

NEWSLETTER Society of Freshwater Science California Chapter & California Bioassessment Workgroup

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Chapter Chair / President Angela De Palma-Dow (Above) serves as a program coordinator for the County of Lake Water Resources Department and provides water quality management for Clear Lake and several tributaries that feed Clear Lake, including the Clover Creek diversion channel (below right) that protects the town of Upper Lake, CA from floods and also serves as a corridor to spawning grounds for the endemic, state-listed Clear Lake Chi / Hitch (*Lavinia exilicauda chi*).

MESSAGE FROM THE CHAIR

Hello and Happy New Year Cal-SFS!
I hope you and your family had a healthy and happy holiday season and are enjoying all the rain and snow that brought in the new year - our state's aquatic habitats and ecosystems sure needed it! With the rain came storms and winds and for many of us, it felt weird to put on our rubber boots and grab - and actually need - an umbrella for multiple days, or weeks, in a row. This feeling of winter, wetness, and the soggy experiences of drying drops from our hair and scooting quickly from work door to car door to avoid becoming instantly soaked, is very foreign.
While this might sound like small complaining, know that I am grateful. Grateful for our rivers, creeks, wetlands, lakes, and estuaries to take a big drink and become refreshed. However, I want to also not forget the recent drought, and the strained and stressed conditions many of our aquatic ecosystems went through during the three year dry drought years. In fact, I urge you not to forget the recent past, because we will most certainly repeat it, and soon, and I hope then we don't forget about the rains, atmospheric rivers, slides, and floods.
As freshwater scientists and managers we must remember the "new" climatic cycles we are experiencing - one it seems, of extremes. We must be ready and prepared, and we can best do that by remembering and incorporating that memory in all we do - for all the freshwaters of California.



Angela De Palma-Dow
Cal-SFS Chair / President
she / her / hers
Contact us at any time at our
Cal-SFS email:
cal.chap.sfs@gmail.com

JOIN CAL-SFS TODAY!

Now is the time! Renew or Join SFS at <https://freshwater-science.org/> and select "California Chapter" for \$10 extra to join Cal-SFS. Chapter revenues go towards providing student & early career opportunities as well as support our annual meetings and chapter activities. You can donate directly to Cal-SFS through our chapter treasury VENMO (@CalSFS-John-Olson) or email our treasurer Dr. John Olson to send a check (joolson@csumb.edu). Thank you for your continued support!!



The 29th annual CA Bioassessment Working Group (CABW) / 10th Annual Cal-SFS Meeting was held in-person, and streamed online, on October 11-12, 2022 at the CalEPA Building in Sacramento, CA. This was the first in-person CABW/Cal-SFS meeting since 2019. There were 272 registered attendees. There were 15 presentations, a student poster session and a CA Environmental Flows Framework workshop hosted by Cal-SFS. Thank you to the whole SWAMP Water Board team for organizing, coordinating, hosting, and executing another wonderful CABW / Cal-SFS meeting. The entire meeting, videos from day 1 & 2, the Agenda, presentation Abstracts and Presenter Index, are available on the CA Water Board SWAMP training webpage: https://www.waterboards.ca.gov/water_issues/programs/swamp/bioassessment/training.html

THANK YOU TO OUR SPONSORS



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- January 2023- Renewal/Join SFS + Cal-SFS (<https://freshwater-science.org/>)
- February 3, 2023 - Annual Meeting Abstracts Due (<https://www.freshwaterdownunder2023.org>)
- February 15, 2023 - Cal-SFS Travel Grant Applications Due via email cal.chap.sfs@gmail.com
- June 3-7, 2023 - Freshwater Sciences Meeting in Brisbane, Australia
- Late June / Early July, 2023 - CA Water Board Water Data Science Symposium
- October 12-13 2023 - CA Bioassessment Working Group & Cal-SFS Annual Meeting/ Symposia

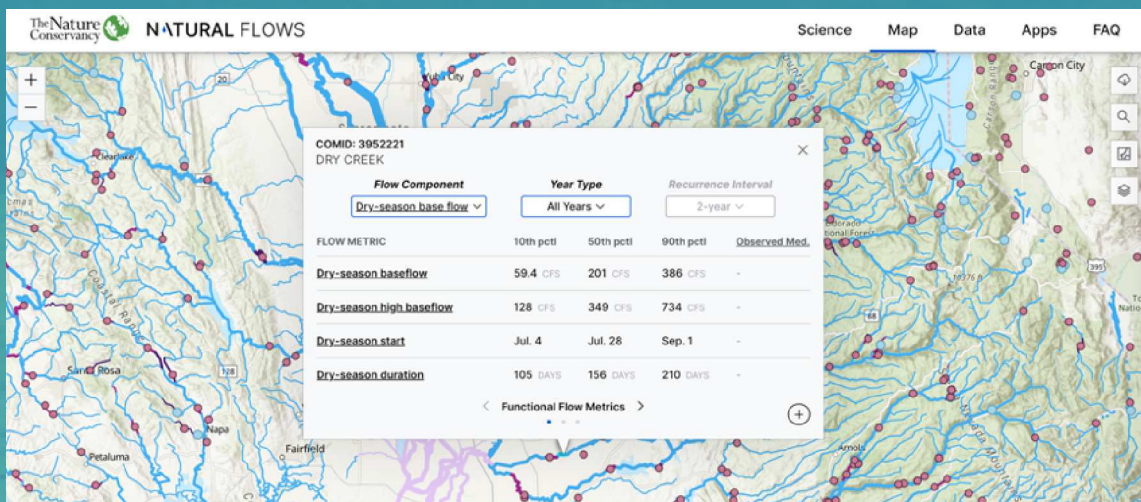
California Environmental Flows Framework Workshop: Overview, Application, and Tools

Written by: Kris Taniguchi-Quan (SCCWRP)

Workshop Co-Organizers and Presenters: Kris Taniguchi-Quan (SCCWRP), Ted Grantham (UC Berkeley), Sarah Yarnell (UC Davis), Julie Zimmerman (The Nature Conservancy), Alyssa Obester (CA Department of Fish and Wildlife), Alex Milward (CA Department of Fish and Wildlife), Kirk Klausmeyer (The Nature Conservancy)

The 2022 CABW-Cal SFS conference held a half day in-person workshop focused on the California Environmental Flows Framework (CEFF), a management approach to efficiently develop scientifically defensible environmental flow recommendations that balance human and ecological needs for water. CEFF was developed to help managers improve the speed, consistency, standardization, and technical rigor in establishing environmental flow recommendations statewide. This workshop provided an overview of CEFF, introduced technical tools that were developed to support CEFF implementation, and highlighted case study applications that address a suite of management questions. The workshop included presentations and interactive elements, including a demonstration of CEFF tools, and was oriented towards practitioners working to assess and protect environmental flows in California's rivers and streams. Workshop participants spanned multiple sectors of the water-quality management community, including State and regional agencies, public utilities, academia, NGOs, tribal communities and consulting firms, as well as several university students.

(Below) Workshop participants got a live demonstration of the Natural Flows Database (<https://rivers.codefornature.org/>), an online webtool containing expected streamflow in the absence of human modification in all the streams and rivers in California.



Did you miss the workshop? A recording of the workshop and all materials can be accessed online:
<https://ceff.sf.ucdavis.edu/presentations>

For more information, contact the workshop organizer:
Kris Taniguchi-Quan (kristinetq@sccwrp.org)

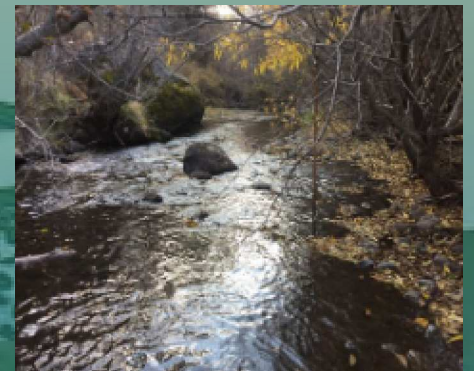
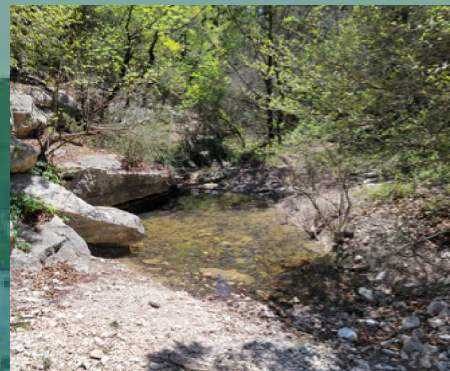
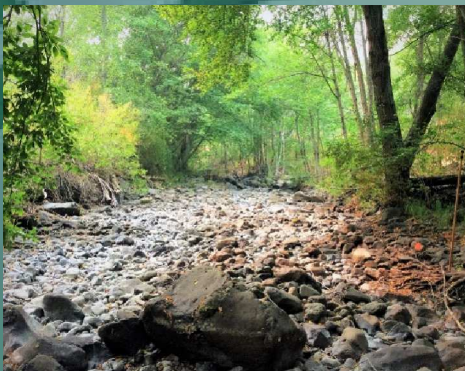
Performance of a modeled insect richness index across flow permanence gradients: comparison with the CSCI and other indices

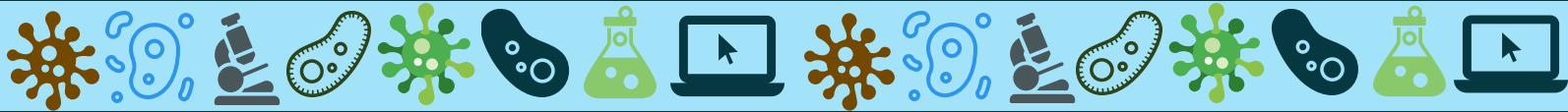
Written by: Jennifer Courtwright and Chuck Hawkins (Utah State University)

Indices developed for perennial streams often perform poorly when applied to nonperennial streams, pointing to the need to optimize indices for nonperennial streams. We used data from 473 sites to develop a bioassessment index applicable across flow permanence gradients in the western USA. We considered several potential indices during development, including a traditional taxa-based O/E index, a modeled MMI including traits thought to be reflective of arid regions, a trait-based O/E, and modeled individual metrics adjusted for the effects of natural environmental gradients. We also included predictors thought to characterize the variability in flow regimes across the arid West and the degree to which streams were isolated from one another. To further validate the top performing index, we applied it to 235 sites of known flow permanence and landscape condition status (reference vs degraded) across California and compared its performance to California's Stream Condition Index (CSCI) developed for perennial streams.

The Modeled Insect Richness Index (MIRI) performed better than all other indices. The top predictor of insect richness was a measure associated with connectivity and disturbance (the percent of streams classified as intermittent by the National Hydrography Dataset (NHD) within a 25-km buffer surrounding the sample site). The Random Forest model accounted for 46% of the variation in insect richness observed across reference sites, and the index assessed 88% of degraded sites as biologically different from reference conditions. Despite the use of traits thought to be sensitive to drying and the inclusion of enhanced predictors characterizing flow regimes, all other indices performed less well than the MIRI and were unlikely to perform well enough for regulatory use (37-74% of degraded sites correctly classified). We think the reason the MIRI performed better than other indices is that richness is more predictable than composition in highly dynamic systems, in which frequent and severe drying events are critically important in structuring local assemblages.

The MIRI and the CSCI assessed a similar percent of degraded, nonperennial streams in California as being in biological nonreference condition (77% and 65%, respectively). This result suggests that the MIRI may be a practical, intuitive measure of biological condition universally applicable to streams in states that monitor and assess both nonperennial and perennial streams. Additionally, the MIRI is based on readily available GIS predictors available from the NHD and the USEPA's StreamCat dataset, so it could be expanded to include sites across the USA and elsewhere. However, even though a single index may be generally applicable across flow permanence classes, practitioners may still need to identify region- or regime-specific thresholds for inferring impairment because mean index scores and index precision varied across perennial and nonperennial streams for both the MIRI and the CSCI.





CABW / Cal-SFS Meeting Presentation Highlight:

Current and Future Thermal Vulnerability in Sierra Nevada Streams

Written by: Kyle Leathers, PhD Candidate at University of California - Berkeley

Climate change could threaten Sierra Nevada streams because warmer air temperatures reduce snowpack and increase the duration of summer droughts. Reduced thermal buffering during low flow could raise water temperatures and harm coldwater species, but it is uncertain if this truly threatens Sierra Nevada ecosystems. Although it has long been known that air temperature influences water temperature in streams, predicting the strength of this relationship, and its variability over space and time, is as consequential as it is challenging. We instrumented a watershed in the Southern Sierra Nevada (Figure 1) with 120 water and air temperature sensors for a year to answer these questions with time-series models.

Air temperature had the greatest influence on water temperature in the late spring and summer, when air and water temperatures peak. This suggests that the summer is vulnerable to future warming. Although wildfires are known for emitting heat, a nearby wildfire during the study actually caused water temperatures to drop because of the thick smoke that cooled the stream temporarily. We found that some headwaters were more vulnerable than others to air warming—and warming has long-range effects downstream. This spatial propagation has implications for designing restoration and conservation actions. Improving upstream habitat may be the most effective strategy to help local stream thermal conditions. Snowmelt and high volumes of water in a stream were also important for cooling water temperature. This is concerning because climate change is poised to decrease the relative amount of precipitation that falls as snow rather than rain—with even lower summer streamflow, and higher maximum water temperatures as a result.

To answer if aquatic macroinvertebrates are vulnerable to climate change in mountain streams, we combined results for when, where, and why water temperature varies to model water temperature throughout the watershed, both now and in 2090 according to a high emission RCP 8.5 climate change scenario (Figure 2). We found that 26% of coldwater habitat in the study watershed could be lost because of climate change, which would threaten 27% of the aquatic species studied. These results suggest that mountain streams could lose coldwater species and rely on immigration of warmwater species to maintain biodiversity and ecosystem functions. Areas that currently get most of their precipitation as snow but are on the cusp of switching to rain, if temperature increases, are especially vulnerable.

This work was recently published in *Limnology and Oceanography* (<https://doi.org/10.1002/lno.12264>) if you would like to learn more about our findings. The methods we developed can be used to more accurately predict areas that are vulnerable to climate change (or refugia) and we would be happy to discuss them with others. I am exploring this system further in my PhD by testing how other drought impacts like silt buildup and stagnant water interact with thermal stress to alter aquatic biodiversity in Sierra Nevada stream ecosystems.

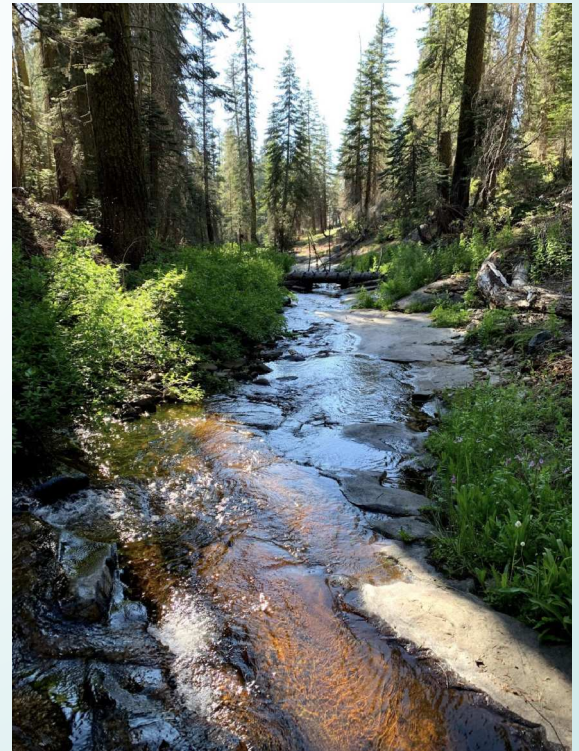


Image Above: Bull Creek at the most downstream reach in the study.





CAL-SFS STUDENT CENTRAL

Student highlights from the 2022 Annual CABW / Cal-SFS Virtual Meeting



GRADUATE STUDENTS - BEST OVERALL: MONICA COLL



Name: Monica Coll

Status: Graduate student

Contact: Monica.Coll@swca.com

Affiliation: California State University, Sacramento, Kneitel Lab

Title: Effects of Fire Retardant on California Vernal Pool Community Composition

Summary: Across the globe, wildfires have recently become more frequent and intense due to climate change, land management, and persistent drought conditions. As a response, federal agencies such as the U.S. Forest Service treat the perimeter of wildfires with fire retardant. I developed a mesocosm study to investigate the impacts of fire retardant on invertebrate abundance and diversity within vernal pool (seasonal freshwater pond) ecosystems. I found that fire retardant significantly changed water quality and decreased species abundance and species richness. This is concerning because vernal pools are an important source of biodiversity and support threatened and endangered species. Based on these preliminary results, it appears that use of fire retardant in the vicinity of sensitive habitats like vernal pools could have negative impacts.

I feel very fortunate to have had the opportunity to present my research at the combined CABW and Cal-SFS meeting this year. Being able to connect with professionals that are interested in protecting freshwater systems motivates me to continue my research and share information that would support management decisions.

Name: Shawn A. Melendy

Status: Masters student

Contact: shmelendy@csumb.edu

Affiliation: California State University Monterey Bay - Watershed Environments & Ecology Lab, P.I. John Olson

Title: Which Environmental Factors Drive eDNA Sampling Outcomes?
Understanding Salmonid eDNA Fate and Detection Probability at the Reach Scale

Summary: My thesis research focused on understanding the nature of salmonid environmental DNA (eDNA) and how it moves and degrades in rivers. We conducted river experiments adding a known amount of Brook Trout eDNA to the water, and then collecting water samples downstream to see how much eDNA we could recover over distance.

The CABW/Cal-SFS Meeting in Sacramento was a great experience to hear from professionals in our field and bounce ideas off people, especially regarding eDNA sampling and its continued incorporation into management decisions. It was also just a fun couple of days, and great to put faces to many names!





CAL-SFS STUDENT CENTRAL

Student highlights from the 2022 Annual CABW / Cal-SFS Virtual Meeting



UNDERGRADUATE WINNERS

Name: Connor Quiroz
Status: Undergraduate student, Junior
Contact: coquiroz@csumb.edu
Affiliation: California State University Monterey Bay - Watershed Environments & Ecology Lab
Title: Causing a Stir in Northern Pitcher Plants (*Sarracenia purpurea*)

Summary: My lab partner, Mahlana Graham, and I under Dr. Peter Kourtev studied how the microbial communities in *Sarracenia Purpurea* are affected by pulse and press (short-term and long-term) disturbances. Our samples are currently getting sequenced but we expect the microbial communities that underwent pulse disturbances to decrease in diversity but recover shortly after whereas in the press disturbances the microbial diversity will not recover to their original amount and assume an alternative stable state. At CalSFS - Meeting people, professors and contractors of similar interests within the Cal-EPA department, specifically in freshwater, was beneficial to understand what path I may want to follow in graduate school and beyond!



Name: Natalie Hunter
Status: Undergraduate student, Senior
Contact: nhunter@csumb.edu
Affiliation: California State University Monterey Bay - Watershed Environments & Ecology Lab
Title: Impacts of Arundo Removal on Aerial Invertebrates in Ephemeral Streams

Summary: This project is in affiliation with the ongoing Arundo Removal Project managed by the Resource Conservation District of Monterey County. I am specifically looking to see how the removal of arundo impacts aerial invertebrates in the Salinas River.

Attending the CABW and Cal-SFS conference in Sacramento was so wonderful because this was my first time at a conference outside of my university where I was able to connect with established experts and graduate students in this field. I felt very welcomed and excited to learn about the different projects that were presented.





2023 Student Travel Grants to SFS (Brisbane, Australia)



The California Chapter of SFS (Cal-SFS) has made **three awards (\$2,000 ea.)** available to support the travel expenses of undergraduate or graduate students presenting at the 2023 SFS annual meeting in Brisbane, Australia. Awarded funds may be used to cover the costs of transportation, lodging, and/or registration. If the student is not yet a member of SFS and the California Chapter, a portion of the travel grant should be used to cover the cost of membership.

Cal-SFS is supporting student travel to the 2023 SFS meeting in Brisbane, Australia in order to provide funding to students who otherwise would not be able to attend, and for whom not attending the meeting would be detrimental to their academic or professional development. Thus, students who have funding available through other sources, such as research grants or university awards, should not apply. Award funding will be given directly to students, and can be used for any expenses related to travel to the meeting.

Please refer to full application details on the Cal-SFS website

Award recipients are expected to:

- Attend the entire SFS meeting, including any Cal-SFS events, and provide any needed assistance, to chapter officers.
- Submit an abstract by the required deadline in order to present their research at the 2023 meeting, in either an oral or poster format.
- Moderate at least one session at the meeting.
- At the end of the calendar year, submit a short descriptive article on your experience for the Cal-SFS newsletter.
- Maintain membership in the larger international SFS society and Cal-SFS in 2023 and 2024. SFS conference membership can be waived if needed.
- Attend and present your research at the Fall 2023 Cal-SFS Chapter meeting, usually in October at UC Davis.
- Recipients of awards are expected to post to, or tag, one of the Cal-SFS social media platforms (Twitter, FB, or Instagram) while at the meeting.

To Apply:

• Please send a single electronic file (.doc, .docx, .pdf, or .txt) as an attachment in an email to Cal-SFS (cal.chap.sfs@gmail.com) by **February 15, 2023**. Please include the following information in your application:

1. Full contact information (name, address, phone, email)
2. Student status (college or university, degree program, years in program, expected graduation date)
3. A brief statement of interest in the SFS meeting (< 250 words). Please describe:
 - A. How your academic and career goals will be advanced by attending the SFS meeting
 - B. Evidence of past or planned education or outreach activities that expand access and involvement in the field of freshwater science in California
 - C. A copy of your submitted abstract, OR a draft copy of the abstract you plan to submit by the meeting's February 3, 2023 abstract deadline, and the name of the session you wish to present in.

Applications shall be judged on academic and career promise, demonstrated need, and the potential for championing freshwater science in California. A committee of Cal-SFS officers and members who are unaffiliated with any applicant shall review submissions and select a recipient before the end of March. Award monies will be delivered, in the form of a check sent directly to the awardees.

Need more information? Contact Cal-SFS Chapter President / Chair, Angela De Palma-Dow (she/her/hers) via email at: adepaladow@gmail.com



Want to support Cal-SFS? Want to get involved? There are several options for you!

#1 Join Cal-SFS today!

Renew or Join SFS & Cal-SFS at <https://freshwater-science.org/> and select "California Chapter" for \$10 to join Cal-SFS. Chapter revenues go directly towards providing student & early career opportunities, support annual meetings and other chapter activities.

#2 Donate directly to Cal-SFS by check or VENMO!



VENMO directly to our treasurer (@CalSFS-John-Olson), or



E mail our treasurer to send a check (joolson@csumb.edu).

#3 Follow Us on Social Media



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