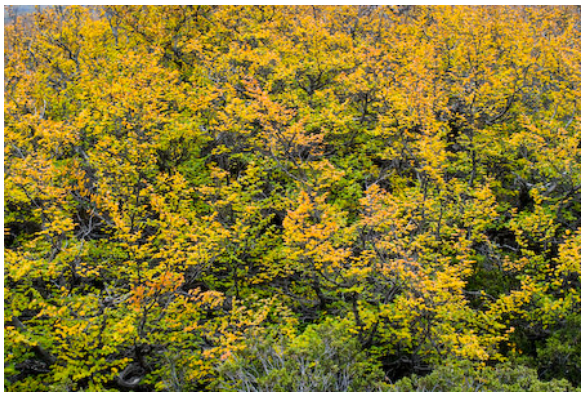
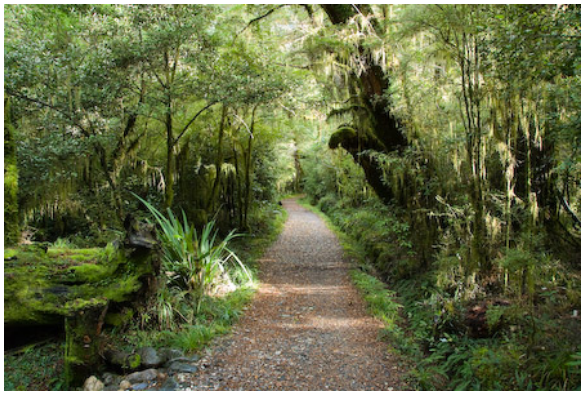
24th Annual Meeting of the Northern California Regional Chapter of the

Society of
Environmental
Toxicology
And
Chemistry

Sustainability:
Research, Tools, and Policy

May 6-7, 2014
University of California, Berkeley
Clark Kerr Campus





Northern California Regional Chapter

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SCHEDULE

24th Annual Meeting of the Northern California Regional Chapter of the Society of Environmental Toxicology and Chemistry

May 6-7, 2014
University of California, Berkeley
Clark Kerr Campus

Tuesday, May 6, 2014
Day One – Short Course

Time	Description	Instructor	Location: Room
8:00-9:00	Registration		Krutch Theatre Entry
9:00-12:00	Causal Analysis/Diagnosis Decision Information System (CADDIS) Part 1	Susan Norton, Ph.D. and Scot Hagerthey , Ph.D. United States Environmental Protection Agency, National Center for Environmental Assessment	Room 102
12:00-13:00	Lunch Break / Registration		Room 102/TBD
13:00-16:30	Causal Analysis/Diagnosis Decision Information System (CADDIS) Part 2	Susan Norton and Scot Hagerthey United States Environmental Protection Agency, National Center for Environmental Assessment	Room 102

- **Box lunches will be provided to short course and meeting attendees each day.**

SCHEDULE

Wednesday, May 7, 2014
Day Two – Conference

Time	Description	Speaker(s)	Location: Room
8:00-12:00	Registration		Krutch Theatre Entry
9:00-9:15	Welcoming Address	Eric Van Genderen, NorCal SETAC President	Krutch Theatre
9:15	Introduction of Plenary Speaker	Eugenia McNaughton, USEPA	Krutch Theatre
9:15-10:15	Plenary Presentation: A Systems Approach to Safer and More Sustainable Chemistry Audience Q&A	Martin Mulvihill, UC Berkeley	Krutch Theatre
10:15-10:30	Coffee Break		Garden Room
10:30-11:30	Panel Discussion - Sustainability Across Sectors: Applying and integrating research tools and policies Audience Q&A	Panel Members: • Tom Sidebottom, FDA • Eric Van Genderen, International Zinc Association • Martin Mulvihill, UC Berkeley Moderator: Michelle Hornberger, USGS	Krutch Theatre
11:30-12:15	Poster Session		Garden Room
12:15-13:15	Box Lunch Pick-up		Krutch Theatre Entry
12:15-13:15	Student -Mentor Lunch	Students, Sustaining Members, Speakers and NorCal SETAC BOD	Garden Room
13:15-14:45	Session 1: Sustainability and Climate Change and Groundwater Protection	Session Chair: David Ostrach	Krutch Theatre
13:15-14:45	Session 2: Aquatic Toxicity and Ecological Risk Assessment	Session Chair: Brad Sample	Room 102
13:15-14:45	Session 3: Integrated Water Quality Monitoring and Assessment	Session Chair: Angie Perez	Room 104
14:45-15:00	**BREAK**		Garden Room
15:00-15:45	**POSTER SESSION**		Garden Room
15:45-16:00	Members Meeting	All	Garden Room
16:00-17:30	Social Reception and Student Awards	All	Garden Room

SCHEDULE

PLATFORM SESSIONS

Sessions 1, 2 and 3 (13:15 – 14:45)

Time	Session 1: Sustainability and Climate Change and Groundwater Protection Chair: David Ostrach Room: Krutch Theatre	Session 2: Aquatic Toxicity and Ecological Risk Assessment Chair: Brad Sample Room: Room 102	Session 3: Integrated Water Quality Monitoring and Assessment Chair: Angie Perez Room: Room 104
13:15-13:35	**Global Sustainability at the Local Scale: An Industry Perspective**. E Van Genderen,	**A multi-year temporal and spatial evaluation of pyrethroid concentrations and biological effects in the lower American River.** SL Clark, A Gantner, RS Ogle, C Harbourt, G Hancock, T Albertson, J Giddings, G Mitchell, A Barefoot, DM Tessier, M Dobbs, and K Henry.	*** Multivariate association between land cover type and discharge of mercury, PCBs, PAHs, and PBDEs in San Francisco Bay Area watersheds.** BK Greenfield, LJ McKee, AN Gilbreath, and JA Hunt.
13:35-13:55	**Effects of elevated CO_2 on the reproduction of a saltwater Cladoceran *Moina monogolica* Daday and their relevant mechanisms.** ZS Wang, CZ Yan, YS Wang, and CD Vulpe,	**Fipronil Water Pollution and Its Sources.** KD Moran	**Measuring the Effectiveness of California's Water Quality Monitoring Council.** K Jones, and J Marshack.
13:55-14:15	**Communicating Climate Change across Disciplines in the Sacramento-San Joaquin Delta.** K Kynett	**Sensitivity of Ecological Soil Screening Levels to Exposure Model Parameterization and Toxicity Reference Values.** BE Sample, A Fairbrother, A Kaiser, and W Adams	**Contaminant Trends in California: A 5-Year Summary of The Stream Pollution Trends (SPoT) Program (2008-2012).** K Siegler, B Phillips, B Anderson, J Voorhees, M Petersen, J Rego, R. Tjeerdema, R Breuer, K Larsen, and D Tadesse.
14:15-14:35	**Assessing the Use of Dry Wells to Reduce Stormwater Runoff While Protecting Groundwater Quality in Urban Watersheds.** C Bowles, M Carr, J Fawcett, V Kretsinger, C Meirovitz, C Nelson, D Wilson, and B Washburn	***The assessment of long-term food web effects following pesticide mixture exposure.** S Hasenbein, SP Lawler, J Geist, and RE Connon.	**Developing a Current Use Agricultural Pesticide Monitoring Strategy for San Francisco Bay.** E Willis-Norton, K Moran, M Sedlak, and R Sutton.
14:35-14:45	**Panel Q & A**	**Panel Q & A**	**Panel Q & A**

"*" indicate student presenters. Student presenters will also be indentified at the beginning of their talks by the Session Chair. Please remember to fill out an evaluation if you view this presentation.

PLENARY SPEAKER

Martin J. Mulvihill, Ph.D., University of California, Berkeley
Executive Director, Berkeley Center for Green Chemistry, http://bcgc.berkeley.edu

"A Systems Approach to Safer and More Sustainable Chemistry"

Marty Mulvihill is committed to meeting the challenges of global sustainability by pioneering interdisciplinary approaches to research and education—and the subsequent integration of this newly expanded understanding in social, political and business practices. Since 2010 Marty has been the Executive Director of the Berkeley Center for Green Chemistry (BCGC) while continuing as a researcher in both Public Health and Environmental Engineering. He received his Ph.D. in 2009 from the University of California, Berkeley in Chemistry and Nanoscience. Subsequently, Marty completed a postdoctoral fellowship at Lawrence Berkeley National Laboratories doing research in the Materials Science and Earth Science Divisions.

ROUND TABLE PANEL

"Sustainability Across Sectors: Applying and integrating research tools and policies"

Panelist 1:
Martin J. Mulvihill, Ph.D.
Executive Director, Berkeley
Center for Green Chemistry, University of California, Berkeley

Panelist 2:
Eric Van Genderen, Ph.D.
Manager of Environment & Sustainability
International Zinc Association

Panelist 3
Thomas Sidebottom, Ph.D
Director, US FDA / ORA
San Francisco Laboratory

Platform Presentation Abstracts

Please note: Abstract titles followed by an "*" indicate student presenters. Student presenters will also be indentified at the beginning of their talks by the Session Chair. Please remember to fill out an evaluation if you view this presentation.

Session 1: Sustainability and Climate Change and Groundwater Protection

Global Sustainability at the Local Scale: An Industry Perspective. E. Van Genderen, San Rafael, CA, International Zinc Association. Sustainability has become a common expression that guides our principles as individuals, choices as consumers, and missions as organizations. Despite a general appreciation for its three pillars – environmental, social, and economic – the incentive for practicing sustainability at all levels is driven by inherent values. However, different individuals, organizations, and communities have different preferences/values that shape their societal preferences. Increasingly the zinc industry is being asked to provide information to downstream users of zinc and zinc containing products on the environmental footprint of the materials it produces. Material specifiers and product engineers in key end use markets, such as building, construction and transportation, are more and more interested in selecting materials that have the best environmental profile while meeting traditional cost, quality and technical performance criteria. Understanding the environmental footprint of zinc starts with documenting the resource requirements and environmental releases associated with upstream metal production operations, but it also involves understanding the impacts and the benefits of using zinc during other stages in the product life cycle. This presentation represents an overview of the numerous sustainable attributes of zinc and its contributions to a sustainable society.

Effects of elevated CO_2 on the reproduction of a saltwater Cladoceran *Moina monogolica* Daday and their relevant mechanisms. Z.S. Wang, Institute of Urban Environment, Chinese Academy of Sciences, Xiamen, China & Department of Nutritional Sciences and Toxicology, University of California, Berkeley, CA; C.Z. Yan, Institute of Urban Environment, Chinese Academy of Sciences, Xiamen, China; Y.S. Wang, South China Sea Institute of Oceanology, Chinese Academy of Sciences, Guangzhou, China; C.D. Vulpe, Department of Nutritional Sciences and Toxicology, University of California, Berkeley, CA. The ocean is facing rapid changes in seawater carbonate chemistry due to the uptake of atmospheric CO_2. The purpose of current study was to quantify the effects of different seawater pH levels on the reproduction of *M. monogolica*, an important saltwater Cladoceran. Results indicated that various reproductive endpoints were affected at high CO_2 exposure. In order to explore relevant mechanisms, variations of ATPase, Antioxidants, CYCP, HSP series enzymes were determined. These widespread changes in enzymatic patterns emphasize the need to expand future studies including a wider spectrum of molecular biomarkers occurred before impacts on calcification. In conclusion, reproductive responses were sensitive to elevated seawater CO_2. However, long-term exposures integrating CO_2 exposure with climate stressors of warming are needed to evaluate overall impacts of environmental changes predicted to occur to *M. monogolica*. (The authors gratefully acknowledge the supports of Grants LTO1203 from State Key Laboratory of Tropical Oceanography, South China Sea Institute of Oceanology and Grants 201210 from the Key Laboratory for Ecological Environment in Coastal Areas, State Oceanic Administration).

Communicating Climate Change across Disciplines in the Sacramento-San Joaquin Delta. K.Kynett, Sacramento-San Joaquin Delta Conservancy, CA.Effective communication to leverage resources is key to addressing the challenges of climate change. Climate change is expected to increase the frequency and intensity of extreme events in California. The Sacramento-San Joaquin Delta (Delta) is arguably ground zero for impacts to California. The Delta supplies over two-thirds of Californians with water, supports a multi-billion dollar agricultural industry and is an ecological hot spot for North America. Climate change impacts are expected to exacerbate the impacts of existing stressors in the Delta and magnify the challenges of managing this natural resource. To address these challenges, state agencies and scientists are taking actions now and are planning for the future. Arobust understanding of the state of the science, as well as uncertainties is necessary for planning and adapting to and mitigating for climate change . The Sacramento-San Joaquin Delta Conservancy's (Conservancy) Climate Change Policy provides guidance on taking

meaningful action in the face of uncertainty. In February 2014, The Conservancy led a workshop focused on the potential impacts to the Delta and the state of the science. Presentations by experts on ecological and agricultural impacts; changing flood risk associated with levees, subsidence and sea level rise; impacts to infrastructure; and impacts to commercial fisheries revealed that there is a need to better communicate across disciplines to leverage resources for addressing the impacts of climate change. This workshop provided a bridge between the science and the human element regarding the impacts on day-to-day life and livelihood.

Assessing the Use of Dry Wells to Reduce Stormwater Runoff While Protecting Groundwater Quality in Urban Watersheds. C. Bowles & M. Carr (cbec, West Sacramento CA), J. Fawcett, V. Kretsinger & C. Meirovitz (Ludhorff Scalmanini, Woodland CA), C. Nelson & D. Wilson (Elk Grove CA), and B. Washburn (OEHHA, Sacramento CA). The risks of using dry wells to capture stormwater runoff and recharge the aquifer will be evaluated. There is great interest, especially in light of the drought, in exploring ways to manage stormwater for aquifer recharge. This can be challenging in areas with clay soils. Dry wells provide one solution, by circumventing the clay layers and facilitating recharge. However, in California, dry wells are used infrequently due to the concerns that by bypassing the natural treatment provided by the uppermost soil units, they could act as a conduit for pollutants to reach groundwater. Studies suggest that the use of dry wells introduces few, if any, contaminants to the groundwater. This project, designed to fill data gaps, will evaluate the risk of groundwater contamination by monitoring water collected from two dry wells and associated pre-treatment features and a series of shallow and deep monitoring wells over two years. A wide range of contaminants, including volatile/semi-volatile organics, PAHs, metals, and pesticides will be analyzed in samples collected four times each year. Estimates of recharge capacity will also be assessed. Results should provide information for decision makers on the safety of using dry wells to manage stormwater runoff in California.

Session 2: Aquatic Toxicity and Ecological Risk Assessment

A multi-year temporal and spatial evaluation of pyrethroid concentrations and biological effects in the lower American River. S.L. Clark, A. Gantner, and R.S. Ogle, Pacific EcoRisk, Fairfield, CA, C. Harbourt and G. Hancock, Waterborne Environmental, T. Albertson, Caltest Analytical, CA, MI, J. Giddings, Compliance Services International, WA; G. Mitchell, FMC Agricultural Products, NJ, A. Barefoot and D.M. Tessier, DuPont Crop Protection, DE, M. Dobbs, Bayer CropScience, NC, and K. Henry, Syngenta Crop Protection, LLC, NC. Previous studies of the lower American River reported that grab water samples collected over a 30-km reach contained pyrethroid insecticides at concentrations reported to be toxic to the amphipod *Hyalella azteca*. Beginning in 2011, we initiated a multi-year monitoring study with the goal of providing a robust understanding of how pyrethroid concentrations vary spatially and temporally in the lower American River. Water samples have been collected during 11 rain events and 3 dry events along multiple cross-river transects and analyzed for pyrethroids. The sampling design initially included the collection of water samples from multiple depths, and later transitioned to depth]-integrated sampling. Samples were also collected during special studies, including a boat-drift study between two key stations, a “loitering” study performed at one transect, and a multi-day sampling study. In addition, water samples were collected from multiple events for toxicity testing with laboratory-reared and field-collected *H. azteca*. The results of these studies will be presented and contrasted to the results of the previous studies. In summary, pyrethroid concentrations have been found to be episodic, generally low and highly spatially variable, indicating that caution should be used when drawing general ecological conclusions based on grab sampling from the bank.

Fipronil Water Pollution and Its Sources. K.D. Moran, TDC Environmental, San Mateo, CA. Urban insect control market changes, partly in response to regulatory actions addressing widespread aquatic toxicity from pyrethroid insecticides, are causing professional and non-professional pesticide users to shift to new pesticide chemicals. The first alternative to pyrethroids to gain significant urban market share is fipronil. California fipronil sales nearly tripled from 2003 to 2011. Recent monitoring has revealed the presence of fipronil and its degradates in urban runoff, municipal wastewater treatment plant effluent, and

in both water and sediment in rivers, streams, and estuaries. Measured fipronil and degradate concentrations are reaching—and in some cases exceeding—concentrations known to cause toxicity to sensitive aquatic organisms. In California, fipronil is used for structural pest control and pet treatments; it is not approved for agricultural use. Except in the Coachella Valley, fipronil may not be used on landscaping in California. Based on fipronil use patterns, urban drainage designs, monitoring data, and environmental fate data, the most likely source (outdoor structural pest control) and pathways for fipronil to move into urban runoff are relatively clear. Further exploration is needed to determine the major source (pet treatment or other discharges?) for fipronil flowing into municipal wastewater treatment plants.

Sensitivity of Ecological Soil Screening Levels to Exposure Model Parameterization and Toxicity Reference Values. B.E. Sample, Ecological Risk Inc., Rancho Murieta, CA; A. Fairbrother, Exponent, Bellevue, WA; A. Kaiser, Exponent, Bellevue, WA; W. Adams, Rio Tinto, Lake Point, UT. Ecological soil-screening levels (Eco-SSLs) were developed by the USEPA are conservative soil screening values to be used to eliminate the need for further ecological assessment for a given site. Eco-SSLs for wildlife represent a simplified dietary exposure model solved in terms of soil concentrations to produce exposure equal to a no observed adverse effect toxicity reference value (TRV). Sensitivity analyses were performed for six avian and mammalian model species, and 16 metals/metalloids for which Eco-SSLs have been developed. The relative influence of model parameters was expressed as the absolute value of the range of variation observed in the resulting soil concentration when exposure is equal to the TRV. Rank Analysis of Variance was used to identify parameters with greatest influence on model output. For both birds and mammals, soil ingestion displayed the broadest overall range (variability), although TRVs consistently had the greatest influence on calculated soil concentrations; bioavailability in food was consistently the least influential parameter, although an important site specific variable. Relative importance of parameters differed by trophic group. Soil ingestion ranked second for carnivores and herbivores, but was the fourth for invertivores. Different patterns were exhibited depending upon which parameter, trophic group, and analyte combination was considered.

***The assessment of long-term food web effects following pesticide mixture exposure.** S Hasenbein, University of California, Davis, CA, SP Lawler, University of California, Davis, CA, J Geist, Technische University of Munich, Germany, RE Connon, University of California, Davis, CA. Aquatic communities are often impacted by complex mixtures of pesticides and other contaminants. Mesocosms assessments, that simulate natural conditions, allow for risk-evaluations at community levels. We used outdoor mesocosms to assess the long-term effects of tertiary contaminant mixtures of type I (permethrin) and type II (lambda-cyhalothrin) pyrethroid pesticides, along with an organophosphate (chlorpyrifos) on aquatic invertebrate communities. Subsamples of zooplankton and macroinvertebrates were identified and counted on a weekly basis, to evaluate the effects of pesticide application on the community over a course of six months. Identified functional groups of invertebrates included grazers and the various levels of consumers. Fate of all three pesticides was monitored by determining concentrations in both water and sediment samples. The most sensitive macroinvertebrate was the amphipod *Hyalella azteca*. Its abundance significantly decreased following pesticide application. Cladocera was the most sensitive zooplankton order resulting in decreased abundance at environmentally relevant concentrations, followed by the order of copepods. Pyrethroid insecticides dissipated from the water column within seven days, whereas the organophosphate concentrated over time. Results indicated that communities were significantly affected by pesticide exposure even at environmentally relevant concentrations.

Session 3: Integrated Water Quality Monitoring and Assessment

*** Multivariate association between land cover type and discharge of mercury, PCBs, PAHs, and PBDEs in San Francisco Bay Area watersheds.** B.K. Greenfield, Environmental Health Sciences Department, University of California, Berkeley, CA, L.J. McKee, A.N. Gilbreath, and J.A. Hunt, SFEI, Richmond, CA. The prediction of pollutant discharge from watershed spatial traits is complicated by high correlation among predictor variables. For 22 watersheds surrounding San Francisco Bay, we compared land cover type (e.g., residential, commercial, industrial), impervious surface, and watershed size to water pollutant concentrations. Water concentrations of Hg, methylmercury (MeHg), PCBs, PAHs, PBDEs, and

total organic carbon were measured as the particle normalized concentration averaged from 3 to 7 grab samples collected during storm events in the main stem channel draining each watershed. Principle component analysis described integrated metrics of 17 correlated land cover attributes for 206 Bay Area watersheds (including the 22 sampled watersheds). Three principal components (56% of variation) were explained by imperviousness and urban land cover; area and residential land cover; and industrial land cover, respectively. At least one of the principal components was significantly associated with each of the pollutants (R^2 = 0.26 to 0.75) except MeHg. These results indicated that small urbanized watersheds with high imperviousness had higher concentrations of monitored pollutants. This finding was surprising for mercury, which has historic local sources in mercury mines, draining into large mixed-use watersheds. These results support a conceptual model that watershed-scale historic and current land use intensity affects trace pollutant loading into San Francisco Bay.

Measuring the Effectiveness of California's Water Quality Monitoring Council. K. Jones, California Water Quality Monitoring Council, California Department of Water Resources, West Sacramento, CA, J. Marshack, California Water Quality Monitoring Council, California Environmental Protection Agency, Sacramento, CA. In December 2010, in response to state legislation and a formal agreement between the state's environmental protection and natural resource management agencies, the newly formed California Water Quality Monitoring Council delivered its recommended Comprehensive Monitoring Program Strategy for California. The strategy was mandated to improve the efficiency and effectiveness of the state's water quality and associated ecosystem monitoring, assessment, and reporting through increasing collaboration between a myriad of governmental agencies and non-governmental organizations that currently monitor California waters. The Council's strategy focuses on delivering water quality and ecosystem health information to decision makers and the public through a set of theme-specific internet portals. These portals bring together data and information in a readily understandable manner that directly addresses users' questions. The Council's enabling legislation requires that the Secretaries of California's environmental protection and natural resource management agencies conduct a triennial audit of the effectiveness of the Comprehensive Strategy. The audit will answer fundamental questions such as: Are users satisfied with access to data? Are we better able to answer key management questions? Have these improvements allowed better use of data in management decisions?

Contaminant Trends in California: A 5-Year Summary of The Stream Pollution Trends (SPoT) Program (2008-2012). K. Siegler, UC Davis, Dept. of Environmental Toxicology, Monterey, CA, B. Phillips, UC Davis, Dept. of Environmental Toxicology, Monterey, CA, B. Anderson, UC Davis, Dept. of Environmental Toxicology, Monterey, CA, J. Voorhees, UC Davis, Dept. of Environmental Toxicology, Monterey, CA, M. Petersen, UC Davis, Dept. of Environmental Toxicology, Monterey, CA, J. Rego, UC Davis, Dept. of Environmental Toxicology, Monterey, CA, R. Tjeerdema, UC Davis, Dept. of Environmental Toxicology, Davis, CA, Richard Breuer, California State Water Resources Control Board, Sacramento, CA, Karen Larsen, California State Water Resources Control Board, Sacramento, CA, D. Tadesse, California State Water Resources Control Board, Sacramento, CA. The Stream Pollution Trends (SPoT) monitoring program conducts statewide surveys of stream water quality. As part of the Surface Water Ambient Monitoring Program (SWAMP), SPoT is designed to detect long-term trends in contamination and toxicity in major watersheds of California. Integrative measurements of sediment toxicity and a suite of pesticides, metals, and industrial compounds have been conducted annually since 2008. Consistent sediment toxicity to *Hyalella azteca* was observed between 2008-2012. Concentrations of pyrethroid pesticides significantly increased in urban watersheds and statewide. Bifenthrin was measured in 69% of the samples. Concentrations of organochlorine pesticides and PCBs significantly declined, while PAH, PBDE, and trace metal trends were stable. Principal components analysis regression showed a significant relationship between pyrethroids and toxicity, and toxicity testing conducted at a lower temperature resulted in lower amphipod survival, indicating pyrethroids contributed to the observed toxicity. Baseline data for two emerging contaminants were collected in 2013. Fipronil and the cyanotoxin microcystin were measured in a subset of urban watersheds. Microcystin was detected at 77% of the sites measured. Fipronil results are pending. Continued monitoring of toxicity and contaminants will inform policy makers and establish an understanding of statewide trends.

Developing a Current Use Agricultural Pesticide Monitoring Strategy for San Francisco Bay. E. Willis-Norton, San Francisco Estuary Institute, Richmond CA, K. Moran, TDC Environmental, San Mateo CA, M.Sedlak, San Francisco Estuary Institute, Richmond CA, R. Sutton, San Francisco Estuary Institute, Richmond CA. The Regional Monitoring Program for Water Quality in San Francisco Bay (RMP) has measured current use pesticide (CUP) concentrations in water, sediment, and tissue since 1993. RMP monitoring indicates that fipronil and pyrethroids are of moderate and low concern for Bay aquatic life, respectively. However, not all CUPs have been monitored in the Bay and the potential risks of these contaminants are not fully understood. To address this information gap, a list of CUP monitoring priorities for the Bay was developed. To develop the list, spatially explicit agricultural pesticide application data, for years 2006-2011 and within the Region 2 Water Quality Control Board boundary, were obtained from the California Department of Pesticide Regulation. The risk ratio for the CUPs with the highest use was calculated by dividing total use by the CUPs' lowest aquatic life benchmark. The 20 CUPs with the highest risk ratio are being considered for future screening studies in the Bay. To help inform site selection for these monitoring efforts, applications of the 20 CUPs were mapped. For the majority of the pesticides, use was concentrated in Napa County, in western San Mateo County, and in southern Santa Clara County.

Poster Presentation Abstracts

Please note: Abstract titles followed by an "*" indicate posters by student presenters. Please remember to fill out an evaluation if you view this presentation.

1-Bee-Toxic Pesticides Found in "Bee-Friendly" Plants Sold at Garden Centers Nationwide. T.J. Brown, Pesticide Research Institute, Berkeley, CA, S.E. Kegley, Pesticide Research Institute, Berkeley, CA, L. Archer, Friends of the Earth-US, Berkeley, CA. Populations of honey bees, bumblebees, and other pollinators are declining worldwide, and many concerned citizens have responded by planting "bee-friendly" gardens to provide urban foraging grounds. In this pilot study, we investigated whether bee-attractive nursery plants sold at top retailers in the U.S. contain persistent, systemic neonicotinoid insecticides that have been shown to impair the health and survival of bees and other vulnerable pollinators. The plants included in this study were purchased from major nursery outlets and garden centers in three locations across the country and submitted to an independent accredited analytical laboratory to identify specific neonicotinoids and quantify their concentrations in whole plant material. Neonicotinoid residues were detected in seven out of thirteen samples (54 percent) of commercial nursery plants. In the samples with detections, concentrations ranged from 11 to 1,500 micrograms per kilogram (parts per billion) of plant material. The high percentage of contaminated plants and their neonicotinoid concentrations suggest that this problem is widespread, and that many home gardens have likely become a source of exposure for bees. Here we present the detailed results of our garden plant sampling study in the context of the toxicity of neonicotinoid insecticides to honey bees and wild pollinators.

***2- A Framework for the Toxicological Assessment of Industrial Compounds During The Chemical Design Process.** D.M. Faulkner, University of California, Berkeley, CA, C.M. Genualdi, University of California, Berkeley, CA, C.K. Hill, University of California, Berkeley, CA, L. Rubin, University of California, Berkeley, CA, D.E. Johnson, University of California, Berkeley, CA, C.D. Vulpe, University of California, Berkeley, CA. Integrating hazard assessment into the chemical design process allows chemists to make choices based on toxicological considerations as well as desirable chemical properties, but there is no guidance for conducting assessments quickly or efficiently. We propose a framework for the rapid elucidation of likely chemical hazard traits and prediction of putative toxicological mechanisms. Chemicals of interest are first subjected to computational analysis. The Derek and Meteor suites from Lhassa enable *in silico* toxicity testing and metabolite prediction, respectively, and QSARs will provide additional physicochemical and toxicity data. Once likely hazard traits are identified computationally, targeted assays are run to validate the *in silico* data, while untargeted *in vitro* assays are run in parallel to elucidate any hazard traits that were not identified in the computational testing phase.
To appraise this framework, we are collaborating with chemists who are developing liquid organic hydrogen carriers for use in fuel cells and furans for use as biochemical feedstocks. As the compounds are evaluated, so is the framework for their evaluation, allowing us to refine our strategy. Ultimately, we aim to

develop a rapid, efficient, and scalable approach to hazard assessment to apply to chemicals during the design process, leading to safer industrial products.

3-Filling Data Gaps to Meet the California's Safer Consumer Products Regulation. J. Hedgecock, U. Vedagiri, C. Schwach, and H. Loso, URS- San Francisco and Oakland, CA. There is increasing concern about the release and potential health effects of chemicals that may be commonly used in product manufacture and distributed widely in the environment. California's Safer Consumer Products regulation and Europe's Registration, Evaluation, Authorisation and Restriction of Chemical (REACH) program attempt to regulate the use of such chemicals and promote investigation of safer alternatives. However, adequate information regarding environmental fate and human and ecological toxicity are often lacking for chemical alternatives presenting difficulties in risk evaluation and decision-making. Based on a world-wide review of information sources, an approach for identifying data for fate and transport attributes and for acute and chronic toxicity information for human health and for aquatic ecological receptors (including birds and marine mammals) is described. The methods for evaluation of the quality of data available and identification of data gaps, including the adequacy of the existing database, as well as the impact of these uncertainties on risk estimates and, ultimately decision-making, will be presented.

***4-Genomic responses to PAHs in 2 pollution tolerant populations of *Fundulus heteroclitus*.** J. T. Miller, W. Pilcher, D. Champlin, D. Proestou, D. Nacci and A. Whitehead, University of California-Davis, Department of Environmental Toxicology, Louisiana State University, Department of Biological Science, US Environmental Protection Agency, Office of Research and *Development.* Previous studies have shown that populations of Atlantic Killifish, *Fundulus heteroclitus*, resident to different EPA superfund sites have repeatedly evolved extreme tolerance to dioxin-like contaminants (DLCs). Tolerant populations appear to converge on a common phenotype that is protective from DLC toxicity via suppression of the aryl hydrocarbon receptor (AHR) signaling pathway. Most DLCs share common properties insofar as they act at least in part through the AHR signaling pathway, but also cause unique biological responses. The exact mechanisms of evolved tolerance are unknown, including whether mechanisms of tolerance are common among tolerant populations, especially for populations inhabiting sites that differ in their contaminant profiles. This study measured genome expression profiles in embryos from two pollution tolerant killifish populations that differ widely in site specific contamination profiles; one resident to a site highly contaminated with diverse PCB congeners, and the other with complex PAH mixtures. In addition to coming from habitats that differ in contaminant profiles, these two populations are also drawn from divergent genetic backgrounds which may facilitate different adaptive strategies. In a common laboratory environment, embryos were statically exposed to a wide dose range of B[a]P, the predominant contaminant in the Southern tolerant populations. Gene expression data were compared between tolerant populations, as well as between geographically-paired tolerant and sensitive populations. Results indicate that both tolerant populations share a common repression of the AHR-activated transcriptional response. Nearby sensitive populations, on the other hand, appear to dramatically up regulate genes associated with inflammatory response, wounding, and coagulation at concentrations much lower than those that induce the canonical AHR response. Embryonic genome expression patterns implicate mechanisms of evolved tolerance and their implications for potential vulnerabilities and adaptive values associated with independently evolved-DLC tolerance in killifish.

5- Development and Implementation of Hazard Ranking Tools for Integrated Pest Management. E.K. Morse, S.E. Kegley, and S.J. Adams, Pesticide Research Institute, Berkeley, CA. Currently there are no tools readily available that provide comparative information on the hazards pesticide products pose to human and environmental health. To address this data gap, PRI has developed the PRI Pesticide Product Evaluator, an online, LEED-compliant hazard-ranking tool, as well as pest management bulletins emphasizing low-impact pest control methods. Each product is evaluated using the Hazard Tier ranking system developed by the City of San Francisco, with hazard information on acute and chronic toxicity to humans, wildlife and aquatic life. Water contamination potential and low-toxicity indicators are also provided. PRI overlays expert judgment on pesticide active ingredient data and information from leading international, federal, and state agencies including: IARC, US EPA, NIH, the European Union, CA

OEHHA, and CA DPR. PRI pest management bulletins utilize this information to present the hazards associated with chemical methods of pest control and enable users to make informed pest management decisions for a variety of common household and landscape pests.

6- California Estuary Monitoring Workgroup – Using Web Portals to Improve Scientific Understanding. K. Jones, California Water Quality Monitoring Council, California Department of Water Resources, West Sacramento, CA, J. Marshack, California Water Quality Monitoring Council, California Environmental Protection Agency, Sacramento, CA. The California Water Quality Monitoring Council was mandated to improve the efficiency of California's water quality and associated ecosystem monitoring, assessment, and reporting through increasing collaboration between the numerous governmental agencies and non-governmental organizations that monitor California's waters. Under the guidance of the Monitoring Council, the Estuary Monitoring Workgroup is beginning to answer stakeholder questions with a collaborative toolset that brings together peer-reviewed datasets with tools to help practitioners tell their stories. This process has resulted in the development of the California Estuaries Portal, an interactive website that strives to present information for decision makers and the public on water quality and quantity, living resources, habitat, ecosystem processes, and stewardship for California's estuaries. While there is a current focus on the San Francisco Bay-Delta Estuary, content relating to California's remaining estuaries will be added in future portal updates. The Estuary Monitoring Workgroup will continue efforts to develop the public portal, improve web-based collaboration tools, enhance access to environmental monitoring data, and identify performance measures – ecosystem health indicators with target goals. This collaborative effort involves multiple state and federal government agencies and non-governmental organizations, working toward improved estuarine science, restoration, and protection of beneficial uses of California's water resources.

7- Where Are Our Wetlands and How Are They Doing? K. Jones, California Water Quality Monitoring Council, California Department of Water Resources, West Sacramento, CA, J. Marshack, California Water Quality Monitoring Council, California Environmental Protection Agency, Sacramento, CA. The California Water Quality Monitoring Council recently released a completely redesigned internet portal to connect decision makers and the public with water quality and ecosystem health information. The theme of this new portal is "Are Our Wetland Ecosystems Healthy?" The new portal is accessed from California's "My Water Quality" website (www.MyWaterQuality.ca.gov) under "Are Our Aquatic Ecosystems Healthy?" The new California Wetlands Portal includes interactive graphics, maps and monitoring data that focus on the location, extent and health of the state's wetland resources. Data presented in the portal are housed in another new web-based tool called EcoAtlas (www.ecoatlas.org); EcoAtlas provides an online resource for compiling maps and data about wetlands produced by numerous local, state and federal agencies and non-governmental organizations. This collaborative workgroup facilitates dialogue and coordination among twenty-three state, federal, and local agencies and non-governmental organizations that monitor and assess our state's wetlands. Their new portal provides a way to make the information collected as part of this monitoring investment more readily accessible so that it can inform policies and management decisions. Furthermore, it allows the general public to access information about local and statewide resources that were compiled by public agencies with public resources.

***8- Using fecal samples to characterize the stress response of the chronically lead-exposed California condor (*Gymnogyps californianus*)**. Z.E. Kuspa, M.E. Finkelstein, UC Santa Cruz, Ca, C. Eng, Los Angeles Zoo and Botanical Gardens, Ca, A. Goodnight, Oakland Zoo, Ca, R. Wolstenholme, Pinnacles National Park, Paicines, Ca, D.R. Smith, UC Santa Cruz, Ca. Elevated stress can reduce vertebrate reproduction and survival. Measuring stress hormone metabolites in fecal samples as a proxy for stress in animals is a promising method for understanding effects of toxic substances on wild populations. However, stress hormone metabolism differs widely among species, as does the duration and magnitude of hormone responses to a stressor. Therefore, to determine effects of an environmental contaminant on a wild population, we must first characterize species-specific stress hormone responses and metabolism. California condors (*Gymnogyps californianus*) are critically endangered and chronically lead poisoned. However, effects of lead on the condor stress response have not been determined. Here we present, for the first time, a characterization of the stress hormone metabolites found in California condor fecal and urate

samples, and the rate of degradation of these metabolites at ambient temperature. We also submit the first profile of fecal stress hormone metabolite concentrations in a California condor over 24 hours following an acute stressor (e.g., a routine capture and handling event). Our findings will be used to investigate lead-induced alterations to the condor stress response and potential impacts California condor recovery.

9- Comparison and Ranking of 33 decision-support tools used to screen and prioritize chemicals. A.M. Gauthier, Cardno ChemRisk, LLC San Francisco, CA, M. Fung, Cardno ChemRisk LLC, San Francisco, CA, J. Panko, Cardno ChemRisk, LLC Pittsburgh, PA, T. Kingsbury, Cardno ChemRisk, LLC San Francisco, CA, A.L. Perez, Cardno ChemRisk, LLC San Francisco, CA, K. Hitchcock, Cardno ChemRisk, LLC Pittsburgh, PA. In the last decade, there has been an increased focus on evaluating the safety and sustainability of consumer products. This evaluation requires tools that characterize hazard, exposure, and risk pertaining to products and processes. Many tools will provide the information necessary to identify problematic chemistries and have potential applications in various steps of an alternatives analysis. We examined a representative sample of 33 chemical characterization tools from government, industry, academia, and non-governmental organizations (NGOs). As the tools we studied varied widely in their scope and methods of assessment, we separated them into five categories for comparison: 1) Screening and Prioritization, 2) Database Utilization 3) Hazard Assessment, 4) Exposure and Risk Assessment, and 5) Certification and Labeling. Each tool was evaluated against other tools in the same category based on our weighted set of criteria and assigned a numerical score out of 75 or 100, depending on the category. Ten tools received a high score of 66 or more in one or more categories. In one or more categories, 10 tools received a high score of 66 or more, 24 tools received a medium score, 33 to 65, and five tools received a low score of 32 or less. The primary limitations and capabilities of the tools are described. Though many of the tools assessed may be useful in providing guidance for hazard and in some cases exposure, few tools characterize risk. Risk characterization should be the focus of further tool development efforts. To our knowledge, this is the first study to provide a methodology to quantitatively rank chemical characterization tools.

10- Screening-Level Ecological Risk Assessment Approach for Quantifying Lead Ammunition Ingestion and Adverse Effects in Upland and Wetland Birds. C.L. Tsao, M. Zafonte, B.J. Stanton, R. Donohoe, C. Rech, C. Huang, and M.J. Anderson. California Department of Fish and Wildlife, Sacramento, CA. The deleterious effects of wildlife ingestion of lead shot or bullet fragments have been well documented over many years and in numerous scientific studies. Despite this fact, many ecological risk assessments submitted for regulatory review in the State of California do not consider the Pb shot ingestion pathway, particularly those that assess former or abandoned skeet and firing ranges.
We propose a probabilistic method for measuring and quantifying the degree that Pb particle contamination in soil would be available for incidental or purposeful (grit) ingestion by birds. Our extension of Peddicord and LaKind Model (2000) was evaluated for four bird species that select grit within the 0.5 to 2.8 mm ingestible range. The model demonstrates that smaller birds with longer lifespans are most at risk; other factors such as shorter retention times (i.e. high rE) and higher Pb density compound the exposure. The abundance of Pb particles in the preferred grit-size range should be measured relative to other natural particles (expressed as percent Pb particles). When establishing Pb cleanup levels, considerations should include: cost, level of protectiveness, species and resources at risk, and the total amount of Pb particles that would remain in soil and degrade overtime.

11- Monitoring Cyanotoxins in California Sediments. J.P. Voorhees, B.S. Anderson, B.M. Phillips, K. Siegler, M.S. Peterson, J. Rego, and R.S. Tjeerdema, UC Davis, Marine Pollution Studies Laboratory, Monterey, CA, S. Blanco, E. Stanfield, and M. Los Huertos, California State University Monterey Bay, Monterey, CA, D. Tadesse, State Water Resources Control Board. As part of the Surface Water Ambient Monitoring Program (SWAMP), the Stream Pollution Trends program (SPoT) monitors changes in water quality and land use in major California watersheds. Its three primary goals are to determine long-term trends in stream contaminant concentrations and effects statewide, to relate water quality indicators to land-use characteristics and management efforts, and to establish a network of sites throughout California to

serve as a backbone for collaboration with local, regional, and federal monitoring. Sediment samples, collected annually, are analyzed for toxicity, pesticides, trace metals, and organic compounds. New chemicals of emerging concern (CEC) are identified for monitoring in consultation with stakeholder groups. Among these CECs, cyanotoxins from cyanobacteria have been detected in numerous waterbodies in the state, and bloom occurrence is expected to increase due to nutrient enrichment and warming temperatures and extreme weather associated with climate change. Microcystins are a class of potent cyanotoxins occurring primarily in freshwater environments. In 2013, CSUMB researchers analyzed SPoT sediments for microcystins. Microcystin-LR, the most toxic and often most common variant of microcystins, was identified in 77% of the samples (n=83). This is the first statewide survey of microcystin presence in California sediments.

12- An Examination of the Feasibility of Generating Electricity Using Waste Heat Produced by Spent Nuclear Fuel Housed in Dry Storage Casks at Pacific Gas and Electric Company's Humboldt Bay Generating Station and a Thermoelectric Generator. K.C.Martin, Independent Researcher. Arcata, Ca. Spent nuclear fuel rods have been stored at Pacific Gas and Electric Company's Humboldt Bay Generating Station (HBGS, formerly Humboldt Bay Power Plant) since they were removed from the reactor in 1976. The nuclear reactor has not operated since then and is currently in the process of being decommissioned. After 32 years in a cooling pool the spent fuel rod assemblies were removed and placed into dry storage casks. 390 fuel rod assemblies are currently being stored onsite in five casks. It has been found from the research that these fuel rod assemblies will give off a relatively stable amount of heat for the next 90 years. It is here proposed that a thermoelectric generator be designed to capture this waste heat and convert it into usable electricity. Calculations based on existing data indicate that the power output using off-the-shelf thermoelectric (TE) modules could amount to 17kW. This is enough electricity to serve approximately 54 low usage households or 18 average use American households and represents a minimum value of the potential electrical energy to be recovered from the waste heat generated by larger quantities of stored spent nuclear fuel at other facilities around the country.

13- Mitigation strategies for reducing aquatic toxicity from organophosphate pesticides in cole crops. M. Petersen, B.S. Anderson, B.M. Phillips, C. Siegler, J. Rego, R.S. Tjeerdema, J.P. Voorhees, UC Davis, Marine Pollution Studies Laboratory, Monterey, CA, Michael Cahn, Laura Murphy, Barry Farrara, Tom Lockhart, UC Cooperative Extension, Monterey County, Rob Budd, Kean Goh, DPR. High pesticide loads in row crop runoff lead to impaired water body listings and TMDLs in central coast watersheds. The organophosphate pesticide chlorpyrifos has been targeted for regulation by the Central Coast Regional Water Quality Control Board, as listings are partly due to this pesticide. The California Department of Pesticide Regulation, the Monterey County Agriculture Commissioner and other stakeholders are investigating different approaches to reduce chlorpyrifos in run-off. In this two year study, effectiveness of several runoff treatment practices are being assessed. Year 1 trials evaluated each of three individual treatments designed to reduce chlorpyrifos in simulated agriculture run-off. These were: a vegetated drainage ditch, a bare drainage ditch with compost filters, and a bare ditch with activated carbon filters. These treatments were compared to a bare ditch without treatment. Average chlorpyrifos reduction in year 1 trials were 82% in the vegetated ditch, 25% in the compost treatment, 96% in the carbon treatment, and 19% in the bare ditch. Year 2 trials will evaluate all four treatments combined in an integrated system. Chlorpyrifos reduction will be measured under two flow rates. Food safety conflicts, treatment and disposal costs, and carbon treatment capacity will ultimately factor into evaluations of overall treatment effectiveness and feasibility.

14- Delta Watershed Initiative Network (Delta WIN). S. Azimi-Gaylon, Sacramento-San Joaquin Delta Conservancy, CA, N.D. Ullrey, Sacramento-San Joaquin Delta Conservancy, CA, K.Kynett, Sacramento-San Joaquin Delta Conservancy, CA. The Sacramento-San Joaquin Delta (Delta) supplies water to two-thirds of Californians, to a multi-billion dollar agricultural economy, and to an ecological landscape of national significance. However, Delta waterways are identified as threatened and listed on the Clean Water Act Section 303(d) list as impaired by multiple pollutants. The current drought and projected impacts of climate change are expected to exacerbate existing water quality problems. At this critical junction for

water resource management, a platform is needed to connect people, resources, organizations, and programs, and to facilitate a regional network of locally initiated projects. Many water quality and ecosystem problems have multiple causes and are therefore best addressed using an integrated and coordinated approach, at the watershed level. A comprehensive supports sound science, informs adaptive management, uses innovative thinking, and implements best management practices. Integrating multiple efforts at the local level to improve water quality and ecosystem health has been key to moving forward to form a comprehensive approach, called the Delta Watershed Initiative Network (Delta WIN). Delta WIN will conduct water quality monitoring using a combination of data collected by citizens and state agencies to analyze water quality trends. These data will be used to establish baseline for understanding watershed conditions, screening for potential pollution problems, and to inform adaptive management decisions and best management practices. Delta WIN provides a platform that connects resources and expertise, and sets ideas and plans into action.