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MEMORANDUM

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SUBJECT: MONITORING RESULTS OF ORYZALIN IN SAN JOAQUIN RIVER BASIN DURING 2000-2001 WINTER STORM SEASON (STUDY #202)

INTRODUCTION

The Department of Pesticide Regulation (DPR) conducted a monitoring study to determine the presence and concentrations of oryzalin in the San Joaquin River (SRJ) and one of its tributaries during the winter storm season of 2000-2001. This study was undertaken following a previous data analysis which identified oryzalin as a potential surface water contaminant that needed further monitoring (Guo and Spurlock, 2000). Oryzalin is a preemergent herbicide used primarily in fruit trees, nut trees, and vineyards for controlling annual grasses and broadleaf weeds. The pesticide has a water solubility of 2.5 μg/mL, and a K_{oc} of 600 cm^3/g, and a field dissipation half life of 42 days (EXTOXNET, 2001). These properties indicate a potential for offsite movement by runoff and percolation. In addition, oryzalin is moderately toxic to aquatic organisms with a reported 96-hour LC_{50} of 2.88 and 3.26 mg/L to Bluegill Sunfish and Rainbow Trout, respectively (DPR Ecotox Database, 2003).

Based on historical pesticide use data, the San Joaquin River basin has the highest oryzalin use during the months of October to March. The heavy precipitation during this period would

enhance the potential of oryzalin runoff into surface water. This study was designed to characterize the distribution and pattern of oryzalin contamination in the SJR basin during this high-risk period. This memo documents the procedures and monitoring results of the monitoring study.

MATERIALS AND METHODS

The study was conducted from December 2000 to March 2001 during the winter storm season, coinciding with the peak use period of oryzalin in the San Joaquin River basin. Surface water samples were collected at two locations: (1) the main stem of SJR near Vernalis; and (2) a western tributary, Orestimba Creek at River Road (Figure 1). The water quality conditions at these two sites reflect different characteristics of hydrology and land uses in the basin. The Vernalis site is selected as a synoptic site quantifying the overall impacts of activities from all upstream tributaries. The Orestimba Creek, in contrast, contains primarily drainage water from local agricultural fields, and is expected to be a sensitive site to any agricultural activities affecting surface water quality.

The sampling of surface water at Vernalis was conducted three times each week, on Mondays, Wednesdays, and Fridays, and at Orestimba Creek twice each week on Mondays and Wednesdays. Surface water samples were collected using a depth-integrated sampler (D-77) with a 3-L Teflon bottle. A grab sample was collected using the sampling device and split on-site into two 1-L duplicates in amber glass bottles. Samples were sealed immediately with Teflon-line caps and stored on wet ice until delivered to laboratory for analysis. For each sampling event, general water quality parameters of dissolved oxygen (DO), pH, electrical conductivity (EC) and water temperature were measured *in situ* at each site. The chemical analysis of the water samples was performed by the California Department of Food and Agriculture Center for Analytical Chemistry using method #50.6 (CDPR Reference #214). The detection limit of this method for oryzalin was 0.08 μg/L, with an overall mass recovery of 90.2±7.0%.

RESULTS AND CONCLUSIONS

A total of 55 water samples were collected. The oryzalin concentration was below the detection limit of 0.08 µg/L for all water samples. The water quality parameters measured are presented in Figures 2 and 3. The pH for the Vernalis site was neutral and ranged between 7.0 and 8.0 (Figure 2a). The electrical conductivity varied between 471 to 1067 µs/cm, with the lowest EC detected on Feb. 28, and highest on Feb. 7, 2001 (Figure 2b). The total dissolved oxygen varied from 8.2 to 10.4 mg/L, roughly corresponded inversely with changes in temperature (Figure 2c). The pH of Orestimba Creek was slightly more basic in the range of 7.6 to 8.2 (Figure 3a). The EC was less variable between 499 to 843 µs/cm, (Figure 3b). The measured DO varied from 9.0 to 11.6 mg/L with a mean of 10.3 mg/L, compared to 9.4 mg/L for Vernalis (Figure 3c). These values are all within the expected range for surface water in the area.

The NOAA (National Oceanic and Atmospheric Administration) records at the Newman station in Stanislaus County indicated a relatively low precipitation during the monitoring period. The cumulative rainfall for this period was 7.1 inch. This value, however, was still within the 95% confidence interval for mean rainfall (6.7-11.0 inch) since 1990. A review of Pesticide Use Report (PUR) data, as shown in Figure 4, also showed substantial decrease in the oryzalin use during the monitoring period from December 2000 to March 2001, compared to other years. The sum of oryzalin use during this period was only 25,000 lb, well below historical wintertime use of 100,000 to 200,000 pounds annually for the prior 10 years (Figure 4).

Based on the monitoring results of this study and the use and precipitation data, oryzalin was not present at detectable concentrations in the San Joaquin River at Vernalis or at Orestimba Creek during the winter 2000-2001 low use and low precipitation conditions. If its use or precipitation increases in the future, additional monitoring would be required to assess its presence in the surface water.

ACKNOWLEDGEMENT

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REFERENCES

Guo, L. and F. Spurlock. 2000. Recommendation for priority surface water monitoring on selected pesticides. Department of Pesticide Regulation, Sacramento, California.

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EXTOXNET, 2001. Extension Toxicology Network, Pesticide Information Profiles. http://ace.orst.edu/info/extoxnet/pips/oryzalin.htm

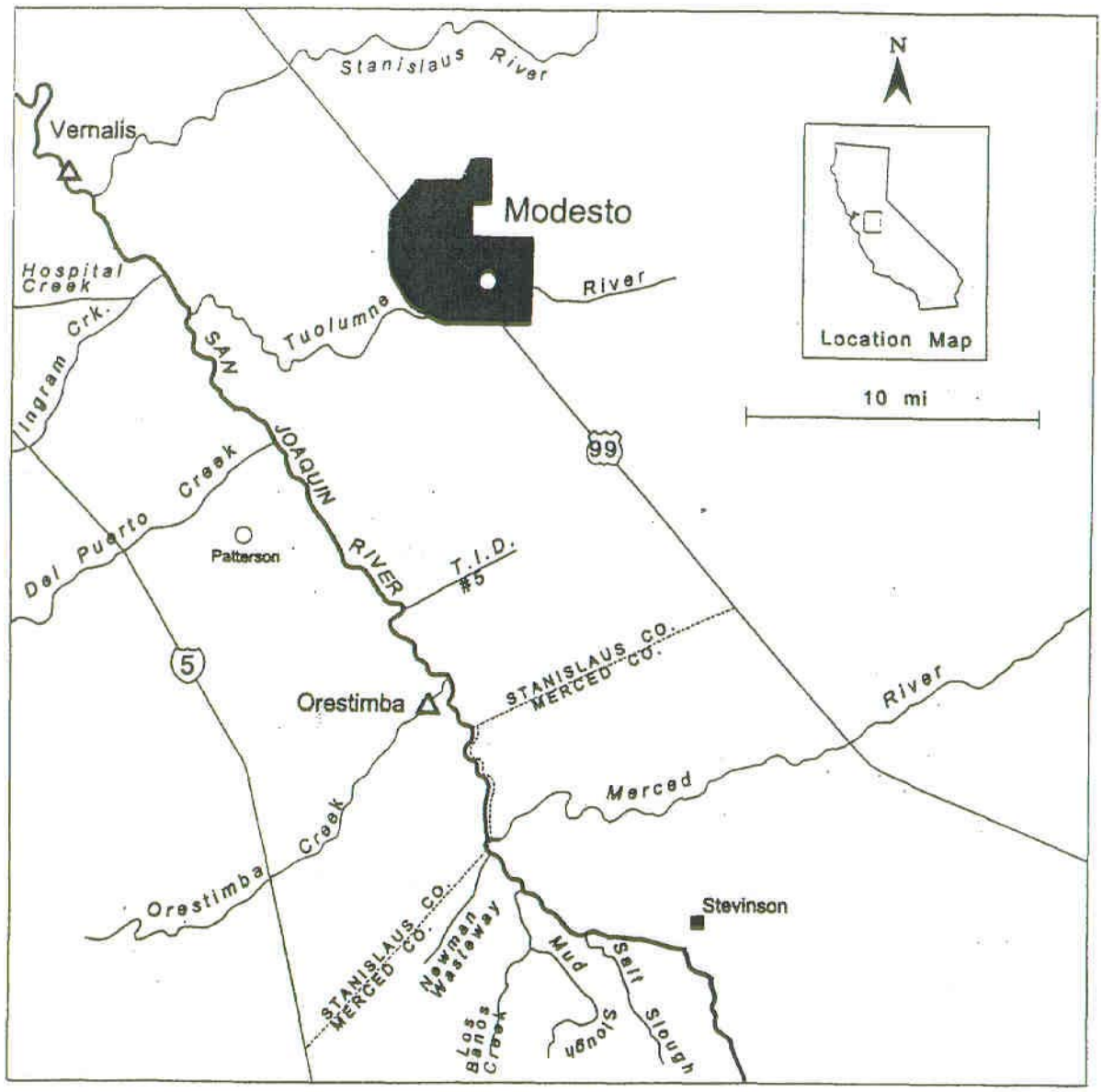

Figure 1. The sampling locations (∆) for oryzalin monitoring in the San Joaquin River Basin during 2000-2001 winter storm season.

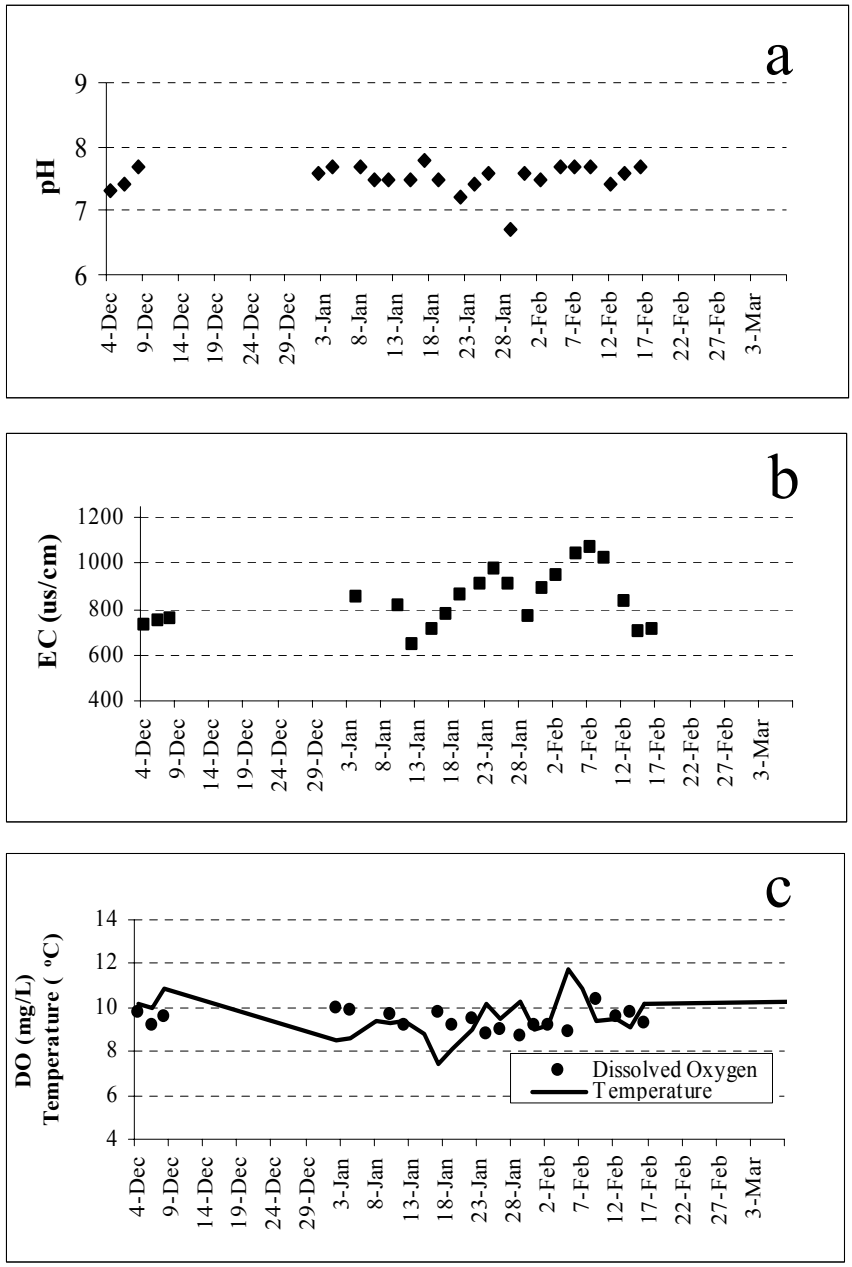

Figure 2. The measured pH (a), EC (b), and DO and temperature (c) for the San Joaquin River at the Vernalis site, Stanislaus County during December 2000 to March 2001.

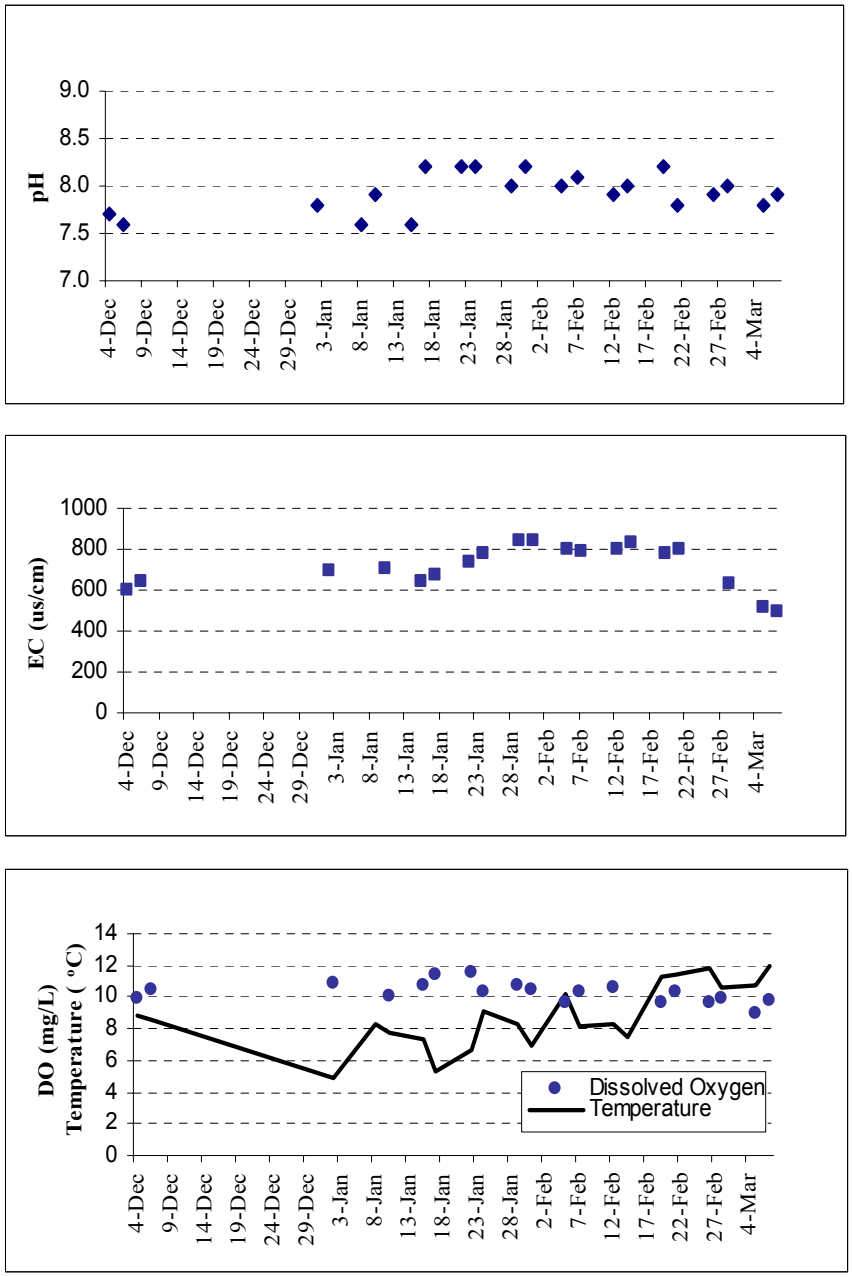

Figure 3. The measured pH (a), EC (b), and DO and temperature (c) for the Orestimba Creek at River Road, Stanislaus County during December 2000 to March 2001.

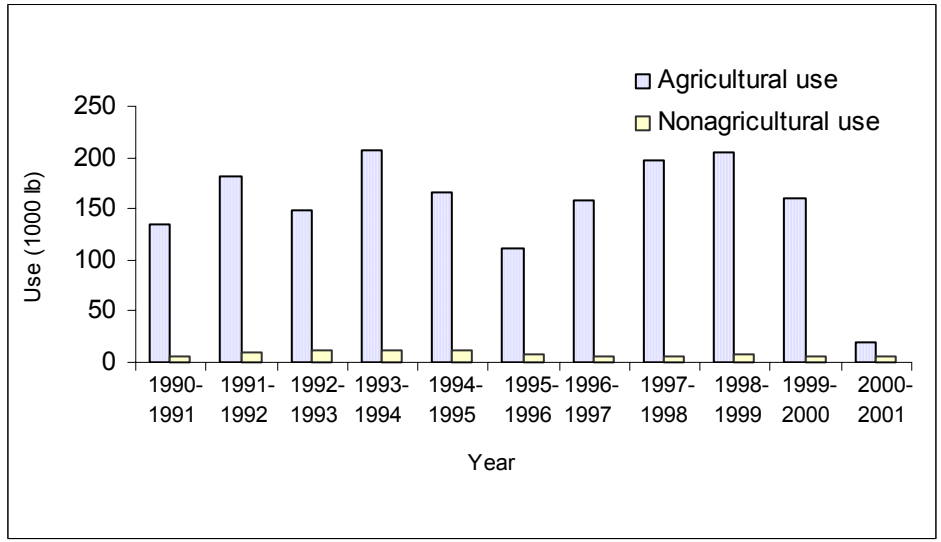

Figure 4. The sum of oryzalin use in counties located in the San Joaquin River basin during December to March of the1990 to 2001 winter storm seasons