

CERF 2013

Toward Resilient Coasts & Estuaries Science for Sustainable Solutions

3-7 November 2013
Town & Country Convention Center
San Diego, CA



SPECIAL SESSIONS FOR CERF 2013 BIENNIAL CONFERENCE

SYMPOSIUM: MANAGING NUTRIENTS IN A CHANGING WORLD

Plenary Session: Managing Nutrients In A Changing World

Martha Sutula & Jim Hagy & Suzanne Bricker

This 90-minute plenary session will feature two keynote speakers. The first will address the challenges in establishing water quality goals for nutrients within the constraints in existing regulatory structures and uncertainty in science. The second will provide perspectives of how water quality goals must evolve to improve our ability to adaptively manage ecosystems through a discussion of biologically based water quality goals, estuarine tipping points and restoration trajectories.

SCI-001 Bridging The Gap Between Eutrophication Assessment Frameworks And Nutrient Water Quality Criteria.

Martha Sutula & Jim Hagy & Suzanne Bricker & Tiffany Crawford

Over the past decade, standardized assessment frameworks have been developed using ecological response indicators to assess eutrophication in estuaries. Concurrently, scientific efforts have supported development of numeric nutrient criteria as a first step toward regulatory management of nutrient pollution. This session consists of invited and contributed talks to explore how these two enterprises are being developed around the world, highlighting commonalities in the science supporting these efforts, including: (a) developing quantitative response measures to represent water quality goals, (b) modeling to link response indicators to nutrient criteria or targets, (c) addressing spatio-temporal variability of nutrient and response indicators, and (d) use of multiple lines of evidence to arrive at scientifically-defensible conclusions. The session will conclude with panel discussion presenting a debate by invited speakers to highlight the case for opposing viewpoints on controversial topics on how this science should be translated to management.

SCI-002 Comparative Understanding Of Estuarine Eutrophication Tipping Points And Restoration Trajectories.

Daniel Conley & Jacob Carstensen & Holly Greening

A tremendous amount of uncertainty exists in the selection of chemical or biologically-based water quality goals, how achieving these goals may relate to human activities, and the nature of environmental degradation and recovery trajectories within the context of global change. The concept that ecological effects involve "tipping points," beyond which the consequences of nutrient enrichment become more severe and perhaps less reversible, is appealing to many as motivation for action to limit nutrient enrichment. The converse argument, that short of such tipping points nutrient enrichment is acceptable and without significant consequence, is equally tempting. These complex questions highlight the formidable challenge facing the science and management communities in address the complex causes and consequences of nutrient pollution. This session would focus on effectiveness and uncertainties of water quality goals and nutrient management in addressing the effects of nutrient pollution through an exploration of case studies on estuarine tipping points, and the effects of load reductions on restoration trajectories in a variety of settings.

SCI-004 Alternative Nutrient Management Strategies: Creative Solutions To A Complex Problem.

Julie Rose & Suzanne Bricker

As coastal populations continue to expand, nutrient management becomes an ever-changing and increasingly important issue. Many watershed management programs have embarked on successful campaigns to upgrade wastewater treatment plants and implement agricultural and stormwater best management practices, addressing several major sources of point- and nonpoint source nutrients. However, a wider range of tools could be beneficial to resource managers challenged with meeting water quality standards in highly eutrophic water bodies in the face of diminishing returns on investment in traditional management measures. This session will address new and innovative approaches to nutrient reduction, including but not limited to topics such as shellfish and seaweed aquaculture, integrated multi-trophic aquaculture, shellfish restoration, wetland restoration and algal turf scrubbers. Discussions related to science, implementation, issues of scaling and economics are encouraged.

SCI-005 Nutrient Fluxes And Nutrient Accounting In Coastal Catchments And Water Bodies: Methods And Applications

Dennis Swaney

Methods for modeling, accounting or otherwise estimating the contributions of nutrients from various sources in watersheds can be useful in managing nutrient loads to coastal waters from watersheds. This session discusses such methods, the responses of coastal waters, and their potential management implications, including the implications of uncertainty & variability, scale, and integration of alternative methods.

SCI-006 Efficient Watershed Management: Tracking, Trading, And Exchanges In The Chesapeake And Other Coastal Systems

Lewis Linker & Gary Shenk & Richard Batiuk & Lisa Wainger

The Chesapeake Bay Program is committed to taking an adaptive management approach to the Bay TMDL and expects that new or increased loadings of nitrogen, phosphorus, and sediment from growth in the Chesapeake Bay watershed will be offset by loading reductions and credits generated by other sources under programs that are credible, transparent, and consistent with achieving and maintaining the Bay's nutrient goals. Tracking and exchanges of nitrogen and phosphorus between basins, sources, and airshed to watershed are key elements of efficient management of implementation measures to restore the

Chesapeake water quality and living resources. Other coastal systems engaged in nutrient trades and exchanges will also be examined.

SCI-007 Translational Science: The Complexities Of Watershed And Estuarine Restoration Efforts.

Mike Allen & Amanda Rockler & Tammy Newcomer & Fredrika Moser

Nutrient and sediment runoff from urban and agricultural land and land use change/habitat destruction are recognized contributors to water quality and habitat degradation in coastal ecosystems. While restoration measures have long been studied and implemented, estuaries and watersheds continue to experience the consequences of these stressors. In this session, we seek submissions on the science of coastal watershed restoration and management practices. In particular, we seek contributions that examine the science underlying nutrient reduction actions, case studies exploring successes and challenges underlying restoration efforts, studies involving scientist-citizen partnerships, and the effects of management and restoration actions on the surrounding ecosystem.

SYMPOSIUM – RESPONDING TO SEA LEVEL RISE

Plenary Session: Responding To Sea-Level Rise

Gary Griggs (CERF) & Megan Bailiff (The Coastal Society)

The plenary and special sessions in this symposium will address the following issues: (1) what is known, and the associated uncertainties, regarding future sea level rise; (2) geographic or regional differences in historic and projected future sea-level rise rates; (3) the past and potential or probable future impacts of a rising sea level on different geomorphic or geographic environments; (4) the adaptation measures that are available for both developed and natural environments in the face of a rising sea; (5) examples of success stories or adaptation plans that are being implemented; (6) examples of resilient development or land use that can serve as models; (7) estuary/wetland restoration efforts and how to use them as effective barriers against SLR; and (8) managing for extreme events.

SCI-008 Past And Probable Future Impacts Of A Rising Sea On Different Geomorphic Environments.

Aaron McGregor & David Revell

This session will examine how different coastal environments (cliffs, bluffs, dunes, beaches, wetlands, marshes, etc.) have responded to the 125m (400 ft) of post-glacial sea-level rise and how these environments are likely to respond to future climate scenarios. Some questions that will be addressed include: What methods or models exist for predicting or projecting how these geomorphic environments are likely to respond to future sea-level rise and storm conditions? What are the strengths and weaknesses of these methods or models and how have they been used to hindcast observed changes? Are these methods or models being applied to policy and planning processes, and at what temporal and spatial scales? How are uncertainties being presented to decision-makers and integrated into the decision-making process?

SCI-009 Adapting To Sea Level Rise – California Communities Preparing For The Future

Becky Smyth

Unique challenges are faced by communities with high-investment coastal infrastructure and high-value real estate along shorelines, often within a few feet of sea level. Communities around the nation are working to address these challenges through adaptation planning that incorporates gray and green infrastructure. The session will present coastal communities that have are currently working on or have

developed adaptation plans and discuss the steps involved in developing these plans, including understanding risk and vulnerability to both critical natural and built environment, and engaging the community partners, stakeholders and public throughout the process. What are the challenges in developing the plans and how are these challenges being addressed? What would constitute a 'successful' adaptation plan that ensures that these critical infrastructure are 'safe' from future impacts?

SCI-010 Cities On The Coast – Present And Future Challenges, With Lessons Learned From Superstorm Sandy.

John Largier

Hurricane Sandy in October 2012 made painfully evident the risks of large cities built very close to sea level. Past sea level rise has contributed to this risk, and risks will only increase with the projected rise of sea level in the decades ahead. As federal funding for reconstruction and recovery are being debated in Congress, and the wisdom of rebuilding in heavily damaged areas is being questioned by coastal geologists, massive engineering proposals are being put forward to protect portions of Manhattan from similar events in the future. Manhattan is not alone, however – portions of Seattle, San Francisco, Los Angeles, New Orleans, Tampa, Miami, Charleston, Norfolk, Baltimore and Boston lie within a few feet of sea level. How do we begin to deal with future sea-level rise problems in large urban areas on these scales? What knowledge is needed to do this?

SCI-011 Storm Effects On Estuaries: Hurricane Irene, Tropical Storm Lee And Superstorm Sandy.

Peter Tango

Annual climate variability influences the delivery of flow and loads driving short and long term estuarine chemical, physical and biological responses. Years punctuated by large tropical weather systems provide natural experiments emphasizing rare extremes in the statistical distribution of wind intensities, durations and rainfall. The proposed session will examine abiotic and biotic responses of eastern U.S. estuaries to recent storms, highlighting management relevant lessons learned from monitoring and analysis.

SCI-012 Sentinel Sites: A National Network To Monitor Sea-Level Impacts.

Philippe Hensel & William Reay

This session will focus on regional sentinel site programs (or similar programs) supporting sustainable coastal communities resilient to sea-level change impacts. A number of agencies have recently incorporated "sentinel" concepts in their coastal monitoring programs, including an initiative to develop regional sentinel site cooperatives, leveraging existing capabilities across all potential partners within a defined region to ensure that the whole continuum (from science to stewardship and service) is being addressed efficiently. This symposium is open to anyone who would like to share their lessons learned in developing similar sentinel site programs, from consistent data standards and protocols to decision support and outreach.

SCI-013 Marshes, Storms, And Sea Level Rise

Tom Allen & Enrique Reyes & Tim Webster

Marshes are critical habitats to ecologically healthy coasts. This session synthesizes ecological and geomorphic responses of marshes to sea level rise, including insights from geospatial analyses and investigations of responses to episodic storms and chronic sea level rise.

SYMPOSIUM – ACIDIFICATION IMPACTS ON ESTUARIES

Plenary Session: Acidification Impacts On Estuaries

Jan Newton & Libby Jewett & Karen McLaughlin

This symposium will have plenary speakers set the stage of the science, economic impacts, and management responses of ocean acidification in estuaries. The plenary will be followed up by special sessions that will include both invited and contributed talks. The symposium will also include a workshop led by the Alliance of Coastal Technologies on making acidification measurements, and on sensor technologies. This symposium will offer new insights relating to ocean acidification as the focus is on acidification in estuaries and in other freshwater-influenced waters, rather than on the open sea. Moreover, it will highlight an increasingly recognized topic, and one that is of increasing urgency, as witnessed by the attention given to the Washington State Governor who established a Blue Ribbon Panel on Ocean Acidification in Washington's coastal and inland waters.

SCI-014 Drivers And Consequences Of NearShore Ocean Acidification.

George Waldbusser & Denise Breitburg & Lisa Levin & Gretchen Hofmann

The focus of this session will be on examining different drivers and patterns of ocean acidification in near-shore environments and the possible consequences to different levels of biological organization. Within these near-shore habitats drivers such as upwelling/overturb, eutrophication, and watershed alteration will interact with increasing atmospheric carbon dioxide in complex ways with possibly complex outcomes for biological responses. Submissions are encouraged that utilize case studies of different systems or address links between temporal variability in near-shore carbonate chemistry and biological responses.

SCI-015 Acidification And Hypoxia In Estuaries.

Tawnya Peterson & Joseph Needoba & Curtis Roegner & Catherine Corbett

Acidification and hypoxia, often in combination, are increasingly threatening the health of aquatic ecosystems worldwide. Estuaries, which receive inputs from freshwater and marine systems, are particularly vulnerable to the presence of multiple stressors. Understanding and predicting how estuarine ecosystems respond to acidification or hypoxia involves identifying and characterizing processes that mitigate or exacerbate these conditions, including the phenology of algal blooms and variations in water chemistry (e.g. dissolved inorganic carbon and alkalinity) associated with oceanic versus river inputs to estuarine waters. In this session, we seek contributions that focus on the relative roles of marine and freshwater processes and their interactions in driving or mitigating estuarine acidification or hypoxia. Regional contrasts and comparisons between different estuary types are welcome. We are particularly interested in studies that link key processes to estuarine ecosystem structure or biogeochemical function through observations or models and that include a management perspective.

SCI-019 Extending Acidification Modeling From The Ocean To Estuaries

Samantha Siedlecki

In the open ocean, decades of monitoring have culminated in the development of numerous ocean models that can predict changes in ocean chemistry and related ecosystem changes due to rising atmospheric CO₂. However, extending these models to the near-shore and estuarine environments is complicated by numerous stressors that can exacerbate the effects of ocean acidification in coastal waters (e.g., freshwater input, tidal forcing and stratified waters, nutrient over-enrichment and eutrophication, hypoxia), all of which must be incorporated into coastal models. This session will explore ways that acidification modeling can be extended to near shore environments and obstacles to developing causal and predictive models at a variety of spatial and temporal scales.

SCI-020 Acidification Observing Networks And Data Sharing

Andrew Dickson & Emilio Mayorga

Observational data and data products on ocean acidification and its implications on ecosystem health are needed to inform policy and the public. Ocean acidification is occurring at a global scale but can be exacerbated by local processes; therefore local measurements and observations must be linked to larger regional and global data sets in order to accurately understand ocean acidification and its drivers and predict future ecosystem changes. This requires collection of data at local to global scales as well as integration of data into a shared data management platform. The observing data can then be input into models (see session SCI-019) and other data visualization tools (this session) to understand the drivers and effects of changing ocean conditions at a variety of spatial and temporal scales. Observing data are critical tools that can be utilized by industry, policy makers, and regional managers to develop strategies to mitigate the effects of ocean acidification and develop strategies to adapt to expected changes whenever possible. This session will examine ocean acidification observing networks, existing data sharing platforms and visualization tools and strategies, and explore development of larger-scale observing networks.

SYMPOSIUM – ANTHROPOGENIC FACILITATION OF SPECIES INVASIONS

Plenary Session: Anthropogenic Facilitation Of Species Invasions.

Jeff Crooks & Jim Eckman

This plenary session will address the role of anthropogenic activities in accelerating species invasions of estuarine habitats, and the compromises faced by environmentalists, managers, and regulators who must use extremely limited resources to choose which invasions to attempt to control and how control efforts must be approached. Three keynote speakers will present different, and possibly discordant, perspectives on this topic.

SCI-021 Dynamics, Impacts Or Control Of Invasive Species.

Jeff Crooks & Jim Eckman

To complement a plenary session on "Anthropogenic Facilitation of Species Invasions" we are soliciting oral and poster contributions on a variety of issues related to the topic of "invasive species" - such as (though not restricted to) a) documentation of species introduction, establishment and spread; b) their impacts on ecosystems invaded; c) analysis of vectors of invasion, and/or d) efficacy and impacts of attempts to control. Contributions will be grouped into sessions of internally closely related talks or posters based on submissions received.

SCI-022 Restoring Wetland Function by Controlling Invaders: Spartina & Phragmites.

Joel Gerwein

Efforts to eradicate invasive Spartina from the west coast of North America provide a case study for restoring wetland function through control of invasive species. Spartina grasses are keystone tidal marsh species, valued where native – and frequent targets of eradication where non-native. Demonstrated ecological effects of Spartina invasions include hybrid swamping, trophic shifts, and beneficial interactions with endangered species. Spartina control in the U.S. has been successful: infestations have been reduced from 9,000 acres in Washington and 2,500 acres in San Francisco Estuary to less than 7 acres and 50 acres, respectively. Challenges include effects on endangered species and opposition to herbicides.

SCI-023 The Relevance Of Biological Invasions On Ecosystem Functioning.

Pedro Morais & Ronaldo Sousa

This session will demonstrate the need to merge the study of biological invasions in estuarine and coastal ecosystems with the putative impacts that non-indigenous species (NIS) might exert on ecosystem processes and functions. This central topic unfolds in several subtopics- the interplay of NIS with native species (e.g. biotic interactions, population dynamics, genetic diversity); how NIS affect the abiotic environment (e.g. ecosystem engineering, nutrient budgets); how NIS shift the goods and services that estuarine and coastal ecosystems provide (e.g. fisheries; management- including monitoring and eradication programs). Thus, all works covering these topics will be considered to integrate this session.

EDUCATION SESSIONS

SCI-024 Strategies For Mentoring In Coastal And Estuarine Science.

Timothy Dellapenna & Janet Nestlerode & Erin Burge & Melissa Baustain

The mentoring relationship of faculty and graduate students and peers with undergraduates and advanced high school students can be one of the highest impact components of the academic experience for both the mentor and mentee. Presentations contributed to this session will explore best practices and provide examples of programs that foster and promote effective mentor/mentee relationships across strata of academia and/or those that integrate these partnerships into the curriculum and research experiences. Submitting an abstract to present in this session should not preclude presenters from submitting abstracts scientific presentations elsewhere in the CERF scientific program.

SCI-025 Research And The Classroom: Connections Between Scientists And Educators

Laura Murray & Linda Duguay

Partnerships between research scientists and educators can establish the necessary links to open-ended, real-world explorations that makes science come alive for students and can help bridge the gap between current scientific research and the classroom. Collaborations between teachers and scientists can be mutually beneficial and can form sustained partnerships between scientists and educators. Additionally, students who have freedom to explore and to engage in the cognitive scientific process, gain an appreciation of and interest in sciences. This session is intended to feature examples of high quality scientist-educator partnerships, which provide students with real-world research projects that spark interest, develop skills in science disciplines and increase student's ability to comprehend practices of scientific processes. We encourage scientists and educators to submit abstracts, which give examples of their work of bringing coastal and estuarine research to students. Authors should describe format of interaction, level of project (K-12, undergraduate), research intensity, impacts and assessment strategy.

OTHER SESSIONS

SCI-026 Genomic Tools In Marine Ecosystem Monitoring And Assessment, Within Ocean Policy Legislation And Governance

Naiara Rodriguez-Ezpeleta & Rusty Brainard & Angel Borja

The interest in marine ecosystem protection and sustainable use of oceans has developed in national ocean policies (e.g. U.S.), legislation (e.g. Canada Oceans Act) and the Marine Strategy Framework Directive (Europe), focusing on integrative tools for assessing environmental status. The extensive

monitoring networks required to cover coastal waters make traditional monitoring and assessment methods unsuitable, because they are slow, expensive and, sometimes, lack standardized procedures. Recently developed genomic technologies, such as DNA barcoding, metagenomics, transcriptomics, etc. come up as an efficient and standardizable alternative. We will explore the advances in the use of these technologies. Special attention will be paid to opportunities of across oceans collaborations to develop powerful standardized tools, for ocean assessment and monitoring.

SCI-027 Unraveling The "Black Box" Of Migration With Novel Methods.

Benjamin Walther & Karin Limburg

Migrations in the coastal realm are often unquantified and relegated to a "black box" status in life history models. However, advances in novel techniques such as otolith chemistry, stable isotope analysis, satellite tagging, biophysical dispersal models, and population genetics can provide unprecedented insight into movement and population mixing at both small and large spatial scales. We seek presentations that use these and other techniques, preferably in combination, to reveal migratory dynamics of diverse taxa, including vertebrate, invertebrate, diadromous, estuarine, and marine species. Presentations that investigate migration in both basic and applied (e.g. management) contexts are welcome.

SCI-028 Ecological Tracers In Coastal Ecosystems: Path To Sustainability.

Joel Hoffman & Autumn Oczkowski & Jim Kaldy

Ecological tracers are used to discover how coastal ecosystems function, to link upstream human activities to effects in coastal waters, to help unravel food webs, and to follow a contaminant through an ecosystem. Notably, the types of tracers (e.g., isotopes, hormones, manufactured chemicals), scales at which tracers are used, and kinds of ecological information gained continue to expand. In this session, we will discuss the state of the science and explore how tracer studies can inform decision-making and promote sustainability.

SCI-029 Bio-Optical Techniques For *In Situ* Plankton Research – Where Are We Now?

Judy Yaqin Li & Chris Melrose

The temporal and spatial scales required to resolve ecological processes in estuarine and coastal environments often call for more rigorous measurements. The development of various fixed-site, shipboard and underway bio-optical technologies have enabled measurements at finer temporal and spatial scales. What are the latest developments and applications of these emerging technologies? What new insights have these technologies provided to our understanding of estuarine and coastal processes? What are the limitations of these technologies? This special session welcomes presentations using technologies including but not limited to, automated imaging systems, variable fluorescence, spectrally resolved fluorescence, spectrophotometry, size spectrum analysis, and flow cytometry.

SCI-030 Shifting Technology Paradigms: A Case For Innovation By Way Of Collaboration.

Tony Hale

There is a growing movement in resource management to harness diverse sets of tools and human resources, to create a synergy where the whole is greater than the sum of its parts. Successful innovations in collaboration technology and the expansive use of open-source software are helping to demonstrate that the merits of collaboration can outweigh the merits of competition. As the technological tide is beginning to change, we must reconsider how we view the role of technology in addressing complex resource management challenges. In this session, we will explore what opportunities exist for bridging persistent divides in information and organizational resources. How might new collaborative paradigms such as online communities, agile software development, and data-as-a-service help to formulate a common purpose?

SCI-031 Trophic Subsidies In Coastal Ecosystems: Implications For Coastal Management.

James Nelson

Our understanding of the connections between coastal ecosystems has evolved substantially since the concept of 'outwelling' was first introduced. Recent research has identified trophic/biomass subsidies as an important link between ecosystems. In this symposium we seek to identify common themes in trophic subsidy research, with the aim of understanding how management practices can affect these fluxes.

SCI-033 Can Animal Movements Change Spatially-Explicit Trophic Processes In Seascapes?

Martha Mather & Linda Deegan & Jack Finn & James Nelson

To understand and predict patterns and processes in ecological systems, we need a framework that will unify what is known about the spatial and temporal patterns of animal movement using existing conceptual, empirical and analytical approaches. In this symposium, we seek to integrate empirical movement studies with ecological theory on spatial patterns and trophic interactions to guide movement studies, as well as to ground and test theoretical predictions.

SCI-034 Planktonic Food Webs In An Era Of Global Environmental Change.

Michael Wetz & David Kimmel

Interactions between functional groups of plankton determine a number of important ecological processes in estuarine and coastal ecosystems. Our current understanding of these interactions remains incomplete, particularly in the face of rapid, global environmental changes. It is nonetheless important to understand planktonic food web interactions if we are to develop predictive ecological models that offer insight into the future functioning of coastal systems. We invite contributions that are based on field, experimental or modeling studies of contemporaneous or projected future planktonic food webs. Studies focusing on the effects of anthropogenic and climatic environmental changes are particularly welcome.

SCI-035 Numerical Modeling Of Estuarine And Coastal Systems.

Tate McAlpin & Robert McAdory and Gaurav Savant & Jennifer Tate

With the widespread use of physics based numerical models incorporating water quality and ecosystem modules, it is essential that experienced, expert modelers provide the best means of applying these tools to real world problems, and that non-modelers have an understanding of these tools. A mixture of talks concerning model development, case studies, and examples of modeling efforts in which the focus of the modeling changed and the modeling approach had to be adjusted will provide CERF members with a better understanding of numerical model capabilities, applications, and limitations.

SCI-036 Perceptions Of Environmental Models And Stakeholder Participation.

Michael Paolisso & Kevin Sellner & Raleigh Hood

Modeling is critically important in managing watersheds, estuaries, and coastal environments, whether for water quality, living resources, land use, protecting coastal infrastructure and health, or economic productivity. The interactions between scientists and non-scientists can be complex and difficult. Frames of reference differ, as well as cultural, social, and historical belief systems, leading to difficulties in developing models that are accepted by all constituents as well as sufficiently technically sound to satisfy the scientific community. The proposed session will examine some of these difficulties through case studies, insights, and a panel discussion to foster better opportunities for model acceptance in future management programs.

SCI-037 Transferability of Models for Predicting Ecosystem Services.

Ted DeWitt & Marc Russell & Jessica Moon

This session will explore the theoretical and practical considerations underlying the application of ecological production functions in new locations or times other than where/when those models were developed. That is, what are the requirements and limitations for transferring ecological models used to predict production of ecosystem services? The focus will be on those models that are useful for predicting the production of final estuarine ecosystem services, i.e., the goods and processes that are produced in estuaries that people directly use or benefit from.

SCI-038 Enriching Our Coasts: The Past, Present, And Future Of Fertilization Studies As A Management Guide.

Brita Jessen & David Johnson

Population growth and associated changes in land use and fossil fuel combustion has resulted in an acceleration of nutrient (nitrogen and phosphorus) cycling in coastal regions. Controlled nutrient enrichment (fertilization) studies have been conducted in temperate and tropical systems at temporal scales ranging from years to decades. This session will present past and ongoing studies of nutrient enrichment in coastal systems, with a special emphasis on translating the results of these studies to useful management implications. Relevant topics include: common responses to nutrient enrichment across different coastal systems (salt marsh and mangrove); assessing vulnerabilities or resilience capacity of coastal ecosystem functions under excess nutrient input; identifying information gaps. The session will end with a discussion of the future of fertilization studies and relevance to management strategies.

SCI-039 Synthesis Research In Estuarine And Coastal Science: Focus On Process And Application.

Mike Kemp & Walt Boynton & Jeremy Testa & Damian Brady

There has been growing interest in the integration of existing ideas and data to produce new synthetic models and hypotheses, leading to discovery and advancement in estuarine and coastal science. Presentations will provide diverse examples of synthetic research across disciplines and topics, applying a range of methods including cross-system comparisons, analysis of time series data, balance of cross-boundary fluxes, and system simulation modeling. Presenters will also describe their underlying thought-processes to help illustrate how synthesis is done, and they will highlight how their synthesis science has advanced basic knowledge and/or addressed resource management problems.

SCI-040 Synthesis Research In Estuarine And Coastal Science: A Session In Honor Of Scott W. Nixon.

Lindsey Fields & Robinson Fulweiler & Mark Brush & Kelly Henry

Throughout his career, Dr. Scott W. Nixon demonstrated an elegant approach to synthesizing data across scales of space and time. His analyses of coastal ecosystems around the world forged new insights into the structure and function of these systems, and he generated volumes of data through pioneering studies. This session will feature synthetic studies that make use of Dr. Nixon's approach of creativity, clarity, and impact. We invite presentations highlighting a variety of methods for conducting synthesis that further our understanding of coastal systems and guide sound management of coastal resources, which was a hallmark of Scott's career.

SCI-041 Resilience In Coastal Ecosystems, Part 1: Impact Of Stressors On Resilience, Stability, And Recovery In Communities Dominated By Seagrass Or Benthic Algae.

Benjamin Fertig & Jessie Jarvis

This session explores the impacts of stressors (natural and/or anthropogenic) on community stability and resilience, as well as projections of community trajectory. We are particularly interested in the effects of individual and interactive effects of multiple synergistic stressors on freshwater, estuarine, lagoon, and

coastal ecosystems across latitudes, at local, regional, and global scales. Monitoring, fieldwork, experimental, modeling, theoretical, and other approaches (and/or combinations thereof) are welcome. We encourage oral and poster presentations that explore evidence of tipping points of abiotic or biotic stressors which predicate large-scale shifts in community dominance and the implications for management and restoration.

SCI-042 Resilience In Coastal Ecosystems, Part 2: Evaluating And Conserving Resilience In Indo-Pacific Coastal Marine Habitats.

Robert Coles & Len McKenzie & Michael Rasheed & Marcus Sheaves

Coastal habitats such as saltmarsh, mangroves and seagrass meadows are not static and when managed properly can recover after impacts. But our understanding of change and recovery processes and the factors that determine resilience are not well understood. We would like to share experiences where science underpinning an understanding of change, recovery and resilience has been used to influence management decisions. We encourage oral papers and posters with a blend of pure and applied science to management and management strategies.

SCI-043 Resilience In Coastal Ecosystems, Part 3: Resiliency Of Coastal And Marine Ecosystems And The Services They Provide.

David Yoskowitz & Jim Morris

Coastal and marine ecosystems are subject to both acute natural (droughts and floods) and man-made (oil spills) disturbances. At the same time there are slow changes in the environment (sea level rise) that can potentially compound the impact of the acute events, leading to “regime shifts” in vulnerable systems. Given that humans are directly and indirectly impacted by ecosystem services provided by the environment, dramatic shifts in ecosystem structure and function can have a substantial impact on human wellbeing. This session will explore the connection between ecosystem resilience and ecosystem services resilience. We invite papers that focus on the resilience of coastal and marine ecosystems, the resilience of social systems, and the connection between resilient coastal ecosystems and resilient ecosystem services. We encourage submissions from the natural, social, and policy sciences.

SCI-044 Engineering With Nature: Striving For Sustainable, Multi-Objective Coastal Infrastructure.

Thomas Fredette & Todd Bridges & Burton Suedel

Engineering With Nature (EWN) is the intentional alignment of natural and engineering processes to efficiently and sustainably deliver economic, environmental, and social benefits through collaborative processes in association with infrastructure development. Recent investigations have identified a number of case studies around the world that can be used to provide models for use elsewhere. Although the EWN concept began within the US Army Corps of Engineers, there is a need to reach out to a broader community, integrate the concept more widely with academic research, and look for collaboration opportunities. This session will provide that opportunity and will seek to scope science and engineering needs for advancing EWN as a part of future practice.

SCI-045 Disturbance And Stressor Impacts On Microbial Communities And Biogeochemical Feedbacks.

Brian Roberts & Anne Bernhard & Annette Engel & Anne Giblin

Microbes are critical to cycling and regulating carbon and nutrient fluxes into and through coastal ecosystems, yet little is known about the relationship between microbial community diversity and ecosystem function, and even less about community responses to pollutants or any remediation approaches. This session will examine feedback mechanisms that control and impact microbial communities and the biogeochemical processes they carry out in coastal ecosystems as a consequence of disturbance or stress. Feedback mechanisms could include how disturbance triggers spatial and temporal

microbial diversity changes and how these changes alter reaction rates in biogeochemical cycles including greenhouse gas fluxes.

SCI-046 Synergistic Effects Of Climate And Land-Use Change On Estuarine And Coastal Systems.

Michael Williams & Raymond Najjar

Climate and land-use change strongly influence estuaries through changes in runoff quantity and quality. This session will focus on current observations and predictions of climate change and potentially synergistic interactions with anthropogenic stressors such as land-use change on estuarine and coastal systems. Submissions to this session should address how these stressors alter coastal hydrology, the downstream transport of nutrients and sediments, and salinity regimes. Collaborative research that informs better management practices for mitigating hydrological changes associated with climate and land-use changes and their impacts in the coastal zone will also be considered.

SCI-047 Drivers And Ecological Effects Of Hypoxia In Coastal Upwelling Systems.

Steve Litvin & Larry Crowder & Lisa Levin

Zones of hypoxic water have spread dramatically, most associated with bays and semi-enclosed seas and land-based anthropogenic nutrient inputs. However, open coast systems such as the coastal marine ecosystems in eastern boundary currents are also increasingly experiencing oxygen depletion and hypoxia has recently been documented on the inner shelf of open coasts. Within the California Current Large Marine Ecosystem (CCLME) upwelling-related oxygen depletion occurs regularly from Baja, Mexico to Washington State. This session will assess the extent, drivers, ecological consequences and management implications of hypoxia on the inner shelf of the CCLME and other eastern boundary current systems.

SCI-048 Climate Change And Species Interactions: Implications For Ecosystem Functions And Services.

Walter Nelson & Erik Bonsdorff & Chris Janousek

The impact of meteorological and nearshore ocean changes arising from climate change will exert stress on estuarine and coastal biological communities. Biological community responses will also be mediated by other stressors such as increased pressure from non-indigenous species and by changes in existing species-species interactions such as competition and facilitation. In particular, foundation or keystone species responses to climate forcing may strongly alter habitat characteristics and associated community assemblages. Such alterations will have major implications for ecosystem functions and services supported by coastal habitats. The session will focus on current results and new approaches to measuring, monitoring and modeling the influence of climate change coupled with biological interactions on estuarine habitat structure and function.

SCI-049 Coastal And Estuarine Carbon Cycling.

Matthew Kirwan & Thomas Mozdzer & James Fourqurean & Catherine Lovelock

The emerging realization that coastal and estuarine ecosystems sequester carbon at globally significant rates is driving an explosion in carbon cycling research in tidal marshes, mangroves, and seagrass dominated ecosystems. This session will highlight new contributions to “blue carbon” research in both restored and natural ecosystems. Presentations focusing on the size of carbon pools, rates of carbon burial, and the sensitivity of carbon cycling to anthropogenic factors including land use, climate change, and invasive species are desired. We especially encourage processes-oriented submissions (e.g. transport of carbon through an ecosystem, response of carbon to submergence, erosion, or human development) and contributions that synthesize existing data at regional to global scales.

SCI-052 Assessing Coastal Condition Using National, Regional And State Monitoring Programs.

Treda Grayson & Hugh Sullivan & Virginia Hansen & Linda Harwell

Large-scale monitoring programs such as USEPA's National Coastal Condition Assessment (NCCA) are designed to assess the condition of the nation's estuaries and coastal waters. USEPA partners with states, tribes, federal agencies and other entities to survey estuarine and near-shore coastal waters across the US, and in the Great Lakes. This session presents information on program changes and enhancements, results from the 2010 NCCA survey, federal, regional and state collaboration efforts and plans for the 2015 field sampling effort. Papers on comparable monitoring programs are encouraged.

SCI-053 Changing The MPA Management Dialogue: An Investment Portfolio For The Future.

Erin Meyer

Implementation of marine protected areas has increased dramatically in the last decade. However, evaluations of MPA performance remain limited. The question 'are they working?' is frequently addressed by considering whether target fish populations have increased in density inside MPAs. This misses the opportunity to evaluate whether MPAs play a role in buffering against episodic events such as harmful algal blooms or providing resilience to the effects of ocean acidification and climate change. This session will draw together experts from multiple disciplines to share new knowledge, tools and approaches for using MPAs as part of an investment portfolio for ocean health.

SCI-054 Exploring Approaches To Understanding Decision-Makers' Science Needs.

Emily Knight & Ryan Meyer

We hear increasing calls for science that informs decision-maker needs. But understanding what those needs are is challenging. Many factors, both practical and political, can drive decision-makers' demand for and use of science. While there is no single best approach to understanding user needs, an increasing number are available. This session explores different approaches to understanding user needs for coastal and marine science.

SCI-055 Real World Applications Of Ecosystem-Based Management To Ocean And Coastal Challenges.

Margaret Caldwell & Ashley Erickson & Melissa Foley & Erin Prahler

Ocean and coastal practitioners work within existing financial constraints, jurisdictions, and legislative authorities to manage living coastal and marine resources while seeking to promote and maintain a healthy and productive coastal economy. Fulfilling this mandate necessitates incorporation of best available science, including ecosystem based management (EBM) into coastal and ocean management decisions. We will address creative methods for applying EBM principles with particular emphasis on available legal and regulatory authorities. This session will explore how challenging assumptions and incorporating emerging data and methods into decision-making and resource management can improve the overall health of our coastal and marine ecosystems for the benefit of current and future generations.

SCI-056 Science Communication Strategies For Ecosystem-Based Management.

William Nuttle & Heath Kelsey & Caroline Wicks & William Dennison

The strength of ecosystem-based management derives from its holistic approach to solving environmental problems, one which recognizes that each element of the coastal environment is connected to others through a web of interrelationships. This web of interrelationships also connects all the social and economic sectors involved, and success depends on developing effective communications within this network. This session solicits presentations on communications strategies used to support the

implementation of coastal EBM. Of interest are strategies for scientists and managers in gathering and disseminating scientific and technical information. Presentations should focus on the challenges encountered, the techniques used, and results obtained in the communications efforts, rather than on details of the scientific and technical information itself. We will attempt a synthesis of lessons learned, best practices and guidelines for implementing an effective science communications strategy.

SCI-061 Comparative Approaches To Horseshoe Crab Ecology And Conservation In North America And Southeast Asia.

Mark Botton & Paul Shin & S.G. Cheung & Ruth Carmichael

There is a growing community of estuarine scientists focusing on the biology and conservation of horseshoe crabs in North America and Asia. Stimulated by our productive interactions at a Special Session at ERF 2005, our group has held International Conferences in 2007 (Long Island, NY) and 2011 (Hong Kong), with a third meeting planned for 2015 (Japan). CERF 2013 is an ideal venue to bring together the key scientists from North America and Southeast Asia to discuss progress in horseshoe crab research and conservation since the Hong Kong workshop.

SCI-062 Global Patterns Of Phytoplankton Dynamics In Estuarine And Coastal Ecosystems.

Hans Paerl & Kedong Yin & James Cloern & Paul Harrison

Phytoplankton biomass and community structure have undergone dramatic changes in estuarine and coastal ecosystems over the past several decades in response to climate variability and human disturbance. These changes have short- and longer-term impacts on global carbon and nutrient cycling, food web structure and productivity, and coastal ecosystem services. There is a need to identify the underlying processes and measure rates at which they alter coastal ecosystems on a global scale. SCOR Working Group 137 (WG 137) has been gathering long time-series data sets from estuarine and coastal systems worldwide in order to examine patterns of anthropogenic and climate-driven change. We encourage participation from investigators with decadal observational data from geographically diverse regions. The wealth of information in these data sets provides an unprecedented opportunity to develop a global analysis and investigation of the dynamics and status of ecosystems where land and sea meet.

SCI-063 ICOL, TOCE And Other Bar-Built Estuaries.

John Largier & Janine Adams & Charles Simenstad

Small coastal lagoons and estuaries with wave-built sand barriers at the mouth (ICOL = intermittently closed and open lagoons; TOCE = temporarily open and closed estuaries) have narrow and shallow channels connecting them to the sea, and the mouth of these systems may close from time to time. Unique and often transient water quality conditions (e.g., dissolved oxygen) and ecological communities are observed in these systems, which also may include essential habitat for species of concern. In many of these estuaries, significant variability in freshwater inflow produces strong seasonal, synoptic, and interannual variability in habitat quality and quantity. How ICOL, TOCE and other bar-built estuary ecosystems have adapted to this unpredictability and retained resilience is the focus of this session. We will bring together researchers from different regions in the world and seek common understanding across diverse studies, including geomorphology, stratification, habitat patterns, connectivity, food web structure, and eutrophication. Conservation and management issues in response to global change will be addressed.

SCI-064 Hydrodynamics And Sediment Dynamics In Estuaries And Coastal Seas.

Arnoldo Valle-Levinson & Tim Dellapenna & Carl Friedrichs & Chari Pattiaratchi & Henk Schuttelaars & Alex Souza & Parker MacCready & Bob Chant & Courtney Harris

This session seeks oral and poster contributions on the study of the physics of estuaries and coastal seas, including sediment dynamics and morphodynamics. The session will include studies related to any

physical or geological aspect of estuaries and coastal seas, through the use of observations, numerical models, analytical solutions or laboratory experiments. We propose to gather a series of presentations that highlight recent findings on various aspects of along-estuary and across-estuary hydrodynamics; physics of coastal seas; turbulence studies; investigations in low-inflow coastal lagoons; non-cohesive and cohesive sediment transport and sedimentation; as well as research on morphodynamics.

SCI-065 Recent Advances To Understand The Continuing Evolution Of The San Francisco Bay Ecosystem.

James Cloern & Tara Schraga & Frederick Feyrer

CERF returns to California for the first time since the 1991 meeting in San Francisco. Estuarine-coastal systems around the world have changed, in some places remarkably, over the intervening two decades as a result of species introductions, altered pollutant loadings, water diversions, habitat transformations (including restoration), environmental policies, landscape transformations that alter sediment supply, and climate variability including the 1998-99 climate shift across the Pacific. This session will highlight changes occurring in California's largest estuary. Prospective talks will address recent findings from studies of: fish communities; sediment transport; Bay-Ocean exchanges; nutrient and algal bloom dynamics; bird use of marsh habitats; long-term trends of contaminants; outcomes of the largest tidal wetland restoration project in the western US; algal toxins; historical ecology; projected responses to climate change and implications for adaptation.

SCI-066 Integrating Science And Management To Benefit Estuarine And Coastal Ecosystem Restoration.

Lynn Wingard & Frank Marshall, Patrick Pitts, and David Rudnick

This session will focus on projects that have integrated scientific research with management objectives for restoration of estuarine and coastal ecosystems. We encourage both scientists and resource managers to participate in this session, and ideally would like to see paired sets of talks or joint talks presented from both the management and the science perspective. Issues to be addressed are what are the management issues that have directed science efforts and how has research contributed to the solution of these issues? What are the lessons learned? Issues covered may include development of performance measures and targets, sustainable management practices, incorporating sea level rise and climate change into planning, invasive species, eutrophication, and identification of ecosystem services among other issues.

SCI-067 Interactions Of Bivalves And Estuarine Biogeochemical Processes.

Iris Anderson & Mark Luckenbach & Pier Viaroli & Mark Brush

Bivalve aquaculture is often seen as a means of enhancing water column filtration and mitigating the effects of anthropogenic nutrient loading, yet it also has the potential to contribute to localized eutrophication through amplification of dissolved nutrient releases to the water column from bivalve excretion and shifts in benthic microbial metabolism in response to nutrient enrichment from bio-deposits. We welcome submissions addressing impacts of bivalve aquaculture on water and sediment quality, the biogeochemical cycling of nutrients and carbon, the potential to mitigate eutrophication, the importance of scale in determining ecosystem impacts, and the development of models of coupled bivalve-estuarine systems.

SCI-068 Estuarine Shallows, Part 1: Biophysical Interactions.

Jessie Lacy & Heidi Fuchs

Many estuarine habitats, including subtidal and intertidal flats, seagrass meadows, and marshes, occupy shallow water. Shallows differ from deeper estuarine water in many ways, including the relative importance of bed friction, waves, and tidal inundation. These physical factors affect habitat type and ecosystem function. In turn, ecosystem-engineering species may modify the physical environment,

enhancing ecosystem function or providing services by reducing flooding or erosion. Many such interactions remain poorly understood, and predicting change due to anticipated sea-level rise and anthropogenic alterations creates additional challenge. This session will focus on mechanistic linkages between the physics and ecosystems of shallow estuarine habitats.

SCI-069 Estuarine Shallows, Part 2: Monitoring, Modeling, And Managing.

Carl Cerco

Shallow-water regions (depth < 2 to 3 m) of deep, expansive estuaries are emerging as “hot spots” for water quality management. These regions typically form a ribbon between the shoreline and open-water expanses. Impairments include harmful algal blooms, poor water clarity, and intermittent hypoxia. The nature and origins of these impairments can differ from similar impairments in deep, open water. We solicit contributions that describe monitoring programs, observed water quality impairments, modeling approaches, and management programs in the shallow-water regions of deep, expansive estuaries.

SCI-070 Microbial Ecology: Processes, Linkages And Ecosystem Feedbacks.

Leila Hamdan & Robert Jonas & Jennifer Biddle

Microbial processes influence water quality, shape benthic and pelagic environments and mediate biogeochemical cycles. Microbiomes are shaped by past events and change in the contemporary environment. The metabolic roles of coastal and estuarine microorganisms are being probed through investigations of newly discovered processes (eg: ANAMOX, AOM) and uncultivated lineages. Their impact on environmental issues (e.g., hypoxia, oil spills, eutrophication, climate) and settings (hydrocarbon seeps, high latitudes) is important and can affect entire trophic webs. This session will highlight new discoveries of microbial processes, lineages and environmental feedbacks and explore how these discoveries can inform understanding of whole ecosystem function.

SCI-071 Geological And Biogeochemical Processes In The Sediments And Soils Of Coastal Wetlands.

Zhanfei Liu & Alexander Kolker & Kehui Xu

Coastal wetlands are biogeochemically one of the most important categories of coastal sediments. They play an important role in filtering pollutants, regulating biogeochemical cycles, preserving biodiversity, and reducing the impacts of storm surge. Many of these ecosystem services are controlled by the sediment, thus understanding subsurface processes is critical for protection and management of the wetlands. Despite the importance of coastal wetland sediments, their geology and biogeochemistry has been relatively understudied. This session aims to bring together researchers examining physical, geological and biogeochemical processes occurring in coastal wetland sediments, such as sediment delivery and transport, sediment deposition in response to river diversion, carbon and nitrogen cycles, preservation of sedimentary organic matter, and coastal protection and wetland restoration. This session seeks to synthesize current knowledge and develop new models of coastal wetland geology and geochemistry. We invite both field observations and theoretical studies from coasts around the world.

SCI-072 Mangrove Expansion Into Salt Marsh Habitats: Causes And Consequences.

Candy Feller & Dan Gruner & John Parker & Rick Osman & Steve Pennings & Anna Armitage

The mechanisms behind the encroachment of mangroves into salt marshes remain obscure and are thought to involve multiple interacting factors, e.g., global warming, changes in rainfall patterns, land-use change, and increases in nutrient levels and sedimentation. Given that these shifts entail the replacement of one critically important foundation species with a dissimilar though equally important foundation species, there are likely to be large though relatively unstudied consequences. Thus, this session will focus on the mechanisms driving the current and future displacement of salt marsh species along coastlines around the world by invading native and non-native mangroves and will examine the implications for

coastal management. This session will also include studies that focus on the ecology of shifting wetland ecotones, such as the effects on community composition, food web dynamics, nutrient cycling, carbon sequestration, and buffering capacity against shoreline erosion.

SCI-073 Marine Debris Monitoring And Assessment: Research To Guide Prevention.

Sherry Lippiatt & Shelly Moore

Anthropogenic marine debris is widespread in coastal and estuarine ecosystems. Assessment of the quantity, composition, and spatial extent of marine debris is necessary to understand the drivers of debris movement and impacts on wildlife and habitats. Observational research and monitoring supports and evaluates efforts to mitigate marine debris, and leads to more effective policies to reduce impacts on the environment and coastal communities. This session will examine efforts to monitor and assess marine debris, including discussion of how these data may be used to better understand debris movement and evaluate the chemical, biological, physical, and/or socioeconomic impacts of marine debris.

SCI-074 South And Central American Estuaries And Coasts.

Paulina Martinetto & Osmar Möller & Robert Christian & Sharon Herzka

This session will build on the Coastal and Estuarine Research Federation's Inaugural Conference of the Americas, held in Mar del Plata, Argentina in November 2012. Estuaries within the region exhibit a high level of diversity in their geomorphology, hydrodynamics, dominant ecological processes, interaction with the coastal environment and the interaction with regional climatic conditions. Estuaries are also subject to different types of anthropogenic pressures, including nutrient inputs, habitat loss and modification due to development, fishery related activities and changes in freshwater inflow, among others. We welcome studies in Central and South America estuarine and coastal systems within the general theme of a changing environment. In particular, we encourage presentations that utilize a broad comparative approach between Northern and Southern Hemispheres. We also promote the presentation of case studies that exemplify the link between the science used to assess anthropogenic impacts and understand ecosystem function and the development of management strategies oriented toward the sustainable use and conservation of estuarine and coastal ecosystems.

GENERAL SESSIONS

SCI-075 Ecology Of Coasts And Estuaries.

Kathy Boyer & Steven Morgan & Max Castorani & Violet Renick & Rochelle Seitz Megan Tyrrell & Christy Tyler & Linda Blum & Lora Harris & Nengwang Chen

This session will include papers on the ecology of estuaries and coastal waters. This session is focused on the interactions of organisms with their biotic and abiotic environments, and may include studies of population or community dynamics that influence the structure or function of estuarine and coastal ecosystems.

SCI-076 Biogeochemistry Of Coasts And Estuaries.

Alex Parker & Serena MosemanValtierra

Coastal and estuarine ecosystems are highly productive environments that play a central role in elemental cycling at the interface between land and sea. In many locations globally, biogeochemical processes at these sites have been altered by a broad suite of anthropogenic stressors. This general session will accept submissions focused on benthic or pelagic biogeochemistry in the coastal ocean and estuaries, including research that explores how systems respond to anthropogenic forcing.

SCI-077 Estuarine Restoration.

John Callaway & Ken Krauss & Megan La Preye & Mark Hester & Steve Schoeter & Christine Whitcraft

There is a long history of restoration of estuarine habitats, and growing interest in improving the design and management of restoration projects by incorporating enhanced monitoring and more manipulative experiments into restoration efforts. This general session will focus on the evaluation of habitat restoration in estuaries and coastal waters, including the incorporation of experiments into restoration projects. Papers can cover work with wetland plant communities, SAV and kelp ecosystems, as well as restoration focused on creating habitat for fish, birds and other animals.

SCI-078 Policy And Management Of Coasts And Estuaries.

Skyli McAfee

This interdisciplinary session will explore the interplay of science, policy, and management practices related to estuaries and coastal waters. Each of these fields of study, with its own specialized knowledge and culture, is evolving. And each has important implications for the others. For example, how can policy and management make effective use of science? How can research agendas (and scientists) be more responsive to policy and management needs? How do innovative management practices get translated into effective policies? We invite case studies and/or theory that can inform these questions.

SCI-079 Socio-Economic Sciences For Coasts And Estuaries.

David Yoskowitz & Cristina Carollo

This session will include papers on the economic and social dimensions of estuarine and coastal waters and the interaction between activities taken in the upland environments, such as development, and the impact on coastal systems. Topics may include human dimensions assessment of coastal communities, evaluation of ecosystem services, cost-benefit analysis of coastal restoration, commercial and recreational fisheries, and others.

SCI-081 San Francisco Bay Upper Estuary.

Richard Dugdale

This session will include papers on the San-Francisco-Bay Delta, which is the upper estuary of the larger San Francisco Bay estuarine system. It follows session SCI-065, which is focused on the mid/lower estuary.
