

## **EFFECTS OF ULTRA-LOW VOLUME PYRETHRIN, MALATHION, AND PERMETHRIN ON MONTARGET INVERTEBRATES, SENTINEL MOSQUITOES, AND MOSQUITOFISH IN SEASONALLY IMPOUNDED WETLANDS**

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### **ABSTRACT**

Wildlife managers are concerned that insecticides used to control mosquitoes could suppress invertebrates on which wildlife feed. We assessed whether ultra-low volume (ULV) applications of pyrethrin, permethrin, and malathion for control of adult mosquitoes reduced macroinvertebrate abundance and biomass or killed mosquitofish in seasonal wetlands in California. Pyrethrin was applied over 3 seasonal wetlands on Sutter National Wildlife Refuge (NWR), and malathion or permethrin were each applied over 2 seasonal wetlands on the Colusa NWR. Three control wetlands were used per site. We measured aquatic macroinvertebrate abundance and biomass before and after insecticide application and compared the survival of mosquito larvae held in sentinel cages. At Colusa, we also used mosquitofish as sentinels, caged adult mosquitoes over the wetlands to test for pesticide efficacy and drift, and sampled night-flying insects using ultraviolet light traps. Results showed no detectable reductions in the abundance or biomass of aquatic macroinvertebrates in treated wetlands. Larval mosquitoes showed high survival in all areas. All adult mosquitoes died when caged over wetlands treated with malathion or permethrin, but all survived in controls. All mosquitofish survived. Flying insect abundance decreased after insecticide application in both treated and control wetlands but rebounded in 48 h. Results indicated that ULV applications of these insecticides to control adult mosquitoes are unlikely to have substantial effects on the aquatic insects or fish in seasonal wetlands.

**Keywords:** Aquatic macroinvertebrates, California, insects, malathion, mosquito control, mosquitofish, permethrin, pyrethrin, seasonal wetlands

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