

**California Environmental Protection Agency
Department of Pesticide Regulation
Environmental Monitoring and Pest Management
830 K Street
Sacramento, California 95814-3510**

**MONITORING SURFACE WATER FOR SELECTED
INSECTICIDES IN RED IMPORTED FIRE ANT TREATMENT AREAS**

August 30, 1999

I. INTRODUCTION

The California Department of Food and Agriculture (CDFA) proposes to use ground applications of insecticides including, but not limited to, abamectin, bifenthrin, chlorpyrifos, diazinon, fenoxycarb, hydramethylnon and pyriproxyfen to manage red imported fire ant (RIFA) infestations in California. The Environmental Hazards Assessment Program (EHAP) of the Department of Pesticide Regulation (DPR) will conduct surface water monitoring of selected treatment sites to provide information on the concentrations of the above listed compounds, as well as any additional pesticides registered, approved and used by the RIFA project. Additionally, toxicity to aquatic organisms will be determined. This monitoring plan follows the general models in previous studies of pesticides in water runoff during Mediterranean fruit fly eradication projects and collecting surface water samples for aquatic toxicity determinations (Bradley et al. 1997; Nordmark et al. 1996).

This monitoring plan will be implemented in areas where surface water may be impacted by RIFA insecticide applications. More than one application event will be monitored; the total number of events to be monitored and the total numbers of samples collected depend on the extent of the treatment program.

II. OBJECTIVE

The objectives of this study are to:

1. Measure the amount of red imported fire ant insecticides (abamectin, bifenthrin, chlorpyrifos, diazinon, fenoxycarb, hydramethylnon and pyriproxyfen) in surface, irrigation, and storm water runoff after applications to manage red imported fire ant infestations.
2. Determine levels of acute toxicity and the relationship between toxicity and pesticide concentrations in collected samples.

III. PERSONNEL

This study will be conducted by EHAP under the general direction of Kean S. Goh, Program Supervisor. Key personnel include:

Project Leader: Dave Kim

Senior Staff Scientist: Lisa Ross

Field Coordinator: Roger Sava

Statistician: Terri Barry

Laboratory Liaison: Carissa Ganapathy

Analyzing Laboratories:

California Department of Food and Agriculture, Center for Analytical Chemistry

California Department of Fish and Game, Aquatic Toxicology Laboratory

Agency and Public Contact: Madeline Brattesani

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IV. STUDY DESIGN

The majority of the RIFA infestation is in Orange County, with residential RIFA finds also in Riverside, Los Angeles, Kern, and San Diego Counties. Applications sites can range from individual mounds to entire parks or schools. Surface water sampling may occur outside treatment areas if they receive runoff water from within the treatment area. Sampling site selection will follow the general guideline in Standard Operating Procedure (SOP) FSWA002.00 (Bennett 1997)

Surface waterways draining residential/urban and agricultural/nursery runoff will be monitored monthly with an attempt to choose sites that could separate these two land uses. Samples will be collected both prior to and following applications to determine insecticide concentrations. Additionally, accessible storm runoff sites will be monitored during rain runoff events to determine concentrations due to wash off from exposed surfaces. During the first rain event after the initial application, samples will be collected at points of discharge and/or at areas of concern for aquatic organisms. The number and frequency of samples collected will depend on intensity and duration of the runoff event. A sufficient number of rain event samples will be collected so as to include the first flush of runoff, peak concentrations of pesticides, and a clear indication of decreasing concentrations.

Water collected from each site will be analyzed for insecticide concentration and toxicity to selected sensitive aquatic species. DPR had consulted with Department of Fish and Game (DFG) and Santa Ana Regional Water Quality Control Board (RWQCB) on selection of water sampling sites and specie selection for toxicity tests. When treatment areas overlap with RWQCB permanent surface water sampling sites, EHAP will use the same site.

Aquatic toxicity will be determined using 96-hour acute toxicity tests (employing static renewal water) for all water samples. In consultation with DFG's Aquatic Toxicology Laboratory staff, *Ceriodaphnia dubia* was selected as the test organism for all toxicity tests. Samples with an electro-conductivity (EC) reading of 1600 $\mu\text{S}/\text{cm}$ or higher will also have a second test performed using *Neomycid mercedes*. If preliminary results continue to indicate that *C. dubia* survival rate is not being affected by the higher E.C.s, the second test using *N. mercedes* will be discontinued. Toxicity testing will use U. S. Environmental Protection Agency (1993) and American Society for Testing of Materials (1992) methods. Water quality parameters (alkalinity, hardness, electro-conductivity, ammonia, pH, dissolved oxygen, and water temperature) will also be measured.

Subject to revision because of future expansion of the RIFA treatment areas, the following surface water sites, located in Orange County, have been selected (please see map):

1. Bolsa Chica Channel at Westminster Ave.
2. East Garden Grove Channel at Gothard
3. Bonita Creek at University Dr.
4. San Diego Creek at Campus Dr.
5. Central Irvine Channel (Hines' Drain)
6. El Modeno Drain (Drain at Portola Pkwy. and Bee Canyon access road)
7. Marshburn Creek (Bordier's Nursery Drain)
8. San Juan Creek at Stonehill Dr.
9. Arroyo Trabuco at Oso Parkway (O'Neill Park)

Sites 1, 2, 3, 4, 8, & 9 drain major urban areas but may also contain some agriculture/nursery runoff. Sites 5, 6, & 7 drain primarily large production nurseries and some agriculture.

V. SAMPLING METHODS

Surface water samples will be collected using a depth-integrated sampler (D-77) with a 3-liter Teflon® bottle and nozzle as outlined in SOP FSWA003.00 (Bennett 1998). Five to twenty vertical depth-integrated samples will be composited at each site. At sites where the D-77 sampler cannot be used, due to insufficient water depth or access, a grab sample will be collected. Grab samples will be collected as close to center channel as possible using a 10-liter stainless steel bucket or a grab pole consisting of a glass bottle at the end of a 5-foot pole. Samples will be split into amber glass bottles using a Geotech® 10-port splitter then sealed with Teflon®-lined lids according to SOP FSWA004 (Ganapathy 1998). Specific chemical analyses require the preservation of field samples by adjusting the sample pH to 3.0 using 3N hydrochloric acid. Samples will be transported and stored on wet ice or refrigerated at 5°C until extraction. Toxicity samples will be delivered on wet ice to the DFG Aquatic Toxicity Laboratory within 30 hours and will not be pH adjusted.

A measurement of discharge will be recorded at each sample site at the time the sample is collected. If discharge volume is not available, flow will be determined according to SOP FSWA009.00 (Fecko 1999).

VI. CHEMICAL ANALYSIS / TOXICITY TESTING

Chemical analysis on all applied RIFA insecticides will be performed by the CDFA's Center for Analytical Chemistry. Quality control measures are described in SOP QAQC001.00 (Segawa 1995). DFG's Aquatic Toxicology Laboratory will perform aquatic toxicity tests on surface water samples and measure totals of alkalinity, hardness and ammonia in the laboratory.

VII. DATA ANALYSIS

Concentrations of insecticides in water will be reported as micrograms per liter ($\mu\text{g/L}$) (which is equivalent to parts per billion (ppb)). When sample frequency permits, means, percentiles and frequency histograms will be presented. Toxicity data will be presented as percent survival. Water concentrations will be compared with toxicity data to aid in the interpretation of toxicity test result.

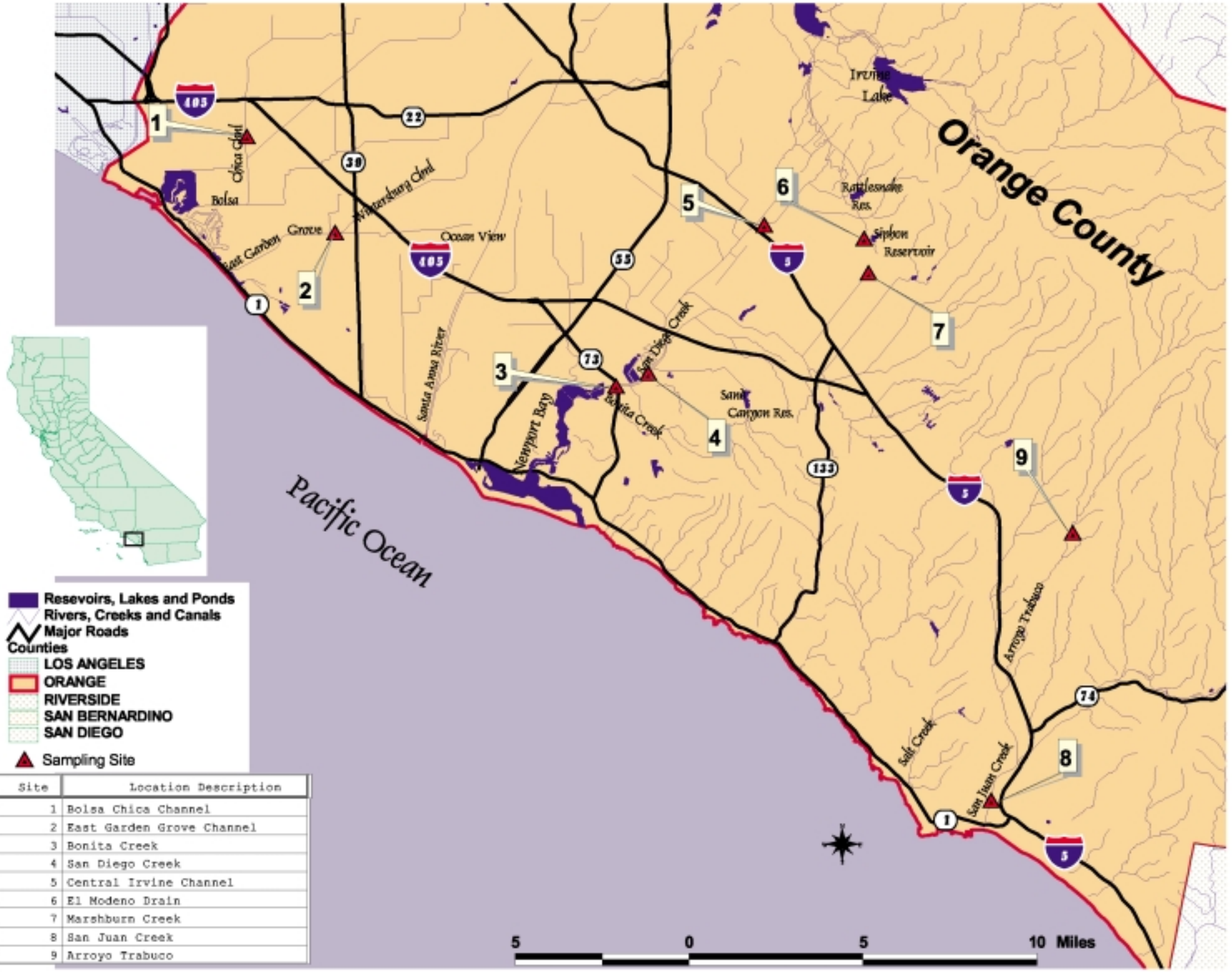
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- Reservoirs, Lakes and Ponds
- Rivers, Creeks and Canals
- Major Roads
- Counties**
- LOS ANGELES
- ORANGE
- RIVERSIDE
- SAN BERNARDINO
- SAN DIEGO
- Sampling Site

Site	Location Description
1	Bolsa Chica Channel
2	East Garden Grove Channel
3	Bonita Creek
4	San Diego Creek
5	Central Irvine Channel
6	El Modeno Drain
7	Marshburn Creek
8	San Juan Creek
9	Arroyo Trabuco

