Project Updates

December 9, 2009
TRC Meeting

Items

- Modeling Strategy and Workplan
- Year 1 Modeling Scope of Work
- Remote Sensing
- Guadalupe Watershed Model

Quick Updates

- **Remote Sensing**
  - Draft report to be presented to CFWG Jan 2010
- **Guadalupe Watershed Model**
  - On hold. Waiting for empirical results from related SPLWG and STLS projects
    - Land-use specific loads
    - Spreadsheet model
    - Prop 13 contaminant data
  - To resume 2nd qtr 2010
  - Technical Reports
    - Draft - Summer 2010
    - Final - December 2010

Goal

- To predict the effect of different management alternatives on:
    - contaminant loads from watersheds
    - recovery of contaminated areas on the Bay margin
   - recovery of the Bay as a whole

Priority Questions

1. **Bay Margins:** What is the contribution of contaminated Bay margins to Bay impairment and what are the projected impacts of management actions to Bay recovery?

2. **Recovery of the Bay:** What patterns of exposure are forecast for major segments of the Bay under various management scenarios?

3. **Small Tributary Loads:** Priority management questions regarding small tributary loading are listed in the Small Tributaries Loading Strategy. Watershed modeling will be needed to address questions 1, 2, and 4 from the Small Tributaries Loading Strategy.

Anticipated End Product

- The Bay model will consist of:
  - The core **hydrodynamic** model
  - A **sediment transport** model that includes interaction with the sediment bed
  - A **particle tracking** model - allows one to track the trajectories of contaminated particles
  - A **scalar transport** model – allows tracking of the transport of dissolved materials
  - A **biota** model - closely linked to physical model

Anticipated End Product

- Model will utilize a flexible grid
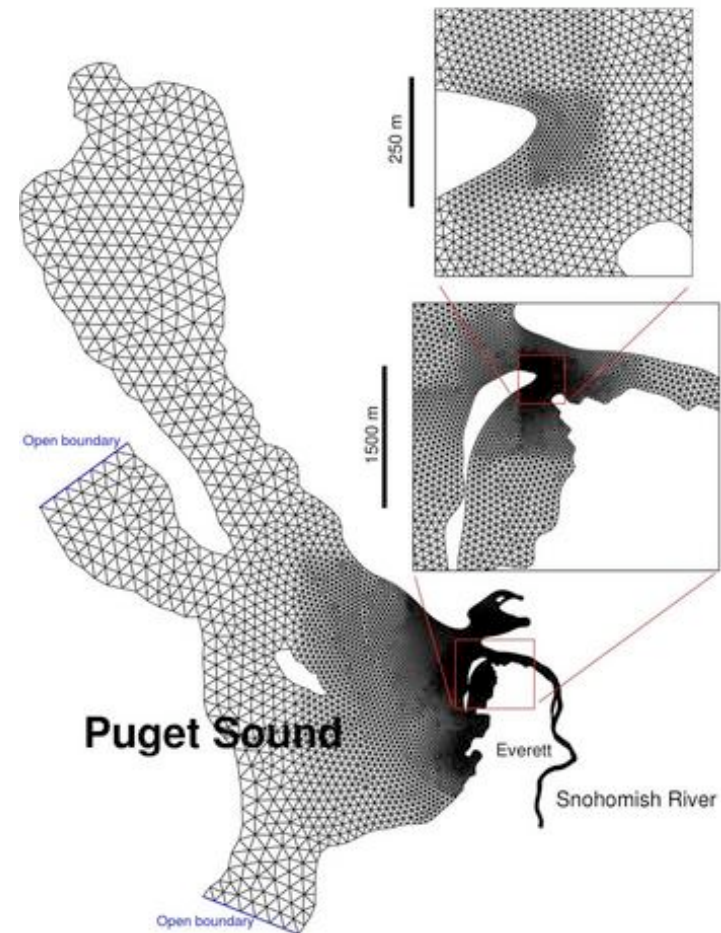
What Can Be Expected of the Model?

- improve understanding of the fate of sediment and contaminants that enter the Bay in the vicinity of a particular Bay margin

- project effects of management at a contaminated site or within the watersheds adjacent to a site

- project progress toward cleanup targets for a site, region, or segment under various management scenarios

- aid in identifying high-leverage small tributaries and understanding the mechanisms by which they contribute to Bay impairment

- identify and quantify major input and loss pathways for water, sediment and contaminants

- aid in the development of climate change adaptation strategies

How much better than multibox?
How much uncertainty in predictions
at different spatial scales?
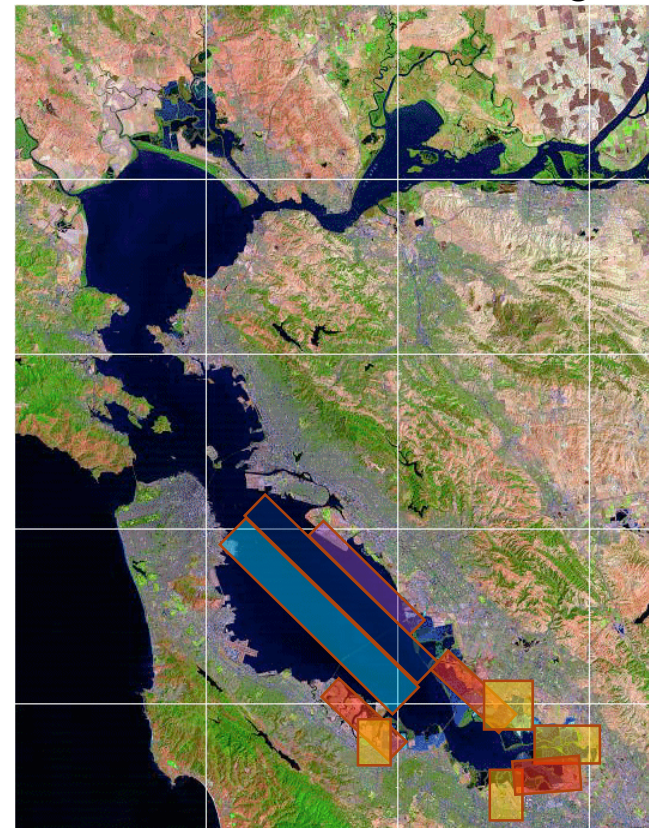
Bay "Boxes" and Linkages

Geographic Components

Central Bay, South Bay, North Bay,
Suisun Bay, Delta
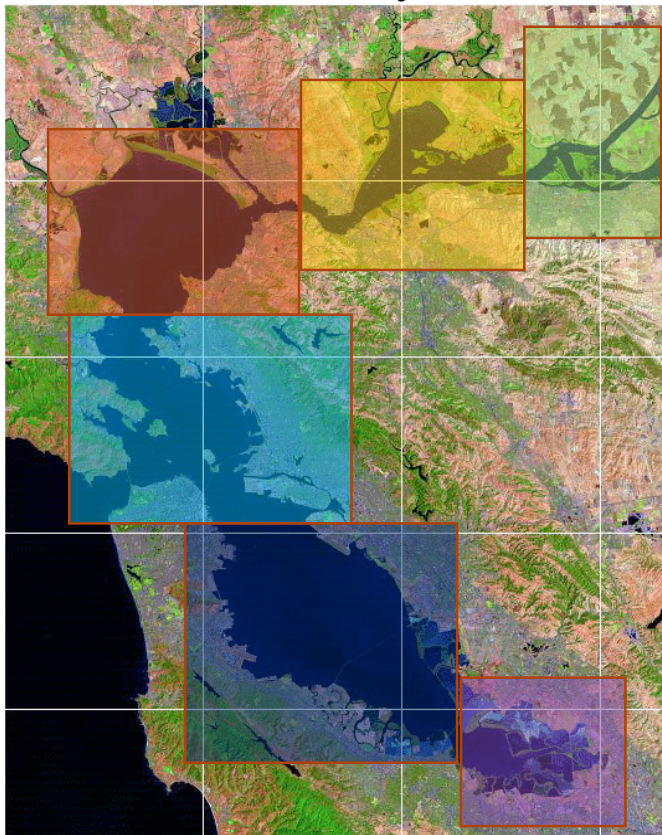
Habitat Components

Channels, Subtidal shoals, Intertidal,
Marshes, Perimeter Sloughs

Habitat-based decomposition more useful in
understanding processes and pathways

What Will Limitations Be?

- Model will not
  - Be a real-time operational model
  - Predict exact attributes of single events

- Rather, model will predict general attributes of a collection of similar events

How Will Model Be Tested & Verified?

- Hydrodynamic model
  - calibrated and validated using existing physical data (temperature, salinity, sea-surface elevation, currents).

- The sediment model
  - calibrated and validated using existing suspended sediment and bed sedimentation data

- Contaminant model
  - calibrated and validated using existing water column, sediment, and biota contaminant data

Initial results will guide future data collection efforts.

How Will Uncertainty Be Assessed?

- Statistically by running a number of model simulations while varying input parameters and assessing the central tendency of all model outcomes
  - e.g., Monte Carlo simulations

- Analyses will put confidence limits around model predictions.

Potential Future Data Needs?

- high-resolution bathymetry (especially in margins)
- flux measurements at the mouth of local tributaries
- flux measurements at key Bay constriction points (e.g. Dumbarton Bridge)
- sediment erosivity studies (flume studies)
- sediment cores
- contaminant monitoring in shallow margin areas
- improved watershed loads estimates (currently being addressed by the RMP SPLWG and the Municipal Regional Permit)

Coordination With Other Efforts

- USGS
  - Delft model : sediment transport at GG
  - CASCaDE : effects of environmental change on restored ecosystems
- Stanford & UCB
  - Hydrodynamics & sediment transport in South Bay

Why Not Use Existing Models?

- RMP is asking very specific, detailed questions. Customized model is needed to answer these specific questions.

Contribution Of Other Programs

- The Coastal Conservancy originally funded the same investigators (M. Stacey et al) to develop a model of South Bay.

  – funds frozen indefinitely

- Scope for the Conservancy funds is similar to RMP modeling strategy

  – anticipated that when (if) unfrozen the two projects will provide synergy to move things forward at an even faster pace

Commitment Of Our Collaborators

- RMP modeling workplan is highly dependent on our collaborators
  - RMP does not have the capacity to develop and maintain the proposed models without their help
- RMP staff have developed relationships with the modeling collaborators over the past five years
- Collaborators have expressed their intention to participate in this project over the next five years

Contingency Plan

- Hire a modeler, though this would significantly increase the cost of the workplan
  - Either contract or full-time hire
  - Full-time hire better for RMP capacity building.

- RMP should maintain working version of model code and inputs
  - wherever possible, request copies of all model code and input files from contractors

Tasks

Task	2009	2010	2011	2012	2013	2014	2015
Bay & Margins Modeling							
Margins Conceptual Model	$40,000*						
South Bay Water and "Sediment" Model		$100,000					
Biota Conceptual Model		$40,000					
Fieldwork to support South Bay Modeling			$50,000				
South Bay Sediment Model			$30,000				
Update South Bay Model With Empirical Results				$50,000			
South Bay Contaminant & Biota Models					$100,000		
Extend Model to Full Bay (Water and Sediment)						$100,000	
Add Contaminants and Biota to Full Bay Model							$140,000
Watershed Modeling							
Priority questions and detailed task descriptions addressed by the SPLWG							
Coordination							
Participation in or development of a Bay Area Modeling Forum		$5,000	$5,000	$5,000	$5,000	$5,000	$5,000

Budget Confidence: Budget has been vetted with our collaborators. Some changes have been made to tasks, so another round of vetting is in order.

South Bay Model - hydrodynamics, particle tracking, maybe sediments

Participants: Mark Stacey, Ed Gross, SFEI Staff
RMP Contribution: $100,000
Project Completion: Dec-2010

Objectives

- Develop extensions of the SUNTANS-SF Bay modeling framework to consideration of specific perimeter watersheds.

- Extensions motivated by desire to understand how sediments and contaminant sourced in small, local watersheds are transported and distributed under the influence of tidal, wind and buoyancy forcing.

Tasks

- Assess possible locations for studies
- Develop necessary grid and forcing information
- Perform preliminary transport studies for passive scalars and Lagrangian particles

Information Gained/Uncertainty Reduced

- Preliminary information on the exchange of material between watersheds, margins, and open bay.

- Preliminary prioritization of margins and watersheds based on data availability and management concerns.

- Identify information gaps and data needs for future RMP modeling efforts

Timeline

Presentations and Reports:

Q1 - Assessment of data availability; Identification of 3 study areas; Evaluation of time period to model.

Q2 - Acquire and process data; Grid generation at first location.

Q3 - Begin simulations at first location; Grid generation of second location.

Q4 - Begin simulations at second location; Grid generation of third location; Presentation of results.

Deliverables

Draft and final technical reports documenting:

- Model development
- Preliminary (un-verified) results
  - Maps of initial zones of settling/dilution
  - Estimates of flushing rates/residence times for select margin locations
- Model grid(s)
- Model input files
- Model code (pending discussions with Stanford regarding license agreement)