

Flow-Proportioned Sampling Design for Pesticides in the **PAJARO AND SALINAS RIVERS**

Many of the pesticides currently and historically used in the Pajaro and Salinas River valleys have water quality objectives established by the State of California and US Environmental Protection Agency (EPA) for the protection of ecosystem integrity and other beneficial uses.

In addition to legacy and current uses in agriculture, many of these pesticides are found in everyday household products such as insecticides (e.g., bug sprays) for pest control in and around homes and in topical applications on pets for flea control.

Study Summary

Sixteen sampling events, eight during the wet season and eight during the dry season, occurred from 2019 to 2023 in the Pajaro and Salinas Rivers. Flow-

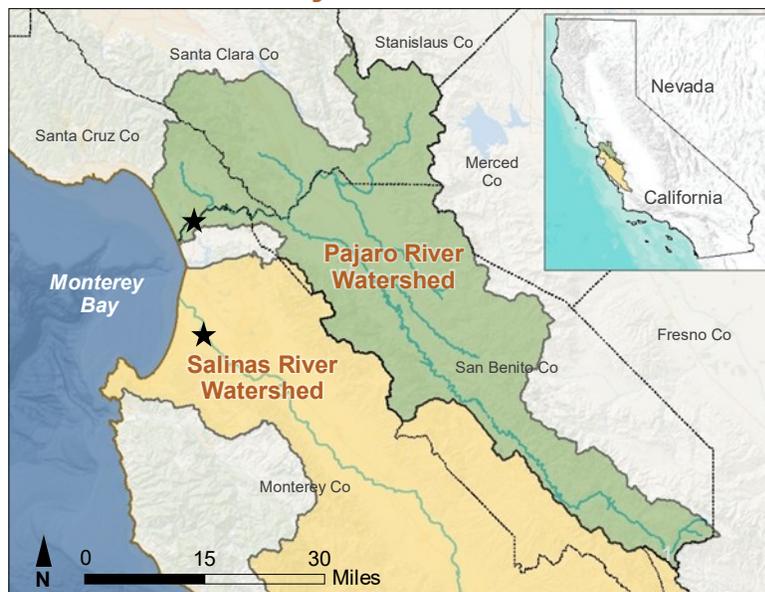


Sea otters in Monterey Bay

proportioned samples (see page 2) were obtained for current-use pesticides (e.g., neonicotinoids, pyrethroids, fipronils, phenolics, organophosphate pesticides, and carbamates) and legacy pesticides (i.e., organochlorine pesticides), many of which have been outlawed for decades. Each flow-proportioned sampling event occurred within a 30-day period depending on constituent holding time.

Resulting pesticide measurements from both rivers were then compared against US EPA toxicity criteria. Study descriptions and results may be found in the fact sheets *Flow-Proportioned Sampling Results for Pesticides in the Pajaro River 2019-2023* and *Flow-Proportioned Sampling Results for Pesticides in the Salinas River 2019-2023*.

Study Watersheds



★ location of sampling stations

● LEGACY PESTICIDES

These organochlorine compounds, such as dichlorodiphenyltrichloroethane (DDT), dieldrin, and toxaphene, were common agricultural and residential pesticides until many were banned in the late 1900s. Many have chemical properties that cause them to attach to soil particles and be absorbed in fatty tissues when consumed in prey. They can have harmful effects on the environment as they are persistent chemicals that accumulate over time in higher concentrations farther up the food chain (i.e., biomagnification: *the increased concentrations of pesticides in organisms feeding at higher levels of the food chain*).

● CURRENT-USE PESTICIDES

These compounds were designed as more degradable and less toxic alternatives to previously used organochlorine pesticides. Still, they can enter groundwater or surface waters through secondary processes after application, such as ground permeation, aerial drift, and soil erosion.

Grab Sampling vs. Flow-Proportioned Sampling

Grab samples consist of single, discrete specimens that provide an instantaneous view of the existing conditions at the moment of collection. Flow-proportioned samples are composites taken over time in proportion to the stream flow during their collection. The sampling device varies the volume of sample collected in proportion to the volume of water passing the sample intake port in the stream at specific time intervals, or by volume. At each river site (right), sampling devices are located in areas where the flow is known and quantifiable.

Moreover, use of in situ, solid-phase extraction media allows sampling of many liters of water over periods of days or weeks. More accurate estimations of loads are achieved when flow-proportioned sampling takes place over multiple days because flows increase over days and weeks following large rainfall events. This difference in estimated daily loads between grabs and flow-proportioned samples becomes even greater over time if concentration varies with flow.

Use of flow-proportioned sampling ensures that periods with higher stream flows are accurately represented in load estimates and protects against under-estimation of loads in cases when contaminant concentration changes with flow volume.



Sampling stations on the Pajaro River (above) and Salinas River (below)

The Benefit of Estimating Loads

The effects of contaminant discharges on rivers and the ocean are directly related to total mass of the contaminant (loads) discharged to the receiving water. Contaminant loads are measured by multiplying the concentration of a contaminant by the volume of flow at the time of sample collection.

Water bodies that are declared to be impaired due to high contaminant concentrations can only be restored to healthy conditions by reducing the loads of contaminants they receive. For example, impairments to Monterey Bay caused by continuing DDT loads can be reduced through the implementation of best management practices to capture contaminated runoff and prevent soil erosion and subsequent sedimentation.



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Photos: (1) [Robert Shea](#); Others: CCAMP