California Aquatic Bioassessment Workgroup/California Chapter Society for Freshwater Science Newsletter

Recap of the 23rd Annual California Aquatic Bioassessment Workgroup Meeting: Here is what you enjoyed if you were there and what you missed if you weren't

The CABW/CalSFS workshop on the nexus between hydrology and biology provided participants with hands-on opportunities to learn how to access and use tools to assess hydrology and apply results to interpret bioassessment outputs.

The 23rd annual California Aquatic Bioassessment Workgroup meeting was held on the campus of UC Davis on October 18th and 19th. Once again, bioassessment practitioners and scientists from throughout California and surrounding states gathered to discuss the latest technical developments, research, and applications of bioassessment science to assess and manage California's freshwater resources. This year's workshop was considered one of the best ever based on the evaluation comments received; here is what participants are saying:

"There were some great ideas for how to analyze our data and infer stream health and causes of stress"

"Great opportunity to meet others in field, share ideas, and make connections with potential collaborators"

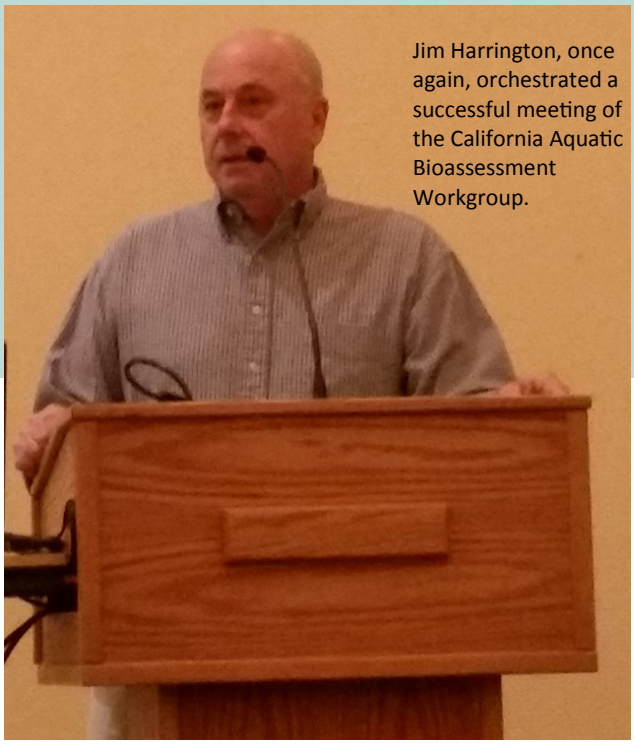
"This workshop helps tie the aquatic bioassessment fields together. It will help me to interpret the field sampling results and see how the data we collect is being used for big picture studies"

"I was not aware of all the resources available through SWAMP. I will definitely research more and see how these tools can help in my work in the Water Quality Monitoring Program"

"Learned about the many groups involved with aquatic bioassessment in California, where to find information and it caused me to think about watersheds and data analysis in new ways"

"Great networking opportunities, nice broad range in talk topics"

Approximately 250 agency staff, research scientists, consultants and students participated in discussions on new assessment tools and future directions for California's bioassessment programs. This year saw the continuation of special sessions on topics of interest and the addition of several new program elements. The first special session focused on aquatic ecology and bioassessment research conducted by the US Geological Survey from new mapping tools to condition assessment to stressor diagnosis. The second special session focused on ecohydrology research aimed at improving the ability to relate hydrologic change to biological responses in streams and develop strategies to manage and mitigate hydrologic impacts.



Jim Harrington, once again, orchestrated a successful meeting of the California Aquatic Bioassessment Workgroup.

Two new features for this year were sponsored by the California chapter of the Society for Freshwater Science (SFS), which co-hosted the meeting. The first-ever CABW/CalSFS fundraiser and workshop on Hydrology was on understanding the nexus between flow and biology and provided hands-on opportunities for approximately 25 participants to learn how to acquire and process hydrologic data for interpretation of bioassessment results. This workshop raised over $1000 to fund student travel to scientific conferences. CalSFS also co-sponsored a special chapter session on the latest developments in stream and vernal pool assessment. The session concluded with an exciting discussion on strategies to communicate science outcomes to agencies and the public. You can check out Tina Mendez's video on caddisfly case-building, *"Sticky. Stretchy. Waterproof. The Amazing Underwater Tape of the Caddisfly"* , done for KQED's *Deep Look*, and help her unseat the slime mold as the most watched video in the series at https://ww2.kqed.org/science/2016/08/09/sticky-stretchy-waterproof-the-amazing-underwater-tape-of-the-caddisfly/ If you're interested in how these videos are made, there's also a behind the scenes video about the caddisfly episode at https://ww2.kqed.org/science/2016/08/16/behind-the-scenes-with-deep-look-caddisflies/

Following the CABW meeting, the California chapter of Society for Freshwater Science (SFS) held their annual meeting and announced their new President/Chair, Jeanette Howard of The Nature Conservancy and Secretary/Treasurer, John Olson of the Desert Research Institute and Cal State Monterey Bay.

The SFS is an international scientific organization whose purpose is to promote further understanding of freshwater ecosystems (rivers, streams, lakes, reservoirs, and estuaries) and ecosystems at the interface between aquatic and terrestrial habitats (wetlands, bogs, fens, riparian forests and grasslands). The SFS is establishing regional North American and international chapters of the society, and California is the newest regional chapter in the organization.

Please consider becoming a member of the Society for Freshwater Science and the California Chapter of SFS! http://www.freshwater-science.org/About/About-SFS-Membership.cfm

Below are a few highlights of talks that were presented during this year's meeting; an overview and presentations from the 2016 workshop can be found at:

http://www.waterboards.ca.gov/water_issues/programs/swamp/bioassessment/training.shtml#cabw

If you were not able to make it this year, please mark your calendars for Fall 2017 and join us for the 24th annual CABW meeting at UC Davis!!!!

GARCIA RIVER WATERSHED AND MONITORING PROGRAM

Jonathan Warmerdam, North Coast Regional Water Quality Control Board
Jennifer Carah, The Nature Conservancy

Like most watersheds of the North California Coast, the Garcia River in Mendocino County is impaired from excess sediment and elevated water temperatures due to human land-disturbing activities that have been occurring in the watershed during the last two centuries. The legacy of impacts from these activities - land clearing, agriculture, grazing, forest conversion, splash dam logging, industrial logging, road building, gravel mining, and more - are still present today. The populations of several species of native, ocean-run salmon and trout species are greatly diminished.

But the standards for land-use practices have been elevated, legacy impacts are diminishing, and monitoring data provides evidence to support that the health of the watershed is improving. Watershed-wide sediment control efforts, sustainable forest management, and instream habitat restoration are accelerating the path towards recovery. Forests are growing back, erosion scars are healing over, and land-use practices are improving.

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In 2002, the North Coast Regional Water Quality Control Board (Regional Water Board) adopted a new regulatory strategy, termed a Total Maximum Daily Load (TMDL), to address the sediment impairment. The goal of the TMDL was simple: control the remaining sources of erosion across the landscape to accelerate the recovery of the watershed from the legacy impacts of the past. Landowners who own lands totaling approximately 80% of the entire watershed have been implementing erosion control measures to reduce the amount of sediment contribution to the Garcia River and its tributaries. At the same time, environmental groups like The Nature Conservancy, The Conservation Fund, Trout Unlimited, and Mendocino Redwood Company, LLC, have implemented large wood restoration projects on more than 10 miles of fish-bearing streams.

In 2007, The Nature Conservancy and the Regional Water Board initiated a new, watershed-wide monitoring program known as the Garcia River Monitoring Program. The purpose of the monitoring program is to identify the physical, chemical, and biological conditions of the Garcia River watershed and to track the trajectory of its conditions over time. TNC and the Regional Water Board used the U.S. Environmental Protection Agency's (U.S. EPA) Environmental Monitoring and Assessment Program (EMAP-West) and the Surface Water Ambient Monitoring Program (SWAMP) as the basis for the Garcia River Monitoring Program.

The results of the monitoring data, analyzed from 80 monitoring reaches, are showing that the watershed is on a trajectory towards recovery. Although conditions in the Garcia mainstem still need time to recover, the tributaries are improving and in some cases are now meeting the established numeric targets. Most importantly, the watershed's native salmon and trout species continue to return; the Garcia River Monitoring Program will continue to track improvements to their aquatic habitats and distribution over time.

THE EFFECTS OF DROUGHT ON TOTAL DISSOLVED SOLIDS/ CONDUCTIVITY IN STREAMS AND RIVERS

John R. Olson, Desert Research Institute/ Cal State University Monterey Bay

Total dissolved solids, measured as specific electrical conductivity (EC), is one of the main chemical properties that influences the distributions of aquatic organisms. Previous models have predicted spatial variation in EC across the US, but the recent availability of monthly climate data from models and satellites (i.e., PRISM and MODIS) allow us to model EC variation in both space and time. As part of a larger project funded by the EPA to investigate the effects of drought on aquatic macroinvertebrates, I developed models predicting how EC varies temporally and spatially at monthly time intervals between 2001 and 2016 across the contiguous US. I first associated all available EC observations made over the modeling period from Storet and NWIS databases with their specific NHD+ stream segment.

These observations were then paired with watershed level summaries of human disturbance for each stream segment produced as part of the USEPA's StreamCat Dataset (Hill et al. 2015) and selected sites with minimal human disturbance. This yielded 12,780 EC observations made at 1,857 sites, ~5% of which were withheld for model validation. I created a Random Forest model (a non-parametric, machine learning technique) relating the EC observations to watershed summaries of environmental predictors (e.g., geology, soils, and climate from the StreamCat dataset). Using the StreamCat technique, I also calculated monthly watershed summaries of maximum and mean temperature, precipitation, and evapotranspiration, which were then related to monthly observations.

The resulting models explained 89% of the variation in the training data (Fig. 1, black circles, validation R2 = 92% shown in red circles), with a root mean squared error of 73 µS/cm (validation RMSE = 122 µS/cm). These models predict changes in EC over time, as shown in Fig. 2 comparing monthly observations and predictions for a USGS gage on the Sisquoc River. Predictions can be made in both time and space, so EC conditions can be compared between wet years (i.e., 2005) and dry years (i.e., 2015) as shown in Fig. 3.

Predicted EC can be used as a general surrogate for water quality conditions and can provide insight into the ability of a site to support certain invertebrate taxa. As such, it can be used as a screening tool in biomonitoring programs and to support preliminary causal assessments in streams with altered biological communities.

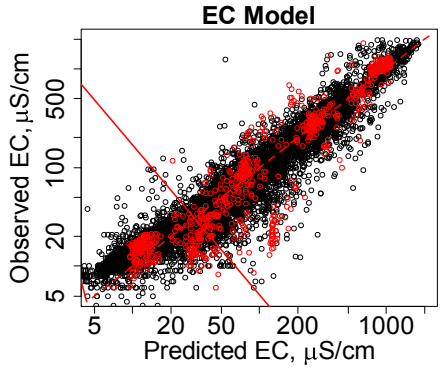

Fig. 1

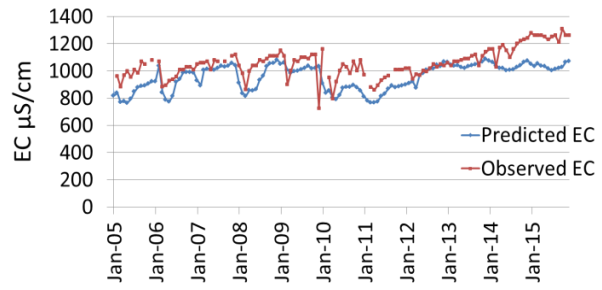

Fig. 2

USGS Gage 11138500

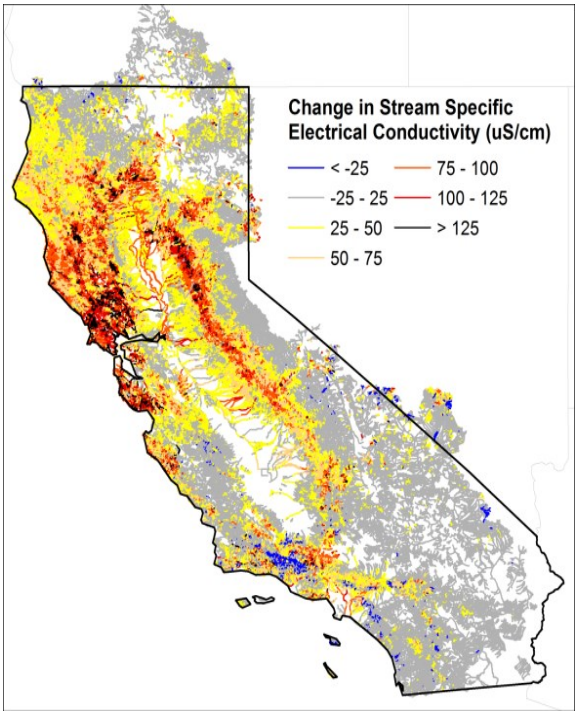

Fig. 3