3rd Annual Water Board Data Science Symposium

2018 | #CAWATERDATADIVE

June 20-21, 2018

California Water Boards Data Science Symposium: Adapting in the Face of Disruptive Landscape Change

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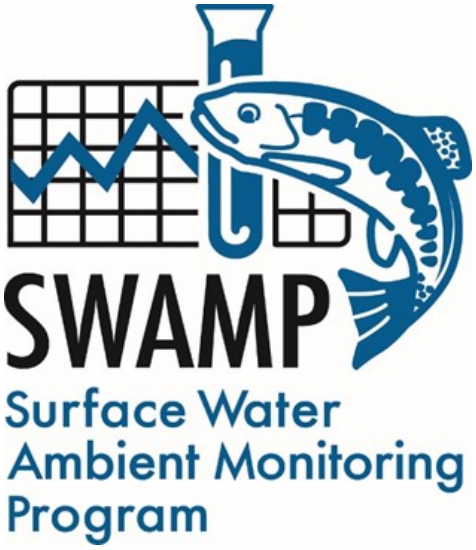
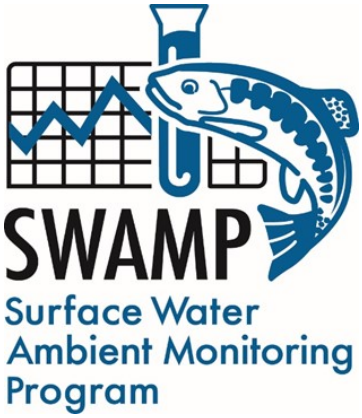


Presentations:



Presentations:

2018 California Water Boards Science Symposium: Adapting in the Face of Disruptive Landscape Change

3rd Annual Science Symposium, June 20-21, 2018
The Ziggurat Building - 707 3rd St. West Sacramento, CA 95605

Day 1- Wednesday, June 20th 2018 (Abstracts and Bios on pages 3 - 12)	
8:00 - 8:30	Registration and Check-In
8:30 - 8:40	Welcome and Logistics
8:40 - 9:10	Keynote Speaker
9:15 - 9:35	Working with Nature Across the Land-Use Spectrum: a Holistic Approach to Ecological Resilience
9:40 - 10:00	Urban Ecology: Designing the Climate-Resilient Cities of the Future
10:00 - 10:20	**Break**
10:20 - 10:40	California's Future – Warmer, Drier and Wetter
10:45 - 11:05	Effects of Climate Uncertainty on the Development and Evaluation of Adaptation Strategies
11:10 - 11:30	Reexamination of Sediment Management in Newport Bay under Accelerating Sea-Level Rise
11:35 – 11:55	Use of Urban Vegetation As Climate Adaptation- Effective, and Low Cost When Done Well
11:55 - 1:10	**Lunch**
1:10 - 1:30	Land Use Change, Fire, Cannabis
1:35 - 1:55	Erosion and Best Management Practices after Forest Fire
2:00 - 2:20	Drinking Water Quality Impacts of Watershed Fires: A Case Study
2:20 - 3:00	**Extended break for Guided Tour of the Innovation Vendors, visiting posters, and networking**
3:00 - 3:40	Panel Discussion: How to address water quality monitoring problems associated with fire?
3:45 - 4:15	Lightning Talks: Short presentations on innovative tech and special studies
4:15 - 4:25	Daily wrap and Adjourn

2018 California Water Boards Science Symposium: Adapting in the Face of Disruptive Landscape Change

3rd Annual Science Symposium, June 20-21, 2018
The Ziggurat Building - 707 3rd St. West Sacramento, CA 95605

Day 2- Thursday, June 21st 2018 (Abstracts and Bios on pages 13 - 19)	
8:00 - 8:30	Registration and Check-In
8:30 - 8:40	Welcome and Logistics
8:40 - 9:00	Monitoring Bioaccumulation in California's Changing Landscapes
9:05 - 9:25	Remote Sensing of Cyanobacteria Abundance: Next Steps in Utilizing Satellite Imagery and Data
9:30 - 9:50	Statewide Contaminant and Toxicity Monitoring Related to Land Use
9:55 - 10:15	From Open Data to Open Indicators
10:15 - 10:35	**Break**
10:35 - 10:55	A Vision for More Effective Use of Biological Data in Water Resource Management
11:00 - 11:20	Prioritizing Management Goals for Stream Biological Integrity Within the Context of Landscape Constraints
11:25 - 11:45	Using an Interactive Dashboard to Communicate Bioassessment Data
11:45 - 1:00	**Lunch**
1:00 - 1:20	eDNA Methods and Application for several State and Federally Listed Aquatic Species
1:25 - 2:25	Panel Discussion: What are the Water Data Needs to Address the Management Decisions Related to Landscape Change?
2:25 - 3:00	**Extended break for visiting vendors, posters, and networking**
3:00 - 3:10	Unveiling of the 2018 Water Quality Status Report
3:15 - 4:00	Data Story and Visualization Panel Discussion
4:05 - 4:15	Symposium Wrap Up and Next Events

Keynote:

As this year's distinguished keynote speaker Dr. Ajami will provide an inspirational overview of the work she and her team has performed to inform water sector decision makers in the West. This will include a fascinating look at how we can use data to update our strategies related to governance, communication, and financing of California's water resource projects.

Dr. Newsha Ajami, Stanford University/San Francisco Bay Regional Water Quality Control Board

Dr. Ajami is the director of Urban Water Policy with Stanford University's Water in the West program. She is a leading expert in sustainable water resource management, water policy, innovation, and financing, and the water-energy-food nexus. Her research throughout the years has been interdisciplinary and impact driven, focusing on the improvement of the science-policy-stakeholder interface by incorporating social and economic measures and effective communication.

Dr. Ajami is also a gubernatorial appointee to the San Francisco Bay Regional Water Quality Control Board. Before joining Stanford, she worked as a senior research associate at the Pacific Institute, and served as a Science and Technology fellow at the California State Senate's Natural Resources and Water Committee where she worked on various water and energy related legislation. She has published many highly-cited peer-reviewed articles, co-authored two books, and contributed opinion pieces to the *New York Times, San Jose Mercury News,* and *Sacramento Bee*. She was the recipient of the 2005 National Science Foundation award for AMS Science and Policy Colloquium and ICSC-World Laboratory Hydrologic Science and Water Resources Fellowship from 2000 to 2003. Dr. Ajami received her Ph.D. in civil and environmental engineering from the UC, Irvine, an M.S. in hydrology and water resources from the University of Arizona, and a B.S. in civil and environmental engineering from Tehran Polytechnic.

PowerPoint Presentation

TOPIC: Historical Ecology

Title: Working with Nature Across the Land-Use Spectrum: a Holistic Approach to Ecological Resilience

Many approaches to ecological restoration and enhancement of ecosystem services focus on particular parts of the landscape – open spaces high in watersheds, urban areas in valleys, waterways or shorelines. This cookie-cutter approach to dividing up large physical and ecological systems is more tractable, but may fail to maximize benefits across the full system. Across the land use gradient from open space high in watersheds, to urbanized and farmed valleys, to the shoreline, nature-based interventions can provide multiple benefits to people and wildlife. This presentation will highlight several novel initiatives across the land-use spectrum that are working toward this holistic approach to restoration of ecological functions and ecosystem services in the San Francisco Bay Area. They stem from a synthesis of the scientific literature on ecological resilience, and they focus on shorelines, creeks, urban areas, working landscapes, and open spaces. While the entire complex equation of how to optimize ecosystem services and ecological functions across the landscape is not yet solvable, these initiatives begin to point toward a path for a new approach to resilience focused on working with nature to benefit from natural processes.

Presenter: Dr. Letitia Grenier, San Francisco Estuary Institute

Letitia Grenier is a Senior Scientist at the San Francisco Estuary Institute, where she co-directs the Resilient Landscapes Program. She was the science lead for the 2015 State of the Estuary Report (a SF Estuary Partnership project) and the 2015 climate change update to the Baylands Ecosystem Habitat Goals (a California Coastal Conservancy project), heading a team of over 200 environmental scientists, managers, and regulators to develop science-based recommendations for restoring and maintaining the health the Bay's tidal wetlands in the face of rising sea levels and other stressors. She is a principal investigator for the Delta Landscapes project, which has completed in-depth analyses on the change in the Delta over time and is now offering science-based guidance on how ecosystem health can be recovered as part of this working landscape. Letitia holds a Ph.D. in Conservation Biology from the University of California at Berkeley and has previously worked on investigating bioaccumulation of contaminants in estuarine food webs, the condition of California’s wetlands, and other ecological questions about San Francisco Bay. Her focus now is to work with partners to conserve California's living resources by developing landscape-scale, collaborative visions and solutions for ecological resilience.

Title: Urban Ecology: Designing the Climate-Resilient Cities of the Future

As we anticipate more extreme conditions in the coming decades, we need to transform our cities into more ecologically resilient systems. Yet the components of resilience—including green infrastructure, urban forestry, native landscaping, and other actions—are generally designed in isolation and for small areas at a time. Based on the recently-developed Landscape Resilience Framework, we are developing multi-benefit urban greening strategies that re-integrate natural ecosystems at the city scale to improve resilience for both people and native wildlife. As one example, through Re-Oaking efforts strategically planted native oaks are establishing drought-tolerant urban shade with high rates of carbon storage and support for native biodiversity. Currently we are developing an urban biodiversity strategy to guide synergistic ecological improvements and site-specific guidance for spatially prioritizing different climate resilience benefits such as runoff reduction, carbon storage, and shade production.

Presenter: Robin Grossinger, San Francisco Estuary Institute

Robin Grossinger is a Program Director and Senior Scientist at the San Francisco Estuary Institute, where he co-directs SFEI's Resilient Landscapes program. Robin leads efforts throughout the state to reintegrate natural processes within our highly modified landscapes, creating healthier and more adaptive neighborhoods, cities, and surrounding landscapes. He advises restoration strategies for San Francisco Bay, the Sacramento-San Joaquin Delta, urban landscapes such as the Google campus, and rivers throughout California. Recently Robin has been involved in the development of SFEI's Urban Biodiversity Framework for enhancing the ecological contributions of urban greening activities.

TOPIC: Climate Change

Title: California's Future – Warmer, Drier, and Wetter

Climate models project higher variability of precipitation in California over the coming decades, both within seasons and across years. Increased wetness, when it occurs, will be due to more frequent, more intense precipitation events. Increased dry days will lead to more dry years, and more dry years will lead to more dry decades. The substantial warming that is projected in virtually all climate model simulations results in diminished spring snow pack, which becomes extremely low during drier years.

Presenter: Dan Cayan, University of California, San Diego

Daniel R. Cayan is a research meteorologist in the Climate Research Division of Scripps Institution of Oceanography, University of California, San Diego. Cayan studies climatic influences on the transfer of heat and moisture between the ocean and atmosphere, and the impacts of atmospheric circulation and precipitation on the surface hydrology over North America. Regionally, Cayan is studying climate variations over the West Coast and in particular over California.

Cayan directs the California Applications Program, a National Atmospheric and Oceanic Administration-sponsored effort to improve climate information for decision makers in the California region, and also directs the Scripps component of California Climate Change Center (CCCC), a

multi-investigator effort sponsored by the California Energy Commission to assess potential climate change effects in California. Cayan is also a researcher with the Water Resources Division of the U.S. Geological Survey.

Title: Effects of Climate Uncertainty on the Development and Evaluation of Adaptation Strategies

The Sacramento-San Joaquin Basins Study was performed to address the effects of 21st century uncertainties in climate and socioeconomic conditions on the management of urban, agricultural and water related resources in the Central Valley and Central Coast regions of California. A system risk and reliability assessment was performed. To address the identified risks, portfolios of a diverse water management actions including demand management, supply augmentation, reuse, desalination, watershed management, storage and conveyance, and adaptive system operations were developed and evaluated to determine their effectiveness in addressing potential risks in seven major water resource management categories. This work explores the effects of climate uncertainty on the effectiveness and tradeoffs between the portfolios and demonstrates how this information may be used in developing and evaluating multi-objective adaptation strategies.

Presenter: Michael Tansey, United States Bureau of Reclamation

Michael Tansey is the Regional Climate Change Coordinator working in the Division of Planning at the Bureau of Reclamation Mid Pacific Regional Office in Sacramento where he has worked as a hydrologist, water resource modeler, planner and research scientist since 2000. His professional experience includes more than 30 years working for government, consulting and academic institutions. He received a BS in Agriculture from Montana State University, MS in Hydrology from New Mexico Tech and PhD in Hydrologic Science from UC Davis. His personal interests include sailing, soccer, photography, and traveling to exotic lands.

Title: Reexamination of Sediment Management in Newport Bay Under Accelerating Sea-Level Rise

Newport Bay is an important economic and ecological resource of Orange County, providing critical estuarine and wetland habitat for over 200 species of birds and generating about $200 million dollars a year in economic impact through tourism. Excess sediment from the watershed historically threatened to bury wetland habitat in the Upper Bay and clog navigational channels in Newport Harbor. However, reduced watershed loads combined with the possibility of accelerating sea level rise raises concern that critical intertidal habitat will convert to subtidal habitat, and points to the need for better understanding of future morphodynamic change under the combined influence of human activity (e.g., dredging, watershed controls) and natural processes (e.g., tide and storm-driven erosion and deposition). Herein we present a hydromorphodynamic model (Delft3D) to simulate the response of Newport Bay to future storms, tidal dynamics, and dredging under sea level rise scenarios. The model is calibrated and validated using time series of bathymetry, water levels and currents, and uncertainties in model predictions are assessed. Additionally, an innovative method to perform computationally-demanding hydromorphodynamic simulations of episodic storm inputs over decadal time scales is developed. Model results point to

the possibility that marsh accretion can be enhanced by altering dredging practices in Newport Bay, thus making the system less vulnerable to inundation by sea level rise.

Presenter: Matthew Brand, University of California Irvine
Matthew Brand is a PhD student at the University of California, Irvine studying environmental engineering. Matthew's work focuses combining sediment transport and morphodynamic modeling in coastal embayments, with a particular focus on how regulatory policy and human interventions play a role in shaping these systems. Matthew received his bachelor's and Master's degrees from the University of Vermont in Environmental Engineering, and is currently in his second year in UCI's PhD program. Matthew is funded through the NOAA Ecological Effects of Sea Level Rise (NOAA-EESLR) project and the National Science Foundation's Graduate Research Fellowship."

Title: Use of Urban Vegetation As Climate Adaptation – Effective, and Low Cost When Done Well
The fact that almost 95% of Californians live in urban areas speaks volumes as to the importance of our state's urban forests. The benefits of these forests run a great breadth of environmental, social, and economic values. Among these are wildlife habitat, water quality, flood reduction, energy conservation, enhanced property values and economic activity, climate change mitigation, and reduced crime. "Urban forestry" is the cultivation and management of native or introduced trees and related vegetation in urban areas for their present and potential contribution to the economic, physiological, sociological, and ecological well-being of urban society. There is a continuum in how we manage urban forests all the way out to very rural forests, including for fire-related issues.

Presenter: John Melvin, CAL FIRE
John Melvin is the Staff Chief for Resource Protection and Improvement for the California Department of Forestry and Fire Protection (CAL FIRE). This position includes oversight of the Urban and Community Forestry, Forest Pest Management and Vegetation Management Programs (which relates to fuels reduction and use of prescribed fire). From 2009 until 2016, John managed the Urban and Community Forestry Program This included program design, budgeting, supervision of program personnel, as well as policy analysis and implementation. Prior to that, he spent 7 years working as a Regional Urban Forester for CAL FIRE (4 years in southern CA, 3 years in northern CA) prior to promoting to manage the program. All CAL FIRE Foresters also participate in the Department's Emergency Response mission.

John graduated from Humboldt State University in 1999 with Bachelor of Science degree with a major in Forestry and a minor in business. He is an International Society of Arboriculture Certified Arborist, a Society of American Foresters Certified Urban Forester, and a State of California Registered Professional Forester. John is also a member of the California Urban Forests Council, the International Society of Arboriculture, and the Society of American Foresters.

TOPIC: Fire and Cannabis

Title: Land Use Change, Fire, and Cannabis

For decades cannabis has played an important role in many California communities, providing income to rural residents and transforming local ecologies. Recent legalization and regulation of cannabis production and consumption in California is an unprecedented change in public policy and may have profound impacts on the environment and communities across the state. At this moment of change there is a need for scholarship on cannabis-producing communities and their relation to the natural environment, including land use change. In this talk Dr. Butsic will describe cannabis expansion across four counties in California, explore the underlying factors which lead to cannabis expansion in these areas, and speculate on the future of cannabis as a driver of land use change in California.

Presenter: Van Butsic, University of California Berkeley

Van Butsic is an Assistant Cooperative Extension Specialist and Adjunct Professor at UC Berkeley in the department of Environmental Science Policy and Management where he conducts research on land system science, fire and forest policy, land use planning, and coupled human and natural systems. He holds a PhD in Forestry and MS in Agricultural and Applied Economics both from the University of Wisconsin - Madison, and a BA in economics from Reed College.

Title: Erosion and Best Management Practices after Forest Fire: How Water Quality Monitoring and Bioassessment Studies Reveal Impacts of the Ponderosa, Rim, and King Fires.

Sierra Pacific Industries (SPI) manages 1.66 million acres of forestlands in California. Since 2000, SPI's Research and Monitoring Program has studied timber operations and fire as they relate to water quality, sedimentation, erosion, aquatic life, and habitat. Research has been facilitated by a growing network of stations collecting continuous water quality and weather data. Twenty-two continuous water quality monitoring stations collect data for 10 parameters. Over 90 weather stations (32 permanent) collect data for 13 critical fire-related parameters pertaining to air, wind, and soil. SPI's monitoring data is supplemented by field and laboratory bioassessment studies focused on algae, benthic macroinvertebrates, and physical habitat assessment. Monitoring and bioassessment data is produced under a formal quality assurance system that is comparable with the Surface Water Ambient Monitoring Program, including data upload to the California Environmental Data Exchange Network.

The Ponderosa (2012), Rim (2013), and King (2014) fires burned a combined >380,000 acres with almost 58,000 of those acres on SPI forestlands. A dataset of over 2 million relevant results has allowed SPI's Research and Monitoring Program to study a variety of aspects of the pre-and post-fire environment. This presentation will discuss pre- and post-fire turbidity, flow, water temperature, and dissolved oxygen results and how they relate to California Stream Condition Index Scores from 2014-2017 bioassessment studies.

The presentation will also address SPI's development and implementation of Best Management

Practices (BMPs) in response to wildfire. For example, ongoing water quality data and hillslope monitoring suggested that contour tilling and salvage logging mitigated fire-related sediment erosion and delivery to streams. BMPs that were implemented post-fire were revised; the new approach began treatment in areas adjacent to streamside buffer zones first, and then treatment was applied outward from the streams. Contour tilling and salvage logging was subsequently adopted by SPI and applied to 9,875 acres following the Ponderosa Fire. These BMPs were also implemented immediately post-fire in the Rim and King Fires."

Presenter: Dr. Cajun James, Sierra Pacific Industries, Forestry Division, Research and Monitoring Program
Since 2000, Dr.Cajun James has worked at Sierra Pacific Industries to establish the Research and Monitoring Department. She develops and directs several large monitoring networks, integrating water quality studies with the largest private weather station and repeater network in the United States. Dr. James' specialties include water quality, benthic macroinvertebrates, land-use related erosion, instream wood recruitment, canopy cover estimation, near stream microclimate studies, watershed analysis, pre-and post-wildfire sedimentation, riparian responses to forest management and wildfire, rare plant surveys, road erosion inventories and modelling, and fire forecasting using the National Fire Weather Danger System.
http://spi-ind.com/research/SPI_Research_and_Monitoring_QAPP.pdf

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Title: Drinking Water Quality Impacts of Watershed Fires: A Case Study
In 2007, the Zaca Fire burned 240,000 acres in the Los Padres National Forest, half of which is within the watershed of the Santa Ynez River. The City of Santa Barbara and several communities in Santa Barbara County rely on the Santa Ynez River for the majority of their drinking water supply. The winter storms following the fire washed massive amounts of ash and debris into the two main reservoirs on the River: Gibraltar Reservoir and Lake Cachuma. This caused a complete change in the quality of the water treated by the City of Santa Barbara's Cater WTP. As a result, the City implemented a comprehensive water quality monitoring program to track the quality of the water from the sources to its distribution system. More recently, last summer's Thomas Fire has already impacted water quality in the watershed. This presentation will include details about the City's monitoring effort and its outcome, and a discussion of how the City is managing deteriorating quality of its drinking water source.

Presenter: Ryan Anderson, Carollo Engineers
Ryan has 15 years of experience as a process design engineer with Carollo Engineers, Inc.. He has designed facilities ranging from small 400 gpm wells up to 600 mgd conventional surface water treatment facilities. His area of professional focus has been conventional surface water treatment with specific focus on helping utilities achieve compliance with the Disinfectant/Disinfection By-Product Rule. He as experience with design of advanced oxidation processes (ozone), enhanced coagulation strategies for TOC removal, disinfection strategies through the use of UV, chlorine, and ozone, as well as design of GAC contactors for TOC removal, chemical feed facilities, solids handling, groundwater treatment. He has been working with the City of Santa Barbara since 2004 and has also been a consultant for several municipalities in Southern California.

Panel Discussion:

How to address water quality monitoring problems associated with fire.

Moderator: Ali Dunn, State Water Resources Control Board

Panelists:

- **Dr. Alex Chow,** Clemson University
- **Van Butsic,** University of California, Berkeley
- **Dr. Cajun James,** Sierra Pacific Industries
- **Ryan Anderson,** Carollo Engineers

Lightning Talks: Short 5-minute talks on specific studies and products.

Title: Rethinking water demand estimates of cannabis cultivation in the North Coast Region of California

To date, evaluations of water demand of cannabis cultivation have been based largely upon scaling up from individual plant use estimates, which have been unable to address factors of water use inefficiency, monthly variation, and the widespread use of stored water. This has led to disagreement about the impacts of cannabis cultivation on California's water resources. This study analyzed water use reporting data from cannabis cultivators in the North Coast who are enrolled for regulatory coverage under the North Coast Regional Water Quality Control Board Cannabis Waste Discharge Regulatory Program.

Presenter: Dr. Christopher Dillis, North Coast Water Quality Control Board

Christopher Dillis is an Environmental Scientist in the Cannabis Division at the North Coast Regional Water Quality Control Board. He received his PhD in Ecology from UC-Davis, as an NSF Graduate Research Fellow, studying the impacts of illegal logging on rainforest health in Indonesia. He served as an environmental consultant while finishing graduate school, specializing in permitting related to the Porter-Cologne Water Quality Control Act. His current research is focused on the impacts of cannabis cultivation to water quality and instream flow. He has worked to enhance the quality and quantity of data collected from cannabis cultivators, in an effort to facilitate research on this relatively understudied industry.

Title: Impacts of a Wildfire on Source Water Quality - A Case Study in 2015 Wragg Fire

Frequency and intensity of wildfires are expected to be increased in California because of the changing climate. As a result, post-fire watershed runoff could deteriorate source water quality. We conducted a two-year field study (2015 – 2016 water year) to examine the impacts of the 2015 Wragg Fire on downstream water quality. The Wragg Fire consumed about 32 km2 of forest-shrub lands and burned nearly 100% of the watershed in Napa and Solano Counties, California. Stream water samples were collected at the outlet of the burned watershed during major rainfall events and compared to streamwater from a nearby non-burned reference watershed.

Presenter: Dr. Alex Chow, Clemson University

Dr. Chow received his BS in Chemistry at UC Berkeley and MS, and PhD in Hydrologic Science at UC Davis. Currently he is an associate professor in the Department of Forestry & Environmental Conservation / Environmental Engineering and Earth Sciences at Clemson University, South Carolina. Dr. Chow's research interest is on the watershed sources of disinfection byproduct (DBP) precursors, including agricultural drainage, wetlands, and forest ecosystems. Currently one of his focus is on the impacts of forest fire on DBP precursors in source water. In the last three years, he has published several articles about the impacts of wildfire on source water quality, including the study on CA Rim Fire and CO Hayman Fire.

Title: Blue Forest Conservation has designed a Forest Resilience Bond, a public-private partnership that enables private capital to finance much-needed forest restoration across the western U.S. By utilizing upfront investor capital and cost-sharing among public and private beneficiaries based on the water, fire, and other benefits created by the restoration activities, the FRB is redefining how society addresses environmental challenges. **PowerPoint Presentation**

Presenter: Dr. Phil Saksa, Blue Forest Conservation
Dr. Saksa works with research groups, conservation finance firms, stakeholders, and land managers to develop innovative approaches to funding and implementing natural resource management, working towards a collective mission is to work towards creating ecologically resilient and sustainable landscapes.

Title: Artificial Intelligence (AI) platform that prevents water wastage, predicts asset failures, and avoids expensive operations/maintenance costs for water treatment plants, water utilities, and irrigation systems by using Deep Learning algorithms to model time-series data coming from internet-connected sensors. **PowerPoint Presentation**

Presenter: Prateek Joshi, Founder Pluto AI
Prateek is the founder of Pluto AI, an operational analytics platform for water treatment plants. As an Artificial Intelligence researcher, a published author of 8 books, and a TEDx speaker, he has been featured on Forbes 30 Under 30, CNBC, TechCrunch, Silicon Valley Business Journal, and many more publications.

Title: Fast, accurate, microfluidics-based water analysis system that enables laboratory-grade, real-time, trace-level chemical analysis for a wide range of compounds from arsenic to organic food contaminants. **PowerPoint Presentation**

Presenter: Mark Peterson, OndaVia
Mark is a serial entrepreneur with broad technical and business experience. He founded a recycling company at thirteen, led programming efforts for environmental compliance software at a start-up during his undergraduate studies, and invented the core technology that would become the foundation for two later start-ups during graduate school. Mark has a PhD in Applied Physics from Stanford University.

Title: Spectral image processing technology that provides growers with easy-to-use data to optimize water and nitrogen application. Deployed in over 170,000 acres in California and Australia**.** Applications to watershed monitoring, regulatory compliance, and many other relevant fields. **PowerPoint Presentation**

Presenter: Anthony Atlas, Ceres Imaging

DAY TWO- Thursday, June 21st 2018

TOPIC: Proactive Water Resource Monitoring

Title: Monitoring Bioaccumulation in California's Changing Landscapes: A 50 Year Vision
Consumption advisories due to contaminants like mercury and PCBs have been issued for hundreds of water bodies across California. Mercury is the most severe and widespread problem, one that traces back to the massive historical landscape change triggered by the Gold Rush. Mercury, PCBs, and a long list of other emerging contaminants is monitored across the state by the State Water Board's Surface Water Monitoring Program (SWAMP) and other programs to track trends and to assess whether any additional contaminants are rising to a level of significant concern. Rising temperatures; increased fires, droughts, and floods; urbanization and urban greening; changes in agriculture; and other landscape changes in the next 50 years and beyond will all have an impact on bioaccumulation in California water bodies. This presentation will outline the elements of the bioaccumulation monitoring that will be needed to track progress in addressing existing problems and to prevent the creation of new ones.

Presenter: Jay Davis, San Francisco Estuary Institute
Dr. Davis grew up near the PCB-contaminated aquatic food web of Lake Michigan. He has worked on contaminant issues in San Francisco Bay since 1986. He received his Ph.D. in Ecology at the University of California, Davis in 1997. Dr. Davis is Lead Scientist of the Regional Monitoring Program for Water Quality in San Francisco Bay, a comprehensive water quality monitoring program. He is also lead scientist for the Bioaccumulation element of the California State Water Resource Control Board's Surface Water Ambient Monitoring Program, which conducts statewide surveys of contaminants in aquatic food webs. Dr. Davis is also the co-Director of SFEI's Clean Water Program. His primary research interest is monitoring the accumulation of persistent contaminants in aquatic food webs of the Bay, its watershed, and aquatic ecosystems in California.

Title: Remote Sensing of Cyanobacteria Abundance: Next Steps in Utilizing Satellite Imagery and Data
Remote sensing of cyanobacteria abundance in large water bodies using satellite imagery is a valuable tool for understanding the spatial and temporal patterns of harmful algal blooms (HABs). Satellite data also provides near-real time screening tool for nuisance blooms of cyanobacteria that may be dominated by toxin-producing cyanobacteria, providing managers the tools to initiate field monitoring to assess risk and protect human, animal, and wildlife health. Additionally, satellite data can be a valuable resource to water and land managers for understanding inter-relationships between environmental conditions driving HABs, including land use and hydrologic alteration, nutrient loading, and associated impacts to protected species, drinking water resources, and waterbody impairments. This presentation will outline satellite data collected in California to date and highlight how other programs can integrate this remote sensing data to improve understanding of the drivers and implications of HABs on other resource management issues.

Presenter: Randy Turner, San Francisco Estuary Institute - Aquatic Science Center
Randy Turner is an Associate Environmental Scientist for the San Francisco Estuary Institute and admittedly, a life-long fish-head. He received his Master's in Environmental Science and Management at UC Santa Barbara's Bren School and has worked for more than a decade on fisheries and water quality monitoring projects on the Klamath River and many Northern California coastal streams. For the San Francisco Estuary Institute, Randy has two main roles: he is the Principal Investigator for CyanoHAB projects and is the Coordinator of the Klamath Basin Monitoring Program, whose goal is to help stakeholders implement, coordinate, and collaborate on water quality monitoring and research to better inform resource management throughout the Klamath Basin.

Title: Stream Pollution Trends Program (SPoT): Statewide Contaminant and Toxicity Monitoring Related to Land Use
The Stream Pollution Trends Program (SPoT) monitors the health of 100 watersheds statewide through measurements of sediment toxicity and contaminants. The focus of the program is trend monitoring based on land use, particularly developed, agricultural and open lands. Developed land area in California increased by 3.7% between 2001 and 2011, and the net increase in impervious surface was 8.8%. Among the developed land uses, open space decreased, and there were substantial increases in medium and high impact development. Increases in developed land have coincided with decreases in scrub, grasslands and agricultural lands. Since its inception in 2008, SPoT has identified significant increasing trends in current-use pesticides, heavy metals and the PBDE flame retardants in urban areas. Some individual pyrethroid pesticide concentrations are significantly increasing in all three land use areas, whereas individual metals such as copper are only increasing in open areas. Concentrations of legacy contaminants, such as DDT and PCBs are low at SPoT sites, but significantly decreasing trends are not discernable. Trends in toxicity, measured as survival of laboratory test organisms in ambient sediment samples, have been decreasing in open areas, but are stable statewide. The highest incidence and magnitude of toxicity has been associated with urban land use and pyrethroid pesticides. SPoT recently expanded its analyte list to include another urban-use pesticide, fipronil, and has added another test organism for urban monitoring to assess potential impacts of this pesticide. SPoT will continue to adapt to identify trends in emerging contaminants.

Presenter: Bryn Phillips, University of California, Davis
Bryn Phillips has worked at the University of California Davis Granite Canyon Laboratory since 1992. During his career he has managed aspects of a number of large-scale monitoring projects that most recently include the Surface Water Ambient Monitoring Program, and the Stream Pollution Trends Program. Mr. Phillips has conducted a number of research project related to agricultural and urban runoff, as well as research projects funded through agencies such as the California Water Boards, the Department of Pesticide Regulation and various Resource Conservation Districts.

Title: From Open Data to Open Indicators

California is developing open and federated web-based systems for water (and other) data, under AB 1755 and with coordination among state agencies. These data will be critical to understanding ecosystem, economic, and equity aspects of water use, impacts, and sustainability. One of the ways that water data can be used is to populate condition and management indicators useful in decision-making and education. I will describe a web-based system for using California's online water data resources to inform an automated indicator evaluation of California water-bodies. The system automatically retrieves web-accessible data, calculates equivalent indicator scores (based on Tribe and state goals) and provides dynamically updated map and chart-based visualization of results. This Environmental Protection Agency, Exchange Network-sponsored project has been a collaboration between UC Davis and Tribes, with input from California DWR staff and scientists, as well as others in the California Water Quality Monitoring Council.

Presenter: Fraser Shilling, University of California, Davis

Fraser Shilling has spent the last 20 years at UC Davis investigating ways to bring environmental data to bear in management and policy decisions, including the first watershed-based, web-informatics system. He devises systems to collect, analyze and visualize transportation, land, and water-related data to understand how we can become more sustainable.

Title: A Vision for More Effective Use of Biological Data in Water Resource Management

SWAMP's investments in bioassessment infrastructure have given water resource managers a growing suite of tools they can use to reliably quantify the ecological condition of streams and rivers. However, because biological communities respond to natural and anthropogenic disturbances at multiple spatial scales, managers also need tools that will help them interpret patterns in data from individual sites in the context of drivers that occur at larger spatial scales (e.g., habitat and flow alteration, land use patterns, weather and climate patterns). To meet this need, SWAMP's Bioassessment Program has been developing two new types of technical tools: 1) response models that set management targets for stressors (e.g., nutrients, hydromodification, physical habitat alteration) that will protect biological integrity and 2) landscape and spatial network models that provide context and encourage practitioners to look beyond reaches and consider patterns in condition occurring across larger regions. This context will help water resource agencies apply the Water Boards' biointegrity and biostimulatory policies more effectively and ultimately lead to more effective conservation and restoration decisions.

Presenter: Peter Ode, California Department of Fish and Wildlife

Peter Ode, laboratory program supervisor with the California Department of Fish and Wildlife's Office of Spill Prevention and Response, received a Ph.D. in Entomology from Cornell University, specializing in stream insect ecology. Pete has been a scientist at the DFW Aquatic Bioassessment Laboratory since he came to California in 1995. Since 2005, he has also served as the lead scientist for the State Water Resources Control Board's SWAMP Bioassessment Program. He was also a co-lead of the state's technical team charged with developing the scientific foundation for California's statewide biological water quality standards (bio-objectives). Pete's

primary research interests focus on developing and enhancing the technical foundation for using ecological indicators as the primary measures of stream health in California's various water resource agencies.

Presenter: Raphael Mazor, Southern California Coastal Water Research Project
Raphael Mazor received a doctorate in Environmental Science, Policy, and Management from the University of California at Berkeley, and has worked at SCCWRP since 2006. He is a recognized leader in the field of bioassessment, organizing international conferences on the subject for the Society for Freshwater Science, and serving as a founding officer of their California chapter. As the coordinator of the southern California stream survey of the Stormwater Monitoring Coalition, he oversees the sampling efforts of several stormwater and regulatory agencies in one of the nation's most comprehensive stream assessment programs. He is a recognized leader in the assessment of intermittent rivers, having organized several international workshops and authored a forthcoming book chapter on the topic.

Title: Prioritizing Management Goals for Stream Biological Integrity Within the Context of Landscape Constraints
Many streams are failing to achieve desired biological condition and require management decisions to restore designated uses. Some management goals may be impractical with limited resources, particularly in streams where large-scale changes on the landscape (e.g., urbanization) impose constraints on the upper limit of biological integrity. A statewide landscape model was developed that sets reasonable expectations for observed conditions within landscape constraints to prioritize management actions. The model provides a context for what is likely to be achieved at a given site independent of an actual bioassessment score. With this approach, sites can be ranked as over- or under-scoring relative to an expectation that is typical for the observed level of landscape alteration. We developed a visualization tool to compare observed bioassessment scores with modelled expectations to rapidly identify reaches that were scoring better or worse than expected. Using this tool, a group of regulators, dischargers, stormwater agencies, and environmental advocates from the San Gabriel River watershed (Los Angeles County, California) identified regions in the watershed with consistent patterns in bioassessment scores relative to expectations. Based on these patterns, they prioritized different management actions for each region. Sites in both developed and undeveloped areas that scored below expectations were prioritized for restoration; in contrast, restoration was not a priority at developed sites where scores were low but within expected ranges. Sites scoring better than expected were prioritized for enhanced protection, as well as additional monitoring. Interactive tools that connect landscape models with observed data can help set management goals appropriate for stakeholder needs and likely constraints on biological integrity. These tools can easily be applied to other locations where biological data are used to assess environmental condition.

Presenter: Marcus W. Beck, Southern California Coastal Water Research Project
Marcus is an ecologist in the Biology Department at the Southern California Coastal Water Research Project. He has experience in the development and application of open source programming tools for the analysis of water quality and bioassessment data. He received his Ph.D.

and M.S. in conservation biology from the University of Minnesota, and his B.S. in zoology from the University of Florida. Prior to working with SCCWRP, he spent four years as a post-doc in the USEPA Office of Research and Development exploring time series methods for analyzing coastal water quality.

Title: Using an Interactive Dashboard to Communicate Bioassessment Data

My presentation will focus on how I use an interactive dashboard as a data visualization to summarize and display bioassessment data from SWAMP's two statewide monitoring programs. The goal of the interactive dashboard is to help communicate monitoring results to managers at the regional board and state board levels. The Perennial Streams Assessment (PSA) uses a statewide statistical survey design to determine the status of streams based on biology. PSA sites were classified into four categories based on land use/land cover in the local and full upstream watershed: urban, agricultural, forest, other. The Reference Condition Monitoring Program (RCMP) targets streams with minimal human disturbance. Reference sites set the benchmark for biological conditions expected when human activity in the landscape is absent or minimal. The data from the PSA and RCMP will be summarized at the regional board level.

Presenter: Calvin Yang, State Water Resources Control Board

Calvin Yang, environmental scientist in the State Water Resources Control Board's Surface Water Ambient Monitoring Program, received a bachelor's of science in biological sciences from California State University, Sacramento. Calvin has worked at the Central Valley Regional Water Quality Control Board and State Water Resources Control Board since 2006. Calvin's main task is to facilitate coordination of statewide and regional bioassessment programs while also calculating California Stream Condition Index scores for benthic macroinvertebrate samples.

Title: eDNA Methods and Application for several State and Federally Listed Aquatic Species

California's aquatic and semi aquatic ecosystems are replete with rare, visually evasive, ESA listed or otherwise protected species that occur at low density, which results in low detection probability using standard field survey methods. In addition, the waterways of California are susceptible to an ever increasing exposure to invasive aquatic species. Perhaps more importantly, low population abundances restrict 'take' under the State and Federal Endangered Species Act, which limits monitoring activities permitted that target or may encounter protected species. At the current rate of climate change, landscape change and bio-invasion, enhanced survey methods with increased sensitivity, lower impacts (risks) and efficient scaling costs are much needed and would dramatically improve monitoring program capabilities to associate species occurrence with relevant habitat attributes. Environmental DNA (eDNA) methods provide a means to address limitations of traditional surveys, because they are 1) cost effective and feasible to deploy over a large survey area 2) unambiguously identify single or multiple target organisms simultaneously and 3) are sensitive, capable of detecting trace amounts of DNA in sampled material. The eDNA approach differs from traditional sampling and monitoring in that a given survey does not capture or directly observe the target organisms themselves, but the biological material those organisms leave in their

environment. This presentation highlights the methodology, application and interpretation of an eDNA survey for several state and federally listed aquatic species.

Presenter: Gregory Schumer, Genidaqs Laboratory at Cramer Fish Sciences
Gregg is the Director of Lab Services for the Genidaqs Laboratory at Cramer Fish Sciences. For the past 8 years Gregg has worked to adapt and transfer the technology of traditional lab based molecular biology techniques for use in the fields of ecology and resource management. This 8-year pursuit has resulted in dozens of eDNA surveys across the Western United States in both aquatic and terrestrial environments, as well as, population genetic studies for some of California's endangered and protected fish species.

Panel Discussion:

What are the water data needs to address the management decisions related to landscape change?

Moderator: Greg Gearheart, State Water Resources Control Board

Panelists:

- **Jonathan Bishop, Chief Deputy Director** , State Water Resources Control Board
- **Dr. Stephen Weisberg, Executive Director** , Southern California Coastal Water Research Project, **PowerPoint Presentation**
- **Dr. Christopher Dillis, Cannabis Division** , North Coast Regional Water Quality Control Board
- **James Smith, Assistant Executive Officer** , San Diego Regional Water Quality Control Board
- **Nicholas Martorano, Director**, California Water Quality Monitoring Council

TOPIC: Unveiling of the 2018 Water Quality Status Report

The Water Quality Status Report is an annual data-driven snapshot of the Water Board's water quality and ecosystem data. This second edition of the report is organized around the watershed from land to sea. Each theme- specific story includes a brief background, a data analysis summary, an overview of management actions, and access to the raw data.

Panel Discussion:

Data Stories and Visualizations of the Water Quality Status Report

Moderator: Nick Martorano, State Water Resources Control Board

Panelists:

- **Marcus W. Beck,** Southern California Coastal Water Research Project
- **Rebecca Nordenholt,** State Water Resources Control Board
- **Calvin Yang,** State Water Resources Control Board
- **Dawit Tadesse,** State Water Resources Control Board
- **Michelle Tang,** State Water Resources Control Board
- **Jay Davis,** San Francisco Estuary Institute
- **Bryn Phillips,** University of California, Davis
- **Stefanie Scott,** State Water Resources Control Board

POSTER PRESENTATIONS

1. **Title:** High mercury levels in streams of previously burned catchments in the first wet season and their recovery in the second wet season in northern California
   Presenter: Dr. Alex Chow, Clemson University

2. **Title:** Tracking and Communicating Shoreline Change with Sea Level Rise and Flooding
   Presenter: Dr. Fraser Shilling, University of California Davis

3. **Title:** Water demand estimates of cannabis cultivation in the North Coast Region of California based on farmer reporting data
   Presenter: Dr. Chris Dillis, North Coast Regional Water Quality Control Board

4. **Title:** Complex pesticide mixtures in Central California Coastal Streams (2017) and their potential effects on aquatic life
   Presenter: Lisa Nowell, United States Geological Survey

5. **Title:** Project tracking to account for effects of restoration and mitigation on landscape conditions
   Presenter: Cristina Grosso, San Francisco Estuary Institute

6. **Title:** Modeling and Monitoring Watersheds: A Vision for Stakeholder Participation in Water Resources Management
   Presenter: Matthew O'Connor, Coast Range Watershed Institute

7. **Title:** Curated and publicly-available database of water and sediment monitoring data for synthetic pyrethroids
   Presenter: Jeff Wirtz, Compliance Services

8. **Title:** Statewide Inland Harmful Algal Blooms (HABs)
   Presenter: Marisa VanDyke, State Water Resources Control Board

9. **Title:** Potential Impacts of Extensive Salt Crust on a Dynamic and Changing Salton Sea
   Presenter: Jeff Geraci, Colorado River Regional Water Quality Control Board

10. **Title:** Influence of Climate Uncertainty on Groundwater Remediation and Restoration
    Presenter: Scott D. Warner, Ramboll U.S. Corporation.

11. **Title:** The New California Water Quality Monitoring Council's California Estuary Portal
    Presenter: Kristopher Jones, California Water Quality Monitoring Council

Posters:


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MONITORING COUNCIL


RAMBOLL

VENDOR EXHIBITS

1. **Description:** Forest Resilience Bond is a public-private partnership that enables private capital to finance much-needed forest restoration across the western U.S.
   Presenter: Dr. Phil Saksa, Blue Forest Conservation

2. **Description:** Artificial Intelligence platform to prevent water wastage, predict asset failures, and avoid expensive operations/maintenance costs for water treatment plants, water utilities, and irrigation systems by using Deep Learning algorithms to model time-series data coming from internet-connected sensors.
   Presenter: Prateek Joshi, Pluto AI

3. **Description:** Microfluidics-based water analysis system that enables laboratory-grade, rapid chemical testing for a wide range of compounds from arsenic to organic food contaminants.
   Presenter: Mark Peterson, OndaVia

4. **Description:** Spectral image processing technology that provides farmers with easy-to-use data to optimize water and nitrogen application. Deployed in over 170,000 acres in California and Australia.
   Presenter: Anthony Atlas, Ceres Imaging

5. **Description:** Proprietary in-field monitors and predictive analytics tool which measure real-time microclimate weather data and plant growth drivers to generate actionable insights on yield, harvest timing, and crop quality.
   Presenter: Ian Bailey, Arable

Vendors:


ARABLE


BLUE FOREST
CONSERVATION


ceres
imaging


OndaVia


pluto


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