



Department of Pesticide Regulation



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MEMORANDUM

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SUBJECT: PRELIMINARY RESULTS OF PESTICIDE ANALYSIS OF MONTHLY
SURFACE WATER MONITORING FOR THE RED IMPORTED FIRE ANT
PROJECT IN ORANGE COUNTY, MAY 2002 (STUDY 183)

SUMMARY

During May 2002, monthly surface water samples were collected from five sites in Orange County, California. Water samples showed no detects of fenoxycarb, hydramethylnon, pyriproxyfen, chlorpyrifos, dimethoate, malathion, and methidathion. Bifenthrin was detected in two samples at 0.277 and 0.502 parts per billion (ppb) at the two nursery sites. Diazinon was detected in three samples ranging from 0.056 to 0.382 ppb at two urban and an integrated site. Malathion was detected in two samples at 0.058 and 0.086 ppb at two nursery sites. Water samples collected from a mitigation filter strip planted with *Canna* showed 7% and 49% reductions of bifenthrin and malathion residues, respectively.

SCOPE OF THIS MEMORANDUM

This memorandum reports results of water sampling conducted by the Department of Pesticide Regulation (DPR), under interagency agreement with the California Department of Food and Agriculture (CDFA), for the Red Imported Fire Ant (RIFA) control project. Data included here are from the May 29, 2002 monthly monitoring, and encompass results from chemical analyses. This memorandum summarizes results for bifenthrin, fenoxycarb, hydramethylnon, pyriproxyfen, and five organophosphorus insecticides: chlorpyrifos, diazinon, dimethoate, malathion, and methidathion. Only bifenthrin, fenoxycarb, hydramethylnon, pyriproxyfen, and chlorpyrifos are used in the RIFA control program. The other four organophosphates are in our multiresidue analytical method and are included in this report to assist in the interpretation of the toxicity results. An in-depth interpretation of data is not included here, but will be provided in the final report when the 2002 pesticide use report becomes available.

Reports of the monthly surface water sampling events will continue through the conclusion of the study. This memo is the thirty-second in the monthly sampling series. You can request previous sampling results memos by calling the number above or you may view or download them from DPR's website at <www.cdpr.ca.gov/docs/rifa>.

MATERIALS AND METHODS

Sample and Data Collection

On May 29, 2002, surface water samples were collected at five sites, C, D, E, F, and G within the Orange County treatment area (Table 1 and Figure 1) including one rinse blank. Site G was sampled at the outflow of the vegetative filter strip (see mitigation sampling). No sample was collected at site H due to lack of water. This sampling event did not coincide with measurable rainfall.

Table 1. Sampling site descriptions in Orange County, California

Site #	Description	Coordinates
A	Bolsa Chica Channel at Westminster Ave.	N 33°45'35", W 118°02'36"
B	East Garden Grove Channel at Gothard St.	N 33°43'03", W 117°59'59"
C	Westcliff Park	N 33°37'24", W 117°54'02"
D	Bonita Creek at San Diego Creek	N 33°39'03", W 117°51'49"
E	San Diego Creek at Campus Dr.	N 33°39'18", W 117°50'44"
F	Hines at Weir	N 33°42'30", W 117°44'19"
G	El Modeno Gardens	N 33°42'43", W 117°44'16"
H	Marshburn Slough at Irvine Blvd.	N 33°41'45", W 117°44'02"
I	San Juan Creek at Stonehill Dr.	N 33°28'31", W 117°40'43"
J	Arroyo Trabuco at Oso Parkway	N 33°35'06", W 117°38'09"

All water samples were collected at center channel using a 10-liter stainless steel bucket and divided into one-liter amber sample bottles using a Geotech® 10-port splitter. Samples designated for organophosphate chemical analysis were preserved by acidification with 3N hydrochloric acid to a pH between 3.0 and 3.5. Because diazinon rapidly degrades under acidic conditions, it was analyzed from a separate, un-acidified sample. All samples were stored on wet ice or in a 4° C refrigerator until transported to the appropriate laboratory for analysis.

Mitigation Sampling

In addition to the monthly surface water samples being collected at sites throughout Orange County, mitigation samples are being collected at El Modeno Gardens (site G) from a concrete lined ditch approximately 160 yards long, three and a half feet deep, and four to six feet wide. The filter strip consists of nine successive settling basins planted with *Canna x 'Tropicana'*. At the time of this sampling, *Canna* was planted in all basins. Water samples are collected at the inlet and outlet of the filter strip. Rodamine dye is added to water at the inflow of the filter strip immediately after sampling. The purpose of the dye is to ensure that the same parcel of water is sampled at the inflow and the outflow of the filter strip. Water at the outflow is then sampled just prior to the dye exiting the filter strip.

Water samples were collected and transported using the technique described previously.

Environmental Measurements

Water quality parameters measured *in situ* included temperature, pH, electrical conductivity (EC), and dissolved oxygen (DO). Water pH was measured using an IQ Scientific Instruments® (model IQ 150) pH meter. EC, water temperature, and DO were measured using an YSI® multi parameter meter (model 85).

Insecticide Analyses

All water samples were analyzed for bifenthrin, fenoxycarb, hydramethylnon, pyriproxyfen, chlorpyrifos, diazinon, dimethoate, malathion, and methidathion. The CDFA Center for Analytical Chemistry performed all analyses using gas chromatography and a flame photometric detector for the five organophosphorus insecticides; a high performance liquid chromatography and a ultra violet detector for fenoxycarb, hydramethylnon, and pyriproxyfen; and gas chromatography with an electron capture detector confirmed with a mass selective detector for bifenthrin. The reporting limit (reliable detection levels) for chlorpyrifos and diazinon is 0.04 ppb, 0.1 ppb for fenoxycarb and pyriproxyfen, 0.2 ppb for hydramethylnon, and 0.05 ppb for the other insecticides.

RESULTS and DISCUSSIONS

Insecticide Concentrations

Of the nine insecticides analyzed, only chlorpyrifos, bifenthrin, fenoxycarb, hydramethylnon, and pyriproxyfen were allowed use in nurseries for treatment of fire ants to comply with the U.S. Department of Agriculture's quarantine requirements. All of the organophosphorus insecticides listed are registered for uses in commercial agriculture, nurseries, golf courses or parks for the control of other insect pests. Malathion and diazinon are widely available for homeowner use.

The Bonita Creek site, an urban drain, had the highest concentration of diazinon (0.382 ppb) with additional detections of diazinon at Westcliff Park and San Diego Creek. Bifenthrin and malathion were detected at the two nursery sites. Water from the nursery sites did not contribute to bifenthrin or malathion residues in water at San Diego Creek.

The *Canna* vegetative filter strip showed 7% and 49% reductions of bifenthrin and malathion residues, respectively (Table 3).

Table 2. Insecticide concentrations in monthly surface water samples, May 2002, Orange County, California.

Site	Concentration (ppb)								
	bifenthrin	fenoxycarb	hydramethylnon	pyriproxyfen	chlorpyrifos	diazinon	dimethoate	malathion	methidathion
C	ND	ND ¹	ND	ND	ND	0.147	ND	ND	ND
D	ND	ND	ND	ND	ND	0.382	ND	ND	ND
E	ND	ND	ND	ND	ND	0.056	ND	ND	ND
F	0.277	ND	ND	ND	ND	ND	ND	0.086	ND
G	0.502	ND	ND	ND	ND	ND	ND	0.058	ND
RB ²	ND	ND	ND	ND	ND	ND	ND	ND	ND

¹ ND = none detected at the reporting limit for that chemical.

² RB = rinse blank

Table 3. Insecticide concentrations at mitigation site, May 2002, Orange County, California.

Location	Concentration (ppb)								
	bifenthrin	fenoxycarb	hydramethylnon	pyriproxyfen	chlorpyrifos	diazinon	dimethoate	malathion	methidathion
<u>Surface Water Samples</u>									
Filter strip inflow	0.539	ND ¹	ND	ND	ND	ND	ND	0.114	ND
Filter strip outflow	0.502	ND	ND	ND	ND	ND	ND	0.058	ND

¹ ND = none detected at the reporting limit for that chemical.

Toxicity Data

No toxicity samples were taken. Bifenthrin detections at sites F and G were above the LC₅₀'s for *C. dubia* and Rainbow trout. Table 4 gives LC₅₀ values for some aquatic organisms.

Table 4. LC₅₀'s of insecticides (ppb) for three aquatic species.¹

Pesticide	Rainbow trout	<i>D. magna</i>	<i>C. dubia</i>
Bifenthrin	0.15	1.6	0.078 ²
Chlorpyrifos	10	0.1	0.13 ³
Diazinon	3200	0.96	0.51 ⁴
Dimethoate	8500	2500	NA
Fenoxycarb	1600	400	NA
Hydramethylnon	160	1140	NA
Malathion	68	1.0	1.14 ⁵ - 2.12 ⁶
Methidathion	10.5	7.2	2.2
Pyriproxyfen	>325	400	NA

¹ Data from CDPR, 2000

² Data from CDFG, 2000

³ Data from Menconi and Paul, 1994

⁴ Data from Menconi and Cox, 1994

⁵ Data from Nelson and Roline, 1998

⁶ Data from Ankley et al., 1991

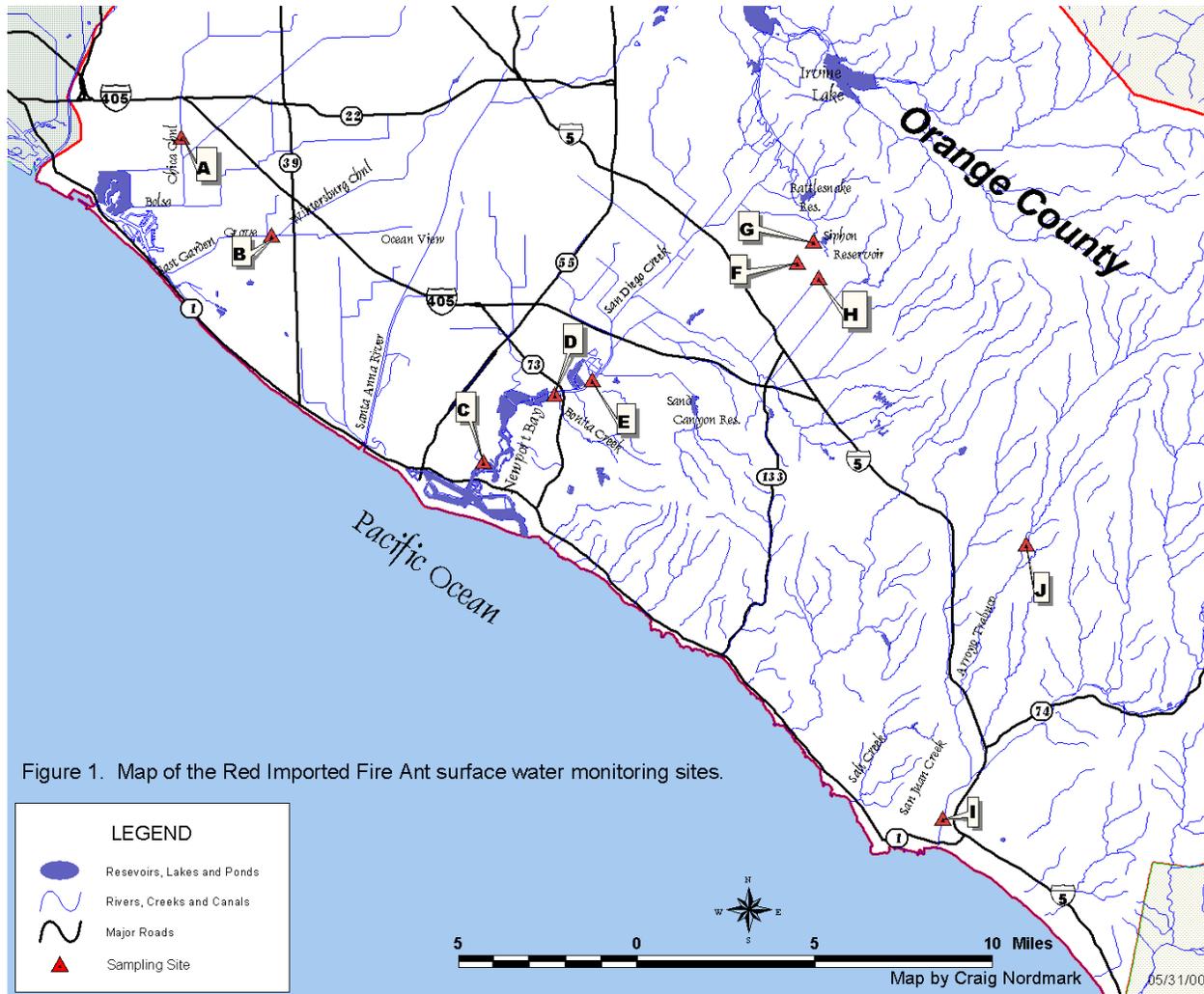
Environmental Measurements

Table 5 presents the data for DO, temperature, pH, and EC. The California Regional Water Quality Control Board, Water Quality Control Plan, Santa Ana River Basin (1995), and the Water Quality Control Plan, San Diego Basin (1994), list the following water quality guidelines as acceptable: water temperature no higher than 78°F (25.5°C), pH between 6.5 and 8.5, and DO above 5.0 mg/L. The plans do not provide an acceptable range for EC. The temperature and pH at site C were above the maximum guidelines.

Table 5. Water quality measurements at sampling sites, May 2002, Orange County, California.

Site	Temperature (°C)	pH	Dissolved Oxygen (mg/L)	Electroconductivity (µS/cm)
C	29.2	9.85	NR	617
D	16.9	7.79	5.79	3244
E	23.8	8.14	12.59	2655
F	22.3	7.68	7.97	1441
G	24.6	7.03	8.97	1537
Filter strip inflow	21.9	7.90	8.72	1985
Filter strip outflow	24.6	7.03	8.97	1537

NR= no reading available



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Precipitation data obtained from The University of California Statewide Integrated Pest Management Project, California Weather Databases. <www.ipm.ucdavis.edu/WEATHER/>