MONTANA BUREAU OF MINES AND GEOLOGY

Artificial Recharge: Exploring options for increasing Big Hole River flow

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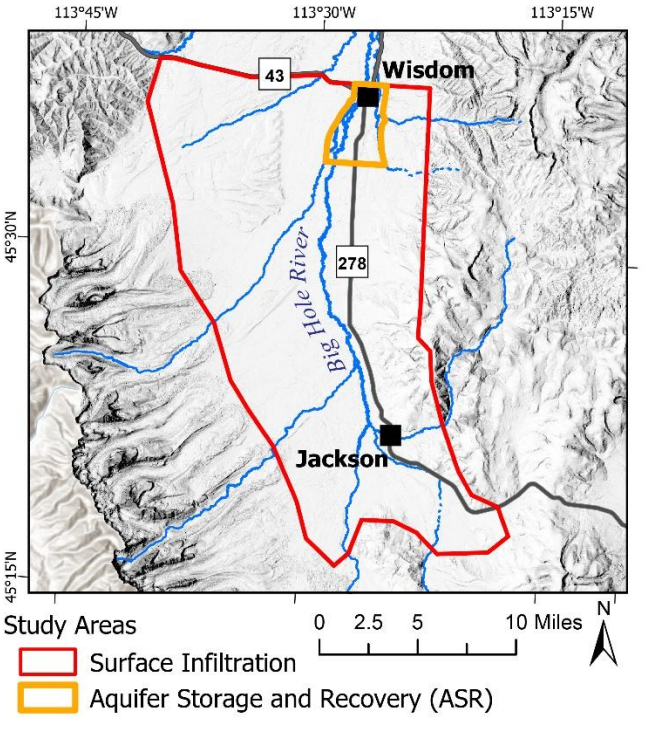
The **Big Hole River** is critical to agriculture, recreation, and fisheries. The Big Hole River is also critical habitat for the Artic grayling. The Big Hole drought management plan has established 20 cubic feet per second (cfs) as the minimum conservation flow in the Big Hole River at the USGS stream flow gage at Wisdom; however, flows have dipped into the single digits each year from 2021-2024. Stream flow has dropped below the 20 cfs target in 25 of the 37 monitored years (1988-2024).

Managed aquifer recharge (MAR) provides a means to supplement water supplies by intentionally recharging aquifers when water is plentiful, and recovering water during times of need. The two primary approaches to MAR are surface infiltration and aquifer storage and recovery (ASR) wells. Surface infiltration is typically accomplished by using infiltration basins and in some areas augmenting recharge through agricultural lands, while ASR wells directly inject and extract water to/from the aquifer. A key consideration for MAR is identifying aquifers with appropriate properties.

Purpose:

This project will investigate the feasibility of using MAR in an area near Wisdom, MT, to increase low flows in the Big Hole River by at least 5 cfs. This will include evaluation of:

- potential sources of water for recharge,
- suitable surface infiltration sites, and
- the potential for ASR wells.



Data Collection to evaluate:

- Aquifer suitability for ASR wells:
  - Groundwater-level monitoring to provide information on seasonal changes
  - Drill exploration wells near the Big Hole River to determine potential ASR aquifers.
    - Collect aquifer sediments to evaluate potential geochemical interactions with the injected water.
    - Install a pumping well and monitoring wells.
    - Conduct an aquifer test and collect water quality samples.
- Surface infiltration site suitability:
  - Develop detailed information on the distribution of geologic units, soil and aquifer properties, and depth to groundwater.
  - Determine what distances from target surface waters provide an appropriate lag time.
  - Proximity to sources of water.
- Quantity and quality of source waters:
  - Monitor flows and water quality on the Big Hole River and major tributaries.
  - Evaluate the existing distribution network (e.g. canals).

Products:

Reports summarizing potential source waters, and the potential for surface infiltration or ASR wells to meet the flow target.

The ***Ground Water Investigation Program (GWIP)*** answers locally identified, site-specific water resource questions prioritized by the Montana Ground Water Steering Committee (MCA 85-2-525). As mandated by the Montana Legislature, GWIP conducts research on the most urgent water issues in the State.

MBMG Staff:

Andy Bobst
Hydrogeologist/Project Lead
406-496-4409
abobst@mtech.edu

Ann Hanson
Hydrogeologist
406-496-4653
ahanson4@mtech.edu

Cole Denver
Hydrogeologist
406-496-4153
cdenver@mtech.edu