

Upper Arkansas Basin High Priority Issue

Interstate Cooperation to Address Water Quality

January 2009

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Issue

Interstate cooperation and management is needed to address poor quality [surface water](#) that is impacting or threatening public water supply wells along the Arkansas River corridor. Protection of the fresh ground water in the region is critical for municipal, industrial and agricultural uses.

Description

The Arkansas River in western Kansas is among the most saline in the country. The contamination is caused by high levels of salinity in the river as it enters Kansas from eastern Colorado (Figure 1).⁽⁶⁾ In 2000, Kansas began to address the salinity issue by developing a Total Maximum Daily Load (TMDL) on the upper Arkansas River for sulfate. The Colorado Water Quality Control Division (Division) was consulted in the development of the TMDL. One of the outcomes after the TMDL approval was establishment of a comparable water quality criterion for sulfate. The sulfate TMDL is now consistent between Kansas and Colorado. In this phase of the TMDL, an interim endpoint is to reduce the long term average sulfate concentration below the current average of 1875 mg/L that occurs at Pierceville, near Garden City.

confines the intrusion of saline water to the immediate alluvium of the river above this point.

Data from the U.S. Geological Survey and the Kansas Geological Survey (KGS) show uranium concentrations in the river during saline low flows generally exceeding the Environmental Protection Agency (EPA) drinking water standards. The dissolved concentrations of uranium are well correlated with sodium, sulfate, and chloride concentrations.

In general, selenium and uranium concentrations increase with increasing salinity of the surface and ground waters. Just as the primary source of the sulfate in the waters is natural (leaching of rocks and soils), the primary source of the uranium is natural. However, the high concentrations of both sulfate and uranium in the Arkansas River surface water and ground water affected by

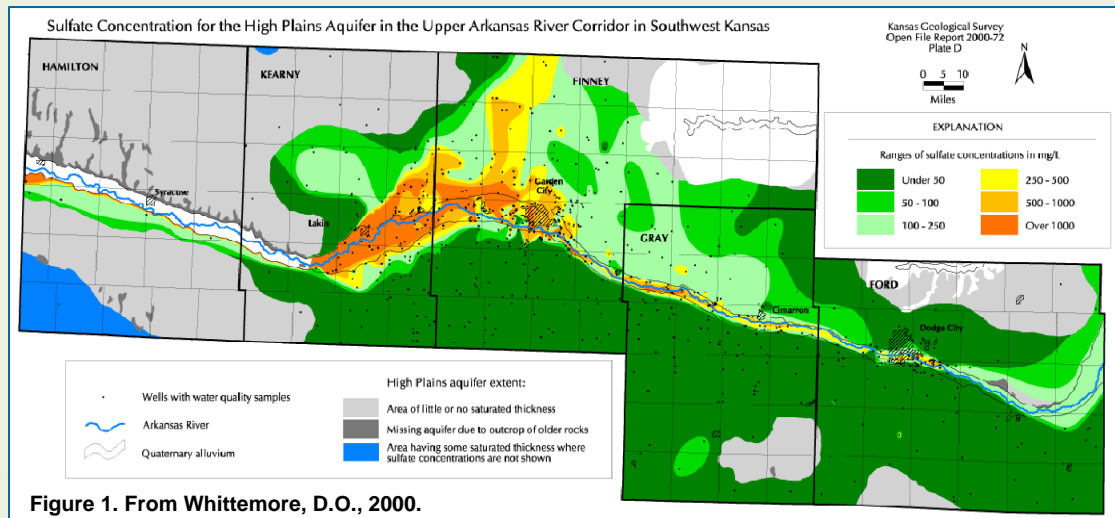


Figure 1. From Whittemore, D.O., 2000.

In 2007, the Kansas Department of Health and Environment (KDHE) completed a TMDL to address selenium water quality impairments along the Arkansas River from the Colorado stateline to Pierceville. Selenium concentrations are high during summer (April to September) when deliveries to Kansas irrigation ditches are made by Colorado pursuant to the Arkansas River Compact. Moreover, concentrations during the irrigation off-season (October to March) remain elevated with the onset of drier conditions. The greatest concentrations of selenium are seen in the immediate vicinity of the river where large-scale irrigation diversion of ground water begins east of the Bear Creek fault in Kearny County. In short, irrigation return flow deliveries from Colorado are poorer water quality than main stem deliveries, and the best water quality is from releases from John Martin Reservoir that never is diverted for Colorado farmland irrigation. The diminishment of streamflow east of Garden City

the river are not natural but the result of the evapotranspiration consumption of water in Colorado, leaving the residual salts dissolved in a much smaller volume of water.

The saline water from the Arkansas River seeps into the subsurface alluvial [aquifer](#) and then the Ogallala-High Plains aquifer in Kansas, thereby contaminating the ground water with high sulfate and uranium concentrations (Figure 1). In some cases, additional uranium may be derived from the sediments in which ground waters reside, and in other cases, some uranium may be removed by chemical conditions in ground water or by the sediments.

Stakeholders from Kansas, including KDHE, Kansas Department of Agriculture—Division of Water Resources (DWR), Southwest Kansas Groundwater Management

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District No. 3 (GMD3), KGS, and Kansas Water Office (KWO) have been actively engaged in discussions with stakeholders from Colorado, including Colorado Water Quality Control Commission and Colorado State University to discuss the common issues and concerns related to the water quality along the Arkansas River.

Tamarisk Control

Infestations of tamarisk, a non-native, high water consuming plant, along the Arkansas River also impacts the water quality in the basin. Tamarisk is prevalent along the mainstem and tributaries to the Arkansas River; surveyed infested riparian acres exceed 15,000 within the Upper Arkansas basin. To a lesser extent, Russian olive has also infested the river corridor, and control measures for tamarisk and Russian olive are similar. In order to achieve true, long-term successful tamarisk control, Kansas will need to actively coordinate with Colorado on this issue. Working collaboratively will allow Kansas to identify opportunities that make the most effective use of our collective resources.

In 2008, Kansas and Colorado initiated plans to implement a cooperative control project in Prowers County, Colorado and Hamilton County, Kansas. The project seeks to build partnerships and develop local leadership so long-term tamarisk control will be successful. Treating tamarisk infestation in the watershed will improve the limited streamflow and the interconnected alluvial and Ogallala-High Plains aquifers along the Arkansas River where tamarisk has become a significant problem.

Conclusion

The Arkansas River system is excessively high in total dissolved solids, one of which is sulfate, impairing the environmental and economic uses of the river on both sides of the stateline. This issue highlights the need for Kansas and Colorado to derive common goals for future water quality conditions, including the components of selenium and sulfate. Kansas recognizes the complications between achieving the goals of the Clean Water Act and water quality standards, while maintaining compliance with the Arkansas River Compact. However, both can be achieved through development of joint solutions.

Recommended Actions

1. Initiate meetings in 2008 and 2009 between Kansas and the Colorado water quality and water appropriation agencies to discuss proposals to improve water quality in the Arkansas River within the context of the Arkansas River Compact. Coordinate with water compact representatives. Identify pilot areas in the Arkansas River valley in 2009 to test remedial measures for lowering salinity in the river.
2. Cooperate with Colorado State University in the investigation of nitrate management as a means to reduce selenium loadings in irrigated areas below John Martin Reservoir.
3. Investigate, through the KGS, radionuclide loading from the Arkansas River into the aquifer sources of Kansas communities such as Deerfield and Lakin.
4. Collaborate between Colorado State University and KGS on the use of a model to identify salinity loading regions and the potential impact.
5. Initiate installation of Best Management Practices in pilot areas along the Arkansas River over 2010-2012 to determine the effect of those practices on water quality improvement and water management under the Compact.
6. Based on results from the pilot efforts, jointly obtain funding with Colorado in 2012 to implement salinity reduction measures throughout the Arkansas River valley, including EPA Targeted Watershed Grants, Water Resource Development Act (WRDA) environmental restoration projects and state funded projects.
7. Cooperate with Colorado on joint tamarisk and other non-native phreatophyte control in the Arkansas River watershed.

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Resources

1. KDHE 2007. *Upper Arkansas Basin Total Maximum Daily Load for the Arkansas River from the Colorado Stateline to Pierceville*, Water Quality Impairment: Selenium.
2. KDHE. 2000. *Upper Arkansas Basin Total Maximum Daily Load for the Arkansas River near Garden City*, Water Quality Impairment: Sulfate.
3. Kansas Geological Survey. March 2007. *The Geology of Radon in Kansas*. Public Information Circular (PIC) 25.
4. Kansas Geological Survey. November 2000. *Arkansas River Water High in Salinity*. News Release.
5. Kansas Water Office. January 2007. *Upper Arkansas Basin Section of the Kansas Water Plan: Watershed Restoration and Protection Basin Priority Issue*.
6. Whittemore, D.O. 2000. *Water Quality of the Arkansas River in Southwest Kansas*. Kansas Geological Survey.