



# Department of Pesticide Regulation



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## MEMORANDUM

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SUBJECT: PRELIMINARY RESULTS OF PESTICIDE ANALYSIS AND ACUTE  
TOXICITY TESTING OF MONTHLY SURFACE WATER MONITORING  
FOR THE RED IMPORTED FIRE ANT PROJECT IN ORANGE COUNTY,  
NOVEMBER 2001 (STUDY 183)

### SUMMARY

During November 2001, monthly surface water samples were collected from five sites in Orange County, California. Water samples showed no detects of fenoxycarb, hydramethylnon, pyriproxyfen, dimethoate, and methidathion. Bifenthrin was detected in two samples at 0.243 and 0.531 parts per billion (ppb) at the two nursery sites. Chlorpyrifos was detected in one integrated sample site at 0.141 ppb. Diazinon was detected in three samples ranging from 0.091 to 0.31 ppb at two urban and an integrated site. Malathion was detected at two nursery sites and one urban site ranging from 0.108 to 0.382 ppb. Water samples collected from a mitigation filter strip planted with *Canna* showed a 39% and 24% reduction of bifenthrin and malathion concentrations, 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 November 28, 2001 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 2001 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 twenty-sixth 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](http://www.cdpr.ca.gov/docs/rifa)>.

## MATERIALS AND METHODS

### Sample and Data Collection

On November 28, 2001, 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. Sample at site G was collected 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. Samples designated for toxicity testing were delivered to the testing laboratory within 36 hours of collection. 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'*. Water samples are collected at the inlet and outlet of the filter strip. At the time of this sampling *Canna* had been planted in all of the settling basins. Additional water was entering the filter strip from a rose growing area after collection of the inlet sample.

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 an 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 use 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 San Diego Creek site, an integrated site, had the highest concentration of diazinon (0.31 ppb) and the only detection of chlorpyrifos (0.141 ppb). Additional detections of diazinon were made at Bonita Creek and Westcliff Park. Bifenthrin was only detected at the two nursery sites and did not contribute to residue in water at San Diego Creek.

The *Canna* vegetative filter strip showed a 39% and a 24% reduction of bifenthrin and malathion residues.

Table 2. Insecticide concentrations in monthly surface water samples, November 2001, Orange County, California.

Site	Concentration (ppb)								
	bifenthrin	fenoxycarb	hydramethylnon	pyriproxyfen	chlorpyrifos	diazinon	dimethoate	malathion	methidathion
C	ND <sup>1</sup>	ND	ND	ND	ND	0.145	ND	0.382	ND
D	ND	ND	ND	ND	ND	0.091	ND	ND	ND
E	ND	ND	ND	ND	0.141	0.31	ND	ND	ND
F	0.531	ND	ND	ND	ND	ND	ND	0.108	ND
G	0.243	ND	ND	ND	ND	ND	ND	0.169	ND
RB <sup>2</sup>	ND	ND	ND	ND	ND	ND	ND	ND	ND

<sup>1</sup> ND = none detected at the reporting limit for that chemical.

<sup>2</sup> RB = rinse blank

Table 3. Insecticide concentrations at mitigation site, November 2001, Orange County, California.

Location	Concentration (ppb)								
	bifenthrin	fenoxycarb	hydramethylnon	pyriproxyfen	chlorpyrifos	diazinon	dimethoate	malathion	methidathion
<u>Surface Water Samples</u>									
Filter strip inflow	0.393	ND <sup>1</sup>	ND	ND	ND	ND	ND	0.22	ND
Filter strip outflow	0.243	ND	ND	ND	ND	ND	ND	0.169	ND

<sup>1</sup> 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 LC<sub>50</sub>'s for *C. dubia* and Rainbow trout. Chlorpyrifos detection at site E was above the LC<sub>50</sub>'s for *C. dubia* and *D. magna*. Table 4 gives LC<sub>50</sub> values for some aquatic organisms.

Table 4. LC<sub>50</sub>'s of insecticides (ppb) for three aquatic species.<sup>1</sup>

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

<sup>1</sup> Data from CDPR, 2000.

<sup>2</sup> Data from CDFG, 2000.

<sup>3</sup> Data from Menconi and Paul, 1994

<sup>4</sup> Data from Menconi and Cox, 1994

<sup>5</sup> Data from Nelson and Roline, 1998

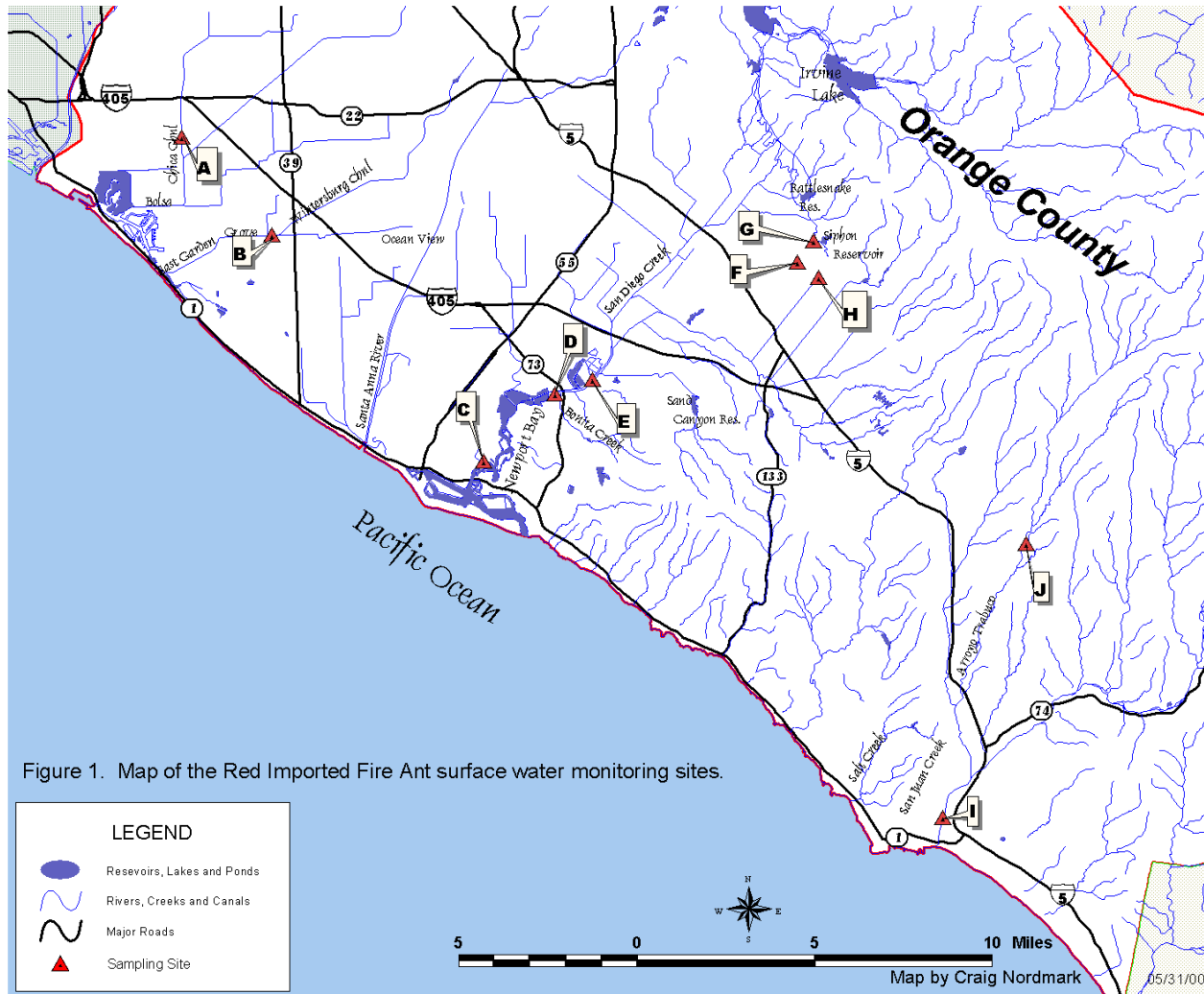
<sup>6</sup> Data from Ankley et al., 1991

## 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 Santa Ana River Basin plan determines ammonia levels to be dependent upon water temperature and pH, while the San Diego Basin plan states that ammonia levels shall not exceed 0.025 mg/L. The plans do not provide an acceptable range for EC, alkalinity, or hardness. The pH at site C was above the maximum guideline.

Table 5. Water quality measurements at sampling sites, November 2001, Orange County, California.

Site	Temperature (°C)	pH	Dissolved Oxygen (mg/L)	Electroconductivity (µS/cm)
C	16.0	8.72	15.5	380
D	9.6	7.72	9.05	2950
E	12.1	7.67	8.81	2421
F	11.6	8.2	9.95	2020
G	12.8	7.0	8.14	1875
Filter strip inflow	9.8	7.91	9.6	1922
Filter strip outflow	12.8	7.0	8.14	1875



## References

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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/](http://www.ipm.ucdavis.edu/WEATHER/)>

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