Review of the Long-Term Operations of the Central Valley Project and the State Water Project

Committee

Peter Goodwin

Chair

Peter Goodwin (chair) is recently retired as the President of the University of Maryland Center for Environmental Science and Vice-Chancellor of Environmental Sustainability for the University of Maryland system, where he served from September 2017 to September 2023. He played an integral role on the Governor’s Chesapeake Bay Cabinet, as well as being the lead science advisor on the Maryland Commission on Climate Change. Before coming to Maryland, Dr. Goodwin was the founding director of the Center for Ecohydraulics Research at the University of Idaho. From 2015 to 2019, he was the President of the International Association for Hydro-Environment Engineering and Research (IAHR)—a worldwide independent organization of engineers and water specialists working in fields related to the hydro-environmental sciences and their practical application. His research has focused on hydrodynamic and geomorphic modeling, tidal wetland restoration, and river and ecosystem management. Dr. Goodwin was the lead scientist for the Delta Science Program in California from 2012 to 2015 and has also served on the Delta Independent Science Board. He is a Fellow of both the Institution of Civil Engineers, United Kingdom, and the American Society of Civil Engineers. Dr. Goodwin holds a B.S. in Civil Engineering from the University of Southampton, United Kingdom, and an M.S. and Ph.D. in Hydraulic and Coastal Engineering from University of California, Berkeley. He served on the National Academies of Sciences, Engineering, and Medicine Committee on the Restoration and Protection of Coastal Louisiana.

Jerad D. Bales

Member

Jerad D. Bales is recently retired as Executive Director of the Consortium of Universities for the Advancement of Hydrologic Science, a non-profit research organization representing more than 130 U.S. universities and international water science-related organizations. Previously, Dr. Bales was Chief Scientist for Water at USGS from 2009 to 2016, where he was responsible for, among other things, the USGS Bay Delta program through the National Research Program. In this position, he was the Senior Executive responsible for $100 million of activities related to the planning and development of national hydrologic research and technology transfer. Dr. Bales is a hydrologist with expertise in water resources management, hazards, water quality issues, and climate science and has published more than 120 articles and technical reports on this work. He also has served on many interagency committees, including serving as Co-Chair of OSTP's Subcommittee on Water Availability and Quality, as Chair of the U.S. National Committee for the UNESCO International Hydrological Programme, and as a member of the Board of Scientific Counselors for EPA's Safe and Sustainable Water Resources Program. Dr. Bales holds both a B.S. and M.S. in Civil Engineering from the University of Tennessee, as well as a Ph.D. in Civil Engineering and Environmental Engineering from the University of Texas, Austin.

Stephen B. Brandt

Member

Stephen B. Brandt is a Professor Emeritus in the Department of Fisheries, Wildlife, and Conservation Sciences at Oregon State University where he specializes in fish ecology and management in marine and freshwater ecosystems. Previously, he held faculty positions at the University of Maryland's Chesapeake Biological Laboratory, SUNY College at Buffalo, and SUNY ESF Syracuse. Dr. Brandt directed the NOAA Great Lakes Environmental Research Laboratory for 12 years and earned the President's Rank Award. There, he created and led the NOAA Center of Excellence for Great Lakes and Human Health. He has written over 150 publications and given 300 scientific presentations on food webs, fish bioenergetics and habitat quality, physical/biological interactions, hypoxia, and ecosystem forecasting spanning the Great Lakes, Chesapeake Bay, Gulf of Mexico, Adriatic Sea, South Pacific, Western Atlantic and small lakes. Dr. Brandt received his Ph.D. and M.S. in Oceanography and Limnology from the University of Wisconsin, Madison. He has served on the National Academies of Science, Engineering, and Medicine Committee on the St. Lawrence Seaway and the Panel on Niagara River Ice Boom Investigations. He spent 10 years on the Independent Science Board of the Delta Stewardship Council, during which time he was twice elected as Chair.

Stephen Brandt is serving as a compensated panelist for the Delta Science Program during May and June 2025 to do a peer review of the Healthy Rivers and Landscapes Science Plan.

Erin N. Bray

Member

Erin N. Bray is an Assistant Professor in the Department of Earth and Climate Sciences/School of the Environment and leads the Rivers Lab at San Francisco State University. Previously, she was an Assistant Professor at California State University Northridge where she served as the Co-Lead for the Water Science Program. Dr. Bray's research focuses on hydrology and fluvial geomorphology, with an emphasis on river processes, river restoration, and water resources management. She has developed a model that, together with field measurements and climate data, can be used to study impacts of flow releases from dams and climate on the energy balance and water temperature of rivers. She also conducts in-situ field measurements of saturated hydraulic conductivity to better understand the impacts of sediment transport, sediment permeability, and flow on patterns of hyporheic exchange, and how those patterns generate and sustain physical processes that support salmon spawning habitat. Dr. Bray was a Postdoctoral Fellow at the University of California, Berkeley and at the University of California, Santa Barbara, supported under a fellowship from the Delta Stewardship Council. She received her B.S. from Cornell University, her M.A. from Brown University, and her Ph.D. from the University of California, Santa Barbara.

Erin N. Bray's research is partially funded by the USGS and the State Water Contractors.

Phaedra E. Budy

Member

Phaedra E. Budy is a Professor of fisheries management and aquatic ecology in the Department of Watershed Sciences at Utah State University and the Unit Leader of the USGS Utah Cooperative Fish and Wildlife Unit. She has worked broadly in conservation biology, invasion ecology, and food web dynamics of aquatic systems, covering a wide geographical range including Utah (from the south of the state up to high elevation points in the Bear River drainage), the Columbia River basin, the Colorado River basin, the Rio Grande basin, Nevada, and Alaska. She has studied many species of salmonids, imperiled native desert fishes, and numerous warm water lentic fishes—particularly those that have been imperiled due to hydrological alteration of aquatic habitats through river regulation, human water use, and introduction of nonnative competitors and predators. She has taken part in conservation actions such as nonnative fish suppression, flow experiments designed to benefit nearshore habitats, adaptive stream restoration, and large river management. Her current research also considers the effects of climate change on mountain stream hydrology and the resulting effects on downstream aquatic communities and their management. Dr. Budy completed her B.S. in Limnology from the University of California, Davis, and her Ph.D. in Aquatic Ecology from Utah State University.

Harindra J. Fernando

Member

Harindra Joseph Fernando is the Wayne and Diana Murdy Endowed Professor of Engineering and Geosciences at University of Notre Dame. Prior to Notre Dame, he spent over 20 years at Arizona State University. His research has spanned many topics, including fluid dynamics, oceanography and atmospheric sciences, environmental sciences and engineering, air pollution, climate, and alternative energy sources. He has served on numerous domestic and international committees, including the Louisiana Coastal Area Science Board, the Delta Independent Science Board, and the National Science Foundation Directors' Advisory Committee for Environmental Research and Education. Dr. Fernando is a Fellow of the American Society of Mechanical Engineers, American Physical Society, American Meteorological Society, American Association for the Advancement of Science, American Geophysical Union, and International Association of Hydro-Environmental Research and Engineering. He has a docteur honoris causa from University of Grenoble, France, and a Doctor of Laws Honoris Causa from University of Dundee, Scotland. He received his B.S. in Mechanical Engineering at the University of Sri Lanka, and both his M.A. and Ph.D. in Geophysical Fluid Mechanics from the Johns Hopkins University.

Rene E. Henery

Member

Rene E. Henery is an ecologist and ecogeographer who serves as California Science Director for Trout Unlimited, the country's oldest and largest salmon conservation organization. His work over the last decade has focused on cultivating spaces for collaborative engagement around freshwater systems and the diverse communities that they connect, with a particular focus on the science and policy of river and floodplain restoration in California's Central Valley and mountain meadow restoration in the Sierras and Cascades. His work outside of the U.S. includes United for Lake Atitlán (Unidos por Lago Atitlán), a multi-national effort to build capacity for the long-term health and resilience of Guatemala's Lake Atitlan Watershed, and participation in the conservation of Mongolia's Eg River and its population of Hucho Taimen, the world's largest salmon. He is a member of the Water Solutions Network and co-founder of the Central Valley Salmon Habitat Partnership and the Sierra Meadows Partnership. Dr. Henery received his B.A. in English Literature from Reed College and his Ph.D. in Environmental Geography from the University of California, Davis.

Dr. Henery's research is partially funded by the State Water Contractors and the Delta Science Program.

Jay R. Lund

Member

Jay R. Lund is a Distinguished Professor Emeritus at the University of California, Davis, and Vice Director of the UC Davis Center for Watershed Sciences. His research interests are water and environmental systems engineering, management, and policy, approached by combining traditional engineering with operations research and economics. He has worked on a wide range of water resources issues including water supply, flood control, ecological sustainability, reservoir operations, and demand management, primarily in California. From 2012 to 2022 he served on the Delta Stewardship Council's Independent Science Board, including a rotation as chair. He has co-authored three books on the Sacramento San Joaquin Delta: Managing California's Water: From Conflict to Reconciliation (2011), Comparing Futures for the Sacramento-San Joaquin Delta (2010), and Envisioning Futures for the Sacramento-San Joaquin Delta (2007) and authored over 170 journal articles. Dr. Lund has won a variety of professional awards and is a member of the National Academy of Engineering. He has a B.A. in International Relations and Regional Planning from the University of Delaware, a M.S. in Geography from the University of Washington, and a B.S.C.E. and Ph.D. in Civil Engineering from the University of Washington. Dr. Lund has served on past Academies' committees including those on the Review of the New York City Watershed Protection Program and Further Studies of Endangered and Threatened Fishes in the Klamath River.

Jay R. Lund is an editor and contributor of the California Waterblog and, along with academic partners, posts weekly about California water issues, including those in the Delta.

Josué Medellín-Azuara

Member

Josué Medellín-Azuara is an Associate Professor at the University of California, Merced. His research interests include large-scale hydroeconomic modeling for water management and policy analysis; water management for agricultural, environmental, and urban uses; agricultural production adaptation to drought and climate change; sustainable agroecosystems for water and food security; water informatics; consumptive water use in agriculture using remote sensing; and impact analysis using partial and general equilibrium models. His work spans across California and both Central and South America. In addition to more technical issues, he has published on the socioeconomic inequities experienced by disadvantaged communities in terms of representation in scientific papers, California newspaper articles, and legislative bills. Dr. Medellín-Azuara holds a B.S. in Mechanical and Electrical Engineering and an M.B.A., both from Instituto Tecnológico y de Estudios Superiores de Monterrey, Mexico. He received a M.S. in Agricultural and Resource Economics and a Ph.D. in Ecology and Environmental Policy Analysis, both from the University of California, Davis.

Josué Medellín-Azuara is a Partner in a research and consulting company that has conducted projects in the Delta and other regions in California.

Michelle Miro

Member

Michelle E. Miro is a Senior Information Scientist at the RAND Corporation and Professor at the Pardee RAND Graduate School. She has a broad portfolio of work across climate resilience and adaptation and disaster recovery for critical infrastructure, with a focus on the water sector. Her research supports international, federal, and local emergency, infrastructure, and resource management agencies with climate adaptation, disaster resilience and recovery, and water resources planning. She has worked on projects related to climate adaptation across California's Central Valley and Southern California, including carrying out climate stress tests of imported water supplies. She holds a B.A. in Humanities from the University of Texas, Austin, an M.S. in Civil Engineering from the University of Illinois Urbana-Champaign, and a Ph.D. in Civil Engineering from the University of California, Los Angeles. Dr. Miro also serves as a co-investigator for the National Oceanic and Atmospheric Administration (NOAA) Mid-Atlantic Regional Integrated Sciences and Assessments (MARISA) Climate Adaptation Partnership program and has recently served as a co-investigator on a National Academy of Sciences coastal resilience grant focused on future flood risk for communities in the Gulf of Mexico.

Michelle E. Miro's research is partially funded by the San Bernardino Valley Municipal Water District and has been partially funded in the past five years by Westlands Water District.

Mohammed Ombadi

Member

Mohammed Ombadi is an Assistant Professor in the department of Climate and Space Sciences and Engineering at the University of Michigan. Prior to his appointment at the University of Michigan, Ombadi was a post-doctoral fellow at Lawrence Berkeley National Laboratory. He has a keen interest in understanding and quantifying climate change impacts on hydroclimatic extremes. From heavy storms and floods to extreme heatwaves and droughts, Dr. Ombadi's research focuses on the changing characteristics of these events and their impacts on our daily lives. Additionally, his recent work has focused on developing new techniques to measure resilience of environmental systems to extreme events, with the ultimate goal of informing mitigation and adaptation strategies to climate change. His work has been acknowledged with awards from the American Geophysical Union, Orange County Engineering Council, UC Irvine School of Engineering and U.S.-China Clean Energy Research Center for Water-Energy Technologies (CERC-WET). He holds a B.S. in Civil Engineering from the University of Khartoum, and an M.S. and Ph.D. in Civil and Environmental Engineering from the University of California, Irvine.

David R. Owen

Member

David R. Owen is the Harry D. Sunderland Professor of Law and Associate Dean for Research at the University of California Law, San Francisco. He previously was a professor at the University of Maine School of Law and the University of San Diego School of Law, a practicing water lawyer, a clerk to Judge Samuel Conti (United States District Court, Northern District of California), and, before law school, a geologist for an environmental consulting firm. He teaches environmental, water, energy, and administrative law. His research focuses primarily on water resource management, including groundwater-surface water interactions and groundwater-use regulation, the roles of negotiation in environmental decision-making, implementation of the Clean Water Act, Endangered Species Act, and public trust doctrine, and dam removal. His peers have recognized many of his articles as among the top environmental-law articles of their year, and he also has won UC Law's highest teaching award. Mr. Owen has co-authored two books: Practicing Environmental Law (2021) and Natural Resources Law: A Place-Based Book of Problems and Cases (2022). He earned his B.A. in Geology from Amherst College and his J.D. from the University of California, Berkeley.

Dr. Owen's research was partially funded by the State Water Resources Control Board.

Denise J. Reed

Member

Denise J. Reed is a Research Professor Gratis at the University of New Orleans. Prior to that, she spent five years as Chief Scientist at The Water Institute of the Gulf. Dr. Reed's research has focused on coastal marsh sustainability and the role of human activities in modifying coastal and deltaic systems, with over 35 years of experience studying coastal management issues in the United States and abroad. She has been involved in restoration and resilience planning in coastal Louisiana for over three decades, as well as in the California Bay-Delta, San Francisco Bay, and Puget Sound. She has served on numerous boards and panels addressing the effects of human alterations on natural environments and the role of science in guiding restoration including the NOAA Science Advisory Board and the U.S Army Corps of Engineers Environmental Advisory Board. Dr. Reed received her B.S., M.A., and Ph.D. degrees in Geography from the University of Cambridge, UK. She has served on several National Academies' committees including Sea Level Rise in California, Oregon, and Washington (2010-2013), Everglades restoration (2015-2023), and sustainable management of the California Bay-Delta (2009-2012).

Denise J. Reed's work has been partially funded in the past five years by the State Water Contractors and the USBR.

Albert Ruhi

Member

Albert Ruhi is a freshwater ecologist and Associate Professor at the University of California, Berkeley. His research involves combining field experiments and large-scale data analysis to advance understanding of the ecology and conservation of rivers and wetlands, focusing on aquatic food-web responses to hydrologic regimes. He has conducted most of his research in water-scarce regions of the world—namely, the Mediterranean basin and the American Southwest—and has been the principal investigator on six research grants focused on modeling Bay-Delta fisheries and food webs. Previously, he was a postdoctoral researcher at Arizona State University, and a Fellow at the National Socio-Environmental Synthesis Center (SESYNC) in Maryland, where he studied impacts of flow alteration by U.S. dams. Dr. Ruhi has published over 60 papers, is an Associate Editor for the journal Conservation Letters, and has received numerous awards, such as a National Science Foundation CAREER award, a California Sea Grant New Faculty Award, a Hellman Fellow Award, and University of Girona's Extraordinary Doctoral Degree Award in Environmental Sciences for his Ph.D. work on wetland ecosystem restoration. Dr. Ruhi received a B.S. in Biology and a Ph.D. in Ecology from the University of Girona (Catalonia, Spain).

Dr. Ruhi's research is partially funded by the Delta Stewardship Council, the State Water Contractors, and the California State Water Resources Control Board.

Steven Sadro

Member

Steven Sadro is an Associate Professor of limnology and aquatic ecosystems ecology in the Department of Environmental Science and Policy at the University of California, Davis. His research broadly examines how abiotic and biotic factors interact to control the structure and function of lakes, ponds, estuaries, and wetlands. Much of his work focuses on ecosystem energetics and metabolic rates, the biogeochemical cycling of carbon and nutrients within ecosystems and through food webs, and how aquatic ecosystems respond to global change. His research is carried out in the mountains of California and portions of the Sacramento-San Joaquin Delta. His research group maintains one of the longest running lake-watershed studies in California and developed the California Mountain Lake Network, a network of over 25 lakes located throughout the state instrumented with environmental sensors that seeks to understand how local scale factors mediate regional scale processes associated with climate change. He worked for nearly a decade studying intertidal and estuarine ecology in the Pacific Northwest as a researcher for the University of Oregon, South Slough National Estuary Research Reserve and the U.S. EPA. Since 2016 he has served on the Tahoe Science Advisory Council, working to advise policymakers to promote, enhance, and maintain the ecological integrity of Lake Tahoe and its watershed. He holds a B.A. from the University of California, Santa Cruz, where he studied the biology of intertidal invertebrates, and a Ph.D. in Limnology and Aquatic Ecosystems Ecology from the University of California, Santa Barbara.

Steven Sadro's research is partially funded by the USBR.

David B. Senn

Member

David B. Senn is a Senior Scientist at the San Francisco Estuary Institute, with research interests in the biogeochemistry and fate and transport of nutrients and trace metals/metalloids in lakes, rivers, wetlands, and estuarine/marine systems. He is the lead scientist for the San Francisco Bay Nutrient Management Strategy, which seeks to understand how high nutrient concentrations (mainly from discharged wastewater) can cause increased phytoplankton biomass, low dissolved oxygen, and increased harmful algal blooms and toxins, with detrimental effects on species and ecosystems. Prior to joining SFEI, Dr. Senn's research focused on nitrogen pollution and iron and arsenic cycling in contaminated urban lakes; mercury cycling, bioaccumulation, and human exposure in the Gulf of Mexico; and the ecological impacts of large dams in the Zambezi River Basin in southern Africa. Dr. Senn holds a B.S. in Civil and Environmental Engineering from Rutgers University and a Ph.D. in Civil and Environmental Engineering from the Massachusetts Institute of Technology.

Jery R. Stedinger

Member

Jery R. Stedinger is the Dwight C. Baum Professor of Engineering Emeritus in Civil and Environmental Engineering at Cornell University. His research has focused on statistical issues in hydrology and optimal operation of water resource systems. His projects have addressed the value of historical and paleoflood data in flood frequency analysis, regional hydrologic regression and network analyses, risk and uncertainty analysis of flood-risk reduction projects, calibration and uncertainty analysis for rainfall-runoff-quality models, stochastic simulation of water resource systems, and efficient multiple-reservoir and hydropower system operation considering dynamic energy markets and stochastic inflows and forecasts. He is a member of the National Academy of Engineering and has won numerous awards, including the ASCE Julian Hinds and Ven Te Chow awards for contributions to water resources and to hydrology and the ASCE-EWRI Lifetime Achievement Award. He holds a B.A. in Applied Mathematics from the University of California, Berkeley, and a Ph.D. in Environmental Systems Engineering from Harvard University. Dr. Stedinger has served on several committees of the National Academies, including the committees on Risk Based Analyses for Flood Damage Reduction Studies, on American River Flood Frequencies, and on Flood Control Alternatives in the American River Basin.

Patrick J. Sullivan

Member

Patrick J. Sullivan is Professor Emeritus in the Department of Natural Resources and the Environment at Cornell University. His research interests include developing and applying advanced statistical methods to estimate and analyze the spatial and temporal dynamics of fish in freshwater, estuarine and marine environments. In addition, he has statistically characterized the dynamics of marine mammals, birds, bats, insects, invertebrates, forests, soils, wetlands, microplastics and aquatic toxins. Dr. Sullivan holds a B.S. in Biology from the University of California, Davis, an M.S. in Fisheries Biology from the University of Washington, and a Ph.D. in Biomathematics and Biostatistics from the University of Washington. He has chaired National Academies' committees on Improving the Collection, Management and Use of Marine Fisheries Data (2000) and the Review of Recreational Fisheries Survey Methods (2006) and co-chaired the committee on Evaluating the Effectiveness of Stock Rebuilding Plans of the 2006 Fishery Conservation and Management Reauthorization Act (2013). He was a committee member on Science and Its Role in the National Marine Fisheries Service (2002) and gave testimony to and reviewed the product from the committee on Improving the Use of the "Best Scientific Information Available" Standard in Fisheries Management.

Laura J. Ehlers

Staff Officer