Hydrogeologic Conceptual Model & Basin Conditions

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Santa Margarita Groundwater Agency

September 26, 2019

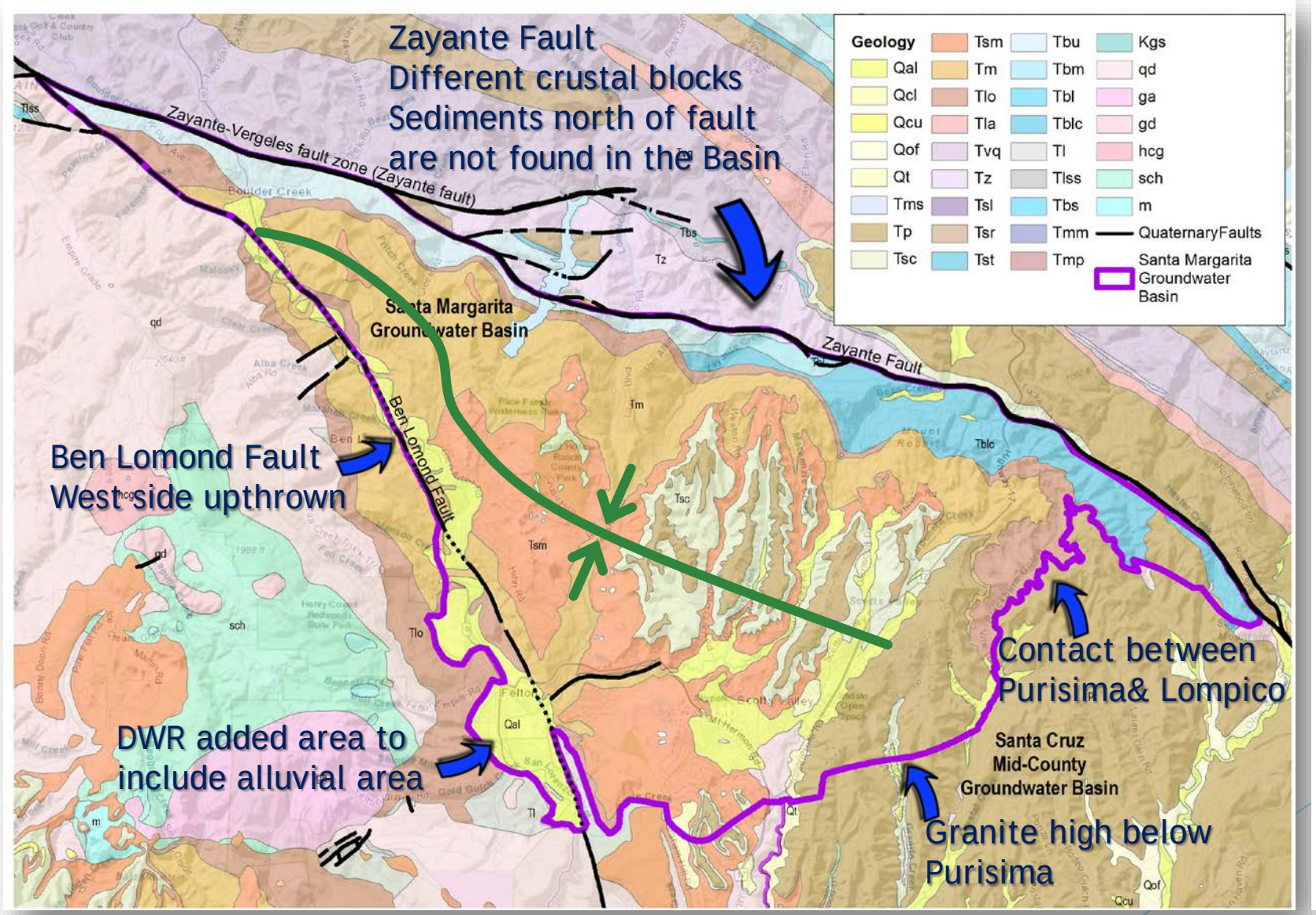
Santa Margarita Basin Setting Topics Section 2 of GSP

- Hydrogeological Conceptual Model (HCM)
- Basin Conditions
- Water Budget (January 2020 - need the groundwater model)
- Management Areas (Nov 2019)

Hydrogeological Conceptual Model (§ 354.14)

- Description of:
  - Regional geologic and structural setting of basin and surrounding area
  - Adjacent basin boundaries, including major geologic features that significantly impede or impact groundwater flow
  - Definable bottom of the basin
  - Principal aquifers and aquitards
- Maps
  - Topographic information
  - Surficial geology
  - Soil characteristics of relative permeability
  - Recharge areas that substantially contribute to the replenishment of the basin
- Cross-sections that display information contained in the written description

Santa Margarita Basin HCM



- Syncline bound by **Ben Lomond Fault and Zayante Fault**. These faults form some of the basin boundaries
- Sequence of **sandstone, siltstone, and mudstone** folded into a geologic trough called the **Scotts Valley Syncline**
- Geologically complex because of **variability of layers**

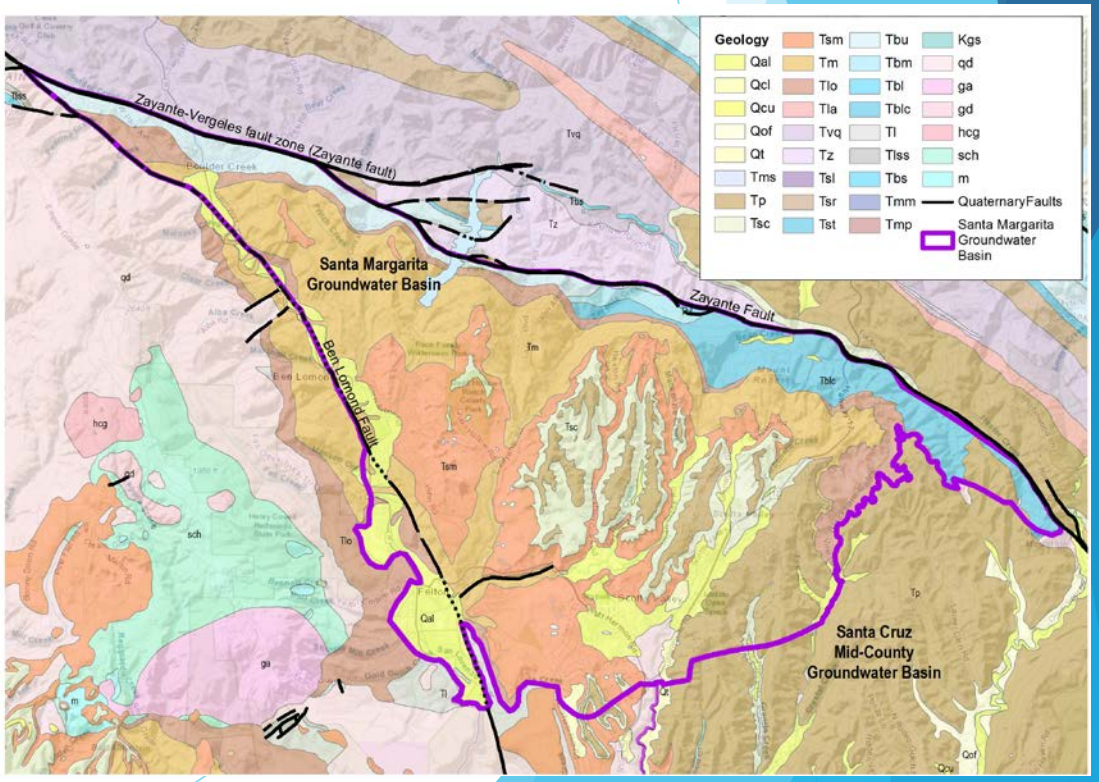
Hydrogeologic Conceptual Model

Era	Period	Series	Geologic Formation		Lithology	Maximum Thickness in Basin (feet)
Cenozoic	Quaternary	Pleistocene -Holocene	Alluvium and Terrace Deposits		Alluvium –silt, sand and gravel Terrace Deposits – sand and gravel	< 100
	Tertiary	Pliocene	Purisima Formation		siltstone and sandstone	200
		Miocene	Santa Cruz Mudstone		mudstone; locally graded to sandy siltsone	250
			Santa Margarita Sandstone		sandstone	450
			Lompico	Monterey Formation	mudstone and sandy siltstone	2,000
			Sandstone		sandstone	400
		Eocene	Butano Sandstone	Upper	sandstone with some thin beds of siltstone	3,000
				Middle	siltstone	250 – 750
				Lower	sandstone with pebble conglomerate in lower part	1,500
		Paleocene	Locatelli Formation		siltstone with sandstone locally at base	800
Mesozoic	Cretaceous		Crystalline Basement		Quartz diorite	

unconformity

principal aquifer

Modified after Johnson (2009) and Kennedy/Jenks (2015)

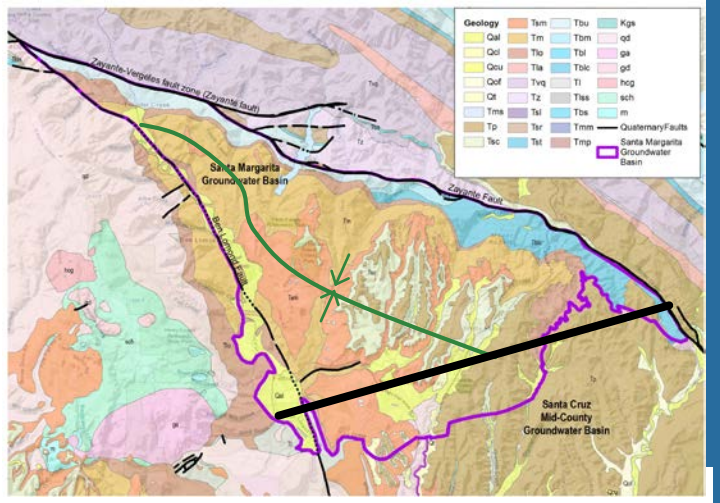


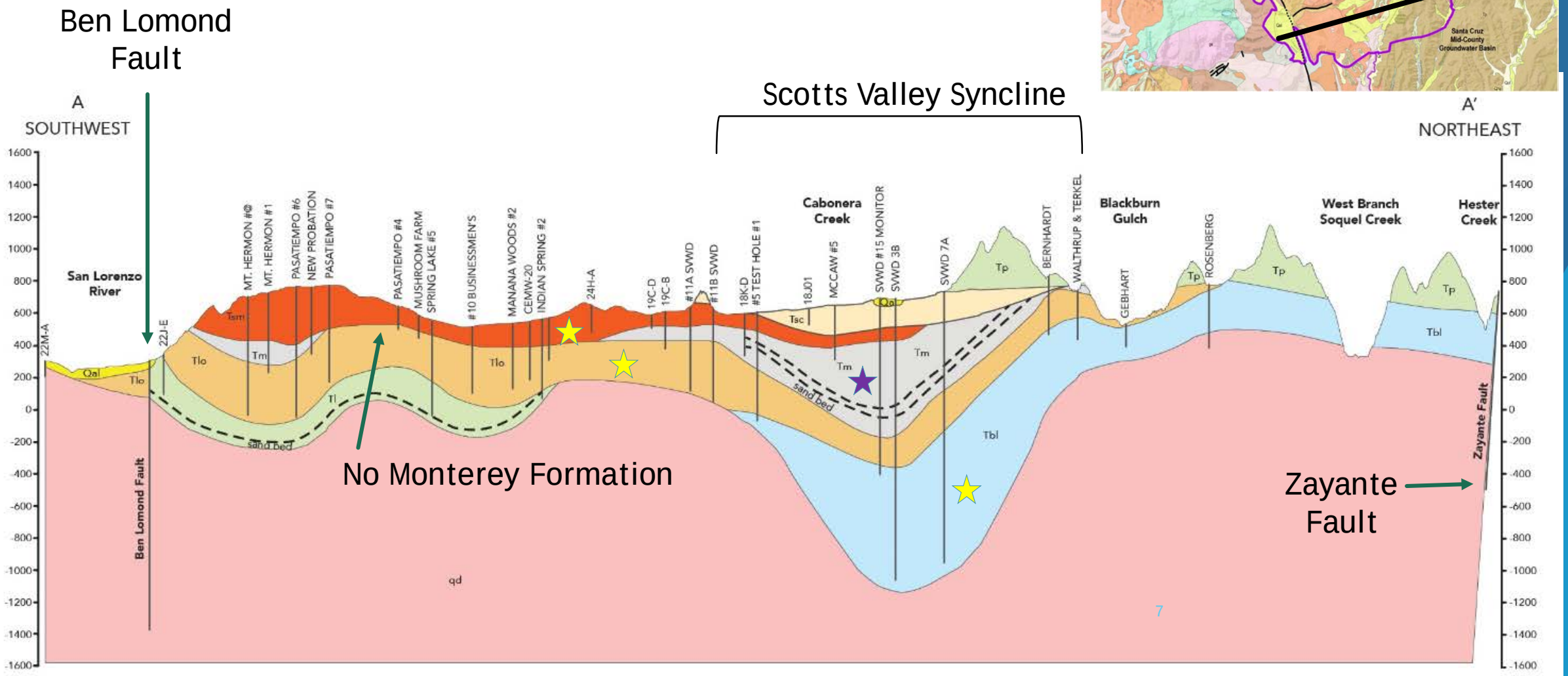
3D Model of geology and land surface

- Surface geology over land surface
- Base of the basin is granitic bedrock (qd)

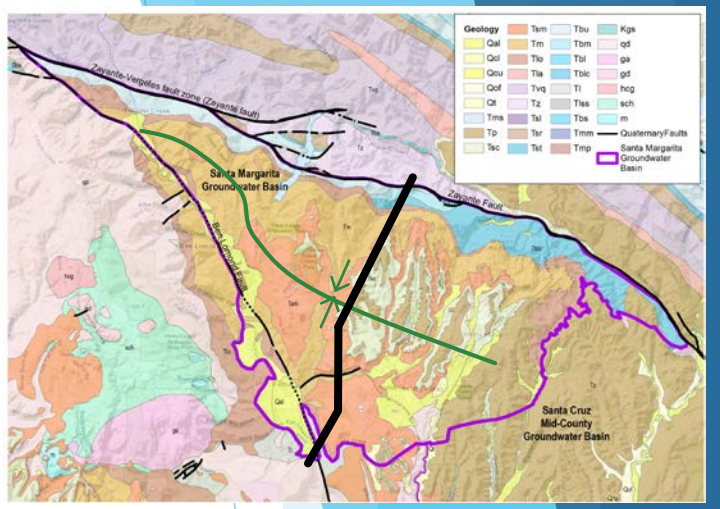
Basin Geology

- Santa Margarita Fm – sandstone
- Monterey Fm – shale with some sandstone
- Lompico Fm – sandstone
- Butano Fm – sandstone & shale
- Locatelli Fm – shale





Basin Geology



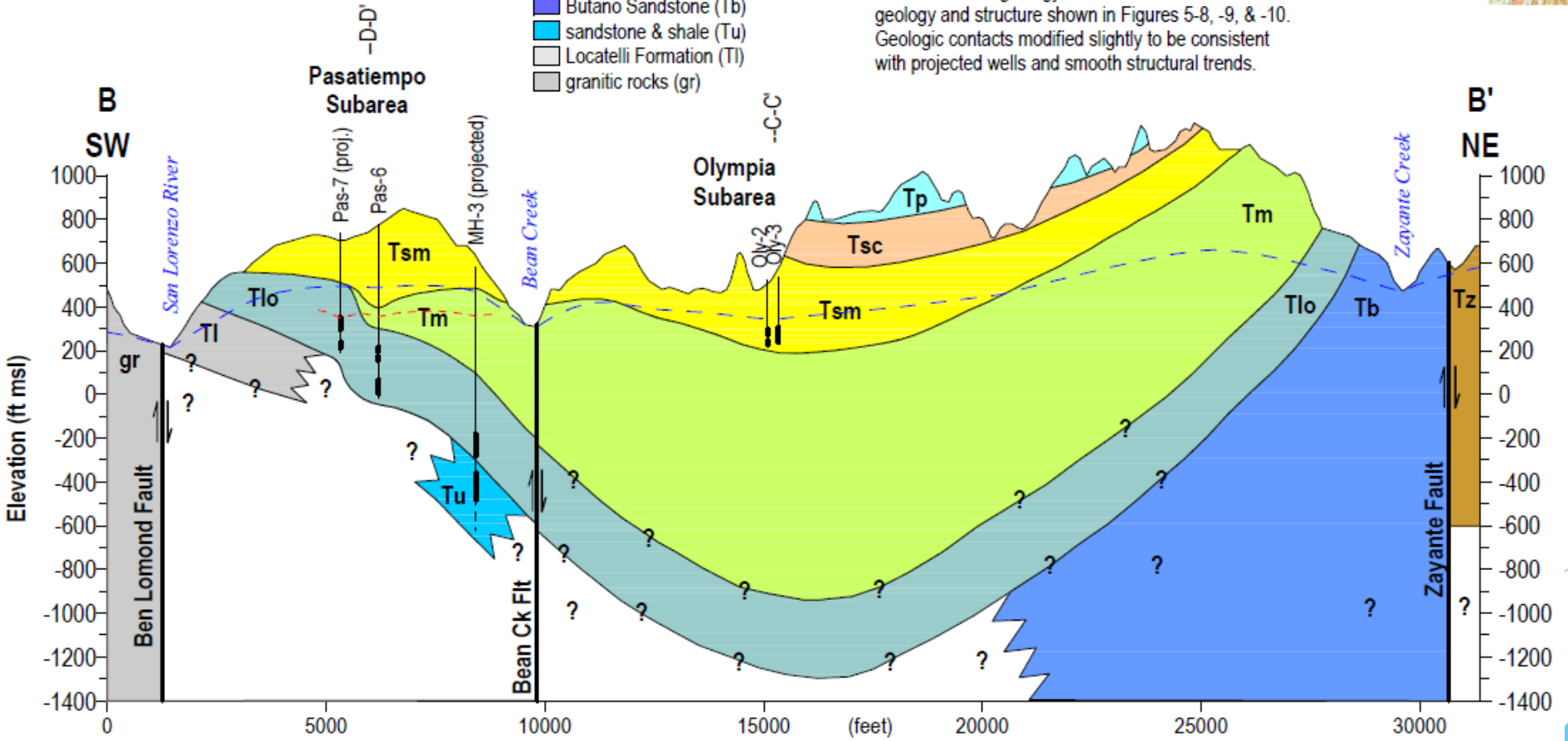
Vertical exaggeration 5X.
See Figure 5-6 for line of section.
Alluvial and terrace deposits not shown.

- Purisima Formation (Tp)
- Santa Cruz Mudstone (Tsc)
- Santa Margarita Sandstone (Tsm)
- Monterey Formation (Tm)
- Lompico Sandstone (Tlo)
- Zayante Sandstone (Tz)
- Butano Sandstone (Tb)
- sandstone & shale (Tu)
- Locatelli Formation (Tl)
- granitic rocks (gr)

Estimated recent average static piezo-metric surface of uppermost saturated zone.

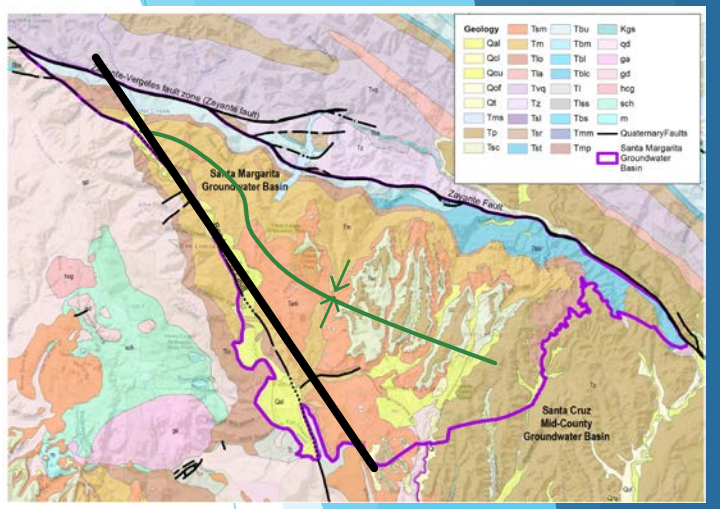
Estimated recent average static piezo-metric surface of production zone.

Cross-sectional geology consistent with surficial geology and structure shown in Figures 5-8, -9, & -10. Geologic contacts modified slightly to be consistent with projected wells and smooth structural trends.

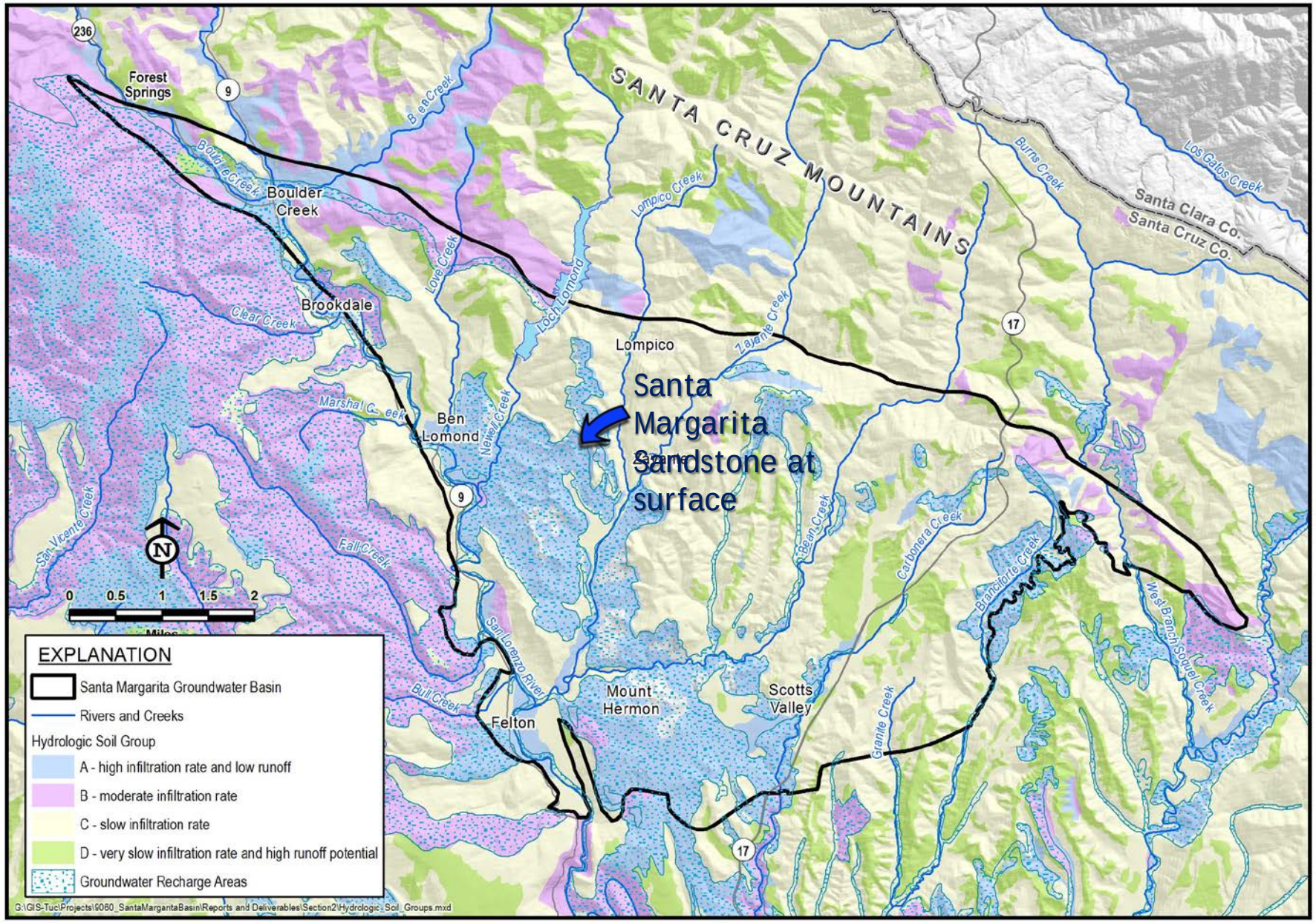


Basin Geology cont.

- Santa Margarita Fm – sandstone
- Monterey Fm – shale with some sandstone
- Lompico Fm – sandstone
- Butano Fm – sandstone & shale
- Locatelli Fm – shale



Soil Characteristics & Recharge Areas

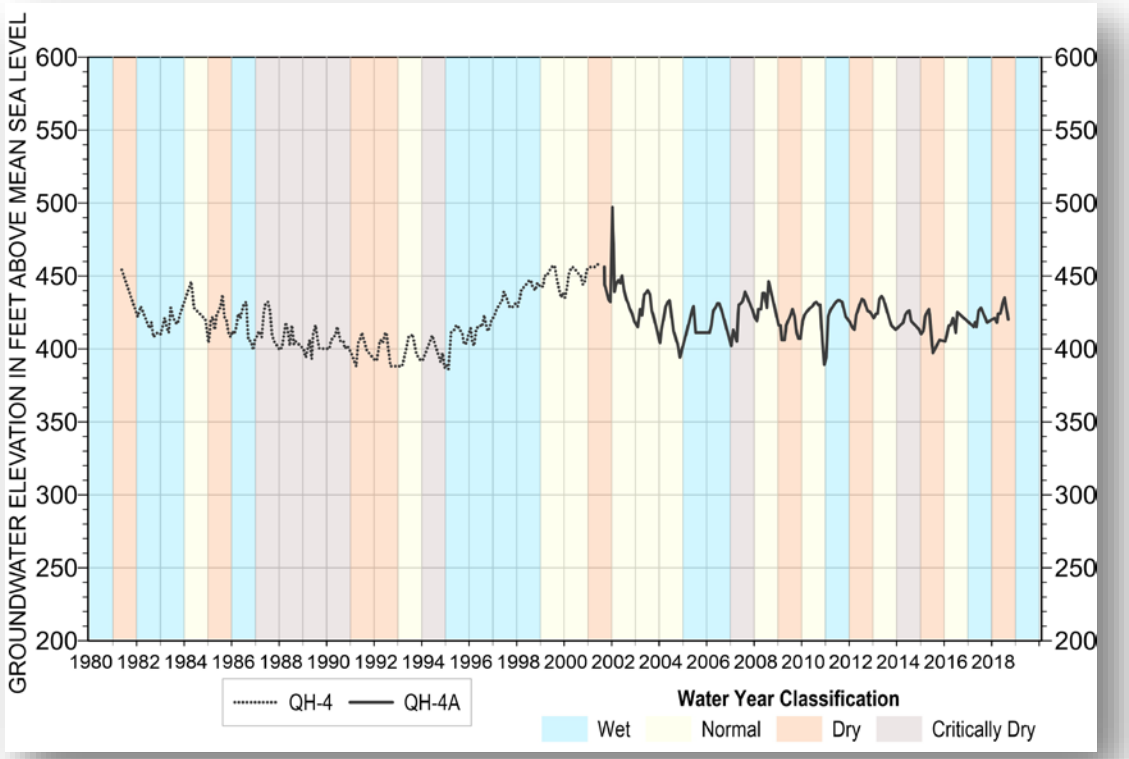


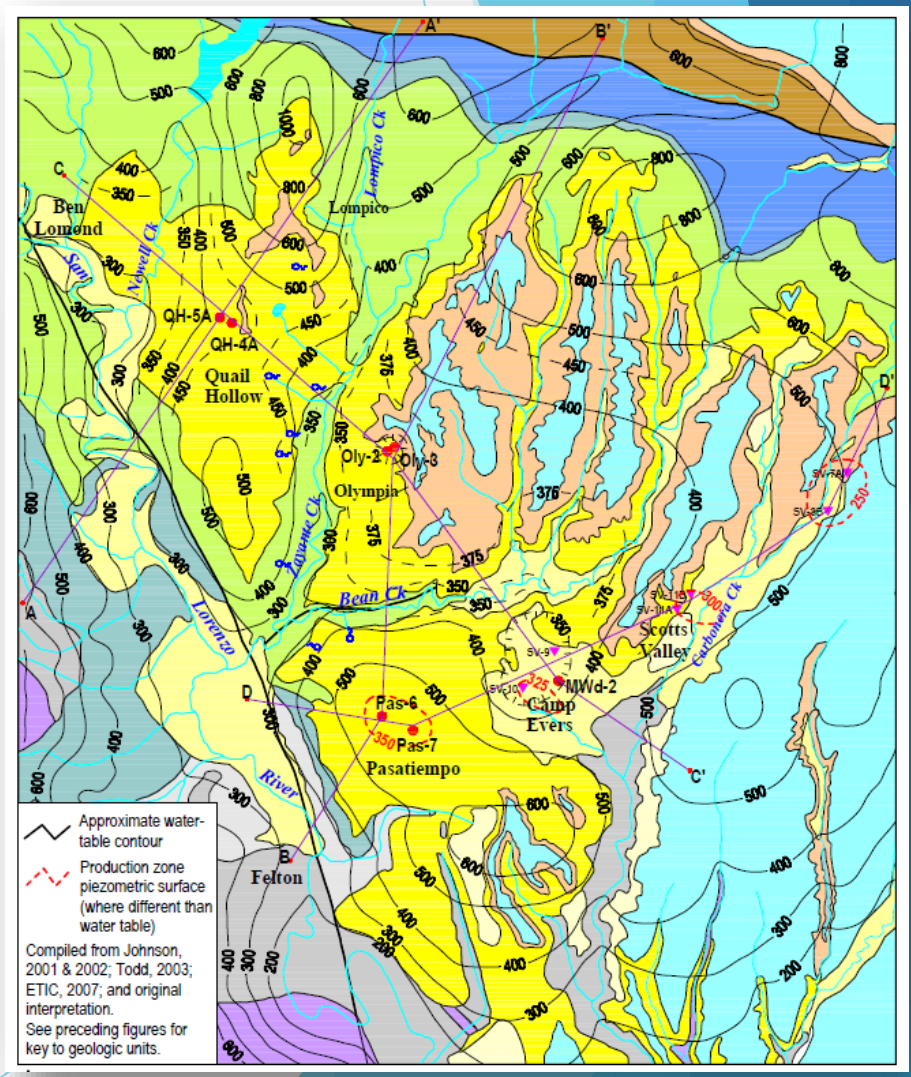
Basin Conditions

Basin Conditions (§ 354.16)

Lowering GW Levels

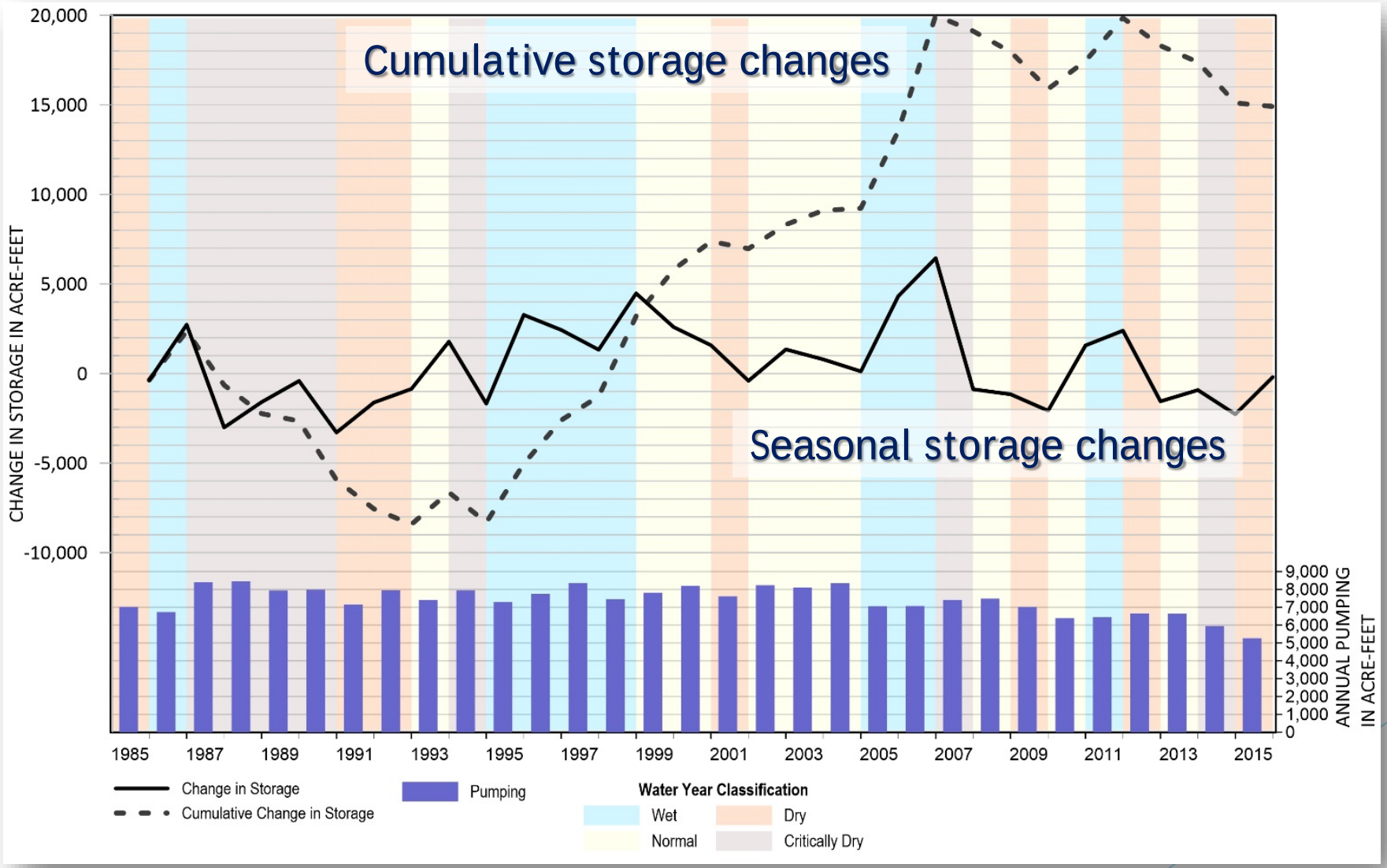
Groundwater elevations showing regional pumping patterns and flow direction





Basin Conditions (§ 354.16)

Reduction of Storage

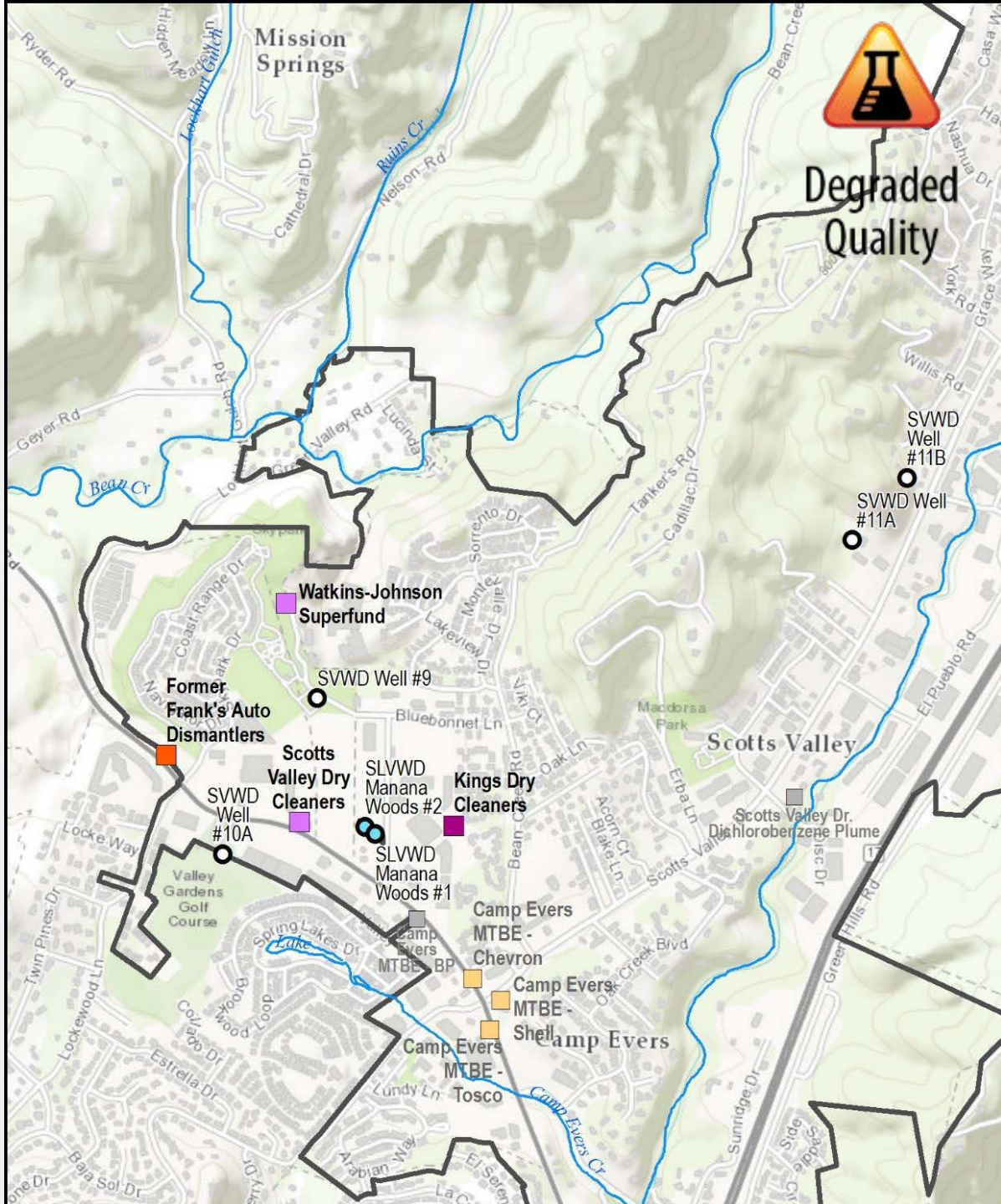


Groundwater in Storage – we will get this from the groundwater model

Basin Conditions (§ 354.16)

Groundwater quality issues that may impact the supply and beneficial uses of groundwater

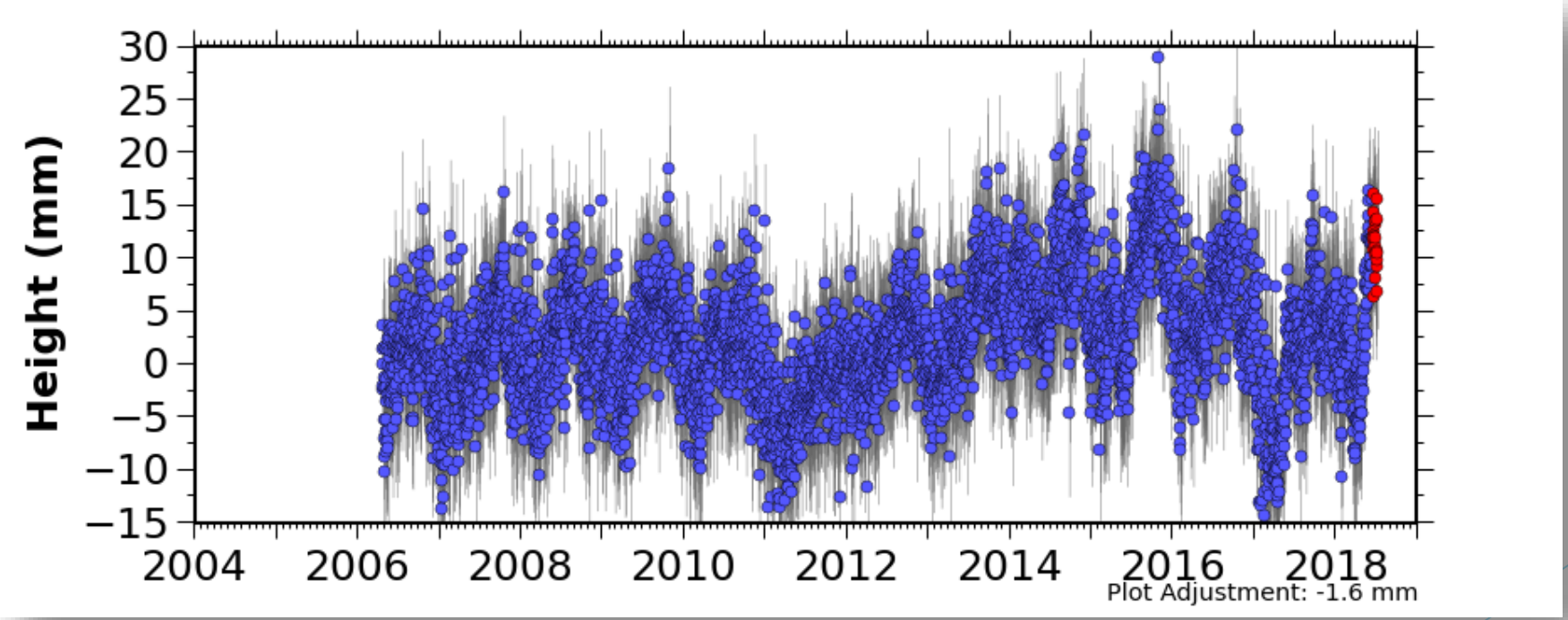
- Location of contaminants sites and plumes
- Known historical or ongoing cleanup activities or Superfund sites
- Proximity, in both distance and depth, to known groundwater contamination



Basin Conditions (§ 354.16)

Land Subsidence

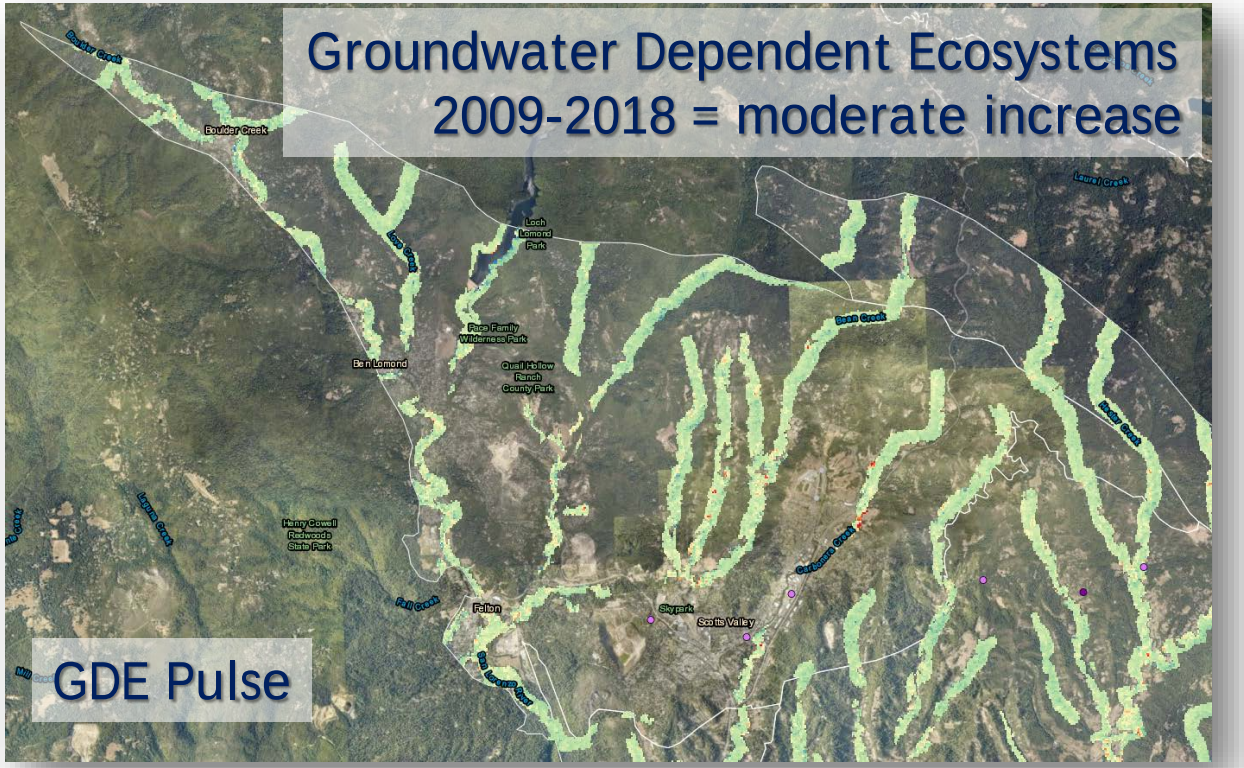
Extent and rate of land subsidence caused by lowered groundwater levels

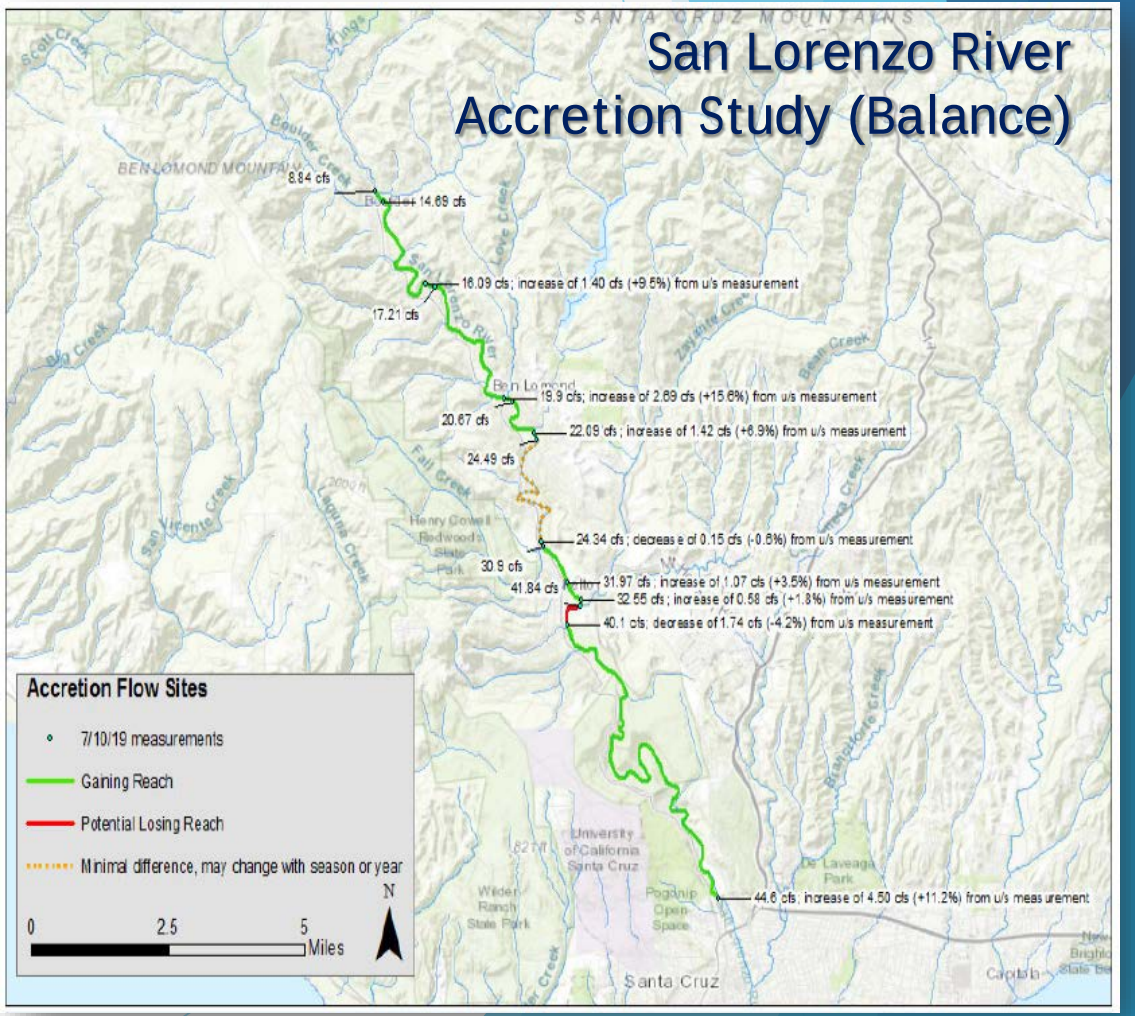


Basin Conditions (§ 354.16)

Surface Water Depletion

Identify interconnected surface water and groundwater dependent ecosystems (GDEs)



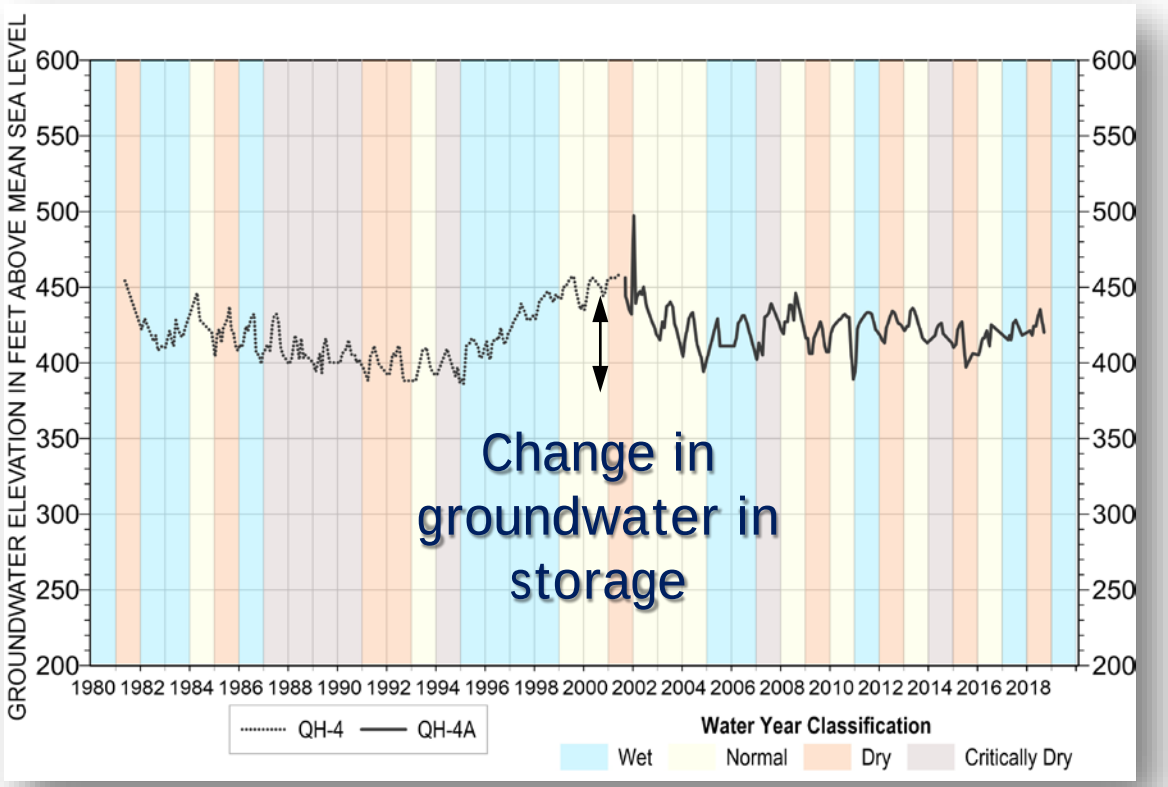


Groundwater Levels

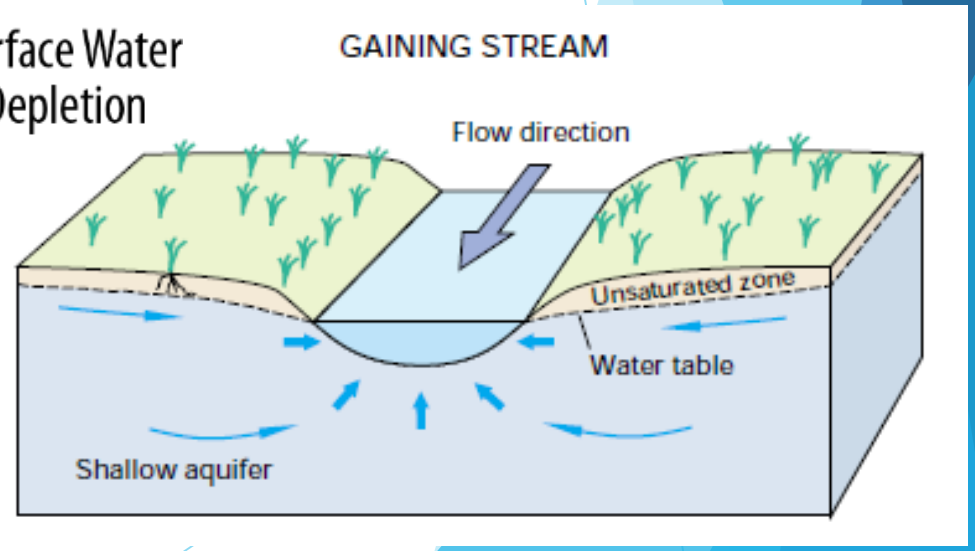
Most sustainability indicators are related to groundwater levels

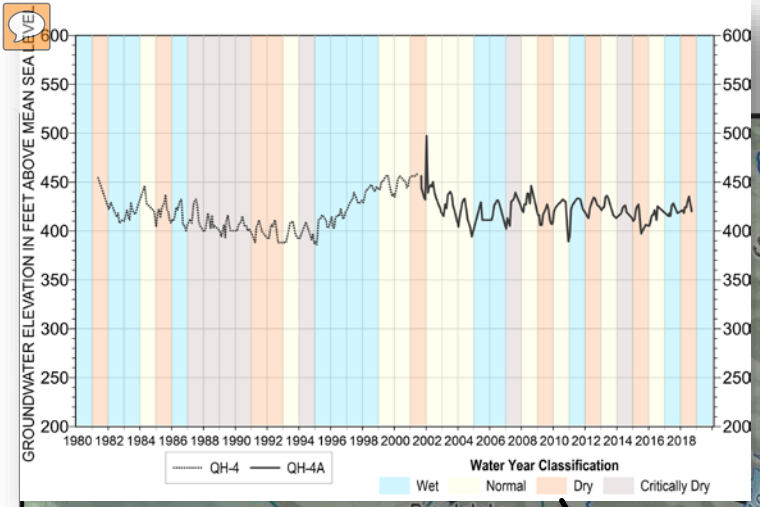
Lowering GW Levels

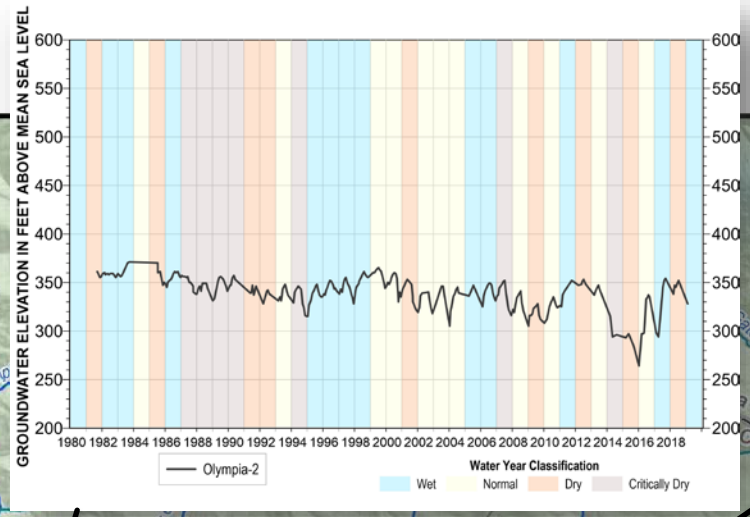
Reduction of Storage

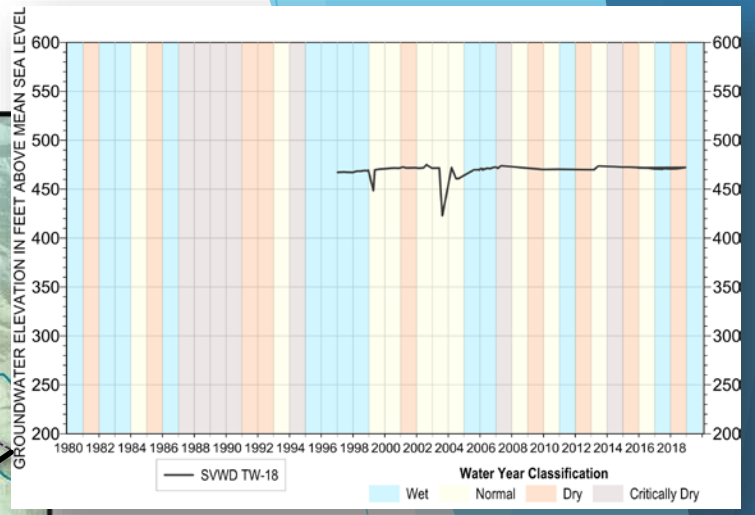


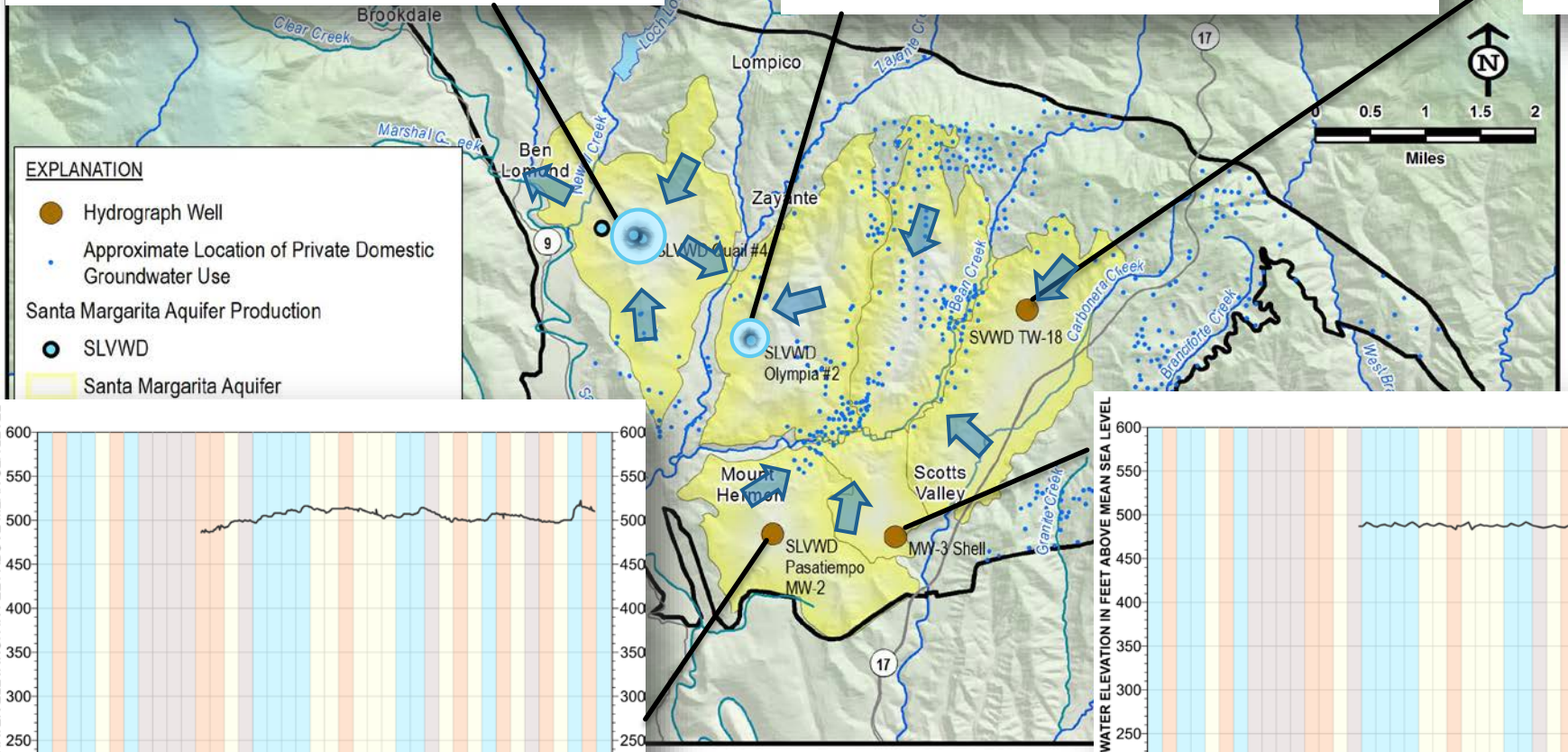
Surface Water Depletion



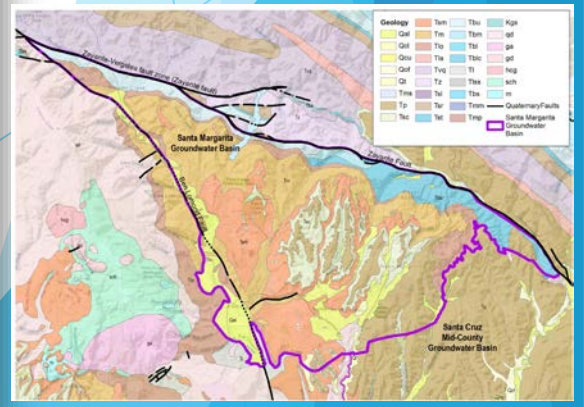




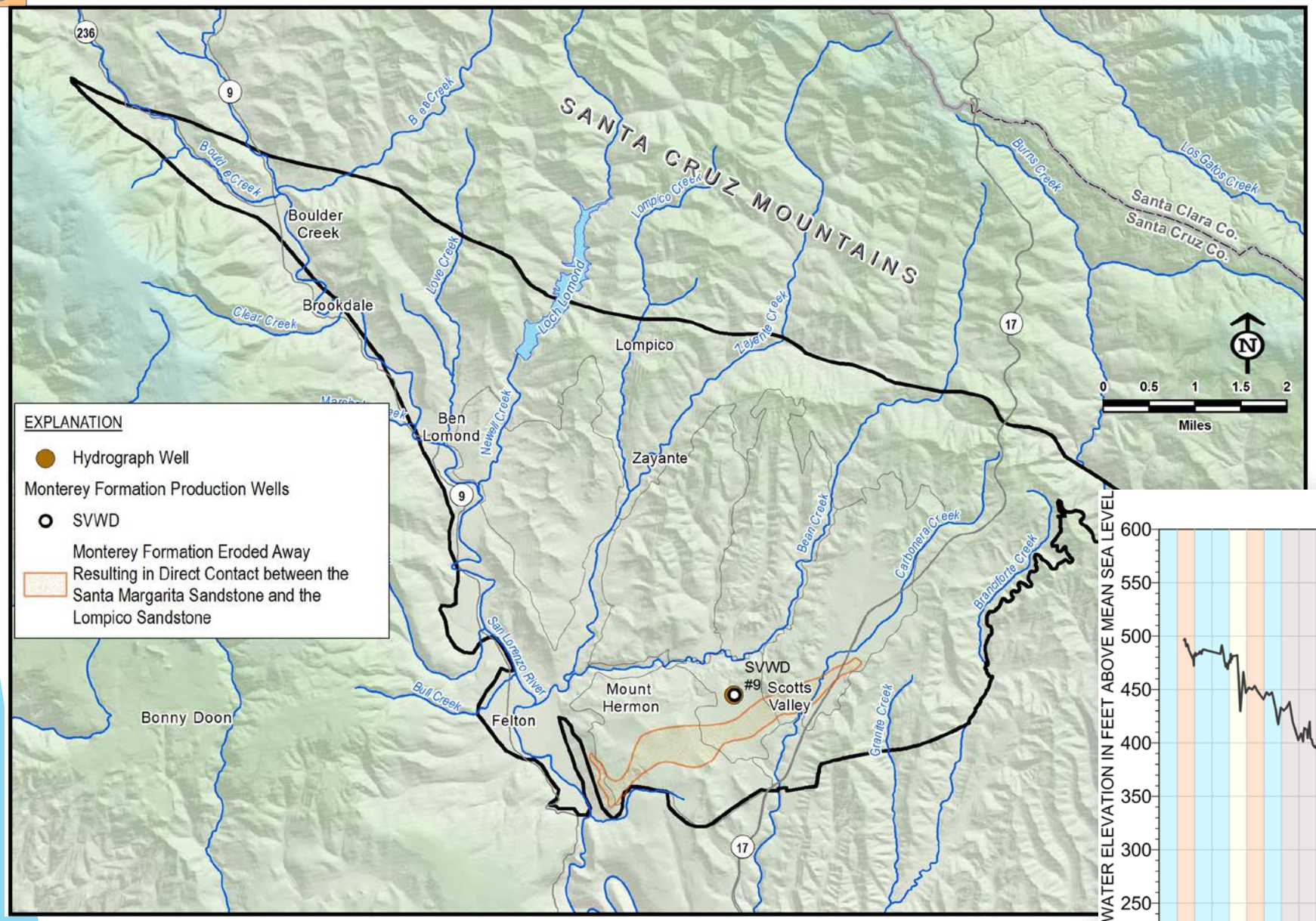


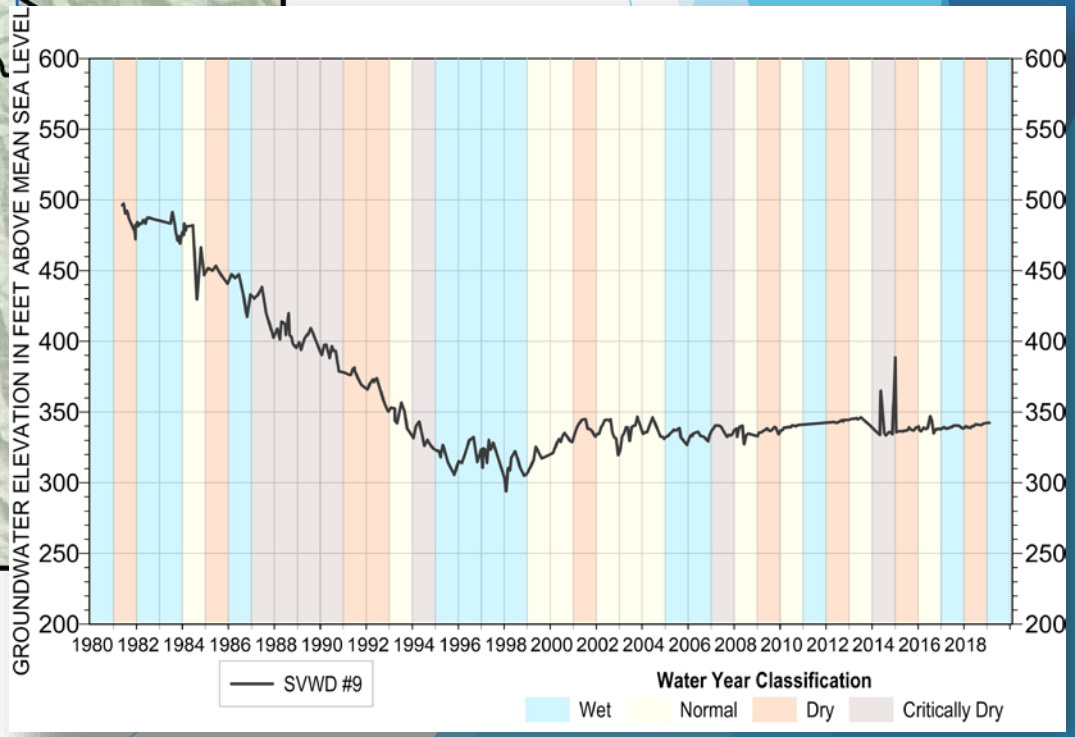


Santa Margarita Historic Groundwater Levels

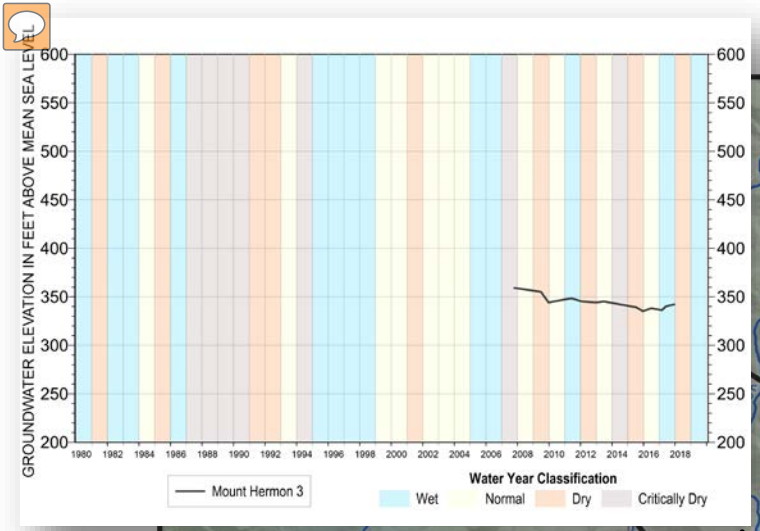


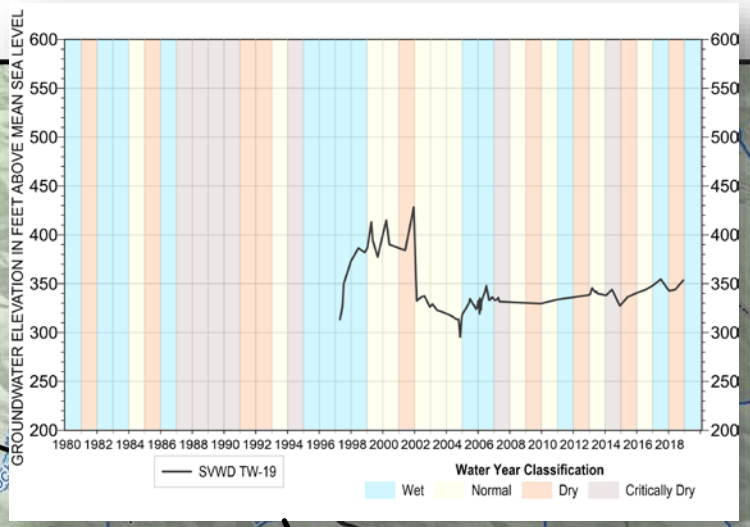
Monterey Formation Historic Groundwater Levels

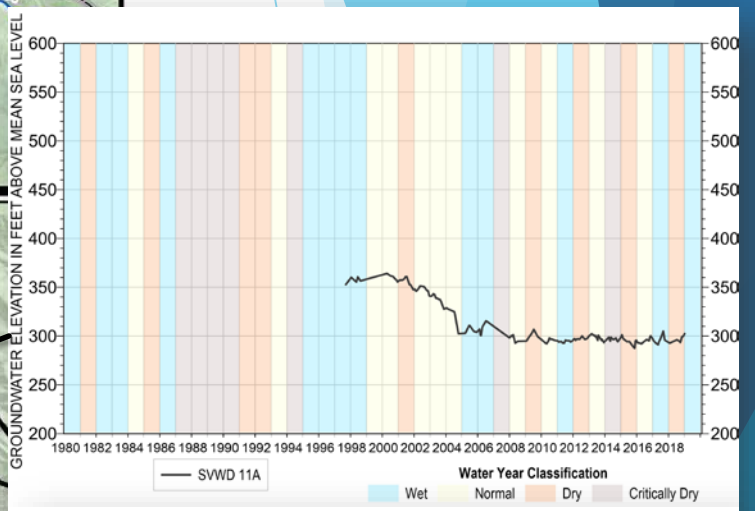


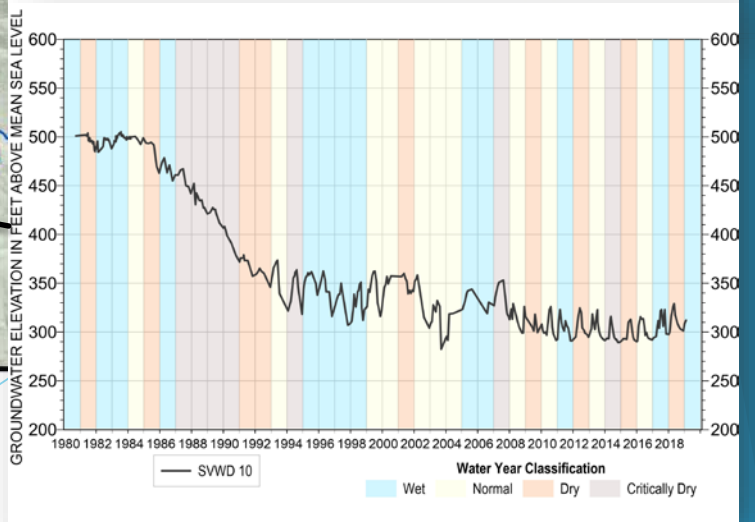


Lompico Aquifer Historic Groundwater Levels

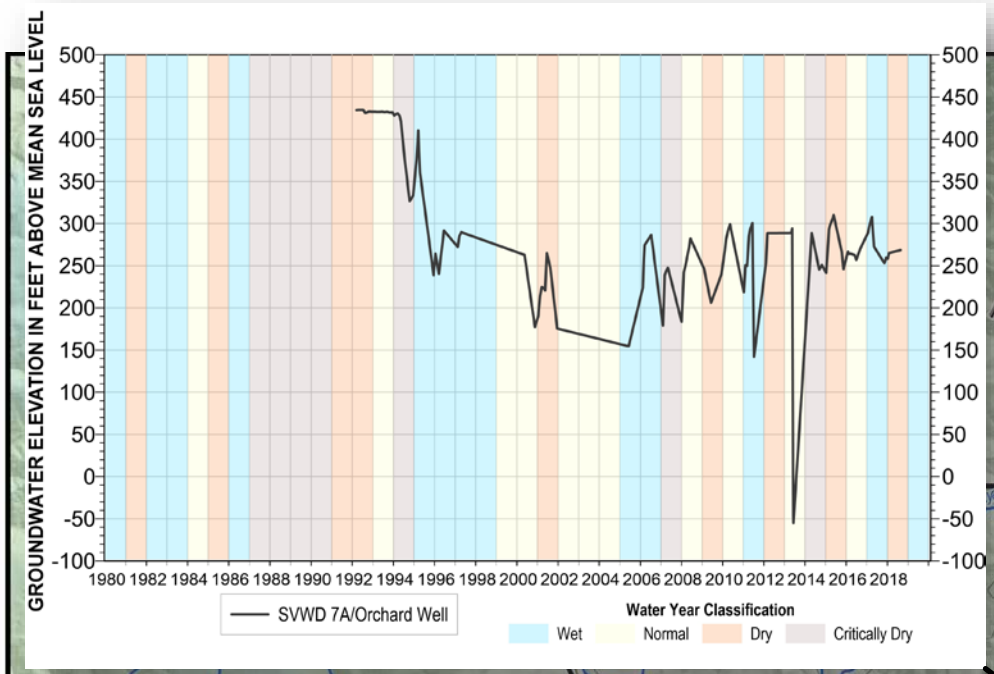


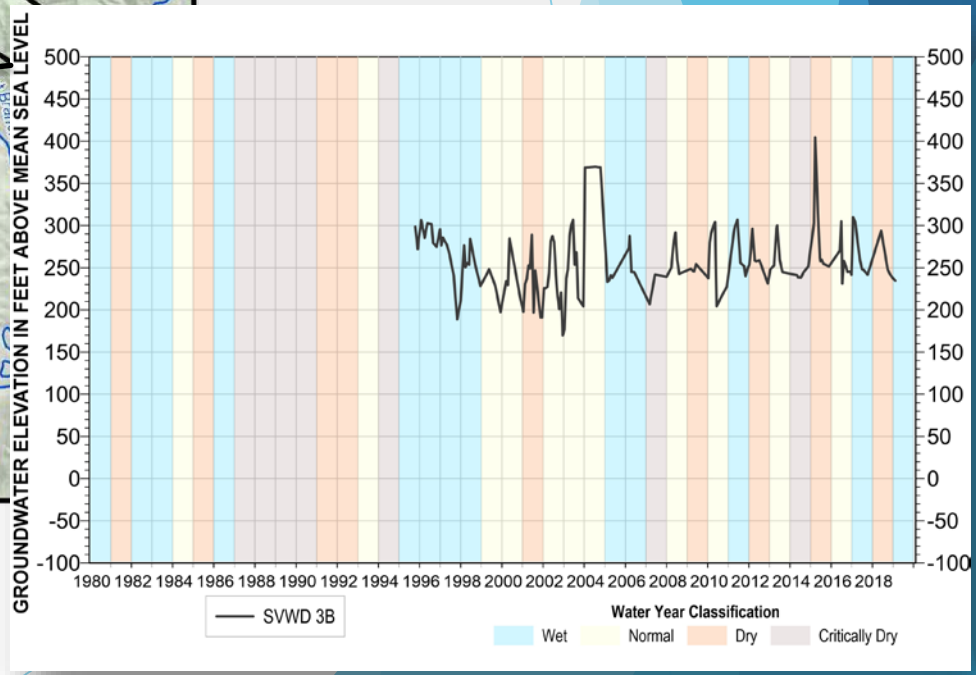






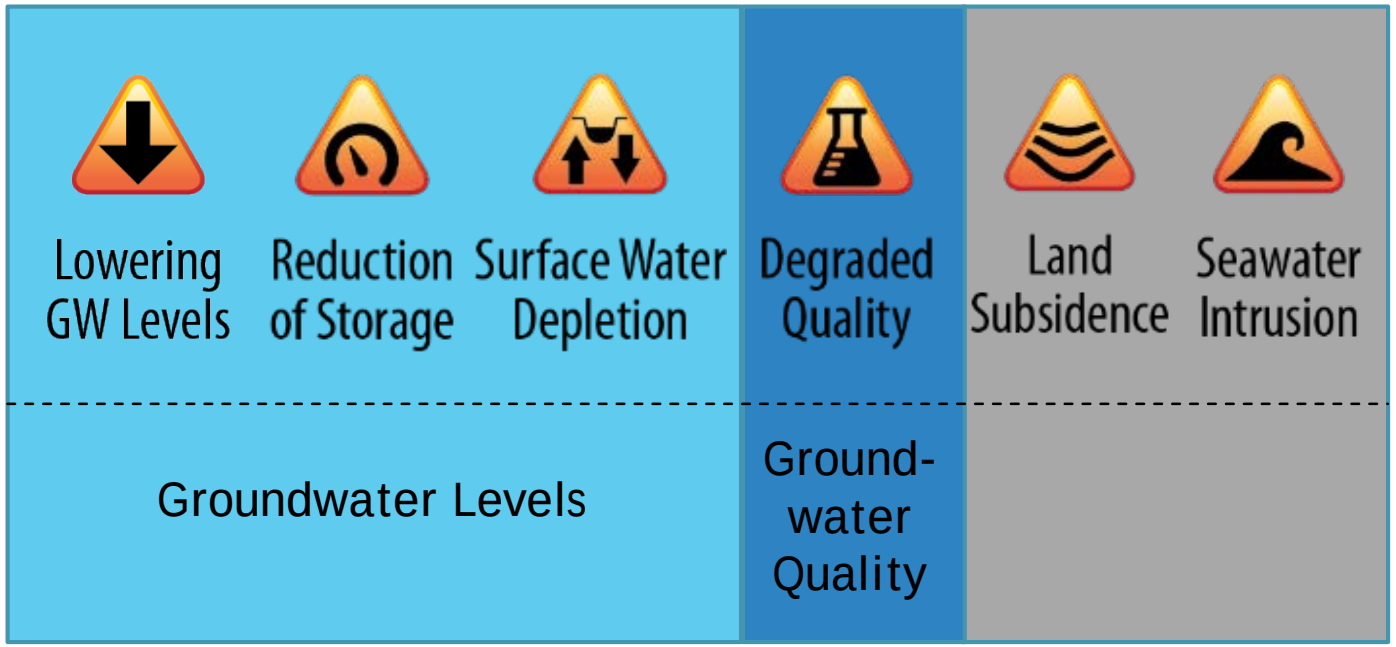
Butano Aquifer Historic Groundwater Levels





Sustainability Indicators

Implementation of the GSP must not cause:

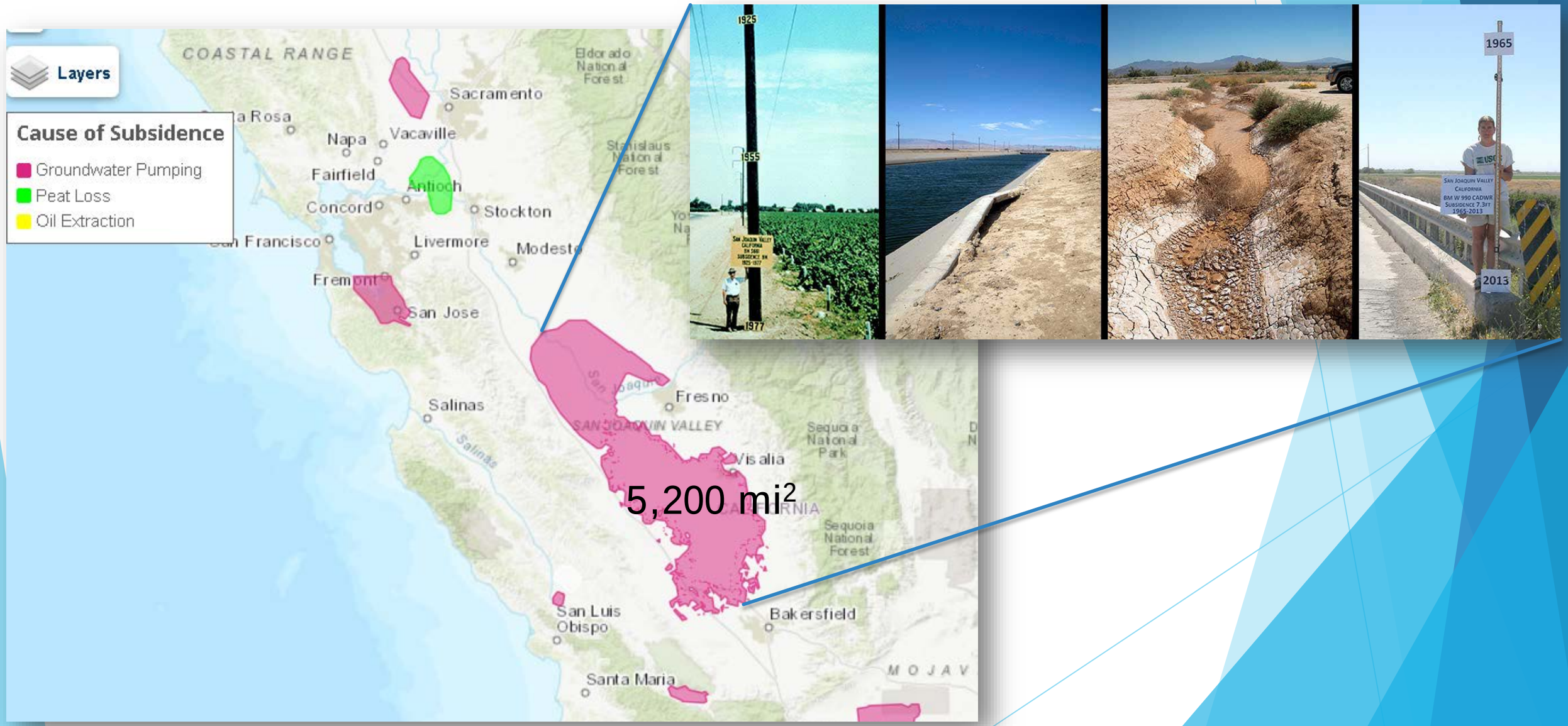


Potential Inapplicable Sustainability Indicators

Land Subsidence

- Land subsidence is a gradual settling or sudden sinking of the Earth's surface owing to subsurface movement of earth materials.
- The principal causes are:
  - Aquifer-system compaction,
  - Drainage and decomposition of organic soils
  - Underground mining, oil and gas extraction, hydrocompaction, natural compaction, sinkholes, and thawing permafrost

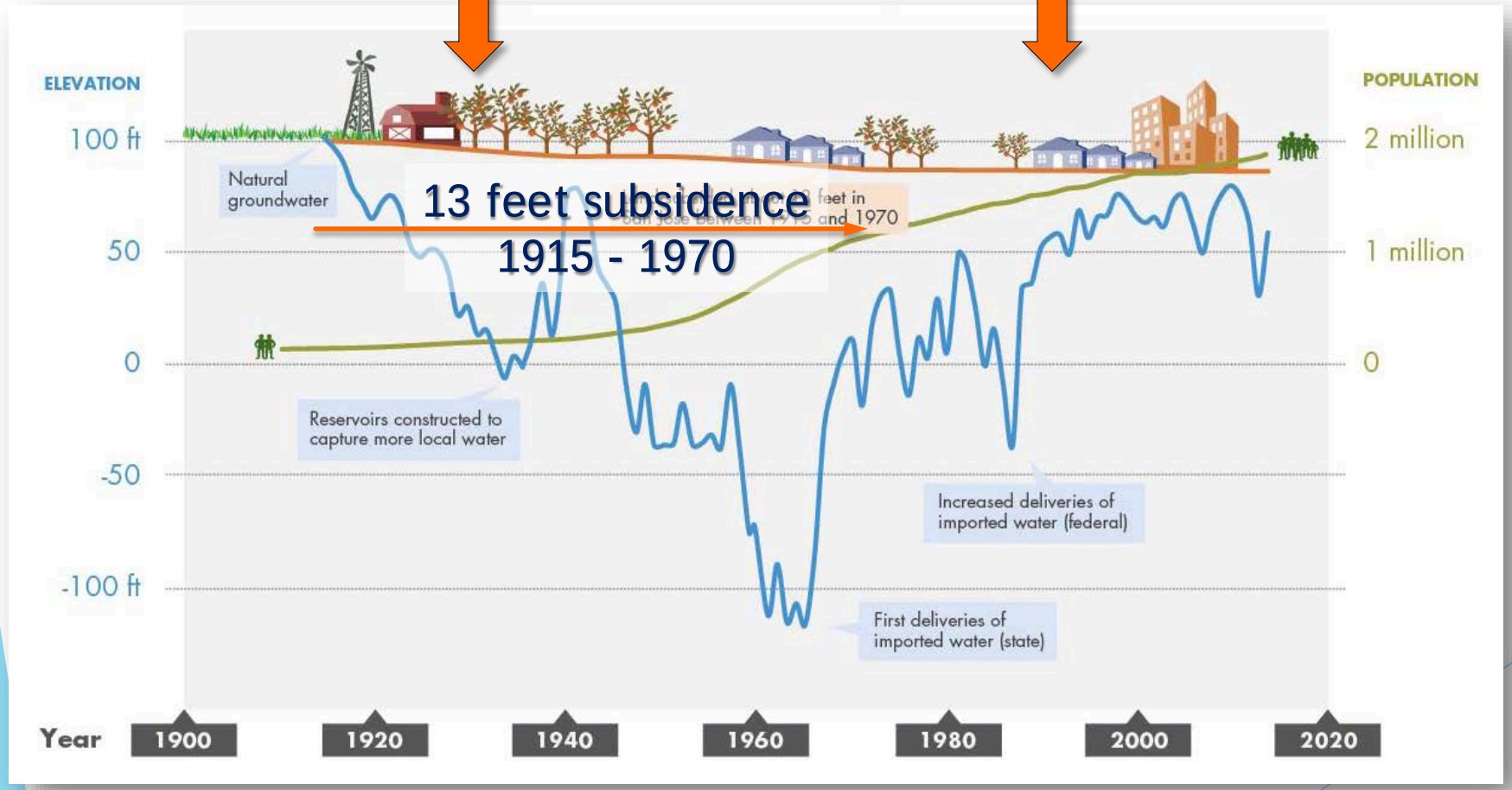
Nearby Documented Land Subsidence

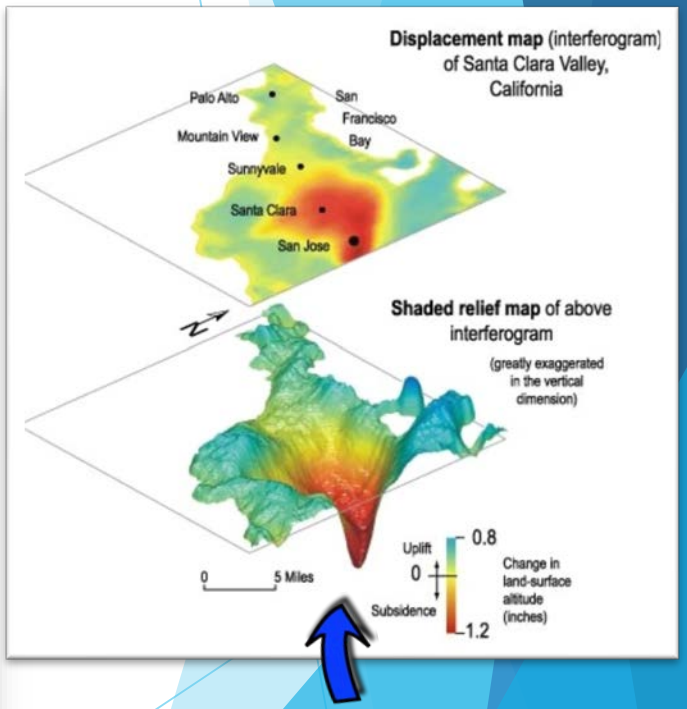


Santa Clara Valley Land Subsidence

Subsidence starts
1933

Some uplift in response to increased groundwater levels
1992



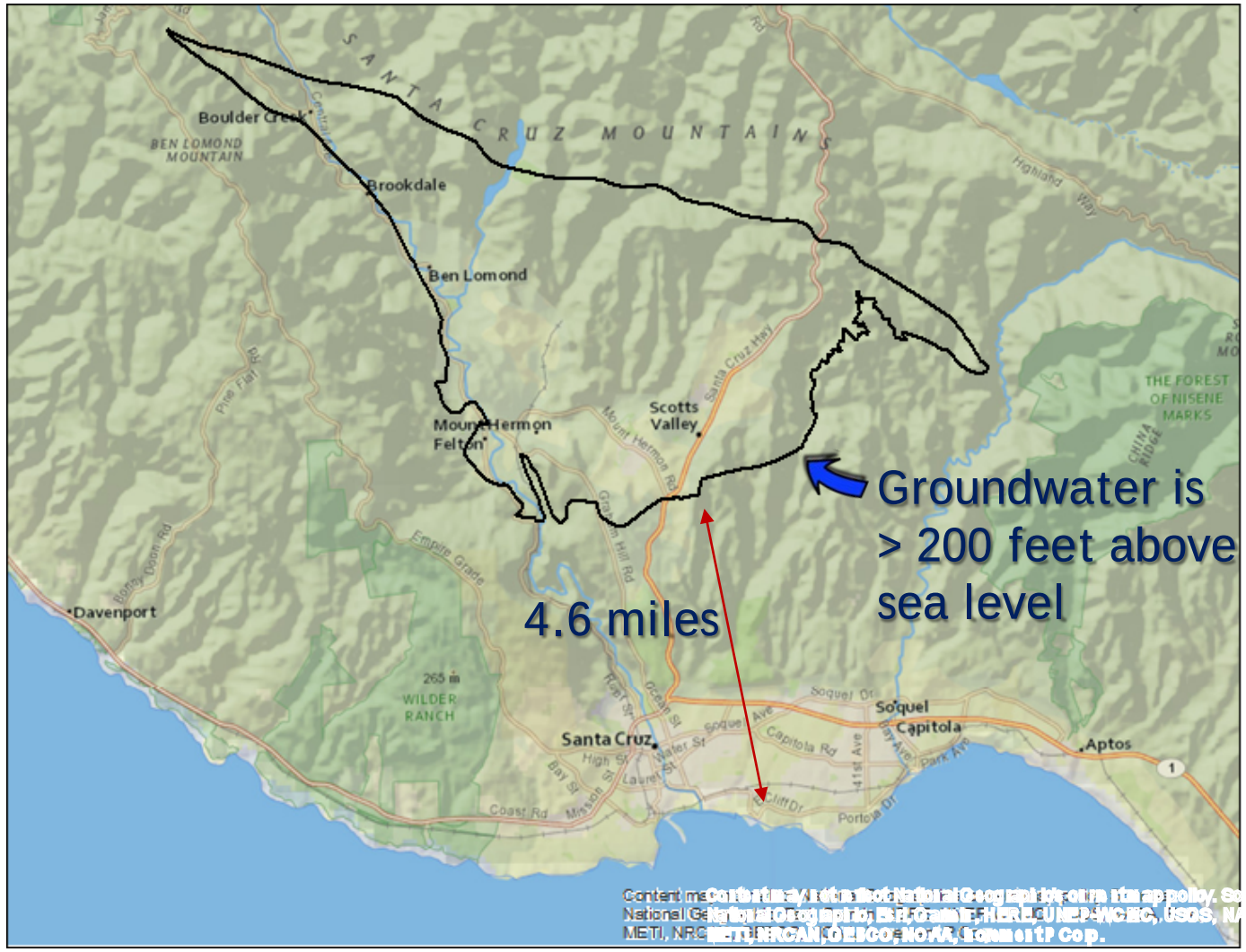


Elastic subsidence that recovers seasonally

Available Tool to Monitor Subsidence

Vertical displacement data by DWR/TRE ALTAMIRA Inc.

Seawater Intrusion



Discussion of Sustainability Indicator Inapplicability

- Land subsidence from lowered groundwater levels
- Seawater intrusion