SWAMP Surface Water Ambient Monitoring Program

SWAMP Newsletter

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SWAMP Toxicity Testing

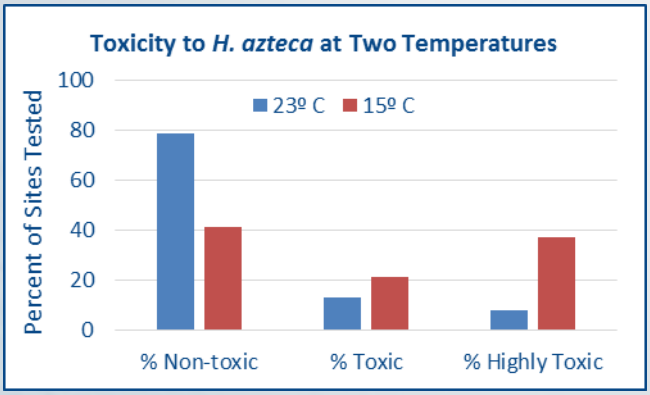
Organism Choices and Modified Methods Reveal Additional Information

Between 2001 and 2010 half of the SWAMP sites visited had at least one toxic sample (Statewide Toxicity Report). Evaluation of simultaneously obtained chemistry data, as well as performance of toxicity identification evaluations (TIEs), determined that much of the observed toxicity was caused by pesticides.

In 2008 the Stream Pollution Trends (SPoT) Monitoring Program 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. The toxicity test methods for *H. azteca* were developed by the U.S. EPA to evaluate sediment and water quality, and although it is sensitive to a variety of contaminants, including pyrethroid pesticides, it is less sensitive to a number of emerging pesticides such as neonicotinoids and fipronil and its degradates. Imidacloprid, the most commonly applied neonicotinoid pesticide, is more often detected in agriculturally dominated watersheds. The neonicotinoid class of pesticides is very water soluble, and have been implicated in worldwide declines in beneficial insect populations, most notably the honey bee. Fipronil is registered for use in urban applications.

To illustrate how the use of different test protocols influences monitoring results, ambient water samples from streams receiving agricultural runoff were tested side-by-side with *H. azteca* and the midge, *Chironomus dilutus* (organism highlight below). Comparing the results demonstrates different patterns of toxicity based on varying sensitivities to pyrethroid pesticides and neonicotinoid pesticides, for which *C. dilutus* has a higher sensitivity. Testing ambient samples with different species can provide valuable information on the presence of emerging pesticides in receiving waters. An updated SWAMP memo provides recommendations for monitoring current-use pesticide toxicity in water and sediment.

	% Lethality to Test Organism	
Water Body	***H. azteca***	***C. dilutus***
Alisal Slough	62	100
Chualar Creek	100	27
Main St. Ditch	6	8
Orcutt Creek	50	52
Oso Flaco Creek	100	58
Quail Creek	100	98
Rec Ditch III	70	96
Solomon Creek	2	100
Tembladero Slough	41	17



In addition to testing with different species, conducting the toxicity test at a different temperature can help diagnose toxicity caused by pyrethroids. The standard laboratory test temperature for *H. azteca* is 23°C, but this temperature is not representative of the average ambient surface water temperature in California, which is 15.8°C. SPoT tests a subset of sites at 15°C to better evaluate toxicity at ambient conditions. Increased toxicity at 15°C is indicative of the presence of pyrethroid pesticides in the sediments. Samples were 2.7 times more toxic when tested at 15°C (2014 SPoT Report). These data suggest that the potential for surface water toxicity caused by pyrethroids is likely underestimated when assessed at the standard protocol temperature of 23°C.

SPoT is currently completing its eighth year of sampling, and has recently undergone an extensive re-design based on trends exhibited in the first five years of monitoring. SPoT will continue to adapt its monitoring priorities to identify contaminants with the greatest potential to impact California watersheds.

⇒ **SWAMP Toxicity Test Species Highlight: Midge larvae—*Chironomus dilutus***