



PUBLIC COMMENT ON TOXICITY MONITORING

SWRCB SURFACE WATER EXPERT PANEL

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[SURFACE WATER AG COMPLIANCE MONITORING FOR REGION 3 ILRP]



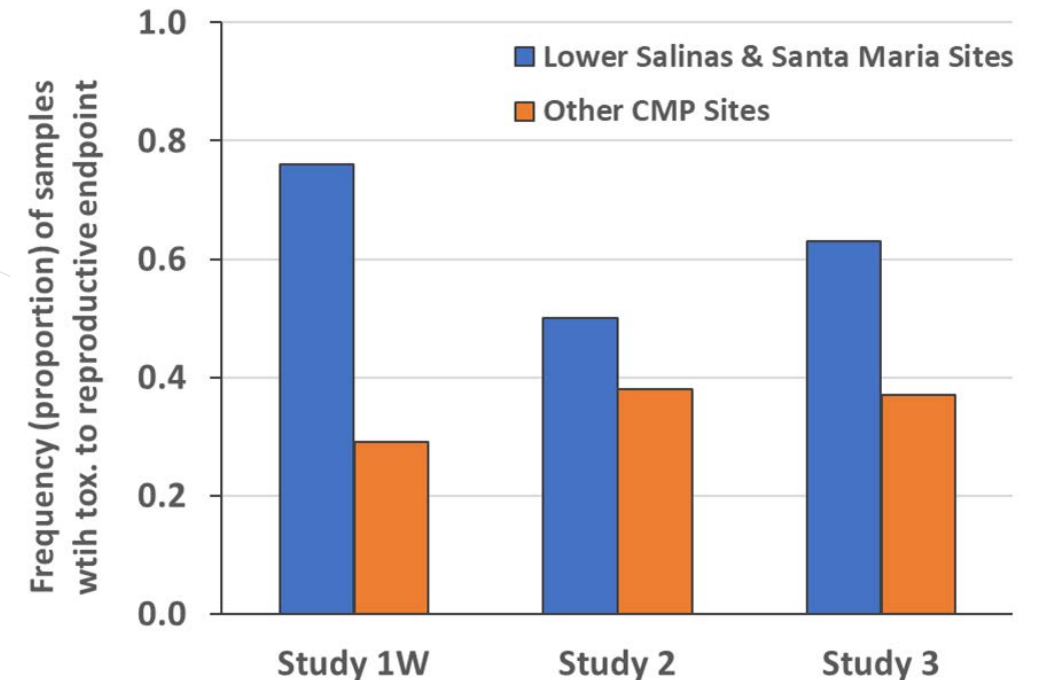
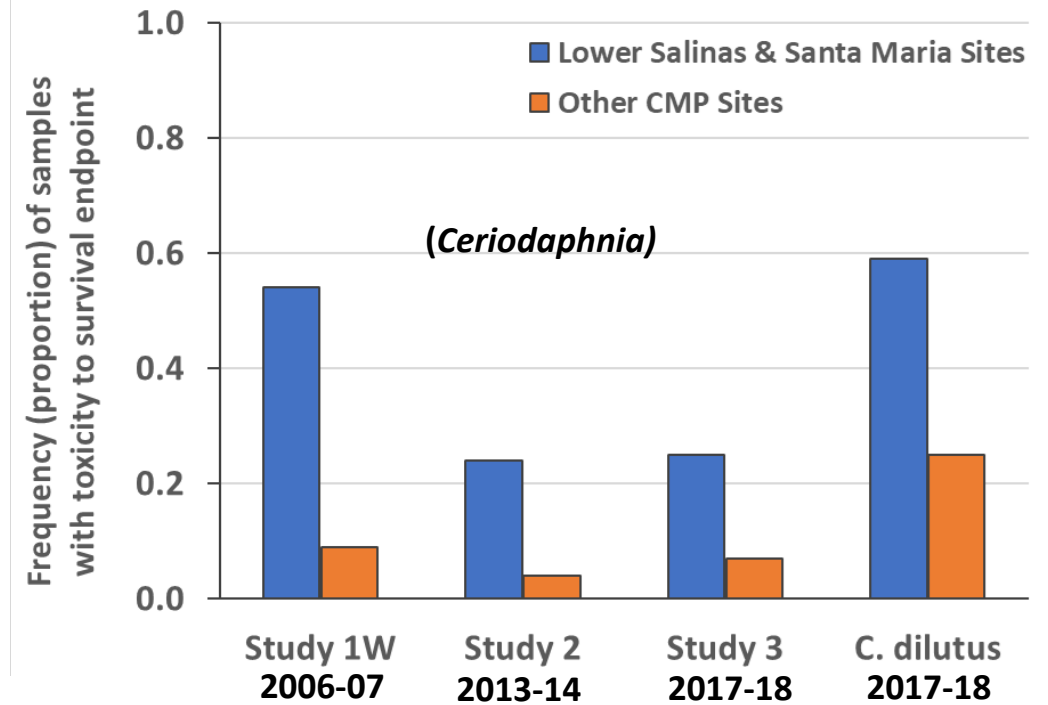
COOPERATIVE MONITORING APPROACH TO TOXICITY/PESTICIDES

- 4x/year toxicity bioassays in water, 55 sites
 - Algae (*Selenastrum*)
 - *Ceriodaphnia dubia*
 - *Chironomus* (replaced Fathead Minnow in 2016)
- 1-2x/year toxicity bioassays in sediment, 55 sites
 - *Hyaella azteca*
- Periodic Follow-up Studies (~1 study every 4-5 years), 55 sites
 - Suite of potential toxicants (pesticides, herbicides, metals)
 - 4x water tests in a 1-yr study period
 - 1-2x sediment tests in a 1-yr study period
 - Concurrent with water/sediment toxicity bioassays
 - Samples split for bioassay & chem analysis



WHAT DO WE KNOW? - WATER

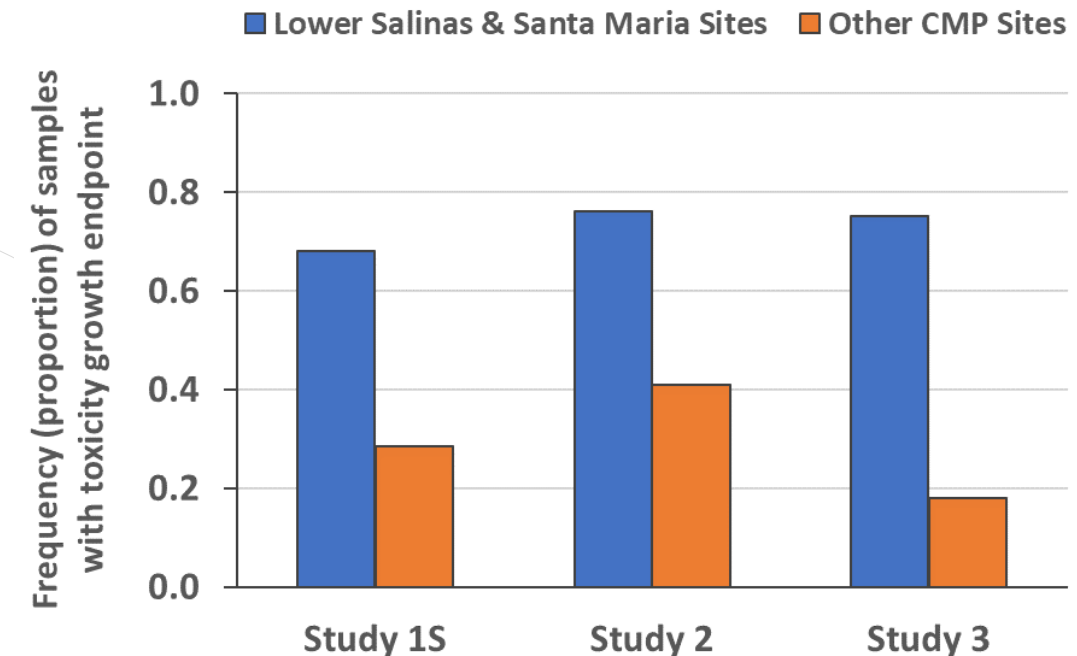
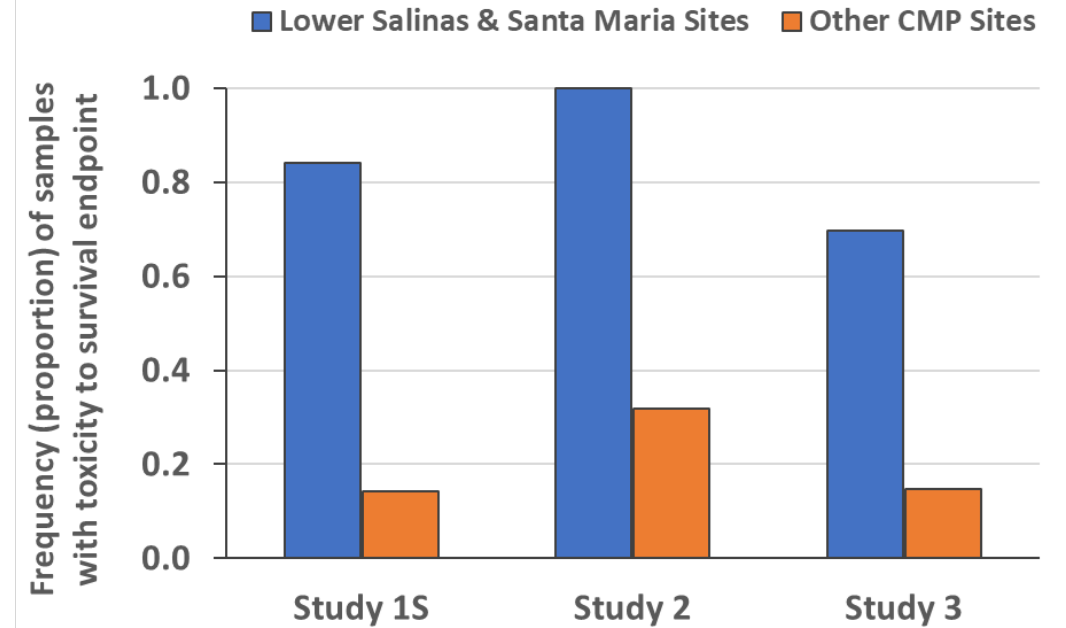
- Toxicity to *C. dubia* in water significantly reduced from initial study period to Study 2 ($p < 0.01$); no change between Study 2 and 3
- Toxicity to *C. dubia* and *Chironomus* in water significantly lower in Ag areas outside of the Salinas and Santa Maria valleys ($p < 0.01$)
- In Study 3 (first *Chironomus* tests), there was more mortality to *Chironomus* than to *C. dubia*, BUT *C. dubia* reproduction was a more sensitive endpoint than *Chironomus* mortality





WHAT DO WE KNOW? - SEDIMENT

- Toxicity to *H. azteca* in sediment has not changed as much over time on a program-wide basis (some site-specific exceptions)
- Toxicity to *H. azteca* in sediment significantly lower in Ag areas outside of the Salinas and Santa Maria valleys
- Sediment bioassays (and chemistry) are VERY expensive; need high information value to justify
 - Sediment is most appropriate matrix for *Hyaella*

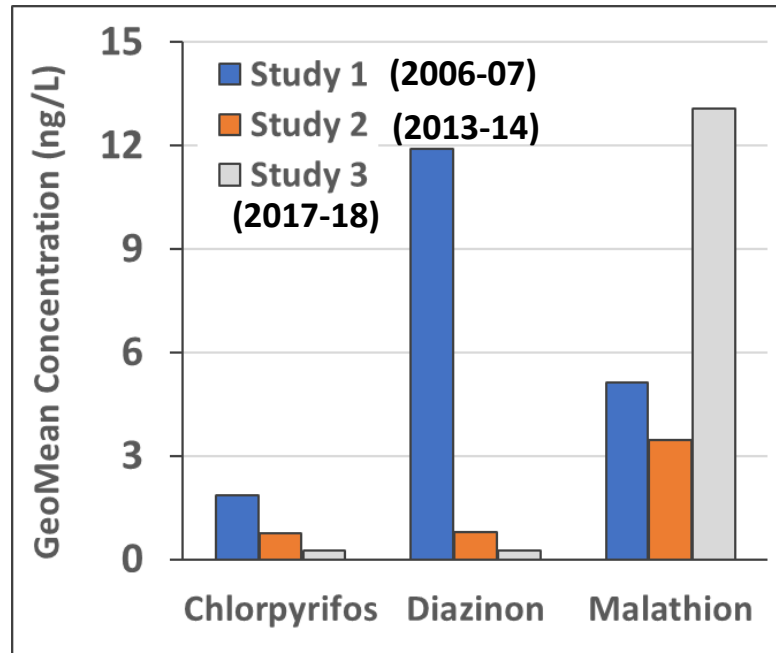




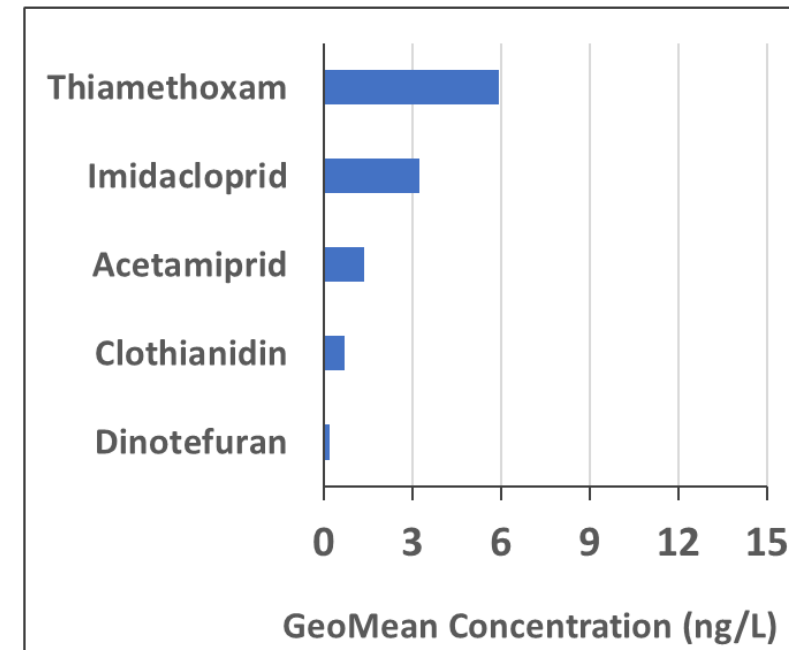
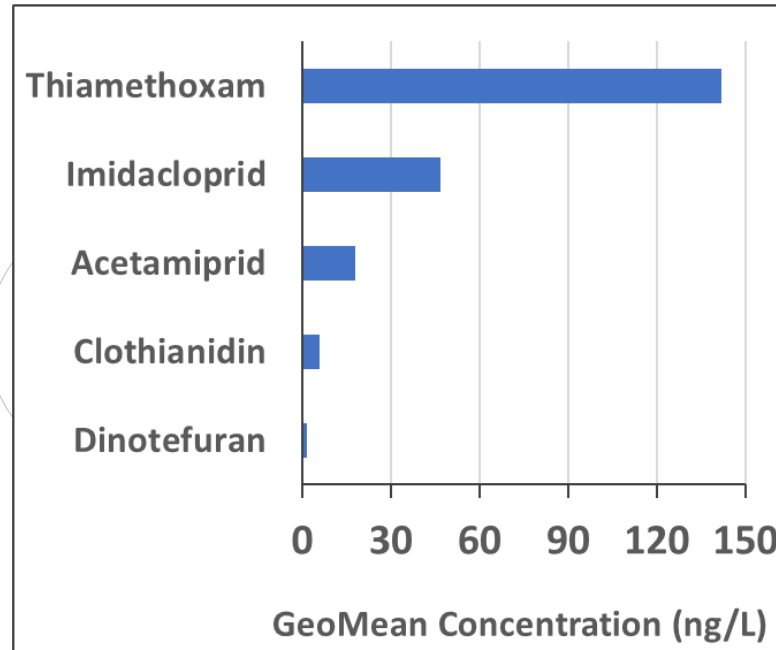
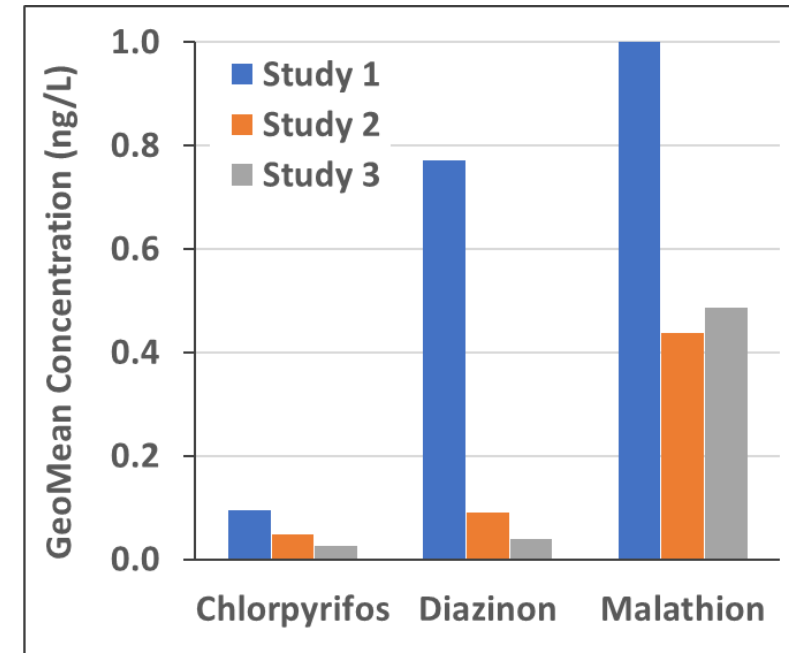
PESTICIDES IN WATER

- Chlorpyrifos & Diazinon detections decreased significantly ($p < 0.01$) over time; Malathion has not.
- Organophosphate & Neonicotinoid concentrations significantly lower in Ag areas outside of the Salinas and Santa Maria valleys ($p < 0.01$)
 - Some site-specific exceptions

Sites in Salinas/Santa Maria Valleys



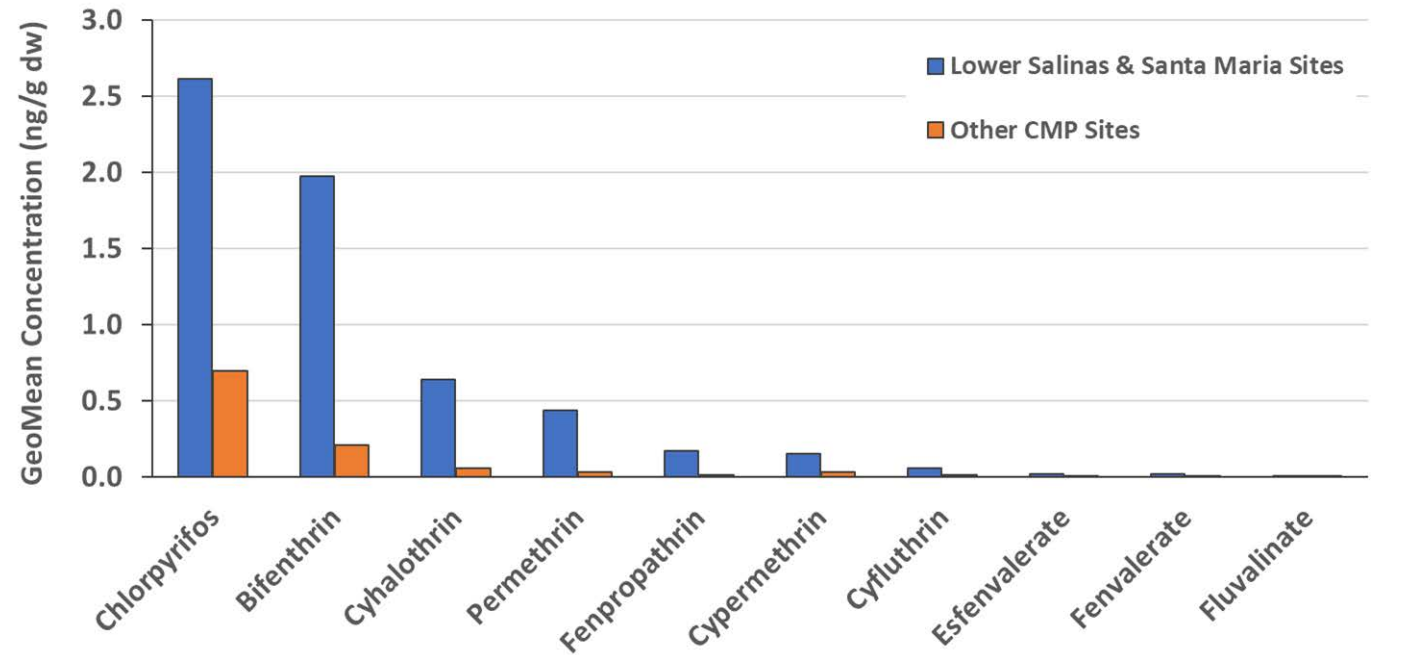
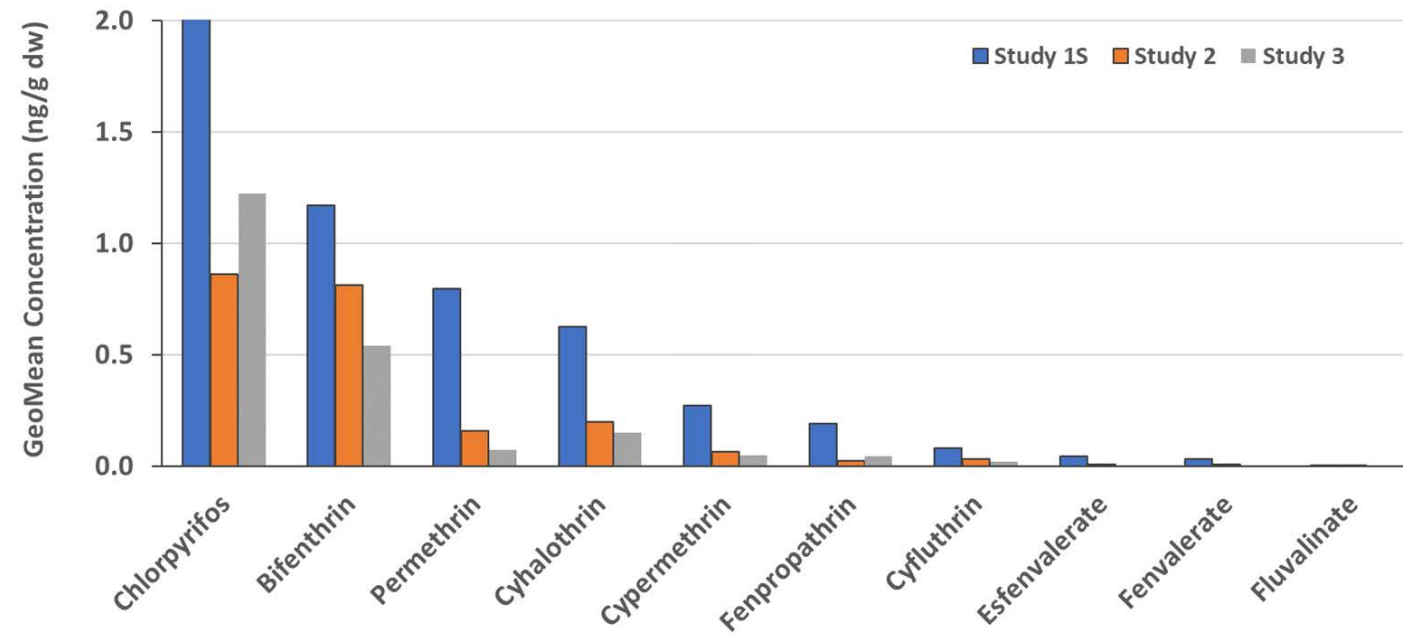
Sites in other CC Ag areas





PESTICIDES IN SEDIMENT

- Many Pyrethroids & Chlorpyrifos have decreased significantly over time
- Pyrethroid & Chlorpyrifos concentrations significantly lower in Ag areas outside of the Salinas and Santa Maria valleys
 - Some site-specific exceptions



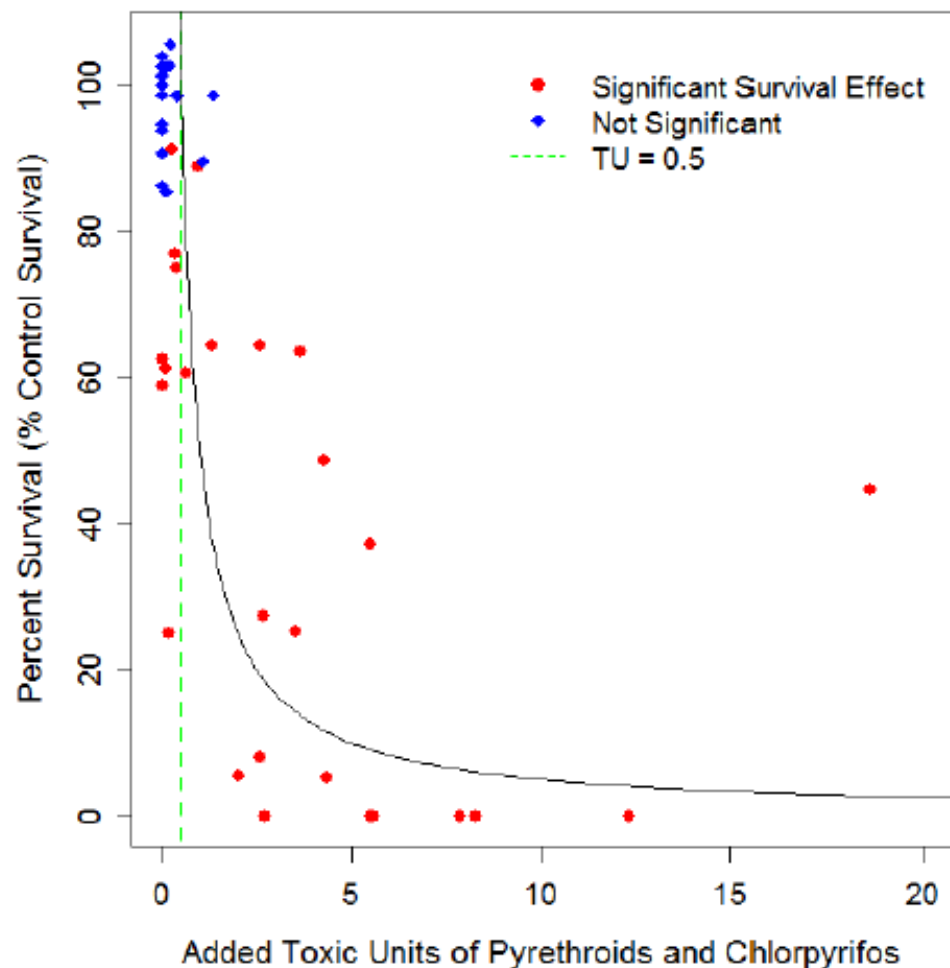
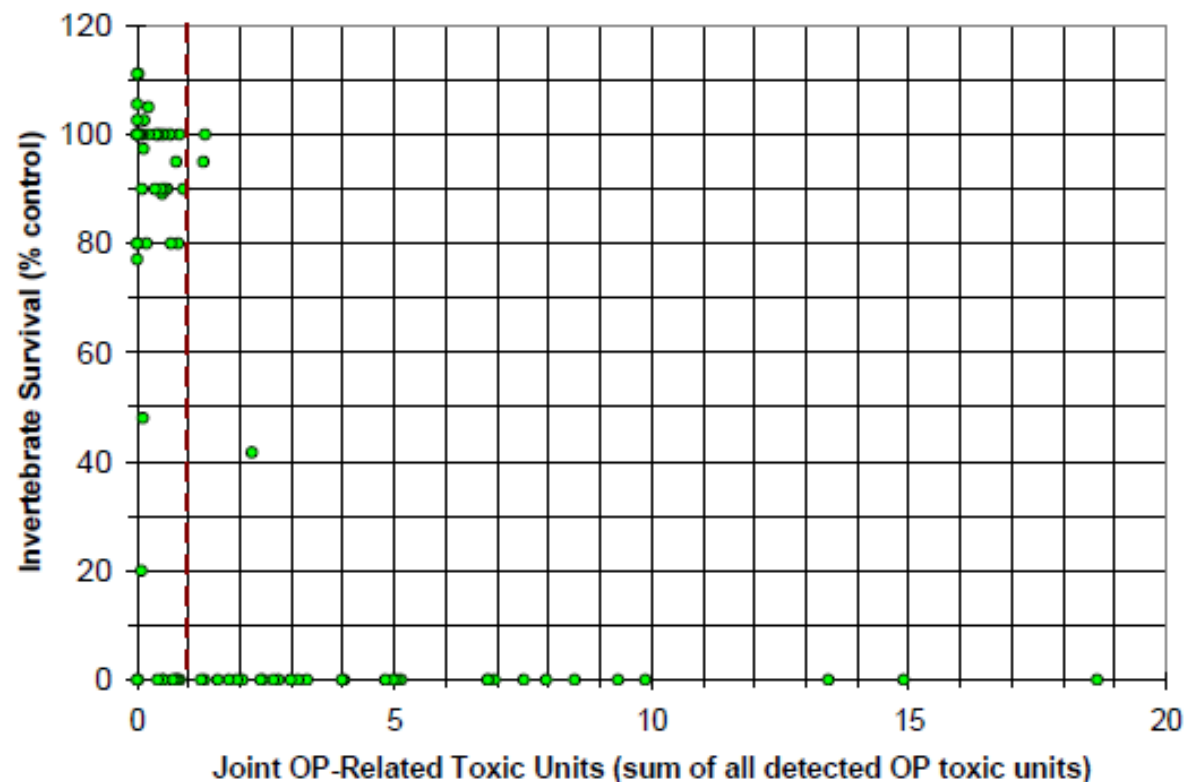


Figure 12. Survival of *H. azteca* (compared with control) exposed to sediments collected from Central Coast waterbodies in comparison with the added toxic units (TU's) of pyrethroids and chlorpyrifos. The hashed line at 0.5 TUs represents a toxic threshold, which is strongly associated with significant mortality. The solid black line represents 50/TUs, such that 50% survival matches 1 TU and roughly approximates anticipated survival.

Data from 2010, 1 round of sampling at 50 sites in sediment
10-day *Hyaella* bioassays & sediment pyrethroid/chlorpyrifos

Figure 1. Relationship between joint OP-related toxic units (TU's) and observed toxicity to aquatic invertebrates in original CMP Phase I Follow-up OP monitoring project (CCWQP 2008). (Toxic units were derived from OP concentrations measured and the published LC50 values given in Table 2.) One outlier (105 OP-related TU's and 0% survival) has been omitted to improve readability of the graph. The dashed line delineates results greater and less than 1 OP-related TU.



Data from 2006-2007, 4x samples at 50 sites in water
C. Dubia in water bioassays & split Organophosphate chems

Figure 8. *Ceriodaphnia* Survival and Total Toxicity Units of Organophosphate and Neonicotinoid Pesticides in Water

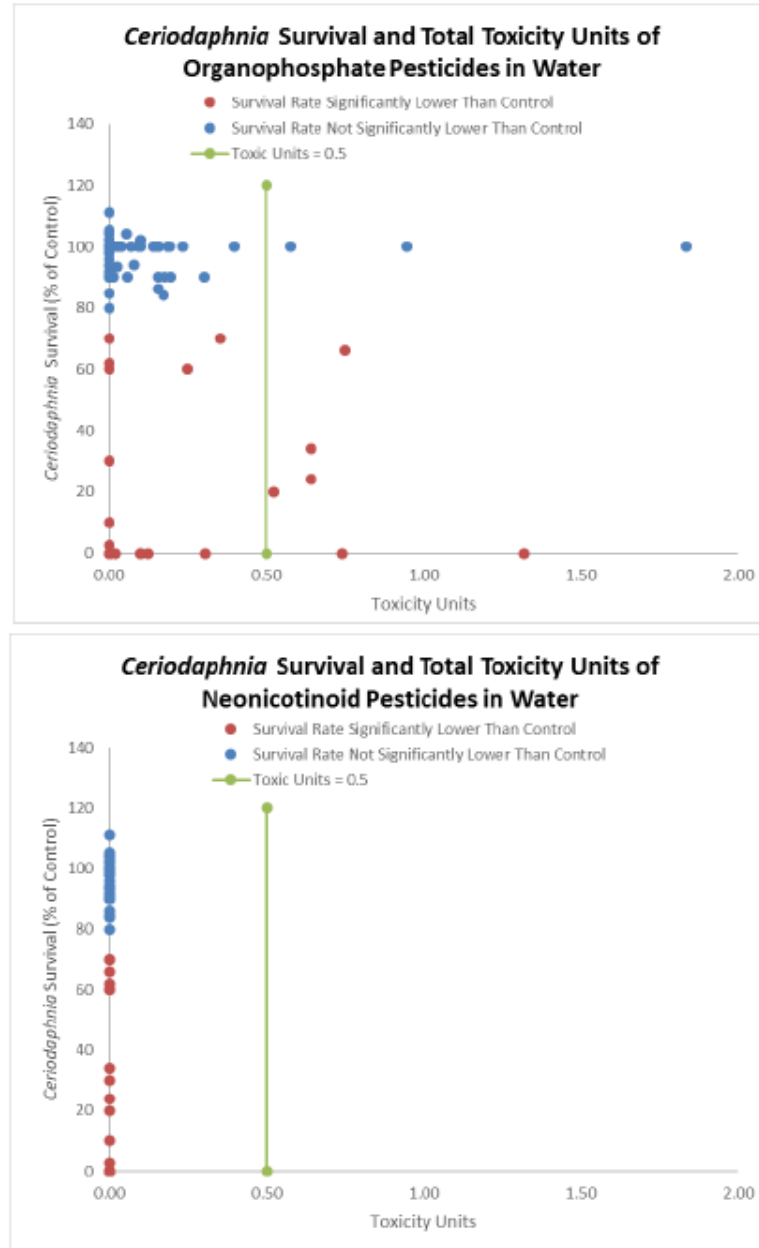


Figure 8. Survival of *C. dubia* (compared to laboratory control) exposed to water collected from Central Coast waterbodies in comparison with the total toxic units for organophosphates and neonicotinoids. The vertical line at 0.5 TUs represents a toxic threshold, which in some studies has been strongly associated with significant mortality.

Figure 9. *Chironomus* Survival and Total Toxicity Units of Organophosphate and Neonicotinoid Pesticides in Water

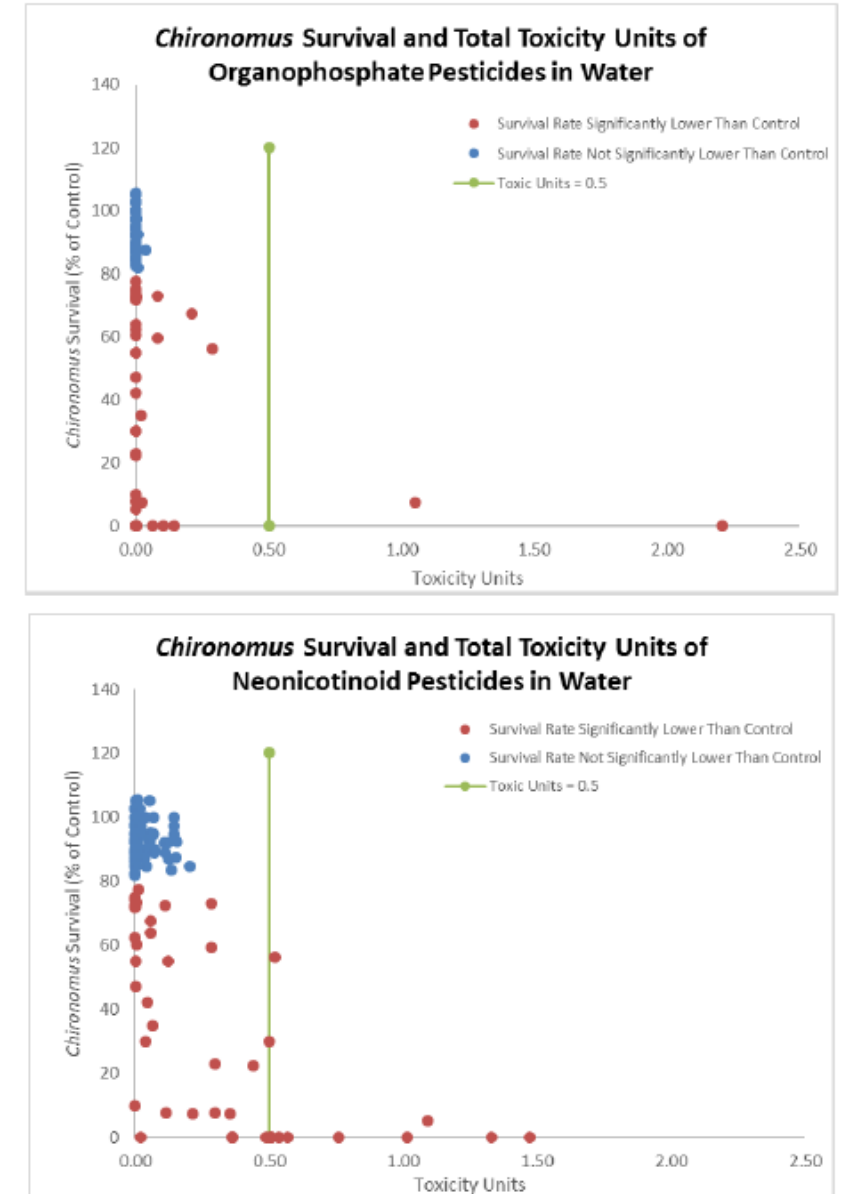


Figure 9. Survival of *Chironomus* (compared with control) exposed to water collected from Central Coast waterbodies in comparison with the total toxic units for organophosphate and neonicotinoid pesticides. The vertical line at 0.5 TUs represents a toxic threshold, which in some studies has been strongly associated with significant mortality.



PESTICIDE USE & DETECTIONS

- SR (all ranches draining to CMP site)
- Ag Commissioner records, past 12 months

Top Pesticides	Recent CMP Detection?	Applied Acreage	Applied Pounds	Product
MALATHION	Yes	1983	3905	MALATHION 8 AQUAMUL
ACETAMIPRID	Yes	4043	512	ANARCHY 70 WP, ASSAIL 30SG,
IMIDACLOPRID	Yes	1153	348	IMIDASHOT DF, ADMIRE PRO, AE F106464 00 SC43 A4 INSECTICIDE, WRANGLER, LEVERAGE 360, NUPRID 2SC, IMIDASHOT, MACHO 2.0 FL
THIAMETHOXAM	Yes	5242	329	ACTARA, FLAGSHIP, PLATINUM, VOLIUM FLEXI
BIFENTHRIN	Yes	2527	259	BRIGADE WSB INSECTICIDE/MITICIDE, SNIPER, BIFENTURE 10DF
PERMETHRIN	Yes	625	107	PERMETHRIN, PERM-UP 25 INSECTICIDE, PERM-UP 25DF, POUNCE
METHOMYL	not sampled	128	83	DU PONT LANNATE SP INSECTICIDE
LAMBDA-CYHALOTHRIN	Yes	1366	34	SCIMITAR GC INSECTICIDE, WARRIOR II WITH ZEON, LAMBDA-CY EC INSECTICIDE-RUP, BESIEGE INSECTICIDE, SILENCER VXM,
COPPER Compounds	Yes	14	19	CHAMP FORMULA 2, BADGE X2, CUEVA FUNGICIDE
CLOTHIANIDIN	Yes	29	6	BELAY INSECTICIDE
ESFENVALERATE	No	84	4	ASANA XL INSECTICIDE

Chlorpyrifos, Danitol (Fenpropathrin), Cypermethrin also detected



BOTTOM LINE

MONITORING SHOULD HELP US DETERMINE WHERE AQUATIC TOXICITY OCCURS AND WHAT (USUALLY) CAUSES IT.

AFTER THAT, RESOURCES NEED TO GO TO HELPING GROWERS MANAGE OFF-SITE MOVEMENT OF TOXICANTS.

THERE ARE DIMINISHING RETURNS ON MONITORING FOR ABSOLUTE CERTAINTY ON EVERYTHING.