DEPARTMENT OF PESTICIDE REGULATION

AMBIENT MONITORING REPORT

Date: January 13, 2016

1. Study highlights:

- Study Number: 270
- Title: Urban Monitoring in Southern California Watersheds FY 2014-2015
- Author Robert Budd

- Study area:
  - County: Orange, Los Angeles, San Diego
  - Waterbody/ Watershed: Ballona Creek, Bouquet Creek, Los Angeles River, Salt Creek, San Diego River, Wood Canyon Creek

- Land Use Type: ☐ Ag ☒ Urban ☐ Forested ☐ Mixed ☐ Other

- Water body type: ☒ Storm drain outfall ☒ Creek ☒ River ☐ Pond ☐ Lake ☐ Drainage ditch ☐ Other: Click here to enter describe other

- Objectives: 1. Determine pesticide presence and concentrations in runoff from urban neighborhoods in Southern California watersheds; 2. Compare pesticide concentrations to US EPA benchmarks; 3. Determine the toxicity of a subset of samples to Hyalella azteca in 96-hr water column testing; 4. Determine potential pyrethroid toxicity of sediments.

- Sampling period: July 1, 2014 – June 30, 2015

- Pesticides monitored:

  2,4-D, benfluralin, bifenthrin, bromacil, chlorfenapyr, chlorothalonil, chlorpyrifos, cyfluthrin, deltamethrin/tralomethrin, desulfinyl fipronil, desulfinyl fipronil amide, diazinon, dicamba, diuron, ethalfluralin, fenvalerate/esfenvalerate, fipronil, fipronil amide, fipronil sulfide, fipronil sulfone, imidacloprid, lambda-cyhalothrin, malathion, MCPA, norflurazon, oryzalin, oxyfluorfen, pendimethalin, permethrin, prodiamine, prometon, simazine, triclopyr, trifluralin

- Major findings:

  Bifenthrin was the most frequently detected (80%) pesticide in water samples collected at Southern California monitoring locations between July 1, 2014 and June 30, 2015. Bifenthrin concentrations exceeded the lowest aquatic benchmark (BM) set by the US EPA in 73% of samples. Five other pyrethroid insecticides were detected at lower frequencies. All detections of permethrin (43%), deltamethrin/ tralomethrin (25%), and lambda-cyhalothrin (15%) exceeded their respective BM. Cyfluthrin was detected in 40% of samples, with an associated 35% exceedance, and fenvalerate/esfenvalerate was detected in 10% of samples, with 5% of concentrations exceeding BM values.

  Fipronil was also frequently detected (75%) at concentrations greater than aquatic BM. Several of fipronil degradate by-products were also detected in surface waters, including desulfinyl fipronil (65%), fipronil sulfone (63%), desulfinyl fipronil amide (10%) and fipronil sulfide (8%). Only fipronil sulfone exceeded BM values in 55% of samples. Fipronil amide and desulfinyl fipronil amide do not have established aquatic BM values.

  The neonicotinoid imidacloprid was also detected at high frequency (73%); however, none of the concentrations exceeded aquatic BM. The only other insecticide detected above reporting limits was the organophosphate malathion (18%), all concentrations of which were exceedances.

  Several herbicides were present in surface water samples, including triclopyr (75%), 2,4-D (70%), dicamba (38%), prodiamine (9%), and MCPA (3%). None of the herbicide concentrations were above their respective aquatic BM.

  No other pesticide was detected in water samples within the sampling period.

  96-hr water column toxicity tests were conducted using the test organism *Hyalella azteca*. Four samples were collected at storm drain outlets and three were collected within receiving waters during the dry season. Significant toxicity was observed in all samples collected at storm drains, with percent survival ranging between 0 – 42%. Samples collected within receiving waters were not significantly different from controls (89 – 98% survivability).

  Six sediment samples were analyzed for the pyrethroids bifenthrin, cyfluthrin, cypermethrin, deltamethrin, fenpropathrin, esfenvalerate, lambda-cyhalothrin, and permethrin. Bifenthrin, cyfluthrin, deltamethrin, lambda-cyhalothrin and permethrin were detected in every sample. Half of the samples contained cypermethrin, and 67% of samples contained esfenvalerate. Fenpropathrin was not detected in any sample. Bifenthrin accounted for the largest average percentage (65%) of toxicity units (TUs; an indicator of potential toxicity), followed by cypermethrin (14%), deltamethrin (10%), cyfluthrin (5%), lambda-cyhalothrin (4%), permethrin (1%), and esfenvalerate (<1%).

2. Pesticide detection frequency

Table 1. Pesticides detected in water. Complete data set in Appendix.

Pesticide	Number of samples	Number of detections	Detection frequency (%)	Reporting limit (µg/L)*	Lowest USEPA benchmark (BM) (µg/L)		Number of BM exceedances	BM exceedance frequency (%)
2,4-D	40	28	70	0.05	13.1	VA	0	0
Benfluralin	6	0	0	0.05	1.9	FC	0	0
Bifenthrin	40	32	80	0.001	0.0013	IC	29	73
Bromacil	10	0	0	0.05	6.8	NVA	0	0
Chlorfenapyr	11	0	0	0.1	2.915	IA	0	0
Chlorothalonil	10	0	0	0.05	0.6	IC	0	0
Chlorpyrifos	11	0	0	0.01	0.04	IC	0	0
Cyfluthrin	40	16	40	0.002	0.0074	IC	14	35
Deltamethrin/ Tralomethrin	40	10	25	0.005	0.0041	IC	10	25
Desulfinyl fipronil	40	26	65	0.02	0.59	FC	0	0
Desulfinyl fipronil amide	40	4	10	0.03	na*	- *	-	na
Diazinon	11		0	0.01	0.105	IA	0	0
Dicamba	40	15	38	0.05	61	NVA	0	0
Diuron	10	0	0	0.05	2.4	NVA	0	0
Ethalfluralin	6	0	0	0.05	0.4	FC	0	0
Fenvalerate/ Esfenvalerate	40	4	10	0.005	0.017	IC	2	5
Fipronil	40	30	75	0.02	0.011	IC	30	75
Fipronil amide	40	7	18	0.03	na	-	-	na
Fipronil sulfide	40	3	8	0.02	0.11	IC	0	0
Fipronil sulfone	40	25	63	0.03	0.037	IC	22	55
Imidacloprid	40	29	73	0.05	1.05	IC	0	0
Lambda-cyhalothrin	40	6	15	0.002	0.002	IC	6	15
Malathion	11	2	18	0.02	0.035	IC	2	18
MCPA	40	1	3	0.05	170	VA	0	0
Norflurazon	10	0	0	0.05	9.7	NVA	0	0
Oryzalin	11	0	0	0.05	15.4	VA	0	0
Oxyfluorfen	6	0	0	0.05	0.29	NVA	0	0
Pendimethalin	11	0	0	0.05	5.2	NVA	0	0
Permethrin	40	17	43	0.002	0.0014	IC	17	43
Prodiamine	11	1	9	0.05	1.5	IC	0	0

Pesticide	Number of samples	Number of detections	Detection frequency (%)	Reporting limit (µg/L)*	Lowest USEPA benchmark (BM) (µg/L)		Number of BM exceedances	BM exceedance frequency (%)
Prometon	10	0	0	0.05	98	NVA	0	0
Simazine	10	0	0	0.05	2.24	NVA	0	0
Triclopyr	40	30	75	0.05	4100	NVA	0	0
Trifluralin	11	0	0	0.05	1.14	FC	0	0

* Only most recent RL listed, FA, fish acute; FC, fish chronic; IA, invertebrate acute; IC, invertebrate chronic; NA, non-vascular acute; VA, vascular acute; na, value not available; dash, not applicable

Table 2. Pesticides detected in sediment. Complete data set in Appendix.

Pesticide	Number of samples	Number of detections	Detection frequency (%)	LC_{50} (µg/ g OC)*	Detection frequency of sediments $\geq$ 1	Median TUs*
Bifenthrin	6	6	100	0.52	100	6.68
Cyfluthrin	6	6	100	1.08	33	0.51
Cypermethrin	6	3	50	0.38	17	0.10
Deltamethrin/ Tralomethrin	6	6	100	0.79	17	0.53
Fenpropathrin	6	0	0	NA	0	0.00
Fenvalerate/ Esfenvalerate	6	4	67	1.54	0	0.08
Lambda-cyhalothrin	6	6	100	0.45	17	0.33
Permethrin	6	6	100	10.83	0	0.10

*Sediment Toxicity Units (TUs) are calculated using the formula, use TU = C/LC_{50} * % TOC * 10, where C = concentration (µg/kg dry weight), LC_{50} is derived from accepted published values (from Amweg et al. 2005, Toxicol. Chem. 24:966-972; Amweg and D.P. Weston 2007, Environ. Toxicol. Chem. 26:2389-2396; Maund et al. 2002, Environ. Toxicol. Chem., 21:9-15), % TOC is stated in the sediment results Appendix III, and 10 is a conversion factor. One TU is equal to the LC_{50}. If using other LC_{50} values, list value and reference.

3. Laboratory QC summary

QC Type	Water Samples		Sediment Samples	
	Total Number	Number of QC out of contro1	Total Number	Number of QC out of control
Lab Blanks	113	0	36	0
Matrix Spikes/Duplicates	115	0	36	0
Laboratory Control Spikes/Duplicates	0	0	36	0
Blind Spikes	6	0	0	0
Surrogate Spikes	13	0	40	0
Other QC: Describe	0	0	0	0
Other QC: Describe	0	0	0	0
Explain out of control QC and interpretation of data:				

4. Supporting Information

<u>Submit the following Supporting Information combined into one PDF file with your report:</u>

Index of Supporting Information

Appendix I. Study protocol

Appendix II. Sampling site information and pictures (recommended)

Appendix III. Water quality data

Appendix IV. Water or sediment monitoring data

Appendix V. Aquatic toxicity data

Appendix VI. Analytical methods