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BEFORE THE HOUSE APPROPRIATIONS SUBCOMMITTEE ON
INTERIOR, ENVIRONMENT AND RELATED AGENCIES

May 27, 2010

USGS Science in Response to the Deepwater Horizon Oil Spill

Good morning, Mr. Chairman and Members of the Subcommittee. Thank you for the opportunity to discuss the USGS role in the aftermath of the April 20, 2010, Deepwater Horizon oil spill in the Gulf of Mexico.

The USGS is home to a breadth of multidisciplinary science expertise, an extensive, national, on-the-ground presence, and a wealth of biologic, geologic, geographic, and hydrologic monitoring capabilities and existing data, in scales ranging from microscopic to global. It is USGS' long-term monitoring capabilities, supported and championed by this Subcommittee, that have positioned the USGS to understand changes in our environment – from water quality to ecosystem composition. The USGS brings its brightest minds and best monitoring and modeling capabilities to issues that present crucial natural resource management challenges. It is this broad capacity combined with a presence in all 50 States and Puerto Rico that enables the USGS to bring science immediately to bear not only in natural hazards such as earthquakes, floods, and volcanoes but also in environmental hazards such as the Deepwater Horizon oil spill. For more than a century, the USGS has been on point in response to natural disasters; it is this experience and expertise that uniquely prepares the agency for dealing efficiently and effectively with the challenge that lies before us today and the challenges that will face us in the weeks, years, and decades to come.

As part of the Secretary's commitment to ensure that British Petroleum (BP) is doing all that it can to meet its critical responsibilities for this major oil spill and provide every available resource to get the job done, the Secretary dispatched me to the BP Command Center in Houston, Texas to support and coordinate the efforts of Federal scientists and BP engineers who are working to develop solutions to the crisis. I am a newcomer to the Federal government and must say that I am impressed with the manner in which Federal and State agencies and the private sector have come together in this crisis. But I know that there is more that can, and will, be done. Efforts underway in the aftermath of the Deepwater Horizon oil spill reflect the power and ability of government to work together toward a common goal. Following the hearing today, I will return to Houston and continue to coordinate joint efforts to address technological challenges and approaches to secure the damaged well head, capture the leak, and control the spill. My commitment, and that of the Secretary, to ensure that the very best scientific and technological expertise informs those solutions, is unwavering.

USGS Science: From Response to Recovery

When we first learned of the leak, a number of backbone efforts to the USGS response were launched including activation of the USGS Tactical Oil Response Team and its sub-team, the USGS Geospatial Information Response Team (GIRT). The International Charter to support the National Oceanic and Atmospheric Administration (NOAA) and the U.S. Coast Guard (USCG) was also activated.

A Unified Command was established to link organizations responding to the Deepwater Horizon incident and to provide a forum for those agencies to make consensus decisions. The Unified Command is committed to providing the public with reliable, timely and transparent information through their Joint Information Center (JIC). The USGS helped to establish and manage the JIC's social media component by providing oversight and operation of the Facebook, Twitter, Flickr and Youtube accounts for BP spill response. Around 22,000 people are following the effort on Facebook; 4,700 people on Twitter; and 38 videos are available on Youtube with one video having almost 1 million views. This effort is critical not only to keeping the public informed, but also to providing the Unified Command with information about the topics of greatest public concern. These outreach efforts demonstrate the Administration's commitment to engage and inform the public in the response effort.

The challenge of characterizing the effects of contamination resulting from the free flow of oil and gas from the drilling site lies in the enormity of the volume of oil, the expanse of sea, air, and land into which it flows, and the inability to predict exactly where this oil and the associated dispersant is going and how it will impact the various ecosystems with which it interacts, on scales from microscopic to human. Specific examples of USGS science activities underway in support of Department of the Interior (DOI) Bureaus, NOAA, USCG, and other agencies are outlined as follows:

Estimating oil volume

Using cutting edge techniques USGS, NASA and NOAA scientists will estimate the volume of oil now at the ocean surface resulting from the Deepwater Horizon oil spill. NASA's Airborne Visible/Infrared Imaging Spectrometer (AVIRIS) measures areal extent of the oil, its thickness, and what fraction is mixed with seawater. Federal researchers also plan to analyze the AVIRIS data for changes in vegetation along the coastline and assess where and how oil may be affecting marshes, swamps, bayous, and beaches that are difficult to survey on the ground. The combination of satellite and airborne imagery will assist NOAA in forecasting the trajectory of the oil and in documenting changes in the ecosystem. This is the first time AVIRIS has been used during a large oil spill, but the technology is widely recognized and has been successfully applied in other instances; for example, to map debris from the September 11 event, to map locations of naturally occurring asbestos, and to map liquid hydrocarbons on Saturn's moon Titan.

Geospatial Support

The USGS hosts a forum of over 50 Federal and State agencies that ensures coordination of remote-sensing efforts, minimizes duplicative efforts, and provides a clearinghouse of geo-

spatial information. The USGS has provided historical images and nautical charts of the Mississippi Delta and Louisiana coast to the FWS, the USCG, the U.S. Navy, and BP. Landsat imagery, acquired by the USGS, is being used to monitor the extent and movement of the oil slick. Post-spill and historical LiDAR topography from the Chandeleur Islands is being used by coastal scientists to make predictions of barrier island inundation and overwash for guidance on locations of oil deposition on beaches. The USGS has provided many GIS products to other agencies that show locations of reptiles, coastal vegetation, cold-water corals, mammals, fish, artificial reefs, and endangered species along the Gulf Coast from Texas to the Florida Keys to aid in protection of these trust resources.

Water, sediment, and biota sampling

Important to any scientific investigation of the effects of an oil spill on the environment is a complete understanding of the pre-existing condition, or baseline condition, of the water, sediment, and biota prior to landfall of the spill. USGS Science Centers in Texas, Louisiana, Mississippi, Alabama, and Florida have coordinated efforts to sample water and bottom material from coastal wetlands, DOI lands on-shore, and on the barrier islands most likely to be impacted now that the oil has come ashore. The USGS will document current conditions at these sites and the existence of any historic oil present including “fingerprints” of existing oil, Polycyclic aromatic hydrocarbons (PAHs), oil and grease, trace metals, volatile organic compounds, surfactants, dissolved organic carbon (DOC) characterization, bacterial populations capable of digesting oils, nutrients, and benthic invertebrates. Scientists are monitoring radio-tagged manatees for deviations from normal behavior in priority areas on the Gulf Coast of Florida. Aerial surveys of mangroves and wetlands along the Gulf coast of Florida are being conducted to differentiate between damage from the January 2010 freeze and any potential impact from the oil spill. Aerial surveys and sub-bottom profiling of sea grass beds along the Louisiana coast were completed to document current pre-spill conditions. The USGS will also work with Natural Resource Trustees in their establishment of regulatory baseline data for natural resource damages under the Oil Pollution Act. The EPA is complimenting a number of these efforts that will be discussed in detail in their testimony.

Scientific evaluation of State proposals

The USGS, along with other Interior bureaus and entities in Louisiana, is addressing concerns related to Governor Bobby Jindal’s barrier island proposal. The U.S. Fish and Wildlife Service (FWS) requested the USGS provide input on the proposal because of our experience in prior investigations that described the coastal geomorphic processes of the Chandeleur Islands. USGS research is enabling the FWS and others to engage in evaluation of the proposed construction of the berm. As originally written, the effort would do harm to the Chandeleur Islands in the long term by potentially reducing the available sand for natural restoration.

The USGS has also been targeted to provide science support for efforts by the MMS and USCG Joint Investigation such as the analysis of rocks and rock-like debris associated with the explosion to determine the source of the material. The collected materials may have originated from 1) below the sea floor, including sedimentary rocks that are part of the oil reservoir, 2) from the sea floor surface, including drilling debris, sedimentary rocks, coral, and sea floor sediment,

3) rock samples that may have been stored on the drilling rig, and 4) debris fragments from the sunken drilling rig. Initial tests are expected to include the characterization of the materials by Earth scientists to determine if the samples are geologic (coming from rocks and sediment) or are construction materials coming from the platform itself. Testing should determine the source and possible history of the materials during the explosion, and potentially provide information as to whether natural geologic processes contributed to the cause of the explosion.

While current USGS efforts are focused on response in the aftermath of the oil spill, USGS leadership, managers, and scientists are also planning for future research needs associated with the Deepwater Horizon oil spill. As such, a longer-term USGS Environmental Incident Science Team was launched in early May 2010. The team, that includes personnel from the FWS, the NPS, and the MMS representing their bureaus' science and resource management needs, is developing a long-term science plan designed to address the research needs as we move from an immediate response to a more mature response phase of this event and into recovery. Some of the efforts to be contained in that plan are described briefly below.

Transport, fate, and potential impacts of oil and dispersants

The use of chemical dispersants has added to the challenge of understanding the fate and transport of oil (along with the dispersant) in the Gulf of Mexico region. Chemical dispersants have converted the oil into microscopic water-soluble droplets, facilitating their movement away from the surface oil slick and into the water column to the seafloor. This procedure results in potential impacts not only to surface and shore biota but also to the vast ecosystems that reside beneath the surface of the Gulf of Mexico. To understand these impacts, the USGS will address the fate and transport of not only oil and dispersant but also the mixture of oil and dispersant to determine their impact on coastal and marine ecosystems, such as wetlands, estuaries, reef communities, beaches, and the associated species that reside in these critical habitats. In addition, the USGS stands ready to assist trustee agencies with internal and external examinations and photography of carcasses in evaluating cause of death.

Deep coral sampling

The USGS, in collaboration with the MMS, NOAA, and other agencies, has been conducting research on a variety of deep-sea and outer shelf habitats in the Gulf of Mexico for more than a decade. The comprehensive data archive, diverse skills, and technical capabilities of this group are ideal for investigating the impacts of the Deepwater Horizon oil spill on deep water coral ecosystems in the Gulf of Mexico. The September 2010 research cruise, as part of the USGS DISCOVER expedition, would be the basis for short and long-term studies that would begin with the collection of sediment and bacterial community samples. Samples such as these would allow for a comparison of the pre-spill habitat to the post-spill habitat to measure the effect of contaminants on these deep water coral ecosystems.

Conclusion

The USGS will continue to work closely with Interior and other Federal and State agencies as well as the private sector in response to the Deepwater Horizon oil spill. The USGS

Environmental Incident Science Team will lead the effort to develop a plan to identify Interior's long-term research needs in the aftermath of this disaster. As Interior moves from response to recovery, the USGS stands ready to offer its best efforts and brightest scientists to inform and guide decisions. I want to thank the Subcommittee for its support for USGS science. Without your recognition of the importance of USGS long-term monitoring and data collection, the USGS would not have the tools, data, and information that have allowed our rapid response to this crisis and our Nation would not have the science necessary to begin its recovery from this tragedy. Thank you for the opportunity to testify before you today. I will be pleased to answer any questions that you may have.