NEWSLETTER Society of Freshwater Science
California Chapter & California Bioassessment Workgroup

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Aerial view of Clear Lake, Lake County, CA where Angela (image below) works in the Lake County Water Resources Dept. Clear Lake is the focus of current research for water quality, cyanobacteria, HABs, and post-fire impacts.

Join Cal-SFS Today!

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 of Cal-SFS!!

INSIDE THIS ISSUE:

Message from the Chair

Hello Cal-SFS! To start, I want to express how grateful I am for the opportunity to serve as your chapter president/chair for the next two years. I thank you you all for having the confidence in me to lead Cal-SFS forward into the future of freshwater in California and beyond.

I am extremely grateful for the stability and reliability of the chapter and it's role in helping me grow my professional and personnel love of all things water and I aim to make this a reality for all our membership. This chapter belongs to all it's current and future members I am merely the current steward of this amazing organization. I hope you consider Cal-SFS a safe space, where you always feel welcome, where you can feel comfortable asking and answering questions and freely receive and offer help. I want our chapter to be a place where anyone, of any academic or professional level or background can access needed resources, learn about awesome opportunities, and where we can culture connections and nurture networks.

This goal is even more relevant in our society's current situation, with the past year having thrown many challenges and obstacles in our way as we are forced to change both our real and research lives and livelihoods under the dark clouds of a pandemic, unpredictable politics, and a major economic recession. Current events, as it always seems, highlight the growing importance of a diverse, inclusive, and dedicated workforce prepared to tackle the important role of understanding and protecting our most valuable resource - freshwater. Members of Cal-SFS are at the forefront of this charge, and over the next two years I wish to work with you, all of you, as we strive to make California's freshwater healthier, safer, and more accessible to all people, plants, and animals.

To anyone who has lost or suffered due to COVID-19, know that Cal-SFS is thinking of you and we send you our thoughts and condolences. Together, with support from the parent SFS, we can help to get you back to being involved in the Society. The last page of this newsletter highlights some of the current opportunities we have available, but are not limited to. When you are ready, we are here. Thank you and Cheers to a New Year in 2021!

Cal-SFS email: cal.chap.sfs@gmail.com

~ Angela De Palma-Dow ~
she / her / hers

The 27th annual CA Bioassessment Working Group (CABW) / 8th Annual Cal-SFS Meeting was held virtually on October 13-14, 2020. The meeting attracted over 436 registered participants and hosted one keynote presentation, 21 research/applied presentations, a Environmental DNA panel, a 2-day R workshop, and a poster/ lightning talk session that included 11 posters and one lightning talk. Thank you to the whole SWAMP Water Board team for organizing, coordinating, hosting, and executing another wonderful CABW / Cal-SFS meeting including but not limited to Shuka Rastegarpour, Ali Dunn, and Anna Holder. 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#college.

Save The Dates 2021

- January 2021- Renewal/Join SFS + Cal-SFS (https://freshwater-science.org/)
- February 10, 2021 - Cal-SFS Fellowship Applications due (info on page 6)
- Feb 12,12:30 PM - Cal-SFS Winter Members Meeting (Zoom ID: 889 5230 9331, PW: freshwater)
- February 15, 2021 - Abstracts due SFS Annual Virtual Meeting
- May 23-27, 2021 - SFS Annual Meeting Virtual (https://sfsannualmeeting.org/)
- June 29-30, 2021 - CA Data Water Symposium Virtual
- October 12-13 2021 - CA Bioassessment Working Group & Cal-SFS Annual Meeting/ Symposia

Annual Cal-SFS Meeting Workshop Highlights
Contribution by Workshop Organizers: Ryan Peek (UC Davis) and Heili Lowman (SCWWRP)

The 2020 CABW-SFS conference included an entirely virtual workshop designed to provide an overview to those interested in beginning to work in the programming language R. We had 42 participants on day 1 and 44 on day 2. Most had little programming or coding background knowledge, so the workshop was designed to start from the basics of getting everything installed and setup, before moving to importing data and visualizing data. All instruction was done via zoom, and instructors Heili and Ryan live-coded each of the exercises from our public website: **https://ucd-cws.github.io/CABW2020_R_training/**. The website was built entirely in R and is freely hosted on Github, replete with excellent graphics courtesy of Allison Horst.

The website contained all the workshop content, as well as a live-updating dropbox file that folks could check to see all the code that had been entered or used by the instructors. This provides a way to make sure participants don't feel they've fallen behind or missed something, and ensuring there is a record of everything that is covered in the workshop.

The lifeblood of any successful workshop is the helpers that ensure participants can get the attention and assistance to work through any difficulties that inevitably arise, or simply ask questions. We were lucky to have seven excellent helpers from both UCSB and the R-Ladies group as well as from the UCD Davis R-Users Group. These folks were constantly making sure our virtual workshop ran smoothly and that attendees were able to work through questions quickly and smoothly.
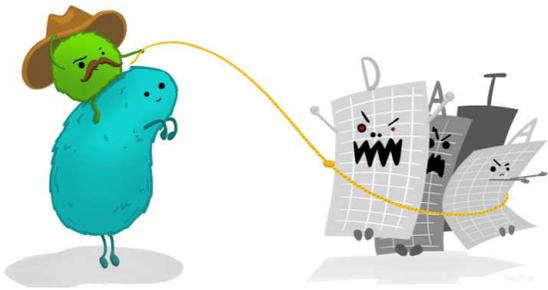

The first day of the workshop covered the basics of R and RStudio, followed by how to import data into R (using a .csv), some data wrangling and tidying, and finally a very brief introduction to using the graphics package {ggplot2} to make boxplots. The second day of the workshop covered how to import data from an excel spreadsheet, some tidy data principles, how to join data, how work with spatial data in R, and finally, how to make an interactive map.

Feedback from participants consistently highlighted how important the helpers were, that having the material online as well as the live-code saved on the fly was much appreciated, and how they appreciated learning the importance of data organization and file management (naming files, setting up a project) at the start. The general consensus from comments regarding how to improve the workshop nearly all related to wanting more time (i.e., a longer workshop) or that things moved quickly (but folks understood with a short workshop this was one of the tradeoffs).

Overall, it certainly seems there is a demand for this sort of training, both virtually and in-person. Future workshops would benefit from having a solid group of helpers as well as potentially a longer chunk of time in order to spend more time working through the content.

Cal-SFS Student Central
Student highlights from the 2020 Annual CABW / Cal-SFS Virtual Meeting

While the annual CABW / Cal-SFS meeting looked a little different this year, there was increased participation and presentations from more global SFS members and freshwater scientists. Students were invited to participate in an online competitive poster/lightning talk session on Tuesday afternoon with a corresponding live "Q&A" opportunity on the CABW/Cal-SFS Meeting Slack Channel. All posters / lightning talks are available for viewing on the Cal-SFS new website at https://cal-sfs.github.io/2020-CABW-SFS/index.html and Q&A session is available on the meeting Slack Channel "California Bioassessment Workgroup Meeting" at slack.com.

First Prize Overall

Name: Jasmine Shen **Contact:** js602@humboldt.edu **Affiliation:** O'Dowd Lab, Humboldt State University **Title:** Responses of macroinvertebrate drift biomass concentration to pulse flow releases downstream of Lewiston Dam on the Trinity River, CA (preliminary results) **Summary:** While dams have dramatically altered aquatic ecosystems, I believe that these impoundments provide a unique opportunity to support freshwater conservation goals. For example, functional flow regimes specific to a river system can be designed to mitigate dam-related impacts. My research interests surround the effects of streamflow alterations on benthic macroinvertebrate (BMI) drift dynamics. I am hopeful that the results from this study can provide insights to regulating streamflow in ways that will increase BMI availability in the drift, which may have cascading effects on drift-feeding juvenile salmonid production.

Even though this year's CalSFS meeting was virtual, it was still an invaluable learning and networking experience. It was a privilege to share some early results from my project with a wider audience and I am appreciative of everyone who took the time to provide any feedback and comments. I am also extremely grateful to the funders for supporting the meeting and encouraging student poster participation.

Best Undergraduate Poster

Name: Jonathon Carmichael
Contact: jcarmichael@csumb.edu
Affiliation: CSU Monterey Bay
Title: Effects of the Removal of Invasive Giant Cane on Aerial Macroinvertebrates

Summary: Arundo donax (giant cane) is an invasive species which alters river morphology and nutritional resources of riparian ecosystems. We examined if the removal of A. donax improves biodiversity in aerial macroinvertebrates in the Salinas River. We collected invertebrates during the summer of 2019 for 8 days, at 5 sites, with 5 sets of 4 adhesive traps at each site. Traps each faced one of four directions, away/toward the river channel, and up/down stream. The furthest upstream sites had A. donax removed in 2016. We saw a greater family level richness and increased dispersal from the channel and upstream at the site where A. donax was removed. The removal site had slightly greater abundance, whereas the site with A. donax had a slightly increased Shannon diversity (H = 2.63 with A. donax, H = 2.43 without). The impact of A. donax on macroinvertebrates imply that removing A. donax may result in only minor effects on the food web. The lack of improvement for most taxa may be due to the ecosystem needing more than three years after treatment to fully recover. Although A. donax reshapes ecological river habitats, its removal does not immediately restore the ecosystem.

This was my first time attending Cal-SFS as well as my first virtual conference. Although this year's conference was virtual, it was a great experience to be able to listen and interact with the freshwater community. I would like to thank Cal-SFS for allowing me the opportunity to share the research I have been working on for my undergrad to a group of individuals that are excited and passionate about freshwater science. I learned a lot during this conference and appreciate the insight from the freshwater community. I would like to thank those who have helped make this conference possible and all the support I've been given along the way. I hope to meet everyone face-to-face at the next conference.

Don't forget that your annual $10 membership to Cal-SFS provides student research and presentation opportunities. Want to provide more support? You can donate directly to Cal-SFS through our chapter treasury VENMO (@CalSFS-John-Olson) or email our treasurer to send a check (joolson@csumb.edu).

Best MS Poster Award
Name: Nick Framsted
Contact: ntframsted@ucdavis.edu
Affiliation: UC Davis Tahoe Environmental Research Center
Poster Title: Nutrients from the deep: internal phosphorus loading in hyper-eutrophic Clear Lake
Summary: My poster covered research my team and I conducted on phosphorus cycling in Clear Lake, a hyper-eutrophic lake heavily impacted by harmful algal blooms. I seek to quantify rates of phosphorus flux from lake-bottom sediments (termed internal loading) and estimate annual loads of phosphorus to the lake. These results will be applied in a hydrodynamic lake-model to estimate phosphorus flux throughout Clear Lake and inform potential management strategies to local stakeholders.
I really enjoyed participating in the virtual poster session and it allowed long-term interactions with researchers even after the poster session ended. The opportunity to engage with a diverse group of researchers across the state gave me new perspectives on my project, and future directions of research. It is an honor to have been awarded for my poster, and I am grateful to the meeting organizers and award funders for making this great experience possible.

Figure Left: Nick after collecting sediment core samples from Clear Lake, Lakeport, CA.

Best PhD Poster Award
Name: William Ota
Contact: wota001@ucr.edu
Social Media: Twitter @Willie_mota
Affiliation: Anderson Research Lab at UC Riverside
Poster Title: How wastewater discharge is structuring communities in the urban Santa Ana River headwaters
Summary: The Santa Ana River runs through dense urban development and common invasive species include largemouth bass, yellow bullhead, and mosquitofish. Invasive species are changing the community structure in the Santa Ana River as novel biotic filters in this urban river. We assessed the trophic niche of these three common invasive species across two wastewater discharge channels using bulk C/N isotope analyses. We found significant differences in the invasive communities along the assessed reaches of the Santa Ana River and that the same species held different isotopic niches based on which channel they were located in. This work also suggests significant differences in overall food web composition between the two wastewater discharge channels. Presenting this work at the CalSFS poster session gave me an opportunity to share my results with others interested in California's freshwater systems, learn about methods to apply in the future, and practice presenting my work in a format that I am not used to. I loved that while the session was held virtually, we had a chance to interact live using slack, and the questions I got were so insightful. I want to thank the donors who contributed to this award and am excited to attend more CalSFS events in the future!

Figure Right top: William in waders at his fish collection site. Figure Right bottom: A largemouth bass which had recently consumed a Santa Ana sucker

CLIMATE CHANGE IMPACTS ON A SIERRA NEVADA FOOTHILL WATERSHED: TWO DECADES OF CITIZEN-SCIENCE DATA DEMONSTRATE CLIMATE-DRIVEN SHIFTS IN PERENNIAL STREAM WATER QUALITY

Written by: Jeff Lauder of the Sierra Streams Institute

Climate change is projected to have outsized impacts on freshwater systems via increasing temperatures and decreased precipitation. Variation in land cover type (e.g. forest vs. grassland) can increase or decrease climate stress through differences in shading, runoff, and other landscape traits. Building climate resilience into freshwater ecosystems depends on identifying locations of particular climate susceptibility, as well as drivers of that susceptibility that may allow us to develop mitigation and restoration projects that pre-empt climate impacts.

Watershed groups that use citizen-science approaches are an important source of long-term ecological data that can be leveraged to track changes over long time periods, including periods with climatic extremes that can be used to model future response to those extremes. We used structural equation modeling with two decades of citizen-science data on water quality from a perennial stream in the foothills of the Sierra Nevada mountains—including both the hottest/driest and wettest years on record—to ask how climate and land cover
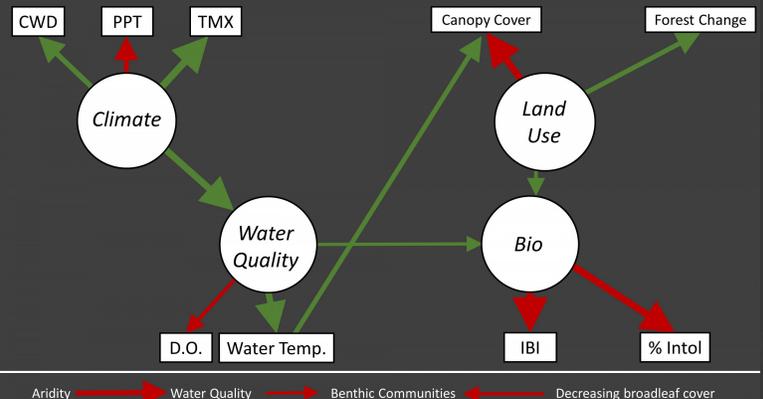

Figure 1: Structural equation diagram showing impacts of (top row from top left) climatic water deficit (aridity, CWD), precipitation (PPT), maximum temperature (TMX), riparian canopy cover, and %change in forest cover at the watershed scale on water quality and benthic macroinvertebrate communities. Green arrows are positive relationships, red are negative, and sizes of arrows represent sizes of relationships. D.O. = dissolved oxygen, IBI = index of biotic integrity, a measure of BMI community health, and % Intol = amount of stress-intolerant taxa.

drive changes in freshwater stream quality and ecological community integrity. We found that over the last 2 decades, increasing temperature and aridity, as well as increasing forest area but decreasing riparian canopy cover were associated with a decline in water quality, primarily via a crash in dissolved oxygen and a spike in water temperature. This shift in water quality was then associated with a decline in benthic macroinvertebrate (BMI) community integrity. We then projected overall change and variability in aridity and precipitation at all of our sampled sides by 2099, and found that lower-elevation sites in our study watershed are likely to experience spikes in aridity and concurrent declines in water quality and BMI integrity in the future. However, our model showed that preventing riparian canopy cover loss may mitigate some of these impacts. These results demonstrate that by combining climate sensitivity analysis with land cover/land use change analysis, we can take an early pre-emptive approach to watershed management by targeting climate change-susceptible sites for building resilience and protecting resilient sites that already exist.
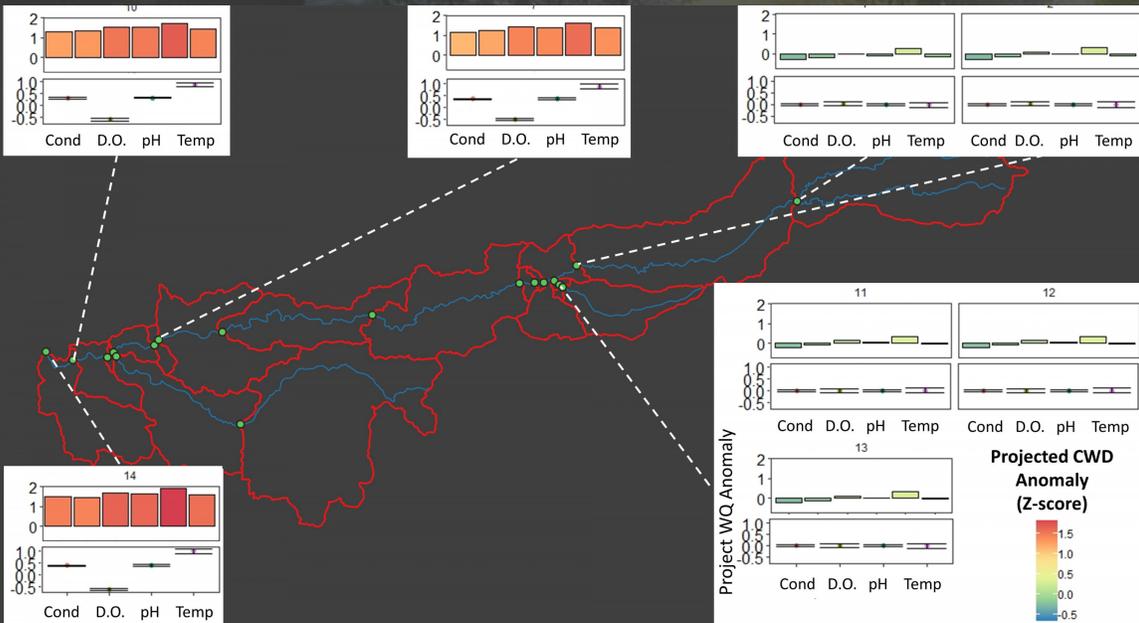

Figure 2 (left): Projected aridity anomaly (red bars) and resulting water quality at subset of sampling locations (green dots) in the Deer Creek watershed in the Sierra Nevada mountains by 2099. Projected aridity drawn from 6 global circulation models that best represent California. Bars that are taller and more red = greater future aridity. Blue bars represent declining future aridity.

In Aug 2020 the Jones Fire burned down Sierra Institute office and everything inside, including monitoring equipment.

Cal-SFS is now accepting applications to their first-ever Cal-SFS Fellowship Program! We are looking for students and early career freshwater scientists to serve as Cal-SFS Fellows for the next year (March 2021 – March 2022). This Fellowship Program is meant to foster and support the next generation of Cal-SFS members and satisfies several of the Society of Freshwater Science Long Range Planning Committee values and goals, including the promotion and development of students and early career freshwater scientists and practitioners through specific programs and actions. Cal-SFS Fellows will receive many benefits, and the chapter will benefit greatly from investment in the Fellowship program. Please share this notice widely with anyone you think would be interested in applying. We hope that you, or someone you know, will consider applying to the 2021 Cal-SFS Fellowship Program today! **Please refer to full application details on the Cal-SFS website**

What do fellows receive?
- Recognition as a 2021 Cal-SFS Fellow
- Mentor opportunity with someone from the California Water Boards of similar research interests or career goals
- Financial assistance where needed. This could include SFS/Chapter Membership or renewal, SFS Annual Meeting registration, Research tools or software financial support Publication support, OR Workshop enrollment to further career or research skills

What are fellows required to do during their tenure?
- Participate in the SFS Annual Meeting (Virtual in May 2021)
- Coordinate a Cal-SFS session at the 2021 California Water Data Science Symposium (Jun. 29-30, 2021) with other 2021 Fellows
- Present a talk, poster, and/or lightning talk at the annual CABW / Cal-SFS Meeting (Oct 12-13, 2021)
- Submit written contribution to the 2021-2022 winter newsletter
- Contribute and post to Cal-SFS social media as appropriate
- Participate in Cal-SFS meetings during the Fellowship

Who is eligible to be a fellow?
Students currently enrolled in undergraduate, masters, or doctoral programs and will be considered eligible if:
- Student applicant must be enrolled in a water-related academic program that is at an institution physically located within the state of California, or
- Involves aquatic systems located in California but the institution itself is not located in California, or
- Enables the student to conduct research outside of California while residing in California and the student is or has been active in Cal-SFS in the last 5 years

Early Career or Postdoctoral applicants will be considered eligible if:
- They are currently within 10 years of graduation from their terminal degree
- If their place of employment or research is physically located within the state of California
- They are working in policy, management, application, or research and development of aquatic systems located in California

How do I Apply?
Send a completed application to Cal-SFS by the application deadline via email to Cal-SFS at cal.chap.sfs@gmail.com
Subject line: "Cal-SFS Fellowship Application – Your FULL NAME" & Attach a PDF file, 1-2 pages in length, use 12 pt. font and 1 inch margins
Name your PDF file: LastName_FirstName_CalSFS_Fellowship_App.pdf.

- **For student applicants:** Name of Institution, Degree Program, Degree Sought

- **For early career or postdoctoral applicants:** Name of Employer, Brief work or research description, Years since terminal degree

- First and Last Name, Preferred Pronouns
- List research / career interests in 4-7 keywords or phrases
- 1,000 word statement to emphasize your education, vocation or career goals and how a Cal-SFS fellowship will help you achieve those goals
- 1-2 sentence statement describing your intended involvement at the SFS Meeting in May 2021 (Ex. Do you plan to present/attend a workshop)

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

SIERRA STREAM INSTITUTE JONES FIRE RECOVERY – WE NEED YOUR HELP TO REBUILD

On August 18th, the Sierra Streams Institute office and everything in it was destroyed in the Jones Fire. We are a watershed monitoring, research, restoration, and education nonprofit based out of Nevada City. Our incredible staff and volunteers have been working for over 20 years to link water, science, and people for the benefit of human and environmental health in the Sierra foothills. In order to keep protecting Deer Creek and Bear River, restoring our lands, researching environmental impacts on human health, and inspiring community science stewards of all ages, we need YOUR help to help us rebuild!

Follow us @SierraStreams

Show your support today! Scan the QR code or visit **https://gf.me/u/yucj99**

Prefer to write a check? They can be made out & mailed to
Sierra Streams Institute
13075 Woolman Lane,
Nevada City, CA 95959

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