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California faces serious groundwater problems

From the massive reservoir and canal systems that capture winter snows to the thousands of wells that tap acquifers beneath valley floors, water underpins the economy of California. Many Californians take for granted the system that delivers, on call, high-quality water to their homes without effort.

But today water quality is becoming an increasing concern, with much of the emphasis on groundwater pollution. Some water experts say water contamination is so serious that it could result in a self-imposed, long-term water shortage in California.

Groundwater is critical to California's well being. Even with its extensive surface water system, the state derives 40 percent of its total water supply from groundwater. Ninety-four percent of the state's rural water supply comes from groundwater. The quality of that groundwater is now at risk. Much of the problem emanates from nonpoint source pollutants from agriculture, forestry, mining, and construction.

A wide variety of nonpoint pollutants is found in California groundwater. Some are naturally occurring trace elements. Selenium, for example, has attracted worldwide attention since its linkage with waterfowl deaths near the Kesterson Reservoir. Others are directly related to man-made systems. Fertilizers and animal wastes appear to be the principal sources of high nitrate concentrations in several regions of California.

Some agricultural chemicals continue to cause serious groundwater pollution problems years after their application. Investigators recently found an increasing number of locations where DDT and related compounds occur in groundwater, even though DDT was banned in 1972. DBCP, a nematicide banned since 1977, was recently detected in more than 2,500 drinking wells in 15 California counties.

Also pervasive is salinity and the often related waterlogging of irrigated cropland. About one-third of California's 12 million acres of crop and pasture land are affected by salts and waterlogging, including large areas of the Imperial and San Joaquin valleys and the densely populated upper Santa Ana River basin.

A great deal of planning and investment undergirds water delivery in California. But until recently, comparatively little planning went into the critical issue of managing the drainage that remains after the water's final use. Now more attention is focusing on problems associated with wastewater disposal.

Water quality problems are not limited to California. Nationwide the problems are so widespread that President Bush has declared improvement of water quality a presidential initiative. Congressional budget negotiators recently tripled the U. S. Department of Agriculture budget for water quality research and extension.

California has been a pioneer in efforts to improve water quality. For years, efforts focused on municipal and industrial pollutants, sources that could usually be addressed by developing sophisticated treatment plants for a few large point sources of pollution.

But progress has been slower on nonpoint contamination, which is much more difficult to manage than point sources. The challenge is compounded by the fact that groundwater is a far less visible, less understood, and more complex system than surface water.

The University of California has carried on an active program of research and education in water problems for nearly a century. Professor Eugene Hilgard investigated alkali soils in the San Joaquin Valley in 1888, at Tulare. That site is near the University's Kearney Agricultural Center, which today continues to conduct research on water problems. Today the University spends more than $2.5 million a year on agricultural water research, from the Berkeley, Davis, and Riverside campuses. In addition, several special programs wrestle with specific problems, among them the Water Resources Center, the UC Salinity / Drainage Task Force, and the Kesterson Cleanup Research Program.

The University's Cooperative Extension and the U. S. Department of Agriculture this year began a program to help growers improve water management. Because agriculture is central to much of the surface and groundwater contamination, this program can be a key to improving water quality. Another UC-USDA project will help rice growers in the Sacramento Valley improve their weed control programs, continuing grower efforts to reduce the use of herbicides that had been killing fish in the Sacramento River.

Long-term improvement of water quality must be approached simultaneously from several directions. Research to expand the technological options to clean up already polluted water is clearly needed. So is research to provide agriculture with alternative production technologies to reduce the use of chemicals and other materials that contribute to nonpoint pollution. Improved water management also is necessary, and here Cooperative Extension has a large role to play.

But more will be needed in the form of public policies to create an economic environment providing incentives to clean up existing pollution and to adopt technologies and management practices that discourage pollution at its source. Some of the needed incentives can be provided through the marketplace as, for example, the pricing of water to reflect its economic scarcity and value. But regulatory policy reflecting the "common good" properties of clean water also will be necessary, whether it is policy premised on the principle that "polluters pay" or policy that prohibits the use of pollutants in the first place.

The threat to groundwater quality in California is real and widespread, although often invisible. It is an issue of potential major economic significance to California agriculture. But many others—urban and industrial—also have a stake. Ultimately, a coalition of these interests must be attained for resolution of the issue. The University of California has an important role to play through expanded programs of research and extension education and in facilitating development of the needed coalition of interests in the state.