

Upper Arkansas River Basin High Priority Issue

Middle Arkansas Subbasin

January 2009

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Issue

Reduction of ground water withdrawals is necessary to stabilize the hydrologic system in the Middle Arkansas subbasin.

Description

The water resources in the Middle Arkansas subbasin, which covers all or parts of Stafford, Edwards, Barton, Pawnee, Kiowa, Rush and Rice counties, have been heavily developed (Figure 1). Irrigation accounts for approximately 82% of the authorized water use, with recreation the next highest user. Most of the recreational use is for Cheyenne Bottoms Wildlife Area. Cheyenne Bottoms has a fairly senior water right in the subbasin, at file number 2427, which authorizes 18,185 acre feet from the Arkansas River and 19,175 acre feet from the Wet Walnut Creek. There are three appropriations up for certification that authorize additional quantities from the Dry Walnut, Blood Creek and Deception Creek. There are 1,836 points of diversion for an authorized 258,147 acre feet of water in the subbasin. Annual reported use is typically about 60% of the authorized amount. The Arkansas River streamflow, as measured at the Kinsley gage, has reduced drastically in recent decades, as shown in the median monthly streamflow from 1945-1973, and 1974-2002. Ground water is withdrawn from both the alluvial aquifer and the Great Bend Prairie aquifer, part of the High Plains [aquifer](#). The ground water table has had significant decreases and at times no longer contributes water to the Arkansas River, resulting in depletion of the stream baseflow. With ground water levels stabilized, during normal or wetter climatic conditions, it could rise to streambed elevation and baseflow be re-established.

Arkansas River streamflow at Kinsley has been around 0.1 cubic feet per second (cfs) for much of 2007-2008, with increases in September 2007 and January 2008 to almost 0.4 cfs. Drops in streamflow to zero, which has occurred as recently as 2006, suggest that the ground water elevation has dropped below the streambed, so that the stream is not in hydraulic contact with the aquifer and baseflow has apparently ended. Long-term streamflow recovery most likely depends on aquifer recovery.

The Kansas Water Appropriation Act⁽⁸⁾ was amended in 1984 to protect waters necessary to preserve and maintain streamflows at or above the minimum desired levels. Although not a water right in itself, the Chief Engineer, Kansas Department of Agriculture-Division of Water Resources (DWR), is to withhold from appropriation that amount of water needed to maintain Minimum Desirable Streamflow (MDS).⁽⁹⁾ MDS established before July 1, 1990 have a priority date of April 12, 1984. The purpose of MDS is to protect flow from depleted conditions as a result of extensive water appropriation.

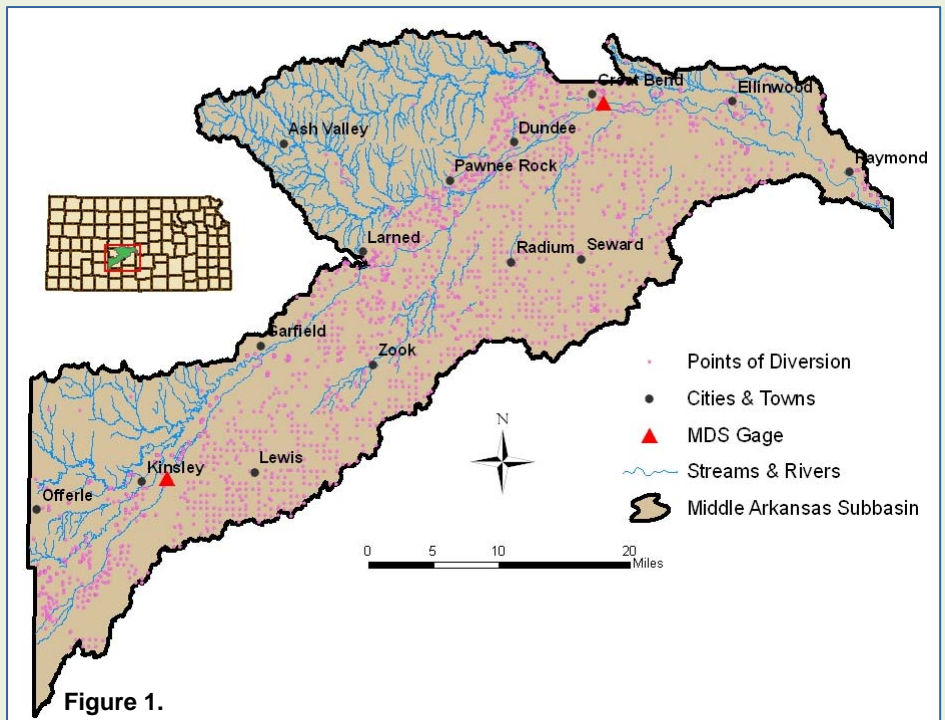


Figure 1.

A MDS is set at the US Geological Survey (USGS) stream gage near Kinsley. The MDS is set at a high of 5 cfs in May and June, to a low of 1 cfs in August through September. Minimum desirable streamflows protect flow for instream uses relative to fish, wildlife, water quality, general aesthetics and downstream domestic and senior water rights.

The DWR has worked with water users and others in the Middle Arkansas subbasin to address the water shortages. This effort began in 1998 to develop a water management plan that identifies strategies to reduce water withdrawals, and works toward a sustainable hydrologic system.⁽⁴⁾ The management plan proposal was approved by the Chief Engineer in 2004.⁽⁵⁾ The goals are to stabilize the ground water levels, return ground water levels to channel elevation and maintain a baseflow in the river under normal climatic conditions. A number of strategies

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are identified, one of which is more efficient irrigation systems. One recommendation is to remove end-guns from center pivot irrigation systems.



Cheyenne Bottoms. Photo courtesy KGS

Kansas State University, under contract for the Kansas Water Office (KWO), evaluated the water use efficiency of end guns in the region to [crop](#) production and farm economy. One tool developed is a computer spreadsheet program for individual site assessments. Users enter general system and field characteristics; the model will provide expected yields, water use efficiency values and costs associated with the use of the end gun in that site's operation.

Circle K Ranch

The Circle K Ranch, located in the Middle Arkansas subbasin, is owned by the Cities of Hays and Russell. The ranch has 8,039 acre feet of water rights appropriated for irrigation. In 2004, it was proposed that the State of Kansas purchase the ranch to be managed by the Kansas Department of Wildlife and Parks, possibly for a wildlife viewing and hunting area. The goal is to reduce water use in this area while minimizing the economic impact to the region.⁽³⁾ The Middle Arkansas Modflow model was used to evaluate the effect of the retirement of these water rights and it was shown there would be a localized benefit. As of 2008, no state purchase of Circle K Ranch has been made and it appears unlikely to occur. In 2007, a significant number of water rights were enrolled into a 10-year Water Right Conservation Program at DWR, to protect the right from abandonment while not used. The associated acres were enrolled into a U.S. Department of Agriculture, Natural Resources Conservation Services (NRCS) program to transition to dryland.

EQIP Quick Response Areas

A number of irrigated acres have been enrolled in the USDA NRCS Environmental Quality Incentive Program (EQIP) as quick response areas to transition to dryland for four years. Many of the associated water rights enrolled in the DWR Water Right Conservation Program for 10 years, which protects water right from abandonment during a period of non-use. NRCS provides payments to transition to dryland use, such as farming, pasture or grass. The EQIP program requires the land remain non-irrigated a minimum of 4 years, but it does not require the water right to be permanently retired. The Groundwater Management Districts' boards make the initial recommendation for the quick response areas, which is then reviewed by the Kansas Technical Committee and determined by the State Conservationist. For areas outside a district, DWR makes recommendations for quick response areas.

Conservation Reserve Enhancement Program (CREP)

On December 20, 2007, the Kansas Farm Service Agency began accepting applications to enroll land in the Conservation Reserve Enhancement Program (CREP).

This voluntary program provides incentives and cost-sharing to participants that enroll their land into eligible conservation practices such as native vegetation establishment or wildlife conservation for a period of 14 to 15 years.⁽⁶⁾ The CREP project area lies within 10 counties along the Arkansas River corridor, covering 1,571,440 acres. In the CREP area, 718,683 acres are authorized for ground water irrigation; approximately another 10,680 acres are authorized for irrigation from surface water. The state seeks to enroll up to 20,000 acres into the program over the next several years. Reducing irrigation demands on the stream-aquifer system will help slow the aquifer declines, mitigate the spread of saline waters into the aquifer, and help restore stream and riparian health throughout the CREP area and within the Middle Arkansas subbasin.

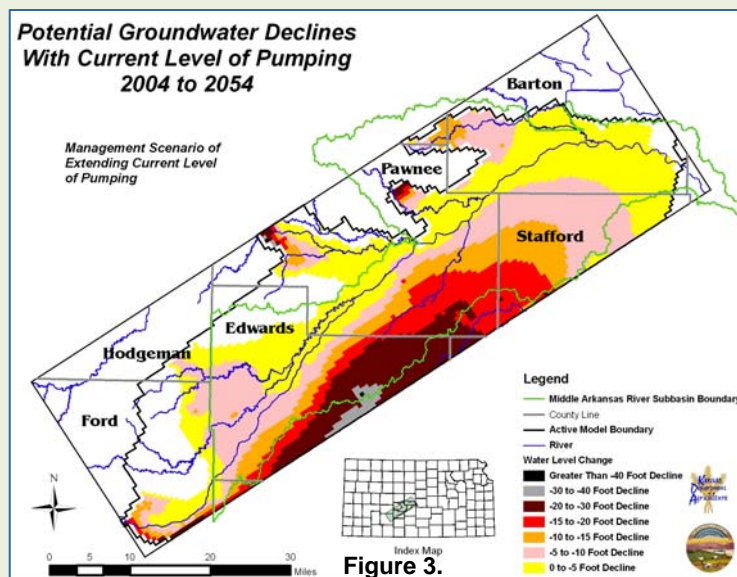
As of December 30, 2008, 8,198 acres had been enrolled in the CREP program. For the acres enrolled into the CREP program, 16,479 acre feet of authorized quantity will be permanently retired from irrigation.

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Ground Water Model

The DWR and the KWO contracted with the Kansas Geological Survey to develop a Modflow water model to provide additional information on the nature of stream-aquifer interactions and the effect of ground water pumping, for use in planning and management of water resources in the Middle Arkansas subbasin.⁽⁷⁾ The computer model extends from northeast Ford County through much of Edwards and Pawnee counties to north-central Stafford and southern Barton counties (Figure 3).



Five different scenarios were simulated with the model: 1) increased streamflow from 1980-2004, 2) continued pumping at current levels; 3) no pumping; 4) 24% reduction of pumping in the proposed area for the CREP, and 5) retirement of water rights in the Circle K Ranch.

Regulatory Options

One recommended action under the current *Middle Arkansas Subbasin Management Plan* is to implement regulatory options to help achieve water conservation.⁽⁵⁾ In 1978, the Kansas Legislature enacted provisions for designation of Intensive Groundwater Use Control Areas (IGUCA) within the Groundwater Management District Act.⁽¹⁰⁾ These statutes allow the Chief Engineer to implement additional corrective control provisions in areas where it is determined, through a public hearing process, that ground water levels are declining excessively, the rate of ground water withdrawal exceeds the rate of ground water recharge, unreasonable deterioration of ground water quality has occurred or may occur,

or other conditions exist warranting additional regulation to protect public interest.

Recommended Actions

1. Coordinate interagency efforts to implement strategies identified in the *Middle Arkansas Subbasin Management Plan*, as approved by the Chief Engineer.
2. Use the hydrologic model to evaluate future management scenarios and strategies that may be needed to achieve the subbasin goals.

Resources

1. Kansas Department of Agriculture-Division of Water Resources. 2003. Analysis conducted by Subbasin Water Resources Management program (personal comm., September 2003).
2. Kansas Water Office, Kansas Department of Agriculture, State Conservation Commission and Kansas Department of Wildlife and Parks. July 2003. *Improved Center Pivot Efficiencies by End Gun Removal, Water Issue Strategic Plan*.
3. Kansas Water Office. August 2003. *Stream Depletion of the Arkansas River due to irrigation pumping on Circle K Ranch*. 19p.
4. Kansas Department of Agriculture-Division of Water Resources. June 2003, *Middle Arkansas River Basin. Draft Management Strategies*. 14p.
5. Kansas Department of Agriculture-Division of Water Resources. January 2004. *Middle Arkansas River Subbasin Management Strategies*. <http://www.ksda.gov/subbasin/content/199>
6. Kansas Water Office. May 2007. *Upper Arkansas River Conservation Reserve Enhancement Program*, Hamilton, Kearny, Finney, Gray Ford, Edwards, Pawnee, Stafford, Barton and Rice Counties, State of Kansas, 130 p.
7. Whittemore, Don, M. Sophocleous, J. Butler Jr., B. Wilson, M. Tsou, X. Zhan, D. Young, M. McGlashan, June 2006. Numerical Model of the Middle Arkansas River Subbasin, KGS Open File Report 2006-25. www.kgs.ku.edu/HighPlains/MidArk_model_report_all_071206.pdf

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8. Kansas Water Appropriation Act, K.S.A. 82a-730.
Citation of Act. <http://www.kslegislature.org/legsrv-statutes/getStatuteInfo.do>
9. Kansas Water Appropriation Act. K.S.A. 82a-703b.
Minimum desirable streamflows. <http://www.kslegislature.org/legsrv-statutes/getStatuteInfo.do>
10. Groundwater Management Districts Act, Intensive Groundwater Use Control Areas. K.S.A. 82a-1036.
Initiation of proceedings for designation of intensive groundwater control areas. <http://www.kslegislature.org/legsrv-statutes/getStatuteInfo.do>