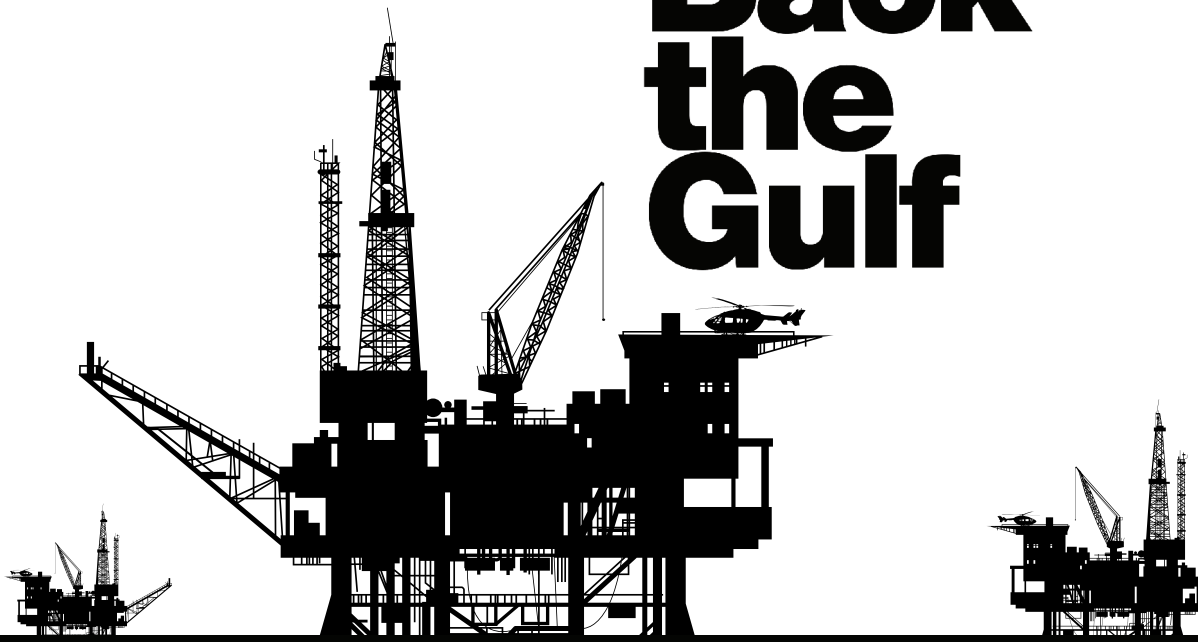
Bring Back the Gulf

A Better Plan Than Dumping Abandoned Oil Rigs into The Gulf of Mexico

DeeVon Quirolo

Richard Charter

Bring Back the Gulf

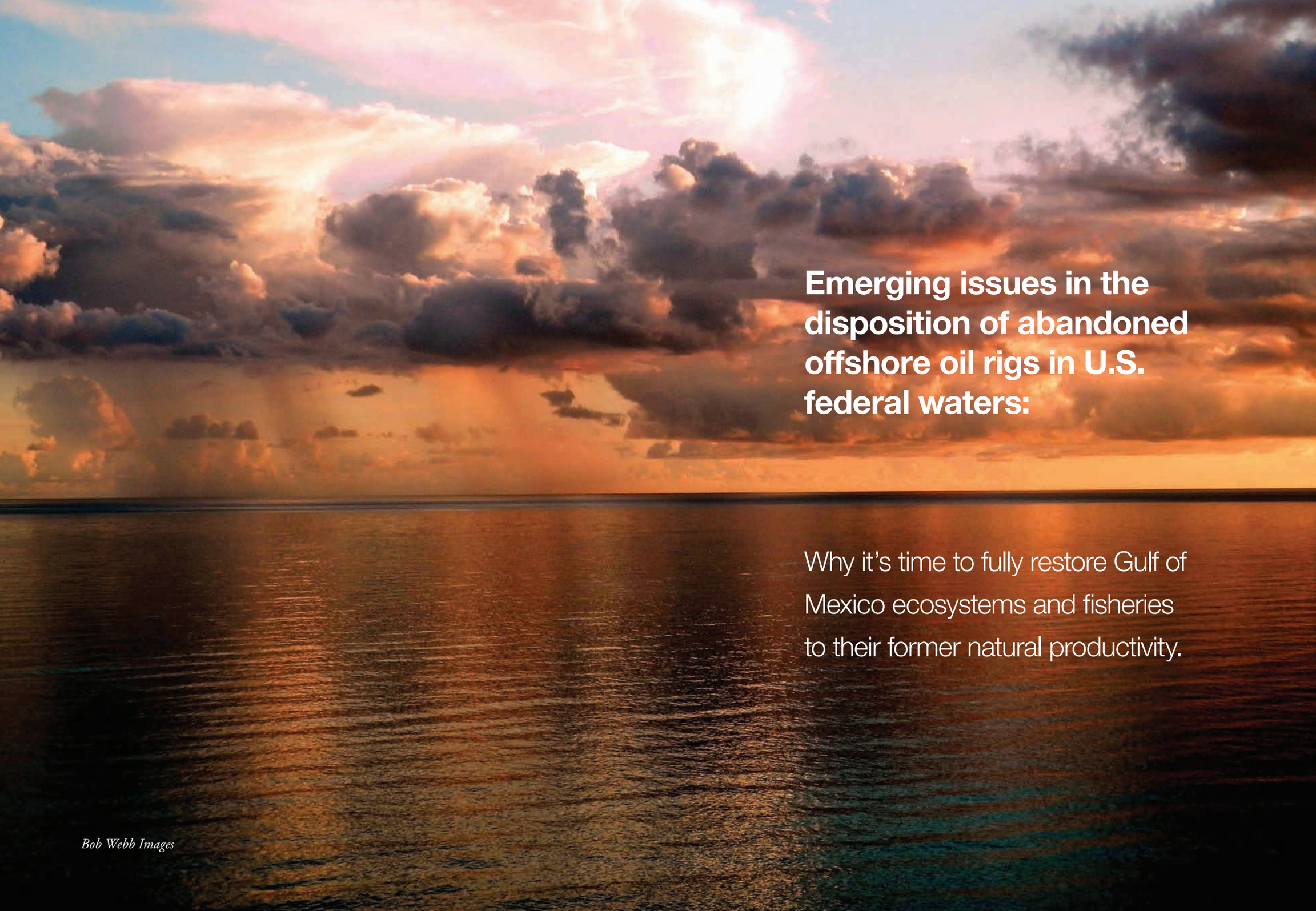


Bring Back the Gulf

A Better Plan Than Dumping Abandoned Oil Rigs into The Gulf of Mexico

DeeVon Quirolo

Richard Charter



Emerging issues in the disposition of abandoned offshore oil rigs in U.S. federal waters:

Why it's time to fully restore Gulf of Mexico ecosystems and fisheries to their former natural productivity.

Bob Webb Images

Contents

Acknowledgements ix
Abbreviations.....x

1. Executive Summary 1

2. Hope for the Future in Lessons from the Past 5

3. History of Offshore Oil and Artificial Underwater Structures on the Outer Continental Shelf 9

4. Scientific Analysis of Potential Fisheries Value of Rigs Used as Artificial Underwater Habitats..... 19

5. Do Retired Offshore Oil & Gas Structures Qualify Under NOAA's National Artificial Reef Plan? 29

6. U.S. Interior Department Idle Iron Policy 35

7. Rigs-to-Reefs Programs 43

8. Recent Efforts to Expand Rigs-to-Reefs 53

9. Environmental Considerations..... 63

10. Stakeholder Considerations 81

11. How Rigs-to-Reefs Saves the Oil and Gas Industry Billions 87

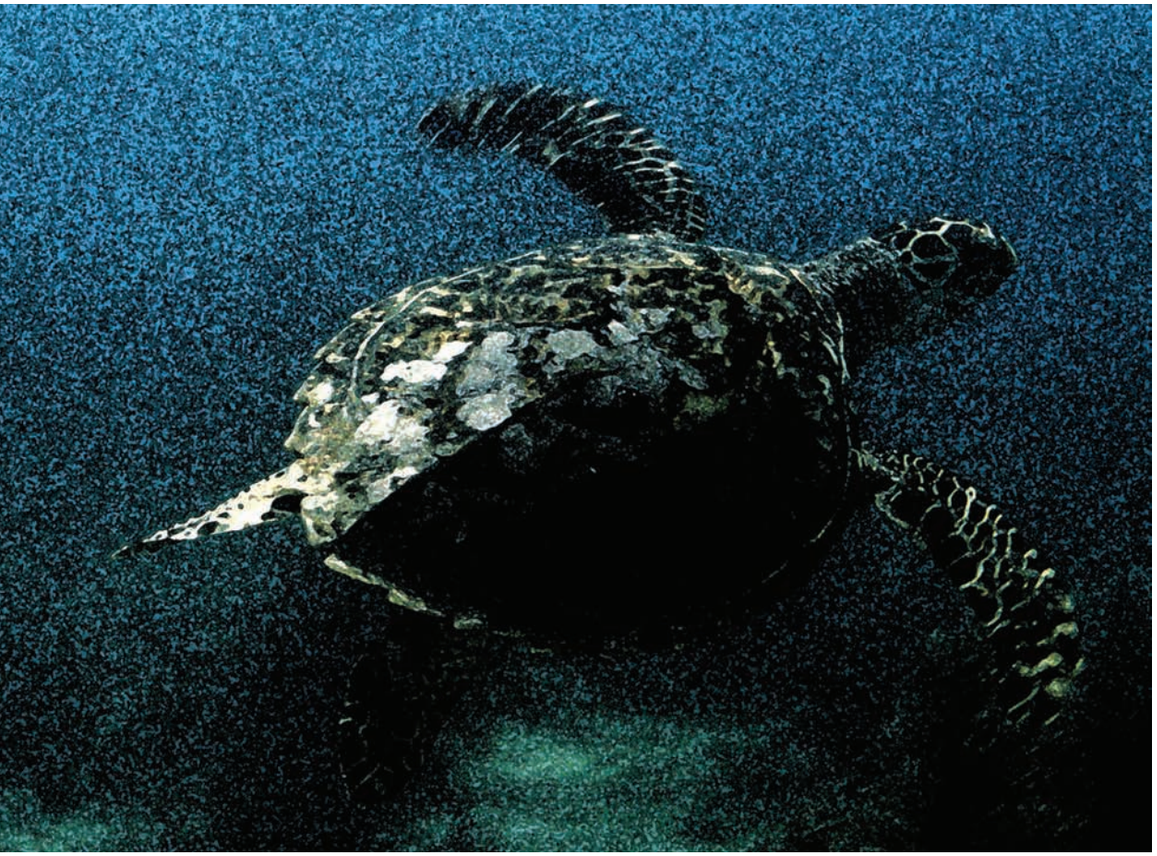
12. Gulf of Mexico Restoration Goals 91

13. Implications for Other Regions..... 95

14. Recommendations for Action 97

15. Bring Back the Gulf: Conclusions..... 105

16. References..... 109



Craig Quirolo reefreliefarchive.org

Acknowledgements

This publication was made possible through the support of the Herbert W. Hoover Foundation. Special thanks to Elizabeth Hoover for her vision and commitment to turn the tide. So many individuals have helped and we thank you all. However, special thanks are due to James Cowan, G.P. Schmahl, James Bohnsack, Cyn Sarthou, John McManus, Kristopher Benson, Alan Hebel, Jeff Webb, Mark Spalding, Sonny Vergara, Robert C. Byrd, Craig Quirolo, Ed Lallo, Jan-Michael Stump, John Amos, David Manthos, Jeffrey Dubinsky, and Bob Webb.

HWH Herbert W Hoover Foundation

Published by the Coastal Coordination Program of The Ocean Foundation, Washington, DC, http://www.oceanfdn.org/

The Ocean Foundation
Coastal Coordination Program

An electronic retrievable copy of this publication may be downloaded free of charge from the website http://www.bringbackthegulf.org
We also invite you to join an ongoing dialog about the issues in this publication at the same online link.

Production and Design by *the*BookDesigners, bookdesigners.com

Written by DeeVon Quirolo and Richard Charter.
Individual photos and graphics used with permission
and remain the sole property of their creators.
Except where otherwise noted, the content of this publication is
licensed under a Creative Commons 3.0 Attribution License
creativecommons.org/licenses/by-nc/3.0/

Abbreviations

BOEM—U.S. Interior Department Bureau of Ocean Energy Management
Bn—Billion
BP—British Petroleum
BSEE —U.S. Interior Department Bureau of Safety and Environmental Enforcement
DOE—U.S. Department of Energy
DOI—U.S. Department of the Interior
DWH—Deepwater Horizon
EFH—Essential Fish Habitat
EPA—U.S. Environmental Protection Agency
FAD—Fish Attracting Device
FMP—Fisheries Management Plans
GOM—Gulf of Mexico
GOMR—Gulf of Mexico Region
HAB—Harmful Algal Blooms
MPA—Marine Protected Areas
MSRA—Magnuson-Stevens Reauthorization Act of 2006
MMS—Minerals Management Service
NEPA—National Environmental Policy Act
NMFS—National Marine Fisheries Service
NOAA —U.S. Department of Commerce National Oceanic and Atmospheric Administration
NTL—Notice to Lessees
OCS—Outer Continental Shelf
OCSLAA—Outer Continental Shelf Lands Act as Amended
ROV—Remotely Operated Vehicle
SARS—Special Artificial Reef Site
SMZ—Special Management Zones
USACOE—U. S. Army Corps of Engineers
USDC—U. S. Department of Commerce

Executive Summary

The goal of this analysis is to enable a reasonable assessment of the most promising future scenarios that would support returning the Gulf of Mexico to its richly-productive natural state. We provide an examination of the best information available on the Gulf of Mexico with respect to the extensive growth of the oil and gas industry and emerging policies for the decommissioning of spent offshore oil and gas structures. We integrate decision-making regarding the oil industry and its spent oil and gas structures with the greater national goal of restoring Gulf of Mexico ecosystems. It is hoped that findings from this study will contribute to an objective understanding of the role that discarded oil and gas infrastructure may play in impeding the restoration of the Gulf of Mexico to full ecosystem health and productivity.

Our examination of the development of the U.S. Department of the Interior's *Idle Iron* policy reveals the manner in which many temporary oil and gas structures have now been discarded to become a permanent part of the seascape under the *Rigs-to-Reefs* waiver. We investigated the scientific studies and found that despite the fact the rigs may provide habitat for fish and often attract fishermen and divers, there is no scientific consensus that these discarded structures contribute to maintaining fisheries stocks or otherwise achieve overarching fisheries management goals. Instead, these artificial underwater structures aggregate fish, thereby contributing to over-fishing. It also is apparent that they fail to equal or rival natural coral reefs in biological diversity. In fact, the most abundant fish on the rigs, red snapper, are considered "overfished" in the Gulf of Mexico and are subject to stock recovery strategies despite the fact that approximately 5% of the habitat in the Gulf of Mexico is now comprised of oil rigs. We track the regulatory review of the *Rigs-to-Reefs* program and question whether the criteria of the National Artificial Reef Plan are being met with respect to decommissioned rigs.

In the next few years, numerous rigs will reach the end of their usefulness and will require decommissioning, both in the Gulf of Mexico and on the California coast. We report on efforts underway to expand the *Rigs-to-Reefs* program, despite great agency concern regarding the structural damage that recent hurricanes have caused to offshore rigs. We review how extensive oil and gas development has affected various stakeholders in the Gulf and how the *Rigs-to-Reefs* effort impacts them. The oil and gas industry profits hugely from a lax reefing policy because this method of disposal cuts its decommissioning costs by roughly one-half. We analyze the environmental impacts of the *Rigs-to-Reefs* policy in the greater context of the overall impacts of present widespread oil and gas development on Gulf of Mexico ecosystems.

We conclude it is time to re-examine the *Rigs-to-Reefs* policy. The Gulf of Mexico may be reaching a "critical mass" of such artificial structures, beyond which additional underwater debris is considered unlikely to contribute to much larger efforts underway to create naturally resilient, healthy ecosystems. One promising scenario would lead to a Gulf that includes only the already-extensive system of artificial underwater structures comprised of spent oil and gas platform "jackets" and those either toppled or left in place with a clearance of 85 feet below the water line. The Gulf likely will not accommodate hundreds more of these without sustaining tangible damage to the ecological balance of the region. The economic valuation of a Gulf of Mexico that boasts sustainable seafood harvests, safe navigation, ecological stability, and healthy quality of life for its residents is worth protecting, in contrast to the fiscal and ecological liabilities that will fall to the public as a result of an expansion of the practice of simply discarding retired rigs on the seabed.

We offer additional recommendations within the context of a greater restoration effort to bring back the Gulf of Mexico. We ask that a broad representation of the full range of public interests be more inclusively involved in the relevant federal and state decision-making processes.

We call for monitoring of state *Rigs-to-Reefs* programs to ensure ecological integrity in current maintenance practices and in any future deployment. We call for more independent scientific research that is not unduly influenced by the oil and gas industry, especially for deep-sea processes that are vulnerable to impacts accompanying the growth of deepwater drilling. We reiterate the need for new vigor in the enforcement of existing environmental laws to help ensure a healthy Gulf. Our conclusions also call for effective management and restoration of reef fish populations for long term ecosystem-based resilience. Finally, we encourage the creation of deepwater preserves to protect biologic diversity and provide research opportunities to allow the public to learn more through a Gulf-wide monitoring effort, especially in the northern Gulf, where so much oil and gas production is concentrated.

2

Hope for the Future in Lessons from the Past

The pre-industrial baseline conditions in the Gulf of Mexico historically represented one of our planet's most productive marine ecosystems, with clean waters harboring prolific fish and marine mammal populations supported by the foodsource and nursery habitats of extensive healthy wetlands. The more recent deteriorating state of the Gulf of Mexico ecosystem is the cumulative result of a range of adverse impacts resulting from routine and accidental oil and waste discharges from offshore and coastal oil and gas facilities, expansion of commercial and recreational fishing pressures, coastal wetland degradation caused by interruption of sediment transport, ill-considered dredging, land subsidence induced by petroleum extraction, strong storm surge, increasing rates of sea level rise, and a range of additional impacts from industrial society. These phenomena are all occurring in combination with the land-based influx of runoff and

Sonny Vergara, Skyshadow Photography

river inflows containing excess waterborne nutrients, which contribute to Harmful Algal Blooms (HAB's) that often lead to an extensive "dead zone" in the Gulf.

Many coastal states and local communities legitimately concerned about the long-term fate of the Gulf now have the benefit of substantial available funding from the BP Deepwater Horizon oil spill settlements. This one-time source of funding could provide the impetus to initiate specific steps that would move us toward our collective societal goal of restoring the coastal wetlands and open waters of the Gulf of Mexico back to something resembling their original levels of ecosystem services and productivity over time. The compelling positive objective of true restoration would be to achieve the most optimistic estimate of an economic value of the full ecosystem productivity that could be anticipated from a return to an unpolluted healthy Gulf. Now is the time to plan for the "post oil extraction" future the Gulf will inevitably face in a few decades.

This task seems clear when broken down into four major goals. First, restore the coastal wetlands upon which so much of the Gulf's marine life depends. Second, curtail excess nutrients and toxic pollution now flowing into Gulf waters. Third, properly and effectively manage all fisheries for long-term, ecosystem-based resilience and sustainability. And fourth, as always promised by industry lessees, once an offshore oil or gas operation has ceased to be an economical undertaking, reliably seal off the wellhead, cut off the drill casing below the mud line, remove the steel rig structure for recycling, and restore the seabed to as near pre-lease conditions as possible. What could be simpler? It turns out that unforeseen complications arise to impede each of these necessary steps.

As a reference benchmark, the Flower Garden Banks National Marine Sanctuary stands as one small increment of the Gulf ecosystem that has not experienced industrial insults on the scale of other

Platforms damaged during Katrina Hurricane in 2005. Wiegand, 2011 (Image: Wiegand, 2011)

Gulf waters. Here, within a limited discreet area in the northwestern Gulf, one still finds healthy corals and a lone "grandfathered" offshore drilling structure due for decommissioning. The careful management of this site has kept it relatively pristine, a model for the kind of healthy ecosystem to which other parts of the Gulf could still eventually return. Elsewhere, along Florida's majestic Gulf Coast and Panhandle beaches, the annual bipartisan imposition of a two-decade congressional and presidential moratorium on new offshore leasing, followed more recently by the enactment by President George W. Bush of the bipartisan Gulf of Mexico Energy Security Act (GOMESA), have ensured that nearshore waters extending 150 miles from Tampa Bay will remain free of offshore petroleum leases until at least 2022, and perhaps beyond. We need to learn from some of these near-baseline reference examples to get an idea of what a restored Gulf could be again, and from these lessons we can reach the best restoration decisions before it's too late.

Kerr McGee, the world's first well out of sight of land. September 1947. Courtesy of BOEM Image Library.

3 History of Offshore Oil and Artificial Underwater Structures on the Outer Continental Shelf

The spread of industrial infrastructure throughout the Gulf of Mexico began slowly, but continues to accelerate today. The first offshore drilling platform was installed off the coast of Louisiana in 1937. In 1947 "Block 32," southeast of the northeast coast of Texas, brought in a gusher of oil and the full-scale exploration for petroleum in the northwestern Gulf of Mexico had begun (Yergin, 1991).

The federal offshore leasing program got its real start in 1954. For the next several decades, thousands of platforms were deployed in the relatively shallow shelf area of the region, markedly transforming the available habitat in the Gulf. In 1987, there were 4,000 oil and gas production platforms in state and federal waters more than 1,000 feet deep and extending more than 130 miles from shore, constituting 99% of all U.S. platforms (Reggio, 1987).

The Gulf of Mexico Outer Continental Shelf has led the nation in offshore energy production and the offshore oil rigs have become artificial underwater habitats for a variety of fish and marine life (Reggio, 1986). By 2003, the number of operations in the northern Gulf had grown to 4046 platforms. These oil and gas platforms operating in state and federal waters of the northern Gulf of Mexico have created the largest *de facto* artificial underwater habitat system in the world. Combined, they increase the surface area of hard substrate available in the northern Gulf of Mexico by only 4% (Stanley and Wilson 1990, 1991, 1997), but they arguably have a substantial impact on regional fisheries (Wilson and Miller, 2003).

By 2009, there were approximately 3,000 oil platforms still standing with nearly an equal number (approximately 100) being constructed and decommissioned annually (R. Kasperzak, 2009). In March 2013, this number had increased to 3,085.

As of April 2014, BOEM reported 6,251 active federal leases in the Gulf of Mexico Planning Area and an additional 5,196 non-producing leases. Most were in the Central Gulf (4,246 active, 3,349 non-producing). An additional 43 active federal leases exist on the Pacific Outer Continental Shelf in southern California, with none non-producing. Alaska has 607 active leases and 604 non-producing leases. Of a total of 381,641,990 acres leased for oil and gas activities, 28,680,156 acres were non-producing leases (See chart below).

Combined Leasing Report
As of April 1, 2014

Planning Areas by Region[1]		Total Blocks	Total Acres	Number of Active Leases[2,6]	Acreage of Active Leases	Number of Producing Leases[3]	Acreage of Producing Leases	Number of Non-Producing Leases[3,4]	Acreage of Non-Producing Leases
Gulf of Mexico									
	Western	5,240	28,576,813	1,243	7,080,044	112	615,998	1,131	6,464,046
	Central	12,409	66,446,351	4,246	22,616,754	897	4,356,671	3,349	18,260,083
	Eastern	11,526	64,563,679	112	601,664	0	0	112	601,664
Region Subtotal		29,175	159,586,843	5,601	30,298,462	1,009	4,972,669	4,592	25,325,793
Pacific[6]									
	Southern California	16,164	89,028,609	43	217,669	43	217,669	0	0
Region Subtotal		16,164	89,028,609	43	217,669	43	217,669	0	0
Alaska[5]									
	Beaufort Sea	11,876	65,075,663	147	760,129	3	10,424	144	749,705
	Chukchi sea	11,472	62,594,455	460	2,604,658	0	0	460	2,604,658
	Cook Inlet	1,093	5,356,420	0	0	0	0	0	0
Region Subtotal		24,441	133,026,538	607	3,364,787	3	10,424	604	3,354,363
Totals		69,780	381,641,990	6,251	33,880,918	1,055	5,200,762	5,196	28,680,156

Footnotes/Definitions:

1. A Planning Area is a large, contiguous portion of the OCS, consisting of defined OCS blocks, considered as an entity for administrative planning purposes. The quantity and size of a planning area can vary by Region.

2. An Active Lease is a lease that has been executed by the Lessor and the Lessee(s), has an effective date and has not been relinquished, expired or terminated.

3. A Producing lease is an active lease that has produced product i.e. oil or gas, or both. A non-producing lease is an active lease that has not produced product. NOTE: There can be a difference in the definition for producing and non-producing leases between BOEM and ONRR (i.e. time lag, fiscal versus calendar year, etc.) because of different purposes in collecting data (i.e. operations versus revenue collection).

4. There are 9 leases split between CGOM and EGOM accounting for a small variation in acreage and production as of October 2013 for GOMR.

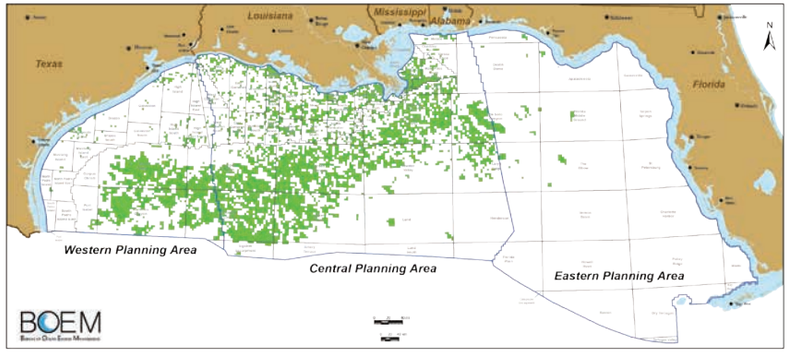
5. There are 4 planning areas in the Pacific Region, but only 1 planning area with existing leases. There are 15 planning areas in the Alaska Region, but only the three planning areas with leases or that are being considered for leasing in the 2012 to 2017 Five-Year Program are displayed. There are no leases or plans to lease in the other planning areas through 2017.

6. Some leases have more than one block. Blocks are generally 9 square miles but can vary. Slight numerical discrepancies are the result of the processes used during the rounding of acreage.

Source: http://www.boem.gov/Combined-Leasing-Report/

The recent trend toward deeper drilling has resulted in numerous offshore oil and gas lease sales along the slope of the Outer Continental Shelf in Gulf waters. A military use buffer zone in the Eastern Gulf of Mexico Planning Area along portions of Florida's Gulf Coast and Panhandle remains under a bipartisan Congressional moratorium on new offshore leasing that will expire in 2022 unless renewed.

BOEM Gulf of Mexico OCS Region
Blocks and Active Leases by Planning Area
March 3, 2014



Planning Areas	Total Blocks	Total Acres	Number of Leases	Acres Leased
Western	5,240	28,576,813	1,247	7,103,084
Central	12,409	66,446,351	4,267	22,730,444
Eastern	11,526	64,563,679	112	601,664
Sub-Totals	29,175	159,586,843	5,626	30,435,192
CPA / EPA Shared Blocks*	(86)		(9)	
Totals	**29,089**	**159,586,843**	**5,617**	**30,435,192**

Active Leases
Planning Area Boundary

* CPA and EPA contain 86 shared blocks of which 9 are leased. These blocks are given both a CPA and EPA designation in the data which accounts for a higher block total

http://www.boem.gov/Gulf-of-Mexico-Region-Leasing-Information/

Removal of non-producing platforms from Gulf waters began in 1973. Leaving the spent rig in place while transferring liability to another party is the least costly option for industry because the oil companies are relieved of all future costs and responsibilities for operation, maintenance, liability, and removal upon transfer of title. But the rig can become an attractive nuisance or a navigational hazard contributing to significant future liability concerns.

If a structure is located in an artificial reef planning area it may be toppled-in-place or partially abandoned (topped). To topple a structure in place, the piles and conductors are severed from the "jacket." The jacket is the portion of a platform extending from the seabed to the surface that is used as a template for pile driving and as a lateral bracing for the pile. It is pulled over to form the artificial underwater habitat. The cost of maintenance can be expected to be high for future partial or total removal costs or toppling if cathodic (corrosion) protection is not continually maintained (Reggio, 1987). Financial liability associated with each discarded structure remains a lingering unresolved issue, usually to be addressed on a case-by-case basis.

A second disposal option is for the upper drilling floor and part of the jacket superstructure to be partially removed to a depth allowing for safe navigation clearance. The jacket top is cut off to achieve at least 85 feet clearance from the waterline. This top portion may be placed on the seabed near the bottom of the remaining jacket, which will be left in place. In a partial removal, the piles and conductors do not need to be severed from the bottom structure, and non-explosive methods are used to make the mid-water cuts. Sometimes, the top portion is shackled to the anchored base and the remaining jacket is left standing. This option often is considered to offer the best potential for fishery development and for hook-and-line fishing in shallow to mid-water soft bottom. Then the site of the residual structure must be marked with buoys and mapped. The incentive for utilizing this option often increases with water depth.

A third option is for the structure itself to be toppled on location, then removed from vertical moorings and retained on site in a lateral orientation. This arrangement can be attractive for certain types of commercial and recreational fishing, and tends to favor snapper, grouper, and groundfish populations, and can be considered suitable for water depths of 150 feet or more (Reggio, 1987).

Another option is to remove the structure and relocate it to develop a new underwater habitat elsewhere. The oil company pays to transport and deploy it, but due to the greater cost, this is the least attractive option. It is suitable for waters that are 150 feet deep or more.

There also are combination artificial underwater habitat complexes where rig structures are disposed of and clustered, such as the Buccaneer Field off the Galveston-Freeport coast. Texas proposed creating such a cluster 80 miles off the coast with 200 structures previously installed within a 50-mile radius to be subsequently concentrated into a one-square-mile permit area.

In 1983, then-Secretary of Interior James Watt and the President of National Ocean Industries Association together announced the formation of the Recreational Environmental Enhancement for Fishing the Seas (REEFS) task force. The goal was to create a strategy for a national artificial reef policy, plan, and program in the United States. This effort was driven by the emerging theory that "new" artificial seafloor substrate in a smooth seabed might be expected to lead to more fish in that particular location.

President Ronald Reagan first brought attention to artificial reefs in a broader context of planning and responsibility when Congress enacted, and he signed into law, the National Fishing Enhancement Act of 1984 (Title II of P.L. 98-623). The Act called for the development of a long-term National Artificial Reef Plan. The National Marine Fisheries Service (NMFS) was given the lead in the development of the plan and it was completed and adopted in 1985. The National Plan discusses general criteria for materials used in the development of artificial underwater habitats, including function, compatibility, durability and stability, and availability (National Plan, Stone 1985).

Since then, the Gulf of Mexico Fishery Management Council has allowed the designation of Special Management Zones (SMZs) as an incentive to create artificial underwater habitats and fish attraction devices to increase the numbers of fish in an area and/or create fishing opportunities that would not exist otherwise. Fisheries Management Plans (FMPs) for groupers and snappers in the Gulf of Mexico and the South Atlantic, as well the Atlantic black sea bass FMP, contain SMZ language specific to artificial underwater habitat development and use in these fisheries. Anyone in possession of an Army Corps of Engineers permit to create an artificial underwater habitat may request that the South Atlantic Council designate the area as an SMZ (USDC 2007).

Several demonstration projects involved oil rigs. From 1977-83 Texas proceeded to sink three oil rigs and declared them to be artificial reefs. In 1980, Florida began deploying various kinds of artificial underwater habitats beginning with a donated rig from Exxon. Three years later, Tenneco donated a second rig to Florida for a project in Pensacola. Alabama permitted an artificial underwater habitat south of Mobile Bay using a Marathon Oil platform in 240 feet of water. In 1985, Tenneco donated a second rig to be sunk in the Miami-Ft. Lauderdale area.

By 1984, 70% of recreational fishing trips in the Gulf of Mexico Fishery Conservation Zones located offshore at a distance of 3 miles or more involved fishing on artificial underwater structures comprised of oil and gas structures. Thirty-seven percent of saltwater fishing trips by Louisiana residents targeted these structures. The oldest platforms were 25 miles from shore in less than 200 feet of water. That year, researcher B.J. Gallaway determined the oil rig structures constituted 28% of known hard-bottom habitat of the coasts of Louisiana and Texas (Reggio, 1987).

The Louisiana Fishing Enhancement Act was passed in 1987, authorizing a state-directed artificial underwater habitat program. That year, the Alabama Department of Conservation received a U.S. Army Corps of Engineers permit covering more than 1,200 square miles of continental shelf bottom in depths of approximately 20 to 90 meters, where

an estimated 20,000 artificial underwater habitat structures have been placed, some of them concrete structures. Previous to this deployment, the permit area was primarily sandy mud with limited hard bottom.

Texas has one of the largest artificial reef programs in the U.S., with 140 oil and gas platforms deployed since 1990. The cost was reported to range from $1- to $5-million each (Christian, 1984).

Approximately 420 platforms, or about 10% of all platforms removed in the Gulf of Mexico, have been discarded as artificial underwater habitats. This includes 302 platforms deployed offshore in Louisiana waters, 103 platforms in Texas waters, eight platforms in Mississippi waters, four platforms in Alabama waters, and three platforms in Florida waters.

Grouper Image: Craig Quirolo reefreliefarchive.org

4 Scientific Analysis of Potential Fisheries Value of Rigs used as Artificial Underwater Habitats

Much scientific debate has centered on what role oil and gas platforms ultimately play in the larger Gulf of Mexico ecosystem and whether they are similar in any way to coral reefs. There is a widely held belief about artificial reefs in the Gulf to the effect that new artificial seafloor substrate on an otherwise smooth seabed will result in more red snapper and other reef fish. In the following review of published scientific papers on Gulf fisheries, we analyze whether there is a proven relationship between oil and gas rigs used as artificial underwater habitats and the overarching goal of advancing toward achieving fisheries management objectives of abundant fisheries and biologically rich oceans.

We find there is no scientific certainty that rigs used as artificial underwater habitats increase fisheries production, or that they equal or rival natural coral reefs in biologic diversity. In addition, deploying legitimate fish-attracting devices long has been believed to provide one promising method of creating habitat. However, the Gulf and Caribbean Marine Fisheries Management Councils have concluded that appropriate habitat is not limited in the Gulf. There is no need for additional habitat to ensure healthy fisheries in the Gulf of Mexico.

It is time to question whether more artificial underwater habitats comprised of oil and gas structures are actually beneficial to achieving overall conservation goals for healthy U.S. waters. Perhaps they are merely

being promoted as a way for oil companies, acting from self-interest, to avoid their obligations under current leases to restore the seabed to its previous condition.

Dr. James Bohnsack's 1989 paper applies today. It concluded that "Artificial underwater habitats may not be effective for increasing fish biomass under some circumstances, and enthusiasm for them may detract from more productive management approaches. Artificial underwater habitats may not increase production of recruitment-limited populations. If they primarily attract fishers, they may not increase total biomass and may accelerate stock depletion by increasing catchability, especially under heavy fishing pressure. Without other management actions, artificial underwater habitats are unlikely to increase biomass for intensely exploited or overfished populations. Interestingly, the incentive to build artificial underwater habitats is most likely to increase when signs of overfishing occur. Under these circumstances other management actions may be needed in addition to, or instead of, building such structures" (Bohnsack, J.A. 1989).

A view in support of well designed artificial reef structures was presented in 2008 by Dr. Stephen Bortone with a model that explains the advantage that artificial underwater habitats may have in providing both attraction and production benefits to fish that comprise demersal fisheries, like red snapper. He concluded artificial habitats may attract fish, but they also may provide increased habitat that relieves a "bottleneck" in the life history that previously restricted population abundance (Shipp & Bortone. 2009). However, it has not been demonstrated that spent oil rigs provide that kind of "bottleneck" relief, as, for example, low relief habitat such as oyster reefs may create for juvenile life stages of red snapper.

A 2010 paper by Dr. James H. Cowan Jr., et al, concluded that "The role of Gulf oil and gas platforms as fish habitat, including red snapper, has recently been reviewed (VERSAR 2009), and these large structures appear to function quite differently from small, relatively low-relief artificial reefs typical of those deployed off Alabama and the Florida panhandle. Oil and gas platforms that began appearing in the western Gulf in the late 1940s function secondarily as large artificial reefs. However, platforms bear little resemblance to either natural reefs or most artificial reef materials intentionally placed to promote fisheries, and it is possible that artificial reefs primarily attract fish to shelter rather than directly producing more fish. From a life history perspective, even if artificial reefs have increased carrying capacity, but not the intrinsic rate of population growth, and the stock is still at low abundance, adding habitat would not have had any significant positive impact on stock biomass. Nor would it increase the overfishing level as a proportion of biomass, rather it would only increase the potential yield. This is true unless artificial reefs provide habitat of substantially higher quality than existing natural reefs. Therefore, we infer that red snapper life history is inconsistent with the notion that habitat limitation is a strong actor in regulating population size in this species."

Cowan agrees with Bohnsack and further concludes that the preponderance of scientific information does not support the position that artificial underwater habitats have increased red snapper stock size sufficiently to defer compliance with the Magnuson-Stevens Reauthorization Act of 2006 (MSRA) (Cowan, et. al. 2010).

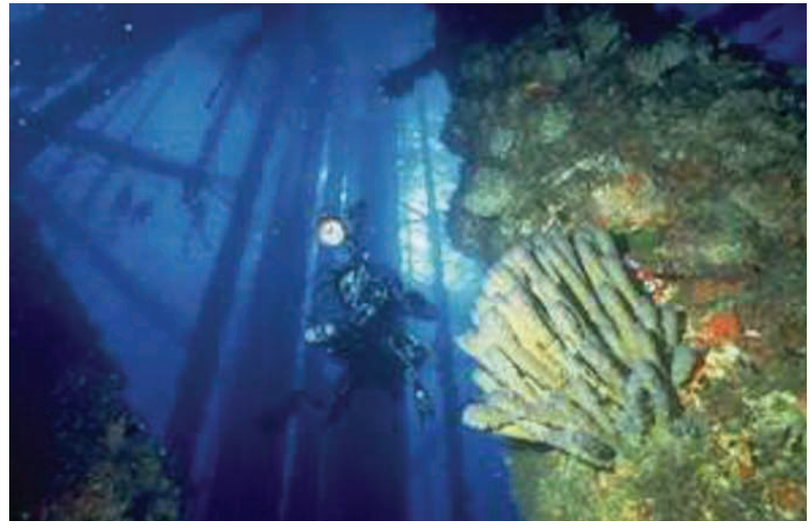
Dr. John W. McManus noted on the NOAA Coral-list that: "Gene Shinn said that there are non-fishermen citizens who thoroughly dislike these artificial reefs because they make it easier to catch the fish." McManus added: "That's the sociological side of the issue. I would add that many fishery scientists are cautious about these structures, who understand that: 1. Many coral reef fish that are targets of fisheries are overfished; 2. In many cases, no legal and enforcement mechanisms to keep this fishing under control are effective enough to do so; 3. And therefore, in many cases, an important rule in managing overfishing is, do not make it easier to catch fish" (McManus, 2013).

Jeff Polovina brilliantly pointed out a fundamental flaw in the logic of using such structures to enhance local fisheries by stating: "Given that overfishing implies a substantial reduction in a fish population, which therefore frees up substantial habitat for newly settling fish, why would anyone think that the best strategy to getting more fish would be to create more habitat?" (Polovina, J. 1989).

These researchers recognize that red snapper are overfished in the Gulf of Mexico. Efforts to reverse this under the MSRA are needed. Another misconception regarding oil rigs used as artificial underwater habitats is that they equal or exceed the marine diversity of natural coral reefs. Various glowing promotions for the *Rigs-to-Reefs* programs by oil industry representatives extol the abundant corals on the rigs, but the science doesn't confirm this.

John Embesi, et. al, studied the offshore oil rig located within the Texas Flower Garden Banks National Marine Sanctuary compared to a nearby natural coral reef. The High Island A-389-A platform emerges from 124 meters water depth and is 1.6 kilometers from the coral reef crest of the East Flower Garden Bank. It was installed in 1981 and has developed a complex benthic and fish community over the past 32 years by providing hard substrate within the water column.

Divers conducted benthic surveys of the platform to document species diversity. The results indicated that the platform communities, even though located in close proximity, did not resemble the coral reefs of the East Flower Garden Bank. The platform structure was dominated by fouling organisms, including bivalves, sponges, barnacles, hydroids and algae. The dominant coral on the structure was *Tubastraea*, an exotic, ahermatypic species. Very few native coral colonies were observed. In contrast, more than half of the benthic cover of East Flower Garden Bank, from 20 to 40 meters depth, is comprised of living hermatypic corals. Sponges, mollusks and hydroids are minimal components of the reef at these depths (Embesi 2013).



Rigs lack the biologic diversity of natural reefs.
Atlantic and Gulf States Marine Fisheries Council

A 2003 Department of the Interior-sponsored study on rigs and reefs reported similar results. "The Western Flower Garden Banks, for example, supports more than 2 million fish that can be detected by acoustics. This fish biomass is comparable to the combined fish populations of 150 standing platforms and or 1,000 "reefed" platforms in similar water depths (ranging from 100 to 500 meters)" (DOI MMS 2003).

An October 18, 2013 coral-list online comment by Dr. John McManus notes: "Clearly a major issue is that people confuse 'artificial reefs' with coral reefs. They are always enormously different than natural coral reefs. I suggest we stop using the term 'artificial reefs.' Let us use the following: 'artificial underwater structure (AUS)' for any underwater structure one builds or deploys. These will always support some kind of marine life, either intentionally or incidentally." For structures specifically placed to provide living space for marine organisms, he suggested that the term 'artificial underwater habitat' would be more specific.

One significant finding that scientists have documented is that artificial underwater habitats alter Gulf of Mexico marine communities by congregating fish populations, especially red snapper, the most commercially valuable fishery in the Gulf of Mexico, especially at rigs with high vertical structure.

Scientists at the Harte Research Institute (HRI) for the Gulf of Mexico have been monitoring 15 sites using dive surveys, ROV surveys, and vertical longlines. Snapper species accounted for 26% of the total fish abundance at sites surveyed in 2012, with a total of 52 fish species from 18 families identified. Red snapper show up on all types of artificial underwater oil and gas structures. Ninety percent of catches on longlines, which represent fish from deeper water, are red snapper, which could reflect a cutoff's higher relief, compared to standing and toppled rigs. (See chart below)

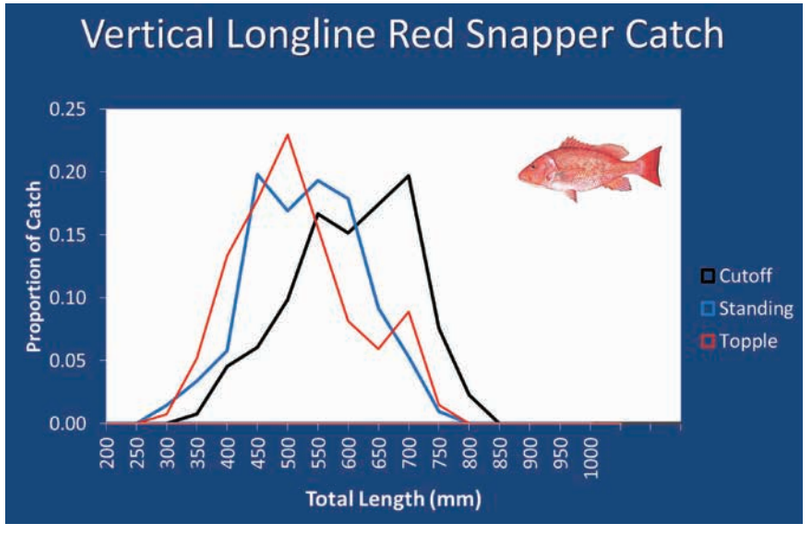


Chart compliments of Harte Research Institute
http://blogs.scientificamerican.com/expeditions/2013/12/23/counting-fish-wrap-up-and-conclusion/

In coastal waters off Louisiana, Stanley and Wilson determined that each standing platform seasonally provides habitat for 10,000-20,000 fish, many of which are of great recreational and commercial importance. "By adding substantially to the amount of reef available, petroleum platforms have doubtless affected many regional ecosystem processes such as energy (food) availability, habitat, recruitment, competition, and predation." (Wilson and Miller 2003).

Their earlier study compared the vertical relief of standing rigs to toppled ones. "Based on our results a toppled deepwater artificial reef would be utilized by few fishes and a structure sited in this manner would have limited value as an artificial reef. This project is the first demonstrating the importance of vertical relief in maximizing the effectiveness of platforms as artificial reefs, especially with respect to deep water environments." (Stanley and Wilson 2000).

Charles Wilson and others concluded: "Overall, we found that fish biomass and density and around the standing oil and gas platform was higher than the artificial reefs or natural reef. Our results are in support of previous findings that when a platform is converted into an artificial reef by toppling in place or by partial removal, it loses a significant portion of the fish community. In each habitat, we tended to find higher fish densities in habitats with more vertical structure." (Wilson 2003).

The scientific community remains uncertain, however, that these artificial underwater habitats advance fisheries goals or even achieve habitat restoration goals. A 2003 study by Sean Powers and associates recommended traditional management strategies, such as marine reserves and preventing harmful fishing practices, and confirmed underlying biological uncertainty regarding the use of artificial underwater habitats to achieve fisheries goals or for restoration projects. They note "The establishment of marine reserves to promote recovery of overfished stocks of recruitment-limited fishes does not require the construction of

new reefs on the shallow continental shelf; rather, it requires the management of existing reefs as reserves in an effective design (Lubchenco, et al. 2003)".

Powers confirmed Bohnsack's assessment that the possibility of any gain in production from creation of an artificial underwater habitat may be offset by intense fishing pressure, especially by recreational fishermen. Finally, the inability of the scientific community to agree about whether artificial habitats attract red snapper from nearby natural habitats, or actually enhance production of new biomass (i.e., the attraction-vs.-production debate), is meaningless and should have no influence on policies to permit additional artificial underwater habitats from retired oil and gas structures.

A 2010 paper by James Cowan, Jr., and others analyzed data from other factors that influenced the fisheries, reflecting the evolution of scientific understanding on this topic to one of more skepticism that more underwater artificial habitats are needed to achieve fisheries and restoration goals (Cowan, 2010).

Cowan published a second paper in 2011 referring to the very real difficulty of estimating numbers of individuals among other benchmarks of a population of widely distributed, often mobile fishes for which direct measurement of almost everything is impossible. "Despite large differences in estimates of the status of red snapper stocks in the Gulf of Mexico (U.S.) and south Atlantic Ocean (U.S.), and the management conclusions and decisions drawn from these assessments, there are more similarities than differences in the basic data being used to inform assessment models, as well as in model outcomes concerning trends in biomass, catch-at-age and stock productivity" (Cowan, 2011). Cowan now believes that artificial reefs don't have negative impacts; rather, it appears they simply have no impact on population demographics of the species that use them. (Email communication Feb. 4, 2014).

The oil industry would have the public believe that dumped rigs or cutoff rigs sited at "reefing" sites as artificial underwater habitats result in net increased marine productivity and more recreational fisheries. However, this assumption is not borne out by current scientific studies. On March 27, 2014, Gulf Seafood News reported that the U.S. District Court for the District of Columbia found that the Department of Commerce, NOAA, and the National Marine Fisheries Service had violated the law by failing to properly manage the Gulf of Mexico red snapper fishery. The plaintiffs, comprised of commercial fishermen, argued that federal fisheries laws had failed to ensure that the recreational fishing sector adheres to its annual fishing quota. The court's decision found that lack of accountability measures in the recreational sector caused a *de facto* reallocation of the fishery from the commercial to the recreational sector, routinely allowing that sector to catch far more red snapper than is allocated under the fishery. (Gulf Seafood Institute Newsroom, http://gulfseafoodnews.com/2014/03/27/federal-ruling-on-allocation-favors-gulf-commercial-red-snapper-fishermen/)

This 50-page ruling reflects that recreational sector overharvesting is occurring in offshore federal waters, due in part to unreported catches for many reef fish, especially red snapper. Much of that recreational fishing occurs at oil rigs that act as fish attracting devices.

It is time to consider moving beyond the policy of leaving spent rigs in the ocean and focus resources on effective management of all fisheries for long term, ecosystem-based resiliency. This is one small step that is consistent and supports, rather than impedes, current post-BP Deepwater Horizon spill restoration as millions of dollars are being dedicated to improve and restore ecosystem functions in the Gulf of Mexico.

BP Deep Water Platform Thunderhorse after Hurricane Dennis 2011 (Prof Goose)
http://oilprice.com/Energy/Energy-General/The-Offshore-Oil-Industry-And-Hurricane-Season.html

5 Do Retired Offshore Oil & Gas Structures Qualify under NOAA's National Artificial Reef Plan?

According to the NOAA National Artificial Reef Plan, objectives of any proposed artificial "reef" should be compatible with fisheries conservation and management programs of the pertinent fishery management entities. The plan states "Clear objectives for the proposed reef should be based on an assessment of public need, existing shore-based infrastructure, and the best available science. The scientific information that is used in decision-making should be relevant, inclusive, objective, transparent, timely, and peer-reviewed. In addition, reef builders should select the target species or species groups, and consider life stages they wish to enhance or rebuild. Critical habitat and environmental requirements of those species also should be identified. If selected target species are particularly sensitive to water temperature, salinity, dissolved oxygen levels, water turbidity and contaminants, or if they have stringent habitat or food requirements, these parameters should be used as artificial reef site selection and design criteria."

"For example, in building reefs for snapper, grouper, black sea bass, rockfish and other marine demersal species, low- and medium-profile reefs should be constructed from different sized materials, which will create numerous holes and crevices of varying sizes, providing shelter for juveniles and adults" (USDC 2007).

Currently proposals are pending to establish new "reefing sites" for spent rigs no more than 35 miles from the existing locations of offshore

oil structures. They may not qualify under these criteria and should be examined critically.

In fact, spent oil structures under the *Rigs-to-Reefs* program would not qualify for BP-Deepwater Horizon restoration funds. Powers stated that such artificial underwater habitats do not qualify for mitigation projects. "Evidence is weak that habitat provided by artificial reefs on the shallow continental shelf of the southeastern USA is currently limiting to fish production. Until convincing empirical evidence appears, high scientific uncertainty limits confidence in using artificial reefs as compensatory mitigation. Furthermore, even if augmented production were achieved, managing fishing impacts would be critical to achieving the expected production benefit. Until uncertainty is resolved and actual enhancement of fish production is demonstrated, only habitats in which the current scientific consensus supports the assumption of habitat limitation represent good candidates for compensatory restoration" (Powers, et. al 2003).

Kristopher Benson of the NOAA Restoration Center of NOAA Fisheries, noted that "Artificial reefs are frequently promoted as a habitat restoration technique to benefit reef fisheries, despite limited scientific understanding of value for fisheries production or in achieving habitat functions." He cited the "public controversy" regarding the role of artificial reefs in supporting reef fisheries production and in their function as habitat (Powers, et.al., 2003; Shipp and Bortone, 2009; Cowan, et. al. 2010; Cowan, 2011).

Benson reiterated what Sean Powers had said; such structures are not appropriate for habitat restoration projects. "When evaluated against other fishery restoration options, artificial reef projects have not been selected as preferred alternatives for ecological injuries, largely due to technical uncertainties about their use in increasing habitat value or production of target species. Plus, when overfishing is a problem, artificial reefs may aggravate the overfishing problem by concentrating remaining fishes and making them more vulnerable to fishing pressure. Purpose, design, placement and management considerations are critical to project viability."

Benson got to the core issue when he asked: "Central to the question is the lack of literature to identify impacts to stocks of commercially and recreationally significant species on artificial reefs that are not managed for over-exploitation, regardless of whether the reefs increase fish production or simply attract fish from other areas. The ecosystem service value (ESV) of discreet components of artificial reef communities (e.g., non-targeted fish species, targeted fish species, epifauna, sessile organisms) and, in some cases, whether the ESV provided by artificial reefs outweighs the ESV of pre-existing habitats needs to be fully evaluated. Especially in hurricane-prone environments, are materials stable and do they endure on soft bottoms? Do materials break up to become hazards to navigation, fishing gear hazards, or projectiles that damage sensitive habitats?" (Benson, 2013).

"How many artificial reefs sites are designed to clearly identify and articulate a determination that it is the appropriate and most effective restoration action?" asks Benson. Are *Rigs-to-Reefs* projects designed and sited to meet this stated purpose? Do they include robust management and monitoring plans to demonstrate that the purpose is being met or to adaptively respond if the purpose is not being met?

Although past artificial reef development in most states has been directly tied to the availability of materials "of convenience" due to budgetary constraints, the National Artificial Reef Plan notes "This may not be the most desirable situation for continued planning and development of reef construction efforts in the future. While a total dependency on scrap materials is not the most effective means of managing reef development activities, some forms of scrap, when available in the proper condition, are very desirable as reef construction materials and should continue to be utilized" (USDC 2013).

The science doesn't support the conclusion that the "reefed" rigs achieve these goals. This program raises the overarching question: Is the use of rigs for artificial underwater habitat projects actually meeting the NOAA criteria, or is the use of rigs driven by the inordinate influence and desire of the oil industry to conveniently relieve itself of its financial responsibility and contractual obligation to safely decommission a spent rig?

Are *Rigs-to-Reefs* programs an example of the substantial economic savings dictating seabed disposal as the preferred methodology for rig decommissioning? Given the significant cost-savings to the oil industry, and the scientific uncertainty regarding their success as fisheries management tools, along with persistent questions as to the fulfillment of public need, is seabed disposal simply an expedient way for the oil industry to avoid its legal responsibility to decommission non-producing rigs and return the seabed to its natural pre-lease conditions?

6

U.S. Interior Department's *Idle Iron* Policy

A segment of the large ExxonMobil Harmony platform in 1998 onshore prior to its installation in California waters. For scale, the arrow points to a person. Image: Robert C. Byrd, TSB Offshore.

The development of offshore oil and gas in the Outer Continental Shelf has resulted in the placement of thousands of oil and gas platforms and associated structures in both state and federal waters throughout the Gulf of Mexico, as well as a smaller number off the coast of California. Under the Interior Department's *Idle Iron* policy, lease agreements for oil and gas exploration in the federal waters of the Outer Continental Shelf stipulate that once a rig has ended its production phase, it must be decommissioned.

Oil and gas structures that exist on a lease that have not produced in the past year or that fail to serve a useful economic purpose are called "*Idle Iron*" (Kaiser 2007). Full decommissioning and removal of obsolete offshore oil drilling rigs from U.S. federal waters after the economic life of a seafloor oil field has concluded is established public policy. Oil companies are required to remove and carefully plug old wells within a certain timeframe, with penalties for noncompliance within the U.S. Exclusive Economic Zone (beyond state waters that extend three miles from shore off most coastal states and beyond 10 miles off of Texas, Louisiana, Mississippi, Alabama and along Florida's Gulf Coast). Since 1947, more than 2,300 structures have been removed from the Gulf of Mexico, and over the past decade 125 structures have been removed annually.

Lease terms and dimensions vary with the time of the auction and the location of the lease, but most give the leaseholder the exclusive right

to explore for oil and gas for a period of 5-10 years. Inactive leases hold idle and auxiliary structures, and if auxiliary structures are still being used for production activities, the Interior Department would not terminate an inactive lease as long as the structures are being used to support production activity.

In federal waters, the end of life of a structure is generally defined as one year after production activities on the lease have ceased to take place. These long-standing federal regulations require drilling platform "jackets" to be disposed of by being cleaned of oils, cut up, and either recycled for metals or transferred to landfills, while any remaining seafloor oil well casings have to be sealed and severed 15 feet below the mud line. According to Reggio, the policy is usually implemented when an existing well is plugged and abandoned. Reusable and disposable equipment, facilities and supplies are removed. What remains are the submerged platform jacket and the superstructure consisting of one to three decks and a heliport (Reggio, 1987).

Each Outer Continental Shelf (OCS) lease contract between the U.S. Department of the Interior and petroleum companies includes such eventual full decommissioning as part of the legally binding terms of the lease. The goal is a restored ocean returning to vibrant healthy productivity after offshore rigs are removed. The environmental benefits of this program enable the ocean to recreate the biological niche that had previously evolved in that location. The Interior Department's Bureau of Safety and Environmental Enforcement cites the following rationale for its policy:

1. Environmental Effects — Toppled structures pose a potential environmental hazard due to the topsides and the associated equipment, electronics, wiring, piping, tanks, etc., that are left on the bottom of the Gulf of Mexico. These items pose a financial, safety, and environmental burden, and must be removed from the bottom.

2. Safety — Severe weather, such as hurricanes, have toppled, severely damaged, or destroyed the structures associated with oil and gas production. While any structure could be destroyed during a hurricane, idle facilities pose an unnecessary risk of leaks from wells into the environment and potential damage to the ecosystem, passing ships, and commercial fishermen.

Typically, the structures are removed to shore for storage, refurbishment and recycling, but some of them may also become artificial underwater structures, either voluntarily or by acts of nature (hurricanes, explosions). Rig removals under the *Idle Iron* Policy have steadily increased since 1998 as wells installed years ago reach the end of their productive years. (See table below).

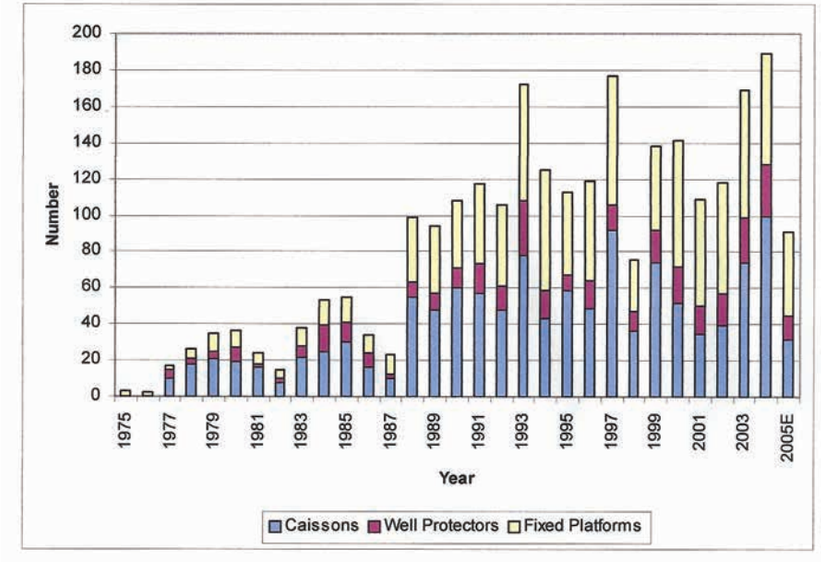


Figure A.1. Structures Removed in the Outer Continental Shelf of the Gulf of Mexico, 1973-2005 (Data for 2005 as Reported on March 3, 2006 and Indicated as 2005E).

Source: Kaiser, et al, 2007

However, many rigs have been left on the ocean floor for years with little enforcement activity to ensure their removal. One such rig is located within the boundaries of the Texas Flower Garden Banks National Marine Sanctuary. That rig is undergoing the decommissioning process and Interior Department policies could allow it to remain on-site after the platform is removed utilizing a waiver under the *Rigs-to-Reefs* policy, but its fate remains uncertain.

On May 17, 2002, the Interior Department's Minerals Management Service (MMS) issued regulations that amended requirements for plugging wells, decommissioning platforms and pipelines, and clearing sites effective July 16, 2002. Later that year, on Oct. 30, 2002, corrections to these regulations were issued. The new regulations provided agency oversight of all *Idle Iron*.

By 2003, nearly three-fourths of the 1,225 idle structures that existed on active leases were held by production and therefore permitted by federal regulation. The remaining 329 idle structures on inactive leases – about one-fourth of the total number of idle structures that exist – needed to be examined on an individual basis to determine if the structure serves a useful economic purpose and if special permission has been granted for extension. Most inactive leases contained one inactive structure and more than half of the number of idle structures on inactive leases could be found on 30 leases.

In 2008, after devastating Gulf of Mexico hurricane seasons in 2004, 2005 and 2008, the Minerals Management Service conducted an Alternative Internal Control Review (AICR) of idle structures and wells on active leases in the Gulf of Mexico Outer Continental Shelf (OCS). One-hundred-eleven structures were destroyed or significantly damaged from Hurricanes Katrina and Rita. Fifty percent of these structures were located on terminated leases. The Interior Department review looked at the presence of this idle infrastructure and defined a new process of identifying, tracking and decommissioning these idle wells and structures.

The total cost to decommission a structure is determined according to three cost categories – plugging and abandonment, structure removal, and site clearance and verification. "The cost for removing an individual structure will range from hundreds of thousands to tens of millions of dollars, depending on size, location and water depth. We all share in obsolete platform disposal costs one way or another, as they are subtracted from profits before taxes" (Reggio 1987).

Operators have an economic motivation to maintain structures in place to defer the cost of removal, to increase the opportunity for resale, to reduce the risk and expense of storing platforms in a fabrication yard, and to reduce the cost of decommissioning through economies of scale, scheduling, and shared mobilization costs.

The location of each structure is a major factor in evaluating the options for disposal. The distance to shore, proximity to the nearest reef site, water depth, and planning area are all important factors in removal and reefing decisions because they directly impact the cost of the operation. Several structures usually are contained on a lease, thus it is generally only when production from the last remaining structure on the lease ceases that all of the structures on that lease are required to be removed (*Idle Iron* 2007).

In 1996, the National Research Council studied techniques for removing offshore structures noting: "International laws relevant to the removal of offshore structures include the Convention on the Continental Shelf and the U.N. Convention on the Law of the Sea, which require that abandoned or unused installations be removed. International Maritime Organization guidelines also call for the removal of abandoned offshore structures. There is no definition of the depth of removal, except that the structure should be 'entirely removed' and not interfere with navigation. Exceptions are granted to coastal nations for reusing structures if they deem it beneficial."

The NRC paper concluded that allowing partial removal of structures in 300 (or more) feet of water with a cut at least 85 feet below the water surface was recommended, but added: "Given all of these problems, the leave-in-place option is probably not feasible now, except in a very few cases, such as when a structure has become a popular spot for recreational fishermen. Some way of handling the liability problem, such as an industry-funded fund, would have to be established to make leaving-in-place a viable option." (NRC, 1996).

7

Rigs-to-Reefs Programs

*This **Rigs-to-Reefs** deployment is at the High Island A-497 site, located 80 NM south east from Freeport, TX. The image shows the top of the structure which has been partially removed and placed next to the base. Image: Chris Ledford, Texas Parks and Wildlife Department Artificial Reef Program.*

Pursuant to the 1985 National Artificial Reef Plan developed by the National Marine Fisheries Service, the *Idle Iron* policy has been revised. It allows some of the decommissioned rigs to remain on site or be donated to states with programs that allow deployment of the rigs as underwater artificial habitats under the nickname *Rigs-to-Reefs*. The discarding of retired rigs in this manner can save the oil companies considerable expense if the so-called "reefing" sites are near the rig locations.

Since 1986, the Department of the Interior has approved more than 400 *Rigs-to-Reefs* proposals and has denied six. The reasons provided for denying certain proposals were mainly due to proximity to Outer Continental Shelf infrastructure, especially active oil or gas pipelines. Additionally, the Bureau of Safety and Environmental Enforcement has denied proposals where the proposed artificial underwater habitat site was located in a potential mudslide area and where the proposed site was located outside of a "reef" planning area. (DOI-BOEM & BSEE, et al. 2012).

Rig-to-Reefs has become an established practice in the Gulf of Mexico, where operators often tow their decommissioned steel jackets to designated sites (or topple the structure in place). Kaiser opined that oil structure "jackets" make ideal artificial reefs because they are environmentally safe and are constructed of a highly durable and stable material that

withstands displacement and breakup. "Reefing" is usually less expensive than onshore removal, but distance is a determining factor.

In the last decade the oil and gas industry in the Gulf of Mexico has rapidly moved its operating area from depths of hundreds of meters on the continental shelf to the continental slope and continental rise where depths exceed 3,000 meters. Larger rigs and floating rigs are now increasingly being used. About 10% of the total number of disused structures removed from the Gulf of Mexico in any given year become artificial underwater habitats, but the percentages increase significantly with increasing water depth. A majority are located in the western Gulf of Mexico.

Reefing Probability as a Function of Water Depths and Planning Area

Water Depth (ft)	WGOM (%)	CGOM(%)
0-20	0	0
21-100	11	1
101-200	65	27
201-400	82	63
Total	42	13

Source: Kaiser and Pulsipher, 2005
Note: WGOM = Western Gulf of Mexico, CGOM = Central Gulf of Mexico

In 2009, the MMS issued a *Rigs-to-Reefs* Addendum that established policy for the following year. "The purpose of the MMS GOMR's *Rigs-to-Reefs* policy is to evaluate platform-removal applications seeking an alternative to onshore disposal through the approval of tow-and-place, topple-in-place, and partial removal-in-place of platforms or facilities for conversion to an artificial reef" (DOI MMS 2009).

Included in the 2009 addendum to the DOI's *Rigs-to-Reefs* policy was a distance standard of five miles between reef sites. This distance standard is sometimes referred to as the "5-mile rule" which states that, "New reef sites will not be established within 5 miles of existing reef locations. This standard allows room for future OCS exploration and development activities between reefs and ensures that potential routes remain for future pipelines."

The Bureau of Ocean Energy Management, Regulation and Enforcement (BOEMRE), formerly the Minerals Management Service (MMS), was replaced by the Bureau of Ocean Energy Management (BOEM) and the Bureau of Safety and Environmental Enforcement (BSEE) as part of a major internal agency reorganization.

BOEM is responsible for managing environmentally and economically responsible development of the nation's offshore resources. Its functions include federal offshore leasing, resource evaluation, review and administration of oil and gas exploration and development plans, renewable energy development, National Environmental Policy Act (NEPA) analysis and environmental studies.

BSEE is responsible for safety and environmental oversight of federal offshore oil and gas operations, including permitting and inspections of offshore oil and gas operations. The agency's functions include the development and enforcement of safety and environmental regulations, permitting offshore exploration, development and production, inspections, offshore regulatory programs, oil spill response and newly formed training and environmental compliance programs.

In the wake of several destructive hurricanes between 2004 and 2008 that resulted in severe damage to active and inactive oil and gas infrastructure in the Gulf of Mexico, BSEE restated the *Idle Iron* policy "so that inactive facilities and structures would not litter the Gulf of Mexico or threaten increased risks to the marine environment and navigation. Inactive wells and platforms are susceptible to the adverse effects of severe weather. Inactive platforms may topple during storms and cause significant environmental contamination (such as the release

of hydrocarbons to the surrounding waters), damage operating infrastructure, and result in new navigation and safety hazards. In general, under the Outer Continental Shelf Lands Act and the Department of Interior's implementing regulations, non-producing platforms must be removed because they can create serious safety, environmental and navigational risks. Under certain circumstances, a platform may remain in place for the creation of an artificial reef; this is known as reefing-in-place, which differs from abandonment of the platform." (DOI-BOEM et al 2012)

How a temporary platform that remains in place differs from risky abandoned platforms that are allowed to permanently remain on the ocean floor is not defined and can raise serious safety issues, given the policy directive to prevent risks to the marine environment and navigation. Were these temporary structures originally engineered and designed to remain in ocean waters permanently?

Arizona Congressman Raul Grijalva, D-3rd District, wrote to then-Interior Secretary Ken Salazar in August 2010, calling on the government to enforce existing regulations and force oil companies to dismantle abandoned offshore platforms. He suggested that more than 1,000 structures in the Gulf are out of compliance and that enforcing the rules would provide desperately needed work for oilfield employees affected by a federal drilling moratorium that had been established to help ensure that a second Gulf rig accident did not coincide with the followup activities being conducted in the wake of the Deepwater Horizon disaster. Michael Bromwich, who reported directly to Secretary Salazar, said he already had a regulatory proposal on *Idle Iron* in the works and expected to roll out new enforcement measures soon.

The reorganized agencies renewed their commitment to decommissioning in October 2010, when BOEM's Gulf of Mexico OCS Region issued Notice To Lessees (NTL) 2010-G05, "Decommissioning Guidance for Wells and Platforms," to establish guidelines that provide a consistent and systematic approach to determine the future utility of idle infrastructure on active leases and to ensure that all wells, structures, and pipelines on terminated leases, and pipelines on terminated pipeline rights-of-way are decommissioned within the timeframes established by regulations, conditions of approval, and lease instruments.

The NTL noted that oil and gas structures "no longer useful for operations" must be removed 5 years after determination, but all other requirements remained the same. "Findings indicate that there are a significant number of idle platforms that have not been removed and idle wells that have not been permanently plugged. This idle infrastructure poses a potential threat to the OCS environment and is a financial liability to you and possibly the federal government if subsequently destroyed or damaged in a future event such as a hurricane. The cost and time to permanently plug wells and remove storm-damaged infrastructure (including pipelines) is significantly higher than decommissioning assets that are not damaged when decommissioned. These increased costs have potential ramifications on financial security requirements and may even impact the future viability of your company." (DOI BOEM 2010)

The NTL clarified existing regulations that apply when a well or platform is "no longer useful for operations," and needs to be plugged (in the case of a well) or removed (in the case of platforms and other structures). BSEE ordered wells that were not useful (had not produced for five years) at the time the NTL was published to be plugged by October 2013. Any well that became idle or not useful for lease operations subsequent to the NTL's publication is expected to be plugged no later than 3 years after the well became idle. BSEE will enforce the decommissioning of platforms considered idle or no longer useful at the time the NTL was published by October 2015. Any platform that became idle or not useful for lease operations subsequent to the NTL's publication is expected to be decommissioned no later than 5 years after the platform became idle. Platforms affected by the *Idle Iron* NTL are decommissioned in accordance with Outer Continental Shelf

Lands Act (OCSLA) regulations. The final disposition of the material may be a scrap yard, fabrication yard, or an artificial reef site.

This policy notice reconfirmed a commitment to the *Rigs-to-Reefs* Program. "Generally, after the useful life of an oil and gas platform, it must be decommissioned (i.e., dismantled and disposed of) according to the terms of the Department of the Interior (DOI) lease by which the platform was authorized. DOI regulations include a disposal option that, under certain circumstances, allows keeping a biologically valuable structure in the marine environment as an artificial reef through a process called *Rigs-to-Reefs*. Artificial reefs not only can enhance aquatic habitat, but also provide an additional option for conserving, managing, and/or developing fishery resources and can provide recreational opportunities." (DOI BOEM 2010)

In June, 2013, the Interior Department released another new policy directive. It restated BSEE support for *Rigs-to-Reefs* programs and reduced the required five-mile buffer zone between reefing areas to two miles. It allowed for artificial underwater habitats to be sited in place when appropriate in Special Artificial Reef Sites, or SARS, and provided for extensions to regulatory decommissioning deadlines for companies pursuing a *Rigs-to-Reefs* proposal. "The use of explosives on platforms that are proposed for this program will be evaluated on a case-by-case basis, but will not be approved if analysis determines their use will cause harm to established artificial reef sites and/or natural biological features. The policy formalizes many of the changes requested during workshops with select stakeholders in New Orleans and Houston over the past year (2013)."

The U.S. Army Corps of Engineers is responsible for permitting the placement of decommissioned platforms as artificial underwater habitats under section 10 of the Rivers and Harbors Act of 1899. Although *Rigs-to-Reefs* deployments are authorized under the National Artificial Reef Plan administered by NOAA, states have taken the lead to implement it. The plan encourages the states to develop artificial underwater habitats in state waters and to participate in the planning for them in nearby federal waters. Once the rig is donated, the U.S. Coast Guard places a buoy and maintains it until it is charted (if the location is within a newly-designated "reefing" site).

Interior considers individual states to be the primary agencies developing the *Rigs-to-Reefs* program once BOEM & BSEE have granted a waiver indicating that the structure meets their criteria. "The Department of the Interior's *Rigs-to-Reefs* policy encourages the reuse of obsolete oil and gas facilities as artificial reefs and describes the conditions under which DOI would waive OCSLAA (Outer Continental Shelf Lands Act) platform removal requirements. The decision to pursue donation of a decommissioned platform to a coastal state under the *Rigs-to-Reefs* process is optional and completely at the discretion of the lessees." The Interior Department's *Rigs-to-Reefs* policy is implemented by BSEE and BOEM, which administer different provisions of the OSCLAA. These platform removal waiver conditions include:

> The structure must become part of a state artificial reef program that complies with the criteria in the National Artificial Reef Plan; The appropriate state agency acquires a Rivers and Harbors Act section 10 permit from the U.S. Army Corps of Engineers and accepts title and liability for the structure once removal and reefing operations are concluded;
>
> The reefing proposal complies with BSEE Regional Engineering, Stability, and Environmental Reviewing Standards and Reef-Approval Guidelines, as well as being consistent with the best management practices and cleanup standards in national guidance prepared by EPA and the Maritime Administration regarding the preparation of vessels intended for use as artificial reefs;
>
> The operator satisfies U.S. Coast Guard navigational safety requirements, and;

The structure does not pose an unreasonable impediment to future mineral and energy development."

By 2009, Texas had 2,320 acres designated among 58 established sites with contributions of $5.1 million to the Texas Artificial Reef Fund. That same year, Louisiana had almost 20,000 acres in nine planning areas and 28 established sites, including 295 donated platform components. Louisiana's Artificial Reef Plan designated offshore waters deeper than 400 feet as a deep water planning area with many artificial underwater structures established. Donations to the Louisiana Artificial Reef Fund totaled $41 million. Mississippi also had 16,000 total acres and had established 15 sites including eight donated platforms.

By 2012, the states of Louisiana, Texas, Mississippi and California had passed specific legislation to establish programs for decommissioning oil and gas platforms. The federal waters of the Gulf of Mexico have 11 designated "reefing" areas. The U.S. Department of the Interior has designated the federal Outer Continental Shelf waters off Mississippi as an artificial underwater habitat planning area.

To date, the Louisiana Department of Wildlife and Fisheries, the Texas Parks and Wildlife Department, and the Mississippi Department of Marine Resources have administered state artificial reef plans, including ongoing offshore *Rigs-to-Reefs* programs.

The artificial reef coordinators from these states assess the interest of their respective states in acquiring oil or gas structures offered for artificial reef development, work with the structure operator (or agent) in securing any permit required under statutes administered by the U.S. Army Corps of Engineers, negotiate an agreement for a structure donation, and accept title and responsibility on behalf of the state for the structure as a permanent state-approved artificial reef.

The California Department of Fish and Game has an active artificial reef program and in 2010 the state legislature, under pressure from oil industry lobbyists, enacted *Rigs-to-Reefs* legislation. As of September 2012, however, no platforms have been reefed off California (DOI, et. al. 2012).

In addition, BSEE is currently working with the Texas Parks and Wildlife Department to develop two new artificial underwater habitat planning areas off the coast of Corpus Christi. And Louisiana had 300 rigs scheduled for deployment during 2012 to expand 70 existing artificial underwater habitat sites.

The rate of removal accelerated in 2009. About 200 platforms are taken out each year and 3,085 were left as of March 5, 2013. At least 359 of the 2,996 other platforms in the Gulf of Mexico were expected to be decommissioned before the end of 2013. This approximation was based on the number of existing platforms on expired leases (DOI-BOEM & BSEE, et al 2012).

BOEM reported the number of remaining rigs for 2013 had dropped to 2608 by year end, with 219 decommissioned and 13 deployed as artificial underwater habitats, however the number of those decommissioned may increase as not all those projects were completely closed out. See chart provided below. (Personal communication J.Cowan 5//1/14 per Peter Douglas, BSEE)

Number of Rigs Installed at "Reefs", Decommissioned, Remaining 2009-2013

Year	Installed	Decommissioned	Remaining
2009	32	231	3560
2010	27	219	3368
2011	17	293	3092
2012	7	285	2814
2013	13	219	2608

http://www.data.boem.gov/homepg/data_center/platform/platform/master.asp

At what point, if any, does adding more obsolete structures to a large, deepwater seafloor shelf cease to augment fishery benefits and start to become clutter or a cover for ocean dumping? The costs associated with developing artificial underwater habitats with oil and gas structures are astronomical and of orders of magnitude greater than traditional reef development projects in this country.

8

Recent Efforts to Expand *Rigs-to-Reefs*

Despite Interior's great accommodation to the concerns and interests of the oil industry, additional efforts are underway to weaken the *Idle Iron* policy and further expand the use of obsolete drilling rigs as artificial underwater habitats. In a June 2012 letter to then-Interior Secretary Ken Salazar, the Sport Fishing & Boating Partnership Council wrote to express its concern with the expedited removal of wells under the September 2010 policy announcement. The 18-member advisory committee appointed by the Interior Department and the U.S. Fish & Wildlife Service subsequently sought a temporary moratorium on the removal of structures under the *Idle Iron* policy.

This was followed by a similar request from the Congressional Sportsmen's Caucus in a letter dated July 25, 2012. That same month, another letter addressed to Interior Secretary Salazar by various sport fishing associations asked for a moratorium on rig removals until a stakeholder process could be developed.

A relevant meeting was convened on Nov. 7, 2012 by BSEE Director James Watson, although it was led by a limited stakeholder representation dominated by the oil industry and sport fishers. Noticeably absent were any organizations dedicated to environmental protection, reform of offshore safety protocols, or any local commercial fishers, tourism interests, or other affected groups from coastal areas. Panelists included: BSEE Director Watson; Dr. Larry McKinney,

Texas A&M University; Dale Shively, Artificial Reef Team Leader for the state of Texas; Drew Hunger, Decommissioning Manager for Apache Corporation; and Ted Venker, Coastal Conservation Association director and council member.

Some of the concern expressed was driven by the fact that the structures were being removed by explosives that in turn were thought to be causing mass mortality of red snapper at a time when recreational harvest seasons were being reduced. Recreational fishers objected that red snapper being killed in this process were not being factored into the quota for Gulf red snapper removals (Personal communication, Jessica McCawley, 2014).

A follow-up letter from the Sports Fishing and Boating Partnership Council dated Nov. 21, 2012, concluded the group had reached consensus on the following requests:

- Improve the efficiency of the *Rigs-to-Reefs* permitting process, with a goal of having federal agencies (BSEE and BOEM) establish a 6-month timeline for completing the process.
- Open more reef planning areas, especially closer to shore, and focus staff from the various agencies with jurisdiction on this common goal. For example, additional new near-shore sites had been approved recently off the Texas coast. Oil industry representatives at the Council meeting indicated that this expansion was critical in making more decommissioned infrastructure available for reefing since the economic "break-even" point between reefing and on-shore salvage operations is a 36-mile tow.
- Establish more reef sites.
- Develop a sliding-scale water cover requirement over reef sites based on water depth and likelihood of commercial boat traffic. Panelists indicated that current policy prescribes 85 feet of water as cover. This creates a major impediment to siting reefs in shallow water areas where the need and demand is greatest and traffic by large commercial vessels is least likely.
- Review the 2009 *Rigs-to-Reefs* Addendum to determine whether the required 5-mile separation between reef areas can be reduced. Oil industry representatives on the panel indicated they need as little as ½-mile to continue to manage active infrastructure on the Gulf floor. The Special Artificial Reef Sites (SARS) program also was requested to be reestablished to allow toppling in place as a reefing option.
- Maintain reef donation to states in exchange for the state taking liability for the reef.

Interior responded in February 2013, thanking the Sport Fishing and Boating Partnership Council for meeting with them and noting the agency and stakeholder meeting of November 2012 at Texas Southern University. Another workshop was held Feb. 21, 2013 in New Orleans to discuss revisions to the *Rigs-to-Reefs* Addendum.

At the February workshop, BSEE Director Watson underlined the Interior Department's collaborative approach to supporting the *Rigs-to-Reefs* program by meeting with representatives from the states, fisheries councils, Congress, and advisory panels to hear their concerns about the expedited effort to remove decommissioned rigs. But he indicated that recent hurricane damage was a driver for recognizing that there are a lot of old remaining structures on the Outer Continental Shelf and, although removal is destructive, he said, the federal agencies must find a balance. The *Idle Iron* law is clear; these structures go in and they come out per the law. They are temporary structures meant to be removed. No mitigation is required because the operators are not removing natural habitat. But it is a balancing act with all the involved agencies and interests.

BSEE's David Smith asked whether it were possible to find other ways to mitigate for the loss of decommissioned rigs. Are there other structures that would work better? The National Artificial Reef Plan provides a list of other materials that can be used to establish underwater artificial habitats. One speaker indicated that no mitigation was needed because the fish simply moved to another rig or natural area. NOAA indicated that the ships-to-reefs program would be ending as no more ships remain available from the period prior to 1985. In the end, Smith noted, the liability is still the primary issue, in conjunction with sharing the ocean. The Interior Department wants the state programs to be the focus of the efforts to utilize decommissioned oil structures for underwater artificial habitats.

There also is concern about the SARS process, namely Louisiana's Special Artificial Reef Sites program, which seeks permission to place rigs outside established reefing sites. The program is on hold, subject to a moratorium, with no date set for it to resume. According to the Louisiana Fish & Wildlife Department's Doug Peters, "It was never intended to deal with hurricane damage," meaning that hurricane damaged rigs are expensive to remove and the oil industry is seeking to simply leave them in place, which is outside of current regulations. Ten SARS sites were requested after hurricanes Andrew, Ivan and Lilli. Thirty-seven more requests were filed after Hurricanes Rita and Katrina, with another half-dozen after Gustav and Ike. As a result, new program requirements are being written.

Proposed changes include establishing a minimum water depth of 135 feet; maintaining a distance of 5 miles from existing SARS or reef planning areas and a minimum of 1,000 feet from an active pipeline; applying the Environmental Protection Agency and U.S. Maritime Administration's National Guidance on Best Practices for Preparing Vessels Intended to Create Artificial Reefs; and creating a SARS advisory committee composed of user group representatives to review each SARS proposal. There is concern that as many as 40 proposed SARS sites may not be permitted under the new rules. A primary outstanding issue that emerged related to the 5-mile separation required between such structures in the context of ongoing oil industry efforts to reduce that distance. Whether Louisiana maintains that 5-mile rule is still at issue. Under the Interior Department's recent revisions, there no longer is a minimum distance required between artificial underwater habitats, although future structures would be compelled to adhere to the environmental and engineering standards of the new policy.

The new federal policy does not restrict Louisiana and other states from developing artificial underwater habitat sites outside of traditional planning areas. Based on the Council's last meeting and talks with the state's new artificial reef coordinator, Louisiana plans to resume its evaluation and possible reinstatement of the SARS program (J. Cowan, email communication February 2014).

Another overarching issue is that some traditional platform jackets in deep water will be technically and financially challenging to remove without the "reefing in site" option. Industry savings can be expected to soar, and potential donations to the state for reefing could reach as high as $20 million each.

One concern raised by the environmental community has been the lack of state environmental review and public input on items left on the seabed. Texas is revising its policies to incorporate more public input. Nonetheless, the drive for more disposal sites continues and there are removal applications filed with Interior for new sites off Aransas, Texas.

One artificial reef representative spoke at the workshop supporting the need for large, complex structures that are stable and durable, which will "last from now until eternity." The Interior Department admits that these temporarily-deployed rigs are vulnerable and lack stability during severe storms; it has no idea what happened to many of the rig jackets that were accidentally dispersed during recent past hurricanes.

BSEE's David Smith responded to the oil industry's stated desire for expedited permit processing by saying, "We support and encourage *Rigs-to-Reefs*, and are trying to streamline the permitting process to speed it up. But when there are engineering safety issues, well issues or pipeline or structure issues for the abandon in place requests, it takes time to resolve them. And it is important to get input from shrimpers and fishermen." BSEE has prepared language for the programmatic Environmental Impact Statements for the Western and Eastern Gulf of Mexico that, so long as the terms and conditions are met, can be incorporated by reference without further research to complete any subsequent National Environmental Policy Act reviews.

The rig owner must submit a decommissioning plan that, once approved, is followed by a removal application that is reviewed by USACOE, EPA, NOAA, BSEE, BOEM and the state reefing agency. The state will assume liability for it and receive funds for the oil trust fund established in each state to fund its maintenance and cover liability issues. Louisiana's permit process for *Rigs-to-Reefs* usually takes about six months, although hurricane damage slows things down.

At the behest of recreational fishermen, the Gulf of Mexico Fishery Management Council approved a process at its April 2012 meeting to declare rigs and related structures Essential Fish Habitat (EFH) under the National Oceanic and Atmospheric Administration National Marine Fisheries Service's Magnuson-Stevens Fishery Conservation and Management Act.

It was one year later, in April, 2013, that this effort was put on hold based on an assessment by the Advisory Panel on Artificial Reefs that it would have little impact on the existing process. The Gulf of Mexico already is designated as Essential Fish Habitat and many questioned whether oil and gas structures qualified under the definition. Of 66 online and 13 written comments, all were in support of the designation of oil and gas structures as essential fish habitat and many opposed the use of explosives to remove decommissioned rigs based on the potential loss of marine life.

The accompanying effort to designate oil and gas structures as essential fish habitat was driven by the presumption that they provide important habitat for fish. The Interior Department commissioned one study that found oil and gas structures create more hard substrate and successfully aggregate fish. It concluded that standing rigs are more effective than toppled rigs in attracting fish. A second study found higher fish biomass at the rigs than at natural reefs. Neither study addressed whether or not the rigs fulfilled a need for more habitat or if the rigs contributed to fisheries strategies for ensuring maximum sustainable yields, or addressed other priorities of the fisheries council. Providing habitat in an area that has not been established as habitat-limited for key fisheries does not meet the criteria for designation of Essential Fish Habitat (Stanley and Wilson 2000, Wilson 2003).

The first study by D. R. Stanley and others in 2000 quantifies the current extent of underwater artificial structures in the Gulf. "The 4,000 petroleum platforms in the northern Gulf of Mexico, provide an estimated 12.1 km2 of additional hard substrate to an ecosystem that is dominated by a mud/sand substrate. The total area of the MMS No Activity Zones (this includes known natural reefs and hard bottom areas in the northern Gulf of Mexico) is 292.81 km2. The additional hard substrate provided by the petroleum platforms acting as *de facto* artificial reefs increases the amount of hard bottom habitat by 4.1% from Destin, Florida, to Brownsville, Texas. Off Louisiana, the contribution is greater as the 3,600 platforms off the coast provide an estimated 10.9 km2. The total area of the seventeen MMS No Activity Zones off the Louisiana coast is 104.5 km2. Based on these estimates, platforms increase the hard bottom by 10.4%. The expansion of hard substrate habitat, especially habitat in the upper water column, has undoubtedly changed the dynamics of energy flow and influenced the utilization of marine resources, but it has proven difficult to quantify the impact of these structures."

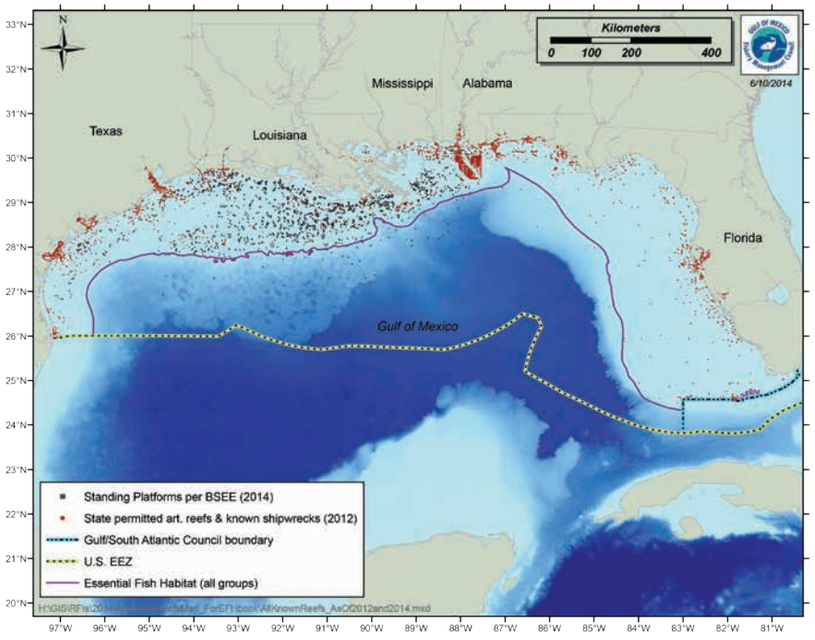


Chart compliments of Gulf of Mexico Fishery Management Council

As of May 2014, the *Idle Iron* Policy remains in effect with the Interior Department waiver that diverts decommissioned structures that qualify to *Rigs-to-Reefs* programs. This transfers responsibility for the programs and liability for the structures to the states. The program is funded by a donation from the structure owner that is equivalent to approximately one-half of what it would have cost for full decommissioning. This funding is placed in a trust fund to maintain the reefed structure and support future liability claims. Some funds are used for other related programs and millions in the Louisiana fund have recently been used for other purposes by Governor Bobby Jindal. There is little discussion of creating marine protected areas at the reefing sites; they are clearly destined for use by recreational divers and both recreational and commercial fishermen. Most are located in waters less than 400 feet deep.

At the May 2014 Offshore Technology Conference in Houston, Tommy Beaudreau, former director of BOEM, said that new U.S. regulations governing the decommissioning of old offshore oil infrastructure will be developed in the summer of 2014. The coming regulations are expected to deal with concerns that existing bonding requirements for oil and gas companies are insufficient in an era of ultra deep exploration far from the coast. "This will be an open, transparent process on how we meet these challenges around aging infrastructure and decommissioning," said Beaudreau, who is now chief of staff to Interior Secretary Sally Jewell. The issue is a live one as some of the oldest deep-water wells in the Gulf of Mexico reach the end of their lives and companies look to dismantle the operations. The National Ocean Industries Association recommended that any changes embrace *Rigs-to-Reefs* programs.

At the same conference, Statoil announced that it wants to build huge underwater "factories" off of Norway by 2020 that would sit on the seabed as they produce and process natural gas offshore, each also including an electrical power source and machinery to separate oil, gas and water. The company says subsea factories will be vital in parts of the world that are farthest from shore in deep, cold, harsh environments. One key to making them work is development of giant undersea gas compressors. Statoil is set to deploy a pair of those devices next year off the coast of Norway at a site called Åsgard, stating: "It's as large as a soccer stadium - something you put on the seafloor." http://www.houstonchronicle.com/business/energy/conferences/article/New-rules-coming-for-retiring-offshore-oil-5458587.php

Clearly, the precedents now being established for eventual responsible disposal of spent offshore oil and gas infrastructure will have far-reaching implications.

This oil rig beached just off Dauphin Island, Alabama, in August, 2005, after Hurricane Katrina brought the enormous structure just a few hundred meters from shore. Image: Jan-Michael Stump: http://www.smh.com.au/news/business/billiton-oil-platform-badly-damaged-by-rita/2005/09/27/1127586840609.html

9 Environmental Considerations

There is a compelling case to be made that the ocean should be restored to its natural pre-drilling state once drilling activity ends, as originally spelled out in the OCS lease agreements.

Offshore, oil and gas structures are especially vulnerable to hurricane damage. The 2005 hurricane season significantly disrupted Gulf of Mexico hydrocarbon production and was the worst in the history of the offshore oil industry, destroying more than 123 structures and significantly damaging several dozen other structures (Kaiser 2007). The Gulf of Mexico has experienced 191 hurricanes since 1937 and 79 have passed over or close to offshore oil and gas structures (National Hurricane Center, 2011). How much more vulnerable are rigs in a state of decay located at "reefing sites?"

When Hurricane Ivan coursed through the Gulf of Mexico in 2004, it knocked out operations at a Taylor Energy Company platform complex. Waves created by Ivan, at least one of which was estimated to be 100 feet high, caused an underwater mudslide at Taylor's Mississippi Canyon Block 20 site, knocking the platform 700 yards away and covering the 450-foot-deep wellheads with 100 feet of sediment. Since then the wells have been continuously leaking oil into the sea 12 miles south of New Orleans, and further efforts to cap the wells appear to have ceased in 2011. While Taylor Energy has stated that the resultant slick is 200 feet wide and 6.5 miles long, NOAA's estimates and available satellite images

suggest that there is often a one-mile wide, 20.2 mile-long oil slick trailing on the prevailing currents away from this installation. That is roughly 80 times larger than Taylor is reporting. http://www.nola.com/environment/index.ssf/2013/07/taylor_energy_oil_platform_des_1.html

Six environmental groups filed litigation initiating a freedom-of-information action to the U.S. Coast Guard in an attempt to learn more about the Taylor Energy platform after denial of two previous freedom-of-information-act (FOIA) requests. The groups also filed a separate lawsuit against Taylor Energy, asserting that 28 wells that were damaged by the underwater landslide back in 2004 still continue to leak to this day. http://www.nola.com/environment/index.ssf/2012/02/environmental_groups_sue_taylo.html

Taylor Energy is a privately held oil company, operating in the Gulf of Mexico, that was sold to a joint venture of Samsung and Korea National Oil Company (KNOC) in 2008, now known as Ankor Energy LLC and purchased by CEO Phyllis Taylor in 2004. The plaintiffs, which include Waterkeeper Alliance, Atchafalya Basinkeeper, Galveston Baykeeper, Louisiana Bayoukeeper, Apalachicola Riverkeeper, and the Louisiana Environmental Action Network (LEAN), claim that the Coast Guard has been unresponsive to requests for information regarding the cause of the leak, the volume being released, and what actions are being taken to stop it.

According to Marc Yaggi, executive director of Waterkeeper Alliance, "We filed this suit to stop the spill and lift the veil of secrecy surrounding Taylor Oil's eight-year long response and recovery operation. Neither the government nor Taylor will answer basic questions related to the spill response, citing privacy concerns."

Machelle Hall, an attorney with the Tulane Environmental Law Clinic, says that factual information, such as how much oil has been released, is not included in the exemptions provided by the law to protect agencies' ability to deliberate or discuss private information and make decisions.

"The Taylor Oil spill is emblematic of a broken system, where oil production is prioritized over concerns for human health and the environment," said Paul Orr, of the Lower Mississippi Riverkeeper. "Nearly three years after the Deepwater Horizon Spill, none of the comprehensive reforms recommended by the National Oil Spill Commission have been enacted and Congress has yet to pass a single law to better protect workers, the environment or coastal communities." http://www.triplepundit.com/2013/03/oil-leak-gulf-supposed-about/

In 2004, Hurricane Ivan, a Category 3 storm, created a sub-sea landslide that wiped out Taylor Energy Platform #23051 off the Louisiana coast. Ten years later, crude oil continues to ooze into the waters of the Gulf. Image: Jeffrey Dubinsky/Louisiana Environmental Action Network

There is mounting concern that rigs, especially those in deeper Gulf waters, will become problematic once they come up for decommissioning. DecomWorld.com published an April 30, 2014, article entitled "Proactive approach to well integrity 'urgently needed', expert warns." The article reads: "An industry wide wake-up call is necessary because too many new wells are being handed over with integrity problems.

And shut in wells are not being monitored properly, leading to major - and unnecessary - problems at the permanent plug and abandonment stage. Asset-integrity company Wood Group Intetech's Dr. Liane Smith says there is still insufficient focus on integrity at the design and drilling phases, and that changing well conditions are not being tracked, leading to problems permanently abandoning shut-in wells."

Old non-producing platforms tend to create serious safety, environmental and navigational risks, and often-present serious navigational hazards for an extensive period of time. On Nov. 10, 2012 a barge loaded with 5 million gallons of fuel oil hit a submerged oil platform in the Gulf of Mexico 30 miles south of Lake Charles, La. The platform had been damaged by Hurricane Rita and was marked with unlit buoys. The 150,000-barrel double-hull barge DBL 152 suffered a 35-by-6-foot gash in one of its cargo tanks after striking the West Cameron 229A platform, leaking an estimated 1.3 million gallons of oil into the Gulf. Efforts to remove remaining oil from the barge continued for more than a month after the collision.

Disabled Tank Barge DBL 152 vessel before capsizing, showing discharge of oil.
http://www.darrp.noaa.gov/southeast/dbl152/

Chronic leaks are a continuing source of water quality degradation in the Gulf. Jonathan Henderson of the Gulf Restoration Network recently reported that after the BP still, "I started noticing, towards the end of 2010, other leaks that were unrelated to the BP disaster. I would find wellheads that were leaking or platforms that were leaking. Just in the last year, I have filed 50 reports for different leaks and spills unrelated to the BP disaster." He is part of a nonprofit monitoring consortium that patrols the Gulf of Mexico that includes Southwings, a group of volunteer pilots, and Skytruth, a technology group that turns measurements of oil slicks from satellite images into "conservative estimates" of the gallons of oil on the water. Spills large enough to create a visible sheen on the water must be reported to the National Response Center run by the Coast Guard. When Henderson checked, many of the smaller spills were not making the list. David Manthos of Skytruth reports that estimates of those spills that are reported are usually 10 times larger than had been reported. http://www.npr.org/2014/04/19/304707516/telltale-rainbow-sheens-show-thousands-of-spills-across-the-gulf

A collision or the failure of a seafloor casing or cement seal is not the only way spent rigs can contribute to ocean pollution. At the site of many offshore drilling rigs in relatively shallow water, seafloor obstructions consisting of drill mud mounds containing toxic substances often remain behind. Studies conducted around offshore drilling rigs in the Gulf of Mexico have revealed significant amounts of mercury with the potential to bio-accumulate in the fisheries food chain leading to humans. This mercury pollution is thought to originate from mercury contained in routine discharges of spent barite drill muds that have been used to cool and lubricate the drill bit, after which the used muds have been discharged into the water column and dumped on the seafloor. Other toxic, carcinogenic, and mutagenic chemicals, including lead and cadmium, often remain concentrated within the seafloor wastes accumulated from years of drilling and oil production. Concentrations of these discharged oil-related pollutants do not need to be particularly high to be of serious biological concern.

Research on oil pollution in Alaska's Prince William Sound since the 1989 Exxon Valdez oil spill has provided compelling evidence that very low levels of PAH compounds (polycyclic aromatic hydrocarbons) associated with the spilled oil have been causing life-cycle mutagenic damage to the eggs of pink salmon at levels of two parts-per-billion. Dilution, it turns out, is not the solution for toxic pollution that bio-concentrates in the marine food chain, whatever the source.

More research is also needed into the role that discarded petroleum infrastructure plays in introducing, distributing, and harboring various non-native marine invasive species, but there is already adequate cautionary evidence to flag this issue as a problem in the Gulf and elsewhere.

Although the harmful algae *Ciguatera* has not yet been formally designated as a Non-Indigenous Species (NIS), dinoflagellates such as *G. toxicus*, often associated with being the source of *Ciguatera*, have been found growing on certain oil platforms near Port Aransas, Texas. Fish at the Flower Garden Banks National Marine Sanctuary off of Texas have recently tested positive for *Ciguatera*.

The polyether toxins produced by these benthic dinoflagellates cause *Ciguatera* fish poison incidents in humans. Providing hard substrate on oil platforms, in waters where such habitat has not previously been found, can have unforeseen impacts on human health, and warming water temperatures and expanding fish migration patterns may contribute to the potential for increased levels of *G. toxicus* (Villareal, 2006). Both petroleum platform structures and constructed artificial reefs can provide habitats suitable for Non-Indigenous Species, because such structures stay in one place for long periods of time, have no hull maintenance, and when moved, transit at a slower speed than other vessels. The biofouling complex on such structures can be more developed and sheds less of its biological material during slow transits.

The vertical profile of drilling platforms enables them to recruit NIS species from throughout the water column. Two species of the six NIS now found in the Gulf, the brown mussel and the white crust tunicate (*ascidian*), currently cause a range of problems. Delays in platform removal can create additional risks of NIS, while the number and scale of platforms in the Gulf, in conjunction with a range of related stress factors, increases the risk of future adverse NIS impacts. Although movement of spent platforms tends to transport smaller fish such as blennies and gobies, a network of existing oil and gas structures also can provide a vector for inducing inadvertent range expansion of larger fish. Indirect effects of structures in place include increased availability of food resources and providing spawning or ovodeposition sites that alter local distributions of larger species and potentially result in range expansions. The creation of a corridor of platform structures shortens the distance between available habitats and can allow progressive movement of unforeseen species over time, often with unpredictable consequences (Ault, J. 2008).

Commonly Identified Marine Non-Indigenous Species in the Northern Gulf of Mexico				
Species Name	**Common Name**	**Means of Introduction**	**Habitat**	**Impacts**
Tubastrea coccinea	Orange cup coral	Natural currents, fouling	Hard substrate, platforms, coral reefs	Competition with benthic invertebrates, may contribute to removal of native corals
Perna perna	Brown Mussel	Ballast water, fouling	Hard substrate, platforms; Texas	Fouling navigation buoys, intake pipes: competition with indigenous species, Thermal tolerance may limit expansion
Perna viridis	Green Mussel	Ballast water, fouling	Generally estuarine, but found on artificial reefs, spreading south and northwest from Tampa	Clog intake pipes, foul manmade structures, oyster reef injury, disease transfer, Wider thermal tolerance, may expand to the rest of the GOM
Phyllorhiza punctata	Australian Spotted Jellyfish	Natural currents (loop current eddies), or fouling	Pelagic medusae, hard substrate scyphistoma stage	Comm. fisheries (shrimp nets), predation on eggs and larvae of economically important species, food competition with larval fish
Didemnum perlucidum	White Crust Tunicate (ascidian)	Ballast water, fouling	Hard substrate, platforms	Overgrows and smoothers epibiots
Hypsoblennius invemar	Tessellated Blenny	Ballast water, fouling on ships or oil rigs from South America.	Hard substrate. Occupies empty barnacle tests, platforms	Possible competition with native species
Sources include: Gulf States Marine Fisheries Commission: U.S. Geological Survey, Global Invasive Species Database; ACOE (Ray)				

Source: Ault, et. al. 2008

Throughout the world's oceans, the physical presence of large structures has the potential to emulate fish-attracting devices that can impact management of highly migratory fish species, including yellowfin and bluefin tunas and broadbill swordfish that are managed by federal and international constraints. Any artificial concentration of these species also will concentrate fishing efforts into a novel and potentially detrimental situation for Gulf of Mexico fish stocks.

There also is the issue of interference with feeding and spawning of species. The physical presence of large structures impacts populations of highly migratory fish species through changes in their feeding and spawning behavior. Potential geographic shifts in the location of spawning and feeding could impact these species' populations.

Questions about how oil rigs may be altering Gulf ecosystem dynamics have also been recognized by Congress in the fiscal year 2015 NOAA Appropriations Report language. At page 21 in the National Marine Fisheries Service stock assessment section, the House of Representatives calls for a study of how drilling platforms change spawning of yellowfin tuna in the Gulf of Mexico: "Epipelagic apex predators. - The Committee is aware of growing evidence that yellowfin tuna and other epipelagic apex predators are aggregating at offshore oil platforms in a similar manner to their more traditional aggregation points. These offshore rigs may alter yellowfin movements, diet, diseases, growth, age at maturity, and spawning. However, NOAA lacks fundamental data on how this new association may impact these species. The recommendation includes funding to examine the impact of offshore oil platforms on the biology of highly migratory species. NOAA shall provide a report on the results of this research no later than one year after enactment of this Act."

In the wake of the BP spill and its impact on the Gulf of Mexico, a broader general concern arises about the biodiversity of fish and macroinvertebrates. The effects of population densities and how regional biodiversity affects deepwater fish and macroinvertebrates are poorly understood. The potential effects of human intervention and activity in these geographic realms are unknown and this concern applies to the development of additional extensive artificial underwater habitats utilizing retired oil and gas structures (Carney, 1997).

An expert panel convened by the Pew Environment Group to make recommendations on restoring the Gulf of Mexico has recommended

that pursuing a policy of complete decommissioning could provide mitigation for dolphin mortality as a result of the BP spill. "The BP oil spill appears to have led to deaths of bottlenose dolphins in the Gulf, so compensatory restoration will be needed. One potential restoration action could be to properly shut down and seal so-called orphan wells in the Gulf coastal zone, of which there are many—in the low hundreds in Louisiana waters alone. To the extent that these abandoned wells are releasing oil and possibly other pollutants on a chronic basis, they are polluting the sea surface where marine mammals come to breathe and fouling coastal and estuarine habitats frequented by bottlenose dolphins. Shutting these abandoned wells would contribute to the enhancement of environmental quality, supporting healthier populations of multiple species, including dolphins" (Peterson, 2011).

A wide range of species, from dolphins to coral, are still dealing with the long-term results of the BP spill that unleashed nearly 5 million barrels of oil into the Gulf. Image: Robert Burton/USFWS http://emagazine.com/daily-news/br-spill-two-years-after/

Single-species attraction (red snapper, primarily) does not signify a healthy ecosystem. Existing artificial underwater habitats provide significant opportunities for commercial and sport fishing but this also aggregates fish and leads to overfishing. "Artificial reef programs arose from the unexpected development of marine life on offshore oil and gas platforms," according to Harte Research Institute Director Larry McKinney. "Around these platforms are the most desirable fish in the Gulf," McKinney says, referring to red snapper. "People started fishing around platforms because that's where the fish were and the structures were easy to find, especially in pre-GPS days" (Gaskill 2013). The only demonstrable effect of this boon has been overfishing.

NOAA researchers are among those not convinced of the value of artificial underwater structures for production or achieving habitat functions. At the November 2013 Gulf and Caribbean Marine Fisheries Annual Meeting in Corpus Christi, presenter Kristopher Benson, from NOAA's Restoration Center in Galveston, agreed that artificial reefs can divert fishing pressure, but said the agency doesn't consider the issue of production versus concentration to be resolved. "The literature shows reefs function on a spectrum between the two. Whether the services of artificial reefs outweigh those of existing habitat where the reefs will be placed remains unanswered." Further study is needed, he added, as is research on optimal siting of artificial reefs, appropriate design for specific ecosystem management goals, and the functional development of these reefs over time.

Not all artificial reefs, of any kind, can be guaranteed to produce positive results. A 176-acre rocky-bottom fish habitat that Southern California Edison Company built a half-mile off San Clemente in 2008, supposedly "replacing" fish lost due to operations at the company's nearby nuclear power plant, has recently been found to be failing to propagate enough fish to meet the agreed-to mitigation requirements.

Another environmental consequence of offshore oil and gas development in the Gulf of Mexico is damage to deep-sea corals. "Recent studies have revealed extensive hydrocarbon fluid seeps along the continental slope from depths of 100 to more than 3,000 meters along with intermittent coral heads (*Lophelia pertusa*, principally) and their associated invertebrates. These assemblages, known generally as seep communities and associated *Lophelia pertusa* coral assemblages, are given special consideration during exploratory drilling for oil and gas because of MMS regulations specifying minimal distances required between the wellhead and these communities. The corals require solid substrate, and these are found at older seep sites with diminishing flows of hydrocarbons where carbonates have been deposited. Ironically, these remarkable assemblages are encountered where oil and gas prospects also are high, with, for example, numerous documented occurrences of *Lophelia* thickets at relatively small distances (a few kilometers) from the BP drill site. A marine reserve protecting these communities might best be designed to encompass the range of environments and the scope of biological differences among *Lophelia* communities" (Peterson, 2011).

With the onset of deepwater drilling, other issues arise, especially if the petroleum industry structures are allowed to remain in place. There is a very real probability that new kinds of taller structures will present unique abandonment difficulties and raise new questions concerning artificial reef planning.

If the total environmental impact of oil and gas development in the Gulf of Mexico were limited to the direct impacts of the existing extensive system of offshore pipelines, wells, rigs, and associated oil and gas infrastructure that has been deployed in the Gulf of Mexico over the past 75 years, the eventual complete removal of all left-over infrastructure under the *Idle Iron* policy could provide a relatively straightforward means of beginning to return the seabed itself to its former natural state.

Any discussion of whether to grant the oil industry more new concessions by providing additional waivers for the *Rigs-to-Reefs* programs within the greater context of Gulf of Mexico restoration must take into consideration the accumulated losses to Gulf coastal ecosystems from the indirect impacts of intensive oil and gas shoreline development as well. The larger picture of total cumulative environmental loss is an order of magnitude greater, making additional concessions to industry via waivers from the *Idle Iron* policy inappropriate given the environmental consequences and lack of need for more such habitat in the Gulf.

All along the Gulf coast, coastal development, oil and gas infrastructure, and navigation channels have degraded and destabilized oyster reefs, marshes, beaches, and barrier islands, thereby diminishing the ecosystem services these habitats should be providing. What habitat remains is more susceptible to further erosion by storm-generated waves, currents and winds, and changes in the hydrological framework in which they were created. In Louisiana, wetland loss is especially severe because of extensive dredging of oil and gas navigation canals through wetlands, which enhances erosion. At the same time, the land is subsiding, in some areas as rapidly as 20 to 30 millimeters (mm) per year, and the current rate of eustatic sea level rise of around 3 mm per year is increasing with global climate change.

According to scientists who studied the Gulf for restoration opportunities in the wake of the BP Gulf spill, the long-term consequences of intensive oil and gas development in the Gulf has resulted in massive loss of coastal wetlands. "Compounding the rapid residential development, dredging for oil and gas extraction has been causally linked to coastal wetland loss in the Gulf. More than 90 percent of U.S. offshore oil and gas reserves, past production, and present yields are in the coastal waters of the Gulf of Mexico, but the inshore recovery peaked more than a decade ago. Large-scale efforts to slow or reverse wetland losses along the Gulf began in the early 1990s, focused on construction of river diversions. Such projects make up the largest and

most expensive strategy for addressing wetland loss in the Louisiana coastal area, with future costs possibly reaching several billion dollars (Peterson, C. H. et al, 2011).

The dredging of navigation routes through Gulf coastal wetlands began at least 200 years ago (Davis 1973), but it has been primarily the canals dredged for oil and gas development, beginning in the 1930s and peaking in the 1960s, that have produced demonstrable and coast-wide adverse influences on wetlands. The direct impact of dredging on wetlands amounted to 1,017 square kilometers of canals in 1990, with an equal area of spoil banks stacked on the adjacent wetlands. There is a much larger indirect impact from canals and the dredged spoil deposits that is demonstrable at several temporal and spatial scales. For example, (1) land loss rates in the deltaic plain, in similar geological substrates, are directly related to dredging; (2) the amount of land loss where dredging is low is near zero, and; (3) the land loss rates accelerated and slowed when dredging rose and slowed in the Barataria basin (Turner et al. 2007b).

The rise in the rate of dredging appears more than coincidental with the rise of wetland loss. Other plausible explanations for wetland loss are related to the loss of the accumulated organic matter and plant stress accompanying an altered hydrology. But the fact that sea level rise, soil subsidence, and the concentration of suspended sediment in the river have remained essentially similar from the 1960s to the present supports the conclusion that the current dominant cause of Gulf wetland loss is dredging.

An article in *Metropolis*, dated Jan. 14 2014, by John Barry, depicted a leaking oil facility in the Pass-a-Loutre Wildlife Management Area. Oil production facilities, along with the barge traffic that they create, have helped degrade the wetlands of southern Louisiana. These protective wetlands are disappearing at a rate of about a football field-size area every 50 minutes. One major factor in land loss has been the operations of the oil and gas industry. The industry has dredged about 10,000 miles of canals and pipelines through coastal Louisiana, every inch of which has allowed saltwater intrusion, changed salinity, interfered with natural hydrology and killed plant life, thus leading to the erosion of land. No serious observer, including those in the fossil fuel industry, disputes that oil and gas operations have caused substantial land loss. A U.S. Geological Survey (USGS) study, in which industry scientists participated, concluded that energy industry activities accounted for 36 percent of all of the state's land loss. Evidence is growing that oil and gas companies have extracted such a large volume of material that the land has actually sunk. The impact of Big Oil's role in subsidence may not be entirely reflected in the USGS study.

Wetlands loss is demonstrated by this image of the ConocoPhillips Alliance Refinery in Belle Chasse, La., taken 9/10/12 after Hurricane Ike, showing standing water from the storm. Jeffrey Dubinsky/Louisiana Environmental Action Network

Onshore oil production is having catastrophic impacts, creating a sinking coastline driven by unsustainable oil, gas, and groundwater extraction. Although natural subsidence processes, such as sediment compaction and downward warping of underlying crust (e.g., in the Mississippi River Delta plain, Barataria Basin, and Atchafalaya Basin)

are occurring along the coast, the withdrawals of subsurface oil and gas are major contributors to Gulf wetland loss in some places. For example, the rates of soil compaction and eustatic sea level rise along the upper Texas coast can exceed 13 millimeters per year (mm yr-1), while human-induced subsidence rates can be as high as 120mm per year-1. In the Houston-Galveston area, withdrawal of groundwater has caused up to three meters of land surface subsidence, with the rate of subsidence ranging from 10mm per year-1 to more than 60mm yr-1 (Gabrysch and Coplin 1990).

Any consideration of wetlands loss is amplified by the corresponding loss of habitat that supports sensitive life stages and critical processes such as spawning, nesting, and overwintering of fish, birds, and other wildlife. Endangered species such as sea turtles are compromised by loss of habitat in the Gulf due to oil and gas production. The role of habitat protection in their recovery is essential.

Another impact on Gulf ecology is marine debris from oil and gas operations. Marine debris comes from many sources, including cargo ships, commercial fishing boats, and recreational craft. But in the Gulf, the offshore oil and gas industry is a significant source of debris (NRC 1995, 2008). Up to 10 percent of all debris on Padre Island National Seashore has been attributed to oil and gas operations (Miller and Jones 2003). Debris on the shoreline affects coastal residents and visitors, while debris throughout the seafloor, sea surface, shoreline habitats, estuaries, and other waterways also adversely impacts wildlife and their habitats.

Not all potential impacts from offshore oil are from past activities. There are environmental concerns related to more proposed petroleum storage in salt domes, a practice that has gone on for more than 40 years throughout the Gulf of Mexico, with active storage sites in Louisiana and Texas (DOE 2011). Domes are considered attractive storage receptacles because the salt forms a seal around contained substances, creating a stable reservoir. But leakages in similar domes off Weeks Island, La., have proven problematic, resulting in the removal of petroleum stores and abandonment of the site. Undoubtedly, heterotrophic microbes exist in the continental shelf that can eventually degrade petroleum hydrocarbons. But if the oil leakage creates significant patches of floating oil or contaminates oysters or other shellfish, then leakage is clearly unacceptable.

A proposal from the DOE to create a petroleum reserve site in Mississippi salt domes, which was recently withdrawn, threatened the Pascagoula River basin. The process for preparing the Mississippi site for oil storage would involve inundating the dome each day with millions of gallons of freshwater drawn from the river to dissolve the salt and then pumping out the resulting hypersaline (264 parts per thousand) solution into a pipeline constructed over 1,500 acres of wetlands to transport it 80 miles to the Gulf of Mexico. The activity would require five to six years to complete, severely reduce flow in the Pascagoula and discharge millions of gallons of salt brine just south of Horn Island, a 2,763-acre barrier island that is part of a group of islands along the Mississippi coast that the federal government has spent millions of dollars to protect. Other anticipated damage includes saltwater intrusion from the Mississippi Sound up the river, with potentially devastating outcomes (if damage caused by Hurricane Katrina is any indication), and development of a dead zone near the outfall from the pipeline. Although the proposal was withdrawn in March 2011, it still looms over the river's future (Peterson, C. H. 2011).

The list of long-term consequences directly linked to the extensive development of oil and gas production in the Gulf of Mexico includes not just the issue of oil and gas rig disposal, but represents a lengthy record of extensive, damaging environmental consequences as a result of such activity. It's time to reassess and reinvigorate the discussion of what logical steps can be taken to restore and prevent additional degradation of Gulf of Mexico ecosystems.

10 Stakeholder Considerations

Reggio reported as early as 1987 that scientists and technical journalists speculated that the *Rigs-to-Reefs* concept has a favorable effect on offshore recreational fishing, commercial hook-and-line fishing, and scuba diving. "There is no place in the Gulf of Mexico that cannot be found or reached with our sophisticated navigation tools and powerful boats," said Dr. Larry McKinney, director of the Harte Research Institute at Texas A&M University. "To me, the question is not whether artificial reefs are an effective [fisheries management] tool. They're a critical tool. Recreational fishermen are the largest contributor to conservation funding, through taxes, to the tune of $7.3 billion since 1952. In 2001, the peak year for platforms, saltwater anglers contributed $621 million in retail sales. In 2006, that number was $981 million, and the full economic impact in Texas alone was $1.7 billion" (Gaskill, 2013).

An MMS Study in 2002 concluded "There is substantial recreational activity associated with the presence of oil and gas structures in the Gulf of Mexico from Alabama through Texas and these activities have a considerable economic impact. But the process by which fishermen and divers select the specific oil and gas structures to visit is not well understood. Fishermen and divers visit multiple structures on each trip. Decision-making processes for structure removal should include consideration of the needs of recreational fishermen and divers. Moreover, fishing and diving interests across the Gulf should be kept informed about the processes of structure removal and given opportunities to participate in such decisions" (Hiett and Milon 2002).

Stakeholder conflicts do exist. The physical presence of oil and gas structures and associated operations conflict with certain sectors of commercial and recreational fishing. Multimillion-dollar fishing efforts in deepwater include upper-ocean trolling for billfish; mixed-depth long-lining for yellowfin, tuna and shark; and, deep-bottom trawling for royal red shrimp. The equipment for these types of fishing is significant in terms of size, weight and expense. Interactions between oil and gas activity and fishing may be costly, potentially environmentally hazardous, and pose a tangible human safety hazard.

Shrimpers consider rigs to be a "minefield" in the Gulf of Mexico. Although they object to the structures because they are a hazard to navigation, they agreed to the establishment of reefing sites in order to restrict them to those sites instead of leaving them in place. There is a historical resistance to anything that reduces trawlable bottom in the Gulf and some shrimpers say the fishery has suffered as a consequence of reduced fishing grounds. The Louisiana Shrimpers Association filed a lawsuit against the Louisiana Department of Fisheries and Wildlife over the Special Artificial Reef Sites (SARS) program that expanded the state's decommissioned rig placements outside of existing "reefing" sites. The court found that platforms that currently exist are not trawlable and denied a request for an injunction against the SARS program in June 2009.

Richard Thompson of the New Orleans Times-Picayune reported on Oct. 24, 2010 that "As long as the potential reef sites aren't expanded, that's welcome news to Clint Guidry, who heads the Louisiana Shrimp Association. Shrimp fishers need the bottom of the ocean to be cleared off in order to run their nets, Guidry said, and while he's glad the platforms are being removed, he doesn't believe that additional sites are necessary." Guidry noted, "It's something that I appreciate the administration doing," he said about removing the platforms. "There's a lot of abandoned stuff out there, and it's just causing navigation problems, really.''

Clint Guidry, shrimper. Image: Ed Lallo/Gulf Seafood News

Commercial fishermen who have lost gear or suffered other economic losses due to uncharted hazards created by oil and gas structures on the Outer Continental Shelf have become such a problem that NOAA has used oil and gas revenues to establish and fund a revolving Fishermen's Contingency Fund. Louisiana has a similar fund. It compensates fishermen for loss of gear due to "unknown obstructions" not marked on the charts, obstructions often associated with oil and gas structures. The oil industry has considered expanding the scope of the fund to provide shrimpers and commercial fishermen with GPS data to mark artificial underwater structures.

In the event of a major pollution incident such as the BP Deepwater Horizon oil spill, fishermen are affected by the closure of commercial and recreational fisheries for shrimp, oyster, blue crabs, reef fish, and other finfish due to concerns over contamination. This causes extensive economic losses and stress on the ethnically diverse coastal populations (Gulf and South Atlantic Fisheries Foundation Inc. 2010).

Bar pilots for the most part accept the *Rigs-to-Reefs* programs so long as the resulting obstacles remain out of the shipping lanes and do not create navigational hazards. Navigating large vessels, oil barges and tankers, and cruise ships through the shipping lanes leading to major ports in the Gulf is difficult.

But small craft vessels are often challenged in shallow waters and are particularly vulnerable to navigating safely around nearshore artificial underwater structures. And now there is a new view of hurricane risk from leaving old structures on site due to the recently demonstrated potential for extensive damage when vessels encounter unmarked debris.

The U.S. Coast Guard inherits the job of marking the new artificial underwater sites with buoys and absorbs the expense of adding them to navigational charts. More important, the agency is responsible for responding to increased instances of boating safety issues and rescues generated by those who encounter hazards to navigation created by storm-damaged oil structures.

Unfortunately, no one has examined the effect that such structures have had on the long-term culture, history, and quality of life of residents and visitors. The Gulf of Mexico's coastal and ocean ecosystems provide valuable services to the public, including fish production, opportunities for wildlife watching, watersports, and more.

Despite the development of extensive oil and gas infrastructure, the northern Gulf of Mexico coastal zone is one of the major recreational regions of the U. S., particularly in connection with marine fishing and beach-related activities. The shorefronts along the Gulf coasts of Alabama, Mississippi, Louisiana, Texas, and Florida offer a diversity of natural and developed landscapes and seascapes. The coastal beaches, barrier islands, estuarine bays and sounds, river deltas and tidal marshes are extensively and intensively used for recreational activity by the residents of the Gulf South and tourists from throughout the nation, as well as by visitors from foreign countries. Publicly-owned and administered areas such as national seashores, parks, beaches, and wildlife lands, as well as specially-designated preservation areas such as historic and natural sites and landmarks, wilderness areas, wildlife sanctuaries, and scenic rivers attract residents and visitors throughout the year. Commercial and private recreational facilities and establishments, such as resorts, marinas, amusement parks and ornamental gardens, also serve as primary interest areas and support services for people who seek enjoyment from the recreational resources associated with the Gulf (MMS 1989).

Understandably, negative public sentiment toward the oil and gas industry has grown, especially since the BP Deepwater Horizon disaster. For a long time in the Gulf of Mexico, the oil and gas industry has conducted activities that have caused cumulative impacts on coastal wetlands, which are disappearing at an alarming pace. Other adverse impacts, while less visible, accompany petroleum activity.

The extensive losses of salt marsh, oyster reef and coastal barriers affect more than fish and wildlife. This habitat loss increases the vulnerability of coastal residents to loss of life and property during hurricanes. The biological barriers provided by these foundation organisms that would normally dissipate erosive and damaging storm-wave energy and help suppress movement of storm surge inland are no longer providing this protective service to the Gulf's coastal residents, particularly in the Mississippi Delta.

Yet, onshore coastal infrastructure is still expanding for the oil and gas industry. Of 23 Liquefied Natural Gas export applications filed with the U.S. Energy Department, at least eight are proposed for facilities in Louisiana or near its coast (Litvan, 2014). And permits for deepwater drilling continue to be submitted with each additional lease sale offered for the Gulf of Mexico OCS.

Returning the seabed to its former natural state after an oil structure reaches the end of its useful life is a small step forward in advancing reasonable restoration goals, given the extensive coastal losses already experienced and the continued expansion of oil and gas operations in the Gulf today.

Persistent damage from past drilling operations really does often carry forward into future use considerations, which are therefore an overriding concern that must be addressed by the agencies seeking to balance the growing push for more *Rigs-to-Reefs* waivers with long-term needs to preserve ecosystem services and provide for potential new uses. All too often, the only future use consideration is allowing for further development of offshore petroleum resources. The substantial investment being made to restore the Gulf of Mexico in the post-BP-spill era is focused on a larger goal: restoring the Gulf of Mexico ecosystems and fisheries to their former productivity for the benefit of all concerned.

This larger effort will require a complimentary long-term approach to the future pressure for more discarded rigs posing as underwater artificial habitats. These offshore petroleum structures were always intended to be temporarily deployed and each rig owner accepts a legal obligation in the lease sale to fully decommission it and return the seabed to its previous natural state. It is especially critical that we value the multitude of ecosystem and human services provided by critical components of the Gulf ecosystem, because human prosperity and economic health of the Gulf depend on the restoration of these ecosystem services.

11

How *Rigs-to-Reefs* Saves the Oil and Gas Industry Billions

Of course, the loudest stakeholder in this discussion is the petroleum industry as it seeks to reduce the costs of decommissioning rigs by up to 50% through the use of the *Rigs-to-Reefs* waiver. The current average distance from shore for most existing rigs is 56 nautical miles, but if this waiver program continues, most future artificial underwater habitats from oil and gas platforms will be located in water depths of 100 feet or greater, and located too far offshore to benefit recreational divers and fishermen. This significantly undermines the justification for allowing spent rigs to remain in Gulf waters after the structures stop producing petroleum.

In 2009, the petroleum industry in the Gulf estimated its total savings to date through the *Rigs-to-Reefs* program was $92 million. Its representatives calculated that if 13% of the remaining structures in less than 300 feet of water obtain waivers to remain deployed, there would be a future savings of another $71 million. If 26% of the remaining structures in less than 300 feet of water were deployed, the savings would grow to $142 million. If large platforms in waters greater than 300 feet deep were allowed to be reefed on site, outside of designated sites under the Louisiana Special Artificial Reef Sites (SARS) Program, another $167 million in future savings would be realized by the oil industry.

But not all oil structures are appropriate for reefing. It is feasible primarily when the cost to reef in place or offsite is significantly less expensive than complete removal. Seeking a *Rigs-to-Reefs* waiver is

most advantageous for heavy "jackets" (the oil rig structure with the platform removed) that cannot be removed using a derrick barge and placed on a material barge in a single lift, or when damaged or downed platforms are involved. In such cases, if the structure can be left in place or toppled, additional expense to remove it is avoided. The incremental costs to reef a jacket to provide a minimum 85 feet of vertical clearance between the top of the remaining structure and the water surface to comply with current regulations can cost up to $1 million. Moving a jacket to a new location can cost up to $1.75 million. This relocation cost reduces the incentive to "reef" spent structures.

In 2012, decommissioning costs represented an annual market value between $142- to $394-million per year for structure removals, and $235- to $430-million per year for plugging and abandonment activity (Delta Rigging & Tools, 2012). For 2014, the effort to plug and abandon old wells is estimated at $40- $50-billion in the Gulf of Mexico. (DecommWorld, 2014). http://social.decomworld.com/structures-and-maintenance/deep-water-decommissioning-four-times-more-costly-study-finds

In the Gulf of Mexico, liability is transferred to the state at the point that the structure is accepted by the state as an artificial reef, under the respective artificial reef programs. The steel jacket structure from the rig is transferred to the state (or other public entity) after it has obtained an Army Corps of Engineers permit for an artificial reef development. The rig owner is responsible for providing platform insurance until any such transfer. Recognizing the overarching liability issue, the oil industry has noted that obtaining affordable insurance is becoming a growing financial burden that makes expediting such transfers even more attractive from a financial perspective.

There is a projected net economic benefit to the oil industry from retiring old platforms. "The most likely, or reference, forecast of the number of operating offshore structures on the Gulf of Mexico shows a decline of about 29 percent over the period 1999 to 2023. The decline will occur because the number of platforms being removed is predicted to increase significantly above current levels, while the number of platforms being installed is predicted to increase only slightly above current levels. As a consequence of this pattern, and the larger size of the platforms being installed, overall activity in removing and installing platforms increases significantly, despite the decline in the number of operating platforms during the forecast period. Many of the platforms installed in the future are expected to be larger platforms located in deeper water farther from shore, while more of the platforms forecast to be removed are smaller platforms located in shallower waters. At the same time, this tends to indicate that expenditures on installing and operating new platforms and pipelines (as well as on removing old platforms) will dwarf expenditures lost as smaller platforms cease operating. Thus, the net effect on the economies of adjacent coastal areas may be quite positive despite the overall decline in the number of platforms operating" (Pulsipher et al. 2001).

Another dynamic underway is that many of the near-spent rigs are sold by the large oil companies to smaller companies that have fewer resources available for decommissioning. The 5th edition of the "Offshore Decommissioning Report 2014 - Gulf of Mexico" published by DecomWorld "concluded that small companies tend to be cost-minimizers in decommissioning while large companies focus on risk management, with specialized teams and business units dedicated to the task, potentially pushing costs higher."

The oil and gas industry has a strong influence on many Members of Congress, and is actively pressing to expand the *Rigs-to-Reefs* programs. On March 11, 2013, the Congressional Oceans Caucus Foundation hosted a discussion on *Rigs-to-Reefs* with a panel of speakers who represented industry and environmental stakeholders and academia. They concluded that "Proponents of *Rigs-to-Reefs* are supported by a substantive body of research that artificial reefs do produce biomass and export energy to the surrounding ecosystem, as well as attract a remarkable

quantity and variety of marine life, serving to benefit both fishing and recreation interests. Concerns that these structures only attract fish are mitigated by proven fisheries management tools that would compensate for any adverse impact" (McKinney, 2013).

In the 112th Congress, Rep. Steven Palazzo, R-MS, and Sen. David Vitter, R-LA, proposed twin bills in the U.S. House and Senate for a moratorium on rig removal so that regional coordination could take place between federal and state agencies and industry (H.R. 3429 and S.B. 1555, respectively). While the resulting "Rigs to Reefs Habitat Protection Act" would have deferred action on the many sites that would be lost during the anticipated time it would have taken to settle the issue, opponents say an indefinite moratorium would place the *Rigs-to-Reefs* program at the mercy of congressional gridlock that might lead to rigs staying in place permanently with undue liability and maintenance burdens being placed on oil and gas companies. Some stakeholders thus argue a fixed-term moratorium would provide an appropriate amount of pressure for quick action on the issue (McKinney, 2013).

12 Gulf of Mexico Restoration Goals

The future of underwater artificial habitats using retired oil and gas structures should be considered within the context of future use considerations and current efforts to restore the Gulf of Mexico in a post-BP-spill era. Researchers have analyzed the potential for restoration activities and concluded that "At best, the long-term Gulf restoration plan would redress past insults and restore a resilient Gulf ecosystem similar in functioning to its historic baseline condition, within which compensatory restoration of habitat and natural resources injured by the Deep Water Horizon (DWH) oil release could be self-sustaining. President Obama's mandate to address historical and immediate ecological damage in the Gulf provides an opportunity for this ideal restoration strategy; the Mabus Report, commissioned by President Obama and written by Secretary of the Navy Ray Mabus, provides a broad and bold vision for how to proceed with important aspects of fulfilling this mandate" (Peterson, C.H., et al 2011).

"The Gulf ecosystem has been buffeted and so deeply modified by such a wide variety of anthropogenic and natural stressors that merely following traditional government guidelines for 'in-place, in-kind' compensatory restoration is unlikely to provide sustainable benefits. For example, the combination of subsidence, global sea level rise, shoreline erosion by major hurricanes, and erosion and flooding facilitated by numerous navigation channels cut through the wetlands could easily lead to submersion and drowning of *Spartina* marsh constructed at most or all sites where the DWH oil spill destroyed previous marsh

habitat. Consequently, at a minimum, compensatory restoration of injuries caused by DWH oil and collateral damage from emergency response actions should contemplate expected dynamic change to ensure durability of restoration projects" (Peterson, C. H. et al. 2011).

The ongoing discussion of how to deal with spent oil rigs can be approached from this broader context and considered as a contributing factor in the impending restoration of the Gulf of Mexico. One promising future scenario, once the oil and gas industry has exhausted economically recoverable hydrocarbon resources, would be a Gulf that is free of the discarded debris from the rigs that produced those hydrocarbons, or at least a Gulf that includes only the already-extensive system of artificial underwater habitats comprised of spent oil and gas structures that are now a public liability in states with *Rigs-to-Reefs* programs.

Is the Gulf of Mexico approaching a "critical mass" of such artificial structures, beyond which additional dumped materials are likely to contribute to cumulative ecological damage at a time when greater efforts are underway to create naturally resilient healthy ecosystems?

What would the economic valuation be of a Gulf of Mexico that resembled pre-industrial levels of ecosystem services and productivity? Would the continued disposal of hundreds and eventually thousands of retired offshore oil and gas structures into the Gulf ultimately delay the needed recovery leading to a healthy Gulf of Mexico? What navigational and safety problems for the "Post Panamax" ships and larger vessels now plying the waters of the world will discarded drilling jackets present? Especially in the case of deep-water rigs, what marine stressors result when leaving a temporary structure to decay on the seabed permanently?

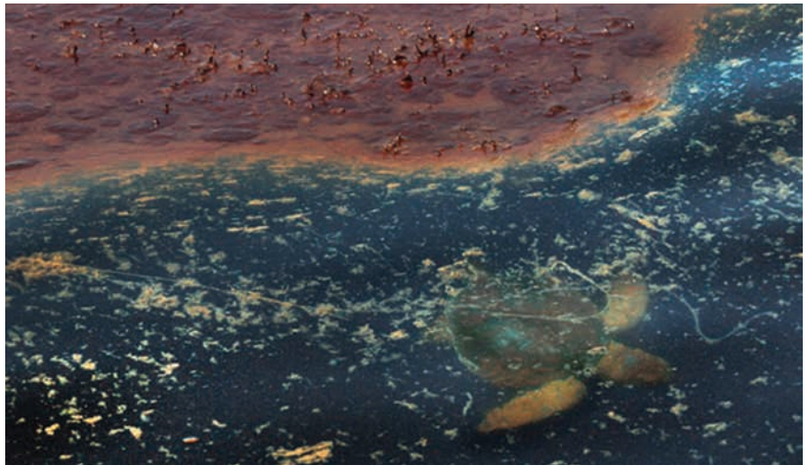
Protecting our nation's future long-term reliance on the Gulf of Mexico for safe navigation and transshipment of goods and for future sustainable seafood harvests is an objective that is likely within our reach, once constructive progress on current excess nutrient loading and coastal erosion due to loss of wetlands is made. But these worthwhile goals will be undermined if abandoned petroleum structures have not been removed as promised by industry when offshore oil and gas tracts were first leased. The liabilities, both fiscal and ecological, will fall to the public if hazards to navigation, persistent oil leaks, or other kinds of chronic pollution persist in the Gulf as a result of the continued permission to permit retired rigs to be dumped on the seabed under the guise of artificial reefs.

13

Implications for other Regions

The restoration of the Gulf of Mexico will provide critical lessons for other regions not yet facing immediate decisions about how best to deal with spent petroleum industry infrastructure and with determining how best to distribute the range of associated liabilities and return America's waters to natural levels of biological integrity and productivity.

The outcome of such decisions in Gulf waters will also skew consideration of bidding on future lease-sales in fragile marine areas elsewhere, if the oil industry knows it will be able to avoid millions of dollars in eventual decommissioning expenses, especially for deepwater rigs.



Sea Turtle oiled in sargassum. (Image: NOAA)

14 Recommendations for Action

To be certain, the problems and uncertainties spawned by harvesting petroleum in the Gulf of Mexico will take time to reconcile. However, there are fundamental steps that can be taken now to change perspectives, level the playing field and expedite results, including:

- **Re-examine the *Rigs-to-Reefs* program**
- **Involve the public in the federal and state decision-making process**
- **Include the public in monitoring state Rigs-to-Reefs programs**
- **Eliminate conflicts of interest in research**
- **Place the Gulf's future in national and global contexts**
- **Renew our nation's dedication to existing environmental laws that can help ensure healthy, robust and diverse Gulf of Mexico ecosystems**
- **Support effective management of all fisheries for long-term, ecosystem-based resilience and sustainability**
- **Establish deepwater preserves to protect biological diversity**

Further explanation is submitted to support each of these recommendations:

1. Re-examine the *Rigs-to-Reefs* program. Given the anticipated increase in the decommissioning of spent oil and gas structures in the Gulf of Mexico and elsewhere, it is time for the Interior Department and other involved state and federal agencies to begin a rigorous re-examination of the wisdom of continuing to casually utilize spent rigs in hopes of creating effective artificial underwater habitats in the Gulf of Mexico. Our review of the history, science, environmental impact, economics and sociology of the issue has failed to provide a demonstrated need, a fisheries management objective, or some other worthwhile goal in the analysis for allowing these structures to remain in our oceans, other than as a cost-saving benefit to the oil industry. This is an industry that has entered into legally binding agreements to remove these temporary structures once their economic life has come to an end. Importantly, scientists agree that the Gulf is not habitat-limited, thus there is no demonstrated need for more of these discarded structures. Recreational and commercial fishers and divers who dominate public discussion of the program have every right to express their views, but they also know better than anyone that they contribute to the over-fishing of key species of Gulf fisheries. The fish aggregate on the rigs, thereby facilitating their depletion by fishers and divers and undermining fisheries strategies to rebuild key fish stocks. Other environmental issues exist as well, including the threat of non-native invasive species and the overarching issue of liability from increasingly destructive hurricanes. It's time to end the expansion of the *Rigs-to-Reefs* programs and focus realistic efforts on managing the existing reef sites that have been established, which together comprise the largest artificial underwater habitat in the world. The Pew Environment report on restoring the Gulf of Mexico recommends that spent rigs be decommissioned as mitigation for dolphin losses from the BP Deepwater Horizon spill.

2. Involve the public in the federal decision-making process. There is a need for public involvement and oversight regarding decisions made to decommission oil and gas structures. The Interior Department has made great strides in formalizing the *Idle Iron* policy. The *Rigs-to-Reefs* waiver process that has been developed over the past few years, however, provides that structures can remain on the ocean floor to be reefed on site, or moved to another site. This dilutes the original goal that temporary structures should be removed once their useful life ends. The waiver is not justifiable in terms of supporting larger Gulf of Mexico restoration or fisheries goals and represents an unnecessary current and future liability to the states involved. It has been developed within an atmosphere that has been unduly influenced by the oil and gas industry to the exclusion of legitimate ocean conservation interests and absent a larger vision of a future healthy Gulf ecosystem. Involving a broad spectrum of individuals in this decision-making process with a view toward ending this one-sided waiver bias will benefit everyone. Representatives of all affected interests, including scientists, researchers, ocean conservation organizations, local community development leaders, residents, recreational boaters, divers, commercial and recreational fishermen, bar pilots, and cruise ship and cargo shipping industry representatives are all affected by decisions made to establish additional underwater artificial habitats, and should be included in future decisions about whether to continue granting such waivers.

3. Involve the public and provide monitoring in state *Rigs-to-Reefs* programs. There is a similar need for broad public involvement and oversight as well as regulatory monitoring of state managed "reefing sites" containing artificial underwater habitats in the Gulf of Mexico. This should be undertaken on a state-by-state basis. Plans should include management oversight through the creation of independent advisory panels. Involvement by a wide range of stakeholders in decisions about whether to deploy additional underwater artificial reef structures at the state level will ensure a more transparent process that incorporates the current and future needs of all those affected by their

potential development and hopefully an accurate valuation of the alternatives to action.

"Whether using designed materials or secondary use materials, it is likely that artificial reef development will continue at a pace that early activists would not have predicted, a situation that clearly requires examination and oversight" (Gulf States Marine Fisheries Commission & Atlantic States Marine Fisheries Commission 2004). If additional underwater artificial structures can be justified on the basis of a demonstrated need in the Gulf, beyond the already extensive placement of structures on the sea bottom, examination of best available materials is needed so that natural conditions can be more accurately achieved.

"Experimentation and small-scale deployment of specifically designed artificial reef structures began in the United States in the late 1970s, and continues to the present. While secondary use materials are still used in the majority of artificial reef construction projects, several coastal states have, in recent years, begun utilizing designed reef structures to carry out artificial reef development objectives. This expanded reliance upon designed reef materials is due, in part, to the development of more readily available, affordable, and seemingly dependable designs, recent increases in funding levels of some artificial reef programs, and the loss of previously relied-upon supplies of certain secondary use materials" (Reggio, 1987).

4. Eliminate conflicts of interest in research. Address institutional resistance. Scientific research and management of natural resources in the Gulf of Mexico is heavily influenced by the oil and gas industry. Independent research without conflicts of interest is needed to produce rigorous scientific analysis unhampered by political considerations, especially for those involved in scientific research of this aspect of oceanography.

By the same token, educational programs offered by NOAA and other government agencies should be conservation-oriented instead of biased toward promoting oil and gas interests. The oil industry is all too willing to sponsor such activities with a goal of influencing the message and diluting the ecological impact of their activities, but the public is not always well-served by the industry's promotional self-interest.

Strong support for natural resource protection should champion political considerations on the part of state and federal agencies vested with their management, some of which now accept donations from the petroleum industry to sponsor conferences and other activities that directly influence policy decisions. The inordinate influence of the oil and gas industry in the Gulf of Mexico must be overcome with a more balanced approach for all involved. This is especially critical in view of the continued growth of deepwater oil exploration and development in the Gulf of Mexico, and the compelling need for independent study of the impacts they generate.

"Legitimate concern over long-term, delayed impacts will persist if the science remains incomplete and the deep sea processes continue to be a black box of unknowns. Because of the probable mortality of particle feeders in the water column from exposure to fine particulate oil and of suspension and deposit feeders of the deep-sea floor from fouling by adhesive oil deposits, the most important deep-sea injury is likely to be disruption of energy flow and production in both pelagic and benthic food chains. Thus, restoration planning needs to address both restoration of deep-sea pelagic and benthic food-web production" (Peterson, C. H. et al. 2011).

5. Focus on the future of the Gulf in the national and global context. Integrate decision-making regarding the oil and gas industry and the *Rigs-to-Reefs* policy within the greater goal of restoring the Gulf of Mexico in a post-BP-spill era. As recommended in the Restoration Recommendations of an Expert Working Group after the BP spill, "Restoration will require a comprehensive and integrated plan focused on rebuilding the functional integrity and services of entire ecosystems that have been harmed as a consequence of the BP oil spill, in addition

to responding to the systematic degradation that has progressively compromised Gulf ecosystems. To ensure sustainability, restoration should be defined to include enhancement of natural resources over and above pre-Deepwater Horizon levels and should take explicit account of the highly dynamic nature of the Gulf environment that will require adaptive management as conditions change. The institutional mantra of 'in-place, in-kind' restoration is inappropriate without including analysis of sustainability and would probably lead to longer-term failures without planning for future changing conditions. Efforts to achieve durable restoration should not be diluted by calls for economic and community development" (Peterson, C. H. et al. 2011).

6. Renew dedication to existing environmental laws that seek to ensure healthy, robust and diverse Gulf of Mexico ecosystems. "In the late 1960s and early 1970s, Congress reacted to decades of increasingly unhealthy air and water pollution and unsustainable exploitation of natural resources by enacting a set of environmental statutes designed to protect, restore and maintain the country's natural resources and to manage those resources in a sustainable manner. These laws include National Environmental Policy Act (1969), Clean Air Act (1970), the Marine Mammal Protection Act of 1972, the Federal Water Pollution Control Act Amendments of 1972 (Clean Water Act), the Marine Protection, Research and Sanctuaries Act (the Ocean Dumping Act), Endangered Species Act and the Fishery Conservation and Management Act of 1976 (later renamed the Magnuson-Stevens Fishery Conservation and Management Act). These major federal statutes provide needed protections to sustain public health and to perpetuate the valuable services that ocean ecosystems provide naturally. Restoration of the Gulf ecosystems will depend on the effectiveness and improved compliance with these laws" (Peterson, C. H. et al. 2011).

7. Support effective management of all fisheries for long-term, ecosystem-based resilience and sustainability for the ultimate benefit of fishermen and the ecosystem itself. The *Rigs-to-Reefs* program has been a contributing factor in the overharvest of reef fish by recreational fishermen. Strengthening tested management strategies will bear great rewards. The result will be that stocks will rebuild and fishermen will ultimately find important compensations over time as fishery yields grow.

8. Establish deepwater preserves to protect biological diversity with support from the oil and gas industry. Biological preserves should be established to protect organisms, such as coral, that provide habitat structure. No comprehensive monitoring system exists for the whole northern Gulf, where oil and gas drilling is so intensely focused. Such marine protected areas would provide opportunities to monitor and learn more about these habitats, some of which feature deepwater corals, as well as to help researchers to uncover emerging damage of these valuable deep ocean communities so that adaptive management strategies can be employed to prevent further deterioration, especially for *Lophelia*, a deepwater coral, and other deep sea benthic communities.

"The current trend toward increased levels of deepwater drilling in the Gulf should require that the industry develop and deploy Deep Ocean Bottom Observatories (DOBOs) at some wellheads. Open access in real time to data showing what is happening at deep ocean habitats would also provide new avenues for informing and educating scientists and the public. DOBOs would facilitate monitoring of conditions and processes, research and public education of an intriguing and remote environment" (Peterson, C. H. et al. 2011).

Sonny Vergara, Skyshadow Photography

15 Bring Back the Gulf: Conclusions

The word "ecosystem" finds its meaning in the Greek word *oikos*, defining a "house, dwelling place, or habitation." The ocean is a critical and irreplaceable part of our collective home. Within ecosystems, diversity is closely connected with network structure. A diverse ecosystem is resilient because it contains many species with overlapping ecological functions that can partially replace one another. Humans are living with, and living as part of, the Earth's ocean ecosystem.

Left alone by human intervention and absent polluting activities, the ocean environment can prove to be a powerful and pervasive self-healing mechanism, and the case could be made that the natural ecosystem design that preceded the age of offshore oil development likely was the most successful biological niche that could have evolved in a particular location. Ultimately allowing the marine environment to restore itself was the stated rationale for the decommissioning contracts that the drillers originally accepted and signed when they began to explore and develop the offshore sites now in question, and there is no conclusive evidence that *Rigs-to-Reefs* is a beneficial use of spent drilling rigs for anyone but the accounting department of an oil company.

The outcome of the present debate over the future fate of obsolete drilling structures throughout the Gulf of Mexico has implications affecting as-yet-undrilled waters far beyond the confines of the Gulf itself. The Interior Department and the oil companies are well aware that altering the "life-cycle-costing" considerations for a company as it

evaluates whether to bid on a particular future drill site can prejudice a bidding decision considerably when the drilling company knows it will not be required to remove and recycle the rig itself at the end of its useful lifetime. This means that sensitive waters like the Arctic Ocean, the California coastline, the mid- and south-Atlantic regions, and Florida's long-protected Gulf Coast and Panhandle, for example, will be placed at increased jeopardy as industry bids more aggressively on challenging or remote drilling targets with the foreknowledge that each company ultimately will be able to just cheaply discard a platform in the ocean near the drilling site.

Allowing the ocean disposal of industrial trash by the petroleum industry also sets a dangerous future precedent for the discarding of other kinds of outmoded facilities from a range of industries. Massive offshore wind farms and wave energy hydrokinetic energy power plants are not expected to cause the major toxic pollution problems commonly associated with oil and gas production. But at the end of the useful life of each of these renewable energy facilities, dumping the structures and their anchor cables and extensive seafloor wiring on the seabed should not be the preferred option. Likewise, as offshore finfish aquaculture begins to be proposed for the Gulf and elsewhere, complex and fragile floating netpens, seabed anchors, and other extensive offshore infrastructure also can be anticipated. If the unresolved questions about biological pollution and escapement of non-native species associated with ocean aquaculture can be resolved, our marine environment will next face the discard of future leftover machinery from yet another industry trying to circumvent restoration amidst the dangerous cost-cutting precedent being set by the oil industry in the Gulf of Mexico today.

Decisions being made now about whether spent oil rigs need to be removed as promised have very broad implications. The decisions we make today about restoring the Gulf are, in effect, about the fate of much of our global ocean, either restored to former vitality, or as a junkyard of epic proportions. With tar balls and tar mats from the BP Deepwater Horizon spill still being recovered on our Gulf Coast beaches in Alabama and Florida as of 2014, it is abundantly clear that a true restoration ethic must play an important role in the future of America and, if we continue to lead by example, the world.

16 References

Ault, J. , Cowan, J., Rose, K., Sheehy, D. Gallaway, B., Love, M. 2009. " Search and Data Synthesis of Biological Information for Use in Management Decisions Concerning Decommissioning of Offshore Oil and Gas Structures in the Gulf of Mexico." MMS Contract # 1435-01-05-39082. Versar, Inc. Columbia, Maryland. February 2008.

Benson, K. 2013. "Gap Analysis for the application of artificial reefs as habitat restoration" presentation at the 66th annual meeting of the Gulf and Caribbean Fisheries Institute at Corpus Christi in November, 2013, NOAA Restoration Center, NOAA Fisheries Service. Corpus Christi, Texas.

Bohnsack, J. A. 1989. "Are high densities of fishes at artificial reefs the result of habitat limitation or behavioral preference?" Bull. Mar. Sci. 44: 631645.

Bortone, S. A. 1998. "Resolving the attraction-production dilemma in artificial reef research: some yeas and nays." Fisheries 23:6–10. http://www.tandfonline.com/doi/abs/10.1577/1548-8446%281998%29023%3C0006%3ARTADIA%3E2.0.CO%3B2#preview

Carney, R. S. 1997. "Workshop on environmental issues surrounding deepwater oil and gas development: Final report." OCS Study MMS 98-0022 US Dept. of the Interior, Minerals Mgmt. Service, Gulf of Mexico OCS Region, New Orleans, La. 163 pp. http://search.usa.gov/search?affiliate=boem.gov&query=Carney,R.S.%22Workshop%20on%20environmental%20issues%20surrounding%20deepwater%20oil%20and%20gas%20development

Christian, R.T. 1984. "Transportation Costs of Artificial Reef Materials." Sport Fishing Institute Technical Report No. 4, September 1984. Washington, D.C.: Artificial Reef Development Center, 10 pp.

Coastal Conservation Association. 2013 "Policy Shift Favors Artificial Reefing." June 27, 2013. www.joincca/articles/618.

Cowan, J. H., Jr., C. B. Grimes, W. F. Patterson III, C. J. Walters, A. C. Jones, W. J. Lindberg, D. J. Sheehy, W.E. Pine III, J. E. Powers, M. D. Campbell, K. C. Lindeman, S. L. Diamond, R. Hilborn, H. T. Gibson, and K. A. Rose. 2010. "Red snapper management in the Gulf of Mexico: science- or faith-based?" Fish Biology and Fisheries 21: 187–204. http://link.springer.com/article/10.1007%2Fs11160-010-9165-7#page-1

Cowan, J.H., Jr. 2011. "Red snapper in the Gulf of Mexico and U.S. South Atlantic: Data, doubt, and debate." Fisheries 36(7): 319-331. http://www.tandfonline.com/doi/abs/10.1080/03632415.2011.589318#preview

Davis, D. W. 1973. "Louisiana canals and their influence on wetland development." Ph.D. Dissertation, Louisiana State University, Baton Rouge, LA.

Delta Rigging & Tools. 2012. "Decommissioning and Abandonment Summit 2012" posted March 2, 2012. http://www.deltarigging.com/2012/03/02/769/

DOI BOEM. 2002. Regulations for Decommissioning Oil and Gas Structures. Federal Register, Vol. 67, No. 210, pages 66046-66049. October 30, 2002. http://www.gpo.gov/fdsys/pkg/FR-2002-10-30/html/02-26643.htm

DOI BOEM 2010. Regulations for Decommissioning Oil and Gas Structures. Federal Register, Vol. 67, No. 210, pages 66046-66049. September 2010. http://search.usa.gov/search?affiliate=boem.gov&query=Regulations%20for%20Decommissioning%20Oil%20and%20Gas%20Structures%20Sept.%202010

DOI BOEM 2014. Combined Leasing Report as of April 1, 2014. http://www.boem.gov/Combined-Leasing-Report/

DOI-BOEM & BSEE , EPA, NOAA, USCG USACOE. 2012. "Decommissioning and Rigs to Reefs in the Gulf of Mexico: Frequently Asked Questions" September 2012. http://www.bsee.gov/Exploration-and-Production/Decomissioning/FAQ/

DOI MMS. 1989. "Gulf of Mexico Sales 123 and 125: Central and Western Planning Area Final Environmental Impact Statement." U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Regional Office. New Orleans. http://books.google.com/books?id=HUvxAAAAMAAJ&pg=SL603-PA21&lpg=SL603-PA21&dq=MMS+Gulf+of+Mexico+Sales+123+and+125:+Central+and+Western+Planning+Area+Final+Environmental+Impact+Statement+1989&source=bl&ots=-AT6fM0zkT&sig=nlXuVIRbxHu0cGJzcYyyfVHGc0k&hl=en&sa=X&ei=erFeU6GxFIfRsQSouoCYAg&ved=0CCsQ6AEwAA#v=onepage&q=MMS%20Gulf%20of%20Mexico%20Sales%20123%20and%20125%3A%20Central%20and%20Western%20Planning%20Area%20Final%20Environmental%20Impact%20Statement%201989&f=false

DOI MMS. 2002. Regulations for Decommissioning Oil & Gas Structures. Federal Register, Vol. 67, No. 96, pages 35398-35411 May 17, 2002 https://www.google.com/search?q=Federal+Register%2C+Vol+67%2C+No.+96+page+35398&ie=utf-8&oe=utf-8&aq=t&rls=org.mozilla:en-US:official&client=firefox-a&channel=sb

DOI MMS. 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." Prepared by the Coastal Fisheries Institute, School of the Coast and Environment. Louisiana State University. U.S. Dept. of the Interior, Minerals Mgmt. Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study. http://www.boem.gov/Gulf-of-Mexico-OCS-Region-Publications/

DOI MMS. 2009. "*Rigs-to-Reefs* Policy Addendum: Enhanced Reviewing and Approval Guidelines in Response to the Post-Hurricane Katrina Regulatory Environment." U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, La. December 31, 2009. 4 pp. http://search.usa.gov/search?affiliate=boem.gov&query=Rigs%20to%20Reefs%20Policy%20Addendum%202009

Embesi, J., R. Eckert, E. Hickerson, M. Johnston, M. Nuttal, and G. P. Schmahl. 2013. "Benthic Community Composition Associated with a Petroleum Platform, High Island A-389-A, Located within the Flower Garden Banks National Marine Sanctuary." Poster presented at 66th annual meeting of the Gulf and Caribbean Fisheries Institute in Corpus Christi in Nov. 2013. http://flowergarden.noaa.gov/document_library/scidocuments.html

Gaskill, M. 2013. "Counting Fish: Wrap up and Conclusion." Scientific American blog. 12/23/13. http://blogs.scientificamerican.com/expeditions/2013/12/23/counting-fish-wrap-up-and-conclusion/

Gulf of Mexico Fishery Management Council. http://www.gulfcouncil.org

Gulf and South Atlantic Fisheries Foundation Inc. 2010. "Development of Social Indicators for Fishing Communities of the Southeast: Measures of Dependence, Vulnerability, Resilience and Gentrification," Tampa, Fl. NOAA Award # NA08NMF4270412 U.S. Dept. of Commerce. May 2010. www.gulfsouthfoundation.org/uploads/reports/103_final_full_Report.pdf

Gulf Monitoring Consortium. Manthos, D. david.manthos@skytruth.org 2014. "The Lens Volunteers use airborne patrols, satellite photos to spot oil spills along Louisiana coast." / January 23, 2014. http://www.gulfmonitor.org/category/uncategorized

Gulf Monitoring Consortium. teri@skytruth.org "Environmental Impacts From Hurricane Isaac" September 13, 2012. http://www.gulfmonitor.org/2012/09/

Gulf Seafood Institute Newsroom, "Federal Ruling on Allocation Favors Gulf Commercial Red Snapper Fishermen" March 28, 2014. http://gulfseafoodnews.com/2014/03/27/federal-ruling-on-allocation-favors-gulf-commercial-red-snapper-fishermen/

Hammer, D. 2010. "Interior Department should enforce rules on dismantling abandoned offshore oil platforms, congressman urges." The Times Picayune August 4, 2010. http://connect.nola.com/user/dhammer/posts.html

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." OCS Study MMS 2002-010. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. 98 pp. www.data.boem.gov/PI/PDFImages/ESPIS/2/3058.pdf

Hunger, D. 2010. "Preserving and Expanding the *Rigs-to-Reefs* Program in the Gulf of Mexico." Apache Corporation. Powerpoint Presentation. The Woodlands, Texas. January 20, 2010. www.ocsadvisoryboard.org/files/workshops/2010/5.pdf

Kaiser, M. J., and A. G. Pulsipher 2007. "*Idle Iron* 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 2007-031. 197 pp. www.data.boem.gov/PI/PDFImages/ESPIS/4/4254.pdf

Kasperzak, R., 2009. Louisiana Dept. of Wildlife and fisheries, personal communication from Shipp, R.L. and S.A. Bortone. 2009. "A perspective of the importance of artificial reef habitat on the management of red snapper in the Gulf of Mexico." Reviews in Fisheries Science 17: 41-47.

Kelly, S. 2012. "BP Spill Two Years After." E Magazine. http://www.emagazine.com/daily-news/bp-spill-two-years-after/

Litvan, L. 2014. "Drillers Eye Gains From Oil-State Senators Heading Panel" Bloomberg.com. Bloomberg Politics. February 10, 2014. http://www.bloomberg.com/news/2014-02-11/drillers-eye-gains-from-oil-state-senators-heading-panel.html

R.R. Lukens, and C. Selberg, Editors, Ansley, H., C. M. Bailey, D. Bedford, M. Bell, M. Buchanan, L. Dauterive, J. Dodrill, B. Figley, J. Francesconi, S. R. Heath, B. Horn, R. Kasprzak, C. LaPorta, V. Malkoski, R. M. Martore, M. H. Meier, K. Mille, R. Satchwill, D. Shively, Frank Steimle and J. Tinsman, authors. 2004. "2004 Guidelines for Marine Artificial Reef Material." Gulf States Marine Fisheries Council & Atlantic States Marine Fisheries Commission. U. S. Fish & Wildlife Service Grant No. GS 96 Amendment 7, A-4-1, and A-5-1. 205 pp. January, 2004. http://myfwc.com/conservation/saltwater/artificial-reefs/ar-program

J. Lubchenco, Palumbi, S. R, Gaines, S. D., and Andelman, S. 2003. "Plugging a Hole in the Ocean: The Emerging Science of Marine Reserves." Ecological Applications, 13(1) Supplement, 2003, pp. S3–S7q 2003 by the Ecological Society of America. http://www.esajournals.org/toc/ecap/13/sp1

Mabus, R. 2010. "America's Gulf coast: a long term recovery plan after the Deepwater Horizon oil spill." 130 pages. http://libguides.tulane.edu/content.php?pid=20077&sid=697717

Marshall, B. 2014 "Telltale Rainbow Sheens Show Thousands of Spills Across the Gulf" NPR http://www.npr.org/2014/04/19/304707516/telltale-rainbow-sheens-show-thousands-of-spills-across-the-gulf/ April 19, 2014.

McKinney. L., Nussman, M., Sterne, J. 2013 (OCF) "*Rigs-to-Reefs*: Creating Thriving New Reef Ecosystems." ICCF Foundation March 11, 2013 http://iccfoundation.us/index.php?option=com_content&view=article&id=471:rigs-to-reefs-creating-new-cosystems&catid=73:briefings-2013&Itemid=jmcmanus@rsmas.miami.edu, McManus, John. "Artificial Reefs" NOAA Coral-list.gov Oct 18 & 22, 2013.

Miller, J. E., and E. R. Jones. 2003. "A study of shoreline trash: 1989-1998 Padre Island National Seashore." National Park Service, U.S. Department of the Interior.

National Research Council (NRC). 1995. "Clean Ships, Clean Ports, Clean Oceans: Controlling Garbage and Plastic Wastes at Sea." The National Academies Press, Washington, D.C. 384 pages. http://www.nap.edu/openbook.php?isbn=0309051371

National Research Council. "An Assessment of Techniques for Removing Offshore Structures." Washington, DC. The National Academies Press. 1996. http://www.nap.edu/catalog.php?record_id=9072

National Research Council (NRC). 2008. "Tackling Marine Debris in the 21st Century." The National Academies Press, Washington, D.C. 218 pages. http://www.nap.edu/catalog.php?record_id=12486

Neff, J.M., S. McKelvie and R.C. Ayers, Jr. 2000. "Environmental impacts of synthetic based drilling fluids." Report prepared for MMS by Robert Ayers & Associates, Inc. August 2000. U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 2000-064. 118 pp. www.data.boem.gov/PI/PDFImages/ESPIS/3/3175.pdf

NOAA 2005. "Case: Tank Barge DBL152, Federal Waters of the Gulf of Mexico" General Counsel for Natural Resources, Office of Habitat Conservation, Office of Response and Restoration, Southeast Region. 2005. http://www.darrp.noaa.gov/southeast/dbl152/

2014 OCS Workshop *Getting Back to Business*. 2014. "BOEM Operational Risk Factors on the OCS" www.ocsadvisoryboard.org/. Andarko Tower, The Woodlands, Texas. January 23, 2014

Peterson, C. H. et al. 2011. "A Once and Future Gulf of Mexico Ecosystem: Restoration Recommendations of an Expert Working Group." Pew Environment Group. Washington, DC. 112 pp. sgmsummit.org/stepping-stones/pdf/12-OnceAndFuture.pdf

Polovina. J. 1989. "Should anyone build reefs?" Bulletin of Marine Science 1989 44(2):1056-1057. http://coral.aoml.noaa.gov/pipermail/coral-list/2013-October/013501.html

Powers, Sean J., Jonathan H. Grabowski, Charles H. Peterson, William J. Lindberg. 2003. "Estimated enhancement of fish production by offshore artificial reefs: uncertainty exhibited by divergent scenarios." Mar Ecol Prog Ser 264: 265-277. www.int-res.com/articles/theme/m264p265.pdf

Pulsipher, A. G., 0 .0. 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." Prepared by the Center for Energy Studies, Louisiana State University, Baton Rouge, La. OCS Study MMS 2001-013 . U.S . Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, La. 52 pp . www.data.boem.gov/PI/PDFImages/ESPIS/3/3104.pdf

Quirolo, D. 2014. "No Oil Drilling" blog http://www.reefrelieffounders.com/drilling/

Reggio, V., V. Van Sickle, and C. Wilson. 1986. "Rigs to Reefs." Louisiana Conservationist. January/February 1986. Louisiana Department of Wildlife and Fisheries, Baton Rouge, La. pp. 4—7.

Reggio, Jr., V.C. 1987. "*Rigs-to-Reefs*: The use of obsolete petroleum structures as artificial reefs." Reprint from the collections of the University of California Libraries. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Report MMS 87-0015. 6--7, 17 pp.

Saunders, Kyle (Prof Goose) 2011. "OGPSS Gulf of Mexico Production and Hurricanes. BP Thunderhorse image. Bit Tooth Energy. July 27, 2011. http://bittooth.blogspot.com/2011/07/ogpss-gulf-of-mexico-production-and.html

Schwacke, L., et. al. 2014. "Health of Common Bottlenose Dolphins (Tursiops truncates) in Bataria Bay, Louisiana, Following the Deepwater Horizon Oil Spill," Environmental Science & Technology. 2014, 48 (1), pp 93–103. http://pubs.acs.org/doi/abs/10.1021/es403610f

Shipp, R. L., and S. A. Bortone. 2009. "A prospective of the importance of artificial habitat on the management of red snapper in the Gulf of Mexico." Reviews in Fisheries Science 17:41–47.

Spiegel, R.P. 2013. "The Oil Leak in the Gulf We're Not Supposed to Know About." Triple Pundit people planet profit. March 13,2013. http://www.triplepundit.com/2013/03/oil-leak-gulf-supposed-about/

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." OCS Study MMS 2000-005. Prepared by the Coastal Fisheries Institute, Center for Coastal, Energy and Environmental Resources Louisiana State University. U.S. Dept. of the Interior, Minerals Mgmt. Service, Gulf of Mexico OCS Region, New Orleans, LA 252 pp. DOI-BOEM http://www.data.boem.gov/PI/PDFImages/ESPIS/3/3156.pdf

Stone, R.B. 1985. "National Artificial Reef Plan." NOAA Technical Memorandum, NMFS OF-06 National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Washington, DC. Pg 3. www.nmfs.noaa.gov/sfa/PartnershipsCommunications/NARPwCover3.pdf

Streich, M., M. Ajemian, J. Wetz and G. Stunz. 2013. "Relative abundance and size structure of Red Snapper, Jutjanus Campechanus, across habitat types in the northwestern Gulf of Mexico," Texas Parks & Wildlife Department preliminary report presented at 66th annual meeting of the Gulf and Caribbean Fisheries Institute in Corpus Christi in Nov. 2013.

Summers, Dave. 2011. Oilprice.com "The Offshore Oil Industry and Hurricane Season." July 29, 2011. http://oilprice.com/Energy/Energy-General/The-Offshore-Oil-Industry-And-Hurricane-Season.html

Sweet, Rod. 2014 Decomworld.com "Proactive approach to well integrity "urgently needed", expert warns" April 20, 2014. http://social.decomworld.com/structures-and-maintenance/proactive-approach-well-integrity

Sweet, Rod. 2014. Decomworld.com "Deepwater decommissioning up to four times more costly, study finds." April 20, 2014. http://social.decomworld.com/structures-and-maintenance/deepwater-decommissioning-four-times-more-costly-study-finds

Sydney Morning Herald. 2005. "Billiton oil platform badly damaged b y Rita. Business. September 27, 2005. http://www.smh.com.au/news/business/billiton-oil-platform-badly-damaged-by-rita/2005/09/27/1127586840609.html

Turner, R.E., E.M. Swenson, C.S. Milan and J.M. Lee. 2007b. "Hurricane signals in salt marsh sediments: inorganic sources and soil volume." Limnology and Oceanography 52: 1231-1238.

Twachtman Snyder & Byrd, Inc. and Center for Energy Studies, Louisiana State University. 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. 50 pp. www.boem.gov/BOEM-Newsroom/Library/Publications/2004/2004-074.aspx

Twachtman Snyder and Byrd, Inc. 2006. Platform Listing Service. http://pls.tsboffshore.com/sellindex.asp.

U.S. Dept of Commerce. 2007. "National Artificial Reef Plan (as amended): Guidelines for Siting, Construction, Development, and Assessment of Artificial Reefs," Washington, D.C.: National Oceanic and Atmospheric Administration. Page 24, 38. www.nmfs.noaa.gov/sfa/PartnershipsCommunications/NARPwCover3.pdf

Wetz, J., M. Ajemian and G. Stunz 2013 "Fish community structure and abundance on Texas artificial reefs: A preliminary assessment." Texas Parks & Wildlife Department preliminary report presented at 66th annual meeting of the Gulf and Caribbean Fisheries Institute in Corpus Christi in November 2013.

Wiegand, S. 2011. "An Analysis to the Main Economic Drivers for Offshore Wells Abandonment and Facilities Decommissioning." Thesis presented to the faculty of the Graduate School of The University of Texas at Austin for Master of Science in Engineering. August 2011.

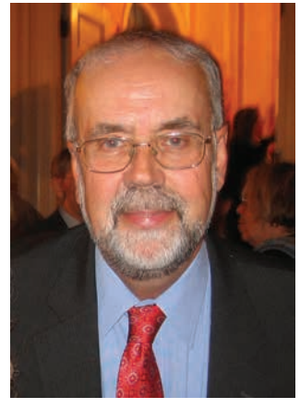
Wilson, C.A., A. Pierce, and M.W. Miller. 2003. "Rigs and Reefs: a Comparison of the Fish Communities at Two Artificial Reefs, a Production Platform, and a Natural Reef in the Northern Gulf of Mexico." Prepared by the Coastal Fisheries Institute, School of the Coast and Environment. Louisiana State University. U.S. Dept. of the Interior, Minerals Mgmt. Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 2003-009. 95 pp. www.data.boem.gov/PI/PDFImages/ESPIS/0/176.pdf

Yergin, D. "The Prize: The Epic Quest for Oil, Money, and Power" New York. Simon and Schuster, 877 pp. (1991). http://www.amazon.com/The-Prize-Quest-Money-Power/dp/1439110123

About the Authors

DeeVon Meade Quirolo is a Florida native who loves the ocean. She is an experienced marine conservationist with a focus on the protection of coral reefs and water quality. She and her husband Craig Quirolo founded Reef Relief, a Key West-based non-profit organization dedicated to coral reef protection. The effort began in 1986 with installing mooring buoys to protect Keys reefs from anchor damage, in addition to educational programs and watchdog advocacy efforts. This led to establishing similar grassroots programs throughout the Caribbean, advanced wastewater treatment in Key West, bans on offshore oil development in the Florida Keys and creation of the Florida Keys National Marine Sanctuary. DeeVon was graduated from The George Washington University and attended law school at the University of Miami. She and Craig live in Brooksville, Florida, where she maintains several blogs including one that monitors oil and gas development.

http:// www.reefrelieffounders.com, http://www.reefreliefarchive.org
Email: dquirolo@gmail.com



Richard Charter is a native Californian and a Senior Fellow with The Ocean Foundation. Richard has been working with elected officials, fishing interests, and the conservation community for over three decades on behalf of coastal communities dealing with offshore oil and gas drilling issues. Richard coordinated the local government support that led to the creation of the Gulf of the Farallones, Cordell Bank, Channel Islands, and Monterey Bay National Marine Sanctuaries, and presently serves as Vice-Chair of the Gulf of the Farallones Sanctuary Advisory Council. Richard is also an appointee to the U.S. Department of Energy's Methane Hydrates Advisory Committee, which makes policy recommendations affecting future Gulf hydrocarbon technologies. Richard helped to facilitate congressional passage and designation by President George W. Bush of the bipartisan *Gulf of Mexico Energy Security Act* that provides a lease-free buffer off of Florida's Gulf Coast and Panhandle until at least 2022, while sending a portion of existing drilling revenues to various Gulf States. In addition, Richard works on improving worker and environmental safety policies affecting the offshore oil and gas industry. Richard and his wife Marilyn Castellblanch live on the Northern California coast and have three grown sons and two grandchildren, part of the future generations to whom this publication is dedicated.

http://www.oceanfdn.org/
Email: waterway@sonic.net

Front Cover Photo Credits:

1. Background Sunset: Bob Webb images.
2. BP Deepwater Platform Thunderhorse after Hurricane Dennis 2011 Prof Goose

   http://oilprice.com/Energy/Energy-General/The-Offshore-Oil-Industry-And-Hurricane-Season.html
3. *Rigs-to-Reefs* deployment at the High Island A-497 site, located 80 NM southeast from Freeport, TX. The image shows the top of the structure, which has been partially removed and placed next to the base. Image: Chris Ledford, Texas Parks and Wildlife Department.
4. Sea turtle: Craig Quirolo, http://reefreliefarchive.org

Back Cover Photo Credits:

1. Wetland image: Sonny Vergara, Skyshadow Photography.
2. A segment of the large ExxonMobil Harmony platform in 1998 onshore prior to its installation in California waters. For scale, the arrow points to a person. Image: Robert C. Byrd, TSB Offshore.

Bring Back the Gulf

The underlying agreement between the oil companies and the public has, from the beginning, been based on clear assurances that spent offshore drilling rigs would be removed and the seafloor restored when oil and gas extraction reached its conclusion. Thousands of such rigs, designed as temporary installations, are coming up for decommissioning in the Gulf of Mexico over the next few years. The *Rigs-to-Reefs* waiver process instead allows these massive industrial structures to become permanent fixtures on the ocean floor. This waiver obviously saves the petroleum industry millions of dollars, but is not justifiable in terms of supporting larger Gulf of Mexico restoration or fisheries goals. These structures impose an unnecessary long term maintenance and liability burden on the public in states with *Rigs-to-Reefs* programs and create serious environmental and stakeholder issues. *Bring Back the Gulf* is the story of how Big Oil decided to fool the American taxpayer, and why their complicated scheme is not in the public interest.