Work Element 2: Define The Problem

Activities Update

Click right and left arrows to scroll through activities. *Note*: Timeline dates are approximate

Task 2 Timeline [1]

Task 2.1 Develop Conceptual Models of Ecosystem Response to Nutrient Loads

The goal of this task is to develop conceptual models for SFB that characterize important processes linking nutrient and organic matter loading, biological responses, and indicators of adverse effects of nutrient over-enrichment.

The approach to nutrient objectives proposed for San Francisco Bay involves: 1) the use of response indicators to diagnose adverse effects from nutrient overenrichment in an assessment framework 2) the use of models to link response indicators to nutrient loads that will sustain and protect beneficial uses. The conceptual models developed in this task are needed to confirm appropriate indicators and their linkages to SF Bay beneficial uses; identify the spatial and temporal scales of importance in monitoring; and frame the questions that may eventually be explored through quantitative modeling efforts. The conceptual models will identify the key drivers/factors that need to be incorporated into models (e.g., internal processes of biogeochemical cycling of nutrients and carbon, including important internal sources and sinks, important physical drivers, and interactions between nutrients and other stressors). Because of the large differences in hydrography and nutrient dynamics between regions of the Bay, the Bay will be divided into a manageable number of segments and habitat-types, and conceptual models will be evaluated across these sub-embayments and habitat types.

Subtasks include:
• 2.1a Develop conceptual models of nutrient loads, cycling and response
Nutrient Conceptual Model Draft Final [2] 📄 Nutrient Conceptual Model Draft Final [3]
• 2.1b Update nutrient conceptual model

Task 2.1 - Subtasks Completion [4]
Chart omitted.

Task 2.2 Develop Problem statement and future scenarios

A problem statement will be developed for SFB that addresses the question "If SFB had a nutrient problem, how would it manifest itself?" A nutrient problem can take multiple forms, and the form(s) may vary by subembayment and habitat, and seasonally. The problem statement will address this spatial and seasonal variability, and be linked to beneficial use impairment.

With the problem statement identifying states of the SFB ecosystem that would result in beneficial use impairment, and the conceptual models from Task 2.1 serving as a framework for evaluating change, a list of plausible future scenarios for the Bay will be developed that identify changes that could lead to a problem, and scenarios under which a problem would be less likely to occur. Two broad categories of scenarios are envisioned: i) changes in management actions (e.g., increases or decreases in nutrient loads via various sources, changes in the timing or quantity of freshwater flows); and ii) changes in environmental factors outside of human control (e.g., changes in suspended sediment load and water clarity, changes in temperature, interannual variability in freshwater flow, large-scale climate forcings and climate change).

The combination of the conceptual models and evaluation of future scenarios will assist in visualizing the spectrum of current, suspected, or potential future sources of impairment.

Subtasks include:
• 2.2a Develop a problem statement for the Bay, and scenarios for future response Nutrient Conceptual Model Draft Final [3]
• 2.1b Update nutrient conceptual model

Task 2.2 - Subtasks Completion [5]
Chart omitted.

Task 2.3 Synthesize and Interpret Existing Ambient Water Quality Data and Identify Major Data or Conceptual Gaps in Bay Response to Nutrients

Through nearly 40 years of Bay-wide research by the USGS[1], and nearly 40 years of California-sponsored research and monitoring in northern San Francisco Bay and the Delta[2], there is an enormous archive of nutrient and phytoplankton related data. Some of this data has been analyzed in scientific publications. Other data has received limited attention to date.

This task will synthesize and interpret nutrient and phytoplankton-related data in SFB's subembayments. The data will be interpreted within the context of the conceptual models developed in Task 2.1, and where necessary conceptual models will be modified to reflect new insights. Goals will include: i) identifying spatial, seasonal, and temporal trends in ecosystem condition or response; ii) developing improved understanding of ecosystem response to nutrients; and iii) compiling and preparing data for eventual use in numerical modeling.

Based on analysis in Tasks 2.1-2.2, this task will also identify major data and knowledge gaps, and identify monitoring priorities and additional scientific investigation (e.g., Special Studies) that will be required in order to adapt conceptual models into quantitative models (Work Element 6).

Subtasks include:
• 2.3a Identify data/conceptual gaps related to adverse impacts from ammonium
[Suisun Synthesis I](#) [6] [Suisun Synthesis I](#) [7]
• 2.3b Identify data/conceptual gaps related to adverse impacts from altered nutrient forms/ratios
• 2.3c Identify data/conceptual gaps related to nutrient cycling and ecosystem resposne in Lower South Bay
• 2.3d Quantify nutrient transformations in the Delta
• 2.3e Characterize the influence of nutrients on phytoplankton community composition (lit review)
• 2.3f On-going data synthesis, interpretation and reporting

[Task 2.3 - Subtasks Completion](#) [8]
Chart omitted.

Task 2.4 Develop Nutrient Loading Conceptual Model

A conceptual model for external loads to SFB will be developed that considers major sources and pathways through the watershed, airshed, and oceanic sources. This conceptual model will identify differences in important loads between subembayments.

Subtasks include:
• 2.4a Develop a nutrient load conceptual model
[External Nutrient Loads to SF Bay](#) [9] [External Nutrient Loads to SF Bay](#) [10]
• 2.4b Update/refine nutrient load conceptual model

[Task 2.4 - Subtasks Completion](#) [11]
Chart omitted.

Task 2.5 Synthesize Existing Loading Data and Identify Data Gaps

The purpose of this task is to synthesize existing information to develop, to the extent possible, spatially and temporally explicit estimates of nutrient and organic carbon external loads via major pathways. This task will also identify major data gaps that contribute to current uncertainty in total loads, speciation of those loads, and the relative importance of various sources.

Subtasks include:
• 2.5a Estimate spatially and seasonally varying nutrient loads, as well as changes over time
[External Nutrient Loads to SF Bay](#) [9] [External Nutrient Loads to SF Bay](#) [10]
• 2.5b Develop a conceptual model and coarse estimates of nutrient loads to the Bay through exchange through the Golden Gate
[Ocean Nutrient Flux [DRAFT]](#) [12] [Ocean Nutrient Flux [DRAFT]](#) [13]
• 2.5c Refine POTW effluent load estimates
[POTW Load Estimates Yr 1 [DRAFT]](#) [14] [POTW Load Estimates Yr 1 [DRAFT]](#) [15]
• 2.5d Refine Delta loads estimates
• 2.5e Refine stormwater load estimates
[Task 2.5 - Subtasks Completion](#) [16]
Chart omitted.

[Task 2.1 - Subtasks Completion](#) [4]
Chart omitted.

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Links

[1] http://sfbaynutrients.sfei.org/content/task-2-timeline

[2] http://sfbaynutrients.sfei.org/files/nutrient-conceptual-model-draft-final

[3] http://sfbaynutrients.sfei.org/sites/default/files/SFBNutrientConceptualModel_Draft_Final_Oct2014.pdf

[4] http://sfbaynutrients.sfei.org/content/task-21

[5] http://sfbaynutrients.sfei.org/content/task-22

[6] http://sfbaynutrients.sfei.org/files/suisun-synthesis-i

[7] http://sfbaynutrients.sfei.org/sites/default/files/SuisunSynthesisI_Final_March2014.pdf

[8] http://sfbaynutrients.sfei.org/content/task-23

[9] http://sfbaynutrients.sfei.org/files/external-nutrient-loads-sf-bay

[10] http://sfbaynutrients.sfei.org/sites/default/files/NutrientLoadsFINAL_FINAL_Jan232014.pdf

[11] http://sfbaynutrients.sfei.org/content/task-24

[12] http://sfbaynutrients.sfei.org/files/ocean-nutrient-flux-draft

[13] http://sfbaynutrients.sfei.org/sites/default/files/Draft%20Report%20GG%20Nutrient%20Flux%2031Dec13.pdf

[14] http://sfbaynutrients.sfei.org/files/potw-load-estimates-yr-1-draft

[15] http://sfbaynutrients.sfei.org/sites/default/files/POTW_effluent_characterization_Yr1_DRAFT_Oct082013.pdf

[16] http://sfbaynutrients.sfei.org/content/task-25