IMPACTS OF DECLINING STREAM FLOW ON SURFACE WATER QUALITY

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Many streams in western Kansas have experienced a progressive reduction in flow during the past two decades. Trends are most dramatic in the upper Arkansas, Cimarron, and Smoky Hill river basins, where a shift toward irrigated crop production has contributed to the lowering of the groundwater table and largely eliminated baseflow contributions from shallow aquifers. Continued emphasis on the production of corn and other water intensive crops threatens to reduce stream flow over an even wider geographic area (Figure 1).

Declines in flow exert a direct impact on surface water quality by reducing the dilution base available to sewage treatment plants and other pollution sources. In the face of such declines, contaminant loadings eventually begin to exceed the assimilatory capacity of streams. Nuisance odors, blooms of filamentous or scum-forming algae, episodic fish kills, and the elimination of pollution intolerant plant and animal life often accompany reductions in flow and increases in contaminant concentrations.

Reductions in stream flow also aggravate problems associated with the intrusion of highly mineralized groundwater. In streams receiving significant baseflow contributions from saline aquifers, concentrations of chloride, sulfate and other ions tend to increase as baseflow contributions from upstream (overlying) freshwater aquifers decline. These circumstances render streams less valuable as sources of domestic and irrigation water and place a profound physiological stress on many native aquatic and semiaquatic species.

The conversion of perennial streams to intermittent water bodies, characterized by the formation of shallow, stagnant pools during the irrigation season, also subjects aquatic biota to overcrowding, high concentrations of metabolic wastes, increased incidence of disease, and heavy predation. These problems are often compounded by the tendency of livestock to congregate near pools, resulting in sediment disturbance, heavy organic loadings, and anoxic and highly unsanitary conditions.

The relationship between stream flow and surface water quality is not explicitly recognized under existing water allocation laws. However, stream flow is an important consideration in the implementation of the Kansas surface water quality standards. Under the standards' mixing zone provisions, declines in available dilution base necessarily impose more stringent effluent limitations on discharging facilities and often add to the cost of wastewater treatment (K.A.R. 28-16-28c(b)).

State efforts to establish minimum desirable stream flows have not reversed the trend toward stream dewatering and water quality deterioration in western Kansas. Absent any changes in the laws and policies governing water usage, regional depletion of groundwater will inevitably lead to further decreases in stream flow, further reductions in surface water quality, and the elimination of the beneficial uses historically associated with flowing waters.

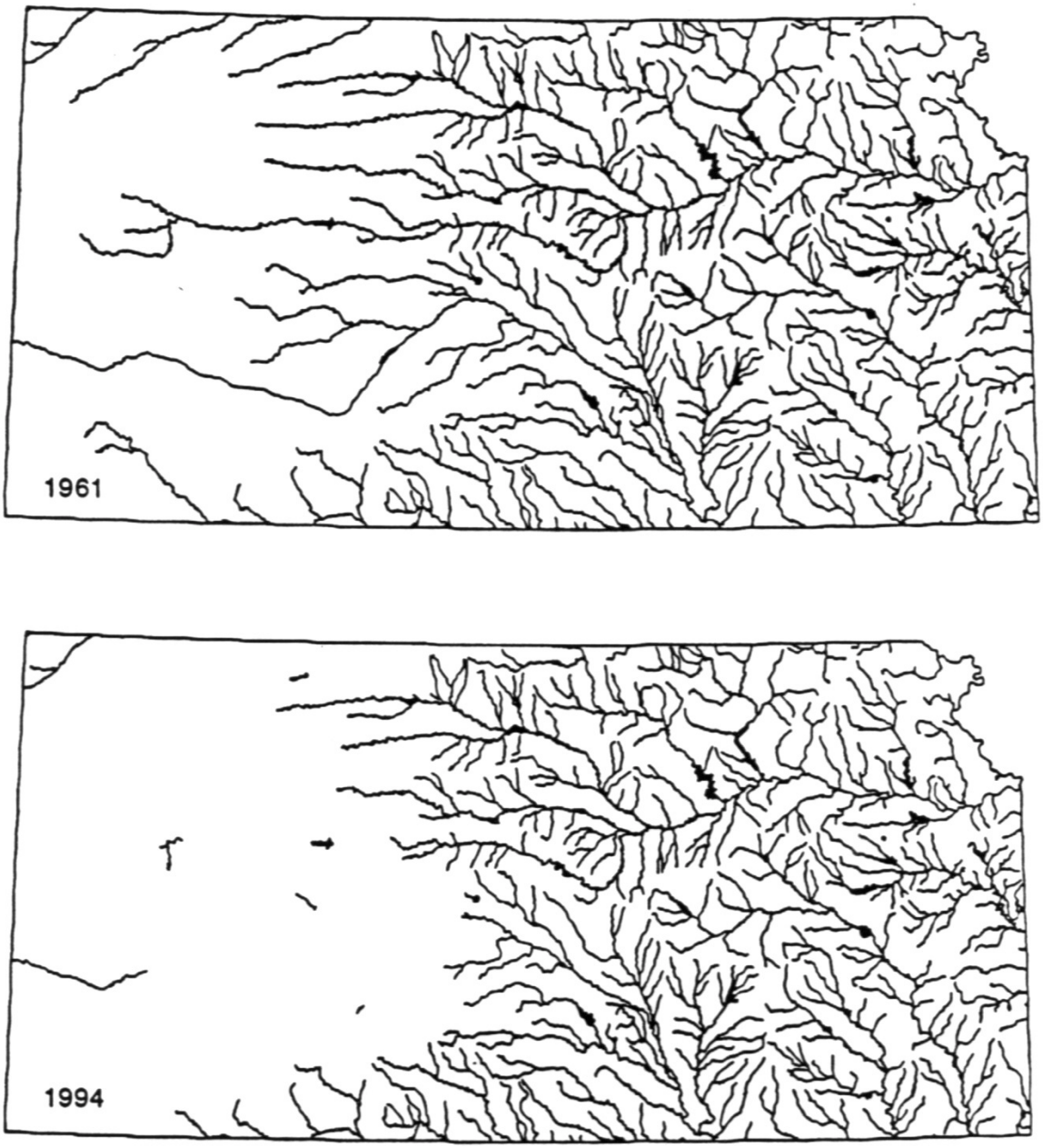

Figure 1. Major perennial streams in Kansas, 1961 versus 1994[1].

[1]Top illustration is adapted from United States Geological Survey 1:500,000 scale base map compiled in 1961. Bottom illustration summarizes stream flow observations made by the Kansas Department of Health and Environment from October 1989 through January 1994.