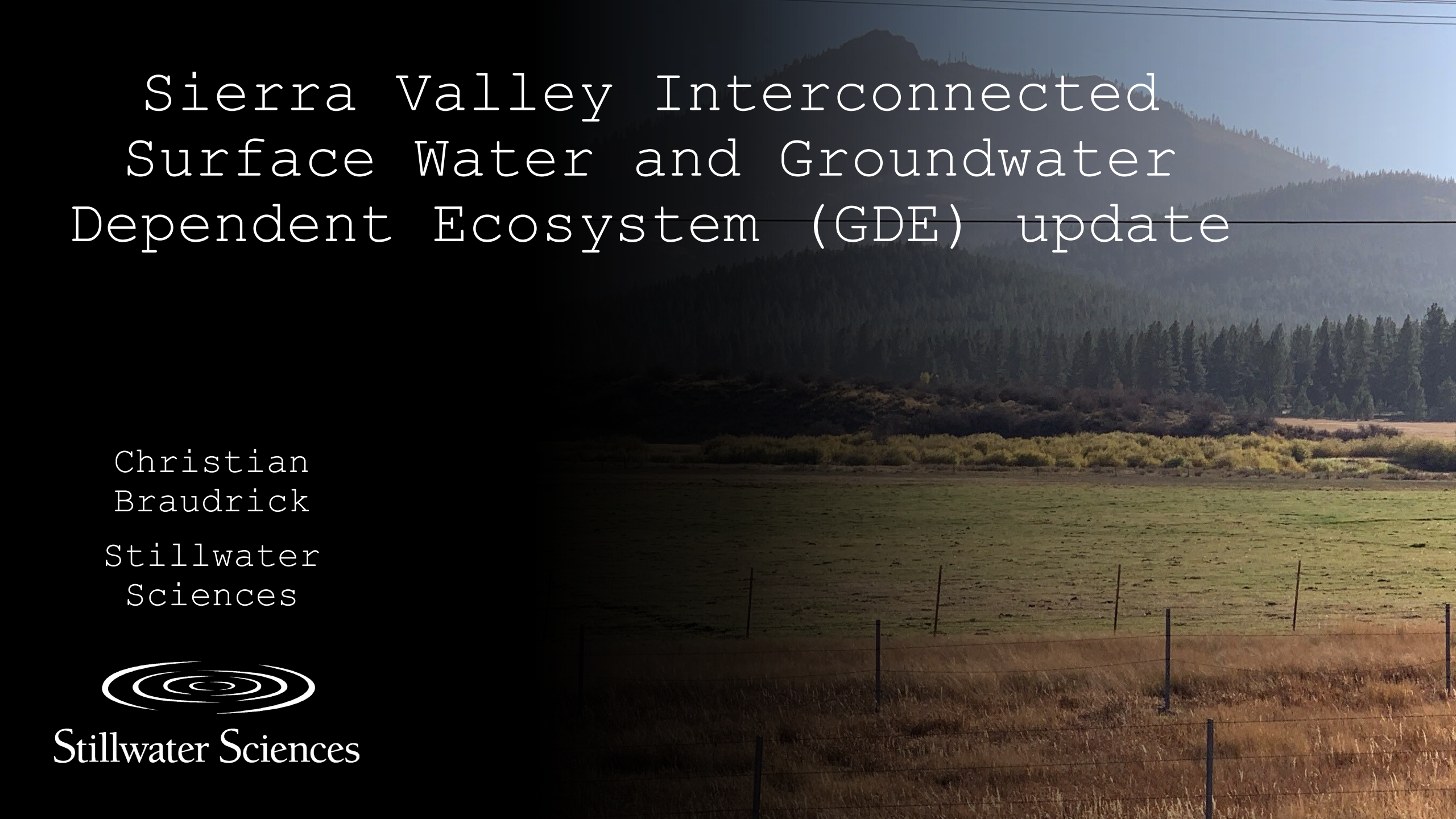
Sierra Valley Interconnected Surface Water and Groundwater Dependent Ecosystem (GDE) update



Christian Braudrick

Stillwater Sciences

Stillwater Sciences

Background

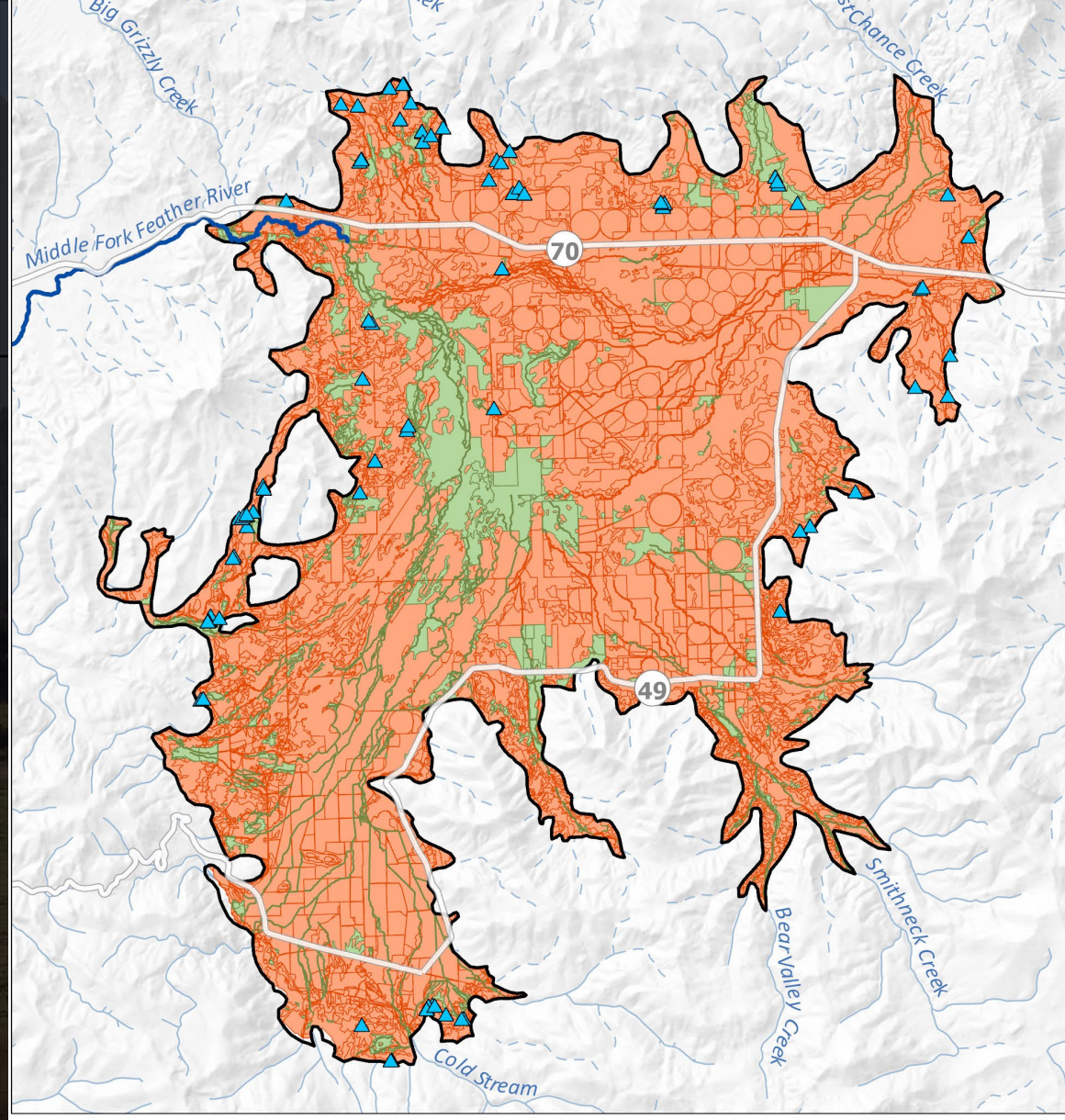
- Since the GSP was submitted a new vegetation map was completed for the Doyle-Loyalton Area that includes the entire Subbasin
- The relative monitoring point analysis (GDE health) was updated and includes new wells and includes WY 2025
- We added temporal presence/observation trends for representative special-status birds to better understand the timing of potential impact to birds.

Updated GDE Map

- Doyle-Loyalton Vegetation Map completed Chico State (Kreb 2023).
- Relative to the previous Sierra Valley vegetation map, this map:
  - Was field tested
  - Covers approximately 1.6 million acres
  - Resolution is 0.25 acres for wetlands and riparian areas vs. 0.5-2.0 in previous map (2-5x better)
  - Based on 2018 NAIP imagery

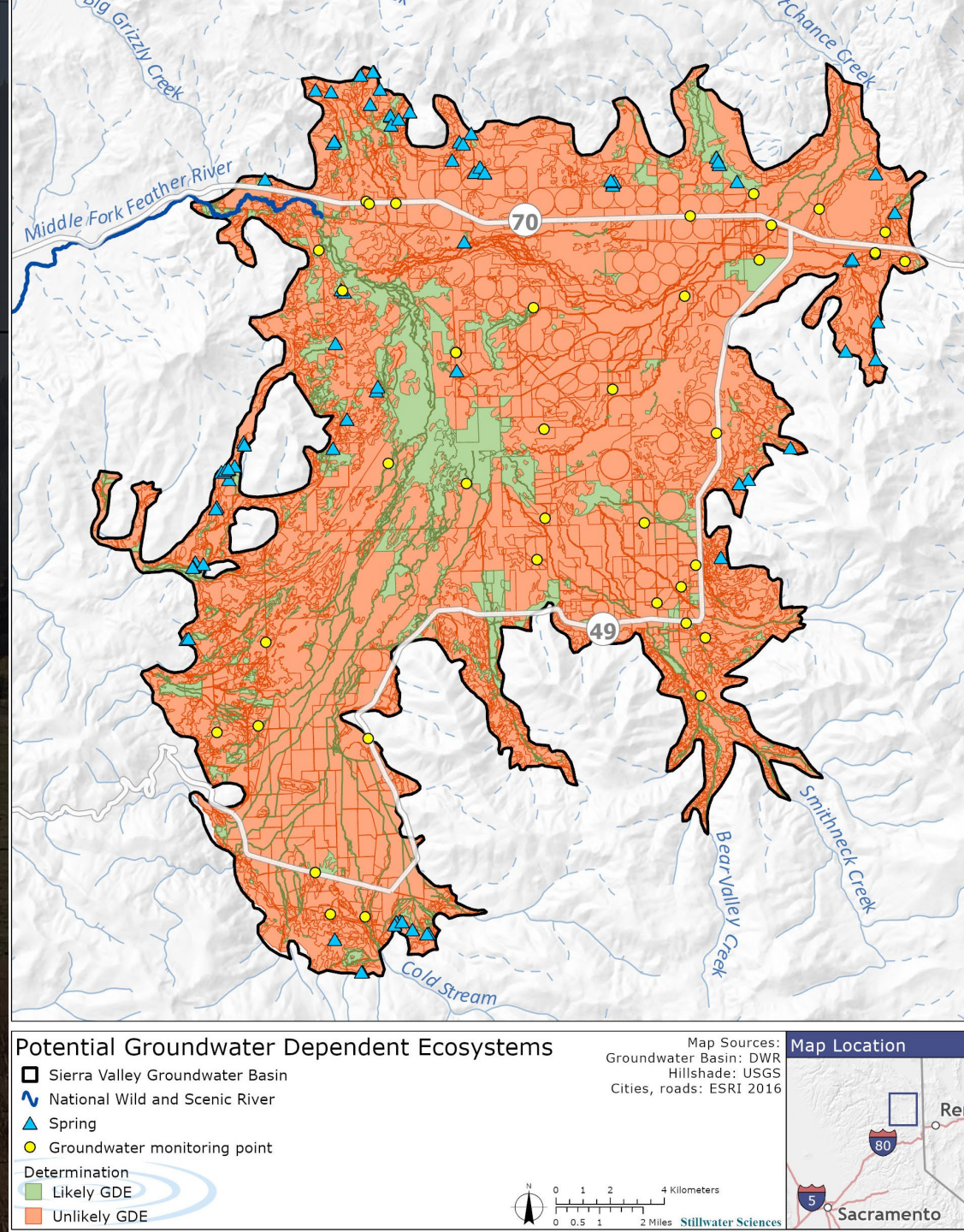
Revised Map

- Used the updated GDE map and previous mapping of interconnected surface water.
- Most of the GDEs occur in the large wetland in the western half of the subbasin
- Most (> 2/3) of the GDEs are marsh plants with relatively shallow rooting depths
- 12,000 acres of GDEs total (17,000 acres in previous map, but the trends are generally the same)
- Most of the change was due to removing what was subsequently mapped as irrigated pasture from the previous map

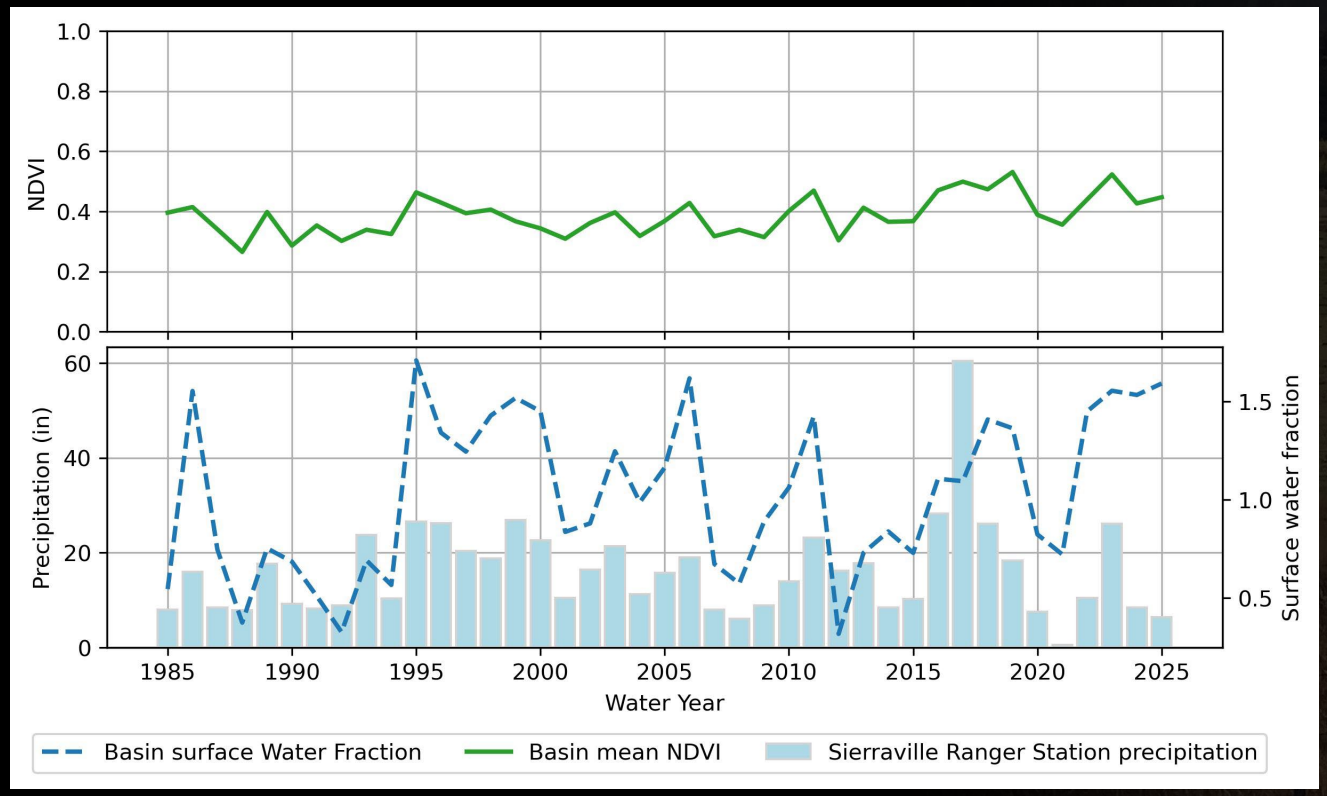


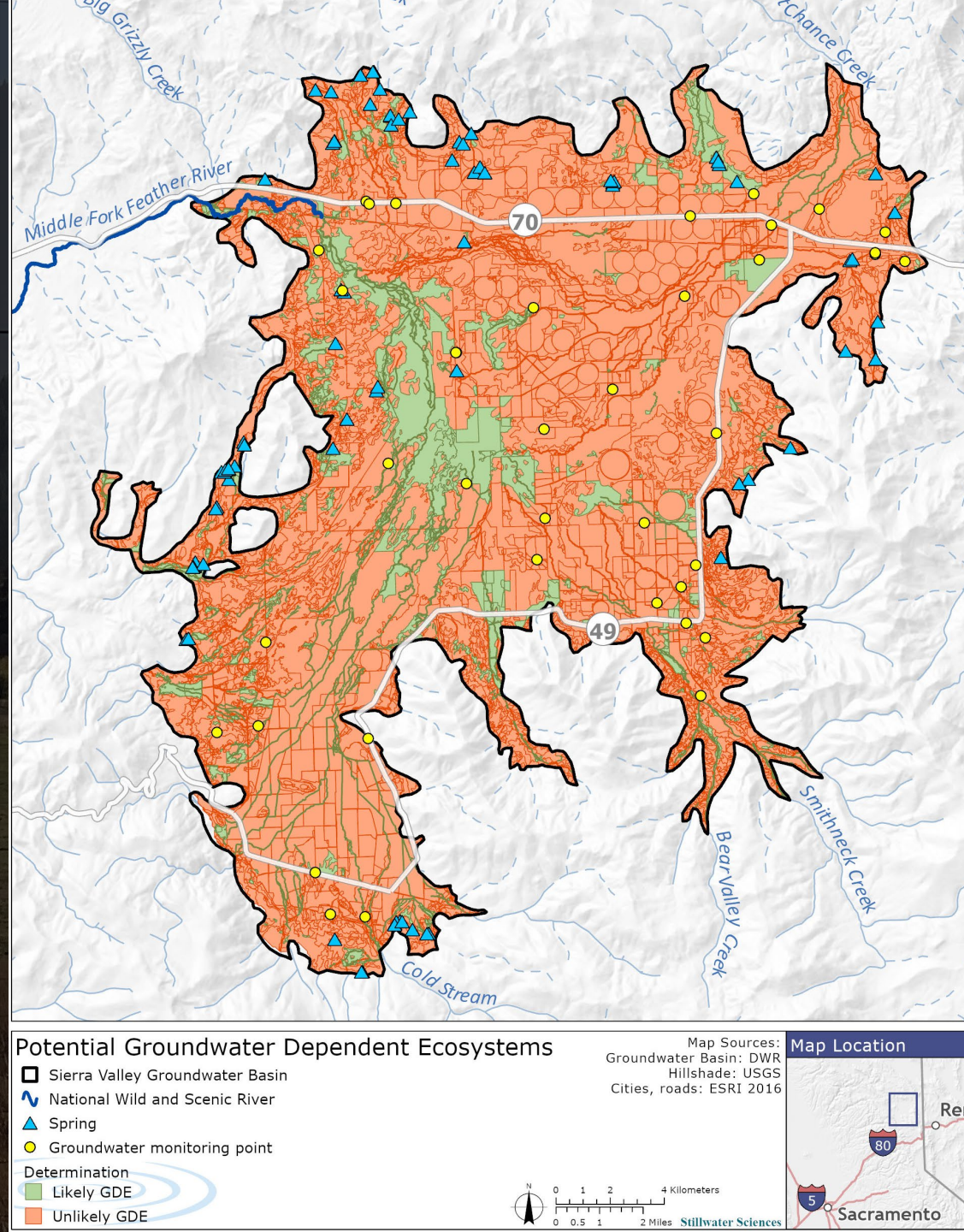
GDE Health

- For each well, search within a 1-mile radius for vegetation from the updated GDE map
- Assessed Normalized Difference Vegetation Index (NDVI) for all GDE polygons ((NDVI is a measure of vegetation greenness, measured from a satellite)
- Compare summer groundwater depth and summer NDVI to assess the relationship between groundwater elevation and GDE health
- Monitoring points are the same as the GSP, with the exception of the new wells near the wetland



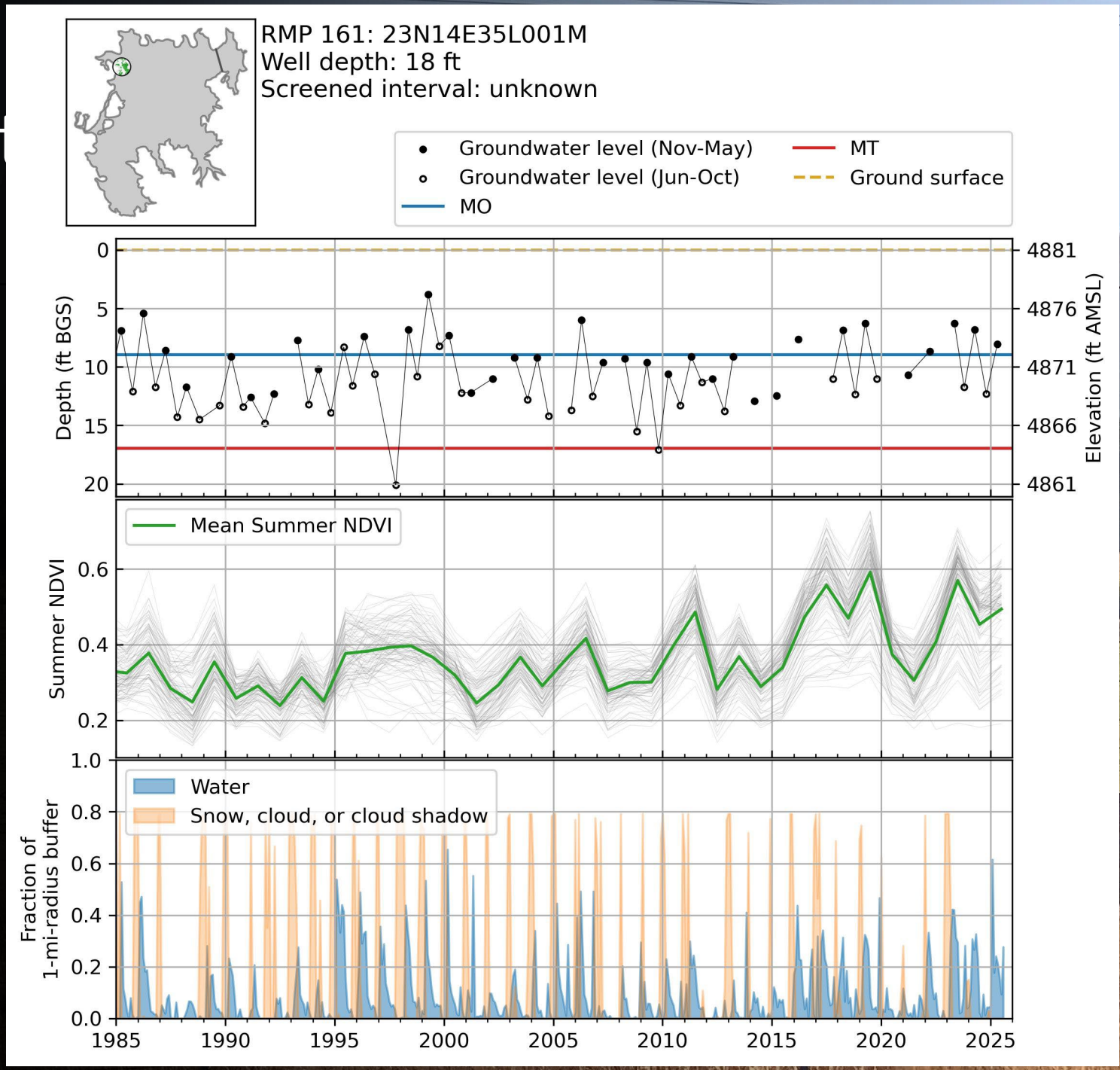
Basinwide GDE Health Trends





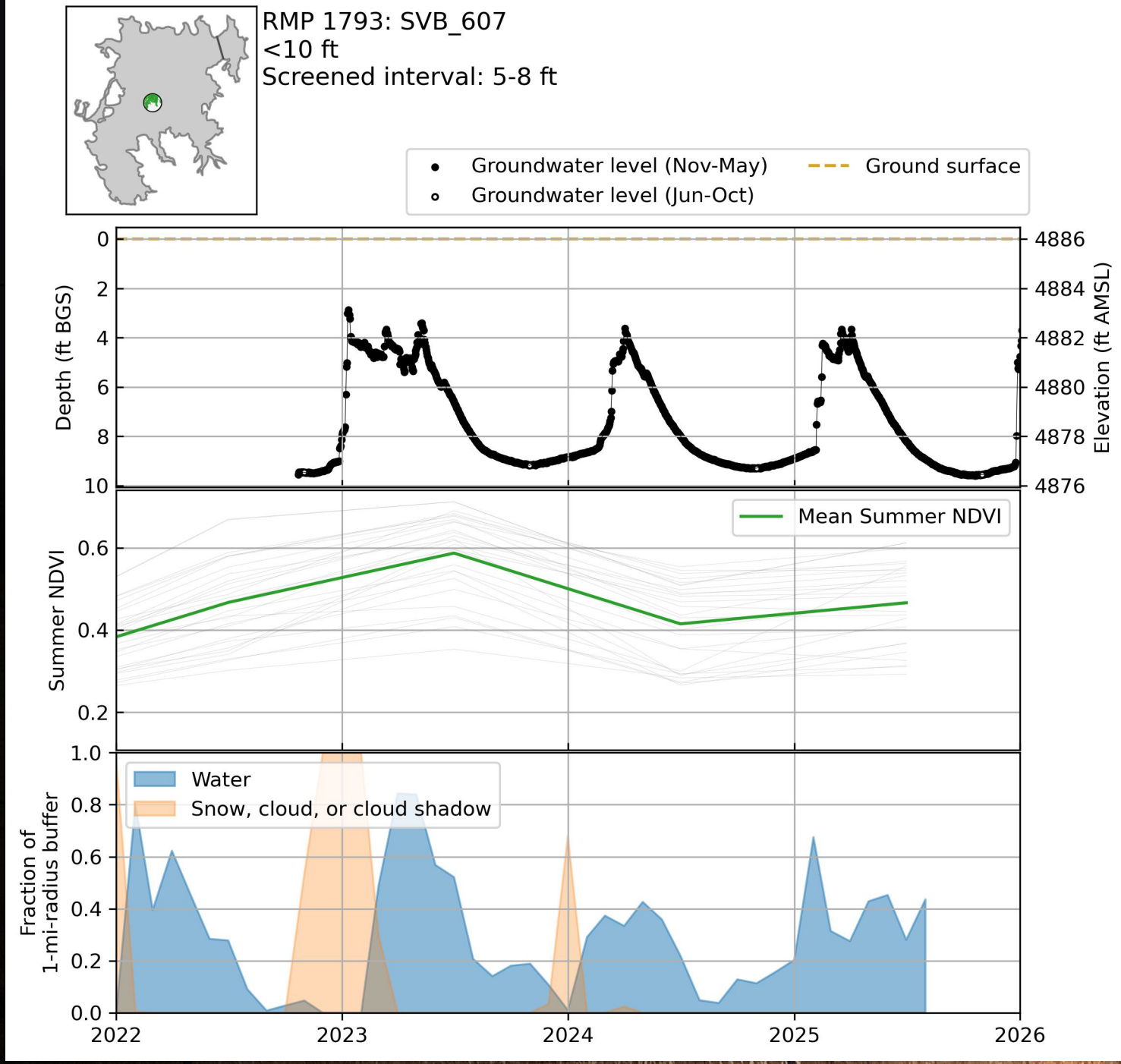
Example result

- RMP 161
- 495 acres
- NDVI dropped in 2021, but recovered the next year
- No drop in NDVI observed in 1996, when depth fell below the MT. Given precipitation in the basin, this is likely an erroneous reading.



Example results

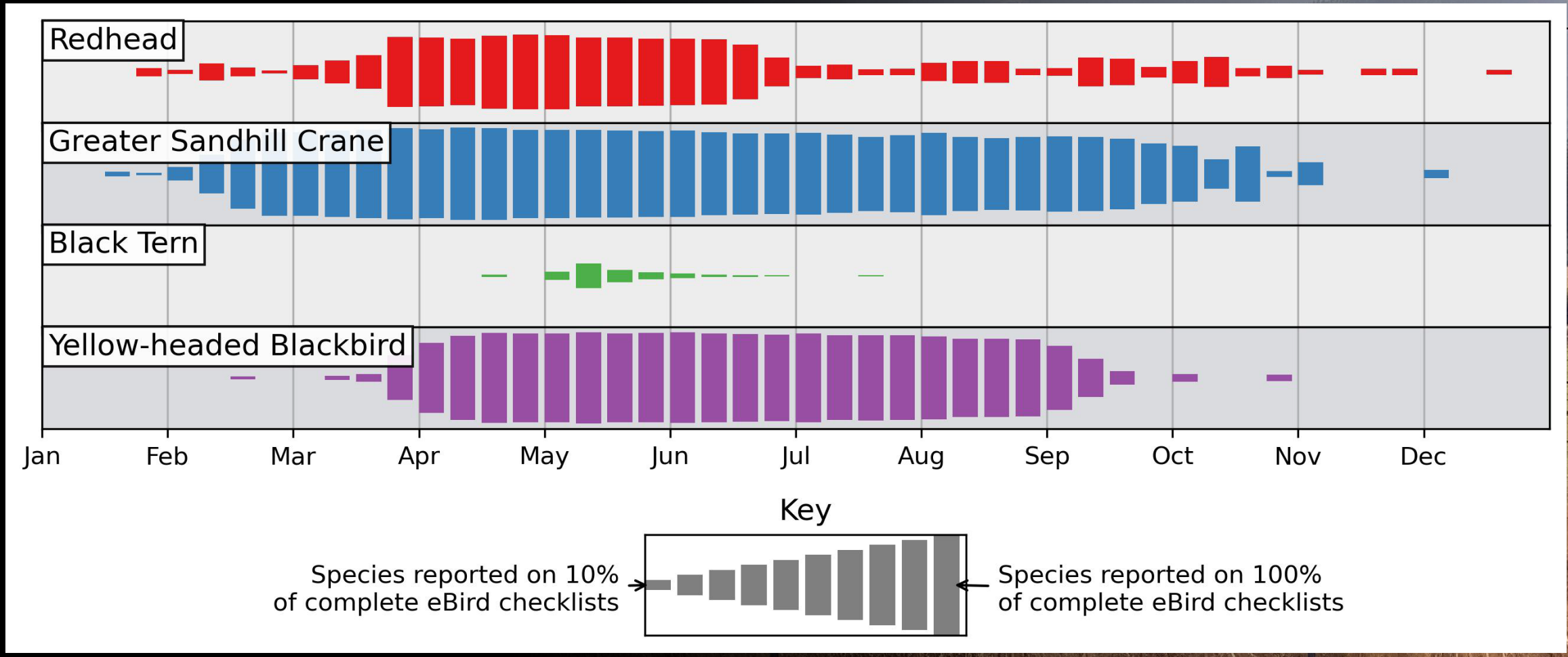
- RMP 1793
- 1069 acres of GDE (over half of the 3.1 mile area within the search radius)
- Groundwater < 10 ft deep.
- Annual minimum groundwater elevation is relatively steady to date
- NDVI increases in the relatively wet



Special-status species

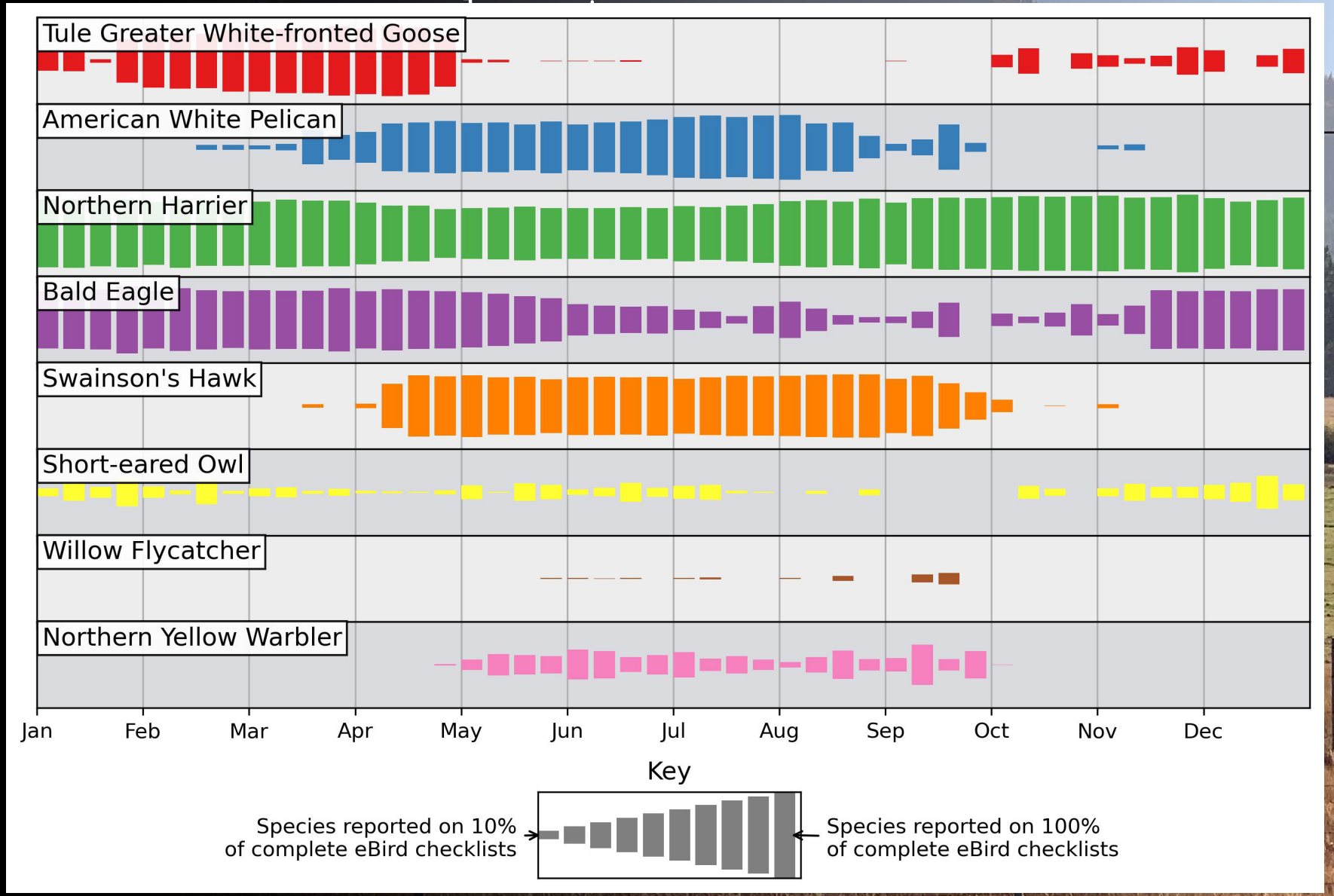
- The Sierra Valley Groundwater Basin has a high ecological value. The Audubon Society has designated Sierra Valley as an Important Bird Area.
- Based on comments during the GSP, the description of birds, their habitat requirements and the timing of their usage of the basin has been expanded using data from eBird.org.

Special status birds directly dependent on groundwater



Data from eBird 2000-2025

Special-status birds indirectly dependent



Data from eBird 2000-2025

Summary

- The revised GDE map is based on updated vegetation mapping. The total acreage of GDEs is reduced, mostly due to remove what was subsequently mapped as irrigated pasture and vernal pools
- Groundwater levels and NDVI of GDEs declined in 2022 but subsequently rebounded to previous levels
- No long-term trend in groundwater elevation or NDVI was observed at the monitoring points
- The description of the timing and habitat requirements of birds has been expanded. Four SS birds were identified as directly dependent on groundwater while eight SS birds were indirectly dependent on groundwater