



Department of Pesticide Regulation



Paul E. Helliker
Director

MEMORANDUM

Gray Davis
Governor
Winston H. Hickox
Secretary, California
Environmental
Protection Agency

TO: John S. Sanders, Ph.D., Chief
Environmental Monitoring Branch

FROM: Johanna Walters, Environmental Research Scientist
Dave Kim, Associate Environmental Research Scientist
Kean S. Goh, Agriculture Program Supervisor IV
Environmental Monitoring Branch
(916) 324-4340

DATE: July 3, 2002

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

SUMMARY

During March 2002, monthly surface water samples were collected from four sites in Orange County, California. Water samples showed no detects of fenoxycarb, hydramethylnon, pyriproxyfen, chlorpyrifos, dimethoate, malathion, and methidathion. Bifenthrin was detected in one sample at 0.357 parts per billion (ppb) at one nursery site. Diazinon was detected in two samples at 0.075 and 0.084 ppb at two urban sites.

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 March 12, 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 thirtieth 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 March 12, 2002, surface water samples were collected at four sites, C, D, E, and F within the Orange County treatment area (Table 1 and Figure 1) including one rinse blank. No samples were collected at sites G and 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 no samples were collected due to lack of water.

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 CDFCA 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 Westcliff Park site, an urban drain, had the highest concentration of diazinon (0.084 ppb) with an additional detection of diazinon at Bonita Creek. Bifenthrin was detected at one nursery site at 0.357 ppb. Water from the nursery site did not contribute bifenthrin residues into water at San Diego Creek.

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

Site	Concentration (pbb)								
	bifenthrin	fenoxycarb	hydramethylnon	pyriproxyfen	chlorpyrifos	diazinon	dimethoate	malathion	methidathion
C	ND	ND ¹	ND	ND	ND	0.084	ND	ND	ND
D	ND	ND	ND	ND	ND	0.075	ND	ND	ND
E	ND	ND	ND	ND	ND	ND	ND	ND	ND
F	0.357	ND	ND	ND	ND	ND	ND	ND	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

Toxicity Data

No toxicity samples were taken. The bifenthrin detection at site F was above the LC₅₀'s for *C. dubia* and Rainbow trout. Table 3 gives LC₅₀ values for some aquatic organisms.

Table 3. 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 4 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 4. Water quality measurements at sampling sites, March 2002, Orange County, California.

Site	Temperature (°C)	pH	Dissolved Oxygen (mg/L)	Electroconductivity (µS/cm)
C	26.1	9.82	15.71	789
D	13.5	7.55	8.74	3069
E	19.4	7.5	8.82	3006
F	15	8.15	8.95	2400

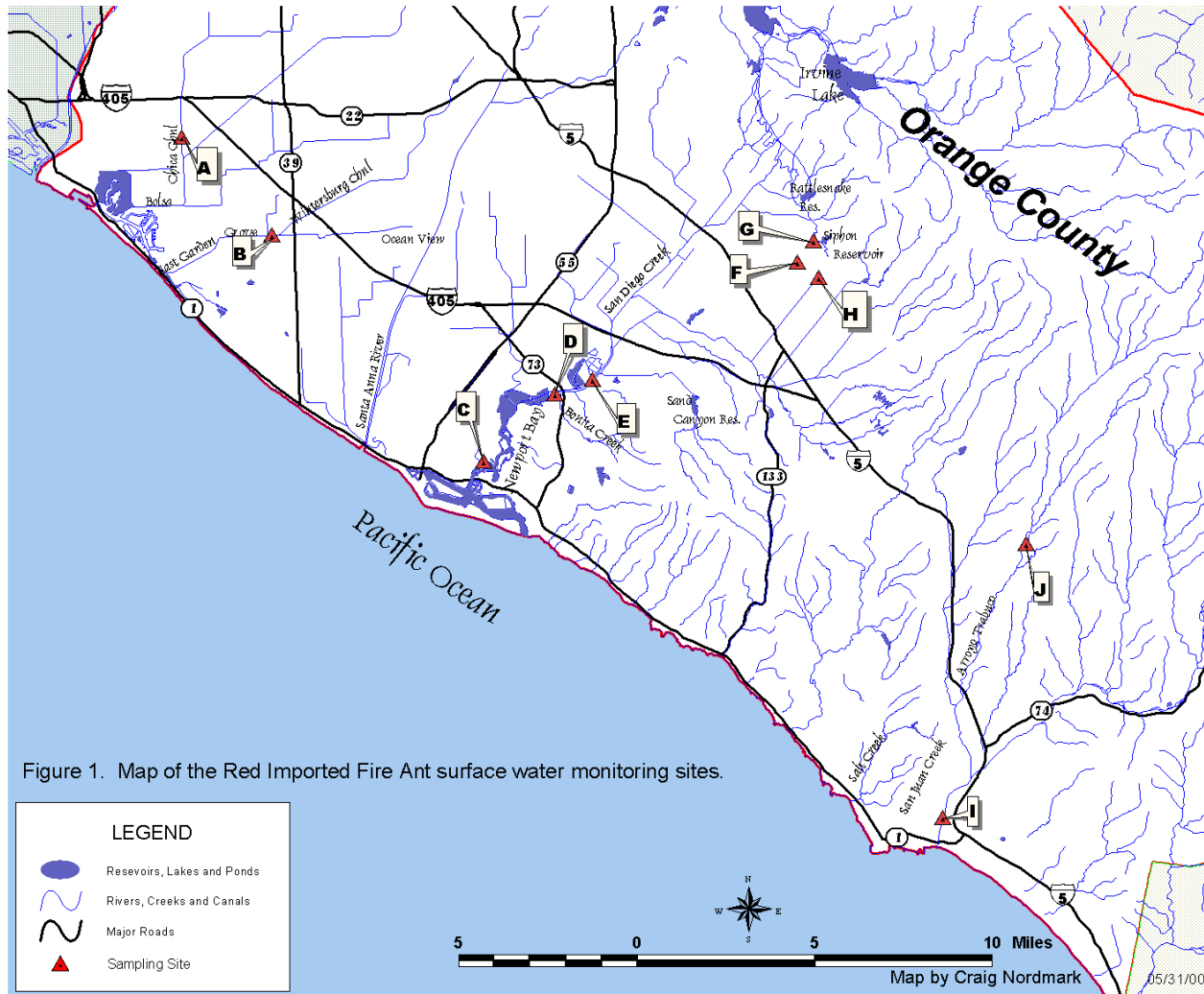


Figure 1. Map of the Red Imported Fire Ant surface water monitoring sites.

References

Ankley, G.T., J.R. Dierkes, D.A. Jensen, and G.S Peterson. 1991. Piperonyl Butoxide as a Tool in Aquatic Toxicological Research with Organophosphate Insecticides. *Ecotoxicology and Environmental Safety* 21(3): 266-274.

CDFG. 2000. Pesticide Investigation Unit. Aquatic Toxicology Laboratory Report P-2161-2.

CDPR. 2000. CDPR Aquatic Toxicology Registration Database.

California Regional Water Quality Control Board. 1995. Water Quality Control Plan (Basin Plan), Region 8, Santa Ana River Basin. Riverside, California.

California Regional Water Quality Control Board. 1994. Water Quality Control Plan (Basin Plan), Region 9, San Diego Basin. San Diego, California.

Menconi, Mary, and Angela Paul. 1994. Hazard Assessment of the Insecticide Chlorpyrifos to Aquatic Organisms in the Sacramento-San Joaquin River System. California Department of Fish and Game, Environmental Services Division, Administrative Report 94-1.

Menconi, Mary, and Cara Cox. 1994. Hazard Assessment of the Insecticide Diazinon to Aquatic Organisms in the Sacramento-San Joaquin River System. California Department of Fish and Game, Environmental Services Division, Administrative Report 94-2.

Nelson, S.M. and R.A. Roline. 1998. Evaluation of the Sensitivity of Rapid Toxicity Tests Relative to Daphnid Acute Lethality Tests. *Bulletin of Environmental Contamination and Toxicology* 60: 292-299.

U.S. Environmental Protection Agency. 1993. Methods for measuring the acute toxicity of effluents and receiving waters to freshwater and marine organisms. 4th ed. EPA/600/4-90/027F. August 1993.

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