



News Release

February 24, 2009

Larry Putnam

605 394-3212

ldputnam@usgs.gov

Mark T. Anderson

605 394-3220

manders@usgs.gov

Septic Systems Can Affect Ground-Water Quality in Rapid City Area

A recent study by the U.S. Geological Survey shows that water quality in the Rapid City area can be affected by onsite wastewater disposal systems, which generally consist of a septic tank and drainfield. During the study, samples were collected from wells and streams upgradient and downgradient from areas near dense septic systems to characterize water-quality effects and indicators of septic system effluent.

Elevated nitrogen (nitrite plus nitrate) and chloride concentrations were found in ground-water downgradient from septic systems. Because nitrogen in ground water can originate from multiple sources—such as fertilizers, septic systems, and animal wastes—tests were conducted to determine the source of the elevated nitrogen. These tests indicated that septic system effluent was the predominant nitrogen source at most sites.

Nitrogen concentrations in 50 percent of downgradient ground-water samples were higher than 5 milligrams per liter and 18 percent of samples were higher than 10 milligrams per liter. According to USGS Hydrologist Larry Putnam, the highest nitrogen concentrations were in samples from wells completed in a fractured limestone aquifer. The U.S. Environmental Protection Agency indicates that nitrogen concentrations in drinking water greater than 10 milligrams per liter may be injurious when used in feeding infants.

Chloride can be an indicator of wastewater because it typically occurs in low concentrations in natural waters but occurs in higher concentrations in wastewater. In the areas studied, chloride concentrations in ground water were higher in areas downgradient from septic systems than in areas upgradient. In some areas, concentrations of boron (contained in household cleaning products) were elevated downgradient from septic systems.

Microbiological indicators of animal and human waste were found in ground water downgradient from septic systems. In addition, coliphages, which are viruses that infect the bacterium *E. coli* and are indicators of transport of viruses in ground water, were detected in a few ground-water samples indicating that viruses are capable of being transported in Black Hills aquifers.

In surface water, chloride, boron, and microbiological indicators were higher downstream from septic systems than upstream. Surface-water results may give more insight into the effects of residential activities in general, as direct runoff probably contributes a greater proportion of the contaminants than septic system effluents.

The report, "Water-Quality Effects and Characterization of Indicators of Onsite Wastewater Disposal Systems in the East-Central Black Hills Area, South Dakota, 2006-08," was recently released by the U.S. Geological Survey and prepared in cooperation with the West Dakota Water Development District and the South Dakota Department of Environment and Natural Resources. The report is available online at <http://pubs.usgs.gov/sir/2008/5232/>.

Additional information about USGS water-resources studies in South Dakota can be obtained by visiting the USGS South Dakota Water Science Center home page at <http://sd.water.usgs.gov>.

USGS provides science for a changing world. For more information visit www.usgs.gov.

Subscribe to USGS News Releases via our [electronic mailing list](#) or [RSS](#) feed.

www.usgs.gov