

Conceptual Uncertainties in Modeling Depletion of Interconnected Surface Water



SGMA

- CWC §10721(x) – “Undesirable result” means one or more of the following effects caused by groundwater conditions occurring throughout the basin:
 - (6) Depletions of interconnected surface water that have significant and unreasonable adverse impacts on beneficial uses of the surface water.

Sustainability

Avoid Six Undesirable Results

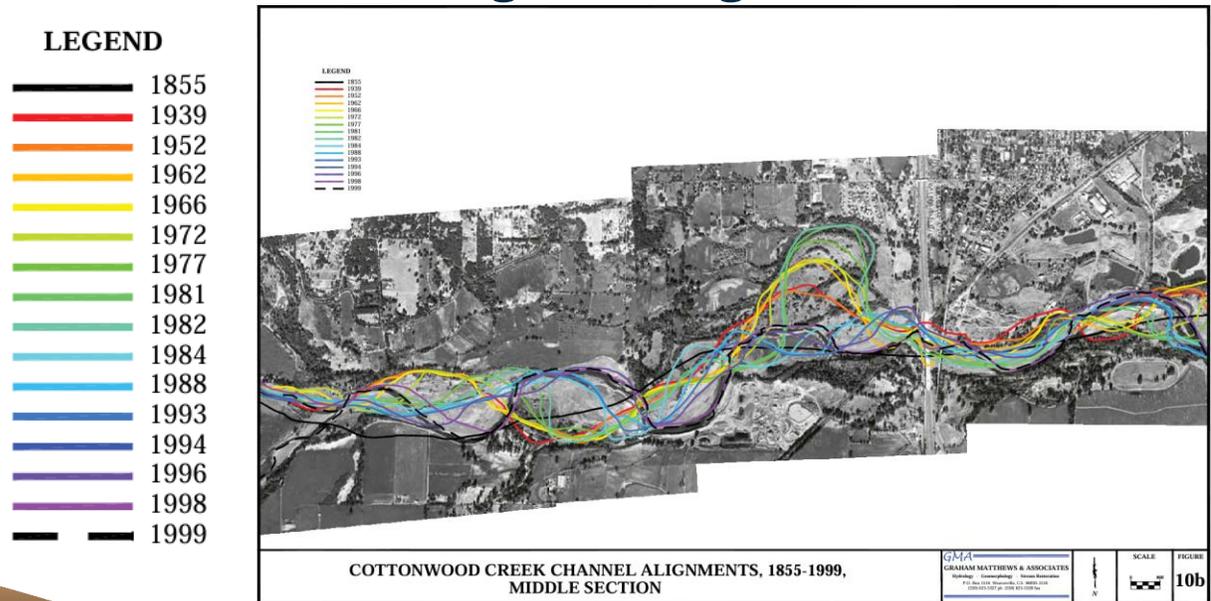
		
<i>Lowering of GW Levels</i>	<i>Reduction of GW Storage</i>	<i>Seawater Intrusion</i>
		
<i>Degraded Water Quality</i>	<i>Land Subsidence</i>	<i>Depletion of Interconnected Streams</i>

Uncertainties in simulating stream depletion

stream-continuity
streamflow-routing,
stream-geometry,
stage-measurements,
aquifer-properties,
aquifer-heterogeneity, surface-water-representation,
paleo-channels,
high-flows, disconnection-reconnection,
man-made-alterations, low-flows
flow-measurements,

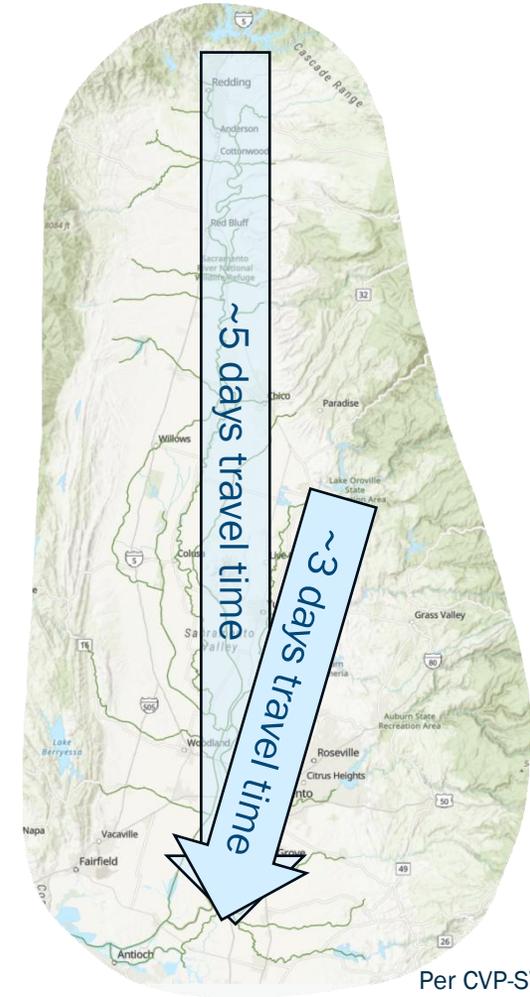
Stream Geometry

- Geometry - Shape of the channel carrying water
 - How well do we know this longitudinally along the channel?
 - Does it change after high flow events?



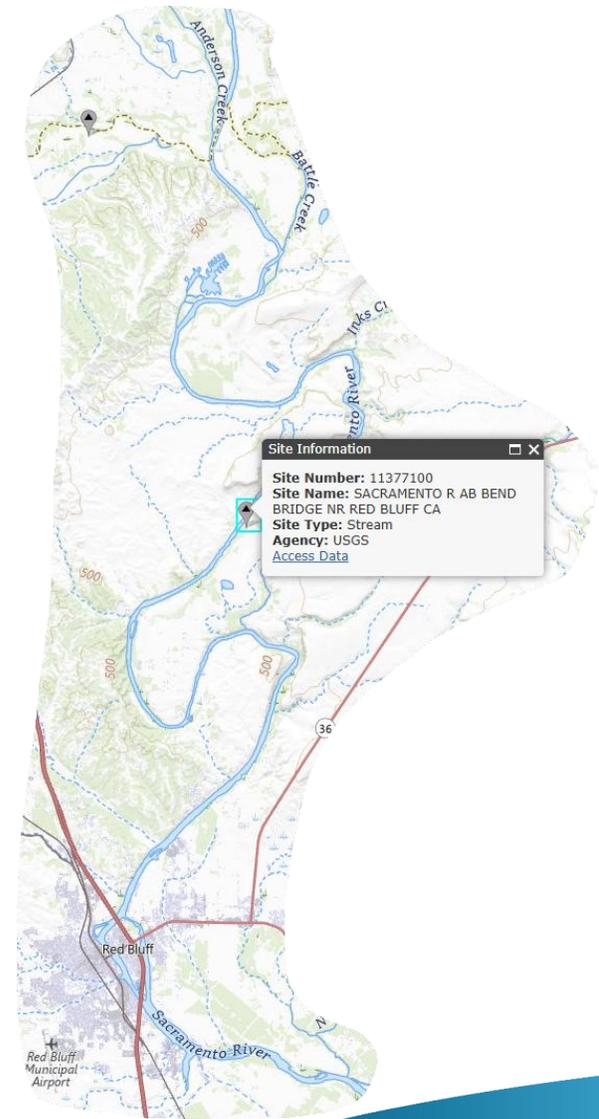
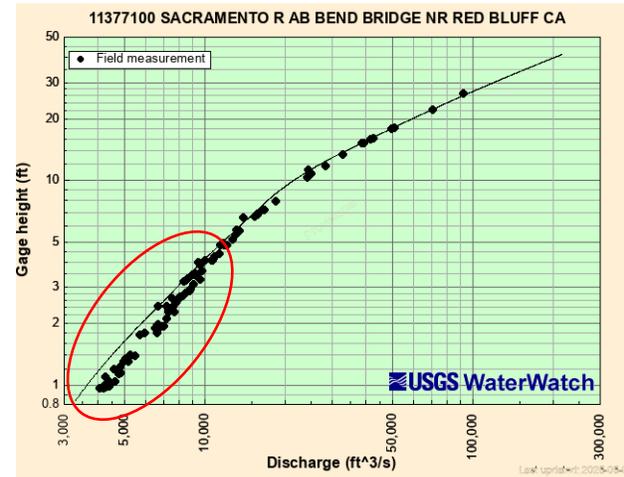
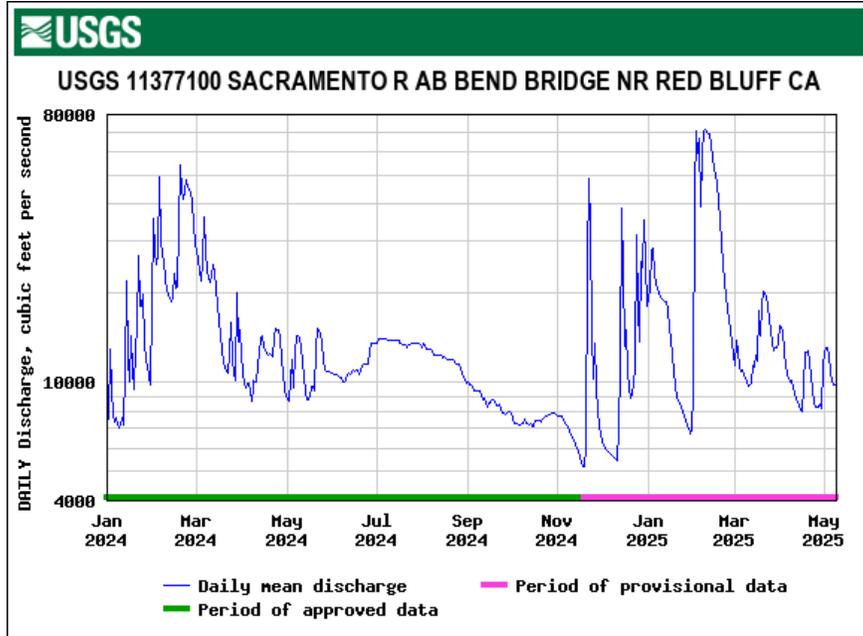
Streamflow Routing

- Stream flows are used as inputs and the model estimates stream stages based on rating curve or other method (e.g. manning's equation)
 - Low flows/High flows
 - In-stream storage (“instantaneous” routing)

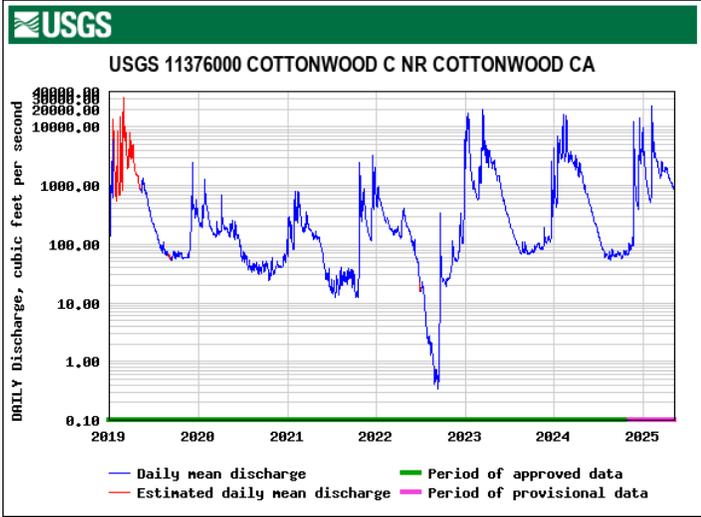
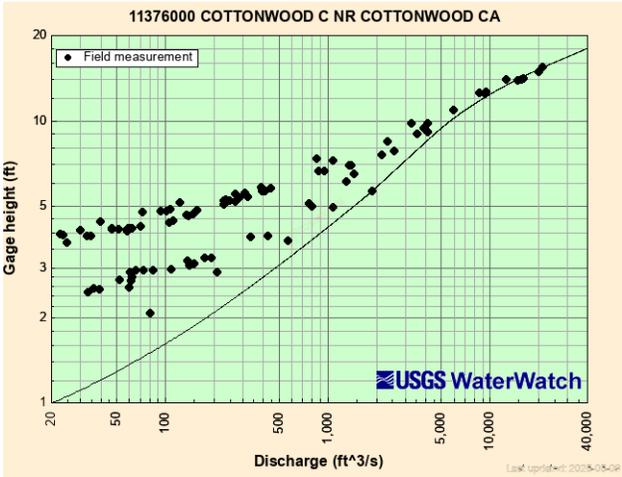
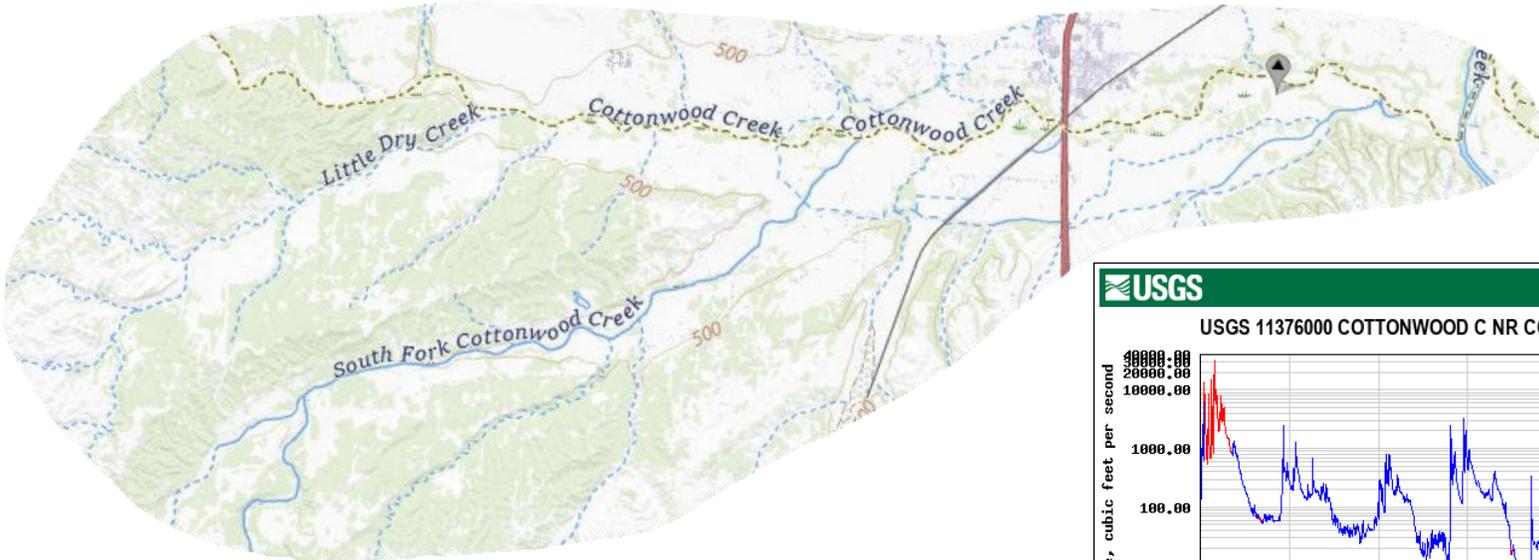


Per CVP-SWP COA

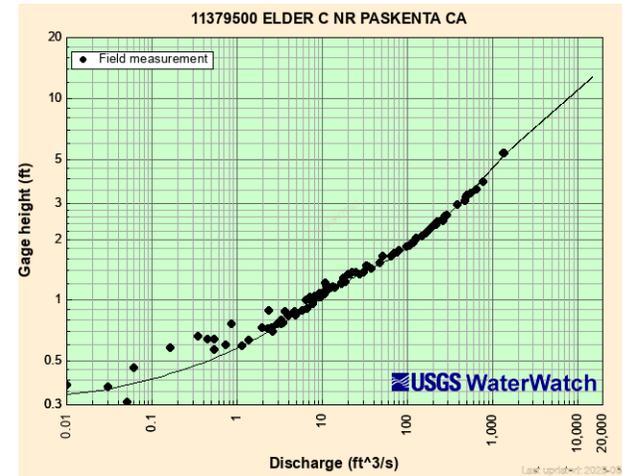
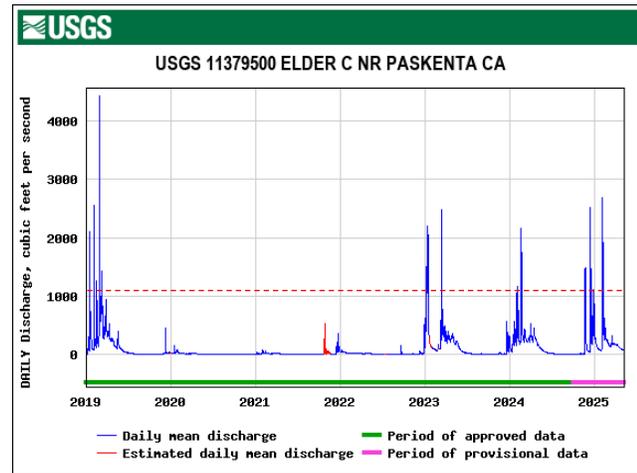
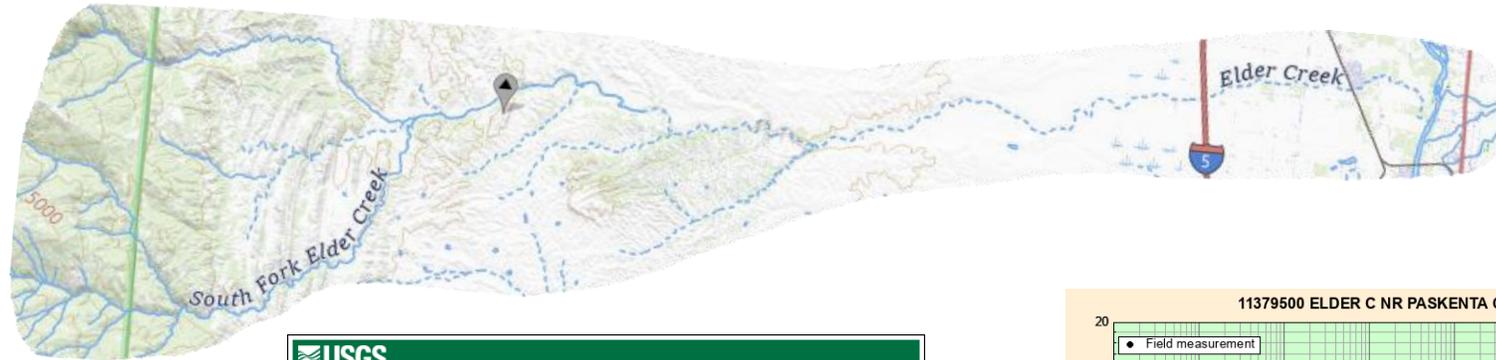
Streamflow Routing



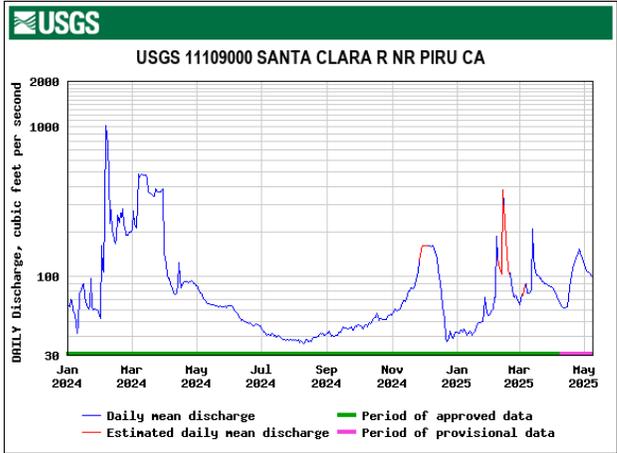
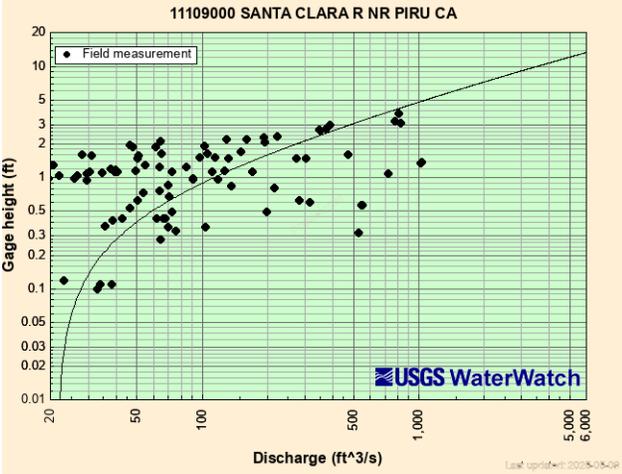
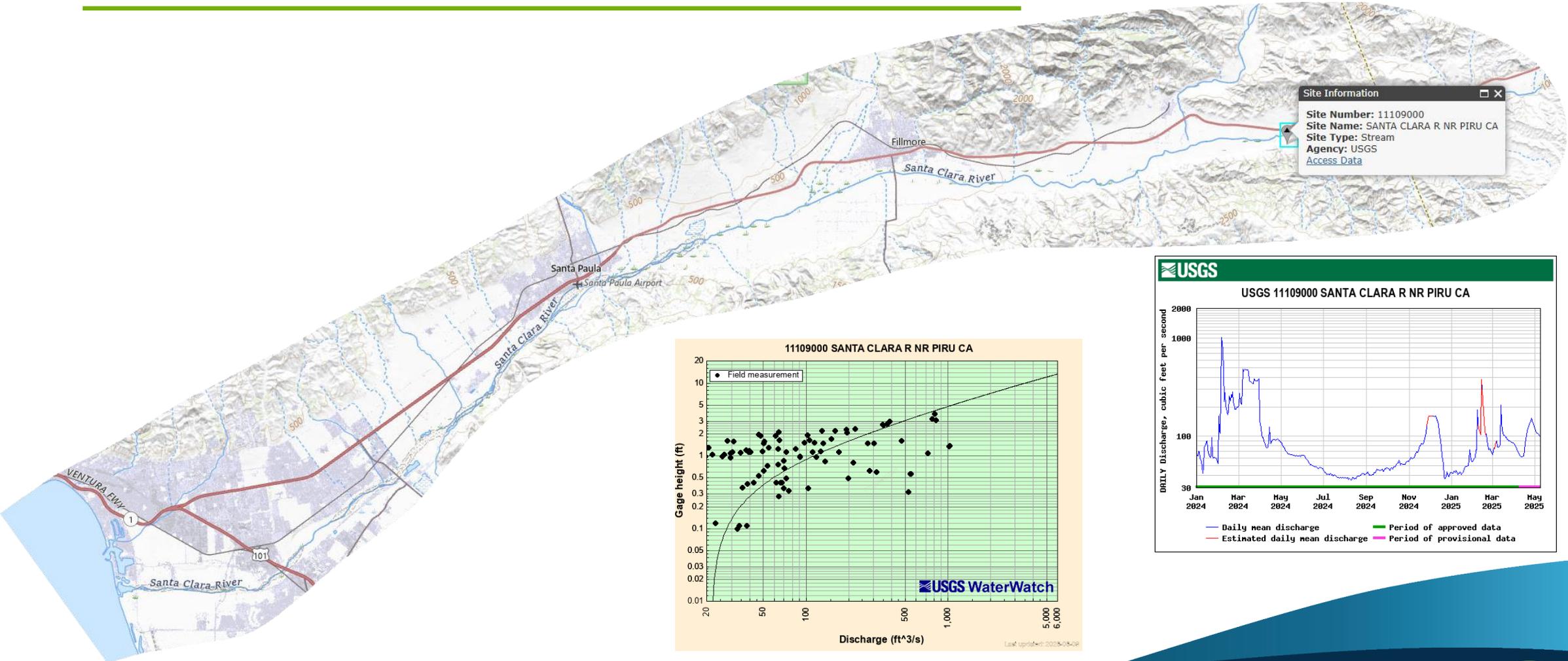
Streamflow Routing



Streamflow Routing



Streamflow Routing

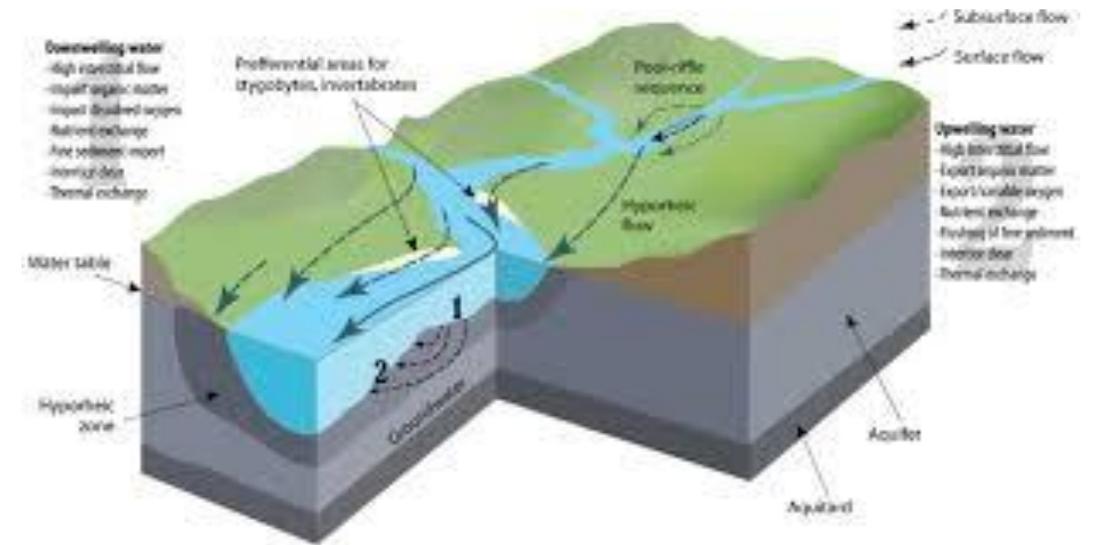
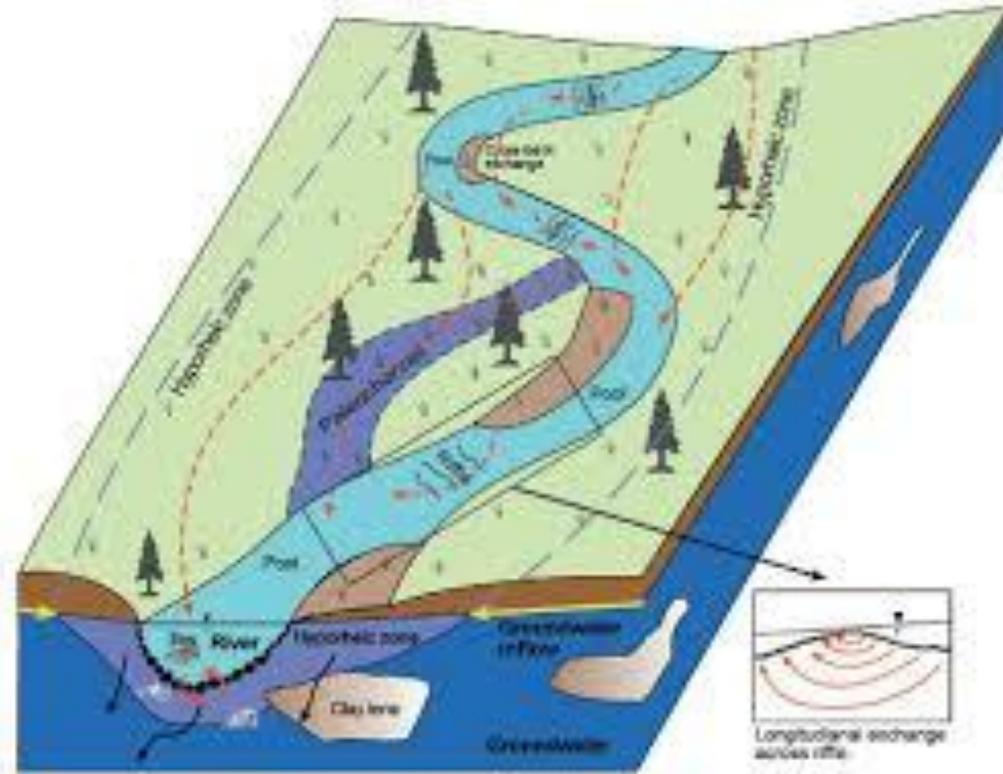


Disconnection/Reconnection

- Disconnection occurs when an unsaturated zone forms under the surface water body and its no longer interconnected
- Models (specifically MODFLOW SFR or IWFM) assume disconnection occurs when groundwater levels drop below the bottom of the stream bed. IWFM also allows for disconnection at the top of the stream bed.



Interaction between surface and groundwater



Key Points

- There is much we don't know about quantifying ISW
 - Practical limitations to data
- We can get a ballpark estimate of ISW exchanges and depletion from models
- Uncertainty is part of the game, so focus on the outcome.
 - What do we need to understand impacts?
 - Be conservative and adapt

Understanding Impacts from Depletion

- What could be impacted and when?
- How are they impacted?
- Is there data that can be used to constrain your model to help understand?
 - e.g. stream continuity through time, how aquifer storage refills annually.



How can models help us?

- Provide estimates of location, timing, and quantity (yes, this is uncertain)
- Help guide efforts to better understand how interconnected surface water responds during critical times of the year i.e. the times when impacts are most likely → low flows
 - Decision support under uncertainty
 - Data worth

Questions

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