Potential Upwelling in Rainwater Basin Playas

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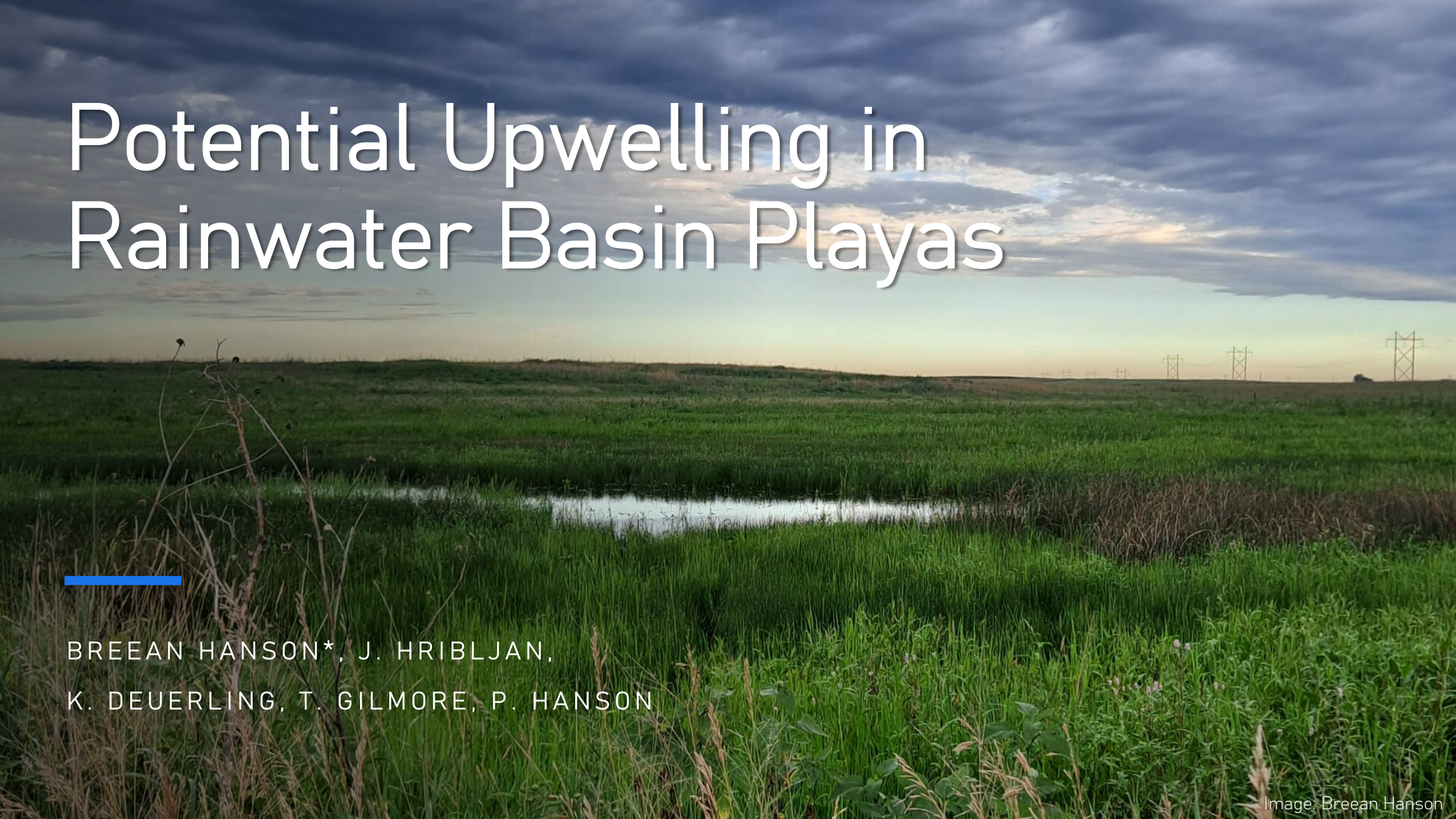
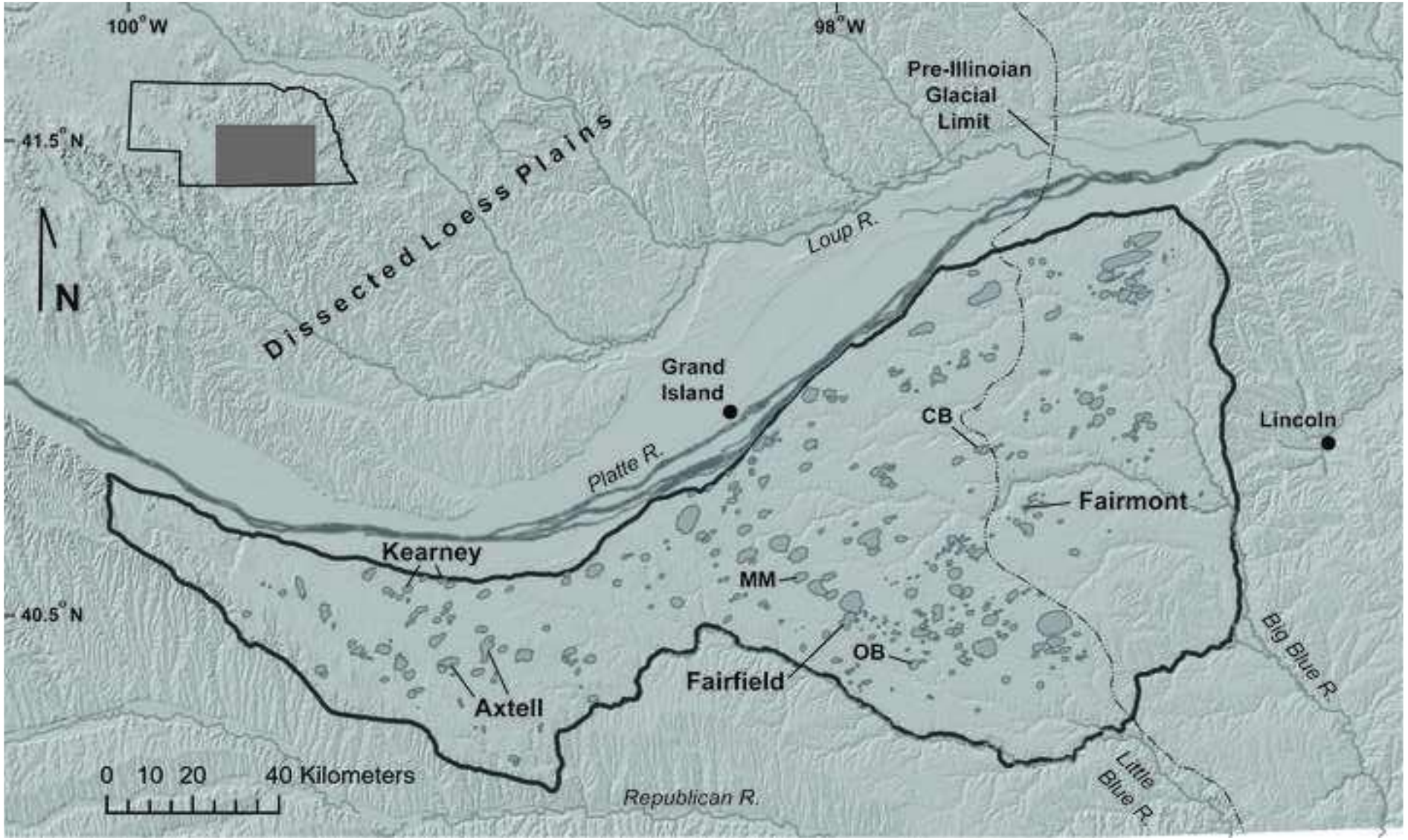


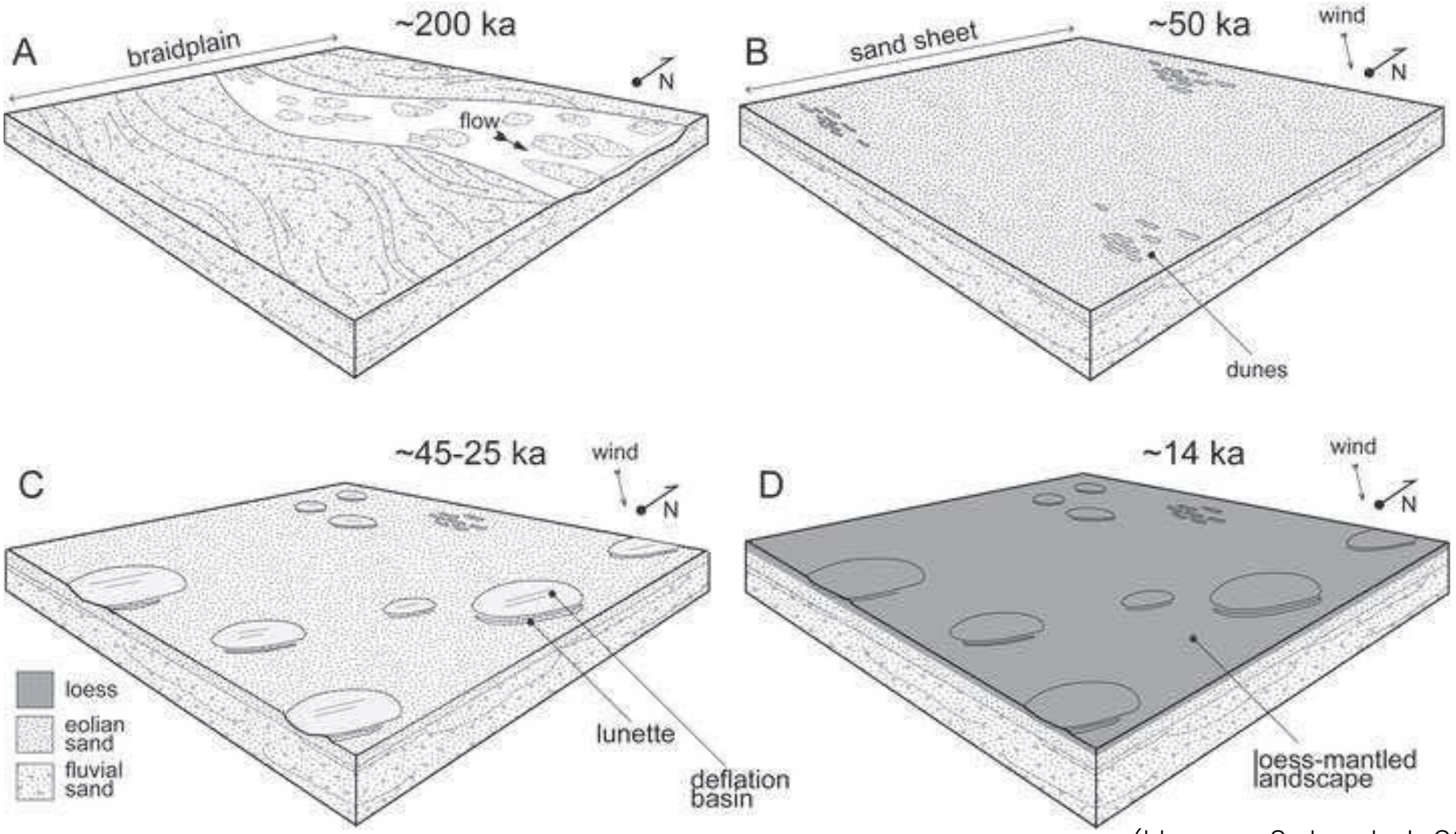
Image: Breean Hanson

Rainwater Basin Playa Distribution



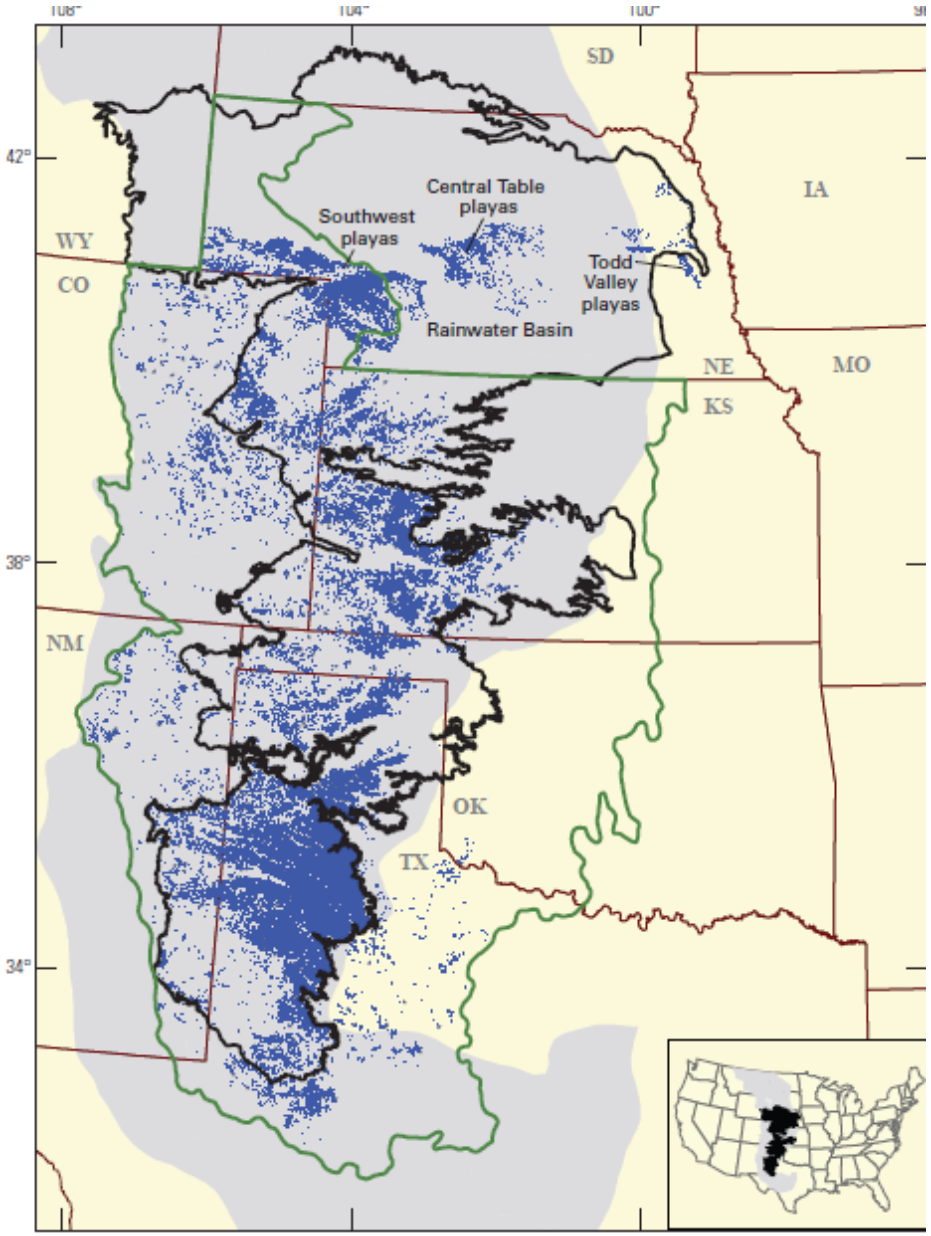
(Hanson & Joeckel, 2025)

Rainwater Basin Playa Formation



(Hanson & Joeckel, 2025)

Playas Recharge High Plains Aquifer



Base information from U.S. Geological Survey digital data, 1:100,000
Albers Equal-Area projection
Standard Parallels 29°30' and 45°30', central meridian –96°

0 50 100 150 MILES
0 50 100 150 KILOMETERS

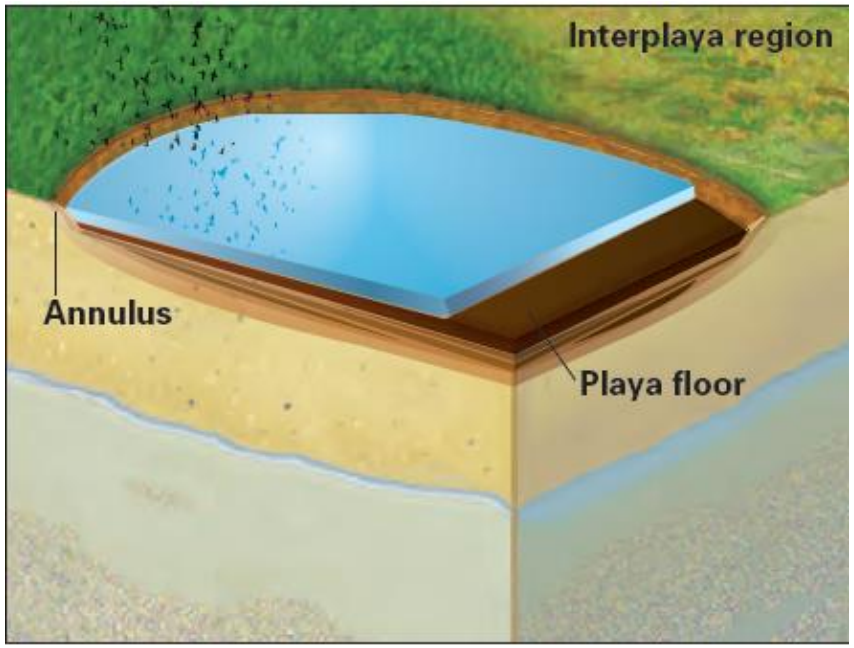
EXPLANATION

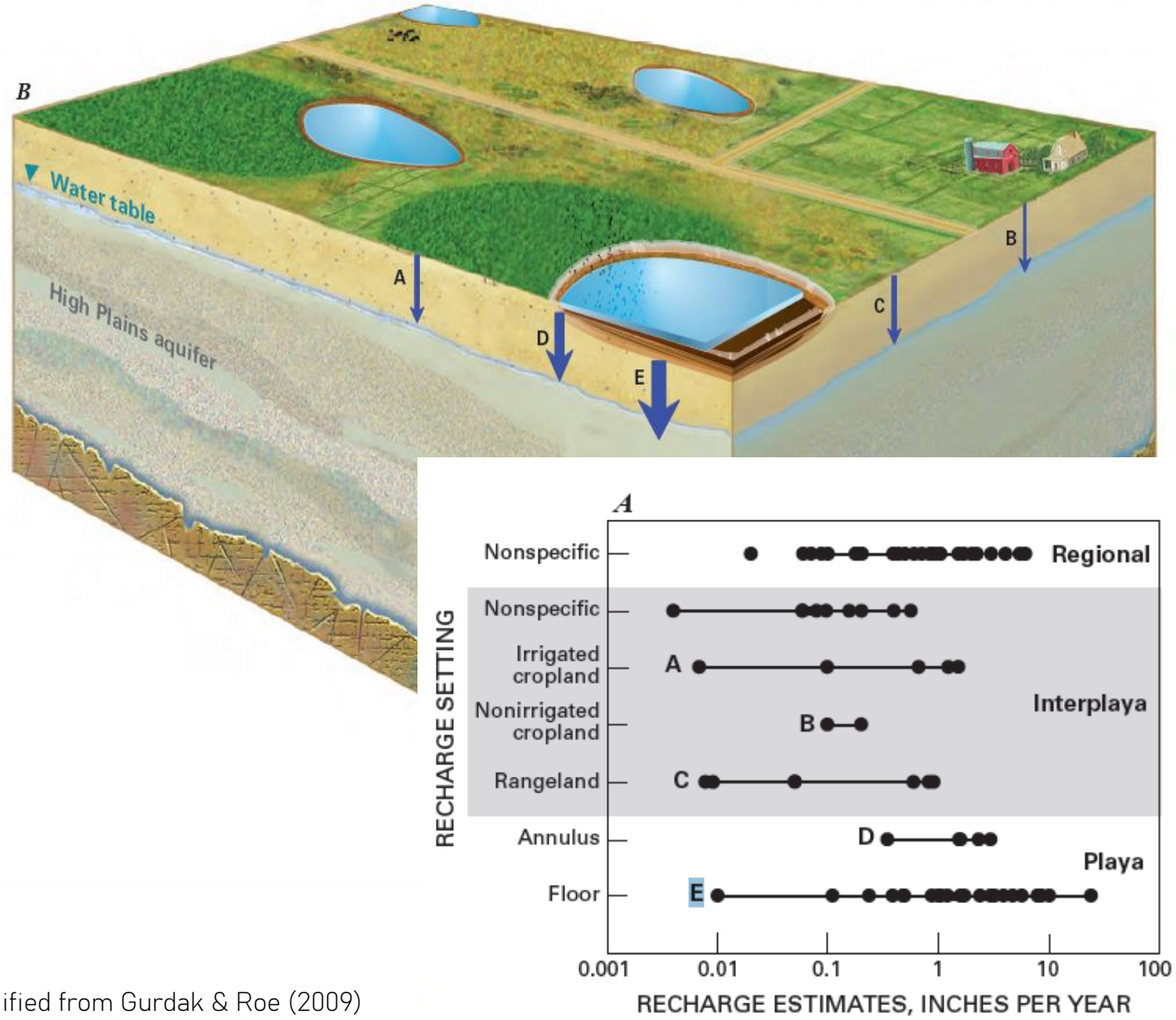
- Playas
- Great Plains physiographic province
- High Plains aquifer
- Playa Lakes Joint Venture (PLJV) boundary

Modified from Gurdak & Roe (2009)

Playa Wetland Model

- Clay-lined depressions retain rainwater → ephemeral wetlands
- Surface recharge concentrated in playas, less interplaya

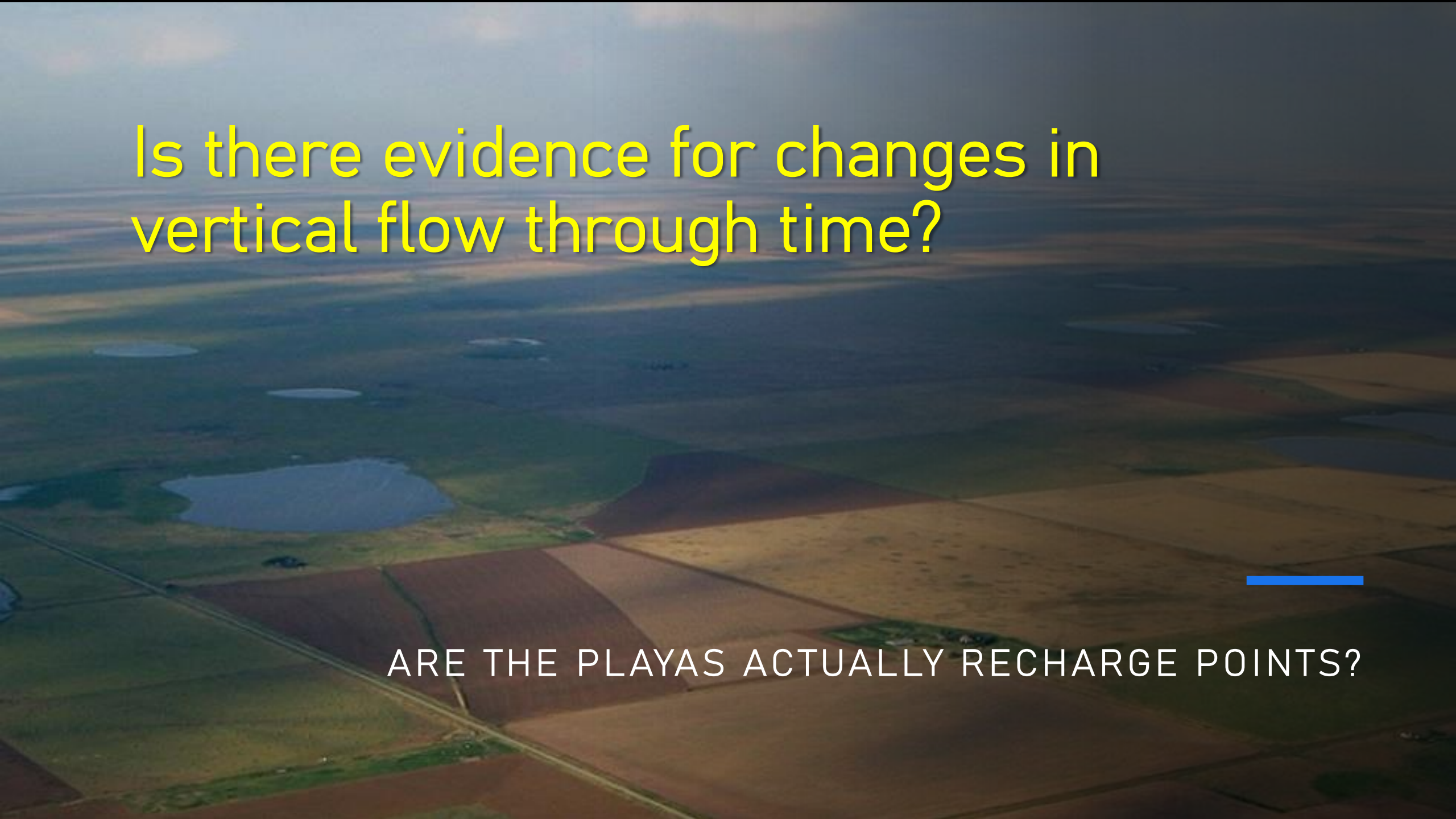


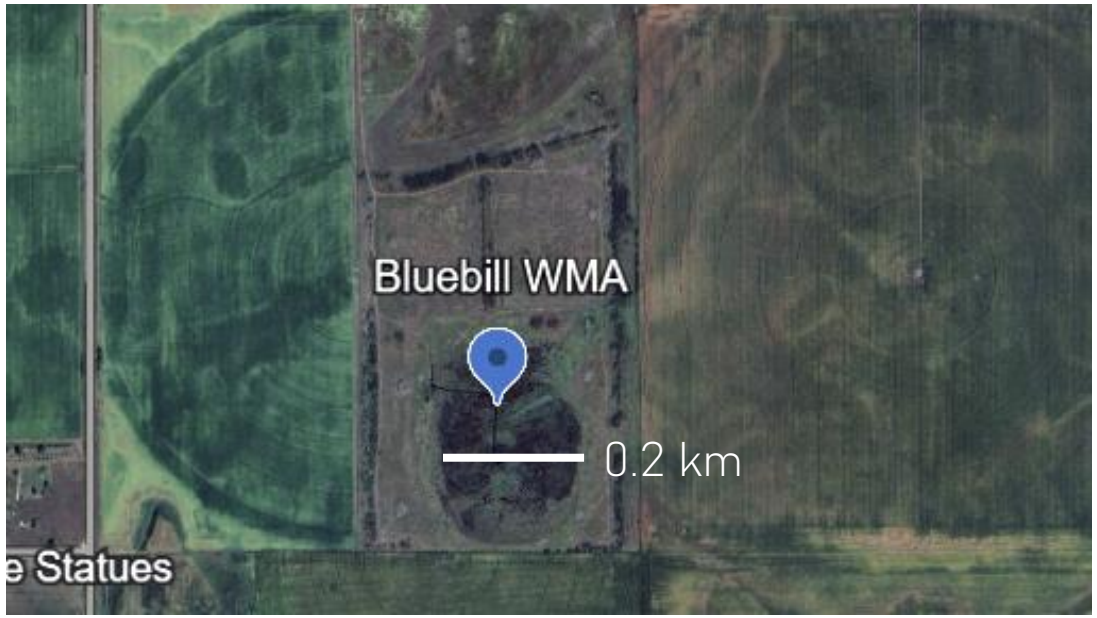


Modified from Gurdak & Roe (2009)

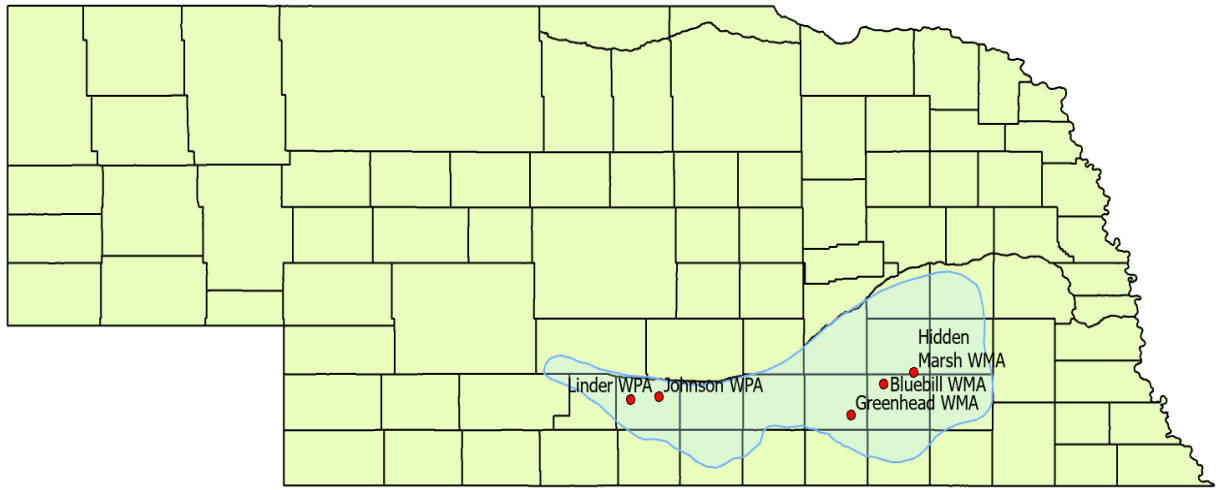
Significance: Migration Sites, Aquifer Chemistry

Image: Ethan Freese via NE Games & Parks


Is there evidence for changes in vertical flow through time?
ARE THE PLAYAS ACTUALLY RECHARGE POINTS?


Bluebill WMA
0.2 km
e Statues


Hidden Marsh WMA
0.2 km


Hidden
Marsh WMA
Linder WPA
Johnson WPA
Bluebill WMA
Greenhead WMA


Greenhead WMA
0.5 km

Instrumentation

Shallow wells

Piezometers

Rain loggers

Evapotranspiration sensor

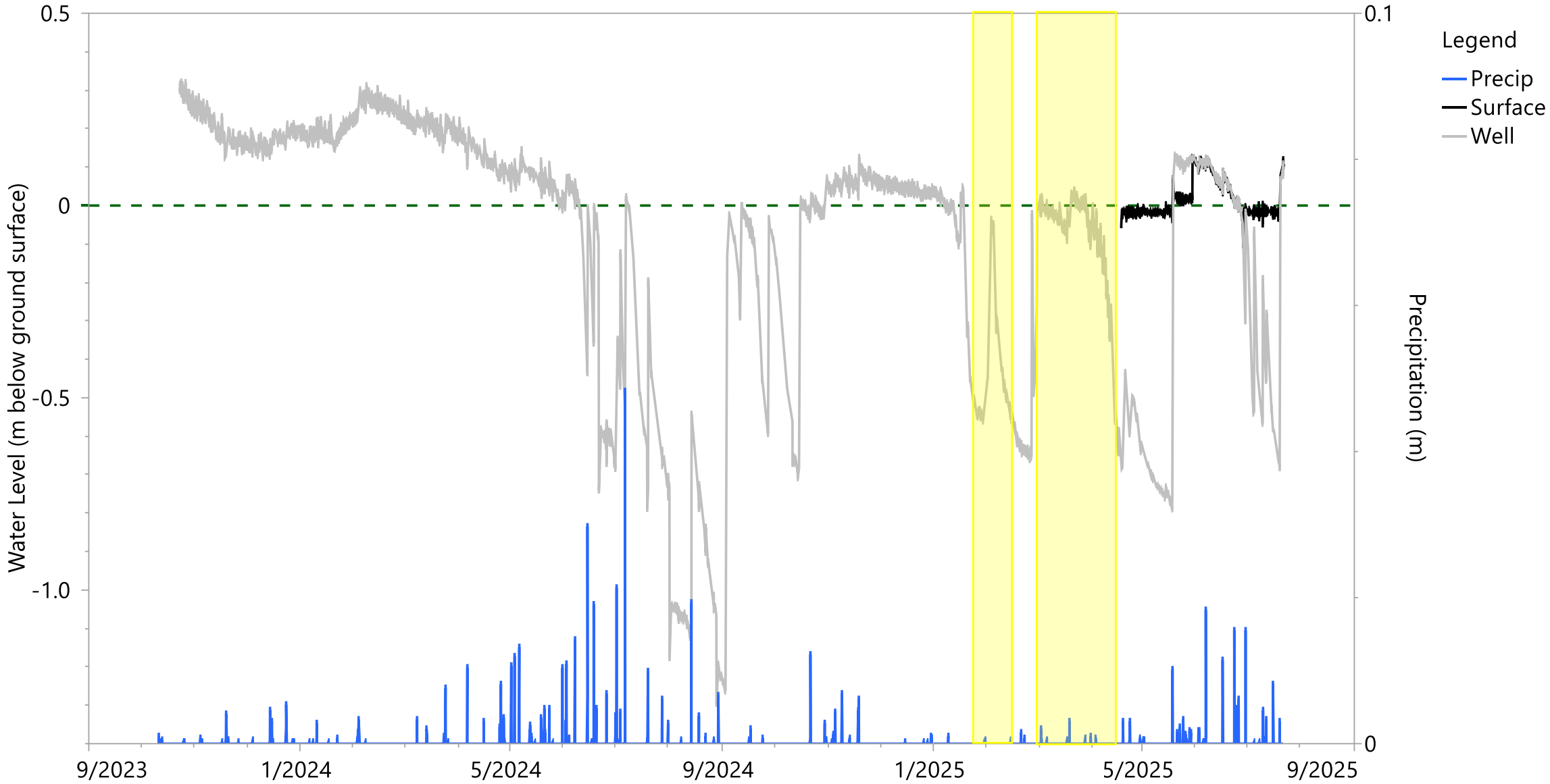
Late 2023-2024

2025

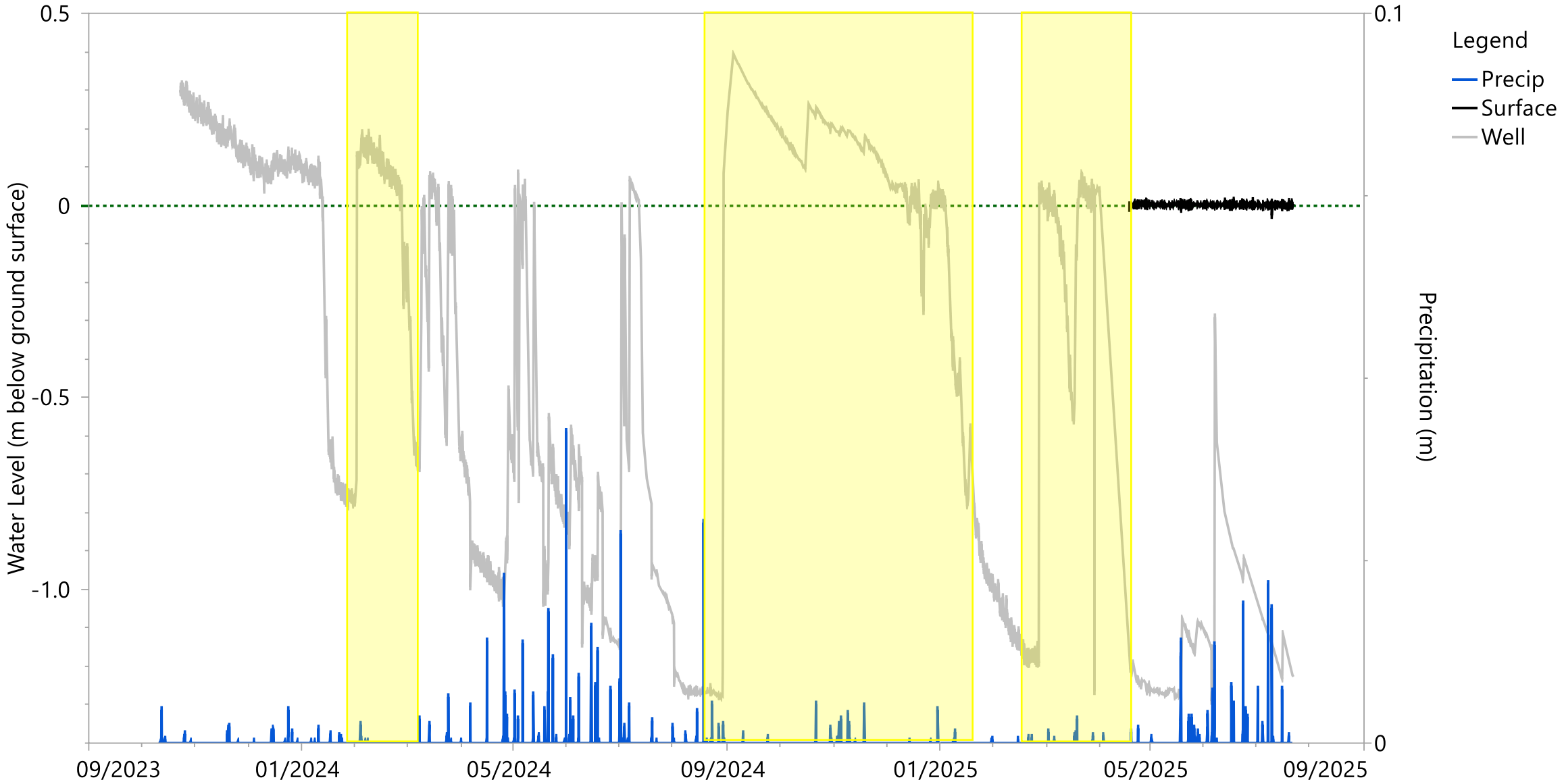
Focus on Hidden Marsh, Bluebill, and Greenhead

- Additional loggers
- Soil moisture and water potential probes

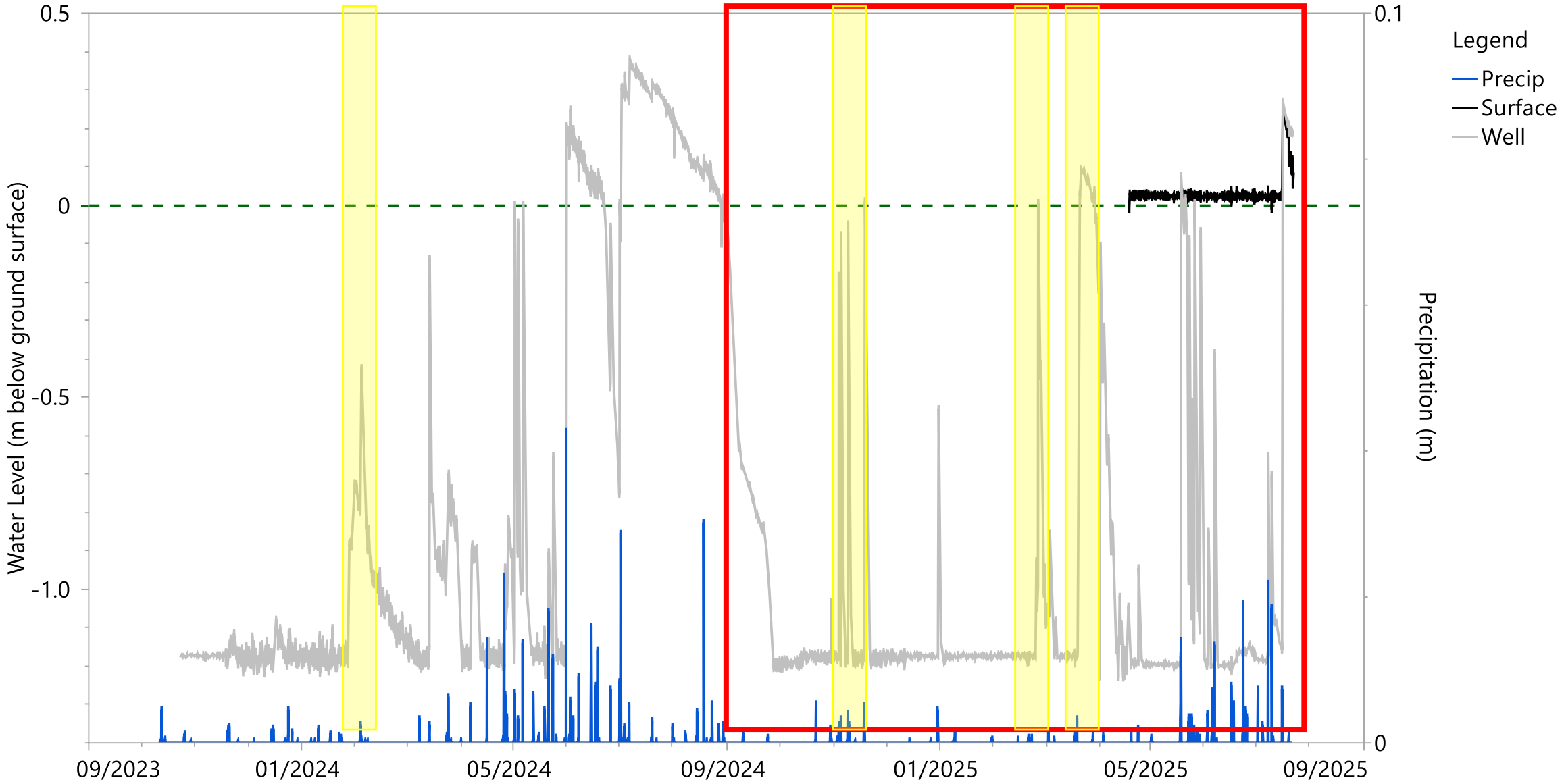
Greenhead


0.5
0
-0.5
-1.0
Water Level (m below ground surface)
0.1
0
Precipitation (m)
9/2023
1/2024
5/2024
9/2024
1/2025
5/2025
9/2025
Legend
Precip
Surface
Well

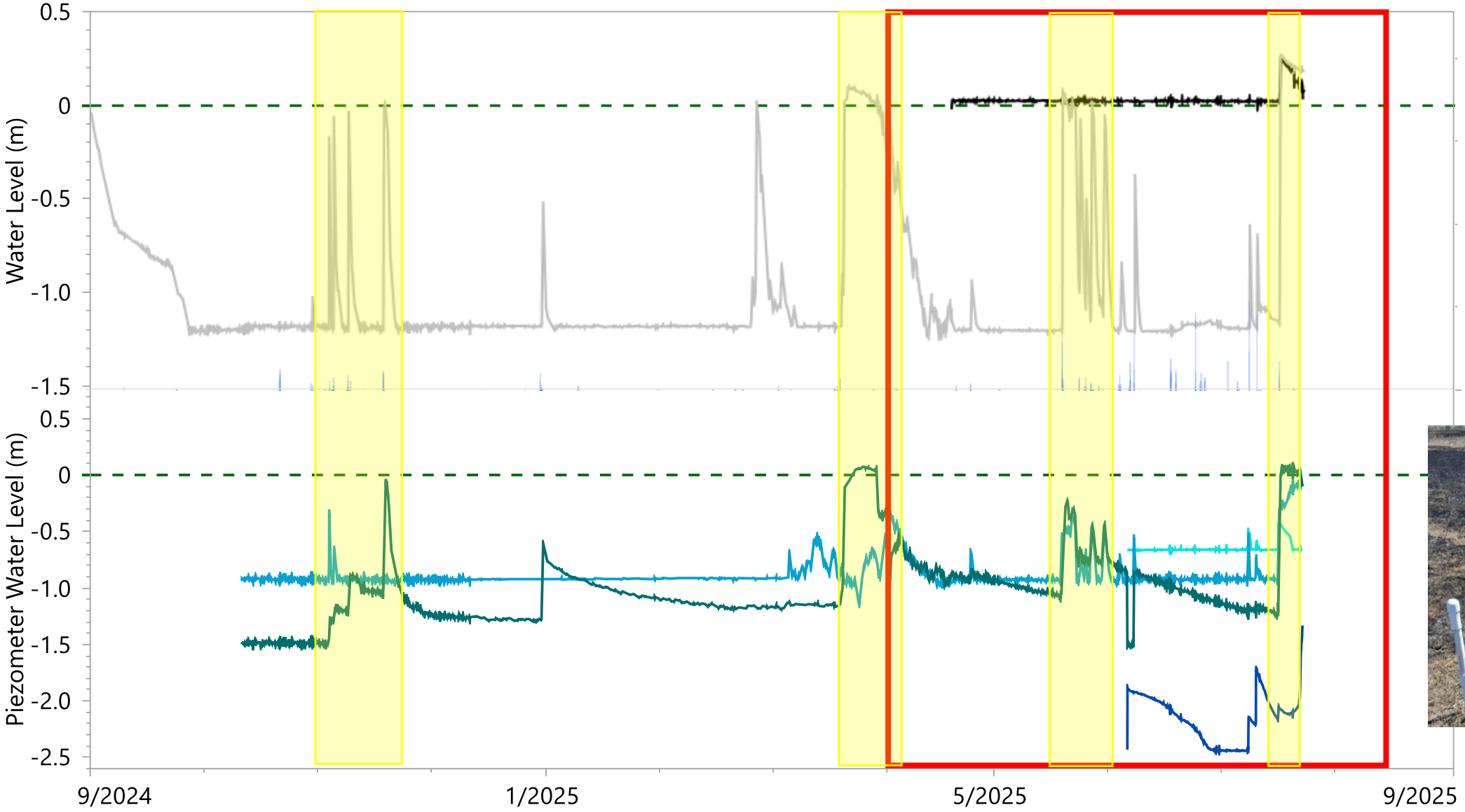
Bluebill


0.5
0
-0.5
-1.0
Water Level (m below ground surface)
0.1
0
Precipitation (m)
09/2023
01/2024
05/2024
09/2024
01/2025
05/2025
09/2025
Legend
Precip
Surface
Well

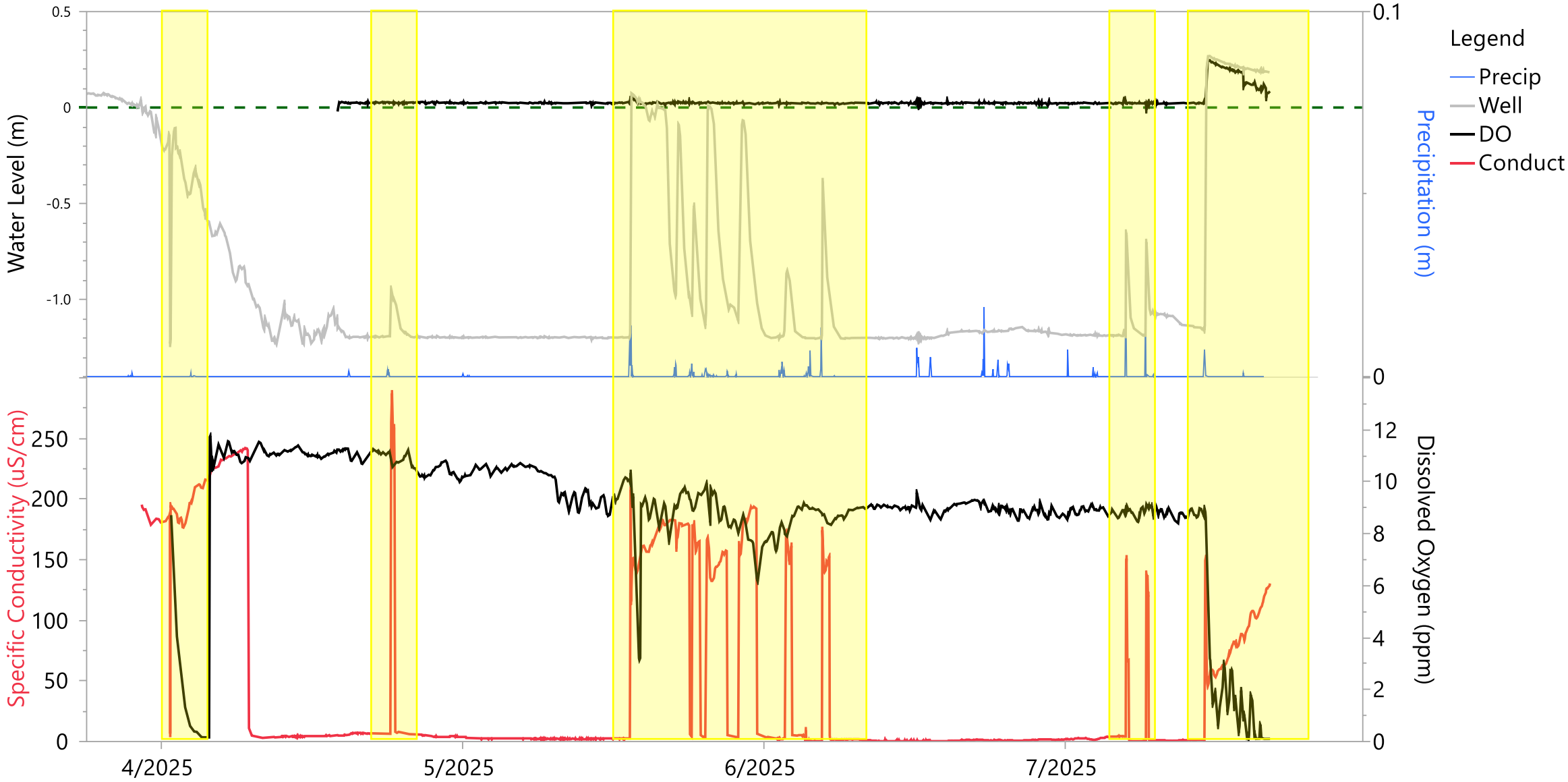
Hidden Marsh



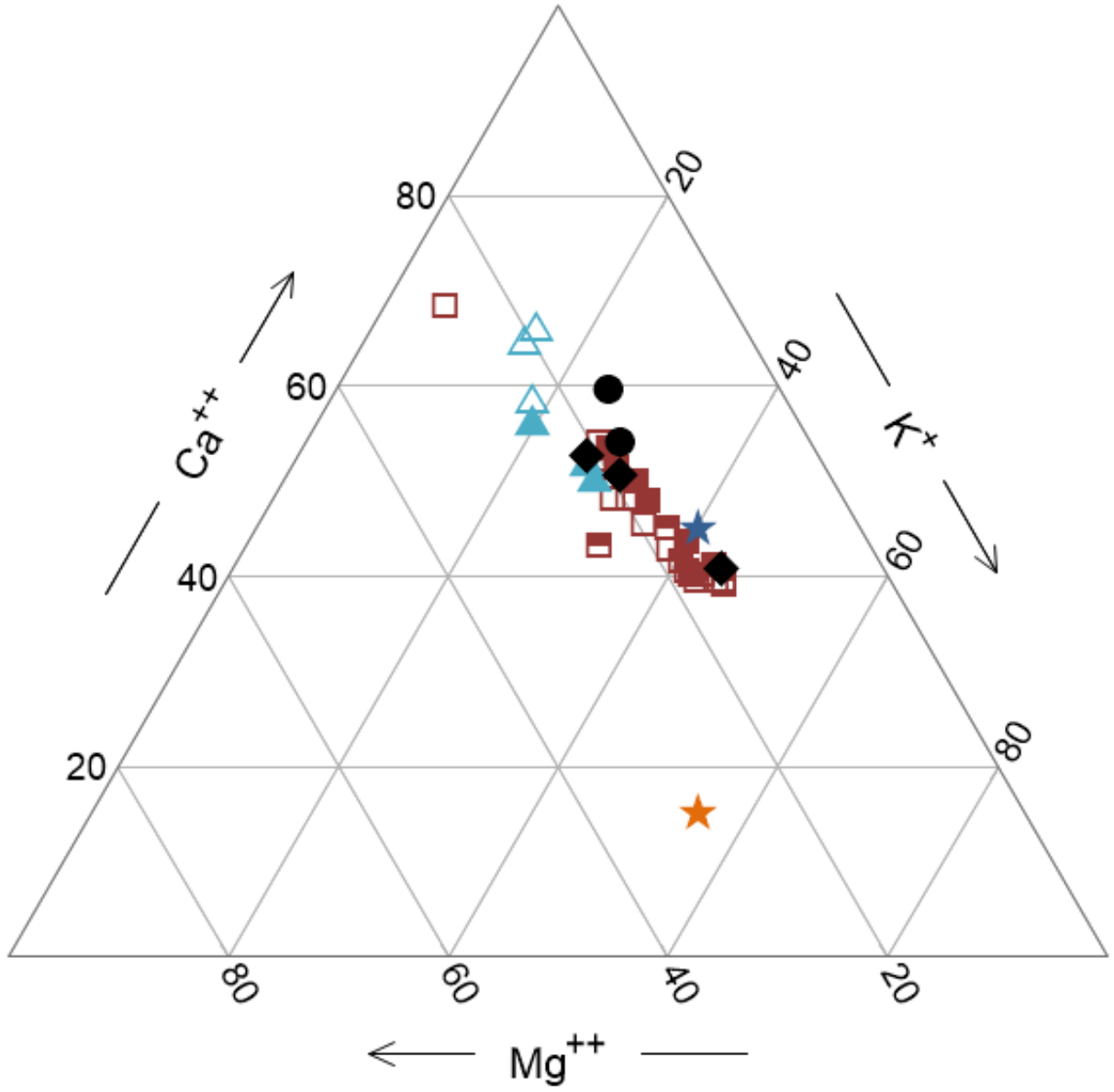
Hidden Marsh



Hidden Marsh

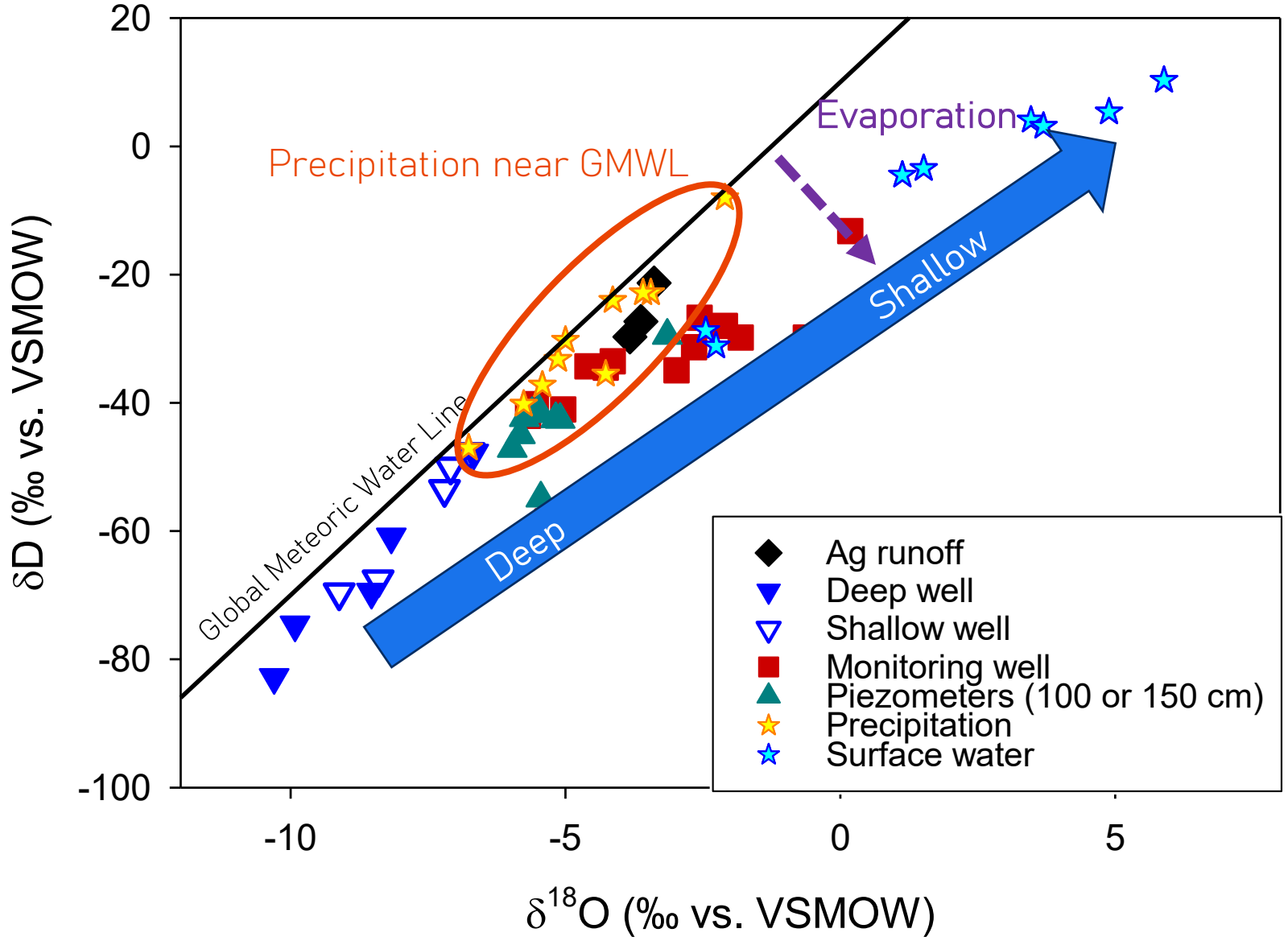


Chemistry: Hidden Marsh Cations



- Ag runoff
- Deep well
- Shallow well
- Monitoring well
- Piezometers (100 or 150 cm)
- Precipitation
- Surface water

Chemistry: Stable Isotopes (all sites)



- Evidence for upwelling occurring in times of low precipitation – ***opposite to classical model***
- ↑specific conductivity and ↓dissolved oxygen indicate long(er) flow path groundwaters

Future work:

1)Impact of hydrological regime on nutrient cycling

2)^{3}H age dates → relative flow path length

3)Correlating to irrigation/flooding timing as potential water sources + timeseries camera

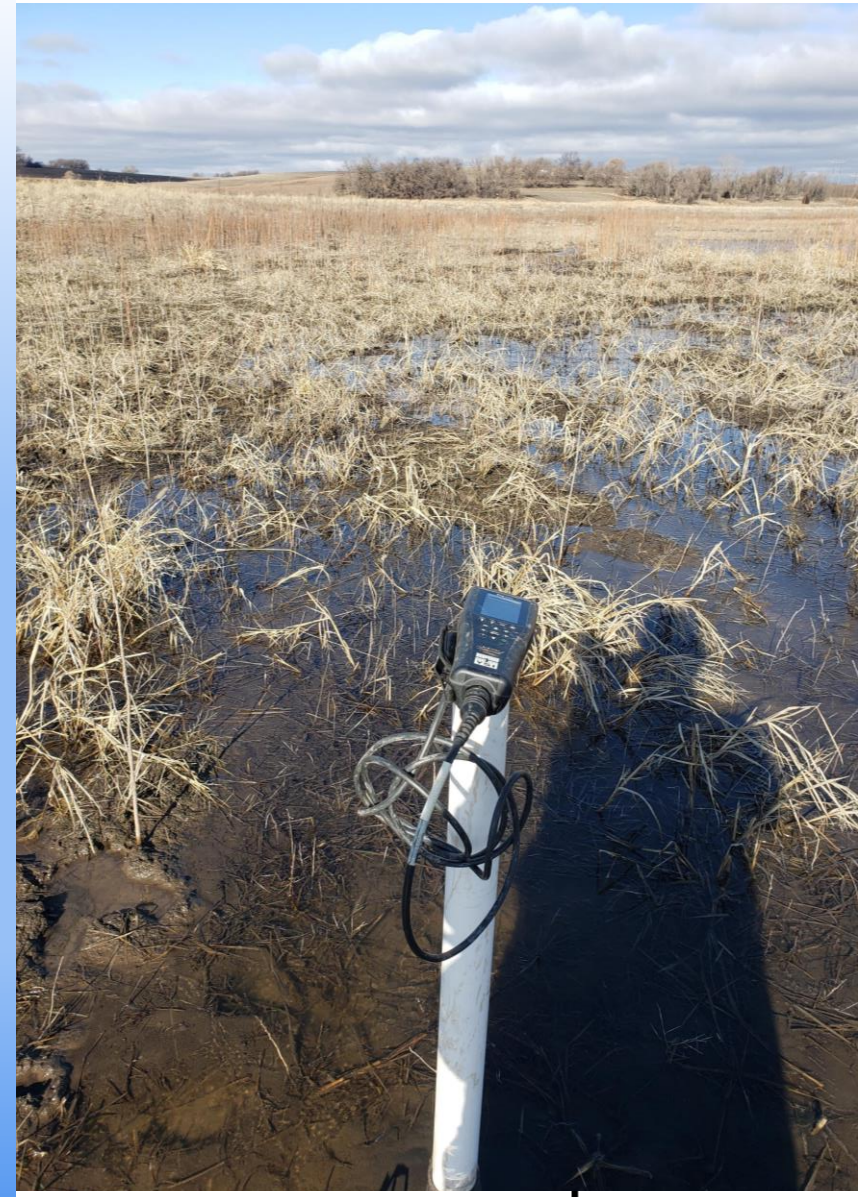
4)Geophysics – find the (ground)water!

5)Basin stratigraphy

University of Nebraska

COLLABORATION INITIATIVE

SUPPORTED BY NRI FUNDS



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Questions?