The Gulf Research Program Annual Report 2015

DETAILS

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Gulf Research Program; National Academies of Sciences, Engineering, and Medicine

GULF RESEARCH PROGRAM

INNOVATE | EDUCATE | COLLABORATE

THE GULF RESEARCH PROGRAM ANNUAL REPORT 2015

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The National Academies of
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The **National Academy of Sciences** was established in 1863 by an Act of Congress, signed by President Lincoln, as a private, nongovernmental institution to advise the nation on issues related to science and technology. Members are elected by their peers for outstanding contributions to research. Dr. Marcia McNutt is president.

The **National Academy of Engineering** was established in 1964 under the charter of the National Academy of Sciences to bring the practices of engineering to advising the nation. Members are elected by their peers for extraordinary contributions to engineering. Dr. C. D. Mote, Jr., is president.

The **National Academy of Medicine** (formerly the Institute of Medicine) was established in 1970 under the charter of the National Academy of Sciences to advise the nation on medical and health issues. Members are elected by their peers for distinguished contributions to medicine and health. Dr. Victor J. Dzau is president.

The three Academies work together as the **National Academies of Sciences, Engineering, and Medicine** to provide independent, objective analysis and advice to the nation and conduct other activities to solve complex problems and inform public policy decisions. The Academies also encourage education and research, recognize outstanding contributions to knowledge, and increase public understanding in matters of science, engineering, and medicine.

Learn more about the National Academies of Sciences, Engineering, and Medicine at **www.national-academies.org**.

THE GULF RESEARCH PROGRAM
ANNUAL REPORT 2015

Who We Are

The Gulf Research Program (GRP) is an independent, science-based program that was founded in 2013. The GRP is housed within the National Academies of Sciences, Engineering, and Medicine (the Academies)—a private, nonprofit organization with a 150-year history as an independent adviser to the nation on issues of science, engineering, and medicine. Through grants, fellowships, and other activities, the GRP seeks to enhance oil system safety and the protection of human health and the environment in the Gulf of Mexico region and other areas along the U.S. outer continental shelf with offshore oil and gas operations. During its 30-year duration (2013–2043), the GRP will seek to improve understanding of the region's interconnecting human, environmental, and energy systems and foster the application of these insights to benefit Gulf communities, ecosystems, and the nation.

The GRP's origins can be traced to the 2010 *Deepwater Horizon* tragedy and its many human and ecosystem impacts. As part of agreements resolving the criminal charges against BP Exploration and Production Inc. and Transocean Deepwater Inc., the National Academy of Sciences is receiving $500 million (see Funding Schedule below) to support research and development, monitoring, and education and training to improve the safety of oil and gas operations in offshore environments and the protection of people and environmental resources. The agreements ensure the GRP's independence in allocating funds to achieve its priorities. BP Exploration and Production Inc. and Transocean Deepwater Inc. play no role in the GRP's decision making.

This report summarizes how the GRP funds were used in 2015, drawing on final financial documents available in June 2016, and highlights some of the program's key activities and accomplishments.

Funding Schedule	BP Exploration and Production Inc.	Transocean Deepwater Inc.	Total Funds Received by the National Academy of Sciences
2013	$5 million	$2 million	$7 million
2014	$15 million	$7 million	$29 million
2015	$45 million	$21 million	$95 million
2016	$80 million	$60 million	$235 million
2017	$90 million	$60 million	$385 million
2018	$115 million		$500 million

A Message from the Executive Director

In 2015, the Gulf Research Program (GRP) of the National Academies of Sciences, Engineering, and Medicine (the Academies) began implementing its strategic vision and many of the year's accomplishments are GRP "firsts." For example, we conducted our first funding competitions, awarding more than $6.5 million of research grants and fellowships to people and institutions in the Gulf region and around the nation (see our key accomplishments on pp. 6-7).

The GRP also developed four initiatives to characterize the program's main areas of interest: (1) reducing risk in offshore oil and gas operations, (2) observation and monitoring for healthy ecosystems and coastal communities, (3) planning and action for healthy and resilient coastal communities, and (4) building capacity to address cross-boundary challenges (see pp. 16-20). The initiatives and strategies for lasting benefit are designed to foster scientific insights and actions that benefit coastal communities and ecosystems and will shape the GRP's portfolio of grants, fellowships, and activities.

The strategies for lasting benefit are

- Emphasizing a **long-term, cross-boundary perspective** that takes advantage of the program's 30-year duration and supports activities that cross geographical, disciplinary, and sectoral boundaries.
- Supporting **science to advance understanding** of large, complex issues and challenges.
- Ensuring the development and application of **science to serve community needs**.
- Encouraging **synthesis and integration** of data and information already available.
- Leveraging program funds through **coordination and collaboration**.
- Investing in **leadership development and capacity building** to support people with the skills and abilities needed to solve complex problems and support innovation.

As the program matures, it will evolve into a national program that tackles complex challenges that arise where energy systems, people, and sensitive ecosystems coexist. We look forward to continued interactions with stakeholders from research, government, industry, and nonprofit communities as we work on behalf of the Academies to bring lasting benefits to the Gulf region and the nation.

Chris Elfring

Chris Elfring
Executive Director

KEY ACCOMPLISHMENTS IN 2015

1

SELECTED four scientists as the GRP's first class of Science Policy Fellows. Awards totaling $210,000 support their work on policy issues in host offices in the Gulf region.

2

SELECTED eight scientists as the GRP's first class of Early-Career Research Fellows. Awards totaling $608,000 support research-related expenses, travel, trainee support, and professional development of researchers in the critical pre-tenure phase of their careers.

3

FUNDED $1.5 million of Exploratory Grants for 12 projects—at institutions in the Gulf region and across the nation—to catalyze innovative approaches to educating and training offshore oil and gas and health professionals or to improve understanding of how oil and gas production affects linkages between human well-being and ecosystem services.

4

FUNDED $4.4 million of Synthesis Grants for 9 research teams comprising expertise from 20 institutions in the Gulf region and elsewhere in the nation. Syntheses of existing data will inform efforts to restore and maintain Gulf ecosystem services or will enhance understanding of the deep waters of the Gulf of Mexico and connectivity to the coast.

5

DEVELOPED Requests for Application (RFA) topics for 2016 Exploratory and Synthesis Grants that emphasize human factors research, community resilience, and the integration of data from health and social sciences with environmental data to address safety, human health, and well-being.

6

DEVELOPED a new grant type to support nonprofit, non-academic, community, or regionally focused organizations. Opened in May 2016, the first Capacity-Building Grants RFA offers funding for projects of community networks to improve coastal environments, health, and well-being.

9

INITIATED a collaborative project with the Robert Wood Johnson Foundation to open a competition in 2016 that will provide $10 million of grants to enhance the resilience of communities in the Gulf region to the negative impacts of climate change, severe weather, and disasters in ways that also improve community health, equity, and well-being.

7

EXPANDED communications and outreach. Through a variety of conferences and meetings, staff shared information about the GRP and the National Academies of Sciences, Engineering, and Medicine. Subscriptions to the GRP's "e-updates" digital communications increased by nearly one-third.

10

CHARACTERIZED four initiatives that will focus and guide the GRP's work:

- Reducing Risk in Offshore Oil and Gas Operations
- Observation and Monitoring for Healthy Ecosystems and Coastal Communities
- Planning and Action for Healthy and Resilient Coastal Communities
- Building Capacity to Address Cross-Boundary Challenges

8

SUPPORTED the 2015 Oil Spill and Ecosystem Science Conference, including a session designed for students to improve communications about their scientific research.

2015 Investments

SCIENTIFIC LEADERSHIP AND CAPACITY BUILDING

In September 2015, the GRP's two new fellowship programs—Science Policy Fellowships and Early-Career Research Fellowships—welcomed their first cohorts of fellows at an orientation in New Orleans, Louisiana. The talented group of scientists selected for these fellowships reflects the GRP's commitment to supporting the development of future generations of scientists, engineers, and health professionals prepared to work at the intersections of oil system safety, human health and well-being, and environmental resources. Four Science Policy Fellows and eight Early-Career Research Fellows received a total of $818,000 of funding in stipends and research monies, for 1 year (Policy Fellows) or 2 years (Research Fellows).

Science Policy Fellowships

Science Policy Fellows spend 1 year on the staff of a state environmental, natural resources, oil and gas, or public health agency, or in regional offices of relevant federal agencies in the Gulf region. These fellowships provide an immersive policy experience for early-career scientists, by which they gain first-hand knowledge of the regulatory and policy-making organizations that work to address challenges particular to coastal regions. Additional funds (up to $5,000 per fellow) are available for professional development activities and travel.

In 2015, fellows were placed in host offices at the Florida Department of Environmental Protection; the Gulf of Mexico Office of the Bureau of Ocean Energy Management (BOEM); the National Oceanic and Atmospheric Administration (NOAA) Resources and Ecosystems Sustainability, Tourist Opportunities, and Revived Economies of the Gulf Coast States Act (RESTORE Act) Science Program; and the Gulf Coast Ecosystem Restoration Council (RESTORE Council). According to the GRP's first cohort of fellows and host offices, this fellowship is a mutually beneficial experience; the fellows gained significant experience working at the science–policy interface, while also bringing valuable new perspectives to their host offices. See p. 9 to learn more about the fellows and their experiences.

Early-Career Research Fellowships

The GRP offers Early-Career Research Fellowships for assistant professors (or equivalent) at colleges, universities, and research institutions to recognize professionals at the critical pre-tenure phase of their careers for exceptional leadership, past performance, and potential for future contributions to improving oil system safety, human health and well-being, or environmental protection.

In 2015, eight individuals—five from Gulf institutions and three located elsewhere across the nation working on Gulf-relevant topics—received the GRP's first Early-Career Research Fellowships. These fellows have wide-ranging expertise that spans chemical engineering, public health, and coastal geology. The 2 years of funding and mentorship provided by the fellowship program allows researchers to pilot new and potentially risky research, broaden the disciplinary scope of their work, support trainees, and travel to build networks with new collaborators. See p. 10 to learn more about the GRP's first Early-Career Research Fellows and how GRP support is affecting their research.

2015 Science Policy Fellows

Diana Del Angel holds an M.S. in environmental science from Texas A&M University–Corpus Christi, where she studied beach and dune dynamics on South Padre Island, Texas. As a GRP Science Policy Fellow, she worked in the Florida Department of Environmental Protection in Tallahassee, Florida.

On the type of work a fellow might encounter: *"Over the last year, I had the opportunity to work with the Florida Department of Environmental Protection (FDEP). The FDEP's Florida Coastal Office manages over 2 million acres of submerged lands and select coastal uplands within 41 aquatic preserves, with the goal of maintaining their natural conditions for the propagation of fish and wildlife and public recreation. One of the biggest values of my fellowship is collaborating with a great group of individuals from the main office in Tallahassee, in the field offices throughout the state, as well as other partners outside the FDEP who work to maintain, restore, monitor, and educate the public about these areas. It has been a privilege to work with a number of outstanding professionals who are passionate about their work."*

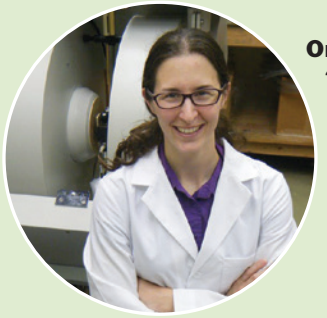
Elizabeth Gomez holds an M.S. in marine science from Stony Brook University in New York, where she studied the impacts of oyster restoration on fish communities. She worked at the NOAA RESTORE Act Science Program Office in Stennis, Mississippi.

On broadening networks and perspectives: *"Some of the biggest benefits [of the fellowship] have been the ability to start building a great network of professionals in the Gulf region and the amount of information I have learned from these individuals. I have gained an incredible perspective on science and management issues in the Gulf from conversations with scientists and managers, something that cannot be gained in any book, journal article, or classroom."*

Jessica Henkel holds a Ph.D. in ecology and evolutionary biology from Tulane University, where she examined how environmental change and habitat degradation are impacting migratory bird populations in the Gulf of Mexico region. Her host office was the RESTORE Council in New Orleans, Louisiana.

On the professional development benefits: *"I really could not recommend this fellowship strongly enough. If you are interested in a career in science policy, the opportunities to interact with decision makers and advise on science through this fellowship are fantastic. If you are planning to return to academia, this fellowship will provide a better understanding of funding opportunities and the research needs in the Gulf of Mexico. In addition, the funding provided to attend conferences, training, etc., can improve your skills whether you are planning to return to academia or stay working in science policy."*

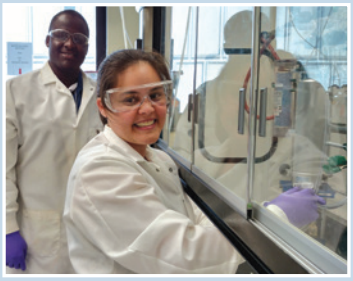
Cholena Ren is a doctoral candidate in chemistry at Louisiana State University in Baton Rouge, where her research focuses on particulates generated from combustion processes. She worked at BOEM's Gulf of Mexico Office located in New Orleans, Louisiana.



On the rapid accumulation of knowledge: *"I was surprised at how the employees at [BOEM] were so welcoming and helpful. Every time I had a question or needed help someone was there and this made my fellowship experience even more valuable. All the knowledge I have gained should have taken years to learn, but only took 1 year."*

2015 Early-Career Research Fellows

Julie Albert, Ph.D., is an assistant professor in the Department of Chemical and Biomolecular Engineering at Tulane University in New Orleans, Louisiana. Her laboratory studies polymers, which are large molecules composed of many repeating smaller molecules or subunits. Wood, plastic, and rubber are common examples of polymers. With support provided by the GRP's Early-Career Research Fellowship, they are working on creating a thin plastic membrane with tiny nanopores that can perform oil–water separations. Used in combination with existing oil spill cleanup technologies, this product could provide an economical, nontoxic, and practical solution to removing oil from the environment and recovering the oil so that it can be sold to fund remediation efforts.



On the broad scientific environment: *"The [Early-Career Research Fellowship] program is broad scientifically, which is one of the attributes I like best about it—at our meetings, I get to hear from ecologists, biologists, medical doctors, and policy makers about their perspectives on preserving and interacting with the Gulf environment."*

Alberto Caban-Martinez, D.O., Ph.D., M.P.H., C.P.H., is an assistant professor of public health sciences and director of the Musculoskeletal Disorders and Occupational Health Lab at the University of Miami's Leonard M. Miller School of Medicine. He focuses on finding ways to promote safe work practices, healthy behaviors, and healthy work environments. Dr. Caban-Martinez is especially concerned about redressing disparities in musculoskeletal disorder risk, whether by race/ethnicity, gender, or occupation. By exploring occupational and environmental health surveillance activities, he provides rigorous scientific evidence about effective ways to reduce musculoskeletal disorders and improve the well-being of worker populations.

On new interdisciplinary thinking: *"My research world is centered around human health and population-level sciences that often do not take into account the broader ecosystem and community environment that can impact human health. The fellowship has allowed me to explore via networks and mentorships the dyads of human health and environmental health, ecology, and marine biology."*

Zack Darnell, Ph.D., is an assistant professor in the Department of Biological Sciences at Nicholls State University in Thibodaux, Louisiana. He is interested in how marine invertebrates respond to and cope with changing environmental conditions. Much of his research focuses on reproduction and migration in the context of climate change and fisheries.

On new research opportunities: *"[The fellowship] has allowed me to pursue new research directions and conduct high-risk research that many funding agencies would have been hesitant to fund without preliminary data. The data we are currently generating will be leveraged to pursue additional funding now that we have established the feasibility and the method."*

Kelly Dorgan, Ph.D., is a senior marine scientist at Dauphin Island Sea Lab and an assistant professor in the Department of Marine Sciences at the University of South Alabama. Her research examines how animals that live in sediments (mostly worms) interact with their environment. Much like earthworms in a garden, marine worms burrow through and feed on sediments, mixing sediment grains, regenerating nutrients, and pumping water down into sediments to oxygenate them. In her research, she applies engineering theory to understand how worms burrow through and feed on sediments, which will help improve understanding of how sediments are mixed.

On expanding the network of peers: *"It's been great meeting and getting to know the other fellows and having a cohort of peers who are at the same stage in their careers. It's easy to meet scientists working in my field, but meeting experts in very different fields doesn't happen as often."*

Joel Fodrie, Ph.D., is an assistant professor of fisheries oceanography and ecology at the University of North Carolina at Chapel Hill. His research lab studies the population ecology of estuarine fishes; in particular, he explores their movements and how those movements affect patterns of habitat use.

On broadened research opportunities: *"There are lots of projects we'd like to tackle that often don't fit within the scope of a 'normal' funded grant. For instance, the fellowship is going to help pay for a survey study this fall across the northern rim of the Gulf of Mexico. We'll be collecting fishes from Louisiana to Florida, with an eye toward extending our studies on the impacts of the 2010 Macondo Oil Spill as well as the consequence of long-term warming in the Gulf of Mexico."*

Anna Michel, Ph.D., is an assistant scientist in the Department of Applied Ocean Physics and Engineering at Woods Hole Oceanographic Institution in Woods Hole, Massachusetts. In her lab, she designs and builds instruments that can measure chemicals in the environment. They use these chemical measurements to learn about natural processes and human-induced impacts. They focus primarily on measuring two greenhouse gases: methane and carbon dioxide. They work in a variety of environments from the Arctic to the Gulf of Mexico.

On professional travel benefits: *"The fellowship has allowed me to recently attend a Gordon Conference on Methane Hydrates at which I was an invited speaker. I also used funds to help cover my travel to a workshop on rivers. I am interested in learning about how we can use sensors to enable studies of rivers and river–marine interactions such as where the Mississippi River meets the Gulf of Mexico. From these activities, I now have several new research collaborations starting!"*

Davin Wallace, Ph.D., is an assistant professor in the Department of Marine Science at the University of Southern Mississippi. He studies the response of coastal environments to sea-level rise, storm impacts, and sediment supply variations. This type of research can expand understanding of how coastlines might evolve in the future by examining periods in the geological past that might have had similar rates of change.

On enhanced research flexibility: *"Science is often difficult to plan in terms of a pre-budgeted spreadsheet. Therefore, having the flexibility to examine research problems as they come up has been incredibly valuable to move my research program forward."*

Helen White, Ph.D., is an associate professor of chemistry at Haverford College in Haverford, Pennsylvania. Her research examines human-derived chemicals that are released into the marine environment and persist there for extended periods of time, often as long as decades after the initial release. She is particularly interested in chemicals that are derived from oil as well as pesticides and plastics. Her work aims to understand how natural processes that occur in the environment interact with these compounds and whether the compounds pose a threat to human and environmental systems.

On enriched professional assessment: *"I greatly value the space for reflection this fellowship offers. It is often difficult to make time to ask for professional feedback from mentors both in and outside of the college, but this fellowship creates a structure for me to take stock of my accomplishments, seek out constructive criticism, and plot the next crucial steps."*

SCIENCE TO ADVANCE UNDERSTANDING AND SERVE COMMUNITY NEEDS

In 2015, the GRP opened competitions for its first two research grant opportunities: Exploratory Grants and Synthesis Grants to spark innovative and cross-disciplinary research on topics identified in the GRP's 2014 opportunity analysis workshops. After a rigorous peer-review process, 21 projects were selected to receive GRP funding totaling $5.9 million for award year 2015 grants.

Exploratory Grants

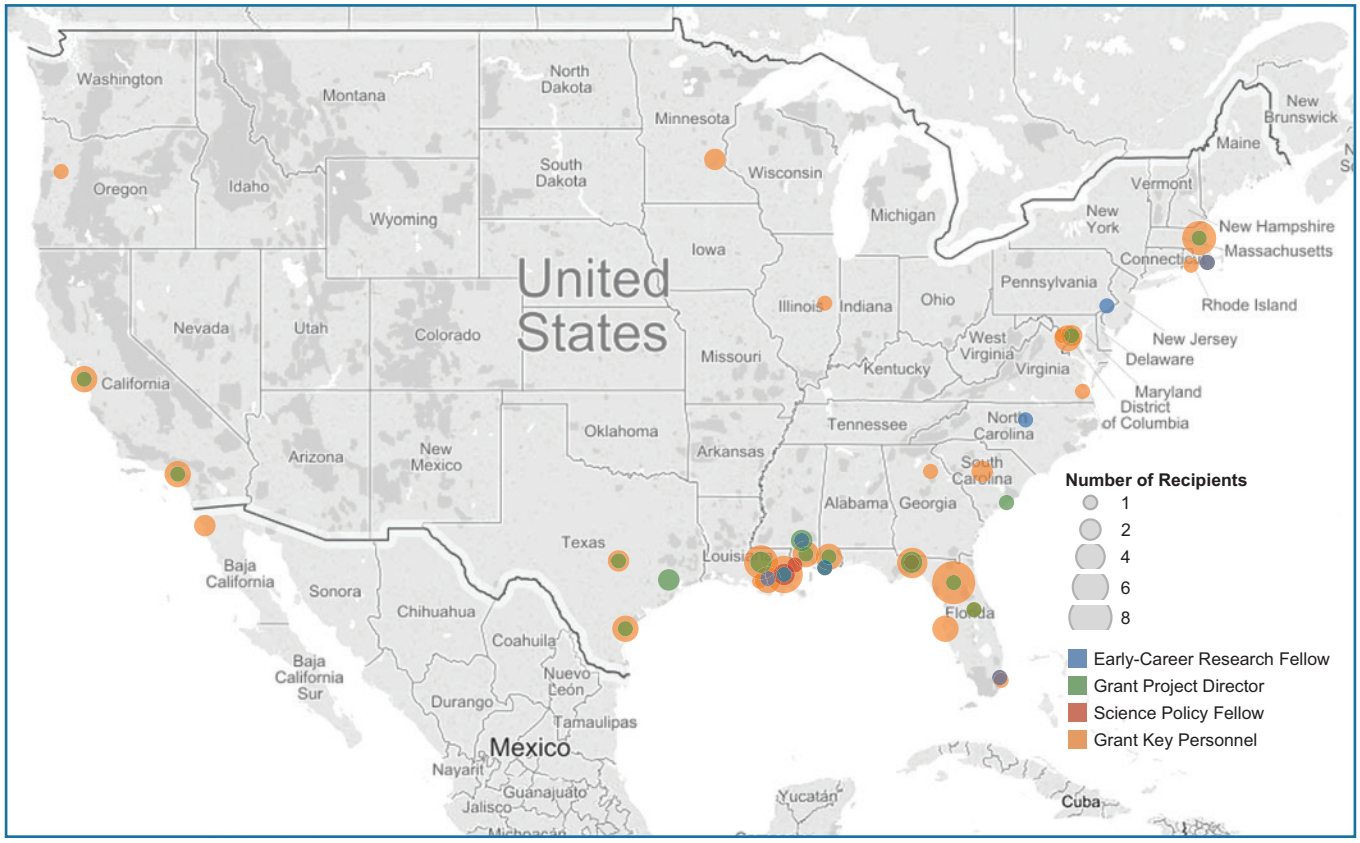
2015 Exploratory Grants were made for two themes: (1) how to effectively educate and train offshore oil and gas and health professionals, and (2) how to improve understanding of links between human well-being and ecosystem services related to oil and gas production. Twelve projects—with personnel from 15 institutions in the Gulf states and 9 from elsewhere in the United States—received a total of $1.5 million of grant funds.

Exploratory grants are intended to catalyze innovative thinking by providing seed money to advance research in its early conceptual phase, accelerate progress from concept to testing, and foster the development of novel approaches. The Summary of Grantees (see pp. 23-27) lists grantee projects, which span research on virtual offshore disaster training, environmental health leadership development, and management decision support tools.

Synthesis Grants

2015 Synthesis Grants were made for two themes: (1) to use existing monitoring data to inform efforts to restore and maintain the Gulf of Mexico's ecosystem services, and (2) to enhance understanding of

2015 Grant and Fellowship Recipients



the Deep Gulf or its physical and biological connectivity to coastal communities. Nine research teams, bringing together expertise from 20 institutions from across the nation, received a total of $4.4 million of grant funds.

Synthesis grants seek to extend the usefulness of existing monitoring data by encouraging applicants to synthesize and integrate data derived from different sources or collected for different purposes to obtain novel insights or to increase the applicability of scientific research. The Summary of Grantees (see pp. 23-27) lists grantee projects, which include integration of visual and acoustic data to develop cetacean habitat models, using medical claims and other data to conduct large-scale evaluations of disaster effects, and combining historical observation data with contemporary models to understand circulation in the Deep Gulf.

Planning for Award Year 2016 Grants

To complement the RFA opportunities offered in 2015, the GRP developed new topics for a second round of Exploratory and Synthesis Grant competitions in 2016. These topics emphasize community resilience, protecting human health and well-being, and the role of human and organizational factors for creating a culture of safety in offshore oil and gas operations. The GRP also created a third grant type—Capacity-Building Grants—for community-focused organizations. The 2015 and 2016 topics reflect the GRP's broad mission to enhance oil system safety and the protection of human health and the environment (see 2015 and 2016 Grant Topics below).

As the program develops, our portfolio of funding opportunities and activities will continue to evolve and span the social, health, environmental, and physical sciences, and offer new opportunities that seek to engage the variety of perspectives—including research, governmental, industry, and community organizations—needed to address complex, cross-boundary challenges.

2015 AND 2016 GRANT TOPICS

EXPLORATORY GRANTS

- **2015:** Approaches for effective education and training of workers in the offshore oil and gas industry and health professions
- **2015:** Linking ecosystem services related to and influenced by oil and gas production to human health and well-being
- **2016:** Scenario planning to advance safety culture and minimize risk in offshore oil and gas operations
- **2016:** Informing coastal community planning and response to environmental change in regions with offshore oil and gas operations

SYNTHESIS GRANTS

- **2015:** Data synthesis to address one of two themes:
  - Inform plans and efforts to restore and maintain the services provided by Gulf coastal ecosystems
  - Enhance understanding of the Deep Gulf or the connectivity of the Deep Gulf to the coast, including physical and biological connectivity to coastal communities
- **2016:** Scientific synthesis connecting environmental with social and/or health data to address one of two themes:
  - Improve understanding of impacts of offshore oil and gas production on coastal communities
  - Improve understanding of human exposure to environmental contaminants

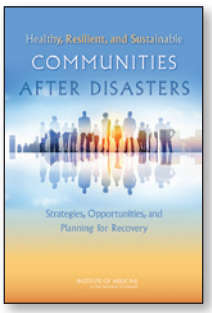
CAPACITY-BUILDING GRANTS

- **2016:** Enhancing community networks that improve coastal environments, health, and well-being

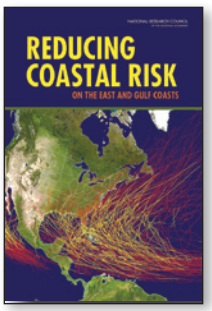
Activities at the National Academies of Sciences, Engineering, and Medicine

The GRP also supports projects that take advantage of the consensus-building and convening power of the National Academies of Sciences, Engineering, and Medicine. In 2015, the GRP funded one consensus report and two report dissemination activities relevant to the Gulf region.

Report on *Effective Monitoring to Evaluate Ecological Restoration in the Gulf of Mexico*: In 2015, an Academies' study committee convened by the Division on Earth and Life Studies' Ocean Studies Board and Water Science and Technology Board began its work to develop a report that will provide guidance on effective approaches for monitoring and assessing Gulf restoration. The study concept was developed with help from other *Deepwater Horizon*–related funders and agencies, including the National Fish and Wildlife Foundation; the RESTORE Council; NOAA; and a number of other federal and state agencies with restoration responsibilities. The report was released in July 2016.



Community Discussion Toolkit for Health in Post-Disaster Recovery Planning: The GRP provided funds to the Board on Health Sciences Policy to partner with a Gulf Region community to conduct a pilot test of a discussion toolkit designed to help communities identify and implement recovery planning and strategies that optimize community health. The toolkit is based on the 2015 report *Healthy, Resilient, and Sustainable Communities After Disasters: Strategies, Opportunities, and Planning for Recovery*. The pilot will take place in September 2016.



Planning Meeting for a Community Engagement Activity About Coastal Risk Reduction: The GRP provided funds to the Academies' Koshland Science Museum, the Water Science and Technology Board, and the Ocean Studies Board to follow up on the 2014 report *Reducing Coastal Risk on the East and Gulf Coasts*. The museum and boards convened a planning meeting to discuss a tool for engaging communities in decision making about the challenges of and solutions for responsible coastal development. Coastal risk experts from the Gulf region and beyond met to outline a framework for an interactive tool that could be used by communities and decision makers.

Outreach and Collaboration

Because the GRP is still a relatively new entity, we strive to raise awareness of our work and that of the Academies and to reach out to new stakeholders and potential collaborators both in the Gulf region and beyond. In 2015, GRP staff and advisory board members participated in a wide variety of meetings relevant to oil system safety, human health and well-being, and environmental protection. We met with a broad array of individuals at meetings and conferences. Our online audience of subscribers grew by nearly one-third.

The GRP is one of many organizations born of the *Deepwater Horizon* disaster and one of several more with a shared commitment to fostering science that brings significant and lasting benefits to the Gulf region and the nation. To reduce duplication of efforts and to identify areas for collaboration, the GRP interacts frequently with many of these programs and groups. For example, the GRP:

- Participates in the *Deepwater Horizon* Gulf Funders Ad Hoc Group, which includes the National Fish and Wildlife Foundation, NOAA, North American Wetlands Conservation Fund, the RESTORE Council, and RESTORE Act state Centers of Excellence, and coordinates with relevant federal agencies, such as BOEM, the Bureau of Safety and Environmental Enforcement (BSEE), and the Interagency Coordinating Committee on Oil Pollution Research (ICCOPR).
- Coordinates with 20 liaisons from 12 federal agencies and programs (i.e., BOEM, BSEE, ICCOPR, U.S. Fish and Wildlife Service, National Institute of Environmental Health Sciences, NOAA, U.S. Army Corps of Engineers, U.S. Arctic Research Commission, U.S. Department of Energy, U.S. Environmental Protection Agency, U.S. Geological Survey, and the RESTORE Council) to share information and coordinate activities on issues of shared interest.
- Provides support for the Gulf of Mexico Research Initiative's Oil Spill and Ecosystem Science Conference, including sponsorship of sessions designed for helping students improve their ability to communicate about their scientific research.
- Serves as co-sponsor for a BOEM workshop, "U.S.–Mexico Workshop to Coordinate Future Environmental Studies Related to Ocean Energy Management in the Gulf of Mexico" planned for 2017.
- Initiated a collaborative project with the Robert Wood Johnson Foundation to establish a 2016 funding opportunity focused on enhancing community resilience in the Gulf of Mexico region to the negative impacts of climate change, severe weather, and disasters in ways that also improve health and well-being.



Program Initiatives

As outlined in the GRP's strategic vision released in 2014, offshore oil and gas operations generate scientific, social, and environmental challenges for both the Gulf region and other coastal regions. Addressing these challenges requires a long-term and multi-faceted approach. For the GRP, this means increasing the size and scope of our investments and supporting a strategic and mission-driven portfolio of activities.

In 2015, the GRP developed four initiatives (see pp. 17-20) to characterize the program's main areas of interest:

- Reducing risk in offshore oil and gas operations;
- Observation and monitoring for healthy ecosystems and coastal communities;
- Planning and action for healthy and resilient coastal communities; and
- Building capacity to address cross-boundary challenges.

Each initiative is focused on a long-term outcome that is critical to the GRP's mission and goals, and the GRP will use the initiatives to build on the strengths of the Academies and to guide the development of a portfolio of grants, fellowships, and other activities with cumulative and lasting impact. The program's initiatives characterize key challenges at the interface of human, environmental, and offshore energy systems and they seek to address a broad and overlapping set of issues through research and development, monitoring and synthesis, and education and capacity building. As the program matures, these program initiatives will evolve to meet new challenges.

REDUCING RISK IN OFFSHORE OIL AND GAS OPERATIONS

Helping to make offshore operations safer for people and the environment

OVERVIEW

Comprehensive risk awareness can help both industry and regulators to better anticipate, reduce, and avoid risks in the offshore oil and gas environment. In collaboration with others, the GRP is working to identify risk-management approaches that can prevent oil spills, loss of life, and harmful exposures related to offshore oil and gas drilling, production, and transportation.

OUR APPROACH

- Encourage collaboration among industry, regulatory, and academic communities to better understand and communicate the nature of systemic risks in the offshore environment and ultimately help to instill an industry-wide culture of safety.
- Develop, test, and implement educational and training approaches to help organizations and individuals develop a strong culture of safety that is fundamental to avoiding risks in offshore operations.
- Identify, promote, and fund fundamental research to spur innovation and reduce and manage risk. Our current areas of interest include human factors and safety culture research, operations research on risk and decision making, research to understand fundamental scientific processes at play, and technical improvements for preventing and responding to large and small oil leaks and spills.

OBSERVATION AND MONITORING FOR HEALTHY ECOSYSTEMS AND COASTAL COMMUNITIES

Helping people understand and plan for a changing environment with long-term data, observations, and information

OVERVIEW

Managers and decision makers can better anticipate and mitigate environmental change and community and ecosystem disruptions with timely, accurate observation and monitoring information. We are working with others to improve how researchers and practitioners collect, interpret, and use monitoring and observing information. Our current areas of interest include the deep waters of the Gulf of Mexico, community resilience, and environmental restoration.

OUR APPROACH

- Identify, promote, and fund monitoring, research, and synthesis activities to better understand and track how offshore oil and gas development affects ecosystems and communities (including environmental, social, economic, and health dimensions).
- Develop more efficient, effective tools and methods to collect and interpret monitoring and observing data, and to translate these data into information that decision makers can use to protect and restore living resources and to enhance community resilience.
- Convene activities and support research to foster the exchange of information among observing networks in U.S. outer continental shelf regions. This includes identifying shared priorities and standardized indicators to track how offshore oil and gas development influences the human communities and ecosystems.

PLANNING AND ACTION FOR HEALTHY AND RESILIENT COASTAL COMMUNITIES

Strengthening the capacity of coastal communities facing adverse environmental challenges to effectively respond, adapt, and thrive

OVERVIEW

Natural disasters, climate change impacts, and other environmental stressors, such as those resulting from oil spills, present complex challenges to the health and well-being of coastal communities and to the integrity of the environments upon which they depend. In collaboration with others, the GRP will support the work of researchers, communities, and public- and private-sector actors to enhance the resilience of coastal communities to the adverse impacts of environmental challenges in ways that also improve well-being.

OUR APPROACH

- Encourage the development, synthesis, and translation of research to improve responses to major oil spills in ways that minimize harm to people and communities.
- Support research, capacity building, and communications that strengthen the science and practice of resilience by exploring linkages among health, social, economic, and environmental contexts of communities associated with offshore oil- and gas-producing regions in the United States and by identifying strategies that can be implemented at the community level to improve resilience.
- Foster the development of processes, policies, tools, and approaches that can be used by local and state leaders, researchers, industry, and community organizations to improve responses to environmental challenges in ways that also improve the well-being of coastal residents.

BUILDING CAPACITY TO ADDRESS CROSS-BOUNDARY CHALLENGES

Enhancing resources and human capital by bridging disciplines, sectors, and geographical boundaries

OVERVIEW

Collaboration and communication among individuals in communities, industry, universities, and the public sector are essential to understanding and addressing the interwoven scientific, social, and environmental challenges associated with offshore oil and gas operations. By supporting the development of new approaches, tools, and education and training experiences, the GRP seeks to foster cross-boundary leadership and capacity for solving complex challenges in coastal regions along the U.S. outer continental shelf.

OUR APPROACH

- Enhance leadership and decision-making capabilities in professions related to offshore oil and gas development, ecosystem and public health protection, and community planning and development through education and training.
- Develop capacity for scientific syntheses in which research and analyses routinely cross scientific disciplines.
- Assess and enhance capacity to translate scientific information to inform policy decisions at local, state, and federal levels.
- Support research, education, and other activities that engage communities, including those that represent underrepresented and vulnerable populations, to address complex scientific, social, and environmental challenges that directly affect them.

Financials

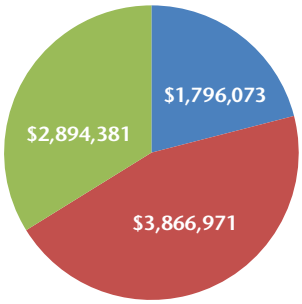
Proceeds Received by the National Academy of Sciences

		BP Exploration and Production Inc.	Transocean Deepwater Inc.	Total
Proceeds received:	2013:	$ 5,000,000	$ 2,000,000	$ 7,000,000
	2014:	15,000,000	7,000,000	22,000,000
	2015:	45,000,000	21,000,000	66,000,000
Proceeds received to date:		**$ 65,000,000**	**$ 30,000,000**	**$ 95,000,000**
Proceeds to be received:	2016:	80,000,000	60,000,000	140,000,000
	2017:	90,000,000	60,000,000	150,000,000
	2018:	115,000,000	—	115,000,000
Proceeds to be received:		**$ 285,000,000**	**$ 120,000,000**	**$ 405,000,000**
Total proceeds:		**$ 350,000,000**	**$ 150,000,000**	**$ 500,000,000**

Financial Overview

Proceeds received to date	$ 95,000,000
Investment return	2,348,557
Total funds available	97,348,557
Program expenditures	
2013	(1,372,402)
2014	(3,018,699)
2015	(8,557,425)
Total program expenditures	(12,948,526)
Net funds available at 12/31/2015	**$ 84,400,031**
Cash on hand for expenditures	1,373,214
Funds invested	83,026,817
Net funds available at 12/31/2015	**$ 84,400,031**

2015 Expenditures



This chart tracks expenditures based on the three types of activities highlighted in agreements that led to the GRP's creation.

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Ocean Springs, Mississippi

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Louisiana State University
Baton Rouge

Summary of Grantees

EXPLORATORY GRANTS

Identifying critical middle-skilled positions and career pathways in the upstream oil and gas industry – $138,000
Project Director: Madeline Burillo, Ed.D., Houston Community College
By identifying the most safety-critical jobs in the Gulf Coast of Mexico, project partners intend to help industry standardize and prioritize training programs that enhance safety culture and reduce risk during offshore drilling. Partners also plan to develop a training program for one of the jobs identified.

Assessing long-term linkages between development of oil and gas industry–related coastal infrastructure, societal well-being, and ecosystem function in coastal Louisiana – $130,000
Project Director: Tim J.B. Carruthers, Ph.D., The Water Institute of the Gulf
Scott Hemmerling, Ph.D., The Water Institute of the Gulf
Researchers will examine the costs and benefits of expanding oil and gas activity in coastal Louisiana by looking at how human well-being and ecosystems changed as onshore oil and gas infrastructure developed from 1950 to 2015. Their work could help future land managers make informed decisions about coastal planning and restoration.

Advancing optimization of ecosystem services to inform management and restoration of the Gulf of Mexico – $128,000
Project Director: Gretchen Daily, Ph.D., Stanford University
Katie Arkema, Ph.D., Spencer A. Wood, Ph.D., and Anne D. Guerry, Ph.D., Stanford University
Bonnie Keeler, Ph.D., and Peter Hawthorne, Ph.D., University of Minnesota
Josh Goldstein, Ph.D., and Christine Shepard, Ph.D., The Nature Conservancy
This project team will work to advance the use of science in strategic management and planning in the Gulf of Mexico. Team members plan to develop a science-based framework to prioritize restoration projects that provide the greatest returns for people and nature.

Expanding ecosystem service provisioning from coastal restoration to minimize environmental and energy constraints – $148,000
Project Director: John Day, Ph.D., Louisiana State University
David Dismukes, Ph.D., Christopher D'Elia, Ph.D., Robert Lane, Ph.D., and David Batker, Louisiana State University
Researchers will examine how healthy ecosystems support healthy and resilient Gulf communities through benefits such as improved water quality, sustainable fisheries and recreation, and better storm protection. The team plans to address how these benefits change over time, both with and without restoration activities that respond to climate change, sea-level rise, and future energy costs.

Virtual offshore disaster training (VODT) site – $125,000
Project Director: Rich Haut, Ph.D., Houston Advanced Research Center
This project team will work to enhance oil and gas workers' ability to prevent and respond to offshore disasters by developing an interactive, virtual training tool. Workers will be able to use this tool to practice how they would respond to an emergency offshore.

Immersion simulation (ISIM): Interdisciplinary training for the Gulf of Mexico workforce – $125,000
Project Director: Joan Hendrix, D.N.P., Mississippi Gulf Coast Community College
John Shows, Millie Hyatt, and Larry Porter, Mississippi Gulf Coast Community College
The project team proposes to train oil and gas workers and health professionals to better understand, communicate, and work with each other, enhancing their ability to respond to emergencies in the Gulf of Mexico.

Using problem-based learning to develop a future labor force of environmentally knowledgeable and safety-certified workers – $125,000
Project Director: Jabaria Jenkins, Mobile Area Education Foundation
Jennifer Langhinrichsen-Rohling, Ph.D., University of South Alabama
Sue Ann Sarpy, Sarpy and Associates, LLC
Larry Mouton, Mobile County Public Schools
Robert Keyser, AH Environmental Consultants
Melissa Dean, Mobile Area Education Foundation
This project team will work to cultivate future safety leaders for the energy and maritime workforce in Mobile, Alabama by creating an environmental health and safety leadership program for high school students. The team plans to evaluate the degree to which this program prepares students to influence safety in their future workplaces.

Linking energy-production technologies to human health protection: A "to and through" approach to the interdisciplinary training of a middle-skilled workforce – $125,000
Project Director: Maureen Lichtveld, M.D., M.P.H., Tulane University
Roy Rando, Sc.D., and Jeffrey Wickliffe, Ph.D., Tulane University
Derrick Manns, Ph.D., Alvin Justelien III, Ph.D., and Sonia Fanguy-Clarke, D.N.P., Fletcher Technical Community College
Carl Moore, South Central Louisiana Technical College
The project team will work to build a safer workforce in southeastern Louisiana by identifying key environmental health and disaster management skills and teaching them to community college students and current workers in oil production, marine operations, and nursing fields.

The effect of the *Deepwater Horizon* oil spill on human well-being in the Gulf of Mexico – $118,000
Project Director: Paul Montagna, Ph.D., Texas A&M University–Corpus Christi
David Yoskowitz, Ph.D., and Cristina Carollo, Ph.D., Texas A&M University–Corpus Christi
Researchers plan to develop a better understanding of how offshore oil and gas production affects the links between human well-being and offshore ecosystems in the Gulf of Mexico. Their work will produce a model that could predict how oil and gas production may influence human well-being in other regions.

Modeling stress-associated health effects of multiple impacted ecosystem services in the Gulf of Mexico – $126,000
Project Director: Paul Sandifer, College of Charleston
Ariana Sutton-Grier, Ph.D., University of Maryland
Dwayne Porter, Ph.D., and Geoffrey I. Scott, Ph.D., University of South Carolina
William Sullivan, Ph.D., University of Illinois
Tracy Collier, Ph.D. (retired)
Researchers will examine how human health and well-being are affected when people derive fewer benefits from ecosystems following a natural or technological disaster. This work could provide a framework for improving resilience and recovery planning for future disasters.

Preparing underserved communities for career paths in energy, environmental health, and restoration – $177,000
Project Director: Minor Sinclair, Oxfam America
Telley Madina and Laura Inouye, Oxfam America
Patrick Barnes, P.G., Sherry Callaway, P.G., and Elizabeth Cornell, P.G., Limitless Vistas, Inc.
To improve economic opportunities, promote resilience, and fill workforce gaps, the project team will work to train underserved minorities and women in low-income Gulf Coast communities for high-demand, higher-wage work with local employers in energy, environmental health, disaster response, and ecosystem restoration.

Developing a decision support tool to evaluate ecosystem services and associated uncertainties using a Bayesian belief network – $124,000
Project Director: Wei Wu, Ph.D., University of Southern Mississippi
This project proposes to develop a tool that integrates knowledge from both natural and social sciences and quantifies uncertainties to help resource managers in the Gulf of Mexico understand how ecosystems—and the benefits they provide to people—may change as a result of different management decisions (such as developing offshore oil and gas or restoring coastal wetlands). This tool may be used by policy makers in other regions who want to maximize the benefits that ecosystems provide.

SYNTHESIS GRANTS

Understanding the trajectory of coastal salt marsh structure, function, and processes in the face of sea-level rise: A synthesis from historical imagery, biophysical processes, and hierarchical modeling – $507,000
Project Director: Patrick D. Biber, Ph.D., University of Southern Mississippi
Wei Wu, Ph.D., and Gregory Alan Carter, Ph.D., University of Southern Mississippi
Deepak Mishra, Ph.D., University of Georgia
Coastal wetlands in the northern Gulf of Mexico are vulnerable to degradation by natural and human-induced environmental changes. The project researchers plan to combine historical aerial photography and satellite imagery with analyses of wetland fragmentation and other biophysical and biogeochemical data to improve predictions of the health and productivity of coastal wetlands. The products of this research are expected to inform plans for marsh preservation, restoration, and the future viability of the ecosystem services provided by coastal marshes to human communities.

The transport of oil to the coast in the top centimeter of the water column – $433,000
Project Director: Allan J. Clarke, Ph.D., Florida State University
Without a reliable estimate of surface-level flow, predictions of the movement of oil floating in the Gulf of Mexico and where and when it will reach the coast are inaccurate. Theory suggests that the surface flow can differ considerably from the flow at even half a meter depth. This project will use drift card data collected by the Gulf Integrated Spill Response Consortium during 2013 and 2014, together with measurements of winds, waves, and state-of-the-art numerical models, to improve the reliability of surface-flow estimates and advance understanding of the connectivity between the Deep Gulf and coastal waters.

Living shorelines: Synthesizing the results of a decade of implementation in coastal Alabama – $469,000
Project Director: Kenneth L. Heck, Jr., Ph.D., Dauphin Island Sea Lab
Dorothy Byron David, Dauphin Island Sea Lab
Judy Haner, The Nature Conservancy

Jonathan H. Grabowski, Ph.D., Steven B. Scyphers, Ph.D., and Matthias Ruth, Ph.D., Northeastern University

Restoration of coastal habitats has proceeded rapidly during the past two decades and will likely accelerate in light of the civil settlement stemming from the 2010 *Deepwater Horizon* oil spill. With opportune timing, the project research team plans to synthesize data that capture biological and physical effects of living shorelines with data from companion socioeconomic studies to fully evaluate the benefits of living shoreline projects across coastal Alabama. The research is expected to contribute insights into the performance and efficacy of the different environmental-restoration strategies being applied across the Gulf region.

Integrating visual and acoustic data on cetacean abundance and habitat in Gulf of Mexico deep water – $451,000

Project Director: John A. Hildebrand, Ph.D., Scripps Institution of Oceanography

Kaitlin E. Frasier, Ph.D., Scripps Institution of Oceanography

Protected species in the deep ocean, such as dolphins and whales, require monitoring for management and conservation purposes. In response to the need for improved monitoring, the project team will integrate temporally rich acoustic survey data and spatially rich visual survey data of whales and dolphins from the Gulf of Mexico and develop habitat models. These models could inform the development of new conservation and management strategies—particularly after events such as the *Deepwater Horizon* oil spill.

Utilizing secondary data to assess the health and health system impacts of natural and technological disasters in the Gulf – $181,000

Project Director: Jennifer A. Horney, Ph.D., M.P.H., C.P.H., Texas A&M University Health Science Center

Tiffany A. Radcliff, Ph.D., and Hongwei Zhao, Sc.D., Texas A&M University Health Science Center

Socially vulnerable groups who live in hazard-prone coastal areas such as the Gulf Coast are disproportionally at risk from both natural and technological disasters such as oil spills. The project researchers plan to integrate publicly available federal data and individual medical claims data in order to conduct a large-scale evaluation of the effects of disasters on the health status and health system utilization of Medicare beneficiaries living in coastal Gulf communities. Such efforts could help policy makers anticipate risks posed by future disasters and help enhance the resilience of vulnerable communities.

Synthesizing spatial dynamics of recreational fish and fisheries to inform restoration strategies: Red drum in the Gulf of Mexico – $480,000

Project Director: Kai Lorenzen, Ph.D., University of Florida

Charles M. Adams, Ph.D., Robert Ahrens, Ph.D., Micheal S. Allen, Ph.D., Edward Camp, Ph.D., Jynessa Dutka-Gianelli, Ph.D., Sherry L. Larkin, Ph.D., William E. Pine III, Ph.D., and Juliane Struve, Ph.D., University of Florida

Luiz R. Barbieri, Ph.D., Susan K. Lowerre-Barbieri, Ph.D., and Michael D. Murphy, Ph.D., Florida Fish and Wildlife Research Institute

James M. Tolan, Ph.D., Texas Parks and Wildlife Department

Healthy recreational fisheries in the Gulf are important economic and environmental indicators of coastal communities' well-being, but these fisheries are vulnerable to disturbances such as oil spills. The project team plans to synthesize diverse data sets from monitoring programs and research projects in an effort to develop an integrated, social-ecological systems model for the red drum fishery that can be applied to potential restoration strategies. The team's work could advance management strategies applied to other coastal recreational fisheries across the nation.

Quantifying environmental and anthropogenic drivers of sea turtle distribution and abundance in the Gulf of Mexico – $494,000
Project Director: Katherine Mansfield, Ph.D., Department of Biology, University of Central Florida
Erin E. Seney, Ph.D., Department of Biology, University of Central Florida
Nathan F. Putman, Ph.D., Cooperative Institute for Marine and Atmospheric Studies, University of Miami
Biological connectivity can facilitate the propagation of impacts due to environmental and anthropogenic stressors from local to regional scales, posing significant challenges for ecosystem management and protection of species. To address these challenges and to help guide the management and protection of sea turtles in the Gulf of Mexico, the project research team plans to synthesize sea turtle distribution and abundance data with key oceanographic data to advance our understanding of how human activities influence the distribution and abundance of mobile marine species.

Synthesis of historical observations using novel model approaches to improve understanding and predictability of deep Gulf of Mexico circulation – $897,000
Project Director: Steven Morey, Ph.D., Florida State University
Amy S. Bower, Ph.D., Woods Hole Oceanographic Institution
Eric P. Chassignet, Ph.D., Dmitry S. Dukhovskoy, Ph.D., Cathrine Hancock, Ph.D., and Kevin Speer, Ph.D., Florida State University
Bruce D. Cornuelle, Ph.D., and Ganesh Gopalakrishnan, Ph.D., Scripps Institution of Oceanography
Kathleen A. Donohue, Ph.D., University of Rhode Island
Peter Hamilton, Ph.D., Leidos
João Marcos Azevedo Correia De Souza, Ph.D., and Enric Pallàs Sanz, Ph.D., Centro de Investigación Científica y de Educación Superior de Ensenada
Ashwanth Srinivasan, Ph.D., Tendral, LLC
Understanding of the physical processes that control the deep circulation in the Gulf of Mexico is a fundamental goal for improving the characterization and prediction of the deep water environment. Project researchers will synthesize a mix of historical observations with new models to better understand the unique currents that flow through the deep Gulf of Mexico. Findings are expected to improve forecasting methodologies critical for the safe design and operation of offshore oil and gas infrastructure, as well as improve our predictive capabilities for the transport of deep water organisms and contaminants.

Improved understanding of the northern Gulf of Mexico pelagic ecosystem: Integration, synthesis, and modeling of high-resolution zooplankton and fish data – $504,000
Project Director: Michael R. Roman, Ph.D., University of Maryland
James J. Pierson, Ph.D., University of Maryland
Stephan B. Brandt, Ph.D., Oregon State University
Zooplankton and small fish provide the foundation for commercially and recreationally important fish species in the Gulf of Mexico, but their limited mobility makes them particularly vulnerable to impaired environmental conditions. Project researchers will build on a variety of models to assess potential responses of zooplankton and fish to stressors such as oil spills and events limiting oxygen supply in the northern Gulf of Mexico. The synthesis of historic data with a broad range of new information will identify new, cost-effective ways of monitoring critical living marine resources in the Gulf.

About the Program

In collaboration with others in the Gulf region and around the nation, the Gulf Research Program works to improve understanding of the connections among offshore energy production, the environment, and the people who depend on both. The Gulf Research Program is a division of the National Academies of Sciences, Engineering, and Medicine.

Learn More

Visit www.nas.edu/gulf to learn more and to sign up for e-updates about program activities and funding opportunities. To learn more about the Academies, visit www.national-academies.org.

Contact the Program

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Over its 30-year duration, the Gulf Research Program will work to enhance oil system safety and the protection of human health and the environment in the Gulf of Mexico and other U.S. outer continental shelf areas by seeking to improve understanding of the region's interconnecting human, environmental, and energy systems and fostering application of these insights to benefit Gulf communities, ecosystems, and the nation.

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