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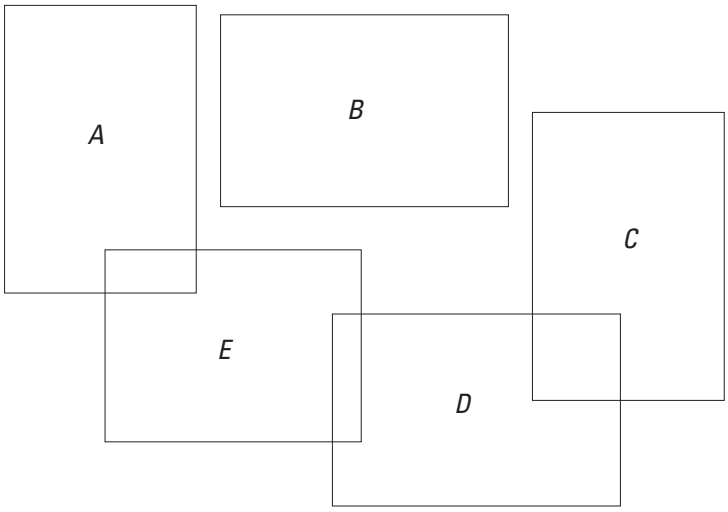
Detections of Current-Use Pesticides at 12 Surface Water Sites in California During a 2-Year Period Beginning in 2015

Data Series 1088

U.S. Department of the Interior
U.S. Geological Survey



Cover photographs:
A, SNAKE R A NUESTRO RD NR SUTTER CA. Photo taken August 22, 2016, by Jim Orlando, USGS.
B, ALISAL C A LA GUARDIA ST NR SALINAS CA, view looking upstream. Photo taken April 28, 2016, by Jim Orlando, USGS.
C, INGRAM C A RIVER RD NR PATTERSON CA, looking downstream during storm runoff. Photo taken January 19, 2016, by Jim Orlando, USGS.
D, KINGS R A EMPIRE WEIR 2 A STRATFORD CA. Photo taken April 14, 2015, by Central Valley Regional Water Quality Control Board personnel.
E, UNNAMED TRIB TO ALDER C A IRON POINT RD NR FOLSOM CA, sampling storm runoff by USGS personnel. Photo taken November 2, 2015, by Jim Orlando, USGS.
See figure 1 for locations.

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U.S. Department of the Interior
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U.S. Geological Survey
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Conversion Factors, Datums, and Water-Quality Units

International System of Units to U.S. customery units

Multiply	By	To obtain
	Length	
millimeter (mm)	0.3937	inch (in.)
micrometer (µm)	$3.937e^{-5}$	inch (in.)
meter (m)	3.281	foot (ft)
kilometer (km)	0.6214	mile (mi)
	Area	
square kilometer (km^2)	0.3861	square mile (mi^2)
	Volume	
microliter (µL)	$3.3814e^{-5}$	ounce, fluid (fl. oz)
milliliter (mL)	0.033814	ounce, fluid (fl. oz)
liter (L)	33.814	ounce, fluid (fl. oz)
	Flow rate	
cubic meter per second (m^3/s)	35.31	cubic foot per second (ft^3/s)
milliliter per minute (mL/min)	$3.53147e^{-5}$	cubic foot per minute (ft^3/min)
	Mass	
kilogram (kg)	2.20462	pounds (lbs)
gram (g)	0.03527	ounce avoirdupois (oz)
milligram (mg)	$3.527e^{-5}$	ounce avoirdupois (oz)
nanogram (ng)	$3.527e^{-11}$	ounce avoirdupois (oz)

Temperature in degrees Celsius (°C) may be converted to degrees Fahrenheit (°F) as follows:

$$°F = (1.8 \times °C) + 32.$$

Supplemental Information

Concentrations of chemical constituents in water and suspended sediment are given in nanograms per liter (ng/L). Suspended sediment samples are reported using the volume of water they are filtered from. (Each water sample is associated with a suspended sediment sample, and that volume of water is used to report both values.

Abbreviations

CDPR	California Department of Pesticide Regulation
DCM	dichloromethane
EPA	U.S. Environmental Protection Agency
EtOAc	ethyl acetate
GC/MS	gas chromatography/mass spectrometry
LC/MS/MS	liquid chromatography/tandem mass spectrometry
PFRG	Pesticide Fate Research Group
QAPP	Quality Assurance Project Plan
SPE	solid phase extraction
USGS	U.S. Geological Survey

Detections of Current-Use Pesticides at 12 Surface Water Sites in California During a 2-Year Period Beginning in 2015

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Abstract

Surface water samples were collected by the U.S. Geological Survey and multiple cooperators during base flow/irrigation runoff and storm runoff conditions from 12 sites throughout California, over 2 consecutive years beginning in April 2015, from both urban and agriculturally dominated watersheds. Water samples were analyzed by gas chromatography/mass spectrometry and liquid chromatrography/tandem mass spectrometry for a suite of 157 pesticides and degradates. Suspended sediments associated with these water samples were analyzed by gas chromatography/mass spectrometry for a suite of 131 pesticides and degradates. Overall, 85 pesticides and degradates were detected in the water: 32 fungicides, 25 herbicides, 27 insecticides, and 1 synergist. In the suspended sediment, 29 pesticides were detected: 9 fungicides, 10 herbicides, and 10 insecticides. Sixteen pesticides (bifenthrin, carbendazim, chlorpyrifos, clothianidin, diazinon, diuron, fenpyroximate, fipronil, fipronil sulfone, fluopicolide, imidacloprid, metolachlor, novaluron, oxyflurofen, permethrin, and simazine) were detected in the water at concentrations that were above at least one aquatic life benchmark value as defined by the U.S Environmental Protection Agency.

Introduction

This study was designed to characterize the mixtures of a large suite of current-use pesticides and pesticide degradates in surface water and associated suspended sediments present in both agricultural and urban sites throughout California. Pesticides are used in California in both urban and agricultural settings and are routinely detected in surface water. In 2014, nearly 190 million pounds of pesticide active ingredients were reported as used in California (California Department of Pesticide Regulation, 2017).

The California State Water Resources Control Board and Regional Water Quality Control Board have placed 1,162 streams and rivers within California on the 303(d) list, indicating "impaired waters," as designated under the Federal Clean Water Act. Of these, 290 are listed as impaired due to pesticides (State Water Resources Control Board, 2012). These designations have prompted many studies of surface waters in California, and these studies have often shown an even greater need for further study in the region. A previous study by the California Department of Pesticide Regulation examined surface-water-quality monitoring data collected between 1991 and 2010 for pesticides and compared these data to U.S. Environmental Protection Agency (EPA) aquatic life benchmarks. Numerous pesticides were detected in both agricultural and urban sites at concentrations above EPA benchmarks, including diazinon, chlorpyrifos, bifenthrin, and fipronil (Starner and Zhang, 2011). A more recent study, conducted over 2 years starting in 2012 by the U.S. Geological Survey (USGS) Pesticide Fate Research Group (PFRG), detected over 30 pesticides in water samples from just two sites in California (Orlando and others, 2014). Studies such as these have shown the need for a project of larger scope, incorporating more sites and samples across a wider area of California (with equal representation of urban and agriculturally dominated watersheds) with analysis of more current-use pesticides. To address the identified needs, the USGS began the current study in cooperation with the Central Valley Regional Water Quality Control Board; San Francisco Bay Regional Water Quality Control Board; Central Coast Regional Water Quality Control Board; San Diego Regional Water Quality Control Board; California Department of Pesticide Regulation; Irrigated Lands Regulatory Program; and the University of California, Davis. This study sampled surface water from both urban and agricultural streams over a 2-year period starting in April of 2015, and these water samples were analyzed for 157 pesticides and degradates by the USGS PFRG.

Purpose and Scope

This report details the study design, field and laboratory methods, and describes pesticide concentrations in surface water from both urban and agricultural sites across California during wet and dry seasons over a 2-year study period.

Study Design

Surface water samples were collected from 12 sites throughout California. Sampling sites were chosen to be representative of either urban or agricultural land use (six sites

Albers Equal-Area Conic projection, North American Datum of 1983

Figure 1. Twelve agricultural and urban surface water sites sampled during 2015–17 in California.

each; fig. 1). Initially, several State agencies that conduct water-quality monitoring were contacted (Department of Pesticide Regulation, Surface Water Ambient Monitoring Program, and various State Water Resources Control Board regional offices) to provide lists of sampling sites that were to be monitored for pesticides and toxicity in 2015 and 2016. These lists were then compiled and the final list of 12 sites selected based on the following criteria: (1) amount of urban or agricultural land use within the upstream watershed; (2) historical data, which indicated pesticide toxicity at the site; (3) 303(d) or other regulatory listings for the waterbody; and (4) recent pesticide usage data (table 1).

Just as the sites were chosen to be representative of both agricultural and urban sites, the sampling dates were chosen to be representative of both wet and dry seasons. Exact sample timing was at the discretion of the cooperating entity and coincided with either the collection of samples for other studies or long-term monitoring projects. The USGS PFRG provided all needed supplies to the cooperators. At several sites, toxicity samples were also collected in conjunction with the pesticide samples; however, these results are not the focus of this report and are therefore not included in this dataset.

Site Descriptions

Sampling sites representative of either primarily agricultural or urban land uses (six sites each) were located throughout California (fig. 1). Agricultural sites were chosen to represent the wide variety of crops grown in California, whereas specific urban sites were chosen to represent varying degrees of age and density of urban development. In general, sampling sites were on small agricultural drainage channels or urban streams (channel capacities estimated to be less than 250 cubic feet per second).

Agricultural Watersheds

Alisal Creek at La Guardia Street near Salinas, CA

Samples were collected from a manmade drainage channel in an area of intense agricultural land use (fig. 2). The site is on the eastern edge of the town of Salinas, California, upstream of any major urban land use (fig. 1), but does receive runoff from industrial farm produce-processing operations. The contributing watershed upstream of this site is just under 40 square miles (mi^2), and land use is approximately 30 percent agricultural (National Land Cover Database, 2011; table 1). The primary crops grown in this watershed are strawberries and vegetables (U.S. Department of Agriculture, 2016). Runoff passing this site eventually enters the Pacific Ocean through Elkhorn Slough at the Elkhorn Slough National Estuarine Research Reserve (not shown on fig. 1).

Photograph by Jim Orlando, U.S. Geological Survey, April 28, 2016

Figure 2. Alisal Creek at La Guardia Street near Salinas, CA, sampling site location.

French Camp Slough at Airport Way near Stockton, CA

Samples were collected from a leveed channel near the town of French Camp, Calif. (fig. 3). The contributing watershed upstream of this site is approximately 385 mi^2 and drains primarily agricultural lands in the eastern parts of San Joaquin and Stanislaus Counties (fig. 1). Land use in the watershed is approximately 41 percent agricultural (National Land Cover Database, 2011; table 1). The primary crops grown in this watershed are almonds, walnuts, grapes, and alfalfa (U.S. Department of Agriculture, 2016). Approximately 5 miles (mi) downstream of the sampling site, French Camp Slough (not shown on fig. 1) drains into the San Joaquin River and the Sacramento–San Joaquin Delta.

Photograph by Jim Orlando, U.S. Geological Survey, July 12, 2016

Figure 3. French Camp Slough at Airport Way near Stockton, CA, sampling site location.

Table 1. Sampling site and watershed characteristics data.

[Data from U.S. Census Bureau, 2008, 2011. Horizontal datum is North American Datum of 1983. **Abbreviations**: CA, California; Dr, Drive; lbs, pounds; mi², square mile; Rd, Road; St, Street; USGS, U.S. Geological Survey]

USGS station number	USGS station name	Latitude	Longitude	Watershed area (mi²)	Site type	Urban area (mi²)	Agricultural area (mi²)	Other area (mi²)
363925121364701	Alisal Creek at La Guardia St near Salinas, CA	36.65694	–121.61306	37.7	Agricultural	4.0	11.1	22.5
375252121145401	French Camp Slough at Airport Way near Stockton, CA	37.88104	–121.24939	385.1	Agricultural	17.7	156.8	210.6
373747121125200	Ingram Creek at River Rd near Patterson, CA	37.60049	–121.22466	30.6	Agricultural	1.1	9.8	19.7
361044119500101	Kings River at Empire Weir 2 at Stratford, CA	36.17889	–119.83361	1,989.8	Agricultural	35.4	201.5	1,752.8
332455117090701	Rainbow Creek at Huffstatler St at Rainbow, CA	33.41528	–117.15194	6.8	Agricultural	1.3	0.2	5.3
391107121421201	Snake River at Nuestro Rd near Sutter, CA	39.18528	–121.70333	48.5	Agricultural	2.2	36.3	10.0
384755121205201	Pleasant Grove Creek at Crocker Ranch Rd near Roseville, CA	38.79861	–121.34778	16.6	Urban	12.9	0.6	3.1
333018117423301	Salt Creek at Niguel Rd at Laguna Niguel, CA	33.50500	–117.70917	2.2	Urban	1.7	0.0	0.5
351436120405201	San Luis Obispo Creek at Los Osos Valley Rd near San Luis Obispo, CA	35.24333	–120.68111	41.4	Urban	9.3	1.6	30.5
372004122035201	Stevens Creek at Barranca Dr at Monta Vista, CA	37.33444	–122.06444	19.7	Urban	2.6	0.0	17.2
323932117023201	Sweetwater River at Willow St at Chula Vista, CA	32.65861	–117.04222	206.2	Urban	50.3	0.4	155.5
383844121084001	Unnamed Tributary to Alder Creek at Iron Point Rd near Folsom, CA	38.64556	–121.14444	0.4	Urban	0.4	0.0	0.0

USGS station number	USGS station name	Urban area (percent)	Agricultural area (percent)	Other area (percent)	Population 2000	Population 2010	Population density 2010 (persons per mi²)	Pesticide application 2014 (lbs)
363925121364701	Alisal Creek at La Guardia St near Salinas, CA	10.7	29.6	59.7	1,054	947	25	133,927
375252121145401	French Camp Slough at Airport Way near Stockton, CA	4.6	40.7	54.7	18,481	20,056	52	415,405
373747121125200	Ingram Creek at River Rd near Patterson, CA	3.7	31.9	64.4	124	128	4	30,685
361044119500101	Kings River at Empire Weir 2 at Stratford, CA	1.8	10.1	88.1	76,693	89,556	45	881,707
332455117090701	Rainbow Creek at Huffstatler St at Rainbow, CA	19.3	2.7	78.0	593	699	103	2,027
391107121421201	Snake River at Nuestro Rd near Sutter, CA	4.6	74.9	20.5	2,143	2,555	53	88,362
384755121205201	Pleasant Grove Creek at Crocker Ranch Rd near Roseville, CA	77.7	3.9	18.4	20,580	50,993	3,075	6,238
333018117423301	Salt Creek at Niguel Rd at Laguna Niguel, CA	77.8	0.0	22.3	10,965	10,711	4,913	684
351436120405201	San Luis Obispo Creek at Los Osos Valley Rd near San Luis Obispo, CA	22.5	3.9	73.6	37,845	41,557	1,003	2,246
372004122035201	Stevens Creek at Barranca Dr at Monta Vista, CA	12.9	0.0	87.0	6,334	6,725	341	1,176
323932117023201	Sweetwater River at Willow St at Chula Vista, CA	24.4	0.2	75.4	159,977	168,081	815	17,957
383844121084001	Unnamed Tributary to Alder Creek at Iron Point Rd near Folsom, CA	98.5	0.0	1.1	1,146	2,063	5,546	210

Ingram Creek at River Road near Patterson, CA

At this site, samples were collected from a small agricultural drainage ditch in western Stanislaus County (figs. 1, 4). The watershed for this site is approximately 31 mi^2 and is 32 percent agricultural (table 1). However, streamflow originating in the western uplands part of the watershed reaches the sampling site only during extremely high storm runoff conditions, which did not occur during the sampling period. Streamflow at the sampling site during the study period consisted primarily of surface runoff and subsurface tile drainage from adjacent agricultural lands. The effective watershed for this site is almost entirely agricultural, and the primary crops grown in this watershed are almonds, walnuts, beans, and tomatoes (U.S. Department of Agriculture, 2016. Approximately 2 mi downstream of the sampling site, Ingram Creek drains into the San Joaquin River, which then flows north to the Sacramento–San Joaquin Delta.

Photograph by Jim Orlando, U.S. Geological Survey, July 12, 2016

Figure 4. Ingram Creek at River Road near Patterson, CA, sampling site location.

Kings River at Empire Weir 2 at Stratford, CA

Samples were collected at this site from a large manmade channel immediately upstream of an irrigation control structure (Empire Weir 2) on the Kings River in the southern part of California's Central Valley (figs. 1, 5). The natural hydrology of this region has been extensively modified to provide water for irrigation and flood control (ECORP Consulting, 2007). As a result, inputs and diversions influencing streamflow at this sampling site vary throughout the year, which makes it difficult to determine sources of potential contaminants. Given those uncertainties, the potentially contributing watershed upstream of the sampling site is just under 2,000 mi^2 (table 1). Despite the fact that this watershed is just over 10 percent agricultural, the regions immediately upstream of the sampling site are predominantly agricultural, which is why this site is categorized as such. The primary crops grown in this watershed are grapes, almonds, alfalfa, walnuts, oranges, pistachios, and cotton (U.S. Department of Agriculture, 2016).

Photograph by Central Valley Regional Water Quality Control Board personnel, April 13, 2015

Figure 5. Kings River at Empire Weir 2 at Stratford, CA, sampling site location.

Rainbow Creek at Huffstatler Street at Rainbow, CA

This site was specifically selected because it receives runoff from a large number of plant nursery operations (indoor and outdoor). Samples were collected at this site from a small concrete-lined channel near Rainbow, Calif. (fig. 6). The upstream watershed for this site is just under 7 mi^2 (table 1). Land use in the watershed is classified as mostly urban; however, most of this built-up area consists of plant nursery facilities.

Photograph taken by Jim Orlando, U.S. Geological Survey, August 7, 2016

Figure 6. Rainbow Creek at Huffstatler Street at Rainbow, CA, sampling site location.

Snake River at Nuestro Road near Sutter, CA

At this site, water samples were collected from an approximately 40-foot-wide agricultural drainage ditch near Sutter, Calif. (figs. 1, 7). The watershed for this site is just over 48 mi^2 and consists primarily of agricultural lands (table 1). Streamflow at this site consists entirely of agricultural drainage water. The primary crops grown in this watershed are rice, almonds, walnuts, and prunes (U.S. Department of Agriculture, 2016). Water passing this site eventually makes its way into the Sacramento–San Joaquin Delta via the Sacramento River and Sutter Bypass.

Photograph by Jim Orlando, U.S. Geological Survey, August 22, 2016

Figure 7. Snake River at Nuestro Road near Sutter, CA, sampling site location.

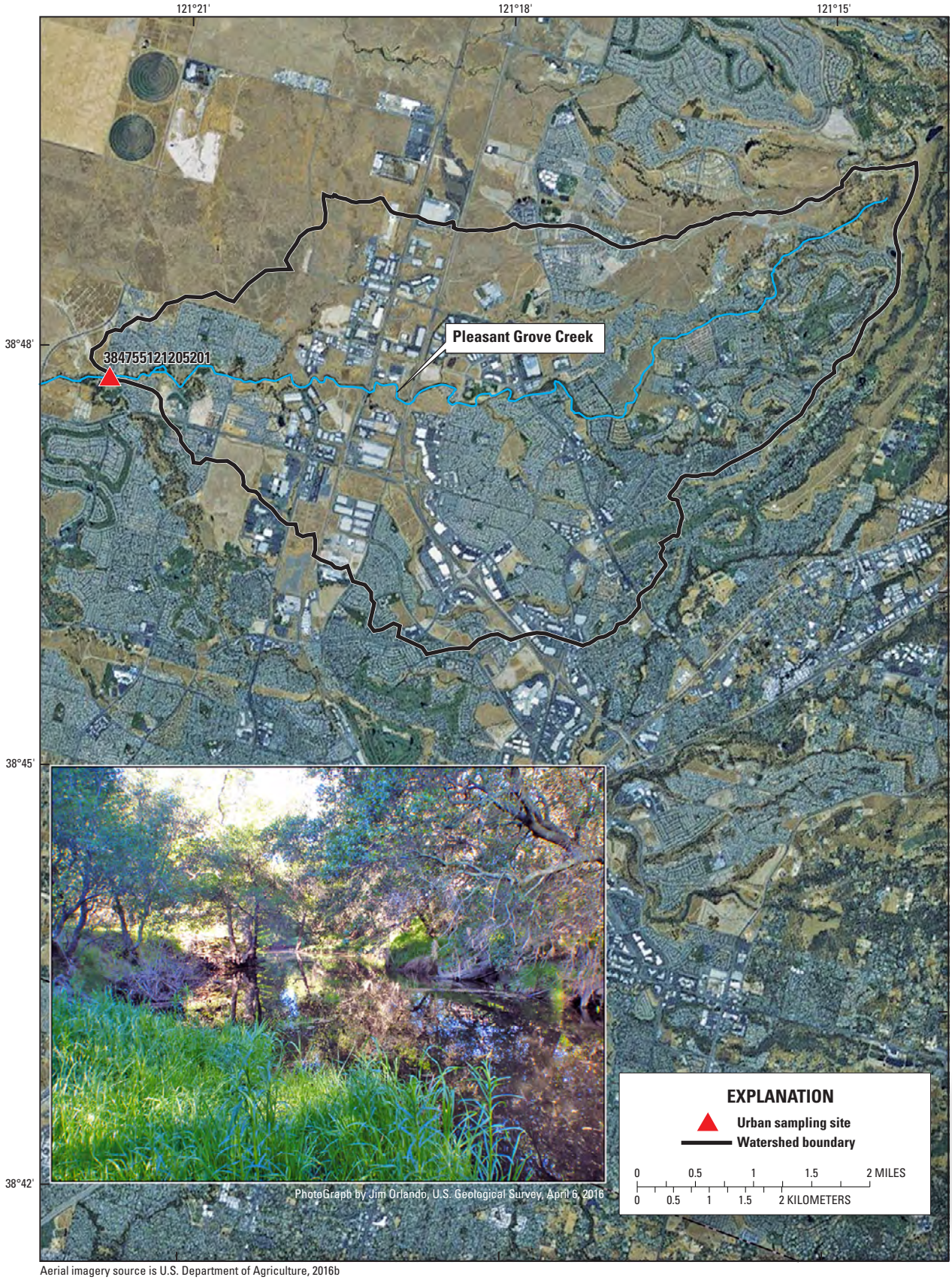
Urban Watersheds

Pleasant Grove Creek at Crocker Ranch Road near Roseville, CA

This sampling site is in a greenbelt area immediately downstream of a large residential area (fig. 8). The contributing watershed area is just over 16 mi^2 and is nearly 78 percent urban (table 1). Urbanization within this watershed is relatively recent with the population increasing by nearly 150 percent from 2000 to 2010 (U.S. Census Bureau, 2008, 2011; table 1). Population density based on the 2010 census data for this watershed is just over 3,000 persons per mi^2. Water passing this site eventually makes its way into the Sacramento–San Joaquin Delta via the Sacramento River.

Salt Creek at Niguel Road at Laguna Niguel, CA

This sampling site is in a greenbelt area immediately downstream of a large residential area in Orange County, Calif. (figs. 1, 9) The contributing watershed area is just under 2 mi^2 and is nearly 78 percent urban (table 1). Urbanization within this watershed occurred prior to 2000, and the population was nearly unchanged from 2000 to 2010 (U.S. Census Bureau, 2008, 2011; table 1). Population density based on the 2010 census data for this watershed is nearly 5,000 persons per mi^2. Water passing this site enters the Pacific Ocean approximately 2 mi downstream of the sampling site.



Aerial imagery source is U.S. Department of Agriculture, 2016b

Figure 8. View of Pleasant Grove Creek at Crocker Ranch Road near Roseville, CA, watershed and sampling site location.

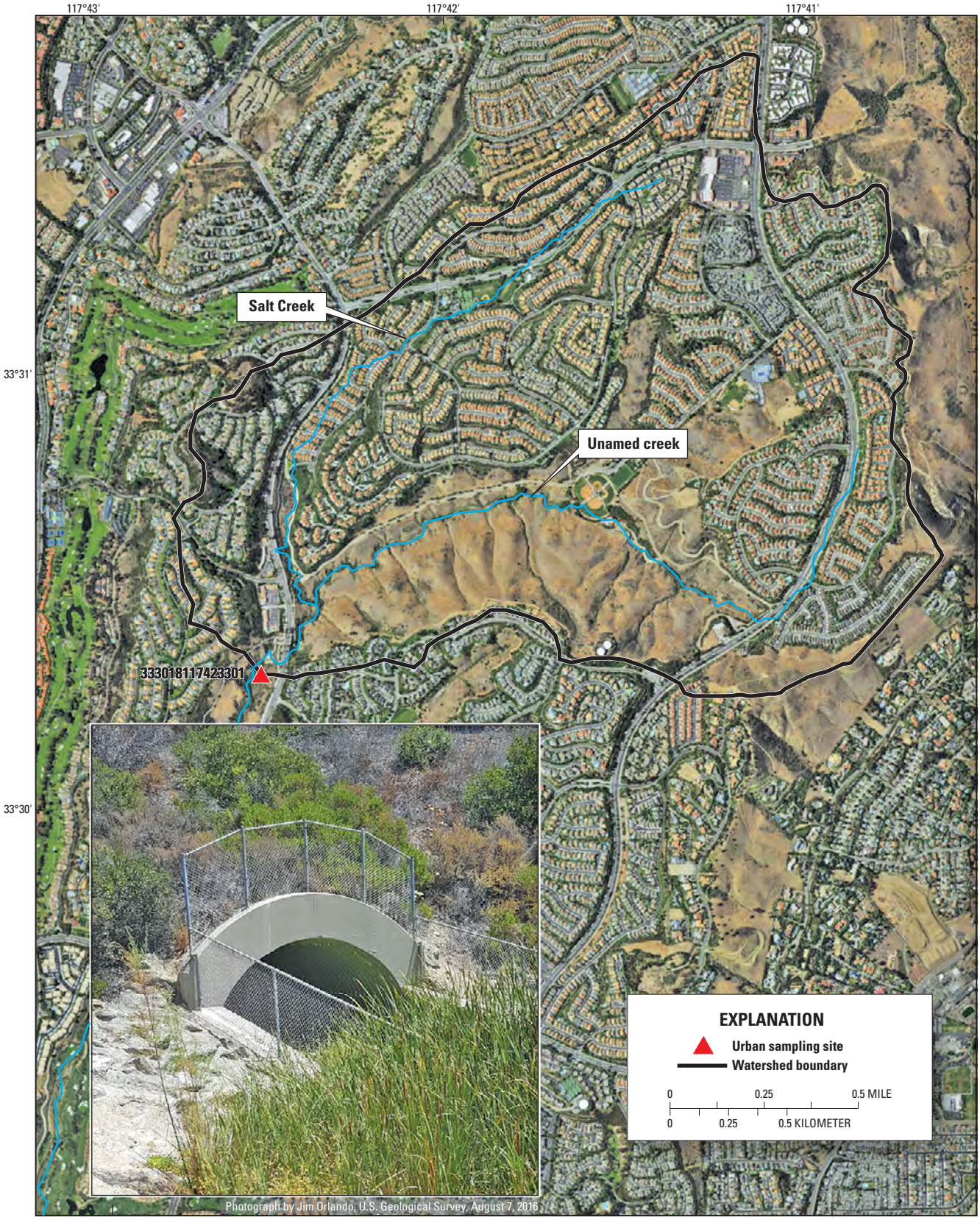


Figure 9. View of Salt Creek at Niguel Road at Laguna Niguel, CA, watershed and sampling site location.

San Luis Obispo Creek at Los Osos Valley Road near San Luis Obispo, CA

This sampling site is immediately downstream of the town of San Luis Obispo, Calif., and receives treated effluent from the city's wastewater treatment facility (figs. 1, 10). The watershed upstream of this site is just over 41 mi^2 and is about 22 percent urban (table 1). Urbanization within this watershed occurred prior to 2000, and the population increased about 10 percent from 2000 to 2010 (U.S. Census Bureau, 2008, 2011; table 1). Population density based on the 2010 census data for this watershed is 1,003 persons per mi^2. Water passing this site enters the Pacific Ocean approximately 6.5 mi downstream of the sampling site.

Stevens Creek at Barranca Drive at Monta Vista, CA

This sampling site is in the Monta Vista area in the city of Cupertino, Calif., at the southern end of San Francisco Bay (figs. 1, 11). The watershed upstream of this site is just under 20 mi^2 and is roughly 13 percent urban (table 1). Urbanization within this watershed occurred prior to 2000, and the population increased by slightly over 6 percent from 2000 to 2010 (U.S. Census Bureau, 2008, 2011; table 1). Population density based on the 2010 census data for this watershed is 341 persons per mi^2. Streamflow at this site is regulated by discharge from Stevens Creek Reservoir, which is 3 mi upstream. This reservoir provides flood control and maintains minimum summertime flows in Stevens Creek. Approximately 7 mi downstream of the sampling site, water from Stevens Creek enters San Francisco Bay.

Sweetwater River at Willow Street at Chula Vista, CA

This sampling site is immediately downstream of a municipal golf course within the city of Chula Vista, Calif., in southern California (figs. 1, 12). The potential watershed upstream of this site is just over 200 mi^2 and is about 24 percent urban (table 1). Urbanization within this watershed occurred prior to 2000, and the population increased by 5.1 percent from 2000 to 2010 (U.S. Census Bureau, 2008, 2011; table 1). Population density based on the 2010 census data for this watershed is 815 persons per mi^2. Streamflow at this site is regulated by Sweetwater Reservoir, which is 3.3 mi upstream. Water impounded in Sweetwater Reservoir is treated and used for public supply, and water has not been released to the Sweetwater River downstream of the dam since 1998. The Sweetwater Authority also operates an urban water-diversion system in the area, which is designed to capture urban (storm and low-flow) runoff and route it around Sweetwater Reservoir and into the river channel below the dam (Sweetwater Authority, 2017). Water passing the sampling site was therefore likely made up entirely of urban runoff, and the effective watershed during the study period likely was much smaller and more heavily urbanized than reported in table 1. Water passing this sampling site enters San Diego Bay approximately 5 mi downstream.

Unnamed Tributary to Alder Creek at Iron Point Road near Folsom, CA

This sampling site is immediately downstream of a large residential area in the city of Folsom, Calif. (fig. 13). The contributing watershed is less than 0.5 mi^2 and is over 98 percent urban (table 1). Urbanization within this watershed is relatively recent with the population increasing by 80 percent from 2000 to 2010 (U.S. Census Bureau, 2008, 2011; table 1). Population density based on the 2010 census data for this watershed is just over 2,000 persons per mi^2. An urban runoff retention pond is less than half a mile upstream of the sampling site. During the study period, streamflow at this site was affected by mandated urban-water-use cutbacks, and in general, this site only had flowing water following rainfall events. Water passing this site eventually makes its way into the Sacramento–San Joaquin Delta via the American River followed by the Sacramento River.

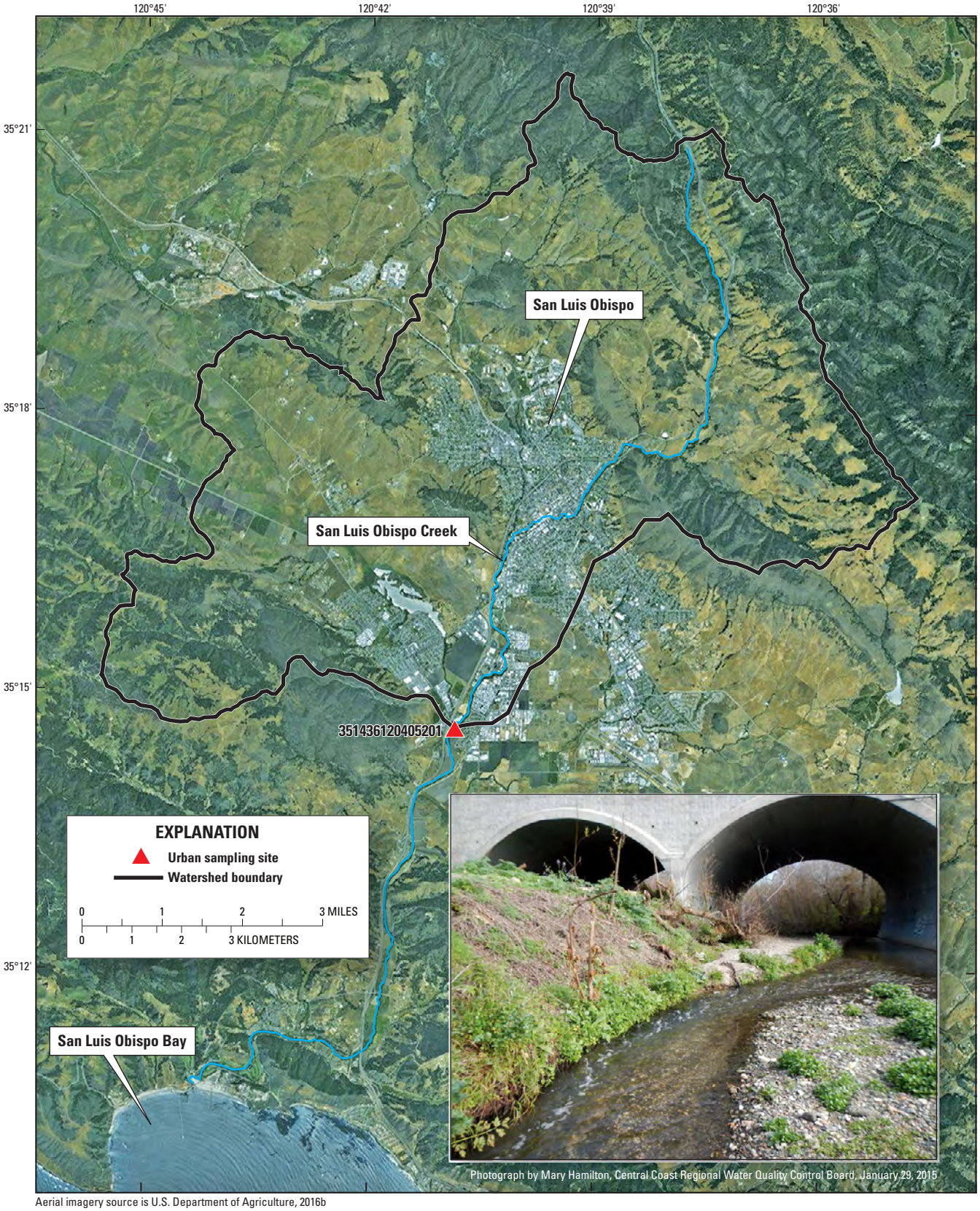


Figure 10. View of San Luis Obispo Creek at Los Osos Valley Road near San Luis Obispo, CA, watershed and sampling site location.

Figure 11. View of Stevens Creek at Barranca Drive at Monta Vista, CA, watershed and sampling site location.

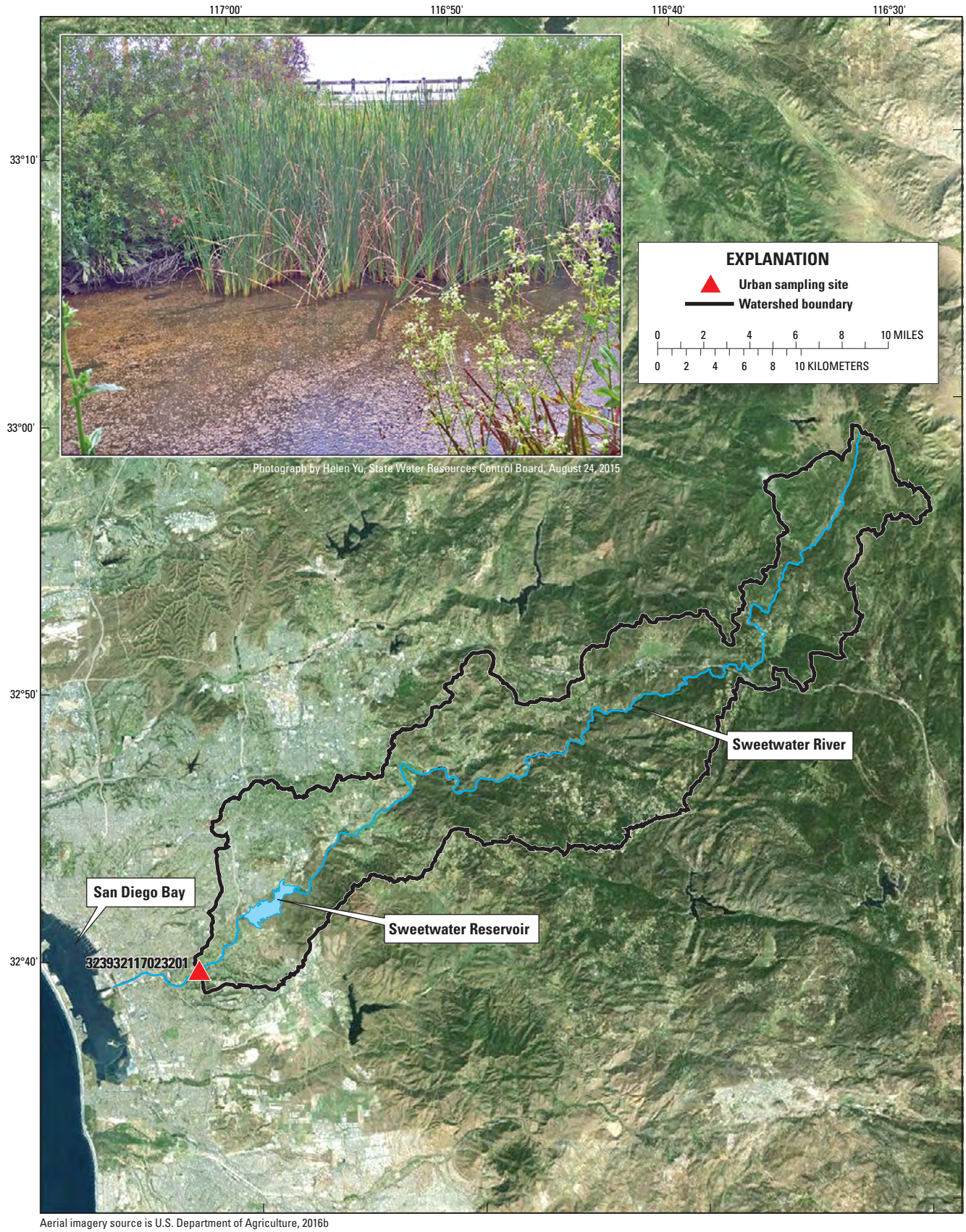
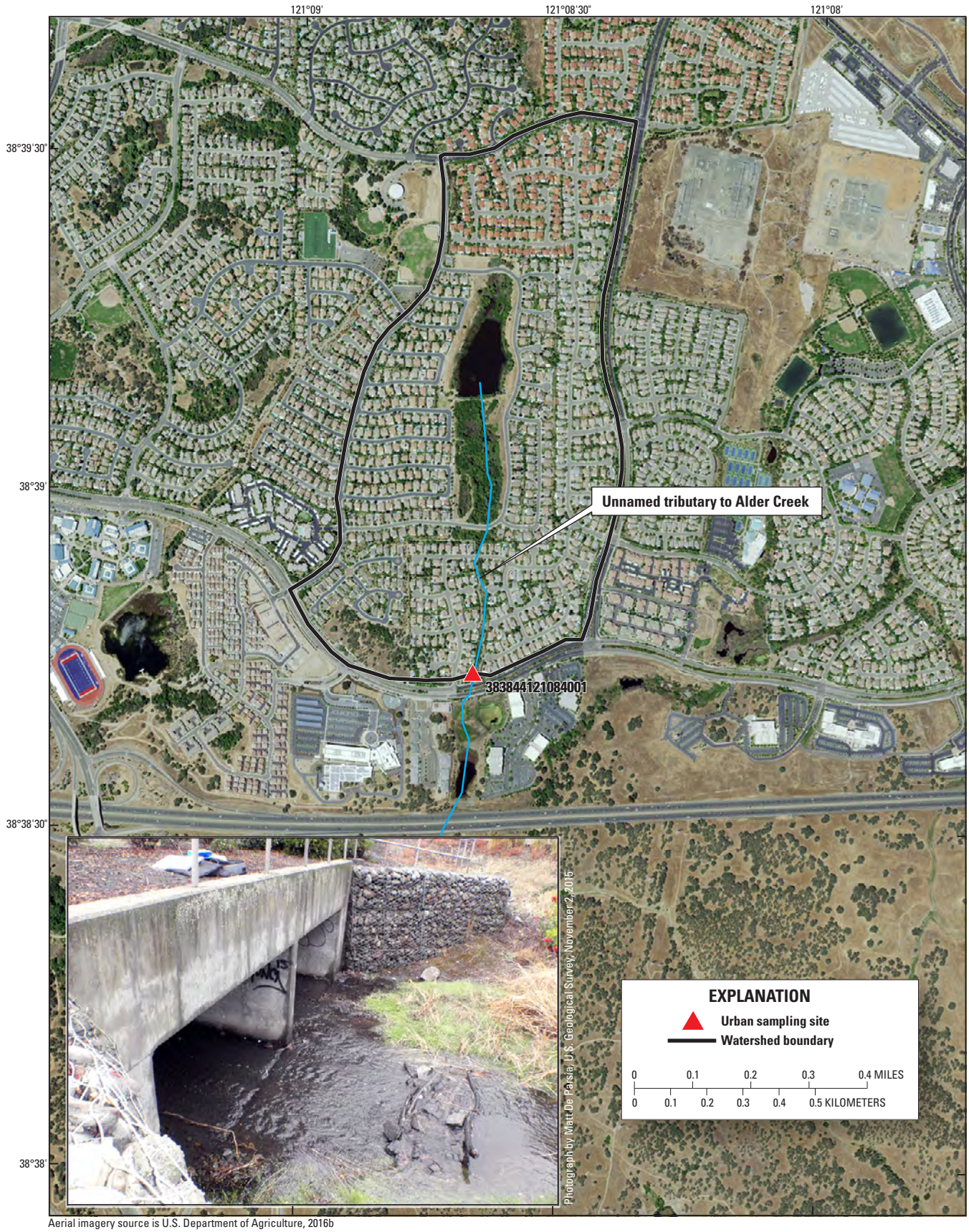


Figure 12. View of Sweetwater River at Willow Street at Chula Vista, CA, watershed and sampling site location.



Aerial imagery source is U.S. Department of Agriculture, 2016b

Figure 13. View of Unnamed Tributary to Alder Creek at Iron Point Road near Folsom, CA, watershed and sampling site location.

Pesticide Use

Since 1990, the California Department of Pesticide Regulation (CDPR) has had a full-use reporting system that requires pesticide applicators to provide detailed information on pesticide use. The CDPR system is the most comprehensive pesticide reporting system in the Nation, and these data are valuable in assessing trends in pesticide use, changes in application patterns, and potential for environmental contamination. The CDPR reporting system, however, does not contain information on pesticide applications made by homeowners using products purchased at retail stores, and this leads to an underestimation of pesticide use in urban areas. Synthetic organic pesticide application totals for 2015 (the latest year for which data are available) for the watersheds upstream of the sampling sites are reported in table 1 (California Department of Pesticide Regulation, 2017).

Hydrologic Conditions

Pesticide transport is strongly affected by the spatial and temporal application of pesticides as well as by rainfall and streamflow. From April 2015 to January 2017, nearly all of California experienced some degree of drought conditions (average of 97.4 percent by area), with over one-third of the State on average (33.9 percent) experiencing exceptional drought conditions (National Integrated Drought Information System, 2017). These drought conditions led to mandated urban-water-use cutbacks throughout the State as well as major reductions in agricultural water supplies from State and Federal water projects. As a result, streamflow was likely affected at all sampling sites. Unfortunately, none of the sites had streamflow gages associated with them; thus, no quantitative comparisons can be made to characterize departures from long-term streamflow trends.

Procedures and Methods

The USGS PFRG oversaw and coordinated the collection of the samples by the cooperators to ensure proper sampling methods and techniques. All sample processing and analysis was done by the USGS PFRG.

Sample Collection

Samples were collected three times from each sampling location per year over a period of 2 years beginning April 2015. At each sample-collection event, a minimum of 2 liters (L) of water was collected in two pre-cleaned and baked 1-L amber glass bottles. Additional bottles were collected for quality-control samples on a schedule determined by the USGS PFRG. A representative from each cooperating agency filled the provided 1-L bottles using a grab technique following (QAPP) Surface Water Ambient Monitoring Program protocols and the project-specific Quality Assurance Project Plan; State Water Resources Control Board, 2014). Samples were shipped overnight to the USGS Organic Chemistry Research Laboratory (OCRL) in chilled coolers (4 degrees Celsius [°C]) and were processed immediately upon receipt.

Sample Processing and Analytical Methods

Prior to pesticide analysis, all water samples were filtered through pre-weighed, pre-combusted 0.7-micrometer (µm) nominal pore-size glass-fiber filters (Grade GF/F, Whatman, Piscataway, New Jersey) to remove suspended material. Filter papers containing suspended sediments were dried at room temperature overnight (in the dark), then stored in a freezer at −20 °C until extraction.

High Performance Liquid Chromatography/Tandem Mass Spectrometry Analysis

The extraction procedure and instrumental analysis method by liquid chromatography/tandem mass spectrometry (LC/MS/MS) have been previously described in Hladik and Calhoun (2012). Filtered water samples were spiked with recovery surrogate standards, monuron (Chem Service, West Chester, Pennsylvania) and imidacloprid-d4 (Cambridge Isotope Laboratories, Andover, Massachusetts). Samples were loaded onto an Oasis hydrophilic-lipophilic balance (HLB) solid phase extraction (SPE) cartridge (6 milliliters, mL; 500 milligrams, mg; Waters, Milford, Massachusetts) that had been cleaned with one column-volume of dichloromethane (DCM) followed by one column-volume of acetone and two column-volumes of deionized water prior to use. Water samples were pumped through the SPE cartridge at a flow rate of 10 milliliters per minute (mL/min); the SPE cartridge was dried under nitrogen until the SPE sorbent was dry. Analytes were eluted with 10 mL of 50:50 DCM:acetone. The eluent was evaporated to less than 0.5 mL using a gentle stream of dry nitrogen, solvent-exchanged into acetonitrile (ACN), and further evaporated to 0.2 mL. An internal standard (13C3-caffeine, Cambridge Isotope Laboratories) was then added (20 microliters [µL] of a 5-nanograms-per-microliter [ng/µL] solution). Sample extracts were stored in a freezer at −20 °C until analysis (up to 30 days).

Water extracts were analyzed on an Agilent (Palo Alto, Calif.) 1100 high performance liquid chromatography (HPLC) system coupled to a 6430 tandem mass spectrometry (MS) system with a Zorbax Eclipse XDB-C18 column (2.1 millimeters [mm] × 150 mm × 3.5 mm; Agilent). The column flow rate was 0.6 mL/min, and the column temperature was 30 °C. Data were collected in the multiple-reaction-monitoring (MRM) mode. Additional instrument method details can be found in Hladik and Calhoun (2012).

Gas Chromatography/Mass Spectrometry Analysis

The extraction procedure and instrumental analysis method by gas chromatography mass spectrometry (GC/MS) have been previously described in Hladik and others (2008, 2009) and Hladik and McWayne (2012), respectively. Briefly, filtered water samples were spiked with a recovery surrogate standard consisting of 13C3-atrazine, d-triflurlalin, and 13C-fipronil (Cambridge Isotopes, Andover, Massachusetts). Samples were loaded onto an Oasis HLB SPE cartridge (6 mL, 500 mg; Waters, Milford, Massachusetts) that had been cleaned with two column-volumes of ethyl acetate (EtOAc) followed by two column-volumes of methanol (MeOH) and two column-volumes of deionized water prior to use. Water samples were pumped through the SPE cartridge at a flow rate of 10 mL/min; the SPE cartridges were dried under nitrogen until the SPE sorbent was dry. Following extraction, sodium sulfate was added to the sample bottle to remove any residual water, and the bottle was rinsed in triplicate with approximately 2 mL of DCM into a collection tube. The bottle rinse was concentrated to 1 mL under a gentle stream of nitrogen gas. The SPE cartridges were dried under nitrogen until the SPE sorbent was dry, and then analytes were eluted with 12 mL of EtOAc into the concentrator tube containing its bottle rinse. The combined bottle rinse and eluent mixture was evaporated to less than 0.2 mL using a gentle stream of dry nitrogen; 20 µL of a 10 ng/µL internal standard (deuterated polycyclic aromatic hydrocarbon compounds acenaphthene-d10, phenanthrene d-10, and pyrene-d10) was then added to the sample. Sample extracts were stored in a freezer at −20 °C until analysis (up to 30 days).

Filter papers were cut up and placed in an Erlenmeyer flask and extracted twice with 50 mL of dichloromethane in a sonicator (Branson 5200; Danbury, Connecticut) for 15 minutes. The extract was filtered through sodium sulfate, reduced using a Zymark Turbovap II (Hopinkton, Maryland) to 0.5 mL, then solvent exchanged into EtOAc, and further evaporated to less than 0.2 mL using a gentle stream of dry nitrogen. Following the evaporation, 20 µL of a 10 ng/µL internal standard (deuterated polycyclic aromatic hydrocarbon compounds acenaphthene-d10, phenanthrene d-10, and pyrene-d10) was then added to the sample. Sample extracts were stored in a freezer at −20 °C until analysis (up to 30 days).

Water and filter extracts were analyzed on an Agilent 7890A GC chromatograph with an Agilent 5975C Inert XL EI mass-selective detector (MSD) system using a DB-5MS analytical column (30 meter [m] by 0.25 mm by 0.25 µm; Agilent, Palo Alto, Calif.) for separation using helium as the carrier gas. Data were collected in the selected-ion-monitoring mode. Additional details of the GC/MS method can be found in Hladik and others (2008, 2009).

Method detection limits for pesticide concentrations in water were validated in previous work (Hladik and others, 2008; Hladik and Calhoun, 2012). Method detection limits for pesticide in the suspended sediment phase were validated in previous studies by Hladik and Kuivila (2009). Method detection limits are shown in table 2.

Table 2. Method detection limits for gas chromatography/mass spectrometry (GC/MS) and liquid chromatography/tandem mass spectrometry (LC/MS/MS) methods.

[MDL, method detection limit; ng/L, nanogram per liter; NWIS, National Water Information System]

Pesticide	NWIS parameter code	MDL (ng/L)
3,4-Dichloroaniline*	66584	3.2
3,4-Dichloroaniline	66584	8.3
3,5-Dichloroaniline	67536	7.6
Acetamiprid	68302	3.3
Acibenzolar-S-methyl	51849	3.0
Alachlor	65064	1.7
Allethrin	66586	1.0
Atrazine	65065	2.3
Azinphos-methyl	65066	9.4
Azinphos-methyl oxon	68211	9.4
Azoxystrobin	66589	3.1
Benefin (benfluralin)	51643	2.0
Bifenthrin	65067	0.7
Boscalid	67550	2.8
Bromoconazole	68315	3.2
Butralin	68545	2.6
Butylate	65068	1.8
Captan	68322	10.2
Carbaryl	65069	6.5
Carbendazim	68548	4.2
Carbofuran	65070	3.1
Chlorantraniliprole	51856	4.0
Chlorothalonil	65071	4.1
Chlorpyrifos	65072	2.1
Chlorpyrifos oxon	68216	5.0
Clomazone	67562	2.5
Clothianidin	68221	3.9
Coumaphos	51836	3.1
Cyantraniliprole	51862	4.2
Cyazofamid	51853	4.1
Cycloate	65073	1.1
Cyfluthrin	65074	1.0
Cyhalofop-butyl	68360	1.9
Cyhalothrin (all isomers)	68354	0.5
Cymoxanil	51861	3.9
Cypermethrin	65075	1.0
Cyproconazole	66593	4.7
Cyprodinil	67574	7.4
DCPA	65076	2.0
DCPMU	68231	3.5
DCPU	68226	3.4
Deltamethrin	65077	0.6
Desthio-prothioconazole	51865	3.0
Desulfinylfipronil	66607	1.6
Desulfinylfipronil amide	68570	3.2
Diazinon	65078	0.9
Diazoxon	68236	5.0
Difenoconazole	67582	10.5
Dimethomorph	68373	6.0
Dinotefuran	68379	4.5
Dithiopyr	51837	1.6
Diuron	66598	3.2
EPTC	65080	1.5
Esfenvalerate	65081	0.5
Ethaboxam	51855	3.8
Ethalfluralin	65082	3.0
Etofenprox	67604	2.2
Famoxadone	67609	2.5
Fenamidone	51848	5.1
Fenarimol	67613	6.5
Fenbuconazole	67618	5.2
Fenhexamid	67622	7.6
Fenpropathrin	65083	0.6
Fenpyroximate	51838	5.2
Fenthion	51839	5.5
Fipronil	66604	2.9
Fipronil sulfide	66610	1.8
Fipronil sulfone	66613	3.5
Flonicamid	51858	3.4
Fluazinam	67636	4.4
Fludioxonil	67640	7.3
Flufenacet	51840	4.7
Flumetralin	51841	5.8
Fluopicolide	51852	3.9
Fluopyram	52761	3.8
Flupyradifurone	52764	3.0
Fluoxastrobin	67645	9.5
Fluridone	51864	3.7
Flusilazole	67649	4.5
Flutolanil	51842	4.4
Flutriafol	67653	4.2
Fluxapyroxad	51851	4.8
Hexazinone	65085	8.4
Imazalil	67662	10.5

Table 2. Method detection limits for gas chromatography/mass spectrometry (GC/MS) and liquid chromatography/tandem mass spectrometry (LC/MS/MS) methods.—Continued

[MDL, method detection limit; ng/L, nanogram per liter; NWIS, National Water Information System]

Pesticide	NWIS parameter code	MDL (ng/L)
Imidacloprid	68426	3.8
Indoxacarb	68627	4.9
Ipconazole	52762	7.8
Iprodione	66617	4.4
Kresoxim-methyl	67670	4.0
Malaoxon	68240	5.0
Malathion	65087	3.7
Mandipropamid	51854	3.3
Metalaxyl	68437	5.1
Metconazole	66620	5.2
Methidathion	65088	7.2
Methoprene	66623	6.4
Methoxyfenozide	68647	2.7
Methyl parathion	65089	3.4
Metolachlor	65090	1.5
Molinate	65091	3.2
Myclobutanil	66632	6.0
Napropamide	65092	8.2
Novaluron	68655	2.9
Oryzalin	68663	5.0
Oxadiazon	51843	2.1
Oxyfluorfen	65093	3.1
p,p’-DDD	65094	4.1
p,p’-DDE	65095	3.6
p,p’-DDT	65096	4.0
Paclobutrazol	51846	6.2
Pebulate	65097	2.3
Pendimethalin	65098	2.3
Penoxsulam	51863	3.5
Pentachloroanisole	66637	4.7
Pentachloronitrobenzene	66639	3.1
Penthiopyrad	52769	3.2
Permethrin	65099	0.6
Phenothrin	65100	1.0
Phosmet	65101	4.4
Picoxystrobin	51850	4.2
Piperonyl butoxide	65102	2.3
Prodiamine	51844	5.2
Prometon	67702	2.5
Prometryn	65103	1.8
Propanil	66641	10.1
Propargite	68677	6.1
Propiconazole	66643	5.0
Propyzamide	67706	5.0
Pyraclostrobin	66646	2.9
Pyridaben	68682	5.4
Pyrimethanil	67717	4.1
Quinoxyfen	51847	3.3
Resmethrin	65104	1.0
Sedaxane	52648	5.2
Simazine	65105	5.0
Tau-fluvalinate	65106	0.7
Tebuconazole	66649	3.7
Tebupirimfos	68693	1.9
Tebupirimfos oxon	68694	2.8
Tefluthrin	67731	0.6
Tetraconazole	66654	5.6
Tetradifon	51651	3.8
Tetramethrin	66657	0.5
Thiabendazole	67161	3.6
Thiacloprid	68485	3.2
Thiamethoxam	68245	3.4
Thiazopyr	51845	4.1
Thiobencarb	65107	1.9
Tolfenpyrad	51866	2.9
Triadimefon	67741	8.9
Triadimenol	67746	8.0
Triallate	68710	2.4
Tribufos	68711	3.1
Trifloxystrobin	66660	4.7
Triflumizole	67753	6.1
Trifluralin	65108	2.1
Triticonazole	67758	6.9
Zoxamide	67768	3.5

*Denotes MDL for compound in LC/MS/MS method.

Quality-Control Methods and Results for Water and Suspended Sediment Samples

A QAPP was developed for this project, which dictated the quantity and types of quality-control samples collected. These samples consisted of trip blanks, environmental and field replicate pairs, and laboratory matrix spikes and matrix-spike replicate pairs, all of which were used to validate pesticide concentrations measured in water samples using GC/MS and LC/MS/MS and in the suspended sediment using GC/MS. Recovery of surrogates was also used to monitor the efficiency of each extraction, and all samples were within the control limit of 70–130 percent.

Seven trip blanks (four analyzed by GC/MS and three analyzed by LC/MS/MS) were collected to verify the cleanliness of processing protocols and the absence of atmospheric contamination. Filters from the four trip blanks collected for GC/MS were also saved and analyzed as suspended sediment trip blanks. No pesticides were detected in any of the trip blanks.

Seven environmental and field-replicate sample pairs (four analyzed by GC/MS and three analyzed by LC/MS/MS) were collected to verify the accuracy of the method. Filters from the four replicate samples collected for GC/MS analysis were also saved and analyzed as suspended sediment replicates. All results from the environmental and field replicate sample pairs were within the 25 percent relative standard deviation data-quality objective. All compounds detected in the environmental samples were also detected in the field replicates.

Eight matrix-spike and matrix-spike-replicate pairs (four analyzed by GC/MS and four analyzed by LC/MS/MS) were collected to verify the recovery of the target analytes as well as the accuracy of the method. Filters from the four matrix-spike and matrix-spike-replicate pairs collected for GC/MS analysis were also saved and analyzed as suspended sediment matrix spikes and matrix-spike replicates. All compounds in each matrix-spike and matrix-spike-replicate pair were recovered within the control limit of 70–130 percent, and all results from each pair were within the 25 percent relative standard deviation data-quality objective (table 3).

Table 3. Matrix-spike recoveries.

[GC/MS, gas chromatography/mass spectrometry; LC/MS/MS, liquid chromatography/tandem mass spectrometry; ** denotes compounds in LC/MS/MS method, all other compounds in GC/MS method]

Pesticide	Minimum recovery	Maximum recovery	Median recovery	Relative standard deviation (percent)
3,4-Dichloroaniline	71.1	105.0	80.4	15
3,4-Dichloroaniline**	84.3	105.2	93.5	8
3,5-Dichloroaniline	73.3	108.9	86.8	15
Acetamiprid**	71.3	95.5	83.9	11
Acibenzolar-S-methyl	86.0	113.4	98.3	9
Alachlor	91.1	118.1	99.3	9
Allethrin	86.3	111.4	97.6	11
Atrazine	73.8	111.4	101.3	15
Azinphos methyl	87.6	112.9	99.4	9
Azinphos methyl oxon	68.2	107.8	86.5	16
Azoxystrobin	76.9	110.1	92.1	12
Benfluralin	71.4	104.9	85.5	12
Bifenthrin	81.0	93.2	89.5	5
Boscalid	85.3	110.2	97.2	10
Bromoconazole	88.8	127.1	95.7	14
Butralin	74.9	119.7	88.7	18
Butylate	74.8	103.0	84.0	13
Captan	75.2	105.7	97.9	12
Carbaryl	89.7	107.0	99.2	6
Carbendazim**	86.8	101.7	96.0	5
Carbofuran	87.9	127.9	101.7	13
Chlorantraniliprole**	86.8	107.8	97.5	7
Chlorothalonil	78.6	128.6	107.6	16
Chlorpyrifos	89.3	111.9	99.2	7
Chlorpyrifos oxon	71.6	113.7	103.2	18
Clomazone	74.8	118.2	108.4	16
Clothianidin**	82.0	100.4	92.3	7
Coumaphos	88.1	117.0	99.5	11
Cyantraniliprole**	94.3	116.6	103.9	7
Cyazofamid**	75.1	105.7	94.0	14
Cycloate	80.5	117.2	96.4	14
Cyfluthrin	101.6	118.4	107.8	5
Cyhalofop-butyl	84.4	108.9	94.9	8
Cyhalothrin	73.7	124.5	97.1	18
Cymoxanil**	70.4	105.0	83.1	14
Cypermethrin	79.5	110.7	105.8	13
Cyproconazole	90.6	114.8	99.0	8
Cyprodinil	82.5	115.4	97.2	12
DCPA	89.9	114.8	107.3	9
DCPMU	78.0	111.9	88.1	14
DCPU	79.2	93.9	89.0	6
Deltamethrin	92.4	112.9	102.9	6
Desthio-prothioconazole**	89.3	121.6	94.2	13
Desulfinylfipronil	78.6	108.5	96.4	11
Desulfinylfipronil amide	81.4	98.5	90.5	7
Diazinon	71.3	110.9	87.6	16

Table 3. Matrix-spike recoveries—Continued

[GC/MS, gas chromatography/mass spectrometry; LC/MS/MS, liquid chromatography/tandem mass spectrometry; ** denotes compounds in LC/MS/MS method, all other compounds in GC/MS method]

Pesticide	Minimum recovery	Maximum recovery	Median recovery	Relative standard deviation (percent)
Diazoxon	77.8	107.4	86.8	12
Difenconazole	77.2	122.0	103.5	19
Dimethomorph	91.8	114.1	99.1	8
Dinotefuran**	73.5	105.7	92.9	12
Dithiopyr	97.9	119.4	106.4	7
Diuron**	85.0	108.4	102.0	8
EPTC	86.0	102.1	97.7	7
Esfenvalerate	90.5	118.0	95.9	10
Ethaboxam**	76.6	106.6	100.4	12
Ethalfluralin	74.6	96.9	85.1	11
Etofenprox	78.9	118.6	86.2	17
Famoxadone	89.8	108.3	98.4	7
Fenamidone	91.3	118.8	102.4	10
Fenarimol	75.8	106.8	102.5	13
Fenbuconazole	75.1	104.2	95.8	12
Fenhexamide	82.5	102.8	88.7	9
Fenpropathrin	75.8	96.7	91.4	8
Fenpyroximate	76.5	92.9	86.6	7
Fenthion	91.8	118.2	101.1	9
Fipronil	82.5	102.2	90.9	9
Fipronil sulfide	75.8	114.5	101.7	15
Fipronil sulfone	78.2	116.7	96.3	14
Flonicamid**	85.2	107.0	96.9	9
Fluazinam	101.7	118.7	110.3	6
Fludioxinil	86.0	97.9	91.7	4
Flufenacet	92.7	126.6	102.9	11
Flumetralin	76.2	121.1	81.3	19
Fluopicolide	81.8	114.1	102.0	13
Fluopyram	82.4	105.6	92.2	10
Fluoxastrobin	72.7	116.0	95.1	16
Flupyradifurone**	79.6	104.8	94.9	10
Fluridone**	88.0	104.8	99.4	6
Flusilazole	84.2	107.0	95.1	8
Flutolanil	78.7	120.2	91.8	17
Flutriafol	71.7	91.4	78.6	8
Fluxapyroxad	90.2	121.3	102.0	11
Hexazinone	96.1	110.7	102.2	5
Imazalil	76.7	117.0	98.8	17
Imidacloprid**	84.7	104.0	97.3	6
Indoxacarb	85.0	102.7	91.4	6
Ipconazole	78.2	104.7	95.6	10
Iprodione	85.1	102.1	95.9	6
Kresoxim-methyl	80.4	110.5	101.2	11
Malaoxon	89.0	115.4	100.0	9
Malathion	90.4	105.5	101.4	5
Mandipropamid**	92.1	102.9	98.7	3
Metalaxyl	87.7	115.1	98.3	10
Metconazole	96.8	117.3	108.9	7
Methidathion	70.7	120.0	84.1	21
Methoprene	80.2	110.4	95.3	12
Methoxyfenozide**	91.2	110.2	98.1	7
Methyl parathion	71.2	121.1	90.9	21
Metolachlor	91.7	109.3	99.1	6
Molinate	83.0	106.5	94.4	10
Myclobutanil	82.8	110.8	89.8	9
Napropamide	83.2	108.4	101.7	10
Novaluron	70.7	79.2	75.5	4
Oryzalin**	71.6	103.6	88.7	13
Oxydiazon	80.4	108.9	95.4	13
Oxyfluorfen	75.4	97.3	92.2	8
p,p’-DDD	71.4	101.8	93.1	13
p,p’-DDE	70.0	101.3	90.3	15
p,p’-DDT	97.1	106.2	102.6	3
Paclobutrazol	74.8	109.8	93.3	13
Pebulate	88.6	104.4	97.2	6
Pendimethalin	84.4	119.1	94.6	13
Penoxsulam**	85.5	98.0	91.8	4
Pentachloroanisole	72.1	90.6	76.4	9
Pentachloronitro-benzene	91.9	120.8	105.2	11
Penthiopyrad**	72.4	111.5	105.8	15
Permethrin	84.0	110.0	94.4	10
Phenothrin	89.5	101.4	98.8	4
Phosmet	78.7	111.5	91.9	14
Picoxystrobin	84.0	111.2	95.2	11
Piperonyl butoxide	77.7	118.8	94.2	15
Prodiamine	77.4	107.6	99.6	12
Prometon	72.6	119.7	86.2	20
Prometryn	71.2	113.2	80.6	19
Propanil	70.2	104.6	97.4	15
Propargite	88.1	99.9	93.9	4
Propiconazole	78.5	95.4	90.2	7
Propyzamide	77.7	105.2	93.4	11
Pyraclostrobin	78.0	96.7	87.1	8
Pyridaben	83.4	116.7	97.0	11
Pyrimethanil	80.6	123.0	97.9	15
Quinoxyfen	88.3	114.0	105.8	8

Table 3. Matrix-spike recoveries—Continued

[GC/MS, gas chromatography/mass spectrometry; LC/MS/MS, liquid chromatography/tandem mass spectrometry; ** denotes compounds in LC/MS/MS method, all other compounds in GC/MS method]

Pesticide	Minimum recovery	Maximum recovery	Median recovery	Relative standard deviation (percent)
Resmethrin	92.7	117.9	100.9	8
Sedaxane	80.1	110.6	92.1	12
Simazine	84.4	109.8	103.2	10
tau-Fluvalinate	83.9	117.5	102.3	11
Tebuconazole	74.1	125.4	114.5	19
Tebupirimfos	77.9	113.6	100.2	15
Tebupirimfos oxon	84.6	112.2	102.1	11
Tefluthrin	85.7	117.9	94.6	13
Tetraconazole	78.3	111.2	97.0	13
Tetradifon	87.8	107.9	99.1	6
Tetramethrin	77.3	107.0	97.7	11
Thiabendazole**	83.0	92.4	87.5	3
Thiacloprid**	73.1	88.0	82.0	6
Thiamethoxam**	75.2	106.6	87.0	13
Thiazopyr	91.2	112.5	102.9	8
Thiobencarb	90.5	111.1	95.4	8
Tolfenpyrad**	80.2	104.4	93.8	11
Triadimefon	79.9	103.3	90.2	9
Triadimenol	76.4	111.4	80.6	16
Triallate	77.3	115.7	101.2	15
Tribufos	87.6	101.4	95.8	5
Trifloxystrobin	86.2	108.9	104.1	9
Triflumizole	89.4	106.3	97.6	6
Trifluralin	73.8	108.8	88.1	13
Triticonazole	73.8	110.2	92.2	16
Zoxamide	91.4	107.5	103.0	6

Results From Water Samples

Over the duration of the study, 85 pesticides and degradates were detected in the water (dissolved phase): 32 fungicides, 25 herbicides, 27 insecticides, and 1 synergist (tables 4, 5). All but two samples contained mixtures of multiple pesticides, and the greatest number of pesticides detected in a single sample was 45 (Alisal Creek at La Guardia Street near Salinas, CA, collected December 15, 2015). The most frequently detected pesticides overall were diuron (75 percent, herbicide), boscalid (75 percent, fungicide), and imidacloprid (69 percent, neonicotinoid insecticide; table 6).

Table 4. Pesticide results in water samples from agricultural sites.

This table is distributed as part of this report in Microsoft Excel 2010 format and is available for download at https://doi.org/10.3133/ds1088.

Table 5. Pesticide results in water samples from urban sites.

This table is distributed as part of this report in Microsoft Excel 2010 format and is available for download at https://doi.org/10.3133/ds1088.

Out of 36 water samples from agricultural sites, all samples contained between 3 and 45 pesticides, with an average of 20 pesticides detected per sample (table 4). Out of 752 total detections in samples from agricultural sites, 36 percent were fungicides, 38 percent were herbicides/herbicide degradates, and 26 percent were insecticides/insecticide degradates (table 6).

Out of 36 water samples from urban sites, 35 had between 1 and 25 pesticides detected, with an average of 12 pesticides detected per sample (table 5). One sample had no pesticide detections (Stevens Creek at Barranca Drive at Monta Vista, CA, collected January 3, 2017). Out of 426 total pesticide detections in samples from urban sites, 20 percent were fungicides, 34 percent were herbicides/herbicide degradates, and 46 percent were insecticides/insecticide degradates (table 6).

In addition, 16 pesticides (bifenthrin, carbendazim, chlorpyrifos, clothianidin, diazinon, diuron, fenpyroximate, fipronil, fipronil sulfone, fluopicolide, imidacloprid, metolachlor, novaluron, oxyflurofen, permethrin, and simazine) were detected in the water at concentrations that were above at least one aquatic life benchmark value (figs. 14, 15) as defined by the EPA (U.S. Environmental Protection Agency, 2017). These concentrations were detected most frequently in urban-dominated watersheds, with at least 1 detection over an aquatic life benchmark in 23 out of the 36 urban samples. In the agriculturally dominated watersheds, 19 out of the 36 samples were found to have at least 1 detection over an aquatic life benchmark; however, these detections consisted of a larger variety of pesticides than those found in the urban samples. Of the 16 pesticides detected at concentrations above aquatic life benchmarks, 12 of them (carbendazim, chlorpyrifos, clothianidin, diazinon, diuron, fenpyroximate, fluopicolide, metolachlor, novaluron, oxyflurofen, permethrin, and simazine) were found to exceed benchmarks primarily in the agricultural samples. Fipronil and fipronil sulfone were detected above aquatic life benchmark concentrations exclusively in urban sites, and bifenthrin and imidacloprid were detected in both urban and agricultural sites at concentrations above an aquatic life benchmark (figs. 16–21).

Table 6. Total number of detections in water samples from agricultural and urban sites.

[*, fungicide; **, insecticide degradate; ***, herbicide degradate; ****, synergist]

Pesticide	Agricultural sites		Urban sites		Total	
	Detections	Detection frequency (percent)	Detections	Detection frequency (percent)	Detections	Detection frequency (percent)
3,4-Dichloroaniline***	25	69	14	39	39	54
3,5-Dichloroaniline***	6	17	1	3	7	10
Acetamiprid**	9	25	0	0	9	13
Atrazine***	1	3	0	0	1	1
Azoxystrobin*	28	78	6	17	34	47
Bifenthrin**	5	14	9	25	14	19
Boscalid*	32	89	22	61	54	75
Carbaryl**	6	17	3	8	9	13
Carbendazim*	20	56	21	58	41	57
Chlorantraniliprole**	26	72	13	36	39	54
Chlorothalonil*	3	8	4	11	7	10
Chlorpyrifos**	3	8	0	0	3	4
Clomazone***	5	14	0	0	5	7
Clothianidin**	20	56	7	19	27	38
Cyantraniliprole**	6	17	0	0	6	8
Cyazofamid*	1	3	0	0	1	1
Cyprodinil*	15	42	3	8	18	25
DCPA***	8	22	2	6	10	14
DCPMU***	27	75	18	50	45	63
DCPU***	11	31	13	36	24	33
Desulfinylfipronil**	1	3	23	64	24	33
Desulfinylfipronilamide **	0	0	16	44	16	22
Diazinon**	4	11	1	3	5	7
Difenconazole*	5	14	0	0	5	7
Dimethomorph*	9	25	1	3	10	14
Dinotefuran**	13	36	15	42	28	39
Dithiopyr***	16	44	21	58	37	51
Diuron***	27	75	27	75	54	75
Fenamidone*	6	17	0	0	6	8
Fenhexamid*	3	8	2	6	5	7
Fenpyroximate**	2	6	1	3	3	4
Fipronil**	1	3	19	53	20	28
Fipronil sulfide**	1	3	23	64	24	33
Fipronil sulfone**	1	3	21	58	22	31
Flonicamid**	8	22	0	0	8	11
Fluazinam*	1	3	0	0	1	1
Fludioxonil*	6	17	0	0	6	8
Fluopicolide*	6	17	0	0	6	8
Fluopyram*	9	25	0	0	9	13
Flupyradifurone**	5	14	0	0	5	7
Fluridone***	5	14	3	8	8	11
Flutolanil*	0	0	2	6	2	3
Fluxapyroxad*	20	56	1	3	21	29
Hexazinone***	16	44	0	0	16	22

Table 6. Total number of detections in water samples from agricultural and urban sites.—Continued

[*, fungicide; **, insecticide; ***, herbicide; ****, synergist]

Pesticide	Agricultural sites		Urban sites		Total	
	Detections	Detection frequency (percent)	Detections	Detection frequency (percent)	Detections	Detection frequency (percent)
Imidacloprid**	24	67	26	72	50	69
Iprodione*	6	17	4	11	10	14
Mandipropamid*	9	25	0	0	9	13
Metalaxyl*	13	36	0	0	13	18
Metconazole*	1	3	0	0	1	1
Methoprene**	0	0	3	8	3	4
Methoxyfenozide**	26	72	10	28	36	50
Metolachlor***	15	42	4	11	19	26
Myclobutanil*	16	44	0	0	16	22
Napropamide***	6	17	0	0	6	8
Novaluron**	1	3	0	0	1	1
Oryzalin***	17	47	4	11	21	29
Oxydiazon***	10	28	16	44	26	36
Oxyfluorfen***	23	64	1	3	24	33
p,p'-DDD**	3	8	0	0	3	4
p,p'-DDE**	6	17	0	0	6	8
p,p'-DDT**	1	3	0	0	1	1
Paclobutrazol*	1	3	0	0	1	1
Pendimethalin***	13	36	6	17	19	26
Penoxsulam***	6	17	2	6	8	11
Penthiopyrad*	6	17	0	0	6	8
Permethrin**	2	6	0	0	2	3
Piperonyl butoxide****	7	19	1	3	8	11
Prodiamine***	6	17	5	14	11	15
Prometryn***	7	19	0	0	7	10
Propanil***	2	6	0	0	2	3
Propargite**	2	6	0	0	2	3
Propiconazole*	26	72	8	22	34	47
Propyzamide***	6	17	0	0	6	8
Pyrimethanil*	8	22	2	6	10	14
Quinoxyfen*	1	3	0	0	1	1
Simazine***	21	58	6	17	27	38
Tebuconazole*	3	8	3	8	6	8
Tetraconazole*	5	14	1	3	6	8
Thiabendazole*	0	0	6	17	6	8
Thiamethoxam**	16	44	6	17	22	31
Thiobencarb***	3	8	0	0	3	4
Triadimefon*	3	8	0	0	3	4
Triadimenol*	4	11	0	0	4	6
Trifloxystrobin*	4	11	0	0	4	6
Trifluralin***	1	3	0	0	1	1

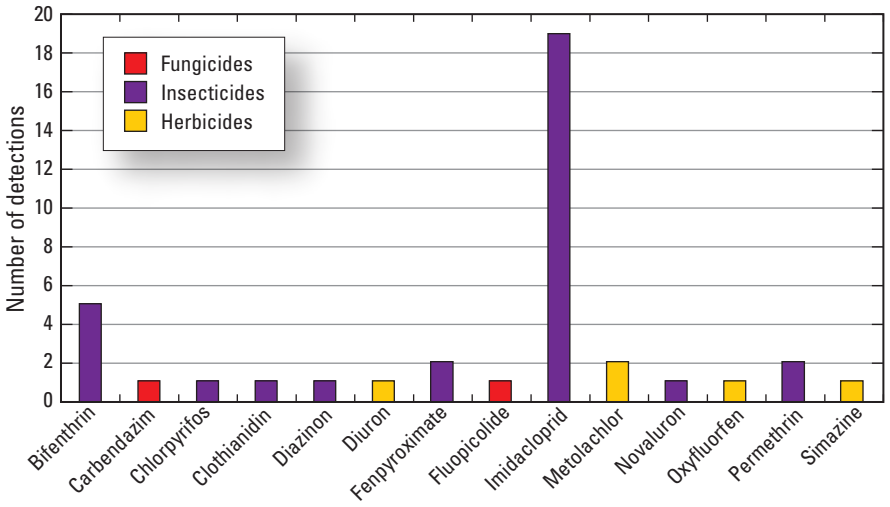


Figure 14. Number of pesticide detections in surface water samples from agricultural sites over a U.S. Environmental Protection Agency aquatic life benchmark value.

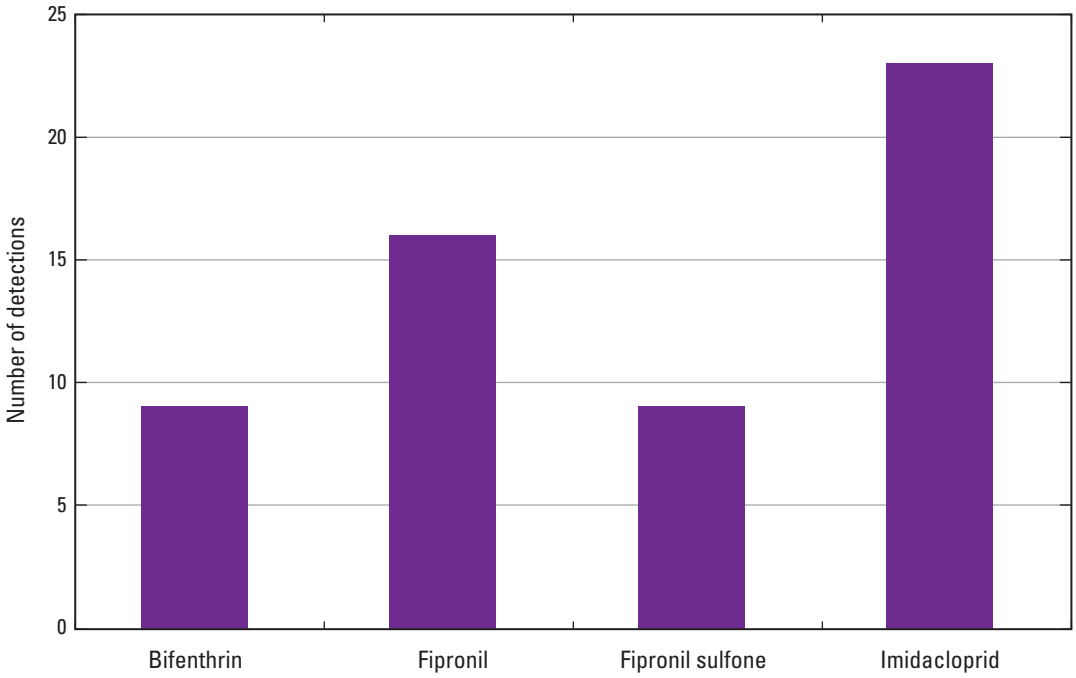


Figure 15. Number of pesticide detections in surface water samples from urban sites over a U.S. Environmental Protection Agency aquatic life benchmark value.

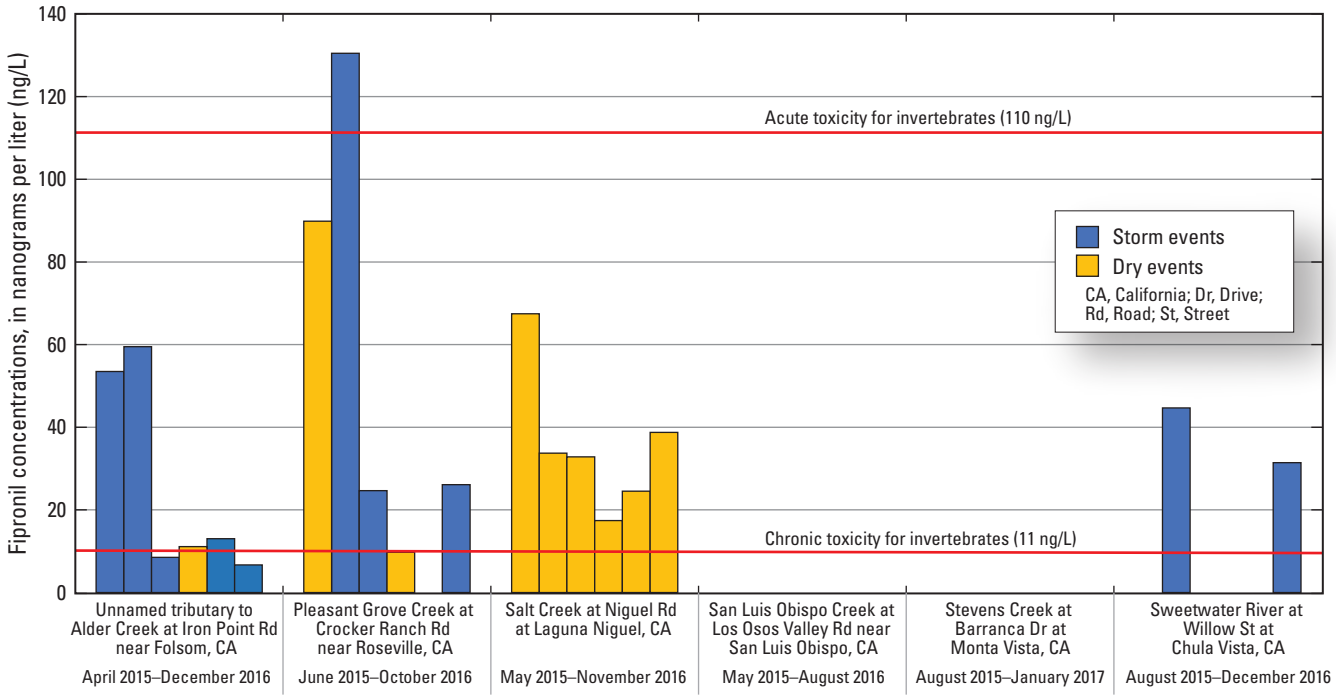


Figure 16. Dissolved concentrations of fipronil in urban sites, and U.S. Environmental Protection Agency aquatic life benchmarks.

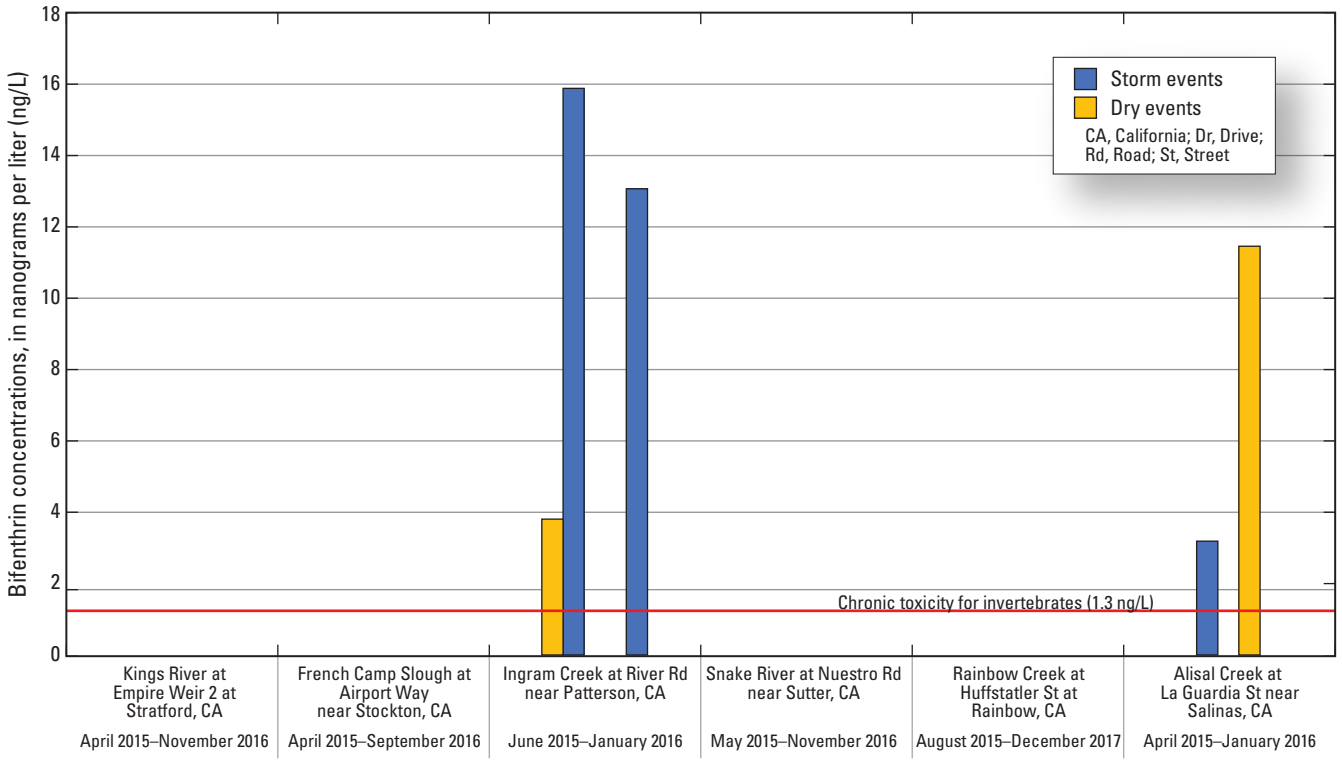


Figure 17. Dissolved concentrations of bifenthrin in agricultural sites, and U.S. Environmental Protection Agency aquatic life benchmarks.

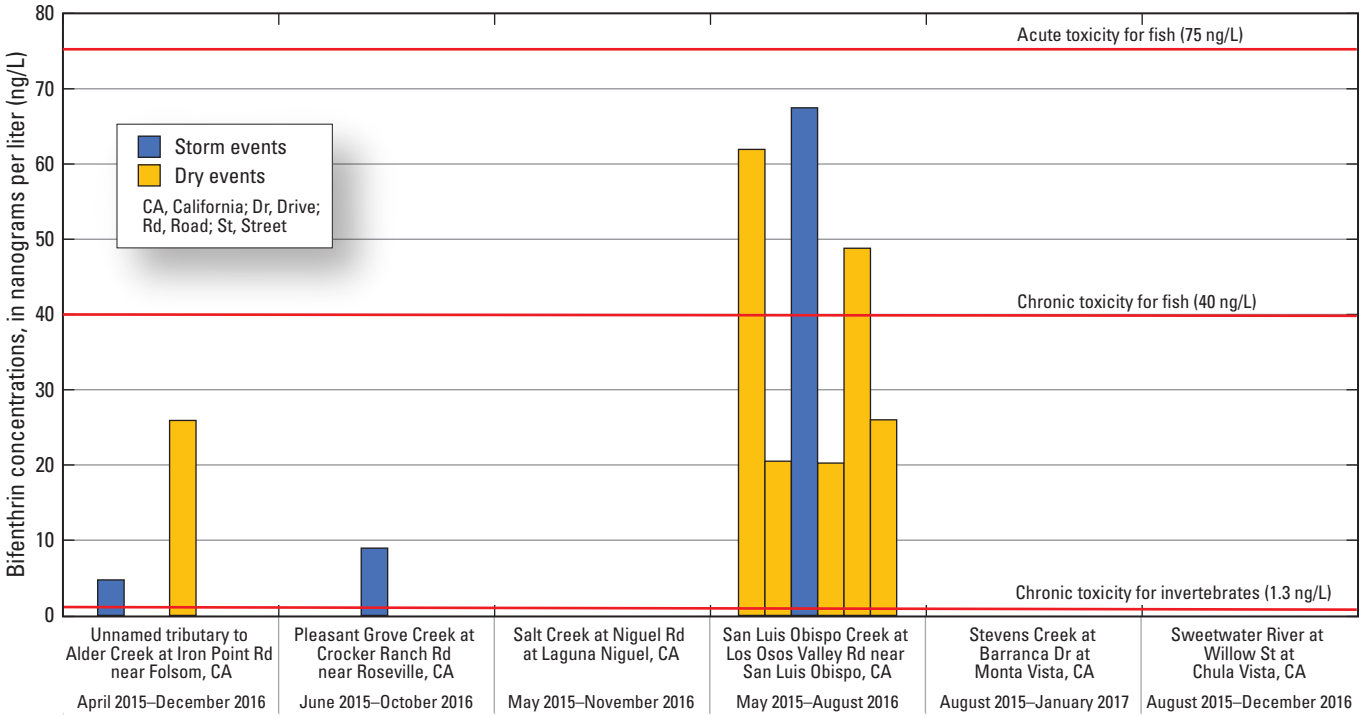


Figure 18. Dissolved concentrations of bifenthrin in urban sites, and U.S. Environmental Protection Agency aquatic life benchmarks.

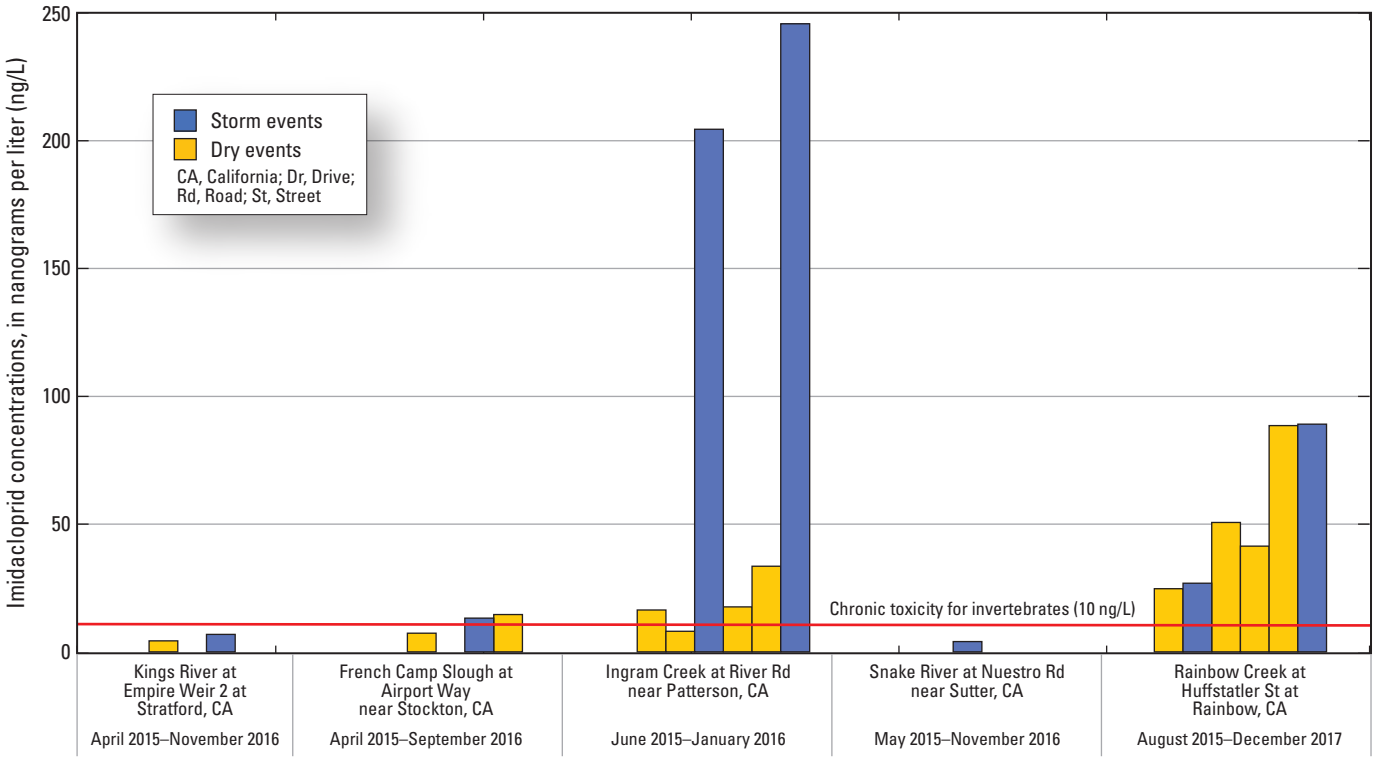


Figure 19. Dissolved concentrations of imidacloprid in agricultural sites, and U.S. Environmental Protection Agency aquatic life benchmarks.

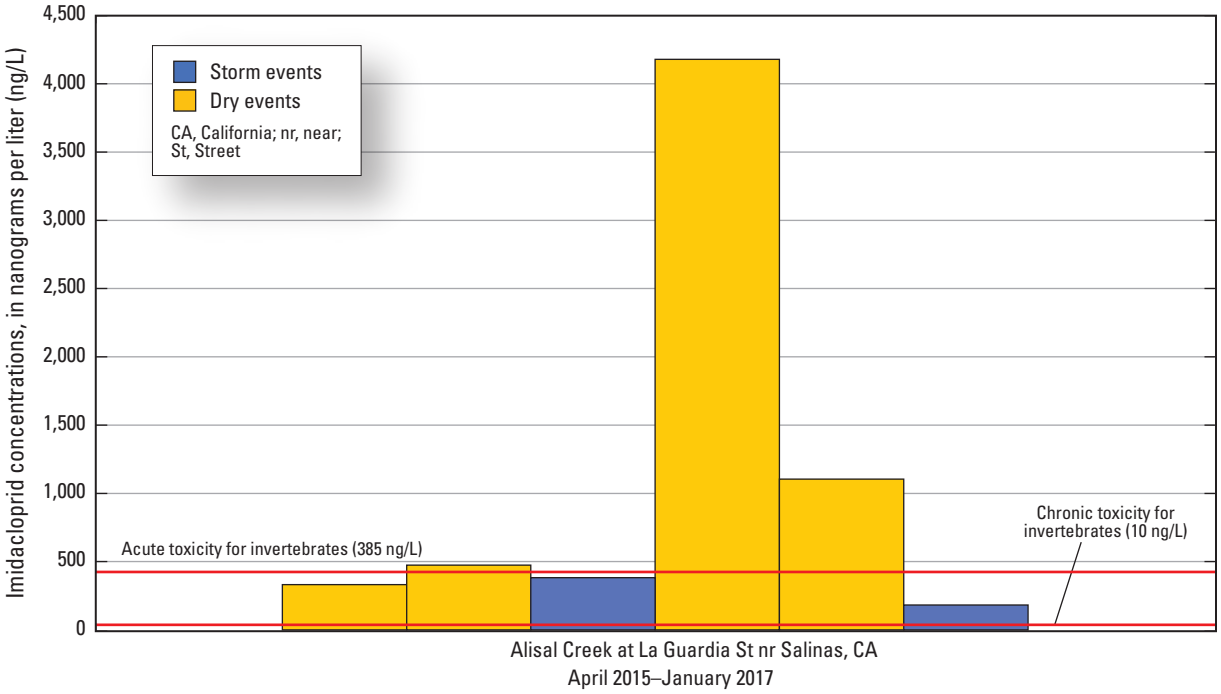


Figure 20. Dissolved concentrations of imidacloprid in the agricultural site Alisal Creek at La Guardia Street near Salinas, CA.,and U.S. Environmental Protection Agency aquatic life benchmarks.

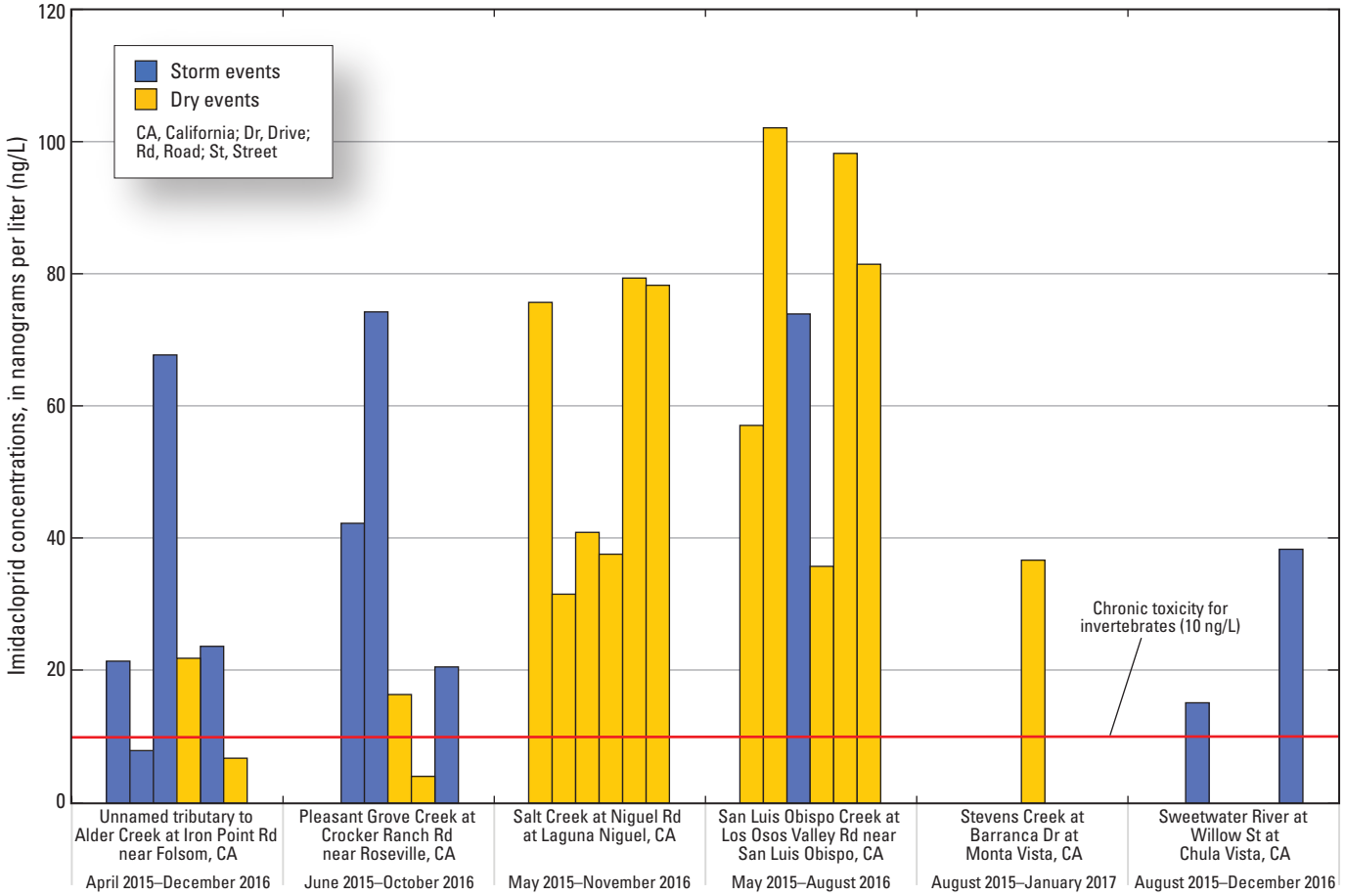


Figure 21. Dissolved concentrations of imidacloprid in urban sites, and U.S. Environmental Protection Agency aquatic life benchmarks.

Results From Suspended Sediment Samples

Over the duration of the study, 29 pesticides were detected in suspended sediment: 9 fungicides, 10 herbicides, and 10 insecticides (tables 7, 8). The most frequently detected pesticides overall were bifenthrin (51 percent, insecticide), oxyfluorofen (28 percent, herbicide), and p-p'-DDE (19 percent, insecticide degradate).

Concentrations of pesticide compounds in suspended-sediments are provided in ng/L in tables 7 and 8 to facilitate the approximation of a whole-water pesticide concentration by summing the dissolved and suspended-sediment concentrations of pesticide compounds.

Out of 36 suspended sediment samples from agricultural sites, 27 had between 1 and 15 pesticides detected, with an average of 4 pesticides detected per sample (table 7). Nine samples had no pesticide detections. Out of 134 total pesticide detections in samples from agricultural sites, 17 percent were fungicides, 37 percent were herbicides, and 46 percent were insecticides (table 9).

Out of 36 suspended sediment samples from urban sites, 16 had between 1 and 5 pesticides detected, with an average of 1 compound detected per sample (table 8). Twenty samples

Table 7. Pesticide results in suspended-sediment samples from agricultural sites.

[All results in nanogram per liter (ng/L). Compounds analyzed for but not detected: 3,4-dichloroaniline, 3,5-dichloroaniline, acetamiprid, acibenzolar-S-methyl, alachlor, allethrin, atrazine, azinphos-methyl, azinphos-methyl oxon, benefin (benfluralin), bromoconazole, butralin, butylate, captan, carbaryl, carbendazim, carbofuran, chlorantraniliprole, chlorpyrifos, chlorpyrifos oxon, clothianidin, coumaphos, cyantraniliprole, cyazofamid, cycloate, cyfluthrin, cyhalofop-butyl, cymoxanil, cyproconazole, cyprodinil, DCPMU, DCPU, deltamethrin, desthio-prothioconazole, desulfinylfipronil, desulfinylfipronil amide, diazinon, diazoxon, difenoconazole, dimethomorph, dinotefuran, diuron, EPTC, esfenvalerate, ethaboxam, ethalfluralin, etofenprox, famoxadone, fenamidone, fenarimol, fenbuconazole, fenhexamid, fenpropathrin, fenpyroximate, fenthion, fipronil, fipronil sulfide, fipronil sulfone, flonicamid, fluazinam, flufenacet, flumetralin, fluopyram, flupyradifurone, fluoxastrobin, fluridone, flusilazole, flutolanil, flutriafol, hexazinone, imazalil, imidacloprid, indoxacarb, ipconazole, iprodione, kresoxim-methyl, malaoxon, malathion, mandipropamid, metconazole, methidathion, methoprene, methoxyfenozide, methyl parathion, molinate, napropamide, novaluron, oryzalin, paclobutrazol, pebulate, penoxsulam, pentachloroanisole, pentachloronitrobenzene, penthiopyrad, phenothrin, phosmet, picoxystrobin, piperonyl butoxide, prometon, prometryn, propanil, propiconazole, pyraclostrobin, pyrimethanil, quinoxyfen, resmethrin, sedaxane, tebupirimfos, tebupirimfos oxon, tefluthrin, tetraconazole, tetradifon, tetramethrin, thiabendazole, thiacloprid, thiamethoxam, thiazopyr, thiobencarb, tolfenpyrad, triadimefon, triadimenol, triallate, tribufos, trifloxystrobin, triflumizole, trifluralin, triticonazole, zoxamide. **Abbreviations**: CA, California; g, gram; hh:mm, hour:minute; mm/dd/yyyy, month/day/year; Rd, Road; St, Street; USGS, U.S. Geological Survey; —, nondetect]

USGS site name	USGS site number	Date (mm/dd/yyyy)	Time (hh:mm)	Event	Mass (g)	Azoxystrobin	Bifenthrin	Boscalid	Chlorothalonil	Clomazone	Cyhalothrin
Kings River at Empire Weir 2 at Stratford, CA	361044119500101	04/14/2015	09:25	Dry	0.065	—	—	—	—	—	—
Kings River at Empire Weir 2 at Stratford, CA	361044119500101	06/30/2015	11:41	Dry	0.036	—	—	—	—	—	—
Kings River at Empire Weir 2 at Stratford, CA	361044119500101	11/03/2015	11:41	Storm	0.102	—	61.6	—	—	—	—
Kings River at Empire Weir 2 at Stratford, CA	361044119500101	03/07/2016	10:40	Storm	0.071	—	2.2	—	—	—	—
Kings River at Empire Weir 2 at Stratford, CA	361044119500101	09/26/2016	11:05	Dry	0.065	—	4.0	—	—	—	—
Kings River at Empire Weir 2 at Stratford, CA	361044119500101	11/30/2016	10:45	Dry	0.088	—	—	—	—	—	—
French Camp Slough at Airport Way near Stockton, CA	375252121145401	04/21/2015	11:50	Dry	0.055	—	[1]0.2	—	—	—	—
French Camp Slough at Airport Way near Stockton, CA	375252121145401	07/21/2015	12:40	Dry	0.028	—	5.0	—	—	—	—
French Camp Slough at Airport Way near Stockton, CA	375252121145401	01/06/2016	09:40	Storm	0.0117	—	—	—	—	—	—
French Camp Slough at Airport Way near Stockton, CA	375252121145401	03/07/2016	11:40	Storm	0.068	—	4.0	—	—	—	—
French Camp Slough at Airport Way near Stockton, CA	375252121145401	07/19/2016	12:20	Dry	0.012	—	—	—	—	—	—
French Camp Slough at Airport Way near Stockton, CA	375252121145401	09/20/2016	11:40	Dry	0.022	—	—	—	—	—	—
Ingram Creek at River Rd near Patterson, CA	373747121125200	06/09/2015	08:45	Dry	0.386	—	5.4	—	—	—	—
Ingram Creek at River Rd near Patterson, CA	373747121125200	09/15/2015	10:00	Dry	0.024	—	8.2	—	5.1	—	—
Ingram Creek at River Rd near Patterson, CA[2]	373747121125200	01/19/2016	13:20	Storm	0.616	—	133	—	38.0	—	—
Ingram Creek at River Rd near Patterson, CA	373747121125200	04/28/2016	16:05	Dry	0.235	—	6.0	—	—	—	—
Ingram Creek at River Rd near Patterson, CA	373747121125200	07/12/2016	13:30	Dry	0.423	—	18.3	—	—	—	—
Ingram Creek at River Rd near Patterson, CA	373747121125200	01/09/2017	12:40	Storm	0.083	—	24.0	50.3	—	—	—
Snake River at Nuestro Rd near Sutter, CA	391107121421201	05/20/2015	09:15	Dry	0.019	—	—	—	—	8.8	—
Snake River at Nuestro Rd near Sutter, CA	391107121421201	07/21/2015	14:00	Dry	0.031	—	—	—	—	—	—
Snake River at Nuestro Rd near Sutter, CA	391107121421201	03/08/2016	08:45	Storm	0.082	—	—	—	11.4	—	—
Snake River at Nuestro Rd near Sutter, CA	391107121421201	07/19/2016	11:15	Dry	0.037	—	—	—	—	—	—
Snake River at Nuestro Rd near Sutter, CA	391107121421201	08/16/2016	19:20	Dry	0.024	—	—	—	—	—	—
Snake River at Nuestro Rd near Sutter, CA	391107121421201	11/16/2016	16:10	Storm	0.428	—	—	—	—	—	—
Rainbow Creek at Huffstatler St at Rainbow, CA	332455117090701	08/26/2015	10:30	Dry	0.219	—	60.9	15.5	—	—	—
Rainbow Creek at Huffstatler St at Rainbow, CA	332455117090701	02/01/2016	12:35	Storm	0.010	—	1.2	—	—	—	—
Rainbow Creek at Huffstatler St at Rainbow, CA	332455117090701	06/08/2016	12:00	Dry	0.048	—	—	—	—	—	—
Rainbow Creek at Huffstatler St at Rainbow, CA	332455117090701	08/07/2016	11:00	Dry	0.018	—	—	—	—	—	—
Rainbow Creek at Huffstatler St at Rainbow, CA	332455117090701	10/18/2016	11:30	Dry	0.041	—	7.5	—	—	—	—

Table 7. Pesticide results in suspended-sediment samples from agricultural sites.—Continued

[All results in nanogram per liter (ng/L). Compounds analyzed for but not detected: 3,4-dichloroaniline, 3,5-dichloroaniline, acetamiprid, acibenzolar-S-methyl, alachlor, allethrin, atrazine, azinphos-methyl, azinphos-methyl oxon, benefin (benfluralin), bromoconazole, butralin, butylate, captan, carbaryl, carbendazim, carbofuran, chlorantraniliprole, chlorpyrifos, chlorpyrifos oxon, clothianidin, coumaphos, cyantraniliprole, cyazofamid, cycloate, cyfluthrin, cyhalofop-butyl, cymoxanil, cyproconazole, cyprodinil, DCPMU, DCPU, deltamethrin, desthio-prothioconazole, desulfinylfipronil, desulfinylfipronil amide, diazinon, diazoxon, difenoconazole, dimethomorph, dinotefuran, diuron, EPTC, esfenvalerate, ethaboxam, ethalfluralin, etofenprox, famoxadone, fenamidone, fenarimol, fenbuconazole, fenhexamid, fenpropathrin, fenpyroximate, fenthion, fipronil, fipronil sulfide, fipronil sulfone, flonicamid, fluazinam, flufenacet, flumetralin, fluopyram, flupyradifurone, fluoxastrobin, fluridone, flusilazole, flutolanil, flutriafol, hexazinone, imazalil, imidacloprid, indoxacarb, ipconazole, iprodione, kresoxim-methyl, malaoxon, malathion, mandipropamid, metconazole, methidathion, methoprene, methoxyfenozide, methyl parathion, molinate, napropamide, novaluron, oryzalin, paclobutrazol, pebulate, penoxsulam, pentachloroanisole, pentachloronitrobenzene, penthiopyrad, phenothrin, phosmet, picoxystrobin, piperonyl butoxide, prometon, prometryn, propanil, propiconazole, pyraclostrobin, pyrimethanil, quinoxyfen, resmethrin, sedaxane, tebupirimfos, tebupirimfos oxon, tefluthrin, tetraconazole, tetradifon, tetramethrin, thiabendazole, thiacloprid, thiamethoxam, thiazopyr, thiobencarb, tolfenpyrad, triadimefon, triadimenol, triallate, tribufos, trifloxystrobin, triflumizole, trifluralin, triticonazole, zoxamide. **Abbreviations**: CA, California; g, gram; hh:mm, hour:minute; mm/dd/yyyy, month/day/year; Rd, Road; St, Street; USGS, U.S. Geological Survey; —, nondetect]

USGS site name	USGS site number	Date (mm/dd/yyyy)	Time (hh:mm)	Event	Mass (g)	Azoxystrobin	Bifenthrin	Boscalid	Chlorothalonil	Clomazone	Cyhalothrin
Rainbow Creek at Huffstatler St at Rainbow, CA	332455117090701	12/19/2016	12:10	Storm	0.020	—	7.6	—	—	—	—
Alisal Creek at La Guardia St near Salinas, CA	363925121364701	04/29/2015	11:05	Dry	0.050	8.7	19.4	157	—	—	—
Alisal Creek at La Guardia St near Salinas, CA	363925121364701	08/25/2015	13:00	Dry	0.150	19.8	5.9	158	—	—	—
Alisal Creek at La Guardia St near Salinas, CA[3]	363925121364701	12/15/2015	12:30	Storm	0.173	—	62.4	59.2	—	—	—
Alisal Creek at La Guardia St near Salinas, CA	363925121364701	04/28/2016	12:26	Dry	0.180	—	28.3	157	—	—	110
Alisal Creek at La Guardia St near Salinas, CA	363925121364701	09/28/2016	12:25	Dry	0.064	—	4.1	6.0	—	—	—
Alisal Creek at La Guardia St near Salinas, CA[4]	363925121364701	01/12/2017	09:45	Storm	0.451	—	59.4	59.2	—	—	41.5

USGS site name	USGS site number	Date (mm/dd/yyyy)	Time (hh:mm)	Event	Cypermethrin	DCPA	Dithiopyr	Fludioxinil	Fluopicolide	Fluxapyroxad	Metalaxyl
Kings River at Empire Weir 2 at Stratford, CA	361044119500101	04/14/2015	09:25	Dry	—	—	—	—	—	—	—
Kings River at Empire Weir 2 at Stratford, CA	361044119500101	06/30/2015	11:41	Dry	—	—	—	—	—	—	—
Kings River at Empire Weir 2 at Stratford, CA	361044119500101	11/03/2015	11:41	Storm	—	—	—	—	—	—	—
Kings River at Empire Weir 2 at Stratford, CA	361044119500101	03/07/2016	10:40	Storm	—	—	—	—	—	—	—
Kings River at Empire Weir 2 at Stratford, CA	361044119500101	09/26/2016	11:05	Dry	—	—	—	—	—	—	—
Kings River at Empire Weir 2 at Stratford, CA	361044119500101	11/30/2016	10:45	Dry	—	—	—	—	—	—	—
French Camp Slough at Airport Way near Stockton, CA	375252121145401	04/21/2015	11:50	Dry	—	—	—	—	—	—	—
French Camp Slough at Airport Way near Stockton, CA	375252121145401	07/21/2015	12:40	Dry	—	—	—	—	—	—	—
French Camp Slough at Airport Way near Stockton, CA	375252121145401	01/06/2016	09:40	Storm	—	—	—	—	—	—	—
French Camp Slough at Airport Way near Stockton, CA	375252121145401	03/07/2016	11:40	Storm	—	—	2.8	—	—	—	—
French Camp Slough at Airport Way near Stockton, CA	375252121145401	07/19/2016	12:20	Dry	—	—	—	—	—	—	—
French Camp Slough at Airport Way near Stockton, CA	375252121145401	09/20/2016	11:40	Dry	—	—	—	—	—	—	—
Ingram Creek at River Rd near Patterson, CA	373747121125200	06/09/2015	08:45	Dry	—	—	—	—	—	—	—
Ingram Creek at River Rd near Patterson, CA	373747121125200	09/15/2015	10:00	Dry	—	—	—	—	—	—	—
Ingram Creek at River Rd near Patterson, CA[2]	373747121125200	01/19/2016	13:20	Storm	—	—	—	—	—	—	—
Ingram Creek at River Rd near Patterson, CA	373747121125200	04/28/2016	16:05	Dry	—	—	—	—	—	—	—
Ingram Creek at River Rd near Patterson, CA	373747121125200	07/12/2016	13:30	Dry	—	—	—	—	—	—	—
Ingram Creek at River Rd near Patterson, CA	373747121125200	01/09/2017	12:40	Storm	—	—	—	—	—	—	—
Snake River at Nuestro Rd near Sutter, CA	391107121421201	05/20/2015	09:15	Dry	—	—	—	—	—	—	—
Snake River at Nuestro Rd near Sutter, CA	391107121421201	07/21/2015	14:00	Dry	—	—	—	—	—	—	—

Table 7. Pesticide results in suspended-sediment samples from agricultural sites.—Continued

[All results in nanogram per liter (ng/L). Compounds analyzed for but not detected: 3,4-dichloroaniline, 3,5-dichloroaniline, acetamiprid, acibenzolar-S-methyl, alachlor, allethrin, atrazine, azinphos-methyl, azinphos-methyl oxon, benefin (benfluralin), bromoconazole, butralin, butylate, captan, carbaryl, carbendazim, carbofuran, chlorantraniliprole, chlorpyrifos, chlorpyrifos oxon, clothianidin, coumaphos, cyantraniliprole, cyazofamid, cycloate, cyfluthrin, cyhalofop-butyl, cymoxanil, cyproconazole, cyprodinil, DCPMU, DCPU, deltamethrin, desthio-prothioconazole, desulfinylfipronil, desulfinylfipronil amide, diazinon, diazoxon, difenoconazole, dimethomorph, dinotefuran, diuron, EPTC, esfenvalerate, ethaboxam, ethalfluralin, etofenprox, famoxadone, fenamidone, fenarimol, fenbuconazole, fenhexamid, fenpropathrin, fenpyroximate, fenthion, fipronil, fipronil sulfide, fipronil sulfone, flonicamid, fluazinam, flufenacet, flumetralin, fluopyram, flupyradifurone, fluoxastrobin, fluridone, flusilazole, flutolanil, flutriafol, hexazinone, imazalil, imidacloprid, indoxacarb, ipconazole, iprodione, kresoxim-methyl, malaoxon, malathion, mandipropamid, metconazole, methidathion, methoprene, methoxyfenozide, methyl parathion, molinate, napropamide, novaluron, oryzalin, paclobutrazol, pebulate, penoxsulam, pentachloroanisole, pentachloronitrobenzene, penthiopyrad, phenothrin, phosmet, picoxystrobin, piperonyl butoxide, prometon, prometryn, propanil, propiconazole, pyraclostrobin, pyrimethanil, quinoxyfen, resmethrin, sedaxane, tebupirimfos, tebupirimfos oxon, tefluthrin, tetraconazole, tetradifon, tetramethrin, thiabendazole, thiacloprid, thiamethoxam, thiazopyr, thiobencarb, tolfenpyrad, triadimefon, triadimenol, triallate, tribufos, trifloxystrobin, triflumizole, trifluralin, triticonazole, zoxamide. **Abbreviations**: CA, California; g, gram; hh:mm, hour:minute; mm/dd/yyyy, month/day/year; Rd, Road; St, Street; USGS, U.S. Geological Survey; —, nondetect]

USGS site name	USGS site number	Date (mm/dd/yyyy)	Time (hh:mm)	Event	Cyperme-thrin	DCPA	Dithiopyr	Fludioxinil	Fluopicolide	Fluxapy-roxad	Metalaxyl
Snake River at Nuestro Rd near Sutter, CA	391107121421201	03/08/2016	08:45	Storm	—	—	—	—	—	—	—
Snake River at Nuestro Rd near Sutter, CA	391107121421201	07/19/2016	11:15	Dry	—	—	—	—	—	—	—
Snake River at Nuestro Rd near Sutter, CA	391107121421201	08/16/2016	19:20	Dry	—	—	—	—	—	—	—
Snake River at Nuestro Rd near Sutter, CA	391107121421201	11/16/2016	16:10	Storm	—	—	—	—	—	—	—
Rainbow Creek at Huffstatler St at Rainbow, CA	332455117090701	08/26/2015	10:30	Dry	—	—	—	—	—	—	—
Rainbow Creek at Huffstatler St at Rainbow, CA	332455117090701	02/01/2016	12:35	Storm	—	—	—	—	—	—	—
Rainbow Creek at Huffstatler St at Rainbow, CA	332455117090701	06/08/2016	12:00	Dry	—	—	—	—	—	—	—
Rainbow Creek at Huffstatler St at Rainbow, CA	332455117090701	08/07/2016	11:00	Dry	—	—	—	—	—	—	—
Rainbow Creek at Huffstatler St at Rainbow, CA	332455117090701	10/18/2016	11:30	Dry	—	—	—	—	—	—	—
Rainbow Creek at Huffstatler St at Rainbow, CA	332455117090701	12/19/2016	12:10	Storm	—	—	—	—	—	—	—
Alisal Creek at La Guardia St near Salinas, CA	363925121364701	04/29/2015	11:05	Dry	—	—	—	—	—	13.5	—
Alisal Creek at La Guardia St near Salinas, CA	363925121364701	08/25/2015	13:00	Dry	—	50.0	—	41.3	30.8	—	12.2
Alisal Creek at La Guardia St near Salinas, CA[3]	363925121364701	12/15/2015	12:30	Storm	—	264	—	—	—	—	—
Alisal Creek at La Guardia St near Salinas, CA	363925121364701	04/28/2016	12:26	Dry	61.9	68.4	—	—	—	—	—
Alisal Creek at La Guardia St near Salinas, CA	363925121364701	09/28/2016	12:25	Dry	—	—	—	—	—	—	—
Alisal Creek at La Guardia St near Salinas, CA[4]	363925121364701	01/12/2017	09:45	Storm	—	106	—	—	—	—	—

USGS site name	USGS site number	Date (mm/dd/yyyy)	Time (hh:mm)	Event	Metolachlor	Myclobutanil	Oxydiazon	Oxyfluorfen	p,p′-DDD	p,p′-DDE	p,p′-DDT
Kings River at Empire Weir 2 at Stratford, CA	361044119500101	04/14/2015	09:25	Dry	—	—	—	—	—	—	—
Kings River at Empire Weir 2 at Stratford, CA	361044119500101	06/30/2015	11:41	Dry	—	—	—	—	—	—	—
Kings River at Empire Weir 2 at Stratford, CA	361044119500101	11/03/2015	11:41	Storm	—	—	—	—	—	—	—
Kings River at Empire Weir 2 at Stratford, CA	361044119500101	03/07/2016	10:40	Storm	—	—	—	2.8	—	—	—
Kings River at Empire Weir 2 at Stratford, CA	361044119500101	09/26/2016	11:05	Dry	—	—	—	—	—	—	—
Kings River at Empire Weir 2 at Stratford, CA	361044119500101	11/30/2016	10:45	Dry	—	—	—	—	—	—	—
French Camp Slough at Airport Way near Stockton, CA	375252121145401	04/21/2015	11:50	Dry	—	—	—	2.3	—	3.2	—
French Camp Slough at Airport Way near Stockton, CA	375252121145401	07/21/2015	12:40	Dry	—	—	—	—	—	—	—
French Camp Slough at Airport Way near Stockton, CA	375252121145401	01/06/2016	09:40	Storm	—	—	—	—	—	—	—
French Camp Slough at Airport Way near Stockton, CA	375252121145401	03/07/2016	11:40	Storm	—	—	32.7	22.1	—	—	—
French Camp Slough at Airport Way near Stockton, CA	375252121145401	07/19/2016	12:20	Dry	—	—	—	—	—	—	—
French Camp Slough at Airport Way near Stockton, CA	375252121145401	09/20/2016	11:40	Dry	—	—	—	—	—	—	—

Table 7. Pesticide results in suspended-sediment samples from agricultural sites.—Continued

[All results in nanogram per liter (ng/L). Compounds analyzed for but not detected: 3,4-dichloroaniline, 3,5-dichloroaniline, acetamiprid, acibenzolar-S-methyl, alachlor, allethrin, atrazine, azinphos-methyl, azinphos-methyl oxon, benefin (benfluralin), bromoconazole, butralin, butylate, captan, carbaryl, carbendazim, carbofuran, chlorantraniliprole, chlorpyrifos, chlorpyrifos oxon, clothianidin, coumaphos, cyantraniliprole, cyazofamid, cycloate, cyfluthrin, cyhalofop-butyl, cymoxanil, cyproconazole, cyprodinil, DCPMU, DCPU, deltamethrin, desthio-prothioconazole, desulfinylfipronil, desulfinylfipronil amide, diazinon, diazoxon, difenoconazole, dimethomorph, dinotefuran, diuron, EPTC, esfenvalerate, ethaboxam, ethalfluralin, etofenprox, famoxadone, fenamidone, fenarimol, fenbuconazole, fenhexamid, fenpropathrin, fenpyroximate, fenthion, fipronil, fipronil sulfide, fipronil sulfone, flonicamid, fluazinam, flufenacet, flumetralin, fluopyram, flupyradifurone, fluoxastrobin, fluridone, flusilazole, flutolanil, flutriafol, hexazinone, imazalil, imidacloprid, indoxacarb, ipconazole, iprodione, kresoxim-methyl, malaoxon, malathion, mandipropamid, metconazole, methidathion, methoprene, methoxyfenozide, methyl parathion, molinate, napropamide, novaluron, oryzalin, paclobutrazol, pebulate, penoxsulam, pentachloroanisole, pentachloronitrobenzene, penthiopyrad, phenothrin, phosmet, picoxystrobin, piperonyl butoxide, prometon, prometryn, propanil, propiconazole, pyraclostrobin, pyrimethanil, quinoxyfen, resmethrin, sedaxane, tebupirimfos, tebupirimfos oxon, tefluthrin, tetraconazole, tetradifon, tetramethrin, thiabendazole, thiacloprid, thiamethoxam, thiazopyr, thiobencarb, tolfenpyrad, triadimefon, triadimenol, triallate, tribufos, trifloxystrobin, triflumizole, trifluralin, triticonazole, zoxamide. **Abbreviations**: CA, California; g, gram; hh:mm, hour:minute; mm/dd/yyyy, month/day/year; Rd, Road; St, Street; USGS, U.S. Geological Survey; —, nondetect]

USGS site name	USGS site number	Date (mm/dd/yyyy)	Time (hh:mm)	Event	Metolachlor	Myclobutanil	Oxydiazon	Oxyfluorfen	p,p′-DDD	p,p′-DDE	p,p′-DDT
Ingram Creek at River Rd near Patterson, CA	373747121125200	06/09/2015	08:45	Dry	—	—	—	46.0	6.1	40.5	14.0
Ingram Creek at River Rd near Patterson, CA	373747121125200	09/15/2015	10:00	Dry	—	—	—	9.8	—	3.0	—
Ingram Creek at River Rd near Patterson, CA[2]	373747121125200	01/19/2016	13:20	Storm	26.7	96.1	—	783	31.3	139	84.1
Ingram Creek at River Rd near Patterson, CA	373747121125200	04/28/2016	16:05	Dry	—	—	—	10.2	—	14.6	—
Ingram Creek at River Rd near Patterson, CA	373747121125200	07/12/2016	13:30	Dry	6.3	—	—	62.7	9.0	44.3	7.1
Ingram Creek at River Rd near Patterson, CA	373747121125200	01/09/2017	12:40	Storm	—	160	—	684	—	9.7	—
Snake River at Nuestro Rd near Sutter, CA	391107121421201	05/20/2015	09:15	Dry	—	—	—	—	—	—	—
Snake River at Nuestro Rd near Sutter, CA	391107121421201	07/21/2015	14:00	Dry	—	—	—	52.9	—	—	—
Snake River at Nuestro Rd near Sutter, CA	391107121421201	03/08/2016	08:45	Storm	—	—	—	21.5	—	—	—
Snake River at Nuestro Rd near Sutter, CA	391107121421201	07/19/2016	11:15	Dry	—	—	—	—	—	—	—
Snake River at Nuestro Rd near Sutter, CA	391107121421201	08/16/2016	19:20	Dry	—	—	—	—	—	—	—
Snake River at Nuestro Rd near Sutter, CA	391107121421201	11/16/2016	16:10	Storm	—	—	—	—	—	—	—
Rainbow Creek at Huffstatler St at Rainbow, CA	332455117090701	08/26/2015	10:30	Dry	—	7.8	51.2	49.5	—	—	—
Rainbow Creek at Huffstatler St at Rainbow, CA	332455117090701	02/01/2016	12:35	Storm	—	—	6.0	3.5	—	—	—
Rainbow Creek at Huffstatler St at Rainbow, CA	332455117090701	06/08/2016	12:00	Dry	—	—	3.1	2.3	—	—	—
Rainbow Creek at Huffstatler St at Rainbow, CA	332455117090701	08/07/2016	11:00	Dry	—	—	5.8	—	—	—	—
Rainbow Creek at Huffstatler St at Rainbow, CA	332455117090701	10/18/2016	11:30	Dry	—	—	19.2	—	—	—	—
Rainbow Creek at Huffstatler St at Rainbow, CA	332455117090701	12/19/2016	12:10	Storm	—	—	9.2	—	—	—	—
Alisal Creek at La Guardia St near Salinas, CA	363925121364701	04/29/2015	11:05	Dry	—	—	—	11.3	8.3	23.7	20.4
Alisal Creek at La Guardia St near Salinas, CA	363925121364701	08/25/2015	13:00	Dry	—	19.9	—	17.7	6.1	14.6	10.4
Alisal Creek at La Guardia St near Salinas, CA[3]	363925121364701	12/15/2015	12:30	Storm	—	—	—	37.3	14.4	56.4	37.5
Alisal Creek at La Guardia St near Salinas, CA	363925121364701	04/28/2016	12:26	Dry	—	—	—	56.8	9.5	26.5	28.7
Alisal Creek at La Guardia St near Salinas, CA	363925121364701	09/28/2016	12:25	Dry	—	—	—	2.4	2.2	11.5	—
Alisal Creek at La Guardia St near Salinas, CA[4]	363925121364701	01/12/2017	09:45	Storm	—	—	—	198	57.0	198	118

Table 7. Pesticide results in suspended-sediment samples from agricultural sites.—Continued

[All results in nanogram per liter (ng/L). Compounds analyzed for but not detected: 3,4-dichloroaniline, 3,5-dichloroaniline, acetamiprid, acibenzolar-S-methyl, alachlor, allethrin, atrazine, azinphos-methyl, azinphos-methyl oxon, benefin (benfluralin), bromoconazole, butralin, butylate, captan, carbaryl, carbendazim, carbofuran, chlorantraniliprole, chlorpyrifos, chlorpyrifos oxon, clothianidin, coumaphos, cyantraniliprole, cyazofamid, cycloate, cyfluthrin, cyhalofop-butyl, cymoxanil, cyproconazole, cyprodinil, DCPMU, DCPU, deltamethrin, desthio-prothioconazole, desulfinylfipronil, desulfinylfipronil amide, diazinon, diazoxon, difenoconazole, dimethomorph, dinotefuran, diuron, EPTC, esfenvalerate, ethaboxam, ethalfluralin, etofenprox, famoxadone, fenamidone, fenarimol, fenbuconazole, fenhexamid, fenpropathrin, fenpyroximate, fenthion, fipronil, fipronil sulfide, fipronil sulfone, flonicamid, fluazinam, flufenacet, flumetralin, fluopyram, flupyradifurone, fluoxastrobin, fluridone, flusilazole, flutolanil, flutriafol, hexazinone, imazalil, imidacloprid, indoxacarb, ipconazole, iprodione, kresoxim-methyl, malaoxon, malathion, mandipropamid, metconazole, methidathion, methoprene, methoxyfenozide, methyl parathion, molinate, napropamide, novaluron, oryzalin, paclobutrazol, pebulate, penoxsulam, pentachloroanisole, pentachloronitrobenzene, penthiopyrad, phenothrin, phosmet, picoxystrobin, piperonyl butoxide, prometon, prometryn, propanil, propiconazole, pyraclostrobin, pyrimethanil, quinoxyfen, resmethrin, sedaxane, tebupirimfos, tebupirimfos oxon, tefluthrin, tetraconazole, tetradifon, tetramethrin, thiabendazole, thiacloprid, thiamethoxam, thiazopyr, thiobencarb, tolfenpyrad, triadimefon, triadimenol, triallate, tribufos, trifloxystrobin, triflumizole, trifluralin, triticonazole, zoxamide. **Abbreviations**: CA, California; g, gram; hh:mm, hour:minute; mm/dd/yyyy, month/day/year; Rd, Road; St, Street; USGS, U.S. Geological Survey; —, nondetect]

USGS site name	USGS site number	Date (mm/dd/yyyy)	Time (hh:mm)	Event	Pendimethalin	Permethrin	Prodiamine	Propargite	Propyzamide	Pyridaben	Simazine
Kings River at Empire Weir 2 at Stratford, CA	361044119500101	04/14/2015	09:25	Dry	—	—	—	—	—	—	—
Kings River at Empire Weir 2 at Stratford, CA	361044119500101	06/30/2015	11:41	Dry	—	—	—	—	—	—	—
Kings River at Empire Weir 2 at Stratford, CA	361044119500101	11/03/2015	11:41	Storm	—	—	—	—	—	—	—
Kings River at Empire Weir 2 at Stratford, CA	361044119500101	03/07/2016	10:40	Storm	34.5	—	—	—	—	—	—
Kings River at Empire Weir 2 at Stratford, CA	361044119500101	09/26/2016	11:05	Dry	—	—	—	—	—	—	—
Kings River at Empire Weir 2 at Stratford, CA	361044119500101	11/30/2016	10:45	Dry	—	—	—	—	—	—	—
French Camp Slough at Airport Way near Stockton, CA	375252121145401	04/21/2015	11:50	Dry	—	—	10.5	—	—	—	—
French Camp Slough at Airport Way near Stockton, CA	375252121145401	07/21/2015	12:40	Dry	—	—	—	—	—	—	—
French Camp Slough at Airport Way near Stockton, CA	375252121145401	01/06/2016	09:40	Storm	—	—	—	—	—	—	—
French Camp Slough at Airport Way near Stockton, CA	375252121145401	03/07/2016	11:40	Storm	54.7	—	—	—	—	—	16.2
French Camp Slough at Airport Way near Stockton, CA	375252121145401	07/19/2016	12:20	Dry	—	—	—	—	—	—	—
French Camp Slough at Airport Way near Stockton, CA	375252121145401	09/20/2016	11:40	Dry	—	—	—	—	—	—	—
Ingram Creek at River Rd near Patterson, CA	373747121125200	06/09/2015	08:45	Dry	470	—	—	—	—	—	—
Ingram Creek at River Rd near Patterson, CA	373747121125200	09/15/2015	10:00	Dry	—	—	—	—	—	—	—
Ingram Creek at River Rd near Patterson, CA[2]	373747121125200	01/19/2016	13:20	Storm	185	—	—	—	—	—	—
Ingram Creek at River Rd near Patterson, CA	373747121125200	04/28/2016	16:05	Dry	—	—	—	—	—	—	—
Ingram Creek at River Rd near Patterson, CA	373747121125200	07/12/2016	13:30	Dry	—	—	—	—	—	—	—
Ingram Creek at River Rd near Patterson, CA	373747121125200	01/09/2017	12:40	Storm	29.1	—	—	19.3	—	—	—
Snake River at Nuestro Rd near Sutter, CA	391107121421201	05/20/2015	09:15	Dry	—	—	—	—	—	—	—
Snake River at Nuestro Rd near Sutter, CA	391107121421201	07/21/2015	14:00	Dry	—	—	—	—	—	—	—
Snake River at Nuestro Rd near Sutter, CA	391107121421201	03/08/2016	08:45	Storm	15.9	—	—	—	—	—	—
Snake River at Nuestro Rd near Sutter, CA	391107121421201	07/19/2016	11:15	Dry	—	—	—	—	—	—	—
Snake River at Nuestro Rd near Sutter, CA	391107121421201	08/16/2016	19:20	Dry	—	—	—	—	—	—	—
Snake River at Nuestro Rd near Sutter, CA	391107121421201	11/16/2016	16:10	Storm	—	—	—	—	—	—	—
Rainbow Creek at Huffstatler St at Rainbow, CA	332455117090701	08/26/2015	10:30	Dry	—	33.5	130	—	—	9.4	—
Rainbow Creek at Huffstatler St at Rainbow, CA	332455117090701	02/01/2016	12:35	Storm	—	—	6.6	—	—	—	—
Rainbow Creek at Huffstatler St at Rainbow, CA	332455117090701	06/08/2016	12:00	Dry	—	—	—	—	—	—	—
Rainbow Creek at Huffstatler St at Rainbow, CA	332455117090701	08/07/2016	11:00	Dry	—	—	—	—	—	—	—
Rainbow Creek at Huffstatler St at Rainbow, CA	332455117090701	10/18/2016	11:30	Dry	—	—	4.5	—	—	—	—

Table 7. Pesticide results in suspended-sediment samples from agricultural sites.—Continued

[All results in nanogram per liter (ng/L). Compounds analyzed for but not detected: 3,4-dichloroaniline, 3,5-dichloroaniline, acetamiprid, acibenzolar-S-methyl, alachlor, allethrin, atrazine, azinphos-methyl, azinphos-methyl oxon, benefin (benfluralin), bromoconazole, butralin, butylate, captan, carbaryl, carbendazim, carbofuran, chlorantraniliprole, chlorpyrifos, chlorpyrifos oxon, clothianidin, coumaphos, cyantraniliprole, cyazofamid, cycloate, cyfluthrin, cyhalofop-butyl, cymoxanil, cyproconazole, cyprodinil, DCPMU, DCPU, deltamethrin, desthio-prothioconazole, desulfinylfipronil, desulfinylfipronil amide, diazinon, diazoxon, difenoconazole, dimethomorph, dinotefuran, diuron, EPTC, esfenvalerate, ethaboxam, ethalfluralin, etofenprox, famoxadone, fenamidone, fenarimol, fenbuconazole, fenhexamid, fenpropathrin, fenpyroximate, fenthion, fipronil, fipronil sulfide, fipronil sulfone, flonicamid, fluazinam, flufenacet, flumetralin, fluopyram, flupyradifurone, fluoxastrobin, fluridone, flusilazole, flutolanil, flutriafol, hexazinone, imazalil, imidacloprid, indoxacarb, ipconazole, iprodione, kresoxim-methyl, malaoxon, malathion, mandipropamid, metconazole, methidathion, methoprene, methoxyfenozide, methyl parathion, molinate, napropamide, novaluron, oryzalin, paclobutrazol, pebulate, penoxsulam, pentachloroanisole, pentachloronitrobenzene, penthiopyrad, phenothrin, phosmet, picoxystrobin, piperonyl butoxide, prometon, prometryn, propanil, propiconazole, pyraclostrobin, pyrimethanil, quinoxyfen, resmethrin, sedaxane, tebupirimfos, tebupirimfos oxon, tefluthrin, tetraconazole, tetradifon, tetramethrin, thiabendazole, thiacloprid, thiamethoxam, thiazopyr, thiobencarb, tolfenpyrad, triadimefon, triadimenol, triallate, tribufos, trifloxystrobin, triflumizole, trifluralin, triticonazole, zoxamide. **Abbreviations**: CA, California; g, gram; hh:mm, hour:minute; mm/dd/yyyy, month/day/year; Rd, Road; St, Street; USGS, U.S. Geological Survey; —, nondetect]

USGS site name	USGS site number	Date (mm/dd/yyyy)	Time (hh:mm)	Event	Pendimethalin	Permethrin	Prodiamine	Propargite	Propyzamide	Pyridaben	Simazine
Rainbow Creek at Huffstatler St at Rainbow, CA	332455117090701	12/19/2016	12:10	Storm	—	—	—	—	—	—	—
Alisal Creek at La Guardia St near Salinas, CA	363925121364701	04/29/2015	11:05	Dry	—	—	—	—	—	—	—
Alisal Creek at La Guardia St near Salinas, CA	363925121364701	08/25/2015	13:00	Dry	—	33.3	—	—	12.5	—	—
Alisal Creek at La Guardia St near Salinas, CA[3]	363925121364701	12/15/2015	12:30	Storm	53.7	105	—	—	—	—	—
Alisal Creek at La Guardia St near Salinas, CA	363925121364701	04/28/2016	12:26	Dry	—	26.0	—	—	2.7	—	—
Alisal Creek at La Guardia St near Salinas, CA	363925121364701	09/28/2016	12:25	Dry	—	—	—	—	—	—	—
Alisal Creek at La Guardia St near Salinas, CA[4]	363925121364701	01/12/2017	09:45	Storm	92.3	—	—	—	—	—	—

USGS site name	USGS site number	Date (mm/dd/yyyy)	Time (hh:mm)	Event	tau-Fluvalinate	Tebuconazole
Kings River at Empire Weir 2 at Stratford, CA	361044119500101	04/14/2015	09:25	Dry	—	—
Kings River at Empire Weir 2 at Stratford, CA	361044119500101	06/30/2015	11:41	Dry	—	—
Kings River at Empire Weir 2 at Stratford, CA	361044119500101	11/03/2015	11:41	Storm	—	—
Kings River at Empire Weir 2 at Stratford, CA	361044119500101	03/07/2016	10:40	Storm	—	—
Kings River at Empire Weir 2 at Stratford, CA	361044119500101	09/26/2016	11:05	Dry	—	—
Kings River at Empire Weir 2 at Stratford, CA	361044119500101	11/30/2016	10:45	Dry	—	—
French Camp Slough at Airport Way near Stockton, CA	375252121145401	04/21/2015	11:50	Dry	—	—
French Camp Slough at Airport Way near Stockton, CA	375252121145401	07/21/2015	12:40	Dry	—	—
French Camp Slough at Airport Way near Stockton, CA	375252121145401	01/06/2016	09:40	Storm	—	—
French Camp Slough at Airport Way near Stockton, CA	375252121145401	03/07/2016	11:40	Storm	—	—
French Camp Slough at Airport Way near Stockton, CA	375252121145401	07/19/2016	12:20	Dry	—	—
French Camp Slough at Airport Way near Stockton, CA	375252121145401	09/20/2016	11:40	Dry	—	—
Ingram Creek at River Rd near Patterson, CA	373747121125200	06/09/2015	08:45	Dry	—	—
Ingram Creek at River Rd near Patterson, CA	373747121125200	09/15/2015	10:00	Dry	—	—
Ingram Creek at River Rd near Patterson, CA[2]	373747121125200	01/19/2016	13:20	Storm	—	—
Ingram Creek at River Rd near Patterson, CA	373747121125200	04/28/2016	16:05	Dry	—	—
Ingram Creek at River Rd near Patterson, CA	373747121125200	07/12/2016	13:30	Dry	—	—
Ingram Creek at River Rd near Patterson, CA	373747121125200	01/09/2017	12:40	Storm	—	—
Snake River at Nuestro Rd near Sutter, CA	391107121421201	05/20/2015	09:15	Dry	—	—
Snake River at Nuestro Rd near Sutter, CA	391107121421201	07/21/2015	14:00	Dry	—	—

Table 7. Pesticide results in suspended-sediment samples from agricultural sites.—Continued

[All results in nanogram per liter (ng/L). Compounds analyzed for but not detected: 3,4-dichloroaniline, 3,5-dichloroaniline, acetamiprid, acibenzolar-S-methyl, alachlor, allethrin, atrazine, azinphos-methyl, azinphos-methyl oxon, benefin (benfluralin), bromoconazole, butralin, butylate, captan, carbaryl, carbendazim, carbofuran, chlorantraniliprole, chlorpyrifos, chlorpyrifos oxon, clothianidin, coumaphos, cyantraniliprole, cyazofamid, cycloate, cyfluthrin, cyhalofop-butyl, cymoxanil, cyproconazole, cyprodinil, DCPMU, DCPU, deltamethrin, desthio-prothioconazole, desulfinylfipronil, desulfinylfipronil amide, diazinon, diazoxon, difenoconazole, dimethomorph, dinotefuran, diuron, EPTC, esfenvalerate, ethaboxam, ethalfluralin, etofenprox, famoxadone, fenamidone, fenarimol, fenbuconazole, fenhexamid, fenpropathrin, fenpyroximate, fenthion, fipronil, fipronil sulfide, fipronil sulfone, flonicamid, fluazinam, flufenacet, flumetralin, fluopyram, flupyradifurone, fluoxastrobin, fluridone, flusilazole, flutolanil, flutriafol, hexazinone, imazalil, imidacloprid, indoxacarb, ipconazole, iprodione, kresoxim-methyl, malaoxon, malathion, mandipropamid, metconazole, methidathion, methoprene, methoxyfenozide, methyl parathion, molinate, napropamide, novaluron, oryzalin, paclobutrazol, pebulate, penoxsulam, pentachloroanisole, pentachloronitrobenzene, penthiopyrad, phenothrin, phosmet, picoxystrobin, piperonyl butoxide, prometon, prometryn, propanil, propiconazole, pyraclostrobin, pyrimethanil, quinoxyfen, resmethrin, sedaxane, tebupirimfos, tebupirimfos oxon, tefluthrin, tetraconazole, tetradifon, tetramethrin, thiabendazole, thiacloprid, thiamethoxam, thiazopyr, thiobencarb, tolfenpyrad, triadimefon, triadimenol, triallate, tribufos, trifloxystrobin, triflumizole, trifluralin, triticonazole, zoxamide. **Abbreviations**: CA, California; g, gram; hh:mm, hour:minute; mm/dd/yyyy, month/day/year; Rd, Road; St, Street; USGS, U.S. Geological Survey; —, nondetect]

USGS site name	USGS site number	Date (mm/dd/yyyy)	Time (hh:mm)	Event	tau-Fluvalinate	Tebuconazole
Snake River at Nuestro Rd near Sutter, CA	391107121421201	03/08/2016	08:45	Storm	—	—
Snake River at Nuestro Rd near Sutter, CA	391107121421201	07/19/2016	11:15	Dry	—	—
Snake River at Nuestro Rd near Sutter, CA	391107121421201	08/16/2016	19:20	Dry	—	—
Snake River at Nuestro Rd near Sutter, CA	391107121421201	11/16/2016	16:10	Storm	—	—
Rainbow Creek at Huffstatler St at Rainbow, CA	332455117090701	08/26/2015	10:30	Dry	59.6	—
Rainbow Creek at Huffstatler St at Rainbow, CA	332455117090701	02/01/2016	12:35	Storm	—	—
Rainbow Creek at Huffstatler St at Rainbow, CA	332455117090701	06/08/2016	12:00	Dry	—	—
Rainbow Creek at Huffstatler St at Rainbow, CA	332455117090701	08/07/2016	11:00	Dry	—	—
Rainbow Creek at Huffstatler St at Rainbow, CA	332455117090701	10/18/2016	11:30	Dry	—	—
Rainbow Creek at Huffstatler St at Rainbow, CA	332455117090701	12/19/2016	12:10	Storm	—	—
Alisal Creek at La Guardia St near Salinas, CA	363925121364701	04/29/2015	11:05	Dry	—	—
Alisal Creek at La Guardia St near Salinas, CA	363925121364701	08/25/2015	13:00	Dry	—	77.3
Alisal Creek at La Guardia St near Salinas, CA[3]	363925121364701	12/15/2015	12:30	Storm	—	—
Alisal Creek at La Guardia St near Salinas, CA	363925121364701	04/28/2016	12:26	Dry	—	—
Alisal Creek at La Guardia St near Salinas, CA	363925121364701	09/28/2016	12:25	Dry	—	—
Alisal Creek at La Guardia St near Salinas, CA[4]	363925121364701	01/12/2017	09:45	Storm	—	—

[1]Value detected below minimum detection limit.

[2]Sample was obtained from a filtered volume differing from its associated water sample. The volume associated with this sample is 0.515 liters.

[3]Sample was obtained from a filtered volume differing from its associated water sample. The volume associated with this sample is 0.340 liters.

[4]Sample was obtained from a filtered volume differing from its associated water sample. The volume associated with this sample is 0.300 liters.

Table 8. Pesticide results in suspended-sediment samples from urban sites.

[All results in nanograms per liter (ng/L). Compounds analyzed for but not detected: 3,4-dichloroaniline, 3,5-dichloroaniline, acetamiprid, acibenzolar-S-methyl, alachlor, allethrin, atrazine, azinphos-methyl, azinphos-methyl oxon, azoxystrobin, benefin (benfluralin), bromoconazole, butralin, butylate, captan, carbaryl, carbendazim, carbofuran, chlorantraniliprole, chlorpyrifos, chlorpyrifos oxon, clomazone, clothianidin, coumaphos, cyantraniliprole, cyazofamid, cycloate, cyfluthrin, cyhalofop-butyl, cyhalothrin (all isomers), cymoxanil, cypermethrin, cyproconazole, cyprodinil, DCPA, DCPMU, DCPU, deltamethrin, desthio-prothioconazole, desulfinylfipronil, desulfinylfipronil amide, diazinon, diazoxon, difenoconazole, dimethomorph, dinotefuran, diuron, EPTC, esfenvalerate, ethaboxam, ethalfluralin, etofenprox, famoxadone, fenamidone, fenarimol, fenbuconazole, fenhexamid, fenpropathrin, fenpyroximate, fenthion, fipronil, fipronil sulfide, fipronil sulfone, flonicamid, fluazinam, fludioxonil, flufenacet, flumetralin, fluopicolide, fluopyram, flupyradifurone, fluoxastrobin, fluridone, flusilazole, flutolanil, flutriafol, fluxapyroxad, hexazinone, imazalil, imidacloprid, indoxacarb, ipconazole, iprodione, kresoxim-methyl, malaoxon, malathion, mandipropamid, metalaxyl, metconazole, methidathion, methoprene, methoxyfenozide, methyl parathion, metolachlor, molinate, myclobutanil, napropamide, novaluron, oryzalin, oxadiazon, oxyfluorfen, p,p'-DDT, paclobutrazol, pebulate, penoxsulam, pentachloroanisole, pentachloronitrobenzene, penthiopyrad, phenothrin, phosmet, picoxystrobin, piperonyl butoxide, prometon, prometryn, propanil, propargite, propiconazole, propyzamide, pyraclostrobin, pyridaben, pyrimethanil, quinoxyfen, resmethrin, sedaxane, simazine, tau-fluvalinate, tebuconazole, tebupirimfos, tebupirimfos oxon, tefluthrin, tetraconazole, tetradifon, tetramethrin, thiabendazole, thiacloprid, thiamethoxam, thiazopyr, thiobencarb, tolfenpyrad, triadimefon, triadimenol, triallate, tribufos, trifloxystrobin, triflumizole, trifluralin, triticonazole, zoxamide. **Abbreviations**: CA, California; Dr, Drive; g, gram; hh:mm, hour:minute; L, liter; mm/dd/yyyy, month/day/year; Rd, Road; St, Street; USGS, U.S. Geological Survey; —, nondetect]

USGS site name	USGS site number	Date (mm/dd/yyyy)	Time (hh:mm)	Event	Volume (L)	Mass (g)	Bifenthrin	Boscalid	Chlorothalonil	Dithiopyr
Unnamed Tributary to Alder Creek at Iron Point Rd near Folsom, CA	383844121084001	04/07/2015	11:10	Storm	1.010	0.007	30.7	—	5.5	—
Unnamed Tributary to Alder Creek at Iron Point Rd near Folsom, CA	383844121084001	11/02/2015	10:50	Storm	0.975	0.001	15.3	—	—	—
Unnamed Tributary to Alder Creek at Iron Point Rd near Folsom, CA	383844121084001	02/18/2016	10:05	Storm	1.06	0.004	—	—	—	—
Unnamed Tributary to Alder Creek at Iron Point Rd near Folsom, CA	383844121084001	04/07/2016	12:00	Dry	1.040	0.014	5.1	—	—	—
Unnamed Tributary to Alder Creek at Iron Point Rd near Folsom, CA	383844121084001	10/14/2016	16:52	Storm	1.015	0.013	6.8	—	—	—
Unnamed Tributary to Alder Creek at Iron Point Rd near Folsom, CA	383844121084001	12/06/2016	11:30	Dry	0.920	0.002	—	—	—	—
Pleasant Grove Creek at Crocker Ranch Rd near Roseville, CA	384755121205201	06/08/2015	11:00	Dry	1.025	0.044	1.2	—	—	—
Pleasant Grove Creek at Crocker Ranch Rd near Roseville, CA	384755121205201	11/02/2015	1:20	Storm	1.020	0.012	37.2	—	—	—
Pleasant Grove Creek at Crocker Ranch Rd near Roseville, CA	384755121205201	02/17/2016	22:37	Storm	1.03	0.023	22.4	—	—	7.6
Pleasant Grove Creek at Crocker Ranch Rd near Roseville, CA	384755121205201	06/14/2016	10:15	Dry	1.040	0.009	—	—	—	—
Pleasant Grove Creek at Crocker Ranch Rd near Roseville, CA	384755121205201	08/01/2016	10:05	Dry	1.040	0.038	2.1	—	—	—
Pleasant Grove Creek at Crocker Ranch Rd near Roseville, CA	384755121205201	10/14/2016	13:45	Storm	1.025	0.023	17.8	—	—	—
Salt Creek at Niguel Rd at Laguna Niguel, CA	333018117423301	05/04/2015	17:40	Dry	0.980	0.049	[1]0.6	—	—	—
Salt Creek at Niguel Rd at Laguna Niguel, CA	333018117423301	02/04/2016	11:12	Dry	1.000	0.102	9.5	—	—	—
Salt Creek at Niguel Rd at Laguna Niguel, CA	333018117423301	05/19/2016	12:20	Dry	1.020	0.0385	3.0	—	—	—
Salt Creek at Niguel Rd at Laguna Niguel, CA	333018117423301	08/07/2016	12:50	Dry	1.020	0.038	—	—	—	—
Salt Creek at Niguel Rd at Laguna Niguel, CA	333018117423301	08/18/2016	7:30	Dry	1.040	0.042	—	—	—	—
Salt Creek at Niguel Rd at Laguna Niguel, CA	333018117423301	11/03/2016	7:45	Dry	1.050	0.025	—	—	—	—
San Luis Obispo Creek at Los Osos Valley Rd near San Luis Obispo, CA	351436120405201	05/20/2015	8:15	Dry	1.025	0.014	—	—	—	—
San Luis Obispo Creek at Los Osos Valley Rd near San Luis Obispo, CA	351436120405201	09/09/2015	12:00	Dry	1.040	0.012	4.2	—	—	—
San Luis Obispo Creek at Los Osos Valley Rd near San Luis Obispo, CA	351436120405201	11/16/2015	12:00	Storm	1.000	0.0115	—	16.2	—	—
San Luis Obispo Creek at Los Osos Valley Rd near San Luis Obispo, CA	351436120405201	04/06/2016	14:15	Dry	1.000	0.003	—	—	—	—
San Luis Obispo Creek at Los Osos Valley Rd near San Luis Obispo, CA	351436120405201	07/13/2016	10:55	Dry	1.030	0.010	13.3	—	—	—
San Luis Obispo Creek at Los Osos Valley Rd near San Luis Obispo, CA	351436120405201	08/30/2016	11:44	Dry	1.030	0.013	—	—	—	—
Stevens Creek at Barranca Dr a Monta Vista, CA	372004122035201	08/05/2015	12:08	Dry	0.920	0.008	—	—	—	—
Stevens Creek at Barranca Dr a Monta Vista, CA	372004122035201	02/01/2016	10:35	Dry	1.020	0.010	—	—	—	—
Stevens Creek at Barranca Dr a Monta Vista, CA	372004122035201	03/24/2016	11:14	Dry	1.030	0.046	—	—	—	—
Stevens Creek at Barranca Dr a Monta Vista, CA	372004122035201	06/08/2016	13:00	Dry	1.050	0.016	—	—	—	—

Table 8. Pesticide results in suspended-sediment samples from urban sites.—Continued

[All results in nanograms per liter (ng/L). Compounds analyzed for but not detected: 3,4-dichloroaniline, 3,5-dichloroaniline, acetamiprid, acibenzolar-S-methyl, alachlor, allethrin, atrazine, azinphos-methyl, azinphos-methyl oxon, azoxystrobin, benefin (benfluralin), bromoconazole, butralin, butylate, captan, carbaryl, carbendazim, carbofuran, chlorantraniliprole, chlorpyrifos, chlorpyrifos oxon, clomazone, clothianidin, coumaphos, cyantraniliprole, cyazofamid, cycloate, cyfluthrin, cyhalofop-butyl, cyhalothrin (all isomers), cymoxanil, cypermethrin, cyproconazole, cyprodinil, DCPA, DCPMU, DCPU, deltamethrin, desthio-prothioconazole, desulfinylfipronil, desulfinylfipronil amide, diazinon, diazoxon, difenoconazole, dimethomorph, dinotefuran, diuron, EPTC, esfenvalerate, ethaboxam, ethalfluralin, etofenprox, famoxadone, fenamidone, fenarimol, fenbuconazole, fenhexamid, fenpropathrin, fenpyroximate, fenthion, fipronil, fipronil sulfide, fipronil sulfone, flonicamid, fluazinam, fludioxonil, flufenacet, flumetralin, fluopicolide, fluopyram, flupyradifurone, fluoxastrobin, fluridone, flusilazole, flutolanil, flutriafol, fluxapyroxad, hexazinone, imazalil, imidacloprid, indoxacarb, ipconazole, iprodione, kresoxim-methyl, malaoxon, malathion, mandipropamid, metalaxyl, metconazole, methidathion, methoprene, methoxyfenozide, methyl parathion, metolachlor, molinate, myclobutanil, napropamide, novaluron, oryzalin, oxadiazon, oxyfluorfen, p,p'-DDT, paclobutrazol, pebulate, penoxsulam, pentachloroanisole, pentachloronitrobenzene, penthiopyrad, phenothrin, phosmet, picoxystrobin, piperonyl butoxide, prometon, prometryn, propanil, propargite, propiconazole, propyzamide, pyraclostrobin, pyridaben, pyrimethanil, quinoxyfen, resmethrin, sedaxane, simazine, tau-fluvalinate, tebuconazole, tebupirimfos, tebupirimfos oxon, tefluthrin, tetraconazole, tetradifon, tetramethrin, thiabendazole, thiacloprid, thiamethoxam, thiazopyr, thiobencarb, tolfenpyrad, triadimefon, triadimenol, triallate, tribufos, trifloxystrobin, triflumizole, trifluralin, triticonazole, zoxamide. **Abbreviations**: CA, California; Dr, Drive; g, gram; hh:mm, hour:minute; L, liter; mm/dd/yyyy, month/day/year; Rd, Road; St, Street; USGS, U.S. Geological Survey; —, nondetect]

USGS site name	USGS site number	Date (mm/dd/yyyy)	Time (hh:mm)	Event	Volume (L)	Mass (g)	Bifenthrin	Boscalid	Chlorothalonil	Dithiopyr
Stevens Creek at Barranca Dr a Monta Vista, CA	372004122035201	01/03/2017	13:00	Storm	1.010	0.012	—	—	—	—
Stevens Creek at Barranca Dr a Monta Vista, CA	372004122035201	01/10/2017	11:50	Storm	1.020	0.103	—	—	—	—
Sweetwater River at Willow St at Chula Vista, CA	323932117023201	08/24/2015	10:30	Dry	0.925	0.108	—	—	—	—
Sweetwater River at Willow St at Chula Vista, CA	323932117023201	02/01/2016	10:45	Storm	0.950	0.026	4.3	—	—	—
Sweetwater River at Willow St at Chula Vista, CA	323932117023201	06/08/2016	10:30	Dry	0.990	0.043	—	—	—	—
Sweetwater River at Willow St at Chula Vista, CA	323932117023201	08/03/2016	14:50	Dry	1.030	0.047	—	—	—	—
Sweetwater River at Willow St at Chula Vista, CA	323932117023201	10/18/2016	10:00	Dry	0.970	0.040	—	—	—	—
Sweetwater River at Willow St at Chula Vista, CA	323932117023201	12/19/2016	10:30	Storm	0.995	0.019	—	—	—	—

USGS site name	USGS site number	Date (mm/dd/yyyy)	Time	Event	p,p′-DDD	p,p′-DDE	Pendimethalin	Permethrin	Prodiamine
Unnamed Tributary to Alder Creek at Iron Point Rd near Folsom, CA	383844121084001	04/07/2015	11:10	Storm	—	—	—	—	—
Unnamed Tributary to Alder Creek at Iron Point Rd near Folsom, CA	383844121084001	11/02/2015	10:50	Storm	—	—	—	—	—
Unnamed Tributary to Alder Creek at Iron Point Rd near Folsom, CA	383844121084001	02/18/2016	10:05	Storm	—	—	—	—	—
Unnamed Tributary to Alder Creek at Iron Point Rd near Folsom, CA	383844121084001	04/07/2016	12:00	Dry	—	—	—	12.0	—
Unnamed Tributary to Alder Creek at Iron Point Rd near Folsom, CA	383844121084001	10/14/2016	16:52	Storm	—	—	—	—	—
Unnamed Tributary to Alder Creek at Iron Point Rd near Folsom, CA	383844121084001	12/06/2016	11:30	Dry	—	—	—	—	—
Pleasant Grove Creek at Crocker Ranch Rd near Roseville, CA	384755121205201	06/08/2015	11:00	Dry	—	—	—	—	—
Pleasant Grove Creek at Crocker Ranch Rd near Roseville, CA	384755121205201	11/02/2015	1:20	Storm	—	—	—	—	—
Pleasant Grove Creek at Crocker Ranch Rd near Roseville, CA	384755121205201	02/17/2016	22:37	Storm	—	—	140	29.1	5.3
Pleasant Grove Creek at Crocker Ranch Rd near Roseville, CA	384755121205201	06/14/2016	10:15	Dry	—	—	—	—	—
Pleasant Grove Creek at Crocker Ranch Rd near Roseville, CA	384755121205201	08/01/2016	10:05	Dry	—	—	—	—	—
Pleasant Grove Creek at Crocker Ranch Rd near Roseville, CA	384755121205201	10/14/2016	13:45	Storm	—	—	33.6	—	—
Salt Creek at Niguel Rd at Laguna Niguel, CA	333018117423301	05/04/2015	17:40	Dry	—	—	—	—	—
Salt Creek at Niguel Rd at Laguna Niguel, CA	333018117423301	02/04/2016	11:12	Dry	—	—	—	44.2	—
Salt Creek at Niguel Rd at Laguna Niguel, CA	333018117423301	05/19/2016	12:20	Dry	—	—	—	5.6	—
Salt Creek at Niguel Rd at Laguna Niguel, CA	333018117423301	08/07/2016	12:50	Dry	—	—	—	—	—
Salt Creek at Niguel Rd at Laguna Niguel, CA	333018117423301	08/18/2016	7:30	Dry	—	—	—	—	—
Salt Creek at Niguel Rd at Laguna Niguel, CA	333018117423301	11/03/2016	7:45	Dry	—	—	—	—	—

Table 8. Pesticide results in suspended-sediment samples from urban sites.—Continued

[All results in nanograms per liter (ng/L). Compounds analyzed for but not detected: 3,4-dichloroaniline, 3,5-dichloroaniline, acetamiprid, acibenzolar-S-methyl, alachlor, allethrin, atrazine, azinphos-methyl, azinphos-methyl oxon, azoxystrobin, benefin (benfluralin), bromoconazole, butralin, butylate, captan, carbaryl, carbendazim, carbofuran, chlorantraniliprole, chlorpyrifos, chlorpyrifos oxon, clomazone, clothianidin, coumaphos, cyantraniliprole, cyazofamid, cycloate, cyfluthrin, cyhalofop-butyl, cyhalothrin (all isomers), cymoxanil, cypermethrin, cyproconazole, cyprodinil, DCPA, DCPMU, DCPU, deltamethrin, desthio-prothioconazole, desulfinylfipronil, desulfinylfipronil amide, diazinon, diazoxon, difenoconazole, dimethomorph, dinotefuran, diuron, EPTC, esfenvalerate, ethaboxam, ethalfluralin, etofenprox, famoxadone, fenamidone, fenarimol, fenbuconazole, fenhexamid, fenpropathrin, fenpyroximate, fenthion, fipronil, fipronil sulfide, fipronil sulfone, flonicamid, fluazinam, fludioxonil, flufenacet, flumetralin, fluopicolide, fluopyram, flupyradifurone, fluoxastrobin, fluridone, flusilazole, flutolanil, flutriafol, fluxapyroxad, hexazinone, imazalil, imidacloprid, indoxacarb, ipconazole, iprodione, kresoxim-methyl, malaoxon, malathion, mandipropamid, metalaxyl, metconazole, methidathion, methoprene, methoxyfenozide, methyl parathion, metolachlor, molinate, myclobutanil, napropamide, novaluron, oryzalin, oxadiazon, oxyfluorfen, p,p'-DDT, paclobutrazol, pebulate, penoxsulam, pentachloroanisole, pentachloronitrobenzene, penthiopyrad, phenothrin, phosmet, picoxystrobin, piperonyl butoxide, prometon, prometryn, propanil, propargite, propiconazole, propyzamide, pyraclostrobin, pyridaben, pyrimethanil, quinoxyfen, resmethrin, sedaxane, simazine, tau-fluvalinate, tebuconazole, tebupirimfos, tebupirimfos oxon, tefluthrin, tetraconazole, tetradifon, tetramethrin, thiabendazole, thiacloprid, thiamethoxam, thiazopyr, thiobencarb, tolfenpyrad, triadimefon, triadimenol, triallate, tribufos, trifloxystrobin, triflumizole, trifluralin, triticonazole, zoxamide. **Abbreviations**: CA, California; Dr, Drive; g, gram; hh:mm, hour:minute; L, liter; mm/dd/yyyy, month/day/year; Rd, Road; St, Street; USGS, U.S. Geological Survey; —, nondetect]

USGS site name	USGS site number	Date (mm/dd/yyyy)	Time	Event	p,p'-DDD	p,p'-DDE	Pendimethalin	Permethrin	Prodiamine
San Luis Obispo Creek at Los Osos Valley Rd near San Luis Obispo, CA	351436120405201	05/20/2015	8:15	Dry	—	—	—	—	—
San Luis Obispo Creek at Los Osos Valley Rd near San Luis Obispo, CA	351436120405201	09/09/2015	12:00	Dry	214	—	—	18.1	—
San Luis Obispo Creek at Los Osos Valley Rd near San Luis Obispo, CA	351436120405201	11/16/2015	12:00	Storm	—	—	—	—	—
San Luis Obispo Creek at Los Osos Valley Rd near San Luis Obispo, CA	351436120405201	04/06/2016	14:15	Dry	—	—	—	—	—
San Luis Obispo Creek at Los Osos Valley Rd near San Luis Obispo, CA	351436120405201	07/13/2016	10:55	Dry	—	—	—	—	—
San Luis Obispo Creek at Los Osos Valley Rd near San Luis Obispo, CA	351436120405201	08/30/2016	11:44	Dry	—	—	—	—	—
Stevens Creek at Barranca Dr a Monta Vista, CA	372004122035201	08/05/2015	12:08	Dry	—	—	—	—	—
Stevens Creek at Barranca Dr a Monta Vista, CA	372004122035201	02/01/2016	10:35	Dry	—	—	—	—	—
Stevens Creek at Barranca Dr a Monta Vista, CA	372004122035201	03/24/2016	11:14	Dry	—	—	—	—	—
Stevens Creek at Barranca Dr a Monta Vista, CA	372004122035201	06/08/2016	13:00	Dry	—	—	—	—	—
Stevens Creek at Barranca Dr a Monta Vista, CA	372004122035201	01/03/2017	13:00	Storm	—	—	—	—	—
Stevens Creek at Barranca Dr a Monta Vista, CA	372004122035201	01/10/2017	11:50	Storm	—	—	—	—	—
Sweetwater River at Willow St at Chula Vista, CA	323932117023201	08/24/2015	10:30	Dry	—	—	—	—	—
Sweetwater River at Willow St at Chula Vista, CA	323932117023201	02/01/2016	10:45	Storm	—	3.9	—	17.2	—
Sweetwater River at Willow St at Chula Vista, CA	323932117023201	06/08/2016	10:30	Dry	—	—	—	—	—
Sweetwater River at Willow St at Chula Vista, CA	323932117023201	08/03/2016	14:50	Dry	—	—	—	—	—
Sweetwater River at Willow St at Chula Vista, CA	323932117023201	10/18/2016	10:00	Dry	—	—	—	—	—
Sweetwater River at Willow St at Chula Vista, CA	323932117023201	12/19/2016	10:30	Storm	—	—	—	—	—

[1]Value detected below minimum detection limit.

Table 9. Total number of detections in suspended-sediment samples from agricultural and urban sites.

[*, fungicide;**, insecticide; ***, herbicide]

Pesticide	Agricultural sites		Urban sites		Total	
	Detections	Detection frequency (percent)	Detections	Detection frequency (percent)	Detections	Detection frequency (percent)
Azoxystrobin*	2	6	0	0	2	3
Bifenthrin**	22	61	15	42	37	51
Boscalid*	8	22	1	3	9	13
Chlorothalonil*	3	8	1	3	4	6
Clomazone***	1	3	0	0	1	1
Cyhalothrin**	2	6	0	0	2	3
Cypermethrin**	1	3	0	0	1	1
DCPA***	4	11	0	0	4	6
Dithiopyr***	1	3	1	3	2	3
Fludioxinil*	1	3	0	0	1	1
Fluopicolide*	1	3	0	0	1	1
Fluxapyroxad*	1	3	0	0	1	1
Metalaxyl*	1	3	0	0	1	1
Metolachlor***	2	6	0	0	2	3
Myclobutanil*	4	11	0	0	4	6
Oxydiazon***	7	19	0	0	7	10
Oxyfluorfen***	20	56	0	0	20	28
p,p’-DDD**	9	25	1	3	10	14
p,p’-DDE**	13	36	1	3	14	19
p,p’-DDT**	8	22	0	0	8	11
Pendimethalin***	8	22	2	6	10	14
Permethrin**	4	11	6	17	10	14
Prodiamine***	4	11	1	3	5	7
Propargite*	1	3	0	0	1	1
Propyzamide***	2	6	0	0	2	3
Pyridaben*	1	3	0	0	1	1
Simazine***	1	3	0	0	1	1
tau-Fluvalinate*	1	3	0	0	1	1
Tebuconazole*	1	3	0	0	1	1

had no pesticide detections. Out of 29 total pesticide detections in samples from urban sites, 7 percent were fungicides, 14 percent were herbicides, and 79 percent were insecticides (table 9).

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