

Subject: Impacts of Pesticides on Aquatic Invertebrates Within the Delta

Background: Water samples collected in the Sacramento River, San Joaquin River, the Delta and major tributaries frequently test toxic in standard U.S. EPA three species bioassays. Toxicity identification evaluations (TIEs) and chemical analysis often implicate the pesticides diazinon and chlorpyrifos as the primary cause of acute toxicity to the invertebrate test species (*Ceriodaphnia dubia*), while chemical monitoring and transport studies have confirmed the frequent presence of these two compounds. Sources appear to be from both urban and agricultural applications. Instream concentrations are frequently above the various criteria to protect aquatic life, as developed by the National Academy of Science, Great Lakes Research Council, and California Department of Fish and Game. Values of diazinon and chlorpyrifos are also greater than concentrations reported in the literature to be lethal to sensitive aquatic invertebrates including species present in the Central Valley and Delta.

Other pesticides (for example, carbofuan) have been detected at levels that test toxic to the invertebrate test species. Invertebrate toxicity cannot always be completely explained by the pesticides that are monitored. This is not unreasonable, since only half of the most commonly used pesticides have analytical methods that allow testing at ecologically significant levels.

No information is available on the impact of pesticides on local invertebrate communities. However, Novartis, the registrant for diazinon, has recently completed a probabilistic risk assessment and concluded that a combination of pesticides causes acutely toxic conditions to 10% of the most sensitive species about 30% of the time in the mainstem San Joaquin River. The study recommends that the population dynamics of susceptible invertebrate species in the basin be evaluated along with the feeding habits and nutritional requirements of common species. Because invertebrates form a vital link in the food chain, this type of study would help determine the ecological significance of the observed elevated pesticide levels found in the Delta and the rivers tributary to it.

Proposed Action: The Interagency Ecological Program's Contaminant Effects Group was formed at the request of Agency Directors; its mission is to acquire and disseminate information on the effects of contaminants on aquatic resources in the Central Valley and Estuary. The Contaminant Effects Group will be asked to develop a study plan to determine the ecological impact of pesticides on aquatic invertebrate communities in the mainstem San Joaquin River, mainstem Sacramento River, and Delta. These studies should determine the times, locations, and types of organisms most at risk, changes in the abundance and distribution of key invertebrates, the time necessary for population recovery, and whether changes in available invertebrate food resources affect the growth or survival of any priority fish species. Once the study has been designed by the Contaminant Effects Group, CALFED will use a focused grant program to determine the entity/entities which will conduct the work.

Geographic Area: Sacramento River, San Joaquin River, Delta.

Recommended Funding: \$1,500,000

Coordination/Overlap with Existing Studies: As previously mentioned, there are no ongoing or planned studies to determine the impact of pesticides on Delta invertebrates. We are proposing to fill gaps in the general knowledge of this subject.

Related water quality/pesticide studies include: (a) a 1997 CALFED Category III funded proposal to determine the impact of contaminants on Delta smelt, (b) a USGS study, supported by the Contaminant Effects Group, to correlate herbicide levels in Delta water with primary production and algal species abundance, (c) a Contaminant Effects Group sponsored study to evaluate the toxicity of Suisun Bay water to a local invertebrate and fish, (d) a Contaminant Effects Group sponsored study to look at the potential impacts of the fungicide Ziram to fathead minnows, (e) the Sacramento River Watershed Program's 1999 collection of water samples at 26 sites and use of bioassays employing *Ceriodaphnia dubia* and fathead minnow, (f) a 1997 CALFED Category III funded proposal by DeltaKeeper to conduct limited bioassay monitoring in the Delta, and (g) a USGS program to collect monthly pesticide data from the mainstem Sacramento River.

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