North Central
Climate Adaptation
Science Center

Prairie Climate Companion

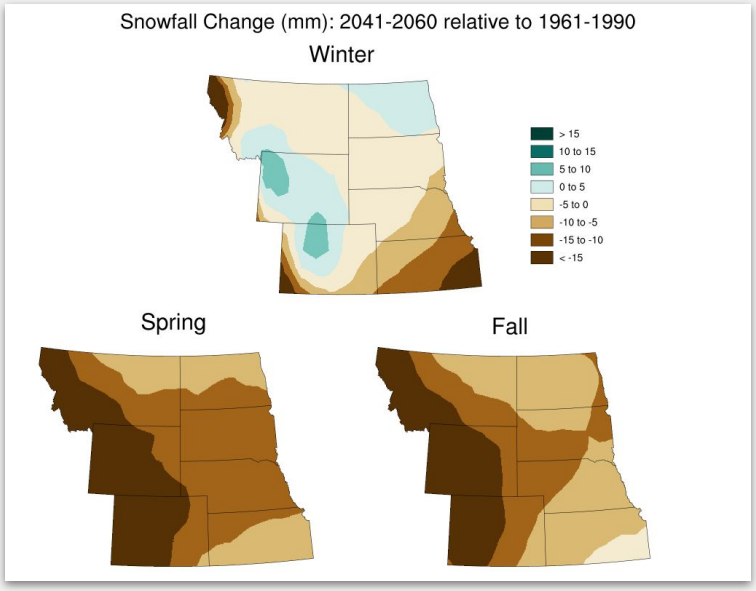
Informing adaptive grassland management in the North Central region where winds are strong, the grazers are good-looking, and the temperature… is above average.

Water Availability

The Issue

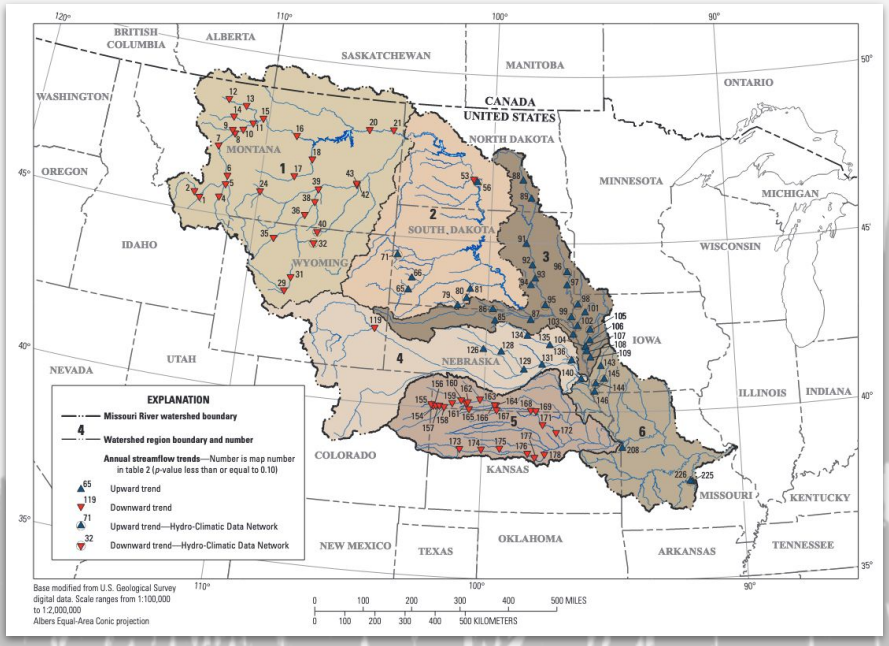
Climate change impacts on temperature and precipitation will in turn **impact water availability**.

Increased temperatures will result in **more precipitation falling as rain rather than snow** in the future. This will lead to more runoff and streamflow in winter and spring and **decreased runoff and streamflow in late summer and fall**, with some spatial variation.



Projected snowfall change

The **Missouri River Basin** has experienced increases in annual streamflow in eastern parts of the basin and **decreases in western and southern parts** of the basin since the 1960s.



Streamgages in the Missouri River Basin with statistically significant trends (upward trends in blue & downward trends in red) in annual streamflow between 1960 – 2011. Source: Image reproduced from Norton, Anderson, & Stamm, *Scientific Investigations Report*, 2014.

Implications for Grasslands Management

Future projections suggest modest increases in annual streamflow across much of the basin but with **potential decreases seasonally** in late-summer and fall, which may **impact fish and other aquatic species**.

Soil moisture is expected to decrease under warming temperatures, although increases in winter and spring precipitation will seasonally facilitate high soil water content. With changes in soil moisture, management practices that **improve water infiltration** and **reduce runoff** will be important to help mitigate both droughts and floods.

The water levels and flows of the region's wetlands, lakes, streams, and groundwater are strongly influenced by the temporal and spatial variability of precipitation duration and intensity, and regional land-use patterns. **Water availability will likely be more variable** in the future, requiring **flexible grassland management** that can adjust to changing conditions.

Selected Resources

The U.S. Geological Survey **National Water Dashboard** displays an interactive map with current and historical stream, lake, water quality, and groundwater data, along with weather, drought status, and hazard conditions.

The U.S. Geological Survey **National Climate Change Viewer** allows the user to visualize projected changes in climate and the simulated water balance for a state, county, and for USGS Hydrologic Units (HUC) 4 and 8. For example, users can view runoff or snow water equivalent for baseline and future conditions by county or watershed.

Contacts

Katherine J. Chase, P.E., Surface-Water Specialist, U.S. Geological Survey, kchase@usgs.gov

Dr. Owen McKenna, Research Ecologist, U.S. Geological Survey, omckenna@usgs.gov

Dr. Imtiaz Rangwala, Climate Science Lead, North Central Climate Adaptation Science Center, imtiaz.rangwala@colorado.edu

Check out the synthesis report here!

Miller Hesed, C. D., Yocum, H., Chase, K., McKenna, O., Rangwala, I., & Peña, U. (2023). Prairie Climate Companion: Water Availability. North Central Climate Adaptation Science Center, Cooperative Institute for Research in Environmental Sciences, University of Colorado Boulder, Boulder, CO.

Supported by Cooperative Agreement No. G20AC00075 from the United States Geological Survey. Contents do not necessarily represent the views of USGS.

North Central Climate Adaptation Science Center

CIRES

USGS