Missouri River Basin

Basin Overview

At 2,636 miles in length, the Missouri River is the longest river in the United States and the fifteenth longest river in the world. Its watershed spans more than 525,000 square miles (one-sixth of the entire lower 48 United States) through portions of ten States and two Canadian provinces, making it the largest watershed within the United States. The Missouri River Basin presents unique water management challenges due to the size and complexity of the basin. It encompasses different geographical areas, climates, and uses.

Future Changes in Climate and Hydrology

Temperature

The 2018 National Climate Assessment (NCA) projected that the Great Plains – North Region, which best represents the Missouri River Basin, may see a 4.05°F (degrees Fahrenheit) to 5.10°F increase in annual average temperatures by mid-century (2036 to 2065) and a 5.44°F to 9.37°F increase by late-century (2071 to 2100).

Precipitation

Across much of the upper Missouri River Basin, precipitation is projected to increase in winter, spring, and fall and decrease in the summer. In the southern part of the basin, the largest increases are expected to occur during the spring. In the central and southern parts of the basin, the largest decreases are expected to occur during the summer.

Snowpack

The Upper Missouri River Basin Impacts Assessment found that multiple future scenarios projected progressively larger decreases in peak snowpack in the future, primarily due to increasing temperatures.

Runoff

In the Niobrara River subbasin, projected changes in mean annual runoff for the future time period (mid-century) indicates an increase in runoff ranging from approximately 11 percent in the eastern portion of the subbasin to 15 percent in the western portion.

Water Management Impacts

Several studies have evaluated the impacts from the potential changes to temperature, precipitation, snowpack, and runoff on water deliveries, hydropower, flood risk management, fish and wildlife, recreation, and water quality. Below are some of the potential impacts for the basin:

- Increases in temperatures are expected to augment agricultural demands, and projected increases in precipitation will not be enough to offset this increased demand.
- Increases in the frequency and intensity of high precipitation events, particularly in a landscape dominated by agriculture, will lead to increased runoff of sediments, fertilizers, and pesticides into water bodies.

Summary of Studies in the Missouri River Basin

- **Missouri Headwaters Basin Study**
- **Niobrara River Basin Study**
- **2017 Montana Climate Assessment**
- **Impacts, Risks, and Adaptation in the United States: 4th National Climate Assessment, Volume II: Report-in-Brief**
- **Upper Missouri River Basin Impacts Assessment**

Adaptation Strategies

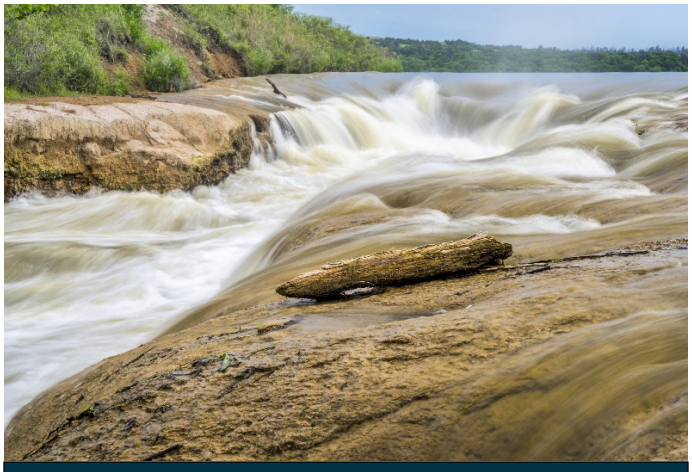
Adaptation strategies have been developed to address future water needs in the basin and to adjust future water infrastructure operations to changing hydrologic conditions. Described below are two examples of adaptation strategies.

Water Management Strategy for Increased Drought Resilience

This strategy continues the efforts begun through the National Drought Resilience Partnership and Reclamation's drought contingency planning processes by preparing for drought rather than responding to crises as they occur. The partners will continue to work collaboratively to engage and train community-based drought coordinators to lead planning, mitigation, and project implementation in eight watersheds in the Missouri River headwaters.

The Mirage Flats Irrigation District Canal Recharge

This strategy proposes using the Mirage Flats Irrigation District main canal and lateral system to recharge local groundwater. The District would continue to divert water during the growing season and allow water to seep from its canals as recharge to mitigate the effect of the increased pumping. The increase in recharge from the canal seepage would exceed any decrease in recharge resulting from changes in on-farm irrigation practices.



Norden Chute on Niobrara River, Nebraska

Innovations

A variety of innovative projects and research have occurred within Reclamation's Missouri Basin Region since the 2016 SECURE Report. An example is presented below:

Missouri River Headwaters Paleohydrology

A fundamental limitation in using historical observations to estimate future conditions is the uncertainty in whether historical measurements reflect the full range of hydrologic variability that the river system may experience. To address this limitation, and in order to better understand the full range of hydrologic variability in the basin, tree-ring based paleohydrologic records were developed to provide estimates of streamflow at key gaging locations that date back 1200 years or more.

By providing information over a longer period, paleohydrologic information provides a broader context for understanding past and potential future streamflow variability. This broader context helps water managers and decision makers better understand the range of possible future water supplies for meeting current and future demands.

Next Steps

Reclamation is currently working with partners in the Missouri River Basin to update the St. Mary River and Milk River Basins Study. The study will update the 2012 St. Mary River and Milk River Basins Study; improve water resources planning capability for the region; and support the identified goals in the updated Montana State Water Plan that was submitted to the 2015 Montana Legislature.

To see the full basin report and other components of the 2021 SECURE Water Act Report, please visit: https://www.usbr.gov/climate/secure