Final Project Report

San Luis and Delta Mendota Water Authority

AGRICULTURAL DISCHARGE MANAGEMENT PROGRAM MONITORING AND EVALUATION-WEST STANISLAUS COUNTY

July 15, 2008

San Joaquin River

Orestimba Creek and Del Puerto Creek Sub-Watersheds

Project Type: WC § 79114

Reduce the discharge of pollutants to state waters from non-point sources

Funded by: Proposition 13 Funds

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Task 2.7 Analyze Four BMPs Active within WSC

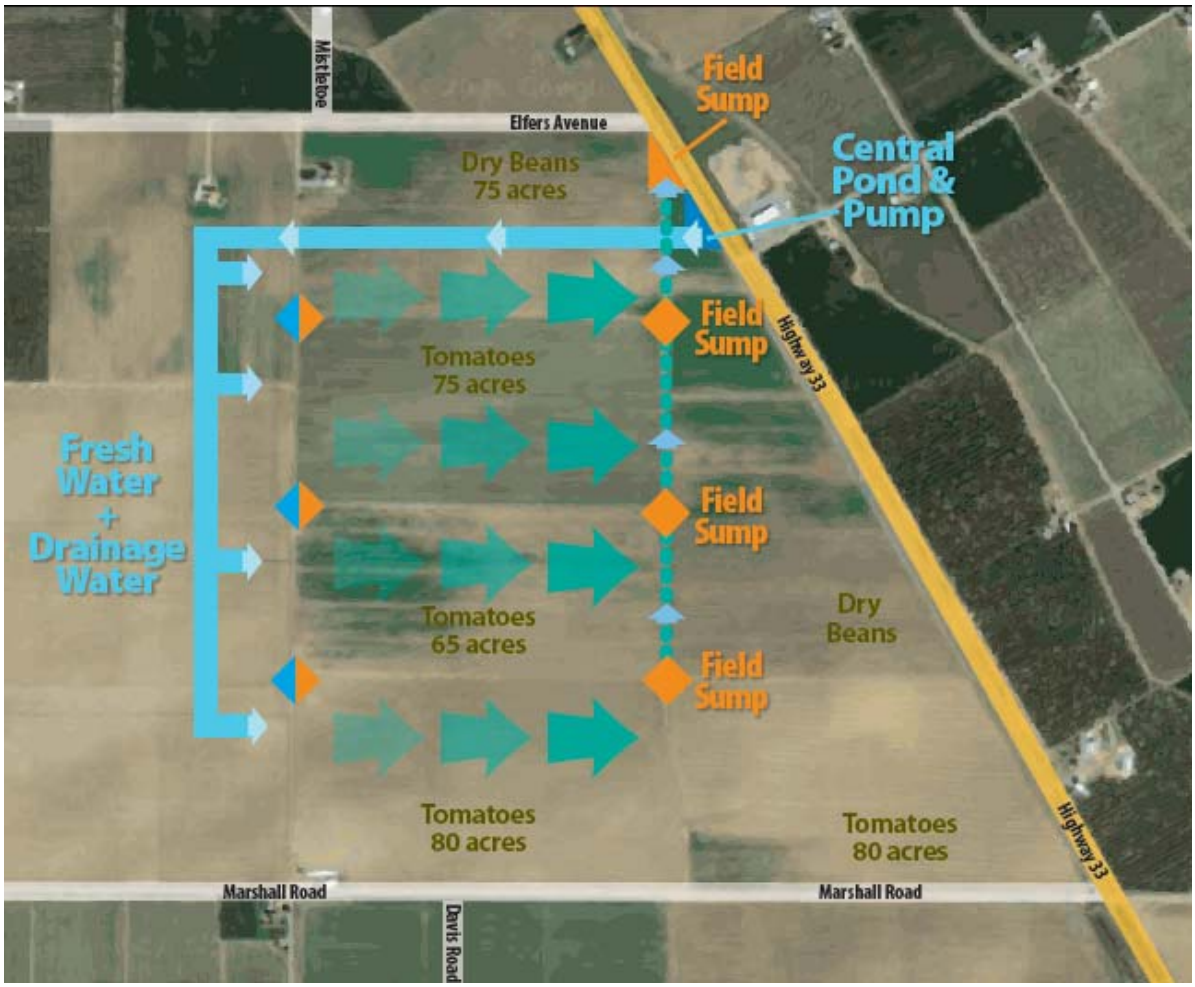
The project focused on examining and evaluating four BMPs currently being practiced within WSC---vegetative ditches, retention ponds, wetlands and on-field practices such as the use of polyacrylamide (PAM). A map of the BMP Study sites is provided in Figure 11.

Use of Polyacrylamide (PAM)

The use of polyacrylamide (PAM) and sediment basins have long been recognized as effective Best Management Practices (BMPs) for reducing sediment loads in irrigated agriculture. By reducing sediment loads there is also the potential for reducing other constituents that may adhere to sediment in the irrigation tailwater.

The initial plan for the polyacrylamide BMP study was to run the study in parallel with the vegetative ditch on the Westside Patterson Farms. However, due to the problems as elaborated above, the first vegetative ditch study was relocated and conducted in the second year. The crops that were being irrigated at that time (primarily alfalfa and orchard crops), were not ideal candidates for the study (typically PAM works best with row crops such as corn and tomatoes). In searching for alternate sites, one other study site in the project area was located (see Figure 21) that was being used for a combined PAM and sediment basin study for pyrethroids, but timing was such that the analysis of the non-pesticide parameters couldn't be arranged in time. A summary of the PAM study is provided below. The complete study can be found in Appendix 11.

Figure 21. Plot Diagram Showing Location of Combined PAM and Sediment Basin Study



PAM Study Summary

This study examined the effectiveness of PAM and sediment basins for reducing pyrethroid residues in tailwater in two different trials conducted on a section of a large-scale commercial farm in the Central Valley of California planted with processing tomatoes. The first trial was conducted under relatively high flow conditions with no PAM added so that the irrigation tail water was laden with total suspended solids (TSS). The second trial was conducted under relatively low flow conditions with PAM added to the top of the irrigation furrows so that the irrigation tailwater had considerably less TSS. In both trials the sediment basin reduced the peak pyrethroid (lambda-cyhalothrin) concentration in tailwater entering the sediment basin and flowing out of the sediment basin by about a factor of 10 and the total mass load of pyrethroid leaving the sediment basin was reduced by 80 percent.

Lambda-cyhalothrin residue levels in the runoff samples from the study conducted without adding PAM to the irrigation runoff ranged from 2.005 down to 0.191 ug/L at the field exit (prior to entering the sediment basin) and 0.135 down to 0.102 at the exit of the sediment basin. At the same time, the levels of total suspended solids ranged from 860 mg/L down to 390 mg/L prior to entering the sediment basin and 535 mg/L down to 85 mg/L at the exit of the sediment basin. The results show a decline in TSS and pyrethroid concentrations during the time the sediment basin was discharging as well as a comparison of the highest concentrations observed in the inlet and outlet streams.

The use of PAM dramatically clarifies the water exiting the field (see Figure 22) and this reduction in sediment load (as measured by TSS) results in decreased loss of hydrophobic chemicals, such as the pyrethroid insecticides, in irrigation tailwater.

Figure 22. Comparison of runoff samples taken at field exit with and without the use of PAM.

In addition to sediment load and pyrethroids, PAM has also been shown to be effective in reducing the runoff potential for nitrates (85% reduction) and total phorphorus (90% reduction) by Entry and Sojka (2003). The authors also noted a reduction of ammonia nitrogen, calcium magnesium, manganese, iron, copper, boron, and zinc (10 to 40 fold reduction). Studies by Cahn et al (2004) and Entry et al (2003) have shown a 30-50% decline in total coliform bacteria and fecal coliform bacteria.

Disclosure: Funding for this project has been provided in full or in part through an Agreement with the State Water Resources Control Board (SWRCB) pursuant to the Costa-Machado Water Act of 2000 (Proposition 13) and any amendments thereto. The contents of this document do not necessarily reflect the views and policies of the SWRCB. Information regarding equipment and other entities was provided solely for presenting testing materials required for the work and does not imply an endorsement of the entities or products.