NITRATES: NItrate TRansport And Transformation in Elkhorn Slough

Funded by Proposition 84 California SeaGrant

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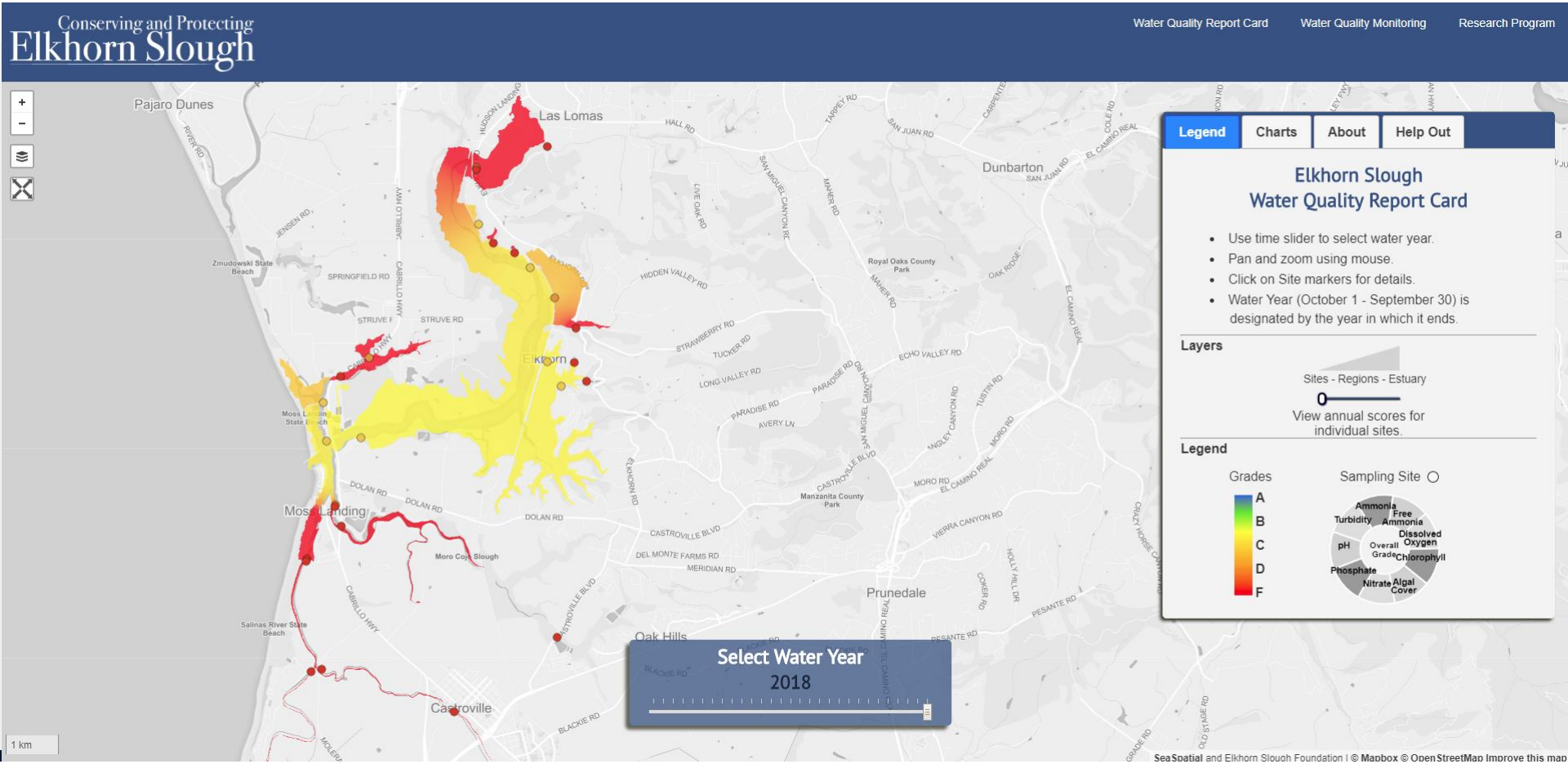
NITRATES Research Motivation

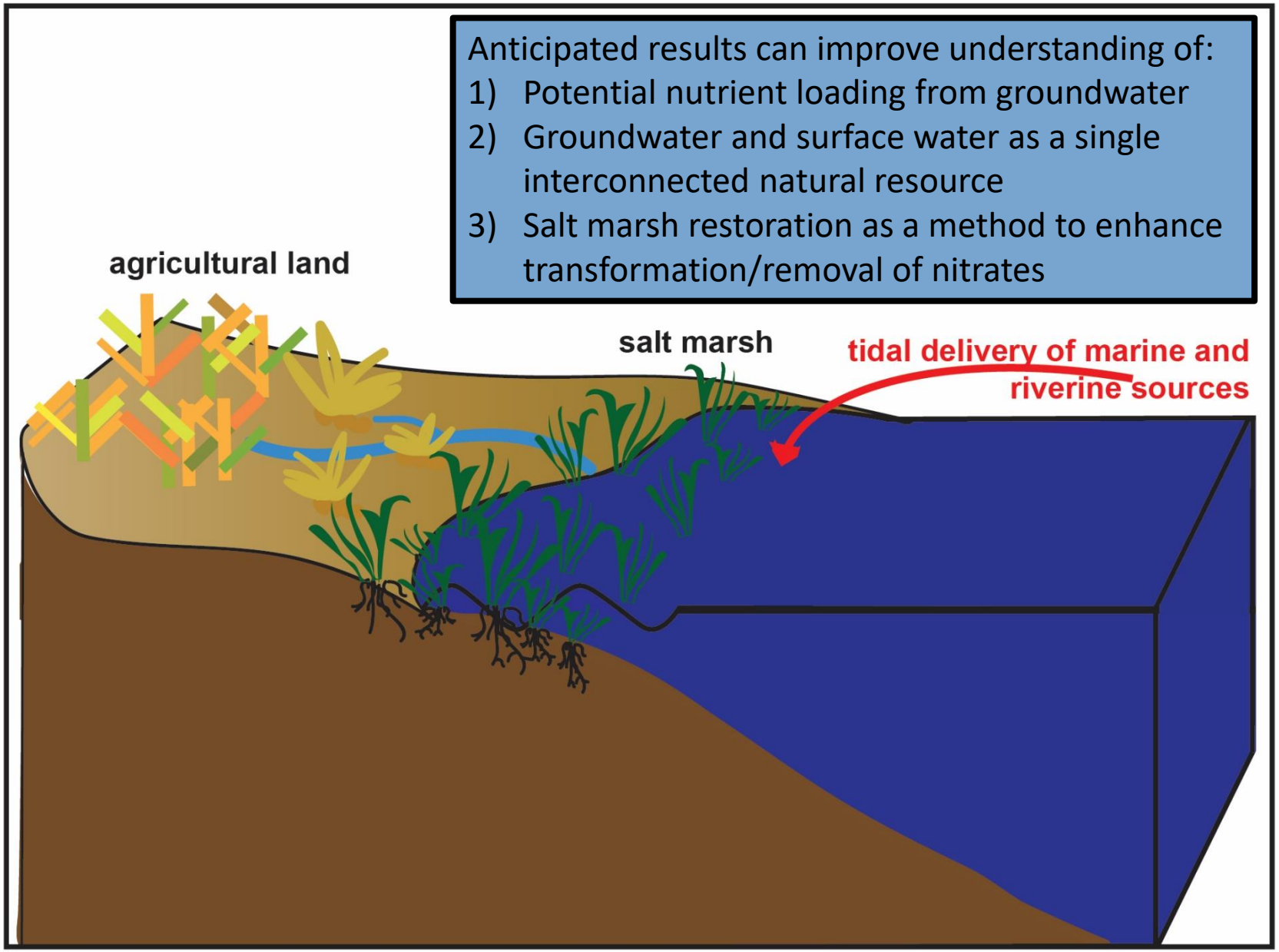
We seek to build on the outstanding long-term and high resolution surface water quality datasets developed by ES NERR and others.



NITRATES Research Motivation

Anticipated results can improve understanding of:

1) Potential nutrient loading from groundwater
2) Groundwater and surface water as a single interconnected natural resource
3) Salt marsh restoration as a method to enhance transformation/removal of nitrates



NITRATES Research Questions

Question 1 (Q1): How do groundwater inputs into salt marshes contribute to estuarine nitrate loading? **(nitrate transport)**

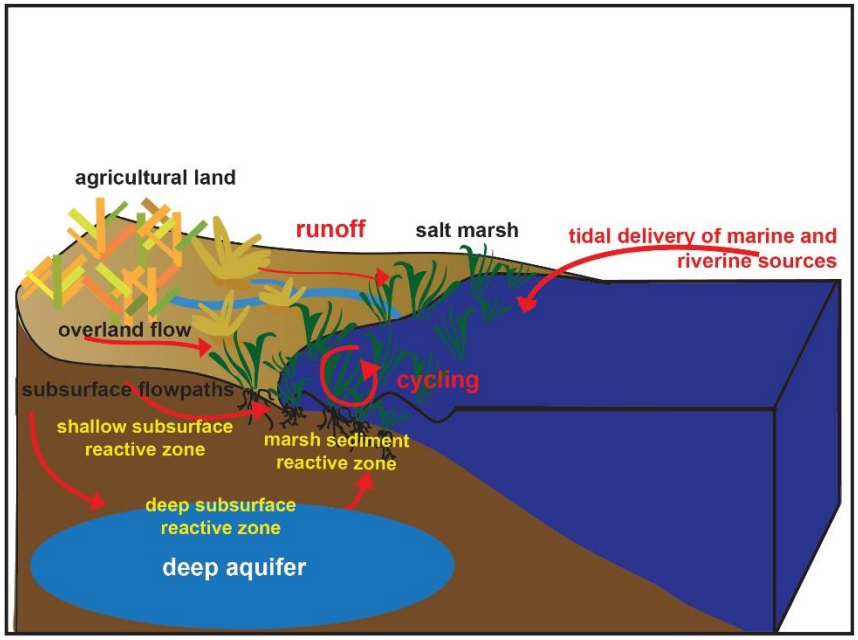
- Monitor nitrate fluxes in contributing groundwater (GW) flowpaths to the estuary.

Question 2 (Q2): What are the main nitrate transformation and removal processes in salt marsh systems? **(nitrate transformations)**

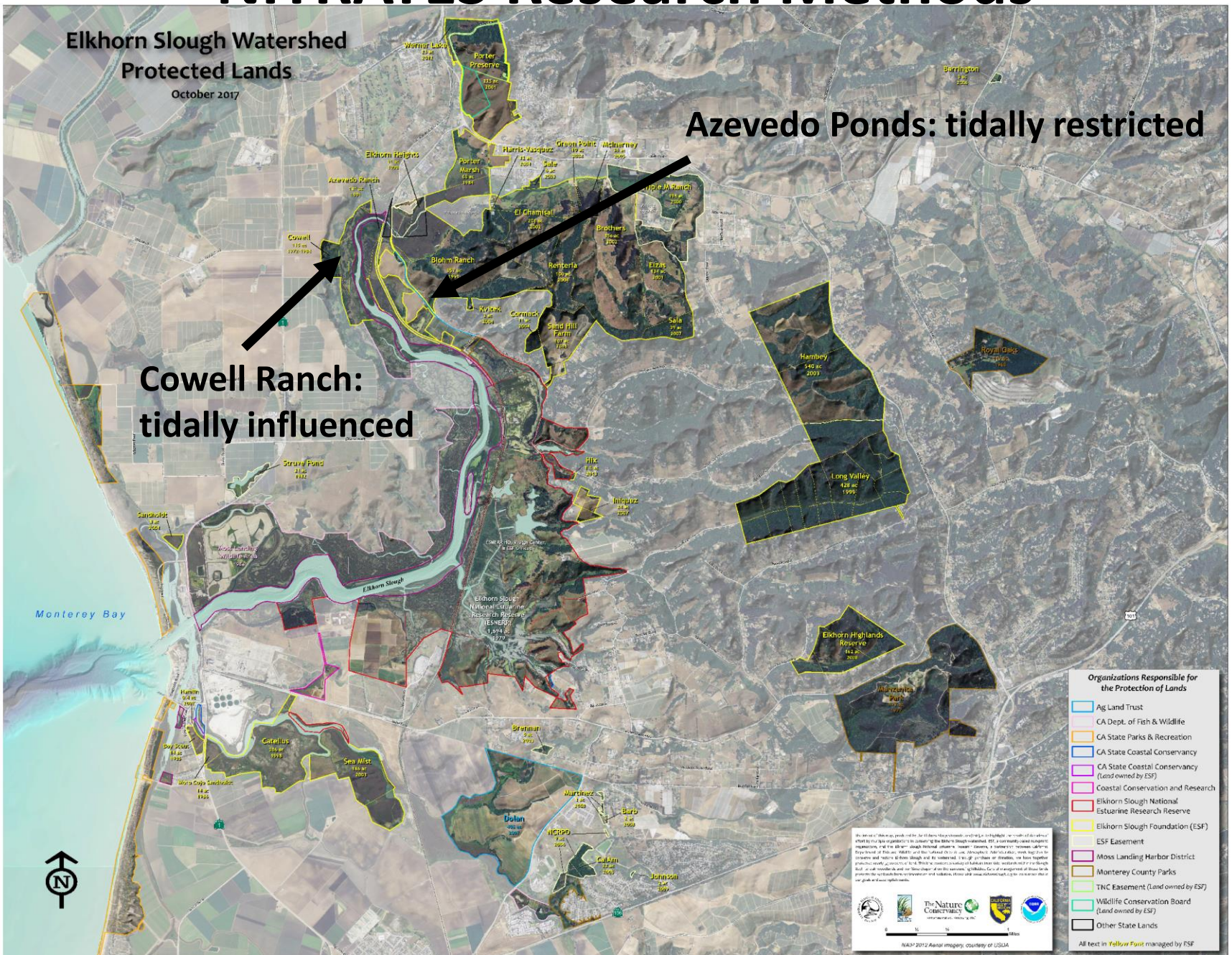
- Quantification of denitrification along GW flowpaths and in marsh sediments.

Question 3 (Q3): How temporally variable are nitrate transport and transformation processes in groundwater and sediment pore water? **(temporal variability)**

- High resolution sampling, including event sampling campaigns.



NITRATES Research Methods



NITRATES Research Methods

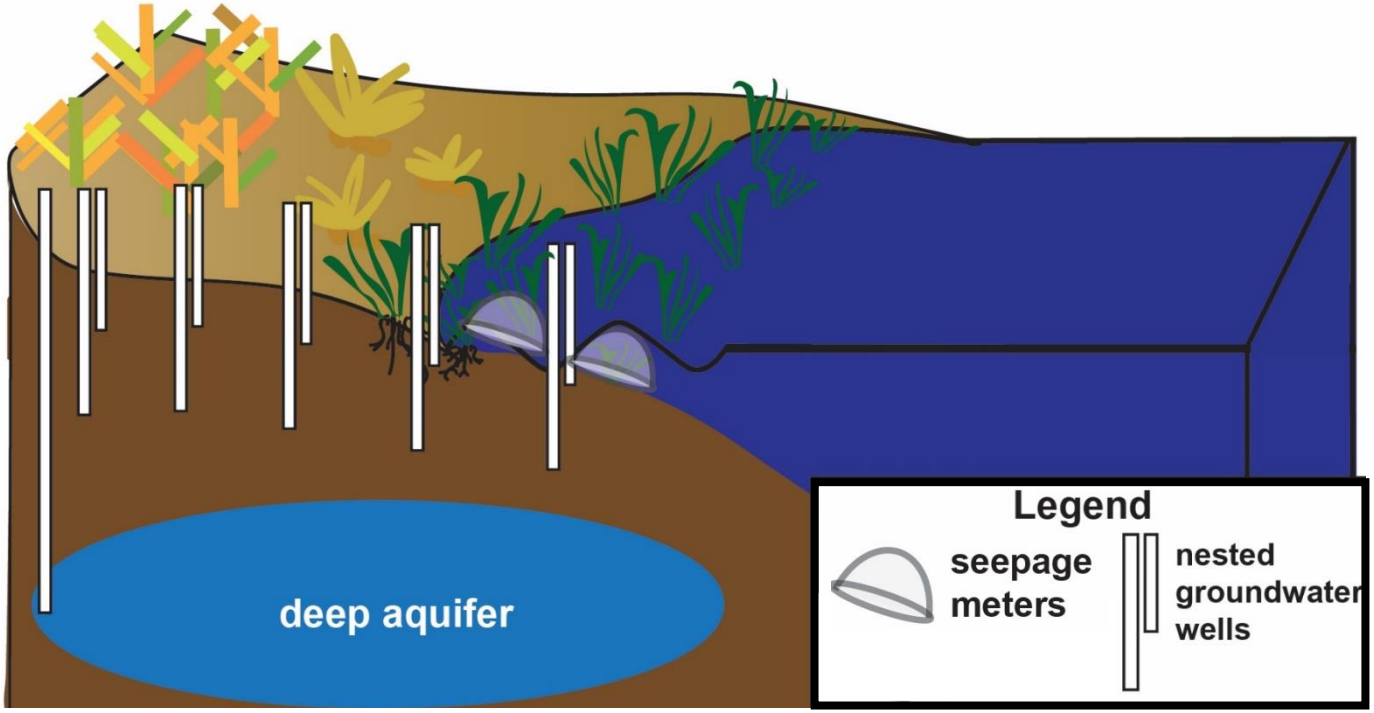
Cowell Ranch: tidally influenced

Azevedo Ponds: tidally restricted

Q1. Nitrate transport

- *Physical GW flow characteristics*: Longitudinal measurements
  - Monitor groundwater levels in nested groundwater wells
  - Flux measurements at sediment interface with seepage meters
  - Sample for tritium-helium groundwater age dating (range: months to years)

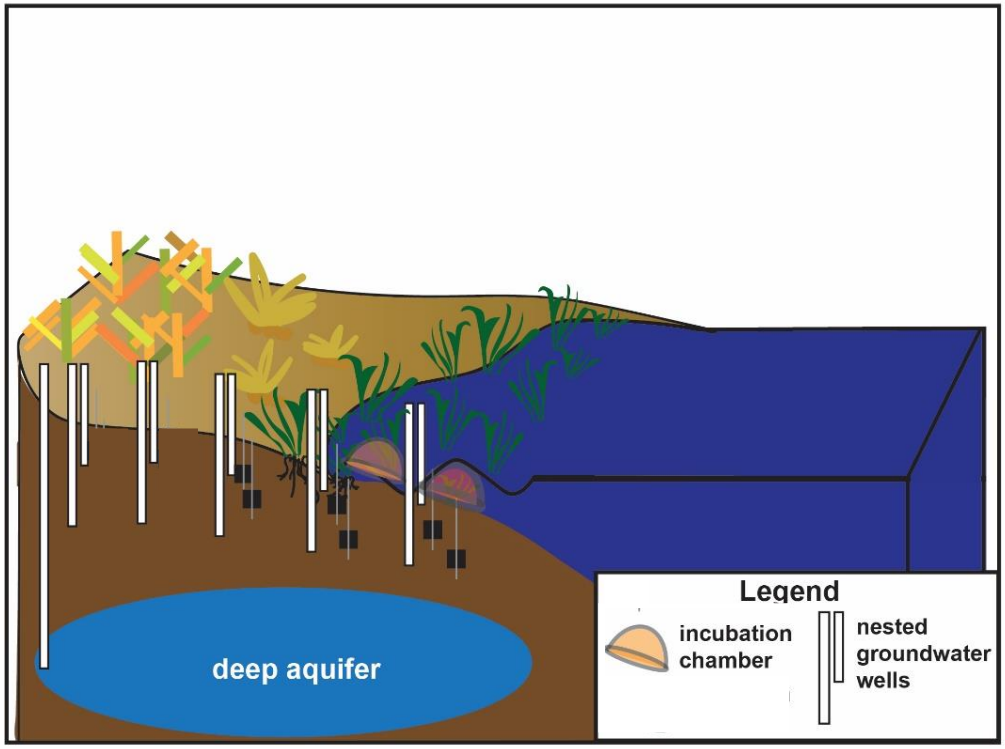
- *Nitrate concentrations along flowpaths:* Periodic sampling
  - Monitor GW and pore water nitrate concentrations on monthly basis.



Q2. Nitrate transformation

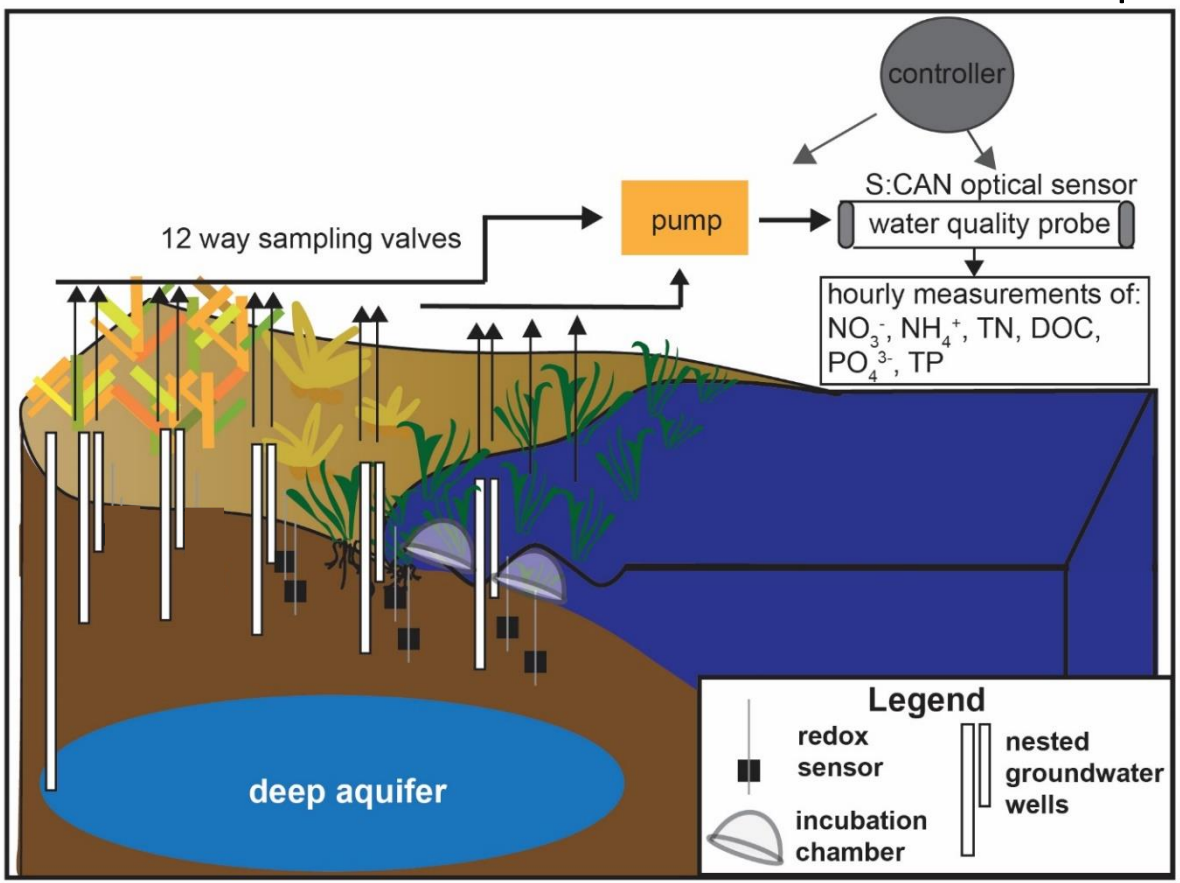
- *Denitrification along GW flowpaths*: Longitudinal surveys of N_2:Ar ratio
  - Accumulation of N_2 (end product of denitrification) along flowpaths indicates denitrification
  - Sample dissolved gases from well transect
  - Analyze on membrane inlet mass spectrometer (MIMs)

- *Denitrification in shallow sediments*: In-situ chamber incubations
  - Incubate shallow sediments and measure accumulation of N_2 in overlying water layer
  - Analyze dissolved gas samples using MIMS

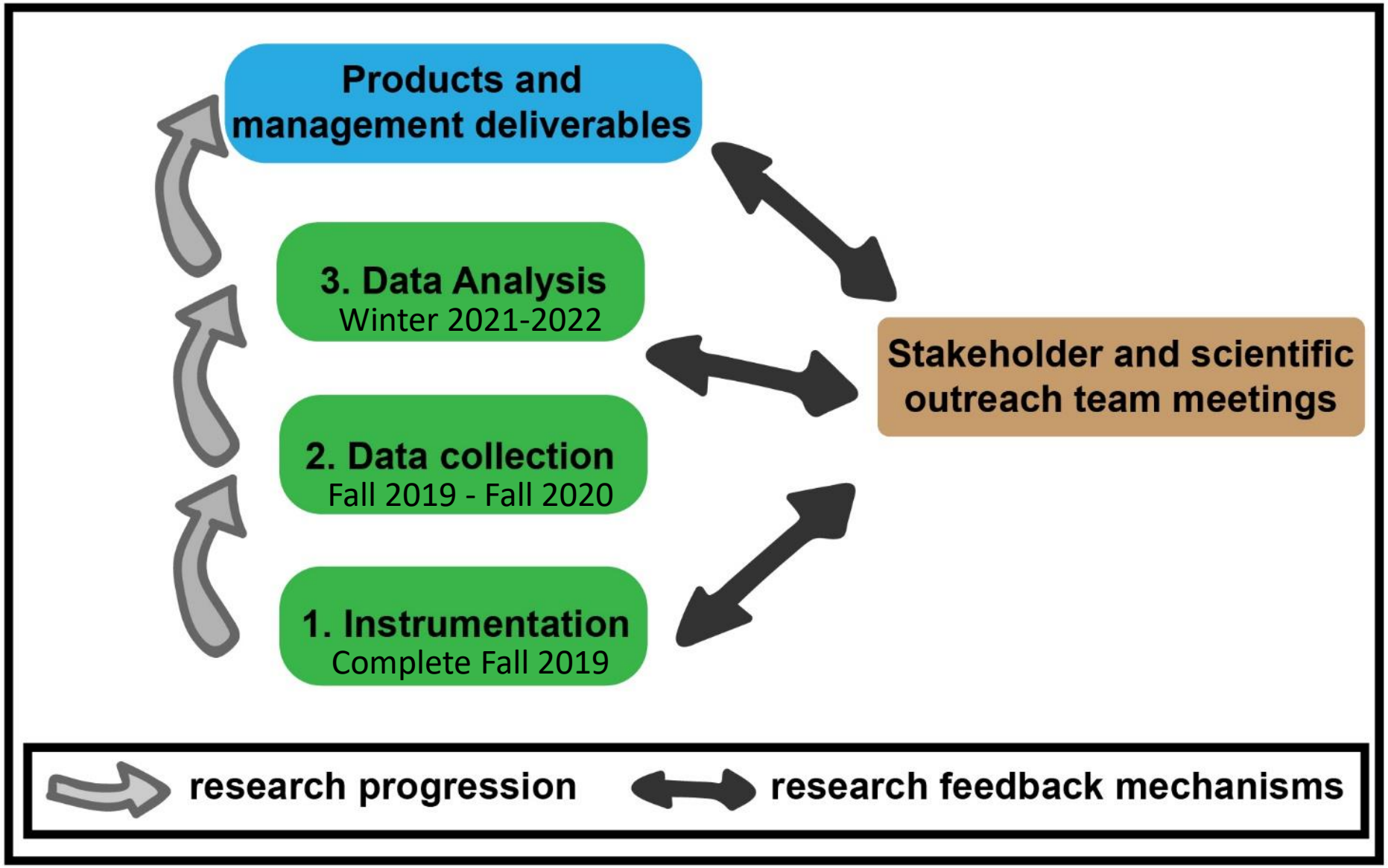


Q3. Temporal variability

- *Temporal variability within transect*: High resolution monitoring
  - Use field deployable spectrophotometer with pump manifold to measure an absorbance spectra at high temporal frequencies.
  - Calibrate absorbance spectra to get DOC, nitrate, SRP, etc. concentrations.
  - Redox sondes to measure reduction-oxidation potential of subsurface.



NITRATES Project Outreach and Collaborations



NITRATES Discussion Questions

1. Within the NITRATES project and methods framework, what can we add to our field studies that can benefit others who are studying water quality dynamics in Elkhorn Slough?

2. How can we leverage past or current research in the broader Elkhorn Slough area to amplify our community's efforts? (e.g. science-focused workshops, publicly available data repositories)

3. Do you have suggestions for possible stakeholders who our findings may be relevant to?

NITRATES Discussion Questions

4. What existing data are already out there that can bolster our efforts?

5. What relevant data or experiences can the community provide to help guide our NITRATES research efforts?