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Research Brief #2

Land Use and Water Quality on California's Central Coast: Nutrient Levels in Coastal Waterways

An increased focus on addressing nonpoint source (NPS) pollution[1] throughout the U.S. has raised awareness of agriculture's impact on water quality. Growers are being asked to voluntarily limit the effects of their operations on adjacent waterways through programs such those initiated by county Farm Bureaus. If pollution cannot be voluntarily controlled, growers may face mandatory regulatory actions in the future.

Maintaining water quality is an ongoing challenge in the Monterey Bay watershed, where industry, urban development, and farming all affect sensitive waterways. Excess nitrogen and phosphorous, herbicides, insecticides, and sediments that end up in sloughs and wetlands surrounding Monterey Bay have compromised water quality, contaminated shellfish, birds, and other wildlife, and generated unsafe levels of nitrate in drinking water.

Although nutrient contamination is well recognized, to date there have been few efforts to link water quality with land uses such as urban development and farming in the region. To determine the way that land uses affect nitrogen and phosphorous concentrations in central coast waterways, researchers Marc Los Huertos, Lowell Gentry, and Carol Shennan have monitored water flow and sampled water quality in the Pajaro River and in other Pajaro Valley and Elkhorn Slough watershed creeks and agricultural drainages, for the past two water years (October 2000–September 2002). The research takes place through the UC Santa Cruz Center for Agroecology and Sustainable Food Systems (the Center) and is part of a larger U.S. Department of Agriculture grant awarded to Center director Shennan (see box, next page). This water quality monitoring program was developed in cooperation with the Santa Cruz County Farm Bureau, local Resource Conservation Districts, and other groups (see box, page 4).

We are particularly interested in the concentrations of two nutrients, nitrogen (nitrate-N) and phosphorus (ortho-P, also known as soluble reactive phosphorus), that are components of non-point source (NPS) pollution originating from urban and agricultural land uses. What are reasonable concentrations of these nutrients? The drinking water standard for nitrate-N is 10mg/L (ppm). Higher levels are considered a human health risk.

Even at levels well below the drinking water standards, nitrate can adversely affect ecosystem function. Elevated nitrate levels can lead to harmful "blooms" of algae and other plants that eventually starve wildlife of the light and oxygen they need. No numeric drinking water standard has yet been set for ortho-P, but even low concentrations (0.1 ppm) can result in algal blooms, thus compromising ecosystem quality.

Nitrogen and phosphorous fertilizers are used extensively in the watersheds' row crop operations. Our results show that the concentrations of these nutrients increase as waterways pass through agricultural areas—the first clear evidence collected in this region that agricultural activities are an important source of nutrient contamination.

One goal of this research is to inform the agricultural community of current conditions so that they can decide what steps should be taken to reduce agriculture's impact on water quality while continuing to farm profitably. We also work with growers to develop practices designed to decrease nutrient runoff from their farms. In this research brief, we present nitrate and phosphorous concentration data collected during the 2000-01 and 2001-02 water years for Corralitos Creek, the Pajaro River, and Watsonville Slough.

PROCEDURES

We collected water samples twice weekly at 35 sites located throughout the Pajaro River and Elkhorn Slough watersheds. These sites were selected to target major water sources of the Monterey Bay that have important consequences for wetland and near-shore habitat. In addition to biweekly sampling, several lo-