

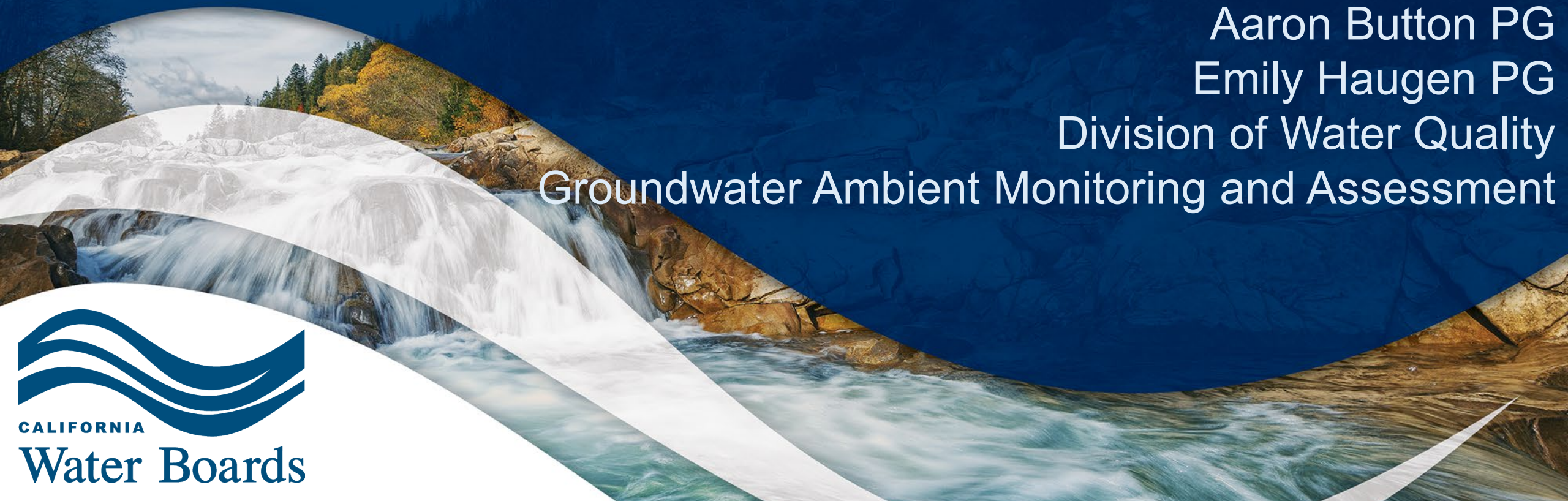
# California's Groundwater Recharge and its Potential Effects on Groundwater Quality

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Groundwater Ambient Monitoring and Assessment



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# Presentation Overview

- Water Board Involvement
- Groundwater Fundamentals
- GAMA program Participation
- Stakeholder Contributions
- Future goals
- Discussion and Questions

# GAMA Program

Groundwater Ambient Monitoring and Assessment (GAMA)

- Assess groundwater conditions
  - Work with USGS
  - Provide technical assistance
- Compile available groundwater quality data
  - Various state, federal, local groundwater quality data shared with our data system, GAMA GIS (GAMA Groundwater Information System)

# Background

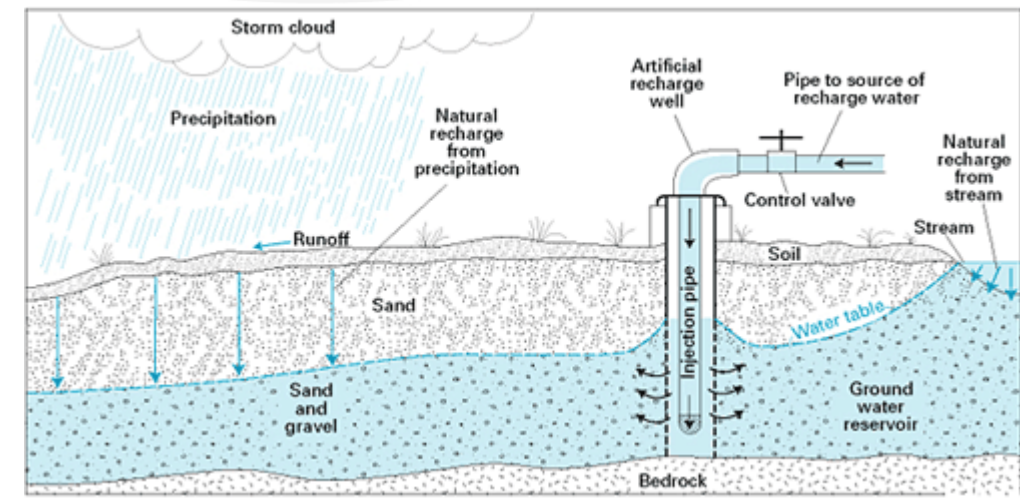
- 2023 Atmospheric Rivers
- Does recharge effect groundwater quality?
- Initial study performed several months after 2023 Atmospheric Rivers, focused on:
  - Proximity to ponded water
  - Wells with periodic sampling – mostly monitoring wells
  - Over 100 wells

# Interagency Coordination

- Department of Water Resources
- California Department of Pesticide Regulation
- California Department of Public Health
- State Water Board:
  - Division of Water Quality
  - Office of Sustainable Groundwater Management
  - Division of Water Rights
  - Division of Drinking Water

# Groundwater Basics

- Groundwater – confined and **unconfined**
- Recharge – surface water infiltrates the ground
- Runoff – surface water that flows to a low point or another body of water
- Land surface contaminants
  - Urban lands – pesticides, petroleum products, nutrients
  - Agricultural lands – pesticides and nutrients
  - Landfills – VOCs, pesticides, petroleum products, nutrients



<https://www.usgs.gov/media/images/groundwater-can-be-recharged-naturally-and-artificially>

# Groundwater Quality

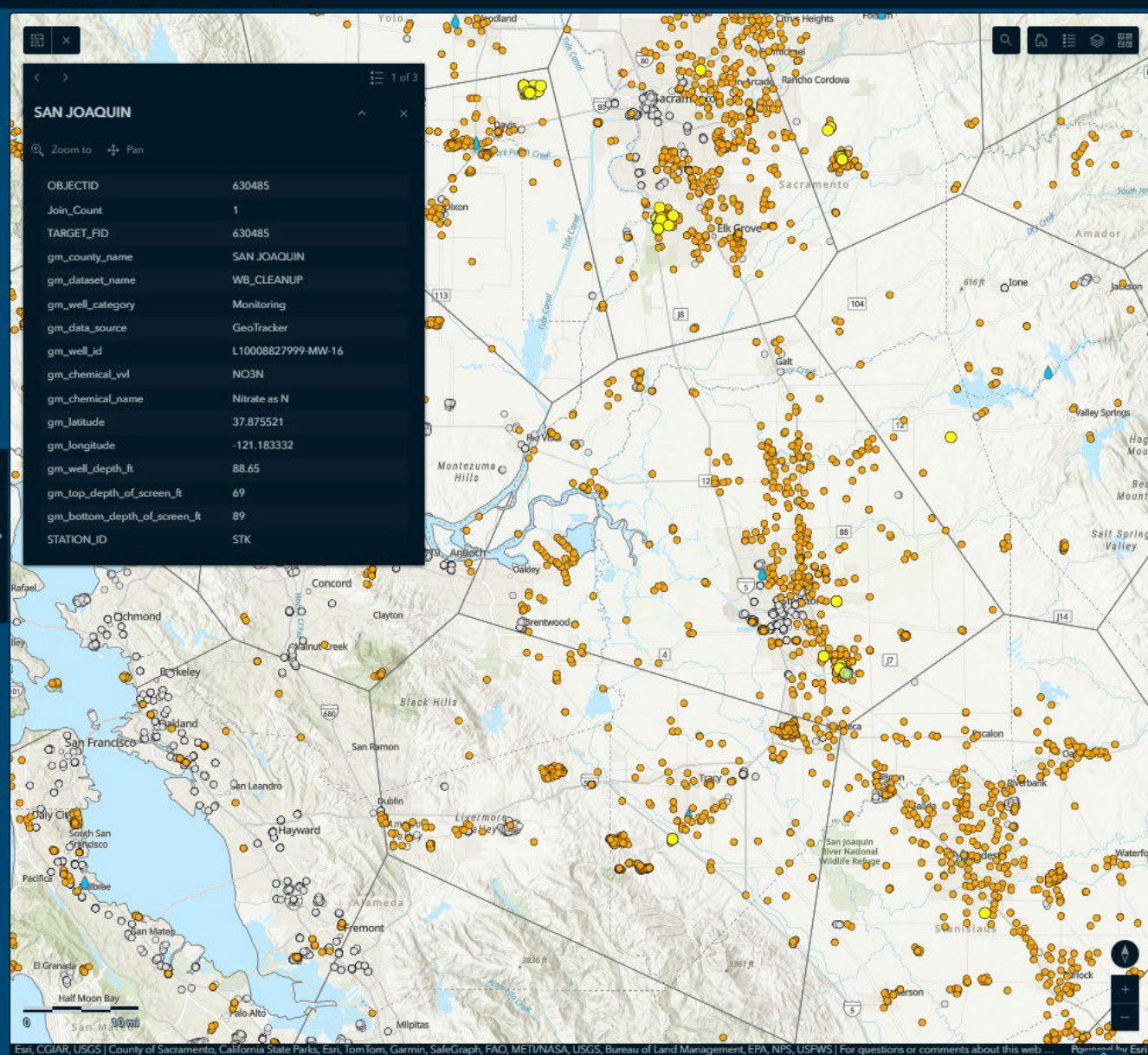
- Geogenic influence – constituents from water-rock interactions in aquifers
- Anthropogenic influence – surficial applications, wastewater discharge, industrial activities, etc.
- Groundwater quality is always in flux
  - Removal or addition of water to groundwater will change quality
- “Dilution is the solution to pollution”

# Monitoring Groundwater Quality

- GAMA GIS used to select wells:
  - All well types allowed
  - No proximity required
  - Not all constituents represented in each well
  - 8 or more analyses of a constituent
  - Analyses since 2014
  - Most recent sample event in 2024
- Precipitation from California Data Exchange Center (CEDEC)
- Groundwater Elevation data from:
  - DWR California Statewide Groundwater Elevation Monitoring (CASGEM)
  - GeoTracker Depth-to-Water measurements
  - USGS National Water Information System (NWIS)
- Result: ~35,000 wells and ~300 constituents

# Publicly Available Data

- All data used are from public sources
- Quarterly data uploads on [Open Data Portal](#)
- [Effects of Recharge on Groundwater Quality](#) website
- Project [StoryMap](#)
  - Focus on the atmospheric rivers of 2023 and close proximity wells
- [Data Visualization Dashboard](#)
  - Interactive map of California
  - Graphs comparing groundwater quality data and precipitation or groundwater elevations

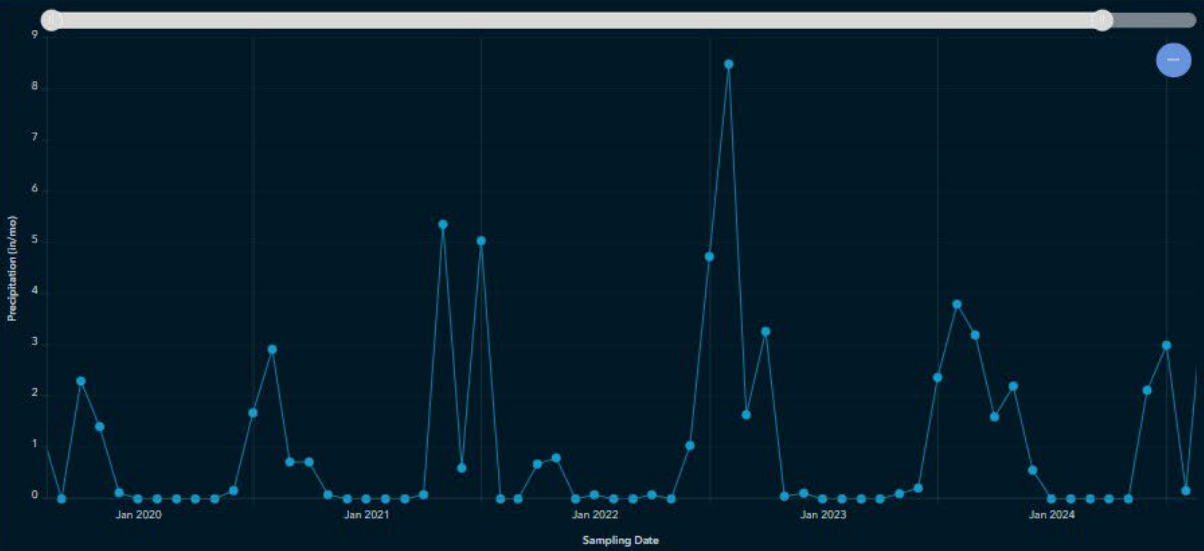


Select a Chemical (Required)  
Nitrate as N

Select a Timeframe (Required)  
Last 5 Years

Filter By Well Category  
All Categories

Filter by Top of Screen  
Filter not Active



Precipitation

GW Elev: WDL

GW Elev: GeoTracker

GW Elev: NWIS

Water Quality Results: Nitrate as N (MG/L)



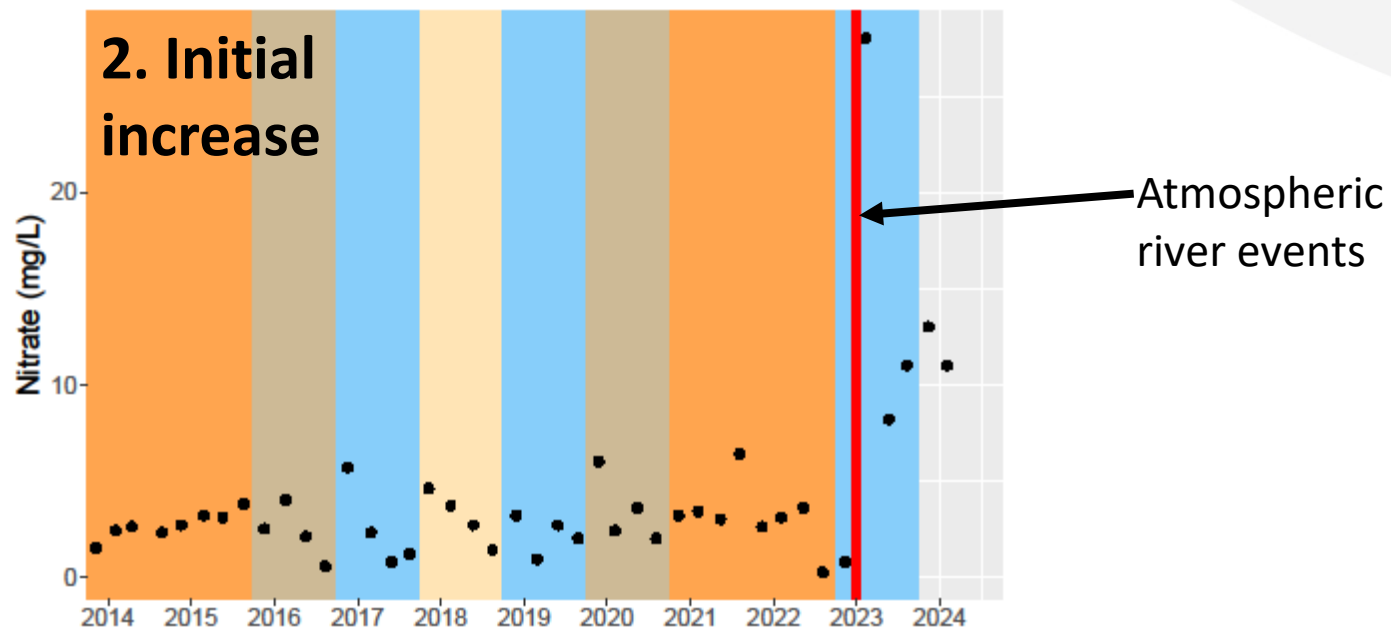
# Groundwater Quality Indicators

- Compare amount of recharge to constituent concentrations
- Influx of recharge
  - Monthly precipitation
  - Groundwater elevations
- Groundwater quality changes
  - Spike in concentrations
  - Increase constituent concentration
  - Decrease constituent concentration
  - Any change in concentration from base level

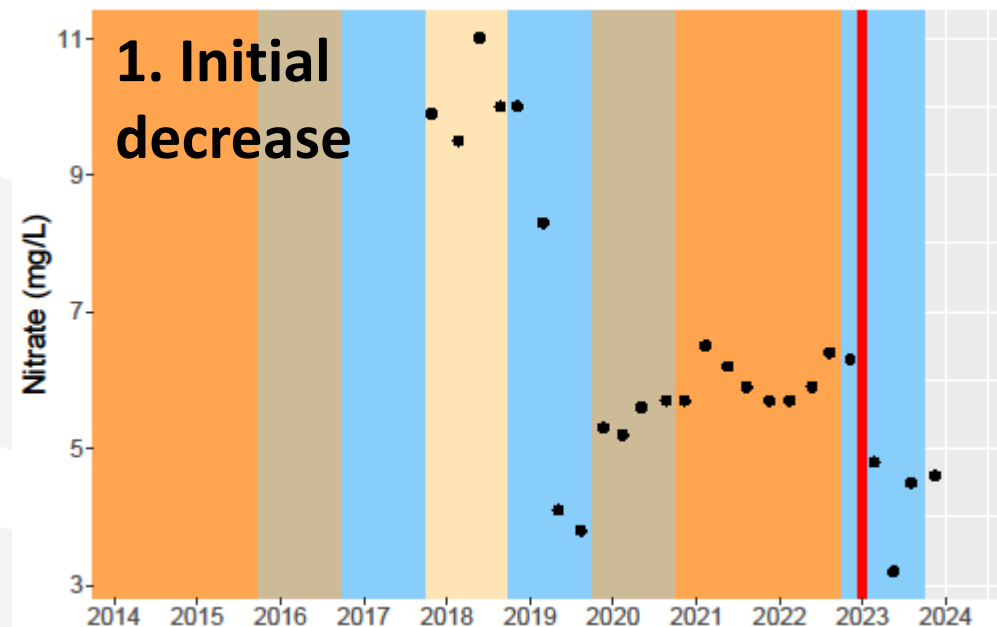
# Example Nitrate Plots

- Colors correspond to wet (blue) and dry (brown-orange) years as defined by DWR in the California's Groundwater Semi-Annual Conditions Update

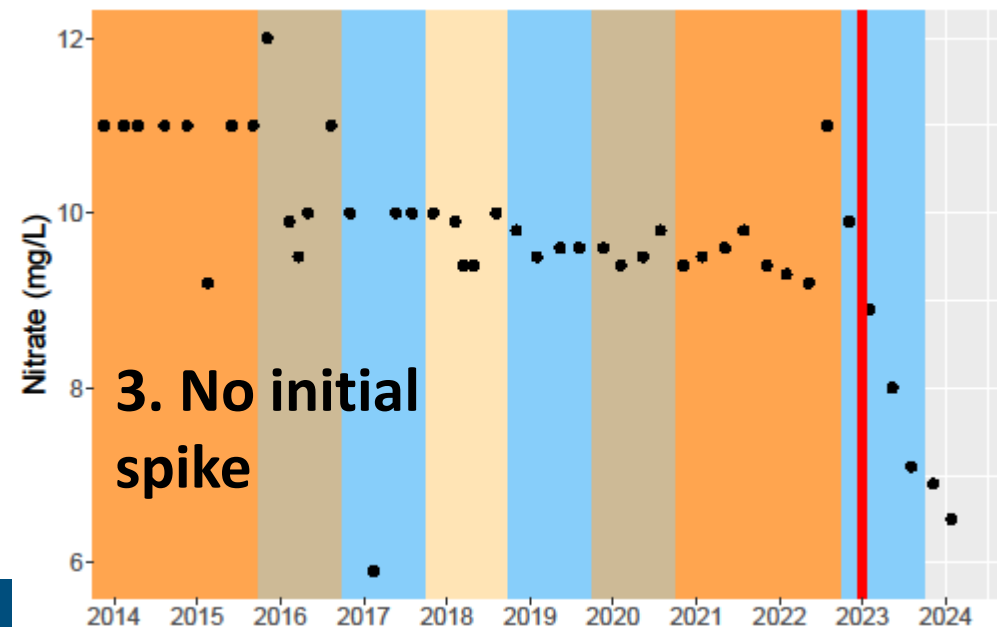
Nitrate concentration in L10008827999-MW-2A



Nitrate concentration in L10001937128-MW-18



Nitrate concentration in L10008827999-AMW-13



# DWR Flood-MAR Water Quality Sampling

- Investigate potential water quality changes and benefits of flooding and MAR to groundwater.
- Establish targeted water quality monitoring networks near known flooded areas and repeated managed aquifer recharge, primarily in the San Joaquin Valley.
- Groundwater quality samples and groundwater level measurements will be collected on a quarterly or semiannual basis.
- Sampling is anticipated to begin in late Summer or early Fall 2025 and continue for 4 years

# Recharge and Water Quality TAC

- Led by Sustainable Conservation and Department of Water Resources
- Address water quality concerns and opportunities related to managed aquifer recharge
- Identify next steps for the development of a tool to make more informed MAR decisions

# Contact Information

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GAMA General Email

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- [The Groundwater Ambient Monitoring and Assessment \(GAMA\) Program | California State Water Resources Control Board](#)