Framework for a Salt and Nitrate Management Plan for the Central Valley

CV-SALTS Workshop

June 22, 2016

Presentation Outline

- CV-SALTS Overview
- Technical Foundation
  - Groundwater Water Quality
  - Nitrate Management (NIMS)
  - Salt Management (SSALTS)
- Implementation Framework
  - Permitting Strategies
- Recommended Policies to Support Framework
- Process to Finalize SNMP

Handouts

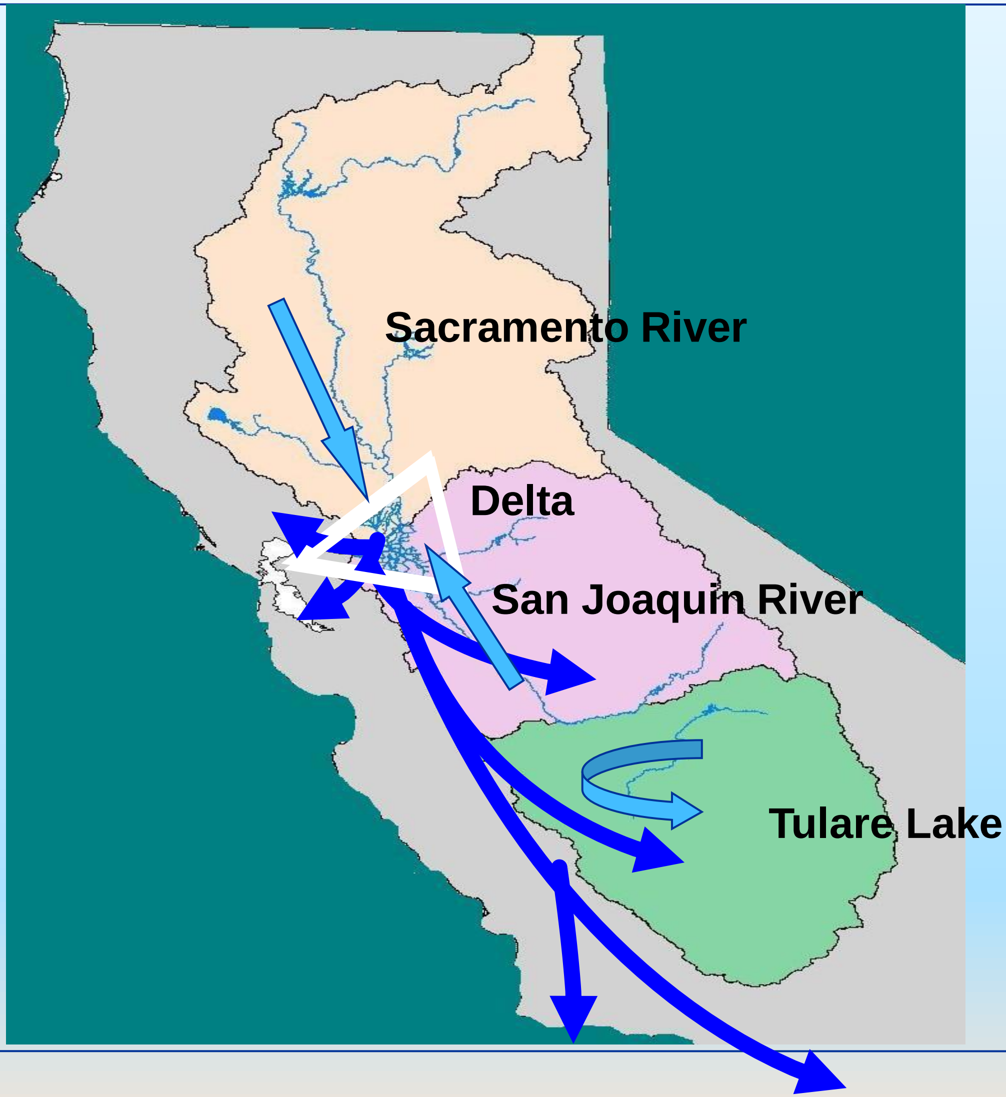
- Key Elements
- Flowchart/Timeline
- Glossary/Table GW Info
- Offset Examples

Overview

CV-SALTS is in the home stretch of a 10-year stakeholder effort

- State, Federal, local agencies, discharger community, EJ and DAC representatives
- Comprehensive Salt and Nitrate Management Plan
- Environmental and Economic Sustainability

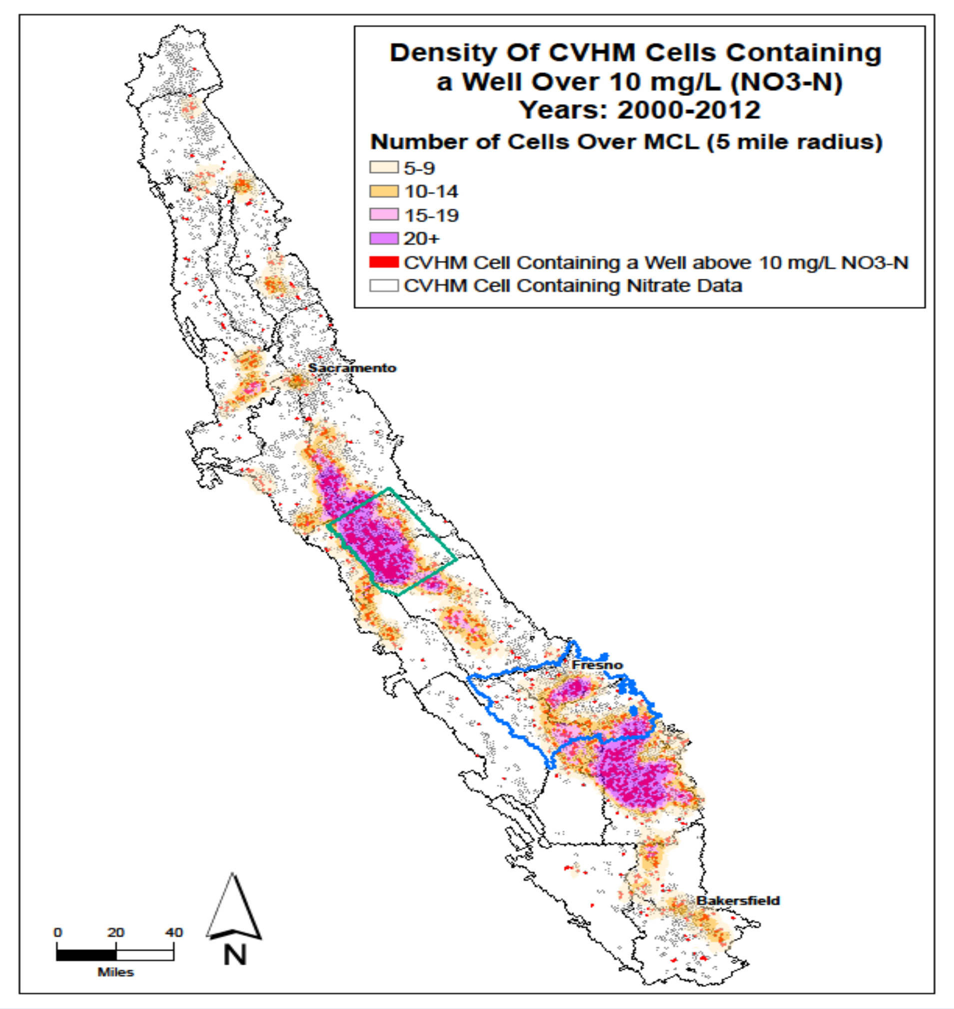
Central Valley Salt Issues



More salt enters the Central Valley Region than leaves

- Impacts (current/legacy)
  - Agricultural Production
  - Drinking Water Supplies
- Economic Cost by 2030
  - Direct Annual: $1.5 Billion
  - Statewide annual income impact: $3.0 Billion
- Diverse Sources

Central Valley Nitrate Issues



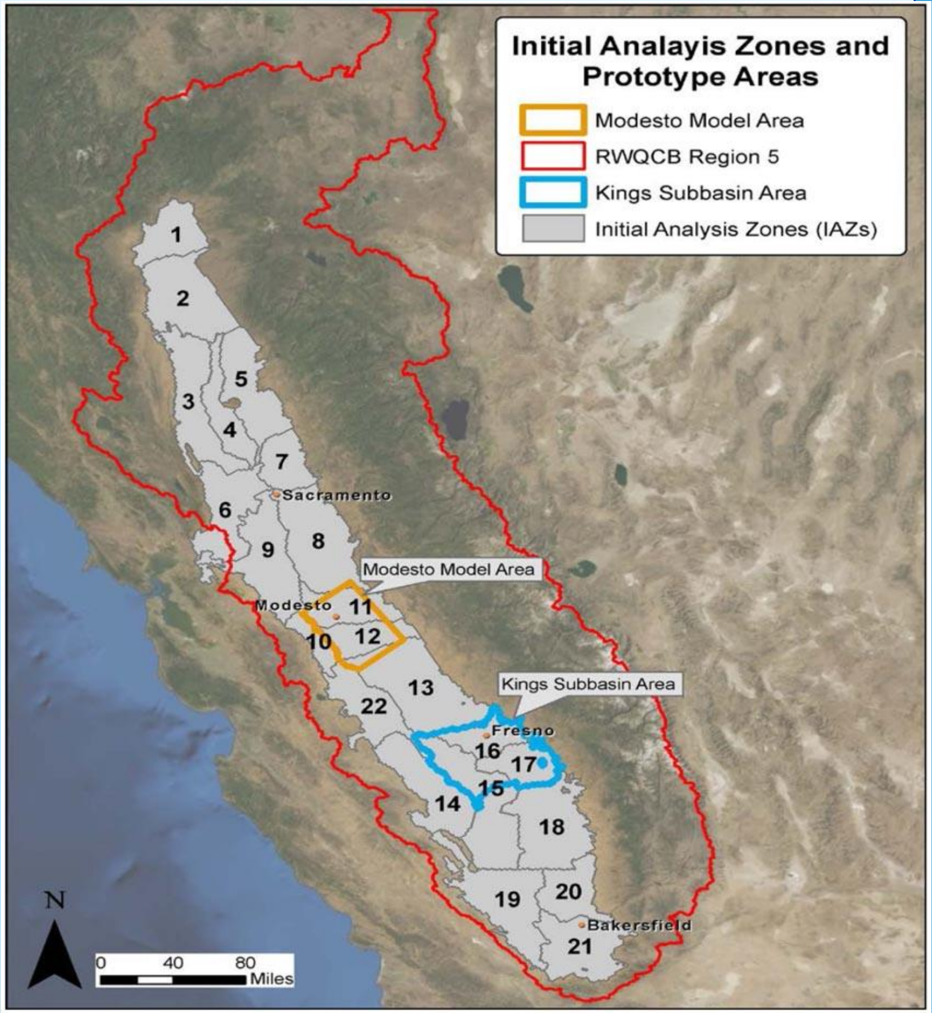
- Legacy/Current Conditions
- Direct Impacts
  - Drinking Water Supplies
- Economic Costs
  - Treatment
  - Alternate Supply
- Diverse Sources

TECHNICAL FOUNDATION

Central Valley Water Quality

Technical Foundation

- Data Compilation and Modeling
  - ✓ Conceptual Model
  - ✓ GIS Beneficial Use/ AGR Zone Efforts
- Beneficial Use
  - ✓ Tulare Lake Groundwater
  - ✓ MUN in Ag Dominated Water bodies
- Water Quality Objectives
  - ✓ Aquatic Life
  - ✓ Stock Watering
  - ✓ Salt Effects on Irrigated Ag
  - ✓ Salt Effects on MUN
  - ✓ Lower San Joaquin River
- Implementation
  - ✓ SSALTS (Accumulation/Transport)
  - ✓ NIMS (Nitrate Management Strategy)
  - ✓ Alternate Compliance Strategy (Management Zone)



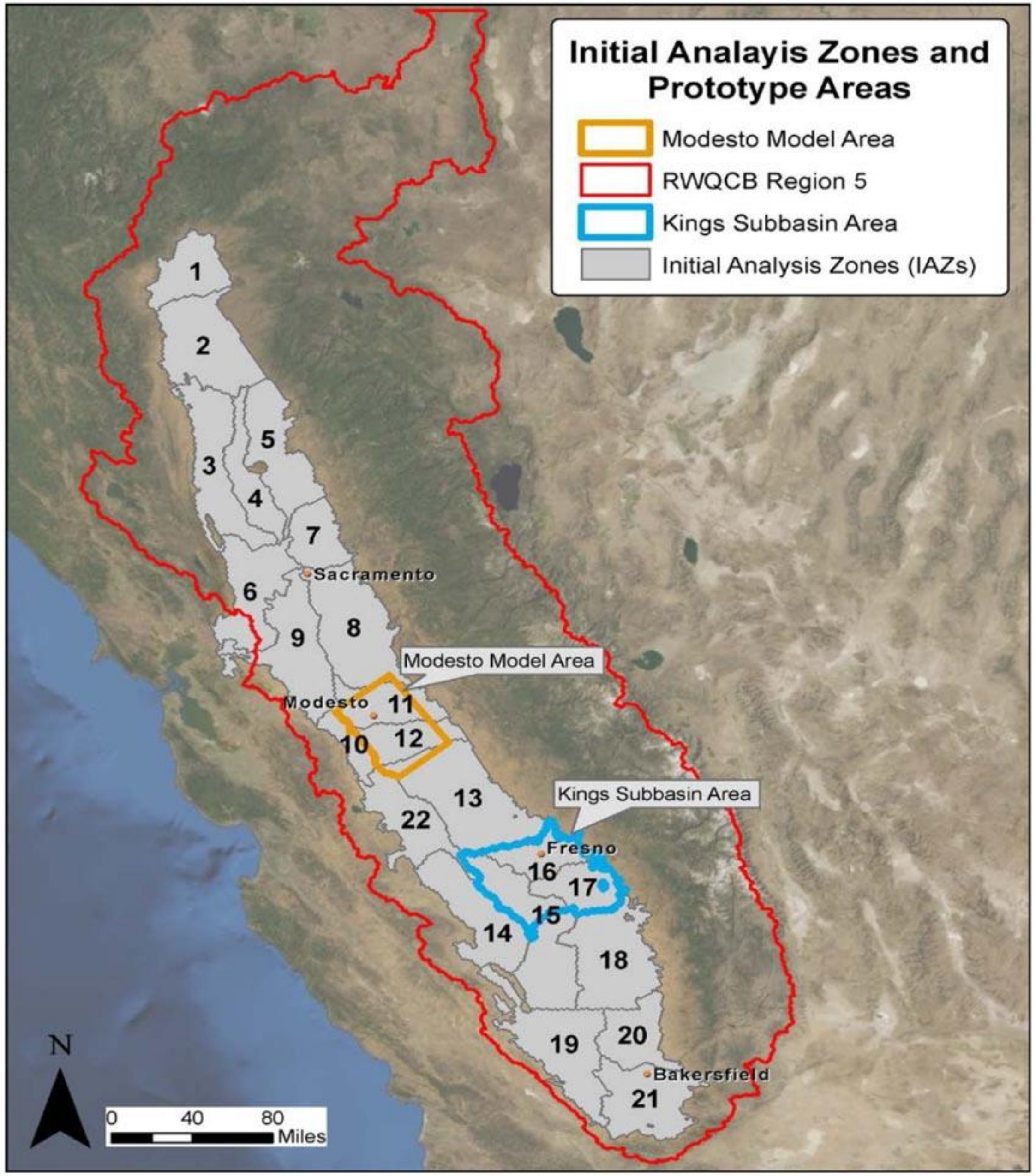
Data Compilation and Modelling

Issue: Salt and Nitrate (NO_3) Occurrence, Transport, and Management

- Salt and NO_3 Accumulation
  - ✓ What is ambient water quality (current condition)?
  - ✓ Where are salt and NO_3 in balance/accumulating/depleting?
  - ✓ Where are priority areas?
  - ✓ What is potential assimilative capacity?

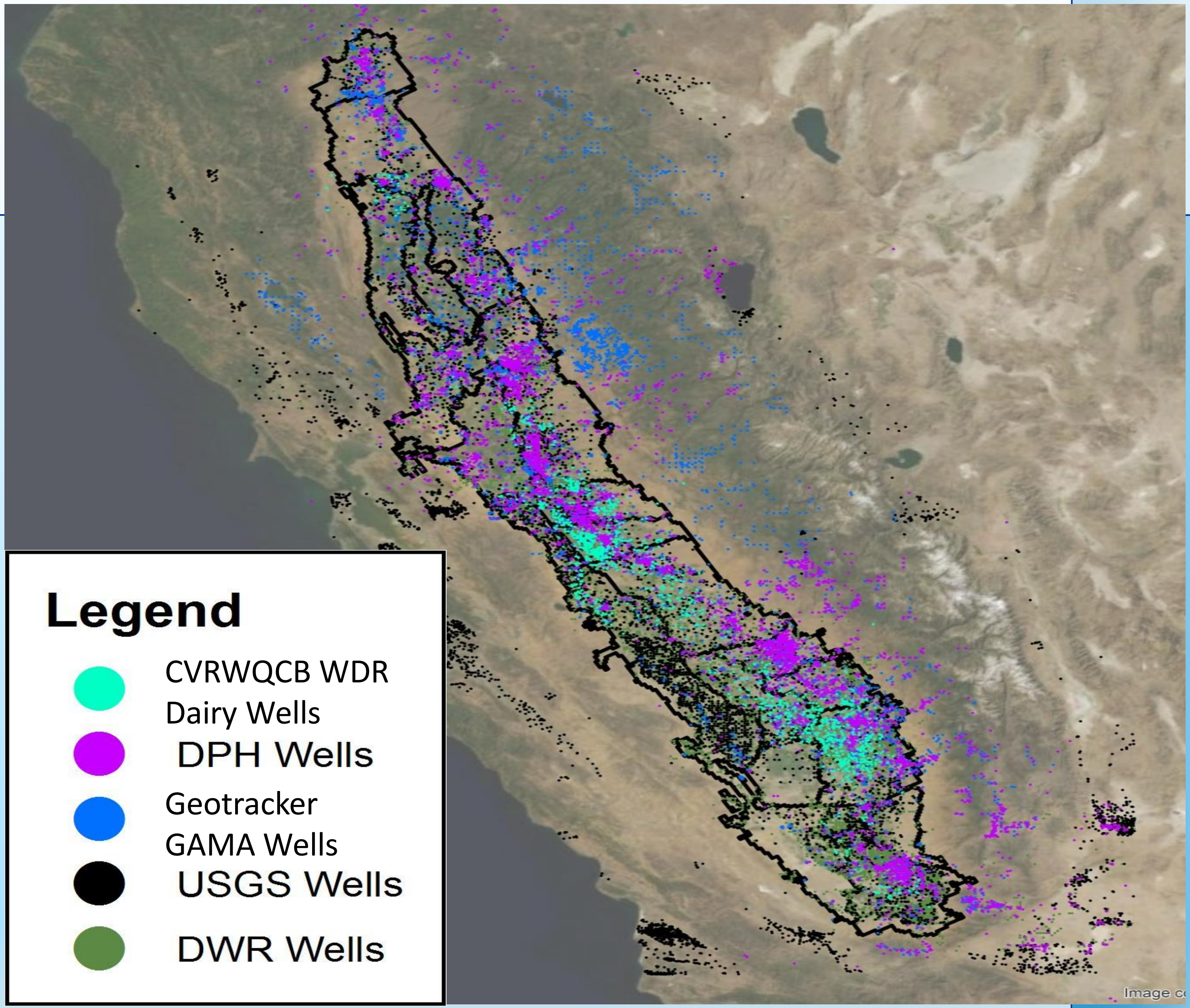
Initial Analysis Zones and Prototype Areas

- 21 CVHM Sub-regions (Plus One Divided)
  - 22 Initial Analyses Zones (IAZs)
- Existing WARMF Coverage
- Prototype Areas
  - Modesto
  - Kings Subbasin

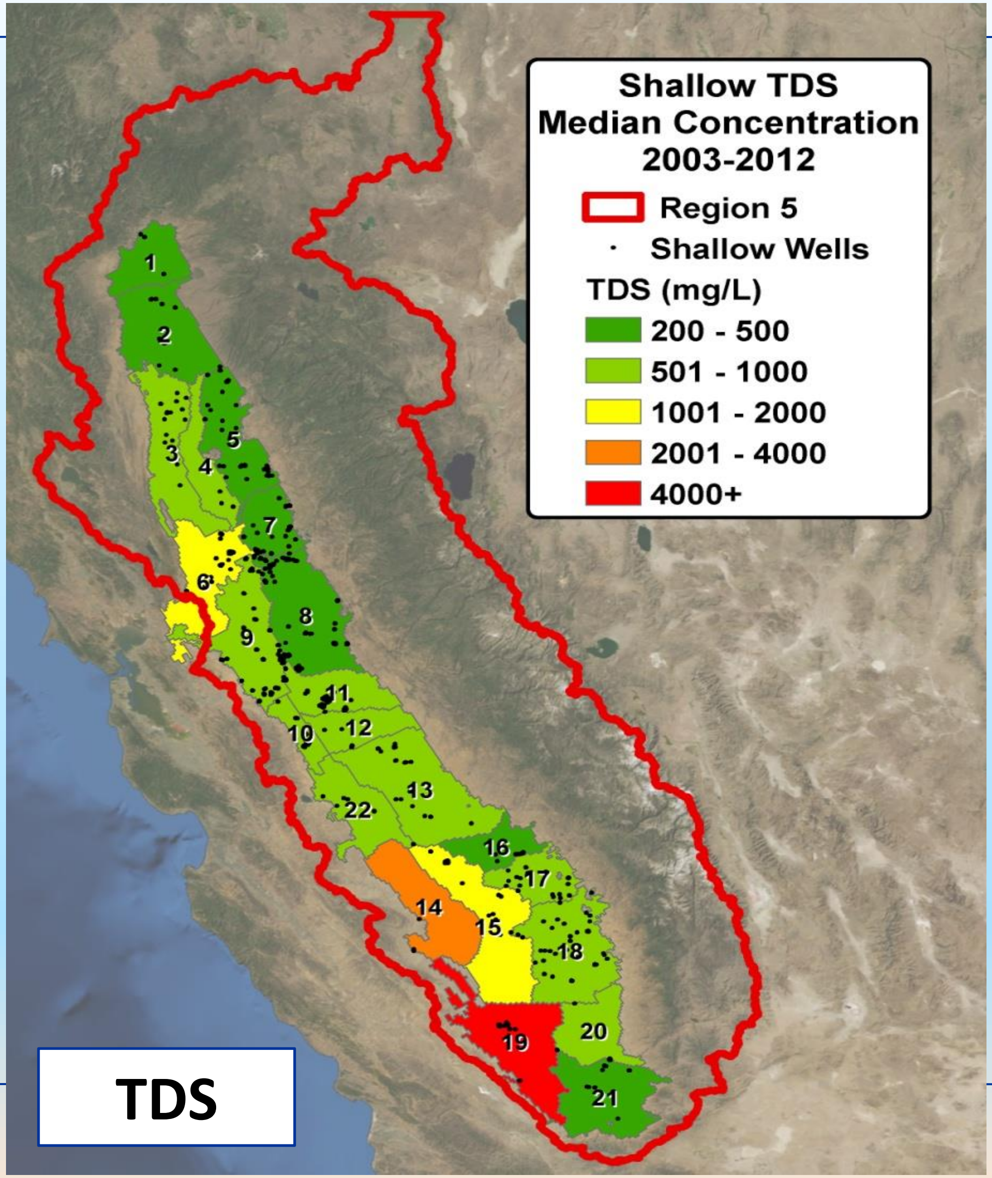


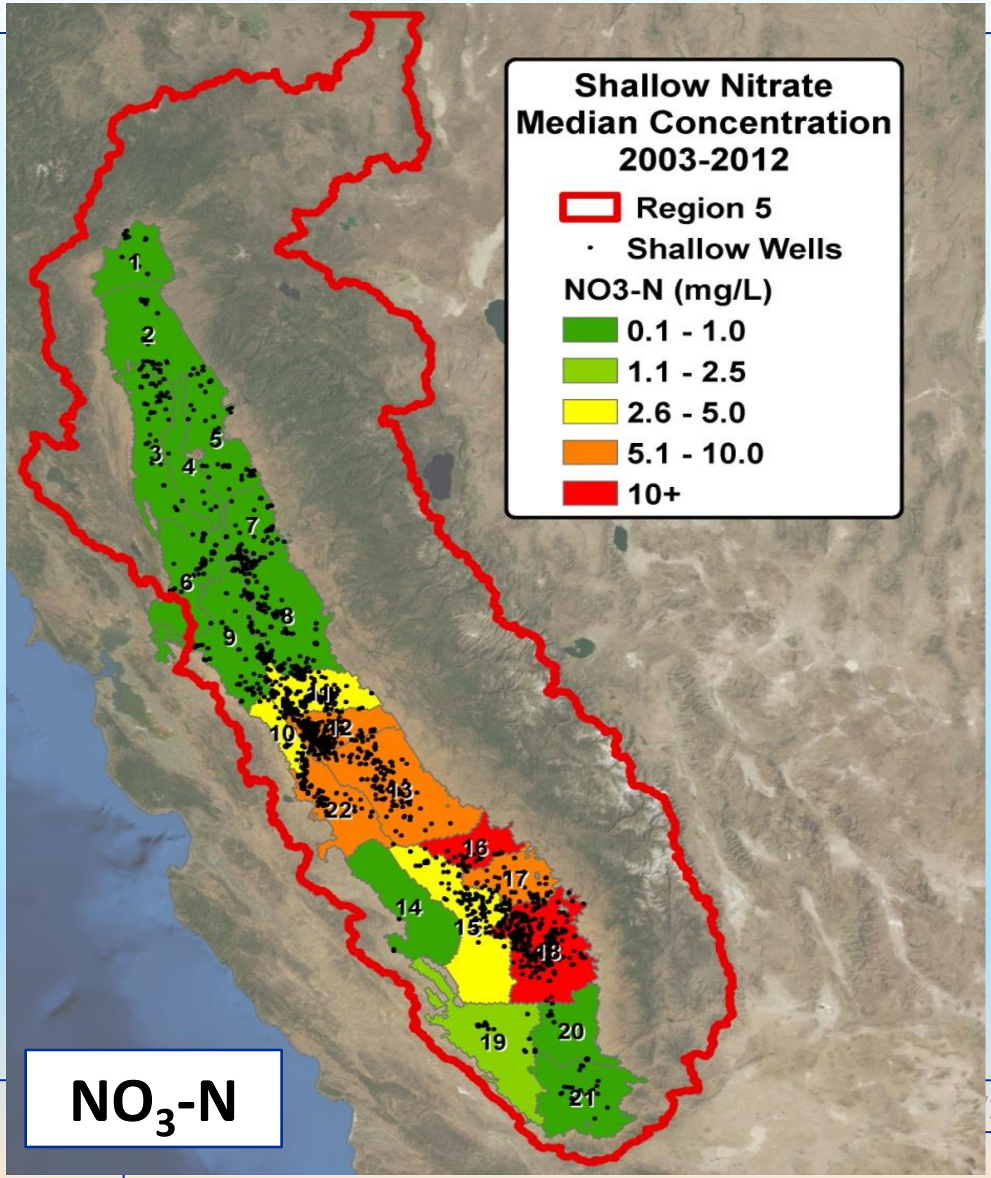
Groundwater Quality Data: All Wells with Salt and Nitrate Data

- Full dataset =
  - 50,478 wells
  - 33,305 wells in IAZs



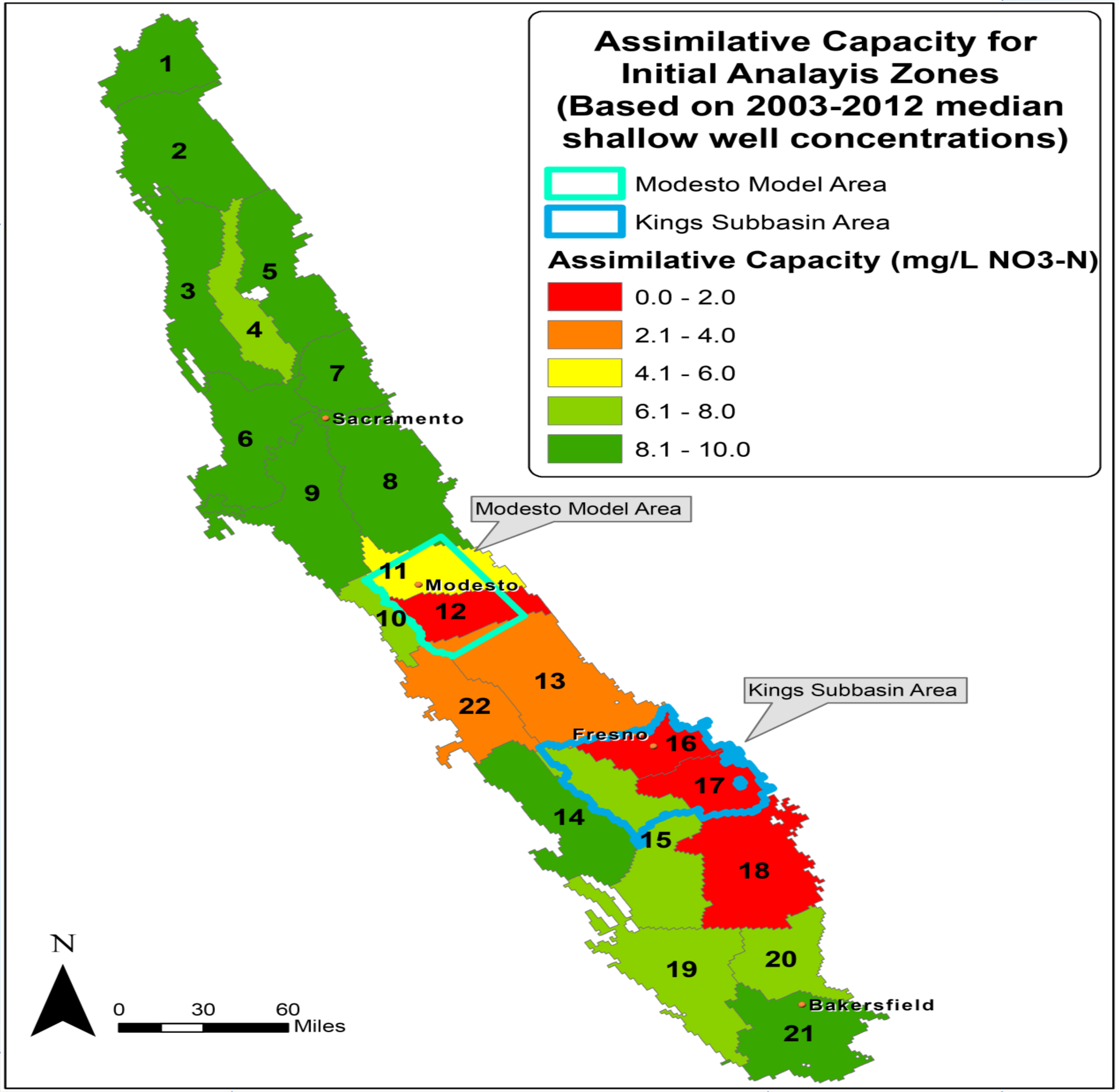
Ambient Groundwater Quality - Median CVHM Cell Concentration ("Shallow" Wells 2003-2012): Depth over 20-yr travel-time





Preliminary Assimilative Capacity: Nitrate

- Assimilative Capacity is determined relative to Nitrate at 10 mg/L (as N)



Well Data Characterization

- Issues
  - Many wells do not have readily available construction information
  - Many wells not characterized with respect to their completion in the aquifer system

Wells with NO_3-N Data
28,081 Wells

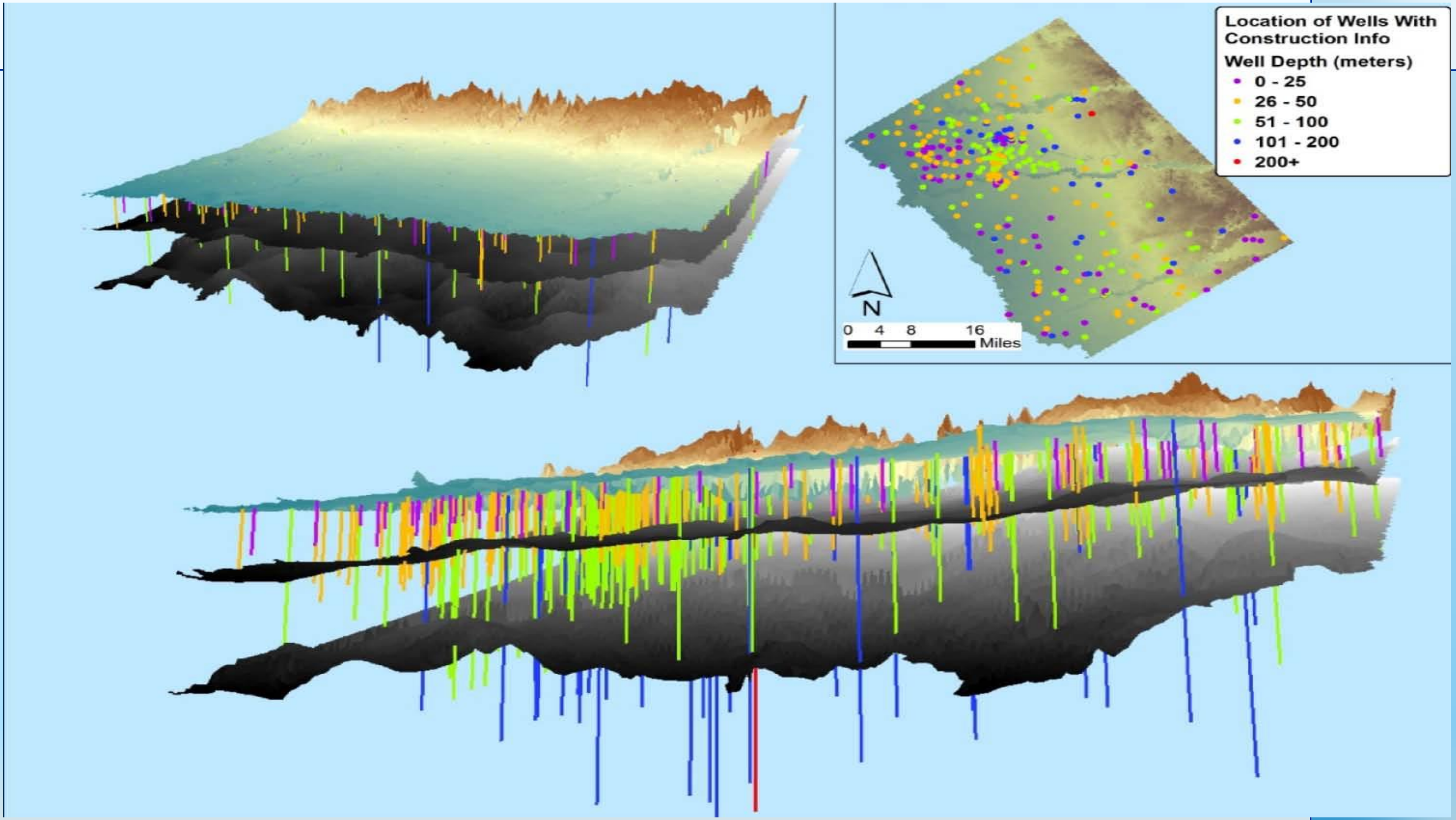
- **Deep Wells: 10,954**
- **Shallow Wells: 7,074**
- **Unknown Depth: 10,052 (36%)**

Wells with TDS Data
24,820 Wells

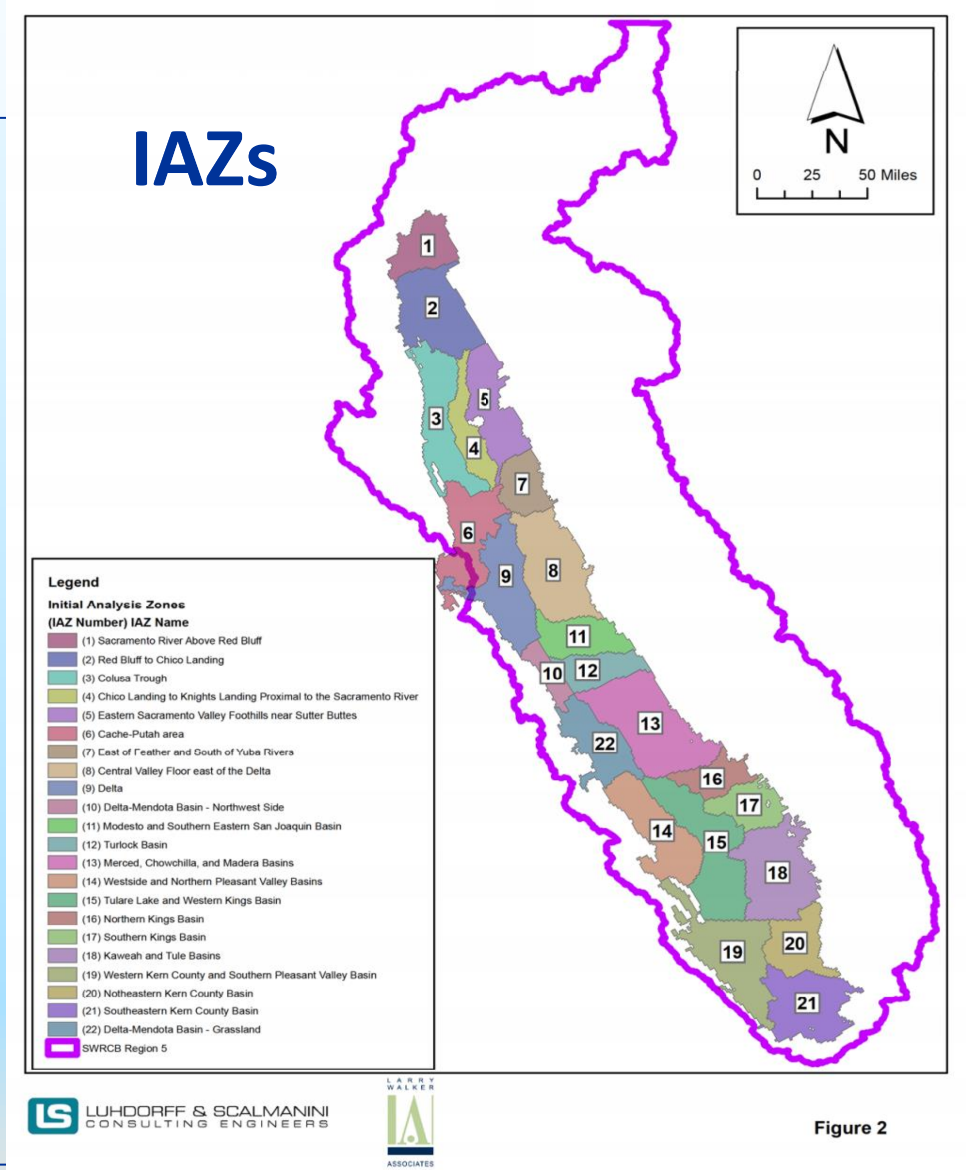
- **Deep Wells: 8,843**
- **Shallow Wells: 3,339**
- **Unknown Depth: 12,637 (51%)**

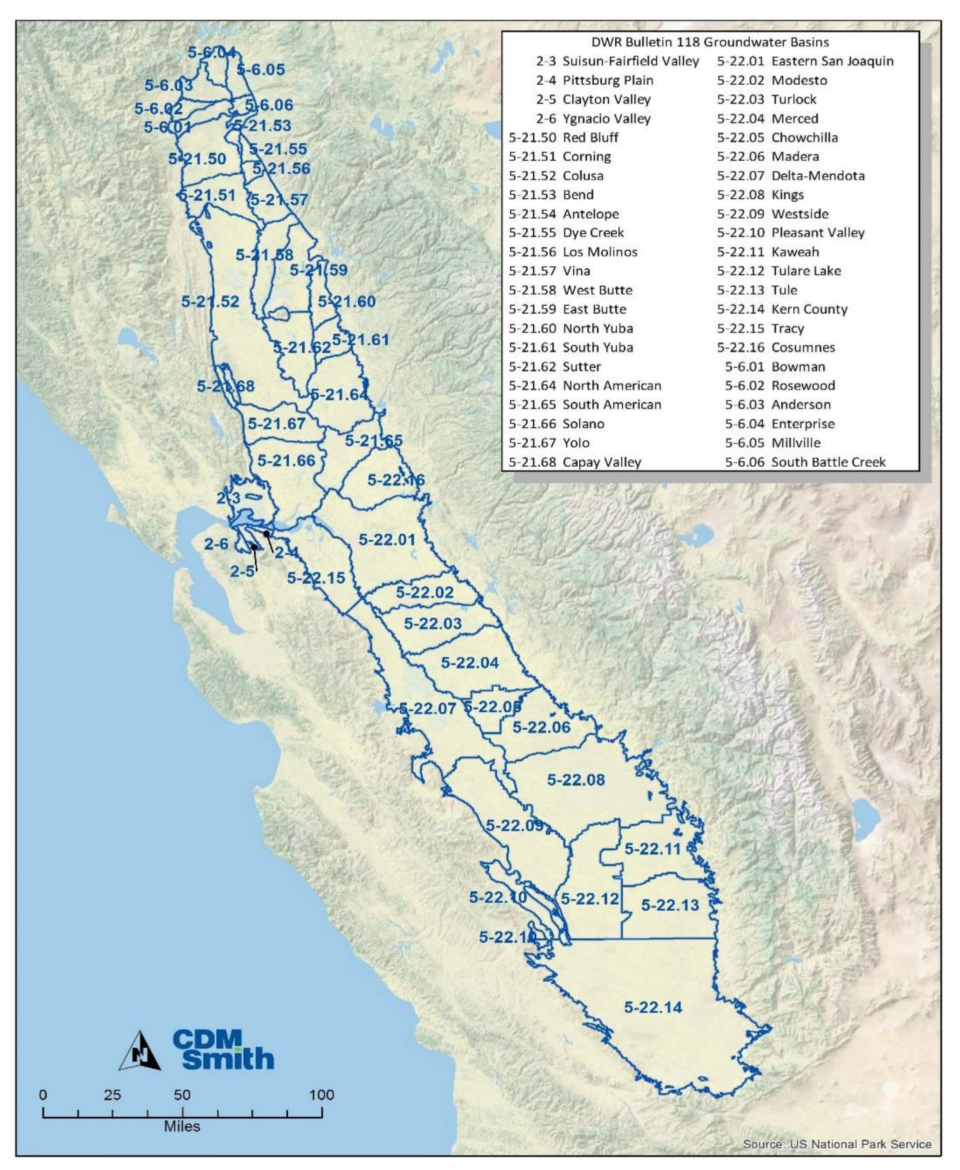
Geohydrology Considerations

- Cross-Sectional View of Groundwater Layers in Relation to Well Depth



Refinement of Groundwater Data by DWR Sub-basins (41)

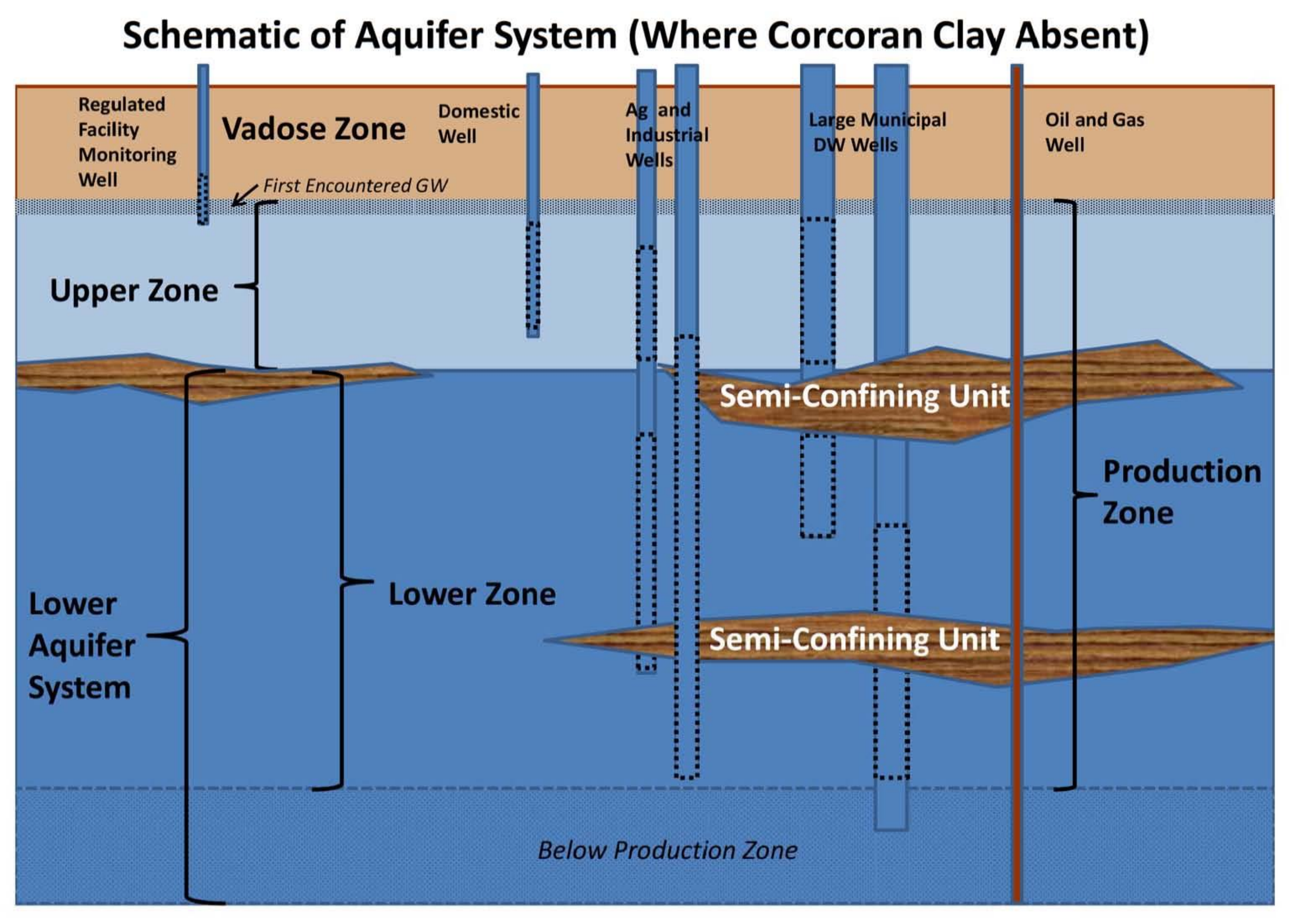




Defining Existing Water Quality Conditions (Utilized 41 DWR Basins vs 22 IAZs)

Corcoran Clay *Absent*

- Upper Zone
  - Domestic wells
  - Adjusted Average
- Production Zone
  - Assimilative Capacity
  - Volume-weighted Average
- Special Considerations
  - Limited number active wells
  - Tightly Grouped Wells
  - Outliers
  - Corcoran Clay



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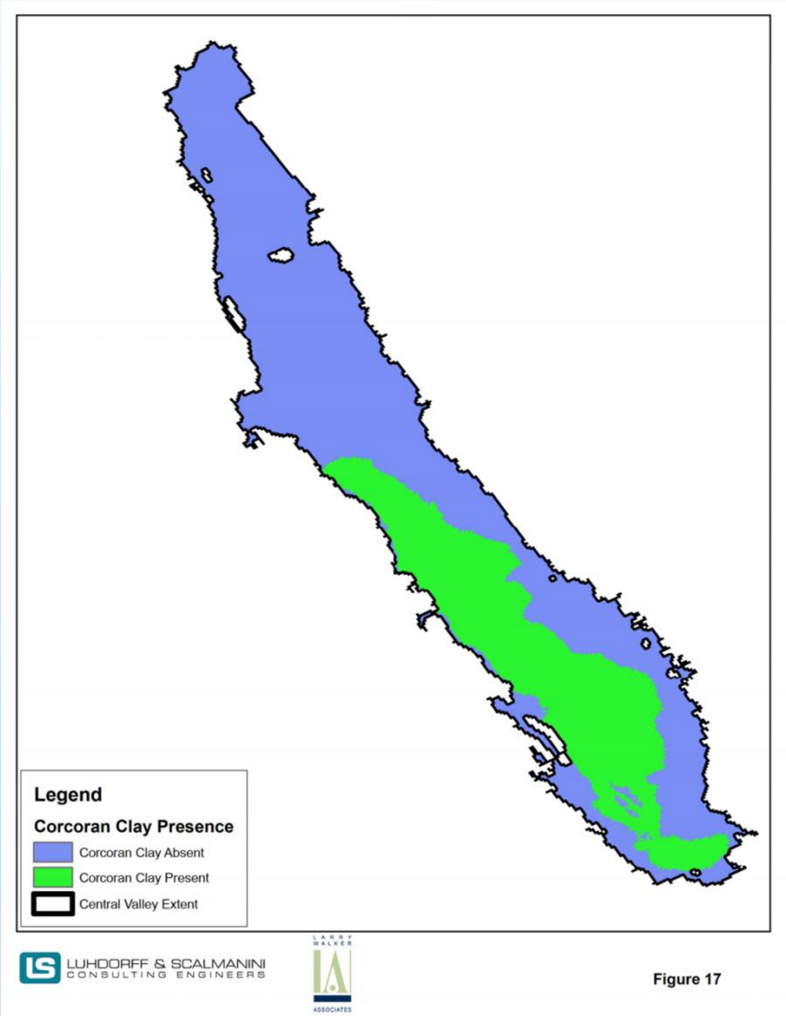
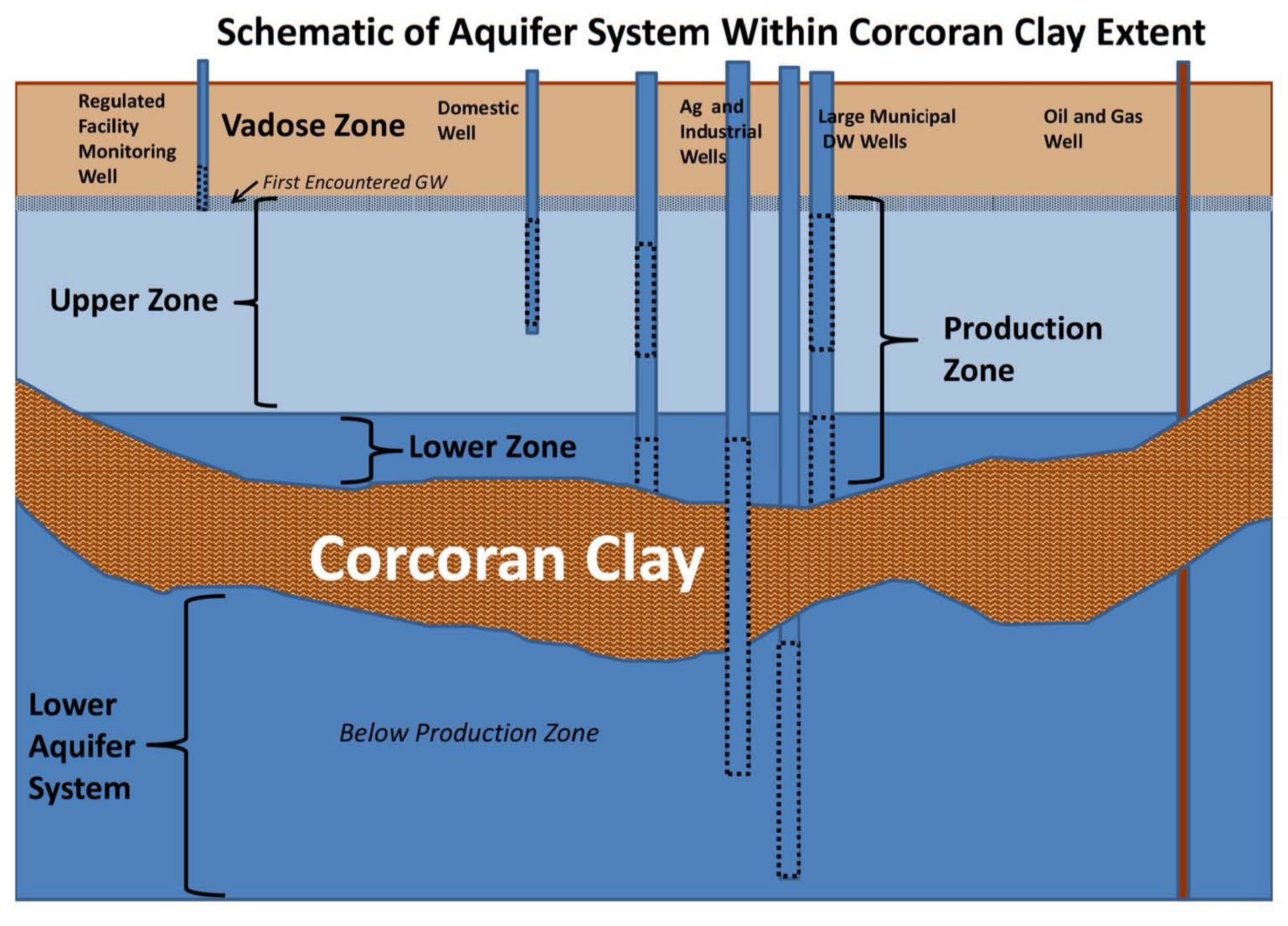




Existing Water Quality

- Nitrate Ambient Conditions
  - Upper Zone (Average)
  - Production Zone (Volume-weighted)

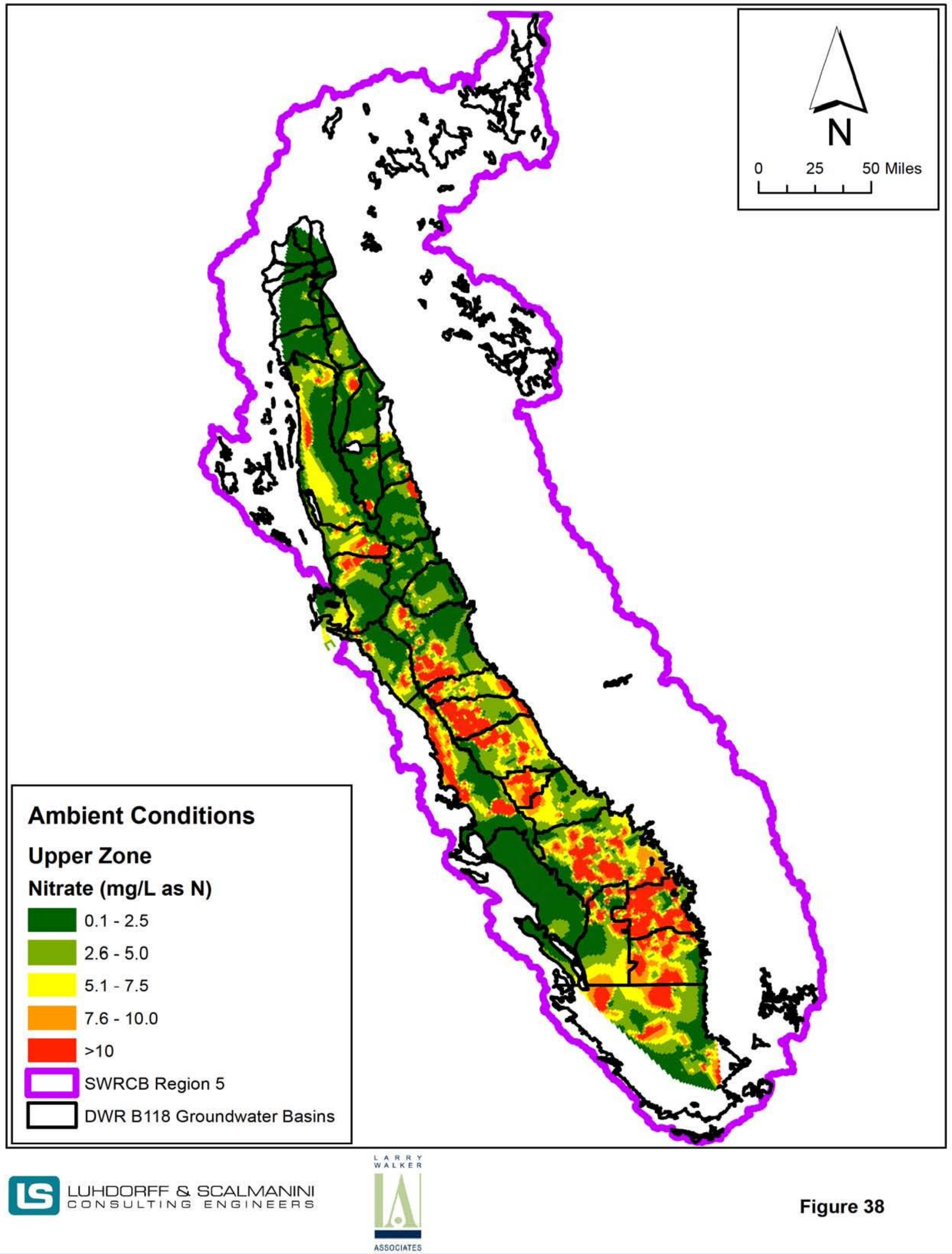


Figure 38

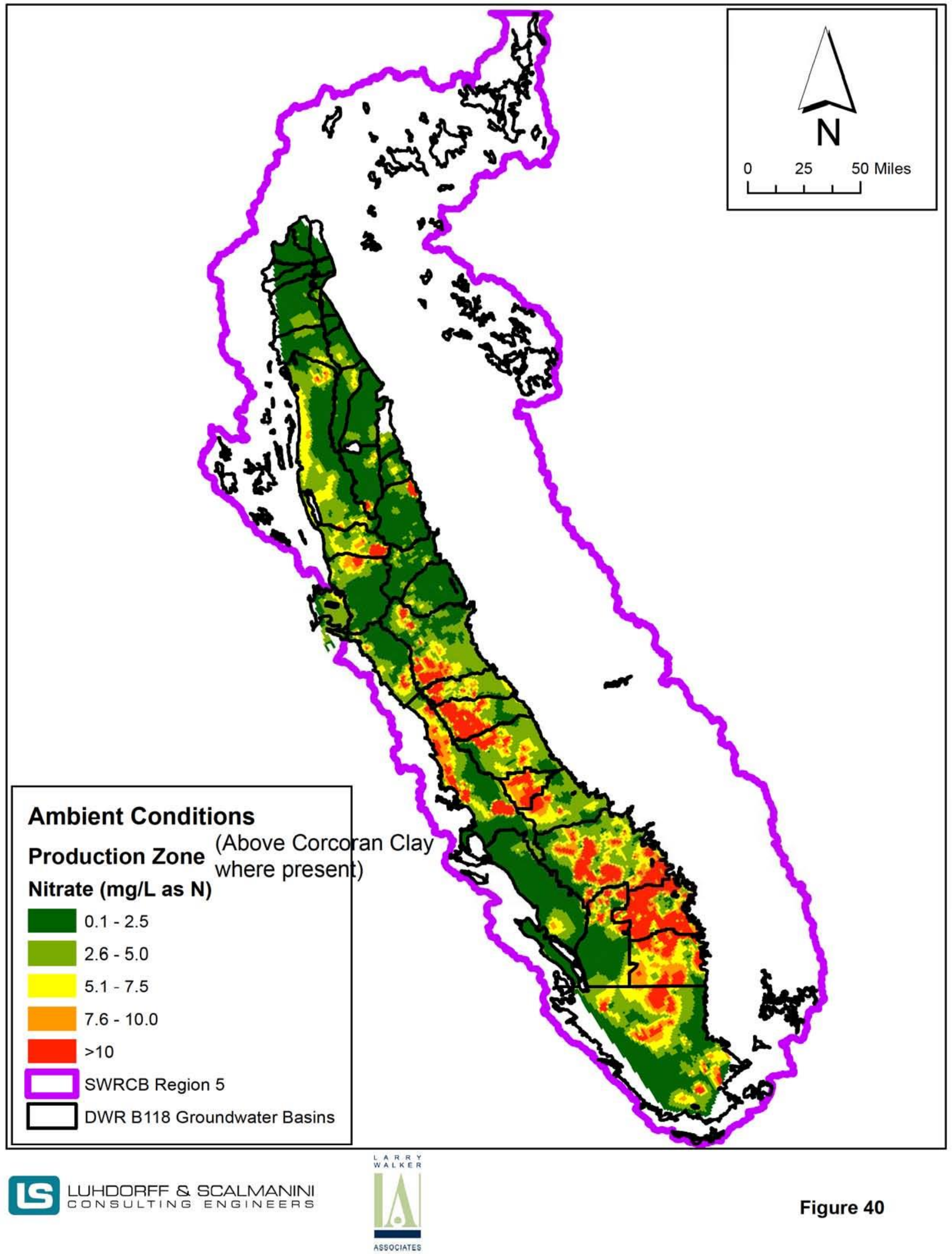
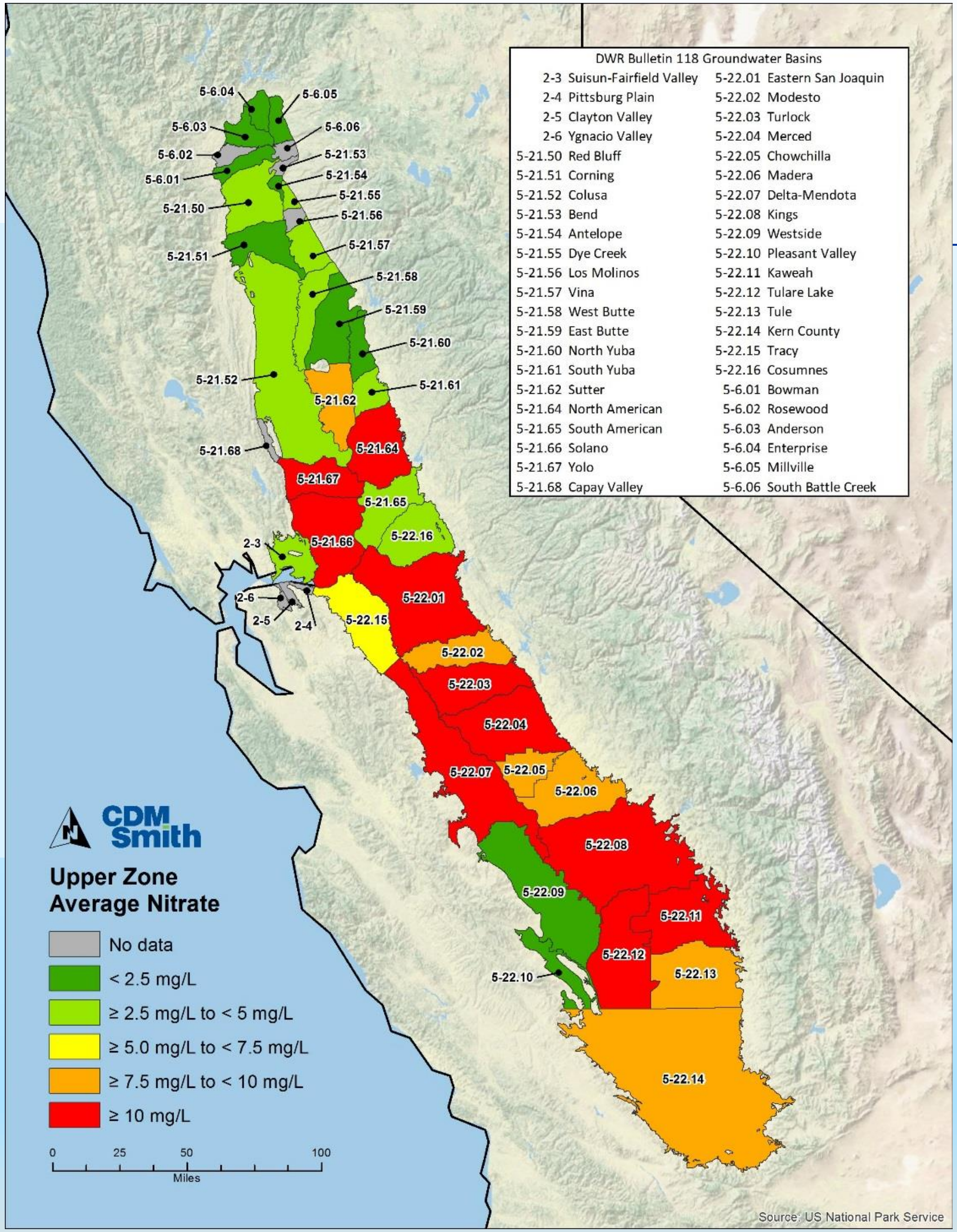
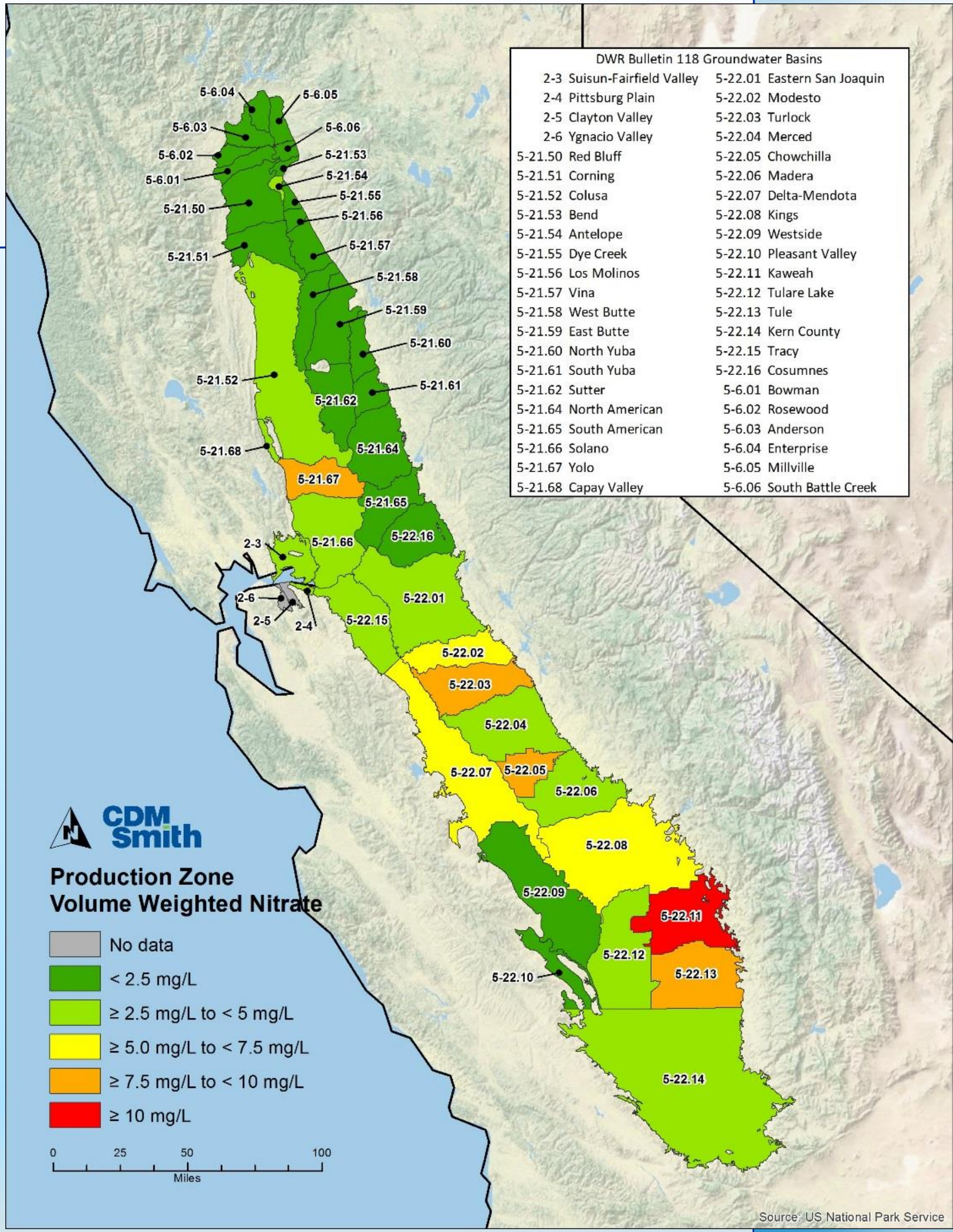


Figure 40

Existing Water Quality

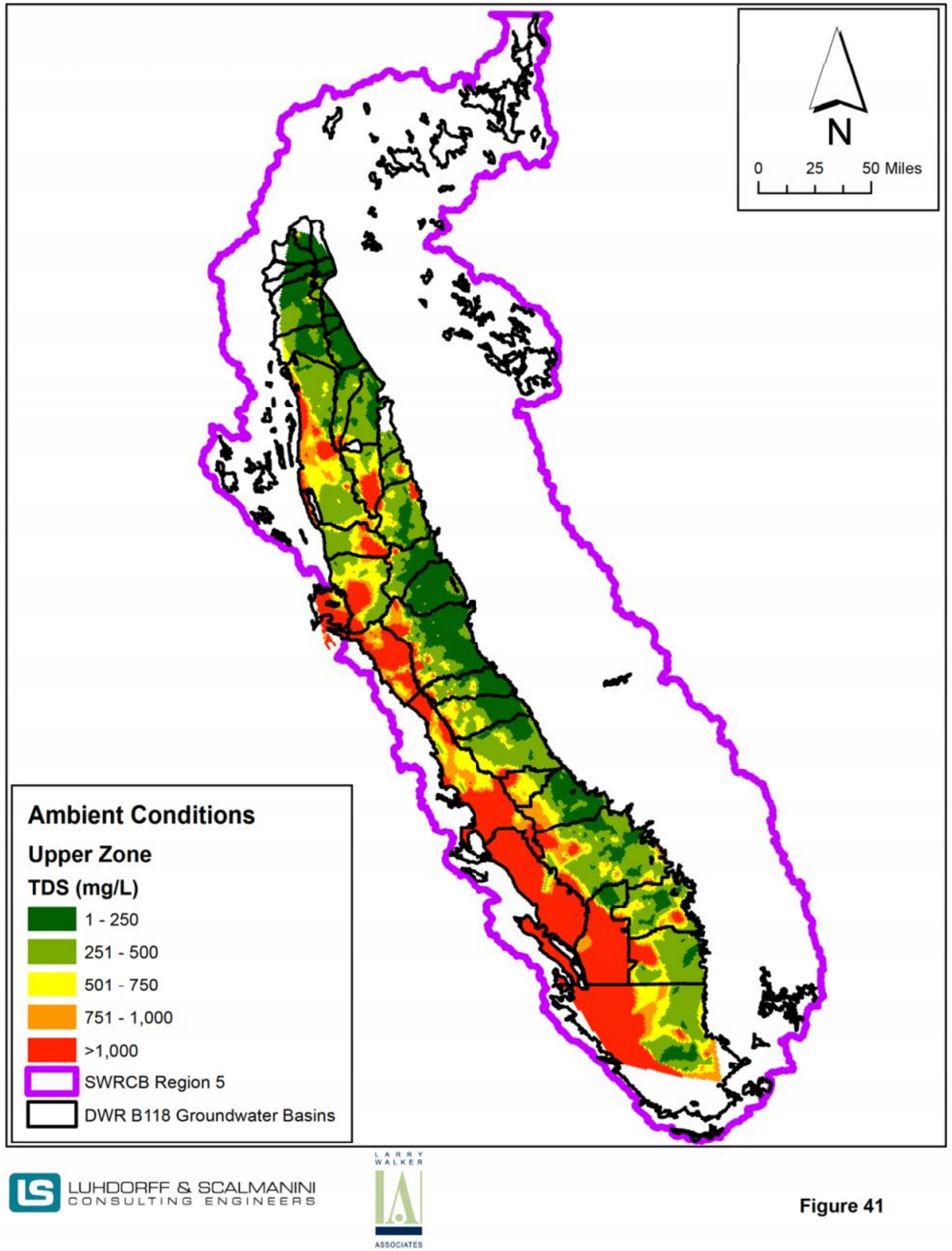
- Nitrate Ambient Conditions
  - Upper Zone (Average)
  - Production Zone (Volume-weighted)

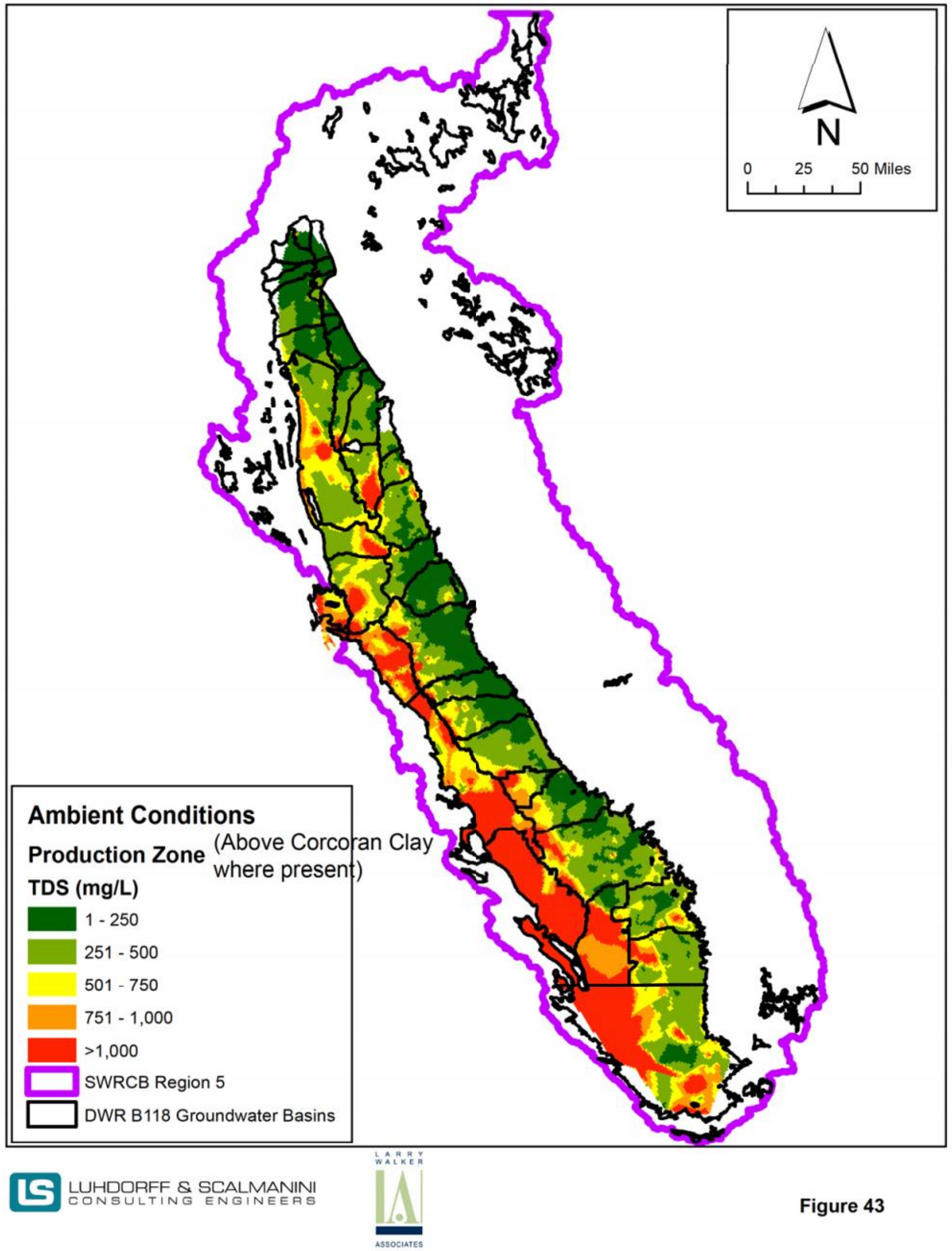




Existing Water Quality

- TDS Ambient Conditions
  - Upper Zone (Average)
  - Production Zone (Volume-weighted)





Existing Water Quality

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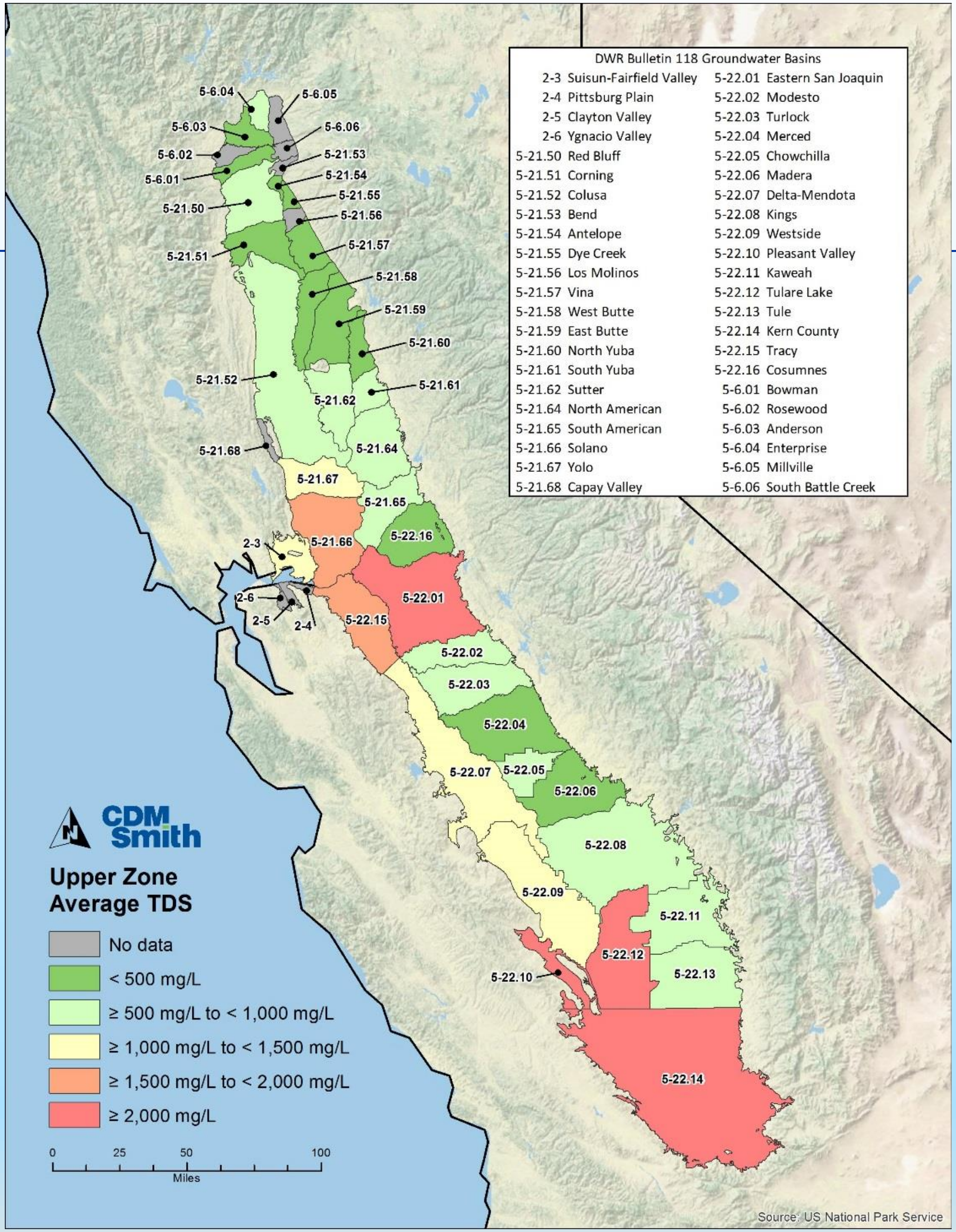
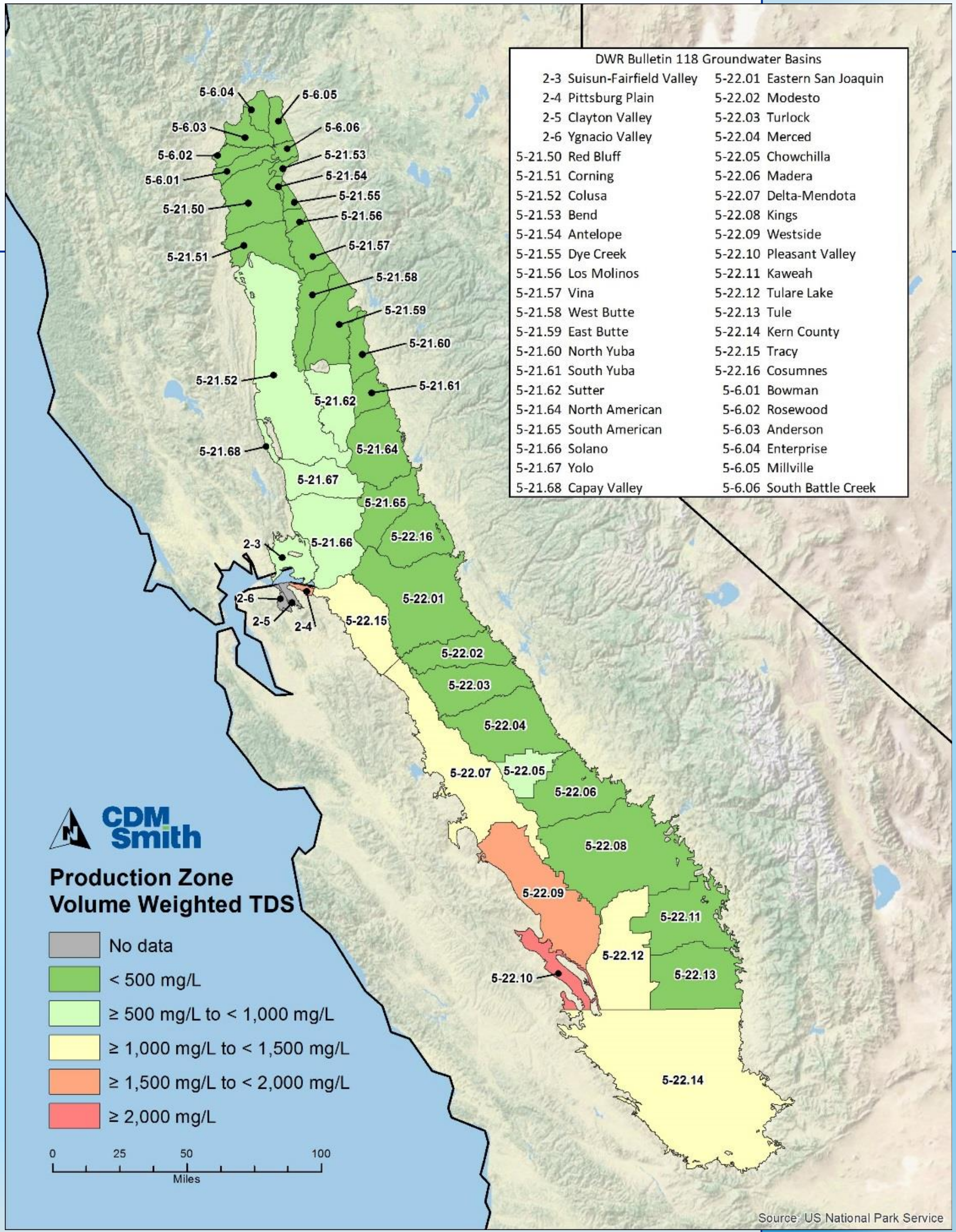
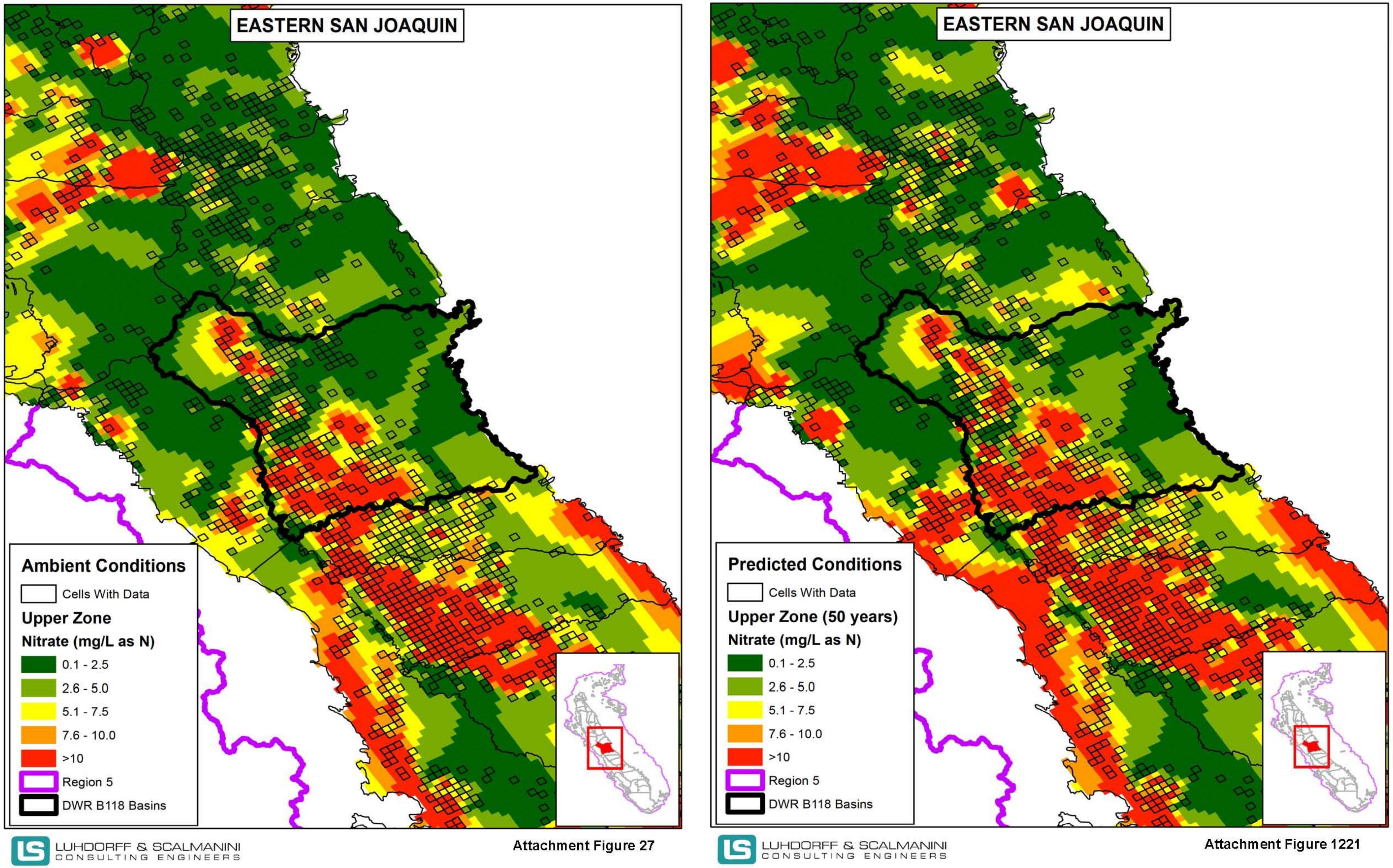
  - Production Zone (Volume-weighted)





Water Quality Trends

- Nitrate – Eastern San Joaquin Groundwater Subbasin
  - Upper Zone (Ambient)
  - Upper Zone – 20 Years
  - Upper Zone – 50 Years



Water Quality Trends

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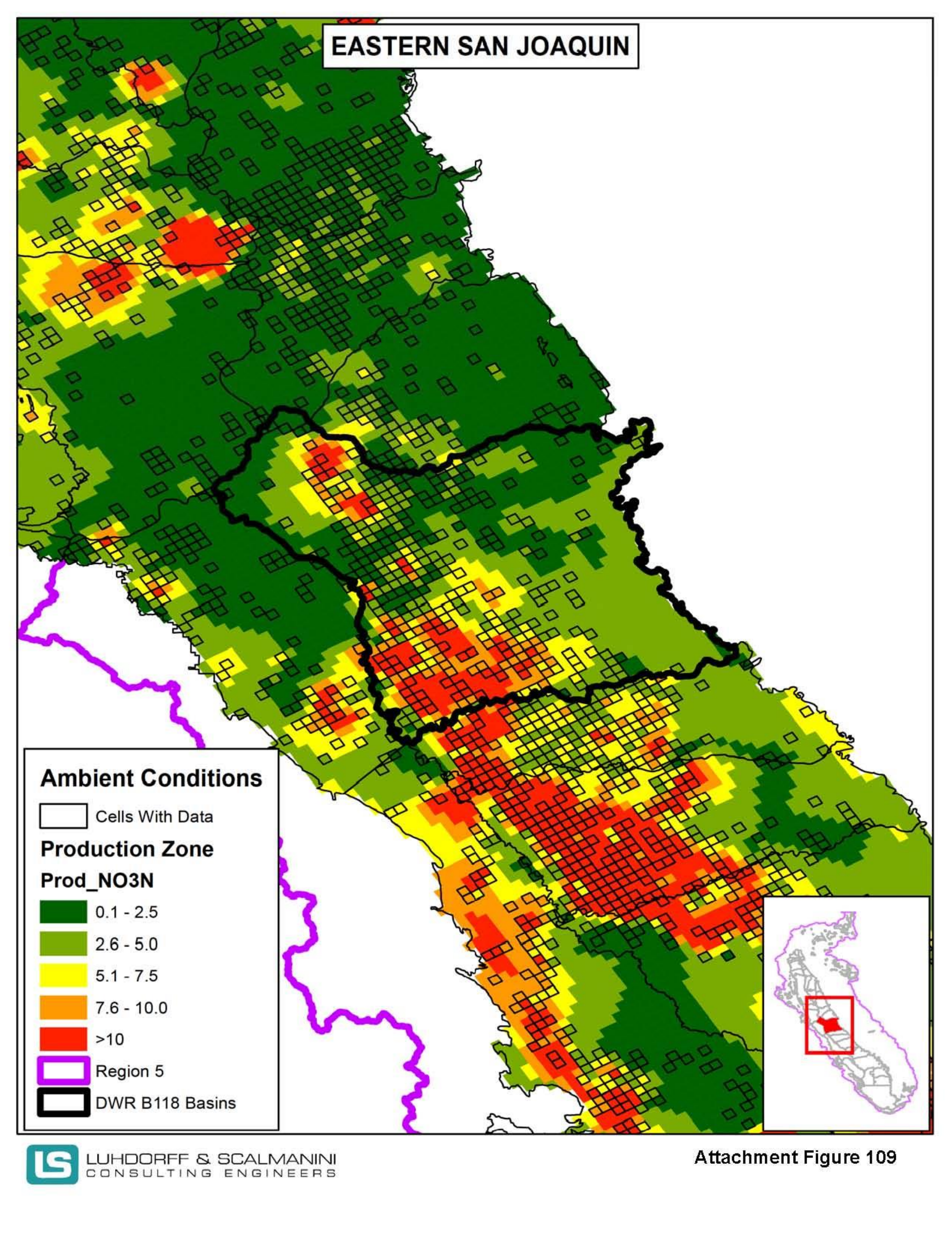


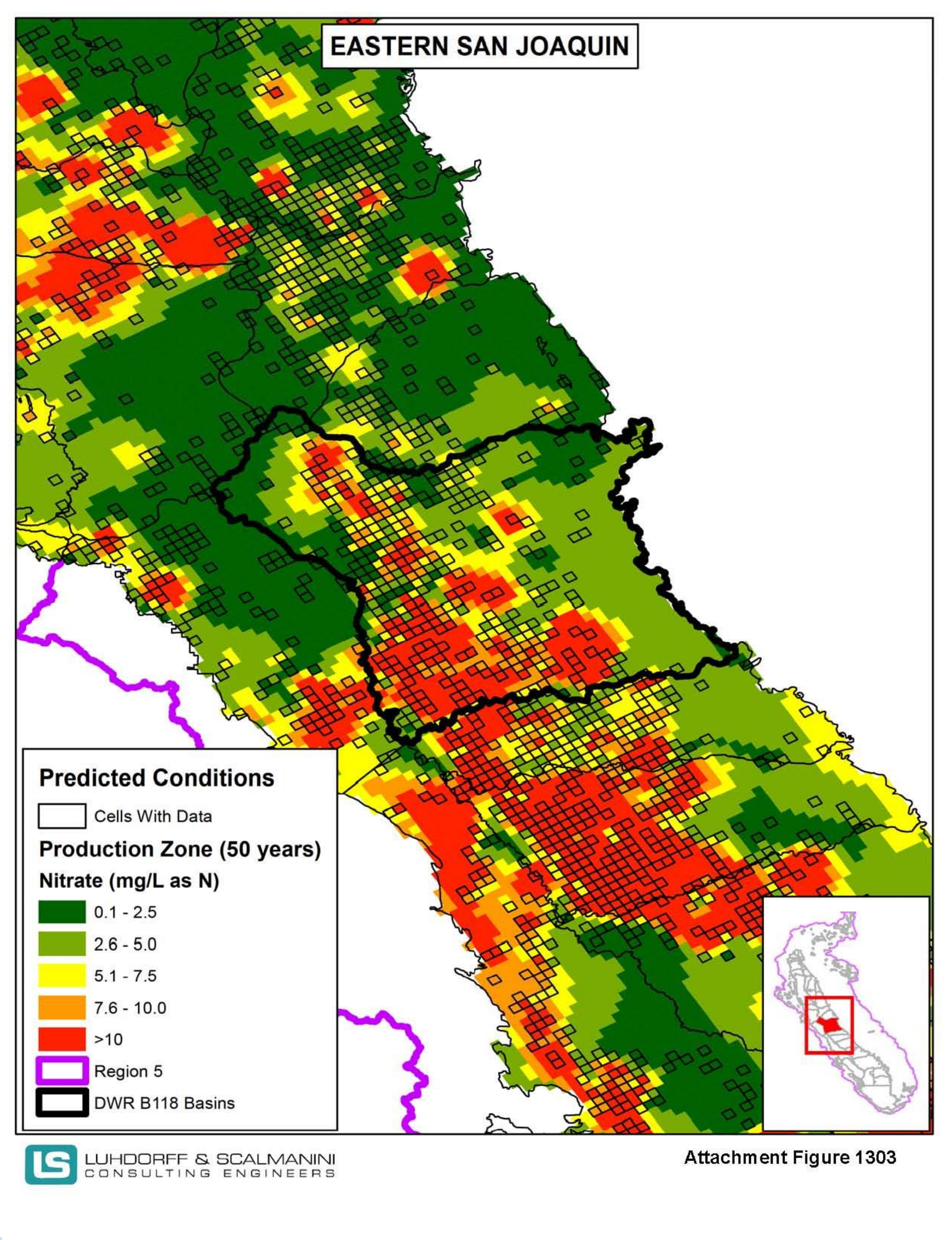
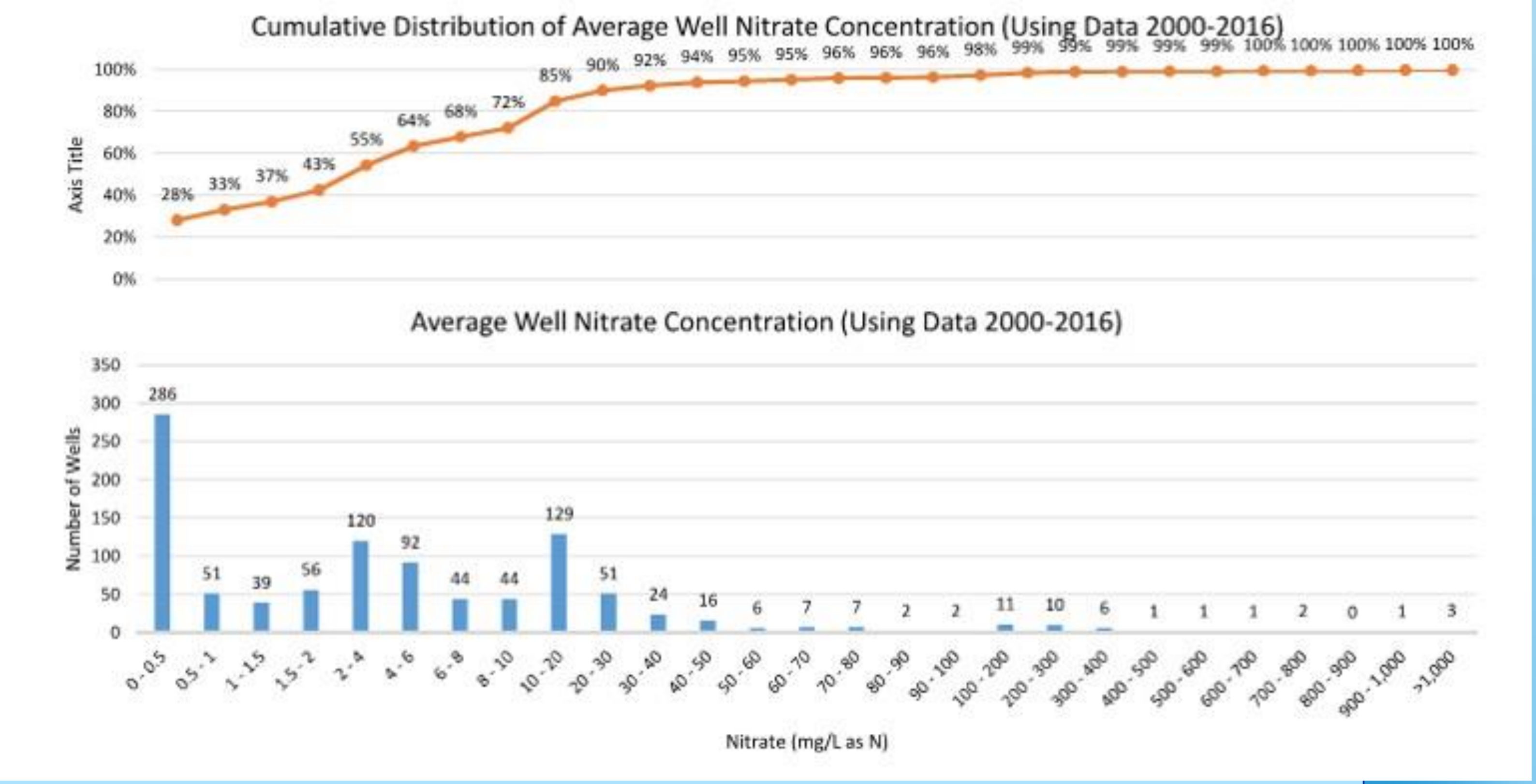


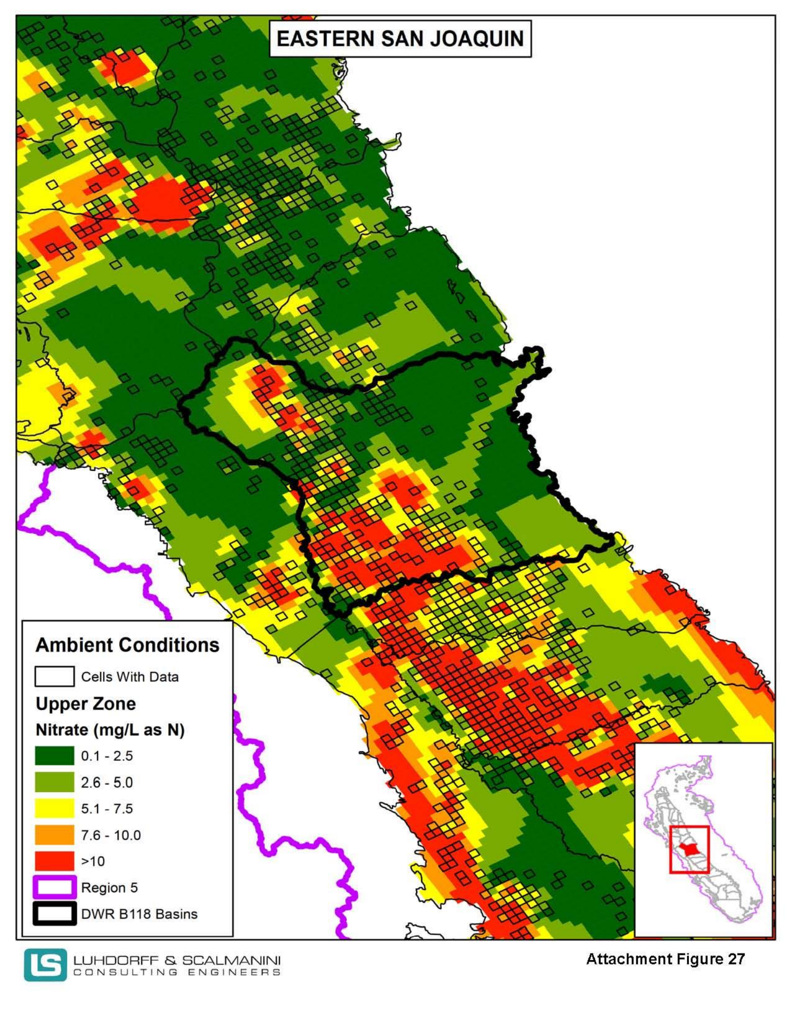
Illustration of Data Variability – East San Joaquin Groundwater Sub-basin

Statistic	Nitrate (mg/L N as Nitrogen)
Number of Wells	1,012
Mean	22.43
Median	3.12
Maximum	1920.69
Standard Deviation	106.99
Coefficient of Variation	4.77
75th Percentile	11.51
95th Percentile	61.67



Conclusions

- Utilize high resolution information
  - Set priorities
  - Develop long-term monitoring plan (SAMP)
- Common Data Set Available through CVSALTS
  - Can be utilized by individuals/groups
  - Build upon common data set
- Not Perfect
  - Limited data for some basins
    - Average vs. Median vs. Volume-weighted
  - Difficult to analyze trends
  - Site specific evaluation/validation recommended

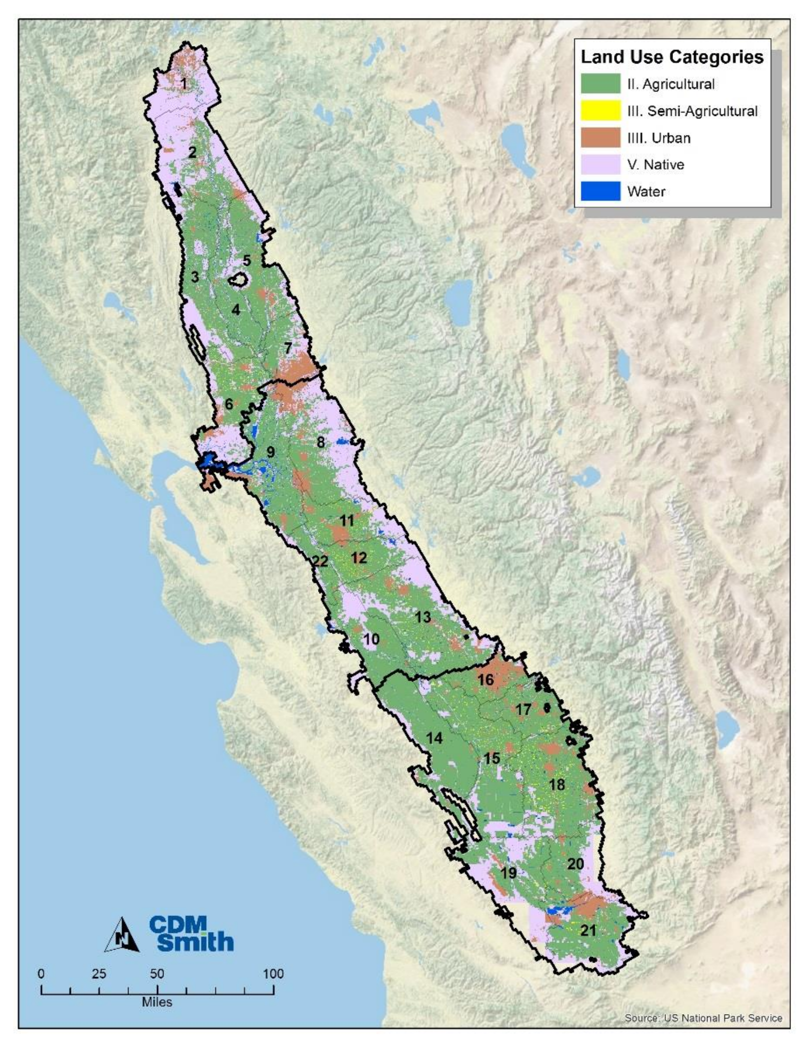


TECHNICAL FOUNDATION

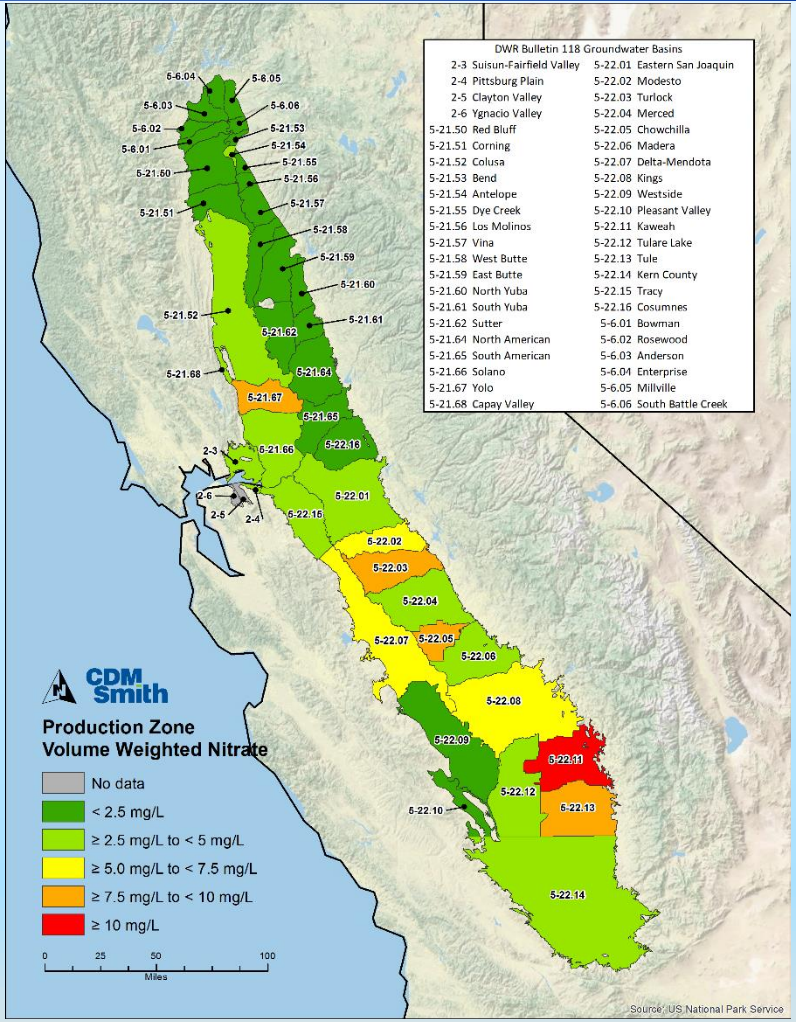
Nitrate Implementation Measures Study (NIMS)

Nitrate Implementation Measures Study (NIMS)

- NIMS investigated:
  - Magnitude of the problem
  - Requirements to achieve safe drinking water for all
  - Implementation measures to mitigate groundwater contamination
  - Implementation measures will be integrated into the SNMP



Magnitude of Nitrate Contamination in Groundwater



- Volumes of groundwater that exceed 10 and 5 mg/L were estimated using an equal area, uniform grid approach.

Aquifer Zone	Volume of Groundwater Underlying the Valley Floor	Exceeds MCL	Exceeds Half MCL	Exceeds MCL	Exceeds Half MCL
	(MAF)	(MAF)	(MAF)	(%)	(%)
Shallow Zone	235	54	105	23%	45%
Deep Zone	401	40	97	10%	24%
Totals	636	94	202	15%	32%

Salt and Nitrate Management Goals

- Management Goal 1 – Assure Safe Drinking Water
  – Short & Long-term Solutions
- Management Goal 2 - Achieve Salt/Nitrate Balance
  – Timeframe and costs vary
- Management Goal 3 - Restore Groundwater Quality
  – Where feasible and practicable

Nitrate Implementation Measures

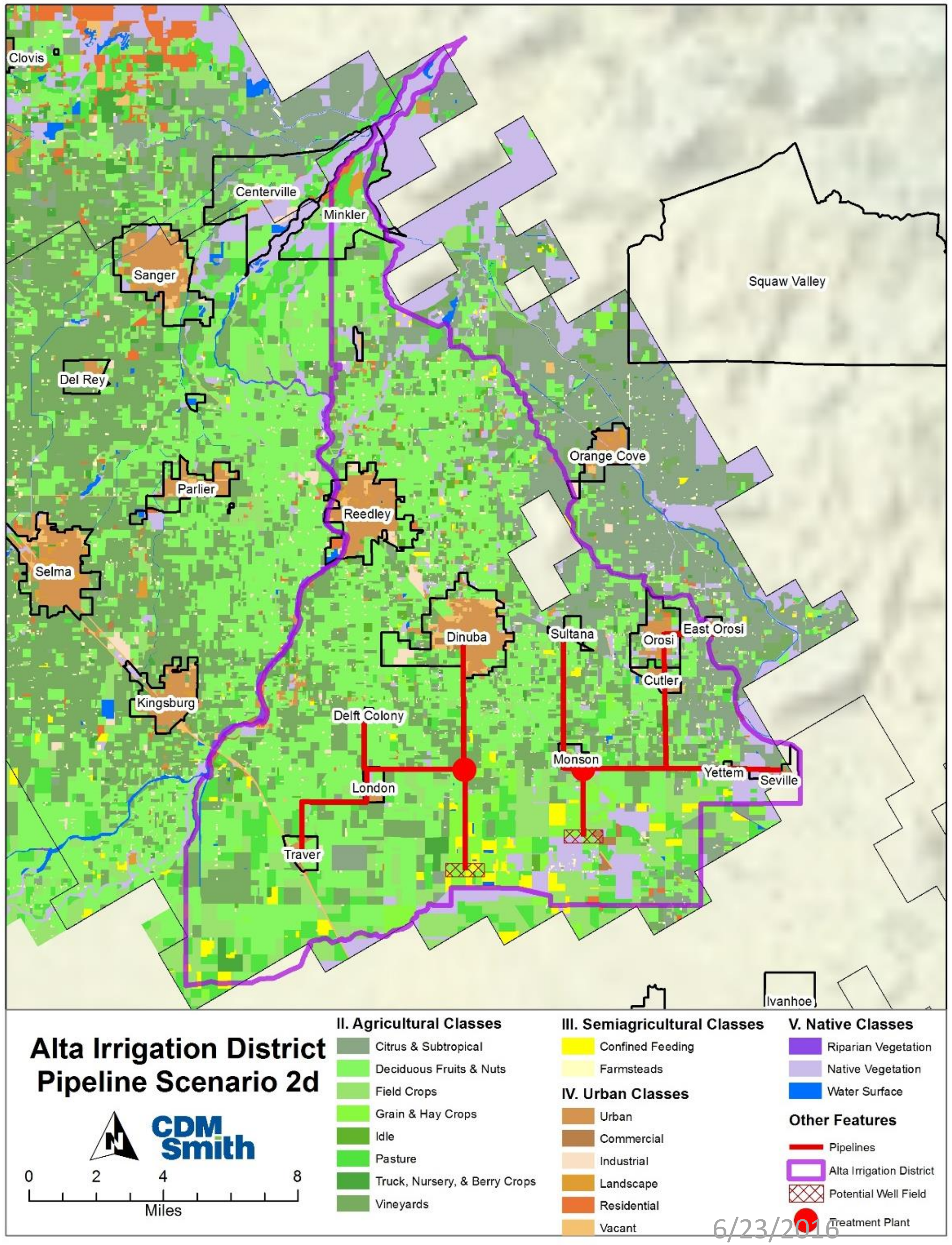
- Alternate drinking water supplies
- Source control measures
- Recharge of high quality waters/coordination with Groundwater Sustainability Plans
- Groundwater remediation
  - Pump and fertilize
  - Pump and treat aboveground
  - *In situ* treatment

Key Nitrate Treatment Alternatives

- Ion Exchange (IX)
  - Pro: Good for drinking water
  - Con: Expensive at high nitrate concentrations, creates waste
- Reverse Osmosis (RO)
  - Pro: Good for drinking water
  - Con: High energy costs, creates waste
- Electrodialysis Reversal (EDR)
  - Pro: Good for high nitrate water
  - Con: High energy and capital costs, creates waste
- Biological Vessels
  - Pro: Good for high nitrate water
  - Con: Less accepted for drinking water treatment
- Permeable Reactive Barriers (PRBs)
  - Pro: Low cost, good for high nitrate concentrations
  - Con: Cannot be used for deep contamination, slow

NIMS Pilot Study

- Alta Irrigation District
- Areas of high nitrate in groundwater
- Disadvantaged Communities
- Pump, Treat, and Reinject at the MZ-Scale
  - Achieve MCL in 70+ years
  - $5.9M to $14.2M annually
- Pump, Treat, and Serve to Meet Potable Demands
  - Achieve MCL in 121 years
  - $2.2M to $8.7M annually



Summary of Findings

- Dischargers, in conjunction with impacted users, will be able to use the NIMS findings as a basis for evaluating and selecting nitrate implementation measures to support nitrate management in the area under the influence of their discharge.
- Where necessary for the discharger(s) to develop an SNMP Compliance Plan, NIMS findings may be used to support development of this plan.
- All categories of implementation measures need to be considered: alternative drinking water supplies, source control measures, recharge of high quality water, and groundwater remediation.

Summary of Findings (cont.)

- The cost for treating groundwater that exceeds the MCL in the Central Valley could range from $36B to $81B.
- Regardless of the implementation measures selected, the time required to achieve management goals to achieve aquifer restoration or even mass balance is very long.
- Given these findings, efforts are being made to address safe drinking water issues early because achieving balance or restoring the aquifer cannot occur in a timely manner. The most immediate management goal for the Central Valley is to ensure that a safe drinking water supply is available to all residents of the region.

SALINITY MANAGEMENT

Strategic Salt Accumulation Land and Transportation Study (SSALTS)

Central Valley Salinity Problem

- Over seven million tons of salt are accumulating annually in the groundwater basins underlying the Central Valley floor.
- The sources of salinity in groundwater are agriculture, municipal and industrial discharges, and – in some groundwater basins – sediments of marine origin with naturally-occurring salts that can be leached out.
- In a study commissioned by the State Water Board, UC Davis economists found *“that if salinity increases at the current rate until 2030, the direct annual costs will range from $1 billion to $1.5 billion. Total annual income impacts to California will range between $1.7 billion to $3 billion by 2030.”*

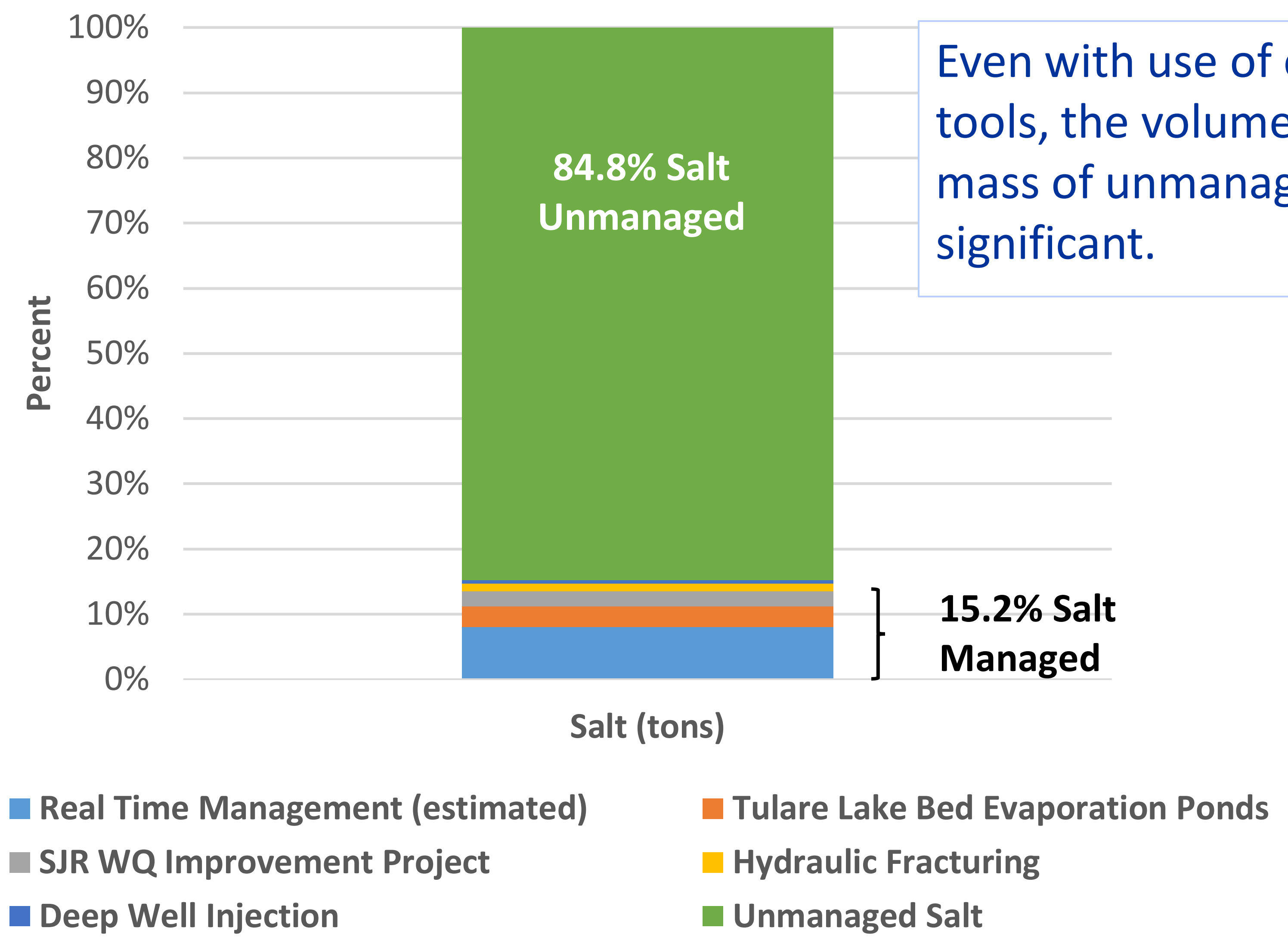
SSALTS – Identify Sustainable Salt Management Alternatives

- SSALTS investigating:
  - Magnitude of the problem
  - Requirements to achieve sustainability
  - Available salt management tools - now vs. future
  - Implementation measures for inclusion in the SNMP

Key Salt Management Alternatives

Treatment & Salt Recovery Technology	Brine Disposal and Storage
• Mature Technologies – Reverse Osmosis – Ion Exchange – Lime Softening – Evaporation Ponds • Emerging Technologies – Smart Integrated Membrane System (SIMS) – WaterFX Aqua4 System – Multi-effect Distillation – Zero Discharge Distillation by Veolia – Electrodialysis Metathesis – New Sky Energy – Temperature Control and Electrodialysis – Element Renewal – Addition of polymers to remove trace elements	• Brine Supply for Hydraulic Fracturing • Deep Well Injection • Salt Management Disposal Areas – Landfills – Dedicated Disposal Sites – San Joaquin River Improvement Project • San Joaquin River Real Time Management • Transport Brine Out of Valley – Truck/Rail Brine – Regulated Brine Line – Bay Area WWTP – New, permitted Bay Area Outfall

Achieving Salt Sustainability – Example Scenario from Southern Part of Central Valley

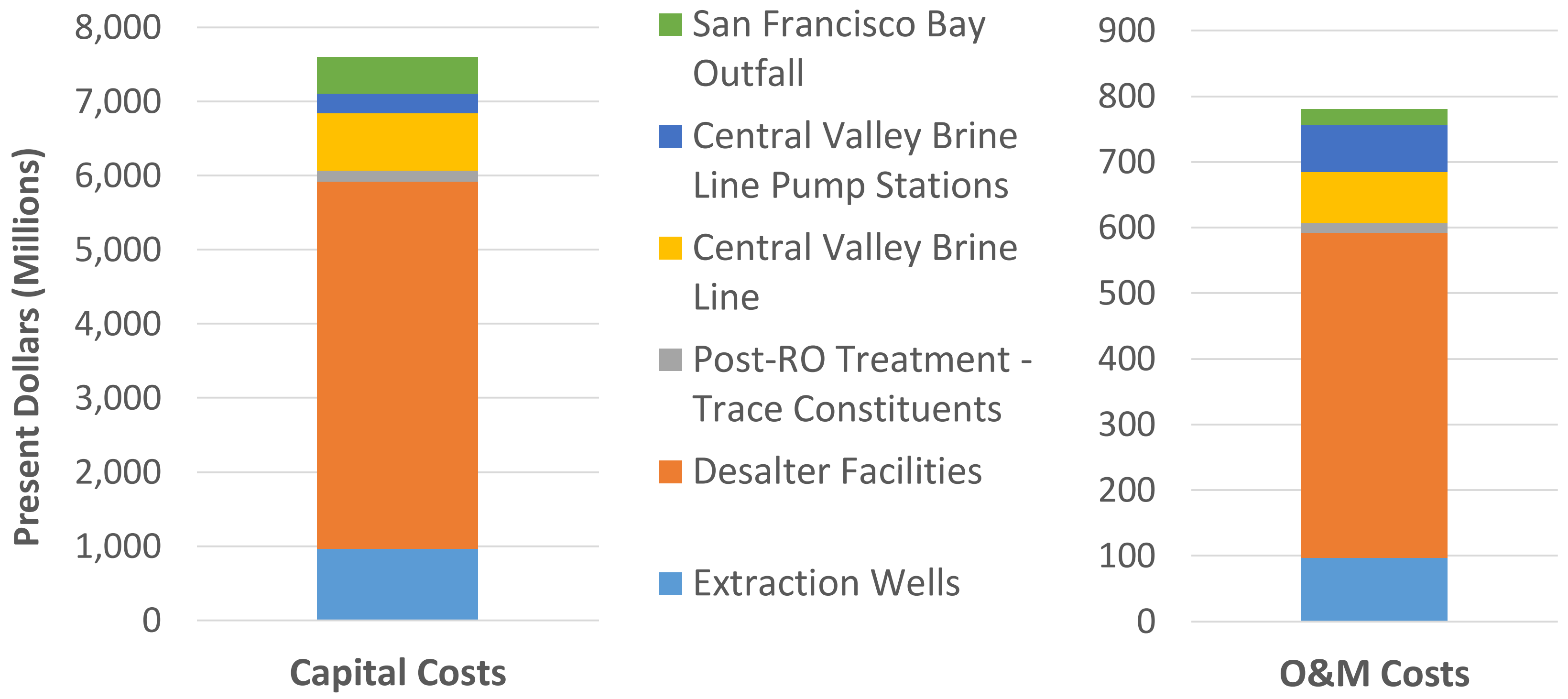


Even with use of existing tools, the volume and mass of unmanaged salt is significant.

Achieving Sustainability Requires Having the Means to Move Salt Out of the Central Valley

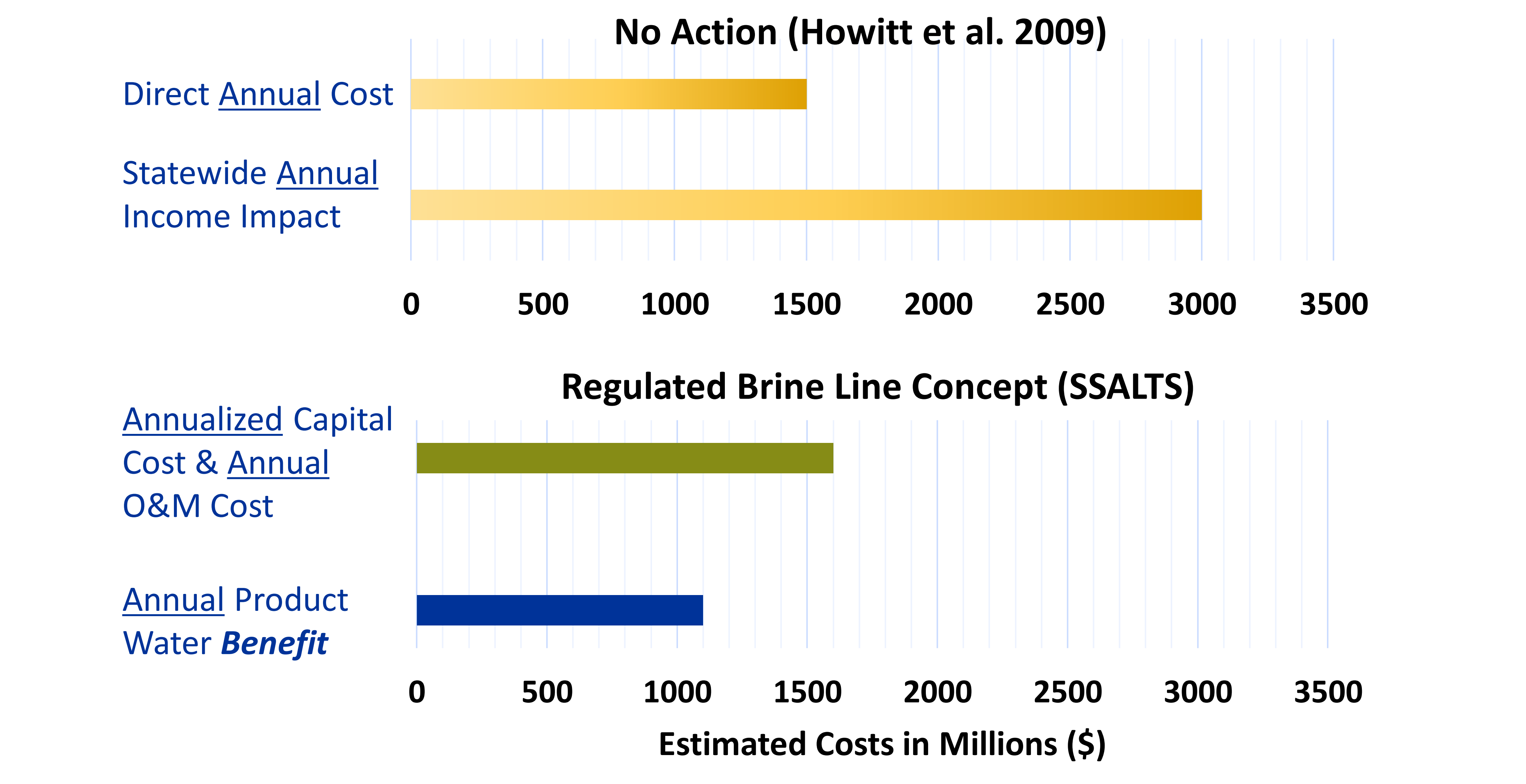
- Central to all evaluated salt management alternatives is a ***regulated Central Valley brine line***
- Concept level analysis completed
  - Alternative Central Valley routes
  - Preliminary Brine Discharge Alternatives
    - Via existing East Bay Municipal Utility District outfall
    - Via an alternative outfall to San Francisco Bay
  - Concept-level cost estimate – Capital and O&M

Conceptual Level Costs for Regulated Brine Line Alternative – Outfall to San Francisco Bay



- Implementation of this alternative would yield product water with an estimated value of $1.1B/year

Regulated Brine Line Concept vs. No Action



Implementation Timeline – Regulated Brine Line Alternative

- Short-Term Implementation Activities (~20 Year Period). Key activities during this period include:
  - Prioritization and Optimization Plan – Further evaluate possible project configurations;
  - Conceptual Design – Feasibility study to evaluate the engineering approach;
  - Funding Plan – Capital and operation & maintenance costs;
  - Environmental/Permitting – Meet the requirements of CEQA/NEPA;
  - Project Design – Detailed design of key components
  - Governance Plan – Develop operational plan with roles and responsibilities defined
- Long-Term Implementation Activities (~30 Year Period)
  - Phased construction and operation over extended period

Summary of Key Findings

- The only salt disposal option that can manage or dispose of the mass of salt that is accumulating annually in a sustainable manner is disposal of brine through a regulated brineline with a permitted ocean or San Francisco Bay outfall.
- The major components of this treatment system include extraction wells, desalter facilities (*e.g.*, Reverse Osmosis [RO]), injection wells, post-RO treatment for trace elements, the Central Valley Brine Line (CVBL), CVBL pump stations, and disposal costs at the wastewater treatment plant (WWTP).
- Conceptual level capital costs for the long-term regional salinity treatment system is about $11 billion dollars. Operations and maintenance (O&M) costs would be about $1.2 billion dollars.
- The value of the product water produced along with other sources of revenue, *e.g.*, biosolids exported to the Central Valley, total about $1.1 billion dollars annually.

SNMP IMPLEMENTATION FRAMEWORK

Overview

SNMP Implementation Strategy: Two Primary Goals

Assure Safe Drinking Water

<u>and</u>

Sustain the Agricultural Economy

Either we achieve both or get neither: our focus needs to be on solving each other's problems

SNMP Implementation Strategy Primary Goals

- Given these goals, the SNMP must provide a…
  - Mechanism to implement alternative water supplies
  - Means to legally authorize discharges from modern farming practices and Central Valley Communities
  - Strategy to prevent further water quality degradation
  - Implementable plan to restore degraded groundwater where it is reasonably feasible and practicable to do so

Central Valley Water Board's Existing Regulatory Options

- Permit Discharges
  - Must require compliance with water quality standards
  - May allocate assimilative capacity
  - If no assimilative capacity: (a) require discharge to meet water quality objective; (b) change the water quality standard; or (c) prohibit the discharge
- Mandate Replacement Water
  - Issue Cleanup and Abatement Order

Challenges…

- Central Valley Water Board's options are limited
- Agricultural and community discharges might be prohibited
- Expensive, unnecessary treatment might be required
- Fails to assure safe drinking water

SNMP Identifies Additional Regulatory Options

- Alternatives for calculating assimilative capacity – depends on constituent
- Expansion of existing Exceptions Policy
- Creation of Management Zones
- Offsets Policy
- Considerations for Conservation and Drought Conditions

Application of Regulatory Options Must Ensure Compliance with SNMP Management Goals

Management Goal 1

- Safe Drinking Water Supply
  - Short & Long Term Solutions

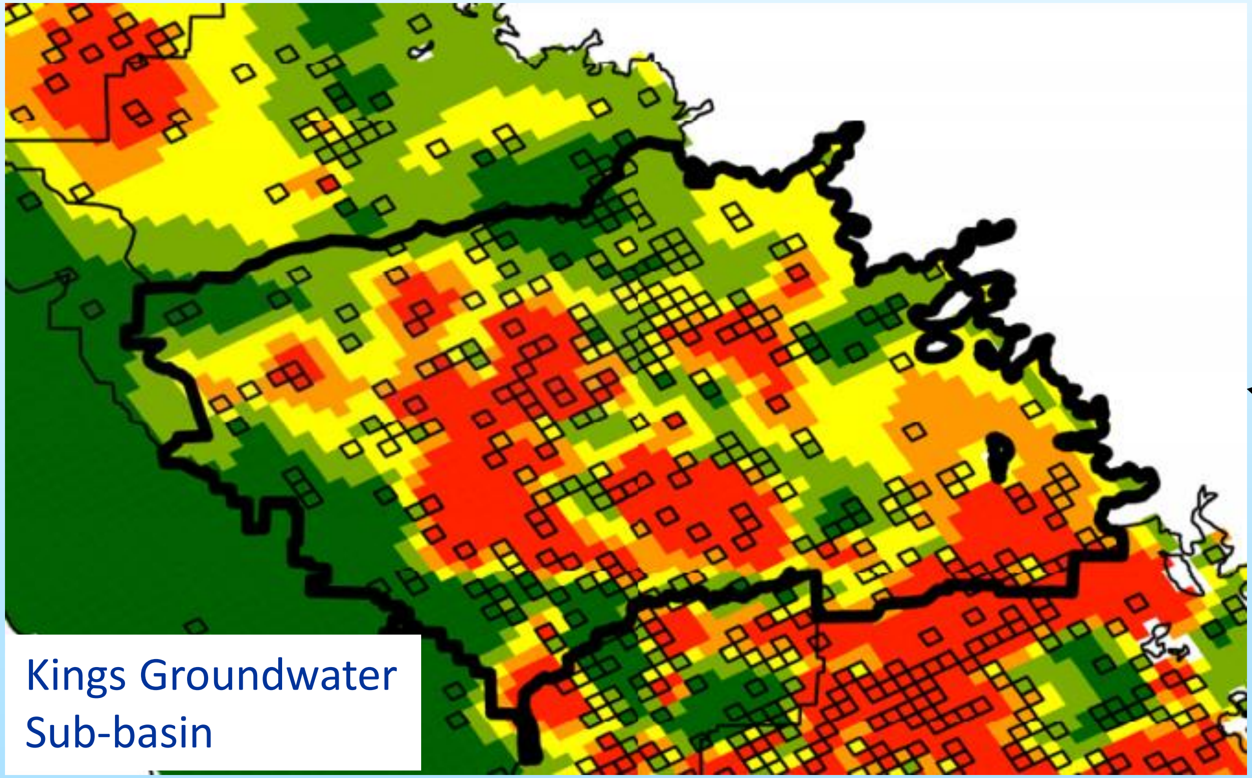
Management Goal 2

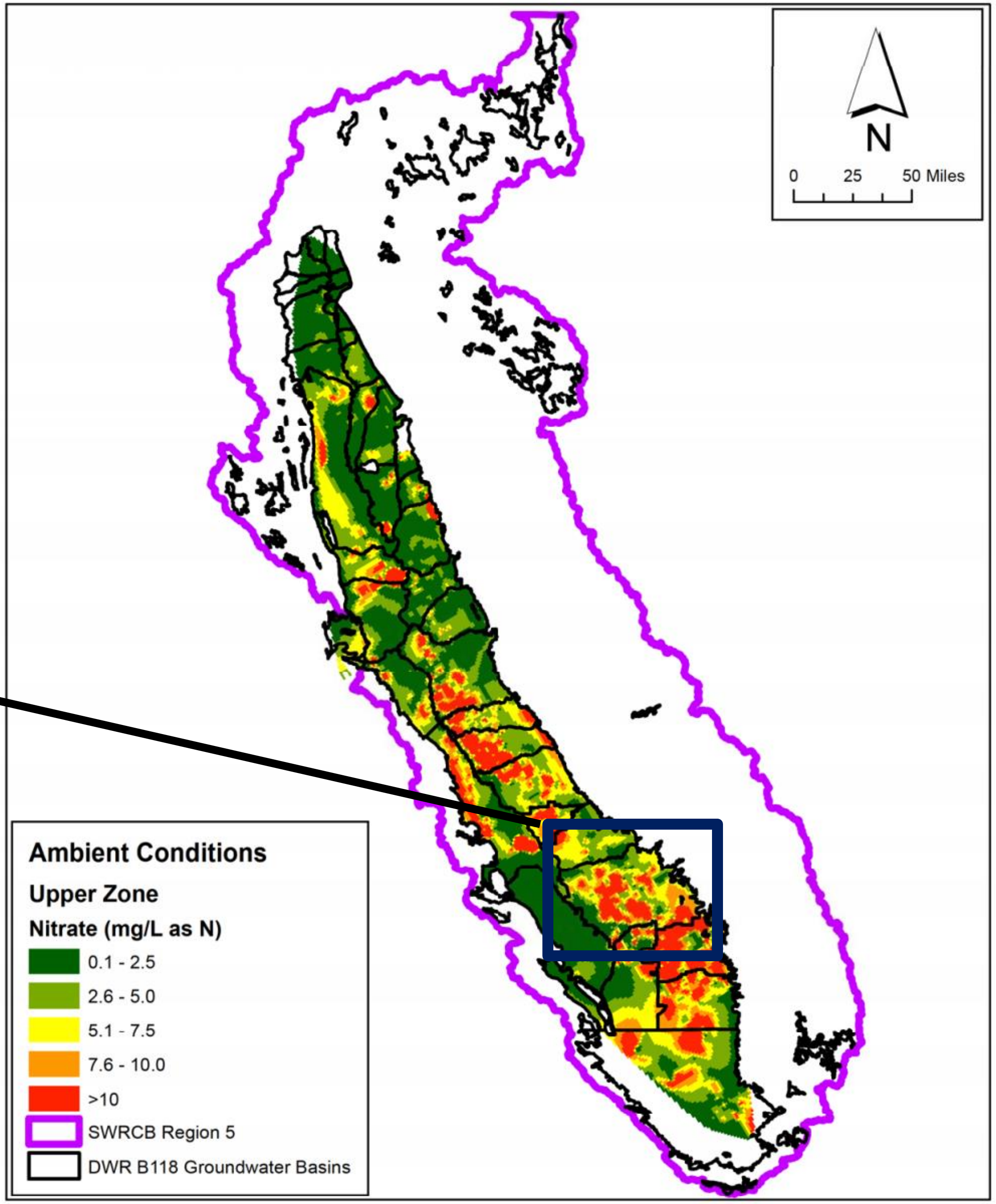
- Achieve Salt/Nitrate Balance
  - Timeframe & Costs Vary

Management Goal 3

- Restore Groundwater Quality
  - Where Feasible & Practicable

SNMP Implementation Needs to Accommodate Diversity in Conditions





LUHDORFF & SCALMANINI CONSULTING ENGINEERS

LARRY WALKER ASSOCIATES

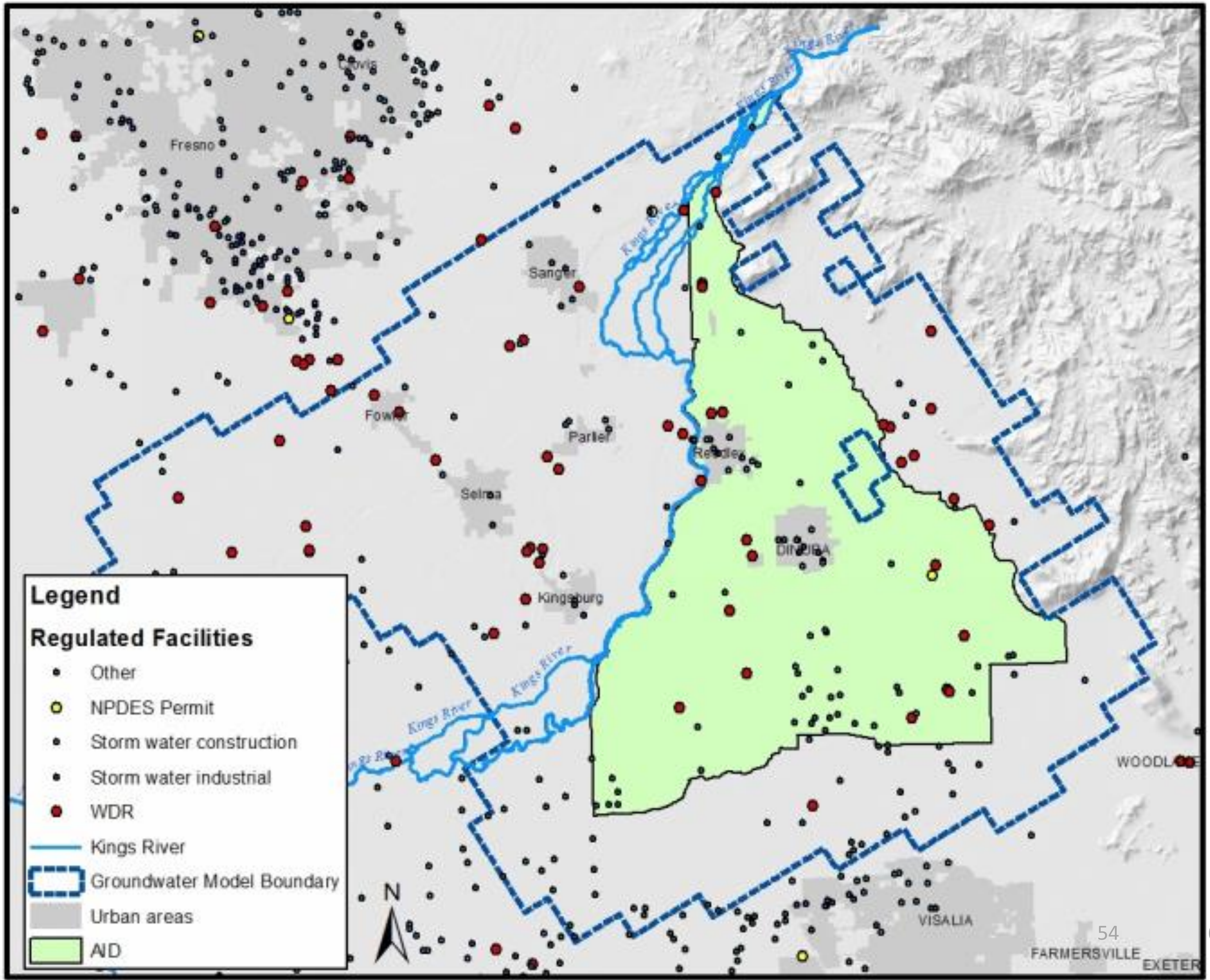
Figure 38

SNMP IMPLEMENTATION FRAMEWORK

Approach for Nitrates: Translating the SNMP into Enforceable Requirements

Defining the Appropriate Scale

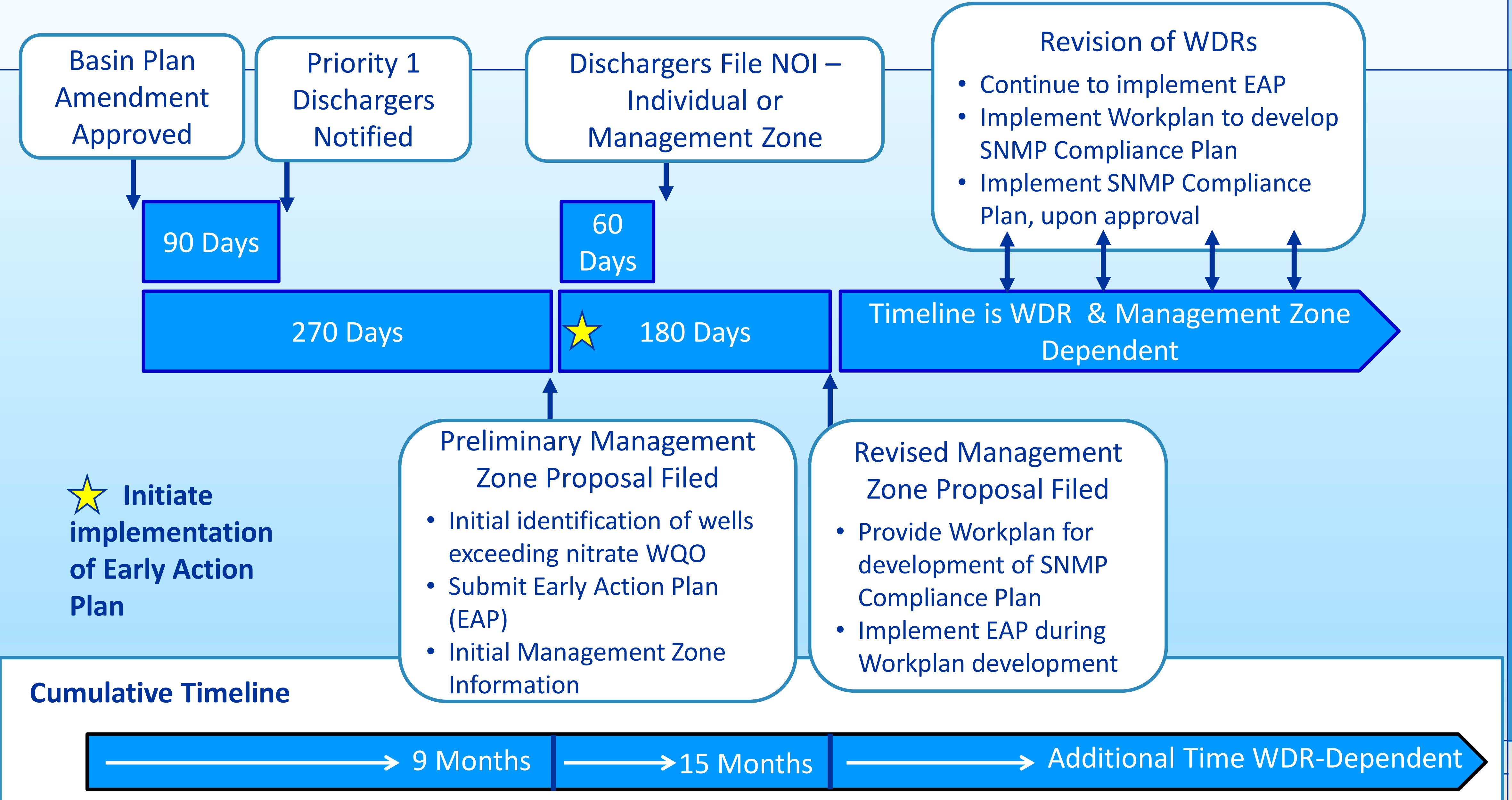
- Groundwater Basins/Subbasins – DWR Bulletin 118
- Management Zone – Defined area for collective management of nitrates by multiple dischargers
- Individual Discharger/Dischargers under a single order – Option for discharger(s) under a single order to manage nitrate at the local level


Legend
Regulated Facilities
Other
NPDES Permit
Storm water construction
Storm water industrial
WDR
Kings River
Groundwater Model Boundary
Urban areas
AID
N
Clovis
Fresno
Sanger
Fowler
Parlier
Reedley
Selma
Kingsburg
DINUBA
VISALIA
FARMERSVILLE
EXETER
WOODLAKE
Kings River

Management Zone vs Individual/Single Permit

Management Zone	Individual/Single Permit
• Preferred path, but not appropriate everywhere • Participation in Management Zone may not be necessary for all dischargers • Need to incentivize participation and avoid ability for individuals to "game" the system	• Need to have option where there is no Management Zone • Need to maintain option where participation in Management Zone is not necessary • May require additional conditions/demonstrations if Management Zone is available as an option

Implementation Timeline – Management Zones



Key Issues Being Discussed

- Prioritization of areas for implementation
  - DWR Basins
  - Nitrate-based
  - Volume-weighted vs. average water quality
  - Upper Zone vs. Production Zone

- Time needed to develop Preliminary and Revised Management Zone Proposals
- Discretion for Executive Officer to grant extension
- Coordinate with SGMA timelines, where feasible
- Ability for individual to join Management Zone at later time

Priority 1 Area – Starting the Process

- Notify dischargers within that area of need to comply with SNMP
- Educate dischargers regarding options for compliance
  - Management Zone vs. Individual/Single Permit
- Encourage establishment of a Management Zone

Management Zone (MZ) Pathway

1. Prepare *Preliminary Management Zone Proposal*
   – Proposed boundaries; water quality conditions; initial participants; other targeted participants; coordination with others
   – *Early Action Plan* to address immediate drinking water concerns
2. Implement *Early Action Plan* and Submit *Revised Management Zone Proposal*
   – Identify alternative compliance pathway(s) and associated milestones
   – Detailed Workplan for development of *Management Zone Implementation Plan*; governance structure; participants
3. Central Valley Water Board Revises WDRs for Management Zone Participants
   – Incorporate specific requirements for compliance with *Management Zone Implementation Plan*

Management Zone Implementation Plan Must…

- Be consistent with SNMP Management Goals
- Assure safe drinking water within the Management Zone
- Rank and prioritize implementation efforts
- Include a Monitoring Program
- Establish phased implementation strategy
- Be publically noticed and have opportunity for comment before Executive Officer approval

Individual/Single Permit Pathway

1. Initial Assessment
   - Receiving water/discharge water quality conditions
   - Nitrate-related discharge impacts to nearby drinking water wells
   - *Early Action Plan* development, if applicable
   - Compliance pathway
     - For example, allocation of assimilative capacity, application for an Exception to meet nitrate standard, request for an offset
2. Implement *Early Action Plan* (if applicable)
3. Central Valley Water Board revises WDR
   - WDR conditions for compliance with SNMP will reflect requirements associated with the selected compliance pathway

Key Issues Being Discussed

- Central Valley Water Board staff resources for notifications
- Timing of Early Action Plans
- Process for Central Valley Water Board approval/acceptance of Early Action Plans
- Commitment to implement Early Action Plans prior to revision of WDRs
- Lead entity(ies) for implementing Early Action Plans
- Assurances of compliance

SNMP IMPLEMENTATION FRAMEWORK

Allocation of Assimilative Capacity vs.
Use of an Exception to Meet Nitrate
Water Quality Objectives

Aggregated Volume-Weighted Ambient Nitrate Water Quality Conditions

- Excerpted data from CV-SALTS Hi-Resolution Mapping Project
- Highlighted cells exceed the 10 mg/L nitrate water quality objective
- Where no assimilative capacity is available, an Exception may be requested

	DWR Bulletin 118 Groundwater Basin Code	Nitrate (mg/L as N)	
		Upper Zone	Production Zone*
Middle Central Valley	5-21.65	2.13	1.78
	5-21.66	4.46	3.36
	5-22.01	6.07	4.72
	5-22.02	7.58	5.53
	5-22.03	10.97	7.74
	5-22.04	6.48	4.85
	5-22.05	8.88	8.21
	5-22.06	4.65	4.09
	5-22.07	5.84	5.01
	5-22.15	3.64	3.04
	5-22.16	2.65	1.87
Southern Central Valley	5-22.08	7.12	6.84
	5-22.09	1.26	1.80
	5-22.10	2.32	1.37
	5-22.11	11.88	12.64
	5-22.12	5.33	3.23
	5-22.13	8.31	8.30
	5-22.14	5.54	3.76

*Above Corcoran Clay where present.

Scenarios for Allocating Assimilative Capacity for Individual/ Single Permit

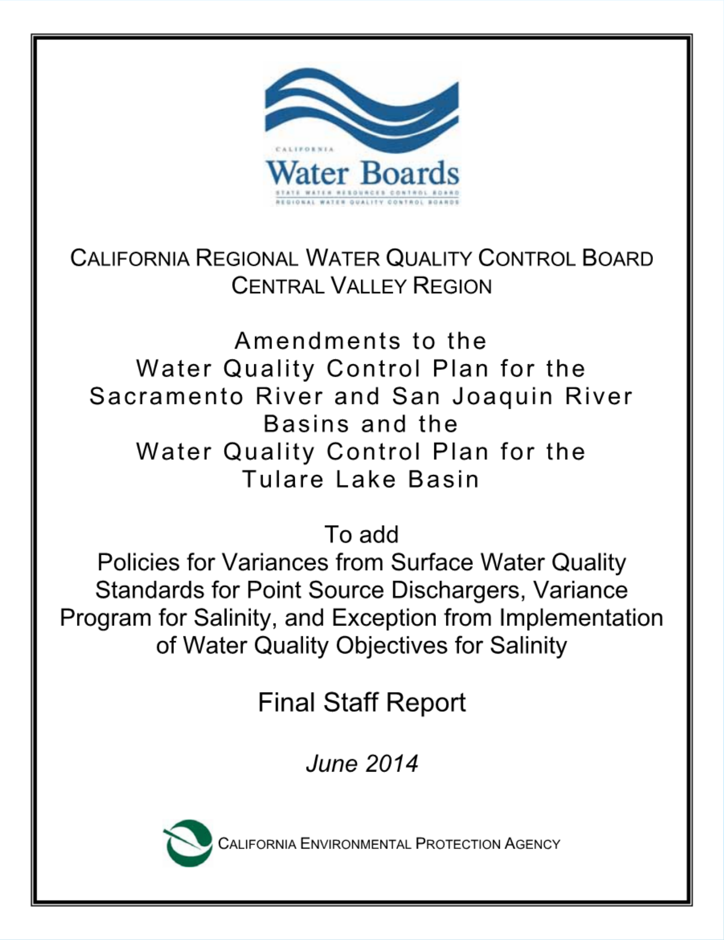
No Management Zone	Within Area where Management Zone has Assimilative Capacity	Within Area where Management Zone has No Assimilative Capacity
• Central Valley Water Board may allocate • Level of demonstration (i.e., antidegradation analysis) varies based on degree of assimilative capacity and point of compliance • Must consider impact to nitrate concentrations in Upper Zone over 20-year planning horizon	• Central Valley Water Board may allocate, but will consider impact to implementation of Management Zone Plan and allocation of assimilative capacity to Management Zone combined participants • Individual cannot use more than 10% of available assimilative capacity in the Upper Zone over 20-year planning horizon	• Not a complete bar if discharger can demonstrate localized available assimilative capacity • Central Valley Water Board will consider impact to implementation of MZ Plan

Scenarios for Allocating Assimilative Capacity for a Management Zone

- Volume-weighted average of Upper Zone vs Production Zone
  - Considering Upper Zone for nitrate and Production Zone for salt
- Demonstrate sufficient assimilative capacity available for combined discharges to Management Zone
- Must assure safe drinking water
  - Short-term and long-term
- Must comply with SNMP Management Goals

Definition and Application of an Exception

- Exception to meeting a water quality standard
  - Not an exception to complying with the SNMP or WDR
- Not reasonable, feasible or practical:
  - To prohibit discharge
  - Issue time schedule order, or
  - Revise the water quality standard (e.g., de-designate MUN beneficial use)


California Water Boards

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION

Amendments to the
Water Quality Control Plan for the
Sacramento River and San Joaquin River
Basins and the
Water Quality Control Plan for the
Tulare Lake Basin

To add
Policies for Variances from Surface Water Quality Standards for Point Source Dischargers, Variance Program for Salinity, and Exception from Implementation of Water Quality Objectives for Salinity

Final Staff Report

June 2014

CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY

Requirements

Allocation of Assimilative Capacity

Exception

Implementation Plan Framed on SSALTS and NIMS and incorporates three Goals/Priorities

1. **Safe Drinking Water**
2. **Balance**
3. **Managed Restoration where Feasible**

Utilizing best local solutions that could include: Mitigation Banks; Offsets; Recharge; Pump/Treat; Other

Determine need for, develop and implement Early Action Plan (nitrate)

Develop and implement Salt and/or Nitrate Compliance Plan

Formalize through WDRs

Key Issues Being Discussed

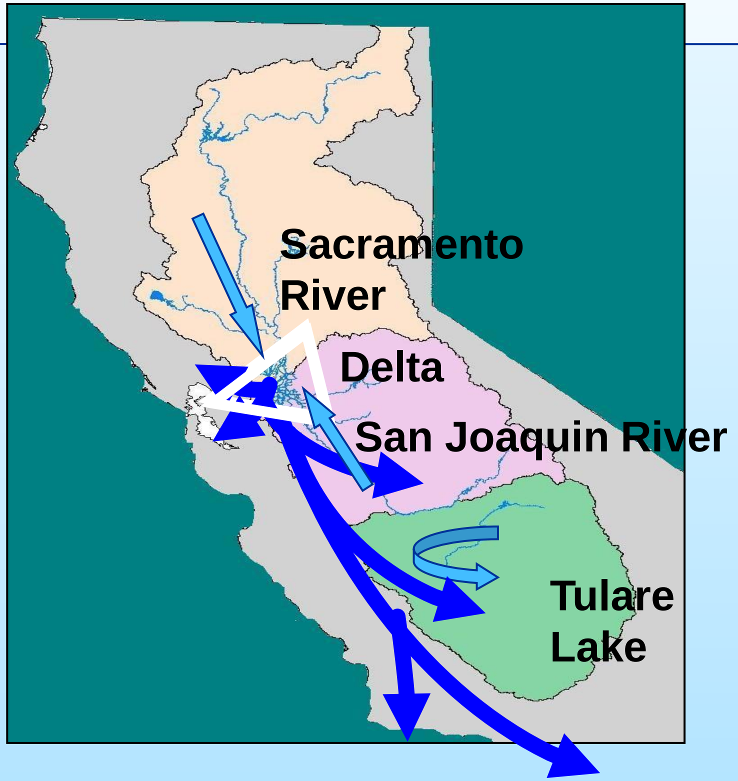
- Amount of assimilative capacity available for allocation (i.e., margins of safety)
- Allocation of assimilative capacity to individuals within a Management Zone
- Need to seek an Exception rather than seek an allocation of assimilative capacity
- Triggers for elevating commitments necessary to comply with SNMP

SNMP IMPLEMENTATION FRAMEWORK

Approach for Salinity Management

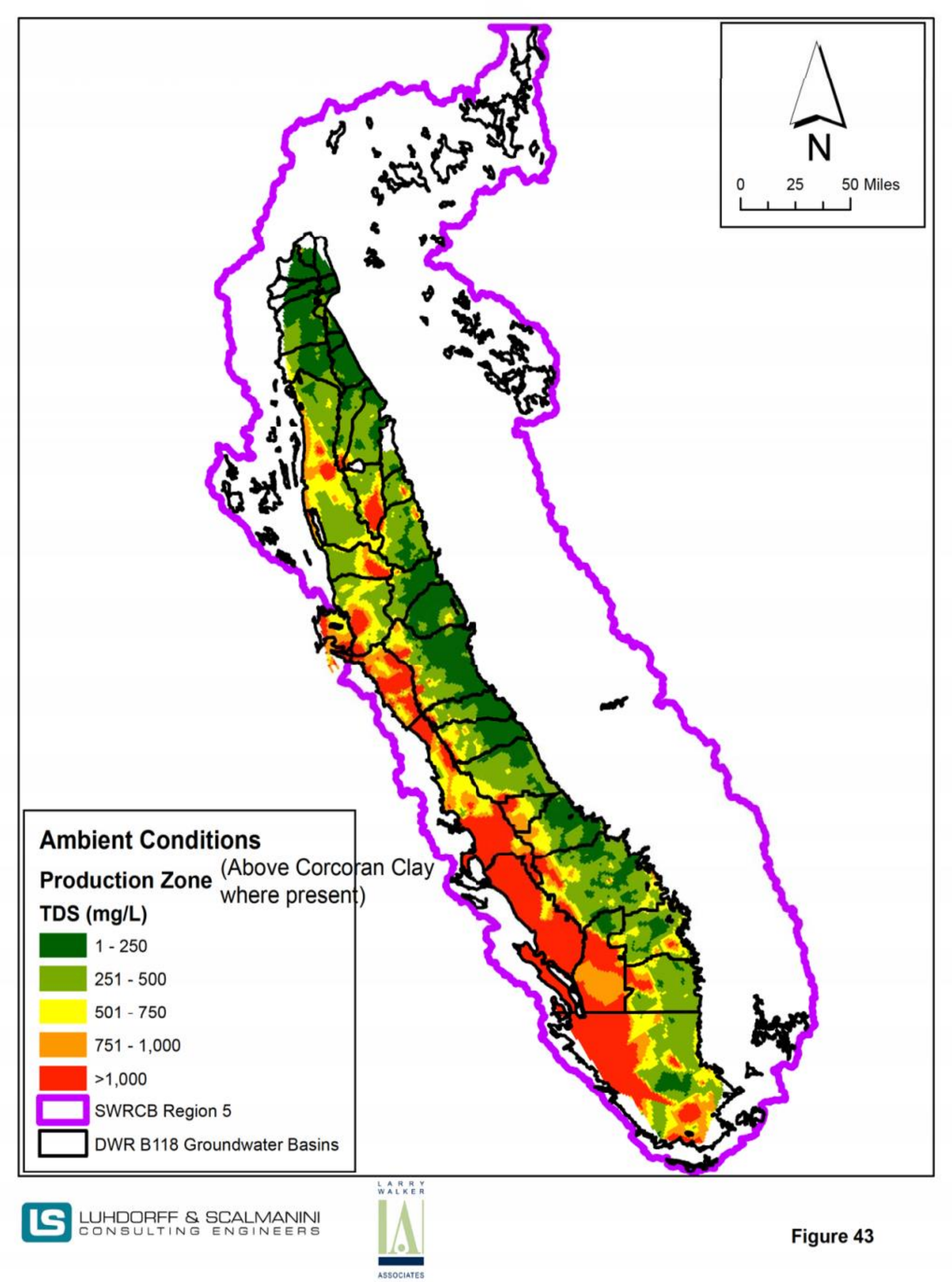
Salinity Management Program: Challenges

- Salt Travels with Water Supply
- Naturally Concentrates
- Balancing Act: Protect Us from Ourselves
- Salt = Slow Lingering Problem
- Highest Priority Safe Drinking Water



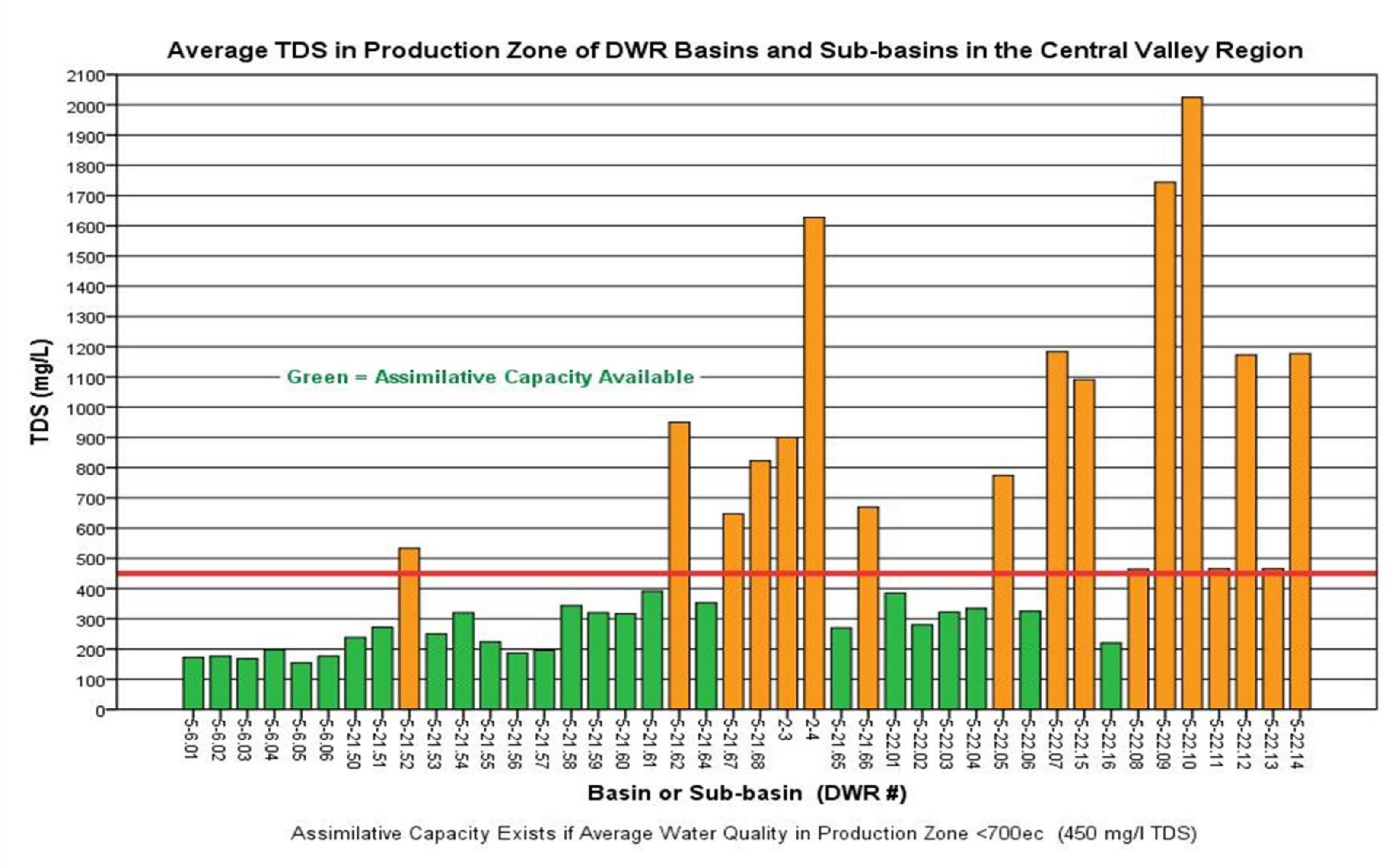
Salt is less urgent not less important

- Existing Conditions of the Production Zone



Salinity Management Program: Process and Progress

- Not the same as nitrate
  - Conservative
- Focus on Implementation Options
  - SSALTS
  - Treatment Alternatives
  - Containment Areas



Salinity Management Program: Process and Progress

Manage/minimize Degradation

- Move salt to area where does the least damage
  - Salinity Management Zones

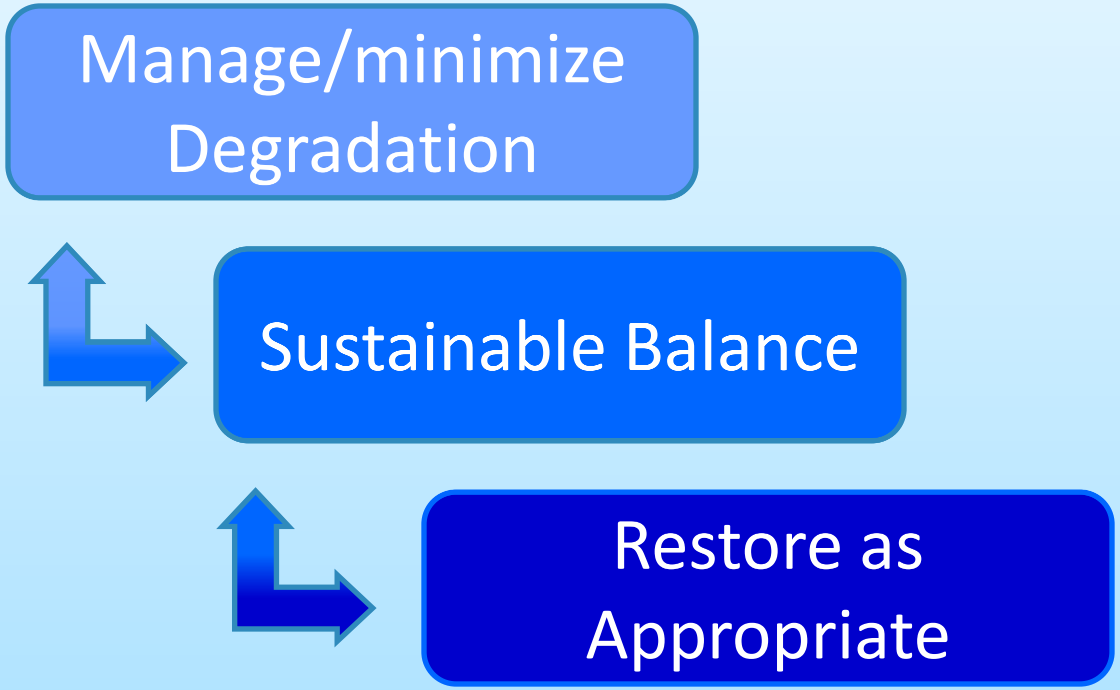
Sustainable Balance

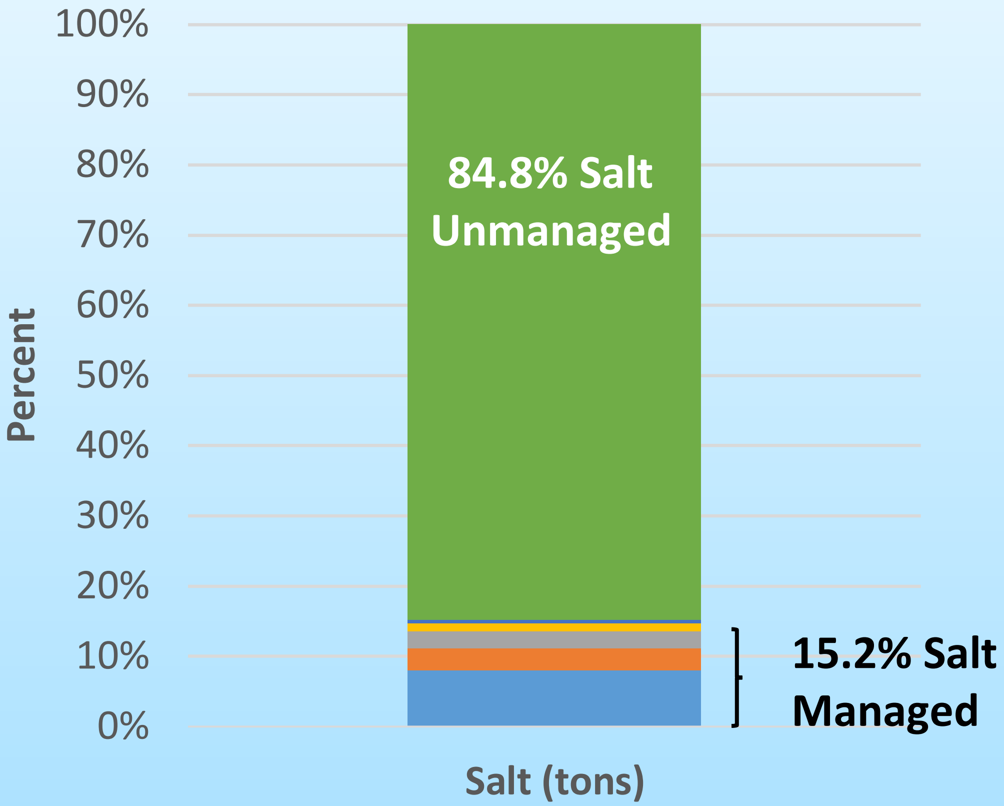
- Achieve Salt Balance
  - Timeframe & Costs Vary

Restore as Appropriate

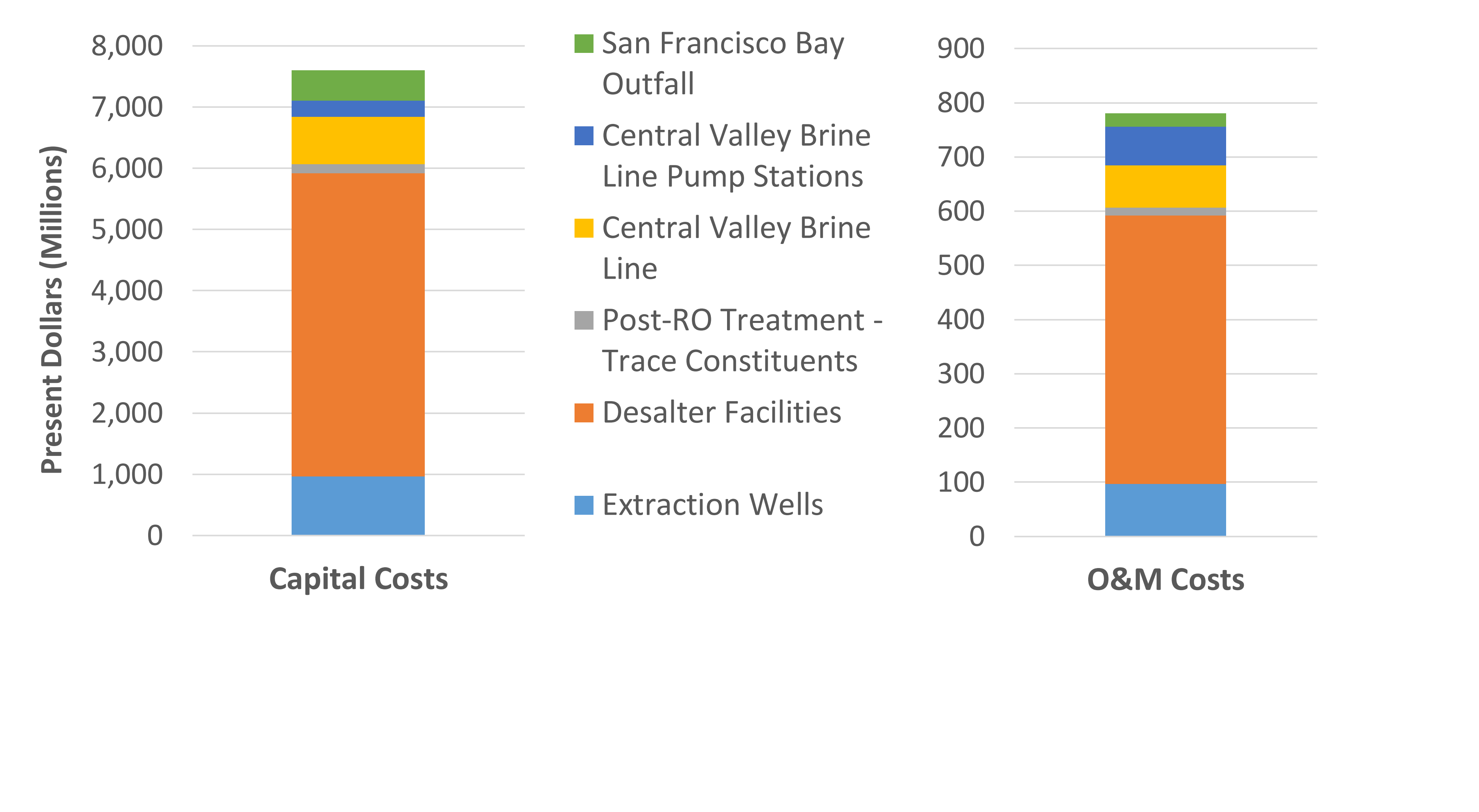
- Restore Groundwater Quality
  - Where Feasible & Practicable

Salinity Management Program: Process and Progress





Conceptual Level Costs for Regulated Brine Line Alternative – Outfall to San Francisco Bay



Salinity Management Program: Determining Milestones

- Development of a comprehensive Salinity Management Plan will continue while near term measures are taken to manage salinity levels in the Central Valley
- Assign an AGR class to each groundwater basin/sub-basin based on ambient volume-weighted concentrations in the Production Zone
- Salinity will be managed within the range established for the assigned AGR class
- Decisions regarding how to permit discharges to manage salt within an AGR Class, including what triggers additional actions to meet SNMP Management Goals, will be developed as part of a Salinity Permitting Strategy

Salinity Management Program: Timelines

- Address nitrate/safe drinking water first
- Realistic Timelines are Necessary
  - Regulated Brineline: 20 years to design, permit, fund;   30-years to build
- Interim Activities: Plan/Organize/**Fund**/Implement
- Not immediate crisis; Need to motivate society to take action

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Secondary Maximum Contaminant Levels (SMCLs)

SMCLs – Background

- All surface and groundwaters presumed to be protected for MUN.
- Challenges exist for dischargers to meet salinity-based SMCLs in permits.
- The Basin Plans provide limited guidance on the implementation of SMCLs, which are incorporated by reference from CCR Title 22. Specificity needed regarding:
  - Application of “Recommended”, “Upper”, and “Short Term” concentrations for TDS, electrical conductivity, chloride and sulfate.
  - Application of a finished drinking water standard (consistent with CCR Title 22) to surface waters and groundwater bodies.
  - Appropriate use of filtered or unfiltered samples for determining compliance.
  - Specification of an averaging period for determining compliance.
  - Determination of what is a “naturally occurring background concentration.”

22 CCR Table 64449-B: SMCLs "Consumer Acceptance Contaminant Level Ranges"

Constituents, Units	Recommended	Upper	Short Term
Total Dissolved Solids, mg/L, or	500	1,000	1,500
Specific Conductance, µS/cm	900	1,600	2,200
Chloride, mg/L	250	500	600
Sulfate, mg/L	250	500	600

SMCLs - Problem Statement

- Many receiving waters already > 500 mg/L TDS (780 EC).
- Most discharge quality is > 500 mg/L TD.
- Not feasible, practicable, reasonable to meet 500 mg/L TDS.
- Unintended consequences from conservation practices (e.g., drip irrigation), increased use of recycled water.
- Only alternative is to disallow the discharge (regardless of actual impact on uses).

SMCLs – Proposed Solutions

- Amend the Basin Plan to address the following:
  - 22 CCR text that provides guidance for the application of consumer acceptance levels, including provisions that describe factors that must be considered when using the Upper or Short Term thresholds
  - Clarify method for determining compliance, e.g., filtered vs. unfiltered sample
  - Clarify averaging period for assessing compliance, e.g., annual average
- Additional considerations:
  - Not proposing to change Bay-Delta standards;
  - No automatic increase in effluent limits from 500 to 1,000 mg/L TDS; appropriate effluent limit is a permit decision
  - Antidegradation policy and CEQA still apply
  - Still must meet 500 mg/L TDS at downstream water supply intakes

22 CCR Table 64449-A: SMCLs “Consumer Acceptance Contaminant Levels”

Constituents	Maximum Contaminant Levels/Units
Aluminum	0.2 mg/L
Color	15 Units
Copper	1.0 mg/L
Foaming Agents (MBAS)	0.5 mg/L
Iron	0.3 mg/L
Manganese	0.05 mg/L
Methyl-*tert*-butyl ether (MTBE)	0.005 mg/L
Odor – Threshold	3 Units
Silver	0.1 mg/L
Thiobencarb	0.001 mg/L
Turbidity	5 Units
Zinc	5.0 mg/L

SMCLs – Discussion Items

- Areas for Input:
  - Do dischargers have an obligation to comply with SMCLs in the same manner as drinking water providers?
  - If compliance with SMCLs is based on ensuring compliance at the nearest downstream water intake, does this provide adequate use compliance?
  - What are appropriate measures of compliance for dischargers?
    - Filtered or unfiltered samples
    - Compliance assessment time period

- Areas Still Under Discussion:
  - Definition for the phrase, “naturally occurring background concentration” needed along with guidance on how to determine what is naturally occurring background

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AGR Beneficial Use Protection for Salinity in Groundwater

AGR Use Protection for Salinity in Groundwater – Background

- With limited exception, all groundwaters presumed suitable for agriculture.
- The Basin Plans generally rely on a narrative water quality objective to protect the AGR use in groundwater; no guidance exists to interpret this narrative.
- Guidance is needed because the Board typically applies a conservative approach to writing WDRs that ensures protection of the most sensitive crop in all locations at all times
  - Electrical Conductivity < 700 µmhos/cm, unless...site-specific objective established
  - Compliance generally assessed at first encountered groundwater (assumes no mixing)
- Basin Plans have different language with regards to salinity management.

Ayers & Westcot Guidance - 1985

Constituent	Degree of Restriction on Use		
	None	Slight to Moderate	Severe
Electrical Conductivity (irrigation water) (µS/cm)	< 0.7	0.7 – 3.0	> 3.0
Total Dissolved Solids (mg/L)	< 450	450 – 2,000	> 2,000

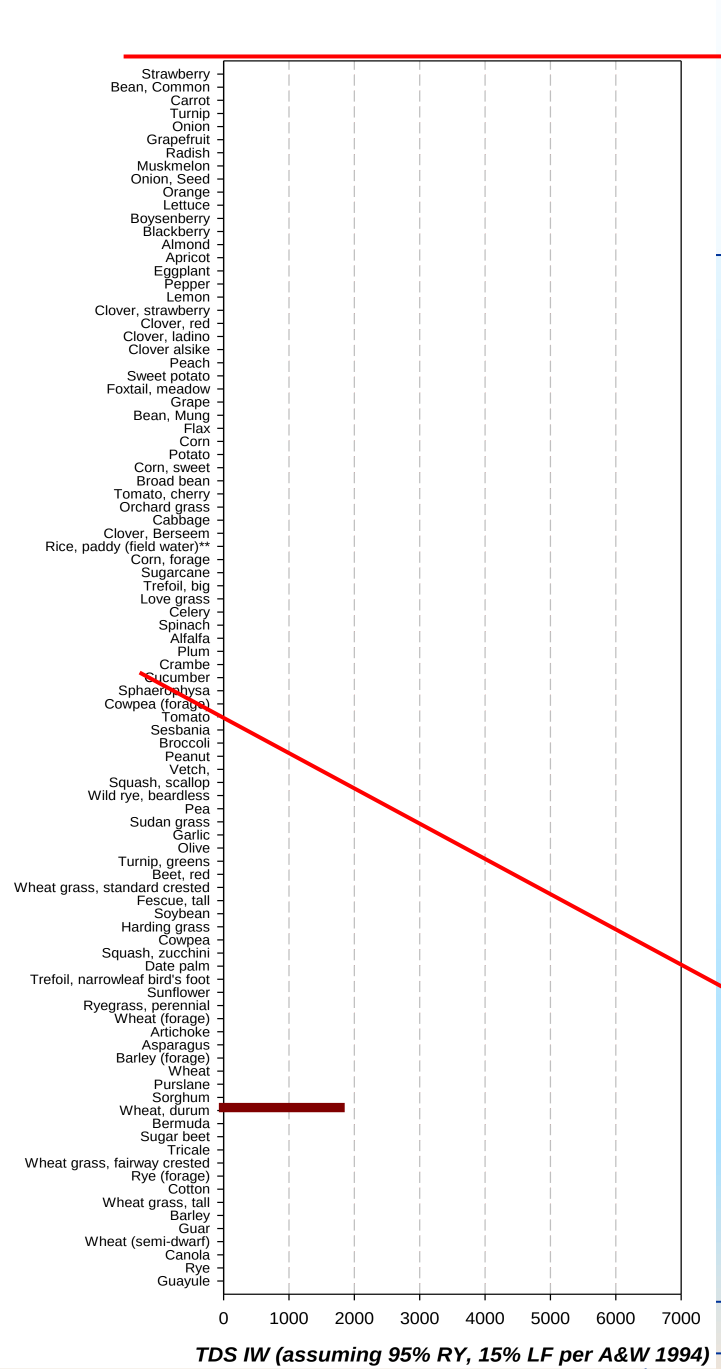
Excerpt from Table 1: Ayers and Wescot, 1985. *Water Quality for Agriculture*.

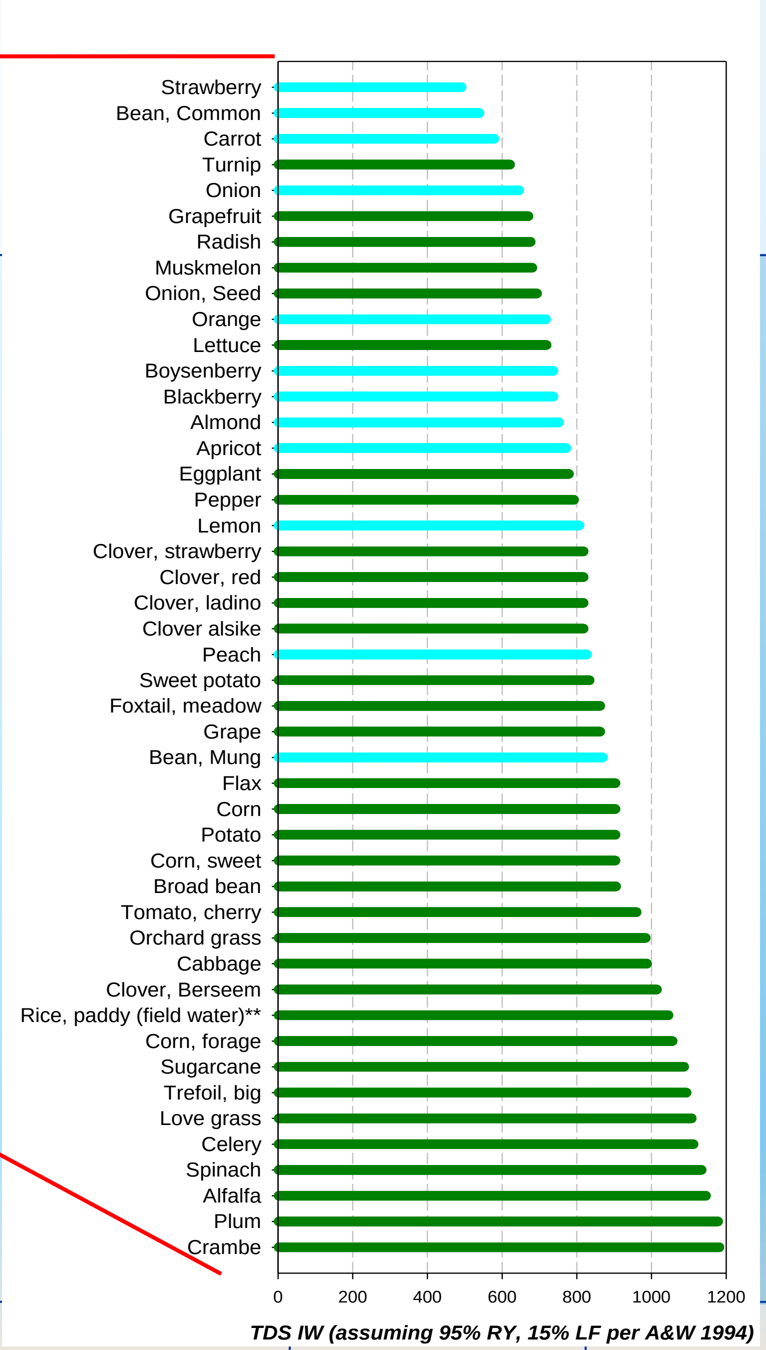
AGR Use Protection for Salinity in Groundwater – Problem Statement

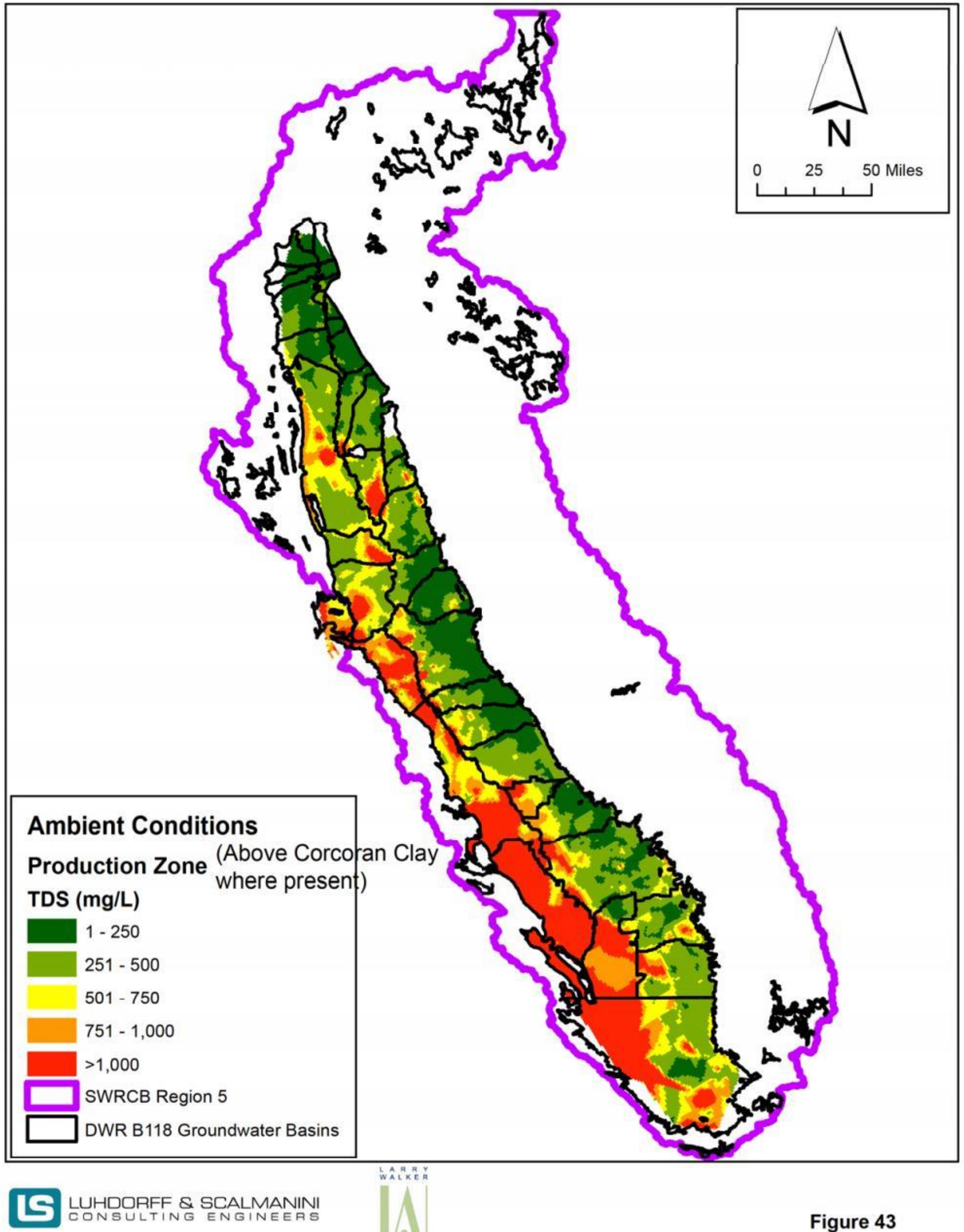
- Similar issues as discussed with regards to SMCLs
  - Many receiving waters already > 450 mg/L TDS (700 EC)
  - Most discharge water quality is > 450 mg/L TDS
  - No feasible, practicable, reasonable means to meet 450 mg/L TDS
  - Unintended consequences from conservation practices (e.g., drip irrigation), increased use of recycled water
  - Only alternative is to disallow the discharge (regardless of actual impact on uses)
- Unique considerations related to AGR-salinity
  - Can adjust irrigation strategies to mitigate salt impacts
  - In Central Valley, crop selection is far more dependent on surface water supplies
  - Wide variation in crop sensitivities
  - Many irrigation wells in deeper, more reliable, higher quality sections of the aquifer

Variation in Crop Sensitivity

- Sensitivity of crops to salinity varies dramatically from about 450 mg/L TDS to well over 3,000 mg/L TDS







N
0 25 50 Miles
Ambient Conditions
Production Zone (Above Corcoran Clay where present)
TDS (mg/L)
1 - 250
251 - 500
501 - 750
751 - 1,000
>1,000
SWRCB Region 5
DWR B118 Groundwater Basins
LUHDORFF & SCALMANINI CONSULTING ENGINEERS
LARRY WALKER

Figure 43

AGR Use Protection – Proposed Solutions

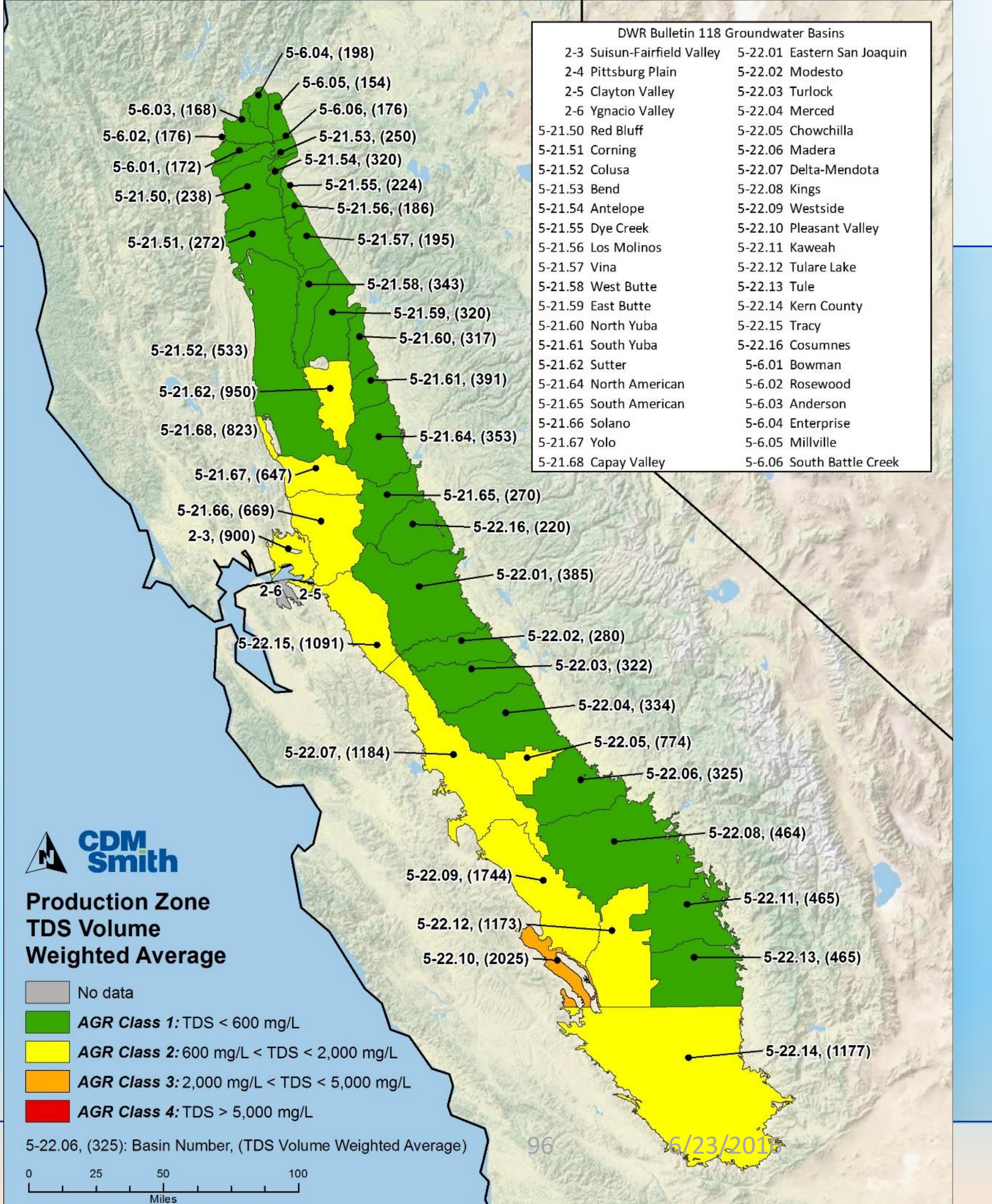
- Retain narrative objective approach – direct permit writers to consider a wide range of factors when developing WDRs.
- Amend the Basin Plans to assign AGR classes to groundwater basins/sub-basins based on existing ambient water quality in the production zone of the basin/sub-basin, and manage salinity within these ranges.
  - *AGR Class 1: TDS ≤ 640 mg/L (EC ≤ 1,000 µS/cm).*
  - *AGR Class 2: 640 mg/L < TDS ≤ 2,000 mg/L (1,000 µS/cm < EC ≤ 3,000 µS/cm).*
  - *AGR Class 3: 2,000 mg/L < TDS ≤ 5,000 mg/L (3,000 µS/cm < EC ≤ 7,500 µS/cm).*
  - *AGR Class 4: TDS > 5,000 mg/L (EC > 7,500 µS/cm).*
- Thresholds provide basis to estimate assimilative capacity for each basin/sub-basin.

AGR Use Protection – Proposed Solutions (cont.)

- Develop WDRs in accordance with antidegradation policy; keep salt concentrations within the range established in the assigned AGR class.
- Prioritize development of local salt management plans.
- Establish special consideration for conservation, recycled water use, groundwater recharge, etc.

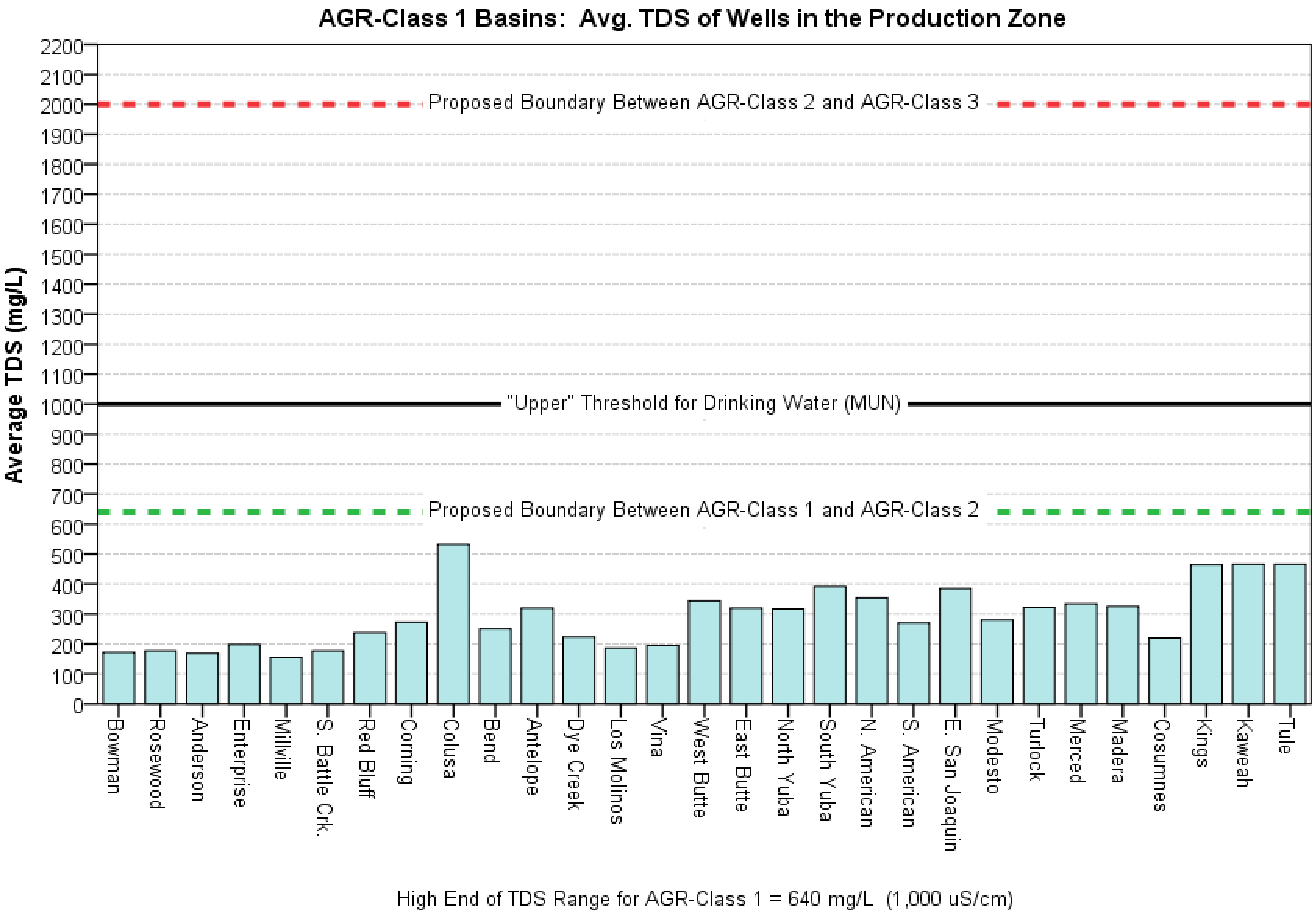
Example AGR Class Assignments

- Class assignments based on the volume-weighted TDS concentration in the Production Zone.



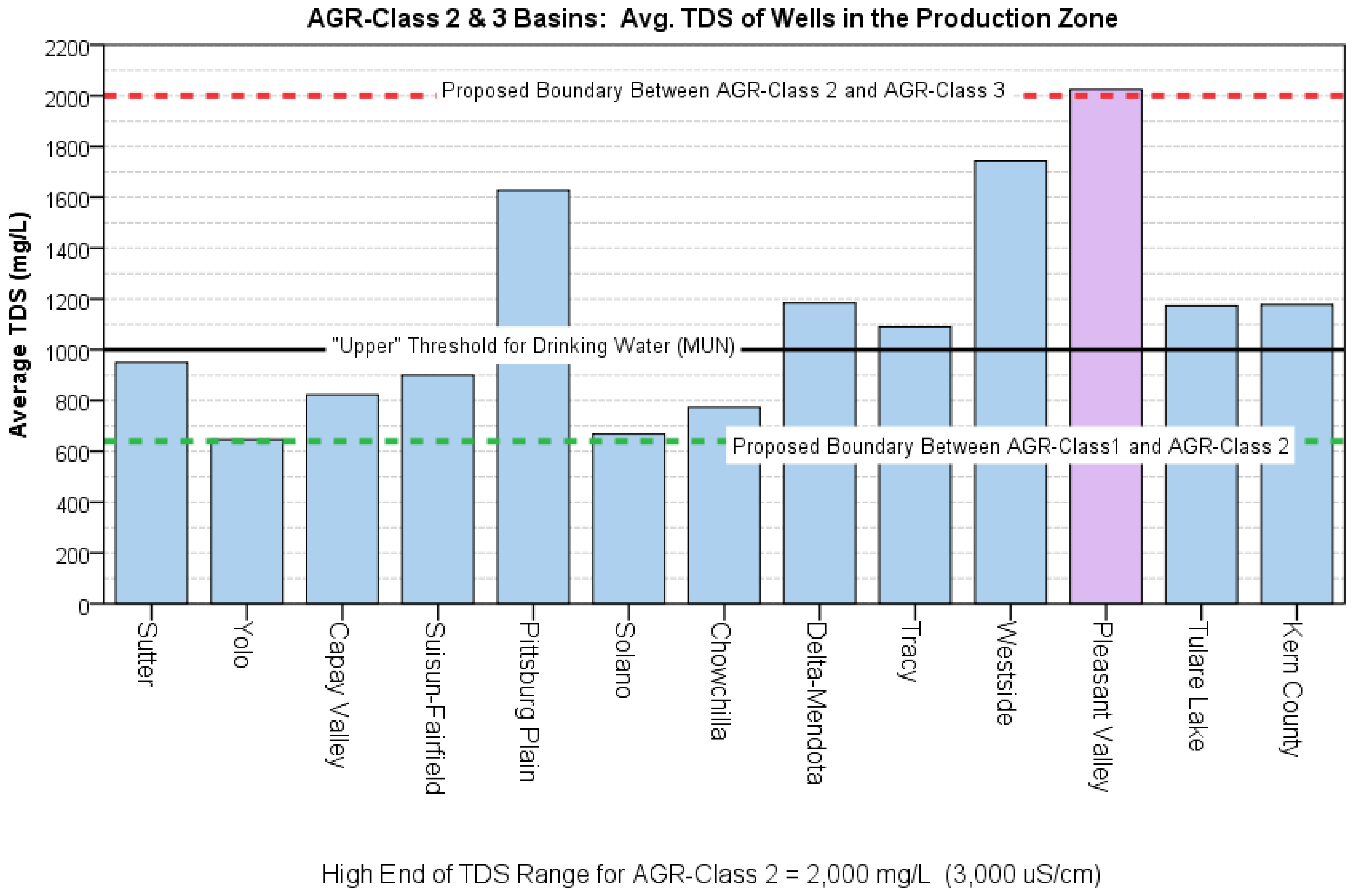
AGR Class 1

- TDS in the Production Zone of Central Valley Groundwater Basins and Sub-basins



AGR Classes 2 & 3

- TDS in the Production Zone of Central Valley Groundwater Basins and Sub-basins



AGR Use Protection – Discussion Items

- Are the proposed AGR class ranges appropriate?
- How should salinity be managed within an AGR class to keep salinity levels within the range established for the class?
- What should be the triggers for establishing commitments to implementation of a long term salt management program?

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Alternative Compliance Programs (ACP) & Permit Implementation

- Offsets
- Exceptions
- Management Zones

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Offsets

Offsets – Background

- Traditionally, compliance with WDRs is assessed at the point of discharge or first encountered groundwater
- WDRs focused exclusively on addressing the problem, directly, at the source
- Offset provide an alternative tool for use in developing WDRs

> Offsets – "provide an indirect approach to compliance with a WDR/Waiver requirement for a given pollutant by managing other sources and loads so that *the net effect on receiving water quality from all known sources is functionally-equivalent to or better than* that which would have occurred through direct compliance with the WDR at the point-of-discharge."

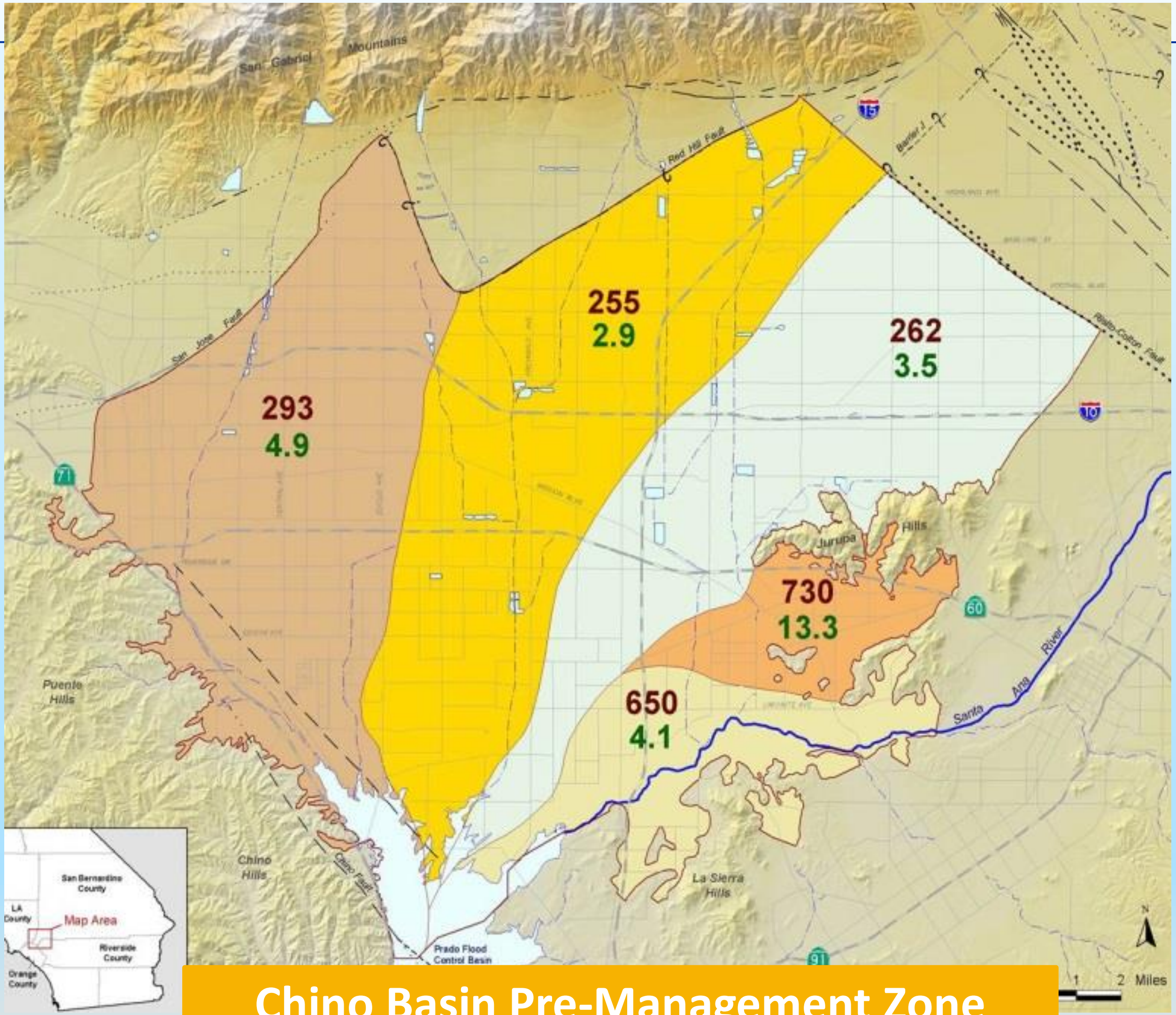
Offsets – Problem Statement

- Without authorization to apply Offsets:
  - May miss more efficient water quality management strategies
  - May miss more effective water quality management strategies
  - May miss opportunities for collaboration among various entities to solve multiple problems at the same time

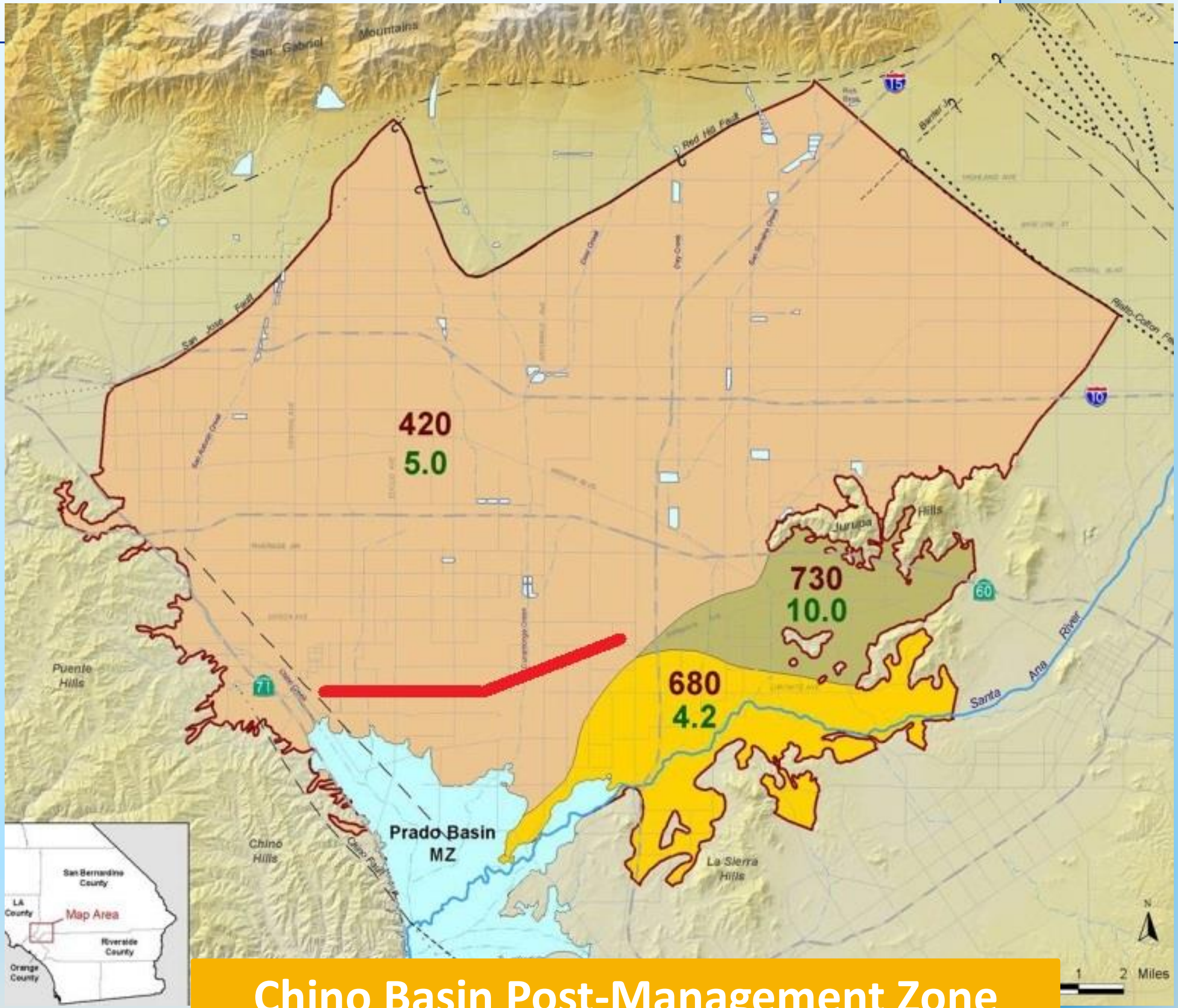
Offsets – Proposed Solutions

- Amend the Basin Plan to authorize use of Offsets to demonstrate compliance
- Offsets are an Alternative Compliance Strategy
- Key Considerations
  - Offset results in same or better water quality than traditional compliance
  - Offset results in same of better water quality than prohibiting the discharge
  - When traditional compliance is infeasible, impracticable or unreasonable
  - When traditional compliance makes very little difference to the receiving water
  - When Offset project addresses multiple problems and has multiple benefits

Illustration of Management Zone Concept – Chino Basin

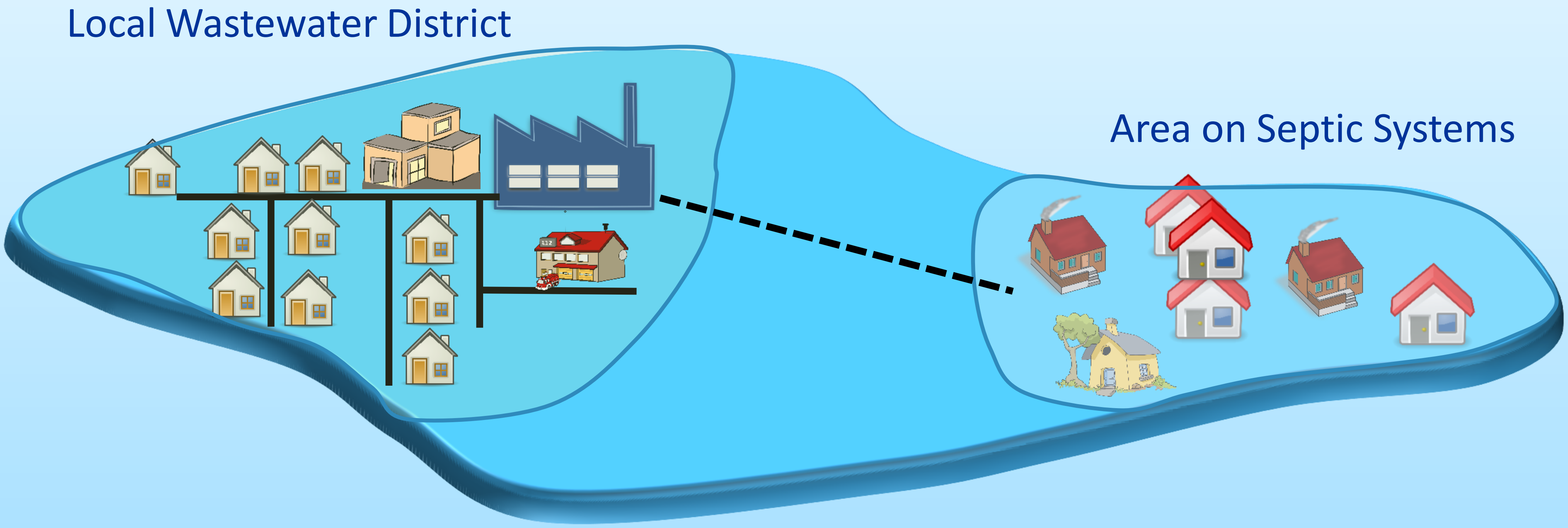


Chino Basin Pre-Management Zone Formation



Chino Basin Post-Management Zone Formation

Example of Application of Offset Policy



Offsets – Discussion Items

- Should an Offset program be limited to trades "within pollutants" (e.g., salt for salt) and not "between pollutants" (salt for nitrate)?
- Should the measured net effect of the Offset be flexible, or should there be a minimum benefit ratio?
- Should the measured net effect of the Offset be limited to direct water quality benefits or should other environmental or user benefits be considered?

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Exceptions

Exceptions – Background

- WDRs must be written to ensure compliance with water quality standards
  - At point of discharge
  - At first encountered groundwater
  - In receiving water
- Limited flexibility, e.g., compliance schedules (if such authority exists)
- Historically, no other regulatory options to allow non-compliant discharges to continue
- Basin Plans currently authorize Exceptions as an ACS in groundwater, but:
  - Authority sunsets after June 30, 2019
  - Existing authority is limited to salinity-related constituents
  - Streamlined process; intended to provide time for CV-SALTS to develop SNMP

Exceptions – Problem Statement

- Preferred path (traditional compliance, compliance schedule, assimilative capacity)
- Worst case scenario
  - Unable to comply with WDRs; infeasible, impracticable, or unreasonable even with TSO
  - No assimilative capacity available
  - Prohibiting the discharge is untenable
    - Infeasible, impracticable, or unreasonable
    - May not do much to improve water quality or protect users
    - May make water quality worse in some cases
    - May cause significant adverse economic impacts in the region.
- Not just a salt issue; nitrate too

Exceptions – Proposed Solutions

- Amend the Basin Plan to:
  - Add nitrate to the list of chemical constituents for which the Board may authorize an Exception if appropriate conditions met;
  - Remove the existing sunset provision that prohibits the granting of an Exception beyond June 30, 2019; and
  - Retain the existing provision that limits the term of an Exception to no more than 10 years, but add a new provision stating:
    - Exceptions may be reauthorized for one/more additional 10-year periods
    - Require that a status report be presented to the Central Valley Water Board every 5 years.
- Develop implementation guidance
  - Application requirements including CEQA
  - Factors to be considered (initial and renewal)
  - Key Terms and Conditions

Exceptions – Discussion Items

- Should the Basin Plan be amended:
  - To authorize the granting of an Exception beyond June 30, 2019?
  - To authorize the granting of an Exception for nitrate?
  - To allow re-authorization of an Exception for additional 10-year periods after the initial Exception authorization (subject to conditions)?

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Management Zone

Existing Ambient Water Quality

- <u>Left</u> - Nitrate Ambient Conditions in the Upper Zone (Average)
- <u>Right</u> TDS Ambient Conditions in the Upper Zone (Average)

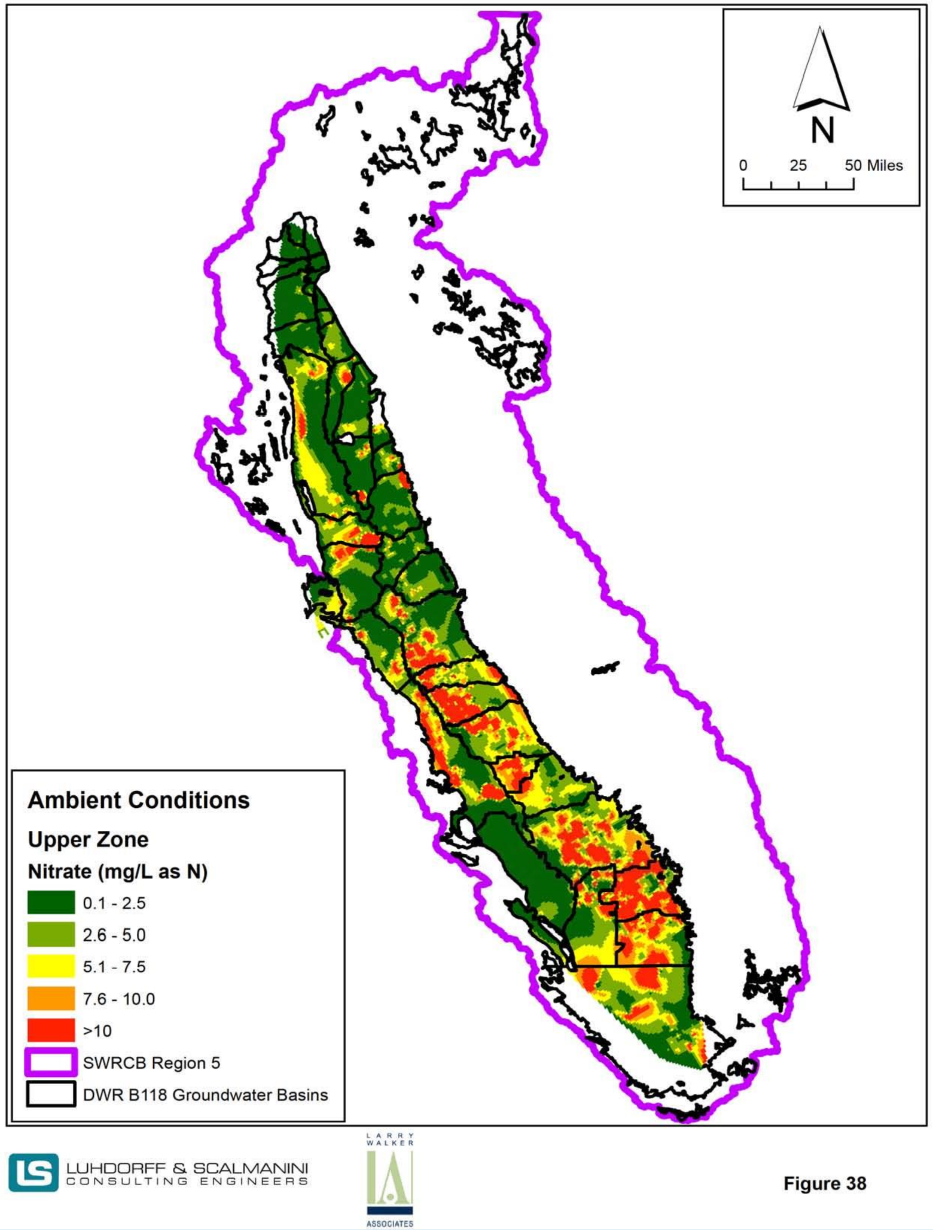


Figure 38

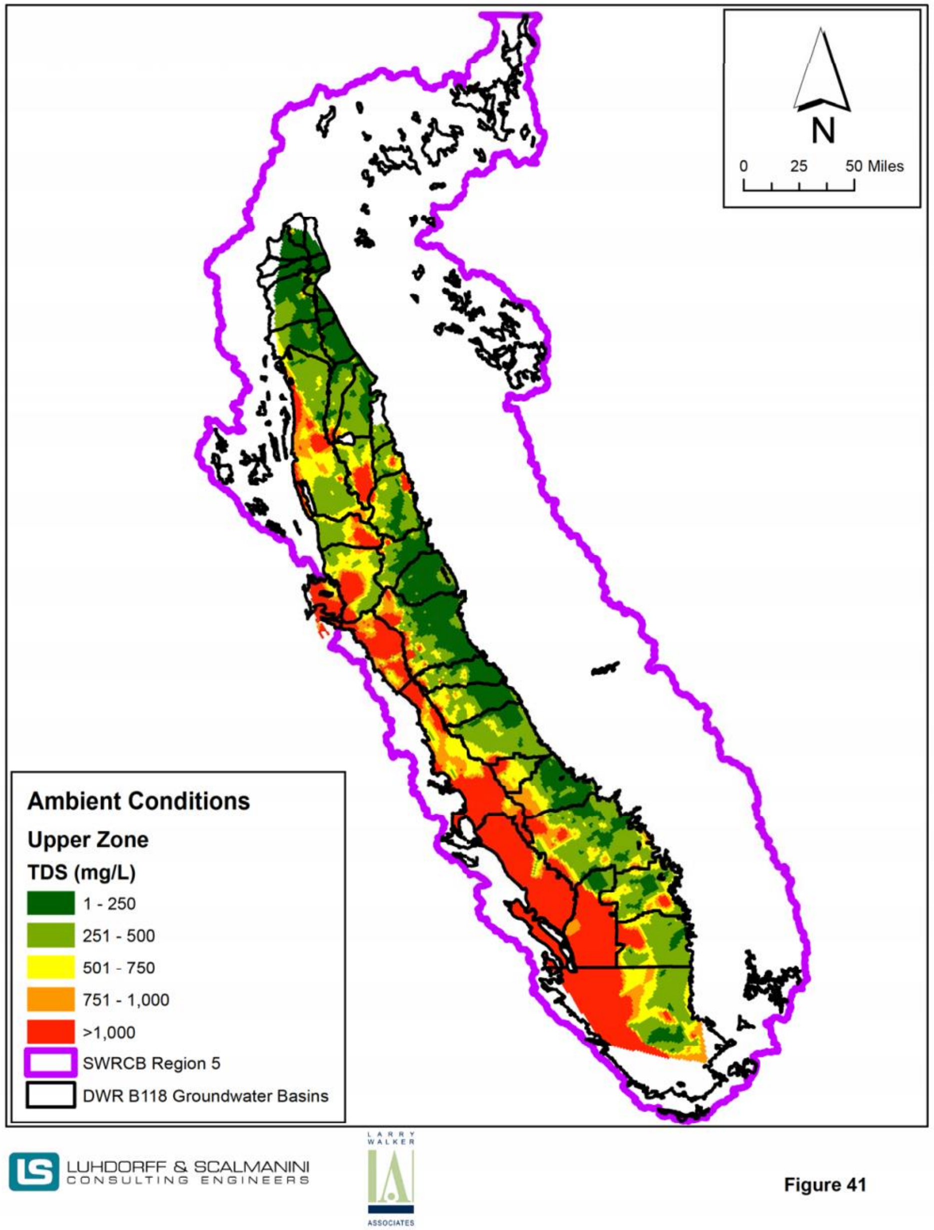
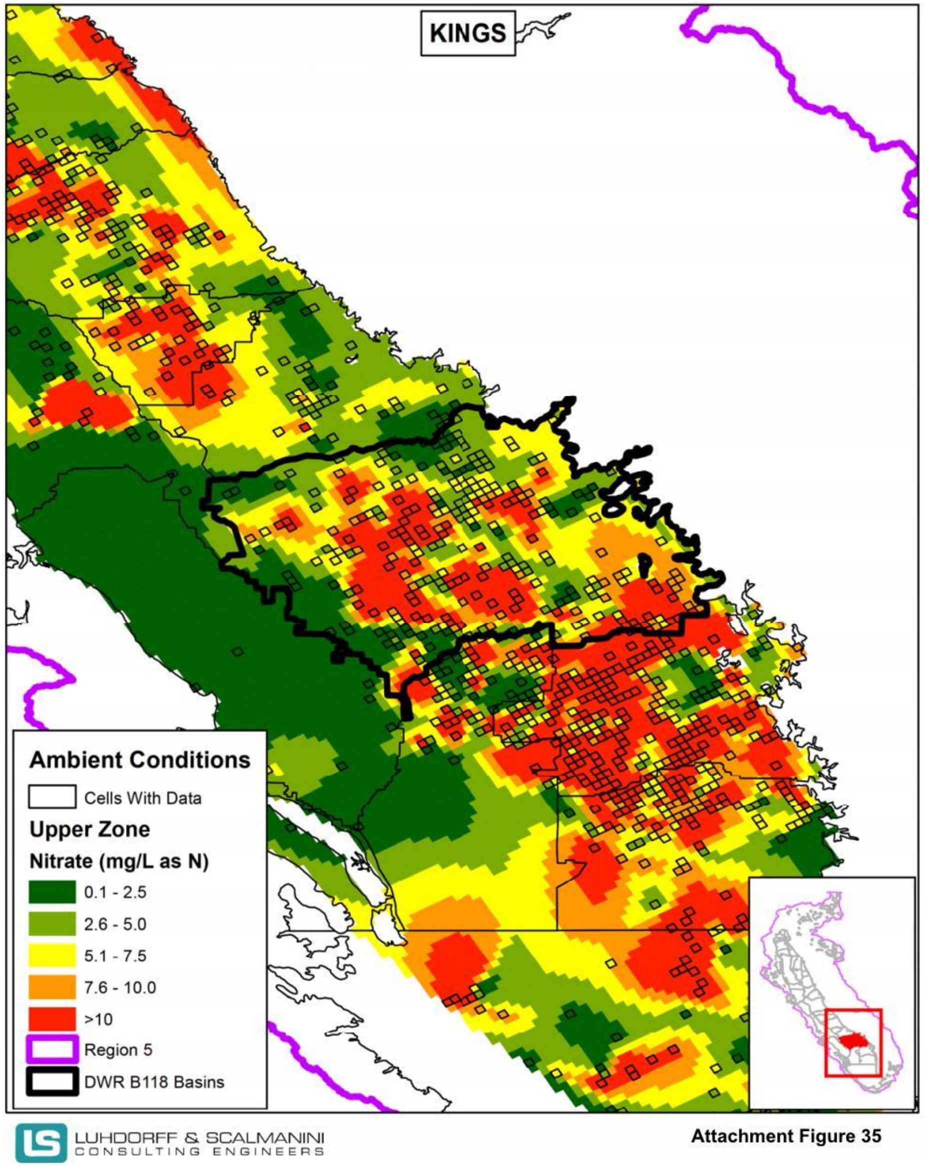


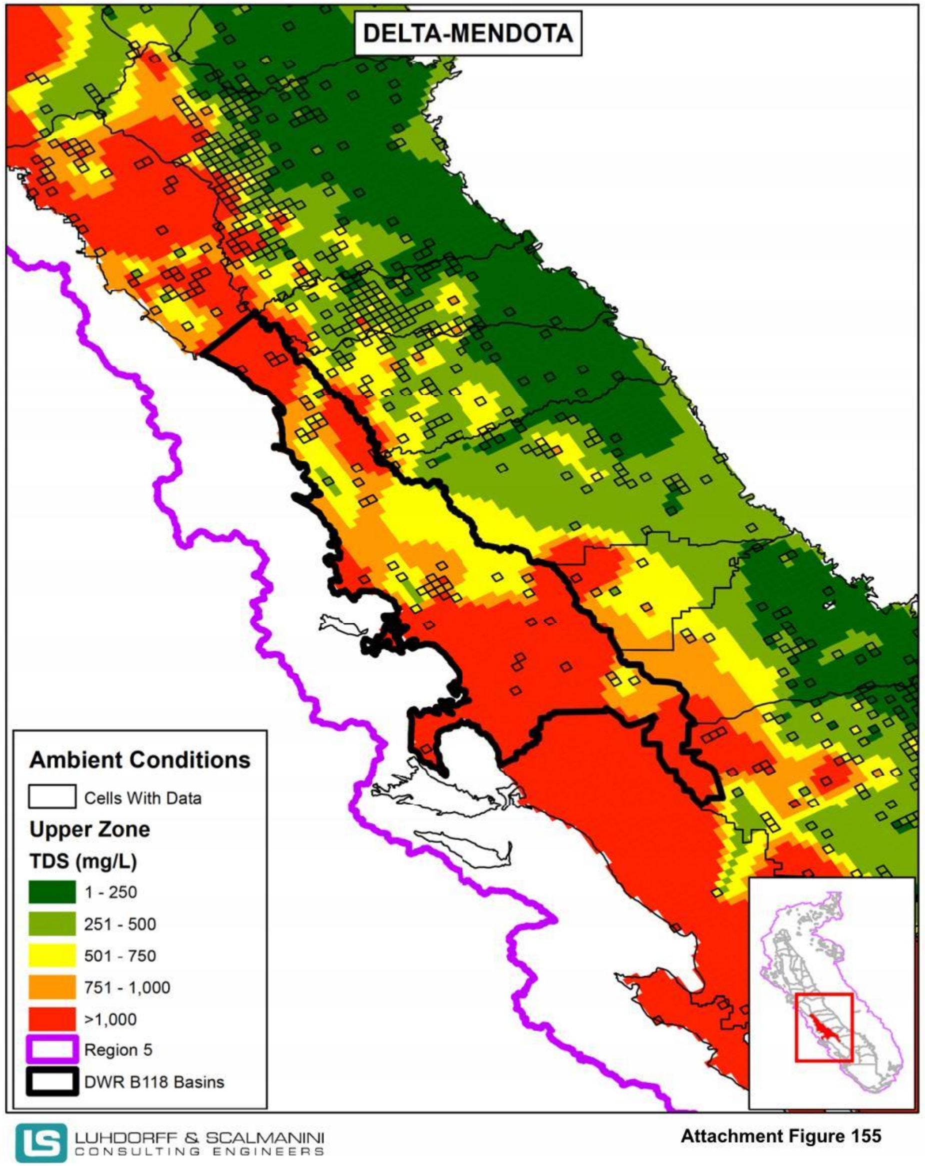
Figure 41

Water Quality Variability

- Left - Variation in Nitrate Water Quality in Upper Zone in the Kings Sub-basin (5-22.07)
- Right - Variation in TDS Water Quality in Upper Zone in the Delta-Mendota Sub-basin (5-22.08)



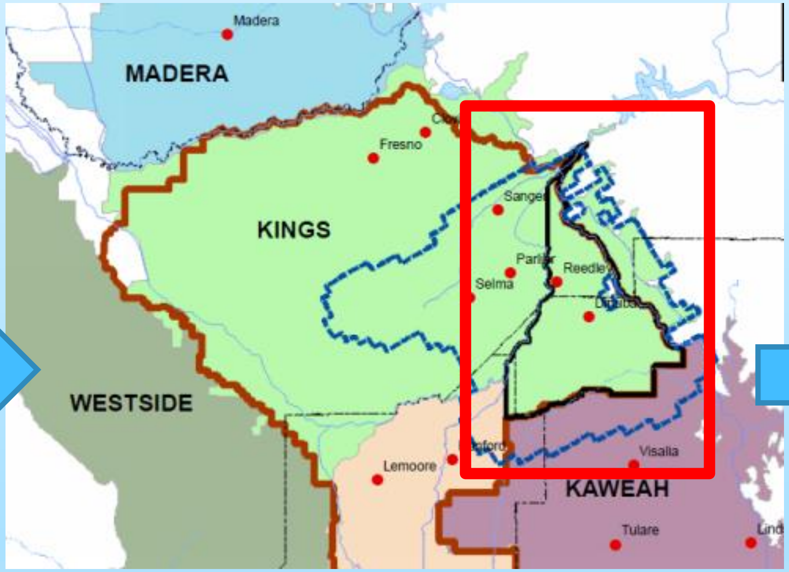
Attachment Figure 35

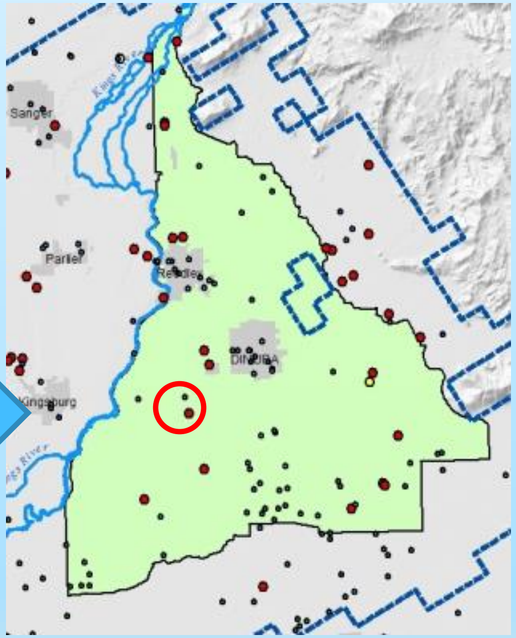


Attachment Figure 155

Management Zones – Problem Statement

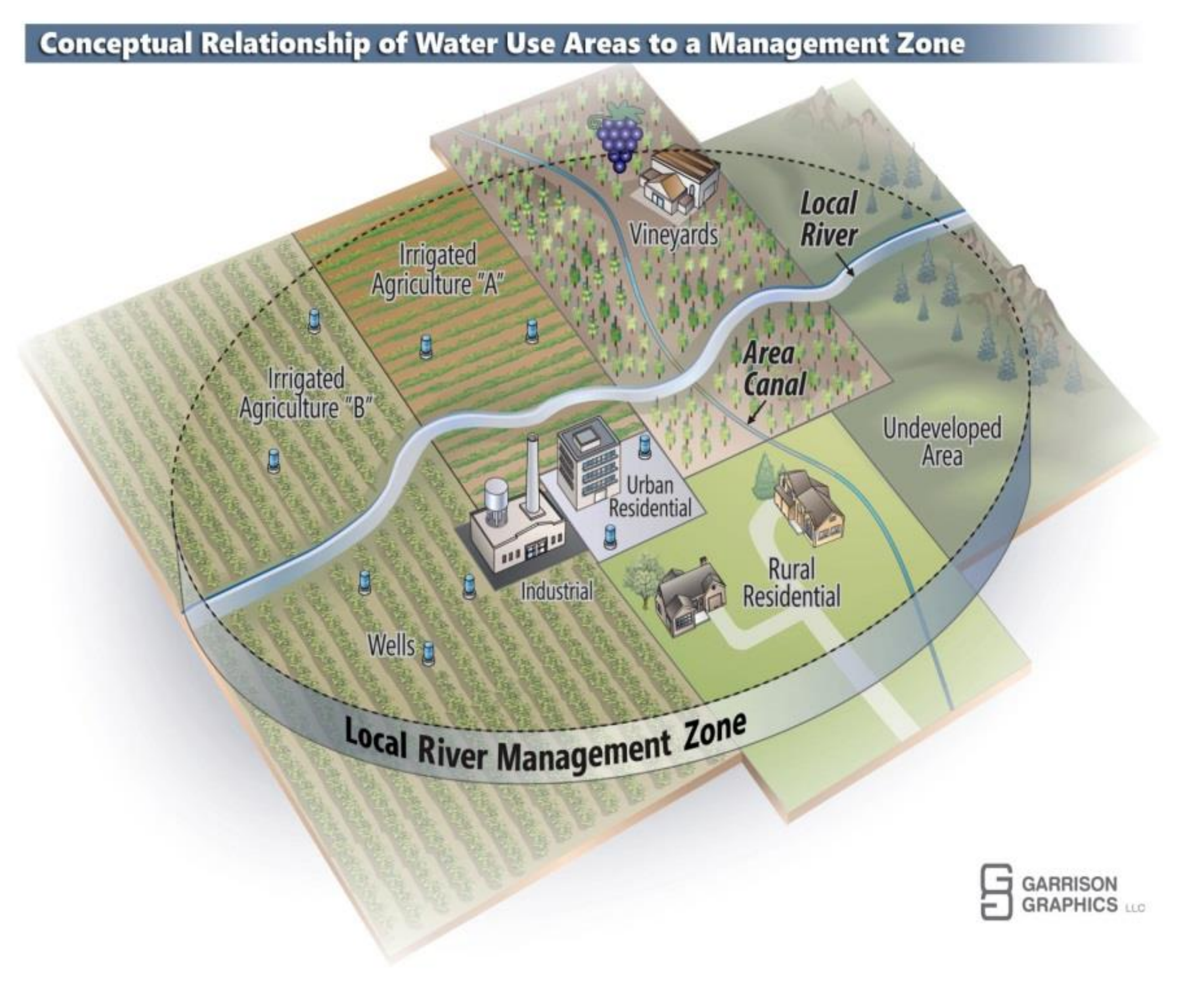
- To effectively manage salt/nitrate in large geographic areas, the Central Valley must adopt an implementation approach that allows salt/nitrate management activities to be tied as closely as possible to local management efforts.





Management Zones – Proposed Solutions

- Amend the Basin Plans to:
  - Allow and encourage management of salt/nitrate through the establishment of Management Zones
  - Establish criteria for the formation and operation of a Management Zone



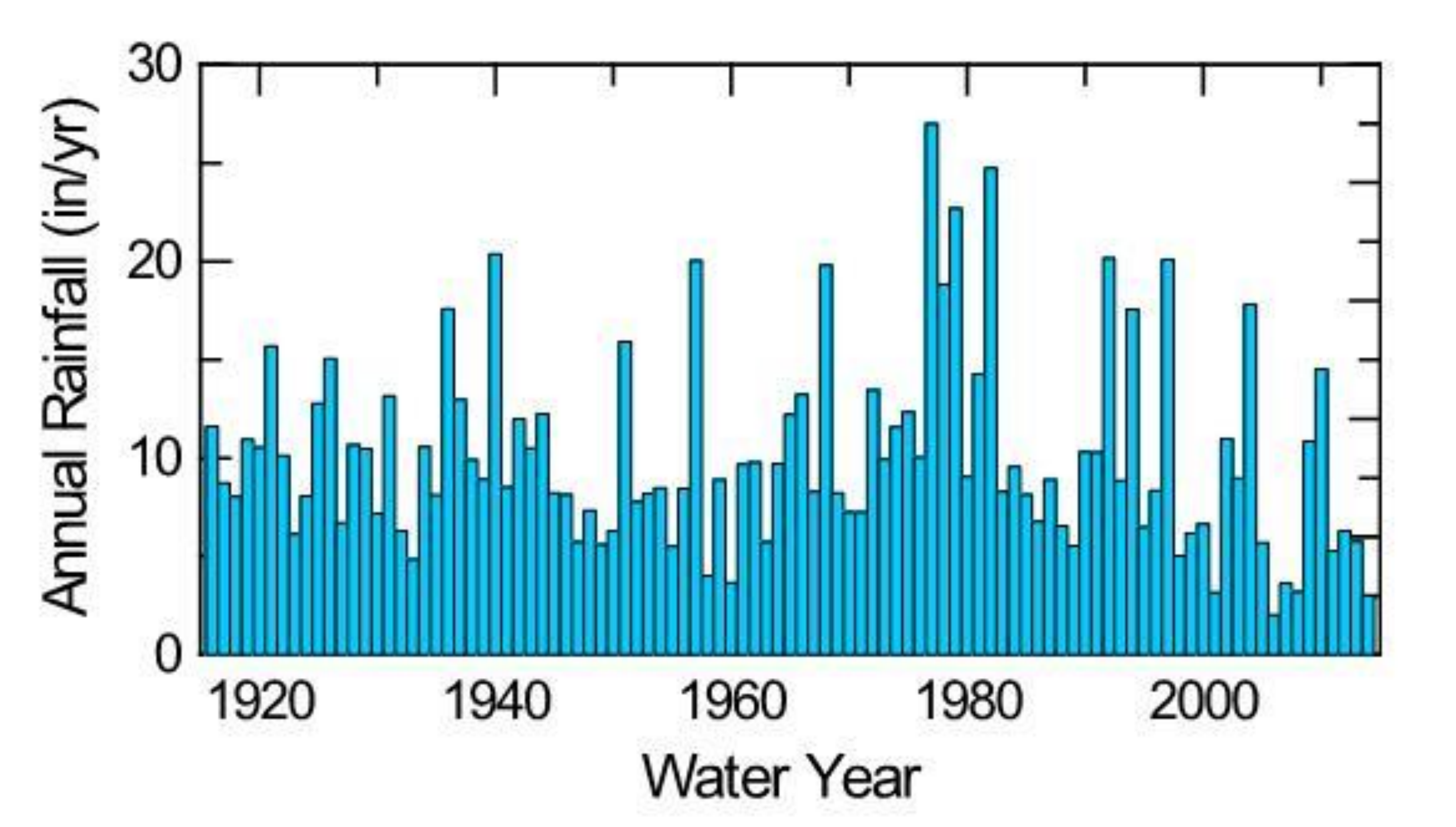
Management Zones – Discussion Items

- What is the appropriate basis for determining available assimilative capacity in groundwater within the boundary of a Management Zone?
  - E.g., Upper Zone vs. Production Zone?
- Should assimilative capacity be allocated differently for individual dischargers and the Management Zone?
- How do we incentivize or motivate agencies to participate in a Management Zone?
  - Dischargers within the delineated boundary
  - Agencies without WDRs within the boundary, e.g., drinking water providers

DRAFT CENTRAL VALLEY SNMP POLICIES

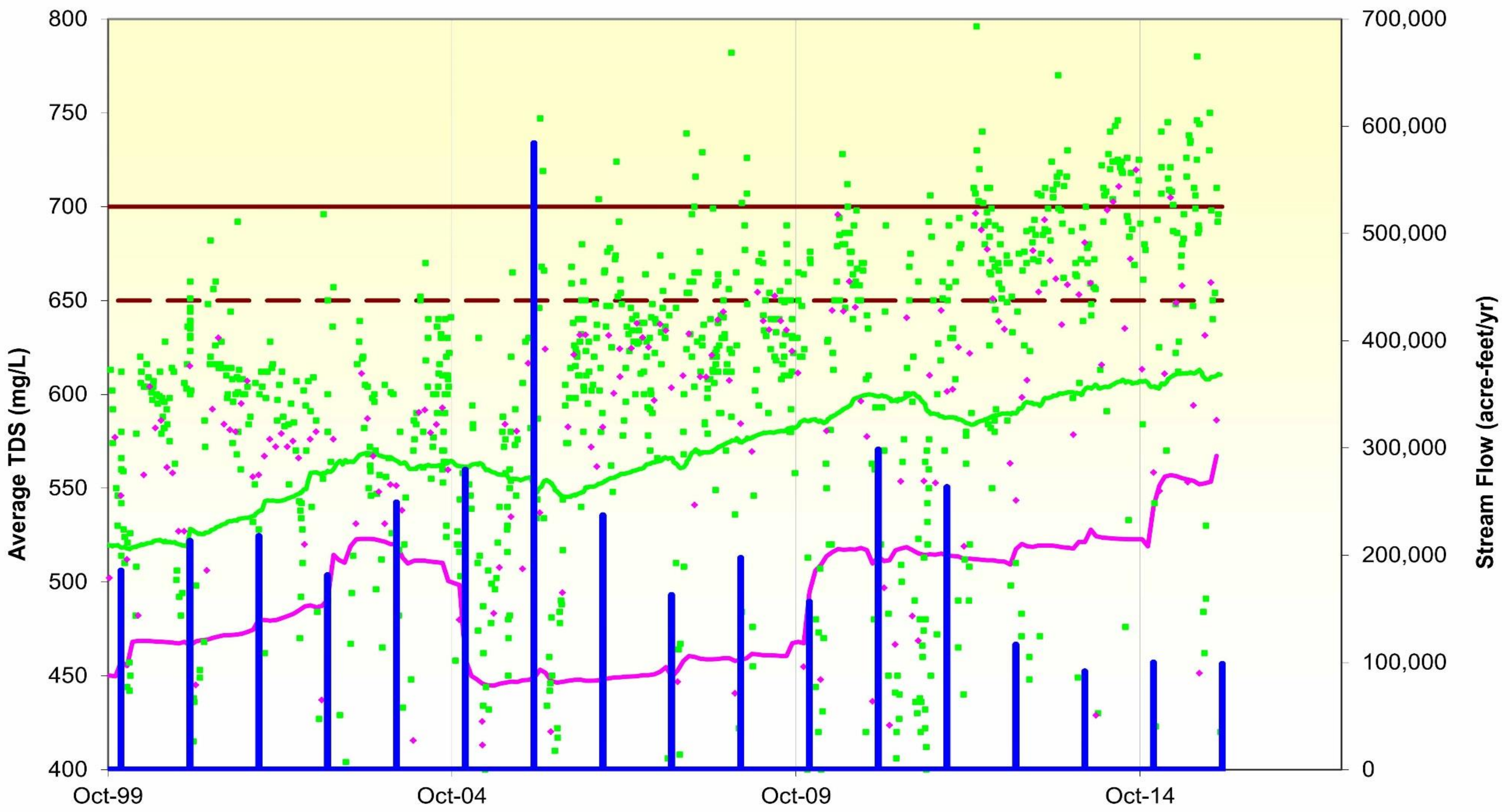
Drought and Water Conservation

Illustration of Potential Rainfall Variability



Example of California Long-term Precipitation Variability

Oscillations in TDS Concentrations in a Surface Water Related to Varying Precipitation



Drought & Water Conservation – Problem Statement

- State policies to protect against drought benefit the state, but these policies create challenges with regards to water quality management
  - Increased water reuse concentrates salt
  - Replacement water supplies (e.g., substituting groundwater for surface water) results in use of water with higher salt content
  - Increased use of high efficiency, low-flow fixtures and appliances, and greater use of in-home water softeners, concentrates salt in influent.
- WDRs rarely include provisions or consideration for variation in effluent quality that may occur as a result of changes in influent quality related to recurrent drought conditions or conservation/reuse activities.

Drought & Water Conservation – Proposed Solutions

- Establish automatic triggers for implementation of a variance/exception when extended dry periods occur
  - Make early findings regarding maximum benefit
  - Applicable to all salinity-related constituents
- Allow use of long-term (10+ years) flow-weighted average to take into account variation in rainfall/percolation
- Authorize implementation of Offset projects that can create/bank “credits” during wet years (see Offset Policy)

Drought & Water Conservation – Discussion Items

- What is an appropriate trigger for implementation of an automatic variance/exception when extended dry periods occur?
  - What should be the maximum benefit findings?
- What is an appropriate long-term averaging period for groundwater to take into account variability in rainfall and percolation?

SUMMARY/TIMELINE

Summary

- Complex and Ambitious
  - Salt/Nitrate
  - Surface/Groundwater
  - Point/Non-Point Sources
  - Existing/Legacy Loads
- Must Complete
  - Ensure safe drinking water supply while sustaining vital economy

Summary

- Reality: Long Timeline
  - Phase and Prioritize
    - Safe Drinking Water
    - Continue BPTC to limit further degradation and assure long-term sustainability
    - Implement large-scale projects to restore groundwater quality to the best of our ability
  - Flexibility of Scale
  - Local Solutions

Summary: What is Still Needed?

What?

- Prioritization
- Default Methodologies
  - Upper/Production/Average/Volume Weighted
- Triggers
  - De Minimus; Increased Activity; What activity
- Specific Milestones
  - EAP Implementation; SSALTS Planning
- Compliance End Points
  - What is measured/what is the consequence

When?

For Economic and Environmental Review (By the end of August)

Timeline

- September 2016: Finalize Permitting Strategies
- 17 August 2016: Public Workshop
  - MUN Evaluation in Ag Dominated Water Bodies
  - Salt/Boron Water Quality Objectives in Lower San Joaquin River
  - MUN/AGR Evaluation Portion of Tulare Lake Bed Groundwater
- October 2016: CEQA/Econ Analyses Complete
- December 2016 (potential): Informational Item
- 31 December 2016: Deadline to Submit SNMP
- Early 2018: Board Consideration Basin Plan Amendment

Final Questions