

SWRCB Proposed Update to the Bay-Delta Water Quality Control Plan

Potential Land Subsidence , Water Quality and Supply Related Impacts in Merced County

12/19/16

Ron Rowe

Merced County Department of Public Health
Division of Environmental Health Director

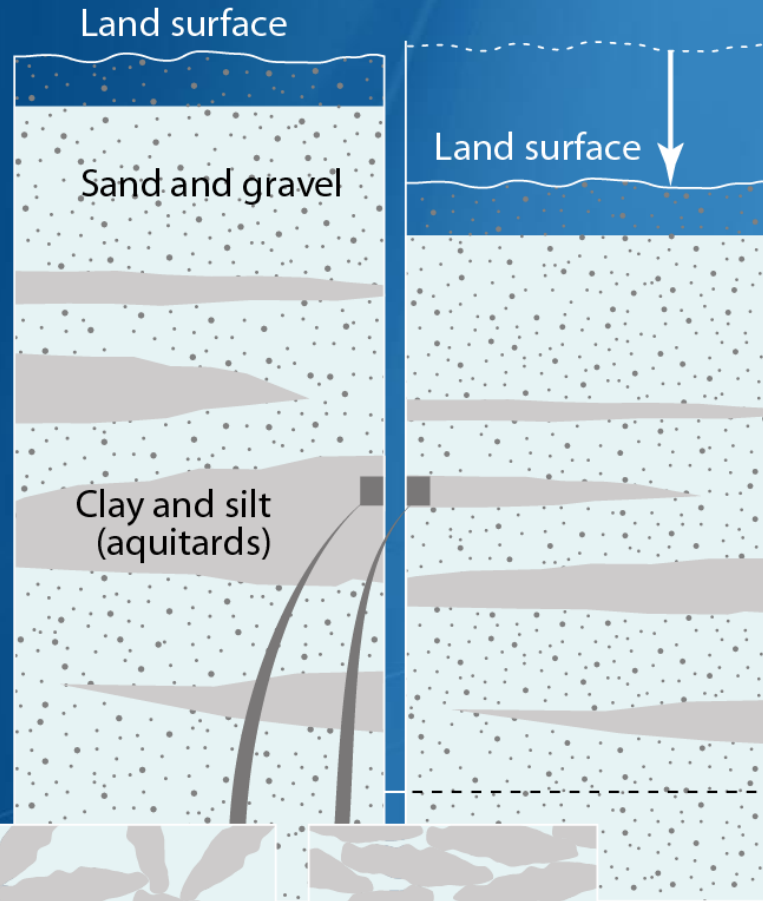
Presentation Overview

November 29, 2016 SWRCB request for specific information regarding the proposed update to the Bay-Delta Water Quality Control Plan and related impacts in Merced County–

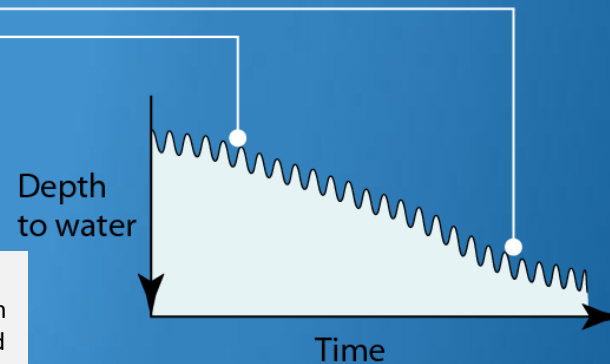
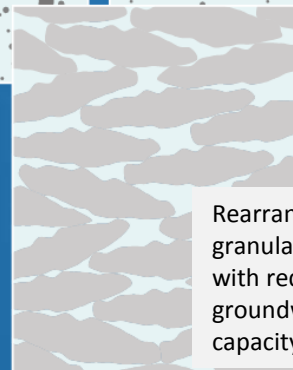
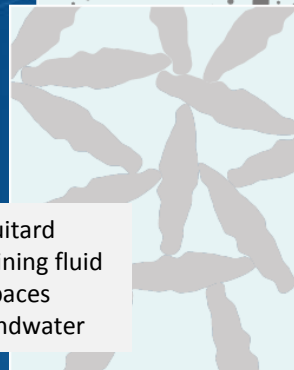
- Potential Land Subsidence Impacts
- Potential Water Quality Impacts

Land Subsidence in the San Joaquin Valley

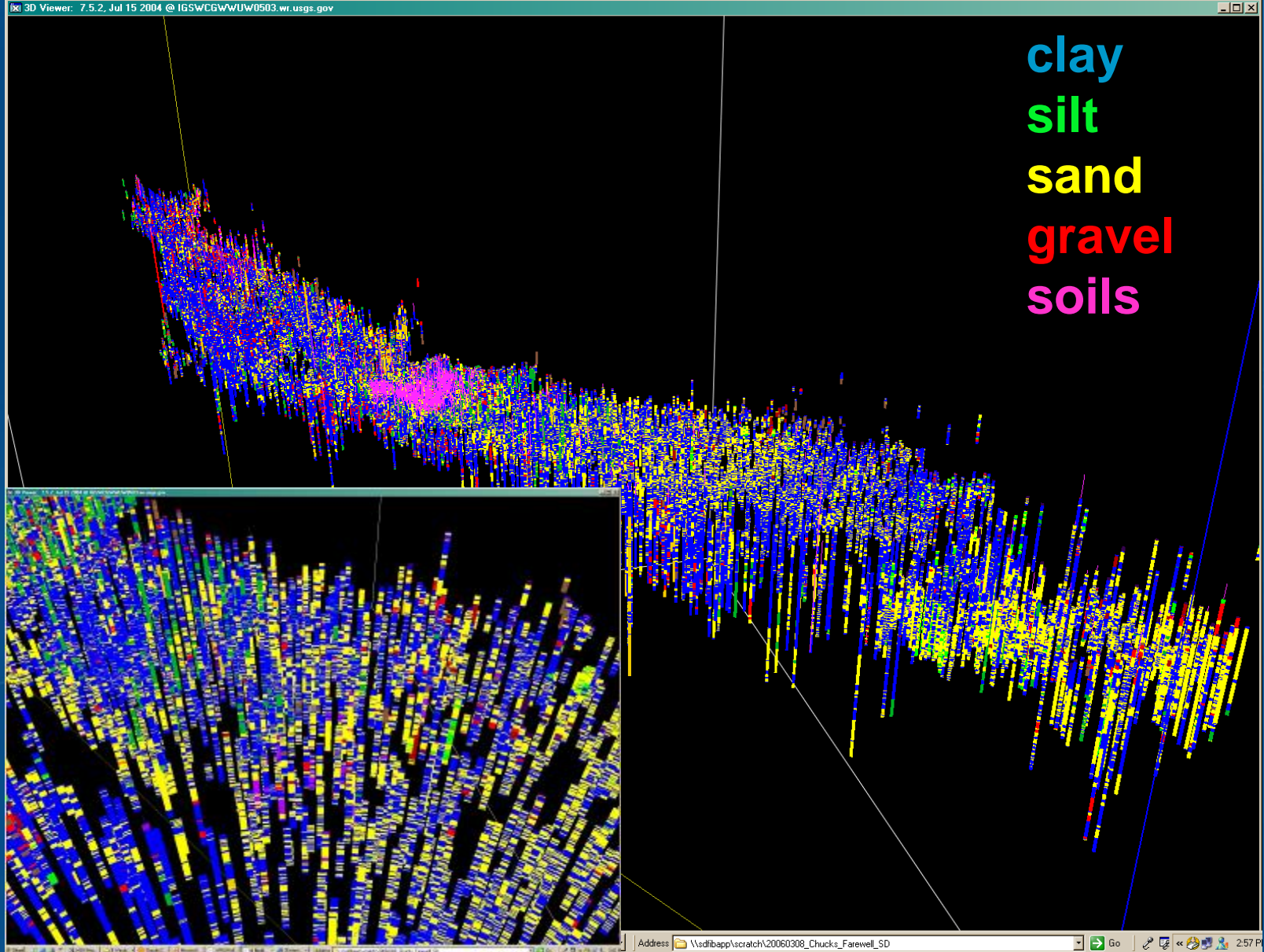
A deep process: Aquifer-System Compaction



- Groundwater withdrawal can effect fluid filled pore spaces
- Effects concentrated in the fine-grained deposits (aquitards)
- Inelastic (irreversible) compaction can occur
- **Groundwater Storage Capacity can be Reduced**



8,500 Central Valley Well Logs



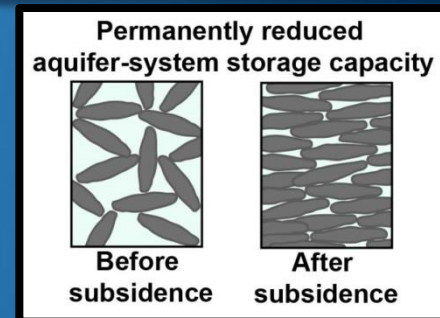
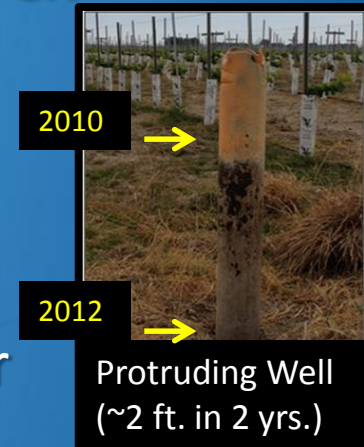
Land Subsidence Damages Natural Resources and Infrastructure

● Flood Protection and Infrastructure

- Damage to water conveyance systems and other infrastructure
 - Reduced conveyance capacity and freeboard, panel damage; water surface and liner misalignment; erosion/deposition in unlined channels
 - Roads, rails, bridges, pipelines, wells, etc.

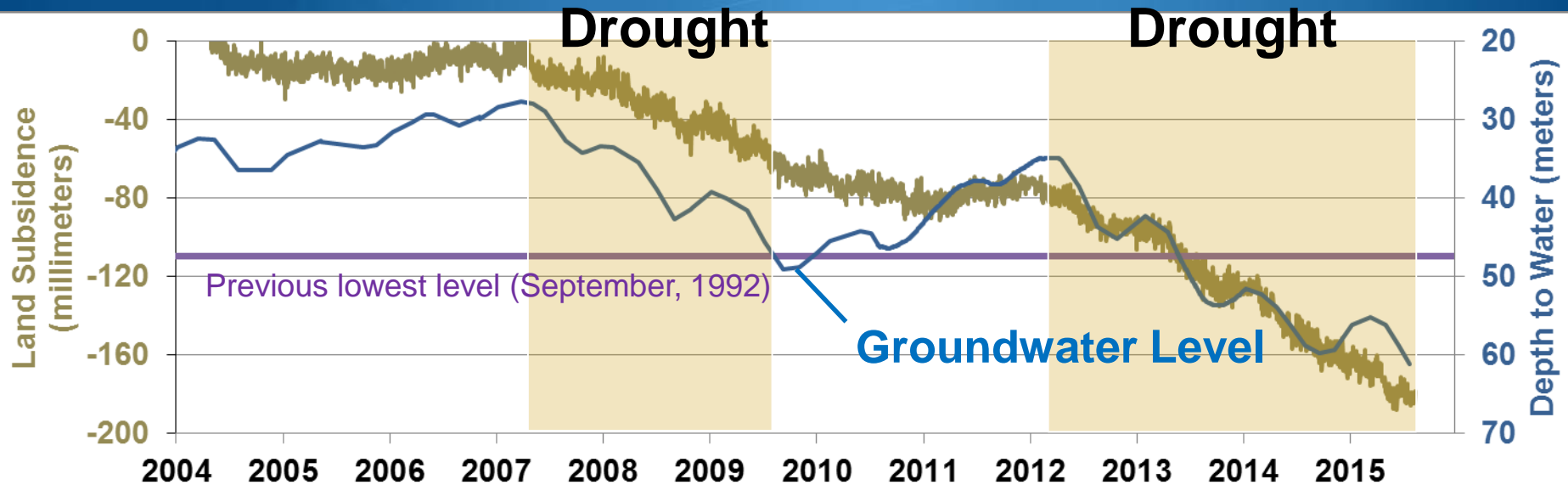
● Natural resources

- Reduces aquifer-system storage capacity
- Impacts to wetland, riparian, and aquatic ecosystems
- Restricted land uses

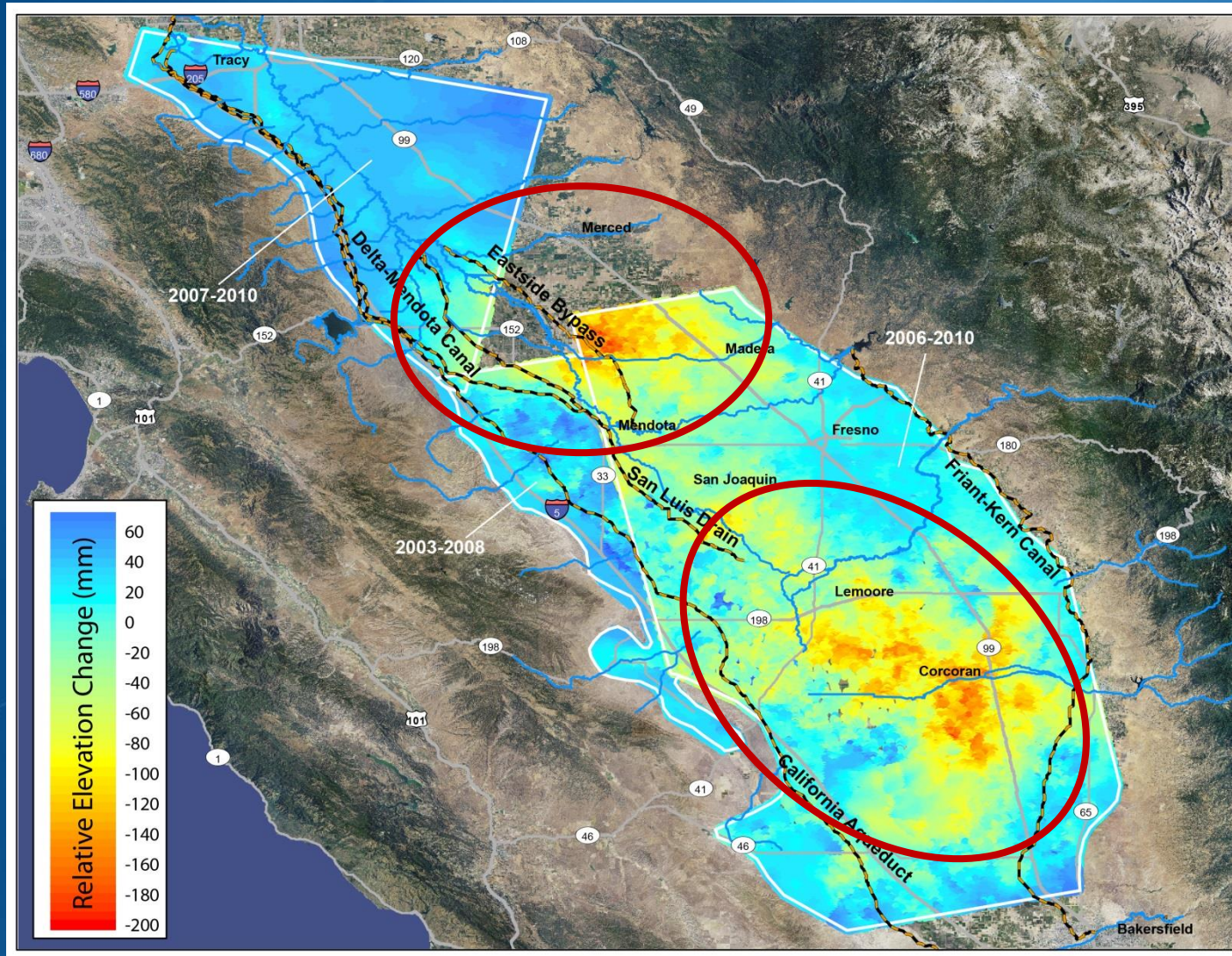


Recent Land Subsidence

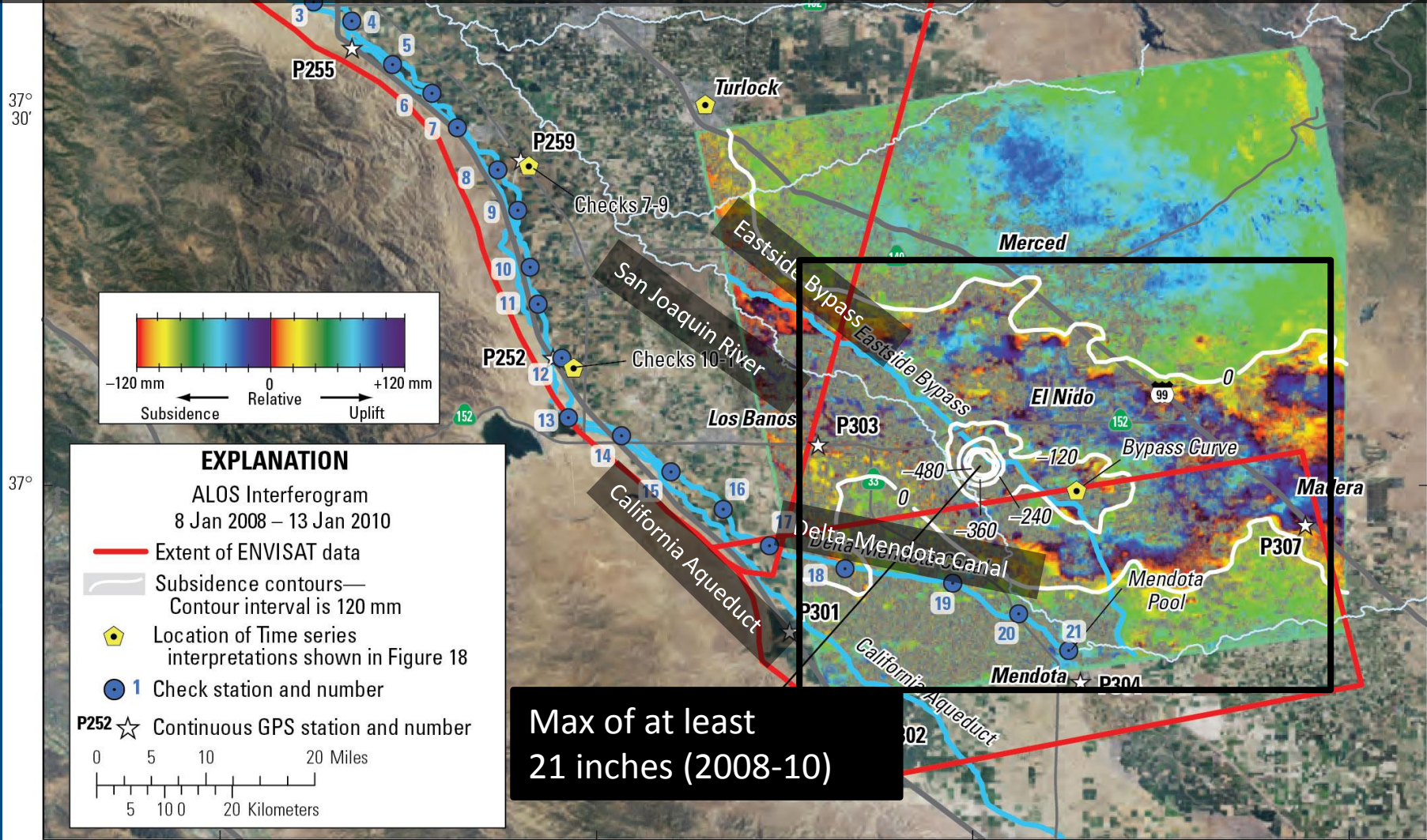
- Renewed subsidence concern during 2007-09 drought, and now, the current drought
 - Reduced surface water importation
 - More reliance on the groundwater resources
 - As it turns out...this is not just a problem during droughts for some areas without surface-water access



InSAR-Measured Subsidence (2003-2010)



InSAR Subsidence Measurements: Maximum Subsidence Area near El Nido, between Eastside Bypass and San Joaquin River



37° 30'

37°

**Max of at least
21 inches (2008-10)**

EXPLANATION

ALOS Interferogram
8 Jan 2008 – 13 Jan 2010

— Extent of ENVISAT data

— Subsidence contours—
Contour interval is 120 mm

⬡ Location of Time series
interpretations shown in Figure 18

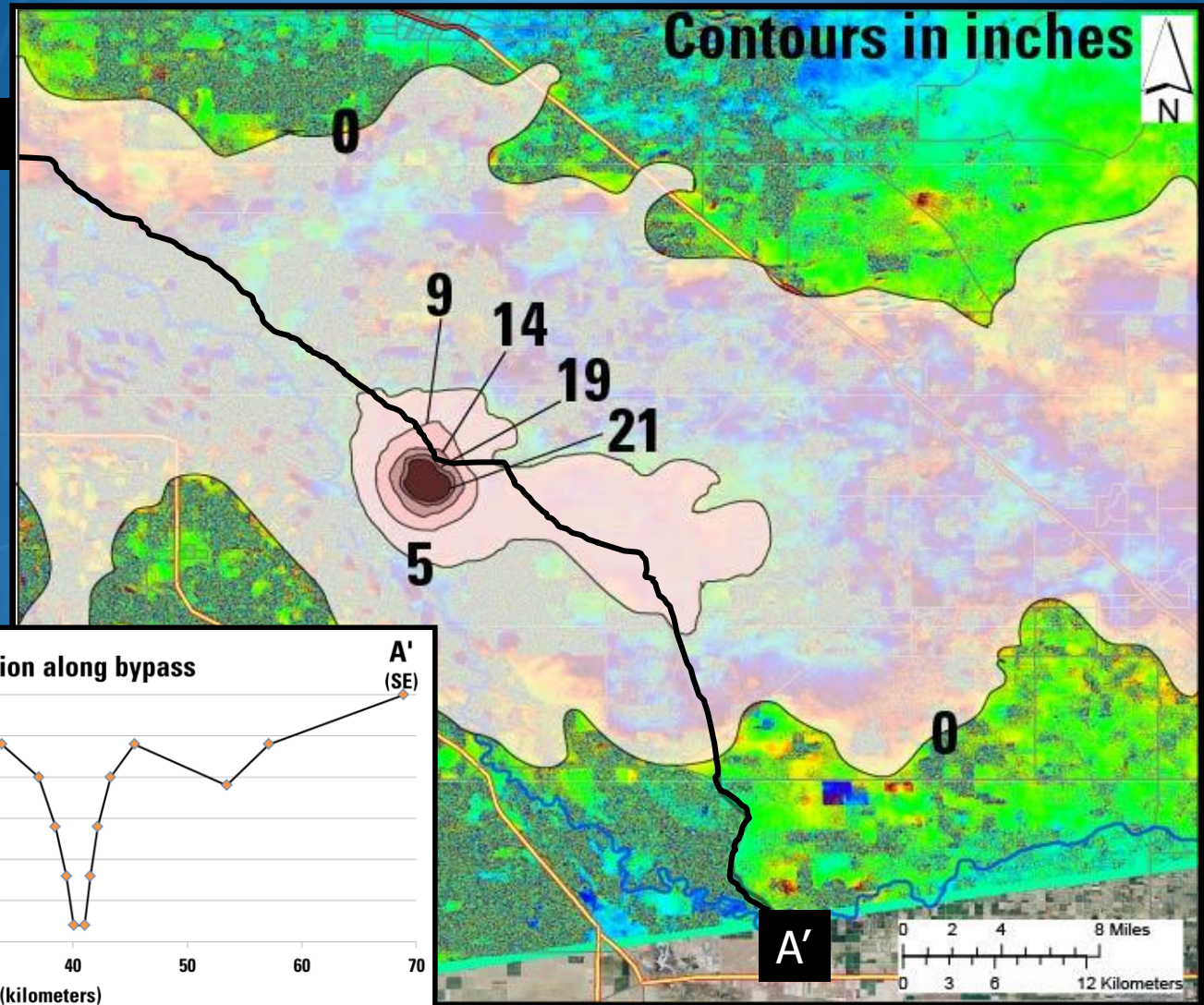
● 1 Check station and number

☆ P252 Continuous GPS station and number

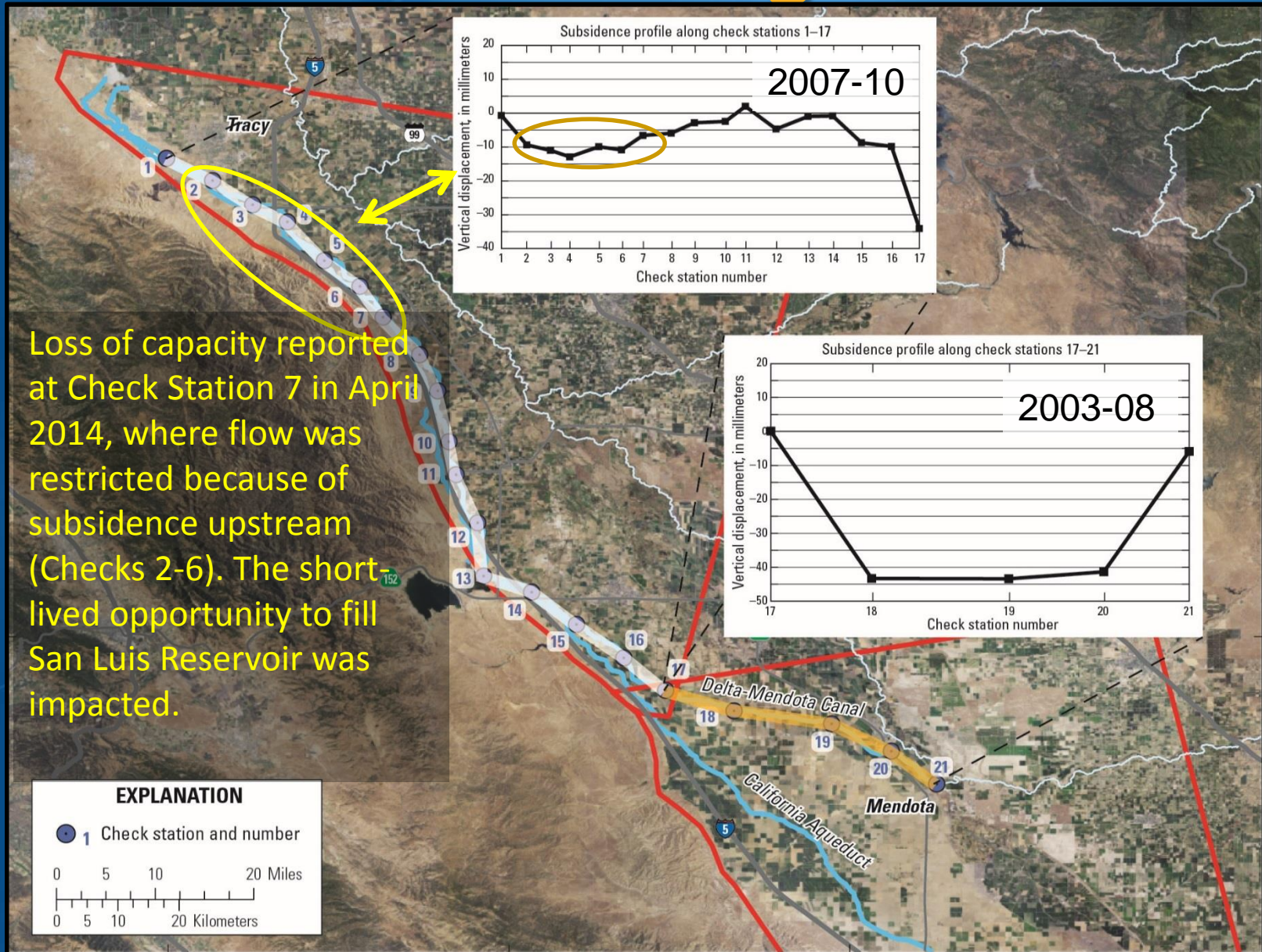
0 5 10 20 Miles

0 5 10 20 Kilometers

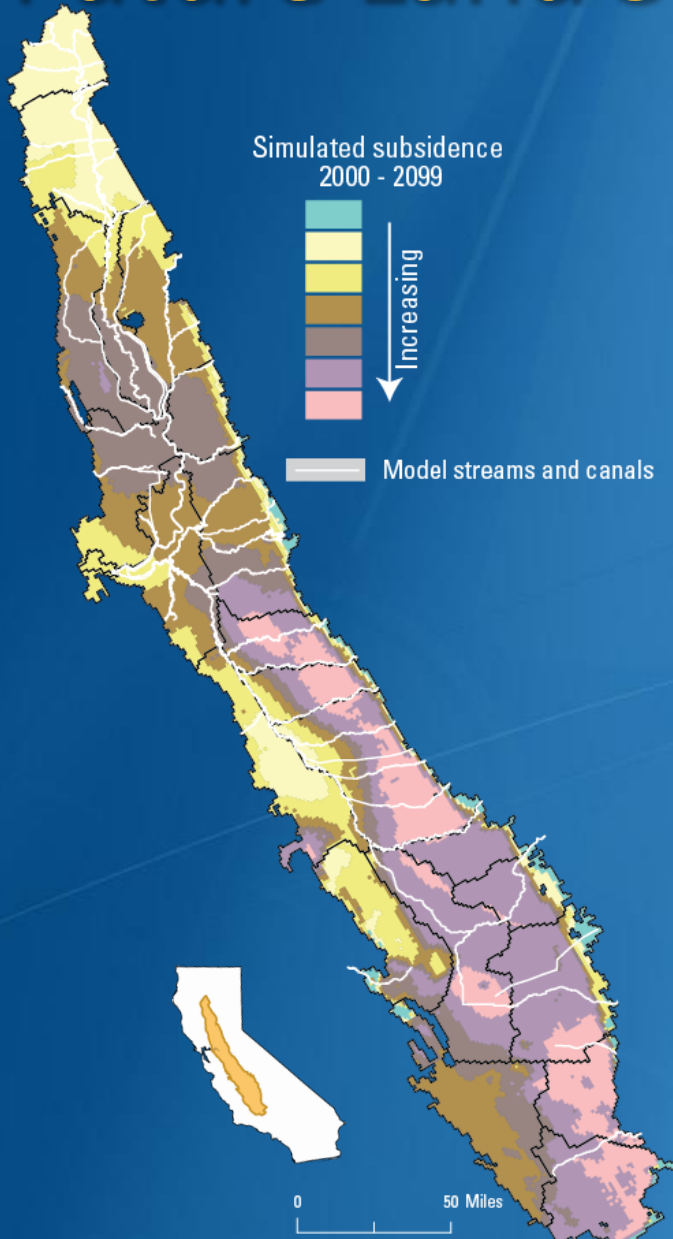
Highest Impact from Land Subsidence: Merced County Eastside Flood Bypass/Flood Implications



Land Subsidence along the DMC



Future Land Subsidence Trend?



Old and New Subsidence

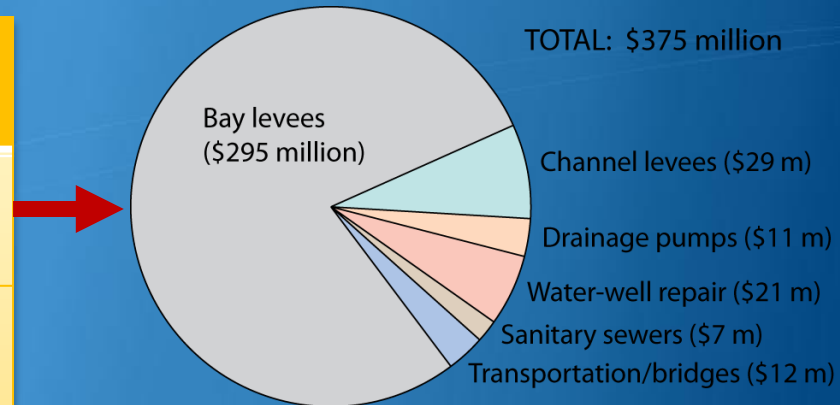
- Renewed subsidence in historical areas
- Largest new subsidence potential adjacent to Sierras where surface-water deliveries for irrigation are less (finer-grained deposits not directly connected to Sierra Nevada glaciations)
- Additional subsidence in growing urban areas
- Nearly 200 million acre-ft from fine-grained sediments in 21st Century

What is the Economic Impact of Land Subsidence in California?

- Vastly underestimated and under reported!

Estimated Costs of Subsidence

| Site | Damages | Costs ¹ , M\$ |
|----------------|---------------------------------|--------------------------|
| Santa Clara V. | Levees, wells, sewers, roadways | 375 |
| San Joaquin V. | Canals; design modifications | 145 |
| Long Beach | Flood; structural | 600 |



¹Costs in year 2007 \$US

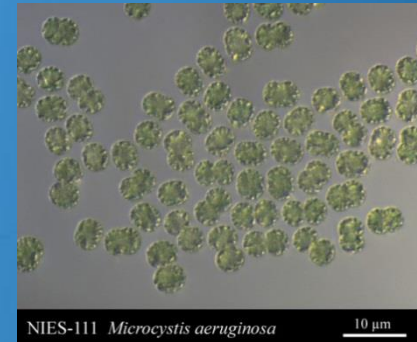
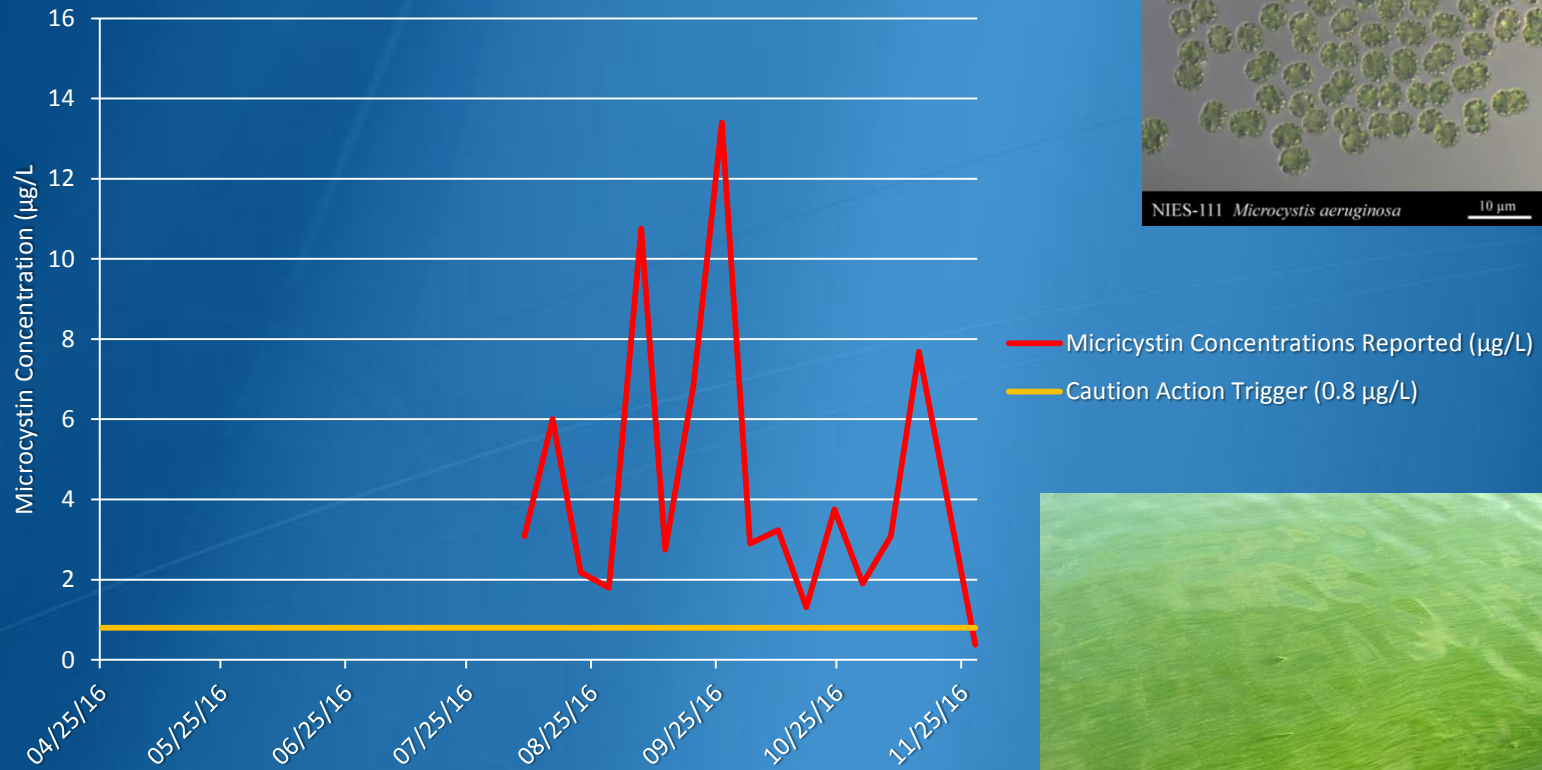
Sources: Fowler, 1981; Freeze, 2000; NRC, 1991

Combined \$1,120,000,000 (\$Billion) Impact

Harmful Algal Blooms (CyanoHABs)

San Luis Reservoir Basalt Boat Launch 2016 CyanoHABs - Microcystin Detections Reported

(Chart Data Source: DWR Statewide Notifications 12/02/16)



**San Luis Reservoir Elevation Low for 2016 at 353.19 feet on 7/25/16,
A 25 year low!**



CyanoHABs - San Luis Reservoir Danger Notice

“No swimming in San Luis Reservoir, and other dire warnings after latest toxicity test”

Read more here:

<http://www.fresnobee.com/news/local/article110480652.html#storylink=cpy>



Summary of Potential Impacts in and Near Merced County

- Loss of Surface Water
- Reduced Opportunities for Surface Water Reliant Groundwater Recharge
- Increased Dependence on Stressed Groundwater Resources
- Deterioration of Groundwater and Surface Water Quality
- Land Subsidence Impacts to Water Conveyances and Transportation Infrastructure, Pipelines, Wells, and Loss of Groundwater Storage Capacity
- Disproportionate Impacts to Disadvantaged Communities (DAC's)...



C. Scott Stoddard

Farm Advisor

University of California Cooperative Extension

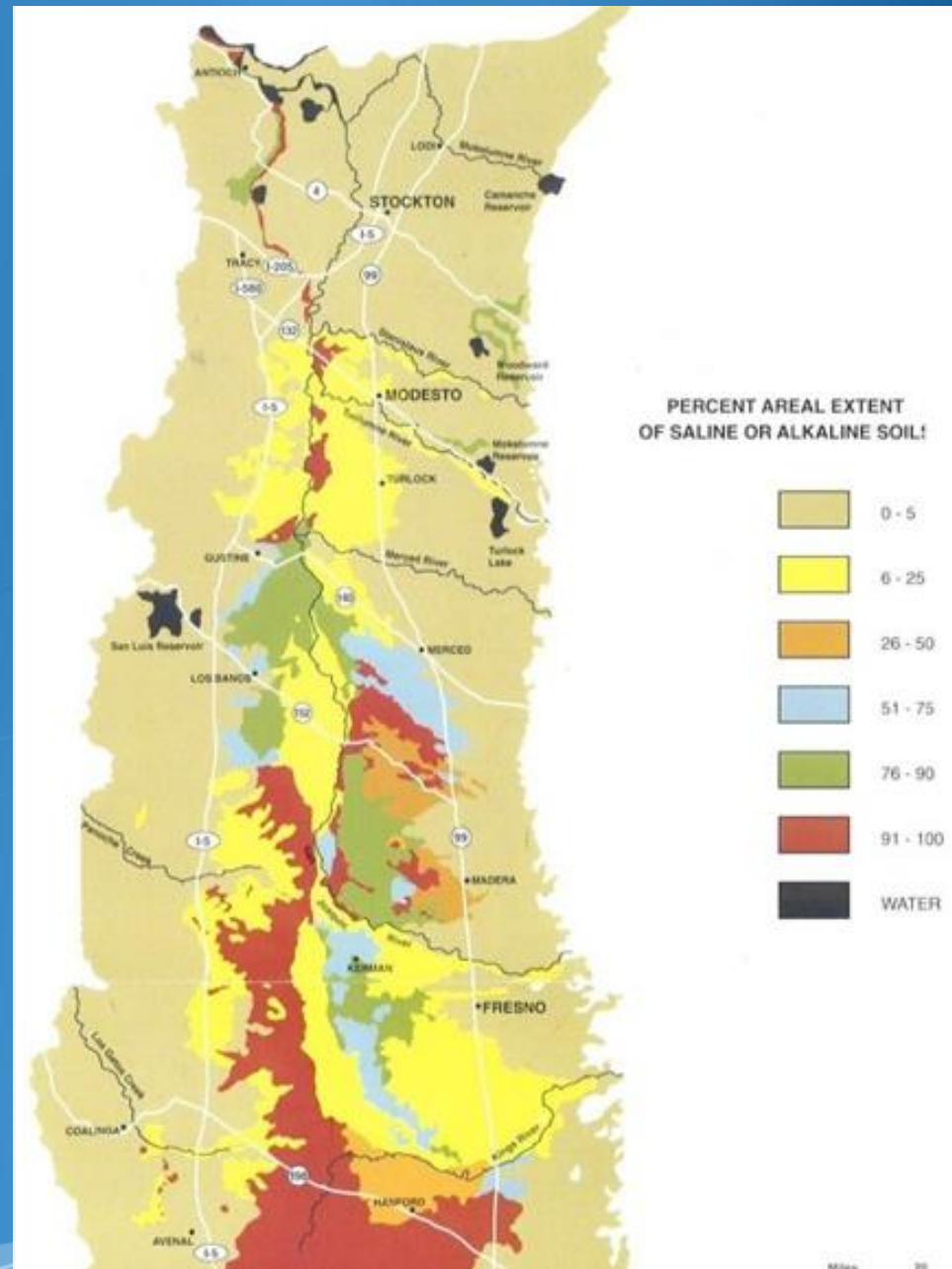
University of California
Agriculture and Natural Resources

The background of the blue box features a large, faint watermark of the University of California seal. The seal is circular and contains the text 'THE UNIVERSITY OF CALIFORNIA' around the perimeter. In the center, there is a depiction of a book and a torch, with the year '1868' at the bottom.

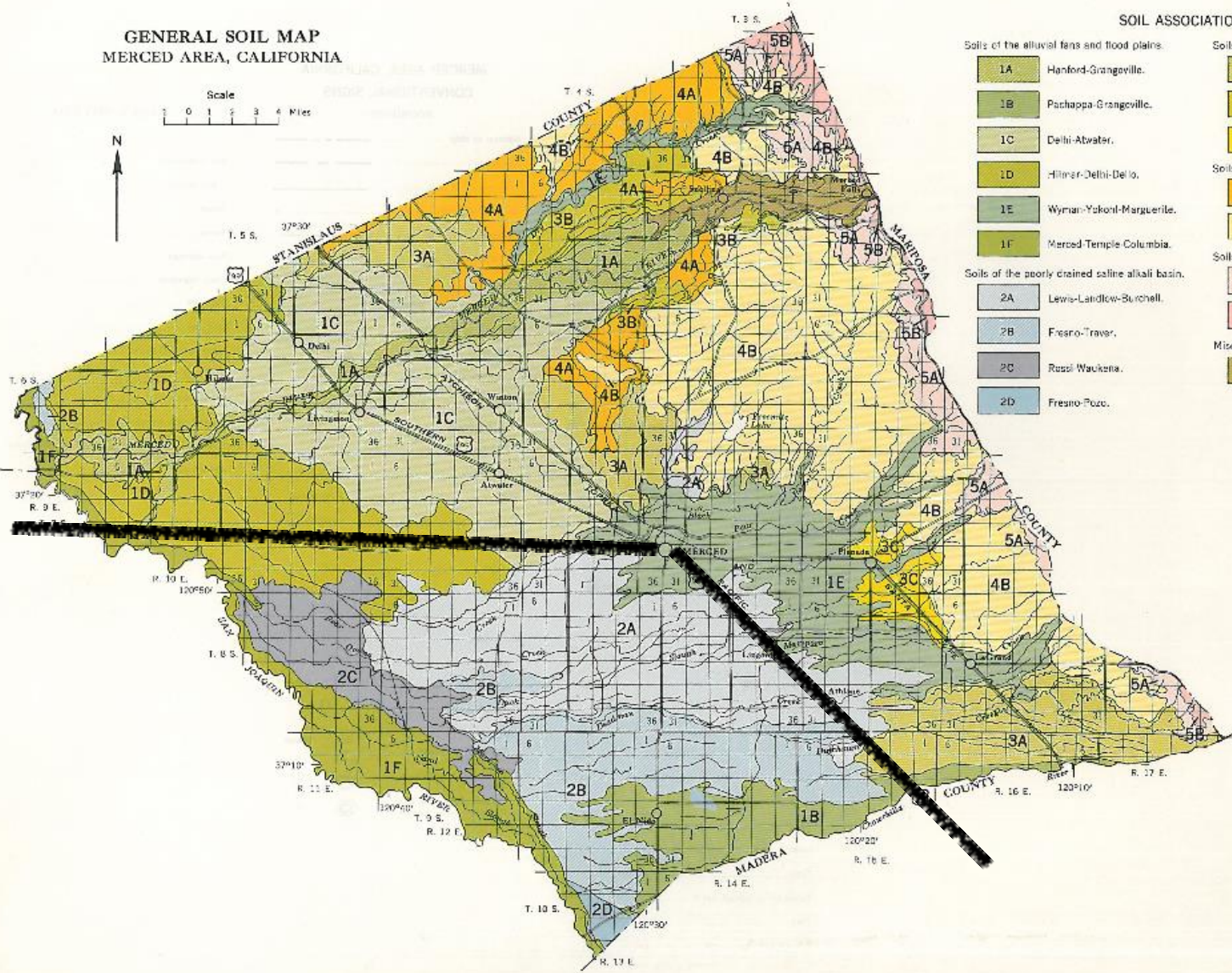
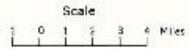
*Making a Difference
for California*

Soil Salinity

- One of the main production issues for all crops in the county.
- Reduces yield
- Management: leaching with non-saline (MID canal) water



**GENERAL SOIL MAP
MERCED AREA, CALIFORNIA**



SOIL ASSOCIATIONS

Soils of the alluvial fans and flood plains.

- 1A Hanford-Grangerville.
- 1B Pachappa-Grangerville.
- 1C Delhi-Atwater.
- 1D Hillier-Delhi-Delo.
- 1E Wyman-Yakoni-Marguerite.
- 1F Merced-Temple-Columbia.

Soils of the poorly drained saline alkali basin.

- 2A Lewis-Landlow-Burchell.
- 2B Fresno-Traver.
- 2C Rossi-Waukena.
- 2D Fresno-Pozo.

Soils of the low terraces.

- 3A San Joaquin-Madera.
- 3B Snelling-Greenfield.
- 3C Porterville-Seville.

Soils of the high terraces.

- 4A Whitney-Rocklin-Montpellier.
- 4B Rodding-Petz-Peters.

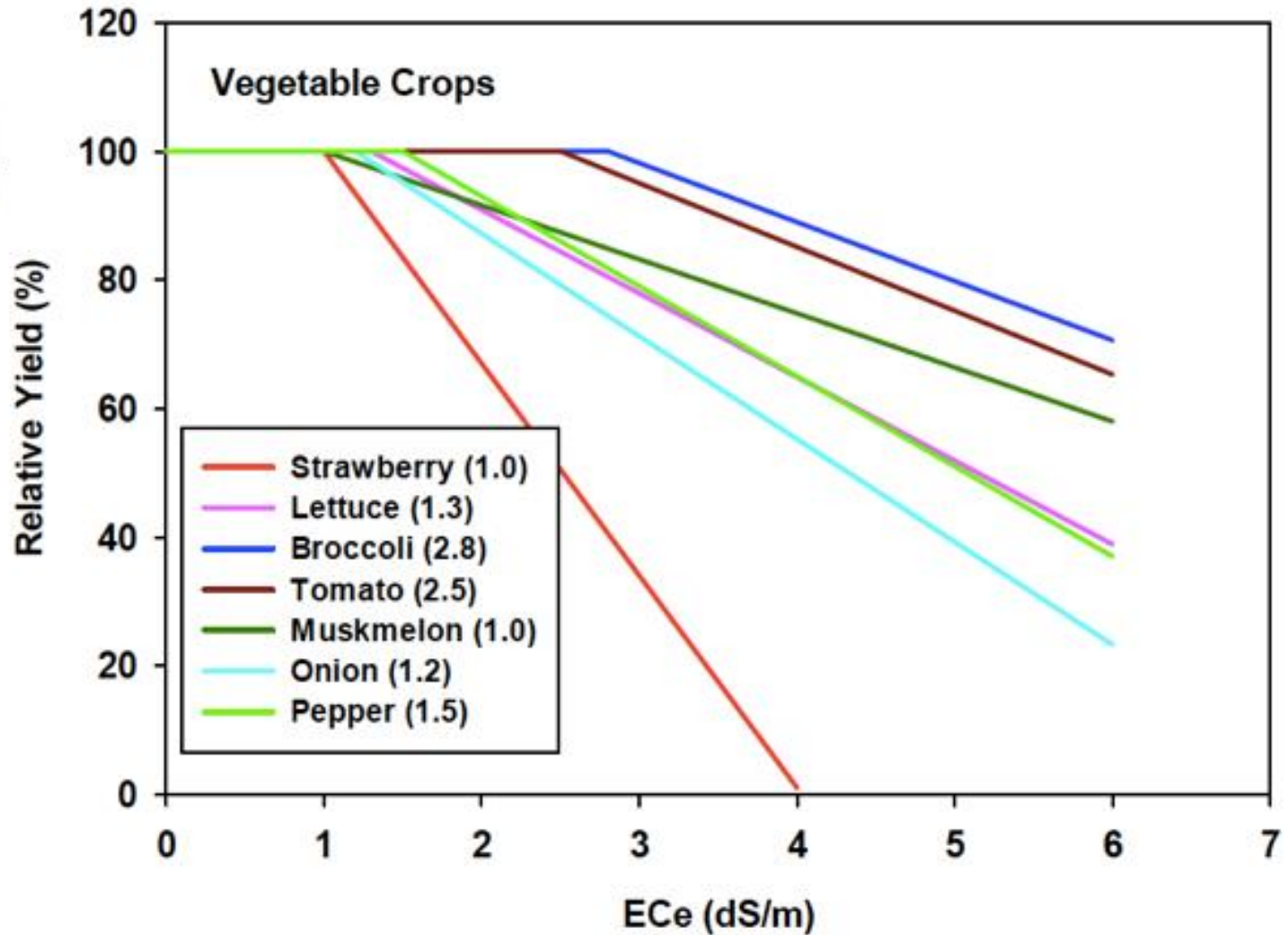
Soils of the uplands.

- 5A Amador-Hornitos.
- 5B Auburn-Exchequer-Daughton-Walterrock.

Miscellaneous land types.

- T Tailings.

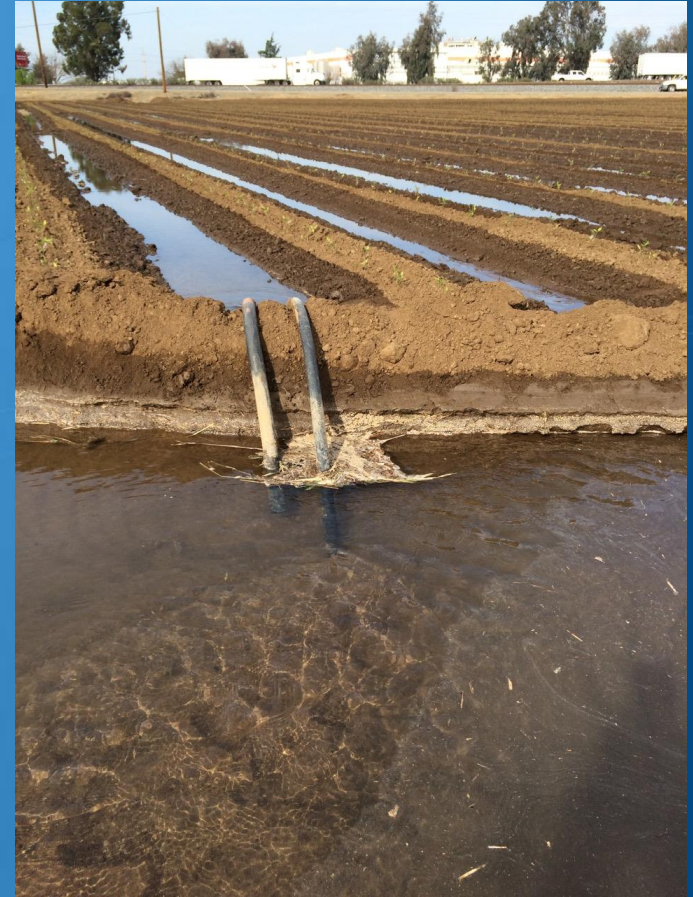
Crop Tolerance to Soil Salinity



Crop Water Use

Depleted Moisture + Leaching Requirement

Application Efficiency



Crop Water Use

Depleted Moisture + Less 2012-15 Requirement

Application Efficiency



The “Almond Doctor” Says Salt Is Slowly Crippling California’s Almond Industry

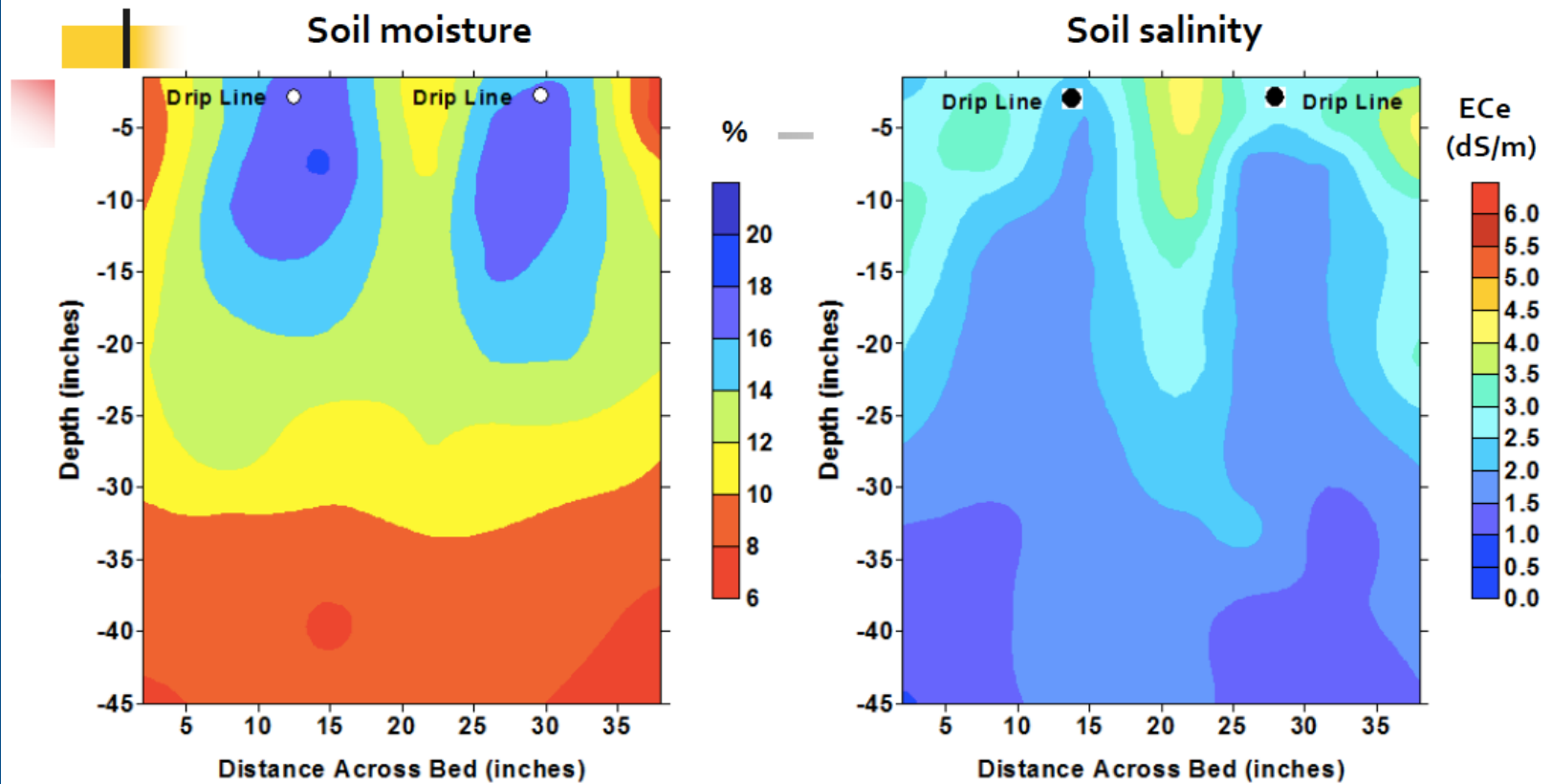
By [EZRA DAVID ROMERO](#) • [JUL 21, 2015](#)



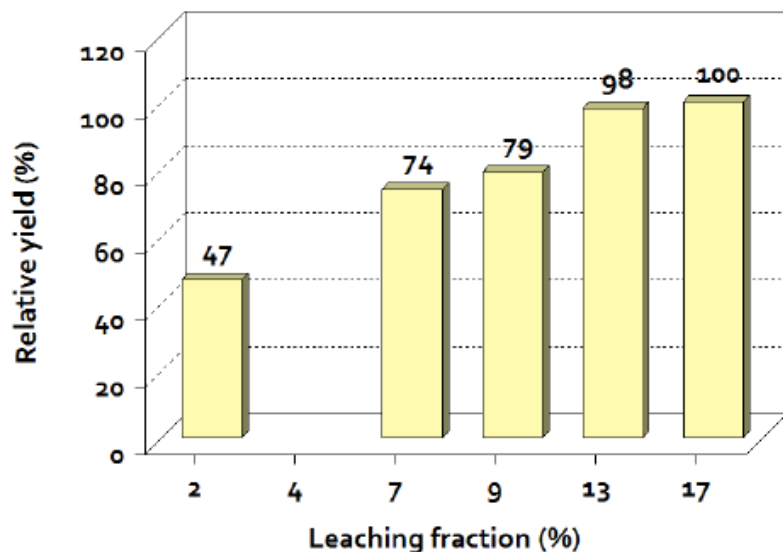


“tip rot” in sweetpotatoes increases as soil EC increases.

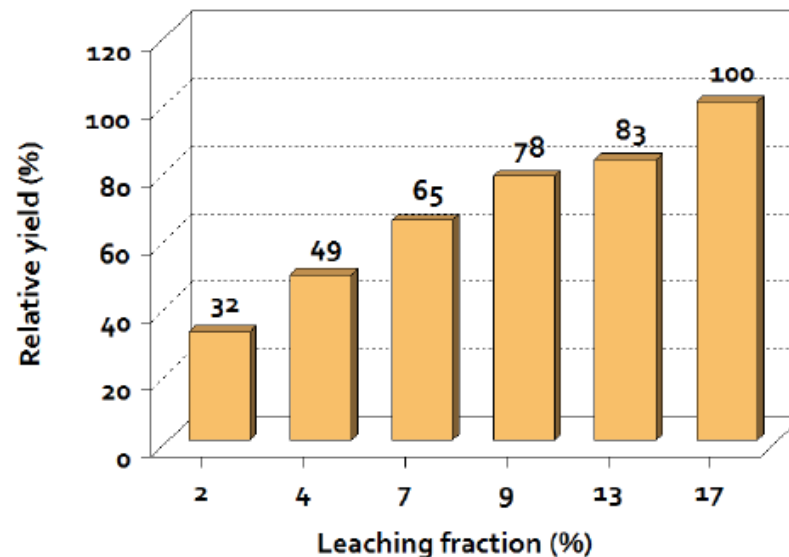
Salts in soil are leached through the use of high quality water.



Cauliflower



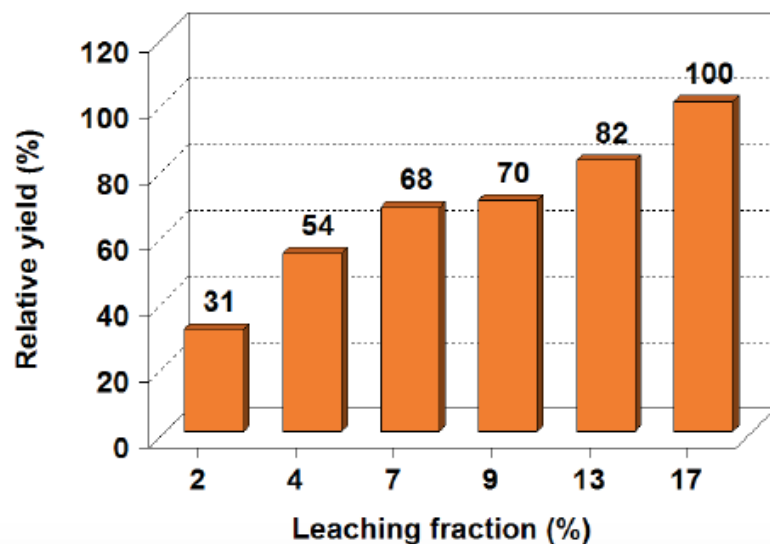
Lettuce



ECi = 2.1 dS/m

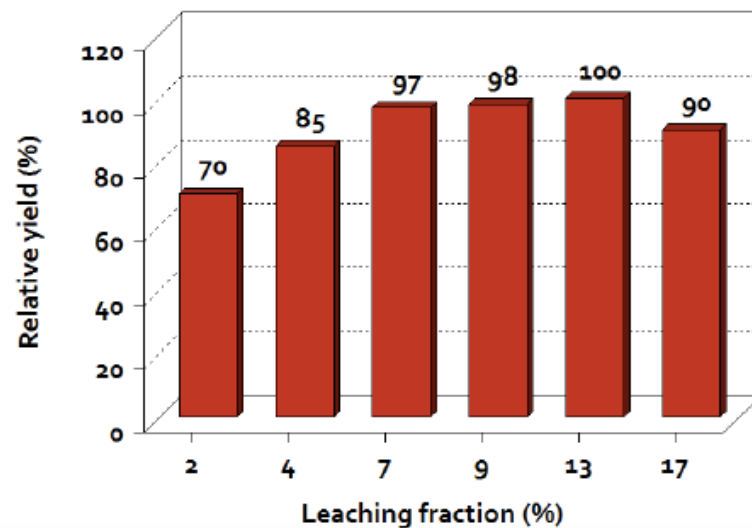
Effect of leaching fraction on yield

Tomato



ECi = 2.1 dS/m

Barley



ECi = 2.1 dS/m

SUMMARY

- Traditionally considered a “west side” issue, salinity problems are now occurring throughout the county.
- Lack of canal water, increased well water use, and deficit irrigation all contribute.
- Irrigating with low EC canal water is necessary to maintain crop productivity and long-term sustainability.

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Small Water Districts Facing Significant Challenges

Stan Feathers

General Manager, Delhi County Water District

Operational Challenges

- Drought
- SGMA
- Water Quality Issues
- Aging infrastructure
- Increasing operational demands

Districts face significant fiscal challenges

- Limited financial resources
- Water Conservations efforts have already reduced ongoing revenue streams
- Most Districts operate with limited Reserve levels
- SED would impact a decade of capital and operations planning
- Substantial rate impacts could threaten ability to sustain a viable operation

Staffing Impacts

- Scaled down staff level – less staffing capacity
- Staffing dynamics lean more toward generalist tendencies
- Limited staffing resources constrains ability to respond to significant technical and specialized workload demands/issues

Merced County Office of Education

Superintendent Steven Gomes

WATER LEVEL

LE GRAND ELEMENTARY

LE GRAND, CA, MERCED COUNTY



2004 – **WATER LEVEL**
174 FT

2015 – **WATER LEVEL**
271 FT

IN 11 YEARS GROUND WATER
LEVEL DROPPED 97 FEET!



1. What is the impact of the water take in this proposed plan going to have on groundwater in the near future?
2. With groundwater levels dropping over 9 feet a year, like Le Grand Elementary, what is the plan when schools run out of water? How will that be mitigated?
3. The superintendents and boards of education want an explanation detailing how 1100 salmon have a higher priority than an uninterrupted educational process for 27,000 students.