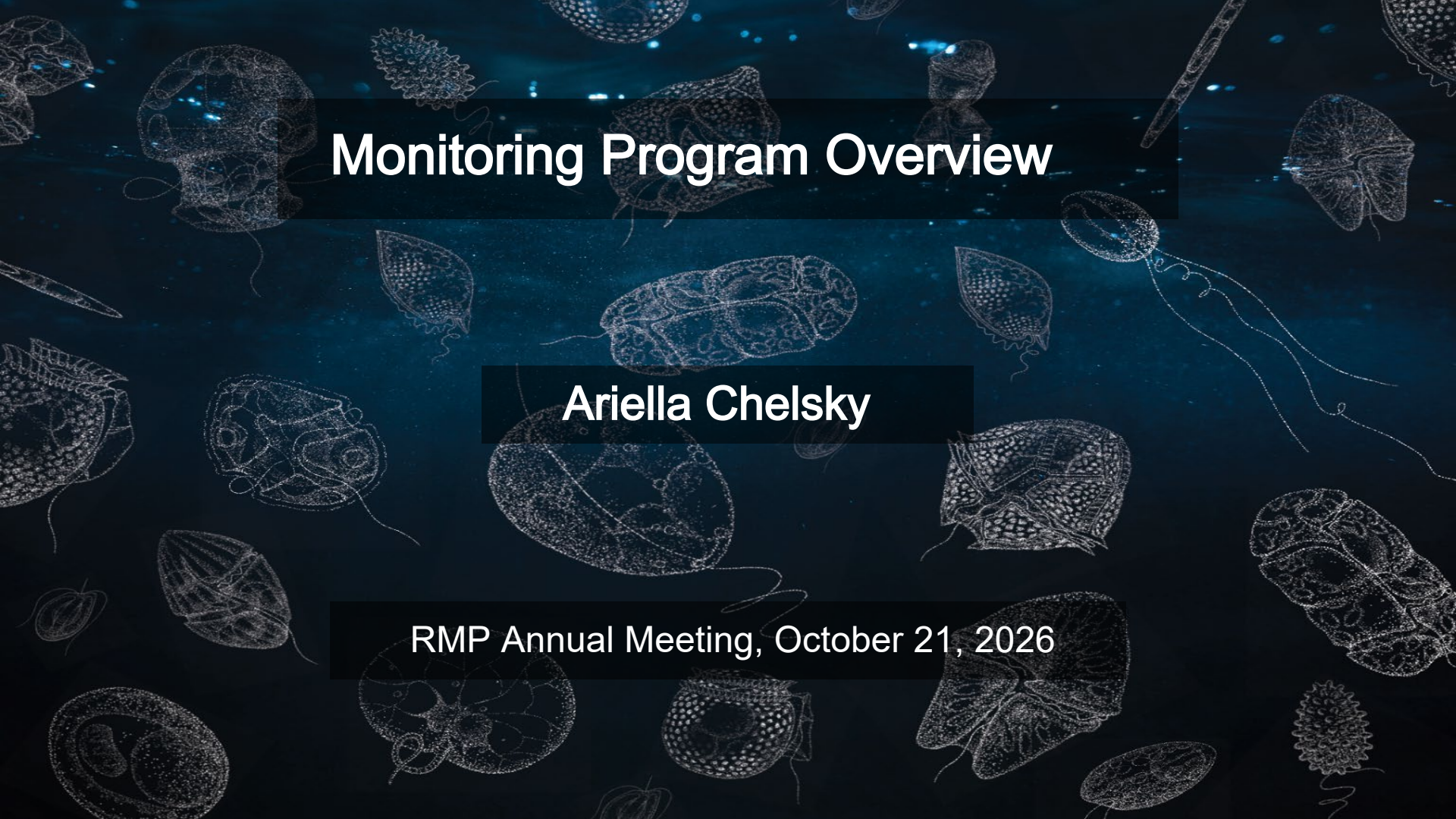


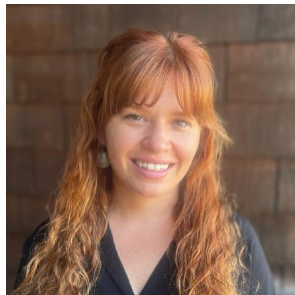


Monitoring Program Overview

Ariella Chelsky

RMP Annual Meeting, October 21, 2026

SFEI Monitoring Team



Katie Harding



Katie Noland



Charlotte Diamant



Lucy Montgomery



Martin Volaric



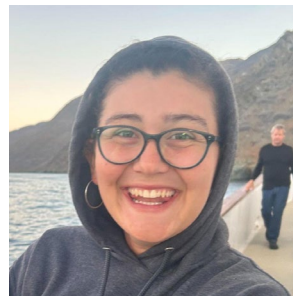
David Senn



Dan Killam



Cal Buelo



Francesca LoPresti



Siliyah Greer

Key Collaborators



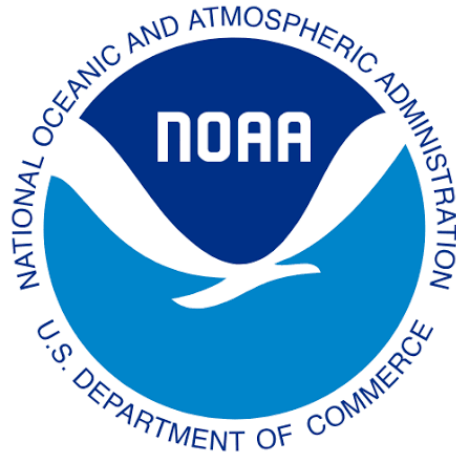
Watershed Stewards Program



Funders

SFEI

Nutrient Management
Strategy



Monitoring Program Overview

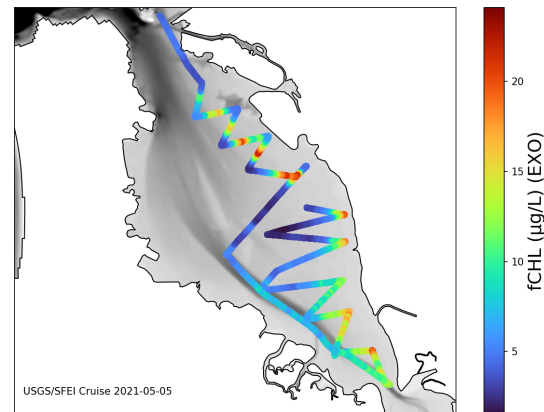
Ship - based channel sampling



Moored sensor network



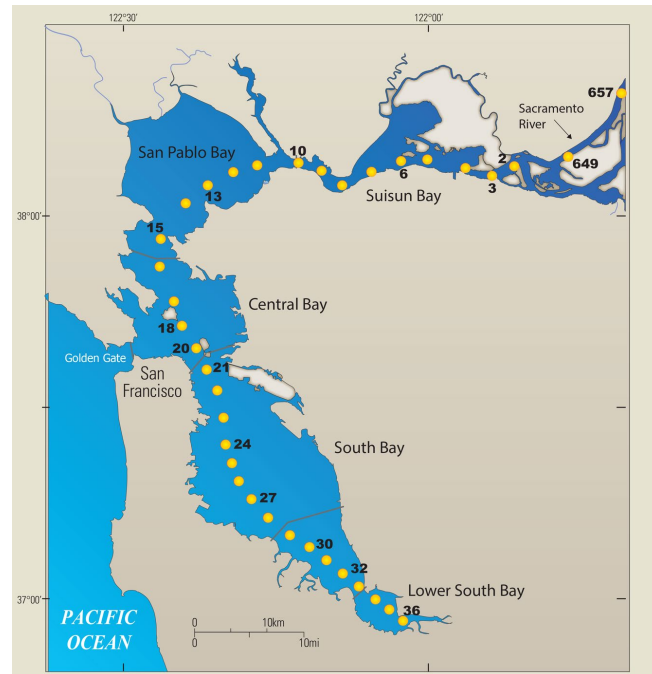
High frequency shoal mapping



Ship - based Channel Sampling

Program description

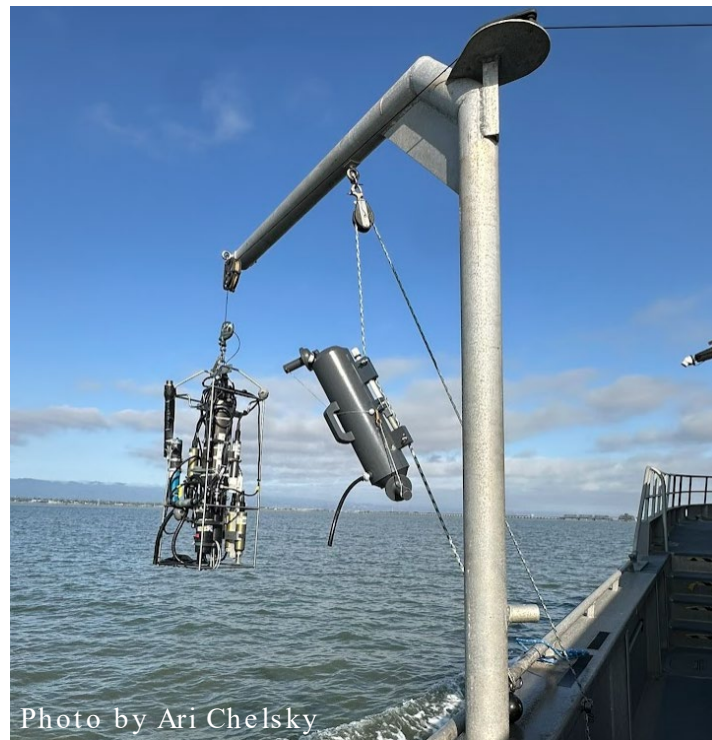
- Led by USGS Water Science Center
- Monthly cruises
- CTD profiles at every station
- Surface flow-through
- Discrete samples at subset of stations



Ship - based Channel Sampling

New additions

- HAB parameters
- Water quality sensor and nitrate sensor in flow-through system
- Depth profiles of nitrate
- Discrete nutrients at depth
- Station at the Golden Gate



Ship - based Channel Sampling

Preliminary findings from expansion

- Molecular phytoplankton data show subembayment differences, with northern Bay samples bridging the gap between the Bay and Delta
- Water quality parameters vary throughout Bay, nitrate patterns dominated by north/south variability

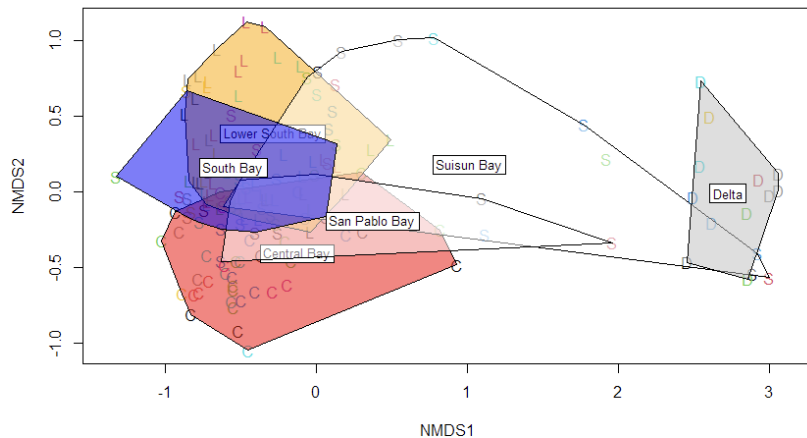


Figure by Katie Harding

Ship - based Channel Sampling

Preliminary findings from expansion

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Sept 17, 2026 cruise

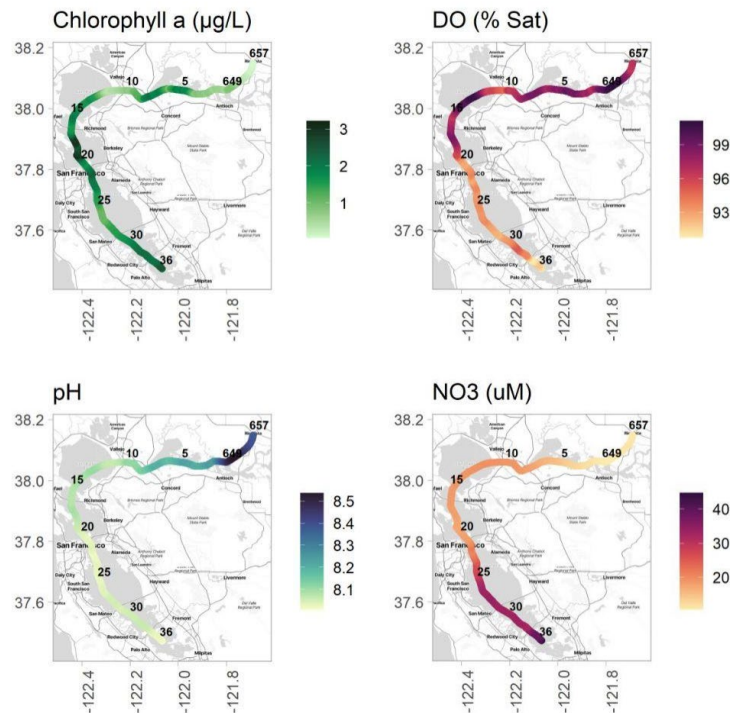


Figure by Schuyler Nardelli

Ship - based channel sampling

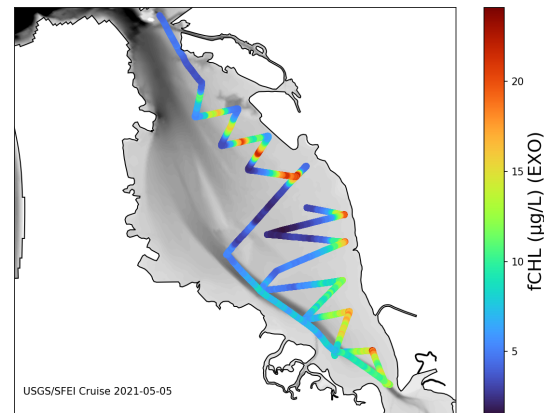


- Measurement types and locations have been expanded
- New data better capture connection between Bay/Delta and nutrient dynamics throughout the Bay

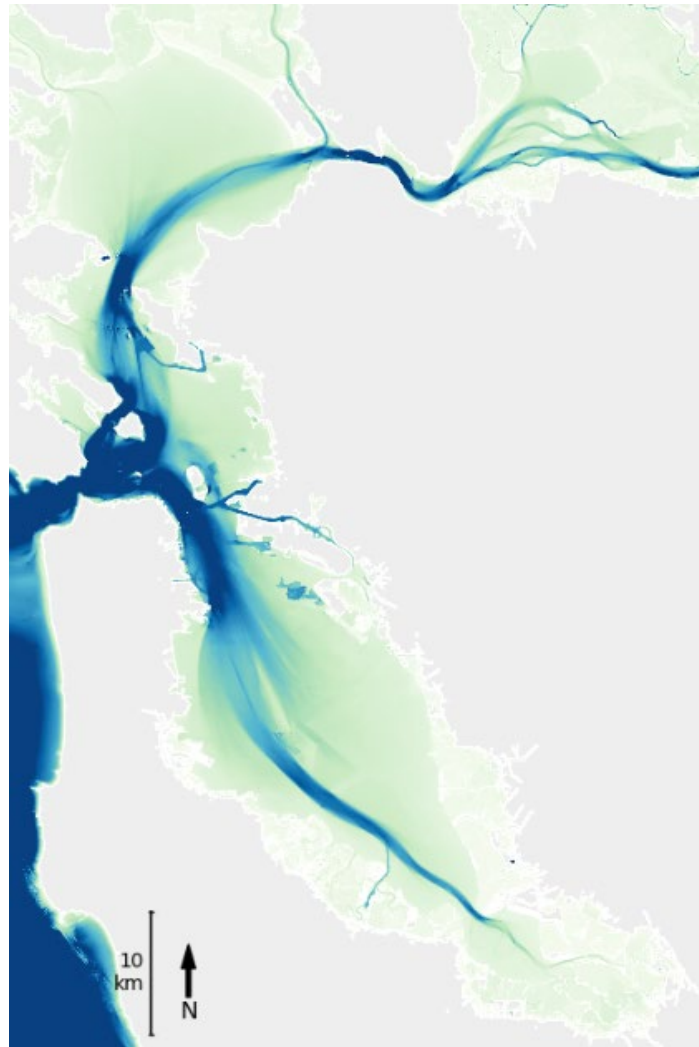
Moored sensor network



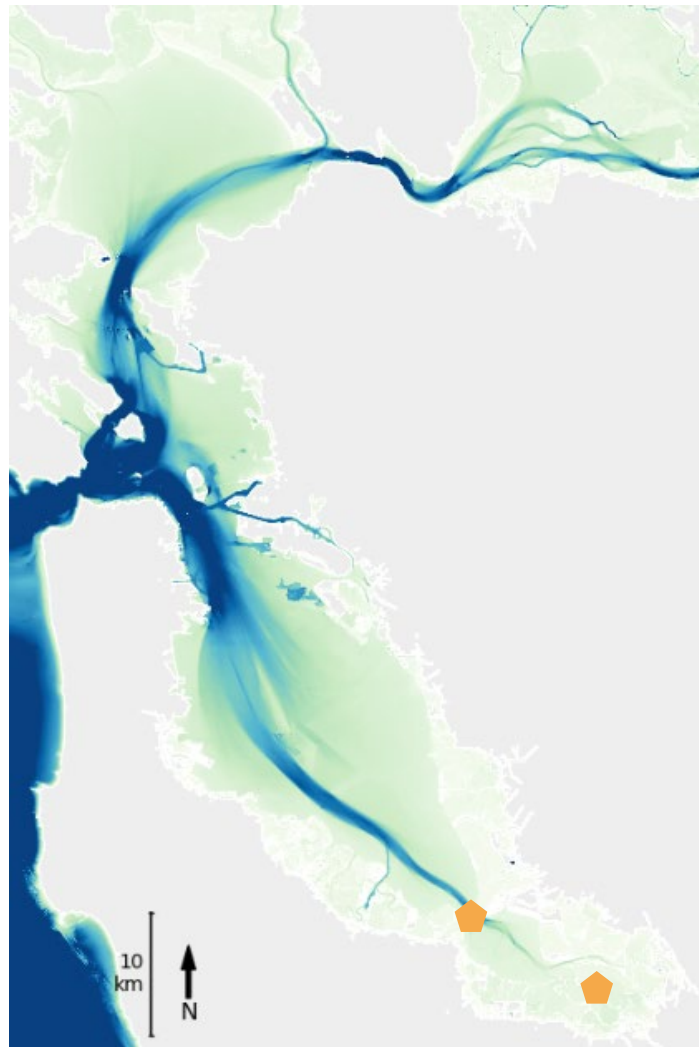
High frequency shoal mapping



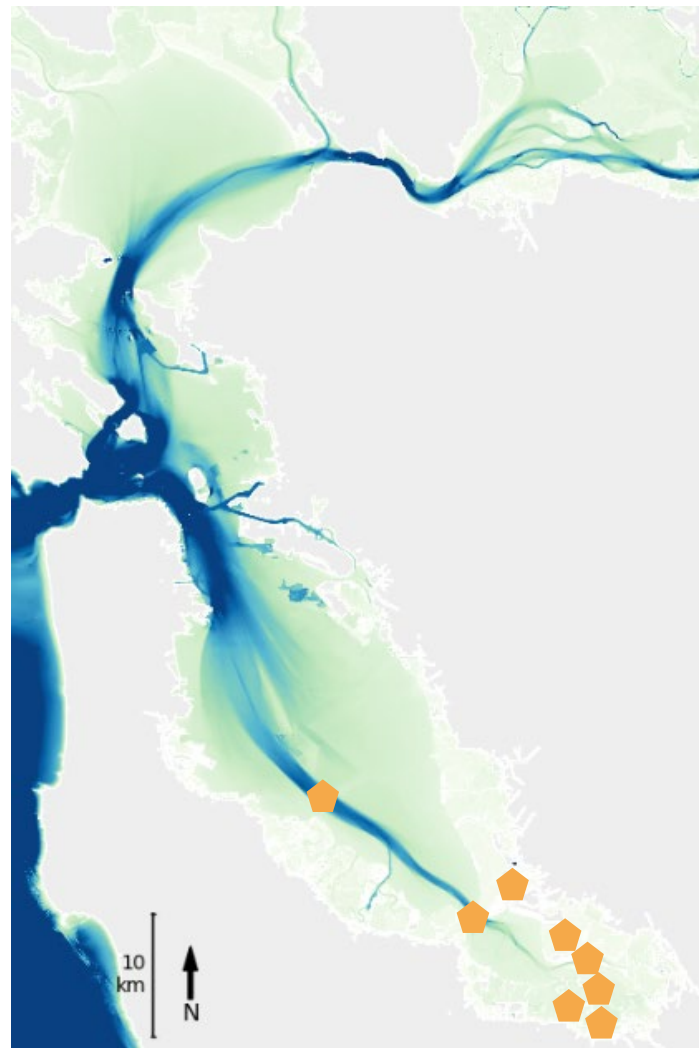
Evolution of the Moored Sensor Network



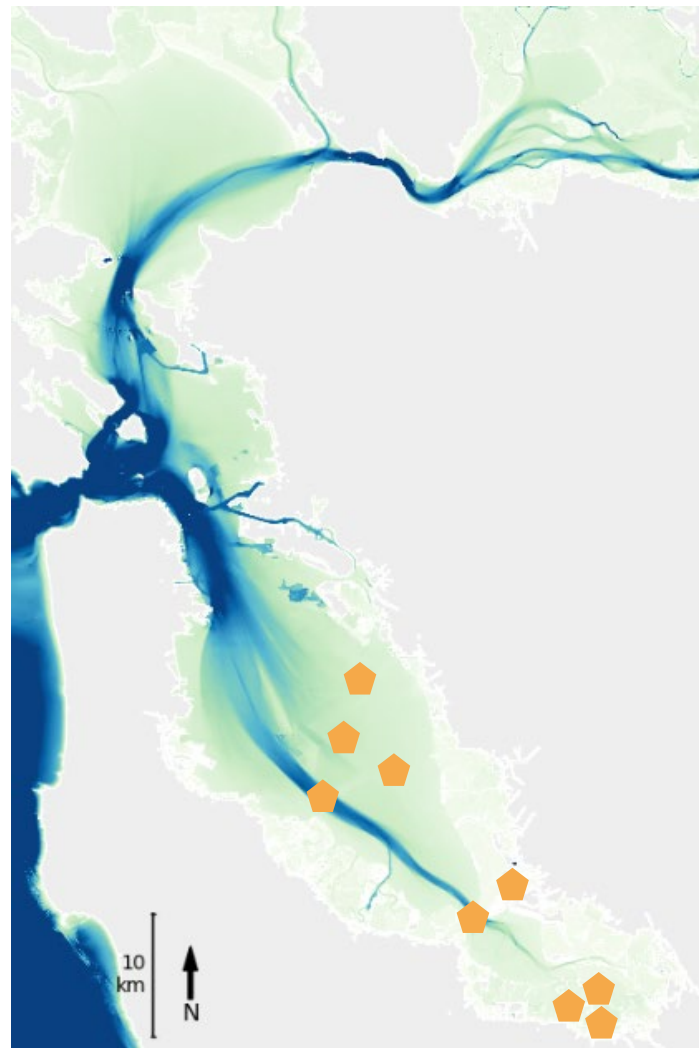
2013



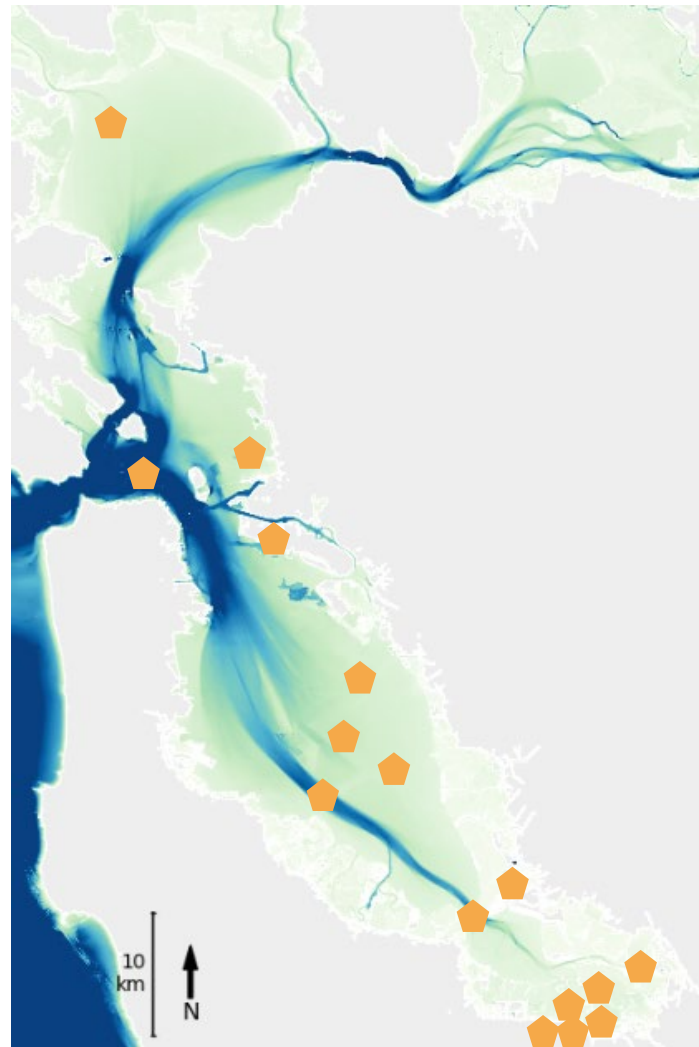
2015



2020



2026

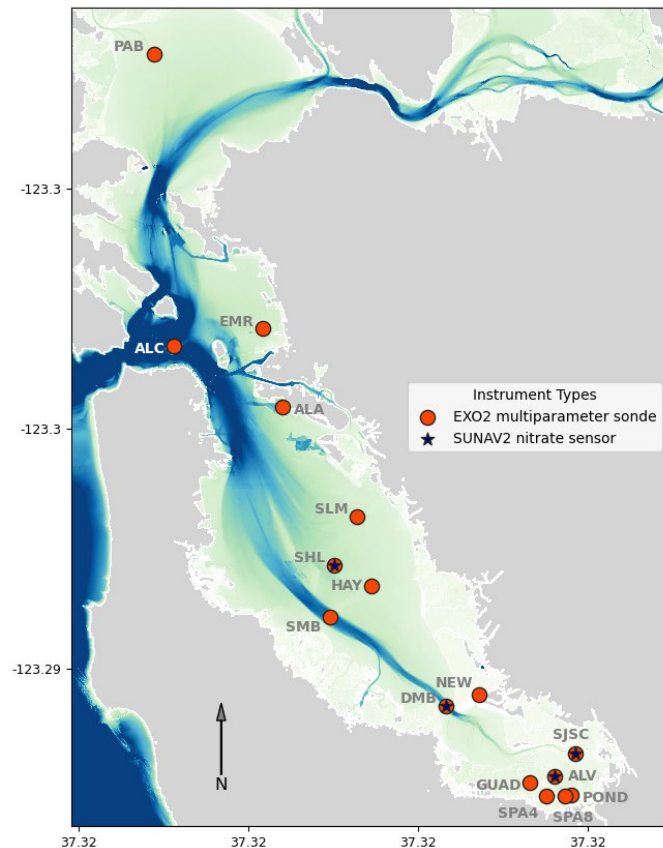


SFEI

Moored Sensor Network

Program description

- Currently 16 stations across many subembayments and habitat types
- Collect water quality data every 15 minutes
- Measure chlorophyll, dissolved oxygen, temperature, salinity etc.
- Three stations measure nitrate



Moored Sensor Network

New additions

- New stations in Lower South Bay, Central Bay, San Pablo Bay
- Continuous nitrate sensors
- pH at all stations
- Real-time data at five stations (and counting)



Moored Sensor Network

Preliminary findings from expansion

- Elevated springtime chlorophyll observed at new stations
- Chlorophyll tends to be higher at shallow stations compared to channel

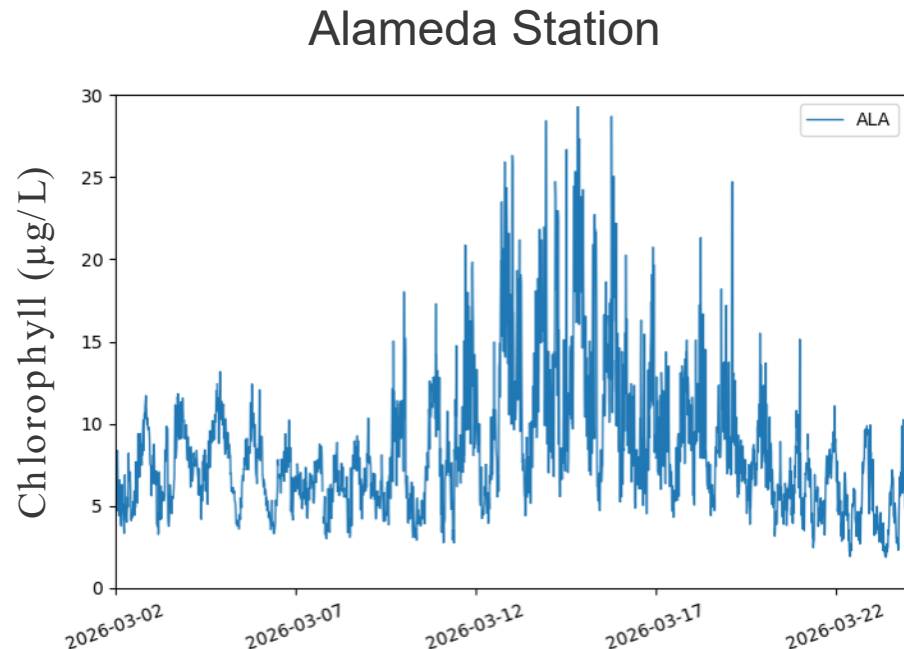


Figure by Martin Volaric

Moored Sensor Network

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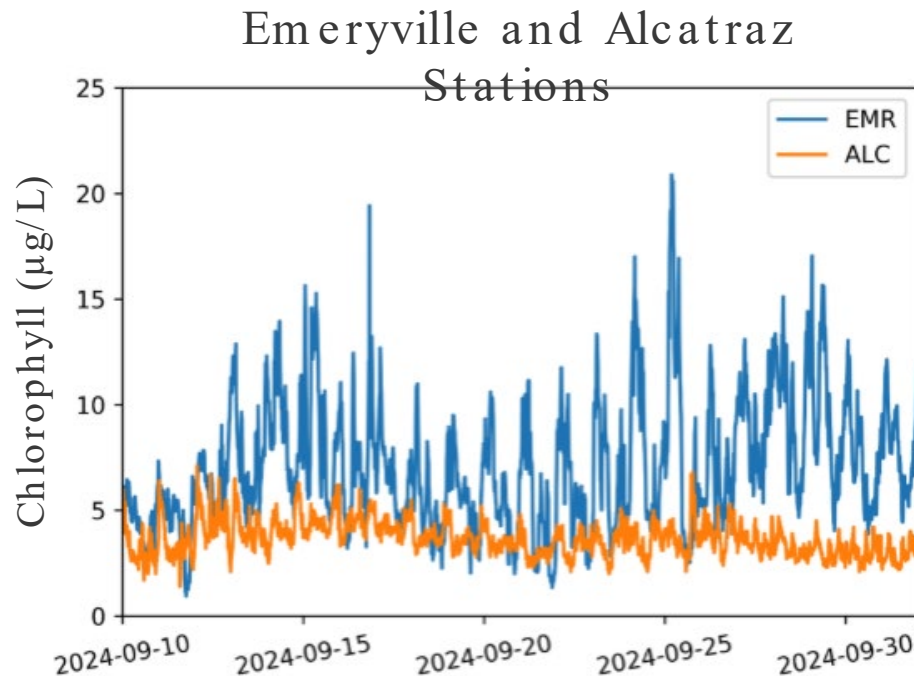


Figure by Martin Volaric

Ship - based channel sampling



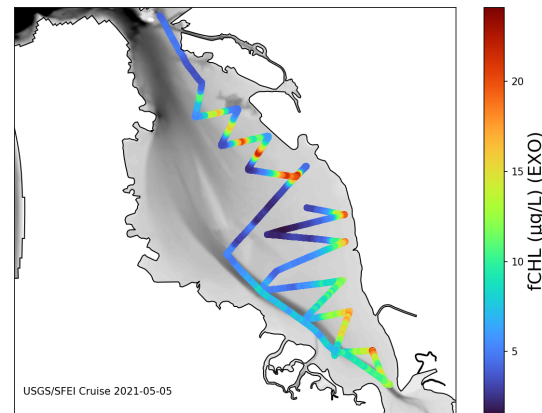
- Measurement types and locations have been expanded
- New data better capture connection between Bay/ Delta and nutrient dynamics throughout the Bay

Moored sensor network



- New sensor locations are key hot spots of production
- Differences between channel and shoals support need for monitoring shallow areas

High frequency shoal mapping



High Frequency Shoal Mapping

Program description

- Mapping trips conducted six times per year
- Boat zig-zags between channel and shallow shoals
- Measures suite of parameters while underway

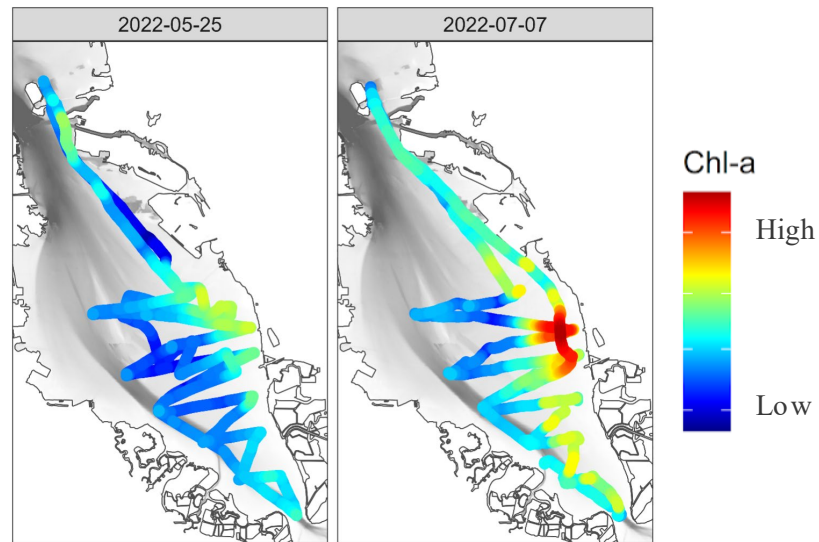


Figure by Dan Killam

High Frequency Shoal Mapping

New additions

- Four north Bay mapping trips per year
- Expanded particulate carbon and nitrogen sampling
- Alkalinity measurements

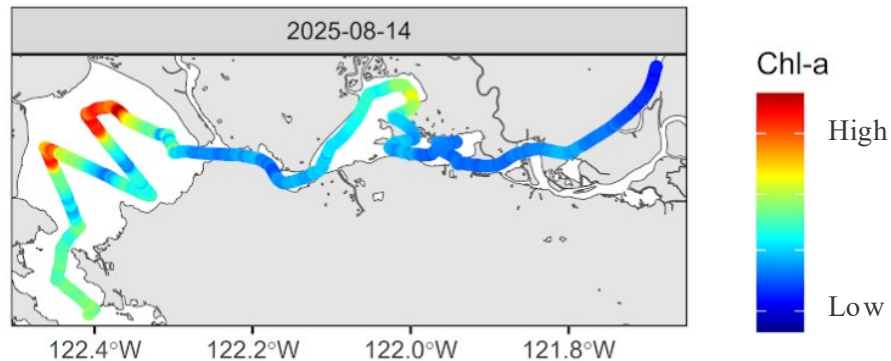


Figure by Dan Killam

High Frequency Shoal Mapping

Preliminary findings from expansion

- High chlorophyll concentrations on San Pablo Bay shoals
- Phytoplankton production covaries spatially with pH and nutrient availability

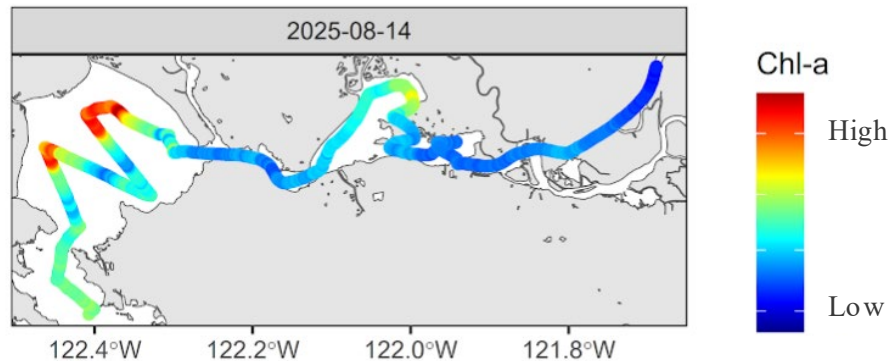


Figure by Dan Killam

High Frequency Shoal Mapping

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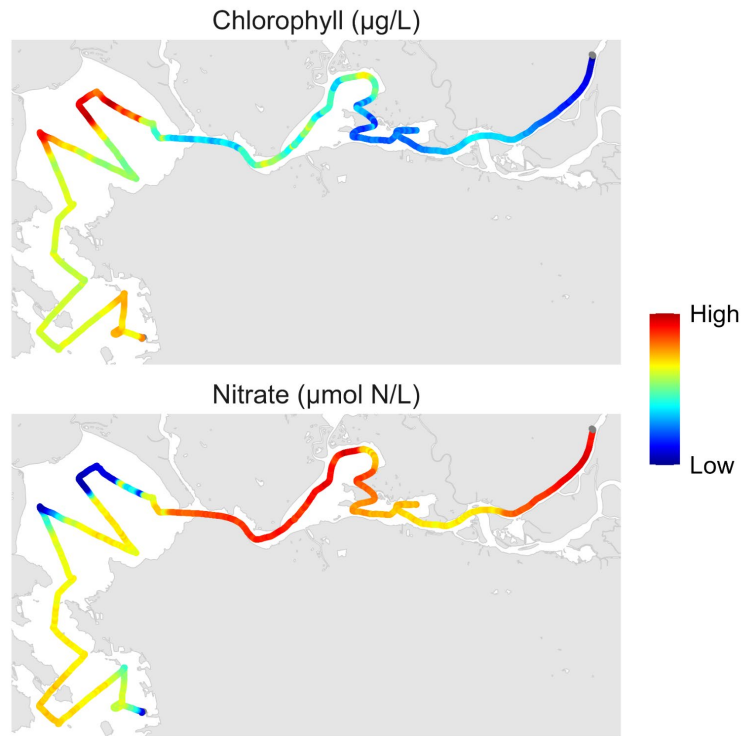


Figure by Dan Killam

Ship - based channel sampling



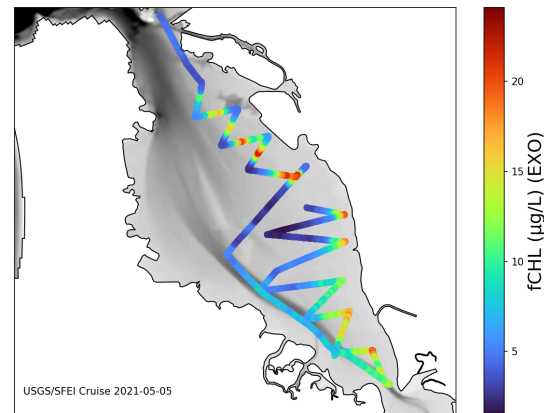
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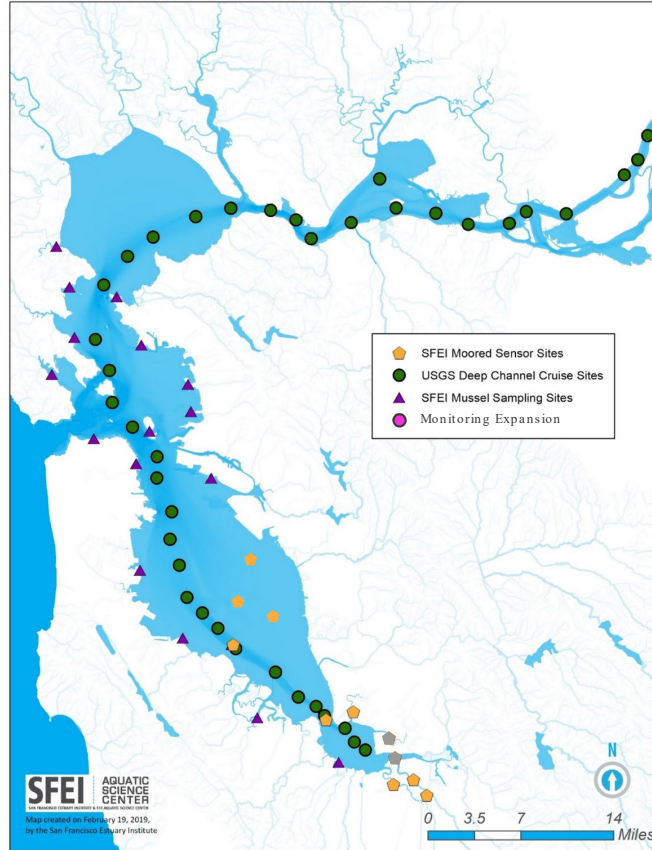
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High frequency shoal mapping

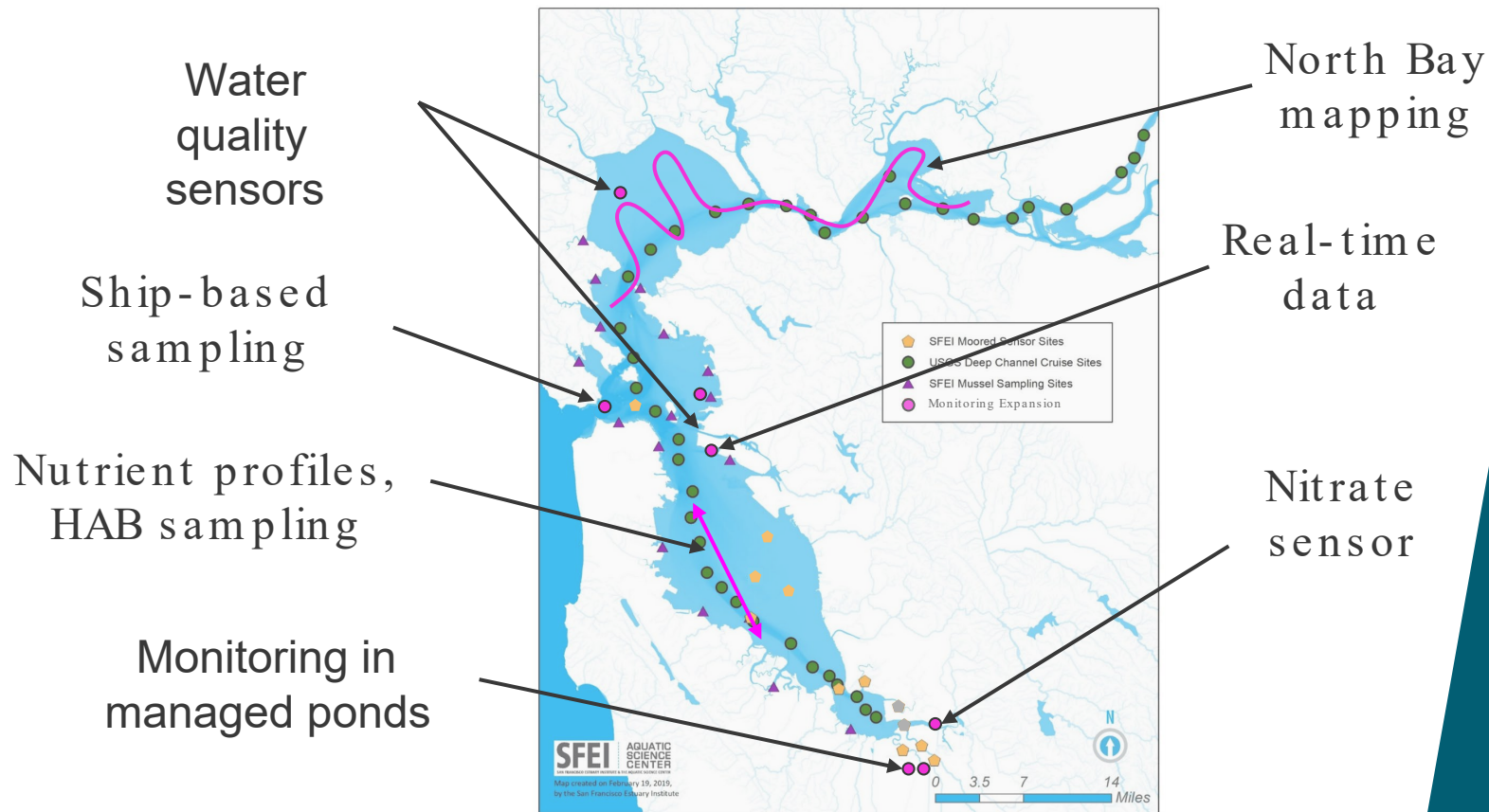


- Expanded mapping trips are improving our understanding of northern Bay dynamics
- Parameters vary rapidly on small spatial scales, multiple parameters help elucidate drivers

Expanded Monitoring Network



Expanded Monitoring Network



Next steps

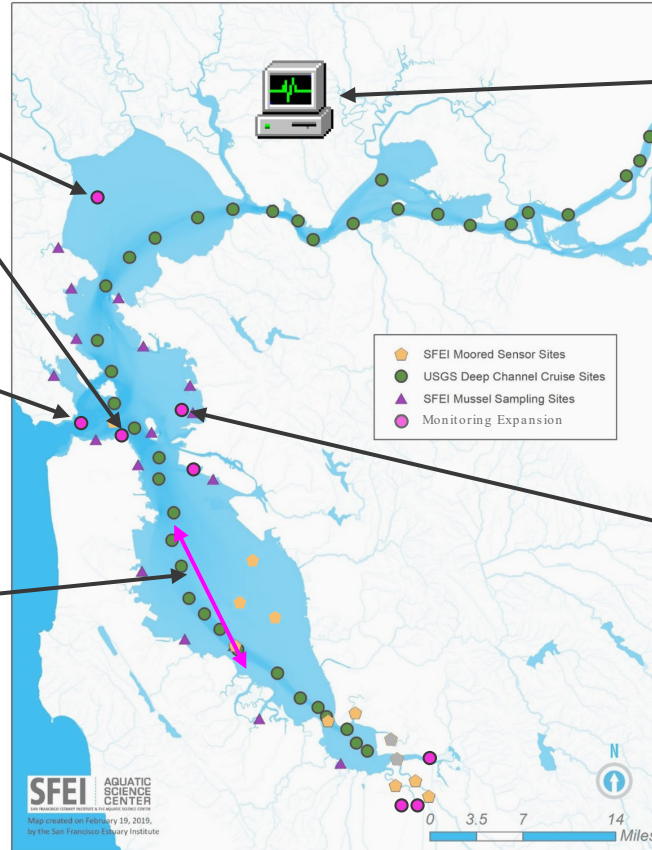
Nitrate sensors

Coastal nutrient
inputs

Carbonate
chemistry

Data
dashboard

Real-time
data



Key Takeaways

- NMS monitoring program is supporting key management decisions
- The program is expanding to target key data gaps
- Data from initial expansion efforts have improved our scientific understanding of the system



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