Salinas Valley Basin GSA
Watershed Workshop

Presented to SVBGSA Stakeholders
August 26, 2020

Prepared by
MONTGOMERY & ASSOCIATES

Goals of Workshop

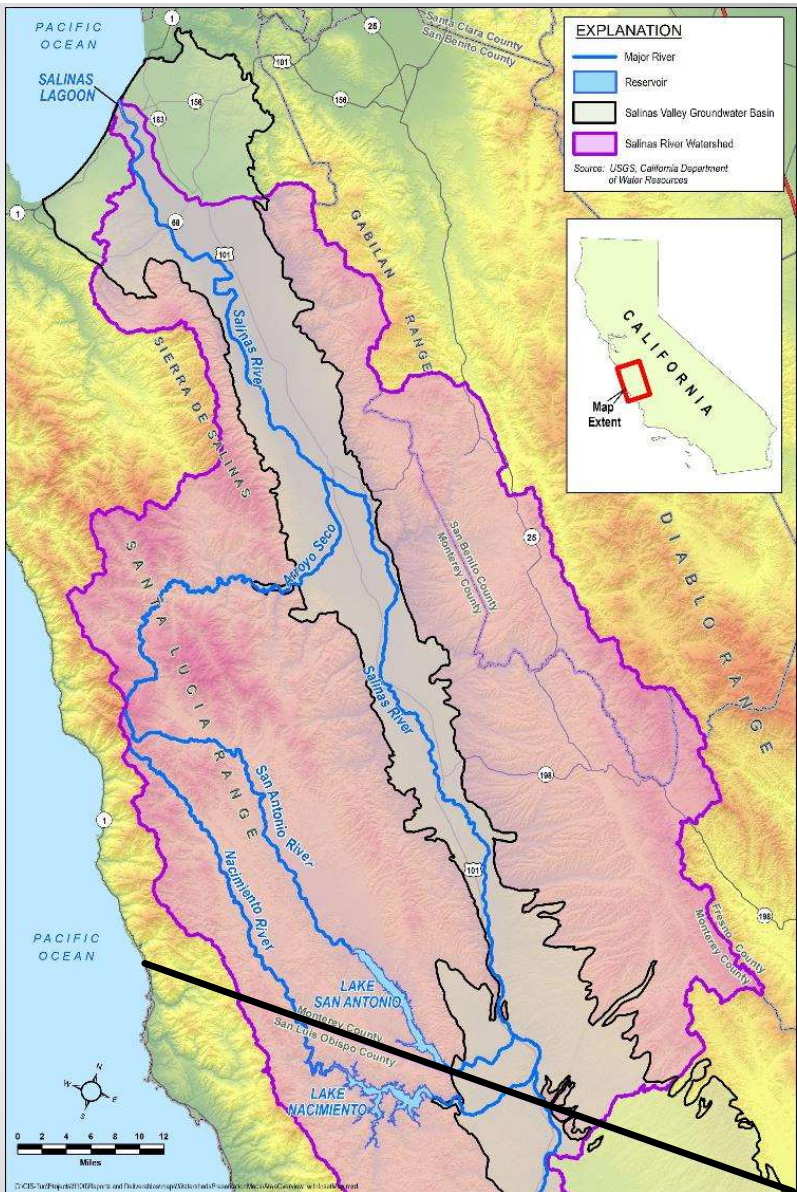
- **Explain "how" the Salinas Valley Basin works, including surface water, groundwater**
- Enable stakeholders to understand the components of water budgets

Presentation topics

- Overview of the Valley
- How the Surface Water Works
- How the Groundwater Works
- Special Groundwater Challenges

Salinas Valley Watershed

- Both surface water and groundwater use
- Ultimately, all water comes from rainfall
- The Valley does not import water from outside the watershed
- Pumping deeper groundwater has only temporary benefits.

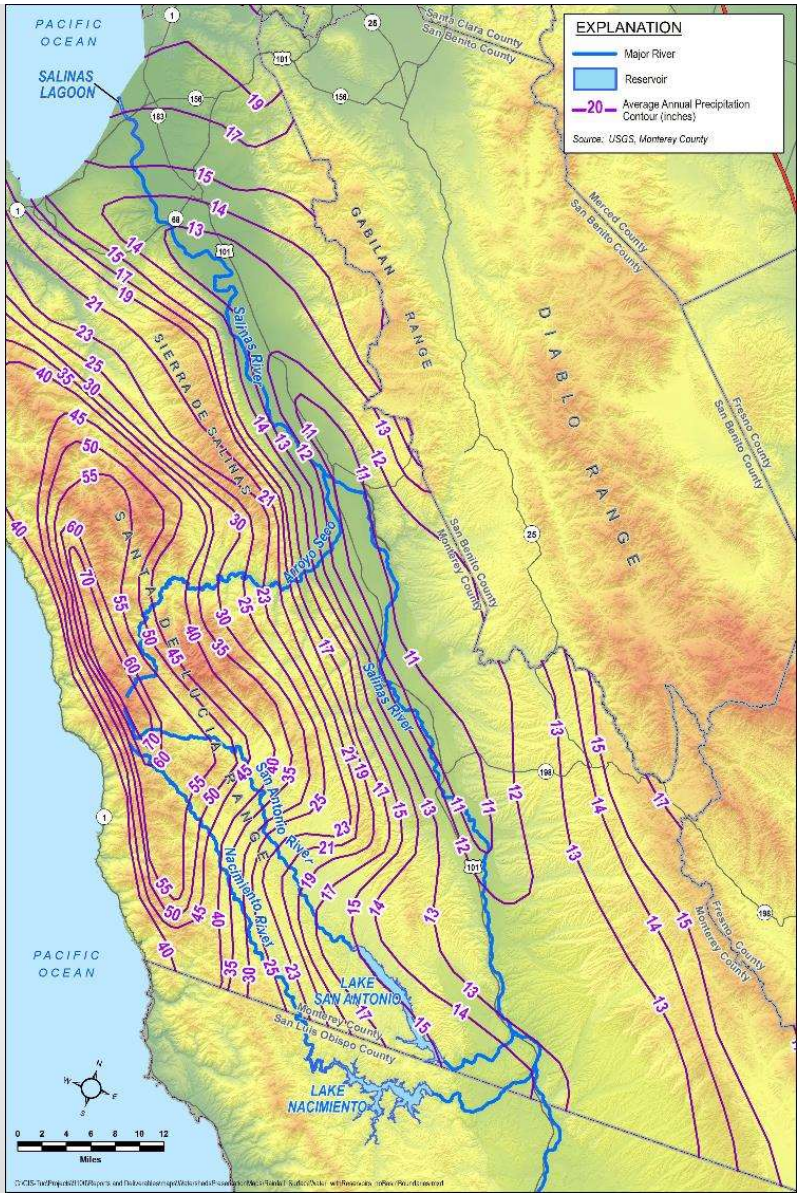


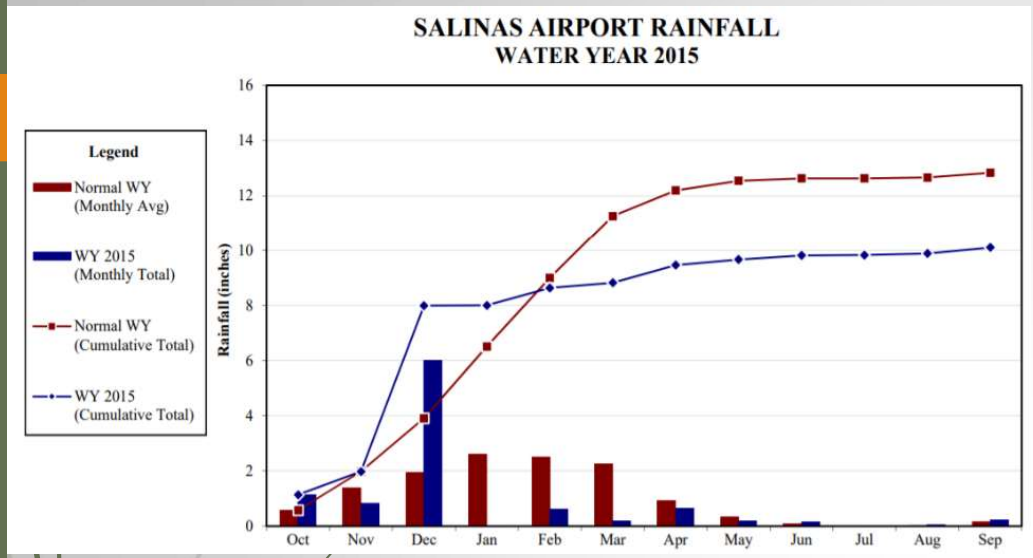
Slide 4

TC8 waiting on Michael for precip contour map
Tiffani Cañez, 8/20/2020

DW15 This should actually be a watershed map. Let's put the precip pmpa in slide 5
Derrik Williams, 8/21/2020

Rainfall is Variable Across the Watershed, by Season, and by Year




SALINAS AIRPORT RAINFALL
WATER YEAR 2015
Legend
Normal WY (Monthly Avg)
WY 2015 (Monthly Total)
Normal WY (Cumulative Total)
WY 2015 (Cumulative Total)
Rainfall (inches)
0
2
4
6
8
10
12
14
16
Oct
Nov
Dec
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Mar
Apr
May
Jun
Jul
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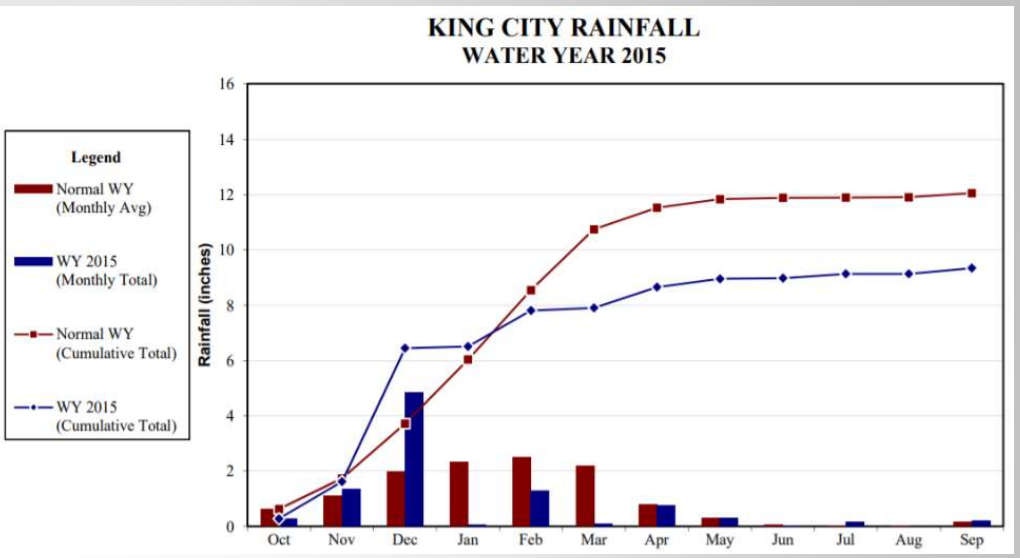
Sep


KING CITY RAINFALL
WATER YEAR 2015
Legend
Normal WY (Monthly Avg)
WY 2015 (Monthly Total)
Normal WY (Cumulative Total)
WY 2015 (Cumulative Total)
Rainfall (inches)
0
2
4
6
8
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Oct
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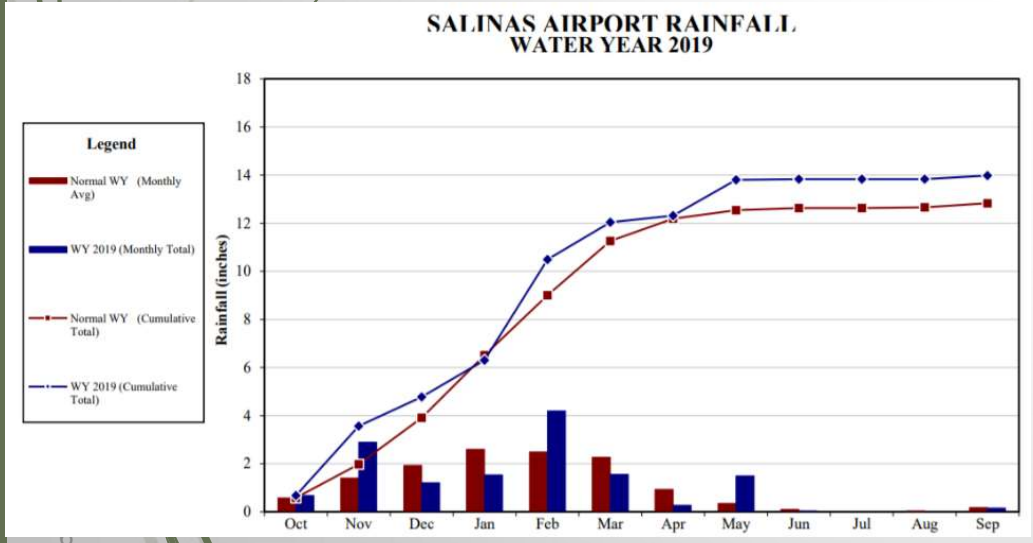
SALINAS AIRPORT RAINFALL
WATER YEAR 2019
Legend
Normal WY (Monthly Avg)
WY 2019 (Monthly Total)
Normal WY (Cumulative Total)
WY 2019 (Cumulative Total)
Rainfall (inches)
0
2
4
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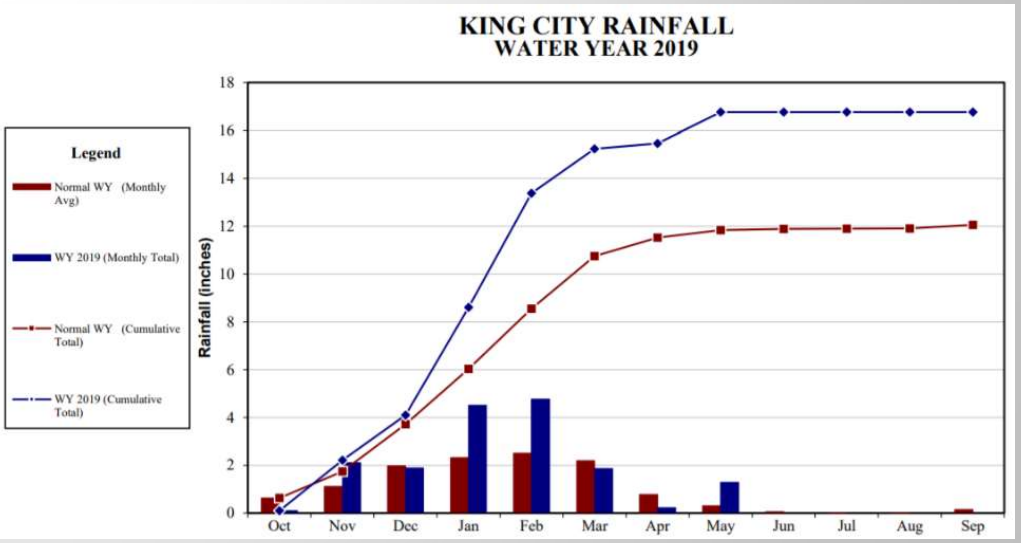
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18
Oct
Nov
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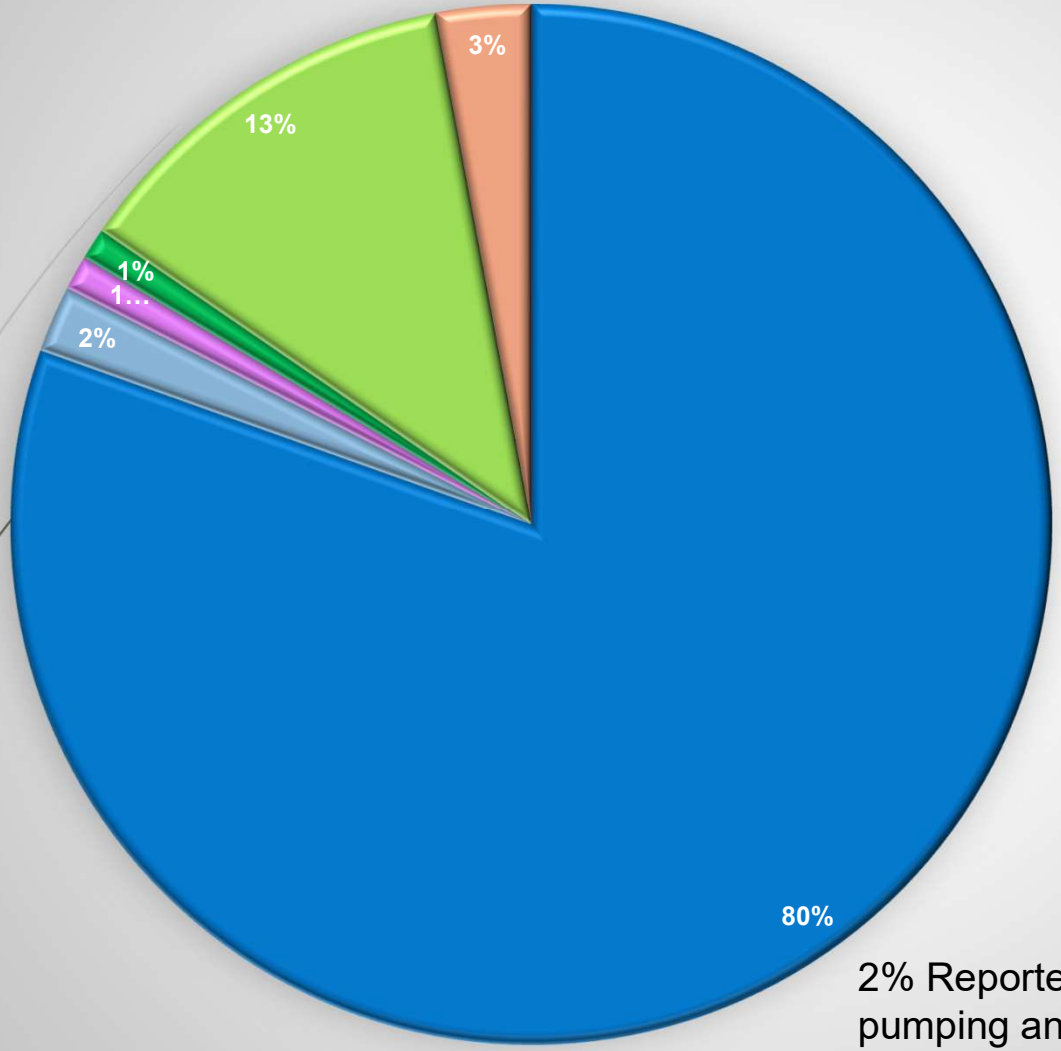
Sep

Water Management Purpose

- Provide reliability by decreasing seasonal, inter-annual, and spatial differences in water availability
- Modify how the basin works to benefit all users
    1. Environmental
    2. Municipal
    3. Domestic
    4. Agricultural
    5. Recreation (reservoirs)

2017 Salinas Valley Water Use by Type



- Agricultural and Other Groundwater Pumping
- Municipal Groundwater Pumping
- Clark Colony Diversion
- CSIP Diversion
- Other Diversions
- SVRP-Recycled Water

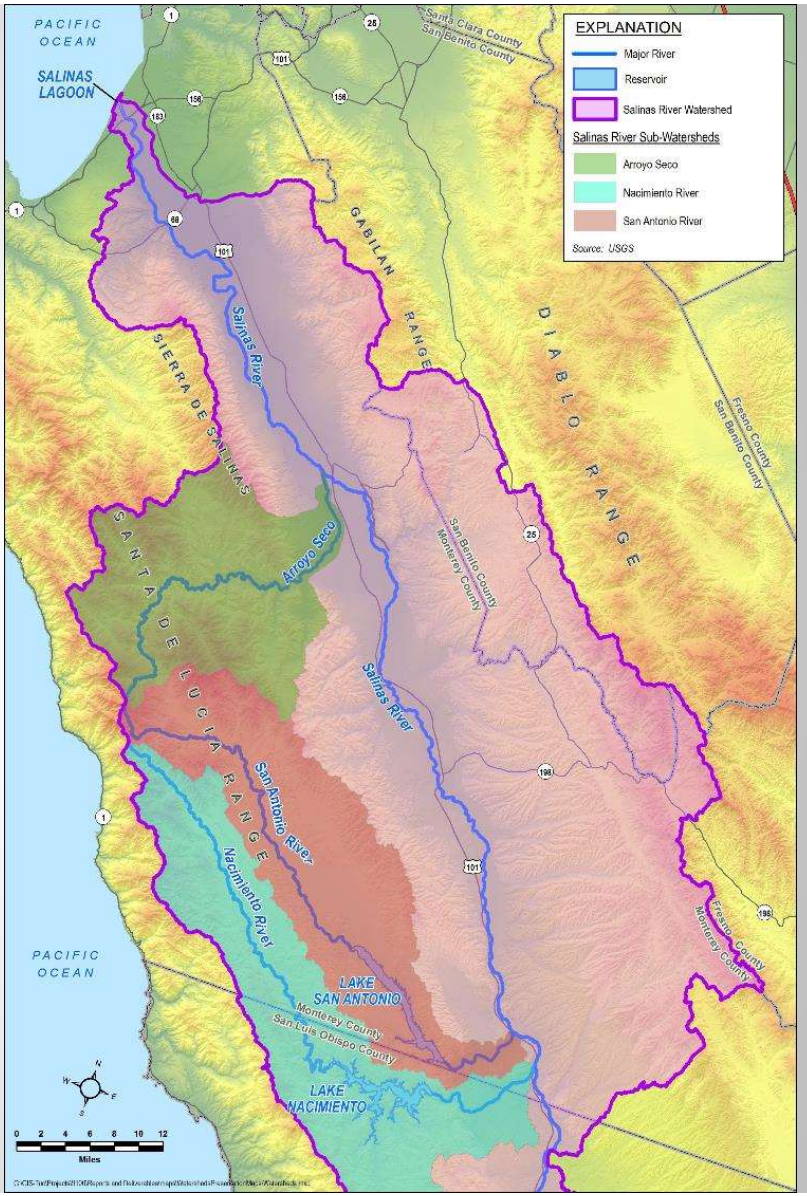
2% Reported as both groundwater pumping and surface water diversion

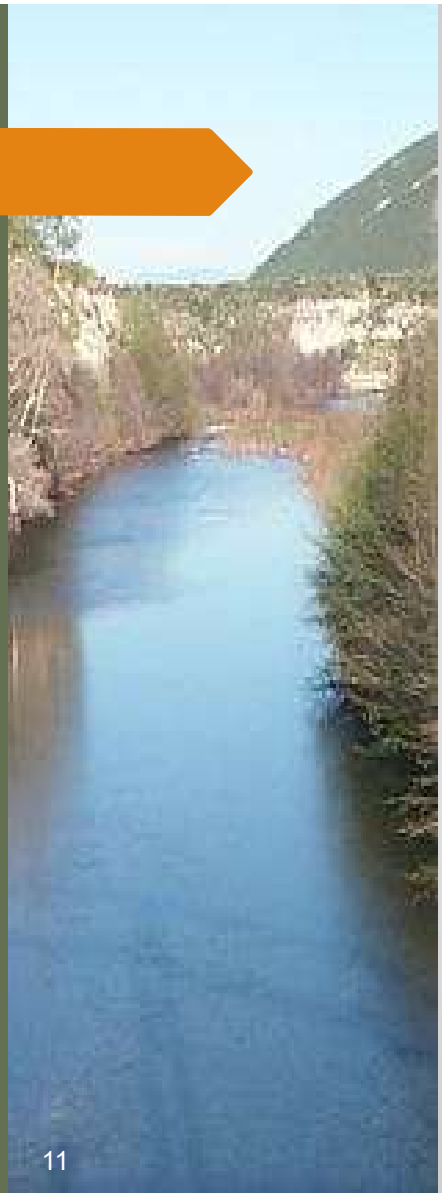
Getting Water into the Groundwater

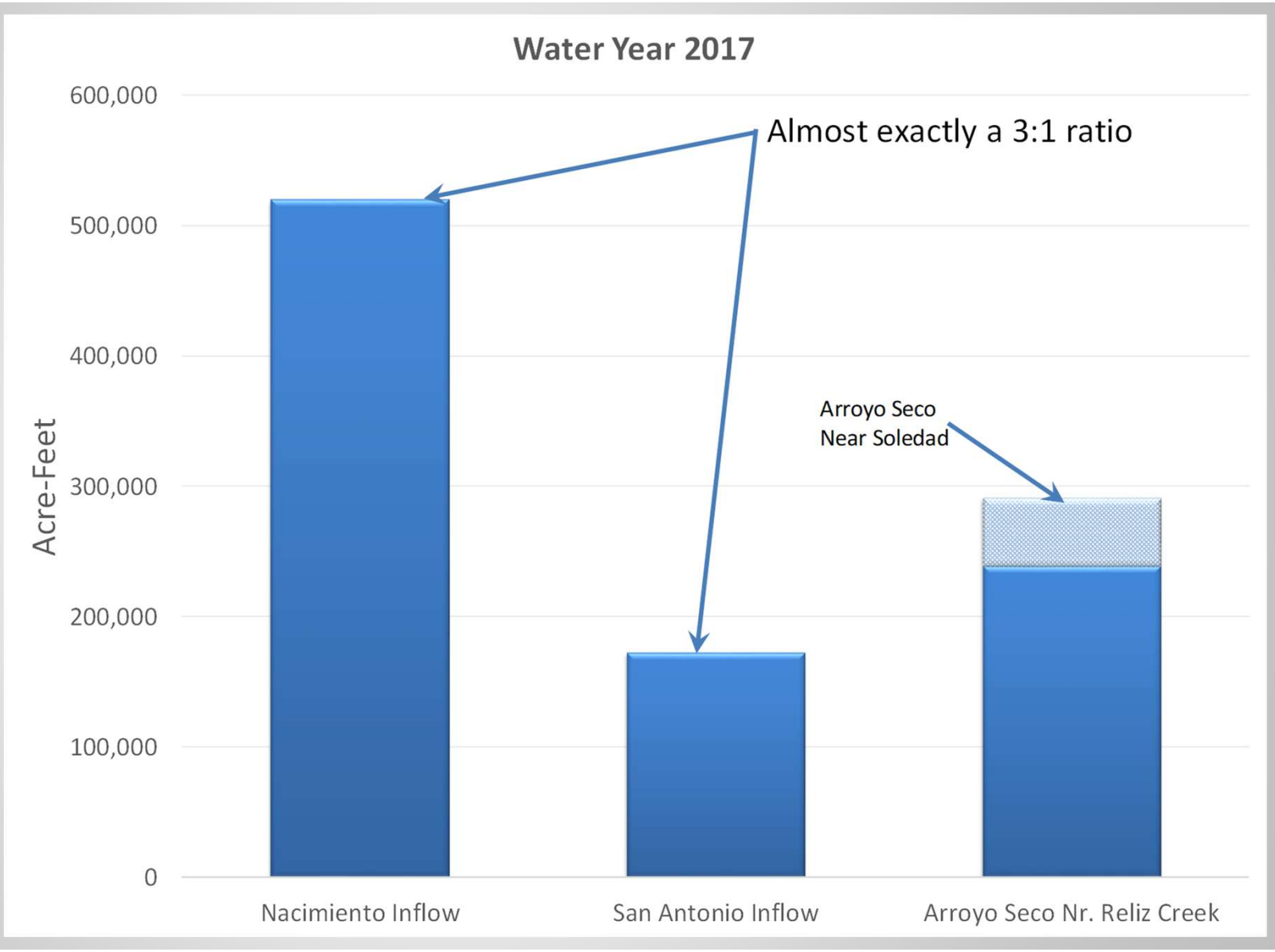
Watersheds

- There are three major sub-watersheds in Monterey County:

1. Nacimiento River watershed,
2. San Antonio River watershed
3. Arroyo Seco watershed





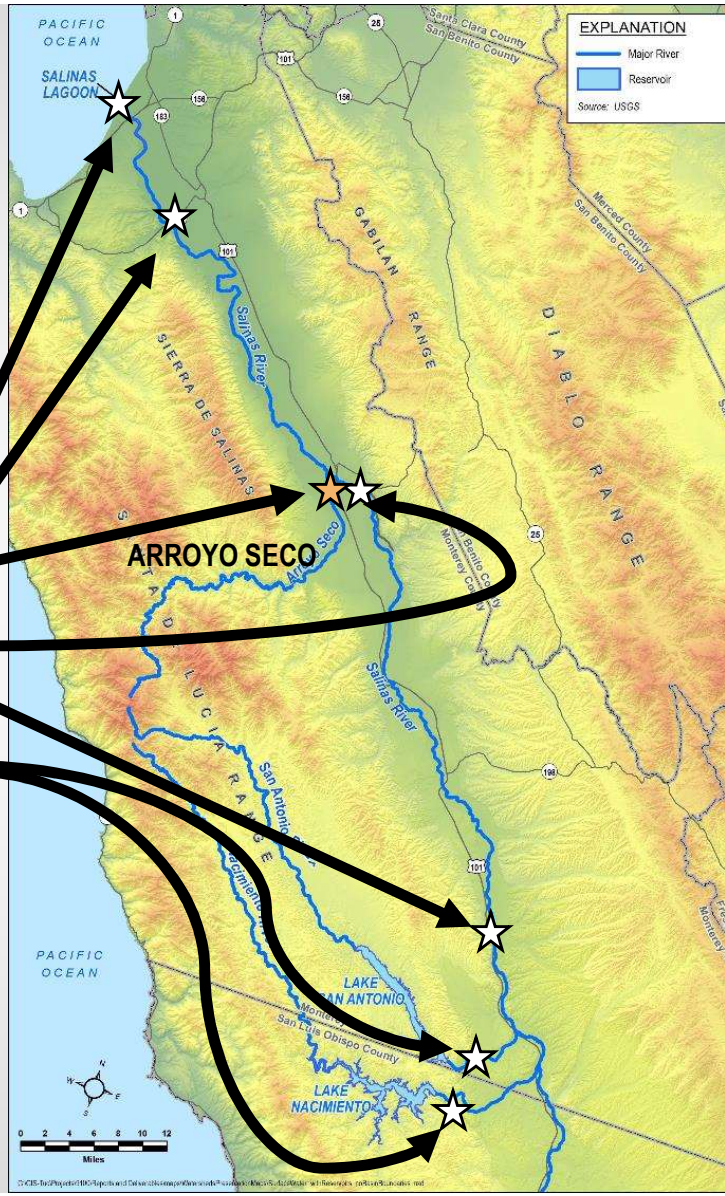

Water Year 2017
600,000
500,000
400,000
300,000
200,000
100,000
0
Acre-Feet
Almost exactly a 3:1 ratio
Arroyo Seco
Near Soledad
Nacimiento Inflow
San Antonio Inflow
Arroyo Seco Nr. Reliz Creek

Recharge from surface water flow

- Undammed Arroyo Seco
  - Median recharge in the Arroyo Seco Cone is 265 acre-feet/day when there is flow at the Reliz Creek gauge
- Salinas River winter flows
- 2017 Nacimiento and San Antonio conservation
  - 880 acre-feet per day of recharge between Bradly and Soledad
  - 600 acre-feet per day of recharge between Soledad and Spreckels

Reservoir Releases and Surface Water Flows (2017)

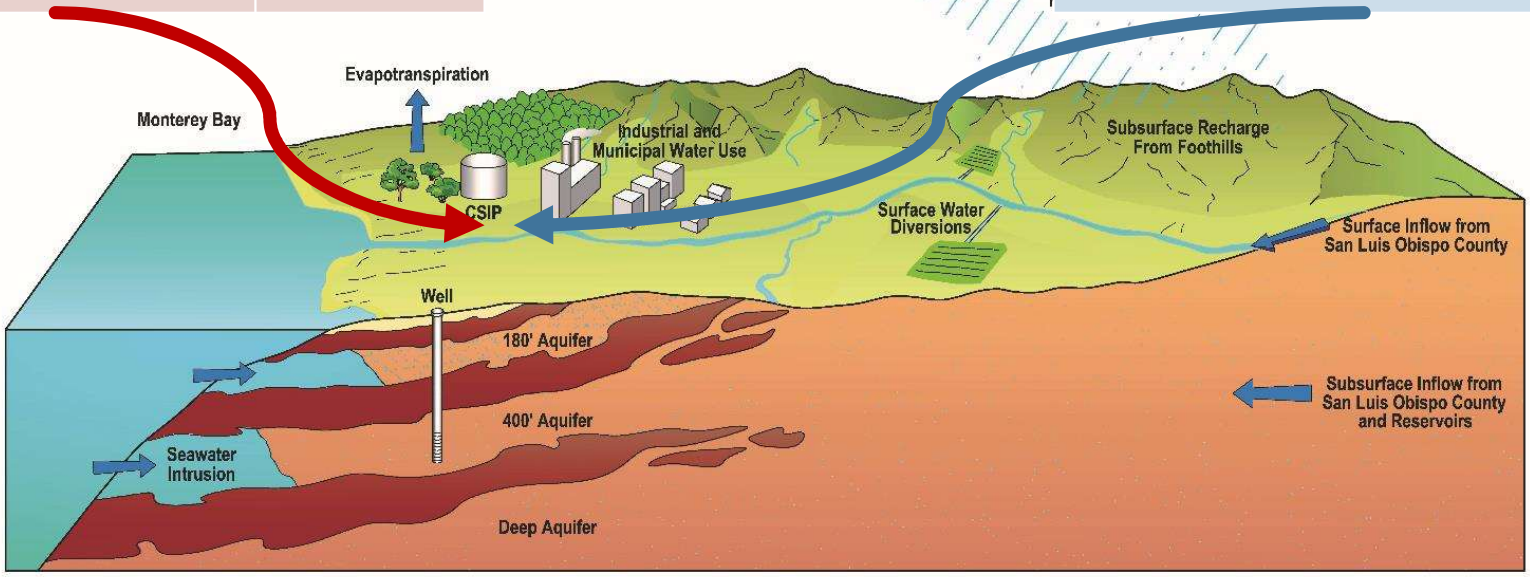
Location	Winter (CFS)	Summer (CFS)
Salinas Lagoon (below SRDF)	1312	14
Salinas River near Spreckels	1312	26
Arroyo Seco below Reliz Creek	933	0
Salinas River at Soledad	1053	333
Salinas River near Bradley	1601	760
Combined reservoir releases	927	776



CSIP Provides In-Lieu Recharge

August 2017 CSIP Deliveries - TOTAL	3,134 AF
CSIP Well Deliveries	373 AF
SRDF Deliveries	877 AF
SVRP Deliveries	1,884 AF

February 2017 CSIP Deliveries - TOTAL	102 AF
CSIP Well Deliveries	102 AF
SRDF Deliveries	0
SVRP Deliveries	0

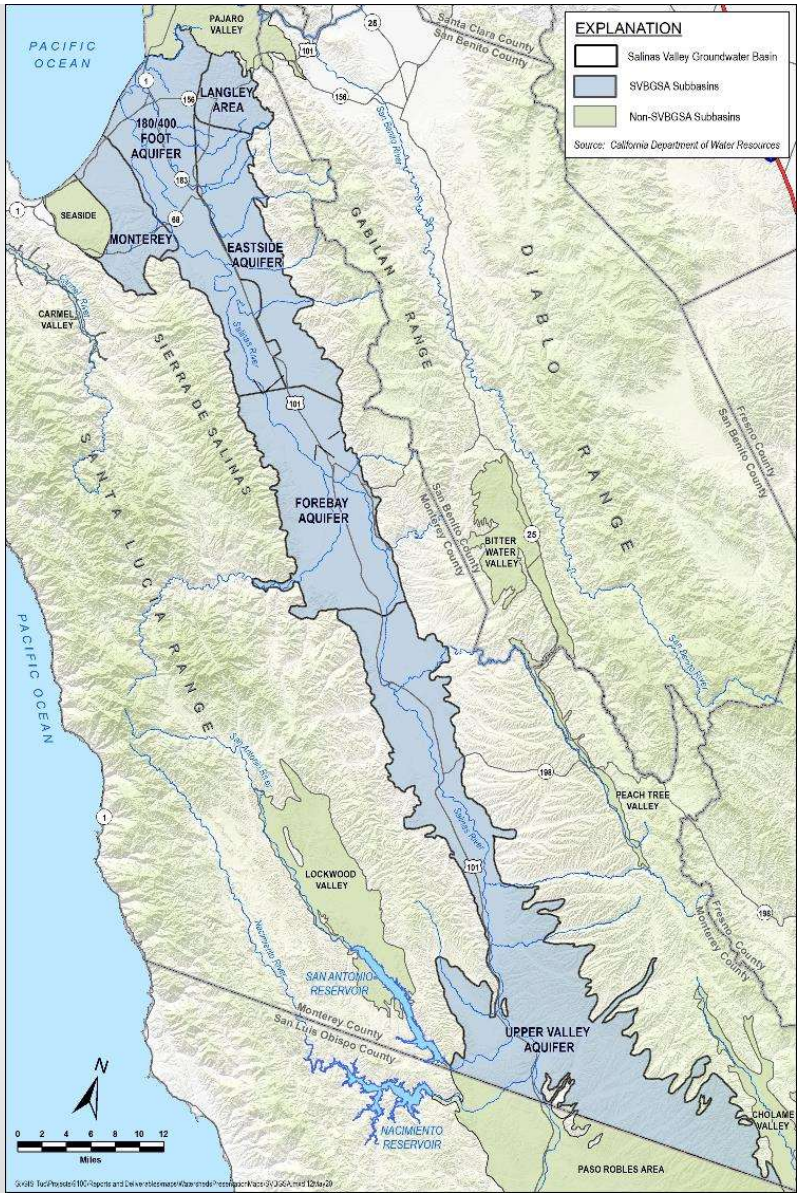


What happens now that water is in the Ground

TC4

Salinas Valley Groundwater Basin

- Covers about 530,000 acres
- Seven subbasins in Monterey County; one is adjudicated (Seaside Basin)
- The subbasins are all connected to some degree



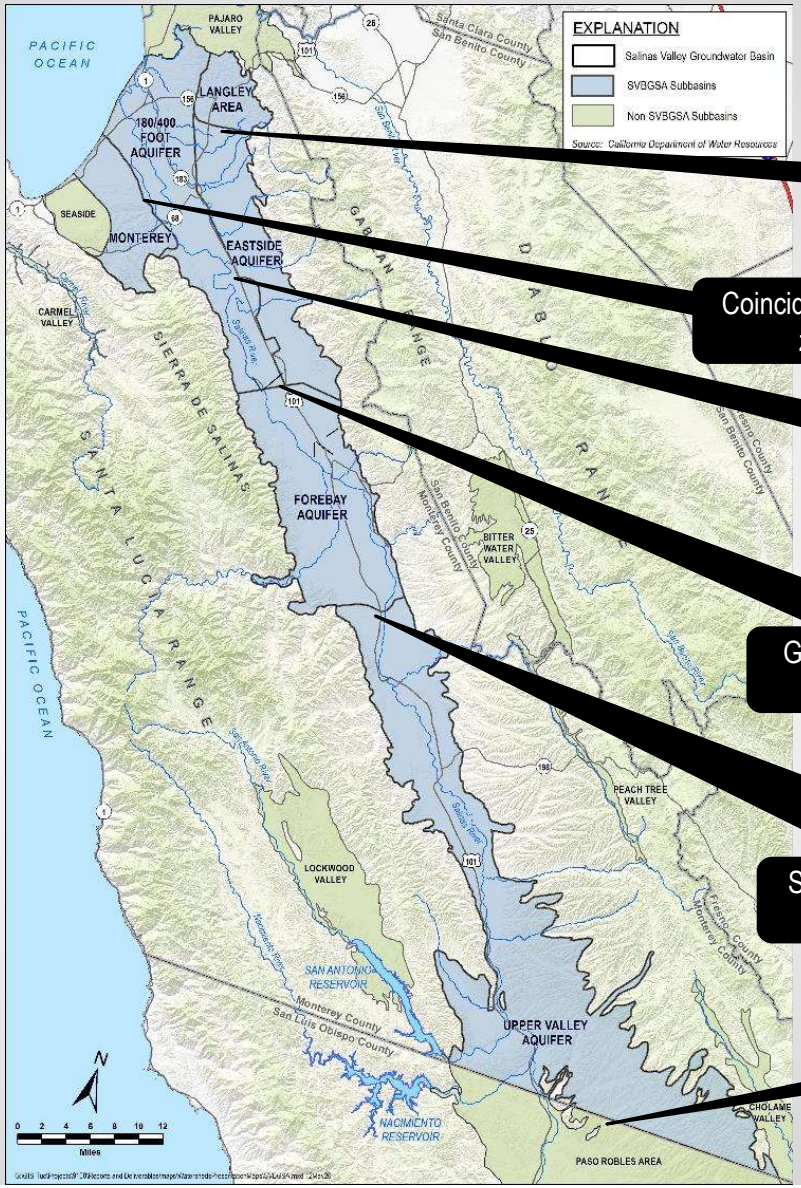
Slide 16

TC4 get rid of this slide??
Tiffani Cañez, 8/20/2020

AO9

Subbasins are Interconnected

- DWR defined subbasins for purposes of resource management, using a combination of geographic, administrative, land use, and physical features



Topographic change from dissected upland (Langley) to terrace (East Side).

Coincides with the Reliz and Rinconada fault zone and a groundwater divide

Eastern limit of the confining conditions and the location of State Highway 101

Generally coincides with southern limit of confining conditions

Separates the portion of the valley upgradient from influence of Arroyo Seco recharge

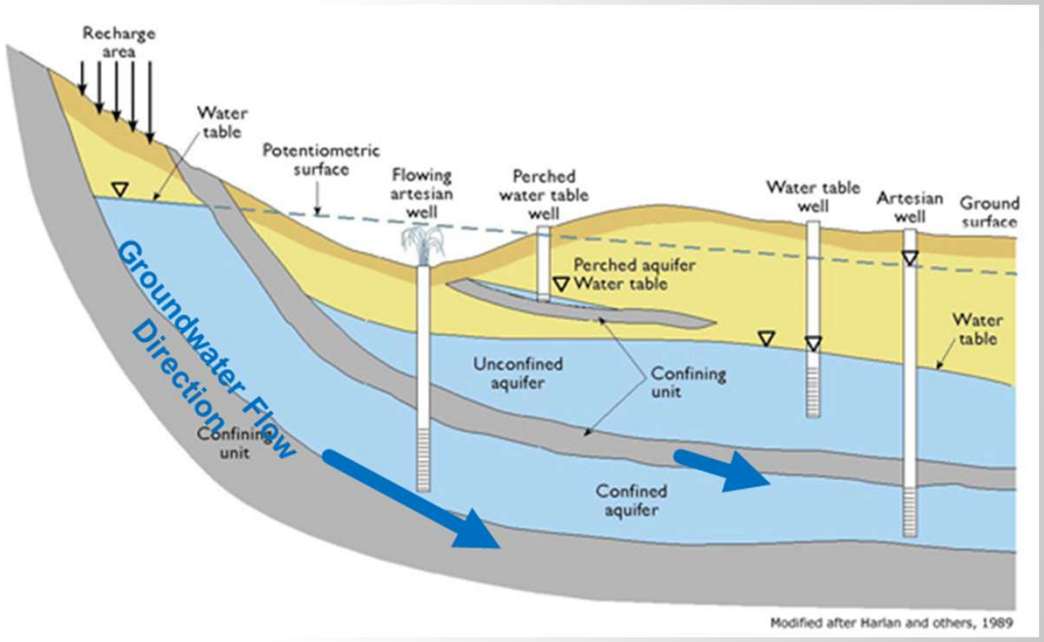
County line

Slide 17

AO9 Maybe put this slide right after the first view of the gw basin and before the subbasin slides?
Abby Ostovar, 8/21/2020

Aquifers and Aquitards

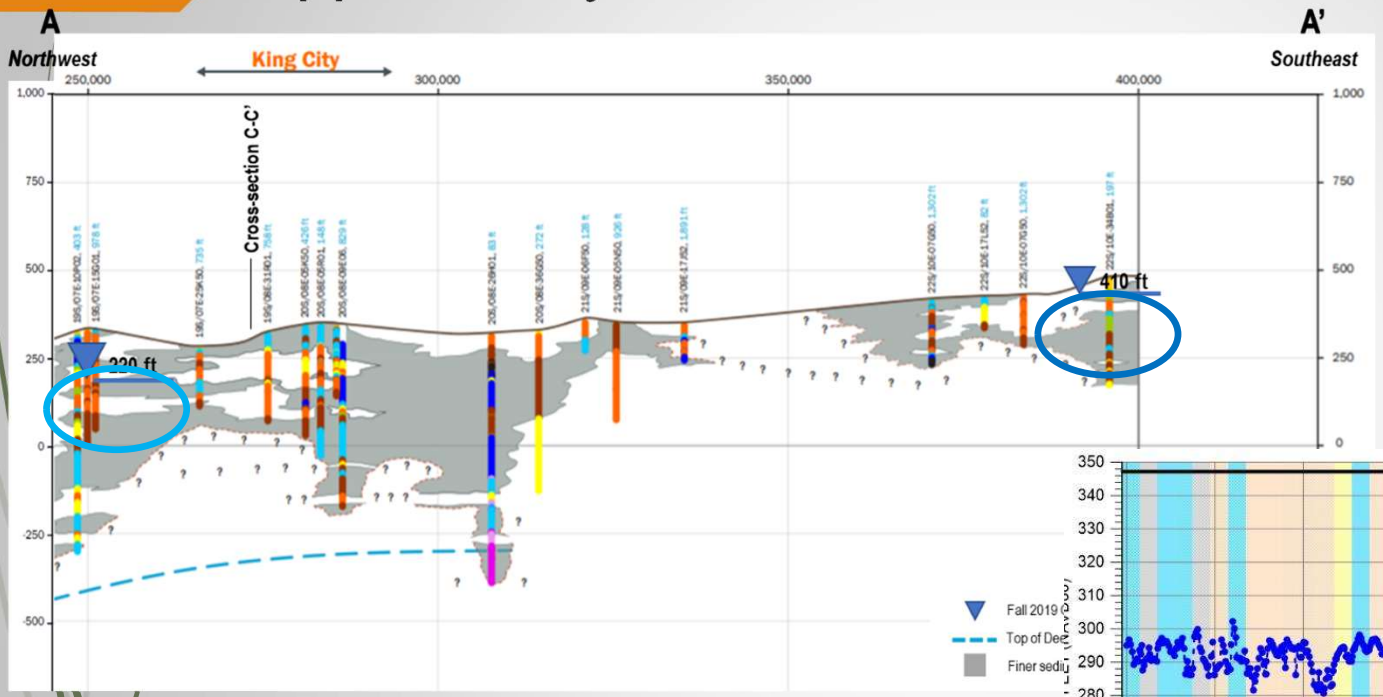
- Aquifers have large pores between sand grains, allowing water to flow more rapidly → high hydraulic conductivity
- Aquitards have small pores between silt and clay platelets, slowing down the flow of water→ low hydraulic conductivity

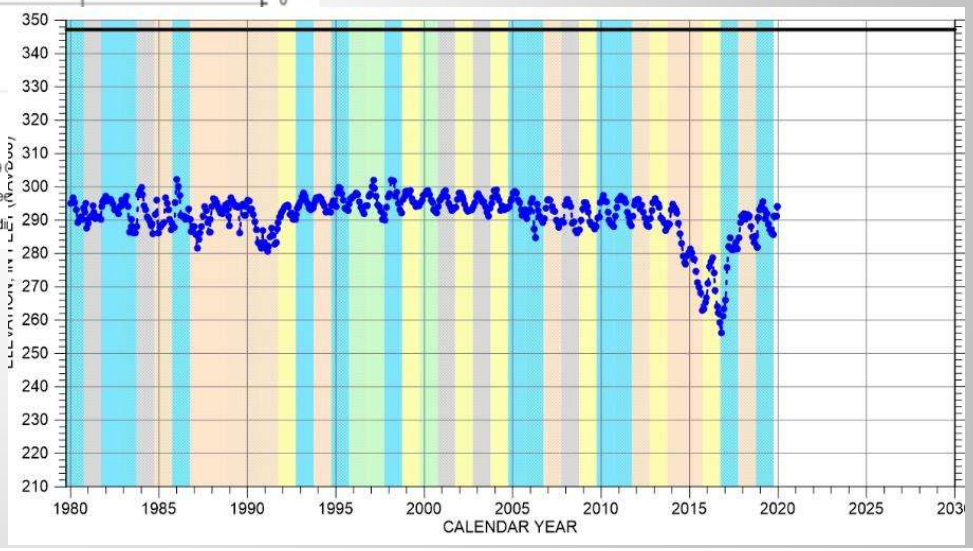


Three Subbasins Along the Valley's South – North Axis

- All subbasins are defined by fluvial deposits from the ancient Salinas River
  - Forebay Subbasin has significant, coarse, alluvial deposits
- Aquifers become more confined going from South to North
- Less recharge from Salinas river in the North due to geologic constraints

Upper Valley Subbasin



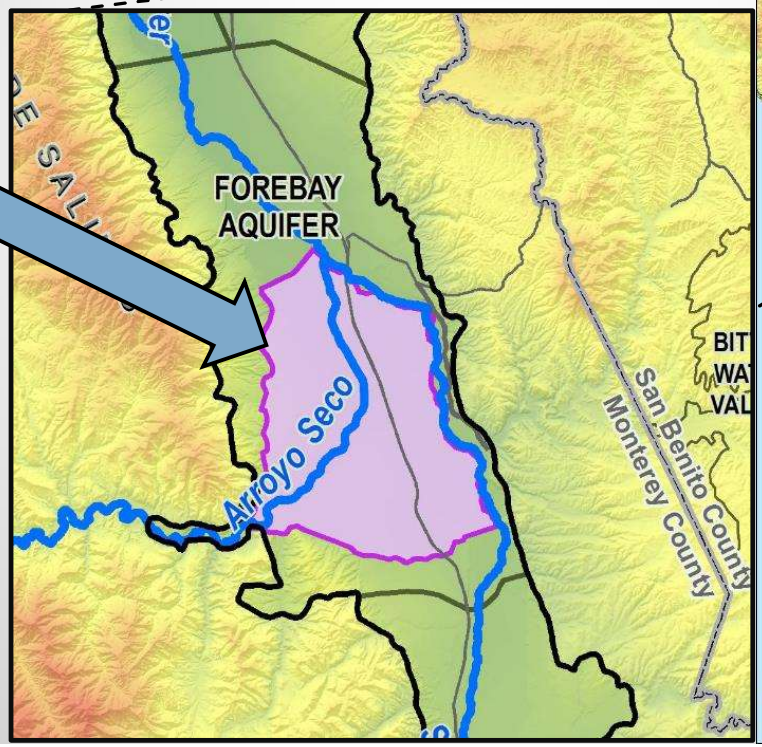


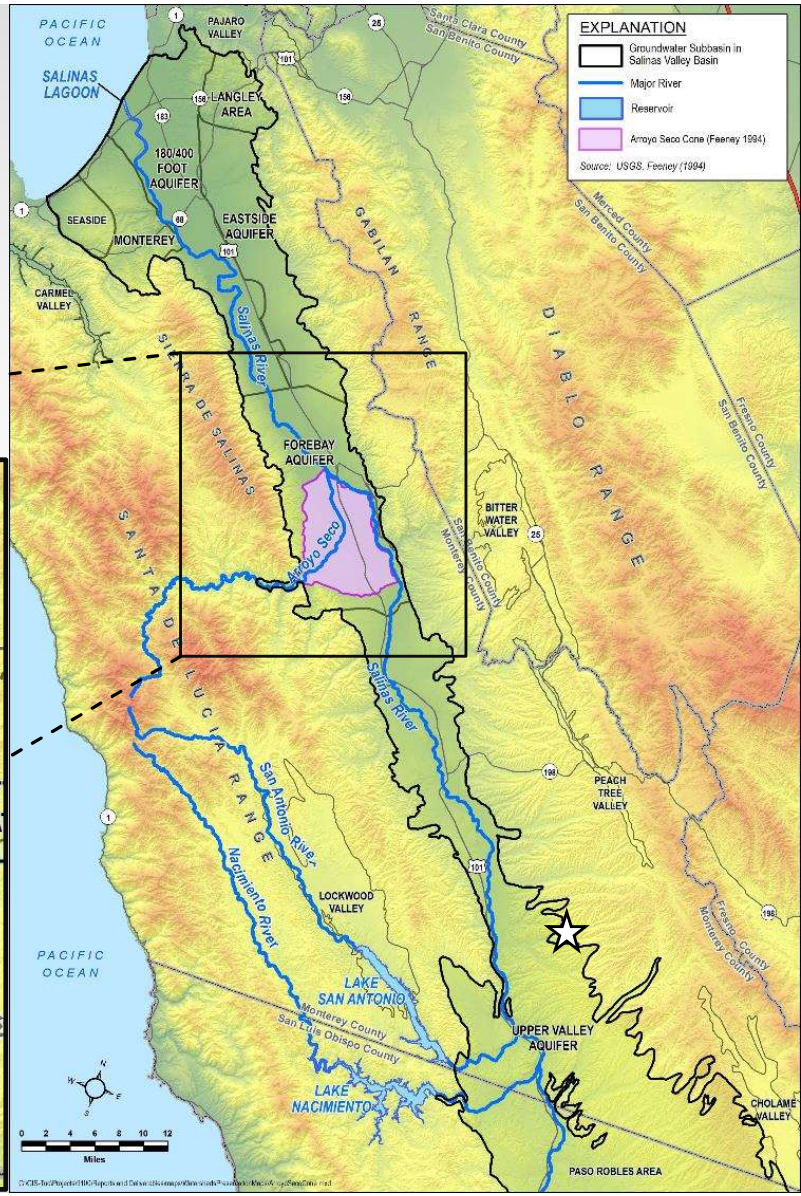
- Generally a single, unconfined aquifer
- Significant recharge from the Salinas River. (However, there is now a significant area away from the river).

Forebay Aquifer Subbasin

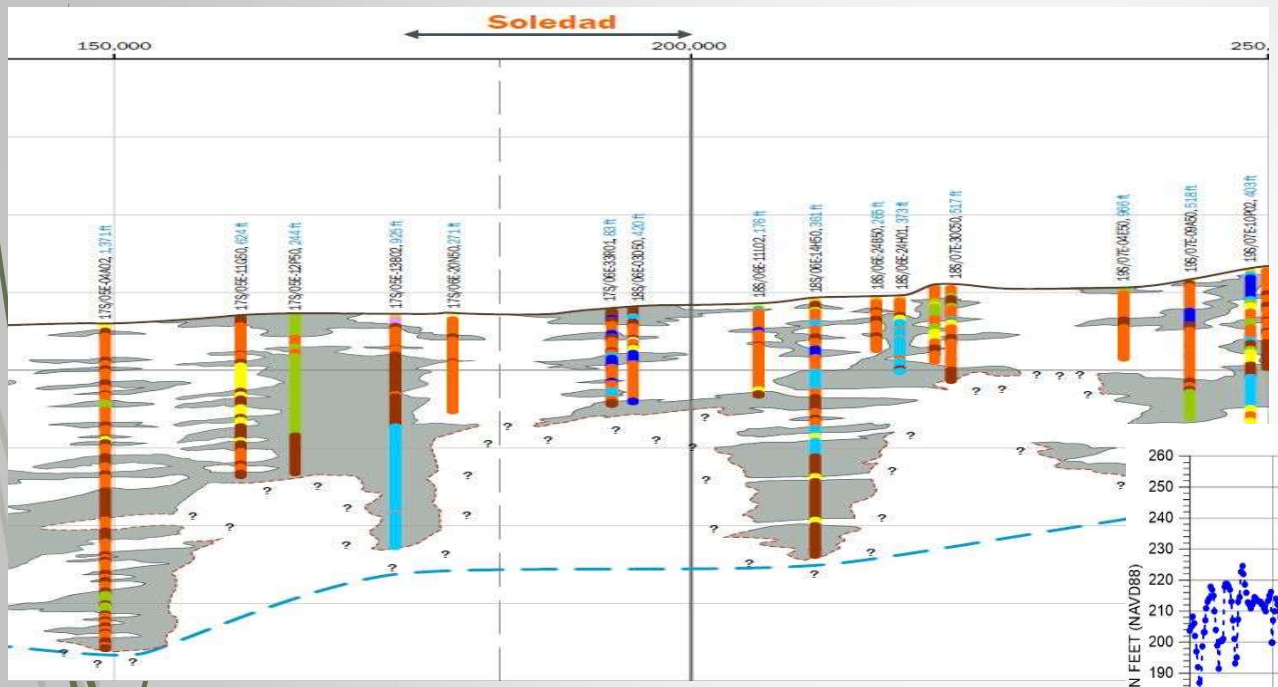
- Arroyo Seco Cone

Coarse sediments in the west, more Salinas River like sediments in the east

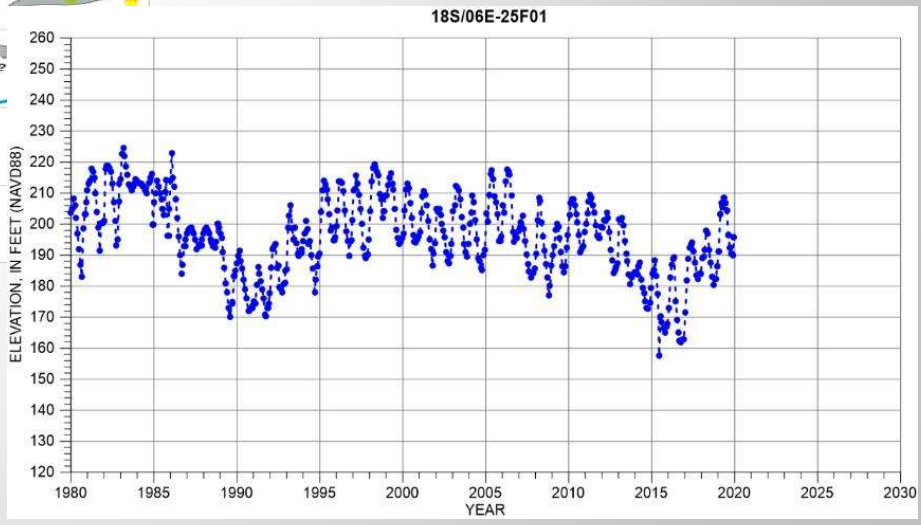




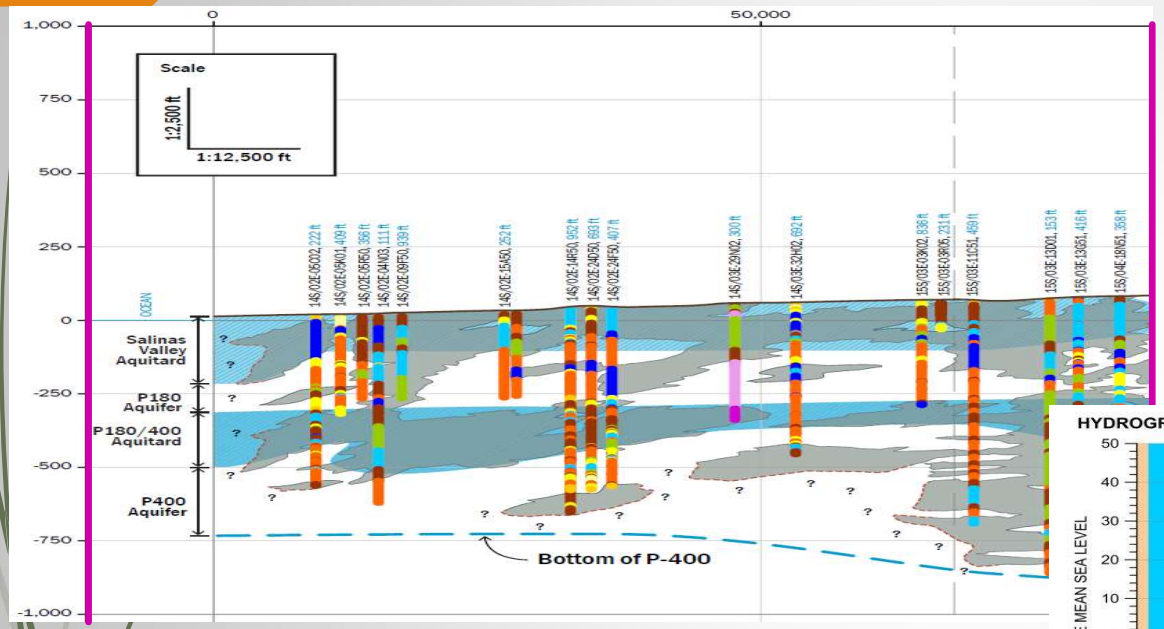
Forebay Aquifer Subbasin



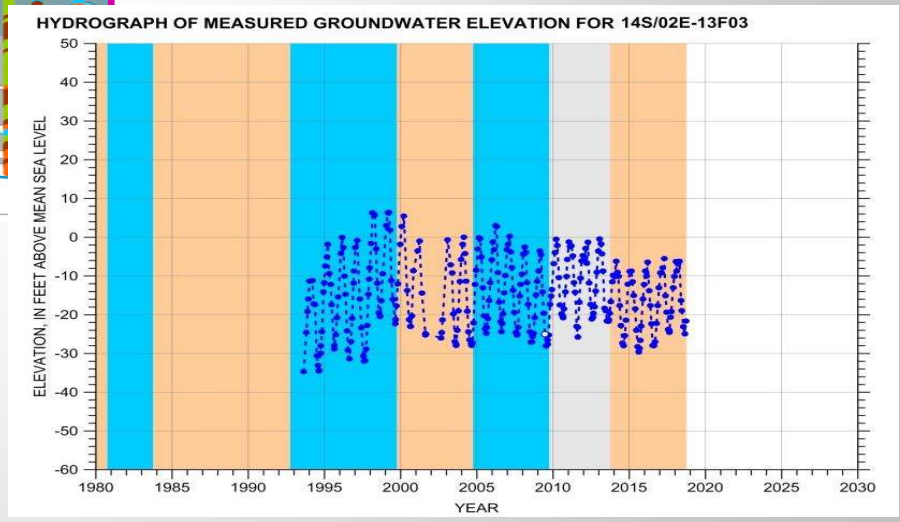
- One Aquifer: Basin Fill (180 and 400-foot aquifers, Arroyo Seco Cone, and (potentially) Deep are all connected)
- Recharge from Salinas River, Arroyo Seco, and Upper Valley



180/400-Foot Aquifer Subbasin



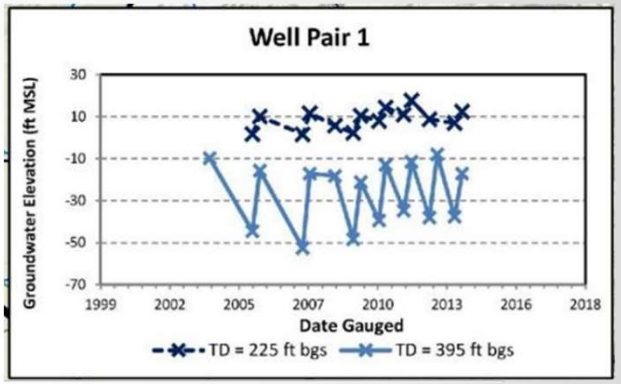
- Three Aquifers: 180-Foot, 400-foot, and Deep
- Recharge from Salinas River is limited by aquitards
- Recharge from Forebay Subbasin



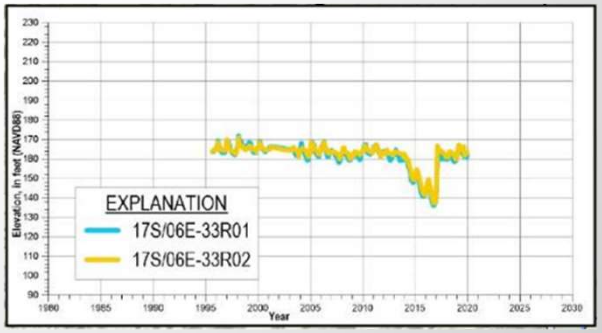
Groundwater elevations maintained by seawater intrusion

Relative Confinement of Subbasins

180/400 Subbasin
Vertical Gradients



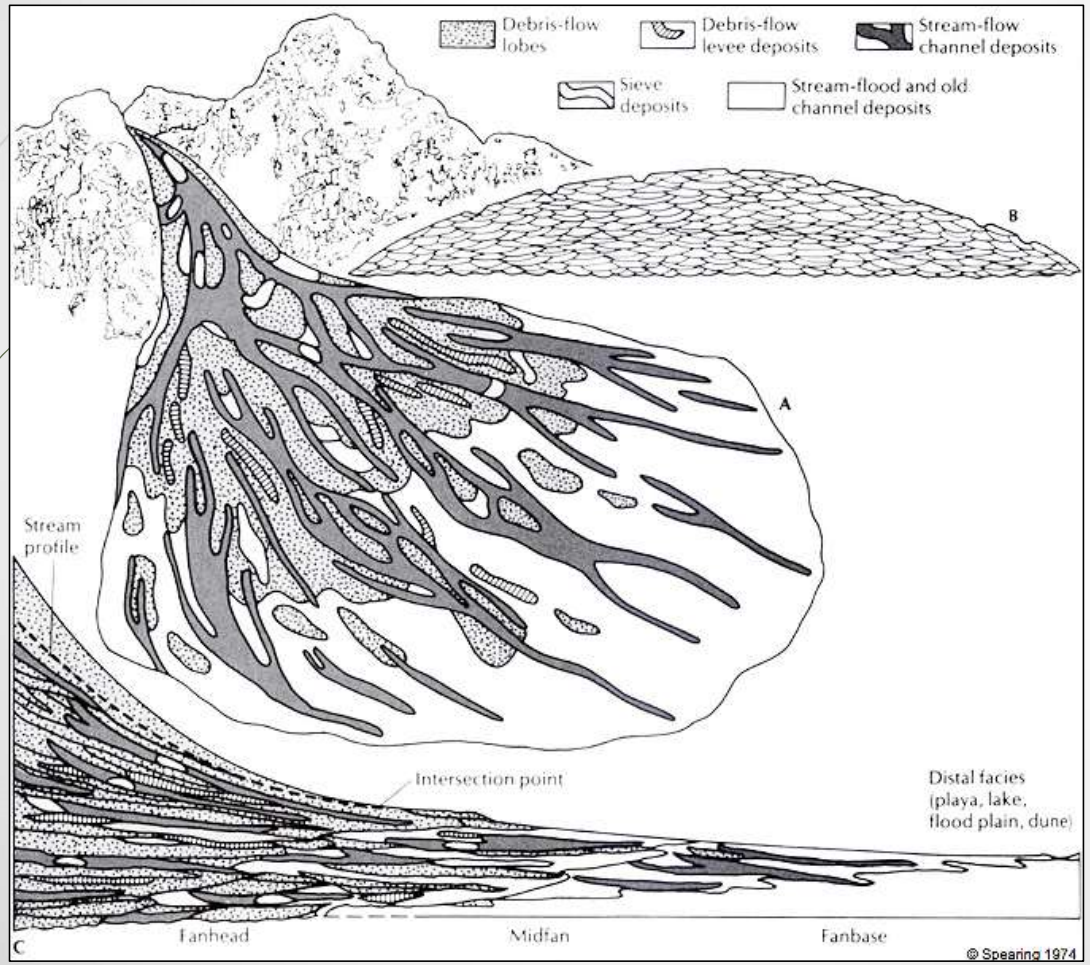
Forebay Subbasin
Vertical Gradients



Subbasins Away from the Salinas River

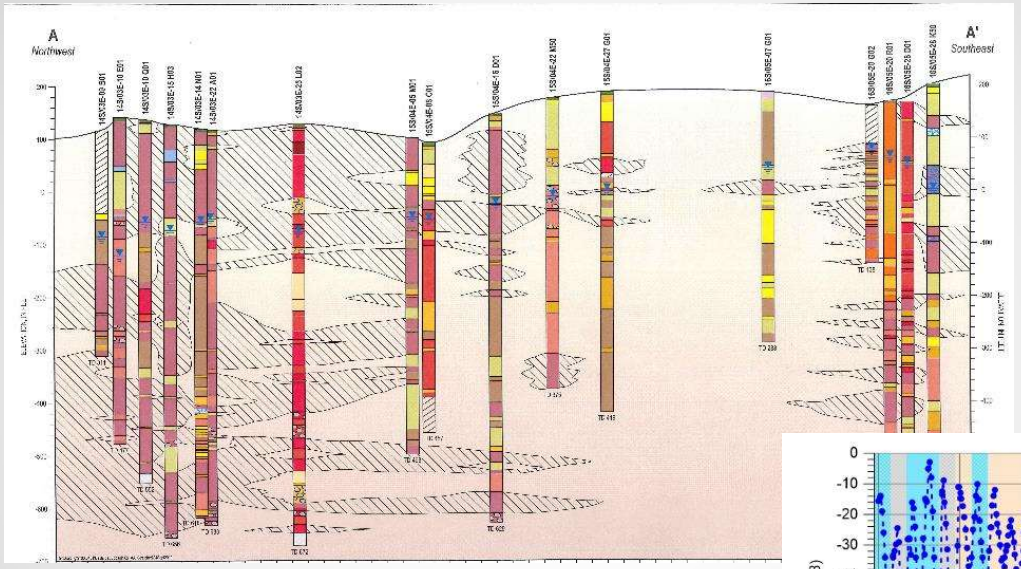
- Varying alluvial and fluvial geology
- Limited to no direct recharge from the Salinas River
- Hydrologically connected to other subbasins
  - Eastside may have limited connection

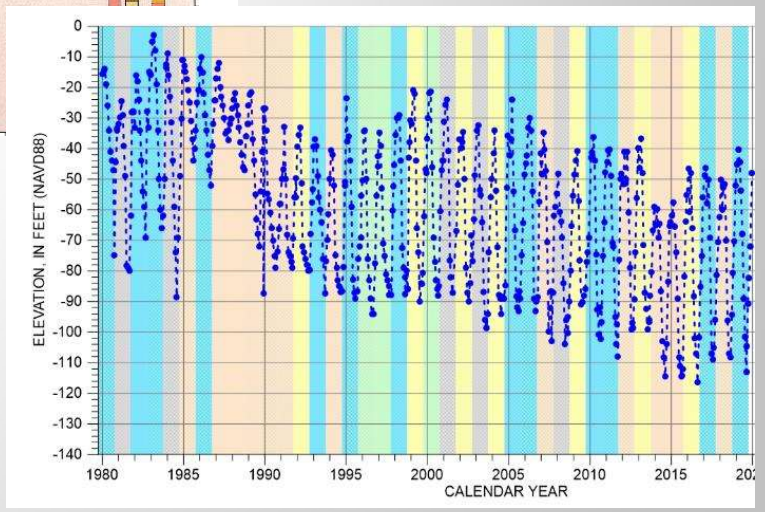
Eastside Aquifer Subbasin



- Geologically distinct alluvial deposits
  - Discontinuous sands and gravels
  - No laterally extensive aquifer
- Not well connected to surrounding subbasins
- Recharge from precipitation and local runoff

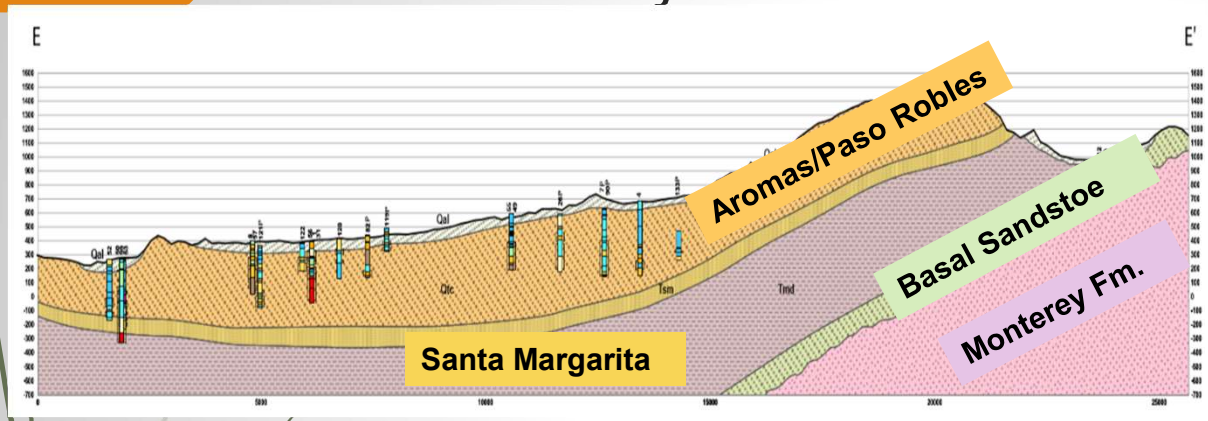
Eastside Aquifer Subbasin



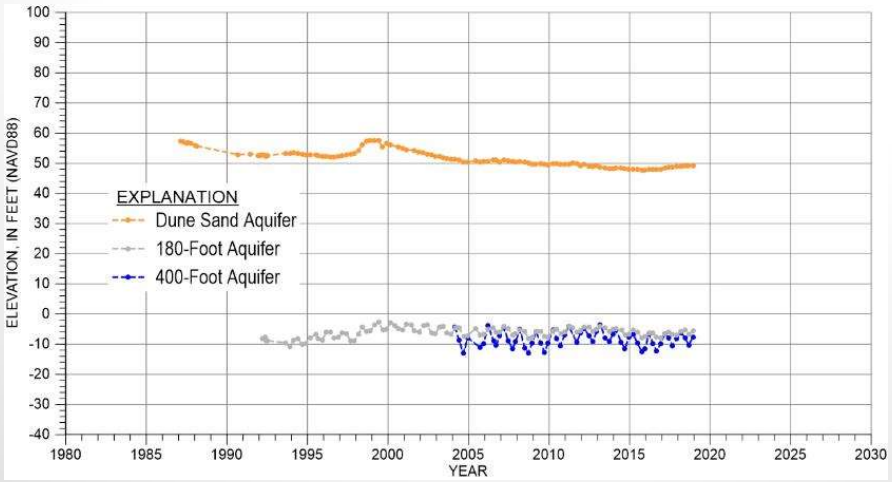


- Groundwater declines may be more localized due to geology

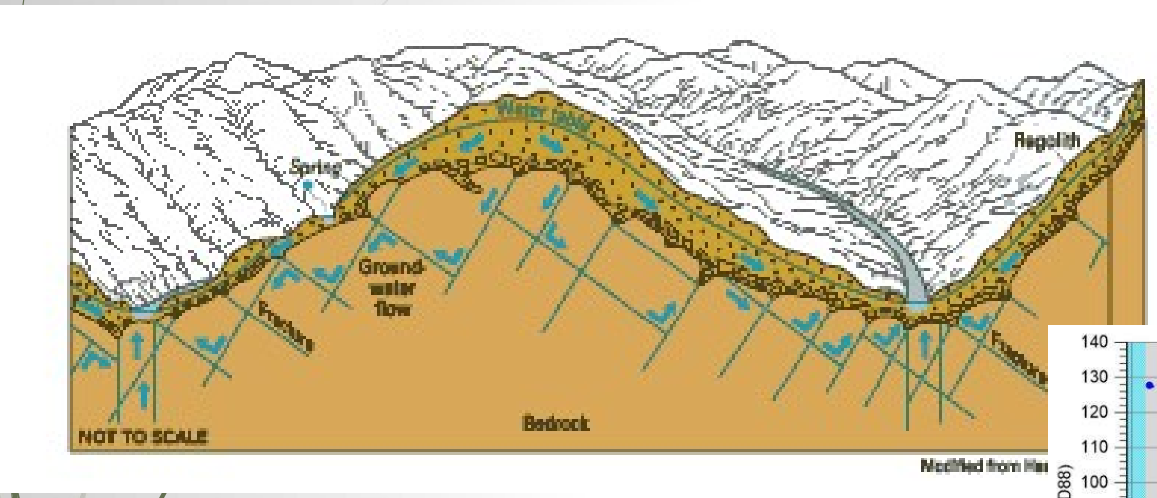
Monterey Subbasin



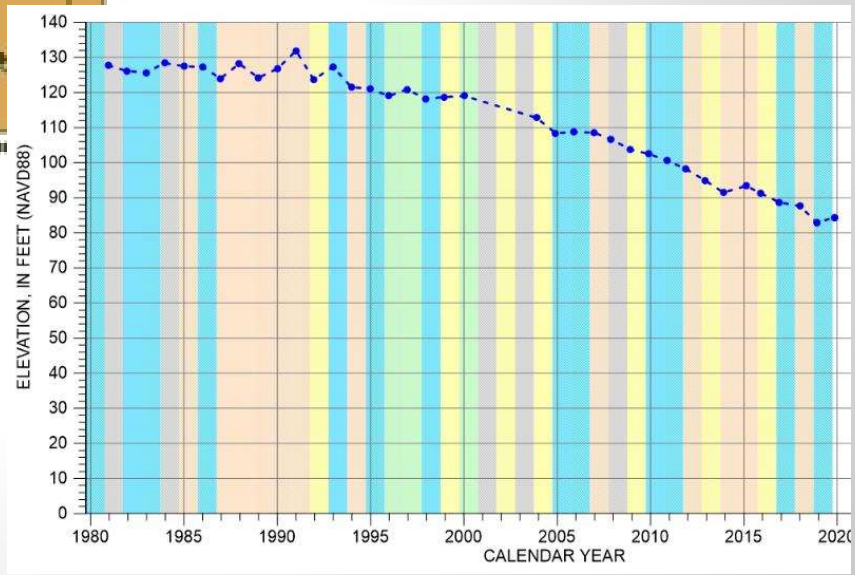
- Geologically similar to the 180/400
  - 180-Foot aquifer appears absent in the southern portion.
- Recharge from the nearby Salinas River is limited by aquitards
- Recharge from neighboring subbasins and precipitation
- Relatively limited data – except for MCWD and Fort Ord remediation

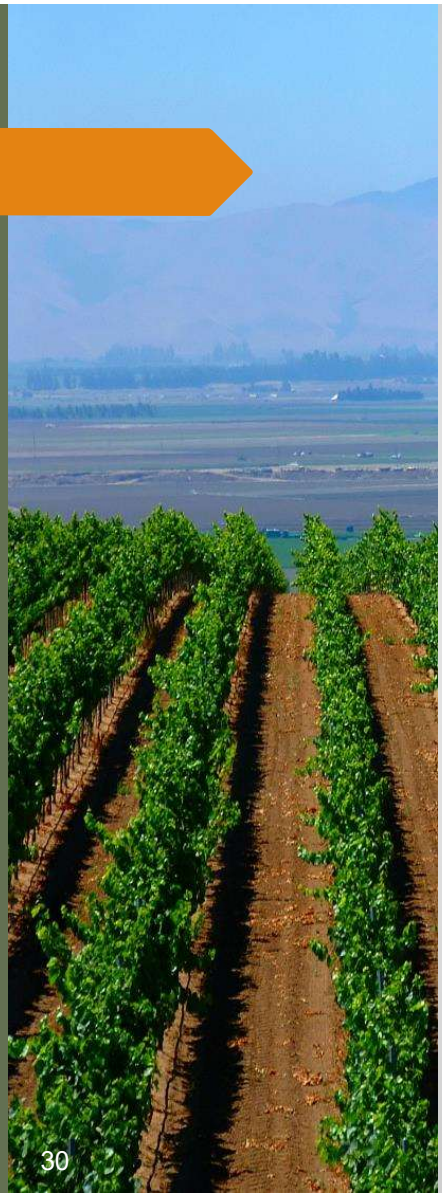


Langley Subbasin



- Geologically somewhat distinct
- Many wells draw water from fractured bedrock
- Thin aquifer above the bedrock



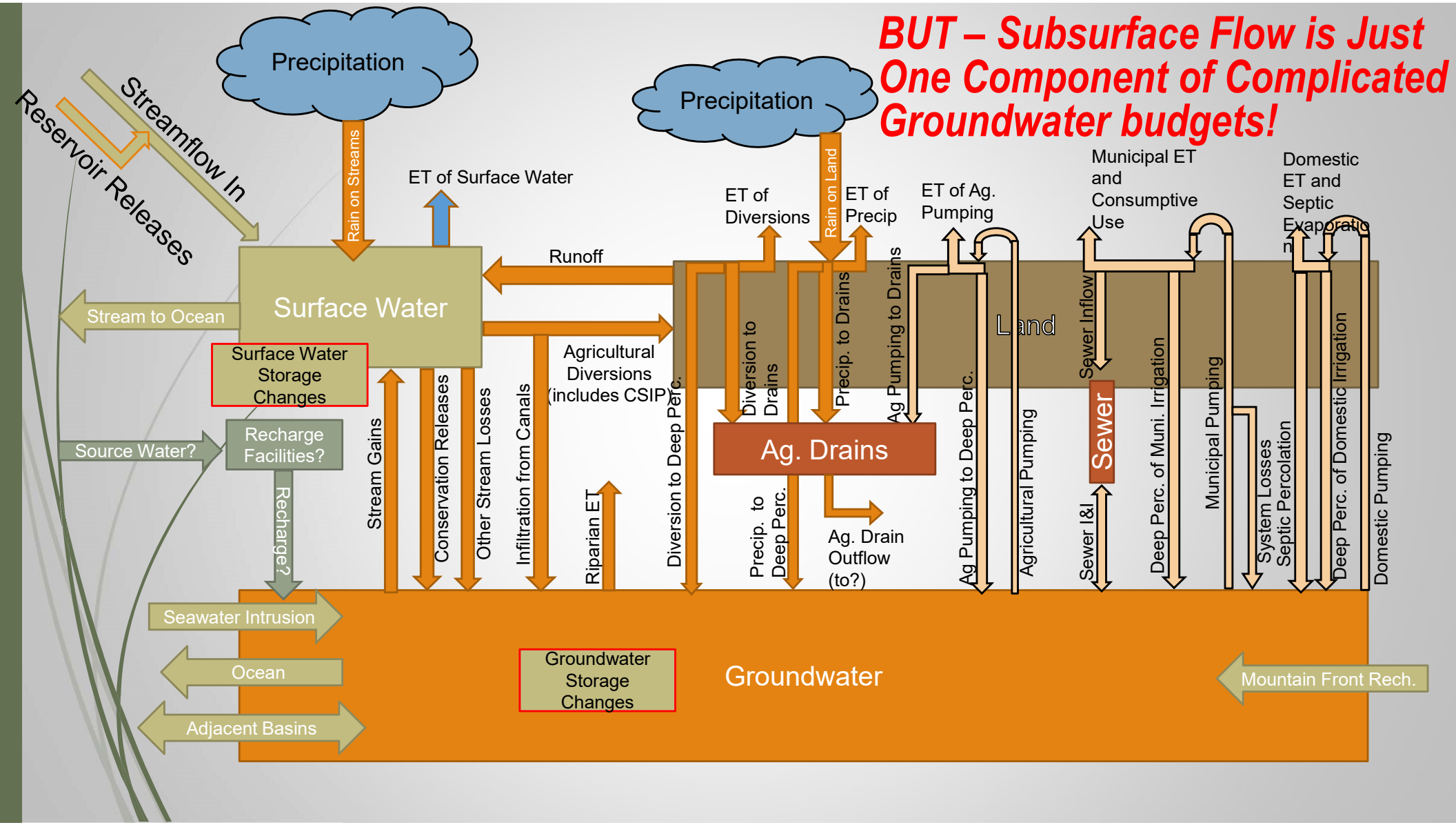


Flow between subareas

MCWRA Subarea	Average of WY 1958 - 1994 (from MW, 1998)				2017 Groundwater Pumping
	Inflow (AF/year)		Outflow (AF/year)		
	Natural Recharge	Subsurface Inflow	Groundwater Pumping	Subsurface Outflow	
Pressure	117,000	17,000	130,000	8,000	94,000
Eastside	41,000	17,000	86,000	0	58,000
Forebay	154,000	31,000	160,000	20,000	128,000
Upper Valley	165,000	7,000	153,000	17,000	87,000

From Brown & Caldwell, 2015

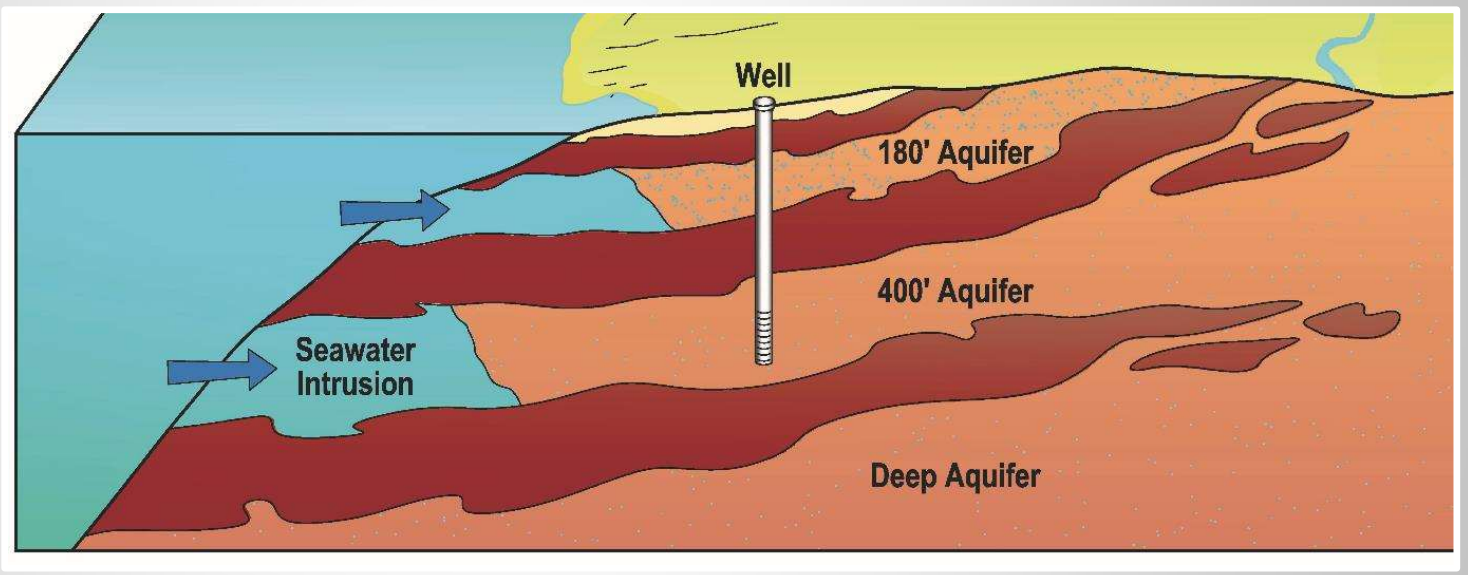
Subsurface inflow accounts for between 4% and 29% of water supplies


BUT – Subsurface Flow is Just One Component of Complicated Groundwater budgets!
Precipitation
Precipitation
Streamflow In
Reservoir Releases
Rain on Streams
ET of Surface Water
Runoff
Surface Water
Stream to Ocean
Surface Water Storage Changes
Source Water?
Recharge Facilities?
Recharge?
Stream Gains
Conservation Releases
Other Stream Losses
Infiltration from Canals
Agricultural Diversions (includes CSIP)
Riparian ET
Diversion to Deep Perc.
Rain on Land
ET of Diversions
ET of Precip
Diversion to Drains
Precip. to Drains
Ag. Drains
Precip. to Deep Perc.
Ag. Drain Outflow (to?)
ET of Ag. Pumping
Ag Pumping to Drains
Ag Pumping to Deep Perc.
Agricultural Pumping
Land
Municipal ET and Consumptive Use
Sewer Inflow
Sewer
Sewer I&I
Deep Perc. of Muni. Irrigation
Municipal Pumping
System Losses Septic Percolation
Domestic ET and Septic Evaporation
Deep Perc. of Domestic Irrigation
Domestic Pumping
Seawater Intrusion
Ocean
Adjacent Basins
Groundwater Storage Changes
Groundwater
Mountain Front Rech.

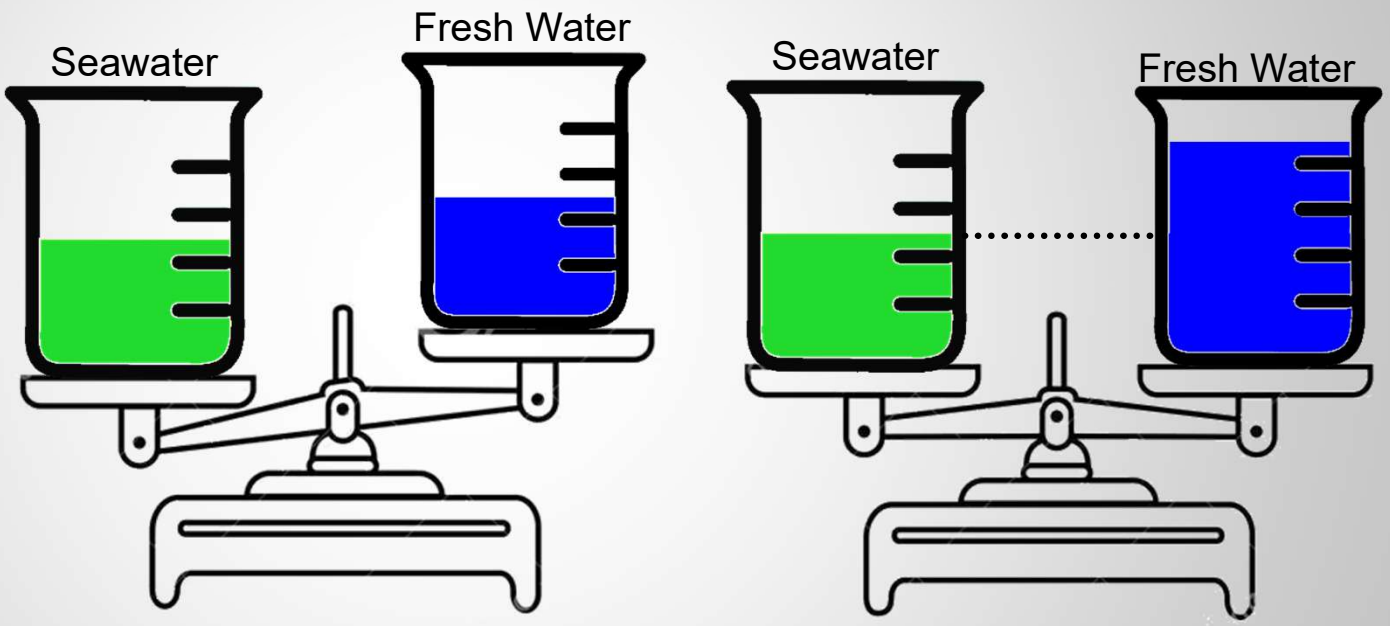
Water Supply Challenges in the Salinas Valley

- Seawater intrusion
- Groundwater depletion (levels and storage)
  - Unequal access to recharge
- Maintaining ecological benefits
- Groundwater quality degradation

Seawater Intrusion



Seawater Intrusion



Recap

- All water ultimately comes from rainfall
- Projects provide reliability by decreasing seasonal, inter-annual, and spatial differences in water availability
- Current projects include two reservoirs and CSIP
- Subbasins along the Salinas River have better access to recharge than those away from the River, although the vary South to North
- Some Subbasins are geologically unique
- All Subbasins are interconnected

Next Workshop – Projects! Future/where we go