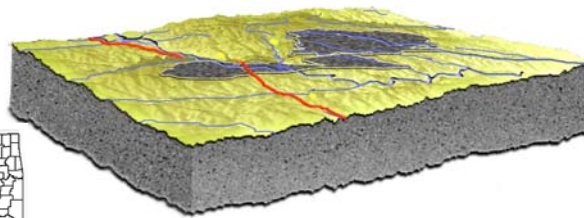


# Arbuckle-Simpson Hydrology Study

## Newsletter



THE OKLAHOMA WATER RESOURCES BOARD

July 2004

## Arbuckle-Simpson Study Update

In addition to continuous U.S. Geological Survey stream gages on Pennington Creek and the Blue River, OWRB staff recently began periodic stream flow and stage height monitoring at sites on the Blue River, Pennington Creek, Mill Creek, Honey Creek, Delaware Creek, and Oil Creek. In January, staff collected base flow measurements on approximately 30 tributaries emanating from the Arbuckle-Simpson aquifer to gather data necessary in calculating the water budget and in modeling groundwater flow. The OWRB has installed groundwater level recorders on 10 existing wells in the Arbuckle-Simpson region, and in May geology students from Oklahoma State University assisted the OWRB by measuring water levels from several water wells in the Hunton Anticline area (the aquifer's eastern region).

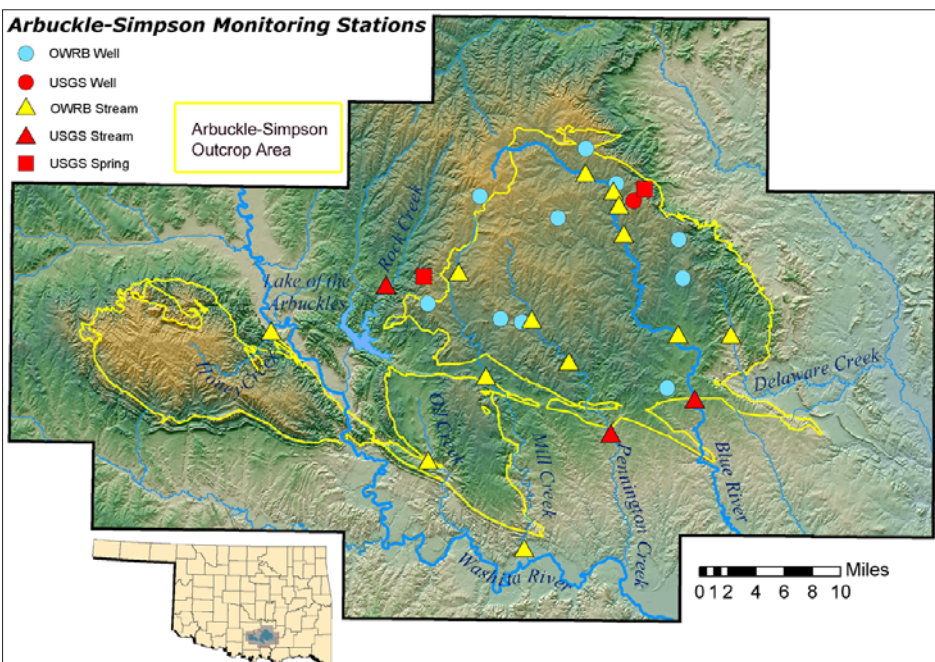
In the coming weeks, the USGS plans to install a stream gage on Honey Creek

downstream of Turner Falls. The agency is also investigating the potential use of geochemistry to gain better understanding of the flow paths of Arbuckle-Simpson waters; an initial sampling plan is in development. Meanwhile, Dr. Todd Halihan (OSU) has conducted field experiments in the aquifer region to determine the potential value of electrical imaging of water wells to gain a more accurate representation of surrounding geology. Dr. Halihan may also conduct model simulations to discern how the heavily fractured rocks affect the flow of groundwater through the aquifer.

The number of participating individuals and agencies continues to grow as the investigation progresses into its second year. In February members of the Technical Peer Review Team met with Dr. Baxter Vieux, Professor of Civil Engineering and Environmental Science at the University of Oklahoma, to discuss



*An OWRB hydrologist measures the initial depth of a well selected for installation of a water level recorder. The well, located south of Connerville in the eastern region of the study area, is one of 10 wells equipped with the automated groundwater level recording device.*



*Surface (stream and spring gage) and groundwater (well) monitoring locations for the Arbuckle-Simpson study. USGS sites provide real-time hydrologic data, available on both the USGS and OWRB Web sites.*

formulation of a rainfall-runoff model for the study focusing on the Blue River. The group discussed the potential for coupling Dr. Vieux's model with a groundwater flow model to better estimate recharge to the aquifer, a critically important aspect of the study. Also under consideration—as proposed by Dr. Aondover Tarhule, Assistant Professor of Hydrology at OU—is the potential use of tree ring analysis in reconstructing stream flow and precipitation records throughout the past 200-300 years. Tree rings, which

*continued on back page*

## Arbuckle Project Funding

The Oklahoma State Legislature, which adjourned sine die in May, appropriated \$500,000 from the state's gross production tax to match \$632,000 allocated by the Bureau of Reclamation to fund study work throughout the next year of the Arbuckle-Simpson project.



indicate past growth rates, hold valuable information about historical climatological conditions.

The Arbuckle project team welcomes a new associate who should prove invaluable to the investigation's long-term progress. Sue Braumiller, a relatively new employee of the National Park Service, is now serving as regional hydrologist and will be working out of the Chickasaw National Recreational Area (CNRA). In addition to her value as a federal representative of the study, Braumiller brings extensive experience in groundwater modeling and fractured aquifers to the project. On a related note, Drs. Dan and Allegra Scheirer, with the USGS in Menlo Park, California, are currently conducting a geophysical investigation of the park area for CNRA.



*Kelly Self, OWRB environmental specialist, obtains streamwater flow and river stage measurements at Delaware Creek. Weekly discharge measurements are conducted by Board staff at 13 sites throughout the study area.*

Other study-related activities include a review of historical precipitation records and permitted water use reports. OSU is also assisting the Water Board in a literature and data review of the region's hydrology. Dr. Jim Puckette (OSU) is evaluating petroleum-related information in the region to better understand the geologic and hydrologic properties of the aquifer. The OWRB has hired two graduate student researchers, Ivy Graham (OSU) and Brent Wilson (OU), to assist in the study. In particular, Wilson is currently conducting a historical review of flowing artesian wells in the Sulphur area while Graham updates information on springs emanating from the Arbuckle-Simpson aquifer.

Concerning work further into the future, the OWRB and Oklahoma Climatological Survey are investigating the potential addition of a Mesonet weather recording station in the region overlying the aquifer. Also, as funds allow, the OWRB plans to drill some deep wells across the Arbuckle region to gain a more comprehensive understanding of the aquifer's geology and hydrology.

For digital data sets and real-time hydrologic data, visit the USGS Web site at <http://ok.water.usgs.gov/>.

To join the mailing list for this and other materials related to the Arbuckle-Simpson Hydrology Study, call the OWRB at 405-530-8800.

For more information, visit the OWRB's Web site at [www.owrb.state.ok.us](http://www.owrb.state.ok.us).

## OWRB Looking for Artesian Wells Near Sulphur

As part of the ongoing hydrology study, the OWRB is soliciting information from local citizens on flowing artesian wells in the Sulphur area of the Arbuckle-Simpson aquifer. The Water Board is relying upon public assistance in identifying the location of those wells throughout the area, which will allow our hydrologists and geologists to establish historic trends in groundwater flow, availability, and usage. An artesian well is one that has been drilled into a pressurized aquifer, such as the Arbuckle-Simpson, where the underground pressure is great enough for the water to rise inside the well and, in some cases, discharge to the surface without a pump.

The first flowing well drilled in the Sulphur area was the Bridgeman Well, drilled in 1889, but proliferation of flowing wells did not occur until the 1920s and 1930s. According to the U.S. Geological Survey, the total flow from artesian wells in 1987 was only about 10 percent of that reported in 1939. The Vendome Well—one of the most significant landmarks in the Chickasaw National Recreation Area, originally drilled in 1922—once flowed at an estimated 2,500 to 3,500 gallons per minute. Today, however, it yields only about 400 to 500 gallons per minute.

It has become evident that artesian flow in the aquifer has decreased drastically over time, although many artesian wells still exist and are utilized in the Arbuckle region. Because a number of these wells were drilled a generation ago, records have been lost and their locations remain a relative mystery. Once the well sites are located and flows determined, researchers can compare current to historic flow rates, which in turn will provide a better understanding of the dynamics of the aquifer flow system.

Specifically, OWRB researchers are seeking the following information on existing artesian wells:

- location;
- date the well was drilled;
- flow of the well or approximate date that flow ceased; and
- owner contact information.

OWRB staff will frequent the Arbuckle-Simpson area throughout the summer to inventory wells and collect other supporting data for the ongoing hydrologic study of the region's water resources. To contribute information on the location of artesian or other wells, springs, sinkholes, or caves in the Sulphur vicinity, call Brent Wilson or Noel Osborn at 405-530-8800.



*The OWRB's Brent Wilson obtains the global positioning system (GPS) location of the Townsley water well in the City of Sulphur. (Photo courtesy Sulphur Times-Democrat.)*