SWAMP Surface Water Ambient Monitoring Program

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Importance of Monitoring Current-Use and Emerging Pesticides

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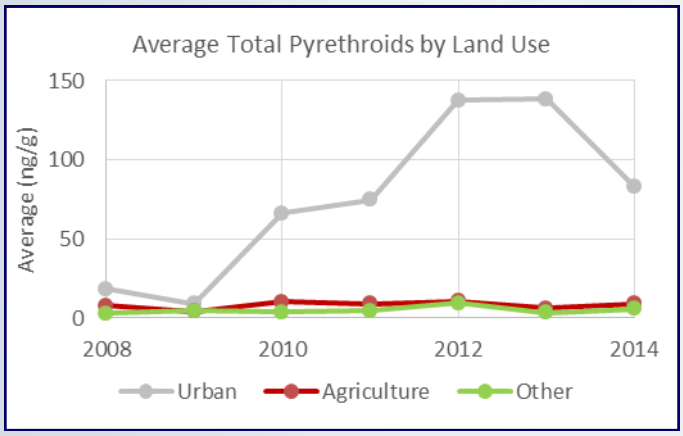
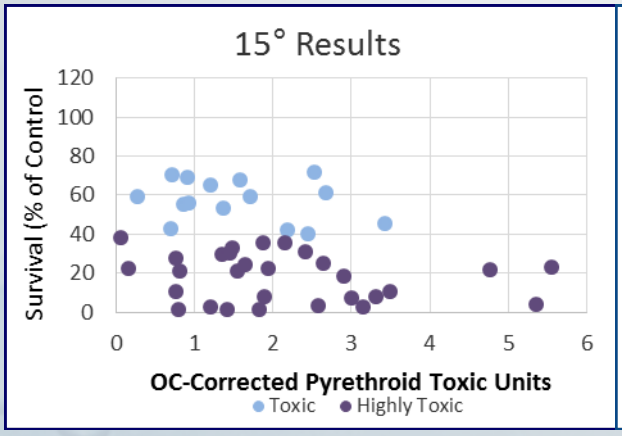
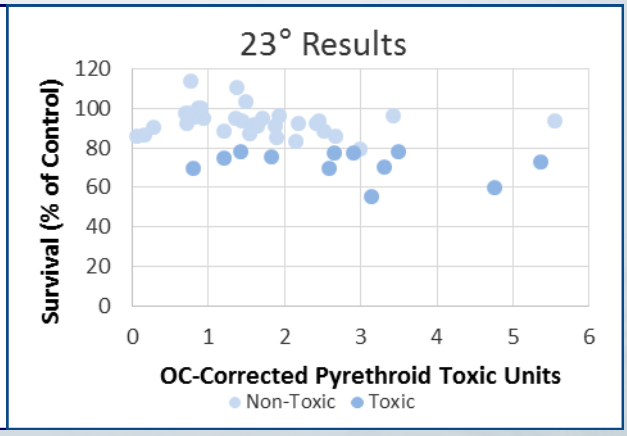
The Stream Pollution Trends (SPoT) Monitoring Program is one of several statewide monitoring programs under SWAMP, and the only program to evaluate contaminants and toxicity. In 2008, SPoT started visiting up to 100 sites per year to assess trends in sediment contamination and toxicity to the amphipod *Hyalella azteca*, an invertebrate native to California streams. SPoT measures contaminant concentrations and toxicity in sediments that accumulate in the lower reaches of large watersheds. The most recent report, *Spatial and Temporal Trends in Toxicity and Chemical Contamination Relative to Land Use in California Watersheds* (view Fact Sheet), summarizes results from seven years of annual SPoT surveys that assessed how stream pollutant concentrations are affected by land use, with an emphasis on urban and agricultural development.

Much of the observed toxicity in SWAMP's regional and statewide monitoring is caused by pesticides and, within the SPoT dataset, at least some portion of the low survival observed in 79% of the toxic samples can be explained by pyrethroid and organophosphate pesticides. Contaminant concentrations are both increasing and decreasing. Average concentrations of pyrethroid pesticides, metals and PBDEs are significantly increasing, driven by elevated concentrations and detections in urban watersheds. Between 2010 and 2013, average concentrations of pyrethroids doubled. Fipronil is a pesticide of emerging concern whose use is increasing, as are the number of detections and average concentrations. The organochlorine compounds (DDTs and PCBs) are significantly decreasing.



Urban watersheds have the highest contaminant concentrations, and toxicity has the strongest correlations with urban insecticides. Further evidence of the contribution of pyrethroid pesticides is seen in toxicity exposures at colder temperatures. Pyrethroid toxicity increases with lower temperature. Significantly more samples were toxic, and the magnitude of toxicity was much greater when samples were tested at the more environmentally-relevant test temperature of 15°C.





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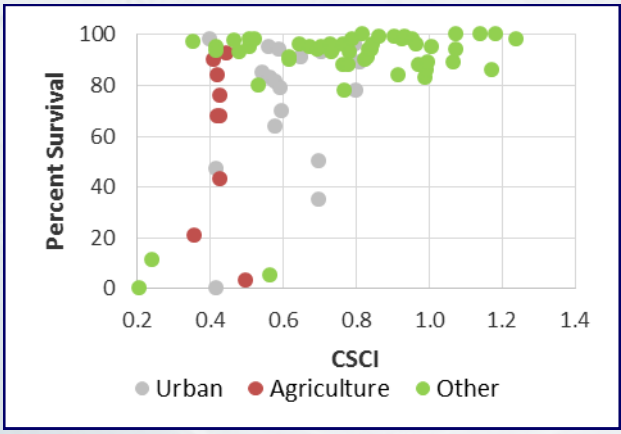
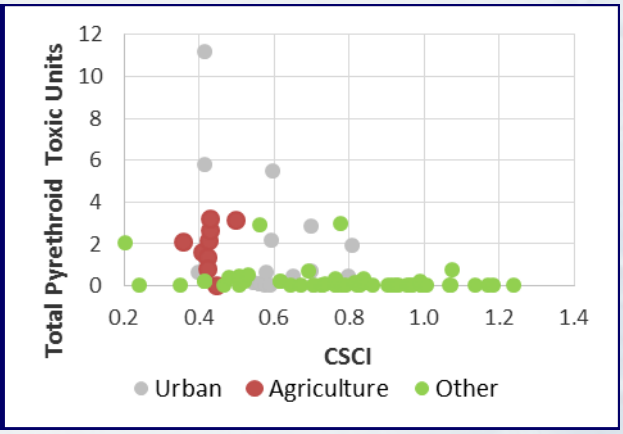
Analysis of data from SPoT and other monitoring programs suggests that pesticides are correlated with impacted ecosystem health. Amphipod survival in laboratory toxicity tests is significantly correlated with healthy benthic macroinvertebrate communities, while declines in amphipod survival and low California Stream Condition Indices (CSCI) are correlated with elevated pyrethroid concentrations. Data from SPoT and other projects indicate that elevated concentrations of current-use pesticides, such as pyrethroids, may be a significant environmental stressor affecting laboratory toxicity and correlating with low CSCI scores.





From its inception, SPoT has been an adaptive and collaborative program by adding emerging pesticides to its analyte list, utilizing an alternate test organism to address varying sensitivity (*Chironomus dilutus*), and by working with the Department of Pesticide Regulation (DPR) to monitor changes in label regulations and the emergence of new pesticides. A recent collaborative effort integrated Regional SWAMP water column toxicity monitoring with DPR's agricultural surface water monitoring program. Significant toxicity was observed at sites that were minimally toxic to U.S. EPA three-species tests (see *SWAMP Toxicity Testing: Organism Choices and Modified Methods Reveal Additional Information* in the Winter 2016 SWAMP Newsletter). Chemical analysis by DPR detected a number of current-use and emerging pesticides, and toxicity test results indicated these chemicals have the potential to impact receiving waters. In addition to monitoring organophosphate and pyrethroids in water, this collaborative monitoring is specifically targeting concentrations of the neonicotinoid insecticide imidacloprid. Because neonicotinoids are not expected to partition to sediments due to their high solubility, SPoT and DPR will continue to work together to analyze the toxicity of water samples collected from ten urban and agricultural watersheds.

Water column toxicity testing with *C. dilutus* and *H. azteca*, coupled with DPR's analysis of current-use pesticides in water is intended to provide up-to-date information on the risk of emerging contaminants in California watersheds. These data can then be used to more proactively manage neonicotinoids and other pesticides before they further impact receiving waters.