SCV GSA

MEMBER AGENCIES

SCV WATER

CITY OF SANTA CLARITA

LOS ANGELES COUNTY DEPARTMENT of REGIONAL PLANNING

LACWD

Understanding Groundwater Budgets

November 4, 2020

Background

Santa Clarita Valley Groundwater Sustainability Agency (SCV-GSA)

- Tasked with sustainable management of groundwater
- Developing plan tailored to local resources and needs
- Groundwater Sustainability Plan due January 2022
- Process includes public and stakeholder input

The Sustainable Groundwater Management Act (SGMA)

- Creates framework for use of groundwater
- Designed to prevent over-pumping, or overdraft, of groundwater basins
- Agencies in medium- and high-priority basins must develop a Groundwater Sustainability Plan to balance pumping and recharge
- Sustainability required in 20 years

What is a Groundwater Budget?

- SGMA requires development of a water budget to quantify the sources and uses of water and ensure they are in long-term balance
- Takes into account future population growth and climate change impacts
- Takes into account the surface water budget
- Inflows and outflows have to balance over the long-term

Why is a Water Budget Important?

- Helps understand historical conditions and how future changes to supply, demand, hydrology, population, land use, and climate may affect water resources.
- Allow planning to prevent chronic overdraft, which would make basin unusable.

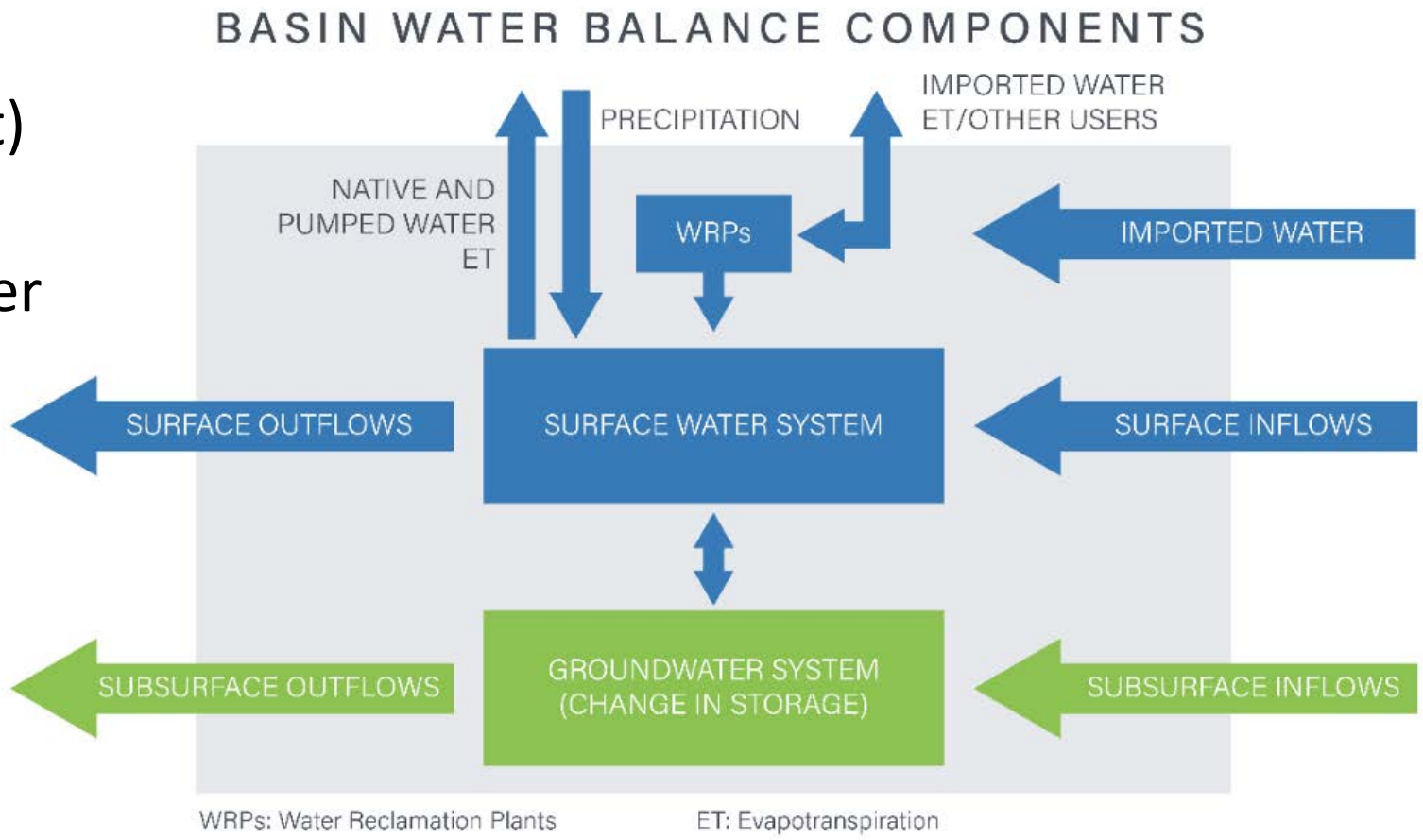
Basin Water Balance Components

Water sources

- Imports (State Water Project)
- Surface waters (streamflow, rainfall, irrigation, wastewater treatment plant discharges)
- Groundwater

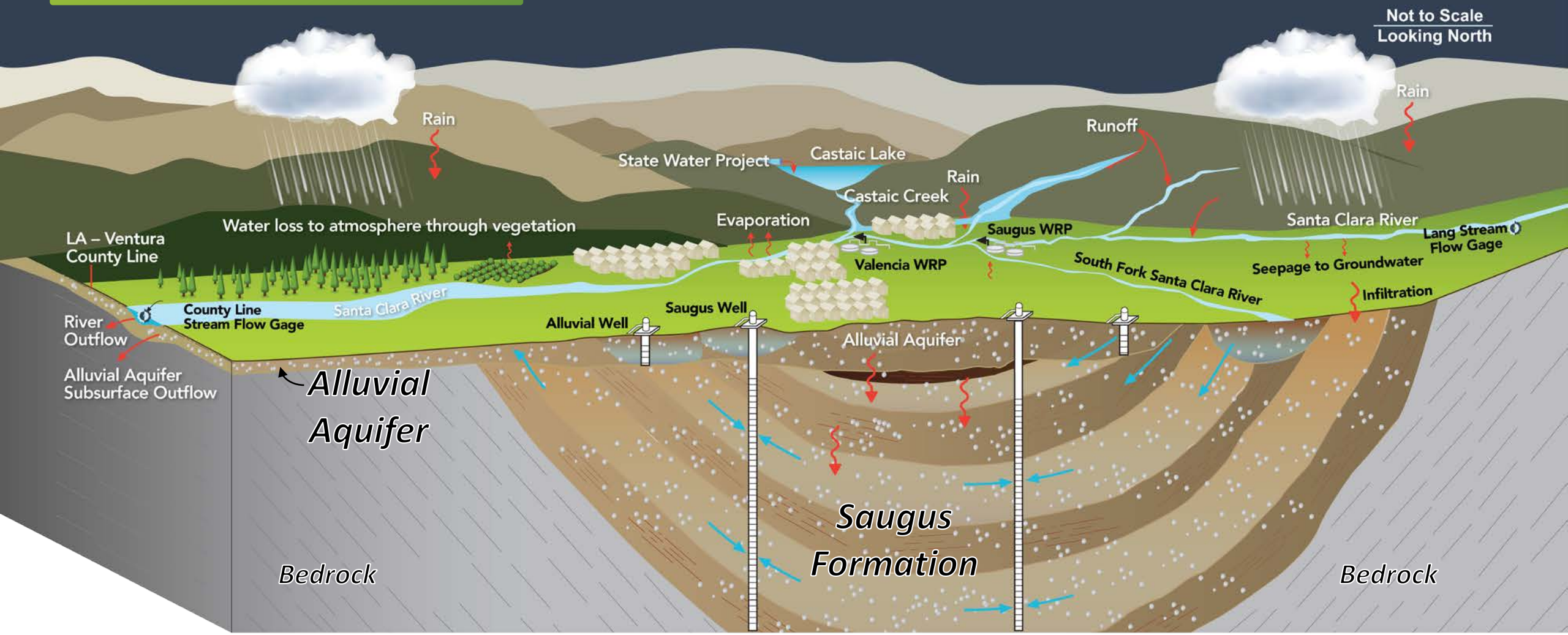
Water uses

- Municipal/agricultural
- Environmental (plants/evapotranspiration)

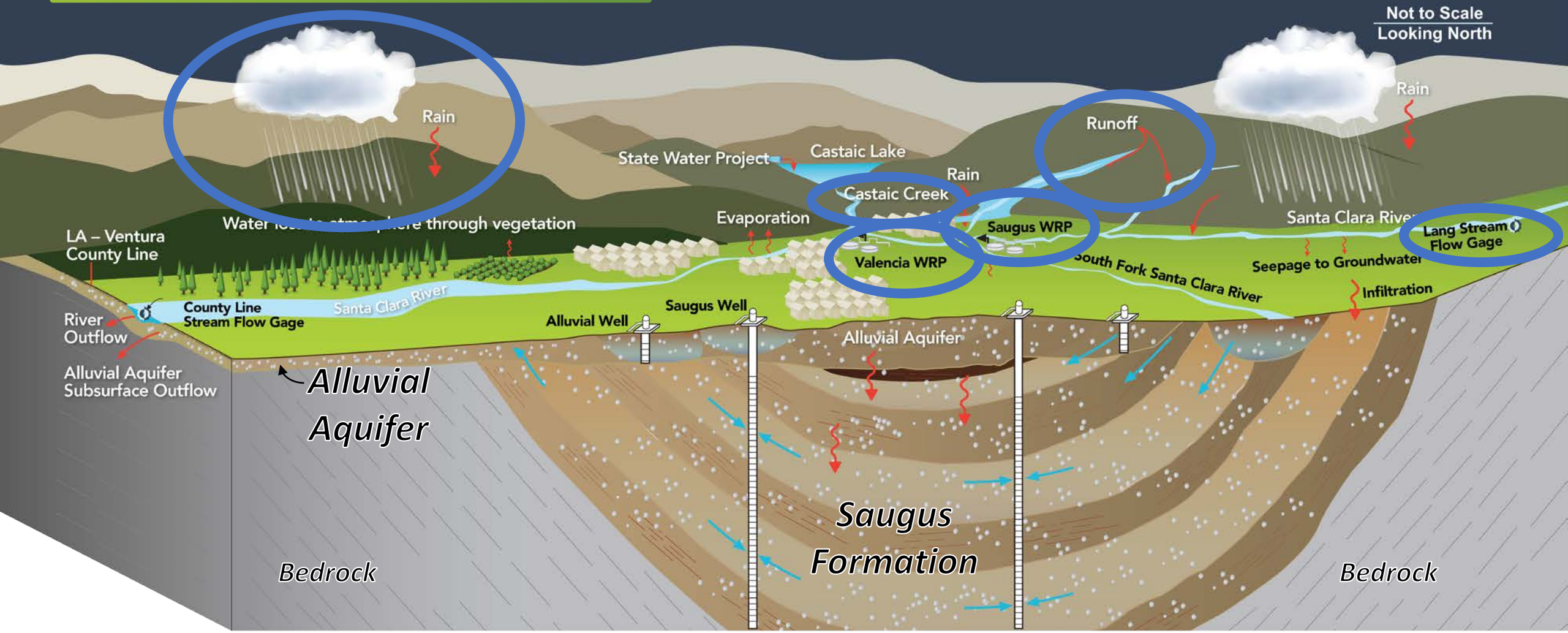


Basin Definition

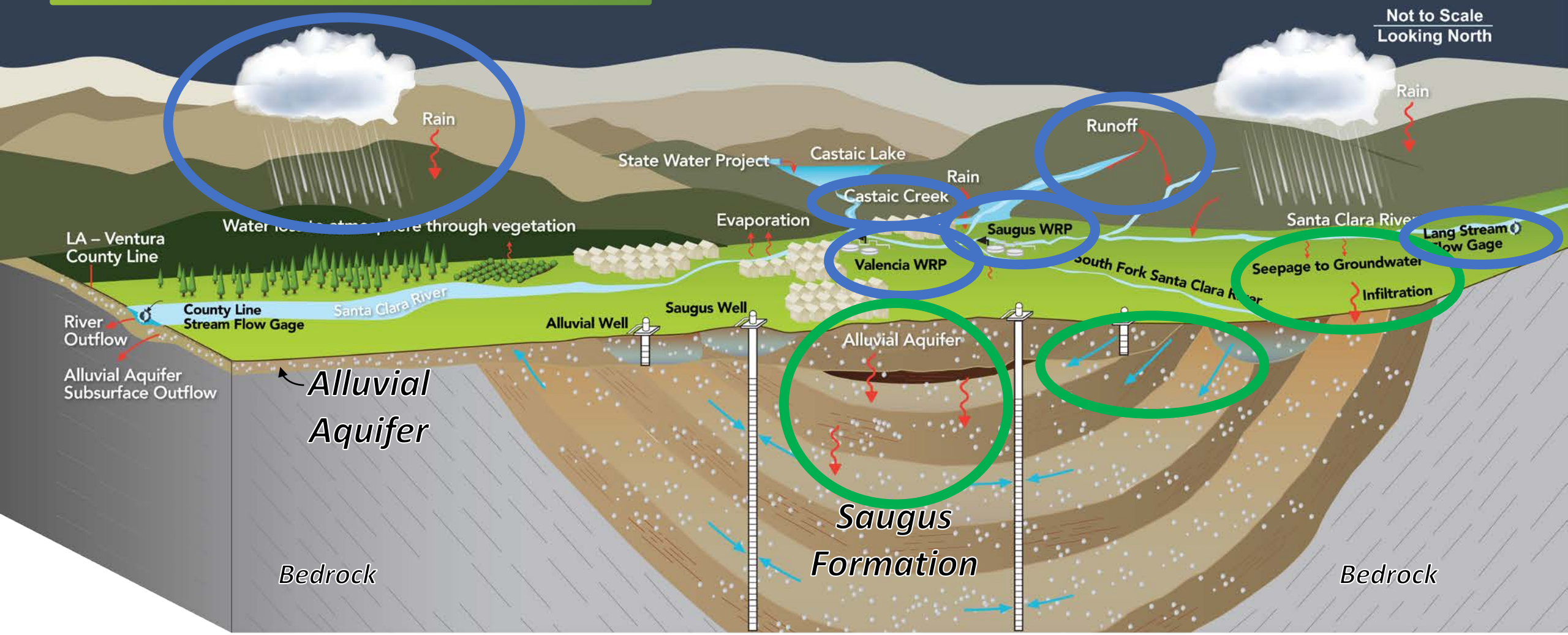
Santa Clara River Valley East Subbasin: Eastern-most and furthest upstream among six subbasins comprising the Santa Clara River Valley Groundwater Basin



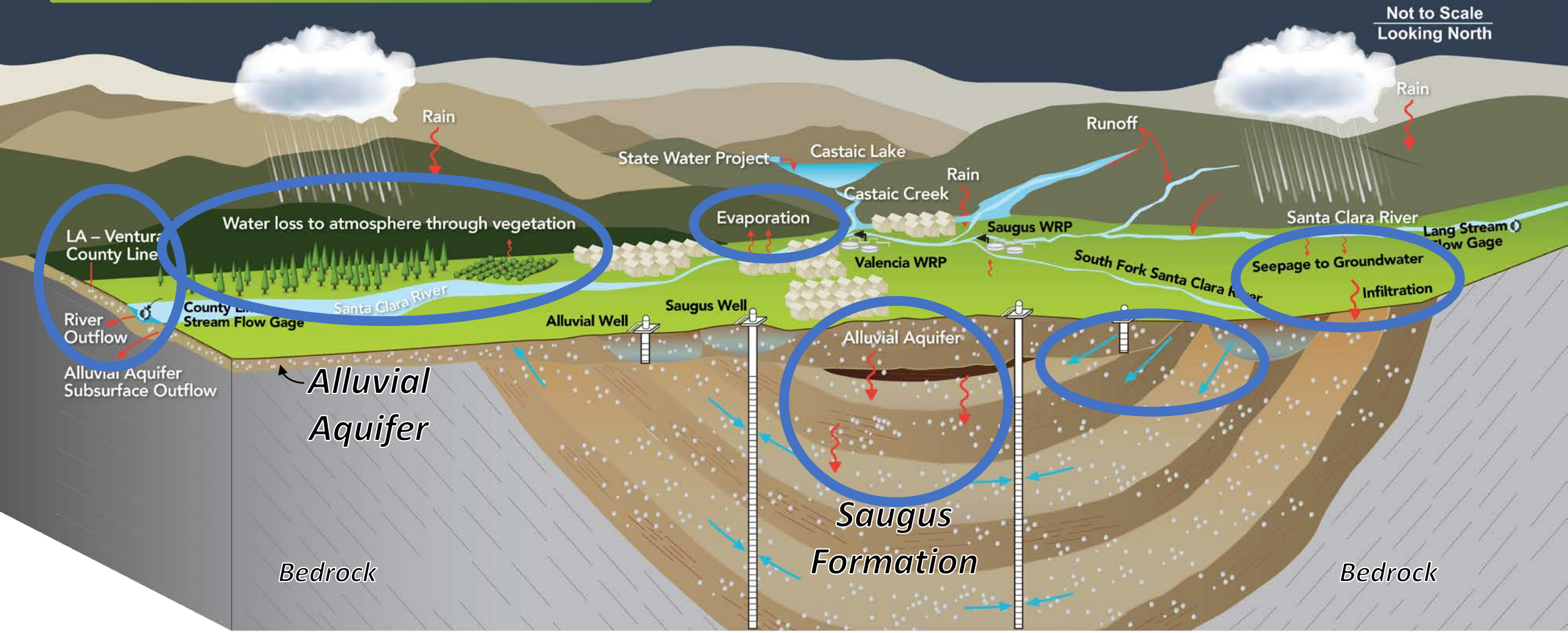
Surface Water Inflows



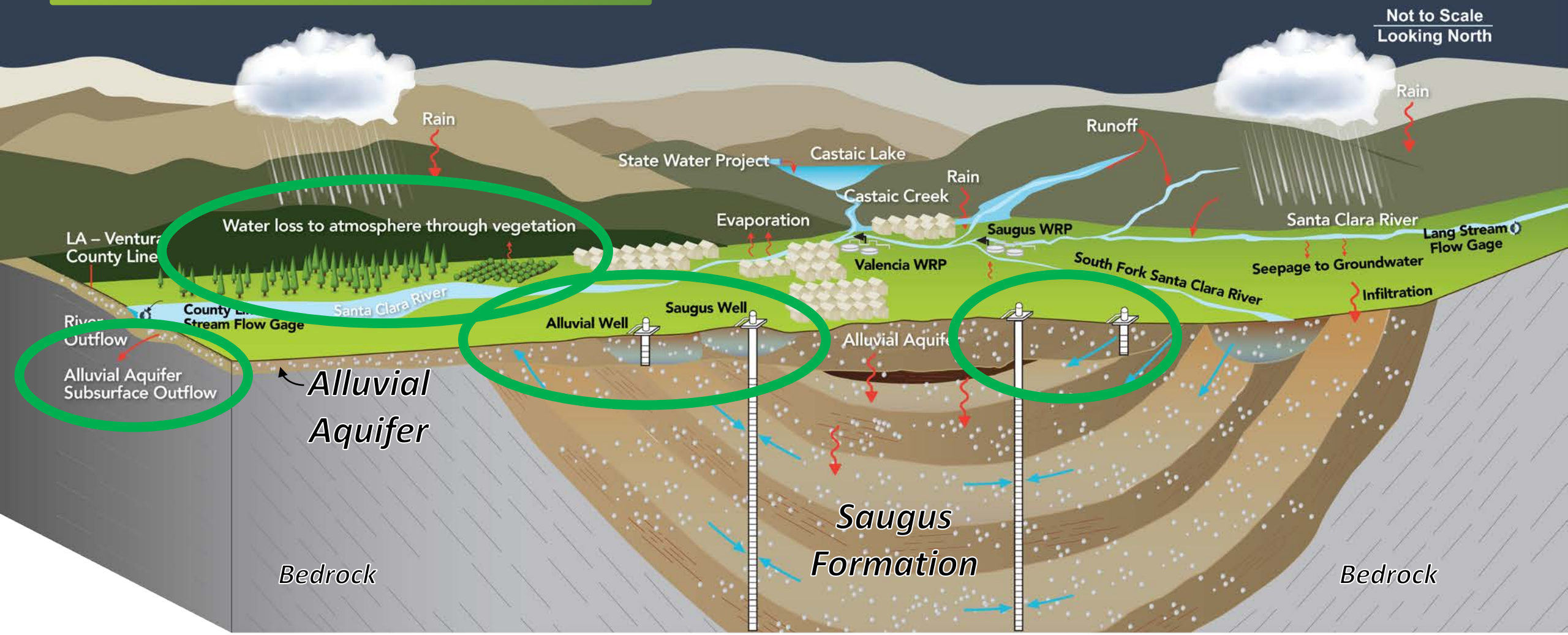
Groundwater Inflows



Surface Water Outflows



Groundwater Outflows

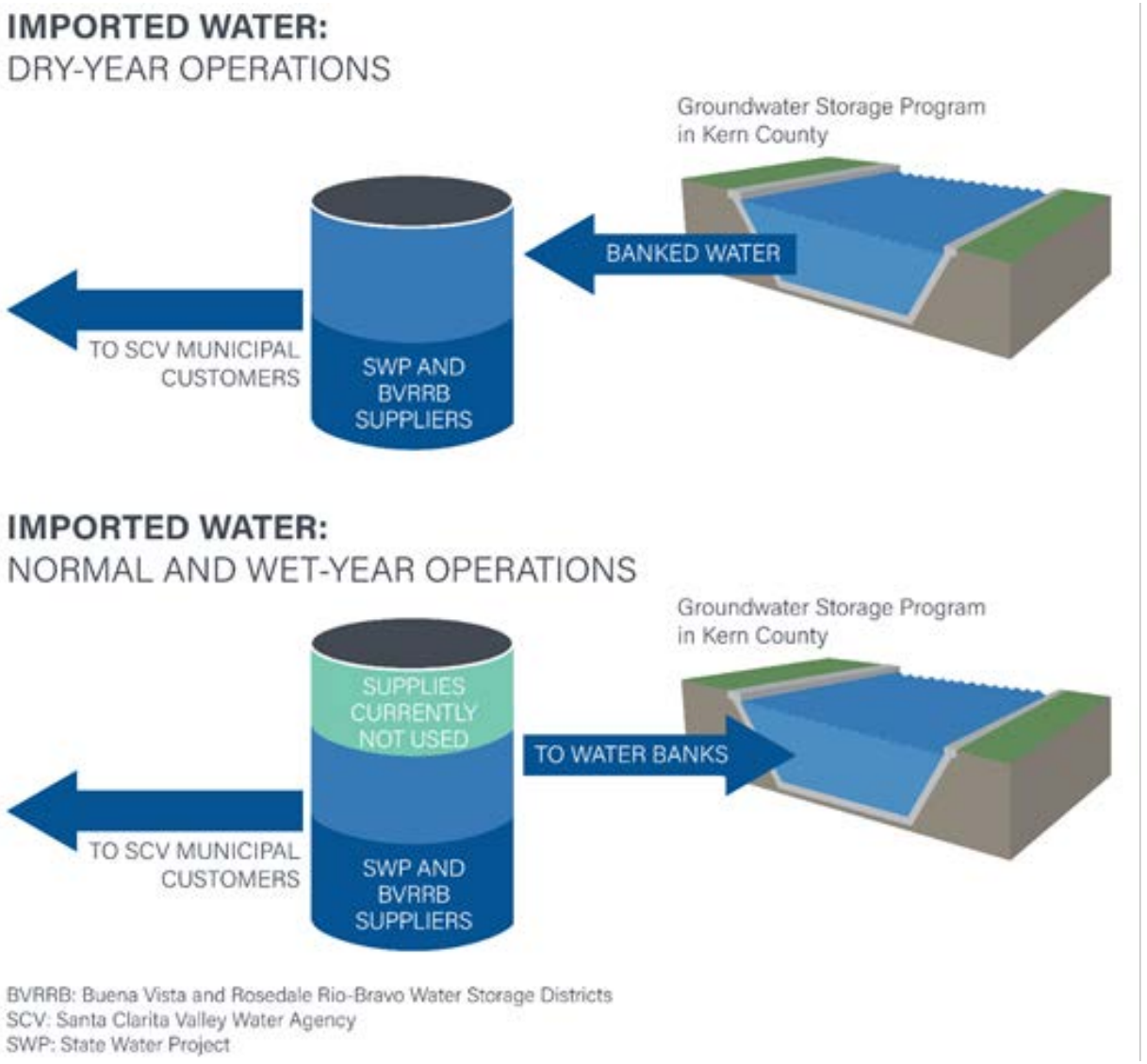


Primary Information and Data Sources for Water Budget

- Weather stations / rainfall gages
- Streamflow data (natural flows and controlled releases)
  - USGS and LADWP stream gages
  - DWR data for Castaic Lake inflows and releases
  - LADWP data and agreement for Bouquet Reservoir releases
  - WRP flows into Santa Clara River (LACSD)
- CIMIS stations (irrigation demands, evapotranspiration), GDE mapping
- Pumping data (municipal, agricultural, private, Whittaker remediation)
- Basin study and data reports
  - Geology, hydrology, aquifer system, water supplies and uses, water management plans

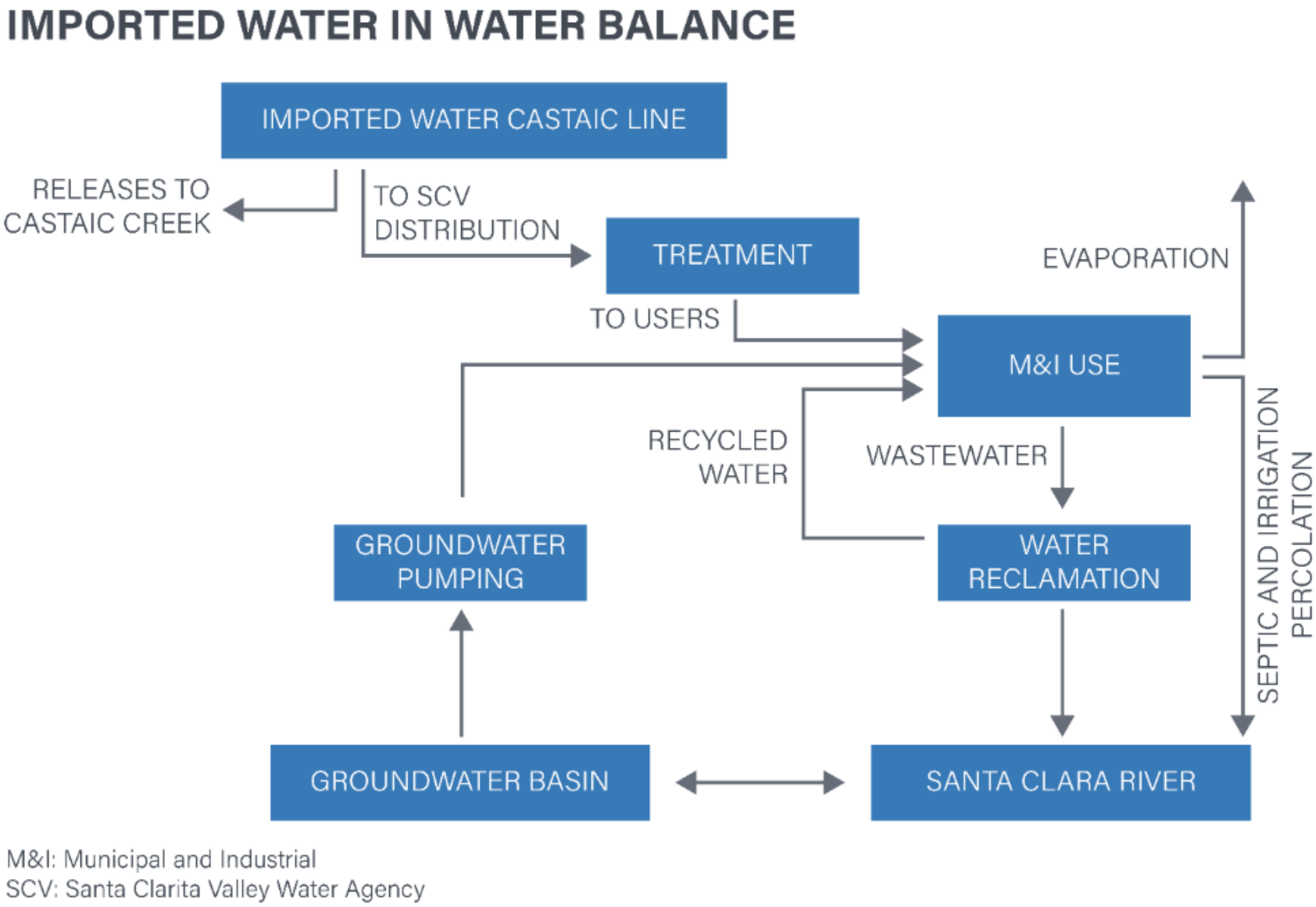
Imported Water

- State Water Project
  - Contract for 95,200 acre-feet per year (AFY)
  - Averages 60% (highly variable)
- Buena Vista and Rosedale Rio-Bravo Water Storage Districts
  - 11,000 AFY groundwater
- Long-term storage banks
  - 140,000 acre-feet in Kern County



The Role of Imported Water

Essential to meeting the needs of the region and its water balance



SCV Water's Groundwater Basin Operating Plan

- Balances reliance on imported water and groundwater to prevent overdraft condition.
  - **Drought years:** Draw groundwater storage reserves to augment limited State Water Project supplies.
  - **Normal years:** Resume normal groundwater pumping, allow natural replenishment of reserves.

Groundwater Production Chart

The AB 3030 plan established a Basin Operating Plan that specified the following annual groundwater production schedule:

	Groundwater Production (AFY)			
	Normal Years	Dry Year 1	Dry Year 2	Dry Year 3
Alluvial Aquifer	30,000 to 40,000	30,000 to 35,000	30,000 to 35,000	30,000 to 35,000
Saugus Formation	7,500 to 15,000	15,000 to 25,000	21,000 to 25,000	21,000 to 35,000
Total	**37,500 to 55,000**	**45,000 to 60,000**	**51,000 to 60,000**	**51,000 to 70,000**

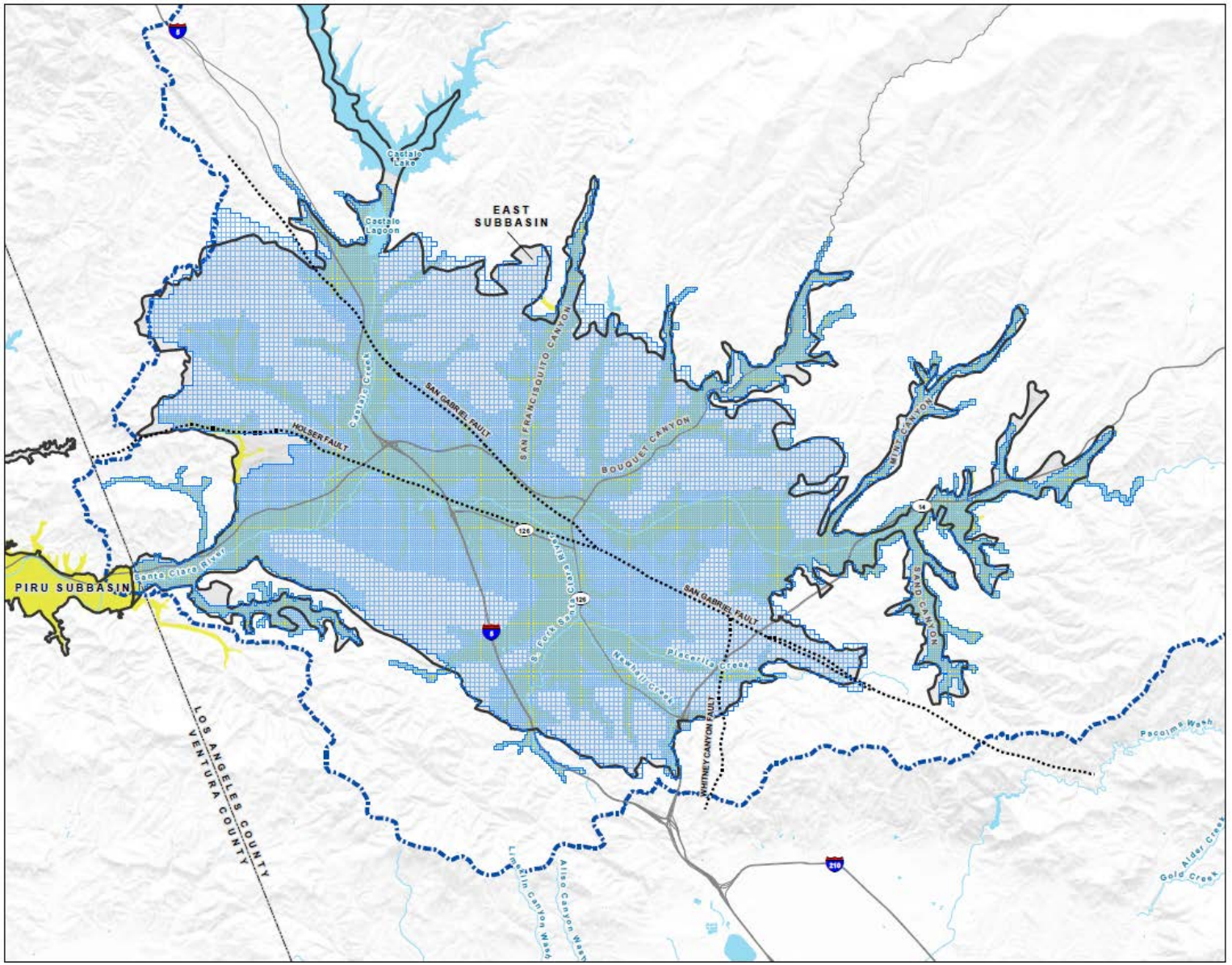
AFY: acre-feet per year

Approach for Water Budget Analysis

- Water budgets are developed for multiple time frames
  - Historical conditions
    - Droughts, wet cycles
    - Evolving land and water uses
  - Current conditions
    - Current land use development, water demands, and supply use (imported water, groundwater)
    - Applied to the historical record of droughts and wet cycles
  - Future conditions
    - Full build-out of land uses and water demands
    - Increased groundwater pumping (per the basin operating plan)
    - Applied to historical wet/dry cycles with adjustments for future climate-change scenarios
- Use a 3-D numerical computer model
  - Simulates all groundwater processes including interactions with surface water

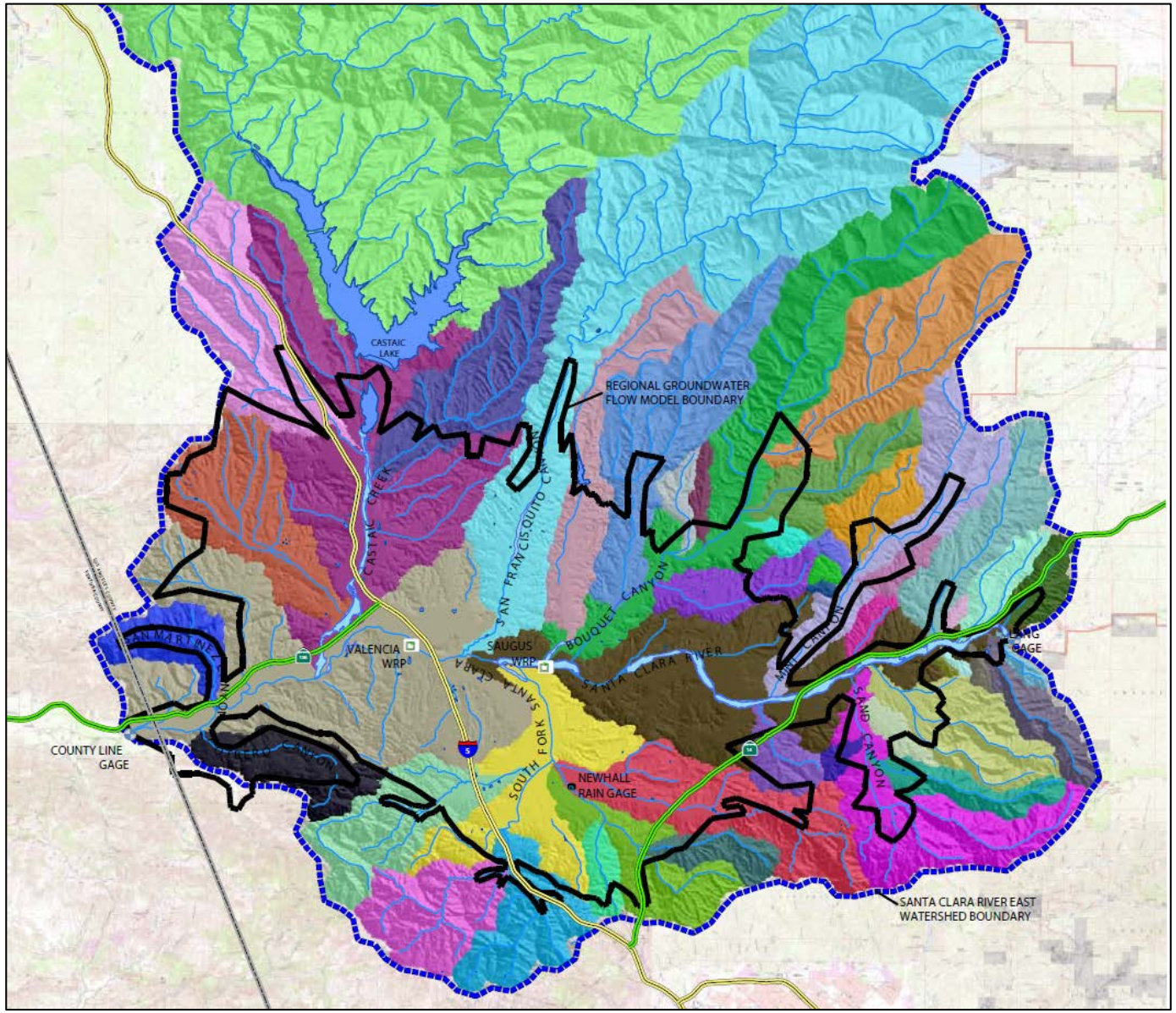
Groundwater Model Design

Model Grid



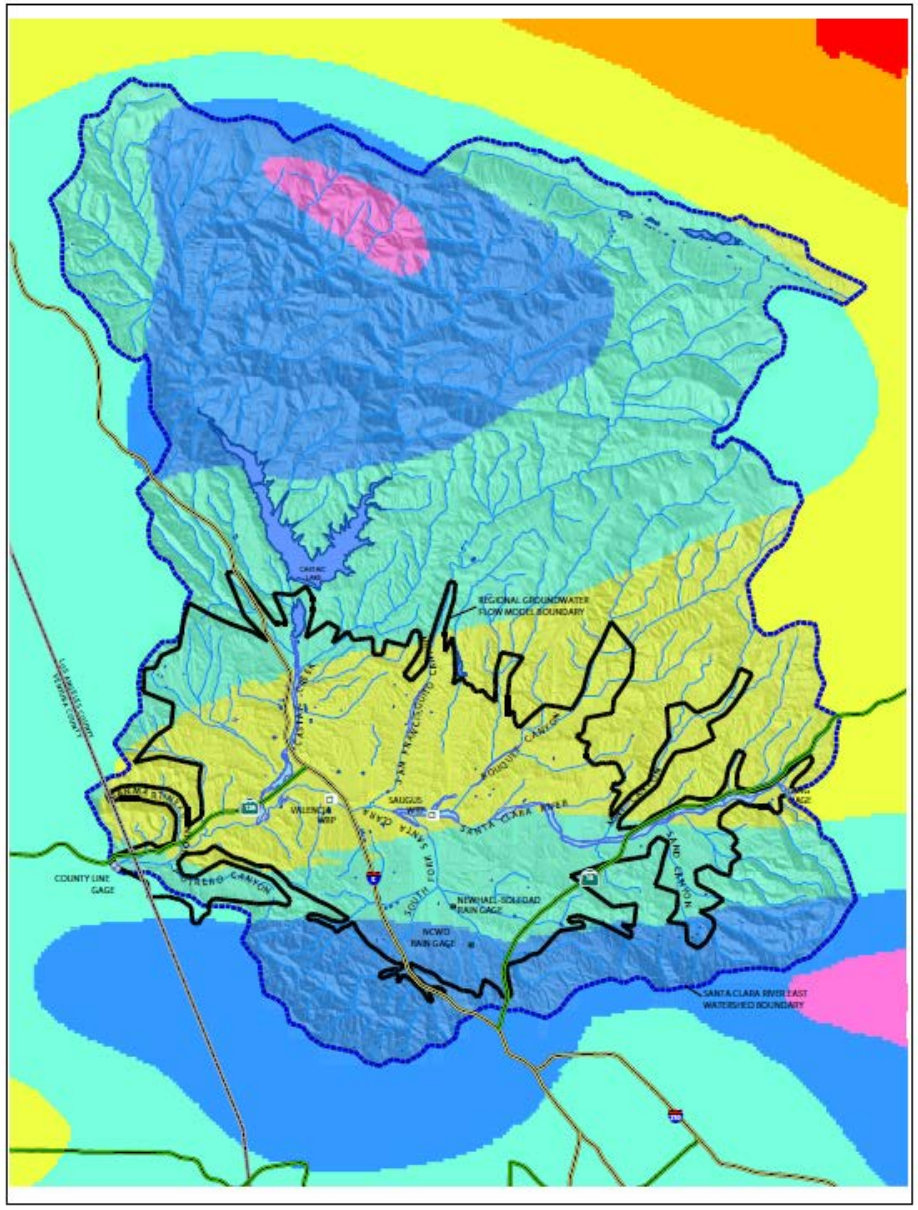
Groundwater Model Design

Surrounding Watersheds



Groundwater Model Design

Geographic Variation in Precipitation

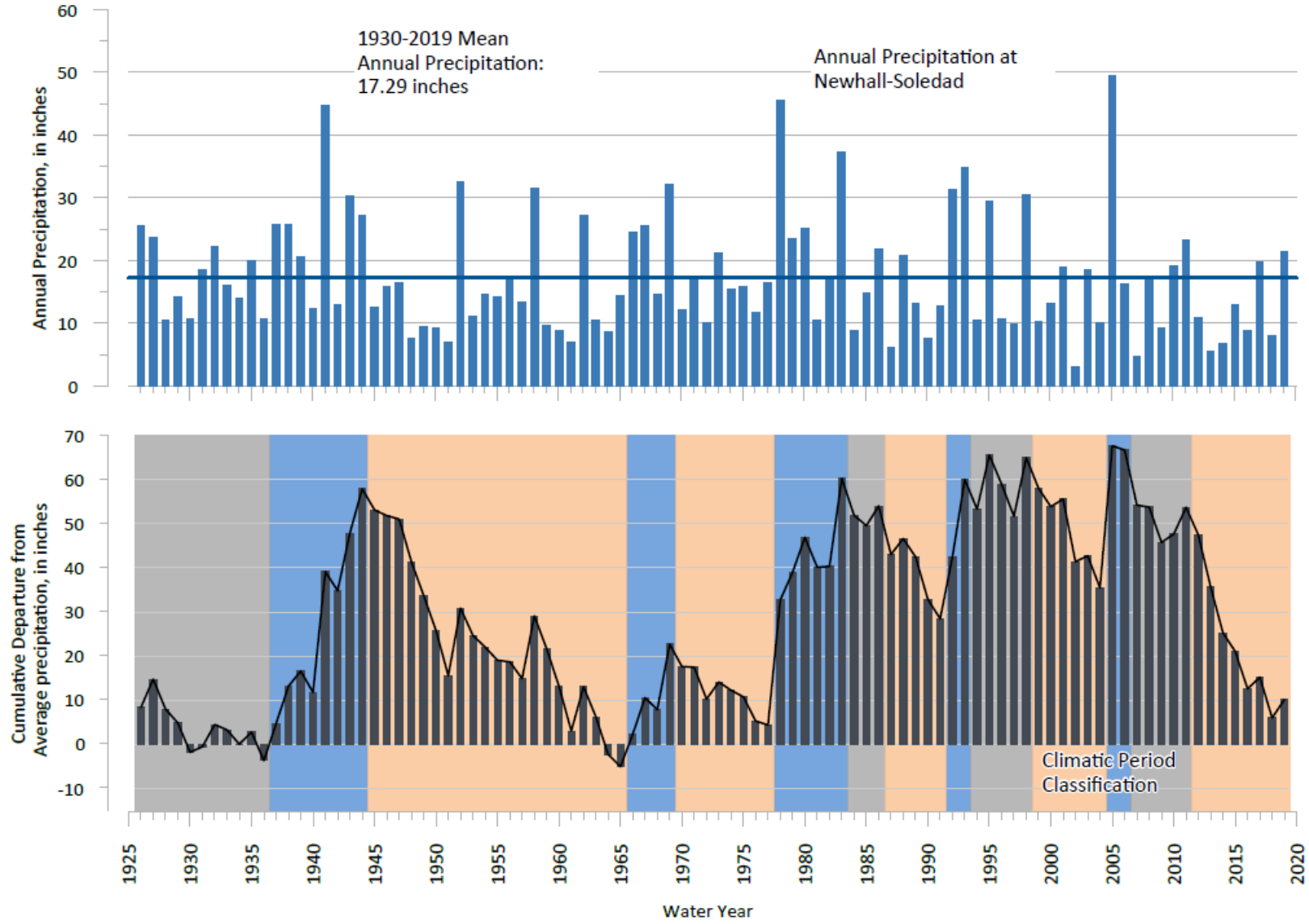


Annual Precipitation (inches)

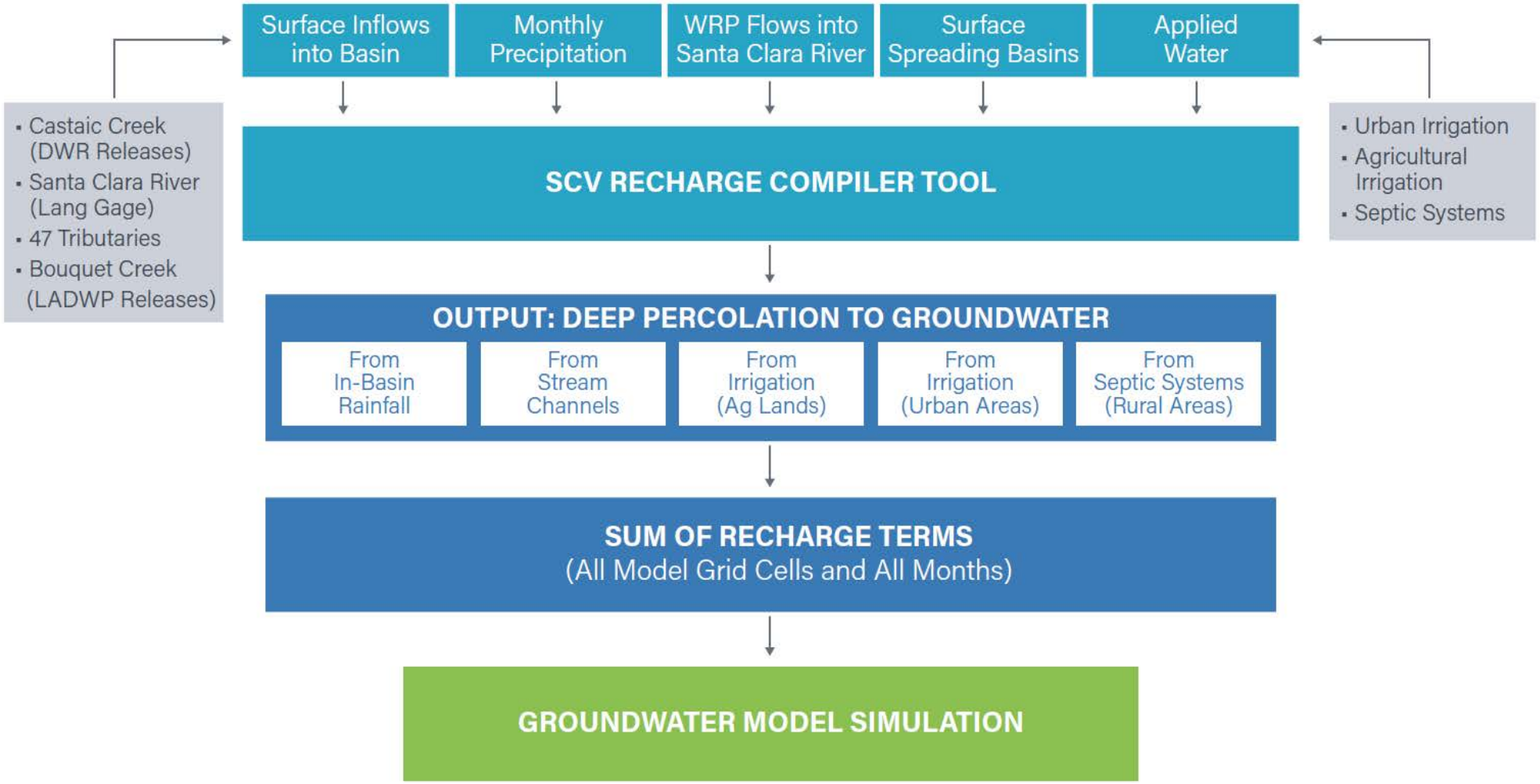
- <5
- 5 to 10
- 10 to 15
- 15 to 20
- 20 to 25
- 25 to 30

Groundwater Model Design

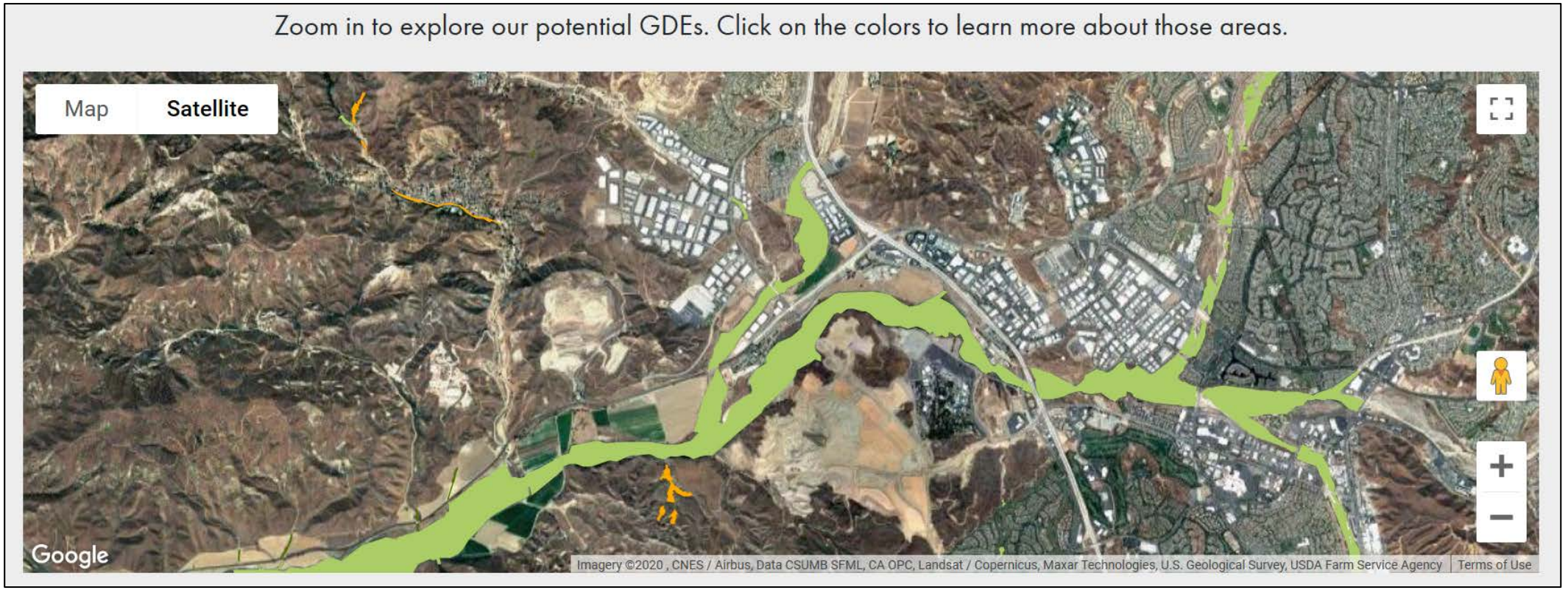
Annual Variations in Precipitation



Groundwater Model Design (Land Surface Processes)



Groundwater Model Design (GDEs)



https://scvgsa.org/local-ecosystems-and-the-groundwater-surface-water-connection-workshop/

Basin History

- Agricultural (1920's-1959)
- Transition from Ag to Urban (1960 -1980)
  - Reduced groundwater pumping
  - Contract for imported supplies (in anticipation of urban demands)
- Modern Record (1980 to Present)
  - Recovery of groundwater pumping levels
  - Importation of State Water Project water
  - Development of the Groundwater Operating Plan

Historical Water Supplies and Demands

1925 to 2019

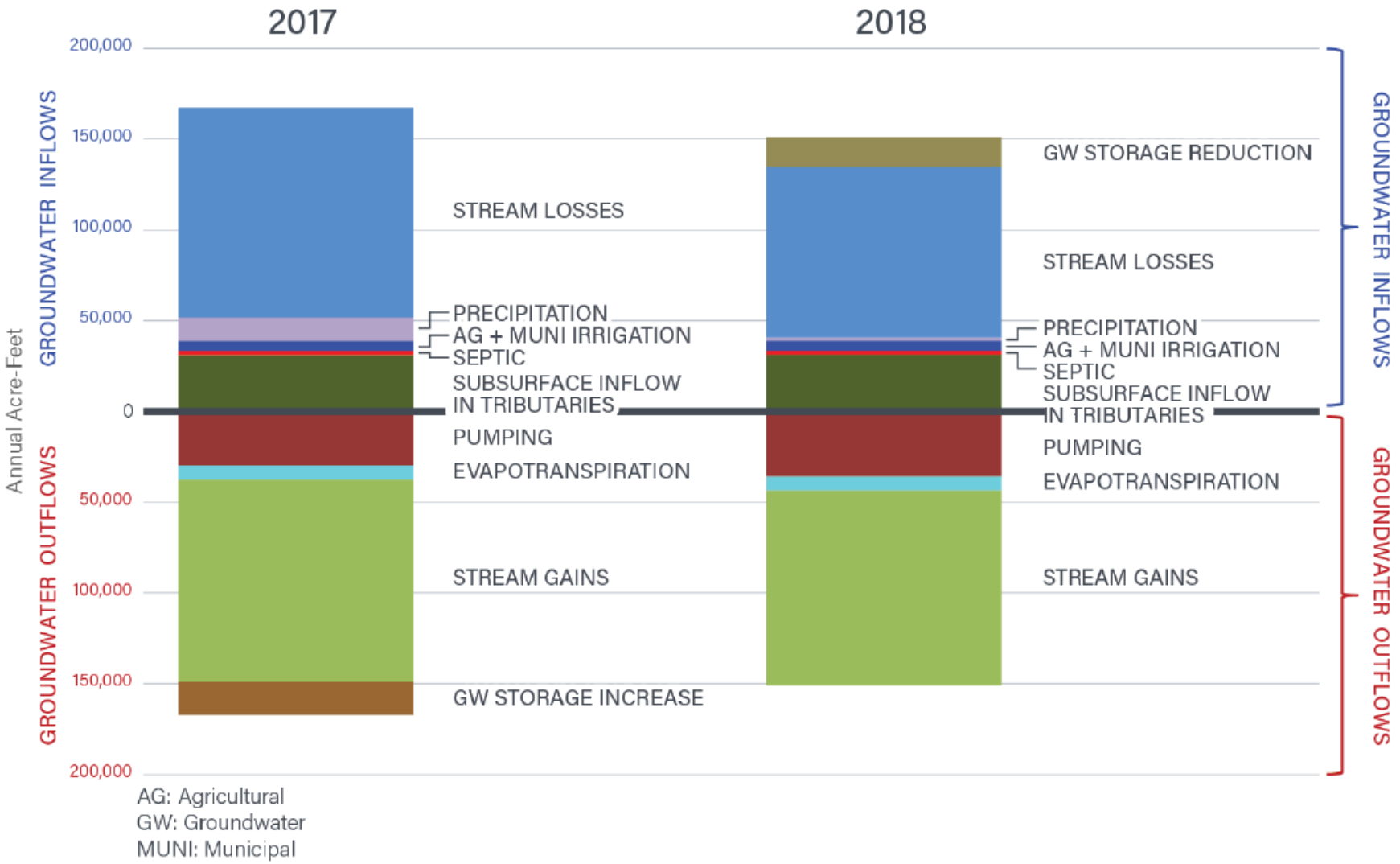
- Growth of water use over time
- Introduction of imported water

Acre-Feet per Year

		Municipal Users				Other Users	Total	
Years	Statistic	Local Groundwater	Imported Water	Recycled Water	Total	Local Groundwater	Local Groundwater	Demand
1936-1949	Min	0	0	0	0	5,000	5,000	5,000
	Average	0	0	0	0	33,500	33,500	33,500
	Max	0	0	0	0	50,000	50,000	50,000
1950-1959	Min	500	0	0	500	50,000	50,500	50,500
	Average	500	0	0	500	50,000	50,500	50,500
	Max	500	0	0	500	50,000	50,500	50,500
1960-1979	Min	500	0	0	500	14,000	29,000	29,000
	Average	11,500	0	0	11,500	23,500	35,000	35,000
	Max	20,000	7	0	20,000	50,000	50,500	50,500
1980-2019	Min	12,201	1,126	0	21,386	9,975	24,138	33,323
	Average	25,820	26,486	167	52,473	13,990	39,810	66,463
	Max	34,612	47,205	507	77,311	17,312	50,373	92,079

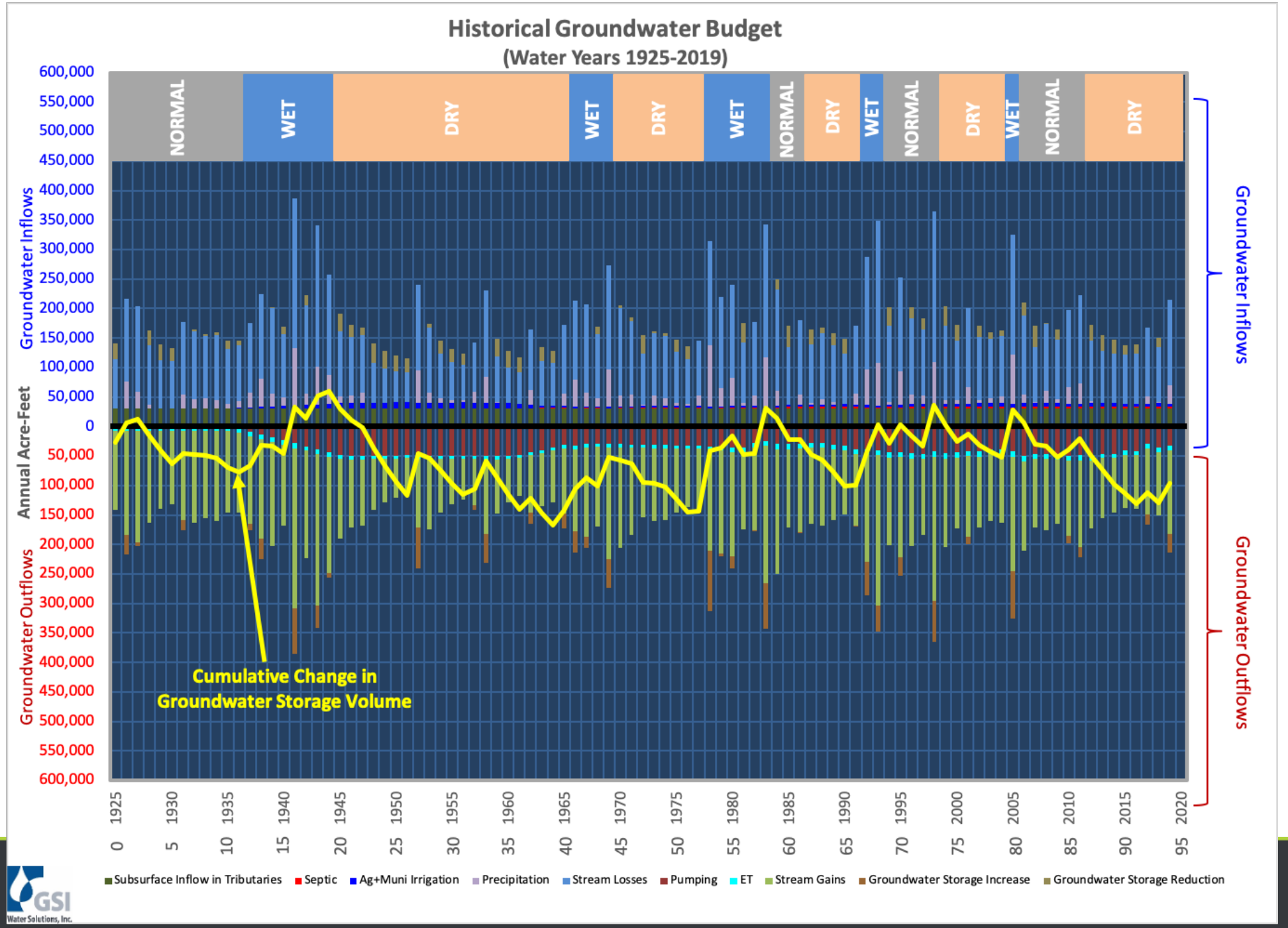
This water budget analysis models the historical pattern of natural hydrologic conditions, groundwater pumping, and development patterns.

Example Graphic for Groundwater Budget



Historical Water Budget

Rainfall and wet/normal/dry cycles are representative of past conditions. Future conditions and sequences may differ.



Current Water Supplies and Demands

Municipal Users				Other Users	Total	
Local Groundwater	Imported Water	Recycled Water	Total	Local Groundwater	Local Groundwater	Demand
34,612	33,092	474	68,178	14,623	49,235	82,801

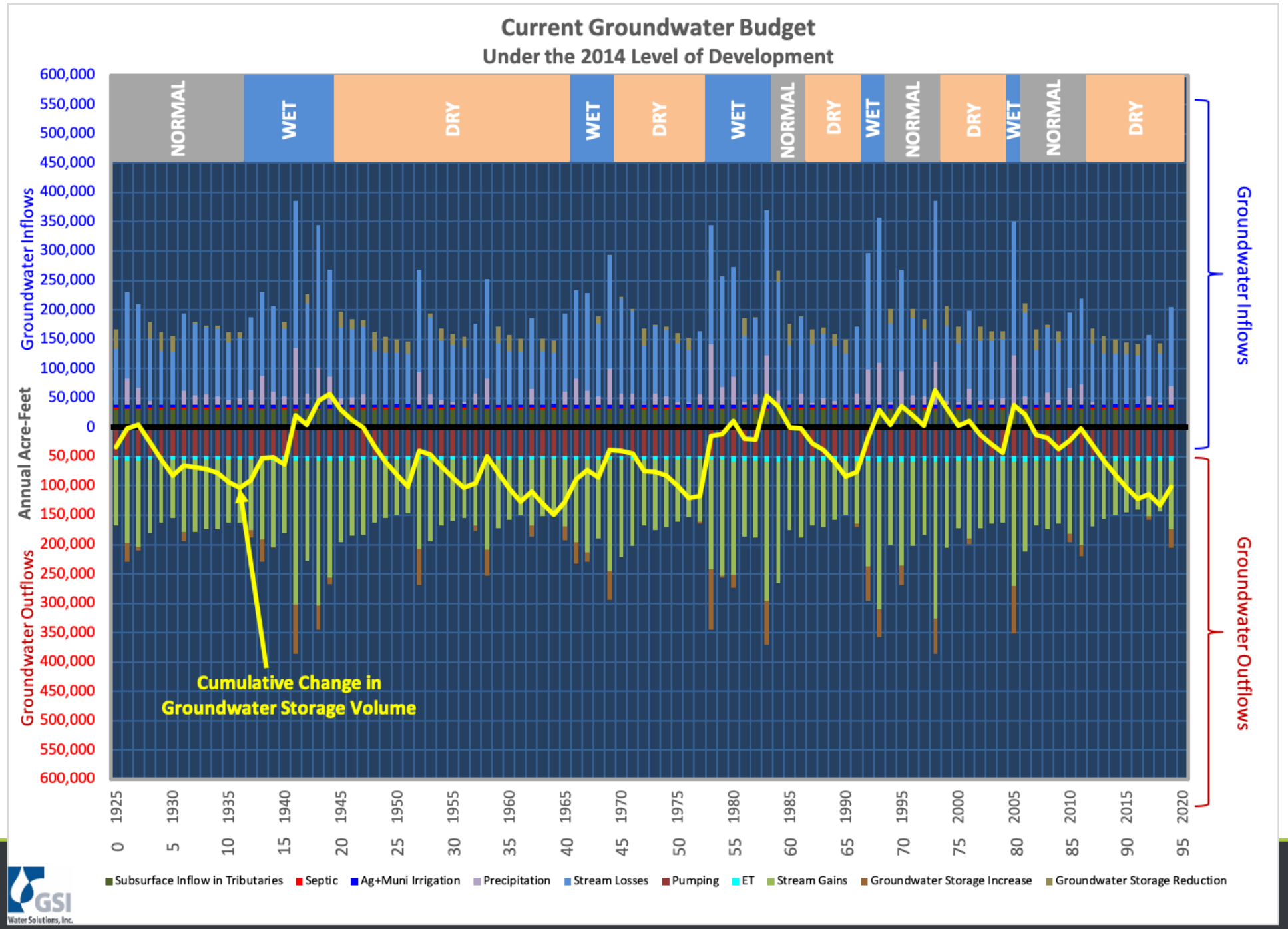
Notes

All values are in units of acre-feet.

Groundwater pumping consists of actual 2014 municipal water use, 2010-2019 average pumping for other pumpers, and 500 AFY for the containment pumping system at the Whittaker-Bermite property.

This water budget analysis models the historical pattern of natural hydrologic conditions, current levels of groundwater pumping, and current development patterns.

Current Water Budget



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Conclusions for Current Water Budget

- ✓No long-term decline in groundwater levels
- ✓No continuing decrease in storage
- ✓No chronic overdraft

Future Water Budget

Uses full buildout land uses and water demands plus three climate scenarios:

- No climate change
- 2030 climate change
- 2070 climate change

	Municipal Users				Other Users	Total	
Year Type	Local Groundwater	Imported Water	Recycled Water	Total	Local Groundwater	Local Groundwater	Demand
Normal	40,708	43,892	9,300	93,900	7,585	48,293	101,485
Dry Year 1	44,915	49,085	9,300	103,300	7,585	52,500	110,885
Dry Year 2	49,915	44,085	9,300	103,300	7,585	57,500	110,885
Dry Year 3+	59,915	34,085	9,300	103,300	7,585	67,500	110,885
Average (1925-2019)	**44,530**	**42,940**	**9,300**	**96,770**	**7,585**	**52,115**	**104,355**

Notes

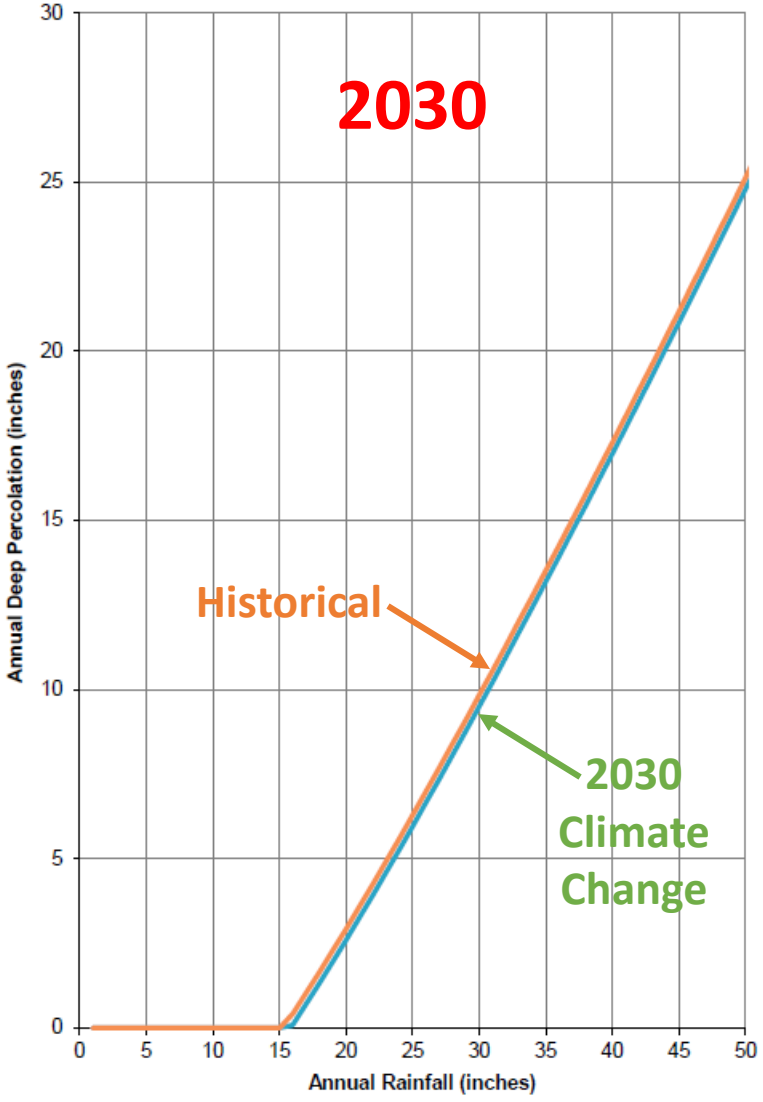
All values are in units of acre-feet per year (AFY).

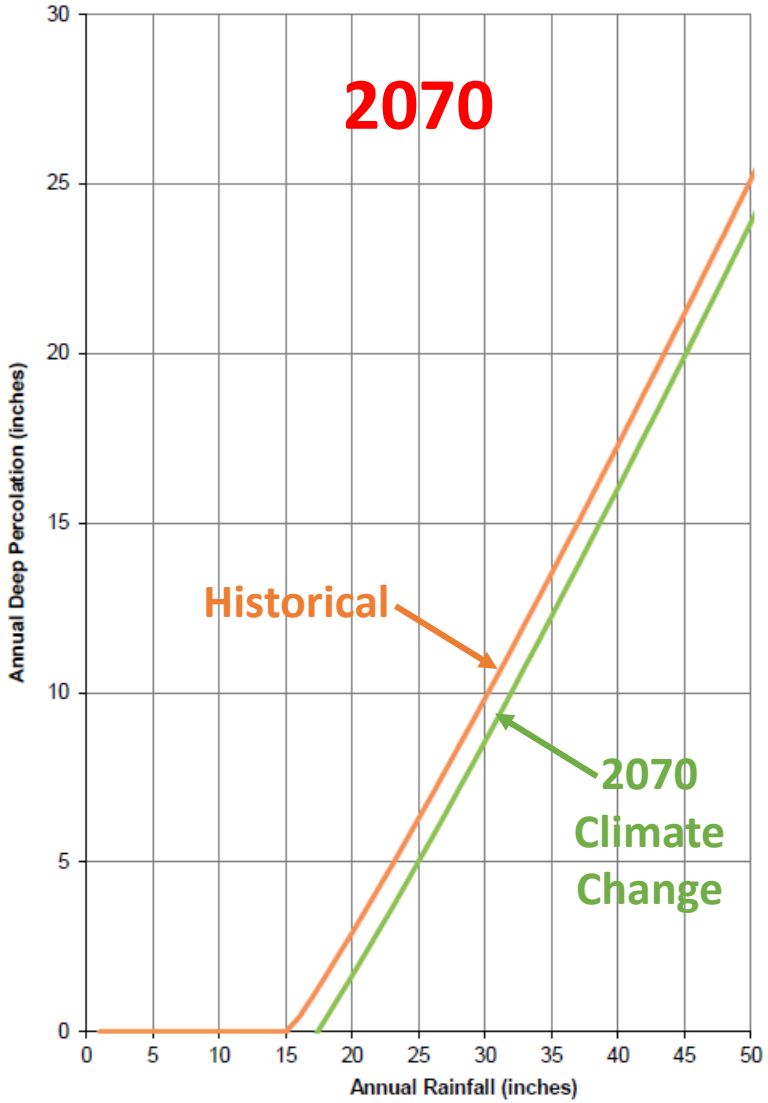
Other users include 500 AFY for the containment pumping system at Whittaker-Bermite.
Total demand by municipal users in normal years (93,900 AFY) and in dry years (103,300 AFY) is for Year 2050, as shown in Tables 6-2, 6-3, 6-4A, and 6-4B of the 2015 UWMP (KJC et al., 2016), and is the demand with the plumbing code and active conservation.

Climate-Change Effect on Groundwater Recharge

Climate change affects recharge to groundwater

- Slightly less rain
- Hotter, more evaporation, less recharge water
- Effect is more pronounced long-term than near-term



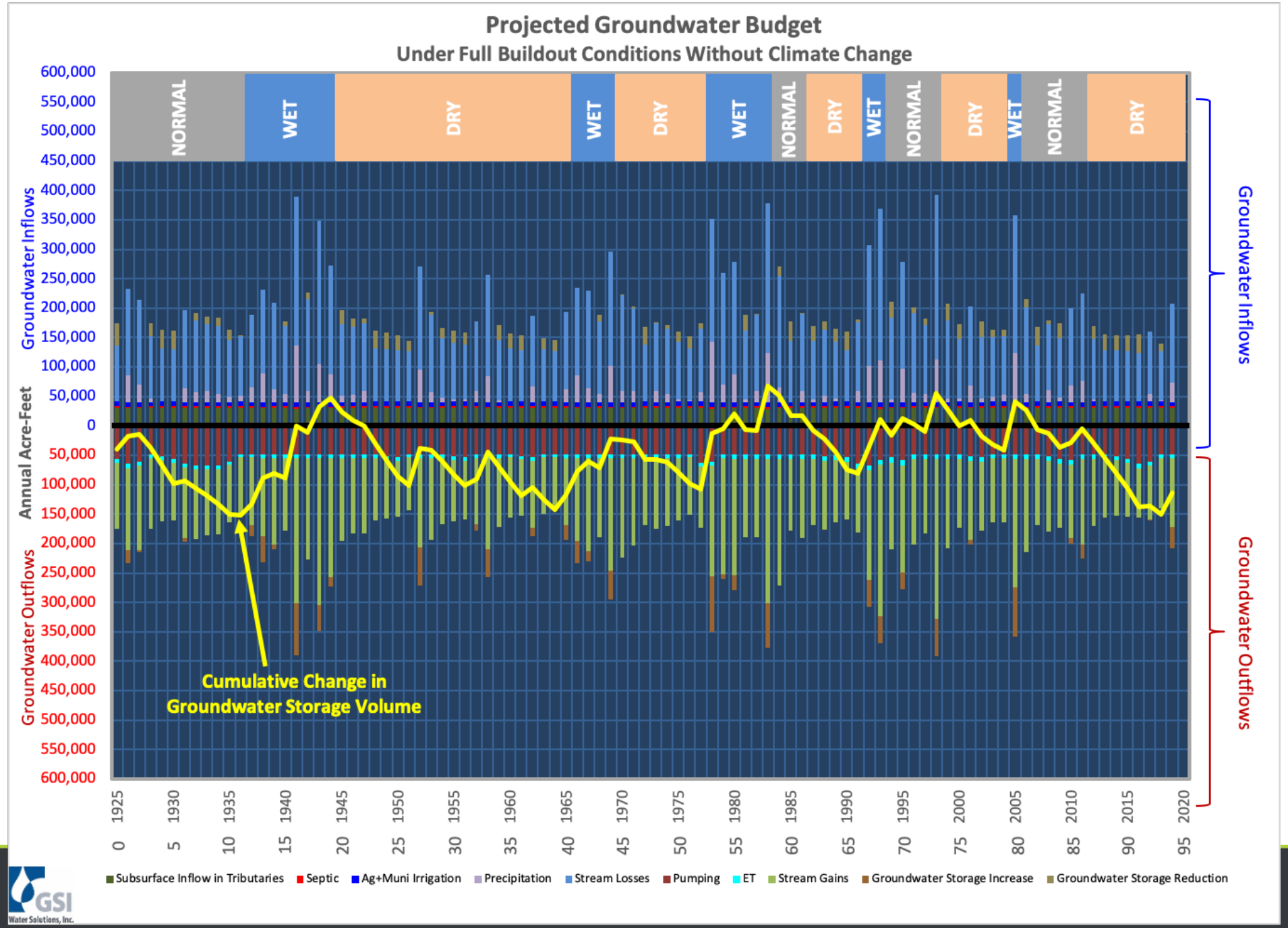


Future Water Budget

Full buildout of land uses and water demands plus:

- No climate change

Rainfall and wet/normal/dry cycles are representative of past conditions. Future conditions and sequences may differ.



Future Water Budget

Full buildout of land uses and water demands plus:

- No climate change
- 2030 climate change

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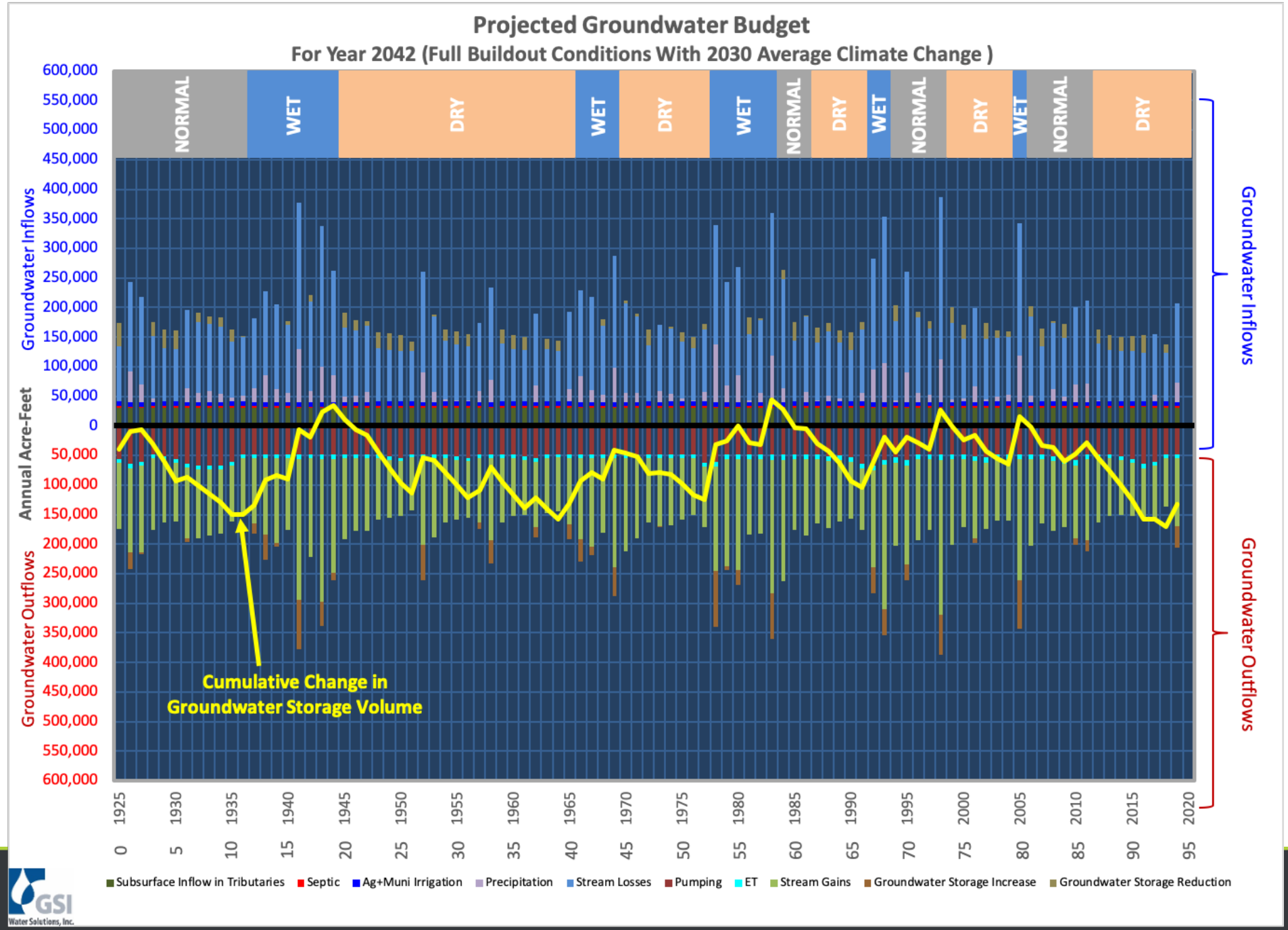

Future Water Budget

Full buildout of land uses and water demands plus:

- No climate change
- 2030 climate change
- 2070 climate change

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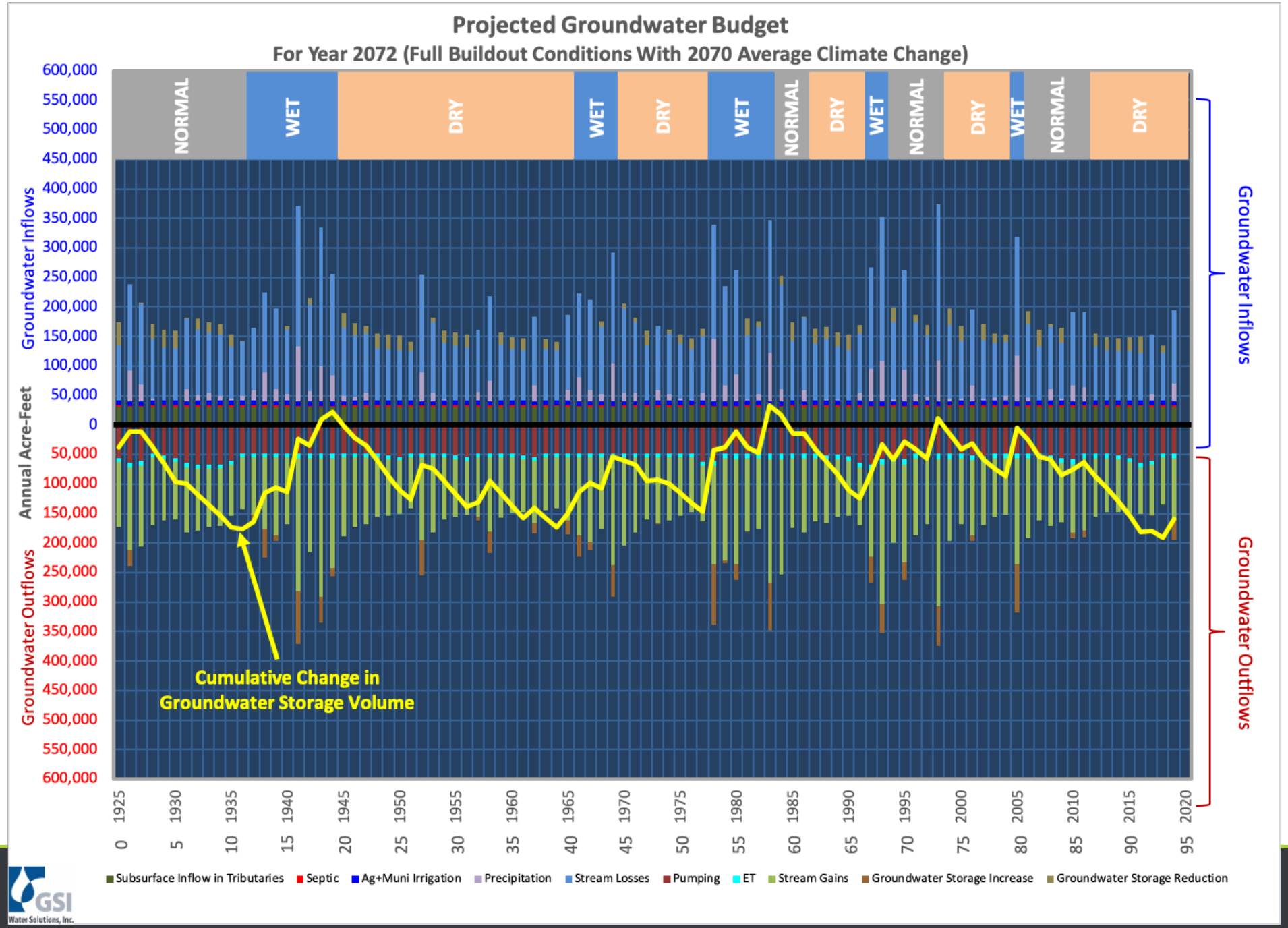
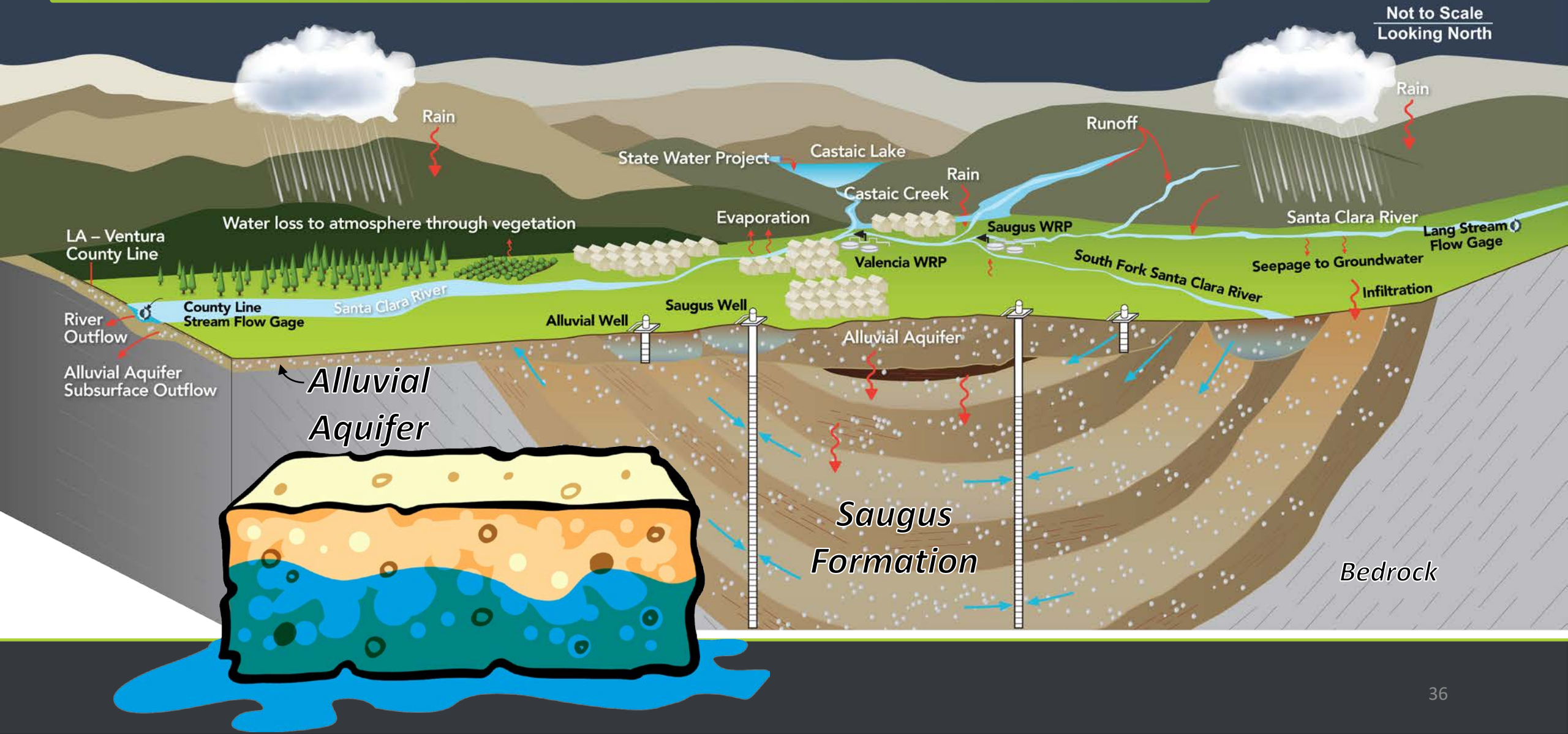


Groundwater as a Buffer for Climate Change



Conclusions

- ✓No long-term decline in groundwater levels
- ✓No continuing decrease in storage
- ✓No chronic overdraft predicted

- ✓*SCV Water's groundwater operating plan is unlikely to exceed the basin's safe yield in the future under the modeled climatic conditions*

Safe Yield vs. Sustainable Yield

- **Safe Yield:** the average amount of pumping that can occur on a long-term basis without creating a chronic overdraft, based on the long-term average replenishment rate of the aquifer.
- **Sustainable Yield:** beyond chronic overdraft, takes into account other undesirable results (degradation of water quality, subsidence, surface water depletion, seawater intrusion) and impacts to groundwater dependent ecosystems (GDEs). Required under SGMA.

Safe Yield

Year Type	Modeled Groundwater Pumping for the Projected Water Budgets	Pumping Ranges Specified in the Groundwater Operating Plan
Normal	48,300	37,500 to 55,000
Dry Year 1	52,500	45,000 to 60,000
Dry Year 2	57,500	51,000 to 60,000
Dry Year 3+	67,500	51,000 to 70,000
Modeled Average for Projected Water Budgets	**52,115**	

Note

All values are in units of acre-feet per year (AFY).

- *Safe yield (the long-term average pumping that avoids chronic water level declines and overdraft conditions) is at least 52,115 AFY.*
- *Pumping rates of at least 67,500 AFY can occur during multiple dry years without causing chronic water level declines and overdraft conditions.*

Next Steps

- **Investigate possibility of undesirable results for sustainability indicators**
- **If likely, develop projects and actions to mitigate**