DEPARTMENT OF PESTICIDE REGULATION

AMBIENT MONITORING REPORT Date: March 20, 2019

1. Study highlights

- Study Number: 310
- Title: Northern California Agricultural Monitoring
- Author Scott D. Wagner
- Study area:
  - County: Colusa, Solano, Yolo, Yuba
  - Waterbody/ Watershed: Lower Logan Creek, Willow Creek, Colusa Drain, Jack Slough, Clarks Ditch-Colusa Basin Drain, Gibson Canyon Creek-Sweany Creek
- Land Use Type: ☒ Ag ☐ Urban ☐ Forested ☐ Mixed ☐ Other
- Water body type: ☐ Storm drain outfall ☒ Creek ☐ River ☐ Pond ☐ Lake ☒ Drainage ditch ☐ Other: type
- Objectives: 1. Prioritize pesticide monitoring candidates based on current use reports at the watershed level; 2. Determine the presence and concentrations of prioritized pesticide active ingredients in surface waters in the selected monitoring regions; 3. Analyze chemistry data to evaluate potential impacts on aquatic life
- Sampling period: May 2018 – September 2018
- Pesticides monitored:

  Abamectin, Atrazine, Azoxystrobin, Benfluralin, Bifenthrin, Carbaryl, Chlorantraniliprole, Chlorpyrifos, Cyfluthrin, Cypermethrin, Cyprodinil, Diazinon, Diflubenzuron, Dimethoate, Diuron, Esfenvalerate/fenvalerate, Ethalfluralin, Hexazinone, Imidacloprid, Lambda-Cyhalothrin, Malathion, Methidathion, Oryzalin, Oxyfluorfen, Pendimethalin, Permethrin, Prodiamine, Propanil, Propargite, Propiconazole, Pyraclostrobin, Pyriproxyfen, Simazine, S-metolachlor, Thiobencarb, Trifloxystrobin, Trifluralin

- Major findings:

Water samples collected from Colusa, Solano, Yolo, and Yuba Counties were monitored for 37 active ingredients (A.I.s), at eight agricultural field sites in May, July and September of 2018. A.I.s included herbicides, fungicides and insecticides of high use for these particular areas. The most frequently detected A.I.s were azoxystrobin (87.5%), thiobencarb (75.2%), S-metolachlor (33%), diuron (25%), propiconazole (25%), and propanil (25%); bifenthrin, lambda-cyhalothrin, malathion, and thiobencarb exceeded their lowest U.S. Environmental Protection Agency (U.S. EPA) aquatic benchmark values. The pyrethroid lambda-cyhalothrin (16.7% detection frequency) was detected only in May. Concentrations of the rice herbicides propanil and thiobencarb were higher during the May sampling event while concentrations of the fungicide azoxystrobin were higher in July and September.

Sediment samples collected at two sites in Colusa and Solano Counties were monitored for 6 pyrethroid insecticides in July of 2018; sediment from a third site in Colusa County was collected in October of 2018. Bifenthrin was detected at one site in July in a sediment sample with total organic carbon (TOC) below the reporting limit. Thus, a toxicity unit (TU) could not be calculated; however, the low TOC content in the sediment suggests that most or all of the bifenthrin detected would be bioavailable.

96-hr water column toxicity tests were conducted using the test organisms *Hyalella azteca* and *Chironomus dilutus*. Four samples in May and four in September were collected for toxicity testing. The samples in May were tested using *H. azteca* and *C. dilutus*; samples from September were tested using *H. azteca*. Significant toxicity to *H. azteca* was observed in one sample collected in May. No significant toxicity was observed in the other samples. In the sample that showed toxicity, thiobencarb and lambda-cyhalothrin were detected at concentrations above the chronic invertebrate benchmark.

- Recommendations for pesticides that need a CDFA analytical method (from SWMP):

Thiamethoxam, Clothianidin, Dinotefuran

2. Pesticide detection frequency

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

Pesticide	Number of samples	Number of detections	Reporting Limit (µg/L)	Detection frequency (%)	Lowest USEPA benchmark (BM) (µg/L)*	Number of BM exceedances	BM exceedance frequency (%)
Abamectin	24	0	0.02	0	0.17 IA	0	0
Atrazine	24	0	0.02	0	<1 NVA	0	0
Azoxystrobin	24	21	0.02	87.5	44 IC	0	0
Benfluralin	24	0	0.05	0	1.9 FC	0	0
Bifenthrin	24	2	0.001	8.3	0.0013 IC	1	4.1
Carbaryl	24	0	0.02	0	0.5 IC	0	0

Chlorantraniliprole	24	1	0.02	4.1	4.4 IC	0	0
Chlorpyrifos	24	0	0.02	0	0.04 IC	0	0
Cyfluthrin	24	0	0.002	0	0.0074 IC	0	0
Cypermethrin	24	0	0.005	0	0.069 IC	0	0
Cyprodinil	24	0	0.02	0	8 IC	0	0
Diazinon	24	0	0.02	0	0.105 IA	0	0
Diflubenzuron	24	0	0.02	0	0.00025 IC	0	0
Dimethoate	24	0	0.02	0	0.5 IC	0	0
Diuron	24	6	0.02	25	2.4 NVA	0	0
Esfenvalerate/fen.	24	0	0.005	0	0.017 IC	0	0
Ethalfluralin	24	0	0.05	0	0.4 FC	0	0
Hexazinone	24	0	0.02	0	7 NVA	0	0
Imidacloprid	24	0	0.02	0	0.01 IC	0	0
Lambda-cyhalothrin	24	4	0.002	16.7	0.002 IC	3	12.5
Malathion	24	1	0.02	4.1	0.049 IA	1	4.1
Methidathion	24	0	0.02	0	0.66 IC	0	0
Oryzalin	24	0	0.05	0	13 VA	0	0
Oxyfluorfen	24	0	0.05	0	0.29 NVA	0	0
Pendimethalin	24	0	0.05	0	5.2 NVA	0	0
Permethrin	24	0	0.002	0	0.0014 IC	0	0
Prodiamine	24	0	0.05	0	1.5 IC	0	0
Propanil	24	6	0.02	25	9.1 FC	0	0
Propargite	24	0	0.02	0	7.0 IA	0	0
Propiconazole	24	6	0.02	25	21 NVA	0	0
Pyraclostrobin	24	0	0.02	0	1.5 NVA	0	0
Pyriproxyfen	24	0	0.02	0	0.015 IC	0	0
Simazine	24	2	0.02	8.3	2.24 NVA	0	0
S-Metolachlor/Metolachlor	24	8	0.02	33	1 IC	0	0
Thiobencarb	24	19	0.02	79.2	1 IC	6	25
Trifloxystrobin	24	0	0.02	0	2.76 IC	0	0
Trifluralin	24	0	0.05	0	1.9 FC	0	0

*FA, fish acute; FC, fish chronic; IA, invertebrate acute; IC, invertebrate chronic; NVA, non-vascular acute; VA, vascular acute; NA, benchmark not available

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)[1]	Detection frequency of sediments ≥1 TU[1]
Bifenthrin	3	1	33	0.52	NA
Cyfluthrin	3	0	0	1.08	0
Cypermethrin	3	0	0	0.38	0
Esfenvalerate/fenvalerate	3	0	0	1.54	0
Lambda-cyhalothrin	3	0	0	0.45	0
Permethrin	3	0	0	10.83	0

[1]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 3, 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. Tracking Benchmark Exceedances (BME) or Sediment Toxicity (TU)

Table 3. For further data analysis: pesticides that have ≥ 10% aquatic benchmark exceedances [BME] [Table 1] or ≥ 1 sediment toxicity units [TU] [Table 2] for 3 consecutive years are recommended for further detailed data analysis (Ambient Urban Monitoring Strategy SOP [http://cdpr.ca.gov/docs/emon/pubs/protocol.htm?filter=surfwater])

BME (for pesticides with ≥ 10% BME) or Sediment TUs (for pesticides with ≥ 1 Sediment TU) (all sites) for the past 5 years							Last written evaluation (reference)	Further data analysis (Y/N)
Area	Pesticide	Water	Sediment	Current year (i)	i - 1	i - 2		
Sacramento Valley	Bifenthrin	X		4.1	10			N
	Lambda-cyhalothrin	X		12.5	0			N
	Malathion	X		4.1	0			N
	Thiobencarb	X		25	0			N
	Bifenthrin		X	33				N

4. QC

Table 3. Laboratory Quality Control (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	76	0	7	0
	Matrix Spikes/Duplicates	76	0	7	0
	Laboratory Control Spikes/Duplicates	0	0	0	0
	Blind Spikes	5	0	0	0
	Surrogate Spikes	48	0	0	0
Other QC:	Field Blank	0	0	0	0
Explain out of control QC and interpretation of data:	NA				

5. Supporting Information

Submit the following Supporting Information combined into one PDF file with your report:

Index of Supporting Information
Appendix I. Study protocol
Appendix II. Sampling site information and pictures
Appendix III. Water quality data
Appendix IV. Sediment monitoring data
Appendix V. Water monitoring data
Appendix VI. Aquatic toxicity data
Appendix VII. Analytical methods