DEPARTMENT OF PESTICIDE REGULATION (DPR) Date: January 7, 2026

SURFACE WATER AMBIENT MONITORING REPORT

1. Study Highlights

- DPR Study Number 310
- SURF (Surface Water Database) Study Number 658
- Study Title Surface Water Monitoring for Pesticides in Agricultural Areas of Northern California, 2024
- Project Lead Mason Zoerner
- Email mason.zoerner@cdpr.ca.gov
- Protocol Source (*protocol available online for five years, thereafter, request a copy from the SWPP list of archived files)* Environmental Monitoring Protocol Page

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- Study Area

  County: Butte, Colusa, Merced, Stanislaus, Sutter, Yolo

  Waterbody/Watershed: Butte Creek, Lower Logan Creek, Willow Creek, Clarks Ditch-Colusa Basin Drain, 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

  ☒ Creek ☐ River ☐ Pond ☐ Lake

  ☒ Drainage Ditch ☐ Storm drain outfall ☐ Other Enter other type

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- Objectives

1) Determine the presence and concentrations of selected pesticides in surface waters and sediments collected from selected sites; 2) Assess potential impacts to aquatic organisms by comparing measured pesticide concentrations to USEPA aquatic life benchmarks; 3) Determine the toxicity of collected water samples using toxicity tests conducted on representative test organisms, *Hyalella azteca* and *Chironomus dilutus*; 4) Evaluate spatial correlations between observed pesticide concentrations/detection frequencies and region-specific pesticide use data; and 5) Analyze patterns and trends in pesticide concentrations.

- Sampling Period January 2024 to December 2024

- Major Findings

INSECTICIDES IN WATER: Overall, the most frequently detected insecticidal active ingredients (AIs) were as follows: methoxyfenozide (81%), chlorantraniliprole (50%), bifenthrin (30%), permethrin (17%),

lambda-cyhalothrin (10%), and diflubenzuron (10%). Insecticides with < 10% detection frequencies (DFs) include imidacloprid, cypermethrin, dinotefuran. Other monitored insecticides were not detected in any samples collected during 2024. Insecticides with exceedance frequencies (EF %) of their lowest USEPA aquatic life benchmarks (BMs) included bifenthrin (30%), permethrin (12%), lambda cyhalothrin (10%), diflubenzuron (10%), imidacloprid (7%), clothianidin (5%), and cypermethrin (5%).

HERBICIDES AND FUNGICIDES IN WATER: Listed by greatest detection frequency (DF %), herbicides that were detected included glyphosate (100%), thiobencarb (33%), S-metalachlor (29%), propanil (26%), hexazinone (30%), diuron (17%). glufosinate (17%), and simazine (5%). Herbicides that exceeded aquatic life BMs included S-metalachlor (2%) and diuron (2%). Fungicides detected in 2024 included azoxystrobin (79%) and propiconazole (38%). There were no fungicide concentrations that exceeded aquatic life BMs. Other monitored herbicides and fungicides were not detected in any sample collected in 2024.

PYRETHROIDS IN SEDIMENT: Five sediment samples were collected in September 2024 from the Sacramento and San Joaquin Valleys. Samples were screened for bifenthrin, cyfluthrin, cypermethrin, esfenvalerate, lambda-cyhalothrin, and permethrin. The DF of bifenthrin was 40%, while the DFs of lambda-cyhalothrin and permethrin were 20%. However, none of the detections exceeded sediment LC_{50} benchmark values. Other pyrethroids were not detected in any sediment samples collected during the sampling year.

TOXICITY: Fifty-four samples were used for toxicity testing. The 96-hour toxicity tests were conducted on an acute exposure basis, measuring survival of test organisms, *Hyalella azteca* and *Chironomus dilutus*. Survival decreased to a statistically significant degree when compared to laboratory controls in 7% of tests on *H. azteca*. However, survival was not significantly affected on any of the tests on *C. dilutus*.

- Recommendations for pesticides that need a California Department of Food and Agriculture (CDFA) analytical method; recommendations based on the Surface Water Monitoring Prioritization model (SWMP):

  None.

2. Pesticide Detection Frequency

Data available in SURF upon yearly update. Contact Project Lead for data not yet uploaded. In SURF, use "SURF Study Number" (Section 1) to obtain the data.

Table 1. Pesticide detections in water

Pesticide	Sample Number	Detection Number	Detection Frequency (%)	Minimum Reporting Limit (µg/L)	Lowest USEPA Benchmark (BM) (µg/L)[1]	BM[2]	Number of BM Exceed-ances	BM Exceedance Frequency (%)
Abamectin	42	0	0.0	0.02	0.17	FIA	0	0.0
Acetamiprid	45	0	0.0	0.02	2.1	FIC	0	0.0

Pesticide	Sample Number	Detection Number	Detection Frequency (%)	Minimum Reporting Limit (µg/L)	Lowest USEPA Benchmark (BM) (µg/L)[1]	BM[2]	Number of BM Exceed-ances	BM Exceedance Frequency (%)
AMPA	30	28	93.3	0.2	249500	FA	0	0.0
Atrazine	42	0	0.0	0.02	1	NVA	0	0.0
Azoxystrobin	42	33	78.6	0.02	20	NVC	0	0.0
Benfluralin	4	0	0.0	0.05	1.9	FVC	0	0.0
Bensulide	42	0	0.0	0.02	11	FIC	0	0.0
Bifenthrin	23	7	30.4	0.001	0.00005	FIC	7	30.4
Boscalid	42	1	2.4	0.02	116	FVC	0	0.0
Bromacil	42	0	0.0	0.02	1.1	NVC	0	0.0
Carbaryl	42	0	0.0	0.02	0.5	FIC	0	0.0
Chlorantraniliprole	36	18	50.0	0.02	3.02	FIC	0	0.0
Chlorfenapyr	7	0	0.0	0.1	2.915	FIA	0	0.0
Chlorpyrifos	42	0	0.0	0.02	0.04	FIC	0	0.0
Clothianidin	39	2	5.1	0.02	0.05	FIC	2	5.1
Cyfluthrin	26	0	0.0	0.002	0.00012	FIC	0	0.0
Cypermethrin	20	1	5.0	0.005	0.195	FA	1	5.0
Cypermethrin	20	1	5.0	0.005	0.00005	FIC	1	5.0
Cypermethrin	20	1	5.0	0.005	0.00005	FIC	0	0.0
Cypermethrin	20	1	5.0	0.005	0.195	FA	0	0.0
Cyprodinil	42	0	0.0	0.02	8.2	FIC	0	0.0
Deltamethrin	32	0	0.0	0.004	0.000026	FIC	0	0.0
Desulfinyl Fipronil	42	0	0.0	0.01	0.53	FVC	0	0.0
Desulfinyl Fipronil Amide	42	0	0.0	0.01		(no BM)	0	0.0
Diazinon	42	0	0.0	0.02	0.105	FIA	0	0.0
Diflubenzuron	42	4	9.5	0.02	0.00025	FIC	4	9.5
Dimethoate	42	0	0.0	0.02	0.5	FIC	0	0.0
Dinotefuran	36	1	2.8	0.02	6360	FVC	0	0.0
Diuron	42	7	16.7	0.02	0.83	FIC	1	2.4
Esfenvalerate	20	0	0.0	0.005	0.0000309	FIC	0	0.0
Ethalfluralin	4	0	0.0	0.05	0.4	FVC	0	0.0
Ethoprop	42	0	0.0	0.02	0.8	FIC	0	0.0
Etofenprox	42	0	0.0	0.02	0.17	FIC	0	0.0
Fenamidone	42	0	0.0	0.02	4.7	FVC	0	0.0
Fenhexamid	36	0	0.0	0.02	101	FVC	0	0.0
Fenpropathrin	20	0	0.0	0.005	0.0015	FIC	0	0.0
Fipronil	42	0	0.0	0.01	0.011	FIC	0	0.0
Fipronil Amide	42	0	0.0	0.01		(no BM)	0	0.0
Fipronil Sulfide	42	0	0.0	0.01		(no BM)	0	0.0
Fipronil Sulfone	42	0	0.0	0.01	0.22	FIC	0	0.0
Fludioxonil	42	0	0.0	0.02	4.66	NVC	0	0.0
Glufosinate	30	5	16.7	0.07	41	NVC	0	0.0

Pesticide	Sample Number	Detection Number	Detection Frequency (%)	Minimum Reporting Limit (µg/L)	Lowest USEPA Benchmark (BM) (µg/L)[1]	BM[2]	Number of BM Exceed-ances	BM Exceedance Frequency (%)
Imidacloprid	45	3	6.7	0.01	0.01	FIC	3	6.7
Indoxacarb	42	0	0.0	0.02	75	FIC	0	0.0
Isoxaben	42	0	0.0	0.02	6	VPC	0	0.0
Kresoxim-methyl	42	0	0.0	0.02	12	NVC	0	0.0
Lambda-cyhalothrin	20	2	10.0	0.002	0.00004	FIA	2	10.00
Malathion	42	0	0.0	0.02	0.049	FIA	0	0.0
Mefenoxam	42	0	0.0	0.02	1200	FIC	0	0.0
Methidathion	42	0	0.0	0.02	0.66	FIC	0	0.0
Methomyl	42	0	0.0	0.02	0.7	FIC	0	0.0
Methoxyfenozide	42	34	81.0	0.02	3.1	FIC	0	0.0
Metribuzin	42	0	0.0	0.02	2.3	NVC	0	0.0
Norflurazon	42	0	0.0	0.02	5.33	NVC	0	0.0
Oryzalin	42	0	0.0	0.02	13	VPA	0	0.0
Oxadiazon	42	0	0.0	0.02	0.88	FVC	0	0.0
Oxyfluorfen	7	0	0.0	0.05	0.33	VPA	0	0.0
Pendimethalin	7	0	0.0	0.05	0.7	NVC	0	0.0
Permethrin	17	3	17.7	0.001	0.0033	FIA	2	11.8
Prodiamine	7	0	0.0	0.05	1.5	FIC	0	0.0
Prometon	42	0	0.0	0.02	32	NVC	0	0.0
Prometryn	42	0	0.0	0.02	0.288	NVC	0	0.0
Propanil	42	11	26.2	0.02	2.4	FVC	0	0.0
Propargite	42	0	0.0	0.02	1.27	NVC	0	0.0
Propiconazole	42	16	38.1	0.02	15	FVC	0	0.0
Pyraclostrobin	42	0	0.0	0.02	1.18	NVC	0	0.0
Pyriproxyfen	42	0	0.0	0.015	0.015	FIC	0	0.0
Quinoxyfen	42	0	0.0	0.02	13	FVC	0	0.0
Simazine	42	2	4.8	0.02	6	NVA	0	0.0
S-Metolachlor	42	12	28.6	0.02	8	NVA	1	2.4
Sulfoxaflor	36	0	0.0	0.02	660	FVC	0	0.0
Tebuconazole	42	0	0.0	0.02	11	FVC	0	0.0
Tebufenozide	42	0	0.0	0.02	29	FIC	0	0.0
Tebuthiuron	42	0	0.0	0.02	13	NVC	0	0.0
Thiabendazole	36	0	0.0	0.02	42	FIC	0	0.0
Thiacloprid	45	0	0.0	0.02	0.97	FIC	0	0.0
Thiamethoxam	45	2	4.4	0.02	0.74	FIC	0	0.0
Thiobencarb	42	14	33.3	0.02	1	FIC	0	0.0
Trifloxystrobin	42	0	0.0	0.02	2.76	FIC	0	0.0
Trifluralin	4	0	0.0	0.05	1.9	FVC	0	0.0

[1] Benchmarks from freshwater organisms are used as a screening tool for relative toxicity

[2] FVA, fish acute; FVC, fish chronic; FIA, invertebrate acute; FIC, invertebrate chronic; NVA, non-vascular acute; NVC, non-vascular chronic; VPA, vascular plant acute; VPC, vascular plant chronic

Table 2. Pesticide detections in sediment

Pesticide	Sample Number	Detection Number	Detection Frequency (%)	LC_{50} (µg/kg OC)*	Detection Frequency > LC_{50} (%)
Bifenthrin	5	2	40.0	520	0
Cyfluthrin	5	0	0.0	1080	0
Cypermethrin	5	0	0.0	380	0
Esfenvalerate	5	0	0.0	790	0
Fenpropathrin	5	1	20.0	1540	0
Lambda-cyhalothrin	5	0	0.0	no BM	0
Permethrin	5	1	20.0	450	0

* LC_{50} is derived from 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)

3. Tracking Exceedances of Aquatic Benchmarks or Sediment LC_{50} values

For further data analysis: pesticides that have ≥ 10% aquatic benchmark exceedance rate or exceed their OC normalized sediment LC_{50} for three consecutive years are recommended for further detailed data analysis if no analysis has been complete in the past five years (Ambient Urban Monitoring Methodology SOP METH014).

Table 3. Pesticides with three consecutive years of either 1) ≥ 10% of their detections exceeding their lowest USEPA aquatic life water benchmark or 2) percentage of sediment detections exceeding their sediment LC_{50} (normalized to OC)

Pesticide	Matrix	Current Year (2024)	2023	2022	Last Written Evaluation (Reference)	Further Data Analysis (Y/N)
Bifenthrin	Water	30	13	22	Deng et al. 2019	Y

4. Quality Control

Table 4. Laboratory Quality Control (QC) data flag summary*

Lab QC	Matrix	Total Samples	H	L	E	O	R
Lab Blank	Sediment	10	-	-	-	-	-
Matrix Spike	Sediment	10	-	-	-	-	-
Field Matrix Spike	Water	79	-	-	13	-	1
Field Matrix Spike Duplicate	Water	79	-	-	13	-	1
Lab Blank	Water	643	-	-	-	-	-
Matrix Spike	Water	643	-	-	99	3	20
Surrogate Spike	Water	162	-	-	35	9	-

*Note: "H" = Analysis performed beyond holding times; "L" = Trace level contamination detected in LabBlank; "E" = Matrix spike is out of established control limits; "O" = Matrix spike is out of ongoing control limits; "R" = Matrix spike out of 50-150% recovery, data not acceptable for SURF upload (Table 5)

Table 5. "R" flagged data. Recoveries for these matrix spikes are outside of acceptable QC limits. These matrix spikes potentially affected the analytical results of 20 total samples for their respective AIs. Associated R flag data is not included in this report and will not be uploaded into SURF.

Pesticide	Number R Flags
Benfluralin	1
Bifenthrin	2
Chlorantraniliprole	1
Cyfluthrin	1
Cypermethrin	2
Dinotefuran	1
Esfenvalerate	2
Ethalfluralin	1
Fenhexamid	1
Fenpropathrin	2
Lambda Cyhalothrin	2
Permethrin	2
Thiabendazole	1
Trifluralin	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 Project Lead or SURF database administrator for the data.