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In Memoriam

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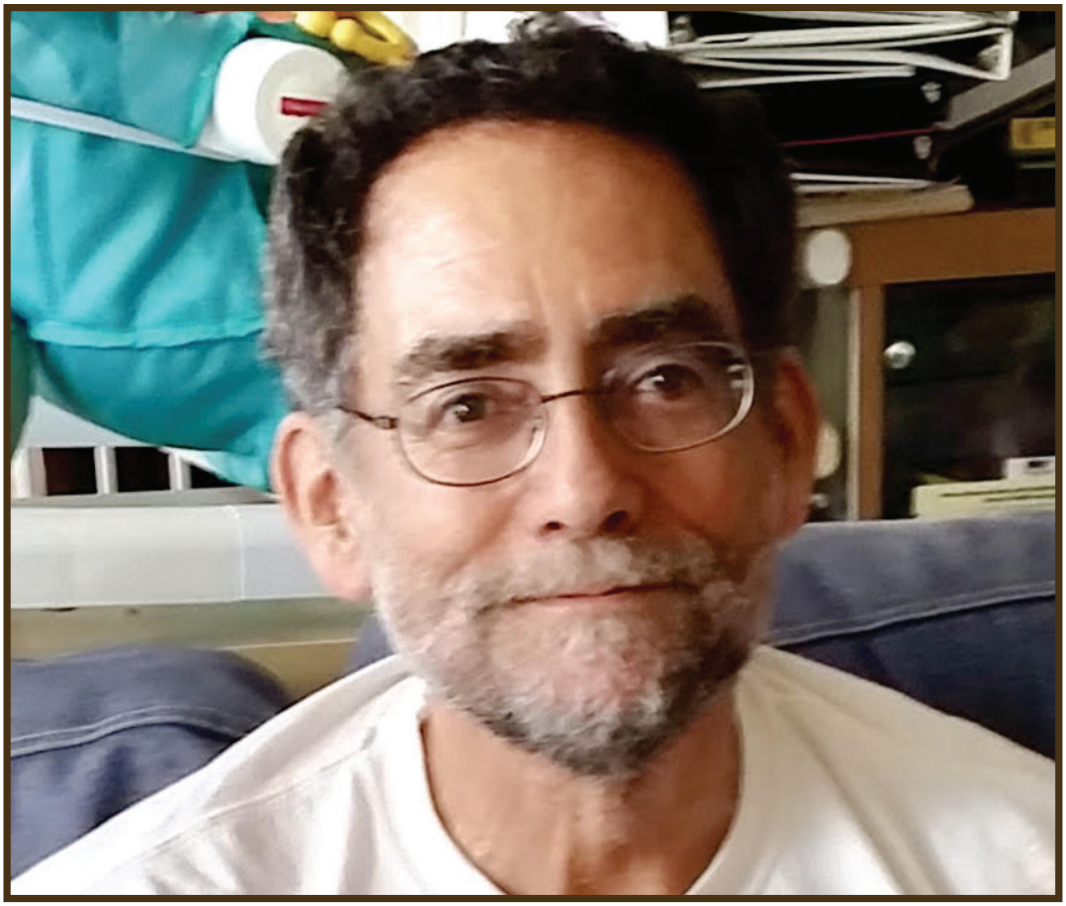

In Honor of Dr. Larry R. Brown

Bruce Herbold, Peter B. Moyle, Anke Mueller–Solger, Ted Sommer

Dr. Larry Richard Brown[1] died of a heart attack suddenly and unexpectedly on February 10, 2021 while at his parents' house in Arizona. This note attempts to capture how important his scientific work was in the San Francisco Estuary and why he will be intensely missed by many of his colleagues.

1. 'Larry' was on his birth certificate and he will be called 'Larry' hereinafter.

Fish Ecology Research Collective, September 1988

Top row, *left to right*: Larry Brown, Rollie White, Rob Leidy, Erik Wikramanayake, Bill Bennett (*with nets*). **Second row**, *left to right*: Lesa Meng, Gina Sato, Liz Strange. Front: Jack Williams, Bruce Herbold, Peter Moyle. Lynn Decker probably took the photo.

Larry arrived at UC Davis in 1979 where he got a second Bachelor's degree and subsequently an MS and PhD under the guidance of Dr. Peter Moyle. Dr. Moyle remembers:

> *"Larry first came to my attention in 1980 as an outstanding student in my undergraduate fish biology class. I found out later that he already had a BS in Biology from UC Irvine and was working on his second BS in Wildlife & Fisheries at UC Davis. He also applied to the UC Davis Graduate Group in Ecology (GGE), because he wanted do field-oriented work rather than be stuck in a laboratory. I was looking for a graduate student at the time and my choice had boiled down to Larry and another fellow, who was more expressive of his enthusiasm for working with me. I went to the GGE office to look at the applications and make a decision. Winnie Spurr, the staff manager of the GGE, saw the files I was looking at and told me in no uncertain terms that I should take on Larry. He is really smart, she said, and a really nice guy besides. I could see I really had no choice if I wanted to stay in Winnie's good graces--important!*
>
> *"It turned out he was an extraordinarily good choice. For the next 10 years, he did research on native fishes in my laboratory, first as a graduate student and then as a post-doctoral researcher. In that period, we co-authored 12 publications and numerous reports, most with Larry as the lead author. He also published other papers as well. He proved to be a meticulous and energetic researcher who liked being in charge of projects, especially*

field-oriented projects, and who worked well with a diversity of field assistants, mostly inexperienced students.

"Larry's first experience sampling the SF Estuary was working on the UCD Suisun Marsh fish project. Dr. Bruce Herbold was in charge of the sampling and was always working to find a monthly field crew. Larry was always available if needed, no excuses, no arguments—no complaints—and no extra pay.

"During that period, the Moyle Lab was busy with multiple projects and there was a lot of shared labor. At some point we started calling ourselves the Fish Ecology Research Collective. Larry was an active member!"

After his post-graduate work with Dr. Moyle, Larry was hired by the US Geological Survey in August, 1991. Shortly after establishing himself at USGS, Larry met the man who would end up as his supervisor, Fred Feyrer, who recalls:

"My first interaction with Larry was in the spring of 1993 when, as a UC Davis undergrad, I applied for a summer job with him to do stream work in the Sierra. I really can still remember sitting in Peter Moyle's lab doing the interview because it was the first real "fish job" I ever tried to get. I was super confident. I remember being so excited that I was going to get to do research on fish that summer in an amazing place. He didn't hire me and, man, was I totally bummed. I later joked with him that helping me get hired at USGS in 2014 kinda made up for it."

Larry sampling in the San Joaquin Valley early in his career at USGS

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Because of his experience with fishes of the estuary and his multi-disciplinary approach, Larry was the most prominent representative of USGS within the Interagency Ecological Program (IEP), serving on the IEP Management Team and multiple project work teams. He brought much of the USGS work on climate change from the Computational Assessments of Scenarios of Change for the Delta Ecosystem (CASCaDE) project into IEP, and co-chaired IEP's Climate Change Project Work Team. Larry was also intensely involved in IEP work on Delta Smelt ecology, hydrodynamics and fish distribution, food web structure, contaminant effects, and temperature patterns. The IEP community relied heavily on Larry's unique ability to lead data analysis and synthesis efforts, including IEP work with the National Center for Analysis and Synthesis on the causes of the "Pelagic Organism Decline" in the Bay–Delta. Working closely with the IEP Lead Scientist Dr. Anke Mueller–Solger, Larry was one of the scientists who helped to make synthesis the priority it is today in IEP and in the Bay–Delta as a whole.

The extremely long list of papers and reports he wrote were helpful, but he likely had the greatest impact on Bay–Delta management through his talks to decision-makers. He was one of the most knowledgeable experts on Bay–Delta ecology, making him always in demand at meetings, symposia, and panels. For example, his work is cited widely in many of the major regulatory forums, including State Water Resources Control Board water rights evaluations, federal Biological Opinions, and state Incidental Take Permits. Most recently, he worked with the multi-stakeholder Collaborative Science and Adaptive Management Program (CSAMP) as an expert on Delta Smelt. He led the Delta Smelt Fall Outflow Environmental Assessment, a large effort to assess how high outflows in the fall of wet years influenced Delta Smelt survival. The findings from this study were a major advance in understanding how temperatures in summer and outflow in fall interact to determine the survival of Delta Smelt. Larry was also a leading expert in CSAMP's efforts to use structured decision-making to identify adaptive management experiments that might contribute to Delta Smelt recovery efforts in the Bay–Delta. His presentations, via CSAMP, to the leadership of stakeholder groups as well as to heads of state and federal agencies will influence policy decisions for years to come.

Larry's influence expanded in breadth and depth with time, as did his career, which grew to include many investigations in other systems and at the national scale, many of them included his close colleagues at the USGS California Water Science Center. For his contributions to the USGS, Larry received the Meritorious Service Award of the Department of the Interior in 2018. Based on his long and impressive publications record (80+ publications), he was identified by a Stanford study as among the world's top 2% of scientists in his field. It is both appropriate and sad that Larry was chosen to receive the prestigious Brown–Nichols Award at the April 2021 Bay–Delta Science conference. There is no question that he died just as his expertise, patience, persistence, and leadership were most recognized and most needed. As noted in the nomination letter for the 2021 Brown-Nichols Award, Larry stood out for his "sustained contributions to original science for the Bay–Delta, the impact these contributions have had on Bay–Delta management,

and Larry's remarkable record of scientific leadership and mentorship in a system that's likely one of the most "complex, chaotic, and cantankerous" (Luoma et al. 2015) estuarine systems on earth.

In acknowledging his DOI Meritorious Service Award, Larry commented, "I have never really thought of myself as a mentor, though I am told I am. I just try and find the people that are willing to help get the job done, and they are often younger scientists so we work together to get to the end. I guess they learn something along the way... ."

Larry was crucial in the establishment of the online journal *San Francisco Estuary and Watershed Science*. When the journal started, there was a long-standing debate over whether flows or improving physical habitat were more important for protecting valued fish of the estuary. The first issue of *SFEWS* addressed this concern head-on, with Larry organizing the contributions and writing four of the six articles. The principal article, "Will Tidal Wetland Restoration Enhance Populations of Native Fishes?" is still required reading for anyone working in the estuary. The other five *SFEWS* articles on which he was author demonstrate the breadth of his interests:

Food webs of the Delta, Suisun Bay and Suisun Marsh: an update on current understanding and possibilities for management. Brown LR, Kimmerer W, Conrad JL, Lesmeister S, Mueller–Solger A. 2016. San Francisco Estuary and Watershed Science 14(3). Available from: *http://escholarship.org/uc/item/4mk5326r*

Delta Smelt: Life history and decline of a once abundant species in the San Francisco Estuary. Moyle PB, Brown LR, Durand JR, Hobbs JA. 2016. San Francisco Estuary and Watershed Science 14(2). Available from: *http://escholarship.org/uc/item/09k9f76s*

Linking hydrodynamic complexity to Delta Smelt (*Hypomesus transpacificus*) distribution in the San Francisco Estuary, USA. Bever AJ, MacWilliams ML, Herbold B, Brown LR, Feyrer FV. 2016. San Francisco Estuary and Watershed Science 14(1). Available from: *http://escholarship.org/uc/item/2x91q0fr*

The role of tidal marsh restoration in fish management in the San Francisco Estuary. Herbold B, Baltz DM, Brown L, Grossinger R, Kimmerer W, Lehman P, Moyle PB, Nobriga M, Simenstad CA. 2014. San Francisco Estuary and Watershed Science 12(1). Available from: *http://escholarship.org/uc/item/1147j4nz*

Variation in spring nearshore resident fish species composition and life histories in the lower Sacramento–San Joaquin Watershed and Delta. Brown LR, May JT. 2006. San Francisco Estuary and Watershed Science 4(2). Available from: *https://escholarship.org/uc/item/09j597dn*

Larry was one of the most active members of the journal's editorial board, leading peer reviews of articles within his expertise and reviewing other manuscripts.

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Larry also contributed to the Bay–Delta science enterprise in other important ways. He participated in many events and work teams sponsored by the Delta Science Program (formerly CALFED), including authoring portions of the "State of Bay–Delta Science" reports and papers, and organizing and co-chairing several of the biennial Bay–Delta Science Conferences.

All the hard work and intelligence Larry brought to bear would not have had such a great impact if he was not a person people knew, respected, relied upon, and loved. Unsolicited comments from his colleagues show this:

> *"thoughtful, kind, patient"* — Lauren Buffaloe-Muscatine
>
> *"Larry [w]as a rock we all could count on."* — Dan Castleberry
>
> *"empathic, smart and dedicated"* — Chris Dewees
>
> *"such a gentle soul"* — Kelly Souza
>
> *"fair to everyone. A huge loss. I learned a lot from his authentic kindness. He was such a good man."* — Cynthia LaDoux Bloom
>
> *"What a sweet and noble man. Larry, was a mentor to me in so many ways. He was a field leader and inspiration for my first fisheries position and helped me get into grad school. He was on my committee for both my MS and PhD. Always willing to discuss new ideas and thoughts even if we disagreed, he approached our discussions from a positive angle. I love how he took on studies in areas others had chalked up as not as important. He had such a quiet, awesome sense of humor."* — Joe Merz

Larry is sorely missed.

REFERENCE

Luoma SN, Dahm CN, Healey M, Moore JN. 2015. Challenges facing the Sacramento–San Joaquin Delta: complex, chaotic, or simply cantankerous? *San Franc Estuary Watershed Sci* [accessed 2021 April 08];13(3). https://doi.org/10.15447/sfews.2015v13iss3art7