DEPARTMENT OF PESTICIDE REGULATION

AMBIENT MONITORING REPORT

Date: November 10, 2016

1. Study highlights:

- Study Number: 270
- Title: Urban monitoring in Southern California watersheds FY 2015-2016
- Author Robert Budd

- Study area:
  - County: Orange, Los Angeles, San Diego
  - Waterbody/ Watershed: Ballona Creek, Bouquet Creek, Los Angeles River, San Gabriel River, Salt Creek, San Diego River, Tecolote Canyon Creek, 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, 2015 – June 30, 2016

- Pesticides monitored:

  2,4-D, atrazine, bifenthrin, bromacil, carbaryl, chlorfenapyr, chlorpyrifos, cyfluthrin, cypermethrin, deltamethrin/tralomethrin, desulfinyl fipronil, desulfinyl fipronil amide, dicamba, dichlorvos, diuron, fenvalerate/esfenvalerate, fipronil, fipronil amide, fipronil sulfide, fipronil sulfone, imidacloprid, lambda cyhalothrin, malathion, MCPA, oryzalin, pendimethalin, permethrin, prodiamine, prometon, simazine, triclopyr, trifluralin

- Major findings:

  Bifenthrin was the most frequently detected (75%) pesticide in water samples collected at southern California monitoring locations between July 1, 2015 and June 30, 2016. Bifenthrin concentrations exceeded the lowest aquatic benchmark (BM) set by the US EPA in 68% of samples. Six other pyrethroid insecticides were detected at lower frequencies. All detections of permethrin (41%), lambda cyhalothrin (25%), and deltamethrin/ tralomethrin (23%) exceeded their respective BM. Cyfluthrin was detected in 64% of samples, with an associated 39% exceedance. Cypermethrin and fenvalerate/esfenvalerate were detected in 16% of samples; however, none of concentrations exceeded BM values.

  Fipronil was also frequently detected (59%) at concentrations greater than aquatic BM. Several of fipronils degradate by-products were also detected in surface waters, including fipronil sulfone (55%), desulfinyl fipronil (43%), desulfinyl fipronil amide (7%), fipronil amide (7%), and fipronil sulfide (2%). Only fipronil sulfone exceeded BM values in 39% of samples. Fipronil amide and desulfinyl fipronil amide do not have established aquatic BM values.

  The neonicotinoid imidacloprid was also detected at high frequency (68%), with 2% of concentrations exceeding aquatic BM. The only other insecticides detected above reporting limits were the organophosphate malathion (7%) and the carbamate carbaryl (36%). All detections of malathion and 18% of carbaryl samples were benchmark exceedances.

  Several herbicides were present in surface water samples, including triclopyr (75%), 2,4-D (61%), diuron (45%), dicamba (23%), pendimethalin (8%), and MCPA (7%). Only diuron was detected above its aquatic BM (1%).

  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*. Five samples were collected at storm drain outlets; two during a storm event and three during the dry season. Six samples were collected within receiving waters during the dry season. Significant toxicity was observed in all samples collected at storm drains, with 100 percent mortality during all events. Samples collected within receiving waters experienced a wide range of toxicity (0 – 100% mortality).

  Five sediment samples were analyzed for the pyrethroids bifenthrin, cyfluthrin, cypermethrin, deltamethrin, fenpropathrin, esfenvalerate, lambda cyhalothrin, and permethrin. Bifenthrin, cyfluthrin, deltamethrin, esfenvalerate, lambda cyhalothrin and permethrin were detected in every sample. Cypermethrin was detected in 80% of the samples. Fenpropathrin was not detected in any sample. Bifenthrin accounted for the largest average percentage (55%) of toxicity units (TUs; an indicator of potential toxicity), followed by lambda cyhalothrin (12%), deltamethrin (11%), cypermethrin (9%), cyfluthrin (9%), permethrin (3%), 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 (ug/L)	Lowest USEPA benchmark (BM) (ug/L)		Number of BM exceedances	BM exceedance frequency (%)
2,4-D	44	27	61	0.05	13.1	VA	-	0
Atrazine	11	0	0	0.05	0.001	VA	-	0
Bifenthrin	44	33	75	0.001	0.0013	IC	30	68
Bromacil	10	0	0	0.05	6.8	NVA	-	0
Carbaryl	11	4	36	0.05	0.5	IC	2	18
Chlorfenapyr	12	0	0	0.1	2.915	IA	-	0
Chlorpyrifos	15	0	0	0.01	0.04	IC	-	0
Cyfluthrin	44	28	64	0.002	0.0074	IC	17	39
Cypermethrin	44	7	16	0.005	0.069	IC	-	0
Deltamethrin/ Tralomethrin	44	10	23	0.005	0.0041	IC	10	23
Desulfinyl fipronil	44	19	43	0.02	0.59	FC	-	0
Desulfinyl fipronil amide	44	3	7	0.03	na	-	-	0
Dicamba	44	10	23	0.05	61	NVA	-	0
Dichlorvos	15	0	0	0.03	0.0058	IC		0
Diuron	11	5	45	0.05	2.4	NVA	1	9
Fenvalerate/ Esfenvalerate	44	7	16	0.005	0.017	IC	-	0
Fipronil	44	26	59	0.02	0.011	IC	26	59
Fipronil amide	44	3	7	0.03	na	-	-	0
Fipronil sulfide	44	1	2	0.02	0.11	IC	-	0
Fipronil sulfone	44	24	55	0.03	0.037	IC	17	39
Imidacloprid	44	30	68	0.05	1.05	IC	1	2
Lambda Cyhalothrin	44	11	25	0.002	0.002	IC	11	25
Malathion	15	1	7	0.05	0.035	IC	1	7
MCPA	44	3	7	0.05	170	VA	-	0
Oryzalin	12	0	0	0.05	15.4	VA	-	0
Pendimethalin	12	1	8	0.05	5.2	NVA	-	0
Permethrin	44	18	41	0.002	0.0014	IC	18	41
Prodiamine	12	0	0	0.05	1.5	IC	-	0
Prometon	11	0	0	0.05	98	NVA	-	0
Simazine	10	0	0	0.05	2.24	NVA	-	0
Triclopyr	44	33	75	0.05	5900	NVA	-	0
Trifluralin	12	0	0	0.05	1.14	FC	-	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 TU*	Median TUs*
Bifenthrin	5	5	100	0.52	100	2.75
Cyfluthrin	5	5	100	1.08	20	0.33
Cypermethrin	5	4	80	0.38	40	0.18
Deltamethrin/ Tralomethrin	5	5	100	0.79	0	0.38
Fenpropathrin	5	0	0	NA	0	0.00
Fenvalerate/ Esfenvalerate	5	5	100	1.54	0	0.03
Lambda cyhalothrin	5	5	100	0.45	20	0.19
Permethrin	5	5	100	10.83	0	0.12

*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	158	0	18	0
Matrix Spikes/Duplicates	158	0	0	0
Laboratory Control Spikes/Duplicates	0	0	18	0
Blind Spikes	25	0	0	0
Surrogate Spikes	4	0	23	0
Other QC:	0	0	0	0
Other QC:	0	0	0	0
Explain out of control QC and interpretation of data:				

4. Supporting Information