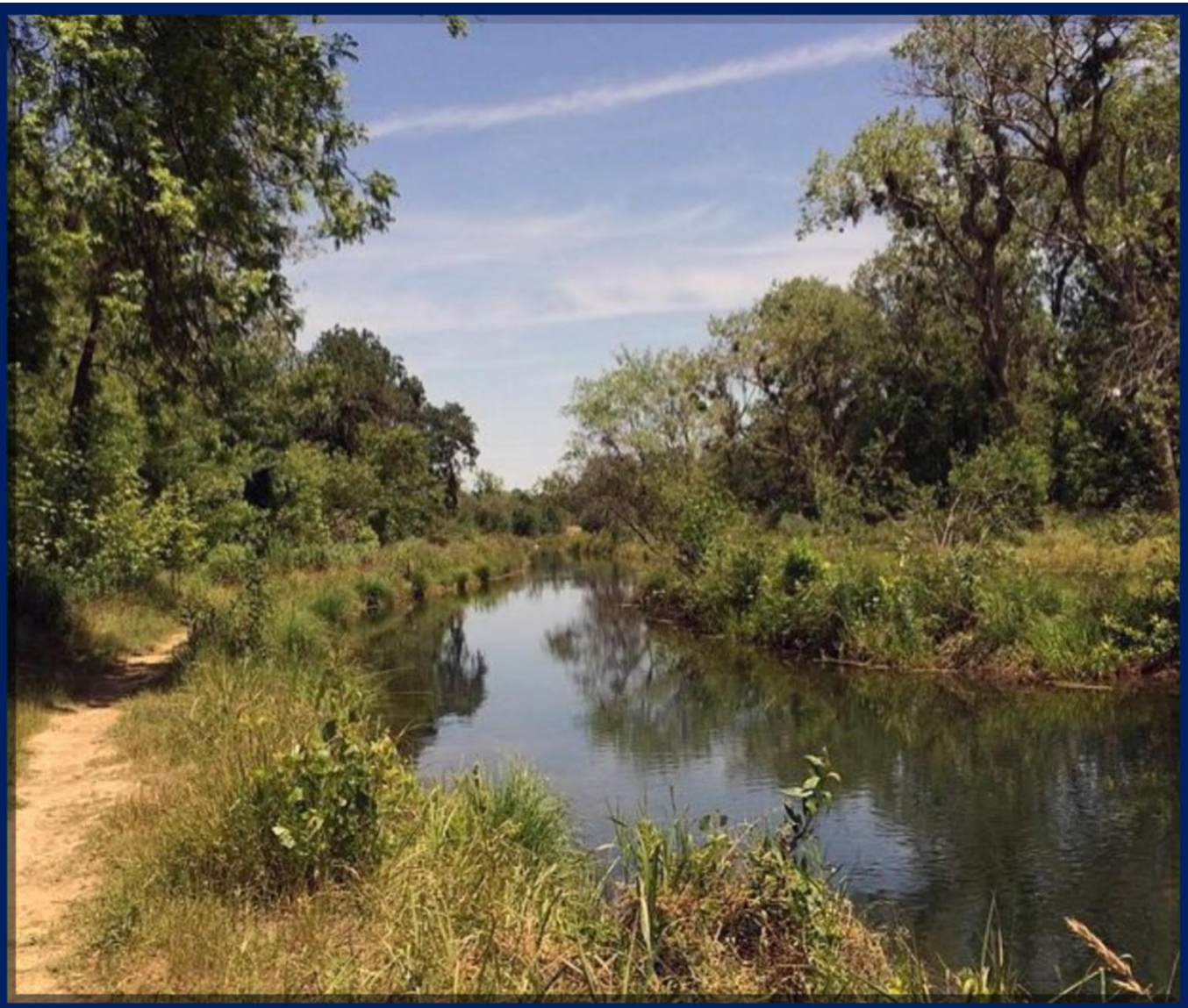
Understanding Groundwater in the Solano Subbasin

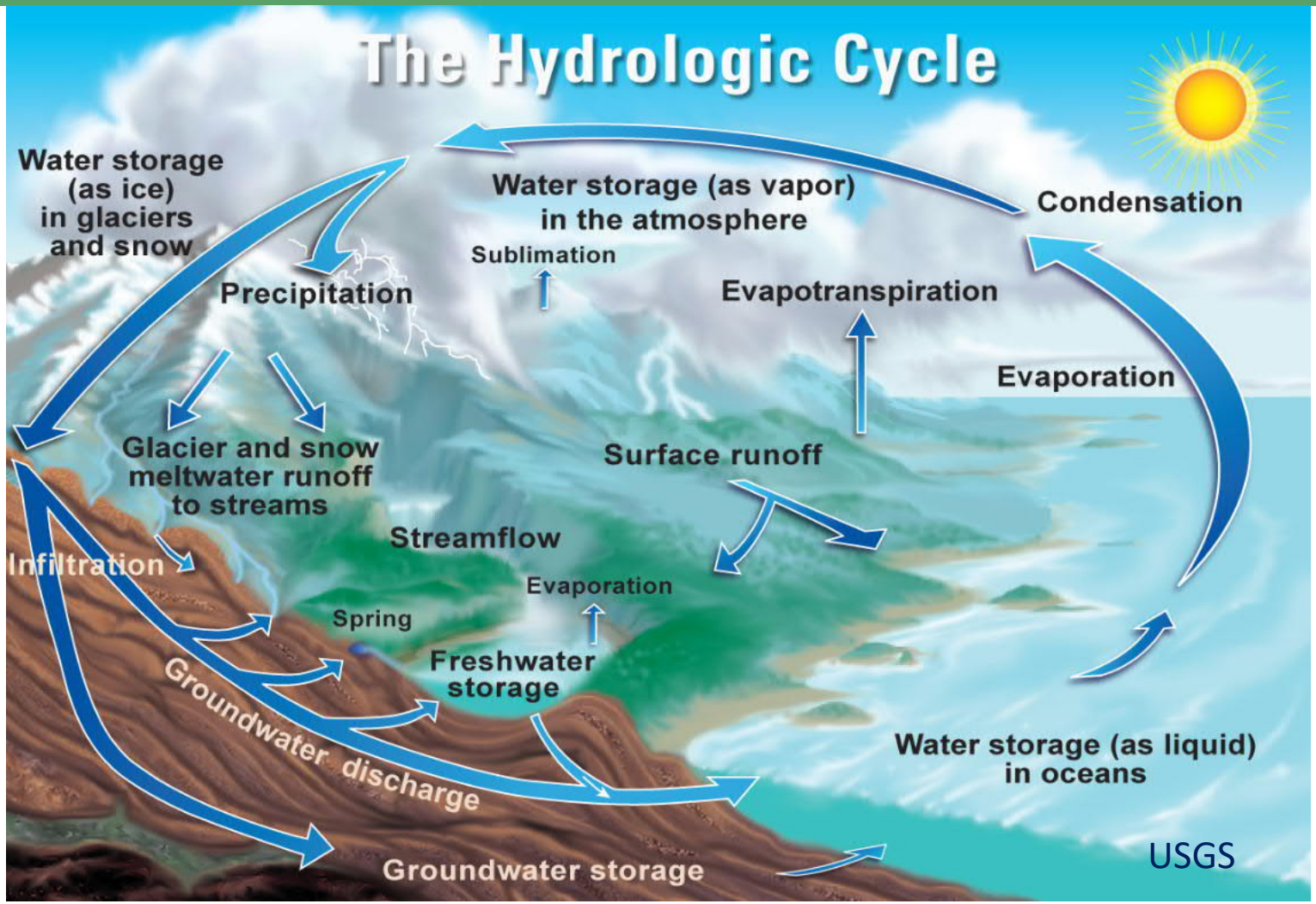
Solano GSA Collaborative
April 2019 Workshop



Maintaining a Sustainable Solano Subbasin

Groundwater: Basic Concepts

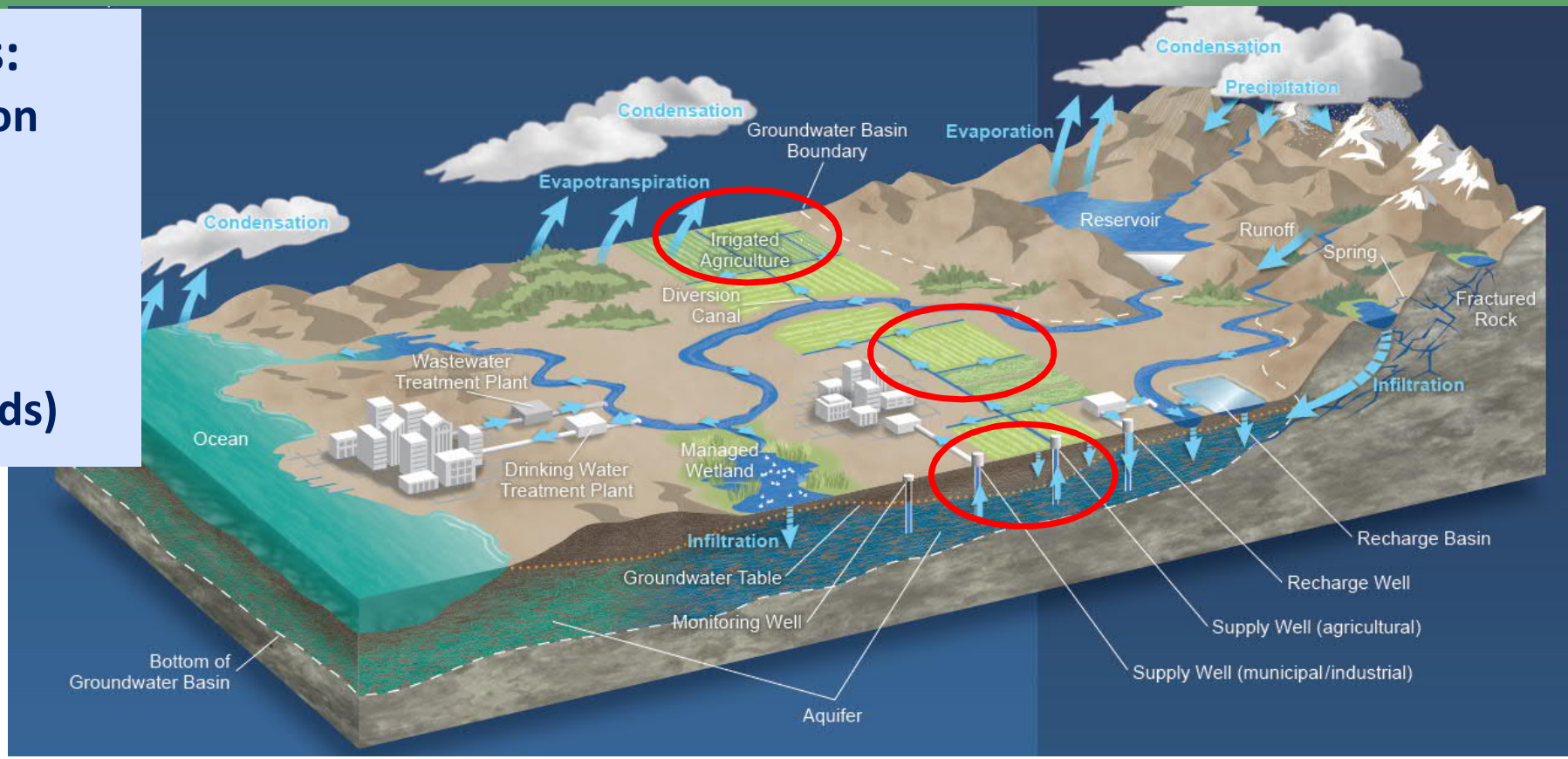
Where Does Groundwater Come From and Go To?



Other Groundwater Discharge

A Few Examples:

- Evapotranspiration (crops)
- GW pumping
- Drains
- Evaporation (wastewater ponds)



DWR, 2017

Account for Water with a "Budget"

Inflows

- Precipitation;
- SW inflow & infiltration;
- Intentional recharge (ponds, ditches, etc.);
- Applied water, net recharge (e.g., irrigation);
- Unintentional recharge (leaky pipelines);
- Subsurface inflows from outside basin.

Outflows

- GW extraction by wells;
- GW discharge to SW/springs;
- Evapotranspiration; and
- Subsurface outflow from basin.

Inflows* – *Outflows* = Δ *S

Change in GW Storage

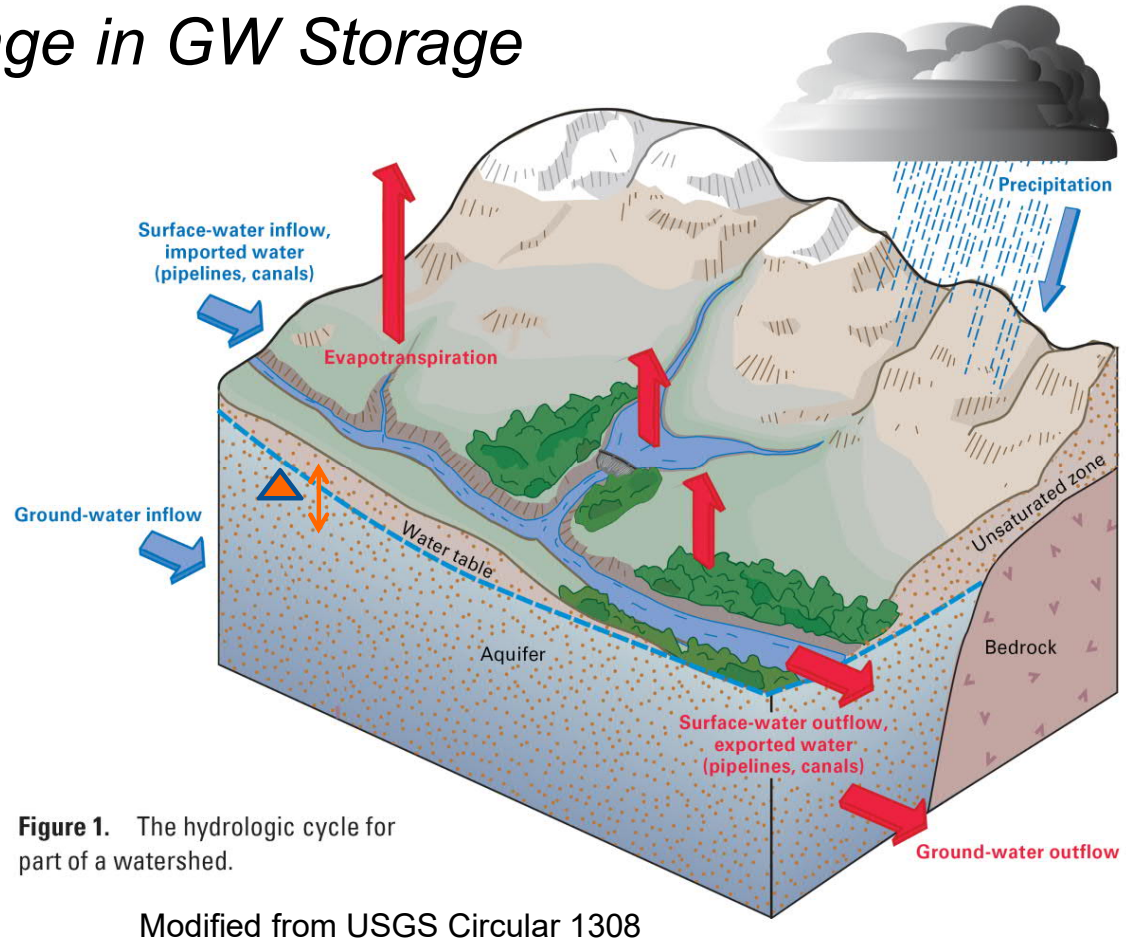


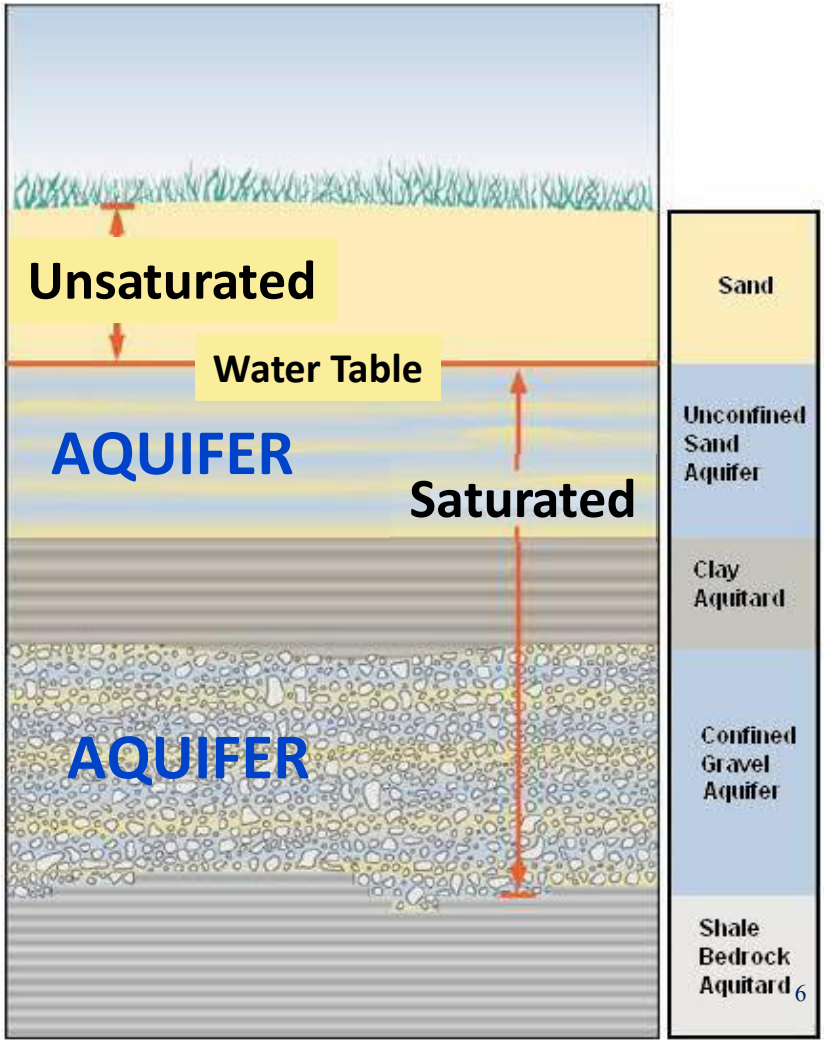
Figure 1. The hydrologic cycle for part of a watershed.

Modified from USGS Circular 1308

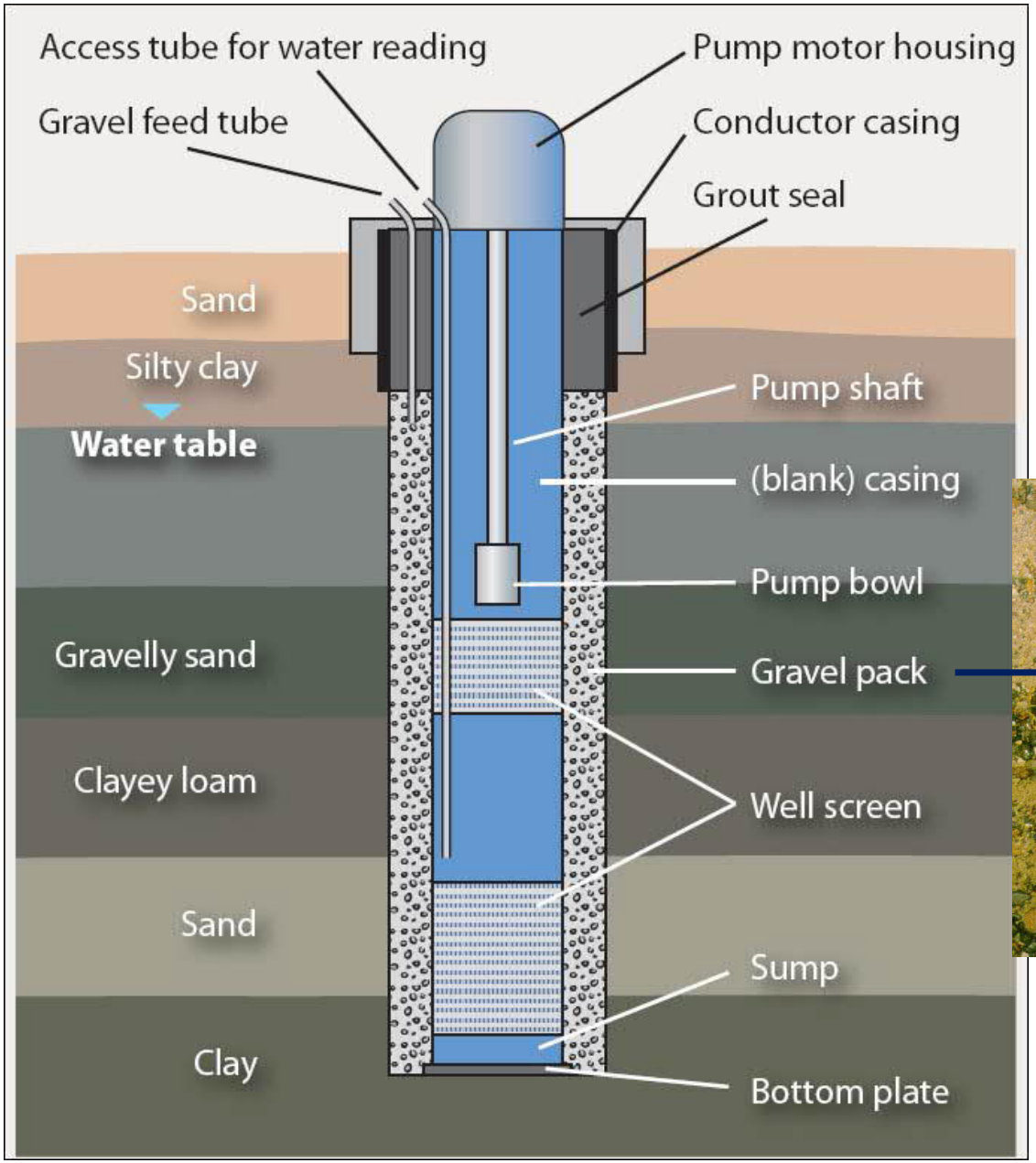
Aquifers

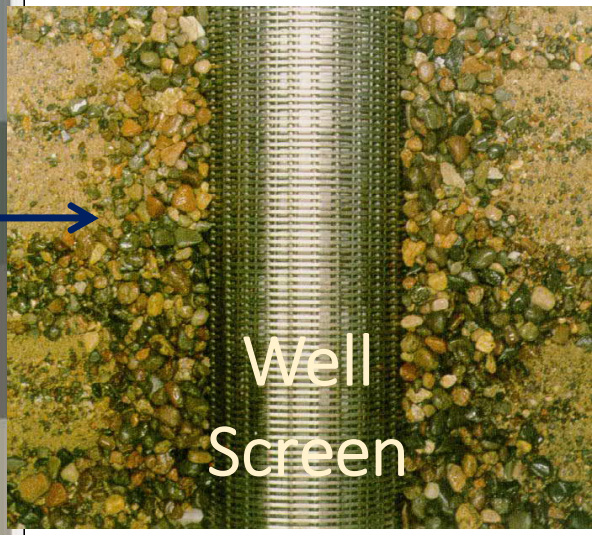
What is an Aquifer?

- A body of rock or sediment that is sufficiently porous and permeable to store, transmit, and yield significant or economic quantities of groundwater to wells and springs (DWR)
- From *aqua* or water and *ferre* to bear or carry



Groundwater Well





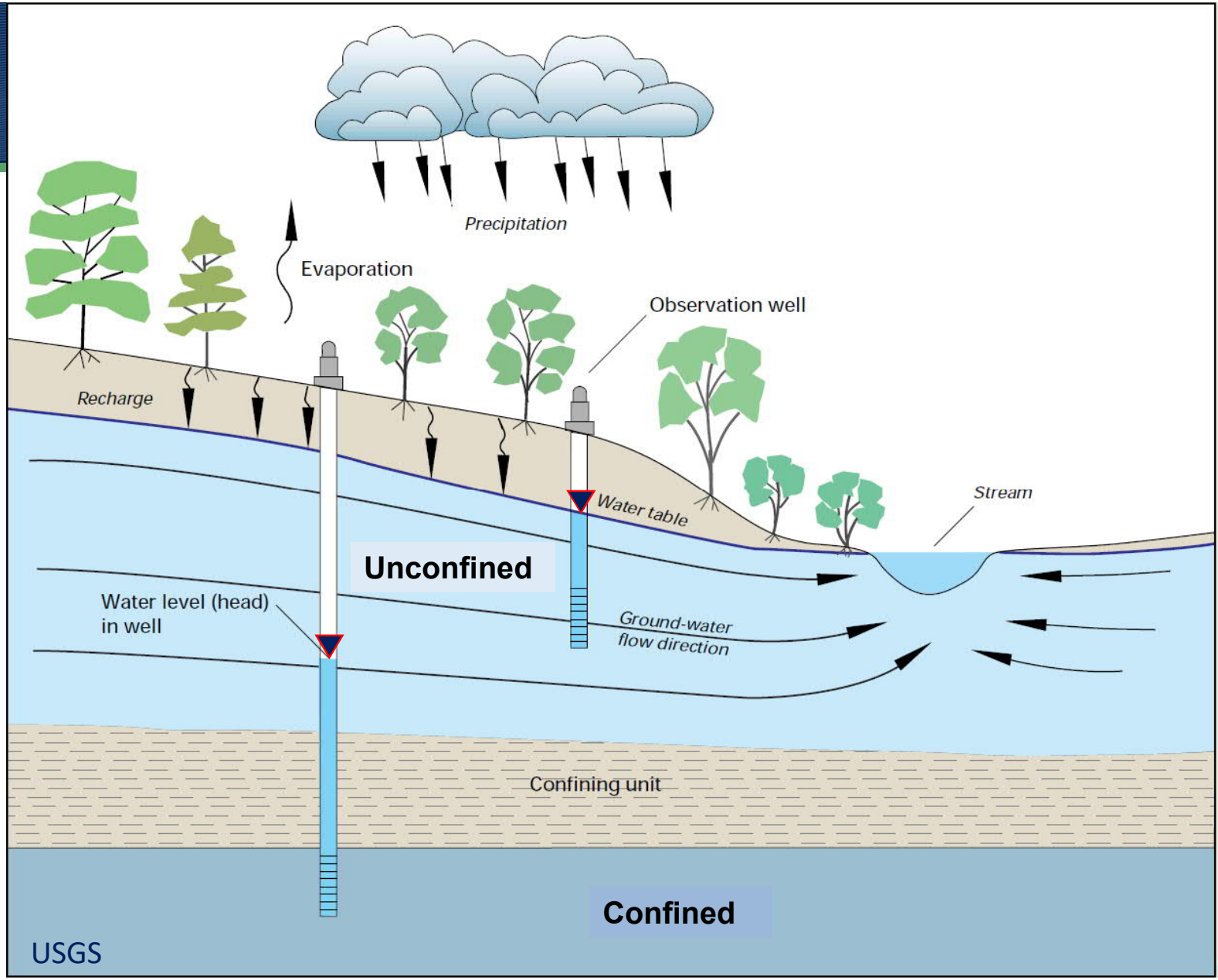
Groundwater:
Unconfined & Confined

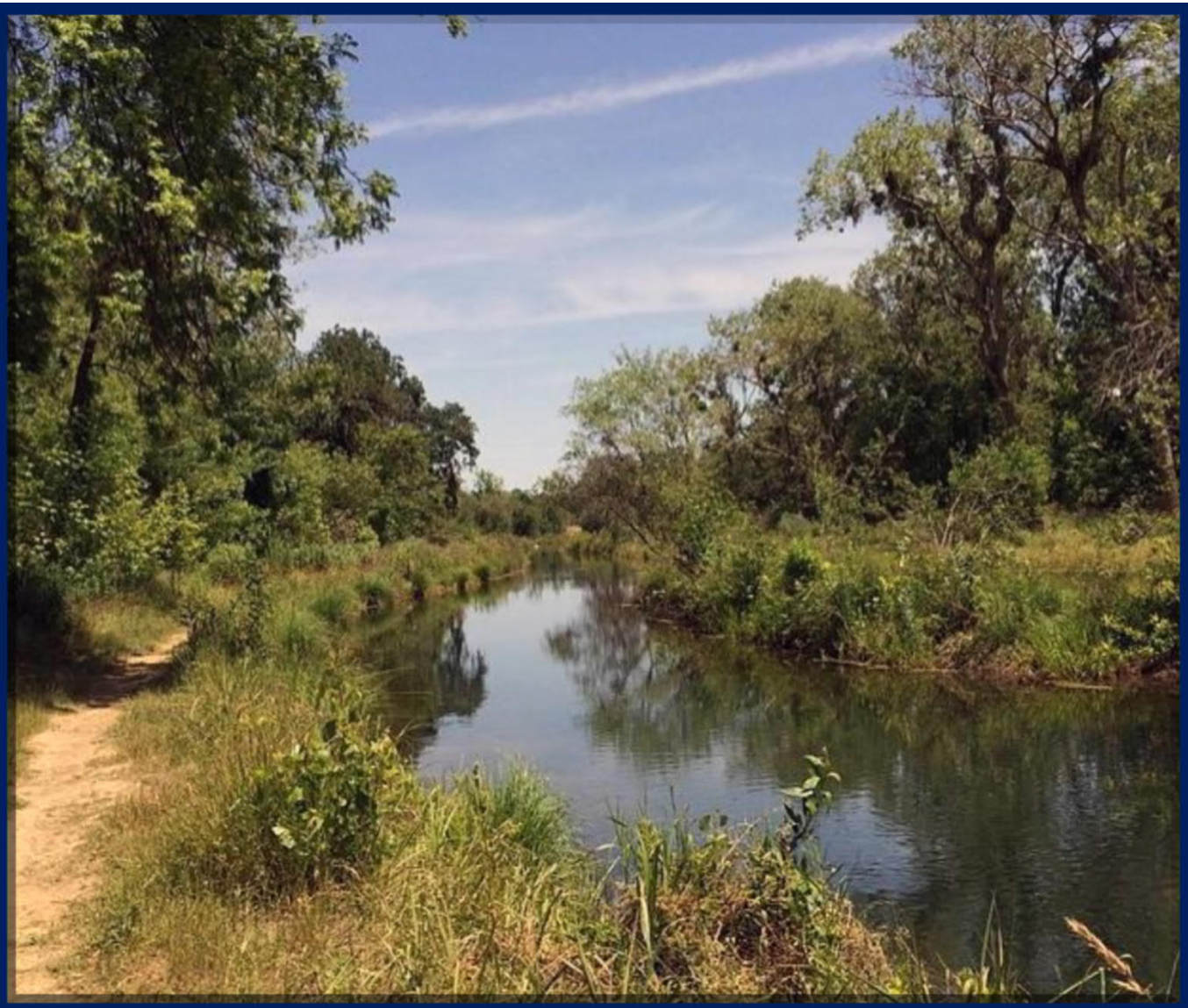
Unconfined:

At atmospheric pressure; no overlying low Permeability materials

Confined:

Groundwater under pressures greater than atmospheric by overlying low permeability (confining) materials





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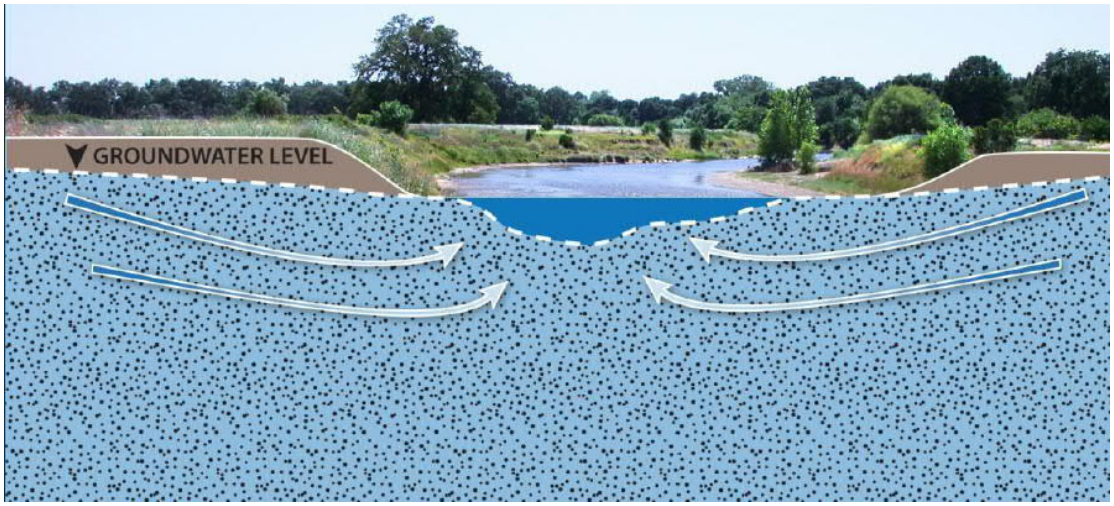
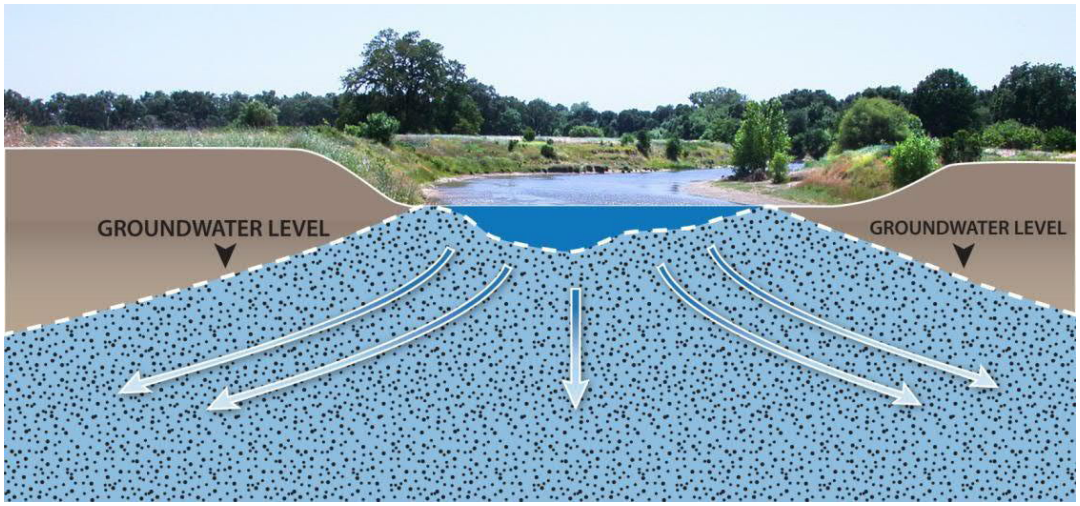
Groundwater and Surface Water: One Way or Another it is all Connected

Gaining and Losing Stream Conditions

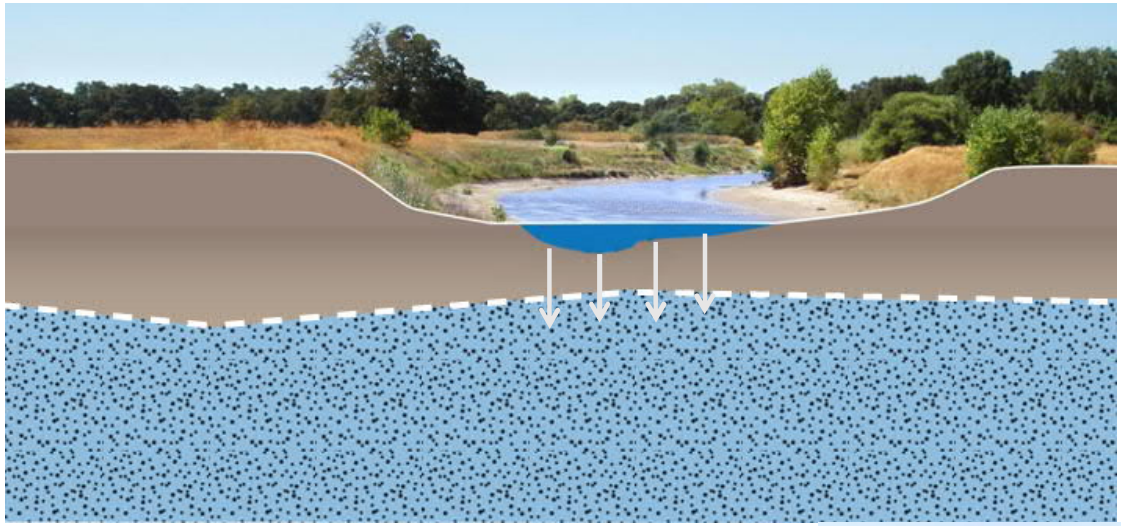


Gaining Stream:
Groundwater Provides Baseflow to Stream



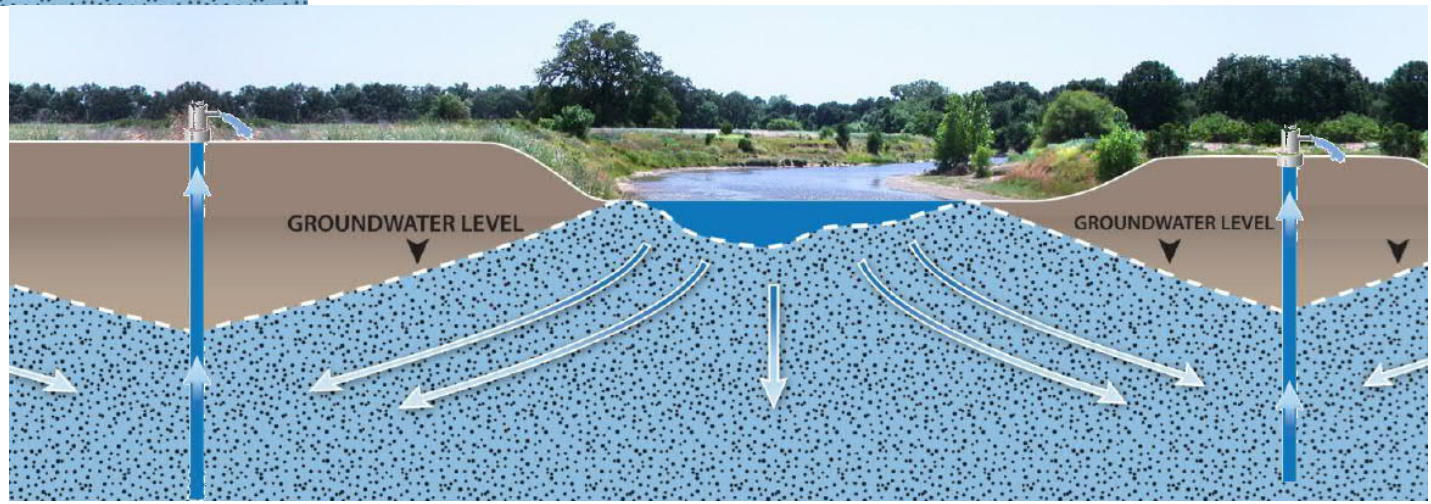
Losing Stream:
Stream Recharges Groundwater

Recharge and Streamflow Depletion



Disconnected Stream:
Stream Recharges Groundwater

Streamflow Depletion from Groundwater Pumping



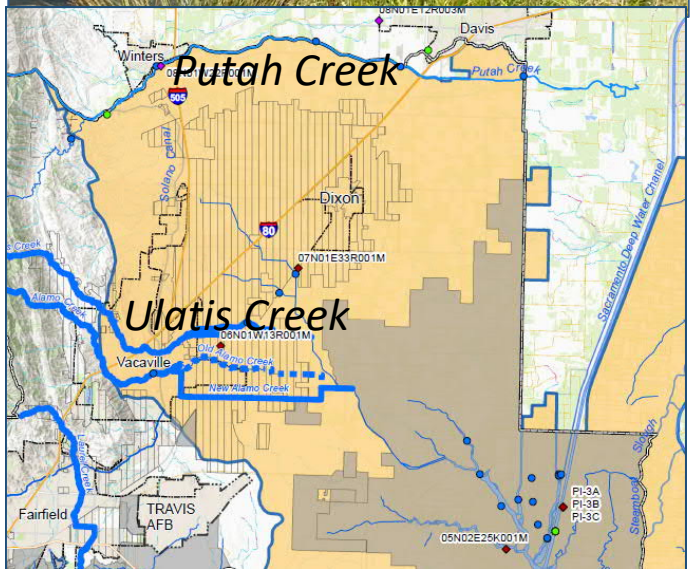
The Nature Conservancy

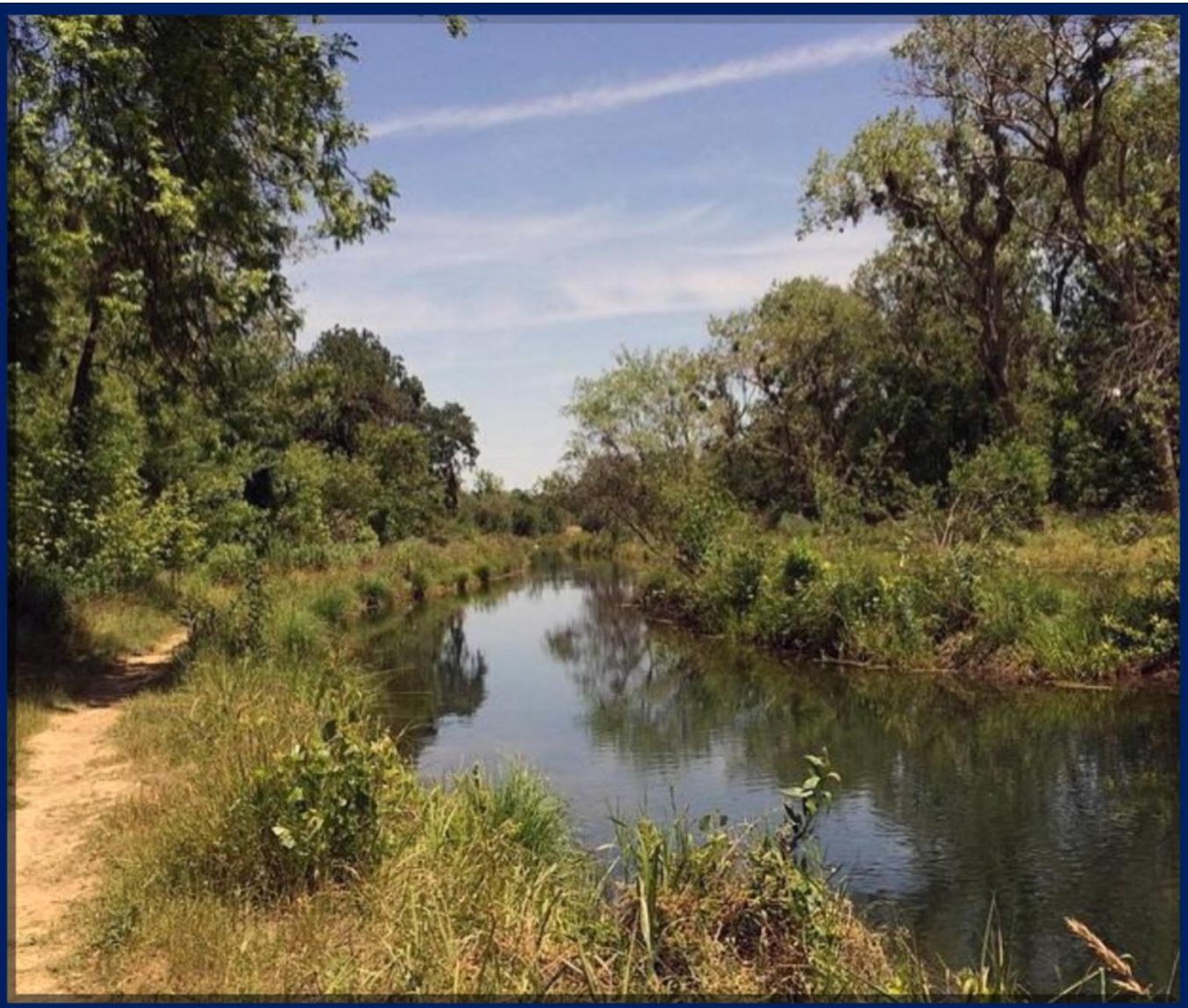
Groundwater and Surface Water Interaction: A Key Sustainability Indicator

- Monitoring data and hydrogeologic understanding to characterize SW/GW relationship
  - Surface water infiltrating below stream channels and/or groundwater contributing flow to stream channels
  - Groundwater Dependent Ecosystems (GDEs)

> "ecological communities or species that depend on groundwater emerging from aquifers or on groundwater occurring near the ground surface" (CA Code of Regulations, Groundwater Sustainability Plans § 351(m))

- Establish baseline data to accurately assess whether groundwater pumping is influencing streamflow





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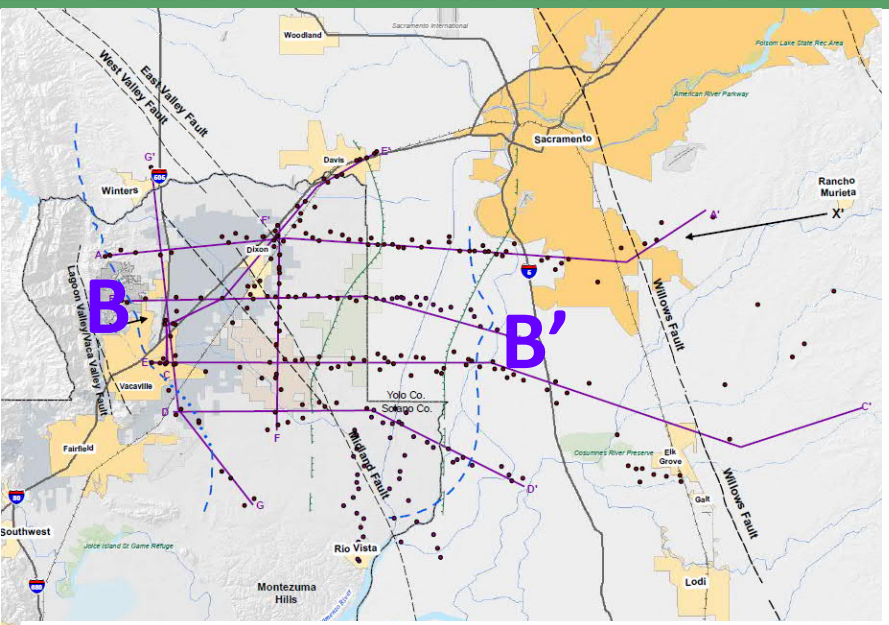
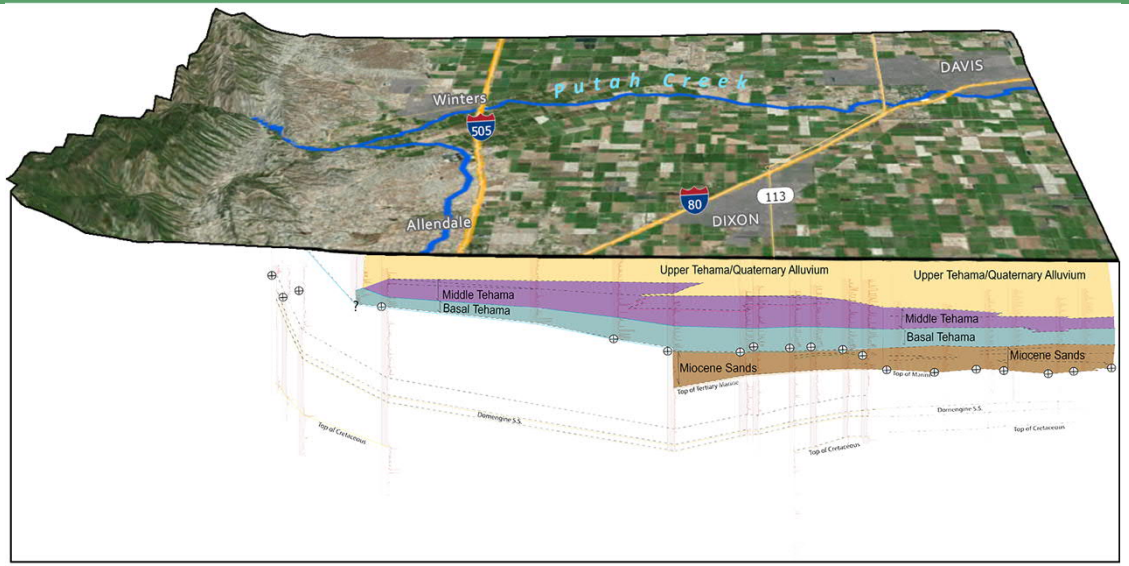
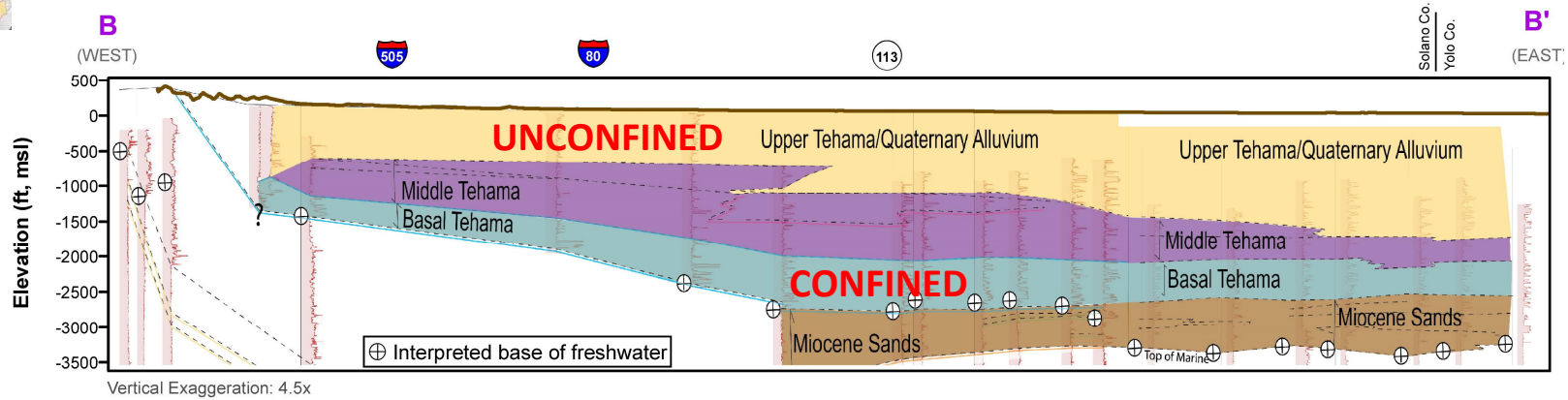
Groundwater Conditions:
High Level Overview

Hydrogeologic Setting: Understanding the Regional Geology



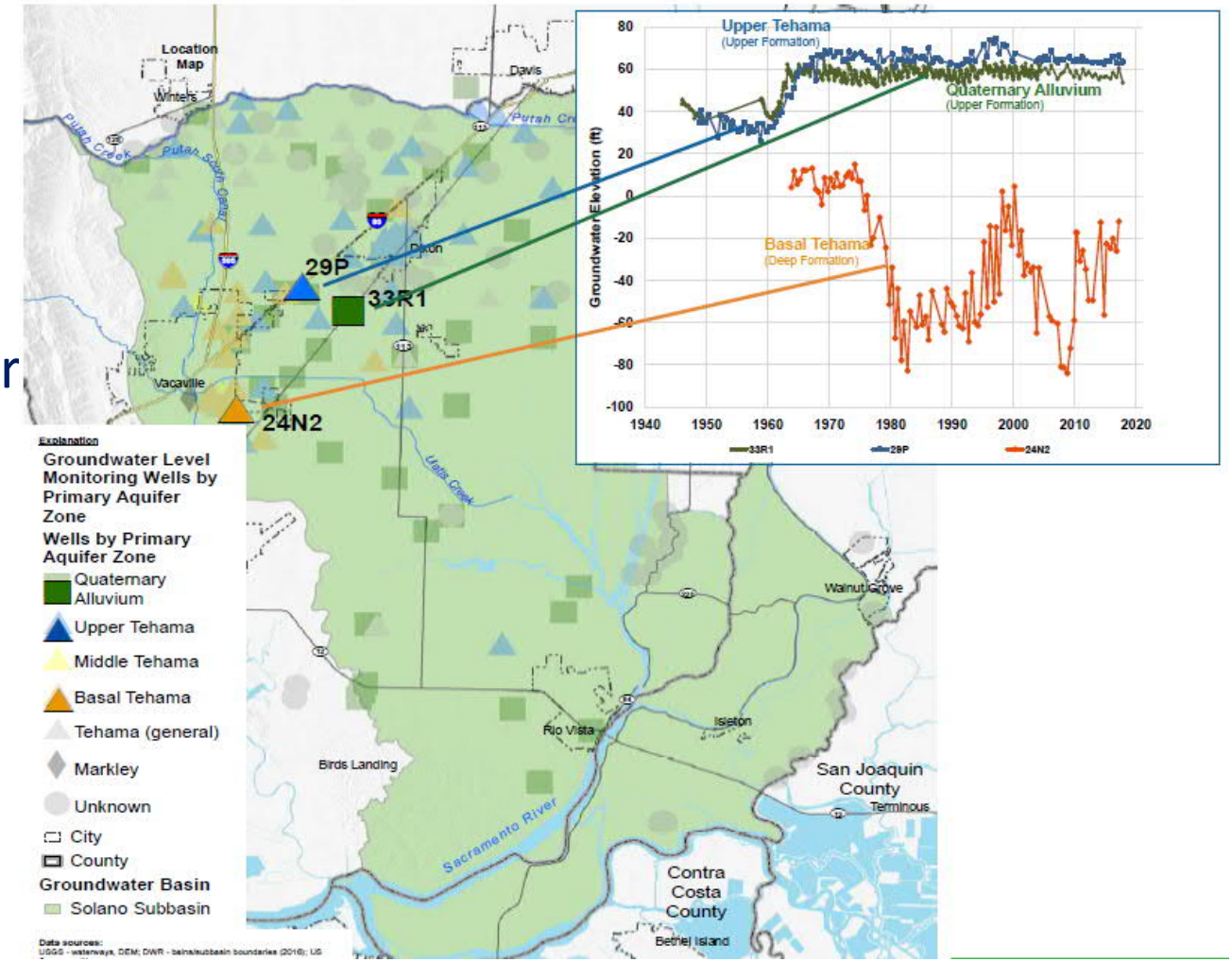




- Solano geologic cross sections; many more than one mile deep
- Understand groundwater system to understand response to recharge and pumping

Groundwater Monitoring

- Local agencies monitoring for decades to understand groundwater conditions in the subbasin
  - Regionally stable groundwater conditions
- Extensive groundwater monitoring network
- Add additional monitoring as needed to meet local SGMA objectives and ensure sustainability



Thank You