

An aerial photograph of the San Francisco Bay area, showing the bay's coastline, the city of San Francisco, and the surrounding hills. The water is a deep blue, and the land is a mix of green and brown. The text is overlaid on the top half of the image.

Estuarine Nutrient Numeric Endpoint
San Francisco Bay Stakeholder Advisory
Group (SF Bay SAG) Meeting
October 4, 2010, 1- 3:30 pm

Meeting Goals

- Provide overview of approach and near-term steps to develop nutrient numeric endpoints (NNE) for SF Bay
- Form the SF Bay stakeholder advisory group by selecting members and alternates

Agenda

- Welcome, introductions, meeting goals, logistics
- Overview of NNE project, organization and key staff
- NNE conceptual approach and workplan development for San Francisco Bay
- Role and selection of San Francisco Bay stakeholder advisory group members and alternates (SF Bay SAG)
- Summary of action items, next steps

SWRCB is Developing Nutrient Objectives for California Waterbodies

- Completed nutrient numeric endpoint (NNE) framework for streams & lakes (EPA 2006)
- Conceptual approach and work plan drafted for NNE development in California estuaries (EPA 2008)
- In 2008, SWRCB staff initiated a project to develop NNE framework for estuaries
 - Scope of effort called for literature review and work plan specific for San Francisco Bay

Philosophical Approach to Developing Nutrient Objectives

- Science-based, consistent approach statewide
 - Regional customization if supported by science
- Transparent, public process
 - Opportunities for stakeholders to provide feedback throughout process

Project Organization

**Stakeholder
Advisory Group
(SAG)**

**State Water
Resources
Control Board
(SWRCB)**

**State & Regional
Technical Advisory
Group (STRTAG)**

Stakeholder Advisory Groups (SAGs)

- Role: Provide feedback to SWRCB on NNE science and policy
- Composed of members of regulated community, land owners, environmental NGOs, and interested public



Project Organization

**Stakeholder
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**State Water
Resources
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**State & Regional
Technical Advisory
Group (STRTAG)**

Technical Team (TT)

**Science Advisory
Board (SAB)**

Technical Team

- Role: Synthesize available science relevant for NNE development
- Composed of experts on the ecosystem components impacted by eutrophication

Macroalgae

Submerged aquatic vegetation

Fisheries

Benthic ecology

Hydrodynamics

Phytoplankton/nekton

Biogeochemistry/water quality

- Team composition can change as a function of focus of the particular product

Science Advisory Board

- Role: review products and recommendations of the technical team
- Composed of 3-4 nationally recognized experts in eutrophication (outside of California)
- Operate completely independent of technical team

Project Organization- SF Bay

SF Bay SAG

**State Water
Resources
Control Board
(SWRCB)**

SF RWQCB

STRTAG

SF Bay Technical Team

**Science Advisory
Board (SAB)**

Project Organization –Key Staff

- SWRCB lead - Rik Rasmussen and Steve Camacho
- SF RWQCB lead- Naomi Feger
- EPA Region 9 – Suesan Saucerman and Terry Fleming
- SF Bay and Coastal SAG Lead – Brock Bernstein
- Statewide Technical Team Lead- Martha Sutula (SCCWRP)
- SF Bay Technical Team –Lester McKee (SFEI)

Agenda

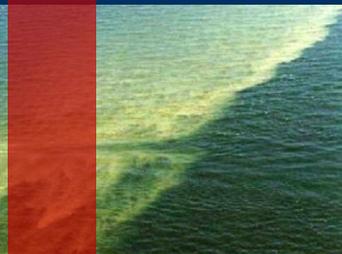
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Increased Nitrogen and Phosphorus can Cause “Eutrophication” in Water Bodies

Increased Nutrient Loads



Eutrophication:
Excessive Organic
Matter Production



Low Dissolved Oxygen

Harmful Algal Bloom

Loss of Critical Habitat

Alteration of Ecosystem Services

A. Increased Nutrient/Organic Matter Loads, and/or Altered N:P:Si Ratios

B. Ecological Response

Primary Producers

Water/Sediment Chemistry

Consumers (Invertebrates, Birds, Fish, Mammals)

C. Co-Factors, e.g.:

Hydraulic Residence Time
Climate
Suspended Sediment
Stratification
Estuarine circulation
Hyposgraphy
Top-down grazing
Denitrification

Ecosystem Services and Beneficial Uses

Ecological Services

Beneficial Uses

Habitat, Food for Birds, Fish, Invertebrates, and Mammals

EST, MAR, WILD

Protection of Biodiversity, Spawning, Migration and Threatened/Rare Species

SPWN, MIGR, RARE

Production of Commercial Recreational Fish and Invertebrates

COMM, SHELL, AQUA

Human Services

Aesthetics, Odor

REC2

Good Water Quality, Taste

REC1

Conceptual Model:
Linking Nutrients,
Ecological Response,
& Beneficial Uses

Co-factors modulate
ecological response

California's Approach: Nutrient Numeric Endpoint (NNE) Framework

SWRCB Staff Strategy: Narrative objectives (criteria) with numeric guidance (coined as “NNE”)

Conceptual Approach:

1. Response indicators (rather than nutrients) to assess “eutrophication”
2. Use multiple indicators in a “weight of evidence” approach
3. Create tools to link ecological response to nutrient loads/ concentrations et al. co-factors (e.g. hydrology)

Stream NNE Indicators: Example of 303(d) Algal Biomass Thresholds by Beneficial Use



Benthic Algae
+
pH
+
Dissolved Oxygen

Response Indicator	Beneficial Use					
	COLD	WARM	REC-1 &-2	MUN	SPWN	MIGR
Benthic Algal Biomass (mg chl a m ⁻²)	100	150	Same as WARM/COLD	100	100	Not Defined

NEE Benthic Biomass Spreadsheet Tool

- Spreadsheet tools to convert response *targets* to site-specific *TN and TP concentration goals*
- Account for co-factors that modify biological response to nutrients
- Used for initial screening – defer to more complete modeling / monitoring studies

The screenshot displays the 'USER INPUTS' and 'RESULTS' sections of the spreadsheet tool. The 'USER INPUTS' section includes fields for Site (SJTC3), Analyst (Betty Fetscher), and Date (1/11/2010). It also contains tables for Nutrient Concentrations (mg/L) and Unshaded Solar Radiation (cal/cm²/d). The 'RESULTS' section includes a table comparing different methods for determining Max algal density and Benthic chlorophyll a, and a scatter plot titled 'Revised QUAL2K, benthic chl a' showing TP (mg/L) vs TN (mg/L) with observed data points and target lines.

USER INPUTS

Site: SJTC3
 Analyst: Betty Fetscher
 Date: 1/11/2010

Nutrient Concentrations (mg/L)

	Average	Minimum	Maximum
Ammonia-N	0.013166	0.013166	0.013166
Nitrite-N	0.0005	0.0005	0.0005
Nitrate-N	0.003002	0.003002	0.003002
Organic N	0.139332	0.139332	0.139332
Total N (calc)	0.156	0.156	0.156
Inorganic P	0.051417	0.051417	0.051417
Organic P	0	0	0
Total P (calc)	0.051417	0.051417	0.051417

Unshaded Solar Radiation (cal/cm²/d)

	Average	Minimum	Maximum
Enter manually	649	649	649
Estimate	Latitude: 33.54	Month Range: Jun - Jun	

Stream Inputs

Stream Depth (m)	0.223558
Stream Velocity (m/s)	0.03
Water Temperature (°C)	18.9
Days of Accrual (optional)	
Canopy Closure	<input type="checkbox"/> 0% <input type="checkbox"/> 20% <input checked="" type="checkbox"/> 40% <input type="checkbox"/> 80%

Method & Target Selection

Select Method: Revised QUAL2K, benthic chl a

Target Benthic Chl a (mg/m ²)	100
Corresponding Algal Density (g/m ² AFDW)	40

California Benthic Biomass Tool, v12 (July 2006)

RESULTS

Less than or equal to Target
 Greater than Target

Method	Max algal density, ave conditions (g/m ² AFDW)	Benthic chlorophyll a estimate (mg/m ²)
Standard QUAL2K	8	20
Revised QUAL2K	19	47
Revised QUAL2K with accrual adj	N/A	N/A
Dodds '97, mean Chl a	9	22
Dodds '97, max Chl a	28	70
Dodds '02, mean Chl a	11	27
Dodds '02, max Chl a	33	82

Max algal contribution to DO deficit (mg/L): 2.46

Revised QUAL2K, benthic chl a

Allowable TN-TP for target (line), Observed TN-TP (triangle)

TP (mg/L) vs TN (mg/L) plot showing observed data points and target lines.

Take Home Message

NNE “framework” consists of two components:

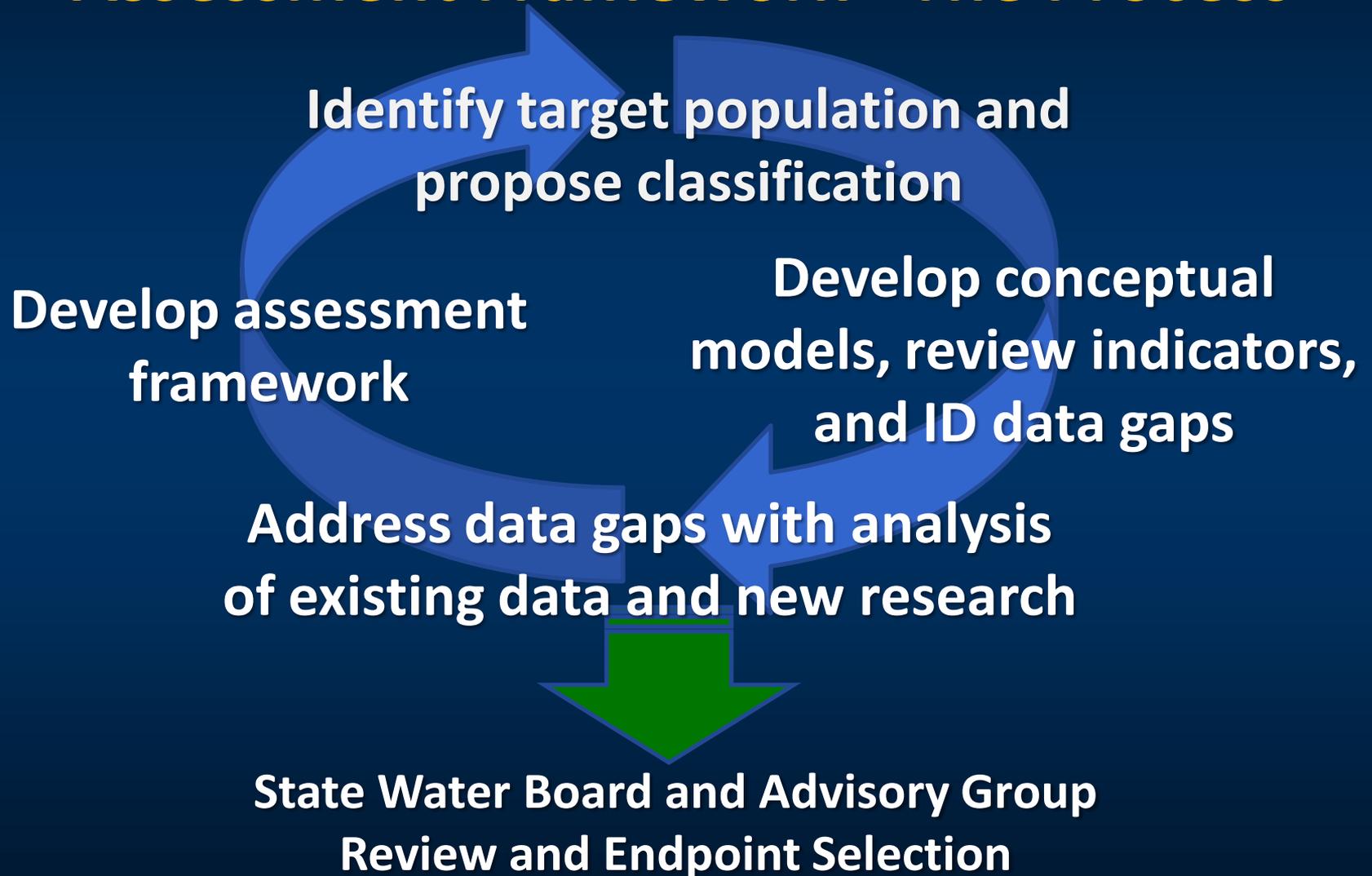
- Numeric endpoints – ecological response
- Tools to link ecological response indicators back to nutrients and other co-factors controlling response to eutrophication

NNE Indicators Vary By Waterbody Type

Waterbody Type	Status	Near-term Indicators
Streams	Endpoints and Tools drafted	Benthic algal biomass Dissolved oxygen pH
Lakes	Endpoints and Tools drafted	Phytoplankton biomass Dissolved oxygen pH
Enclosed Bays & Estuaries	Endpoints under development	Dissolved oxygen ?

What are the appropriate indicators and endpoints for California Estuaries?

Technical Basis to Develop Estuarine NNE Assessment Framework– The Process



E-NNE Development- Two Phases

Phase I:

- Development of NNE for selected indicators based on existing literature
- Majority of effort focused on “other” California estuaries

Phase II:

- Analysis of existing data and research to address data gaps for “other” estuaries
- Nutrient load-response tools
- Element of work plan focused on San Francisco Bay

Major E-NNE Products- Phase I

Phase I – Development of NNE for selected indicators based on existing literature

- Target definition and estuarine classification
- Literature review of candidate indicators
- Review of dissolved oxygen objectives
- Studies supporting NNE for macroalgae on intertidal flats
- Literature review and work plan for San Francisco Bay

SF Bay Literature Review and Workplan Development

- Process
- Geographic Scope
- Timeframe
- Technical Team- Short list

Developing NNE Workplan for SF Bay- Process

Science

- Form technical team
- Review literature on use of NNE candidate indicators in SF Bay
- Identify “promising” indicators, data gaps and recommended next steps

Developing NNE Workplan for SF Bay- Process

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- Form technical team
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Stakeholders

- Form SF Bay SAG
- Review NNE framework & background documents
- Provide feedback on SF Bay literature review, data gaps and prioritize next steps

Developing NNE Workplan for SF Bay- Process

Science

- Form technical team
- Review literature on use of NNE candidate indicators in SF Bay
- Identify “promising” indicators, data gaps and recommended next steps

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NNE Workplan for SF Bay

Geographic Scope of SF Bay Literature Review and Initial NNE Development

Figure 1-1 San Francisco Bay Basin



Timeframe for Effort

SF Bay Tech Team

SF Bay SAG



SF Bay Technical Team- Short List

- Lester McKee (SFEI)
- Rafael Kudela (UC Santa Cruz)
- Jim Cloern (USGS)
- Kathy Boyer (SFSU)
- Dick Dugdale (SFSU)
- Martha Sutula (SCCWRP)

Clearinghouse for NNE Documents

The screenshot displays the California Estuarine NNE Project website interface. The main navigation bar includes links for Home, About the NNE, Freshwater NNE, STRTAG, and a dropdown for California Estuarine NNE Project. A secondary navigation bar shows Home, About the NNE, Freshwater NNE, STRTAG, and SF Bay SAG. The page content is organized into several sections:

- What is the SF Bay SAG?**: A text-based section explaining the role of NNE Stakeholder Advisory Groups (SAG) and the formation of the SF Bay SAG.
- SF Bay SAG -Member List**: A list of members, including Brock Bernstein, Coastal SAG Facilitator, with contact information and an "Add person" button.
- SF Bay SAG Meeting Materials**: A list of meeting materials, including "SF Bay SAG mtng 10-04-10 agenda Final.DOC", with an "Add file" button.
- Comment and Message board**: A section for discussing topics, with an "Add topic" button.
- Inventory and Classification**: A section containing documents like "Interpretation of Definition Memo 07102009.pdf" and "Classification Study Plan-September 14 2009 fo...", with an "Add file" button.
- Candidate Indicator Reviews**: A section for candidate indicator reviews, including "Indicator Review Document -Outline..." and "So. Calif. Bight '08 Eutrophication Assessment", with an "Add file" button.

Each section includes an "options" dropdown menu and a "Close" button for the section header. The page also features a "Preview page" button and a "Members" dropdown in the top right corner.

<http://californiaestuarinenneproject.shutterfly.com/>

Questions? Comments?

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Proposed Groups

- Municipal dischargers
 - Bay/ Delta and by region of the Bay
- Industrial/refineries
- Agriculture
- Environmental
- Land owners/managers
- South Bay Salt Pond Restoration (CC/UFWS)
- Commercial and recreational fisheries

Action Items, Next Steps

- Confirm members and alternates
- Set date for first SF Bay SAG meeting- November