OIL SPILL SCIENCE

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TOP 5 FREQUENTLY ASKED QUESTIONS ABOUT THE DEEPWATER HORIZON OIL SPILL

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This outreach publication addresses the five most common questions that tourists have surrounding how oil was cleaned up, where the oil moved in the environment, and the ecological and health impacts of the spill.

In April 2010, the Deepwater Horizon (DWH) oil spill occurred about 50 miles offshore of Louisiana. Approximately 172 million gallons of oil entered the Gulf of Mexico. Roughly 1.8 million gallons of the **dispersants Corexit 9527A and 9500A** (referred to as Corexit in this document) were used to break-up the oil to reduce the amount of oil reaching the shoreline.

Filming of oil slick at the site of the Deepwater Horizon oil spill. (NOAA)

QUESTION #1: *Is Gulf seafood safe to eat?*

The DWH oil spill left some consumers with concerns about eating Gulf seafood. Ongoing monitoring has shown that Gulf seafood harvested from waters that are open to fishing is safe to eat.

During the oil spill, federal agencies, such as National Oceanic Atmospheric Administration (NOAA), U.S. Food and Drug Administration (FDA) and U.S. Environmental Protection Agency (EPA) worked with Gulf of Mexico states to develop a testing program to ensure seafood safety. Additionally, state agencies conducted their own sampling in state waters.[1]

Seafood had to pass a series of tests in order for the waters to be reopened for fishing.[1,2] In areas that were free of an oil sheen, the edible portion of fish, blue crabs, oysters, and shrimp were collected from waters and tested. If these samples passed a smell and taste test, they were tested for **polycyclic aromatic hydrocarbons (PAHs)**, one of the toxic parts of oil, and **dioctyl sodium sulfosuccinate (DOSS)**, a chemical found in dispersants. If the levels of chemicals were below the FDA's level of concern, the area was reopened to fishing. The level of concern determines how much of a certain chemical will harm a human. By testing seafood samples and making sure the chemicals were below these levels, the FDA could determine when Gulf seafood was safe to eat.

Federal and state agencies tested more than 22,000 seafood samples for PAHs and DOSS. Not a single sample came back with levels above the level of concern established by the U.S. Food and Drug Administration (Figure 1).[1,3,4,5,6]

Scientists continue to test seafood from the Gulf of Mexico that people catch or buy at the market. To learn more about the sampling that occurred, and to access the data from these sampling programs, read our outreach publication about seafood safety at the Oil Spill Science Outreach website (http://gulfseagrant.org/oilspilloutreach).

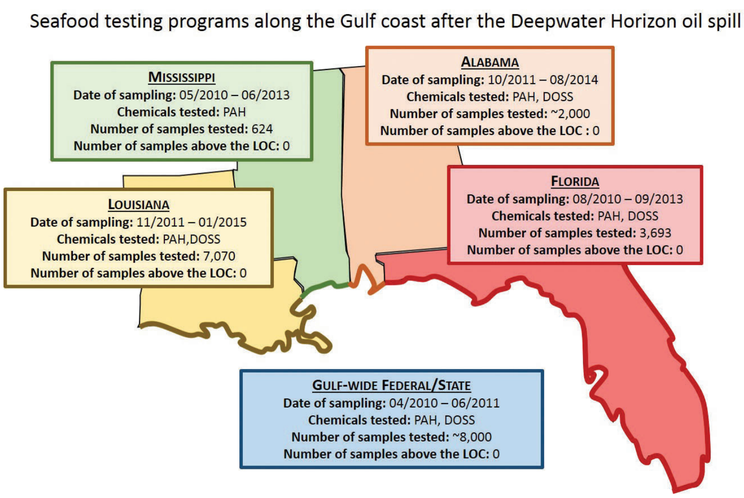

FIGURE 1. *Federal and state agencies tested seafood for polycyclic aromatic hydrocarbons (PAHs) and dioctyl sodium sulfosuccinate (DOSS), a chemical in dispersants after the Deepwater Horizon oil spill. Finfish, shrimp, oysters, and crabs were sampled in the federal program and by all state programs, and Florida also tested clams and lobsters. Of the more than 22.000 seafood samples tested, none contained PAH or DOSS concentrations above the Food and Drug Administration's Level of Concern (LOC).*[1,3,4,5,6] *(Mississippi-Alabama Sea Grant)*

QUESTION #2: *What are the impacts to wildlife?*

The Gulf of Mexico is a complex **aquatic ecosystem** comprised of many different **species** living in different, but connected **habitats** -- from **bacteria**, fish, oysters, to whales, turtles, and birds. **Food webs** interconnect all wildlife and humans (Figure 2). When oil enters an aquatic ecosystem, impacts from the spill could flow through the food web and influence entire **populations** and **communities** of interacting organisms.

These interactions can make the question of "How did the DWH oil spill affect wildlife?" complicated to answer. Scientists are addressing this challenge by grouping studies into three general groups: 1) how oil may affect a single **organism**, 2) how the oil spill affected a group of organisms of the same species and, 3) how the oil spill affected many different species living in an area or habitat together.

In the lab, scientists found that exposing very young fish (killifish, mahi-mahi, spotted sea trout, and tuna) to oil-based compounds causes problems with important metrics such as heart development, growth, and swimming ability.[7,8,9,10,11] Scientists study how these health problems might affect populations of fish. Some studies involved catching and counting populations of fish in oiled inshore areas, both before and after the DWH oil spill. Some results showed that a few species experienced a brief drop in abundance but quickly regained normal levels.[12,13,14] Other species showed an increase in abundance, but results have not been conclusive.[12,13,14] While oil affected individuals of some fish in the lab, scientists have not found consistent evidence that the DWH oil spill impacted whole fish populations or communities in the wild.[12,13,14] Scientists continue to study fish populations over time to determine the long term impact the oil spill might have.

The oil spill did affect at least one non-fish population. A mass die-off of a population of bottlenose dolphins living in the Gulf was linked to exposure to chemicals from DWH oil.[15,16] The loss of these dolphins was not caused by eating contaminated fish, rather it was due to disease complicated by oil exposure. It is not yet known if the loss of dolphins will cause an impact to its **prey**, which includes fish, squid, and crustaceans.[17]

Food webs, disease, and many other elements, are all involved in understanding wildlife impacts from oil spills. The answer to this question will require a long-term investigation into the dynamics of species and their environment.

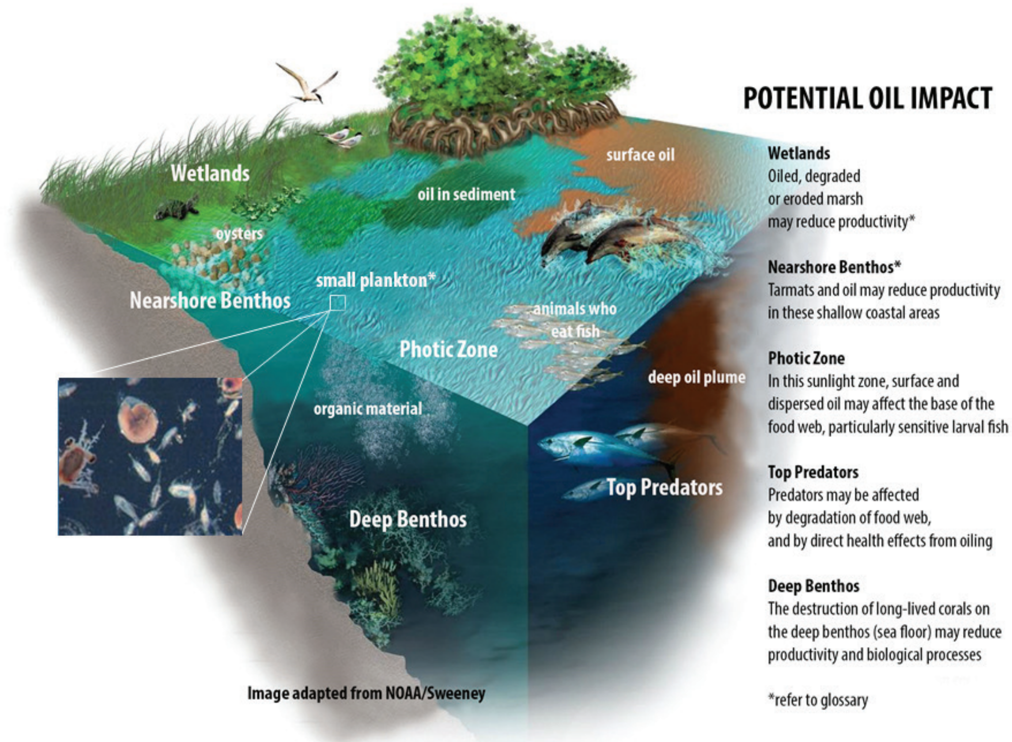

FIGURE 2. *The Gulf of Mexico ecosystem is a made up of a variety of animals living in different, but connected habitats. Because of this, oil exposure may impact animals and habitats both directly and indirectly. (Adapted from Kate Sweeney illustration with contributions from Florida Sea Grant/Anna Hinkeldey)*

QUESTION #3: *What cleanup techniques were used, and how were they implemented?*

During the DWH oil spill, responders used different methods to remove the oil. Offshore, responders focused on removing the oil using skimmers and controlled burns.[18]

Skimmers are devices used for removing oil from the sea's surface before it reaches the coastline (Figure 3). During the DWH oil spill, boats equipped with skimmers were used near the site of the spill. Boats with smaller skimmers were used near-shore at beaches, bays, and around marshes.[18] Oil on the surface was also removed by enclosing it with fireproof booms and then burning it.[19]

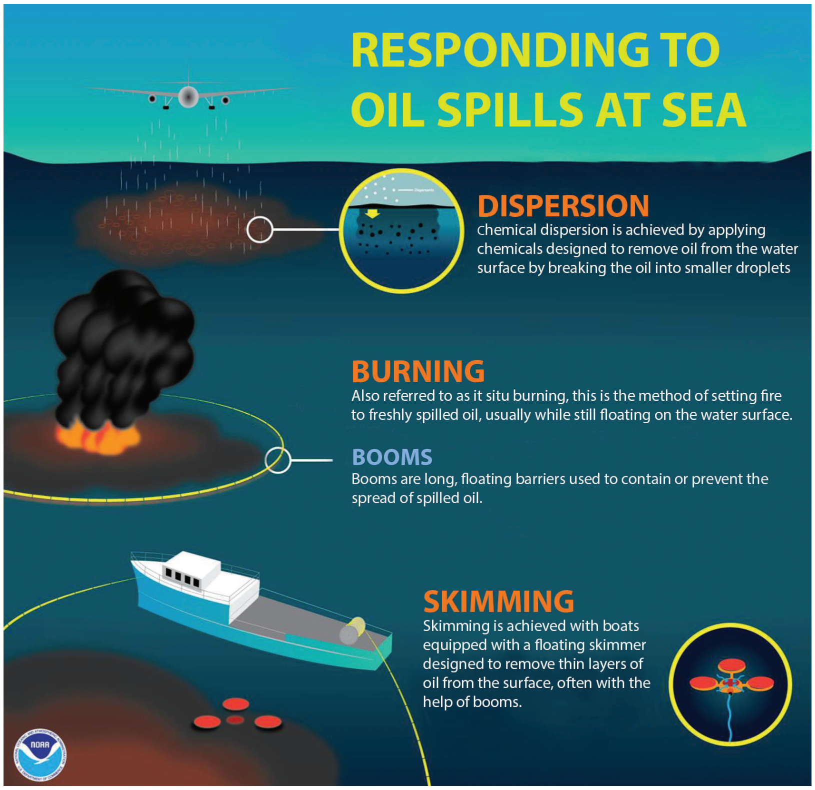

FIGURE 3. *Cleanup techniques used during the DWH oil spill. (NOAA)*

Dispersants (Corexit 9527A and 9500A) were used to break up the oil at the surface and below the surface. Chemical dispersants not only help to reduce the amount of oil reaching the shorelines but also enhances the amount of oil mixing into the water column. This makes the oil more available to the microbes that naturally remove the oil from the water. Dispersants were applied in three ways:

- A remotely operated vehicle (ROV) sprayed dispersants directly into the oil and gas coming out from the wellhead;
- Boats sprayed dispersants at the surface near the well site and drill rigs to control **volatile organic compounds** (VOCs) that posed health and safety threats to the crews; and
- Planes sprayed dispersants at the surface to disperse oil slicks that were more than five nautical miles from the well site.

Dispersants were not allowed to be sprayed within 2.3 miles of any vessel, within 3.45 miles of the shoreline or visible marine life, or in areas where the water depth was less than 33 feet deep.[18]

Closer to shore, emergency responders focused on protecting the shoreline, especially sensitive areas, using skimmers and containment booms.[18] Booms float on the surface of the water and act as physical barriers to floating oil. In an ideal situation, booms quickly contain floating oil. However, water currents, waves and winds can cause oil to make its way over and under the boom. Booms can be placed across inlets to reduce the risk of oil passing through into sensitive areas.[19]

Once the oil made its way to shore, responders surveyed the affected areas to better define the affected habitat and determine the appropriate method(s) for cleaning the shoreline. Responders recorded those methods as Shoreline Cleanup Assessment Techniques (SCAT). SCAT teams surveyed the shoreline, recorded the amount of oil, type of shoreline, habitat and animals found in the area, and noted archeological or historic sites.[18] Based on this information, an appropriate clean-up plan was created. Shoreline cleanup on beaches involved sifting sand, removing surface residual balls (sometimes referred to as tarballs), and digging out tar mats. Marsh cleanup involved minimally invasive techniques, such as swabbing the marsh with materials that absorb oil or low pressure flushing with water.

QUESTION #4: *Where did the oil go and where is it now?*

Using satellite images, NOAA determined that surface oil from the DWH oil spill reached a maximum area of 29,000 square miles, covering approximately 4.7% of the Gulf of Mexico's surface (Figure 4). During and after the spill, oil mixed with Gulf of Mexico waters and made its way into some coastal and deep-sea sediments. Oil moved with the ocean currents along the continental shelf off Texas, the coastlines of Louisiana, Mississippi, Alabama, and Florida. The oil spill impacted approximately 1,100 miles of the 3,540 miles of Gulf of Mexico coastline.[20,21] Oil was also found southwest of the

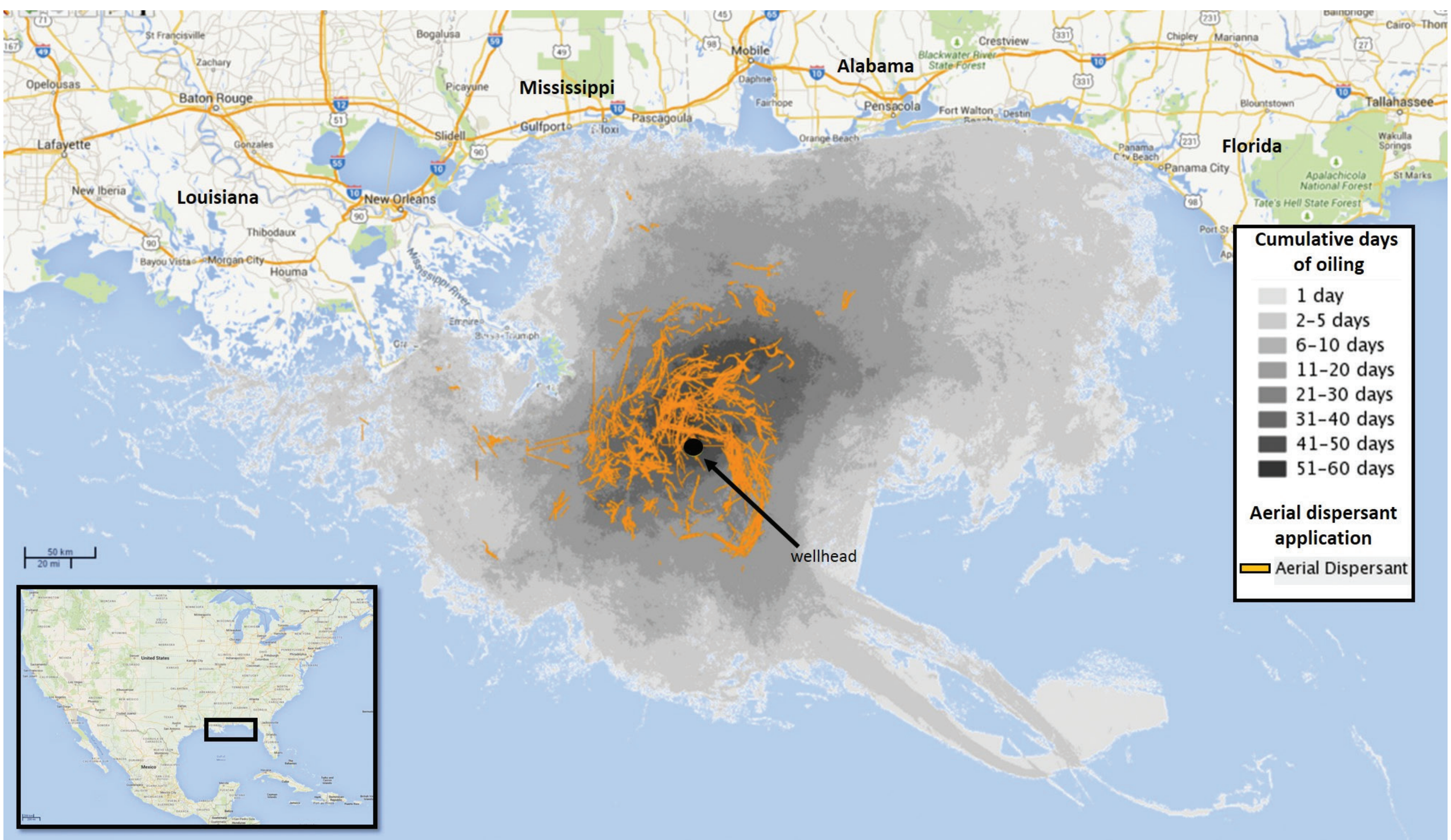

FIGURE 4. *This map shows areas that were oiled during the Deepwater Horizon oil spill (gray) and where dispersants were applied via plane (orange). Dispersants were also sprayed by boats and at subsurface depths (not shown on this map). (Environmental Response Management Application)*

wellhead at depths as great as 3,200 feet below the surface. A large plume was found between 3,200 and 4,000 feet below the surface and a more dispersed plume between 160 and 1,600 feet below the surface.[22,23]

Scientists developed seven categories to describe what happened to the oil (Figure 5):

- Recovered at the wellhead – oil captured directly from the wellhead using a riser pipe insertion tube and top hat system
- Skimmed
- Burned
- Chemically dispersed – chemicals applied to the oil to break the oil into small droplets and make it more available to microbes
- Naturally dispersed – natural mixing, such as waves, caused the oil to breakdown and mix into the water column
- Evaporated or dissolved – oil evaporated into the atmosphere when it reached the surface or dissolved in the water
- Unaccounted for.[24]

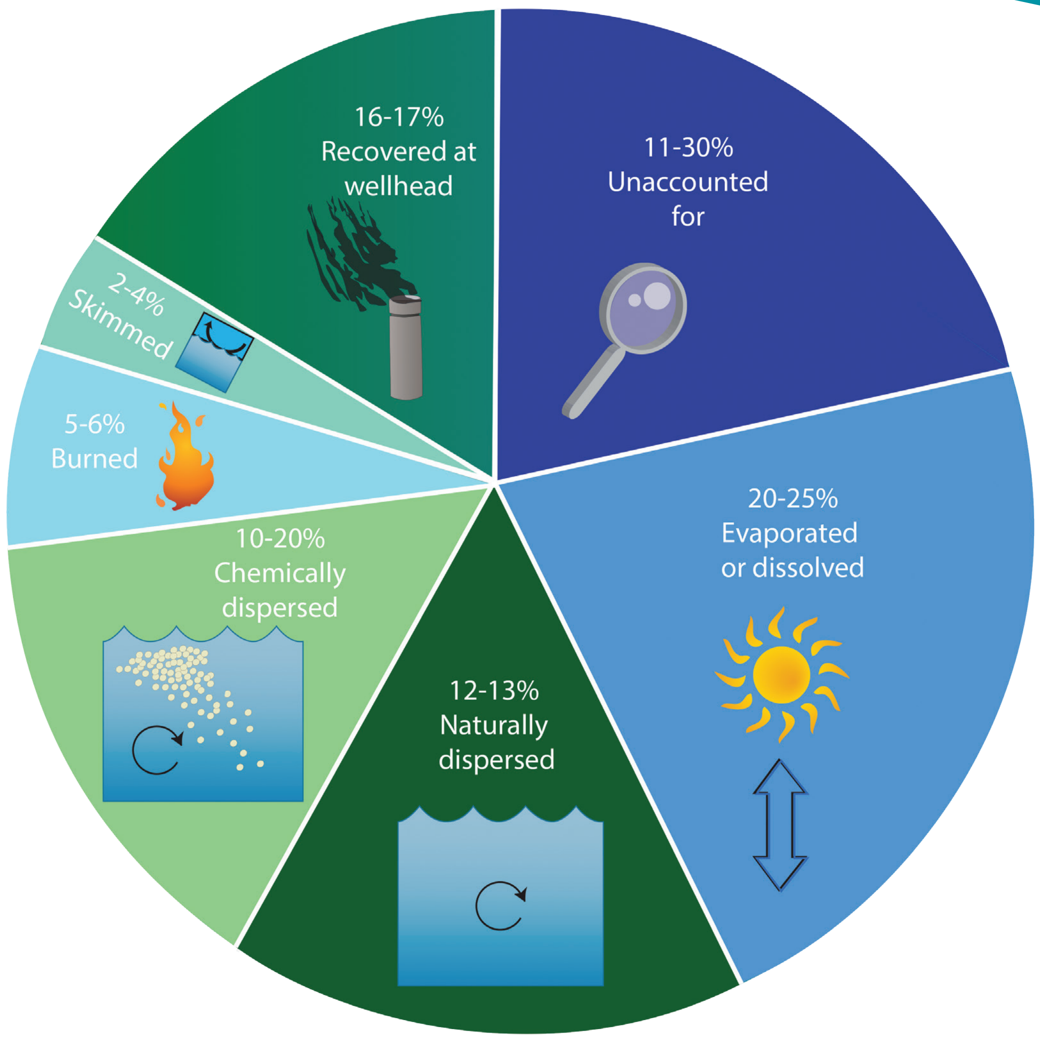

FIGURE 5. *An estimate of what happened to approximately 200 million gallons oil from the DWH oil spill. Data from Lehr, 2014. (Florida Sea Grant/Anna Hinkeldey)*

Recent studies show that about 3-5% of the unaccounted oil has made its way onto the seafloor. A region of approximately 1,200 square miles around the Macondo well has been polluted with different amounts of oil and oil-derived carbon from the well.[25,26] Oil on the seafloor can persist for a long period of time due to cold temperatures, lack of sunlight, and low oxygen levels all of which slow the breakdown of oil.[26]

QUESTION #5: *Do dispersants make it unsafe to swim in the water?*

The dispersant used on the spill was a product called Corexit. Corexit has become a public health topic due to its use during the spill. This is especially true as exposure to high levels of Corexit can cause respiratory problems and skin irritation.[27]

To understand if Corexit could pose a threat to swimmers, the maximum level of Corexit in the Gulf post-DWH must be considered. During the spill, emergency responders applied Corexit at the wellhead and distances more than 3.45 miles from shore. Teams of scientists sampled areas around the DWH wellhead in May and June 2010 to understand what the highest levels of dispersant in the environment might be.[28,29] They collected waters samples of more than 26 sites near the wellhead. Samples were taken from the water's surface and down to water depths of nearly one mile. DOSS was used to estimate the concentration of dispersant actually in the environment. The highest level of DOSS detected in these tests was 0.23 ppm. This is 425 times lower than the levels of DOSS known to cause harm to the human liver in studies by the EPA, NIH, and FDA (100-250 ppm).[30,31] Scientists often look to the liver to understand how a chemical may effect human health since the liver is key in breaking down foreign chemicals in the body.[32] Work is continuously being done to better understand the public health implications of Corexit and DOSS. However, the difference between actual environmental levels and those that cause health problems provide a relatively large margin for human safety.

GLOSSARY

Aquatic ecosystem
Communities of organisms that live in the water and are dependent on each other and on their environment.

Bacterium (*plural* Bacteria)
A member of a large group of unicellular microorganisms that have cell walls but lack organelles and an organized nucleus, including some that can cause disease.

Benthos
The flora and fauna found on the bottom, or in the bottom sediments, of a sea, lake, or other body of water.

Community
Groups of different species of organisms interacting with one another and with the environment in a specific region.

Corexit 9527A and 9500A
Dispersants approved for use in US waters and those that were used to minimize the presence of surface oil slicks during the Deepwater Horizon oil spill.

Dioctyl sodium sulfosuccinate (DOSS)
A primary component of both dispersant formulas used in the Deepwater Horizon oil spill. It increases the attraction between oil and water molecules and hinders the formation of large oil slicks on the surface of the ocean. DOSS can also be found in consumer products such as detergents, cosmetics and laxatives and therefore can be found in coastal waters.

Dispersants
Chemicals that are used during oil spill response efforts to break up oil slicks and can limit floating oil from impacting sensitive ecosystems such as coastal habitats.

Food web
A system of interlocking and interdependent food chains.

Food chain
A figure of speech describing organisms, each dependent upon the next as a source of food, in a series beginning with plants and ending with carnivores.

Habitat
The place where an organism, population, or community lives.

Organism
An individual animal, plant, or single-celled life form.

Plankton
Very small and microscopic organisms such that drift or float in bodies of water. Consisting of algae, protozoans, and the eggs and larval stages of larger animals, they are an important part of food webs.

Polycyclic aromatic hydrocarbon (PAH)
A group of hydrocarbons commonly found in oil, tar, burned wood and animal fats.

Population
Organisms of the same species inhabiting a specified area.

Prey
An animal that is hunted and killed by another for food.

Productivity
The rate that biomass or energy is generated in an ecosystem.

Species
Organisms forming a natural population or group of populations that transmit specific characteristics from parent to offspring.

Volatile organic compounds (VOCs)
Gases released from certain solids or liquids, such as oil. Inhaling these compounds for a long period of time can be harmful to one's health.

For more information about these ongoing studies, go to GoMRI's website: http://gulfresearchinitiative.org.

You can find other publications focusing on dispersants on the Sea Grant oil spill science outreach website at: www.gulfseagrant.org/oilspilloutreach.

REFERENCES

1. Ylitalo, G. M., Krahn, M. M., Dickoff, W. W., Stein, J. E., Walker, C. C., Lassitter, C. L., ... Dickey, R.W. (2012). Federal seafood safety response to the Deepwater Horizon oil spill. *PNAS 109 (50),* 20274-20279.
2. FDA. (2014). Overview of testing protocol to re-open harvest waters that were closed in response to the Deepwater Horizon oil spill. Retrieved from ***http://www.fda.gov/Food/ucm217598.htm***.
3. Gulfsource. (2015). Testing data. Retrieved from: ***http://gulfsource.org/#***
4. Mississippi Department of Marine Resources. (2015). Mississippi Seafood Safety. Retrieved from: http://www.dmr.state.ms.us/joomla16/images/publications/seafood-technology/seasafe.pdf.
5. Alabama Public Health. (2015). Seafood testing results. Retrieved from: http://www.adph.org/epi/Default.asp?id=5648.
6. Florida Department of Agriculture and Consumer Services. (2015). Florida Seafood is Safe. Retrieved from: ***http://www.freshfromflorida.com/Florida-Seafood-is-Safe#***.
7. Dubansky, B., Whitehead, A., Miller, J. T., Rice, C. D. & Galvez, F. (2013). Multi-tissue molecular, genomic, and developmental effects of the Deepwater Horizon oil spill on resident gulf killifish (*Fundulus grandis*). *Environmental Science & Technology, 47,* 5074–5082.
8. Whitehead, A., Dubansky, B., Bodinier, C., Garcia, T. I., Miles, S., Pilley, C., ...Glavez, F. (2012). Genomic and physiological footprint of the Deepwater Horizon oil spill on resident marsh fishes. *Proceedings of the National Academy of Sciences, 109*(50), 20298–20302.
9. Mager, E. M., Esbaugh, A. J., Stieglitz, J. D., Hoenig, R., Bodinier, C., Incardona, ...Grosell, M. (2014). Acute embryonic or juvenile exposure to Deepwater Horizon crude oil impairs the swimming performance of mahi-mahi (*Coryphaena hippurus*). *Environmental Science & Technology, 48* (12), 7053–7061.
10. Brewton, R. A., Fulford, R., & Griffitt, R.J. (2013). Gene expression and growth as indicators of effects of the BP Deepwater Horizon oil spill on spotted seatrout (*Cynoscion nebulosus*). *Journal of Toxicology and Environmental Health, Part A: Current Issues, 76(21),* 1198-1209.
11. Incardona, J. P., Gardner, L. D., Linbo, T. L., Brown, T. L., Esbaugh, A. J., Mager, E. M., ... & Scholz, N. L. (2014). Deepwater Horizon crude oil impacts the developing hearts of large predatory pelagic fish. *Proceedings of the National Academy of Sciences, 111*(15), E1510-E1518.
12. Fodrie, F. J. & Heck, K. L. (2011). Response of coastal fishes to the Gulf of Mexico oil disaster. *PLoS ONE, 6*(7), e21609.
13. Moody, R. M., Cebrian, J., Heck, K. L., & Browman, H. (2013). Interannual recruitment dynamics for resident and transient marsh species: evidence for a lack of impact by the Macondo oil spill. *PLoS ONE, 8*(3), e58376.
14. Fodrie, F. J., Able, K. W., Galvez, F., Heck Jr., K. L., Jensen, O. P., Lopez-Duarte, P. C., ...Whitehead, A. (2014). Integrating organismal and population responses of estuarine fishes to the Macondo spill reveals research priorities in the Gulf of Mexico. *BioScience, 64*(9), 778–788.
15. Carmichael, R. H., Graham W. M., Aven A., Worthy G., & Howden, S. (2012). Were multiple stressors a 'Perfect Storm' for Northern Gulf of Mexico bottlenose dolphins (*Tursiops truncatus*) in 2011? *PLoS ONE 7*(7): e41155. doi:10.1371/journal.pone.0041155.
16. Venn-Watson, S., Colegrove K. M., Litz J., Kinsel M., Terio K., Saliki J., ...Rowles, T. (2015). Adrenal gland and lung lesions in Gulf of Mexico common bottlenose dolphins (Tursiops truncatus) found dead following the Deepwater Horizon oil spill. *PLoS ONE 10*(5): e0126538. doi:10.1371/journal.pone.0126538.
17. Love, M., Baldera, A., Yeung, C., & Robbins, C. (2013). The Gulf of Mexico ecosystem: a coastal and marine atlas. New Orleans, LA: Ocean Conservancy, Gulf Restoration Center.
18. United States Coast Guard. (2011). ***On scene coordinator report Deepwater Horizon oil spill***. Retrieved from http://www.uscg.mil/foia/docs/dwh/fosc_dwh_report.pdf.
19. National Oceanic and Atmospheric Administration. (2010). Spill containment methods. Retrieved from http://response.restoration.noaa.gov/oil-and-chemical-spills/oil-spills/spill-containment-methods.html%20.
20. Dietrich, J. C., Trahan, C. J., Howard, M. T., Fleming, J. G., Weaver, R. J., Tanaka, S., ... Twilley, R. R. (2012). Surface trajectories of oil transport along the Northern Coastline of the Gulf of Mexico. *Continental Shelf Research, 41,* 17-47.
21. Michel, J., Owens, E. H., Zengel, S., Graham, A., Nixon, Z., Allard, T., ...Taylor, E. (2013). Extend and degree of shoreline oiling: Deepwater Horizon oil spill, Gulf of Mexico, USA. *PLOS ONE, 8*(6), 1-9.

REFERENCES

22. Camilli, R., Reddy, C. M., Yoerger, D. R., Van Mooy, B. A. S., Jakuba, M. V., Kinsey, J. C., ...Maloney, J. V. (2010). Tracking hydrocarbon plume transport and biodegradation at Deepwater Horizon. *Science, 330*, 201-204.

23. Montagna, P. A., Baguley, J. G., Cooksey, C. Harwell, I., Hyde, L. J., Hyland, J. L., Kalke, R. D., ...Rhodes, A. C. E. (2013). Deep-sea benthic footprint of the Deepwater Horizon blowout. *PLOS ONE, 8*(8), 1-8.

24. Lehr, W., Bristol, S., & Possola, A. (2010). ***Oil budget calculator Deepwater Horizon***. Retrieved from Federal Interagency Solutions Group, Oil budget calculator science and engineering team. http://www.restorethegulf.gov/sites/default/files/documents/pdf/OilBudgetCalc_Full_HQ-Print_111110.pdf.

25. Valentine, D. L., Fisher, G. B., Bagby, S. C., Nelson, R. K., Reddy, C. M., Sylva, S. P., & Woo, M. A. (2014). Fallout plume of submerged oil from Deepwater Horizon. *Proceedings of the National Academy of Sciences, 111*(45), 15906-15911.

26. Chanton, J., Zhao, T., Rosenheim, B. E., Joye, S., Bosman, S., Brunner, C., ...Hollander, D. (2015). Using natural abundance radiocarbon to trace the flux of petrocarbon to the seafloor following the Deepwater Horizon oil spill. *Environmental Science & Technology, 49*, 847-854.

27. Centers for Disease Control and Prevention. (2010). Oil spill dispersant (COREXIT® EC9500A and EC9527A) information for health professionals. ATSDR http://www.cdc.gov/nceh/oil_spill/docs/Oil%20Spill%20Dispersant.pdf.

28. Place, B. J., Perkins, M. J., Sinclair, E., Barsamian, A. L., Blakemore, P. R., & Field, J. A. (2014). Trace analysis of surfactants in Corexit oil dispersant formulations and seawater. *Deep Sea Research II.* , http://dx.doi.org/10.1016/j.dsr2.2014.01.015i.

29. Gray, J. L., Kanagy, L. K., Furlong, E. T., Kanagy, C. J., McCoy, J. W., Mason, A., & Lauenstein, G. (2014). Presence of the Corexit component dioctyl sodium sulfosuccinate in Gulf of Mexico waters after the 2010 Deepwater Horizon oil spill. *Chemosphere 95*, 124-130.

30. Gómez-Lechón, M. J., Castell, J. V., & Donato, M. T. (2007). Hepatocytes—the choice to investigate drug metabolism and toxicity in man: In vitro variability as a reflection of in vivo. *Chemico-Biological Interactions, 168*(1), 30-50.

31. Judson, R. S., Martin, M. T., Reif, D. M., Houck, K. A., Knudsen, T. B., Rotroff, D. M., ...Dix, D. J. (2010). Analysis of either oil spill dispersants using rapid, in vitro tests for endocrine and other biological activity. *Environmental Science and Technology 44*, 5979-5985.

32. Bandele, O. J., Santilloa, M. F., Ferguson, M., & Wiesenfeld, P. L. (2012). In vitro toxicity screening of chemical mixtures using HepG2/C3A cells. *Food and Chemical Toxicology 50*, 1653-1659.

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