



The Harbor Toxics TMDL: Focused Scientific Studies and Modeling

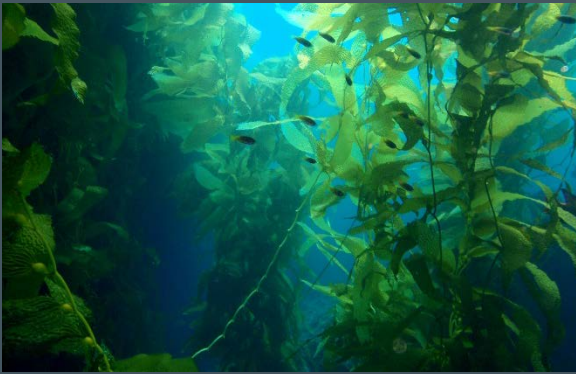
Presented by
Andrew Jirik, Port of Los Angeles
James Vernon, Port of Long Beach

June 8th, 2018

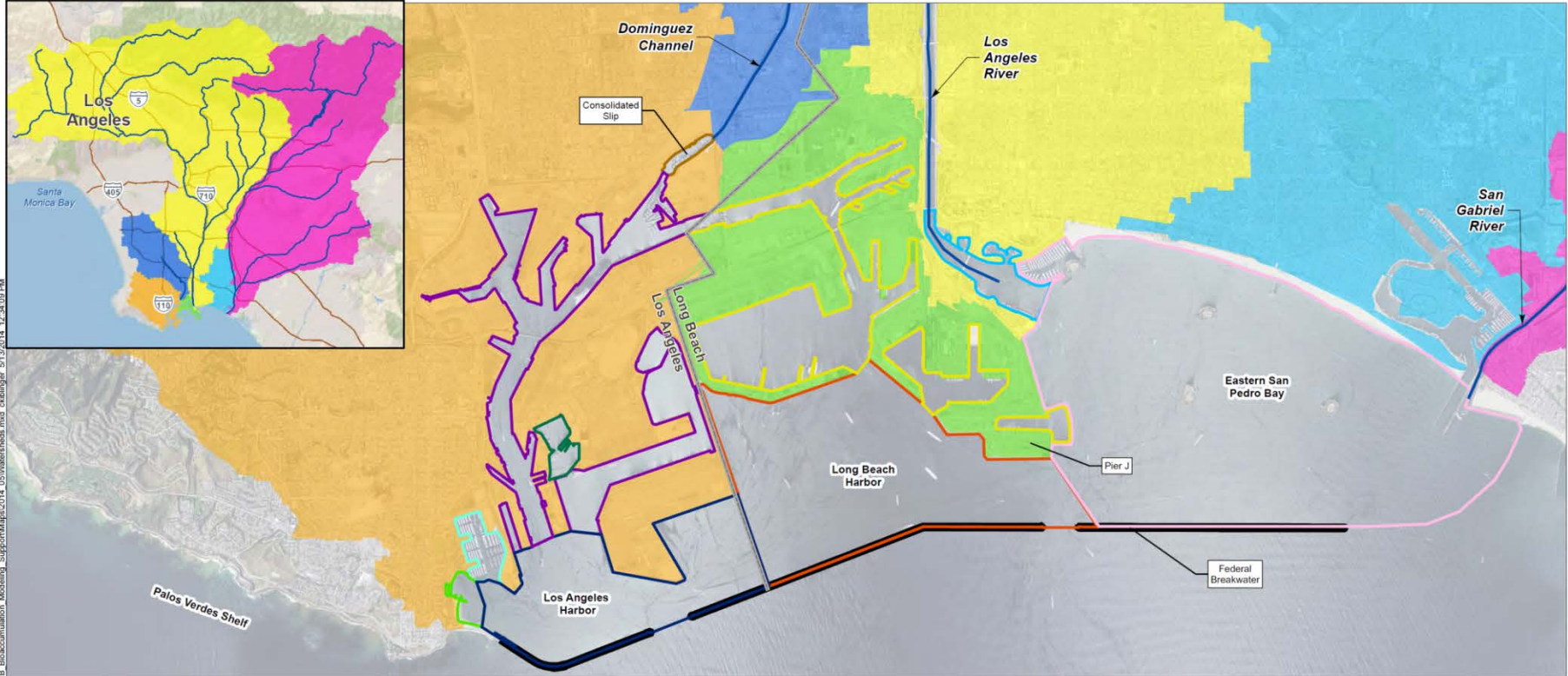
Dominguez Channel and Greater LA/LB Harbor Waters Toxics TMDL

- Impairments due to multiple constituents in sediment and fish
 - Water quality targets – California Toxics Rule criteria
 - Fish tissue targets – fish contaminant goals (OEHHA*)
 - Associated sediment targets based on San Francisco Bay (PCBs) and Newport Bay (DDTs) studies

* OEHHA = Office of Environmental Health Hazard Assessment, State of California



TMDL Waterbodies and Other Boundaries



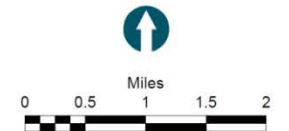
O:\0601120711-01_Port_of_Los_Angeles\POLA_POLB_Bioaccumulation_Monitoring_Support\Map\2014_05\Watersheds.mxd c:\abinger 5/13/2014 12:34:09 PM

- Dominguez Channel Watershed
- Los Angeles River Watershed
- POLA Watershed
- POLB Watershed
- San Pedro Bay Watershed
- San Gabriel River Watershed

- Federal Breakwater
- Jurisdictional Boundary

- TMDL Waterbodies**
- Fish Harbor
 - Los Angeles Harbor - Cabrillo Marina
 - Los Angeles Harbor - Consolidated Slip
 - Los Angeles Harbor - Inner Cabrillo Beach Area
 - Los Angeles Inner Harbor

- Los Angeles Outer Harbor (inside breakwater)
- Los Angeles River Estuary (Queensway Bay)
- Long Beach Inner Harbor
- Long Beach Outer Harbor (inside breakwater)
- Eastern San Pedro Bay



Overview

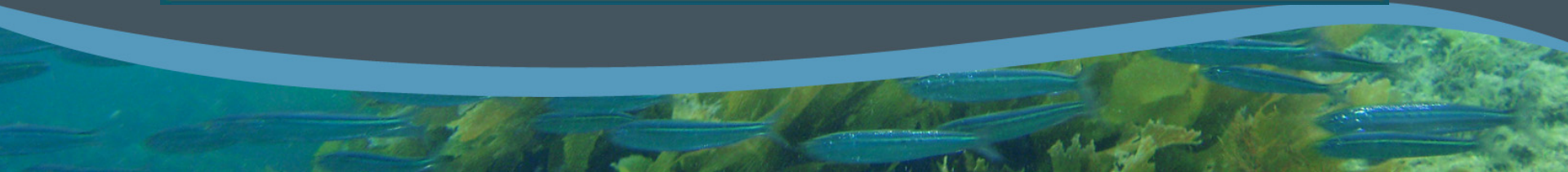
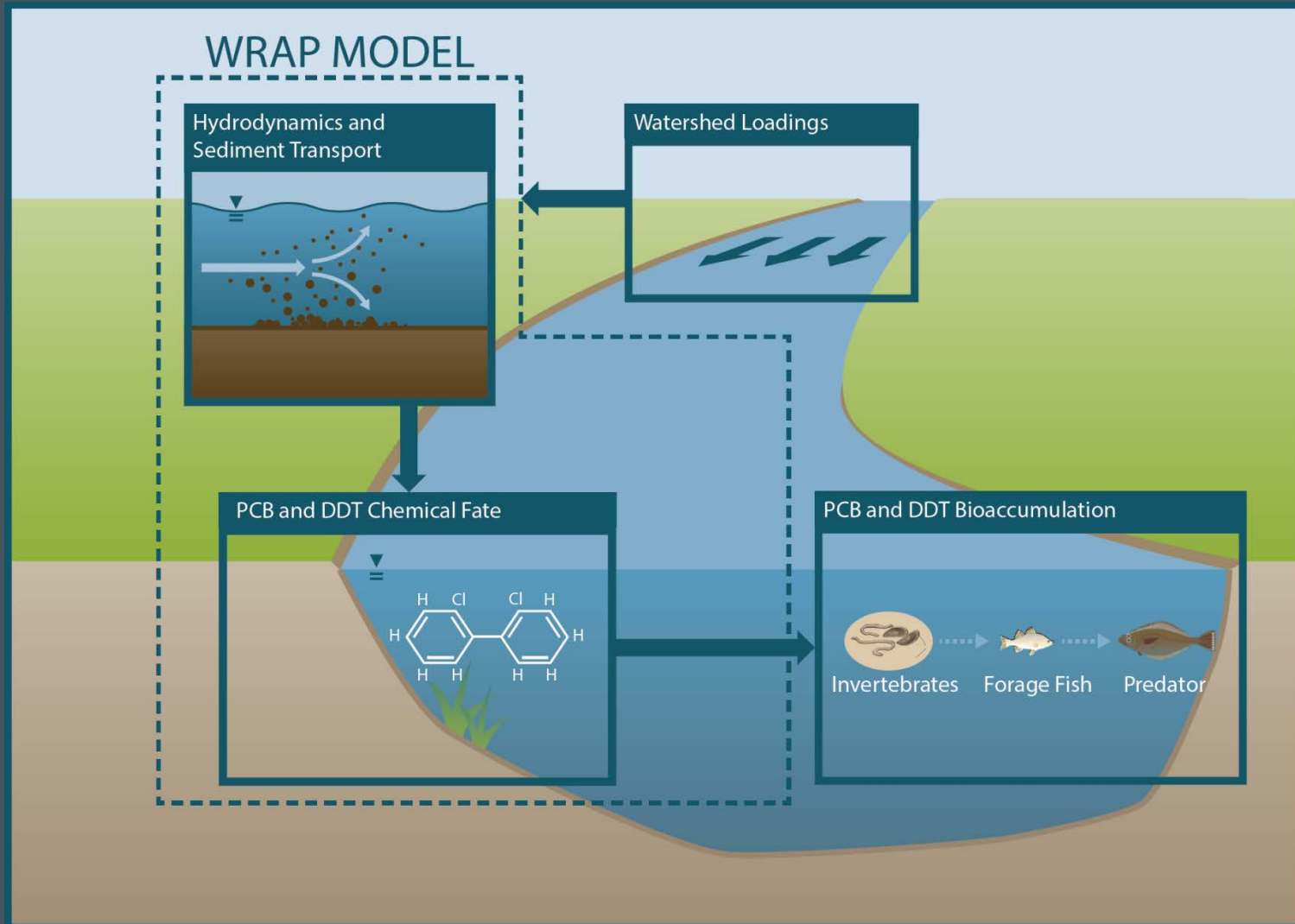
- The Ports developed a strategy to reduce fish tissue PCBs and DDX and meet the TMDL
- Strategy involves using linked computer models to simulate the Harbor
- Special study data required to calibrate and validate models
- Work in collaboration with Harbor Technical Working Group (HTWG) composed of Ports, Regional and State Board staff, and SCCWRP

Ports TMDL Program Goals

- Implement source reduction measures and determine most effective management strategies
- Conduct required TMDL monitoring (RMC)
- Develop the necessary science and tools
 - To understand linkages between sources and fish tissue impairments
 - To identify the most effective management actions for reducing fish tissue impairments
 - To provide the technical basis for modifications to the TMDL at the reconsideration (2018/19)

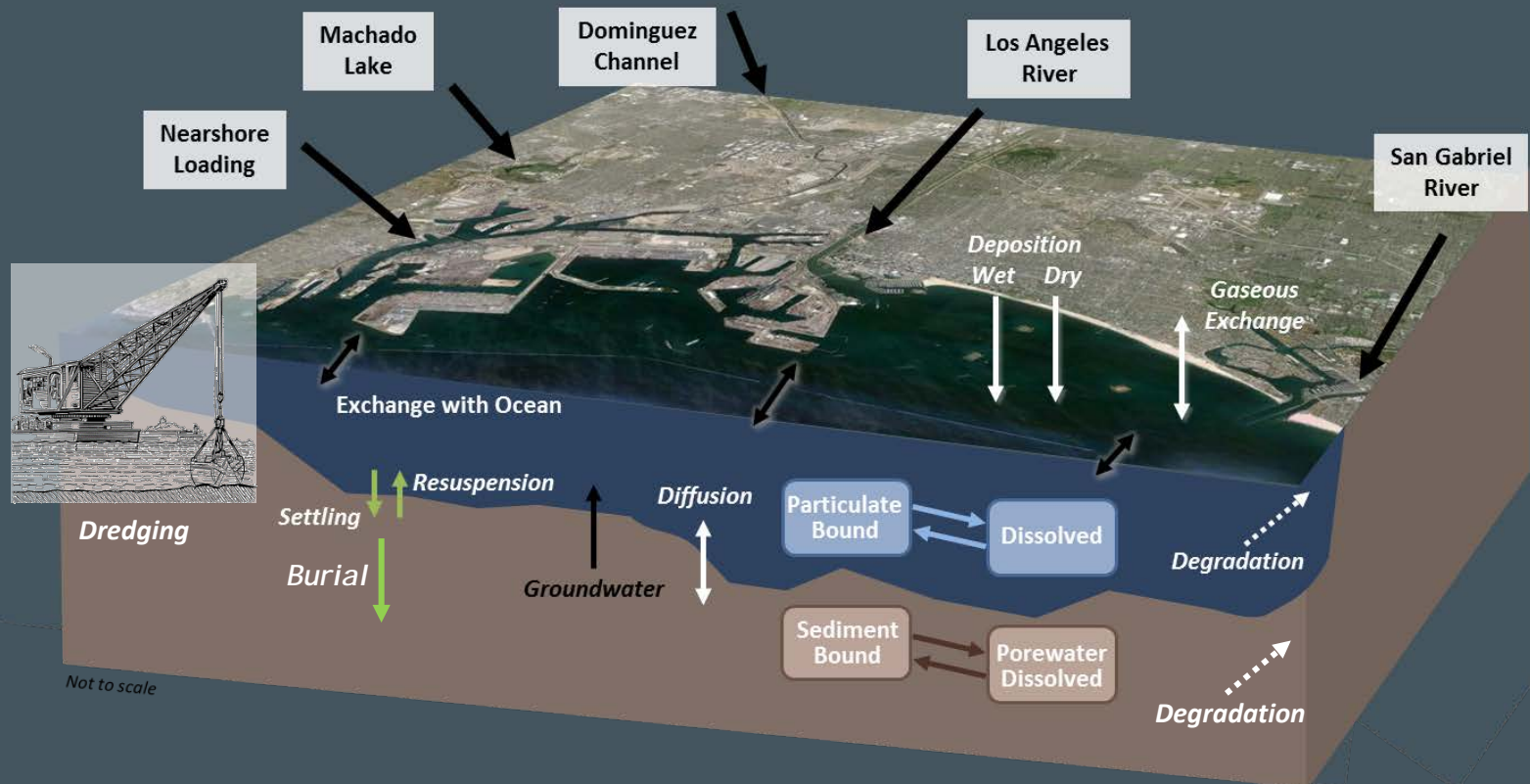


Overview of Modeling Approach



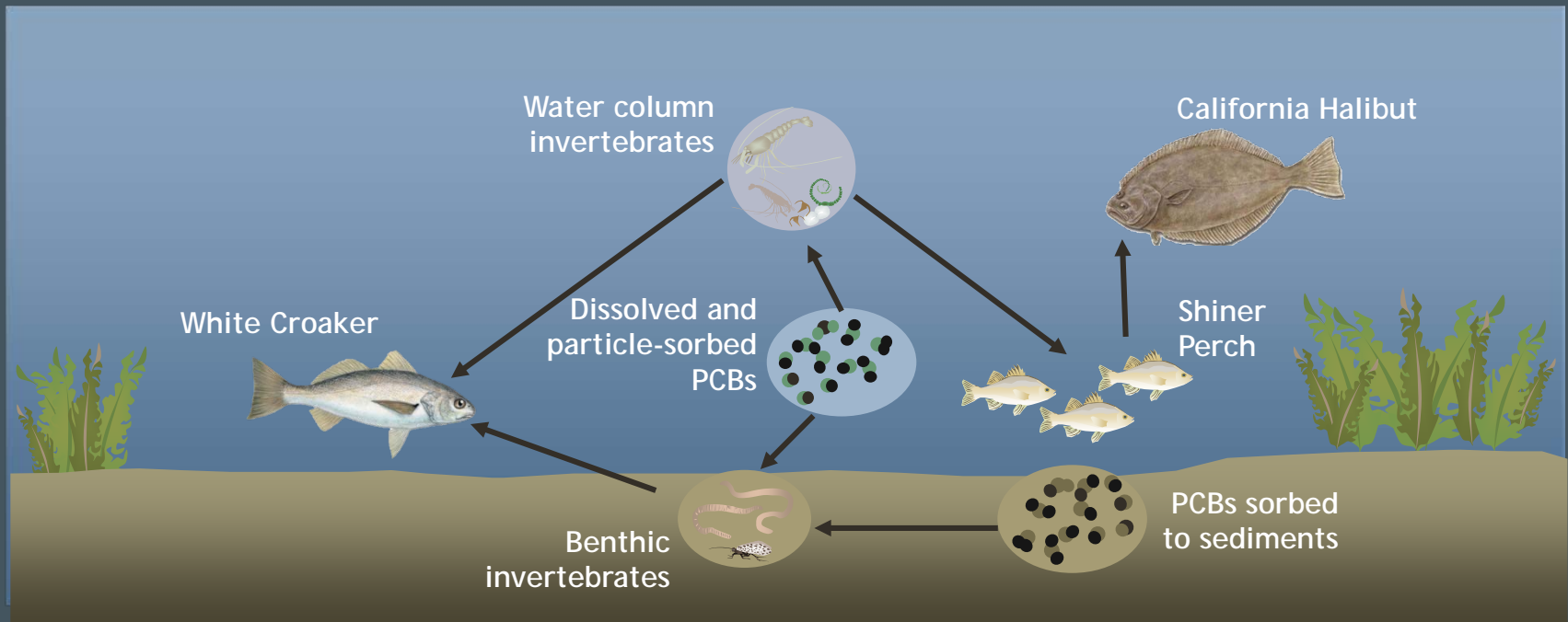
CSM for Chemical Fate

- Shows key processes affecting chemicals in Harbor water column and sediment

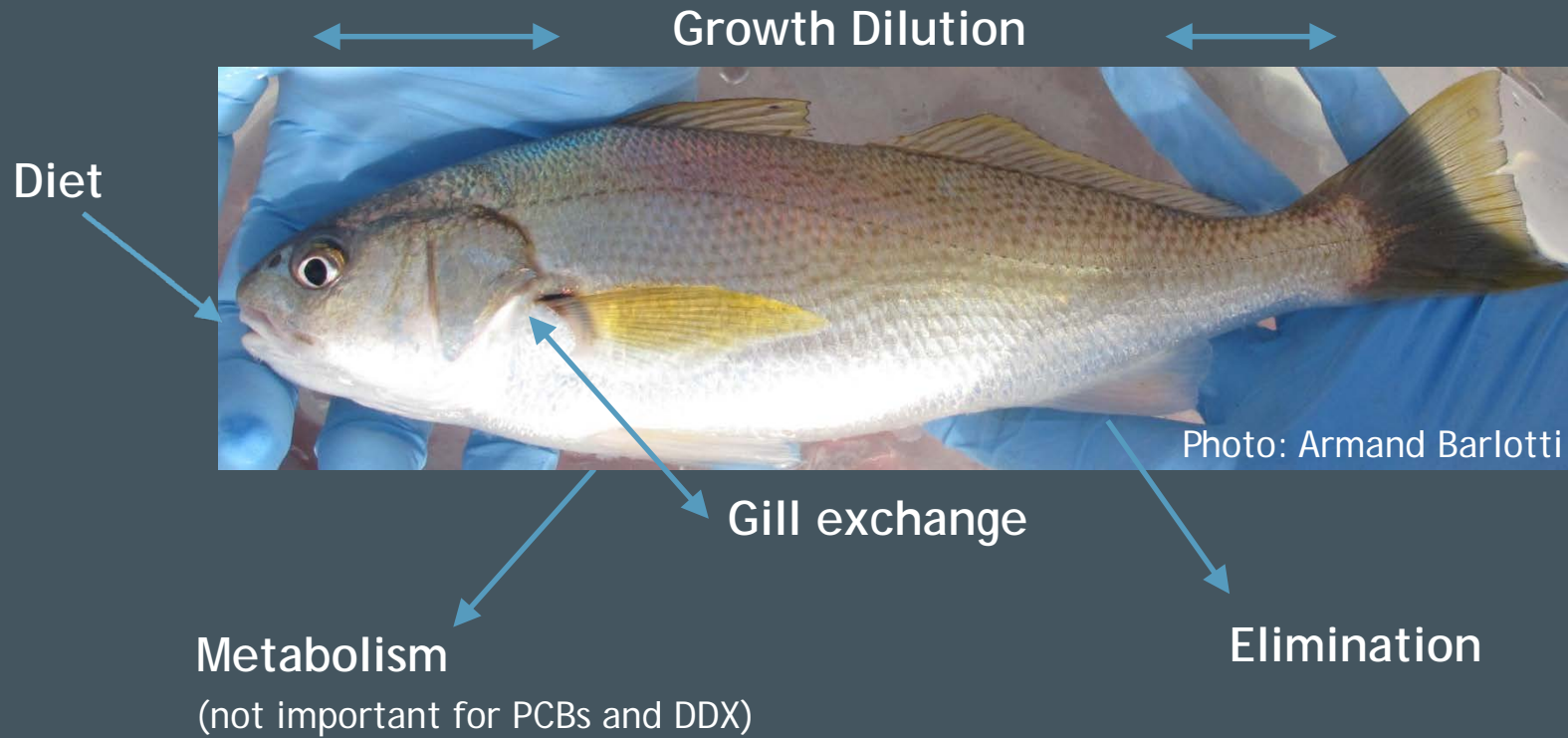


CSM for Bioaccumulation

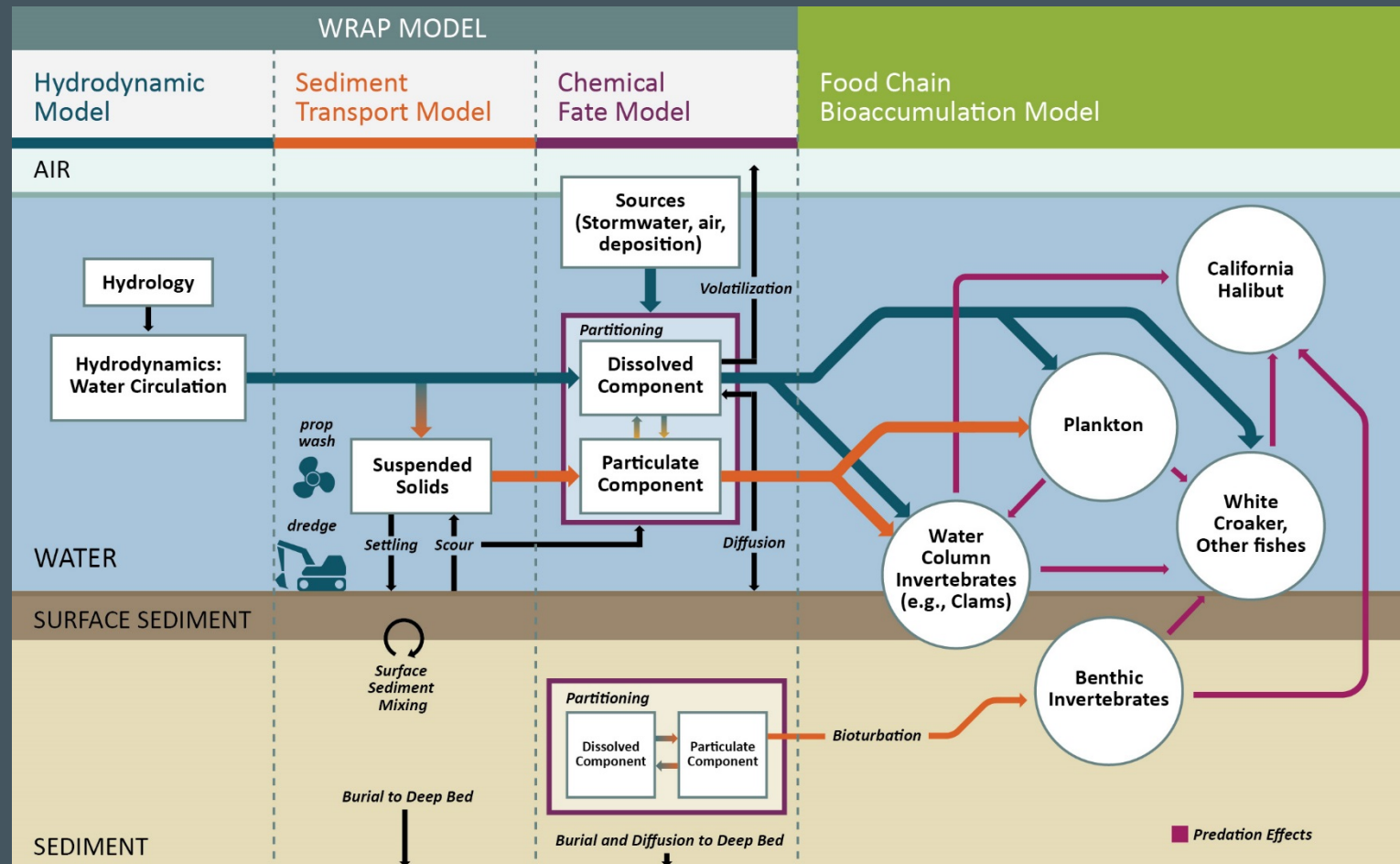
- Shows receptors of concern and key sources
- Fish accumulate PCBs and DDTs from water column and sediment sources



Bioaccumulation Model Key Processes



Modeling Framework



Special Studies Necessary for Model Development

- Hydrodynamic/sediment transport
 - Bathymetry, watershed loading, velocity (ADCP*), and propwash analysis
- Chemical fate
 - Gaps in surface sediment PCBs/DDTs and water column PCBs/DDTs
- Bioaccumulation
 - PCBs/DDTs in food web, food web structure, and fish movement
- Natural recovery rate estimation
- Regional background concentrations evaluation

* ADCP = Acoustic Doppler Current Profiler

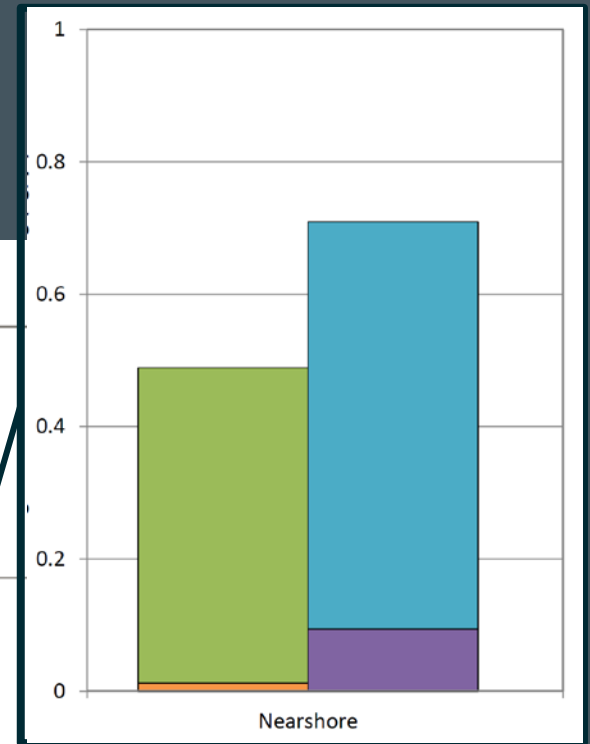
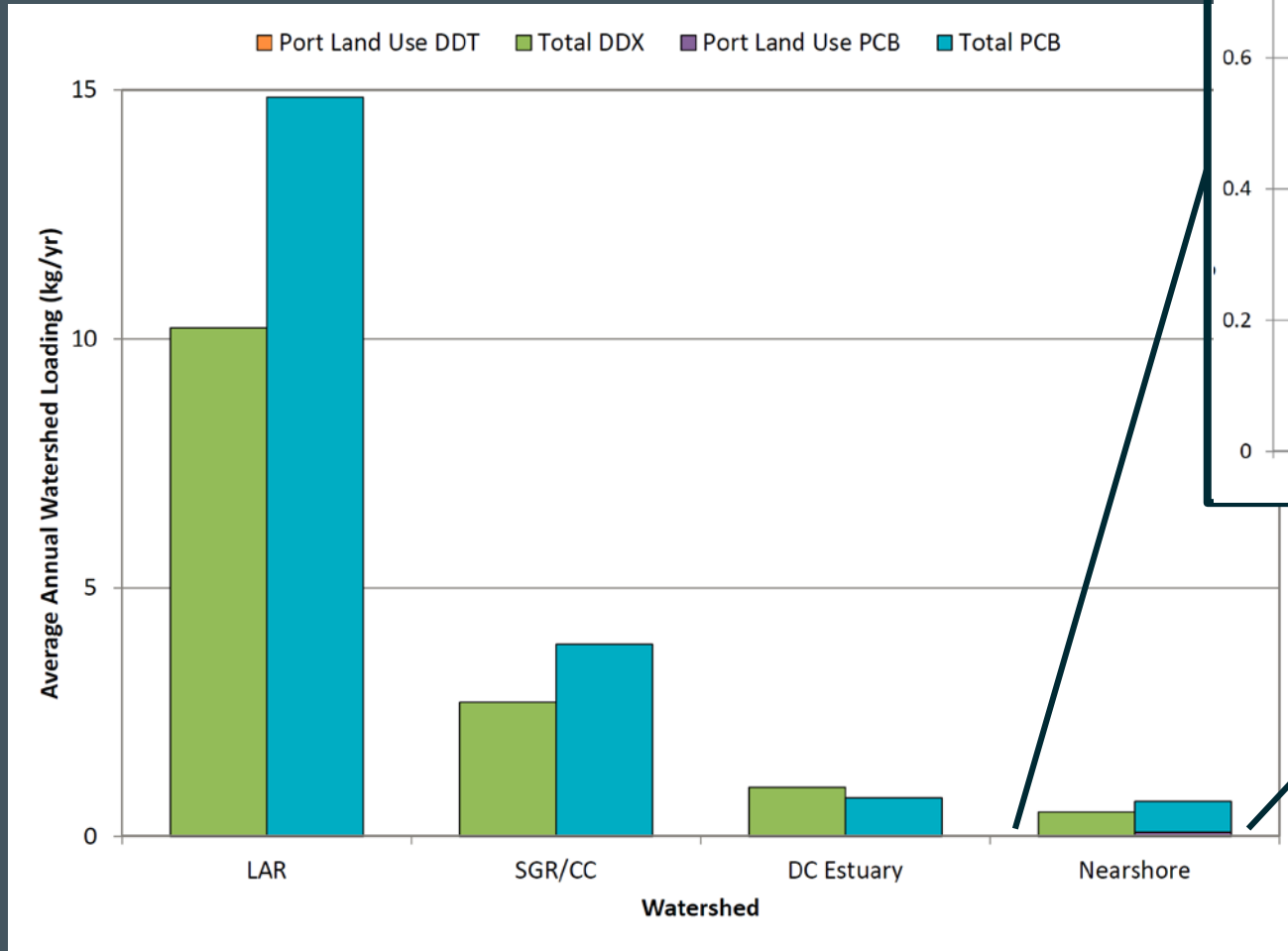


Watershed Loading Special Study

- Several sites sampled in the watersheds
- Numerous sampling events (2014 to 2015)
- High volume sampling
- Best analytical methods available



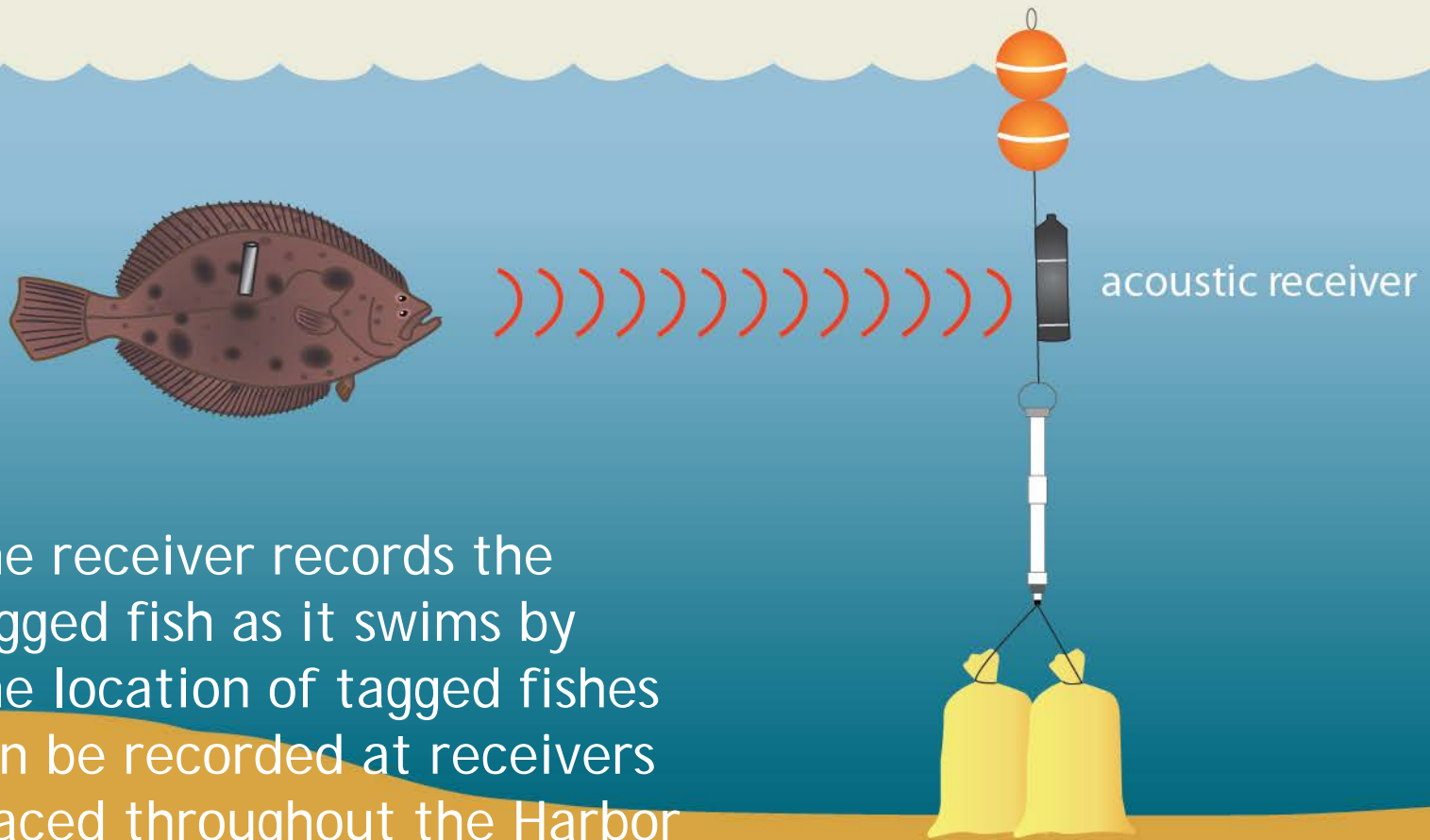
TPCB and TDDX Annual Loads



Fish Movement Study

- CSU Long Beach passive tracking study in Harbor
- Study overlapped with passive tracking study on Palos Verdes (PV) Shelf
- Used acoustic telemetry
 - Surgically placed coded tag in fish (white croaker)
 - Underwater receivers detect fish as they swim by
- CSU Long Beach also conducted an active tracking study





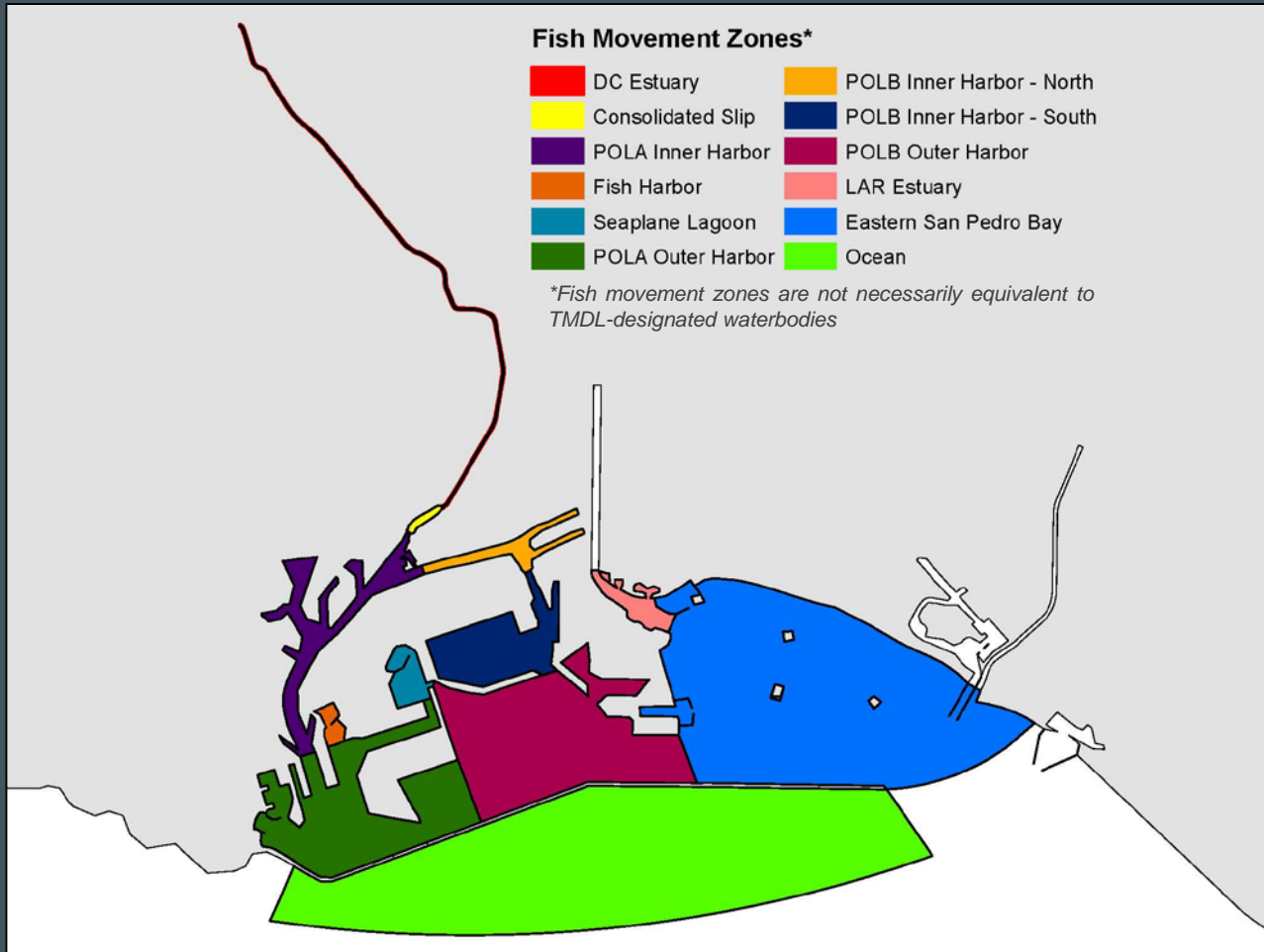
- The receiver records the tagged fish as it swims by
- The location of tagged fishes can be recorded at receivers placed throughout the Harbor



Receivers in Harbor and PV Shelf



Fish Movement Zones



Low Detection Limit Water Column Sampling

- Objective: to collect consistent, reliable, low-detection water column PCB/DDX data for WRAP Model calibration



Sampling Methods

SPME Sampling



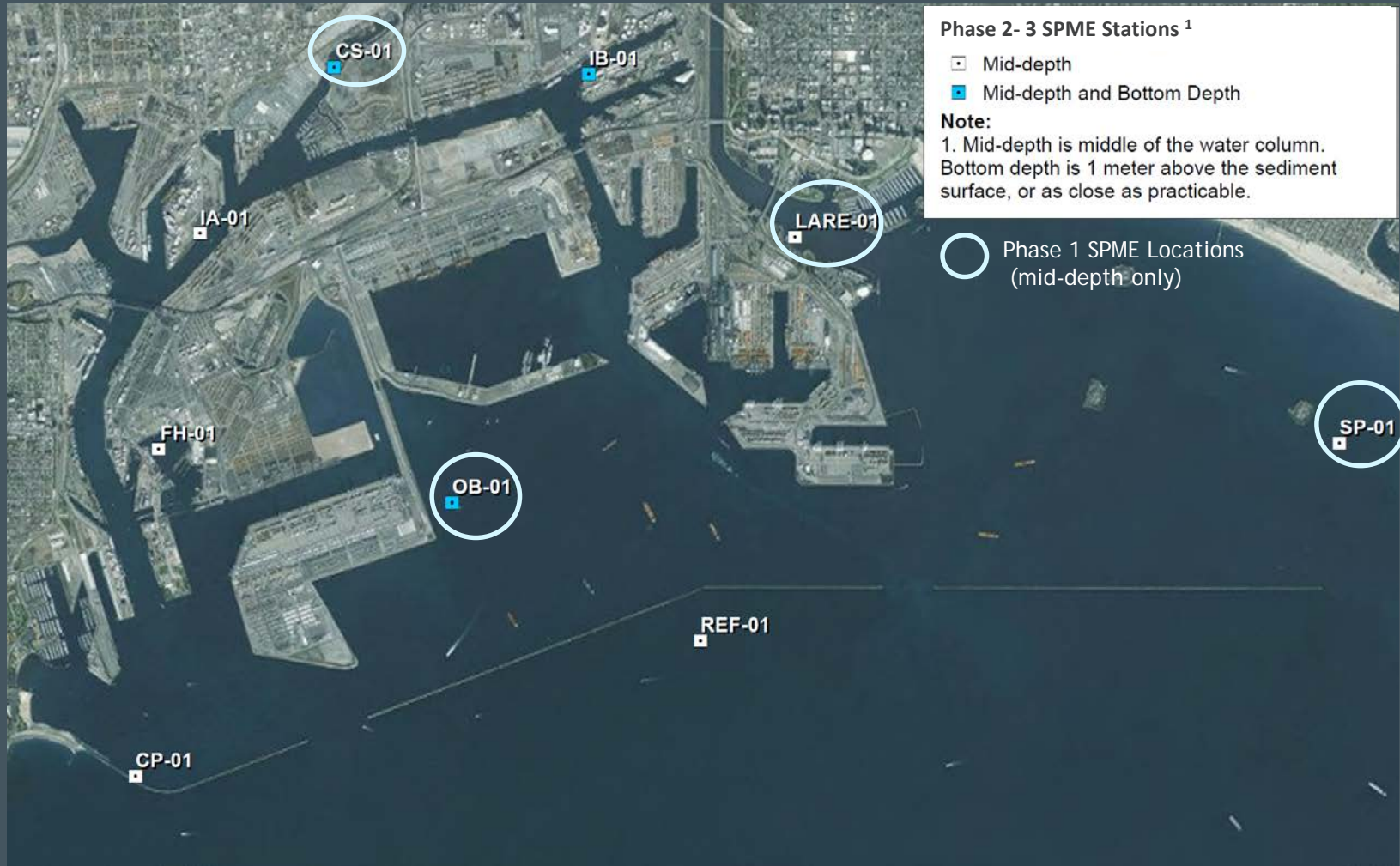
High Volume Sampling



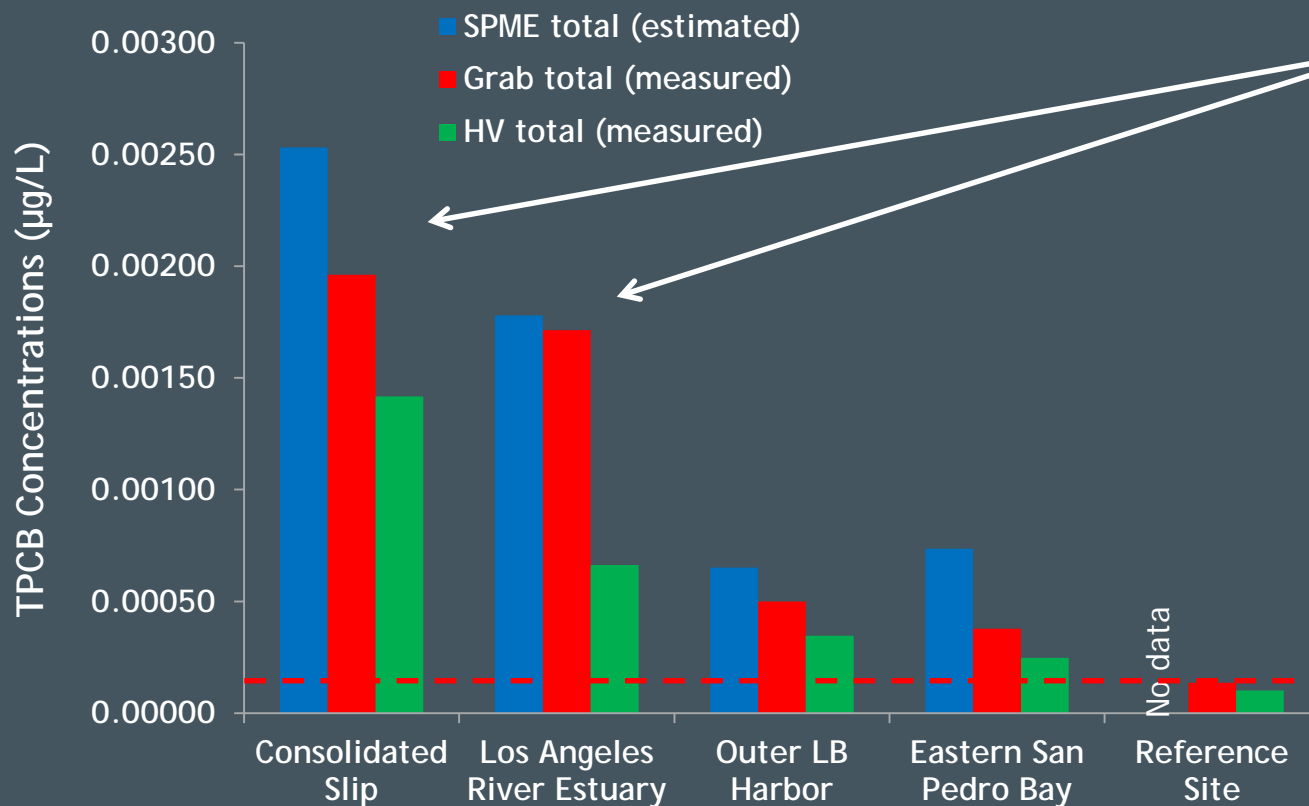
Van Dorn (Grab) Sampling



SPME Station Locations



Total PCBs Detected in Harbor Waters Using Three Methods



Summary:

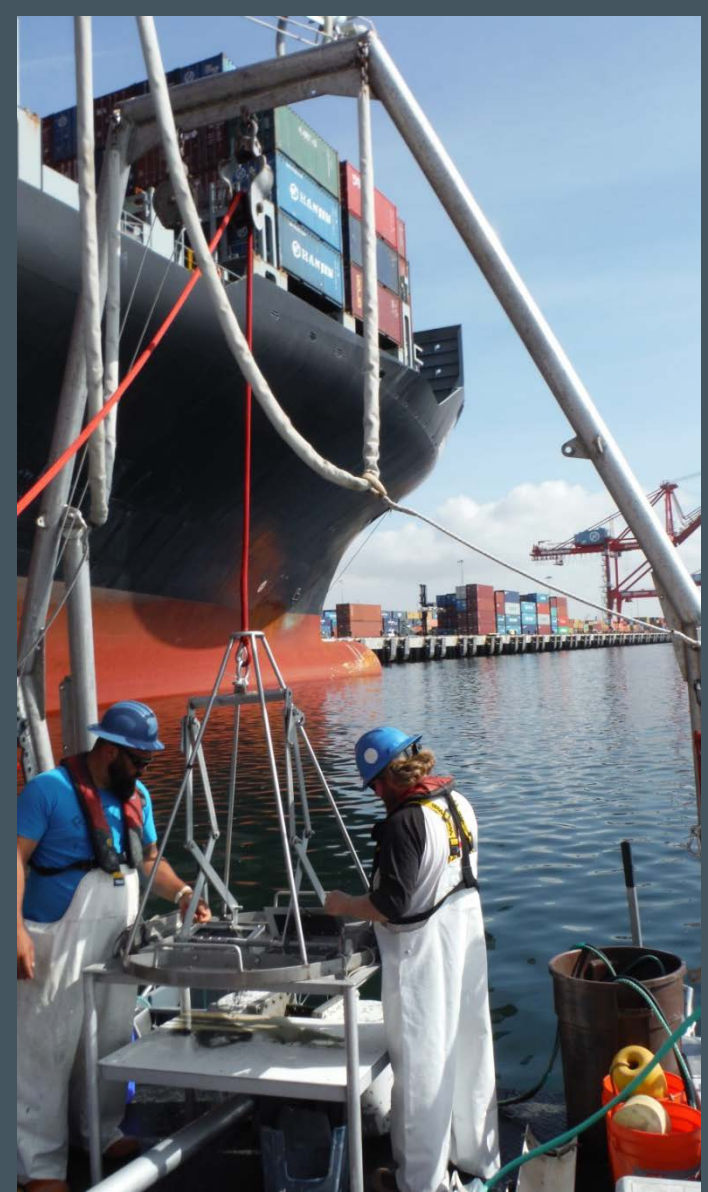
- Highest concentrations measured were near the major stormwater inputs
- All concentrations are at or above the CTR Human Health criterion ($0.00017 \mu\text{g/L}$)

HV = High Volume
SPME = solid-phase microextraction
TPCBs = Total PCBs



Surface Sediment Study

- Goals:
 - Supplement current surface sediment dataset
 - Fill spatial and temporal data gaps
 - Sample bioactive layer (top 5 cm)



Surface Sediment Special Study

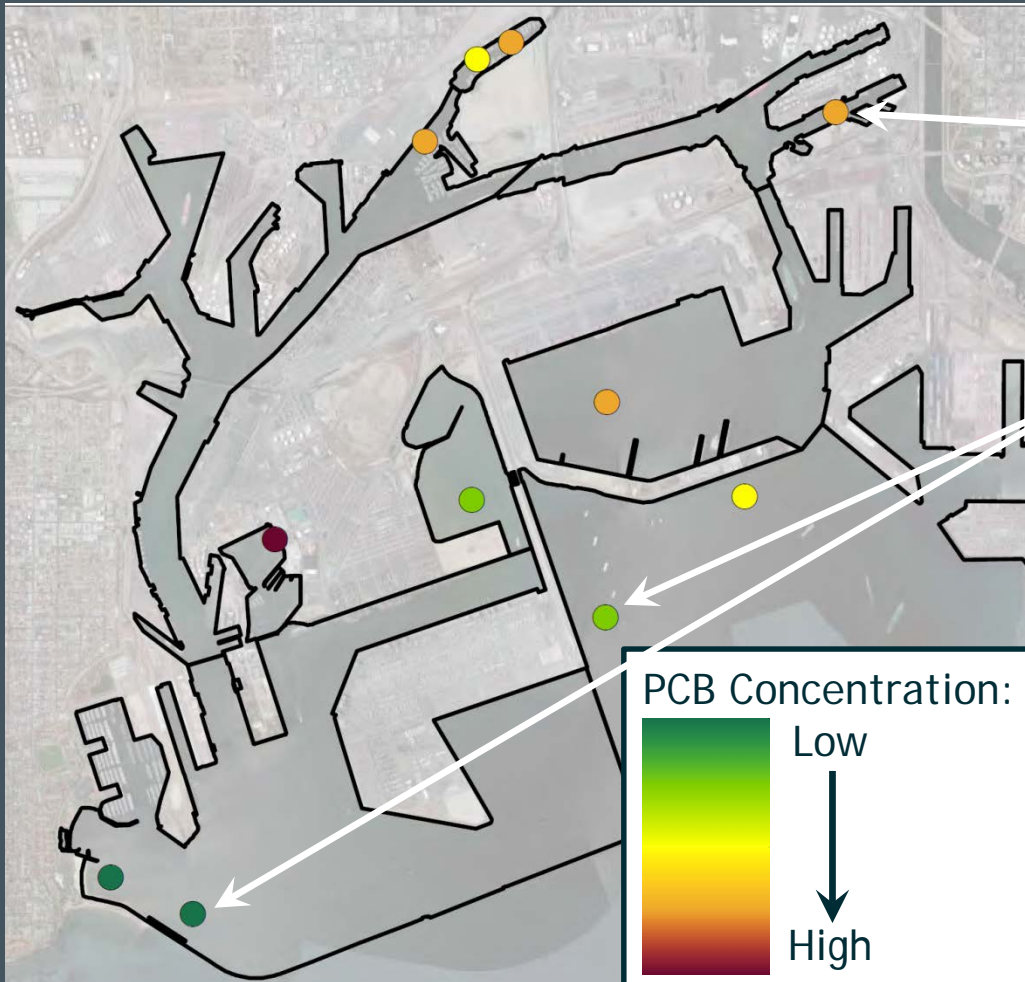
Summary:

- Higher PCB concentrations in Inner Harbor areas
- Lower PCB concentrations in Outer Harbor
- New data generally consistent with historical data



Food Web Special Study

Benthic Organism PCBs

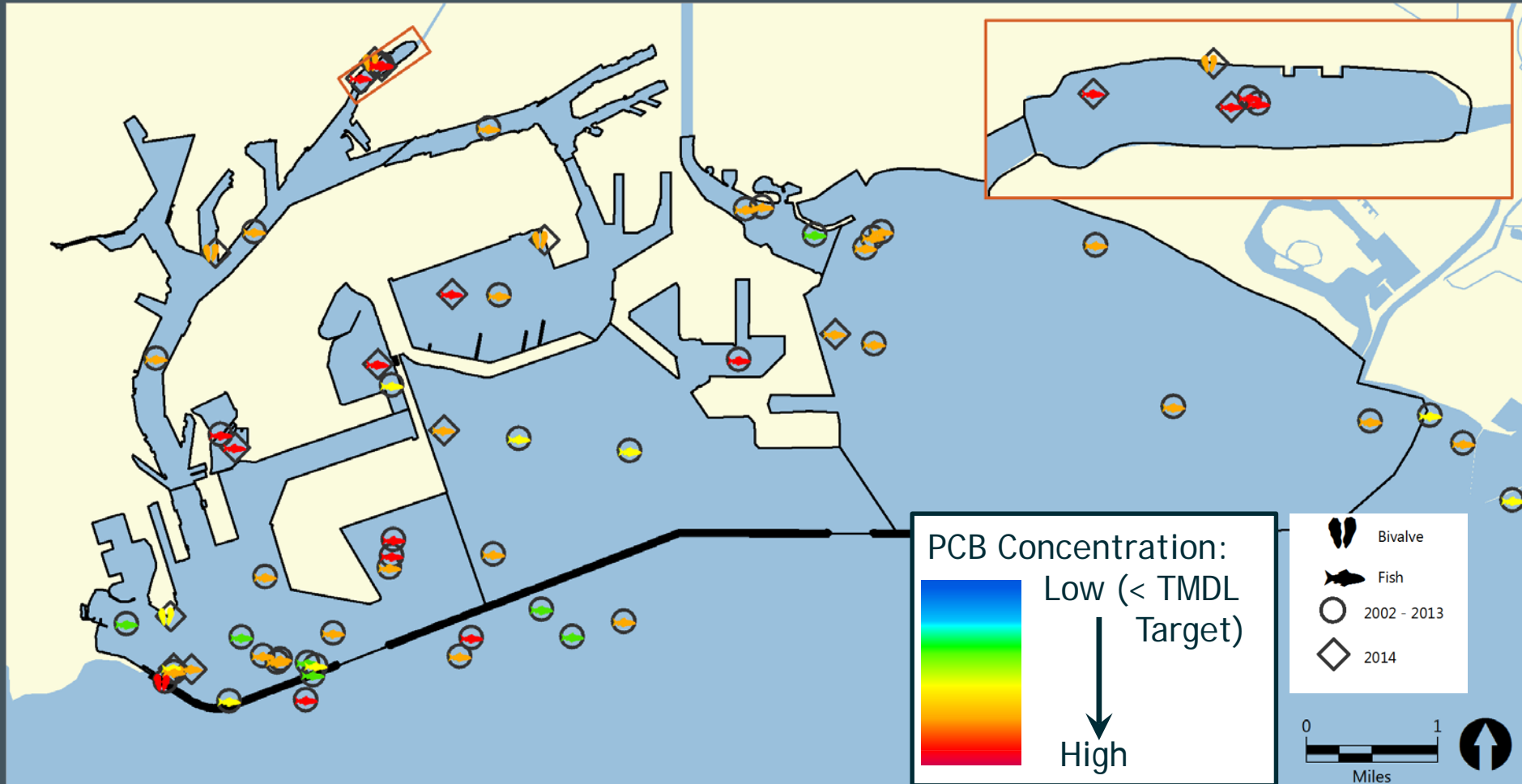


Summary:

- Higher PCB concentrations in Inner Harbor areas
- Lower PCB concentrations in Outer Harbor
- Pattern consistent with sediment PCB concentrations

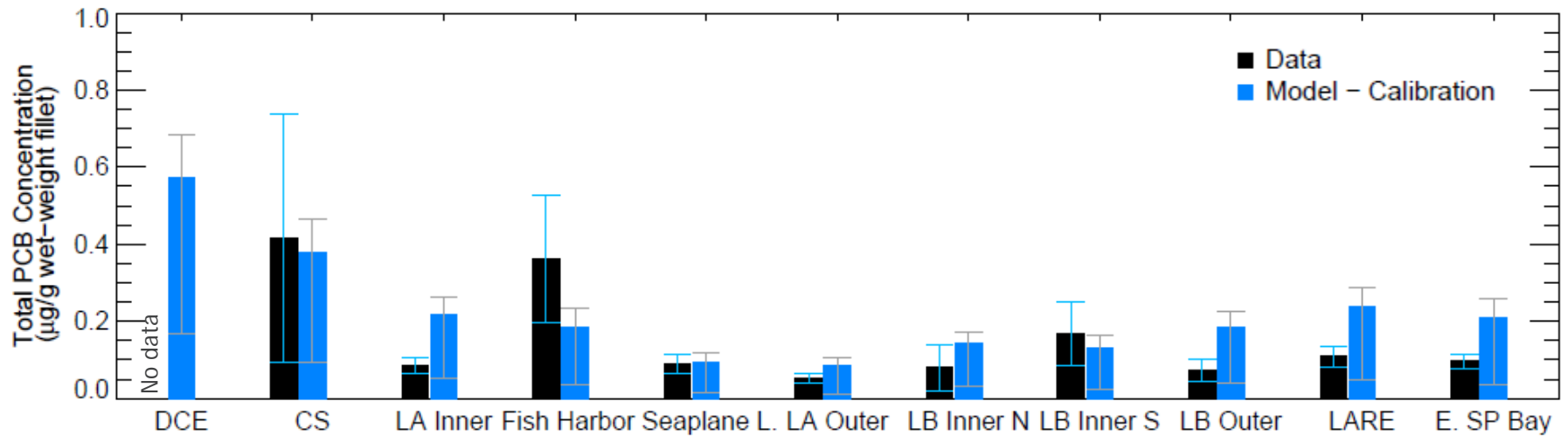


Food Web Special Study: *Fish and Bivalve PCBs*



Initial Model Performance

Steady-state Simulation of White Croaker PCBs



Summary:

- Good model performance
- Model-predicted concentrations are similar to measured concentrations in fish



Modeling Scenario Development

- Key elements for consideration in each modeling scenario
 - Watershed loadings at inflow boundary
 - Ocean water concentrations at ocean boundary
 - Post-dredge surface residual concentrations
 - Port operations
 - Configuration of terminals
 - Water depths
 - Vessel movements and types



Examples of Types of Modeling Scenarios

- Baseline (i.e., natural recovery and ongoing Port operations)
- Watershed loading reductions
- Remediation of named hot spots
- Combinations of future management actions



Summary

- Numerous special studies have been conducted by the Ports in order to understand the system and build a linked model
- The linked model has passed a peer review analysis
- The Ports are now using the model to run scenarios to determine effects of various management actions on reduction of fish tissue PCBs and DDTs

