

Assessing impacts of the Deepwater Horizon oil spill in the Gulf of Mexico

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While numerous studies are under way to determine the impacts of the Deepwater Horizon oil spill on the Gulf of Mexico, the extent and severity of these impacts and the value of the resulting losses cannot fully be measured without considering the goods and services provided by the Gulf, says a new report from the National Research Council. The congressionally mandated report offers an approach that could establish a more comprehensive understanding of the impacts and help inform options for restoration activities.

Currently, state and federal [resource managers](#) tasked with providing timely assessments of the damage use a process called the Natural Resources Damage Assessment, which is authorized under the Oil Pollution Act of 1990 and measures impacts in ecological terms such as the number of fish killed or acres of wetland destroyed. As a result, restoration activities usually focus on replacing individual resources. But the impacts of environmental damage extend beyond individual resources, the report says.

The people who live and work in the Gulf region depend on ecosystems for services such as food and fuel, flood and storm protection, and tourism and recreation. Damage to natural resources could impair these services, leading to social and [economic impacts](#) that may not be apparent from an assessment of [environmental damage](#) alone. In a 2011 interim report, the authoring committee introduced the concept of an ecosystem services approach to damage assessment, which requires an understanding of the environmental impacts from a disruption, the resulting decrease in goods and services, and the cost of those losses to individual communities and society at large.

In the final report, the committee illustrated how this approach might be applied to [coastal wetlands](#), fisheries, marine mammals, and the deep sea—each of which provide key ecosystem services in the Gulf—and identified substantial differences

among these case studies. For example, the amount and quality of available baseline data varies significantly among these ecosystem services. The case studies also demonstrate that some services are more easily monetized than others.

Coastal wetlands. Approximately 1,100 linear miles of coastal wetland were affected by the Deepwater Horizon oil spill. In areas where roots survived the impact, little to no long-term impairment is expected. However, where the oil destroyed vegetation and root systems, sediment erosion converted the marshland to open water. Since storm mitigation is directly related to the total area of wetlands, the change in area is the most practical measurement of change in ecosystem services. The service can be valued in monetary terms by estimating the cost of storm damage that would be incurred in the absence of the wetlands.

Fisheries. Fishery closures decreased commercial production by 20 percent, which created an immediate economic hardship for fishermen. The spill also triggered public concerns regarding the safety of Gulf seafood. Productivity of the fish populations could be impacted by the spill's toxic effects on reproduction and development, which may take years or decades to determine. Although certain fisheries may experience persistent impacts, others have already shown signs of recovery. The economic value of fisheries as an ecosystem service can be calculated using data on market prices, harvest yields, and production costs.

Marine mammals. Dolphins provide scientific, cultural, and recreational services in the Gulf of Mexico. Beginning before the oil spill in February 2010 through December 2012, 817 bottlenose dolphin deaths were documented, compared with about 100 per year between 2002 and 2009. Because some dead dolphins were likely not found and not reported, these figures underestimate actual mortality. However, uncertainty regarding the

abundance of dolphins and the range of environmental stressors that affect them complicate the assessment of the true impact of the oil spill on their populations and the ecosystem services they provide.

Deep sea. The deep sea is the largest yet least well-understood region of the Gulf, making it difficult to assess the full impact of the oil spill on ecosystem services. Among the services derived from the deep sea are pollution attenuation by hydrocarbon-degrading microbes, and nutrient recycling, which supports much of the marine biodiversity at all depths in the Gulf of Mexico.

In addition, the committee evaluated a suite of technologies used in the spill response. Techniques applied offshore, including burning, skimming, and chemical dispersants, reduced the volume of oil by as much as 40 percent before it reached shore, while those applied near or onshore were comparatively less effective and more expensive. But the unprecedented scale at which these techniques were applied leaves the long-term impacts on [ecosystem services](#) to be determined, the report says.

Lack of data on the ecological conditions of the Gulf before the spill and an incomplete understanding of complex ecosystem interactions make establishing the full scope of damage difficult. Capturing the entire range of impacts will also require more data on human and economic factors, as well as the development of models that can describe the complex dynamics of ecosystem interactions and better inform decision makers. The report emphasizes that many services may have enormous value despite being difficult to measure, and that such services should be given adequate consideration in evaluating restoration options.

Provided by National Academy of Sciences

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