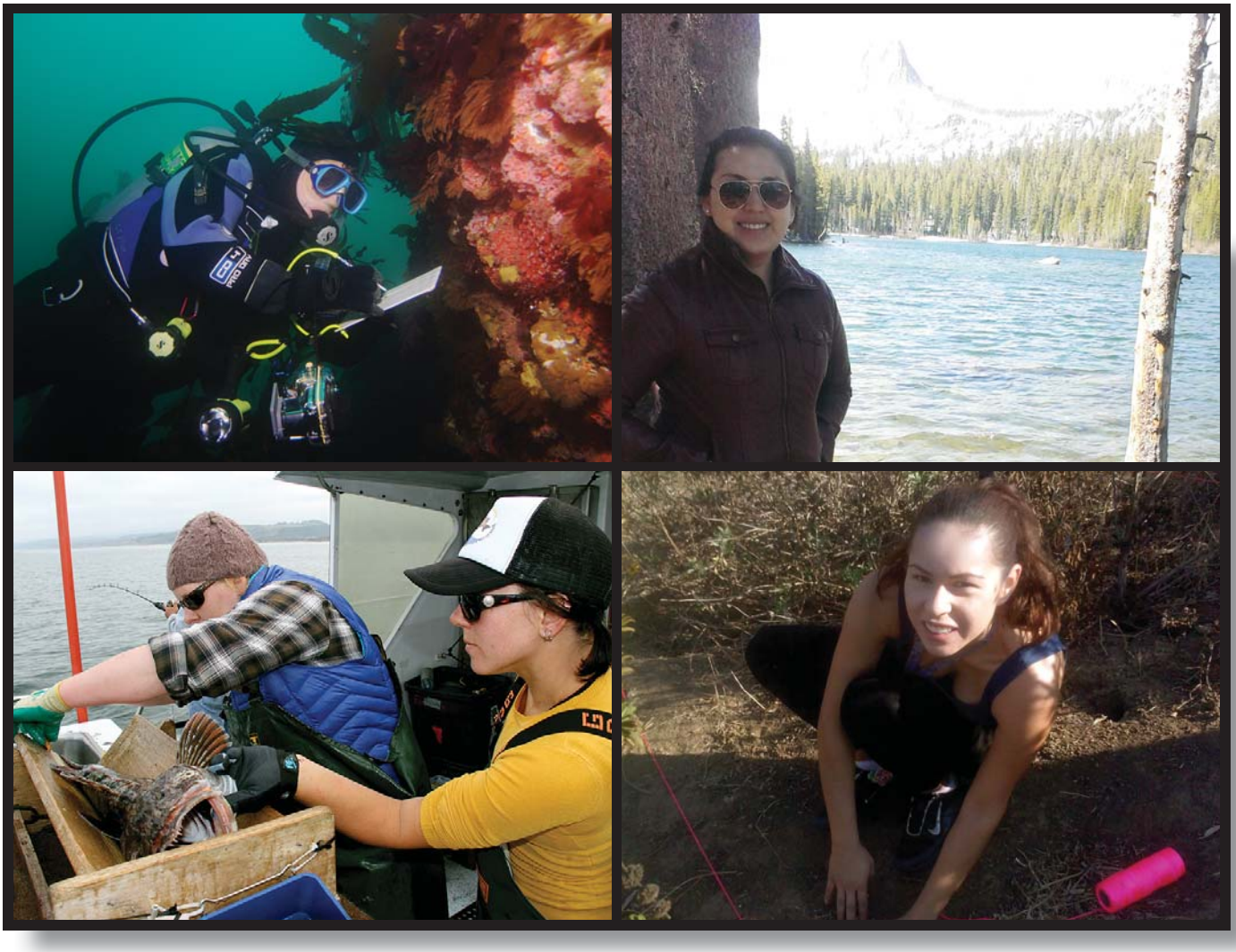
CSU The California State University



CSU COAST-WRPI

Student-Faculty Research Poster Reception

March 24, 2015 • Long Beach, CA

Book of Abstracts

WRPI

Welcome!

On behalf of the CSU Council on Ocean Affairs, Science & Technology (COAST) and the Water Resources and Policy Initiatives (WRPI), we are pleased to welcome you to the fourth annual Student-Faculty Research Poster Reception at the Chancellor's Office. Student researchers and their faculty mentors from each of the 23 CSU campuses and the marine consortia are on hand to highlight the excellent and timely research conducted throughout the system. COAST and WRPI are proud to present a suite of projects representing efforts to develop solutions to the complex water and coastal zone challenges we currently face. Each project also demonstrates the commitment of CSU faculty members and students to education and learning while advancing our knowledge of California's natural resources, reinforcing the value of the basic scientific process, and achieving excellence.

Thank you for joining us today, and enjoy!

Krista Kamer, Ph.D.
Director
COAST

Boykin Witherspoon III
Executive Director
WRPI

Council on Ocean Affairs, Science & Technology
100 Campus Center
Seaside, CA 93955
415-518-2161
http://www.calstate.edu/coast/

Water Resources and Policy Initiatives
5500 University Pkwy
San Bernardino, CA 92407
909-537-7681
http://www.calstate.edu/water/

Table of Contents

Note: * denotes student authors throughout

CSU Bakersfield

Title: **Microcrustacean diversity in ponds of Kern County, CA, that harbor the amphibian pathogen *Batrachochytrium dendrobatidis (Bd)***

Authors: Matthew Lemons*, Jose Orozco*, Esther Ibarra*, and Antje Lauer

Affiliation: Department of Biology

Abstract: *Batrachochytrium dendrobatidis (Bd)* is a fungal pathogen that is responsible for the dramatic decrease in the amphibian populations worldwide during the past few decades, causing chytridiomycosis. Natural predators of *Bd*, among them different species of microcrustaceans and rotifers, might be useful to control the growth and spread of this pathogen in the environment. Several ponds in the Southern San Joaquin Valley and the surrounding hills were investigated in this study for the presence of *Bd* and populations of microcrustaceans. We detected *Bd* at most sites using a RT-PCR method and found that populations of microcrustaceans differed at each site when investigated via microscopy and PCR/DGGE. First *Bd*-feeding experiments using microcrustacean species and *Bd*-zoospores as the only food source were performed in the lab to determine strong *Bd* predatory microeukaryotes which can be important in mitigating amphibian decline due to chytridiomycosis. Results of our ongoing research has indicated that microcrustacean species differ in regard to their efficiency to reduce the amount of zoospores in a medium, and thus differ in regard to being suitable biocontrol agents for *Bd* contamintated waters.

WRPI

CSU Channel Islands

Title: **Monitoring the rocky intertidal zone of the Channel Islands: past, present, and future**

Authors: Julia Dorosh*[1], Ryan Newkirk*[2], Paul Spaur*[2], Alexis Wallengren*[2], and Geoff Dilly[2]

Affiliation: [1]Environmental Science and Resource Management
[2]Department of Biology

Abstract: The rocky intertidal research team at California State University Channel Islands (CSUCI), in conjunction with the National Park Service (NPS) and the Santa Rosa Island Research Station, assess the past, present, and future of intertidal monitoring. Our work involves analyzing historic data from 21 long-term intertidal sites on the Channel Islands starting in the 1980s, revising and updating current monitoring methodology, and adding two new sites on Santa Rosa to be continuously monitored by future CSUCI teams. Using statistical analysis (JMP v11), trends in species distribution and abundance of historic NPS monitoring data are discussed with relation to spatial and temporal shifts. Significant changes are matched to historic National Oceanic and Atmospheric Administration thermal data to identify possible sea surface temperature correlation. Current efforts are also being made to review and update the NPS monitoring protocols for use in two new sites on Santa Rosa Island to ensure statistical rigor moving forward. Finally, we present our progress with student built and modified Remotely Operated Vehicles (ROV) to assess species abundance and diversity in the subtidal zone. This is an area traditionally dangerous and difficult to survey, and if successful, this method could be integrated concurrently with intertidal monitoring.

CSU Chico

Title: **Tsunami wave propagation over underwater obstacles**

Authors: Tucker Hartland*, Ravi Shankar*, and Sergei Fomin

Affiliation: Department of Mathematics and Statistics

Abstract: Seismic sea waves, better known as tsunami waves, have destructively impacted human life, infrastructure and coastal environments for time immemorial. Dynamics of a tsunami wave is greatly affected by sea-floor topography. With funding from the NSF, we modeled the propagation of shallow-water waves over underwater shelves and rectangular obstacles in order to examine the effect of seafloor perturbations on wave-breaking. Using explicit finite difference methods, an accurate numerical algorithm was developed to solve the discontinuous partial differential equations, which model the tsunami wave propagation over underwater obstacles. The numerical solutions were validated by comparison with experimental data and analytical solutions obtained for some particular cases. The developed numerical model is capable of predicting wave profiles, breaking times, and post-breaking bore propagation. The simulations and numerical data are relevant to the engineering of breakwaters to dissipate energy of shallow water waves thereby reducing their destructive potential as well as the generation of ideal waves for recreational surfing. Areas of practical application include coastal defense against tsunami inundation, harbor protection and erosion prevention with submerged breakwaters, and the construction and design of artificial reefs to use for recreational surfing.

CSU Dominguez Hills

Title: **?**

Authors: Jose Martinez

Affiliation: ?

Abstract: ?

CSU East Bay

Title: **Enhancing the restoration of California estuaries by exploring the genetic basis of environmental tolerance in Olympia oysters *(Ostrea lurida)***

Authors: Ashley Maynard*[1], Jillian Bible*[2], Eric Sanford[2], and Tyler Evans[1]

Affiliation: [1]Biological Sciences, CSU East Bay
[2]Bodega Marine Laboratory, UC Davis

Abstract: The Olympia oyster, *Ostrea lurida*, is the only oyster native to the west coast of North America and a foundation species in estuarine habitats. Once abundant, *O. lurida* is now functionally extinct. To restore California's degraded estuary ecosystems, *O. lurida* is being considered for reintroduction. However, the ability of oysters to tolerate climate change may influence the success of restoration. Restoration should use genotypes capable of surviving future conditions, but which *O. lurida* populations will be most tolerant of climate change is uncertain. In San Francisco Bay, climate change will increase the frequency of freshwater flooding events that can cause mass mortality in oyster beds. Tolerance of low salinity was explored in three *O. lurida* populations in and around San Francisco Bay. Oysters from Loch Lomond had significantly higher survival rates during freshwater challenge than Oyster Point or Tomales Bay populations. We are exploring mechanisms of differential salinity tolerance in *O. lurida* using RNA sequencing. Shifts in gene expression following exposure to reduced salinity are being compared among the populations to determine physiological changes that underlie enhanced freshwater tolerance. Changes in allele frequency among oysters surviving freshwater challenge and controls are being identified to understand evolutionary basis of salinity tolerance.

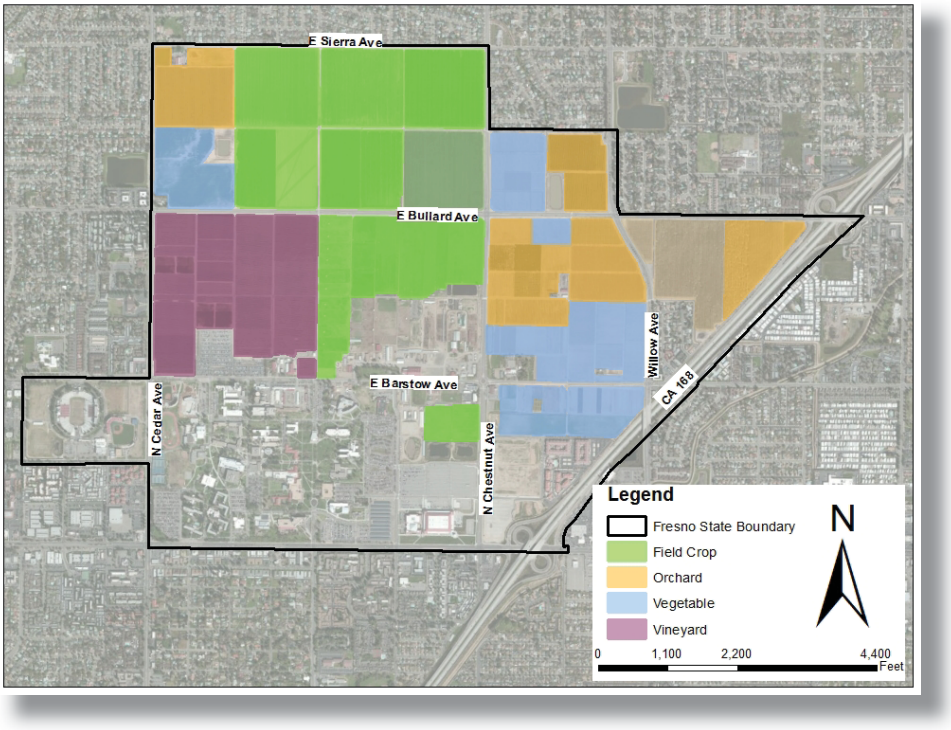
CSU Fresno

Title: **Development of a mass balance model for on-farm drainage management**

Authors: Jurancco Liao* and Fayzul Pasha

Affiliation: Civil and Geomatics Engineering Department

Abstract: A significant amount of land in the Central Valley is cultivated not only for the different types of crops, but also for the animal grazing. For both purposes water and nutrient are the key components. The question that seeks answer is; can the nutrient or the effluent produced from the animal grazing or dairy farm be used as fertilizer for other crops? Just discharging this effluent containing high concentration of nutrient to a stream or a lake can impair the quality of in-stream or lake water, causing severe environmental impacts. Preserving water for sustainable future is not a slogan anymore; it is a burning question for all water users including agricultural communities who are embracing various water resources management practices to preserve the water for sustainable future. On-farm drainage management can be such a practice in which the effluent full of nitrate and other nutrients from rangeland or dairy farm can be used as fertilizer for other crops. This practice not only provides irrigation water but also supplies nitrate and other nutrients to the crops, necessary for their high yields. This measure reduces the environmental wastes to the air and surface water and groundwater. This study calculates the total nutrients available in the effluent from the rangeland including the dairy farm and also the nutrients required for various types of crops at their different stage of lives. A mass balance model is setup to quantify the available and required mass. The mass balance model is capable of quantifying the mass at different points of time and space. Model is applied to the University Agricultural Laboratory (UFL) of California State University, Fresno.



CSU Fullerton

Title: **Evidence of coseismic subsidence along the Newport-Inglewood fault zone during the late holocene**

Authors: Robert Leeper*[1,2], Brady Rhodes[2], Dr. Matthew Kirby[2], Dr. Katherine Scharer[1], Scott Starratt[3], Dr. Eileen Hemphill-Haley[4], Dr. Nicole Bonuso[2], Behnaz Balmaki[5], Dylan Garcia*[2], and D'lissa Creager*[2]

Affiliation: [1]U.S. Geological Survey, Pasadena, CA
[2]Department of Geological Sciences, CSU Fullerton
[3]U.S. Geological Survey, Menlo Park, CA
[4]EHH Consulting Micropaleontology, McKinleyville, CA
[5]Department of Geological Sciences, University of Nevada, Reno

Abstract: The Seal Beach wetlands (SBW) are located along the Newport-Inglewood fault zone (NIFZ). Coseismic subsidence along the fault should cause sudden changes in sediment of the marsh. Based on multiple analyses of sediment cores, we identify four stratigraphic units in the SBW: (1) very fine to fine sand from 426-350 cm; (2) organic-rich mud from 350-225 cm; (3) fine to coarse silt and clay from 225-100 cm; and (4) organic-rich mud with interbedded mud laminae from 100-0 cm. We hypothesize that unit 2 represents a relic marsh surface that subsided coseismically. Fossil diatoms suggest unit 4 is an intertidal deposit, unit 3 is a fresh/slightly brackish water deposit, and unit 2 is an intertidal deposit. Units 2 and 3 are separated by a sharp, irregular contact. These observations are consistent with the marsh subsiding abruptly during an earthquake on the NIFZ. As a result of the earthquake, the intertidal environment abruptly changed to an environment dominated by fresh to slightly brackish water. We suggest that the marsh did not flood by seawater because coseismic uplift of the southwest segment of the NIFZ temporarily isolated the SBW from tidal influence. Radiocarbon dates constrain this event to <1957 cal yr BP.

Humboldt State University

Title: **Computational Fluid Dynamics Models of RO-PRO and FO-RO Hybrid Processes**

Authors: Lori Jones* and Andrea Achilli

Affiliation: Department of Environmental Resources Engineering

Abstract: Reverse osmosis (RO) is the main technology employed in seawater desalination due to its proven effectiveness and relatively low energy consumption compared to thermal desalination. However, RO consumes more energy than alternative technologies used to secure fresh water and discharging the produced brine is also of environmental concern. Osmotically driven membrane processes, combined with RO, can mitigate these issues. One system uses forward osmosis (FO) to dilute seawater with water from an impaired water source, reducing the osmotic pressure (and thus the energy requirement) of the RO feed water (Figure 1a). Another system uses pressure retarded osmosis (PRO), which uses the brine from RO and the impaired water source to recover energy and prepressurize the RO feed water, reducing its energy requirement (Figure 1b). The objectives of the investigation are to compare and minimize the energy consumption of both hybrid systems by maximizing the power density of PRO and water recovery from FO. Computational fluid dynamics (CFD) models of FO and PRO are being developed to evaluate the effects that the module geometry, flow rates, and flow type have on the specific energy of each process. The gross and net specific energy of FO, PRO, and the hybrid systems are modeled and compared.

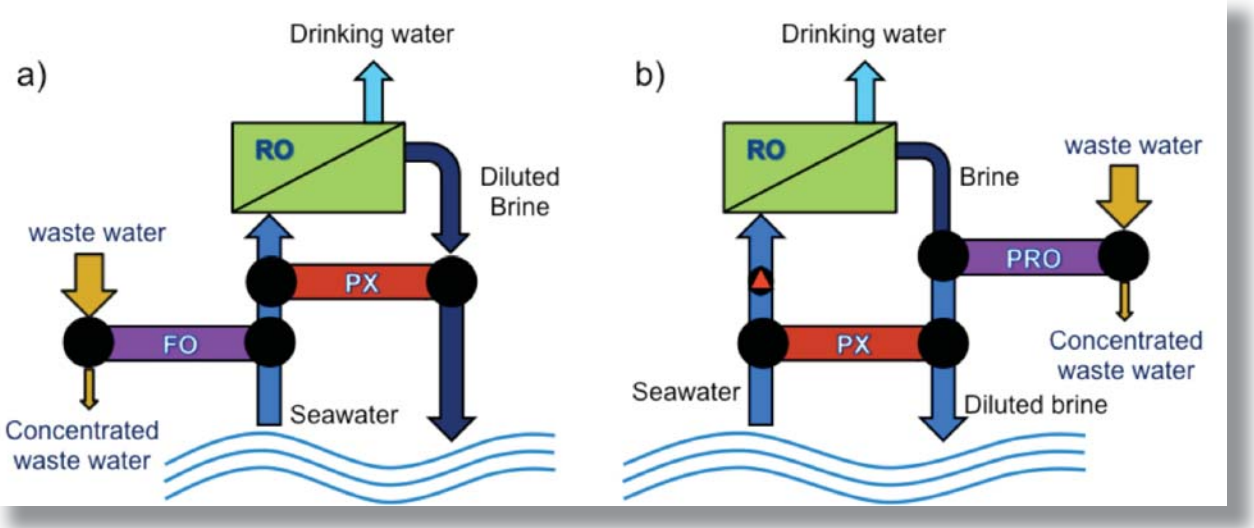


Figure 1: Schematics of the FO-RO hybrid system (a) and the RO-PRO hybrid system (b). In the FO-RO system, seawater is first passed through the FO subsystem where it gets diluted, through the FO membrane, by water from the impaired water source. The diluted seawater is then passed through the RO subsystem where drinking water is produced. A pressure exchanger recovers energy from the pressurized brine produced by RO. The brine produced by RO is at the concentration of seawater, and can be discharged with no further treatment. In the RO-PRO system, seawater is first passed through the RO subsystem where drinking water is produced. The pressurized brine is then passed through the PRO subsystem where it gets diluted, through the PRO membrane, by water from the impaired water source. A pressure exchanger recovers energy from the diluted brine. The diluted brine is at the concentration of seawater, and can be discharged with no further treatment.

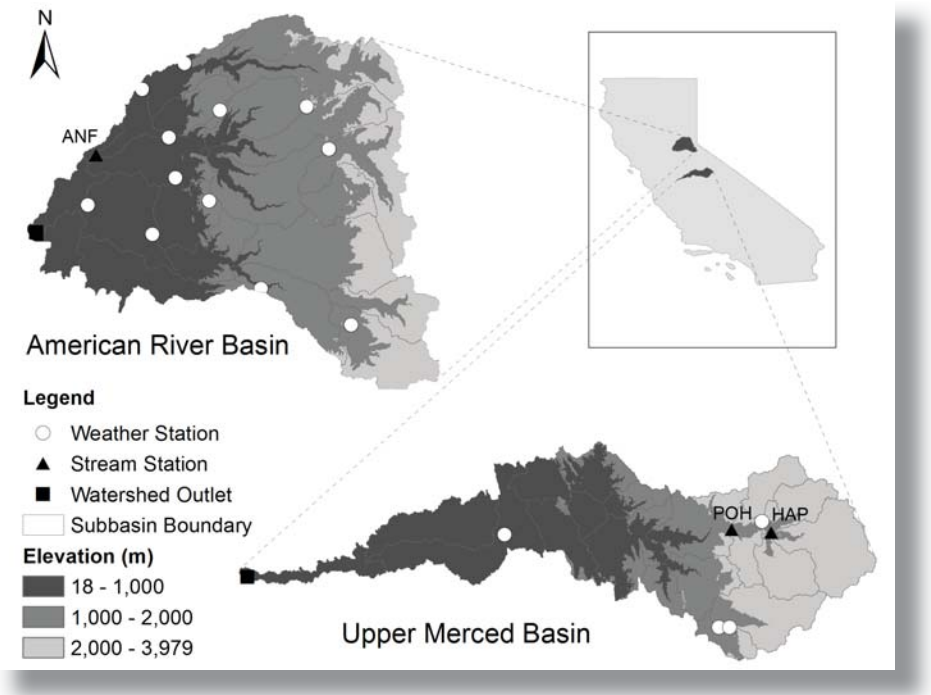
CSU Long Beach

Title: **Modeling potential impacts of climate change on streamflow in two mountainous basins in California**

Authors: Molan Choi*[1] and Rebeka Sultana[2]

Affiliation: [1]Department of Geography
[2]Department of Civil Engineering and Construction Engineering Management

Abstract: American River and Upper Merced basins are two important river basins in the Sierra Nevada mountain range for hydropower generation and irrigation to central valley. The future climate changes of the basins were studied by simulating the watersheds using the Soil and Water Assessment Tool (SWAT) model. Monthly precipitation and temperature data from two downscaled global climate model outputs were used as input in SWAT and the watersheds were studied using RCPs 4.5 and 8.5 future projections for 50 year period (2015-2065). Compared to the baseline (1965-1999), peak discharge in Upper Merced basin is projected to increase by 7% to 57% at the USGS stream gauge site located upstream in the basin. At the basin outlet, peak discharge in July decreases by 15% for RCP 4.5 scenario but increases by 30% for RCP 8.5 scenarios. Winter streamflow increases for both RCPs 4.5 and 8.5 scenarios by 50-125%. At the American River basin, there is no change in projected summer streamflow but 30-68% increase is projected in winter streamflow at the basin outlet. Overall, there will be significant change in temporal distribution of the regions' water resource but high elevated mountain zones are projected to have small change compared to the lower elevated downstream zones of the basins.



Location map of the watersheds with three elevation gradients, weather stations and USGS stream gauges. The Pohono (POH) streamgauge in the Upper Merced basin was used for hydrologic model parameter calibration and validation. Potential changes in streamflow was studied at Pohono (Upper Merced Basin) and American North Fork (American River Basin) stream gauges and watershed outlets.

WRPI

CSU Los Angeles

Title: **Population genomics and signatures of selection in grass rockfish *(Sebastes rastrelliger)***

Authors: Edith Martinez* and Dr. Andres Aguilar

Affiliation: Department of Biological Sciences

Abstract: Traditionally, genetic studies in non-model organisms have used few loci to estimate demographic parameters and infer population structure. New technologies allow for the use of thousands of loci that can also be used to identify candidate regions in the genome that may be under selection. In this study, we examined genetic variation and signatures of selection in grass rockfish *(Sebastes rastrelliger)* using next generation sequencing. A total of 160 individuals collected from eight localities throughout the geographic range were analyzed to estimate genetic diversity within and among sampling locations. Restriction-site associated DNA (RAD) sequencing was used to sample the genome via single nucleotide polymorphisms (SNPs). Thus far, over 12,000 SNPs at >30x coverage have been genotyped in 114 individuals from six locations. Preliminary analyses suggest high gene flow among sampling locations (mean FST ≈ 0). We expect a small proportion of these SNPs (outlier loci) to exhibit significantly increased levels of differentiation among sampling localities. Outlier loci may indicate the presence of adaptive variation, as grass rockfish occur in habitats that vary in environmental conditions (e.g., sea surface temperature). Furthermore, we plan to use these outlier loci to better define stock structure in this species.

California Maritime Academy

Title: **Undergraduate investigation into the environmental and ethical issues involved in the Point Reyes National Seashore v. Drake's Bay Oyster Company controversy**

Authors: Kevin Prochnow*, Michael Aguilar*, Jason Drouyor*, Edie Kwok*, and Robert Neumann

Affiliation: Maritime Policy and Management

Abstract: Supported by funding from COAST, a team of four Cal Maritime undergraduate students examined the issues surrounding the question of lease renewal or termination for Drake's Bay Oyster Company, located within Point Reyes National Seashore. Their findings were presented at the annual meeting of the International Assembly for Collegiate Business Education in San Diego on April 9, 2014, for a business ethics case study competition. Following the guidelines of the competition, the Cal Maritime team examined relevant legal, economic, and environmental aspects of this case. Their presentation discussed conflicting views on environmentalism, the purpose of the national seashore, jurisdiction over estuaries and bottomlands, and the use or misuse of scientific data as evidence. Their determination was that the park service misrepresented data, withheld critical information, and used proxies to disseminate erroneous information in order to influence public opinion. This issue divided the coastal, agricultural, and environmental communities, and has national implications. The legal case (Drakes Bay Oyster Company v. Point Reyes National Seashore) went through several levels of court challenges to the decision made by the Secretary of the Interior Salazar to close the oyster farm, including an appeal to the U.S. Supreme Court.

CSU Monterey Bay

Title: **Effects of ocean acidification on juvenile rockfish *(Sebastes spp.)* gene expression**

Authors: April D. Makukhov*[1], Lauren Tobosa*[1], Dr. Giacomo Bernardi[2], Hamilton W. Fennie*[3], Dr. Scott Hamilton[3], and Dr. Cheryl A. Logan[1]

Affiliation: [1]Department of Science and Environmental Policy, CSU Monterey Bay
[2]Long Marine Laboratory, UC Santa Cruz
[3]Moss Landing Marine Laboratories

Abstract: Despite teleosts' high capacity for acid-base regulation, recent ocean acidification (OA) studies on tropical marine fish have documented negative physiological effects on growth and reproduction. Impacts on temperate fish, however, remain understudied. Our previous work showed that temperate rockfish reared under chronic OA conditions have reduced swimming performance, with juvenile blue rockfish *(Sebastes mystinus)* being more OA-tolerant than juvenile copper rockfish *(S. caurinus)*. To investigate potential underlying mechanisms leading to differences in OA susceptibility, we compared rockfish transcriptomes after chronic exposure to predicted end-of-century pH levels (7.2, 7.5, 7.8, 8.0). We extracted total RNA from white muscle tissue and prepared cDNA libraries for RNA-sequencing. We assembled a copper de novo transcriptome using Trinity, mapped sequences using RSEM, and examined differential gene expression (DE) using edgeR (FDR<0.05). We identified hundreds of significant DE genes among pH treatments for each species, with fewer than 20 genes in common between them, suggesting differential acclimation responses to chronic OA exposure. Our study is the first to use high-throughput sequencing to examine gene expression of OA-tolerant versus susceptible teleosts, providing important information about sublethal changes associated with OA resistance in marine fishes.

CSU Northridge

Title: **The effects of an invasive alga, Sargassum horneri, on kelp forest fishes at Santa Catalina Island, California**

Authors: Sam Ginther* and Mark Steele

Affiliation: Department of Biology

Abstract: Biological invasions cause major ecological damages and losses that total billions of dollars annually. Native to northeastern Asia, *Sargassum horneri* is an alga that was discovered on the western side of Santa Catalina Island in 2006, and within a year spread along the entire leeward coast, forming dense groves in numerous areas. Although having persisted on Catalina for nearly a decade, the effects of this invasive alga on kelp forest communities are not well understood. In our study, we sought to understand the effect of *S. horneri* on fish assemblages at Catalina Island using observational and experimental field studies. Our results indicate that the alga has variable effects on fishes. Abundance of certain cryptic species (*Rhinogobiops nicholsii*) is reduced by the invasive alga, whereas densities of some mobile species (*Paralabrax clathratus* and *Halichoeres semicinctus*) increase where *S. horneri* is abundant. Generally, smaller more mobile individuals benefit from the vertical structure of *S. horneri*, which increases from summer to winter months. High water temperatures in summer and fall of 2014 caused mass declines in the abundance of *Macrocystis pyrifera*, thus providing a unique opportunity to evaluate how replacement of an important native alga by an invasive alga affects fish assemblages.

Cal Poly State University, Pomona

Title: **An evaluation of management strategies to protect rocky intertidal species from the impacts of human activities**

Authors: Benjamin J. Lucas* and Dr. Jayson R. Smith

Affiliation: Department of Biological Sciences

Abstract: In urbanized southern California, marine rocky intertidal habitats are frequented by large numbers of human visitors. Visitor activities, such as collecting, can harm rocky shore flora and fauna, including reducing their abundances, diversity, and shifting the size/age structure of populations. Research characterizing human use of these ecosystems in 1995/96 at 8 sites in Orange County, California, suggested that levels of visitation and collecting were high at some sites, despite being within Marine Protected Areas, and that these behaviors have adversely impacted some organisms. Over the following decade, the Orange County Marine Protected Area Council (OCMPAC), a local conservation collaborative, increased efforts in education, outreach, and enforcement to reduce the harmful activities of visitors. To evaluate the effectiveness of OCMPAC management, we compared human use patterns between 1995/96 and 2013/14. While comparisons reveal an increase in visitation at most sites, the frequency of collecting and fishing, has decreased. Additionally, we compared the size structures of *Lottia gigantea*, an exploited limpet herbivore, over the last two decades. Although variable among sites, patterns of increases in limpet size were detected. Results suggest that OCMPAC management has been effective in reducing the detrimental activities of visitors and, potentially, the recovery of an impacted species.

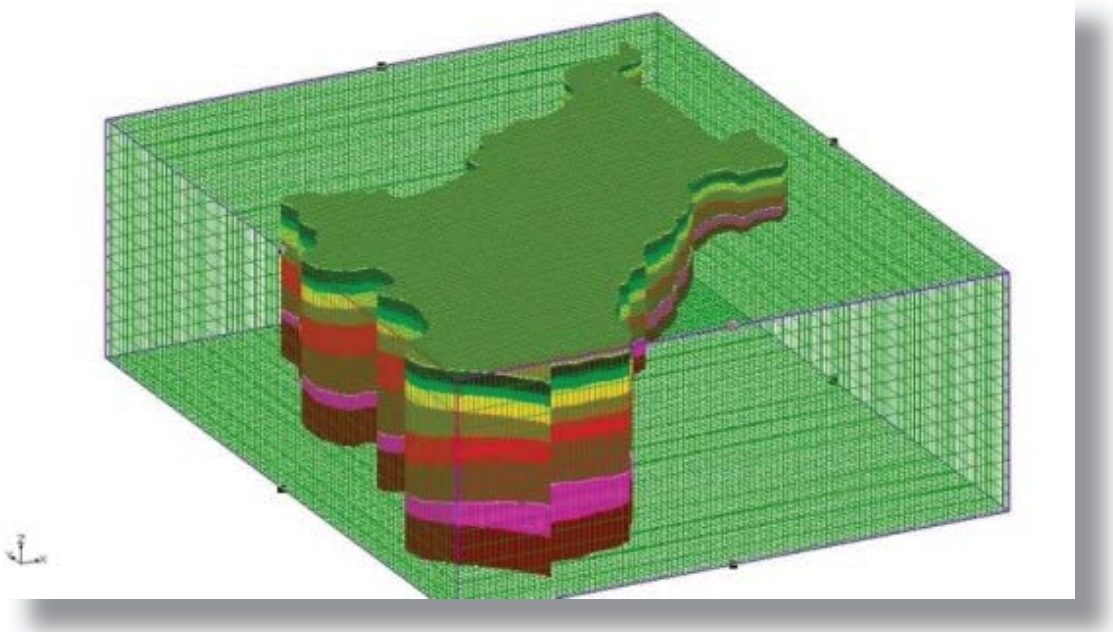
CSU Sacramento

Title: **Feasibility of groundwater banking under various hydrologic conditions in California, USA**

Authors: Samsur Safi*[1] and Saad Merayyan[2]

Affiliation: [1]Assistant Engineer, Sacramento Area Sewer District
[2]Associate Professor, Civil Engineering Department, CSU Sacramento

Abstract: This study evaluates the feasibility of groundwater banking in the Central Basin. The Central Basin is located in Sacramento County in northern California, USA. The study basin is bounded by three rivers (the Sacramento, the American, the Consumes and Mokelumne rivers), and by the Sierra-Nevada mountain range. This study focuses on the potential for groundwater recharge in the Central Basin for three water years (critical, wet, above normal). For that purpose, a 3-D Groundwater Modeling System (GMS) with MODFLOW was created. Three recharge wells were added to the calibrated groundwater model to recharge the water table with 10,000 Acre-Feet (AF) of water to the Central Basin. The banking of 10,000 AF during the critical and wet years, were effective in raising the water table elevation in the cone of depression area without causing any negative impact elsewhere in the basin. According to the findings of the Central Basin model, banking up to 10,000 AF of groundwater during any year type is feasible. More than 10,000 AF of groundwater banking might cause more negative impacts than positive benefits.



After entering all the center blocks (materials and their respective layers, rivers, wells, precipitation recharge, and boundary and initial conditions) of the Central Basin model, the model now has all the components for various simulations. The conceptual approach was then converted into 3-D Grid. This figure shows the 200 x 200 x 14 grid containing the 3-D region of the Central Basin.

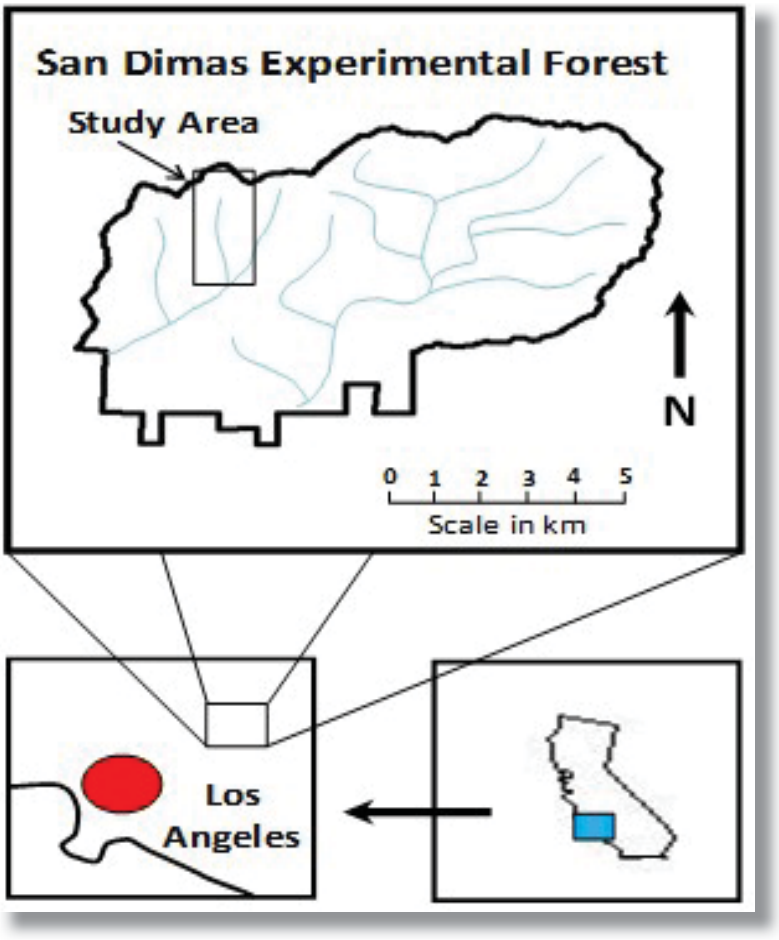
CSU San Bernardino

Title: **Volfe Watershed Rainfall/Runoff in Southern California**

Authors: Sandra Jimenez* and Peter Wohlgemuth

Affiliation: [1]Water Resources Institute, CSU San Bernardio
[2]Pacific South West Research Station, US Forest Service

Abstract: Water is a limiting commodity in arid regions worldwide, including southern California. If more water supplies could be developed locally, less would be needed via expensive water delivery systems. However, supplies are variable annually with unpredictable rainfall. If rainfall/runoff relationships were better understood, perhaps variable supplies could be better estimated. The research performed with Pacific Southwest Research Station enabled for the creation of past and present water stream flow charts, reading from the Volfe Watershed/Runoff accessible to future researchers.



San Diego State University

Title: **Regional productivity predicts individual growth and recruitment of rockfishes**

Authors: Sarah G. Wheeler*[1], Todd W. Anderson[2], Tom W. Bell[3], Steven G. Morgan[4], and James A. Hobbs[5]

Affiliation: [1]Department of Biology, SDSU, and Graduate Group in Ecology
[2]Department of Biology and Coastal and Marine Institute, SDSU
[3]Earth Research Institute, UC Santa Barbara
[4]Bodega Marine Laboratory, UC Davis
[5]Biological and Agricultural Engineering, UC Davis

Abstract: Recruitment of marine fishes is largely determined by biological and environmental factors acting on early-life stages. Overlap of larval production and favorable feeding conditions may drive recruitment for many temperate marine fishes, but challenges associated with studying marine larvae have made it difficult to assess how environmental processes act on individual larvae to affect their growth and survival. In a two-year field study, we assess the influence of regional productivity, temperature, and larval condition in explaining growth in rockfishes (*Sebastes* spp.). We employ a combination of otolith microstructure and satellite imagery to measure initial larval growth and estimate the productivity and temperature experienced by individuals to determine their relative importance in subsequent growth at metamorphosis. To gain insight into the predictive power of remotely sensed data, we compared model performance using indexed environmental conditions scaled over three different regions. Net primary productivity explained the most variation in pre-metamorphic growth relative to temperature and initial growth. This relationship was consistent across spatial regions, although model fit was highest scaled to the south shelf region. Recent settlement, juvenile recruitment, and individual growth were significantly higher in a year when productivity bloomed earlier and individual larvae experienced higher levels of productivity. These results support the hypothesis that large-scale oceanographic processes that stimulate upwelling and secondary production are primary drivers of larval growth and subsequent year-class strength in rockfishes.

San Francisco State University

Title: **Ecohydrology of a restored Sierra Nevada montane meadow**

Authors: Suzanne Maher* and Andrew Oliphant

Affiliation: Department of Geography and Environment

Abstract: Montane meadows are common geomorphological features of the Sierra Nevada. They store, filter and regulate water, and support wetland and riparian plant communities, which in turn provide unique wildlife habitat. Many of these meadows have been degraded by enhanced runoff and gullying, primarily due to historical agricultural and extractive industries. Restoration techniques are being utilized in select meadows to redress the gullying and return the water table to pre-disturbance levels. The objective of this study is to examine the role of restoration practices on the ecohydrology of meadow ecosystems, particularly atmospheric exchanges of water, carbon and energy. The rate and sign of these exchanges were measured using eddy covariance in a restored Sierra Nevada montane meadow during the growing season. Biometric sampling was also conducted both within the measurement footprint and in a degraded meadow for comparison. The restored meadow ecosystem provides a strong sink for atmospheric carbon and source of atmospheric water, and has a high ratio of latent to sensible heat flux. There was also significantly higher soil moisture and organic content, vegetation diversity and density, and above and below-ground biomass in the restored montane meadow as compared to the degraded meadow.

San Jose State University

Title: **Aquatic invasive species: Compliance monitoring of ships' ballast water using a newly developed, rapid assay for adenosine triphosphate (ATP)**

Authors: Jules Kuo* and Nick Welschmeyer

Affiliation: Moss Landing Marine Laboratories, SJSU

Abstract: Commercial ships are now required to treat ballast water to reduce the concentrations of living organisms below regulatory ballast water discharge standards (BWDSs) thus, controlling the spread of aquatic invasive species. Regulatory agencies have voiced a keen interest in the development of rapid methods to address this compliance problem. Here we describe a new assay for adenosine triphosphate (ATP), which serves as a quantitative proxy for living organisms in ballast water. ATP is the universal 'biochemical energy currency' for all living organisms. ATP has been used as an indicator of living microbial biomass for decades since 1) the cellular content of ATP in living cells scales predictably with organism size and 2) the ATP molecule degrades rapidly when organisms die. The method described here introduces a new extraction method for ATP that achieves rapid (20 min), efficient recovery of ATP from plankton without the need for inconvenient mechanical disruption such as heating, grinding, and/or sonication. Our results show a 3-5x increase in estimates of ATP in seawater when compared to existing methods that have been used in oceanography over the last 50 years. The new ATP method was successfully executed during full-scale shipboard treatment tests at the Golden Bear test facility (Cal Maritime Academy, CSU); those results will be discussed.

Cal Poly State University, San Luis Obispo

Title: **Investigating the effects of 4-nonylphenol pollution on California's estuaries: impacts on hormone signaling in the arrow goby *Clevelandia ios***

Authors: Kaitlin M. Johnson* and Sean C. Lema

Affiliation: Department of Biological Sciences, Center for Coastal Marine Sciences

Abstract: Recent evidence indicates that some of California's coastal estuaries are contaminated with 4-nonylphenol (4-NP). The chemical 4-NP is well established as an estrogen-active endocrine disrupting compound, and 4-NP exposure has been shown to alter testicular structure, decrease sperm counts, and cause intersex gonads in fish. In California's estuaries, some of the highest tissue burdens of 4-NP recorded worldwide were found in the benthic intertidal arrow goby (*Clevelandia ios*). We examined the impacts of 4-NP exposure for endocrine and reproductive function in the arrow goby with the dual aims of validating biomarkers indicative of 4-NP exposure and determining the time course of biomarker responses. Adult male arrow gobies were exposed to either ethanol vehicle control, 17β-estradiol [E2] at 50 ng/L (positive control), 4-NP at 5 µg/L (low 4-NP dose), or 4-NP at 50 µg/L (high 4-NP dose), and relative expression levels of estrogen-responsive genes were quantified. Exposure to E2 and high dose 4-NP significantly elevated liver mRNA encoding the egg envelope proteins choriogenin L and choriogenin H, as well as mRNAs for the yolk proteins vitellogenin A and C. These results provide a foundation for assessing whether male gobies in California's estuaries are being feminized by 4-NP pollution.

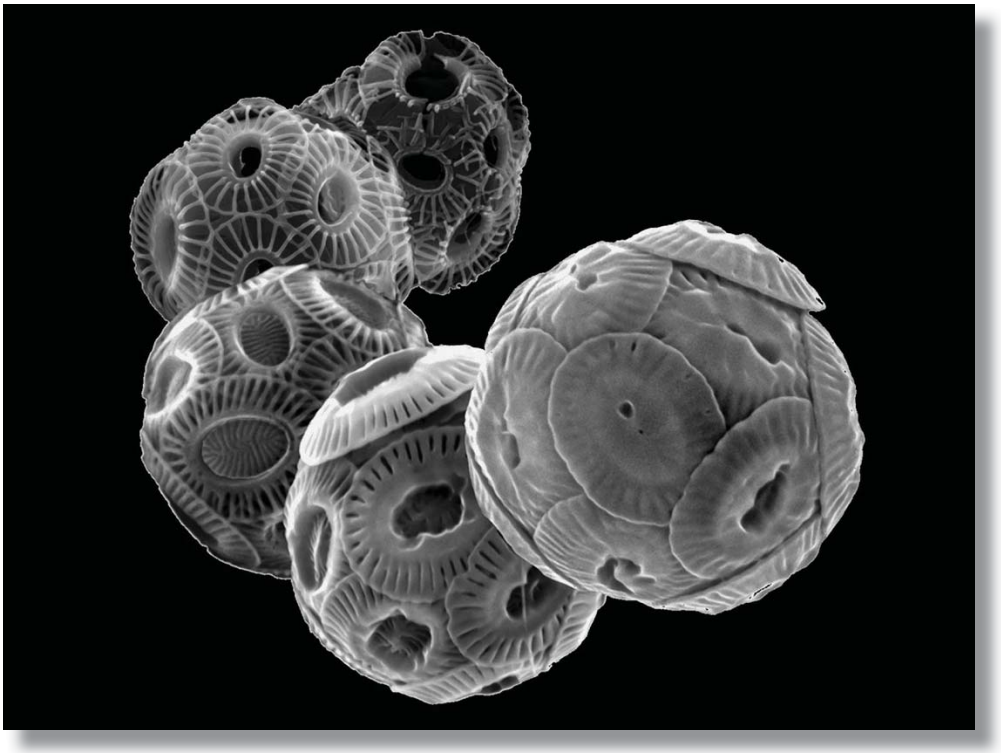
CSU San Marcos

Title: **Dissection alkenone biosysnthesis pathways in *Emiliania huxleyi* using UV-light and EMS mutagenesis**

Authors: Patricia Byrne*, Sarito Murrel-Bastian*, and Betsy Read

Affiliation: Department of Biological Sciences

Abstract: *Emiliania huxleyi (E. huxleyi)* is one of the most prominent coccolithophores. Given favorable conditions, *E. huxleyi* blooms can reach sizes exceeding 100,000km^2 with densities of 10^7 cells per L (Olson & Strom 2002). *E. Huxleyi* stores energy predominately as uniquely structured polyunsaturated long chain (C_{37-39}) alkenes, alkenones and alkenoates (abbreviated as PULCAs). Unlike the stored energy of macroalgae and higher order plants, triacylglycerols (TAGs), PULCAs provide a similar composition to native petroleum crude oils, which offers a more cost effective and higher yielding extraction process. For these reasons *E. huxelyi* has the potential to be an attractive system for algal biofuel. The broad and long-term objective of our research is to elucidate the alkenone biosynthesis pathway in *E. Huxleyi*, using random mutagenesis techniques. We propose to use UV light and methylmethane sulfonate (MMS) to create a mutant population, from which clones unable to synthesize alkenones will be selected. Identifying genes whose specific mutations underlie the loss-of-function phenotype will then reveal genes of interest. Our immediate goal, and the aim of this research was to determine the UV and MMS dose response rates for *E. huxleyi* to ascertain optimal doses defined as a 50% survival rate for each of the two mutagens.



Sonoma State University

Title: **The effect of the Sonoma State University campus and the City of Rohnert Park on the water quality in the Laguna de Santa Rosa**

Authors: Amanda Appel*, Colleen Dailey*, Felix Desperrier*, Pauline Espinoza*, Paul George*, Roman Gomez*, Maya Hoholick*, Kara Kelly*, Christopher March*, Justine Minyard*, Thanh Quach*, Ashleen Rai*, Justin Regester*, Cameron Revere*, Taylor Swain*, Daniel Tehrani*, Byron Williams*, and Jacquelyn Guilford

Affiliation: Department of Environmental Studies and Planning

Abstract: The Laguna de Santa Rosa is the largest freshwater wetlands complex in northern California, and is listed as a wetland of international significance. During urbanization that began in the late 1800s, water quality and biodiversity in the Laguna deteriorated significantly. Despite recent restoration efforts, the Laguna de Santa Rosa is listed as impaired under the Clean Water Act for sediment, nitrogen, phosphorus, temperature, mercury, and dissolved oxygen, making it the most impaired water body on the northern California coast. Sonoma State University (SSU) is working with the Sonoma County Water Agency to identify possible sources of contaminants that are delivered to the Laguna via the Copeland Creek tributary. From September 2014 to February 2015, undergraduate students sampled Copeland Creek water as it left the SSU campus, at downstream sites within the City of Rohnert Park, and at the Laguna downstream of its confluence with Copeland Creek. The water samples were analyzed for temperature, pH, dissolved oxygen, and nutrient levels (i.e. nitrogen and phosphorus). This project is part of WATERS, a collaborative endeavor between the Sonoma County Water Agency and SSU that facilitates interdisciplinary student research projects in watershed management.

CSU Stanislaus

Title: **A comparison of professional and citizen-level biological water quality assessment methodologies**

Authors: Felisha Walls* and Matthew R. Cover

Affiliation: Department of Biological Sciences

Abstract: The Clean Water Act requires that states assess and report water quality conditions on a biennial basis. In California, the Surface Waters Ambient Monitoring Program (SWAMP) uses a standardized, professional-level rapid bioassessment (RBA) method with benthic macroinvertebrates (BMI) to conduct statewide assessments. Many citizen-based watershed groups, however, use simpler and more rapid procedures. The objectives of this study were to determine (1) if a simpler RBA method produced a similar classification of impairment as the more resource-intensive SWAMP method, and (2) if identification of macroinvertebrates in the laboratory improved the accuracy of the field-based RBA method. We performed a modified RBA method at 12 sites on urban streams in the eastern San Francisco Bay Area that had previously been sampled with the SWAMP method, and identified macroinvertebrates in the field (mField) and in the lab (mLab). There was no significant difference in index of biological integrity (IBIs) scores among the three methods. IBI scores were strongly correlated between mField and mLab and moderately correlated between the modified RBA protocols and the SWAMP protocol. The results of this study support the hypothesis that the modified RBA methods produce similar classifications of impairment as the SWAMP method while lowering time and costs of the entire assessment process.

WRPI

Author Index

CSU COAST-WRPI Student-Faculty Research Poster Reception
March 24, 2015

Printed on recycled paper, using sustainable printing practices, by the Chancellor's Office Copy Center