Greenfields Irrigation Recharge to Groundwater

Montana Bureau of Mines and Geology Ground Water Investigation Program

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MBMG

Montana Bureau of Mines and Geology

A non-regulatory research Bureau for the State of Montana
A department within Montana Tech of the University of Montana

Butte

Since **1919**, the MBMG has been the principal source of earth science information for the state of Montana

The MBMG mandate is to *conduct research and assist in the orderly development of the State's energy, mineral and water resources.*

Billings

Montana Bureau of Mines and Geology

Our mission is to provide information for the sound use of Montana's geological and water resources.

- **Established in 1919 to provide reliable and unbiased earth science information**
- **Non regulatory, applied research**

Geology

- ✓ Geologic Mapping
- ✓ Geohazards/Earthquake Studies
- ✓ Economic Geology
- ✓ Energy Resources

Water Resources

- ✓ Ground Water Assessment Program
- ✓ Ground Water Investigation Program
- ✓ State-wide groundwater monitoring network

https://www.mbmg.mtech.edu/




MBMG Data Center

Thursday, March 17, 2016

Welcome to MBMG's Data Center. Here you'll find shortcuts to the datasets from our different programs and projects.

Click on the icons for databases.

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AIM

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streams quakes MAPPER wells geology, borders, etc.

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Ground Water Investigation Program (GWIP)

- Nominated projects are prioritized by the Ground Water Assessment Steering Committee (MCA 2-15-1523).
- Prioritization is based on current and anticipated growth of agriculture, industry, housing, and commercial activity.
- The Greenfield Irrigation project was nominated by the Greenfield Irrigation District and the Sun River Watershed Group

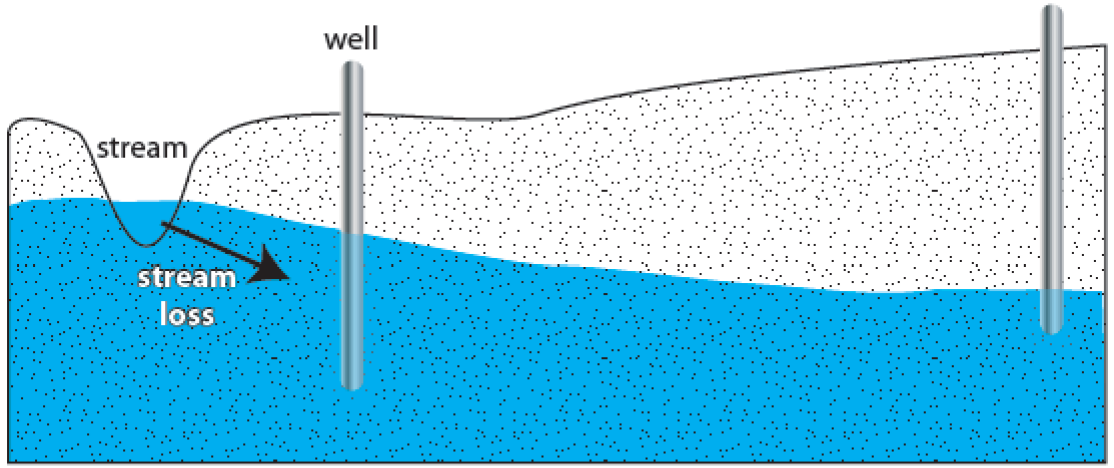
Greenfields Irrigation Recharge Study

Modernization of the canal system has the potential to reduce groundwater recharge. The MBMG will develop a conceptual groundwater model, develop a groundwater budget, and construct a computer flow model (MODFLOW) to investigate potential impacts and mitigation measures.

Field data collection will be 2025 to mid-2026.

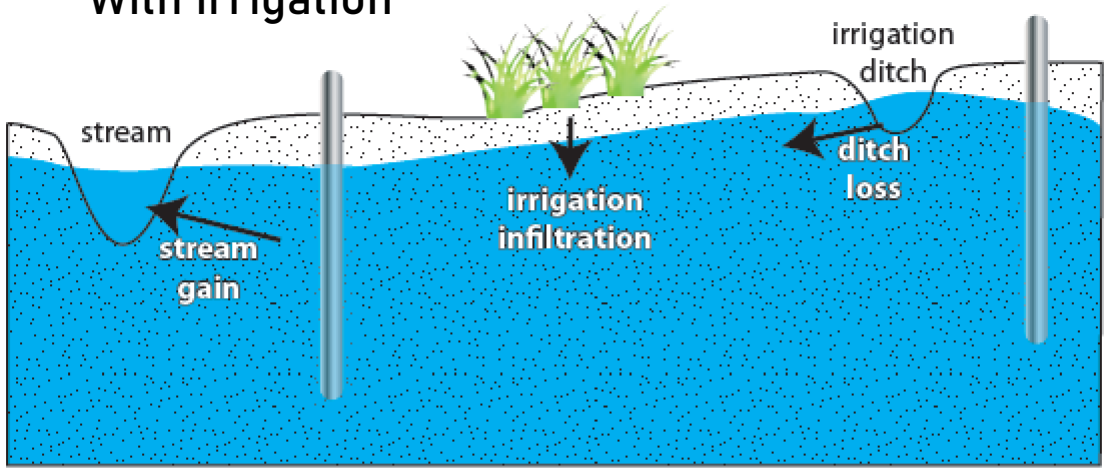
Schematic of irrigation recharge

Without irrigation

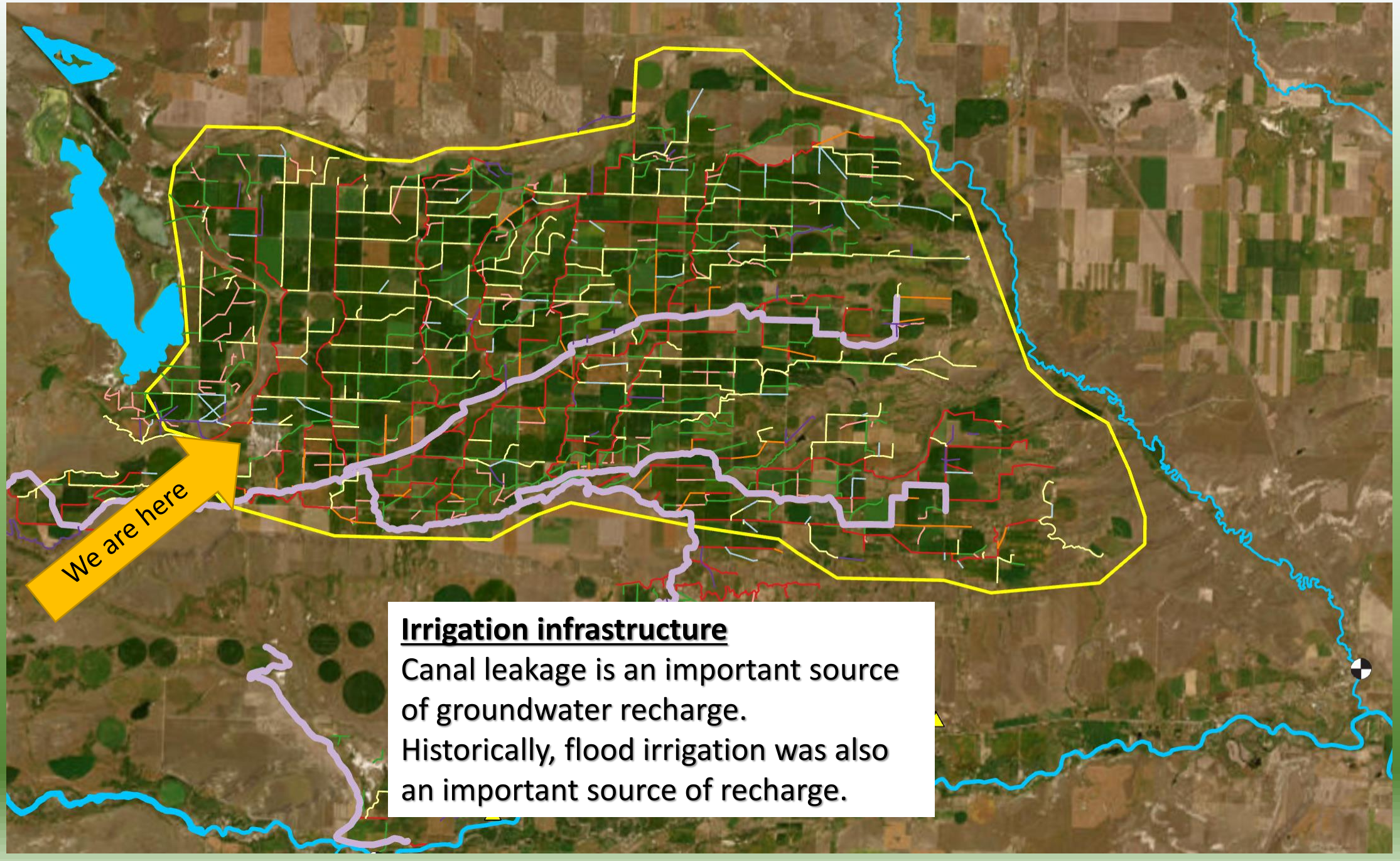


Prior to the introduction of irrigation, alluvial groundwater levels reflect stream stage, local precipitation, and bedrock aquifer contributions.

With irrigation



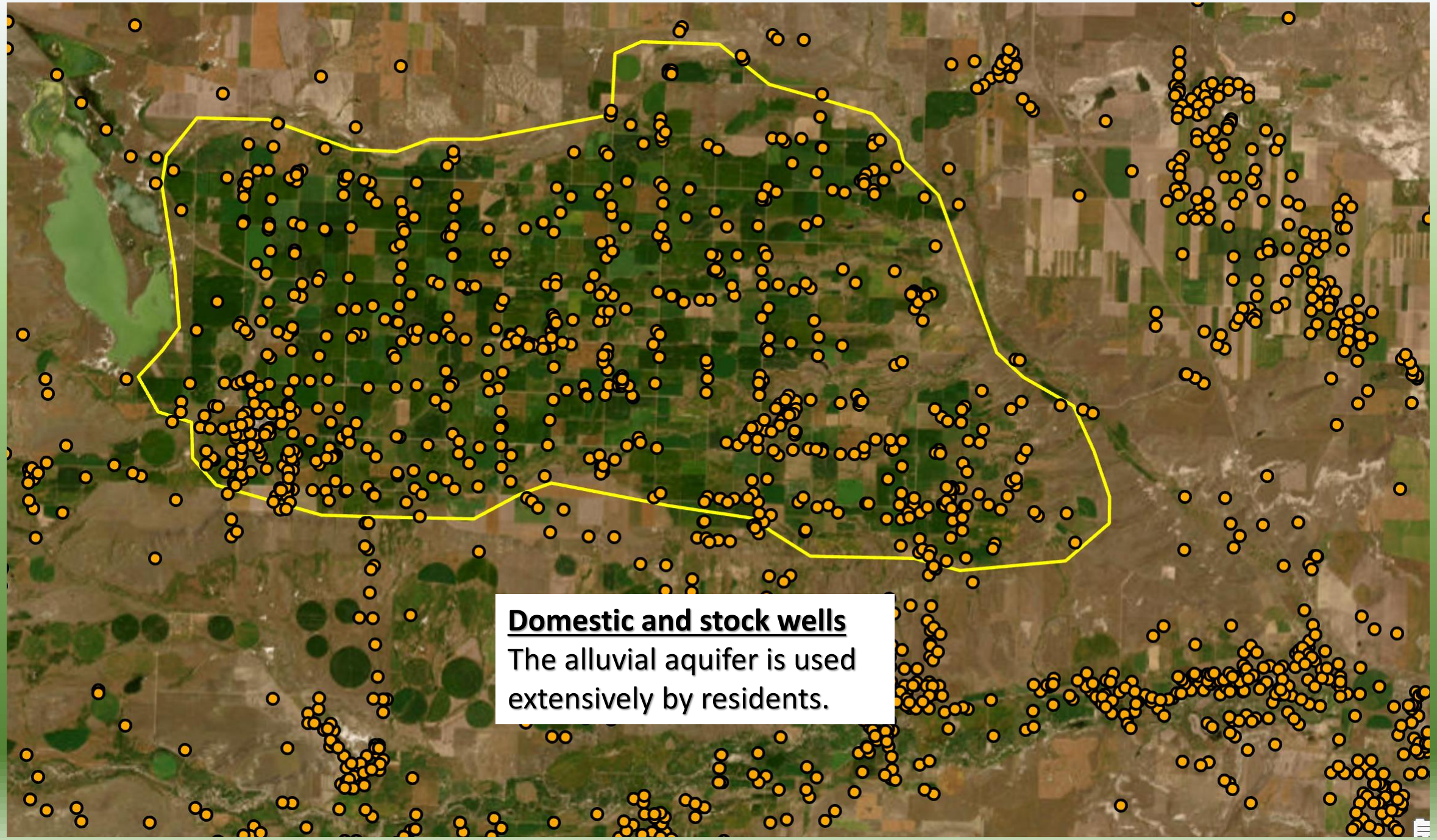
Irrigation supplies water to shallow, alluvial aquifers through ditch leakage and through infiltration from applied irrigation water. Wells in these augmented systems are more productive and reliable. Longer storage and retention times increase late season stream flows. Infiltration rates from irrigation vary by irrigation type, crops, soils, and climate.

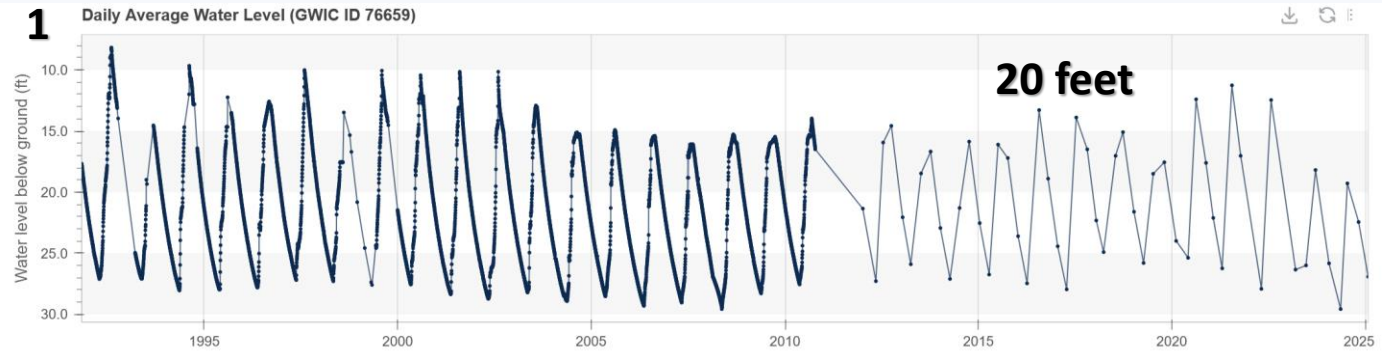


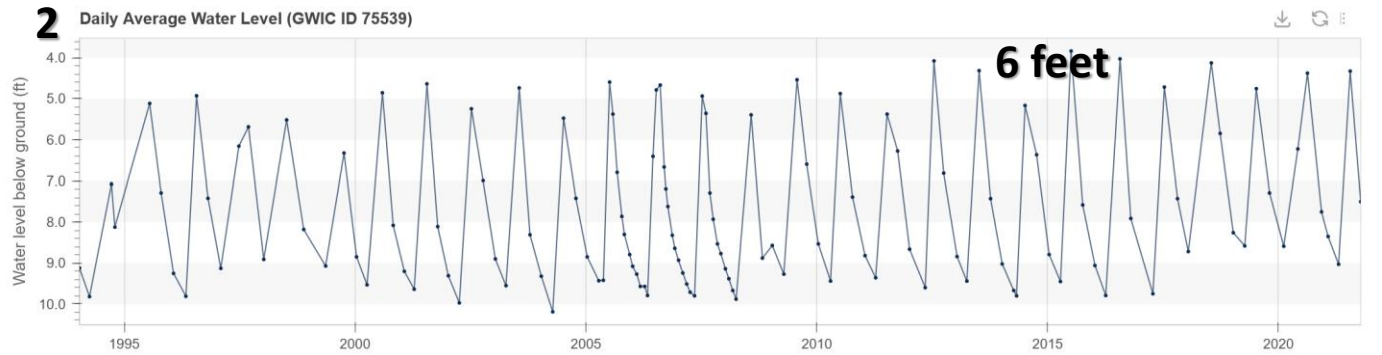
Irrigation infrastructure

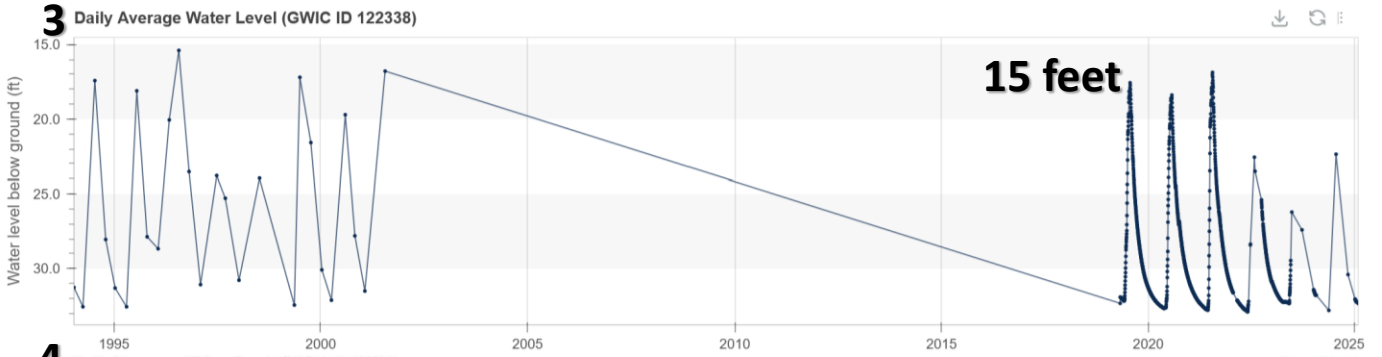
Canal leakage is an important source of groundwater recharge.

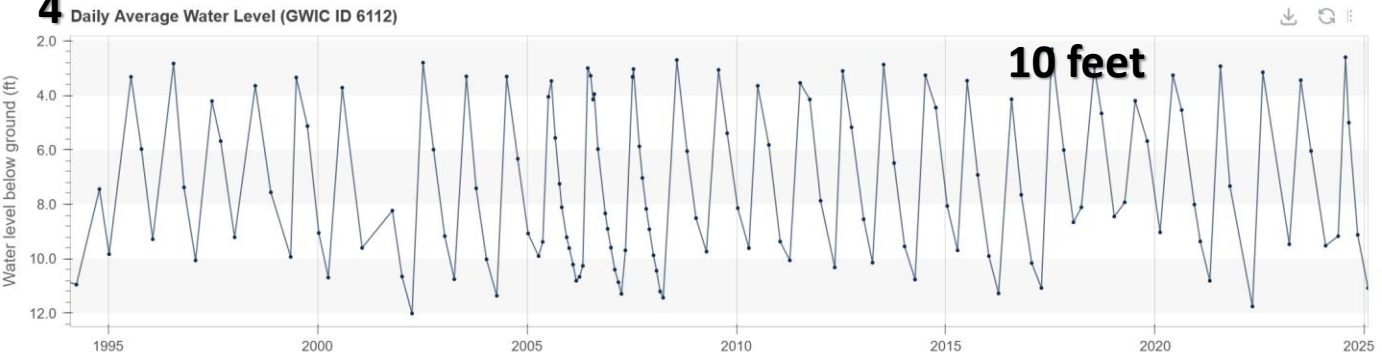
Historically, flood irrigation was also an important source of recharge.

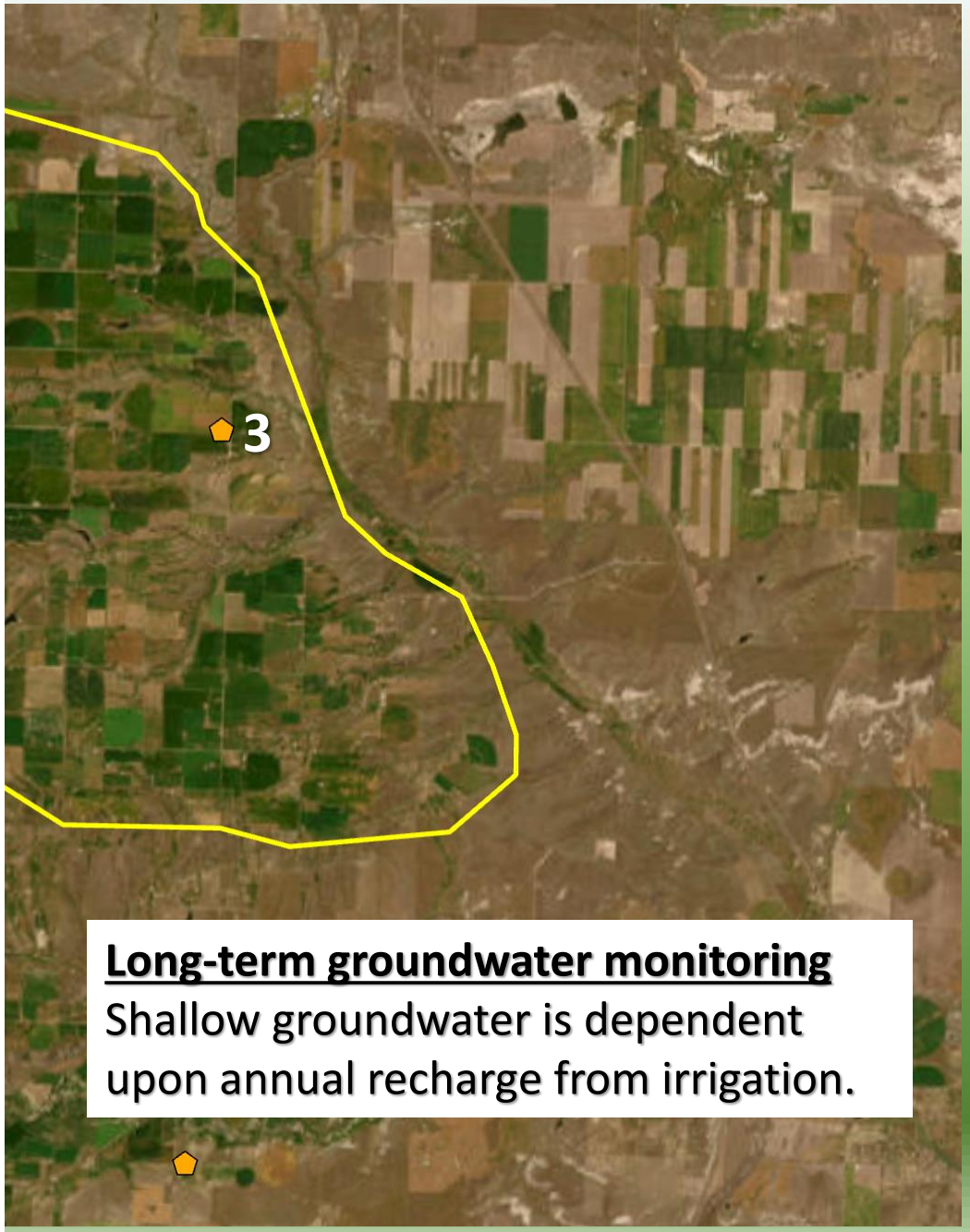

Domestic and stock wells
The alluvial aquifer is used extensively by residents.





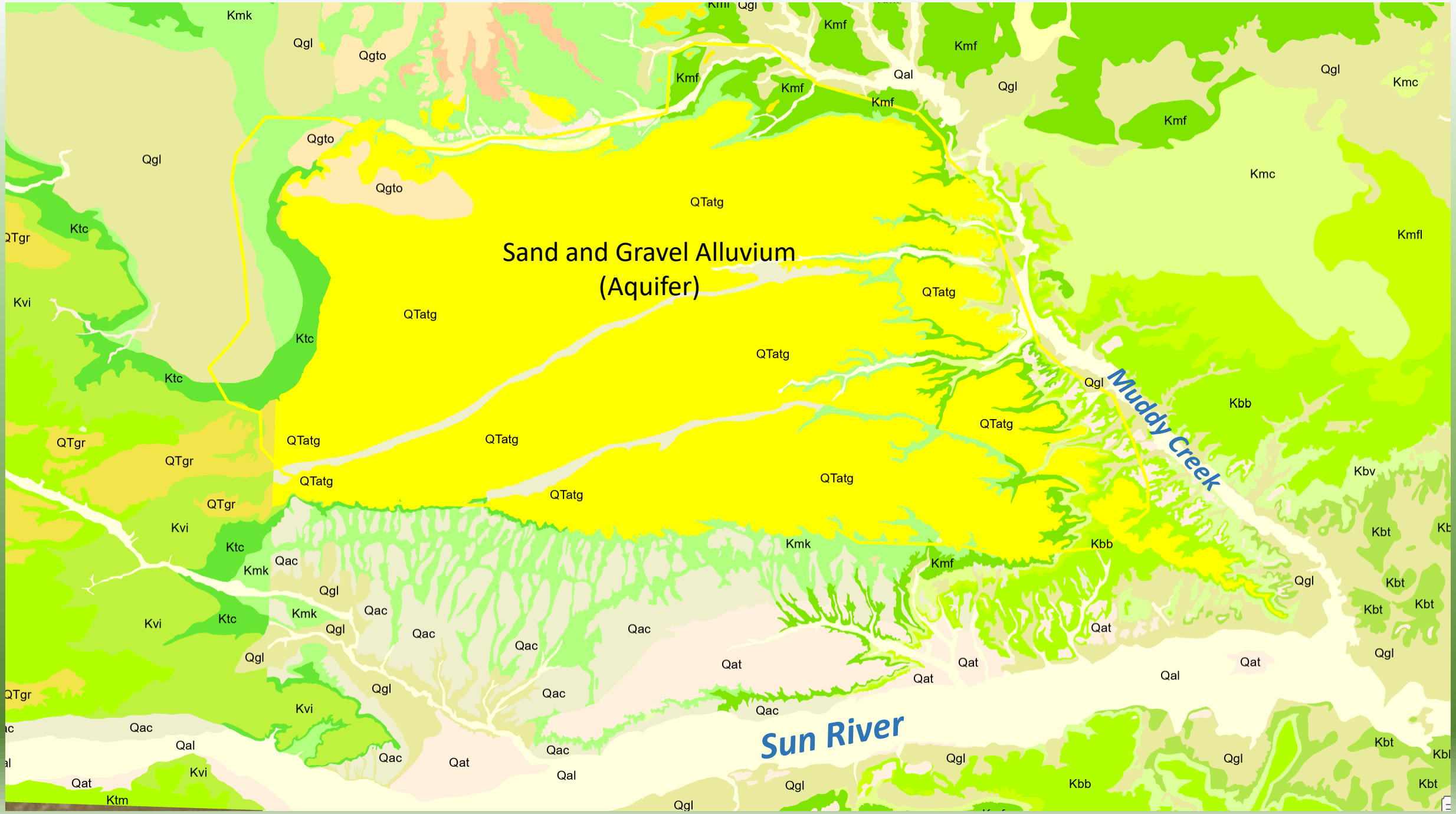






<u>Long-term groundwater monitoring</u>

Shallow groundwater is dependent upon annual recharge from irrigation.


Sand and Gravel Alluvium
(Aquifer)
Muddy Creek
Sun River
QTatg
Qgl
Qgto
Kmf
Kmc
Kmfl
Kbb
Kbv
Kbt
Ktc
Kvi
QTgr
Kmk
Qac
Qal
Qat
Ktm

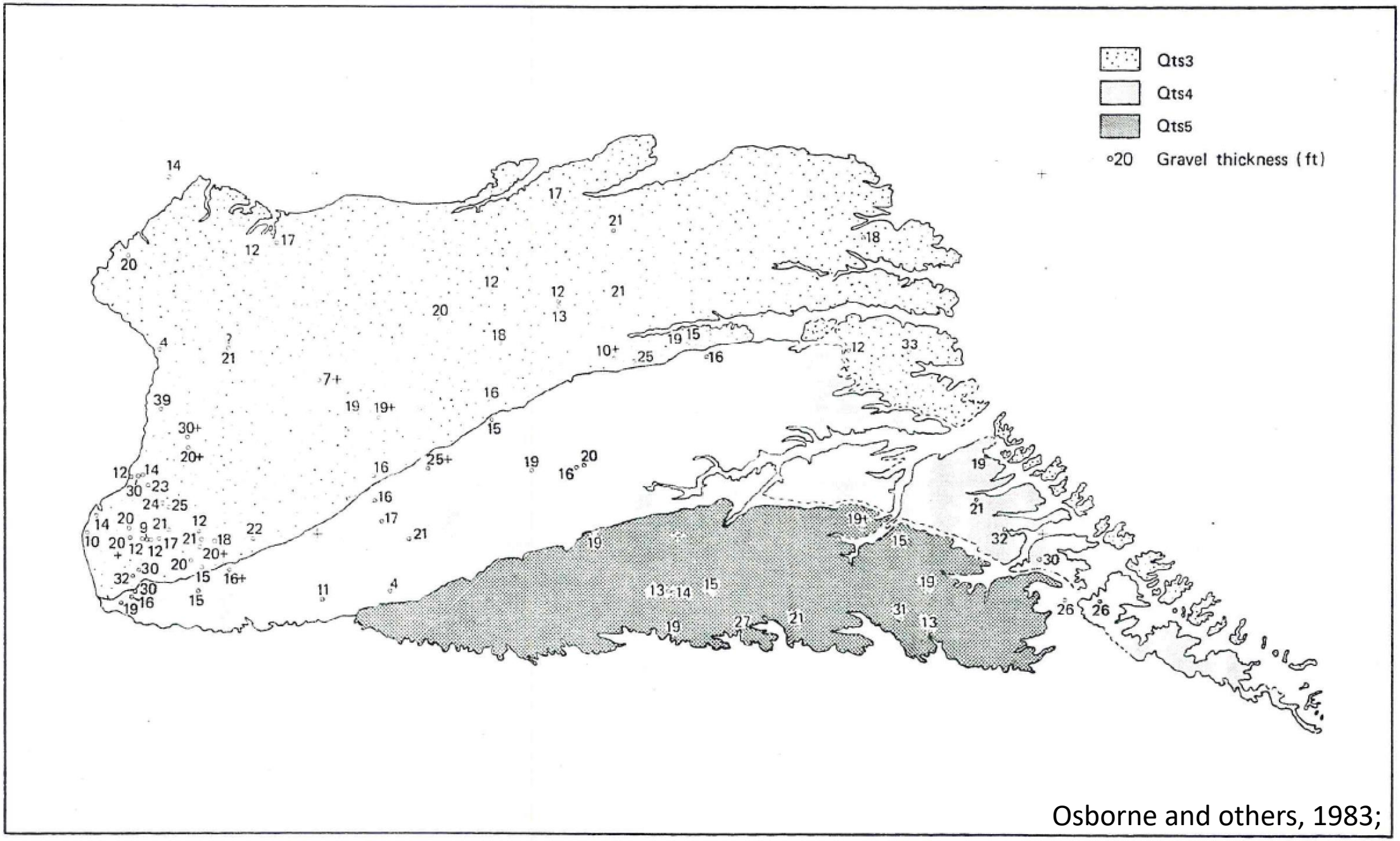


Figure 4 — Gravel terraces of the Greenfield Bench.

Osborne and others, 1983;
MBMG OFR 113

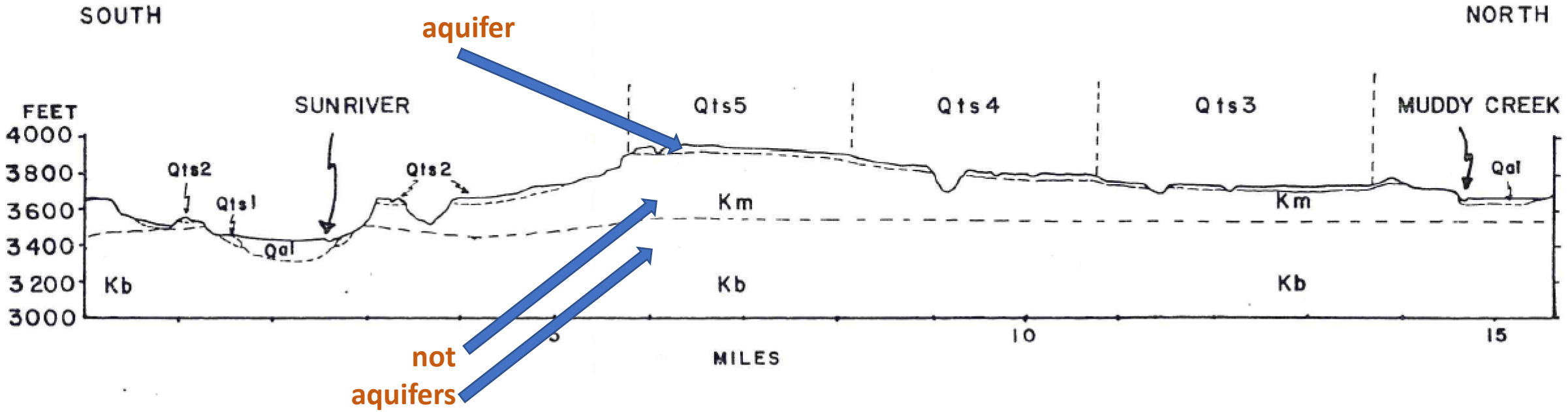


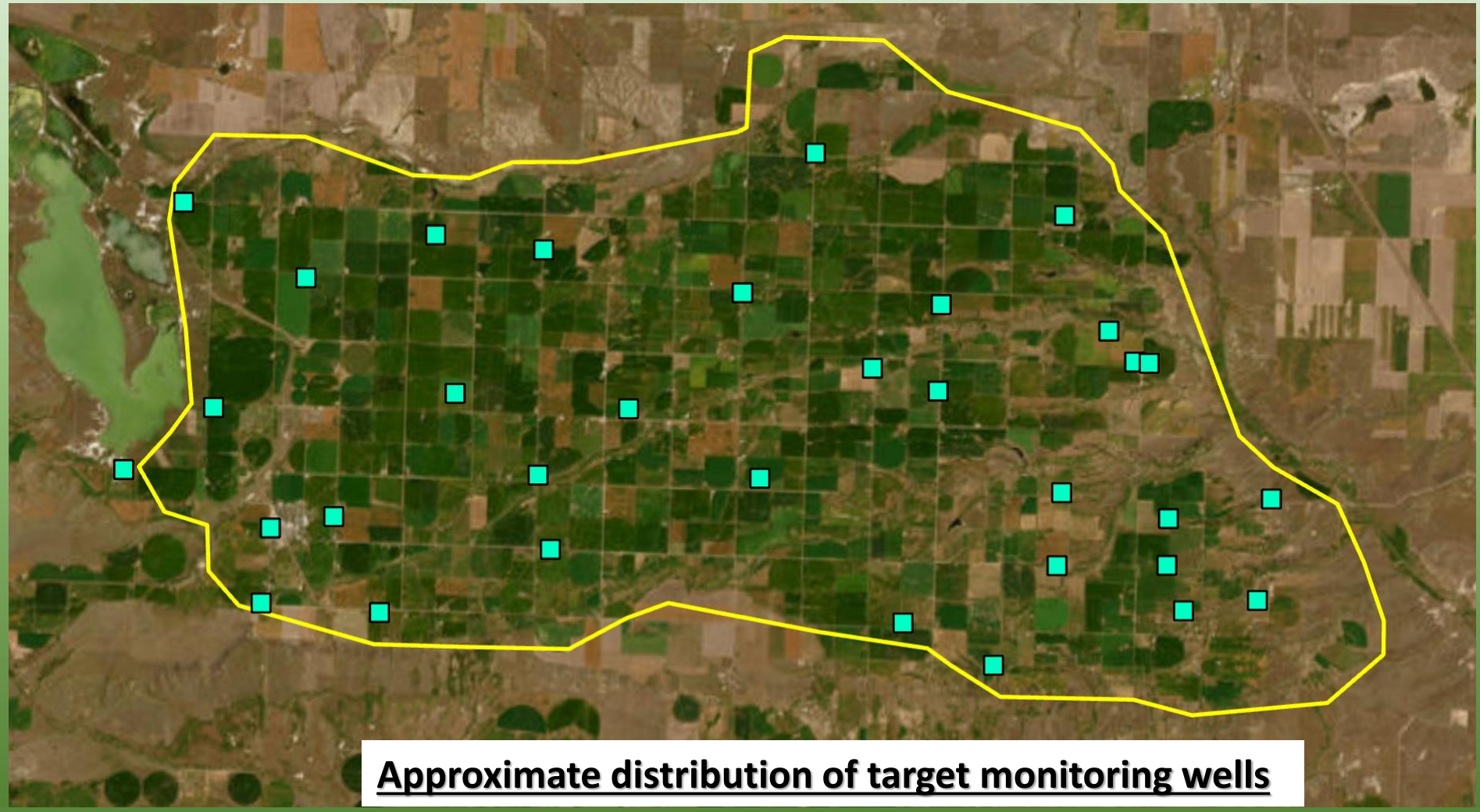
Figure 5 — Geologic cross-sections through the Greenfield Bench.

Osborne and others, 1983; MBMG OFR 113

We are looking for wells to include in our groundwater monitoring network.

If you are interested in having your water level measured either throughout the study, or once, please come visit us during the break!

THANK YOU!



Approximate distribution of target monitoring wells