

## 1. PROJECT PURPOSE

The Greenfields Irrigation District (GID) overlies the Greenfields Bench aquifer near Fairfield, MT. This aquifer supplies drinking water for the City of Fairfield, the Tri-County water system, and over 400 private residences. Water shortages are widespread, and in recent years the City of Fairfield has implemented seasonal water restrictions for its users.<sup>1,2</sup> In 2025, many residents with private wells had to haul water for domestic use.

The Ground Water Investigation Program (GWIP) at the Montana Bureau of Mines and Geology (MBMG) is conducting a study to investigate interactions between GID irrigation infrastructure/practices and the alluvial groundwater system. Stakeholders want to know:

***How will groundwater respond to potential changes in the canal delivery system and irrigation practices?***

## 2. IRRIGATION ON THE GREENFIELDS BENCH

Precipitation and irrigation (directly applied and canal leakage) are the only sources of recharge to the aquifer. The Sun River is diverted into the Gibson Reservoir which flows into Pishkun Reservoir. Releases from Pishkun supply all the irrigation water for the GID. In 2024 and 2025, the annual releases from Pishkun were the lowest in the last 30 years.<sup>3</sup> Snowpack has also been below average; in 2024 and 2025 the maximum snow water equivalents (SWE) were the 3rd and 4th lowest in almost 50 years.<sup>4</sup> Decreased reservoir releases and less snowpack lead to shorter irrigation seasons and less groundwater recharge. Additionally, Pishkun is 20 miles west of the Greenfields Bench, and the long water delivery time from the reservoir, during which time weather conditions may change, leads to unused canal water discharging to Muddy Creek.



In the future, GID plans to install a series of re-regulation ponds that will store water closer to the point of use, thereby improving water delivery efficiency and decreasing the amount of unused irrigation water discharged to Muddy Creek.

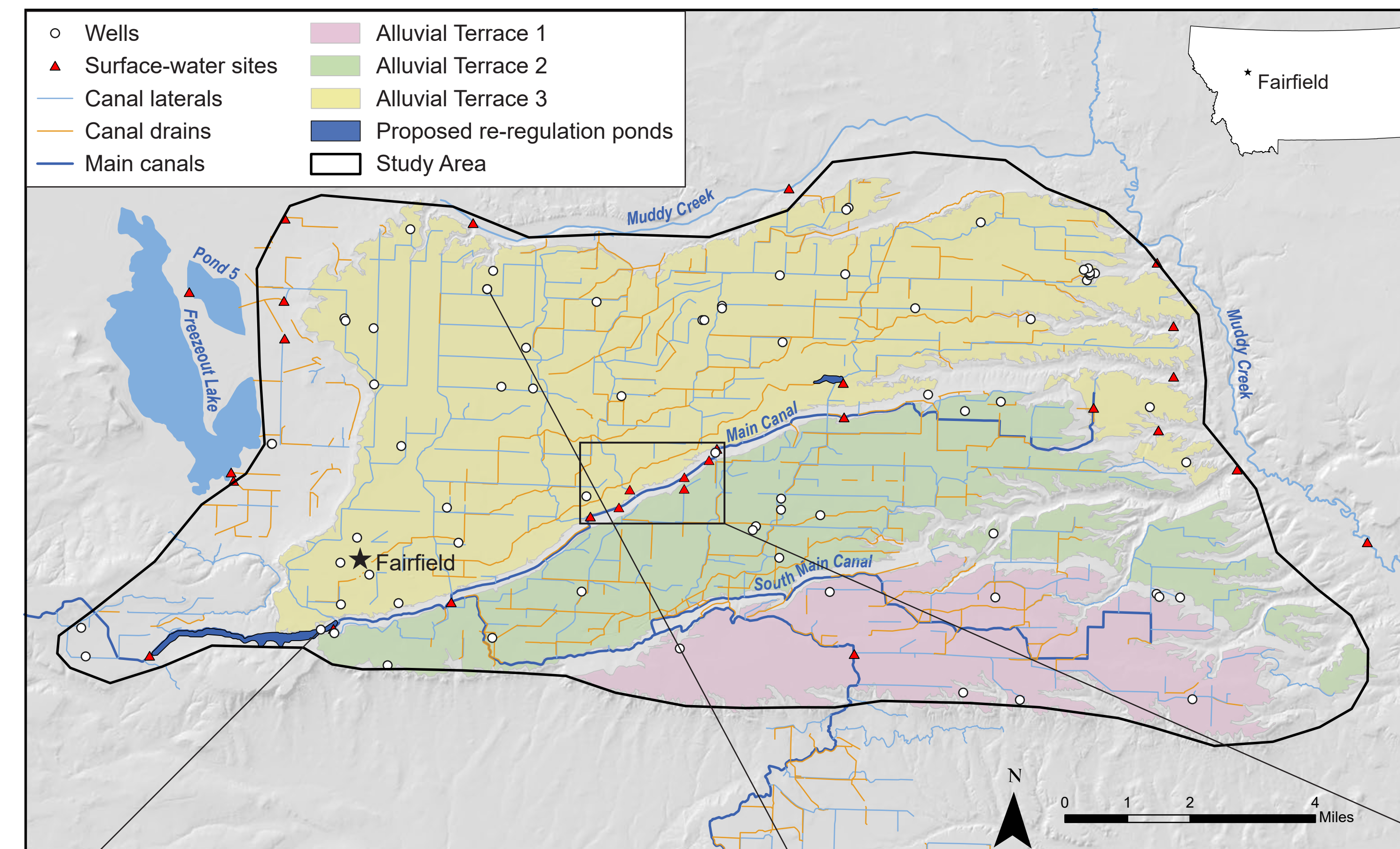
## 3. PREVIOUS STUDIES

Osborne and others, (1983) investigated the sources and quantities of runoff to the Muddy Creek drainage from the Greenfields Bench.<sup>5</sup> Two of the study's recommendations include:

- improving irrigation inefficiencies, such as increasing use of sprinklers, and
- optimizing the timing and amount of water delivery and irrigation.

Since the time of this study, many irrigators have transitioned from flood to pivot/sprinkler, and the proposed re-regulation ponds aim to optimize water delivery.

## 4. GROUNDWATER AND SURFACE-WATER MONITORING NETWORK

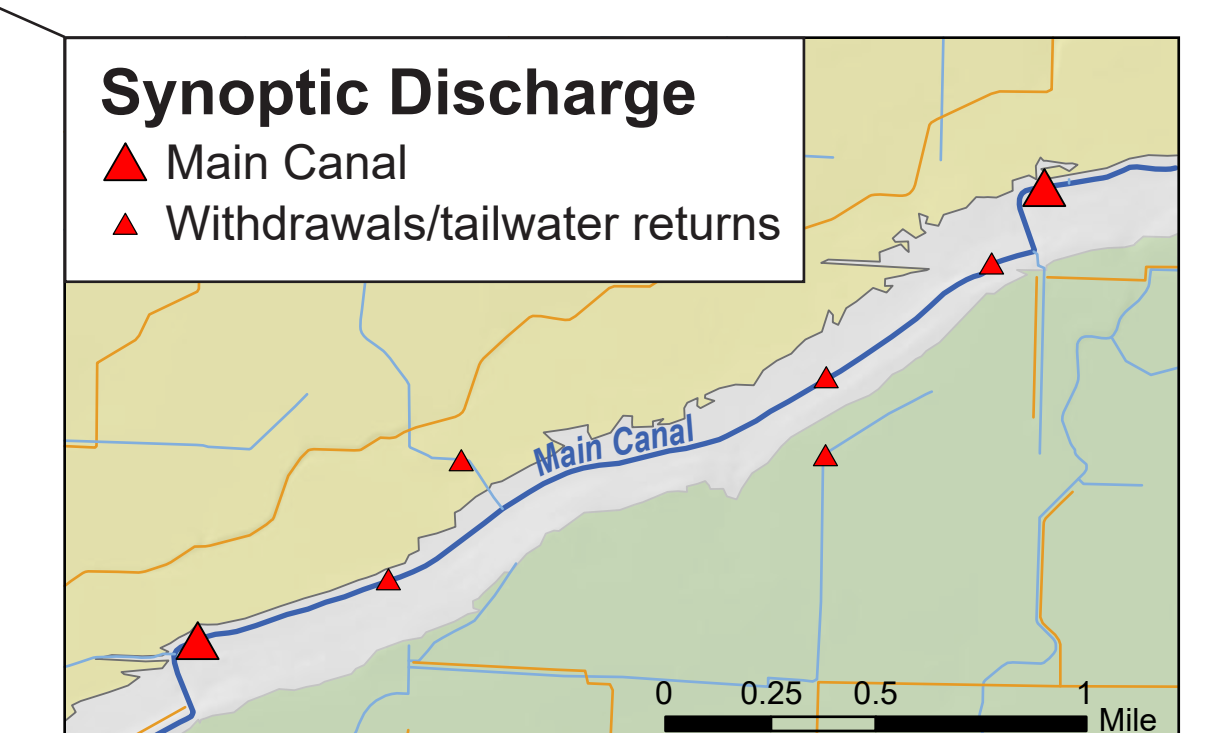
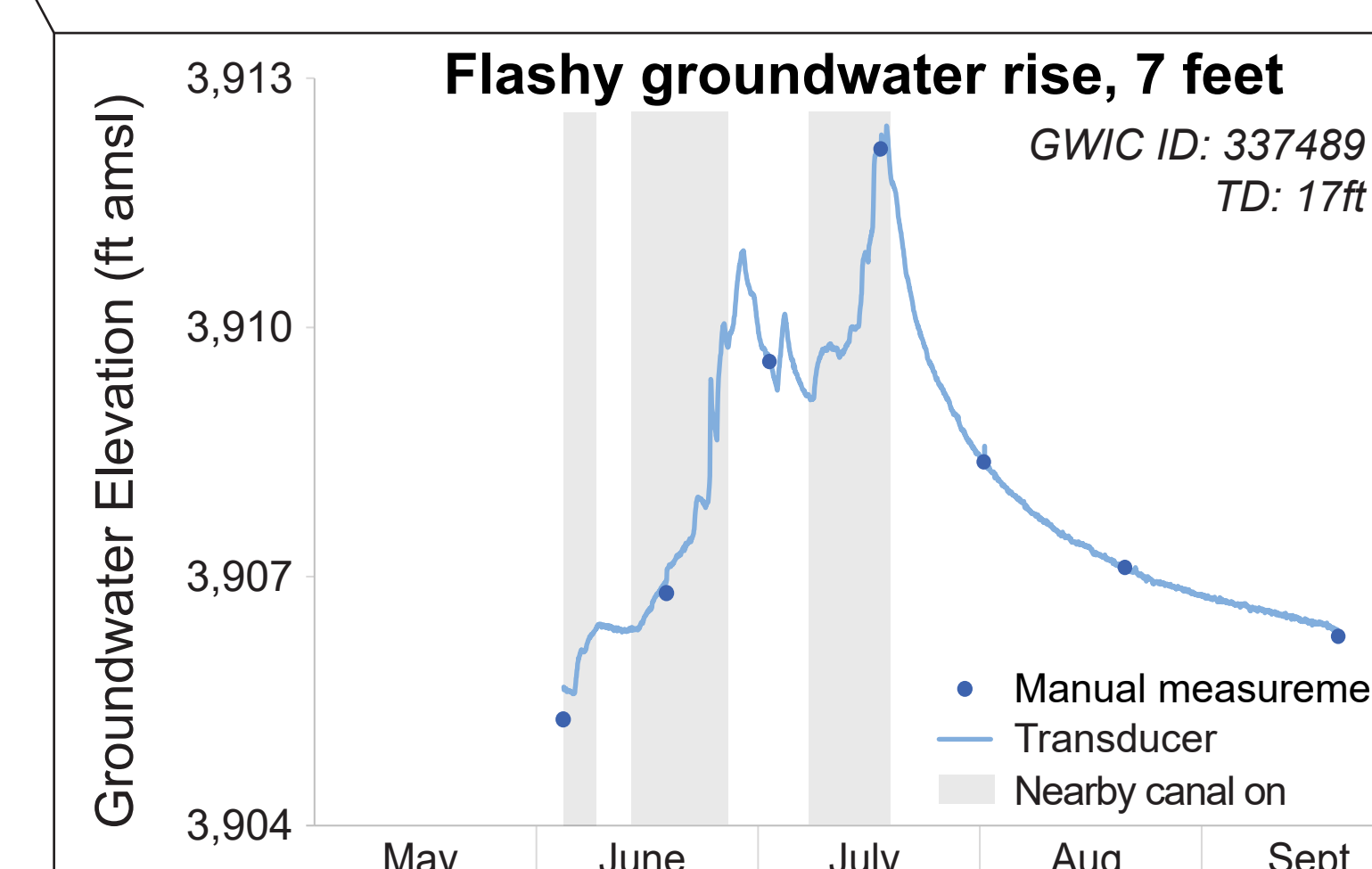
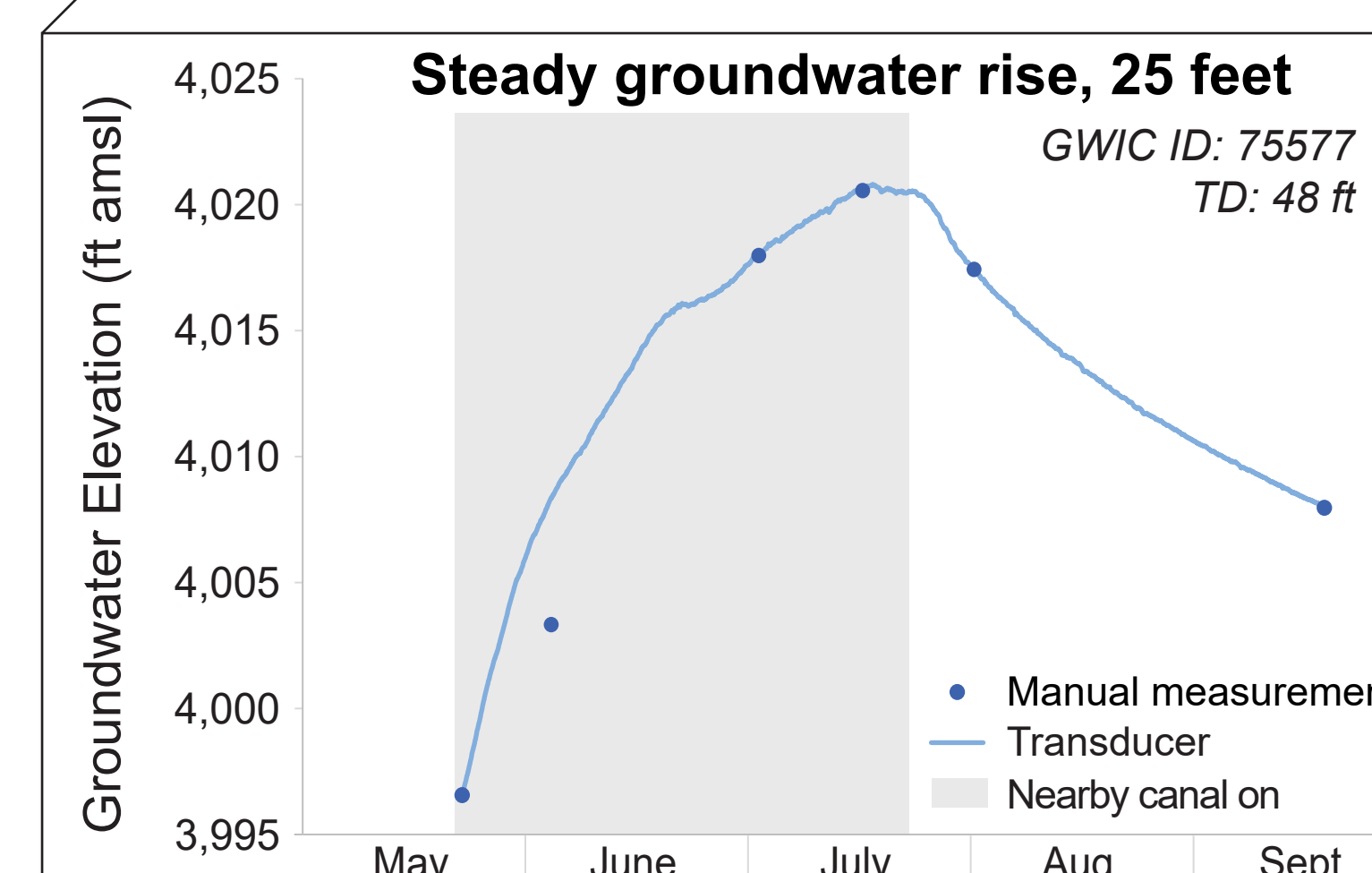


- 130 mi<sup>2</sup> study area with 280 miles of canals

- Aquifer is generally < 30 ft thick, and is comprised of three distinct alluvial terraces

- Well monitoring: monthly static water levels measured in all wells, with hourly water levels collected at 30 wells

- Surface-water monitoring: monthly discharge measurements and hourly stage levels



Preliminary data show canal seepage losses ranged from 4.1 to 4.9 cfs/mi at this location.

## 5. FUTURE FIELD WORK AND MODELING



- Data collection will continue in 2026.
- Field data will be used to develop a conceptual model and groundwater budget to quantify the relationship between irrigation and groundwater.
- A groundwater flow model will be built to test how hypothetical scenarios would impact groundwater on the Greenfields Bench, such as the proposed re-regulation ponds.

## 6. ACKNOWLEDGEMENTS

Thanks to landowners for allowing access and to GID and Sun River Watershed Group for proposing this project. Montana Tech graduate student Josie Grigsby provided assistance with field data collection and data entry.

## 7. REFERENCES

- <sup>1</sup>Jacobson, V., 2024, Low water levels lead to early August canal shut off, in Choteau Acantha
- <sup>2</sup>Jacobson, V., 2025, Fairfield imposes water-use restrictions, in Choteau Acantha
- <sup>3</sup>Bureau of Reclamation, Reclamation Information Sharing Environment, site: Pishkun Reservoir available at <http://data.usbr.gov/rise/api/result/> [Accessed August 2025]
- <sup>4</sup>Natural Resources Conservation Service (NRCS) National Water and Climate Center (NWCC), 2025, SNOTEL site: Wood Creek, available at <https://wcc.sc.egov.usda.gov/nwcc/tabget?state=MT> [Accessed September 2025]
- <sup>5</sup>Osborne, T.J., Noble, R.A., Zaluski, M., and Schmidt, F.A., 1983, Evaluation of the ground-water contribution to Muddy Creek from the Greenfield irrigation district, Cascade and Teton counties, Montana: Montana Bureau of Mines and Geology Open-File Report 113, 232 p.