ENVIRONMENTAL INDICATOR: AQUATIC LIFE

WATERBODY TYPE: STREAMS DRAINING LARGE WATERSHEDS	**MEASURE:** SEDIMENT TOXICITY

MESSAGE:

Sediment data from the sampling pool (N= 92) indicate that 76 % of the watershed locations sampled are not significantly toxic.

KEY STATISTICS	
Number of sites sampled:	*92*
Sites were sampled in large, mixed land-use watersheds representing about half the area of California	

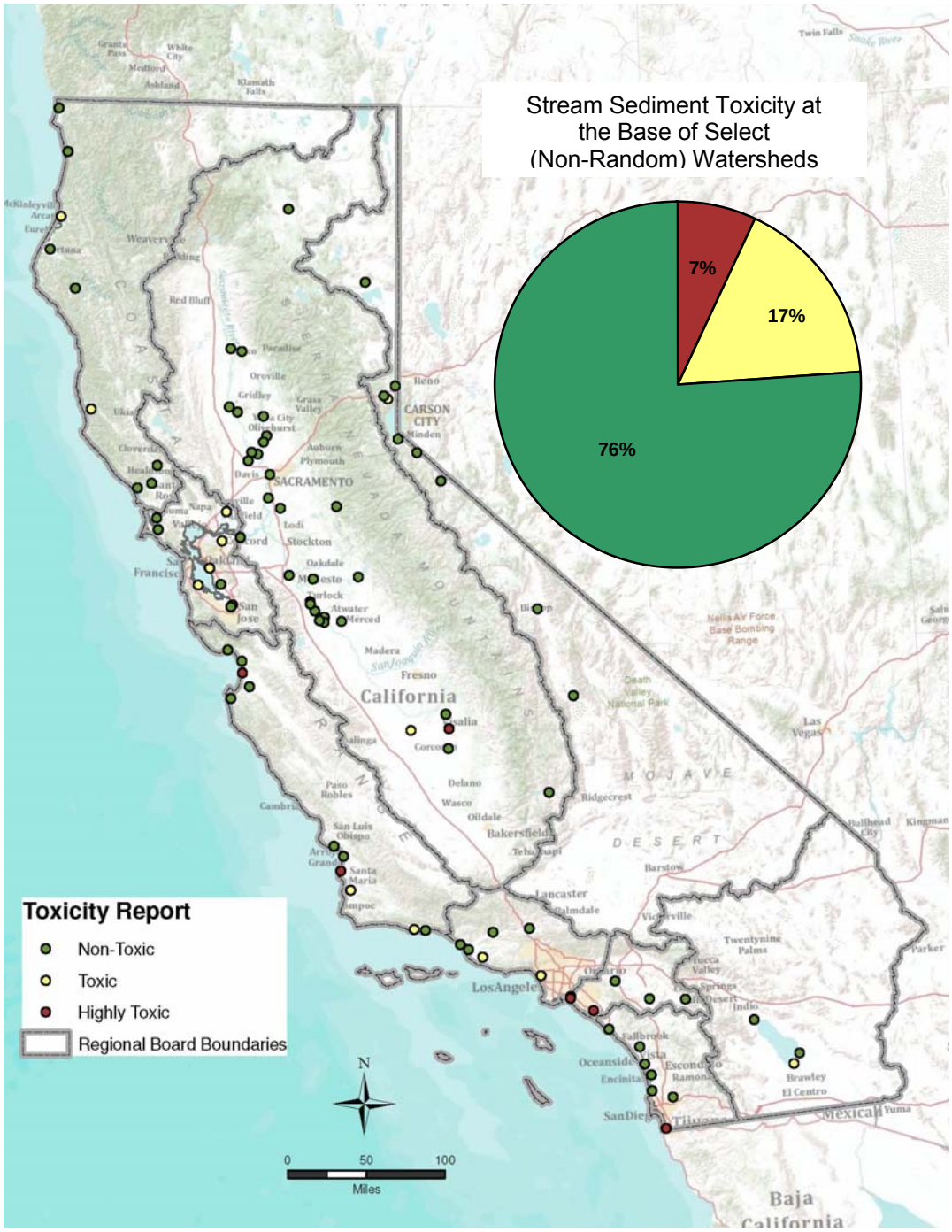

Figure 1. Observed Toxicity in Stream Sediment.

The pie chart represents the percent of stream sediment, from the bottom of selected watersheds, that were non-toxic (green), toxic (yellow) and highly toxic (red) condition, not the overall condition Statewide. Black lines correspond to Regional Water Board boundaries. Ninety-two (92) sites were sampled.

WHAT IS THE MEASURE SHOWING?

This measure shows the magnitude of toxicity in sediment in California streams (Figure 1). There is strong evidence that pyrethroid pesticides are linked to sediment toxicity in streams and that the concentration of these pesticides corresponds to the degree of specific land use in the surrounding landscape. Data show that overall, at the local scale (Figure 2), urban land cover exhibits higher stream sediment pollutant levels than do samples taken at the watershed scale (Figure 3). It is important to note that while these results were collected from across the state, they do not represent an integrated statewide picture. At local and regional scales, stream pollution has been associated with agricultural use and other types of land cover activities.

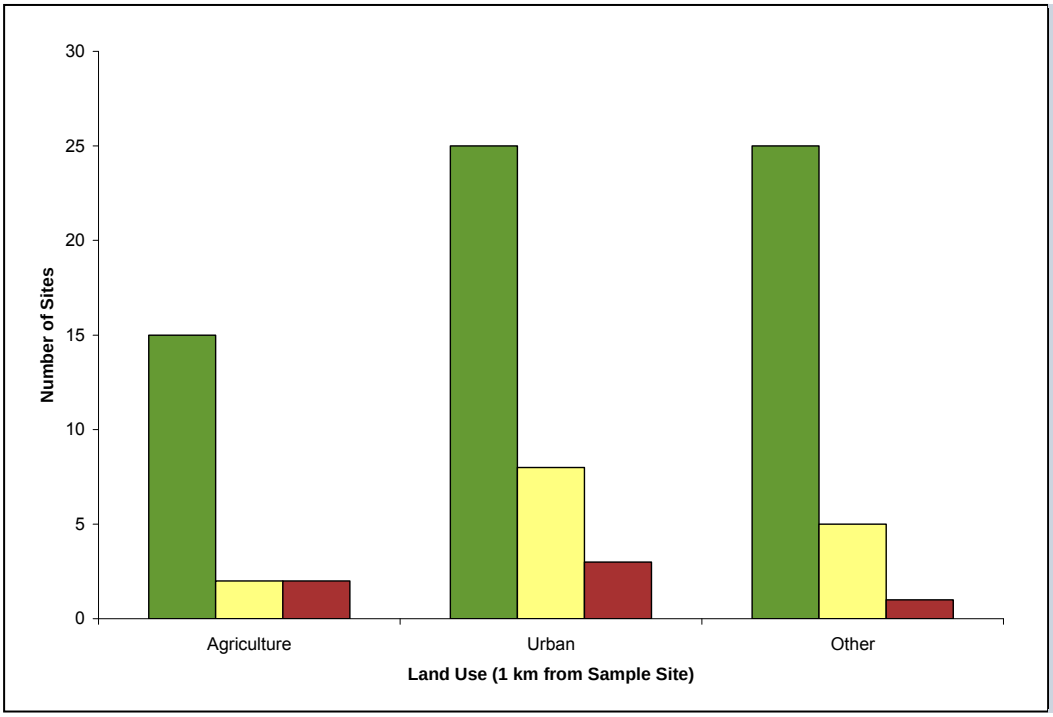

Figure 2. Sediment Toxicity Associated with Land Use Category at the Local Scale. The colors indicate: green = non-toxic, yellow = significantly toxic, red = highly toxic. Sites were categorized as "Urban" if the watershed upstream had greater than 10% urban land cover. Sites where the upstream watershed had greater than 25% agricultural land cover were categorized as "Agriculture." Sites that did not exceed the thresholds for the urban and agriculture categories were categorized as "Other."

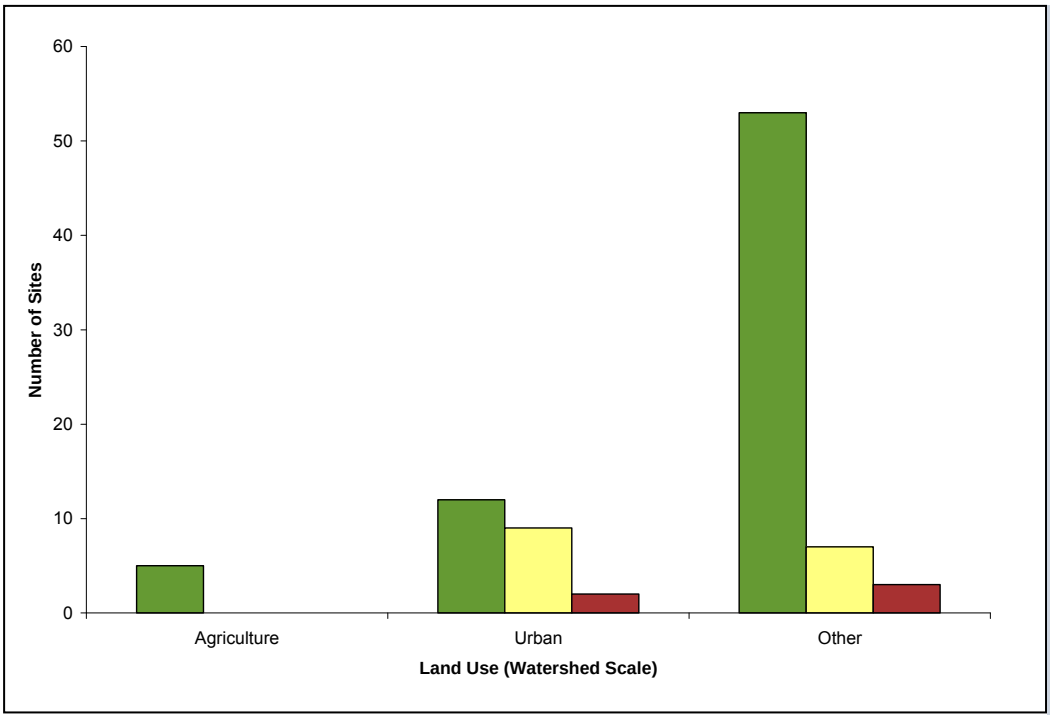

Figure 3. Sediment Toxicity Associated with Land Use Category at the Watershed Scale. The colors indicate: green = non-toxic, yellow = significantly toxic, red = highly toxic. Sites were categorized as "Urban" if the watershed upstream had greater than 10% urban land cover. Sites where the upstream watershed had greater than 25% agricultural land cover were categorized as "Agriculture." Sites that did not exceed the thresholds for the urban and agriculture categories were categorized as "Other."

WHY IS THIS MEASURE IMPORTANT?

As certain pollutants flow downstream, they become associated with fine sediment particles that accumulate where slower flows allow sediments to sink to the bottom of the stream. Pollutants may persist for months or longer in these depositional areas, leaving pollution "signatures" related to activities in the upstream watershed. These pollutants have been shown to be toxic to aquatic life. Measurements taken in these areas are important for three primary reasons. These measurements provide information about aquatic toxicity in a large number of California streams; identify the types of land uses most related to stream toxicity; and determine changes in pollution levels over time. This is important for determining how land use changes or water quality management activities affect stream condition.

WHAT FACTORS INFLUENCE THE MEASURE?

Samples are collected once a year at the base of 92 large watersheds. This survey is designed to make the best use of this limited coverage by including the following components in program design: (1) Pollutants and toxicity are measured in depositional sediment, where pollutant concentrations are relatively stable over many months; (2) Sediments are collected when streams return to normal flow levels after the rainy season so that samples capture pollutants mobilized by high flows, but also characterize typical sediment conditions: (3) Collection sites are located where sediment settles out near the bottom of large watersheds, thus allowing a general characterization of pollution from throughout a large area; and (4) Chemical and toxicological analyses were conducted so that both the concentrations and biological effects of pollutants could be assessed.

TECHNICAL CONSIDERATIONS:

- Data source: The California Surface Water Ambient Monitoring Program (SWAMP) Stream Pollution Trends (SPoT) program.
- Sediment toxicity was measured using the standardized 10-day test with the amphipod crustacean *Hyalella azteca*. Amphipods of the genus *Hyalella* are ecologically important residents of natural benthic communities in streams throughout California, and are relatively sensitive to many pollutants.

GLOSSARY

Amphipods
Small, shrimp-like crustaceans.

Benthic
Pertaining to the bottom (bed) of a water body. Benthic organisms dwell on or in the sediment at the bottom of a water body.

Ephemeral
Flowing during only part of the year.

Sediment
Mineral particles and associated organic matter that are either suspended in water or deposited on the streambed.

Stream
A flowing body of water of any size, ranging from ephemeral creeks in relatively small dry watersheds to large rivers such as the Klamath or Sacramento.

Toxicity
A statistically significant increase in the number of aquatic test organisms (in this case amphipods) exhibiting a measured physiological impact (in this case mortality) in field-collected samples tested under highly controlled laboratory conditions.

Watershed
Land area over which all water flows downhill to a particular water body.

(Updated 9/14/2011)