

Assessing the Biological Condition of Intermittent and Ephemeral Streams in the San Diego Region

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This past year, the San Diego Regional Water Board conducted a study to develop biological indicators of stream condition for use in the dry phase of intermittent rivers and ephemeral streams. Ephemeral streams are a large component of watersheds throughout the State, yet they are often excluded from monitoring or management programs because of a lack of tools to assess their condition. They provide important habitat for aquatic and terrestrial wildlife, process nutrients, transport sediment, and provide an array of other services. Maintaining the health of ephemeral streams can sustain beneficial uses in downstream rivers and estuaries.

In partnership with the Southern California Coastal Water Research Project and California State University at Monterey Bay, the Regional Water Board developed protocols to sample several potential indicators of condition (specifically, terrestrial or riparian arthropods, and mosses, Figure. 1). These indicators were selected after a review of scientific literature, and an evaluation of assessment programs in Australia and Europe.

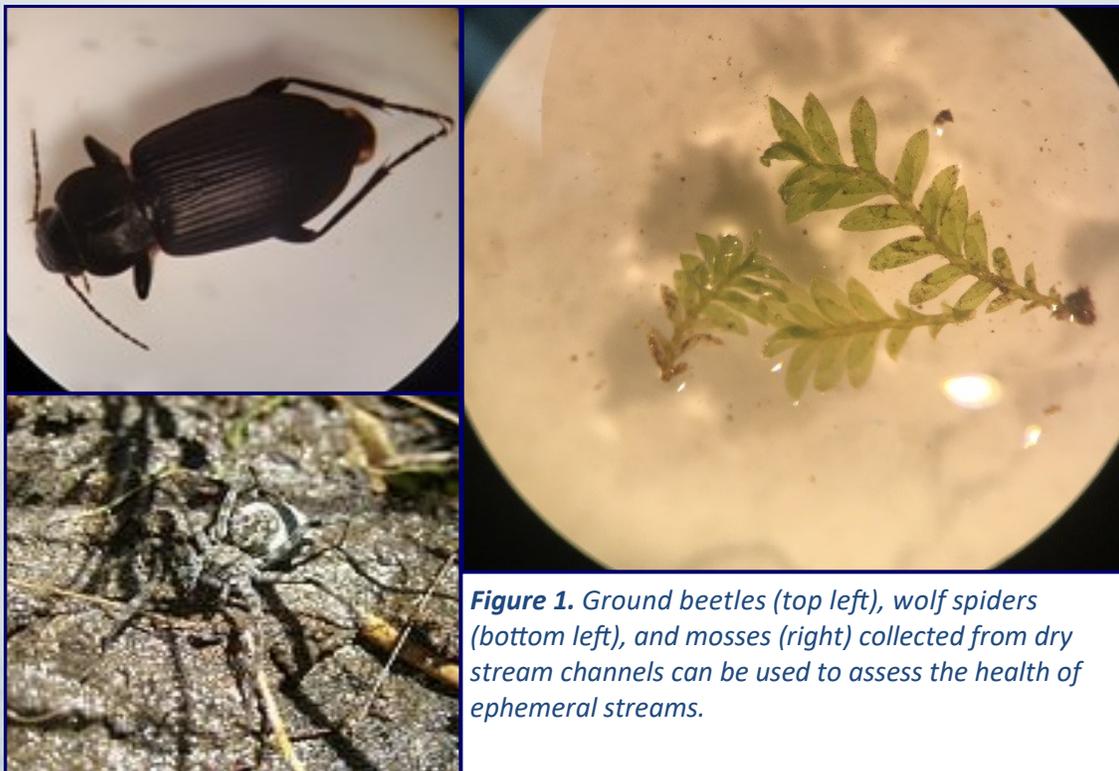


Figure 1. Ground beetles (top left), wolf spiders (bottom left), and mosses (right) collected from dry stream channels can be used to assess the health of ephemeral streams.

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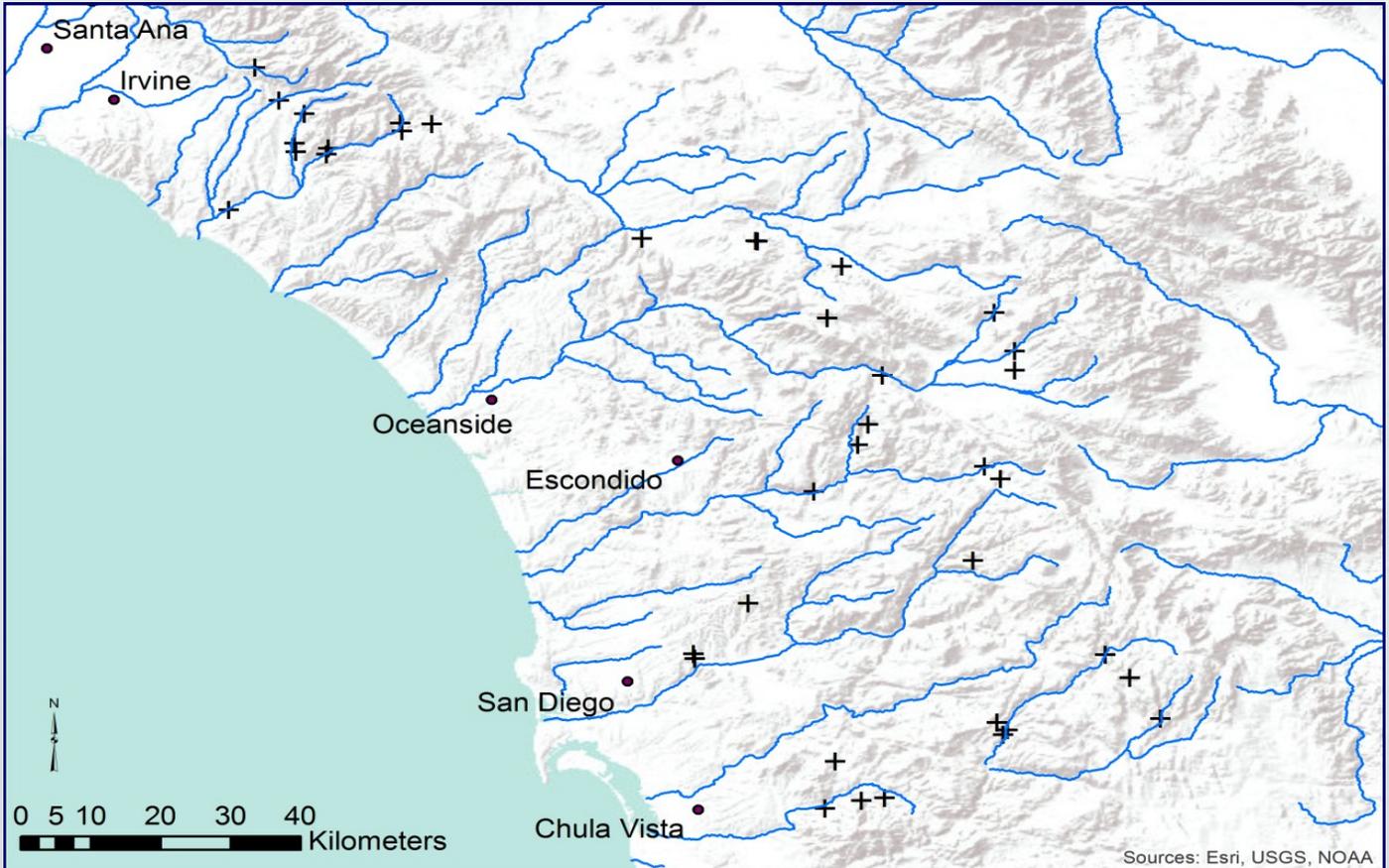


Figure 2. Map of 39 sites (black crosses) sampled in July-August 2016 in southern California.

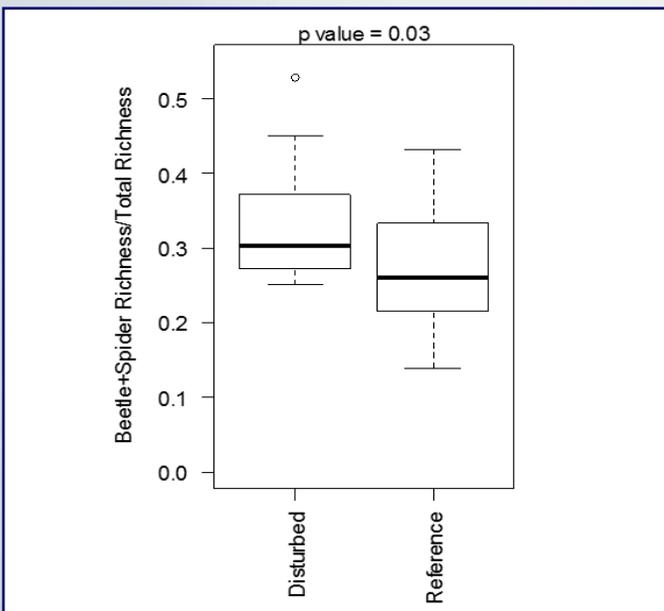


Figure 3. Beetle and Spider Richness at reference and stressed sites.

In 2016, sampling protocols were implemented at 39 sites representing a variety of environmental settings and disturbance gradients in the San Diego region (Figure 2). Reference sites included highly episodic streams that flow only after large storms every few years, as well as sites that flow for months nearly every year. Disturbed sites were impacted by urban runoff, grazing, and recreation.

Following taxonomic analysis, a suite of metrics characterizing community structure were calculated. Several metrics were able to discriminate between reference and stressed sites (Figure 3). For example, beetles and spiders (two groups of arthropods dominated by ambush and foraging predators) comprised a higher proportion of the total taxa found at disturbed sites than at reference sites, potentially indicating a change in trophic structures at disturbed sites.

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Many metrics were influenced by natural factors, suggesting that a predictive, site-specific approach (similar to that of the California Stream Condition Index [CSCI]) may be appropriate for assessing these biological indicators. For example, sites with high soil organic matter often had greater fly richness than sites where organic content was low (Figure 4).

This pilot project demonstrates the feasibility of assessing the biological condition of intermittent and ephemeral streams during the dry phase. Additional data from both reference and stressed sites will be needed to calibrate an index for use in Water Board programs or routine monitoring. The San Diego Regional Water Board has funded an additional year of sampling to characterize inter-annual variability. In addition, the U.S. EPA has funded a study to evaluate these indicators in California and Arizona. We anticipate building an index after additional data have been collected.

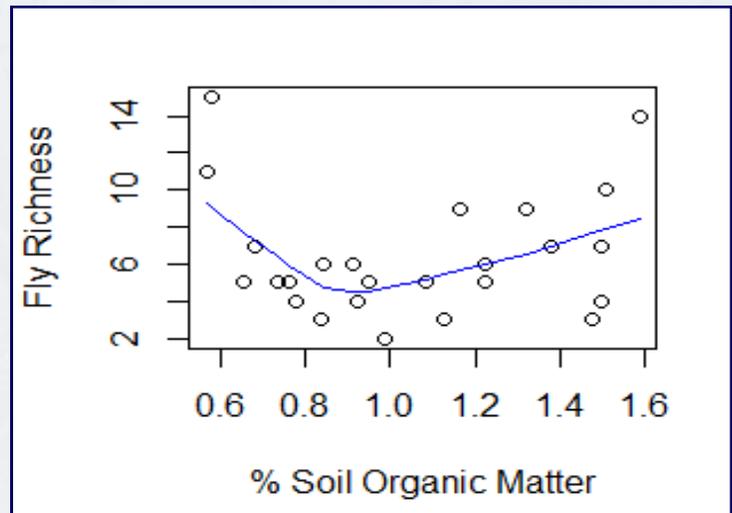


Figure 4. Fly richness, in relation to percent soil organic matter.