Nutrients Assessment Framework Stakeholder Meeting

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California Water Boards
State Water Resources Control Board
Regional Water Quality Control Boards

Purpose of Today's Meeting

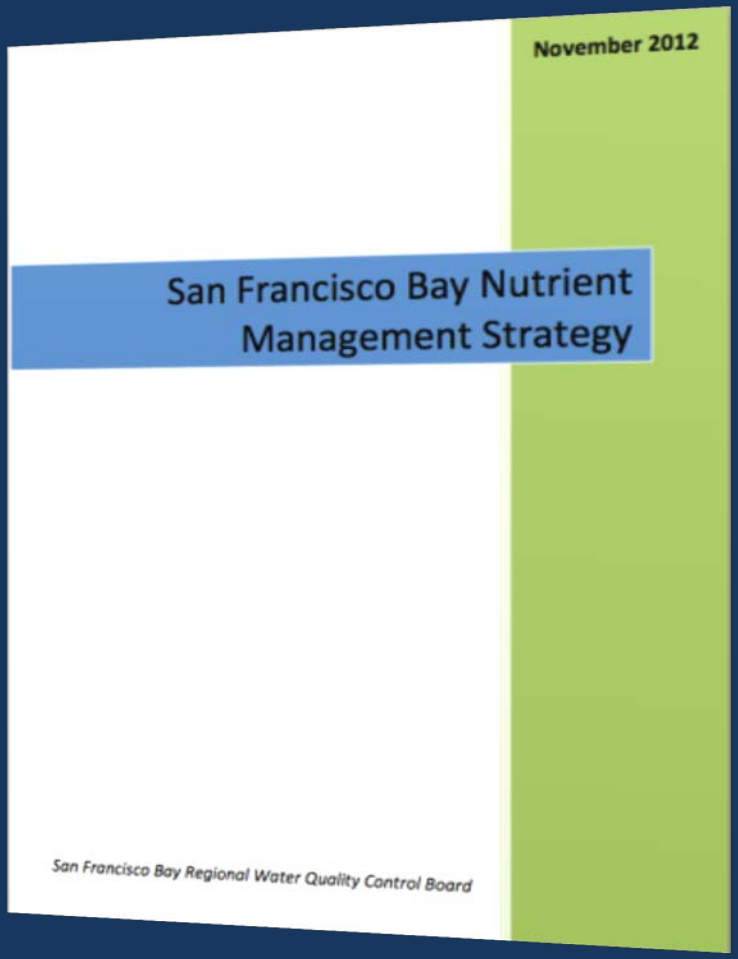
- Present and discuss approach for using Chlorophyll-a endpoints to assess nutrient impacts on the Bay

- Opportunity to ask questions about analyses and draft assessment framework
  - Martha Sutula, Dave Senn, Jim Cloern and Raphe Kudela

- Discuss Next Steps

SF Bay Nutrient Strategy

- Element 4 – Establish Guidelines
- Nutrient Assessment Framework



What Is An Assessment Framework?

A decision support tool to assess and classify Bay segments by status of eutrophication and other adverse effects of nutrient overenrichment

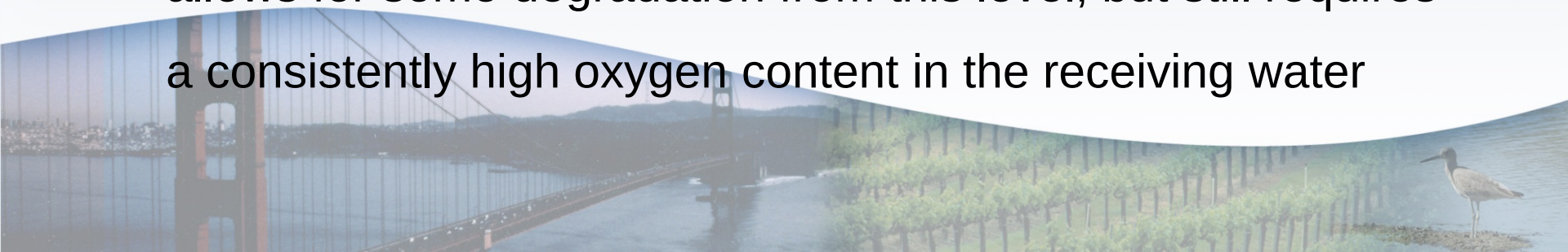
- Condition assessment i.e., assess risk of impairment
- Provides management targets for use in modelling to determining “allowable loads”

Water Board Perspective

- Draft assessment framework
  - Starting Point
- Classification bins and thresholds
  - Test drive and refine
- Assessment framework ≠ regulatory
  - Integral to NMS implementation
  - Useful to inform monitoring and modeling

Review - Basin Plan DO Objectives

- DO numeric objectives - minimum values to protect fish
- Higher concentrations - desirable to protect sensitive aquatic forms
- In areas unaffected by waste discharges, a level of about 85 percent of oxygen saturation exists
- A three month median of 80 percent of oxygen saturation allows for some degradation from this level, but still requires a consistently high oxygen content in the receiving water



Today's Agenda

- Jim Cloern - SF Bay perspective
- Martha Sutula – Analyses completed
- Martha Sutula – Framework development
- Dave Senn – Framework application
- Naomi Feger – Next Steps
- Dave Senn – Relevance to Science Plan

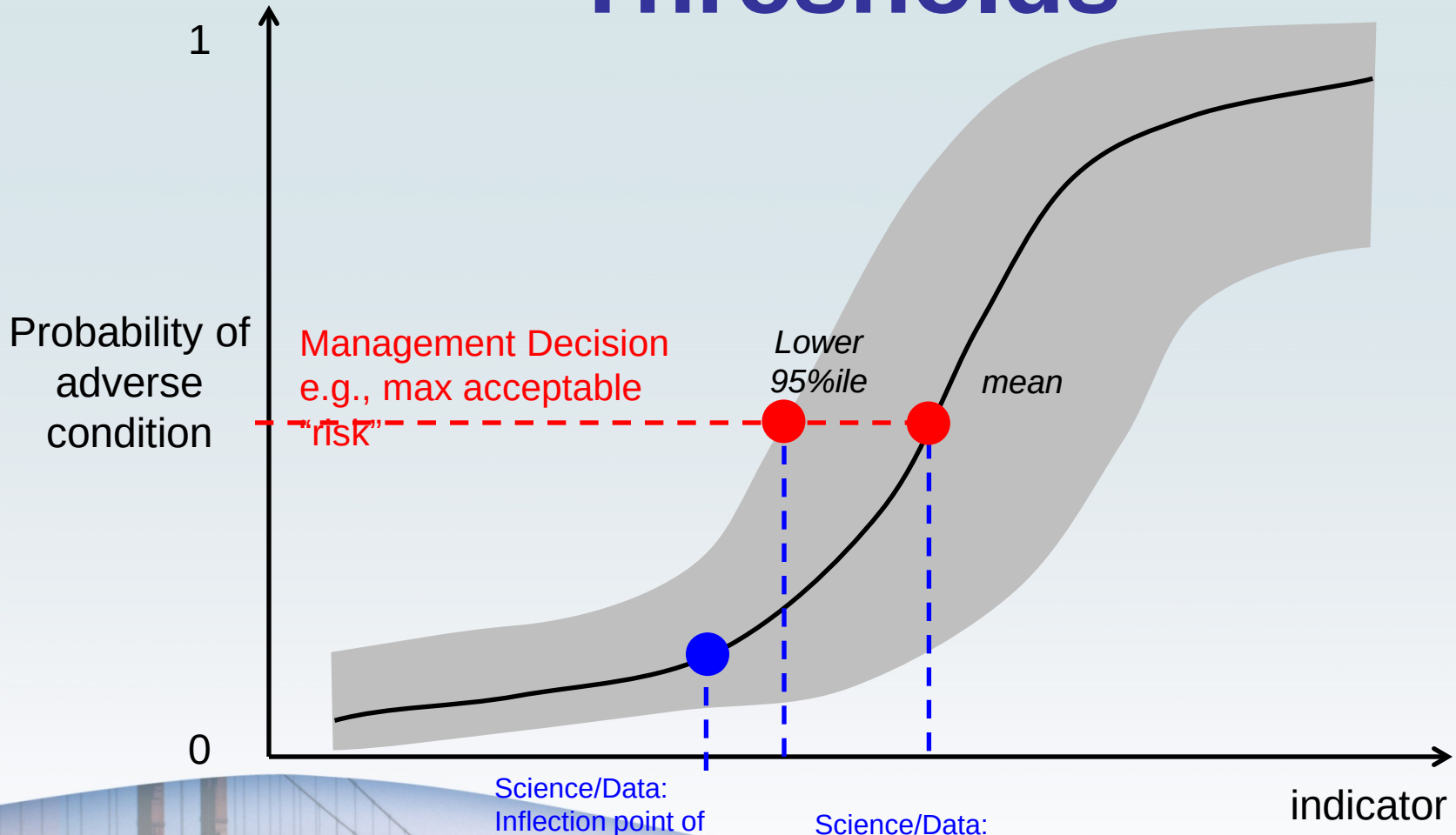
Water Board Perspective & Next Steps

What have we learned?

- Currently attaining numeric DO Objectives - based on USGS data
- 80% saturation 3-month median is about 7 mg/L

Sub-embayment	10th Percentile of Summer Vertical Median DO (mg/L)	10th Percentile of DO Summer Vertical Minimum (mg/L)	% of Time Summer DO< 5 mg/L
Lower South Bay	5.7	5.6	2.9
South Bay	5.9	5.8	0.5
Central Bay	6.5	6.5	0.2
North Central Bay	6.8	6.4	1.9
San Pablo Bay	7.1	7	0
Suisun Bay	7.8	7.7	0

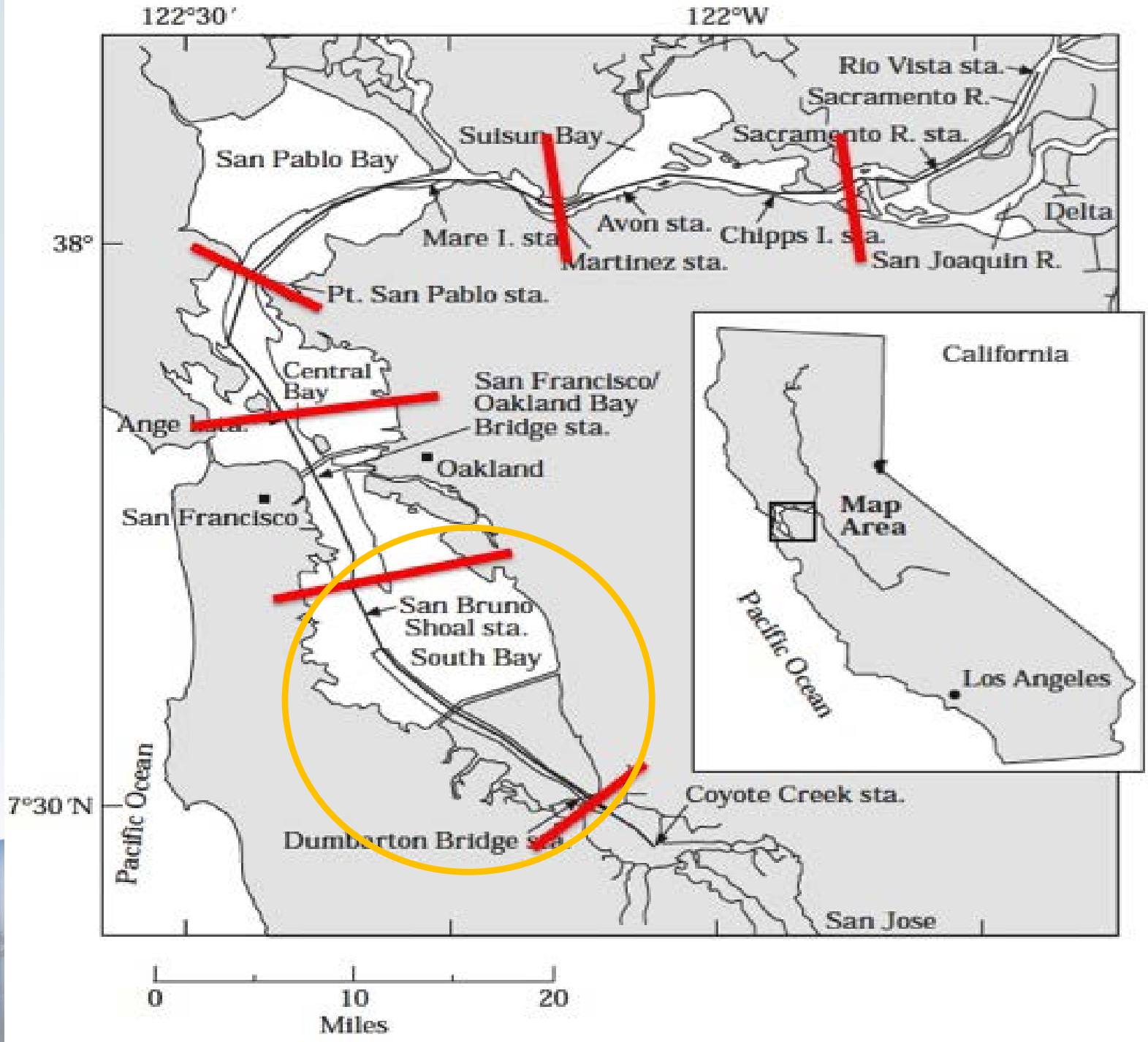
Chl-a DO Classification Thresholds



Chl-a DO Classification Thresholds

- Mean vs 95% LCL of the mean
- High vs low condition
- Impairment vs degradation

DO % (= ~ DO mg L^{-1})	Predicted Mean Chl-a (95% CI) for τ = 0.1	
	LSB (N=48)	SB (N=161)
80% (~ 7.0 mg L^{-1})	4 (-4 – 12)	14 (13 – 15)
66% (~5.7 mg L^{-1})	25 (15– 39)	32 (30 – 32)
57% (~ 5.0 mg L^{-1})	36 (30 – 54)	44 (40 – 46)


122°30′
122°W
38°
37°30′N
Rio Vista sta.
Sacramento R.
Sacramento R. sta.
Suisun Bay
San Pablo Bay
Mare I. sta.
Avon sta.
Chipps I. sta.
Martinez sta.
Delta
San Joaquin R.
Pt. San Pablo sta.
Central Bay
San Francisco/ Oakland Bay Bridge sta.
Oakland
San Francisco
San Bruno Shoal sta.
South Bay
Coyote Creek sta.
Dumbarton Bridge sta.
San Jose
Pacific Ocean
California
Map Area
Pacific Ocean
Los Angeles
0
10
20
Miles

Recommendations

- 1. Improve scientific basis for segmentation
- 2. Include diked baylands, restored salt ponds and tidal sloughs in future iterations of assessment framework
- 3. Include dissolved oxygen classification and recommendations for monitoring in future iterations
  - Improve scientific basis for DO expectations in deepwater and margin habitats of SFB subembayments

Recommendations

- 4. Optimize spatial-temporal sampling of AF indicators to best align quality of the information produced, while balancing costs, logistics, and power to detect trends

  identify most sensitive lines of evidence

2016 – Monitoring Plan Development

Recommendations

- 5.Reduce sources of uncertainty in chlorophyll-a classification

(HAB abundance and toxin classification)

  - Significance of ecological and human risk of HABs
  - Synthesize scientific understanding of chronic effects of HAB toxins
  - Improve linkage of chlorophyll-a to HAB toxin concentrations rather than cell counts

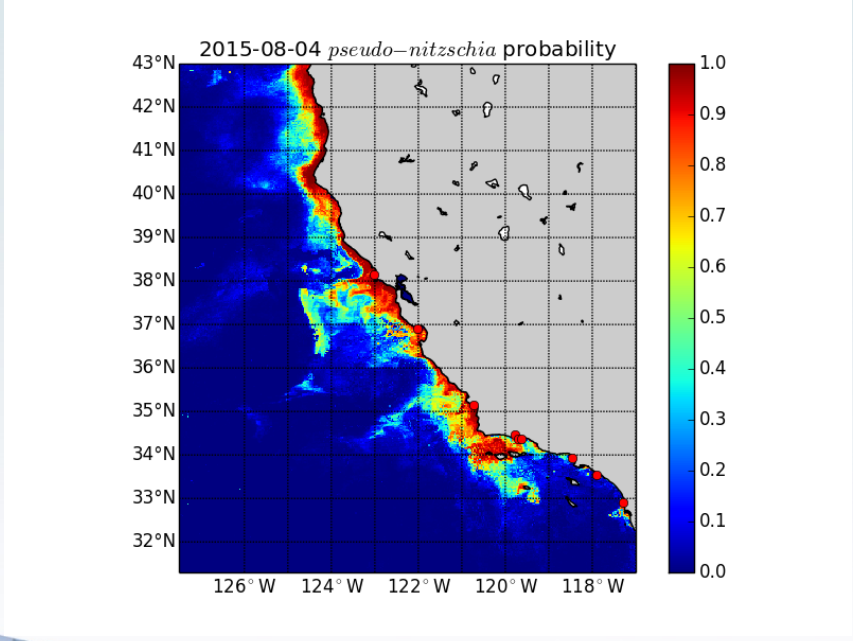
- 6. Link HABs more specifically to nutrients

Harmful Algal Toxins

- Human health
  - Alert levels & shellfish bed closure guidelines – marine toxins
  - Recreation and drinking water - microcystin
- Aquatic life – no guidelines
- Need to establish chronic effect levels

Harmful Algal Toxins

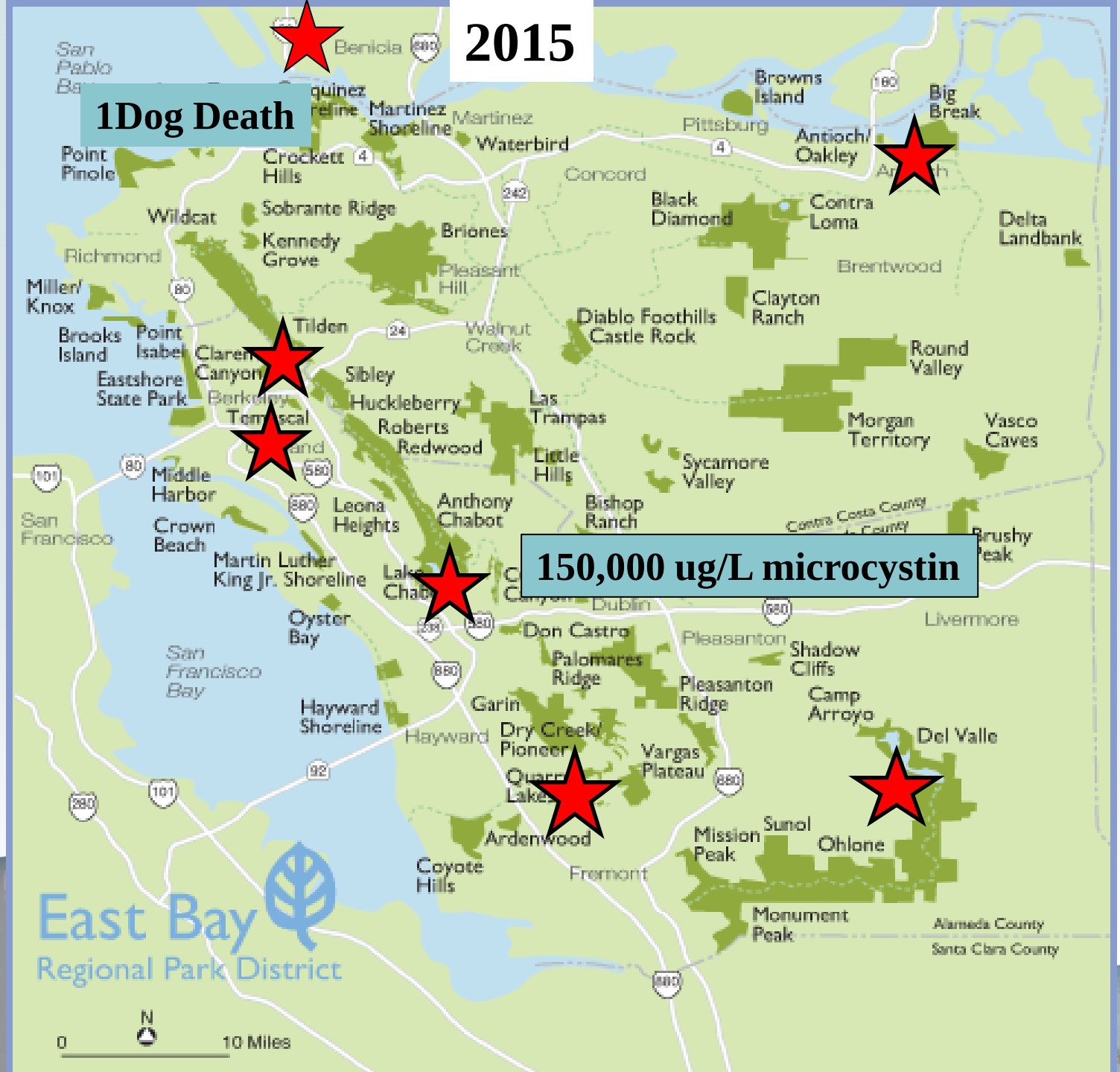
- New and Growing Concerns
  - Pacific Ocean – long duration pseudo-nitzchia blooms



www.cencoos.org/data/models/hab

Harmful Algal Toxins

- New and Growing Concerns
  - Regional freshwater Lakes
  - Source and fate of microcystin to the Bay


2015
1Dog Death
150,000 ug/L microcystin
Benicia
Martinez
Martinez Shoreline
Waterbird
Crockett Hills
Point Pinole
Wildcat
Sobrante Ridge
Kennedy Grove
Briones
Pleasant Hill
Concord
Pittsburg
Antioch/ Oakley
Browns Island
Big Break
Black Diamond
Contra Loma
Delta Landbank
Brentwood
Clayton Ranch
Diablo Foothills
Castle Rock
Walnut Creek
Round Valley
Morgan Territory
Vasco Caves
Las Trampas
Little Hills
Sycamore Valley
Bishop Ranch
Brushy Peak
Livermore
Dublin
Pleasanton
Shadow Cliffs
Don Castro
Palomares Ridge
Pleasanton Ridge
Camp Arroyo
Del Valle
Garin
Dry Creek/ Pioneer
Vargas Plateau
Hayward
Hayward Shoreline
Ardenwood
Fremont
Coyote Hills
Mission Peak
Sunol
Ohlone
Monument Peak
Alameda County
Santa Clara County
Richmond
Miller/ Knox
Brooks Island
Point Isabel
Eastshore State Park
Berkeley
Tilden
Claremont Canyon
Tamalpais
Sibley
Huckleberry
Roberts Redwood
Middle Harbor
Crown Beach
Martin Luther King Jr. Shoreline
Leona Heights
Anthony Chabot
Lake Chabot
Oyster Bay
San Francisco
San Francisco Bay
East Bay
Regional Park District
N
0
10 Miles

How to Use Indicators as Multiple Lines of Evidence, given Uncertainty

- Three indicators should be given strong weight given their strong linkage to beneficial uses:
  - DO
  - HAB toxins
  - GPP
- Two indicators should be given moderate weight
  - HAB abundances, pending better characterization of HAB risk
  - Chlorophyll-a endpoints, because of uncertainty in thresholds that lead to unacceptable risk of HAB toxins and low DO
  - Use these endpoints as testable hypotheses, to be refined by modeling and monitoring
- Focus on research and data visualization for phytoplankton composition and food quality index investigate trends and explain drivers

SFB Has Potential for Biomass That Exceeds High Risk Endpoint, Based on Available Dissolved Inorganic Nitrogen (DIN)

2000-2014 Median Values of DIN, Measured *chl-a*, and Potential chl-a if all DIN was Assimilated into Additional Phytoplankton Biomass (Eppley et al. 1971)

Sub-embayment	DIN (µM)	Measured Chl-a (mg m^{-3})	Potential Chl-a (mg m^{-3})
SUB	36.9	2.5	39.7
SPB	29.0	3.8	33.6
SB	31.4	5.5	39.2
LSB	57.5	7.5	67.0

Next Steps

- Finalize report – fix errors but no significant changes
- Prioritize report recommendations
  - Science Plan development
- Sensitivity analysis – part of model development?
- Multiple lines of evidence – need for more discussion