Agenda	Upper San Luis Rey Groundwater Subbasin G.S.A Executive Team - Stakeholder Outreach Wednesday, June 16, 2021 4:00 P.M. 34928 Valley Center Road, Pauma Valley, California

This meeting will be held via Zoom.

AGENDA TOPICS

1. **Call to Order**

   Introductions

2. **Stakeholder Outreach Presentation**

   A. Basin Setting Chapter Review

   The full Basin Setting Chapter Draft can be found at the following link.
   https://geoscience.syncedtool.com/shares/file/BQFYJdpjxMQ/

   B. Question & Answer

3. **Adjournment**

Groundwater Sustainability Plan
Upper San Luis Rey Groundwater Subbasin

GEOSCIENCE

The First Name in Groundwater

Stakeholder Workshop
Basin Setting

June 16, 2021

Basin Setting Chapter

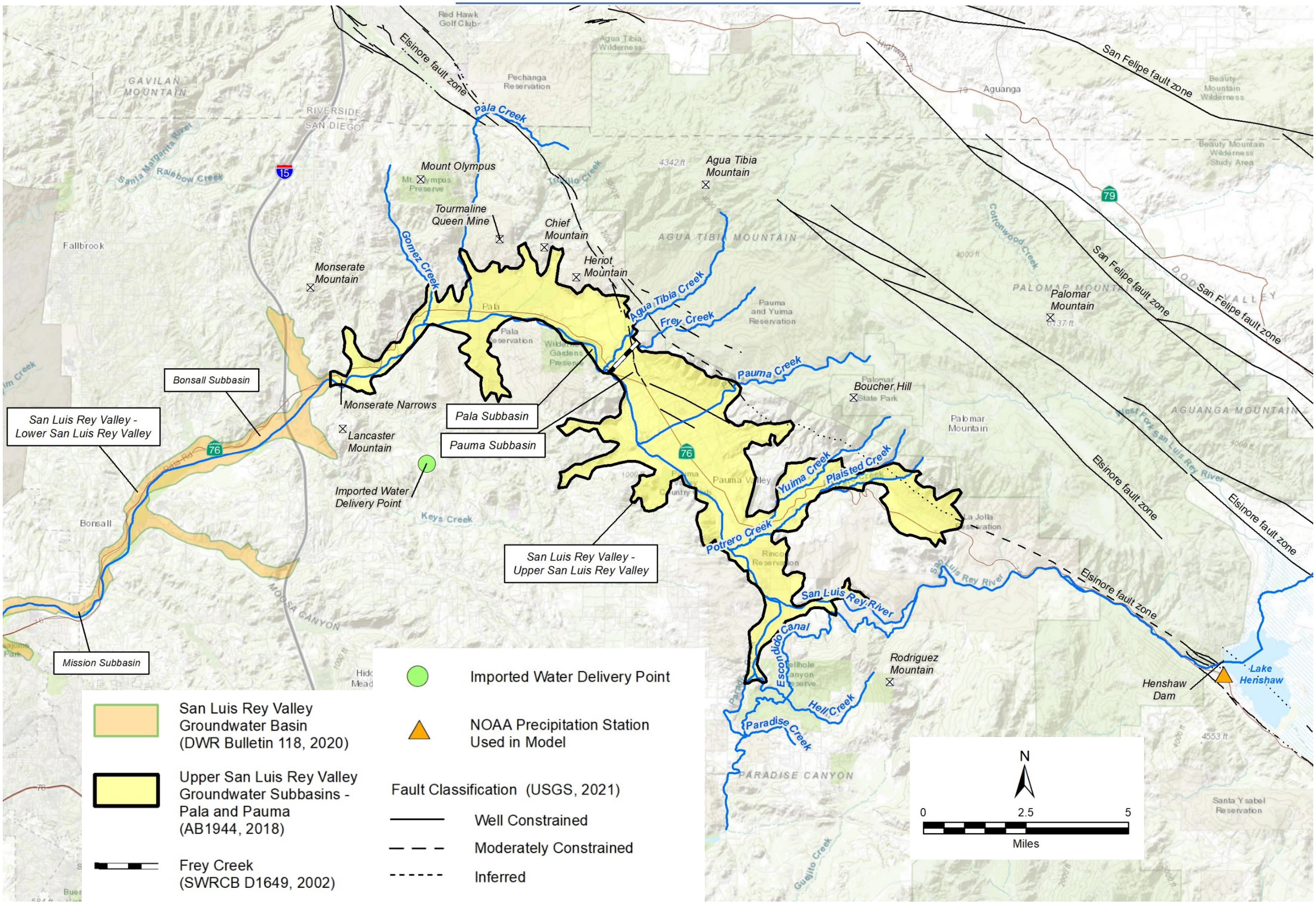
Goal

- Describe the Pauma and Pala Subbasin setting, including current/historical groundwater conditions and water budgets (sustainable yield).

Contents

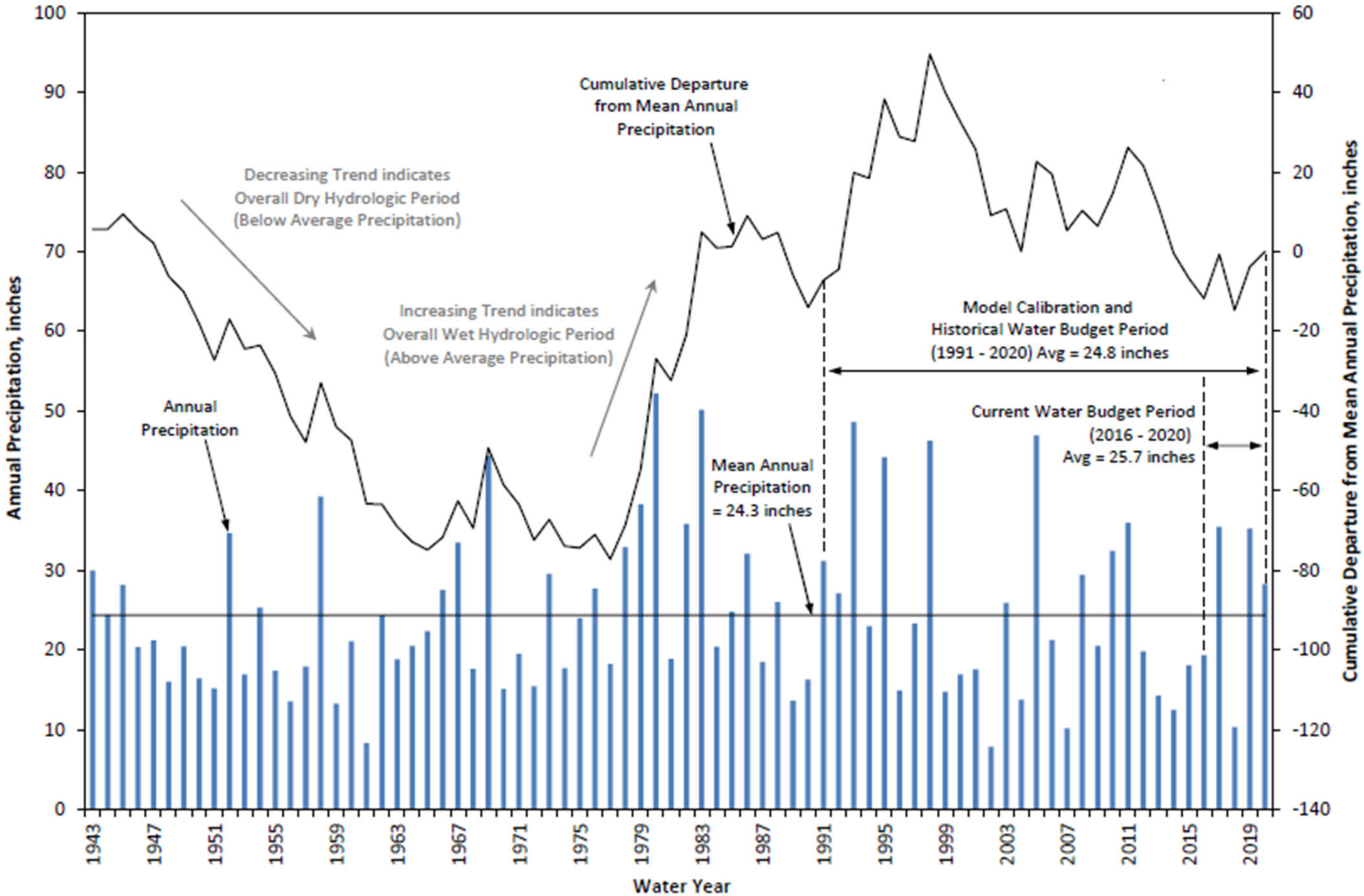
- General Setting
- Hydrogeologic Conceptual Model
  - Geology
  - Basin Boundaries
  - Aquifer Systems
  - Recharge/Discharge
- Groundwater Conditions
  - Groundwater Elevations
  - Groundwater Storage
  - Water Quality
  - Interconnected Groundwater/ Surface Water Systems
- Water Budgets

Geography

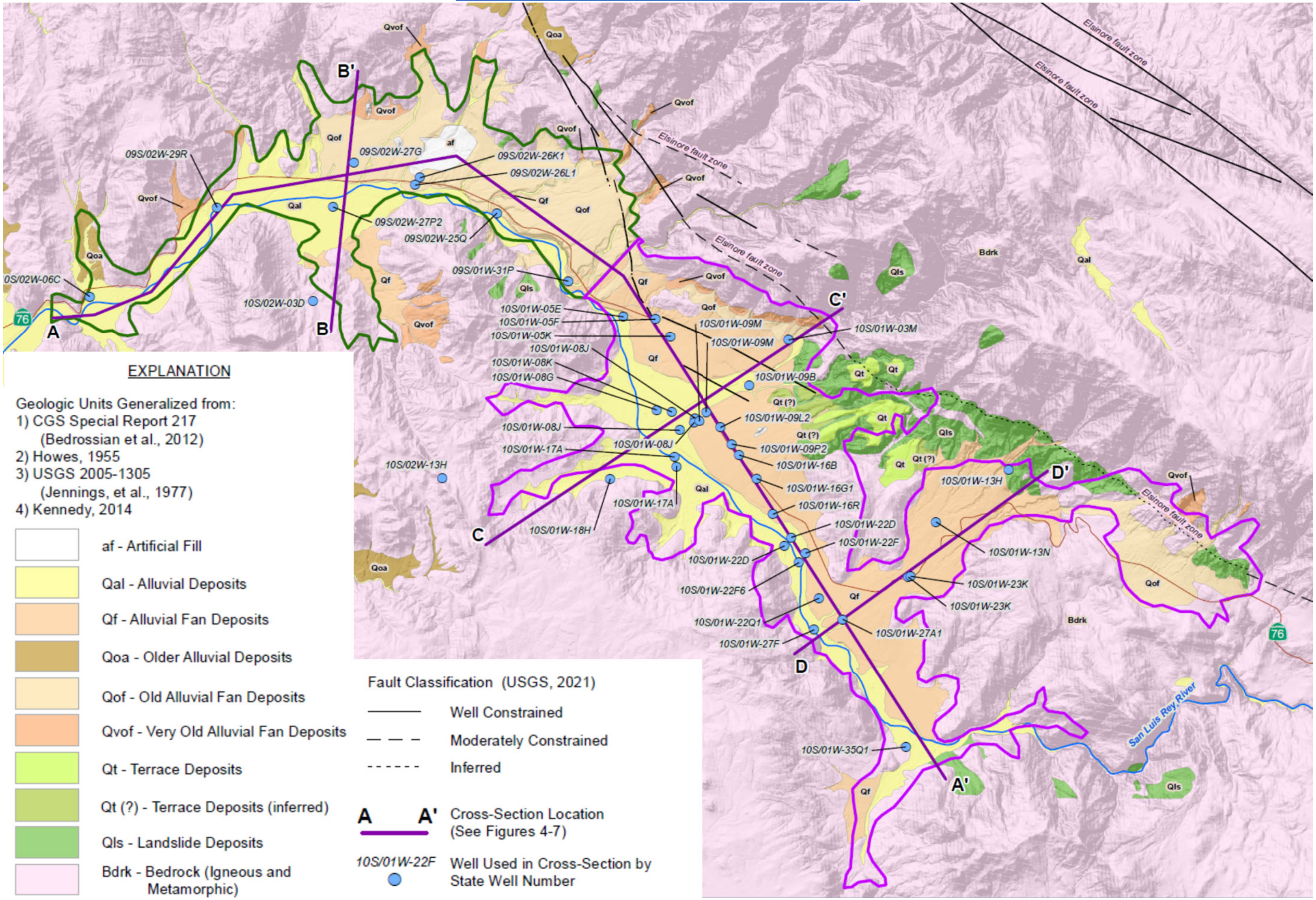


Bonsall Subbasin
San Luis Rey Valley - Lower San Luis Rey Valley
Mission Subbasin
Pala Subbasin
Pauma Subbasin
San Luis Rey Valley - Upper San Luis Rey Valley
Monserate Narrows
Monserate Mountain
Lancaster Mountain
Imported Water Delivery Point
Mount Olympus
Tourmaline Queen Mine
Chief Mountain
Heriot Mountain
Agua Tibia Mountain
AGUA TIBIA MOUNTAIN
Palomar Mountain
PALOMAR MOUNTAIN
Boucher Hill
Rodriguez Mountain
Henshaw Dam
Lake Henshaw
Pala Creek
Gomez Creek
Agua Tibia Creek
Frey Creek
Pauma Creek
Yuima Creek
Plaisted Creek
Potrero Creek
San Luis Rey River
Escondido Canal
Hell Creek
Paradise Creek
Keys Creek
Rainbow Creek
Santa Margarita River
Cottonwood Creek
West Fork San Luis Rey River
Elsinore fault zone
San Felipe fault zone
Fallbrook
Bonsall
Aguanga
PARADISE CANYON
AGUANGA MOUNTAIN
San Luis Rey Valley Groundwater Basin (DWR Bulletin 118, 2020)
Upper San Luis Rey Valley Groundwater Subbasins - Pala and Pauma (AB1944, 2018)
Frey Creek (SWRCB D1649, 2002)
Imported Water Delivery Point
NOAA Precipitation Station Used in Model
Fault Classification (USGS, 2021)
Well Constrained
Moderately Constrained
Inferred
N
0
2.5
5
Miles

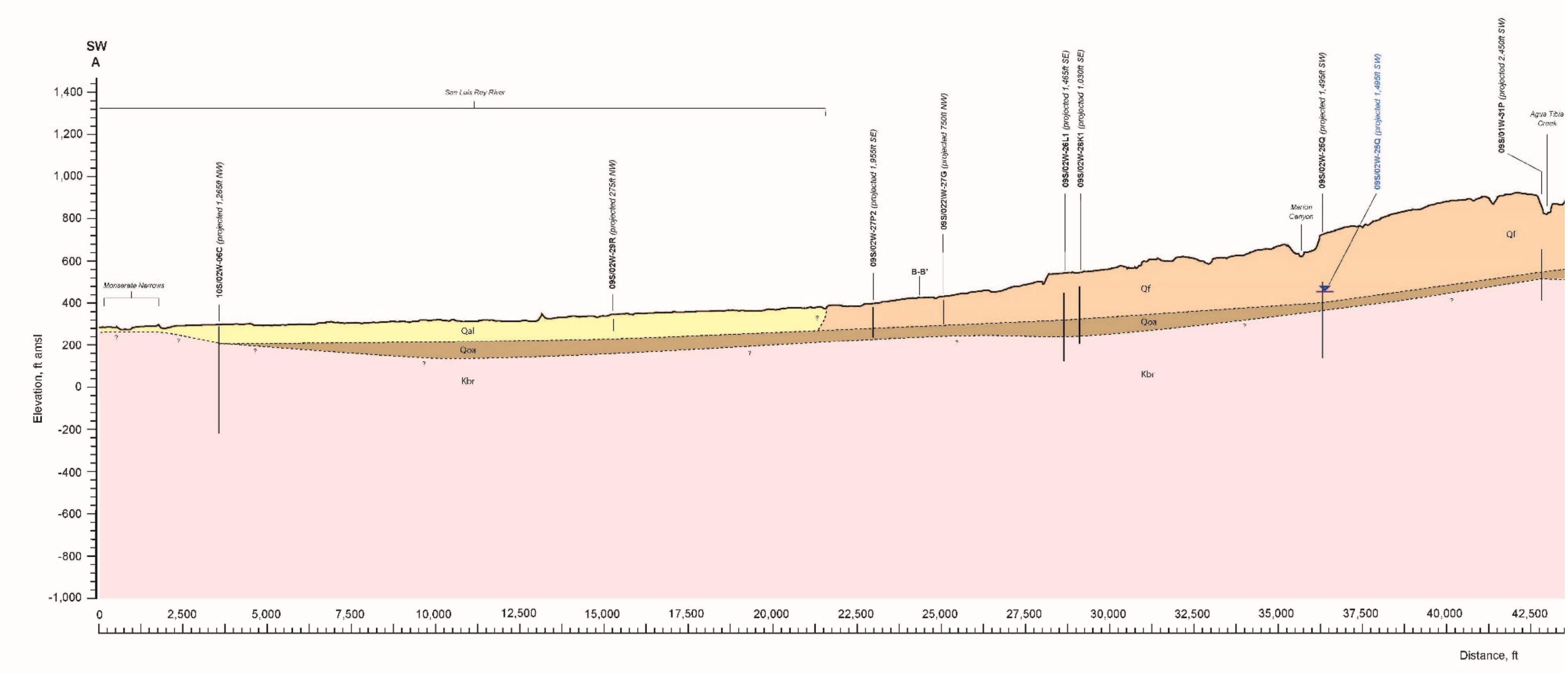
Climate: Precipitation at Henshaw Dam



Geology


EXPLANATION
Geologic Units Generalized from:
1) CGS Special Report 217 (Bedrossian et al., 2012)
2) Howes, 1955
3) USGS 2005-1305 (Jennings, et al., 1977)
4) Kennedy, 2014
af - Artificial Fill
Qal - Alluvial Deposits
Qf - Alluvial Fan Deposits
Qoa - Older Alluvial Deposits
Qof - Old Alluvial Fan Deposits
Qvof - Very Old Alluvial Fan Deposits
Qt - Terrace Deposits
Qt (?) - Terrace Deposits (inferred)
Qls - Landslide Deposits
Bdrk - Bedrock (Igneous and Metamorphic)
Fault Classification (USGS, 2021)
Well Constrained
Moderately Constrained
Inferred
A A' Cross-Section Location (See Figures 4-7)
10S/01W-22F Well Used in Cross-Section by State Well Number
Elsinore fault zone
San Luis Rey River
A
A'
B
B'
C
C'
D
D'
76
09S/02W-29R
09S/02W-27G
09S/02W-26K1
09S/02W-26L1
09S/02W-27P2
09S/02W-25Q
09S/01W-31P
10S/02W-06C
10S/02W-03D
10S/02W-13H
10S/01W-05E
10S/01W-05F
10S/01W-05K
10S/01W-08J
10S/01W-08K
10S/01W-08G
10S/01W-09M
10S/01W-03M
10S/01W-09B
10S/01W-09L2
10S/01W-09P2
10S/01W-16B
10S/01W-16G1
10S/01W-16R
10S/01W-17A
10S/01W-18H
10S/01W-13H
10S/01W-13N
10S/01W-22D
10S/01W-22F
10S/01W-22F6
10S/01W-22Q1
10S/01W-23K
10S/01W-27A1
10S/01W-27F
10S/01W-35Q1

Geologic Cross-Section: Upper San Luis Rey Valley



EXPLANATION

Quaternary
- Qal — Alluvial Deposits
- Qf — Alluvial Fan Deposits
- Qlp — Paleo Lake Pauma Deposits
- Qoa — Older Alluvial Deposits

Cretaceous or Pre-Tertiary?
- Kbr — Bedrock - Igneous & Metamorphic

State Well Number — 10S/01W-22Q1
Projected off of Cross-Section — (projected 605ft SW)

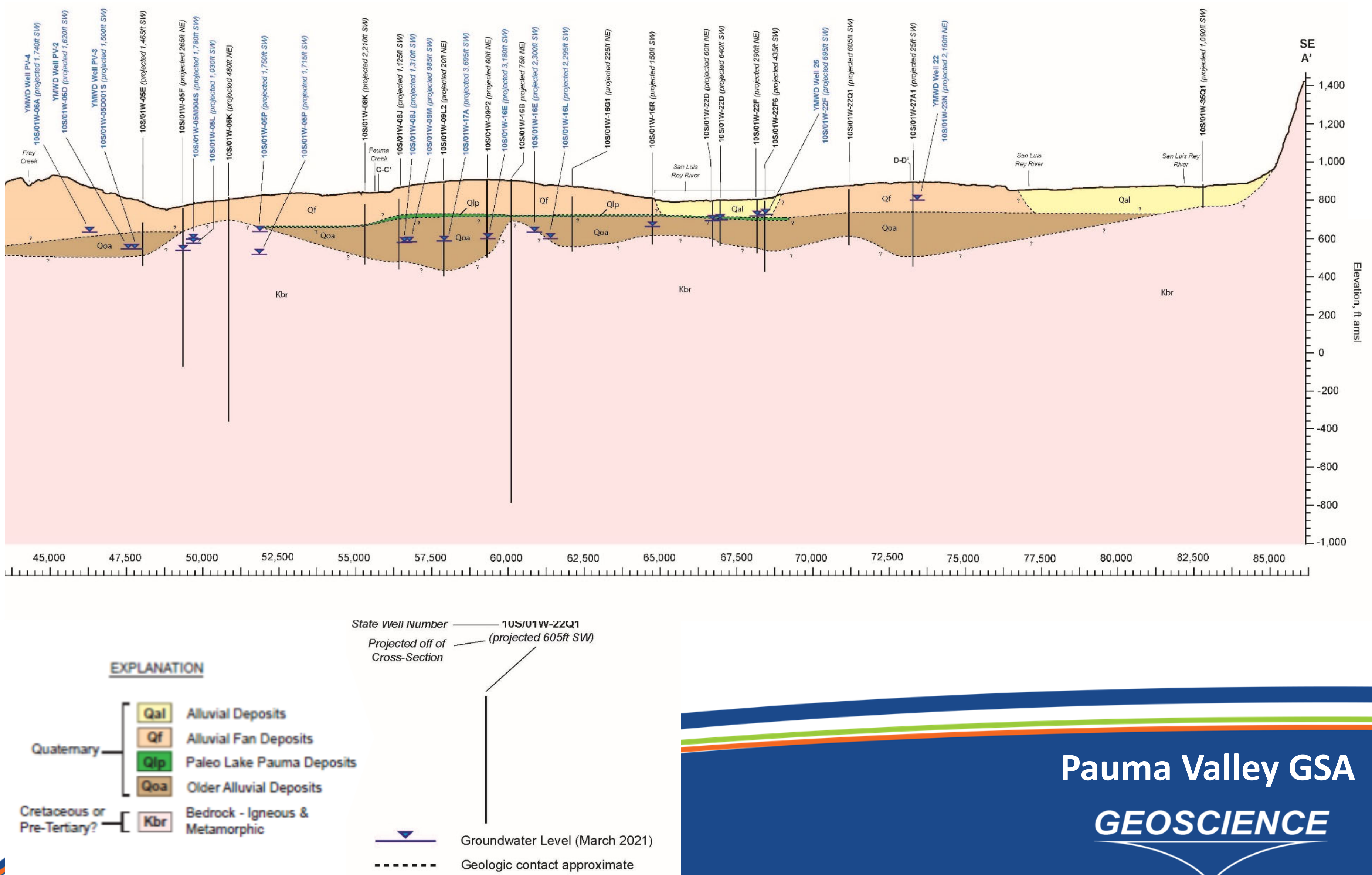
Groundwater Level (March 2021)

Geologic contact approximate

Pauma Valley GSA

GEOSCIENCE

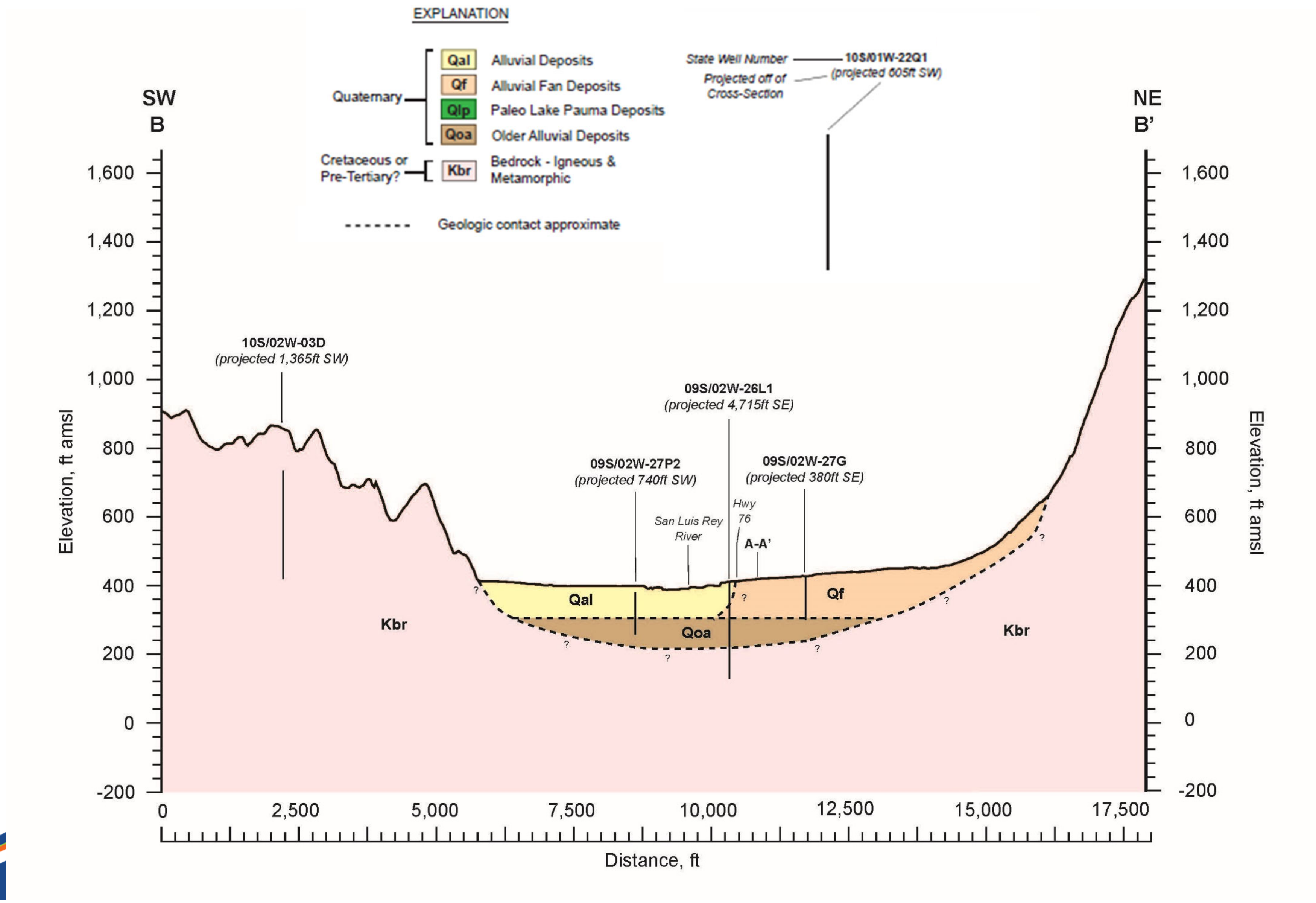
Geologic Cross-Section: Upper San Luis Rey Valley



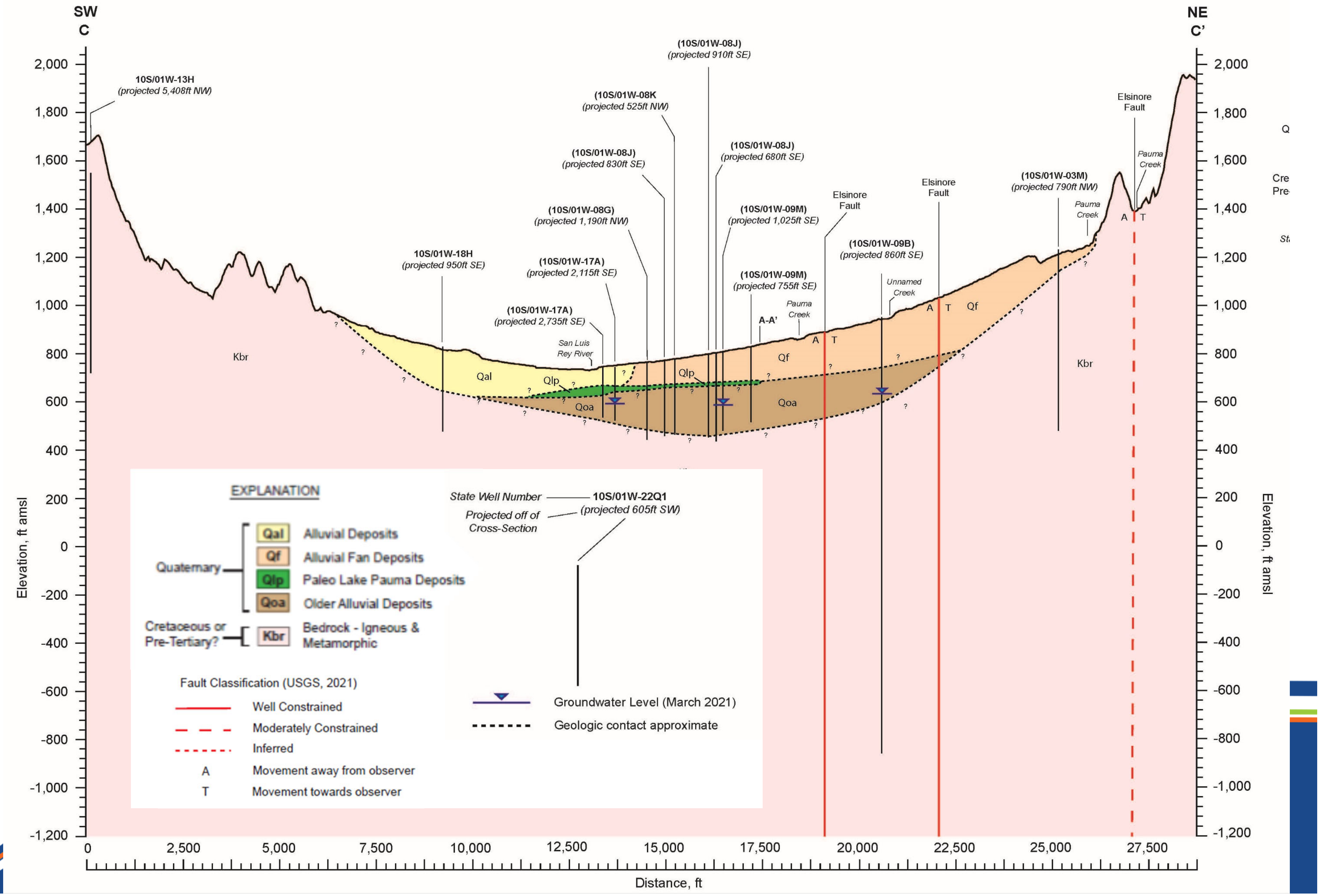
Pauma Valley GSA

GEOSCIENCE

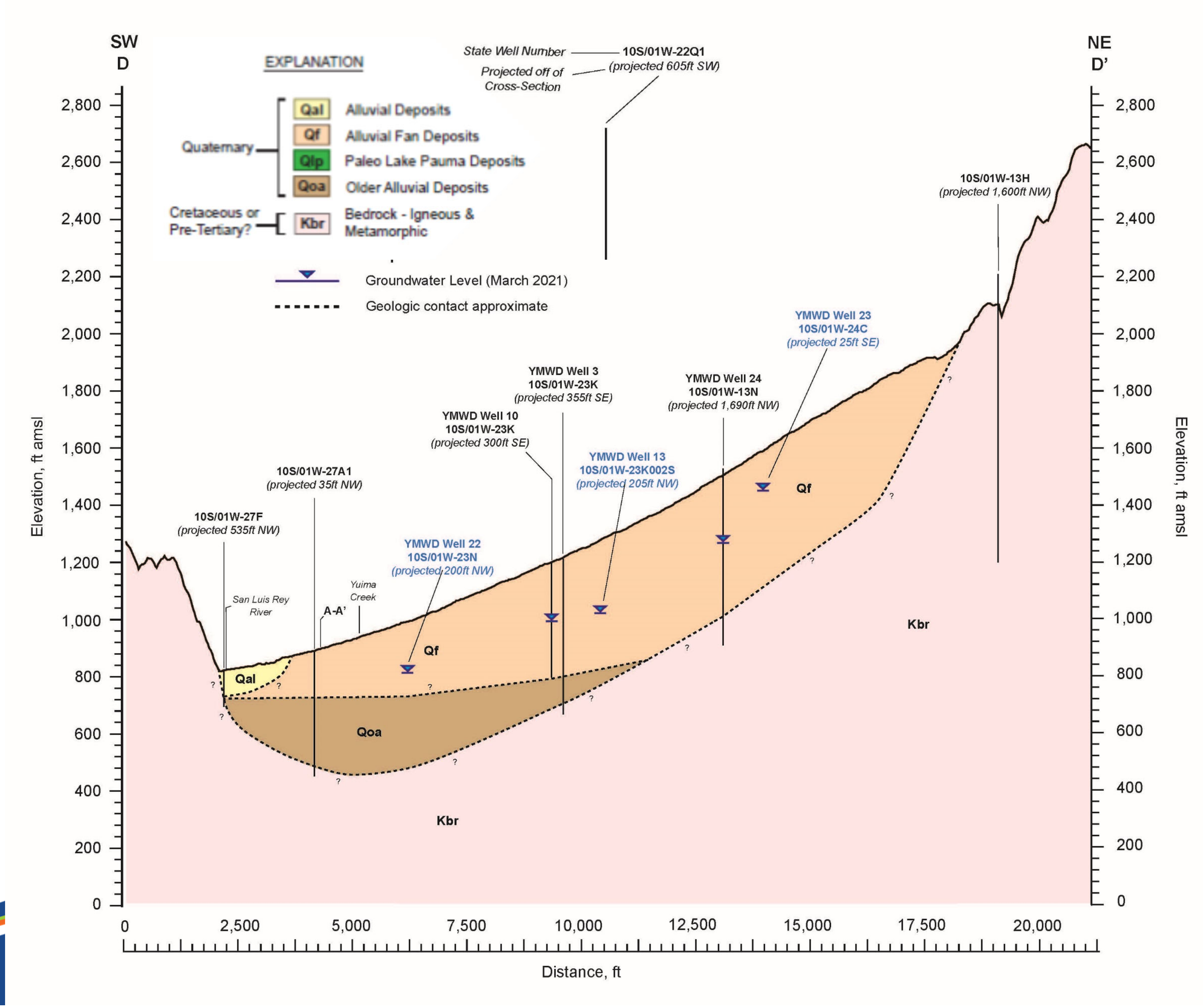
Geologic Cross-Section: Pala Subbasin



Geologic Cross-Section: Pauma Subbasin



Geologic Cross-Section: Pauma Subbasin



ey GSA
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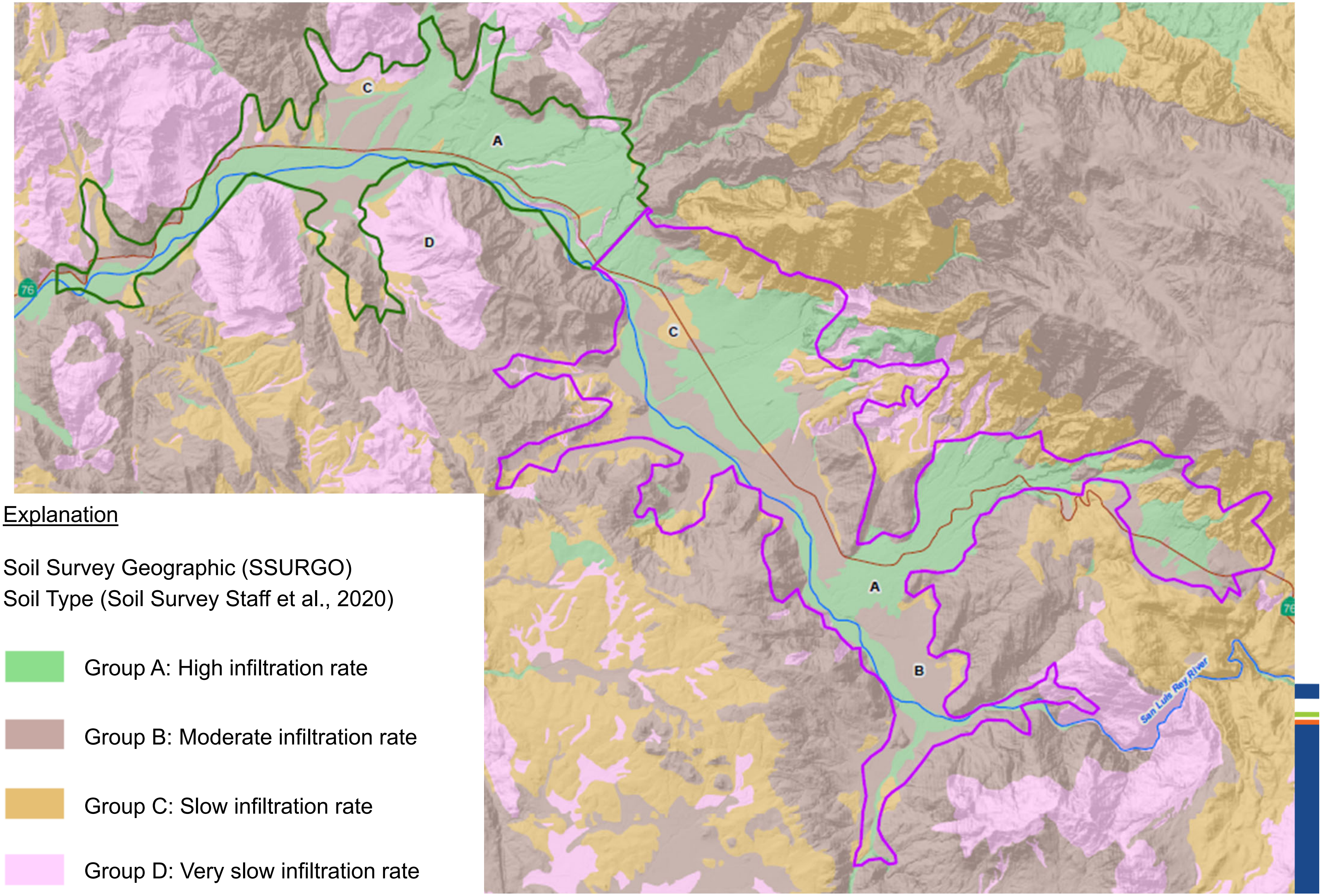
Soils

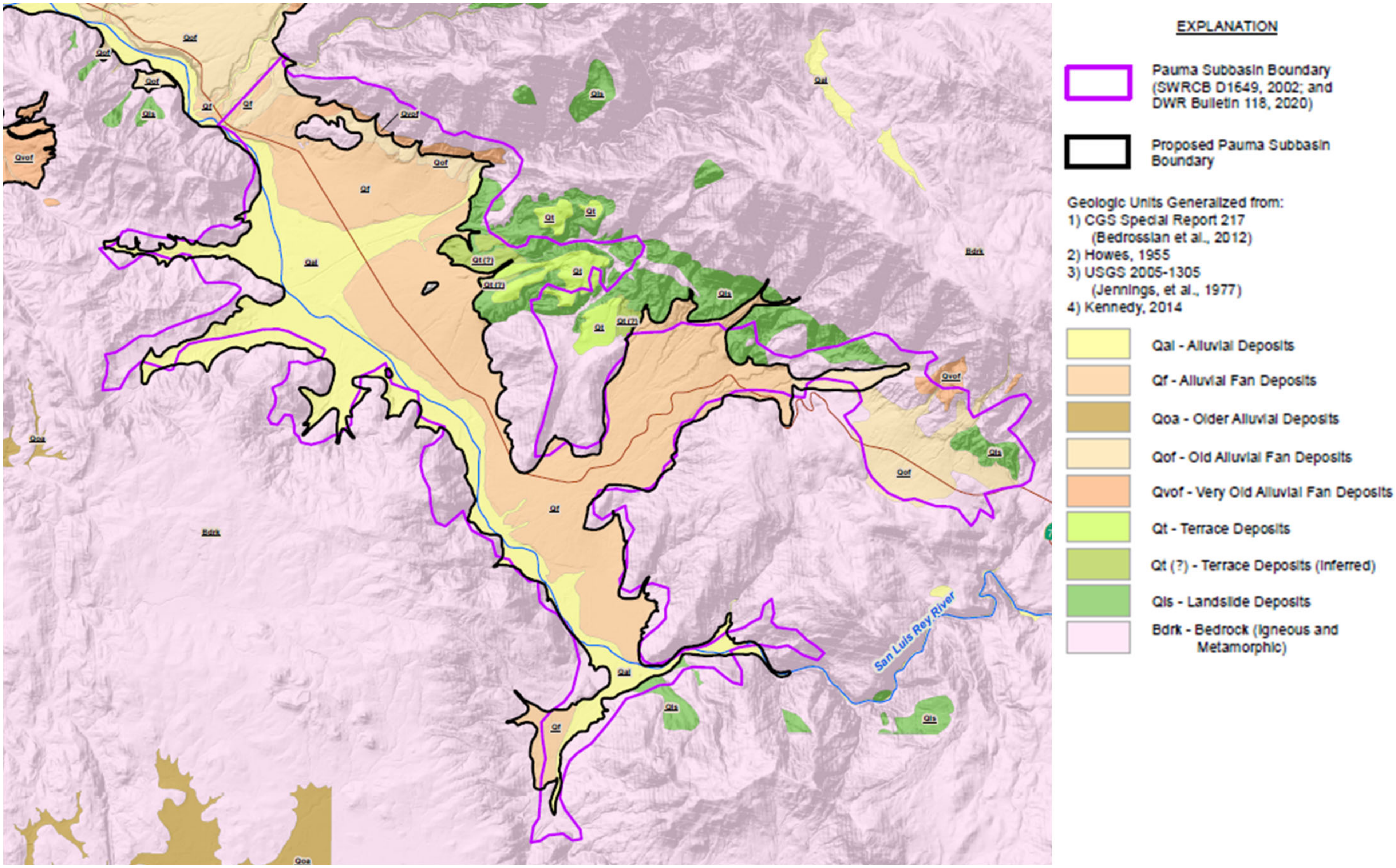


Explanation

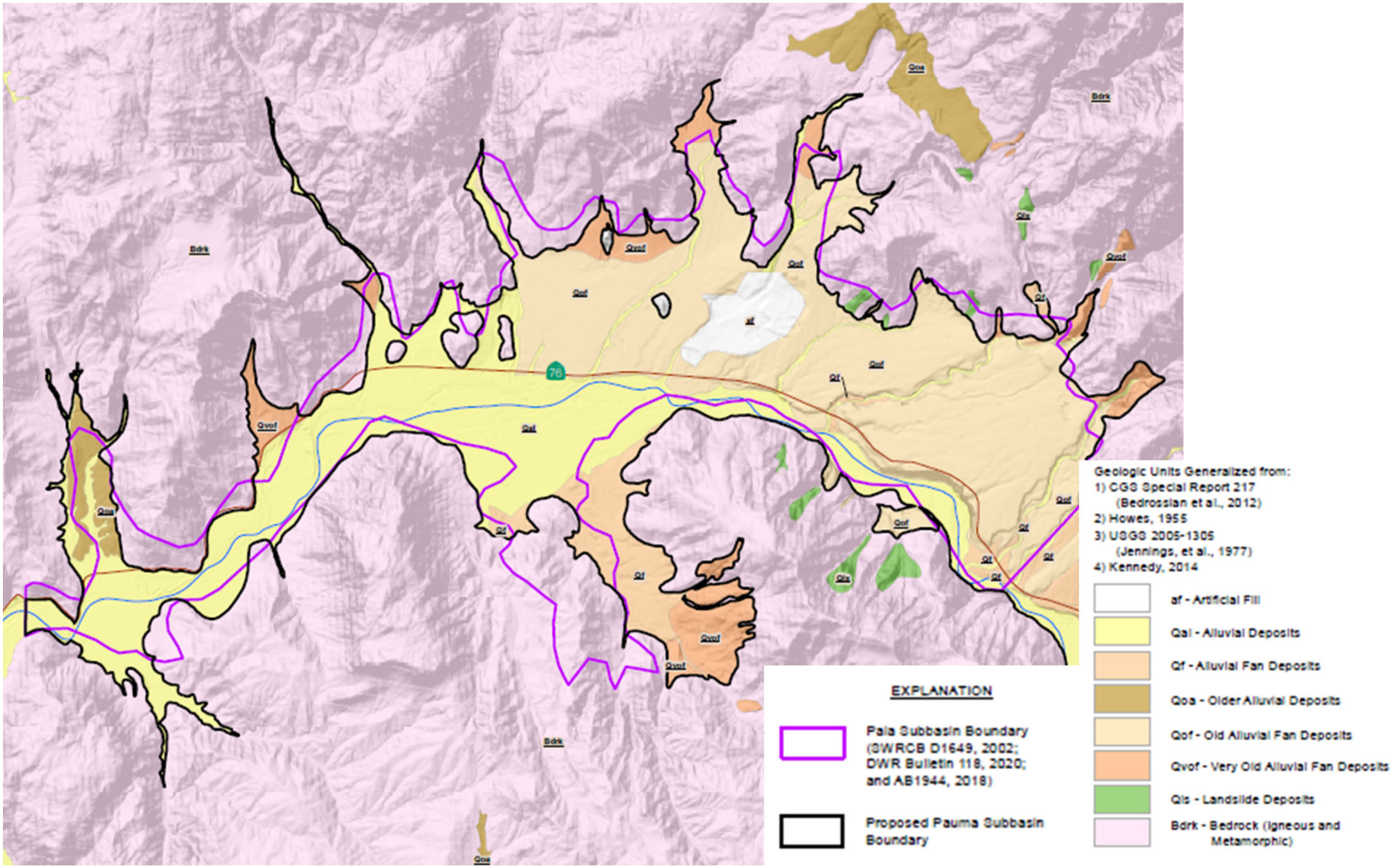
Soil Survey Geographic (SSURGO)
Soil Type (Soil Survey Staff et al., 2020)

- Group A: High infiltration rate
- Group B: Moderate infiltration rate
- Group C: Slow infiltration rate
- Group D: Very slow infiltration rate

Basin Boundaries – Pauma Subbasin



Basin Boundaries – Pala Subbasin

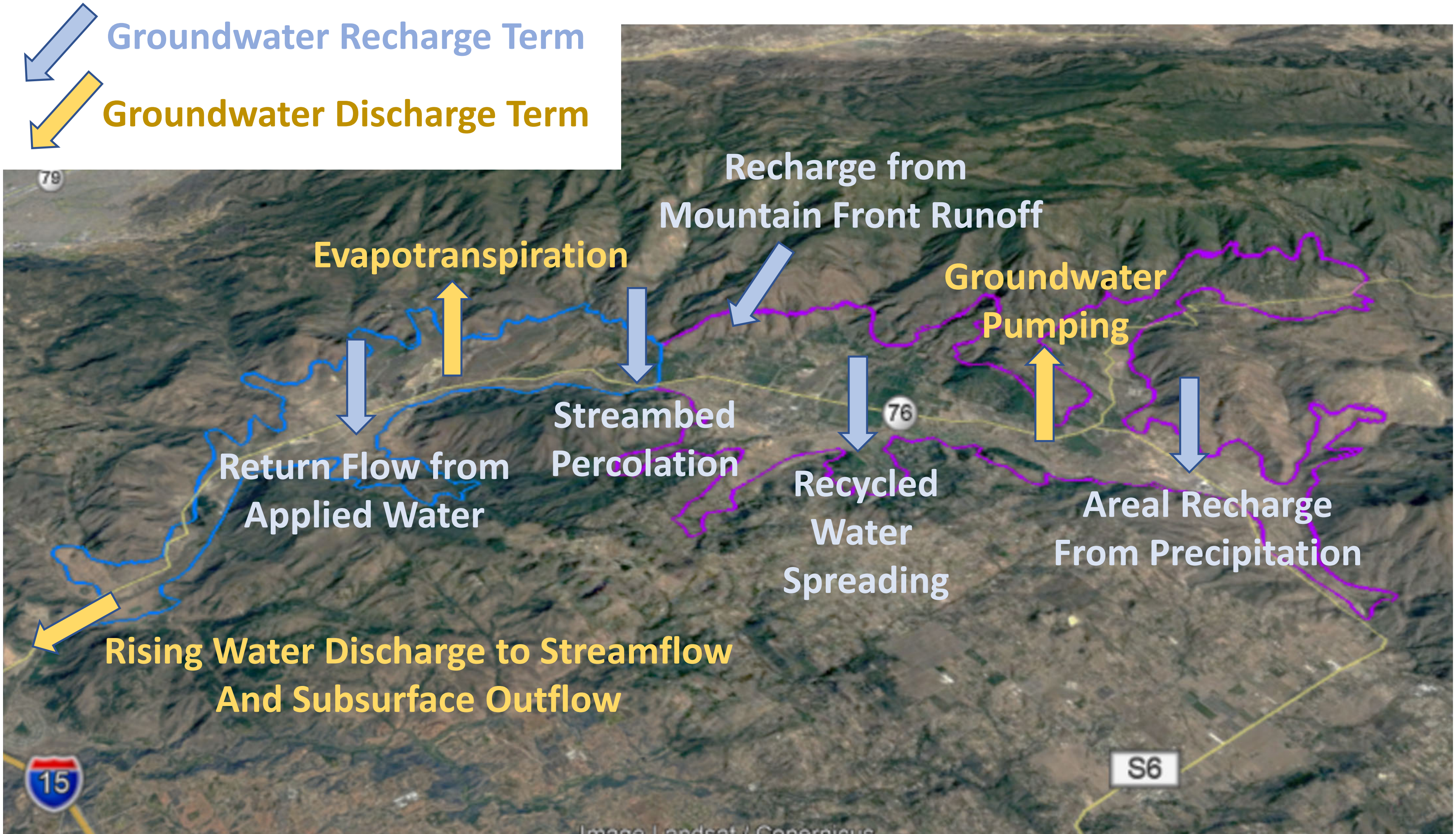


Groundwater Occurrence and Aquifer Systems

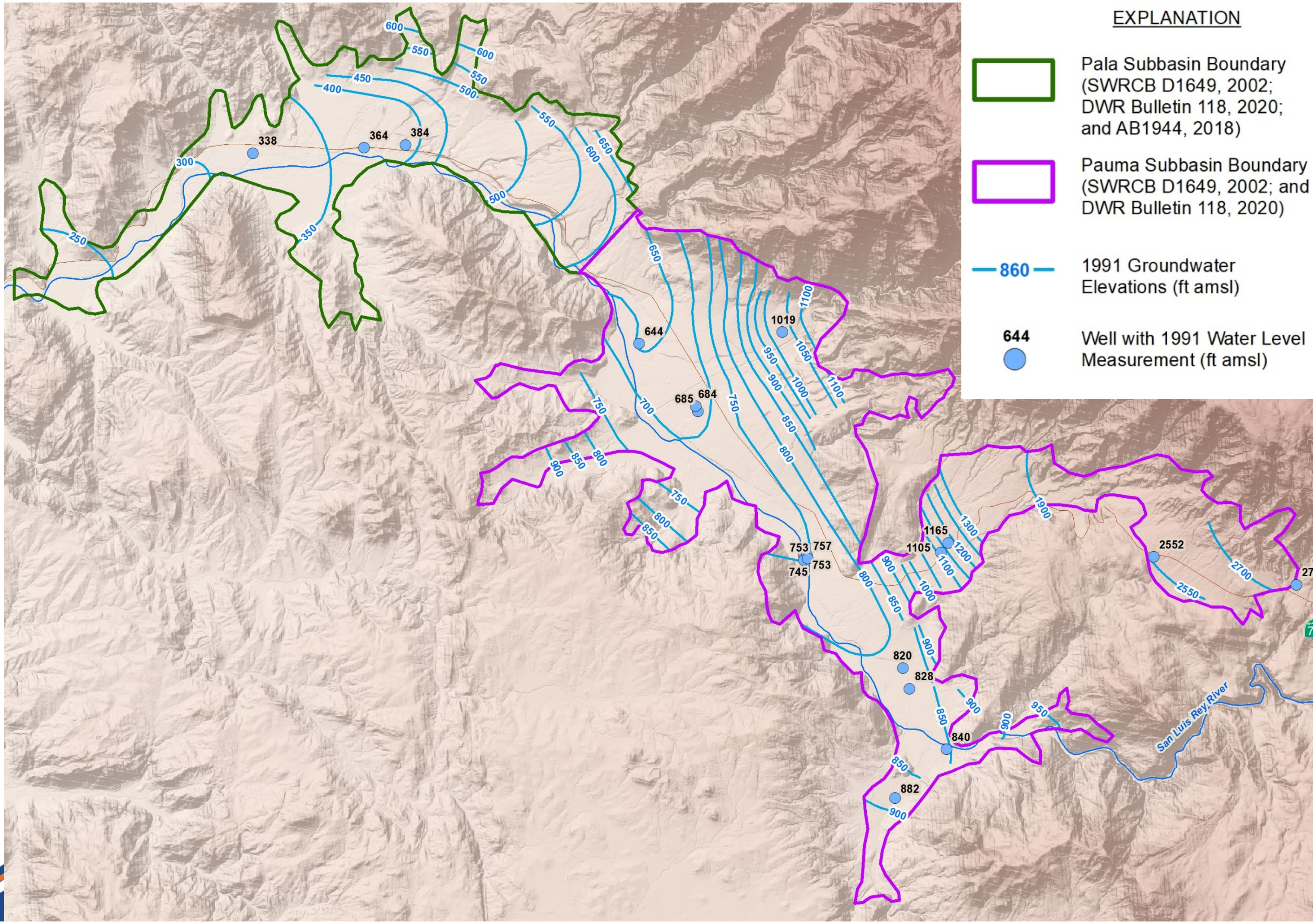
- **Most water in the Subbasin is produced from alluvial aquifers**
  - Younger Alluvium along San Luis Rey River
  - Alluvial Fan deposits

- **Fractured rock systems are not typically considered an aquifer unit**
  - Reduced capacity
  - Variable productivity
  - Limited groundwater yield

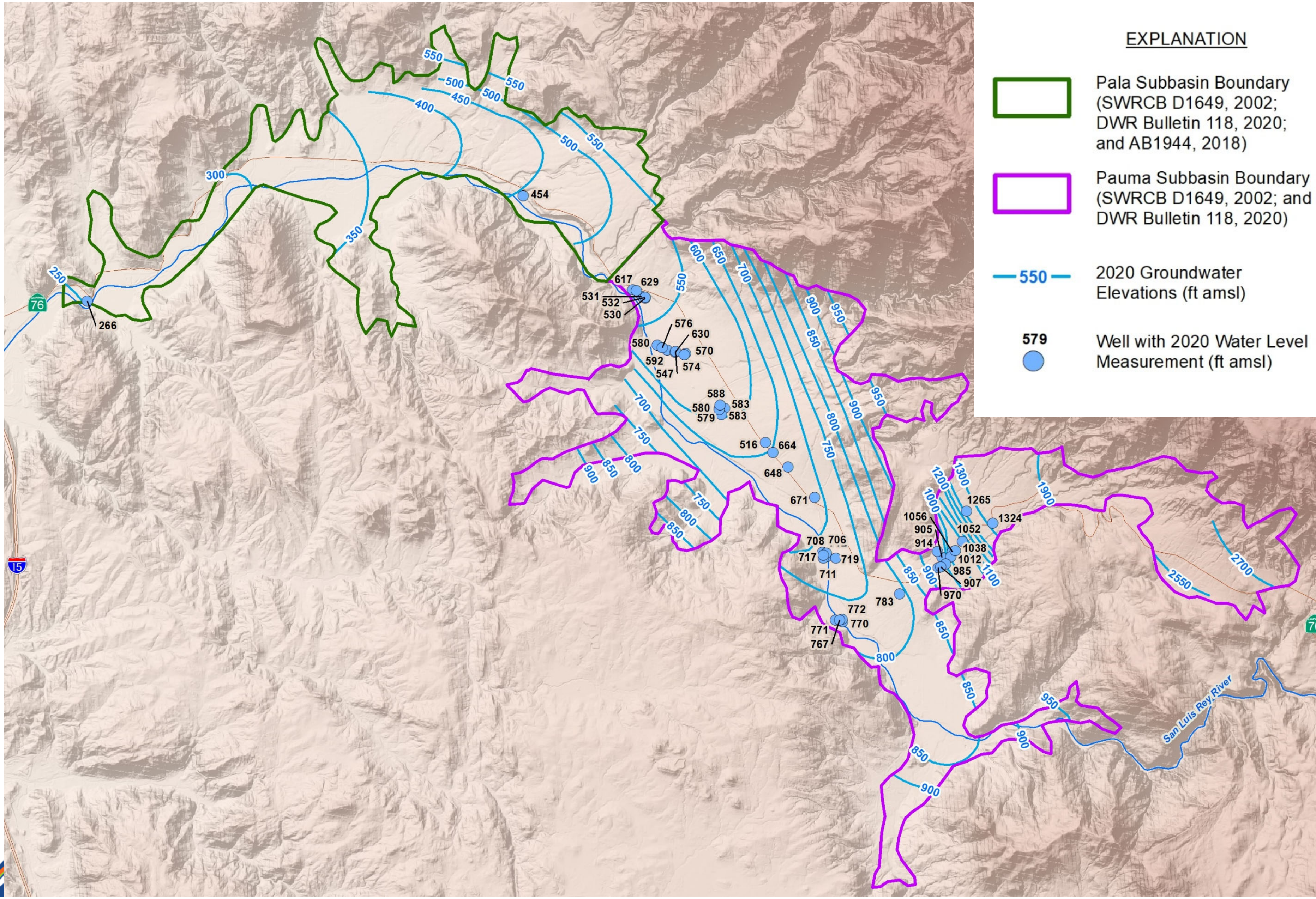
Groundwater Recharge and Discharge



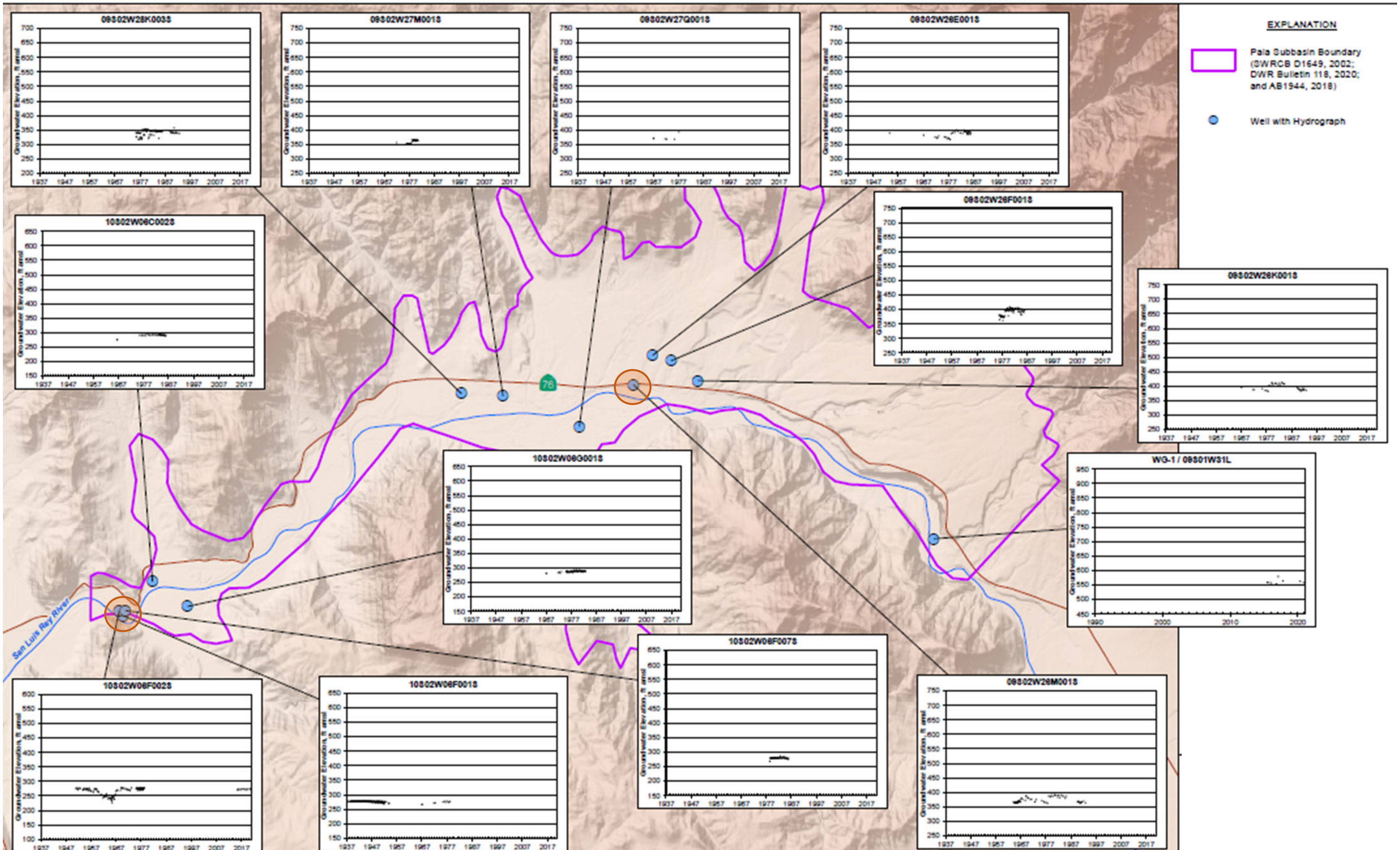
Groundwater Elevations - 1991



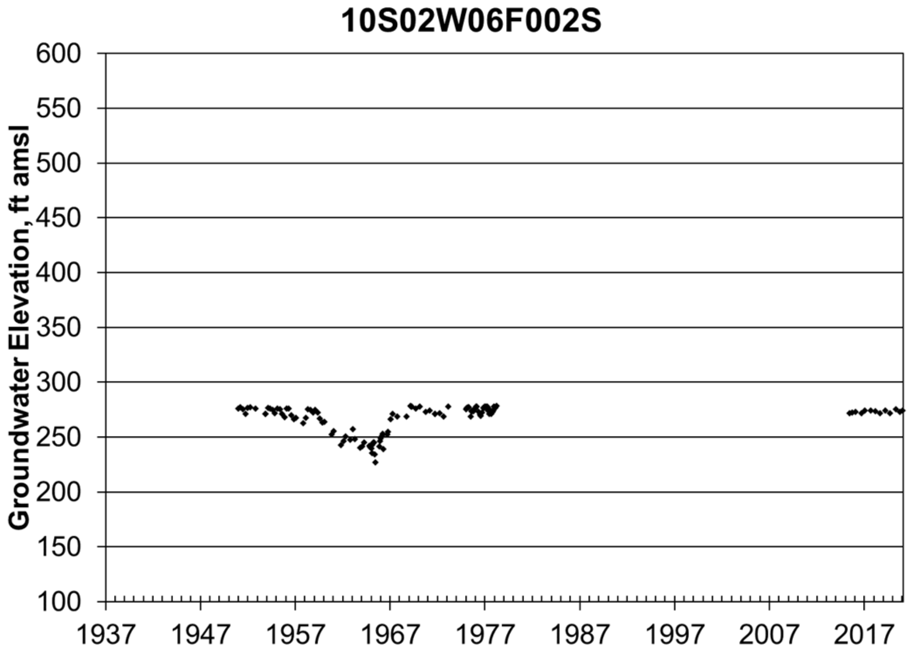
Groundwater Elevations - 2020

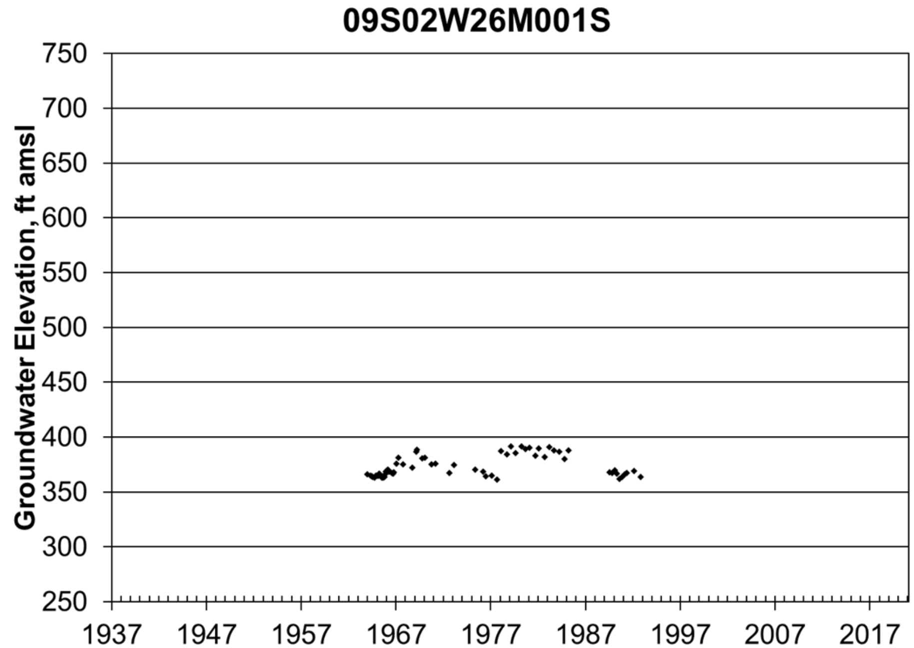


Hydrographs – Pala Subbasin



Hydrographs – Pala Subbasin (continued)

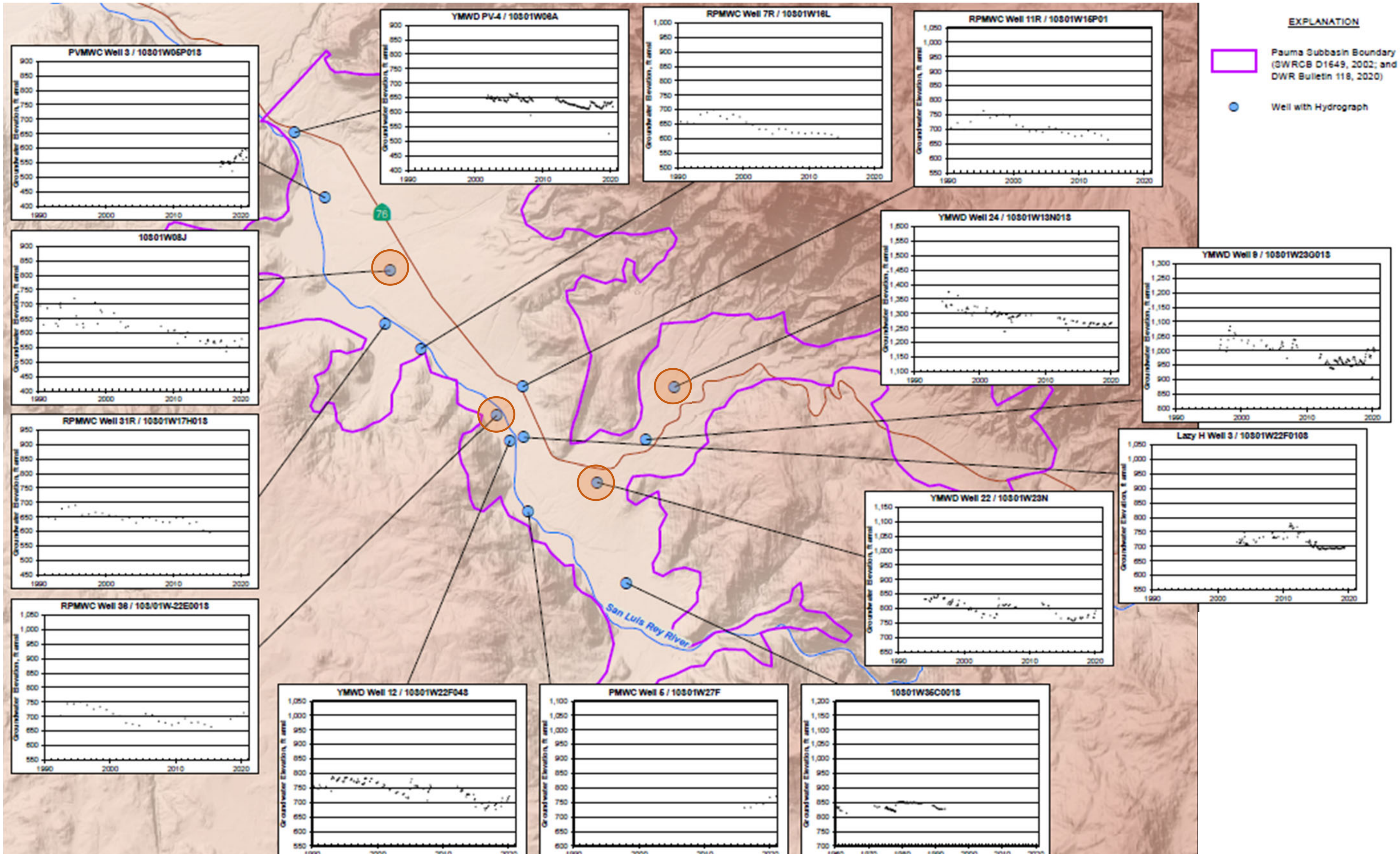




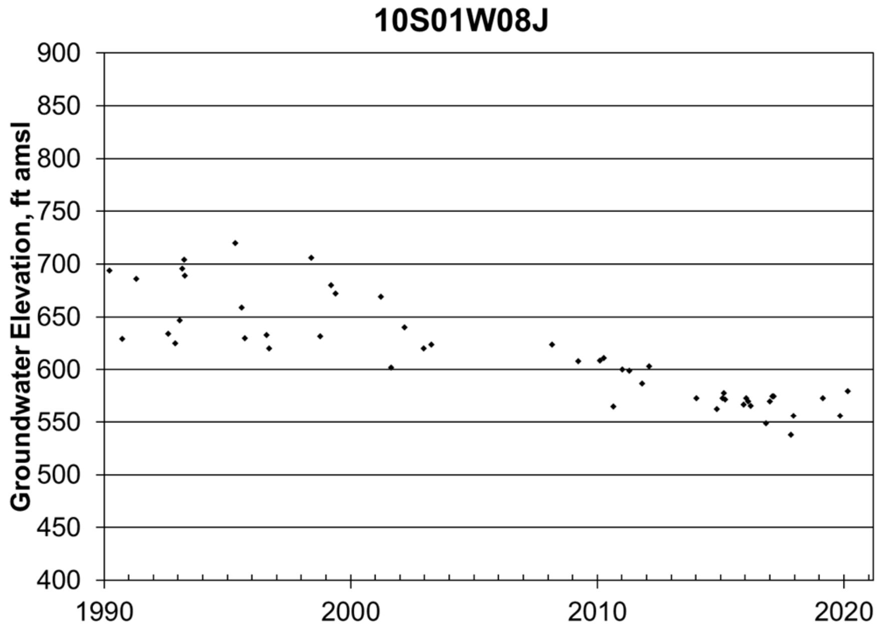
Pauma Valley GSA

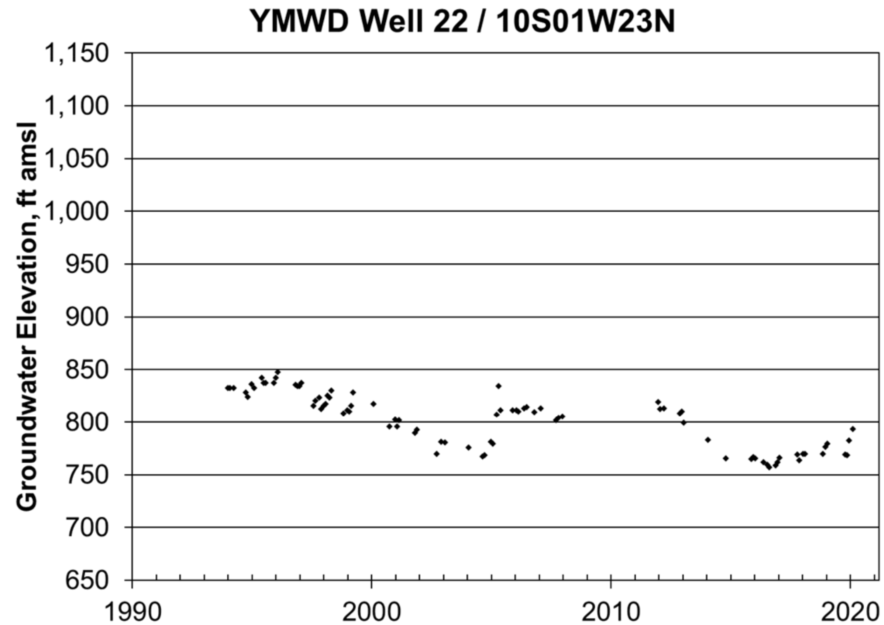
GEOSCIENCE

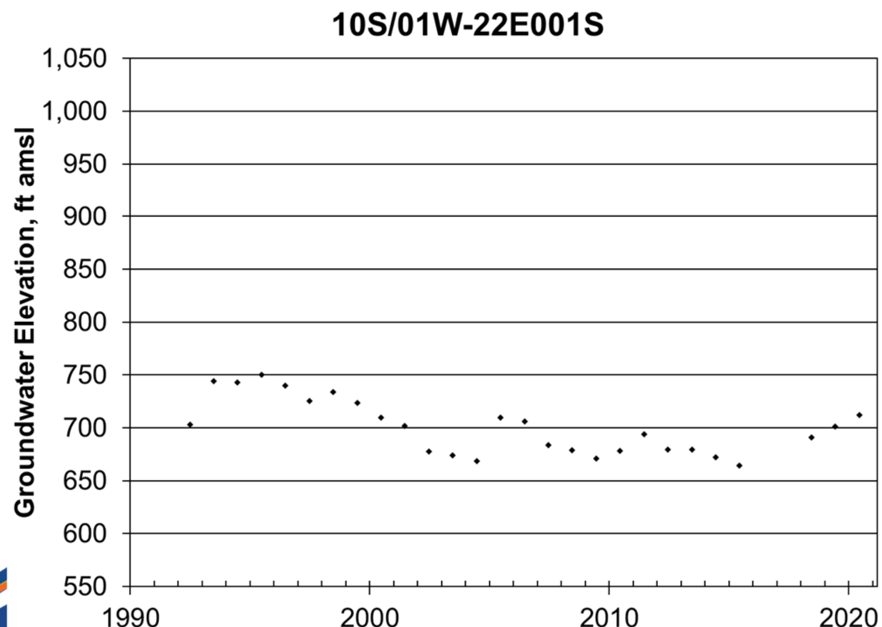
Hydrographs – Pauma Subbasin

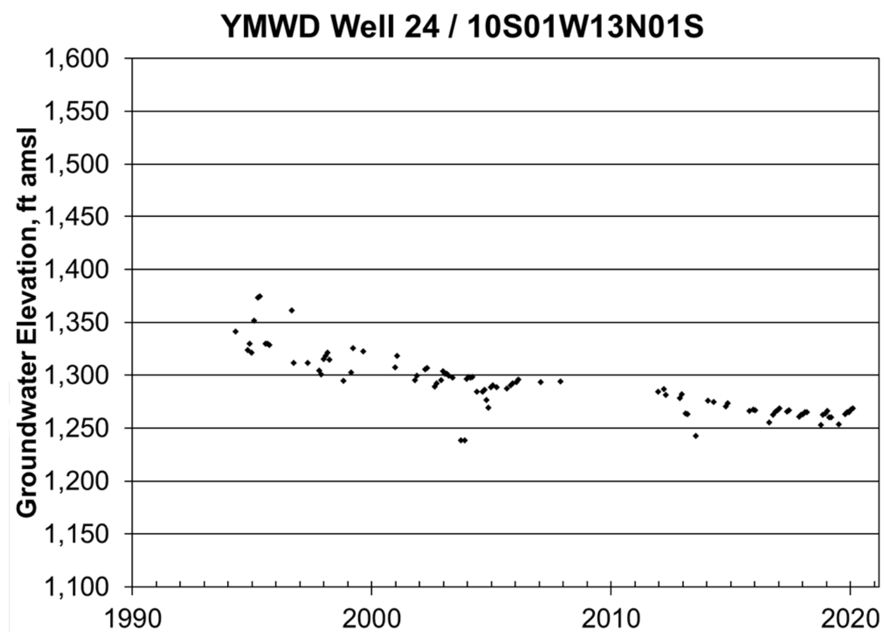


Hydrographs – Pauma Subbasin (continued)







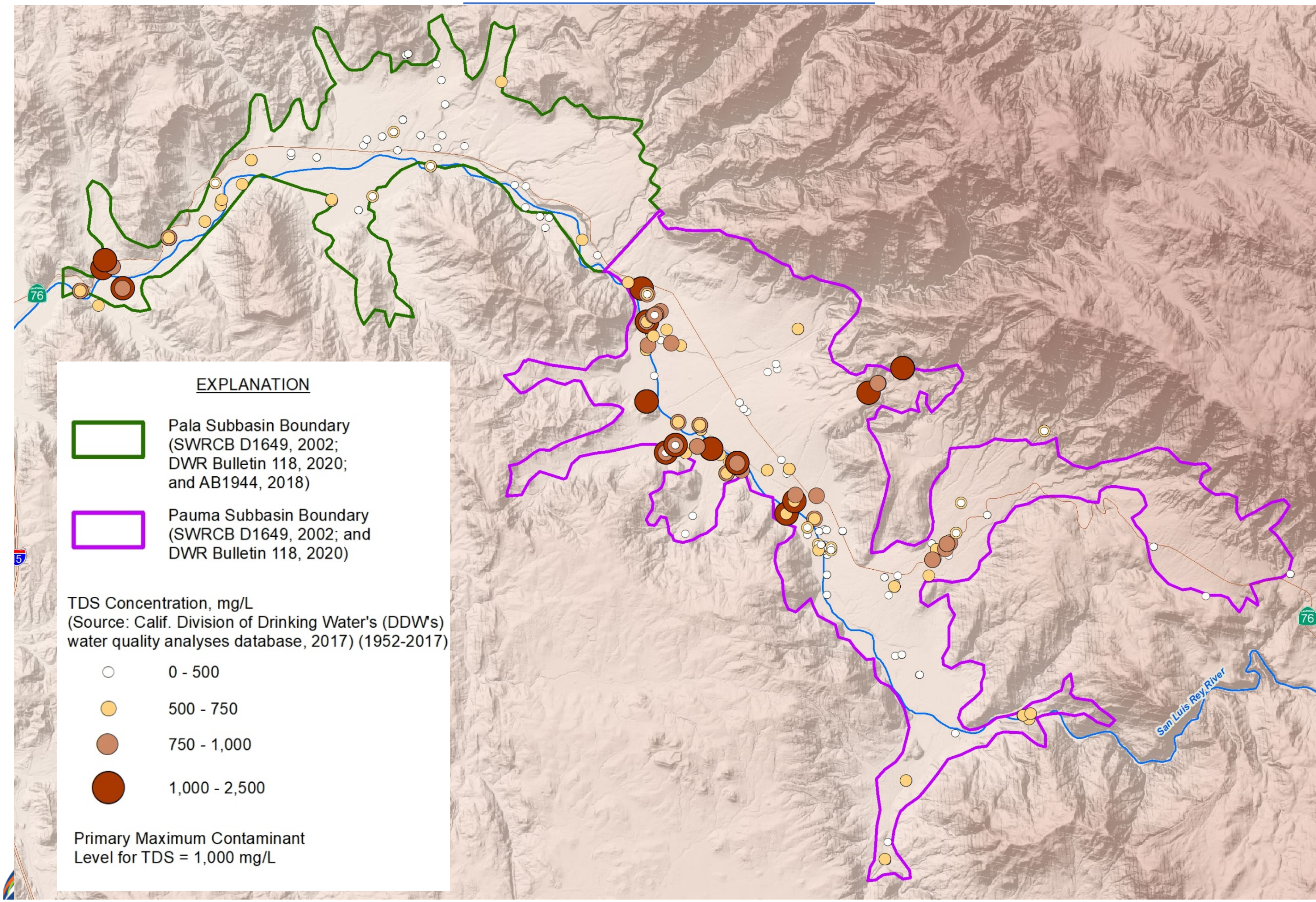


Groundwater Storage (Preliminary Estimate)

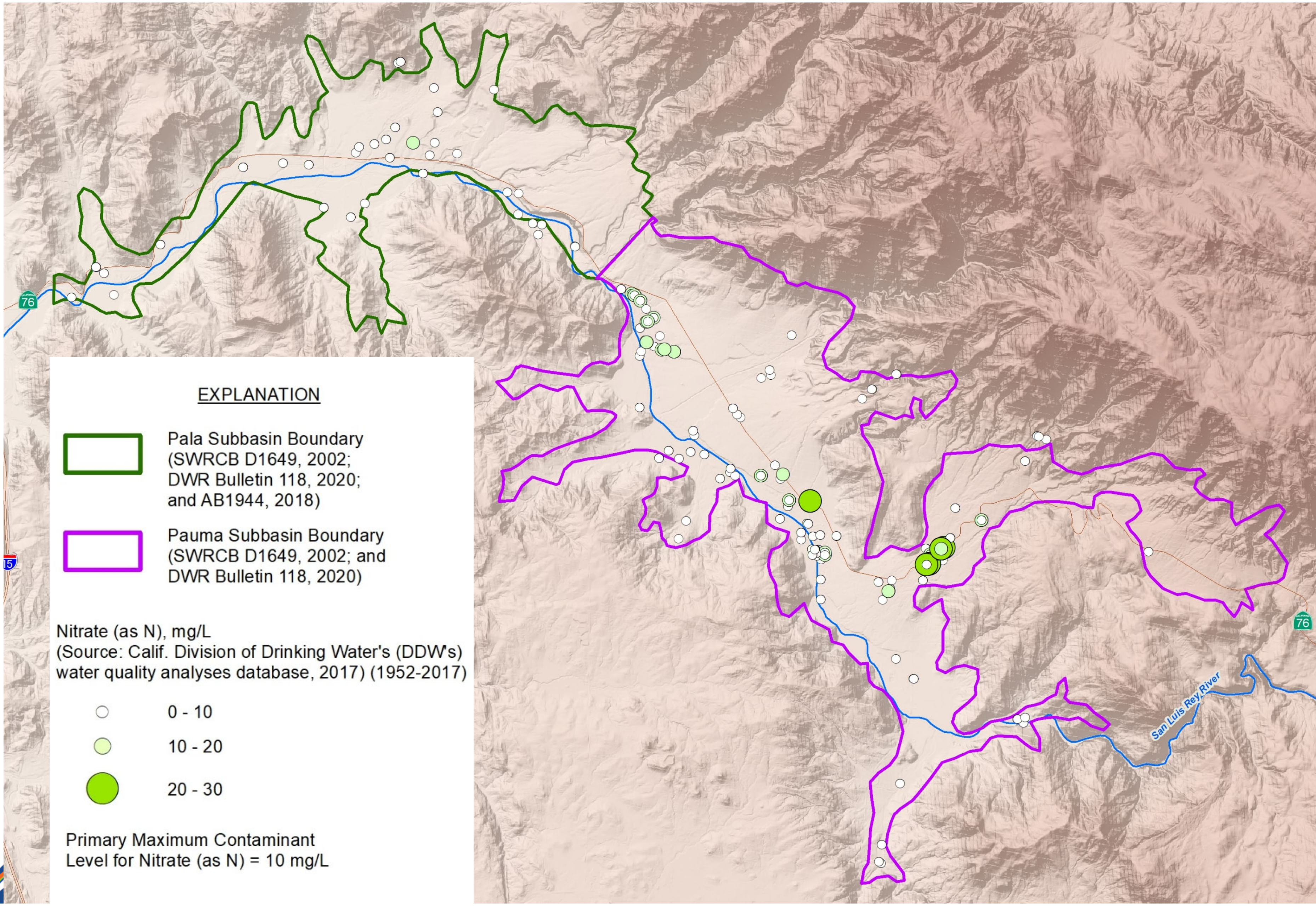
Groundwater Storage	
1991	184,000 acre-ft
2020	124,000 acre-ft
Change	-60,000 acre-ft

Final estimate of groundwater storage will be based on results from the calibrated surface water/groundwater model

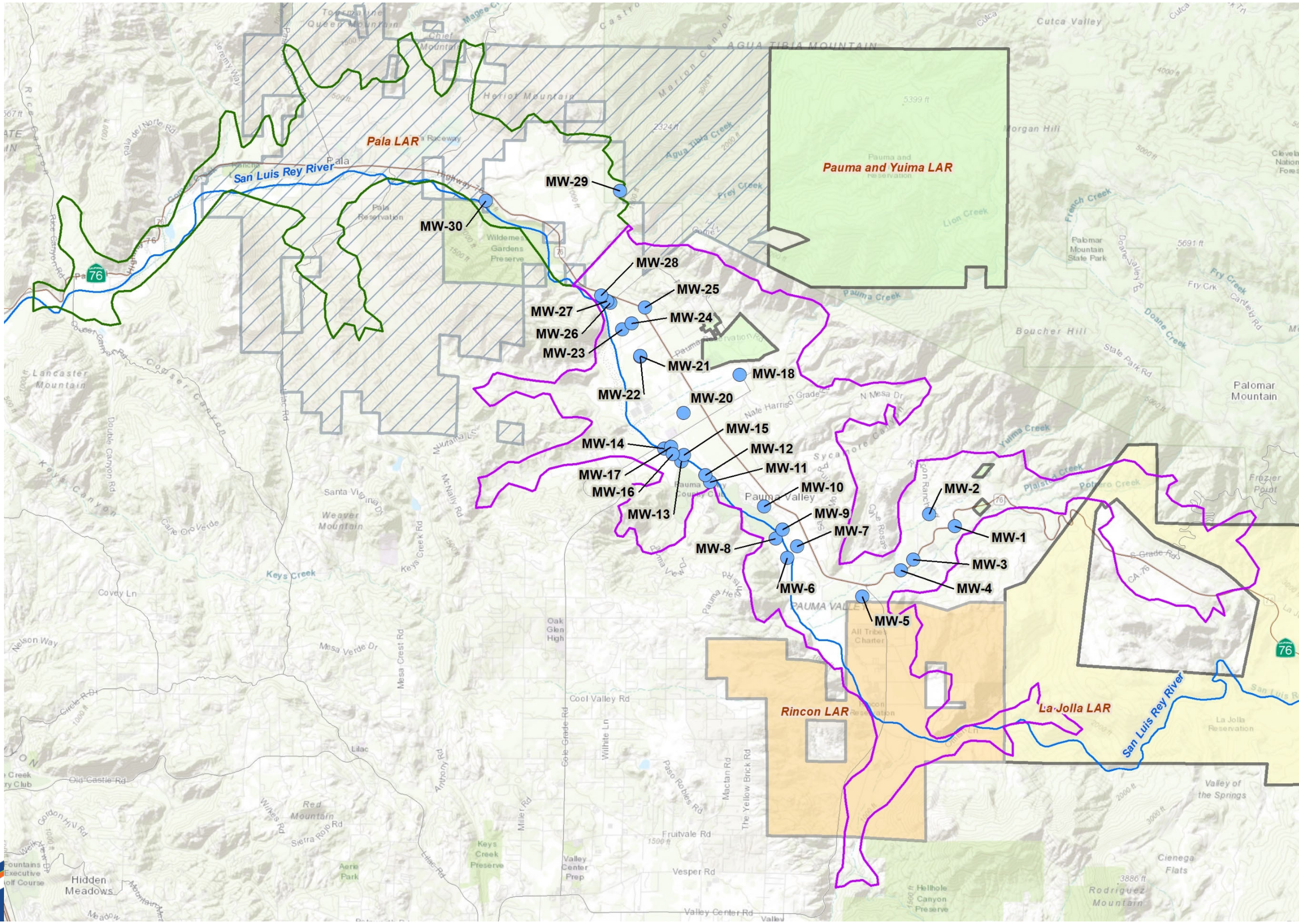
Historical Water Quality – TDS (1952-2017)



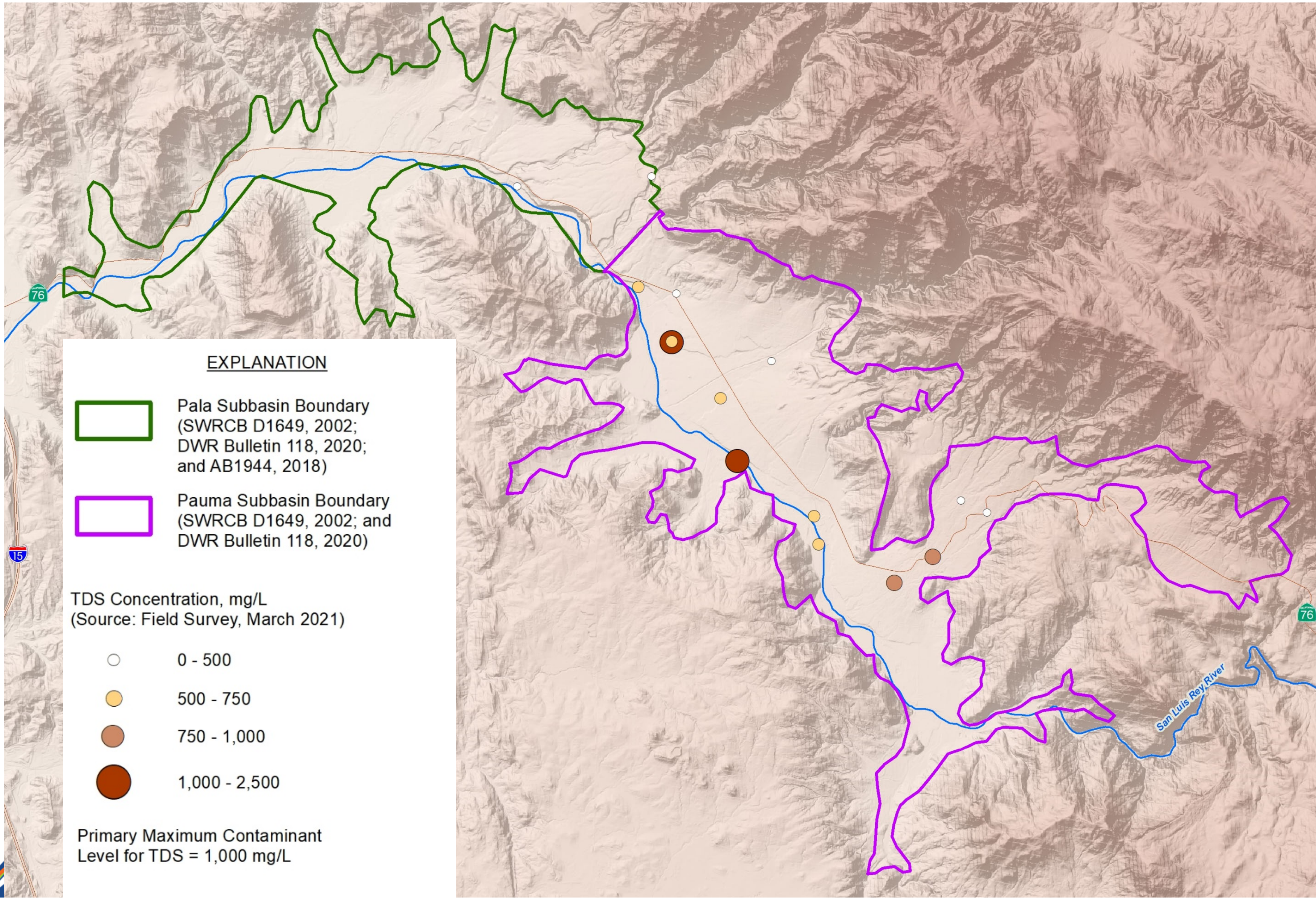
Historical Water Quality – Nitrate (1952-2017)



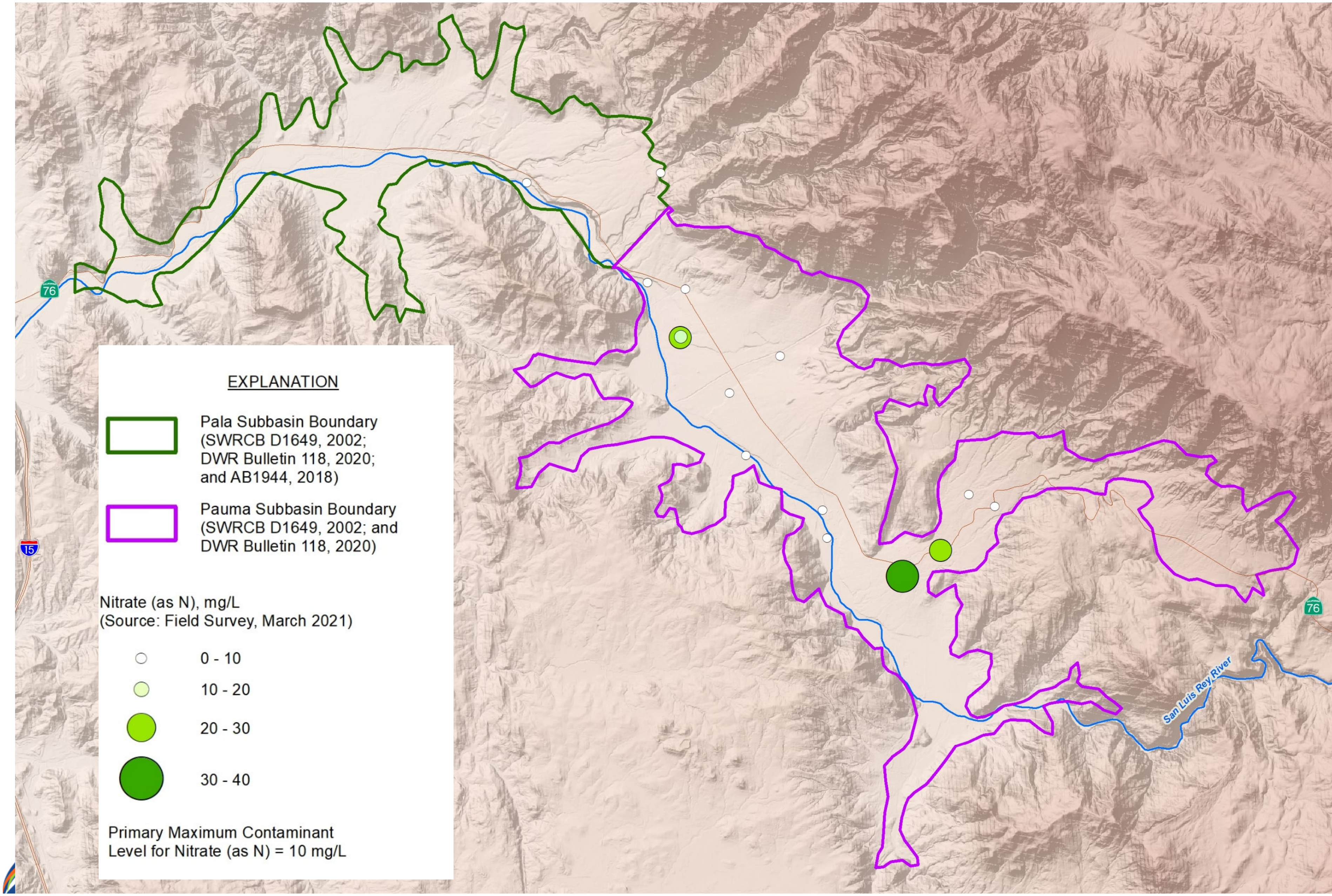
Initial Monitoring Well Locations



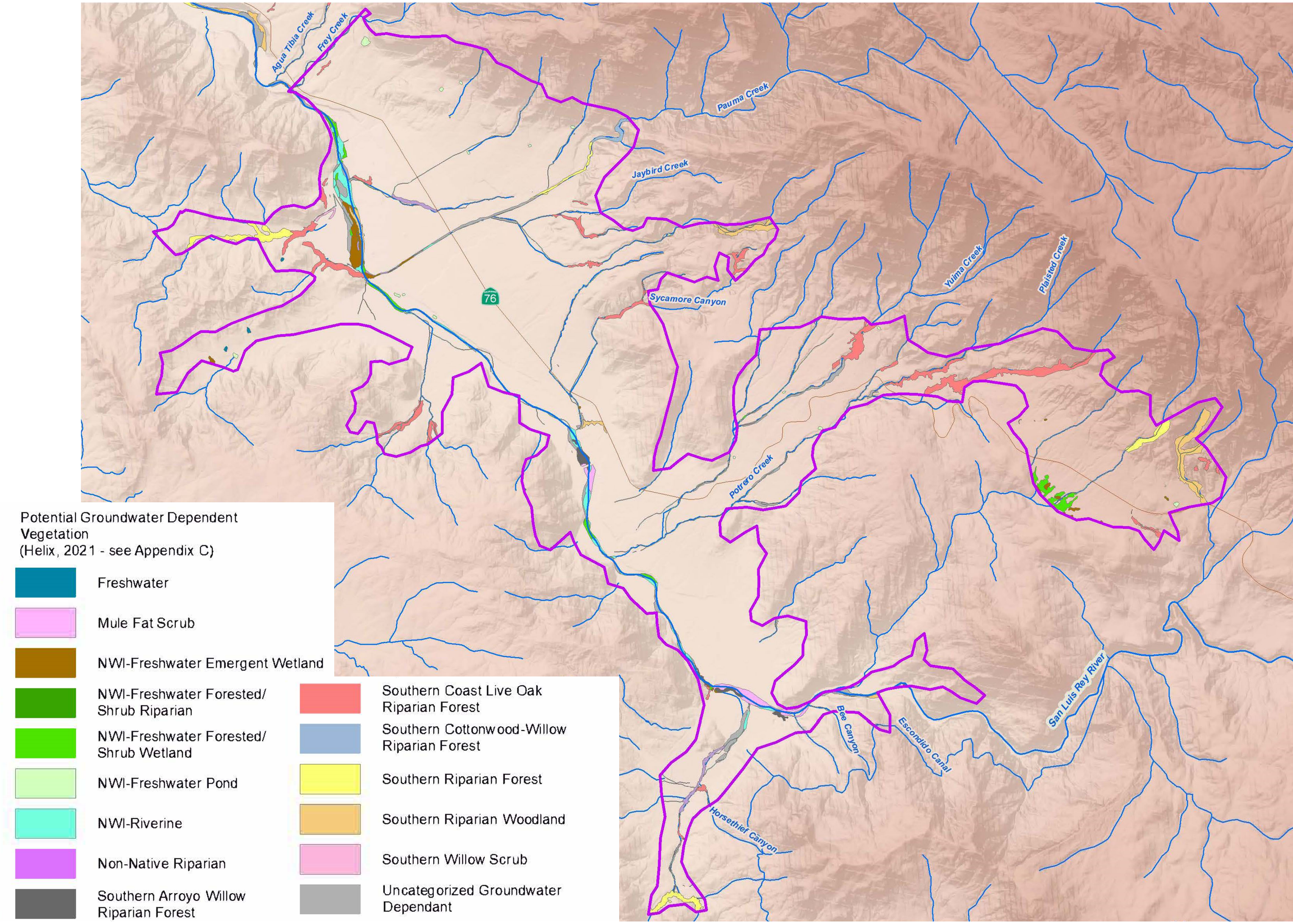
Current Water Quality - TDS



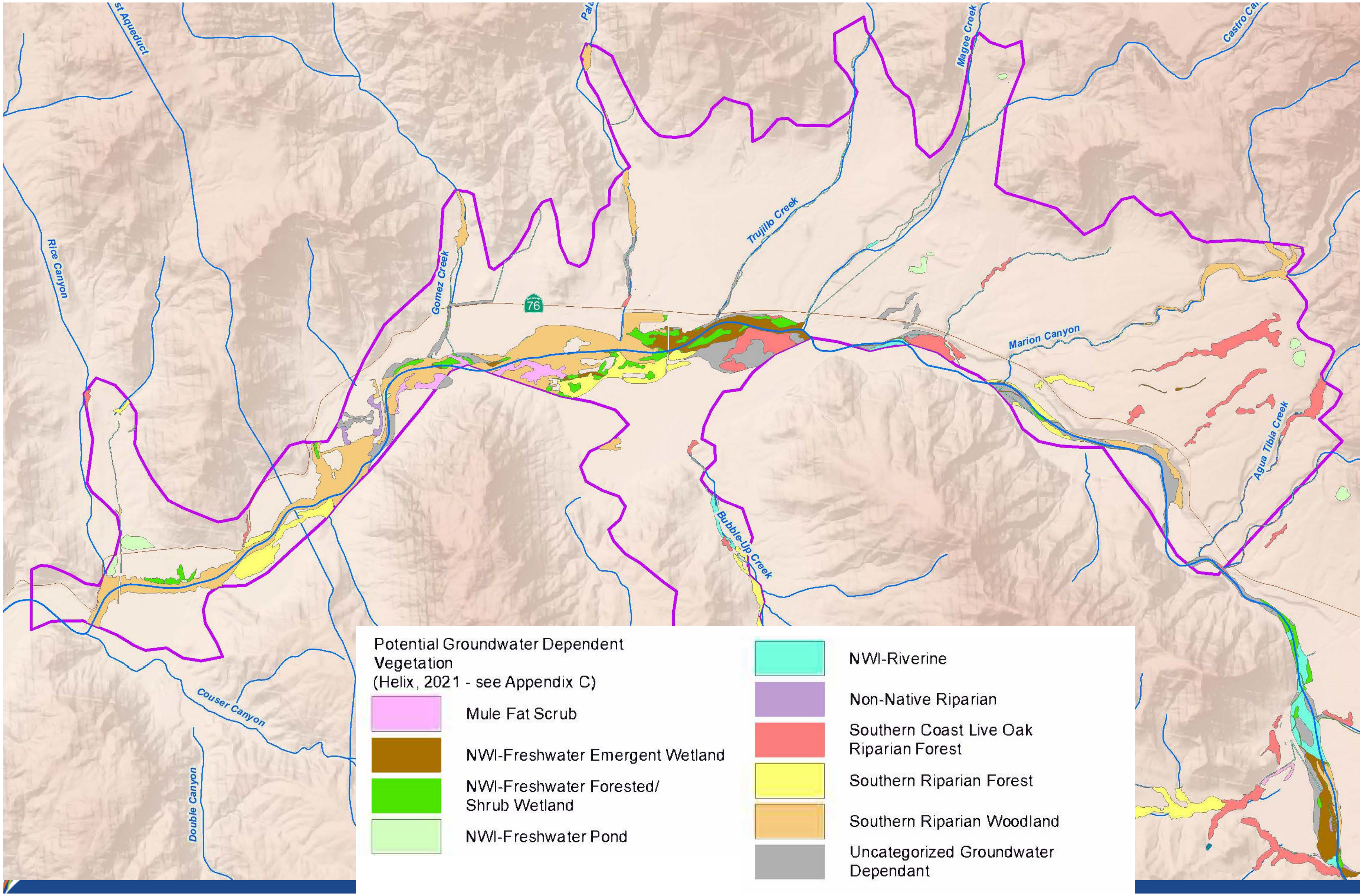
Current Water Quality - Nitrate



Potential Groundwater Dependent Vegetation (Pauma)

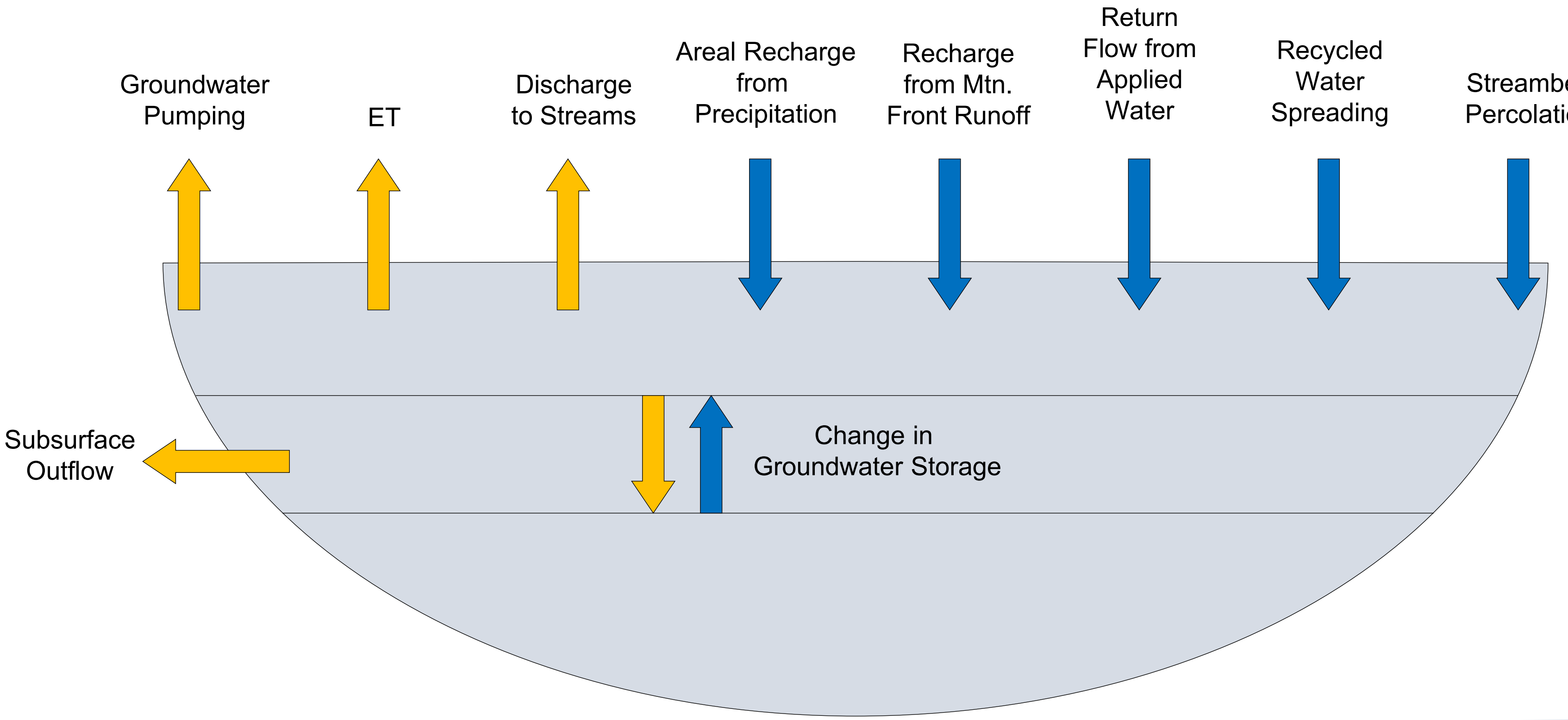


Potential Groundwater Dependent Vegetation (Pala)

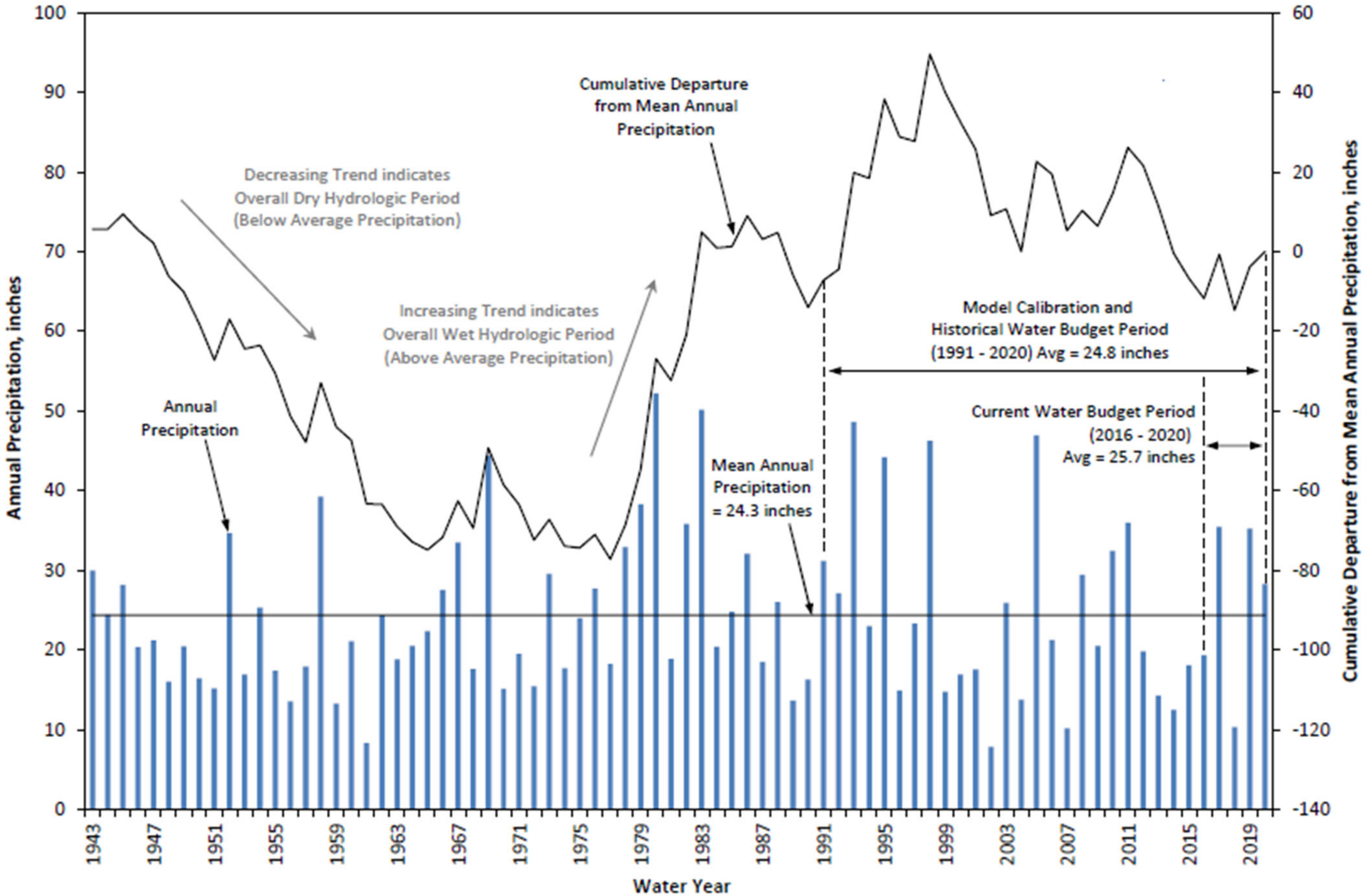


Water Budget

Inflow = Outflow +/- Change in Groundwater Storage



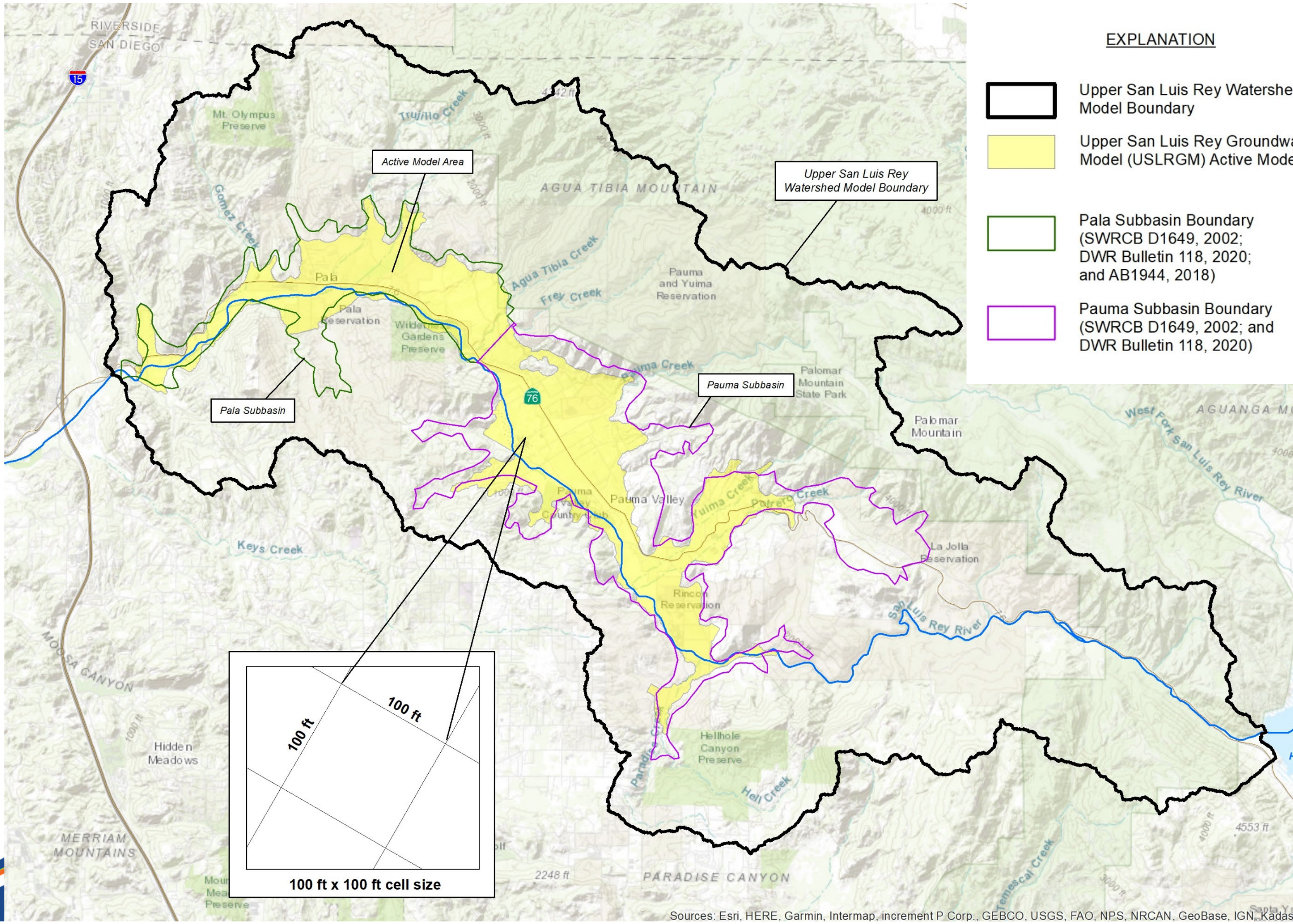
Water Budget Base Periods



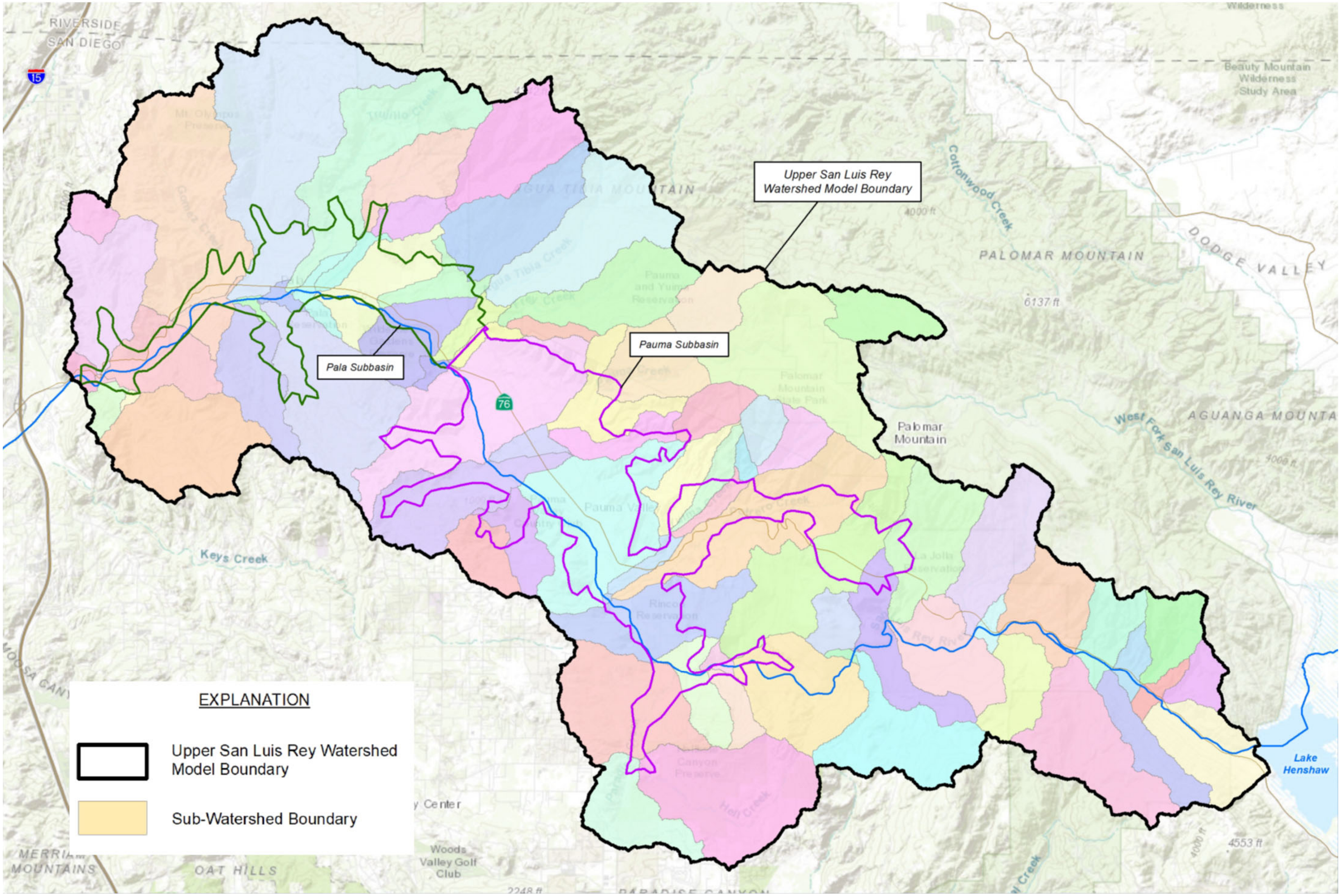
Projected Water Budget

- **Development of model scenario(s) considering:**
  - Long-term water supply planning
  - Future projects and management actions
  - Effects of climate change

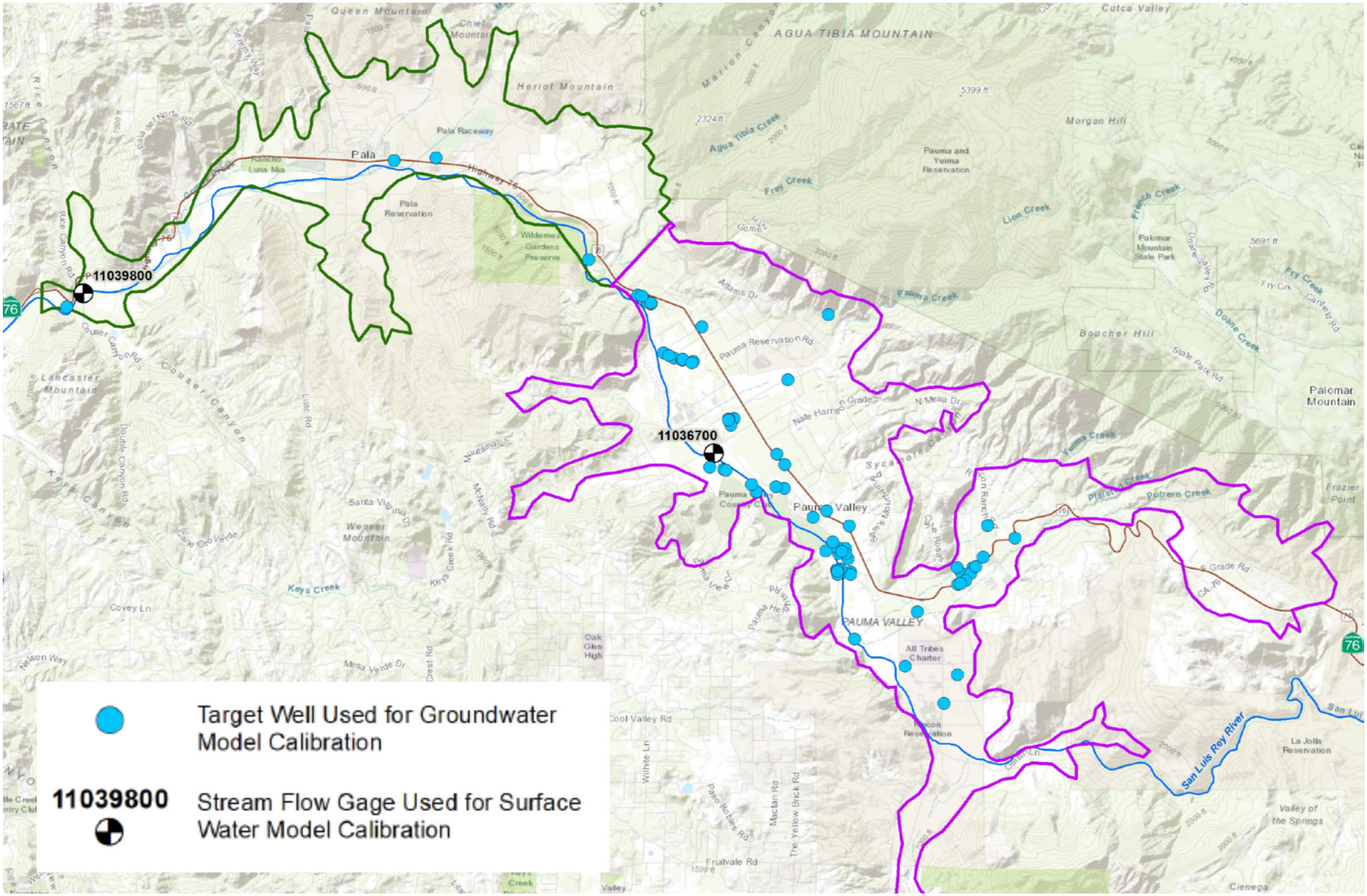
Upper San Luis Rey Model



Upper San Luis Rey Surface Water Model



Model Calibration



Groundwater Inflows

Term	Approach
Recharge from Mountain Front Runoff	Surface water **model-calculated** based on observed precipitation, potential ET, soil type, land use, topography/slope, etc.
Areal Recharge from Precipitation	Surface water **model-calculated** based on observed precipitation, potential ET, soil type, land use, topography/slope, etc.
Streambed Percolation	Groundwater **model-calculated** based on simulated groundwater levels and surface water-calculated runoff/flow.
Return Flow from Applied Water	**Estimated** using values from previous studies.
Recycled Water Spreading	Based on **historical records**.

Groundwater Outflows

Term	Approach
Groundwater Pumping	Based on **historical pumping** (where available), **or estimated** based on land use, crop type (from DWR crop mapping), and water demand estimates (from County Department of Planning and Land Use).
Rising Water Discharge to Surface Water	Groundwater **model-calculated** based on simulated groundwater elevation and streambed elevation.
Subsurface Outflow	Groundwater **model-calculated** based on simulated groundwater elevations.
Evapotranspiration	Groundwater **model-calculated** based on simulated groundwater elevations, rooting depths, and consumptive use estimates from previous studies.

Model Status

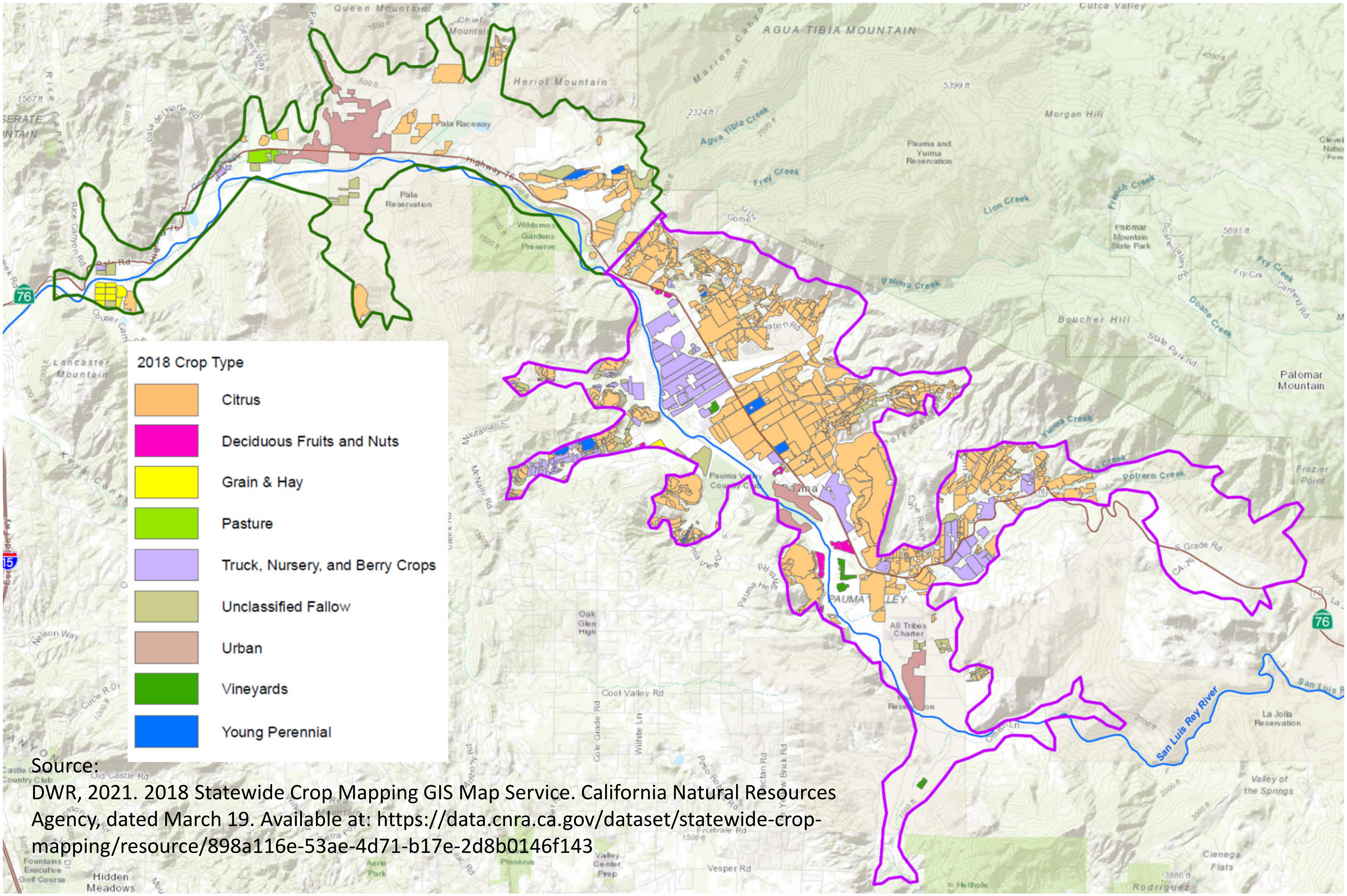
- **Surface Water Model**
  - Physical model constructed (subwatershed areas, hydrologic parameters, etc.)
  - Calibration of water balance and gaging stations complete
  - Surface water model output transfer for groundwater model input complete (recharge from mountain front runoff, precipitation, streamflow, tributary percolation)
  - QA/QC complete
- **Groundwater Model**
  - Physical model constructed (model boundaries, layers, initial aquifer parameters, etc.)
  - Pumping, water level, and other flux data (spreading, return flow) compiled, Well Package, Recharge Package, and Target Well files developed
  - Setting up ET Package based on Helix mapping
  - Currently working on Steady State calibration (1991) for establishment of initial groundwater elevations.
  - Next steps: Transient calibration (1991-2020), QA/QC, model documentation

Sustainable Yield (Preliminary Estimate)

- **The maximum quantity of water, calculated over a base period representative of long-term conditions in the basin… that can be withdrawn annually from a groundwater supply without causing an undesirable result.**

Sustainable Yield = Pumping +/- Change in Storage

Example Crop Type Mapping (2018)



Source:
DWR, 2021. 2018 Statewide Crop Mapping GIS Map Service. California Natural Resources Agency, dated March 19. Available at: https://data.cnra.ca.gov/dataset/statewide-crop-mapping/resource/898a116e-53ae-4d71-b17e-2d8b0146f143

Estimated Agricultural Water Demand

Agricultural Water Demand Categories	Crop Type	1998	1999	2000	2001	4-Year Avg.
Field Crops Category 1	Alfalfa	3.6	3.9	5.1	4.6	4.3
	Pasture	3.2	3.6	4.7	4.1	3.9
			Average Applied Water Demand (af-acre)			**4.1**
Field Crops Category 2	Grain	0.4	1.6	1.6	1.1	1.2
	Other Field Crops (sudan hay, grain sorghum and sunflowers)	0.9	1.5	1.5	1.4	1.3
	Dry Beans	1.1	1.4	1.5	1.5	1.4
			Average Applied Water Demand (af-acre)			**1.3**
Orchards and Vineyards Category 1	Almonds and Pistachios	3.2	3.6	3.7	3.5	3.5
	Subtropicals (citrus, avocados)	2.8	3.5	3.5	3.2	3.2
	Other Deciduous (apples, prunes, figs, and walnuts, etc.)	3.0	3.5	3.6	3.2	3.3
			Average Applied Water Demand (af-acre)			**3.4**
Orchards and Vineyards Category 2	Vineyards	0.8	1.4	1.4	1.1	1.2
			Average Applied Water Demand (af-acre)			**1.2**
Truck Crops	Corn	1.5	2.2	2.2	1.9	1.9
	Tomatoes (for processing)	1.5	2.3	2.3	2.0	2.0
	Tomatoes (for fresh use)	1.9	2.3	2.0	1.9	2.0
	Cucumbers	0.7	1.3	1.4	1.2	1.2
	Onions and Garlic	2.5	1.8	2.0	1.4	1.9
	Potatoes	2.5	2.7	2.8	2.8	2.7
	Other Truck Crops (nurseries, greenhouses, Christmas tree farms, etc.)	1.9	2.2	2.2	2.1	2.1
			Average Applied Water Demand (af-acre)			**2.0**

Note: Applied water demand data was obtained from the California Department of Water Resources - Land and Water Use Section (DWR). The numbers above reflect estimated average applied water demands for coastal and inland agricultural lands of San Diego County mapped by DWR in 1998. DWR agricultural land use data was developed in 1998 using aerial photography and extensive field visits

af-acre - acre-feet of groundwater applied per acre

Source: County, 2010. County of San Diego Department of Planning and Land Use: General Plan Update, Groundwater Study. Dated April.

Groundwater Pumping (Preliminary Estimate)

- Reported pumping based on historical records, where available.

= 8,000 acre-ft/yr

- Unreported pumping was estimated to be water use not met by reported pumping, based on land use and crop type/coverage through time obtained from DWR and County Department of Planning and Land Use water demand estimates.

= 10,000 acre-ft/yr

TOTAL PUMPING = 18,000 acre-ft/yr (1991 – 2020)

Sustainable Yield (Preliminary Estimate)

Sustainable Yield = Pumping +/- Change in Storage

Historical Period (1991 – 2020)

Groundwater Pumping	Change in Storage	Sustainable Yield
18,000 acre-ft/yr	-2,000 acre-ft/yr	16,000 acre-ft/yr

Final estimate of sustainable yield will be based on the comprehensive water budget from the calibrated surface water/groundwater model

Quantification of Overdraft (Preliminary)

Period		Groundwater Pumping	Sustainable Yield (Est.)
Historical	1991 - 2020	18,000 acre-ft	16,000 acre-ft/yr
Current	2016 - 2020	16,000 acre-ft	-

Final evaluation of overdraft will be based on the comprehensive water budget from the calibrated surface water/groundwater model

NEXT: Sustainable Management Criteria Chapter

Sustainability has specific meanings in SGMA

SUSTAINABILITY INDICATOR	CHRONIC LOWERING OF GROUNDWATER LEVELS	REDUCTION OF GROUNDWATER STORAGE	SEAWATER INTRUSION	WATER QUALITY DEGRADATION	LAND SUBSIDENCE	INTER-CONNECTED SURFACE WATER DEPLETIONS
METRIC(S) USED	Groundwater Elevation	Total Volume	Chloride Concentration Isocontour	- Migration Plumes - # of Supply Wells - Volume - Location of Isocontour	Rate and extent of land subsidence	Volume or rate of surface water depletion

NEXT: Sustainable Management Criteria Chapter

Goal

- Present measurable objectives and sustainability indicators for the basin and describe proposed sustainability actions.

Contents

- Description of Sustainability Goal (based on Basin Setting information)
- Measurable Objectives for each Sustainability Indicator
- Minimum Thresholds
- Undesirable Results

Upper San Luis Rey GSP Schedule

Winter 2018/2019	Summer – Winter 2020	Spring 2021	Summer 2021	Fall 2021	Winter 2021/2022
Notice of Intent to Develop GSP	Data Collection	Plan Area & Basin Setting	Sustainable Management Criteria	Projects & Management Actions GSP Implementation	Notice of Proposed GSP Adoption **Public Review of Draft GSP**
		Stakeholder Meeting	**Stakeholder Meeting**	**Stakeholder Meeting**	**Public Hearing to Adopt GSP**

Ongoing Community Outreach →

Stakeholder Meetings

Meeting Date	Draft Chapter
January 27, 2021	First Stakeholder Workshop
March 24, 2021	Plan Area
June 16, 2021	Basin Setting (Water Budget)
August (TBD)	Sustainable Management Criteria
Sept 2021 (TBD)	Projects and Management Actions
Sept/Oct 2021 (TBD)	Plan Implementation
Nov 2021 (TBD)	Public Review of Draft GSP (Public Hearing to Adopt GSP)

Questions

Please feel free to contact us!

Geoscience Support Services, Inc.

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