DEPARTMENT OF PESTICIDE REGULATION

SURFACE WATER AMBIENT MONITORING REPORT

Date: March 20, 2020

1. Study highlights

- DPR Study Number 310
- SURF Study Number
- Study Title Northern California Agricultural Monitoring, 2019
- Project Lead Scott Wagner
- Email Scott.Wagner@cdpr.ca.gov
- Protocol url
  https://www.cdpr.ca.gov/docs/emon/pubs/protocol/study310_wagner_2019.pdf
  Protocol available online for five years, thereafter, please request a copy from the SWPP list of archived files

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- Study Area
  County: Colusa, Yolo, Madera, Merced, Stanislaus
  Waterbody/Watershed: Lower Logan Creek, Willow Creek, Clarks Ditch-Colusa Basin Drain, Lower Cottonwood Creek, South Slough-Deadman Creek, Town of Hilmar-San Joaquin River, Ingram Creek

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- Land use type ☒ Ag ☐ Urban ☐ Forested ☐ Mixed ☐ Other

- Water body type
  ☒ Ag ☐ River ☐ Pond ☐ Lake
  ☒ Drainage Ditch ☐ Storm Drain Outfall ☐ Other

- 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

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- Sampling period May 2019 – September 2019

- Pesticides monitored

  Abamectin, Acetamiprid, Atrazine, Azoxystrobin, Benfluralin, Bifenthrin, Bromacil, Carbaryl, Chlorantraniliprole, Chlorpyrifos, Clothianidin, Cyfluthrin, Cypermethrin, Cyprodinil, Diazinon, Diflubenzuron, Dimethoate, Diuron, Esfenvalerate/fenvalerate, Ethalfluralin, Ethoprop, Etofenprox, Hexazinone, Imidacloprid, Indoxacarb, Isoxaben, Kresoxim-methyl, Lambda-Cyhalothrin, Malathion, Methidathion, Methomyl, Methoxyfenozide, Metribuzin, Norflurazon, Oryzalin, Oxyfluorfen, Pendimethalin, Permethrin, Prodiamine, Propanil, Propargite, Propiconazole, Pyraclostrobin,

Pyriproxyfen, Quinoxyfen, Simazine, S-metolachlor, Tebufenozide, Thiamethoxam, Thiobencarb, Trifloxystrobin, Trifluralin

- Major findings

Water samples collected from Colusa, Yolo, Madera, Merced, and Stanislaus Counties were monitored for 61 active ingredients (A.I.s), at seven agricultural field sites in May, June, July, August and September of 2019. These sites were distributed across two large regions: the Sacramento Valley and the San Joaquin Valley. A.I.s included herbicides, fungicides and insecticides of high use for these particular areas. Eleven active ingredients had detection frequencies of greater than 10%: azoxystrobin (59%), bifenthrin (23%), chlorantraniliprole (32%), lambda-cyhalothrin (10%), methoxyfenozide (71%), oxyfluorfen (20%), pendimethalin (13%), propanil (29%), propiconazole (35%), S-metolachlor/metolachlor (32%), and thiobencarb (59%). Bifenthrin, imidacloprid, lambda-cyhalothrin, oxyfluorfen and thiobencarb exceeded their lowest U.S. Environmental Protection Agency (U.S. EPA) aquatic benchmark values. A greater number of pesticides was detected at the 3 sites in Sacramento Valley than at the 4 sites in San Joaquin Valley. Concentrations of the rice herbicides propanil and thiobencarb were higher during the May sampling events in Sacramento Valley while concentrations of the fungicide azoxystrobin were higher in July and September.

Sediment samples collected at five sites in Colusa, Stanislaus, and Merced Counties were monitored for 6 pyrethroid insecticides in July of 2019. Bifenthrin was detected at two sites, no other pyrethroids were detected in sediment at the other sites. One of the detections resulted in a sediment toxicity unit of greater than 1; at this particular site, bifenthrin was also detected in the water sample.

Water column toxicity tests were conducted using the test organisms *Hyalella azteca* (96-hour test) and *Chironomus dilutus* (10-day test). Samples from seven sites in June and six sites in September were collected for toxicity testing (one site in September did not have water). In June, significant toxicity to *C. dilutus* was observed at one site in Colusa County; water from another site in Stanislaus County was significantly toxic to *H. azteca*. In September, the same site in Stanislaus County showed toxicity to *H. azteca*; no significant toxicity was observed in *C. dilutus*. Bifenthrin was detected in the samples that showed toxicity to *H. azteca*.

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

Dinotefuran

2. Pesticide detection frequency

Data available in SURF (https://www.cdpr.ca.gov/docs/emon/surfwtr/surfdata.htm) upon yearly update. Contact Project Lead for data not yet uploaded. In SURF, use "SURF Study Number" (Section 1) for obtaining the data.

Table 1. Pesticides detected in water

Pesticide	Sample Number	Detection Number	Detection frequency (%)	Reporting Limit (µg/L)	Lowest USEPA benchmark (BM) (µg/L)*	BM Type**	Number of BM exceed-ances	BM exceedance frequency (%)
Abamectin	34	0	0	0.02	0.17	IA	0	0
Acetamiprid	15	0	0	0.02	2.1	IC	0	0
Atrazine	34	2	6	0.02	<1	NVA	0	0
Azoxystrobin	34	20	59	0.02	44	IC	0	0
Benfluralin	15	0	0	0.05	1.9	FC	0	0
Bensulide	7	0	0	0.02	11	IC	0	0
Bifenthrin	30	7	23	0.001	0.0013	IC	5	17
Bromacil	7	0	0	0.02	6.8	NVA	0	0
Carbaryl	33	0	0	0.02	0.5	IC	0	0
Chlorantraniliprole	34	11	32	0.02	4.4	IC	0	0
Chlorpyrifos	34	0	0	0.02	0.04	IC	0	0
Clothianidin***	15	1	7	0.02	0.05	IC	NA***	NA
Cyfluthrin	30	0	0	0.002	0.0074	IC	0	0
Cypermethrin	30	0	0	0.005	0.069	IC	0	0
Cyprodinil	20	0	0	0.02	8	IC	0	0
Diazinon	34	0	0	0.02	0.105	IA	0	0
Diflubenzuron	34	0	0	0.02	0.00025	IC	0	0
Dimethoate	34	2	6	0.02	0.5	IC	0	0
Diuron	34	2	6	0.02	2.4	NVA	0	0
Esfenvalerate	30	0	0	0.005	0.017	IC	0	0
Ethalfluralin	15	0	0	0.05	0.4	FC	0	0
Ethoprop	7	0	0	0.02	0.8	IC	0	0
Etofenprox	7	0	0	0.02	0.17	IC	0	0
Hexazinone	7	0	0	0.02	7	NVA	0	0
Imidacloprid	34	3	9	0.01	0.01	IC	3	9
Indoxacarb	7	0	0	0.02	75	IC	0	0
Isoxaben	7	0	0	0.02	10	VA	0	0
Kresoxim-methyl	7	0	0	0.02	30.3	NVA	0	0
Lambda-cyhalothrin	30	3	10	0.002	0.002	IC	3	10
Malathion	34	0	0	0.02	0.049	IA	0	0
Methidathion	7	0	0	0.02	0.66	IC	0	0
Methomyl	7	0	0	0.02	0.7	IC	0	0
Methoxyfenozide	34	24	71	0.02	3.1	IC	0	0
Metribuzin	7	0	0	0.02	8.1	NVA	0	0
Norflurazon	7	0	0	0.02	9.7	NVA	0	0
Oryzalin	34	0	0	0.05	13	VA	0	0
Oxyfluorfen	15	3	20	0.05	0.29	NA	1	7
Pendimethalin	15	2	13	0.05	5.2	NVA	0	0
Permethrin	30	0	0	0.002	0.0014	IC	0	0
Prodiamine	15	0	0	0.05	1.5	IC	0	0

Pesticide	Sample Number	Detection Number	Detection frequency (%)	Reporting Limit (µg/L)	Lowest USEPA benchmark (BM) (µg/L)*	BM Type**	Number of BM exceed-ances	BM exceedance frequency (%)
Propanil	34	10	29	0.02	9.1	FC	0	0
Propargite	34	0	0	0.02	7	IA	0	0
Propiconazole	20	7	35	0.02	21	NVA	0	0
Pyraclostrobin	20	1	5	0.02	1.5	NVA	0	0
Pyriproxyfen	34	0	0	0.02	0.015	IC	0	0
Quinoxyfen	7	0	0	0.02	13	FC	0	0
Simazine	34	1	3	0.02	2.24	NVA	0	0
S-Metolachlor/Metolachlor	34	11	32	0.02	1	IC	0	0
Tebufenozide	7	0	0	0.02	29	IC	0	0
Thiamethoxam	14	0	0	0.02	0.74	IC	0	0
Thiobencarb	34	20	59	0.02	1	IC	6	18
Trifloxystrobin	34	0	0	0.02	2.76	IC	0	0

*Benchmarks are used as a screening tool for risk analysis

**FA, fish acute; FC, fish chronic; IA, invertebrate acute; IC, invertebrate chronic; NVA, non-vascular acute; VA, vascular acute

***Clothianidin detections are qualitative only

Table 2. Pesticides detected in sediment

Pesticide	Sample Number	Detection Number	Detection frequency (%)	LC_{50} (µg/g OC)*	Detection frequency (%) of sediments ≥ 1 TU*	MedianTUs*
Bifenthrin	5	2	40	0.52	20	0.64
Cyfluthrin	5	0	0	1.08	0	0
Cypermethrin	5	0	0	0.38	0	0
Esfenvalerate/fenvalerate	5	0	0	1.54	0	0
Lambda-cyhalothrin	5	0	0	0.45	0	0
Permethrin	5	0	0	10.83	0	0

*Sediment Toxicity Units (TUs) are calculated using the formula, use TU = C/1000/LC50 / % TOC, where C = concentration (µg/kg dry weight), LC50 (µg/kg) 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. One TU is equal to the LC50. If using other LC50 values, list value and reference

3. Tracking Benchmark Exceedances (BME) or Sediment Toxicity (TU)

For further data analysis: pesticides that have ≥ 10% aquatic benchmark exceedances [BME] or ≥ 1 sediment toxicity units [TU] for 3 consecutive years are recommended for further detailed data analysis (Ambient Urban Monitoring Methodology SOP METH014).

Table 3. BME (for pesticides with ≥ 10% BME) or median sediment TUs (for pesticides with ≥ 1 sediment TU) (all sites) for the past 3 years

Pesticide	Water	Sedi-ment	Currentyear (i)	i - 1	i - 2	Last written evaluation (reference)	Further data analysis (Y/N)
Bifenthrin	X		17	4.1	10		N
Lambda-cyhalothrin	X		10	12.5	0		N
Thiobencarb	X		18	25	0		N
Bifenthrin		X	20	33	NA		N

4. QC

Table 4. Laboratory Quality Control (QC) summary

QC Type	Water Samples Total Number	Water Samples Number of QC Out of Control	Sediment Samples Total Number	Sediment Samples Number of QC Out of Control
Lab Blanks	84	5	5	0
Matrix Spikes/Duplicates	84	0	5	0
Blind Spikes	0	0	0	0
Surrogate Spikes	5	0	0	0

Comments on out of control QC and interpretation of data: Carbaryl was detected in some of the lab blanks; the lab was aware of the problem and resolved the issue as the sampling season progressed. A carbaryl result for one ambient sample was included in this report due to the issue (Table 1)

5. Data: water quality, aquatic toxicity, and analytical chemistry results

Water quality data, aquatic toxicity data, and monitoring results are available upon request. Please contact the SURF database administrator (https://www.cdpr.ca.gov/docs/emon/surfwtr/surfdata.htm) or Project Lead for the data.