and summaries 2007-2014. Internet website: <http://www.bsee.gov/Inspection-and-Enforcement/Accidents-and-Incidents/Collisions/>. Accessed May 14, 2015.
- U.S. Dept. of the Interior. Bureau of Safety and Environmental Enforcement. 2015d. Spills – statistics and summaries archive ≥ 50 bbls. Internet website: <http://www.bsee.gov/Inspection-and-Enforcement/Accidents-and-Incidents/Spills-Archive/>. Accessed March 31, 2015.
- U.S. Dept. of the Interior. Bureau of Safety and Environmental Enforcement. 2015e. Yearly oil and gas production. Internet website: http://www.data.bsee.gov/homepg/data_center/production/ocsprod.asp. Accessed November 9, 2015.
- U.S. Dept. of the Interior. Bureau of Safety and Environmental Enforcement. 2015f. Installations and removals – offshore production facilities in federal waters. Internet website: http://www.bsee.gov/uploadedFiles/BSEE/Newsroom/Offshore_Stats_and_Facts/OCSPPlatformActivity%20%201942-%202013final.pdf. Accessed November 9, 2015.
- U.S. Dept. of the Interior. Bureau of Safety and Environmental Enforcement. 2015g. Incident statistics and summaries. Internet website: <http://www.bsee.gov/Inspection-and-Enforcement/Accidents-and-Incidents/Listing-and-Status-of-Accident-Investigations/>. Accessed September 2015.
- U.S. Dept. of the Interior. Bureau of Safety and Environmental Enforcement. 2015h. Rigs to reefs information. Internet website: <http://www.bsee.gov/About-BSEE/Divisions/EED/EED-Rigs-to-Reefs/>. Accessed July 31, 2015.
- U.S. Dept. of the Interior. Bureau of Safety and Environmental Enforcement. 2015i. Installations and removals: Offshore production facilities in federal waters. Internet website: <http://www.bsee.gov/BSEE-Newsroom/Offshore-Stats-and-Facts/Offshore-Stats-and-Facts/>. Accessed August 10, 2015.
- U.S. Dept. of the Interior. Fish and Wildlife Service. 1991. Recovery plan—Mississippi sandhill crane (third revision). U.S. Dept. of the Interior, Fish and Wildlife Service, Region 4, Division of Migratory Bird Management Office, Atlanta, GA. 48 pp.

- U.S. Dept. of the Interior. Fish and Wildlife Service. 1999. National wetlands inventory: 1996 coastal Mississippi habitat data. U.S. Dept. of the Interior, Fish and Wildlife Service, National Wetlands Center, Lafayette, LA.
- U.S. Dept. of the Interior. Fish and Wildlife Service. 2001. Florida manatee recovery plan, (*Trichechus manatus latirostris*), third revision. U.S. Dept. of the Interior, Fish and Wildlife Service. Atlanta, GA. 144 pp. + apps.
- U.S. Dept. of the Interior. Fish and Wildlife Service. 2006. West Indian manatee response plan. U.S. Dept. of the Interior, Fish and Wildlife Service, Ecological Services Field Office, Jacksonville, FL. 7 pp.
- U.S. Dept. of the Interior. Fish and Wildlife Service. 2007. Wood stork (*Mycteria americana*): 5-year review, summary and evaluation. U.S. Dept. of the Interior, Fish and Wildlife Service, Region 4, Jacksonville Ecological Services Field Office, Jacksonville, FL. 34 pp.
- U.S. Dept. of the Interior. Fish and Wildlife Service. 2009. Whooping cranes and wind development—an issue paper. U.S. Dept. of the Interior, Fish and Wildlife Service, Albuquerque, NM. 28 pp.
- U.S. Dept. of Interior. Fish and Wildlife Service. 2010a. Final recovery plan for the St. Andrew beach mouse (*Peromyscus polionotus peninsularis*). U.S. Dept. of the Interior, Fish and Wildlife Service, Atlanta, GA. 95 pp.
- U.S. Dept. of Interior. Fish and Wildlife Service. 2010b. Five-year review for the Cape Sable Seaside Sparrow (*Ammodramus maritimus mirabilis*). U.S. Dept. of the Interior, Fish and Wildlife Service, Vero Beach, FL. 22 pp.
- U.S. Dept. of the Interior. Fish and Wildlife Service. 2010c. Caribbean roseate tern and North Atlantic roseate tern (*Sterna dougallii dougallii*): 5-year review, summary and evaluation. U.S. Dept. of the Interior, Fish and Wildlife Service, Region 5, New England Field Office, Concord, NH. 148 pp.
- U.S. Dept. of the Interior. Fish and Wildlife Service. 2011. Endangered Species Act – Section 7 consultation on the construction of a second explosive handling wharf at Bangor Navy Base, Kitsap County. Conducted by the U.S. Dept. of the Interior, Fish and Wildlife Service, Lacey, WA. 137 pp.
- U.S. Dept. of Interior. Fish and Wildlife Service. 2012. Five-year review: Summary and evaluation for the whooping crane (*Grus Americana*). Corpus Christi and Austwell, TX. 44 pp.
- U.S. Dept. of Interior. Fish and Wildlife Service. 2015a. Kemp's ridley sea turtle, *Lepidochelys kempii*. In: South Florida Multi-Species Recovery Plan. Internet website: <http://www.fws.gov/verobeach/ListedSpeciesMSRP.html>. Pp. 4-649 through 4-664.
- U.S. Dept. of Interior. Fish and Wildlife Service. 2015b. Leatherback sea turtle, *Dermochelys coriacea*. In: South Florida Multi-Species Recovery Plan. Internet website: <http://www.fws.gov/verobeach/ListedSpeciesMSRP.html>. Pp. 4-665 through 4-703.

- U.S. Dept. of Interior. Fish and Wildlife Service. 2015c. Hawksbill sea turtle, *Eretmochelys imbricata*. In: South Florida Multi-Species Recovery Plan. Internet website: <http://www.fws.gov/verobeach/ListedSpeciesMSRP.html>. Pp. 4-615 through 4-648.
- U.S. Dept. of the Interior. Geological Survey. 1988. Report to Congress: Coastal barrier resource system. Recommendations for additions to or deletions from the Coastal Barrier Resource System. Vol. 18, Louisiana.
- U.S. Dept. of the Interior. Geological Survey. 2008. Coastal change hazards: Hurricanes and extreme storms. Internet website: <http://coastal.er.usgs.gov/hurricanes/>. Accessed April 15, 2011.
- U.S. Dept. of the Interior. Geological Survey. 2010. NAS—nonindigenous aquatic species. *Pterois volitans/miles*. Internet website: <http://nas.er.usgs.gov/queries/collectioninfo.aspx?NoCache=8%2F11%2F2009+10%3A53%3A53+AM&SpeciesID=963&State=&County=&HUCNumber=>. Accessed October 18, 2010.
- U.S. Dept. of the Interior. Geological Survey. 2014. Press release: Interior, Agriculture Departments partner to measure conservation impacts on water quality. Internet website: <http://www.usgs.gov/newsroom/article.asp?ID=4034&from=rss#.VQH8fPnF8k0>. Accessed March 12, 2015.
- U.S. Dept. of the Interior. Geological Survey. 2015. Non-indigenous species mapper. Internet website: <http://nas2.er.usgs.gov/viewer/omap.aspx?SpeciesID=963>. Accessed March 25, 2015.
- U.S. Dept. of the Interior. Minerals Management Service. 1983. Memorandum of understanding between the Environmental Protection Agency and the Department of the Interior concerning the coordination of NPDES permit issuance with the outer continental shelf oil and gas lease program. Internet website: http://www.bsee.gov/uploadedFiles/BSEE/Newsroom/Publications_Library/001_1984-MOU.pdf.
- U.S. Dept. of the Interior. Minerals Management Service. 1984. Port Arthur and Bouma Bank quads, sheets I-VIII. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Map MMS 84-0003.
- U.S. Dept. of the Interior. Minerals Management Service. 1989. Memorandum of agreement between the U.S. Environmental Protection Agency (EPA), Region 6, and the Gulf of Mexico Regional Office, Minerals Management Service (MMS), coordinating the EPA NPDES permit compliance program with the MMS offshore inspection program. Internet website: http://www.bsee.gov/uploadedFiles/BSEE/Newsroom/Publications_Library/1989%20NPDES%20MOA%20EPA-R6%20and%20GOMR.pdf.
- U.S. Dept. of the Interior. Minerals Management Service. 1999. Investigation of Chevron Pipe Line Company pipeline leak, South Pass Block 38, September 29, 1998.
- U.S. Dept. of the Interior. Minerals Management Service. 2000a. Deepwater development: A reference document for the deepwater environmental assessment Gulf of Mexico OCS (1998

- through 2007). U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Report MMS 2000-015. 94 pp.
- U.S. Dept. of the Interior. Minerals Management Service. 2000b. Gulf of Mexico deepwater operations and activities: Environmental assessment. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS EIS/EA MMS 2000-001. 264 pp.
- U.S. Dept. of the Interior. Minerals Management Service. 2001. Proposed use of floating production, storage, and offloading systems on the Gulf of Mexico outer continental shelf, Western and Central Planning Areas—final environmental impact statement. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS EIS/EA MMS 2000-090. 782 pp.
- U.S. Dept. of the Interior. Minerals Management Service. 2004a. Fate and effects of a spill of synthetic-based drilling fluid at Mississippi Canyon Block 778. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Report MMS 2004-039. 18 pp.
- U.S. Dept. of the Interior. Minerals Management Service. 2004b. Geological and geophysical exploration for mineral resources on the Gulf of Mexico outer continental shelf—final programmatic environmental assessment. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS EIS/EA MMS 2004-054. 466 pp.
- U.S. Dept. of the Interior. Minerals Management Service. 2005. Structure-removal operations on the Gulf of Mexico outer continental shelf—programmatic environmental assessment. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS EIS/EA MMS 2005-013. 358 pp.
- U.S. Dept. of the Interior. Minerals Management Service. 2006. Deepwater Gulf of Mexico 2006: America's expanding frontier. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Report MMS 2006-022. 144 pp.
- U.S. Dept. of the Interior. Minerals Management Service. 2007a. Gulf of Mexico OCS oil and gas scenario examination: Pipeline landfalls. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Report MMS 2007-053. 8 pp.
- U.S. Dept. of the Interior. Minerals Management Service. 2007b. Gulf of Mexico OCS oil and gas lease sales: 2007-2012; Western Planning Area Sales 204, 207, 210, 215, and 218; Central Planning Area Sales 205, 206, 208, 213, 216, and 222—final environmental impact statement. 2 vols. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS EIS/EA MMS 2007-018.
- U.S. Dept. of the Interior. Minerals Management Service. 2007c. Gulf of Mexico OCS oil and gas scenario examination: Exploration and development activity. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Report MMS 2007-052. 14 pp.

- U.S. Dept. of the Interior. Minerals Management Service. 2008a. Preliminary evaluation of in-place gas hydrate resources: Gulf of Mexico outer continental shelf. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Report MMS 2008-004.
- U.S. Dept. of the Interior. Minerals Management Service. 2008b. MMS completes assessment of destroyed and damaged facilities from Hurricanes Gustav and Ike. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. News Release R-08-3932. Internet website: <http://www.onrr.gov/PDFDocs/20081121a.pdf>.
- U.S. Dept. of the Interior. National Park Service. 2001. Oil and gas management plan for Padre Island National Seashore. March 2001. 194 pp.
- U.S. Dept. of the Interior. National Park Service. 2005. November 2005 archeology e-gram. Internet website: <http://www.nps.gov/archeology/pubs/egram/0511.pdf>. Accessed July 20, 2010.
- U.S. Dept. of the Interior. National Park Service. 2008. Padre Island National Seashore: The 2008 sea turtle nesting season. Internet website: <http://www.nps.gov/pais/naturescience/2008-season.htm>. Accessed September 14, 2015.
- U.S. Dept. of the Interior. National Park Service. 2011a. Managing sea turtles during the oil spill response. 2 pp. Internet website: http://www.restorethegulf.gov/sites/default/files/imported_pdfs/external/content/document/2931/771879/1/NPS_Turtles_Web.pdf. Accessed September 16, 2015.
- U.S. Dept. of the Interior. National Park Service. 2011b. Beach vehicle environmental assessment for Padre Island National Seashore.
- U.S. Dept. of the Interior. National Park Service. 2014a. General management plan, environmental impact statement; Gulf Islands National Seashore; Florida and Mississippi. July 2014. 562 pp.
- U.S. Dept. of the Interior. National Park Service. 2014b. The Historic Preservation Fund annual report. Internet website: http://www.nps.gov/shpo/downloads/2014%20Historic%20Annual%20Report_Web.pdf.
- U.S. Dept. of the Interior. National Park Service. 2016. Padre Island National Seashore; sea turtle science and recovery. Internet website: <http://www.nps.gov/pais/learn/nature/stsr-index.htm>. Accessed March 8, 2016.
- U.S. Dept. of the Interior. Office of Natural Resources Revenue. 2015. ONRR statistical information online query. Internet website: <http://statistics.onrr.gov/ReportTool.aspx>. Accessed March 27, 2015.
- U.S. Dept. of the Navy. 2001. Shock trail of the Winston S. Churchill (DDG 81): Final environmental impact statement. U.S. Dept. of the Navy and U.S. Dept. of Commerce, National Marine Fisheries Service.

- U.S. Dept. of Transportation. Maritime Administration (MARAD). 2012. North American cruises, key statistics (capacity and traffic in thousands). Internet website: http://www.marad.dot.gov/documents/north_america_cruise_summary_data.xls. Accessed June 19, 2013.
- U.S. Dept. of Transportation. Maritime Administration (MARAD). 2013. Vessel calls in U.S. ports and terminals – privately-owned, oceangoing merchant vessels over 1,000 gross tons. Internet website: http://www.marad.dot.gov/wp-content/uploads/xls/Tanker_Calls_at_U_S_Ports.xls. Accessed September 14, 2015.
- U.S. Dept. of Transportation. Maritime Administration (MARAD). 2015a. Vessel calls at U.S. ports by vessel type. Internet website: http://www.marad.dot.gov/wp-content/uploads/xlsx/DS_U.S.-Port-Calls-2013.xlsx. Current as of June 17, 2015. Accessed September 14, 2015.
- U.S. Dept. of Transportation. Maritime Administration (MARAD). 2015b. Approved application and operational facilities. Internet website: <http://www.marad.dot.gov/ports/office-of-deepwater-ports-and-offshore-activities/>. Accessed September 14, 2015.
- U.S. Dept. of Transportation. National Transportation Safety Board. 1998. Safety recommendation M-98-124.
- U.S. Environmental Protection Agency. 1991. Evaluation of dredged material proposed for ocean disposal. U.S. Environmental Protection Agency and U.S. Dept. of the Army, Corps of Engineers. EPA 503/9-91/001.
- U.S. Environmental Protection Agency. 1993a. Development document for effluent limitations guidelines and new source performance standards for the offshore subcategory of the oil and gas extraction point source category, final. January 1993. EPA-821-R-93-003. U.S. Environmental Protection Agency, Office of Water, Washington, DC. 386 pp.
- U.S. Environmental Protection Agency. 1993b. Supplemental information for effluent limitation guidelines and new source performance standards for the offshore subcategory of the oil and gas extraction point source category (49 CFR 435); Office of Water, Washington, DC. Also supportive documents produced by the Office of Water Regulations and Standards, Washington, DC. Economic impact analysis of proposed effluent limitation guidelines and standards for the offshore oil and gas industry. Prepared by Eastern Research Group, Inc. EPA 440/2-91-001. Regulation published in the *Federal Register*, 58 FR 41, pp. 12,453-12,512. March 4, 1993.
- U.S. Environmental Protection Agency. 1999. Development document for proposed effluent limitations guidelines and standards for synthetic-based drilling fluids and other non-aqueous drilling fluids in the oil and gas extraction point source category. EPA-821-B-98-021. 289 pp.
- U.S. Environmental Protection Agency. 2000a. Environmental assessment of final effluent limitations guidelines and standards for synthetic-based drilling fluids and other non aqueous drilling fluids in the oil and gas extraction point source category. December 2000. EPA-821-B00-014. U.S. Environmental Protection Agency, Office of Water, Washington, DC. 292 pp.
- U.S. Environmental Protection Agency. 2000b. Development document for final effluent limitations guidelines and standards for synthetic-based drilling fluids and other non-aqueous drilling fluids

- in the oil and gas extraction point source category. December 2000. EPA-821-B-00-013. U.S. Environmental Protection Agency, Office of Water, Washington, DC. 518 pp.
- U.S. Environmental Protection Agency. 2004. Final NPDES general permit for new and existing sources and new dischargers in the offshore subcategory of the oil and gas extraction category for the western portion of the outer continental shelf of the Gulf of Mexico (GMG290000). U.S. Environmental Protection Agency. 117 pp. Internet website: <http://www.epa.gov/region6/water/npdes/genpermit/gmg290000finalpermit2004.pdf>.
- U.S. Environmental Protection Agency. 2006. Technical development document for the final Section 316(b) Phase III rule. EPA-821-R-06-003. U.S. Environmental Protection Agency, Office of Water, Washington, DC.
- U.S. Environmental Protection Agency. 2007. NPDES general permit for new and existing sources and new dischargers in the offshore subcategory of the oil and gas extraction category for the western portion of the outer continental shelf of the Gulf of Mexico (GMG290000). U.S. Environmental Protection Agency. 15 pp. Internet website: <http://www.epa.gov/Region06/water/npdes/genpermit/gmg290000fedreg.pdf>.
- U.S. Environmental Protection Agency. 2009a. Marine debris factsheet. Internet website: http://water.epa.gov/type/oceb/marinedebris/upload/2009_05_11_oceans_debris_marine_debris_final.pdf.
- U.S. Environmental Protection Agency. 2009b. Region 4 environmental assessment for the National Pollutant Discharge Elimination System permitting for eastern Gulf of Mexico offshore oil and gas exploration, development and production. Permit 904/P-09-001. 129 pp.
- U.S. Environmental Protection Agency. 2010a. Region 4, final National Pollutant Discharge Elimination System (NPDES) general permit No. GEG460000 for offshore oil and gas activities in the eastern Gulf of Mexico.
- U.S. Environmental Protection Agency. 2010b. Air monitoring on Gulf coastline (monitoring air quality along the Gulf Coast, 2011). Internet website: <http://www.epa.gov/BPSpill/air.html>. Accessed June 29, 2010.
- U.S. Environmental Protection Agency. 2012a. Region 6, the NPDES general permit for new and existing sources and new discharges in the offshore subcategory of the oil and gas extraction point source category for the western portion of the outer continental shelf of the Gulf of Mexico (GMG290000).
- U.S. Environmental Protection Agency. 2012b. National Coastal Condition Report IV, September 2012. Internet website: http://water.epa.gov/type/oceb/assessmonitor/nccr/upload/0_NCCR_4_Report_508_bookmarks.pdf.
- U.S. Environmental Protection Agency. 2013a. Vessel General Permit for discharges incidental to the normal operation of vessels (Final 2013 VGP).

- U.S. Environmental Protection Agency. 2013b. Future climate change: Future sea level change. Internet website: <http://www.epa.gov/climatechange/science/future.html#sealevel>. Accessed July 26, 2013.
- U.S. Environmental Protection Agency. 2013c. Our built and natural environments: A technical review of the interactions among and use, transportation and environmental quality. Internet website: <http://www2.epa.gov/sites/production/files/2014-03/documents/our-built-and-natural-environments.pdf>. Accessed September 7, 2015.
- U.S. Environmental Protection Agency. 2014a. Small Vessel General Permit for discharges incidental to the normal operation of vessels less than 79 feet (Final 2014 svGP).
- U.S. Environmental Protection Agency. 2014b. National Contingency Plan Subpart J. Internet website: <http://www2.epa.gov/emergency-response/national-contingency-plan-subpart-j>. Accessed March 18, 2014.
- U.S. Environmental Protection Agency. 2014c. General facts about the Gulf of Mexico. Internet website: <http://www.epa.gov/gmpo/about/facts.html>. Accessed July 31, 2015.
- U.S. Environmental Protection Agency. 2015a. Central data exchange. Internet website: www.cdx.epa.gov. Accessed November 10, 2015.
- U.S. Environmental Protection Agency. 2015b. NetDMR. Internet website: <http://echo.epa.gov/>. Accessed November 10, 2015.
- U.S. Environmental Protection Agency. 2015c. Enforcement and compliance history online. Internet website: <https://netdmr.epa.gov/netdmr/public/home.htm>. Accessed November 10, 2015.
- U.S. Environmental Protection Agency. 2015d. National ambient air quality standards (NAAQS). Internet website: <http://www3.epa.gov/ttn/naaqs/criteria.html>. Accessed August 18, 2015.
- U.S. Environmental Protection Agency. 2015e. National list of beaches. Internet website: <http://www2.epa.gov/beach-tech/national-list-beaches>. Accessed July 22, 2015.
- U.S. Environmental Protection Agency. Region IV Regional Response Team. 1996. Use of dispersants in Region IV. Internet website: <http://ocean.floridamarine.org/ACP/KWACP/Documents/RRTIVDocs/RRT4DispersantPlan.pdf>. Accessed November 9, 2015.
- U.S. Government Accountability Office. 2007. Coastal wetlands: Lessons learned from past efforts in Louisiana could help guide future restoration and protection. Government Accountability Office, Washington DC. GAO 08-130. 62 pp. Internet website: <http://www.gao.gov/new.items/d08130.pdf>.
- U.S. National Response Team. 2010. Oil spill response strategies for coastal marshes during the *Deepwater Horizon* MC252 spill. 10 pp. Internet website: [http://www.nrt.org/Production/NRT/NRTWeb.nsf/AllAttachmentsByTitle/SA-1061NRT_Marsh_Cleanup_Options_DWH.06032010.pdf/\\$File/NRT_marsh_cleanup_overview_6-15.pdf?OpenElement](http://www.nrt.org/Production/NRT/NRTWeb.nsf/AllAttachmentsByTitle/SA-1061NRT_Marsh_Cleanup_Options_DWH.06032010.pdf/$File/NRT_marsh_cleanup_overview_6-15.pdf?OpenElement). Accessed December 23, 2010.

- U.S. National Response Team. 2013. Environmental monitoring for atypical dispersant operations: Including guidance for subsea application and prolonged surface application. Internet website: [http://www.nrt.org/Production/NRT/NRTWeb.nsf/AllAttachmentsByTitle/SA-1086NRT_Atypical_Dispersant_Guidance_Final_5-30-2013.pdf/\\$File/NRT_Atypical_Dispersant_Guidance_Final_5-30-2013.pdf?OpenElement](http://www.nrt.org/Production/NRT/NRTWeb.nsf/AllAttachmentsByTitle/SA-1086NRT_Atypical_Dispersant_Guidance_Final_5-30-2013.pdf/$File/NRT_Atypical_Dispersant_Guidance_Final_5-30-2013.pdf?OpenElement).
- Urick, R.J. 1972. Noise signature of an aircraft in level flight over a hydrophone in the sea. *Journal of the Acoustical Society of America* 52:993-999.
- Valentine, D.L., G.B. Fisher, S.C. Bagby, R.K. Nelson, C.M. Reddy, S.P. Sylvia, and M.A. Woo. 2014. Fallout plume of submerged oil from *Deepwater Horizon*. *Proceedings of the National Academy of Sciences* 111(45):15906-15911. doi:10.1073/pnas.1414873111.
- van Dam, R. and C. Diez. 1998. Home range of immature hawksbill turtles (*Eretmochelys imbricata*) at two Caribbean islands. *Journal of Experimental Marine Biology and Ecology* 220(1):15-24.
- Van Houtan, K.S. and J.M. Halley. 2011. Long-term climate forcing in loggerhead sea turtle nesting. *PLOS ONE* 6(4):e19043. doi:10.1371/journal.pone.0019043.
- Van Houtan, K.S., O.L. Bass, Jr., J. Lockwood and S.L. Pimm. 2010. Importance of estimating dispersal for endangered bird management. *Conservation Letters* 00(2010):1-7.
- Van Houtan, K.S., C.M. Smith, M.L. Dailer, and M. Kawachi. 2014. Eutrophication and the dietary promotion of sea turtle tumors. *PeerJ* 2:e602. doi:10.7717/peerj.602.
- Van Vleet, E.S. and G. Pauly. 1987. Characterization of oil residues scraped from stranded sea turtles from the Gulf of Mexico. *Caribbean Journal of Science* 23:77-83.
- Van Vleet, E.S., W.M. Sackett, F.F. Weber Jr., and S.B. Reinhardt. 1983. Input of pelagic tar into the northwest Atlantic from the Gulf Loop Current: Chemical characterization and its relationship to weathered IXTOC-I oil. *Canadian Journal of Fisheries and Aquatic Sciences* 40(S2):s12-s22. Internet website: http://www.nrcresearchpress.com/doi/abs/10.1139/f83-306#.VbuOO_IVjMF.
- Vanderlaan, A.S.M. and C.T. Taggart. 2007. Vessel collisions with whales: The probability of lethal injury based on vessel speed. *Marine Mammal Science* 23:144-156.
- Vargo, S., P. Lutz, D. Odell, E. Van Vleet, and G. Bossart. 1986. Study of the effects of oil on marine turtles, a final report. Volume II: Technical report. 3 vols. U.S. Dept. of the Interior, Minerals Management Service, Atlantic OCS Region, Washington, DC. OCS Study MMS 86-0070. 181 pp.
- Veil, J. 1999. Update on onshore disposal of offshore drilling wastes. U.S. Environmental Protection Agency, Engineering and Analysis Division. USDOE Contract W-31-109-Eng-38. 18 pp.
- Veil, J. 2015. U.S. produced water volumes and management practices in 2012. Prepared for the Ground Water Protection Council. 119 pp. Internet website: http://www.gwpc.org/sites/default/files/Produced%20Water%20Report%202014-GWPC_0.pdf.

- Veil, J., T.A. Kimmell, and A.C. Rechner. 2005. Characteristics of produced water discharged to the Gulf of Mexico hypoxic zone. Prepared for the U.S. Dept. of Energy, National Energy Technology Laboratory. Contract W-31-109-Eng-38. Internet website: http://www.perf.org/images/Archive_Hypoxic_Report.pdf.
- Venn-Watson S., K. Colegrove, J. Litz, M. Kinsel, K. Terio, J. Saliki, S. Fire, R. Carmichael, C. Chevis, W. Hatchett, J. Pitchford, M. Tumlin, C. Field, S. Smith, R. Ewing, D. Fauquier, G. Lovewell, H. Whitehead, D. Rotstein, W. McFee, E. Fourgeres, and T. Rowles. 2015. Adrenal gland and lung lesions in Gulf of Mexico common bottlenose dolphins (*Tursiops truncatus*) found dead following the *Deepwater Horizon* oil spill. PLOS ONE 10(5):e0126538. doi:10.1371/journal.pone.0126538.
- Veron, J.E.N. 1995. Corals in space and time: The biogeography and evolution of the Scleractinia. Australian Institute of Marine Science. Sydney, Australia: University of New South Wales Press.
- Veron, J.E.N. 2000. Corals of the world. Volumes 1-3. Australian Institute of Marine Science, Townsville, Australia. 1410 pp.
- Vittor, B.A. 2000. Benthic macroinfauna of the northeastern Gulf of Mexico OCS, near DeSoto Canyon. In: Schroeder, W.W. and C.F. Wood, eds. Physical/Biological Oceanographic Integration Workshop for the DeSoto Canyon and Adjacent Shelf, October 19-21, 1999. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 2000-074. 168 pp.
- Volz, D. 2013. Port Fourchon completes dredging as part of big expansion project. Professional Mariner. March 27, 2013. Internet website: <http://www.professionalmariner.com/April-2013/Port-Fourchon-completes-dredging-as-part-of-big-expansion-project/>. Accessed September 7, 2015.
- Voss, G.L. and T.F. Brakoniecki. 1985. Squid resources of the Gulf of Mexico and southeast Atlantic coasts of the United States. NAFO Scientific Council Studies 9:27-37.
- Walker, N. 2001. Tropical storm and hurricane wind effects on water level, salinity, and sediment transport in the river-influenced Atchafalaya-Vermilion Bay System, Louisiana, USA. Estuaries 24:489-508.
- Wallace, R.K. 1996. Coastal wetlands in Alabama. Auburn University, Marine Extension and Research Center, Mobile, AL. Circular ANR-831 MASGP-96-018.
- Wang, F.C. 1987. Effects of levee extension on marsh flooding. Journal of Water Resources Planning and Management 113:161-176.
- Wang, F.C. 1988. Saltwater intrusion modeling: The role of man-made features. In: Turner, R.E. and D.R. Cahoon, eds. Causes of wetland loss in the coastal central Gulf of Mexico. Volume 2. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 87-0120. Pp. 71-100.

- Wardle, C.S., T.J. Carter, G.G. Urquhart, A.D.F. Johnstone, A.M. Ziolkowski, G. Hampson, and D. Mackie. 2001. Effects of seismic air guns on marine fish. *Continental Shelf Research* 21(8):1005-1027.
- Waring, G.T., E. Josephson, K. Maze-Foley, and P.E. Rosel, eds. 2011. U.S. Atlantic and Gulf of Mexico marine mammal stock assessments—2010. U.S. Dept. of Commerce, National Oceanic and Atmospheric Administration. NOAA Technical Memorandum NMFS-NE-219. 598 pp. Internet website: <http://www.nefsc.noaa.gov/publications/tm/tm219/>.
- Waring, G.T., E. Josephson, K. Maze-Foley, and P.E. Rosel, eds. 2013. U.S. Atlantic and Gulf of Mexico marine mammal stock assessments – 2012. NOAA Technical Memorandum NMFS-NE-223. 419 pp. Internet website: <http://www.nefsc.noaa.gov/nefsc/publications/>.
- Waring, G.T., E. Josephson, K. Maze-Foley, and P.E. Rosel, eds. 2014. U.S. Atlantic and Gulf of Mexico marine mammal stock assessments – 2013. NOAA Technical Memorandum NMFS-NE-228. 464 pp. Internet website: <http://www.nefsc.noaa.gov/nefsc/publications/>.
- Waters, M.R., S.L. Forman, T.A. Jennings, L.C. Nordt, S.G. Driese, J.M. Feinberg, J.L. Keene, J. Halligan, A. Lindquist, J. Pierson, C.T. Hallmark, M.B. Collins, and J.E. Wiederhold. 2011. The Buttermilk Creek complex and the origins of Clovis at the Debra L. Friedkin Site, Texas. *Science* 331:1599-1603.
- Watkins, W.A. and W.E. Scheville. 1977. Sperm whale codas. *Journal of the Acoustical Society of America* 62:1485-1490.
- Watkins, W.A., K.E. Moore, and P. Tyack. 1985. Sperm whales acoustic behaviour in the southeast Caribbean. *Cetology* 49:1-15.
- Watkins, W.A., M.A. Daher, K.M. Fristrup, Y.J. Howald, and G.N. Disciara. 1993. Sperm whales tagged with transponders and tracked underwater by sonar. *Marine Mammal Science* 9:55-67.
- Waycott, M., C.M. Duarte, T.J.B. Carruthers, R.J. Orth, W.C. Dennison, S. Olyamik, A. Calladine, J.W. Fourqurean, K. Heck, Jr., A.R. Hughes, G.A. Kendrick, W.J. Kentworthy, F.T. Short, and S.L. Williams. 2009. Accelerating loss of seagrass across the globe threatens coastal ecosystems. *Proceedings for the National Academy of Sciences* 106(3):12377-12381. Internet website: <http://www.pnas.org/content/106/30/12377.full>.
- Weatherly, G. 2004. Intermediate depth circulation in the Gulf of Mexico: PALACE float results for the Gulf of Mexico between April 1998 and March 2002. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 2004-013. 51 pp.
- Weaver, D.C., G.D. Dennis, and K.J. Sulak. 2002. Northeastern Gulf of Mexico coastal and marine ecosystem program: Community structure and trophic ecology of demersal fishes on the pinnacles reef tract; final synthesis report. U.S. Dept. of the Interior, Geological Survey, USGS BSR-2001-0008 and U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA, OCS Study MMS 2002-034. 92 pp. + apps.

- Webb, J.W., S.K. Alexander, and J.K. Winters. 1985. Effects of autumn application of oil on *Spartina alterniflora* in a Texas salt marsh. Environmental Pollution Series A, Ecological and Biological 38(4):321-337.
- Webster, R.K. and T. Linton. 2013. Development of implementation of *Sargassum* early advisory system (SEAS). Shore and Beach. Journal of the American Shore and Beach Preservation Association 81:43-48.
- Wei, C., G.T. Rowe, C.C. Nunnally, and M.K. Wicksten. 2012. Anthropogenic "litter" and macrophyte detritus in the deep northern Gulf of Mexico. Marine Pollution Bulletin 64:966-973.
- Weilgart, L.S. and H. Whitehead. 1988. Distinctive vocalizations from mature male sperm whales (*Physeter macrocephalus*). Canadian Journal of Zoology 66:1931-1937.
- Weilgart, L. and H. Whitehead. 1997. Group-specific dialects and geographical variation in coda repertoire in South Pacific sperm whales. Behavioral Ecology and Sociobiology 40:277-285.
- Wells, P.G. 1989. Using oil spill dispersants on the sea—issues and answers. In: Duke, T.W. and G. Petrazzuolo. Oil and dispersant toxicity testing. Proceedings of a Workshop on Technical Specifications held in New Orleans, LA, January 17-19, 1989. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 89-0042. Pp. 1-4.
- Wells, R.J.D. and J.R. Rooker. 2004. Spatial and temporal habitat use by fishes associated with *Sargassum* mats in the NW Gulf of Mexico. Bulletin of Marine Science 74:81-99.
- Wells, R.S. and M.D. Scott. 1997. Seasonal incidence of boat strikes on bottlenose dolphins near Sarasota, Florida. Marine Mammal Science 13:475-480.
- Wells, R.S. and M.D. Scott. 1999. Bottlenose dolphin—*Tursiops truncatus* (Montagu, 1821). In: Ridgway, S.H. and R. Harrison, eds. Handbook of marine mammals. Volume 6: Second book of dolphins. San Diego, CA: Academic Press. Pp. 137-182.
- Wells, R.J.D., J.H. Cowan Jr., and W.F. Patterson III. 2008. Habitat use and the effect of shrimp trawling on fish and invertebrate communities over the northern Gulf of Mexico continental shelf. Journal of Marine Science 65:1610-1619.
- Welsh, S.E., M. Inoue, L.J. Rouse, Jr., and E. Weeks. 2009. Observation of the deepwater manifestation of the Loop Current and Loop Current rings in the eastern Gulf of Mexico. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 2009-050. 110 pp.
- Wenger, A.S., M.I. McCormick, G.G. Endo, I.M. McLeod, F.J. Kroon, and G.P. Jones. 2014. Suspended sediment prolongs larval development in a coral reef fish. The Journal of Experimental Biology 217(7):1122-1128.
- Wheaton, J.W. and W.C. Jaap. 1988. Corals and other prominent benthic cnidaria of Looe Key National Marine Sanctuary, FL. Florida Marine Research Publication 43.

- Wheeler, N.M., S.B. Reid, K.J. Craig, J.R. Zielonka, D.R. Stauffer, and S.R. Hanna. 2008. Cumulative increment analysis for the Breton National Wilderness Area. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 2008-058. 334 pp.
- White, C. 2014. Gulf Islands National Seashore acoustic monitoring report. Natural Resource Technical Report NPS/NRSS/NRTR-2014/835.
- White, W.A., T.R. Calnan, R.A. Morton, R.S. Kimble, T.G. Littleton, J.H. McGowen, H.S. Nance, and K.E. Schmedes. 1986. Submerged lands of Texas, Brownsville-Harlingen area. University of Texas at Austin, Bureau of Economic Geology, Austin, TX.
- White, H.K., P. Hsing, W. Cho, T.M. Shank, E.E. Cordes, A.M. Quattrini, R.K. Nelson, R. Camilli, A.W.J. Demopoulos, C.R. German, J.M. Brooks, H.H. Roberts, W. Shedd, C.M. Reddy, and C.R. Fisher. 2012. Impact of the *Deepwater Horizon* oil spill on a deep-water coral community in the Gulf of Mexico. Proceedings of the National Academy of Sciences of the United States of America, early edition, special feature, March 27, 2012. Internet website: <http://www.pnas.org/content/early/2012/03/23/1118029109.full.pdf+html>. Accessed April 9, 2012.
- White, H.K., S.L. Lyons, S.J. Harrison, D.M. Findley, Y. Liu, and E.B. Kujawinski. 2014. Long-term persistence of dispersants following the *Deepwater Horizon* oil spill. Environmental Science & Technology Letters 1(7):295-299. doi:10.1021/ez500168r.
- Whitehead, H. 2002. Estimates of the current global population size and historical trajectory for sperm whales. Marine Ecology Progress Series 242:295-304.
- Wicker, K.M., R.E. Emmer, D. Roberts, and J. van Beek. 1989. Pipelines, navigation channels, and facilities in sensitive coastal habitats: An analysis of outer continental shelf impacts, Coastal Gulf of Mexico. Volume I: Technical narrative. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 89-0051. 470 pp.
- Wiese, F.K., W.A. Montevicchi, G.K. Davoren, F. Huettmann, A.W. Diamond, and J. Linke. 2001. Seabirds at risk around offshore oil platforms in the north-west Atlantic. Marine Pollution Bulletin 42:1285-1290.
- Wilber, D.H., W. Brostoff, D.G. Clarke, and G.L. Ray. 2005. Sedimentation: Potential biological effects from dredging operations in estuarine and marine environments. DOER Technical Notes Collection. ERDC TN-DOER-E20. U.S. Dept. of the Army, Engineer Research and Development Center, Vicksburg, MS.
- Wilcox, C., E. Van Sebille, and B.D. Hardesty. 2015. Threat of plastic pollution to seabirds is global, pervasive, and increasing. Proceedings of the National Academy of Sciences 112:11899-11904.
- Williams, S.L. 1988. *Thalassia testudinum* productivity and grazing by green turtles in a highly disturbed seagrass bed. Marine Biology 98(3):447-455.

- Wilson, C.A., A. Pierce, and M.W. Miller. 2003. Rigs and reefs: A comparison of the fish communities at two artificial reefs, a production platform, and a natural reef in the northern Gulf of Mexico. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 2003-009. 95 pp.
- Wilson, D., J. Fanjoy, and R. Billings. 2004. Gulfwide emission inventory study for the regional haze and ozone modeling effort: Final report. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 2004-072. 241 pp.
- Wilson, D., R. Billings, R. Oommen, and R. Chang. 2007. Year 2005 Gulfwide emission inventory study: Final report. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 2007-067. 149 pp.
- Wilson, D., R. Billings, R. Oommen, B. Lange, J. Marik, S. McClutchey, and H. Perez. 2010. Year 2008 Gulfwide emission inventory study: Final report. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study BOEM 2010-045. 185 pp.
- Wilson, D., R. Billings, R. Chang, H. Perez, and J. Sellers. 2014. Year 2011 Gulfwide emissions inventory study. U.S. Dept. of the Interior, Bureau of Ocean Energy Management, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study BOEM 2014-666. 182 pp.
- Wiltschko, R. and W. Wiltschko. 2014. Sensing magnetic directions in birds: radical pair processes involving cryptochrome. *Biosensors* 4(3):221-242.
- Winge, O. 1923. The Sargasso Sea, its boundaries and vegetation. Report on the Danish Oceanography Expedition 1908-1910. Volume III: Miscellaneous Papers. Carlsberg Physiological Laboratory, Copenhagen, Denmark.
- Wise, C.F., J.T.F. Wise, S.S. Wise, W.D. Thompson, J.P. Wise Jr., and J.P. Wise Sr. 2014. Chemical dispersants used in the Gulf of Mexico oil crisis are cytotoxic and genotoxic to sperm whale skin cells. *Aquatic Toxicology* 152:335-340.
- Wiseman, W.J., Jr., and W. Sturges. 1999. Physical oceanography of the Gulf of Mexico: Processes that regulate its biology. In: Kumpf, H., K. Steidinger, and K. Sherman, eds. *The Gulf of Mexico large marine ecosystem: Assessment, sustainability, and management*. Malden, MA: Blackwell Science, Inc.
- Witham, R. 1978. Does a problem exist relative to small sea turtles and oil spills? In: *Proceedings, Conference on Assessment of Ecological Impacts of Oil Spills, 14-17 June 1978, Keystone, CO*. American Institute of Biological Sciences. Pp. 629-632.
- Witham, R. 1983. A review of some petroleum impacts on sea turtles. In: Keller, C.E. and J.K. Adams, eds. *Proceedings of a Workshop on Cetaceans and Sea turtles in the Gulf of Mexico: Study planning for effects of outer continental shelf development*. U.S. Dept. of the Interior, Fish and Wildlife Service and U.S. Dept. of the Interior, Minerals Management Service. FWS/OBS-83-03. Pp. 7-8.

- Witham, R. 1995. Disruption of sea turtle habitat with emphasis on human influence. In: Bjorndal, K.A., ed. *Biology and conservation of sea turtles*; revised edition. Washington, DC: Smithsonian Institution Press. Pp. 519-522.
- Witherington, B.E. 1994. Flotsam, jetsam, post-hatchling loggerheads, and the advecting surface smorgasbord. In: Bjorndal, K.A., A.B. Bolten, D.A. Johnson, and P.J. Eliazar, comps. *Proceedings of the Fourteenth Annual Symposium on Sea Turtle Biology and Conservation*. NOAA Technical Memorandum NMFS-SEFSC-351.
- Witherington, B.E. and R.E. Martin. 1996. Understanding, assessing, and resolving light-pollution problems on sea turtle nesting beaches. Florida Marine Research Institute Technical Report TR-2, Florida Dept. of Environmental Protection. 73 pp.
- Witherington, B., P. Kubilis, B. Brost, and A. Meylan. 2009. Decreasing annual nest counts in a globally important loggerhead sea turtle population. *Ecological Applications* 19:30-54.
- Witherington, B., S. Hirma, and R. Hardy. 2012. Young sea turtles of the pelagic *Sargassum*-dominated drift community: Habitat use, population density, and threats. *Marine Ecology Progress Series* 463:1-22.
- Witzell, W.N. 1992. The incidental capture of sea turtles in commercial non-shrimping fisheries in southeastern U.S. waters. Report to the U.S. Dept. of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Miami Lab., Miami, FL. Contribution No. MIA-91/92-43.
- Wolbers, D. and R. Hovinga. 2003. Installation of deepwater pipelines with sled assemblies using the new J-Lay system of the DCV Balder. Paper presented at the Offshore Technology Conference, May 5-8, 2003, Houston, Texas. OTC 15336.
- Woods & Poole Economics, Inc. 2015. The 2015 complete economic and demographic data source (CEDDS) on CD-ROM.
- World Port Source. 2015. Port Panama City; port commerce. Internet website: http://www.worldportsource.com/ports/commerce/USA_FL_Port_Panama_City_27.php. Accessed September 23, 2015.
- [Wright](#), S.L., [R.C. Thompson](#), and [T.S. Galloway](#). 2013. The physical impacts of microplastics on marine organisms: A review. *Environmental Pollution* 178:483-492.
- Würsig, B. 1990. Cetaceans and oil: ecologic perspectives. In: Geraci, J.R. and D.J. St. Aubin, eds. *Sea mammals and oil: Confronting the risks*. San Diego, CA: Academic Press. Pp. 129-165.
- Würsig, B., T.A. Jefferson, and D.J. Schmidly. 2000. *The marine mammals of the Gulf of Mexico*. College Station: Texas A&M University Press. 232 pp.
- Würsig, B., R.R. Reeves, and J.G. Ortega-Ortiz. 2002. Global climate change and marine mammals. In: Evans, P.G.H. and Raga, J.A., eds. *Marine mammals – biology and conservation*. New York, NY: Kluwer Academic/Plenum Publishers. Pp. 589-608.

- Wyers, S.C., H.R. Frith, R.E. Dodge, S.R. Smith, A.H. Knap, and T.D. Sleeter. 1986. Behavioral effects of chemically dispersed oil and subsequent recovery in *Diploria strigosa*. *Marine Ecology* 7:23-42.
- Wysocki, L.E. and F. Ladich. 2005. Hearing in fishes under noise conditions. *Journal of the Association for Research in Otolaryngology* 6:28-36.
- Yarwood, G., G. Mansell, M. Jimenez, and S. Lau. 2004. 2000 Gulf-wide emissions inventory—OCS on-shore impacts modeling (Texas), a preliminary look. Prepared for the U.S. Dept. of the Interior, Minerals Management Service, New Orleans, LA. Novato, CA: ENVIRON International Corporation.
- Yelverton, J.T., D.R. Richmond, E.R. Fletcher, and R.K. Jones. 1973. Safe distances from underwater explosions for mammals and birds. Report by the Lovelace Foundation for Medical Education and Research, Albuquerque, NM, for Defense Nuclear Agency, Washington, DC. Technical Report No. 3114 T. 72 pp.
- Yender, R.A. and J. Michel, eds. 2010. Oil spills in coral reefs: Planning and response considerations. Second edition. U.S. Dept. of Commerce, National Oceanic and Atmospheric Administration, Office of Response and Restoration. 82 pp. Internet website: http://response.restoration.noaa.gov/sites/default/files/Oil_Spill_Coral.pdf.
- Yuill, B., D. Lavoie, and D.J. Reed. 2009. Understanding subsidence processes in coastal Louisiana. *Journal of Coastal Research* SI(54):23-36.
- Yuro, A.M. 2011. The impact of storm surge from successive hurricanes on the Alabama beach mouse population. Master's Thesis, The University of Alabama. 75 pp.
- Zambrano, R.H., H.T. Smith and M. Robson. 2000. Summary of breeding roseate terns in the Florida Keys: 1974-1998. *Florida Field Naturalist* 28:64-68.
- Zavala-Hidalgo, J., A. Gallegos-García, B. Martínez-López, S.L. Morey, and J.J. O'Brien. 2006. Seasonal upwelling on the western and southern shelves of the Gulf of Mexico. *Ocean Dynamics* 56:333-338. doi:10.1007/s10236-006-0072-3.
- Zengel, S., B. Bernik, N. Rutherford, Z. Nixon, J. Michel, and F. Csulak. 2014. Salt marsh remediation and the Deepwater Horizon oil spill: The role of planting in ecological recovery. Gulf of Mexico Oil Spill & Ecosystem Science Conference, 26-29 January 2004, Mobile, AL, USA.
- Zengel S., B.M. Bernik, N. Rutherford, Z. Nixon, and J. Michel. 2015. Heavily oiled salt marsh following the *Deepwater Horizon* oil spill, ecological comparisons of shoreline cleanup treatments and recovery. *PLOS ONE* 10(7):e0132324. doi:10.1371/journal.pone.0132324.
- Zieman, J.C. 1982. The ecology of the seagrasses of south Florida: A community profile. U.S. Dept. of the Interior, Fish and Wildlife Service. FWS/OBS-82/25. 123 pp.

-
- Zieman, J.C., R. Orth, R.C. Phillips, G. Thayer, and A. Thorhaug. 1984. The effects of oil on seagrass ecosystems. In: Cairns, J., Jr. and A.L. Buikema, Jr., eds. Restoration of habitats impacted by oil spills. Boston, MA: Butterworth Publishers.
- Zug, G.R. and J.F. Parham. 1996. Age and growth in leatherback turtles, *Dermochelys coriacea*: A skeletochronological analysis. *Chelonian Conservation and Biology* 2(2):244-249.

CHAPTER 7

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CHAPTER 8

GLOSSARY

8 GLOSSARY

Acute—Sudden, short term, severe, critical, crucial, intense, but usually of short duration, as opposed to chronic. Effects associated with acute can vary depending on the context of its use (e.g., acute [short-term] exposure could be more or less problematic than chronic [long-term] exposure).

Anaerobic—Capable of growing in the absence of molecular oxygen.

Annular preventer—A component of the pressure control system in the BOP that forms a seal in the annular space around any object in the wellbore or upon itself, enabling well control operations to commence.

Anthropogenic—Coming from human sources, relating to the effect of humankind on nature.

Antipatharian Transitional Zone—The area located between 50 and 90 m (164 and 295 ft), where available light is reduced and there is a gradual ecosystem change from tropical shallow-water corals that are dependent on light to deeper water species, such as antipatharian black corals that are not.

API gravity—A standard adopted by the American Petroleum Institute for expressing the specific weight of oil.

Aromatic—Class of organic compounds containing benzene rings or benzenoid structures.

Attainment area—An area that is shown by monitored data or by air-quality modeling calculations to be in compliance with primary and secondary ambient air quality standards established by the USEPA.

Barrel (bbl)—A volumetric unit used in the petroleum industry; equivalent to 42 U.S. gallons or 158.99 liters.

Benthic—On or in the bottom of the sea.

Biological Opinion—The FWS or NMFS evaluation of the impact of a proposed action on endangered and threatened species, in response to formal consultation under Section 7 of the Endangered Species Act.

Block—A geographical area portrayed on official BOEM protraction diagrams or leasing maps that contains approximately 5,760 ac (2,331 ha; 9 mi²).

Blowout—An uncontrolled flow of fluids below the mudline from appurtenances on a wellhead or from a wellbore.

Blowout preventer (BOP)—One of several valves installed at the wellhead to prevent the escape of pressure either in the annular space between the casing and drill pipe or in open hole (i.e., hole with no drill pipe) during drilling completion operations. Blowout preventers on jackup or platform rigs are located at the water's surface; on floating offshore rigs, BOPs are located on the seafloor.

Bottom kill—A wild well-control procedure involving the intersection of an uncontrolled well with a relief well for the purpose of pumping heavy mud or cement into the wild well to stanch the flow of oil or gas (the well-control strategy for the *Macondo* spill deployed in mid-July 2010 that resulted in the successful capping of the well).

Cetacean—Aquatic mammal of the order Cetacea, such as whales, dolphins, and porpoises.

Chemosynthetic—Organisms that obtain their energy from the oxidation of various inorganic compounds rather than from light (photosynthetic).

Coastal waters—Waters within the geographical areas defined by each State's Coastal Zone Management Program.

Coastal wetlands—forested and nonforested habitats, mangroves, and marsh islands exposed to tidal activity. These areas directly contribute to the high biological productivity of coastal waters by input of detritus and nutrients, by providing nursery and feeding areas for shellfish and finfish, and by serving as habitat for birds and other animals.

Coastal zone—The coastal waters (including the lands therein and thereunder) and the adjacent shorelands (including the waters therein and thereunder) strongly influenced by each other and in proximity to the shorelines of several coastal states; the zone includes islands, transitional and intertidal areas, salt marshes, wetlands, and beaches, and it extends seaward to the outer limit of the United States territorial sea. The zone extends inland from the shorelines only to the extent necessary to control shorelands, the uses of which have a direct and significant impact on the coastal waters. Excluded from the coastal zone are lands the use of which is by law subject to the discretion of or which is held in trust by the Federal Government, its officers, or agents (also refer to State coastal zone boundaries).

Completion—Conversion of a development well or an exploration well into a production well.

Condensate—Liquid hydrocarbons produced with natural gas; they are separated from the gas by cooling and various other means. Condensates generally have an API gravity of 50°-120°

Continental margin—The ocean floor that lies between the shoreline and the abyssal ocean floor, includes the continental shelf, continental slope, and continental rise.

Continental shelf—General term used by geologists to refer to the continental margin province that lies between the shoreline and the abrupt change in slope called the shelf edge, which generally occurs in the Gulf of Mexico at about the 200-m (656-ft) water depth. The continental shelf is characterized by a gentle slope (about 0.1°). This is different from the juridical term used in Article 76 of the United Nations Convention on the Law of the Sea Royalty Payment (refer to the definition of Outer Continental Shelf).

Continental slope—The continental margin province that lies between the continental shelf and continental rise, characterized by a steep slope (about 3°-6°).

Critical habitat—Specific areas essential to the conservation of a protected species and that may require special management considerations or protection.

Crude oil—Petroleum in its natural state as it emerges from a well or after it passes through a gas-oil separator, but before refining or distillation. An oily, flammable, bituminous liquid that is essentially a complex mixture of hydrocarbons of different types with small amounts of other substances.

Delineation well—A well that is drilled for the purpose of determining the size and/or volume of an oil or gas reservoir.

Demersal—Living at or near the bottom of the sea.

Development—Activities that take place following discovery of economically recoverable mineral resources, including geophysical surveying, drilling, platform construction, operation of onshore support facilities, and other activities that are for the purpose of ultimately producing the resources.

Development and Production Plan (DPP)—A document that must be prepared by the operator and submitted to BOEM for approval before any development and production activities are conducted on a lease or unit in any OCS area other than the western Gulf of Mexico.

Development Operations Coordination Document (DOCD)—A document that must be prepared by the operator and submitted to BOEM for approval before any development or production activities are conducted on a lease in the western Gulf of Mexico.

Development well—A well drilled to a known producing formation to extract oil or gas; a production well; distinguished from a wildcat or exploration well and from an offset well.

Direct employment—Consists of those workers involved in the primary industries of oil and gas exploration, development, and production operations (Standard Industrial Classification Code 13—Oil and Gas Extraction).

Discharge—Something that is emitted; flow rate of a fluid at a given instant expressed as volume per unit of time.

Dispersant—A suite of chemicals and solvents used to break up an oil slick into small droplets, which increases the surface area of the oil and hastens the processes of weathering and microbial degradation.

Dispersion—A suspension of finely divided particles in a medium.

Drilling mud—A mixture of clay, water or refined oil, and chemical additives pumped continuously downhole through the drill pipe and drill bit, and back up the annulus between the pipe and the walls of the borehole to a surface pit or tank. The mud lubricates and cools the drill bit, lubricates the drill pipe as it turns in the wellbore, carries rock cuttings to the surface, serves to keep the hole from crumbling or collapsing, and provides the weight or hydrostatic head to prevent extraneous fluids from entering the well bore and to downhole pressures; also called drilling fluid.

Economically recoverable resources—An assessment of hydrocarbon potential that takes into account the physical and technological constraints on production and the influence of costs of exploration and development and market price on industry investment in OCS exploration and production.

Effluent—The liquid waste of sewage and industrial processing.

Effluent limitations—Any restriction established by a State or the USEPA on quantities, rates, and concentrations of chemical, physical, biological, and other constituents discharged from point sources

into U.S. waters, including schedules of compliance.

Epifaunal—Animals living on the surface of hard substrate.

Essential habitat—Specific areas crucial to the conservation of a species and that may necessitate special considerations.

Estuary—Coastal semienclosed body of water that has a free connection with the open sea and where freshwater meets and mixes with seawater.

Eutrophication—Enrichment of nutrients in the water column by natural or artificial methods accompanied by an increase of respiration, which may create an oxygen deficiency.

Exclusive Economic Zone (EEZ)—The maritime region extending 200 nmi (230 mi; 370 km) from the baseline of the territorial sea, in which the United States has exclusive rights and jurisdiction over living and nonliving natural resources.

Exploration Plan (EP)—A plan that must be prepared by the operator and submitted to BOEM for approval before any exploration or delineation drilling is conducted on a lease.

Exploration well—A well drilled in unproven or semi-proven territory to determine whether economic quantities of oil or natural gas deposit are present.

False crawls—Refers to when a female sea turtle crawls up on the beach to nest (perhaps) but does not and returns to the sea without laying eggs.

Field—An accumulation, pool, or group of pools of hydrocarbons in the subsurface. A hydrocarbon field consists of a reservoir in a

shape that will trap hydrocarbons and that is covered by an impermeable, sealing rock.

Floating production, storage, and offloading (FPSO) system—A tank vessel used as a production and storage base; produced oil is stored in the hull and periodically offloaded to a shuttle tanker for transport to shore.

Gathering lines—A pipeline system used to bring oil or gas production from a number of separate wells or production facilities to a central trunk pipeline, storage facility, or processing terminal.

Geochemical—Of or relating to the science dealing with the chemical composition of and the actual or possible chemical changes in the crust of the earth.

Geophysical survey—A method of exploration in which geophysical properties and relationships are measured remotely by one or more geophysical methods.

Habitat—A specific type of environment that is occupied by an organism, a population, or a community.

Hermatypic coral—Reef-building corals that produce hard, calcium carbonate skeletons and that possess symbiotic, unicellular algae within their tissues.

Harassment—An intentional or negligent act or omission that creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavior patterns that include, but are not limited to, feeding or sheltering.

Hermatypic—Corals in the order Scleractinia that build reefs by depositing hard calcareous material for their skeletons, forming the stony framework of the reef. Corals that do not contribute to coral reef

development are referred to as ahermatypic (non-reef-building) species.

Hydrocarbons—Any of a large class of organic compounds containing primarily carbon and hydrogen. Hydrocarbon compounds are divided into two broad classes: aromatic and aliphatics. They occur primarily in petroleum, natural gas, coal, and bitumens.

Hypoxia—Depressed levels of dissolved oxygen in water, usually resulting in decreased metabolism.

Incidental take—Takings that result from, but are not the purpose of, carrying out an otherwise lawful activity (e.g., fishing) conducted by a Federal agency or applicant (refer to Taking).

Indirect employment—Secondary or supporting oil- and gas-related industries, such as the processing of crude oil and gas in refineries, natural gas plants, and petrochemical plants.

Induced employment—Tertiary industries that are created or supported by the expenditures of employees in the primary or secondary industries (direct and indirect employment), including consumer goods and services such as food, clothing, housing, and entertainment.

Infrastructure—The facilities associated with oil and gas development, e.g., refineries, gas processing plants, etc.

Jack-up rig—A barge-like, floating platform with legs at each corner that can be lowered to the sea bottom to raise the platform above the water.

Kick—A deviation or imbalance, typically sudden or unexpected, between the downward pressure exerted by the drilling

fluid and the upward pressure of *in-situ* formation fluids or gases.

Landfall—The site where a marine pipeline comes to shore.

Lease—Authorization that is issued under Section 8 or maintained under Section 6 of the Outer Continental Shelf Lands Act and that authorizes exploration for, and development and production of, minerals.

Lease sale—The competitive auction of leases granting companies or individuals the right to explore for and develop certain minerals under specified conditions and periods of time.

Lease term—The initial period for oil and gas leases, usually a period of 5, 8, or 10 years depending on water depth or potentially adverse conditions.

Lessee—A party authorized by a lease, or an approved assignment thereof, to explore for and develop and produce the leased deposits in accordance with regulations at 30 CFR part 250 and 30 CFR part 550.

Littoral zone—Marine ecological realm that experiences the effects of tidal and longshore currents and breaking waves to a depth of 5-10 m (16-33 ft) below the low-tide level, depending on the intensity of storm waves.

Longshore sediment transport—The cumulative movement of beach sediment along the shore (and nearshore) by waves arriving at an angle to the coastline and by currents generated by such waves.

Lower marine riser package—The head assembly of a subsurface well at the point where the riser connects to a blowout preventer.

Macondo—Prospect name given by BP to the Mississippi Canyon Block 252 exploration well that the *Deepwater Horizon* rig was drilling when a blowout occurred on April 20, 2010.

Macondo spill—The name given to the oil spill that resulted from the explosion and sinking of the *Deepwater Horizon* rig from the period between April 24, 2010, when search and recovery vessels on site reported oil at the sea surface, and September 19, 2010, when the uncontrolled flow from the *Macondo* well was capped.

Marshes—Persistent, emergent, nonforested wetlands characterized by predominantly cordgrasses, rushes, and cattails.

Military warning area—An area established by the U.S. Department of Defense within which military activities take place.

Minerals—As used in this document, minerals include oil, gas, sulphur, and associated resources, and all other minerals authorized by an Act of Congress to be produced from public lands as defined in Section 103 of the Federal Land Policy and Management Act of 1976.

Naturally occurring radioactive materials (NORM)—naturally occurring material that emits low levels of radioactivity, originating from processes not associated with the recovery of radioactive material. The radionuclides of concern in NORM are Radium-226, Radium-228, and other isotopes in the radioactive decay chains of uranium and thorium.

Nepheloid—A layer of water near the bottom that contains significant amounts of suspended sediment.

Nonattainment area—An area that is shown by monitoring data or by air-quality modeling calculations to exceed primary or secondary ambient air quality standards established by USEPA.

Nonhazardous oil-field wastes (NOW)—Wastes generated by exploration, development, or production of crude oil or natural gas that are exempt from hazardous waste regulation under the Resource Conservation and Recovery Act (*Regulatory Determination for Oil and Gas and Geothermal Exploration, Development and Production Wastes*, dated June 29, 1988, 53 FR 25446; July 6, 1988). These wastes may contain hazardous substances.

Oceanic zone—Offshore water >200 m (656 ft) deep. It is the region of open sea beyond the edge of the continental shelf and includes 65 percent of the ocean's completely open water.

Offloading—Unloading liquid cargo, crude oil, or refined petroleum products.

Operational discharge—Any incidental pumping, pouring, emitting, emptying, or dumping of wastes generated during routine offshore drilling and production activities.

Operator—An individual, partnership, firm, or corporation having control or management of operations on a leased area or portion thereof. The operator may be a lessee, designated agent of the lessee, or holder of operating rights under an approved operating agreement.

Organic matter—Material derived from living plants or animals.

Outer Continental Shelf (OCS)—All submerged lands that comprise the

continental margin adjacent to the United States and seaward of State offshore lands.

Passerines—Perching birds (members of the Order Passeriformes) and songbirds.

Potential Biological Removal (PBR)—Of or pertaining to the open sea; associated with open water beyond the direct influence of coastal systems.

Pelagic—Of or pertaining to the open sea; associated with open water beyond the direct influence of coastal systems.

Plankton—Passively floating or weakly motile aquatic plants (phytoplankton) and animals (zooplankton).

Platform—A steel or concrete structure from which offshore development wells are drilled.

Play—A prospective subsurface area for hydrocarbon accumulation that is characterized by a particular structural style or depositional relationship.

Primary production—Organic material produced by photosynthetic or chemosynthetic organisms.

Produced water—Total water discharged from the oil and gas extraction process; production water or production brine.

Production—Activities that take place after the successful completion of any means for the extraction of resources, including bringing the resource to the surface, transferring the produced resource to shore, monitoring operations, and drilling additional wells or workovers.

Province—A spatial entity with common geologic attributes. A province may include a single dominant structural element such

as a basin or a fold belt, or a number of contiguous related elements.

Ram—The main component of a blowout preventer designed to shear casing and tools in a wellbore or to seal an empty wellbore. A blind shear ram accomplishes the former and a blind ram the latter.

Recoverable reserves—The portion of the identified hydrocarbon or mineral resource that can be economically extracted under current technological constraints.

Recoverable resource estimate—An assessment of hydrocarbon or mineral resources that takes into account the fact that physical and technological constraints dictate that only a portion of resources can be brought to the surface.

Recreational beaches—Frequently visited, sandy areas along the Gulf of Mexico shorefront that support multiple recreational activities at the land-water interface. Included are National Seashores, State Park and Recreational Areas, county and local parks, urban beachfronts, and private resorts.

Refining—Fractional distillation of petroleum, usually followed by other processing (e.g., cracking).

Relief—The difference in elevation between the high and low points of a surface.

Reserves—Proved oil or gas resources.

Rig—A structure used for drilling an oil or gas well.

Riser insertion tube tool—A “straw” and gasket assembly improvised during the *Macondo* spill response that was designed to siphon oil and gas from the broken riser of the *Deepwater Horizon* rig lying on the

sea bottom (an early recovery strategy for the *Macondo* spill in May 2010).

Royalty—A share of the minerals produced from a lease paid in either money or “in-kind” to the landowner by the lessee.

Saltwater intrusion—Saltwater invading a body of freshwater.

Sciaenids—Fishes belonging to the croaker family (Sciaenidae).

Seagrass beds—More or less continuous mats of submerged, rooted, marine, flowering vascular plants occurring in shallow tropical and temperate waters. Seagrass beds provide habitat, including breeding and feeding grounds, for adults and/or juveniles of many of the economically important shellfish and finfish.

Sediment—Material that has been transported and deposited by water, wind, glacier, precipitation, or gravity; a mass of deposited material.

Seeps (hydrocarbon)—Gas or oil that reaches the surface along bedding planes, fractures, unconformities, or fault planes.

Sensitive area—An area containing species, populations, communities, or assemblages of living resources, that is susceptible to damage from normal OCS oil- and gas-related activities. Damage includes interference with established ecological relationships.

Shear ram—The component in a BOP that cuts, or shears, through the drill pipe and forms a seal against well pressure. Shear rams are used in floating offshore drilling operations to provide a quick method of moving the rig away from the hole when there is no time to trip the drill stem out of the hole.

Shoreline Cleanup and Assessment Team—The on-the-scene responders for post-spill shoreline protection who established priorities, standardized procedures, and terminology.

Site fidelity or philopatry—The tendency to return to a previously occupied location.

Spill of National Significance—Designation by the USEPA Administrator under 40 CFR § 300.323 for discharges occurring in the inland zone and the Commandant of the U.S. Coast Guard for discharges occurring in the coastal zone, authorizing the appointment of a National Incident Commander for spill-response activity.

State coastal zone boundary—The State coastal zone boundaries for each CZMA-affected State are defined at <https://coast.noaa.gov/czm/media/StateCZBoundaries.pdf>.

Structure—Any OCS facility that extends from the seafloor to above the waterline; in petroleum geology, any arrangement of rocks that may hold an accumulation of oil or gas.

Subarea—A discrete analysis area.

Subsea isolation device—An emergency disconnection and reconnection assembly for the riser at the seafloor.

Supply vessel—A boat that ferries food, water, fuel, and drilling supplies and equipment to an offshore rig or platform and returns to land with refuse that cannot be disposed of at sea.

Taking—To harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect any endangered or threatened species, or to attempt to engage in any such conduct (including actions that induce stress,

adversely impact critical habitat, or result in adverse secondary or cumulative impacts). Harassments are the most common form of taking associated with OCS Program activities.

Tension-leg platform (TLP)—A production structure that consists of a buoyant platform tethered to concrete pilings on the seafloor with flexible cable.

Tidal prism—The volume of water in an estuary or inlet between mean high tide and mean low tide, or the volume of water leaving an estuary at ebb tide.

Total dissolved solids—The total amount of solids that are dissolved in water.

Total suspended particulate matter—The total amount of suspended solids in water.

Total suspended solids—The total amount of suspended solids in water.

Trunkline—A large-diameter pipeline receiving oil or gas from many smaller tributary gathering lines that serve a large area; common-carrier line; main line.

Turbidity—Reduced water clarity due to the presence of suspended matter.

Volatile organic compound (VOC)—Any organic compound that is emitted to the atmosphere as a vapor.

Water test areas—Areas within the eastern Gulf where U.S. Department of Defense research, development, and testing of military planes, ships, and weaponry take place.

Weathering (of oil)—The aging of oil due to its exposure to the atmosphere, causing marked alterations in its physical and chemical makeup.

APPENDIX A

POSTLEASE PERMITTING AND APPROVAL PROCESSES

A POSTLEASE PERMITTING AND APPROVAL PROCESSES

BOEM is responsible for managing the development of the Nation's offshore energy and mineral resources in an environmentally and economically responsible way. The functions of BOEM include leasing, exploration and development plan administration, geological and geophysical permitting, environmental studies, NEPA analysis, resource evaluation, economic analysis, marine minerals, and renewable energy development. BOEM's regulations for oil, gas, and sulphur lease operations are specified in 30 CFR parts 556, 550, 551 (except those aspects that pertain to drilling), and 554.

The BSEE is responsible for enforcing safety and environmental regulations. The functions of BSEE include all field operations, including permitting and research, inspections, offshore regulatory programs, oil-spill response, and training and environmental compliance functions. The BSEE's regulations for oil, gas, and sulphur operations are specified in 30 CFR parts 250 and 254.

Measures to minimize potential impacts are an integral part of the OCS Program. These measures are implemented through lease stipulations, operating regulations, NTLs, and project-specific requirements or approval conditions that are applied to all plans for OCS oil- and gas-related activities (e.g., exploration and development plans, pipeline applications, and structure-removal applications). These measures address concerns such as endangered and threatened species, geologic and manmade hazards, military warning and ordnance disposal areas, archaeological sites, air quality, oil-spill response planning, chemosynthetic communities, artificial reefs, operations in hydrogen sulfide (H₂S) prone areas, and shunting of drill effluents in the vicinity of biologically sensitive features. Refer to **Appendix B** ("Commonly Applied Mitigating Measures") for more information on the mitigations that BOEM and BSEE could apply at the postlease stage. Standard mitigating measures in the Gulf of Mexico OCS include the following:

- limiting the size of explosive charges used for structure removals (NTL 2010-G05);
- requiring placement of explosive charges at least 15 ft (5 m) below the mudline;
- requiring site-clearance procedures to eliminate potential snags to commercial fishing nets upon abandonment;
- establishment of No Activity and Modified Activity Zones around high-relief live bottoms;
- requiring remote-sensing surveys to detect and avoid potential archaeological sites and biologically sensitive areas such as low-relief live bottoms, pinnacles, and chemosynthetic communities; and
- requiring coordination with the military to prevent multiuse conflicts between OCS and military activities.

BOEM and BSEE issue NTLs to provide clarification, description, or interpretation of a regulation; guidelines on the implementation of a special lease stipulation or regional requirement; or convey administrative information. A detailed listing of current Gulf of Mexico OCS Region NTLs is available through BOEM's and BSEE's Gulf of Mexico OCS Region websites (<http://www.boem.gov/notices-to-lessees-and-operators/> and <http://www.bsee.gov/Regulations-and-Guidance/Notices-to-Lessees-and-Operators/>) or through the Region's Public Information Office at 1-800-200-GULF.

Formal plans must be submitted to BOEM for review and approval before any project-specific activities, except for ancillary activities (such as geological and geophysical activities or studies that model potential oil and hazardous substance spills), can begin on a lease. Conditions of approval are mechanisms to control or mitigate potential safety or environmental problems associated with proposed operations. Conditions of approval are based on BOEM's technical and environmental evaluations of the proposed operations. Comments from Federal and State agencies (as applicable) are also considered in establishing conditions. Conditions may be applied to any OCS plan, permit, right-of-use of easement, or pipeline right-of-way grant.

Some BOEM-identified mitigating measures are implemented through cooperative agreements or coordination with the oil and gas industry and Federal and State agencies. These measures include NMFS's Observer Program to protect marine mammals and sea turtles when OCS structures are removed using explosives, labeling of operational supplies to track sources of accidental debris loss, development of methods of pipeline landfall to eliminate impacts to barrier beaches, and semiannual beach cleanup events.

The following postlease approval processes apply to the proposed lease sale areas in the WPA, CPA, and EPA.

A.1 GEOLOGICAL AND GEOPHYSICAL SURVEY AUTHORIZATIONS

A geological and geophysical (G&G) permit must be obtained from BOEM prior to conducting off-lease geological or geophysical exploration or scientific research on unleased OCS lands or on lands under lease to a third party (30 CFR §§ 551.4(a) and (b)). Geological investigations include various seafloor sampling techniques to determine the geochemical, geotechnical, or engineering properties of the sediments.

Ancillary activities, or G&G exploration and development activities conducted on lease, are defined in 30 CFR § 250.105 and 30 CFR § 550.105 with regulations outlined in 30 CFR §§ 550.207 through 550.210. Ancillary activities include geological and high-resolution geophysical, geotechnical, archaeological, biological, physical oceanographic, meteorological, socioeconomic, or other surveys; or various types of modeling studies. This Agency issued NTL 2009-G34, "Ancillary Activities," to provide guidance and clarification on conducting ancillary activities in BOEM's Gulf of Mexico OCS Region. Operators should notify the Gulf of Mexico OCS Region, Regional Supervisor, Office of Leasing and Plans, Plans Section, in writing 30 days in advance before conducting any of the following types of ancillary activities related to a G&G exploration or development G&G activity:

- involving the use of an airgun or airgun array anywhere in the GOM regardless of water depth;
- independent of water depth, involving the use of explosives as an energy source; and
- independent of water depth, including ocean-bottom cable surveys, node surveys, and time-lapse (4D) surveys.

Additionally, NTL 2009-G34 clarifies that the Gulf of Mexico OCS Region, Regional Supervisor, Office of Leasing and Plans, Plans Section, should be notified in writing 15 days in advance before conducting the following types of other ancillary activities:

- involving the use of an airgun or airgun array anywhere in the EPA of the GOM regardless of water depth and 200 m (656 ft) or greater for the rest of the GOM;
- involving bottom disturbance, independent of water depth, including ocean-bottom cable surveys, node surveys, and time-lapse (4D) surveys; and
- a geotechnical evaluation involving piston/gravity coring or the recovery of sediment specimens by grab sampling or similar technique and/or any dredging or other ancillary activity that disturbs the seafloor (including deployment and retrieval of bottom cables, anchors, or other equipment).

This NTL also provides guidance for each type of ancillary activity, the type and level of BOEM review, and follow-up, post-survey report requirements.

Shallow hazard assessments are required under 30 CFR §§ 550.214 and 50.244; NTL 2008-G05, "Shallow Hazards Program," explains the requirements for these surveys and their reports. Included in shallow hazard assessments is a structural and stratigraphic interpretation of seismic data to qualitatively delineate abnormal pressure zones, shallow free gas, seafloor instability, shallow waterflow, and gas hydrates.

Seismic surveys are performed to obtain information on surface and near-surface geology and on subsurface geologic formations. Low-energy, high-resolution seismic surveys collect data on surficial geology used to identify potential shallow geologic or manmade hazards (e.g., faults or pipelines) for engineering and site planning for bottom-founded structures. The high-resolution surveys are also used to identify environmental and archaeological resources such as low-relief live bottom areas, pinnacles, chemosynthetic community habitat, and shipwrecks. High-energy, deep-penetration, common-depth-point (CDP) seismic surveys obtain data about geologic formations thousands of feet below the seafloor. The two-dimensional (2D) and three-dimensional (3D) CDP data are used to map structure features of stratigraphically important horizons in order to identify potential hydrocarbon traps. They can also be used to map the extent of potential habitat for chemosynthetic communities. In some situations, a set of 3D surveys can be run over a time

interval to produce a four-dimensional (4D), or “time-lapse,” survey that could be used to characterize production reservoirs.

BOEM’s predecessor completed the *Geological and Geophysical Exploration for Mineral Resources on the Gulf of Mexico Outer Continental Shelf: Programmatic Environmental Assessment* (G&G Programmatic EA) (USDOJ, MMS, 2004). Upon receiving a complete G&G permit application, BOEM conducts a NEPA review that will result in a categorical exclusion, an EA, or an EIS in accordance with the G&G Programmatic EA’s conclusions, NEPA guidelines, and other applicable BOEM policies. When required under an approved coastal management program, proposed G&G permit activities must receive State concurrence prior to BOEM permit approval.

A.2 EXPLORATION AND DEVELOPMENT PLANS

To ensure compliance with the OCSLA, other laws, applicable regulations, and lease provisions, and to enable BOEM to carry out its functions and responsibilities, formal plans (30 CFR §§ 550.211 and 550.241) with supporting information must be submitted for review and approval by BOEM before an operator may begin exploration, development, or production activities on any lease. Supporting environmental information, archaeological reports, biological reports (monitoring and/or live-bottom survey), and other environmental data determined necessary must be submitted with an OCS plan. This information provides the basis for an analysis of both offshore and onshore impacts that may occur as a result of the activities. BOEM may require additional specific supporting information to aid in the evaluation of the potential environmental impacts of the proposed activities. BOEM can require an amendment of an OCS plan based on inadequate or inaccurate supporting information. The 30 CFR part 550 subpart B regulations were revised to update the information that must be submitted with OCS plans and were published in the *Federal Register* on August 30, 2005 (*Federal Register*, 2005).

The OCS plans are reviewed by subject-matter experts that include, but are not limited to geologists, geophysicists, engineers, biologists, archaeologists, air quality specialists, water quality specialists, oil-spill specialists, NEPA coordinators, and/or environmental scientists. The plans and accompanying information are evaluated to determine whether any seafloor or drilling hazards are present; that air and water quality issues are addressed; that plans for hydrocarbon resource conservation, development, and drainage are adequate; that environmental issues and potential impacts are properly evaluated and mitigated; and that a proposed action is in compliance with NEPA, the Coastal Zone Management Act, BOEM’s operating regulations, and other requirements. Federal agencies, including the FWS, NMFS, USEPA, U.S. Navy, U.S. Air Force, and USCG, may be consulted if the proposal has the potential to impact areas under their jurisdiction. Each Gulf Coast State has a designated CZM agency that takes part in the review process. The OCS plans are also made available to the general public for comment through BOEM’s Gulf of Mexico OCS Region’s Public Information Office.

In response to deepwater activities in the Gulf of Mexico, this Agency developed a comprehensive strategy to address NEPA compliance and environmental issues in the deepwater

areas. A key component of that strategy was the completion of a Programmatic EA to evaluate the potential effects of deepwater technologies and operations (USDOJ, MMS, 2000). As a supplement to the Programmatic EA, this Agency prepared a series of technical papers that provide a summary description of the different types of structures that may be employed in the development and production of hydrocarbon resources in the deepwater areas of the GOM (Regg et al., 2000). Information in the Programmatic EA and technical papers were used in the preparation of this Multisale EIS.

On the basis of BOEM's reviews of the OCS plan, the findings of the proposal-specific environmental review, EA, or EIS, and other applicable BOEM studies and NEPA documents, the OCS plan is approved or disapproved by BOEM, or modified and resubmitted for further analyses and decision. Although few OCS plans are ultimately disapproved, many must be amended prior to approval to fully comply with BOEM's operating regulations and requirements or other Federal laws, to address reviewing agencies' concerns, or to avoid potential hazards or impacts to environmental resources.

Exploration Plans

An exploration plan (EP) must be submitted to BOEM for review and approval before any exploration activities, except for preliminary activities (such as hazard surveys or geophysical surveys), can begin on a lease. The EP describes exploration activities, drilling rig or vessel, proposed drilling and well-testing operations, environmental monitoring plans, and other relevant information, and it includes a proposed schedule of the exploration activities. Guidelines and environmental information requirements for lessees and operators submitting an EP are addressed in 30 CFR § 550.211 and are further explained in NTL 2008-G05, "Shallow Hazards Program," and NTL 2009-G27, "Submitting Exploration Plans and Development Operations Coordination Documents." The NTL 2008-G04 provides guidance on information requirements and establishes the contents for OCS plans required by 30 CFR part 550 subpart B. The NTL 2015-BOEM-N01, "Information Requirements for Exploration Plans, Development and Production Plans, and Development Operations Coordination Documents on the OCS for Worst Case Discharge and Blowout Scenarios," effective January 14, 2015, supersedes NTL 2010-N06. The NTL 2009-G27 clarifies guidance for submitting OCS plans to BOEM's Gulf of Mexico OCS Region.

After receiving an EP, BOEM determines if the plan is complete and adequate before technical and environmental reviews. BOEM evaluates the proposed exploration activities for potential impacts relative to geohazards and manmade hazards (including existing pipelines), archaeological resources, endangered species, sensitive biological features, water and air quality, oil-spill response, State CZMA requirements, and other uses (e.g., military operations) of the OCS. The EP is reviewed for compliance with all applicable laws and regulations.

A site-specific environmental review (SSER) is generated and completed for each plan. As a result of the SSER, a determination is made whether a categorical exclusion can be applied or whether additional NEPA analysis in the form of an EA or EIS will be prepared for the proposed

activity. Categorical exclusions are "a category of actions which do not individually or cumulatively have a significant effect on the human environment and for which, therefore, neither an environmental assessment nor an environmental impact statement is required" (40 CFR § 1508.4). In the event an action cannot be categorically excluded, the decision to prepare an EA will be made by the Regional Supervisor, Leasing and Environment or the Chief, Environmental Division. The SSER is based on the best available information, which may include the geophysical report (for determining the potential for the presence of deepwater benthic communities); archaeological report; air emissions data; waste and discharge data; live-bottom survey and report; biological monitoring plan; and recommendations by the affected State(s), DOD, FWS, NMFS, and/or internal BOEM offices. As part of the review process, each EP must contain a certification of consistency and the necessary data and information for the State to determine that the proposed activities comply with the enforceable policies of the States' approved Coastal Management Plan (CMP) and that such activities will be conducted in a manner that is consistent with the CMP (16 U.S.C. § 1456(c)(3)(A) and 15 CFR § 930.76).

If the EP is approved, and prior to conducting drilling operations, the operator is required to submit and obtain approval for an Application for Permit to Drill (APD) (refer to Wells under Permits and Applications below).

Operations Plans

In 1992, this Agency formed an internal Deepwater Task Force to address technical issues and regulatory concerns relating to deepwater (>1,000 ft; 305 m) operations and projects utilizing subsea technology. Based on the Deepwater Task Force's recommendation, an NTL (2000-N06) was at first developed that was incorporated into 30 CFR part 550 subpart B. The revisions to subpart B were finalized August 30, 2005, and it requires operators to submit a Deepwater Operations Plan (DWOP) for all operations in deep water (400 m [1,312 ft] or greater) and all projects using subsea technology. DeepStar, an industry-wide cooperative workgroup focused on deepwater regulatory issues and critical technology development issues, worked closely with this Agency's Deepwater Task Force to develop the initial guidelines for the DWOP. The DWOP requirement was established to address regulatory issues and concerns that were not addressed in the Agency's then-existing regulatory framework, and it is intended to initiate an early dialogue between BSEE and industry before major capital expenditures on deepwater and subsea projects are committed. Deepwater technology has been evolving faster than BSEE's ability to revise OCS regulations; the DWOP was established through the NTL process, which provides for a more timely and flexible approach to provide guidance on regulatory requirements and keep pace with the expanding deepwater operations and subsea technology.

The DWOP is intended to address the different functional requirements of production equipment in deep water, particularly the technological requirements associated with subsea production systems, and the complexity of deepwater production facilities. The DWOP provides BSEE with information specific to deepwater equipment issues to demonstrate that a deepwater project is being developed in an acceptable manner as mandated in the OCSLA, as amended, and

BSEE's operating regulations at 30 CFR part 250. The BSEE reviews deepwater development activities from a total system perspective, emphasizing operational safety, environmental protection, and conservation of natural resources. The DWOP process is a phased approach that parallels the operator's state of knowledge about how a field will be developed. A DWOP outlines the design, fabrication, and installation of the proposed development/production system and its components. A DWOP will include structural aspects of the facility (i.e., fixed, floating, or subsea); station-keeping (includes mooring system); wellbore, completion, and riser systems; safety systems; product removal or offtake systems; and hazards and operability of the production system. The DWOP provides BSEE with the information to determine that the operator has designed and built sufficient safeguards into the production system to prevent the occurrence of significant safety or environmental incidents. The DWOP, in conjunction with other permit applications, provides BSEE the opportunity to assure that the production system is suitable for the conditions in which it will operate.

This Agency recently completed a review of several industry-developed, recommended practices that address the mooring and risers for floating production facilities. The recommended practices address such things as riser design, mooring system design (station-keeping), and hazard analysis. Hazard analyses allow BSEE to be assured that the operator has anticipated emergencies and is prepared to address them, either through their design or through the operation of the equipment in question. The BSEE released these clarifications of its requirements in recent NTL's: NTL 2009-G03, "Synthetic Mooring Systems"; NTL 2009-G11, "Accidental Disconnect of Marine Drilling Risers"; and NTL 2009-G13, "Guidelines for Tie-downs on OCS Production Platforms for Upcoming Hurricane Seasons."

Conservation Reviews

One of BOEM and BSEE's primary responsibilities is to ensure development of economically producible reservoirs according to sound resource conservation, engineering, and economic practices as cited in 30 CFR §§ 550.202(c), 550.203, 550.210, 550.296, 550.297, 550.298, 550.299, 250.204, and 250.205. Operators should submit the necessary information as part of their EP, initial and supplemental development operations and coordination documents (DOCDs) or development and production plans (DPPs), and Conservation Information Document. Conservation reviews are performed to ensure that economic reserves are fully developed and produced, and that there is no harm to the ultimate recovery.

Development Operations and Coordination Documents and Development and Production Plans

Before any development operations can begin on a lease in a proposed lease sale area, a DOCD/DPP must be submitted to BOEM for review and decision. A DOCD/DPP describes the proposed development activities, drilling activities, platforms or other facilities, proposed production operations, environmental monitoring plans, and other relevant information; and it includes a proposed schedule of development and production activities. Requirements for lessees and

operators submitting a DOCD/DPP are addressed in 30 CFR §§ 550.241 and 550.242, and information guidelines for DOCDs/DPPs are provided in NTLs 2008-G04, 2009-G27, and 2010-N06.

After receiving a DOCD/DPP, BOEM performs technical and environmental reviews. BOEM evaluates the proposed activity for potential impacts relative to geohazards and manmade hazards (including existing pipelines), archaeological resources, endangered species, sensitive biological features, water and air quality, oil-spill response, State CMPs requirements, and other uses (e.g., military operations) of the OCS. The DOCD/DPP is reviewed for compliance with all applicable laws and regulations.

A SSER is generated and completed for each DOCD/DPP. As a result of the SSER, a determination is made whether a categorical exclusion can be applied or whether additional NEPA analysis in the form of an EA or EIS will be prepared for the proposed activity. The environmental review is based on the best available information, which may include the geophysical report (for determining the potential for the presence of deepwater benthic communities); archaeological report; air emissions data; waste and discharge data, live-bottom survey and report; biological monitoring plan; and recommendations by the affected State(s), DOD, FWS, NMFS, and/or internal BOEM offices.

As part of the review process, each DOCD/DPP must contain a certification of consistency and the necessary data and information for the State to determine that the proposed activities comply with the enforceable policies of the States' approved CMP and that such activities will be conducted in a manner that is consistent with the CMP (16 U.S.C. § 1456(c)(3)(A) and 15 CFR § 930.76).

New or Unusual Technologies

Technologies continue to evolve to meet the technical, environmental, and economic challenges of deepwater development. New or unusual technologies (NUTs) may be identified by the operator in its EP, DWOP, and DOCD/DPP or through BOEM's plan review processes. Some of the technologies proposed for use by the operators are actually extended applications of existing technologies and interface with the environment in essentially the same way as well-known or conventional technologies. These technologies are reviewed by BOEM for alternative compliance or departures that may trigger additional environmental review. Some examples of new technologies that do not affect the environment differently and that are being deployed in the OCS Program are synthetic mooring lines, subsurface safety devices, and multiplex subsea controls.

Some new technologies differ from established technologies in how they function or interface with the environment. These include equipment or procedures that have not been installed or used in Gulf of Mexico OCS waters. Having no operational history, they have not been assessed by BOEM through technical and environmental reviews. New technologies may be outside the framework established by BOEM's regulations and, thus, their performance (safety, environmental protection, efficiency, etc.) has not been addressed by BOEM. The degree to which these new

technologies interface with the environment and the potential impacts that may result are considered in determining the level of NEPA review that would be initiated.

BOEM has developed a NUTs' matrix to help facilitate decisions on the appropriate level of engineering and environmental review needed for a proposed technology. Technologies will be added to the NUTs' matrix as they emerge, and technologies will be removed from the matrix as sufficient experience is gained in their implementation. From an environmental perspective, the matrix characterizes new technologies into three categories: technologies that may affect the environment; technologies that do not interact with the environment any differently than "conventional" technologies; and technologies about which BOEM does not have sufficient information to determine their potential impacts to the environment. In this latter case, BOEM will seek to gain the necessary information from operators or manufacturers regarding the technologies to make an appropriate determination on potential effects on the environment.

Alternative Compliance and Departures

The BSEE's project-specific engineering safety review ensures that equipment proposed for use is designed to withstand the operational and environmental conditions in which it would operate. When an OCS operator proposes the use of new or unusual technology or procedures not specifically addressed in established BSEE regulations, the operations are evaluated for alternative compliance or departure determination. Any new technologies or equipment that represents an alternative compliance or departure from existing BSEE regulations must be fully described and justified before they would be approved for use. For BSEE and BOEM to grant alternative compliance or departure approval, the operator must demonstrate an equivalent or improved degree of protection as specified in 30 CFR § 250.141 and 30 CFR § 550.141. Comparative analysis with other approved systems, equipment, and procedures is one tool that BSEE uses to assess the adequacy of protection provided by alternative technology or operations. Actual operational experience is necessary with alternative compliance measures before BSEE would consider them as proven technology.

Emergency Plans

Criteria, models, and procedures for shutdown operations and the orderly evacuation of platforms and rigs for an impending hurricane have been in place in the Gulf of Mexico OCS for more than 30 years. (Such emergency plans are different from the oil-spill response plans described later in this chapter.) Operating experience from extensive drilling activities and more than 4,000 platforms during the 50-plus years of the Gulf of Mexico OCS Program have demonstrated the effectiveness and safety of securing wells and evacuating a facility in advance of severe weather conditions. Preinstallation efforts, historical experience with similar systems, testing, and the actual operating experience (under normal conditions and in response to emergency situations) are used to formulate the exact time needed to secure the wells and production facility and to evacuate it as necessary. Operators develop site-specific curtailment, securing, and evacuation plans that vary in complexity and formality by operator and type of activity. In general terms, all plans are intended to make sure the facility (or well) is secured in advance of an impending storm or developing

emergency. The operating procedures developed during the engineering, design, and manufacturing phases of the project, coupled with the results (recommended actions) from hazard analyses performed, are used to develop the emergency action and curtailment plans. Evacuation and production curtailment must consider a combination of factors, including the well status (drilling, producing, etc.) and the type and mechanics of wellbore operations. These factors are analyzed onsite through a decisionmaking process that involves onsite facility managers. The emphasis is on making real-time, situation-specific decisions and forecasting based on available information. Details of the shut-in criteria and various alerts are addressed on a case-by-case basis, as explained below.

Plans for shutting in production from the subsea wells are addressed as part of the emergency curtailment plan. The plan specifies the various alerts and shutdown criteria linked to both weather and facility performance data, with the intent to have operations suspended and the wells secured in the event of a hurricane or emergency situation. Ensuring adequate time to safely and efficiently suspend operations and secure the well is a key component of the planning effort. Clearly defined responsibilities for the facility personnel are part of the successful implementation of the emergency response effort.

For a severe weather event such as a hurricane, emergency curtailment plans would address the criteria and structured procedures for suspending operations and ultimately securing the wellbore(s) prior to weather conditions that could exceed the design operating limitations of the drilling or production unit. For drilling operations, the plan might also address procedures for disconnecting and moving the drilling unit off location after the well has been secured, should the environmental conditions exceed the floating drilling unit's capability to maintain station. Curtailment of operations consists of various stages of "alerts" indicating the deterioration of meteorological, oceanographic, or wellbore conditions. Higher alert levels require increased monitoring, the curtailment of lengthy wellbore operations, and, if conditions warrant, the eventual securing of the well. If conditions improve, operations could resume based on the limitations established in the contingency plan for the known environmental conditions. The same emergency curtailment plans would be implemented in an anticipated or impending emergency situation, such as the threat of a terrorist attack.

Neither BSEE nor the USCG mandates that an operator must evacuate a production facility for a hurricane; it is a decision that rests solely with the operator. The USCG does require the submittal of an emergency evacuation plan that addresses the operator's intentions for evacuation of nonessential personnel, egress routes on the production facility, lifesaving and personnel safety devices, firefighting equipment, etc. As activities move farther from shore, it may become safer to not evacuate the facility because helicopter operations become inherently more risky with greater flight times. Severe weather conditions also increase the risks associated with helicopter operations. The precedent for leaving a facility manned during severe weather is established in the North Sea and other operating basins.

Redundant, fail-safe, automatic shut-in systems located inside the wellbore and at the sea surface, and in some instances at the seafloor, are designed to prevent or minimize pollution. These systems are designed and tested to ensure proper operation should a production facility or well be catastrophically damaged. Testing occurs at regular intervals with predetermined performance limits designed to ensure functioning of the systems in case of an emergency.

After the *Deepwater Horizon* explosion, oil spill, and cleanup, the testing requirements for well control systems came under immediate scrutiny in the DOI Secretary's *Increased Safety Measures for Energy Development on the Outer Continental Shelf* (Safety Measures Report), which was delivered on May 27, 2010 (USDOJ, 2010). The Safety Measures Report included a recommendation of a program for immediate recertification of blowout preventers (BOPs). As stated above, the new regulatory section at 30 CFR § 250.451(i) requires that, if a blind-shear ram or casing shear ram is activated in a well control situation where the pipe is sheared, the BOP stack must be retrieved, fully inspected, and tested.

A.3 PERMITS AND APPLICATIONS

After the approval of an EP or DOCD/DPP, the operator submits applications for specific activities to BOEM for approval. These applications include those for drilling wells; well-test flaring; temporary well abandonment; installing a well protection structure, production platforms, satellite structures, subsea wellheads and manifolds, and pipelines; installation of production facilities; commencing production operations; platform removal and lease abandonment; and pipeline decommissioning.

Wells

The BSEE requirements for the drilling of wells can be found at 30 CFR part 250 subpart D. Lessees are required to take precautions to keep all wells under control at all times. The lessee must use the best available and safest technology to enhance the evaluation of abnormal pressure conditions and to minimize the potential for uncontrolled well flow.

Prior to conducting drilling operations, the operator is required to submit and obtain approval for an Application for Permit to Drill (APD). The APD requires detailed information (including project layout at a scale of 1:24,000, design criteria for well control and casing, specifications for blowout preventers, a mud program, cementing program, directional drilling plans, etc.) to allow for BOEM's evaluation of operational safety and pollution-prevention measures. The APD is reviewed for conformance with the engineering requirements and other technical considerations.

The BSEE is responsible for conducting technical and safety reviews of all drilling, workover, and production operations on the OCS. These detailed analyses determine if the lessee's proposed operation is in compliance with all regulations and all current health, safety, environmental, and classical engineering standards.

The BSEE regulations at 30 CFR §§ 250.1710-1717 address the requirements for permanent abandonment of a well on the OCS. A permanent abandonment includes the isolation of zones in the open wellbore, plugging of perforated intervals, plugging the annular space between casings (if they are open), setting a surface plug, and cutting and retrieving the casing at least 15 ft (5 m) below the mudline. All plugs must be tested in accordance with the regulations. There are no routine surveys of permanently abandoned well locations. If a well were found to be leaking, BOEM would require the operator of record to perform an intervention to repair the abandonment. If a well is temporarily abandoned at the seafloor, an operator must provide BSEE with an annual report summarizing plans to permanently abandon the well or to bring the well into production.

Platforms and Structures

The BSEE does a technical review of all proposed structure designs and installation procedures. All proposed facilities are reviewed for structural integrity. These detailed engineering reviews entail an evaluation of all operator proposals for fabrication, installation, modification, and repair of all mobile and fixed structures. The lessee must design, fabricate, install, use, inspect, and maintain all platforms and structures on the OCS to assure their structural integrity for the safe conduct of operations at specific locations. Applications for platform and structure approval are filed in accordance with 30 CFR § 250.901. Design requirements are presented in detail at 30 CFR §§ 250.904 through 250.909. The lessee evaluates characteristic environmental conditions associated with operational functions to be performed. Factors such as waves, wind, currents, tides, temperature, and the potential for marine growth on the structure are considered. In addition, pursuant to 30 CFR §§ 250.902 and 250.903, a program has been established by BSEE to assure that new structures meeting the conditions listed under 30 CFR § 250.900(c) are designed, fabricated, and installed using standardized procedures to prevent structural failures. This program facilitates review of such structures and uses third-party expertise and technical input in the verification process through the use of a Certified Verification Agent. After installation, platforms and structures are required to be periodically inspected and maintained under 30 CFR § 250.912.

Pipelines

Regulatory processes and jurisdictional authority concerning pipelines on the OCS and in coastal areas are shared by several Federal agencies, including DOI, the Department of Transportation (DOT), the COE, the Federal Energy Regulatory Commission, and the USCG. Aside from the enforcement of pipeline regulations, these agencies have the responsibility of overseeing and regulating the following areas: the placement of structures on the OCS and pipelines in areas that affect navigation; the certification of proposed projects involving the transportation or sale of interstate natural gas, including OCS gas; and the right of eminent domain exercised by pipeline companies onshore. In addition, the DOT is responsible for promulgating and enforcing safety regulations for the transportation in interstate commerce of natural gas, liquefied natural gas, and hazardous liquids by pipeline. This includes, for the most part, offshore pipelines on State lands beneath navigable waters and on the OCS that are operated by transmission companies. The regulations are contained in 49 CFR parts 191 through 193 and 195. In a Memorandum of Understanding between the DOT and DOI dated December 10, 1996, each party's respective

regulatory responsibilities are outlined. The DOT is responsible for establishing and enforcing design, construction, operation, and maintenance regulations, and for investigating accidents for all OCS transportation pipelines beginning downstream of the point at which operating responsibility transfers from a producing operator to a transporting operator. The DOI's responsibility extends upstream from the transfer point described above.

The BSEE is responsible for regulatory oversight of the design, installation, modification, repair, and decommissioning of OCS producer-operated oil and gas pipelines. The BSEE's operating regulations for pipelines, found at 30 CFR part 250 subpart J, are intended to provide safe and pollution-free transportation of fluids in a manner that does not unduly interfere with other users of the OCS. Pipeline applications may be for on-lease pipelines or right-of-way pipelines that cross other lessees' leases or unleased areas of the OCS. Pipeline permit applications to BSEE include the pipeline location drawing, profile drawing, safety schematic drawing, pipe design data, a shallow hazard survey report, and an archaeological report, if applicable.

The BSEE evaluates the design and proposed route of all OCS pipelines. Proposed pipeline routes are evaluated for potential seafloor or subsea geologic hazards and other natural or manmade seafloor or subsurface features or conditions (including other pipelines) that could have an adverse impact on the pipeline or that could be adversely impacted by the proposed operations. Routes are also evaluated for potential impacts on archaeological resources and biological communities. A NEPA review is conducted in accordance with applicable policies and guidelines. BOEM prepares an EA on all pipeline right-of-ways that go ashore. For Federal consistency, applicants must comply with the regulations as clarified in NTL 2007-G20, "Coastal Zone Management Program Requirements for OCS Right-of-way Pipeline Applications." All Gulf Coast States require consistency review of right-of-way pipeline applications as described in the clarifying NTL. The design of the proposed pipeline is evaluated for an appropriate cathodic protection system to protect the pipeline from the effects of external corrosion on the pipe; an external pipeline coating system to prolong the service life of the pipeline; measures to protect the inside of the pipeline from the detrimental effects, if any, of the fluids being transported; proposed maximum allowable operating pressure and hydrostatic test pressure of the line; inclusion and settings of all safety devices required by regulation; and protection of other pipelines crossing the proposed route. Such an evaluation includes the following: (1) reviewing the calculations used by the applicant in order to determine whether the applicant properly considered such elements as the grade of pipe to be used, the wall thickness of the pipe, de-rating factors (the practice of operating a component well inside its normal operating limits to reduce the rate at which the component deteriorates) related to the submerged and riser portions of the pipeline, the pressure rating of any valves or flanges to be installed in the pipeline, the pressure rating of any other pipeline(s) into which the proposed line might be tied, and the required pressure to which the line must be tested before it is placed in service; (2) protective safety devices such as pressure sensors and remotely operated valves, the physical arrangement of those devices proposed to be installed by the applicant for the purposes of protecting the pipeline from possible overpressure conditions and for detecting and initiating a response to abnormally low-pressure conditions; and (3) the applicant's planned compliance with regulations requiring that pipelines installed in water depths less than 200 ft (61 m) be buried to a

depth of at least 3 ft (1 m) (30 CFR § 250.1003). In addition, pipelines crossing fairways require a COE permit and may be required to be buried greater than 3 ft (1 m).

Operators are required to periodically inspect pipeline routes. Monthly overflights are conducted to inspect pipeline routes for leakage. When a pipeline requires a repair, a repair plan notification and repair completion report must be submitted to BSEE for review and acceptance.

Applications for pipeline decommissioning must also be submitted for BSEE review and approval. Decommissioning applications are evaluated to ensure they will render the pipeline inert and/or to minimize the potential for the pipeline becoming a source of pollution by flushing and plugging the ends and to minimize the likelihood that the decommissioned line will become an obstruction to other users of the OCS by filling it with water and burying the ends.

In addition, BOEM's Marine Minerals Program and Coastal Zone Management Coordinators, BSEE's Pipelines Section, and the State of Louisiana's Office of Coastal Management and Coastal Protection and Restoration Authority are working closely to ensure that sediment resources on the OCS are made available for restoration projects by requiring the removal of decommissioned pipelines. BOEM is also coordinating with BSEE's Pipeline Section, the State of Louisiana, and applicants with regards to rerouting the proposed pipelines when an application is submitted for emplacement to avoid the sediment resources if at all possible.

A.4 INSPECTION AND ENFORCEMENT

The OCSLA authorizes and requires BSEE to provide for both an annual scheduled inspection and a periodic unscheduled (unannounced) inspection of all oil and gas operations on the OCS. The inspections are to assure compliance with all regulatory constraints that allowed commencement of the operation.

The primary objective of an initial inspection is to assure proper installation of mobile drilling units and fixed structures, and proper functionality of their safety and pollution prevention equipment. After operations begin, additional announced and unannounced inspections are conducted. Unannounced inspections are conducted to foster a climate of safe operations, to maintain a BSEE presence, and to focus on operators with a poor performance record. These inspections are also conducted after a critical safety feature has previously been found defective. Poor performance generally means that more frequent, unannounced inspections may be conducted on a violator's operation.

The annual inspection examines all safety equipment designed to prevent blowouts, fires, spills, or other major accidents. These annual inspections involve the inspection for installation and performance of all facilities' safety-system components.

The inspectors follow the guidelines as established by the regulations, API RP 14C, and the specific BSEE-approved plan. The BSEE inspectors perform these inspections using a national

checklist called the Potential Incident of Noncompliance list. This list is a compilation of yes/no questions derived from all regulated safety and environmental requirements.

The BSEE administers an active civil penalties program (30 CFR part 250 subpart N). A civil penalty in the form of substantial monetary fines may be issued against any operator that commits a violation that may constitute a threat of serious, irreparable, or immediate harm or damage to life, property, or the environment. The BSEE may make recommendations for criminal penalties if a willful violation occurs. In addition, the regulation at 30 CFR § 250.173(a) authorizes suspension of any operation in the Gulf of Mexico region if the lessee has failed to comply with a provision of any applicable law, regulation, or order or provision of a lease or permit. Furthermore, the Secretary may invoke his authority under 30 CFR § 550.185(c) to cancel a nonproductive lease with no compensation. Exploration and development activities may be canceled under 30 CFR §§ 550.182 and 550.183.

A.5 POLLUTION PREVENTION, OIL-SPILL RESPONSE PLANS, AND FINANCIAL RESPONSIBILITY

Pollution Prevention

Pollution prevention is addressed through proper design and requirements for safety devices. The BSEE regulations at 30 CFR § 250.401 require that the operator take all necessary precautions to keep its wells under control at all times. The lessee is required to use the best available and safest drilling technology in order to enhance the evaluation of conditions of abnormal pressure and to minimize the potential for the well to flow or kick. Redundancy is required for critical safety devices that will shut off flow from the well if loss of control is encountered.

In addition, BSEE's regulations at 30 CFR part 250 subparts E, F, and H require that the lessee assure the safety and protection of the human, marine, and coastal environments during completion, workover, and production operations. All production facilities, including separators, treaters, compressors, headers, and flowlines are required to be designed, installed, tested, maintained, and used in a manner that provides for efficiency, safety of operations, and protection of the environment. Wells, particularly subsea wells, include a number of sensors that help in detecting pressures and the potential for leaks in the production system. Safety devices are monitored and tested frequently to ensure their operation, should an incident occur. To ensure that safety devices are operating properly, BSEE incorporates the API RP 14C into the operating regulations. The API RP 14C incorporates the knowledge and experience of the oil and gas industry regarding the analysis, design, installation, and testing of the safety devices used to prevent pollution. The API RP 14C presents proven practices for providing these safety devices for offshore production platforms. Proper application of these practices, along with good design, maintenance, and operation of the entire production facility, should provide an operationally safe and pollution-free production platform.

Also, BSEE's regulations at 30 CFR part 250 subpart J require that pipelines and associated valves, flanges, and fittings be designed, installed, operated, and maintained to provide safe and

pollution-free transportation of fluids in a manner that does not unduly interfere with other uses on the OCS.

The BSEE regulation at 30 CFR § 250.300(a) requires that lessees not create conditions that will pose an unreasonable risk to public health, life, property, aquatic life, wildlife, recreation, navigation, commercial fishing, or other uses of the ocean during offshore oil and gas operations. The lessee is required to take measures to prevent the unauthorized discharge of pollutants into the offshore waters. Control and removal of pollution is the responsibility and at the expense of the lessee. Immediate corrective action in response to an unauthorized release is required. All hydrocarbon-handling equipment for testing and production, such as separator and treatment tanks, is required to be designed, installed, and operated to prevent pollution. Maintenance and repairs that are necessary to prevent pollution are required to be taken immediately. Drilling and production facilities are required to be inspected daily or at intervals approved or prescribed by BSEE's District Field Operations Supervisor to determine if pollution is occurring.

Operators are required to install curbs, gutters, drip pans, and drains on platform and rig deck areas in a manner necessary to collect all greases, contaminants, and debris not authorized for discharge. The rules also explicitly prohibit the disposal of equipment, cables, chains, containers, or other materials into offshore waters. Portable equipment, spools or reels, drums, pallets, and other loose items must be marked in a durable manner with the owner's name prior to use or transport over offshore waters. Smaller objects must be stored in a marked container when not in use. Operational discharges such as produced water and drilling muds and cuttings are regulated by the USEPA through the National Pollutant Discharge Elimination System permit program for new and existing discharges and sources (40 CFR part 435 subpart A). The BSEE may restrict the rate of drilling fluid discharge or prescribe alternative discharge methods. No petroleum-based substances, including diesel fuel, may be added to the drilling mud system without prior approval of BSEE's District Field Operations Supervisor.

Oil-Spill Response Plans

The BSEE regulations at 30 CFR part 254 require that all owners and operators of oil-handling, storage, or transportation facilities located seaward of the coastline submit an oil-spill response plan (OSRP) for approval. The term "coastline" means the line of ordinary low water along that portion of the coast that is in direct contact with the open sea and the line marking the seaward limit of inland waters. The term "facility" means any structure, group of structures, equipment, or device (other than a vessel), which is used for one or more of the following purposes: exploring for; drilling for; producing; storing; handling; transferring; processing; or transporting oil. A mobile offshore drilling unit is classified as a facility when engaged in drilling or downhole operations.

The regulation at 30 CFR § 254.2 requires that an OSRP must be submitted and approved before an operator can use a facility. The BSEE can grant an exception to this requirement during BSEE's review of an operator's submitted OSRP. In order to be granted this exception during this time period, an owner/operator must certify in writing to BSEE that it is capable of responding to a

“worst-case” spill or the substantial threat of such a spill. To continue operations, the facility must be operated in compliance with the approved OSRP or BSEE-accepted “worst-case” spill certification. Owners or operators of offshore pipelines are required to submit an OSRP for any pipeline that carries oil, condensate, or gas with condensate; pipelines carrying essentially dry gas do not require an OSRP. Current OSRPs are required for abandoned facilities until they are physically removed or dismantled.

The OSRP describes how an operator intends to respond to an oil spill. The OSRP may be site-specific or regional (30 CFR § 254.3). The term “regional” means a spill response plan that covers multiple facilities or leases of an owner or operator, including affiliates, which are located in the same BSEE Gulf of Mexico region. The subregional plan concept is similar to the regional concept, which allows leases or facilities to be grouped together for the purposes of (1) calculating response times, (2) determining quantities of response equipment, (3) conducting oil-spill trajectory analyses, (4) determining worst-case discharge scenarios, and (5) identifying areas of special economic and environmental importance that may be impacted and the strategies for their protection. The number and location of the leases and facilities allowed to be covered by a subregional OSRP will be decided by BSEE on a case-by-case basis considering the proximity of the leases or facilities proposed to be covered. The NTL 2012-N06 includes guidance on the preparation and submittal of regional OSRPs.

The Emergency Response Action Plan within the OSRP serves as the core of BSEE-required OSRPs. In accordance with 30 CFR part 254, the Emergency Response Action Plan requires identification of (1) the qualified individual and the spill-response management team, (2) the spill-response operating team, (3) the oil-spill cleanup organizations under contract for response, and (4) the Federal, State, and local regulatory agencies that an owner/operator must notify or that they must consult with to obtain site-specific environmental information when an oil spill occurs. The OSRP is also required to include an inventory of appropriate equipment and materials, their availability, and the time needed for deployment, as well as information pertaining to dispersant use, *in-situ* burning, a worst-case discharge scenario, contractual agreements, training and drills, identification of potentially impacted environmental resources and areas of special economic concern and environmental importance, and strategies for the protection of these resources and areas. The response plan must provide for response to an oil spill from the facility, and the operator must immediately carry out the provisions of the plan whenever an oil spill from the facility occurs. The OSRP must be in compliance with the National Contingency Plan and the Area Contingency Plan(s). The operator is also required to carry out the training, equipment testing, and periodic drills described in the OSRP. All BSEE-approved OSRPs must be reviewed at least every 2 years. In addition, revisions must be submitted to BSEE within 15 days whenever

- a change occurs that appreciably reduces an owner/operator’s response capabilities;
- a substantial change occurs in the worst-case discharge scenario or in the type of oil being handled, stored, or transported at the facility;

- there is a change in the name(s) or capabilities of the oil-spill removal organizations cited in the OSRP; or
- there is a change in the applicable Area Contingency Plans.

As a result of the *Deepwater Horizon* explosion and oil spill, although BSEE is not requiring the submission of revised OSRPs at this time, BSEE will provide guidance regarding additional information that operators should submit regarding spill response and surface containment in light of the “worst-case” discharge calculations that are now required by the regulations and as clarified in NTL 2010-N06, “Information Requirements for Exploration Plans, Development and Production Plans, and Development Operations Coordination Documents on the OCS,” which became effective on June 18, 2010. This NTL provides clarification of the regulations requiring a lessee or operator to submit supplemental information for new or previously submitted EPs, DPPs, or DOCDs. The required supplemental information includes the following: (1) a description of the blowout scenario as required by 30 CFR §§ 550.213(g) and 550.243(h); (2) a description of their assumptions and calculations used in determining the volume of the worst-case discharge required by 30 CFR § 550.219(a)(2)(iv) (for EPs) or 30 CFR § 550.250(a)(2)(iv) (for DPPs and DOCDs); and (3) a description of the measures proposed that would enhance the ability to prevent a blowout, to reduce the likelihood of a blowout, and to conduct effective and early intervention in the event of a blowout, including the arrangements for drilling relief wells and any other measures proposed. The early intervention methods could actually include the surface and subsea containment resources that BSEE announced in NTL 2010-BSEE-N10, “Statement of Compliance with Applicable Regulations and Evaluation of Information Demonstrating Adequate Spill Response and Well Containment Resources,” which states that BSEE will begin reviewing to ensure that the measures are adequate to promptly respond to a blowout or other loss of well control.

Additionally, to address new improved containment systems, NTL 2010-N10 became effective on November 8, 2010. This NTL applies only to operators conducting operations using subsea or surface BOPs on floating facilities. It clarifies the regulations that lessees and operators must submit a certification statement signed by an authorized company official with each application for a well permit, indicating that they will conduct all of their authorized activities in compliance with all applicable regulations, including the Increased Safety Measures Regulations (*Federal Register*, 2010). The NTL also informs lessees that BSEE will be evaluating whether or not each operator has submitted adequate information demonstrating that it has access to and can deploy surface and subsea containment resources that would be adequate to promptly respond to a blowout or other loss of well control. Although the NTL does not provide that operators submit revised OSRPs that include this containment information at this time, operators were notified of BSEE’s intention to evaluate the adequacy of each operator to comply in the operator’s current OSRP; therefore, there is an incentive for voluntary compliance.

The following requirements are implemented according to BSEE’s regulations at 30 CFR parts 250 and 254:

- requires immediate notification for spills >1 bbl—all spills require notification to USCG, and BSEE receives notification from the USCG of all spills ≥ 1 bbl;
- conducts investigations to determine the cause of a spill;
- assesses civil and criminal penalties, if needed;
- oversees spill source control and abatement operations by industry;
- sets requirements and reviews and approves OSRPs for offshore facilities;
- conducts unannounced drills to ensure compliance with OSRPs;
- requires operators to ensure that their spill-response operating and management teams receive appropriate spill-response training;
- conducts inspections of oil-spill response equipment;
- requires industry to show financial responsibility to respond to possible spills; and
- provides research leadership to improve the capabilities for detecting and responding to an oil spill in the marine environment.

BOEM receives and reviews the worst-case discharge and blowout scenarios information submitted for EPs, DPPS, and DOCs on the OCS. BOEM also has regulatory requirements addressing site-specific OSRPs and spill response information. As required by BOEM at 30 CFR §§ 550.219 and 550.250, operators are required to provide BOEM with an OSRP that is prepared in accordance with 30 CFR part 254 subpart B with their proposed exploration, development, or production plan for the facilities that they will use to conduct their activities; or to alternatively reference their approved regional OSRP by providing the following information:

- a discussion of the approved OSRP;
- the location of the primary oil-spill equipment base and staging area;
- the name of the oil-spill equipment removal organization(s) for both equipment and personnel;
- the calculated volume of the worst-case discharge scenario in accordance with 30 CFR § 254.26(a) and a comparison of the worst-case discharge scenario in the approved regional OSRP with the worst-case discharge calculated for these proposed activities; and
- a description of the worst-case discharge to include the trajectory information, potentially impacted resources, and a detailed discussion of the spill response proposed to the worst-case discharge in accordance with 30 CFR §§ 254(b)-(d).

All OSRPs are reviewed and approved by BSEE, whether submitted with a BOEM-associated plan or directly to BSEE in accordance with 30 CFR part 254. Hence, BOEM relies

heavily upon BSEE's expertise to ensure that the OSRP complies with all pertinent laws and regulations, and demonstrates the ability of an operator to respond to a worst-case discharge. The operator is also required to carry out the training, equipment testing, and periodic drills described in the OSRP. Since 1989, BSEE has conducted government initiated unannounced exercises that provide an economically feasible mechanism for agencies to comply with the requirements defined in 30 CFR part 254. In 2014, BSEE carried out seven table-top, government-initiated unannounced exercises and two deployment government-initiated unannounced exercises (USDOl, BSEE, 2014). Equipment deployment exercises most often take place in waterways adjacent to where the equipment is stored, but they may be moved if the exercise requires it. Typical deployment exercises last only a few hours and rarely longer than a day (USDOl, BSEE, official communication, 2015). Site-specific OSRPs are required to be submitted to BOEM with a proposed exploration, development, or production plan, and BOEM's regulations require that an operator must have an approved OSRP prior to BOEM's approval of an operator-submitted exploration, development, or production plan.

Several NTLs and guidance documents have been issued by BOEM and BSEE that clarify additional oil-spill requirements since the occurrence of the *Deepwater Horizon* explosion, oil spill, and response. The following is a summary of that information.

Worst-Case Discharge and Blowout Scenario Information

NTL 2015-BOEM-N01

BOEM issued NTL 2015-BOEM-N01, "Information Requirements for Exploration Plans, Development and Production Plans, and Development Operations Coordination Documents on the OCS for Worst Case Discharge and Blowout Scenarios". This NTL became effective on January 4, 2015, and explains the procedures for the lessee or operator to submit worst-case discharge and blowout scenario information for new or previously submitted EPs, DPPs, or DOCDs. This NTL supersedes NTL 2010-N06, "Information Requirements for Exploration Plans, Development and Production Plans, and Development Operations Coordination Documents on the OCS." The required information to be submitted for new EPs, DPPs, and DOCDs or as a supplement to a previously submitted plan includes the following: (1) a blowout scenario as required by 30 CFR §§ 550.213(g) and 550.243(h); (2) a description of their assumptions and calculations used in determining the volume of the worst-case discharge required by 30 CFR § 550.219(a)(2)(iv) (for EPs) or 30 CFR § 550.250(a)(2)(iv) (for DPPs and DOCDs); and (3) a description of the measures proposed that would enhance the ability to prevent a blowout, to reduce the likelihood of a blowout, and to conduct effective and early intervention in the event of a blowout, including the arrangements for drilling relief wells and any other measures proposed.

BOEM also issued NTL 2015-BOEM-N01 "Frequently Asked Questions Information Sheet for Information Requirements for Exploration Plans, Development and Production Plans, and Development Operations Coordination Documents on the OCS for Worst Case Discharge and Blowout Scenarios". This Frequently Asked Questions information sheet provides guidance intended to assist an operator's compliance with the worst-case discharge and blowout scenario

information requirements pursuant to NTL 2015-BOEM-N01 and also provides information regarding BOEM's review of the submitted information.

NTL 2013-BSEE-N02

The BSEE issued NTL 2013-BSEE-N02, "Significant Change to Oil Spill Response Plan Worst Case Discharge Scenario." This NTL clarifies what BSEE considers a significant change in a worst-case discharge scenario, which requires that a revision to an OSRP be submitted. The guidance issued by this NTL states that a significant change in worst-case discharge may occur when calculating a new worst-case discharge based upon the following:

- the addition of a new facility installation or well;
- a modification to an existing facility; or
- a change in any assumptions and calculations used to determine the prior estimated worst-case discharge.

The NTL 2013-BSEE-N02 identifies the process an owner or operator of a facility should utilize to determine whether the newly calculated worst-case discharge represents a significant change. The BSEE considers a change in worst-case discharge as significant and thus requiring revision when the process identifies the need for additional onshore or offshore response equipment beyond what is included in an approved OSRP. Although information to make this determination is submitted to BOEM and forwarded to BSEE with a proposed exploration, development, or production plan, pursuant to NTL 2013-BSEE-N02, the 15-day timeframe for notification of a significant change will be enforced by BSEE as beginning no later than the date that the operator submitted an Application for Permit to Drill to BSEE.

Typically, for OSRP revisions, once BSEE approves an OSRP, it must be reviewed at least every 2 years, and modifications must be submitted in accordance with 30 CFR § 254.30(a). If no modifications are deemed necessary, the owner or operator must inform BSEE in writing that there are no changes. A separate revision to an OSRP must be submitted to BSEE within 15 days when the following conditions are met:

- there is a change that significantly reduces operator response capabilities;
- a significant change occurs in the worst-case discharge or in the type of oil being handled, stored, or transported at a facility;
- there is a change in the names or capabilities of the oil-spill removal organizations cited in the plan; or
- there is a significant change to the Area Contingency Plan.

NTL 2012-BSEE-N06

The BSEE also issued NTL 2012-BSEE-N06, "Guidance to Owners and Offshore Facilities Seaward of the Coast Line Concerning Regional Oil Spill Response Plans." This NTL, which was effective on August 10, 2012, provides clarification, guidance, and information concerning the preparation and submittal of a regional OSRP for owners and operators of oil handling, storage, or transportation facilities, including pipelines located seaward of the coastline. A regional OSRP is defined as a spill response plan covering multiple facilities or leases of an owner, or operator, or their affiliates, which are located in the same BSEE region. Site-specific OSRPs submitted with BOEM exploration, development, or production plans can either be prepared using the 30 CFR part 254 regulations or the guidance outlined in NTL 2012-BSEE-N06.

Some of the clarifications and encouraged practices identified in NTL 2012- BSEE-N06 are based upon lessons learned from the *Deepwater Horizon* oil-spill response. This NTL indicates that BSEE's review of OSRPs would also be based, in part, upon information obtained during the *Deepwater Horizon* oil-spill response. For example, during the *Deepwater Horizon* oil-spill response, it was discovered that the total estimated de-rated recovery capacity for all equipment listed in the OSRP overestimated the amount of oil that could be removed from the water. The NTL 2012-BSEE-N06 therefore states that the OSRP should be developed considering (1) a fully developed response strategy that includes the identification of the available dedicated recovery equipment as well as the actual operating characteristics of the systems associated with each skimmer and (2) the use of new technology and response systems that will increase the effectiveness of mechanical recovery tactics.

The NTL 2012-BSEE-N06 is designed to encourage owners and operators of offshore facilities to include innovative offshore oil-spill response techniques, particularly for a continuous high-rate spill. This NTL includes requirements for the submittal of information regarding subsea containment equipment and subsea dispersant application among other provisions. This NTL also encourages the inclusion of options that would improve spill-response capabilities such as:

- using remote-sensing techniques as a tool for safe night operations to increase oil-spill detection and to improve thickness determinations for ascertaining the effectiveness of response strategies;
- increasing spill-response operational time by reducing transit times to disposal locations and decontamination equipment;
- identifying sources for supplies and materials, such as fire boom and dispersants, that can support a response to an uncontrolled spill lasting longer than 30 days or for the duration of the spill response; and
- the use and specification of primary and secondary communications technology and software for coordinating and directing spill-response operations systems and/or providing a common operating picture to all spill management and response personnel, including the Federal On-Scene Coordinator and participating Federal and State government officials.

NTL 2012-BSEE-N07

The BSEE issued NTL 2012-BSEE-N07, "Oil Discharge Written Follow-up Reports." This NTL addresses the oil discharge reports (30 CFR § 254.46(b)(2)) that are required to be submitted by a responsible party to BSEE for spills >1 bbl within 15 days after a spill has been stopped or ceased. The responsible party is encouraged to report cause, location, volume, remedial action taken, sea state, meteorological conditions, and the size and appearance of the slick.

NTL 2010-N10

The Bureau of Ocean Energy Management, Regulation and Enforcement issued NTL 2010-N10, "Statement of Compliance with Applicable Regulations and Evaluation of Information Demonstrating Adequate Spill Response and Well Containment Resources," which became effective on November 8, 2010. This NTL applies only to operators conducting operations using subsea or surface BOPs on floating facilities. It explains that lessees and operators submit a statement signed by an authorized company official with each application for a well permit indicating that they will conduct all of their authorized activities in compliance with all applicable regulations, including the Increased Safety Measures Regulations (*Federal Register*, 2010). The NTL also informs lessees that BOEM will be evaluating whether or not each operator has submitted adequate information demonstrating that it has access to and can deploy surface and subsea containment resources that would be adequate to promptly respond to a blowout or other loss of well control. The NTL notifies the operator that BOEM intends to evaluate the adequacy of each operator to comply in the operator's current OSRP; therefore, there is an incentive for voluntary compliance. The NTL lists the type of information that BOEM would review as follows:

- subsea containment and capture equipment, including containment domes and capping stacks;
- subsea utility equipment, including hydraulic power, hydrate control, and dispersant injection equipment;
- riser systems;
- remotely operated vehicles;
- capture vessels;
- support vessels; and
- storage facilities.

Spill Response Initiatives

For more than 25 years, BSEE and its predecessors have maintained a comprehensive long-term research program to improve oil-spill response knowledge and technologies. The major focus of the program is to improve the methods and technologies used for oil-spill detection, containment, treatment, recovery, and cleanup. The BSEE Oil Spill Response Research program is a cooperative

effort bringing together funding and expertise from research partners in State and Federal government agencies, industry, academia, and the international community. The projects funded cover numerous spill response-related issues such as chemical treating agents; *in-situ* burning of oil; research conducted at BSEE's Oil Spill Response Test Facility (Ohmsett) located in Leonardo, New Jersey; behavior of oil; decisionmaking support tools; mechanical containment; and remote sensing.

A few of BSEE's research contracts that highlight the varied types of research funded include the following:

- “Leveraging Offshore Hydrocarbon Risk Assessment Models and Datasets to Support the Evaluation and Ranking of Worst Case Discharge Scenarios” (Project Number 1046) – The objective of this project is to develop a set of methodologies and algorithms, and a computer model for the comparison and ranking of different spill scenarios to determine which one has the greater potential for damage to the environment or result in other significant impacts and should be classified as the worst-case discharge.
- “Scientifically Based Field Tools for Predicting Dispersant Effectiveness and Usage Rates” (Project Number 1043) – This project will bridge the gap between laboratory methodology and field analysis by incorporating the modified 1-liter Baffled Flask Test and fluorescence probe for determining dispersant effectiveness in the field.
- “Technology Readiness Level (TRL) Definitions for Oil Spill Response Technologies and Equipment” (Project Number 1042) – The objective of this study is to establish a uniform and objective means to determine the level of maturity of a new technology and when it is ready for use in the field.
- “HC-Sentinel: An AUV Glider for High Endurance Subsea Hydrocarbon Detection” (Project Number 1041) – The objective of this study is to develop and test a next generation *in-situ* mass spectrometer payload that operates on an autonomous underwater vehicle glider for real-time subsea hydrocarbon detection and classification and that can be designed to operate for long-term subsea inspection, monitoring, and incident response.

More information on these and the other awarded and completed research projects can be found on BSEE's website at <http://www.bsee.gov/Technology-and-Research/Research/>.

Incident Reporting

The Minerals Management Service (MMS) (BOEM's predecessor) revised operator incident reporting requirements in a final rule effective July 17, 2006 (*Federal Register*, 2006). The incident reporting rule defines what incidents must be reported, includes incidents that have the potential to be serious, and requires the reporting of standard information for both oral and written reports. As part of the incident reporting rule, BOEM's regulations at 30 CFR § 250.188(a)(6) require an

operator to report all collisions that result in property or equipment damage greater than \$25,000. "Collision" is defined as the act of a moving vessel (including an aircraft) striking another vessel or striking a stationary vessel or object (e.g., a boat striking a drilling rig or platform).

Financial Responsibility

The responsible party for covered offshore facilities must demonstrate oil-spill financial responsibility, as required by 30 CFR part 553. These regulations implement the oil-spill financial responsibility requirements of Title I of the Oil Pollution Act of 1990, as amended. Penalties for noncompliance with these requirements are covered at 30 CFR § 553.51 and in NTL 2008-N05, "Guidelines for Oil Spill Financial Responsibility for Covered Facilities." A covered offshore facility, as defined in 30 CFR § 553.3, is any structure and all of its components (including wells completed at the structure and the associated pipelines), equipment, pipeline, or device (other than a vessel or other than a pipeline or deepwater port licensed under the Deepwater Port Act of 1974) used for exploring, drilling, or producing oil, or for transporting oil from such facilities. The BSEE ensures that each responsible party has sufficient funds for removal costs and damages resulting from the accidental release of liquid hydrocarbons into the environment for which the responsible party is liable.

A.6 AIR EMISSIONS

The OCSLA (43 U.S.C. § 1334(a)(8)) requires the Secretary of the Interior to promulgate and administer regulations that comply with the National Ambient Air Quality Standards, pursuant to the Clean Air Act (42 U.S.C. §§ 7401 *et seq.*), to the extent that authorized activities significantly affect the air quality of any State. Under provisions of the Clean Air Act Amendments of 1990, the USEPA Administrator has jurisdiction and, in consultation with the Secretary of the Interior and the Commandant of the Coast Guard, established the requirements to control air pollution in OCS areas of the Pacific, Atlantic, Arctic, and eastward of 87.5° W. longitude in the Gulf of Mexico. Air quality in the OCS area westward of 87.5° W. longitude in the Gulf of Mexico is under BOEM's jurisdiction.

For OCS air emission sources located east of 87.5° W. longitude and within 25 mi (40 km) of the States' seaward boundaries, the requirements are the same as would be applicable if the source were located in the corresponding onshore area. The USEPA requirements for these OCS areas are at 40 CFR part 55, Appendix A. For air emission sources located east of 87.5° W. longitude and more than 25 mi (40 km) from the States' seaward boundaries, sources are subject to Federal requirements as specified in 40 CFR § 52.13. The USEPA regulations also establish procedures that allow the USEPA Administrator to exempt any OCS source from an emissions control requirement if it is technically infeasible or poses unreasonable threat to health or safety.

This Agency issued NTL 2009-N11 to clarify that its regulatory authority and BOEM's implementing regulations in 30 CFR part 250 subpart C and 30 CFR part 550 apply only to those air emission sources in the Gulf of Mexico westward of 87.5° W. longitude. The regulated pollutants include carbon monoxide, total suspended particulate matter, sulphur dioxide, nitrogen oxides, and volatile organic compounds. All new or supplemental EPs and DOCDs must include air emissions

information sufficient to determine whether an air quality review is required (30 CFR §§ 550.218 and 550.249). BOEM's regulations require a review of air quality emissions to determine if the projected emissions from a facility result in onshore ambient air concentrations above BOEM's significance levels and to identify appropriate emissions controls to mitigate potential onshore air quality degradation.

Emissions data for new or modified onshore facilities directly associated with proposed OCS oil- and gas-related activities are required to be included in development plans submitted to BOEM so that affected States can determine potential air quality impacts on their air quality.

BOEM uses a two-level hierarchy of evaluation criteria to evaluate potential impacts of offshore emission sources to onshore areas. The evaluation criteria are the exemption level and the significance level. If the proposed activities exceed the criteria at the first (exemption) level, the evaluation moves to the significance level criteria. The initial evaluation compares the worst-case emissions with BOEM's exemption criteria. This corresponds to the USEPA's screening step, where the proposed activity emissions are checked against the screening thresholds or "exemption levels." If the proposed activity's emissions are below the exemption levels, the proposed activity is exempt from further air quality review.

If exemption levels are exceeded, then the second step requires refined modeling using the Offshore and Coastal Dispersion (OCD) Model or the California Puff Model (CALPUFF). The results from these models, the modeled potential onshore impacts, are compared with BOEM's significance levels. If the significance levels are exceeded in an attainment area, which is an area that meets the National Ambient Air Quality Standards, the operator would be required to apply best available control technology to the emissions source. If the affected area is classified as nonattainment, further emission reductions or offsets may be required. Projected contributions to onshore pollutant concentrations are also subject to the same increments that the USEPA applies to the onshore areas under their Prevention of Significant Deterioration program.

A.7 FLARING/VENTING

Flaring is the controlled burning of natural gas, and venting is releasing gas directly into the atmosphere without burning (refer to **Chapter 3.1.8.4**). The BSEE regulates flaring/venting to minimize the loss of revenue producing natural gas resources. The BSEE regulations at 30 CFR part 250 allow, without prior BSEE approval, flaring or venting of natural gas on a limited basis under certain specified conditions. Regulations permit more extensive flaring/venting with prior approval from BSEE. Records must always be prepared by the operator for all flaring/venting, and justification must be provided for flaring/venting not expressly authorized by BSEE's regulations.

A.8 HYDROGEN SULFIDE CONTINGENCY PLANS

The operator of a lease must request a BSEE area classification for the presence of hydrogen sulfide (H₂S) gas. The BSEE classifies areas for proposed operations as (1) H₂S absent, (2) H₂S present, or (3) H₂S unknown.

All OCS operators must provide information about potential contact with sour hydrocarbons (contains H₂S) that could result in atmospheric H₂S concentrations above 20 parts per million in their exploration or development plan. If an area is known to contain H₂S or is in an area where H₂S potential is unknown, operators are required to file an H₂S contingency plan with BSEE. This plan must include the 30 CFR part 250 requirements that are intended to ensure workers' safety at the production facility and provide contingencies for simultaneous drilling, well-completion, well-workovers, and production operations. The NTL 2009-G31, "Hydrogen Sulfide (H₂S) Requirements," provides clarification, guidance, and information regarding BSEE's H₂S regulations at 30 CFR part 250.

A.9 ARCHAEOLOGICAL RESOURCES REGULATION

Bottom-disturbing operations such as well placement, anchoring, and pipelaying activities can lead to damage to any resources that reside on or embedded within the seabed, including archaeological resources such as historic shipwrecks. The archaeological resources regulations at 30 CFR § 250.194 and 30 CFR § 550.194 grant authority to BOEM's and BSEE's Regional Directors to require that an archaeological survey report be submitted with the EP, DOCD, or DPP where deemed necessary. The technical requirements of the high-resolution geophysical survey, archaeological analysis, and report are detailed in NTL 2005-G07, "Archaeological Resource Surveys and Reports." If data from the operator's high-resolution geophysical survey and archaeological report suggest that an archaeological resource may be present, the lessee must either locate the site of any operation so as not to adversely affect the area of the seafloor identified for archaeological avoidance, demonstrate that the identified geophysical target is not an archaeological resource through remotely operated vehicle or diver investigation, or demonstrate that potential archaeological resources will not be adversely affected by operations. If the lessee discovers any archaeological resource while conducting approved operations, operations must be immediately stopped and the discovery reported to BOEM's Regional Supervisor, Office of Environment, within 48 hours of its discovery.

High-resolution surveys, where required, provide an effective tool that analysts use to identify and help protect archaeological resources. As part of the environmental reviews conducted for postlease activities, all available information will be evaluated regarding the potential presence of archaeological resources within a proposed action area to determine if mitigation is warranted.

A.10 COASTAL ZONE MANAGEMENT CONSISTENCY REVIEW AND APPEALS FOR POSTLEASE ACTIVITIES

The Coastal Zone Management Act (CZMA) places requirements on any applicant for any federally licensed or permitted activities on the OCS (i.e., OCS plans, right-of-way pipelines, geological and geophysical surveys, and decommissioning) affecting any coastal use or resource, in or outside of a State's coastal zone. The applicant must provide a consistency certification and necessary data and information for the State to determine that the proposed activities comply with the enforceable policies of the State's CMP, approved by NOAA, and that such activities will be fully consistent with those enforceable policies (16 U.S.C. § 1456(c)(3)(A) and 15 CFR § 930.76).

Except as provided in 15 CFR § 930.60(a), State agency consistency review begins when the State receives the OCS plan or application, consistency certification, and necessary data and information pursuant to 15 CFR §§ 930.76(a) and (b). Only missing information can be used to delay the commencement of State agency review, and a request for information and data that are not required by 15 CFR § 930.76 will not extend the date of commencement of review (15 CFR § 930.58). The information requirements for CZM purposes are found at 30 CFR §§ 550.226 and 550.260 and are discussed in NTL 2012-BSEE-N06, "Guidance to Owners and Operators of Offshore Facilities Seaward of the Coast Line Concerning Regional Oil Spill Response Plans"; NTL 2008-G04, "Information Requirements for Exploration Plans and Development Operations Coordination Documents"; NTL 2009-G27, "Submitting Exploration Plans and Development Operations Coordination Documents"; NTL 2015-BOEM-N01, "Information Requirements for Exploration Plans, Development and Production Plans, and Development Operations Coordination Documents on the OCS for Worst Case Discharge and Blowout Scenarios"; NTL 2010-N10, "Statement of Compliance with Applicable Regulations and Evaluation of Information Demonstrating Adequate Spill Response and Well Containment Resources"; and NTL 2007-G20, "Coastal Zone Management Program Requirements for OCS Right-of-Way Pipeline Applications."

All of the Gulf Coast States have federally approved CMP's. Requirements for the CZM consistency information for Texas, Louisiana, Mississippi, Alabama, and Florida are given in NTL's 2012-BSEE-N06, 2008-G04, 2009-G27, 2015-BOEM-N01, 2010-N10, and 2007-G20. In accordance with the requirements of 15 CFR § 930.76, BOEM's Gulf of Mexico OCS Region sends copies of an OCS plan, including the consistency certification and other necessary data and information, to the designated State CMP agency by receipted mail or other approved communication. In accordance with the requirements of 15 CFR § 930.60, the applicants are responsible for sending the State CMP agency a copy of the applicant, consistency certification, and necessary data and information at the same time as when the applicant sends it to BOEM or BSEE. If no State-agency objection is submitted by the end of the consistency review period, BOEM shall presume consistency concurrence by the CZMA State (15 CFR § 930.78(b)). BOEM can require modification of a plan or application.

If BOEM receives a written consistency objection from the State, BOEM and/or BSEE will not approve any activity described in the proposed activity unless (1) the operator amends the application to accommodate the objection, concurrence is subsequently received or conclusively presumed; (2) upon appeal, the Secretary of Commerce, in accordance with 15 CFR part 930 subpart H, finds that the proposed activity is consistent with the objectives or purposes of the CZMA or is necessary in the interest of national security; or (3) the original objection is declared invalid by the courts.

A.11 BEST AVAILABLE AND SAFEST TECHNOLOGIES

To assure that oil and gas exploration, development, and production activities on the OCS are conducted in a safe and environmentally sound manner, 43 U.S.C. § 1347(b) of the OCSLA, as amended, requires that all OCS technologies and operations use the best available and safest

technology (BAST) whenever practical. The BSEE Director may require additional BAST measures to protect safety, health, and the environment, if it is economically feasible and the benefits outweigh the costs. Conformance to the standards, codes, and practices referenced in or required under the authority of 30 CFR part 250 is considered the application of BAST. These standards, codes, and practices include requirements for state-of-the-art drilling technology, production safety systems, oil and gas well completions, oil-spill response plans, pollution-control equipment, and specifications for platform/structure designs. The BSEE conducts periodic offshore inspections and continuously and systematically reviews OCS technologies to ensure that the best available and safest technologies are applied to OCS operations. The BAST is not required when BSEE determines that the incremental benefits are clearly insufficient to justify increased costs; however, it is the responsibility of an operator of an existing operation to demonstrate why application of a new technology would not be feasible. The BAST requirement is applicable to equipment and procedures that, upon failure, would have a significant effect on safety, health, or the environment, unless benefits clearly do not justify the cost (30 CFR §§ 250.107(c) and (d)).

The BAST concept is addressed in BSEE's Gulf of Mexico OCS Region by a continuous effort to locate and evaluate the latest technologies and to report on these advances at periodic Regional Operations Technology Assessment Committee meetings. A part of BSEE's staff has an ongoing function to evaluate various vendors and industry representatives' innovations and improvements in techniques, tools, equipment, procedures, and technologies applicable to oil and gas operations (i.e., drilling, producing, completion, and workover operations). This information is provided to BSEE's District personnel at Regional Operations Technology Assessment Committee meetings. The requirement for the use of BAST has been, for the most part, an evolutionary process whereby advances in equipment, technologies, and procedures have been integrated into OCS operations over a period of time. Awareness by both BSEE inspectors and the OCS operators of the most advanced equipment and technologies has resulted in the incorporation of these advances into day-to-day operations. An example of such an equipment change that evolved over a period of time would be the upgrading of diverter systems on drilling rigs from the smaller diameter systems of the past to the large-diameter, high-capacity systems found on drilling rigs operating on the OCS today.

Production Facilities

The BSEE regulations governing oil and gas production safety systems can be found in 30 CFR 250 Subpart H. Production safety equipment used on the OCS must be designed, installed, used, maintained, and tested in a manner to assure the safety and protection of the human, marine, and coastal environments. All tubing installations open to hydrocarbon-bearing zones below the surface must be equipped with safety devices that will shut off the flow from the well in the event of an emergency, unless the well is incapable of flowing. Surface- and subsurface-controlled safety valves and locks must conform to the requirements of 30 CFR § 250.801. All surface production facilities, including separator and treatment tanks, compressors, headers, and flowlines must be designed, installed, and maintained in a manner that provides for efficiency, safety of operations, and protection of the environment. Production facilities also have stringent requirements concerning

electrical systems, flowlines, engines, and firefighting systems. The safety-system devices are tested by the lessee at specified intervals and must be in accordance with API RP 14 C Appendix D and other measures.

A.12 PERSONNEL TRAINING AND EDUCATION

An important factor in ensuring that offshore oil and gas operations are carried out in a manner that emphasizes operational safety and minimizes the risk of environmental damage is the proper training of personnel. Under 30 CFR part 250 subpart O, BSEE has outlined well control and production safety training program requirements for lessees operating on the OCS. The goal of the regulation (30 CFR § 250.1501) is safe and responsible OCS operations. Lessees must ensure that their employees and contract personnel engaged in well control or production safety operations understand and can properly perform their duties. To accomplish this, the lessee must establish and implement a training program so that all of its employees are trained to competently perform their assigned well control and production safety duties. The lessee must also verify that its employees understand and can perform the assigned duties.

The mandatory Drilling Well-Control Training Program was instituted by this Agency in 1979. In 1983, the mandatory Safety Device Training Program was established to ensure that personnel involved in installing, inspecting, testing, and maintaining safety devices are qualified. As a preventive measure, all offshore personnel must be trained to operate oil-spill cleanup equipment, or the lessee must retain a trained contractor(s) to operate the equipment for them. In addition, BSEE offers numerous technical seminars to ensure that personnel are capable of performing their duties and are incorporating the most up-to-date safety procedures and technology in the petroleum industry.

On February 5, 1997, MMS (BOEM's predecessor) published a final rule in the *Federal Register* (1997) concerning the training of the lessee and contractor employees engaged in drilling, well completion, well workover, well servicing, or production safety system operations in the OCS. The final rule streamlined the previous regulations by 80 percent, provided the flexibility to use alternative training methods, and simplified the training options at 30 CFR part 250 subpart O. Although the rule did away with many of the onerous requirements in subpart O and served as intermediate change to the system, it did not sufficiently address development of a performance-based training system.

On August 14, 2000, MMS (BOEM's predecessor) published in the *Federal Register* (2000) final regulations revising 30 CFR part 250, subpart O, "Well Control and Production Safety Training." The MMS distributed the published final rulemaking to lessees, operators, and training schools. These new performance-based regulations took effect on October 13, 2000. To allow sufficient time for lessees to implement their training programs, the rule provided a 2-year transition period from October 13, 2000, until October 15, 2002. After October 15, 2002, all lessees were required to be in compliance with this rule.

Goal of Performance Training Rule: Safe and responsible OCS operations. Lessees must ensure their employees, including contractors, are trained to competently perform their assigned well control and production safety duties. This rule should allow companies to focus their resources on important areas in their program rather than on sending all of their personnel to the same school program on a routine basis.

Key Elements of Performance Based Training: Under this rule, schools will be free to operate but they will not receive agency approval and they will no longer be able to issue subpart O certifications. By shifting the responsibility of developing training programs to industry, lessees will have to decide upon the type of training for their employees. The BSEE will hold the lessees responsible for the success or failure of these and other training related decisions.

Lessees Training Plan: The lessees' training plan is the core item of BSEE's performance-based program. The plan, which does not have to be approved by BSEE, lays out the company's training philosophy. It must specify the type, method(s), length, frequency, and content of their program. Training requirements under this rule are limited to only well control and production operations.

Performance Indicators: The BSEE will periodically assess lessee and contractor training programs to see how well their employees are trained. To assess programs, BSEE may use one or more of the following evaluation methods: (1) audits; (2) written tests; (3) hands-on tests; and (4) employee interviews.

A.13 STRUCTURE REMOVAL AND SITE CLEARANCE

During exploration, development, and production operations, temporary and permanent equipment and structures are often required to be embedded into or placed onto the seafloor around activity areas. In compliance with Section 22 of BOEM's Oil and Gas Lease Form (BOEM-2005) and OCSLA regulations (30 CFR § 250.1710—*Wellheads/Casings* and 30 CFR § 250.1725—*Platforms and Other Facilities*), operators need to remove seafloor obstructions from their leases within 1 year of lease termination or after a structure has been deemed obsolete or unusable. These regulations also require the operator to sever bottom-founded objects and their related components at least 5 m (15 ft) below the mudline (30 CFR § 250.1716(a)—*Wellheads/Casings* and 30 CFR § 250.1728(a)—*Platforms and Other Facilities*). The severance operations are generally categorized as explosive or nonexplosive.

There are, however, possible exemptions to the 1-year deadline, including the exemptions stated in Section 388 of the Environmental Policy Act. Section 388 clarifies the Secretary's authority to allow an offshore oil and gas structure, previously permitted under the OCSLA, to remain in place after OCS oil- and gas-related activities have ceased in order to allow the use of the structure for other energy- and marine-related activities. This authority provides opportunities to extend the life of facilities for non-OCS oil- and gas-related purposes, such as research, renewable energy production, aquaculture, etc., before being removed.

This Agency previously addressed removal operations and the potential impacts of severing methodologies (nonexplosive/explosive tools) in a Programmatic EA prepared in 1987 (USDOJ, MMS, 1987). The scope of the decommissioning activities analyzed in the Programmatic EA was limited to traditional, bottom-founded structures (i.e., well protectors, caissons, and jacketed platforms) and did not address well abandonment operations; activities similar in nature, but monitored and reported according to a separate section of the OCSLA regulations. In addition, since the majority of removal operations took place in water depths >200 m (656 ft), only the shelf areas of the CPA and WPA were addressed by the proposed actions.

In response to advancements in decommissioning methodologies and regulatory requirements since the 1987 Programmatic EA was prepared, as well as the continued movement into more deepwater prospects (>200 m; 656 ft), this Agency prepared *Structure-Removal Operations on the Gulf of Mexico Outer Continental Shelf: Programmatic Environmental Assessment* (USDOJ, MMS, 2005). This Programmatic EA serves three primary needs:

- aids in the permitting, management, and planning of future structure-removal operations;
- ensures that adequate environmental reviews are conducted on all decommissioning proposals that would help support human health and safety while simultaneously protecting the sensitive marine environment; and
- serves as a reference document to implement the "tiering" objective detailed in NEPA's implementing regulations (40 CFR § 1502.20) (future, site-specific EAs may reference appropriate chapters of this Programmatic EA to reduce reiteration of issues and impacts, allowing analyses to focus on specific issues and impacts related to the removal activity).

In 1988, this Agency requested a "generic" consultation from NMFS pursuant to Section 7 of the Endangered Species Act concerning potential impacts on endangered and threatened species associated with explosive-severance activities conducted during structure-removal operations. Much like the Programmatic EA, the consultation's "generic" Biological Opinion was limited to the best scientific information available and concentrated primarily on the majority of structure removals (water depths <200 m [656 ft]). The Incidental Take Statement was therefore limited to the five species of sea turtles found on the shallow shelf. Reporting guidelines and specific mitigating measures are outlined in the Incidental Take Statement and include (1) the use of a qualified NMFS observer, (2) aerial surveys, (3) detonation delay radii, (4) nighttime blast restrictions, (5) charge staggering and grouping, and (6) possible diver survey requirements.

Emphasizing a continued need for an incentive to keep explosive weights low, this Agency formally requested that NMFS amend the 1988 Biological Opinion to establish a minimum charge size of 5 lb. The NMFS's Southeast Regional Office subsequently addressed explosive charges ≤5 lb in a separate, informal Biological Opinion. The October 2003 "de-minimus" Biological Opinion waives several mitigating measures of the "generic" 1988 Biological Opinion (i.e., aerial

observations, 48-hour pre-detonation observer coverage, onsite NOAA personnel, etc.), reduces the potential impact zone from 3,000 ft to 700 ft (914 m to 213 m) and gives the operators/severing contractors the opportunity to conduct their own observation work.

In 1989, the American Petroleum Institute petitioned NMFS under Subpart A of the Marine Mammal Protection Act regulations for the incidental take of spotted and bottlenose dolphins during structure-removal operations (i.e., for either explosive- or nonexplosive-severance activities). The Incidental Take Authorization regulations were promulgated by NMFS in October 1995 (*Federal Register*, 1995) and on April 10, 1996, the regulations were moved to subpart M (50 CFR §§ 216.141 *et seq.*). Effective for 5 years, the regulations detailed conditions, reporting requirements, and mitigating measures similar to those listed in the 1988 ESA Consultation requirements for sea turtles. After the regulations expired in November 2000, NMFS and this Agency advised operators to continue following the guidelines and mitigating measures of the lapsed subpart pending a new petition and subsequent regulations. At industry's prompting, NMFS released interim regulations in August 2002, which expired on February 2, 2004. Operators have continued to follow the interim conditions until NMFS promulgates new regulations.

After bottom-founded objects are severed and the structures are removed, operators are required to verify that the site is clear of any obstructions that may conflict with other uses of the OCS according to 30 CFR §§ 250.1740-1743. The NTL 98-26, "Minimum Interim Requirements for Site Clearance (and Verification) of Abandoned Oil and Gas Structures in the Gulf of Mexico," provides the requirements for site clearance. The lessee must develop, and submit to BOEM for approval, a procedural plan for the site clearance verification procedures. For platform and caisson locations in water depths of <91 m (300 ft), the sites must be trawled over 100 percent of the designated area in two directions (i.e., N-S and E-W). Individual well-site clearances may use high-frequency (500 kHz) sonar searches for verification. Site-clearance verification must take place within 60 days after structure-removal operations have been conducted.

A NEPA analysis, in the form of an EA or EIS, is completed for all structure removals that propose explosive severance methods and/or site clearance trawling. The Marine Protected Species NTLs' discussion below describes regulations, reporting guidelines, and specific mitigating measures developed through consultation, pursuant to section 7 of the Endangered Species Act and the Marine Mammal Protection Act, concerning potential impacts on endangered and threatened species associated with explosive severance activities conducted during the structure-removal operations. All of the current terms and conditions of structure and well-removal activities are outlined in NTL 2010-G05, "Decommissioning Guidance for Wells and Platforms," which became effective on October 15, 2010.

A.14 MARINE PROTECTED SPECIES NTLs

Four NTLs advise operators of measures designed to reduce impacts to Marine Protected Species: NTL 2012-JOINT-G02, "Implementation of Seismic Survey Mitigation Measures and Protected Species Observer Program"; NTL 2012-BSEE-G01, "Marine Trash and Debris Awareness

and Elimination”; NTL 2012-JOINT-G01, “Vessel Strike Avoidance and Injured/Dead Protected Species Reporting”; and NTL 2010-G05, “Decommissioning Guidance for Wells and Platforms”. The provisions outlined in these NTLs apply to all existing and future oil and gas operations in the Gulf of Mexico OCS.

The NTL 2012-JOINT-G02, “Implementation of Seismic Survey Mitigation Measures and Protected Species Observer Program,” provides guidance to protect marine mammals and sea turtles during seismic operations. This NTL clarifies how operators should implement seismic survey mitigating measures (including ramp-up procedures), the use of a minimum sound source, airgun testing, and protected species observation and reporting.

The NTL 2012-BSEE-G01, “Marine Trash and Debris Awareness and Elimination,” provides information on the marine trash and debris awareness training video and slide show, and both postal and email addresses for submitting annual training reports.

The NTL 2012-JOINT-G01, “Vessel Strike Avoidance and Injured/Dead Protected Species Reporting,” explains how operators must implement measures to minimize the risk of vessel strikes to protected species and report observations of injured or dead protected species.

The NTL 2010-BSEE-G05, “Decommissioning Guidance for Wells and Platforms,” provides clarification and interpretation of regulations regarding decommissioning, as well as guidance to operators proposing to use explosives to perform well/casing severance. These guidelines specify and reference mitigation, monitoring, and reporting requirements that allow explosive charges up to 500 lb, internal and external placement, and both above-mudline and below-mudline detonations.

A.15 RIGS-TO-REEFS

The BSEE is responsible for permitting the placement and eventual removal of temporary oil and gas facilities on the Federal OCS. When an OCS lease expires and/or development and production operations cease, companies are obligated to decommission and remove their facilities (30 CFR § 250.1725(a)) and clear the seabed of all obstructions (30 CFR § 250.1740). The BSEE’s Rigs-to-Reefs Policy provides a means by which lessees may request a waiver to the removal requirement. Under 30 CFR § 250.1730, BSEE may grant a departure from the 30 CFR § 250.1725(a) requirement to remove a platform. Although BSEE supports and encourages the reuse of obsolete oil and gas structures as artificial reefs and is a cooperating agency in implementing the National Artificial Reef Plan, specific requirements must be met for a departure to be granted. The BSEE may allow a departure from removal requirements (30 CFR § 250.1725(a)) and applicable lease obligations provided that

- the structure must become part of a State artificial reef program that complies with the criteria in the National Artificial Reef Plan (30 CFR § 250.1730(a));

- the responsible State agency requires a permit from the COE and must accept title and liability for the reefed structure once removal/reefing operations are concluded (30 CFR § 250.1730(a)); and
- the lessee/operator must satisfy any USCG navigational requirements for the reefed structure (30 CFR § 250.1730(b)).

All five Gulf Coast States have active artificial reef programs that develop and manage artificial reefs on the Federal OCS. Since the inception of Rigs-to Reef, over 450 decommissioned platforms have been donated and deployed as artificial reefs in the Gulf of Mexico.

A.16 REFERENCES

Federal Register. 1995. Incidental take of marine mammals; bottlenose dolphins and spotted dolphins. 60 FR 233, pp. 62243-62244. December 5, 1995.

Federal Register. 1997. Training of lessee and contractor employees engaged in oil and gas and sulphur operations in the outer continental shelf (OCS). Final rule. 62 FR 24, pp. 5320-5329. February 5, 1997.

Federal Register. 2000. Oil and gas and sulphur operations in the outer continental shelf—Subpart O—Well control and production safety training. Final rule. 65 FR 157, pp. 49485-49491. August 14, 2000.

Federal Register. 2005. Oil and gas and sulphur operations in the outer continental shelf—Plans and information. Final Rule. 70 FR 167, pp. 51478-51519. August 30, 2005.

Federal Register. 2006. Oil and gas and sulphur operations in the outer continental shelf—Incident reporting requirements. Final rule. 71 FR 73, pp. 19640-19646. April 17, 2006.

Federal Register. 2010. Oil and gas and sulphur operations in the outer continental shelf—Increased safety measures for energy development on the outer continental shelf. Interim final rule. 75 FR 198, pp. 63346-63377. October 14, 2010.

Regg, J.B., S. Atkins, B. Hauser, J. Hennessey, B. Kruse, J. Lowenhaupt, B. Smith, and A. White. 2000. Deepwater development: A reference document for the deepwater environmental assessment, Gulf of Mexico OCS (1998 through 2007). U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Report MMS 2000-015. 94 pp.

U.S. Dept. of the Interior. 2010. Increased safety measures for energy development on the outer continental shelf, May 27, 2010. U.S. Dept. of the Interior, Washington, DC. 44 pp. Internet website: <http://loe.org/images/content/100528/Increased-Safety-Measures-Report-2.pdf>.

U.S. Dept. of the Interior. Bureau of Safety and Environmental Enforcement. 2014. Annual report 2014. Internet website: http://www.bsee.gov/uploadedFiles/BSEE/BSEE_Newsroom/Publications_Library/Annual_Report/BSEE%202014%20Annual%20Report.pdf. Accessed December 2, 2015.

- U.S. Dept. of the Interior. Bureau of Safety and Environmental Enforcement. 2015. Official communication. Memorandum regarding BSEE's initiated oil spill response equipment deployments – coverage under the National Environmental Policy Act (NEPA) and the Endangered Species Act (ESA). November 18, 2015.
- U.S. Dept. of the Interior. Minerals Management Service. 1987. Programmatic environmental assessment: Structure removal activities, Central and Western Gulf of Mexico Planning Areas. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS EIS/EA MMS 87-0002. 84 pp.
- U.S. Dept. of the Interior. Minerals Management Service. 2000. Gulf of Mexico deepwater operations and activities: Environmental assessment. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS EIS/EA MMS 2000-001. 264 pp. Internet website: <http://www.boem.gov/BOEM-Newsroom/Library/Publications/2000/2000-001.aspx>.
- U.S. Dept. of the Interior. Minerals Management Service. 2004. Geological and geophysical exploration for mineral resources on the Gulf of Mexico outer continental shelf—final programmatic environmental assessment. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS EIS/EA MMS 2004-054. 466 pp.
- U.S. Dept. of the Interior. Minerals Management Service. 2005. Structure-removal operations on the outer continental shelf of the Gulf of Mexico—programmatic environmental assessment. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS EIS/EA MMS 2005-013. 333 pp.

APPENDIX B

COMMONLY APPLIED MITIGATING MEASURES

B COMMONLY APPLIED MITIGATING MEASURES

Postlease mitigating measures have been implemented for over 40 years in the Gulf of Mexico region, as they relate to OCS plans and pipeline applications. These mitigating measures have been amended over time to address changes in regulations, new technology, and new methods of operating. Many of these mitigating measures have been adopted and incorporated into regulations and/or guidelines governing OCS oil and gas exploration, development, and production activities. All plans for OCS oil- and gas-related activities (e.g., exploration and development plans, pipeline applications, geological and geophysical activities, and structure-removal applications) go through rigorous BOEM review and approval to ensure compliance with established laws and regulations. Existing mitigating measures must be incorporated and documented in plans submitted to BOEM. Operational compliance of the mitigating measures is enforced through the Bureau of Safety and Environmental Enforcement's (BSEE's) onsite inspection program.

Mitigating measures are an integral part of BOEM's program to ensure that postlease operations are always conducted in an environmentally sound manner (with an emphasis on minimizing any adverse impact of routine operations on the environment). For example, post-activity surveys are carried out to ensure that a site has been cleared of potential snags to commercial fishing gear, and pre-activity surveys seek to avoid archaeological sites and biologically sensitive areas such as pinnacles, topographic features, and chemosynthetic communities.

Some BOEM-identified mitigating measures are incorporated into OCS operations through cooperative agreements or efforts with industry and State and Federal agencies. These mitigating measures include the National Marine Fisheries Service's (NMFS's) Observer Program to protect marine mammals and sea turtles during explosive removals, labeling operational supplies to track possible sources of debris or equipment loss, development of methods of pipeline landfall to eliminate impacts to beaches or wetlands, and beach cleanup events.

Site-specific mitigating measures are also applied by BOEM during plan and permit reviews. BOEM realized that many of these site-specific mitigations were recurring and developed a list of "standard" or commonly applied mitigations. There are currently over 120 standard mitigations. The wording of a standard mitigation is developed by BOEM in advance and may be applied whenever conditions warrant. Standard mitigation text is revised as often as is necessary (e.g., to reflect changes in regulatory citations, agency/personnel contact numbers, and internal policy). Site-specific mitigation "categories" include the following: air quality; archaeological resources; artificial reef material; chemosynthetic communities; Flower Garden Banks; topographic features; hard bottoms/pinnacles; military warning areas and Eglin Water Test Areas (EWTAs); hydrogen sulfide (H₂S); drilling hazards; remotely operated vehicle surveys; geophysical survey reviews; and general safety concerns. Site-specific mitigation "types" include the following: advisories; conditions of approval; hazard survey reviews; inspection requirements; notifications; post-approval submittals; and safety precautions. In addition to standard mitigations, BOEM may also apply nonrecurring mitigating measures that are developed on a case-by-case basis.

Following a lease sale, an applicant seeks approvals to develop their lease by preparing and submitting OCS plans. The OCS plans are reviewed by BOEM and, depending on what is proposed to take place in a specific place, BOEM may assign conditions of approval (COA). The COAs become part of the approved postlease authorization and include environmental protections, requirements that maintain conformance with law, the requirements of other agencies having jurisdiction, or safety precautions.

Some of BOEM's conditions of approval include the following:

- other approvals prerequisite to BOEM's approval (e.g., the Coastal Zone Management Act);
- safety precautions (e.g., H₂S present);
- post-approval submittals (e.g., surveys and interpretive reports);
- inspection requirements (e.g., pipeline pressure testing);
- pre-deployment notifications (e.g., U.S. Department of Defense use restrictions and Military Warning Areas); and
- reduce or avoid environmental impacts on resources identified in NEPA or other laws (e.g., the National Historic Preservation Act).

BOEM is continually revising applicable mitigations to allow the Gulf of Mexico OCS Region to more easily and routinely track mitigation compliance and effectiveness. A primary focus of this effort is requiring post-approval submittal of information within a specified timeframe or after a triggering event (e.g., end of operations reports for plans, construction reports for pipelines, and removal reports for structure removals).

Table B-1 provides a list and description of standard postlease mitigating measures that may be required by BOEM or BSEE as a result of plan and permit review processes for the Gulf of Mexico OCS Region.

Table B-1. Commonly Applied or “Standard” Mitigating Measures.

Mitigation Number	Mitigating Measure Title	Description of Mitigation
0.0	Non-Recurring Mitigation	A non-recurring mitigation is a mitigating measure that is used for a unique, special, one-time-only mitigation that is added to certain plans.
Boat Traffic Mitigations		
1.04	Seismic Vessels (protected species requirements)	The applicant will comply with Notice to Lessees and Operators (NTL) 2012-JOINT-G02, “Implementation of Seismic Survey Mitigation Measures and Protected Species Observer Program.” Additionally, the applicant will comply with the guidance under this NTL when operating in all water depths (not just in water depths >200 m [656 ft] or in the Eastern Planning Area), and the NTL’s “Shut-Down Conditions” will be applied towards manatees.
1.05	Seismic Vessels (vessel-strike avoidance/reporting)	The applicant will follow the guidance provided under NTL 2012-JOINT-G01, “Vessel Strike Avoidance and Injured/Dead Protected Species Reporting.” This provides guidance on how a seismic applicant should implement monitoring programs to minimize the risk of vessel strikes to protected species and report observations of injured or dead protected species. In lieu of a formal observer program, NTL 2012-JOINT-G01 provides specific guidelines that should be followed to identify and avoid injury to marine mammals and sea turtles.
1.06	Progressive-Transport/“Hopping” (structure removals)	In accordance with the Outer Continental Shelf Lands Act (OCSLA) requirements (30 CFR § 250.1727(g)), if at any point in the decommissioning schedule progressive-transport/“hopping” activities are required to section the jacket assembly or support material barge loading, a prior written request must be submitted and approval must be obtained from the Bureau of Safety and Environmental Enforcement’s (BSEE’s) Regional Supervisor, Field Operations. The applicant’s request to use progressive-transport must include a detailed procedural narrative and separate location plat for each “set-down” site, showing pipelines, anchor patterns for the derrick barge, and any known archaeological and/or potentially sensitive biological features. The diagram/map of the route to be taken from the initial structure location along the transport path to each site must also be submitted with the request. If the block(s) that the applicant intends to use as “set-down” sites have not been surveyed as per NTL 2009-G39, “Biologically-Sensitive Underwater Features and Areas,” and NTL 2005-G07, “Archaeological Resource Surveys and Reports,” the applicant may be required to conduct the necessary surveys/reporting prior to mobilizing on site and conducting any seafloor-disturbing activities.

Table B-1. Commonly Applied or “Standard” Mitigating Measures. (continued).

Mitigation Number	Mitigating Measure Title	Description of Mitigation
1.07	Seismic Vessels (notification requirements)	In accordance with 30 CFR § 550.208(b)(2), the applicant is hereby required to notify other users of the Outer Continental Shelf (OCS) before conducting the proposed ancillary activities. Prior to commencing the survey(s), the applicant must inform the operators of all leases affected by the proposed activities of when and where the applicant intends to conduct the vessel operations to ensure that proper navigation and safety protocol are observed.
Air Quality Mitigations		
2.05	Fuel Usage or Run Time Documentation	The projected nitrogen oxides (NO _x) emissions amounts in the plan were calculated using historic (insert fuel consumption rates, run times). Maintain monthly records of the total annual (insert fuel consumption, run times) for the (specify the affected vessels or equipment) with a limit of (insert limit in gallons/year, limit in hours/year) and provide the information to the Bureau of Ocean Energy Management’s (BOEM’s) Regional Supervisor, Office of Leasing and Plans, Plans Section annually by February 1st of each year, beginning in the year (insert year). If no activities were conducted during a calendar year, provide a statement to that effect in lieu of the required records. If at any time during the applicant’s activities these records indicate that the NO _x annual emissions may exceed the annual limit approved in your plan or the total annual (insert fuel consumption, run time) limit, the applicant must immediately prepare a revised plan pursuant to 30 CFR § 550.283 to include the recalculated emissions amounts. The applicant will not proceed with the actions that could cause the potential annual increase in emissions until the revised plan has been submitted to and approved by BOEM.
2.08	Potential to Exceed SO ₂ Significance Levels (flaring)	Should hydrogen sulfide (H ₂ S) concentrations greater than (insert number) ppm be encountered, the 3- and 24-hour sulphur oxides (SO ₂) onshore ambient air concentration significance levels as prescribed by 30 CFR § 550.303(e) could be exceeded during the proposed well test flaring. Therefore, the applicant is advised that, should H ₂ S concentrations greater than (insert number) ppm be encountered, they shall use the graph included in their plan to determine the maximum allowable flow rate for the flaring operation. The applicant is responsible for ensuring that their maximum emission concentrations remain below the aforementioned significance levels. In accordance with 30 CFR § 250.1164(c), the applicant is hereby required to submit monthly reports that contain the following: (1) the daily volume and duration (number of hours) of each flaring episode; (2) the H ₂ S concentration (ppm) in the flared gas; and (3) the calculated amount of SO ₂ emitted.

Table B-1. Commonly Applied or “Standard” Mitigating Measures. (continued).

Mitigation Number	Mitigating Measure Title	Description of Mitigation
2.11	Using Ultra-Low Sulfur Content Fuel	As proposed, use ultra-low sulfur content diesel fuel (sulfur concentration 0.0015% or less by weight) while conducting these operations. Sulfur content records must be maintained on the platform and made available to authorized BSEE personnel upon request.
2.12	Verification of Emissions Factors (clean burn engines)	<p>The rating, manufacturer, and type of engine(s) proposed in the applicant’s plan will be operated and maintained in accordance with the manufacturer’s specifications. Using a U.S. Environmental Protection Agency (USEPA)-approved or equivalent method, perform an emissions stack test on the subject engine(s) within 60 days following installation and at least every 3 years thereafter. These tests will be performed at loads representing 25, 50, 75, and 100 percent of the rated capacity or at minimum, average, and highest operational loads to verify that the emission factors are not exceeding those used in calculating the proposed emissions in the plan.</p> <p>Prepare a report of the results of each stack test and submit it to BOEM’s Regional Supervisor, Office of Leasing and Plans, Plans Section within 45 days of the test. During engine operation, the applicant will maintain the baseline parameters (such as air-fuel ratios) established during the most recent successful stack test. The applicant must monitor and record these parameters daily to ensure consistency with those observed during the most recent successful stack test. Records of these parameters must be maintained on the platform and made available to authorized BSEE personnel upon request. In addition, the applicant must submit this information to BOEM’s Regional Supervisor, Office of Leasing and Plans, Plans Section annually by February 1st of each year, beginning in the year (insert year). If no activities were conducted during a calendar year, provide a statement to that effect in lieu of the required records.</p>
2.13	Monitoring of NO _x Emissions (catalytic converters)	The rating, manufacturer, and type, and catalytic converter(s) proposed in the plan must be operated and maintained in accordance with the manufacturer’s specifications. Using a USEPA-approved or equivalent method, perform an emissions stack test on the subject engine(s) and catalytic converter(s) within 60 days following installation and at least every 3 years thereafter. These tests will be performed at loads representing 25, 50, 75, and 100 percent of the rated capacity or at minimum, average, and highest operational loads to verify that the emissions factors are not exceeding those used in calculating the proposed emissions in the plan. The applicant must contact BSEE at least 30 days prior to conducting the test to determine proper protocol for the stack test and also to have BSEE’s representative witness the test. Prepare a report of the results of each stack test and submit it to BOEM’s Regional Supervisor, Office of Leasing and Plans, Plans Section within 45 days of the test.

Table B-1. Commonly Applied or “Standard” Mitigating Measures. (continued).

Mitigation Number	Mitigating Measure Title	Description of Mitigation
		<p>During operation, the applicant will maintain the baseline parameters, such as air-fuel ratios for the engine(s) and the pressure drop and temperature increase across the catalytic converter(s) established during the most recent successful stack test. The applicant must monitor and record these parameters daily to ensure they remain consistent with those observed during the most recent successful stack test. The records of these parameters will be maintained on the platform and made available to authorized BSEE personnel upon request. In addition, the applicant must submit this information to BOEM’s Regional Supervisor, Office of Leasing and Plans, Plans Section annually by February 1st of each year, beginning in the year (insert year). If no activities were conducted during a calendar year, the applicant must provide a statement to that effect in lieu of the required records.</p>
2.15	Sulfur Recovery Unit, Flaring Episodes, Production Curtailment	<p>If a shutdown of the sulfur recovery unit necessitates diverting the acid gas stream and if the resulting increased emissions would cause the SO₂ onshore ambient air concentration significance levels as prescribed by 30 CFR § 550.303(e) to be exceeded, begin curtailing production within 6 hours of the onset of the increased emissions. If curtailment is necessary, the appropriate reduced production rate will be reached no later than 8 hours from the onset of the increased emissions and will continue until such time that normal operation of the sulfur recovery unit can resume.</p>
2.16	Monitoring of SO ₂ Emissions (sulfur recovery units)	<p>The amine unit and the (specify name of sulfur recovery unit) proposed in the plan must be operated and maintained in accordance with the manufacturer’s specifications. Using a USEPA-approved or equivalent method, perform an emissions stack test on the subject sulfur recovery unit within 60 days following installation. This test will be performed at loads representing 25, 50, 75, and 100 percent of the rated capacity of the amine unit or at minimum, average, and highest operational loads of the amine unit to verify that the emission factors are not exceeding those used in calculating the proposed emissions in the plan. Contact BSEE’s Environmental Enforcement Division at least 30 days prior to conducting the test to determine proper protocol for the stack test and also to have BSEE’s representative witness the test. Prepare a report of the results of each stack test and submit it to BOEM’s Regional Supervisor, Office of Leasing and Plans, Plans Section within 45 days of the test.</p> <p>The applicant must monitor and record these parameters daily to ensure they remain consistent with the approved baseline parameters from the most recent successful stack test. Records of these parameters must be maintained on the platform and made available to authorized BSEE personnel upon request. In addition, the applicant must</p>

Table B-1. Commonly Applied or “Standard” Mitigating Measures. (continued).

Mitigation Number	Mitigating Measure Title	Description of Mitigation
		submit this information to BOEM’s Regional Supervisor, Office of Leasing and Plans, Plans Section annually by February 1st of each year, beginning in the year (insert year). If no activities were conducted during a calendar year, provide a statement to that effect in lieu of the required records.
2.17	Verification of Emissions Factors (general)	<p>The rating, manufacturer, and type of engine(s) proposed in the plan will be operated and maintained in accordance with the manufacturer’s specifications. Using a USEPA-approved or equivalent method, perform an emissions stack test on the subject engine(s) within 60 days following installation and at least every 3 years thereafter. These tests will be performed at loads representing 25, 50, 75, and 100 percent of the rated capacity or at minimum, average, and highest operational loads to verify that the emission factors are not exceeding those used in calculating the proposed emissions in the plan. Contact BSEE’s Environmental Enforcement Division at least 30 days prior to conducting the test to determine proper protocol for the stack test and also to have the BSEE representative witness the test.</p> <p>Prepare a report of the results of each stack test and submit it to BOEM’s Regional Supervisor, Office of Leasing and Plans, Plans Section within 45 days of the test. During engine operation, the applicant will maintain the baseline parameters (such as air-fuel ratios) established during the most recent successful stack test. The applicant must monitor and record these parameters daily to ensure consistency with those observed during the most recent successful stack test. Records of these parameters must be maintained on the platform and made available to authorized BSEE personnel upon request. In addition, the applicant must submit this information to BOEM’s Regional Supervisor, Office of Leasing and Plans, Plans Section annually by February 1st of each year, beginning in the year (insert year). If no activities were conducted during a calendar year, provide a statement to that effect in lieu of the required records.</p>
2.18	Alternative Monitoring of NO _x Emissions (catalytic converters)	<p>Using your established baseline parameters listed below, monitor the performance of the engine(s) and catalytic converter(s) and record daily to ensure that performance remains consistent. Air to fuel ratio for engine: (insert baseline parameters); pressure drop across catalytic converter: (insert baseline parameters); and temperature increase across catalytic converter: (insert baseline parameters).</p> <p>Records of these parameters must be maintained on the platform and made available to authorized BSEE personnel upon request. In addition, the applicant must submit a summary of these data to BOEM’s Regional Supervisor, Office of Leasing and Plans,</p>

Table B-1. Commonly Applied or “Standard” Mitigating Measures. (continued).

Mitigation Number	Mitigating Measure Title	Description of Mitigation
		Plans Section annually by February 1st of each year, beginning in the year (insert year). The summary will report minimum, average, and maximum values for the above-listed parameters, on a monthly basis, for the year. If no activities were conducted during a calendar year, provide a statement to that effect in lieu of the required records. Notify BOEM's Regional Supervisor, Office of Leasing and Plans, Plans Section as soon as practical but no later than 24 hours after the event, whenever the engine(s) or catalytic converter(s) exceed these parameters for periods greater than a day. File a detailed report with this office within 5 days of the termination of any such event. At a minimum, this report will include a chronology of the event, NO _x emissions rates in pounds per hour, total NO _x emissions for the duration of the event, and any measures taken to regain operation within these parameters or to prevent a recurrence of similar events. If exceeding the above parameters results in increased emissions that would cause onshore NO _x concentration to exceed BOEM significance levels (30 CFR § 550.303(e)), curtail the use of the (identify equipment associated with catalytic converter) within 2 days of the onset of the increased emissions and continue curtailment until such time that normal operation of the catalytic converter can resume.
Archaeology Mitigations		
3.00	Archaeology Non-Recurring Mitigation	A non-recurring mitigation is a mitigating measure that is used for a unique, special, one-time-only mitigation that is added to certain plans.
3.02	Buried Channels (pipeline applications)	BOEM's review indicates that the proposed activities are in the vicinity of buried channel margin features that may contain significant archaeological resources. In accordance with 30 CFR § 250.1007(a)(5), the applicant must either (1) conduct an underwater archaeological investigation (diver and/or remotely operated vehicle (ROV) investigations) prior to commencing activities to determine whether these features represent archaeological resources or (2) ensure that the depth of the pipeline trench in the vicinity of these features does not exceed 3 ft and that all other seafloor-disturbing actions resulting from the proposed activities avoid the subject channel margins (see the enclosed map depicting the avoidance area in the application). If the applicant conducts an underwater archaeological investigation prior to commencing operations, the applicant should contact BOEMs' Office of Environment and BSEE's Environmental Enforcement Branch at least 2 weeks prior to performing operations to obtain the investigation methodology. If the applicant chooses to avoid the features, then the applicant should submit anchor position plats, at a scale of 1 in = 1,000 ft with differential global positioning system (DGPS) accuracy, with your pipeline construction report required by 30 CFR § 250.1008(b). These plats must depict the “as-placed” location of all anchors, anchor

Table B-1. Commonly Applied or “Standard” Mitigating Measures. (continued).

Mitigation Number	Mitigating Measure Title	Description of Mitigation
		chains, wire ropes, and cables on the seafloor (including sweep) and demonstrate that the features were not physically impacted by the construction activities. If the applicant chooses to avoid the features and no anchoring activities were conducted during pipeline construction, provide a statement to that effect in lieu of the required anchor position plats. This mitigation may be applied by BSEE at the post-approval stage.
3.03	Buried Channels (plans)	<p>BOEM’s review indicates that the proposed activities are in the vicinity of buried channel margin features that may contain significant archaeological resources. In accordance with 30 CFR § 550.194, the applicant must either (1) conduct an underwater archaeological investigation (diver and/or ROV investigations) prior to commencing activities to determine whether these features represent archaeological resources or (2) ensure that all seafloor-disturbing actions resulting from the proposed activities avoid the subject features (see the enclosed map depicting the avoidance area in the application). If the applicant conducts an underwater archaeological investigation prior to commencing operations, contact BOEM’s Office of Environment least 2 weeks prior to performing operations to obtain the investigation methodology.</p> <p>If the applicant chooses to avoid the features, then submit an as-built map at a scale of 1 in = 1,000 ft with DGPS accuracy, showing the location of all seafloor disturbances (e.g., the rig or platform, anchors, anchor chains, wire ropes, cables, etc.) relative to these features, to BOEM’s Regional Supervisor, Office of Leasing and Plans, Plans Section at the same time that the applicant submits its (specify submittal type).</p>
3.04 and 3.05	<p>Magnetic Anomalies and/or Side-Scan Sonar Targets (pipeline applications - multiple features)</p> <p>Magnetic Anomalies and/or Side-Scan Sonar Targets (pipeline application – singular feature)</p>	BOEM’s review indicates that the proposed activities are in the vicinity of the unidentified (insert magnetic anomalies, side-scan sonar targets, magnetic anomalies and side-scan sonar targets) listed in the enclosure, features that may represent significant archaeological resources. In accordance with 30 CFR § 250.1007(a)(5), the applicant must either (1) conduct an underwater archaeological investigation (diver and/or ROV investigations) prior to commencing activities to determine whether these features represent archaeological resources or (2) ensure that all seafloor-disturbing actions resulting from the proposed activities avoid the unidentified features by a distance greater than that listed in the enclosure. If the applicant conducts an underwater archaeological investigation prior to commencing operations, then the applicant must contact BOEM’s Office of Environment at least 2 weeks prior to performing operations to obtain the investigation methodology. If the applicant chooses to avoid the features, then submit anchor position plats, at a scale of 1 in = 1,000 ft with DGPS accuracy, with the pipeline construction report required by 30 CFR § 250.1008(b). These plats must depict the “as-

Table B-1. Commonly Applied or “Standard” Mitigating Measures. (continued).

Mitigation Number	Mitigating Measure Title	Description of Mitigation
		placed” location of all anchors, anchor chains, wire ropes, and cables on the seafloor (including sweep) and demonstrate that the features were not physically impacted by the construction activities. If the applicant chooses to avoid the features and no anchoring activities were conducted during pipeline construction, then provide a statement to that effect in lieu of the required anchor position plats. This mitigation may be applied by BSEE at the post-approval stage.
3.06 and 3.07	Magnetic Anomalies and/or Side-Scan Sonar Targets (plans – multiple features) Magnetic Anomalies and/or Side-Scan Sonar Targets (plans – singular feature)	BOEM’s review indicates that the proposed activities are in the vicinity of the unidentified (insert magnetic anomalies, side-scan sonar targets, magnetic anomalies and side-scan sonar targets) listed in the enclosure of the application, features that may represent significant archaeological resources. In accordance with 30 CFR § 550.194, the applicant must either (1) conduct an underwater archaeological investigation (diver and/or ROV investigations) prior to commencing the activities to determine whether these features represent archaeological resources or (2) ensure that all seafloor-disturbing actions resulting from the proposed activities avoid the subject features by a distance greater than that listed in the enclosure of the application. If the applicant conducts an underwater archaeological investigation, then the applicant must contact BOEM’s Office of Environment at least 2 weeks prior to performing operations to obtain the investigation methodology. If the applicant chooses to avoid the features, submit an as-built map at a scale of 1 in = 1,000 ft with DGPS accuracy, showing the location of all seafloor disturbances (e.g., the rig or platform, anchors, anchor chains, wire ropes, cables, etc.) relative to these features to BOEM’s Regional Supervisor, Office of Leasing and Plans, Plans Section at the same time the applicant submits the plan.
3.08	Buried Channels (lease block survey review)	BOEM’s review of the archaeological assessment indicates that there are buried channel margin features that may contain significant archaeological resources in the lease block(s). The enclosed map in the application identifies the areas to be avoided during any future development within the block(s). In accordance with 30 CFR § 550.194, the applicant must either (1) conduct an underwater archeological investigation (diver and/or ROV investigations) to determine whether these features represent archaeological resources or (2) ensure that all seafloor-disturbing actions required by future exploration or development will avoid the subject features. If the applicant chooses to conduct an underwater archaeological investigation, then the applicant must contact BOEM’s Office of Environment at least 2 weeks prior to performing operations to obtain the investigation methodology.

Table B-1. Commonly Applied or “Standard” Mitigating Measures. (continued).

Mitigation Number	Mitigating Measure Title	Description of Mitigation
3.09 and 3.10	<p>Magnetic Anomaly and/or Side-Scan Sonar Target (survey review – single feature)</p> <p>Magnetic Anomaly and/or Side-Scan Sonar Target (survey review – multiple features)</p>	<p>BOEM’s review of the archaeological assessment indicates the presence of the unidentified magnetic anomaly(ies), side-scan sonar target(s), or magnetic anomaly(ies) and side-scan sonar target(s) listed in the enclosure of the application, features that may represent significant archaeological resources. In accordance with 30 CFR § 550.194, the applicant must either (1) conduct an underwater archaeological investigation (diver and/or ROV investigations) to determine whether these features represent archaeological resources or (2) ensure that all seafloor-disturbing actions required by future exploration and development avoid the unidentified features by a distance greater than that listed in the enclosure of the application. If the applicant conducts an underwater archaeological investigation, then the applicant must contact BOEM’s Office of Environment at least 2 weeks prior to performing operations to obtain the investigation methodology.</p>
3.11	Unsurveyed Area (plans)	<p>Avoid impacts to the seafloor in the unsurveyed area approximately (insert number) feet to the (insert direction) of the proposed (specify Well X, Wells X and Y, Platform X, etc.). This area has been identified as requiring a (insert 50-meter or 300-meter) line spacing archaeological resource survey to determine the potential for archaeological resources. BOEM has no archaeological resource assessment on file for this area and, therefore, cannot determine the potential effects to archaeological resources outside of the applicant’s survey coverage. Submit an as-built map at a scale of 1 in = 1,000 ft with DGPS accuracy, showing the location of all seafloor disturbances (e.g., the rig or platform, anchors, anchor chains, wire ropes, cables, etc.) relative to the unsurveyed area to BOEM’s Regional Supervisor, Office of Leasing and Plans, Plans Section at the same time the applicant submits the plan.</p>
3.12 and 3.13	<p>Magnetic Anomalies and/or Side-Scan Sonar Targets (structure removals – multiple features)</p> <p>Magnetic Anomalies and/or Side-Scan Sonar Targets (structure removals – single feature)</p>	<p>BOEM’s review indicates that the proposed activities are in the vicinity of the unidentified magnetic anomaly(ies), side-scan sonar target(s), or magnetic anomaly(ies) and side-scan sonar target(s) listed in the table in the application, a feature that may represent a significant archaeological resource. In accordance with 30 CFR § 250.194(c), the applicant must either (1) conduct an underwater archaeological investigation (diver and/or ROV investigations) prior to commencing activities to determine whether this feature represents an archaeological resource or (2) ensure that all anchoring operations (e.g., anchors, anchor chains, wire ropes, cables, etc.) avoid the unidentified feature by a distance greater than that listed in the table in the application. If the applicant plans to conduct an underwater archaeological investigation prior to commencing operations, then the applicant must contact BOEM’s Office of Environment to obtain the investigation methodology at least 2 weeks prior to performing operations and contact BOEM’s Office of Environment and BSEE’s Environmental Enforcement Branch. If the applicant chooses to</p>

Table B-1. Commonly Applied or “Standard” Mitigating Measures. (continued).

Mitigation Number	Mitigating Measure Title	Description of Mitigation
		avoid the feature, then include in the post-removal report as-built plats, at a scale of 1 in = 1,000 ft with DGPS accuracy, the position of anchors, anchor chains, wire ropes, and cables deployed during the structure removal relative to the feature. In addition, supply a copy of ALL vessel logs related to the removal operations (e.g., anchor handling vessels, lift boats, dive vessels, and tug boats). This mitigation may be applied by BSEE at the post-approval stage.
3.16	ROV Surveys (plans)	The proposed operations are in an area designated by BOEM's Regional Director as having a high potential for the location of historic shipwrecks. In accordance with 30 CFR § 550.194(a)(2), prior to commencing the operations, conduct an ROV investigation (using video, sector-scanning sonar, or multibeam bathymetry) of the seafloor areas that could be disturbed by the operations (e.g., the rig or platform, anchors, anchor chains, wire ropes, cables, etc.) to ensure that the applicant will avoid harming potentially significant archaeological sites. The applicant must contact BOEM's Office of Environment at least 2 weeks prior to performing operations to obtain the investigation methodology. The applicant must submit a report of this investigation prepared by a qualified marine archaeologist, along with an “as-placed” anchor plat and copies of the ROV video and acoustic recordings of the investigation to BOEM's Regional Supervisor, Office of Leasing and Plans, Plans Section at the same time the applicant submits the plan. If the applicant discovers any potential archaeological resource (i.e., cannot be definitively identified as modern debris or refuse) while conducting this investigation or future operations, the applicant must immediately halt any seafloor-disturbing activities and report the discovery to BOEM's Regional Supervisor, Office of Environment.
3.17	Conditional Approval for ROV Surveys (plans)	Drilling permits will not be issued for proposed well(s) and well name(s) until the applicant submits an archaeological report to BOEM's Regional Supervisor, Office of Leasing and Plans, Plans Section and receives approval. This report must be based on an ROV investigation (using video, sector-scanning sonar, or multibeam bathymetry) of the seafloor areas that could be disturbed by the operations. The report must be prepared by a qualified marine archaeologist and must include copies of the ROV video and acoustic recordings of the investigation, along with an “as-placed” anchor plat. If the applicant discovers any potential archaeological resource (i.e., cannot be definitively identified as modern debris or refuse) while conducting this investigation, the applicant must immediately halt any seafloor-disturbing activities and report the discovery to BOEM's Regional Supervisor, Office of Environment. The applicant must contact BOEM's Office of Environment at least 2 weeks prior to performing this survey to obtain the investigation methodology.

Table B-1. Commonly Applied or “Standard” Mitigating Measures. (continued).

Mitigation Number	Mitigating Measure Title	Description of Mitigation
3.18	Buried Channels (structure removal)	BOEM’s review indicates that the proposed activities are in the vicinity of buried channel margin features that may contain significant archaeological resources. In accordance with 30 CFR § 250.194(c), the applicant must either (1) conduct an underwater archaeological investigation (diver and/or ROV investigations) prior to commencing activities to determine whether these features represent archaeological resources or (2) ensure that all seafloor-disturbing actions resulting from the proposed activities (e.g., site-clearance trawling, anchors, anchor chains, wire ropes, cables, etc.) avoid the subject features (see the enclosed map depicting the avoidance area in the application). If the applicant plans to conduct an underwater archaeological investigation prior to commencing operations, then the applicant must contact BOEM’s Office of Environment at least 2 weeks prior to performing operations to obtain the investigation methodology and contact BOEM’s, Office of Environment and BSEE’s Environmental Enforcement Branch. If the applicant chooses to avoid the features, then include in the post-removal report as-built plats, at a scale of 1 in = 1,000 ft with DGPS accuracy, the position of anchors, anchor chains, wire ropes, and cables deployed during the structure removal relative to these features. In addition, supply a copy of ALL vessel logs related to the removal operations (e.g., anchor handling vessels, lift boats, dive vessels, and tug boats). This mitigation may be applied by BSEE at the post-approval stage.
3.20	Avoidance of Potential Archaeological Resources	BOEM’s review indicates that the proposed operations have the potential to impact submerged archaeological resources that could be in the area of potential effect, which encompasses all portions of the seafloor where bottom-disturbing activities are to occur. Before conducting any authorized, bottom-disturbing activities, the company will follow the guidance provided at http://www.boem.gov/Environmental-Stewardship/Archaeology/Gulf-of-Mexico-Archaeological-Information.aspx , which includes minimum survey recommendations, requisite certification submittals, and post-activity reporting standards needed to ensure compliance with the regulations under 30 CFR § 550.194. This mitigation may be applied by BSEE at the post-approval stage.
3.21 and 3.22	Side-Scan Sonar Targets (site clearance – single features) Side-Scan Sonar Targets (site clearance – multiple features)	BOEM’s review indicates that the proposed activities are in the vicinity of the unidentified side-scan sonar target(s) listed in the table in the application, features that may represent significant archaeological resources. In accordance with 30 CFR § 250.194(c), the applicant must conduct an underwater archaeological investigation (diver and/or ROV investigation) under the supervision of a professional archaeologist to determine whether these features represent archaeological resources potentially eligible to the National Register of Historic Places prior to conducting site-clearance trawling activities. This mitigation may be applied by BSEE at the post-approval stage.

Table B-1. Commonly Applied or “Standard” Mitigating Measures. (continued).

Mitigation Number	Mitigating Measure Title	Description of Mitigation
3.23	Protection of Potential Archaeological Resources (all structure removals)	Per 30 CFR § 250.194(c) and clarified in 2005-G07, if, during site-clearance operations the applicant discovers any object of potential archaeological significance, the applicant is required to immediately halt operations. In addition, the applicant must immediately report this discovery to BSEE’s Environmental Enforcement Branch. Additional guidance will be provided to the applicant as to what steps will be needed to protect any potentially submerged archaeological resources. In order for BSEE to ensure compliance with 30 CFR § 250.194(c) and as specified under 30 CFR § 250.1743, the applicant is required to provide the trawling logs for both heavy-duty nets and verification nets, with descriptions of each item recovered. Should the applicant only pull site-clearance verification nets, the applicant must clearly state this within the body of the Site-Clearance Report. The applicant is also requested to provide the following as an appendix in the Site-Clearance Report: a CD or DVD of all digital photographs of the items recovered during the use of both the heavy-duty trawl nets and the site-clearance verification trawl nets. This mitigation may be applied by BSEE at the post-approval stage.
Artificial Reef Material Mitigations		
4.01	Louisiana (artificial reef area)	<p>The proposed anchoring operations are located within 500 ft (152 m) of an artificial reef permit area established by the State of Louisiana. At least 2 weeks prior to conducting anchoring operations (including the use of anchors, anchor chains, and wire ropes) that could disturb the seafloor within 500 ft (152 m) of an artificial reef permit area, the applicant must contact the Louisiana Artificial Reef Coordinator to ensure that the proposed anchoring operations do not damage reefal material. Prior to conducting anchoring operations, the applicant must send an email to BSEE’s Environmental Enforcement Branch confirming that the Louisiana Artificial Reef Coordinator has been contacted.</p> <p>If the anchoring operations intersect or cross-over the artificial reef permit area, then submit anchor position plats, at a scale of 1 in = 1,000 ft with DGPS accuracy, depicting the “as-placed” location of all anchors, anchor chains, wire ropes, and cables (including sweep if applicable) on the seafloor relative to the reefal material. For plans, submit the plats to BOEM’s Regional Supervisor, Office of Leasing and Plans, Plans Section at the same time the applicant submits the End of Operations Report (Form BSEE-0125) to the appropriate BSEE, Gulf of Mexico OCS Region, District Office and/or notification of platform installation date and final as-built location data as directed in 30 CFR § 250.900(e). For pipelines, submit the plats with the pipeline construction report required by 30 CFR § 250.1008(b). For structure removals, submit the plats with the post-removal</p>

Table B-1. Commonly Applied or “Standard” Mitigating Measures. (continued).

Mitigation Number	Mitigating Measure Title	Description of Mitigation
		report. This mitigation may be applied by BSEE at the post-approval stage.
4.02	Texas (artificial reef general permit area)	The proposed operations are located within an artificial reef General Permit Area established by the State of Texas. At least 2 weeks prior to conducting operations (including the use of anchors, anchor chains, and wire ropes) that could disturb the seafloor within the artificial reef General Permit Area, contact the Texas Artificial Reef Coordinator to ensure that the proposed operations do not damage reefal material. Prior to conducting operations, the applicant must send an email to BSEE’s Environmental Enforcement Branch confirming that the Texas Artificial Reef Coordinator has been contacted. This mitigation may be applied by BSEE at the post-approval stage.
4.021	Texas (artificial reef permit area – anchoring)	<p>The proposed anchoring operations are located within 1,000 ft (305 m) of an artificial reef permit area established by the State of Texas. At least 2 weeks prior to conducting anchoring operations (including the use of anchors, anchor chains, and wire ropes) that could disturb the seafloor within 1,000 ft (305 m) of the artificial reef permit area, contact the Texas Artificial Reef Coordinator to ensure that the proposed anchoring operations do not damage reefal material. Prior to conducting anchoring operations, the applicant must send an email to BSEE’s Environmental Enforcement Branch confirming that the Texas Artificial Reef Coordinator has been contacted.</p> <p>If the anchoring operations intersect or cross-over the artificial reef permit area, submit anchor position plats, at a scale of 1 in = 1,000 ft with DGPS accuracy, depicting the “as-placed” location of all anchors, anchor chains, wire ropes, and cables (including sweep if applicable) on the seafloor relative to the reefal material. For plans, submit the plats to BOEM’s Regional Supervisor, Office of Leasing and Plans, Plans Section at the same time the applicant submits the End of Operations Report (Form BSEE-0125) to the appropriate BSEE, Gulf of Mexico OCS Region, District Office and/or notification of platform installation date and final as-built location data as directed in 30 CFR § 250.900(e). For pipelines, submit the plats with the pipeline construction report required by 30 CFR § 250.1008(b). For structure removals, submit the plats with the post-removal report. This mitigation may be applied by BSEE at the post-approval stage.</p>
4.03	Mississippi (artificial reef area)	The proposed anchoring operations are located within 500 ft (152 m) of an artificial reef permit area established by the State of Mississippi. At least 2 weeks prior to conducting anchoring operations (including the use of anchors, anchor chains, and wire ropes) that could disturb the seafloor within 500 ft (152 m) of an artificial reef structure or an artificial reef permit area, contact the Mississippi Artificial Reef Coordinator to ensure that the proposed anchoring operations do not damage reefal material. Prior to conducting

Table B-1. Commonly Applied or “Standard” Mitigating Measures. (continued).

Mitigation Number	Mitigating Measure Title	Description of Mitigation
		anchoring operations, the applicant must send an email to BSEE’s Environmental Enforcement Branch confirming that the Mississippi Artificial Reef Coordinator has been contacted. This mitigation may be applied by BSEE at the post-approval stage.
4.04	Alabama (artificial reef general permit area)	The proposed operations are in a General Permit Area established by the State of Alabama for the placement of artificial reef material. At least 2 weeks prior to conducting operations, contact the Alabama Artificial Reef Coordinator to ensure that the proposed operations do not damage reefal material. Prior to conducting operations, the applicant must send an email to BSEE’s Environmental Enforcement Branch confirming that the Alabama Artificial Reef Coordinator has been contacted. This mitigation may be applied by BSEE at the post-approval stage.
4.05	Florida (artificial reef general permit area)	The proposed operations are in a General Permit Area established by the State of Florida for the placement of artificial reef material. At least 2 weeks prior to conducting operations, contact the Florida Artificial Reef Coordinator to ensure that the proposed operations do not damage reefal material. Prior to conducting operations, the applicant must send an email to BSEE’s Environmental Enforcement Branch confirming that the Florida Artificial Reef Coordinator has been contacted. This mitigation may be applied by BSEE at the post-approval stage.
4.06	Post-Reefing Survey Requirements	BOEM’s review indicates that the structure proposed for decommissioning will be abandoned-in-place as an artificial reef under the Rigs-to-Reefs Program. In order to verify compliance with OCSLA reefing (30 CFR § 250.1727(g)) and obstruction clearance requirements (30 CFR § 250.1740(a)(2)), the applicant is required to conduct a high-resolution sonar survey (500 kHz or greater) of the permitted reefal material. The applicant must design the line spacing (for side-scan) or sonar drops (for sector-scanning) and the display range to ensure that 100 percent of the material permitted under this action is covered and that it is demonstrated that the associated seabed is clear of all obstructions apart from the reefal material. The applicant is required to submit the sonar data/survey report to BSEE’s Environmental Enforcement Branch at the same time as the post-removal report. This mitigation may be applied by BSEE at the post-approval stage.
Chemosynthetic Communities Mitigations		
5.00	Chemosynthetic Communities Non-Recurring Mitigation	A non-recurring mitigation is a mitigating measure that is used for a unique, special, one-time-only mitigation that is added to certain plans.
5.01	Anchor Positioning (GPS) (plans)	The proposed activities are in the vicinity of areas that could support high-density deepwater benthic communities. Use a state-of-the-art positioning system (e.g., DGPS) on the anchor handling vessel to ensure that any seafloor disturbance resulting from the

Table B-1. Commonly Applied or “Standard” Mitigating Measures. (continued).

Mitigation Number	Mitigating Measure Title	Description of Mitigation
		use of anchors (including that caused by the anchors, anchor chains, and wire ropes) does not occur within 250 ft (76 m) of such areas (see the enclosed map/Map xxx [specify map by name], submitted with the survey report, which depicts the areas). Submit plats for Well(s) (insert number[s] or name[s]), which depict the “as-placed” location of all anchors and any associated anchor chains and wire ropes on the seafloor, at a scale of 1 in = 1,000 ft with DGPS accuracy, to BOEM’s Regional Supervisor, Office of Leasing and Plans, Plans Section at the same time the applicant submits the End of Operations Report (Form BSEE-0125) to the appropriate BSEE, Gulf of Mexico OCS Region, District Office to demonstrate that the features were not physically impacted by these anchoring activities. This mitigation may be applied by BSEE at the post-approval stage.
5.02	Conventional Pipeline Laying Vessels (GPS) (pipeline applications)	The proposed pipeline construction activities are in the vicinity of areas that could support high-density deepwater benthic communities. Use a state-of-the-art positioning system (e.g., DGPS) on the pipeline laying vessel and the anchor handling vessels to ensure that any seafloor disturbance (including that caused by anchors, anchor chains, and wire ropes) during pipeline construction activities does not occur within 250 ft (76 m) of such areas (see the enclosed map/Map xxx [specify map by name], submitted with the pipeline application, which depicts the areas). Additionally, include lay barge anchor position plats, at a scale of 1 in = 1,000 ft with DGPS accuracy, with the pipeline construction report required by 30 CFR § 250.1008(b), which depict the “as-placed” location of all anchors, anchor chains, and wire ropes on the seafloor and which demonstrate that the features were not physically impacted by the construction activities. This mitigation may be applied by BSEE at the post-approval stage.
5.03	Anchor Positioning (ROV) (plans)	The proposed activities are in the vicinity of areas that could support high-density deepwater benthic communities. Use an ROV to ensure that any seafloor disturbance resulting from the use of anchors (including that caused by the anchors, anchor chains, and wire ropes) does not occur within 250 ft (76 m) of such areas (see the enclosed map/Map xxx [specify map by name], submitted with your survey report which depicts the areas). Submit plats for Well(s) (insert number[s] or name[s]), which depict the “as-placed” location of all anchors and any associated anchor chains and wire ropes on the seafloor, at a scale of 1 in = 1,000 ft with DGPS accuracy, along with the high-resolution ROV video on disc or removable drive, to BOEM’s Regional Supervisor, Office of Leasing and Plans, Plans Section at the same time the applicant submits the End of Operations Report (Form BSEE-0125) to the appropriate BSEE, Gulf of Mexico OCS Region, District Office to demonstrate that the features were not physically impacted by these anchoring activities. The ROV video screen should show time, date, depth,

Table B-1. Commonly Applied or “Standard” Mitigating Measures. (continued).

Mitigation Number	Mitigating Measure Title	Description of Mitigation
		heading, and location coordinates. Observational notes and a corresponding map showing the ROV heading shall also be provided. If still images are collected, include the same information in the images’ integrated data. This mitigation may be applied by BSEE at the post-approval stage.
5.04	Conventional Pipeline Laying Vessels (ROV) (pipeline applications)	The proposed pipeline construction activities are in the vicinity of areas that could support high-density deepwater benthic communities. Use an ROV to ensure that any seafloor disturbance (including that caused by the anchors, anchor chains, and wire ropes) during pipeline construction activities does not occur within 250 ft of such areas (see the enclosed map/Map “xxx” [specify map by name], submitted with the pipeline application, which depicts the areas). Submit lay barge anchor position plats, at a scale of 1 in = 1,000 ft with DGPS accuracy, with the pipeline construction report required by 30 CFR § 250.1008(b), which depict the “as-placed” location of all anchors, anchor chains, and wire ropes on the seafloor and which demonstrate that the features were not physically impacted by the construction activities. Additionally, submit the high-resolution ROV video on disc or removable drive. The ROV video screen should show time, date, depth, heading, and location coordinates. Observational notes and a corresponding map showing the ROV heading shall also be provided. If still images are collected, include the same information in the images’ integrated data. This mitigation may be applied by BSEE at the post-approval stage.
5.05	Dynamically Positioned Pipeline Laying Vessels (GPS) (pipeline applications)	The proposed pipeline construction activities are in the vicinity of areas that could support high-density deepwater benthic communities. Use a state-of-the-art positioning system (e.g., DGPS) on the dynamically positioned pipeline laying vessel to ensure that any seafloor disturbance resulting from the pipeline construction activities does not occur within 250 ft (76 m) of such areas (see the enclosed map/Map “xxx” [specify map by name], submitted with the pipeline application, which depicts the areas). Additionally, include “as-built” location plats, at a scale of 1 in = 1,000 ft with DGPS accuracy, with the pipeline construction report required by 30 CFR § 250.1008(b), which depict the location of the pipeline(s) relative to these features to demonstrate that the features were not physically impacted by the construction activities. This mitigation may be applied by BSEE at the post-approval stage.
5.07	Anchor Positioning (GPS and ROV)	The proposed activities are in the vicinity of areas that could support high-density deepwater benthic communities. Use a state-of-the-art positioning system (e.g., DGPS) on the anchor handling vessel and use an ROV to ensure that any seafloor disturbance resulting from the use of anchors (including that caused by the anchors, anchor chains, and wire ropes) does not occur within 250 ft (76 m) of such areas. Submit plats for Well(s)

Table B-1. Commonly Applied or “Standard” Mitigating Measures. (continued).

Mitigation Number	Mitigating Measure Title	Description of Mitigation
		(insert number[s] or name[s]), which depict the “as-placed” location of all anchors and any associated anchor chains and wire ropes on the seafloor, at a scale of 1 in = 1,000 ft with DGPS accuracy, along with the high-resolution ROV video on disc or removable drive, to BOEM’s Regional Supervisor, Office of Leasing and Plans, Plans Section at the same time the applicant submits the End of Operations Report (Form BSEE-0125) to the appropriate BSEE, Gulf of Mexico OCS Region, District Office to demonstrate that the features were not physically impacted by these anchoring activities. The ROV video screen should show time, date, depth, heading, and location coordinates. Observational notes and a corresponding map showing the ROV heading shall also be provided. If still images are collected, include the same information in the images’ integrated data. This mitigation may be applied by BSEE at the post-approval stage.
5.08	Well Placement Variance (plans)	There is an area capable of supporting high-density deepwater benthic communities within 2,000 ft (610 m) of the proposed well(s), also known as the chemosynthetic well parameter. The proposed well(s) is/are (insert chemosynthetic distance parameter) from the area capable of supporting high-density deepwater benthic communities, which in this case provides adequate protection from muds and cuttings during operations. The actual well(s) shall not be placed closer than (CHEMO DISTANCE PARAMETER 1) from the potential habitat (see the chemosynthetic map parameter, which depicts the area). Provide a map showing the final as-placed well(s), potential habitat, and distance of the well(s) from the potential habitat to BOEM’s Regional Supervisor, Office of Leasing and Plans, Plans Section at the same time the applicant submits the End of Operations Report (Form BSEE-0125) to the appropriate BSEE, Gulf of Mexico OCS Region, District Office to demonstrate that the feature(s) were not physically impacted by the drilling activity. This mitigation may be applied by BSEE at the post-approval stage.
5.09	Well Placement Variance – “Zero Discharge” (plans)	<p>There is an area capable of supporting high-density deepwater benthic communities within 2,000 ft (610 m) of the proposed well(s) (insert chemosynthetic wells parameter). Since this area is (insert chemosynthetic distance parameter) from your well site(s), chemosynthetic reason parameter, BSEE permits the activity with the following mitigations added.</p> <ul style="list-style-type: none"> • Do not move the well(s) any closer to the area capable of supporting high-density deepwater benthic communities (see chemosynthetic map parameter, which depicts the area). • Follow “zero discharge” practices (i.e., no muds or cuttings shall be discharged near the sea surface in the vicinity of the permitted activity). • In this instance, it is understood that the discharge of muds and cuttings will

Table B-1. Commonly Applied or “Standard” Mitigating Measures. (continued).

Mitigation Number	Mitigating Measure Title	Description of Mitigation
		<p>occur on or near the seafloor for the riserless portion of the drilling operations ONLY as part of the “zero discharge” practice.</p> <ul style="list-style-type: none"> • No muds or cuttings shall be discharged near the seafloor or at the sea surface once the blowout preventer and marine riser have been installed. No additional or excess muds or cuttings beyond those necessary to properly accomplish the riserless portion of the drilling activity shall be discharged on or near the seafloor. • Perform an assessment survey after the drilling of the well(s) is complete. (a) Conduct an ROV survey to assess sedimentation and its effects on the area capable of supporting high-density deepwater benthic communities (see chemosynthetic map parameter 1, which depicts the area. Transects must be run no more than 50 ft apart). (b) Ensure that the imagery in the ROV survey is high enough quality to adequately assess drilling effects. (This can be accomplished by employing the use of high-resolution still photography, high-resolution video, and/or lower resolution imaging through the use of close-up photography.) (c) The surveyed areas shall be recorded and documented on disc or removable drive for review, and the screen should show time, date, depth, heading, and location coordinates. <p>This mitigation may be applied by BSEE at the post-approval stage.</p>
Coastal Zone Management Mitigations		
6.01	Texas (Coastal Zone Management)	Drilling permits cannot be issued for the proposed wells until concurrence with the coastal zone management consistency certification has been received by BOEM’s Office of Environment from the Texas General Land Office or until concurrence with the certification has been conclusively presumed.
6.02	Louisiana (Coastal Zone Management)	Drilling permits cannot be issued for the proposed wells until concurrence with the coastal zone management consistency certification has been received by BOEM’s Office of Environment from the Louisiana Department of Natural Resources or until concurrence with the certification has been conclusively presumed.
6.03	Alabama (Coastal Zone Management)	Drilling permits cannot be issued for the proposed wells until concurrence with the coastal zone management consistency certification has been received by BOEM’s Office of Environment from the Alabama Department of Environmental Management or until concurrence with the certification has been conclusively presumed.
6.04	Mississippi (Coastal Zone Management)	Drilling permits cannot be issued for the proposed wells until concurrence with the coastal zone management consistency certification has been received by BOEM’s Office of

Table B-1. Commonly Applied or “Standard” Mitigating Measures. (continued).

Mitigation Number	Mitigating Measure Title	Description of Mitigation
		Environment from the Mississippi Department of Marine Resources or until concurrence with the certification has been conclusively presumed.
6.05	Florida (Coastal Zone Management)	Drilling permits cannot be issued for the proposed wells until concurrence with the coastal zone management consistency certification has been received by BOEM’s Office of Environment from the Florida Department of Environmental Protection or until concurrence with the certification has been conclusively presumed.
Flower Garden Banks Mitigations		
7.07	Environmental Monitoring Plan	Develop a plan for the early initiation of environmental monitoring of the effects of a hydrocarbon spill that may occur as a result of the proposed activities on the resources of the Flower Garden Banks National Marine Sanctuary, including water quality, pelagic fish, and benthic communities.
7.09	Pressure Sensor Testing	High- and low-pressure sensors protecting the proposed pipeline will be tested at least once bi-weekly with no more than 3 weeks elapsing between each test. The applicant will maintain these records on the platform and will make them available to BSEE personnel upon request.
7.10	Pressure Sensor Setting	The low-pressure sensor protecting the proposed pipeline will be set no lower than 10 percent below the lower limit of the normal operating pressure range.
Hydrogen Sulfide Mitigations		
8.01, 8.02, and 8.03	H ₂ S Present (plans) H ₂ S Unknown (plans) H ₂ S Absent (plans)	In response to the request accompanying your plan for a hydrogen sulfide (H ₂ S) classification, the area in which the proposed drilling operations are to be conducted is hereby classified, in accordance with 30 CFR § 250.490(c), as “H ₂ S present,” “H ₂ S unknown,” or “H ₂ S absent.” Accordingly, comply with the appropriate requirements of 30 CFR § 250.490 if H ₂ S is present or unknown.
8.04	H ₂ S Concentration Deviation	The plan indicates that the applicant anticipates H ₂ S at a concentration of approximately (specify the ppm). Should the applicant actually encounter H ₂ S at a concentration greater than 500 ppm, revise the plan in accordance with 30 CFR § 550.285 to include toxic modeling and an analysis of any potential environmental impacts. Contact BOEM’s Office of Environment to obtain the methodology for modeling an H ₂ S plume. The applicant must receive approval of the revised plan before additional permits filed under the plan will be approved.

Table B-1. Commonly Applied or “Standard” Mitigating Measures. (continued).

Mitigation Number	Mitigating Measure Title	Description of Mitigation
8.05	Corrosion Inspections (H ₂ S pipelines)	Inspect the pipeline(s) bi-annually, annually, or biennially for an indication of corrosion or other flaws. Report the results of these inspections to BSEE’s Office of Field Operations within 30 days of completion. This mitigation may be applied by BSEE at the post-approval stage.
8.07	National Ocean Service Notification (H ₂ S pipelines)	When the applicant provides the National Ocean Service, Nautical Data Section with a copy of the pipeline construction report plat, the applicant must also request that the National Ocean Service, Nautical Data Section include the pipeline(s) on their navigation charts and identify it/them as (an) H ₂ S or toxic sour gas pipeline(s).
8.08	USCG Notification (H ₂ S pipelines)	Immediately after the applicant begins operation of the pipeline(s), the applicant must notify the U.S. Coast Guard Commander, Eighth Coast Guard District that the pipeline(s) is/are in operation and request that the USCG publish information about the pipeline(s), including the fact that it is or they are transporting natural gas with a high concentration of H ₂ S, in the Eighth District Local Notice to Mariners, Gulf of Mexico.
8.09	H ₂ S Concentration Deviation (pipeline applications)	The application indicated that the applicant anticipates the H ₂ S concentration of the product to be transported in the proposed pipeline is approximately (specify the ppm). Should the applicant determine at some future date that the H ₂ S concentration is greater than 500 ppm, immediately submit an application to modify the pipeline in accordance with 30 CFR § 250.1007(b) to include toxic modeling and an analysis of any potential environmental impacts. Contact BOEM’s Office of Environment to obtain the methodology for modeling an H ₂ S plume.
8.10	Notification to Federal Aviation Administration	Prior to initiating operations approved in your plan or pipeline application, the applicant shall update their emergency notification list in their H ₂ S contingency plan to include the Federal Aviation Administration (FAA): Houston Air Traffic Control/Traffic Management Control Desk). In the event of an above-water or below-water sour gas release greater than 100 standard cubic feet, notify the FAA that air traffic (except evacuation and medical aircraft) should be routed safely away from the site until further notice. For purposes of avoidance recommendations to the FAA, a distance of 10 nmi (11.5 mi; 18.5 km) and an altitude of 4,000 ft (1,219 m), as minimal, shall be used. In the case of a release of H ₂ S (that constitutes an emergency), notify all facilities that might be exposed to atmospheric concentrations of 20 ppm or more of H ₂ S (i.e., all facilities located within [insert number] miles of the H ₂ S release). The applicant must also assist in the removal of all personnel as well as any other persons observed within the affected area.
8.11	H ₂ S Absent and H ₂ S Present or Unknown below Certain Depths	In response to the request accompanying the plan for a H ₂ S classification, the area in which the proposed drilling operations are to be conducted above (specify depth) is hereby

Table B-1. Commonly Applied or “Standard” Mitigating Measures. (continued).

Mitigation Number	Mitigating Measure Title	Description of Mitigation
	(plans)	classified, in accordance with 30 CFR § 250.490(c), as H ₂ S absent. However, the area in which the proposed drilling operations are to be conducted below (specify depth) is hereby classified, in accordance with 30 CFR § 250.490(c), as H ₂ S present or unknown. Accordingly, comply with the appropriate requirements of 30 CFR § 250.490.
Live Bottom Areas		
9.00	Hard Bottoms/Pinnacles/ Potentially Sensitive Biological Features Non-Recurring Mitigation	A non-recurring mitigation is a mitigating measure that is used for a unique, special, one-time-only mitigation that is added to certain plans.
9.01	Hard Bottoms/Pinnacles/ Potentially Sensitive Biological Features (conventional lay barge) (pipeline applications)	BOEM’s analysis indicates that there are hard bottoms/pinnacles/potentially sensitive biological features (PSBFs) that likely provide habitat for biological assemblages located within the scope of the anchor array of the pipeline lay barge. The pipeline construction activities (including the use of anchors, chains, and wire ropes) must avoid these hard bottoms/pinnacles/PSBFs as depicted on the enclosed map(s) in the application by a distance of at least 100 ft (30 m). Include lay barge anchor position plats, at a scale of 1 in = 1,000 ft (305 m) with DGPS accuracy, with the pipeline construction report required by 30 CFR § 250.1008(b), which depict the “as-placed” location of all anchors, anchor chains, and wire ropes on the seafloor and which demonstrate that the features were not physically impacted by the construction activities. This mitigation may be applied by BSEE at the post-approval stage.
9.03	Hard Bottoms/Pinnacles/ Potentially Sensitive Biological Features (plans)	BOEM’s analysis indicates that there are hard bottoms/pinnacles/PSBFs located in the vicinity of the activities proposed in the plan that likely provide habitat for biological assemblages. Any bottom-disturbing activities associated with the activities proposed in the plan must avoid these hard bottoms/pinnacles/PSBFs as depicted on the enclosed map(s) in the application by a distance of at least 100 ft (30 m). Submit to BSEE’s Office of Field Operations at the same time you submit your End of Operations report (Form BSEE-0125) to the appropriate BSEE, Gulf of Mexico OCS Region, District Office an as-built map at a scale of 1 in = 1,000 ft with DGPS accuracy, showing the location of any seafloor disturbance (e.g., jack-up rig, barge anchors, etc.) relative to these features. This mitigation may be applied by BSEE at the post-approval stage.
9.04	Hard Bottoms/Pinnacles/ Potentially Sensitive Biological Features (DP lay barge) (pipeline applications)	BOEM’s analysis indicates that there are hard bottoms/pinnacles/PSBFs that likely provide habitat for biological assemblages located on or near the proposed pipeline route. The pipeline construction activities must avoid these hard bottoms/pinnacles/PSBFs as depicted on the enclosed map(s) in the application by a distance of at least 100 ft (30 m).

Table B-1. Commonly Applied or “Standard” Mitigating Measures. (continued).

Mitigation Number	Mitigating Measure Title	Description of Mitigation
		This mitigation may be applied by BSEE at the post-approval stage.
9.05	Hard Bottoms/Pinnacles/ Potentially Sensitive Biological Features (structure removal)	BOEM’s review of the application indicates that there are hard bottoms/pinnacles/PSBFs located in the vicinity of the activities proposed in the application that likely provide habitat for biological assemblages. Any bottom-disturbing activities associated with the activities proposed in the application must avoid these hard bottoms/pinnacles/PSBFs as depicted on the enclosed map(s) in the application by a distance of at least 100 ft (30 m). Include in the post-removal report the as-built plats, at a scale of 1 in = 1,000 ft with DGPS accuracy, which depict the “as-placed” location of all anchors, anchor chains, and wire ropes on the seafloor deployed during the structure removal relative to these features. This mitigation may be applied by BSEE at the post-approval stage.
9.10	ROV Survey Required Non- Recurring Mitigation	A non-recurring mitigation is a mitigating measure that is used for a unique, special, one-time-only mitigation that is added to certain plans.
Military Mitigations		
10.09	Naval Coastal Systems Center	Please be reminded that the lease stipulation requires the applicant to enter into an agreement with the Coastal Test and Evaluation Division, Coastal System Station/Code E21, Panama City, Florida 32407, concerning the control of your electromagnetic emissions and use of boats and aircraft in the Naval Coastal Systems Center Area.
11.11	Military Warning Area (all)	BOEM’s review indicates that the proposed pipeline route and/or the routes to be taken by boats and aircraft in support of the proposed activities are located in or could traverse Military Warning Area W-(insert number) or Eglin Water Test Area EWTA-(insert number) (see BOEM’s website at http://www.boem.gov/MWA-Boundaries/ for a map of the areas). Contact the appropriate individual military command headquarters (see BOEM’s website at http://www.boem.gov/Military-Contacts-for-Warning-and-Water-Test-Areas/ for a list of the contacts) concerning the control of electromagnetic emissions and the use of boats and aircraft in this area(s) before commencing such traffic.
12.01	Unexploded Ordnance	The proposed operations are located in an area that was used until 1970 by the U.S. Department of Defense as an explosives dumping area. Please be advised that precautions should therefore be taken while conducting operations that involve any disturbance of the seafloor in order to avoid possible unexploded ordnance.
12.02	Naval Mine Warfare Area (MU 732, 733, and 734)	The proposed operations are located within a stipulated area designated by the Naval Mine Warfare Command for mine operations. Therefore, surface structures for exploration activities are subject to approval by BOEM’s Gulf of Mexico OCS Region’s Regional Director after consultation with the Commander, Mine Warfare Command. No permanent structures or debris of any kind will be allowed in the area during exploration operations.

Table B-1. Commonly Applied or “Standard” Mitigating Measures. (continued).

Mitigation Number	Mitigating Measure Title	Description of Mitigation
		Plans for any above seafloor development operations within the designated area must be coordinated with the Commander, Mine Warfare Command, 325 Fifth Street, SE, Corpus Christi, Texas 78491-5032.
Shallow Drilling Hazards Mitigations (Plans)		
14.01	Shallow Gas and/or Water Flow	Exercise caution while drilling due to indications of shallow gas (and/or faulting) (and/or possible water flow).
14.02	Seafloor Instability	Exercise caution during drilling rig placement due to indications of seafloor instability.
14.03	Insufficient Information	Exercise caution during drilling rig placement due to insufficient information regarding seafloor foundation integrity.
Shallow Hazards Mitigations		
15.01 and 15.02	Multiple Hazards (plans) Single Hazard (plans)	BOEM’s review indicates that there are pipeline(s), unidentified magnetic anomaly(ies), unidentified side-scan sonar contact(s), or other specified hazard(s) in the vicinity of (insert name of platform(s) or well(s)) that may pose a hazard to the proposed operations. Therefore, take precautions in accordance with NTL 2008-G05, Section VI.B, prior to performing operations.
15.05 and 15.06	Multiple Hazards (plans/pipelines) (anchoring activities) Single Hazard (plans) (anchoring)	BOEM’s review indicates that there is a pipeline(s), unidentified magnetic anomaly(ies), unidentified side-scan sonar contact(s), or other specified hazard(s) in the vicinity of (insert name of platform(s) or well(s)) that may pose a hazard due to anchoring activities associated with the proposed operations. If any of these activities will take place within 150 m (490 ft) of the potential hazard, take precautions in accordance with NTL 2008-G05, Section VI.B, prior to performing operations.
15.07	Pipeline Spanning	BOEM’s review indicates areas of seafloor relief in the vicinity of the proposed pipeline route, which may cause spanning problems for the pipeline. Use an ROV in conjunction with the pipeline construction activities to ensure that these areas are avoided to the extent possible. Additionally, include a report with the pipeline construction report, which is required by 30 CFR § 250.1008(b) and which analyzes the as-laid pipeline with respect to spanning and describes the protective measures taken to ensure pipeline integrity for those portions of the pipeline where the areas of seafloor relief could not be avoided. This mitigation may be applied by BSEE at the post-approval stage.
15.08	Conflict with Anchors	Please be advised that exploration activities have been approved or are pending approval for (insert lease, block, area), which could potentially interfere with the proposed activities. Therefore, the applicant should contact (insert contact name, company, address, phone number) prior to commencement of the activities in order to avoid any potential conflicts.

Table B-1. Commonly Applied or “Standard” Mitigating Measures. (continued).

Mitigation Number	Mitigating Measure Title	Description of Mitigation
Topographic Features Mitigations		
16.00	Topographic Features Non-Recurring Mitigation	A non-recurring mitigation is a mitigating measure that is used for a unique, special, one-time-only mitigation that is added to certain plans.
16.01	Shunting All Wells (plans)	The proposed activities are within the “4-mile, 3-mile, 1-mile, or 1,000-meter zone” of (insert name of topographic feature). Shunt all drill cuttings and drilling fluids to the seafloor through a downpipe that terminates an appropriate distance, but no more than 10 m (33 ft), from the bottom.
16.02	Shunting Some Wells (plans)	Some of the proposed activities are within the “4-mile, 3-mile, 1-mile, or 1,000-meter zone” of (insert name of topographic feature). For (insert name of wells to be shunted”, shunt all drill cuttings and drilling fluids to the seafloor through a downpipe that terminates an appropriate distance, but no more than 10 m (33 ft), from the bottom.
16.03	No Activity Zone (right-of-way pipeline applications)	BOEM’s analysis indicates that the “no activity zone(s)” of the biologically sensitive feature(s) shown on the enclosed map(s) in the application may be located within the scope of the anchor array of the pipeline lay barge. Anchors, anchor chains, and wire ropes associated with the proposed pipeline construction activities must avoid this/these “no activity zone(s)” by a distance of at least 500 ft (152 m). Include lay barge anchor positions plats, at a scale of 1 in = 1,000 ft with DGPS accuracy, with the pipeline construction report required by 30 CFR § 250.1008(b), which depict the “as-placed” location of all anchors, anchor chains, and wire ropes on the seafloor, and which demonstrate that the “no activity zone(s)” was/were not physically impacted by the construction activities. This mitigation may be applied by BSEE at the post-approval stage.
16.04	No Activity Zone (plans)	Bottom-disturbing activities associated with the activities proposed in the plan must avoid the “no activity zone” of the biologically sensitive feature shown on the enclosed map in the application by a distance of at least 500 ft (152 m). Submit to BSEE’s Office of Field Operations, at the same time the End of Operations report (Form BSEE-0125) is submitted to the appropriate BSEE, Gulf of Mexico OCS Region, District Office, an as-built map at a scale of 1 in = 1,000 ft with DGPS accuracy, showing the location of any seafloor disturbance (e.g., jack-up rig placement, rig anchors, construction barge anchors, etc.) to demonstrate that the “no activity zone(s)” was not physically impacted. This mitigation may be applied by BSEE at the post-approval stage.
16.05	No Activity Zone (structure removal)	Bottom-disturbing activities associated with the activities proposed in the application must avoid the “no activity zone” of the biologically sensitive feature shown on the enclosed map in the application by a distance of at least 500 ft (152 m). Include in the post-removal

Table B-1. Commonly Applied or “Standard” Mitigating Measures. (continued).

Mitigation Number	Mitigating Measure Title	Description of Mitigation
		report an as-built plat, at a scale of 1 in = 1,000 ft with DGPS accuracy, depicting the “as-placed” location of all anchors, anchor chains, and wire ropes on the seafloor deployed during the structure-removal activities to show that the “no activity zone” was not physically impacted. This mitigation may be applied by BSEE at the post-approval stage.
Non-Plan and Pipeline Mitigations		
17.02	Fish (structure removals using explosives)	Under the Magnuson-Stevens Fisheries Conservation and Management Act, 50 CFR § 600.725 prohibits the use of explosives to take reef fish in the Exclusive Economic Zone. Consequently, those involved in explosive structure removals must not take such stunned or killed fish on board their vessels. Should this happen, they could be charged by the National Marine Fisheries Service (NMFS) with violation of the Act.
17.04	Site-Clearance Trawling Reporting	If trawling is used to comply with the site-clearance verification requirements under 30 CFR §§ 250.1740-1743, which mandates that turtle excluder devices (TED) be removed from the trawl nets to facilitate the collection of seabed debris, the applicant must abide by maximum trawl times of 30 minutes, allowing for the removal of any captured sea turtles. If, during trawling activities, the applicant captures a sea turtle in the nets, the applicant must (1) contact BSEE’s Environmental Enforcement Branch and the NMFS’s Southeast Regional Office immediately, (2) resuscitate and release any captured sea turtles as per NMFS’s guidelines found online at http://www.sefsc.noaa.gov/turtles/TM_NMFS_SEFSC_580_2010.pdf (refer to page 3-6, Plate 3-1), and (3) photograph the turtle and complete a sea turtle stranding form for each sea turtle caught in the nets. The form can be found at http://www.sefsc.noaa.gov/species/turtles/strandings.htm and submitted to the NMFS and BSEE.
Conservation Information Document Mitigations		
18	Self-Burial Approval	BOEM hereby concurs with the determination that the subject pipeline will be installed in an area that is prone to self-burial. However, in the future, should it be determined that the pipeline(s) constitute(s) a hazard to navigation or commercial fishing operations or unduly interferes(s) with other uses of the OCS, the applicant will be required to bury it (them).
18.01	Conservation Information Document – Condition of Approval	Within 15 days after the proposed well is or wells are completed and logged, submit a revision to the plan consisting of the information required for a Conservation Information Document in accordance with NTL 2000-N05.
18.02	Conservation Information Document – Operations Approval	At the applicant’s request, we are approving your development operation coordination document (DOCD) prior to the completion of our review of the accompanying Conservation Information Document (CID). However, please be advised that, if the CID review indicates that any of the proposed activities do not conform to sound conservation,

Table B-1. Commonly Applied or “Standard” Mitigating Measures. (continued).

Mitigation Number	Mitigating Measure Title	Description of Mitigation
		engineering, and economic practices as cited in 30 CFR §§ 550.202(a) and 550.1101(a), we will, in accordance with 30 CFR § 550.281(4)(b), require such revisions to the DOCD as are necessary to make the activities conform to such practices.
ROV Survey Mitigations		
19.01	ROV Survey Required – Exploration Plans (EP)	In accordance with NTL 2008-G06, the applicant must conduct the two ROV surveys proposed in the plan. The first survey will be for the first well location approved under this plan and which is actually drilled. The post-drilling survey can be conducted at the time the applicant is preparing to leave this location. The applicant must submit both survey reports within 60 days after the rig leaves the well location. This mitigation may be applied by BSEE at the post-approval stage.
19.02	ROV Survey Required – DOCD	In accordance with NTL 2008-G06, the applicant must conduct the ROV surveys proposed in the plan for the facility location approved under this plan. The applicant must submit the pre- and post-installation survey reports within 60 days after the facility installation is completed. This mitigation may be applied by BSEE at the post-approval stage.
19.03	ROV Survey Not Required	In accordance with NTL 2008-G06, BOEM has determined that the applicant will not need to conduct the two ROV surveys proposed in the plan. This mitigation may be applied by BSEE at the post-approval stage.
Surveys Mitigations		
21.01	Archaeology Assessment Not Acceptable	BOEM’s review has determined that the archaeological analysis included in the survey report does not meet current BOEM requirements.
21.02	Archaeology Assessment Acceptable	BOEM’s review has determined that the archaeological analysis included in the survey report meets current BOEM requirements.
21.03	Geophysical Review Acceptable	BOEM’s review has determined that the subject survey report complies with the provisions of NTL 2008-G05 and, based on available data regarding any manmade hazards that may have been present at the time the survey was conducted, contains sufficient information to prepare an acceptable shallow hazards analysis for specific drilling or platform sites that the applicant may propose in future EPs or DOCDs. However, prior to submitting any such EPs or DOCDs, the applicant should update the accompanying anomaly map, if appropriate, to indicate the location of any manmade hazards (e.g., pipelines, abandoned wells, etc.) that did not exist at the time the survey was performed. Additionally, please be reminded that under the guidelines of NTL 2008-G04, the applicant should submit high-resolution survey data from the line closest to any proposed well or platform location, with one copy of each such EP or DOCD.
21.04	Geophysical Survey Report Not	BOEM’s review has also determined the subject survey report does not comply with the

Table B-1. Commonly Applied or “Standard” Mitigating Measures. (continued).

Mitigation Number	Mitigating Measure Title	Description of Mitigation
	Acceptable	provisions of NTL 2008-G05.
21.05	3D Survey Waiver	Use of three-dimensional (3D) seismic data in lieu of high-resolution survey data as per NTL 2008-G05 is acceptable for the requested locations.
Pipeline Section Mitigations and Conditions		
22	Concrete Mats	The applicant’s request to install protective concrete mats over the pipeline crossings in water less than 200 ft (61 m) deep is hereby approved pursuant to 30 CFR § 250.141.
25	Pipeline High-Pressure (PSH) Higher Than 15%	The applicant’s request to set the PSH higher than 15 percent above the normal operating pressure range is hereby approved pursuant to 30 CFR § 250.142. The pipeline PSH shall be set no more than 5 percent above the latest shut-in tubing pressure of the well and will not be set above the maximum allowable operating pressure of the pipeline.
26	Denied Self-Burial	BOEM cannot concur with the applicant’s determination that the subject pipeline will be installed in an area that is prone to self-burial. BOEM will only allow self-burial in areas with a soil strength that does not exceed 200 pounds per square foot. Therefore, the portions of the pipeline in water depths less than or equal to 200 ft (61 m) shall be buried.
28	Hydrostatic Head to Raise Maximum Allowable Operating Pressure	The applicant’s request to determine the internal design pressure of the submerged portion of the pipeline by considering the effects of the external hydrostatic pressure, in lieu of using the standard formula outlined in 30 CFR § 250.1002(a), is hereby approved pursuant to 30 CFR § 250.141(a).
National Marine Fisheries Service Mitigations		
28.001	Species Protective Measures	The applicant must comply with the following species protective measures in all activities conducted pursuant to the plan: NTL 2012-JOINT-G01, “Vessel Strike Avoidance and Injured/Dead Protected Species Reporting”; NTL 2012-JOINT-G02, “Implementation of Seismic Survey Mitigation Measures and Protected Species Observer Program”; and NTL 2012-BSEE-G01, “Marine Trash and Debris Awareness and Elimination.” These measures are designed to promote environmental protection, consistent environmental policy, compliance with environmental laws, and safety.
29	Oil Spill Financial Responsibility (OSFR) Coverage	BOEM’s review of the application indicates that, per 30 CFR §§ 553.3(1)-(3), the proposed right-of-way pipeline is classified as a covered offshore facility (COF) and requires oil-spill financial responsibility (OSFR) coverage. At this time, BSEE’s records do not indicate that the required OSFR coverage is in place. The applicant is advised that they may begin construction of the proposed pipeline immediately. However, in accordance with 30 CFR § 553.15(b), the applicant may not begin operation of the pipeline until they have submitted an application showing evidence of OSFR coverage and that demonstration has been approved by BSEE.

Table B-1. Commonly Applied or “Standard” Mitigating Measures. (continued).

Mitigation Number	Mitigating Measure Title	Description of Mitigation
99	Department of Transportation Right-of-Way Pipeline	The applicant shall construct, operate, and maintain the pipeline in accordance with the appropriate U.S. Department of Transportation regulations.
110	Spanning Potential	There are several fault scarps along with the proposed pipeline route. Include with the construction report a listing of the location and length of any pipeline “spanning,” resulting from laying the pipeline over these fault scarps. Also include a description of any remedial action necessary to minimize “spanning” and prevent pipeline damage. This mitigation may be applied by BSEE at the post-approval stage.
Office of Structural Technical Support Mitigations		
120.1	Reminder of NTL 2008-G05	If there are pipelines within the immediate proximity of the proposed platform site, precautions outlined in NTL 2008-G05, “Shallow Hazards Program,” shall be taken while conducting operations.
120.15	Notify National Imagery and Mapping	In order to assure publication of onsite activity as it affects marine navigation safety, the applicant must notify the National Imagery and Mapping Agency in advance of commencement of platform installation.
120.2	Send Report to Office of Structural and Technical Support (OSTS)	Written notification shall be submitted to the Office of Structural and Technical Support (OSTS) and the Pipeline Section within 15 calendar days of completion of the platform installation operations, at which time the applicant will be provided with the “Complex Identification Number” (CPXID) that has been assigned to this structure. The CPXID should be included with other pertinent information (i.e., the right-of-way number, area code, block number, platform name, etc.) in all future correspondence related to this structure. Should significant problems occur during structure installation operations, please inform OSTS immediately. If for any reason the applicant decides not to install this structure, they shall submit a written cancellation letter.
120.7	Downhole Well Plugging	In accordance with 30 CFR § 250.1710, the applicant must downhole plug and abandon all wells on (insert area/block platform name) (except [insert well names]), no later than (insert date). However, the applicant will not be required to sever the casings, remove the wellhead, or clear the site until the right-of-use expires.
Geological and Geophysical Mitigations (deep-penetration applications) (no assigned mitigation numbers)		
Vessel-Strike Avoidance/Reporting		The applicant will follow the guidance provided under NTL 2012-JOINT-G01, “Vessel Strike Avoidance and Injured/Dead Protected Species Reporting.” The NTL 2012-JOINT-G01 provides guidance on how a seismic operator should implement monitoring programs to minimize the risk of vessel strikes to protected species and should report observations of injured or dead protected species. In lieu of a formal observer program, this NTL

Table B-1. Commonly Applied or “Standard” Mitigating Measures. (continued).

Mitigation Number	Mitigating Measure Title	Description of Mitigation
		provides specific guidelines that should be followed to identify and avoid injury to marine mammals and sea turtles.
Seismic Survey Operation, Monitoring, and Reporting Guidelines		The applicant will follow the guidance provided under NTL 2012-JOINT-G02, “Implementation of Seismic Survey Mitigation Measures and Protected Species Observer Program.” Additionally, the applicant will comply with the guidance under this NTL when operating in all water depths (not just in water depths >200 m [656 ft] or in the Eastern Planning Area), and the NTL’s “shut-down conditions” will be applied towards manatees.
Pre-Activity Sound-Source and Array Calibration Verification		Prior to conducting survey activities, the applicant will verify in writing that the proposed airgun arrays to be used are of the lowest sound intensity level that still achieves the survey goals. The written verification must include confirmation that the airgun array has been calibrated/tuned to maximize subsurface illumination and minimize, to the extent practicable, horizontal propagation of noise.
Mandatory Separation Buffer between Survey Operations		The applicant will be required to maintain, to the extent it can practicably and safely do so, a minimum separation distance of 30 km (19 mi) from any other vessels concurrently conducting deep-penetration seismic surveys and 40 km (29 mi) when operating within an Area of Concern. To assist in implementation of this measure, BOEM will provide the applicant with contact information for all deep-penetration seismic applicants concurrently permitted/authorized to operate within or near the proposed survey area.
Supplemental Reporting Requirements		In addition to the reporting requirements under NTL 2012-JOINT-G02, the applicant is required to submit bi-weekly reports containing the information listed below. The reporting periods end on the 1st and 15th of each month. These bi-weekly reports are required for the total duration of the permit. When applicable, the reports must be submitted with survey navigation data for the 2-week reporting period. BOEM has a suggested format for the written report. If BOEM’s suggested written format is not used, the following information must be submitted along with the navigation data: (1) the dates, locations, and duration of any deep-penetration seismic operations conducted during the reporting period (the navigation data provides this information); (2) any circumstances that caused the total energy output of the airgun source array to exceed that set forth in the permit application; (3) confirmation that the permittee maintained, to the extent they could practicably and safely do so, the minimum separation distance (If applicable, submit a written explanation of why the minimum separation distance was not maintained.); and (4) confirmation that the permittee complied with the other terms of Section V of the Settlement Agreement.
Military Warning Area Coordination		BOEM’s review indicates that the routes to be taken by boats in support of the applicant’s activities traversed Military Warning Areas W-92, W-147AB, and W-602. The applicant shall contact the appropriate individual military command headquarters concerning the

Table B-1. Commonly Applied or “Standard” Mitigating Measures. (continued).

Mitigation Number	Mitigating Measure Title	Description of Mitigation
		control of electromagnetic emissions and use of boats in each of the areas before commencing the operations.
Marine Trash and Debris Awareness and Elimination		The applicant will follow the guidance provided under NTL 2012-BSEE-G01, “Marine Trash and Debris Awareness and Elimination.” The NTL 2012-BSEE-G01 provides information on reducing, if not eliminating, trash intentionally jettisoned into the Gulf of Mexico. The programs described in the NTL to assist in the reduction of marine trash and debris are the marine trash and debris placards, marine trash and debris awareness training, and the marine trash and debris awareness training and certification process.
	Geological and Geophysical Mitigation Natural Resource Defense Council Area of Concern (equal to or greater than 20-m [66-ft] water depth) (no assigned mitigation numbers)	
Seismic Survey Restriction Period		BOEM’s review indicates that the proposed survey area falls within a portion of an unusual mortality event area declared/established by the National Marine Fisheries Service for cetaceans (whales and dolphins). The applicant shall adhere to a restriction period between March 1 and April 30 (primary bottlenose dolphin calving season) for deep penetration seismic surveys on the Federal OCS in coastal waters out to the 20-m (66-ft) isobath in the northern Gulf of Mexico to avoid potential impacts to dolphins in regards to behavioral disruptions to mother/calf bonding or masking of important acoustic cues. No airgun use, including the use of mitigation guns, is permitted during the restriction period.
	Geological and Geophysical Mitigation Natural Resource Defense Council Area of Concern (equal to or greater than 100-m [328-ft] water depth) (no assigned mitigation numbers)	
Required Passive Acoustic Monitoring (PAM)		BOEM requires that the applicant use passive acoustic monitoring (PAM) in water depths of 100 m (328 ft) or greater at times of reduced visibility (darkness, rain, fog, etc.) as part of their protected species observer program. The PAM will be monitored at all times of reduced visibility. Applicants will be required to provide BSEE with a description of the passive acoustic system, the software used, and the monitoring plan prior to its use. Additionally, after survey completion, the applicant will provide an assessment of the usefulness, effectiveness, and problems encountered with the use of PAM for marine mammal detection to BSEE for review.
		Mitigation for High-Resolution Surveys
Vessel-Strike Avoidance/Reporting		The applicant will follow the guidance provided under NTL 2012-JOINT-G01, “Vessel Strike Avoidance and Injured/Dead Protected Species Reporting.” The NTL 2012-JOINT-G01 provides guidance on how a seismic operator should implement monitoring programs

Table B-1. Commonly Applied or “Standard” Mitigating Measures. (continued).

Mitigation Number	Mitigating Measure Title	Description of Mitigation
		to minimize the risk of vessel strikes to protected species and should report observations of injured or dead protected species. In lieu of a formal observer program, this NTL provides specific guidelines that should be followed to identify and avoid injury to marine mammals and sea turtles.
Marine Trash and Debris Awareness and Elimination		The applicant will follow the guidance provided under NTL 2012-BSEE-G01, “Marine Trash and Debris Awareness and Elimination.” The NTL 2012-BSEE-G01 provides information on reducing, if not eliminating, trash intentionally jettisoned into the Gulf of Mexico. The programs described in the NTL to assist in the reduction of marine trash and debris are the marine trash and debris placards, marine trash and debris awareness training, and the marine trash and debris awareness training and certification process.
Geological and Geophysical Non-Recurring Mitigations		
Benthic Communities		<p>Review of BOEM’s 3D seismic database of water bottom anomalies identified both confirmed deepwater benthic communities and features that could potentially support communities within the area of the proposed activities. Based on BOEM’s review of exploration activities proposed in the applicant’s application, the following non-recurring mitigations are applied to the area encompassed by the plan:</p> <ul style="list-style-type: none"> • BOEM’s 3D seismic database of water bottom anomalies and confirmed communities shall be used to identify features for the purpose of applying this mitigation. • The following nine water bottom anomaly categories will be considered as supporting or potentially supporting deepwater benthic communities, unless proved otherwise through high- resolution surveys: anom_conf_coral; anom_conf_mvpl; anom_conf_orgs; anom_poss_oil_pos; wb_anom_lith; wb_anom_mvpl; wb_anom_neg; wb_anom_pock; and wb_anom_pos. • These shape files may be downloaded from http://www.boem.gov/Oil-and-Gas-Energy-Program/Mapping-and-Data/Map-Gallery/Seismic-Water-Bottom-Anomalies-Map-Gallery.aspx. • Features shall be either avoided or surveyed to confirm the presence or absence of deepwater benthic communities. • Per NTL 2009-G40, “Deepwater Benthic Communities,” a minimum separation of 250 ft (76 m) must be maintained between documented communities or features that could potentially support high-density deepwater benthic communities and bottom-disturbing activities (e.g., sensors deployed on the seafloor).

Table B-1. Commonly Applied or “Standard” Mitigating Measures. (continued).

Mitigation Number	Mitigating Measure Title	Description of Mitigation
		<ul style="list-style-type: none"> - Therefore, a minimum distance of separation for planned sensor deployment sites from any feature or community documented in BOEM’s water-bottom anomaly database must be at least 250 ft (76 m). - If at any time it is determined that a node has landed within 250 ft (76 m) of any feature or community documented in BOEM’s water-bottom anomaly database, an ROV must be used to document the seafloor surrounding the landing location. The seafloor beneath the node and arms must be surveyed visually with an ROV for damages. All images collected during this survey, showing the area within the footprint of the node, must be returned to BOEM’s Gulf of Mexico OCS Region, Biological Sciences Unit for evaluation. • As required by NTL 2009-G40, for bottom-disturbing activities occurring within 500 ft (152 m) of a high-density deepwater benthic community, the operator must provide BOEM with an as-placed plat showing the actual location of the disturbance on the seafloor, in relation to documented anomalies and communities. This requirement will apply to sensors placed within 500 ft (152 m) of a documented anomaly or community, as shown in BOEM’s 3D seismic database. <p>For sensor deployments requiring as-placed plats, prepare at a scale of 1 in = 1,000 ft and submit to BOEM’s Regional Supervisor, Office of Resource Evaluation, Data Acquisition and Special Projects Unit.</p>
Tethered Ocean Bottom Node Surveys		<p>Acoustic buoy releases, tethered acoustic pingers, and nodal tethering lines pose an entanglement risk to sea turtles and other marine life. Implementing the following measures act to reduce the risk of entanglement and ensure proper reporting of entanglement situations. Reasonable measures are available to applicants using this deployment technique to reduce the risk of entanglement. These measures include the following: (1) shortening the acoustic buoy line and tethered acoustic pinger line to the shortest length practical; and (2) replacing tether rope lines equal to or greater than ¼-in diameter with a thicker, more rigid tether line, modifying the line by tying knots in the line to increase the diameter and rigidity in order to minimize the risk of entanglement. Additional measures include ensuring that a Protected Species Observer (PSO) is onboard each vessel during tethered node retrieval operations. The PSOs will document any entanglement of marine species in the nodal gear, specifically noting the location where entanglement occurred (e.g., pinger tether, acoustic buoy line, etc.). If a marine protected species becomes entangled, specifically a sea turtle, the PSO will immediately</p>

Table B-1. Commonly Applied or “Standard” Mitigating Measures. (continued).

Mitigation Number	Mitigating Measure Title	Description of Mitigation
		begin resuscitation procedures as described in the National Oceanic and Atmospheric Administration’s guidelines that can be found at http://www.st.nmfs.noaa.gov/Assets/Observer-Program/pdf/Shrimp_Reef_fish_Manual_9_22_10.pdf . The PSO must also contact the sea turtle stranding network’s State coordinator to report the incident, condition of the turtle, and request additional instructions to reduce risk of injury or mortality, including rehabilitation and salvage techniques.
Topographic Features		The applicant must adhere to the provisions of the topographic features lease stipulation and the policy described in NTL 2009-G39, “Biologically-Sensitive Underwater Features and Areas,” which restricts any bottom-disturbing activities within 152 m (500 ft) of the designated “No Activity Zone” of a topographic feature, as well as all applicable requirements described in the NTL.
Potential Archaeological Resource Protection		<p>BOEM’s review of the application indicates that numerous targets identified by existing remote-sensing data are located in the project area where the ocean bottom cables (OBCs) are proposed to be deployed. Therefore, in order to demonstrate compliance with 30 CFR § 551.6(a)(5), the applicant will either (1) ensure that all seafloor-disturbing actions required for the OBC deployment avoid the features by a distance greater than that listed in the tables or (2) conduct an underwater archaeological investigation prior to cable deployment to determine whether the feature represents an archaeological resource. If the applicant chooses to avoid the feature, they will be required to submit a plat, at a scale of 1 in = 1000 ft with DGPS accuracy, with their final report as required by 30 CFR § 551.8(c)(2), which demonstrates the feature was not physically impacted by the OBC deployment and retrieval or by any other associated bottom disturbances. If the applicant chooses to conduct an underwater archaeological investigation, they will be required to comply with the investigation methodology and reporting guidelines found on BOEM’s website at http://www.boem.gov/gom-archaeology/.</p> <p>This is only a partial list of potential archaeological sites within the project area, based on existing remote-sensing data. There are significant portions of the project area within the OCS that have received either limited or no previous archaeological survey, and these areas are likely to contain additional archaeological materials that may be impacted by the proposed operations. If the applicant discovers additional manmade debris that appears to indicate the presence of a shipwreck (e.g., a sonar image or visual confirmation of an iron, steel, or wooden hull; wooden timbers; anchors; concentrations of manmade objects such as bottles or ceramics; and piles of ballast rock) within or adjacent to the proposed action area during the proposed survey operations, the applicant will be required to</p>

Table B-1. Commonly Applied or “Standard” Mitigating Measures. (continued).

Mitigation Number	Mitigating Measure Title	Description of Mitigation
		<p>immediately halt operations, take steps to ensure that the site is not disturbed in any way, and contact BOEM’s Regional Supervisor, Office of Environment within 48 hours of its discovery. The applicant must cease all operations within 1,000 ft (305 m) of the site until BOEM’s Regional Director instructs the applicant on what steps must be taken to assess the site’s potential historic significance and what steps the applicant must take to protect it. If an OBC becomes snagged on any submerged object, divers are required to un-snag and retrieve the OBC, and the applicant must submit a report detailing each instance of this activity. This report should include the coordinates of the snag (to DGPS accuracy), the diver’s description of the submerged object creating the snag, any damage that may have resulted from the OBC placement or retrieval operations, and any photographic or video imagery that is collected. The applicant must submit a report of any data collected as a result of these investigations.</p>

APPENDIX C

**COOPERATING AGENCY
MEMORANDUM OF AGREEMENT**

C COOPERATING AGENCY MEMORANDUM OF AGREEMENT

Memorandum of Agreement – Proposed 2017-2022 Gulf of Mexico Multisale EIS

**MEMORANDUM OF AGREEMENT
BETWEEN
THE BUREAU OF OCEAN ENERGY MANAGEMENT
GULF OF MEXICO OCS REGION
AND
THE U.S. ENVIRONMENTAL PROTECTION AGENCY
REGIONS 4 AND 6
DURING COMPLETION OF THE
MULTISALE ENVIRONMENTAL IMPACT STATEMENT
FOR 2017-2022 PROPOSED OIL AND GAS LEASE SALES
IN THE GULF OF MEXICO OUTER CONTINENTAL SHELF**

INTRODUCTION

The Bureau of Ocean Energy Management (BOEM) is preparing an Environmental Impact Statement (EIS) to identify the environmental and human effects for the 2017-2022 Gulf of Mexico Outer Continental Shelf (OCS) proposed oil and gas lease sales. On April 4, 2015, a Notice of Intent to prepare this EIS was published in the *Federal Register* for initial scoping and identification of scheduled scoping meetings.

The Council on Environmental Quality's regulations at 40 CFR § 1501.6 emphasize agency cooperation in the National Environmental Policy Act (NEPA) process between Federal agencies either having overlapping jurisdiction or special expertise related to a proposed action. The U.S. Environmental Protection Agency (USEPA) requested to be a cooperating agency on this EIS and BOEM has agreed to accept their request.

This Memorandum of Agreement (MOA) outlines the responsibilities of BOEM and USEPA for this EIS. It is designed to establish expectations between the two agencies that apply for the duration of the 2017-2022 Gulf of Mexico Multisale EIS, whereupon it terminates upon publication of the Final EIS or upon written notice of termination as provided below. Executing this MOA does not affect USEPA's independent review and comment responsibilities under Section 309 of the Clean Air Act or its responsibilities under any other statutory or regulatory authorities. This MOA does not affect BOEM's responsibilities under the Outer Continental Shelf Lands Act, regulations under 30 CFR Part 550, or any other statutory or regulatory authorities.

BOEM RESPONSIBILITIES

- (1) BOEM will designate a primary point of contact (POC) for matters related to this MOA. At the present time, Helen Rucker is the POC for the Gulf of Mexico OCS Region. BOEM will notify USEPA if the POC changes during the period of time this MOA is in effect.
- (2) BOEM will provide an EIS preparation schedule for all solicited inputs and review periods, including administrative reviews.
- (3) BOEM will set up and hold public meetings for the Draft EIS.

Memorandum of Agreement – Proposed 2017-2022 Gulf of Mexico Multisale EIS

- (4) BOEM will provide USEPA a copy and summary of pertinent comments received during preparation of this EIS (including scoping and the Draft EIS public comment period).
- (5) BOEM will publish a copy of this MOA as an appendix to this EIS.
- (6) BOEM will provide briefings to USEPA staff on the Draft EIS scope, analyses, and conclusions, as arranged between the BOEM and USEPA POCs.
- (7) BOEM will provide USEPA with preliminary responses to USEPA and public comments on the Draft EIS, and relevant draft sections of the Final EIS for review prior to final lead agency approval and distribution of the document.

USEPA RESPONSIBILITIES

- (1) USEPA Region 4 and Region 6 will designate a primary POC to represent USEPA in matters related to this MOA. At the present time, the USEPA's POC for Region 4 is Dan Holliman and the POC for Region 6 is Jerry Saunders. The USEPA will notify BOEM if either POC changes during the period of time this MOA is in effect.
- (2) USEPA will provide all available information in which USEPA has expertise, as applicable.
- (3) USEPA will comply with BOEM's EIS preparation schedule for all solicited inputs and review periods, including administrative reviews.
- (4) USEPA will be responsible for any expenses incurred by USEPA related to this MOA.

TERMINATION

This MOA may be terminated by written notice by either of the below signatories or their successor at any time. This MOA terminates with publication of the Final 2017-2022 Gulf of Mexico Multisale EIS.

LIMITATIONS

All commitments made in this MOA are subject to the availability of appropriated funds and each agency's budget priorities. Nothing in this MOA obligates BOEM or USEPA to expend appropriations or to enter into any contract, assistance agreement, or interagency agreement, or to incur other financial obligations. This MOA is neither a fiscal nor a funds obligation document. Any endeavor involving reimbursement or contribution of funds between the parties to this MOA will be handled in accordance with applicable laws, regulations, and procedures, and will be subject to separate subsidiary agreements that will be effected in writing by representatives of both parties. This MOA does not create any right or benefit enforceable against BOEM or USEPA, their officers or employees, or any other person. This MOA does not apply to any person outside BOEM and USEPA.

*Memorandum of Agreement – Proposed 2017-2022 Gulf of Mexico Multisale EIS***RESOLUTION OF DISPUTES**

The parties agree to make every attempt to settle any disputes arising under this MOA at the lowest operational level. In the case of a substantial disagreement between BOEM and USEPA, each agency will designate a senior management official at the regional level to seek resolution. If these officials do not resolve the dispute within 30 days, the agencies will further elevate the matter to the Gulf of Mexico Regional Director of BOEM and the Region 6 Compliance Assurance and Enforcement Division Director and Director, Resource Conservation and Restoration Division, Region 4 USEPA for prompt resolution.

NOTICES

Except as otherwise provided herein, all notices relating to this MOA must be provided to the following:

To BOEM: Helen Rucker
1201 Elmwood Park Blvd
New Orleans, Louisiana 70123
Helen.Rucker@boem.gov
504-736-2421

To USEPA Region 4: Dan Holliman
61 Forsyth Street SW
Atlanta, Georgia 30303
Holliman.daniel@epa.gov
404-562-9531

To USEPA Region 6: Jerry Saunders
1445 Ross Avenue, Suite 1200
Dallas, Texas 75202-2733
Saunders.jerry@Epa.gov
214-665-6470

PREDECISIONAL MATERIALS

The undersigned hereby agree to maintain the confidentiality of pre-decisional information and documents shared in furtherance of this MOA during completion of this EIS consistent with the Freedom of Information Act (FOIA) and other applicable statutes. This agreement to maintain confidentiality of information and documents applies to all pre-decisional documents and communications, including, but not limited to, the following: email messages; notes to the file; agendas, pre-meeting materials, presentations, meeting notes and summaries; letters; review evaluations; drafts of documents; and all documents created and shared as part of the collaboration established in this MOA. Any information that is required to be released to the public due to Agency legal obligations should not contain confidential or privileged information, including deliberative process privilege materials related to preparation of the Draft and Final EISs. Upon receipt of a Freedom of Information Act request requesting information related to the activities carried out under this MOA, each agency will coordinate with or refer the request to the agency who generated the information prior to releasing the information to the requester.

Memorandum of Agreement – Proposed 2017-2022 Gulf of Mexico Multisale EIS

* * *

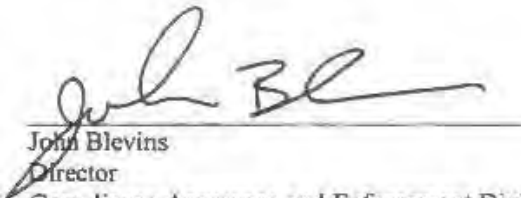
This MOA may be executed in counterparts, each of which will be deemed to be an original. The signatures on this MOA may be executed on separate pages and all of which together will constitute one and the same agreement.



Michael A. Celata
Regional Director
Bureau of Ocean Energy Management
Gulf of Mexico OCS Region

3/14/16

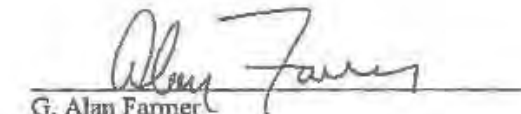
Date



John Blevins
Director
Compliance Assurance and Enforcement Division
USEPA Region 6

2-23-16

Date



G. Alan Farmer
Director
Resource Conservation and Restoration Division
USEPA Region 4

1/7/16

Date

APPENDIX D

PROPOSED PRERELEASE MITIGATING MEASURES (STIPULATIONS)

D PROPOSED PRELEASE MITIGATING MEASURES (STIPULATIONS)

The potential lease stipulations and mitigating measures included for analysis in this Multisale EIS were developed as a result of numerous scoping efforts for the continuing OCS Program in the Gulf of Mexico. The 10 lease stipulations described below would be considered at the prelease stage, as applicable, to any proposed lease sale. These measures will be considered for adoption by the Assistant Secretary for Land and Minerals Management (ASLM), under authority delegated by the Secretary of the Interior. The analysis of any stipulations for any particular alternative does not ensure that the ASLM will make a decision to apply the stipulations to leases that may result from any proposed lease sale nor does it preclude minor modifications in wording during subsequent steps in the prelease process if comments indicate changes are necessary or if conditions change.

Any stipulations or mitigation requirements to be included in a lease sale will be described in the Record of Decision for that lease sale. Mitigating measures in the form of lease stipulations are added to the lease terms and are therefore enforceable as part of the lease. In addition, each exploration and development plan, as well as any pipeline applications that result from a lease sale, will undergo a NEPA review, and additional project-specific mitigations applied as conditions of plan approval at the postlease stage. The BSEE has the authority to monitor and enforce these conditions, and under 30 CFR part 250 Subpart N, may seek remedies and penalties from any operator that fails to comply with those conditions, stipulations, and mitigating measures.

D.1 TOPOGRAPHIC FEATURES STIPULATION

As authorized under 40 CFR § 1502.4, the topographic features located in the WPA and CPA provide habitat for coral-reef-community organisms (**Chapter 4.6.1**). There are currently no identified topographic features protected under this stipulation in the EPA. Oil- and gas-related activities resulting from a proposed action could have a severe, even lethal, impact on or near these communities if the Topographic Features Stipulation is not adopted and such activities were not otherwise mitigated. The DOI has recognized this problem for some years, and since 1973 stipulations have been made a part of leases on or near these biotic communities; impacts from nearby oil- and gas-related activities were mitigated to the greatest extent possible. This stipulation would not prevent the recovery of oil and gas resources but would serve to protect valuable and sensitive biological resources.

The Topographic Features Stipulation was formulated based on consultation with various Federal agencies and comments solicited from the States, industry, environmental organizations, and academic representatives. The stipulation is based on years of scientific information collected since the inception of the stipulation. This information includes various Bureau of Land Management/MMS (BOEM)-funded studies of topographic highs in the GOM; numerous stipulation-imposed, industry-funded monitoring reports; and the National Research Council's (NRC) report entitled *Drilling Discharges in the Marine Environment* (1983). The blocks affected by the Topographic Features Stipulation are shown in **Figure 2-4**.

The requirements in the stipulation are based on the following facts:

- (1) Shunting of the drilling effluent to the nepheloid layer confines the effluent to a level deeper than that of the living components of a high-relief topographic feature. Shunting is therefore an effective measure for protecting the biota of high-relief topographic features (Bright and Rezak, 1978; Rezak and Bright, 1981; NRC, 1983).
- (2) The biological impact on the benthos from the deposition of nonshunted discharge is mostly limited to within 1,000 m (3,281 ft) of the discharge (NRC, 1983).
- (3) The biota of topographic features can be categorized into depth-related zones defined by degree of reef-building activity (Rezak and Bright, 1981; Rezak et al., 1983 and 1985).

The stipulation establishes No Activity Zones at the topographic features. A zone is defined by the 85-m (279-ft) bathymetric contour (isobath) because, generally, the biota shallower than 85 m (279 ft) are more typical of the Caribbean reef biota, while the biota deeper than 85 m (279 ft) are similar to soft bottom organisms found throughout the GOM. Where a bank is in water depths less than 85 m (279 ft), the deepest “closing” isobath defines the No Activity Zone for that topographic feature. Within the No Activity Zones, no operations, anchoring, or structures are allowed. Outside the No Activity Zones, additional restrictive zones are established where oil and gas operations could occur, but where drilling discharges would be shunted.

The stipulation requires that all effluents within the area shown as the “1,000-Meter Zone” on the Topographic Features Stipulation Map (found on BOEM’s website at http://www.gomr.mms.gov/homepg/lcesale/topo_features_package.pdf) be shunted to within 10 m (33 ft) of the seafloor. Banks containing the more sensitive and productive algal-sponge zone require a shunt zone extending 1 nmi (1.2 mi; 1.9 km) and an additional 3-nmi (3.5-mi; 5.6-km) shunt zone for development only.

Exceptions to the general stipulation are made for the Flower Garden Banks and the low-relief banks. Because the East and West features of the Flower Garden Banks have received National Marine Sanctuary status, they are protected to a greater degree than the other banks. The added provisions at the Flower Garden Banks National Marine Sanctuary (i.e., the boundary as of the publication of this Multisale EIS) require that (a) the No Activity Zone be based on the 100-m (328-ft) isobath instead of the 85-m (279-ft) isobath and be defined by the “1/4 1/4 1/4” system (a method of defining a specific portion of a block) rather than the actual isobath and (b) there be a 4-Mile Zone instead of a 1-Mile Zone in which shunting is required. Although Stetson Bank (a high-relief feature) was made part of the Flower Garden Banks National Marine Sanctuary in 1996, it has not as yet received added protection that would differ from current stipulation requirements.

Low-relief banks have only a No Activity Zone. A shunting requirement would be counterproductive because it would put the potentially toxic drilling muds in the same water depth

range as the features associated biota that are being protected. Also, the turbidity potentially caused by the release of drilling effluents in the upper part of the water column would not affect the biota on low-relief features as they appear to be adapted to high turbidity. Claypile Bank, which is a low-relief bank that exhibits the *Millepora*-sponge community, has been given the higher priority protection of a 1,000-Meter Zone where monitoring is required.

The stipulation reads as follows:

Topographic Features Stipulation

- (a) No activity including placement of structures, drilling rigs, pipelines, or anchoring will be allowed within the listed isobath (“No Activity Zone”) of the leases on banks as listed below.
- (b) Operations within the “1,000-Meter Zone” shall be restricted by shunting all drill cuttings and drilling fluids to the bottom through a structurally sound downpipe that terminates at an appropriate distance, but no more than 10 m, from the bottom.
- (c) Operations within a “1-Mile Zone” must be restricted by shunting all drill cuttings and drilling fluids to the bottom through a structurally sound downpipe that terminates at an appropriate distance, but no more than 10 m, from the bottom. (Where there is a “1-Mile Zone” designated, the “1,000-Meter Zone” in paragraph (b) is not designated.) This restriction on operations also applies to areas surrounding the Flower Garden Banks National Marine Sanctuary (i.e., the boundary as of the publication of this Multisale EIS), namely the “4-Mile Zone” surrounding the East Flower Garden Bank and the West Flower Garden Bank.
- (d) Operations within a “3-Mile Zone” must be restricted by shunting all drill cuttings and drilling fluids from development operations to the bottom through a structurally sound downpipe that terminates at an appropriate distance, but no more than 10 m, from the bottom. If more than two exploration wells that are for purposes other than development operations are to be drilled from the same surface location, all drill cuttings and drilling fluids must be restricted by shunting to the bottom through a structurally sound downpipe that terminates at an appropriate distance, but no more than 10 meters, from the bottom.

The Topographic Features Stipulation, together with the appropriate Topographic Features Stipulation Map, will be included only in leases issued as a result of a lease sale on blocks within the areas so indicated in the Western and Central Gulf of Mexico Topographic Features Stipulation Map Package, which is available from the BOEM’s Gulf of Mexico OCS Region’s Public Information Office at 1-800-200-GULF and on BOEM’s website at <http://www.boem.gov/Topo-Stip-Map-Package/>. As referenced in paragraphs (a)-(d) of this stipulation, a Topographic Features Stipulation Map will be attached to each lease instrument subject to this stipulation.

The banks and corresponding blocks to which this stipulation may be applied in the WPA are as follows:

Shelf Edge Banks		Low-Relief Banks ²		South Texas Banks ⁴	
Bank Name	Isobath (m)	Bank Name	Isobath (m)	Bank Name	Isobath (m)
West Flower Garden Bank (defined by ¼ ¼ ¼ system)	100	Mysterious Bank	74, 76, 78, 80, 84	Dream Bank	78, 82
		Coffee Lump	Various	Southern Bank	80
East Flower Garden Bank (defined by ¼ ¼ ¼ system)	100	Blackfish Ridge	70	Hospital Bank	70
		Big Dunn Bar	65	North Hospital Bank	68
MacNeil Bank	82	Small Dunn Bar	65	Aransas Bank	70
29 Fathom Bank	64	32 Fathom Bank	52	South Baker Bank	70
Rankin Bank	85	Claypile Bank ³	50	Baker Bank	70
Bright Bank ¹	85				
Stetson Bank	52				
Appelbaum Bank	85				

¹ CPA bank with a portion of its "3-Mile Zone" in the WPA.

² Low-Relief Banks—only paragraph (a) of the stipulation applies.

³ Claypile Bank—only paragraphs (a) and (b) of the stipulation apply. In paragraph (b), monitoring of the effluent to determine the impact on the biota of Claypile Bank shall be required rather than shunting.

⁴ South Texas Banks—only paragraphs (a) and (b) of the stipulation apply.

The banks and corresponding blocks to which this stipulation may be applied in the CPA are as follows:

Bank Name	Isobath (m)	Bank Name	Isobath (m)
McGrail Bank	85	Jakkula Bank	85
Bouma Bank	85	Sweet Bank ¹	85
Rezak Bank	85	Bright Bank ³	85
Sidner Bank	85	Geyer Bank	85
Sackett Bank ²	85	Elvers Bank	85
Ewing Bank	85	Alderdice Bank	80
Diaphus Bank ²	85	Fishnet Bank ²	76
Parker Bank	85	Sonnier Bank	55

¹ Only paragraph (a) of the stipulation applies.

² Only paragraphs (a) and (b) of the stipulation apply.

³ CPA bank with a portion of its “3-Mile Zone” in the WPA.

Effectiveness of the Lease Stipulation

The purpose of the stipulation is to protect the biota of the topographic features from adverse impacts due to routine oil and gas activities. Such impacts include physical damage from anchoring and rig emplacement and potential toxic and smothering impacts from muds and cuttings discharges. The Topographic Features Stipulation has been used on leases since 1973, and this experience shows conclusively that the stipulation effectively prevents damage to the biota of these banks from routine oil and gas activities. Anchoring related to oil- and gas-related activities on the sensitive portions of the topographic features has been prevented. Monitoring studies have demonstrated that the shunting requirements of the stipulations are effective in preventing the muds and cuttings from impacting the biota of the banks. The stipulation, if adopted for a proposed action, will continue to protect the biota of the banks, specifically as discussed below.

Mechanical damage resulting from oil- and gas-related operations is probably the single most serious impact to benthic habitat. Complying with the No Activity Zone designation of the Topographic Features Stipulation should completely eliminate this threat to the sensitive biota of WPA and CPA topographic features from activities resulting from a proposed action. The sensitive biota within the zones provided for in the Topographic Features Stipulation will thus be protected.

Several other impact-producing factors may threaten communities associated with topographic features. Vessel anchoring and structure emplacement result in physical disturbance of benthic habitat and are the most likely activities to cause permanent or long-lasting impacts to sensitive offshore habitats. Recovery from damage caused by such activities may take 10 or more years (depending on the maturity of the impacted community). Operational discharges (drilling muds

and cuttings, produced waters) may impact the biota of the banks due to turbidity and sedimentation, resulting in death to benthic organisms in large areas. Recovery from such damage may take 10 or more years (depending on the maturity of the impacted community). A loss of well control without the release of substantial amounts of oil could cause similar damage to benthic biota by resuspending sediments, causing turbidity and sedimentation, which could ultimately have a lethal impact on benthic organisms. Recovery from such damage may take up to 10 years (depending on the maturity of the impacted community). Oil spills will cause damage to benthic organisms if the oil contacts the organisms; such contact is unlikely except from spills related to blowouts. There have been few blowouts in the GOM. Structure removal using explosives can result in water turbidity, redeposition of sediments, and explosive shock-wave impacts. Recovery from such damage could take more than 10 years (depending on the maturity of the impacted community). The above activities, especially bottom-disturbing activities, have the greatest potential to severely impact the biota of topographic features. A proposed action, without the Topographic Features Stipulation or comparable mitigation, is expected to have a severe impact on the sensitive offshore habitats of the topographic features.

The stipulation provides different levels of protection for banks in different categories as defined by Rezak and Bright (1981). The categories and their definitions are as follows:

- Category A: zone of major reef-building activity; maximum environmental protection recommended;
- Category B: zone of minor reef-building activity; environmental protection strongly recommended;
- Category C: zone of negligible reef-building activity, but crustose algae present; environmental protection recommended; and
- Category D: zone of no reef-building and insignificant populations of crustose algae; additional protection not necessary.

The stipulation requires that all effluents within 1,000 m (3,281 ft) of Sackett, Fishnet, and Diaphus Banks, categorized by Rezak and Bright (1981) as Category C banks, be shunted into the nepheloid layer; the potentially harmful materials in drilling muds will be trapped in the bottom boundary layer and will not move up the banks where the biota of concern are located. Surface drilling discharge at distances greater than 1,000 m (3,281 ft) from the bank is not expected to impact the biota.

The stipulation protects the remaining banks (Category A and B banks) with even greater restrictions. Surface discharge will not be allowed within 1 nmi (1.2 mi; 1.9 km) of these more sensitive banks. Surface discharges outside of 1 nmi (1.2 mi; 1.9 km) are not expected to impact the biota of the banks, as adverse impacts from surface discharge are limited to 1,000 m (3,281 ft). However, it is possible that, when multiple wells are drilled from a single platform (surface location), typical during development operations, extremely small amounts of muds discharged more than

1 nmi (1.2 mi; 1.9 km) from the bank may reach the bank. In order to eliminate the possible cumulative impact of muds discharged during development drilling, the stipulation imposes a 3-Mile Zone within which shunting of development well effluent is required.

The stipulation would prevent damage to the biota of the banks from routine oil- and gas-related activities resulting from a proposed action, while allowing the development of nearby oil and gas resources. The stipulation will not protect the banks from the adverse impacts of an accident such as a large blowout on a nearby oil or gas operation.

D.2 LIVE BOTTOM STIPULATION

The Live Bottom Stipulation is intended to protect live bottoms and the associated hard bottom communities from damage and, at the same time, provide for recovery of potential oil and gas resources. This stipulation has been routinely applied to appropriate CPA oil and gas lease sales since 1974 to protect known pinnacle trend features. This stipulation has also been applied to appropriate oil and gas lease sales since 1982 to protect known low-relief features; however, blocks subject to the Live Bottom (Low Relief) Stipulation (see below) have not been included in lease sales since the 1980s and that is not anticipated to change. Blocks subject to the Live Bottom (Low Relief) Stipulation are not included in the proposed actions for this Multisale EIS.

The Live Bottom (Pinnacle Trend) Stipulation covers the pinnacle trend area of the CPA (**Figure 2-4**). A small portion of the northeastern proposed CPA lease sale area is characterized by a pinnacle trend, which is classified as a live bottom under the stipulation. The pinnacles are a series of topographic irregularities with variable biotal coverage, which provide structural habitat for a variety of pelagic fish. The pinnacles trend features in the region could be impacted from physical damage of unrestricted OCS oil- and gas-related activities, as noted in **Chapter 4.6.2**. More detail on the Live Bottom (Pinnacle Trend) Stipulation and the affected blocks can be found at <http://www.boem.gov/Biologically-Sensitive-Areas-List/>.

In addition, all EPA blocks in water depths of 100 m (328 ft) or less and the following CPA blocks have known live bottom (low-relief) features that could also be subject to the stipulation: Pensacola Blocks 751-754, 793-798, 837-842, 881-886, 925-930, 969-975; and Destin Dome Blocks 1-7, 45-51, 89-96, 133-140, 177-184, 221-228, 265-273, 309-317, 353-361, 397-405, 441-448, 485-491, 529-534, 573-576. However, these blocks are not a part of a proposed action for this Multisale EIS. While none of the blocks with known concentrations of live bottom low-relief habitat are expected to be offered for lease, several live bottom low-relief areas are adjacent to blocks that would be offered for lease under a proposed action and could potentially be affected by impacts of routine activities and accidental events. Therefore, an analysis of the potential impacts is included in this Multisale EIS. More detail on the Live Bottom (Low-Relief) Stipulation and the affected blocks can be found at <http://www.boem.gov/Biologically-Sensitive-Areas-List/>.

The stipulation reads as follows:

Live Bottom Stipulation

For the purpose of this stipulation, “live bottom areas” are defined as seagrass communities; or those areas which contain biological assemblages consisting of such sessile invertebrates as sea fans, sea whips, hydroids, anemones, ascidians, sponges, bryozoans, or corals living upon and attached to naturally occurring hard or rocky formations with rough, broken, or smooth topography; or areas whose lithotope favors the accumulation of turtles, fishes, and other fauna.

Prior to any drilling activities or the construction or placement of any structure for exploration or development on this lease, including, but not limited to, anchoring, well drilling, and pipeline and platform placement, the lessee will submit to the BOEM Regional Director (RD) a live bottom survey report containing a bathymetry map prepared utilizing remote-sensing data and an interpretation of live bottom areas prepared from the data collected. The resultant bathymetry map shall be prepared for the purpose of determining the presence or absence of live bottoms which could be impacted by the proposed activity. This map shall encompass such an area of the seafloor where surface disturbing activities, including anchoring, may occur.

If the BOEM Regional Director determines that live bottoms might be adversely impacted by the proposed activity, the RD will require the lessee to undertake any measure deemed economically, environmentally, and technically feasible to protect the live bottom area. These measures may include, but are not limited to, relocation of operations, shunting of fluids and cuttings, and monitoring to assess the impact of the activity on the live bottoms.

Effectiveness of the Lease Stipulation

Through detection and avoidance, this stipulation minimizes the likelihood of mechanical damage from OCS oil- and gas-related activities associated with rig and anchor emplacement to the sessile and pelagic communities associated with the crest and flanks of such features. Since this area is subject to heavy natural sedimentation, this stipulation does not include any specific measures to protect the live bottoms from the discharge of effluents.

The sessile and pelagic communities associated with the crest and flanks of the live bottom features could be adversely impacted by oil- and gas-related activities resulting from a proposed action if such activities took place on or near these communities without the Live Bottom Stipulation. For many years, this stipulation has been made a part of leases on blocks in the CPA to ensure that pinnacle trend areas are mitigated to the greatest extent possible from nearby OCS oil- and gas-related activities. This stipulation does not prevent the recovery of oil and gas resources; however, it does serve to protect valuable and sensitive biological resources.

Activities resulting from a proposed action, particularly anchor damage to localized live bottom areas, would be expected to cause substantial damage to portions of these areas because these activities are potentially destructive to the biological communities and could damage one or several individual live bottom areas. The most potentially damaging of these are the impacts associated with mechanical damages that may result from anchors. However, the action is judged to be infrequent because of the limited operations in the vicinity of live bottoms and the small size of many of the features. Minor impact is expected from large oil spills, losses of well control, pipeline emplacement, muds and cuttings discharges, and structure removals. A proposed action, without the benefit of the Live Bottom Stipulation, could have an adverse impact on these areas, but such impact is expected to be localized in nature. Impact from mechanical damage, including anchors, could potentially be long term if the physical integrity of the live bottoms themselves became altered.

The pinnacle trend occurs as patchy regions within the general area of the eastern portion of the CPA (Ludwick and Walton, 1957; Barry A. Vittor and Associates, Inc., 1985; Brooks and Giammona, 1990). The pinnacle trend also extends into the EPA but not in the portion of the EPA proposed for leasing. The stipulation would require the operators to locate the individual pinnacles and associated communities that may be present in the block. Outside of the pinnacle trend, live bottom low-relief features can and do occur in isolated locations in shallow waters (<984 ft; 300 m) throughout the GOM wherever there is suitable hard substrate and other physical conditions (e.g., depth, turbidity, etc.) that allow for epibenthic community development (Rezak et al., 1990). However, they are primarily known to be present in some locations on the Mississippi-Alabama Shelf and in many more locations on the West Florida Shelf (**Figure 4-16**), which is far east of the proposed EPA lease sale area. The stipulation requires that a survey be done to encompass the potential area of proposed surface disturbance and that a bathymetry map depicting any live bottoms in the vicinity be prepared from the survey. BOEM's Regional Director, through consultation with FWS, could then decide if live bottom features would be potentially impacted and, if so, require appropriate mitigating measures.

By identifying the live bottom features present at the activity site, the lessee would be directed to avoid placement of the drilling rig and anchors on the sensitive areas. Thus, mechanical damage to the live bottom features is eliminated when measures required by the stipulation are imposed. The rapid dilution of drill cuttings and muds will minimize the potential of significant concentration of effluents on live bottom features; therefore, the stipulation does not address effluent discharges.

D.3 MILITARY AREAS STIPULATION

The Military Areas Stipulation has been applied to all blocks leased in military areas since 1977 and reduces potential impacts, particularly in regards to safety; but, it does not reduce or eliminate the actual physical presence of oil and gas operations in areas where military operations are conducted. The stipulation contains a "hold harmless" clause (holding the U.S. Government harmless in case of an accident involving military operations) and requires lessees to coordinate their activities with appropriate local military contacts. **Figure 2-7** shows the military warning areas

in the Gulf of Mexico. As referenced in paragraph (a) of the stipulation, a list of the appropriate command headquarters will be included with each lease package subject to this stipulation.

Military Areas Stipulation

(a) Hold and Save Harmless

Whether compensation for such damage or injury might be due under a theory of strict or absolute liability or otherwise, the lessee assumes all risks of damage or injury to persons or property, which occur in, on, or above the OCS, to any persons or to any property of any person or persons who are agents, employees, or invitees of the lessee, its agents, independent contractors, or subcontractors doing business with the lessee in connection with any activities being performed by the lessee in, on, or above the OCS, if such injury or damage to such person or property occurs by reason of the activities of any agency of the United States (U.S.) Government, its contractors or subcontractors, or any of its officers, agents or employees, being conducted as a part of, or in connection with, the programs and activities of the command headquarters listed at the end of this stipulation.

Notwithstanding any limitation of the lessee's liability in Section 14 of the lease, the lessee assumes this risk whether such injury or damage is caused in whole or in part by any act or omission, regardless of negligence or fault, of the U.S. Government, its contractors or subcontractors, or any of its officers, agents, or employees. The lessee further agrees to indemnify and save harmless the U.S. Government against all claims for loss, damage, or injury sustained by the lessee, or to indemnify and save harmless the U.S. Government against all claims for loss, damage, or injury sustained by the agents, employees, or invitees of the lessee, its agents, or any independent contractors or subcontractors doing business with the lessee in connection with the programs and activities of the aforementioned military installation, whether the same be caused in whole or in part by the negligence or fault of the U.S. Government, its contractors, or subcontractors, or any of its officers, agents, or employees and whether such claims might be sustained under a theory of strict or absolute liability or otherwise.

(b) Electromagnetic Emissions

The lessee agrees to control its own electromagnetic emissions and those of its agents, employees, invitees, independent contractors or subcontractors emanating from individual designated defense warning areas in accordance with requirements specified by the commander, or his/her designee, of the command headquarters to the degree necessary to prevent damage to, or unacceptable interference with, Department of Defense flight, testing, or operational activities, conducted within individual designated warning areas. Necessary monitoring control, and coordination with the lessee, its agents, employees, invitees, independent contractors or

subcontractors, will be affected by the commander of the appropriate onshore military installation conducting operations in the particular warning area; provided, however, that control of such electromagnetic emissions shall in no instance prohibit all manner of electromagnetic communication during any period of time between a lessee, its agents, employees, invitees, independent contractors or subcontractors and onshore facilities.

(c) Operational

The lessee, when operating or causing to be operated on its behalf, boat, ship, or aircraft traffic in the individual designated warning areas, shall enter into an agreement with the commander, or his/her designee, of the individual command headquarters, upon utilizing an individual designated warning area prior to commencing such traffic. Such an agreement will provide for positive control of boats, ships, and aircraft operating in the warning areas at all times.

Effectiveness of the Lease Stipulation

The hold harmless section of the military stipulation serves to protect the U.S. Government from liability in the event of an accident involving the lessee and military activities. The actual operations of the military and the lessee and its agents will not be affected.

The electromagnetic emissions section of the stipulation requires the lessee and its agents to reduce and curtail the use of radio, CB, or other equipment emitting electromagnetic energy within some areas. This serves to reduce the impact of oil- and gas-related activity on the communications of military missions and reduces the possible impacts of electromagnetic energy transmissions on missile testing, tracking, and detonation.

The operational section requires notification to the military of oil- and gas-related activity to take place within a military use area. This allows the base commander to plan military missions and maneuvers that will avoid the areas where oil- and gas-related activities are taking place or to schedule around these activities. Prior notification helps reduce the potential impacts associated with vessels and helicopters traveling unannounced through areas where military activities are underway.

This stipulation reduces potential impacts, particularly in regards to safety, but it does not reduce or eliminate the actual physical presence of oil- and gas-related operations in areas where military operations are conducted. The reduction in potential impacts resulting from this stipulation makes multiple-use conflicts unlikely. Without the stipulation, some potential conflict is likely. The best indicator of the overall effectiveness of the stipulation may be that there has never been an accident involving a conflict between military operations and oil- and gas-related activities.

D.4 EVACUATION STIPULATION

This stipulation would be a part of any lease in the easternmost portion of the CPA and all blocks leased in the EPA portion of the proposed lease sale area resulting from a proposed action. An evacuation stipulation has been applied to all blocks leased in these areas since 2001. The Evacuation Stipulation is designed to protect the lives and welfare of offshore oil and gas personnel. Oil- and gas-related activities have the potential to occasionally interfere with specific requirements and operating parameters for the lessee's activities in accordance with the military stipulation clauses contained herein. If it is determined that the operations will result in interference with scheduled military missions in such a manner as to possibly jeopardize the national defense or to pose unacceptable risks to life and property, then a temporary suspension of operations and the evacuation of personnel may be necessary. The stipulation reads as follows:

Evacuation Stipulation

- (a) The lessee, recognizing that oil and gas resource exploration, exploitation, development, production, abandonment, and site cleanup operations on the leased area of submerged lands may occasionally interfere with tactical military operations, hereby recognizes and agrees that the United States reserves and has the right to temporarily suspend operations and/or require evacuation on this lease in the interest of national security. Such suspensions are considered unlikely in this area. Every effort will be made by the appropriate military agency to provide as much advance notice as possible of the need to suspend operations and/or evacuate. Advance notice of fourteen (14) days shall normally be given before requiring a suspension or evacuation, but in no event will the notice be less than four (4) days. Temporary suspension of operations may include the evacuation of personnel, and appropriate sheltering of personnel not evacuated. Appropriate shelter means the protection of all lessee personnel for the entire duration of any Department of Defense activity from flying or falling objects or substances; it will be implemented by a written order from the BSEE Gulf of Mexico Region, Regional Supervisor for District Field Operations (RSDFO), after consultation with the appropriate command headquarters or other appropriate military agency, or higher authority. The appropriate command headquarters, military agency or higher authority will provide information to allow the lessee to assess the degree of risk to, and provide sufficient protection for, lessee's personnel and property. Such suspensions or evacuations for national security reasons will not normally exceed seventy-two (72) hours; however, any such suspension may be extended by order of the RSDFO. During such periods, equipment may remain in place, but all production, if any, must cease for the duration of the temporary suspension if so directed by the RSDFO. Upon cessation of any temporary suspension, the RSDFO will immediately notify the lessee such suspension has terminated and operations on the leased area can resume.

- (b) The lessee shall inform the BSEE of the persons/offices to be notified to implement the terms of this stipulation.
- (c) The lessee is encouraged to establish and maintain early contact and coordination with the appropriate command headquarters, in order to avoid or minimize the effects of conflicts with potentially hazardous military operations.
- (d) The lessee is not entitled to reimbursement for any costs or expenses associated with the suspension of operations or activities or the evacuation of property or personnel in fulfillment of the military mission in accordance with subsections (a) through (c) above.
- (e) Notwithstanding subsection (d), the lessee reserves the right to seek reimbursement from appropriate parties for the suspension of operations or activities or the evacuation of property or personnel associated with conflicting commercial operations.

Effectiveness of the Lease Stipulation

This stipulation would provide for the evacuation of personnel and shut-in of operations during any events conducted by the military that could pose a danger to ongoing oil- and gas-related operations. It is expected that the invocation of these evacuation requirements will be extremely rare.

It is expected that these measures will serve to eliminate dangerous conflicts between oil- and gas-related operations and military operations. Continued close coordination between BSEE and the military may result in improvements in the wording and implementation of these stipulations.

D.5 COORDINATION STIPULATION

This stipulation would be a part of any lease in the easternmost portion of the CPA and all blocks leased in the EPA portion of the proposed leased sale area. A coordination stipulation has been applied to all blocks leased in these areas since 2001. The Coordination Stipulation is designed to increase communication and cooperation between military authorities and offshore oil and gas operators. Specific requirements and operating parameters are established for the lessee's activities in accordance with the Military Stipulation clauses. For instance, if it is determined that the operations will result in interference with scheduled military missions in such a manner as to possibly jeopardize the national defense or to pose unacceptable risks to life and property, then certain measures become activated and the oil- and gas-related operations may be curtailed in the interest of national defense. The stipulation reads as follows and, as referenced in paragraph (a) of the stipulation, a list of military stipulation clauses will be included with each lease package subject to this stipulation.

Coordination Stipulation

- (a) The placement, location, and planned periods of operation of surface structures on this lease during the exploration stage are subject to approval by the BOEM Regional Director (RD) after the review of an operator's EP. Prior to approval of the EP, the lessee shall consult with the appropriate command headquarters regarding the location, density, and the planned periods of operation of such structures, and to maximize exploration while minimizing conflicts with Department of Defense activities. When determined necessary by the appropriate command headquarters, the lessee will enter into a formal Operating Agreement with such command headquarters, that delineates the specific requirements and operating parameters for the lessee's activities in accordance with the military stipulation clauses contained herein. If it is determined that the final operations will result in interference with scheduled military missions in such a manner as to possibly jeopardize the national defense or to pose unacceptable risks to life and property, then the BOEM RD may approve the EP with conditions, disapprove it, or require modification in accordance with 30 CFR part 550. The RD will notify the lessee in writing of the conditions associated with plan approval, or the reason(s) for disapproval or required modifications. Moreover, if there is a serious threat of harm or damage to life or property, or if it is in the interest of national security or defense, pending or approved operations may be suspended in accordance with 30 CFR part 250 or 30 CFR part 550. Such a suspension will extend the term of a lease by an amount equal to the length of the suspension. The BSEE RD will attempt to minimize such suspensions within the confine of related military requirements. It is recognized that the issuance of a lease conveys the right to the lessee as provided in section 8(b)(4) of the Outer Continental Shelf Lands Act, 43 U.S.C. § 1337(b)(4), to engage in exploration, development, and production activities conditioned upon other statutory and regulatory requirements.
- (b) The lessee is encouraged to establish and maintain early contact and coordination with the appropriate command headquarters, in order to avoid or minimize the effects of conflicts with potentially hazardous military operations.
- (c) If national security interests are likely to be in continuing conflict with an existing Operating Agreement, EP, DPP, or DOCD, the BSEE RD, in consultation with BOEM, will direct the lessee to modify any existing operating agreement or to enter into a new operating agreement to implement measures to avoid or minimize the identified potential conflicts, subject to the terms and conditions and obligations of the legal requirements of the lease.

Effectiveness of the Lease Stipulation

This stipulation would provide for review of pending oil and gas operations by military authorities and could result in delaying oil and gas operations if military activities have been scheduled in the area that may put the oil and gas operations and personnel at risk.

D.6 BLOCKS SOUTH OF BALDWIN COUNTY, ALABAMA, STIPULATION

This stipulation will be included only on leases on blocks south of and within 15 mi (24 km) of Baldwin County, Alabama. The stipulation reads as follows:

Blocks South of Baldwin County, Alabama, Stipulation

- (a) In order to minimize visual impacts from development operations on this block, you will contact lessees and operators of leases in the vicinity prior to submitting a DOCD to determine if existing or planned surface production structures can be shared. If feasible, your DOCD should reflect the results of any resulting sharing agreement, propose the use of subsea technologies, or propose another development scenario that does not involve new surface structures.
- (b) If you cannot formulate a feasible development scenario that does not call for new surface structure(s), your DOCD should ensure that they are the minimum necessary for the proper development of the block and that they will be constructed and placed, using orientation, camouflage, or other design measures, to limit their visibility from shore.
- (c) The BOEM will review and make decisions on your DOCD in accordance with applicable Federal regulations and BOEM policies, and in consultation with the State of Alabama (Geological Survey/Oil and Gas Board).

Effectiveness of the Lease Stipulation

For several years, the Governor of Alabama has continually indicated opposition to new leasing south and within 15 mi (24 km) of Baldwin County but has requested that, if the area is offered for lease, a lease stipulation to reduce the potential for visual impacts should be applied to all new leases in this area. Prior to the decision in 1999 on the Final Notice of Sale for Lease Sale 172, BOEM's Gulf of Mexico OCS Region's Regional Director, in consultation with the Geological Survey of Alabama/State Oil and Gas Board, developed a lease stipulation to be applied to any new leases within the 15-mi (24-km) area to mitigate potential visual impacts. The stipulation specifies requirements for consultation that lessees must follow when developing plans for fixed structures. The stipulation has been continually adopted in annual CPA lease sales since 1999. It has been considered satisfactorily responsive to the concern of the Governor of Alabama and was adopted in each of the CPA lease sales in the previous three Five-Year Programs.

D.7 PROTECTED SPECIES STIPULATION

The Protected Species Stipulation has been applied to all blocks leased in the GOM since December 2001. This stipulation was developed in consultation with the U.S. Department of Commerce, National Oceanic and Atmospheric Administration, NMFS and the U.S. Department of the Interior, FWS in accordance with Section 7 of the Endangered Species Act, and it is designed to minimize or avoid potential adverse impacts to federally protected species.

Protected Species Stipulation

- A. The Federal Endangered Species Act (ESA; 16 U.S.C. §§ 1531-1544) and the Marine Mammal Protection Act (MMPA; 16 U.S.C. 1361-1423h) are designed to protect threatened and endangered species and marine mammals and apply to activities on the Outer Continental Shelf (OCS). The Outer Continental Shelf Lands Act (OCSLA; at 43 U.S.C. §§ 1331-1356a) provides that the OCS should be made available for expeditious and orderly development subject to environmental safeguards, in a manner which is consistent with the maintenance of competition and other national needs (see 43 U.S.C. § 1332). BOEM and BSEE comply with these laws on the OCS.
- B. The lessee and its operators must:
 - (1) collect and remove flotsam resulting from activities related to exploration, development, and production of this lease;
 - (2) post signs in prominent places on all vessels and platforms used as a result of activities related to exploration, development, and production of this lease detailing the reasons (legal and ecological) why release of debris must be eliminated;
 - (3) observe for marine mammals and sea turtles while on vessels, reduce vessel speed to 10 knots or less when assemblages of cetaceans are observed, and maintain a distance of 91 meters or greater from whales, and a distance of 45 meters or greater from small cetaceans and sea turtles;
 - (4) employ mitigation measures prescribed by BOEM/BSEE or the National Marine Fisheries Service (NMFS) for all seismic surveys, including the use of an "exclusion zone" based upon the appropriate water depth, ramp-up and shutdown procedures, visual monitoring, and reporting;
 - (5) identify important habitats, including designated critical habitat, used by listed species (e.g., sea turtle nesting beaches, piping plover critical habitat), in oil spill contingency planning and require the strategic placement of spill cleanup equipment to be used only by personnel trained in less-intrusive cleanup techniques on beaches and bay shores; and

- (6) immediately report all sightings and locations of injured or dead protected species (e.g., marine mammals and sea turtles) to the appropriate stranding network. If oil and gas industry activity is responsible for the injured or dead animal (e.g., because of a vessel strike), the responsible parties should remain available to assist the stranding network. If the injury or death was caused by a collision with the lessee's vessel, the lessee must notify BSEE within 24 hours of the strike in accordance with NTL No. 2012-JOINT-G01 (Vessel Strike Avoidance and Injured/Dead Protected Species Reporting).
- C. BOEM and BSEE issue Notices to Lessees (NTLs) which more fully describe measures implemented in support of the above-mentioned implementing statutes and regulations, as well as measures identified by the U.S. Fish and Wildlife Service and NMFS arising from, among others, conservation recommendations, rulemakings pursuant to the MMPA, or consultation. The lessee and its operators, personnel, and subcontractors, while undertaking activities authorized under this lease, must implement and comply with the specific mitigation measures outlined in: NTL No. 2012-JOINT-G01, NTL No. 2012-JOINT-G02 (Implementation of Seismic Survey Mitigation Measures and Protected Species Observer Program), and NTL No. 2012-BSEE-G01 (Marine Trash and Debris Awareness and Elimination). At the lessee's option, the lessee, its operators, personnel and contractors may comply with the most current measures to protect species in place at the time an activity is undertaken under this lease, including but not limited to new or updated versions of the NTLs identified in this paragraph. The lessee and its operators, personnel and subcontractors will be required to comply with the mitigation measures, identified in the above referenced NTLs, and additional measures in the conditions of approvals for their plans or permits.

Effectiveness of the Lease Stipulation

This stipulation was developed in consultation with NMFS and FWS, and is designed to minimize or avoid potential adverse impacts to federally protected species. The stipulation minimizes certain activities and stops others when those actions have the potential to impact marine mammals or sea turtles. These avoidance criteria provide protection by ensuring the animals remain a safe distance from the operations or the activity ceases.

D.8 UNITED NATIONS CONVENTION ON THE LAW OF THE SEA ROYALTY PAYMENT STIPULATION

If the United States becomes a party to the 1982 United Nations Convention on the Law of the Sea (UNCLOS) prior to or during the life of a lease issued by the United States on a block or portion of a block located beyond its Exclusive Economic Zone as defined in UNCLOS, and subject to such conditions that the Senate may impose through its constitutional role of advice and consent,

then the royalty payment lease provisions will apply to the lease so issued, consistent with Article 82 of UNCLOS.

Law of the Sea Convention Royalty Payment Stipulation

- (A) UNCLOS requires payments annually by coastal states party to the Convention with respect to all production at a site after the first five years of production at that site. Any such payments will be made by the U.S. Government and not the lessee.
- (B) For the purpose of this stipulation regarding payments by the lessee to the U.S., each lease constitutes a separate site, whether or not a lease is committed to a unit.
- (C) For the purpose of this stipulation, the first production year begins on the first day of commercial production (excluding test production). Once a production year begins, it will run for a period of 365 days whether or not the lease produces continuously in commercial quantities. Subsequent production years shall begin on the anniversary date of first production.
- (D) If total lease production during the first five years following first production exceeds the total royalty suspension volume(s) provided in the lease terms, or through application and approval of relief from royalties, the following provisions of this stipulation will not apply. If, after the first five years of production, but prior to termination of this lease, production exceeds the total royalty suspension volume(s) provided in the lease terms or through application and approval of relief from royalties, the provisions of this stipulation will no longer apply effective the day after the suspension volumes have been produced.
- (E) If, in any production year after the first five years of lease production, due to lease royalty suspension provisions or through application and approval of relief from royalties, no lease production royalty is due or payable by the lessee to the U.S., then the lessee will be required to pay, as stipulated in paragraph I below, Convention-related royalty in the following amount so that the required Convention payments may be made by the U.S. Government, as provided under the Convention:
 - (1) In the sixth year of production, 1 percent of the value of the sixth year's lease production saved, removed, or sold from the leased area;
 - (2) After the sixth year of production, the Convention-related royalty payment rate shall increase by 1 percent for each subsequent year until the twelfth year and shall remain at 7 percent thereafter until lease termination.
- (F) If the U.S. becomes a party to UNCLOS after the fifth year of production from the lease, and a lessee is required, as provided herein, to pay Convention-related

- royalty, the amount of the royalty due will be based on the above payment schedule as determined from first production. For example, the U.S. Government becomes a party to the UNCLOS in the tenth year of lease production resulting in a UNCLOS-related royalty payment of 5 percent of the value of the tenth year's lease production, saved, removed, or sold from the lease. The following year, a payment of 6 percent would be due, and so forth, as stated above, up to a maximum of 7 percent per year.
- (G) If, in any production year after the first five years of lease production, due to lease royalty suspension provisions or through application and approval of relief from royalties, lease production royalty is paid but is less than the payment provided for by the Convention, then the lessee will be required to pay to the U.S. Government the UNCLOS-related royalty in the amount of the shortfall.
- (H) In determining the value of production from the lease if a payment of UNCLOS-related royalty is to be made, the provisions of the lease and applicable regulations will apply.
- (I) The UNCLOS-related royalty payment(s) required under paragraphs E through G of this stipulation, if any, shall not be paid monthly but will be due and payable to the Office of Natural Resources Revenue on or before 30 days after the expiration of the relevant production lease year.
- (J) The lessee will receive royalty credit in the amount of the UNCLOS-related royalty payment required under paragraphs E through G of this stipulation, which will apply to royalties due under the lease for which the Convention-related royalty accrued in subsequent periods, as non-UNCLOS-related royalty payments become due.
- (K) Any lease production for which the lessee pays no royalty other than a UNCLOS-related requirement, due to lease royalty suspension provisions or through application and approval of relief from royalties, will count against the lease's applicable royalty suspension or relief volume.
- (L) The lessee will not be allowed to apply or recoup any unused UNCLOS-related credit(s) associated with a lease that has been relinquished or terminated.

D.9 BELOW SEABED OPERATIONS STIPULATION

The stipulation language below is intended to be lease sale-specific language and would incorporate maps of the blocks that may be affected by the Below Seabed Operations Stipulation.

Below Seabed Operations Stipulation

Rights-of-use and easements have been granted to allow permanent mooring of floating production facilities. As a result, any lessee holding an interest in oil and gas

leases for these blocks is not allowed to conduct activities, including, but not limited to, the construction and use of structures, operation of drilling rigs, laying of pipelines, and/or anchoring, will occur or be located on the seafloor or in the water column within the areas depicted by the attached maps. Subseabed activities that are part of exploration, development, and production activities from outside the areas depicted by the attached maps may be allowed, including the use of directional drilling or other techniques.

This stipulation will be included in any lease awarded from this sale on the following list of blocks.

Mississippi Canyon 650, 651, 692, 694, 723, 735, 767, 919, 920, 921, and 964

Walker Ridge 293 and 294, 717, 762, and 763

Green Canyon 613, 786, 787, 788, and 860

Keathley Canyon 831

Effectiveness of the Lease Stipulation

This stipulation is designed to minimize or avoid potential space-use conflicts with moored and/or floating production facilities that have already been granted rights-of-use and easements in particular OCS blocks. BOEM has effectively used this stipulation for over a decade to make bidders aware of other activities with rights-of-use and easements on the above OCS blocks and may require buffers or additional requirements prior to acquiring leases on those specific blocks.

D.10 TRANSBOUNDARY STIPULATION

Agreement between the United States of America and the United Mexican States Concerning Transboundary Hydrocarbon Reservoirs in the Gulf of Mexico Stipulation

The “Agreement between the United States of America and the United Mexican States Concerning Transboundary Hydrocarbon Reservoirs in the Gulf of Mexico” (Agreement) signed on February 20, 2012, entered into force on July 18, 2014. All activities carried out under this lease must comply with the Agreement and any law, regulation, or condition of approval of a unitization agreement, plan, or permit adopted by the United States to implement the Agreement before or after issuance of this lease. The lessee is subject to, and must comply with, all terms of the Agreement, including, but not limited to, the following requirements:

This Agreement makes it possible for U.S. lessees to enter into voluntary agreements with a licensee of the United Mexican States (e.g., *Petróleos Mexicanos* (PEMEX)) to develop transboundary reservoirs. Lessees in the Boundary Area may be subject to certain provisions of the Agreement.

- A. When the United States is obligated under the Agreement to provide information that may be considered confidential, commercial, or proprietary to a third-party or the Government of the United Mexican States, if the lessee holds such information, the lessee is required to provide it to the lessor as provided for in the Agreement;
- B. When the United States is obligated under the Agreement to prohibit commencement of production on a lease, the Bureau of Safety and Environmental Enforcement (BSEE) will direct a Suspension of Production with which the lessee must comply;
- C. When the United States is obligated under the Agreement to seek development of a transboundary reservoir under a unitization agreement, the lessee is required to cooperate and explore the feasibility of such development with a licensee of the United Mexican States;
- D. When there is a proven transboundary reservoir, as defined by the Agreement, and the relevant parties, including the lessee, fail to conclude a unitization agreement, the lessee's rights to produce the hydrocarbon resources will be limited by the terms of the Agreement;
- E. If the lessee seeks to jointly explore or develop a transboundary reservoir with a licensee of the United Mexican States, the lessee is required to submit to BSEE information and documents that comply with and contain terms consistent with the Agreement, including, but not limited to, a proposed unitization agreement that designates the unit operator for the transboundary unit and provides for the allocation of production and any redetermination of the allocation of production; and
- F. The lessee is required to comply with and abide by determinations issued as a result of the Agreement's dispute resolution process on, among other things, the existence of a transboundary reservoir, and the allocation and/or reallocation of production.

The lessee and its operators, personnel, and subcontractors are required to comply with these and any other additional measures necessary to implement the provisions of the Agreement, including, but not limited to, conditions of approvals for their plans and permits for activities related to any transboundary reservoir or geologic structure subject to the Agreement.

The term "Boundary Area," means an area comprised of any and all blocks in the Western and Central Planning Areas, that are located wholly or partially within three statute miles of the Maritime and Continental Shelf boundary with Mexico, as the Maritime Boundary is delimited in the Treaty to Resolve Pending Boundary Differences and Maintain the Rio Grande and Colorado River as the International

Boundary, signed November 24, 1970; the Treaty on Maritime Boundaries between the United Mexican States and the United States of America, signed on May 4, 1978; and, as the continental shelf in the Western Gulf of Mexico beyond 200 nautical miles is delimited in the Treaty between the Government of the United Mexican States and the Government of the United States of America, signed on June 9, 2000.

A copy of the Agreement can be found at the Department of the Interior website at: <http://www.boem.gov/BOEM-Newsroom/Library/Boundaries-Mexico.aspx>.

Effectiveness of the Lease Stipulation

The Transboundary Agreement removes uncertainties regarding development of transboundary resources in the resource-rich Gulf of Mexico. As a result of the agreement, nearly 1.5 million ac of the OCS will now be made more accessible for exploration and production activities. BOEM's estimates indicate that this area contains as much as 172 million barrels of oil and 304 billion cubic feet of natural gas. The Agreement also opens up resources in the Western Gap that were off limits to both countries under a previous treaty that imposed a moratorium along the boundary. The Transboundary Agreement sets clear guidelines for the development of oil and natural gas reservoirs that cross the maritime boundary. Under the Agreement, U.S. companies and PEMEX will be able to voluntarily enter into agreements to jointly develop those reservoirs. In the event that consensus cannot be reached, the Transboundary Agreement establishes the process through which U.S. companies and PEMEX can individually develop the resources on each side of the border while protecting each nation's interests and resources.

D.11 REFERENCES

- Barry A. Vittor and Associates, Inc. 1985. Tuscaloosa Trend regional data search and synthesis study. Volume I: Synthesis report. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, Metairie, LA. OCS Study MMS 85-0056. 398 pp.
- Bright, T.J. and R. Rezak. 1978. Northwestern Gulf of Mexico topographic features study: Final report. U.S. Dept. of the Interior, Bureau of Land Management, New Orleans OCS Office, New Orleans, LA. Study No. 1978-4. 692 pp. Internet website: <http://www.gomr.boemre.gov/PI/PDFImages/ESPIS/3/4069.pdf>.
- Brooks, J.M. and C.P. Giammona. 1990. Mississippi-Alabama marine ecosystem study: Annual report; year 2. Volume I: Technical narrative. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 89-0095. 348 pp.
- Ludwick, J.C. and W.R. Walton. 1957. Shelf-edge, calcareous prominences in the northeastern Gulf of Mexico. *Bulletin of the American Association of Petroleum Geologists* 41(9):2054-2101.
- National Research Council (NRC). 1983. Drilling discharges in the marine environment. Panel on Assessment of Fates and Effects of Drilling Fluids and Cuttings in the Marine Environment. National Research Council, Commission on Engineering and Technical Systems, Marine Board. Washington, DC: National Academy Press. Pp. 18-21.

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- Rezak, R. and T.J. Bright. 1981. Northern Gulf of Mexico topographic features study: Final report. U.S. Dept. of the Interior, Bureau of Land Management, Gulf of Mexico OCS Region, New Orleans, LA. Contract No. AA551-CT8-35. 5 vols.
- Rezak, R., T.J. Bright, and D.W. McGrail. 1983. Reefs and banks of the northwestern Gulf of Mexico: Their geological, biological, and physical dynamics. Final Technical Report No. 83-1-T.
- Rezak, R., T.J. Bright, and D.W. McGrail. 1985. Reefs and banks of the northwestern Gulf of Mexico: Their geological, biological, and physical dynamics. New York, NY: Wiley and Sons. 259 pp.
- Rezak, R., S.R. Gittings, and T.J. Bright. 1990. Biotic assemblages and ecological controls on reefs and banks of the northwest Gulf of Mexico. *American Zoologist* 30:23-35.

APPENDIX E

OIL SPILL RISK ANALYSIS FIGURES

E OIL SPILL RISK ANALYSIS FIGURES

The following figures comprise the results of the Oil Spill Risk Analysis (OSRA) conducted for Alternatives A, B, and C. All of the assumptions and scenario estimates for Alternative D (including the commonly applied mitigating measures in **Appendix B**) are the same as for a proposed action under Alternative A, B, or C; consequently, refer to the corresponding Alternative A, B, or C for information relevant to Alternative D. **Chapter 3.2.1** of this Multisale EIS provides for a discussion of oil spills and the OSRA model. In summary, oil-spill risk was calculated by multiplying the probability of contact generated by the OSRA model by the probability of occurrence of one or more spills $\geq 1,000$ bbl as a result of a proposed action. This provides a risk factor that represents the probability of a spill occurring as a result of a proposed action and contacting a specified geographic area or feature. These are referred to as “combined probabilities” because they combine the risk of occurrence of a spill from OCS sources and the risk of such a spill contacting areas of sensitive environmental, social, and economic resources. **Figure E-1** shows the geographic boundaries, known as the domain, used for the analysis. **Figure E-2** through **Figure E-7** show the probabilities of oil spills ($\geq 1,000$ bbl) occurring and contacting within 10 or 30 days the shoreline (counties and parishes) as a result of an Alternative A, B, or C proposed action. **Figure E-8** through **Figure E-19** show the probabilities of oil spills ($\geq 1,000$ bbl) occurring and contacting within 10 or 30 days nearshore (0-20 m), shelf (20-300 m), and deepwater (300 m to outer jurisdiction) areas as a result of the low- or high-case scenario of resource estimates for Alternatives A, B, or C. Lastly, **Figure E-20** shows the probabilities of oil spills ($\geq 1,000$ bbl) occurring and contacting within 10 days and 30 days State offshore waters as a result of Alternative A, B, or C.

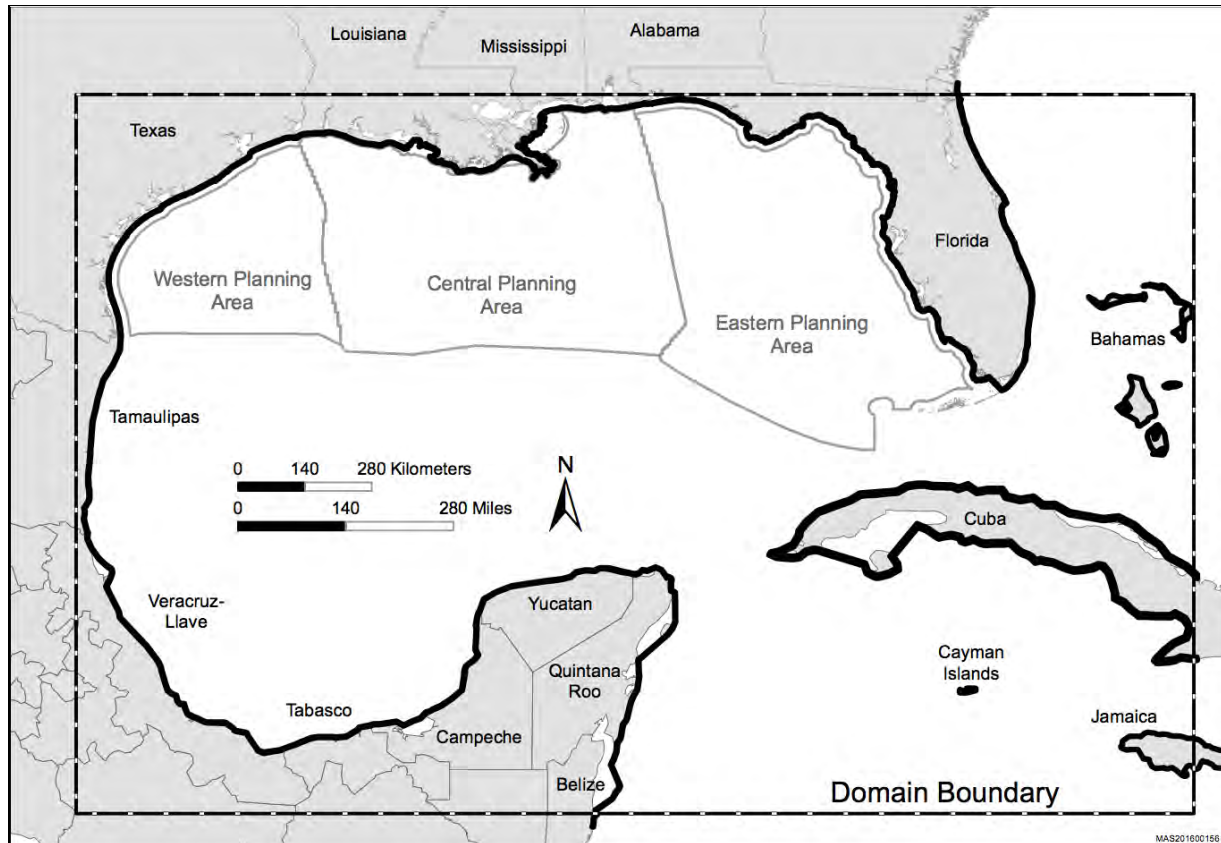


Figure E-1. The Oil Spill Risk Analysis Domain.

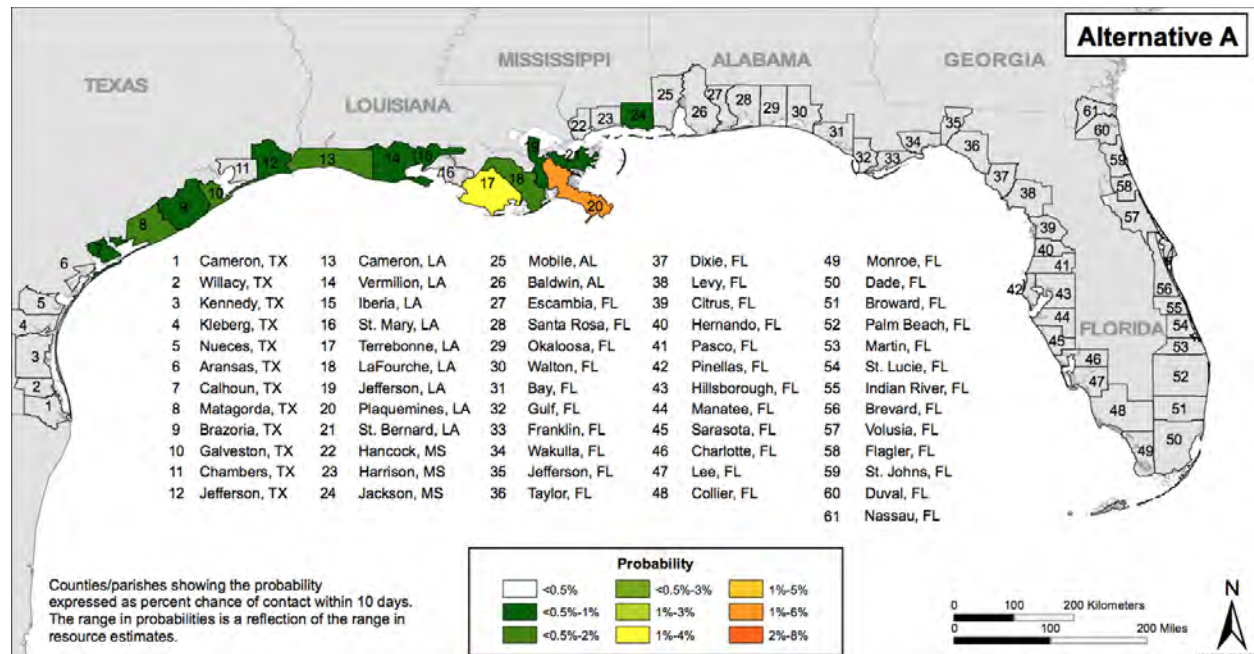


Figure E-2. Probabilities of Oil Spills (≥1,000 bbl) Occurring and Contacting within 10 Days the Shoreline (counties and parishes) as a Result of Alternative A.

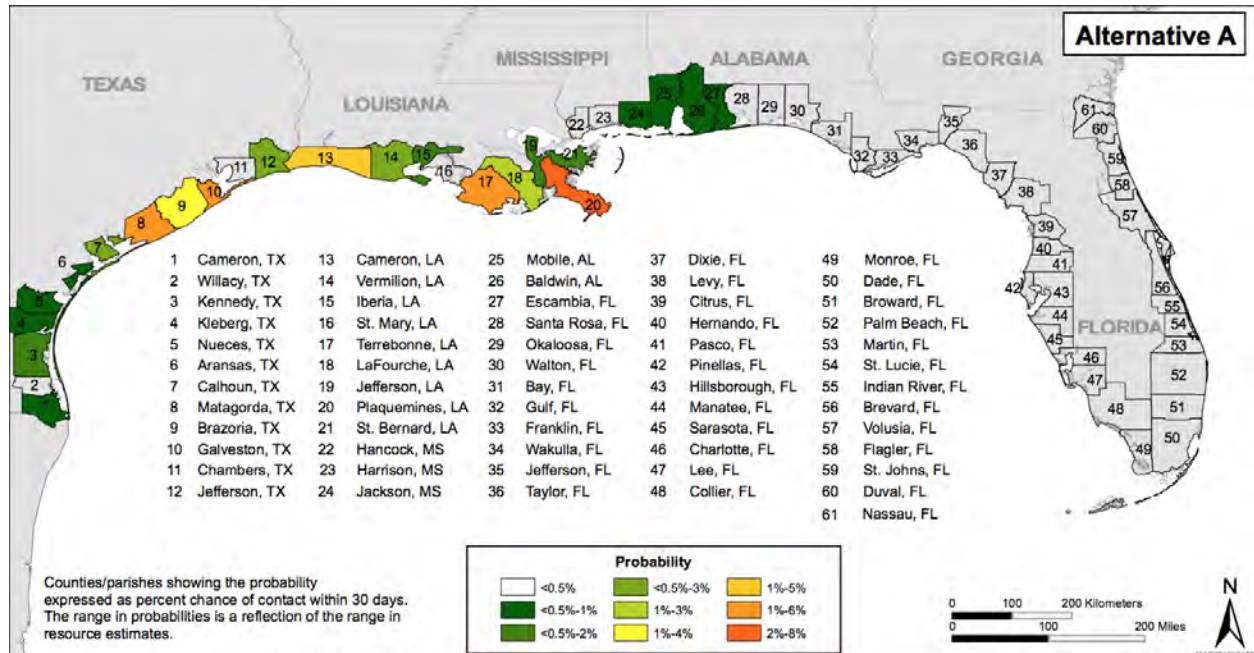


Figure E-3. Probabilities of Oil Spills ($\geq 1,000$ bbl) Occurring and Contacting within 30 Days the Shoreline (counties and parishes) as a Result of Alternative A.

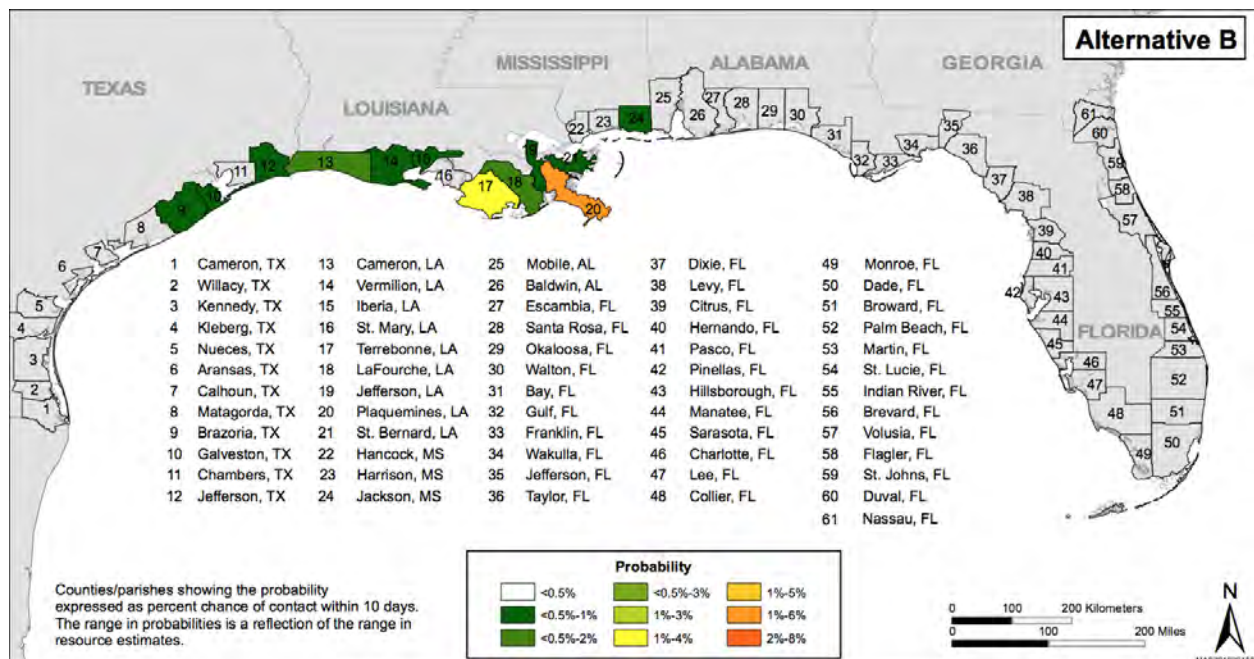


Figure E-4. Probabilities of Oil Spills ($\geq 1,000$ bbl) Occurring and Contacting within 10 Days the Shoreline (counties and parishes) as a Result of Alternative B.

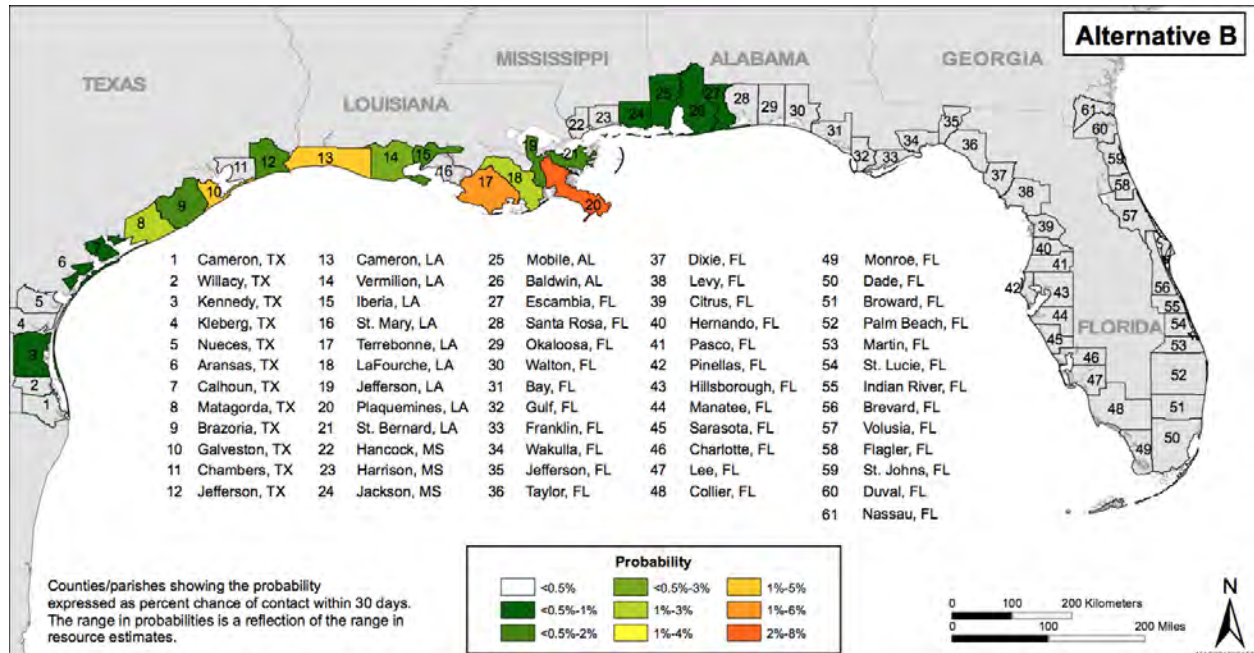


Figure E-5. Probabilities of Oil Spills ($\geq 1,000$ bbl) Occurring and Contacting within 30 Days the Shoreline (counties and parishes) as a Result of Alternative B.

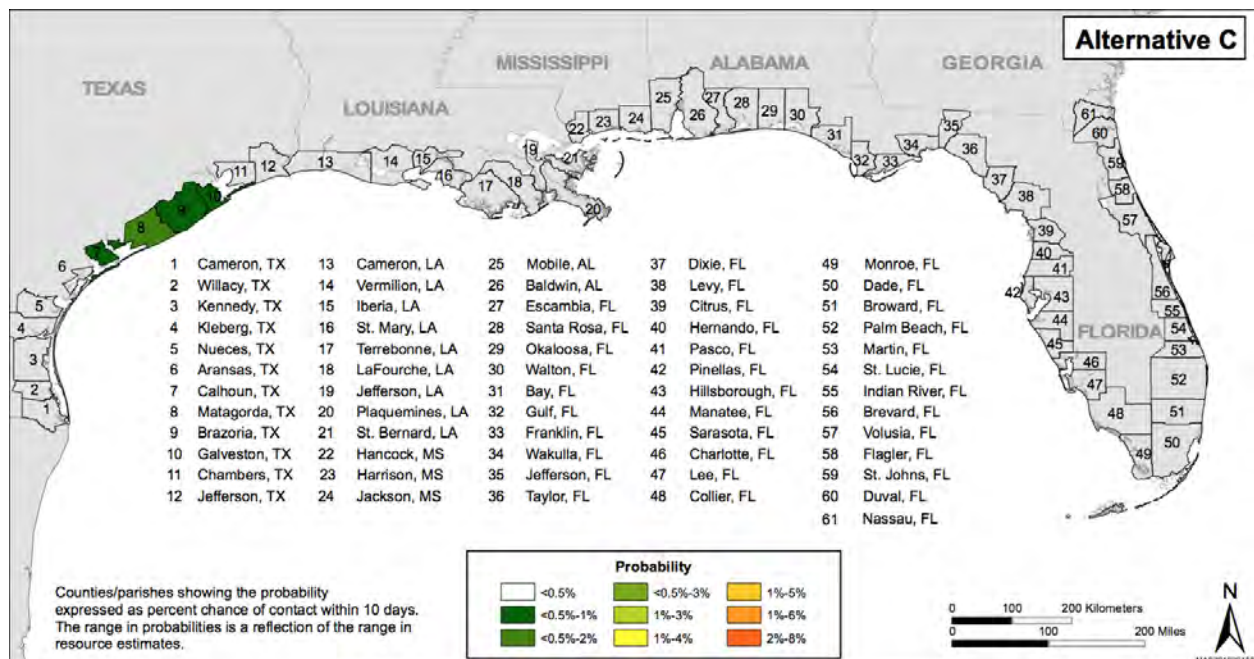


Figure E-6. Probabilities of Oil Spills ($\geq 1,000$ bbl) Occurring and Contacting within 10 Days the Shoreline (counties and parishes) as a Result of Alternative C.

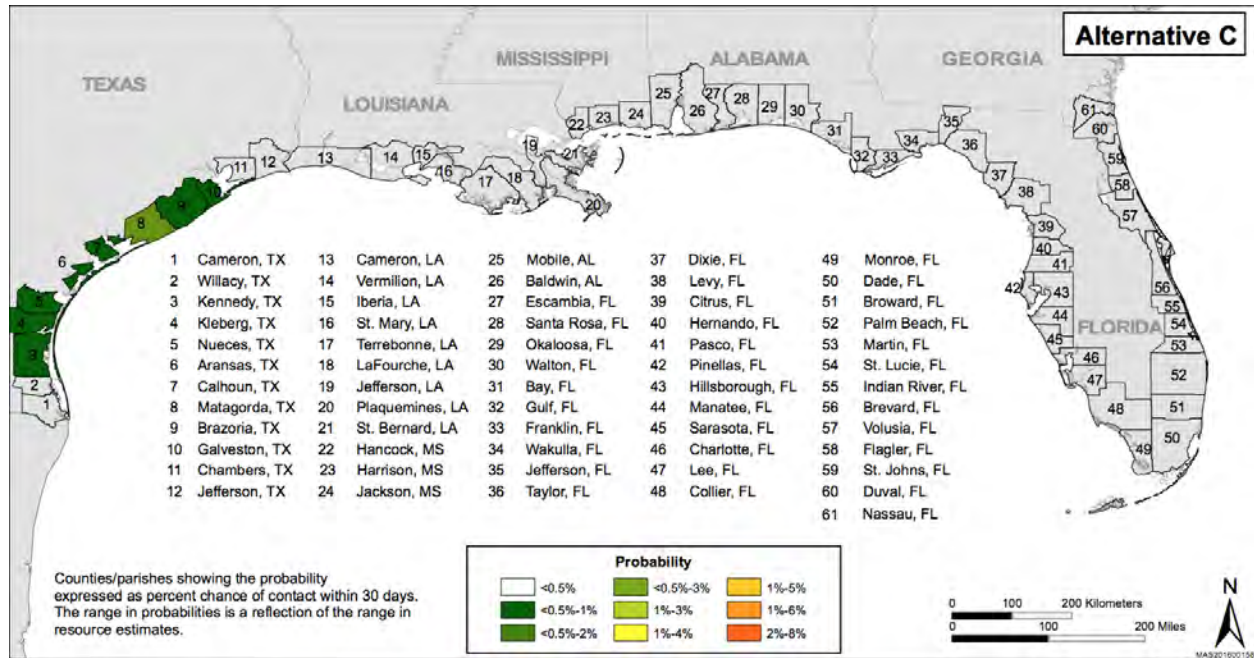


Figure E-7. Probabilities of Oil Spills ($\geq 1,000$ bbl) Occurring and Contacting within 30 Days the Shoreline (counties and parishes) as a Result of Alternative C.

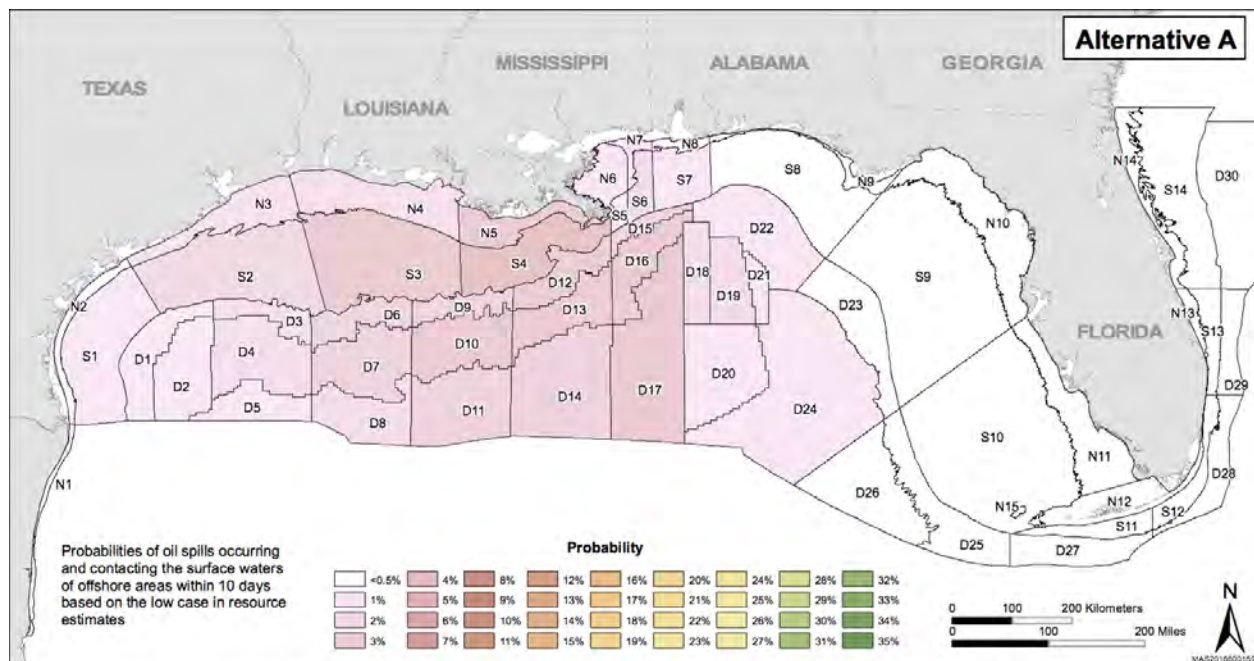


Figure E-8. Probabilities of Oil Spills ($\geq 1,000$ bbl) Occurring and Contacting within 10 Days Nearshore ("N", 0-20 m), Shelf ("S", 20-300 m), and Deepwater ("D", 300 m to outer jurisdiction) Polygons as a Result of the Low Case in Resource Estimates for Alternative A.

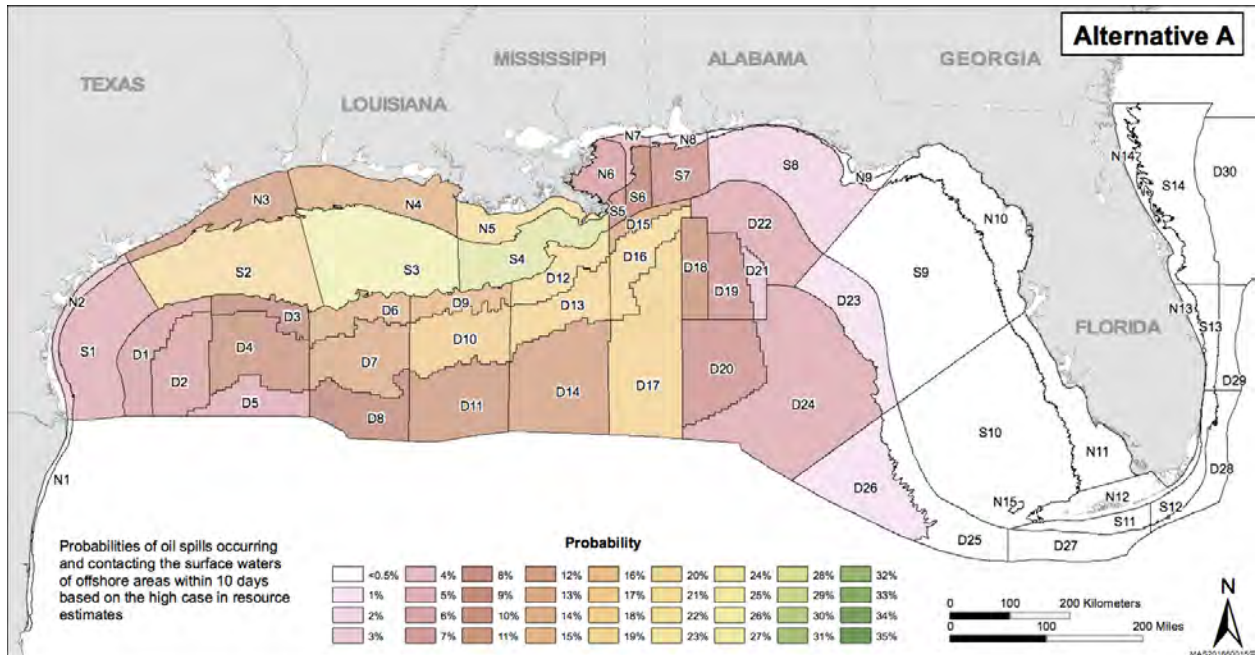


Figure E-9. Probabilities of Oil Spills ($\geq 1,000$ bbl) Occurring and Contacting within 10 Days Nearshore (“N”, 0-20 m), Shelf (“S”, 20-300 m), and Deepwater (“D”, 300 m to outer jurisdiction) Polygons as a Result of the High Case in Resource Estimates for Alternative A.

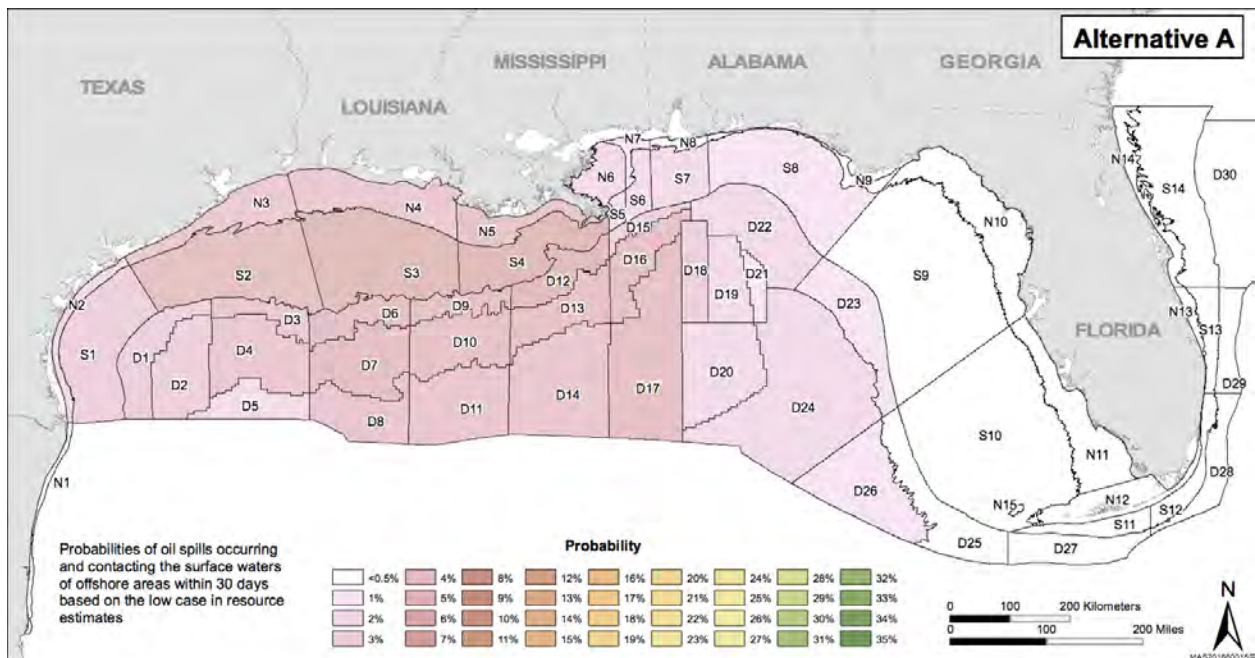


Figure E-10. Probabilities of Oil Spills ($\geq 1,000$ bbl) Occurring and Contacting within 30 Days Nearshore (“N”, 0-20 m), Shelf (“S”, 20-300 m), and Deepwater (“D”, 300 m to outer jurisdiction) Polygons as a Result of the Low Case in Resource Estimates for Alternative A.

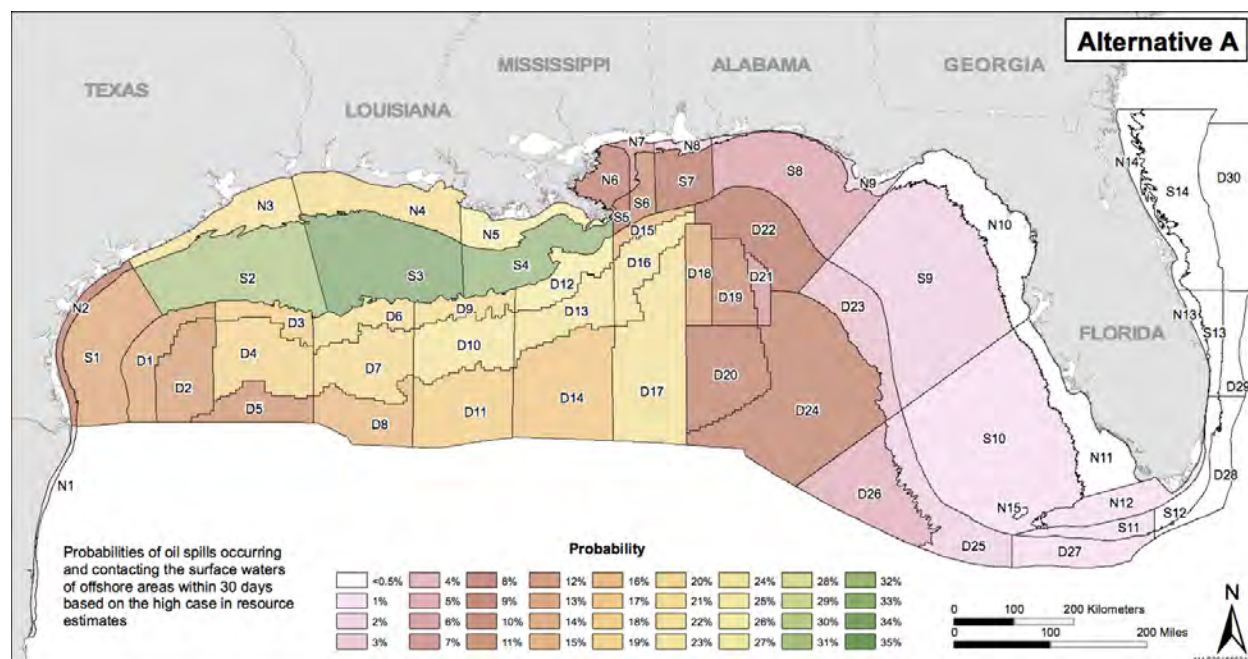


Figure E-11. Probabilities of Oil Spills ($\geq 1,000$ bbl) Occurring and Contacting within 30 Days Nearshore (“N”, 0-20 m), Shelf (“S”, 20-300 m), and Deepwater (“D”, 300 m to outer jurisdiction) Polygons as a Result of the High Case in Resource Estimates for Alternative A.

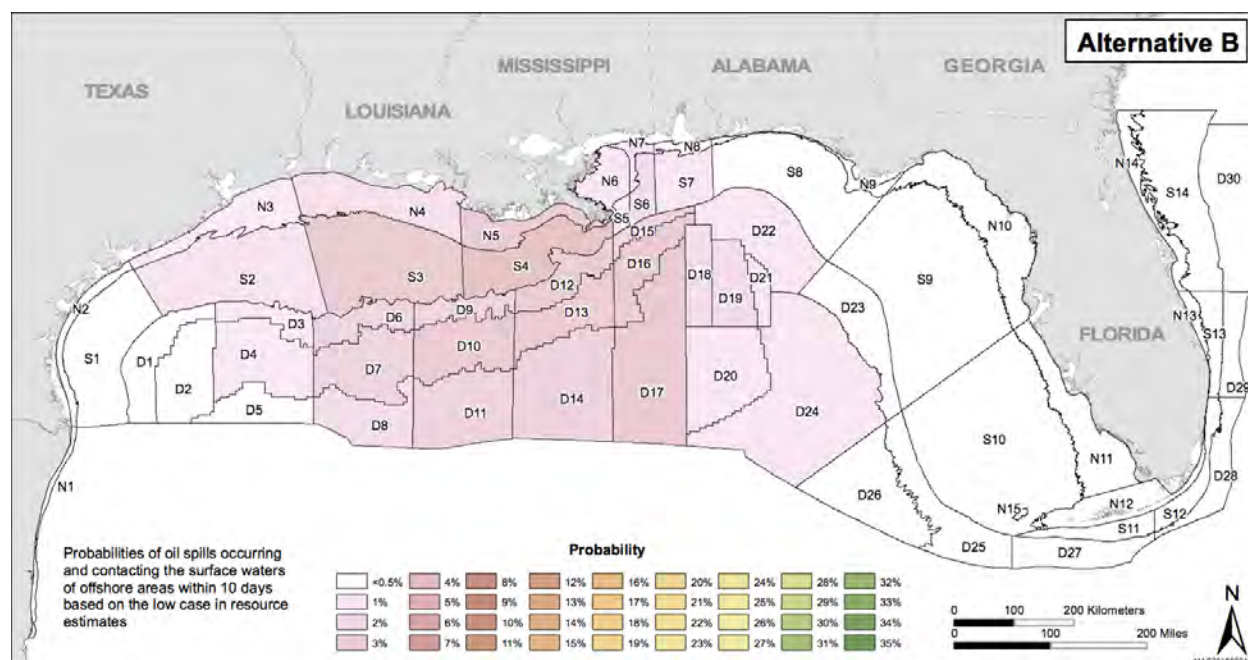


Figure E-12. Probabilities of Oil Spills ($\geq 1,000$ bbl) Occurring and Contacting within 10 Days Nearshore (“N”, 0-20 m), Shelf (“S”, 20-300 m), and Deepwater (“D”, 300 m to outer jurisdiction) Polygons as a Result of the Low Case in Resource Estimates for Alternative B.

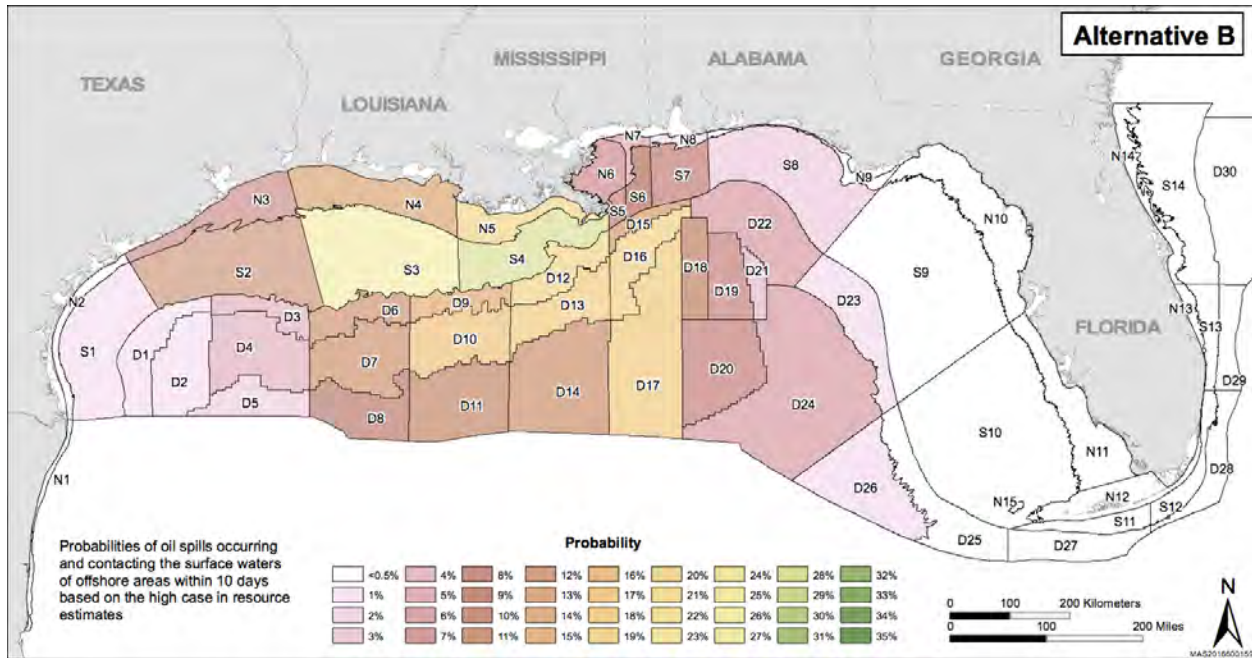


Figure E-13. Probabilities of Oil Spills ($\geq 1,000$ bbl) Occurring and Contacting within 10 Days Nearshore (“N”, 0-20 m), Shelf (“S”, 20-300 m), and Deepwater (“D”, 300 m to outer jurisdiction) Polygons as a Result of the High Case in Resource Estimates for Alternative B.

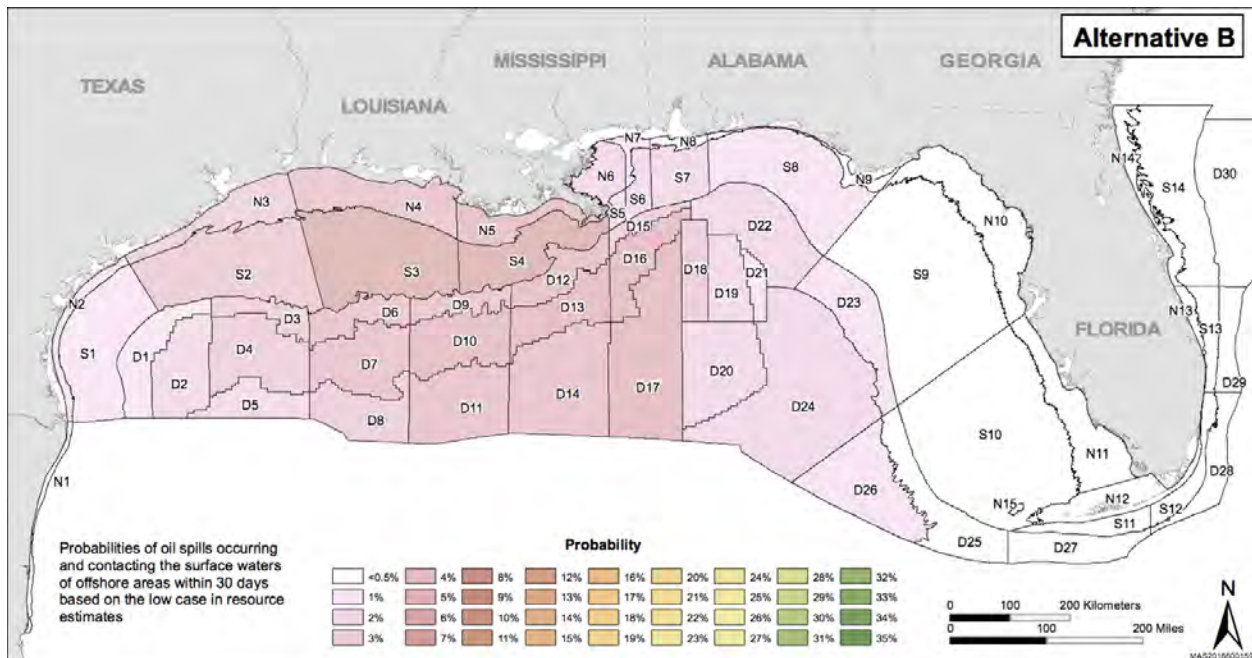


Figure E-14. Probabilities of Oil Spills ($\geq 1,000$ bbl) Occurring and Contacting within 30 Days Nearshore (“N”, 0-20 m), Shelf (“S”, 20-300 m), and Deepwater (“D”, 300 m to outer jurisdiction) Polygons as a Result of the Low Case in Resource Estimates for Alternative B.

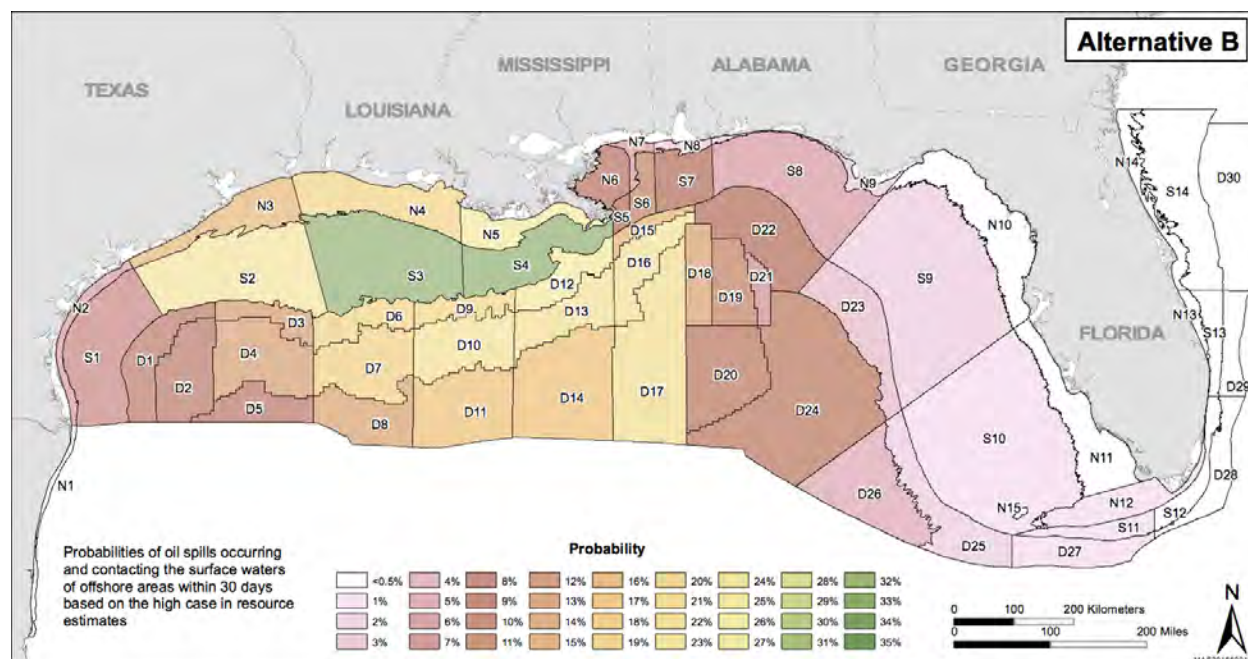


Figure E-15. Probabilities of Oil Spills ($\geq 1,000$ bbl) Occurring and Contacting within 30 Days Nearshore (“N”, 0-20 m), Shelf (“S”, 20-300 m), and Deepwater (“D”, 300 m to outer jurisdiction) Polygons as a Result of the High Case in Resource Estimates for Alternative B.

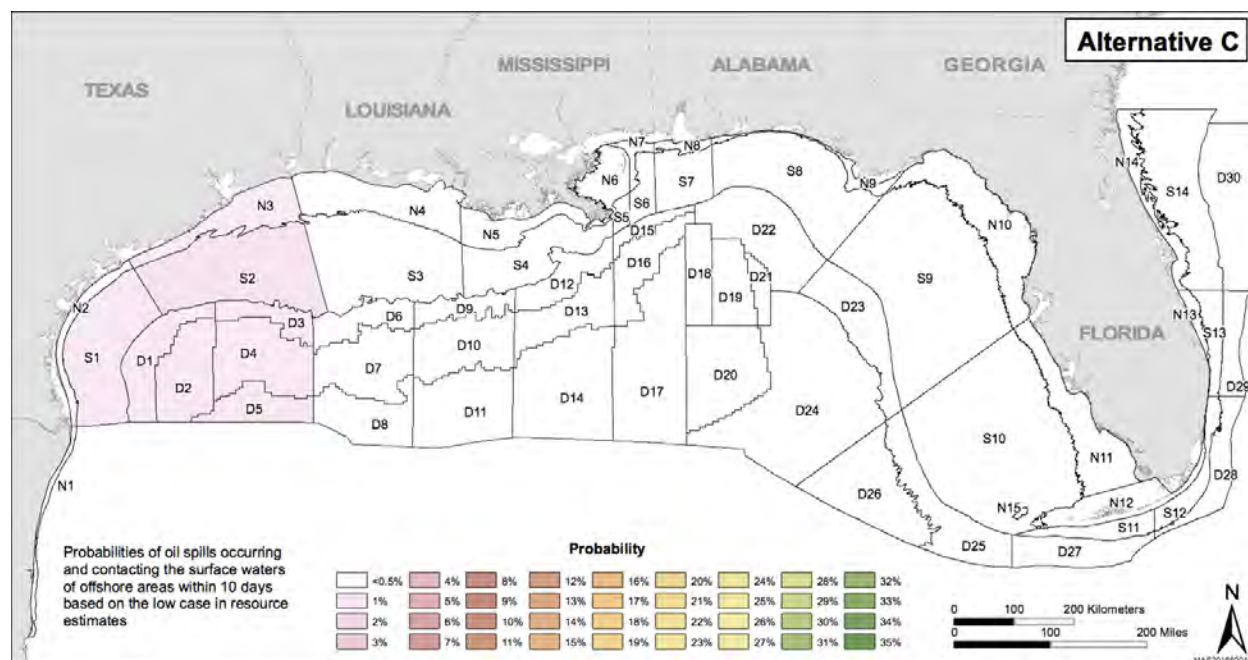


Figure E-16. Probabilities of Oil Spills ($\geq 1,000$ bbl) Occurring and Contacting within 10 Days Nearshore (“N”, 0-20 m), Shelf (“S”, 20-300 m), and Deepwater (“D”, 300 m to outer jurisdiction) Polygons as a Result of the Low Case in Resource Estimates for Alternative C.

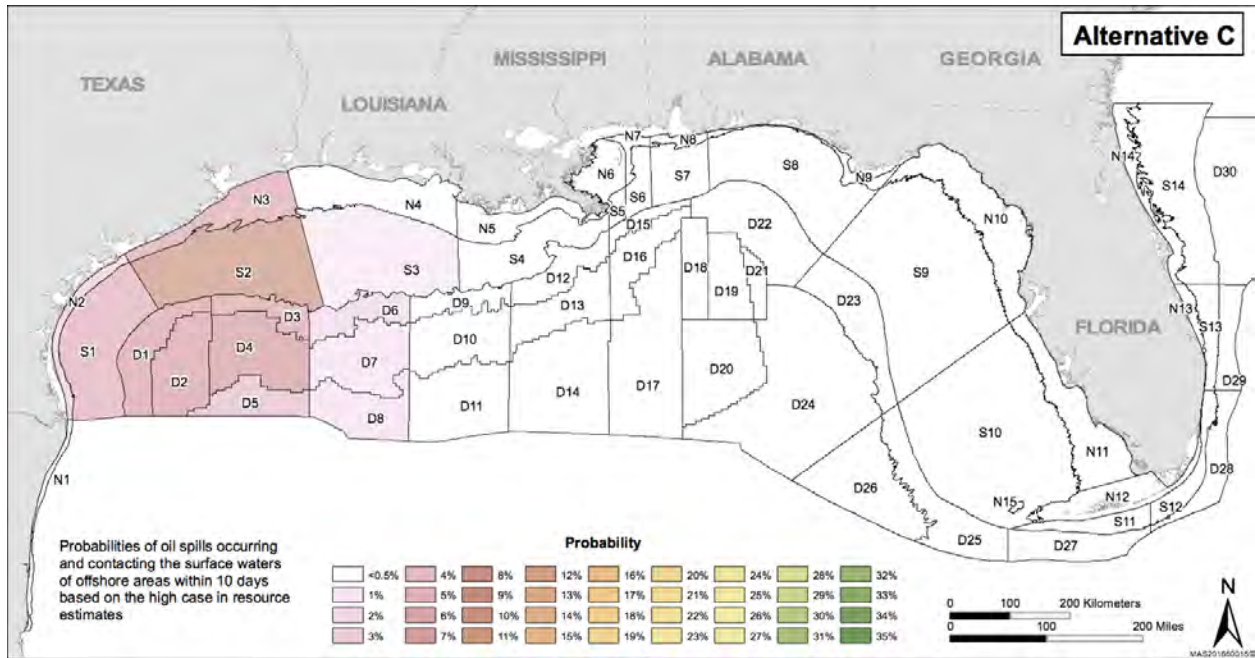


Figure E-17. Probabilities of Oil Spills ($\geq 1,000$ bbl) Occurring and Contacting within 10 Days Nearshore (“N”, 0-20 m), Shelf (“S”, 20-300 m), and Deepwater (“D”, 300 m to outer jurisdiction) Polygons as a Result of the High Case in Resource Estimates for Alternative C.

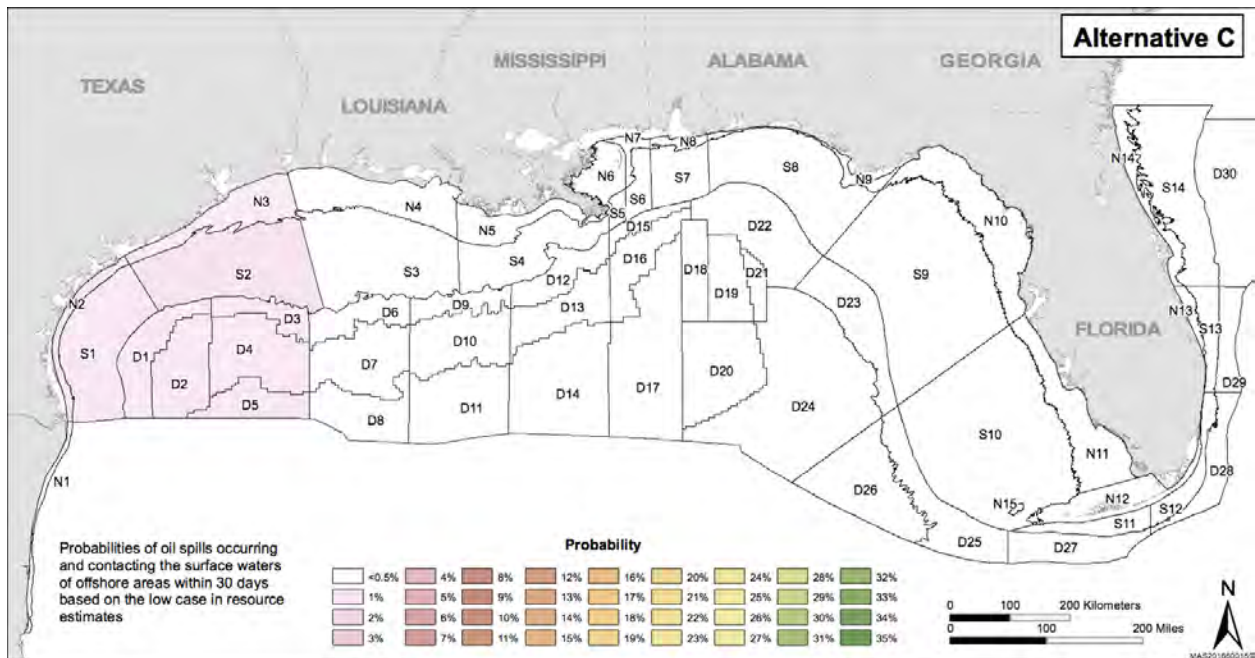


Figure E-18. Probabilities of Oil Spills ($\geq 1,000$ bbl) Occurring and Contacting within 30 Days Nearshore (“N”, 0-20 m), Shelf (“S”, 20-300 m), and Deepwater (“D”, 300 m to outer jurisdiction) Polygons as a Result of the Low Case in Resource Estimates for Alternative C.

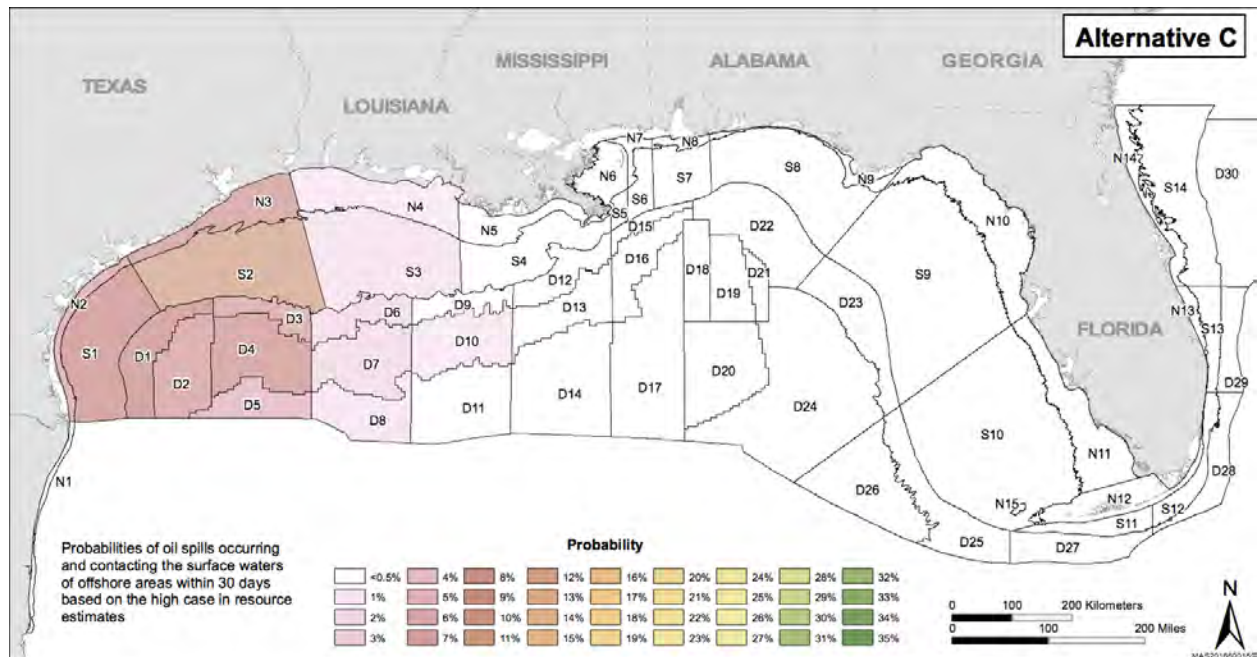


Figure E-19. Probabilities of Oil Spills ($\geq 1,000$ bbl) Occurring and Contacting within 30 Days Nearshore (“N”, 0-20 m), Shelf (“S”, 20-300 m), and Deepwater (“D”, 300 m to outer jurisdiction) Polygons as a Result of the High Case in Resource Estimates for Alternative C.

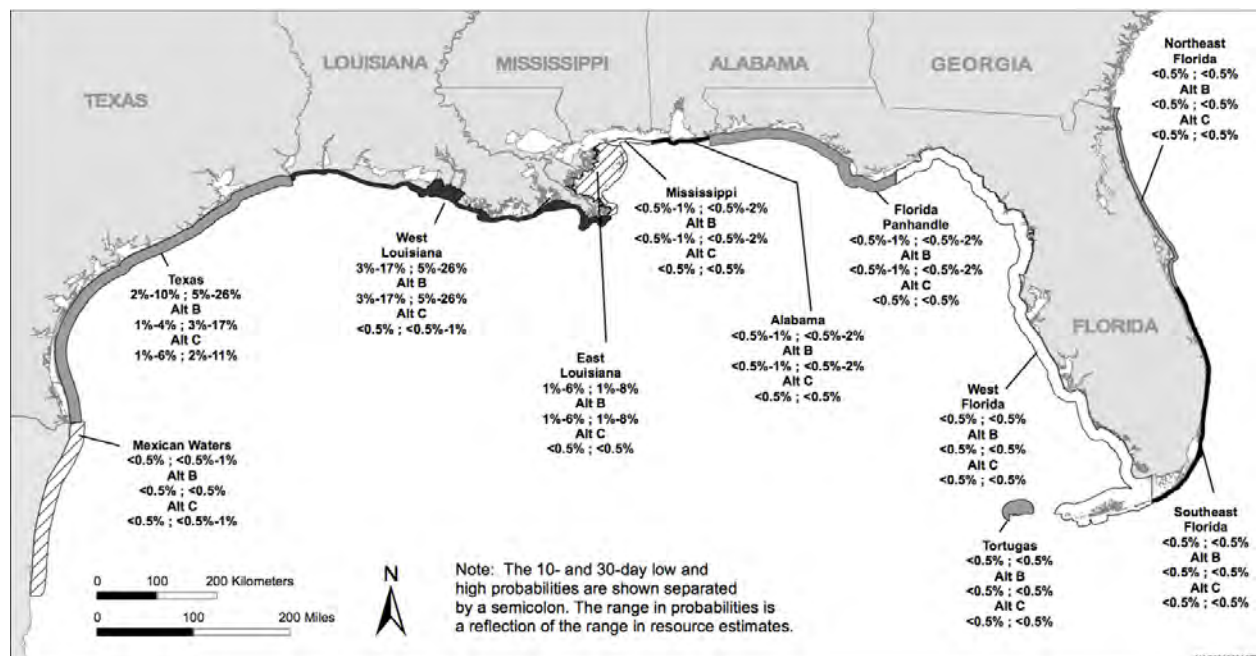


Figure E-20. Probabilities of Oil Spills ($\geq 1,000$ bbl) Occurring and Contacting within 10 Days and 30 Days State Offshore Waters as a Result of Alternative A, B, or C. (Note: The limits of State waters are defined by the States and range from 3 to 9 nmi [3.45 to 10.36 mi; 5.56 to 16.67 km]. Texas and Florida State offshore waters extend 3 marine leagues [just over 9 nmi] seaward from the shoreline [1 marine league = 18,228.3 ft; 5,556 m]. Louisiana State offshore waters extend 3 imperial nautical miles seaward of the shoreline [1 imperial nautical mile = 6,080 ft; 1,853 m].

APPENDIX F

SPECIES NOT CONSIDERED FURTHER

F SPECIES NOT CONSIDERED FURTHER

Common Name	Scientific Name
Mammals	
Bats	
Florida bonneted bat	<i>Eumops floridanus</i>
Gray bat	<i>Myotis grisescens</i>
Indiana bat	<i>Myotis sodalis</i>
Rodents	
Anastasia Island beach mouse	<i>Peromyscus polionotus phasma</i>
Florida salt marsh vole	<i>Microtus pennsylvanicus dukecampbelli</i>
Key Largo cotton mouse	<i>Peromyscus gossypinus allapaticola</i>
Key Largo woodrat	<i>Neotoma floridana smalli</i>
Rice rat	<i>Oryzomys palustris natator</i>
Santa Rosa beach mouse	<i>Peromyscus polionotus leucocephalus</i>
Southeastern beach mouse	<i>Peromyscus polionotus niveiventris</i>
Other Mammals	
Florida panther	<i>Puma concolor coryi</i>
Gulf Coast jaguarundi	<i>Herpailurus yagouaroundi cacomitli</i>
Key deer	<i>Odocoileus virginianus clavium</i>
Louisiana black bear	<i>Ursus americanus luteolus</i>
Lower Keys marsh rabbit	<i>Sylvilagus palustris hefneri</i>
Ocelot	<i>Leopardus pardalis</i>
Puma	<i>Puma concolor</i> (all subspecies except <i>coryi</i>)
Birds	
Attwater's greater prairie-chicken	<i>Tympanuchus cupido attwateri</i>
Audubon's crested caracara	<i>Polyborus plancus audubonii</i>
Bachman's warbler	<i>Vermivora bachmanii</i>
Ivory-billed woodpecker	<i>Campephilus principalis</i>
Everglade snail kite	<i>Rostrhamus sociabilis plumbeus</i>
Florida grasshopper sparrow	<i>Ammodramus savannarum floridanus</i>
Florida scrub-jay	<i>Aphelocoma coerulescens</i>
Kirtland's warbler	<i>Setophaga kirtlandii</i>
Least tern	<i>Sterna antillarum</i>
Northern aplomado falcon	<i>Falco femoralis septentrionalis</i>
Red-cockaded woodpecker	<i>Picoides borealis</i>
Red crowned parrot	<i>Amazona viridigenalis</i>
Sprague's pipit	<i>Anthus spragueii</i>

Common Name	Scientific Name
Reptiles	
Alabama red-belly turtle	<i>Pseudemys alabamensis</i>
American alligator	<i>Alligator mississippiensis</i>
American crocodile	<i>Crocodylus acutus</i>
Atlantic salt marsh snake	<i>Nerodia clarkii taeniata</i>
Black pine snake	<i>Pituophis melanoleucus lodingi</i>
Eastern indigo snake	<i>Drymarchon corais couperi</i>
Gopher tortoise	<i>Gopherus polyphemus</i>
Ringed map turtle	<i>Graptemys oculifera</i>
Sand skink	<i>Neoseps reynoldsi</i>
Yellow-blotched map turtle	<i>Graptemys flavimaculata</i>
Amphibians	
Dusky gopher frog	<i>Rana sevosa</i>
Frosted flatwoods salamander	<i>Ambystoma cingulatum</i>
Reticulated flatwoods salamander	<i>Ambystoma bishopi</i>
Striped newt	<i>Notophthalmus perstriatus</i>
Fishes	
Alabama shad	<i>Alosa alabamae</i>
Alabama sturgeon	<i>Scaphirhynchus suttkusi</i>
Atlantic sturgeon	<i>Acipenser oxyrinchus oxyrinchus</i>
Caribbean electric ray	<i>Narcine bancroftii</i>
Dusky shark	<i>Carcharhinus obscurus</i>
Gulf sturgeon	<i>Acipenser oxyrinchus desotoi</i>
Key silverside	<i>Menidia conchorum</i>
Large-tooth sawfish	<i>Pristis pristis</i>
Nassau grouper	<i>Epinephelus striatus</i>
Okaloosa darter	<i>Etheostoma okaloosae</i>
Opossum pipefish	<i>Microphis brachyurus lineatus</i>
Pallid sturgeon	<i>Scaphirhynchus albus</i>
Pearl darter	<i>Percina aurora</i>
Sand tiger shark	<i>Charcharias taurus</i>
Shortnose sturgeon	<i>Acipenser brevirostrum</i>
Smalltooth sawfish	<i>Pristis pectinata</i>
Speckled hind (grouper)	<i>Epinephelus drummondhayi</i>
Warsaw grouper	<i>Epinephelus nigritus</i>

Common Name	Scientific Name
Invertebrates	
Coral	
Ivory tree coral	<i>Oculina varicosa</i>
Pillar coral	<i>Dendrogyra cylindrus</i>
Rough cactus coral	<i>Mycetophyllia ferox</i>
Clams	
Alabama heelsplitter	<i>Potamilus inflatus</i>
Chipola slabshell	<i>Elliptio chipolaensis</i>
Choctaw bean	<i>Villosa choctawensis</i>
Fat threeridge	<i>Amblema neislerii</i>
Fuzzy pigtoe	<i>Pleurobema strodeanum</i>
Golden orb	<i>Quadrula aurea</i>
Gulf moccasinshell	<i>Medionidus penicillatus</i>
Narrow pigtoe	<i>Fusconaia escambia</i>
Ochlockonee moccasinshell	<i>Medionidus simpsonianus</i>
Oval pigtoe	<i>Pleurobema pyriforme</i>
Purple bankclimber	<i>Elliptoideus sloatianus</i>
Round ebonyshell	<i>Fusconaia rotulata</i>
Shinyrayed pocketbook	<i>Lampsilis subangulata</i>
Smooth pimpleback	<i>Quadrula houstonensis</i>
Southern kidneyshell	<i>Ptychobranthus jonesi</i>
Southern sandshell	<i>Hamiota australis</i>
Tapered pigtoe	<i>Fusconaia burkei</i>
Texas fawnsfoot	<i>Truncilla macrodon</i>
Texas pimpleback	<i>Quadrula petrina</i>
Snails	
Stock Island tree snail	<i>Orthalicus reses</i>
Insects	
Bartram's hairstreak butterfly	<i>Strymon acis bartrami</i>
Florida leafwing butterfly	<i>Anaea troglodyta floridaalis</i>
Miami blue butterfly	<i>Cyclargus thomasi bethunebakeri</i>
Schaus swallowtail butterfly	<i>Heraclides aristodemus ponceanus</i>
Fungi	
Florida perforate cladonia	<i>Cladonia perforata</i>

Common Name	Scientific Name
Plants	
Ferns and Allies	
Florida bristle fern	<i>Trichomanes punctatum</i> ssp. <i>floridanum</i>
Louisiana quillwort	<i>Isoetes louisianensis</i>
Conifers and Cycads	
Florida torreya	<i>Torreya taxifolia</i>
Flowering Plants	
Aboriginal prickly-apple	<i>Harrisia aboriginum</i>
American chaffseed	<i>Schwalbea americana</i>
Apalachicola rosemary	<i>Conradina glabra</i>
Beach jacquemontia	<i>Jacquemontia reclinata</i>
Beautiful pawpaw	<i>Deeringothamnus pulchellus</i>
Big pine partridge pea	<i>Chamaecrista lineata keyensis</i>
Black lace cactus	<i>Echinocereus reichenbachii</i> var. <i>albertii</i>
Blodgett's silverbush	<i>Argythamnia blodgettii</i>
Britton's beargrass	<i>Nolina brittoniana</i>
Brooksville bellflower	<i>Campanula robinsiae</i>
Cape Sable thoroughwort	<i>Chromolaena frustrata</i>
Carter's small-flowered flax	<i>Linum carteri carteri</i>
Carter's mustard	<i>Warea carteri</i>
Chapman rhododendron	<i>Rhododendron chapmanii</i>
Cooley's meadowrue	<i>Thalictrum cooleyi</i>
Cooley's water-willow	<i>Justicia cooleyi</i>
Crenulate lead-plant	<i>Amorpha crenulata</i>
Deltoid spurge	<i>Chamaesyce deltoidea</i> ssp. <i>Deltoidea</i>
Etonia rosemary	<i>Conradina etonia</i>
Everglades bully	<i>Sideroxylon reclinatum</i> ssp. <i>austrofloridense</i>
Florida golden aster	<i>Chrysopsis floridana</i>
Florida pineland crabgrass	<i>Digitaria pauciflora</i>
Florida semaphore cactus	<i>Consolea corallicola</i>
Florida bonamia	<i>Bonamia grandiflora</i>
Florida brickell-bush	<i>Brickellia mosieri</i>
Florida prairie-clover	<i>Dalea carthagenensis floridana</i>
Florida skullcap	<i>Scutellaria floridana</i>
Four-petal pawpaw	<i>Asimina tetramera</i>
Fragrant prickly-apple	<i>Cereus eriophorus</i> var. <i>fragrans</i>
Garber's spurge	<i>Chamaesyce garberi</i>

Common Name	Scientific Name
<i>Flowering Plants (continued)</i>	
Gentian pinkroot	<i>Spigelia gentianoides</i>
Godfrey's butterwort	<i>Pinguicula ionantha</i>
Harper's beauty	<i>Harperocallis flava</i>
Johnson's seagrass	<i>Halophila johnsonii</i>
Key tree cactus	<i>Pilosocereus robinii</i>
Lakela's mint	<i>Dicerandra immaculata</i>
Lewton's polygala	<i>Polygala lewtonii</i>
Longspurred mint	<i>Dicerandra cornutissima</i>
Miccosukee gooseberry	<i>Ribes echinellum</i>
Okeechobee gourd	<i>Cucurbita okeechobeensis</i> ssp. <i>okeechobeensis</i>
Papery whitlow-wort	<i>Paronychia chartacea</i>
pigeon wings	<i>Clitoria fragrans</i>
pineland sandmat	<i>Chamaesyce deltoidea pinetorum</i>
Pygmy fringe-tree	<i>Chionanthus pygmaeus</i>
Rugel's pawpaw	<i>Deeringothamnus rugelii</i>
Sand flax	<i>Linum arenicola</i>
Scrub buckwheat	<i>Eriogonum longifolium</i> var. <i>gnaphalifolium</i>
Scrub plum	<i>Prunus geniculata</i>
Slender rush-pea	<i>Hoffmannseggia tenella</i>
Small's milkpea	<i>Galactia smallii</i>
South Texas ambrosia	<i>Ambrosia cheiranthifolia</i>
Telephus spurge	<i>Euphorbia telephioides</i>
Texas prairie dawn-flower	<i>Hymenoxys texana</i>
Texas ayenia	<i>Ayenia limitaris</i>
Tiny polygala	<i>Polygala smallii</i>
Wedge spurge	<i>Chamaesyce deltoidea serpyllum</i>
White birds-in-a-nest	<i>Macbridea alba</i>
Wide-leaf warea	<i>Warea amplexifolia</i>

APPENDIX G

STATE COASTAL MANAGEMENT PROGRAMS

G STATE COASTAL MANAGEMENT PROGRAMS

Each State's Coastal Management Program (CMP), federally approved by the National Oceanic and Atmospheric Administration (NOAA), is a comprehensive statement setting forth objectives, enforceable policies or guidelines, and standards for public and private use of land and water resources and uses in that State's coastal zone. The program provides for direct State land and water use planning and regulations. The plan also includes a definition of what constitutes permissible land uses and water uses. Federal consistency is the Coastal Zone Management Act (CZMA) requirement where Federal agency activities that have reasonably foreseeable effects on any land or water use or natural resource of the coastal zone must be consistent to the maximum extent practicable with the enforceable policies or guidelines of a coastal state's federally approved coastal management program. The latest Federal consistency regulations concerning State coastal zone management (CZM) programs are found in the *Federal Register* (2000 and 2006).

Each Gulf States' official coastal boundary can be identified from NOAA's website at <https://coast.noaa.gov/czm/media/StateCZBoundaries.pdf>. Once a State's CMP is federally approved, Federal agencies must ensure that their actions are consistent to the maximum extent practicable with the enforceable policies of the approved program. Federal agencies provide feedback to the States through each Section 312 evaluation conducted by NOAA.

To ensure conformance with State CMP policies or guidelines and local land use plans, the Bureau of Ocean Management (BOEM) prepares a Federal consistency determination for each proposed Outer Continental Shelf (OCS) lease sale. Through the designated State CZM agency, local land use entities are provided numerous opportunities to comment on the OCS Program. Local land-use agencies also have the opportunity to comment directly to BOEM at any time, as well as during formal public comment periods related to the announcement of the Five-Year Program, Call for Information/Notice of Intent, environmental impact statement (EIS) scoping, public hearings on the Draft EIS, and the Proposed Notice of Sale.

A State's approved CMP may also provide for the State's review of OCS plans, permits, and license activities to determine whether they will be conducted in a manner consistent with the State's CMP. This review authority is applicable to activities conducted in any area that has been leased under the OCS Lands Act (OCSLA) and that affect any land or water use or natural resource within the State's coastal zone (16 U.S.C. § 1456(c)(3)(B)).

State of Texas Coastal Management Program

The Texas Coastal Management Program (TCMP) Final EIS was published in August 1996. On December 23, 1996, NOAA approved the TCMP, and the requirements therein were made operational as of January 10, 1997. The TCMP is based primarily on the Coastal Coordination Act (CCA) of 1991 (33 Tex. Nat. Res. Code Ann. Ch. 201 *et seq.*), as amended by House Bill 3226 (1995), which calls for the development of a comprehensive coastal program based on existing statutes and regulations. The CCA established the geographic scope of the program by identifying the program's inland, interstate, and seaward boundaries. The program's seaward boundary is the

State's territorial seaward limit (3 leagues or 10.36 miles or 16.67 kilometers). The State's inland boundary is based on the State's Coastal Facilities Designation Line (CFDL). The CFDL was developed in response to the Oil Pollution Act of 1990 and basically delineates those areas within which oil spills could affect coastal waters or resources. For the purposes of the TCMP, the CFDL has been modified to capture wetlands in upper reaches of tidal waters. The geographic scope also extends upstream 200 miles (322 kilometers) from the mouths of rivers draining into coastal bays and estuaries in order to manage water appropriations on those rivers. The program's boundaries encompass all or portions of 18 coastal counties (including Cameron, Willacy, Kenedy, Kleberg, Nueces, San Patricio, Aransas, Refugio, Calhoun, Victoria, Jackson, Matagorda, Brazoria, Galveston, Harris, Chambers, Jefferson, and Orange Counties), roughly 8.9 million acres (3.6 million hectares) of land and water.

Within this coastal zone boundary, the scope of the TCMP's regulatory program is focused on the direct management of 16 generic "Areas of Particular Concern," called coastal natural resource areas (CNRAs). These CNRAs are associated with valuable coastal resources or vulnerable or unique coastal areas and include the following: waters of the open Gulf of Mexico (GOM); waters under tidal influence; submerged lands; coastal wetlands; seagrasses; tidal sand and mud flats; oyster reefs; hard substrate reefs; coastal barriers; coastal shore areas; GOM beaches; critical dune areas; special hazard areas; critical erosion areas; coastal historic areas; and coastal preserves.

The State has designated the Western Planning Area (WPA) as the geographical area in which Federal consistency shall apply outside of the coastal boundary. The TCMP also identifies Federal lands excluded from the State's coastal zone, such as U.S. Department of Defense facilities and wildlife refuges.

Land and water uses subject to the program generally include the siting, construction, and maintenance of electric generating and transmission facilities; oil and gas exploration and production; and the siting, construction, and maintenance of residential, commercial, and industrial development on beaches, critical dune areas, shorelines, and within or adjacent to critical areas and other CNRAs. Associated activities also subject to the program include canal dredging; filling; placement of structures for shoreline access and shoreline protection; on-site sewage disposal, storm-water control, and waste management for local governments and municipalities; the siting, construction, and maintenance of public buildings and public works such as dams, reservoirs, and flood control projects and associated activities; the siting, construction, and maintenance of roads, highways, bridges, causeways, airports, railroads, and nonenergy transmission lines and associated activities; certain agricultural and silvicultural activities; water impoundments and diversions; and the siting, construction, and maintenance of marinas, State-owned fishing cabins, artificial reefs, public recreational facilities, structures for shoreline access and shoreline protection, boat ramps, and fishery management measures in the GOM.

The TCMP is a networked program that is implemented primarily through 8 State agencies, 18 local governments, and the Coastal Coordination Advisory Committee (Committee). The

program relies primarily on direct State control of land and water uses, although local governments will implement State guidelines related to beach and dune management. Implementation and enforcement of the coastal policies is primarily the responsibility of the networked agencies and local governments through their existing statutes, regulatory programs, or other authorizations. Networked agencies include the General Land Office/School Land Board, Texas Commission on Environmental Quality, Railroad Commission of Texas, Texas Parks and Wildlife Commission, Texas Department of Transportation, Texas Water Development Board, Texas State Soil and Water Conservation Board, and the Texas Sea Grant College Program at Texas A&M University. Other members on the Council include four gubernatorial appointees: (1) a coastal business representative; (2) an agriculture representative; (3) a local elected official; and (4) a coastal citizen. Similarly, 18 county and municipal governments, in those counties with barrier islands, are also networked entities with responsibilities for program implementation vis-a-vis beaches and dunes.

Regulations, programs, and expertise of State, Federal, and local government entities are linked to the management of Texas CNRAs in the TCMP. Local governments are notified of relevant TCMP decisions, including those that may conflict with local land-use plans or zoning ordinances. The Committee includes a local government representative as a full-voting member. An additional local government representative can be added to the Committee as a non-voting member for special local matters under review. The Committee established a permanent advisory committee to ensure effective communication for local governments with land-use authority.

In 1994, this Agency entered into a Memorandum of Understanding (MOU) with the Texas General Land Office to address similar mineral resource management responsibilities between the two entities and to encourage cooperative efforts and promote consistent regulatory practices. This MOU, which encompasses a broad range of issues and processes, outlines the responsibilities and cooperative efforts, including leasing and CZMA review processes, agreed to by the respective agencies. Effective January 10, 1997, all operators were required to submit to BOEM certificates of consistency with the TCMP for proposed operations in the WPA.

This Agency developed coordination procedures with the State for submittal of offshore lease sale consistency determinations and plans of operation. The WPA Lease Sale 168 was this Agency's first Federal action subject to State consistency review. This Agency and the State of Texas revised CZM consistency information for OCS plans, permits, and licenses to conform to the revised CZM regulations that were effective January 8, 2001, and updated on January 5, 2006, and have also incorporated streamlining improvements into the latest Notices to Lessees and Operators (NTLs) (NTLs 2008-G04, 2009-G27, and 2015-BOEM-N01). The State of Texas requires an adequate description, objective, and schedule for the project; site-specific information on the onshore support base, support vessels, shallow hazards, oil-spill response, wastes and discharges, transportation activities, and air emissions; and a Federal consistency certification, assessment, and findings. The State's requirements for Federal consistency review are based specifically on U.S. Department of the Interior's (DOI's) regulations at 30 CFR parts 250, 254, 256, and 550, and NOAA's Federal consistency regulations at 15 CFR part 930. This Agency will be continuing a dialogue with the State of Texas on reasonably foreseeable coastal effects for pipelines and other

permits, and the result of these discussions will be incorporated into future updates of this Agency's NTLs and/permitting procedures.

State of Louisiana, Office of Coastal Management

The statutory authority for Louisiana's coastal zone management program, the Louisiana Office of Coastal Management (LOCM), is the State and Local Coastal Resources Management Act of 1978 *et seq.* (Louisiana Administrative Code, Volume 17, Title 43, Chapter 7, Coastal Management, June 1990 revised). The State statute puts into effect a set of State coastal policies and coastal use guidelines that apply to coastal land and water use decisionmaking. A number of existing State regulations are also incorporated into the program, including those concerning oil and gas and other mineral operations; leasing of State lands for mineral operations and other purposes; hazardous waste and radioactive materials; management of wildlife, fish, other aquatic life, and oyster beds; endangered species; air and water quality; and the Louisiana Superport.

The State statute also authorized establishment of Special Management Areas. Included as Special Management Areas are the Louisiana Offshore Oil Port (LOOP) and the Marsh Island Wildlife Refuge. For purposes of the CZMA, only that portion of LOOP within Louisiana's coastal zone is part of the Special Management Area. In April 1989, the Louisiana Legislature created the Wetlands Conservation and Restoration Authority and established a Wetlands Conservation and Restoration Trust Fund to underwrite restoration projects. The Legislature also reorganized part of the Louisiana Department of Natural Resources (LDNR) by creating the Office of Coastal Restoration and Management.

Local governments (parishes) may assume management of uses of local concern by developing a local coastal program consistent with the State CMP. The State of Louisiana has 10 approved local coastal management programs (Calcasieu, Cameron, Jefferson, Lafourche, Orleans, St. Bernard, St. James, Plaquemines, Terrebonne, and St. Tammany Parishes). In addition, two additional parishes, St. John the Baptist and St. Charles, have worked towards developing local coastal management programs. Eight other programs (Assumption, Iberia, Livingston, St. Charles, St. Martin, St. Mary, Tangipahoa, and Vermilion Parishes) have not been formally approved by NOAA. The parish planning and/or permits offices often serve as the permitting agency for projects limited to local concern. Parish-level programs, in addition to issuing permits for uses of local concern, also function as a commenting agency to Louisiana's CZM agency, the LOCM, regarding permitting of uses of State concern.

Appendix C2 of the LOCM outlines the rules and procedures for the State's local CMP. Under the LOCM, parishes are authorized, though not required, to develop local CMPs. Approval of these programs gives parishes greater authority in regulating coastal development projects that entail uses of local concern. Priorities, objectives, and policies or guidelines of local land use plans must be consistent with the policies and objectives of Act 361, the LOCM, and the State guidelines, except for a variance adopted in Section IV.D of Appendix C2 of the LOCM. The Secretaries of LDNR and Wildlife and Fisheries may jointly rule on an inconsistent local program based on local

environmental conditions or user practices. State and Federal agencies review parish programs before they are adopted.

The coastal use guidelines are based on seven general policies or guidelines. State concerns that could be relevant to an OCS lease sale and its possible direct effects or associated facilities and nonassociated facilities are (a) any dredge and fill activity that intersects more than one waterbody, (b) projects involving the use of State-owned lands or water bottoms, (c) national interest projects, (d) pipelines, and (e) energy facility siting and development. Some coastal activities of concern that could be relevant to a lease sale include wetland loss due to channel erosion from OCS traffic; activities near reefs and topographic highs; activities that might affect endangered, threatened, or commercially valuable wildlife; and potential socioeconomic impacts due to offshore development. Secondary and cumulative impacts to coastal resources such as onshore facility development, cumulative impacts from infrastructure development, salt intrusion along navigation channels, etc. are also of particular concern.

Effective August 1993, the LOCM required that any entity applying for permits to conduct activities along the coast must notify the landowner of the proposed activity. An affidavit must also accompany any permit application. Through this regulation, the State strives to minimize coastal zone conflicts.

This Agency and the State of Louisiana revised CZM consistency information for OCS plans, permits, and licenses to conform to the revised CZM regulations that were effective January 8, 2001, and updated on January 5, 2006, and have also incorporated streamlining improvements into the latest NTLs (NTLs 2008-G04, 2009-G27, and 2015-BOEM-N01). Federal consistency for right-of-way (ROW) pipelines is addressed in NTL 2007-G20. The State of Louisiana requires an adequate description, objective, and schedule for the project. Also, the State requires site-specific information on the onshore support base, support vessels, shallow hazards, oil-spill response, wastes and discharges (including any disposal of wastes within the State coastal zone and waters and municipal, parish, or State facilities to be used), transportation activities, air emissions, and secondary and cumulative impacts; and a Federal consistency certification, assessment, and findings. In addition, the State receives consistency reviews on a case-by-case basis for decommissioning activities within OCS Significant Sediment Blocks that the State utilizes marine mineral resources for restoration projects. The State requirements for Federal consistency review are based specifically on DOI's regulations at 30 CFR parts 250, 254, 256, and 550, and NOAA's Federal consistency regulations at 15 CFR part 930. BOEM is continuing a dialogue with the State of Louisiana on reasonably foreseeable coastal effects associated with pipelines and other permits, and the result of these discussions will be incorporated into future updates of the Bureau of Ocean Energy Management's NTL's and/or permitting procedures.

State of Mississippi Coastal Program

The Mississippi Coastal Program (MCP) is administered by the Mississippi Department of Marine Resources. The MCP is built around several enforceable goals that promote comprehensive

management of coastal resources and encourage a balance between environmental protection/preservation and development in the coastal zone. The primary coastal management statute is the Coastal Wetlands Protection Law. Other major features of the MCP include statutes related to fisheries, air and water pollution control, surface and groundwater, cultural resources, and the disposal of solid waste in marine waters. The Department of Marine Resources, the Department of Environmental Quality, and the Department of Archives and History are identified collectively as the “coastal program agencies.” Mississippi manages coastal resources by regulation and by promoting activities that use resources in compliance with the MCP. The State developed a coastal wetlands use plan, which includes designated use districts in coastal wetlands and Special Management Area Plans that steer development away from fragile coastal resources and help to resolve user conflicts.

For the purposes of the coastal program, the coastal zone encompasses the three coastal counties of Hancock, Harrison, and Jackson and all coastal waters. The Mississippi coast has 359 miles (594 kilometers) of shoreline, including the coastlines of offshore barrier islands (Cat, Ship, Horn, and Petit Bois Islands). According to NOAA, there are no approved local CMPs for the State of Mississippi. The Southern Mississippi Planning and Development District serves in an advisory capacity to the State coastal agencies.

This Agency developed coordination procedures with the State for submittal of offshore lease sale consistency determinations and plans of operation. This Agency and the State of Mississippi revised CZM consistency information for OCS plans, permits and licenses to conform to the revised CZM regulations that were effective January 8, 2001, and updated on January 5, 2006, and have also incorporated streamlining improvements into the latest NTLs (NTLs 2008-G04, 2009-G27, and 2015-BOEM-N01). Federal consistency for ROW pipelines is addressed in NTL 2007-G20. The State of Mississippi requires an adequate description, objective, and schedule for the project; site-specific information on the onshore support base, support vessels, shallow hazards, oil-spill response, wastes and discharges, transportation activities, and air emissions; and a Federal consistency certification, assessment, and findings. The State requirements for Federal consistency review are based specifically on DOI’s regulations at 30 CFR parts 250, 254, 256, and 550, and NOAA’s Federal consistency requirements at 15 CFR part 930. BOEM is continuing a dialogue with the State of Mississippi on reasonably foreseeable coastal effects associated with pipelines and other permits, and the result of these discussions will be incorporated into future updates of the Bureau of Ocean Energy Management’s NTL’s and/or permitting procedures.

State of Alabama Coastal Area Management Program

The Alabama Coastal Area Act (ACAA) provides statutory authority to review all coastal resource uses and activities that have a direct and significant effect on the coastal area. The Alabama Department of Conservation and Natural Resources (ADCNR) Lands Division, Coastal Section Office, the lead coastal management agency, is responsible for the management of the State’s coastal resources through the Alabama Coastal Area Management Program (ACAMP). The ADCNR is responsible for the overall management of the program, including fiscal and grants management and public education and information. The department also provides planning and

technical assistance to local governments and financial assistance to research facilities and units of local government when appropriate. The State Lands Division, Coastal Section, also has authority over submerged lands in regard to piers, marinas, bulkheads, and submerged land leases.

The Alabama Department of Environmental Management (ADEM) is responsible for coastal area permitting, regulatory, and enforcement functions. Most programs of ADCNR Coastal Section that require environmental permits or enforcement functions are carried out by the ADEM with the exception of submerged land issues. The ADEM has the responsibility of all permit, enforcement, regulatory, and monitoring activities, and the adoption of rules and regulations to carry out the ACAMP. The ADEM must identify specific uses or activities that require a State permit to be consistent with the coastal policies noted above and the more detailed rules and regulations promulgated as part of the ACAMP. Under the ACAA, State agency activities must be consistent with ACAMP policies and ADEM findings. Further, ADEM must make a direct permit-type review for uses that are not otherwise regulated at the State level. The ADEM also has authority to review local government actions and to assure that local governments do not unreasonably restrict or exclude uses of regional benefit. Ports and major energy facilities are designated as uses of regional benefit. The ADCNR Lands Division manages all lease sales of State submerged bottomlands and regulates structures placed on State submerged bottomlands.

Local governments have the option to participate in the ACAMP by developing local codes, regulations, rules, ordinances, plans, maps, or any other device used to issue permits or licenses. If these instruments are certified to be consistent with ACAMP, ADEM may allow the local government to administer them by delegating its permit authority, thereby eliminating the need for ADEM's case-by-case review.

The South Alabama Regional Planning Commission provides ongoing technical assistance to ADCNR for Federal consistency, clearinghouse review, and public participation procedures. Uses subject to the Alabama's CZM program are divided into regulated and nonregulated categories. Regulated uses are those that have a direct and significant impact on the coastal areas. These uses either require a State permit or are required by Federal law to be consistent with the management program. Uses that require a State permit must receive a certificate of compliance. Nonregulated uses are those activities that have a direct and significant impact on the coastal areas that do not require a State permit or Federal consistency certification. Nonregulated uses must be consistent with ACAMP and require local permits to be administered by ADEM.

This Agency developed coordination procedures with the State for submittal of offshore lease sale consistency determinations and plans of operation. This Agency and the State of Alabama have revised CZM consistency information for OCS plans, permits, and licenses to conform to the revised CZM regulations that were effective January 8, 2001, and updated on January 5, 2006, and have also incorporated streamlining improvements into the latest NTLs (NTLs 2008-G04, 2009-G27, and 2015-BOEM-N01). Federal consistency for ROW pipelines is addressed in NTL 2007-G20. The State of Alabama requires an adequate description, objective, and schedule for the project; site-specific information on the onshore support base, support vessels, shallow hazards, oil-spill

response, wastes and discharges, transportation activities, and air emissions; and a Federal consistency certification, assessment, and findings. The State's requirements for Federal consistency review are based specifically on DOI's regulations at 30 CFR parts 250, 254, 256, and 550, and NOAA's Federal consistency requirements at 15 CFR part 930. BOEM is continuing a dialogue with the State of Alabama on reasonably foreseeable coastal effects associated with pipelines and other permits, and the result of these discussions will be incorporated into future updates of Bureau of Ocean Energy Management's NTLs and/or permitting procedures.

State of Florida Coastal Management Program

For purposes of the CZMA, the State of Florida's coastal zone includes the area encompassed by the State's 67 counties and its territorial seas. Lands owned by the Federal Government and the Seminole and Miccosukee Indian tribes are not included in the State's coastal zone; however, Federal activities in or outside the coastal zone, including those on Federal or Tribal lands, that affect any land or water or natural resource of the State's coastal zone are subject to review by Florida under the CZMA. The Florida Coastal Management Act, codified as Chapter 380, Part II, Florida Statutes, authorized the development of a coastal management program. In 1981, the Florida Coastal Management Program (FCMP) was approved by NOAA.

The policies identified by the State of Florida as being enforceable in the FCMP are the 24 chapters that NOAA approved for incorporation in the State's program. The 2011 Florida Statutes are the most recent version approved by NOAA and include the listing of OCSLA permits under Subpart E and the addition of draft EAs and EISs as necessary data and information for Federal consistency review

A network of eight State agencies and five regional water management districts implement the FCMP's 24 statutes. The water management districts are responsible for water quantity and quality throughout the State's watersheds. The State agencies include the following: the Department of Environmental Protection (DEP), the lead agency for the FCMP and the State's chief environmental regulatory agency and steward of its natural resources; the Department of Community Affairs, which serves as the State's land planning and emergency management agency; the Department of Health, which, among other responsibilities, regulates on-site sewage disposal; the Department of State, Division of Historical Resources, which protects historic and archaeological resources; the Fish and Wildlife Conservation Commission, which protects and regulates fresh and saltwater fisheries, marine mammals, and birds and upland species, including protected species and the habitat used by these species; the Department of Transportation, which is charged with the development, maintenance, and protection of the transportation system; the Department of Agriculture and Consumer Services, which manages State forests and administers aquaculture and mosquito control programs; and the Governor's Office of Planning and Budget, which plays a role in the comprehensive planning process.

Effective July 1, 2000, the Governor of Florida assigned the State's responsibilities under the OCSLA to the Secretary of the Florida DEP. The DEP's Office of Intergovernmental Programs

coordinates the review of OCS plans with FCMP member agencies to ensure that the plan is consistent with applicable State enforceable policies and the Governor's responsibilities under the Act.

This Agency developed coordination procedures with the State for the submittal of offshore lease sale consistency determinations and plans of operation. In 2003, this Agency and the State revised CZM consistency information for OCS plans, permits, and licenses to conform with the revised CZM regulations that were effective on January 8, 2001, and updated on January 5, 2006, and they have also incorporated streamlining improvements into the latest NTLs (NTLs 2008-G04, 2009-G27, and 2015-BOEM-N01). Federal consistency for ROW pipelines is addressed in NTL 2007-G20.

The State of Florida requires an adequate description, objective, and schedule for all activities associated with a project; specific information on the natural resources potentially affected by the proposed activities; and specific information on onshore support base, support vessels, shallow hazards, oil-spill response, wastes and discharges, transportation activities, and air emissions; and a Federal consistency certification, assessment, and findings. As identified by the State of Florida, the State enforceable policies that must be addressed for OCS oil- and gas-related activities are found at <http://www.boem.gov/CZM-Program-Policies-for-GOM-States.aspx>. These requirements have been incorporated into the Plans and Regional Oil-Spill Response NTLs. The State requirements for Federal consistency review are based on the requirements of State statutes, CZMA regulations at 15 CFR part 930, and DOI's regulations at 30 CFR parts 250, 254, 256, and 550. BOEM is continuing a dialog with the State of Florida on reasonably foreseeable coastal effects associated with OCS plans, pipelines, and other permits; the result of these discussions will be incorporated into future updates of the Bureau of Ocean Energy Management's NTLs and/or permitting procedures.

REFERENCES

- Federal Register*. 2000. Coastal Zone Management Act federal consistency regulations. Final rule. 65 FR 237, pp. 77124-77175, December 8, 2000.
- Federal Register*. 2006. Coastal Zone Management Act federal consistency regulations. Final rule. 71 FR 3, pp. 788-831, January 5, 2006.

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The Department of the Interior Mission

The Department of the Interior protects and manages the Nation's natural resources and cultural heritage; provides scientific and other information about those resources; and honors the Nation's trust responsibilities or special commitments to American Indians, Alaska Natives, and affiliated island communities.

The Bureau of Ocean Energy Management Mission

The Bureau of Ocean Energy Management (BOEM) is responsible for managing development of U.S. Outer Continental Shelf energy and mineral resources in an environmentally and economically responsible way.