

Lower Arkansas River Basin High Priority Issue

Long Term Public Water Supply

January 2009

Page 1

Issue

Projected sources of water supply are insufficient to meet projected demands in some areas of the [Lower Arkansas River basin](#). Artificially recharging and conserving the existing supplies of the Equus Beds aquifer should be considered to meet future demands for water for Wichita and other users in the area, as well as to prevent degradation of the water quality of the aquifer by saltwater plumes. Another component of extending the future water supplies is ensuring the sustainability of water supply storage in Cheney Reservoir.

Description

Supply and Demand

In 2006, over 700,000 acre feet of water was reported used in the Lower Arkansas basin. [Irrigation](#) accounted for nearly 75% percent of all reported water pumped or diverted. [Municipal](#) use accounted for 15% of water used in the basin, industry for five percent with recreation, stockwater, and other uses combining to equal about 5 percent.⁽⁴⁾ According to projections conducted using Kansas Division of Budget [population](#) data, the population of the basin is projected to grow more than 38% by the year 2040. Projected future water supplies in the basin may not be adequate to meet the projected demands.

In 2007, the Kansas Water Office (KWO) conducted an analysis of the surface water supply and demand projections for selected basins in eastern Kansas. The analysis compared population growth projections and non-municipal water use demand estimations with Federal reservoir yield and natural streamflow estimates. Demand anticipated to occur under severe drought conditions was then projected. In 2004, a supply and demand projection was conducted by the Burns & McDonnell engineering firm for five counties: Harvey, Butler, Sedgwick, Cowley and Sumner.⁽²⁾ According to the Burns & McDonnell's population and demand projections, Sedgwick County would have the largest population increase amongst the five counties. The City of Wichita, the largest water user within the area, was shown to have a projected demand of 112 million gallons per day (MGD) in the year 2050. The Equus Beds Aquifer Storage and Recovery (ASR) project is part of the city's Integrated Local Water Supply Plan to meet these future demands, along with withdrawals from Cheney Lake.

An assessment of water needs in the southwest portion of this basin, Kingman, Harper, Pratt, Barber, Kiowa, Co-

manche, and three counties in Oklahoma, was reported by Bartlett & West in 2008, as a preliminary engineering report for Sunflower H₂O Initiative.⁽¹⁾ Current supplies appear to meet projected demands in this area.

An inventory of the current water supplies and potential demands was also conducted for nine counties of south central Kansas (Butler, Cowley, Harper, Harvey, Kingman, McPherson, Reno, Sedgwick and Sumner), as a Special Study by the U.S. Bureau of Reclamation for the Kansas Water Office and Regional Economic Area Partnership (REAP). The report provides information to support decision making by local entities to meet future water supply needs.

Aquifer Recharge

The water supply for the City of Wichita in south central Kansas currently comes from two primary sources: the City of Wichita well field in northern Sedgwick and southwestern Harvey counties, and Cheney Reservoir located mostly in southeastern Reno County. These sources will not be adequate to meet the projected water needs of



Recharge Basin.

the Wichita metropolitan area in the 21st century. Artificially recharging the Equus Beds aquifer, which underlies the city well field, is a strategy being implemented to meet future demands for water for Wichita and other users in the area. An additional benefit of artificial recharge includes establishing a hydraulic ridge, thus preventing migration of saltwater plumes originating from the Arkansas River to the southwest and the Burrton oil field to the northwest, which would degrade the water quality of the city's well field.

The Wichita well field was developed in the Equus Beds aquifer to supply water to the city beginning in 1940. Declines in ground water levels can be attributed to

Lower Arkansas River Basin High Priority Issue Long Term Public Water Supply January 2009

pumping from the aquifer by the City of Wichita and local irrigation water users. Increased reliance on [surface water](#) from Cheney Reservoir since 1965 and decreased city pumping from the Equus Beds aquifer have moderated the aquifer water level declines. Between 1992 and 2006, water levels recovered by more than 10 feet in much of the area.

Areas of the Lower Arkansas River basin are affected by salt contamination of fresh ground water and surface water (Figure 1). Several sources of salt have been identified as contributing to the contamination, including waste from salt mining or oil production, and human activities. Some of the salt is naturally occurring, arising from the dissolution of salt deposits in the underlying bedrock.

Artificial recharge is one strategy for addressing both water quantity and water quality concerns for the region. This approach is the vision of the City of Wichita, which has led the effort in partnership with the U.S. Bureau of Reclamation (Bureau) to test the approach and implement later phases.^(9,10) In 1995, the Equus Beds Groundwater Recharge Demonstration Project was initiated to evaluate recharge techniques and their impact on the water quality of the aquifer. As part of the demonstration project, water was diverted from the Little Arkansas River during high flow events. The diverted water was either pumped to the Halstead recharge site and recharged to the aquifer by basin, trench or injection well, or treated and recharged at the Sedgwick recharge site. The demonstration phase of the project was completed in May 2002. The quantity of artificial recharge during the demonstration project was equivalent to less than

three percent of the water pumped for municipal use from the aquifer by the City of Wichita (Table1).

Year	Halstead	Sedgwick	Total
1997	130,622,100	1,828,900	132,451,000
1998	258,947,500	40,360,300	299,307,800
1999	243,059,200	82,285,300	325,344,500
2000	86,436,400	11,530,700	97,967,100
2001	211,182,000	--	211,182,000
2002	16,917,400	--	16,917,400
Total	947,164,600	136,005,200	1,083,169,800

Table 1. Gallons of Water Recharged through May 2002 (Conclusion of Demonstration Project).

In 2006, the first non-demonstration phase of the project was initiated. The purpose of the Equus Beds Aquifer Storage and Recovery (ASR) Project, Phase I, is to inject larger quantities of water into the aquifer for the purposes of storage and later recovery and to form a hydraulic barrier to the brine plume. The project diverts water from the Little Arkansas River through bank storage (diversion) wells and surface water intakes, when flow in the river exceeds base flow. The diverted water then is artificially recharged into the Equus Beds aquifer through injection wells and recharge basins. In 2007, over 350 million gallons were recharged into the aquifer through the ASR project, and in the first six months of 2008, approximately 600 million gallons were recharged.

To protect water quality, the City of Wichita and the State Conservation Commission have cooperatively cost shared with farmers on implementing for atrazine control. Roughly 75% of the farmers planting grain sorghum

in the Little Arkansas River watershed participated and implemented Best Management Practices (BMPs).

Design for Phase II (Figure 2) of the ASR project began in 2008 for the surface water intakes, with construction slated to begin in 2009 and the project to be operational in 2011. Bank storage wells may get incorporated into the project after the capacity performance is fully evaluated. Phase II design elements will cap-

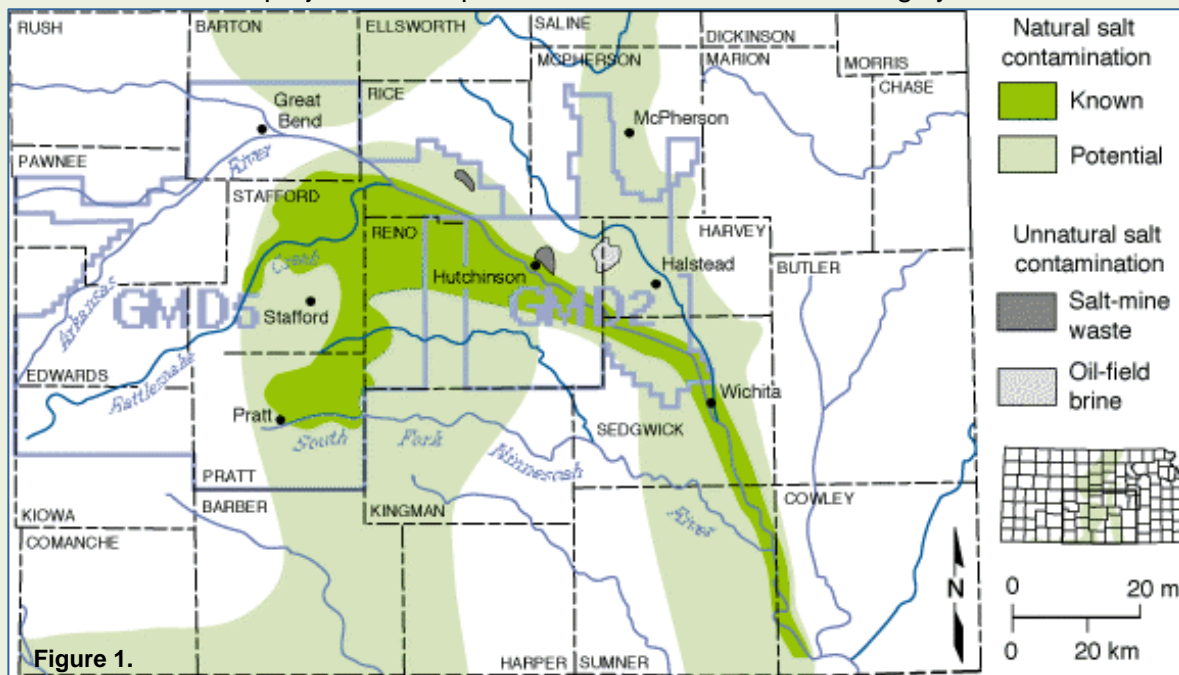


Figure 1.

Lower Arkansas River Basin High Priority Issue

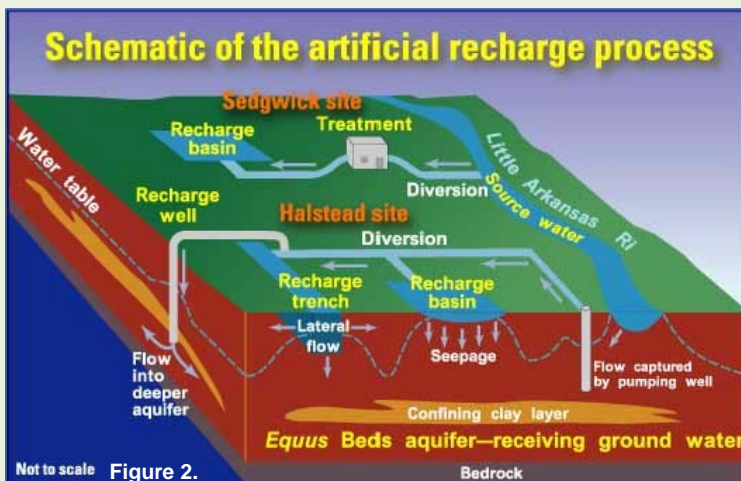
Long Term Public Water Supply

January 2009

Page 3

ture and recharge up to 30 million gallons per day (MGD) and will rely on a treatment plant to treat the water adequately to return directly into recharge wells. The project includes replacement of approximately 17 miles of existing raw water pipeline and 26 recharge/recovery wells.

Phase I and II had been estimated to cost \$137 million five years ago; in 2008, due to inflation, cost estimates for just Phase II are \$200 million or more. There is federal authorization (but not yet an appropriation) that allows cost share of up to 25% of project costs or a maximum of \$30 million (based on the original cost estimate). In addition to the federal assistance, the city is seeking \$1 million from the State, annually, for 5 to 8 years. In fiscal year 2009, \$1 million to the ASR was approved from the State Water Plan Fund. When complete, the ASR will be a major regional water supply for over 600,000 people.



Cheney Reservoir

Cheney Reservoir, located 24 miles west of Wichita on the North Fork of the Ninnescah River, was constructed in 1962-1965 by the Bureau.⁽⁷⁾ The primary purposes for the dam's construction were water supply, flood control, recreation and wildlife benefits. The land use of the watershed that drains to Cheney is 99% production agriculture. The reservoir has storage of 151,800 acre feet at conservation pool, with an additional flood control capacity of 80,860 acre feet.⁽¹¹⁾ The City of Wichita draws more than 60% of its daily water supply from the reservoir.

Approximately 7,100 acre feet of sediment deposition occurred in Cheney Reservoir from 1965 through 1998. As of 1998, sediment had filled 27% of the reservoir's inactive conservation storage pool. Sedimentation affects both the useful life and aesthetic quality of a reser-

voir. Sediment quality is an important environmental concern because sediment may act as a sink for water quality contaminants and as a source of harmful constituents to the overlying water column and biota. Sedimentation also decreases the water storage capacity of the large federal reservoirs, including Cheney.

In 1992, the Reno County Conservation District created a task force including farmers and representatives of state, federal and local agencies to identify potential sources of pollution in the watershed and Cheney Reservoir. The task force prepared a master plan for watershed pollution management to reduce phosphorus and sediment and extend the life of the reservoir to 200 years. Implementation of the plan began in July 1994 under the leadership of the Citizen's Management Committee (CMC) which operates as a subcommittee of the Reno County Conservation District. All members of the CMC live in or own land in the watershed and are farmers, land owners or agribusiness persons with rural interests.

The CMC continues to partner with the agencies and organizations that assisted the original task force. One of the most significant achievements of the Cheney Reservoir Watershed Project is the partnership of rural-urban stakeholders. Because the City of Wichita recognized the value of correcting pollution problems prior to water entering the reservoir, they agreed to provide incentive payments to farmers for implementing BMPs which often times are non-income generating assets for the farmers. For the farmers, implementation carries the obligation of maintaining the practices for the long term.

Since 1994, CMC's accomplishments include:

- Development of a citizen-led organization that promotes conservation practices through farmer-to-farmer information transfer;
- More than 1,400 BMPs implemented on watershed farms over the life of the project;
- Identification of key areas in the watershed with the potential to contribute the most sediment and nutrients to Cheney Reservoir; and
- Development of policy and programs to focus education and incentives to key areas.

Collaborative Water Resource Planning

The Regional Economic Area Partnership (REAP), is comprised of 34 city and county governments in nine counties of south central Kansas, which include Butler, Cowley, Harper, Harvey, Kingman, McPherson, Reno, Sedgwick and Sumner counties. REAP has established

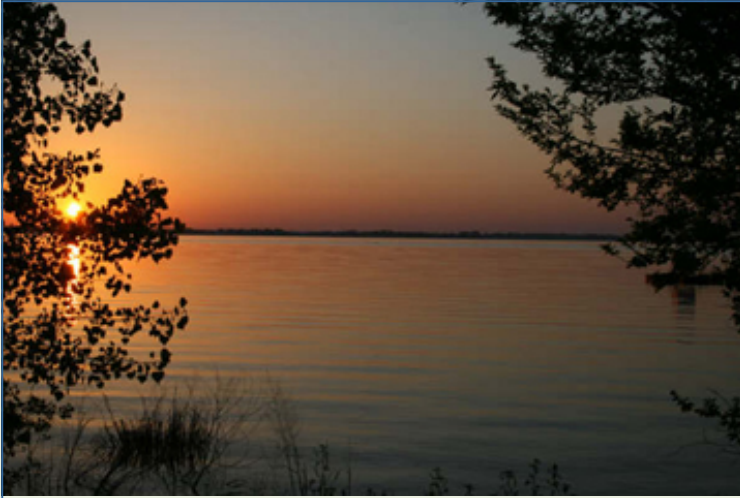
Lower Arkansas River Basin High Priority Issue

Long Term Public Water Supply

January 2009

Page 4

a Water Resources Committee to identify and coordinate collaborative efforts on regional issues of water quality and supply in south central Kansas.



Cheney Reservoir.

REAP participated as a partner in a Special Study conducted by the Bureau, in conjunction with the KWO. The objective of the study was to provide information for the formulation of alternative opportunities to meet the future municipal and industrial demand and usage within the area. Findings of the study report provide areas for further review. These include a focus on the value of conservation and the full utilization of existing [surface water](#) supplies. Development of additional ground water sources in the alluvial river valleys or new reservoir supplies could be evaluated. Reuse of municipal & industrial effluent and desalination of brackish ground water in the area are other areas identified for potential future study.

The Sunflower H₂O Initiative is a consortium of rural communities and water districts in six counties (Barber, Comanche, Harper, Kingman, Kiowa, and Pratt) along with 3 counties in Oklahoma (Alfalfa, Grant and Woods) that are working together to address common water issues. The consortium conducted a regional planning study with funding assistance from the Kansas Department of Health and Environment to evaluate water needs in the area and the most cost effective manner of developing and delivering the needed water supply.⁽¹⁾ All current systems in the area are ground water dependent. Many water supplies have experienced contamination or have threats to their supplies. The Consortium is in the process of trying to move into a next phase of review to evaluate opportunities for further regionalization of resources and systems and to evaluate opportunities to develop additional supply sources, both ground and surface water.

The Equus Beds Groundwater Management District No. 2 (GMD2) is an important water management entity in the basin, covering the eastern portion of the basin where some of the larger municipalities are located. The Big Bend Groundwater Management District No. 5 (GMD5) is another major water management entity in the basin, covering much of the western portion of the basin, including much of the irrigated lands, where most of the water use in the basin occurs.

Recommended Actions

1. Conduct focused supply and demand analyses for areas of rapid growth and/or areas of projected shortage within the basin.
2. Support the Equus Beds Aquifer Storage and Recovery (ASR) Project.
3. Coordinate with and support the efforts of the Regional Economic Area Partnership (REAP), Water Resources Committee, to identify and develop long-term water supplies in south central Kansas.
4. Implement the recommended actions as proposed in the *Enhanced Stream Corridor and Wetland Management to Address Reservoir Sedimentation Policy Section* of the *Kansas Water Plan*.
5. Support the initiatives of the Cheney watershed Citizen's Management Committee's master plan for watershed pollution management, including the targeted voluntary implementation of conservation practices.

Resources

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**Lower Arkansas River Basin High Priority Issue
Long Term Public Water Supply
January 2009**

Page 5

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