In the Watershed

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Understanding water quality in our local creeks: Why is it important?

Creek and ocean water quality are daily news items. Surfers and other recreational users are worried about beach closures, and local municipalities are working hard to carry out mandates of the Clean Water Act of 1970, NPDES (National Pollutant Discharge Elimination System) permits and TMDLs (Total Maximum Daily Loads).

Many contaminants (natural and human related) degrade stream water quality: heavy metals (lead, chromium, mercury); pesticides (insecticides, herbicides, rodenticides), pathogenic bacteria (total coliform, E. coli, enterococcus); endocrine disrupting chemicals (estrogen, testosterone, caffeine); viruses; and nutrients (nitrogen, phosphorous). The potential for pollutants to degrade stream water is related to landuse, chemical application rates, rainfall, plant and microbial activity, and soil properties. Testing creek waters on a monthly basis can provide a general picture of water quality conditions. Here on the South Coast, though, we enjoy a coastal Mediterranean climate characterized by "flashy" streams where most of the annual runoff occurs during, or shortly after, winter rainfall. Since the majority of pollutant transport is associated with storms, it is important to monitor stream water quality during these periods.

Researchers at UC Santa Barbara have embarked on a multi-year project (the Santa Barbara Coastal Ecosystem Long Term Ecological Research Project) to look at the health and well being of our kelp forests, an indicator species of the overall condition of coastal margin ecosystems. Part of the study is focused on understanding the nutrient contribution to near-shore waters from coastal watersheds. We are monitoring over 18 different watersheds from Gaviota to the Santa Clara River to determine the amount and timing of nutrient export to the channel. Excess nutrients can be a pervasive problem in local creeks and coastal marshes, causing nuisance algae blooms that upon decaying reduce dissolved oxygen concentrations and affect species diversity. Chronic high nutrient concentrations can significantly degrade aquatic ecosystems and cause eutrophication.

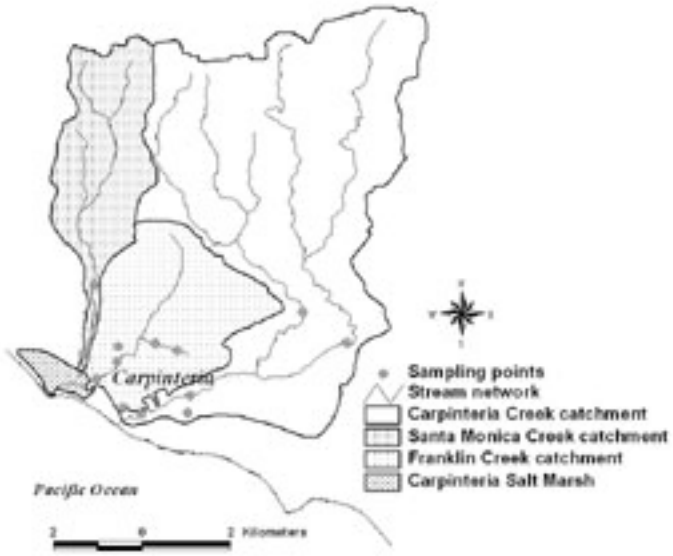
A parallel research project is looking at nutrient runoff from specific land uses in the Carpinteria Valley and developing a model to predict nutrient export at a watershed scale. The six landuse classes being studied include chaparral, avocado orchards, greenhouses, open-field nurseries, residential, and commercial. The sampling sites chosen are along defined drainages or storm drains that collect runoff from relatively homogeneous areas representing each landuse. Collection of water for this project began in 2001 and will continue through 2003. We are analyzing samples for compounds of nitrogen and phosphorous dissolved in water or carried along in particles. Nitrates and phosphates are

common components of fertilizers and fertilizer use is a major contributor to high nutrient concentrations in Carpinteria streams.

Stream water samples are taken every two weeks during the dry season, once a week during the rainy season, and every one to four hours during storms. We mathematically determine flow at all sampling sites from measurements of creek water depth (or stage) with transducers fixed to the bottom of the stream. Staff gauges (a vertical ruler mounted in the stream) have been installed to visually observe stage. Stream and rain water samples are collected by a dedicated bunch of over 15 local volunteers and researchers who work hundreds of hours during wet weather conditions.

Nitrate (NO_3-N) concentrations during low flow varies from less than a milligram per liter (mg/L) in undeveloped catchments to well over 30 mg/L in areas with intensive agricultural practices. During a storm the amount of nitrate entering streams varies from a few grams per acre from undeveloped and residential areas to hundreds of grams per acre from intensive agriculture. Our data indicates that over 10 metric tons of nitrate discharged into the Carpinteria Salt Marsh from Franklin Creek alone during the winter of 2001 (over twice that of Carpinteria Creek and five times that of Santa Monica Creek). Phosphate concentrations have a similar, but much smaller variation from less than 1 to 10 mg/L. Phosphate concentrations are related to the amount of sediment carried by a stream during storm water runoff.

Water quality is fundamental to the health of aquatic ecosystems as well as for the aesthetic beauty and the enjoyment of our surroundings. The first step towards improving water quality along the South Coast is to understand the present state of our local creeks. Hopefully the current research being conducted by UCSB, as well as the ongoing efforts of the County, local governments, Regional Water Quality Control Board and Carpinteria residents and businesses are steps forward in this process.



Sampling points in the three watersheds of the study area in the Carpinteria Valley.

Downloading the transducer at the sampling point at the 8th Street footbridge.

Sampling at the commercial site at 6th Street and Palm Ave.