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National Water-Quality Assessment Program

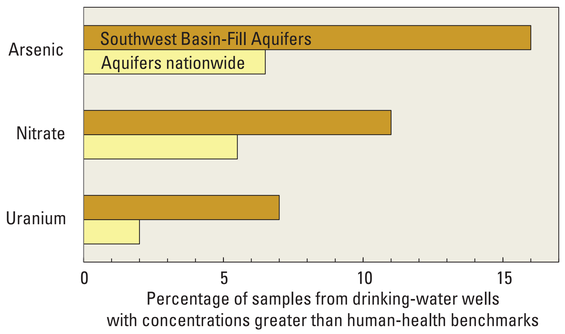
Water Quality of the Southwest Basin-Fill Aquifers

By Susan Thiros

Contaminants in water from one of every three drinking-water wells sampled are a potential human-health concern

Water from about 42 percent of domestic wells and 26 percent of public-supply wells in the Southwest contained at least one contaminant at a concentration that was greater than its human-health benchmark.

Arsenic, uranium, and nitrate exceeded their respective U.S. Environmental Protection Agency Maximum Contaminant Levels (MCLs) more than twice as frequently in samples from Southwest drinking-water wells than in groundwater samples collected nationwide. The widespread detection of contaminants in domestic wells and the lack of regulation underscores the need for public education on where contaminants are likely to occur and testing/treatment options.

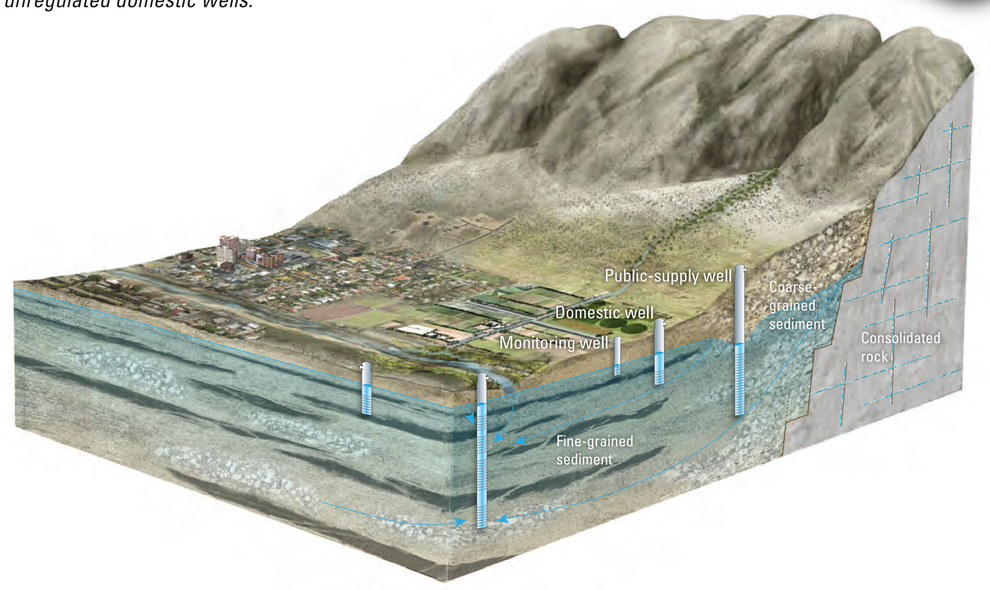


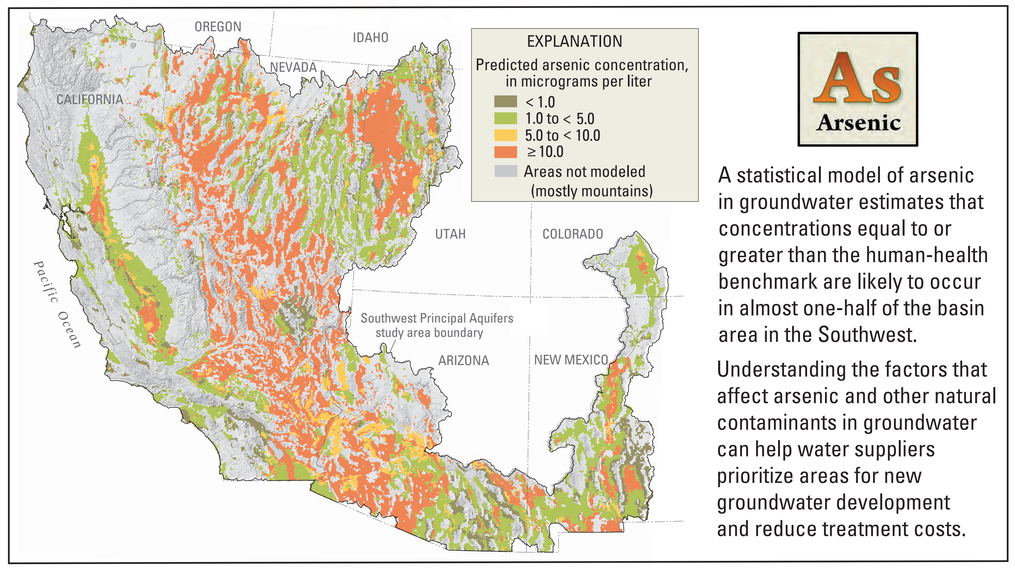
Racetrack Playa, Death Valley, California

Arsenic and uranium derived from natural sources are a potential drinking-water concern

The volcanic and granitic rocks in the Southwest are natural sources of arsenic and uranium in groundwater. Water sampled from 19 percent of public-supply wells and 14 percent of domestic wells in the Southwest exceeded the MCL for arsenic. Exposure to arsenic and uranium contributes to an increased risk of cancer. Overall, contaminants in basin-fill aquifers from natural sources are a greater concern for drinking water than are contaminants from human sources.

The Southwest Principal Aquifers study area encompasses much of California, Nevada, and parts of Utah, Arizona, New Mexico, and Colorado. Over 46.6 million people, 15 percent of the Nation's population, reside in this arid and semiarid area. Demands for irrigation and drinking water have substantially increased groundwater withdrawals and irrigation return flows—these changes have increased the migration of contaminants from natural and human sources to depths used to supply drinking water in many basin-fill aquifers. Groundwater quality and the effects of contaminant movement are of critical importance to the 1.4 million people in mostly rural areas who obtain their water from unregulated domestic wells.





As
Arsenic

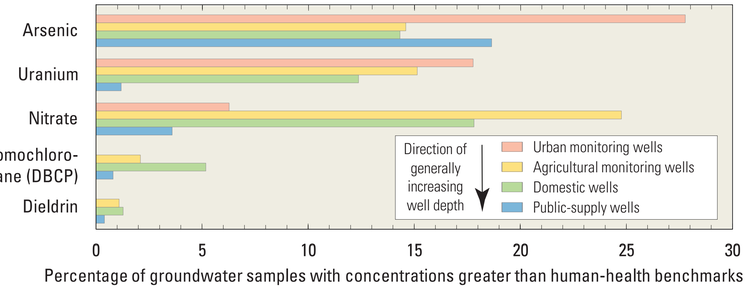
A statistical model of arsenic in groundwater estimates that concentrations equal to or greater than the human-health benchmark are likely to occur in almost one-half of the basin area in the Southwest.

Understanding the factors that affect arsenic and other natural contaminants in groundwater can help water suppliers prioritize areas for new groundwater development and reduce treatment costs.

Artificial recharge and groundwater withdrawals for irrigation and public supply are mobilizing contaminants to basin-fill aquifers

Irrigation well in Central Valley, California

Excess irrigation water and groundwater withdrawals can increase the movement of nitrate from fertilizers and manure, volatile organic compounds and pesticides used in urban and agricultural areas, and dissolved solids to deeper parts of basin-fill aquifers pumped for drinking water. Surprisingly, artificial recharge and groundwater withdrawals are mobilizing naturally-occurring uranium from aquifer sediments—water sampled from one in four domestic wells in the eastern Central Valley, California exceeds the MCL. Nitrate concentrations exceeded its MCL in samples from almost 4 percent of public-supply wells and 18 percent of domestic wells in the Southwest.



Land and water development in combination with natural factors continues to increase dissolved-solids concentrations in groundwater

Concentrations of dissolved solids in deep wells used for public supply are typically low, but substantial increases in concentrations over time in some areas of the Southwest raises questions about the long-term viability of the groundwater resource for drinking water. Dissolved solids, which can impart an unpleasant taste to water, exceeded its secondary MCL in one of every four samples from drinking-water wells (19 percent of public-supply wells and 31 percent of domestic wells).