

Summary Minutes
U.S. Environmental Protection Agency
Science Advisory Board
Oil Spill Research Strategy Review Panel

Panel Members: See Committee Roster – Attachment A

Date and Time: Monday, April 11, 2011 (10:00 a.m. - 5:30p.m.)
Tuesday, April 12, 2011 (10:00 a.m. - 12:00 p.m.)

Location: Meeting conducted via teleconference

Purpose: To review and provide advice on the scientific adequacy and appropriateness of EPA’s Draft Oil Spill Research Strategy.

Attendees:

Panel Chair: Dr. David T. Allen

Members: Ms. Yvonne Addassi
Dr. Kevin Brown
Dr. G. Allen Burton
Dr. Richard Camilli
Dr. James Clark
Dr. Thomas Frazer
Dr. James R. Mihelcic
Dr. Eileen Murphy
Dr. Stephen M. Roberts
Dr. James Sanders
Dr. Kathrine Springman
Dr. Ronald Tjeerdema

SAB Staff Office: Mr. Thomas Carpenter Designated Federal Officer
Dr. Vanessa Vu, Director SAB Office

EPA ORD staff: Mr. Lek Kadeli, Principal Deputy Assistant Administrator
Ms. Cynthia Sonich-Mullin
Ms. Patricia Erickson
Dr. Al Venosa
Dr. Fran Kremer, Ph.D.

Others Present Don Aurand, Ph.D., Ecosystem Management & Associates, Inc.
Linda M. Wilson, New York State Office of the Attorney General
Commander Eric J. Miller, Interagency Coordinating Committee on
Oil Pollution Research
Shannon R. Jenkins Office of Research, Development, Test, &
Evaluation, USCG

Meeting Materials: All meeting materials are available on the SAB Web site, <http://www.epa.gov/sab>, at the [Oil Spill Research Strategy Panel Meeting](#) Page.

Convene Meeting

The meeting was announced in the Federal Register¹ and proceeded according to the meeting agenda, as revised. Mr. Thomas Carpenter, Designated Federal Officer (DFO) for the SAB Oil Spill Research Strategy Review Panel convened the meeting at 9:00 a.m. on April 11, 2011. He stated that the EPA Science Advisory Board (SAB) was a chartered federal advisory committee and reviewed Federal Advisory Committee Act (FACA) requirements. He noted the Committee's compliance with ethics requirements. Mr. Carpenter stated that as DFO, he would be present during the Panels' business and deliberations. He stated that summary minutes of the meeting would be prepared and certified by the Chair. He stated that for this review, the SAB Staff Office had convened an ad-hoc panel inviting experts to participate in the review².

Welcoming Remarks

Dr. Vanessa Vu, Director of the EPA SAB Office, welcomed the Panel members and thanked them for providing advice to EPA on the *Draft Oil Spill Research Strategy*³

Introduction of Members, Purpose of Meeting, and Review of the Agenda

Dr. David Allen, Chair of the SAB Oil Spill Research Strategy Review Panel, hereafter referred to as the Panel, provided introductory remarks. He asked members of the Panel and meeting attendees to introduce themselves. After the introductions, he thanked the Committee members for participating in the meeting, outlined the purpose of the meeting and reviewed the agenda.

Dr. Allen stated that in the review, EPA was seeking advice from the SAB regarding the technical soundness of the draft research strategy. The Charge⁴ to the SAB consisted of three questions. Charge questions 1 and 2 focused on the scope of the Strategy in its entirety and whether the Strategy addressed and discussed the research and science that will be needed to support the Agency's future challenges. Question 3 focused on each of the four research themes and sought SAB advice on whether the project areas under each research theme addressed the key issues, if there are science questions that should be added or deleted from the Strategy and if the proposed project areas are adequately described.

Dr. Allen reviewed the meeting agenda⁵ and provided an overview of how the Panel would develop a consensus advisory report providing advice in response to the charge questions. He outlined the process for developing the report noting that the Panel would discuss the key points and summarize those discussions on the 12th. He stated that following the meeting, the writing groups would send their responses to the Designated Federal Officer who would incorporate them into a draft of the advisory report. He noted that the Committee would hold a public teleconference to discuss the draft advisory report after it had been developed.

Remarks from EPA Office of Research and Development

Mr. Lek Kadeli, Principal Deputy Assistant Administrator, Ms. Cynthia Sonich-Mullin, and Ms. Patricia Erickson from EPA Office of Research and Development provided an overview of the Oil Spill Research Strategy⁶ and why EPA developed the document. Mr. Kadeli recounted the Agency's involvement in the Deepwater Horizon Oil Spill in 2010 and the range of issues EPA had to address. He noted that many of the issues involved new circumstance associated with the depth of the well, volume and velocity off the oil spill, and changes in recovery technologies. Ms. Erickson provided an over view of the Strategy and EPA's rationale for the scope, type of research, and level of detail it presents.

Several members of the Panel asked EPA staff to clarify the level of resources available to projects and needs identified in the Oil Spill Research Strategy including those from the Science To Achieve Results grant programs. Those members also asked EPA to expand on the current fiscal funding, anticipated levels of funding in future fiscal years discussed in the Strategy, and funding levels in the past that may be continued in future appropriations to better gauge how EPA will need to set priorities for oil spill research. EPA staff clarified that the \$2 million funding available under the STAR program is a single fiscal year appropriation that is not anticipated to continue in future years. ORD staff also noted that past oil spill, funding was approximately \$700,000 and future funding across the government is under scrutiny

Members also asked ORD staff to expand on the implementation of projects identified in the Strategy and whether that level of effort was consistent with anticipated level of resources that would be need to implement the research discussed in the Strategy. Another panel member asked how EPA plan to balance the STAR grants and the longer-term research projects

A member asked how EPA would coordinate with many other Agencies performing research and collecting information on oil spills, remediation response, restoration, and addressing public health concerns. As EPA coordinates with those other agencies, are the collaborating Agencies developing research strategies or multi-year plans. Does the EPA Strategy become a master document incorporating other Agencies research needs?

ORD staff further clarified that the research identified in the Strategy focuses on the EPA role in oil spill response as defined in the Oil Pollution Act (OPA) and is not an interagency Research Strategy. For example, EPA is responsible for compiling the information and listing oil control agents under Subpart J of OPA. This includes materials such as dispersants, surface washing agents, oil-collecting agents that are included in the Strategy. Other oil spill remediation materials or mechanisms such as blowout preventers are not defined as an EPA responsibility in OPA. EPA staff further noted that the Strategy includes biofuels, vegetable oils and other fluids identified in OPA. The OPA also delineates inland spills under the jurisdiction of EPA and coastal or deep sea spills under the jurisdiction of the Coast Guard and the National Oceanic Atmospheric Administration.

Discussion of Dispersants

Drs. Richard Camilli, Kathrine Springman, and Ronald Tjeerdema, lead reviewers for the discussion of dispersants, provided an overview of the section and raised these issues in their comments.

Dispersants and other agents need to be considered and included in the Strategy. Dispersants are complex mixtures and the toxicity needs to be considered as an oil mixture. Better analytic methods need to be developed to better understand oil fractions. The strategy needs to consider ranges of oil types and test their toxicity with oils. Surface toxic effects and deep water toxic effect may be different and this should be considered treating surface and subsurface as two separate and distinct classifications.

Fate and efficacy data and information needs to be further developed. There are efficacy and toxicity data on more than 20 chemical treatment agents. However, only one or two dispersants are stockpiled for use. The Strategy does not define the efficacy of dispersants. Fate and transport information needs to be developed with methods and additional monitoring. Models for

fate and transport for dispersants able to account for a wide range of conditions should be developed. Next steps would be to organize and identify the permutations that are most useful for decision makers using fate studies would guide the next round of toxicity studies. The Strategy needs to consider application in Arctic events and low temperature environments under exploration.

There is a need to consider chronic and sub-chronic effects in addition to LC 50 acute endpoints. Food web impacts should be considered and not only economically important species. Changes in bio-available toxicity in dispersants with depth also need to be documented. Bioavailability is a key question and "omics" research could be helpful. The Strategy needs to consider benthos and sessile organisms (i.e., corals).

Improve interagency collaboration with oil pollution prevention response partners e.g., National Oceanic Atmospheric Administration, U.S. Coast Guard and National Institute Environmental Health Services.

Panel Discussion:

Panel members discussed developing a database to house research results from the work on dispersants. The metrics and criteria on dispersant performance under different environments and stressors from the research should populate the database. One member pointed out that the environments and the oil are fairly well understood by equations of state similar to weathering models. Other panel members discussed the utility of dispersant research that is needed by oil spill site decision makers. For example, will the research support dispersant use decisions while considering ecological population recovery? Several members suggested that metrics could be harmonized to allow decisions at multiple and different sites.

One member asked why “green chemistry” for dispersants was identified as a priority in the research strategy and noted that better risk communication would include the public’s right to know dispersant composition and would address human health effects.

Members discussed considerations of dispersant use in submerged and deep-sea application scenarios. One member suggested adding research to evaluate the additives to prevent hydrate formation in deep-sea applications. Members discussed analytic approaches and variables to consider in submerged deep-sea plume toxicity; identification of hydrophilic and hydrophobic dispersant components that remain in the oil plume; dissolved oxygen consumption and hypoxia; direct toxicity, and; degradation rates and intermediate degradation component toxicity.

Members discussed whether the baffled flask test improvements would provide accurate and helpful data. Members noted that wave basin results could be robust and provide controlled condition to base comparisons. Other members noted that there might be limited comparability to deep-water release under high-pressure scenarios.

The panel agreed that key points from their discussion include:

- define efficacy and the endpoints that are being evaluated for dispersants;
- recognize and address the complexity of dispersant oil mixtures and other compounds;
- account for the many variable that need to be considered, collected and organized to provide meaningful data; and
- Identify research and projects that will develop results that oil spill decision makers.

Discussion of Human Health Impacts

Drs. David Allen, Eileen Murphy, and Stephen Roberts were the lead reviewers for the discussion of human health impacts research and provided an overview of the section and their comments.

Reviewers noted that the Strategy generally describes research in other Agencies as well as EPA. They also noted that much of the human health impact research is being conducted outside EPA. It would be helpful to the reader to have a more clear understanding of the collaborators and leads for the research project discussed and who are EPA's collaborators for these studies; is it Science To Achieve Results grants, National Institute of Health, National Toxicity Program or another Agency?

The Strategy could better define epidemiological studies as to what is planned, what is being done or is initiated and by which Agency. Problem formulation needs to be tightened to "Identify" the information gaps that need science to support EPA decisions. For example, epidemiological studies do not state the key piece of research that EPA needs. Do the metrics and interagency work characterize the community impact and effect to the oil spill community? Another important epidemiologic consideration the Strategy did not identify is impacts to communities and residents near oil spills. There is a need to define the studies and the targets. Are they workers, community residents or both? Factors will vary depending on the subject of the studies. EPA should consider how to include environmental justice issues.

There are several key points that are not identified or are missing from the Strategy. One of the significant science issues that is not clear is that short time period exposure is the most common exposure pattern. These exposures consider air and water as the exposure media. Polycyclic aromatic hydrocarbons (PAHs) are carcinogenic and the acute (short-term) exposure may not account for this endpoint. As currently written, the epidemiological studies performed by others (i.e., NTP) are addressing these issues. Other exposures to consider are beach sands, food pathways, and worker dermal exposure. It is not clear if these may not be of direct concern to EPA but are more likely of concern to FDA or OSHA respectively.

The Strategy discusses the importance of risk communication; however, risk communication research seems to be an appropriate area that has not been covered. It would be helpful for the Agency to state whether it was considered or not and discuss whether it is appropriate or not appropriate for the Strategy.

Panel Discussion:

Members wanted to know how the Oil Spill Research Strategy is being leveraged or linked to other ORD efforts such as the Human Health multi-year plan.

Members suggested identifying cohorts from the Deepwater Horizon Spill and following these cohorts to assess latency effects. Members discussed the need to identify methods to use acute exposures and extrapolate those for further research. For example, one member suggested that OSHA data and information on oil spill sites might be valuable to characterize high exposures period that are missed during monitoring in communities. One could use peak measurements or higher frequency of data collection to estimate the community exposure

Members also discussed the need to more clearly identify the research needed to evaluate impacts to disadvantaged communities (Environmental Justice issues). It is important to consider the and incorporate these issues in the early stages of study design in order to achieve meaningful results

The panel agreed that key points from their discussion include:

- The Human health section needs to more clearly define the EPA roles and responsibilities;
- The lack of clarity about which agency is the lead , collaborators roles, and the scope and goals of the research makes the human health discussion weak;
- The Agency needs to consider and better articulate the research for the key exposure pathways, (i.e., water, food and sand); and
- The Agency needs to clearly state the risk communication project areas and goals.

Discussion of Oil Spill Shoreline, Coastal, and Inland Effects

Drs. G. Allen Burton, James Clark, and James Sanders were the lead reviewers for the discussion of research on shoreline, coastal, and inland ecological effects and provided an overview of the section and their comments.

Reviewers recognize that EPA did not attribute responsibilities across agencies for research and this makes it difficult to identify EPA priorities. Reviewers also referred EPA to the SAB Ecosystems Services review and its recommendations for consideration.

Reviewers noted that the list of ongoing and anticipated federal research activities (Appendix A of the Strategy) has virtually no ecological research identified. Academic research (Appendix B) is highly focused on ecological, but much of that research is unfunded, or by Sea Grant or the National Science Foundation. This research seems very random and therefore is not sufficient to answer more complex ecosystem level questions.

Ecological impacts need to be cast in a population/community perspective, with an associated decision management framework that considers the background conditions, existing contamination, knowledge of food web and recruitment/refugia (recovery capacity). This must be coupled with strong exposure characterizations that take into account oil type, dispersant type, loading, and hydrology. For example, currently some cleanups are driven by visible sheen. Site decisions may not be based on habitat destruction, food web contamination, and recovery potential. The Strategy needs to clarify how EPA will develop information to identify and risk tradeoffs. Although mentioned in the Strategy it should be more explicit. Understanding of oil fate and effects will require effort at the population level and above—preferably community and ecosystem.

The “ecosystem services” discussion is very limited and tenuous given where EPA stands on their ecosystem services research strategy. The use of population density as their ecosystem service predictor is a weak one for many organisms and ecosystem functioning.

Panel Discussion

Members discussed the scale and lack of information needed to develop a research strategy for remediation and restoration on a scale as large as the Deepwater Horizon Spill. Members first pointed to the lack of baseline data and information that was available to assess damage from the

spill. Other members expressed concern that there is a general lack of knowledge to understand the effects of any large-scale perturbations. The Strategy needs to be forward looking to identify these impacts at organism, community, population and ecosystem levels.

Other members noted that the scale and heterogeneity of the ecosystem created issues and asked if there were methods or approaches to identify reference ecosystems that are similar and how they might respond to a spill. Other members identified programs that collect data and information from ecosystems that may be useful for oil spill research. One member noted that many academics research PAH issues and suggested that the Environmental Monitoring and Assessment Program (EMAP) run by EPA's Office of Research and Development to develop the tools necessary to monitor and assess the status and trends of national ecological resources. Another member identified the National Estuary Program. A member also identified smaller scale projects that while they may be appropriate for comparing ecotypes in similar climate regions they are not necessarily appropriate to compare to those in different climate zones.

The panel agreed that key points from their discussion include:

- There is a need to develop a resource to house baseline ecological data for comparisons to spill scenarios;
- The Strategy needs to distinguish between short-term and long-term research;
- In developing the research EPA needs to communicate effectively among the interagency partners and collaborators; and
- The Agency should consider developing indicators that, and at an appropriate level, demonstrate ecosystem's response and recovery.

Discussion of Innovative Processes and Technology Development

Ms. Yvonne Addassi, Dr. Kevin Brown, and Dr. Christine Ehlig-Economides were the lead reviewers for the discussion of research on innovative processes and technology development and provided an overview of the section and their comments.

Lead reviewers noted that this research theme does not address prevention issues and has limited discussion of mechanical measures such as blowout preventers. They noted that prevention is a critical element to reducing the potential for oil spills. The reviewers also recognized that the federal research sector may not be best poised to conduct prevention research but believes the Strategy should explicitly identify the importance of prevention measures.

There is limited discussion of mechanical systems. It seems that that physical or mechanical containment technology is outside the scope of the Strategy. The reviewers believe the discussion should be expanded. If they are outside of the scope of the Strategy, this should be clearly indicated in the report introduction along with explanation of how this subject will be addressed in other research strategies.

The reviewers stated the research focus should be on research needed to support revision to National Contingency Plan Subpart J. There is a host of products to consider. Physical approaches need to be accounted for in this section of the strategy. The Agency should also evaluate and mine the information and data developed during the DWH spill. Subpart J NCP test protocols need to be more consistent and robust. The current California List requirements are

more rigorous than the federal requirements. For example, criteria that provided information on when an agent is too toxic for use would be helpful.

From the process perspective, it seems like there should be specific reference in each Research Development Framework for rigorous review of what was learned or still under study from experience, data, and research related to previous incidents.

Panel Discussion

Panel members discussed how the strategy could provide research and information to assist managers and decision makers and identify the remediation and cleanup risk- tradeoffs among options. Members suggested that the Strategy should consider the information needed to make the remediation selection and to develop appropriate metrics and criteria. Members also suggested that defining performance criteria for new technologies would be helpful and should be shared with other oil spill consortia such as the Interagency Coordinating Committee on Oil Pollution Research. For example, high volume oil and water separators/skimers were not deployed during the DWH spill because of sea worthiness, performance, and discharge requirements. Defining the criteria and initiating research to would allow others to develop separators that meet the discharge standard the clean water Act.

Members also discussed how the technology research groups could develop criteria to deploy new and innovative technologies. One Member suggested developing a priori decision trees for deployment and policy decisions on using new technologies. Another member noted the Department of Defense performs technology readiness assessments for new technologies and this may be an appropriate tool to develop a systems management approach for new technologies. The system could provide a selection guide with advantages and disadvantages of the technologies and provide alternatives.

The panel agreed that key points from their discussion include:

- Innovative processes and technology development should focus on EPA's regulatory role;
- If EPA wishes to encourage the development of new or improved technologies the Agency should develop specific operational criteria as part of a review process;
- The Agency should consider using a net environmental benefit analysis approach to identifying and prioritizing research so that it addresses environmental tradeoffs associated with oil spill response decisions; and
- The Panel understands that prevention research may be managed by other agencies. The Strategy should recognize the importance of prevention to reducing the number of oil spills.

RECESS FOR THE DAY

At 5:30 p.m., Mr. Carpenter, DFO adjourned the Panel in recess until 10 am Tuesday April 12, 2011.

RECONVENE

Mr. Carpenter reconvened the Oil Spill Research Strategy Review Panel at 10 am (EDT). Mr. Carpenter called roll and asked that members of the public send an email to document their attendance to the call.

Dr. Allen opened the Panel's deliberations with a short summary of the previous day's discussion and asked members if any additional issues should be mentioned that were not discussed yesterday or should be added to today's discussions.

Members identified monitoring as an area that was not discussed in detail and noted the paucity of monitoring data available to evaluate oil spills. Members noted that monitoring is not consistent across states and not mandated by federal agencies. Members also note that monitoring conducted by academics and other organizations is not routinely collected and compiled. One member suggested that the strategy should include an explanation of the Office of Research and Development and Office of Emergency Response and Remediation responsibilities for monitoring.

Members noted that monitoring is conducted by different Agencies responding to their responsibilities and roles in a spill. They also pointed out the need to collect and compile these data. For example, real-time data are collected to assist decision-makers in identifying the area of concern and in deployment of remediation personnel and equipment including air and water monitoring.

Discussion of General Issues: Charge Questions 1 and 2

Drs. James R. Milhelcic and Thomas Frazer were the lead reviewers for the discussion of research on the charge questions and provided an overview of the section and their comments.

The reviewers noted that there were many issues that appear in more than one of the research themes in the Strategy. It is not clear how the Oil Spill Research Strategy will be incorporated into the Integrated Transdisciplinary Research approach that the Office of Research and development is initiating. Lead reviewers also noted that the discussion on green chemistry in the introduction to the Strategy and individual research themes was somewhat disjointed and should be expanded to include green engineering and life cycle assessment.

Reviewers also noted that the discussion of environmental justice research was not sufficiently emphasized in the Strategy. Discussion of ecosystem services and human health impacts should include environmental justice and the human health section cursorily addresses this topic. The discussants believed that behavioral sciences research would also be an appropriate research area to address.

Panel Discussion

Panel members agreed with the lead reviewer comments and discussed organizational changes to the Strategy and additional issues that should be considered. Members noted that the environmental justice issues discussed in the human health section could also be raised in the Shoreline Coastal and Inland section that discusses ecosystem services. Members also recognized the complexity and interrelated nature of the research themes. The toxicological discussion on dispersants will have implications on research in the ecological and human health sections. Likewise, the dispersant research will need to inform research on innovative processes and technologies as well as information flowing in the opposite direction.

Panel members noted that the Strategy presentation on many of the issues within the research areas are described at a high summary level and not sufficient to address collaborations with entities outside of EPA. Panel members found the Appendixes to be a good resource that should

be expanded upon to include addition research programs, available funding mechanism (i.e., NSF)

The panel agreed that key points from their discussion include:

- Include a discussion on prevention research that may be managed by other agencies. The Strategy should recognize the importance of prevention to reducing the number of oil spills;
- Environmental justice issue should be included in this section and specific issues addressed in the human health section as appropriate;
- The discussion of green chemistry should be expanded to account for green engineering and life cycle assessment; and
- Social and behavioral science research should be added to the Strategy

Discussion of Remaining Issues and Next Steps

Dr. Allen reviewed the points the Panel Members identified as key issues and asked the panel for any additional thoughts. Panel members agreed that the key issues were identified and did not identify any additional issues or comments. Dr. Allen asked the DFO to summarize the next step for Panel members to develop the Advisory Report

Mr. Carpenter stated that writing teams would work to develop draft section of the Advisory Report and submit them to the DFO. The DFO and the Chair would develop the draft Advisory report with the Letter to the Administrator and Executive Summary based on the panel's discussion and draft submissions. The panel would then reconvene to review the draft Advisory Report by teleconference on approximately 6 weeks. Based on the discussion and a second draft Advisory report would be distributed for consensus review. After consensus, the draft Advisory report would be submitted to the chartered Science Advisory Board for Quality Review prior to finalization. Mr. Carpenter will develop a writing schedule and request available times for the teleconference from Panel members.

Dr. Allen asked the Panel for any questions or clarifications. He then called upon the DFO to adjourn the meeting

The Designated Federal Officer adjourned the meeting at 12:00 p.m.

Respectfully Submitted:

Certified as True:

/Signed/

/Signed/

Mr. Thomas Carpenter
SAB DFO

Dr. David Allen
Chair

NOTE AND DISCLAIMER: The minutes of this public meeting reflect diverse ideas and suggestions offered by committee members during the course of deliberations within the meeting. Such ideas, suggestions, and deliberations do not necessarily reflect definitive consensus advice from the panel members. The reader is cautioned not to rely on the minutes represent final, approved, consensus advice and recommendations offered to the Agency. Such advice and recommendations

may be found in the final advisories, commentaries, letters, or reports prepared and transmitted to the EPA Administrator following the public meetings.

Materials Cited

The following meeting materials are available on the SAB Web site, <http://www.epa.gov/sab>, at the [Oil Spill Research Strategy Panel Meeting](#) Page. .

¹ Federal Register Notice Announcing the Meeting (75 FR 16769-16770)

² Determination Memorandum and Biosketches of Candidates

³ Draft Oil Spill Research Strategy 2011

⁴ Charge to the SAB Oil Spill Research Strategy Review Panel

⁵ Meeting Agenda

⁶ Presentation to the Science Advisory Board Panel – Draft Oil Spill Research Strategy

ATTACHMENT A
U.S. Environmental Protection Agency
Science Advisory Board
Oil Spill Research Strategy Review Panel

CHAIR

Dr. David T. Allen, Professor, Department of Chemical Engineering, University of Texas, Austin, TX

Ms. Yvonne Addassi, Senior Environmental Scientist, California Office of Spill Prevention and Response, California Department of Fish and Game, Sacramento, CA,

Dr. Kevin Brown, Professor, Scripps Institution of Oceanography, University of California San Diego, La Jolla, CA

Dr. G. Allen Burton, Professor and Director, Cooperative Institute for Limnology and Ecosystems Research, School of Natural Resources and Environment, University of Michigan, Ann Arbor, MI

Dr. Richard Camilli, Associate Scientist, Applied Ocean Physics and Engineering, Woods Hole Oceanographic Institution, Woods Hole, MA

Dr. James Clark, Independent Consultant, Edmonds, WA

Dr. Christine Ehlig-Economides, Professor, Petroleum Engineering, College of Engineering, Texas A&M University, College Station, TX

Dr. Thomas Frazer, Professor, Fisheries and Aquatic Sciences, School of Forest Resource Conservation, University of Florida, Gainesville, FL

Dr. James R. Mihelcic, Professor, Civil and Environmental Engineering, University of South Florida, Tampa, FL

Dr. Eileen Murphy, Grants Facilitator, Ernest Mario School of Pharmacy, Rutgers University, Piscataway, NJ

Dr. Stephen M. Roberts, Professor, Department of Physiological Sciences, Director, Center for Environmental and Human Toxicology, University of Florida, Gainesville, FL

Dr. James Sanders, Director and Professor, Skidaway Institute of Oceanography, Savannah, GA

Dr. Kathrine Springman, Associate Professor, Chemistry Department, Portland State University, Portland, OR

Dr. Ronald Tjeerdema, Professor and Chair, Environmental Toxicology, College of Agricultural and Environmental Sciences, University of California, Davis, CA

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