Trends in Streamflow in the Missouri River Basin from 1957 to 2006

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The hydrologic consequences of the late 20th century atmospheric warming are of great interest to water managers and agricultural producers in the Northern Great Plains and the Missouri River Basin (MRB). For several other regions of North America, changes in streamflow characteristics are attributed to atmospheric warming, such as the earlier snowmelt runoff from the Sierra Nevada Mountains of California. The MRB streamflow record was examined for evidence of long-term trends in the mean annual flow, minimum flow, and seasonality for all stations (205) with continuous record for the last 50 years (1957-2006). Trends were statistically analyzed using the non-parametric Kendall Tau test.

Fifty-five stations demonstrate an upward trend in streamflow, whereas 26 stations demonstrate a downward trend for the study period. No trends were significant at most stations, presumably due to the large interannual variability that is characteristic of the Northern Great Plains. Stations with trends are distributed in regional patterns. Downward streamflow trends were found in western Montana, Wyoming, Nebraska, and Kansas. Upward trends were found in North Dakota, South Dakota, Nebraska, and Iowa.

Minimum flows for the period were examined using 62 stations of the USGS Hydro-Climatic Data Network that have continuous record for the period 1957-2006. Twenty-one stations in North Dakota, South Dakota and Iowa demonstrate an upward trend of minimum flows. Three stations in Montana and Wyoming demonstrated a downward trend of minimum flows. Monthly streamflow records at 205 stations were analyzed for seasonality using the temporal centroid of streamflow (CT) or center of mass approach. At 28 stations, runoff occurs earlier in the year.