

San Francisco Bay Nutrient Management Strategy and Nutrient Watershed Permit

ACWA Nutrients Permitting Workshop
- Trading and Flexibilities

October 27, 2020

Thomas Mumley

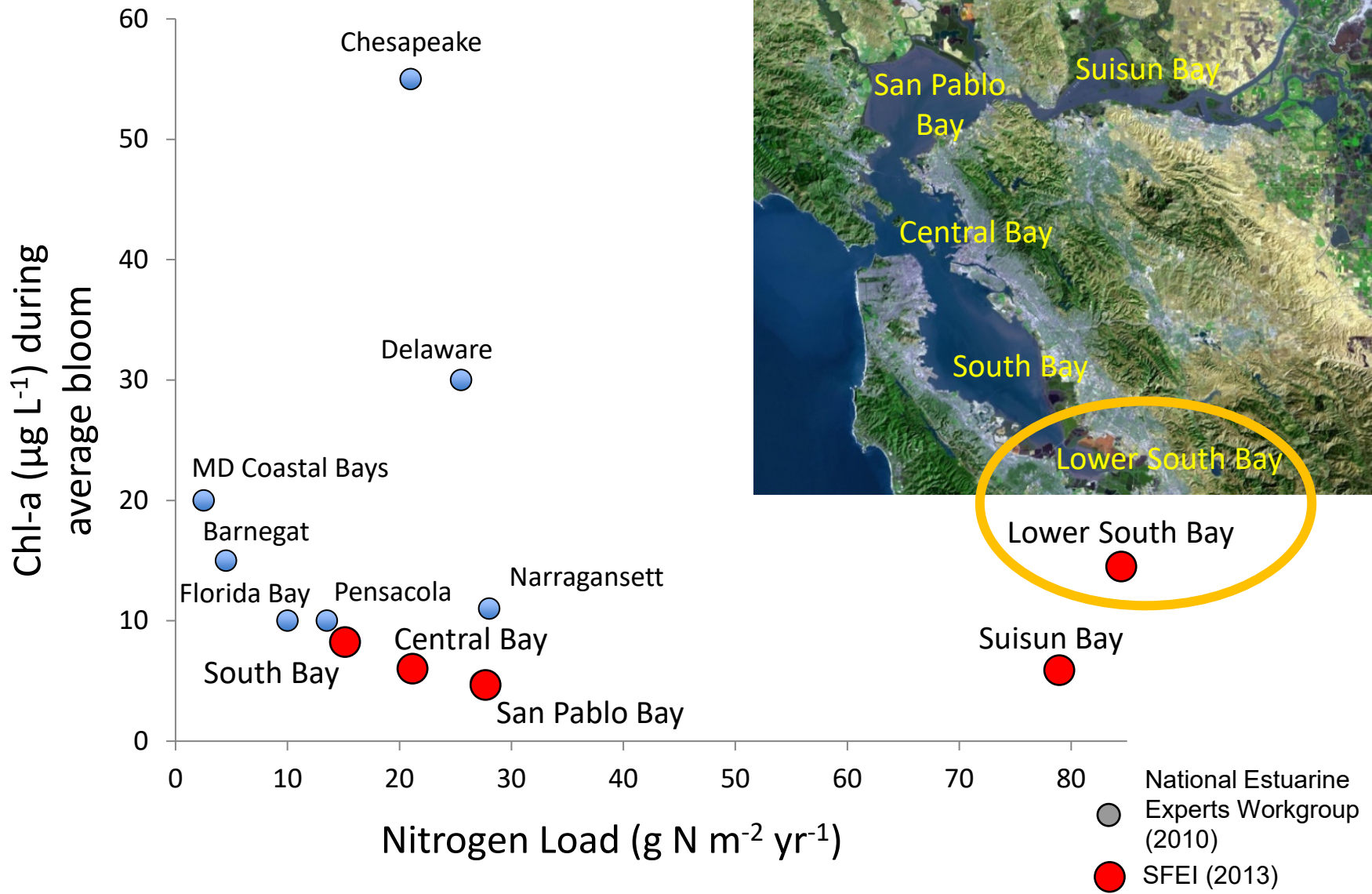
Assistant Executive Officer

San Francisco Bay Regional Water Quality Control Board



SF Bay is Nutrient Enriched

In upper 90th percentile of estuaries worldwide

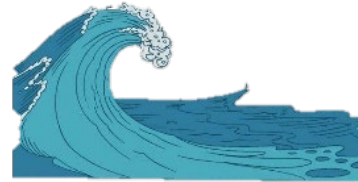


San Francisco Bay is Resilient to Nutrients

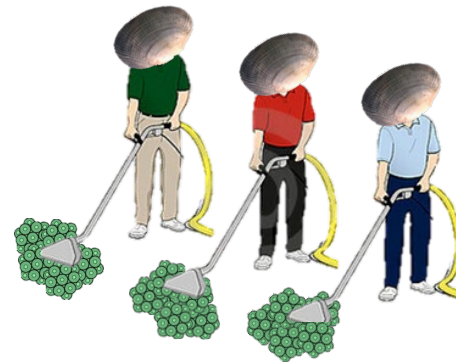
1. High Turbidity



2. Strong Tidal Mixing

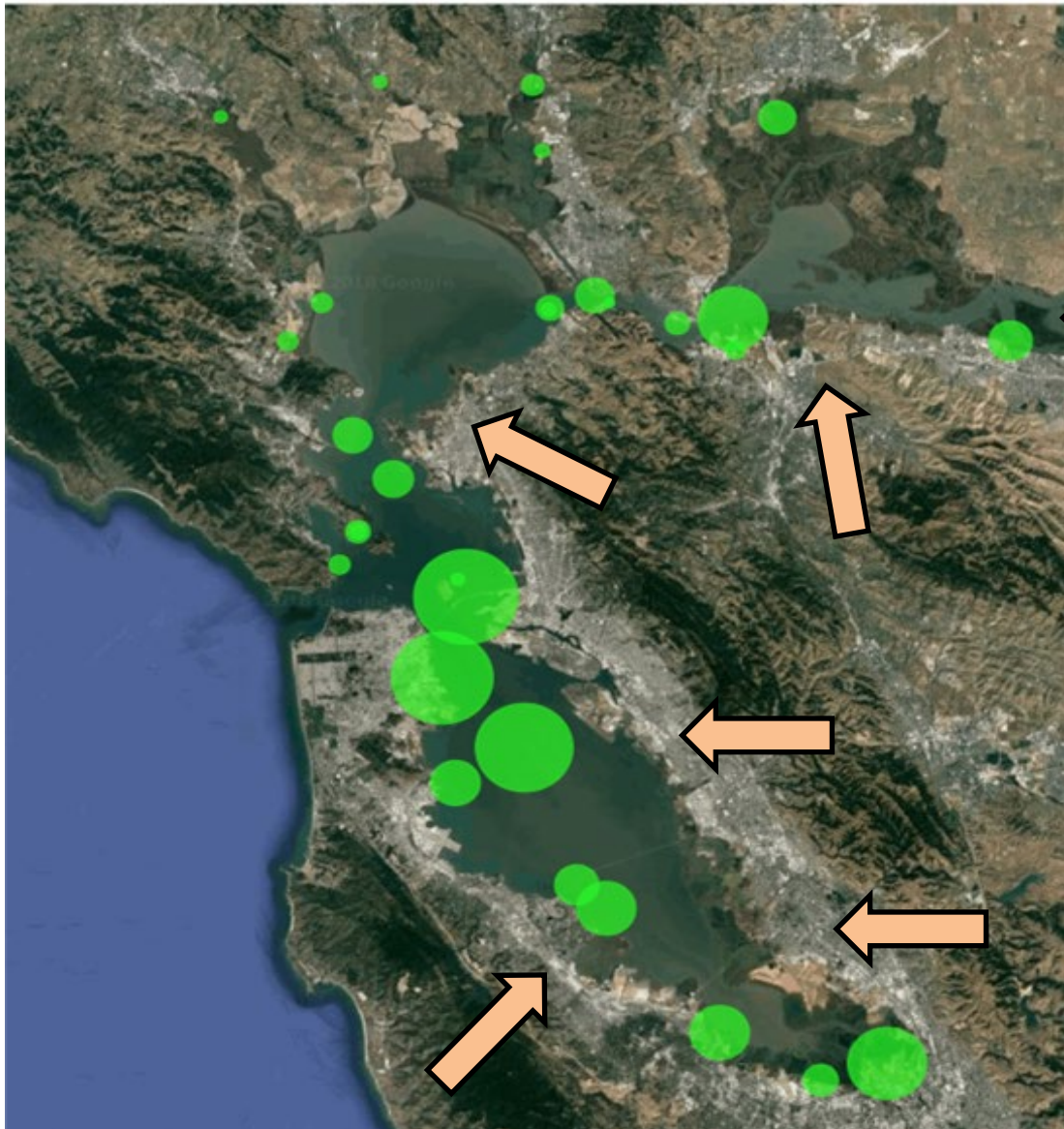


3. Filter-feeding clams



But resilience is waning

Municipal Wastewater = Major Source



Bay-wide Loads

N: 50,000 kg/d

P: 5,000 kg/d

65% WWTP

20% Delta/Ag

15% Stormwater

**Actions needed to ensure
Bay does not trend
towards impairment**

Nutrient Management Strategy



- 💧 Water quality standard
 - Nutrient numeric endpoints?
 - **Antidegradation**
- 💧 Science strategy
 - Assessment framework
 - Monitoring and modeling
- 💧 Management options
 - Grey and green alternatives
 - Other drivers, e.g., CECs
 - Multi-benefits

SF Bay Regional Monitoring Program

Since 1993

Discharger funded
~\$4 million/yr
~\$400,000 /yr
for nutrients



San Francisco Bay Nutrient Watershed Permit

2014

1st Permit

2019

2024

Monitor and Analyze
Nutrient load trends

No Effluent Limits
Nutrient discharge
levels unregulated

Study
Nutrient reduction at
WWTPs

Support
Science Program

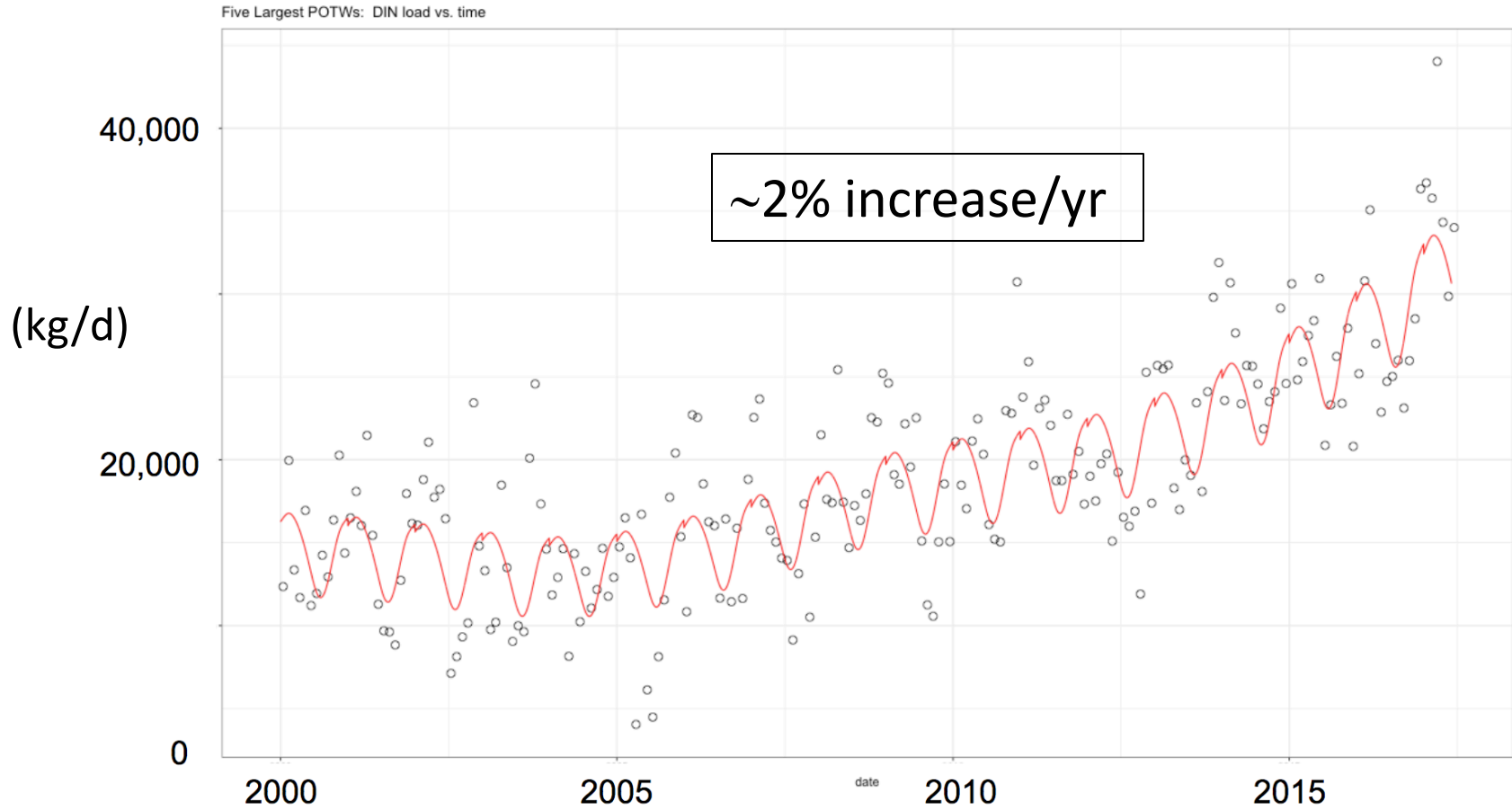
\$880K/year



Regional Science Program

(led by SFEI, governed by the Nutrient Management Strategy)

Summed 5 POTW Dissolved Inorganic N Loads



Using data from NMS Loading Study (SFEI 2015), 2000-2011, combined with new loading data (HDR 2017)

Nutrient Reduction Study Report

- Main report summarizes study findings for all plants
- 37 individual plants
 - Existing plant data
 - Optimization
 - Sidestream treatment
 - Plant upgrades
 - Emerging technologies



Bay Area Clean Water Agencies
Nutrient Reduction Study

Potential Nutrient Reduction
by Treatment Optimization, Sidestream
Treatment, Treatment Upgrades, and Other
Means

Final Report
June 22, 2018



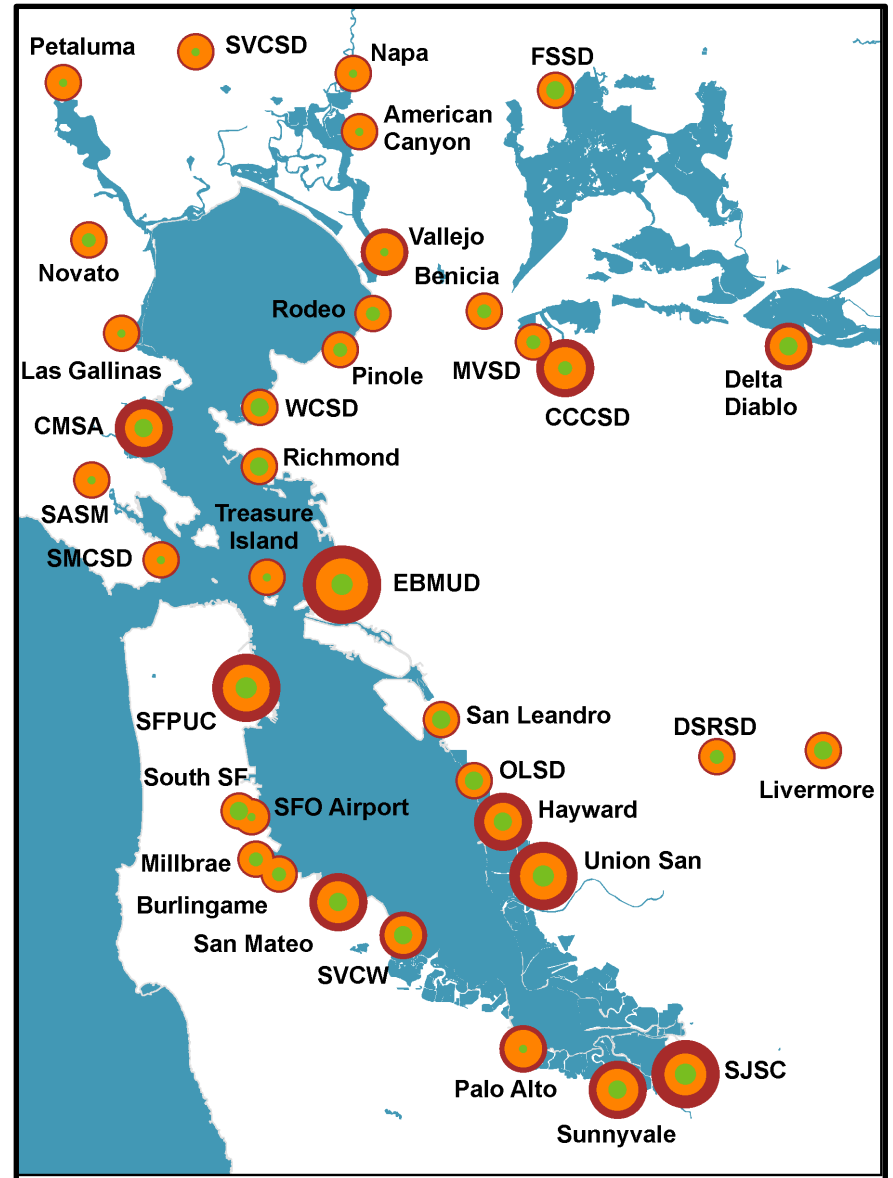
Nutrient Load Reduction Costs

2018 dollars

Total Nitrogen Load Reduction	Total Nitrogen Concentration	Estimated Total Capital Cost
0%	32 mg/l	\$0
10-20%	26 mg/l	\$119 - \$391M
60%	< 15 mg/l	\$7 Billion
80%	< 6 mg/l	\$8.5 Billion

Legend (Circle Size Increases with Cost)

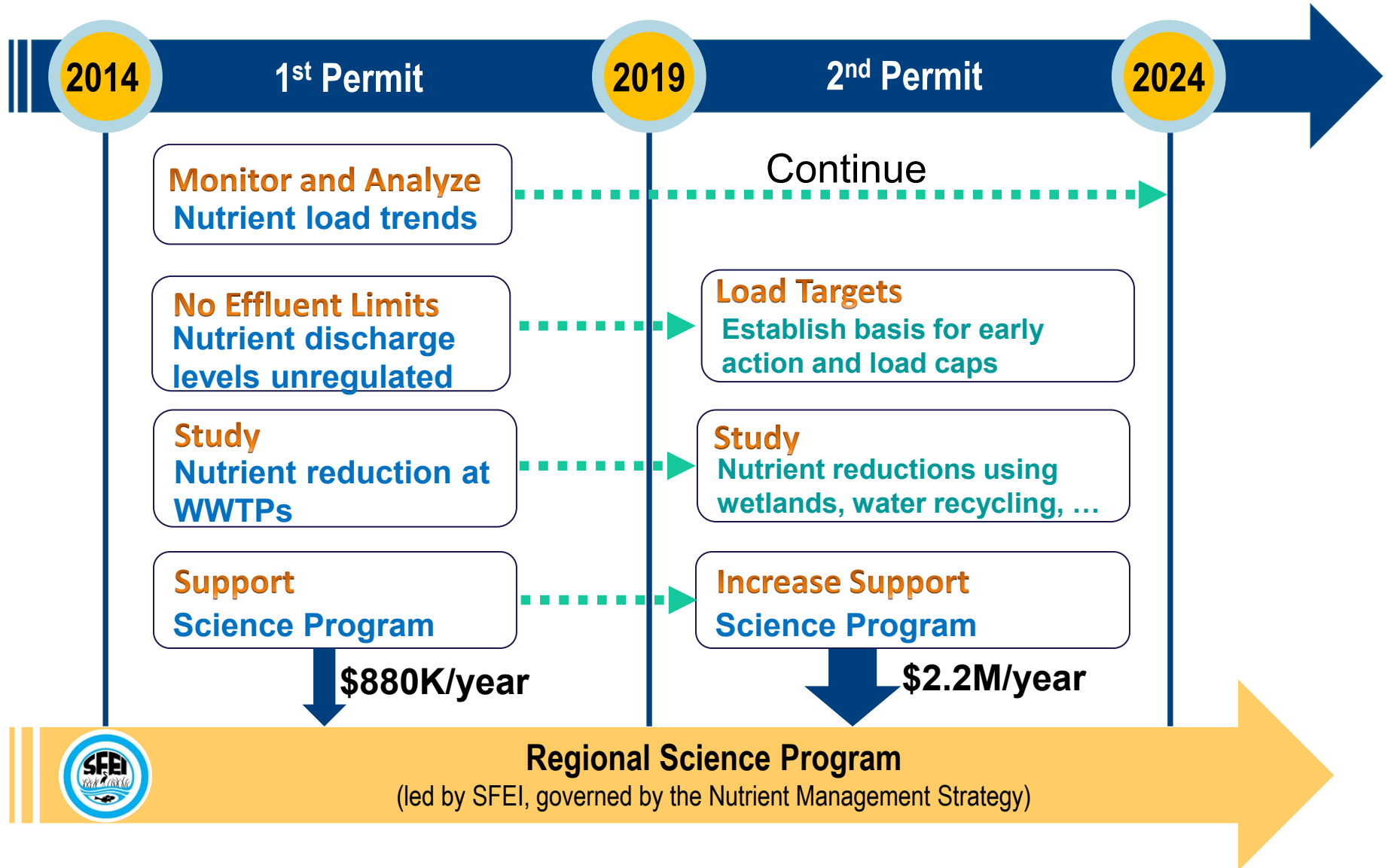
- Cost for 10-20% Nutrient Reduction
- Cost for 60% Nutrient Reduction
- Cost for 80% Nutrient Reduction



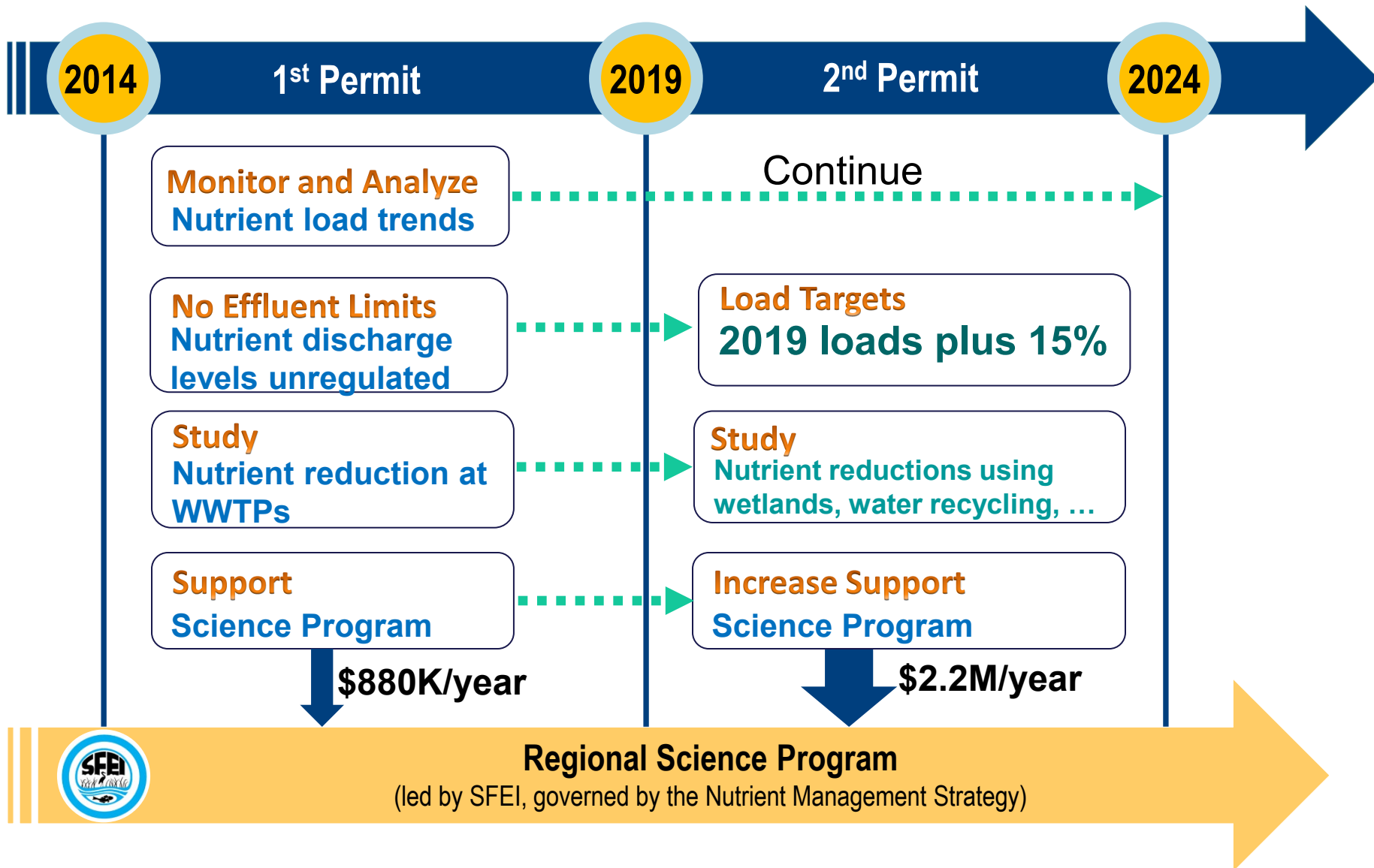
Science Focus Areas

1. Nutrient Loads | Transformations
2. Phytoplankton Blooms & Low DO
3. HABs & Toxins
4. Coastal Ocean Impacts
5. Future Scenarios

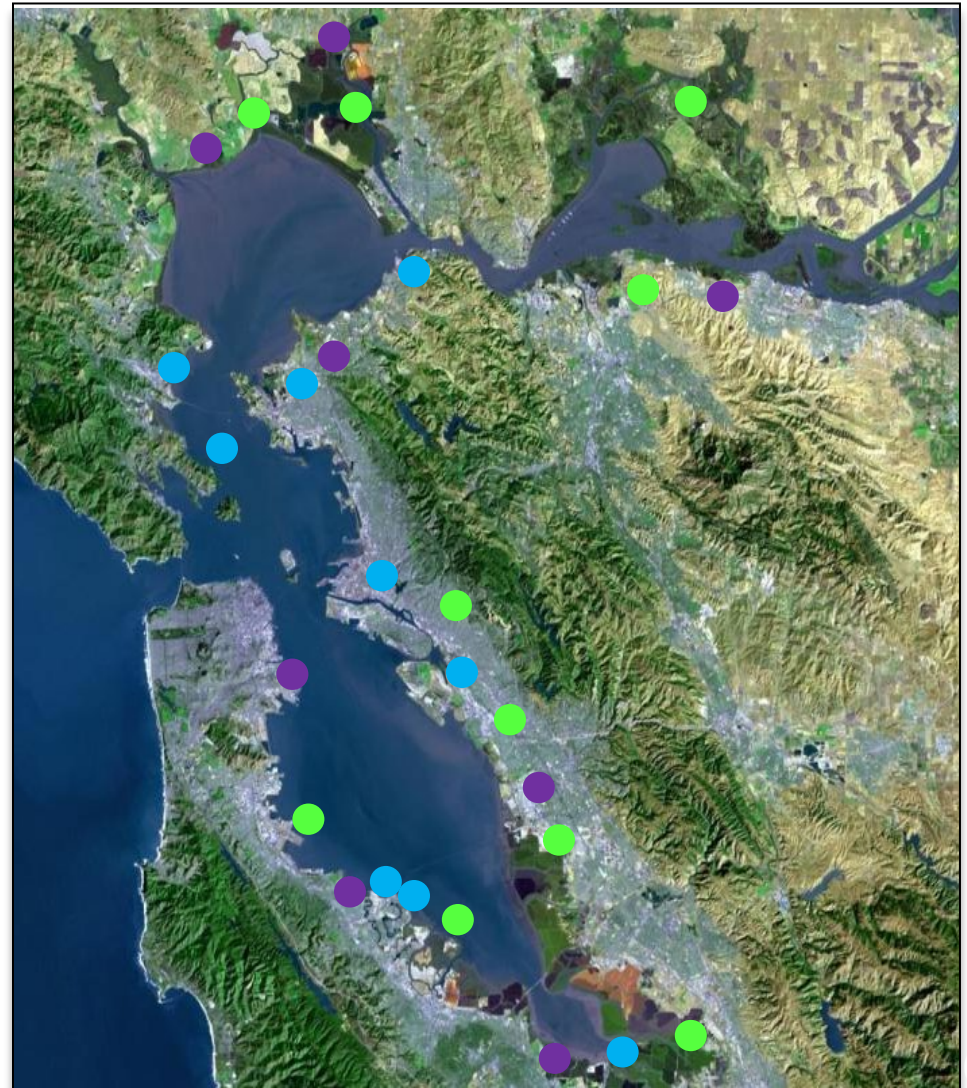
San Francisco Bay Nutrient Watershed Permit



San Francisco Bay Nutrient Watershed Permit



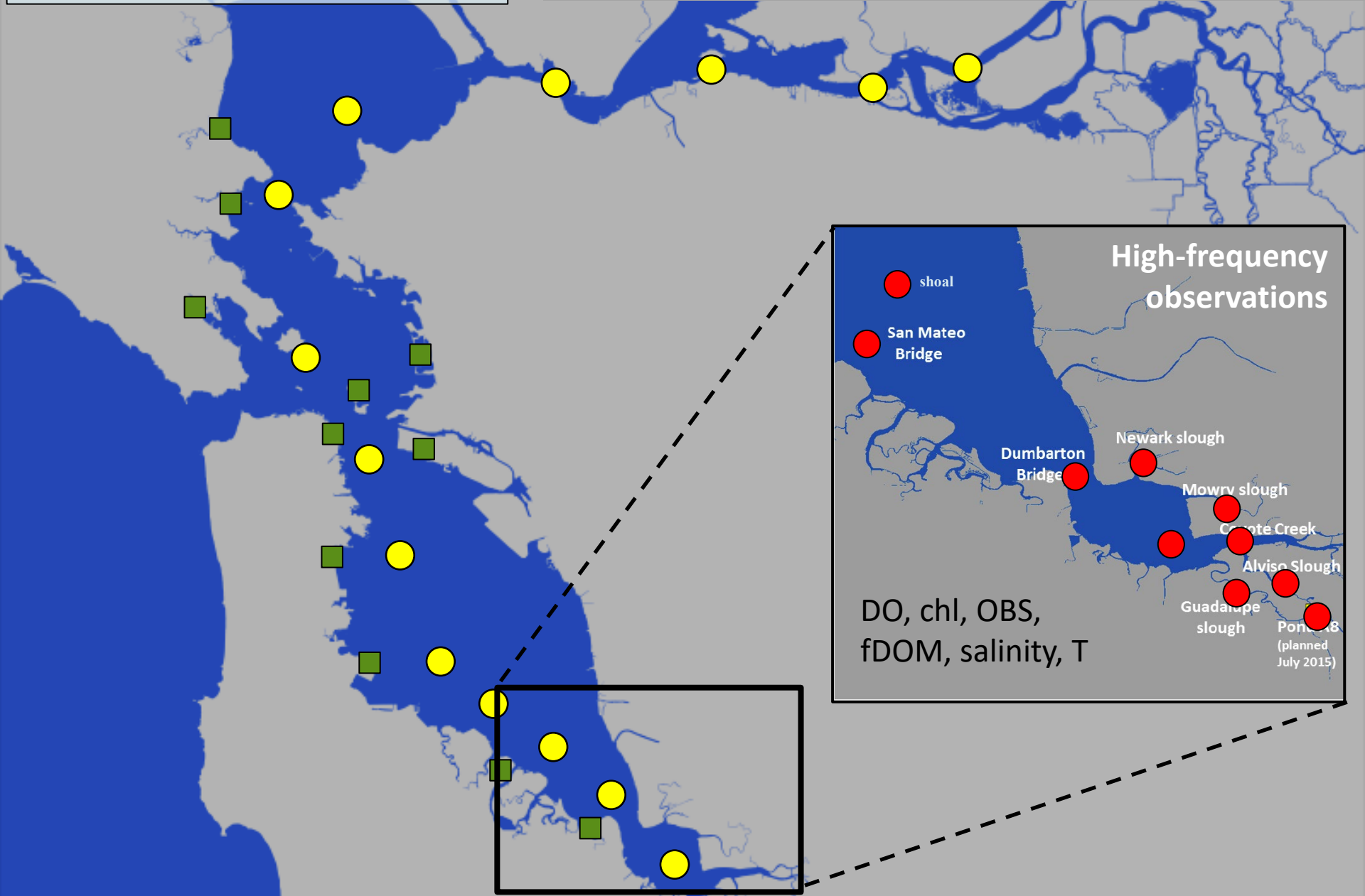
Nature-Based Treatment and Beneficial Reuse Opportunities



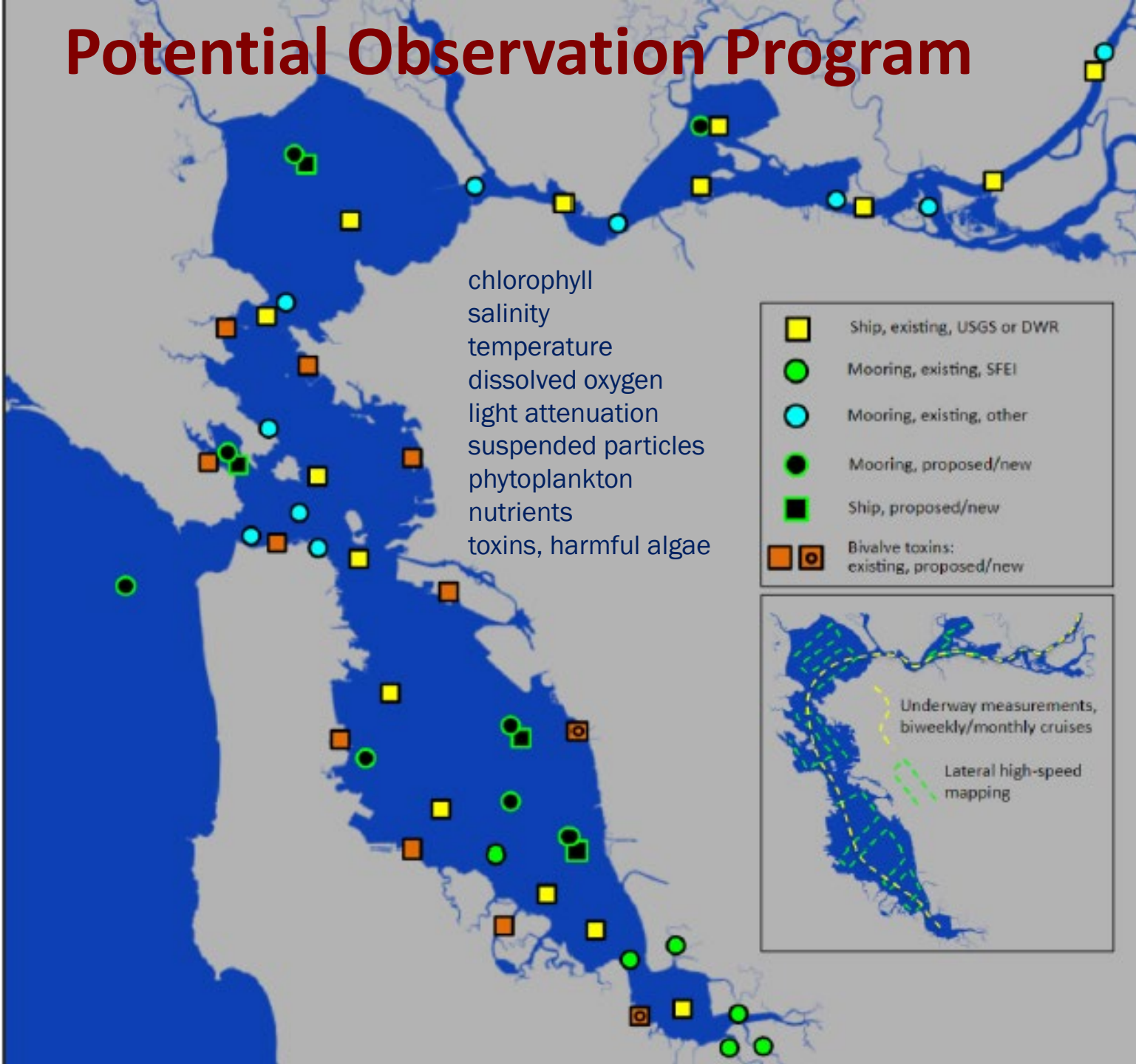
● Ship-based monitoring, with USGS

■ Mussels

SF Bay Nutrient Management Strategy Observation Program

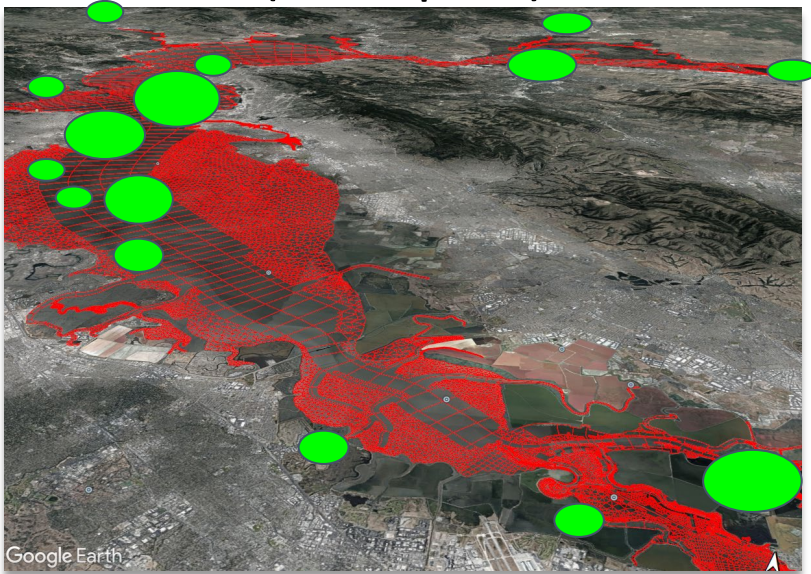


Potential Observation Program



Numerical Models

Hydrodynamic model (Transport)



Transport = advection + dispersion + mixing

Delft Flexible Mess

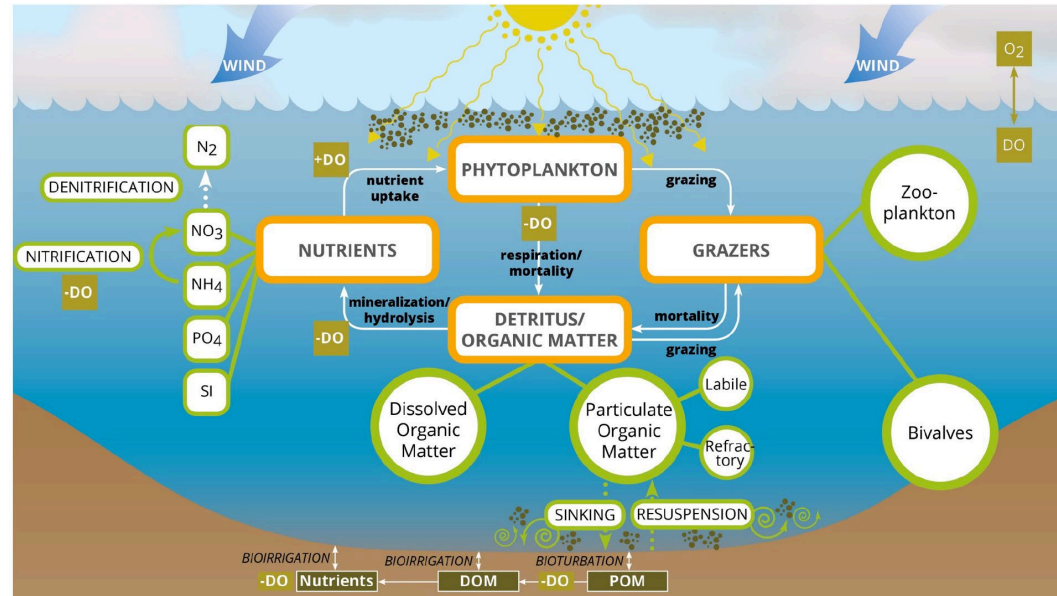
500k 3D cells (10 vertical sigma layers)

Grid resolution: 2km to 20m

~10 days to run 1 year

+

Biogeochemical model (Transformations)



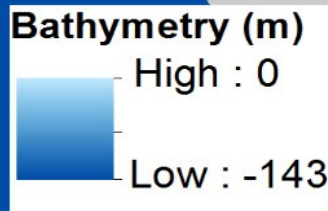
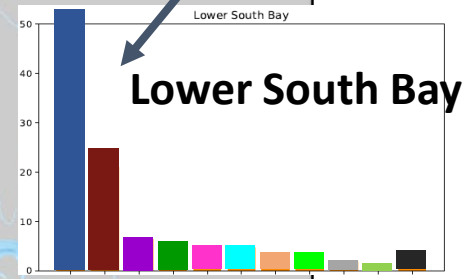
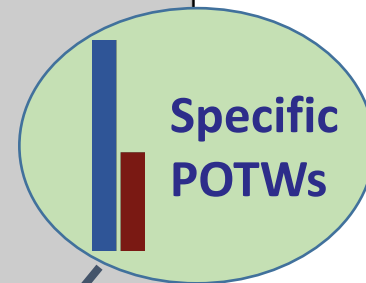
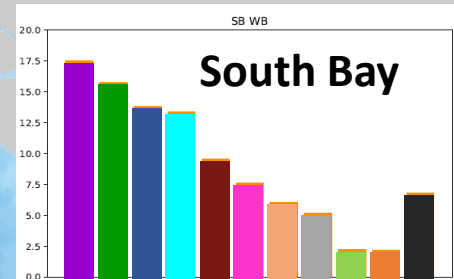
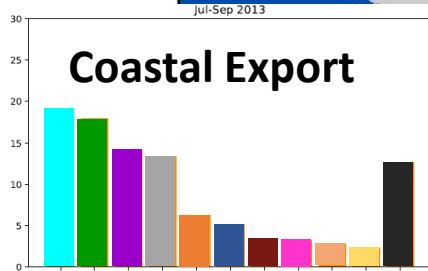
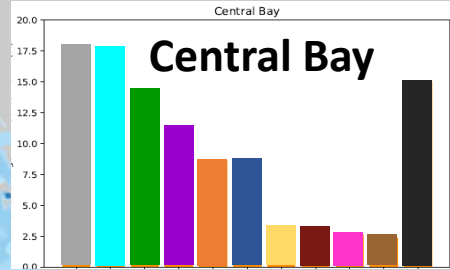
DELWAQ

~10-15 days to run 1 yr in high resolution

Embayment - Based Nutrient Load

San Pablo Bay

Suisun Bay



(2024) 3rd San Francisco Bay Nutrient Watershed Permit

Embayment aggregate load caps

- Current loading with some buffer
- Shared responsibility ↔ trading
- Embayment and individual plans

Bay observation program

- Trend indicators / triggers
 - Level one = enhance studies
 - Level two = corrective action

3rd San Francisco Bay Nutrient Watershed Permit

Embayment aggregate load caps

- If exceeded, compliance with individual caps
- Recognition of early action(s)
- Recognition of response plan(s)

Bay observation program

- Trend indicators / triggers
 - Level one = enhance studies
 - Level two = corrective action

Keys to Success

- 💧 Joint fact-finding-based science strategy
- 💧 Multi-benefit, bang-for-buck approach
- 💧 Sustainable observation program



B A C W A
B A Y A R E A
C L E A N W A T E R
A G E N C I E S



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