

**Stormwater Runoff Water Quality Newsletter  
Devoted to Urban/Rural Stormwater Runoff  
Water Quality Management Issues**

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This issue of the Newsletter presents additional information on the role of **pyrethroid**-based pesticides in causing aquatic life toxicity in stormwater runoff and receiving waters/sediments. Also, information is provided on issues related to using “**adaptive management**” for managing water quality and water resource problems. Announcements of meetings and the availability of materials pertinent to stormwater runoff water quality evaluation/management issues are included.

**National Academies’ Stormwater Runoff Water Quality Meeting Announcement:**

Project Title: **Reducing Stormwater Discharge Contributions to Water Pollution**

Meeting 4 – December 17, 2007 - December 19, 2007

Arnold and Mabel Beckman Center, 100 Academy Dr. Irvine, California

If you would like to attend the sessions of this meeting that are open to the public or need more information please contact: Ellen de Guzman Email: [edguzman@nas.edu](mailto:edguzman@nas.edu)

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**AGENDA**

Monday, December 17 Open Session

8:00 Welcome/Introductions/Review of Meeting Agenda

Claire Welty, Committee Chair

8:05–8:45 The Future of Industrial Stormwater Monitoring

Mike Stenstrom, UCLA

8:45–10:15 Panel on Stormwater Policy/Regulations/Implementation

Gary Wolff, California Water Board

Paula Daniels, City of LA Public Works

Mark Gold, Heal the Bay

10:15–10:30 Break

10:30–12:00 Panel on Stormwater Research, Monitoring, Coordination in LA Region

Geoff Brosseau, California Stormwater Quality Association,

Steve Weisberg, Southern California Coastal Water Research Project

Chris Crompton, Southern California Stormwater Monitoring Coalition

12:00–12:30 Legal Developments with MS4 Permits in California

David Beckman, NRDC

12:30–1:30 Lunch (at the Center)

1:30 Field Trip departs the Beckman Center

2:00–3:00 Local Orange Co. Construction Site TBD

3:00–4:00 Industrial Site TBD

4:00–5:00 Irvine Ranch TBD

Closed Session Summary Posted After the Meeting

### **Overview of Adaptive Management**

Dr. Michael Healey, CALFED Lead Scientist, presented a CALFED Science Seminar entitled, “The Hitch-Hiker’s Guide to Adaptive Management.” That presentation discussed the characteristics of an adaptive management program for managing environmental issues. Typically adaptive management has become the approach used to manage complex environmental problems for which there is need for information to formulate the management approach. Dr. Healey has discussed the components of a properly developed and implemented adaptive management program. His PowerPoint slides are available at, [http://www.science.calwater.ca.gov/pdf/CSP\\_LS\\_brown\\_bag\\_Adapt\\_Management\\_112007.pdf](http://www.science.calwater.ca.gov/pdf/CSP_LS_brown_bag_Adapt_Management_112007.pdf)

### **DPR Pyrethroid Reevaluation**

The widespread aquatic life toxicity caused by pyrethroid-based pesticides used in rural and urban areas has caused the California Department of Pesticide Regulation (DPR) to reevaluate the permitted use of these types of pesticides. The DPR website site states, *“DPR placed certain pesticide products containing pyrethroids into reevaluation on August 31, 2006. The reevaluation is based on recent monitoring surveys and toxicity studies revealing the widespread presence of synthetic pyrethroid residues in the sediment of both agricultural and urban dominated California waterways at levels toxic to Hyalella azteca (H. azteca). Scientists conducted sediment bioassays using H. azteca, a resident species found in some Central Valley water bodies. Scientists commonly use H. azteca, an aquatic crustacean, as an indicator of environmental health and water quality in streams, lakes, and other bodies of water. Significant toxicity was observed at numerous sites. There was a high correlation between concentrations of pyrethroids and observed toxicity. Findings further indicate that the unique physical, chemical, and toxicological properties of the pyrethroid class of chemicals contribute to their propensity to accumulate in sediment at toxic levels. Pyrethroids are synthetic insecticides. Pyrethrins, which are natural insecticides, are found in Chrysanthemum cinerariaefolium, a perennial plant with a daisy-like appearance. DPR did not include pesticide products containing naturally occurring pyrethrins in this reevaluation because pyrethrins are known to break down rapidly in the environment.”* Information on the DPR pyrethroid reevaluation is available at, <http://www.cdpr.ca.gov/docs/registration/reevaluation/chemicals/pyrethroids.htm>.

### **Seminar on Pyrethroid Pesticides as a Cause of Delta Water Quality Problems**

California Bay Delta Authority CALFED Science Program and the University of California Center for Aquatic Biology and Aquaculture (CBDA) organized a seminar entitled, “Pyrethroids and the Delta: Laboratory Studies, Field Results, and Regulatory Actions.” That seminar included a presentation by Dr. Inge Werner (of the Aquatic Toxicology Program, VM: Anatomy, Physiology and Cell Biology, University of California, Davis) made a presentation entitled, “Pyrethroid Toxicity In The Water Column: Is There Reason For Concern?” She reviewed her work and that of others on the potential impact of pyrethroid-based pesticides on aquatic life (Hyalella) toxicity and the potential impact on the pelagic organism decline (POD) that has occurred in the Delta. Those impacts include acute and sub-acute impacts on aquatic life. Dr. Werner has concluded that pesticide toxicity could be a factor in the POD. Her PowerPoint slides are available at, <http://caba.ucdavis.edu/activities.htm>.

Dr. Don Weston (Department of Integrative Biology, University of California Berkeley) presented a review of his work on the environmental occurrence of pyrethroid-based pesticide toxicity to aquatic life. He has found that there is widespread toxicity to *Hyaella* in Central Valley waterbodies in both urban and rural areas. A list of his papers on these issues is available at: <http://caba.ucdavis.edu/activities.htm>

Dr. Weston recently announced the publication of his paper:

Erin L. Amweg and Donald P. Weston, "Whole-Sediment Toxicity Identification Evaluation Tools for Pyrethroid Insecticides: I. Piperonyl Butoxide Addition" *Environmental Toxicology and Chemistry*, Vol. 26, No. 11, pp. 2389–2396, 2007

That paper discussed "*piperonyl butoxide (PBO) as a synergist used in some pyrethroid and pyrethrin pesticide products and has been used in toxicity identification evaluations (TIEs) of water samples to indicate organophosphate or pyrethroid-related toxicity.*" Those authors concluded that aquatic life testing incorporating PBO addition is a reliable tool for evaluation of whether pyrethroid-based pesticides are responsible for aquatic life toxicity. That conclusion is in keeping with the findings of Lee et al. (2000), and Lee and Taylor (2001a,b) in their mid-to-late 1990s studies of aquatic life toxicity in stormwater runoff in the Upper Newport Bay watershed in Orange County, California. Using an approach developed by the University of California, Davis, Aquatic Toxicology Laboratory staff involving toxicity testing in a dilution series with and without PBO addition, Lee and Taylor identified pyrethroid-based pesticides as a cause of aquatic life toxicity in the runoff and receiving waters.

Weston and Amweg recently published the paper:

Donald P. Weston and Erin L. Amweg, "Whole-Sediment Toxicity Identification Evaluation Tools for Pyrethroid Insecticides: II. Esterase Addition," *Environmental Toxicology and Chemistry*, Vol. 26, No. 11, pp. 2397–2404, 2007

The abstract of their paper states, "*An esterase enzyme capable of catalyzing the hydrolysis of the ester bond common to all pyrethroid insecticides has been proposed as a toxicity identification evaluation procedure for the compounds when present in water samples. It appeared to show promise in previous applications to pore water and in one published application to bulk sediment. The present study was designed to provide the additional validation of the technique when applied to whole sediment, demonstrating its efficacy and specificity to pyrethroids.*"

Dr. Frank Spurlock (Environmental Monitoring Branch, California Department of Pesticide Regulation) made a presentation at the CALFED UCD pyrethroid seminar entitled, "Synthetic Pyrethroids and California Surface Water: Regulatory Update." That presentation covered,

- *Regulating pesticides and CA water quality*
- *What is reevaluation?*
- *Types of pyrethroid and their use patterns*
- *Reevaluation*
  - *pyrethroid grouping*
  - *data requirements*
  - *status*

Dr. Spurlock indicated that the DPR Reevaluation is focused on sediment toxicity issues. He indicated, "DPR has also detected pyrethroids in whole water samples from storm runoff, this being in agricultural areas (e.g.

*Bacey, J., F. Spurlock, K. Starner, H. Feng, J. Hsu, J. White, and D.M. Tran. 2005. "Residues and Toxicity of Esfenvalerate and Permethrin in Water and Sediment," California. Bull. Environ. Contam. Toxicol. 74(5): 864-871 in Tributaries of the Sacramento and San Joaquin Rivers. Although we didn't conduct bioassays, we evaluated the potential for LC50 exceedances using a simple probabilistic partition-based screening model,*

*Spurlock, F., J. Bacey, K. Starner and S. Gill. 2005. "A Probabilistic Screening Model for Evaluating Pyrethroid Surface Water Monitoring Data. Environ. Mon. Assess. 109:161-179., concluding that 'water column toxicity of pyrethroids is possible in California's agriculturally-dominated tributaries.'"*

These results are also in keeping with the findings of Lee et al. (2000), and Lee and Taylor (2001a, b) in their study of toxicity of stormwater runoff in the Upper Newport Bay watershed in the mid-to-late 1990s.

Dr. Spurlock's PowerPoint slides covering his presentation are available at, <http://caba.ucdavis.edu/activities.htm>

### **Recent DPR Publications on Pesticides–Water Quality Issues**

Kean Goh of the California Department of Pesticide Regulation (DPR) recently announced the availability of the following publications by DPR staff:

Gunasekara, A., T. Truong, K.S. Goh, F. Spurlock and R.S. Tjeerdema. 2007. Environmental Fate and Toxicology of Fipronil. *J. Pestic. Sci.* 32:189-199.

Guo, L., K. Kelley, and K.S. Goh. 2007 Evaluation of Sources and Loading of Pesticides to the Sacramento River, California, USA, During a Storm Event of Winter 2005. *Environ. Contam. Toxicol.* 26:2274-2281.

Yang, W.C., W. Hunter, F. Spurlock and J. Gan. 2007. Bioavailability of Permethrin and Cyfluthrin in Surface Waters with Low Levels of Dissolved Organic Matter. *J. Environ. Qual.* 36:1678-1685

Bondarenko, S., F. Spurlock and J. Gan. 2007. Analysis of Pyrethroids in Sediment Pore Water by Solid-Phase Microextraction. *Environ. Toxicol. Chem.* 26:2587-2593

Xu, Y., F. Spurlock, Z. Wang and J. Gan. 2007. Comparison Of Five Methods For Measuring Sediment Toxicity Of Hydrophobic Contaminants. *Environ. Sci. Technol.* Web Release Date: 13-Nov-2007

Goh indicated that these papers are available from him upon request at [kgoh@cdpr.ca.gov](mailto:kgoh@cdpr.ca.gov).

### **Regulating Irrigated Agriculture Runoff/Discharges**

Those interested in the current efforts of the California Central Valley Regional Water Quality Control Board's to regulate stormwater runoff and discharges may wish to review the report,

## **“TENTATIVE MONITORING AND REPORTING PROGRAM FOR COALITION GROUPS UNDER AMENDED ORDER NO. R5-2006-0053 COALITION GROUP CONDITIONAL WAIVER OF WASTE DISCHARGE REQUIREMENTS FOR DISCHARGES FROM IRRIGATED LAND**

“The California Central Valley Regional Water Quality Control Board staff has prepared a tentative Monitoring and Reporting Program for Coalition Groups (MRP) regulated under the Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands. Any written comments, evidence or recommendations concerning the enclosed tentative Monitoring and Reporting Program must be received no later than 5:00 p.m. on 28 December 2007 at the letterhead address above, or by email to [mawong@waterboards.ca.gov](mailto:mawong@waterboards.ca.gov). Late written materials will generally not be accepted or become part of the record. No late comments will be accepted if doing so will prejudice any person, including the Regional Water Board.

The Regional Water Board will consider whether to adopt the MRP at the 24/25 January 2008 meeting of the California Regional Water Quality Control Board, Central Valley Region (Regional Water Board). More specific information about the date and time of this item will be available on the Regional Water Board website no later than 14 January 2008.

The MRP and associated documents will be posted by 5 December 2007 at <http://www.waterboards.ca.gov/centralvalley/tentative/>. Any changes to the tentative MRP based on public comments, and other material related to the Board meeting, will be posted on the Regional Water Board's web site approximately two weeks before the January Board meeting.”

If you have questions on the proposed MRP please contact,  
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### **BASS Bioaccumulation Model**

Dr. Craig Barber recently provided updated information on the US EPA BASS bioaccumulation model. According to the US EPA website,

#### **“BASS**

*BASS is a model that simulates the population and bioaccumulation dynamics of age-structured fish communities. Although bass was specifically developed to investigate the bioaccumulation of chemical pollutants within a community or ecosystem context, it can also be used to explore population and community dynamics of fish assemblages that are exposed to a variety of nonchemical stressors such as altered thermal regimes associated with hydrological alterations or industrial activities, commercial or sports fisheries, and introductions of non native or exotic fish species.*

*BASS's model structure is very generalized and flexible. Users can simulate both small, short-lived species (e.g., daces, minnows, etc.) and large, long-lived species (e.g., bass, perch, sunfishes, trout, etc.) by specifying either monthly or yearly age classes for any given species. The community's food web is defined by identifying one or more foraging classes for each fish*

*species based on either body weight, body length, or age. The dietary composition of each of these foraging classes is then specified as a combination of benthos, incidental terrestrial insects, periphyton/attached algae, phytoplankton, zooplankton, and/or other fish species, including its own. There are no restrictions on the number of chemicals or the number of fish species that can be simulated, the number of cohorts / age classes that fish species may have, or the number of foraging classes that fish species may have.”*

Additional information on the BASS model is available at:  
<http://www.epa.gov/ATHENS/research/modeling/bass.html>.

For the latest information on the BASS Model contact,  
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### **OEHHA Guidance on Excessive Bioaccumulation Assessment**

California Office of Environmental Health Hazard Assessment (OEHHA) staff responsible for establishing fish consumption advisories for hazardous chemicals, Drs. S. Klasing, R. Brodberg, and M. Gassel, made a presentation in November 2007 entitled, “Balancing the Scales II: Incorporating Fish Consumption Benefits into the Fish Advisory.” That presentation focuses on balancing the consumption of fish and other aquatic organism containing elevated concentrations of hazardous chemicals such as mercury, legacy organochlorine pesticides, and PCBs, with health benefits of consumption of fish and other aquatic life. Slides from that presentation are available at, <http://www.oehha.ca.gov/fish/pdf/scales111407.pdf>.

### **References**

Lee, G. F., Taylor, S., and County of Orange Public Facilities and Resources Department, “Upper Newport Bay Water Quality Enhancement Project, Final Report,” Agreement Nos. 8-023-258-0 and 8-174-250-0, submitted to State Water Resources Control Board, Santa Ana Regional Water Quality Control Board and Orange County Public Facilities and Resources Department to meet the requirements of the US EPA 319(h) Project, G. Fred Lee & Associates, El Macero, CA and RBF Consulting, Irvine, CA, May (2001a).

Lee, G. F. and Taylor, S., “Results of Aquatic Toxicity Testing Conducted During 1997-2000 within the Upper Newport Bay Orange County, CA Watershed,” Report of G. Fred Lee & Associates, El Macero, CA (2001b).

<http://www.members.aol.com/apple27298/295-319-tox-paper.pdf>

Lee, G. F., Jones-Lee, A. and Taylor, S., "Evaluation of the Water Quality Significance of OP Pesticide Toxicity in Tributaries of Upper Newport Bay, Orange County, CA," Ninth Symposium on Environmental Toxicology and Risk Assessment: Recent Achievements in Environmental Fate and Transport, ASTM STP 1381, pp 35-51 (2000).  
[http://www.gfredlee.com/oppesticide\\_unb.pdf](http://www.gfredlee.com/oppesticide_unb.pdf).