Approaches and Considerations for Assessing Groundwater-Surface Water Interaction in Sonoma County

Stream Depletion Through SGMA Lens Workshop
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SONOMA COUNTY WATER AGENCY

www.sonomacountywater.org

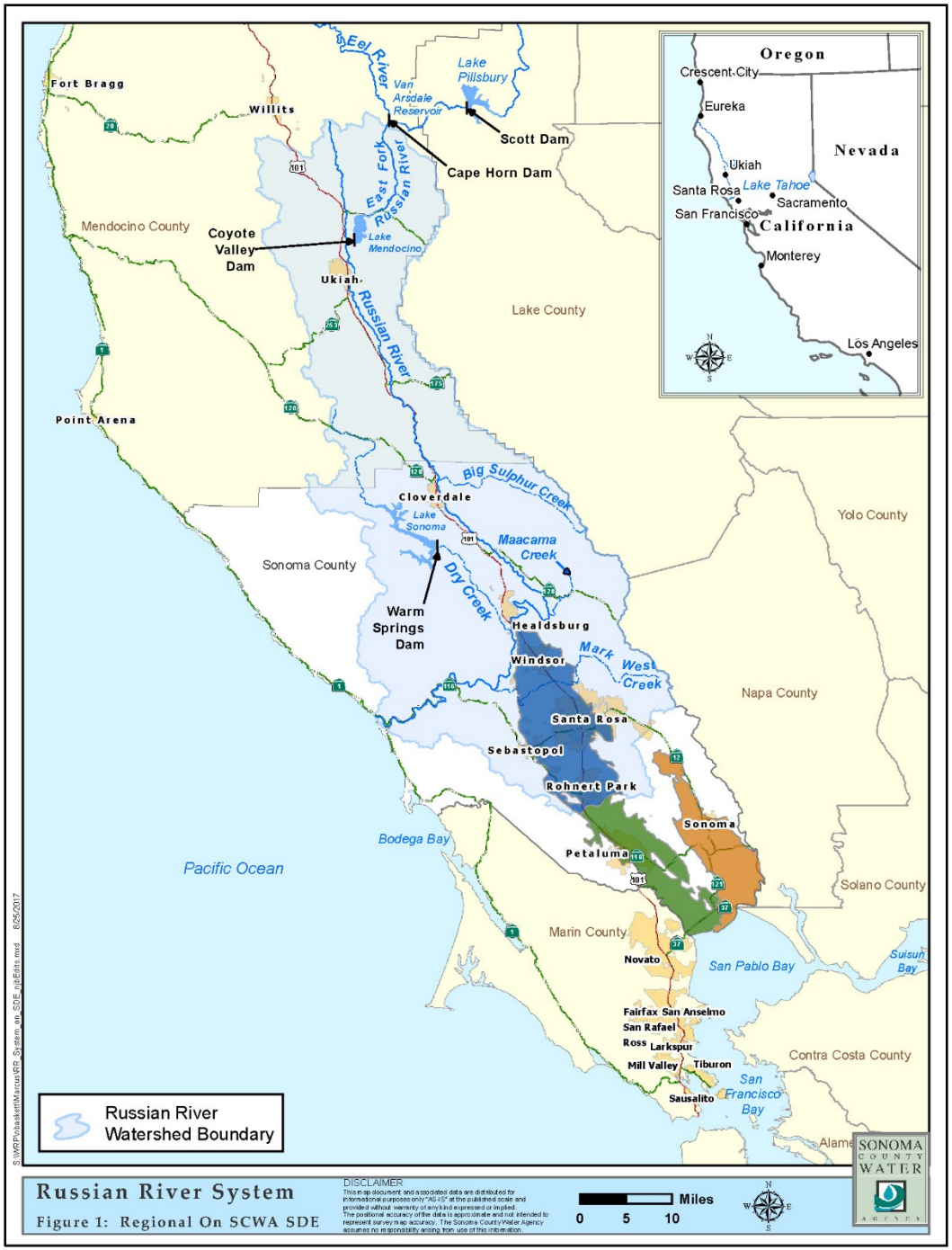
Overview of Presentation

- Background on Sonoma County Water Agency
- Focused Studies at Riverbank Filtration Facility/Russian River Alluvial Aquifer
- Basin-wide Assessment Approaches
- Considerations for SGMA Implementation

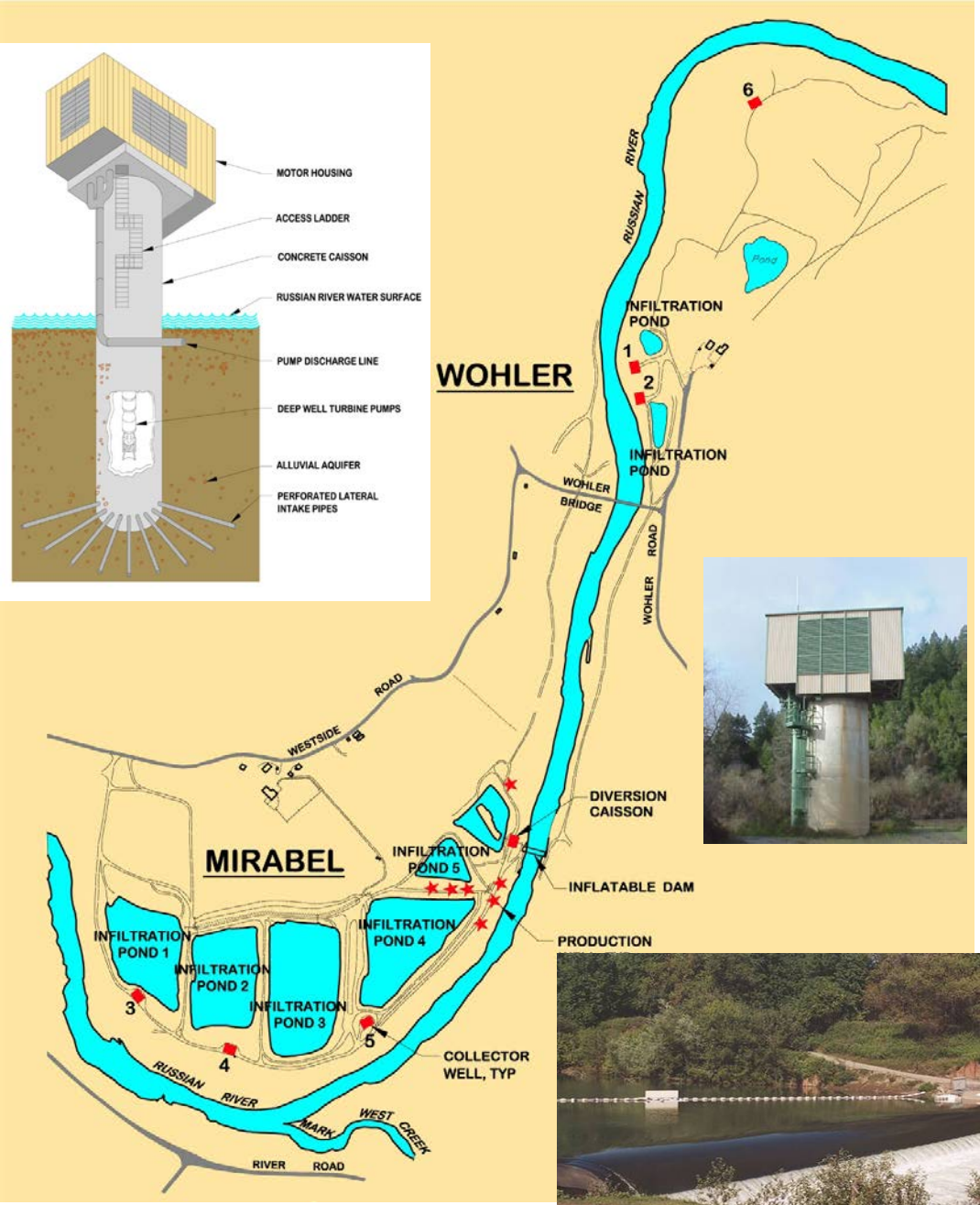
Sonoma County Water Agency

- Wholesale Water Supply
- Flood Control
- Sanitation
- Energy Production

- Cooperative groundwater study programs with USGS
- Pre-SGMA: Lead Agency for two Voluntary Groundwater Management Programs
- Part of and providing Technical Services to three GSAs



Russian River Riverbank Filtration System

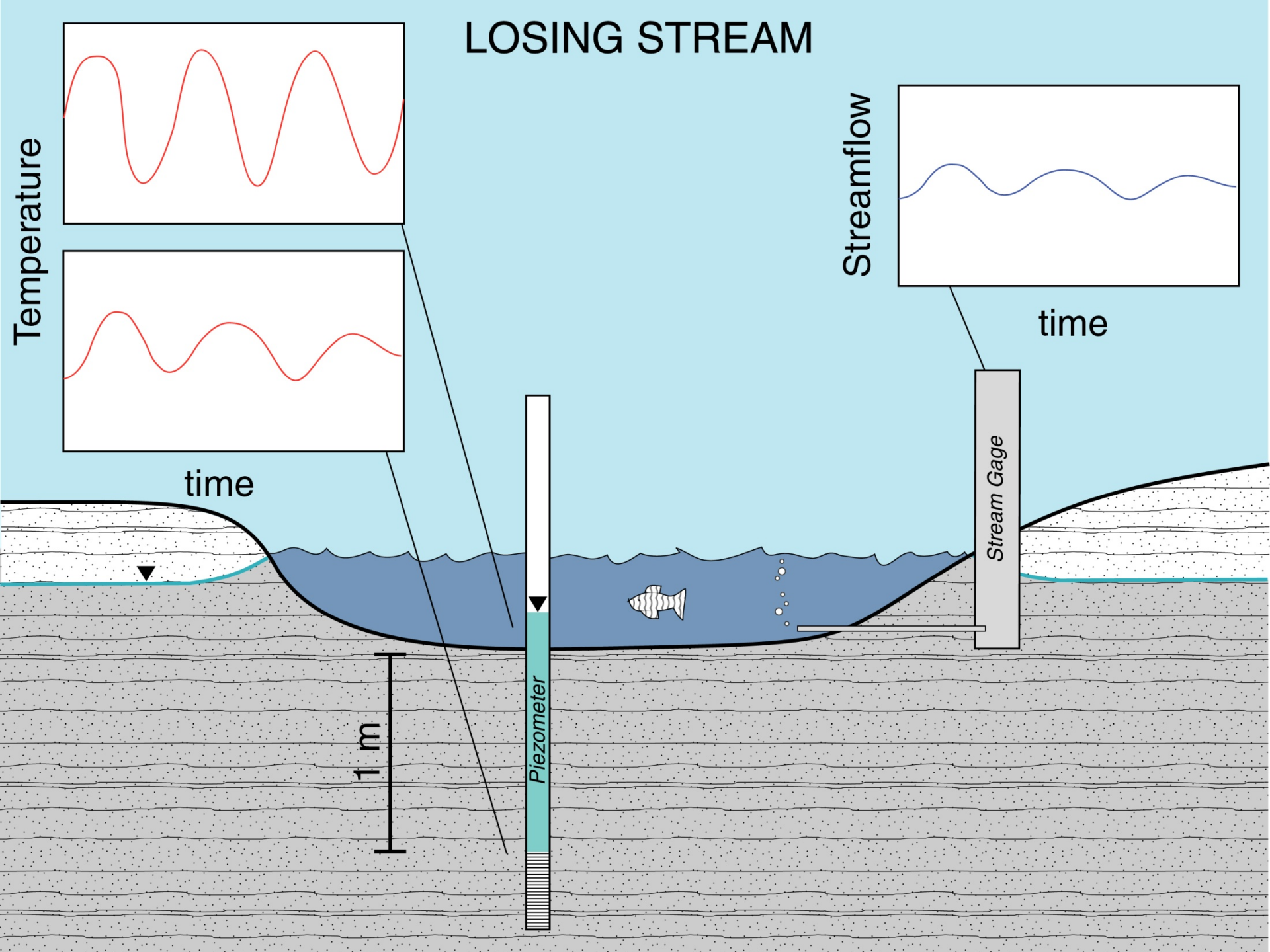


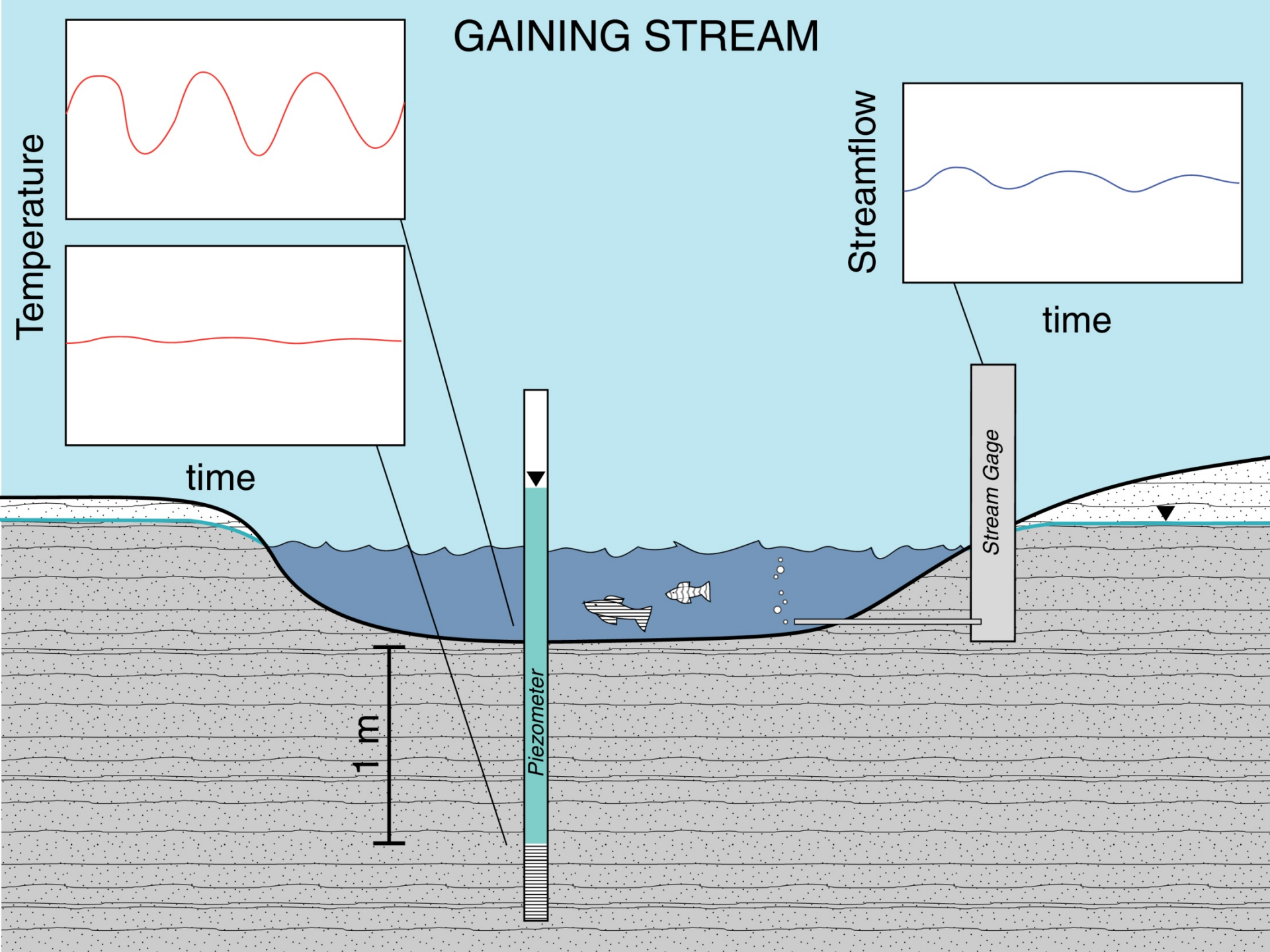
- One of the largest riverbank filtration systems in the world
- Treatment accomplished via natural filtration.
- Production Capacity of up to 92 million gallons per day

- 6 Radial Collector Wells
- 5 Infiltration Ponds
- Inflatable Dam

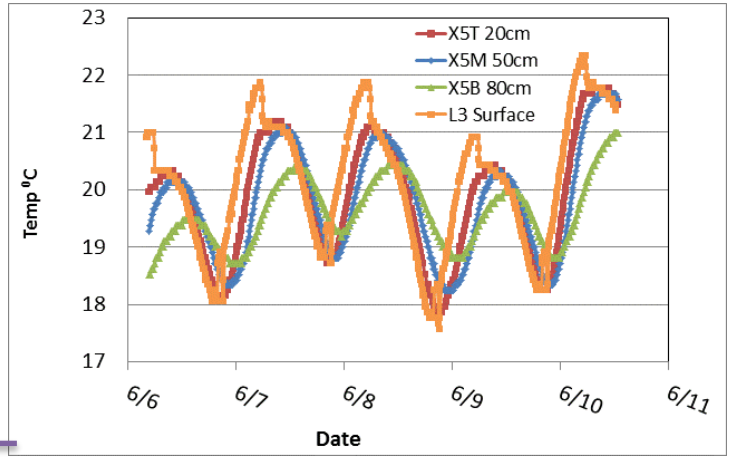
Russian River Facilities: Focused Surface Water-Groundwater Assessment Techniques and Methods

- **Temperature as a tracer**
- **Seepage meters**
- **Riverbed sediment sampling program**
- **Geophysical Methods to Evaluate SW-GW Interactions**
  - Electrical Resistivity
  - Spontaneous Potential
- **Water-Level measurements & vertical gradient analysis**
- **Surface water and groundwater quality studies**

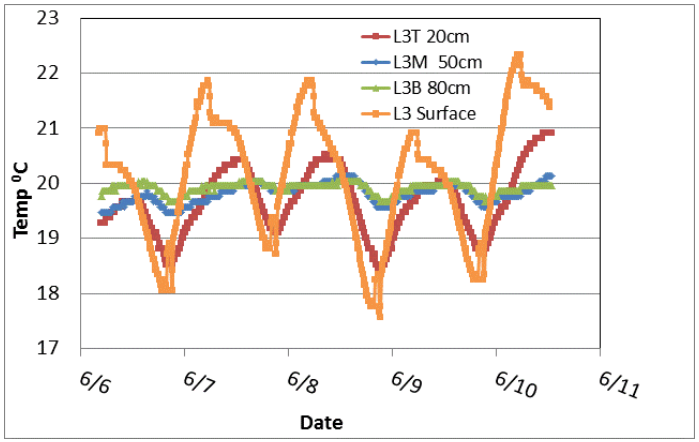

LOSING STREAM
Temperature
time
Streamflow
time
Stream Gage
Piezometer
1 m


GAINING STREAM
Temperature
time
Streamflow
time
Stream Gage
Piezometer
1 m

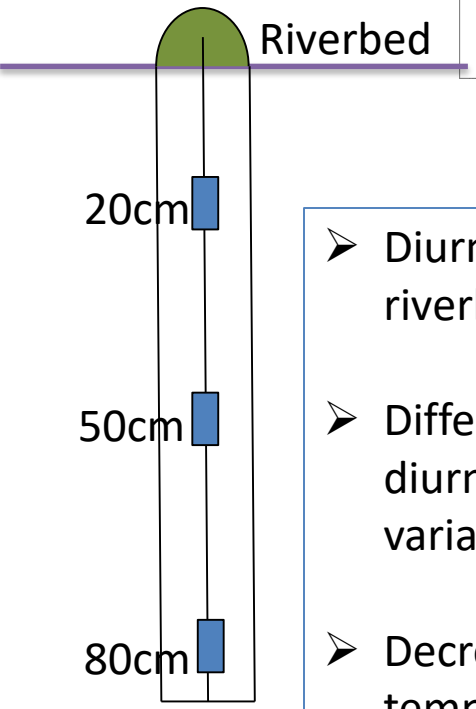
Method: Temperature Profiling



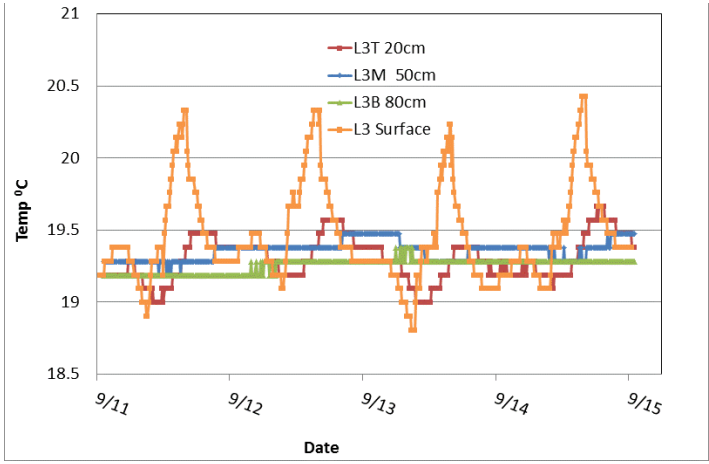
June (Near Thalweg)



June (Edge of Channel)



- Diurnal signals extend beneath riverbed – losing conditions
- Differences in spatial propagation of diurnal signal reflect highly localized variations in streambed morphology
- Decrease in depth of diurnal temperature signal between June and September – increase in riverbed clogging

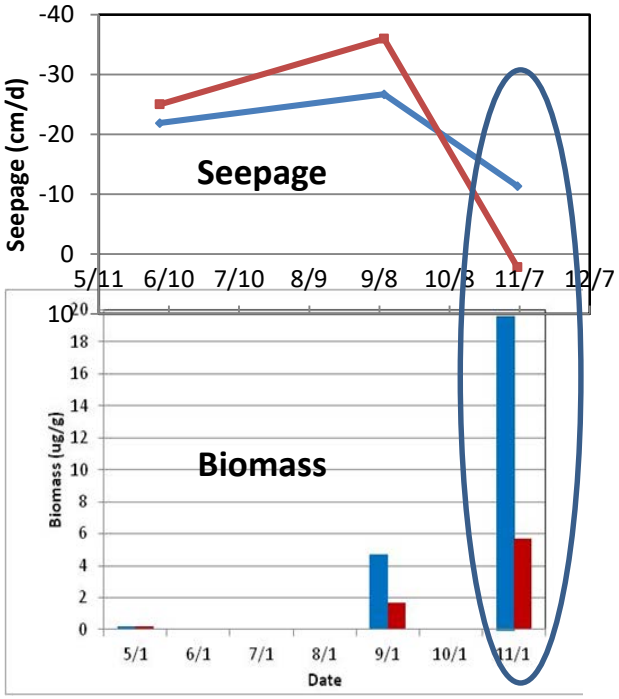


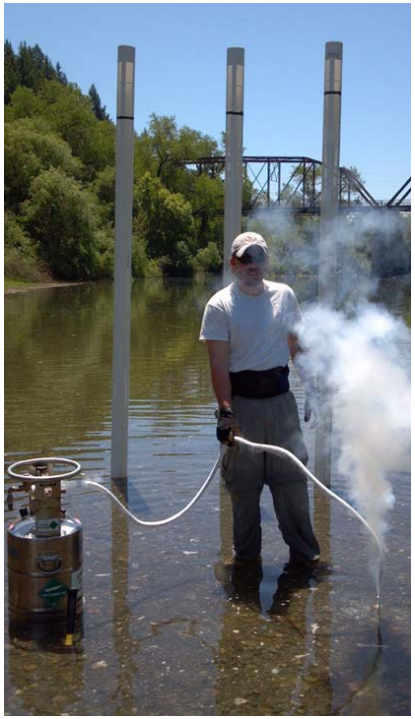
September (Edge of Channel)

Methods: Seepage Meters and Cryocoring

- Seepage meter: steel 55-gal drum, hose connection (~2m), and bag shelter

- Single point measurement of vertical flux (downward or upward)

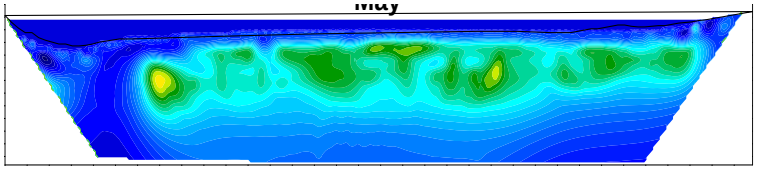


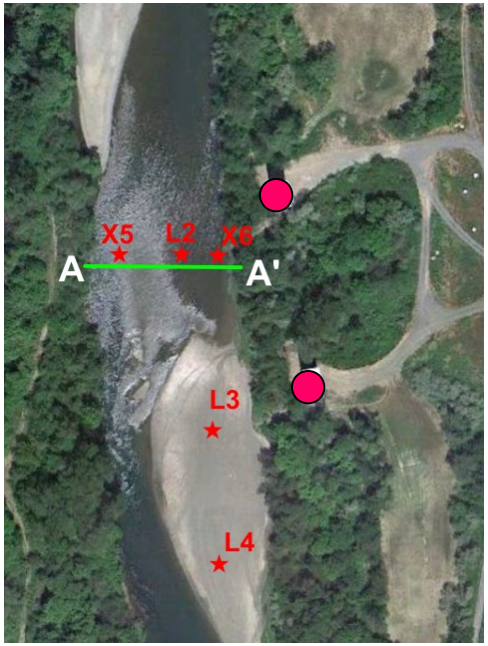


- Cryocoring: Retains structure, pore fluids & microbial ecology

Method: Electrical Resistivity

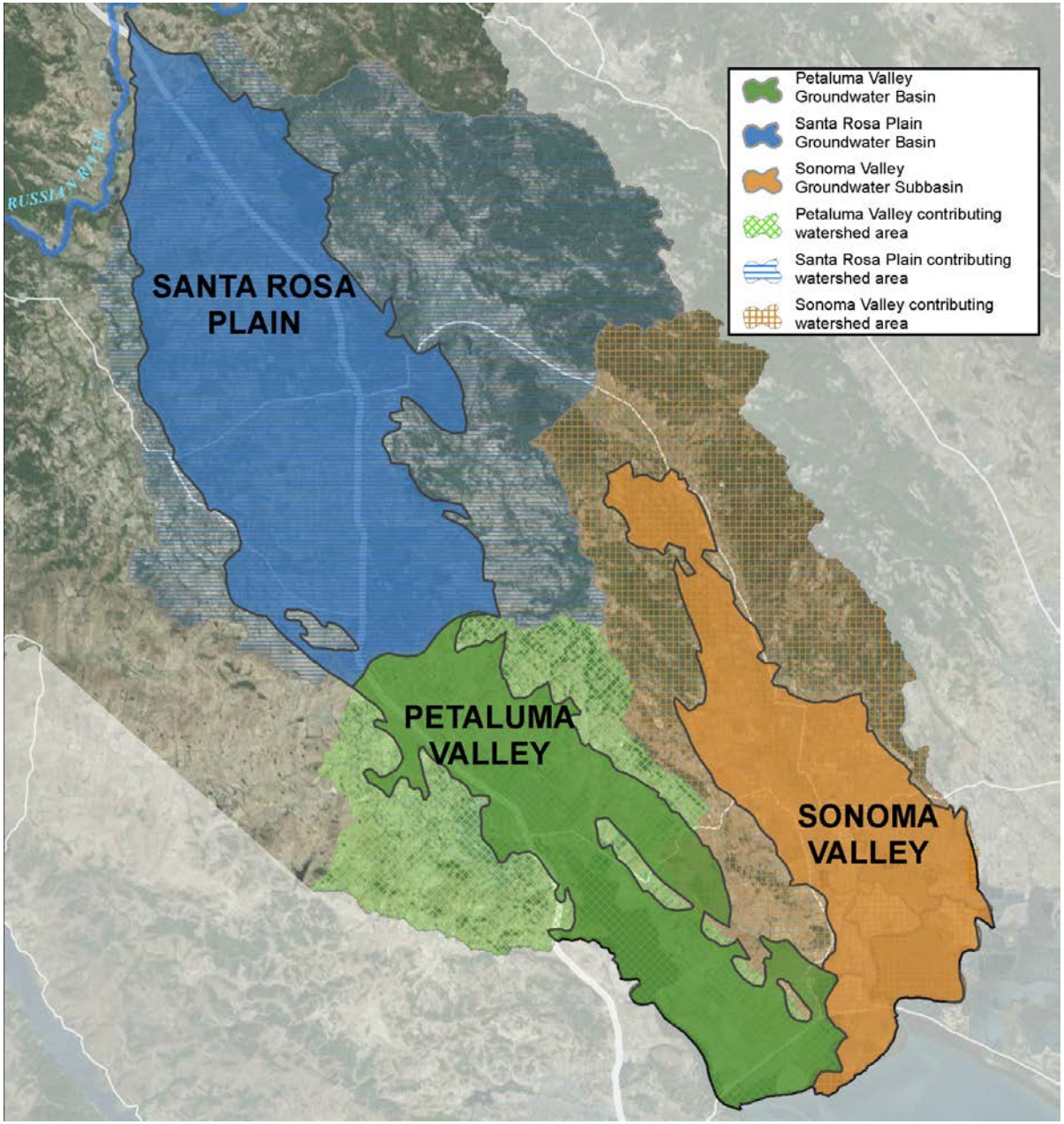
Resistivity along A-A'
(red indicates dryer regions)





- Apparent resistivity increases captures spatial and seasonal temporal changes (May through November)
- Unsaturated zone development ~4 to 6 feet below riverbed, with exception of area beneath thalweg

Sonoma County Medium Priority Basins



Basin-wide Surface Water-Groundwater Assessment Techniques and Methods

- **Seepage runs (synoptic streamflow measurements)**
- **Paired streamflow gauge/groundwater monitoring wells**
- **Regional Numeric Groundwater Flow Models**
  - **GSFLOW: Santa Rosa Plain**
  - **MODFLOW-OHM: Petaluma Valley and Sonoma Valley**

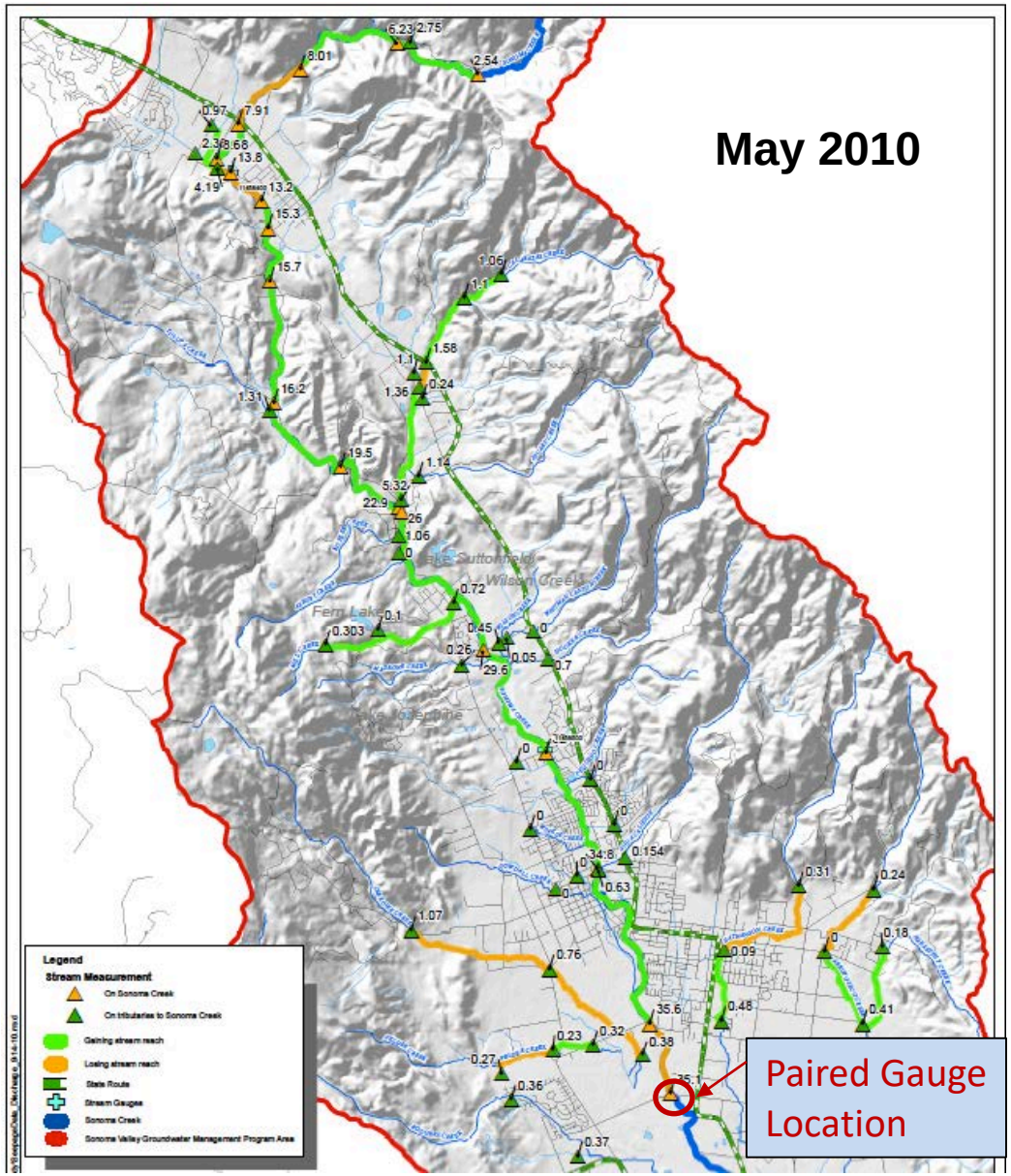
Sonoma Valley: Seepage Runs

Discharge Segments
(Groundwater flows into Stream)

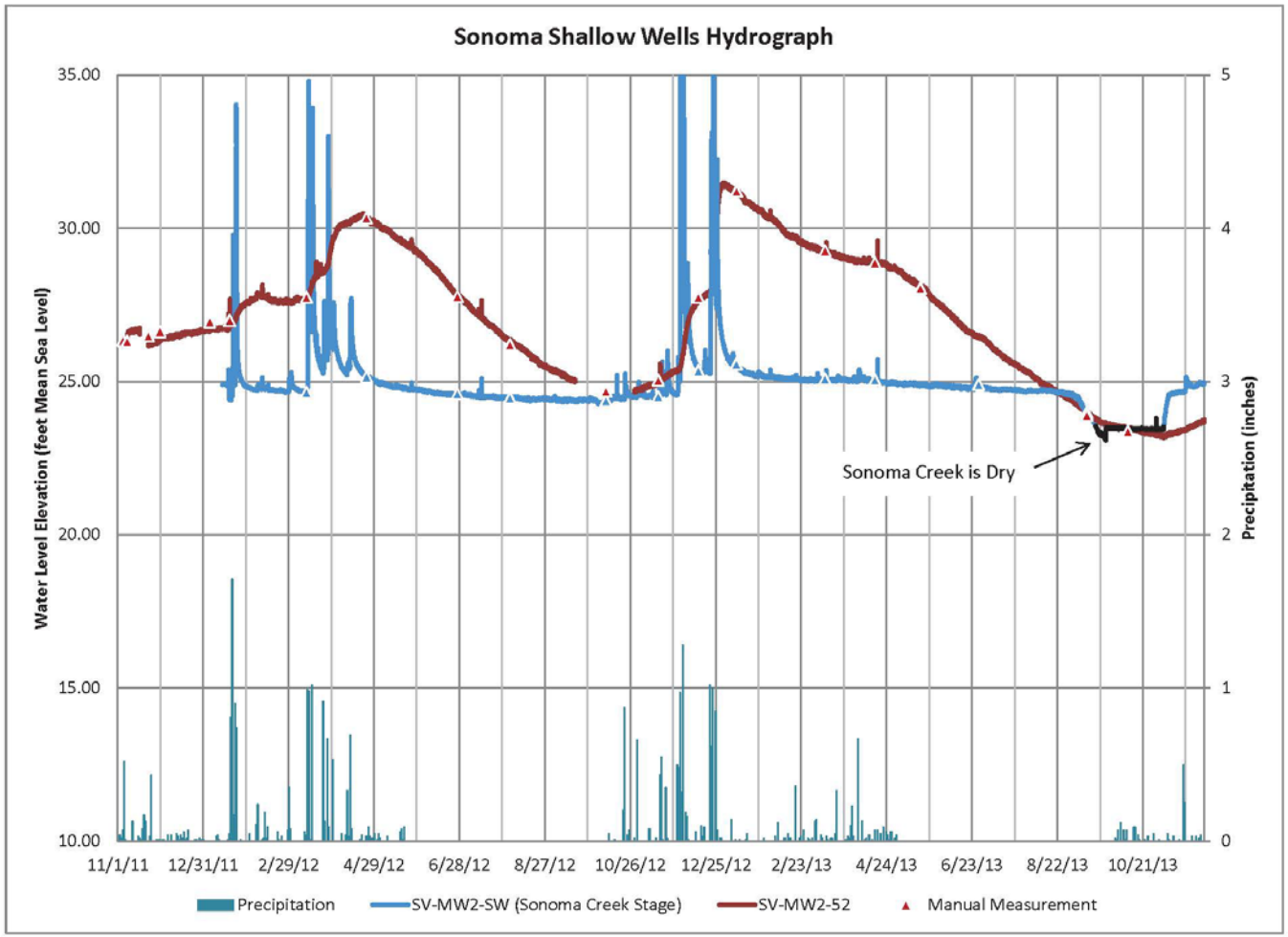
- Most of Sonoma Creek
- Most of Calabazas
- Lower reaches of Fryer and Nathanson

Recharge Segments
(Stream recharges Groundwater)

- Sonoma Creek near Kenwood
- Carriger
- Upper reaches of Fryer and Nathanson
- Portion of Felder Creek



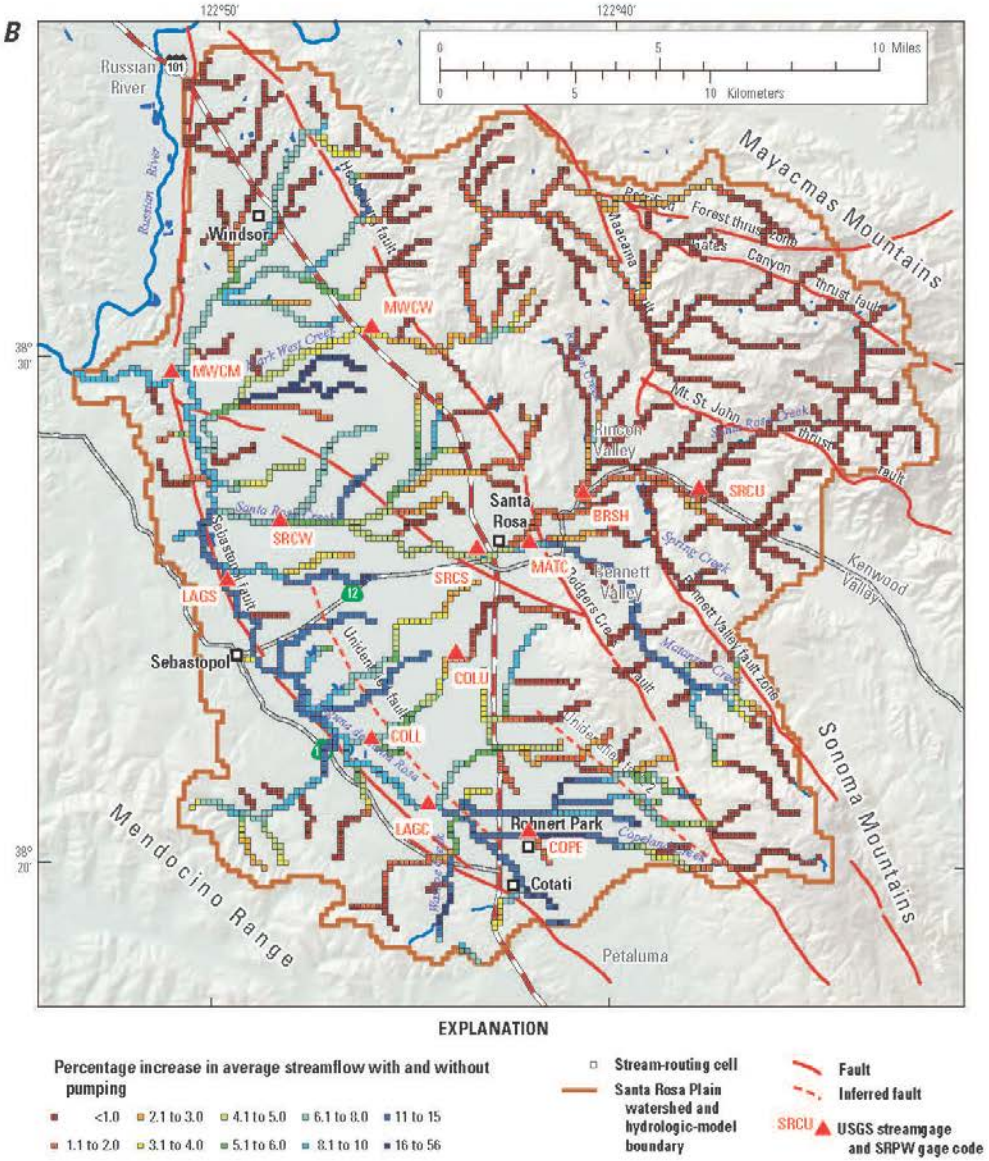
Paired Stream/Groundwater Monitoring Location



*Note: Gaps in data occur when pressure transducer is temporarily out of service or removed for sampling

Simulated Change in Streamflow With and Without Groundwater Pumping (USGS, 2014)

- Average 8% change in total simulated streamflow (35 year simulation)
- USGS currently updating model and developing stream capture maps (USGS project with SWRCB)



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Unique Features/Challenges

- Limited long-term streamgage records
- Geologic Complexities
- Majority of groundwater pumping not measured/reported
- Habitat and ESA Considerations with SW-GW Interactions
  - Biological Opinion issued by NMFS
  - SWRCB Emergency Drought Regulations - Priority Russian River Tributary Watersheds
  - California Water Action Plan Priority Streams - Mark West Creek

Considerations for SGMA

- Spatial and temporal scales for assessing streamflow depletion as an undesirable result
  - Start with broader-scale assessments
  - Finer-scale assessments/monitoring as needed
  - Consider addressing spatial scale through Management Areas?

- Consideration of other regulatory programs and standards
  - Surface water rights and surface water diversions
  - Instream flow requirements
  - Basin Plans
  - Others?