Agricultural BMP's to reduce sediment and pyrethoid insecticides in irrigation runoff

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Funding:

- California State Water Resources Control Board

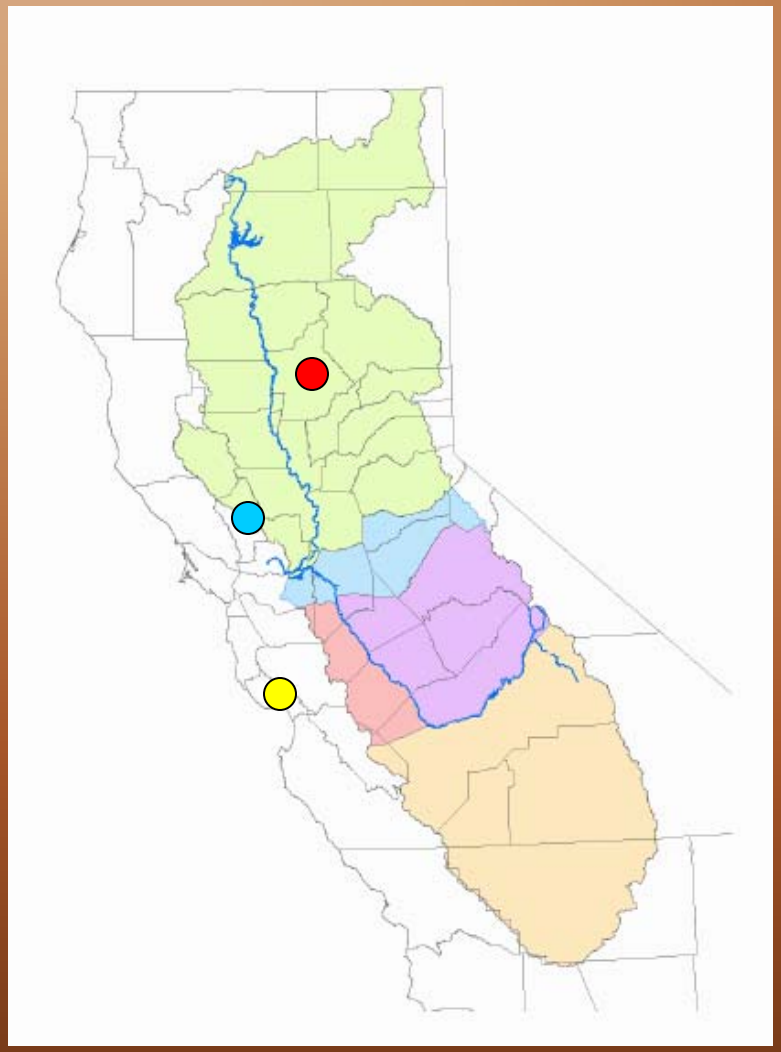
Agricultural BMP’s:

- Anionic polymers (PAM)
- Vegetative ditches
- Sediment traps

Goal:

To understand how to use each of these practices to their fullest potential

2006 and 2007 Field Studies



- Chico, CA
  - Clay loam soil
  - Lima bean
  - Zeta-cypermethrin
- Davis, CA
  - Loam soil
  - Processing tomato
  - Lamda-cyhalothrin
- Salinas, CA
  - Sandy loam soil
  - Lettuce
  - Permethrin

Field Research Layout

General experimental methods:

- Conducted six irrigations per season per site
- First irrigation cultivated but no insecticide
- Subsequent irrigations, cultivated then applied insecticide
- Irrigated within 48 hours of insecticide application

Primary Data Collection

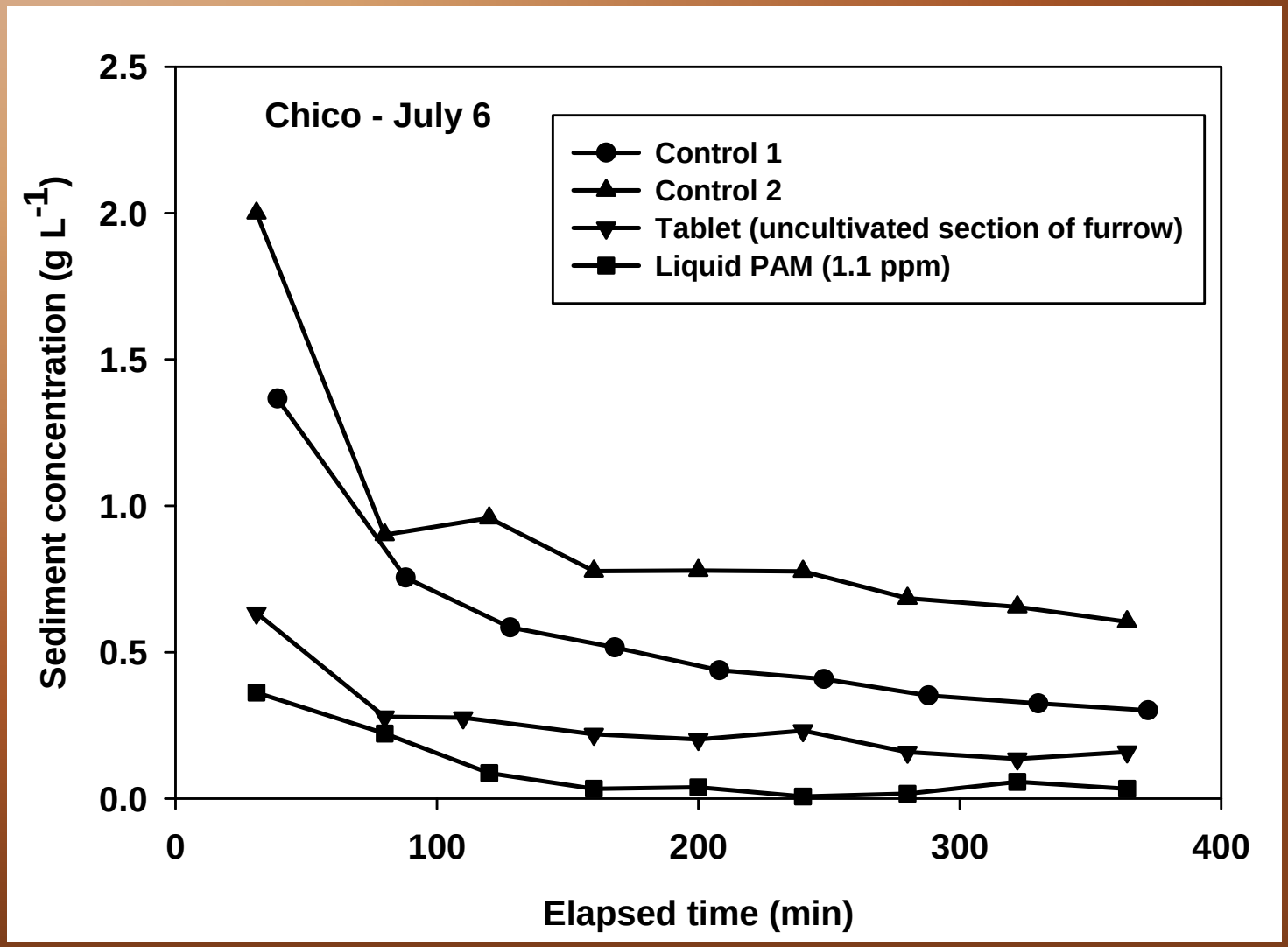
- Volume of flow on and off of each plot
- Suspended sediment concentration in runoff with and without BMP (control vs treatment)
- Pesticide concentration on suspended sediment
- Aquatic toxicity

Results with Anionic Polymer (PAM)

The Effects of:

- Formulations
- Application methods
- PAM concentrations

Effect of PAM on Sediment Concentrations, 2007



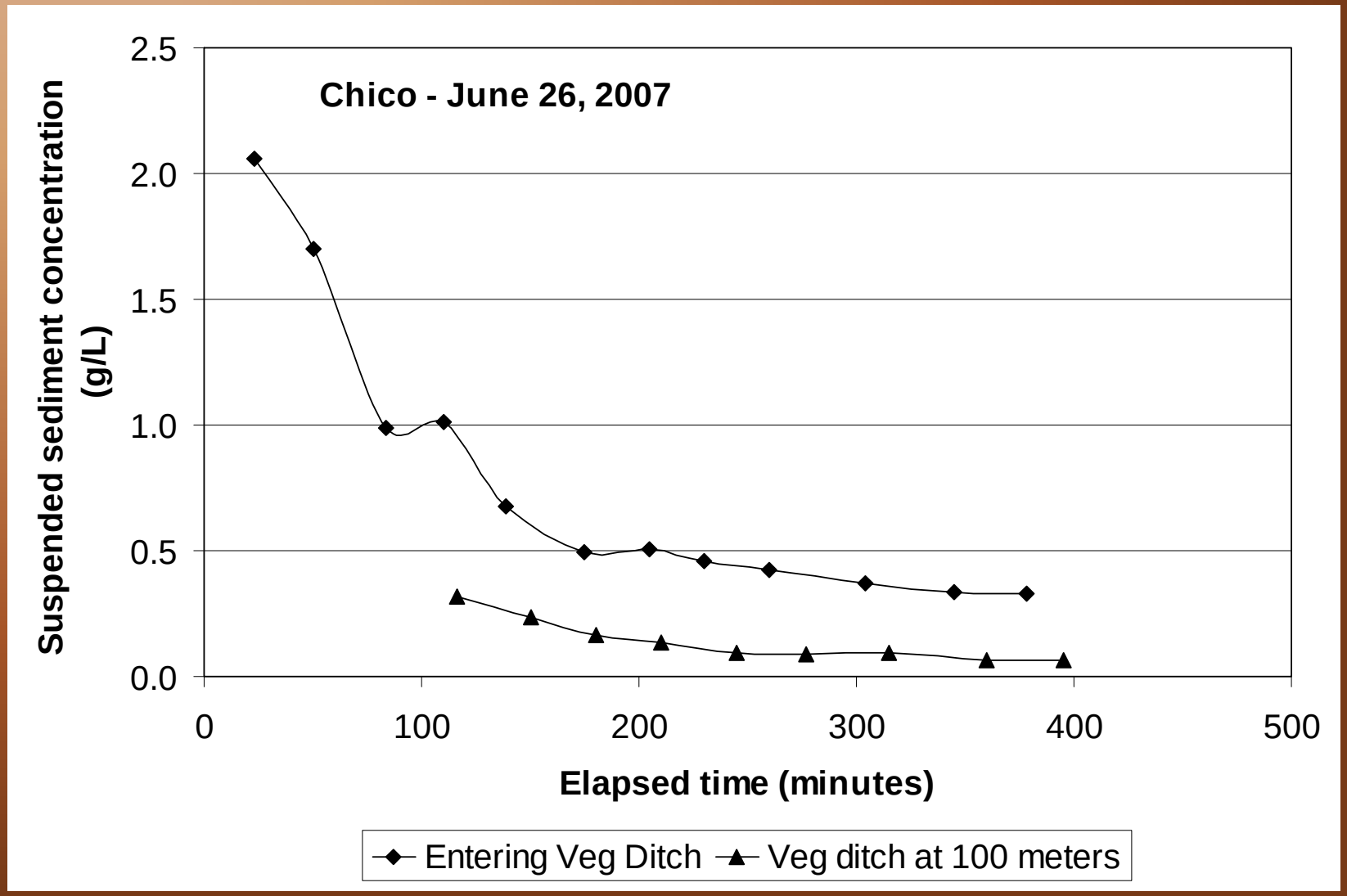
Effect of liquid PAM on Level of Pyrethroid Discharge and Survival of *H. azteca*

- **In 2006, averaged 91 % reduction in pyrethroid discharge across all tests**
- **100 % mortality of *H. azteca***

- **Oil-based PAM (37 % a.i.) LC50 $\geq$ 0.82 ppm, 2.07 ppm (2 tests)**
- **Water-based PAM (50 % a.i.) LC50 $\geq$ 100 ppm**

Results with Vegetated Tailwater Ditch

Effect of Vegetated Tailwater Ditch on Suspended Sediment



Effect of Vegetated Ditches on Level of Pyrethroid Discharge and Survival of *H. azteca*

- **In 2006, averaged 56 % reduction in pyrethroid discharge with a 50 meter vegetative ditch**
- **56 % survival of *H. azteca***

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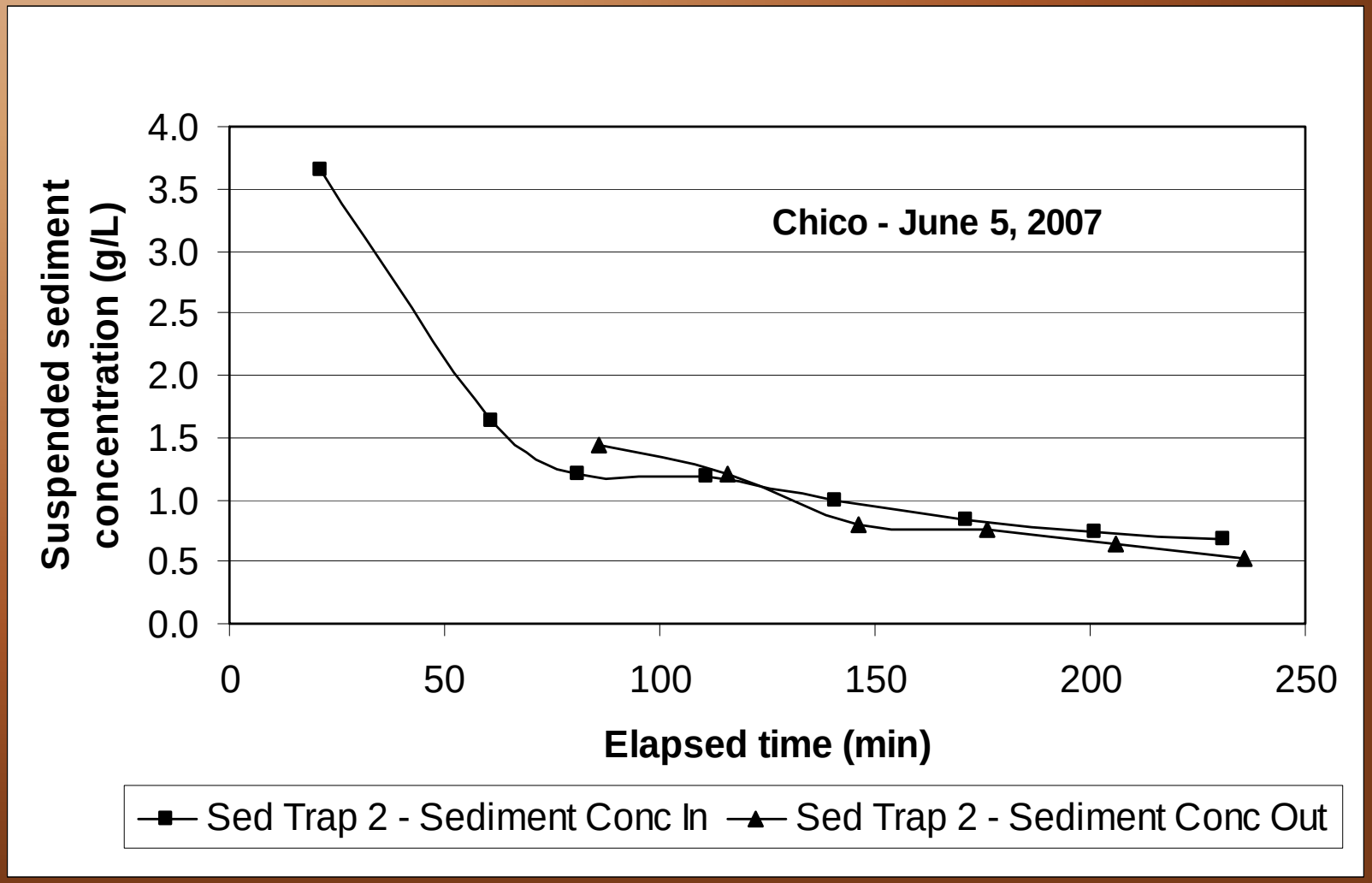
Results with Sediment Traps

Effect of Sediment Traps on Suspended Sediment Concentration



Effect of Sediment Traps on Level of Pyrethroid Discharge and Survival of *H. azteca*

- **In 2006, averaged 1.3 % reduction in pyrethroid discharge**
- **18 % survival of *H. azteca***

Summary:

- PAM emulsions in source water were highly effective at reducing sediment and pyrethroids in runoff.
- Granular and tablet formulations of PAM were effective but not to the extent of emulsions.
- Toxicity to aquatic species was a concern for oil-based PAM emulsions.
- Vegetated tailwater ditches effectively filtered sediment and sediment-bound insecticides.
- Sediment traps were less effective at reducing suspended sediment and pyrethroid insecticides in field runoff.