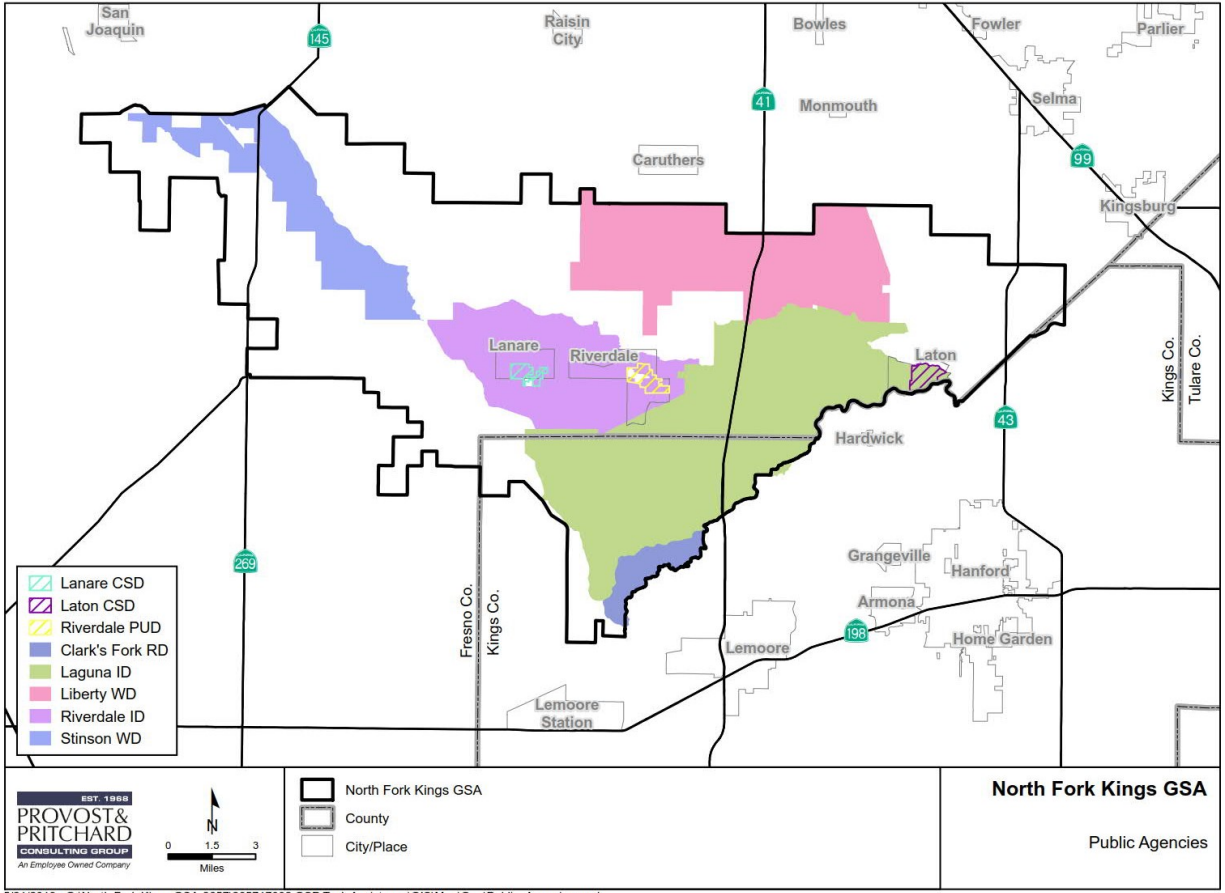
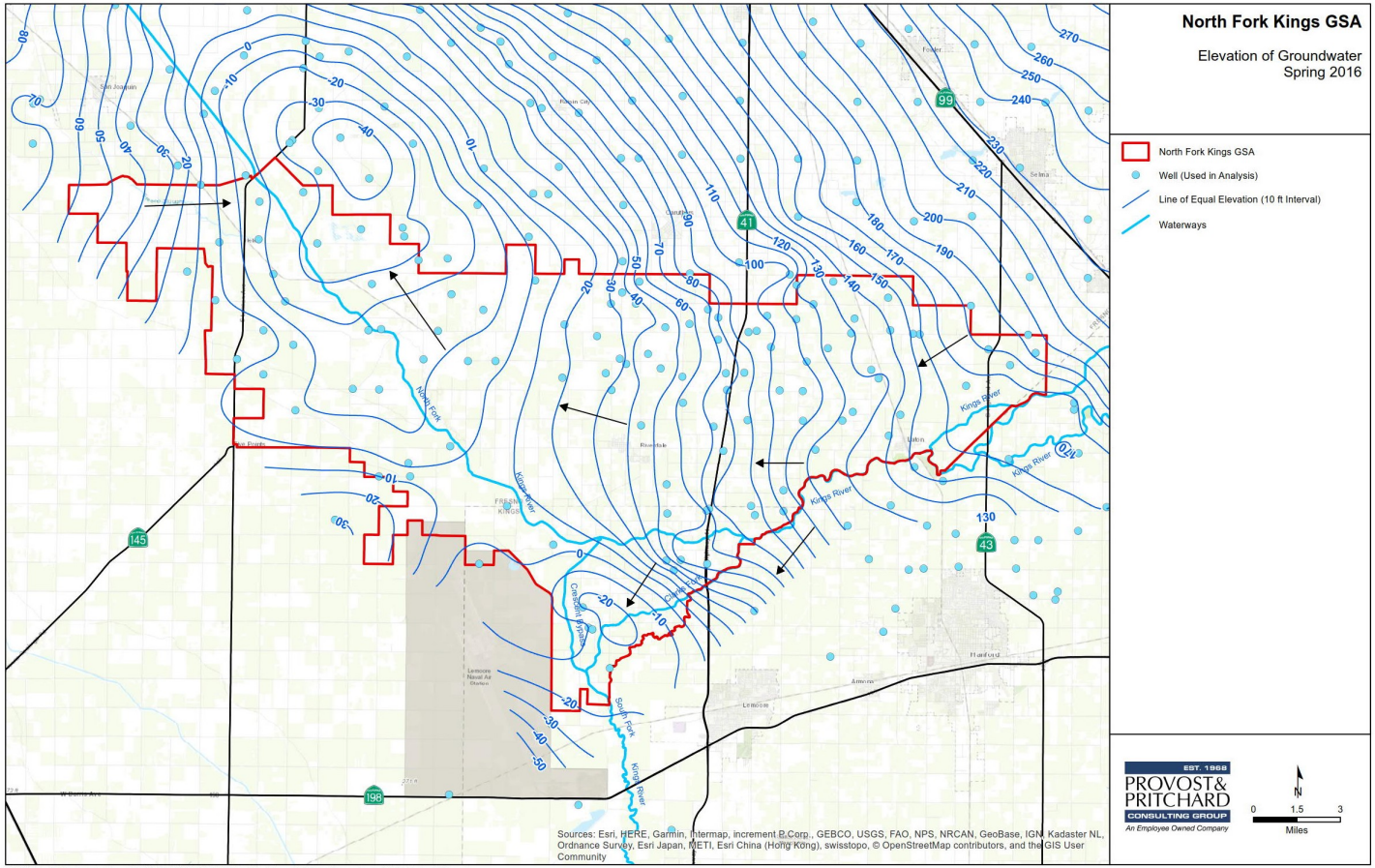
SESSION 2

BASIN SETTING - NFKGSA

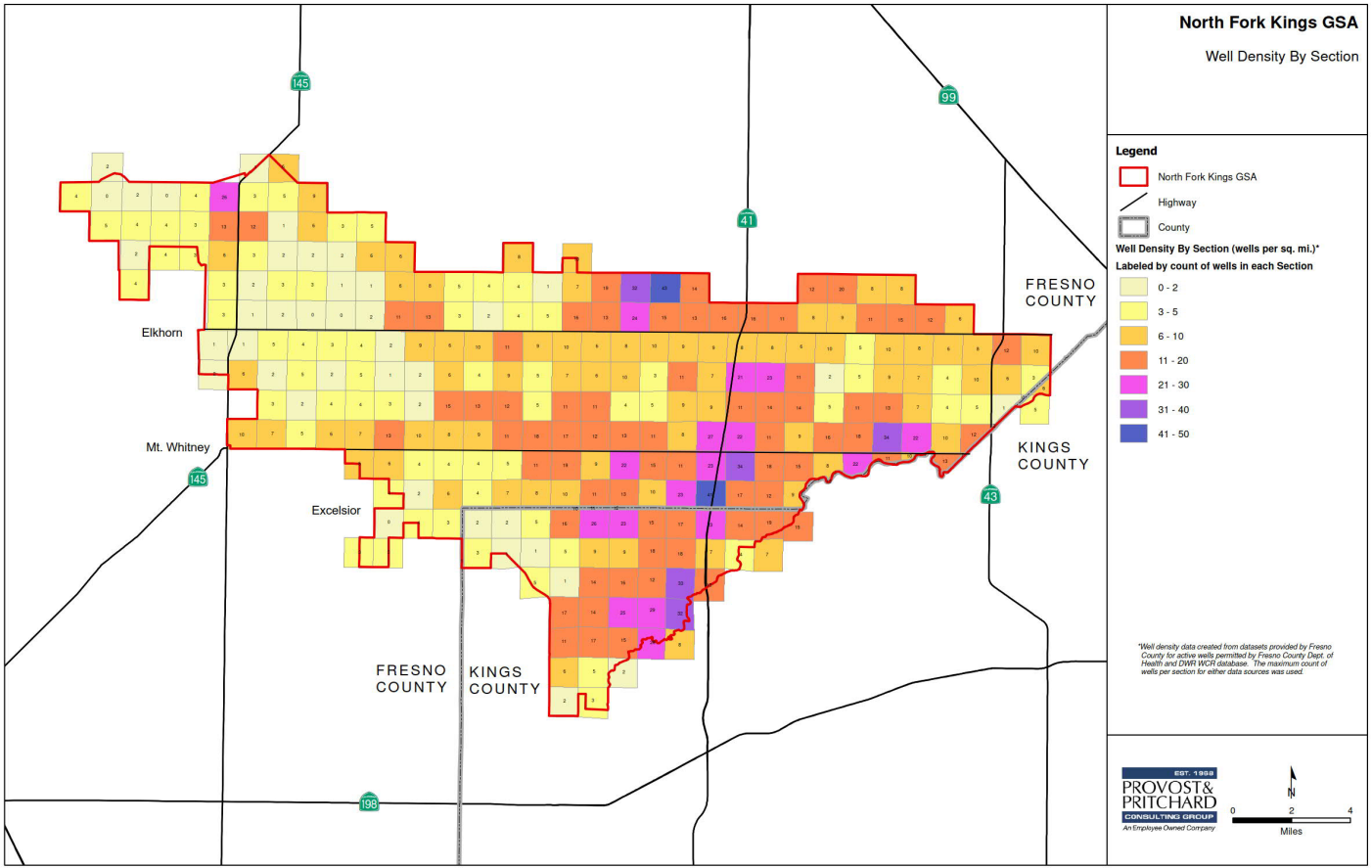
Public Agencies within NFKGSA



Spring 2016 groundwater contour map of unconfined aquifer

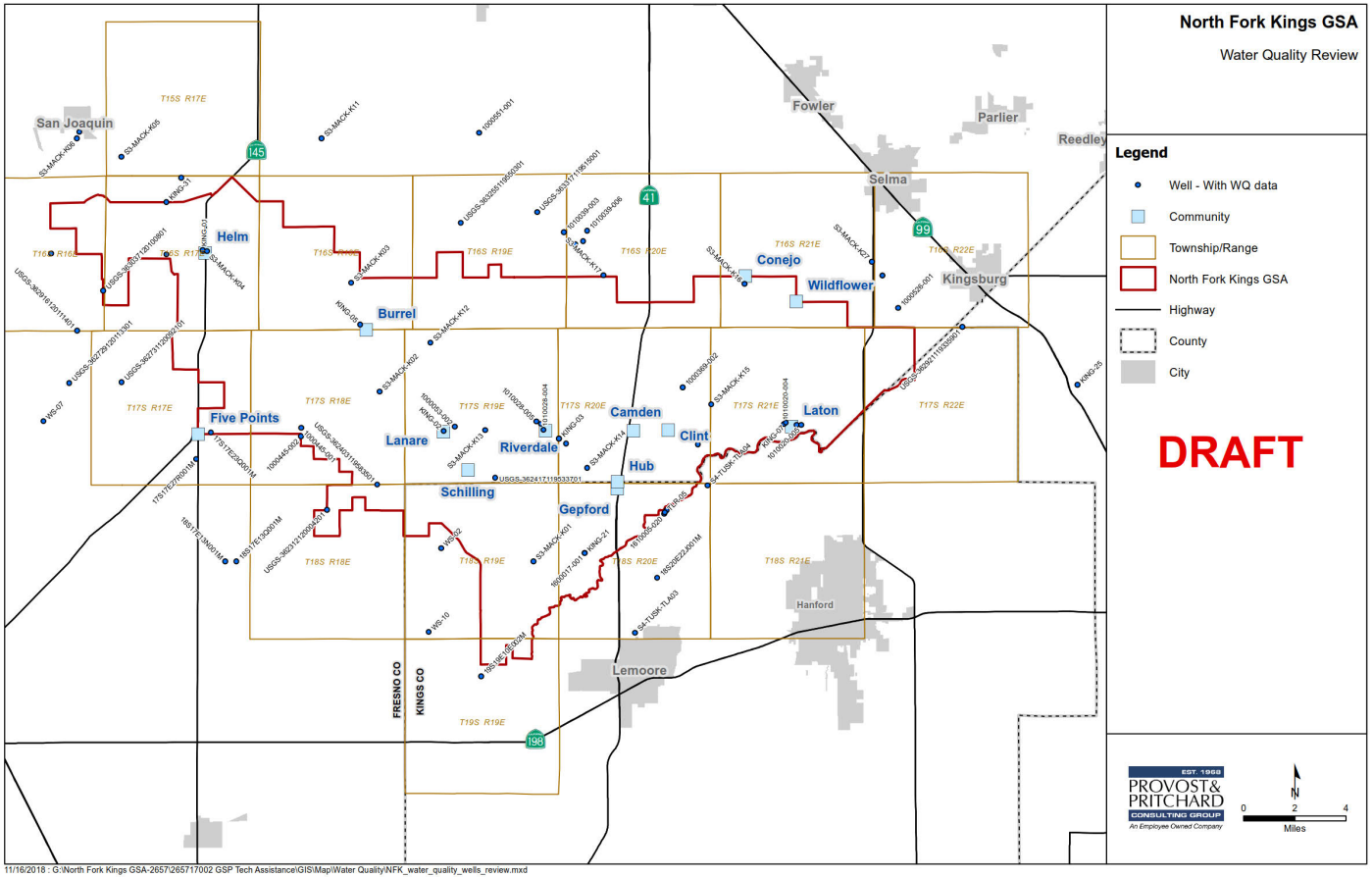


Representative Well Density



Water Quality Review in NFKGSA Vicinity

- Public data from Groundwater Ambient Monitoring and Assessment Program (GAMA) https://www.waterboards.ca.gov/gama/

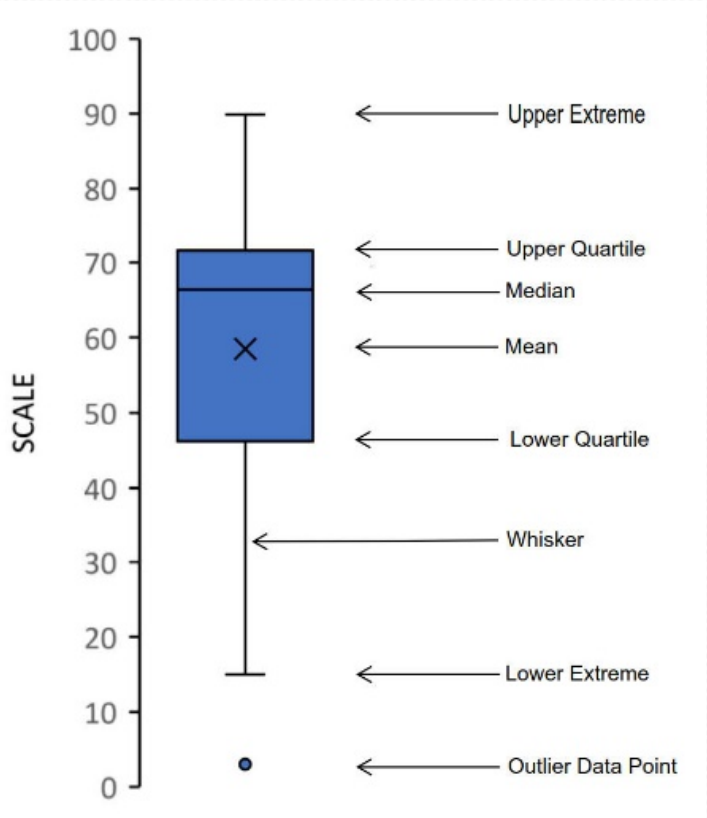


Chemicals of Concern in NFKGSA Vicinity

- Earliest records dated prior to 1989.
- X = California Maximum Contaminant Level (MCL) exceedances

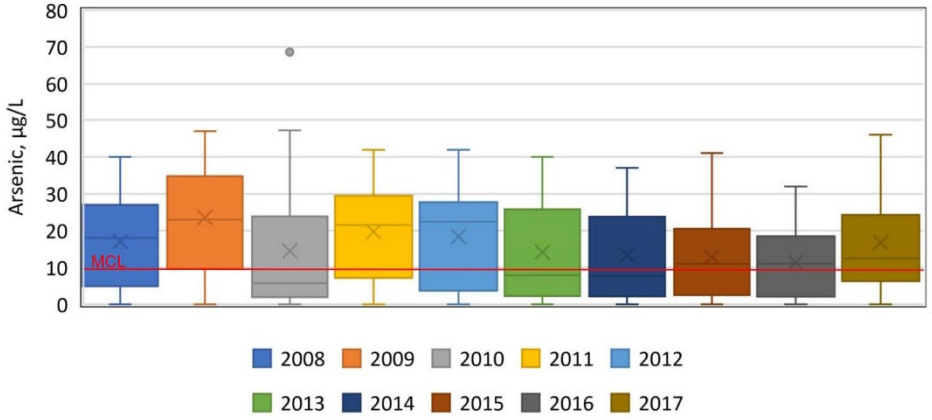
Chemical	Shallow Zone (0 to 150 ft deep)	Intermediate Zone (150 ft deep to E-clay)	Deep Zone (Below E-clay)
Arsenic	X	X	X
Chromium (Total)	X		
Fluoride		X	X
Gross Alpha		X	X
Lead	X		X
Nitrate	X	X	X
1,2,3-Trichloropropane	X	X	X
Uranium	X	X	
Aluminum		X	
Iron	X	X	X
Manganese	X	X	X
Total Dissolved Solids	X	X	X

Water Quality - Box and Whisker Plots

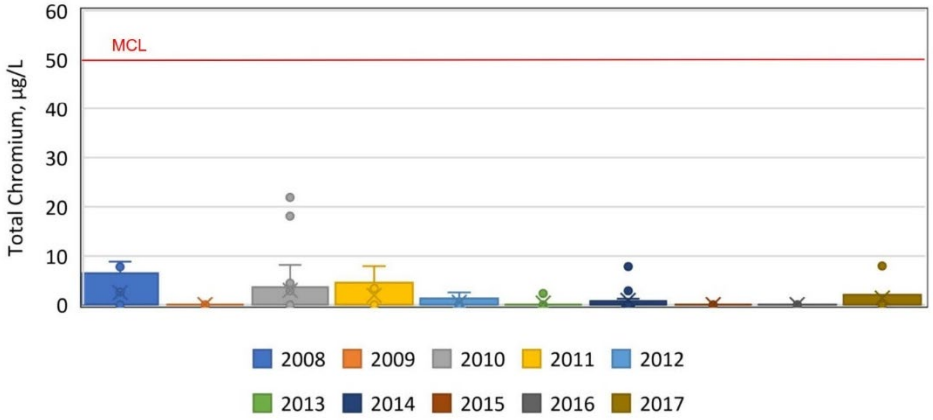


- The box portion of the plot shows the upper and lower quartiles and represent the likely variation of the data set. The difference between the upper and lower quartile values is known as the inter-quartile range. The mean value of a data set is the sum of all the data point values divided by the number of data points in the set. This value is shown as an “X’ in the plot. The median value is the value of the data point in the middle of a data set that has been sorted sequentially from smallest to largest. The upper extreme and the lower extreme are called the whiskers.
- Queries focused on identifying the highest recorded concentration for each constituent for the most recent 10-year period across all zones.

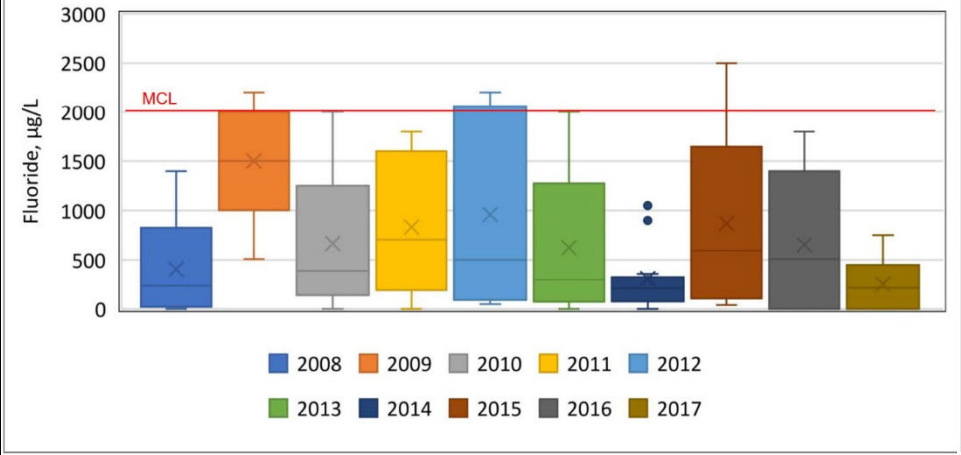
Arsenic Concentration Variation, 2008 to 2017



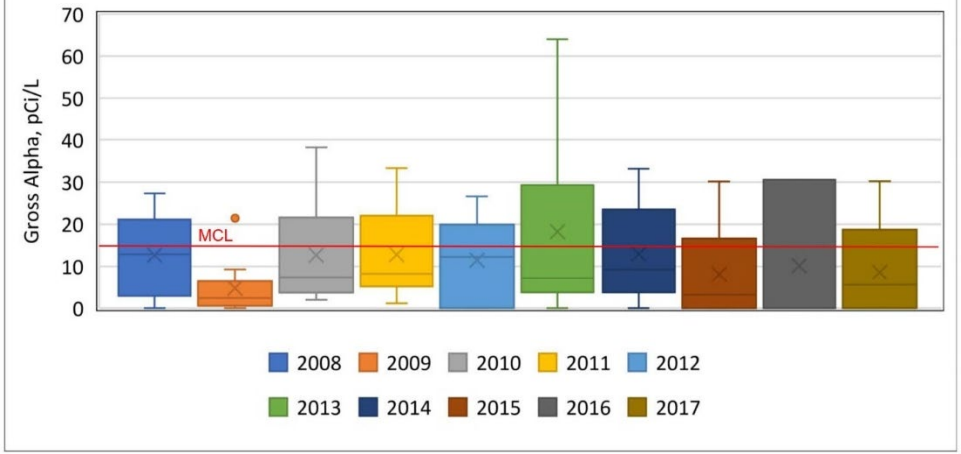
Total Chromium Concentration Variation, 2008 to 2017



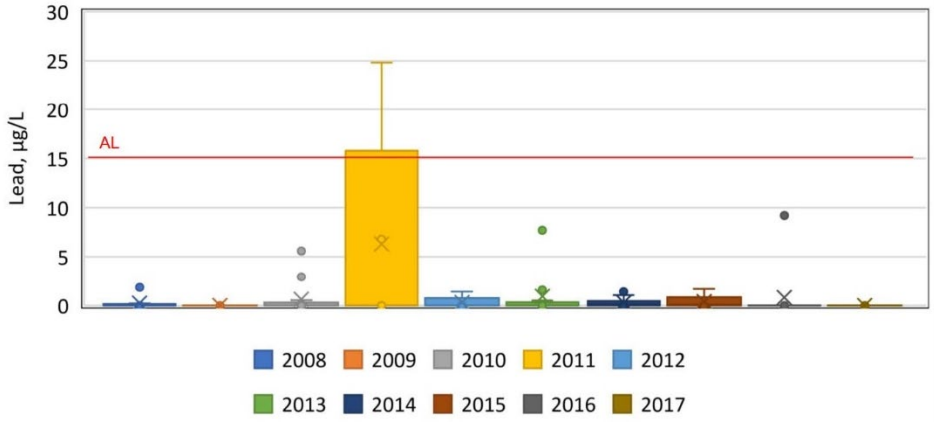
Fluoride Concentration Variation, 2008 to 2017



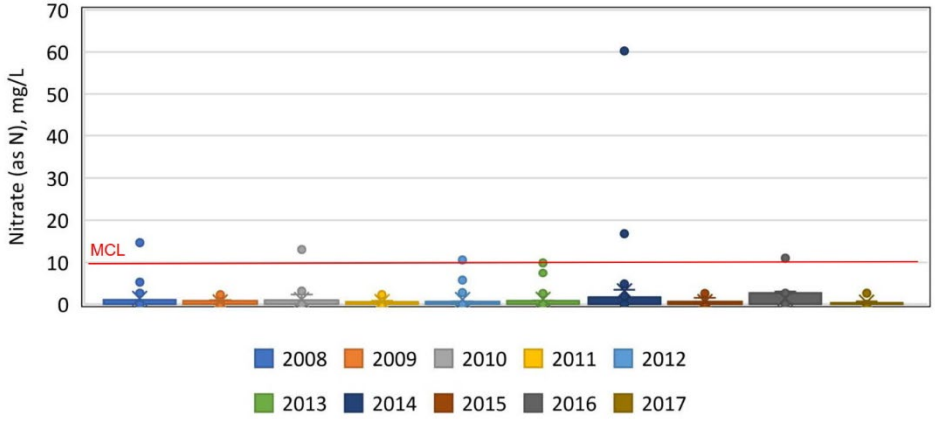
Gross Alpha Concentration Variation, 2008 to 2017



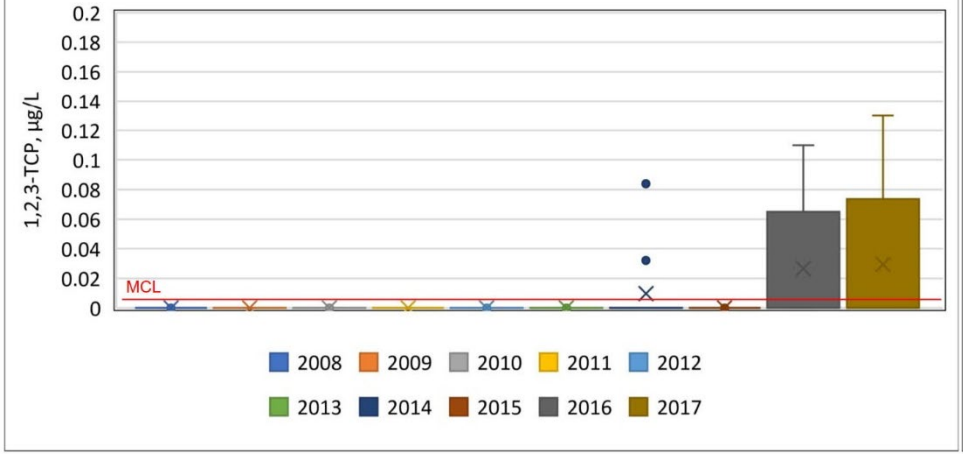
Lead Concentration Variation, 2008 to 2017



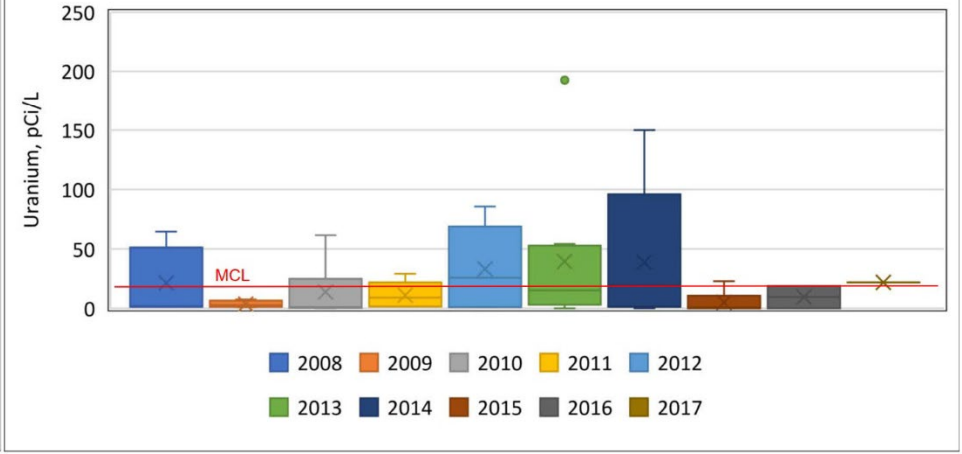
Nitrate Concentration Variation, 2008 to 2017



1,2,3-TCP Concentration Variation, 2008 to 2017



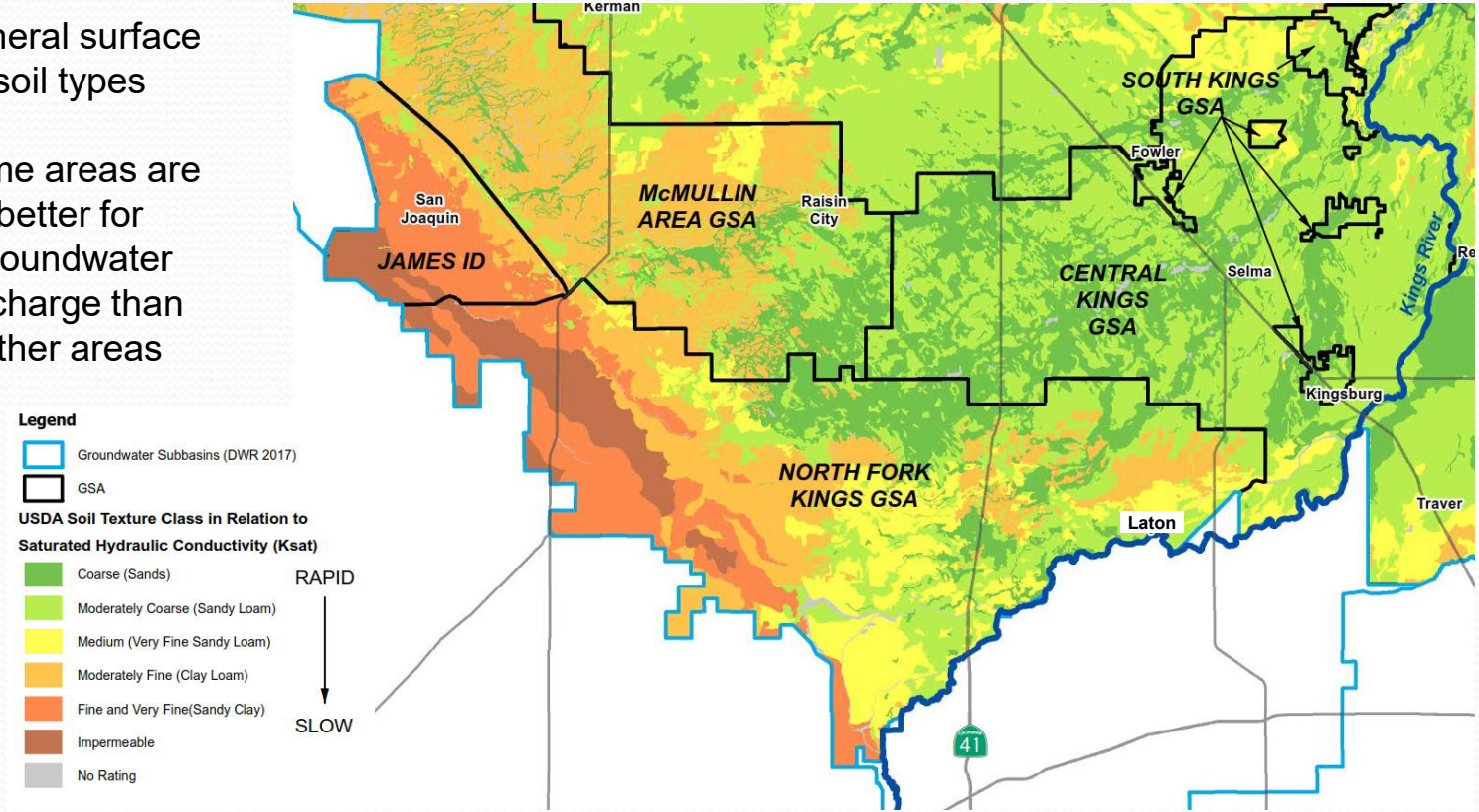
Uranium Concentration Variation, 2008 to 2017



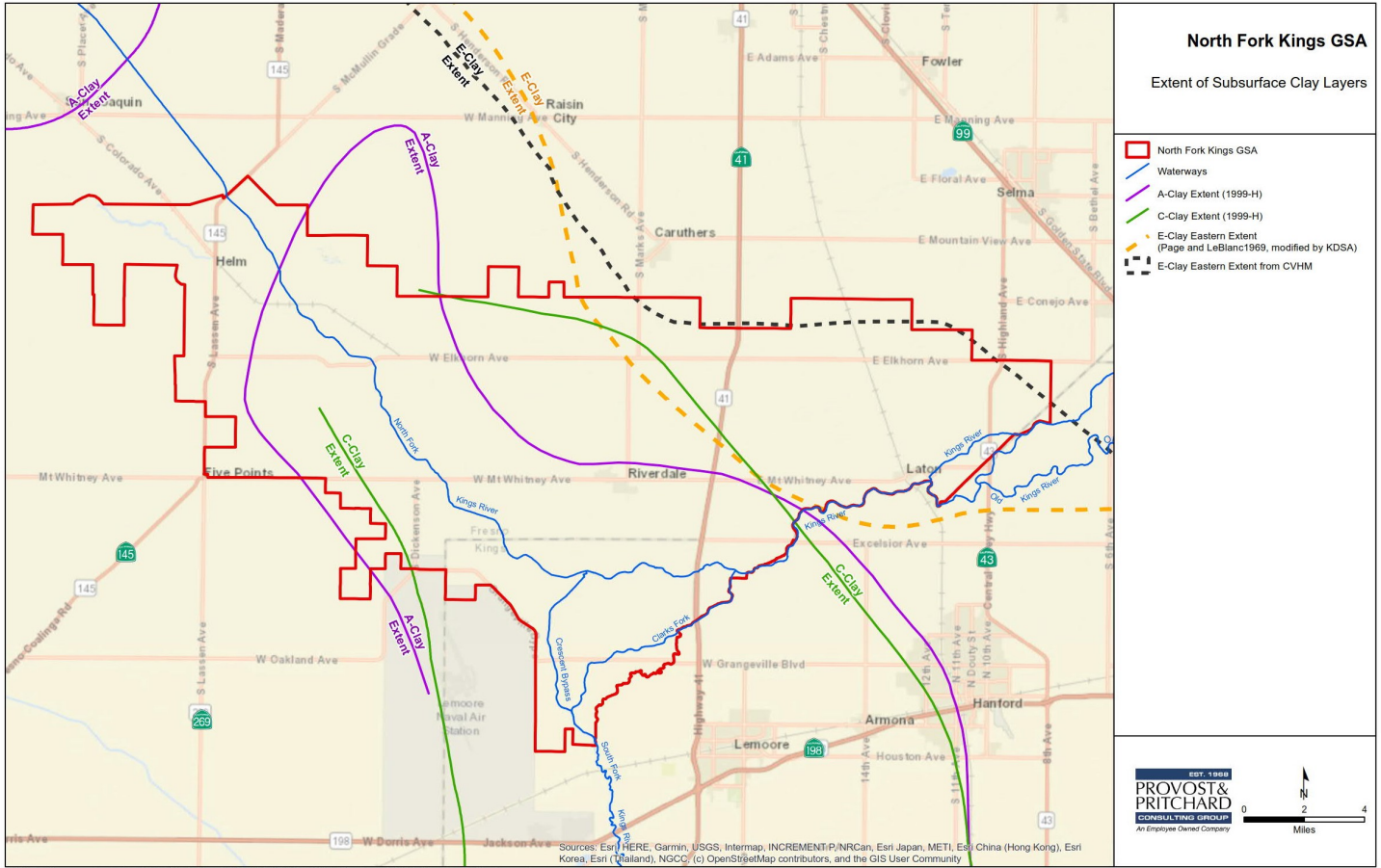
Soil Types in and near NFKGSA

General surface soil types

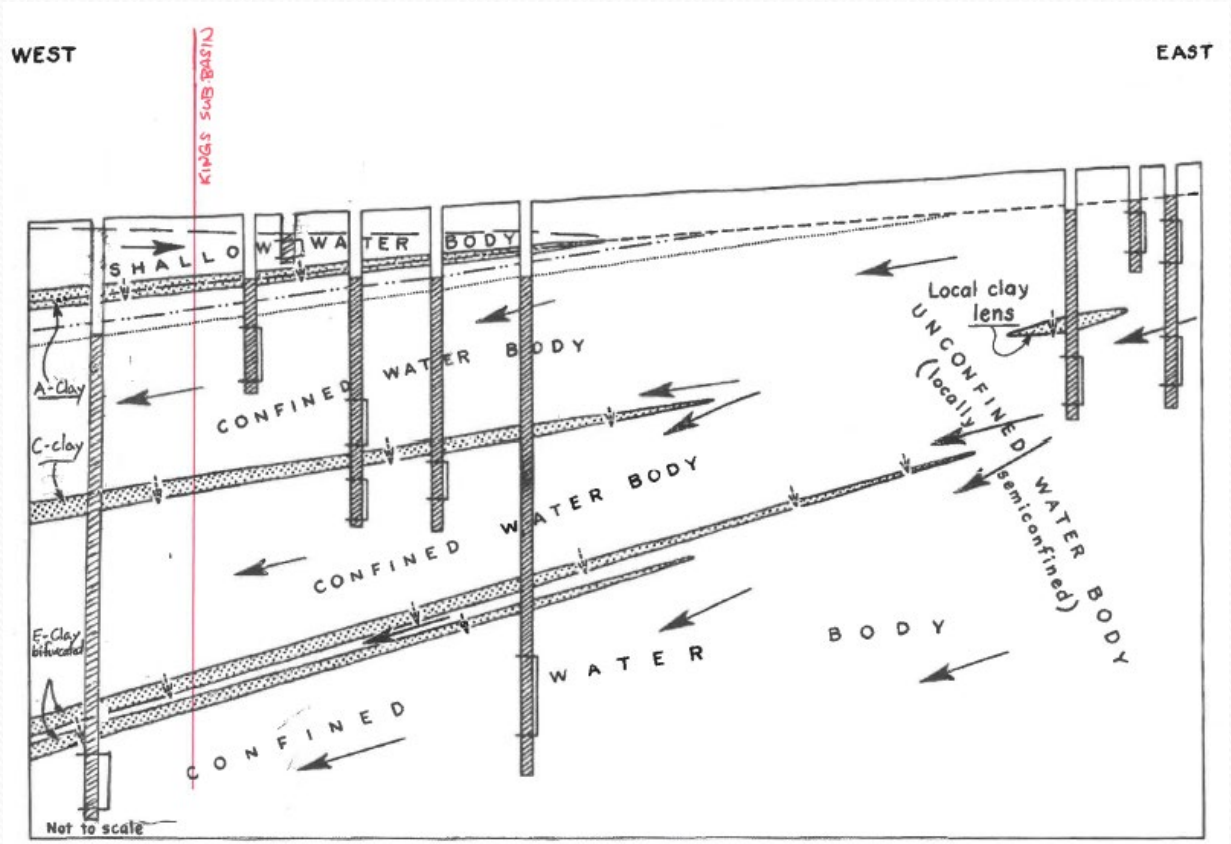
Some areas are better for groundwater recharge than other areas



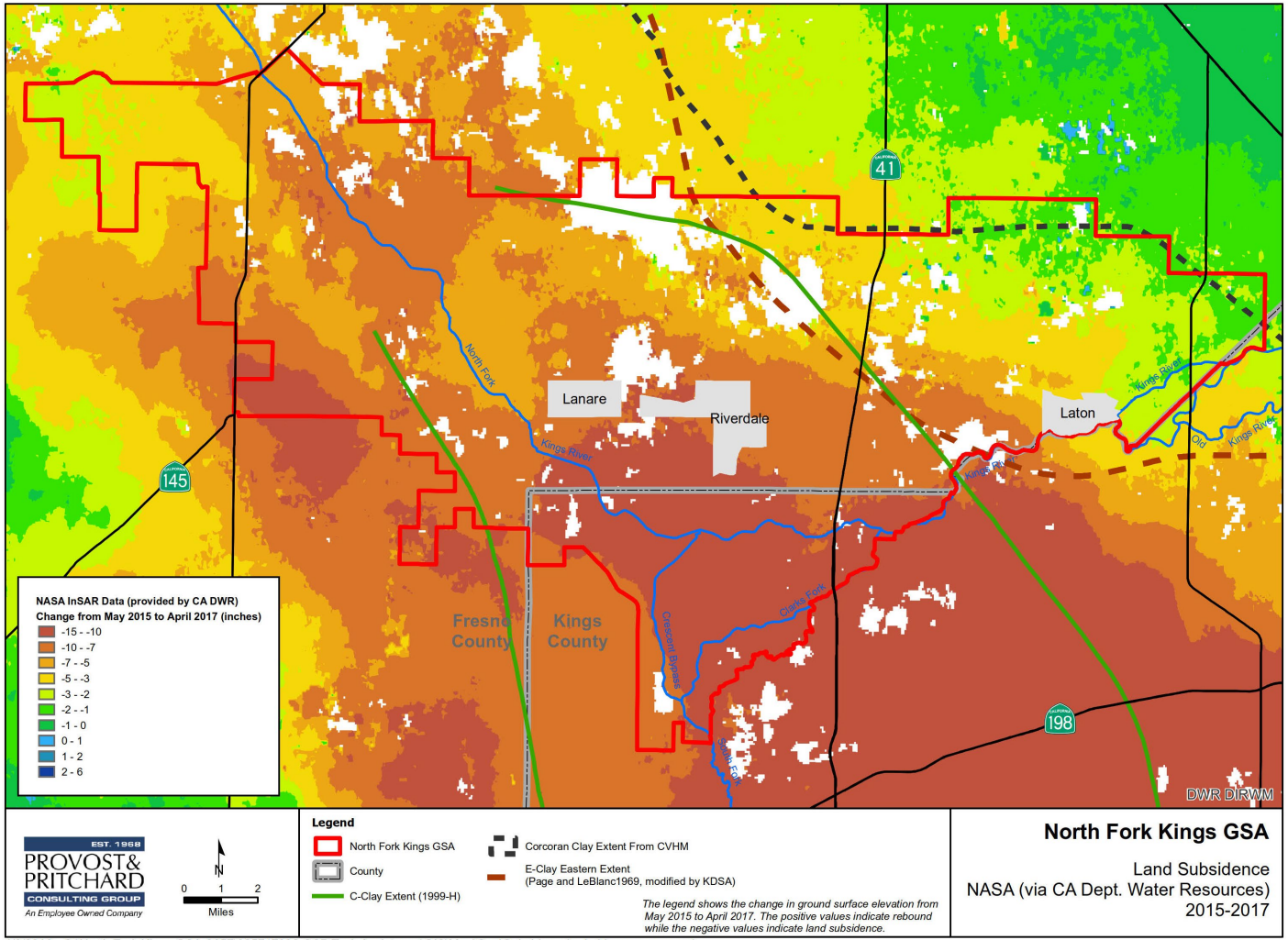
Complicated geology - multiple primary clay layers



Complicated geology - Unconfined vs Confined aquifers



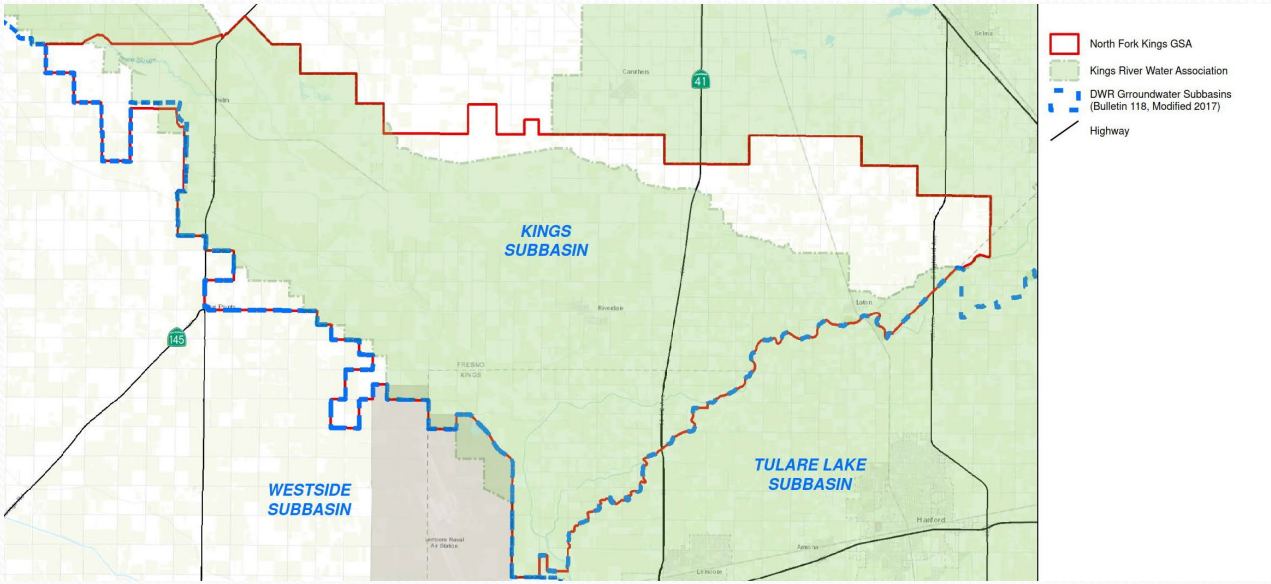
DWR – NASA satellite monitoring of land subsidence
May ’15 – April ‘17



4/9/2019 : G:\North Fork Kings GSA-2657\265717002 GSP Tech Assistance\GIS\Map\Gen\Subsidence\subsidence_nasa.mxd

Water Budget

- Water budget summarizes water use and is used to estimate amount of groundwater pumped
- Water demand not met by surface water or precipitation is met by groundwater pumping
- Surface water supply within NFKGSA almost exclusively Kings River water
- Approximately 22% of NFKGSA area is outside the Kings River service area



Water Budget Components

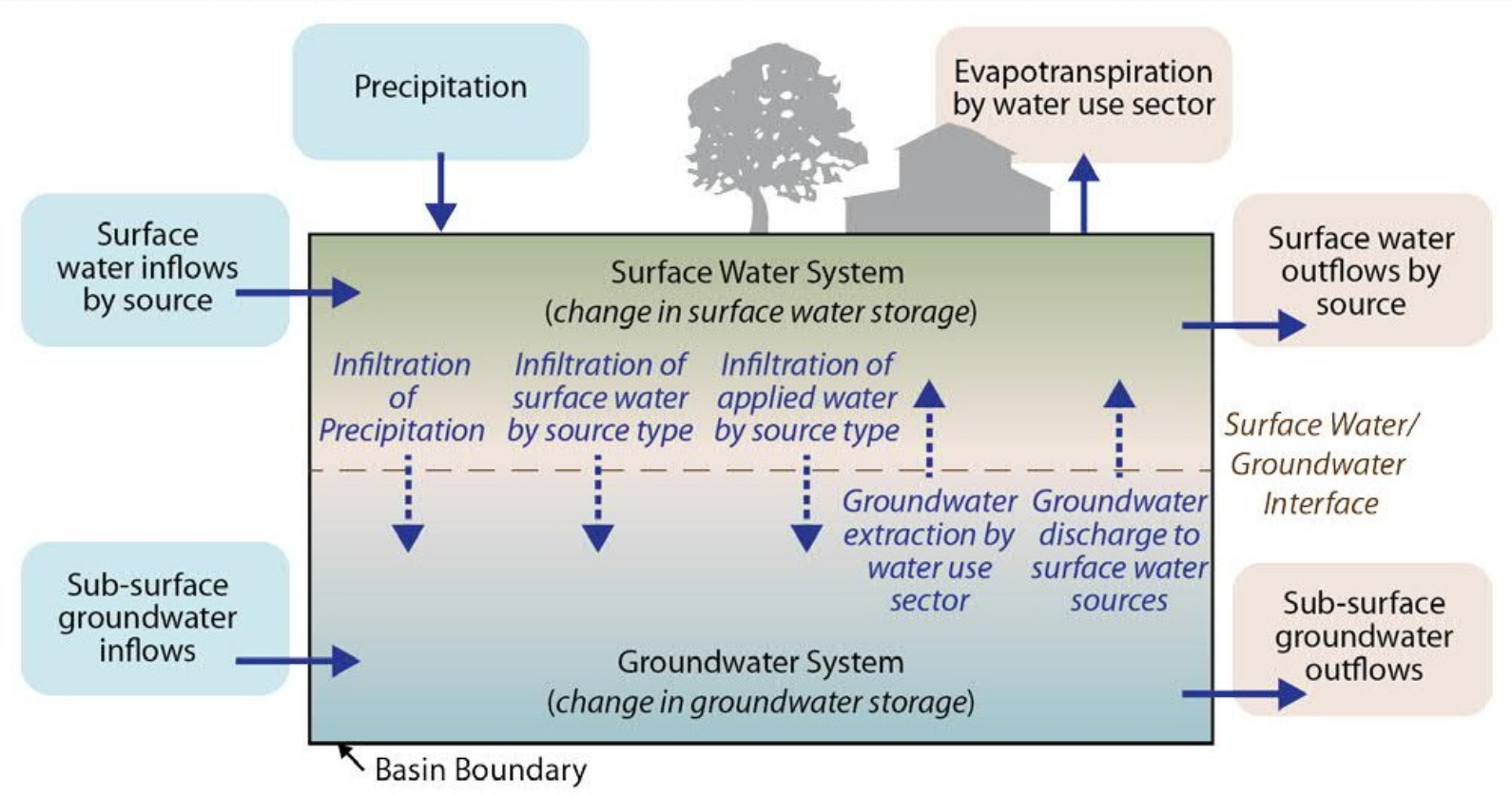
- Summarize all water sources (inputs) and water uses (outputs)
- Estimated change in groundwater storage = Inputs – Outputs
  - Water into groundwater system minus water out of groundwater system
- Apply confidence intervals (error %) to indicate relative uncertainty of components
- Compare change in groundwater storage estimated from water budget to calculated change in storage based on groundwater contours from actual water level data
- Water budget needed to estimate groundwater pumping since pumping is not metered
- Historical, Current and Future Water Budgets required

Water Budget Components

Description
Supply
1) Surface Water for Irrigation and Recharge
2) Surface Water for M&I and Recharge
3) Groundwater Pumping for Irrigation (Agency Wells)
4) Groundwater Pumping for Irrigation (Private Wells, unknown)
Groundwater Pumping for Dairies
5) Groundwater Pumping for M&I (Agency Wells)
6) Groundwater Pumping for M&I (Private Wells)
7) Precipitation
8) Spill Inflows
9) Other Supply - Kings River seepage
Total Supply
Demand
Consumptive Use
10) Evapotranspiration met by Applied Water
11) Evapotranspiration met by Effective Precipitation
12) Evapotranspiration of M&I
13) Other Consumptive Use - dairy
Other Consumptive Use - riparian vegetation
Consumptive Subtotal

Description
Groundwater Recharge
14) Groundwater Inflow
15) Deep Percolation of Irrigation Water
16) Deep Percolation of Precipitation
17) Deep Percolation of M&I Water
18) Seepage of Channels & Pipelines
19) Seepage - Reservoirs
20) Urban Stormwater - Recharge
21) Local Streams/Rivers - Recharge
22) Groundwater - Intentional Recharge
23) Other Recharge
GW Recharge Subtotal
Nonrecoverable Losses
24) Groundwater - Outflow
25) Evaporation - Channels
26) Evaporation - Reservoirs & Recharge Basins
27) Precipitation - Evaporation and Runoff
28) Operational Spills
29) Groundwater - Export
30) Other Losses
Nonrecoverable Subtotal

Simplified Basin Water Budget Diagram



Summary of Water Budget Estimates

- Historical, Current, and Future water budgets prepared for average, wet, and dry years
  - Historical water budget prepared for hydrologic average base period (Oct. 1996 – Sept. 2011)
  - Best available information was used, but better data is needed to improve accuracy
  - **Current overdraft** estimated to be an average of **63,100 AF/yr**
  - Climate change information factored into 2040 and 2070 future water budgets
  - **Future 2040 overdraft** estimated to be **68,900 AF/yr** if water supply and cropping pattern remained constant
  - Projects and management actions identified to achieve **0 AF/yr** avg overdraft in 2040
- The preliminary GSP project list will be updated continuously:
  - Identified groundwater recharge projects are estimated to yield an approximate annual average **62,800 AF/yr** based on historic floodwater availability