Restoring the Gulf

BEYOND THE SHORE | Part II

Ocean Conservancy

Many questions raced through our minds as we watched the news coverage of oil gushing out of a ruptured well-head and into the Gulf of Mexico after the *Deepwater Horizon* explosion in 2010. Could this raging well be capped? How would the oil affect the wildlife and waterfronts? How long would it take for the Gulf to recover? What role could we play to restore the Gulf from the shore to the deep sea?

Today we are still seeking answers to some of those questions, but the $20 billion BP settlement has been finalized. It includes more than $1 billion to restore the open ocean over the next 15 years. We now have an unprecedented opportunity to restore the Gulf not only from the BP oil disaster but also from decades of pollution and other stressors.

Ocean Conservancy recognizes the critical importance of the funds set aside for open ocean restoration. The BP oil disaster occurred 40 miles off the coast and 5,000 feet below the Gulf's surface, severely impacting its wildlife and habitats. Hundreds of thousands of sea turtles, marine mammals and birds died, and many more were exposed to oil. Trillions of larval fish and invertebrates were killed. Deep-water corals, some of them hundreds of years old, died. An area 20 times the size of Manhattan is still polluted by oil on the Gulf seafloor.

The $1 billion earmarked for restoring the open ocean will undoubtedly help in the recovery of fragile marine environments. But it's not nearly enough for the deep ocean to fully recover. That's why we must make smart investments to ensure that restoration is greater than the sum of its parts.

Restoring the Gulf Beyond the Shore - Part II is intended to be a resource to decision-makers like the *Deepwater Horizon* Natural Resource Damage Assessment Trustees as they consider effective, innovative approaches in the next few years to restore the Gulf beyond the shore. It builds on the broad set of projects Ocean Conservancy proposed in 2014 to restore the Gulf. This report focuses on practical, high-impact approaches to restore fish populations, coral reefs and deep-water communities.

Fish and coral communities were greatly impacted by the BP oil disaster and are

Figure 1. Funding for natural resource recovery after the BP oil disaster

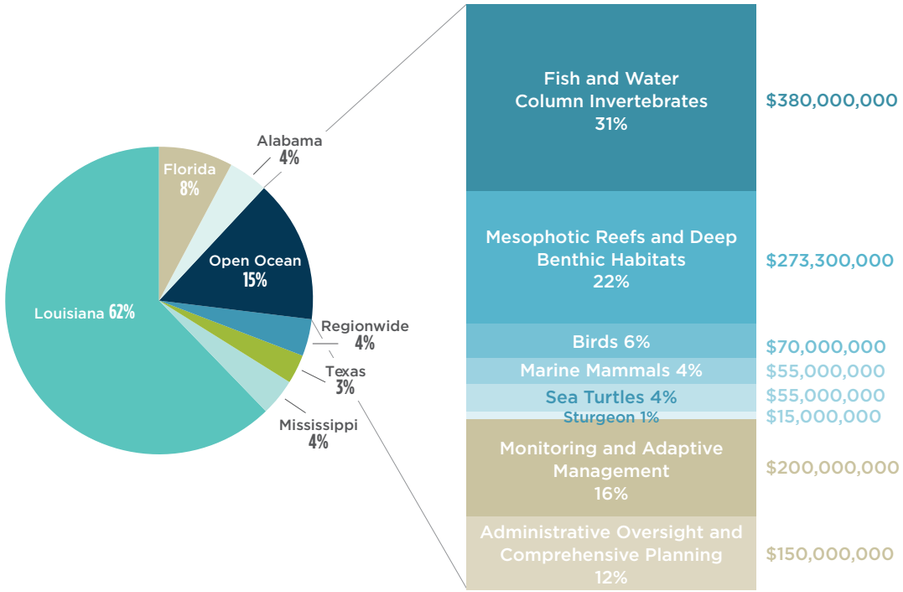
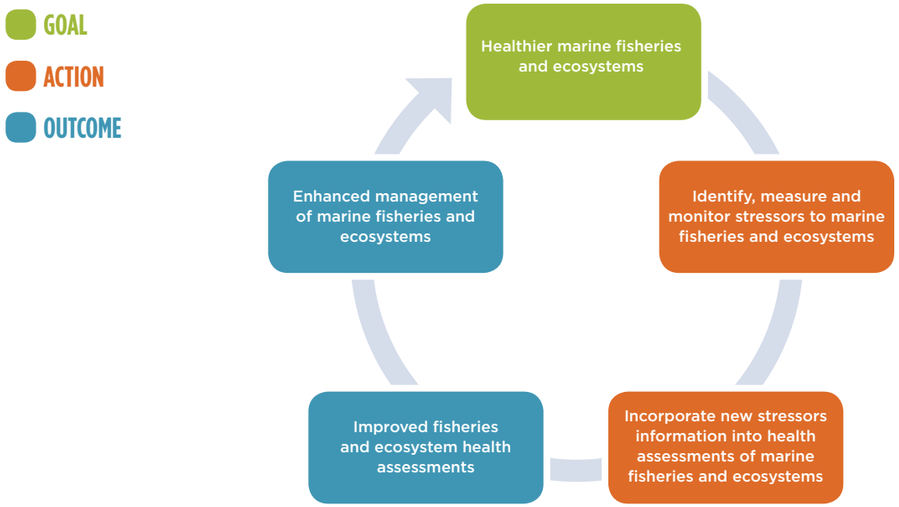


Figure 2. Achieving healthier marine fisheries and ecosystems by better understanding their health and sources of stress



slated to receive over 50% of the funding available to restore the open ocean (Figure 1). Corals provide a home and refuge for many fish and invertebrates, a foundation for marine food webs, and corridors for many species of fish to travel around the Gulf. Fish, especially red snapper, grouper, tuna and other billfish, are important top predators and a cornerstone of the Gulf region's fishing economy.

Restoring the open ocean at this scale is a new frontier. The remoteness of the deep sea and the transient nature of many fish populations present a challenge for aiding and tracking recovery. Success will require smart investments in existing tools and innovative approaches. The best restoration projects are often those that aim to better understand the health of the resources in the Gulf and reduce harm and stressful conditions on them, allowing nature to recover more quickly. In turn, these initial investments in the open ocean can lead to better resource health assessments, improved fishing practices and more informed management decisions, creating a healthier Gulf overall (Figure 2).

The Gulf is poised to regain its status as a thriving, vital resource for us all. It is ready to become a story of hope and success—a shining example of large-scale ecosystem restoration unparalleled in the world.

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Restoring Gulf of Mexico Fish Populations

The Gulf region has a rich fishing tradition, whether to earn a living or to simply enjoy the outdoors. Every year over 3 million anglers fish in the Gulf, contributing billions to the region's gross domestic product. Gulf commercial fishermen bring in 30% of the seafood caught in the continental U.S. The BP oil disaster killed trillions of larval fish and may have exacerbated pre-existing impacts on fisheries. The populations of several reef fish species declined the year immediately following the disaster. Invasive lionfish are rapidly taking over the Gulf's reefs, competing with red snapper for food and habitat, potentially hampering recovery of impacted reef fish. While fishery management has ended overfishing for red snapper and the species is rebuilding, better information is needed to ensure that this recovery continues.

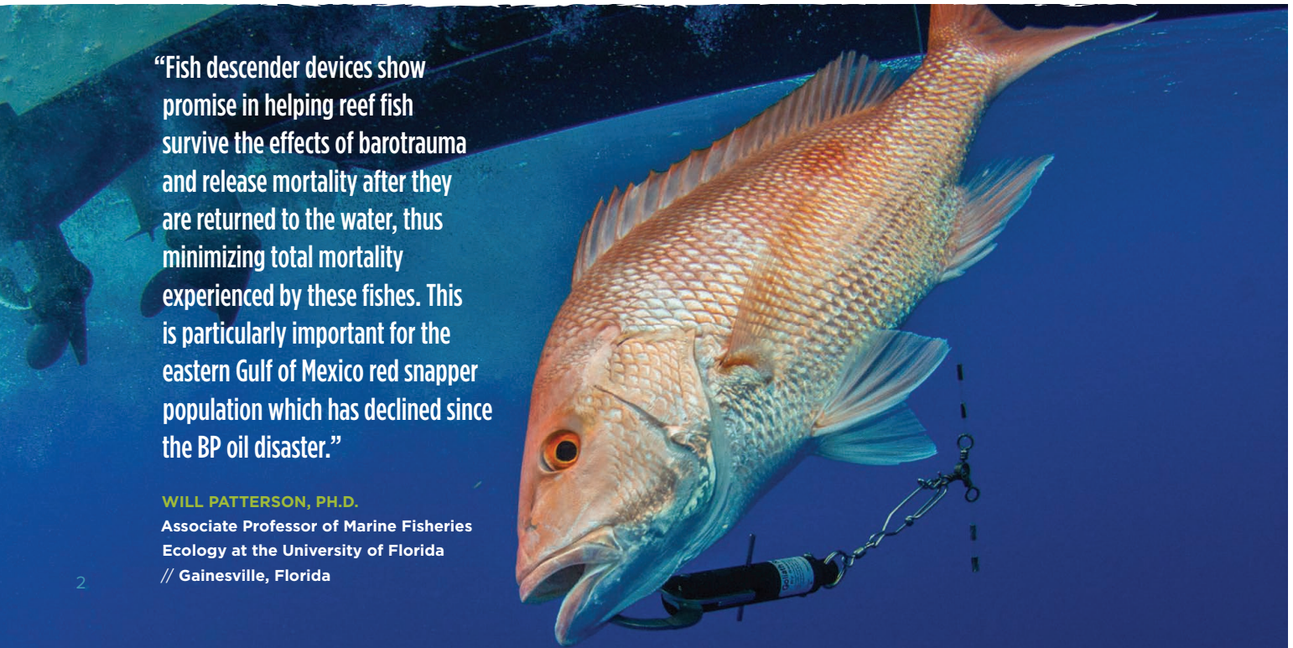
One of the best ways to invest in restoration is to better understand and reduce stressors, allowing fish populations to recover. To do this, we need more information on where fish live in the Gulf, why and how they are using the Gulf's different habitats, and how various types of fishing practices affect them. This information is critical for creating the conditions necessary for full recovery, and will allow us to pass our fishing traditions on to future generations.

Increasing the survival of reef fish after release

Determining best practices for using fish descender devices to reduce the effects of pressure change on reef fish

Imagine you're fishing offshore and you catch a red snapper that is too small to keep—or maybe the fishing season is closed—and you need to throw it back. When pulled up to the water's surface from deeper waters, many fish like red snapper or grouper can experience "the bends" much like SCUBA divers, due to rapid changes in pressure that cause internal physical and physiological stress to the fish. As you throw your red snapper back into the water, it may struggle to return to the seafloor and is at increased risk of being eaten or dying from its injuries.

Preliminary studies across the Gulf have suggested that fish descender devices are a viable tool to help reduce or minimize the effects of pressure change on reef fish, known as barotrauma. However, more research is needed to determine the best way to return these fish to their habitat safely. By working together, scientists and fishermen can help quantify the benefits of and identify best practices for using fish descender devices. By finding ways to reduce the deaths of released fish, we can help these fish populations rebuild while fishermen reap the benefit of a more productive fishery.



"Fish descender devices show promise in helping reef fish survive the effects of barotrauma and release mortality after they are returned to the water, thus minimizing total mortality experienced by these fishes. This is particularly important for the eastern Gulf of Mexico red snapper population which has declined since the BP oil disaster."

WILL PATTERSON, PH.D.
Associate Professor of Marine Fisheries Ecology at the University of Florida // Gainesville, Florida

Tackling an invasive and very hungry predator

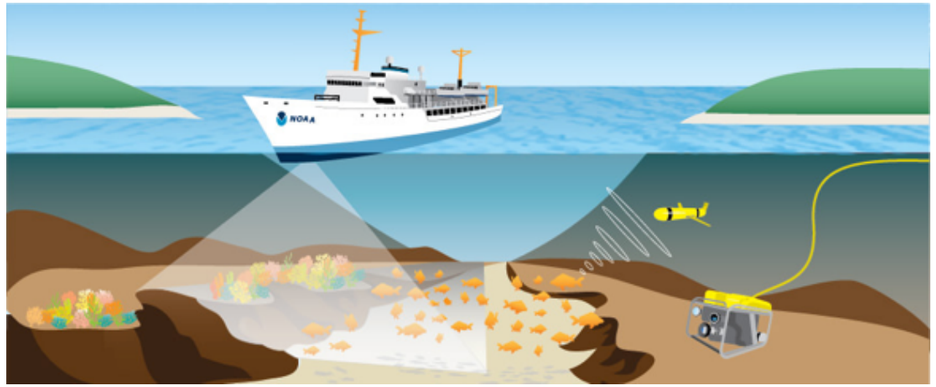
Mapping and quantifying the overlap of lionfish and native reef fish

In the past 10 years, lionfish have taken over the Gulf. Easily identified by its striking coloration and venomous spines, this invasive predator is eating juvenile reef fish and the food sources of native species like red snapper. The lionfish invasion is adding further stress to fisheries that are still recovering from the BP oil disaster and decades of overfishing.

There is much to learn about the impacts of lionfish on other fish populations and fishing industries. Using sonar and underwater video technology to map the seafloor, we can better understand the location of native fish across different types of habitats in the Gulf and how invading lionfish impact them throughout their lifecycles. Once we clarify the impact of lionfish on the survival of native reef fish, we can better identify effective and responsive strategies to help reef fish recover.

"Effective restoration of native reef fish species injured by the *Deepwater Horizon* oil spill requires that we also fill the gaps in our understanding of other stressors on these populations. One such stressor is the spread of the invasive lionfish. Knowing where lionfish populations are concentrated and how their distributions overlap those of reef fishes is crucial and would be better understood by expanding benthic habitat mapping efforts."

STEVE MURAWSKI, PH.D.
Professor at University of South Florida, College of Marine Science // St. Petersburg, Florida



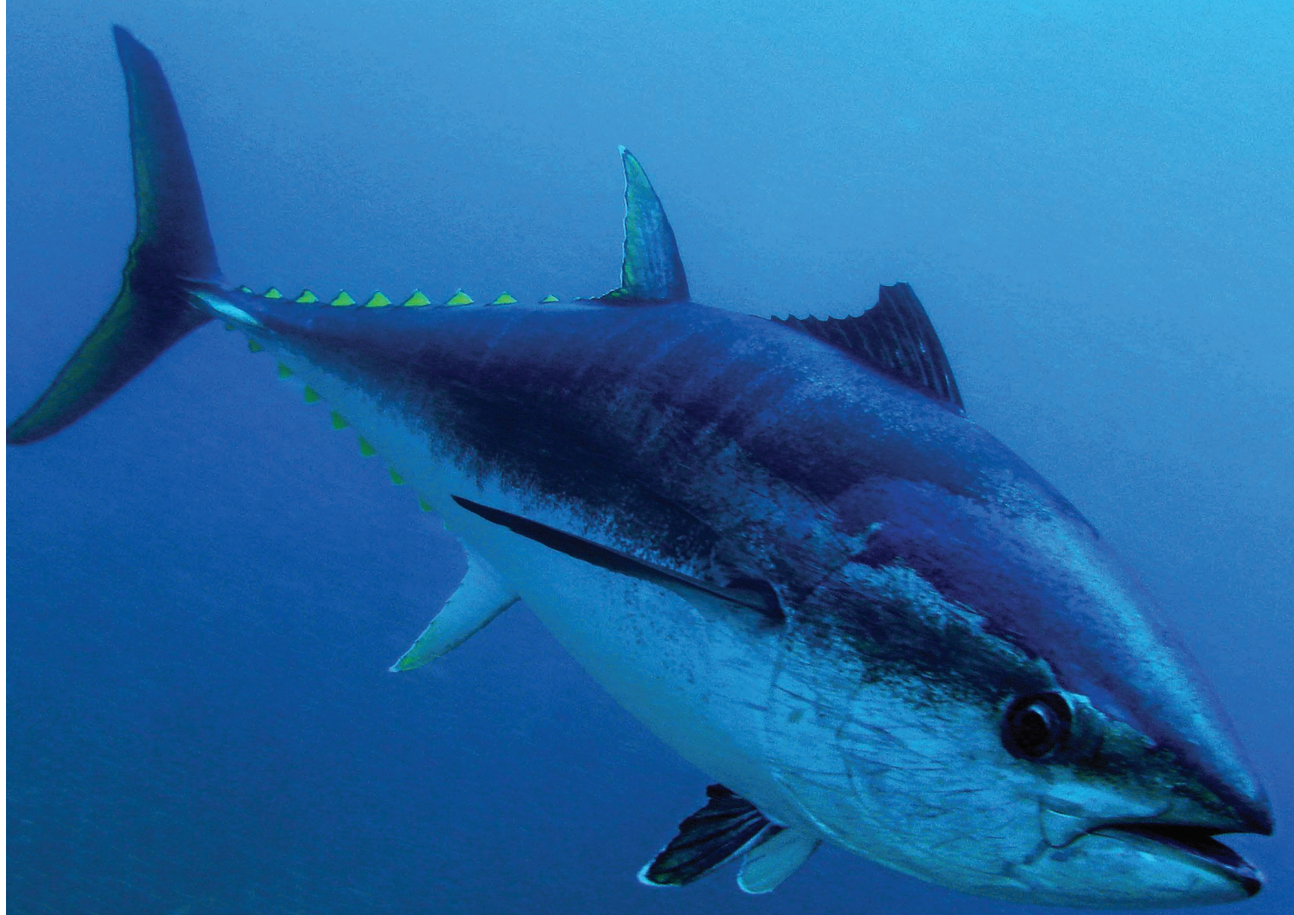
Using a combination of sonar, video and audio recording, a research vessel can map the Gulf seafloor, determine which species of fish are there and estimate fish populations.

Tracking the Gulf's fastest travelers

Tagging highly migratory species and other ocean fish to understand their migration, movement and survival

The Gulf is one of only two areas in the world where Atlantic bluefin tuna are known to spawn. The BP oil disaster started during the height of their spawning season. Lab studies have shown that the larvae of large ocean fish including tuna and swordfish suffer life-threatening heart dysfunction due to oil exposure, which could limit their ability to swim, a critical element of survival for these top predators. Compounding this stress, many ocean fish are caught accidentally by recreational and commercial fishermen targeting other fish. Fishermen are required to release some of these species, especially bluefin tuna, because they are protected in the Gulf and significantly overfished worldwide. However, we don't have enough information to know if the released fish will survive.

By attaching pop-up satellite tags to these fishes, we can gather data to study their survival after release as well as their migration and movement inside and outside of the Gulf. The results of this study will promote recovery of these species and allow us to better manage our fisheries.



"For many large oceanic fish species, and especially for tunas, there is still a lot we need to learn about the stocks and their recovery in the Gulf after the oil disaster. Many fishermen recognize the need to increase our understanding of these species movements and migration, and their survival after being released from fishing gears, as this can help to identify more responsible approaches to fisheries for these species."

CAPTAIN GARY JARVIS
Owner/Operator of Backdown 2 Charters
Founding Member, Charter Fisherman's Association
// Destin, Florida

Improving Our Understanding of Corals and the Deep Sea to Expedite Recovery

Before the BP oil disaster, we knew precious little about the ancient deep-water corals living 5,000 feet below the Gulf's surface. For hundreds of years, these corals have provided a home for an amazing community of curious squat lobsters, mysterious-looking squids and many more species we have yet to identify. Few people have ever seen these places firsthand. Thanks to live streaming technologies on research vessels like the NOAA Ship *Okeanos Explorer* and the Exploration Vessel *Nautilus*, we have live a window into these fragile and unique coral communities and marine life that were previously unknown.

This vibrant seafloor is no less immune from human activities than coastal habitats. They are at risk from oil spills, oil and gas infrastructure, certain types of fishing and even changes in ocean chemistry that slow their growth and recovery. An estimated 10 million gallons of BP oil still contaminates the seafloor today. Research expeditions to the blown-out wellhead found dying corals covered in a layer of oil-tainted material. The recovery time for these slow-growing corals, which can live for more than 500 years, is unknown.

We still know less about the seafloor than the surface of the moon, and our ability to maintain healthy coral communities in the Gulf is hampered by our lack of knowledge of their location, health and barriers to recovery. To fill this information gap for the deep sea, we must increase our understanding of coral habitats through research, monitoring and mapping of the Gulf seafloor. Expanding our knowledge of these remote, special places is the first step to measuring their recovery and restoring the deep sea.

Filling knowledge gaps in a deep-sea oasis

Mapping the habitats and species of deep-water coral communities in and around the DeSoto Canyon

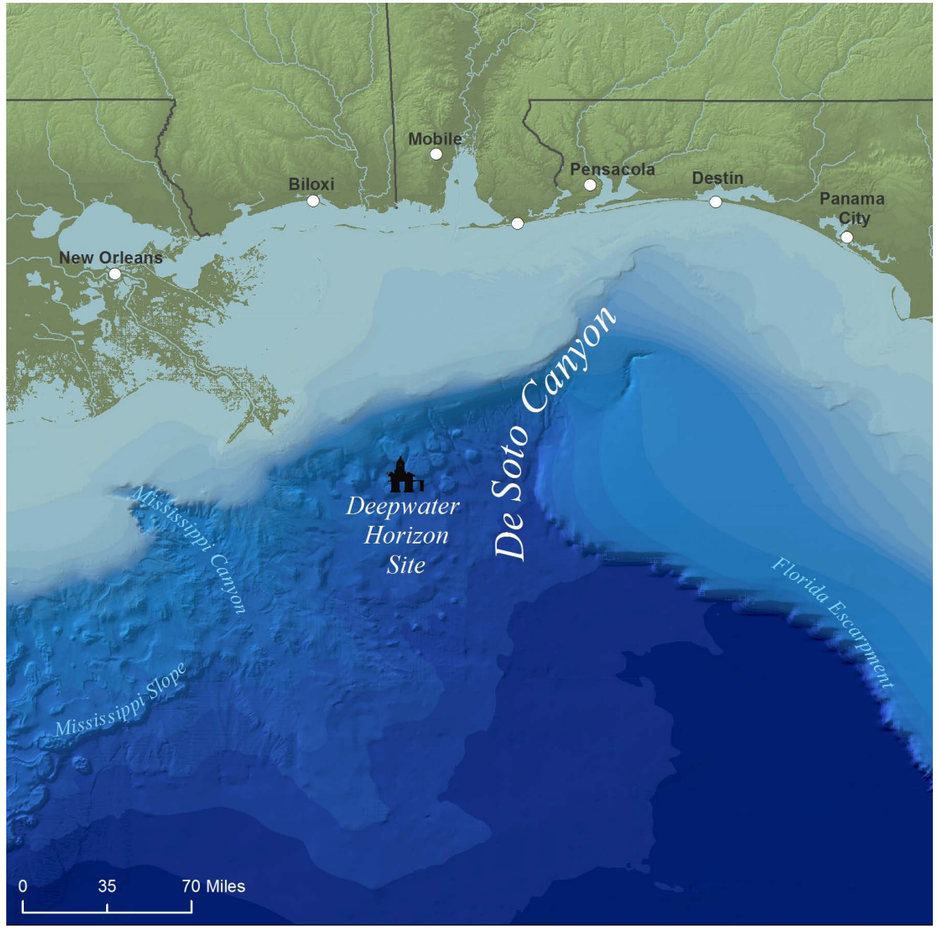
Some of the busiest fishing towns in the country flourish in the Gulf thanks to a huge underwater canyon that lies just 60 miles offshore. Named after a Spanish explorer who once sailed these waters, DeSoto Canyon is a rare feature that cuts through the Gulf's soft, sloping continental shelf. This unique area benefits from the flow of nutrients and cold water pushed up the canyon's coral-decorated walls from deeper parts of the Gulf. It is a haven for marine life including endangered sperm whales.

The BP oil disaster occurred close to this important marine area. It highlighted all we do not know about this ocean oasis. To fill this gap in our knowledge, we need to develop high-resolution maps to determine what types of deep-water corals are in the DeSoto Canyon area and whether they are healthy. Understanding the locations of coral habitat in the DeSoto Canyon area will allow managers to better plan future restoration measures for deep-water coral.

"For successful restoration of deep-sea coral habitats, we have to first locate and assess the health of these habitats across the deep Gulf. Yet in many areas, we are currently missing the necessary keystone: maps of the deep seafloor. Mapping DeSoto Canyon is a key first step. It is not only close to the Macondo wellhead, this canyon system is likely of great ecological importance to the deep Gulf ecosystem."

ANDREA QUATTRINI
Postdoctoral Researcher at Harvey Mudd College // Claremont, California

The DeSoto Canyon area is known to host many coral species similar to those destroyed by the BP oil disaster, including this *Paramuricea*. Here, a healthy coral with brittle stars wrapped around the branches (left), compared to a heavily damaged coral near the *Deepwater Horizon* site (right).



Monitoring corals for environmental and human impacts

Expanding our knowledge of sentinel coral communities through monitoring, research and a best fishing practices program

Corals act as canaries in the coal mine, responding to incremental changes in temperature, acidification and nutrient pollution. Bright, colorful reefs are found in shallow waters off the coast of Florida and in the "twilight" or mid-water zone off the coast of Texas and Alabama, where a small amount of light still reaches the seafloor. Here, tall peaks covered with sponges and brain coral stretch upward toward the Gulf's surface, providing a home for angelfish, red snapper, manta rays and whale sharks. Together, shallow-, mid- and deep-water corals support many species across the Gulf, and any stress on these reefs affects the broader ecosystem as a whole. We too rely on these unique places, as coral reefs accessible by boat are popular among divers as well as commercial and recreational fishermen.

Despite the importance of these reefs, we still lack a complete understanding of their stressors and how the various coral communities across the Gulf are connected by the dispersal of coral larvae from reef to reef. The larvae produced by a healthy reef may help repopulate oiled reefs elsewhere in the Gulf. We can better understand the environmental and human stressors affecting the health and survival of coral communities through a multifaceted approach of researching the connectivity of these corals, monitoring specific "sentinel sites" for environmental change and developing a best fishing practices program. This information will advance our preparedness for future stressors like oil spills and serve as a reference to track the recovery of other coral communities injured by the BP oil disaster.

"Fishermen understand the importance of coral reefs and other natural habitats for the fish species we rely upon, from shallow to deep waters. We also recognize that more effective management approaches for coral sites can be developed and implemented through partnerships between scientists, fishing communities, and fishery managers working together to identify best ways to reduce unintentional threats to coral communities while supporting local fishing economies."

SCOTT HICKMAN
Owner/Operator of Circle H Outfitters and Charters
Founding Member, Charter Fisherman's Association
National Marine Sanctuary Volunteer of the Year 2016
// Galveston, Texas

America relies on a healthy, thriving Gulf of Mexico. From the shore out to the deep sea, the Gulf supports coastal communities, local economies and a celebrated way of life. This is where we get our seafood, where we fish and where we live. We must ensure its recovery so that we can continue to enjoy all that the Gulf has to offer.

Ocean Conservancy is unwavering in our support of science-based solutions to restore the Gulf. We believe that by working together with decision-makers, scientists, fishermen and communities, the Gulf can and will recover.

A HEALTHY, THRIVING AND PRODUCTIVE GULF IS WITHIN OUR REACH.

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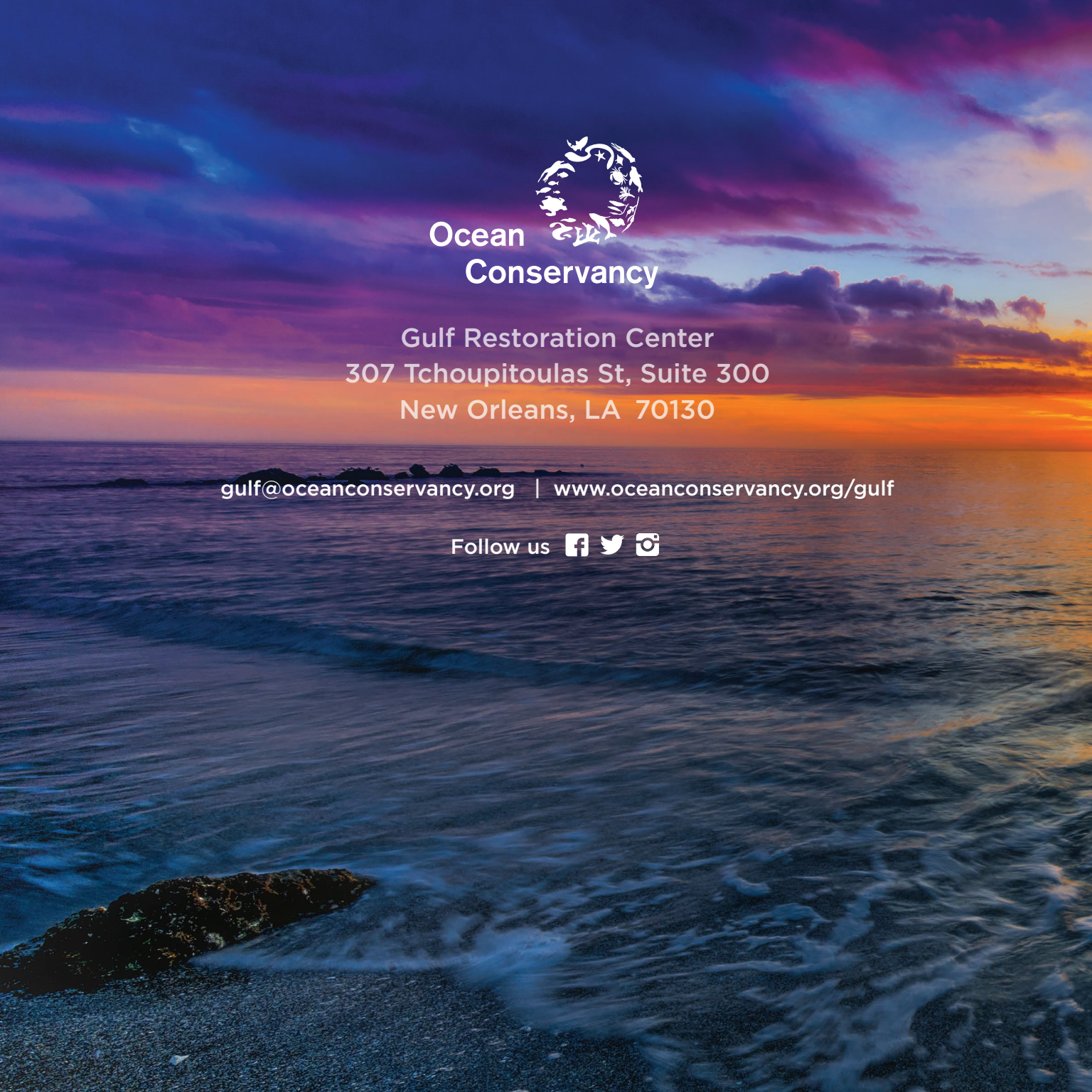
Ocean Conservancy is working to protect the ocean from today's greatest global challenges. Together with our partners, we create science-based solutions for a healthy ocean and the wildlife and communities that depend on it.



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