

Adaptive Management: Is it Robust Enough to Handle Climate Change?

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Since the mid-1980's the concept of adaptive management has been embraced as an alternative approach where system risk and expectations are high. Adaptive management, the concept, is built around the philosophy of learning by doing and embracing management actions as experiments. Three broad categories of adaptive management - passive, active and collaborative have been implemented in multiple venues with varying degrees of success. Adaptive management is increasingly utilized by federal and state agencies as the impact and risk of management actions on system and species responses are unknown. Climate change is adding to management risk and the complexity and potential unintended consequences of decisions. Management decisions, both short and long term, may have both short- and long-term consequences. Useful adaptive management in complex ecosystems requires the balancing of four key components, (1) the right science (monitoring, research, predictive modeling, and assessment), (2) appropriate governance authority, (3) administrative and budget support, and (4) rigorous scientific review. Collectively these four components will assist in developing a culture for adaptive management where flexibility and value of experimentation can feed into a structure decision making environment that can aid managers and decision makers. The Adaptive Management panel will explore the challenges of applying the concept from a policy and science perspective. The panel will include an initial overview of the panel charge (David Wegner) followed by a global policy perspective (Dr. Roger Pulwarty). With this as a setting three case studies of complex system studies and adaptive management will be presented. These include the Everglades (Dr. Fred Sklar), the Colorado River in the Grand Canyon (Dr. Charles Yackulic) and Chesapeake Bay (Dr. Peter Goodwin). The moderated panel discussion will focus on lessons learned and the challenges posed by climate change, exploring whether adaptive management is flexible enough to meet the future.

Panelist Biographies:

David Wegner is a senior strategic scientific consultant for Woolpert Engineering focusing on climate, water, energy and innovative financing of water and climate infrastructure. He has been worked for the Department of the Interior where he was the Director for the Glen Canyon Environmental Studies, worked for the U.S. House of Representatives as Staff Director for the Water and Power Subcommittee; served on the Transportation and Infrastructure Committee staff and on the National Academy of Sciences, Water Science and Technology Board; the EPA Environmental Finance Board; and on multiple academic committees on water and climate.

Roger Pulwarty is the Senior Scientist at the NOAA Physical Sciences Laboratory. He was previously the Senior Science Advisor for Climate, and the Director of the National Integrated Drought Information System (NIDIS) in the NOAA Climate Program Office. His over one hundred articles, book chapters, and technical reports, focus on climate science, risk management and information services in the U.S., Latin America, and the Caribbean. Roger has designed and led programs dealing with climate science and services, including the Regional Integrated Sciences and Assessments, NIDIS, the GEF Mainstreaming Adaptation to Climate Change project in the Caribbean, and the InterAmerican Institute Collaborative Research Network on Eastern Pacific Boundary Currents

Fred Sklar is the Director of the South Florida Water Management District's Everglades division. Dr. Sklar's expertise includes landscape ecology, coastal and wetland ecology, ecosystem modeling, adaptive management for wetland restoration, and computer applications in environmental science. His modeling experience was used in preparing the 2012 Louisiana Coastal Master Plan. Dr. Sklar serves as an Associate Editor for the Ecological Society of America's journal: *Frontiers in Ecology and the Environment*; an executive member of the steering committee for the Florida Coastal Ecosystem LTER Program, and a RECOVER Executive Committee member for the Restoration of the Everglades.

Lorie Staver is a plant ecologist and Associate Research Professor at the University of Maryland, Center for Environmental Science. She has a special interest in restoration of subtidal and intertidal plant communities, and the role of nitrogen in aquatic plant ecology. Her dissertation work was conducted on a large-scale restoration project in Chesapeake Bay, Poplar Island, where nutrient rich dredged material from the shipping channels in upper Chesapeake Bay is used to reestablish remote island habitat. She examined the trajectory of vegetation development; elevation change and nutrient budgets of the restored tidal marshes. She is currently continuing this work, focusing on the effects of nutrient availability on plant establishment, vertical accretion, vegetation health and resilience to sea level rise in restored marshes, including living shorelines.

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