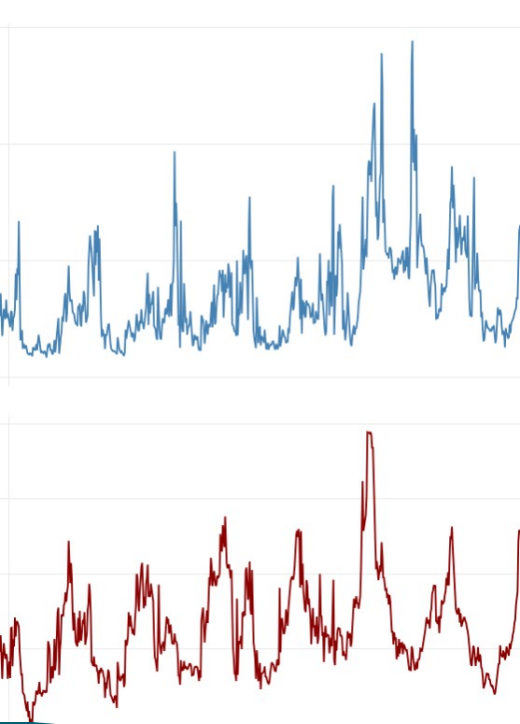




Accessing NMS data

SFEI

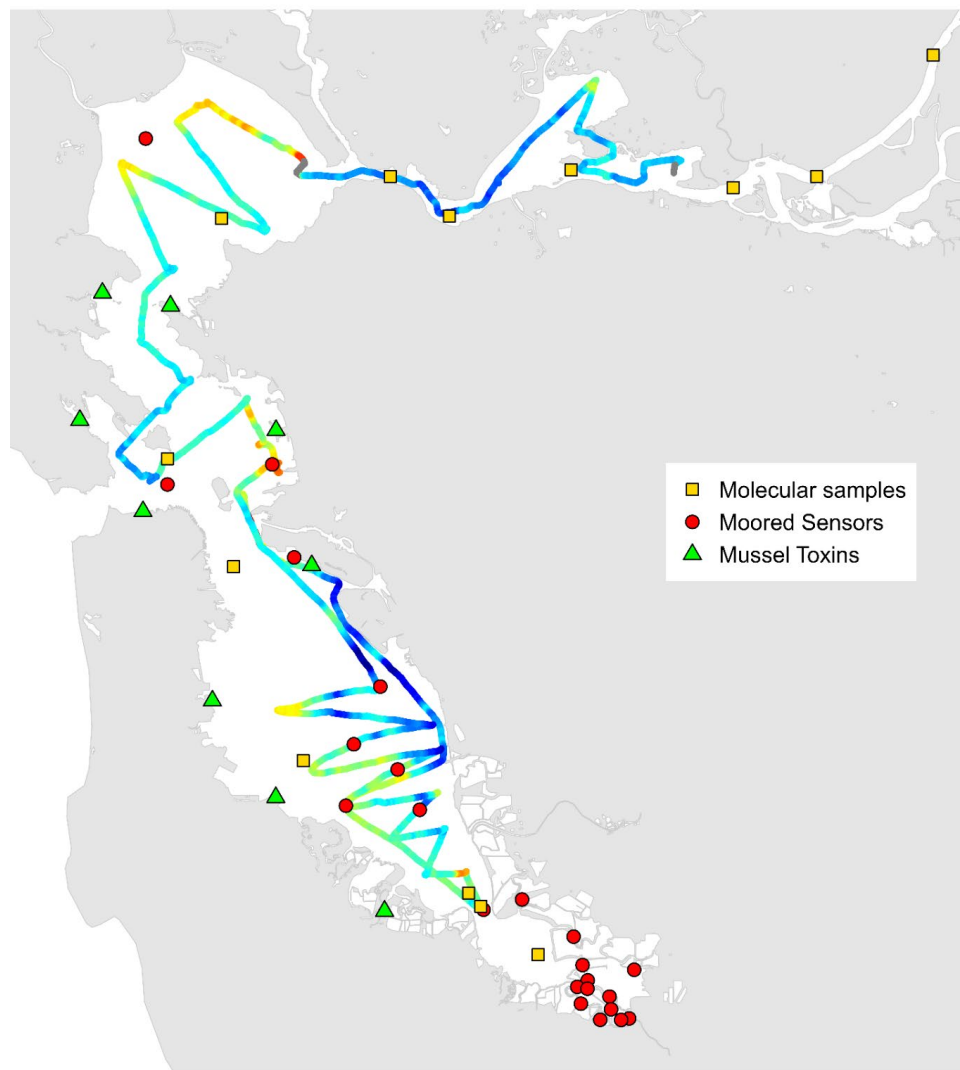
SAN FRANCISCO
ESTUARY INSTITUTE

Dan Killam

Nutrient Management Strategy

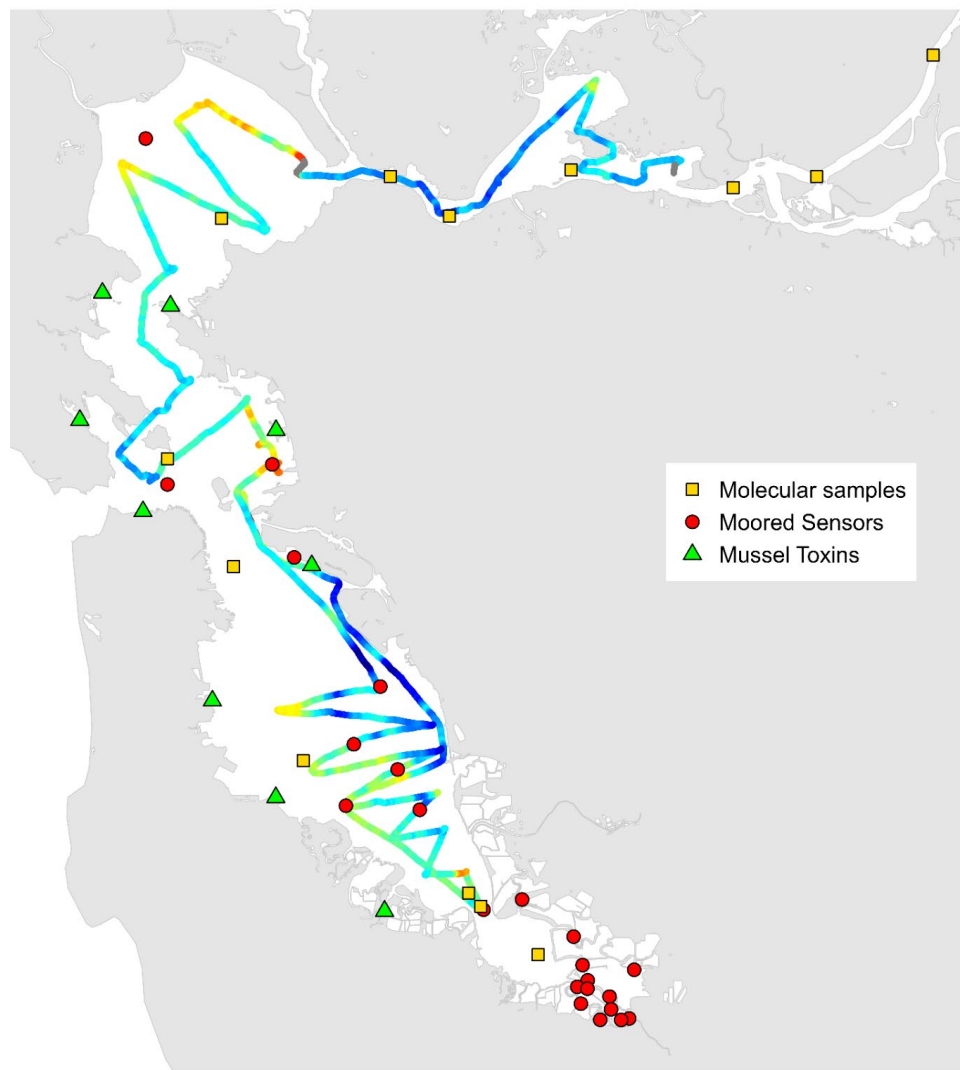
NMS Data

- Moored Stations: ~48 million points, ~20 parameters, >17 stations, starting 2013



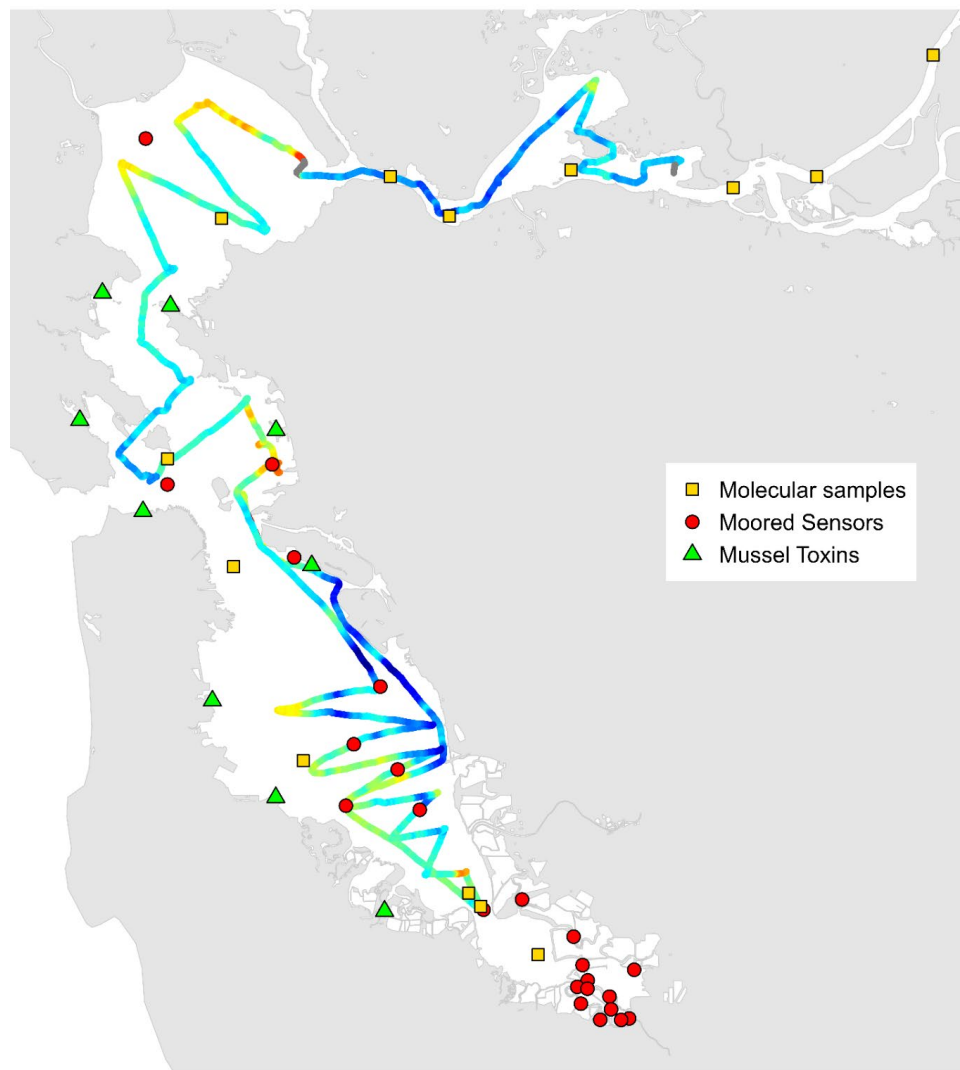
NMS Data

- Moored Stations: ~48 million points, ~20 parameters, >17 stations, starting 2013
- High-frequency mapping: ~1.3 million points across 57 cruises since 2017



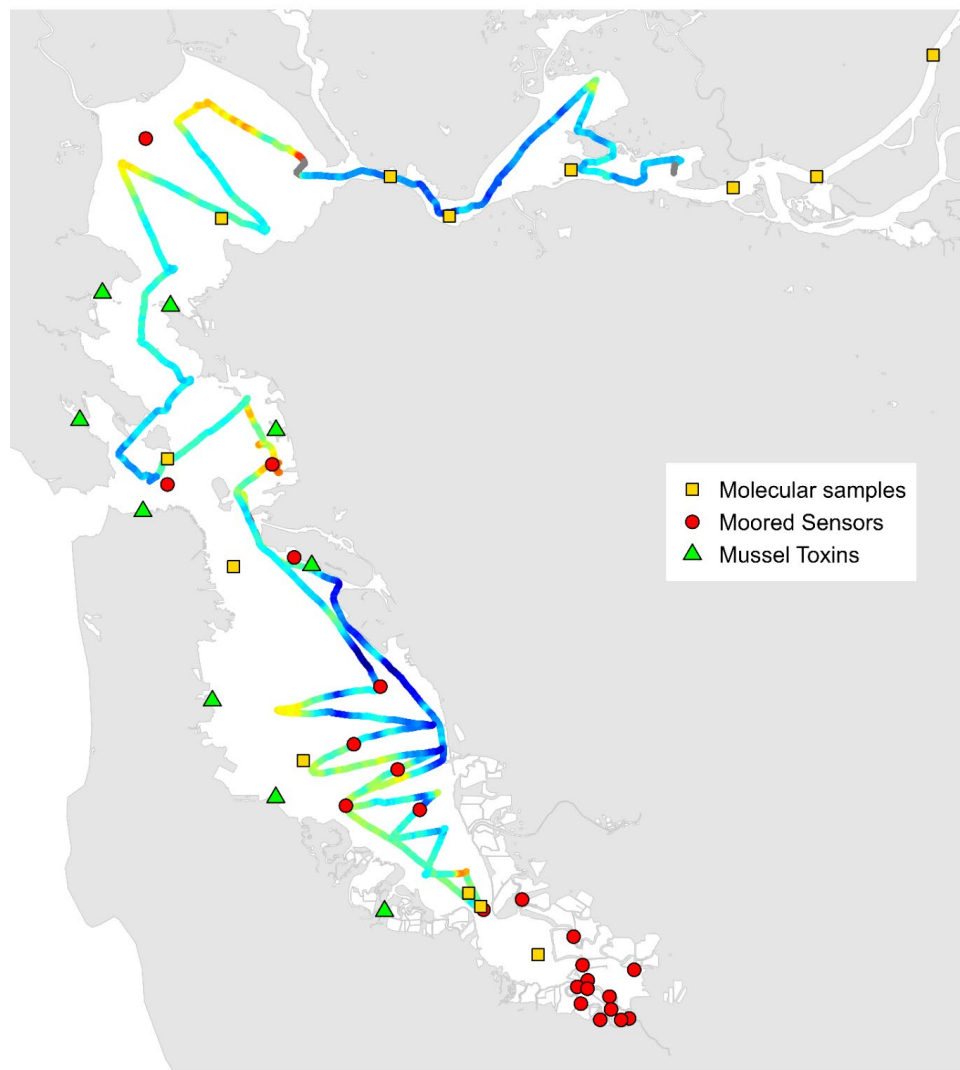
NMS Data

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- ~2000 molecular samples from 2014-present



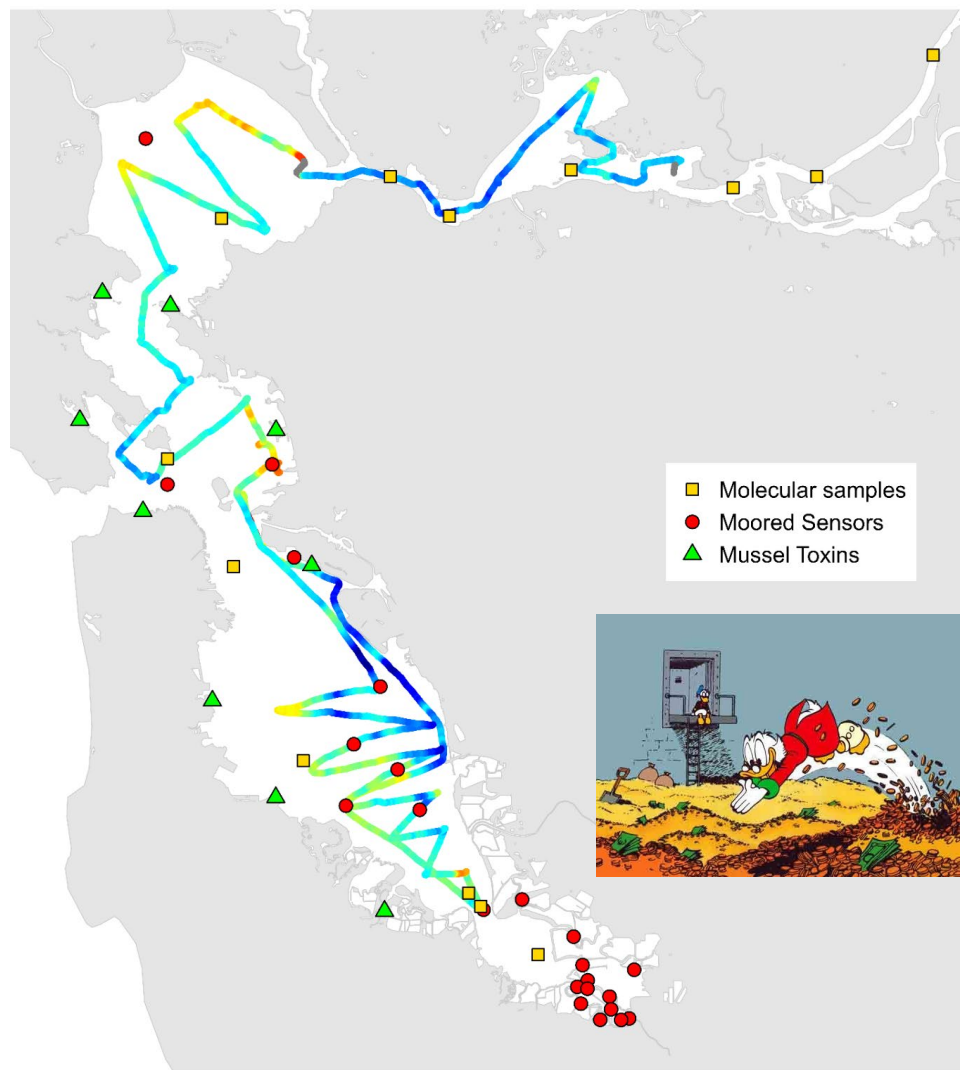
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Uses

- Quantify live biogeochemistry every 15 minutes, with live connection
- Mapping snapshots of broad-scale biogeochemistry, 6x per year
- Surveillance/quantification of the phytoplankton present
- Surveillance of HAB toxins
- Many possible uses!

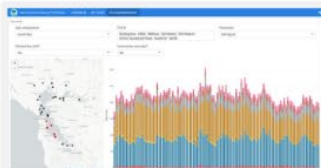
How to browse the data (Shiny dashboards)

Why do we need dashboards?

- NMS has many products that need **data visualization**, including reports, scientific papers, conference presentations, and website content
- But we have **more data than can ever be included** in reports, and users may have needs outside the scope of what we can provide
 - We also have **ongoing monitoring data** that continues to roll in after reports are written
- Online dashboards using frameworks like **Shiny** provide a means for users, collaborators, and even NMS employees to continue to **interact with data in a low-friction, ongoing way**

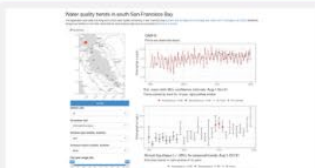
<https://nutrient-data.sfei.org>

Nutrient Management Strategy: Shiny Visualizations



Nutrient Load Browser

This app allows users to browse time series of past POTW loads, either by individual POTW, or grouped by subembayment.



Water Quality Trends

This app, associated with [Beck et al \(2022\)](#) allows for multi-year trends in long-term time series data to be calculated for different Bay stations and parameters including gross primary production, chlorophyll-a, dissolved oxygen and others.



IFCB Viewer

The Imaging Flow Cytobot is used to monitor the density and biovolume of phytoplankton through automated flow cytometry, and can automatically identify some taxa. This app allows users to browse time series of IFCB data from 2018-2023 from a series of stations across SF Bay.



Molecular Data Viewer

NMS has collected a time series of 18S metabarcoding data quantifying the relative abundance of different phytoplankton taxa through time at a series of SF Bay stations. This app allows users to browse through those time series, in a similar interface to the IFCB Viewer app, and change between percent abundance and direct molecular counts.



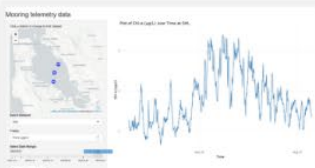
Bay Station Viewer

The Peterson cruises are a long-term time series of water quality data collected from a series of stations across San Francisco Bay. In this app, users can browse through time series of eight different parameters across Central and South Bay stations in the dataset.



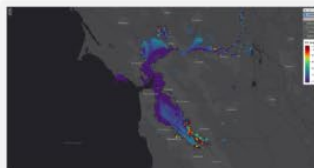
LSB Assessment Framework

Variability of dissolved oxygen across the Lower South Bay of SF Bay was investigated as part of an Assessment Framework effort. In this app, users can view dissolved oxygen time series for a selection of stations in different settings of LSB, and view calculations related to the distributions of DO above or below user-set thresholds.



Telemetry Viewer

The latest data can be viewed from NMS moored sondes at San Leandro Marina (SLM), Shoal (SHL) and San Mateo Bridge (SMB) stations, including continuous chl-a, dissolved oxygen, pH, nitrate and other parameters.



Remote Sensing Viewer

Remote sensed chl-a data from the Sentinel-3 satellites can be viewed, using an algorithm developed for SF Bay as described in [Kudela et al. \(2024\)](#)





Where to download data

Mooring Data

Quality-controlled data
through end of 2021 are
currently available on
Environmental Data Initiative

More available on request!
Email us!

Data Package Summary [View Full Metadata](#)

Title: San Francisco Bay High-frequency Water Quality Sensor Data

Creators: Chelsky, Ariella; Managing Senior Scientist; San Francisco Estuary Institute
Arl, Kristin; Former Employee; San Francisco Estuary Institute
Bresnahan, Philip; Former Employee; San Francisco Estuary Institute
Diamant, Charlotte; Environmental Analyst; San Francisco Estuary Institute
King, Erika; Former Employee; San Francisco Estuary Institute
MacVean, Lissa; Former Employee; San Francisco Estuary Institute
Montgomery, Lucy; Environmental Analyst; San Francisco Estuary Institute
Mourier, Lilla; Former Employee; San Francisco Estuary Institute
Noland, Katie; Environmental Scientist; San Francisco Estuary Institute
Novick, Emily; Former Employee; San Francisco Estuary Institute
Roberts, Derek; Former Employee; San Francisco Estuary Institute
Sylvester, Zephyr; Former Employee; San Francisco Estuary Institute
Volario, Martin; Environmental Scientist; San Francisco Estuary Institute
Winchell, Taylor; Former Employee; San Francisco Estuary Institute
Senn, David; Program Director and Lead Scientist; San Francisco Estuary Institute

[< Show less](#)

Publication Date: 2026-02-13

Citation: Chelsky, A., K. Arl, P. Bresnahan, C. Diamant, E. King, L. MacVean, L. Montgomery, L. Mourier, K. Noland, E. Novick, D. Roberts, Z. Sylvester, M. Volario, T. Winchell, and D. Senn. 2026. San Francisco Bay High-frequency Water Quality Sensor Data ver 1. Environmental Data Initiative. <https://doi.org/10.6073/pasta/69b73427d4f6021e2b7f7b58bbbf23> (Accessed 2026-10-16).

[Copy Citation](#)

Abstract: The Moored Sensor Program (MSP) is a network of high-frequency continuous water quality sensors distributed throughout San Francisco Bay. The network was first established in 2013 as part of the Nutrient Management Strategy, a program tasked with building the scientific foundation needed to inform nutrient-related management decisions in the Bay. The MSP has grown from two monitoring sites to more than fourteen, with more anticipated.

[Show more >](#)

Spatial Coverage:



N: 38.15 S: 37.42 E: -121.82 W: -122.63

Package ID: edl2260.1 (Uploaded 2026-02-13)

Resources: [View Full Metadata](#) (632 views)
[View Quality Report](#)

[Full Data Package \(Zip\)](#) (9 downloads)

Data Entities:

1. ALV_thru2021 (45.9 MB; 62 downloads)

[Download](#) [Explore Data](#)



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Assessing spatial variability of nutrients, phytoplankton, and related water-quality constituents in the San Francisco Bay, California: 2021-2022 High-resolution mapping surveys

Assessing spatial variability of nutrients, phytoplankton, and related water-quality constituents in the San Francisco Bay, California: 2021-2022 High-resolution mapping surveys

View

Dates

Publication Date :

2024-03-18

Start Date :

2021-03-25

End Date :

2022-10-27

Citation

Richardson, E.T., O'Donnell, K., Soto Perez, J., Sturgeon, C.L., Brinkman, J., Delascagigas, A., Nakatsuka, K., Uebner, M.Q., Jaegge, A., Dellwo, P., Jumps, N., Bouma-Gregson, K., Kraus, T.E., and Bergamaschi, B.A., 2024, Assessing spatial variability of nutrients, phytoplankton and related water-quality constituents in the San Francisco Bay, California: 2021-2022 High-resolution mapping surveys: U.S. Geological Survey data release, <https://doi.org/10.5066/P9GXJHZ3>.

Summary

The dataset documents the spatial and temporal variability of nutrients and related water quality parameters at high spatial resolution in the San Francisco Bay of California, USA in 2021 and 2022. The dataset includes nitrate, temperature, conductivity, dissolved oxygen, and chlorophyll as well as information about phytoplankton community composition. Data-collection cruises were conducted under different environmental/flow conditions.

Version history: On 3/15/24, the provisional data files hosted on this webpage were removed, and replaced with updated finalized files.

Contacts

Point of Contact :

Katy O'Donnell

Originator :

Brian A Bergamaschi, Tamara E C Kraus, Keith Bouma-Gregson, Nathan I Jumps, Patrick C Dellwo, Andrea C Jaegge, Maura Q Uebner, Kyle K Nakatsuka, Ayelet Delascagigas, Jacob D Brinkman, Crystal L Sturgeon, Jennifer Soto Perez, Katy O'Donnell, C. Sturgeon, S. Sturgeon

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Attached Files

Click on title to download individual files attached to this item.

Download Metadata_2021-2022_BayMapping.xml Original FGDC Metadata	View 46 KB application/vnd+xml
Download Backlog_2021-2022_DRS.txt	230.14 KB text/plain

[show more](#)

Related External Resources

Type: Related Primary Publication

Kudela, R.M., Senn, D.B., Richardson, E.T., Bouma-Gregson, K., Bergamaschi, B.A., and Sim, L., 2024, Evaluation and Refinement of Chlorophyll-a Algorithms for High-Biomass Blooms in San Francisco Bay (USA): Remote Sensing, v. 16, no. 6, p. 1103, <https://doi.org/10.3390/rs16061103>.

<https://doi.org/10.3390/rs16061103>

Purpose

The objective of this project is to document the variability of nutrients, phytoplankton, and related water quality parameters at high spatial resolution in the San Francisco Bay (California, USA).

Map

Communities

- USGS California Water Science Center
- USGS Data Release Products

Associated Items

- related to Phytoplankton Species Composition and Abundance in the Sacramento-San Joaquin River Delta: Microscopic Enumeration of USGS Samples, beginning in 2016 (ver. 1.1, December 2023)
- related Assessing spatial variability of nutrients, phytoplankton and related water-quality constituents in the California Sacramento-San Joaquin Delta at the landscape scale: High-resolution mapping surveys

[View Associated Items](#)

Mapping Data

USGS high-speed mapping data available through late 2022 via ScienceBase

Data through 2025 will be available by end of year

Molecular/ Toxin Data

PR2 and Silva-taxonomized
data available through 2023
on EDI, alongside mussel
toxin data 2015-2020

Newer Anacapa-processed
data through 2025 will be
available in the coming
months

Data Package Summary [View Full Metadata](#)

Title: San Francisco Estuary Institute Phytoplankton eDNA and Toxin Monitoring, San Francisco Bay, CA, 2014-2023

Creators: Killam, Daniel; Environmental Scientist; San Francisco Estuary Institute
Senn, David; Senior Scientist; San Francisco Estuary Institute
Chelsky, Ariella; Senior Scientist; San Francisco Estuary Institute...

[Show more >](#)

Publication Date: 2025-12-04

Citation: Killam, D., D. Senn, A. Chelsky, T. Otten, and R. Kudela. 2025. San Francisco Estuary Institute Phytoplankton eDNA and Toxin Monitoring, San Francisco Bay, CA, 2014-2023 ver 2. Environmental Data Initiative. <https://doi.org/10.6073/pasta/efbea4030847550c2addf08ac04543c89> (Accessed 2026-10-16).

[Copy Citation](#)

Abstract: From late 2014 present, San Francisco Estuary Institute has conducted molecular monitoring of phytoplankton in partnership with the US Geological Survey from several stations stretching from Rio Vista in the North Delta to the Lower South Bay, past the Dumbarton Bridge. These samples have been analyzed for 185 eDNA data in partnership with Timothy Otten at Bend Genetics, targeting the V7 region. The included dataset covers the 2014-2023 period.

[Show more >](#)



Package ID: edi.2198.2 (Uploaded 2025-12-04)
[previous revision](#)
[all revisions](#)

Resources: [View Full Metadata](#) (589 views)
[View Quality Report](#)
[Full Data Package \(Zip\)](#) (4 downloads)

- Data Entities:**
1. SFB_V7_PR2classified_2015_2023 (17.4 MB; 55 downloads)
[Download](#) [Explore Data](#)
 2. SFB_V7_PR2classified_2015_2023_metadata (65.8 KB; 52 downloads)
[Download](#) [Explore Data](#)
 3. SFBmussels_20152020 (73.0 KB; 53 downloads)
[Download](#) [Explore Data](#)
 4. mussellocs (533 B; 50 downloads)
[Download](#) [Explore Data](#)



IFCB data

Imagery available through
2024 from UC-hosted CA
IFCB Network repository

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San Francisco Bay (Instrument ID: IFCB113, IFCB117)

Component 1 of 8

2017 Raw data

File Size552 MB

File FormatZIP Format

Description

For each sample, the IFCB generates (i) a .hdr file containing information on instrument setup, sample metadata, and headers for the .adc file, (ii) an .adc file with tabular data on the captured ROIs, and (iii) a .roi file containing the images of ROIs themselves.

Download file

View file

Collection

California Imaging FlowCytobot Network (CA IFCB Network)

Cite This Work

Kudela, Raphael M.; Negrey, Kendra (2025). San Francisco Bay (Instrument ID: IFCB113, IFCB117). In California Imaging FlowCytobot Network (CA IFCB Network). UC San Diego Library Digital Collections. Accessed on [Date of Download]. <https://doi.org/10.6075/J0NS0V7R>

Description

Type of deployment: Coastal, topsite
Intake depth: 2m

Data Quality Control: data has not yet undergone QC.

Scope And Content

Check back in the future for updates to this dataset.

Date Collected

2017-07-31 to 2024-12-31

Date Issued

2025

Principal Investigator

Kudela, Raphael M.

Contributor

Negrey, Kendra

Host Institution

University of California, Santa Cruz

Note

Contacts:
Principal Investigator: Raphael Kudela (kudela@ucsc.edu)
Technician: Kendra Negrey (kheyashi@ucsc.edu)

Components

2017 Raw data

2018 Raw data

2019 Raw data

2020 Raw data

2021 Raw data

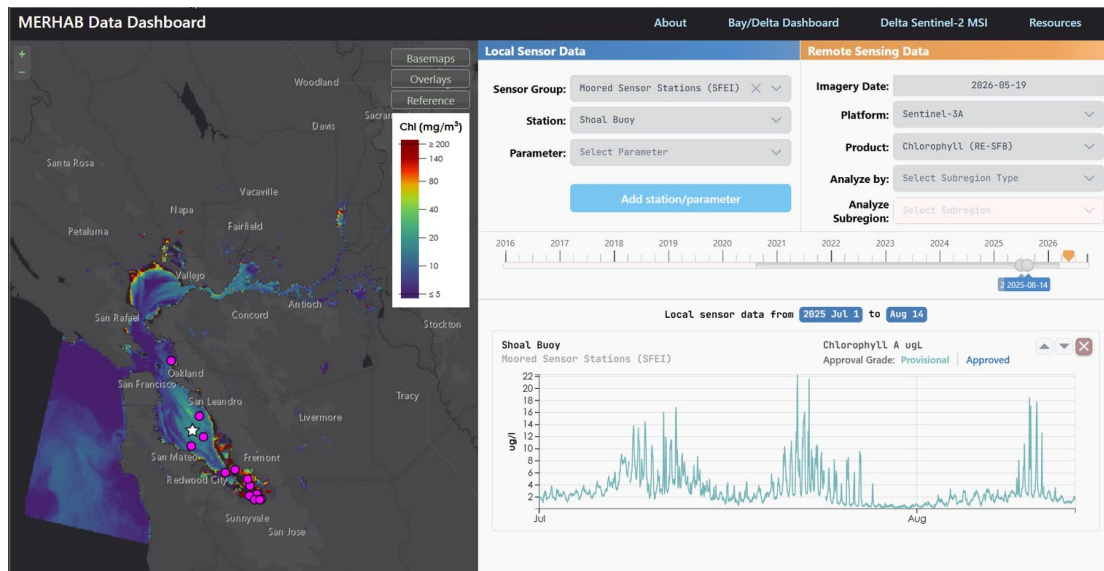
2022 Raw data

2023 Raw data

2024 Raw data

Upcoming Roadmap

Plans to roll out a combined
MERHAB dashboard with live
data alongside remote sensing



Upcoming Roadmap

Plans to roll out a combined **MERHAB dashboard** with live data alongside remote sensing

Several manuscripts are planned for submission including 2022 bloom, broad-scale HAB synthesis, remote sensed turbidity trends

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Carbon production and nitrogen drawdown of the 2022 *Heterosigma akashiwo* harmful algal bloom in San Francisco Bay

Author(s): Martin Volaric | Ariella Chelsky | David Senn

2026

In August 2022, San Francisco Bay (SFIB) experienced an overgrowth of the raphidophyte *Heterosigma akashiwo*, resulting in the most extensive harmful algal bloom (HAB) on record. The progression of the bloom, and associated parameters including concentrations of dissolved...

[2026_HAB_NEM_SFEL_report.pdf](#)



Open Bay Biogeochemical Modeling Progress Report for the Mod San Francisco Bay Numerical Modeling Update, FY2023-FY2026

Author(s): Jordyn Moscoso | Pradeep Mugunthan | Rachel Allen | Farid Karimpour | Dan Killam | Al

2026

[Open_Bay_BGC_Model_Progress_Report_FY2023-2026.pdf](#)



Determining relationships of loads, production and observed nut monitoring for planned load reductions

Author(s): Dan Killam | Ariella Chelsky | Martin Volaric | Katie Harding | David Senn

2026

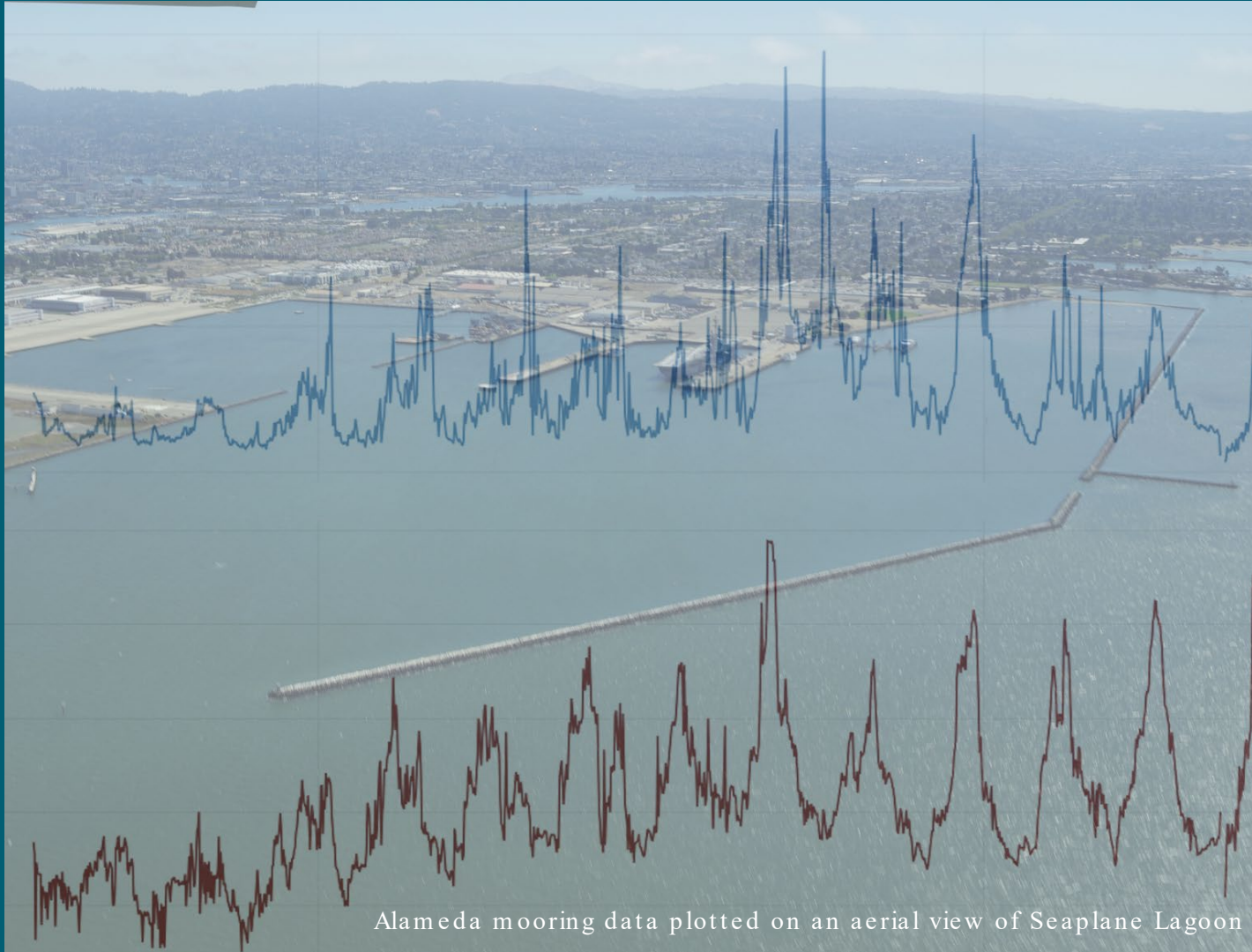


Questions?

dank@sfei.org

This work is made possible by:

- Ari Chelsky and the NMS Moored Sensor Team
- USGS California Water Sciences Center
- Marcus Beck
- Lindsey Sim and SFEI Environmental Informatics
- Bay Area Clean Water Agencies
- CA State Water Resources Control Board, Regional Water Quality Control Boards
- Raphe Kudela and UC Santa Cruz
- Tim Otten, Bend Genetics
- Bill Cochlan and SF State BioKEA, Inc.
- And current/potential collaborators like you!



Alameda mooring data plotted on an aerial view of Seaplane Lagoon