

High Plains Regional Ground-Water-Quality Assessment: Part I--Update

Kevin F. Dennehy
U.S. Geological Survey
Denver, Colorado

ABSTRACT

In 1998, the U.S. Geological Survey (USGS) began evaluating ground-water quality in the High Plains aquifer. The High Plains aquifer underlies 174,000 square miles across the Great Plains in parts of eight States. The High Plains aquifer is the most abundant source of ground water in any agricultural region of the United States and is threatened by deteriorating water quality. Understanding the geologic, hydrologic, and chemical characteristics of this area is essential to assessing the factors that affect this ground-water resource. About 96 percent of water pumped from the aquifer is used to irrigate crops on about 27 percent of the irrigated land in the United States. The aquifer yields about 30 percent of the Nation's ground water used for irrigation of crops including wheat, corn, sorghum, cotton, and alfalfa. In addition, the aquifer provides drinking water to about 82 percent of the 2.4 million people who live over the aquifer. The High Plains aquifer has been significantly affected by human activities. Ground-water withdrawals from the aquifer exceed recharge in many areas, resulting in substantial declines in ground-water levels. Residents once believed that the aquifer was an unlimited resource of high-quality water, but they now face the prospect that much of the water may be gone in the future. Agricultural chemicals also are affecting ground-water quality. Increasing concentrations of nitrate and salinity can first impair the use of the water for public supply and then affect its suitability for irrigation.

As part of the National Water-Quality Assessment (NAWQA) Program, a series of studies have been completed and are planned for the High Plains to determine the occurrence and distribution of chemical constituents in the aquifer and to develop an understanding of the processes that control water quality. The study is subdivided into three regions and staged in the following order: the central High Plains (48,500 mi²), the southern High Plains (29,000 mi²), and the northern High Plains (96,000 mi²). Studies began in 1999 and are planned for completion in 2004. Water-quality conditions will be documented and compared to major contamination sources at land surface and background conditions. In Texas, a broad-scale assessment of the southern High Plains aquifer was completed in 2001 and this year will be followed by an assessment of recently-recharged ground water associated with irrigated agriculture. In addition, process-oriented studies are planned to

explain the variability in water quality observed in the occurrence and distribution studies. Two examples of process-oriented studies include regional transects and unsaturated-zone studies.

Occurrence and distribution studies and process-oriented studies provide a holistic assessment of water quality in the High Plains aquifer. Results of these studies will (1) enable assessment of the rate and movement of water and chemicals entering the aquifer from the unsaturated zone; (2) determine if specific land-use practices affect recently recharged water; and (3) describe the vertical changes in water quality and age of ground water throughout the saturated thickness of the aquifer. This information will be valuable in assessing the long-term sustainability of the aquifer from a water-quality perspective.