SWAMP Surface Water Ambient Monitoring Program

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A More Complete Picture of Watershed Health Through the Integration of Monitoring Program Efforts and Data

by Bryn Phillips, University of California at Davis (bmphillips@ucdavis.edu)
Pete Ode, CA Department of Fish and Wildlife (peter.ode@wildlife.ca.gov)
Robert Budd, CA Department of Pesticide Regulation (robert.budd@cdpr.ca.gov), and
Brian Anderson, University of California at Davis (anderson@ucdavis.edu)

The California Surface Water Ambient Monitoring Program (SWAMP) was created as a unifying program to coordinate all water quality monitoring conducted by the State and Regional Water Boards. In addition to programs within SWAMP, there are other water quality monitoring programs in California, each designed to answer study questions specific to their program. There is a growing recognition that these efforts should be better coordinated, and fledgling efforts to encourage collaboration have begun (e.g., California's Healthy Watersheds Partnership). Building successful collaborations is challenging, but a new emphasis linking pesticide pollution assessments with stream ecological monitoring provides a promising example of how this approach can facilitate improvement of watershed health. Within SWAMP, the Stream Pollution Trends Program (SPoT) monitors trends in sediment toxicity and sediment contaminant concentrations in selected large rivers throughout California, and relates contaminant concentrations and toxicity to watershed land uses. SWAMP's Bioassessment Program conducts long-term statewide surveys of the ecological condition of streams and rivers by monitoring benthic macroinvertebrates (BMIs) and algae, conventional chemical constituents (nutrients, major ions, etc.), and by conducting in-stream and riparian habitat assessments. The California Department of Pesticide Regulation (DPR) also performs statewide monitoring of current-use pesticides in selected agricultural and urban receiving waters through their Surface Water Protection Program. These programs are in the process of integrating their activities in an effort to leverage data to identify pesticides impacting California waters.

Increasing collaboration and overlap among established monitoring programs with differing objectives is not a simple task, and can potentially add costs to the individual programs. SPoT has a directed study design and collects yearly samples from the same base-of-watershed sites, while the Bioassessment Programs survey randomly selected sites, so spatial overlap between the SPoT and the Bioassessment programs is limited. DPR utilizes a prioritization model to identify pesticides of concern at a watershed scale based on current reported use patterns, persistence, and toxicity data, and their efforts have informed SPoT on emerging pesticides to target for monitoring. Although there can be differences in objectives, methodology, and sampling locations among these programs, merging toxicity, chemistry and bioassessment data sets can tell a more complete story about individual watersheds, the impact of specific pesticides in relation to various land uses, and statewide trends in pesticides impacting watershed health. A key step is to produce summary data at the same site.

SPoT and DPR have observed a significant increase in the detection and concentration of pyrethroid pesticides. The pesticide fipronil has also shown an increasing trend, because of its use treating urban ant populations. SPoT has increased its focus on current-use and emerging pesticides because of these trends, and because pesticides are a leading cause of the observed toxicity to invertebrate test species. Neuro-toxic pesticides tend to target arthropods, which form a large portion of the in-stream benthic community, and comprise the base of the aquatic food chain. For this reason, representatives of this community are also the most common organisms used in laboratory sediment toxicity tests.

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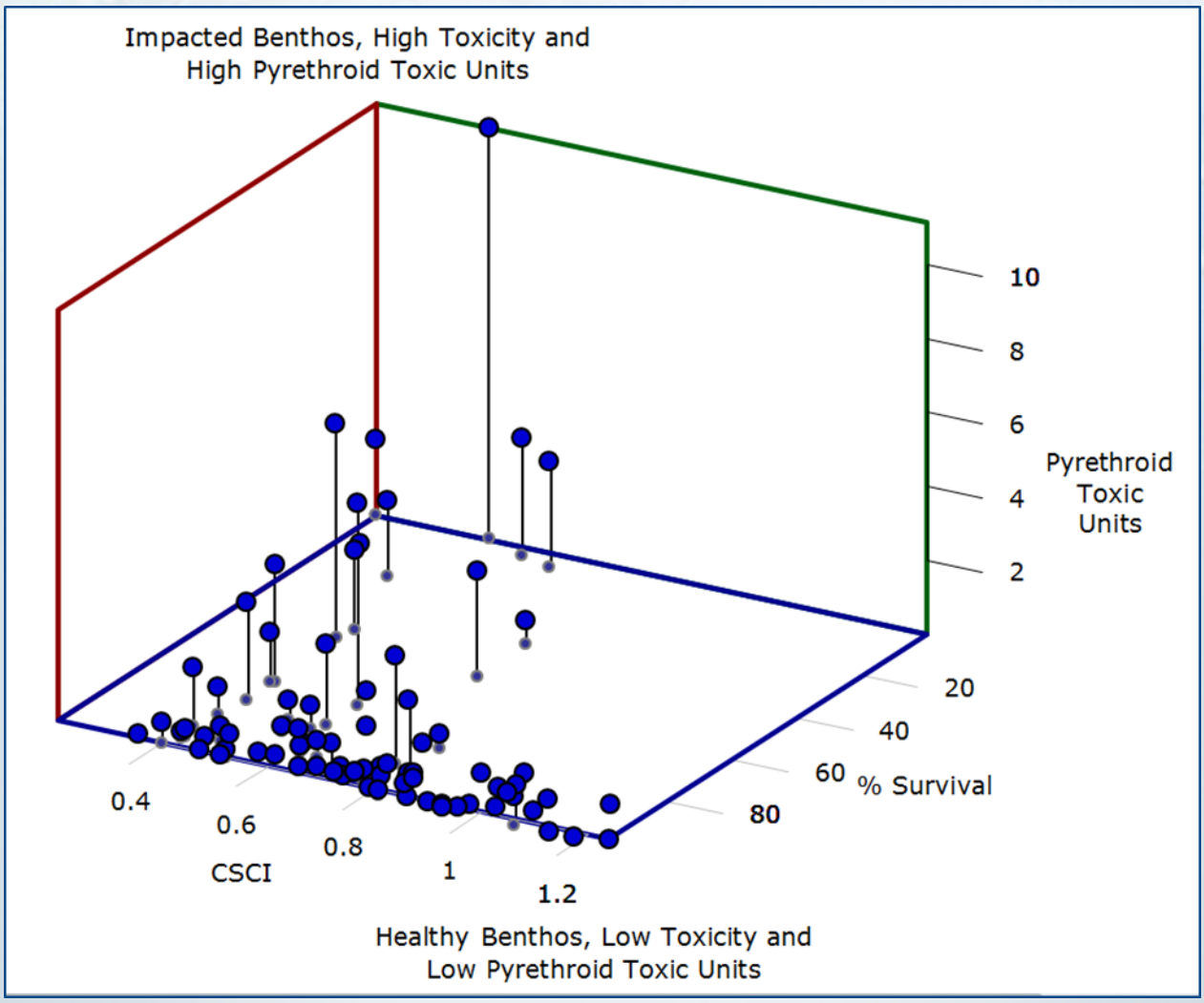
These pesticides currently originate in urban land use, and contribute to the toxicity measured in laboratory tests. The Bioassessment Program has also correlated urban land use with poor biological condition in wadeable streams, but is only beginning to investigate statistical relationships between pesticides and benthic communities. A recent comparison among site-specific data from SPoT, Bioassessment, and various other California monitoring programs demonstrated significant relationships among toxicity, pyrethroid pesticides, and the bioassessment-derived California Stream Condition Index (CSCI). Increases in pyrethroid pesticides, as measured by pyrethroid toxic units, correspond with decreases in CSCI and percent survival in laboratory toxicity tests. These relationships suggest pyrethroids are contributing to degraded benthic environments, and provide basic information for supporting causal assessments.



Combining the efforts of these programs could help demonstrate the effects of current use and emerging pesticides on resident benthic macroinvertebrates. Monitoring data gathered by all three programs can support assessment tools such as the Causal Analysis/Diagnosis Decision Information System (CADDIS) or the Species at Risk Model (SPEAR). Investigations within individual watersheds will require overlapping data collection where possible. SPoT will take the first step toward this goal by broadening its collaboration with DPR and adding a water column toxicity testing component to DPR's surface water program. This collaboration will be the beginning of statewide water toxicity monitoring that mirrors the sediment monitoring SPoT already conducts.