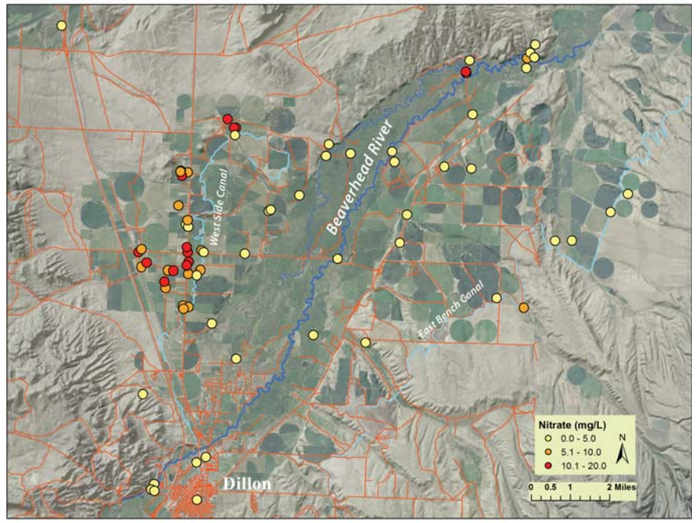


Aquifer Characterization

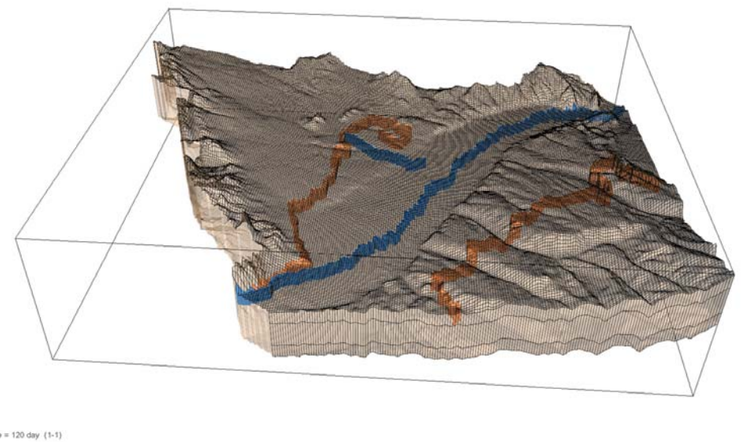
In general, groundwater and surface water are of good quality. There are some exceedances of nitrate, arsenic, iron, manganese, and sulfate at some locations.

Water naturally contains less than 1 mg/L of nitrate. Common sources of elevated nitrate in drinking water include septic systems, animal wastes and fertilizers.

Numerical Modeling

The numerical model is calibrated to the hydrogeologic framework of the real system using field data such as groundwater elevations, surface water flow, and recharge/discharge components that influence the study area.

A calibrated model can be used to make predictions about how the hydrogeologic system responds to factors such as changes in land use or pumping of high-capacity wells.



Project Status

- Potentiometric surface maps are being refined
- Aquifer tests have been conducted
- Water quality samples have been collected and anaylzed
- Surface water–groundwater interactions have been assessed
- The water budget is being estimated
- A numerical hydrogeologic model is being constructed based on the conceptual hydrogeologic model for the area, and will be calibrated using observed water levels and the water budget.
- Once the model is calibrated, it will be used to evaluate local and regional well pumping scenarios.

It is anticipated that this information will assist the DRNC, DEQ, and landowners in making regulatory decisions and planning projects to improve the watershed health.

MBMG Ground Water Investigations Program

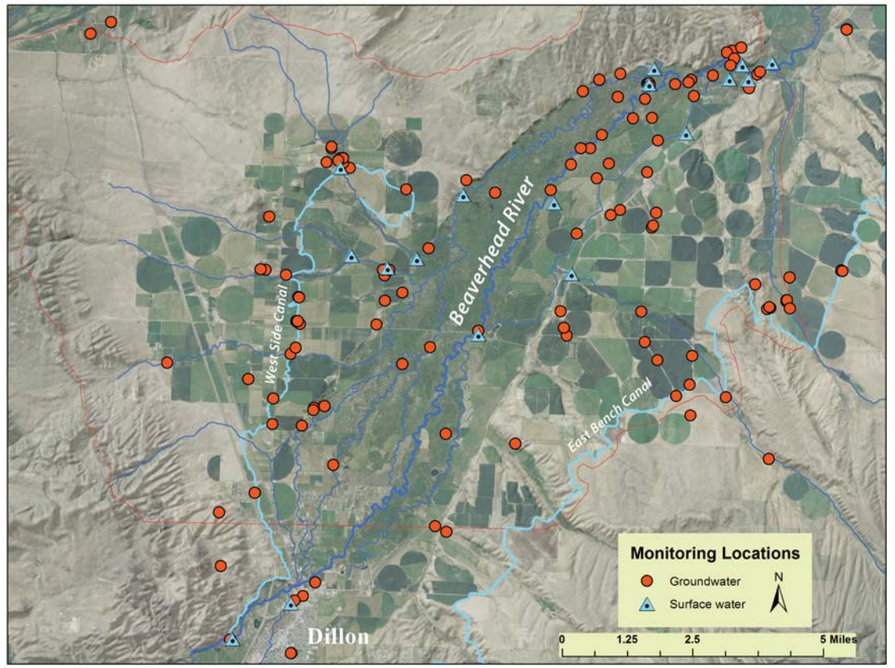
Lower Beaverhead West Study Area—
Beaverhead County

Introduction

The main economy in the lower Beaverhead River basin is agriculture, which relies on groundwater and surface water irrigation. The basin has been closed to new surface water appropriations since 1993.

This closure, combined with drought conditions in past years and increasing irrigation demands, has resulted in an increase in high-volume production wells, and applications for well permits have led to conflicts between senior and junior groundwater and surface water rights holders. A primary concern is that groundwater withdrawals will cause stream depletion by drawing flow away from the stream or by capturing stream recharge. Several hydrogeologic studies were previously conducted in the Beaverhead River valley, but none provided adequate information for the west side of the valley north of Dillon.

A better understanding of the area's hydrogeology (e.g. geologic setting, aquifer properties, recharge/discharge mechanisms, and groundwater–surface water interaction) is being obtained through data collection and interpretation. A numerical model of groundwater flow is being developed to predict impacts of groundwater development on the Beaverhead River and its tributaries.



Groundwater and surface water monitoring network in the study area.

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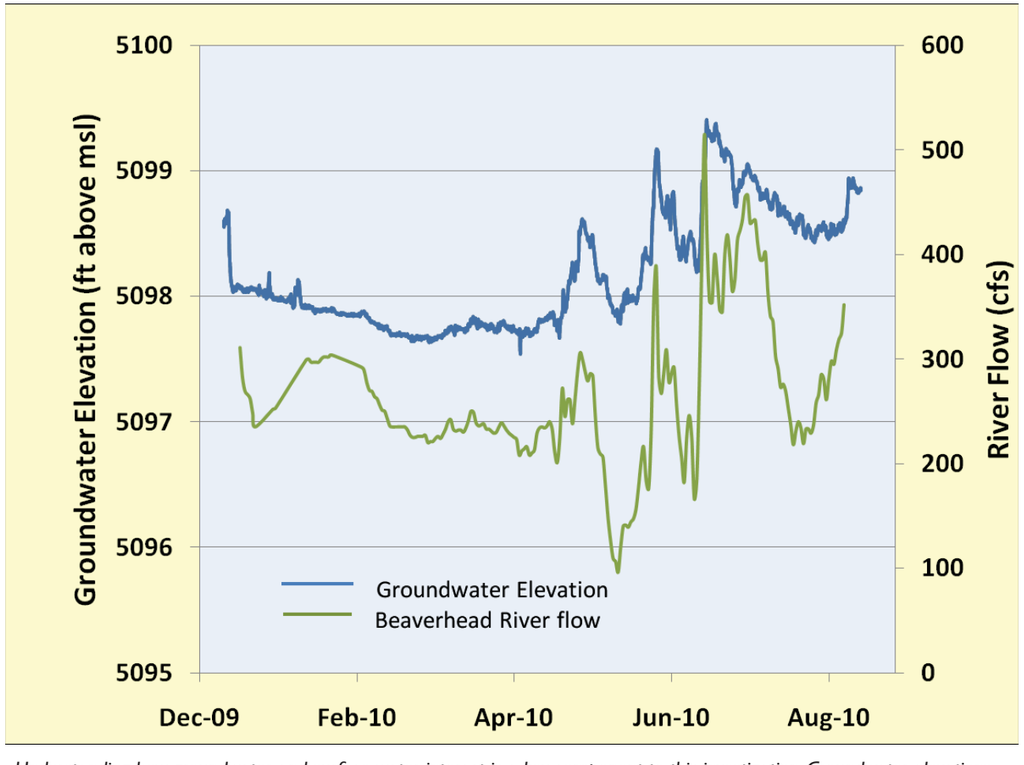
Project Issues

- Are high-capacity irrigation wells depleting groundwater and surface water? If so, to what magnitude?
- What long-term monitoring is needed to examine impacts of irrigation well withdrawals on groundwater and surface water? Long-term monitoring provides information to help in conflict resolution and water resource management.
- Are nitrates a concern in the study area, and if so, what are the sources of nitrate?

Approaches

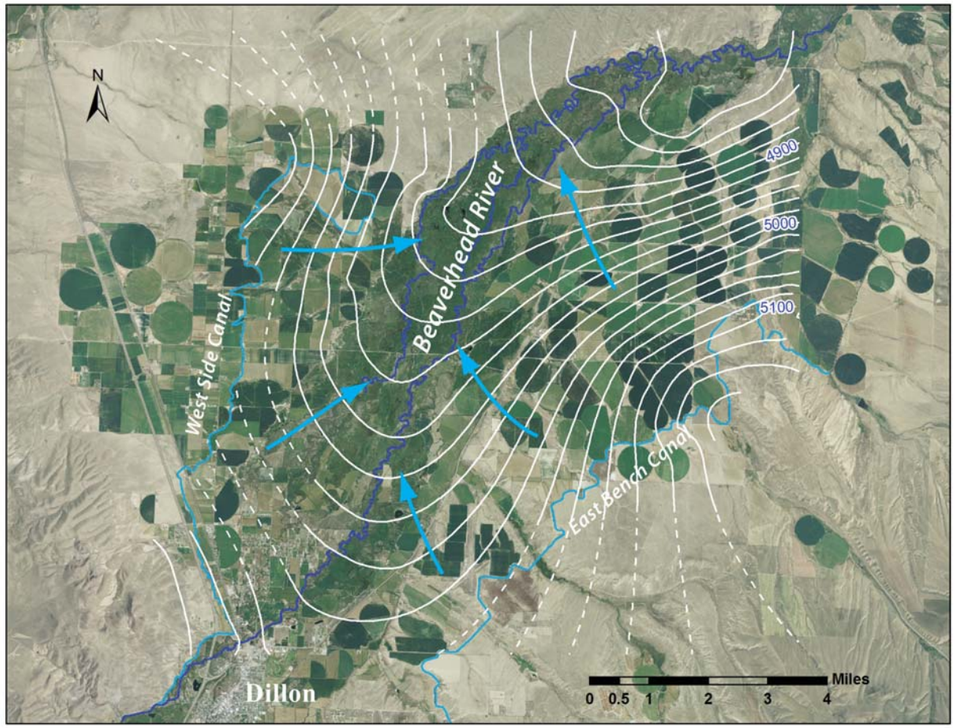
- Monitor groundwater and surface water
- Conduct aquifer tests
- Investigate seepage along the West Side and East Bench canals
- Collect water samples for aquifer characterization
- Estimate the water budget
- Develop a conceptual hydrogeologic model
- Prepare a numerical hydrogeologic model
    - o Calibrate using monitoring data
    - o Simulate the effects of pumping scenarios on the hydrogeologic system

Groundwater–Surface Water Interaction



Understanding how groundwater and surface water interact is a key component to this investigation. Groundwater elevations correlate with river flow (USGS Stream Gaging Station, Dillon, Montana).

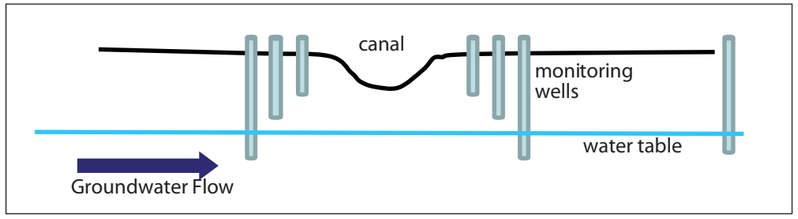
Water Budget Analysis

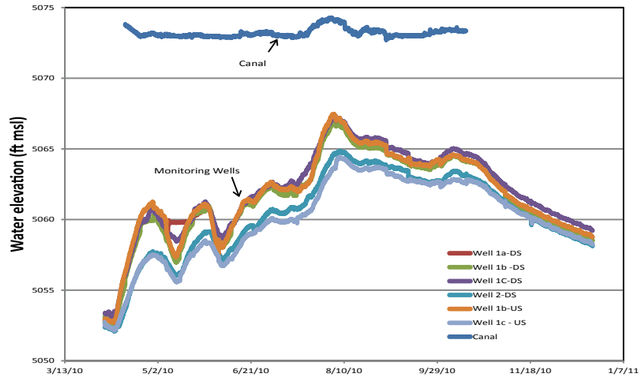


Groundwater elevation monitoring indicates that, overall, the Beaverhead River gains water from groundwater. Groundwater flow converges at Beaverhead Rock and is forced to the surface by bedrock constrictions. Information from groundwater flow maps helps to estimate the water budget for the study area.

Canal Seepage

Seepage from the West Side and East Bench Canals provide a source of recharge to groundwater. This has been documented by installing wells along the canals and monitoring water levels and water chemistry.





Hydrographs show the response of groundwater to the West Side Canal. Groundwater rises in several monitoring wells installed at different depths close to the canal.