Ground-Water Levels and River-Aquifer Interactions in the Upper Arkansas River Corridor in Southwest Kansas

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Hydrologic Responses to Changes in the Upper Arkansas Basin in Southwest Kansas

- Ground-water levels have declined along the Upper Arkansas River corridor in southwest Kansas in response to consumptive pumping from the alluvial and High Plains aquifers. (See Figure 1.)
- Water-level declines in the alluvial aquifer have caused Arkansas River water to seep into the aquifer rather than flowing downstream. Only very high flows from Colorado can pass through southwestern Kansas to reach the Middle Arkansas subbasin.
- Water-level declines along the river valley have produced a downward hydraulic gradient that results in ground-water flow from the alluvial aquifer to the underlying High Plains aquifer.
- Regional water-level declines have produced a ground-water ridge along the river corridor such that ground-water flow is changing from a west to east direction during predevelopment time towards north and south directions away from the river valley. (See Figure 2.)

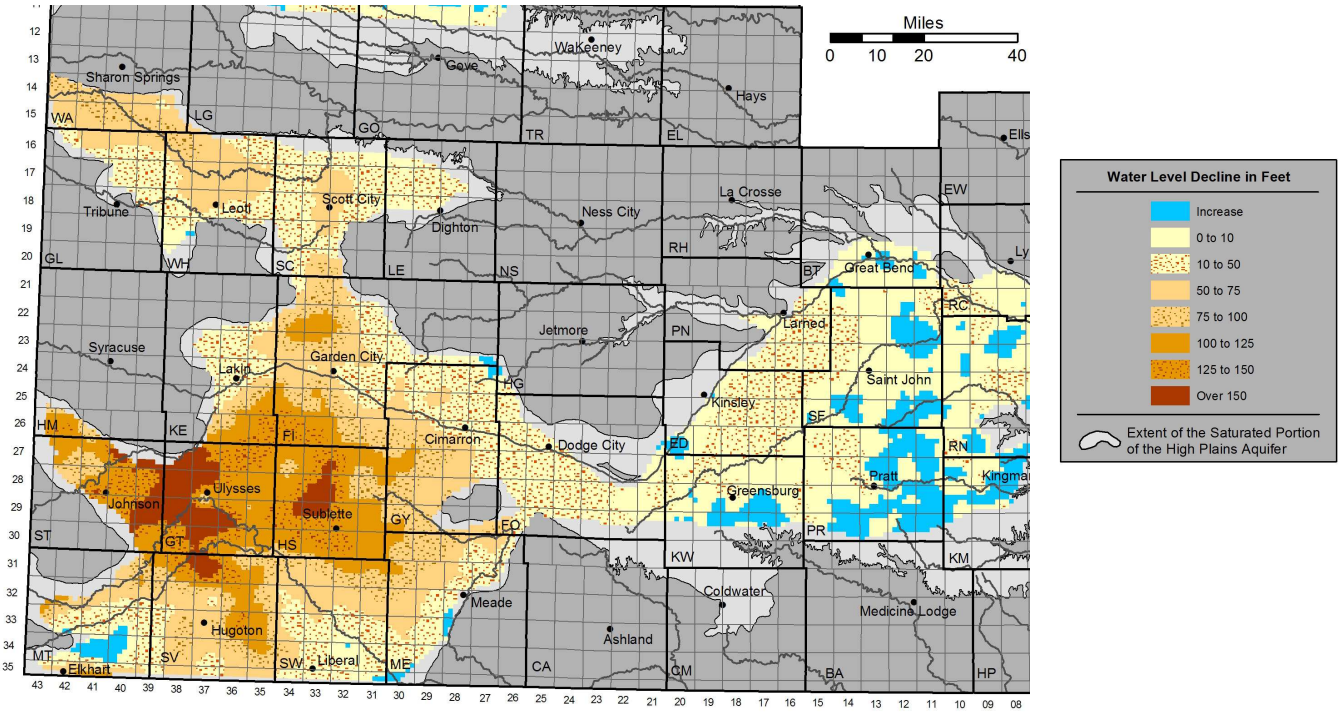

Figure 1. Change in ground-water elevations, predevelopment to average 2004-2006 for the High Plains Aquifer.

Water-Quality Responses to Changes in the Upper Arkansas Basin in Southwest Kansas

- Ground water in the alluvial aquifer has become saline because Arkansas River water, which is saline during both low and high flows, seeps into the aquifer. The dissolved solids concentration in the ground water is greatest in Hamilton and Kearny counties and decreases in a downstream direction.
- Ground water in the High Plains aquifer underlying the river valley has become saline due to downward flow of water from the overlying alluvial aquifer. (See Figure 3.)
- Ground water in the High Plains aquifer underlying the area irrigated with diverted Arkansas River water has become saline due to downward seepage of water from the irrigated fields. (See Figure 3.) Recycling of the saline ground water pumped from the High Plains aquifer for irrigation is increasing the water salinity.
- Saline ground water in the High Plains aquifer is flowing outwards from the Arkansas River valley. The outward flow rate is greatest in Kearny, Finney, and Gray counties. (See Figure 3.)

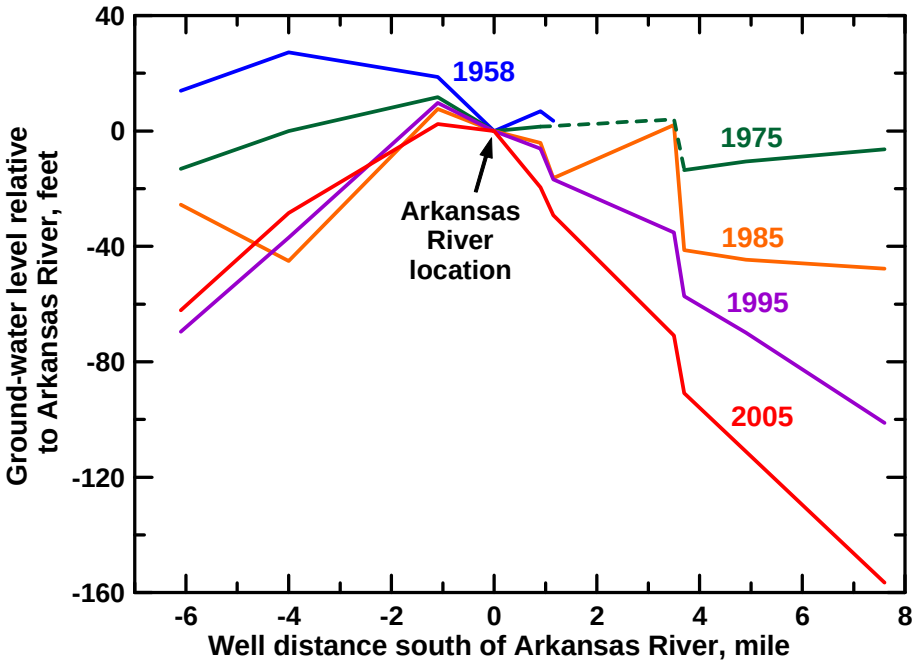

Figure 2. North-south cross section of ground-water levels across the Arkansas River corridor in eastern Kearny County near the Finney County line showing development of a ground-water ridge that has shifted the direction of ground-water flow in the High Plains aquifer from generally along the river corridor to outward from the river.

Hydrologic and Salinity Responses to Future Changes in the Arkansas River Corridor

- Ground-water levels will continue to decline along the Upper Arkansas River corridor in southwest Kansas unless there are substantial reductions in consumptive pumping.
- Continuing water-level declines will increase the rate of Arkansas River water loss into the alluvial aquifer and underlying High Plains aquifer. This will decrease the river flow reaching the Middle Arkansas subbasin for a similar, past high flow from Colorado. More saline water from the Arkansas River will enter the alluvial and High Plains aquifers.
- Continuing water-level declines will increase the slopes of the ground-water ridge along the river corridor such that ground-water flow directions will continue to shift to directions away from the river. This will increase the flow rate of saline water in the High Plains aquifer outwards from the river valley. (See Figure 3.)

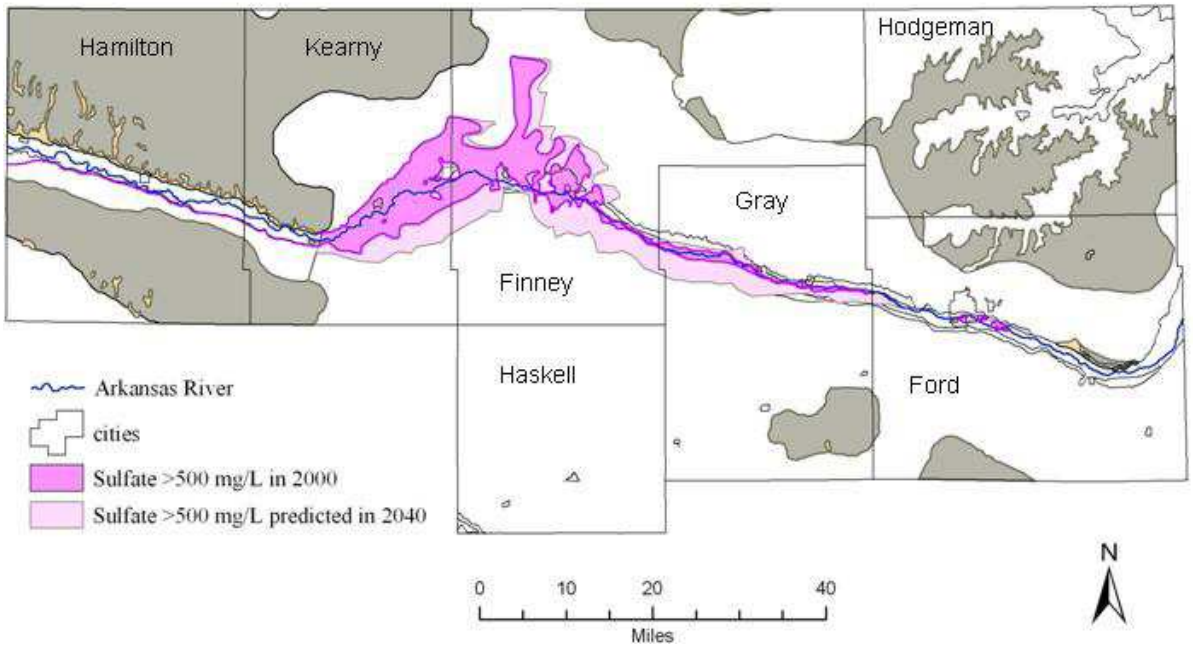

Figure 3. Distribution of high sulfate concentration (>500 mg/L) in ground water along the Arkansas River corridor in southwest Kansas in 2000 from observations and predicted in 2040 from a 40-year simulation of ground-water flow based on average 1990's water use in the High Plains aquifer.