

I M P A C T

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IMPACT is a series of publications highlighting how UC Davis' College of Agricultural and Environmental Sciences makes a difference in the lives of Californians. Through research, teaching and outreach programs, UC Davis research touches almost all aspects of Californian life. Today, millions of people eat safer foods, breathe cleaner air and drink healthier water with the help of our researchers. We're making discovery work -- for California and the world.

IMPROVING WATER QUALITY

THE ISSUE

California's water pollution reveals itself in stream and river damage, reduced fish populations and a lower quality of available water for human use. "Point" pollution from industrial discharge and municipal sewers is relatively easy to control with existing technology and methods. On the other hand, "non-point" pollution -- runoff from urban areas, farm and livestock lands, roads, logging, and abandoned mines -- is the largest source of water pollution in California and the hardest to control.

One pollution control strategy is "Total Maximum Daily Loads" or TMDLs. These describe the amount of a particular pollutant that a water body can absorb on a daily basis while remaining safe for wildlife and people. Under the federal Clean Water Act and state regulations, California will use TMDLs to develop strategies for cleaning up polluted water bodies. At latest count, California has 509 such sites.

WHAT WE'RE DOING

Researchers in the College of Agricultural and Environmental Sciences at UC Davis are developing ways to improve water quality through TMDLs.

Nitrogen from Natural Sources. Research by Randy Dahlgren, professor, Department of Land, Air and Water Resources, indicates that the nitrogen found naturally in rock formations may contribute to high



levels of nitrate in some watersheds, which may adversely affect human health and aquatic ecosystems.

"Given the recent emphasis on developing TMDLs for non-point source nitrate pollution, it is important to consider the potential of natural sources of nitrogen contributing to high background concentrations of nitrate," Dahlgren said.

Sediment Survey. Monitoring water quality is a major issue on California's rangeland watersheds. Landowners now use a "Sediment TMDL Inventory and Monitoring Worksheet" to help address concerns. Kenneth Tate, Cooperative Extension (CE) watershed specialist in the Department of Agronomy and Range Science, and David Lewis, UC farm advisor, developed

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the worksheet, providing a means by which landowners can inventory erosion sites on their property and comply with water quality regulations.

Educating Landowners. Working with USDA researchers and other farm advisors, CE specialist Melvin George helped develop a voluntary “Rangeland Water Quality Short Course” for California’s landowners. Through field trips and classes, participants learn to design a plan to improve ranchland water quality. So far, about one million acres of California rangeland have been put under voluntary water quality plans through these courses.

Rangeland Watersheds. Historic studies of oak woodland and chaparral cleared for grazing highlight hydrology changes and the dangers of erosion. Research also shows that transforming rangelands into vineyards and urban development often increases the risk of pollution runoff and erosion. Other data indicate that appropriate livestock grazing does not significantly increase nutrient and sediment levels in stream water, but that current fecal coliform standards may be exceeded during some storms.

Reducing Fertilizer Use. Reducing fertilizer in sugarbeets can protect water quality, according to research by Steve Kaffka, associate CE specialist in the Department of Agronomy and Range Science, and others. Nutrients from fertilizers can leak into ground and surface waters, impairing water quality. In the rich soils of the Upper Klamath Basin, UC Davis scientists found that sugarbeets can receive little to no fertilization, without affecting sugar yields.

Oak Woodlands. Michael Singer, professor in the Department of Land, Air and Water Resources, and colleagues conducted research on the Sierra foothills pollution or nutrient cycling and water quality in oak woodland watersheds. A 20-year record of water quality shows that annual nutrient and sediment loads leaving the watershed in streams vary based on the time periods involved. The research also shows that oak trees serve as important nutrient “pumps” that concentrate nutrients beneath their canopies. When these oak trees are removed, these nutrients may find their way into surface waters.

Vernal Pools. Researchers are studying processes within vernal pools that appear to cleanse surface water of agricultural contaminants. They also are investigating whether water storage in vernal pools diminishes flood flows and thus contributes significantly to their summertime stream flow. This work will identify the hydrologic conditions needed for sustaining healthy ecosystems in vernal pools, which are among California’s most threatened landscapes.

A SHARED VISION

How TMDLs are developed and enforced is critical to many different stakeholders. While debate continues over the extent of regulatory intervention, it is clear that TMDLs are a force for change in the world of water quality as it relates to non-point pollution. Through research and outreach, UC Davis scientists are helping shape scientific and policy standards vital to everyday life.

That’s impact -- science and policy at work together.

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