Neosho Basin High Priority Issue
Management of the Ozark Plateau Aquifer System and the Spring River
January 2009

Issue

Increased understanding and adjustment of management of the Ozark Plateau aquifer system and the Spring River system is needed to ensure a sustainable water supply for southeast Kansas.(1)

Description

The Ozark Plateau is in a four-state region located primarily in southern Missouri and northern Arkansas, including smaller areas in northwest Oklahoma and southeast Kansas (Figure 1). The Ozark Plateau consists of four physiographic regions: the Springfield Plateau, Salem Plateau, Saint Francois Mountains and Boston Mountains. Of these four regions only a small portion of the Springfield Plateau extends into the far southeastern corner of Kansas. Under this corner of Kansas lies a small but important part of the Ozark Plateau aquifer system.(2)

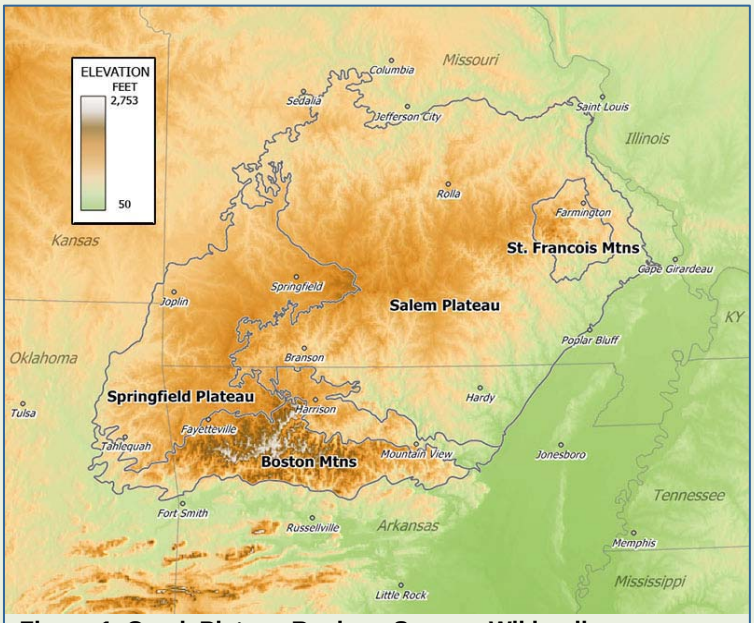

Figure 1. Ozark Plateau Region. Source: Wikipedia

The Neosho River and the Spring River are the two major river systems in Kansas that occur within the boundary of the Ozark Plateau aquifer system. The lower Neosho River flows through Neosho and Labette counties, and briefly flows through the southwest corner of Cherokee County before flowing out of Kansas into Oklahoma. The Spring River enters Kansas on the eastern side of Cherokee County, flows through Cherokee County, and exits the state in the southern part of the county into Oklahoma (Figure 2). Both river systems are monitored by the United States Geological Survey (USGS) and streamflow gages are positioned near Parsons, Kansas on the lower Neosho River, and near Quapaw, Oklahoma and Waco, Missouri on the Spring River (Figure 3).

Water Supply and Quality Concerns

The Ozark Plateau aquifer and Spring River systems serve as important water supply sources in southeastern Kansas, southwestern Missouri and northeastern Oklahoma, an area known as the Tri-State Region. The demand for water in the region is growing rapidly, particularly in southwestern Missouri. Jasper and Newton counties in Missouri, have had strong population growth that has led to an increased water demand. All the high capacity wells in Jasper and Newton counties are drilled into the Ozark aquifer. Some of the well fields have been unable to meet their production goals. As new wells are installed, pumping interference becomes increasingly likely.(4)

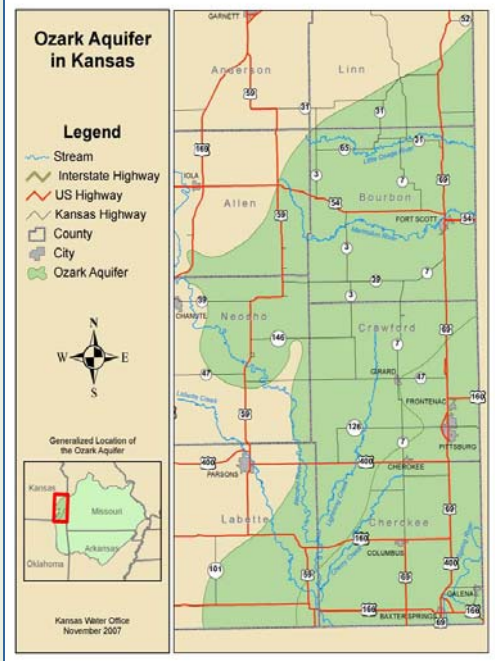

Figure 2. Ozark Aquifer in Kansas

Figure 3. Stream Gages in the Ozark Plateau Aquifer Area

Ground water in the Ozark Plateau aquifer system originates in Missouri and flows into the southeastern corner of Kansas and into Oklahoma. In-

creased withdrawals in Missouri will impact the amount of water moving into Kansas. This portion of southeast Kansas is almost entirely dependent on surface and ground water originating from Missouri. A study commissioned by Missouri American Water Company[7] (2003) projects possible water shortages in as few as 10 years (2013), during drought conditions, given the increasing water demands with the expected continued growth in the region (Figure 4).

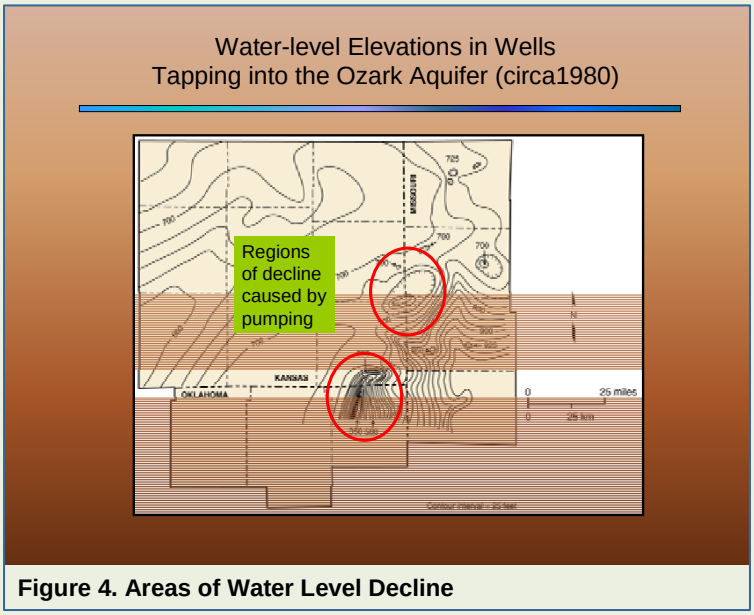

Figure 4. Areas of Water Level Decline

Water quality of the Springfield Plateau aquifer, which overlies the Ozark aquifer in Kansas, is poor and may be unfit for domestic use due to lead and zinc concentrations from extensive lead and ore mining in the area. Mining shafts have allowed contaminated water to move from the surface into the aquifer. The underlying Ozark aquifer contains usable water in southeast Kansas and is the source for most of the ground water supplied to area municipalities and rural water districts. At the bottom of the Ozark aquifer is a brine layer (salt water) that is moving west to east across Kansas. There is concern that significant ground water pumping in some areas could potentially cause upwelling of brines within the aquifer and adversely impact water quality.

The Ozark aquifer was heavily used during lead and zinc mining operations from the late 1880s up into the 1950s. Mining activities are generally inactive at this time but legacy heavy metal contamination in surface and ground water persists. Concerns about water level declines and potential water quality degradation have prompted the need for long-term management actions (Figure 5). In 2003, this issue was identified as a *Kansas Water Plan* basin priority issue by the Neosho River Basin Advisory

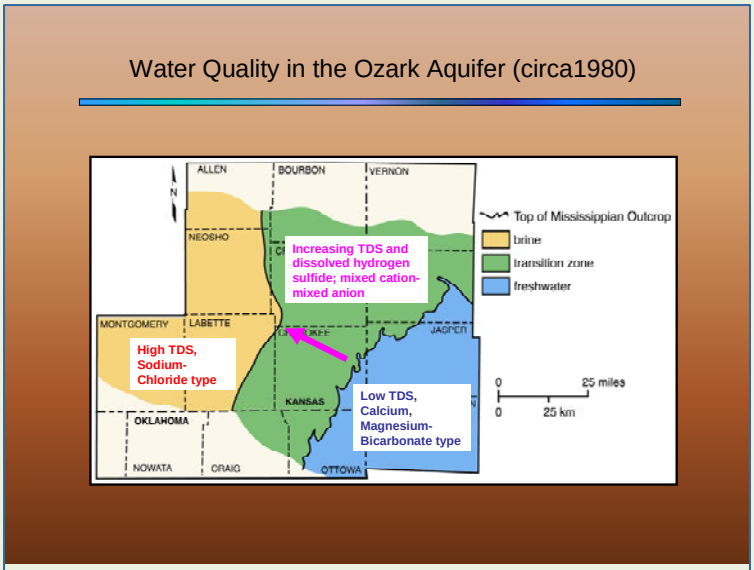

Figure 5. Water Quality in the Ozark Aquifer

Committee (BAC) and the Kansas Water Authority (KWA). Activities to address this issue have been initiated and are described below.

Water Rights Moratorium

Due to uncertainty about the available water supply in the Ozark aquifer, as well as water quality concerns, at the request of the Neosho BAC, in 2004 the Kansas Department of Agriculture's Division of Water Resources (DWR) established a moratorium on new appropriations from the aquifer in Kansas, except for some specified exceptions. K.A.R. 5-3-29 established the moratorium which is still in effect, with a December 31, 2010 deadline for evaluation of permit status. The moratorium exempts domestic wells, appropriation requests for less than five acre-feet under the provision of K.A.R. 5-3-16a, and allows both temporary and term permits from the Ozark Plateau aquifer system. Moratorium term permits may be filed, as long as the permittee can demonstrate availability of an alternate source of water supply. Moratorium permits are allowed through the December 31, 2010 deadline when the DWR will extend, convert, dismiss, or amend the term permits once the ground water model described below is complete.

The DWR has opened a satellite Field Office in Parsons, which is staffed with an environmental scientist under the enhanced water management program. The scientist in Parsons is specifically focused on the Ozark Plateau aquifer system and adjacent moratorium area, and is performing field work and monitoring in this area, as well as addressing water management aspects. An "Ozark Plateau 2007 Field Analysis Summary" has been pre-

pared that provides detailed information on the status and characteristics of the area.[8]

Regional Ground Water Model and Water Quality Assessment Study

To address water supply and quality issues, the state initiated a study supported by the water agencies in the three states that is being conducted by the USGS. Using MODFLOW computer software, a model of the Ozark and Springfield Plateau aquifers is being developed and calibration is almost complete as of April 2008. The model simulates ground water flow within both aquifers and includes interaction between ground and surface water. The model also allows simulation of the effect of withdrawal (diversion) of additional water from the aquifer. The study also will define and assess the current water quality conditions in the Ozark and Springfield Plateau aquifers.

In the spring of 2006, the depth to water was measured in more than 200 wells throughout the three-state region. The Ozark Aquifer Technical Advisory Committee, made up of representatives from the three states' water agencies, the USGS, the City of Monett, Missouri and a representative of local public water suppliers in Kansas, meets quarterly to discuss the study's progress. Annual public meetings that began in the fall of 2006 provide area residents with information about the study. The 3-year study is co-funded by the State of Kansas and the USGS. The ground water model and water-quality study reports are scheduled for publication in March 2009[9].

Well Monitoring Network

In 2004, a ground water well monitoring network was re-established for the Ozark aquifer moratorium area by the DWR. The network consists of 24 wells that are screened within the Springfield Plateau aquifer, the Ozark aquifer, or both aquifers (referred to as the Ozark Plateau aquifer system), and are measured on a quarterly basis (Figure 6). Also, in order to detect the potential eastward movement of salt water, a network consisting of 12 wells has been established from which water quality samples are taken quarterly. Lastly, three continuous monitoring wells have been drilled. Two of the monitoring wells are located in the Ozark aquifer at McCune and Pittsburg and one is located in the Springfield Plateau aquifer, also located at Pittsburg. All three wells have transducers installed and are equipped with satellite telemetry capabilities.

Assessment of Water Quality Changes

The recharge to this aquifer is from the overlying Springfield aquifer, which has numerous mining and industrial contaminants. Declines in the lower aquifer levels, if this is occurring, would induce recharge from the overlying aquifer and the contaminants. In addition, there exists an eastward migrating transition area of brine water, with increasing total dissolved solids, chloride concentrations and hardness, from south central Kansas. One municipal public water supply and a few industrial wells have been abandoned due to taste and odor problems with the brine transition water.

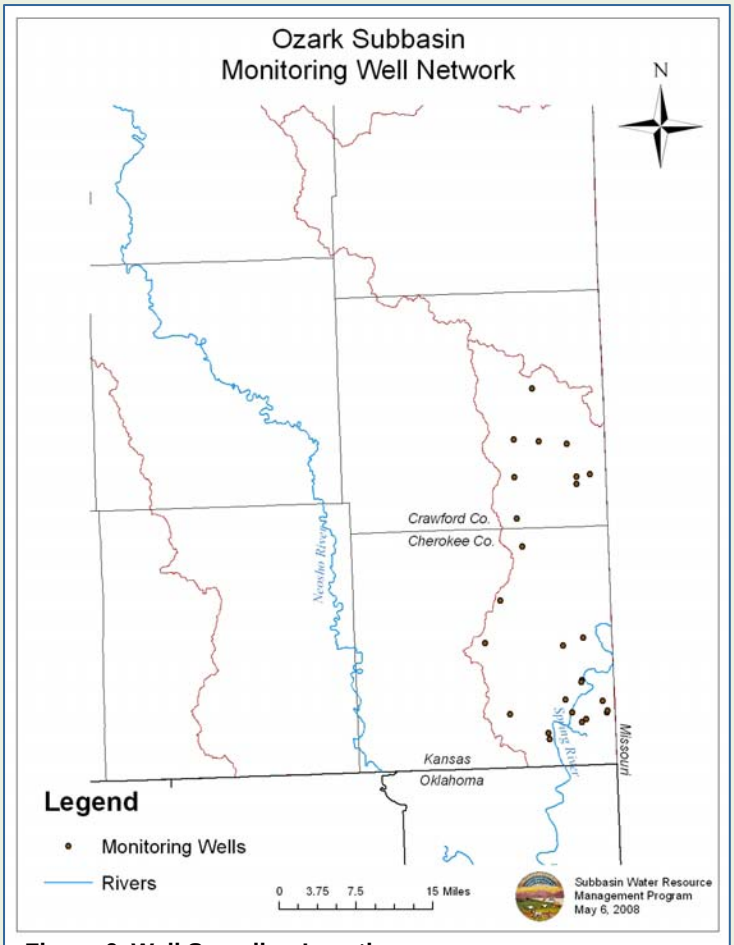

Figure 6. Well Sampling Locations

The Kansas Geological Survey (KGS) is in the second year of a study to assess the influence of pumping over time on the chemical quality of ground water produced by single and multi-aquifer wells within the Ozark aquifer water-quality transition zone in Kansas. This transition zone extends across most of Cherokee County and all of Crawford County; the depth to its top is variable. During the project's first year, monthly water sample collection

for chemical analysis, water-level surveys, and reports of ground water pumpage were used to assess seasonal changes in water quality. The project also compared water quality results from the recent sampling to results from samplings conducted 25 years ago. In its second year the project is focusing on water quality changes during periods of pumping. This report was made available in October 2008.

Tri-State Water Resource Coalition

The Tri-State Water Resource Coalition, a group of municipalities and rural water districts in the region organized in 2003, was formed to determine the region's water needs, better understand available water resources, and make recommendations to provide a long term supply of good quality, affordable water.(6) The Coalition retained Black and Veatch Engineering and the U.S. Army Corps of Engineers (Corps) to evaluate the area's water supply needs to the year 2045 and long-term water supply options to meet that need. The study was completed in the fall of 2006 and cited water supplies from Grand Lake of the Cherokees in Oklahoma, Table Rock Lake in Arkansas, or the construction of a new reservoir in southeast Missouri as the best alternatives. The Coalition has raised $140,000 to match a grant of $50,000 from the Missouri Department of Natural Resources to conduct a study to determine sites that are suitable for a new reservoir and the costs associated with construction. Tri-State Water Resource Coalition members from Kansas include: Baxter Springs, Cherokee Rural Water District No. 3, the City of Pittsburg and the Kansas Rural Water Association. The DWR employee in Parsons is a member of this group.

Figure 7. Spring River near Galena. Photo courtesy G. Manders

Multi-Basin Regional Watershed Council

This recently formed group is involving stakeholders from Arkansas, Oklahoma, Kansas and Missouri to address regional water concerns. Included are concerns about drinking water, wastewater, and water quality/watershed issues. While the recent focus has been on water quality/watershed issues, the Ozark aquifer is part of the overall discussion.

4-All Collaborative

This group also has representation from all four states draining into Grand Lake of the Cherokees. Their recent emphasis has been on education and coordination of the various groups in the four states that are involved in watershed planning. They have sponsored two Environmental Conferences and a third is in the planning phase.

Grand Lake of the Cherokees Alliance Foundation (GLCAF)

The GLCAF is developing a Grand Lake Watershed Management Plan (Plan) with technical and planning assistance from the Oklahoma Conservation Commission. Development of the Plan involves a four state stakeholder-driven approach to watershed management. Once the Plan is developed the GLCAF will solicit private funding to implement recommendations in the plan with an emphasis on installation of targeted Best Management Practices. To date, the watershed has been characterized in all four states, common impairments, pollution sources and causes have been identified, priority impairments and desired reductions have been targeted, and basin-wide management strategies are under development. The Plan recognizes that sub-basin Watershed Restoration and Protection Strategy (WRAPS) plans in Kansas are also under development and seeks to support them through inclusion in the Grand Lake Watershed Management Plan. Once private funding is available from the GLCAF, it is anticipated that some of it will directed to implement Kansas Neosho basin WRAPS plans for priority projects in priority areas.

Spring River Watershed Restoration and Protection Strategy (WRAPS)

The Spring River (Figure 7) is the second largest unallocated water supply in the state. Although most of the

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Ozark aquifer is currently the source of most public water supply in the area, the Spring River is another potential supply. Construction of a dam in southwest Missouri on the Spring River could impact the ability of public water suppliers in this area to use the Spring River as a future supply (see Tri-State Coalition discussion above). In addition, legacy heavy metal contamination (Figure 8) is still present in surface waters and Total Maximum Daily Loads have been developed to address this problem. See the Neosho basin Watershed Restoration and Protection Strategy for more information on Spring River water quality.

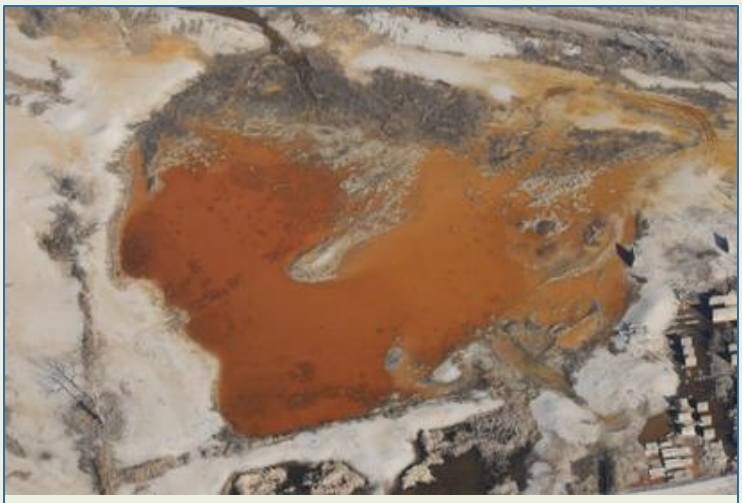

Figure 8. Acid rock drainage colors a body of water reddish-orange near Treece, KS. Source Lawrence Daily Journal World 2008.

Conversations among stakeholders in the Kansas portion of the Spring River began in 2006 and a WRAPS group has been formed to assess the water resource and watershed and formulate goals and objectives to maintain or improve them. Because stream flow is related to ground water levels, this group can serve as an important link for information and education related to the underlying aquifer. Efforts are underway to involve participation from stakeholders in Missouri, Arkansas, and Oklahoma.

Recommended Actions

1. Continue and complete the inter-agency strategy to address the complex water issues of multistate cooperative management, ground water declines and quality, surface water contamination, and public water supply concerns.

2. Use the USGS Regional Ozark Aquifer Study as a management decision support tool to assist DWR in determining the need for continuation or removal of the moratorium on new ground water rights in southeast Kansas, and develop appropriate management strategies.

3. Use the water quality monitoring network established by DWR as a decision support tool.

4. Continue interstate communications concerning the development of new water supplies or the use of existing supplies in adjoining states.

5. Support public water supplier (PWS) efforts to work cooperatively and acquire funding for infrastructure needs for cooperative regional supply systems.

6. Coordinate with Spring River WRAPS and other groups to provide additional information to the public.

Resources

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