



# Groundwater Dependent Ecosystem Investigation

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# What are GDEs



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Flood Control and Water Conservation District

The California Department of Water Resources (CDWR) developed regulations to implement SGMA and officially recognized groundwater dependent ecosystems (GDEs) in the Act and provided the following definitions:

- ‘**Groundwater dependent ecosystem**’ refers to **ecological communities or species** that **depend on groundwater emerging from aquifers or** on groundwater **occurring near the ground surface** (23 CCR § 351(m))

Natural Communities Commonly Associated with Groundwater (NCCAG) defined by TNC and iGDEs are these mapped communities – dataset hosted by DWR



## Field Verification + GIS



Kopta Slough, Fremont Cottonwood

# Field Sampling to assess health of GDEs



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Random points placed throughout mapped community and selected pre-field visit

- **All have three 25m transects**
- Collect data on
  - **Verification of mapped GDE (is it what it says it's mapped as?)**
  - **Native and non-native tree, shrub and herbaceous species presence and percent cover**
  - **Overall assessment of the current health of GDE**
- Sampling design based on *AIM National Aquatic Monitoring Framework: Field Protocol for Lentic Riparian and Wetland Systems* (Technical Reference 1735-3; 2024)



Woodson Bridge, narrow leaf willow

# Field Sampling to assess health of GDEs



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Sampled 30 sites across Antelope (10 sites) and Corning (20) in 2024 and 2025

All sites were identified as GDEs

Dominant communities: Valley Oak, Fremont Cottonwood, narrow leaf willow and California black walnut



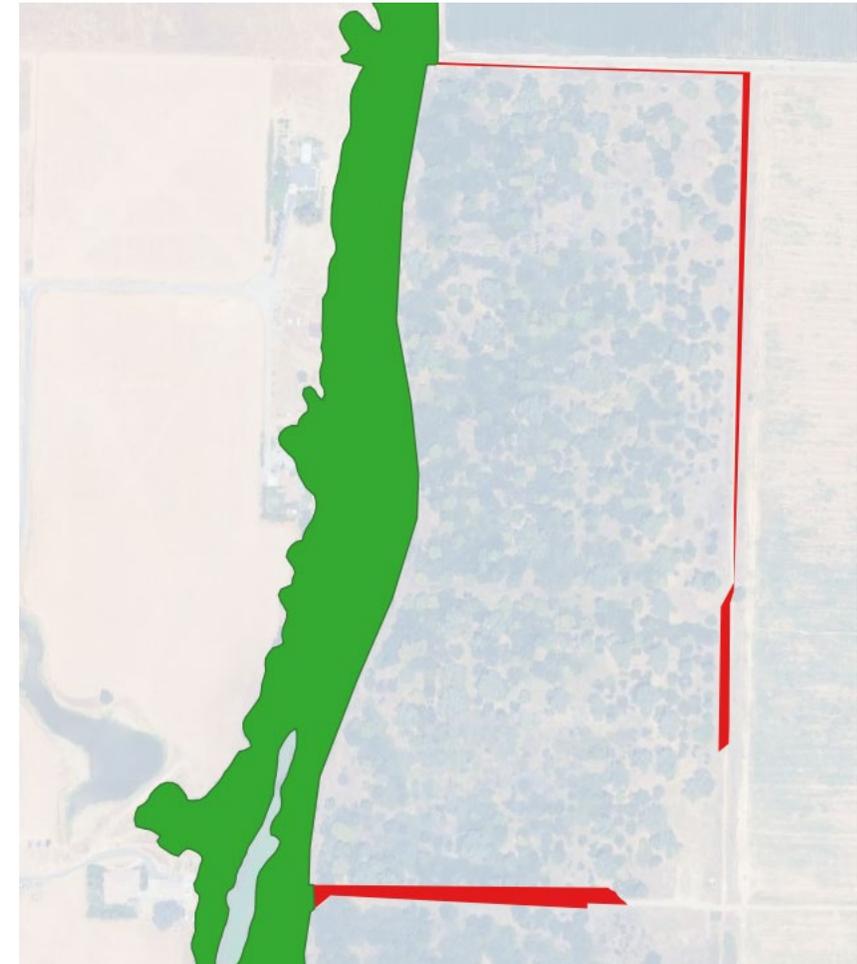
Kopta Slough, Fremont Cottonwood (restored)



## Structured approach:

- Aerial analysis of each polygon
  - Vegetation and land use verification
- Used 2013 – 2024 DWR fall contours  $\longrightarrow$  interpolated surface
- NDVI long-term average for each polygon

We identified polygons that were ‘likely GDEs’ and ones which were ‘not likely GDEs’ to refine the areas that should be monitored in the future



# GIS Investigation – NDVI



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GDE Pulse (TNC) – allows assessment of changes in GDE health

NDVI – based on satellite data, identifies the “greenness” of the site (value from -1 to +1), with higher values meaning healthier vegetation

We calculated an average value over the time period 2013 – 2024

We assumed sites that were **> 0.4 (moderate-high and high) are currently healthy**

Identified GDEs that had an NDVI as **< 0.4 to monitor into the future**

(categories based on Brown 2018)

# Preliminary Results



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	<b>Initial GDE database (TNC)</b>	<b>Likely not GDE</b>	<b>Classified as GDE</b>
<b>Antelope</b>	1451 acres	<b>73 acres</b>	<b>1379 acres</b>
	254 polygons	<b>32 polygons</b>	<b>222 polygons</b>
<b>Corning</b>	6472 acres	<b>1997 acres</b>	<b>4475 acres</b>
	1203 polygons	<b>586 polygons</b>	<b>617 polygons</b>

\*Rounded to the nearest acre



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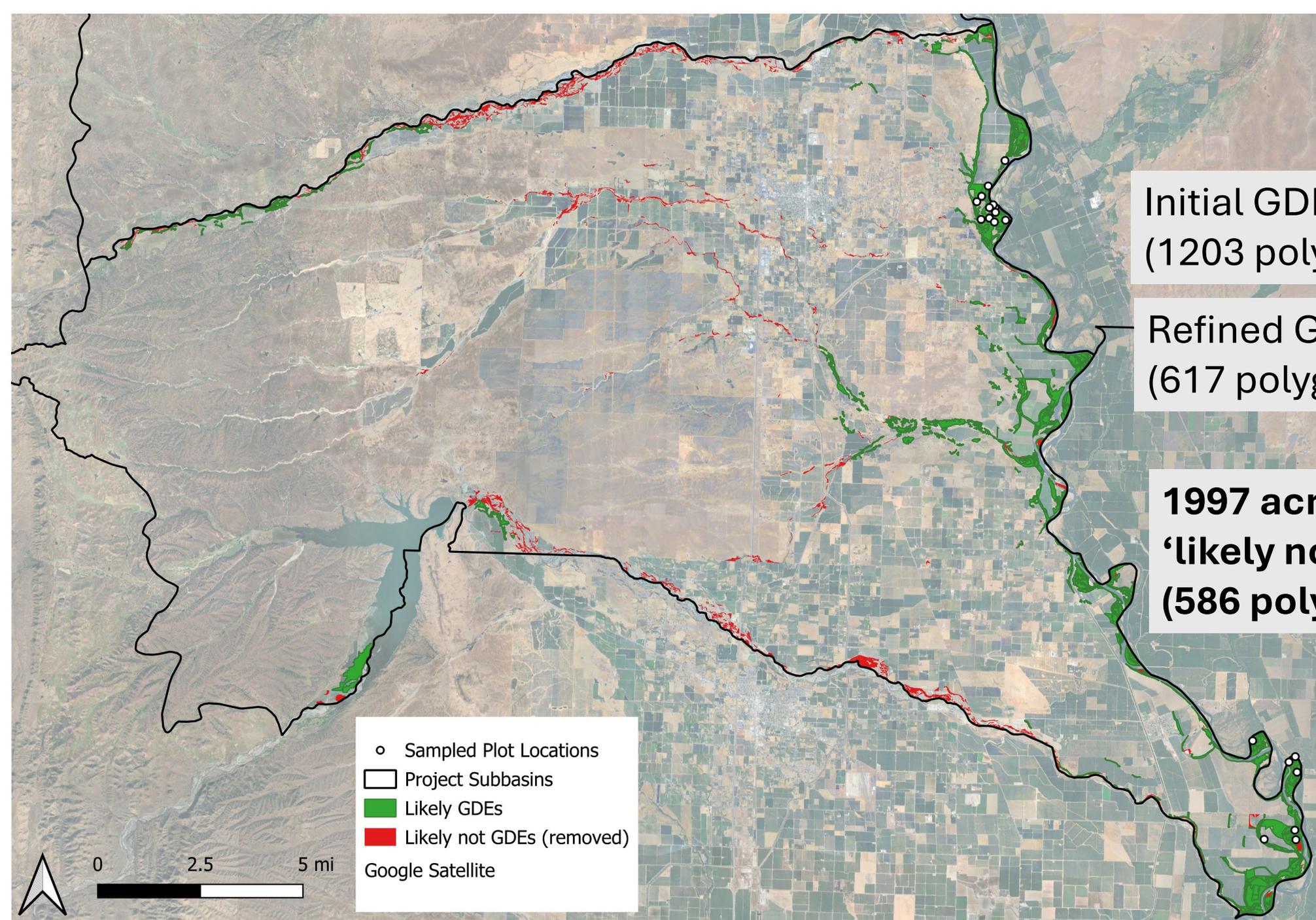
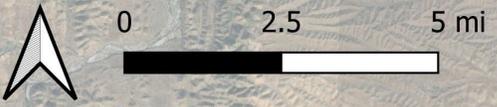
Initial GDEs: 6472 acres  
(1203 polygons)

Refined GDEs: 4475 acres  
(617 polygons)

**1997 acres classified as  
'likely not GDE'  
(586 polygons)**

- Sampled Plot Locations
- Project Subbasins
- Likely GDEs
- Likely not GDEs (removed)

Google Satellite

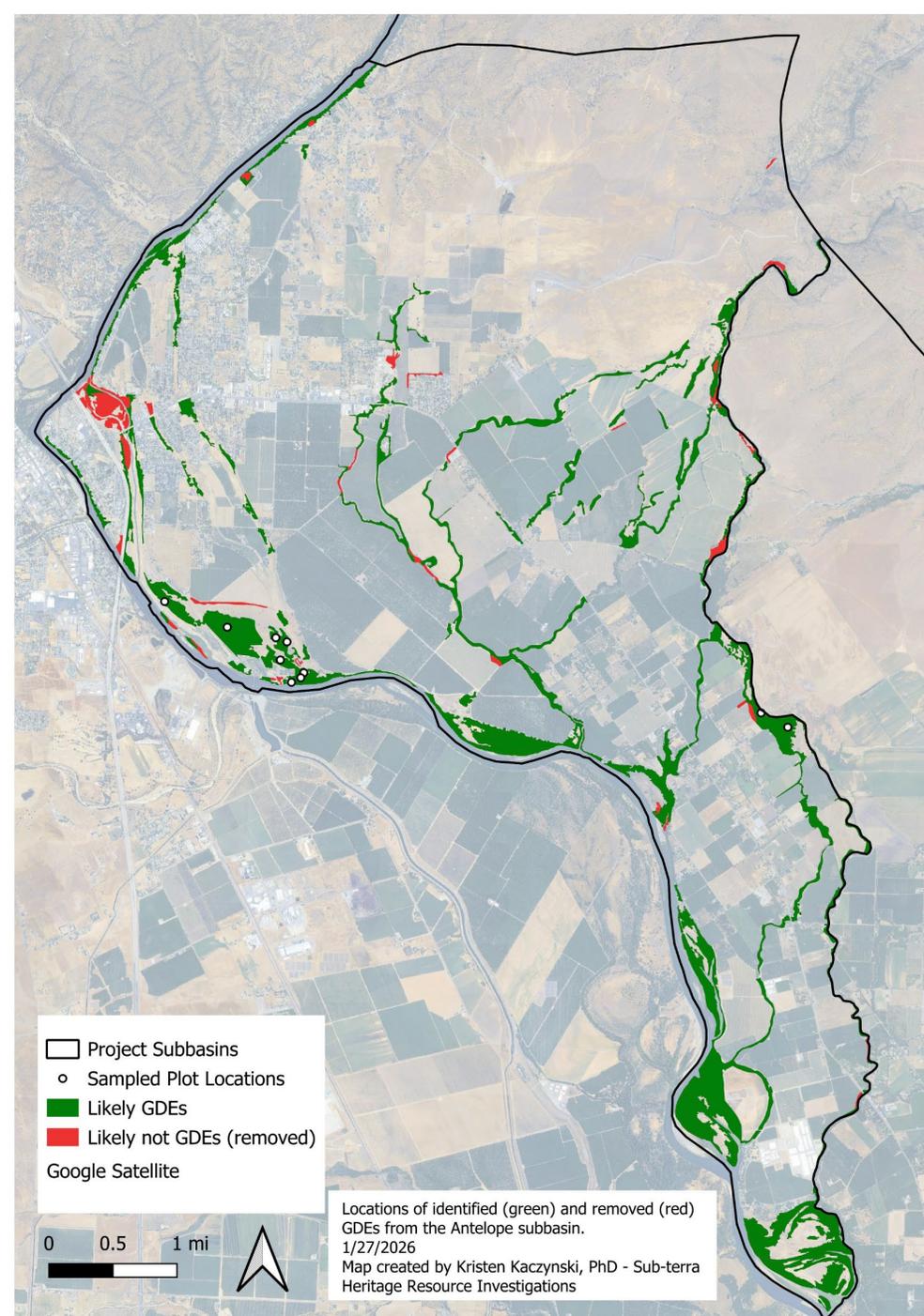


# Results thus far

Initial GDEs: 1451 acres  
(254 polygons)

Refined GDEs: 1379 acres  
(222 polygons)

**73 acres classified as ‘likely  
not GDE’  
(32 polygons)**



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# Suggestions for future monitoring



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- GDEs with low average NDVI in each should be monitored
- Field sampling
  - repeat photos for qualitative assessment
  - more rapid approach looking just at the woody species at the site
- Arundo restoration



Capay Unit, Valley Oak



Technical Memo forthcoming!

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