



Our Coast Three
Years Later
Oil Spills and Gulf Ecology
spillscience.com
www.usm.edu/gcrl

THE ROLE OF SCIENCE IN AN EMERGENCY

Science involves more than the gaining of knowledge. It is the systematic and organized inquiry into the natural world and its phenomena. Science is about gaining a deeper and often useful understanding of the world.

Vanderbilt University course quoted at: <http://www.gly.uga.edu/railsback/1122sciencedefns.html>

Science is based on evidence and each result must be reproducible. This requirement makes the process of acquiring new knowledge to address the oil spill a time consuming task. Scientists from around the world are researching questions related to the Deepwater Horizon oil spill in the Gulf of Mexico. Each new bit of information will provide a small piece to the puzzle. As results are confirmed, our knowledge expands and we improve our understanding of the oil spill's effects on the Gulf. This fact sheet lists some of the ways science can be used during and after a crisis.



Satellite image of Deepwater Horizon oil slick in the northern Gulf of Mexico, May 24, 2010. NASA GSFC MODIS, public domain.

1. RESPOND

- Science provides knowledge gained from previous spills. Government, industry and academic scientists worked to apply existing knowledge to the very different set of conditions presented by the Deepwater Horizon Oil Spill. They also collected data to address a suite of new conditions. For example:
 - How can the flow be stopped?
 - How much oil is being released?
 - Where is the oil going?
- Results from studies on these questions are summarized in a paper written by senior scientists from the federal agencies that played leadership roles in the response (Lubchenco *et al.* 2012).

2. ASSESS

- Science evaluates both immediate and long term effects of an oil spill.
 - A **baseline** is a collection of data that tells us what exists before an emergency occurs. To determine if sea water and resident life forms were changed by the oil spill, we must know what the sea water and organisms were like under pre-spill conditions. For decades scientists at the Gulf Coast Research Laboratory have collected data to facilitate comparisons in the Mississippi Sound.
 - Scientists also conduct **experiments** to address specific hypotheses (ideas about how things work).
- Science addresses immediate needs:
 - Inform decision makers to use dispersants to accelerate natural degradation of the oil (Lubchenco *et al.* 2012).
 - Determine safety of Gulf seafood – this led to new methods of testing for oil and dispersant by NOAA and the Food and Drug Administration (Lubchenco *et al.* 2012).
- Science addresses long term questions: Project scientist, Dr. Dick Lee of Skidaway Institute of Oceanography, is exploring the effect of oil and dispersant on grass shrimp and blue crabs.

3. RESTORE

- Science helps managers determine how to mitigate impacted habitats.
 - Previous spills have taught us much about restoring coastal habitats such as salt marshes.
 - Little is known about the effect of oil and dispersant on deep habitats located near the spill.
- Ideally the restoration effort will bring the Gulf of Mexico system back to its pre-spill condition. Scientists must learn how all the habitats and components of this system were affected as well as what actions can safely be taken to restore them.

4. UNDERSTAND

- Science can reveal a whole new understanding of the Gulf of Mexico as a result of research conducted because of the Deepwater Horizon oil spill:
 - Clarifying exact locations of bluefin tuna spawning grounds (Muhling *et al.* 2012).
 - Unfortunately, sometimes this new understanding recognizes damage because of exposure to oil and dispersants, as in the case of deepwater corals (White *et al.* 2012).
- BP has dedicated \$500 million dollars over ten years to research the effects of the oil spill.
 - Information about the projects already initiated and their results is available through the Gulf of Mexico Research Initiative (<http://research.gulfresearchinitiative.org/gomri-publications/>).
 - Results will contribute in expected (spill effects) and unexpected areas (climate change).

5. PREVENT

- Science can help us avoid future disasters by providing better information for decisions:
 - The Deepwater Horizon oil spill was different from previous oil spill experiences in the duration (87 days) and depth of the release (5000 ft; 1500 m), the mixing oil experienced as it came from the wellhead, the application of dispersant at surface (1,230,000 US gal; 4,700,000 L) and depth (770,000 US gal; 2,900,000 L) and the magnitude (210,000,000 US gal; 780,000,000 L).
 - Laws like the Oil Pollution Act, regulations by the EPA, and policies and procedures used to address the oil spill were designed in the past (Peterson *et al.* 2012).
 - Lawmakers will use new information science produces from this disaster to make laws more appropriate to the increasingly common production of oil in deep water.

REFERENCES

Lubchenco, J., M. McNutt, G. Dreyfus, Murawski, D. Kennedy, P. Anastas, S. Chu, T. Hunter. 2012. Science in support of the Deepwater Horizon response. *Proceedings of the National Academy of Sciences* 109:50:20212-20221.

Muhling, B. A., Roffer, M. A., Lamkin, J. T., Ingram, G. W., Jr., Upton, M. A., Gawlikowski, G., Muller-Karger, F., Habtes, S., Richards, W. J. 2012. Overlap between Atlantic bluefin tuna spawning grounds and observed Deepwater Horizon surface oil in the northern Gulf of Mexico. *Marine Pollution Bulletin* 64:4:679-687.

Peterson, C.H., Anderson, S.S., Cherr, G.N., Ambrose, R.F., Anghera, S., Bay, S., Blum, M., Condon, R., Dean, T.A., Graham, M., Guzy, M., Hampton, S., Joye, S., Lambrinos, J., Mate, B., Meffert, D., Powers, S.P., Somasundaran, P., Spies, R. B., Taylor, C.M., Tjeerdema, R., Adams, E.E.. 2012. A tale of two spills: Novel science and policy implications of an emerging new oil spill model. *Bioscience* 62:5:461-469.

White, H.K., P. Yuan Hsing, W. Cho*, T.M. Shank, E. Cordes, A.M. Quattrini, R. K. Nelson, R. Camilli, A. Demopoulos, C.R. German, J.M. Brooks, H.H. Roberts, W. Shedd, C.M. Reddy, and C.R. Fisher. Impact of the Deepwater Horizon oil spill on a deep-water coral community in the Gulf of Mexico (2012) *Proceedings of the National Academy of Sciences (Special Feature)*. 109:50:20303-20308.

