Groundwater Quality Conditions and Agricultural Discharges

Item 8

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CALIFORNIA Water Boards

Outline

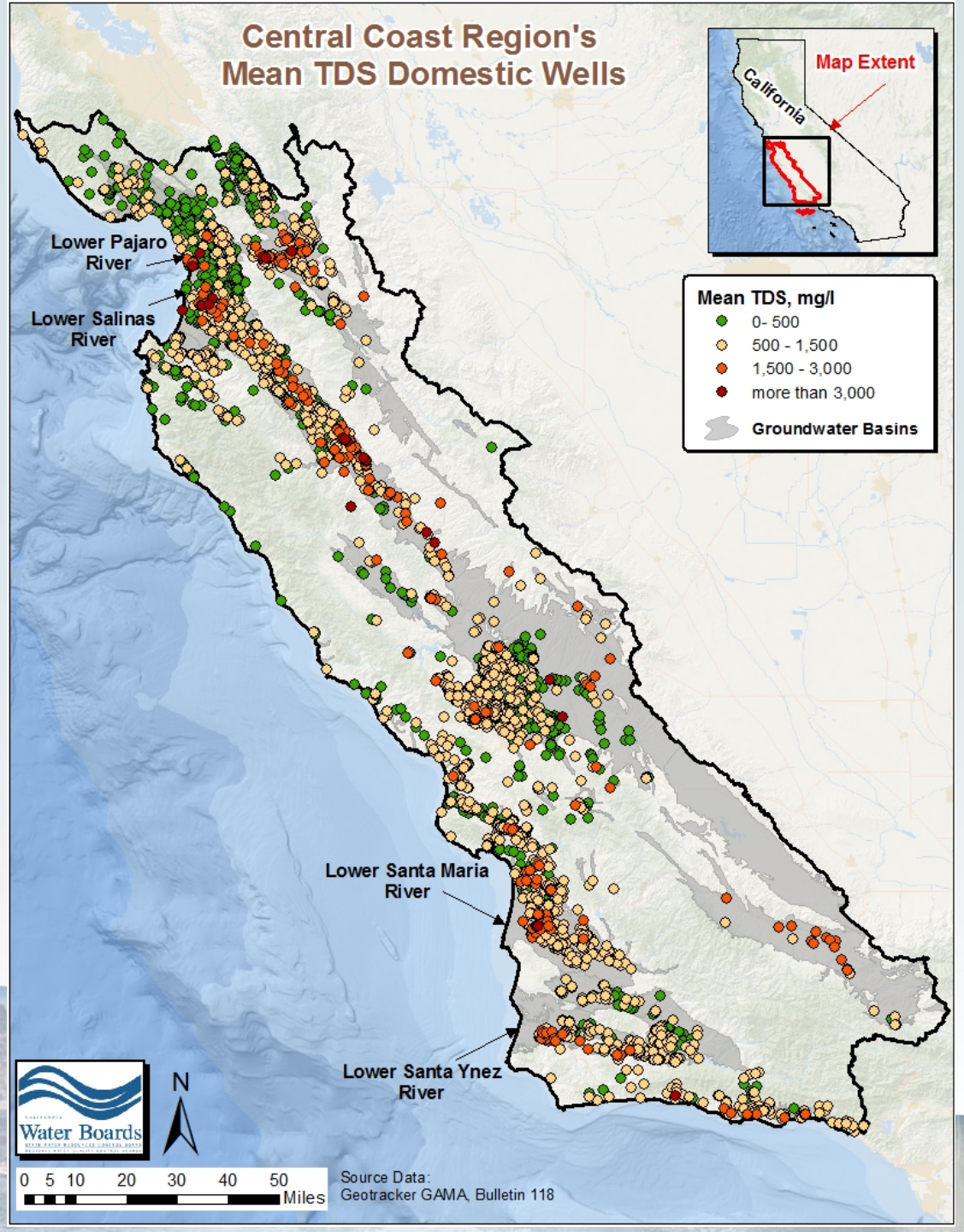
- Overview of contaminants region-wide
- Salinity
- Nitrate
  - Current conditions
  - Changes in concentration through time

Key Findings

- Nitrate and salinity are the biggest threats to groundwater quality in the Central Coast
- Nitrate and salinity impairment are widespread and severe
- Nitrate concentrations are increasing

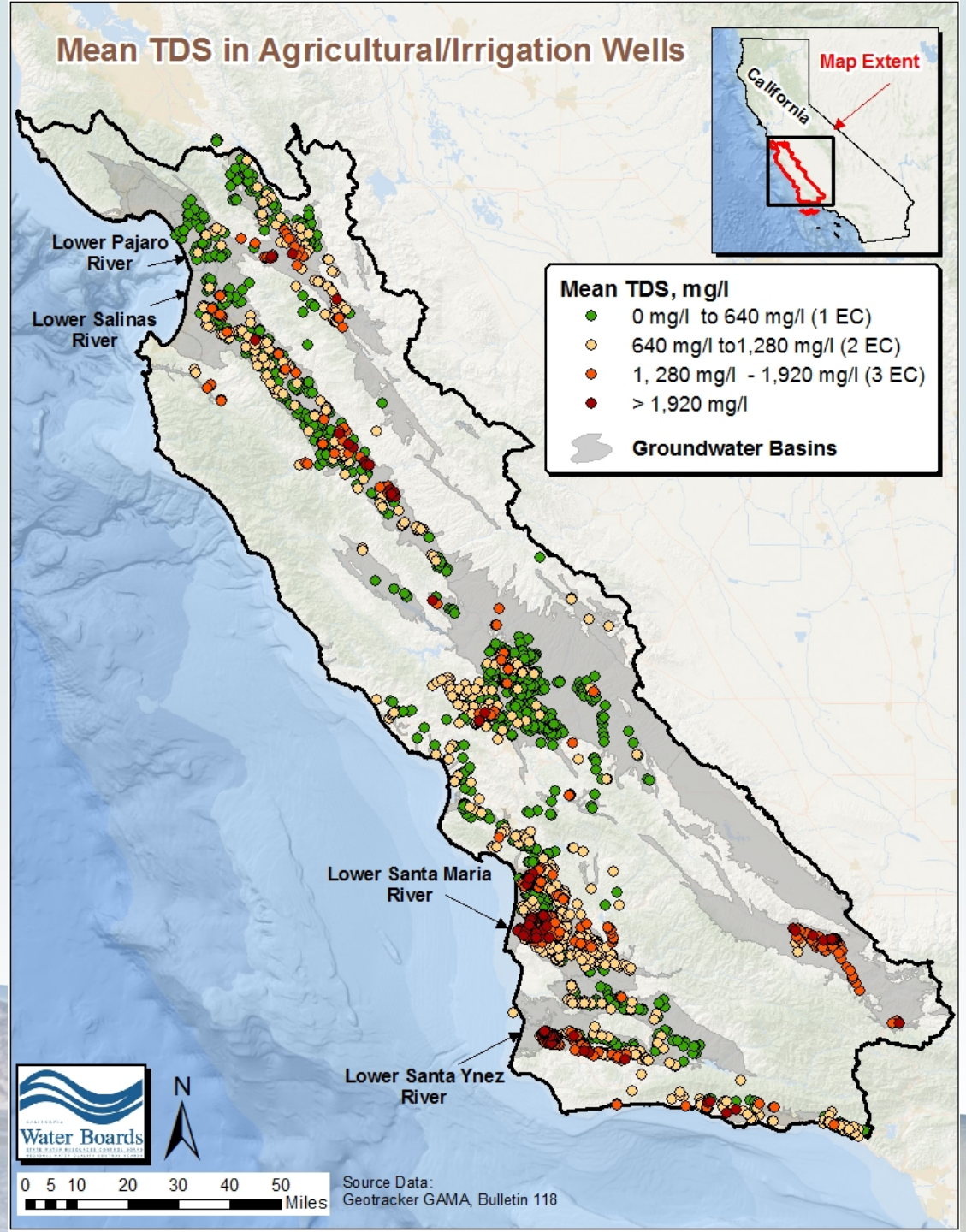
Top Contaminants in the Region

- Iron, manganese, arsenic
  - Naturally Occurring – source control not feasible
- Benzene, hexavalent chromium, and MTBE
  - Localized occurrences and already heavily regulated and remediated
- Nitrate and salinity
  - Widespread, high concentrations, threat to human health, little regulation
- Pesticides?



Mean TDS concentration in domestic and public supply wells

2009 - 2018



Mean TDS concentration in domestic and public supply wells

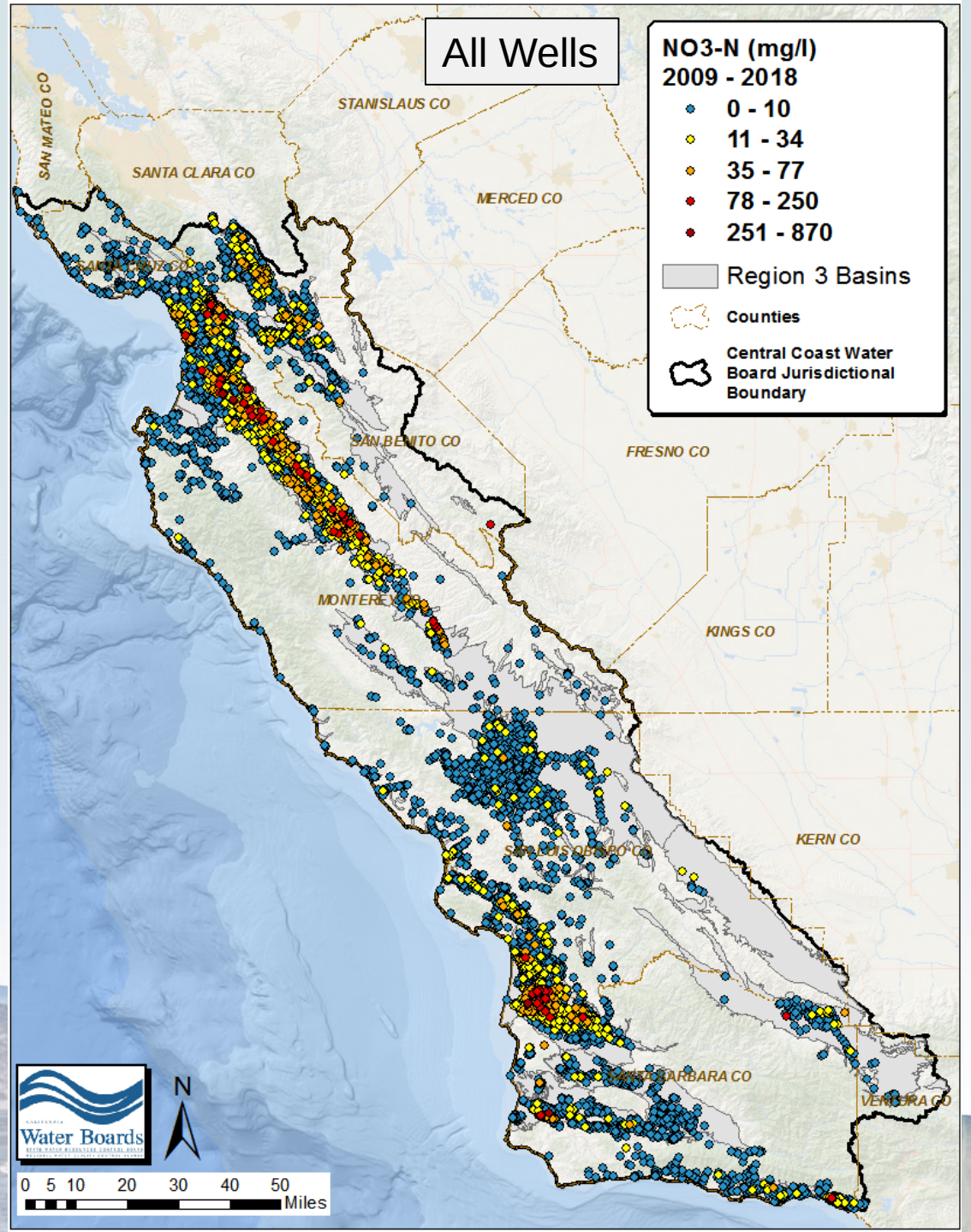
2009 - 2018

Groundwater Nitrate Current Conditions

- All Wells – All well types in the region
  - Integrates concentrations from all depths and everywhere in a basin.
  - 49,505 samples from 9,419 wells

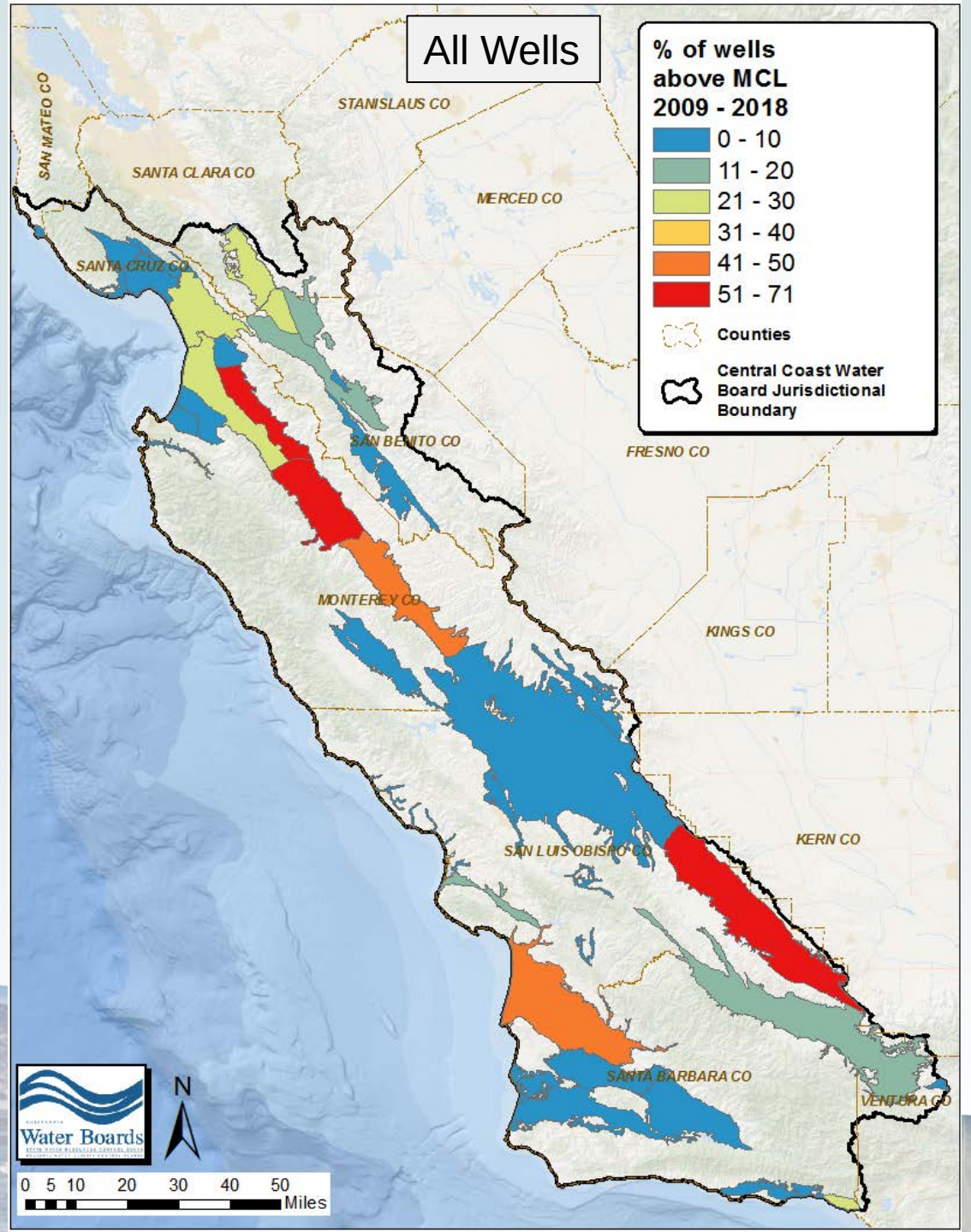
- Domestic Wells – ILRP Domestic Wells
  - Shallow portion of basin
  - Impacts human health
  - Agricultural areas
  - Recent land use practices
  - 4,968 samples from 2,404 wells

- All nitrate data is presented as NO3-N, MCL = 10 mg/l



Mean nitrate concentration in All Wells

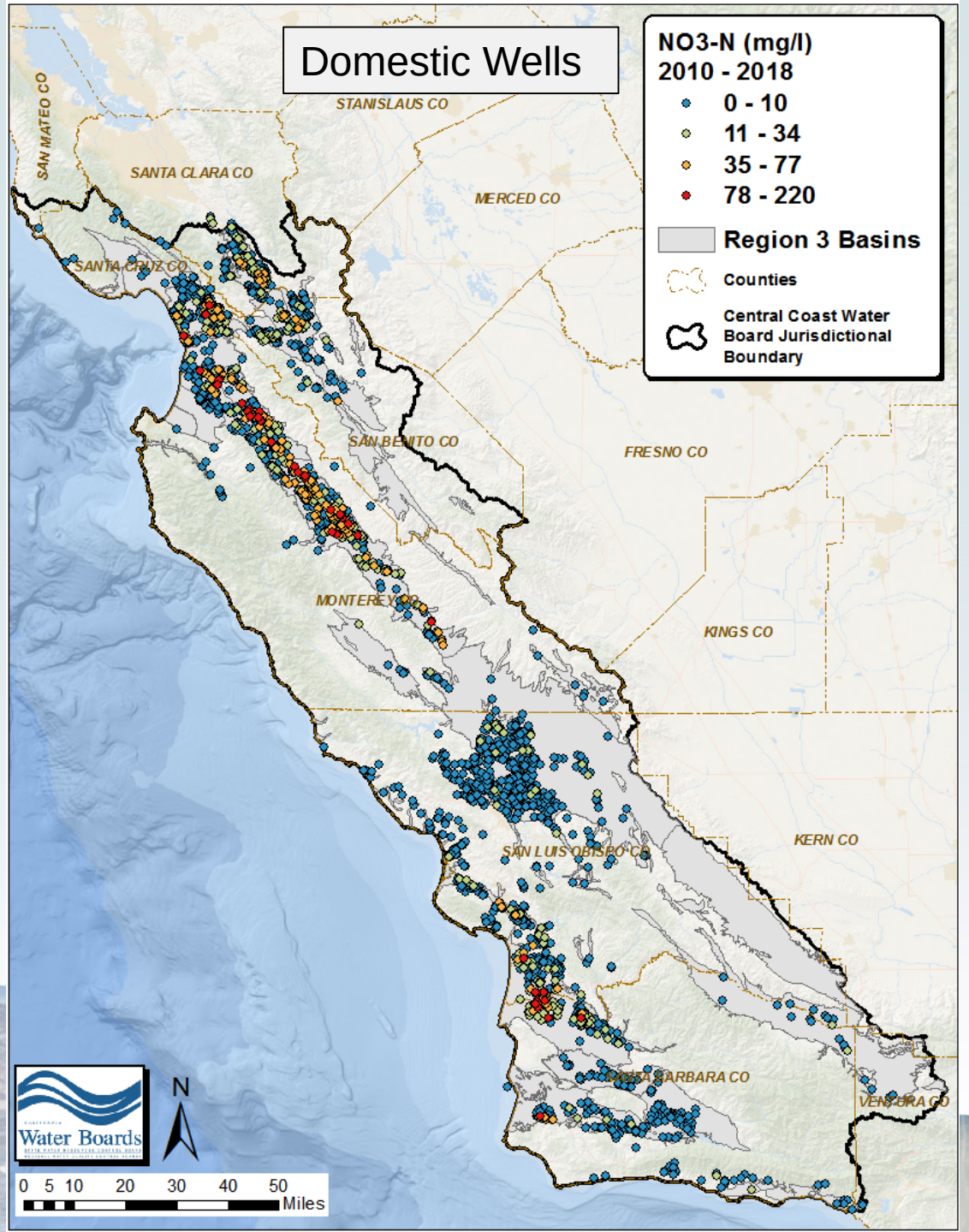
2009 - 2018



Nitrate percent exceedance by basin

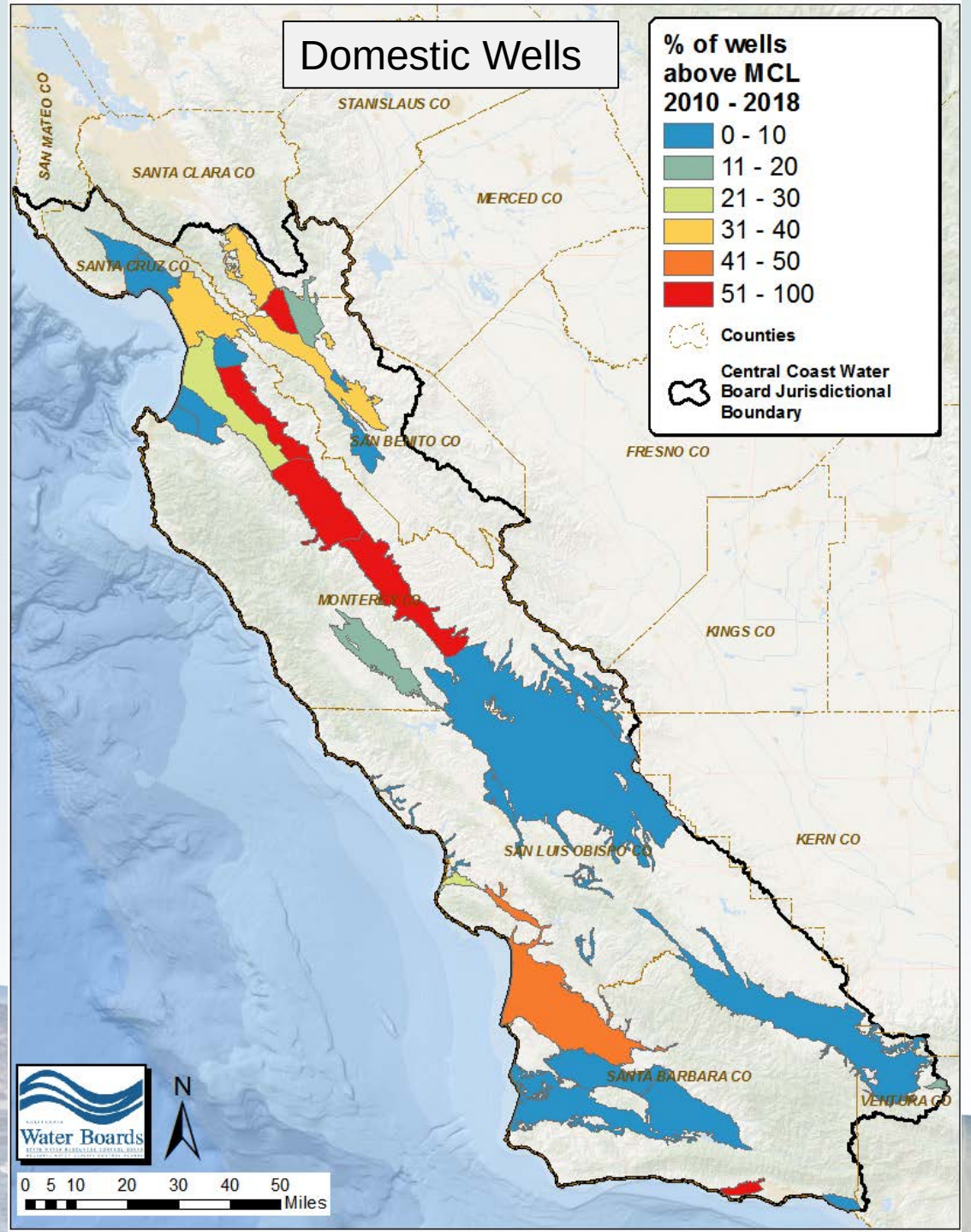
All Wells

2009 - 2018



Mean nitrate concentration in ILRP Domestic Wells

2010 - 2018



Nitrate percent exceedance by basin

ILRP Domestic Wells

2010 - 2018

Nitrate concentration changes through time

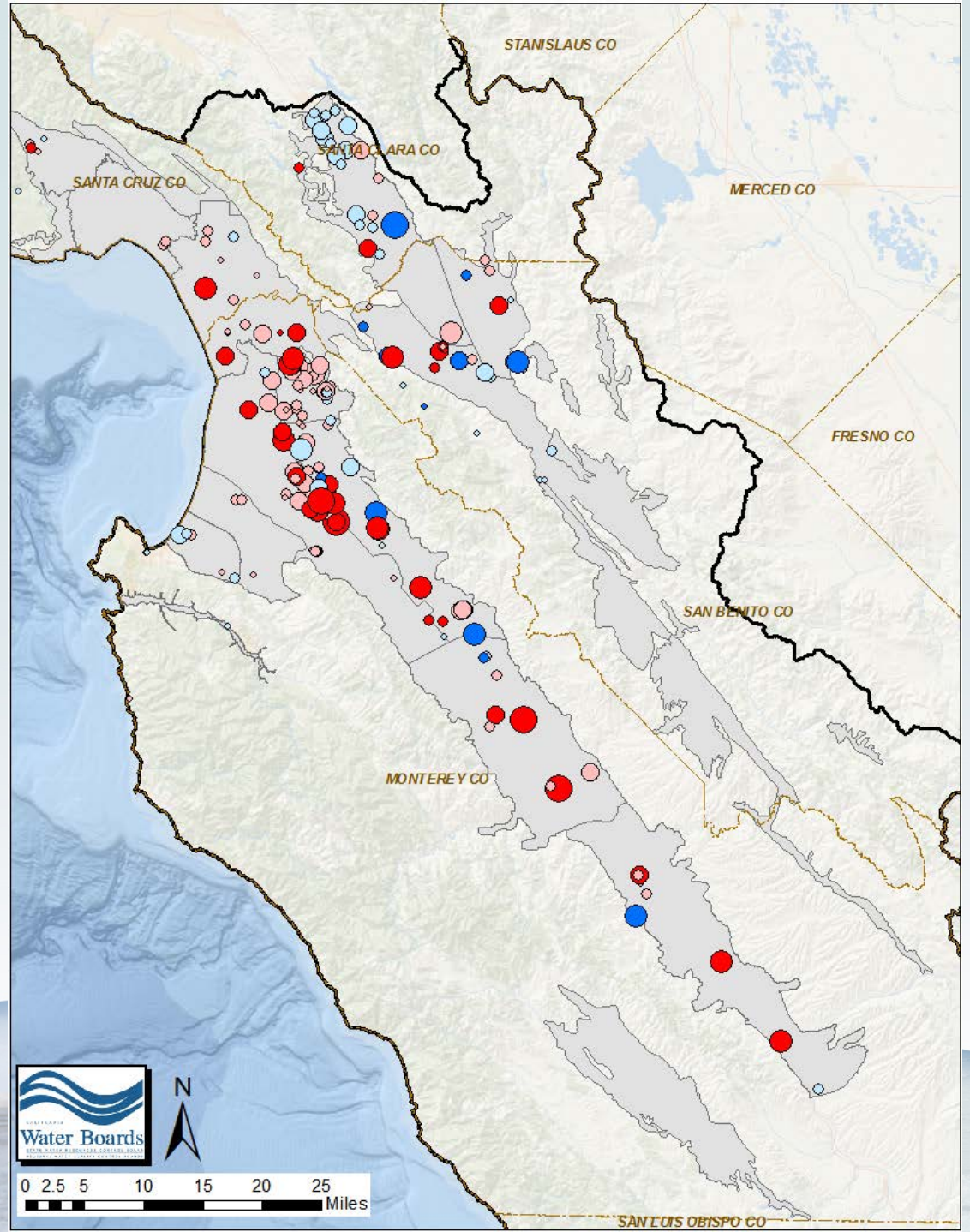
- Trend Analysis
- Paired-sample comparison
- Grouped comparison

Nitrate trend analysis

- Test for statistically significant trends in nitrate concentration through time in a single well.

- Needs minimum of five samples per well
  - Primarily tested Public Supply Wells – deep, clean
  - Includes very few ILRP wells
  - 1,481 wells met the criteria, 365 had significant trends

- Includes data from 2009 – 2018


STANISLAUS CO
SANTA CLARA CO
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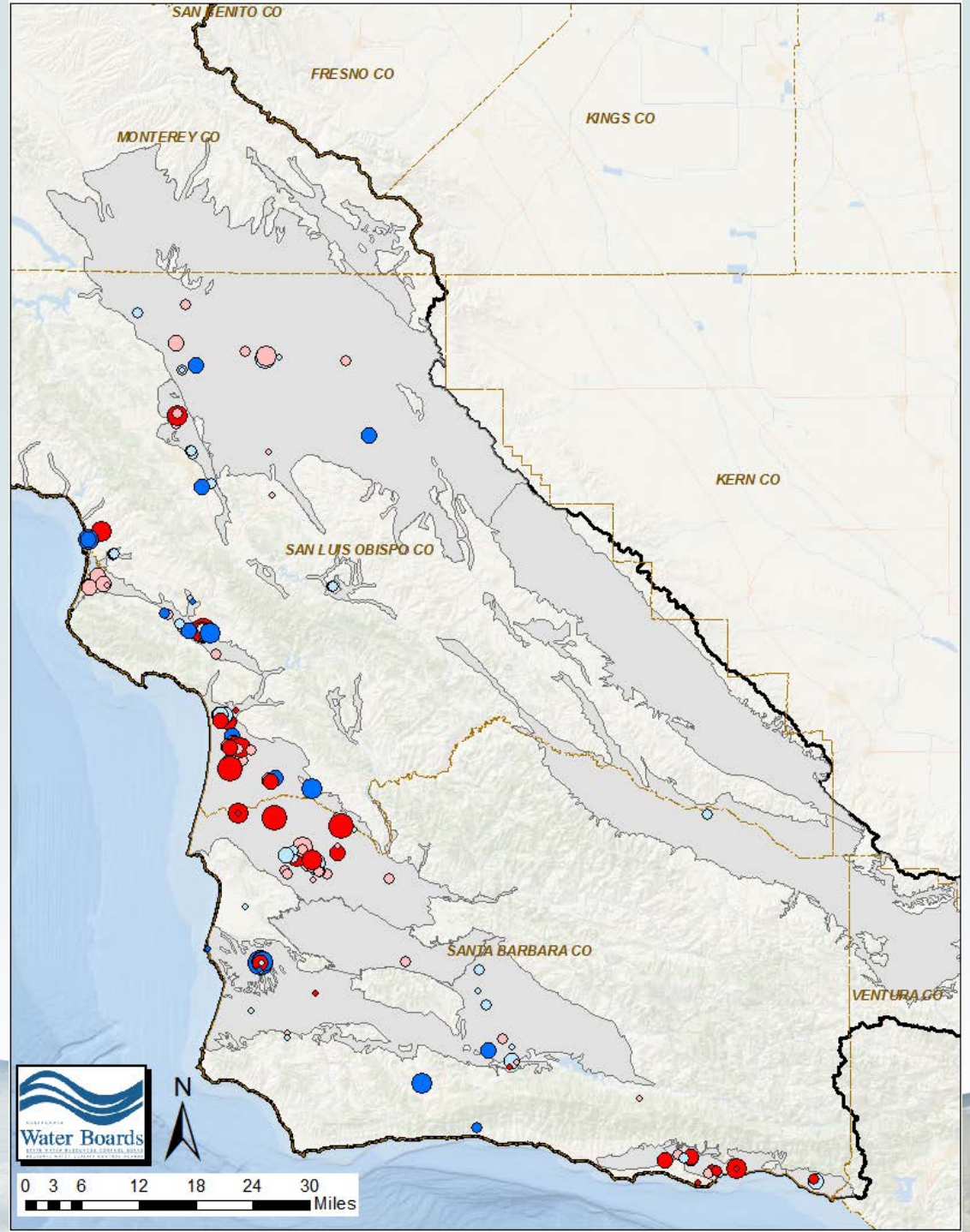
SAN BENITO CO
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SAN LUIS OBISPO CO
SANTA BARBARA CO
VENTURA CO
Water Boards
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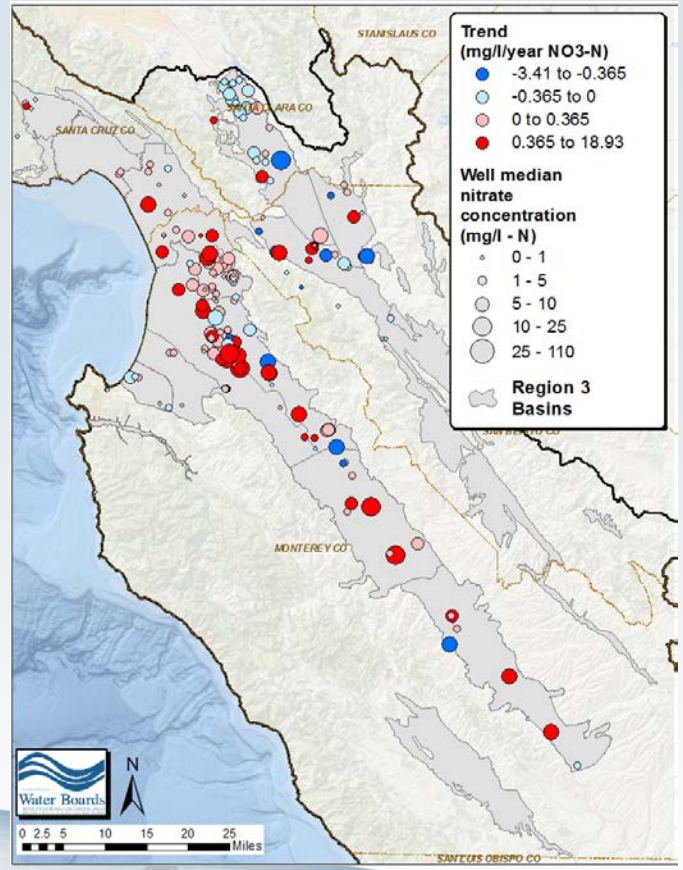
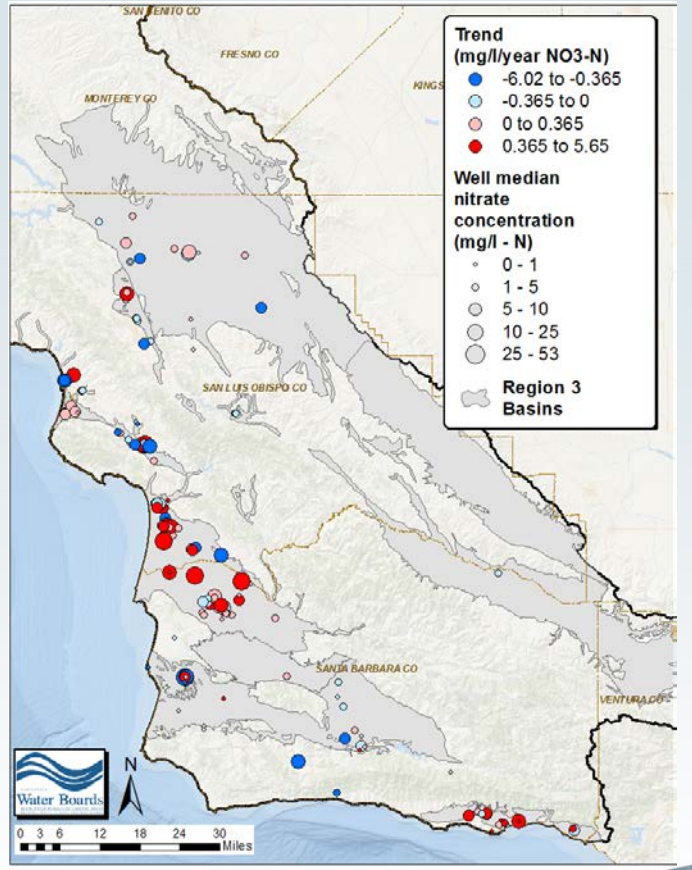
0 3 6 12 18 24 30
Miles

Region-wide Nitrate Trend Analysis

Basin	Wells	decreasing %	increasing %
CORRALITOS PAJARO VALLEY	18	28	72
SV 180/400 FOOT AQUIFER	29	7	93
SV EAST SIDE AQUIFER	26	35	65
SV FOREBAY AQUIFER	9	22	78
SV LANGLEY AREA	35	23	77
SANTA MARIA	59	31	69

GHV LLAGAS AREA	22	82	18
SAN LUIS OBISPO VALLEY	10	70	30
SANTA YNEZ RIVER VALLEY	19	79	21



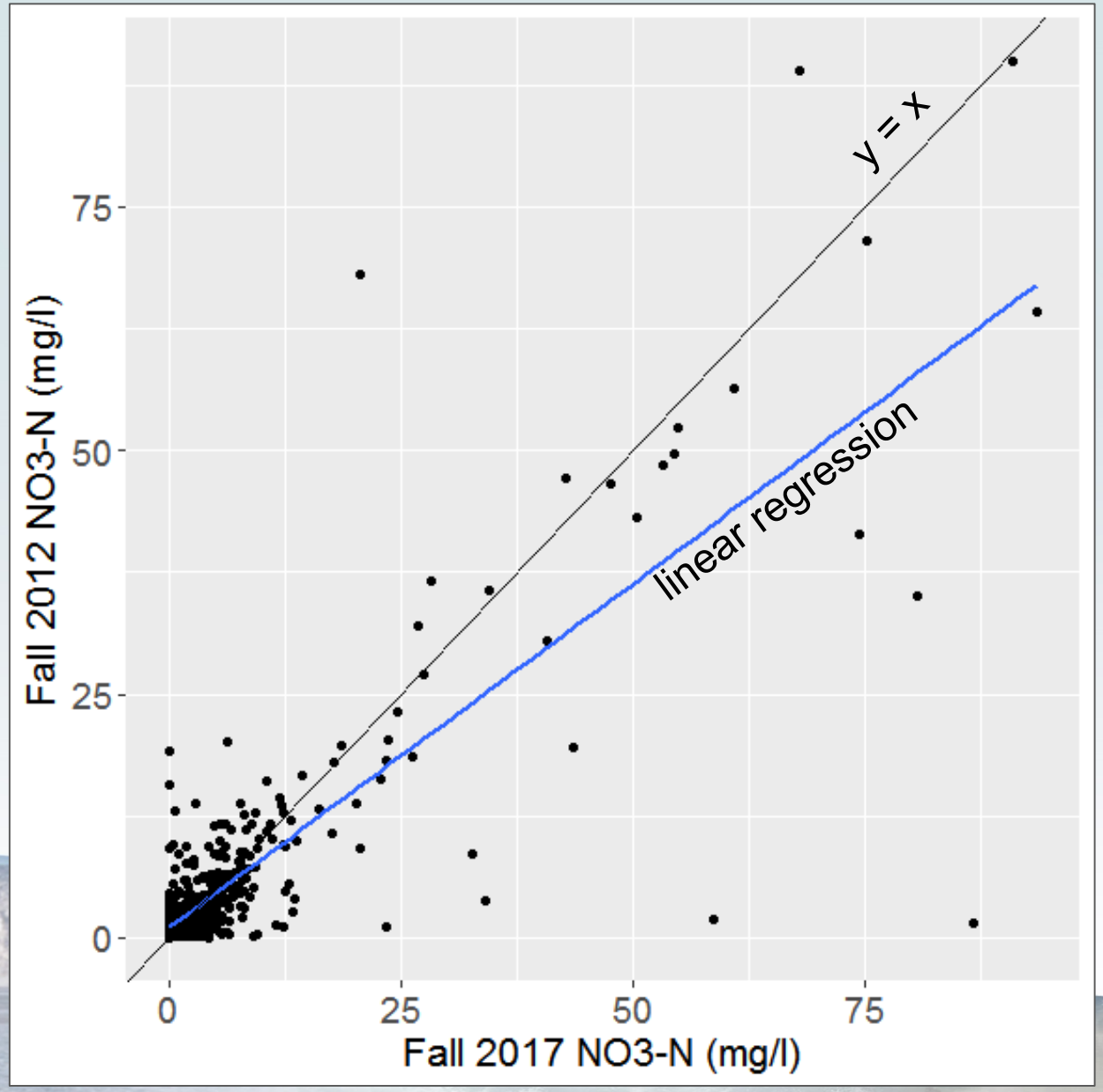


Nitrate Paired-Sample Comparison

- Compares the concentration measured in a well in Fall 2012 to the concentration measured in the same well in Fall 2017.
  - Test for statistically significant differences between 2012 and 2017 groups.

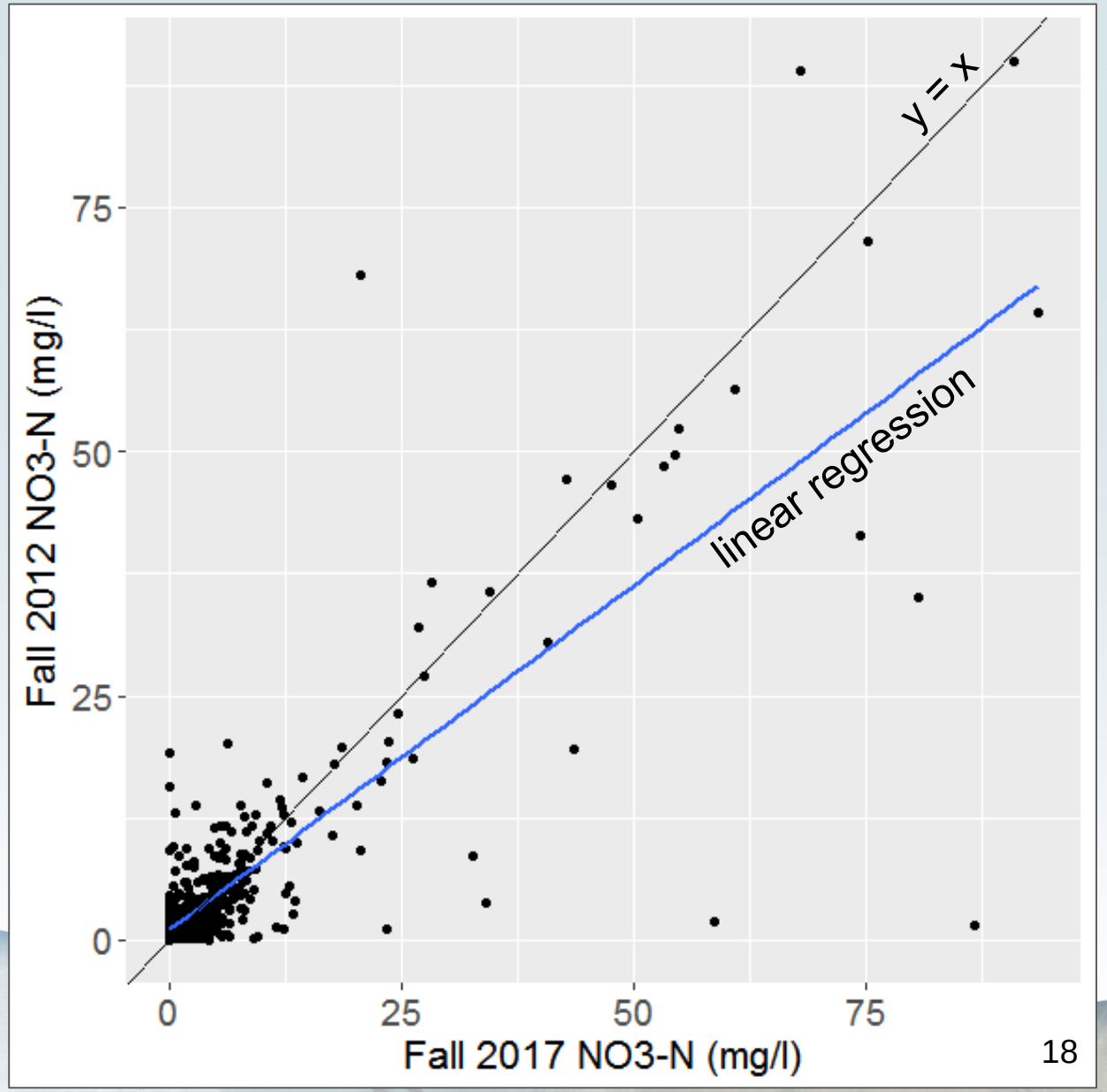
- Used only ILRP wells
  - Limited dataset because of sample-pair requirement
  - Only region-wide comparison possible

Nitrate Paired-Sample Comparison



Nitrate Paired-Sample Comparison

- Results of region-wide comparison between 2012 and 2017 groups are not statistically significant.
- Paired-sample pattern indicates that region-wide, the concentrations in 2017 are generally higher than 2012.
- Second line of evidence suggesting concentrations are increasing.



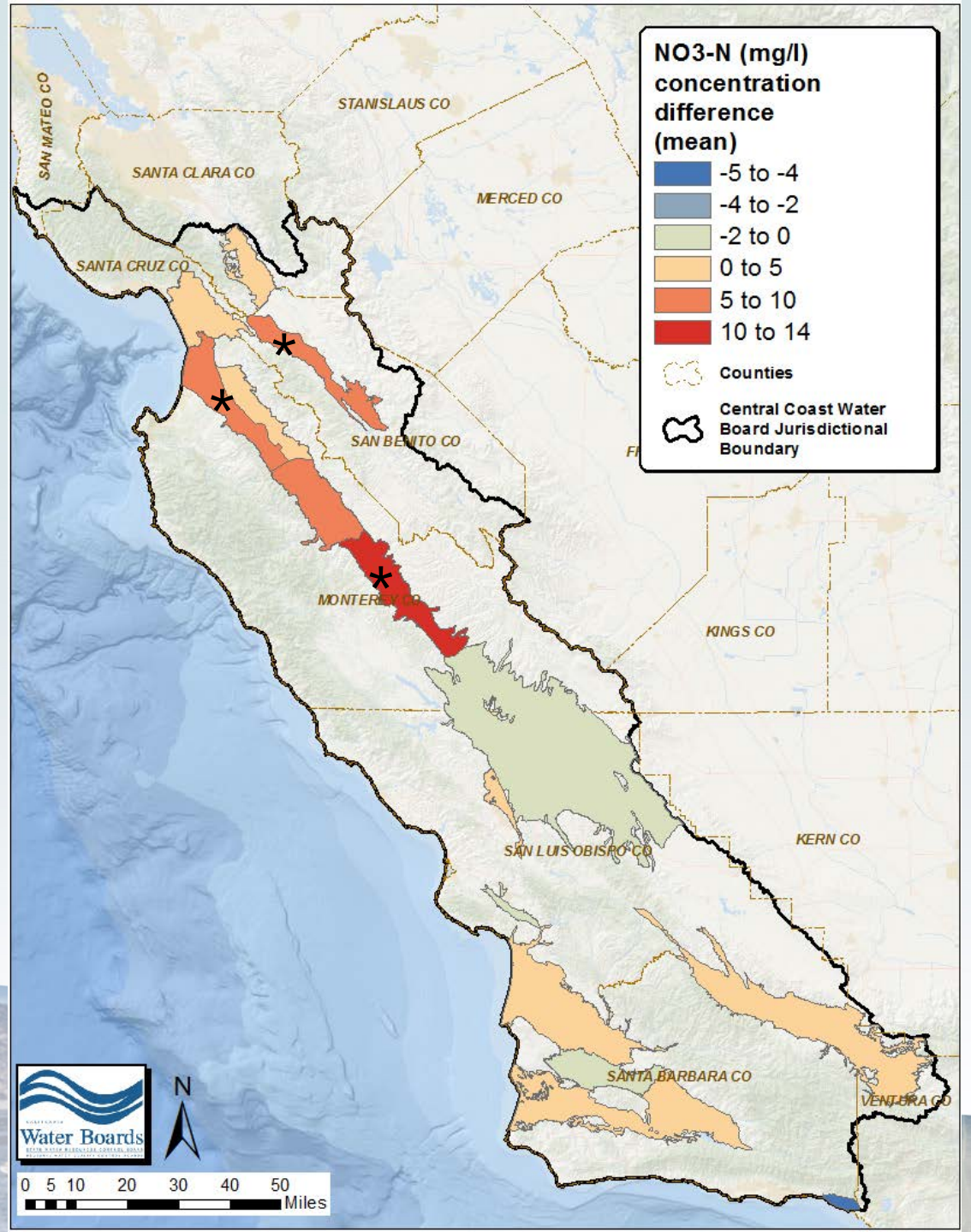
Grouped Comparison by Basin, 2012 vs. 2017

- Compare concentration measured in wells in 2012 to concentration measured in all wells in 2017.
  - Basin-by-basin comparison.
  - Test for significant difference between 2012 and 2017 groups.
  - Much larger dataset than sample-pair comparison, more statistical power.
  - *Compares concentrations in different wells.

- Used only ILRP wells

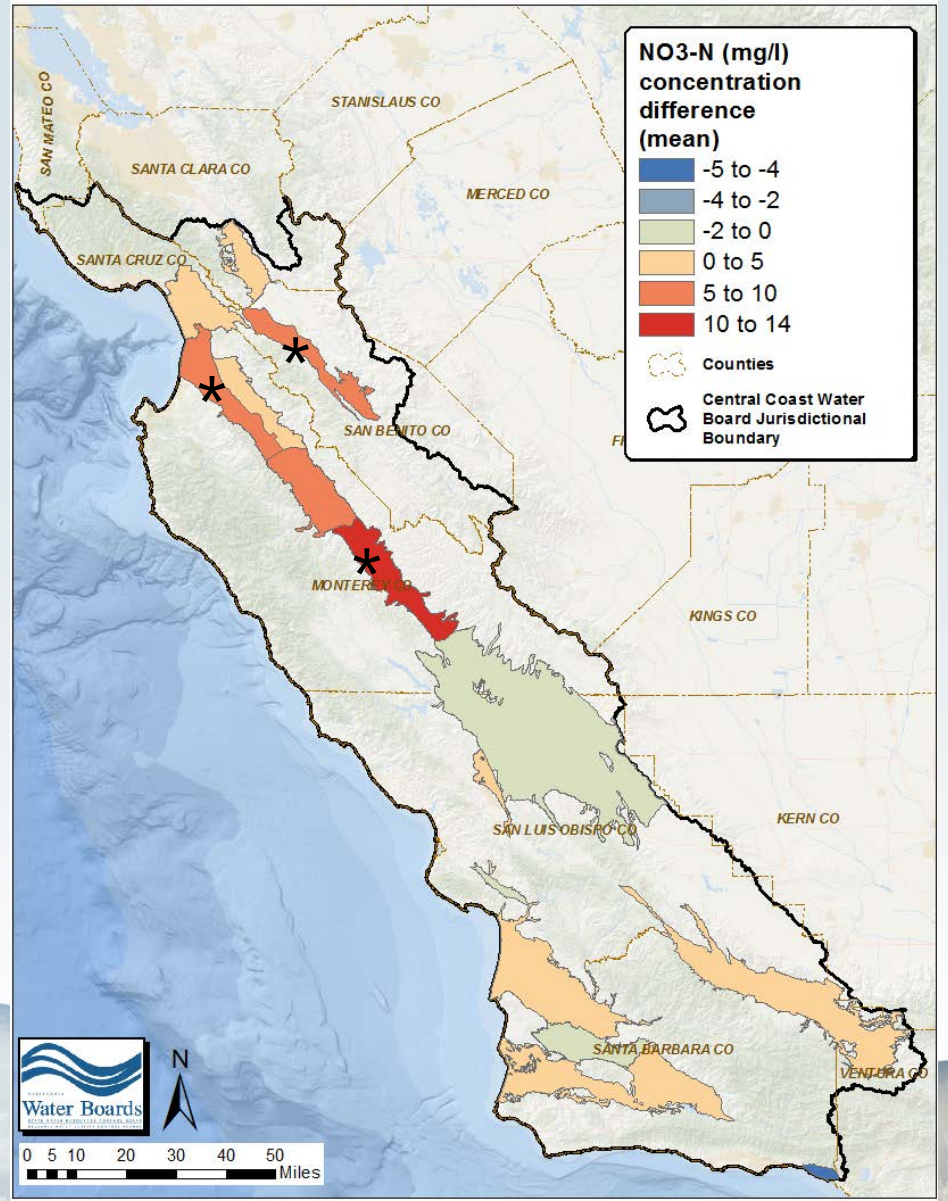
Grouped Comparison by Basin

2012 vs. 2017



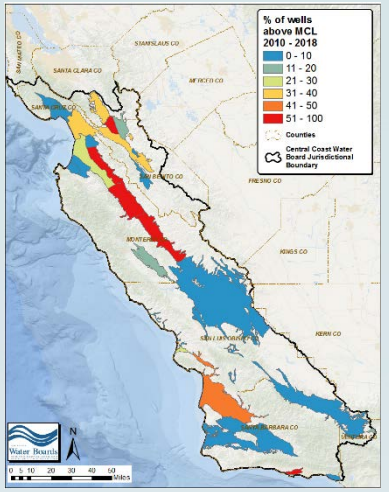
Grouped Comparison by Basin, 2012 vs. 2017

- Most basins show a pattern of increasing concentration from 2012 to 2017
- Salinas Upper Valley, Salinas Valley 180/400, and Gilroy-Hollister Valley San Juan Bautista Area all have statistically significant increases.
- Paso Robles and San Antonio Creek Valley both show decreases in concentrations from 2012 to 2017.
- Third line of evidence suggesting that groundwater nitrate concentrations are getting worse in many basins.



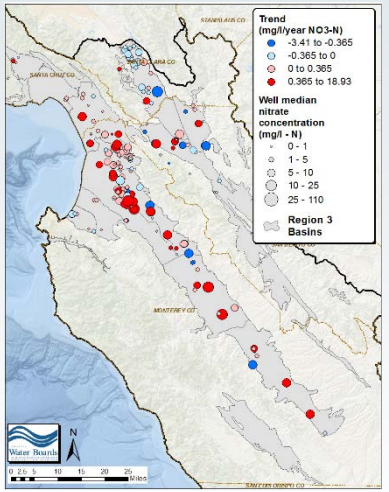
Conclusions

- Groundwater contamination by salt and nitrate is widespread and severe.



- Nitrate concentrations are increasing in many basins.

- More frequent data collection and a dedicated groundwater monitoring network would allow us to better detect changes in groundwater contaminant concentrations.



- Shallow, young groundwater impacted by recent land use practices

- Must control N-loading – more about this tomorrow.