2017 Conference Sessions

Session 001: Bridging Research and Response: Science Discoveries from DWH to Inform Future Oil Spill Response Decision Making and Engage Stakeholders

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During the Deepwater Horizon oil spill, operational choices about response strategies, informed by agency, industry, and consultant practitioner scientists, were made to contain, redirect, remove, and disperse (both surface and subsea applications) the oil to mitigate damage. Decisions were made by Unified Command, and remotely advised by academic experts at the national level on some strategic issues, e.g., well capping. However, limited opportunities existed for academic researchers to share relevant knowledge about the affected areas.

The US National Oil and Hazardous Substances Pollution Contingency Plan (NCP) describes the US preparedness and response framework. This session aims to bridge the gaps among research and practitioner scientists by clarifying the post-DWH science discoveries to inform future operational decisions that could enhance the recovery and restoration of affected resources, ecosystems and communities. Real-time operational science-related decisions include among others: what to protect from spilled oil; decisions about strategies to employ; anticipating the magnitude and duration of likely impacts from spilled oil and response; decision-making involving tradeoffs, i.e., choices among response strategies given potential risks and anticipated benefits; when to stop cleanup actions, e.g., the point when continued oil removal will cause greater environmental damage than natural attenuation.

Outreach efforts of GoMRI-funded consortia have a cohort of educators well versed in disseminating oil spill science to diverse audiences. This session also aims to explore ways researchers can collaborate with outreach professionals to use the capabilities and tools they have developed to frame or communicate research messages to responders, decision makers, and a variety of public audiences (e.g. from fishing and tourism industries).

This session invites presentations from agency, academic, other research scientists, and outreach professionals to:

- Identify scientific discoveries to inform NCP preparedness and response decision making,
- Identify ways to integrate scientific discoveries into the decision making process real-time,
- Make scientific discoveries understandable by decision makers and oil spill stakeholders, and
- Implement capabilities to engage local stakeholders so they understand spill science and decision processes.

Session 002: Decision Support and Integration Tools for Response and Restoration

Lauren Showalter (National Academy of Science Gulf Research Program), Dave Reed (Florida Fish and Wildlife Conservation Commission Fish and Wildlife Research Institute), Amy Merten (NOAA's Office of Response and Restoration)

This year's conference encourages a common theme: putting science to practical use. In the data management realm this includes the development of tools and applications which make information available in desired forms and formats through convenient platforms and portals for a variety of communities. For the past several years, a great deal of effort has been placed on the development of data and information related to oil spill science, post-spill assessments and environmental restoration activities. We have obtained large amounts of data and now need to explore how to incorporate this information to inform future events. How do we incorporate this information to inform response strategies, restoration, planning and connect these data to decision-makers and response personnel at the time of an event? Research data and results are not just to serve scientists, rather the scientific community has an obligation to provide this information in a format that is readily consumable by tools that will allow responders and resource managers the ability to make decisions. This session's goals are to provide tool demonstrations that will assist in getting data and information to the end-user as well as highlighting data integration efforts for synoptic data collections using remote sensing, water column sampling, and working with large volumes of data from sensors. Therefore, we invite tool developers, and researchers from organizations such as the IOOS community, EPA, NOAA, DOI, NSF, NGO's, the oil and gas industry, the US Coast Guard and others to showcase tools and applications, and other efforts that can assist the response and restoration communities at large.

Session 003: Understanding Ocean Surface Currents in Relation to Oil Spill Response

Tamay Özgökmen (University of Miami), Eric D'Asaro (University of Washington)

Material transport in the upper ocean boundary layer is driven by winds, waves and ocean currents. Buoyant pollutants such as oil collect near the surface of the ocean, which is a challenging region not only because of the high gradients between the atmosphere and the ocean, but also the multitude of processes, such as Stoke's drift, Ekman layer, convection, Langmuir turbulence, frontal features created by riverine discharges, submesoscale and mesoscale flows, among others.

We welcome recent observational results (such as those from the LAgrangian Submesoscale Experiment, LASER) as well as leading-edge modeling studies focusing on an accurate estimation of the ocean's surface currents. The presenters are encouraged to make a connection about how their results would relate to oil spill response in application.

Session 004: Understanding Population Status, Trends and Connectivity of Gulf of Mexico Large Marine Vertebrates as Sentinels for Ecosystem Health in the Context of Restoration

Natalia Sidorovskaia (University of Louisiana at Lafayette), Alexis Baldera (Ocean Conservancy), Elizabeth Fetherston (Florida Institute of Oceanography), David Mellinger (Oregon State University), Lori Schwacke (NOAA)

A growing body of research following the Deepwater Horizon oil spill demonstrates injury, impaired health, reproductive failure, and/or loss of important life-history stages in many large marine vertebrates (e.g., marine mammals, birds, and sea turtles). Because these animals are often top predators, their patterns of abundance and habitat use can serve as indicators of the health of Gulf of Mexico ecosystems. For example, some marine mammals have life spans over 70 years, get exposed to the same contaminants as coastal communities, are long-term coastal residents, and also move between deep-water and coastal habitats. After the Deepwater Horizon oil disaster, the region is faced with an unprecedented opportunity to monitor and understand long-term ocean ecosystem recovery, which factors are affecting change, and how this information can be used to inform restoration. Emerging research is now focusing on understanding recovery trajectories for many large marine vertebrate species and identifying the environmental variables and anthropogenic stressors that may contribute to or impede their recovery. New analyses and interdisciplinary models of data generated after the DWH oil spill are important tools in understanding these connections and adaptively managing recovery strategies.

This session will examine next steps in restoring large marine vertebrates by exploring what we know about oil spill impacts, investigating other environmental variables, ecosystem conditions, and anthropogenic stressors that influence population status and trends. The session aims to foster a dialogue about the necessary combination of these disciplines to inform more effective restoration strategies. We invite talks examining the role that environmental and anthropogenic factors may have had in exacerbating or mitigating the effects of the DWH oil spill and response activities on large marine vertebrates; advanced modeling describing interactions among ecosystem components with particular emphasis on connectivity between coastal and deep-water habitats; research exploring the links between ocean ecosystem changes and health and sustainability of large marine vertebrate populations; and approaches applying our understanding of large marine vertebrate distribution/occurrence/foraging ecology/food web dynamics to effective restoration strategies.

Session 005: Deepwater Horizon Natural Resource Damage Assessment: What Have We Learned?

Lisa DiPinto and Tom Brosnan (National Oceanic and Atmospheric Administration)

The Deepwater Horizon Natural Resource Damage Assessment (NRDA) Settlement is final. The nearly six years of assessment studies have been concluded and are summarized in the Final Programmatic Damage Assessment and Restoration Plan. Some of the assessment work conducted in support of the NRDA has been presented at GoMOSES and other conferences, but generally in an individual study by study format. While assessment overviews have been presented at several venues in timeslots ranging from 15 minutes to 60 minutes, never before has a comprehensive overview of the assessment methods and findings been presented in a full, day-long integrated fashion, and especially with an integrated panel of NRDA and non-NRDA resource specialists. This special session will bring together 1) invited resource managers who led the technical working groups for key resources and habitats considered in the assessment; 2) several of the principal investigators that conducted scientific studies in support of the NRDA and 3) invited scientists who conduct research on these Gulf of Mexico resources and habitats outside of the NRDA process.

The overarching goals of this session are to 1) provide a brief overview of our key assessment findings, based on an integrated evaluation of a large number of scientific studies and literature based findings. This will be presented briefly by each of the resource/habitat managers; 2) hear from our mixed panel of NRDA experts and non-NRDA researchers about their considerations for NRDA moving forward. What were the recommended metrics? Sampling Designs? Statistical analyses? Considerations about baseline data? Ability to integrate academic work into the NRDA process? What science gaps have we identified? And especially from our outside experts, what should we consider for our next big NRDA (or similarly, for a large environmental assessment in the region or elsewhere). This will be followed up by 3) a moderated question and answer session with the panelist, session chairs, seeking input from the audience. The full day special session will be broken out into 4 main components. The morning component will focus on the nearshore assessment (early AM), followed by the late morning component on water column and benthic assessment. After lunch, the first afternoon component will focus on marine mammals and sea turtles and the last component will focus on birds and human use.

Session 006: Processes in the Near Field of a Blowout

Michael Schlüter (Hamburg University of Technology), Michel Boufadel (New Jersey Institute of Technology), Claire Paris (University of Miami), Zachary Aman (University of Western Australia)

This session will provide a forum to present and discuss recent results by measuring This session will provide a forum to present and discuss recent results by measuring and modeling the dispersion and dissolution of gas and oil released under deep ocean conditions.

The following influences on bubble and droplet formation, size distribution, rising behavior and dissolution will be addressed:
- high pressure and low temperature conditions;
- addition of surfactants (dispersants);
- gas saturation of “live oil” on dispersion and rising behavior; as well as
- hydrate formation.

The results from experiments and numerical simulations presented in this session are critical to the further modeling and prediction of oil-fate processes in the near field and far field, and to enable a quantifiable understanding of dispersant addition.

This session focuses on experimental, multi-physics computational fluid dynamics (CFD), multi-phase hydrocarbon modeling based studies and their coupling to near- and far-field models that are necessary to predict the distribution of crude oil under high-pressure and low-temperature conditions and to enhance the accuracy and extend the applicability of Lagrangian simulators under these extreme conditions.

This session will join researchers and their results from different disciplines for a deeper understanding of oil spills and their impacts to reduce uncertainties and enable a better prediction and preparation of further spills.

Session 007: Deepwater Horizon Oil Spill Natural Resource Damage Assessment: Comprehensive Integrated Ecosystem Restoration

Melissa Carle (Earth Resources Technology, Inc.), Mike Peccini (NOAA)

The Deepwater Horizon (DWH) settlement of $8.8B for the Natural Resource Damage Assessment (NRDA) portion was finalized on April 4, 2016. The Trustees determined that injuries to natural resources caused by the DWH oil spill constituted an ecosystem-level injury due to the effects on such a wide array of linked resources over such an enormous area. Just as the injuries to individual resources cannot be understood in isolation, restoration efforts must also be considered and implemented from a broader perspective. Consequently, the Trustees developed and will implement a comprehensive integrated restoration portfolio.

This session will focus on the integrated restoration portfolio and how it addresses the diverse suite of injuries that occurred at both regional and local scales. This portfolio allocates restoration funds across restoration types, making investments across Regionwide, Open Ocean and each of the five Gulf states restoration areas to restore coastal and nearshore habitats, improve water quality in priority watersheds, protect and restore living coastal and marine resources, and enhance recreational use opportunities. By making investments across resource groupings and supporting habitats, the Trustees will ensure that the public is appropriately compensated for all the resources and services injured by the spill. This session will also focus on restoration planning within specific restoration areas and how it supports the integrated comprehensive restoration portfolio. The session will include overviews of the tools that Trustees are using to help ensure ecosystem recovery such as strategic frameworks to facilitate making connections across restoration areas for restoration types that have multiple investments, such as birds and sea turtles. The Trustees recognize a need for a robust, scientifically based, monitoring and adaptive management framework to support restoration decision-making and measure restoration benefits. The session will also cover efforts that the Trustees are taking to encourage consistency in NRDA restoration monitoring across restoration areas, manage and integrate data associated with these efforts, and make recommendations to the Trustee Council on effective evaluation of restoration outcomes across multiple scales. Finally, this session will discuss efforts to coordinate restoration across the NRDA, Gulf Environmental Benefit Fund, and RESTORE Council.

Session 008: Ecosystem Structure, Function and Services: Legacies of the Deepwater Horizon Oil Spill

Will Patterson (University of Florida), Dave Portnoy (Texas A&M-Corpus Christi), Steve Murawski (University of Florida)

Acute and chronic impacts of the Deepwater Horizon Oil Spill (DWH) on northern Gulf of Mexico (nGOM) ecosystems are an important legacy of the spill. These impacts have not only affected ecosystem form and function, but myriad ecosystem services also were impacted following the spill. Considerable research effort has been focused on discerning and quantifying ecosystem impacts, and presentations on the scientific evidence of DWH impacts have been prominently featured in past Gulf of Mexico Oil Spill and Ecosystem Science Conferences. However, other important legacies of the spill are novel discoveries and new understanding of nGOM ecosystem structure and function which have resulted from post-spill research conducted among terrestrial, estuarine, shelf, and deep sea systems.

One focus of this session will be on recent findings and further quantification of acute and chronic DWH impacts, while another will be to attract papers that include novel information on ecosystem structure and function. Restoration activities should be based on a clear understanding of DWH impacts, but new information on ecosystem structure and function also will be key to ensuring the efficacy of restoration activities. Furthermore, this new information constitutes important baseline data that were lacking for many systems prior to the DWH, and also is shaping our understanding of ecosystem dynamics, resistance to perturbation, and prospects for resiliency when faced with future large-scale disturbances.

Session 009: Environmental Baseline and Oil Spill Impacts: Utilizing Big Data and Synthesis to Support Decision Making

Kimberly Bittler, Chris DuFore and Jennifer Culbertson (Bureau of Ocean Energy Management)

Quantifying the impact of oil spills and establishing environmental baselines are critical to informed decision making through the National Environmental Policy Act. A massive amount of new information is being generated by ongoing research through GoMRI, the National Academy of Science's Gulf Research Program, the Natural Resource Damage Assessment, and other efforts. To effectively inform decision making, this substantial body of knowledge could be consolidated and analyzed with "big data" approaches, meta-analysis, modeling, reviews, and synthesis. This session will focus on studies that draw conclusions from a large body of information that inform new environmental baselines and quantify the impact of oil spills on aspects of the ocean environment such as water quality, fisheries, benthic communities, socioeconomic factors, protected species, and human health.

Session 010: Genomics and Modeling of Biological Communities to Improve Predictions of Ecosystem Response to and Mitigation of Spilled Oil

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Joel Kostka (Georgia Institute of Technology), David Portnoy (Texas A&M University-- Corpus Christi), Kostas Konstantinidis (Georgia Institute of Technology)

Advances in next generation DNA sequencing and omics approaches have the potential to greatly improve the ability to interrogate mechanisms of petroleum hydrocarbon degradation as well as impacts of oil exposure on ecosystem health and functioning. GoMRI researchers preside over a rapidly expanding database of meta-omics datasets that can be employed to assess resilience, response, and recovery of ecosystems to oil exposure in the Gulf of Mexico and elsewhere. In particular, the rapid development and application of omics approaches has led to characterization of the metabolic pathways and controls of microbially-mediated hydrocarbon degradation. In higher organisms, novel biochemical pathways of immune response and metabolism of hydrocarbon compounds has also been revealed.

The availability of next generation sequence data has enabled rapid determination of shifts in microbial communities in response to oil exposure and identification in higher organisms (vertebrates and invertebrates) of genomic regions associated with local adaptation and immune response. Although much progress has been made, the application of omics research in oil spills remains challenging. For example, changes in microbial communities in response to oil perturbations are well documented, but the implications for these changes to ecosystem health and function remain largely unresolved. Population structure and gene flow in higher organisms also are well documented, but how immune response to perturbations (e.g., oil spills) impact these parameters over large scales is less well known. Omics data must be parameterized for linkage to models of ecosystem impacts as well as biogeochemical models to predict the attenuation of petroleum hydrocarbons. For example, one exciting opportunity is to couple environmental metabolomics or petroleomics with metagenomics to construct metabolic models of hydrocarbon metabolism.

This session encourages presentations from studies that employ genome-enabled measurements, experiments, and modeling to provide a quantitative understanding of the ecological response of biological communities to oiling as well as the role of biodegradation in the fate of petroleum hydrocarbons released from oil discharge. Contributors are encouraged to place their results into context as to how novel findings could be used to improve planning, preparedness, response and recovery in potential future oil spills.

Session 011: Human Dimensions and Activity of Oil Spill Response, Restoration, and Future Preparedness: Interdisciplinary Communications and Community Resilience from a Social Ecological and Systems Approach

Howard Osofsky (Louisiana State University Health Sciences Center), Ann Hayward Walker (SEA Consulting Group), Lisanne Brown (Louisiana Public Health Institute), Alesia Ferguson (University of Arkansas for Medical Sciences), Helena Solo-Gabriele (University of Miami), Melissa Finucane (RAND Gulf States Policy Institute), George Hobor (Louisiana Public Health Institute)

Population groups that are largely dependent on the stability and quality of their local environment for sustaining a traditional marine-based economy, are repeatedly threatened by hurricanes and technological disasters. In addition, coastal human activity patterns such as beach and recreational activities provide many with entertainment, important to health and well-being. Destruction or contamination of the coastal area can impact how we use and interact in these areas along with chemical and changing microbial exposures that can have a profound influence on ecosystems along coastal areas. Past response and restoration experiences have provided opportunities to improve preparedness activities, however these lessons learned often do not receive collaboration among community stakeholders, industry and differing scientific disciplines, necessary for multi-systemic (micro, meso-, and macro) application.

This session will examine multiple aspects of recovery and preparedness and the human dimensions that strengthen current efforts. Specifically the proposed session aims to explore how health, social well-being, demographics, and economics intersect to support community resilience. Opportunities will be explored for innovative approaches and development of models to understand how abrupt and unexpected events lead to, exposure, risk, social-ecological transitions or changes in human activity patterns. Finally we will examine lessons learned from Deepwater Horizon and other oil spills, identifying gaps in knowledge and practice, and formulating priorities for research, outreach, and education activities. The conference objectives will be addressed from the perspective, that synergy of knowledge, linkages between different parts of social systems, and effective risk communications, are essential toward future response and management strategies, thus facilitating community resilience.

Session 012: Deepwater Horizon Oil in Coastal Environments: Observations, Experiments and Predictive Modeling

Michel Boufadel (New Jersey Institute of Technology), Charles Greer (National Research Council), Markus Huettel (Florida State University), Kostas Konstantinidis (Georgia Institute of Technology), Joel Kostka (Georgia Institute of Technology), Christoph Aeppli (Bigelow Laboratory for Ocean Sciences)

The coastal zone, with the transition from the marine to the terrestrial environment, exposes oil deposited during the Deepwater Horizon spill to a broad spectrum of environmental influences, e.g. permanently submerged tar mats degrade under different temperature, nutrient and oxygen conditions compared to surface residual balls deposited on the sublittoral beach or in salt marshes. This session invites presentations addressing the fate, transport and effects of the stranded oil through monitoring, laboratory experiment and modeling in the diverse coastal environments.

To evaluate the effects of the numerous factors controlling the oil degradation in the coastal zone, modeling of the oil degradation process is key. The modeling of petroleum hydrocarbon biodegradation so far has followed two main approaches: 1) An empirical approach, fitting simple models, such as first-order models, to experimental data, and 2) An approach that relies on capturing major environmental pathways for oil biodegradation, such as colonization of the low solubility oil components by microorganisms, dissolution by biosurfactant, and Monod kinetics. The second approach may be more promising for prediction and exploration of various remediation scenarios, but it suffers from the lack of observational and experimental data.

The session attempts to synthesize data collected in the field and through experimental work, and knowledge gained from the modeling of the fate and effects of petroleum hydrocarbons with the aim of guiding future experiments. The goal is to highlight data collection and modeling approaches that would allow long-term prediction of the pathways and influences of oil, and effective bioremediation.

Session 013: Impacts and Recovery of Benthic Marine Environments in the Aftermath of the DWH Event

Patrick Schwing (University of South Florida), David Hollander (University of South Florida), Paul Montagna (Harte Research Institute), Peter Santschi (Texas A&M University at Galveston)

During the Deepwater Horizon (DWH) event, the impingement of the sub-surface hydrocarbon plume and a region-wide marine-oil snow and sedimentation and flocculent accumulation (MOSSFA) event provided transport pathways for a large volume of contaminants causing physical, chemical and biological impacts to marine benthic ecosystems. Since the DWH event, researchers have documented profound changes to the physical sedimentological regimes, the distribution, concentrations and persistence of sedimentary hydrocarbons, sediment redox conditions and impacts to benthic biological communities; including but not limited to microbial communities, meiofauna, benthic infauna, reef and benthic-dependent fish, and deep-sea corals. Now, 6 years later, evaluation and integration of time series studies of environmental conditions (chemical, physical) and benthic biotic communities are needed to develop a comprehensive understanding of the spatial and temporal impacts and recovery rates.

This session encourages submissions of time-series and laboratory studies detailing MOSSFA formation and deposition, benthic environmental (e.g. chemical, physical) and ecological (biological) assessments of impact and recovery, specifically:
1) Biotic and abiotic factors that lead to enhanced production of exopolymeric substances and formation of marine oil snow
2) Long-term impacts of sedimentary deposition related to marine petrochemical release (MOSSFA, toxicity) and the resuspension and post-depositional transport of oiled-sedimentary material
3) Long-term changes in benthic chemical conditions and the degradation and transformation of petrochemical contaminants in sediments
4) Spatio-temporal studies of direct impact, recovery and recovery rates for benthic organisms (e.g. benthic dependent fishes, corals, sedimentary epifauna and infauna, etc.)
5) Establishing current benthic environmental status, providing baselines in case of future spills in the Gulf of Mexico

The primary goals of this session include:
1) Defining the types of time-series studies that can best assess benthic impacts and recovery,
2) Integrating understanding across seminal benthic communities,
3) Identifying critical data gaps in benthic studies,
4) Determining how to better construct cohesive spatio-temporal benthic impact analysis in advance of future spills,
5) Identify new tools and approaches to improve certainty in benthic impact assessment.

These goals are intended to provide meaningful and integrative baseline data products in the event of a future marine petrochemical release.

Session 014: Marine Oil Pollution Monitoring Methods: New and Emerging Techniques for Obtaining and Analysing *in-situ* Observations and Laboratory Data

Emlyn Davies (SINTEF), Ian MacDonald (Florida State University), Robyn Conmy (US Environmental Protection Agency)

The Deepwater Horizon oil spill blowout has spurred scientific debate surrounding the oil droplet size distribution and the resulting environmental impact of the dispersed oil. This debate remains ongoing because direct measurements can be difficult to obtain during spill events, and appropriate / comprehensive basal ecological monitoring rarely exists prior to oil releases. Coincident spatial and temporal measurements of oil droplet size and concentration, gas bubbles, plankton, and marine snow, are but a few examples of what is required for better understanding the transport and fate of particulates below the sea surface. And on the sea surface, aerial and satellite remote sensing techniques offer mechanisms for quantifying the coverage and spreading of oil. Since the Deepwater Horizon spill, a large array of novel measurement techniques have been developed in order to design laboratory experiments, assess long-term ecological responses, characterise changes to seabed sediments, and accurately quantify surface slick properties, to list only a few. This session will bring together all aspects of measurement techniques used in oil spill research. We encourage presentations of new applications of existing methods, emerging and novel techniques, and inter-comparisons of commonly used instrumentation. Discussion at the end of the session will focus on highlighting the potential for new monitoring methods and identify remaining technology gaps that should be filled to progress our observational understanding of marine oil pollution.

Session 015: Monitoring and Modeling Responses to Oil Spill Injury and Restoration: Integrating Tools for Adaptive Management

Cameron Ainsworth (University of South Florida), Michelle Meyers (US Geological Survey), Deborah French McCay (Applied Science Associates), Michael Lee (USGS Texas Water Science Center), Claire Paris-Limouzy (University of Miami), Stephanie Romañach (USGS Wetland and Aquatic Research Center)

Monitoring and modeling combine to help us understand DWH ecological impacts and restoration possibilities. Integration of these components is essential for successful decision making under adaptive management. The development of a cohesive Gulf-wide observation network of existing and new monitoring programs across funding sources, geographic and political boundaries supports ecosystem modeling and ultimately restoration decisions. Ecosystem restoration programs should integrate a robust observational network with modeling to support site selection, project design, and post-project evaluation of restoration programs. This session will present how various monitoring programs can contribute to injury and recovery modeling, and how modeling at the species, community, or ecosystem-level adds value to monitoring data collections. We especially invite papers that synthesize many types of data or consider synergies and antagonisms emergent from the response of individual species. We invite papers that utilize data or modeling to form adaptive management strategies.

Session 016: Oil Spill Response and Mitigation Agents

Michael Fulton, Scott Lundgren and Marie Delorenzo (NOAA)

During an oil spill the Federal on Scene Coordinator (FOSC) with support from regional Scientific Support Coordinators (SSCs) and the Scientific Support Team (SST), must make decisions as to whether chemical countermeasures should be employed. Possible countermeasures include chemical dispersants, surface washing agents (SWAs), and bioremediation products. The EPA maintains the National Product Schedule (NPS) under subpart J of the National Contingency Plan that identifies products that may be used to reduce crude oil impacts. In many cases, there is relatively little information available on the efficacy and potential bioeffects associated with the use of these products.

This session solicits presentations on the effectiveness and bioeffects of these products alone and in combination with crude or fuel oils under both laboratory and field testing scenarios. Data regarding sublethal endpoints, chronic effects, multistressor interactions, post-exposure recovery, and comparison of experimental exposure regimes to actual field (operational) data and field exposure modeling scenarios are of special interest, especially for situations more common involving moderately-sized spills. Assessments of remediation product influence on oil hydrocarbon degradation and environmental distribution are also relevant.

Session 017: Assessing the Impacts of Varying Multi-year Physical and Biogeochemical Stressors to Shelf and Coastal Ecosystems in Conjunction with the Long-term Impacts of Oil Spills

R. Eugene Turner (Louisiana State University), Sabrina Taylor (Louisiana State University), Nancy Rabalais (Louisiana Universities Marine Consortium), Jeffrey Book (Naval Research Laboratory), Zhankun Wang (NOAA), Brian Dzwonkowski (University of South Alabama)

The overall impacts of oil in the marine environment are dependent on the physical conditions in which a release occurs. The large variably in seasonal and multi-year conditions in the Gulf of Mexico may lead to a wide range of potential consequences. Furthermore, the impact of an oil spill may be the result of lagged effects, and the metrics of restoration could be mis-applied or have its results go unrecognized. Future event mitigation, remediation and restoration efforts will be better informed by increasing our understanding of the large and small-scale estuarine and oceanic processes that influence oil spills in conjunction with their cumulative, long-term impacts. In particular, we must understand how the Deepwater Horizon (DwH) oil was transported and dispersed from source to sink, and how interannual changes in river discharge, a major regional forcing function, affect long-term impacts. It is important, therefore, to improve understanding about a) how these variations in discharge modify physical processes from turbulence characteristics to regional circulation and their association with biological patterns, b) how these patterns influence some of the risks of oil spills, c) the significance of rare events (e.g., the Bonnet Carré Spillway opening in early 2016), and d) the changing nature of multi-year impacts. How did the spatial and temporal scales of impact occur and persist within populations/communities/ecosystems, and what ecological and biogeochemical processes were affected? The scale and temporal consequences of these impacts affect how we avoid, minimize, and mitigate activities on the coast, and how we choose to restore the coast from oil impacts.

This session invites contributions exploring circulation, mixing, and ecosystem responses to oil in coastal marshes and nearshore water ecosystems, and how they were affected over many years from oil exposure; comparisons with baseline conditions are particularly encouraged. The morning session is about the variability of ecosystem stressor context including river plume dynamics, mixing and diffusion, oil transport, and climate. The afternoon session will discuss multi-year oil impacts on marsh ecosystem erosion, microbes, vegetation and food webs.

Session 018: Fate and Transport of Oil In the Open Ocean: Water-Sediment Connectivity

Isabel Romero (University of South Florida), Thomas Oldenburg (University of Calgary), Beizhan Yan (Lamont-Doherty Earth Observatory), Jeff Chanton (Florida State University), Sara Lincoln (Pennsylvania State University)

Ongoing research in the Gulf of Mexico (GoM) for the last 6-years has contributed to a much better understanding of the transport mechanisms, fate and impact of the oil spilled in 2010. Using an array of analytical techniques, studies that have focused on different geographic areas in the Gulf (e.g., DeSoto canyon, block MC294) and environments (e.g., surface ocean, water-column, seafloor) have demonstrated that sustained deposition of Deepwater Horizon contaminants to the seafloor of the Gulf occurred during and after the spill. During transport and deposition, many petroleum constituents underwent multiple transformations and chemical partitioning driven by both biotic and abiotic factors that impacted a wide range of water-column (e.g. plankton, whales, mesopelagic communities) and benthic organisms (e.g., soft corals, meiofauna, Red snapper, microbes). Comprehensive tracking of these partially complex and bioactive transformation products requires the use of new technologies, modifications of standard techniques, and novel applications of existing analytical techniques from beyond the traditional toolboxes of petroleum and environmental geochemistry. The ultimate goal of these studies is to generate models that can be used before an oil spill to provide risk assessment and planning opportunities, during a spill to deliver guidance to first responders, including evaluating tradeoffs between different response options, and after a spill, to assess injury.

This session invites researchers to share their results from the water-column, sediments and biota in the GoM open waters, with the goal of developing an overall “big picture” model of the fate and impact of DWH oil in the water-column and its transit and impact on the seafloor in the open ocean. We seek contributions focusing on field-based, experimental, and modeling approaches to understanding the mechanisms and time scales of biotic and abiotic petroleum transformation. Submissions that characterize chemical species using traditional or outside traditional analytical tools, focus on the toxicity of transformation products, offer new insight into microbes as agents of hydrocarbon transformation, or include predictive or policy-directed components are particularly encouraged. In this session we aim to (1) bring together multidisciplinary studies on the GoM open ocean, (2) apply our new understanding of connectivity processes in the open ocean to modeling systems, and (3) develop models that could provide guidance or assessment during oil spill accidents.

Session 019: Policy-Relevant Implications of Science Emerging from the Deepwater Horizon Disaster

Steven Murawski and David Hollander (University of South Florida)

At the time of the Deepwater Horizon (DWH) spill, technologies and procedures for dealing with an ultra-deep blowout were not well developed, and few planning scenarios considered such a spill. As DWH unfolded, the lack of pre-spill preparation necessitated decision making without the benefit of conclusive proof of the efficacy of some strategy options. As well, numerous scientific papers reporting on DWH-related impacts have emphasized the dearth of pre-spill information as a potential impediment to a contextual understanding of DWH-relayed effects. If a similar spill occurred tomorrow, would the same tactical choices be made and would we have sufficient baseline data? What data would help resolve unanswered questions regarding policy choice? Should policies and laws governing oil drilling and spill response be strengthened across interconnected domestic regions and across national boundaries? In the wake of the Exxon Valdez spill, Congress passed and the President signed into law the Oil Pollution Act of 1990 (OPA-90). Does OPA-90 need to be revisited in light of the advent of ultra-deep drilling?

This session will consider a range of public policy implications in light of new research stemming from the DWH disaster. Topics to be considered include the effectiveness of response strategies used (e.g., use of shallow and deep dispersants, freshwater flooding from diversions, burning, construction of diversion barriers, skimming technologies, and consultations on endangered species impacts of responses, etc.), as well as potential alternatives. As well, the relevance and collection of baseline data, and national and international regulations and laws governing oil and gas exploration and production will be considered. This session will consider these and other policy-related questions. In lieu of an invited speaker, a panel discussion will be organized to include current and former agency officials and scientists, industry representatives, academic scientists and policy experts to discuss current policies, potential gaps and opportunities to advance the effectiveness of oil spill mitigation and prevention.

Session 020: Recovery from the Bottom Up: Rates, Processes, and Connectivity in the Deep Gulf of Mexico

Tracey Sutton (Nova Southeastern University), Ian MacDonald (Florida State University), Iliana Baums (Pennsylvania State University), Erik Cordes (Temple University), Amanda Demopoulos (US Geological Survey), Gilbert Rowe (Texas A&M University at Galveston)

The vulnerability of different ecosystem components to a pollution event is largely a function of process rates (e.g., advection/residence, growth, production, mortality, trophic mediation, migration). Understanding impact in the deep sea is particularly complex due to both large data gaps and the extremely wide range of biophysical rates of its ecosystem components. Although the northern Gulf of Mexico has become one of the most intensely studied deep-sea ecoregions in oceanographic history as a result of the DWHOS, developing a science-based strategy for recovery is a work in progress.

Recovery from the impacts of the DWHOS will be a complex and slow process, one that will be facilitated by the mandated Restoration efforts. The time scale and complexity of this issue is most prominent in the deep waters of the outer continental shelf and slope where the release of oil and gas and application of dispersants occurred, and many of the known and potential impacts took place. In these habitats, the Gulf's benthic ecosystem hosts a highly diverse and productive fauna with numerous connections to the broader Gulf-wide ecosystem. Injuries to sessile, slow-growing corals and other benthic invertebrates have been well-documented after DWHOS, but many potential habitats have not been surveyed for impact. It is crucial that improved understanding of the deep Gulf, and its interaction with the pelagic realm, be applied toward prioritizing research that will quantify recovery and ecosystem health in coming decades.

The session invites presentations relating to the timescales of deep circulation, community function and ecology, active and passive carbon flux, and case-studies of toxicity and impacted benthic habitats. The session will address three conference themes:
1) Biogeochemical processes, ecological impacts and human dimensions contributing to effective restorations and recovery efforts;
2) Ecological impacts that inform future spill outcomes and response; and
3) Long-term fate and impacts.

Session 021: Use of Ecological and Socioeconomic Indicators to Demonstrate Ecosystem Recovery

Rebecca Allee, Julien Lartigue and Frank Parker (NOAA)

Ecological and socioeconomic indicators may be thought of as a proxy to reflect the status of ecosystem components of interest. They can help describe the ecosystem in simpler terms that can be understood and used by scientists and non-scientists alike. For example, a resource manager may select a certain species of bird and use estimates of that species' abundance to represent an entire community of birds in a given geographical range. Within the past couple of decades, use of indicators is on the rise. Indicators are a good approach to help scientists assess the health of an ecosystem, and are often used to enlighten the public about what is going on in the environment in which they live. In the field of ecology, indicators have traditionally focused on non-human components of an ecosystem. Today, scientists are interested in providing information to managers that encompasses the entire ecosystem, which includes humans. This approach is necessary for successful ecosystem-based management. Once a comprehensive suite of indicators has been developed that reflects the ecosystem, the services it provides, and the level of human well-being associated with that ecosystem, the information can be turned over to resource managers. Ideally, the integration of ecological and socioeconomic indicators into management practices will improve management decisions and allow managers and the public to monitor the recovery of an ecosystem.

This session invites presentations on the development, evaluation, and application of ecological (including ecosystem services) and socioeconomic indicators in the Gulf of Mexico. Abstracts that focus on indicators used to inform management and response to ecosystem perturbations (e.g., hazards response, natural disasters), including monitoring and/or assessing restoration will be encouraged.

Session 022: Using Scientific Data from the DWH Spill to Inform Development of Broad Conservation Actions

John Reynolds (Mote Marine Laboratory), Sherryl Gilbert (University of South Florida), Richard Wallace (Ursinus College)

The growing body of knowledge of the Gulf of Mexico since 2010 calls for a re-examination of our relationship with the environment, particularly when it arises out of a need for conservation. Within a framework of conservation that explicitly includes sustainability of human enterprises, living resources, and ecosystems and takes a long-term, proactive view, this session provides insights regarding the implications of Gulf research for helping to sustain Gulf ecosystems, species, and human enterprises into the future.

This multi-disciplinary session aims to incorporate what scientists have learned about oil spills, and link science to improved planning, policy, restoration, and sustainability. Invited speakers will define conservation and how to achieve it, discuss the range of possible approaches for optimizing success of conservation actions, and underscore the utility of developing excellent databases to inform decisions. Following presentations by the invited speakers and by selected GOM scientists who apply for this session, the organizers and invited speakers will discuss the applicability of results for conservation and provide a synthesis of recommended actions and approaches that emerged from the presentations and a panel discussion.

We invite abstracts which provide perspective on results of a variety of scientific research projects. Presenters should use specific examples or case studies to illustrate how emerging GoM science is being or could be used by conservation decision makers. Topics of interest include but are not limited to conservation of wild living resources, addressing the needs and values of multiple stakeholders, and sustaining ecosystems in ways to provide diverse ecosystem services.

Session 023: Oil Spill Modeling: Source to Sink

Christopher Barker (NOAA), CJ Beegle-Krause (SINTEF Materials and Chemistry), Juan Restrepo (Oregon State University), Louis Thibodeaux (Louisiana State University), William Dewar (Florida State University), Clint Dawson (University of Texas)

Oil spill models are integrated computer systems that simulate the transport, fate, and effects of oil spills. Models can be used to help understand such processes and the interplay between processes, as well as being critical to Decision Makers before, during and after an oil spill.

- Before an oil spill, these models provide risk assessment and planning opportunities.
- During a spill these models provide guidance to the response, including evaluating uncertainty and trade-offs between different response options
- After a spill, these models are used to assess injury.

Integrated models can also be used to help understand the interplay between various individual processes.

This session aims to bring forward research that targets improving decision support modeling and concepts. Since the Deepwater Horizon oil spill, much has been learned, but how can this work be applied now that we can look back to 2010? What models and analytical techniques can be used to support decision in the heat of a response when information is scarce, public concern is high and time is short? What techniques can be used to quantify interdisciplinary error estimates in order to explain uncertainty in forecasting and in evaluation of effects?

This session will focus on recent developments in integrated models, including individual processes and applications of scientific computing methods, as well as use cases for decision support and/or assessment systems.