

Opportunities and Challenges in Using Multiple Models for Regional Groundwater Management in the Salinas Valley



CWEMF 2026 Annual Meeting

April 21, 2026

Me!

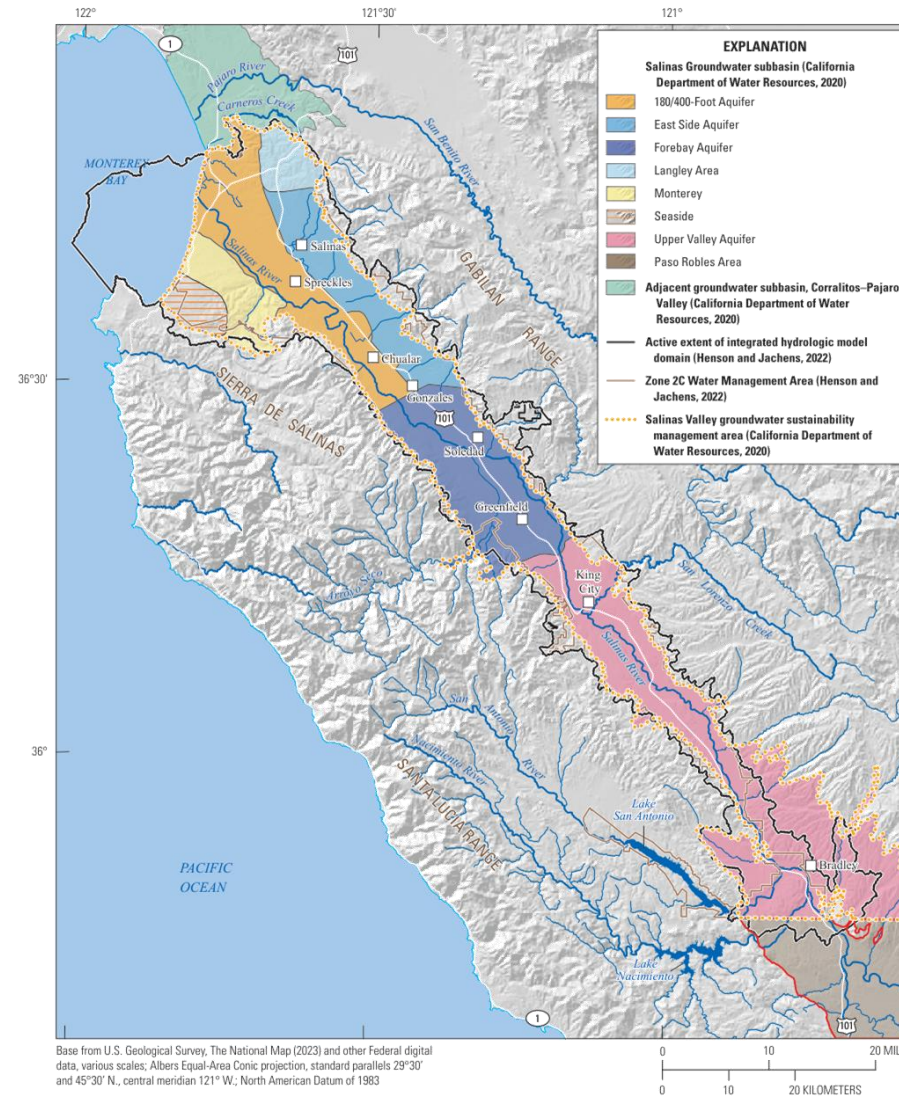
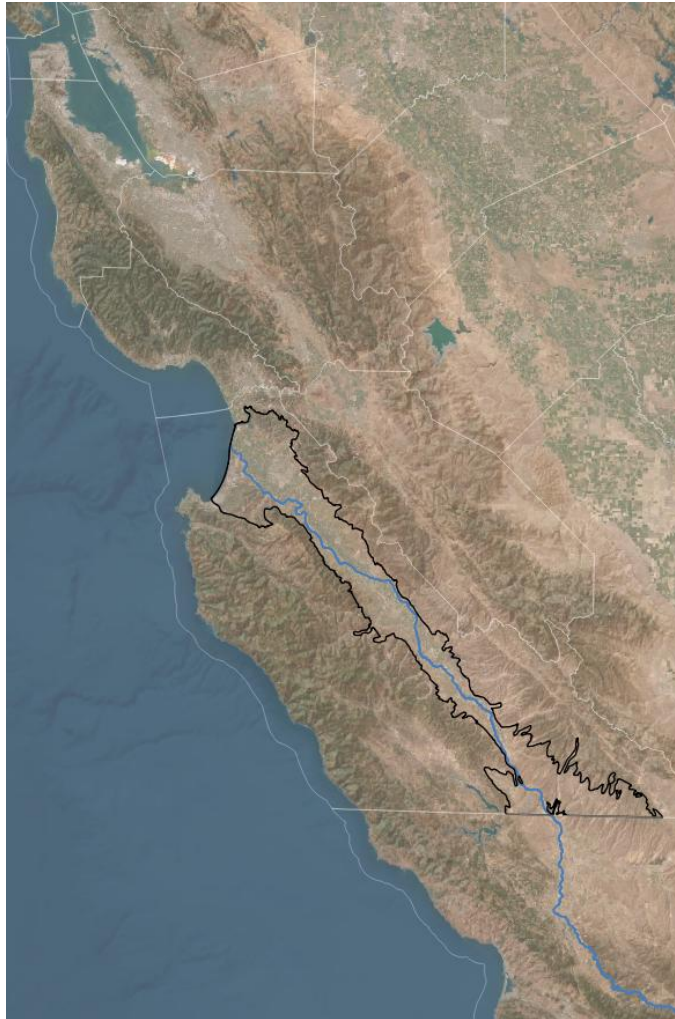
- 13 years groundwater modeling / hydrology
- Started at M&A last fall
- Salinas Valley GSA support



HydroMetrics WRI



Salinas Valley



From: Henson, W., Hanson, R.T., Boyce, S., Hevesi, J.A., Jachens, E.R., 2025, Salinas Valley Integrated Hydrologic and Reservoir Operations Models, Monterey and San Luis Obispo Counties, California: U.S. Geological Survey Scientific Investigations Report Preprint

Undesirable Results and Management

Salinas Valley

Declining Groundwater Levels

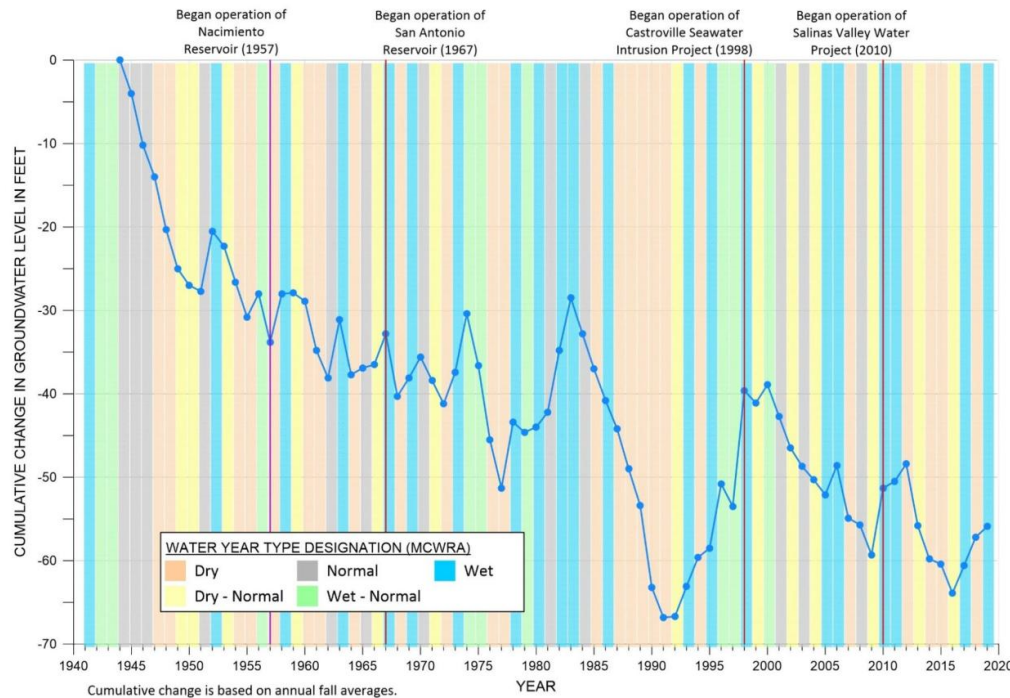


Figure 5-11. Cumulative Groundwater Elevation Change Graph for the Eastside Subbasin (adapted from MCWRA, 2018a, personal communication)

Seawater Intrusion



Simplified conceptual diagram of seawater intrusion in the Salinas Valley 180-Foot and 400-Foot Aquifers. See more at: <https://svbgsa.org/resources/seawater-intrusion/>

Physical Setting

Salinas Valley

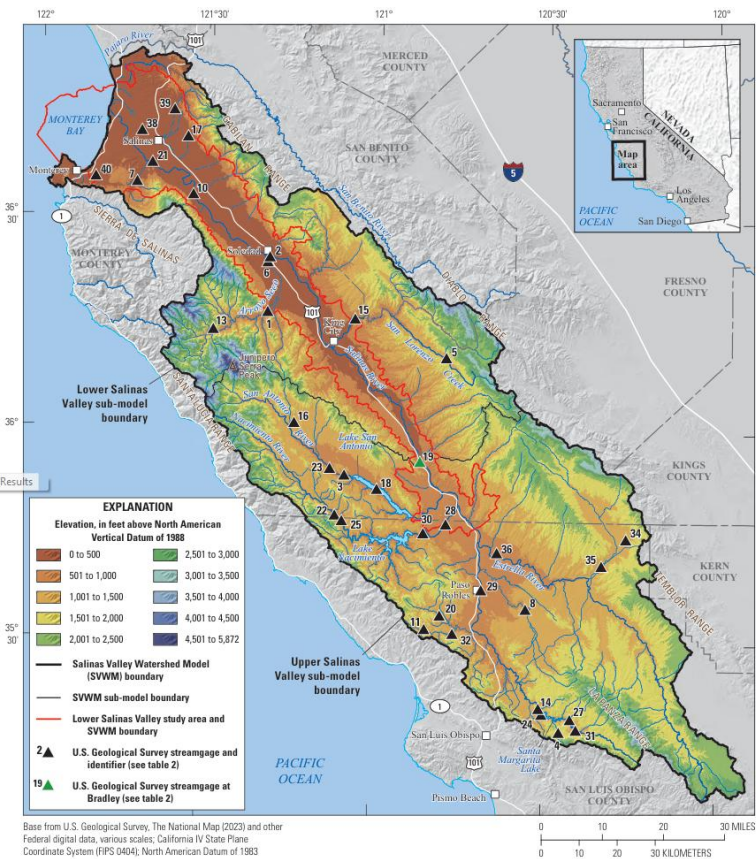


Figure 1. Salinas Valley study area, with land-surface elevation, major rivers and streams, reservoirs, and U.S. Geological Survey streamgages (Henson and others, 2022; U.S. Geological Survey, 2023; Hevesi and others, 2025).

From: Hevesi, J.A., Henson, W., Hanson, R.T., Jachens, E.R., Bond, S., Earll, M.M., and Herbert, D., 2025, Application of Hydrologic Simulation Program—FORTRAN (HSPF) as part of an integrated hydrologic model for the Salinas Valley, California: U.S. Geological Survey Scientific Investigations Report 2025–5009, 148 p., <https://doi.org/10.3133/sir20255009>.

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Hydrogeology

Salinas Valley

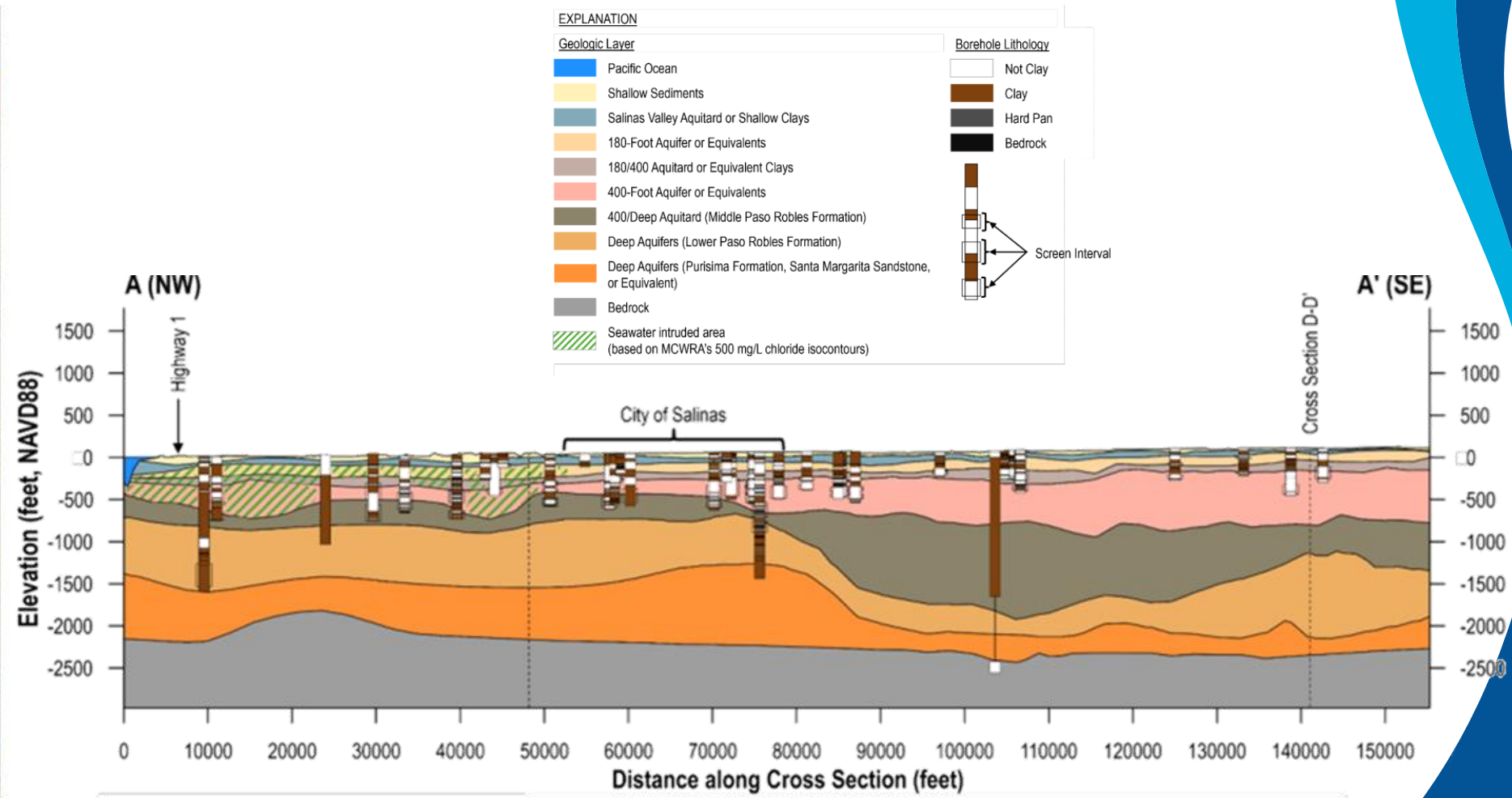
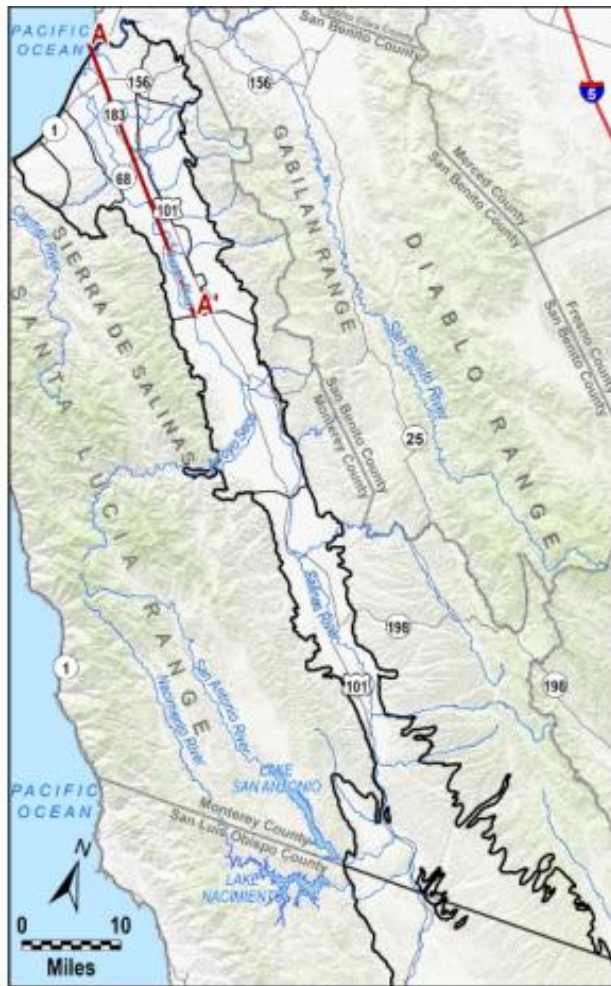


Figure 4. Geologic Cross Section from Updated Hydrogeologic Model: A-A' Valley-wide Longitudinal

Two Models

The Models

- Two problems & variety of possible projects to address

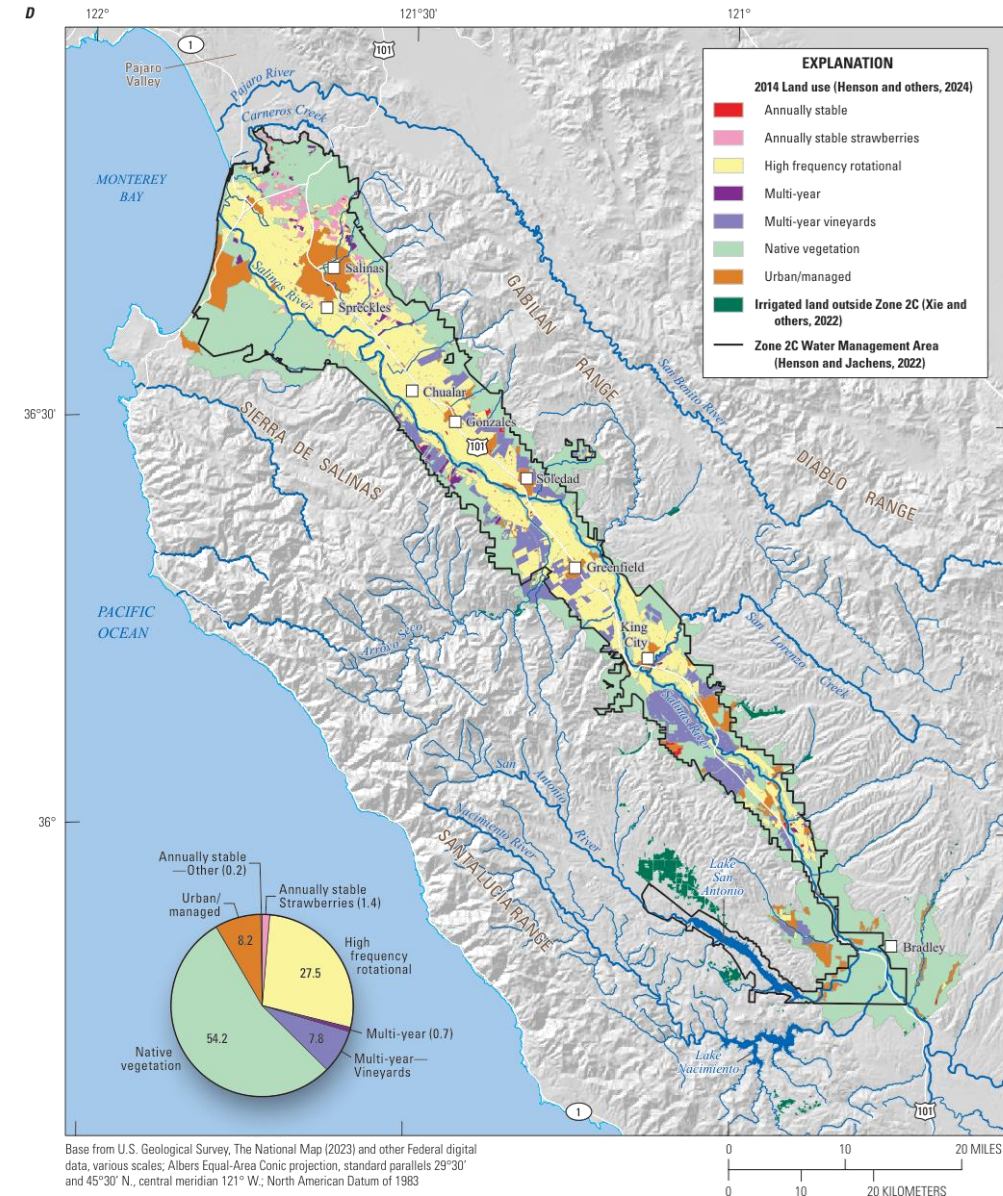
SVIHM (regional) Purpose

Regional groundwater/surface water supply & use

In response to

- Land use
- Climate
- Reservoir operations
- Other interventions

The Models



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SVIHM (regional) Scope

The Models

- MODFLOW OWHM
- Groundwater flow
- Regional interactions over entire basin
- Hydrogeologic layers & multi-aquifer wells
- Streamflow + aquifer interactions
- Farm demand and supply
- Reservoir operations

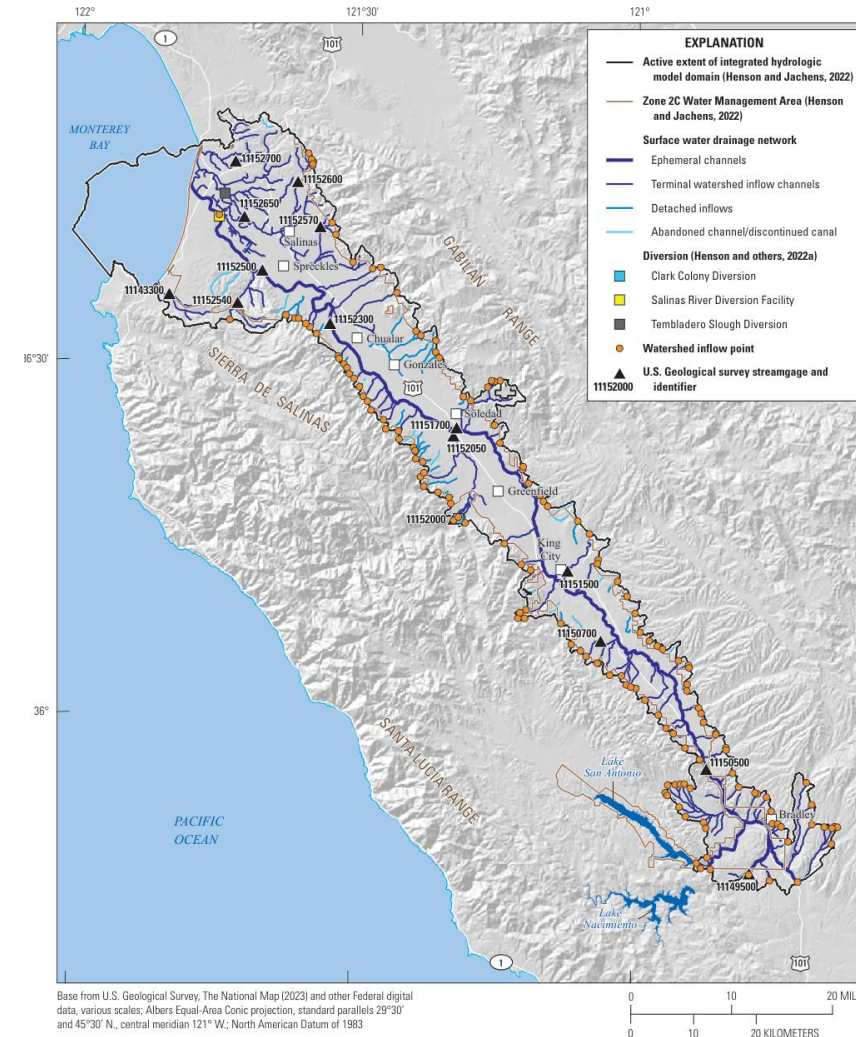


Figure 20. Surface water drainage network channel types within the Salinas Valley study area, USGS National Water Information System streamgages, stream diversion locations, and point locations of watershed inflows from outside the active model domain.

From: Henson, W., Hanson, R.T., Boyce, S., Hevesi, J.A., Jachens, E.R., 2025, Salinas Valley Integrated Hydrologic and Reservoir Operations Models, Monterey and San Luis Obispo Counties, California: U.S. Geological Survey Scientific Investigations Report Preprint

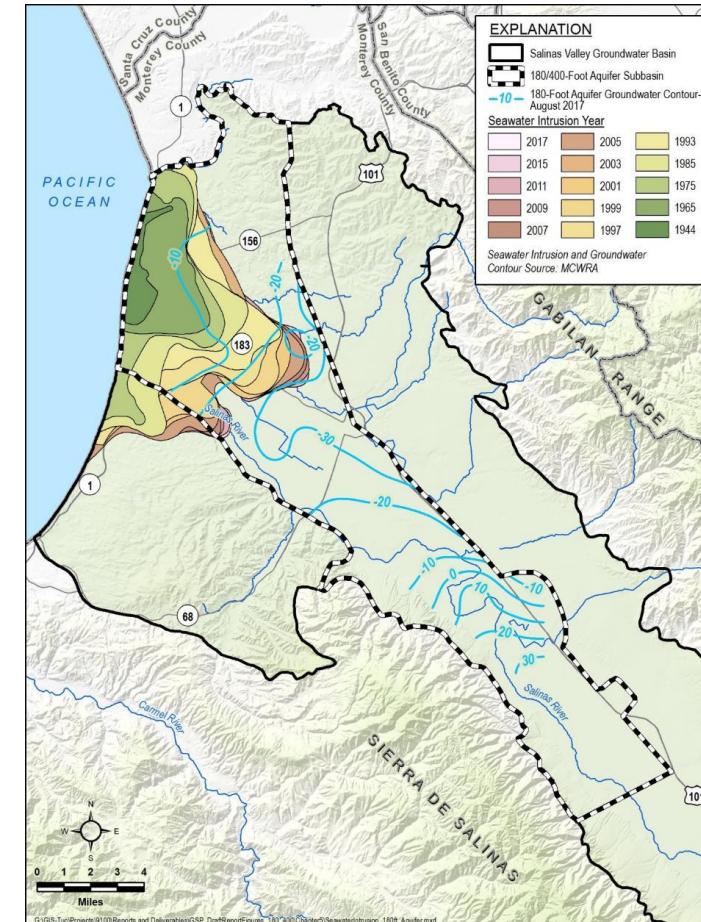
SWIM (coastal) Purpose

The Models

Seawater intrusion
advancement (and retreat?)

In response to

- Local interventions
- Land use
- Climate
- Reservoir operations



SWIM (coastal) Scope

The Models

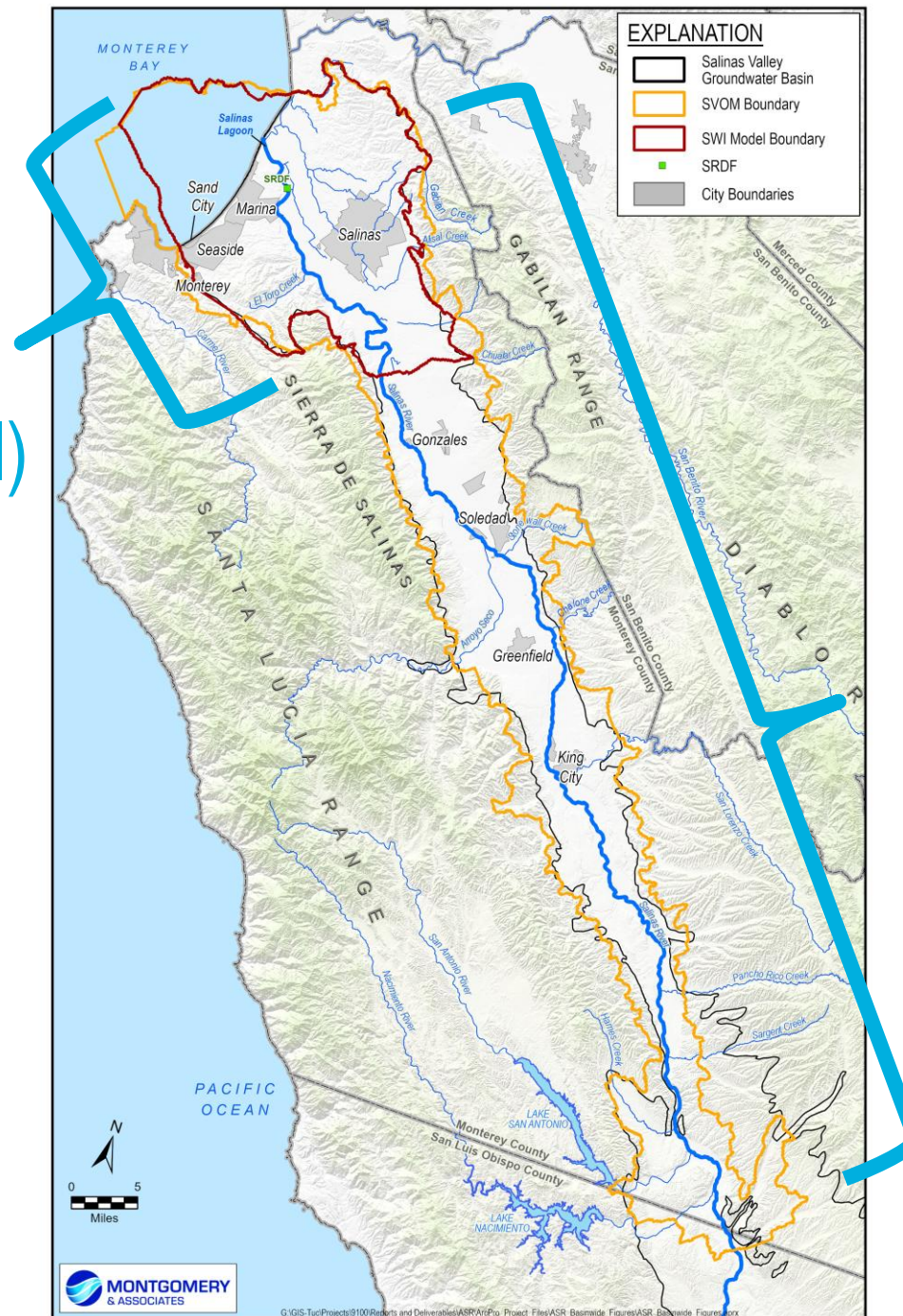
- MODFLOW OWHM
 - Groundwater flow
 - Entire basin
 - Hydrogeologic layers & multi-aquifer wells
 - Streamflow + aquifer interactions
 - Farm demand and supply
 - Reservoir operations
- MODFLOW USG
 - Groundwater flow, transport, density
 - Coastal / intrusion front
 - Hydrogeologic layers & multi-aquifer wells
 - ~ Stream aquifer interactions

Overlap

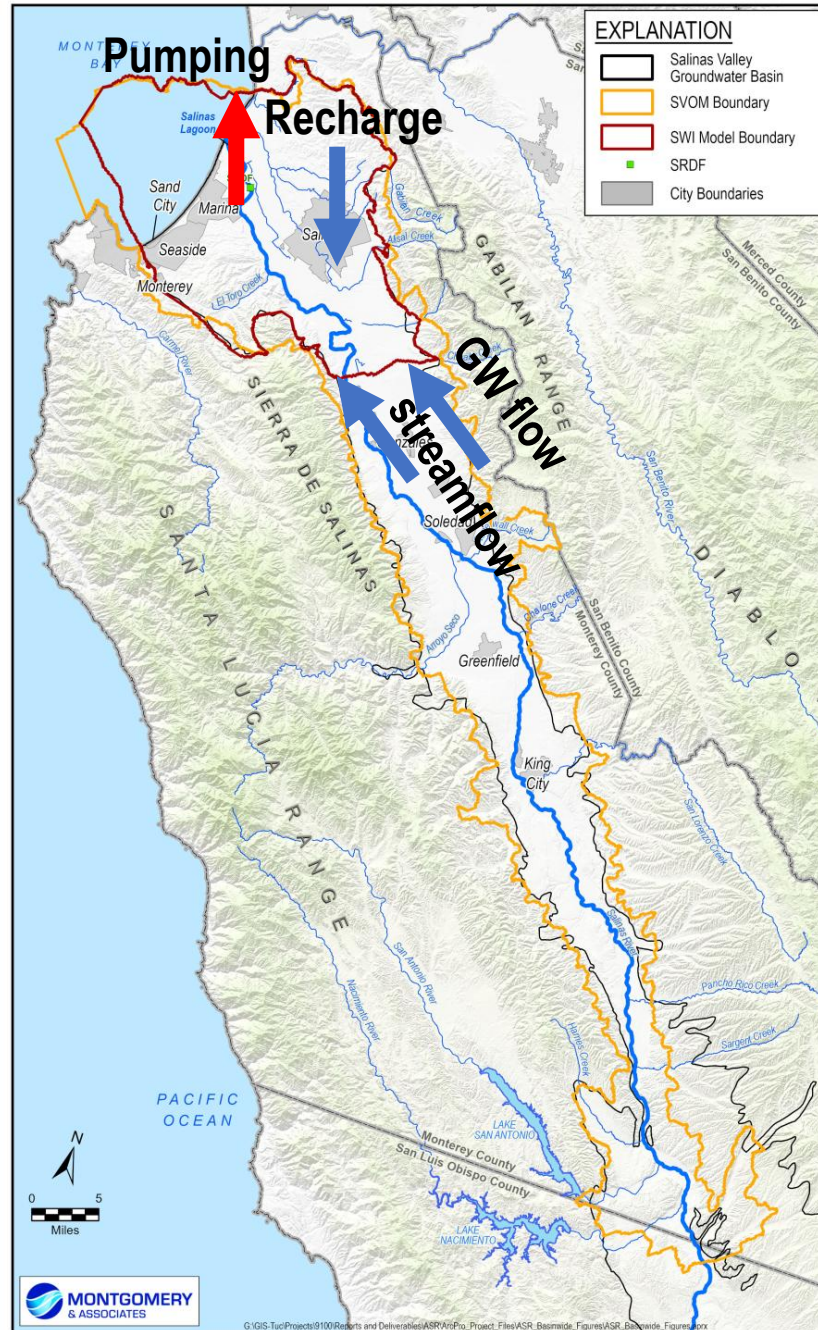
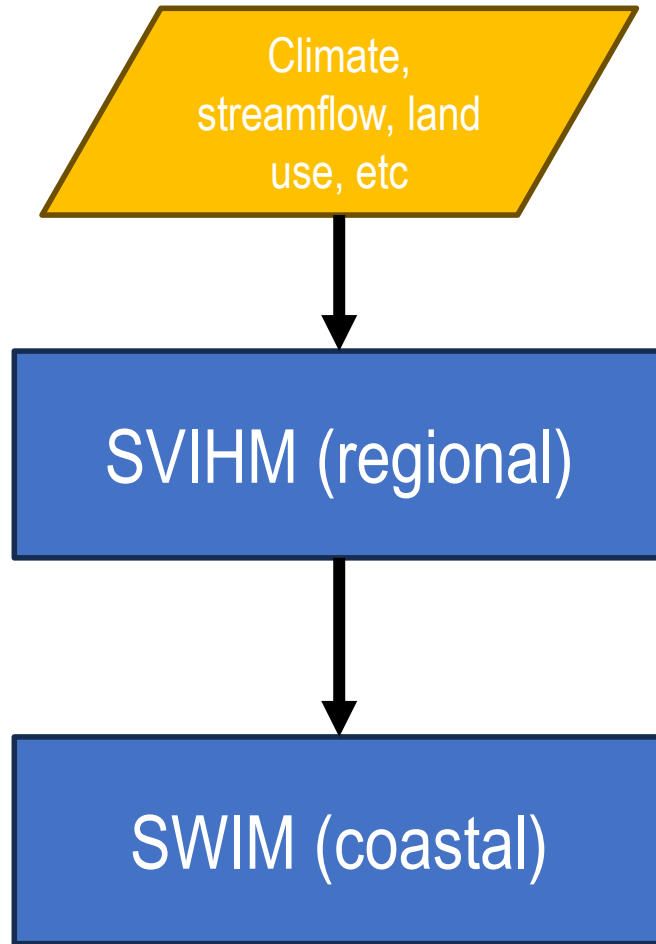
The Models

SWIM
(coastal)

SVIHM
(regional)



Coupled Application



Coupled Application

Alignment Approach

Coupled Application

Paired Parameter Estimation

Coupled Application

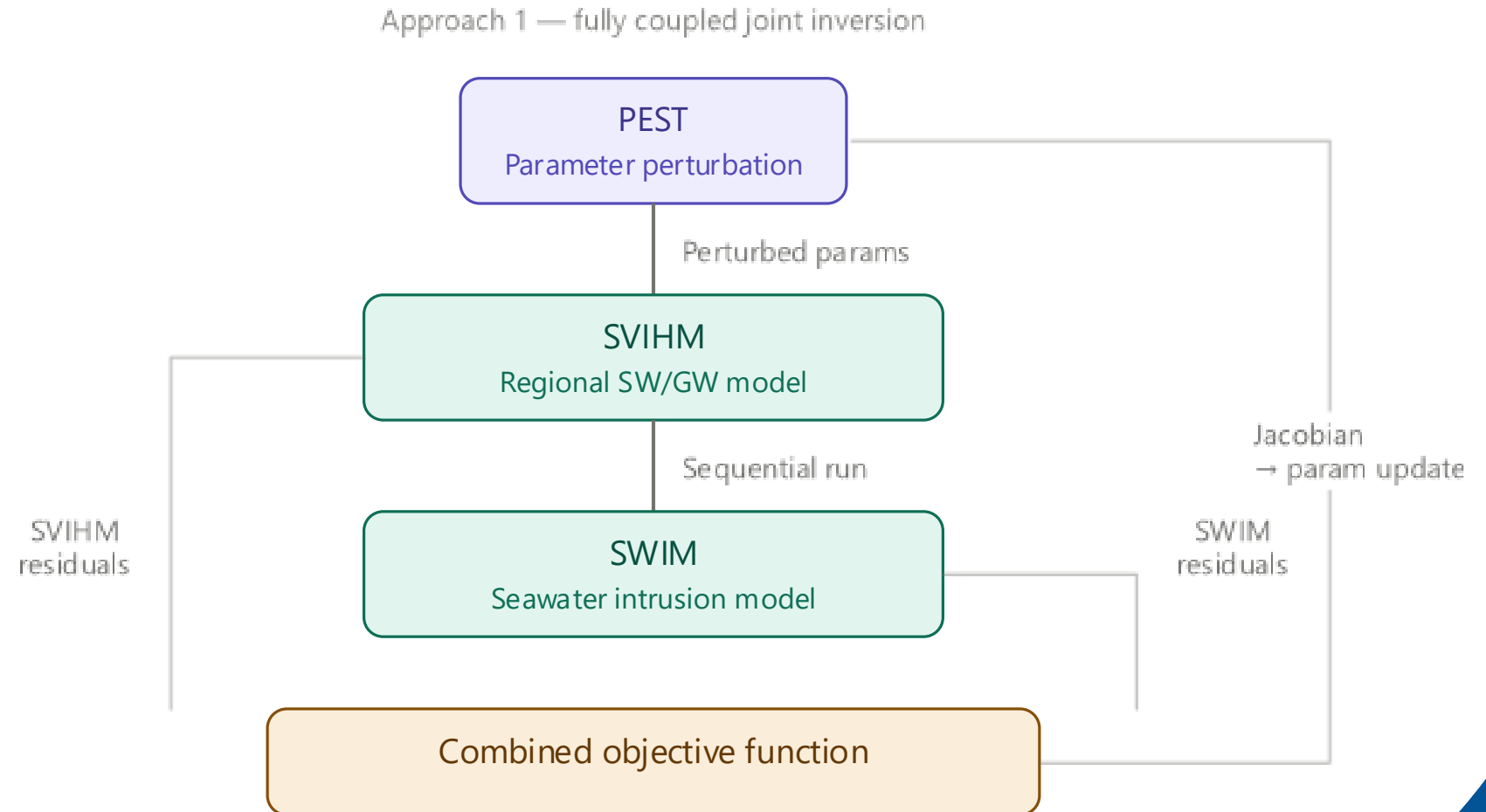
~~Coupled?~~

Time:

- SVIHM: ~3 days
- SWIM: 1-2 days
- Together: 4-5 days

Stability

- SVIHM: pretty good
- SWIM: iffy



Paired Parameter Estimation

Coupled Application

Manual sequential

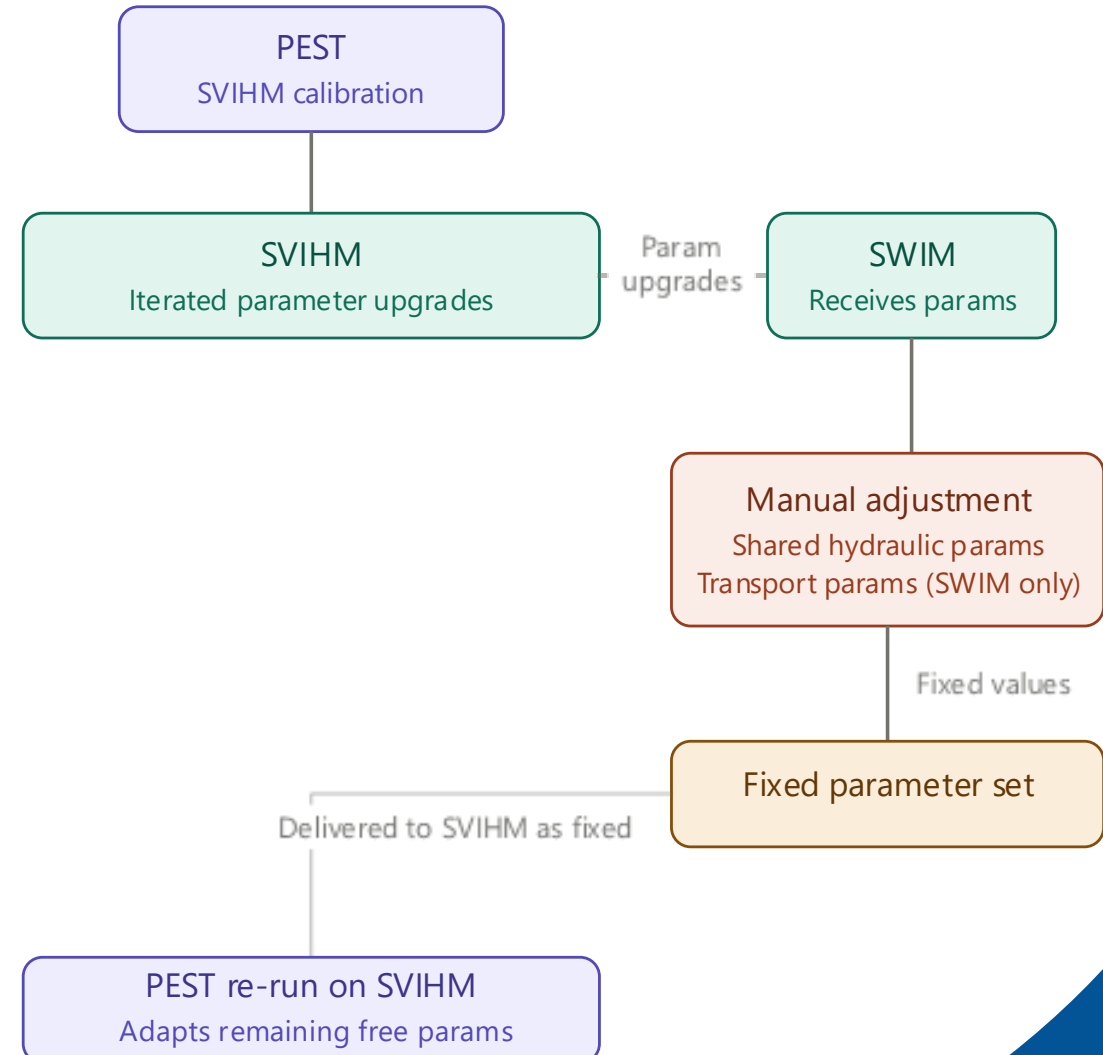
SWIM

- Try not to adjust SWIM too much
- Receive SVIHM updates, manual changes, return to SVIHM

SVIHM

- Iteratively freeze and adjust parameters
-> PEST
- Hydraulic, farm, riverbed parameters
- Pumping rates, water levels, streamflow

Approach 2 — sequential with manual cross-model adjustment



Paired Parameter Estimation

Coupled Application

SWIM

SVIHM

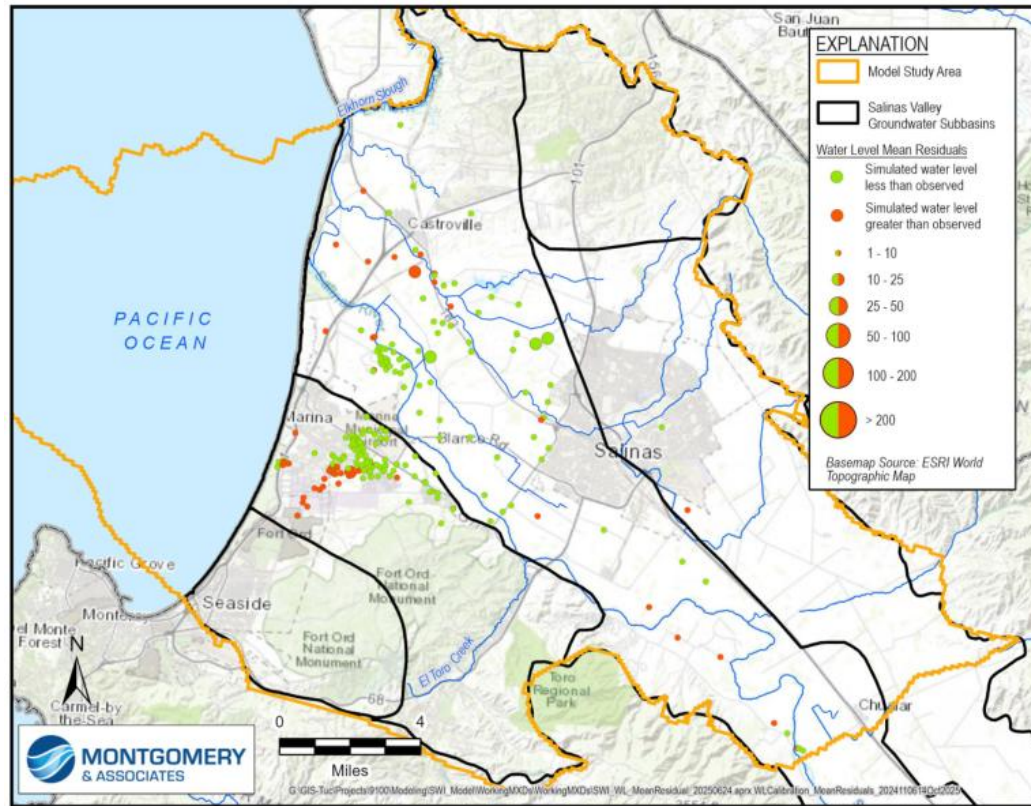


Figure 23. Mean Residual Water Level Bubble Plot within the 180-Foot Aquifer and Equivalent Areas

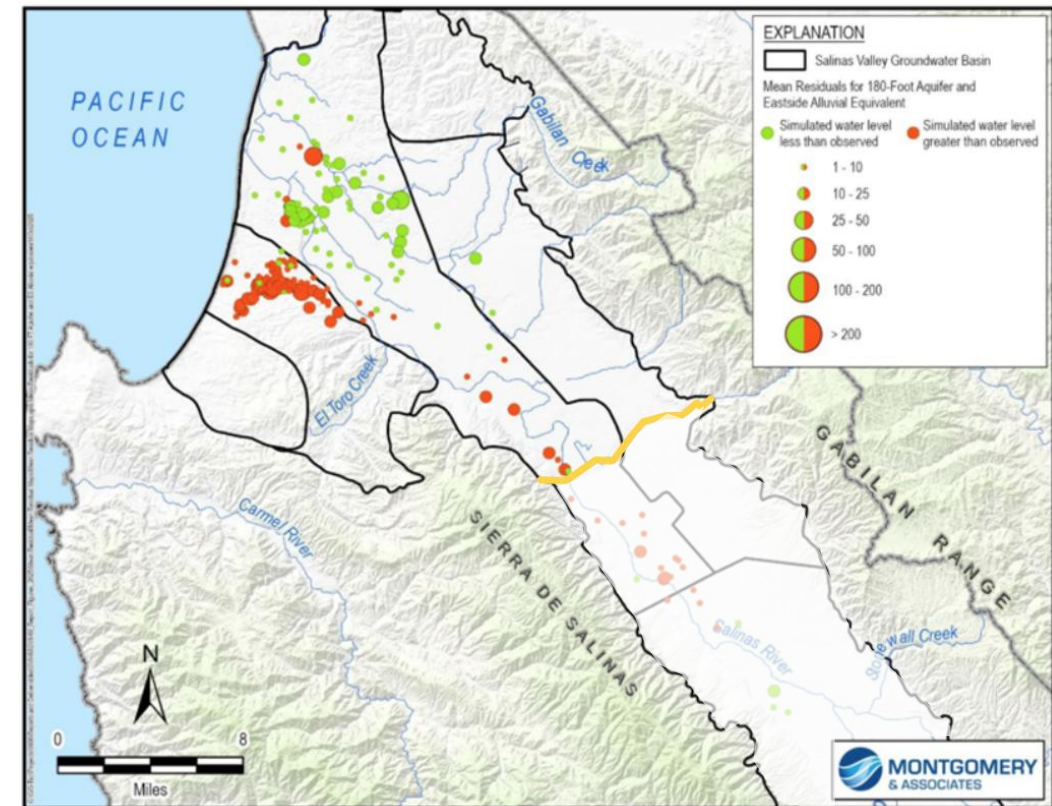
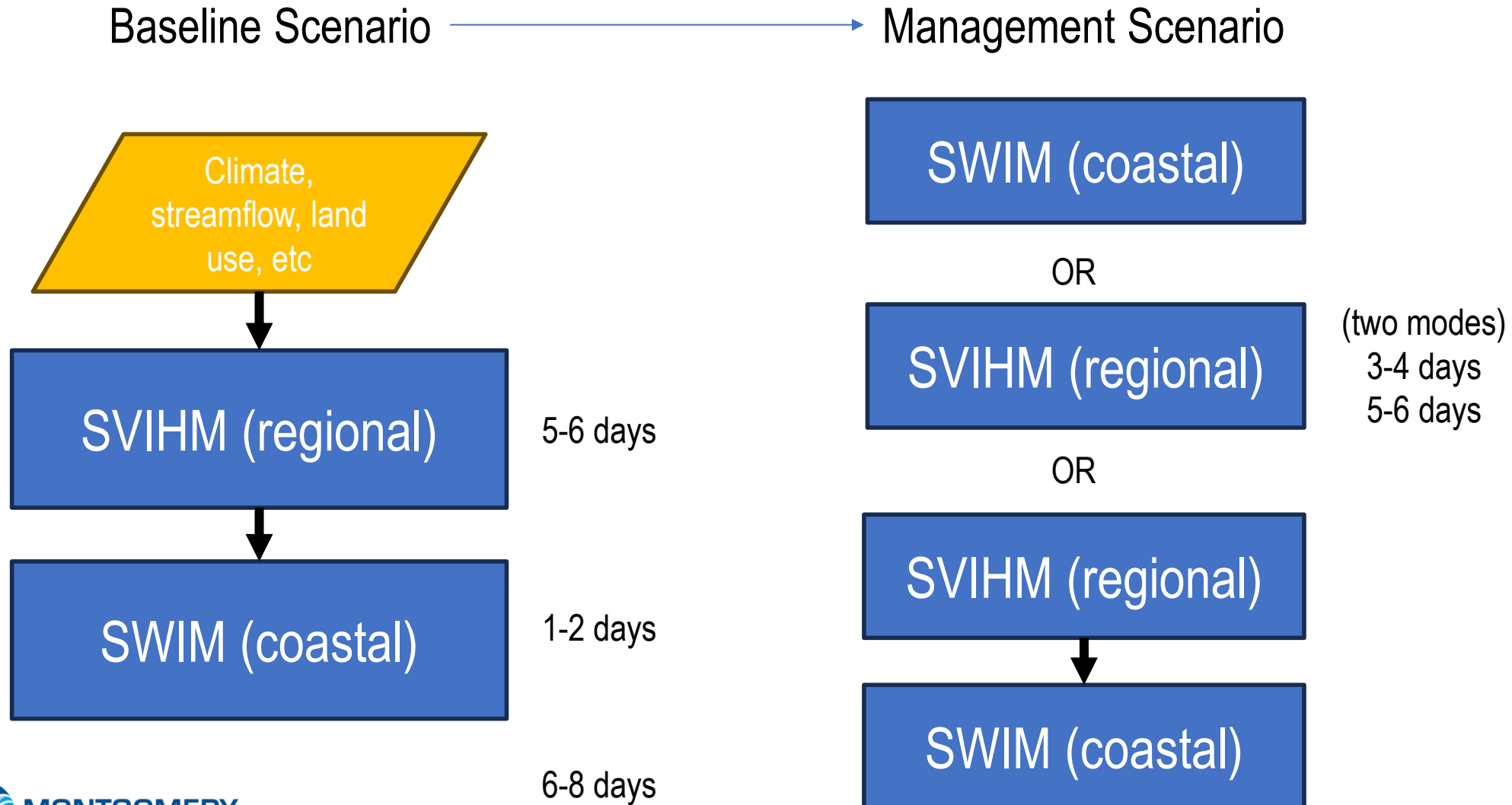


Figure 77. Mean Residual Map for 180-Foot Aquifer and Eastside Alluvial Equivalent

Use in Scenario Modeling

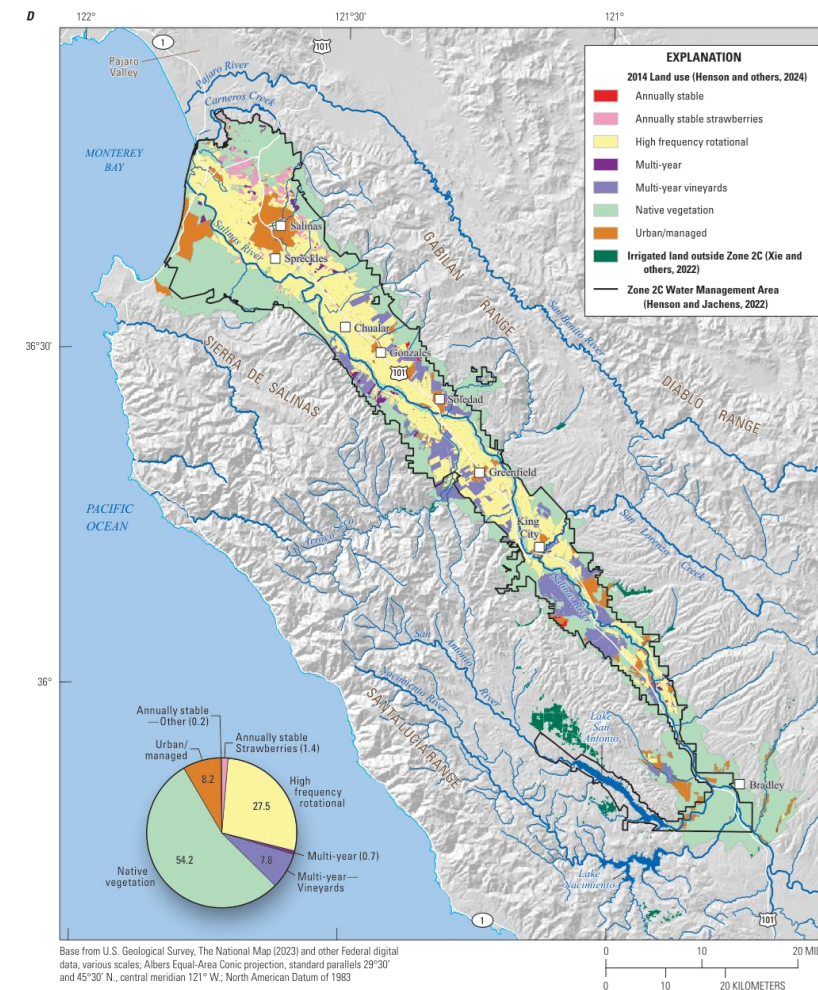
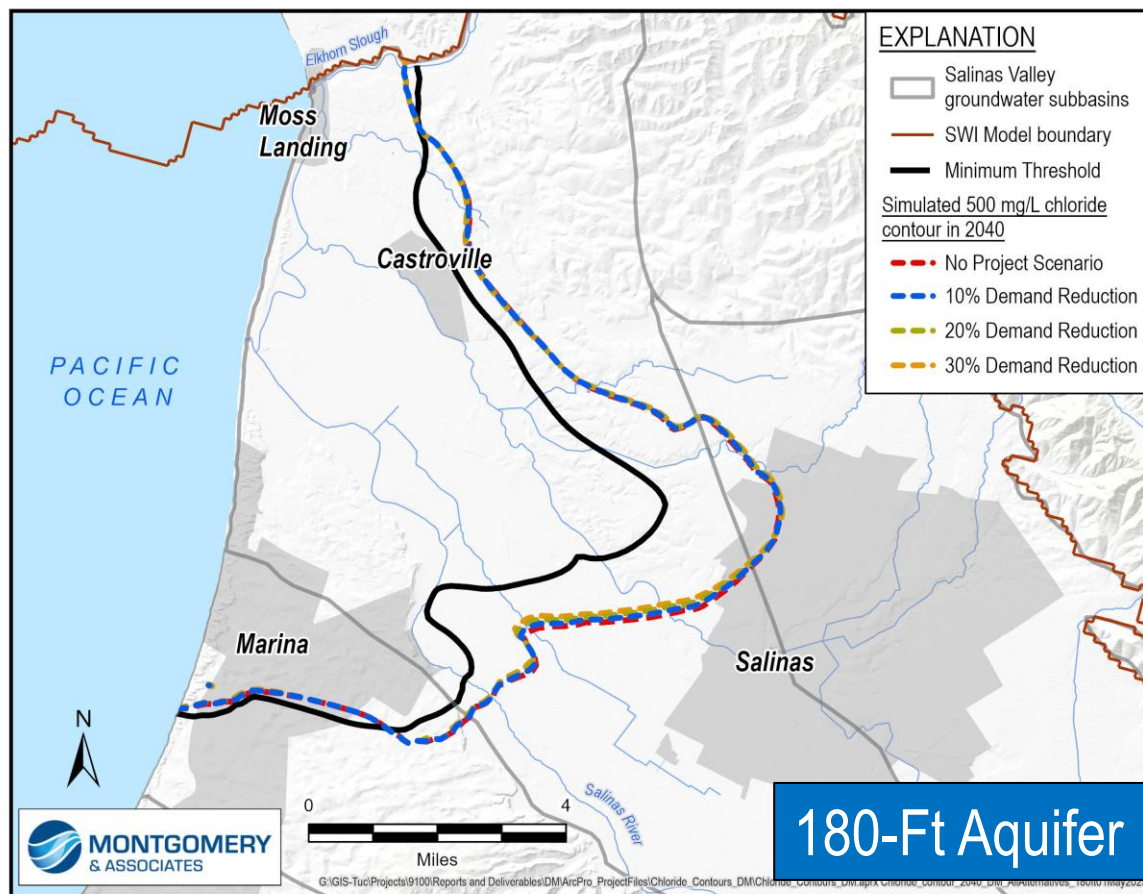
Coupled Application



Example Application: Demand Management

Coupled Application

Paired management scenario

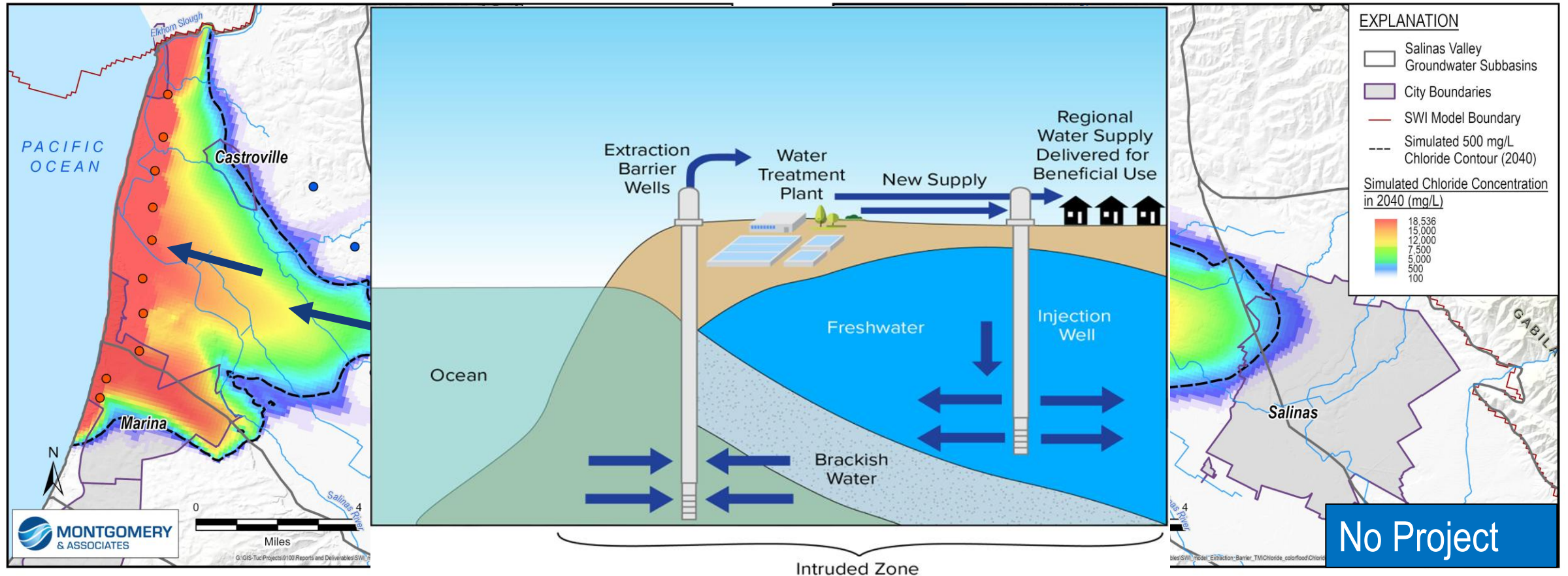


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Example Application: BGRP

Coupled Application

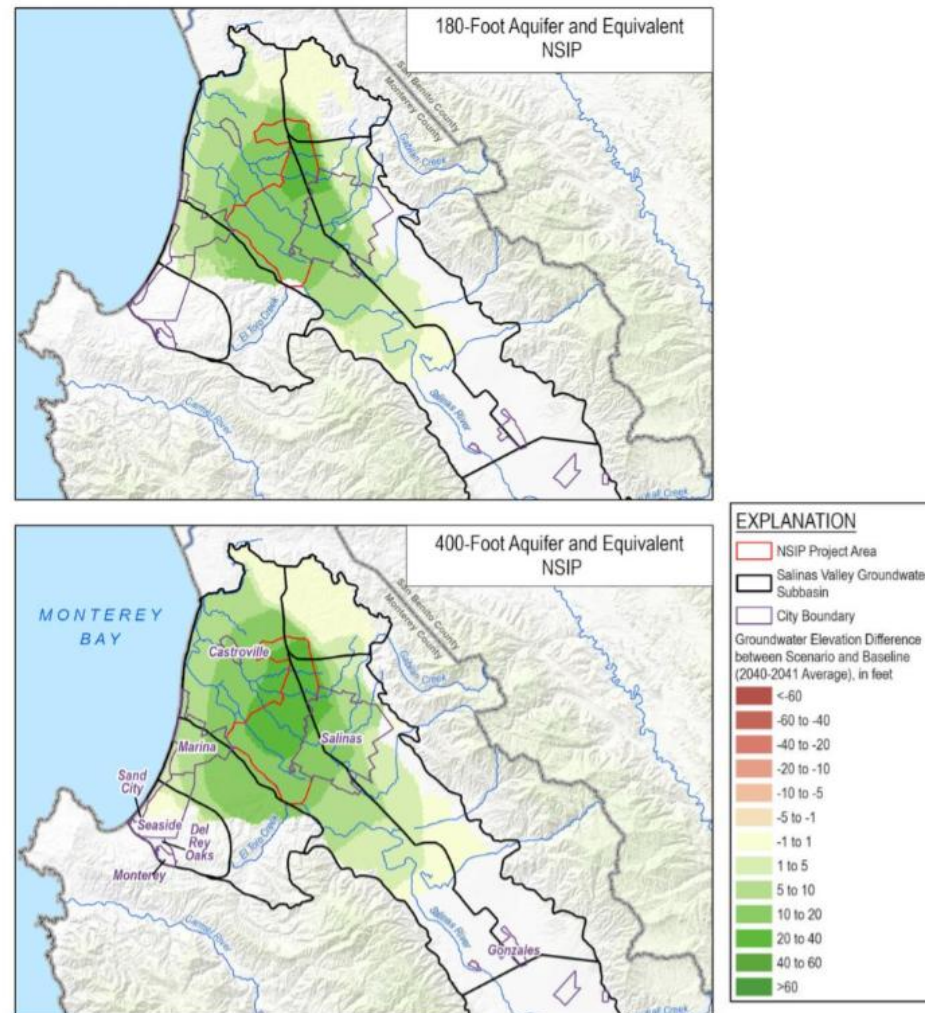
SWIM-only management scenario



Example Application: NSIP

Coupled Application

SWIM-only management scenario, with care



What's Next?

Closing

Closing

Closing

Questions



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