

# MULTI-DISCIPLINARY APPROACH TO TRACE CONTAMINATION OF STREAMS AND BEACHES



Concentrations of fecal-indicator bacteria in urban streams and ocean beaches in and around Santa Barbara occasionally can exceed public-health standards for recreation. The U.S. Geological Survey (USGS), working with the City of Santa Barbara, has used multi-disciplinary science to trace the sources of the bacteria. This research is helping local agencies take steps to improve recreational water quality.

The USGS used an approach that combined traditional hydrologic and microbiological data, with state-of-the-art genetic, molecular, and chemical tracer analysis. This research integrated physical data on streamflow, ground water, and near-shore oceanography, and made extensive use of modern geophysical and isotopic techniques. Using those techniques, the USGS was able to evaluate the movement of water and the exchange of ground water with near-shore ocean water.

The USGS has found that most fecal bacteria in the urban streams came from storm-drain discharges, with the highest concentrations occurring during storm flow. During low streamflow, the concentrations varied as much as three-fold, owing to variable contribution of non-point sources such as outdoor water use and urban runoff to streamflow. Fecal indicator bacteria along ocean beaches were from both stream discharge to the ocean and from non-point sources such as bird fecal material that accumulates in kelp and sand at the high-tide line. Low levels of human-specific *Bacteroides*, suggesting fecal material from a human source, were consistently detected on area beaches. One potential source, a local sewer line buried beneath the beach, was found not to be responsible for the fecal bacteria.



*“The USGS is providing us with the data we need to address one of our area’s most significant water-quality issues. We*

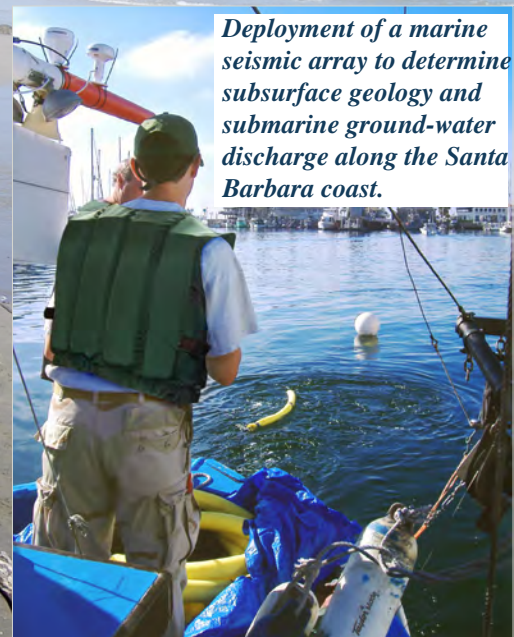
*now have a better understanding of the sources of the contamination so we can devise effective solutions and use our limited financial resources in the best manner.”*

Rebecca Bjork,  
 Water Resources Manager,  
 City of Santa Barbara

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*USGS scientist collecting fecal indicator bacteria accumulated from bird droppings in kelp along the Santa Barbara coast.*



*Deployment of a marine seismic array to determine subsurface geology and submarine ground-water discharge along the Santa Barbara coast.*