
GWA
EASTERN SAN JOAQUIN
GROUNDWATER AUTHORITY
GWA Advisory Committee
July 11, 2018

Agenda

EASTERN SAN JOAQUIN GROUNDWATER AUTHORITY

- Minimum Thresholds
- Projected Water Budget (Update on Assumptions)
- Hydrogeologic Conceptual Model Discussion
- Water Accounting Framework Approach
- August Agenda Items

Minimum Thresholds

Minimum Thresholds are Set for Each Sustainability Indicator

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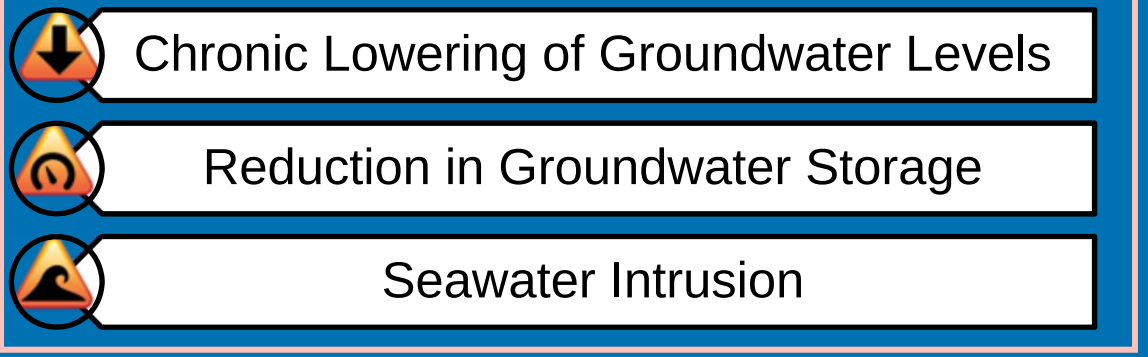
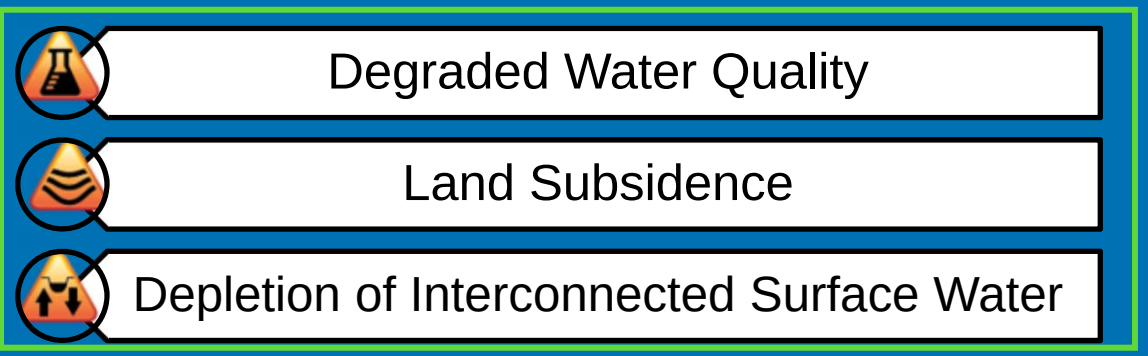


Updates from last time



New this time

Setting Minimum Thresholds: What do we want to strive for as a basin?

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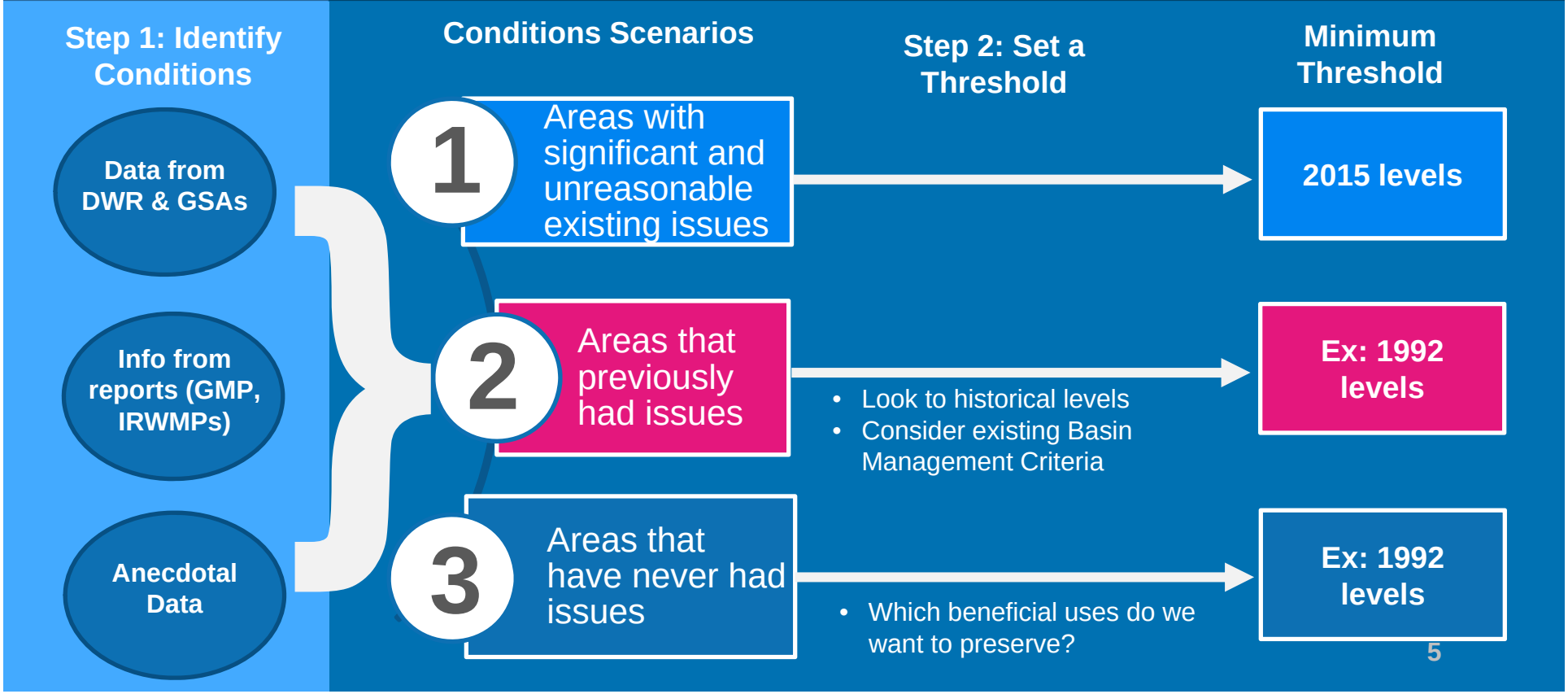

Minimum Thresholds for Sustainability Indicators

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Review

- Chronic Lowering of Groundwater Levels
- Reduction in Groundwater Storage
- Seawater Intrusion
- Degraded Water Quality
- Land Subsidence
- Depletion of Interconnected Surface Water

Some Areas Have Already Declined Below 1992 Levels

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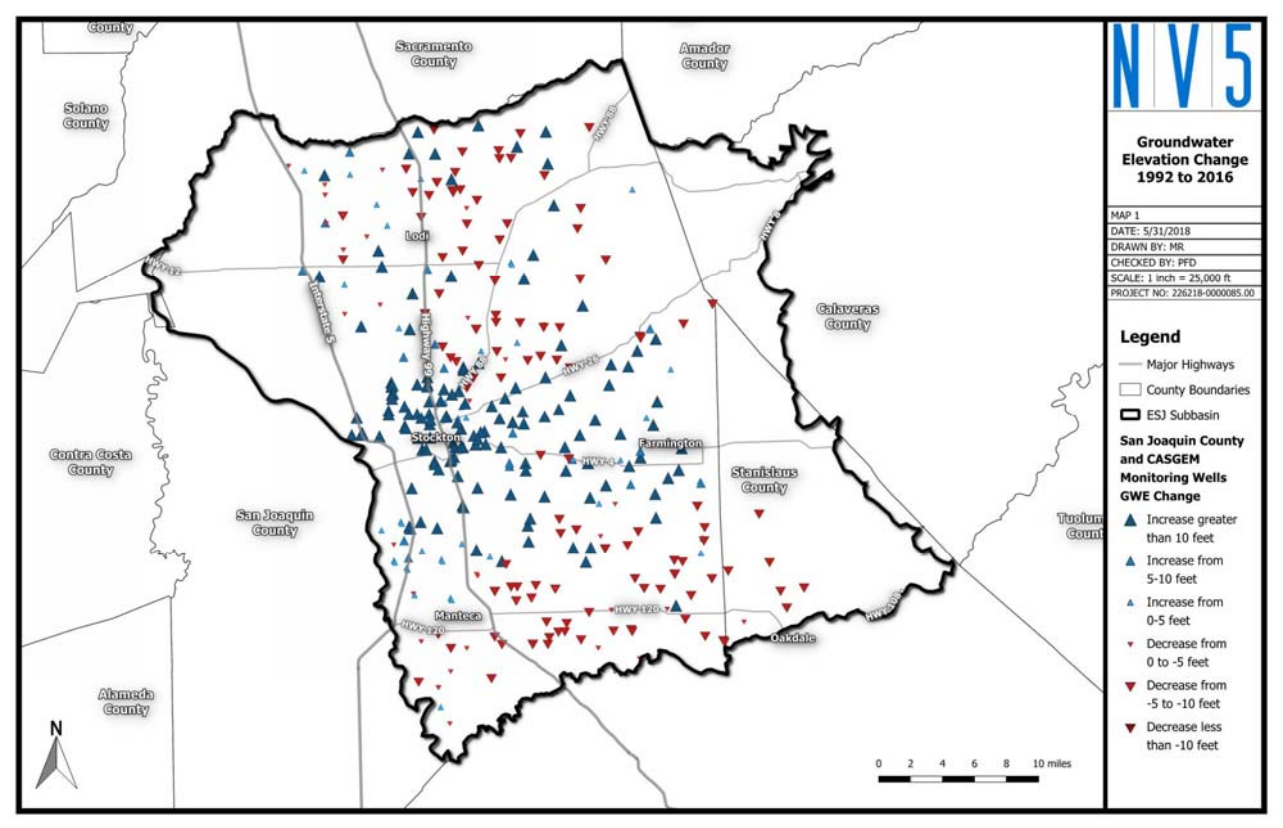
(red) – Areas that have declined since 1992

(blue) – Areas that have recovered since 1992



We Can Set a Threshold at the Lower of the Two

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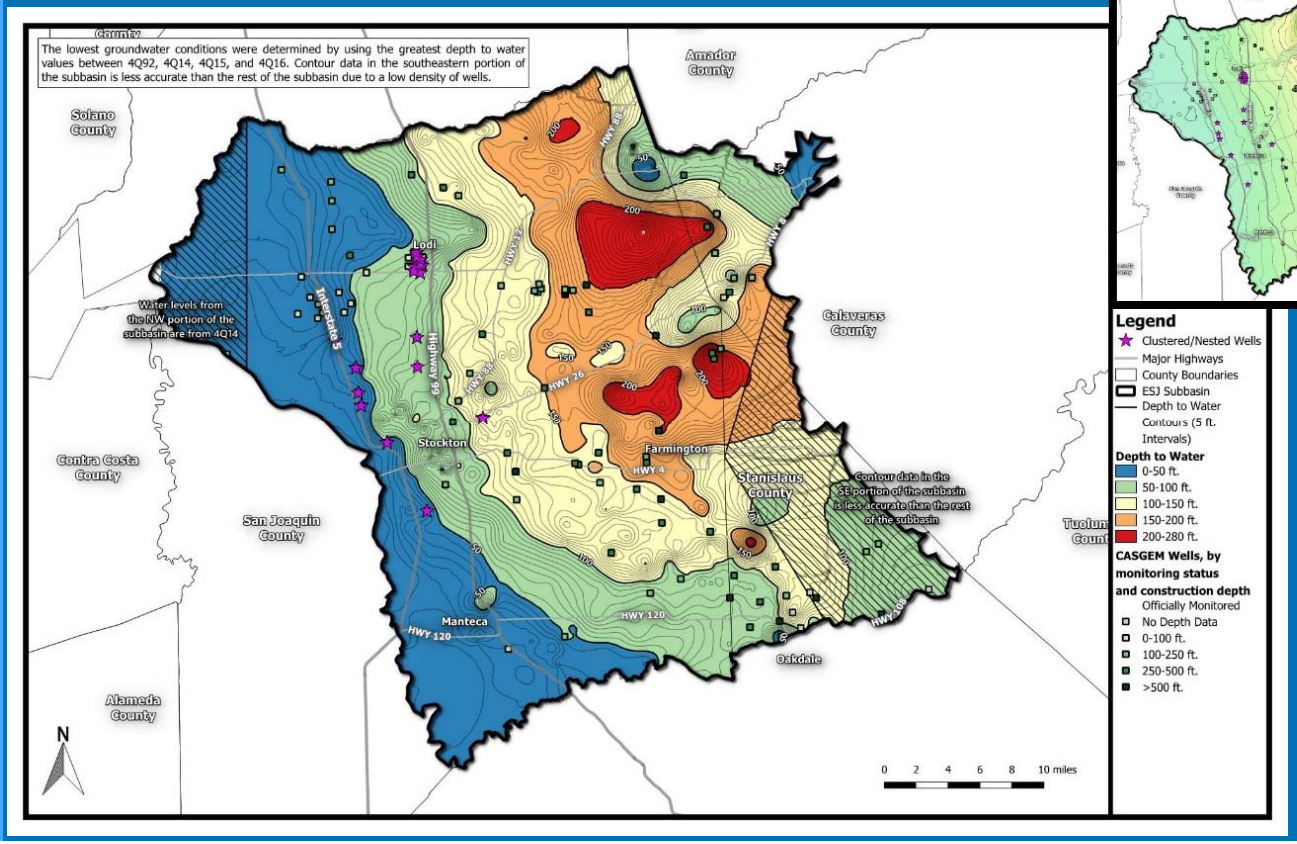
Lowest Lows between 1992 and 2015-16

Shown as Depth to Water



Putting this Threshold into Context

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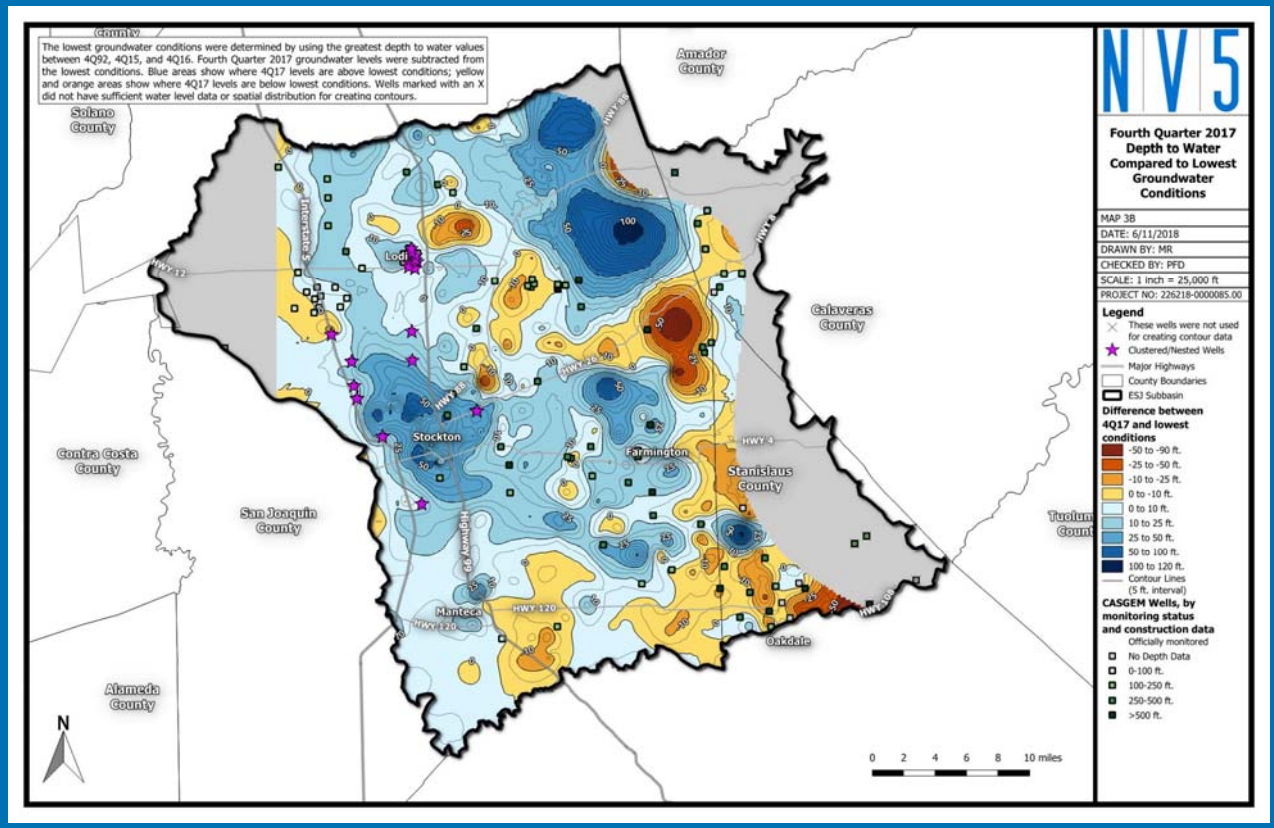
Difference between current levels and the proposed threshold

Shown as Depth to Water



Status Update

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- Reviewing data with GSAs individually to understand where UR's may be occurring, or have occurred in the past
- Reality-checking data based on local knowledge
- Identifying areas where an alternative methodology may be required and / or additional data is needed

Additional Steps: Reviewing GDE Groundwater Needs

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- Starting with data from The Nature Conservancy and ground-truthing to eliminate obvious non-GDE areas
- Reaching out to Department of Fish and Wildlife to prioritize areas with highest ecological value

Minimum Thresholds for Sustainability Indicators

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Reduction in Groundwater Storage

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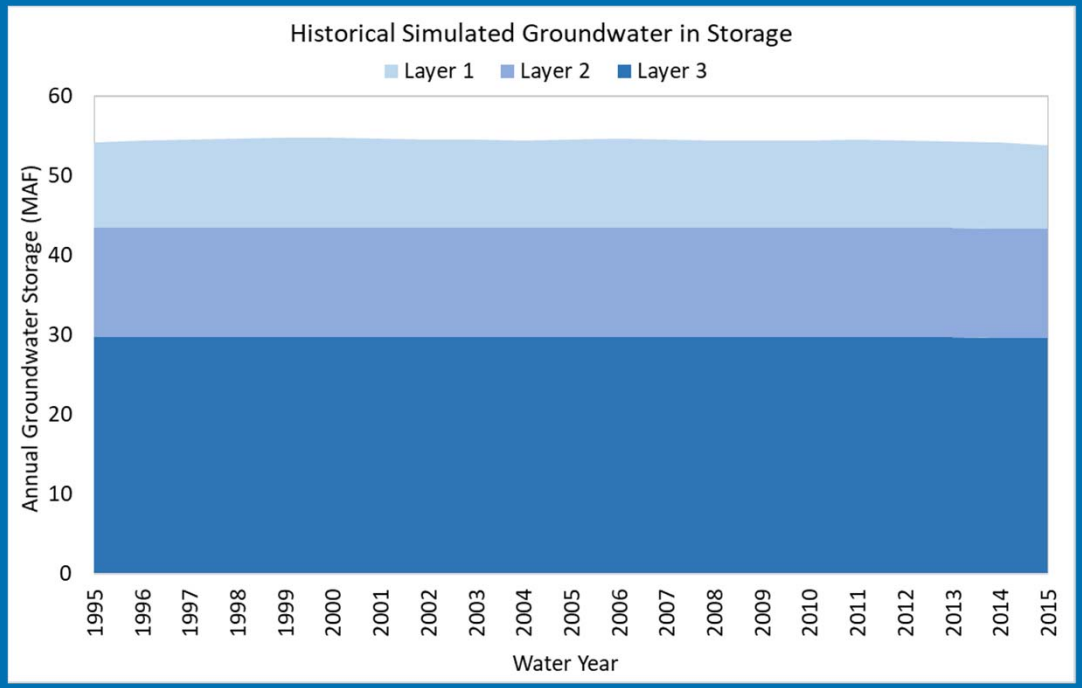
This Sustainability Indicator is not a concern for the Subbasin



Minimum Thresholds for Sustainability Indicators

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- Chronic Lowering of Groundwater Levels
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Seawater Intrusion

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This Sustainability Indicator is not a concern for the Subbasin

- Direct seawater intrusion does not occur in the Subbasin and thresholds do not need to be addressed; salinity will be addressed via the Water Quality Sustainability Indicator

Minimum Thresholds for Sustainability Indicators

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Salinity Data Sources

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Studies / Agencies with Salinity Data for ESJ:

USGS

- 2 studies (2005-6 & 2015)
- Compilation of existing data and data from field tests
- Focused on chloride concentrations
- Data specific to ESJ subbasin
- John Izbicki primary author for both studies

CV Salts

- Compilation of existing state (i.e GeoTracker, USGS, etc.)
- Focused on TDS & nitrate concentrations
- Data for entire Central Valley
- Luhdorff & Scalmanini and Larry Walker Associates compiled & analyzed statewide data in 2016

ILRP

Irrigated Lands Regulatory Program

- Focused on concentrations of pesticides, toxicity, nutrients (including TDS + nitrates) in surface & groundwater
- Growers biannually sample & submit data for irrigation and domestic wells (began in 2017)
- San Joaquin County and Delta Water Quality Coalition Groundwater Quality Assessment Report, Hydrofocus, 2015

USGS Studies (2005-6 & 2015)

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Data:

- From existing USGS wells, DWR wells, and new monitoring wells installed for study
- Historical data (1984+) through 2012
- Measured chloride concentrations in groundwater

Results:

- Delineated vertical & horizontal extent of chloride
- Determined high-chloride water enters from both shallow and deep depths
- 3 main sources of chloride: deep sediments, delta sediments & irrigation evaporation

Source: Izbicki, et al. 2006

Chloride Concentrations in Groundwater 1984 - 2004

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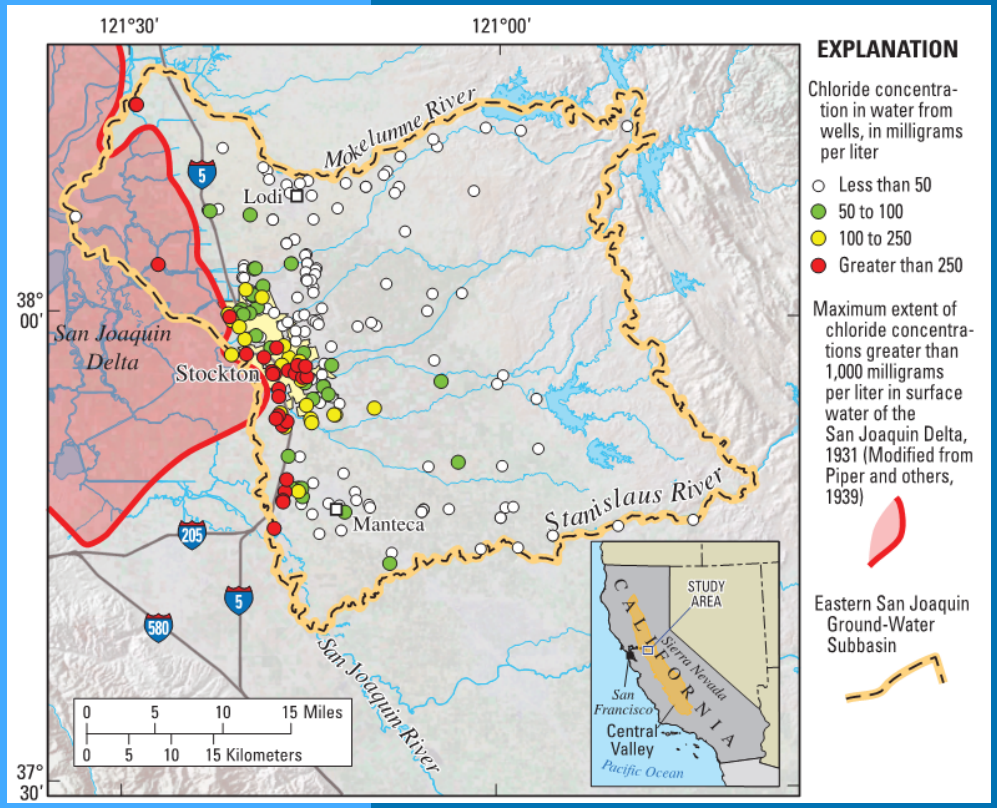

Highest chloride concentrations found near Stockton (concentrations > 250 mg/L)

Source: O'Leary, Izbicki, and Metzger, 2015

CV SALTS

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Focused on nitrates and total dissolved solids (TDS) across the Central Valley

Data Sources – Groundwater Quality from:

- Geotracker Groundwater Ambient Monitoring and Assessment (GAMA) program
- USGS National Water Information System (NWIS)
- California Department of Public Health
- California Department of Water Resources
- Central Valley Water Board Waste Discharge Requirement (WDR) Dairy Data

Data from 2,528 wells within the Eastern San Joaquin initial assessment zones*

*Extends outside the subbasin boundary

Initial Assessment Zones (IAZs)

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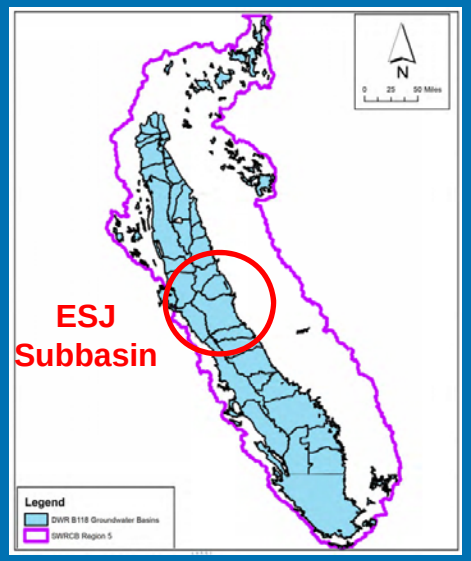
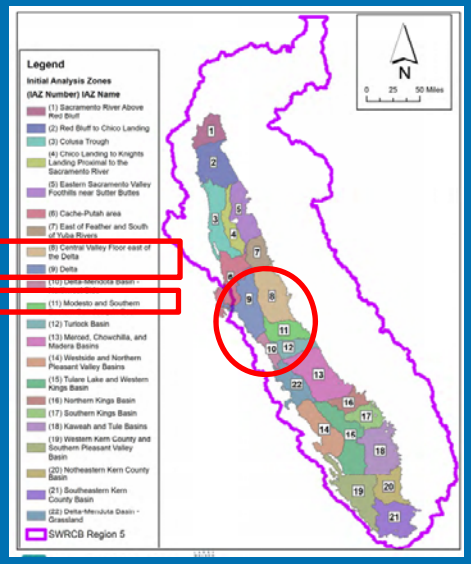
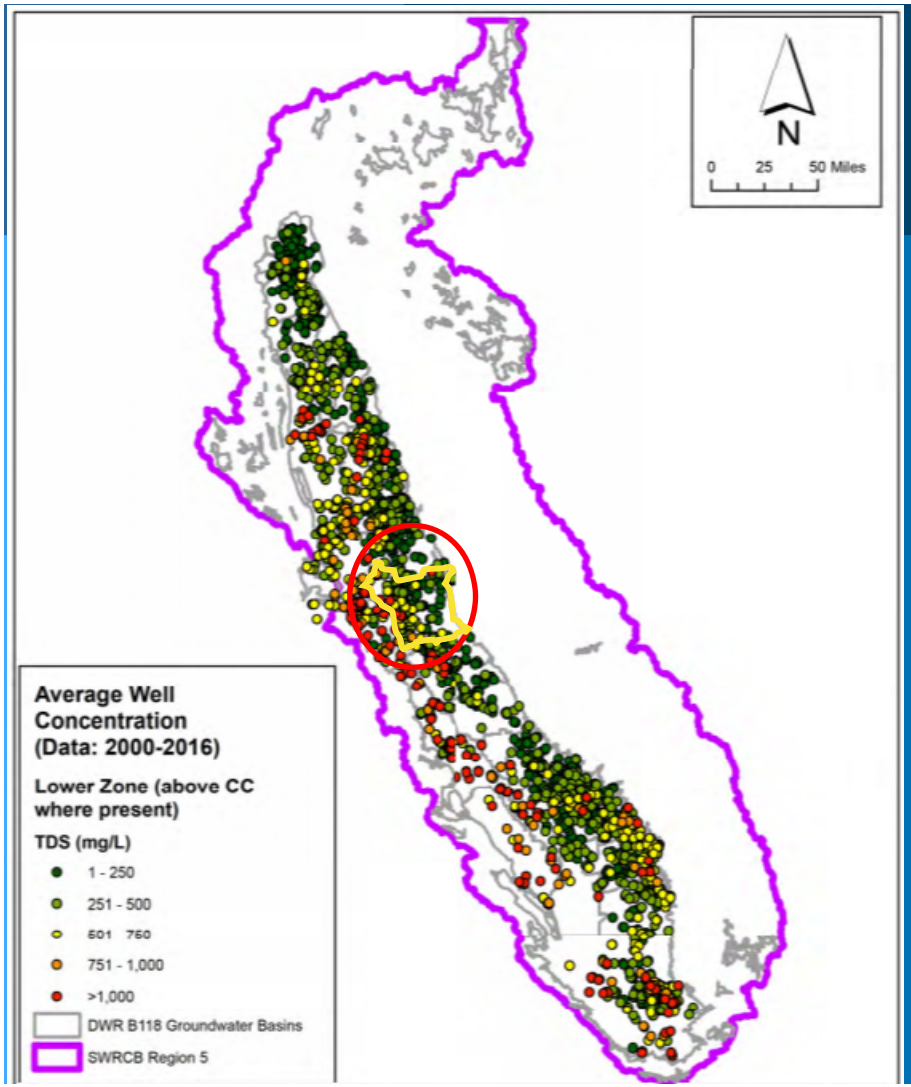
ESJ located within 3 IAZs: Zones #8, #9 & #11

IAZs:

- 22 hydrologically-based areas of analysis (used for the conceptual model)







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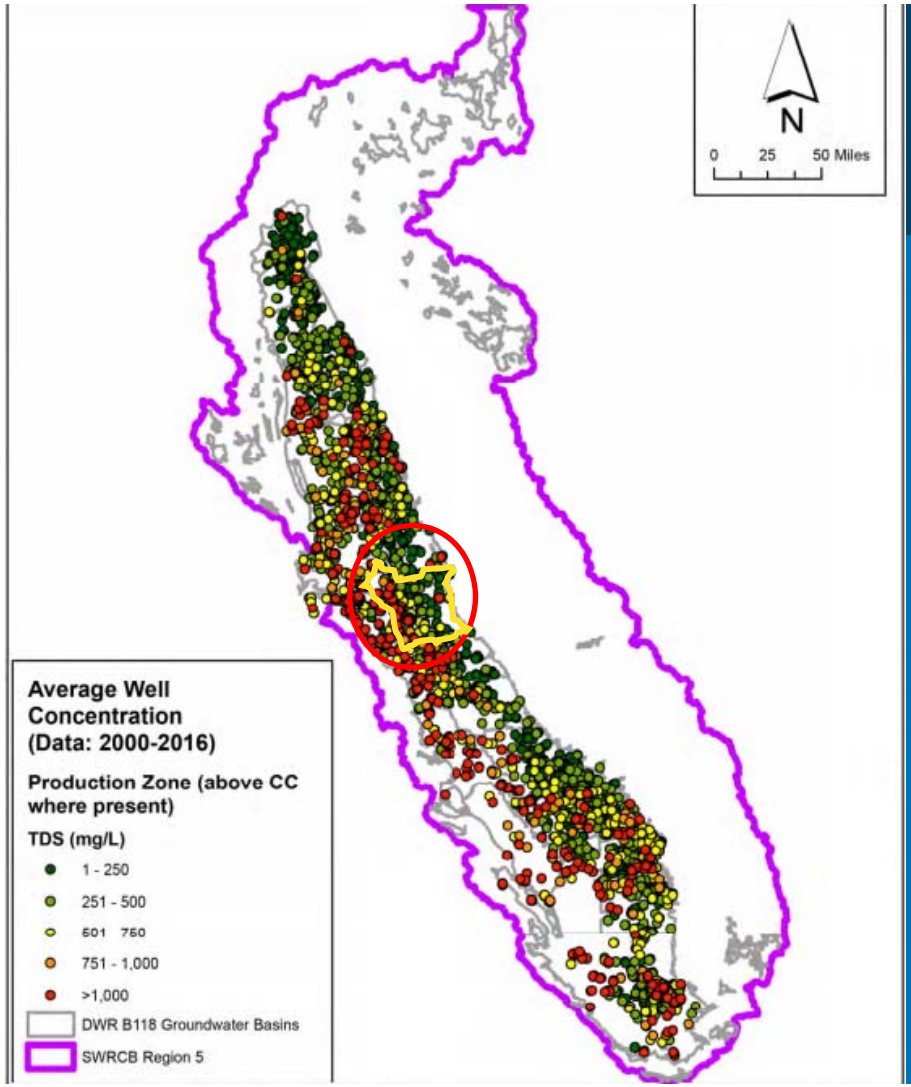
Average TDS Concentration (2000 – 2016)

Highest TDS concentrations found in the west

Source: Luhdorff & Scalmanni and Larry Walker, 2016



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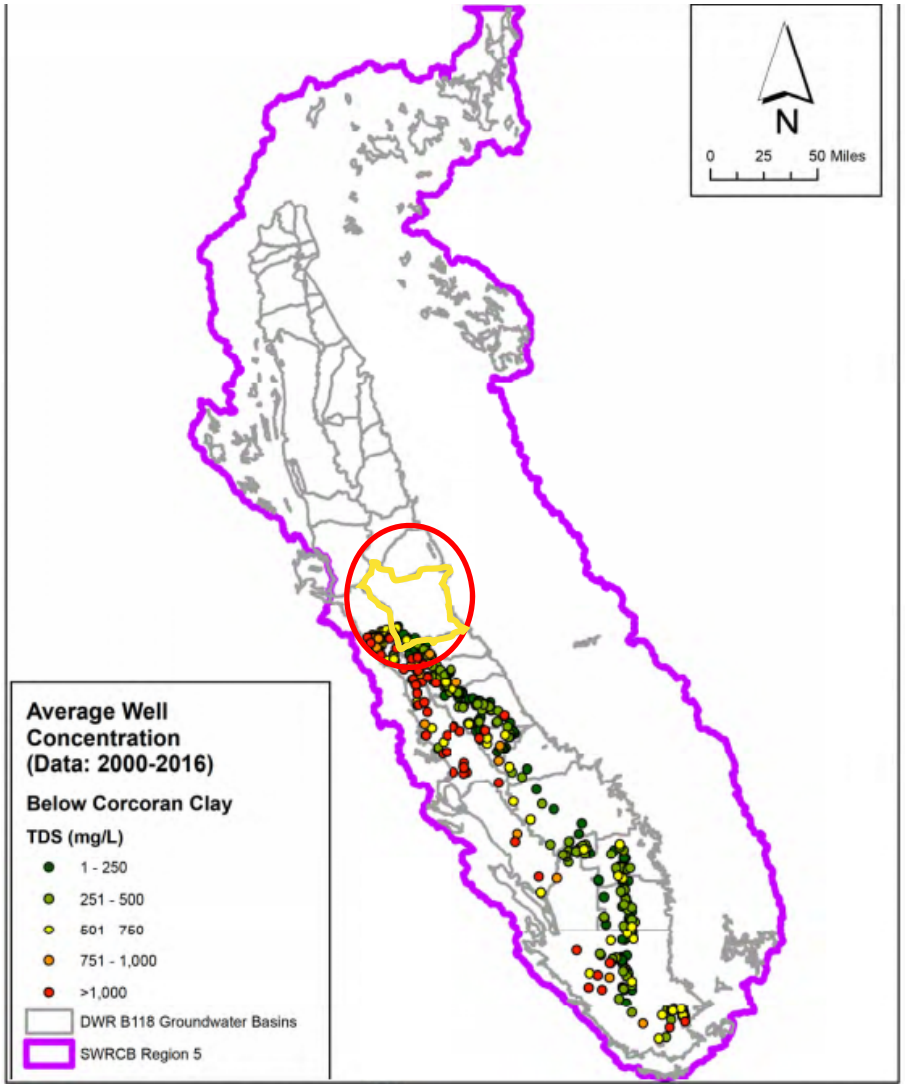
Average TDS Concentration ABOVE Corcoran Clay (2000 – 2016)

Highest TDS concentrations found in the west

Source: Luhdorff & Scalmanni and Larry Walker, 2016



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Average TDS Concentration BELOW Corcoran Clay (2000 – 2016)

TDS concentrations
< 501 mg/L

Source: Luhdorff & Scalmanni and Larry Walker, 2016

TDS Concentrations Statistics for the ESJ Subbasin

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DWR B118 Groundwater Basin Code	Aquifer Zone	Average Well TDS Concentration Statistics				
		Number of Wells	Minimum	Average	Median	Maximum
5-21.64	Upper and Lower Zone	103	80	249	231	667
	Lower Zone	239	58	256	234	691
	Below Production Zone	5	175	372	333	678
	Unknown	20	106	268	260	449
5-21.65	Upper Zone	175	76	646	405	27,276
	Upper and Lower Zone	88	77	217	179	670
	Lower Zone	149	80	211	172	867
	Below Production Zone	13	129	151	150	192
	Unknown	3	169	186	169	220
5-21.66	Upper Zone	169	164	1,868	765	56,500
	Upper and Lower Zone	24	138	394	385	954
	Lower Zone	94	54	508	425	1,600
	Below Production Zone	6	284	335	303	423
	Unknown	8	290	1,170	562	5,387
5-21.67	Upper Zone	194	100	1,488	1,050	6,657
	Upper and Lower Zone	17	262	528	461	1,510
	Lower Zone	87	110	539	543	1,510
	Below Production Zone	8	313	421	346	841
	Unknown	11	184	465	505	720
5-22.01	Upper Zone	451	74	2,418	740	178,909
	Upper and Lower Zone	175	83	335	292	1,230
	Lower Zone	232	35	304	249	1,911
	Below CC Zone	14	186	343	297	718
	Below Production Zone	6	132	1,045	594	3,406
	Unknown	41	92	308	214	957

Source: Luhdorff & Scalmanni and Larry Walker, 2016

Sources of High-Chloride Water

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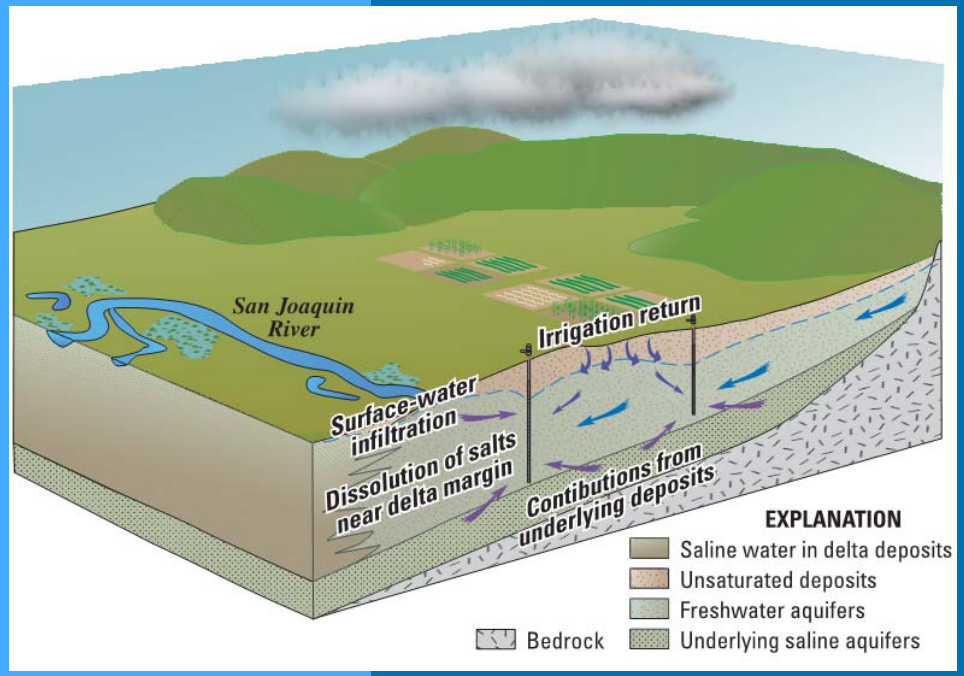

3 Primary Sources :

1. High-Chloride Water from San Joaquin Delta Sediments (50% of wells in study)
2. High-Chloride Water from Deep Deposits (50% of wells in study)
3. Irrigation Return Water (16% of wells in study)

Source: Izbicki, et al. 2006

Potential Management Area – Allow for Different level of Monitoring of Salinity in the Area

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OPTIONS

- Set contour line
- Select # of wells to not exceed a WQ threshold

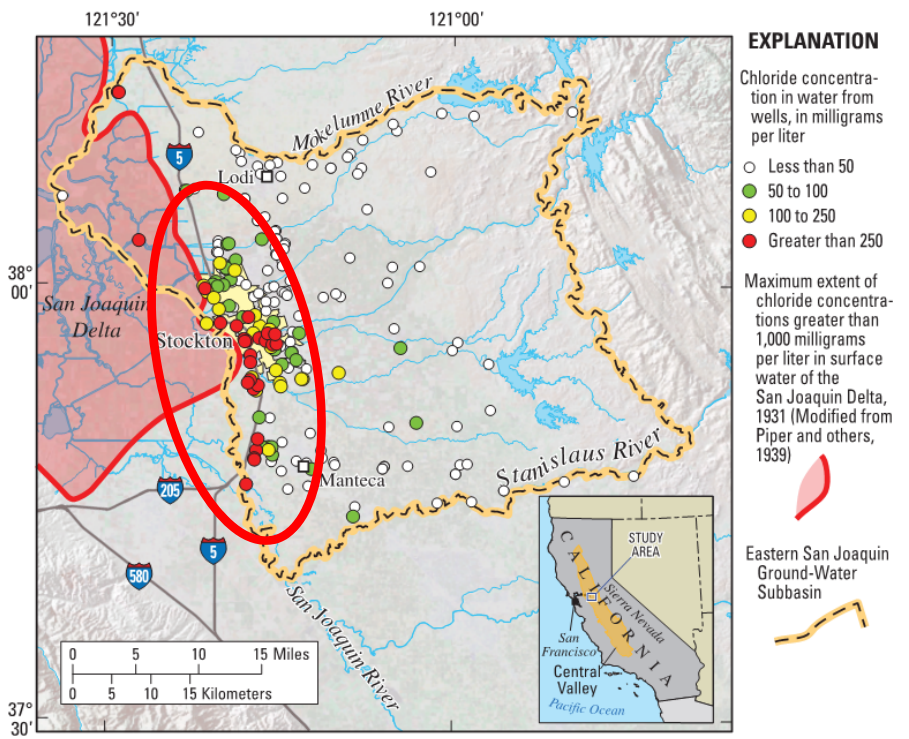

Figure 1. Chloride concentrations in water from wells in the Eastern San Joaquin Ground-Water Subbasin, California, 1984–2004.

Water Quality Thresholds

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1. Recognize existing management and regulatory programs
   - CVSALTs - SNMP for Central Valley includes proposed actions for salinity and nutrients
   - ILRP
   - Plumes (Cal/Federal EPA, Regional Board, DTSC)

2. Limit to nexus with management activities
   - Threat of upconing of deeper, saline water → covered under groundwater level thresholds
   - Control quality of recharge water

Minimum Thresholds for Sustainability Indicators

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- Chronic Lowering of Groundwater Levels
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- Land Subsidence
- Depletion of Interconnected Surface Water

Setting Minimum Threshold for Subsidence

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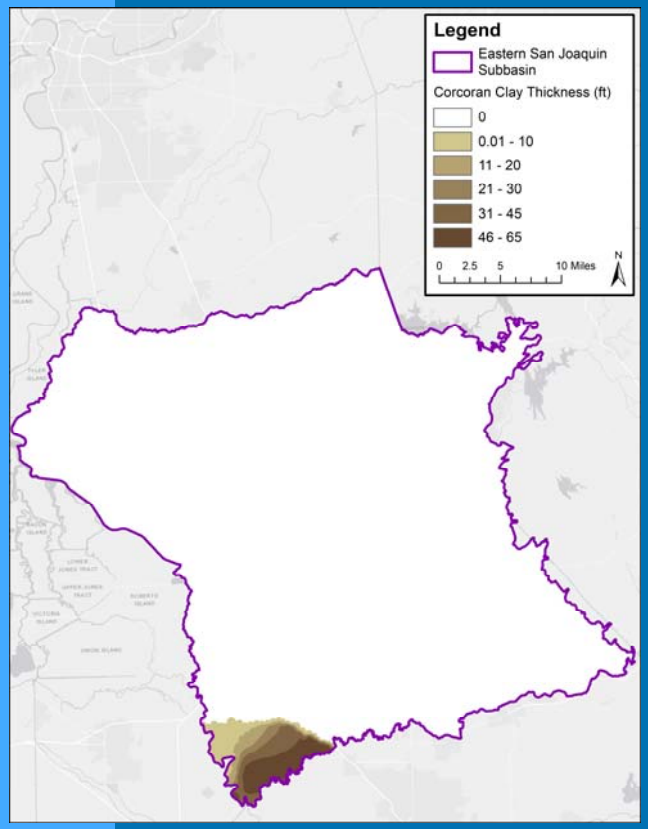
Data Source: USGS, by Page (1986), Central Valley Hydrogeologic Model



- Potential for subsidence in area with Corcoran Clay – none observed historically, extent is limited, groundwater elevations in this area are typically high (proximity to surface water)

Setting Minimum Threshold for Subsidence

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- No Undesirable Results relating to Subsidence have occurred in the past
- Minimum Thresholds for groundwater elevation (based on historical levels) are expected to be protective against subsidence

Minimum Thresholds for Sustainability Indicators

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- Chronic Lowering of Groundwater Levels
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Setting Minimum Thresholds for Depletion of Interconnected Surface Water

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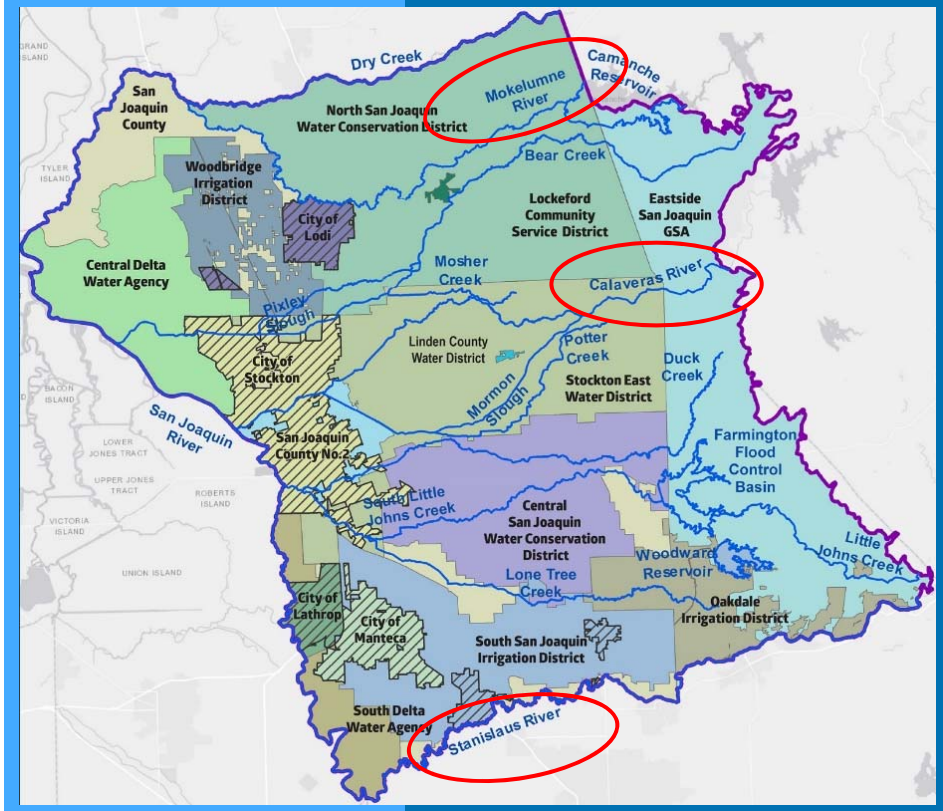

Major river systems in the Subbasin are highly managed. Instream flow requirements, water quality standards, and water rights govern upstream releases.

Potential Minimum Threshold Approach

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- Recognize existing management and regulatory programs in place
- Identify coordination and management activities that integrate with existing programs

Projected Water Budget (Update on Assumptions)

Projected Water Budget Assumptions Being Refined

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- Focus of GSA discussions:
  - Confirm supply and demand projections and sources, including future cropping patterns, riparian diversions, changing supplies, etc
  - Identify demands not currently captured
  - Confirm future supply projects, yield, and timing
- Next steps:
  - Wrap up initial calls
  - Make revisions and follow up where needed
  - Complete draft projected water budget model run

Hydrogeologic Conceptual Model (HCM)

HCM Development – Past Work

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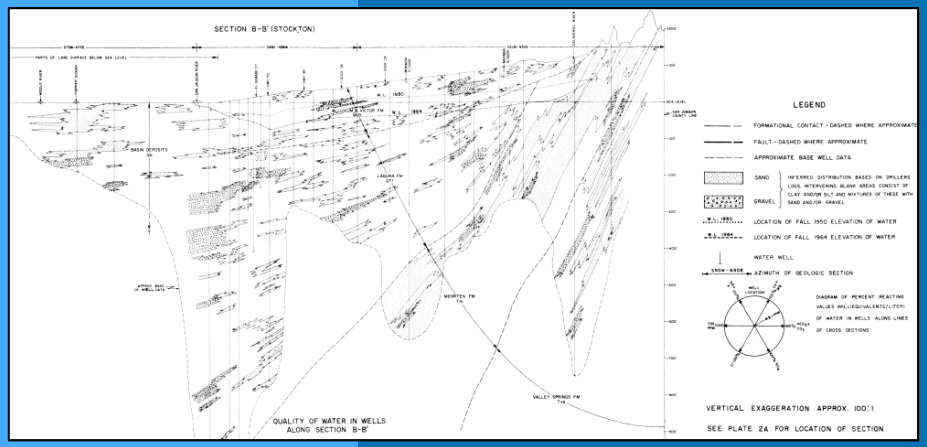
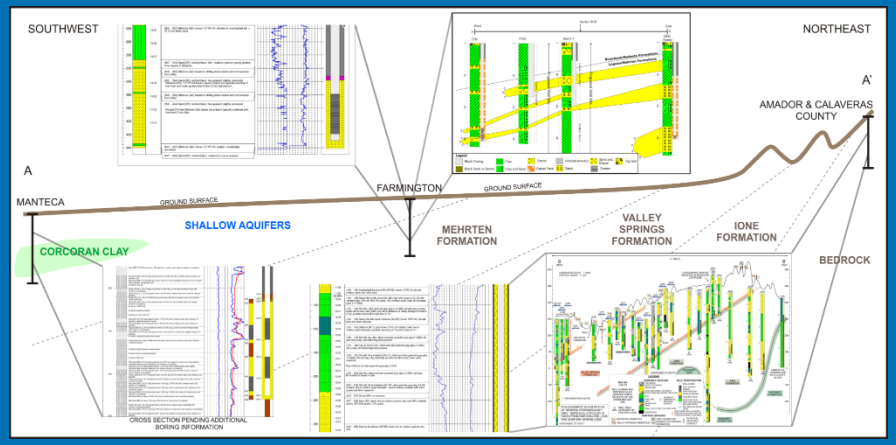
Existing basin-wide figures include:

1. DWR Cross Section from 1967
   - Basic schematic



2. NV5 Cross Section
   - Overview of well logs and cross sections done throughout the ESJ Subbasin



HCM Development – Basic Process

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The process of creating cross sections and other HCM figures comprises 3 basic steps.

Wells and Logs

- Obtaining well logs from various sources.
- Comparing spatial distribution of wells for usefulness in HCM.

Examining Data

- Documenting well log data, such as construction and lithological information.
- Organizing data for use in GIS software and DMS.

Figure Generation

- Producing cross sections and 3D figures of subsurface geology and groundwater conditions via GIS software.

Historical Groundwater Conditions

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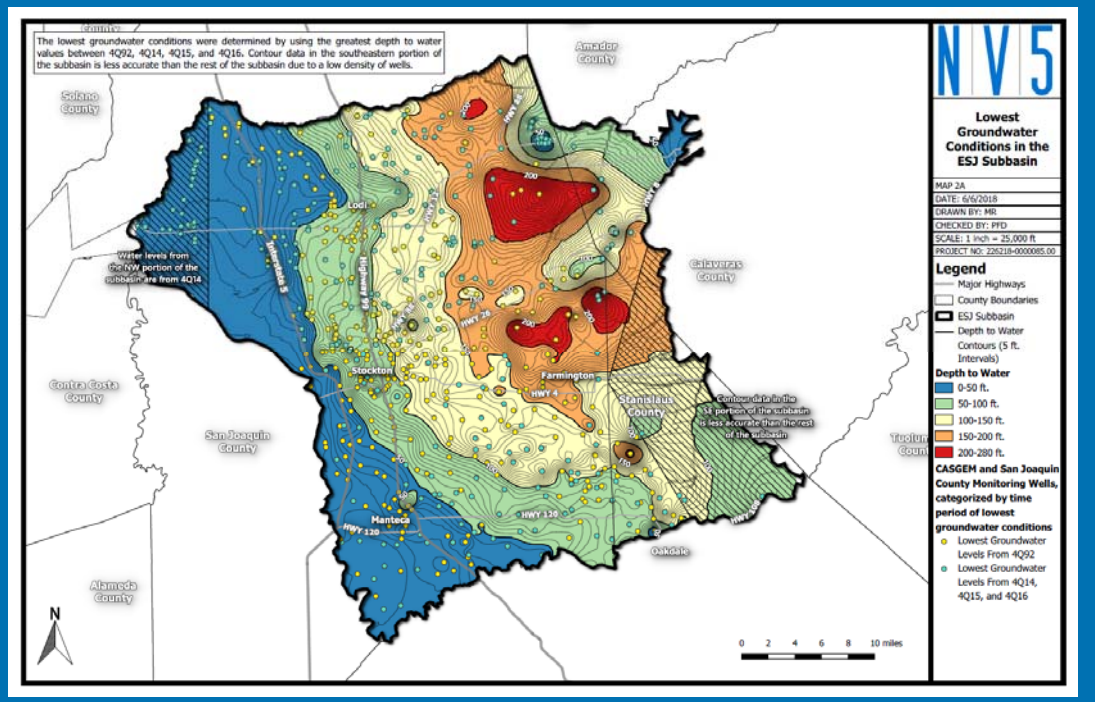
- Groundwater levels are documented for the various well datasets
- Gathering this information provides details such as minimum thresholds
- This data also allows for comparisons of current to past conditions.



HCM Development – Well Logs

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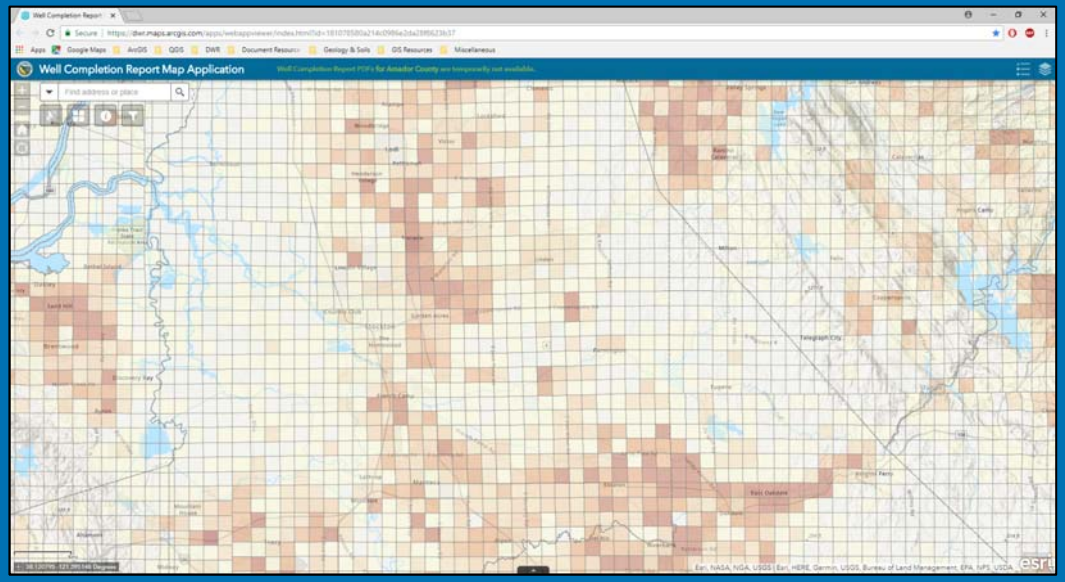
- Well as-builts, boring and geophysical logs are the primary sources for the stratigraphy at each well
- Most logs gathered for the HCM are located on DWR's Well Completion Report website
- Other well log sources included municipality records



HCM Development – Preliminary Cross Section

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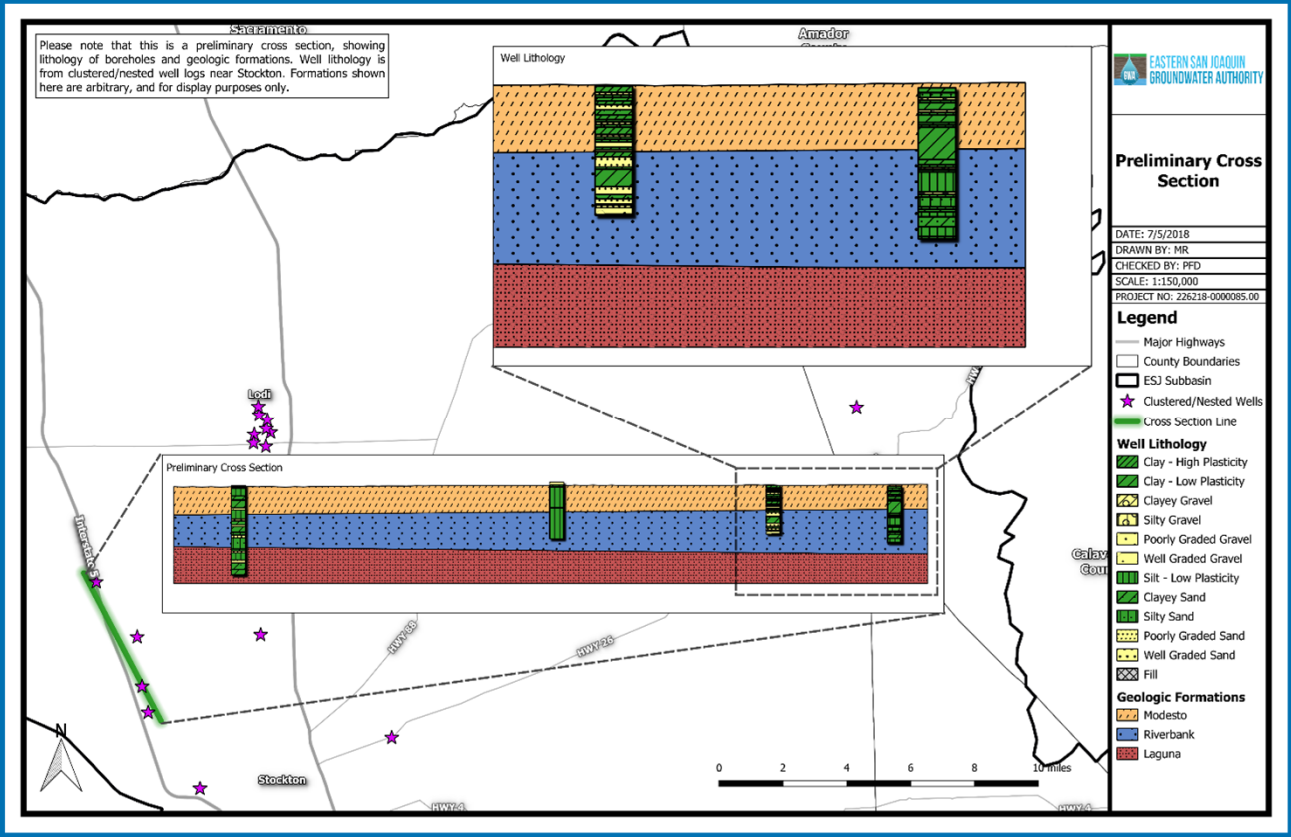
Pictured here is a preliminary cross section in the ESJ Subbasin, produced from documented well log data

Clustered or Nested wells are the primary focus, as these wells generally have the best information available



Water Accounting Framework Approach

The Water Accounting Framework Summarizes the Water Budget

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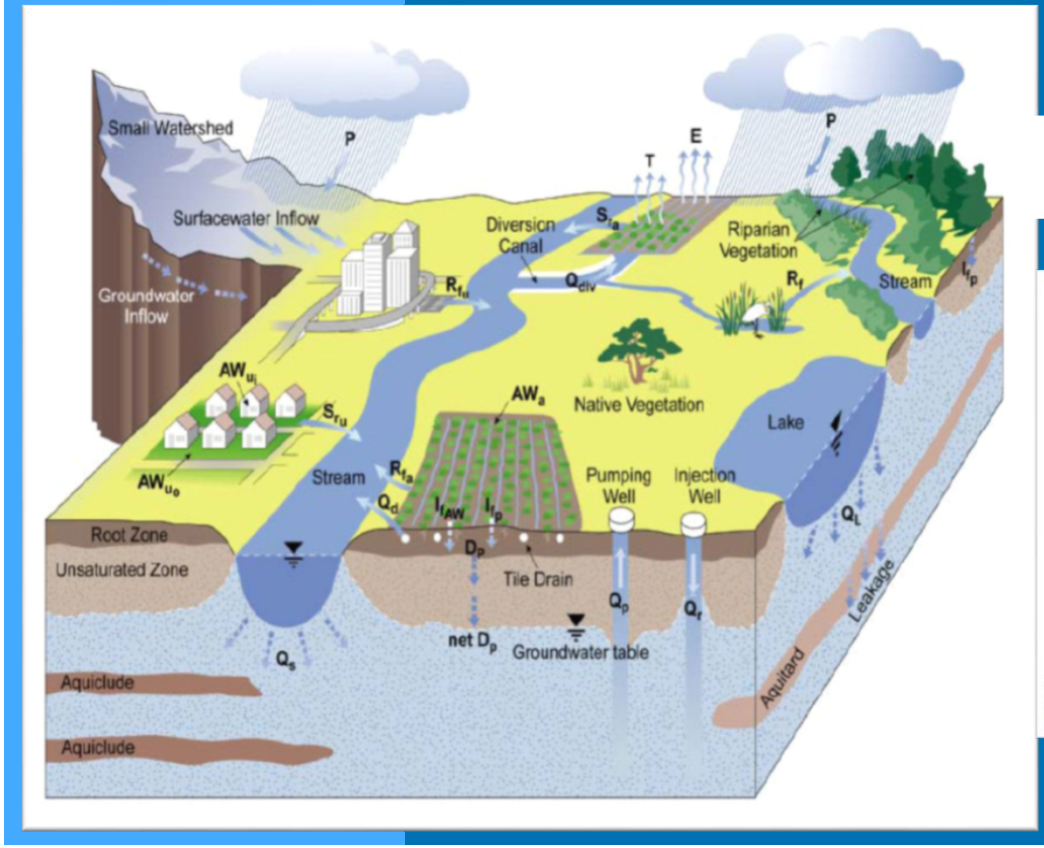
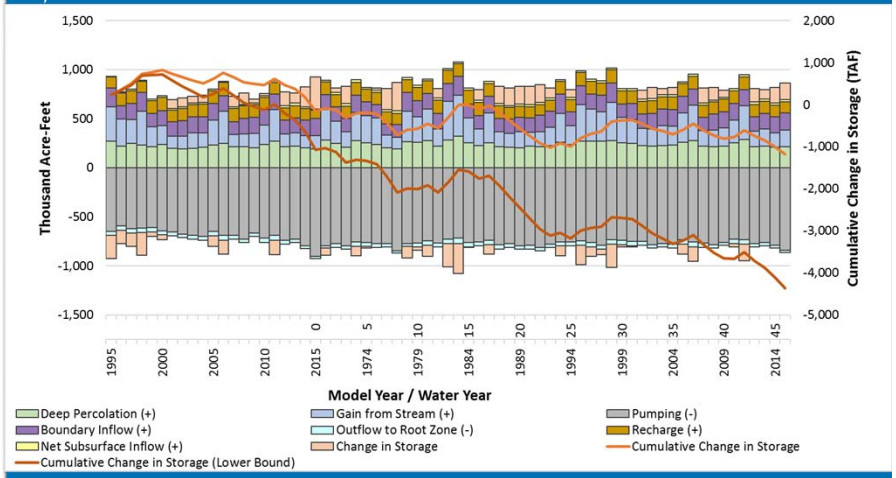


- Historical Water Budget
- Current Conditions Baseline
- Projected Water Budget



“Inputs and Outputs” Summarized at the Basin Scale

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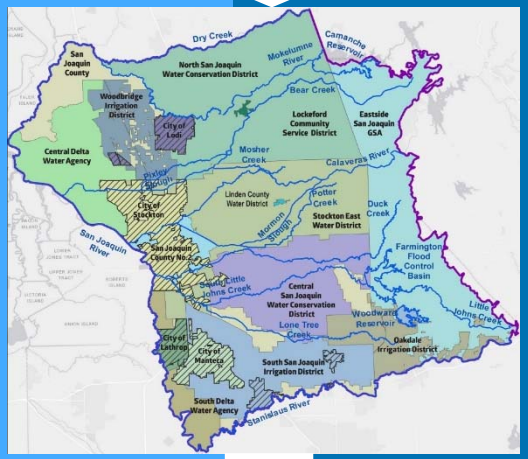
Basin Inputs



Basin Outputs

Projects and Actions

“Gap”

Sustainability


August Agenda Items

August Advisory Committee Topics

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- Minimum Thresholds
- Hydrogeologic Conceptual Model
- Projected Water Budget


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Extra Slides