IOWA'S WATER

Ambient Monitoring Program

# Iowa's Hidden Water Resource – Groundwater

For many Iowans, not much thought is given to the water coming from the kitchen faucet. Where did this water originate? How old is it? Is it safe to drink? For approximately 79 percent of Iowans, the water in their drinking glass is groundwater. Groundwater occurs beneath the land surface. It occupies open spaces between grains of sand or gravel, and along thin horizontal partings between rock layers or in vertical fracture openings. Groundwater is not as visible a resource as the rivers that thread Iowa's terrain or the lakes that dot the landscape. Nonetheless, it is a water resource that Iowans rely on every day for drinking supplies, agriculture, commerce, industry, power generation and mining. The average Iowan uses nearly 1,100 gallons of water each day.

The geology of an area determines where groundwater occurs, how fast it moves, whether it can be tapped for a water supply, what the natural water quality is, and how vulnerable the groundwater is to surface-derived contaminants. In Iowa, nine water-bearing units (aquifers) supply groundwater (Figure 1). These aquifers range from shallow deposits of sand and gravel along Iowa's major rivers to limestone and sandstone bedrock buried tens to hundreds, even thousands of feet beneath the land surface.

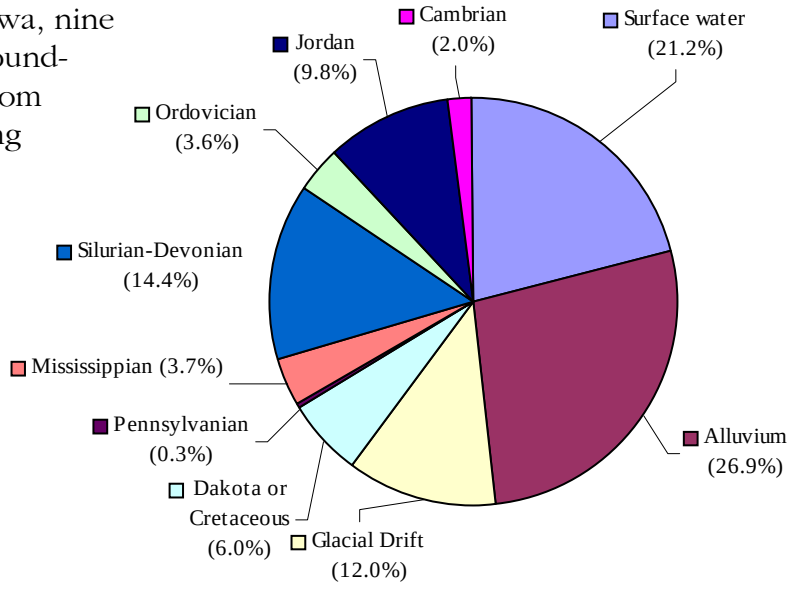


***Figure 1.*** *Drinking water by source. Seventy-nine percent of all Iowans rely on groundwater for their drinking water source, while the remaining 21% use surface water.*

To better understand Iowa's below-ground water resources, groundwater throughout the state is being studied as part of Iowa's Ambient Water Monitoring Program. Information gathered will be used to describe and measure the quality of groundwater. In addition, different aquifers will be characterized, contamination concerns addressed, water quality changes measured and trends identified.

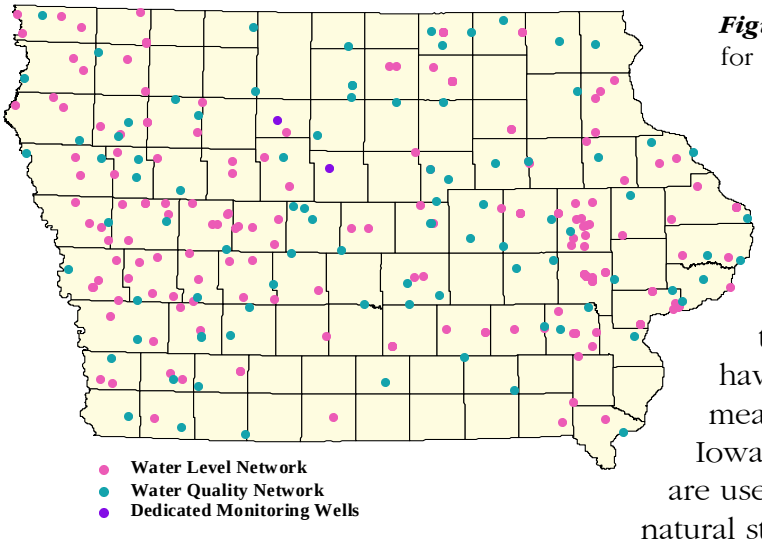


***Figure 2.*** Location of wells being monitored for the groundwater network.

## Groundwater Levels

Since 1982, the Iowa Department of Natural Resources (IDNR) and the U.S. Geological Survey (USGS) have maintained a network of wells to measure groundwater levels across Iowa. Data from this cooperative project are used to document changes in the natural storage of groundwater over time and determine if pumping withdrawal of water exceeds the recharge or replenishment of water through rain and snowmelt to an aquifer. Data are also used to assess the response of hydrologic systems to natural climatic variations and to human-induced stresses. Water levels naturally rise and fall in response to wet and dry periods. The responsiveness of water levels to recharge events can help us understand the water quality of an aquifer.

The current groundwater level network in Iowa consists of 175 wells drilled in the principal deeper bedrock (limestone, sandstone) and shallower (sand and gravel) aquifers that supply groundwater to numerous users throughout the state (Figure 2). An advantage of the groundwater level network is that standing water levels for principal aquifers can be monitored through time.

## Monitoring Groundwater Quality

The IDNR, USGS, and the University of Iowa Hygienic Laboratory (UHL) have conducted the Iowa groundwater quality monitoring program since 1982. This program provides water chemistry data for all the principal aquifers in Iowa and examines the results for possible trends through time or geographic area. The raw or untreated water from these aquifers is sampled from a network of municipals wells across Iowa.

The focus of the groundwater quality network has varied through time, from a periodic, nonspecific sampling of untreated water taken from municipal water wells to a random selection of wells weighted by aquifer vulnerability. In 1992, investigation of water-quality trends became the primary focus of the program. Wells to be sampled were divided into categories based on aquifer type and vulnerability to contaminants originating at the land surface. A total of 90 wells were selected (Figure 2).

In 2001, water from all 90 wells were analyzed for an expanded list of chemicals, including common ions, nutrients, herbicides, metals, volatile organic compounds and radionuclides. For the first time, the age of water from each well was dated using the radioactive element tritium. During the early 1950s, increased levels of tritium were released into the atmosphere from the large-scale testing of nuclear bombs. Any elevated levels of tritium in groundwater indicate the water is "recent" or post-1950 in origin. Groundwater with elevated tritium levels are more susceptible to pollution from surface-derived contaminants. They show that groundwater can move quickly into an aquifer. These 90 wells will continue to be sampled on an annual basis. Beginning in 2002, an additional 50 municipal wells, representing all of the aquifer categories, will be sampled.

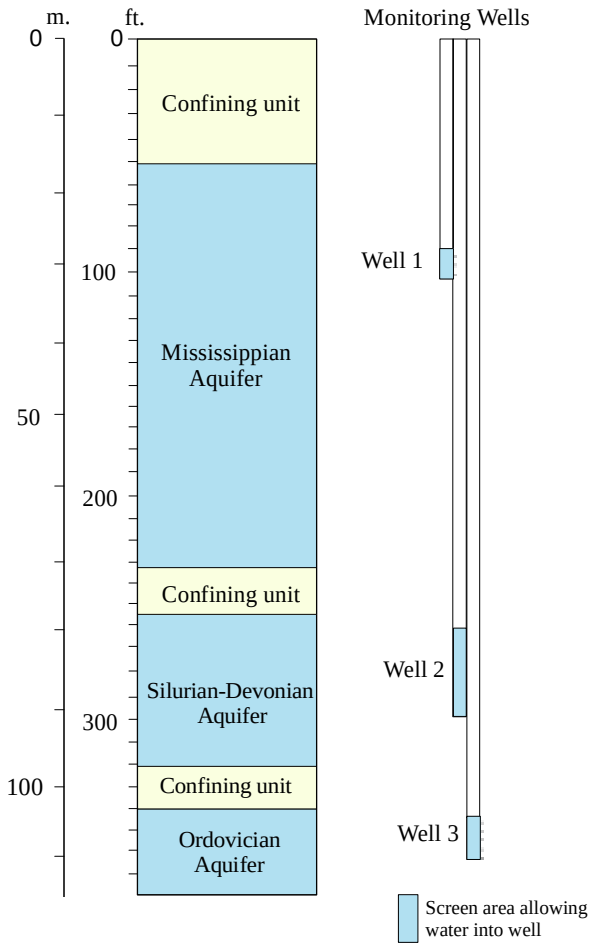


***Figure 3.*** *Diagram of a well nest showing wells tapping groundwater from different aquifers.*

## Examining Specific Aquifers

Monitoring wells dedicated to specific aquifers will be developed throughout the state. This will improve our understanding of the distribution of aquifers in Iowa, the natural quality of water from these aquifers, and their vulnerability to human activities. The goal is to develop two to five sites each year with nested wells. A well nest has two or more wells located in close proximity to each other, with each well completed to a different depth (Figure 3). These will be drilled to tap specific aquifers used in the region. Water from each well will be dated, analyzed for its chemical composition and water levels measured.

The advantage of dedicated monitoring wells is that the well construction, including casing depth, is known, and thus the groundwater source is pinpointed. In addition, a rock core collected during drilling can provide detailed stratigraphic information, and allows for the examination of aquifer properties and water quality information from a specific aquifer under non-pumping conditions. It is also possible to determine the volume of water that a well will pump from a given aquifer, and provide valuable historical baseline data for long-term studies of Iowa's aquifers. Information from monitoring wells will enhance our understanding of the distribution and variability in rock units throughout the state, and their potential as future or expanded sources of groundwater for Iowans.

***Figure 4.*** *Groundwater will be relied on for safe drinking water for generations of future Iowans.*

Two well nests were completed in 2001 into the Mississippian Aquifer in north-central Iowa. Sites include Briggs Woods County Park in Hamilton County and Rutland Marsh county wildlife area in Humboldt County.

## Drinking Water in Small Iowa Towns

In 2002, the IDNR, UHL, University of Iowa Center for Health Effects of Environmental Contamination, University of Iowa Environmental Health Sciences Research Center, USGS and the state's county sanitarians will be joining together to assess the quality of drinking water for residents in small towns who rely on private wells. Samples from these wells will be tested to determine the quality of water being consumed and to assess the vulnerability of their wells to nearby contamination sources.

Results from this study will be compared to the Statewide Rural Well-Water Survey (SWRL) that was conducted between 1988 and 1989. As part of SWRL, 686 private wells across Iowa were sampled to determine what proportion of rural Iowa residents are using well water containing these contaminants. While SWRL focused on rural private wells, the study in 2002 will focus on private wells in incorporated areas.

Only through the ongoing monitoring of Iowa's groundwater resources will we be able to ensure adequate, clean drinking water for future generations.

***Acknowledgements***

The DNR would like to acknowledge the staff from the U.S. Geological Survey and the University of Iowa Hygienic Laboratory for their contributions to the groundwater monitoring efforts in Iowa.

***Funding***

Water monitoring activities of the Iowa Department of Natural Resources are funded by Iowa Infrastructure and State General Fund appropriations, as well as grants provided by the U.S. Environmental Protection Agency from Sections 106 and 319 of the Clean Water Act.

Water Monitoring Program Web Site – www.igsb.uiowa.edu/water

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